

# FLTK 1.5.0 Programming Manual



By F. Costantini, M. Melcher,  
A. Schlosser, B. Spitzak, and M. Sweet.

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## Chapter 1

# FLTK Programming Manual



### **FLTK 1.5.0 Programming Manual**

By F. Costantini, M. Melcher, A. Schlosser, B. Spitzak and M. Sweet.

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<a href="#">Preface</a> <a href="#">Introduction to FLTK</a> <a href="#">FLTK Basics</a> <a href="#">Common Widgets and Attributes</a> <ul style="list-style-type: none"><li>• <a href="#">Colors</a></li><li>• <a href="#">Box Types</a></li><li>• <a href="#">Labels and Label Types</a></li><li>• <a href="#">Drawing Images</a></li></ul> <a href="#">Coordinates and Layout Widgets</a> <a href="#">How Does Resizing Work?</a> <a href="#">Designing a Simple Text Editor</a> <a href="#">Drawing Things in FLTK</a> <ul style="list-style-type: none"><li>• <a href="#">When Can You Draw Things in FLTK?</a></li><li>• <a href="#">What Units Do FLTK Functions Use?</a></li><li>• <a href="#">Drawing Functions</a></li><li>• <a href="#">Drawing Images</a></li><li>• <a href="#">Offscreen Drawing</a></li></ul> <a href="#">Handling Events</a> <ul style="list-style-type: none"><li>• <a href="#">Fl::event_*( ) methods</a></li><li>• <a href="#">Event Propagation</a></li></ul>	<a href="#">Adding and Extending Widgets</a> <a href="#">Using OpenGL</a> <a href="#">FLTK Runtime Options</a> <a href="#">Advanced FLTK</a> <a href="#">Unicode and UTF-8 Support</a>  <b>Appendices:</b> <ul style="list-style-type: none"><li>• <a href="#">Constants and Enumerations</a></li><li>• <a href="#">GLUT Compatibility</a><ul style="list-style-type: none"><li>– <a href="#">class Fl_Glut_Window</a></li></ul></li><li>• <a href="#">Forms Compatibility</a></li><li>• <a href="#">Operating System Issues</a></li><li>• <a href="#">Migrating Code from FLTK 1.3 to 1.4</a></li><li>• <a href="#">Software License</a></li><li>• <a href="#">Example Source Code</a></li><li>• <a href="#">FAQ (Frequently Asked Questions)</a></li></ul>
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# Chapter 2

## Preface

This manual describes the Fast Light Tool Kit ("FLTK") version 1.5.0, a C++ Graphical User Interface ("GUI") toolkit for UNIX, Microsoft Windows, and Apple macOS.

Version 1.4.0 introduced support for a new windowing system under Linux/Unix: Wayland. FLTK applications under Linux/Unix run unchanged as Wayland or X11 clients depending on availability at run-time.

Each of the chapters in this manual is designed as a tutorial for using FLTK, while the appendices provide a convenient reference for all FLTK widgets, functions, and operating system interfaces.

**This manual may be printed, modified, and/or used under the terms of the FLTK license provided in ↵ : [Software License](#).**

## 2.1 Organization

This manual is organized into the following chapters and appendices:

- [Introduction to FLTK](#)
- [FLTK Basics](#)
- [Common Widgets and Attributes](#)
- [Designing a Simple Text Editor](#)
- [Drawing Things in FLTK](#)
- [Handling Events](#)
- [Adding and Extending Widgets](#)
- [Using OpenGL](#)
- [FLTK Runtime Options](#)
- [Advanced FLTK](#)
- [Unicode and UTF-8 Support](#)
- [Constants and Enumerations](#)
- [GLUT Compatibility](#)

- [Forms Compatibility](#)
- [Operating System Issues](#)
- [Migrating Code from FLTK 1.3 to 1.4](#)
- [Developer Information](#)
- [Software License](#)
- [Example Source Code](#)

## 2.2 Conventions

This manual was generated using Doxygen (see <https://www.doxygen.org/>) to process the source code itself, special comments in the code, and additional documentation files. In general, Doxygen recognizes and denotes the following entities as shown:

- classes, such as `Fl_Widget`,
- methods, such as `Fl_Widget::callback(Fl_Callback* cb, void* p)`,
- functions, such as `fl_draw(const char *str, int x, int y)`,
- internal links, such as [Conventions](#),
- external links, such as <https://www.fltk.org/>.

Other code samples and commands are shown in `regular courier type`.

## 2.3 Abbreviations

The following abbreviations are used in this manual:

### X11

The X Window System version 11.

### Xlib

The X Window System interface library.

### Windows, WIN32

The Microsoft Windows Application Programmer's Interface for Windows 2000, Windows XP, Windows Vista, Windows 7 and later Windows versions. FLTK uses the preprocessor definition `__WIN32` for the 32 bit and 64 bit Windows API.

### macOS (aka Mac OS X), APPLE

The Apple desktop operating system macOS 10.0 and later. MacOS 8 and 9 support was dropped after FLTK 1.0.10. FLTK uses the preprocessor definition `__APPLE__` for macOS.

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## Chapter 3

# Introduction to FLTK

The Fast Light Tool Kit ("FLTK") is a cross-platform C++ GUI toolkit for UNIX®/Linux® (X11 and Wayland), Microsoft® Windows®, and Apple® macOS®.

FLTK provides modern GUI functionality without bloat and supports 3D graphics via OpenGL® and its built-in GLUT emulation. It was originally developed by Mr. Bill Spitzak and is currently maintained by a small group of developers across the world with a central repository on GitHub.

### 3.1 History of FLTK

It has always been Bill's belief that the GUI API of all modern systems is much too high level. Toolkits (even FLTK) are *not* what should be provided and documented as part of an operating system. The system only has to provide arbitrary shaped but featureless windows, a powerful set of graphics drawing calls, and a simple *unalterable* method of delivering events to the owners of the windows. NeXT (if you ignored NextStep) provided this, but they chose to hide it and tried to push their own baroque toolkit instead.

Many of the ideas in FLTK were developed on a NeXT (but *not* using NextStep) in 1987 in a C toolkit Bill called "views". Here he came up with passing events downward in the tree and having the handle routine return a value indicating whether it used the event, and the table-driven menus. In general he was trying to prove that complex UI ideas could be entirely implemented in a user space toolkit, with no knowledge or support by the system.

After going to film school for a few years, Bill worked at Sun Microsystems on the (doomed) NeWS project. Here he found an even better and cleaner windowing system, and he reimplemented "views" atop that. NeWS did have an unnecessarily complex method of delivering events which hurt it. But the designers did admit that perhaps the user could write just as good of a button as they could, and officially exposed the lower level interface.

With the death of NeWS Bill realized that he would have to live with X. The biggest problem with X is the "window manager", which means that the toolkit can no longer control the window borders or drag the window around.

At Digital Domain Bill discovered another toolkit, "Forms". Forms was similar to his work, but provided many more widgets, since it was used in many real applications, rather than as theoretical work. He decided to use Forms, except he integrated his table-driven menus into it. Several very large programs were created using this version of Forms.

The need to switch to OpenGL and GLX, portability, and a desire to use C++ subclassing required a rewrite of Forms. This produced the first version of FLTK. The conversion to C++ required so many changes it made it impossible to recompile any Forms objects. Since it was incompatible anyway, Bill decided to incorporate his older ideas as much as possible by simplifying the lower level interface and the event passing mechanism.

Bill received permission to release it for free on the Internet, with the GNU general public license. Response from Internet users indicated that the Linux market dwarfed the SGI and high-speed GL market, so he rewrote it to use X for all drawing, greatly speeding it up on these machines.

Digital Domain has since withdrawn support for FLTK. While Bill is no longer able to actively develop it, he still contributes to FLTK in his free time and is a part of the FLTK development team.

FLTK was later ported to Windows and macOS. FLTK 1.4 added a "driver based" system of virtual device drivers that enabled porting to Wayland as well. Drawing features include Windows GDI+, Cairo (Wayland and X11), and improved text layout with Pango.

There have been experiments using this driver system to build FLTK based on SDL2, Android, and other graphics systems based solely on simple pixel drawing, but this experimental code is not included in FLTK 1.4. There are thoughts to enable more platforms in later FLTK versions.

FLTK 1.5 removed autotools (configure + Makefile) support in favor of exclusive use of CMake to generate the build files. FLTK 1.5 allows to use a basic set of C++ features from the C++11 standard.

## 3.2 Features

FLTK was designed to be statically linked. This was done by splitting it into many small objects and designing it so that functions that are not used do not have pointers to them in the parts that are used, and thus do not get linked in. This allows you to make an easy-to-install program or to modify FLTK to the exact requirements of your application without worrying about bloat. FLTK works fine as a shared library, though, and is included with several Linux distributions.

Here are some of the core features unique to FLTK:

Note: sizes given below are mostly from 32-bit systems and FLTK 1.1 or earlier, this list needs updates for current FLTK 1.5 (64-bit).

- `sizeof(Fl_Widget) == 64` to `92` (120 in FLTK 1.4 on 64-bit Linux).
- The "core" (the "hello" program compiled & linked with a static FLTK library using gcc on a 486 and then stripped) is 114K. (FLTK 1.4 on 64-bit Linux: 1.1 MB).
- The FLUID program (which includes every widget) is 538k. (FLTK 1.4 with more widgets on 64-bit Linux: 2.3 MB and 2.0 MB on 32-bit Windows).
- Written directly atop core libraries (Xlib, Wayland, Windows or Cocoa) for maximum speed and carefully optimized for code size and performance.
- Precise low-level compatibility between the X11/Wayland, Windows, and macOS versions - only about 10% of the code is different.
- Interactive user interface builder program FLUID. Its output is human-readable and editable C++ source code.
- Support for overlay hardware, with emulation if none is available. Note: hardware support has been removed in 1.4.0.
- Very small & fast portable 2-D drawing library to hide Xlib, Cairo, Windows, or macOS Quartz. Since FLTK 1.4 Wayland graphics use Cairo for drawing. This is optionally available for X11 drawing as well.
- OpenGL/Mesa drawing area widget.
- Support for OpenGL overlay hardware on both X11 and Windows, with emulation if none is available.
- Text widgets with cut & paste, undo, and support for Unicode text and international input methods.
- Compatibility header file for the GLUT library.
- Compatibility header file for the XForms library.

## 3.3 Licensing

FLTK comes with complete free source code. FLTK is available under the terms of the [GNU Library General Public License](#) with exceptions that allow for static linking. Contrary to popular belief, it can be used in commercial software - even Bill Gates could use it!

## 3.4 What Does "FLTK" Mean?

FLTK was originally designed to be compatible with the Forms Library written for SGI machines. In that library all the functions and structures started with "fl\_". This naming was extended to all new methods and widgets in the C++ library, and this prefix was taken as the name of the library. It is almost impossible to search for "FL" on the Internet, due to the fact that it is also the abbreviation for Florida. After much debating and searching for a new name for the toolkit, which was already in use by several people, Bill came up with "FLTK", including a bogus excuse that it stands for "The Fast Light Toolkit".

## 3.5 FLUID

FLTK comes bundled with FLUID. FLUID, short for Fast Light User Interface Designer, is a graphical editor capable of generating C++ source code and header files ready for compilation. These files ultimately create the graphical user interface for an application.

The FLUID User Handbook is available at <https://www.fltk.org/documentation.php>. It can also be compiled from the FLTK source repository using the `fluid_docs` target in the CMake build environment.

## 3.6 Building and Installing FLTK with CMake

Starting with version 1.4, the **recommended** FLTK build system was CMake. Since FLTK 1.5.0 CMake is the **only** available build system for FLTK.

CMake is a "Build System Generator" that can generate build environments for usage with Ninja, Make, and many more, for instance several IDE's. See file README.CMake.txt of the FLTK source tree for more information.

By default CMake will look for a C++ compiler named `CC`, `c++`, `g++`, or `gcc`. To use another compiler you can set the `CXX` and `CC` environment variables for the C++ and C compiler, respectively. The code to use depends on your shell, for instance:

```
CXX=clang++; export CXX
setenv CXX "clang++"
CC=clang; export CC
setenv CC "clang"
```

Then execute CMake like

```
cd /path/to/fltk
cmake . -B build [ -G <GENERATOR> ] [ options ... ]
```

Note that you can also specify the compiler and build tools on the CMake command line or in the CMake GUI.

When CMake is done you can just run CMake again to build the FLTK library, fluid, fltk-options (setup tool), and all test programs, depending on the configuration.

```
cmake --build build
```

To install the library, become root and type "cmake --install build". This will copy the "fluid" executable to "bindir", the header files to "includedir", and the library files to "libdir".

## 3.7 Building FLTK Under Microsoft Windows

NOTE: This documentation section is currently under review. More up-to-date information for this release may be available in the files "README.Windows.txt" and "README.CMake.txt" and you should read these files to determine if there are changes that may be applicable to your build environment.

FLTK 1.5 is **officially supported** on Windows 10 (11) and later. We don't intend to remove the ability to build and run FLTK 1.5 programs on older Windows versions but the FLTK Team can't build and test on Windows systems that are no longer supported by Microsoft. Therefore, such older systems (including Windows 10, starting in Oct. 2025, when Microsoft does no longer support Windows 10) may work with FLTK or not.

### Note

FLTK 1.4 is known to work on Windows (2000,) 2003, XP, and later. The main prerequisite is that the OS version supports UTF-8. FLTK 1.4 is also known to work on recent versions of Windows such as Windows 7, Windows 8/8.1, Windows 10, and Windows 11, and has been reported to work in both 32-bit and 64-bit Windows versions. If you need to use FLTK on older versions than Windows 11 (or Windows 10) you may use FLTK 1.4.x.

### Note

Libraries built by any one of the following build environments can not be mixed with object files from any of the other environments because they use incompatible C++ conventions internally.

FLTK currently supports the following development environments on the Windows platform:

### 3.7.1 Free and Commercial Microsoft Visual Studio Versions

Visual Studio 2015 Community or later versions use workspace and project files generated by CMake. Older versions and the commercial versions can be used as well, if they can open the project files generated by CMake. However, FLTK 1.5 and later requires newer C++ features (C++11 or higher) that may not be available in older versions of Visual Studio.

FLTK support of Visual Studio is limited to CMake's support for these Visual Studio versions. Be sure to get your service packs!

Since FLTK 1.5 the project files **MUST** be generated with CMake. Please read "README.txt", "README.CMake.txt", and "README.Windows.txt" for more information about this.

### 3.7.2 Using the Visual C++ DLL Library

The Visual Studio project files can be used to build a DLL version of the FLTK library if CMake option 'FLTK\_BUILD\_SHARED\_LIBS=ON' is set. Because of name mangling differences between PC compilers (even between different versions of Visual Studio) you can only use the DLL that is generated with the same compiler version that you built it with.

When compiling an application or DLL that uses the FLTK DLL with Visual Studio, you need to define the `FL_DLL` preprocessor symbol to get the correct linkage commands embedded within the FLTK header files.

New since FLTK 1.4.0:

If you build your application project with CMake and use the CMake target 'fltk::fltk-shared' to link your application, then 'FL\_DLL' is defined automatically for you (by CMake Compile Definitions). If you use your own (hand-made) Visual Studio project you still need to define `FL_DLL` to compile all source files that use FLTK headers.

### 3.7.3 GNU toolsets (Cygwin or MinGW) hosted on Windows

If using Cygwin with the Cygwin shell, or MinGW with the Msys shell, these build environments behave very much like a Unix or macOS build and the notes above can be applied. Build files are generated by CMake for the platform you are using. See README.CMake.txt for more info.

In general for a build using these tools, e.g. for the Msys shell with MinGW, it should suffice to "cd" into the directory where you have extracted the FLTK tarball and type:

```
cmake . -B build
cmake --build build
```

This will build the FLTK libraries and they can then be utilised directly from the build location. NOTE: this may be simpler than "installing" them in many cases as different tool chains on Windows have different ideas about where the files should be "installed" to.

For example, if you "install" the libraries using Msys/MinGW with the following command

```
cmake --install build
```

then Msys will "install" the libraries to where it thinks the path "/usr/local/" leads to. If you only ever build code from within the Msys environment this works well, but the actual "Windows path" these files are located in will be something like "C:\msys\1.0\local\lib", depending on where your Msys installation is rooted, which may not be useful to other tools.

If you want to install your built FLTK libraries in a non-standard location you may do:

```
cmake . -B build -D CMAKE_INSTALL_PATH="C:/FLTK"
cmake --build build
cmake --install build
```

Where the value passed to "CMAKE\_INSTALL\_PATH" is the path at which you would like FLTK to be installed. Depending on the build environment using standard Windows path syntax may work, or you need to use MinGW (or Cygwin) syntax.

## 3.8 Internet Resources

FLTK is available on the internet in a bunch of locations:

### FLTK Source Repository on GitHub

<https://github.com/fltk/fltk>

### WWW (fltk.org)

<https://www.fltk.org/>  
<https://www.fltk.org/bugs.php> [for reporting bugs]  
<https://www.fltk.org/software.php> [download source code]  
<https://www.fltk.org/newsgroups.php> [newsgroup/forums]

### User Forums and NNTP Newsgroups

<https://groups.google.com/forum/#!forum/fltkgeneral> [Google Groups interface]  
<news://fltk.org:1024/> [NNTP interface]  
<https://www.fltk.org/newsgroups.php> [web interface]

### GitHub

<https://github.com/fltk/fltk>    <https://github.com/fltk/fltk/discussions>  
 [FLTK Discussions on GitHub]    <https://github.com/fltk/fltk/discussions/categories/q-a>  
 [Q&A: Questions and Answers]    <https://github.com/fltk/fltk/releases> [Releases, i.e.  
 Source Code and Documentation]

## 3.9 Reporting Bugs

To report a bug in FLTK, or for feature requests, please use <https://www.fltk.org/bugs.php> for information about where and how to post bugs, feature requests, or ask for help on using FLTK.

For general support and questions, please use the fltk.general newsgroup (see above, "NNTP Newsgroups") or the web interface to the newsgroups at <https://www.fltk.org/newsgroups.php>, or GitHub Discussions (see link above).

## Chapter 4

# FLTK Basics

This chapter teaches you the basics of writing and compiling programs that use FLTK.

### 4.1 Writing Your First FLTK Program

Up to FLTK 1.3.x all FLTK programs were required to include the file `<FL/Fl.H>` as the first FLTK header file.

Since FLTK 1.4.0 this requirement was relaxed and `<FL/Fl.H>` needs only be included if the class `Fl` is used or if some other stuff like enumerations is used in the source code. Example code in this documentation may still include it "everywhere" even if it is no longer strictly required.

In addition the program must include a header file for each FLTK class it uses. Listing 1 shows a simple "Hello, World!" program that uses FLTK to display the window.

Listing 1 - "hello.cxx"

```
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Box.H>
int main(int argc, char **argv) {
    Fl_Window *window = new Fl_Window(340, 180);
    Fl_Box *box = new Fl_Box(20, 40, 300, 100, "Hello, World!");
    box->box(FL_UP_BOX);
    box->labelfont(FL_BOLD + FL_ITALIC);
    box->labelsize(36);
    box->labeltype(FL_SHADOW_LABEL);
    window->end();
    window->show(argc, argv);
    return Fl::run();
}
```

After including the required header files, the program then creates a window. All following widgets will automatically be children of this window.

```
Fl_Window *window = new Fl_Window(340, 180);
```

Then we create a box with the "Hello, World!" string in it. FLTK automatically adds the new box to `window`, the current grouping widget.

```
Fl_Box *box = new Fl_Box(20, 40, 300, 100, "Hello, World!");
```

Next, we set the type of box and the font, size, and style of the label:

```
box->box(FL_UP_BOX);
box->labelfont(FL_BOLD + FL_ITALIC);
box->labelsize(36);
box->labeltype(FL_SHADOW_LABEL);
```

We tell FLTK that we will not add any more widgets to window.

```
window->end();
```

Finally, we show the window and enter the FLTK event loop:

```
window->show(argc, argv);
return Fl::run();
```

The resulting program will display the "Hello, World!" window:

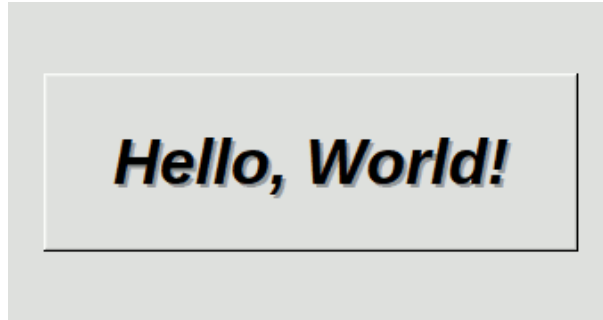


Figure 4.1 The Hello, World! Window

You can quit the program by closing the window or pressing the `ESCAPE` key.

### 4.1.1 Creating the Widgets

The widgets are created using the C++ `new` operator. For most widgets the arguments to the constructor are:

```
Fl_Widget(x, y, width, height, label)
```

The `x` and `y` parameters determine where the widget or window is placed on the screen. In FLTK the top left corner of the window or screen is the origin (i.e. `x = 0`, `y = 0`).

The `width` and `height` parameters determine the size of the widget or window. The maximum widget size is typically governed by the underlying window system or hardware.

[What Units Do FLTK Functions Use?](#) describes the unit FLTK employs for `x`, `y`, `width`, and `height`, and more generally, for all graphical quantities.

`label` is a pointer to a character string to label the widget with or `NULL`. If not specified the label defaults to `NULL`. The label string must be in static storage such as a string constant because FLTK does not make a copy of it - it just uses the pointer.

### 4.1.2 Creating Widget Hierarchies

Widgets are commonly ordered into functional groups, which in turn may be grouped again, creating a hierarchy of widgets. FLTK makes it easy to fill groups by automatically adding all widgets that are created between a `myGroup->begin()` and `myGroup->end()`. In this example, `myGroup` would be the *current* group.

Newly created groups and their derived widgets implicitly call `begin()` in the constructor, effectively adding all subsequently created widgets to itself until `end()` is called.

Calling `end()` on one group widget transfers the "current group" property to the **parent** of that widget. Calling `end()` on a top level window (which has no parent) sets the current group to `NULL`.

Setting the current group to `NULL` will stop automatic hierarchies. New widgets can now be added manually using `Fl_Group::add(...)` and `Fl_Group::insert(...)`.

### 4.1.3 Get/Set Methods

`box->box(FL_UP_BOX)` sets the type of box the [Fl\\_Box](#) draws, changing it from the default of `FL_NO_BOX`, which means that no box is drawn. In our "Hello, World!" example we use `FL_UP_BOX`, which means that a raised button border will be drawn around the widget. More details are available in the [Box Types](#) section.

You could examine the boxtype by doing `box->box()`. FLTK uses method name overloading to make short names for get/set methods. A "set" method is always of the form "void name(type)", and a "get" method is always of the form "type name() const".

### 4.1.4 Redrawing After Changing Attributes

Almost all of the get/set pairs are very fast, short inline functions and thus very efficient. However, *the "set" methods do not call `redraw()`* - you have to call it yourself. This greatly reduces code size and execution time. The only common exceptions are `value()` which calls `redraw()` and `label()` which calls `redraw_label()` if necessary.

### 4.1.5 Labels

All widgets support labels. In the case of window widgets, the label is used for the label in the title bar. Our example program calls the `labelfont()`, `labelsize()`, and `labeltype()` methods.

The `labelfont()` method sets the typeface and style that is used for the label, which for this example we are using `FL_BOLD` and `FL_ITALIC`.

The `labelsize()` method sets the height of the font in FLTK units.

The `labeltype()` method sets the type of label. FLTK supports normal, embossed, and shadowed labels internally, and more types can be added as desired.

A complete list of all label options can be found in the section on [Labels and Label Types](#).

### 4.1.6 Showing the Window

The `show()` method shows the widget or window. For windows you can also provide the command-line arguments to allow users to customize the appearance, size, and position of your windows.

### 4.1.7 The Main Event Loop

All FLTK applications (and most GUI applications in general) are based on a simple event processing model. User actions such as mouse movement, button clicks, and keyboard activity generate events that are sent to an application. The application may then ignore the events or respond to the user, typically by redrawing a button in the "down" position, adding the text to an input field, and so forth.

FLTK also supports idle, timer, and file pseudo-events that cause a function to be called when they occur. Idle functions are called when no user input is present and no timers or files need to be handled - in short, when the application is not doing anything. Idle callbacks are often used to update a 3D display or do other background processing.

Timer functions are called after a specific amount of time has expired. They can be used to pop up a progress dialog after a certain amount of time or do other things that need to happen at more-or-less regular intervals. FLTK timers are not 100% accurate, so they should not be used to measure time intervals, for example.

File functions are called when data is ready to read or write, or when an error condition occurs on a file. They are most often used to monitor network connections (sockets) for data-driven displays.

FLTK applications must periodically check ([Fl::check\(\)](#)) or wait ([Fl::wait\(\)](#)) for events or use the [Fl::run\(\)](#) method to enter a standard event processing loop. Calling [Fl::run\(\)](#) is equivalent to the following code:

```
while (Fl::wait());
```

[Fl::run\(\)](#) does not return until all of the windows under FLTK control are closed by the user or your program.

## 4.2 Naming Conventions

All public symbols in FLTK start with the characters 'F' and 'L':

- Functions are either `Fl::foo()` or `fl_foo()`.
- Class and type names are capitalized: `Fl_Foo`.
- [Constants and Enumerations](#) are uppercase: `FL_FOO`.
- All header files start with `<FL/...>`.

## 4.3 Header Files

The proper way to include FLTK header files is:

```
#include <FL/Fl_xyz.H>
```

### Note

Case *is significant* on many operating systems, and the C standard uses the forward slash (/) to separate directories. *Do not use any of the following include lines:*

```
#include <FL\Fl_xyz.H>
#include <fl/fl_xyz.h>
#include <Fl/fl_xyz.h>
```

## 4.4 Compiling Programs that Use FLTK

Since FLTK 1.4 CMake is the recommended build system. The details below show the "old" methods and reference information in case you like to write your build configuration manually (e.g. Makefiles, Visual Studio, other IDE's ...).

CMake can simplify this task substantially. For now, refer to README.CMake.txt for further information.

**Todo** This section needs a major rework. Add a chapter "Building FLTK with CMake".

### 4.4.1 Compiling Programs with Standard Compilers

Under UNIX (and under Microsoft Windows when using the GNU development tools) you will probably need to tell the compiler where to find the header files. This is usually done using the `-I` option:

```
c++ -I/usr/local/include ...
```

### Note

You need a C++ compiler to build FLTK. The commands given in this chapter are **examples** using 'c++'. Please replace this command with the C++ compiler suitable for your system or use the `fltk-config` script as described below (this is recommended).

### 4.4.2 Compiling Programs with the 'fltk-config' Script

The `fltk-config` script included with FLTK can be used on systems with a Posix compliant shell, for instance Unix/Linux, macOS, Windows with MinGW, MSYS2, or Cygwin.

#### Note

`fltk-config` is not designed to work on Windows with Visual Studio compilers. If it works, then only by accident and this is undefined behavior.

```
fltk-config --help
```

displays all available options.

`fltk-config` can be used to get the compiler and the options that are required by your compiler to build a program using the FLTK library:

```
fltk-config --cc
fltk-config --cxx
```

return the C and C++ compiler commands used to build FLTK.

```
c++ `fltk-config --cxxflags` ...
```

can be used to include the required compiler flags in the command line.

Similarly, when linking your application you will need to tell the compiler to use the FLTK library:

```
c++ ... -L/usr/local/lib -lfltk -lXext -lX11 ... -lm -ldl
```

Aside from the "fltk" library, there are also the following libraries

- "fltk\_forms" for the XForms compatibility classes (deprecated)
- "fltk\_gl" for the OpenGL and GLUT classes
- "fltk\_images" for the image file classes, [Fl\\_Help\\_Dialog](#) widget, and system icon support.

The libraries are named `fltk.lib`, `fltk_forms.lib`, `fltk_gl.lib`, and `fltk_images.lib` under Windows.

#### Note

The separate `fltk_cairo` library is no longer necessary since FLTK 1.4.0. It is no longer built since FLTK 1.5.0.

As before, the `fltk-config` script can be used to get the options that are required by your linker:

```
c++ ... `fltk-config --ldflags`
```

The forms, GL, and images libraries are included with the "--use-foo" options, as follows:

```
c++ ... `fltk-config --use-forms --ldflags`
c++ ... `fltk-config --use-gl --ldflags`
c++ ... `fltk-config --use-images --ldflags`
c++ ... `fltk-config --use-cairo --ldflags`
c++ ... `fltk-config --use-forms --use-gl --use-images --ldflags`
```

The option `--use-cairo` may be used to build your program with Cairo libs if you use Cairo in your code. It does no longer include the `fltk_cairo` lib but all necessary Cairo compiler flags and Cairo libs, if and only if FLTK has been configured with the optional Cairo support by CMake.

Finally, you can use the `fltk-config` script to compile one or more source files as a FLTK program.

The following examples will create an executable named `filename` (or `filename.exe` under Windows) from a single source file:

```
fltk-config --compile filename.cxx
fltk-config --use-forms --compile filename.cpp
fltk-config --use-gl --compile filename.C
fltk-config --use-images --compile filename.cc
fltk-config --use-cairo --compile filename.cpp
fltk-config --use-forms --use-gl --use-images --compile filename.cpp
```

#### Note

'`fltk-config --compile`' accepts only a limited set of file extensions for C++ source files: `'.cpp'`, `'.cxx'`, `'.cc'`, and `'.C'` (capital 'C').

### 4.4.3 Compiling Multiple Source Files with 'fltk-config'

Before version 1.4.0 `fltk-config` accepted only a single source file and no additional compiler options or libraries. Since FLTK 1.4.0 it is possible to use additional compiler flags, more than one source file, and additional link libraries.

This is intended to be used for quick prototyping and not for production code development. It can be used to test compiler command options (like `-Wall` or `-Wextra`) or additional link libraries if these are required.

Building from more than one source file with flags and libraries can be achieved as follows:

```
fltk-config [USE-FLAGS] --compile MAIN [FLAGS] [SOURCES] [--link LFLAGS LIBS]
```

where

- arguments in `[ . . . ]` are optional
- `USE-FLAGS` are as described above, e.g. `--use-images`
- `MAIN` is the main C++ source file as documented above
- `FLAGS` are additional compiler flags
- `SOURCES` are additional source files or libraries
- `--link` is used to separate source files and flags from linker flags and libs
- `LFLAGS` are optional linker flags
- `LIBS` are additional libraries to link against

The final commandline is composed like this example:

```
$ fltk-config --compile main.cxx button.o -Wextra x1.a --link -L/usr/include/cairo/ -lcairo
g++ {fltk-flags} -o main -Wextra main.cxx button.o x1.a {fltk-libs} -L/usr/include/cairo/ -lcairo
```

where `{fltk-flags}` are the compiler flags generated by `fltk-config` as before and `{fltk-libs}` are the usual linker flags and libraries. All optional parameters are used as-is, i.e. there is no syntax checking or special parsing except: the order of flags and source files is preserved (from the commandline) but all flags (`-something`) are positioned before all sources, i.e. arguments w/o leading dash ('-'). All compiler flags and libraries generated from the library build follow all options and source files given on the commandline, and finally everything after `--link` is appended.

### 4.4.4 Compiling Programs with Makefiles

The previous sections described how to use `fltk-config` to build a program from the command line, and this is very convenient for small test programs. But `fltk-config` can also be used to set the compiler and linker options as variables within a Makefile that can be used to build larger programs.

```
CXX      = $(shell fltk-config --cxx)
DEBUG    = -g
CXXFLAGS = $(shell fltk-config --use-gl --use-images --cxxflags) -I.
LDLAGS   = $(shell fltk-config --use-gl --use-images --ldflags)
LDSTATIC = $(shell fltk-config --use-gl --use-images --ldstaticflags)
LINK      = $(CXX)
TARGET   = cube
OBSJS    = CubeMain.o CubeView.o CubeViewUI.o
SRCS     = CubeMain.cxx CubeView.cxx CubeViewUI.cxx
.SUFFIXES: .o .cxx
%.o: %.cxx
    $(CXX) $(CXXFLAGS) $(DEBUG) -c $<
all: $(TARGET)
$(TARGET): $(OBSJS)
    $(LINK) -o $(TARGET) $(OBSJS) $(LDSTATIC)
CubeMain.o: CubeMain.cxx CubeViewUI.h
CubeView.o: CubeView.cxx CubeView.h CubeViewUI.h
CubeViewUI.o: CubeViewUI.cxx CubeView.h
clean:
    rm -f *.o 2> /dev/null
    rm -f $(TARGET) 2> /dev/null
```

### 4.4.5 Compiling Programs with Microsoft Visual C++

In Visual C++ you will need to tell the compiler where to find the FLTK header files. This can be done by selecting "Settings" from the "Project" menu and then changing the "Preprocessor" settings under the "C/C++" tab.

You will also need to add the following libraries to the `Linker` settings:

- `fltk.lib` or `fltkd.lib`, the main FLTK library (postfix 'd' = Debug)
- all FLTK libraries your program requires (`fltk_gl`, `fltk_images`, ...)
- additional libraries like `libpng.lib`, `libjpeg.lib`, etc.
- the Windows Common Controls (`comctl32.lib`) and
- the GDIplus library if used to build FLTK (`gdiplus.lib`) and
- the Windows Socket (`ws2_32.lib`) libraries.

#### Note

There's a `Linker` setting "Additional Library Directories" or similar; the exact name depends on the Visual Studio version you're using. You can and **should** use this to simplify adding the libraries above. If you set this to the FLTK library path you can just use the library **names** and don't need to use the full paths to all libraries.

You must also define `_WIN32` if the compiler doesn't do this. Currently all known Windows compilers define `_WIN32` - unless you use Cygwin (that's correct, you must not define `_WIN32` if you use Cygwin).

More information can be found in `README.Windows.txt`.

You can build your Microsoft Windows applications as Console or Desktop applications. If you want to use the standard C `main()` function as the entry point, FLTK includes a `WinMain()` function that will call your `main()` function for you.



## Chapter 5

# Common Widgets and Attributes

This chapter describes many of the widgets that are provided with FLTK and covers how to query and set the standard attributes.

### 5.1 Buttons

FLTK provides many types of buttons:

- [Fl\\_Button](#) - A standard push button.
- [Fl\\_Check\\_Button](#) - A button with a check box.
- [Fl\\_Light\\_Button](#) - A push button with a light.
- [Fl\\_Repeat\\_Button](#) - A push button that repeats when held.
- [Fl\\_Return\\_Button](#) - A push button that is activated by the `Enter` key.
- [Fl\\_Round\\_Button](#) - A button with a radio circle.

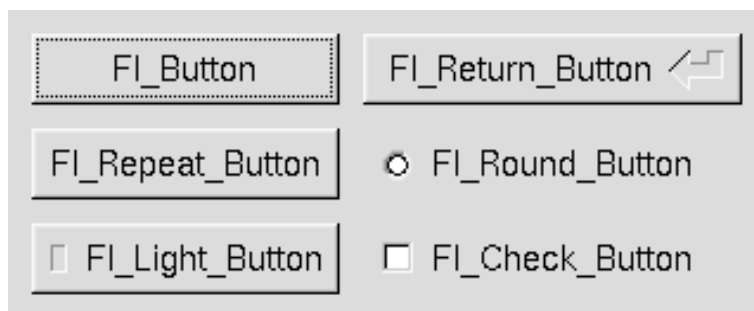


Figure 5.1 FLTK Button Widgets

All of these buttons just need the corresponding `<FL/Fl_xyz_Button.H>` header file. The constructor takes the bounding box of the button and optionally a label string:

```
Fl_Button *button = new Fl_Button(x, y, width, height, "label");
Fl_Light_Button *lbutton = new Fl_Light_Button(x, y, width, height);
Fl_Round_Button *rbutton = new Fl_Round_Button(x, y, width, height, "label");
```

Each button has an associated `type()` which allows it to behave as a push button, toggle button, or radio button:

```
button->type(FL_NORMAL_BUTTON);
lbutton->type(FL_TOGGLE_BUTTON);
rbutton->type(FL_RADIO_BUTTON);
```

For toggle and radio buttons, the `value()` method returns the current button state (0 = off, 1 = on). The `set()` and `clear()` methods can be used on toggle buttons to turn a toggle button on or off, respectively. Radio buttons can be turned on with the `setonly()` method; this will also turn off other radio buttons in the same group.

## 5.2 Text

FLTK provides several text widgets for displaying and receiving text:

- [Fl\\_Input](#) - A one-line text input field.
- [Fl\\_Output](#) - A one-line text output field.
- [Fl\\_Multiline\\_Input](#) - A multi-line text input field.
- [Fl\\_Multiline\\_Output](#) - A multi-line text output field.
- [Fl\\_Text\\_Display](#) - A multi-line text display widget.
- [Fl\\_Text\\_Editor](#) - A multi-line text editing widget.
- [Fl\\_Help\\_View](#) - A HTML text display widget.

The [Fl\\_Output](#) and [Fl\\_Multiline\\_Output](#) widgets allow the user to copy text from the output field but not change it.

The `value()` method is used to get or set the string that is displayed:

```
Fl_Input *input = new Fl_Input(x, y, width, height, "label");  
input->value("Now is the time for all good men...");
```

The string is copied to the widget's own storage when you set the `value()` of the widget.

The [Fl\\_Text\\_Display](#) and [Fl\\_Text\\_Editor](#) widgets use an associated [Fl\\_Text\\_Buffer](#) class for the value, instead of a simple string.

## 5.3 Valuers

Unlike text widgets, valuers keep track of numbers instead of strings. FLTK provides the following valuers:

- [Fl\\_Counter](#) - A widget with arrow buttons that shows the current value.
- [Fl\\_Dial](#) - A round knob.
- [Fl\\_Roller](#) - An SGI-like dolly widget.
- [Fl\\_Scrollbar](#) - A standard scrollbar widget.
- [Fl\\_Slider](#) - A scrollbar with a knob.
- [Fl\\_Value\\_Slider](#) - A slider that shows the current value.

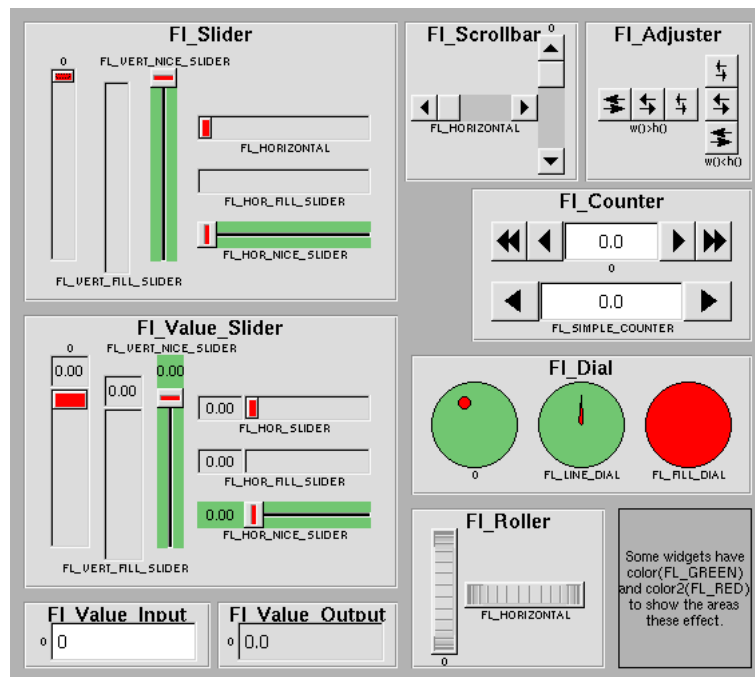


Figure 5.2 FLTK valuator widgets

The `value()` method gets and sets the current value of the widget. The `minimum()` and `maximum()` methods set the range of values that are reported by the widget.

## 5.4 Groups

The `FL_Group` widget class is used as a general purpose "container" widget. Besides grouping radio buttons, the groups are used to encapsulate windows, tabs, and scrolled windows. The following group classes are available with FLTK:

- `FL_Double_Window` - A double-buffered window on the screen.
- `FL_Flex` - A flexible container of one row or column of widgets. `FL_Flex` widgets may be nested, but see also `FL_Grid`.
- `FL_Gl_Window` - An OpenGL window on the screen.
- `FL_Grid` - A flexible container of one or more rows and columns of widgets arranged in a "grid" with auto-layout features. `FL_Grid` widgets can be nested with other `FL_Grid` or many `FL_Group` type widgets. Nesting with other self-resizing containers like `FL_Pack` and `FL_Tile` is not recommended but **may** work.
- `FL_Group` - The base container class; can be used to group any widgets together.
- `FL_Pack` - A collection of widgets that are packed into the group area.
- `FL_Scroll` - A scrolled window area.
- `FL_Tabs` - Displays child widgets as tabs.
- `FL_Tile` - A tiled window area.
- `FL_Window` - A window on the screen.
- `FL_Wizard` - Displays one group of widgets at a time.

## 5.5 Setting the Size and Position of Widgets

The size and position of widgets is usually set when you create them. You can access them with the `x()`, `y()`, `w()`, and `h()` methods.

You can change the size and position by using the `position()`, `resize()`, and `size()` methods:

```
button->position(x, y);
group->resize(x, y, width, height);
window->size(width, height);
```

If you change a widget's size or position after it is displayed you will have to call `redraw()` on the widget's parent.

## 5.6 Colors

FLTK stores the colors of widgets as a 32-bit unsigned number that is either an index into a color palette of 256 colors ( $0 \leq \text{color} \leq 255$ ) or a 24-bit RGB color ( $\text{color} > 255$ ). The color palette is *not* the X or Windows colormap, but instead is an internal table with fixed contents.

See the [Colors](#) section of [Drawing Things in FLTK](#) for implementation details.

There are symbols for naming some of the more common colors:

- `FL_BLACK`
- `FL_RED`
- `FL_GREEN`
- `FL_YELLOW`
- `FL_BLUE`
- `FL_MAGENTA`
- `FL_CYAN`
- `FL_WHITE`

Other symbols are used as the default colors for all FLTK widgets.

- `FL_FOREGROUND_COLOR`
- `FL_BACKGROUND_COLOR`
- `FL_INACTIVE_COLOR`
- `FL_SELECTION_COLOR`

The full list of named color values can be found in [FLTK Enumerations](#).

A color value can be created from its RGB components by using the `fl_rgb_color()` function, and decomposed again with `Fl::get_color()`:

```
Fl_Color c = fl_rgb_color(85, 170, 255);    // RGB to Fl_Color
Fl::get_color(c, r, g, b);                  // Fl_Color to RGB
```

The widget color is set using the `color()` method:

```
button->color(FL_RED);                      // set color using named value
```

Similarly, the label color is set using the `labelcolor()` method:

```
button->labelcolor(FL_WHITE);
```

The `Fl_Color` encoding maps to a 32-bit unsigned integer representing RGBI, so it is also possible to specify a color using a hex constant as a color map index:

```
button->color(0x000000ff);                  // colormap index #255 (FL_WHITE)
```

or specify a color using a hex constant for the RGB components:

```
button->color(0xff000000);                   // RGB: red
button->color(0x00ff0000);                   // RGB: green
button->color(0x0000ff00);                   // RGB: blue
button->color(0xffffffff00);                 // RGB: white
```

## Note

If TrueColor is not available, any RGB colors will be set to the nearest entry in the colormap.

## 5.7 Box Types

The type `FL_Boxtype` stored and returned in `FL_Widget::box()` is an enumeration defined in `Enumerations.H`.

These are the standard box types included with FLTK:

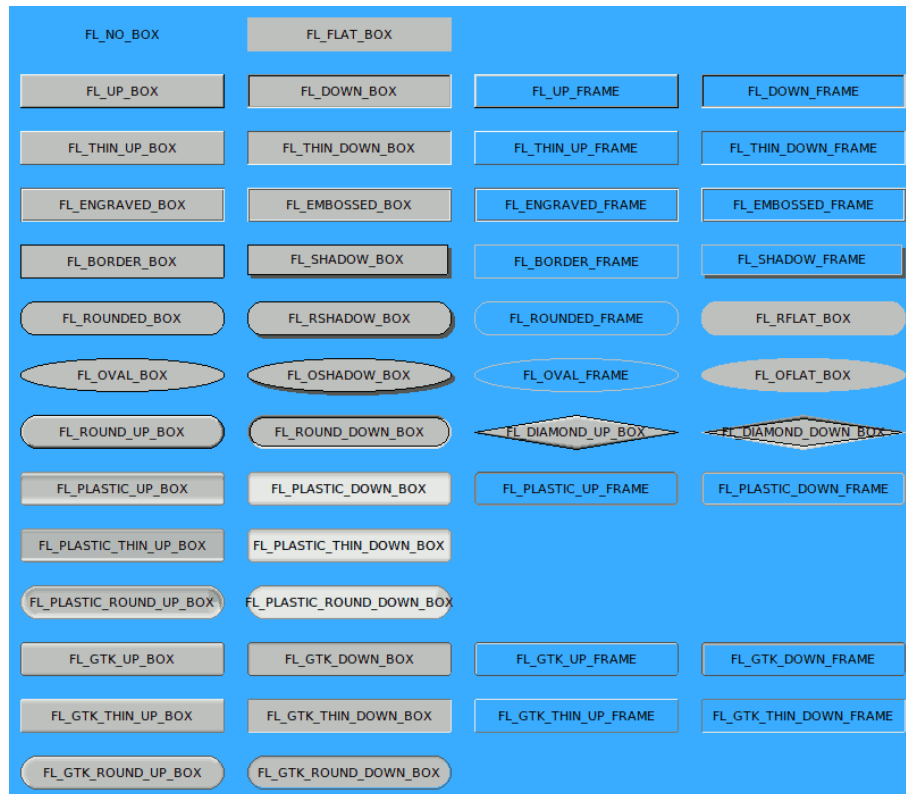


Figure 5.3 FLTK Standard Box Types

`FL_NO_BOX` means nothing is drawn at all, so whatever is already on the screen remains. The `FL_..._FRAME` types only draw their edges, leaving the interior unchanged. The blue color in the image above is the area that is not drawn by the frame types.

### 5.7.1 Making Your Own Boxtypes

You can define your own boxtypes by making a small function that draws the box and adding it to the table of boxtypes.

## The Drawing Function

The drawing function is passed the bounding box and background color for the widget:

```
void xyz_draw(int x, int y, int w, int h, Fl_Color c) {
    ...
}
```

A simple drawing function might fill a rectangle with the given color and then draw a black outline:

```
void xyz_draw(int x, int y, int w, int h, Fl_Color c) {
    fl_color(c);
    fl_rectf(x, y, w, h);
    fl_color(FL_BLACK);
    fl_rect(x, y, w, h);
}
```

Fl\_Boxtype [fl\\_down\(Fl\\_Boxtype b\)](#)

[fl\\_down\(\)](#) returns the "pressed" or "down" version of a box. If no "down" version of a given box exists, the behavior of this function is undefined and some random box or frame is returned. See [Drawing Functions](#) for more details.

Fl\_Boxtype [fl\\_frame\(Fl\\_Boxtype b\)](#)

[fl\\_frame\(\)](#) returns the unfilled, frame-only version of a box. If no frame version of a given box exists, the behavior of this function is undefined and some random box or frame is returned. See [Drawing Functions](#) for more details.

Fl\_Boxtype [fl\\_box\(Fl\\_Boxtype b\)](#)

[fl\\_box\(\)](#) returns the filled version of a frame. If no filled version of a given frame exists, the behavior of this function is undefined and some random box or frame is returned. See [Drawing Functions](#) for more details.

## Adding Your Box Type

The [Fl::set\\_boxtype\(\)](#) method adds or replaces the specified box type:

```
#define XYZ_BOX FL_FREE_BOXTYPE
Fl::set_boxtype(XYZ_BOX, xyz_draw, 1, 1, 2, 2);
```

The last 4 arguments to [Fl::set\\_boxtype\(\)](#) are the offsets for the `x`, `y`, `width`, and `height` values that should be subtracted when drawing the label inside the box.

A complete box design contains four box types in this order: a filled, neutral box (`UP_BOX`), a filled, depressed box (`DOWN_BOX`), and the same as outlines only (`UP_FRAME` and `DOWN_FRAME`). The function [fl\\_down\(Fl\\_Boxtype\)](#) expects the neutral design on a boxtype with a numerical value evenly dividable by two. [fl\\_frame\(Fl\\_Boxtype\)](#) expects the `UP_BOX` design at a value dividable by four.

## 5.8 Labels and Label Types

The `label()`, `align()`, `labelfont()`, `labelsize()`, `labeltype()`, `image()`, and `deimage()` methods control the labeling of widgets.

`label()`

The `label()` method sets the string that is displayed for the label. Symbols can be included with the label string by escaping them using the "@" symbol - "@@" displays a single at sign. These are the available symbols:



Figure 5.4 FLTK label symbols

The @ sign may also be followed by the following optional "formatting" characters, in this order:

- '#' forces square scaling, rather than distortion to the widget's shape.
- '+[1-9] or -[1-9] tweaks the scaling a little bigger or smaller.
- '\$' flips the symbol horizontally, '%' flips it vertically.
- '[0-9] - rotates by a multiple of 45 degrees. '5' and '6' do no rotation while the others point in the direction of that key on a numeric keypad. '0', followed by four more digits rotates the symbol by that amount in degrees.

Thus, to show a very large arrow pointing downward you would use the label string "@+92->".

Symbols and text can be combined in a label, however the symbol must be at the beginning and/or at the end of the text. If the text spans multiple lines, the symbol or symbols will scale up to match the height of all the lines.

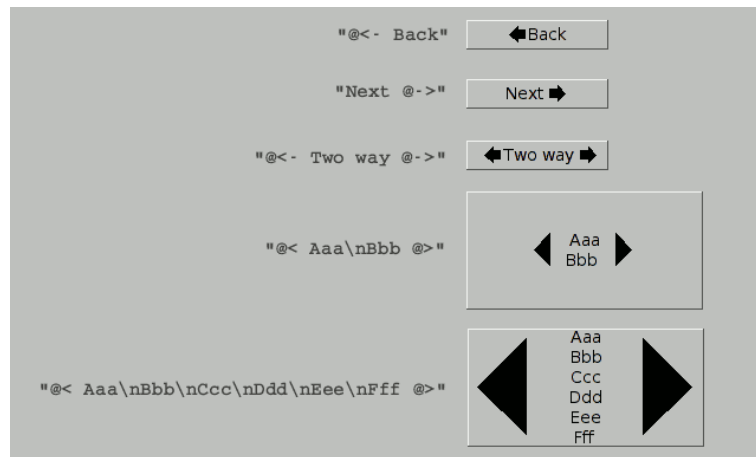


Figure 5.5 FLTK symbols and text

`align()`

The `align()` method positions the label. The following constants are defined and may be OR'd together as needed:

- `FL_ALIGN_CENTER` - center the label in the widget.
- `FL_ALIGN_TOP` - align the label at the top of the widget.
- `FL_ALIGN_BOTTOM` - align the label at the bottom of the widget.
- `FL_ALIGN_LEFT` - align the label to the left of the widget.
- `FL_ALIGN_RIGHT` - align the label to the right of the widget.
- `FL_ALIGN_LEFT_TOP` - The label appears to the left of the widget, aligned at the top. Outside labels only.
- `FL_ALIGN_RIGHT_TOP` - The label appears to the right of the widget, aligned at the top. Outside labels only.
- `FL_ALIGN_LEFT_BOTTOM` - The label appears to the left of the widget, aligned at the bottom. Outside labels only.
- `FL_ALIGN_RIGHT_BOTTOM` - The label appears to the right of the widget, aligned at the bottom. Outside labels only.
- `FL_ALIGN_INSIDE` - align the label inside the widget.
- `FL_ALIGN_CLIP` - clip the label to the widget's bounding box.
- `FL_ALIGN_WRAP` - wrap the label text as needed.
- `FL_ALIGN_TEXT_OVER_IMAGE` - show the label text over the image.
- `FL_ALIGN_IMAGE_OVER_TEXT` - show the label image over the text (default).
- `FL_ALIGN_IMAGE_NEXT_TO_TEXT` - The image will appear to the left of the text.
- `FL_ALIGN_TEXT_NEXT_TO_IMAGE` - The image will appear to the right of the text.
- `FL_ALIGN_IMAGE_BACKDROP` - The image will be used as a background for the widget.

## labeltype()

The `labeltype()` method sets the type of the label. The following standard label types are included:

- `FL_NORMAL_LABEL` - draws the text.
- `FL_NO_LABEL` - does nothing.
- `FL_SHADOW_LABEL` - draws a drop shadow under the text.
- `FL_ENGRAVED_LABEL` - draws edges as though the text is engraved.
- `FL_EMBOSED_LABEL` - draws edges as though the text is raised.
- `FL_ICON_LABEL` - draws the icon ([Fl\\_Image](#)) associated with the text.
- `FL_IMAGE_LABEL` - draws the image ([Fl\\_Image](#)) associated with the text.
- `FL_MULTI_LABEL` - draws multiple parts side by side, see [Fl\\_Multi\\_Label](#).

### Note

Some of these labeltypes are no longer necessary for normal widgets. Widgets allow for an image and a text side by side, depending on the widget's `align()` flag. `FL_MULTI_LABEL` was designed to be used with [Fl\\_Menu\\_Item](#)'s to support icons or small images, typically left of the menu text.

As of this writing (FLTK 1.4.0) `Fl_Menu_Items` support only one label part (text **or** image), but using [Fl\\_Multi\\_Label](#) as the label can extend this to more than one part.

### See also

class [Fl\\_Multi\\_Label](#), [Fl\\_Widget::align\(\)](#)

## image() and deimage()

The `image()` and `deimage()` methods set an image that will be displayed with the widget. The `deimage()` method sets the image that is shown when the widget is inactive, while the `image()` method sets the image that is shown when the widget is active.

To make an image you use a subclass of [Fl\\_Image](#).

### Making Your Own Label Types

Label types are actually indexes into a table of functions that draw them. The primary purpose of this is to use this to draw the labels in ways inaccessible through the `fl_font()` mechanism (e.g. `FL_ENGRAVED_LABEL`) or with program-generated letters or symbology.

## Label Type Functions

To setup your own label type you will need to write two functions: one to draw and one to measure the label. The draw function is called with a pointer to a `Fl_Label` structure containing the label information, the bounding box for the label, and the label alignment:

```
void xyz_draw(const Fl_Label *label, int x, int y, int w, int h, Fl_Align align) {
    ...
}
```

The label should be drawn *inside* this bounding box, even if `FL_ALIGN_INSIDE` is not enabled. The function is not called if the label value is `NULL`.

The measure function is called with a pointer to a `Fl_Label` structure and references to the width and height:

```
void xyz_measure(const Fl_Label *label, int &w, int &h) {
    ...
}
```

The function should measure the size of the label and set `w` and `h` to the size it will occupy.

## Adding Your Label Type

The `Fl::set_labeltype()` method creates a label type using your draw and measure functions:

```
#define XYZ_LABEL FL_FREE_LABELTYPE
Fl::set_labeltype(XYZ_LABEL, xyz_draw, xyz_measure);
```

The label type number `n` can be any integer value starting at the constant `FL_FREE_LABELTYPE`. Once you have added the label type you can use the `labeltype()` method to select your label type.

The `Fl::set_labeltype()` method can also be used to overload an existing label type such as `FL_NORMAL_LABEL`.

## Making your own symbols

It is also possible to define your own drawings and add them to the symbol list, so they can be rendered as part of any label.

To create a new symbol, you implement a drawing function `void drawit(Fl_Color c)` which typically uses the functions described in [Drawing Complex Shapes](#) to generate a vector shape inside a two-by-two units sized box around the origin. This function is then linked into the symbols table using `fl_add_symbol()`:

```
int fl_add_symbol(const char *name, void (*drawit)(Fl_Color), int scalable)
```

`name` is the name of the symbol without the "@"; `scalable` must be set to 1 if the symbol is generated using scalable vector drawing functions.

```
int fl_draw_symbol(const char *name, int x, int y, int w, int h, Fl_Color col)
```

This function draws a named symbol fitting the given rectangle.

## 5.9 Callbacks

Callbacks are functions that are called when the value of a widget changes. A callback function is sent a `Fl_Widget` pointer of the widget that changed and a pointer to data that you provide:

```
void xyz_callback(Fl_Widget *w, void *data) {
...
}
```

The `callback()` method sets the callback function for a widget. You can optionally pass a pointer to some data needed for the callback:

```
int xyz_data;
button->callback(xyz_callback, &xyz_data);
```

### Note

You cannot delete a widget inside a callback, as the widget may still be accessed by FLTK after your callback is completed. Instead, use the `Fl::delete_widget()` method to mark your widget for deletion when it is safe to do so.

Many programmers new to FLTK or C++ try to use a non-static class method instead of a static class method or function for their callback. Since callbacks are done outside a C++ class, the `this` pointer is not initialized for class methods.

To work around this problem, define a static method in your class that accepts a pointer to the class, and then have the static method call the class method(s) as needed. The data pointer you provide to the `callback()` method of the widget can be a pointer to the instance of your class.

```
class Foo {
    void my_callback(Fl_Widget *w);
    static void my_static_callback(Fl_Widget *w, void *f) { ((Foo *)f)->my_callback(w); }
    ...
}
...
w->callback(my_static_callback, (void *)this);
```

In an effort to make callbacks easier, more flexible, and type safe, FLTK provides three groups of macros that generate the code needed to call class methods directly with up to five custom parameters.

- `FL_FUNCTION_CALLBACK_#(WIDGET, FUNCTION, ...)` creates code for callbacks to functions and static class methods with up to five arguments. The `#` must be replaced by the number of callback arguments.
- `FL_METHOD_CALLBACK_#(WIDGET, CLASS, SELF, METH, ...)` creates code for callbacks to arbitrary public class methods
- `FL_INLINE_CALLBACK_#(WIDGET, ..., FUNCTION_BODY)` creates code for callback functions that are very close to (almost in the same line) the widget creation code, similar to lambda function in C++11. The last argument of this macro is the callback code.

The syntax is a bit unconventional, but the resulting code is flexible and needs no additional maintenance. It is also C++98 compatible. For example:

```
#include <FL/fl_callback_macros.H>
...
std::string *str = new std::string("FLTK");
Fl_Button *btn = new Fl_Button(10, 10, 100, 100);
FL_METHOD_CALLBACK_2(btn, std::string, str, insert, int, 2, const char*, "...");
...
Fl_Button *inline_cb_btn_2 = new Fl_Button(390, 60, 180, 25, "2 args");
FL_INLINE_CALLBACK_2( inline_cb_btn_2,
    const char *, text, "FLTK", int, number, 2,
    {
        fl_message("We received the message %s with %d!", text, number);
    }
);
```

### See also

`Fl_Widget::callback(Fl_Callback*, void*)`, `FL_FUNCTION_CALLBACK_3`, `FL_METHOD_CALLBACK_1`, `FL_INLINE_CALLBACK_2`

## 5.10 When and Reason

Normally callbacks are performed only when the value of the widget changes. You can change this using the `Fl_Widget::when()` method:

```
button->when (FL_WHEN_NEVER);
button->when (FL_WHEN_CHANGED);
button->when (FL_WHEN_RELEASE);
button->when (FL_WHEN_RELEASE_ALWAYS);
button->when (FL_WHEN_ENTER_KEY);
button->when (FL_WHEN_ENTER_KEY_ALWAYS);
button->when (FL_WHEN_CHANGED | FL_WHEN_NOT_CHANGED);
```

Within the callback, you can query why the callback was called using `Fl::callback_reason()`. For example, setting

```
myInput->when (FL_WHEN_RELEASE | FL_WHEN_CHANGED)
```

for a text input field may return `FL_REASON_LOST_FOCUS` or `FL_REASON_CHANGED` as a callback reason.

## 5.11 Shortcuts

Shortcuts are key sequences that activate widgets such as buttons or menu items. The `shortcut()` method sets the shortcut for a widget:

```
button->shortcut (FL_Enter);
button->shortcut (FL_SHIFT + 'b');
button->shortcut (FL_CTRL + 'b');
button->shortcut (FL_ALT + 'b');
button->shortcut (FL_CTRL + FL_ALT + 'b');
button->shortcut (0); // no shortcut
```

The shortcut value is the key event value - the ASCII value or one of the special keys described in `Fl::event_key() Values` combined with any modifiers like `Shift`, `Alt`, and `Control`.

## Chapter 6

# Coordinates and Layout Widgets

This chapter describes the coordinate systems that apply when positioning widgets manually, and some of the basics of FLTK layout widgets that are used to position widgets automatically.

### 6.1 The Widget Coordinate System

All widgets have constructors with `x` and `y` parameters to let the programmer specify the desired initial position of the top left corner during explicit manual layout within `Fl_Window` and `Fl_Group` container widgets.

This position is always relative to the enclosing `Fl_Window`, which is usually, but not always, the top-level application window, or a free-floating pop-up dialog window. In some cases it could also be a subwindow embedded in a higher-level window, as shown in the figure below.

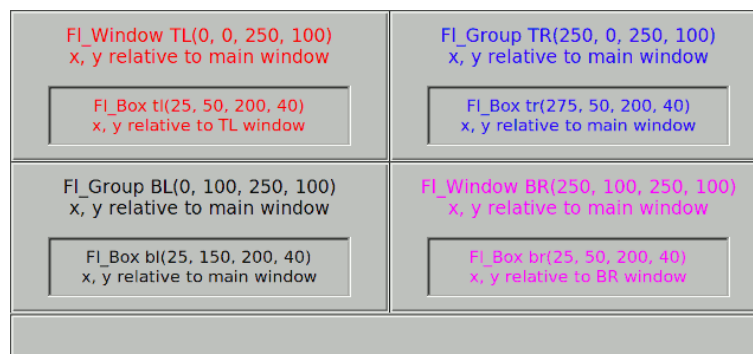


Figure 6.1 FLTK coordinate system

The positions of the TL and BR sub-windows and the TR and BL groups are all relative to the top-left corner of the main window. The positions of the boxes inside the TR and BL groups are also relative to the main window, but the boxes inside the TL and BR sub-windows are positioned relative to the enclosing sub-window.

In other words, the widget hierarchy and positions can be summarized as:

```
Fl_Window main window
  Fl_Window TL subwindow      # x, y relative to main window
    Fl_Box tl box             # x, y relative to TL subwindow
  Fl_Window BR subwindow      # x, y relative to main window
    Fl_Box br box             # x, y relative to BR subwindow
  Fl_Group TR group           # x, y relative to main window
    Fl_Box tr box             # x, y relative to main window
  Fl_Group BL group           # x, y relative to main window
    Fl_Box bl box             # x, y relative to main window
```

## 6.2 Layout and Container Widgets

There are four main groups of widgets derived from `Fl_Group` for a range of different purposes.

The first group are composite widgets that each contain a fixed set of components that work together for a specific purpose, rather than layout widgets as such, and are not discussed here.

The second group are basically containers offering the same manual layout features as `Fl_Group`, as described above, but which add one new capability. These widgets are `Fl_Scroll`, `Fl_Tabs` and `Fl_Wizard`.

The third group are layout managers that relocate and resize the child widgets added to them in order to satisfy a particular layout algorithm. These widgets are `Fl_Flex`, `Fl_Grid`, `Fl_Pack`, and `Fl_Tile`.

The final group consists of `Fl_Window` and its derivatives. Their special capability is that they can be top-level application windows and dialogs that interface with the operating system window manager, but can also be embedded within other windows and groups as shown in the example above. Note that the window manager may impose its own constraints on the position of top-level windows, and the `x` and `y` position parameters may be treated as hints, or even ignored. The `Fl_Window` class has an extra constructor that omits them.

Descriptions of layout and container widgets follow in alphabetical order.

### 6.2.1 The `Fl_Flex` Layout Widget

The `Fl_Flex` widget allows the layout of its direct children as a single row or column. If its `type()` is set to give the row or horizontal layout, the children are all resized to have the same height as the `Fl_Flex` and are moved next to each other. If set to give the column or vertical layout, the children are all resized to have the same width as the `Fl_Flex` and are then stacked below each other.

Widget positions (`x`, `y`) need not be given by the user because widgets are positioned inside the `Fl_Flex` container in the order of its children. Widget sizes can be set to (0, 0) as in `Fl_Pack` since they are calculated by `Fl_Flex`.

This is similar to `Fl_Pack` described below and `Fl_Flex` is designed to act as a drop-in replacement of `Fl_Pack` with some minor differences.

Other than `Fl_Pack` the `Fl_Flex` widget does **not** resize itself but resizes its children to fill the entire space of the `Fl_Flex` container. Single children of `Fl_Flex` can be set to fixed sizes to inhibit this resizing behavior. In this case the remaining space is distributed to all non-fixed widgets.

`Fl_Flex` widgets can be nested inside each other and with `Fl_Grid` in any combination.

The name `Fl_Flex` was inspired by the CSS 'flex' container.

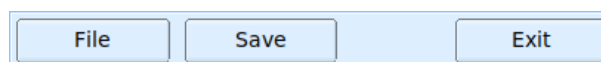


Figure 6.2 Simple `Fl_Flex` Layout

`Fl_Flex` was added in FLTK 1.4.0.

### 6.2.2 The `FL_Grid` Layout Widget

`FL_Grid` is the most flexible layout container in FLTK 1.4. It is based on a flexible grid of **cells** that can be assigned one widget per cell which is the *anchor* of the widget. Widgets can span multiple rows and columns and the cells can constitute a sparse matrix. Widgets can be aligned inside their cells in several ways (left, right, top, bottom) and can stretch horizontally, vertically, or both, i.e. fill the entire cell.

Widget positions (x, y) need not be given by the user because widgets are assigned to a particular grid cell by row and column number. Widget sizes can be given as their **minimal** sizes and will be resized appropriately depending on the free space.

Optional margins around all cells inside the widget border and gaps between rows and cells make the layout even more flexible.

The `FL_Grid` widget should be designed with a grid (matrix) and its minimal size in mind. It is designed to **enlarge** cells and widgets in a flexible way when the `FL_Grid` widget itself is created or resized.

Additional free space inside the `FL_Grid` container is distributed to widgets by considering minimal row heights, column widths, sizes of widgets, and row and column *weights*. These weights are used to distribute the free space proportionally according to the row and column weights.

`FL_Grid` widgets can be nested inside each other and with `FL_Flex` and other subclasses of `FL_Group` in any combination.

#### Note

We don't recommend to use `FL_Pack` as child widgets although this **may** work as well.

The name `FL_Grid` was inspired by the CSS 'grid' container but it has some properties in common with HTML `<table>` containers as well, for instance row and column spanning.

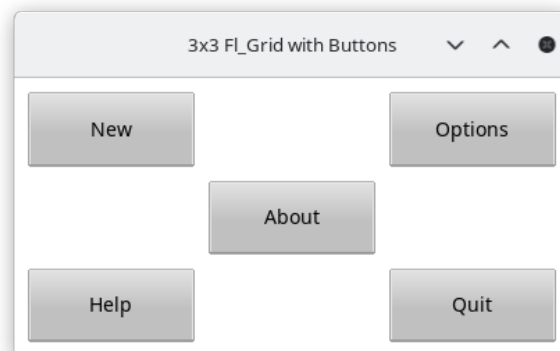


Figure 6.3 Simple `FL_Grid` Layout

`FL_Grid` was added in FLTK 1.4.0.

### 6.2.3 The `Fl_Pack` Layout Widget

The `Fl_Pack` widget allows the layout of its direct children as a single row, or column. If its `type()` is set to give the row or horizontal layout, the children are all resized to have the same height as the `Fl_Pack` and are moved next to each other. If set to give the column or vertical layout, the children are all resized to have the same width as the `Fl_Pack` and are then stacked below each other. The `Fl_Pack` then resizes itself to shrink-wrap itself around all of the children.

`Fl_Pack` widgets are often used inside an `Fl_Scroll`, as shown in the diagram below, to avoid having to deal with tricky resize behavior when used with nested widgets.

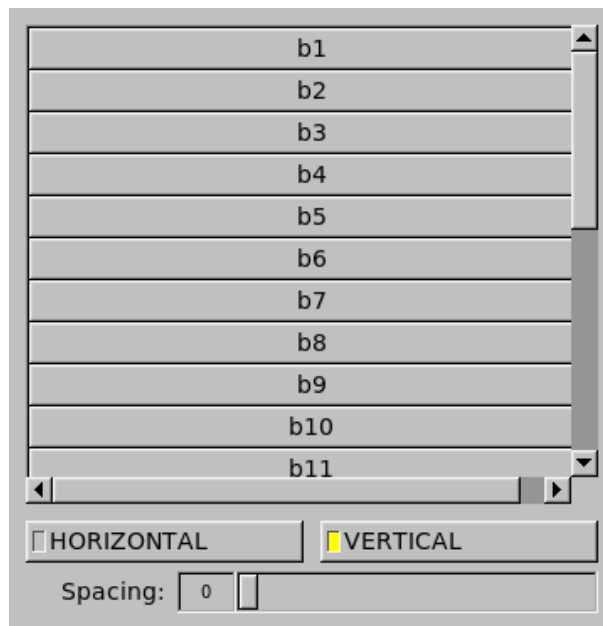


Figure 6.4 `Fl_Pack` test program screenshot

Since FLTK 1.4.0 `Fl_Flex` (described above) can in many cases be used as a drop-in replacement for `Fl_Pack` if this "shrink-wrap" behavior is not required. Note that the `Fl_Pack` layout algorithm can cause some issues because its widget size can change depending on its children and particularly because this is done late, i.e. during `draw()` and not as usual during `resize` of the window.

#### Note

We recommend that developers evaluate whether using `Fl_Flex` or `Fl_Grid` instead of `Fl_Pack` can be a better solution with more predictable and reliable resizing behavior of the overall program layout.

### 6.2.4 The `Fl_Scroll` Container Widget

The `Fl_Scroll` container widget can hold an assortment of widgets that may extend beyond its own width and height, in which case horizontal and/or vertical scrollbars may appear automatically so that you can scroll and view the entire contents.

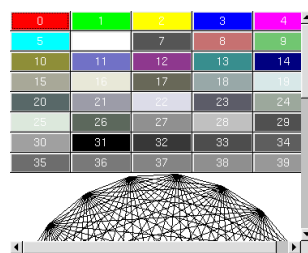


Figure 6.5 `Fl_Scroll` container widget

### 6.2.5 The `FL_Tabs` Container Widget

The `FL_Tabs` widget provides a front-to-back stack of individual panels which usually contain `FL_Group` widgets and their children. The user can switch between panels by clicking on the small tabs that protrude from the panels. The appearance of each tab is determined by the child widget's label and related attributes.

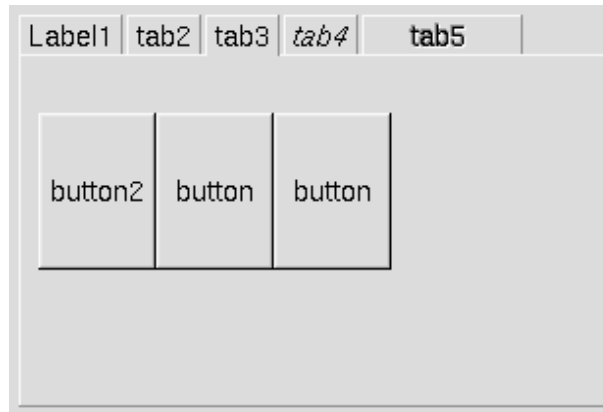


Figure 6.6 `FL_Tabs` container widget

### 6.2.6 The `FL_Tile` Layout Widget

The `FL_Tile` widget allows the user to resize one or more of its children by dragging on the border between adjacent child widgets. However, the programmer must first explicitly layout the child widgets so that their borders exactly fill the width and height of the `FL_Tile` without having any gaps between them, or at the edges. Some care is needed when initially positioning the children and setting the `resizable()` widget within the `FL_Tile` to prevent squeezing a child to have a zero width or height. For more information see the `FL_Tile` widget manual page, and [How Does Resizing Work?](#).

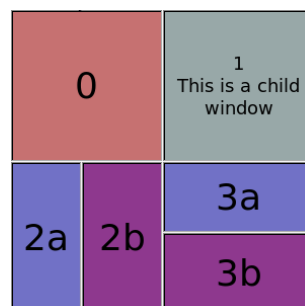


Figure 6.7 The `FL_Tile` layout widget

### 6.2.7 The `FL_Wizard` Container Widget

The `FL_Wizard` widget derives from the `FL_Tabs` class, but instead of having tabs that the user can click to select the corresponding panel, the programmer uses the `prev()`, `next()` or `value()` methods to show the appropriate panel. For example, the user might be able to click on "Next" and "Prev" navigation buttons or keys, as shown below.



Figure 6.8 `FL_Wizard` container widget



## Chapter 7

# How Does Resizing Work?

This chapter describes the basic mechanism behind the creation of resizable user interface elements in FLTK.

FLTK uses a simple, but very versatile system to resize even the most complex dialogs and interfaces. The resizing is implemented within the `Fl_Group` widget, and the exact resizing behavior of that group is determined by its `resizable()` attribute.

### 7.1 Resizing can be disabled

```
Summary:
group = new Fl_Group(xg, yg, wg, hg, "No Resizing");
child1 = new Fl_Box(xb, yb, wb, hb, "B"); // or other widget type
. . .
group->resizable((Fl_Widget*)0); // no resizing
group->end()
```

The `resizable` may be set to the NULL pointer, which means that the group will not resize. Note that this is the default behavior for `Fl_Window` and `Fl_Pack` derived widgets, and therefore the programmer must explicitly set the window's `resizable` attribute if they want to allow the window to be resized.

### 7.2 Resizing can be simple

```
Summary:
group = new Fl_Group(xg, yg, wg, hg, "Simple Resizing");
child1 = new Fl_Box(xb, yb, wb, hb, "B"); // or other widget type
. . .
group->resizable(group); // simple proportional resizing
group->end()
```

The `resizable` may be set to the group itself, which means that all widgets within the group will resize as the group itself is resized. This is the default behavior for `Fl_Group` widgets, and is shown in the diagram below.

If the group is stretched horizontally, the widths of the widgets within the group are adjusted proportionally. The same is true for vertical resizing.

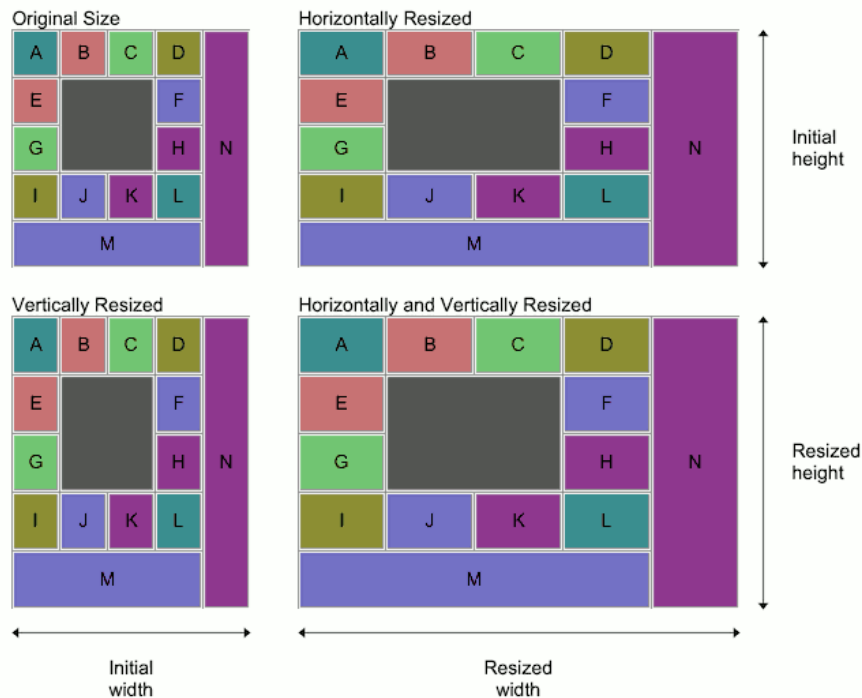


Figure 7.1 Proportional resizing example

### 7.3 Resizing can be complex

Summary:

```
group = new Fl_Group(xg, yg, wg, hg, "Complex Resizing");
child1 = new Fl_Box(xb, yb, wb, hb, "B"); // or other widget type
. . .
group->resizable(child1); // complex resizing
group->end();
```

It is when the group's `resizable` attribute is set to one of the group's child widgets, that things become really interesting.

In the diagram below, imagine vertical lines extending from the left and right sides of the yellow widget marked "resizable", and horizontal lines extending from the top and bottom sides. Exactly which widgets resize, and by how much, is determined by which ones lie completely or partially within this cross.

The widgets marked B, C, J, K and M clearly lie completely or partially within the vertical part of the cross; the widgets marked E, F, G, H and N lie completely or partially within the horizontal part of the cross; and the widgets marked A, D, I and L do not overlap with the cross at all. The resizing behavior is as follows:

- the width and height of the `resizable` widget increase to match the change in the width and height of the group widget as it is stretched;
- the widths of those widgets that overlap with the vertical part of the cross increase proportionally as the width of the group widget increases, but their heights remain unchanged, i.e. the widgets marked B, C, J, K and M;
- the heights of those widgets that overlap with the horizontal part of the cross increase proportionally as the height of the group widget increases, but their widths remain unchanged, i.e. the widgets marked E, F, G, H and N;

- the widths and heights of the remaining widgets stay the same, i.e. the widgets marked A, D, I and L stay the same size.

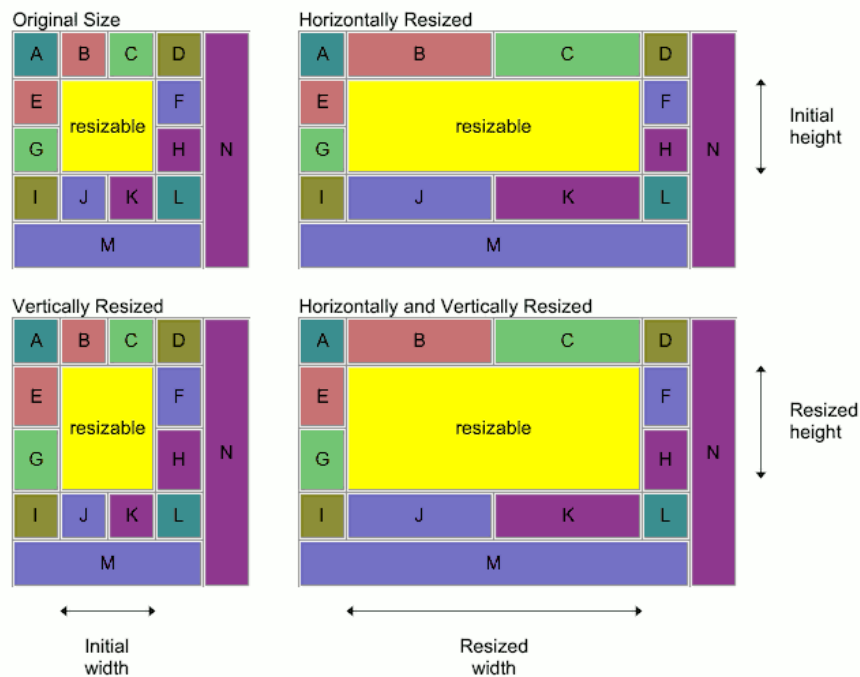


Figure 7.2 Complex resizing example

## 7.4 Practical examples

Why is this so powerful, you may ask. Well, every widget group can have a completely independent resizing strategy. By replacing one or more of the group's "normal" child widgets with another group widget where all of the above rules can be applied again, it is possible to create a hierarchy of group widgets with very complex layouts and resizing behavior.

Consider a simple dialog box, consisting of an icon box and a message area on the top and a button at the bottom right: which widget should be the `resizable` one?

Setting the `resizable` to be the icon box won't give us what we want:

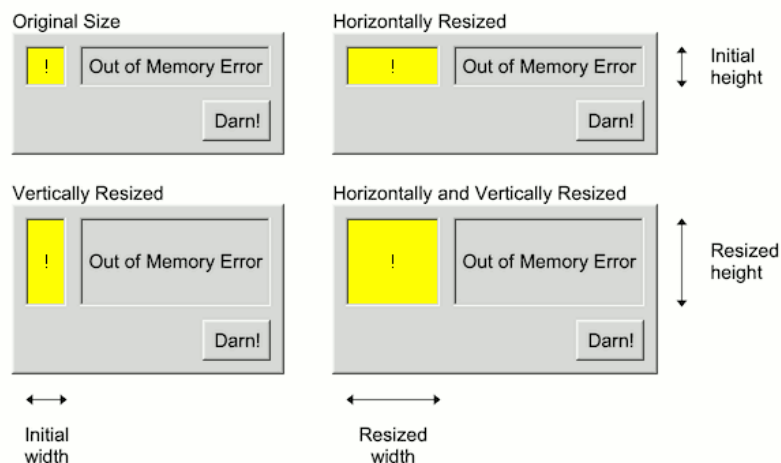


Figure 7.3 Resizing dialog example (a)

The message text area would be the logical choice so that the user can expand the dialog to see if there is more of an explanation below the short error message. This results in the behavior shown in the diagram below.

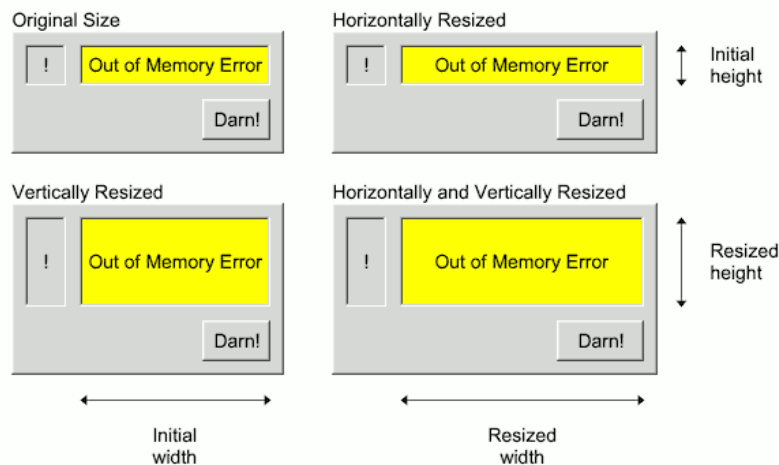


Figure 7.4 Resizing dialog example (b)

The result is close to what we want, but not quite: the text area will fully resize, the "!" icon box will resize vertically but not horizontally, which we can live with, but the "Darn!" button will - wait a minute - resize horizontally?

That's ugly. How do we stop that from happening? Simple: put it in its own group and set the `resizable` to an invisible box widget, as shown in the diagram below.

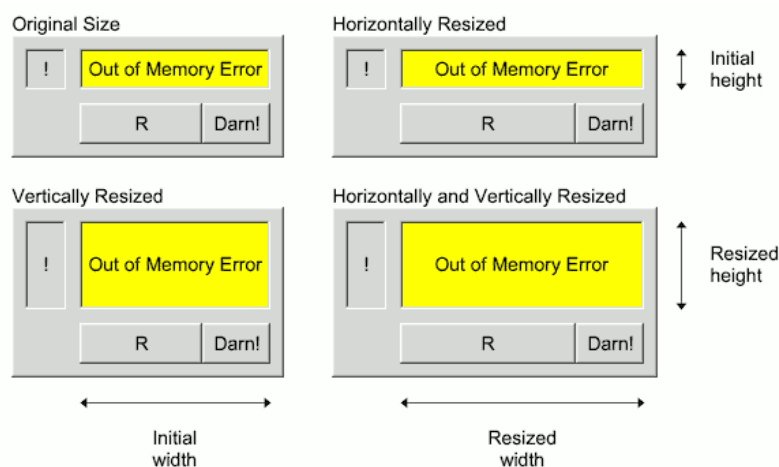


Figure 7.5 Resizing dialog example (c)

Now the invisible box, shown as "R", takes all of the horizontal resizing and the "Darn!" box will stay as it is. Here's the skeleton code:

```
dialog = new Fl_Window(300, 100);
icon = new Fl_Box(0, 0, 50, 50, "!");
text = new Fl_Box(50, 0, 250, 40, "Out of Memory Error");
btns = new Fl_Group(50, 50, 250, 50); // parent group
darn = new Fl_Button(200, 50, 100, 50, "Darn!");
R = new Fl_Box(50, 50, 150, 50); // "invisible" box "R"
R->hide(); // make sure it's invisible
btns->resizable(R); // make "R" parent group resizable
btns->end();
dialog->resizable(text);
dialog->end();
```

Imagine instead that you have a group that has a button, an input field, another button and a second input field, all next to each other, and you want the input fields to resize equally, but not the buttons. How could you achieve this?

Setting either of the input fields to be the `resizable` leaves the other one fixed, as shown below:

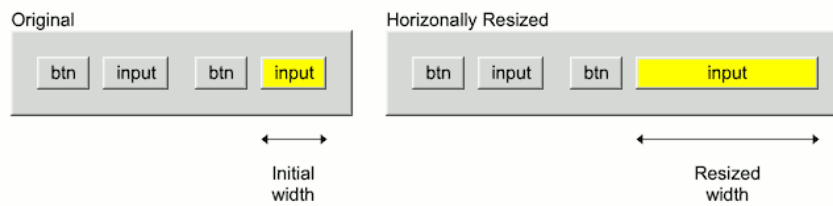


Figure 7.6 Resizing input fields example (b)

The answer is to leave the `resizable` of the group set to itself, and to create two equal size subgroups, each of which will resize equally. Add a button and input field to each subgroup, and set each subgroup's `resizable` to the input field, as shown below. Tada!

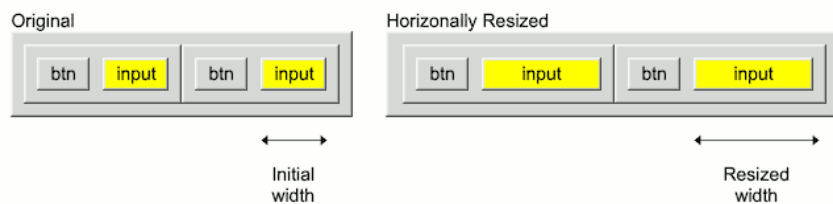


Figure 7.7 Resizing input fields example (b)

In FLTK it is possible to solve almost any layout and resizing problem by introducing an invisible box into a group, or an extra group into the widget hierarchy. It might take some thought to achieve exactly what you want and sometimes it is necessary to introduce parallel hierarchies in order to get widgets in different groups to resize together.

Imagine you have a group containing three widgets in a row, and you want the widget in the middle to stay the same size when the group is stretched and the ones on either side and the padding between them to resize symmetrically. As described earlier, the default resizing behavior for a group results in proportional resizing of the child widgets (and also of the margins and padding between them) as shown below, which is clearly not what you want.

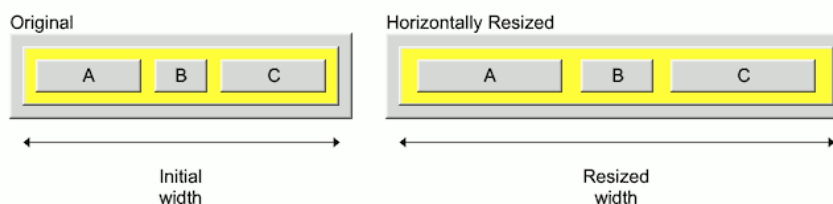


Figure 7.8 Resizing a row of widgets (a)

Simply adding a group around A and B and setting its `resizable` to A, as in the previous btn-input example, will mean that B stays the same size, but the other widgets won't resize symmetrically, so what else is needed? It isn't immediately obvious how to solve this problem, even for experienced FLTK users. This is possibly because users are generally advised to design widgets so that they don't overlap.

Albrecht Schlosser proposed an innovative technique that involves an invisible box that deliberately overlaps others to achieve the desired behavior. For the current example, this means inserting two new groups into the existing group and adding a hidden `resizable` widget.

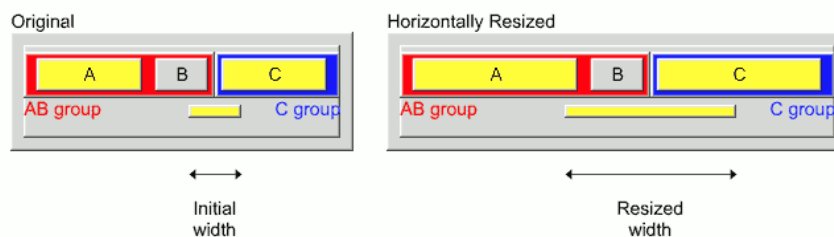
The first group, shown in red below, extends from the left edge of the parent group to the middle of the gap between boxes B and C on the right. This first group contains boxes A and B, where A is the first group's `resizable` attribute.

The second group, shown in blue, extends from the right edge of the first group to the right edge of the parent group. This second group contains box C, where C is the second group's `resizable`.

The extra box widget is added to the parent group and is set as the group's `resizable`. The three `resizable` widgets are shown in yellow.

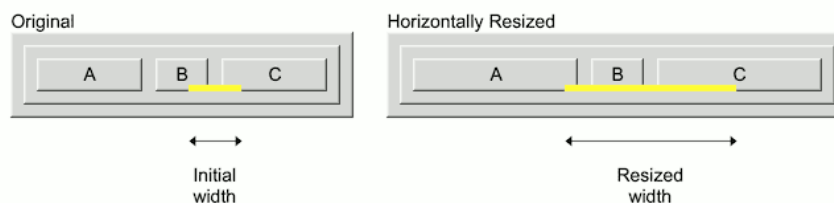
The clever bit is that this extra box widget is not horizontally aligned with any of the existing groups and widgets in the usual way, but instead overlaps the right and left parts of the two new groups by the same small amount, which means that its midpoint is aligned with the edge between the groups.

Note that, for clarity, the height of the original group has been increased to allow space for the additional annotation and to highlight the extra resizable box in the extra space at the bottom of the group. This is fine for the horizontal-only resizing shown here, but means that widgets A, B and C will never change height because the extra resizable box does not overlap them vertically. Only the padding below them will be resized.



**Figure 7.9 Resizing a row of widgets (b)**

In a real application, you probably want to allow widgets A, B and C to resize vertically while the height of any padding or widgets above or below remains fixed, so the extra resizable box has to lie within the height of widgets A, B and C. Obviously after calling `hide()` on the box it is no longer visible, and may therefore be the same height as the other widgets, or a fraction of the height, as shown below.



**Figure 7.10 Resizing a row of widgets (c)**

To summarize the key points of the new technique:

- The new resizable widget must overlap the widgets on each side by exactly the same amount.
- The width of the new resizable widget is not fixed, but should probably be a relatively small value to avoid potential problems.
- The total width of the two new groups must equal the width of the existing group and there can be no offsets or gaps between them because margins and gaps will affect the resizing behavior.
- The same principles apply to vertical resizing.

## Chapter 8

# Designing a Simple Text Editor

This chapter guides you through the design of a simple FLTK-based text editor.

The complete source code for our text editor can be found in the `test/editor.cxx` file.

The tutorial comprises multiple chapters, and you can activate the relevant code by adjusting the `TUTORIAL_↔CHAPTER` macro at the top of the source file to match the chapter number.

Each chapter builds on the previous one. The documentation, as well as the source code, can be read sequentially, maintaining a consistent program structure while introducing additional features step by step.

### Note

The tutorial uses several global variables for brevity. Additionally, the order of code blocks is rather uncommon but helps to keep related features within a chapter.

## 8.1 Determining the Goals of the Text Editor

As our first step, we define what we want our text editor to do:

1. Edit a single text document.
2. Provide a menubar/menus for all functions.
3. Load from a file.
4. Save to a file.
5. Keep track of when the file has been changed.
6. Cut/copy/delete/paste menus.
7. Search and replace functionality.
8. Multiple views of the same text.
9. "C" language syntax highlighting.

## 8.2 Chapter 1: A Minimal App

Let's ensure that we can set up our build process to compile and verify our code as we add features. We begin by writing a minimal program with no other purpose than opening a window.

The code for that is barely longer than a "Hello, world" program and is marked in the source code as `TUTORIAL`↔

```
_CHAPTER = 1.
#include <FL/Fl_Double_Window.H>
#include <FL/Fl.H>
Fl_Double_Window *app_window = NULL;
void tut1_build_app_window() {
    app_window = new Fl_Double_Window(640, 480, "FLTK Editor");
}
int main (int argc, char **argv) {
    tut1_build_app_window();
    app_window->show(argc, argv);
    return Fl::run();
}
```

Passing `argc` and `argv` to `Fl_Double_Window::show()` allows FLTK to parse command line options, providing the user with the ability to change the color or graphical scheme of the editor at launch time.

`Fl::run()` will return when no more windows in the app are visible. In other words, if all windows in an app are closed, hidden, or deleted. Pressing "Escape" or clicking the "Close" button in the window frame will close our only window, prompting `Fl::run()` to return, effectively ending the app.

When building FLTK from source, the CMake environment includes the necessary rules to build the editor. You can find more information on how to write your own CMake files in the `README.CMake.txt` text in the top FLTK directory.

For Linux and macOS, FLTK comes with the `fltk-config` script that generates the compiler commands for you: `fltk-config --compile editor.cxx`

If the code compiles and links correctly, running the app will pop up an empty application window on the desktop screen. You can close the window and quit the app by pressing the 'Escape' key or by clicking the "Close" button in the window frame.

Congratulations, you've just built a minimal FLTK app.

## 8.3 Chapter 2: Adding a Menu Bar

In this chapter, we will handle the window title and add the main menu bar with a File menu and a Quit button.

We need to declare a variable to track track changes in the text, and a buffer for the current filename.

```
// remove 'main()' from chapter 1, but keep the rest of the code, then add...
#include <FL/Fl_Menu_Bar.H>
#include <FL/fl_ask.H>
#include <FL/filename.H>
#include <FL/fl_string_functions.h>
Fl_Menu_Bar *app_menu_bar = NULL;
bool text_changed = false;
char app_filename[FL_PATH_MAX] = "";
```

The window title is either "FLTK Editor" if the text is not saved in any file, or the filename, followed by an \* if the text changed. Note that we have two ways to set the label of a widget. `label()` will link a static text, and `copy_label()` which will copy and manage the label text.

```
void update_title() {
    const char *fname = NULL;
    if (app_filename[0])
        fname = fl_filename_name(app_filename);
    if (fname) {
        char buf[FL_PATH_MAX + 3];
        buf[FL_PATH_MAX + 2] = '\0'; // ensure that the buffer is always terminated
        if (text_changed) {
            snprintf(buf, FL_PATH_MAX+2, "%s *", fname);
        }
    }
}
```

```

    } else {
        snprintf(buf, FL_PATH_MAX+2, "%s", fname);
    }
    app_window->copy_label(buf);
} else {
    app_window->label("FLTK Editor");
}
}

```

Now instead of writing directly to `text_changed`, we write a function that can set and clear the flag, and update the title accordingly.

```

void set_changed(bool v) {
    if (v != text_changed) {
        text_changed = v;
        update_title();
    }
}

```

Let's do the same for changing the filename. If the new filename is NULL, the window title will revert to "FLTK Editor".

```

void set_filename(const char *new_filename) {
    if (new_filename) {
        fl_strncpy(app_filename, new_filename, FL_PATH_MAX);
    } else {
        app_filename[0] = 0;
    }
    update_title();
}

```

But enough of managing window titles. The following code will add the first widget to our window. A menubar is created at the top and all across the main window.

```

void menu_quit_callback(Fl_Widget *, void *) { /* TODO */ }
void tut2_build_app_menu_bar() {
    app_window->begin();
    app_menu_bar = new Fl_Menu_Bar(0, 0, app_window->w(), 25);
    app_menu_bar->add("File/Quit Editor", FL_COMMAND+'q', menu_quit_callback);
    app_window->callback(menu_quit_callback);
    app_window->end();
}
int main (int argc, char **argv) {
    tut1_build_app_window();
    tut2_build_app_menu_bar();
    app_window->show(argc, argv);
    return Fl::run();
}

```

`begin()` tells FLTK to add all widgets created hereafter to our `app_window`. In this particular case, it is redundant because creating the window in the previous chapter already called `begin()` for us.

In the next line, we create the menu bar and add our first menu item to it. Menus can be constructed like file paths, with forward slashes '/' separating submenus from menu items.

Our basic callback is simple:

```

void menu_quit_callback(Fl_Widget *, void *) {
    Fl::hide_all_windows();
}

```

`Fl::hide_all_windows()` will make all windows invisible, causing `Fl::run()` to return and `main` to exit.

The next line, `app_window->callback(menu_quit_callback)` links the same `menu_quit_callback` to the `app_window` as well. Assigning the window callback removes the default "Escape" key handling and allows the `menu_quit_callback` to handle that keypress with a friendly dialog box instead of just quitting the app.

The `Fl_Widget*` parameter in the callback will either be `app_window` if called through the window callback, or `app_menu_bar` if called by one of the menu items.

One of our goals was to keep track of text changes. If we know the text changed and is unsaved, we should notify the user that she is about to lose her work. We achieve this by adding a dialog box in the Quit callback that queries if the user really wants to quit, even if text was changed:

```

void menu_quit_callback(Fl_Widget *, void *) {
    if (text_changed) {
        int c = fl_choice("Changes in your text have not been saved.\n"
                        "Do you want to quit the editor anyway?",
                        "Quit", "Cancel", NULL);
        if (c == 1) return;
    }
    Fl::hide_all_windows();
}

```

## 8.4 Chapter 3: Adding a Text Editor widget

FLTK comes with a pretty capable builtin text editing widget. We will use this `Fl_Text_Editor` widget here to allow users to edit their documents.

`Fl_Text_Editor` needs an `Fl_Text_Buffer` to do anything useful. What might seem like an unnecessary extra step is a great feature: we can assign one text buffer to multiple text editors. In a later chapter, we will use this feature to implement a split editor window.

```
#include <FL/Fl_Text_Buffer.H>
#include <FL/Fl_Text_Editor.H>
Fl_Text_Editor *app_editor = NULL;
Fl_Text_Editor *app_split_editor = NULL; // for later
Fl_Text_Buffer *app_text_buffer = NULL;
// ... callbacks go here
void tut3_build_main_editor() {
    app_window->begin();
    app_text_buffer = new Fl_Text_Buffer();
    app_text_buffer->add_modify_callback(text_changed_callback, NULL);
    app_editor = new Fl_Text_Editor(0, app_menu_bar->h(),
        app_window->w(), app_window->h() - app_menu_bar->h());
    app_editor->buffer(app_text_buffer);
    app_editor->textfont(FL_COURIER);
    app_window->resizable(app_editor);
    app_window->end();
}
```

By setting the `app_editor` to be the `resizable()` property of `app_window`, we make our application window resizable on the desktop, and we ensure that resizing the window will only resize the text editor vertically, but not our menu bar.

To keep track of changes to the document, we add a callback to the text editor that will be called whenever text is added or deleted. The text modify callback sets our `text_changed` flag if text was changed:

```
// insert before tut3_build_main_editor()
void text_changed_callback(int, int n_inserted, int n_deleted, int, const char*, void*) {
    if (n_inserted || n_deleted)
        set_changed(true);
}
```

To wrap this chapter up, we add a "File/New" menu and link it to a callback that clears the text buffer, clears the current filename, and marks the buffer as unchanged.

```
// insert before tut3_build_main_editor()
void menu_new_callback(Fl_Widget*, void*) {
    app_text_buffer->text("");
    set_changed(false);
}
// insert at the end of tut3_build_main_editor()
...
// find the Quit menu and insert the New menu there
int ix = app_menu_bar->find_index(menu_quit_callback);
app_menu_bar->insert(ix, "New", FL_COMMAND+'n', menu_new_callback);
...
```

## 8.5 Chapter 4: Reading and Writing Files

In this chapter, we will add support for loading and saving text files, so we need three more menu items in the File menu: Open, Save, and Save As.

```
#include <FL/Fl_Native_File_Chooser.H>
#include <FL/platform.H>
#include <errno.h>
// ... add callbacks here
void tut4_add_file_support() {
    int ix = app_menu_bar->find_index(menu_quit_callback);
    app_menu_bar->insert(ix, "Open", FL_COMMAND+'o', menu_open_callback, NULL, FL_MENU_DIVIDER);
    app_menu_bar->insert(ix+1, "Save", FL_COMMAND+'s', menu_save_callback);
    app_menu_bar->insert(ix+2, "Save as...", FL_COMMAND+'S', menu_save_as_callback, NULL, FL_MENU_DIVIDER);
}
```

**Note**

The menu shortcuts `FL_COMMAND+'s'` and `FL_COMMAND+'S'` look the same at a first glance, but the second shortcut is actually `Ctrl-Shift-S` due to the capital letter 'S'. Also, we use `FL_COMMAND` as our menu shortcut modifier key. `FL_COMMAND` translates to `FL_CTRL` on Windows and Linux, and to `FL_META` on macOS, better known as the cloverleaf, or simply "the Apple key".

We implement the Save As callback first, because we will want to call it from the Open callback later. The basic callback is only a few lines of code.

```
void menu_save_as_callback(Fl_Widget*, void*) {
    Fl_Native_File_Chooser file_chooser;
    file_chooser.title("Save File As...");
    file_chooser.type(Fl_Native_File_Chooser::BROWSE_SAVE_FILE);
    if (file_chooser.show() == 0) {
        app_text_buffer->savefile(file_chooser.filename());
        set_filename(file_chooser.filename());
        set_changed(false);
    }
}
```

However if the user has already set a file name including path information, it is the polite thing to preload the file chooser with that information. This little chunk of code will separate the file name from the path before we call `file_chooser.show()`:

```
// insert before 'if (file_chooser.show())...'
if (app_filename[0]) {
    char temp_filename[FL_PATH_MAX];
    fl_strncpy(temp_filename, app_filename, FL_PATH_MAX);
    const char *name = fl_filename_name(temp_filename);
    if (name) {
        file_chooser.preset_file(name);
        temp_filename[name - temp_filename] = 0;
        file_chooser.directory(temp_filename);
    }
}
```

Great. Now let's add code for our File/Save menu. If no filename was set yet, it falls back to our Save As callback. `Fl_Text_Editor::savefile()` writes the contents of our text widget into a UTF-8 encoded text file.

```
void menu_save_callback(Fl_Widget*, void*) {
    if (!app_filename[0]) {
        menu_save_as_callback(NULL, NULL);
    } else {
        app_text_buffer->savefile(file_chooser.filename());
        set_changed(false);
    }
}
```

Now that we have a save method available, we can improve the `menu_quit_callback` and offer the option to save the current modified text before quitting the app. Here is the new quit callback code that replaces the old callback:

```
void menu_quit_callback(Fl_Widget *, void *) {
    if (text_changed) {
        int r = fl_choice("The current file has not been saved.\n"
                         "Would you like to save it now?",
                         "Cancel", "Save", "Don't Save");
        if (r == 0) // cancel
            return;
        if (r == 1) { // save
            menu_save_callback(NULL, NULL);
            return;
        }
    }
    Fl::hide_all_windows();
}
```

On to loading a new file. Let's write the function to load a file from a given file name:

```
void load(const char *filename) {
    if (app_text_buffer->loadfile(filename) == 0) {
        set_filename(filename);
        set_changed(false);
    }
}
```

A friendly app should warn the user if file operations fail. This can be done in three lines of code, so let's add an alert dialog after every `loadfile` and `savefile` call. This is exemplary for `load()`, and the code is very similar for the two other locations.

```

void load(const char *filename) {
    if (app_text_buffer->loadfile(filename) == 0) {
        set_filename(filename);
        set_changed(false);
    } else {
        fl_alert("Failed to load file\n%s\n%s",
                filename,
                strerror(errno));
    }
}

```

If the user selects our pulldown "Load" menu, we first check if the current text was modified and provide a dialog box that offers to save the changes before loading a new text file:

```

void menu_open_callback(Fl_Widget*, void*) {
    if (text_changed) {
        int r = fl_choice("The current file has not been saved.\n"
                        "Would you like to save it now?",
                        "Cancel", "Save", "Don't Save");

        if (r == 2)
            return;
        if (r == 1)
            menu_save_callback();
    }
    ...
}

```

If the user did not cancel the operation, we pop up a file chooser for loading the file, using similar code as in Save As.

```

...
Fl_Native_File_Chooser file_chooser;
file_chooser.title("Open File...");
file_chooser.type(Fl_Native_File_Chooser::BROWSE_FILE);
...

```

Again, we preload the file chooser with the last used path and file name:

```

...
if (app_filename[0]) {
    char temp_filename[FL_PATH_MAX];
    fl_strlcpy(temp_filename, app_filename, FL_PATH_MAX);
    const char *name = fl_filename_name(temp_filename);
    if (name) {
        file_chooser.preset_file(name);
        temp_filename[name - temp_filename] = 0;
        file_chooser.directory(temp_filename);
    }
}
...

```

And finally, we pop up the file chooser. If the user cancels the file dialog, we do nothing and keep the current file. Otherwise, we call the `load()` function that we already wrote:

```

if (file_chooser.show() == 0)
    load(file_chooser.filename());
}

```

We really should support two more ways to load documents from a file. Let's modify the "show and run" part of `main()` to handle command line parameters and desktop drag'n'drop operations. For that, we refactor the last two lines of `main()` into a new function:

```

// ... new function here
int main(int argc, char **argv) {
    tut1_build_app_window();
    tut2_build_app_menu_bar();
    tut3_build_main_editor();
    tut4_add_file_support();
    // ... refactor those into the new function
    // app_window->show(argc, argv);
    // return Fl::run();
    return tut4_handle_commandline_and_run(argc, argv);
}

```

Our function to show the window and run the app has a few lines of boilerplate code. `Fl::args_to_utf8()` converts the command line argument from whatever the host system provides into Unicode. `Fl::args()` goes through the list of arguments and gives `args_handler()` a chance to handle each argument. It also makes sure that FLTK specific args are still forwarded to FLTK, so `"-scheme plastic"` and `"-background #aaccff"` will draw beautiful blue buttons in a plastic look.

`fl_open_callback()` lets FLTK know what to do if a user drops a text file onto our editor icon (Apple macOS). Here, we ask it to call the `load()` function that we wrote earlier.

```
// ... args_handler here
int tut4_handle_commandline_and_run(int &argc, char **argv) {
    int i = 0;
    Fl::args_to_utf8(argc, argv);
    Fl::args(argc, argv, i, args_handler);
    fl_open_callback(load);
    app_window->show(argc, argv);
    return Fl::run();
}
```

Last work item for this long chapter: what should our `args_handler` do? We could handle additional command line options here, but for now, all we want to handle is file names and paths. Let's make this easy: if the current arg does not start with a '-', we assume it is a file name, and we call `load()`:

```
int args_handler(int argc, char **argv, int &i) {
    if (argv && argv[i] && argv[i][0]!='-') {
        load(argv[i]);
        i++;
        return 1;
    }
    return 0;
}
```

So this is our basic but quite functional text editor app in about 100 lines of code. The following chapters add some user convenience functions and show off some FLTK features including split editors and syntax highlighting.

## 8.6 Chapter 5: Cut, Copy, and Paste

The FLTK Text Editor widget comes with builtin cut, copy, and paste functionality, but as a courtesy, we should also offer these as menu items in the main menu.

In our feature list, we noted that we want to implement a split text editor. This requires that the callbacks know which text editor has the keyboard focus. Calling `Fl::focus()` may return `NULL` or other unknown widgets, so we add a little test in our callbacks:

```
void menu_cut_callback(Fl_Widget*, void* v) {
    Fl_Widget *e = Fl::focus();
    if (e && (e == app_editor || e == app_split_editor))
        Fl_Text_Editor::kf_cut(0, (Fl_Text_Editor*)e);
}
```

We can write very similar callbacks for undo, redo, copy, paste, and delete. Adding a new menu and the six menu items follows the same pattern as before. Using the Menu/Item notation will create an Edit menu for us:

```
void tut5_cut_copy_paste() {
    app_menu_bar->add("Edit/Undo", FL_COMMAND+'z', menu_undo_callback);
    app_menu_bar->add("Edit/Redo", FL_COMMAND+'z', menu_redo_callback, NULL, FL_MENU_DIVIDER);
    app_menu_bar->add("Edit/Cut", FL_COMMAND+'x', menu_cut_callback);
    app_menu_bar->add("Edit/Copy", FL_COMMAND+'c', menu_copy_callback);
    app_menu_bar->add("Edit/Paste", FL_COMMAND+'v', menu_paste_callback);
    app_menu_bar->add("Edit/Delete", 0, menu_delete_callback);
}
```

## 8.7 Chapter 6: Find and Find Next

Corporate called. They want a dialog box for their users that can search for some word in the text file. We can add this functionality using a callback and a standard FLTK dialog box.

Here is some code to find a string in a text editor. The first four lines make sure that we start our search at the cursor position of the current editor window. The rest of the code searches the string and marks it if found.

```
void find_next(const char *needle) {
    Fl_Text_Editor *editor = app_editor;
    Fl_Widget *e = Fl::focus();
    if (e && e == app_split_editor)
        editor = app_split_editor;
    int pos = editor->insert_position();
    int found = app_text_buffer->search_forward(pos, needle, &pos);
    if (found) {
        app_text_buffer->select(pos, pos + (int)strlen(needle));
    }
}
```

```

    editor->insert_position(pos + (int)strlen(needle));
    editor->show_insert_position();
} else {
    fl_alert("No further occurrences of '%s' found!", needle);
}
}

```

The callbacks are short, using the FLTK text field dialog box and the `find_next` function that we already implemented. The last searched text is saved in `last_find_text` to be reused by `menu_find_next_callback`. If no search text was set yet, or it was set to an empty text, "Find Next" will forward to `menu_find_callback` and pop up our "Find Text" dialog.

```

char last_find_text[1024] = "";
void menu_find_callback(Fl_Widget*, void* v) {
    const char *find_text = fl_input("Find in text:", last_find_text);
    if (find_text) {
        fl_strlcpy(last_find_text, find_text, sizeof(last_find_text));
        find_next(find_text);
    }
}
void menu_find_next_callback(Fl_Widget*, void* v) {
    if (last_find_text[0]) {
        find_next(last_find_text);
    } else {
        menu_find_callback(NULL, NULL);
    }
}

```

And of course we need to add two menu items to our main application menu.

```

...
app_menu_bar->add("Find/Find...", FL_COMMAND+'f', menu_find_callback);
app_menu_bar->add("Find/Find Next", FL_COMMAND+'g', menu_find_next_callback, NULL, FL_MENU_DIVIDER);
...

```

## 8.8 Chapter 7: Replace and Replace Next

To implement the next feature, we will need to implement our own "Find and Replace" dialog box. To make this dialog box useful, it needs the following elements:

- a text input field for the text that we want to find
- a text input field for the replacement text
- a button to find the next occurrence
- a button to replace the current text and find the next occurrence
- a button to close the dialog

This is rather complex functionality, so instead of adding more global variables, we will pack this dialog into a class, derived from `Fl_Window`.

### Note

The tutorial uses `Fl_Double_Window` instead of `Fl_Window` throughout. Historically, on some platforms, `Fl_Window` renders faster, but has a tendency to flicker. In today's world, this has very little relevance and FLTK optimizes both window types. `Fl_Double_Window` is recommended unless there is a specific reason to use `Fl_Window`.

Let's implement the text replacement code first:

```
char last_replace_text[1024] = "";
void replace_selection(const char *new_text) {
    Fl_Text_Editor *editor = app_editor;
    Fl_Widget *e = Fl::focus();
    if (e && e == app_split_editor)
        editor = app_split_editor;
    int start, end;
    if (app_text_buffer->selection_position(&start, &end)) {
        app_text_buffer->remove_selection();
        app_text_buffer->insert(start, new_text);
        app_text_buffer->select(start, start + (int)strlen(new_text));
        editor->insert_position(start + (int)strlen(new_text));
        editor->show_insert_position();
    }
}
```

As before, the first four lines anticipate a split editor and find the editor that has focus. The code then deletes the currently selected text, replaces it with the new text, selects the new text, and finally sets the text cursor to the end of the new text.

### The Replace\_Dialog class

The Replace\_Dialog class holds pointers to our active UI elements as well as all the callbacks for the dialog buttons.

```
class Replace_Dialog : public Fl_Double_Window {
    Fl_Input *find_text_input;
    Fl_Input *replace_text_input;
    Fl_Button *find_next_button;
    Fl_Button *replace_and_find_button;
    Fl_Button *close_button;
public:
    Replace_Dialog(const char *label);
    void show() FL_OVERRIDE;
private:
    static void find_next_callback(Fl_Widget*, void*);
    static void replace_and_find_callback(Fl_Widget*, void*);
    static void close_callback(Fl_Widget*, void*);
};
Replace_Dialog *replace_dialog = NULL;
```

The constructor creates the dialog and marks it as "non modal". This will make the dialog hover over the application window like a toolbox window until the user closes it, allowing multiple "find and replace" operations. So here is our constructor:

```
Replace_Dialog::Replace_Dialog(const char *label)
: Fl_Double_Window(430, 110, label)
{
    find_text_input = new Fl_Input(100, 10, 320, 25, "Find:");
    replace_text_input = new Fl_Input(100, 40, 320, 25, "Replace:");
    Fl_Flex* button_field = new Fl_Flex(100, 70, w()-100, 40);
    button_field->type(Fl_Flex::HORIZONTAL);
    button_field->margin(0, 5, 10, 10);
    button_field->gap(10);
    find_next_button = new Fl_Button(0, 0, 0, 0, "Next");
    find_next_button->callback(find_next_callback, this);
    replace_and_find_button = new Fl_Button(0, 0, 0, 0, "Replace");
    replace_and_find_button->callback(replace_and_find_callback, this);
    close_button = new Fl_Button(0, 0, 0, 0, "Close");
    close_button->callback(close_callback, this);
    button_field->end();
    set_non_modal();
}
```

All buttons are created inside an `Fl_Flex` group. They will be arranged automatically by `Fl_Flex`, so there is no need to set x and y coordinates or a width or height. `button_field` will lay out the buttons for us.

### Note

There is no need to write a destructor or delete individual widgets. When we delete an instance of `Replace_Dialog`, all children are deleted for us.

The `show()` method overrides the window's `show` method. It adds some code to preload the values of the text fields for added convenience. It then pops up the dialog box by calling the original `Fl_Double_Window::show()`.

```
void Replace_Dialog::show() {
    find_text_input->value(last_find_text);
    replace_text_input->value(last_replace_text);
    Fl_Double_Window::show();
}
```

The buttons in the dialog need callbacks to be useful. If callbacks are defined within a class, they must be defined `static`, but a pointer to the class can be provided through the `user_data` field. We have done that in the constructor by adding `this` as the last argument when setting the callback, for example in `close_` button->callback(close\_callback, this);.

The callback itself can then extract the `this` pointer with a static cast:

```
void Replace_Dialog::close_callback(Fl_Widget*, void* my_dialog) {
    Replace_Dialog *dlg = static_cast<Replace_Dialog*>(my_dialog);
    dlg->hide();
}
```

The callback for the Find button uses our already implemented `find_next` function:

```
void Replace_Dialog::find_next_callback(Fl_Widget*, void* my_dialog) {
    Replace_Dialog *dlg = static_cast<Replace_Dialog*>(my_dialog);
    fl_strncpy(last_find_text, dlg->find_text_input->value(), sizeof(last_find_text));
    fl_strncpy(last_replace_text, dlg->replace_text_input->value(), sizeof(last_replace_text));
    if (last_find_text[0])
        find_next(last_find_text);
}
```

The Replace button callback calls our newly implemented `replace_selection` function and then continues on to the `find_next_callback`:

```
void Replace_Dialog::replace_and_find_callback(Fl_Widget*, void* my_dialog) {
    Replace_Dialog *dlg = static_cast<Replace_Dialog*>(my_dialog);
    replace_selection(dlg->replace_text_input->value());
    find_next_callback(NULL, my_dialog);
}
```

This long chapter comes close to its end. We are missing menu items that pop up our dialog and that allow a quick "Replace and Find Next" functionality without popping up the dialog. The code is quite similar to the "Find" and "Find Next" code in the previous chapter:

```
void menu_replace_callback(Fl_Widget*, void*) {
    if (!replace_dialog)
        replace_dialog = new Replace_Dialog("Find and Replace");
    replace_dialog->show();
}

void menu_replace_next_callback(Fl_Widget*, void*) {
    if (!last_find_text[0]) {
        menu_replace_callback(NULL, NULL);
    } else {
        replace_selection(last_replace_text);
        find_next(last_find_text);
    }
}

void tut7_implement_replace() {
    app_menu_bar->add("Find/Replace...", FL_COMMAND+'r', menu_replace_callback);
    app_menu_bar->add("Find/Replace Next", FL_COMMAND+'t', menu_replace_next_callback);
}
```

## 8.9 Chapter 8: Editor Features

Chapter 7 was long an intense. Let's relax and implement something simple here. We want menus with check boxes that can toggle some text editor features on and off:

```
void tut8_editor_features() {
    app_menu_bar->add("Window/Line Numbers", FL_COMMAND+'l', menu_linenumbers_callback, NULL, FL_MENU_TOGGLE);
    app_menu_bar->add("Window/Word Wrap", 0, menu_wordwrap_callback, NULL, FL_MENU_TOGGLE);
}
```

The `Fl_Widget` parameter in callbacks always points to the widget that causes the callback. Menu items are not derived from widgets, so to find out which menu item caused a callback, we can do this:

```
void menu_linenumbers_callback(Fl_Widget* w, void*) {
    Fl_Menu_Bar* menu = static_cast<Fl_Menu_Bar*>(w);
    const Fl_Menu_Item* linenum_item = menu->mvalue();
}
```

```

if (linenumber_item->value()) {
    app_editor->linenumber_width(40);
} else {
    app_editor->linenumber_width(0);
}
app_editor->redraw();
}

```

Setting the width enables the line numbers, setting it to 0 disables the line number display. When changing the value of a widget, FLTK will make sure that the widget is redrawn to reflect the new value. When changing other attributes such as colors or fonts, FLTK assumes that many attributes are changed at the same time and leaves it to the user to call `Fl_Widget::redraw()` when done. Here we call `app_editor->redraw()` to make sure that the change in the line number setting is also drawn on screen.

Let's not forget to update the line number display for a potential split editor widget as well:

```

// add before the end of menu_linenumbers_callback
if (app_split_editor) {
    if (linenumber_item->value()) {
        app_split_editor->linenumber_width(40);
    } else {
        app_split_editor->linenumber_width(0);
    }
    app_split_editor->redraw();
}

```

The word wrap feature is activated by calling `Fl_Text_Editor::wrap_mode()` with the parameters `Fl_Text_Display::WRAP_AT_BOUNDS` and 0. It's deactivated with `Fl_Text_Display::WRAP_NONE`. The implementation of the callback is the same as `menu_linenumbers_callback`.

## 8.10 Chapter 9: Split Editor

When editing long source code files, it can be really helpful to split the editor to view statements at the top of the text while adding features at the bottom of the text in a split text view.

FLTK can link multiple text editors to a single text buffer. Let's implement this now. This chapter will show you how to rearrange widgets in an existing widget tree.

Our initializer removes the main text editor from the widget tree and replaces it with an `Fl_Tile`. A tile can hold multiple widgets that can then be resized interactively by the user by clicking and dragging the divider between those widgets.

We start by replacing the editor widget with a tile group of the same size.

```

#include <FL/Fl_Tile.H>
Fl_Tile *app_tile = NULL;
void tut9_split_editor() {
    app_window->begin();
    app_tile = new Fl_Tile(app_editor->x(), app_editor->y(),
                          app_editor->w(), app_editor->h());
    app_window->remove(app_editor);
}

```

Next we add our existing editor as the first child of the tile and create another text editor `app_split_editor` as the second child of the tile, but it's hidden for now with a height of zero pixels.

### Note

Creating the new `Fl_Tile` also calls `Fl_Tile::begin()`.

Adding `app_editor` to the tile would have also removed it from `app_window`, so `app_window->remove(app_editor)` in the code above is not really needed, but illustrates what we are doing.

```

app_tile->add(app_editor);
app_split_editor = new FL_Text_Editor(app_tile->x(), app_tile->y()+app_tile->h(),
                                     app_tile->w(), 0);
app_split_editor->buffer(app_text_buffer);
app_split_editor->textfont(FL_COURIER);
app_split_editor->hide();

```

Now we clean up after ourselves and make sure that the resizables are all set correctly. Lastly, we add a menu item with a callback.

```

app_tile->end();
app_tile->size_range(0, 25, 25);
app_tile->size_range(1, 25, 25);
app_window->end();
app_window->resizable(app_tile);
app_tile->resizable(app_editor);
app_menu_bar->add("Window/Split", FL_COMMAND+'i', menu_split_callback, NULL, FL_MENU_TOGGLE);
}

```

Now with all widgets in place, the callback's job is to show and resize, or hide and resize the split editor. We can implement that like here:

```

void menu_split_callback(FL_Widget* w, void*) {
    FL_Menu_Bar* menu = static_cast<FL_Menu_Bar*>(w);
    const FL_Menu_Item* splitview_item = menu->mvalue();
    if (splitview_item->value()) {
        int h_split = app_tile->h()/2;
        app_editor->size(app_tile->w(), h_split);
        app_split_editor->resize(app_tile->x(), app_tile->y() + h_split,
                               app_tile->w(), app_tile->h() - h_split);
        app_split_editor->show();
    } else {
        app_editor->size(app_tile->w(), app_tile->h());
        app_split_editor->resize(app_tile->x(), app_tile->y()+app_tile->h(),
                               app_tile->w(), 0);
        app_split_editor->hide();
    }
    app_tile->resizable(app_editor);
    app_tile->init_sizes();
    app_tile->redraw();
}

```

## 8.11 Chapter 10: Syntax Highlighting

Chapter 10 adds a lot of code to implement "C" language syntax highlighting. Not all code is duplicated here in the documentation. Please check out `test/editor.cxx` for all the details.

The `FL_Text_Editor` widget supports highlighting of text with different fonts, colors, and sizes. The implementation is based on the excellent `NEdit` text editor core, from <https://sourceforge.net/projects/nedit/>, which uses a parallel "style" buffer which tracks the font, color, and size of the text that is drawn.

Styles are defined using the `FL_Text_Display::Style_Table_Entry` structure defined in `<FL/Fl_Text_Display.H>`←

```

:
struct Style_Table_Entry {
    FL_Color color;
    FL_Font font;
    int size;
    unsigned attr;
};

```

The `color` member sets the color for the text, the `font` member sets the FLTK font index to use, and the `size` member sets the pixel size of the text. The `attr` member is currently not used.

For our text editor we'll define 7 styles for plain code, comments, keywords, and preprocessor directives:

```

FL_Text_Display::Style_Table_Entry styletable[] = { // Style table
    { FL_BLACK, FL_COURIER, FL_NORMAL_SIZE }, // A - Plain
    { FL_DARK_GREEN, FL_COURIER_ITALIC, FL_NORMAL_SIZE }, // B - Line comments
    { FL_DARK_GREEN, FL_COURIER_ITALIC, FL_NORMAL_SIZE }, // C - Block comments
    { FL_BLUE, FL_COURIER, FL_NORMAL_SIZE }, // D - Strings
    { FL_DARK_RED, FL_COURIER, FL_NORMAL_SIZE }, // E - Directives
    { FL_DARK_RED, FL_COURIER_BOLD, FL_NORMAL_SIZE }, // F - Types
    { FL_BLUE, FL_COURIER_BOLD, FL_NORMAL_SIZE } // G - Keywords
};

```

You'll notice that the comments show a letter next to each style - each style in the style buffer is referenced using a character starting with the letter 'A'.

You call the `highlight_data()` method to associate the style data and buffer with the text editor widget:

```
Fl_Text_Buffer *app_style_buffer;
app_editor->highlight_data(app_style_buffer, styletable,
                           sizeof(styletable) / sizeof(styletable[0]),
                           'A', style_unfinished_cb, 0);
```

Finally, you need to add a callback to the main text buffer so that changes to the text buffer are mirrored in the style buffer:

```
app_text_buffer->add_modify_callback(style_update, app_editor);
```

The `style_update()` function, like the `change_cb()` function described earlier, is called whenever text is added or removed from the text buffer. It mirrors the changes in the style buffer and then updates the style data as necessary:

```
//
// 'style_update()' - Update the style buffer...
//
void
style_update(int      pos,          // I - Position of update
             int      nInserted,    // I - Number of inserted chars
             int      nDeleted,     // I - Number of deleted chars
             int      nRestyled,    // I - Number of restyled chars
             const char *deletedText, // I - Text that was deleted
             void      *cbArg) {    // I - Callback data
    int start,                      // Start of text
        end;                       // End of text
    char last,                     // Last style on line
        *style,                   // Style data
        *text;                    // Text data

    // If this is just a selection change, just unselect the style buffer...
    if (nInserted == 0 && nDeleted == 0) {
        app_style_buffer->unselect();
        return;
    }
    // Track changes in the text buffer...
    if (nInserted > 0) {
        // Insert characters into the style buffer...
        style = new char[nInserted + 1];
        memset(style, 'A', nInserted);
        style[nInserted] = '\0';
        app_style_buffer->replace(pos, pos + nDeleted, style);
        delete[] style;
    } else {
        // Just delete characters in the style buffer...
        app_style_buffer->remove(pos, pos + nDeleted);
    }
    // Select the area that was just updated to avoid unnecessary
    // callbacks...
    app_style_buffer->select(pos, pos + nInserted - nDeleted);
    // Re-parse the changed region; we do this by parsing from the
    // beginning of the line of the changed region to the end of
    // the line of the changed region... Then we check the last
    // style character and keep updating if we have a multi-line
    // comment character...
    start = app_text_buffer->line_start(pos);
    end   = app_text_buffer->line_end(pos + nInserted - nDeleted);
    text  = app_text_buffer->text_range(start, end);
    style = app_style_buffer->text_range(start, end);
    last  = style[end - start - 1];
    style_parse(text, style, end - start);
    app_style_buffer->replace(start, end, style);
    ((Fl_Text_Editor *)cbArg)->redisplay_range(start, end);
    if (last != style[end - start - 1]) {
        // The last character on the line changed styles, so reparse the
        // remainder of the buffer...
        free(text);
        free(style);
        end   = app_text_buffer->length();
        text  = app_text_buffer->text_range(start, end);
        style = app_style_buffer->text_range(start, end);
        style_parse(text, style, end - start);
        app_style_buffer->replace(start, end, style);
        ((Fl_Text_Editor *)cbArg)->redisplay_range(start, end);
    }
    free(text);
    free(style);
}
```

The `style_parse()` function scans a copy of the text in the buffer and generates the necessary style characters for display. It assumes that parsing begins at the start of a line:

```

//
// 'style_parse()' - Parse text and produce style data.
//
void
style_parse(const char *text,
            char *style,
            int length) {
    char current;
    int col;
    int last;
    char buf[255],
        *bufptr;
    const char *temp;
    for (current = *style, col = 0, last = 0; length > 0; length --, text ++ ) {
        if (current == 'A') {
            // Check for directives, comments, strings, and keywords...
            if (col == 0 && *text == '#') {
                // Set style to directive
                current = 'E';
            } else if (strncmp(text, "//", 2) == 0) {
                current = 'B';
            } else if (strncmp(text, "/*", 2) == 0) {
                current = 'C';
            } else if (strncmp(text, "\\\"", 2) == 0) {
                // Quoted quote...
                *style++ = current;
                *style++ = current;
                text ++;
                length --;
                col += 2;
                continue;
            } else if (*text == '\\') {
                current = 'D';
            } else if (!last && islower(*text)) {
                // Might be a keyword...
                for (temp = text, bufptr = buf;
                     islower(*temp) && bufptr < (buf + sizeof(buf) - 1);
                     *bufptr++ = *temp++);
                if (!islower(*temp)) {
                    *bufptr = '\0';
                    bufptr = buf;
                    if (bsearch(&bufptr, code_types,
                               sizeof(code_types) / sizeof(code_types[0]),
                               sizeof(code_types[0]), compare_keywords)) {
                        while (text < temp) {
                            *style++ = 'F';
                            text ++;
                            length --;
                            col ++;
                        }
                        text --;
                        length ++;
                        last = 1;
                        continue;
                    } else if (bsearch(&bufptr, code_keywords,
                                     sizeof(code_keywords) / sizeof(code_keywords[0]),
                                     sizeof(code_keywords[0]), compare_keywords)) {
                        while (text < temp) {
                            *style++ = 'G';
                            text ++;
                            length --;
                            col ++;
                        }
                        text --;
                        length ++;
                        last = 1;
                        continue;
                    }
                }
            }
        } else if (current == 'C' && strncmp(text, "*/", 2) == 0) {
            // Close a C comment...
            *style++ = current;
            *style++ = current;
            text ++;
            length --;
            current = 'A';
            col += 2;
            continue;
        } else if (current == 'D') {
            // Continuing in string...
            if (strncmp(text, "\\\"", 2) == 0) {
                // Quoted end quote...
                *style++ = current;
                *style++ = current;
                text ++;
                length --;
            }
        }
    }
}

```

```
        col += 2;
        continue;
    } else if (*text == '\\') {
        // End quote...
        *style++ = current;
        col ++;
        current = 'A';
        continue;
    }
}
// Copy style info...
if (current == 'A' && (*text == '{' || *text == '}')) *style++ = 'G';
else *style++ = current;
col ++;
last = isalnum(*text) || *text == '.';
if (*text == '\\n') {
    // Reset column and possibly reset the style
    col = 0;
    if (current == 'B' || current == 'E') current = 'A';
}
}
```



## Chapter 9

# FI\_Terminal Technical Documentation

This chapter covers the vt100/xterm style "escape codes" used by [FI\\_Terminal](#) for cursor positioning, text colors, and other display screen control features such as full or partial screen clearing, up/down scrolling, character insert/delete, etc.

### 9.1 The Escape Codes FI\_Terminal Supports

These are the escape codes [FI\\_Terminal](#) actually supports, and is not the 'complete' list that e.g. xterm supports. Most of the important stuff has been implemented, but esoteric features (such as scroll regions) has not.

Features will be added as the widget matures.

```
-----
--- The CSI (Control Sequence Introducer, or "ESC[") ---
-----
ESC[#@ - (ICH) Insert blank Chars (default=1)
ESC[#A - (CUU) Cursor Up, no scroll/wrap
ESC[#B - (CUD) Cursor Down, no scroll/wrap
ESC[#C - (CUF) Cursor Forward, no wrap
ESC[#D - (CUB) Cursor Back, no wrap
ESC[#E - (CNL) Cursor Next Line (crlf) xterm, !gnome
ESC[#F - (CPL) Cursor Preceding Line: move to sol and up # lines
ESC[#G - (CHA) Cursor Horizontal Absolute positioning

    ESC[G - move to column 1 (start of line, sol)
    ESC[#G - move to column #
ESC[#H - (CUP) Cursor Position (#'s are 1 based)

    ESC[H - go to row #1
    ESC[#H - go to (row #) (default=1)
    ESC[#;#H - go to (row# ; col#)
ESC[#I - (CHT) Cursor Horizontal Tab: tab forward

    ESC[#I - tab # times (default 1)
ESC[#J - (ED) Erase in Display

    ESC[0J - clear to end of display (default)
    ESC[1J - clear to start of display
    ESC[2J - clear all lines
    ESC[3J - clear screen history
ESC[#K - (EL) Erase in line

    ESC[0K - clear to end of line (default)
    ESC[1K - clear to start of line
    ESC[2K - clear current line
ESC[#L - (IL) Insert # Lines (default=1)
ESC[#M - (DL) Delete # Lines (default=1)
ESC[#P - (DCH) Delete # Chars (default=1)
ESC[#S - (SU) Scroll Up # lines (default=1)
ESC[#T - (SD) Scroll Down # lines (default=1)
ESC[#X - (ECH) Erase Characters (default=1)
ESC[#Z - (CBT) Cursor Backwards Tab

    ESC[#Z - backwards tab # times (default=1)
```

```

ESC[#a - (HPR) move cursor relative [columns] (default=[row,col+1]) (NOT IMPLEMENTED)
ESC[#b - (REP) repeat prev graphics char # times (NOT IMPLEMENTED)
ESC[#d - (VPA) Line Position Absolute [row] (NOT IMPLEMENTED)
ESC[#e - (LPA) Line Position Relative [row] (NOT IMPLEMENTED)
ESC[#f - (CUP) cursor position (#'s 1 based), same as ESC[H
ESC[#g - (TBC) Tabulation Clear

```

```

ESC[0g - Clear tabstop at cursor
ESC[3g - Clear all tabstops
ESC[#m - (SGR) Set Graphic Rendition

```

#### \*\*\* Attribute Enable \*\*\*

```

ESC[0m - reset: normal attribs/default fg/bg color (VT100)
ESC[1m - bold (VT100)
ESC[2m - dim
ESC[3m - italic
ESC[4m - underline (VT100)
ESC[5m - blink (NOT IMPLEMENTED) (VT100)
ESC[6m - (unused)
ESC[7m - inverse (VT100)
ESC[8m - (unused)
ESC[9m - strikeout
ESC[21m - doubly underline (Currently this just does single underline)

```

#### \*\*\* Attribute Disable \*\*\*

```

ESC[22m - disable bold/dim
ESC[23m - disable italic
ESC[24m - disable underline
ESC[25m - disable blink (NOT IMPLEMENTED)
ESC[26m - (unused)
ESC[27m - disable inverse
ESC[28m - disable hidden
ESC[29m - disable strikeout

```

#### \*\*\* Foreground Text "8 Color" \*\*\*

```

ESC[30m - fg Black
ESC[31m - fg Red
ESC[32m - fg Green
ESC[33m - fg Yellow
ESC[34m - fg Blue
ESC[35m - fg Magenta
ESC[36m - fg Cyan
ESC[37m - fg White
ESC[39m - fg default

```

#### \*\*\* Background Text "8 Color" \*\*\*

```

ESC[40m - bg Black
ESC[41m - bg Red
ESC[42m - bg Green
ESC[43m - bg Yellow
ESC[44m - bg Blue
ESC[45m - bg Magenta
ESC[46m - bg Cyan
ESC[47m - bg White
ESC[49m - bg default

```

#### \*\*\* Special RGB Color \*\*\*

```

ESC [ 38 ; Red ; Grn ; Blue m - where Red,Grn,Blu are decimal (0-255)
ESC[s - save cursor pos (ansi.sys+xterm+gnome, but NOT vt100)
ESC[u - rest cursor pos (ansi.sys+xterm+gnome, but NOT vt100)
ESC[>#q - (DECSCA) Set Cursor style (block/line/blink..) (NOT IMPLEMENTED)
ESC[#;#r - (DECSTBM) Set scroll Region top;bot (NOT IMPLEMENTED)
ESC[#..$t - (DECRARA) (NOT IMPLEMENTED)

```

#### --- C1 Control Codes ---

```

<ESC>c - (RIS) Reset term to Initial State
<ESC>D - (IND) Index: move cursor down a line, scroll if at bottom
<ESC>E - (NEL) Next Line: basically do a crlf, scroll if at bottom
<ESC>H - (HTS) Horizontal Tab Set: set a tabstop
<ESC>M - (RI) Reverse Index (up w/scroll)

```

NOTE: Acronyms in parens are Digital Equipment Corporation's names these VT features.

## 9.2 Useful Terminal Escape Code Documentation

Useful links for reference:

- <https://vt100.net/docs/vt100-ug/chapter3.html>
- <https://www.xfree86.org/current/ctlseqs.html>
- <https://www.x.org/docs/xterm/ctlseqs.pdf>
- <https://gist.github.com/justinmk/a5102f9a0c1810437885a04a07ef0a91> <- alphabetic!
- <https://invisible-island.net/xterm/ctlseqs/ctlseqs.html>

## 9.3 FI\_Terminal Design Document

When I started this project, I identified the key concepts needed to implement [FI\\_Terminal](#):

- Draw and manage multiline Unicode text in FLTK
- Allow per-character colors and attributes
- Efficient screen buffer to handle "scrollback history"
- Efficient scrolling with vertical scrollbar for even large screen history
- Mouse selection for copy/paste
- Escape code management to implement VT100 style / ANSI escape codes.

A class was created for each character, since characters can be either ASCII or Utf8 encoded byte sequences. This class is called `Utf8Char`, and handles the character, its fg and bg color, and any attributes like dim, bold, italic, etc.

For managing the screen, after various experiments, I decided a ring buffer was the best way to manage things, the ring split in two:

- 'screen history' which is where lines scrolled off the top are saved
- 'display screen' displayed to the user at all times, and where the cursor lives

Scrolling the display, either by scrollbar or by new text causing the display to scroll up one line, would simply change an 'offset' index# of where in the ring buffer the top of the screen is, automatically moving the top line into the history, all without moving memory around.

In fact the only time screen memory is moved around is during these infrequent operations:

- during scrolling "down"
- character insert/delete operations within a line
- changing the display size
- changing the history size

So a class "RingBuffer" is defined to manage the ring, and accessing its various parts, either as the entire entity ring, just the history, or just the display.

These three concepts, "ring", "history" and "display" are given abbreviated names in the RingBuffer class's API:

NOTE: Abbreviations "hist" and "disp"

"history" may be abbreviated as "hist", and "display" as "disp" in both this text and the source code. 4 character names are used so they line up cleanly in the source, e.g.

```
ring_rows()    ring_cols()
hist_rows()    hist_cols()
disp_rows()    disp_cols()

4 characters
```

These concepts were able to fit into C++ classes:

## Utf8Char

Each character on the screen is a "Utf8Char" which can manage the UTF-8 encoding of any character as one or more bytes. Also in that class is a byte for an attribute (underline, bold, etc), and two integers for fg/bg color.

## RingBuffer

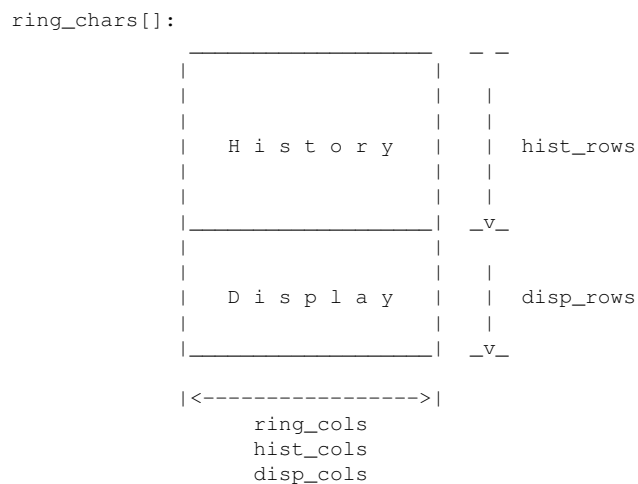
The RingBuffer class keeps track of the buffer itself, a single array of Utf8Chars called "ring\_chars" whose width is ring\_cols() and whose height is ring\_rows().

The "top" part of the ring is the history, whose width is hist\_cols() and whose height is hist\_rows(). hist\_use\_rows() is used to define what part of the history is currently in use.

The "bottom" part of the ring is the display, whose width is disp\_cols() and whose height is disp\_rows().

An index number called "offset" points to where in the ring buffer the top of the ring currently is. This index changes each time the screen is scrolled, and affects both where the top of the display is, and where the top of the history is.

The memory layout of the Utf8Char character array is:



So it's basically a single continuous array of Utf8Char instances where any character can generally be accessed by index# using the formula:

```
ring_chars[ (row*ring_cols)+col ]
```

..where 'row' is the desired row, 'col' is the desired column, and 'ring\_cols' is how many columns "wide" the buffer is.

The "offset" index affects that formula as an extra row offset, and the resulting index is then clamped within the range of the ring buffer using modulus.

Methods are used to allow direct access to the characters in the buffer that automatically handle the offset and modulus formulas, namely:

```
u8c_ring_row(row,col)    // access the entire ring by row/col
u8c_hist_row(row,col)    // access just the history buffer
u8c_disp_row(row,col)    // access just the display buffer
```

A key concept is the use of the simple 'offset' index integer to allow the starting point of the history and display to be moved around to implement 'text scrolling', such as when crlf at the screen bottom causes a 'scroll up'.

This is simply an "index offset" integer applied to the hist and disp indexes when drawing the display. So after scrolling two lines up, the offset is just increased by 2, redefining where the top of the history and display are, e.g.

```
Offset is 0:          2      Offset now 2:
                        D i s p l a y
                        >
H i s t o r y
                        2      H i s t o r y
                        >
D i s p l a y          >
                        D i s p l a y
```

This 'offset' trivially implements "text scrolling", avoiding having to physically move memory around. Just the 'offset' changes, the text remains where it is in memory.

This also makes it appear the top line in the display is 'scrolled up' into the bottom of the scrollbar 'history'.

If the offset exceeds the size of the ring buffer, it simply wraps around back to the beginning of the buffer with a modulo.

Indexes into the display and history are also modulo their respective rows, e.g.

```
act_ring_index = (hist_rows + disp_row + offset - scrollbar_pos) % ring_rows;
```

This way indexes for ranges can run beyond the bottom of the ring, and automatically wrap around the ring, e.g.

```

> 2
  3   D i s p l a y
  4
    <-- offset points here

disp
index      H i s t o r y
wraps

      0   D i s p l a y
      1   <- ring_rows points to end of ring
2 :
      3 :
disp_row(5) -> 4 :.....:

```

The dotted lines show where the display would be if not for the fact it extends beyond the bottom of the ring buffer (due to the current offset), and therefore wraps up to the top of the ring.

So to find a particular row in the display, in this case a 5 line display whose lines lie between 0 and 4, some simple math calculates the row position into the ring:

```

act_ring_index = (histrows      // the display exists AFTER the history, so offset the hist_rows
                  + offset      // include the scroll 'offset'
                  + disp_row    // add the desired row relative to the top of the display (0..disp_rows)
                  ) % ring_rows; // make sure the resulting index is within the ring buffer (0..ring_rows)

```

An additional bit of math makes sure if a negative result occurs, that negative value works relative to the end of the ring, e.g.

```

if (act_ring_index < 0) act_ring_index = ring_rows + act_ring_index;

```

This guarantees the `act_ring_index` is within the ring buffer's address space, with all offsets applied.

The math that implements this can be found in the `u8c_xxxx_row()` methods, where "xxxx" is one of the concept regions "ring", "hist" or "disp":

```

Utf8Char *u8c;
u8c = u8c_ring_row(rrow);    // address within ring, rrow can be 0..(ring_rows-1)
u8c = u8c_hist_row(hrow);    // address within hist, hrow can be 0..(hist_rows-1)
u8c = u8c_disp_row(drow);    // address within disp, drow can be 0..(disp_rows-1)

```

The small bit of math is only involved whenever a new row address is needed, so in a display that's 80x25, to walk all the characters in the screen, the math above would only be called 25 times, once for each row, and each column in the row is just a simple integer offset:

```

for ( int row=0; row<disp_rows(); row++ ) {    // walk rows: disp_rows = 25
    Utf8Char *u8c = u8c_disp_row(row);          // get first char in display 'row'
    for ( int col=0; col<disp_cols(); col++ ) { // walk cols: disp_cols = 80
        u8c[col].do_something();               // work with the char at row/col
    }
}

```

So to recap, the concepts here are:

- The ring buffer itself, a linear array that is conceptually split into a 2 dimensional array of rows and columns whose height and width are:

```
ring_rows -- how many rows in the entire ring buffer
ring_cols -- how many columns in the ring buffer
nchars    -- total chars in ring, e.g. (ring_rows * ring_cols)
```

- The "history" within the ring. For simplicity this is thought of as starting relative to the top of the ring buffer, occupying ring buffer rows:

```
0 .. hist_rows()-1
```

- The "display", or "disp", within the ring, just after the "history". It occupies the ring buffer rows:

```
hist_rows() .. hist_rows()+disp_rows()-1
```

..or similarly:

```
(hist_rows)..(ring_rows-1)
```

The following convenience methods provide access to the start and end indexes within the ring buffer for each entity:

Entire ring ring\_srow() – start row index of the ring buffer (always 0) ring\_erow() – end row index of the ring buffer

"history" part of ring hist\_srow() – start row index of the screen history hist\_erow() – end row index of the screen history

"display" part of ring disp\_srow() – start row index of the display disp\_erow() – end row index of the display

The values returned by these are as described above. For the hist\_xxx() and disp\_xxx() methods the 'offset' included into the formula. (For this reason hist\_srow() won't always be zero the way ring\_srow() is, due to the 'offset')

The values returned by these methods can all be passed to the u8c\_ring\_row() function to access the actual character buffer's contents.

- An "offset" used to move the "history" and "display" around within the ring buffer to implement the "text scrolling" concept. The offset is applied when new characters are added to the buffer, and during drawing to find where the display actually is within the ring.
- The "scrollbar", which only is used when redrawing the screen the user sees, and is simply an additional offset to all the above, where a scrollbar value of zero (the scrollbar tab at the bottom) shows the display rows, and as the scrollbar values increase as the user moves the scrollbar tab upwards, +1 per line, this is subtracted from the normal starting index to let the user work their way backwards into the scrollbar history. Again, negative numbers wrap around within the ring buffer automatically.

The ring buffer allows new content to simply be appended to the ring buffer, and the index# for the start of the display and start of scrollbar history are simply incremented. So the next time the display is "drawn", it starts at a different position in the ring.

This makes scrolling content at high speed trivial, without memory moves. It also makes the concept of "scrolling" with the scrollbar simple as well, simply being an extra index offset applied during drawing.

## Mouse Selection

Dragging the mouse across the screen should highlight the text, allowing the user to extend the selection either beyond or before the point started. Extending the drag to the top of the screen should automatically 'scroll up' to select more lines in the scrollbar history, or below the bottom to do the opposite.

The mouse selection is implemented as a class to keep track of the start/end row/col positions of the selection, and other details such as a flag indicating if a selection has been made, what color the fg/bg text should appear when text is selected, and methods that allow setting and extending the selection, clearing the selection, and "scrolling" the selection, to ensure the row/col indexes adjust correctly to track when the screen or scrollbar is scrolled.

## Redraw Timer

Knowing when to redraw is tricky with a terminal, because sometimes high volumes of input will come in asynchronously, so in that case we need to determine when to redraw the screen to show the new content; too quickly will cause the screen to spend more time redrawing itself, preventing new input from being added. Too slowly, the user won't see new information appear in a timely manner.

To solve this, a rate timer is used to prevent too many redraws:

- When new data comes in, a 1/10 sec timer is started and a modify flag is set.
- `redraw()` is NOT called yet, allowing more data to continue to arrive quickly
- When the 1/10th second timer fires, the callback checks the modify flag:
  - if set, calls `redraw()`, resets the modify to 0, and calls `FI::repeat_timeout()` to repeat the callback in another 1/10th sec.
  - if clear, no new data came in, so DISABLE the timer, done.

In this way, redraws don't happen more than 10x per second, and `redraw()` is called only when there's new content to see.

The redraw rate can be set by the user application using the `FI_Terminal::redraw_rate()`, 0.10 being the default.

Some terminal operations necessarily call `redraw()` directly, such as interactive mouse selection, or during user scrolling the terminal's scrollbar, where it's important there's no delay in what the user sees while interacting directly with the widget.

## Chapter 10

# Drawing Things in FLTK

This chapter covers the drawing functions that are provided with FLTK.

### 10.1 When Can You Draw Things in FLTK?

There are only certain places you can execute FLTK code that draws to the computer's display. Calling these functions at other places will result in undefined behavior!

- The most common place is inside the virtual [FL\\_Widget::draw\(\)](#) method. To write code here, you must subclass one of the existing [FL\\_Widget](#) classes and implement your own version of `draw()`.
- You can also create custom [boxtypes](#) and [labeltypes](#). These involve writing small procedures that can be called by existing [FL\\_Widget::draw\(\)](#) methods. These "types" are identified by an 8-bit index that is stored in the widget's `box()`, `labeltype()`, and possibly other properties.
- You can call [FL\\_Window::make\\_current\(\)](#) to do incremental update of a widget. Use [FL\\_Widget::window\(\)](#) to find the window.

In contrast, code that draws to other drawing surfaces than the display (i.e., instances of derived classes of the [FL\\_Surface\\_Device](#) class, except [FL\\_Display\\_Device](#), such as [FL\\_Printer](#) and [FL\\_Copy\\_Surface](#)) can be executed at any time as follows:

1. Make your surface the new current drawing surface calling the [FL\\_Surface\\_Device::push\\_current\(FL\\_Surface\\_Device\\*\)](#) function.
2. Make a series of calls to any of the drawing functions described below; these will operate on the new current drawing surface;
3. Set the current drawing surface back to its previous state calling [FL\\_Surface\\_Device::pop\\_current\(\)](#).

## 10.2 What Units Do FLTK Functions Use?

Before version 1.4 all graphical quantities used by FLTK were in pixel units: a window of width 500 units was 500 pixels wide, a line of length 10 units was 10 pixels long, lines of text written using a 14-point font were 14 pixels below each other. This organization is not sufficient to support GUI apps that can be drawn on screens of varying pixel density, especially on High-DPI screens, because widgets become very small and text becomes unreadable.

FLTK version 1.4 introduces a new feature, a screen-specific **scale factor** which is a float number with a typical value in the 1-2.5 range and is used as follows: any graphical element with an FLTK value of  $v$  units is drawn on the screen with  $v * scale$  units. Thus, a window with width 500 units is  $500 * scale$  pixels wide, a line of length 10 units is  $10 * scale$  pixels long, lines of text written using a 14-point font are  $14 * scale$  pixels below each other. Consider a system with two screens, one with regular DPI and one with a twice higher DPI. If the first screen's scale factor is set to 1 and that of the second screen to 2, the GUI of any FLTK app appears equally sized on the two screens.

FLTK uses several units to measure graphical elements:

- All quantities used by the public FLTK API to measure graphical elements (e.g., window widths, line lengths, font sizes, clipping regions, image widths and heights) are in **FLTK units** except if it's explicitly documented another unit is used. FLTK units are both platform- and DPI-independent. An example of FLTK API using another unit is `Fl_Gl_Window::pixel_w()`.
- Just before drawing to a screen, the library internally multiplies all quantities expressed in FLTK units by the current value of the scale factor for the screen in use and obtains quantities in **drawing units**. The current scale factor value, for an `Fl_Window` named *window*, is given by  

```
int nscreen = window->screen_num(); // the screen where window is mapped
float s = Fl::screen_scale(nscreen); // this screen's scale factor
```

 One drawing unit generally corresponds to one screen pixel ...
- ... but not on macOS and for retina displays, where one drawing unit corresponds to two pixels.
- ... and not with the Wayland platform, where one drawing unit may correspond to 1, 2, or 3 pixels according to the current value of the Wayland-defined, integer-valued scale factor.

At application start time, FLTK attempts to detect the adequate scale factor value for each screen of the system. Here is how that's done under the [X11](#), [Windows](#), and [Wayland](#) platforms. If the resulting scale factor is not satisfactory, and also under the macOS platform, it's possible to set the `FLTK_SCALING_FACTOR` environmental variable to the desired numerical value (e.g., 1.75) and any FLTK app will start scaled with that value. Furthermore, it's possible to change the scale factor value of any screen at run time with `ctrl+/-/0/` keystrokes which enlarge, shrink, and reset, respectively, all FLTK windows on a screen and their content. Under macOS, the corresponding GUI scaling shortcuts are `cmd+/-/0/`.

GUI rescaling involves also image drawing: the screen area covered by the drawn image contains a number of pixels that grows with the scale factor. When FLTK draws images, it maps the image data (the size of these data is given by `Fl_Image::data_w()` and `Fl_Image::data_h()`) to the screen area whose size (in FLTK units) is given by `Fl_Image::w()` and `Fl_Image::h()`. How exactly such mapping is performed depends on the image type, the platform and some hardware features. The most common case for `Fl_RGB_Image`'s is that FLTK uses a scaled drawing system feature that directly maps image data to screen pixels. An important feature of FLTK for image drawing is the `Fl_Image::scale()` member function, new in FLTK version 1.4. This function controls the image drawing size (in FLTK units, given by `Fl_Image::w()` and `Fl_Image::h()`) independently from the size of the image data (given by `Fl_Image::data_w()` and `Fl_Image::data_h()`). An image with large enough data size can thus be drawn at the full resolution of the screen even when the screen area covered by the image grows following the GUI scale factor.

The `Fl_Image_Surface` class is intended to create an `Fl_RGB_Image` from a series of FLTK drawing operations. The `Fl_Image_Surface` constructor allows to control whether the size in pixels of the resulting image matches the FLTK units used when performing drawing operations, or matches the number of pixels corresponding to these FLTK units given the current value of the scale factor. The first result is obtained with `new Fl_Image_Surface(w, h)`, the second with `new Fl_Image_Surface(w, h, 1)`.

When drawing to `Fl_Printer` or `Fl_PostScript_File_Device`, the drawing unit is initially one point, that is, 1/72 of an inch. This unit is changed by calls to `Fl_Paged_Device::scale()`.

## 10.3 Drawing Functions

To use the drawing functions you must first include the `<FL/fl_draw.H>` header file. FLTK provides the following types of drawing functions:

- [Boxes](#)
- [Clipping](#)
- [Colors](#)
- [Color Contrast](#)
- [Line Dashes and Thickness](#)
- [Drawing Fast Shapes](#)
- [Drawing Complex Shapes](#)
- [Drawing Text](#)
- [Fonts](#)
- [Character Encoding](#)
- [Drawing Overlays](#)
- [Drawing Images](#)
- [Direct Image Drawing](#)
- [Direct Image Reading](#)
- [Image Classes](#)
- [Offscreen Drawing](#)

### 10.3.1 Boxes

FLTK provides three functions that can be used to draw boxes for buttons and other UI controls. Each function uses the supplied upper-lefthand corner and width and height to determine where to draw the box.

```
void fl_draw_box(FL_Boxtype b, int x, int y, int w, int h, FL_Color c)
```

The `fl_draw_box()` function draws a standard boxtype `b` in the specified color `c`.

```
void fl_frame(const char *s, int x, int y, int w, int h)
```

```
void fl_frame2(const char *s, int x, int y, int w, int h)
```

The `fl_frame()` and `fl_frame2()` functions draw a series of line segments around the given box. The string `s` must contain groups of 4 letters which specify one of 24 standard grayscale values, where 'A' is black and 'X' is white. The results of calling these functions with a string that is not a multiple of 4 characters in length are undefined.

The only difference between `fl_frame()` and `fl_frame2()` is the order of the line segments:

- For `fl_frame()` the order of each set of 4 characters is: top, left, bottom, right.
- For `fl_frame2()` the order of each set of 4 characters is: bottom, right, top, left.

Note that `fl_frame(FL_Boxtype b)` is described in the [Box Types](#) section.

### 10.3.2 Clipping

You can limit all your drawing to a rectangular region by calling `fl_push_clip()`, and put the drawings back by using `fl_pop_clip()`. This rectangle is measured in [FLTK units](#) and is unaffected by the current transformation matrix.

In addition, the system may provide clipping when updating windows which may be more complex than a simple rectangle.

```
void fl_push_clip(int x, int y, int w, int h)
void fl_clip(int x, int y, int w, int h)
```

Intersect the current clip region with a rectangle and push this new region onto the stack.

The `fl_clip()` version is deprecated and will be removed from future releases.

```
void fl_push_no_clip()
```

Pushes an empty clip region on the stack so nothing will be clipped.

```
void fl_pop_clip()
```

Restore the previous clip region.

**Note:** You must call `fl_pop_clip()` once for every time you call `fl_push_clip()`. If you return to FLTK with the clip stack not empty unpredictable results occur.

```
int fl_not_clipped(int x, int y, int w, int h)
```

Returns non-zero if any of the rectangle intersects the current clip region. If this returns 0 you don't have to draw the object.

**Note:** Under X this returns 2 if the rectangle is partially clipped, and 1 if it is entirely inside the clip region.

```
int fl_clip_box(int x, int y, int w, int h, int &X, int &Y, int &W, int &H)
```

Intersect the rectangle `x, y, w, h` with the current clip region and returns the bounding box of the result in `X, Y, W, H`. Returns non-zero if the resulting rectangle is different than the original. This can be used to limit the necessary drawing to a rectangle. `W` and `H` are set to zero if the rectangle is completely outside the region.

```
void fl_clip_region(FL_Region r)
FL_Region fl_clip_region()
```

Replace the top of the clip stack with a clipping region of any shape. `FL_Region` is an operating system specific type. The second form returns the current clipping region.

### 10.3.3 Colors

FLTK manages colors as 32-bit unsigned integers, encoded as RGBA. When the "RGB" bytes are non-zero, the value is treated as RGB. If these bytes are zero, the "I" byte will be used as an index into the colormap. Colors with both "RGB" set and an "I" > 0 are reserved for special use.

Values from 0 to 255, i.e. the "I" index value, represent colors from the FLTK standard colormap and are allocated as needed on screens without TrueColor support. The **Fl\_Color** enumeration type defines the standard colors and color cube for the first 256 colors. All of these are named with symbols in [<FL/Enumerations.H>](#). Example:

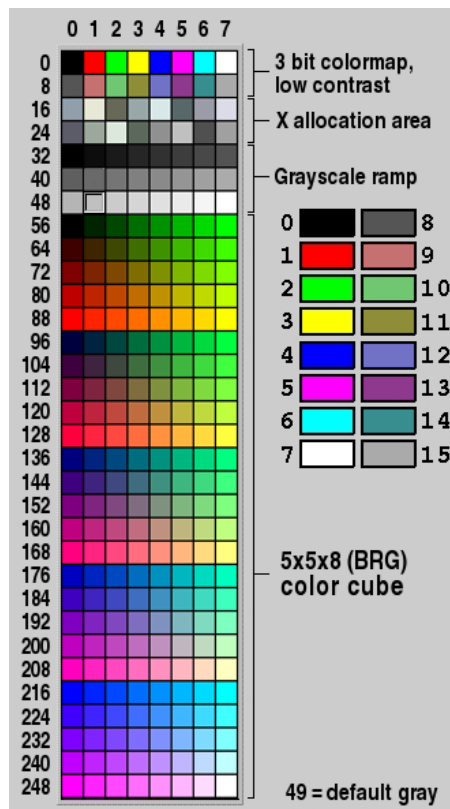


Figure 10.1 FLTK default colormap (Fl\_Color 0x00 - 0xff)

Color values greater than 255 are treated as 24-bit RGB values. These are mapped to the closest color supported by the screen, either from one of the 256 colors in the FLTK colormap or a direct RGB value on TrueColor screens.

```
Fl_Color fl_rgb_color(uchar r, uchar g, uchar b)
Fl_Color fl_rgb_color(uchar grayscale)
```

Generate Fl\_Color out of specified 8-bit RGB values or one 8-bit grayscale value.

```
void fl_color(Fl_Color c)
void fl_color(int c)
```

Sets the color for all subsequent drawing operations. Please use the first form: the second form is only provided for back compatibility.

For colormapped displays, a color cell will be allocated out of `fl_colormap` the first time you use a color. If the colormap fills up then a least-squares algorithm is used to find the closest color.

`Fl_Color fl_color()`

Returns the last color that was set using `fl_color()`. This can be used for state save/restore.

`void fl_color(uchar r, uchar g, uchar b)`

Set the color for all subsequent drawing operations. The closest possible match to the RGB color is used. The RGB color is used directly on TrueColor displays. For colormap visuals the nearest index in the gray ramp or color cube is used.

`unsigned Fl::get_color(Fl_Color i)`

`void Fl::get_color(Fl_Color i, uchar &red, uchar &green, uchar &blue)`

Generate RGB values from a colormap index value `i`. The first returns the RGB as a 32-bit unsigned integer, and the second decomposes the RGB into three 8-bit values.

`Fl::get_system_colors()`

`Fl::foreground()`

`Fl::background()`

`Fl::background2()`

The first gets color values from the user preferences or the system, and the other routines are used to apply those values.

`Fl::own_colormap()`

`Fl::free_color(Fl_Color i, int overlay)`

`Fl::set_color(Fl_Color i, unsigned c)`

`Fl::own_colormap()` is used to install a local colormap [X11 only].

`Fl::free_color()` and `Fl::set_color()` are used to remove and replace entries from the colormap.

There are two predefined graphical interfaces for choosing colors. The function `fl_show_colormap()` shows a table of colors and returns an `Fl_Color` index value. The `Fl_Color_Chooser` widget provides a standard RGB color chooser.

As the `Fl_Color` encoding maps to a 32-bit unsigned integer representing RGBI, it is also possible to specify a color using a hex constant as a color map index:

```
// COLOR MAP INDEX
color(0x000000II)
    ----- |
    | |
    | | Color map index (8 bits)
    | | Must be zero
button->color(0x000000ff); // colormap index #255 (FL_WHITE)
```

or specify a color using a hex constant for the RGB components:

```
// RGB COLOR ASSIGNMENTS
color(0xRRGGBB00)
    | | | |
    | | | Must be zero
    | | Blue (8 bits)
    | Green (8 bits)
    Red (8 bits)
button->color(0xff000000); // RGB: red
button->color(0x00ff0000); // RGB: green
button->color(0x0000ff00); // RGB: blue
button->color(0xffffffff00); // RGB: white
```

#### Note

If TrueColor is not available, any RGB colors will be set to the nearest entry in the colormap.

### 10.3.4 Color Contrast

Although these are not real "drawing" functions, creating readable contrast is essential in a good GUI design. FLTK tries to help with this by providing [fl\\_contrast\(\)](#) and related functions.

The basic function is `Fl_Color fl_contrast(Fl_Color fg, Fl_Color bg, int context, int size);`

The parameters `context` and `size` are optional and reserved for future use (since FLTK 1.4.0).

The return value can be used to substitute the foreground color `fg` used for drawing (usually the "text" or "label" color) on a particular background color `bg` with either black (FL\_BLACK) or white (FL\_WHITE). This is useful if the background color is not known or can be changed by the user or a system "theme".

FLTK calculates the contrast between `fg` and `bg` and returns the same color (`fg`) if the contrast is considered sufficient or one of FL\_BLACK or FL\_WHITE if the contrast of the given foreground color would be insufficient. Then either FL\_BLACK or FL\_WHITE is chosen, whichever has the higher contrast with the background color.

Example, may be used in a widget's `draw()` method:

```
Fl_Color bg = color(); // background color of the widget
Fl_Color fg = FL_BLUE; // the chosen foreground (drawing) color
fl_color(fl_contrast(fg, bg)); // set the drawing color
fl_rect(..); // draw a rectangle with sufficient contrast
```

FLTK 1.4.0 introduced a new contrast algorithm which is superior to the one used up to FLTK 1.3.x. You can use

```
fl_contrast_mode(FL_CONTRAST_LEGACY);
```

early in your program to select the old behavior if you really need strict backwards compatibility. This is discouraged because the new algorithm is much better with regard to human contrast perception. The default mode since FLTK 1.4.0 is

```
fl_contrast_mode(FL_CONTRAST_CIELAB);
```

For more info please see the linked documentation of these functions.

Additionally the old and new contrast calculations can be fine tuned with the new function (since 1.4.0)

```
fl_contrast_level(int level);
```

This is not recommended but can be useful for some border cases. Please refer to the documentation of [fl\\_contrast\\_level\(\)](#).

Finally, developers can define their own contrast calculation function with

```
void fl_contrast_function(Fl_Contrast_Function *f);
```

Please see the documentation for details.

### 10.3.5 Line Dashes and Thickness

FLTK supports drawing of lines with different styles and widths.

void `fl_line_style(int style, int width, char* dashes)`

FL_SOLID		FL_CAP_FLAT	
FL_DASH		FL_CAP_ROUND	
FL_DOT		FL_CAP_SQUARE	
FL_DASHDOT		FL_JOIN_MITER	
FL_DASHDOTDOT		FL_JOIN_ROUND	
		FL_JOIN_BEVEL	

Figure 10.2 `fl_line_style()` styles

Set how to draw lines (the "pen"). If you change this it is your responsibility to set it back to the default with `fl_line_style(0)`.

`style` is a bitmask which is a bitwise-OR of the following values. If you don't specify a dash type you will get a solid line. If you don't specify a cap or join type you will get a system-defined default of whatever value is fastest.

- `FL_SOLID` solid line
- `FL_DASH` 75% dashed line
- `FL_DOT` 50% pixel dotted
- `FL_DASHDOT` dash / dot pattern
- `FL_DASHDOTDOT` dash / two dot pattern
- `FL_CAP_FLAT` end is flat
- `FL_CAP_ROUND` end is round
- `FL_CAP_SQUARE` extends past end point 1/2 line width
- `FL_JOIN_MITER` line join extends to a point
- `FL_JOIN_ROUND` line join is rounded
- `FL_JOIN_BEVEL` line join is flat (tidied)

`width` is the number of [FLTK units](#) thick to draw the lines. Zero results in the system-defined default, which on both X and Windows is somewhat different and nicer than 1.

`dashes` is a pointer to an array of dash lengths, measured in [FLTK units](#). The first location is how long to draw a solid portion, the next is how long to draw the gap, then the solid, etc. It is terminated with a zero-length entry. A `NULL` pointer or a zero-length array results in a solid line. Odd array sizes are not supported and result in undefined behavior.

#### Note

- Full functionality is not available under Windows 95, 98, and Me due to the reduced drawing functionality these operating systems provide.
- Because of how line styles are implemented on Windows systems, you *must* set the line style *after* setting the drawing color. If you set the color after the line style you will lose the line style settings!
- The dashes array does not work under Windows 95, 98, or Me, since those operating systems do not support complex line styles.

### 10.3.6 Drawing Fast Shapes

These functions are used to draw almost all the FLTK widgets. They draw on exact pixel boundaries and are as fast as possible. Their behavior is duplicated exactly on all platforms FLTK is ported. It is undefined whether these are affected by the [transformation matrix](#), so you should only call these while the matrix is set to the identity matrix (the default).

```
void fl_point(int x, int y)
```

Draw a single pixel at the given coordinates.

```
void fl_rectf(int x, int y, int w, int h)
void fl_rectf(int x, int y, int w, int h, FL_Color c)
```

Color a rectangle that exactly fills the given bounding box.

```
void fl_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b)
```

Color a rectangle with "exactly" the passed `r`, `g`, `b` color. On screens with less than 24 bits of color this is done by drawing a solid-colored block using [fl\\_draw\\_image\(\)](#) so that the correct color shade is produced.

```
void fl_rect(int x, int y, int w, int h)
void fl_rect(int x, int y, int w, int h, FL_Color c)
```

Draw a 1-pixel border *inside* this bounding box.

```
void fl_rounded_rect(int x, int y, int w, int h, int radius) void fl_rounded_rectf(int x, int y, int w, int h, int radius)
```

Draw an outlined or filled rectangle with rounded corners.

```
void fl_line(int x, int y, int x1, int y1)
void fl_line(int x, int y, int x1, int y1, int x2, int y2)
```

Draw one or two lines between the given points.

```
void fl_loop(int x, int y, int x1, int y1, int x2, int y2)
void fl_loop(int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)
```

Outline a 3 or 4-sided polygon with lines.

```
void fl_polygon(int x, int y, int x1, int y1, int x2, int y2)
void fl_polygon(int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)
```

Fill a 3 or 4-sided polygon. The polygon must be convex.

```
void fl_xyline(int x, int y, int x1)
void fl_xyline(int x, int y, int x1, int y2)
void fl_xyline(int x, int y, int x1, int y2, int x3)
```

Draw horizontal and vertical lines. A horizontal line is drawn first, then a vertical, then a horizontal.

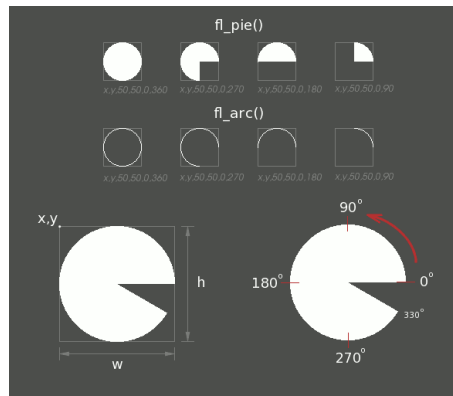
```
void fl_yxline(int x, int y, int y1)
void fl_yxline(int x, int y, int y1, int x2)
void fl_yxline(int x, int y, int y1, int x2, int y3)
```

Draw vertical and horizontal lines. A vertical line is drawn first, then a horizontal, then a vertical.

```
void fl_arc(int x, int y, int w, int h, double a1, double a2)
void fl_pie(int x, int y, int w, int h, double a1, double a2)
```

Draw ellipse sections using integer coordinates. These functions match the rather limited circle drawing code provided by X and Windows. The advantage over using `fl_arc()` with floating point coordinates is that they are faster because they often use the hardware, and they draw much nicer small circles, since the small sizes are often hard-coded bitmaps.

If a complete circle is drawn it will fit inside the passed bounding box. The two angles are measured in degrees counter-clockwise from 3'o'clock and are the starting and ending angle of the arc, `a2` must be greater or equal to `a1`.

Figure 10.3 `fl_pie()` and `fl_arc()`

`fl_arc()` draws a series of lines to approximate the arc. Notice that the integer version of `fl_arc()` has a different number of arguments to the other `fl_arc()` function described later in this chapter.

`fl_pie()` draws a filled-in pie slice. This slice may extend outside the line drawn by `fl_arc()`; to avoid this use `w-1` and `h-1`.

```
void fl_scroll(int X, int Y, int W, int H, int dx, int dy, void (draw_area)(void, int,int,int,int), void* data)
```

Scroll a rectangle and draw the newly exposed portions. The contents of the rectangular area is first shifted by `dx` and `dy` FLTK units. The callback is then called for every newly exposed rectangular area,

### 10.3.7 Drawing Complex Shapes

The complex drawing functions let you draw arbitrary shapes with 2-D linear transformations. The functionality matches that found in the Adobe® PostScript™ language. The exact pixels that are filled are less defined than for the fast drawing functions so that FLTK can take advantage of drawing hardware. On both X and Windows the transformed vertices are rounded to integers before drawing the line segments: this severely limits the accuracy of these functions for complex graphics, so use OpenGL when greater accuracy and/or performance is required.

```
void fl_load_matrix(double a,double b,double c,double d,double x,double y) void fl_load_identity()
```

Set the current transformation.

```
void fl_push_matrix()
void fl_pop_matrix()
```

Save and restore the current transformation. The maximum depth of the stack is 32 entries.

```
void fl_scale(double x,double y)
void fl_scale(double x)
void fl_translate(double x,double y)
void fl_rotate(double d)
void fl_mult_matrix(double a,double b,double c,double d,double x,double y)
```

Concatenate another transformation onto the current one. The rotation angle is in degrees (not radians) and is counter-clockwise.

```
double fl_transform_x(double x, double y)
double fl_transform_y(double x, double y)
double fl_transform_dx(double x, double y)
double fl_transform_dy(double x, double y)
void fl_transformed_vertex(double xf, double yf)
```

Transform a coordinate or a distance using the current transformation matrix. After transforming a coordinate pair, it can be added to the vertex list without any further translations using `fl_transformed_vertex()`.

```
void fl_begin_points()
void fl_end_points()
```

Start and end drawing a list of points. Points are added to the list with `fl_vertex()`.

```
void fl_begin_line()
void fl_end_line()
```

Start and end drawing lines.

```
void fl_begin_loop()
void fl_end_loop()
```

Start and end drawing a closed sequence of lines.

```
void fl_begin_polygon()
void fl_end_polygon()
```

Start and end drawing a convex filled polygon.

```
void fl_begin_complex_polygon()
void fl_gap()
void fl_end_complex_polygon()
```

Start and end drawing a complex filled polygon. This polygon may be concave, may have holes in it, or may be several disconnected pieces. Call `fl_gap()` to separate loops of the path. It is unnecessary but harmless to call `fl_gap()` before the first vertex, after the last one, or several times in a row.

`fl_gap()` should only be called between `fl_begin_complex_polygon()` and `fl_end_complex_polygon()`. To outline the polygon, use `fl_begin_loop()` and replace each `fl_gap()` with a `fl_end_loop();fl_begin_loop()` pair.

**Note:** For portability, you should only draw polygons that appear the same whether "even/odd" or "non-zero" winding rules are used to fill them. Holes should be drawn in the opposite direction of the outside loop.

void `fl_vertex(double x,double y)`

Add a single vertex to the current path.

void `fl_curve(double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double Y3)`

Add a series of points on a Bézier curve to the path. The curve ends (and two of the points are) at `X0, Y0` and `X3, Y3`.

void `fl_arc(double x, double y, double r, double start, double end)`

Add a series of points to the current path on the arc of a circle; you can get elliptical paths by using `scale` and `rotate` before calling `fl_arc()`. The center of the circle is given by `x` and `y`, and `r` is its radius. `fl_arc()` takes `start` and `end` angles that are measured in degrees counter-clockwise from 3 o'clock. If `end` is less than `start` then it draws the arc in a clockwise direction.

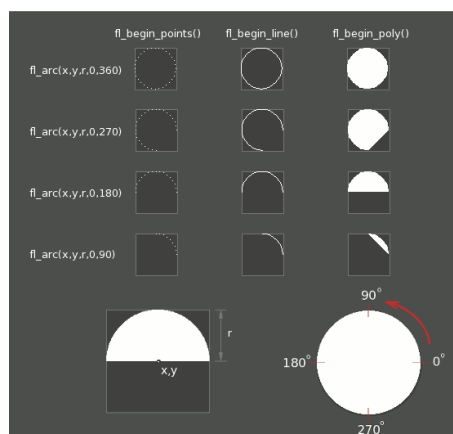


Figure 10.4 `fl_arc(x,y,r,a1,a2)`

void `fl_circle(double x, double y, double r)`

`fl_circle(x, y, r)` is equivalent to `fl_arc(x, y, r, 0, 360)` but may be faster. It must be the *only* thing in the path: if you want a circle as part of a complex polygon you must use `fl_arc()`.

**Note:** `fl_circle()` draws incorrectly if the transformation is both rotated and non-square scaled.

### 10.3.8 Drawing Text

All text is drawn in the [current font](#). It is undefined whether this location or the characters are modified by the current transformation.

```
void fl_draw(const char *, int x, int y)
```

```
void fl_draw(const char *, int n, int x, int y)
```

Draw a nul-terminated string or an array of `n` bytes starting at the given location. In both cases, the text must be UTF-8 encoded. Text is aligned to the left and to the baseline of the font. To align to the bottom, subtract `fl_descent()` from `y`. To align to the top, subtract `fl_descent()` and add `fl_height()`. This version of `fl_draw()` provides direct access to the text drawing function of the underlying OS. It does not apply any special handling to control characters.

```
void fl_rtl_draw(const char *str, int n, int x, int y)
```

Draw a UTF-8 string of length `n` bytes right to left starting at the given `x, y` location.

```
void fl_draw(const char* str, int x, int y, int w, int h, FL_Align align, FL_Image* img, int draw_symbols, int spacing)
```

Fancy string drawing function which is used to draw all the labels. The string is formatted and aligned inside the passed box. Handles `'\t'` and `'\n'`, expands all other control characters to `^X`, and aligns inside or against the edges of the box described by `x, y, w` and `h`. See [FL\\_Widget::align\(\)](#) for values for `align`. The value `FL_ALIGN_INSIDE` is ignored, as this function always prints inside the box. Parameter `spacing` controls the space between text and image.

If `img` is provided and is not `NULL`, the image is drawn above or below the text as specified by the `align` value.

The `draw_symbols` argument specifies whether or not to look for symbol names starting with the `"@"` character.

```
void fl_measure(const char *str, int& w, int& h, int draw_symbols)
```

Measure how wide and tall the string will be when printed by the `fl_draw(...align)` function. This includes leading/trailing white space in the string, kerning, etc.

If the incoming `w` is non-zero it will wrap to that width.

This will probably give unexpected values unless you have called `fl_font()` explicitly in your own code. Refer to the full documentation for `fl_measure()` for details on usage and how to avoid common pitfalls.

#### See also

`fl_text_extents()` – measure the 'inked' area of a string  
`fl_width()` – measure the width of a string or single character  
`fl_height()` – measure the height of the [current font](#)  
`fl_descent()` – the height of the descender for the [current font](#)

`int fl_height()`

Recommended minimum line spacing for the [current font](#). You can also just use the value of `size` passed to `fl_font()`.

#### See also

`fl_text_extents()`, `fl_measure()`, `fl_width()`, `fl_descent()`

`int fl_descent()`

Recommended distance above the bottom of a `fl_height()` tall box to draw the text at so it looks centered vertically in that box.

```
double fl_width(const char* txt)
double fl_width(const char* txt, int n)
double fl_width(unsigned int unicode_char)
```

Return the width of a nul-terminated string, a sequence of `n` characters, or a single character in the [current font](#).

#### See also

`fl_measure()`, `fl_text_extents()`, `fl_height()`, `fl_descent()`

```
void fl_text_extents(const char* txt, int& dx, int& dy, int& w, int& h)
```

Determines the minimum dimensions of a nul-terminated string, ie. the 'inked area'.

Given a string "txt" drawn using `fl_draw(txt, x, y)` you would determine its extents in [FLTK units](#) on the display using `fl_text_extents(txt, dx, dy, wo, ho)` such that a bounding box that exactly fits around the inked area of the text could be drawn with `fl_rect(x+dx, y+dy, wo, ho)`.

Refer to the full documentation for [fl\\_text\\_extents\(\)](#) for details on usage.

See also

[fl\\_measure\(\)](#), [fl\\_width\(\)](#), [fl\\_height\(\)](#), [fl\\_descent\(\)](#)

```
const char* fl_shortcut_label(int shortcut)
```

Unparse a shortcut value as used by [Fl\\_Button](#) or [Fl\\_Menu\\_Item](#) into a human-readable string like "Alt+N". This only works if the shortcut is a character key or a numbered function key. If the shortcut is zero an empty string is returned. The return value points at a static buffer that is overwritten with each call.

### 10.3.9 Fonts

FLTK supports a set of standard fonts based on the Times, Helvetica/Arial, Courier, and Symbol typefaces, as well as custom fonts that your application may load. Each font is accessed by an index into a font table.

Initially only the first 16 faces are filled in. There are symbolic names for them: `FL_HELVETICA`, `FL_TIMES`, `FL_COURIER`, and modifier values `FL_BOLD` and `FL_ITALIC` which can be added to these, and `FL_SYMBOL` and `FL_ZAPF_DINGBATS`. Faces greater than 255 cannot be used in [Fl\\_Widget](#) labels, since [Fl\\_Widget](#) stores the index as a byte.

One important thing to note about 'current font' is that there are so many paths through the GUI event handling code as widgets are partially or completely hidden, exposed and then re-drawn and therefore you can not guarantee that 'current font' contains the same value that you set on the other side of the event loop. Your value may have been superseded when a widget was redrawn. You are strongly advised to set the font explicitly before you draw any text or query the width and height of text strings, etc.

```
void fl_font(int face, int size)
```

Set the current font, which is then used by the routines described above. You may call this outside a draw context if necessary to call [fl\\_width\(\)](#), but on X this will open the display.

The font is identified by a *face* and a *size*. The size of the font is measured in [FLTK units](#) and not "points". Lines should be spaced *size* FLTK units apart or more.

```
int fl_font()
int fl_size()
```

Returns the face and size set by the most recent call to `fl_font(a, b)`. This can be used to save/restore the font.

### 10.3.10 Character Encoding

FLTK 1.3 and later versions expect all text in Unicode UTF-8 encoding. UTF-8 is ASCII compatible for the first 128 characters. International characters are encoded in multibyte sequences.

FLTK expects individual characters, characters that are not part of a string, in UCS-4 encoding, which is also ASCII compatible, but requires 4 bytes to store a Unicode character.

FLTK can draw accurately any Unicode-supported script for which the system contains relevant fonts. Under X11 platforms, this requires to build the library with the `FLTK_USE_PANGO` CMake option turned On (or with configure `--enable-pango`).

Plain text drawing starting at a user-given coordinate is well supported by FLTK, including for right-to-left scripts. Further text-related operations (i.e., selection, formatting, input, and editing) are functional with left-to-right scripts only.

For more information about character encodings, see the chapter on [Unicode and UTF-8 Support](#).

### 10.3.11 Drawing Overlays

These functions allow you to draw interactive selection rectangles without using the overlay hardware. FLTK will XOR a single rectangle outline over a window.

```
void fl_overlay_rect(int x, int y, int w, int h)
void fl_overlay_clear()
```

`fl_overlay_rect()` draws a selection rectangle, erasing any previous rectangle by XOR'ing it first. `fl_overlay_clear()` will erase the rectangle without drawing a new one.

Using these functions is tricky. You should make a widget with both a `handle()` and `draw()` method. `draw()` should call `fl_overlay_clear()` before doing anything else. Your `handle()` method should call `window()->make_current()` and then `fl_overlay_rect()` after `FL_DRAG` events, and should call `fl_overlay_clear()` after a `FL_RELEASE` event.

## 10.4 Drawing Images

To draw images, you can either do it directly from data in your memory, or you can create a [Fl\\_Image](#) object. The advantage of drawing directly is that it is more intuitive, and it is faster if the image data changes more often than it is redrawn. The advantage of using the object is that FLTK will cache translated forms of the image (on X it uses a server pixmap) and thus redrawing is *much* faster.

### 10.4.1 Direct Image Drawing

The behavior when drawing images when the current transformation matrix is not the identity is not defined, so you should only draw images when the matrix is set to the identity.

```
void fl_draw_image(const uchar *buf,int X,int Y,int W,int H,int D,int L)
void fl_draw_image_mono(const uchar *buf,int X,int Y,int W,int H,int D,int L)
```

Draw an 8-bit per color RGB or luminance image. The pointer points at the "r" data of the top-left pixel. Color data must be in *r, g, b* order. The top left corner is given by *X* and *Y* and the size of the image is given by *W* and *H*. *D* is the delta to add to the pointer between pixels, it may be any value greater or equal to 3, or it can be negative to flip the image horizontally. *L* is the delta to add to the pointer between lines (if 0 is passed it uses *W\*D*). and may be larger than *W\*D* to crop data, or negative to flip the image vertically.

It is highly recommended that you put the following code before the first `show()` of *any* window in your program to get rid of the dithering if possible:

```
Fl::visual (FL_RGB);
```

Gray scale (1-channel) images may be drawn. This is done if `abs(D)` is less than 3, or by calling `fl_draw_image_mono()`. Only one 8-bit sample is used for each pixel, and on screens with different numbers of bits for red, green, and blue only gray colors are used. Setting *D* greater than 1 will let you display one channel of a color image.

**Note:** The X version does not support all possible visuals. If FLTK cannot draw the image in the current visual it will abort. FLTK supports any visual of 8 bits or less, and all common TrueColor visuals up to 32 bits.

```
typedef void (*Fl_Draw_Image_Cb)(void *data,int x,int y,int w,uchar *buf)
void fl_draw_image(Fl_Draw_Image_Cb cb,void *data,int X,int Y,int W,int H,int D)
void fl_draw_image_mono(Fl_Draw_Image_Cb cb,void *data,int X,int Y,int W,int H,int D)
```

Call the passed function to provide each scan line of the image. This lets you generate the image as it is being drawn, or do arbitrary decompression of stored data, provided it can be decompressed to individual scan lines easily.

The callback is called with the `void*` user data pointer which can be used to point at a structure of information about the image, and the *x*, *y*, and *w* of the scan line desired from the image. 0,0 is the upper-left corner of the image, *not* *X*, *Y*. A pointer to a buffer to put the data into is passed. You must copy *w* pixels from scanline *y*, starting at pixel *x*, to this buffer.

Due to cropping, less than the whole image may be requested. So *x* may be greater than zero, the first *y* may be greater than zero, and *w* may be less than *W*. The buffer is long enough to store the entire *W\*D* pixels, this is for convenience with some decompression schemes where you must decompress the entire line at once: decompress it into the buffer, and then if *x* is not zero, copy the data over so the *x*'th pixel is at the start of the buffer.

You can assume the `y`'s will be consecutive, except the first one may be greater than zero.

If `D` is 4 or more, you must fill in the unused bytes with zero.

```
int fl_draw_pixmap(char* const* data, int x, int y, FL_Color bg)
int fl_draw_pixmap(const char* const* cdata, int x, int y, FL_Color bg)
```

Draws XPM image data, with the top-left corner at the given position. The image is dithered on 8-bit displays so you won't lose color space for programs displaying both images and pixmaps. This function returns zero if there was any error decoding the XPM data.

To use an XPM, do:

```
#include "foo.xpm"
...
fl_draw_pixmap(foo, X, Y);
```

Transparent colors are replaced by the optional `FL_Color` argument. To draw with true transparency you must use the `FL_Pixmap` class.

```
int fl_measure_pixmap(char* const* data, int &w, int &h)
int fl_measure_pixmap(const char* const* cdata, int &w, int &h)
```

An XPM image contains the dimensions in its data. This function finds and returns the width and height. The return value is non-zero if the dimensions were parsed ok and zero if there was any problem.

### 10.4.2 Direct Image Reading

FLTK provides a single function for reading from the current window or off-screen buffer into a RGB(A) image buffer.

```
uchar* fl_read_image(uchar *p, int X, int Y, int W, int H, int alpha)
```

Read a RGB(A) image from the current window or off-screen buffer. The `p` argument points to a buffer that can hold the image and must be at least `W*H*3` bytes when reading RGB images and `W*H*4` bytes when reading RGBA images. If `NULL`, `fl_read_image()` will create an array of the proper size which can be freed using `delete[]`.

The `alpha` parameter controls whether an alpha channel is created and the value that is placed in the alpha channel. If 0, no alpha channel is generated.

### 10.4.3 Image Classes

FLTK provides a base image class called `FL_Image` which supports creating, copying, and drawing images of various kinds, along with some basic color operations. Images can be used as labels for widgets using the `image()` and `deimage()` methods or drawn directly. Images can be drawn scaled to any size, independently from the size of the image's data (see `FL_Image::scale()`).

The `FL_Image` class does almost nothing by itself, but is instead supported by three basic image types:

- `FL_Bitmap`
- `FL_Pixmap`
- `FL_RGB_Image`

The `FL_Bitmap` class encapsulates a mono-color bitmap image. The `draw()` method draws the image using the current drawing color.

The `FL_Pixmap` class encapsulates a colormapped image. The `draw()` method draws the image using the colors in the file, and masks off any transparent colors automatically.

The `FL_RGB_Image` class encapsulates a full-color (or grayscale) image with 1 to 4 color components. Images with an even number of components are assumed to contain an alpha channel that is used for transparency. The transparency provided by the `draw()` method is either a 24-bit blend against the existing window contents or a "screen door" transparency mask, depending on the platform and screen color depth.

char `fl_can_do_alpha_blending()`

`fl_can_do_alpha_blending()` will return 1, if your platform supports true alpha blending for RGBA images, or 0, if FLTK will use screen door transparency.

FLTK also provides several image classes based on the three standard image types for common file formats:

- `FL_GIF_Image`
- `FL_Anim_GIF_Image`
- `FL_JPEG_Image`
- `FL_PNG_Image`
- `FL_PNM_Image`
- `FL_XBM_Image`
- `FL_XPM_Image`
- `FL_SVG_Image`
- `FL_BMP_Image`
- `FL_ICO_Image`

Each of these image classes loads a named file of the corresponding format. The `FL_Shared_Image` class can be used to load any type of image file - the class examines the file and constructs an image of the appropriate type.

Finally, FLTK provides a special image class called `FL_Tiled_Image` to tile another image object in the specified area. This class can be used to tile a background image in a `FL_Group` widget, for example.

```
virtual FL_Image* FL_Image::copy()
virtual FL_Image* FL_Image::copy(int W, int H) const
```

The `copy()` method creates a copy of the image. The second form specifies the new size of the image - the image is resized using the nearest-neighbor algorithm (this is the default).

#### Note

As of FLTK 1.3.3 the image resizing algorithm can be changed. See [Fl\\_Image::RGB\\_scaling\(Fl\\_RGB\\_Scaling method\)](#)

virtual void [Fl\\_Image::draw\(int x, int y, int w, int h, int ox, int oy\)](#)

The `draw()` method draws the image object. `x, y, w, h` indicates the destination rectangle. `ox, oy, w, h` is the source rectangle. This source rectangle is copied to the destination. The source rectangle may extend outside the image, i.e. `ox` and `oy` may be negative and `w` and `h` may be bigger than the image, and this area is left unchanged.

#### Note

See exceptions for [Fl\\_Tiled\\_Image::draw\(\)](#) regarding arguments `ox`, `oy`, `w`, and `h`.

virtual void [Fl\\_Image::draw\(int x, int y\)](#)

Draws the image with the upper-left corner at `x, y`. This is the same as doing `img->draw(x, y, img->w(), img->h(), 0, 0)` where `img` is a pointer to any [Fl\\_Image](#) type.

## 10.5 Offscreen Drawing

Sometimes it can be very useful to generate a complex drawing in memory first and copy it to the screen at a later point in time. This technique can significantly reduce the amount of repeated drawing. Offscreen drawing functions are declared in `<FL/fl_draw.H>`.

[Fl\\_Double\\_Window](#) uses offscreen rendering to avoid flickering on systems that don't support double-buffering natively.

FLTK can draw into an offscreen buffer at any time. There is no need to wait for an [Fl\\_Widget::draw\(\)](#) to occur.

#### Note

In FLTK 1.3.x and earlier versions all offscreen drawing functions described below were implemented as macros and created certain temporary variables to save context information. You needed to create local scope blocks with curly braces `{ ... }` if you used offscreen functions more than once in a function or method. This is no longer necessary since offscreen drawing is now implemented in real functions (no macros).

#### Example:

```
Fl_Offscreen oscr = fl_create_offscreen(120, 120);
fl_begin_offscreen(oscr);
fl_color(FL_WHITE);
fl_rectf(0, 0, 120, 120);
fl_end_offscreen();
// other code here
fl_begin_offscreen(oscr);
fl_color(FL_BLACK);
fl_rectf(10, 10, 100, 100);
fl_end_offscreen();
// other code here
fl_delete_offscreen(oscr);
```

Fl\_Offscreen [fl\\_create\\_offscreen\(int w, int h\)](#)

Create an RGB offscreen buffer containing as many pixels as in a screen area of size `w,h` [FLTK units](#).

```
void fl_delete_offscreen(Fl_Offscreen)
```

Delete a previously created offscreen buffer. All drawings are lost.

```
void fl_begin_offscreen(Fl_Offscreen)
```

Send all subsequent drawing commands to this offscreen buffer.

```
void fl_end_offscreen()
```

Quit sending drawing commands to this offscreen buffer.

```
void fl_copy_offscreen(int x, int y, int w, int h, Fl_Offscreen osrc, int srcx, int srcy)
```

Copy a rectangular area of the size `w*h` from `srcx,srcy` in the offscreen buffer into the current drawing surface at `x,y`.

```
void fl_rescale_offscreen(Fl_Offscreen &osrc)
```

Adapts the offscreen's size in pixels to a changed value of the scale factor while keeping the offscreen's graphical content.

# Chapter 11

## Handling Events

This chapter discusses the FLTK event model and how to handle events in your program or widget.

### 11.1 The FLTK Event Model

Every time a user moves the mouse pointer, clicks a button, or presses a key, an event is generated and sent to your application. Events can also come from other programs like the window manager.

Events are identified by the integer argument passed to a `handle()` method that overrides the `Fl_Widget::handle()` virtual method. Other information about the most recent event is stored in static locations and acquired by calling the `Fl::event_*` methods. This static information remains valid until the next event is read from the window system, so it is ok to look at it outside of the `handle()` method, for instance in a callback.

Event numbers can be converted to their actual names using the `fl_eventnames[]` array defined in `#include <FL/names.h>`; see next chapter for details.

In the next chapter, the `MyClass::handle()` example shows how to override the `Fl_Widget::handle()` method to accept and process specific events.

### 11.2 Mouse Events

Classic mice provide two or three buttons:

- a primary (left) button, typically used to point and click on objects
- a secondary (right) button, typically used to open special menus etc.
- a middle button for other special events.

The primary and secondary mouse buttons can usually be inverted by system setup functions for left handed usage. FLTK always sends the mouse button number according to the "logical" mouse button, i.e. such a setup is transparent for application programmers.

The middle button was later replaced by a scroll wheel to allow scrolling text or other objects in a window or widget vertically. Pushing the scroll wheel down acts like pushing the middle mouse button.

If the scroll wheel is used to scroll while the Shift key is held, the scrolling direction is horizontal rather than vertical.

Some mice may even have a "scroll ball" or similar (touch) feature. These mice support horizontal and vertical scrolling simultaneously.

Newer mice add even more buttons, called "side buttons":

- a "back" button, typically used to "go back", e.g. in browsers
- a "forward" button, typically used to "go forward", e.g. in browsers

FLTK handles up to five buttons since version 1.3.10 across all supported platforms. Note that Windows doesn't support more than five buttons whereas other platforms may support more. FLTK ignores other buttons as long as they send "mouse button" events.

Some gaming mice with five or more buttons may send their button clicks as keyboard events which will be handled like normal text input by FLTK. This has not been tested though.

### 11.2.1 FL\_PUSH

A mouse button has gone down with the mouse pointing at this widget. You can find out what button by calling `Fl::event_button()`. You find out the mouse position by calling `Fl::event_x()` and `Fl::event_y()`.

A widget indicates that it "wants" the mouse click by returning non-zero from its `handle()` method, as in the `MyClass::handle()` example. It will then become the `Fl::pushed()` widget and will get `FL_DRAG` and the matching `FL_RELEASE` events. If `handle()` returns zero then FLTK will try sending the `FL_PUSH` to another widget.

### 11.2.2 FL\_DRAG

The mouse has moved with at least one button held down. The current button state is in `Fl::event_state()`. The mouse position is in `Fl::event_x()` and `Fl::event_y()`.

In order to receive `FL_DRAG` events, the widget must return non-zero when handling `FL_PUSH`.

Moving the mouse keeps sending `FL_DRAG` events as long as at least one button is held down. If any buttons are pushed and released during the drag operation FLTK sends `FL_PUSH` and `FL_RELEASE` events even while dragging. The current button status can be found in `Fl::event_state()` and in `Fl::event_buttons()`.

When the last button has been released FLTK sends `FL_MOVE` events again. Note: The button released last need not necessarily be the one that started the drag operation.

Since FLTK 1.4.0 dragging is supported for all five supported mouse buttons, for instance the user can drag the mouse while the "back" button is held down. Warning: This may or may not be compatible with other applications for drag-and-drop operations **between** applications and lead to unexpected behavior.

### 11.2.3 FL\_RELEASE

A mouse button has been released. You can find out what button by calling `Fl::event_button()`.

In order to receive the `FL_RELEASE` event, the widget must return non-zero when handling `FL_PUSH`.

### 11.2.4 FL\_MOVE

The mouse has moved without any mouse buttons held down. This event is sent to the `Fl::belowmouse()` widget.

In order to receive `FL_MOVE` events, the widget must return non-zero when handling `FL_ENTER`.

### 11.2.5 FL\_MOUSEWHEEL

The user has moved the mouse wheel. The `Fl::event_dx()` and `Fl::event_dy()` methods can be used to find the amount to scroll horizontally (dx) and vertically (dy). On mice with a single scroll wheel holding the Shift key on the keyboard while scrolling sends horizontal scroll events.

## 11.3 Focus Events

### 11.3.1 FL\_ENTER

The mouse has been moved to point at this widget. This can be used for highlighting feedback. If a widget wants to highlight or otherwise track the mouse, it indicates this by returning non-zero from its `handle()` method. It then becomes the `Fl::belowmouse()` widget and will receive `FL_MOVE` and `FL_LEAVE` events.

### 11.3.2 FL\_LEAVE

The mouse has moved out of the widget.

In order to receive the `FL_LEAVE` event, the widget must return non-zero when handling `FL_ENTER`.

### 11.3.3 FL\_FOCUS

This indicates an *attempt* to give a widget the keyboard focus.

If a widget wants the focus, it should change itself to display the fact that it has the focus, and return non-zero from its `handle()` method. It then becomes the `Fl::focus()` widget and gets `FL_KEYDOWN`, `FL_KEYUP`, and `FL_UNFOCUS` events.

The focus will change either because the window manager changed which window gets the focus, or because the user tried to navigate using tab, arrows, or other keys. You can check `Fl::event_key()` to figure out why it moved. For navigation it will be the key pressed and for interaction with the window manager it will be zero.

### 11.3.4 FL\_UNFOCUS

This event is sent to the previous `Fl::focus()` widget when another widget gets the focus or the window loses focus.

## 11.4 Keyboard Events

### 11.4.1 FL\_KEYBOARD, FL\_KEYDOWN, FL\_KEYUP

A key was pressed (FL\_KEYDOWN) or released (FL\_KEYUP). FL\_KEYBOARD is a synonym for FL\_KEYDOWN, and both names are used interchangeably in this documentation.

The key can be found in [Fl::event\\_key\(\)](#). The text that the key should insert can be found with [Fl::event\\_text\(\)](#) and its length is in [Fl::event\\_length\(\)](#).

If you use the key, then `handle()` should return 1. If you return zero then FLTK assumes you ignored the key and will then attempt to send it to a parent widget. If none of them want it, it will change the event into a FL\_SHORTCUT event. FL\_KEYBOARD events are also generated by the character palette/map.

To receive FL\_KEYBOARD events you must also respond to the FL\_FOCUS and FL\_UNFOCUS events by returning 1. This way FLTK knows whether to bother sending your widget keyboard events. (Some widgets don't need them, e.g. [Fl\\_Box](#).)

If you are writing a text-editing widget you may also want to call the [Fl::compose\(\)](#) function to translate individual keystrokes into characters.

FL\_KEYUP events are sent to the widget that currently has focus. This is not necessarily the same widget that received the corresponding FL\_KEYDOWN event because focus may have changed between events.

**Todo** Add details on how to detect repeating keys, since on some X servers a repeating key will generate both FL\_KEYUP and FL\_KEYDOWN, such that to tell if a key is held, you need [Fl::event\\_key\(int\)](#) to detect if the key is being held down during FL\_KEYUP or not.

### 11.4.2 FL\_SHORTCUT

If the [Fl::focus\(\)](#) widget is zero or ignores an FL\_KEYBOARD event then FLTK tries sending this event to every widget it can, until one of them returns non-zero. FL\_SHORTCUT is first sent to the [Fl::belowmouse\(\)](#) widget, then its parents and siblings, and eventually to every widget in the window, trying to find an object that returns non-zero. FLTK tries really hard to not to ignore any keystrokes!

You can also make "global" shortcuts by using [Fl::add\\_handler\(\)](#). A global shortcut will work no matter what windows are displayed or which one has the focus.

Since version 1.4, FLTK has 3 default global shortcuts (Ctrl+/+/-/0/ [Cmd+/+/-/0/ under macOS]) that change the value of the GUI scaling factor. Ctrl+ zooms-in all app windows of the focussed display (all displays under macOS); Ctrl- zooms-out these windows; Ctrl 0 restores the initial value of the scaling factor. If any window of the display is fullscreen or maximized, scaling shortcuts have no effect. It's possible to deactivate FLTK's default scaling shortcuts with function [Fl::keyboard\\_screen\\_scaling\(\)](#).

Option [Fl::OPTION\\_SIMPLE\\_ZOOM\\_SHORTCUT](#) can facilitate the typing necessary to trigger the zoom-in operation with those keyboard layouts where character '+' is located in the shifted position of its key: when this option is On it's not necessary to press also the Shift key to zoom-in.

These scaling shortcuts are installed when the FLTK library opens the display. They have a lower priority than any shortcut defined in any menu and than any user-provided event handler (see [Fl::add\\_handler\(\)](#)) installed after FLTK opened the display. Therefore, if a menu item of an FLTK app is given FL\_COMMAND+'+' as shortcut, that item's callback rather than FLTK's default zooming-in routine is triggered when Ctrl+ (Cmd+ under macOS) is pressed.

FLTK sends the [FL\\_ZOOM\\_EVENT](#) when the scaling factor value changes, to which a callback can be associated with [Fl::add\\_handler\(\)](#). By default, FLTK displays the new scaling factor value in a yellow, transient window. This can be changed with option [Fl::OPTION\\_SHOW\\_SCALING](#).

## 11.5 Widget Events

### 11.5.1 FL\_DEACTIVATE

This widget is no longer active, due to `deactivate()` being called on it or one of its parents. Please note that although `active()` may still return true for this widget after receiving this event, it is only truly active if `active()` is true for both it and all of its parents. (You can use `active_r()` to check this).

### 11.5.2 FL\_ACTIVATE

This widget is now active, due to `activate()` being called on it or one of its parents.

### 11.5.3 FL\_HIDE

This widget is no longer visible, due to `hide()` being called on it or one of its parents, or due to a parent window being minimized. Please note that although `visible()` may still return true for this widget after receiving this event, it is only truly visible if `visible()` is true for both it and all of its parents. (You can use `visible_r()` to check this).

### 11.5.4 FL\_SHOW

This widget is visible again, due to `show()` being called on it or one of its parents, or due to a parent window being restored. *A child `Fl_Window` will respond to this by actually creating the window if not done already, so if you subclass a window, be sure to pass `FL_SHOW` to the base class `handle()` method!*

#### Note

The events in this chapter ("Widget Events"), i.e. `FL_ACTIVATE`, `FL_DEACTIVATE`, `FL_SHOW`, and `FL_HIDE`, are the only events deactivated and invisible widgets can usually get, depending on their states. Under certain circumstances, there may also be `FL_LEAVE` or `FL_UNFOCUS` events delivered to deactivated or hidden widgets.

## 11.6 Clipboard Events

### 11.6.1 FL\_PASTE

You should get this event some time after you call `Fl::paste()`. The contents of `Fl::event_text()` is the text to insert and the number of characters is in `Fl::event_length()`.

### 11.6.2 FL\_SELECTIONCLEAR

The `Fl::selection_owner()` will get this event before the selection is moved to another widget. This indicates that some other widget or program has claimed the selection. Motif programs used this to clear the selection indication. Most modern programs ignore this.

## 11.7 Drag and Drop Events

FLTK supports drag and drop of text and files from any application on the desktop to an FLTK widget. Text is transferred using UTF-8 encoding.

See [Fl::dnd\(\)](#) for drag and drop from an FLTK widget.

The drag and drop data is available in [Fl::event\\_text\(\)](#) at the concluding `FL_PASTE`. On some platforms, the event text is also available for the `FL_DND_*` events, however application must not depend on that behavior because it depends on the protocol used on each platform.

`FL_DND_*` events cannot be used in widgets derived from [Fl\\_Group](#) or [Fl\\_Window](#).

### 11.7.1 Dropped filenames

Files are received as a list of full path and file names.

- On some X11 platforms, files are received as a URL-encoded UTF-8 string, that is, non-ASCII bytes (and a few others such as space and %) are replaced by the 3 bytes "%XY" where XY are the byte's hexadecimal value. The [fl\\_decode\\_uri\(\)](#) function can be used to transform in-place the received string into a proper UTF-8 string. On these platforms, strings corresponding to dropped files are further prepended by `file://` (or other prefixes such as `computer://`).
- Other X11 situations put all dropped filenames in a single line, separated by spaces.
- On non-X11 platforms, including Wayland, files dropped are received one pathname per line, with no `'\n'` after the last pathname.

### 11.7.2 FL\_DND\_ENTER

The mouse has been moved to point at this widget. A widget that is interested in receiving drag'n'drop data must return 1 to receive `FL_DND_DRAG`, `FL_DND_LEAVE` and `FL_DND_RELEASE` events.

### 11.7.3 FL\_DND\_DRAG

The mouse has been moved inside a widget while dragging data. A widget that is interested in receiving drag'n'drop data should indicate the possible drop position.

### 11.7.4 FL\_DND\_LEAVE

The mouse has moved out of the widget.

### 11.7.5 FL\_DND\_RELEASE

The user has released the mouse button dropping data into the widget. When the receiving widget's `handle()` method gets the `FL_DND_RELEASE` event, it should return 1 to accept the dragged data. Processing of this event must not use code that would make unrelated events be sent to the application (opening a dialog window for example) or that would communicate with the dragging process. The next event received by the `handle()` method will then be an `FL_PASTE` event. The `handle()` method should process this `FL_PASTE` event rapidly to prevent the dragging process from failing with a timeout error.

## 11.8 Other events

### 11.8.1 FL\_SCREEN\_CONFIGURATION\_CHANGED

Sent whenever the screen configuration changes (a screen is added/removed, a screen resolution is changed, screens are moved). Use [Fl::add\\_handler\(\)](#) to be notified of this event.

### 11.8.2 FL\_FULLSCREEN

The application window has been changed from normal to fullscreen, or from fullscreen to normal. If you are using a X window manager which supports Extended Window Manager Hints, this event will not be delivered until the change has actually happened.

## 11.9 Fl::event\_\*() methods

FLTK keeps the information about the most recent event in static storage. This information is good until the next event is processed. Thus it is valid inside `handle()` and `callback()` methods.

These are all trivial inline functions and thus very fast and small:

- [Fl::event\\_button\(\)](#)
- [Fl::event\\_clicks\(\)](#)
- [Fl::event\\_dx\(\)](#)
- [Fl::event\\_dy\(\)](#)
- [Fl::event\\_inside\(\)](#)
- [Fl::event\\_is\\_click\(\)](#)
- [Fl::event\\_key\(\)](#)
- [Fl::event\\_length\(\)](#)
- [Fl::event\\_state\(\)](#)
- [Fl::event\\_text\(\)](#)
- [Fl::event\\_x\(\)](#)
- [Fl::event\\_x\\_root\(\)](#)
- [Fl::event\\_y\(\)](#)
- [Fl::event\\_y\\_root\(\)](#)
- [Fl::get\\_key\(\)](#)
- [Fl::get\\_mouse\(\)](#)
- [Fl::test\\_shortcut\(\)](#)

## 11.10 Event Propagation

Widgets receive events via the virtual `handle()` function. The argument indicates the type of event that can be handled. The widget must indicate if it handled the event by returning 1. FLTK will then remove the event and wait for further events from the host. If the widget's handle function returns 0, FLTK may redistribute the event based on a few rules.

Most events are sent directly to the `handle()` method of the `Fl_Window` that the window system says they belong to. The window (actually the `Fl_Group` that `Fl_Window` is a subclass of) is responsible for sending the events on to any child widgets. To make the `Fl_Group` code somewhat easier, FLTK sends some events (`FL_DRAG`, `FL_RELEASE`, `FL_KEYBOARD`, `FL_SHORTCUT`, `FL_UNFOCUS`, and `FL_LEAVE`) directly to leaf widgets. These procedures control those leaf widgets:

- `Fl::add_handler()`
- `Fl::belowmouse()`
- `Fl::focus()`
- `Fl::grab()`
- `Fl::modal()`
- `Fl::pushed()`
- `Fl::release()` (deprecated, see `Fl::grab(0)`)
- `Fl_Widget::take_focus()`

FLTK propagates events along the widget hierarchy depending on the kind of event and the status of the UI. Some events are injected directly into the widgets, others may be resent as new events to a different group of receivers.

Mouse click events are first sent to the window that caused them. The window then forwards the event down the hierarchy until it reaches the widget that is below the click position. If that widget uses the given event, the widget is marked "pushed" and will receive all following mouse motion (`FL_DRAG`) events until the mouse button is released.

Mouse motion (`FL_MOVE`) events are sent to the `Fl::belowmouse()` widget, i.e. the widget that returned 1 on the last `FL_ENTER` event.

Mouse wheel events are sent to the window that caused the event. The window propagates the event down the tree, first to the widget that is below the mouse pointer, and if that does not succeed, to all other widgets in the group. This ensures that scroll widgets work as expected with the widget furthest down in the hierarchy getting the first opportunity to use the wheel event, but also giving scroll bars, that are not directly below the mouse a chance.

Keyboard events are sent directly to the widget that has keyboard focus. If the focused widget rejects the event, it is resent as a shortcut event, first to the top-most window, then to the widget below the mouse pointer, propagating up the hierarchy to all its parents. Those send the event also to all widgets that are not below the mouse pointer. Now if that did not work out, the shortcut is sent to all registered shortcut handlers.

If we are still unsuccessful, the event handler flips the case of the shortcut letter and starts over. Finally, if the key is "escape", FLTK sends a close event to the top-most window.

All other events are pretty much sent right away to the window that created the event.

Widgets can "grab" events. The grabbing window gets all events exclusively, but usually by the same rules as described above.

Windows can also request exclusivity in event handling by making the window modal.

## 11.11 FLTK Compose-Character Sequences

The character composition done by `Fl_Input` widget requires that you call the `Fl::compose()` function if you are writing your own text editor widget.

Currently, all characters made by single key strokes with or without modifier keys, or by system-defined character compose sequences (that can involve dead keys or a compose key) can be input. You should call `Fl::compose()` in case any enhancements to this processing are done in the future. The interface has been designed to handle arbitrary UTF-8 encoded text.

The following methods are provided for character composition:

- `Fl::compose()`
- `Fl::compose_reset()`

Under Mac OS X, FLTK "previews" partially composed sequences.



## Chapter 12

# Adding and Extending Widgets

This chapter describes how to add your own widgets or extend existing widgets in FLTK.

### 12.1 Subclassing

New widgets are created by *subclassing* an existing FLTK widget, typically [Fl\\_Widget](#) for controls and [Fl\\_Group](#) for composite widgets.

A control widget typically interacts with the user to receive and/or display a value of some sort.

A composite widget holds a list of child widgets and handles moving, sizing, showing, or hiding them as needed. [Fl\\_Group](#) is the main composite widget class in FLTK, and all of the other composite widgets ([Fl\\_Pack](#), [Fl\\_Scroll](#), [Fl\\_Tabs](#), [Fl\\_Tile](#), [Fl\\_Window](#), [Fl\\_Flex](#), [Fl\\_Grid](#), etc.) are subclasses of it.

You can also subclass other existing widgets to provide a different look or user-interface. For example, the button widgets are all subclasses of [Fl\\_Button](#) since they all interact with the user via a mouse button click. The only difference is the code that draws the face of the button.

### 12.2 Making a Subclass of Fl\_Widget

Your subclasses can directly descend from [Fl\\_Widget](#) or any subclass of [Fl\\_Widget](#). [Fl\\_Widget](#) has only four virtual methods, and overriding some or all of these may be necessary.

### 12.3 The Constructor

The constructor should have the following arguments:

```
MyClass(int x, int y, int w, int h, const char *label = 0);
```

This will allow the class to be used in FLUID without problems.

The constructor must call the constructor for the base class and pass the same arguments:

```
MyClass::MyClass(int x, int y, int w, int h, const char *label)
:   Fl_Widget(x, y, w, h, label) {
    // do initialization stuff...
}
```

`Fl_Widget`'s protected constructor sets `x()`, `y()`, `w()`, `h()`, and `label()` to the passed values and initializes the other instance variables to:

```
type(0);
box(FL_NO_BOX);
color(FL_BACKGROUND_COLOR);
selection_color(FL_BACKGROUND_COLOR);
labeltype(FL_NORMAL_LABEL);
labelstyle(FL_NORMAL_STYLE);
labelsize(FL_NORMAL_SIZE);
labelcolor(FL_FOREGROUND_COLOR);
align(FL_ALIGN_CENTER);
callback(default_callback, 0);
flags(ACTIVE|VISIBLE);
image(0);
deimage(0);
```

## 12.4 Protected Methods of `Fl_Widget`

The following methods are provided for subclasses to use:

- `clear_visible()`
- `damage()`
- `draw_box()`
- `draw_focus()`
- `draw_label()`
- `set_flag()`
- `set_visible()`
- `test_shortcut()`
- `type()`

```
void Fl_Widget::damage(uchar mask)
void Fl_Widget::damage(uchar mask, int x, int y, int w, int h)
uchar Fl_Widget::damage()
```

The first form indicates that a partial update of the object is needed. The bits in `mask` are OR'd into `damage()`. Your `draw()` routine can examine these bits to limit what it is drawing. The public method `Fl_Widget::redraw()` simply does `Fl_Widget::damage(FL_DAMAGE_ALL)`, but the implementation of your widget can call the public `damage(n)`.

The second form indicates that a region is damaged. If only these calls are done in a window (no calls to `damage(n)`) then FLTK will clip to the union of all these calls before drawing anything. This can greatly speed up incremental displays. The mask bits are OR'd into `damage()` unless this is a `Fl_Window` widget.

The third form returns the bitwise-OR of all `damage(n)` calls done since the last `draw()`.

When redrawing your widgets you should look at the damage bits to see what parts of your widget need redrawing. The `handle()` method can then set individual damage bits to limit the amount of drawing that needs to be done:

```
int MyClass::handle(int event) {
    // ...
    if (change_to_part1) damage(1);
    if (change_to_part2) damage(2);
    if (change_to_part3) damage(4);
}

void MyClass::draw() {
    if (damage() & FL_DAMAGE_ALL) {
        // ... draw frame/box and other static stuff ...
    }
    if (damage() & (FL_DAMAGE_ALL | 1)) draw_part1();
    if (damage() & (FL_DAMAGE_ALL | 2)) draw_part2();
    if (damage() & (FL_DAMAGE_ALL | 4)) draw_part3();
}
```

**Todo** Clarify `Fl_Window::damage(uchar)` handling - seems confused/wrong? ORing value doesn't match setting behavior in `Fl_Widget.H`!

```
void Fl_Widget::draw_box() const
void Fl_Widget::draw_box(Fl_Boxtype t, Fl_Color c) const
```

The first form draws this widget's `box()`, using the dimensions of the widget. The second form uses `t` as the box type and `c` as the color for the box.

```
void Fl_Widget::draw_focus()
void Fl_Widget::draw_focus(Fl_Boxtype t, int x, int y, int w, int h) const
```

Draws a focus box inside the widget's bounding box. The second form allows you to specify a different bounding box.

```
void Fl_Widget::draw_label() const
void Fl_Widget::draw_label(int x, int y, int w, int h) const
void Fl_Widget::draw_label(int x, int y, int w, int h, Fl_Align align) const
```

The first form is the usual function for a `draw()` method to call to draw the widget's label. It does not draw the label if it is supposed to be outside the box (on the assumption that the enclosing group will draw those labels).

The second form uses the passed bounding box instead of the widget's bounding box. This is useful so "centered" labels are aligned with some feature, like a moving slider.

The third form draws the label anywhere. It acts as though `FL_ALIGN_INSIDE` has been forced on so the label will appear inside the passed bounding box. This is designed for parent groups to draw labels with.

```
void Fl_Widget::set_flag(int c)
```

Calling `set_flag (SHORTCUT_LABEL)` modifies the behavior of `draw_label()` so that '&' characters cause an underscore to be printed under the next letter.

```
void Fl_Widget::set_visible()
void Fl_Widget::clear_visible()
```

Fast inline versions of `Fl_Widget::hide()` and `Fl_Widget::show()`. These do not send the `FL_HIDE` and `FL_SHOW` events to the widget.

```
int Fl_Widget::test_shortcut()
static int Fl_Widget::test_shortcut(const char *s)
```

The first version tests `Fl_Widget::label()` against the current event (which should be a `FL_SHORTCUT` event). If the label contains a '&' character and the character after it matches the keypress, this returns true. This returns false if the `SHORTCUT_LABEL` flag is off, if the label is `NULL`, or does not have a '&' character in it, or if the keypress does not match the character.

The second version lets you do this test against an arbitrary string.

```
uchar Fl_Widget::type() const
void Fl_Widget::type(uchar t)
```

The property `Fl_Widget::type()` can return an arbitrary 8-bit identifier, and can be set with the protected method `type(uchar t)`. This value had to be provided for Forms compatibility, but you can use it for any purpose you want. Try to keep the value less than 100 to not interfere with reserved values.

FLTK does not use RTTI (Run Time Typing Information) to enhance portability. But this may change in the near future if RTTI becomes standard everywhere.

If you don't have RTTI you can use the clumsy FLTK mechanism, by having `type()` use a unique value. These unique values must be greater than the symbol `FL_RESERVED_TYPE` (which is 100) and less than `FL_WINDOW` (unless you make a subclass of `Fl_Window`). Look through the header files for `FL_RESERVED_TYPE` to find an unused number. If you make a subclass of `Fl_Window` you must use `FL_WINDOW + n` (where `n` must be in the range 1 to 7).

## 12.5 Handling Events

The virtual method `Fl_Widget::handle(int event)` is called to handle each event passed to the widget. It can:

- Change the state of the widget.
- Call `Fl_Widget::redraw()` if the widget needs to be redisplayed.
- Call `Fl_Widget::damage(uchar c)` if the widget needs a partial-update (assuming you provide support for this in your `draw()` method).
- Call `Fl_Widget::do_callback()` if a callback should be generated.
- Call `Fl_Widget::handle()` on child widgets.

Events are identified by the integer argument. Other information about the most recent event is stored in static locations and acquired by calling the `Fl::event_*` methods. This information remains valid until another event is handled.

Here is a sample `handle()` method for a widget that acts as a pushbutton and also accepts the keystroke 'x' to cause the callback:

```
int MyClass::handle(int event) {
    switch (event) {
        case FL_PUSH:
            highlight = 1;
            redraw();
            return 1;
        case FL_DRAG: {
            int t = Fl::event_inside(this);
            if (t != highlight) {
                highlight = t;
                redraw();
            }
        }
        return 1;
        case FL_RELEASE:
            if (highlight) {
                highlight = 0;
                redraw();
                do_callback();
                // never do anything after a callback, as the callback
                // may delete the widget!
            }
            return 1;
        case FL_SHORTCUT:
            if (Fl::event_key() == 'x') {
                do_callback();
                return 1;
            }
            return 0;
        default:
            return Fl_Widget::handle(event);
    }
}
```

You must return non-zero if your `handle()` method uses the event. If you return zero, the parent widget will try sending the event to another widget.

For debugging purposes, event numbers can be printed as their actual event names using the `fl_eventnames[]` array, e.g.:

```
#include <Fl/names.h> // defines fl_eventnames[]
[...]
```

```
int MyClass::handle(int e) {
    printf("Event was %s (%d)\n", fl_eventnames[e], e); // e.g. "Event was FL_PUSH (1)"
    [...]
```

## 12.6 Drawing the Widget

The `draw()` virtual method is called when FLTK wants you to redraw your widget. It will be called if and only if `damage()` is non-zero, and `damage()` will be cleared to zero after it returns. The `draw()` method should be declared protected so that it can't be called from non-drawing code.

The `damage()` value contains the bitwise-OR of all the `damage(n)` calls to this widget since it was last drawn. This can be used for minimal update, by only redrawing the parts whose bits are set. FLTK will turn on the `FL_DAMAGE_ALL` bit if it thinks the entire widget must be redrawn, e.g. for an expose event.

Expose events (and the `damage(mask,x,y,w,h)` function described above) will cause `draw()` to be called with FLTK's clipping turned on. You can greatly speed up redrawing in some cases by testing `fl_not_clipped(x,y,w,h)` or `fl_clip_box()` and skipping invisible parts.

Besides the protected methods described above, FLTK provides a large number of basic drawing functions, which are described in the chapter [Drawing Things in FLTK](#).

## 12.7 Resizing the Widget

The `resize(x,y,w,h)` method is called when the widget is being resized or moved. The arguments are the new position, width, and height. `x()`, `y()`, `w()`, and `h()` still remain the old size. You must call `resize()` on your base class with the same arguments to get the widget size to actually change.

This should *not* call `redraw()`, at least if only the `x()` and `y()` change. This is because composite widgets like [Fl\\_Scroll](#) may have a more efficient way of drawing the new position.

## 12.8 Making a Composite Widget

A "composite" widget contains one or more "child" widgets. To make a composite widget you should subclass [Fl\\_Group](#). It is possible to make a composite object that is not a subclass of [Fl\\_Group](#), but you'll have to duplicate the code in [Fl\\_Group](#) anyways.

Instances of the child widgets may be included in the parent:

```
class MyClass : public Fl_Group {
    Fl_Button the_button;
    Fl_Slider the_slider;
    ...
};
```

The constructor has to initialize these instances. They are automatically added to the group, since the [Fl\\_Group](#) constructor does [Fl\\_Group::begin\(\)](#). *Don't forget to call [Fl\\_Group::end\(\)](#) or use the [Fl\\_End](#) pseudo-class:*

```
MyClass::MyClass(int x, int y, int w, int h) :
    Fl_Group(x, y, w, h),
    the_button(x + 5, y + 5, 100, 20),
    the_slider(x, y + 50, w, 20)
{
    ... (you could add dynamically created child widgets here) ...
    end(); // don't forget to do this!
}
```

The child widgets need callbacks. These will be called with a pointer to the children, but the widget itself may be found in the `parent()` pointer of the child. Usually these callbacks can be static private methods, with a matching private method:

```
void MyClass::static_slider_cb(Fl_Widget* v, void *) { // static method
    ((MyClass*) (v->parent()))->slider_cb();
}
void MyClass::slider_cb() { // normal method
    use(the_slider->value());
}
```

If you make the `handle()` method, you can quickly pass all the events to the children using the `Fl_Group::handle()` method. You don't need to override `handle()` if your composite widget does nothing other than pass events to the children:

```
int MyClass::handle(int event) {
    if (Fl_Group::handle(event)) return 1;
    ... handle events that children don't want ...
}
```

If you override `draw()` you need to draw all the children. If `redraw()` or `damage()` is called on a child, `damage(FL_DAMAGE_CHILD)` is done to the group, so this bit of `damage()` can be used to indicate that a child needs to be drawn. It is fastest if you avoid drawing anything else in this case:

```
void MyClass::draw() {
    Fl_Widget *const*a = array();
    if (damage() == FL_DAMAGE_CHILD) { // only redraw some children
        for (int i = children(); i--; a++) {
            update_child(**a);
        }
    } else { // total redraw
        // ... draw background graphics ...
        // now draw all the children atop the background:
        for (int i = children(); i--; a++) {
            draw_child(**a);
            draw_outside_label(**a); // you may not need to do this
        }
    }
}
```

`Fl_Group` provides some protected methods to make drawing easier:

- `draw_child()`
- `draw_children()`
- `draw_outside_label()`
- `update_child()`

`void Fl_Group::draw_child(Fl_Widget &widget) const`

This will force the child's `damage()` bits all to one and call `draw()` on it, then clear the `damage()`. You should call this on all children if a total redraw of your widget is requested, or if you draw something (like a background box) that damages the child. Nothing is done if the child is not `visible()` or if it is clipped.

`void Fl_Group::draw_children()`

A convenience function that draws all children of the group. This is useful if you derived a widget from `Fl_Group` and want to draw a special border or background. You can call `draw_children()` from the derived `draw()` method after drawing the box, border, or background.

`void Fl_Group::draw_outside_label(const Fl_Widget &widget) const`

Draw the labels that are *not* drawn by `draw_label()`. If you want more control over the label positions you might want to call `child->draw_label(x, y, w, h, a)`.

`void Fl_Group::update_child(Fl_Widget& widget) const`

Draws the child only if its `damage()` is non-zero. You should call this on all the children if your own `damage` is equal to `FL_DAMAGE_CHILD`. Nothing is done if the child is not `visible()` or if it is clipped.

## 12.9 Cut and Paste Support

FLTK provides routines to cut and paste UTF-8 encoded text between applications:

- [Fl::copy\(\)](#)
- [Fl::paste\(\)](#)
- [Fl::selection\(\)](#)
- [Fl::selection\\_owner\(\)](#)

It is also possible to copy and paste image data between applications:

- [Fl\\_Copy\\_Surface](#)
- [Fl::clipboard\\_contains\(\)](#)
- [Fl::paste\(\)](#)

It may be possible to cut/paste other kinds of data by using [Fl::add\\_handler\(\)](#). Note that handling events beyond those provided by FLTK may be operating system specific. See [Operating System Issues](#) for more details.

## 12.10 Drag And Drop Support

FLTK provides routines to drag and drop UTF-8 encoded text between applications:

Drag'n'drop operations are initiated by copying data to the clipboard and calling the function [Fl::dnd\(\)](#).

Drop attempts are handled via the following events, already described under [Drag and Drop Events](#) in a previous chapter:

- `FL_DND_ENTER`
- `FL_DND_DRAG`
- `FL_DND_LEAVE`
- `FL_DND_RELEASE`
- `FL_PASTE`

## 12.11 Making a subclass of `Fl_Window`

You may want your widget to be a subclass of [Fl\\_Window](#), [Fl\\_Double\\_Window](#), or [Fl\\_Gl\\_Window](#). This can be useful if your widget wants to occupy an entire window, and can also be used to take advantage of system-provided clipping, or to work with a library that expects a system window ID to indicate where to draw.

Subclassing [Fl\\_Window](#) is almost exactly like subclassing [Fl\\_Group](#), and in fact you can easily switch a subclass back and forth. Watch out for the following differences:

1. [Fl\\_Window](#) is a subclass of [Fl\\_Group](#) so *make sure your constructor calls* `end()` unless you actually want children added to your window.
2. When handling events and drawing, the upper-left corner is at 0,0, not `x()`, `y()` as in other [Fl\\_Widget](#)'s. For instance, to draw a box around the widget, call `draw_box(0,0,w(),h())`, rather than `draw_box(x(),y(),w(),h())`.

You may also want to subclass [Fl\\_Window](#) in order to get access to different visuals or to change other attributes of the windows. See the [Operating System Issues](#) chapter for more information.

## Chapter 13

# Using OpenGL

This chapter discusses using FLTK for your OpenGL applications.

### 13.1 Using OpenGL in FLTK

The easiest way to make an OpenGL display is to subclass [Fl\\_Gl\\_Window](#). Your subclass must implement a `draw()` method which uses OpenGL calls to draw the display. Your main program should call `redraw()` when the display needs to change, and (somewhat later) FLTK will call `draw()`.

With a bit of care you can also use OpenGL to draw into normal FLTK windows (see [Using OpenGL in Normal FLTK Windows](#) below). This allows you to use Gouraud shading for drawing your widgets. To do this you use the `gl_start()` and `gl_finish()` functions around your OpenGL code.

You must include FLTK's `<FL/gl.h>` header file. It will include the file `<GL/gl.h>` (on macOS: `<OpenGL/gl.h>`), define some extra drawing functions provided by FLTK, and include the `<windows.h>` header file needed by Windows applications.

Some simple coding rules (see [OpenGL and support of HighDPI displays](#)) allow to write cross-platform code that will support OpenGL run on HighDPI displays (including the 'retina' displays of Apple hardware).

### 13.2 Making a Subclass of Fl\_Gl\_Window

To make a subclass of [Fl\\_Gl\\_Window](#), you must provide:

- A class definition.
- A `draw()` method.
- A `handle()` method if you need to receive input from the user.

If your subclass provides static controls in the window, they must be redrawn whenever the `FL_DAMAGE_ALL` bit is set in the value returned by `damage()`.

### 13.2.1 Defining the Subclass

To define the subclass you just subclass the `Fl_Gl_Window` class:

```
class MyWindow : public Fl_Gl_Window {
    void draw();
    int handle(int);
public:
    MyWindow(int X, int Y, int W, int H, const char *L)
        : Fl_Gl_Window(X, Y, W, H, L) {}
};
```

The `draw()` and `handle()` methods are described below. Like any widget, you can include additional private and public data in your class (such as scene graph information, etc.)

### 13.2.2 The draw() Method

The `draw()` method is where you actually do your OpenGL drawing:

```
void MyWindow::draw() {
    if (!valid()) {
        ... set up projection, viewport, etc ...
        ... window size is in w() and h().
        ... valid() is turned on by FLTK after draw() returns
    }
    ... draw ...
}
```

### 13.2.3 The handle() Method

The `handle()` method handles mouse and keyboard events for the window:

```
int MyWindow::handle(int event) {
    switch(event) {
        case FL_PUSH:
            ... mouse down event ...
            ... position in Fl::event_x() and Fl::event_y()
            return 1;
        case FL_DRAG:
            ... mouse moved while down event ...
            return 1;
        case FL_RELEASE:
            ... mouse up event ...
            return 1;
        case FL_FOCUS :
        case FL_UNFOCUS :
            ... Return 1 if you want keyboard events, 0 otherwise
            return 1;
        case FL_KEYBOARD:
            ... keypress, key is in Fl::event_key(), ascii in Fl::event_text()
            ... Return 1 if you understand/use the keyboard event, 0 otherwise...
            return 1;
        case FL_SHORTCUT:
            ... shortcut, key is in Fl::event_key(), ascii in Fl::event_text()
            ... Return 1 if you understand/use the shortcut event, 0 otherwise...
            return 1;
        default:
            // pass other events to the base class...
            return Fl_Gl_Window::handle(event);
    }
}
```

When `handle()` is called, the OpenGL context is not set up! If your display changes, you should call `redraw()` and let `draw()` do the work. Don't call any OpenGL drawing functions from inside `handle()` !

You can call *some* OpenGL stuff like hit detection and texture loading functions by doing:

```
case FL_PUSH:
    make_current(); // make OpenGL context current
    if (!valid()) {
        ... set up projection exactly the same as draw ...
        valid(1); // stop it from doing this next time
    }
    ... ok to call NON-DRAWING OpenGL code here, such as hit
    detection, loading textures, etc...
```

Your main program can now create one of your windows by doing `new MyWindow(...)`.

You can also use your new window class in FLUID by:

1. Putting your class definition in a `MyWindow.H` file.
2. Creating a `Fl_Box` widget in FLUID.
3. In the widget panel fill in the "class" field with `MyWindow`. This will make FLUID produce constructors for your new class.
4. In the "Extra Code" field put `#include "MyWindow.H"`, so that the FLUID output file will compile.

You must put `glwindow->show()` in your main code after calling `show()` on the window containing the OpenGL window.

## 13.3 OpenGL and support of HighDPI displays

HighDPI displays (including the so-called 'retina' displays of Apple hardware) are supported by FLTK in such a way that 1 unit of an FLTK quantity (say, the value given by `Fl_Gl_Window::w()`) corresponds to more than 1 pixel on the display. Conversely, when a program specifies the width and height of the OpenGL viewport, it is necessary to use an API that returns quantities expressed in pixels. That can be done as follows:

```
Fl_Gl_Window *glw = ...;
glViewport(0, 0, glw->pixel_w(), glw->pixel_h());
```

which makes use of the `Fl_Gl_Window::pixel_w()` and `Fl_Gl_Window::pixel_h()` methods giving the size in pixels of an `Fl_Gl_Window` that is potentially mapped to a HighDPI display. Method `Fl_Gl_Window::pixels_per_unit()` can also be useful in this context.

### Note

A further coding rule is necessary to properly support retina displays and OpenGL under macOS (see [OpenGL and 'retina' displays](#))

## 13.4 Using OpenGL in Normal FLTK Windows

### Note

Drawing both with OpenGL and Quartz in a normal FLTK window is not possible with the macOS platform. This technique is therefore not useful under macOS because it permits nothing more than what is possible with class `Fl_Gl_Window`.

You can put OpenGL code into the `draw()` method, as described in [Drawing the Widget](#) in the previous chapter, or into the code for a `boxtype` or other places with some care.

Most importantly, before you show *any* windows, including those that don't have OpenGL drawing, you **must** initialize FLTK so that it knows it is going to use OpenGL. You may use any of the symbols described for `Fl_Gl_Window` : `mode()` to describe how you intend to use OpenGL:

```
Fl::gl_visual(FL_RGB);
```

You can then put OpenGL drawing code anywhere you can draw normally by surrounding it with `gl_start()` and `gl_finish()` to set up, and later release, an OpenGL context with an orthographic projection so that 0,0 is the lower-left corner of the window and each pixel is one unit. The current clipping is reproduced with OpenGL `glScissor()` commands. These functions also synchronize the OpenGL graphics stream with the drawing done by other X, Windows, or FLTK functions.

```
gl_start();
... put your OpenGL code here ...
gl_finish();
```

The same context is reused each time. If your code changes the projection transformation or anything else you should use `glPushMatrix()` and `glPopMatrix()` functions to put the state back before calling `gl_finish()`.

You may want to use `Fl_Window::current()->h()` to get the drawable height so that you can flip the Y coordinates.

Unfortunately, there are a bunch of limitations you must adhere to for maximum portability:

- You must choose a default visual with `Fl::gl_visual()`.
- You cannot pass `FL_DOUBLE` to `Fl::gl_visual()`.
- You cannot use `Fl_Double_Window` or `Fl_Overlay_Window`.

Do *not* call `gl_start()` or `gl_finish()` when drawing into an `Fl_Gl_Window` !

## 13.5 Using FLTK widgets in OpenGL Windows

FLTK widgets can be added to `Fl_Gl_Windows` just as they would be added to `Fl_Windows`. They are rendered as an overlay over the user defined OpenGL graphics using 'fl\_.' graphics calls that are implemented in GL.

`Fl_Gl_Window` does not add subsequent widgets as children by default as `Fl_Window` does. Call `myGlWindow->begin()` after creating the GL window to automatically add following widgets. Remember to call `myGlWindow->end()`.

```
class My_Gl_Window : public Fl_Gl_Window {
...
    void draw();
...
};
...
myGlWindow = new My_Gl_Window(0, 0, 500, 500);
myGlWindow->begin();
myButton = new Fl_Button(10, 10, 120, 24, "Hello!");
myGlWindow->end();
...
void My_Gl_Window::draw() {
    // ... user GL drawing code
    Fl_Gl_Window::draw(); // Draw FLTK child widgets.
}
```

Users can draw into the overlay by using GL graphics calls as well as all `fl_.` graphics calls from the "Drawing Fast Shapes" section.

```
void My_Gl_Window::draw() {
    // ... user GL drawing code
    Fl_Gl_Window::draw_begin(); // Set up 1:1 projection
    Fl_Window::draw();          // Draw FLTK children
    fl_color(FL_RED);
    fl_rect(10, 10, 100, 100);
    Fl_Gl_Window::draw_end();   // Restore GL state
}
```

Widgets can be drawn with transparencies by assigning an alpha value to a colormap entry and using that color in the widget.

```
Fl::set_color(FL_FREE_COLOR, 255, 255, 0, 127); // 50% transparent yellow
myGlWindow = new My_Gl_Window(0, 0, 500, 500);
myGlWindow->begin();
myButton = new Fl_Button(10, 10, 120, 24, "Hello!");
myButton->box(FL_BORDER_BOX);
myButton->color(FL_FREE_COLOR);
myGlWindow->end();
```

Transparencies can also be set directly when drawing. This can be used to create custom box types and RGB overlay drawings with an alpha channel.

```
fl_color(0, 255, 0, 127); // 50% transparent green
fl_rectf(10, 10, 100, 100);
fl_color(FL_RED); // back to opaque red
fl_rect(20, 20, 80, 80);
```

## 13.6 OpenGL Drawing Functions

FLTK provides some useful OpenGL drawing functions. They can be freely mixed with any OpenGL calls, and are defined by including `<FL/gl.h>` which you should include instead of the OpenGL header `<GL/gl.h>`.

```
void gl_color(FL_Color)
```

Sets the current OpenGL color to a FLTK color. *For color-index modes it will use `fl_xpixel(c)`, which is only right if this window uses the default colormap!*

```
void gl_rect(int x, int y, int w, int h)
```

```
void gl_rectf(int x, int y, int w, int h)
```

Outlines or fills a rectangle with the current color. If `FL_GL_Window::ortho()` has been called, then the rectangle will exactly fill the pixel rectangle passed.

```
void gl_font(FL_Font fontid, int size)
```

Sets the current OpenGL font to the same font you get by calling `fl_font()`.

```
int gl_height()
```

```
int gl_descent()
```

```
float gl_width(const char *s)
```

```
float gl_width(const char *s, int n)
```

```
float gl_width(uchar c)
```

Returns information about the current OpenGL font.

```
void gl_draw(const char *s)
```

```
void gl_draw(const char *s, int n)
```

Draws a nul-terminated string or an array of `n` characters in the current OpenGL font at the current raster position.

```
void gl_draw(const char *s, int x, int y)
```

```
void gl_draw(const char *s, int n, int x, int y)
```

```
void gl_draw(const char *s, float x, float y)
```

```
void gl_draw(const char *s, int n, float x, float y)
```

Draws a nul-terminated string or an array of `n` characters in the current OpenGL font at the given position.

```
void gl_draw(const char *s, int x, int y, int w, int h, FL_Align)
```

Draws a string formatted into a box, with newlines and tabs expanded, other control characters changed to `^X`, and aligned with the edges or center. Exactly the same output as `fl_draw()`.

## 13.7 Speeding up OpenGL

Performance of [Fl\\_Gl\\_Window](#) may be improved on some types of OpenGL implementations, in particular MESA and other software emulators, by setting the `GL_SWAP_TYPE` environment variable. This variable declares what is in the backbuffer after you do a `swapbuffers`.

- `setenv GL_SWAP_TYPE COPY`

This indicates that the back buffer is copied to the front buffer, and still contains its old data. This is true of many hardware implementations. Setting this will speed up emulation of overlays, and widgets that can do partial update can take advantage of this as `damage()` will not be cleared to -1.

- `setenv GL_SWAP_TYPE NODAMAGE`

This indicates that nothing changes the back buffer except drawing into it. This is true of MESA and Win32 software emulation and perhaps some hardware emulation on systems with lots of memory.

- All other values for `GL_SWAP_TYPE`, and not setting the variable, cause FLTK to assume that the back buffer must be completely redrawn after a swap.

This is easily tested by running the [gl\\_overlay](#) demo program and seeing if the display is correct when you drag another window over it or if you drag the window off the screen and back on. You have to exit and run the program again for it to see any changes to the environment variable.

## 13.8 Using OpenGL Optimizer with FLTK

[OpenGL Optimizer](#) is a scene graph toolkit for OpenGL available from Silicon Graphics for IRIX and Microsoft Windows. It allows you to view large scenes without writing a lot of OpenGL code.

### OptimizerWindow Class Definition

To use [OpenGL Optimizer](#) with FLTK you'll need to create a subclass of `Fl_Gl_Widget` that includes several state variables:

```
class OptimizerWindow : public Fl_Gl_Window {
    csContext *context_; // Initialized to 0 and set by draw()...
    csDrawAction *draw_action_; // Draw action...
    csGroup *scene_; // Scene to draw...
    csCamera *camera_; // Viewport for scene...
    void draw();
public:
    OptimizerWindow(int X, int Y, int W, int H, const char *L)
        : Fl_Gl_Window(X, Y, W, H, L) {
        context_ = (csContext *)0;
        draw_action_ = (csDrawAction *)0;
        scene_ = (csGroup *)0;
        camera_ = (csCamera *)0;
    }
    void scene(csGroup *g) { scene_ = g; redraw(); }
    void camera(csCamera *c) {
        camera_ = c;
        if (context_) {
            draw_action_>setCamera(camera_);
            camera_>draw(draw_action_);
            redraw();
        }
    }
};
```

### The camera() Method

The `camera()` method sets the camera (projection and viewpoint) to use when drawing the scene. The scene is redrawn after this call.

### The draw() Method

The `draw()` method performs the needed initialization and does the actual drawing:

```
void OptimizerWindow::draw() {
    if (!context_) {
        // This is the first time we've been asked to draw; create the
        // Optimizer context for the scene...
#ifdef _WIN32
        context_ = new csContext((HDC)fl_getHDC());
        context_>ref();
        context_>makeCurrent((HDC)fl_getHDC());
#else
        context_ = new csContext(fl_display, fl_visual);
        context_>ref();
        context_>makeCurrent(fl_display, fl_window);
#endif // _WIN32
        ... perform other context setup as desired ...
        // Then create the draw action to handle drawing things...
        draw_action_ = new csDrawAction;
        if (camera_) {
            draw_action_>setCamera(camera_);
            camera_>draw(draw_action_);
        }
    } else {
#ifdef _WIN32
        context_>makeCurrent((HDC)fl_getHDC());
#else
        context_>makeCurrent(fl_display, fl_window);
#endif // _WIN32
    }
    if (!valid()) {
        // Update the viewport for this context...
        context_>setViewport(0, 0, w(), h());
    }
    // Clear the window...
    context_>clear(csContext::COLOR_CLEAR | csContext::DEPTH_CLEAR,
        0.0f,          // Red
        0.0f,          // Green
        0.0f,          // Blue
        1.0f);         // Alpha
    // Then draw the scene (if any)...
    if (scene_)
        draw_action_>apply(scene_);
}
```

### The scene() Method

The `scene()` method sets the scene to be drawn. The scene is a collection of 3D objects in a `csGroup`. The scene is redrawn after this call.

## 13.9 Using OpenGL 3.0 (or higher versions)

The examples subdirectory contains OpenGL3test.cxx, a toy program showing how to use OpenGL 3.0 (or higher versions) with FLTK in a cross-platform fashion. It contains also OpenGL3-glut-test.cxx which shows how to use FLTK's GLUT compatibility and OpenGL 3.

To access OpenGL 3.0 (or higher versions), use the `FL_OPENGL3` flag when calling `FL_Gl_Window::mode(int a)` or `glutInitDisplayMode()`.

**On the Windows and Linux platforms**, FLTK creates contexts implementing the highest OpenGL version supported by the hardware. Such contexts may also be compatible with lower OpenGL versions. Access to functions from OpenGL versions above 1.1 requires to load function pointers at runtime on these platforms. FLTK recommends to use the GLEW library to perform this. It is therefore necessary to install the GLEW library (see below).

**On the macOS platform**, MacOS 10.7 or above is required; GLEW is possible but not necessary. FLTK creates contexts for OpenGL versions 1 and 2 without the `FL_OPENGL3` flag and for OpenGL versions 3.2 and above (**but not below**) with it.

### GLEW installation (Linux and Windows platforms)

FLTK needs a header file, `GL/glew.h`, and a library, `libGLEW.*` or equivalent, to support OpenGL 3 and above.

These can be obtained for most Linux distributions by installing package `libglew-dev`.

For the Windows platform :

- the header and a Visual Studio static library (`glew32.lib`) can be downloaded from <http://glew.sourceforge.net/> ;
- a MinGW-style static library (`libglew32.a`) can be built from source (same web site) with the make command. Alternatively, pre-built files are available for these architectures :
  - x86: download files `glew.h` and `libglew32.a`;
  - x86\_64: install GLEW as an MSYS2 package with command :  
`pacman -S mingw-w64-x86_64-glew`

### Source-level changes for OpenGL 3:

- Put this in all OpenGL-using source files (instead of, or before if needed, `#include <FL/gl.h>`, and before `#include <FL/glut.h>` if you use GLUT):

```
#if defined(__APPLE__)
# include <OpenGL/gl3.h> // defines OpenGL 3.0+ functions
#else
# if defined(_WIN32)
#   define GLEW_STATIC 1
# endif
# include <GL/glew.h>
#endif
```

- Add the `FL_OPENGL3` flag when calling `FL_Gl_Window::mode(int a)` or `glutInitDisplayMode()`.
- Put this in the `handle(int event)` member function of the first to be created among your `FL_Gl_Window`-derived classes:

```
#ifndef __APPLE__
static int first = 1;
if (first && event == FL_SHOW && shown()) {
    first = 0;
    make_current();
    glewInit(); // defines pters to functions of OpenGL V 1.2 and above
}
#endif
```

- Alternatively, if you use GLUT, put

```
#ifndef __APPLE__
glewInit(); // defines pters to functions of OpenGL V 1.2 and above
#endif
```

after the first `glutCreateWindow()` call.

If GLEW is installed on the Mac OS development platform, it is possible to use the same code for all platforms, with one exception: put

```
#ifdef __APPLE__
glewExperimental = GL_TRUE;
#endif
```

before the `glewInit()` call.

### Testing for success of the glewInit() call

Testing whether the glewInit() call is successful is to be done as follows:

```
#include <FL/platform.H> // defines FLTK_USE_WAYLAND under the Wayland platform
#include <FL/Fl.H> // for Fl::warning()
#ifdef __APPLE__
#   if defined(_WIN32)
#       define GLEW_STATIC 1
#   endif
#   include <GL/glew.h>
    GLEW_VAR err = glewInit(); // defines pters to functions of OpenGL V 1.2 and above
#   ifdef FLTK_USE_WAYLAND
        // glewInit returns GLEW_ERROR_NO_GLX_DISPLAY with Wayland
        if (fl_wl_display() && err == GLEW_ERROR_NO_GLX_DISPLAY) err = GLEW_OK;
#   endif
    if (err != GLEW_OK) Fl::warning("glewInit() failed returning %u", err);
#endif // ! __APPLE__
```

### Changes in the build process

Link with libGLEW.so (with X11 or Wayland), libglew32.a (with MinGW) or glew32.lib (with MS Visual Studio); no change is needed on the Mac OS platform.



## Chapter 14

# FLTK Runtime Options

In this chapter, we will cover how to access and alter settings for applications created using FLTK, both as an administrator and as a regular user.

Subchapters:

- [Runtime Options](#)
- [Obtaining Current Settings](#)
- [Administrative Tool](#)
- [List of Options](#)

### 14.1 Runtime Options

FLTK keeps track of various aspects of the user interface in a system-wide database. Users have the ability to set their own preferences and override default or system settings. For instance, FLTK will display a dotted rectangle around the widget with current focus. This might not be desirable for users who do not use keyboard navigation and do not need the rectangle. This can be turned off by setting the `OPTION_VISIBLE_FOCUS` option to 'off' for that user, which will disable the focus rectangle in all FLTK-based applications.

### 14.2 Obtaining Current Settings

Options are kept in preference files using the signature `Fl_Preferences::CORE_SYSTEM, "fltk.org", "fltk"` for system-wide settings and `Fl_Preferences::CORE_USER, "fltk.org", "fltk"` for individual users. They can be accessed by using the function `bool Fl::option(Fl_Option opt)`. If an application needs to temporarily override user or system settings, it can use the function `void option(Fl_Option opt, bool val)`.

To make changes to options permanently, FLTK provides an administrative tool called `fltk-options`.

## 14.3 Administrative Tool

`fltk-options` is a hybrid app that is part of FLTK and can be installed on the target system. It includes an up-to-date man page.

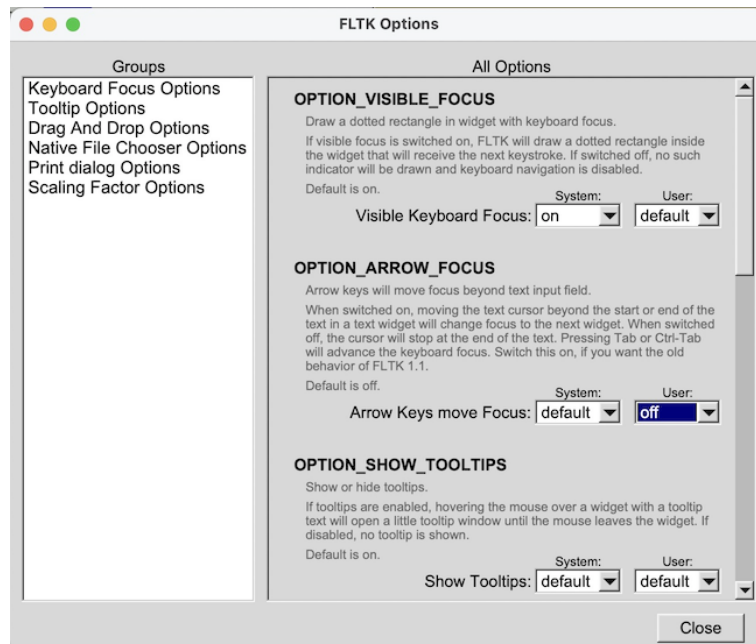


Figure 14.1 `fltk-options` Application

When `fltk-options` is called without any command-line arguments, it opens in interactive mode and provides a user interface to view and alter all system and current user options.

Starting the tool from a shell, the command-line options `-S` and `-U` can be used to display or change system or user options. On MS-Windows, `fltk-options` is also available as `fltk-options-cmd.exe`.

## 14.4 List of Options

Calling `fltk-options --help` gives a list of all available commands, and options and their values. `fltk-options --help OPTION` prints more detailed information for `OPTION` if available. In interactive mode, tooltips provide this additional information.

A full list of options can be found in the manual at [Fl::Fl\\_Option](#).

## Chapter 15

# Advanced FLTK

This chapter explains advanced programming and design topics that will help you to get the most out of FLTK.

### 15.1 Multithreading

FLTK can be used to implement a GUI for a multithreaded application but, as with multithreaded programming generally, there are some concepts and caveats that must be kept in mind.

Key amongst these is that, for many of the target platforms on which FLTK is supported, only the `main()` thread of the process is permitted to handle system events, create or destroy windows and open or close windows. Further, only the `main()` thread of the process can safely write to the display.

To support this in a portable way, all FLTK `draw()` methods are executed in the `main()` thread. A worker thread may update the state of an existing widget, but it may not do any rendering directly, nor create or destroy a window. (**NOTE:** A special case exists for [FL\\_Gl\\_Window](#) where it can, with suitable precautions, be possible to safely render to an existing GL context from a worker thread.)

#### Creating portable threads

We do not provide a threading interface as part of the library. A simple example showing how threads can be implemented, for all supported platforms, can be found in `test/threads.h` and `test/threads.cxx`.

FLTK has been used with a variety of thread interfaces, so if the simple example shown in `test/threads.cxx` does not cover your needs, you might want to select a third-party library that provides the features you require.

### 15.2 FLTK multithread locking - `Fl::lock()` and `Fl::unlock()`

In a multithreaded program, drawing of widgets (in the `main()` thread) happens asynchronously to widgets being updated by worker threads, so no drawing can occur safely whilst a widget is being modified (and no widget should be modified whilst drawing is in progress).

FLTK supports multithreaded applications using a locking mechanism internally. This allows a worker thread to lock the rendering context, preventing any drawing from taking place, whilst it changes the value of its widget.

**Note**

The converse is also true; whilst a worker thread holds the lock, the `main()` thread may not be able to process any drawing requests, nor service any events. So a worker thread that holds the FLTK lock **must** contrive to do so for the shortest time possible or it could impair operation of the application.

The lock operates broadly as follows.

Using the FLTK library, the `main()` thread holds the lock whenever it is processing events or redrawing the display. It acquires (locks) and releases (unlocks) the FLTK lock automatically and no "user intervention" is required. Indeed, a function that runs in the context of the `main()` thread ideally should **not** acquire / release the FLTK lock explicitly. (Though note that the lock calls are recursive, so calling `Fl::lock()` from a thread that already holds the lock, including the `main()` thread, is benign. The only constraint is that every call to `Fl::lock()` **must** be balanced by a corresponding call to `Fl::unlock()` to ensure the lock count is preserved.)

The `main()` thread **must** call `Fl::lock()` **once** before any windows are shown, to enable the internal lock (it is "off" by default since it is not useful in single-threaded applications) but thereafter the `main()` thread lock is managed by the library internally.

A worker thread, when it wants to alter the value of a widget, can acquire the lock using `Fl::lock()`, update the widget, then release the lock using `Fl::unlock()`. Acquiring the lock ensures that the worker thread can update the widget, without any risk that the `main()` thread will attempt to redraw the widget whilst it is being updated.

Note that acquiring the lock is a blocking action; the worker thread will stall for as long as it takes to acquire the lock. If the `main()` thread is engaged in some complex drawing operation this may block the worker thread for a long time, effectively serializing what ought to be parallel operations. (This frequently comes as a surprise to coders less familiar with multithreaded programming issues; see the discussion of "lockless programming" later for strategies for managing this.)

To incorporate the locking mechanism in the library, FLTK must be compiled with `--enable-threads` set during the `configure` process. IDE-based versions of FLTK are automatically compiled with the locking mechanism incorporated if possible. Since version 1.3, the `configure` script that builds the FLTK library also sets `--enable-threads` by default.

## 15.3 Simple multithreaded examples using `Fl::lock`

In `main()`, call `Fl::lock()` once before `Fl::run()` or `Fl::wait()` to enable the lock and start the runtime multithreading support for your program. All callbacks and derived functions like `handle()` and `draw()` will now be properly locked.

This might look something like this:

```
int main(int argc, char **argv) {
    /* Create your windows and widgets here */
    Fl::lock(); /* "start" the FLTK lock mechanism */
    /* show your window */
    main_win->show(argc, argv);
    /* start your worker threads */
    ... start threads ...
    /* Run the FLTK main loop */
    int result = Fl::run();
    /* terminate any pending worker threads */
    ... stop threads ...
    return result;
}
```

You can start as many threads as you like. From within a thread (other than the `main()` thread) FLTK calls must be wrapped with calls to `Fl::lock()` and `Fl::unlock()`:

```
void my_thread(void) {
    while (thread_still_running) {
        /* do thread work */
        ...
        /* compute new values for widgets */
        ...
        Fl::lock();          // acquire the lock
        my_widget->update(values);
        Fl::unlock();        // release the lock; allow other threads to access FLTK again
        Fl::awake();         // use Fl::awake() to signal main thread to refresh the GUI
    }
}
```

**Note**

To trigger a refresh of the GUI from a worker thread, the worker code should call `Fl::awake()`

**Using `Fl::awake` thread messages**

You can send messages from worker threads to the `main()` thread using `Fl::awake(void* message)`. If using this thread message interface, your `main()` might look like this:

```
int main(int argc, char **argv) {
    /* Create your windows and widgets here */
    Fl::lock(); /* "start" the FLTK lock mechanism */
    /* show your window */
    main_win->show(argc, argv);
    /* start your worker threads */
    ... start threads ...
    /* Run the FLTK loop and process thread messages */
    while (Fl::wait() > 0) {
        if ((next_message = Fl::thread_message()) != NULL) {
            /* process your data, update widgets, etc. */
            ...
        }
    }
    /* terminate any pending worker threads */
    ... stop threads ...
    return 0;
}
```

Your worker threads can send messages to the `main()` thread using `Fl::awake(void* message)`:

```
void *msg;          /* "msg" is a pointer to your message */
Fl::awake(msg);     /* send "msg" to main thread
```

A message can be anything you like. The `main()` thread can retrieve the message by calling `Fl::thread_message()`.

**Using `Fl::awake` callback messages**

You can also request that the `main()` thread call a function on behalf of the worker thread by using `Fl::awake(Fl_Awake_Handler cb, void* userdata)`.

The `main()` thread will execute the callback "as soon as possible" when next processing the pending events. This can be used by a worker thread to perform operations (for example showing or hiding windows) that are prohibited in a worker thread.

```
void do_something_cb(void *userdata) {
    /* Will run in the context of the main thread */
    ... do_stuff ...
}
// running in worker thread
void *data;          /* "data" is a pointer to your user data */
Fl::awake(do_something_cb, data); /* call to execute cb in main thread
```

**Note**

The `main()` thread will execute the `Fl_Awake_Handler` callback `do_something_cb` asynchronously to the worker thread, at some short but indeterminate time after the worker thread registers the request. When it executes the `Fl_Awake_Handler` callback, the `main()` thread will use the contents of `*userdata` **at the time of execution**, not necessarily the contents that `*userdata` had at the time that the worker thread posted the callback request. The worker thread should therefore contrive **not** to alter the contents of `*userdata` once it posts the callback, since the worker thread does not know when the `main()` thread will consume that data. It is often useful that `userdata` point to a struct, one member of which the `main()` thread can modify to indicate that it has consumed the data, thereby allowing the worker thread to re-use or update `userdata`.

### Warning

The mechanisms used to deliver `Fl::awake(void* message)` and `Fl::awake(Fl_Awake_Handler cb, void* userdata)` events to the `main()` thread can interact in unexpected ways on some platforms. Therefore, for reliable operation, it is advised that a program use either `Fl::awake(Fl_Awake_Handler cb, void* userdata)` or `Fl::awake(void* message)`, but that they never be intermixed. Calling `Fl::awake()` with no parameters should be safe in either case.

If you have to choose between using the `Fl::awake(void* message)` and `Fl::awake(Fl_Awake_Handler cb, void* userdata)` mechanisms and don't know which to choose, then try the `Fl::awake(Fl_Awake_Handler cb, void* userdata)` method first as it tends to be more powerful in general.

## 15.4 FLTK multithreaded "lockless programming"

The simple multithreaded examples shown above, using the FLTK lock, work well for many cases where multiple threads are required. However, when that model is extended to more complex programs, it often produces results that the developer did not anticipate.

A typical case might go something like this. A developer creates a program to process a huge data set. The program has a `main()` thread and 7 worker threads and is targeted to run on an 8-core computer. When it runs, the program divides the data between the 7 worker threads, and as they process their share of the data, each thread updates its portion of the GUI with the results, locking and unlocking as they do so.

But when this program runs, it is much slower than expected and the developer finds that only one of the eight CPU cores seems to be utilised, despite there being 8 threads in the program. What happened?

The threads in the program all run as expected, but they end up being serialized (that is, not able to run in parallel) because they all depend on the single FLTK lock. Acquiring (and releasing) that lock has an associated cost, and is a **blocking** action if the lock is already held by any other worker thread or by the `main()` thread.

If the worker threads are acquiring the lock "too often", then the lock will **always** be held **somewhere** and every attempt by any other thread (even `main()`) to lock will cause that other thread (including `main()`) to block. And blocking `main()` also blocks event handling, display refresh...

As a result, only one thread will be running at any given time, and the multithreaded program is effectively reduced to being a (complicated and somewhat less efficient) single thread program.

A "solution" is for the worker threads to lock "less often", such that they do not block each other or the `main()` thread. But judging what constitutes locking "too often" for any given configuration, and hence will block, is a very tricky question. What works well on one machine, with a given graphics card and CPU configuration may behave very differently on another target machine.

There are "interesting" variations on this theme, too: for example it is possible that a "faulty" multithreaded program such as described above will work adequately on a single-core machine (where all threads are inherently serialized anyway and so are less likely to block each other) but then stall or even deadlock in unexpected ways on a multicore machine when the threads do interfere with each other. (I have seen this - it really happens.)

The "better" solution is to avoid using the FLTK lock so far as possible. Instead, the code should be designed so that the worker threads do not update the GUI themselves and therefore never need to acquire the FLTK lock. This would be FLTK multithreaded "lockless programming".

There are a number of ways this can be achieved (or at least approximated) in practice but the most direct approach is for the worker threads to make use of the `Fl::awake(Fl_Awake_Handler cb, void* userdata)` method so that GUI updates can all run in the context of the `main()` thread, alleviating the need for the worker thread to ever lock. The onus is then on the worker threads to manage the `userdata` so that it is delivered safely to the `main()` thread, but there are many ways that can be done.

**Note**

Using `Fl::awake` is not, strictly speaking, entirely "lockless" since the awake handler mechanism incorporates resource locking internally to protect the queue of pending awake messages. These resource locks are held transiently and generally do not trigger the pathological blocking issues described here.

However, aside from using `Fl::awake`, there are many other ways that a "lockless" design can be implemented, including message passing, various forms of IPC, etc.

If you need high performing multithreaded programming, then take some time to study the options and understand the advantages and disadvantages of each; we can't even begin to scratch the surface of this huge topic here!

And of course occasional, sparse, use of the FLTK lock from worker threads will do no harm; it is "excessive" locking (whatever that might be) that triggers the failing behaviour.

It is always a Good Idea to update the GUI at the lowest rate that is acceptable when processing bulk data (or indeed, in all cases!) Updating at a few frames per second is probably adequate for providing feedback during a long calculation. At the upper limit, anything faster than the frame rate of your monitor and the updates will never even be displayed; why waste CPU computing pixels that you will never show?

## 15.5 FLTK multithreaded Constraints

FLTK supports multiple platforms, some of which allow only the `main()` thread to handle system events and open or close windows. The safe thing to do is to adhere to the following rules for threads on all operating systems:

- Don't `show()` or `hide()` anything that contains `Fl_Window` based widgets from a worker thread. This includes any windows, dialogs, file choosers, subwindows or widgets using `Fl_Gl_Window`. Note that this constraint also applies to non-window widgets that have tooltips, since the tooltip will contain a `Fl_Window` object. The safe and portable approach is **never** to call `show()` or `hide()` on any widget from the context of a worker thread. Instead you can use the `Fl_Awake_Handler` variant of `Fl::awake()` to request the `main()` thread to create, destroy, show or hide the widget on behalf of the worker thread.
- Don't call `Fl::run()`, `Fl::wait()`, `Fl::flush()`, `Fl::check()` or any related methods that will handle system messages from a worker thread
- Don't intermix use of `Fl::awake(Fl_Awake_Handler cb, void* userdata)` and `Fl::awake(void* message)` calls in the same program as they may interact unpredictably on some platforms; choose one or other style of `Fl::awake(<thing>)` mechanism and use that. (Intermixing calls to `Fl::awake()` should be safe with either however.)
- Starting with FLTK 1.4, it's possible to start (or cancel) a timer from a worker thread under the condition that the call to `Fl::add_timeout` (or `Fl::remove_timeout`) is wrapped in `Fl::lock()` and `Fl::unlock()`.
- Don't change window decorations or titles from a worker thread
- The `make_current()` method will probably not work well for regular windows, but should always work for a `Fl_Gl_Window` to allow for high speed rendering on graphics cards with multiple pipelines. Managing thread-safe access to the GL pipelines is left as an exercise for the reader! (And may be target specific...)

See also: `Fl::lock()`, `Fl::unlock()`, `Fl::awake()`, `Fl::awake(Fl_Awake_Handler cb, void* userdata)`, `Fl::awake(void* message)`, `Fl::thread_message()`.



## Chapter 16

# Unicode and UTF-8 Support

This chapter explains how FLTK handles international text via Unicode and UTF-8.

Unicode support was added to FLTK starting with version 1.3.0 and is still incomplete but mostly functional. This chapter is Work in Progress, reflecting the current state of Unicode support.

### 16.1 About Unicode, ISO 10646 and UTF-8

The summary of Unicode, ISO 10646 and UTF-8 given below is deliberately brief and provides just enough information for the rest of this chapter.

For further information, please see:

- <https://unicode.org>
- <https://iso.org>
- <https://en.wikipedia.org/wiki/Unicode>
- <https://www.cl.cam.ac.uk/~mgk25/unicode.html>
- <https://tools.ietf.org/html/rfc3629>

#### The Unicode Standard

The Unicode Standard was originally developed by a consortium of mainly US computer manufacturers and developers of multi-lingual software. It has now become a defacto standard for character encoding and is supported by most of the major computing companies in the world.

Before Unicode, many different systems, on different platforms, had been developed for encoding characters for different languages, but no single encoding could satisfy all languages. Unicode provides access to over 130,000 characters used in all the major languages written today, and is independent of platform and language.

Unicode also provides higher-level concepts needed for text processing and typographic publishing systems, such as algorithms for sorting and comparing text, composite character and text rendering, right-to-left and bi-directional text handling.

**Note**

There are currently no plans to add this extra functionality to FLTK.

**ISO 10646**

The International Organisation for Standardization (ISO) had also been trying to develop a single unified character set. Although both ISO and the Unicode Consortium continue to publish their own standards, they have agreed to coordinate their work so that specific versions of the Unicode and ISO 10646 standards are compatible with each other.

The international standard ISO 10646 defines the **Universal Character Set** (UCS) which contains the characters required for almost all known languages. The standard also defines three different implementation levels specifying how these characters can be combined.

**Note**

There are currently no plans for handling the different implementation levels or the combining characters in FLTK.

In UCS, characters have a unique numerical code and an official name, and are usually shown using 'U+' and the code in hexadecimal, e.g. U+0041 is the "Latin capital letter A". The UCS characters U+0000 to U+007F correspond to US-ASCII, and U+0000 to U+00FF correspond to ISO 8859-1 (Latin1).

ISO 10646 was originally designed to handle a 31-bit character set from U+00000000 to U+7FFFFFFF, but the current idea is that 21 bits will be sufficient for all future needs, giving characters up to U+10FFFF. The complete character set is sub-divided into *planes*. *Plane 0*, also known as the **Basic Multilingual Plane** (BMP), ranges from U+0000 to U+FFFF and consists of the most commonly used characters from previous encoding standards. Other planes contain characters for specialist applications.

**Todo** FLTK 1.3 and later supports the full Unicode range (21 bits), but there are a few exceptions, for instance binary shortcut values in menus ([Fl\\_Shortcut](#)) can only be used with characters from the BMP (16 bits). This may be extended in a future FLTK version.

The UCS also defines various methods of encoding characters as a sequence of bytes. UCS-2 encodes Unicode characters into two bytes, which is wasteful if you are only dealing with ASCII or Latin1 text, and insufficient if you need characters above U+00FFFF. UCS-4 uses four bytes, which lets it handle higher characters, but this is even more wasteful for ASCII or Latin1.

**UTF-8**

The Unicode standard defines various UCS Transformation Formats (UTF). UTF-16 and UTF-32 are based on units of two and four bytes. UCS characters requiring more than 16 bits are encoded using "surrogate pairs" in UTF-16.

UTF-8 encodes all Unicode characters into variable length sequences of bytes. Unicode characters in the 7-bit ASCII range map to the same value and are represented as a single byte, making the transformation to Unicode quick and easy.

All UCS characters above U+007F are encoded as a sequence of several bytes. The top bits of the first byte are set to show the length of the byte sequence, and subsequent bytes are always in the range 0x80 to 0xBF. This combination provides some level of synchronisation and error detection.

Unicode range	Byte sequences
U+00000000 – U+0000007F	0xxxxxxx
U+00000080 – U+000007FF	110xxxxx 10xxxxxx
U+00000800 – U+0000FFFF	1110xxxx 10xxxxxx 10xxxxxx
U+00010000 – U+001FFFFF	11110xxx 10xxxxxx 10xxxxxx 10xxxxxx
U+00200000 – U+03FFFFFF	111110xx 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx
U+04000000 – U+7FFFFFFF	1111110x 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx

**Note**

This table contains theoretical values outside the valid Unicode range (U+000000 – U+10FFFF). Such values can only be returned by conversion functions for illegal input values (see [Illegal Unicode and UTF-8 Sequences](#)).

Moving from ASCII encoding to Unicode will allow all new FLTK applications to be easily internationalized and used all over the world. By choosing UTF-8 encoding, FLTK remains largely source-code compatible to previous iterations of the library.

## 16.2 Unicode in FLTK

**Todo** Work through the code and this documentation to harmonize the `[OksiD]` and `[fltk2]` functions.

FLTK will be entirely converted to Unicode using UTF-8 encoding. If a different encoding is required by the underlying operating system, FLTK will convert the string as needed.

It is important to note that the initial implementation of Unicode and UTF-8 in FLTK involves three important areas:

- provision of Unicode character tables and some simple related functions;
- conversion of `char*` variables and function parameters from single byte per character representation to UTF-8 variable length sequences;
- modifications to the display font interface to accept general Unicode character or UCS code numbers instead of just ASCII or Latin1 characters.

The current implementation of Unicode / UTF-8 in FLTK will impose the following limitations:

- An implementation note in the `[OksiD]` code says that all functions are LIMITED to 24 bit Unicode values, but also says that only 16 bits are really used under linux and win32. **[Can we verify this?]**
- The `[fltk2]` `fl_utf8encode()` and `fl_utf8decode()` functions are designed to handle Unicode characters in the range U+000000 to U+10FFFF inclusive, which covers all UTF-16 characters, as specified in RFC 3629. *Note that the user must first convert UTF-16 surrogate pairs to UCS.*
- FLTK will only handle single characters, so composed characters consisting of a base character and floating accent characters will be treated as multiple characters.
- FLTK will only compare or sort strings on a byte by byte basis and not on a general Unicode character basis.
- FLTK will not handle right-to-left or bi-directional text.

**Todo** Verify 16/24 bit Unicode limit for different character sets? OksiD's code appears limited to 16-bit whereas the FLTK2 code appears to handle a wider set. What about illegal characters? See comments in `fl_utf8fromwc()` and `fl_utf8toUtf16()`.

## 16.3 Illegal Unicode and UTF-8 Sequences

Three pre-processor variables are defined in the source code [1] that determine how `fl_utf8decode()` handles illegal UTF-8 sequences:

- if `ERRORS_TO_CP1252` is set to 1 (the default), `fl_utf8decode()` will assume that a byte sequence starting with a byte in the range 0x80 to 0x9f represents a Microsoft CP1252 character, and will return the value of an equivalent UCS character. Otherwise, it will be processed as an illegal byte value as described below.
- if `STRICT_RFC3629` is set to 1 (not the default!) then UTF-8 sequences that correspond to illegal UCS values are treated as errors. Illegal UCS values include those above U+10FFFF, or corresponding to UTF-16 surrogate pairs. Illegal byte values are handled as described below.
- if `ERRORS_TO_ISO8859_1` is set to 1 (the default), the illegal byte value is returned unchanged, otherwise 0xFFFD, the Unicode REPLACEMENT CHARACTER, is returned instead.

[1] Since FLTK 1.3.4 you may set these three pre-processor variables on your compile command line with `-D"variable=value"` (value: 0 or 1) to avoid editing the source code.

`fl_utf8encode()` is less strict, and only generates the UTF-8 sequence for 0xFFFD, the Unicode REPLACEMENT CHARACTER, if it is asked to encode a UCS value above U+10FFFF.

Many of the **[fltk2]** functions below use `fl_utf8decode()` and `fl_utf8encode()` in their own implementation, and are therefore somewhat protected from bad UTF-8 sequences.

The **[OksiD]** `fl_utf8len()` function assumes that the byte it is passed is the first byte in a UTF-8 sequence, and returns the length of the sequence. Trailing bytes in a UTF-8 sequence will return -1.

- **WARNING:** `fl_utf8len()` can not distinguish between single bytes representing Microsoft CP1252 characters 0x80-0x9f and those forming part of a valid UTF-8 sequence. You are strongly advised not to use `fl_utf8len()` in your own code unless you know that the byte sequence contains only valid UTF-8 sequences.
- **WARNING:** Some of the **[OksiD]** functions below still use `fl_utf8len()` in their implementations. These may need further validation.

Please see the individual function description for further details about error handling and return values.

## 16.4 FLTK Unicode and UTF-8 Functions

This section provides a brief overview of the functions. For more details, consult the main text for each function via its link.

int [fl\\_utf8locale\(\)](#) **FLTK2**

`fl_utf8locale()` returns true if the "locale" seems to indicate that UTF-8 encoding is used.

*It is highly recommended that you change your system so this does return true!*

int `fl_utf8test(const char *src, unsigned len)` **FLTK2**

`fl_utf8test()` examines the first `len` bytes of `src`. It returns 0 if there are any illegal UTF-8 sequences; 1 if `src` contains plain ASCII or if `len` is zero; or 2, 3 or 4 to indicate the range of Unicode characters found.

int `fl_utf_nb_char(const unsigned char *buf, int len)` **OksiD**

Returns the number of UTF-8 characters in the first `len` bytes of `buf`.

int `fl_unichar_to_utf8_size(Fl_Unichar)`  
int `fl_utf8bytes(unsigned ucs)`

Returns the number of bytes needed to encode `ucs` in UTF-8.

int `fl_utf8len(char c)` **OksiD**

If `c` is a valid first byte of a UTF-8 encoded character sequence, `fl_utf8len()` will return the number of bytes in that sequence. It returns -1 if `c` is not a valid first byte.

unsigned int `fl_nonspacing(unsigned int ucs)` **OksiD**

Returns true if `ucs` is a non-spacing character.

const char\* `fl_utf8back(const char *p, const char *start, const char *end)` **FLTK2**  
const char\* `fl_utf8fwd(const char *p, const char *start, const char *end)` **FLTK2**

If `p` already points to the start of a UTF-8 character sequence, these functions will return `p`. Otherwise `fl_utf8back()` searches backwards from `p` and `fl_utf8fwd()` searches forwards from `p`, within the `start` and `end` limits, looking for the start of a UTF-8 character.

unsigned int `fl_utf8decode(const char *p, const char *end, int *len)` **FLTK2**  
int `fl_utf8encode(unsigned ucs, char *buf)` **FLTK2**

`fl_utf8decode()` attempts to decode the UTF-8 character that starts at `p` and may not extend past `end`. It returns the Unicode value, and the length of the UTF-8 character sequence is returned via the `len` argument. `fl_utf8encode()` writes the UTF-8 encoding of `ucs` into `buf` and returns the number of bytes in the sequence. See the main documentation for the treatment of illegal Unicode and UTF-8 sequences.

unsigned int `fl_utf8froma(char *dst, unsigned dstlen, const char *src, unsigned srclen)` **FLTK2**  
 unsigned int `fl_utf8toa(const char *src, unsigned srclen, char *dst, unsigned dstlen)` **FLTK2**

`fl_utf8froma()` converts a character string containing single bytes per character (i.e. ASCII or ISO-8859-1) into UTF-8. If the `src` string contains only ASCII characters, the return value will be the same as `srclen`.

`fl_utf8toa()` converts a string containing UTF-8 characters into single byte characters. UTF-8 characters that do not correspond to ASCII or ISO-8859-1 characters below 0xFF are replaced with '?'.

Both functions return the number of bytes that would be written, not counting the null terminator. `dstlen` provides a means of limiting the number of bytes written, so setting `dstlen` to zero is a means of measuring how much storage would be needed before doing the real conversion.

char\* `fl_utf2mbcs(const char *src)` **OksiD**

converts a UTF-8 string to a local multi-byte character string. **[More info required here!]**

unsigned int `fl_utf8fromwc(char *dst, unsigned dstlen, const wchar_t *src, unsigned srclen)` **FLTK2**  
 unsigned int `fl_utf8towc(const char *src, unsigned srclen, wchar_t *dst, unsigned dstlen)` **FLTK2**  
 unsigned int `fl_utf8toUtf16(const char *src, unsigned srclen, unsigned short *dst, unsigned dstlen)` **FLTK2**

These routines convert between UTF-8 and `wchar_t` or "wide character" strings. The difficulty lies in the fact that `sizeof(wchar_t)` is 2 on Windows and 4 on Linux and most other systems. Therefore some "wide characters" on Windows may be represented as "surrogate pairs" of more than one `wchar_t`.

`fl_utf8fromwc()` converts from a "wide character" string to UTF-8. Note that `srclen` is the number of `wchar_t` elements in the source string and on Windows this might be larger than the number of characters. `dstlen` specifies the maximum number of **bytes** to copy, including the null terminator.

`fl_utf8towc()` converts a UTF-8 string into a "wide character" string. Note that on Windows, some "wide characters" might result in "surrogate pairs" and therefore the return value might be more than the number of characters. `dstlen` specifies the maximum number of **wchar\_t** elements to copy, including a zero terminating element. **[Is this all worded correctly?]**

`fl_utf8toUtf16()` converts a UTF-8 string into a "wide character" string using UTF-16 encoding to handle the "surrogate pairs" on Windows. `dstlen` specifies the maximum number of `wchar_t` elements to copy, including a zero terminating element. **[Is this all worded correctly?]**

These routines all return the number of elements that would be required for a full conversion of the `src` string, including the zero terminator. Therefore setting `dstlen` to zero is a way of measuring how much storage would be needed before doing the real conversion.

```
unsigned int fl_utf8from_mb(char *dst, unsigned dstlen, const char *src, unsigned srclen) FLTK2
unsigned int fl_utf8to_mb(const char *src, unsigned srclen, char *dst, unsigned dstlen) FLTK2
```

These functions convert between UTF-8 and the locale-specific multi-byte encodings used on some systems for filenames, etc. If `fl_utf8locale()` returns true, these functions don't do anything useful. **[Is this all worded correctly?]**

```
int fl_tolower(unsigned int ucs) OksiD
int fl_toupper(unsigned int ucs) OksiD
int fl_utf_tolower(const unsigned char *str, int len, char *buf) OksiD
int fl_utf_toupper(const unsigned char *str, int len, char *buf) OksiD
```

`fl_tolower()` and `fl_toupper()` convert a single Unicode character from upper to lower case, and vice versa. `fl_utf_tolower()` and `fl_utf_toupper()` convert a string of bytes, some of which may be multi-byte UTF-8 encodings of Unicode characters, from upper to lower case, and vice versa.

Warning: to be safe, `buf` length must be at least `3*len` [for 16-bit Unicode]

```
int fl_utf_strcasecmp(const char *s1, const char *s2) OksiD
int fl_utf_strncasecmp(const char *s1, const char *s2, int n) OksiD
```

`fl_utf_strcasecmp()` is a UTF-8 aware string comparison function that converts the strings to lower case Unicode as part of the comparison. `fl_utf_strncasecmp()` only compares the first `n` characters [bytes?]

## 16.5 FLTK Unicode Versions of System Calls

- `int fl_access(const char* f, int mode)` **OksiD**
- `int fl_chmod(const char* f, int mode)` **OksiD**
- `int fl_execvp(const char* file, char* const* argv)` **OksiD**
- `FILE* fl_fopen(const char* f, const char* mode)` **OksiD**
- `char* fl_getcwd(char* buf, int maxlen)` **OksiD**
- `char* fl_getenv(const char* name)` **OksiD**
- `char fl_make_path(const char* path)` - returns char ? **OksiD**
- `void fl_make_path_for_file(const char* path)` **OksiD**
- `int fl_mkdir(const char* f, int mode)` **OksiD**
- `int fl_open(const char* f, int o, ...)` **OksiD**
- `int fl_rename(const char* f, const char* t)` **OksiD**
- `int fl_rmdir(const char* f)` **OksiD**
- `int fl_stat(const char* path, struct stat* buffer)` **OksiD**
- `int fl_system(const char* f)` **OksiD**
- `int fl_unlink(const char* f)` **OksiD**

TODO:

- more doc on unicode, add links
- write something about filename encoding on OS X...
- explain the `fl_utf8_...` commands
- explain issues with [FL\\_Preferences](#)

## Chapter 17

# Constants and Enumerations

### Note

This file is not actively maintained any more, but is left here as a reference, until the doxygen documentation is completed.

### See also

[FL/Enumerations.H](#).

This appendix lists the enumerations provided in the `<FL/Enumerations.H>` header file, organized by section. Constants whose value are zero are marked with "(0)", this is often useful to know when programming.

## 17.1 Version Numbers

The FLTK version number is stored in a number of compile-time constants:

- `FL_MAJOR_VERSION` - The major release number, currently 1
- `FL_MINOR_VERSION` - The minor release number, currently 4
- `FL_PATCH_VERSION` - The patch release number, currently 1
- `FL_VERSION` - [Deprecated] A combined floating-point version number for the major, minor, and patch release numbers, currently 1.0400
- `FL_API_VERSION` - A combined integer version number for the major, minor, and patch release numbers, currently 10400 (use this instead of `FL_VERSION`, if possible)
- `FL_ABI_VERSION` - A combined integer version number for the application binary interface (ABI) major, minor, and patch release numbers, currently 10400 (default)

### Note

The ABI version (`FL_ABI_VERSION`) is usually constant throughout one major/minor release version, for instance 10300 if `FL_API_VERSION` is 10304. Hence the ABI is constant if only the patch version is changed. You can change this with configure or CMake though if you want the latest enhancements (called "ABI features", see CHANGES).

## 17.2 Events

Events are identified by an [FL\\_Event](#) enumeration value. The following events are currently defined:

- `FL_NO_EVENT` - No event (or an event fltk does not understand) occurred (0).
- `FL_PUSH` - A mouse button was pushed.
- `FL_RELEASE` - A mouse button was released.
- `FL_ENTER` - The mouse pointer entered a widget.
- `FL_LEAVE` - The mouse pointer left a widget.
- `FL_DRAG` - The mouse pointer was moved with a button pressed.
- `FL_FOCUS` - A widget should receive keyboard focus.
- `FL_UNFOCUS` - A widget loses keyboard focus.
- `FL_KEYBOARD` - A key was pressed.
- `FL_CLOSE` - A window was closed.
- `FL_MOVE` - The mouse pointer was moved with no buttons pressed.
- `FL_SHORTCUT` - The user pressed a shortcut key.
- `FL_DEACTIVATE` - The widget has been deactivated.
- `FL_ACTIVATE` - The widget has been activated.
- `FL_HIDE` - The widget has been hidden.
- `FL_SHOW` - The widget has been shown.
- `FL_PASTE` - The widget should paste the contents of the clipboard.
- `FL_SELECTIONCLEAR` - The widget should clear any selections made for the clipboard.
- `FL_MOUSEWHEEL` - The horizontal or vertical mousewheel was turned.
- `FL_DND_ENTER` - The mouse pointer entered a widget dragging data.
- `FL_DND_DRAG` - The mouse pointer was moved dragging data.
- `FL_DND_LEAVE` - The mouse pointer left a widget still dragging data.
- `FL_DND_RELEASE` - Dragged data is about to be dropped.
- `FL_SCREEN_CONFIGURATION_CHANGED` - The screen configuration (number, positions) was changed.
- `FL_FULLSCREEN` - The fullscreen state of the window has changed.

## 17.3 Callback "When" Conditions

The following constants determine when a callback is performed:

- `FL_WHEN_NEVER` - Never call the callback (0).
- `FL_WHEN_CHANGED` - Do the callback only when the widget value changes.
- `FL_WHEN_NOT_CHANGED` - Do the callback whenever the user interacts with the widget.
- `FL_WHEN_RELEASE` - Do the callback when the button or key is released and the value changes.
- `FL_WHEN_ENTER_KEY` - Do the callback when the user presses the ENTER key and the value changes.
- `FL_WHEN_RELEASE_ALWAYS` - Do the callback when the button or key is released, even if the value doesn't change.
- `FL_WHEN_ENTER_KEY_ALWAYS` - Do the callback when the user presses the ENTER key, even if the value doesn't change.

## 17.4 Fl::event\_button() Values

The following constants define the button numbers for `FL_PUSH` and `FL_RELEASE` events:

- `FL_LEFT_MOUSE` - the left mouse button
- `FL_MIDDLE_MOUSE` - the middle mouse button
- `FL_RIGHT_MOUSE` - the right mouse button
- `FL_BACK_MOUSE` - the back mouse button (side button 1)
- `FL_FORWARD_MOUSE` - the forward mouse button (side button 2)

## 17.5 Fl::event\_key() Values

The following constants define the non-ASCII keys on the keyboard for `FL_KEYBOARD` and `FL_SHORTCUT` events:

- `FL_Button` - A mouse button; use `Fl_Button + n` for mouse button `n`.
- `FL_BackSpace` - The backspace key.
- `FL_Tab` - The tab key.
- `FL_Enter` - The enter key.
- `FL_Pause` - The pause key.
- `FL_Scroll_Lock` - The scroll lock key.
- `FL_Escape` - The escape key.
- `FL_Home` - The home key.
- `FL_Left` - The left arrow key.

- `FL_Up` - The up arrow key.
- `FL_Right` - The right arrow key.
- `FL_Down` - The down arrow key.
- `FL_Page_Up` - The page-up key.
- `FL_Page_Down` - The page-down key.
- `FL_End` - The end key.
- `FL_Print` - The print (or print-screen) key.
- `FL_Insert` - The insert key.
- `FL_Menu` - The menu key.
- `FL_Num_Lock` - The num lock key.
- `FL_KP` - One of the keypad numbers or keys; use `FL_KP + 'n'` for number `n` and, say, `FL_KP + '*'`.
- `FL_KP_Enter` - The enter key on the keypad.
- `FL_F` - One of the function keys; use `FL_F + n` for function key `n`.
- `FL_Shift_L` - The lefthand shift key.
- `FL_Shift_R` - The righthand shift key.
- `FL_Control_L` - The lefthand control key.
- `FL_Control_R` - The righthand control key.
- `FL_Caps_Lock` - The caps lock key.
- `FL_Meta_L` - The left meta/Windows key.
- `FL_Meta_R` - The right meta/Windows key.
- `FL_Alt_L` - The left alt key.
- `FL_Alt_R` - The right alt key.
- `FL_Delete` - The delete key.
- `FL_Alt_Gr` - The AltGr key on some international keyboards.

## 17.6 `Fl::event_state()` Values

The following constants define bits in the `Fl::event_state()` value:

- `FL_SHIFT` - One of the shift keys is down.
- `FL_CAPS_LOCK` - The caps lock is on.
- `FL_CTRL` - One of the ctrl keys is down.
- `FL_ALT` - One of the alt keys is down.
- `FL_NUM_LOCK` - The num lock is on.
- `FL_META` - One of the meta/Windows keys is down.
- `FL_COMMAND` - An alias for `FL_CTRL` on Windows, X11 and Wayland, or `FL_META` on MacOS X.

- `FL_CONTROL` - An alias for `FL_META` on Windows, X11 and Wayland, or `FL_CTRL` on MacOS X.
- `FL_SCROLL_LOCK` - The scroll lock is on.
- `FL_BUTTON1` - Mouse button 1 is pushed.
- `FL_BUTTON2` - Mouse button 2 is pushed.
- `FL_BUTTON3` - Mouse button 3 is pushed.
- `FL_BUTTON4` - Mouse button 4 (back) is pushed.
- `FL_BUTTON5` - Mouse button 5 (forward) is pushed.
- `FL_BUTTONS` - Any mouse button (1..5) is pushed.
- `FL_BUTTON(n)` - Mouse button  $n$  ( where  $n > 0$  ) is pushed.

## 17.7 Alignment Values

The following constants define bits that can be used with `Fl_Widget::align()` to control the positioning of the label:

- `FL_ALIGN_CENTER` - The label is centered (0).
- `FL_ALIGN_TOP` - The label is top-aligned.
- `FL_ALIGN_BOTTOM` - The label is bottom-aligned.
- `FL_ALIGN_LEFT` - The label is left-aligned.
- `FL_ALIGN_RIGHT` - The label is right-aligned.
- `FL_ALIGN_CLIP` - The label is clipped to the widget.
- `FL_ALIGN_WRAP` - The label text is wrapped as needed.
- `FL_ALIGN_TOP_LEFT` - The label appears at the top of the widget, aligned to the left.
- `FL_ALIGN_TOP_RIGHT` - The label appears at the top of the widget, aligned to the right.
- `FL_ALIGN_BOTTOM_LEFT` - The label appears at the bottom of the widget, aligned to the left.
- `FL_ALIGN_BOTTOM_RIGHT` - The label appears at the bottom of the widget, aligned to the right.
- `FL_ALIGN_LEFT_TOP` - The label appears to the left of the widget, aligned at the top. Outside labels only.
- `FL_ALIGN_RIGHT_TOP` - The label appears to the right of the widget, aligned at the top. Outside labels only.
- `FL_ALIGN_LEFT_BOTTOM` - The label appears to the left of the widget, aligned at the bottom. Outside labels only.
- `FL_ALIGN_RIGHT_BOTTOM` - The label appears to the right of the widget, aligned at the bottom. Outside labels only.
- `FL_ALIGN_INSIDE` - 'or' this with other values to put label inside the widget.
- `FL_ALIGN_TEXT_OVER_IMAGE` - Label text will appear above the image.
- `FL_ALIGN_IMAGE_OVER_TEXT` - Label text will be below the image.
- `FL_ALIGN_IMAGE_NEXT_TO_TEXT` - The image will appear to the left of the text.
- `FL_ALIGN_TEXT_NEXT_TO_IMAGE` - The image will appear to the right of the text.
- `FL_ALIGN_IMAGE_BACKDROP` - The image will be used as a background for the widget.

## 17.8 Fonts

The following constants define the standard FLTK fonts:

- FL\_HELVETICA - Helvetica (or Arial) normal (0).
- FL\_HELVETICA\_BOLD - Helvetica (or Arial) bold.
- FL\_HELVETICA\_ITALIC - Helvetica (or Arial) oblique.
- FL\_HELVETICA\_BOLD\_ITALIC - Helvetica (or Arial) bold-oblique.
- FL\_COURIER - Courier normal.
- FL\_COURIER\_BOLD - Courier bold.
- FL\_COURIER\_ITALIC - Courier italic.
- FL\_COURIER\_BOLD\_ITALIC - Courier bold-italic.
- FL\_TIMES - Times roman.
- FL\_TIMES\_BOLD - Times bold.
- FL\_TIMES\_ITALIC - Times italic.
- FL\_TIMES\_BOLD\_ITALIC - Times bold-italic.
- FL\_SYMBOL - Standard symbol font.
- FL\_SCREEN - Default monospaced screen font.
- FL\_SCREEN\_BOLD - Default monospaced bold screen font.
- FL\_ZAPF\_DINGBATS - Zapf-dingbats font.

## 17.9 Colors

The FL\_Color enumeration type holds a FLTK color value. Colors are either 8-bit indexes into a [virtual colormap](#) or 24-bit RGB color values. Color indices occupy the lower 8 bits of the value, while RGB colors occupy the upper 24 bits, for a byte organization of RGBI.

### 17.9.1 Color Constants

Constants are defined for the user-defined foreground and background colors, as well as specific colors and the start of the grayscale ramp and color cube in the [virtual colormap](#). Inline functions are provided to retrieve specific grayscale, color cube, or RGB color values.

The following color constants can be used to access the user-defined colors:

- FL\_BACKGROUND\_COLOR - the default background color
- FL\_BACKGROUND2\_COLOR - the default background color for text, list, and valuator widgets
- FL\_FOREGROUND\_COLOR - the default foreground color (0) used for labels and text
- FL\_INACTIVE\_COLOR - the inactive foreground color

- `FL_SELECTION_COLOR` - the default selection/highlight color

The following color constants can be used to access the colors from the FLTK standard color cube:

- `FL_BLACK`
- `FL_BLUE`
- `FL_CYAN`
- `FL_DARK_BLUE`
- `FL_DARK_CYAN`
- `FL_DARK_GREEN`
- `FL_DARK_MAGENTA`
- `FL_DARK_RED`
- `FL_DARK_YELLOW`
- `FL_GREEN`
- `FL_MAGENTA`
- `FL_RED`
- `FL_WHITE`
- `FL_YELLOW`

The following are named values within the standard grayscale:

- `FL_GRAY0`
- `FL_DARK3`
- `FL_DARK2`
- `FL_DARK1`
- `FL_LIGHT1`
- `FL_LIGHT2`
- `FL_LIGHT3`

The inline methods for getting a grayscale, color cube, or RGB color value are described in the [Colors](#) section of the [Drawing Things in FLTK](#) chapter.

## 17.10 Cursors

The following constants define the mouse cursors that are available in FLTK. The double-headed arrows are bitmaps provided by FLTK on X, the others are provided by system-defined cursors.

- `FL_CURSOR_DEFAULT` - the default cursor, usually an arrow (0)
- `FL_CURSOR_ARROW` - an arrow pointer
- `FL_CURSOR_CROSS` - crosshair
- `FL_CURSOR_WAIT` - watch or hourglass
- `FL_CURSOR_INSERT` - I-beam
- `FL_CURSOR_HAND` - hand (uparrow on Windows)
- `FL_CURSOR_HELP` - question mark
- `FL_CURSOR_MOVE` - 4-pointed arrow
- `FL_CURSOR_NS` - up/down arrow
- `FL_CURSOR_WE` - left/right arrow
- `FL_CURSOR_NWSE` - diagonal arrow
- `FL_CURSOR_NESW` - diagonal arrow
- `FL_CURSOR_NONE` - invisible

## 17.11 FD "When" Conditions

- `FL_READ` - Call the callback when there is data to be read.
- `FL_WRITE` - Call the callback when data can be written without blocking.
- `FL_EXCEPT` - Call the callback if an exception occurs on the file.

## 17.12 Damage Masks

The following damage mask bits are used by the standard FLTK widgets:

- `FL_DAMAGE_CHILD` - A child needs to be redrawn.
- `FL_DAMAGE_EXPOSE` - The window was exposed.
- `FL_DAMAGE_SCROLL` - The [Fl\\_Scroll](#) widget was scrolled.
- `FL_DAMAGE_OVERLAY` - The overlay planes need to be redrawn.
- `FL_DAMAGE_USER1` - First user-defined damage bit.
- `FL_DAMAGE_USER2` - Second user-defined damage bit.
- `FL_DAMAGE_ALL` - Everything needs to be redrawn.

## Chapter 18

# GLUT Compatibility

This appendix describes the GLUT compatibility header file supplied with FLTK.

FLTK's GLUT compatibility is based on the original GLUT 3.7 and the follow-on FreeGLUT 2.4.0 libraries.

### 18.1 Using the GLUT Compatibility Header File

You should be able to compile existing GLUT source code by including `<FL/glut.H>` instead of `<GL/glut.h>`. This can be done by editing the source, by changing the `-I` switches to the compiler, or by providing a symbolic link from `GL/glut.h` to `FL/glut.H`.

*All files calling GLUT procedures must be compiled with C++.* You may have to alter them slightly to get them to compile without warnings, and you may have to rename them to get make to use the C++ compiler.

You must link with the FLTK library. Most of `FL/glut.H` is inline functions. You should take a look at it (and maybe at `test/glewtest.cxx` in the FLTK source) if you are having trouble porting your GLUT program.

This has been tested with most of the demo programs that come with the GLUT and FreeGLUT distributions.

### 18.2 Known Problems

The following functions and/or arguments to functions are missing, and you will have to replace them or comment them out for your code to compile:

- `glutGet (GLUT_ELAPSED_TIME)`
- `glutGet (GLUT_SCREEN_HEIGHT_MM)`
- `glutGet (GLUT_SCREEN_WIDTH_MM)`
- `glutGet (GLUT_WINDOW_NUM_CHILDREN)`
- `glutInitDisplayMode (GLUT_LUMINANCE)`
- `glutKeyboardUpFunc(void(*callback)(unsigned char key, int x, int y))`
- `glutLayerGet (GLUT_HAS_OVERLAY)`

- `glutLayerGet (GLUT_LAYER_IN_USE)`
- `glutPushWindow()`
- `glutSetColor(), glutGetColor(), glutCopyColormap()`
- `glutVideoResize()` missing.
- `glutWarpPointer()`
- `glutWindowStatusFunc()`
- Spaceball, buttonbox, dials, and tablet functions

Most of the symbols/enumerations have different values than GLUT uses. This will break code that relies on the actual values. The only symbols guaranteed to have the same values are true/false pairs like `GLUT_DOWN` and `GLUT_UP`, mouse buttons `GLUT_LEFT_BUTTON`, `GLUT_MIDDLE_BUTTON`, `GLUT_RIGHT_BUTTON`, and `GLUT_KEY_F1` thru `GLUT_KEY_F12`.

The strings passed as menu labels are not copied.

`glutPostRedisplay()` does not work if called from inside a display function. You must use `glutIdleFunc()` if you want your display to update continuously.

`glutSwapBuffers()` does not work from inside a display function. This is on purpose, because FLTK swaps the buffers for you.

`glutUseLayer()` does not work well, and should only be used to initialize transformations inside a resize callback. You should redraw overlays by using `glutOverlayDisplayFunc()`.

Overlays are cleared before the overlay display function is called. `glutLayerGet (GLUT_OVERLAY_DAMAGED)` always returns true for compatibility with some GLUT overlay programs. You must rewrite your code so that `gl_color()` is used to choose colors in an overlay, or you will get random overlay colors.

`glutSetCursor (GLUT_CURSOR_FULL_CROSSHAIR)` just results in a small crosshair.

The fonts used by `glutBitmapCharacter()` and `glutBitmapWidth()` may be different.

`glutInit(argc, argv)` will consume different switches than GLUT does. It accepts the switches recognized by `Fl::args()`, and will accept any abbreviation of these switches (such as `"-di"` for `"-display"`).

## 18.3 Mixing GLUT and FLTK Code

You can make your GLUT window a child of a `Fl_Window` with the following scheme. The biggest trick is that GLUT insists on a call to `show()` the window at the point it is created, which means the `Fl_Window` parent window must already be shown.

- Don't call `glutInit()`.
- Create your `Fl_Window`, and any FLTK widgets. Leave a blank area in the window for your GLUT window.
- `show()` the `Fl_Window`. Perhaps call `show(argc, argv)`.
- Call `window->begin()` so that the GLUT window will be automatically added to it.
- Use `glutInitWindowSize()` and `glutInitWindowPosition()` to set the location in the parent window to put the GLUT window.
- Put your GLUT code next. It probably does not need many changes. Call `window->end()` immediately after the `glutCreateWindow()` !
- You can call either `glutMainLoop()`, `Fl::run()`, or loop calling `Fl::wait()` to run the program.

## 18.4 class Fl\_Glut\_Window

### 18.4.1 Class Hierarchy

```
Fl_Gl_Window
|
+----Fl_Glut_Window
```

### 18.4.2 Include Files

```
#include <FL/glut.H>
```

### 18.4.3 Description

Each GLUT window is an instance of this class. You may find it useful to manipulate instances directly rather than use GLUT window id's. These may be created without opening the display, and thus can fit better into FLTK's method of creating windows.

The current GLUT window is available in the global variable `glut_window`.

`new Fl_Glut_Window(...)` is the same as `glutCreateWindow()` except it does not `show()` the window or make the window current.

`window->make_current()` is the same as `glutSetWindow(number)`. If the window has not had `show()` called on it yet, some functions that assume an OpenGL context will not work. If you do `show()` the window, call `make_current()` again to set the context.

`~Fl_Glut_Window()` is the same as `glutDestroyWindow()`.

### 18.4.4 Members

The `Fl_Glut_Window` class contains several public members that can be altered directly:

member	description
<code>display</code>	A pointer to the function to call to draw the normal planes.
<code>entry</code>	A pointer to the function to call when the mouse moves into or out of the window.
<code>keyboard</code>	A pointer to the function to call when a regular key is pressed.
<code>menu[3]</code>	The menu to post when one of the mouse buttons is pressed.
<code>mouse</code>	A pointer to the function to call when a button is pressed or released.
<code>motion</code>	A pointer to the function to call when the mouse is moved with a button down.
<code>overlaydisplay</code>	A pointer to the function to call to draw the overlay planes.
<code>passivemotion</code>	A pointer to the function to call when the mouse is moved with no buttons down.
<code>reshape</code>	A pointer to the function to call when the window is resized.
<code>special</code>	A pointer to the function to call when a special key is pressed.
<code>visibility</code>	A pointer to the function to call when the window is iconified or restored (made visible.)

### 18.4.5 Methods

```
FI_Glut_Window::FI_Glut_Window(int x, int y, int w, int h, const char *title = 0)  
FI_Glut_Window::FI_Glut_Window(int w, int h, const char *title = 0)
```

The first constructor takes 4 int arguments to create the window with a preset position and size. The second constructor with 2 arguments will create the window with a preset size, but the window manager will choose the position according to its own whims.

```
virtual FI_Glut_Window::~~FI_Glut_Window()
```

Destroys the GLUT window.

```
void FI_Glut_Window::make_current()
```

Switches all drawing functions to the GLUT window.

## Chapter 19

# Forms Compatibility

This appendix describes the Forms compatibility included with FLTK.

### Note

The Forms compatibility library is deprecated, no longer actively maintained since FLTK 1.3.0, and likely to be removed completely in FLTK 1.5.

Since FLTK 1.4 building the Forms compatibility library `fltk_forms` (configure/Makefiles) or `fltk::forms` (CMake) can be disabled with one of these commands:

```
- ./configure --disable-forms ...
- cmake -D FLTK_BUILD_FORMS:BOOL=OFF ...
- cmake-gui ...
```

Fluid can still import Forms and XForms designer (.fd) files but w/o any guarantees for working results. Manual fixes may be necessary.

In the next minor or major release (1.5 or higher) the Forms compatibility library will not be built by default or will be removed entirely.

## 19.1 Importing Forms Layout Files

FLUID can read the `.fd` files put out by all versions of Forms and XForms fdesign. However, it will mangle them a bit, but it prints a warning message about anything it does not understand. FLUID cannot write fdesign files, so you should save to a new name so you don't write over the old one.

You will need to edit your main code considerably to get it to link with the output from FLUID. If you are not interested in this you may have more immediate luck with the forms compatibility header, [<FL/forms.H>](#).

## 19.2 Using the Compatibility Header File

You should be able to compile existing Forms or XForms source code by changing the include directory switch to your compiler so that the `forms.h` file supplied with FLTK is included. The `forms.h` file simply pulls in [<FL/forms.H>](#) so you don't need to change your source code. Take a look at [<FL/forms.H>](#) to see how it works, but the basic trick is lots of inline functions. Most of the XForms demo programs work without changes.

You will also have to compile your Forms or XForms program using a C++ compiler. The FLTK library does not provide C bindings or header files.

Although FLTK was designed to be compatible with the GL Forms library (version 0.3 or so), XForms has bloated severely and its interface is X-specific. Therefore, XForms compatibility is no longer a goal of FLTK. Compatibility was limited to things that were free, or that would add code that would not be linked in if the feature is unused, or that was not X-specific.

To use any new features of FLTK, you should rewrite your code to not use the inline functions and instead use "pure" FLTK. This will make it a lot cleaner and make it easier to figure out how to call the FLTK functions. Unfortunately this conversion is harder than expected and even Digital Domain's inhouse code still uses `forms.H` a lot.

## 19.3 Problems You Will Encounter

Many parts of XForms use X-specific structures like `XEvent` in their interface. I did not emulate these! Unfortunately these features (such as the "canvas" widget) are needed by most large programs. You will need to rewrite these to use FLTK subclasses.

[FL\\_Free](#) widgets emulate the *old* Forms "free" widget. It may be useful for porting programs that change the `handle()` function on widgets, but you will still need to rewrite things.

[FL\\_Timer](#) widgets are provided to emulate the XForms timer. These work, but are quite inefficient and inaccurate compared to using [Fl::add\\_timeout\(\)](#).

*All instance variables are hidden.* If you directly refer to the `x`, `y`, `w`, `h`, `label`, or other fields of your Forms widgets you will have to add empty parenthesis after each reference. The easiest way to do this is to globally replace `"->x"` with `"->x()"`, etc. Replace `"boxtype"` with `"box()"`.

`const char *` arguments to most FLTK methods are simply stored, while Forms would `strdup()` the passed string. This is most noticeable with the `label()` of widgets. Your program must always pass static data such as a string constant or malloc'd buffer to `label()`. If you are using labels to display program output you may want to try the [FL\\_Output](#) widget.

The default fonts and sizes are matched to the older GL version of Forms, so all labels will draw somewhat larger than an XForms program does.

`fdesign` outputs a setting of a `fdui` instance variable to the main window. I did not emulate this because I wanted all instance variables to be hidden. You can store the same information in the `user_data()` field of a window. To do this, search through the `fdesign` output for all occurrences of `"->fdui"` and edit to use `"->user_data()"` instead. This will require casts and is not trivial.

The prototype for the functions passed to `fl_add_timeout()` and `fl_set_idle_callback()` callback are different.

**All the following XForms calls are missing:**

- `FL_REVISION`, `fl_library_version()`
- `FL_RETURN_DBLCLICK` (use [Fl::event\\_clicks\(\)](#))
- `fl_add_signal_callback()`
- `fl_set_form_atactivate()` `fl_set_form_atdeactivate()`
- `fl_set_form_property()`
- `fl_set_app_mainform()`, `fl_get_app_mainform()`
- `fl_set_form_minsize()`, `fl_set_form_maxsize()`
- `fl_set_form_event_cmask()`, `fl_get_form_event_cmask()`
- `fl_set_form_dblbuffer()`, `fl_set_object_dblbuffer()` (use an [Fl\\_Double\\_Window](#) instead)
- `fl_adjust_form_size()`
- `fl_register_raw_callback()`
- `fl_set_object_bw()`, `fl_set_border_width()`
- `fl_set_object_resize()`, `fl_set_object_gravity()`
- `fl_set_object_shortcutkey()`

- `fl_set_object_automatic()`
- `fl_get_object_bbox()` (maybe FLTK should do this)
- `fl_set_object_prehandler()`, `fl_set_object_posthandler()`
- `fl_enumerate_fonts()`
- Most drawing functions
- `fl_set_coordunit()` (FLTK uses pixels all the time)
- `fl_ringbell()`
- `fl_gettime()`
- `fl_win*()` (all these functions)
- `fl_initialize(argc, argv, x, y, z)` ignores last 3 arguments
- `fl_read_bitmapfile()`, `fl_read_pixmapfile()`
- `fl_addto_browser_chars()`
- `FL_MENU_BUTTON` just draws normally
- `fl_set_bitmapbutton_file()`, `fl_set_pixmapbutton_file()`
- `FL_CANVAS` objects
- `FL_DIGITAL_CLOCK` (comes out analog)
- `fl_create_bitmap_cursor()`, `fl_set_cursor_color()`
- `fl_set_dial_angles()`
- `fl_show_oneliner()`
- `fl_set_choice_shortcut(a, b, c)`
- command log
- Only some of file selector is emulated
- `FL_DATE_INPUT`
- `fl_pup*()` (all these functions)
- textbox object (should be easy but I had no sample programs)
- xyplot object

## 19.4 Additional Notes

These notes were written for porting programs written with the older IRISGL version of Forms. Most of these problems are the same ones encountered when going from old Forms to XForms:

### Does Not Run In Background

The IRISGL library always forked when you created the first window, unless `"foreground()"` was called. FLTK acts like `"foreground()"` is called all the time. If you really want the fork behavior do `"if (fork()) exit(0)"` right at the start of your program.

### You Cannot Use IRISGL Windows or `fl_queue`

If a Forms (not XForms) program if you wanted your own window for displaying things you would create a IRISGL window and draw in it, periodically calling Forms to check if the user hit buttons on the panels. If the user did things to the IRISGL window, you would find this out by having the value `FL_EVENT` returned from the call to Forms.

None of this works with FLTK. Nor will it compile, the necessary calls are not in the interface.

You have to make a subclass of `Fl_Gl_Window` and write a `draw()` method and `handle()` method. This may require anywhere from a trivial to a major rewrite.

If you draw into the overlay planes you will have to also write a `draw_overlay()` method and call `redraw_↔overlay()` on the OpenGL window.

One easy way to hack your program so it works is to make the `draw()` and `handle()` methods on your window set some static variables, storing what event happened. Then in the main loop of your program, call `Fl::wait()` and then check these variables, acting on them as though they are events read from `fl_queue`.

### You Must Use OpenGL to Draw Everything

The file `<FL/gl.h>` defines replacements for a lot of IRISGL calls, translating them to OpenGL. There are much better translators available that you might want to investigate.

### You Cannot Make Forms Subclasses

Programs that call `fl_make_object` or directly setting the handle routine will not compile. You have to rewrite them to use a subclass of `Fl_Widget`. It is important to note that the `handle()` method is not exactly the same as the `handle()` function of Forms. Where a Forms `handle()` returned non-zero, your `handle()` must call `do_callback()`. And your `handle()` must return non-zero if it "understood" the event.

An attempt has been made to emulate the "free" widget. This appears to work quite well. It may be quicker to modify your subclass into a "free" widget, since the "handle" functions match.

If your subclass draws into the overlay you are in trouble and will have to rewrite things a lot.

### You Cannot Use `<device.h>`

If you have written your own "free" widgets you will probably get a lot of errors about "getvaluator". You should substitute:

Forms	FLTK
MOUSE_X	<code>Fl::event_x_root()</code>
MOUSE_Y	<code>Fl::event_y_root()</code>
LEFTSHIFTKEY,RIGHTSHIFTKEY	<code>Fl::event_shift()</code>
CAPSLOCKKEY	<code>Fl::event_capslock()</code>
LEFTCTRLKEY,RIGHTCTRLKEY	<code>Fl::event_ctrl()</code>
LEFTALTKEY,RIGHTALTKEY	<code>Fl::event_alt()</code>
MOUSE1,RIGHTMOUSE	<code>Fl::event_state()</code>
MOUSE2,MIDDLEMOUSE	<code>Fl::event_state()</code>
MOUSE3,LEFTMOUSE	<code>Fl::event_state()</code>

Anything else in `getvaluator` and you are on your own...

#### Font Numbers Are Different

The "style" numbers have been changed because I wanted to insert bold-italic versions of the normal fonts. If you use Times, Courier, or Bookman to display any text you will get a different font out of FLTK. If you are really desperate to fix this use the following code:

```
fl_font_name(3, "*courier-medium-r-no*");  
fl_font_name(4, "*courier-bold-r-no*");  
fl_font_name(5, "*courier-medium-o-no*");  
fl_font_name(6, "*times-medium-r-no*");  
fl_font_name(7, "*times-bold-r-no*");  
fl_font_name(8, "*times-medium-i-no*");  
fl_font_name(9, "*bookman-light-r-no*");  
fl_font_name(10, "*bookman-demi-r-no*");  
fl_font_name(11, "*bookman-light-i-no*");
```



## Chapter 20

# Operating System Issues

This appendix describes the operating system specific interfaces in FLTK:

- [Accessing the OS Interfaces](#)
- [The Wayland/X11 hybrid library](#)
- [The UNIX \(X11\) Interface](#)
- [The Windows Interface](#)
- [The Apple OS X Interface](#)
- [The Wayland Interface](#)

### 20.1 Accessing the OS Interfaces

All programs that need to access the operating system specific interfaces must include the following header file:

```
#include <FL/platform.H>
```

This header file will define the appropriate interface for your environment. The pages that follow describe the functionality that is provided for each operating system.

#### Note

These definitions used to be in [FL/x.H](#) up to FLTK 1.3.x. Usage of [FL/x.H](#) is deprecated since FLTK 1.4.0. You should replace all references of [FL/x.H](#) with [FL/platform.H](#) if your target is FLTK 1.4 or later. [FL/x.H](#) will be retained for backwards compatibility for some releases but will be removed in a later (not yet specified) FLTK release.

#### **WARNING:**

The interfaces provided by this header file may change radically in new FLTK releases. Use them only when an existing generic FLTK interface is not sufficient.

## 20.2 The Wayland/X11 hybrid library

By default, the FLTK library is, under Linux and Unix, a Wayland/X11 hybrid which can run FLTK-based apps as Wayland clients or as X11 clients. The choice between running an app as a Wayland or an X11 client is done as follows, when the app runs function `fl_open_display()` (that function can be called explicitly by the app or implicitly by FLTK, for example the first time an `Fl_Window` is shown):

- if the app contains a global boolean variable named `fl_disable_wayland` and this variable is true, X11 is used;
- if environment variable `FLTK_BACKEND` is not defined, Wayland is used if a Wayland compositor is available, otherwise X11 is used;
- if `$FLTK_BACKEND` equals "wayland", the library makes the app a Wayland client, and stops with error if no Wayland compositor is available;
- if `$FLTK_BACKEND` equals "x11", the library makes the app an X11 client even if a Wayland compositor is available.

The first condition listed above is meant to facilitate conversion of code written for FLTK 1.3.x and containing X11-specific code; add this single statement anywhere in the app's source code:

```
FL_EXPORT bool fl_disable_wayland = true;
```

and the app will always run as an X11 client.

After function `fl_open_display()` has been called, exactly one of the functions `fl_wl_display()` and `fl_x11_display()` returns a non-NULL value. When the former function does, the app runs as a Wayland client, and Wayland-specific functions and symbols described below ([The Wayland Interface](#)) can be used, whereas X11-specific functions and symbols cannot. Otherwise, the app runs as an X11 client, and only X11-specific functions and symbols below ([The UNIX \(X11\) Interface](#)) can be used.

Because a single app can be expected to run either Wayland or X11, it's necessary to use distinct names for global variables and functions in the X11- and the Wayland-specific source code.

Non-default configurations of the FLTK library under Linux/Unix are described in file `README.Wayland.txt`.

## 20.3 The UNIX (X11) Interface

Cross-platform applications should bracket X11-specific source code between `#if defined(FLTK_USE_X11)` / `#endif` and should ensure function `fl_x11_display()` returns non-NULL before calling X11-specific functions and using X11-specific symbols.

The UNIX interface provides access to the X Window System state information and data structures.

### 20.3.1 Handling Other X Events

```
void Fl::add_handler(int (*f)(int))
```

Installs a function to parse unrecognized events. If FLTK cannot figure out what to do with an event, it calls each of these functions (most recent first) until one of them returns non-zero. If none of them returns non-zero then the event is ignored.

FLTK calls this for any X events it does not recognize, or X events with a window ID that FLTK does not recognize. You can look at the X event in the `fl_xevent` variable.

The argument is the FLTK event type that was not handled, or zero for unrecognized X events. These handlers are also called for global shortcuts and some other events that the widget they were passed to did not handle, for example `FL_SHORTCUT`.

```
extern XEvent *fl_xevent
```

This variable contains the most recent X event.

```
extern ulong fl_event_time
```

This variable contains the time stamp from the most recent X event that reported it; not all events do. Many X calls like cut and paste need this value.

```
Window fl_xid(const FL_Window *)
```

Returns the XID for a window, or zero if not `shown()`.

**Deprecated** Kept for compatibility with FLTK versions before 1.4. Use preferentially `fl_x11_xid(const FL_Window *)` with versions 1.4 and above.

```
FL_Window *fl_find(ulong xid)
```

Returns the `FL_Window` that corresponds to the given XID, or `NULL` if not found. This function uses a cache so it is slightly faster than iterating through the windows yourself.

**Deprecated** Kept for compatibility with FLTK versions before 1.4. Use preferentially `fl_x11_find(Window)` with versions 1.4 and above.

```
int fl_handle(const XEvent &)
```

This call allows you to supply the X events to FLTK, which may allow FLTK to cooperate with another toolkit or library. The return value is non-zero if FLTK understood the event. If the window does not belong to FLTK and the `add_handler()` functions all return 0, this function will return false.

Besides feeding events your code should call `Fl::flush()` periodically so that FLTK redraws its windows.

This function will call the callback functions. It will not return until they complete. In particular, if a callback pops up a modal window by calling `fl_ask()`, for instance, it will not return until the modal function returns.

### 20.3.2 Drawing using Xlib

The following global variables are set before `FL_Widget::draw()` is called, or by `FL_Window::make_current()`:

```
extern Display *fl_display; // for compatibility with previous FLTK versions
extern Display *fl_x11_display(); // preferred access starting with FLTK 1.4
extern Window fl_window;
extern GC fl_gc; // for compatibility with previous FLTK versions
extern GC fl_x11_gc(); // preferred access starting with FLTK 1.4
extern int fl_screen;
extern XVisualInfo *fl_visual;
extern Colormap fl_colormap;
```

You must use them to produce Xlib calls. Don't attempt to change them. A typical X drawing call is written like this: `XDrawSomething(fl_display, fl_window, fl_gc, ...);`

Other information such as the position or size of the X window can be found by looking at `FL_Window::current()`, which returns a pointer to the `FL_Window` being drawn.

```
unsigned long fl_xpixel(FL_Color i)
unsigned long fl_xpixel(uchar r, uchar g, uchar b)
```

Returns the X pixel number used to draw the given FLTK color index or RGB color. This is the X pixel that `fl_color()` would use.

```
int fl_parse_color(const char* p, uchar& r, uchar& g, uchar& b)
```

Convert a name into the red, green, and blue values of a color by parsing the X11 color names. On other systems, `fl_parse_color()` can only convert names in hexadecimal encoding, for example `#ff8083`.

```
extern XFontStruct *fl_xfont
```

Points to the font selected by the most recent `fl_font()`. This is not necessarily the current font of `fl_gc`, which is not set until `fl_draw()` is called. If FLTK was compiled with Xft support, `fl_xfont` will usually be 0 and `fl_xftfont` will contain a pointer to the `XftFont` structure instead.

```
extern void *fl_xftfont
```

If FLTK was compiled with Xft support enabled, `fl_xftfont` points to the xft font selected by the most recent `fl_font()`. Otherwise it will be 0. `fl_xftfont` should be cast to `XftFont*`.

### 20.3.3 Changing the Display, Screen, or X Visual

FLTK uses only a single display, screen, X visual, and X colormap. This greatly simplifies its internal structure and makes it much smaller and faster. You can change which it uses by setting global variables *before the first `FL_Window::show()` is called*. You may also want to call `Fl::visual()`, which is a portable interface to get a full color and/or double buffered visual.

```
int Fl::display(const char *)
```

Set which X display to use. This actually does `putenv("DISPLAY=...")` so that child programs will display on the same screen if called with `exec()`. This must be done before the display is opened. This call is provided under MacOS and Windows but it has no effect.

extern Display \*fl\_display

The open X display. This is needed as an argument to most Xlib calls. Don't attempt to change it! This is `NULL` before the display is opened.

void [fl\\_open\\_display\(\)](#)

Opens the display. Does nothing if it is already open. This will make sure `fl_display` is non-zero. You should call this if you wish to do X calls and there is a chance that your code will be called before the first `show()` of a window.

This may call `Fl::abort()` if there is an error opening the display.

void [fl\\_x11\\_use\\_display\(Display \\*d\)](#)

Directs FLTK to use a pre-established X11 connection.

void [fl\\_close\\_display\(\)](#)

This closes the X connection. You do *not* need to call this to exit, and in fact it is faster to not do so! It may be useful to call this if you want your program to continue without the X connection. You cannot open the display again, and probably cannot call any FLTK functions.

extern int fl\_screen

Which screen number to use. This is set by [fl\\_open\\_display\(\)](#) to the default screen. You can change it by setting this to a different value immediately afterwards. It can also be set by changing the last number in the [Fl::display\(\)](#) string to "host:0.#".

extern XVisualInfo \*fl\_visual  
extern Colormap fl\_colormap

The visual and colormap that FLTK will use for all windows. These are set by [fl\\_open\\_display\(\)](#) to the default visual and colormap. You can change them before calling `show()` on the first window. Typical code for changing the default visual is:

```
Fl::args(argc, argv); // do this first so $DISPLAY is set
fl_open_display();
fl_visual = find_a_good_visual(fl_display, fl_screen);
if (!fl_visual) Fl::abort("No good visual");
fl_colormap = make_a_colormap(fl_display, fl_visual->visual, fl_visual->depth);
// it is now ok to show() windows:
window->show(argc, argv);
```

### 20.3.4 Using a Subclass of `Fl_Window` for Special X Stuff

FLTK can manage an X window on a different screen, visual and/or colormap, you just can't use FLTK's drawing routines to draw into it. But you can write your own `draw()` method that uses Xlib (and/or OpenGL) calls only.

FLTK can also manage XID's provided by other libraries or programs, and call those libraries when the window needs to be redrawn.

To do this, you need to make a subclass of `Fl_Window` and override some of these virtual functions:

virtual void `Fl_Window::show()`

If the window is already `shown()` this must cause it to be raised, this can usually be done by calling `Fl_Window::show()`. If not `shown()` your implementation must call either `Fl_X::set_xid()` or `Fl_X::make_xid()`.

An example:

```
void MyWindow::show() {
    if (shown()) {Fl_Window::show(); return;} // you must do this!
    fl_open_display(); // necessary if this is first window
    // we only calculate the necessary visual colormap once:
    static XVisualInfo *visual;
    static Colormap colormap;
    if (!visual) {
        visual = figure_out_visual();
        colormap = XCreateColormap(fl_display, RootWindow(fl_display, fl_screen),
                                   vis->visual, AllocNone);
    }
    Fl_X::make_xid(this, visual, colormap);
}
```

```
Fl_X *Fl_X::set_xid(Fl_Window*, Window xid)
```

Allocate a hidden class called an `Fl_X`, put the XID into it, and set a pointer to it from the `Fl_Window`. This causes `Fl_Window::shown()` to return true.

```
void Fl_X::make_xid(Fl_Window*, XVisualInfo* = fl_visual, Colormap = fl_colormap)
```

This static method does the most onerous parts of creating an X window, including setting the label, resize limitations, etc. It then does `Fl_X::set_xid()` with this new window and maps the window.

virtual void `Fl_Window::flush()`

This virtual function is called by `Fl::flush()` to update the window. For FLTK's own windows it does this by setting the global variables `fl_window` and `fl_gc` and then calling the `draw()` method. For your own windows you might just want to put all the drawing code in here.

The X region that is a combination of all `damage()` calls done so far is in `Fl_X::flx(this)->region`. If `NULL` then you should redraw the entire window. The undocumented function `fl_clip_region()` ( $\leftrightarrow$  `XRegion`) will initialize the FLTK clip stack with a region or `NULL` for no clipping. You must set region to `NULL` afterwards as `fl_clip_region()` will own and delete it when done.

If `damage()` & `FL_DAMAGE_EXPOSE` then only X expose events have happened. This may be useful if you have an undamaged image (such as a backing buffer) around.

Here is a sample where an undamaged image is kept somewhere:

```
void MyWindow::flush() {
    fl_clip_region(Fl_X::flx(this)->region);
    Fl_X::flx(this)->region = 0;
    if (damage() != 2) {... draw things into backing store ...}
    ... copy backing store to window ...
}
```

#### Note

For compatibility with FLTK versions before 1.4, member function `Fl_X::flx(Fl_Window*)` can also be written `Fl_X::i(Fl_Window*)`.

virtual void `Fl_Window::hide()`

Destroy the window server copy of the window. Usually you will destroy contexts, pixmaps, or other resources used by the window, and then call `Fl_Window::hide()` to get rid of the main window identified by `xid()`. If you override this, you must also override the destructor as shown:

```
void MyWindow::hide() {
    if (mypixmap) {
        XFreePixmap(fl_display, mypixmap);
        mypixmap = 0;
    }
    Fl_Window::hide(); // you must call this
}
```

virtual void `Fl_Window::~~Fl_Window()`

Because of the way C++ works, if you override `hide()` you *must* override the destructor as well (otherwise only the base class `hide()` is called):

```
MyWindow::~MyWindow() {
    hide();
}
```

#### Note

Access to the `Fl_X` hidden class requires to `#define FL_INTERNALS` before compilation.

### 20.3.5 Setting the Icon of a Window

FLTK recommends to set window icons using these platform-independent methods: `FL_Window::icon(const FL_RGB_Image *)` and `FL_Window::icons(const FL_RGB_Image *[], int)`. See also methods setting default window icons `FL_Window::default_icon(const FL_RGB_Image *)` and `FL_Window::default_icons(const FL_RGB_Image *[], int)`.

FLTK on X11 also supports, for backward compatibility, use of the deprecated method `FL_Window::icon(const void *)` as follows :

Sets the icon for the window to the passed pointer. You will need to cast the icon `Pixmap` to a `char*` when calling this method. To set a monochrome icon using a bitmap compiled with your application use:

```
#include "icon.xbm"
fl_open_display(); // needed if display has not been previously opened
Pixmap p = XCreateBitmapFromData(fl_display, DefaultRootWindow(fl_display),
                                icon_bits, icon_width, icon_height);
window->icon((const void*)p);
```

To use a multi-colored icon, the XPM format and library should be used as follows:

```
#include <X11/xpm.h>
#include "icon.xpm"
fl_open_display(); // needed if display has not been previously opened
Pixmap p, mask;
XpmCreatePixmapFromData(fl_display, DefaultRootWindow(fl_display),
                        icon_xpm, &p, &mask, NULL);
window->icon((const void *)p);
```

When using the Xpm library, be sure to include it in the list of libraries that are used to link the application (usually `-lXpm`).

**NOTE:**

You must call `FL_Window::show(int argc, char** argv)` for the icon to be used. The `FL_Window::show()` method does not bind the icon to the window.

Any window icon must be set with the above methods before the window is shown.

### 20.3.6 X Resources

When the `FL_Window::show(int argc, char** argv)` method is called, FLTK looks for the following X resources:

- `background` - The default background color for widgets (color).
- `dndTextOps` - The default setting for drag and drop text operations (boolean).
- `foreground` - The default foreground (label) color for widgets (color).
- `scheme` - The default scheme to use (string).
- `selectBackground` - The default selection color for menus, etc. (color).
- `Text.background` - The default background color for text fields (color).
- `tooltips` - The default setting for tooltips (boolean).
- `visibleFocus` - The default setting for visible keyboard focus on non-text widgets (boolean).

Resources associated with the first window's `FL_Window::xclass()` string are queried first, or if no class has been specified then the class `"fltk"` is used (e.g. `fltk.background`). If no match is found, a global search is done (e.g. `*background`).

### 20.3.7 Display Scaling Factor

FLTK uses the value of the `Xft.dpi` resource divided by 96. to initialize the display scaling factor. That is also what is done by the gnome and KDE desktops.

## 20.4 The Windows Interface

Cross-platform applications should bracket Windows-specific source code between `#ifdef _WIN32 / #endif`.

The Windows interface provides access to the Windows GDI state information and data structures.

### 20.4.1 Using filenames with non-ASCII characters

In FLTK, all strings, including filenames, are UTF-8 encoded. The utility functions `fl_fopen()` and `fl_open()` allow to open files potentially having non-ASCII names in a cross-platform fashion, whereas the standard `fopen()/open()` functions fail to do so.

### 20.4.2 Responding to WM\_QUIT

FLTK will intercept `WM_QUIT` messages that are directed towards the thread that runs the main loop. These are converted to `SIGTERM` signals via `raise()`. This allows you to deal with outside termination requests with the same code on both Windows and UNIX systems. Other processes can send this message via `PostThreadMessage()` in order to request, rather than force your application to terminate.

### 20.4.3 Handling Other Windows API Messages

By default a single `WNDCLASSEX` called "FLTK" is created. All `Fl_Window`'s are of this class unless you use `Fl_Window::xclass()`. The window class is created the first time `Fl_Window::show()` is called.

You can probably combine FLTK with other libraries that make their own window classes. The easiest way is to call `Fl::wait()`, as it will call `DispatchMessage()` for all messages to the other windows. If necessary you can let the other library take over as long as it calls `DispatchMessage()`, but you will have to arrange for the function `Fl::flush()` to be called regularly so that widgets are updated, timeouts are handled, and the idle functions are called.

```
extern MSG fl_msg
```

This variable contains the most recent message read by `GetMessage()`, which is called by `Fl::wait()`. This may not be the most recent message sent to an FLTK window, because silly Windows calls the handle procedures directly for some events (sigh).

```
void Fl::add_handler(int (*f)(int))
```

Installs a function to parse unrecognized messages sent to FLTK windows. If FLTK cannot figure out what to do with a message, it calls each of these functions (most recent first) until one of them returns non-zero. The argument passed to the functions is the FLTK event that was not handled or zero for unknown messages. If all the handlers return zero then FLTK calls `DefWindowProc()`.

`HWND fl_xid(const FL_Window *)`

Returns the window handle for a `FL_Window`, or zero if not `shown()`.

`FL_Window *fl_find(HWND xid)`

Returns the `FL_Window` that corresponds to the given window handle, or `NULL` if not found. This function uses a cache so it is slightly faster than iterating through the windows yourself.

#### 20.4.4 Drawing Things Using the Windows GDI

When the virtual function `FL_Widget::draw()` is called, FLTK stores all the extra arguments you need to make a proper GDI call in some global variables:

```
extern HINSTANCE fl_display; // for compatibility with previous FLTK versions
extern HINSTANCE fl_win32_display(); // preferred access starting with FLTK 1.4
extern HWND fl_window;
extern HDC fl_gc; // for compatibility with previous FLTK versions
extern HDC fl_win32_gc(); // preferred access starting with FLTK 1.4
COLORREF fl_rgb();
HPEN fl_pen();
HBRUSH fl_brush();
```

These global variables are set before `FL_Widget::draw()` is called, or by `FL_Window::make_current()`. You can refer to them when needed to produce GDI calls, but don't attempt to change them. The functions return GDI objects for the current color set by `fl_color()` and are created as needed and cached. A typical GDI drawing call is written like this:

```
DrawSomething(fl_gc, ..., fl_brush());
```

It may also be useful to refer to `FL_Window::current()` to get the window's size or position.

#### 20.4.5 HighDPI support

FLTK apps for the Windows platform are by default "Per-monitor DPI-aware V2". This means that any window automatically adjusts its physical size in relation to the scaling factor of the display where it maps. This also means that all drawings (e.g., text, lines, images) take advantage of the full resolution of the display in use. FLTK apps may also use the manifest mechanism to declare their level of DPI awareness. The FLTK library adapts to the DPI awareness level set in the app's manifest, which can be lower than the default level if the manifest sets it so.

#### 20.4.6 Display Scaling Factor

FLTK uses the value given by function `GetDpiForMonitor()` divided by 96. to initialize the scaling factor of each display in the system. This matches the value of "Change the size of text, apps and other items" found in section "System" subsection "Display" of Windows settings.

### 20.4.7 Setting the Icon of a Window

FLTK recommends to set window icons using these platform-independent methods: `Fl_Window::icon(const Fl_RGB_Image *)` and `Fl_Window::icons(const Fl_RGB_Image *[], int)`. See also methods setting default window icons `Fl_Window::default_icon(const Fl_RGB_Image *)` and `Fl_Window::default_icons(const Fl_RGB_Image *[], int)`.

FLTK on Windows also supports, for backward compatibility, use of the deprecated method `Fl_Window::icon(const void *)` as follows :

Set the icon for the window to the passed pointer. You will need to cast the `HICON` handle to a `char*` when calling this method. To set the icon using an icon resource compiled with your application use:

```
window->icon((const void *)LoadIcon(fl_display, MAKEINTRESOURCE(IDI_ICON)));
```

You can also use the `LoadImage()` and related functions to load specific resolutions or create the icon from bitmap data.

**NOTE:**

You must call `Fl_Window::show(int argc, char** argv)` for the icon to be used. The `Fl_Window::show()` method does not bind the icon to the window.

Any window icon must be set with the above methods before the window is shown.

### 20.4.8 How to Not Get a MSDOS Console Window

Windows has a really stupid mode switch stored in the executables that controls whether or not to make a console window.

To always get a console window you simply create a console application (the `"/SUBSYSTEM:CONSOLE"` option for the linker). For a GUI-only application create a Windows application (the `"/SUBSYSTEM:WINDOWS"` option for the linker).

FLTK includes a `WinMain()` function that calls the ANSI standard `main()` entry point for you. *This function creates a console window when you use the debug version of the library.*

Windows applications without a console cannot write to `stdout` or `stderr`, even if they are run from a console window. Any output is silently thrown away. Additionally, Windows applications are run in the background by the console, although you can use `"start /wait program"` to run them in the foreground.

### 20.4.9 Known Windows Bugs and Problems

The following is a list of known bugs and problems in the Windows version of FLTK:

- If a program is deactivated, `Fl::wait()` does not return until it is activated again, even though many events are delivered to the program. This can cause idle background processes to stop unexpectedly. This also happens while the user is dragging or resizing windows or otherwise holding the mouse down. We were forced to remove most of the efficiency FLTK uses for redrawing in order to get windows to update while being moved. This is a design error in Windows and probably impossible to get around.
- `Fl_Gl_Window::can_do_overlay()` returns true until the first time it attempts to draw an overlay, and then correctly returns whether or not there is overlay hardware.
- `SetCapture` (used by `Fl::grab()`) doesn't work, and the main window title bar turns gray while menus are popped up.
- Compilation with `gcc 3.4.4` and `-Os` exposes an optimisation bug in `gcc`. The symptom is that when drawing filled circles only the perimeter is drawn. This can for instance be seen in the symbols demo. Other optimisation options such as `-O2` and `-O3` seem to work OK. More details can be found in STR#1656

## 20.5 The Apple OS X Interface

Cross-platform applications should bracket macOS-specific source code between `#if defined(__APPLE__) && !defined(FLTK_USE_X11) / #endif`.

FLTK supports Apple OS X using the Apple Cocoa library. Older versions of MacOS are no longer supported.

Control, Option, and Command Modifier Keys

FLTK maps the Mac 'control' key to `FL_CTRL`, the 'option' key to `FL_ALT` and the 'Apple' key to `FL_META`. Furthermore, `FL_COMMAND` designates the 'Apple' key on Mac OS X and the 'control' key on other platforms. Keyboard events return the key name in `Fl::event_key()` and the keystroke translation in `Fl::event_text()`. For example, typing Option-Y on a Mac US keyboard will set `FL_ALT` in `Fl::event_state()`, set `Fl::event_key()` to 'y' and return the Yen symbol in `Fl::event_text()`.

Right Click simulation with Ctrl Click

The Apple HIG guidelines indicate applications should support 'Ctrl Click' to simulate 'Right Click' for e.g. context menus, so users with one-button mice and one-click trackpads can still access right-click features. However, paraphrasing [Manolo's comment on the fltk.coredev newsgroup](#):

- *FLTK does /not/ support Ctrl-Click == Right Click itself because Mac OS X event processing doesn't support this at the system level: the system reports left-clicks with the ctrl modifier when the user ctrl-clicks, and OS X system preferences don't allow changing this behavior. Therefore, applications must handle simulation of Right Click with Ctrl Click in the application code.*

Ian MacArthur provided the following `handle()` method code snippet showing an example of how to do this:

```
case FL_PUSH:
{
    int btn = Fl::event_button();
#ifdef __APPLE__
    int ev_state = Fl::event_state();
#endif
    //
    // Context menu can be called up in one of two ways: -
    // 1 - right click, as normally used on Windows and Linux
    // 2 - Ctrl + left click, as sometimes used on Mac
    //
#ifdef __APPLE__
    // On apple, check right click, and ctrl+left click
    if ((btn == FL_RIGHT_MOUSE) || (ev_state == (FL_CTRL | FL_BUTTON1)))
#else
    // On other platforms, only check right click as ctrl+left is used for selections
    if (btn == FL_RIGHT_MOUSE)
#endif
    {
        // Did we right click on the object?..
    }
}
```

There is a thread about this subject on [fltk.coredev](#) (Aug 1-14, 2014) entitled "[RFC] Right click emulation for one button mouse on Mac".

Apple "Quit" Event

When the user presses Cmd-Q or requests a termination of the application, FLTK sends an `FL_CLOSE` event to all open windows. If any window remains open, the termination request aborts. If all windows close, the application's event loop terminates, that is, `Fl::run()` returns. The application can then follow FLTK's normal termination path executing cleanup code that may be programmed after termination of the event loop, and returning from `main()`. Function `Fl::program_should_quit()` allows to detect whether the event loop terminated because of a program termination request.

### Apple "Open" Event

Whenever the user drops a file onto an application icon, OS X generates an Apple Event of the type "Open". You can have FLTK notify you of an Open event by calling the `fl_open_callback()` function.

void `fl_open_display()`

Opens the display. Does nothing if it is already open. You should call this if you wish to do Cocoa or Quartz calls and there is a chance that your code will be called before the first `show()` of a window.

Window `fl_xid(const Fl_Window *)`

Returns the window reference for an `Fl_Window`, or `NULL` if the window has not been shown. This reference is a pointer to an instance of the subclass `FLWindow` of Cocoa's `NSWindow` class.

`Fl_Window *fl_find(Window xid)`

Returns the `Fl_Window` that corresponds to the given window reference, or `NULL` if not found.

void `fl_mac_set_about( Fl_Callback *cb, void *user_data, int shortcut)`

Attaches the callback `cb` to the "About myprog" item of the system application menu. `cb` will be called with `NULL` first argument and `user_data` second argument. This MacOS-specific function is deprecated in FLTK 1.4 and replaced by `Fl_Sys_Menu_Bar::about(Fl_Callback *cb, void *data)` which is cross-platform.

`Fl_Sys_Menu_Bar` class

The `Fl_Sys_Menu_Bar` class allows to build menu bars that, on Mac OS X, are placed in the system menu bar (at top-left of display), and, on other platforms, at a user-chosen location of a user-chosen window.

## 20.5.1 Setting the icon of an application

- First, create a `.icns` file containing several copies of your icon of decreasing sizes. This can be done using the Preview application or the Icon Composer application available in "Graphics Tools for Xcode". To create a high resolution icon file, it is necessary to use the `iconutil` command-line utility.
- Put your `.icns` file in the Resources subdirectory of your application bundle.
- Add these two lines to the Info.plist file of your application bundle

```
<key>CFBundleIconFile</key>
<string>foo.icns</string>
```

replacing `foo` by your application name. If you use Xcode, just add your `.icns` file to your application target.

## 20.5.2 Drawing Things Using Quartz

All code inside `Fl_Widget::draw()` is expected to call Quartz drawing functions. The Quartz coordinate system is flipped to match FLTK's coordinate system. The origin for all drawing is in the top left corner of the enclosing `Fl_Window`. The function `fl_mac_gc()` returns the appropriate Quartz 2D drawing environment (of type `CGContextRef`). For compatibility with previous FLTK versions, deprecated global variable `fl_gc` gives the same value.

Include `FL/platform.H` to declare the `fl_mac_gc()` function (or the `fl_gc` variable).

## 20.5.3 Internationalization

All FLTK programs contain an application menu with, e.g., the About xxx, Hide xxx, and Quit xxx items. This menu can be internationalized/localized by any of two means.

- using the `Fl_Mac_App_Menu` class.
- using the standard Mac OS X localization procedure. Create a language-specific `.lproj` directory (e.g., `German.lproj`) in the Resources subdirectory of the application bundle. Create therein a `Localizable.strings` file that translates all menu items to this language. The German `Localizable.strings` file, for example, contains:

```
"About %@" = "Über %@";
"Print Front Window" = "Frontfenster drucken";
"Services" = "Dienste";
"Hide %@" = "%@ ausblenden";
"Hide Others" = "Andere ausblenden";
"Show All" = "Alle einblenden";
"Quit %@" = "%@ beenden";
```

Set `"Print Front Window" = ""`; therein so the application menu doesn't show a "Print Front Window" item. To localize the application name itself, create a file `InfoPlist.strings` in each `.lproj` directory and put `CFBundleName = "localized name"`; in each such file.

## 20.5.4 OpenGL and 'retina' displays

It is possible to have OpenGL produce graphics at the high pixel resolution allowed by the so-called 'retina' displays present on recent Apple hardware. For this, call

```
Fl::use_high_res_GL(1);
```

before any `Fl_Gl_Window` is shown. Also, adapt your `Fl_Gl_Window::draw()` and `Fl_Gl_Window::draw_overlay()` methods replacing

```
glViewport(0, 0, w(), h());
```

by

```
glViewport(0, 0, pixel_w(), pixel_h());
```

making use of the `Fl_Gl_Window::pixel_w()` and `Fl_Gl_Window::pixel_h()` methods that return the width and height of the GL scene in pixels: if the `Fl_Gl_Window` is mapped on a retina display, these methods return twice as much as reported by `Fl_Widget::w()` and `Fl_Widget::h()`; if it's mapped on a regular display, they return the same values as `w()` and `h()`. These methods dynamically change their values if the window is moved into/out from a retina display. If `Fl::use_high_res_GL(1)` is not called, all `Fl_Gl_Window`'s are drawn at low resolution. These methods are useful on all platforms because `Fl_Gl_Window::w()` and `Fl_Gl_Window::h()` don't return, on HighDPI displays, the quantities in pixels necessary to OpenGL functions.

The `Fl_Gl_Window::pixels_per_unit()` method is useful when the OpenGL code depends on the pixel dimension of the GL scene. This occurs, e.g., if a window's `handle()` method uses `Fl::event_x()` and `Fl::event_y()` whose returned values should be multiplied by `Fl_Gl_Window::pixels_per_unit()` to obtain the adequate pixel units. This method may also be useful, for example, to adjust the width of a line in a high resolution GL scene.

### 20.5.5 FI\_Double\_Window

OS X double-buffers all windows automatically. On OS X, [FI\\_Window](#) and [FI\\_Double\\_Window](#) are handled internally in the same way.

### 20.5.6 Mac File System Specifics

#### Resource Forks (OS X pre 10.6)

FLTK does not access the resource fork of an application. However, a minimal resource fork must be created for OS X applications. Starting with OS X 10.6, resource forks are no longer needed.

#### Caution (OS X 10.2 and older):

When using UNIX commands to copy or move executables, OS X will NOT copy any resource forks! For copying and moving use CpMac and MvMac respectively. For creating a tar archive, all executables need to be stripped from their Resource Fork before packing, e.g. "DeRez fluid > fluid.r". After unpacking the Resource Fork needs to be reattached, e.g. "Rez fluid.r -o fluid".

It is advisable to use the Finder for moving and copying and Mac archiving tools like Sit for distribution as they will handle the Resource Fork correctly.

#### Mac File Paths

FLTK uses UTF-8-encoded UNIX-style filenames and paths.

See also

[Mac OS X-specific symbols](#)

## 20.6 The Wayland Interface

Cross-platform applications should bracket Wayland-specific source code between `#ifdef FLTK_USE_WAYLAND` / `#endif` and should ensure function `fl_wl_display()` returns non-NULL before calling Wayland-specific functions and using Wayland-specific symbols.

```
extern struct wl_display *fl_wl_display();
```

After `fl_open_display()` has run, function `fl_wl_display()` returns a pointer to the struct `wl_display` representing the connection between the application and Wayland. For example, `wl_display_get_fd(fl_wl_display())` gives the file descriptor one can use to communicate with the Wayland compositor according to the Wayland protocol.

```
struct wld_window *fl_wl_xid(const FI_Window *)
```

Returns a pointer to an [FLTK-defined](#) structure holding Wayland-related data created when a window gets `show()`, or NULL if not `show()`.

[Fl\\_Window](#) \*fl\_wl\_find(struct wld\_window \* wld\_win)

Returns the [Fl\\_Window](#) that corresponds to the given Window, or NULL if not found.

struct wl\_surface \*fl\_wl\_surface(struct wld\_window \*wld\_win)

Returns a pointer to the struct wl\_surface corresponding to a `show()` top-level window or subwindow.

cairo\_t \*fl\_wl\_gc()

Drawing natively to a Wayland window : Within an overridden [Fl\\_Widget::draw\(\)](#) method, or after a call to [Fl\\_Window::make\\_current\(\)](#), it's possible to draw using the Cairo library. Function [fl\\_wl\\_gc\(\)](#) returns the adequate `cairo_t*` value. Regular FLTK coordinates, with top-left origin, are to be used. All FLTK-defined drawing functions (e.g., [fl\\_rect\(\)](#), [fl\\_draw\(\)](#)) can be used too.

void [fl\\_close\\_display\(\)](#)

This closes the Wayland connection. You do not need to call this to exit. It may be useful to call this if you want your program to continue without the Wayland connection. You cannot open the display again, and cannot call any FLTK functions.

See also

[wayland.H](#) for all functions specific of the Wayland platform.

### 20.6.1 HiDPI display support

FLTK Wayland apps automatically scale according to the Wayland-defined, integer-valued scale factor. On a HiDPI display, it's enough to set this factor to 2 for any FLTK app to be drawn using twice as many pixels and thus to be as readable as it is on a regular display. With the gnome and KDE-plasma desktops, that is achieved in the "Displays" section of the "Settings" application, selecting 200 % for the "Scale" parameter. In addition to this, FLTK apps can also be scaled up or down typing `ctrl+/-/0/` and with the `FLTK_SCALING_FACTOR` environment variable.

## 20.6.2 Window icons

Standard FLTK functions `FL_Window::icon(const FL_RGB_Image*)`, `FL_Window::icons(const FL_RGB_Image*[], int)`, `FL_Window::default_icon(const FL_RGB_Image*)` and `FL_Window::default_icons(const FL_RGB_Image*[], int)` have no effect on the Wayland platform. The equivalent of a call to `FL_Window::default_icon(const FL_RGB_Image*)` to set the application-specific window icon can be obtained as follows, using FLTK's editor app as an example:

- create a text file named `editor.desktop` containing :

```
[Desktop Entry]
Version=1.0
Type=Application
Name=Editor
Name[fr]=Editeur
Comment=FLTK editor
Exec=editor %F
Icon=/path/to/icon/file/editor.svg
MimeType=text/plain
```

- The `Name=` line therein determines the string displayed when the app runs.
- Optionally, one or more `Name[locale]=` lines can be used to set locale-specific app names.
- The `Icon=` line accepts also `.png` files.
- Put this file in `/usr/local/share/applications/` so it's available to all system users or in `$HOME/.local/share/applications/` so it's available to a single user.

## 20.6.3 Window titlebars

Wayland supports both client-side window decoration (CSD), where client applications are responsible for drawing window titlebars, and server-side window decoration (SSD), where the Wayland compositor itself draws window titlebars. Among 4 tested Wayland compositors, Mutter (gnome's compositor) and Weston use CSD mode whereas the KWin and Sway compositors use SSD mode. When running in CSD mode, FLTK uses a library called `libdecor` to draw titlebars. The `libdecor` library has been conceived to use various plug-in's to draw titlebars in various fashions intended to match any desktop's preferred titlebar style. FLTK supports drawing titlebars with any `libdecor` plug-in via an environment variable called `LIBDECOR_PLUGIN_DIR` which can be given the name of a directory containing the desired plug-in. When `LIBDECOR_PLUGIN_DIR` is not defined, or points to a directory that doesn't contain a `libdecor` plug-in, FLTK uses its built-in plug-in to draw titlebars. That is the most common situation, until `libdecor` plug-in's become available for popular UNIX desktops.



## Chapter 21

# Migrating Code from FLTK 1.3 to 1.4

This appendix describes the differences between FLTK 1.3.x and FLTK 1.4.x functions and classes and potential requirements to change source code.

We also explain how code can be made compatible so it can be compiled by both FLTK 1.3.x and 1.4.x.

If you need to migrate your code from prior FLTK versions to FLTK 1.4, please consult the relevant appendices in the FLTK 1.3 online documentation or by downloading the FLTK 1.3 documentation. See [https://www.fltk.org/doc-1.3/migration\\_1\\_3.html](https://www.fltk.org/doc-1.3/migration_1_3.html) and/or <https://www.fltk.org/software.php>, respectively.

### 21.1 Changes in Header Files

We strive to include only necessary header files in the public headers of the FLTK library to reduce dependencies and hence compile times.

We try to avoid including system header files as far as possible. Known exceptions are `<stdio.h>` where file system structures and functions are visible in the public API, for instance `FILE*`, and sometimes essential header files like `<stdlib.h>` and/or `<stddef.h>`. Some required system headers **may** be included in platform specific header files like `<FL/platform.H>` or `<FL/platform_types.h>`.

In earlier versions (1.3.x) some of the public FLTK headers included some not strictly required system headers by accident.

The consequence for building user programs with FLTK 1.4 is: if you require a system or FLTK header in your user program that you don't `#include` explicitly but which has been included by FLTK 1.3.x your FLTK 1.3 program may issue compiler errors or warnings about missing header files or missing declarations when compiled with FLTK 1.4.

This is not a fault of FLTK 1.4 but a fault of the source code that did not include all required headers.

In FLTK 1.4 inclusion of `<FL/Fl.H>` is no longer a strict requirement as it was required and documented in FLTK 1.3.x. In FLTK 1.4 you may still need to `'#include <FL/Fl.H>'` if you are using enumerations or methods of class `Fl` like `Fl::run()` but there are exceptions where this header is included by other FLTK headers, like `Fl_Window.H` and other subclasses.

Suggested solution: include all FLTK and system header files your source code requires explicitly and don't rely on FLTK headers to include a particular header file. If you want your code to be as much as possible compatible with FLTK 1.3.x, then you should `'#include <FL/Fl.H>'` as required by 1.3.x.

You don't need to include headers of base classes - this is done by all FLTK headers as required. Besides that you need to include some support headers if you use FLTK functions like `fl_choice()` and others. This is described in the function's documentation (if a required header is missing in the docs this is a bug).

If you follow these rules your program will be compatible with both FLTK 1.3.x and FLTK 1.4.x as long as you use only functions and classes defined in FLTK 1.3.

## 21.2 Fl\_Preferences

Starting with FLTK 1.3, preference databases are expected to be in UTF-8 encoding. Previous databases were stored in the current character set or code page which renders them incompatible for text entries using international characters.

Starting with FLTK 1.4, searching a valid path to store the preference files has changed slightly. Please see [Fl\\_Preferences::Fl\\_Preferences\(Root, const char\\*, const char\\*\)](#) for details.

On Unix/Linux platforms new FLTK preference files are stored using the [XDG Base Directory Specification](#) which means in essence that user preference files are stored in the user's home directory under the subdirectory `.config`, i.e. in `$HOME/.config/fltk.org/` rather than `$HOME/.fltk/fltk.org/`. Existing preference files are still found and used, hence this new location is optional.

You may want to move the preference files from their old locations to their new locations as documented in [Fl\\_Preferences::Fl\\_Preferences\(Root, const char\\*, const char\\*\)](#).

New [Fl\\_Preferences](#) types [Fl\\_Preferences::USER\\_L](#), [Fl\\_Preferences::SYSTEM\\_L](#) and some more combinations with `"_L"` suffix have been defined to make preference files independent of the current locale. This is particularly important for floating point data which is stored in text form with varying decimal separator depending on the locale (either `'.'` or `'.'`). You may want to change your program to use these new constants instead of those without the `"_L"` suffix. For more information see the documentation of [Fl\\_Preferences](#).

## 21.3 Fl::add\_timeout and friends

Since FLTK 1.4.0 internal timeout handling has been unified across platforms. This ensures equal timeout handling, improved accuracy of [Fl::repeat\\_timeout\(\)](#), and easier maintenance (less potential for errors).

This will very likely not affect user code, however there is one subtle exception on macOS and Windows: in FLTK 1.3.x these platforms used system timers to schedule timeouts. Since FLTK 1.4.0 all platforms use the same internal timer management that was previously only used on Unix/Linux/X11. The consequence of this change is that the FLTK event loop needs to be executed to trigger timeout events, i.e. you must either call [Fl::wait\(\)](#) repeatedly or start the event loop with [Fl::run\(\)](#).

Code that did not execute the event loop and relied on the system timers has never been cross platform compatible, i.e. it wouldn't work on Unix/Linux. An example would be code that opened a splash window, scheduled a timeout with [Fl::add\\_timeout\(\)](#), and waited for the timer event w/o running the FLTK event loop. Such code must be modified to execute [Fl::run\(\)](#) and/or use [Fl::wait\(\)](#).

## 21.4 New FL\_OVERRIDE Macro

FLTK 1.4 defines a new macro `FL_OVERRIDE` as "override" if a recent C++ standard (C++11 or higher) is used to compile your code.

This macro is currently defined in [FL/fl\\_attr.h](#) but this may change in a future release. It is enough to `#include <FL/Fl.H>` to enable this macro.

Unfortunately Visual Studio does not define a meaningful value of `__cplusplus` to detect the C++ standard. Hence we use the Visual Studio version (2015 or higher) to decide whether we can define `FL_OVERRIDE` or not.

The `FL_OVERRIDE` macro is used to decorate declarations of overridden virtual methods in subclasses. Example code from [FL/Fl\\_Window.H](#):

```
int handle(int) FL_OVERRIDE;
```

```
void resize(int X, int Y, int W, int H) FL_OVERRIDE;
Fl_Window * as_window() FL_OVERRIDE { return this; }
```

The FL\_OVERRIDE macro translates to 'override' on newer compilers and to an empty string for older compilers.

We recommend to add this to your overridden virtual methods in subclasses derived from FLTK base classes (widgets) and to compile with C++ standard C++11 or higher to enable the compiler to detect some errors if methods are not overridden correctly.

You don't need to declare the overridden methods 'virtual' if you use FL\_OVERRIDE or the keyword override.

**Hint:** For the GCC and clang compilers you can enable the warning '-Wsuggest-override' to detect where you may (want to) add the FL\_OVERRIDE macro.

## 21.5 Fl\_Image::copy() 'const'

Since FLTK 1.4.0 the virtual method `Fl_Image::copy()` has been declared 'const' so read-only ('const') images can be copied w/o casts.

This will very likely not affect user code. However, if you derived your own class from any of the `Fl_*_Image` variants **and** you overrode `Your_Image::copy()` then you **must** declare this 'const' as well, i.e. you must add the keyword 'const' to the declaration of `copy()` in your header file and in the implementation.

We suggest to add the new FL\_OVERRIDE macro or the keyword 'override' (see above) to your own overridden method declarations to enable the compiler to detect such incompatibilities.

Code example in header file:

```
class Your_Image {
    // ...
    Fl_Image *copy() const FL_OVERRIDE;
    Fl_Image *copy(int w, int h) const FL_OVERRIDE;
};
```

Note the 'const' attribute **and** the FL\_OVERRIDE macro.

## 21.6 Using X11 specific code with a "hybrid" FLTK library

Read this section if your FLTK 1.3 program uses X11 specific code with platform specific guards like

```
#if defined(WIN32)
    // Windows specific code here
#elif defined(__APPLE__)
    // macOS specific code here
#else
    // X11 specific code here
#endif
```

or similar.

You may skip this section if you don't use platform (X11) specific code.

FLTK 1.4 introduced Wayland support on Unix-like systems that support Wayland at runtime. The default build selects the Wayland runtime if it exists at program startup and falls back to using X11 if Wayland is not supported. On all currently known Wayland-enabled systems X11 programs are still supported by using "XWayland" which must be installed and enabled on the system. This is usually the case (as of this writing in November 2024).

Since using the Wayland runtime is the default you may get runtime errors if your program uses X11 specific code with the Wayland runtime.

There are two solutions:

1. Change the conditional code shown above everywhere in your program. This is the best and recommended long-term solution but may require some work.
2. Disable the Wayland backend (runtime) for your program. This can be a short-term solution for quick "porting" success.

Details about solution 1 are beyond the scope of this documentation but here's an example how such code can be rewritten in FLTK 1.4 for all platforms. This code is now in `test/fltk-versions.cxx` but may be changed in the future. Change this as you need.

```
static const char *get_platform() {
#ifdef _WIN32
    return "Windows";
#elif defined(FLTK_USE_X11) || defined(FLTK_USE_WAYLAND)
    #if defined(FLTK_USE_X11)
        if (fl_x11_display())
            return "Unix/Linux (X11)";
    #endif
    #if defined(FLTK_USE_WAYLAND)
        if (fl_wl_display())
            return "Unix/Linux (Wayland)";
    #endif
    return "X11 or Wayland (backend unknown or display not opened)";
#elif defined(__APPLE__)
    return "macOS (native)";
#endif
    return "platform unknown, unsupported, or display not opened";
}
```

Solution 2 is described in chapter 2.1 of `README.Wayland.txt`. Please read this chapter if you need to support X11 specific code w/o the Wayland runtime.

Excerpt from `README.Wayland.txt`:

It is possible to force a program linked to a Wayland-enabled FLTK library to use X11 in all situations by putting this declaration somewhere in the source code:

```
FL_EXPORT bool fl_disable_wayland = true;
```

Please note that you may need to do more to link and run your program successfully, depending on the build system.

Additional info can be found in chapter [The Wayland/X11 hybrid library](#).

## 21.7 Modern CMake

FLTK 1.4.0 supports "modern" CMake rather than old or "classic" CMake which was used in FLTK 1.3.x. Modern CMake was introduced in CMake 3.0 (~ 2014) and further developed in later CMake versions. FLTK 1.4.0 requires at least CMake 3.15 (~ 2019) as of February 2024.

There are a lot of advantages that motivated this transition (mentioning only some):

- easier to use for projects using FLTK
- better structure
- uses CMake targets rather than variables
- embeddable in user projects via `FetchContent()` etc.
- embeddable in user projects via `add_subdirectory()`
- better coexistence with main projects if built as a subproject

Note that CMake targets can provide all required build flags and build dependencies which is the main advantage for user projects. For instance, instead of linking both `fltk` and `fltk_images` you need only `fltk_images` and `fltk` is linked in automatically.

Unfortunately there is one drawback you may encounter: Several CMake build option names have been changed, compared to FLTK 1.3.x. This is due to the fact that CMake cache variables are shared between the main (aka superbuild) project and all subprojects. Therefore all FLTK options are now prefixed with `FLTK_`.

This feature is now CMake standard and very common in newer projects. The CMake developers recommend strongly to use modern CMake.

We took the opportunity to redesign all CMake related options and target names for FLTK 1.4.0 to avoid changing these names later. Note that CMake support in 1.3.x was only experimental and the one in FLTK 1.4 (Git) up to the official release was beta state by definition. We apologize for all inconveniencies, hope that this is one of the rare exceptions in FLTK development, and that the new names are now stable as usual.

Changes in Detail:

Since FLTK 1.4.0 CMake target names are "namespaced", i.e. they are created with the prefix `'fltk::'` and the old prefix `'fltk_'` has been stripped off as far as the `CMakeLists.txt` file of user projects is concerned. The known filenames on disk did not change though.

The shared library target names use the common suffix `"-shared"` rather than `"_SHARED"`.

The library `'fltk_cairo'` is no longer used. Its functionality has been included in `libfltk`. FLTK 1.4.0 creates a dummy (empty) `libfltk_cairo` for backwards compatibility only. Please remove `fltk_cairo` from your projects and use only `'fltk::fltk'` and/or the other libraries instead.

For more information and documentation of all options please refer to the file `README.CMake.txt` in the FLTK root directory.

Old and New Library Targets:

Library	Old Target	New Target	Shared Library Target
<code>fltk</code>	<code>fltk</code>	<code>fltk::fltk</code>	<code>fltk::fltk-shared</code>
<code>fltk_forms</code>	<code>fltk_forms</code>	<code>fltk::forms</code>	<code>fltk::forms-shared</code>
<code>fltk_gl</code>	<code>fltk_gl</code>	<code>fltk::gl</code>	<code>fltk::gl-shared</code>
<code>fltk_images</code>	<code>fltk_images</code>	<code>fltk::images</code>	<code>fltk::images-shared</code>
<code>fltk_jpeg</code>	<code>fltk_jpeg</code>	<code>fltk::jpeg</code>	<code>fltk::jpeg-shared</code>
<code>fltk_png</code>	<code>fltk_png</code>	<code>fltk::png</code>	<code>fltk::png-shared</code>
<code>fltk_z</code>	<code>fltk_z</code>	<code>fltk::z</code>	<code>fltk::z-shared</code>
<code>fluid</code>	<code>fluid</code>	<code>fltk::fluid</code>	n/a

For project developers used to the old (1.3.x) names the following table can assist to find the new option names. This table is ordered alphabetically by the old option name. Note that some option names did not change and some of the "old" names have been introduced in early 1.4.0 development.

Old Option Name (FLTK 1.3.x)	New Option Name (FLTK 1.4.x)
<code>FLTK_BUILD_EXAMPLES</code>	<code>FLTK_BUILD_EXAMPLES</code>
<code>FLTK_BUILD_FLTK_OPTIONS</code>	<code>FLTK_BUILD_FLTK_OPTIONS</code>
<code>FLTK_BUILD_FLUID</code>	<code>FLTK_BUILD_FLUID</code>
<code>FLTK_BUILD_FORMS</code>	<code>FLTK_BUILD_FORMS</code>
<code>FLTK_BUILD_TEST</code>	<code>FLTK_BUILD_TEST</code>
<code>FLTK_MSVC_RUNTIME_DLL</code>	<code>FLTK_MSVC_RUNTIME_DLL</code>

Old Option Name (FLTK 1.3.x)	New Option Name (FLTK 1.4.x)
OPTION_ABI_VERSION	FLTK_ABI_VERSION
OPTION_ALLOW_GTK_PLUGIN	FLTK_USE_LIBDECOR_GTK
OPTION_APPLE_X11	FLTK_BACKEND_X11
OPTION_ARCHFLAGS	FLTK_ARCHFLAGS
OPTION_BUILD_HTML_DOCUMENTATION	FLTK_BUILD_HTML_DOCS
OPTION_BUILD_PDF_DOCUMENTATION	FLTK_BUILD_PDF_DOCS
OPTION_BUILD_SHARED_LIBS	FLTK_BUILD_SHARED_LIBS
OPTION_CAIRO	FLTK_OPTION_CAIRO_WINDOW
OPTION_CAIROEXT	FLTK_OPTION_CAIRO_EXT
OPTION_CREATE_LINKS	FLTK_INSTALL_LINKS
OPTION_FILESYSTEM_SUPPORT	FLTK_OPTION_FILESYSTEM_SUPPORT
OPTION_INCLUDE_DRIVER_DOCUMENTATION	FLTK_INCLUDE_DRIVER_DOCS
OPTION_INSTALL_HTML_DOCUMENTATION	FLTK_INSTALL_HTML_DOCS
OPTION_INSTALL_PDF_DOCUMENTATION	FLTK_INSTALL_PDF_DOCS
OPTION_LARGE_FILE	FLTK_OPTION_LARGE_FILE
OPTION_OPTIM	FLTK_OPTION_OPTIM
OPTION_PRINT_SUPPORT	FLTK_OPTION_PRINT_SUPPORT
OPTION_USE_CAIRO	FLTK_GRAPHICS_CAIRO
OPTION_USE_GDIPLUS	FLTK_GRAPHICS_GDIPLUS
OPTION_USE_GL	FLTK_BUILD_GL
OPTION_USE_KDIALOG	FLTK_USE_KDIALOG
OPTION_USE_PANGO	FLTK_USE_PANGO
OPTION_USE_POLL	FLTK_USE_POLL
OPTION_USE_STD	FLTK_OPTION_STD [1]
OPTION_USE_SVG	FLTK_OPTION_SVG
OPTION_USE_SYSTEM_LIBDECOR	FLTK_USE_SYSTEM_LIBDECOR
OPTION_USE_SYSTEM_LIBJPEG	FLTK_USE_SYSTEM_LIBJPEG
OPTION_USE_SYSTEM_LIBPNG	FLTK_USE_SYSTEM_LIBPNG
OPTION_USE_SYSTEM_ZLIB	FLTK_USE_SYSTEM_ZLIB
OPTION_USE_THREADS	FLTK_USE_PTHREADS
OPTION_USE_WAYLAND	FLTK_BACKEND_WAYLAND
OPTION_USE_XCURSOR	FLTK_USE_XCURSOR
OPTION_USE_XFIXES	FLTK_USE_XFIXES
OPTION_USE_XFT	FLTK_USE_XFT
OPTION_USE_XINERAMA	FLTK_USE_XINERAMA
OPTION_USE_XRENDER	FLTK_USE_XRENDER
OPTION_WAYLAND_ONLY	FLTK_BACKEND_X11=OFF

[1] Note: obsolete and therefore removed in 1.5

## 21.8 New FL\_HELVETICA Font on Windows

In FLTK releases before 1.4.2 the Windows font name used for the FLTK font 'FL\_HELVETICA' and its variants was named 'Arial'. It turned out that this was a very old font used in early Windows versions and had been replaced with the newer font name 'Microsoft Sans Serif'. This font has many more UTF-8 capable glyphs (characters) and is almost 100% compatible with the previously used font 'Arial'. It is supported by Microsoft since Windows XP, our oldest currently (partially) supported Windows platform.

This new font is used since FLTK 1.4.2.

We don't expect any issues with this much better font but if you really want strict backwards compatibility with FLTK 1.3.x or early 1.4.0/1.4.1 versions you can apply a tiny patch at the beginning of your program.

This code will load the old font 'Arial' on Windows:

```
#ifdef _WIN32
// reset Windows fonts to pre-1.4.2 state
```

```
Fl::set_font(FL_HELVETICA, "Arial");  
Fl::set_font(FL_HELVETICA + 1, "BArial");  
Fl::set_font(FL_HELVETICA + 2, "IArial");  
Fl::set_font(FL_HELVETICA + 3, "PArial");  
#endif
```



## Chapter 22

# Software License

December 11, 2001

The FLTK library and included programs are provided under the terms of the GNU Library General Public License (LGPL) with the following exceptions:

1. Modifications to the FLTK configure script, config header file, and makefiles by themselves to support a specific platform do not constitute a modified or derivative work.

The authors do request that such modifications be contributed to the FLTK project - send all contributions through the "Software Trouble Report" on the following page: <https://www.fltk.org/bugs.php>

2. Widgets that are subclassed from FLTK widgets do not constitute a derivative work.
3. Static linking of applications and widgets to the FLTK library does not constitute a derivative work and does not require the author to provide source code for the application or widget, use the shared FLTK libraries, or link their applications or widgets against a user-supplied version of FLTK.

If you link the application or widget to a modified version of FLTK, then the changes to FLTK must be provided under the terms of the LGPL in sections 1, 2, and 4.

4. You do not have to provide a copy of the FLTK license with programs that are linked to the FLTK library, nor do you have to identify the FLTK license in your program or documentation as required by section 6 of the LGPL.

However, programs must still identify their use of FLTK. The following example statement can be included in user documentation to satisfy this requirement:

*[program/widget] is based in part on the work of the FLTK project ( <https://www.fltk.org>).*

---

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## Preamble

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## Chapter 23

# Example Source Code

The FLTK distribution contains over 60 sample applications written in, or ported to, FLTK.

If the FLTK archive you received does not contain either an 'examples' or 'test' directory, you can download the complete FLTK distribution from <https://www.fltk.org/software.php>.

Most of the example programs were created while testing a group of widgets. They are not meant to be great achievements in clean C++ programming, but merely a test platform to verify the functionality of the FLTK library.

Note that extra example programs are also available in an additional 'examples' directory, but these are **NOT** built automatically when you build FLTK, unlike those in the 'test' directory shown below.

### 23.1 Example Applications: Overview

<a href="#">adjuster</a>	<a href="#">animated</a>	<a href="#">arc</a>	<a href="#">ask</a>	<a href="#">bitmap</a>	<a href="#">blocks</a>
<a href="#">boxtype</a>	<a href="#">browser</a>	<a href="#">button</a>	<a href="#">buttons</a>	<a href="#">cairo_test</a>	<a href="#">checkers</a>
<a href="#">clipboard</a>	<a href="#">clock</a>	<a href="#">colbrowser</a>	<a href="#">color_chooser</a>	<a href="#">cube</a>	<a href="#">CubeView</a>
<a href="#">cursor</a>	<a href="#">curve</a>	<a href="#">demo</a>	<a href="#">device</a>	<a href="#">doublebuffer</a>	<a href="#">editor</a>
<a href="#">fast_slow</a>	<a href="#">file_chooser</a>	<a href="#">FLUID</a>	<a href="#">fonts</a>	<a href="#">forms</a>	<a href="#">fractals</a>
<a href="#">fullscreen</a>	<a href="#">gl_overlay</a>	<a href="#">glpuzzle</a>	<a href="#">hello</a>	<a href="#">help_dialog</a>	<a href="#">icon</a>
<a href="#">iconize</a>	<a href="#">image</a>	<a href="#">inactive</a>	<a href="#">input</a>	<a href="#">input_choice</a>	<a href="#">keyboard</a>
<a href="#">label</a>	<a href="#">line_style</a>	<a href="#">list_visuals</a>	<a href="#">mandelbrot</a>	<a href="#">menubar</a>	<a href="#">message</a>
<a href="#">minimum</a>	<a href="#">native-filechooser</a>	<a href="#">navigation</a>	<a href="#">offscreen</a>	<a href="#">output</a>	<a href="#">overlay</a>
<a href="#">pack</a>	<a href="#">pixmap</a>	<a href="#">pixmap_browser</a>	<a href="#">preferences</a>	<a href="#">radio</a>	<a href="#">resize</a>
<a href="#">resizebox</a>	<a href="#">rotated_text</a>	<a href="#">scroll</a>	<a href="#">shape</a>	<a href="#">subwindow</a>	<a href="#">sudoku</a>
<a href="#">symbols</a>	<a href="#">table</a>	<a href="#">tabs</a>	<a href="#">threads</a>	<a href="#">tile</a>	<a href="#">tiled_image</a>
<a href="#">tree</a>	<a href="#">twowin</a>	<a href="#">unittests</a>	<a href="#">utf8</a>	<a href="#">valuators</a>	<a href="#">windowfocus</a>

#### 23.1.1 adjuster

`adjuster` shows a nifty little widget for quickly setting values in a great range.

#### 23.1.2 animated

`animated` shows a window with an animated square that shows drawing with transparency (alpha channel).

#### 23.1.3 arc

The `arc` demo explains how to derive your own widget to generate some custom drawings. The sample drawings use the matrix based arc drawing for some fun effects.

#### 23.1.4 `ask`

`ask` shows some of FLTK's standard dialog boxes. Click the correct answers or you may end up in a loop, or you may end up in a loop, or you... .

#### 23.1.5 `bitmap`

This simple test shows the use of a single color bitmap as a label for a box widget. Bitmaps are stored in the X11 '.bmp' file format and can be part of the source code.

#### 23.1.6 `blocks`

A wonderful and addictive game that shows the usage of FLTK timers, graphics, and how to implement sound on all platforms. `blocks` is also a good example for the Mac OS X specific bundle format.

#### 23.1.7 `boxtype`

`boxtype` gives an overview of readily available boxes and frames in FLTK. More types can be added by the application programmer. When using themes, FLTK shuffles boxtypes around to give your program a new look.

#### 23.1.8 `browser`

`browser` shows the capabilities of the [Fl\\_Browser](#) widget. Important features tested are loading of files, line formatting, and correct positioning of the browser data window.

#### 23.1.9 `button`

The `button` test is a simple demo of push-buttons and callbacks.

#### 23.1.10 `buttons`

`buttons` shows a sample of FLTK button types.

#### 23.1.11 `cairo_test`

`cairo_test` shows a sample of drawing with Cairo in an [Fl\\_Cairo\\_Window](#). This program can only be built completely if FLTK was configured with Cairo support. It displays a message box if Cairo support was not included.

#### 23.1.12 `checkers`

Written by Steve Poulsen in early 1979, `checkers` shows how to convert a VT100 text-terminal based program into a neat application with a graphical UI. Check out the code that drags the pieces, and how the pieces are drawn by layering. Then tell me how to beat the computer at Checkers.

### 23.1.13 clipboard

The `clipboard` demo can be used to view the contents of the system clipboard, either text or image contents. Currently an image is preferred if the clipboard contains both formats. Images can be stored as PNG files so screenshots can be stored on disk with this little FLTK demo program.

### 23.1.14 clock

The `clock` demo shows two analog clocks. The innards of the `FL_Clock` widget are pretty interesting, explaining the use of timeouts and matrix based drawing.

### 23.1.15 colbrowser

`colbrowser` runs only on X11 systems. It reads `/usr/lib/X11/rgb.txt` to show the color representation of every text entry in the file. This is beautiful, but only moderately useful unless your UI is written in *Motif*.

### 23.1.16 color\_chooser

The `color_chooser` gives a short demo of FLTK's palette based color chooser and of the RGB based color wheel.

### 23.1.17 cube

The `cube` demo shows the speed of OpenGL. It also tests the ability to render two OpenGL buffers into a single window, and shows OpenGL text.

### 23.1.18 CubeView

`CubeView` shows how to create a UI containing OpenGL with FLUID.

### 23.1.19 cursor

The `cursor` demo shows all mouse cursor shapes that come standard with FLTK. The *fgcolor* and *bgcolor* sliders work only on few systems (some version of Irix for example).

### 23.1.20 curve

`curve` draws a nice Bézier curve into a custom widget. The *points* option for splines is not supported on all platforms.

### 23.1.21 demo

This tool allows quick access to most programs in the `test` directory. The menu tree can be changed by editing `test/demo.menu`.

### 23.1.22 device

Exercises the `FL_Image_Surface`, `FL_Copy_Surface`, and `FL_Printer` classes to draw to an `FL_Image` object, copy graphical data to the clipboard, and for print support.

**Note**

The `clipboard.cxx` program of the 'test' directory is a clipboard watching application that continuously displays the textual or graphical content of the system clipboard (a.k.a pasteboard on macOS) exercising [Fl::paste\(\)](#).

**23.1.23 doublebuffer**

The `doublebuffer` demo shows the difference between a single buffered window, which may flicker during a slow redraw, and a double buffered window, which never flickers, but uses twice the amount of RAM. Some modern OS's double buffer all windows automatically to allow transparency and shadows on the desktop. FLTK is smart enough to not tripple buffer a window in that case.

**23.1.24 editor**

FLTK has two very different text input widgets. [Fl\\_Input](#) and derived classes are rather light weight, however [Fl\\_Text\\_Editor](#) is a complete port of *nedit* (with permission). The `editor` test is almost a full application, showing custom syntax highlighting and dialog creation. See chapter [Designing a Simple Text Editor](#) for a tutorial about creating this program.

**23.1.25 fast\_slow**

`fast_slow` shows how an application can use the [Fl\\_Widget::when\(\)](#) setting to receive different kinds of callbacks.

**23.1.26 file\_chooser**

The standard FLTK `file_chooser` is the result of many iterations, trying to find a middle ground between a complex browser and a fast light implementation.

**23.1.27 fonts**

`fonts` shows all available text fonts on the host system. If your machine still has some pixmap based fonts, the supported sizes will be shown in bold face. Only the first 256 fonts will be listed.

**23.1.28 forms**

`forms` is an XForms program with very few changes. Search for "fltk" to find all changes necessary to port to fltk. This demo shows the different boxtypes. Note that some boxtypes are not appropriate for some objects.

**23.1.29 fractals**

`fractals` shows how to mix OpenGL, Glut and FLTK code. FLTK supports a rather large subset of Glut, so that many Glut applications compile just fine.

**23.1.30 fullscreen**

This demo shows how to do many of the window manipulations that are popular for games. You can toggle the border on/off, switch between single- and double-buffered rendering, and take over the entire screen. More information in the source code.

**23.1.31 gl\_overlay**

`gl_overlay` shows OpenGL overlay plane rendering. If no hardware overlay plane is available, FLTK will simulate it for you.

### 23.1.32 glpuzzle

The `glpuzzle` test shows how most Glut source code compiles easily under FLTK.

### 23.1.33 hello

`hello`: Hello, World. Need I say more? Well, maybe. This tiny demo shows how little is needed to get a functioning application running with FLTK. Quite impressive, I'd say.

### 23.1.34 help\_dialog

`help_dialog` displays the built-in FLTK help browser. The [FL\\_Help\\_Dialog](#) understands a subset of html and renders various image formats. This widget makes it easy to provide help pages to the user without depending on the operating system's html browser.

### 23.1.35 icon

`icon` demonstrates how an application icon can be set from an image. This icon should be displayed in the window bar (label), in the task bar, and in the task switcher (Windows: Alt-Tab). This feature is platform specific, hence it is possible that you can't see the icon. On Unix/Linux (X11) this can even depend on the Window Manager (WM).

### 23.1.36 iconize

`iconize` demonstrates the effect of the window functions `hide()`, `iconize()`, and `show()`.

### 23.1.37 image

The `image` demo shows how an image can be created on the fly. This generated image contains an alpha (transparency) channel which lets previous renderings 'shine through', either via true transparency or by using screen door transparency (pixelation).

### 23.1.38 inactive

`inactive` tests the correct rendering of inactive widgets. To see the inactive version of images, you can check out the pixmap or image test.

### 23.1.39 input

This tool shows and tests different types of text input fields based on [FL\\_Input\\_](#). The `input` program also tests various settings of [FL\\_Input::when\(\)](#).

### 23.1.40 input\_choice

`input_choice` tests the latest addition to FLTK1, a text input field with an attached pulldown menu. Windows users will recognize similarities to the 'ComboBox'. `input_choice` starts up in 'plastic' scheme, but the traditional scheme is also supported.

### 23.1.41 keyboard

FLTK unifies keyboard events for all platforms. The `keyboard` test can be used to check the return values of `Fl::event_key()` and `Fl::event_text()`. It is also great to see the modifier buttons and the scroll wheel at work. Quit this application by closing the window. The ESC key will not work.

### 23.1.42 label

Every FLTK widget can have a label attached to it. The `label` demo shows alignment, clipping, and wrapping of text labels. Labels can contain symbols at the start and end of the text, like *@FLTK* or *@circle uh-huh @square*.

### 23.1.43 line\_style

Advanced line drawing can be tested with `line_style`. Not all platforms support all line styles.

### 23.1.44 list\_visuals

This little app finds all available pixel formats for the current X11 screen. But since you are now an FLTK user, you don't have to worry about any of this.

### 23.1.45 mandelbrot

`mandelbrot` shows two advanced topics in one test. It creates grayscale images on the fly, updating them via the `idle` callback system. This is one of the few occasions where the `idle` callback is very useful by giving all available processor time to the application without blocking the UI or other apps.

### 23.1.46 menubar

The `menubar` tests many aspects of FLTK's popup menu system. Among the features are radio buttons, menus taller than the screen, arbitrary sub menu depth, and global shortcuts.

### 23.1.47 message

`message` pops up a few of FLTK's standard message boxes.

### 23.1.48 minimum

The `minimum` test program verifies that the update regions are set correctly. In a real life application, the trail would be avoided by choosing a smaller label or by setting label clipping differently.

### 23.1.49 native-filechooser

The `native-filechooser` program invokes the platform specific file chooser, if available (see [Fl\\_Native\\_File\\_Chooser](#) widget).

### 23.1.50 navigation

`navigation` demonstrates how the text cursor moves from text field to text field when using the arrow keys, tab, and shift-tab.

### 23.1.51 offscreen

`offscreen` shows how to draw into an offscreen image and display the offscreen image in the program window.

### 23.1.52 output

`output` shows the difference between the single line and multi line mode of the [FL\\_Output](#) widget. Fonts can be selected from the FLTK standard list of fonts.

### 23.1.53 overlay

The `overlay` test app shows how easy an FLTK window can be layered to display cursor and manipulator style elements. This example derives a new class from [FL\\_Overlay\\_Window](#) and provides a new function to draw custom overlays.

### 23.1.54 pack

The `pack` test program demonstrates the resizing and repositioning of children of the [FL\\_Pack](#) group. Putting an [FL\\_Pack](#) into an [FL\\_Scroll](#) is a useful way to create a browser for large sets of data.

### 23.1.55 pixmap

This simple test shows the use of a LUT based pixmap as a label for a box widget. Pixmapes are stored in the X11 '.xpm' file format and can be part of the source code. Pixmapes support one transparent color.

### 23.1.56 pixmap\_browser

`pixmap_browser` tests the shared-image interface. When using the same image multiple times, [FL\\_Shared\\_Image](#) will keep it only once in memory.

### 23.1.57 preferences

I do have my `preferences` in the morning, but sometimes I just can't remember a thing. This is where the [FL\\_Preferences](#) come in handy. They remember any kind of data between program launches.

### 23.1.58 radio

The `radio` tool was created entirely with *FLUID*. It shows some of the available button types and tests radio button behavior.

### 23.1.59 resizebox

`resizebox` shows some possible ways of FLTK's automatic resize behavior.

### 23.1.60 rotated\_text

`rotated_text` shows how text can be rotated, i.e. drawn in any given angle. This demo is device specific, for instance it works under X11 only if configured with Xft.

### 23.1.61 `resize`

The `resize` demo tests size and position functions with the given window manager.

### 23.1.62 `scroll`

`scroll` shows how to scroll an area of widgets, one of them being a slow custom drawing. [Fl\\_Scroll](#) uses clipping and smart window area copying to improve redraw speed. The buttons at the bottom of the window control decoration rendering and updates.

### 23.1.63 `shape`

`shape` is a very minimal demo that shows how to create your own OpenGL rendering widget. Now that you know that, go ahead and write that flight simulator you always dreamt of.

### 23.1.64 `subwindow`

The `subwindow` demo tests messaging and drawing between the main window and 'true' sub windows. A sub window is different to a group by resetting the FLTK coordinate system to 0, 0 in the top left corner. On Win32 and X11, subwindows have their own operating system specific handle.

### 23.1.65 `sudoku`

Another highly addictive game - don't play it, I warned you. The implementation shows how to create application icons, how to deal with OS specifics, and how to generate sound.

### 23.1.66 `symbols`

`symbols` are a speciality of FLTK. These little vector drawings can be integrated into labels. They scale and rotate, and with a little patience, you can define your own. The rotation number refers to 45 degree rotations if you were looking at a numeric keypad (2 is down, 6 is right, etc.).

### 23.1.67 `table`

The `table` demo shows the features of the [Fl\\_Table](#) widget.

### 23.1.68 `tabs`

The `tabs` tool was created with *FLUID*. It tests correct hiding and redisplaying of tabs, navigation across tabs, resize behavior, and no unneeded redrawing of invisible widgets.

The `tabs` application shows the [Fl\\_Tabs](#) widget on the left and the [Fl\\_Wizard](#) widget on the right side for direct comparison of these two panel management widgets.

### 23.1.69 `threads`

FLTK can be used in a multithreading environment. There are some limitations, mostly due to the underlying operating system. `threads` shows how to use [Fl::lock\(\)](#), [Fl::unlock\(\)](#), and [Fl::awake\(\)](#) in secondary threads to keep FLTK happy. Although locking works on all platforms, this demo is not available on every machine.

### 23.1.70 tile

The `tile` tool shows a nice way of using `Fl_Tile`. To test correct resizing of subwindows, the widget for region 1 is created from an `Fl_Window` class.

### 23.1.71 tiled\_image

The `tiled_image` demo uses a small image as the background for a window by repeating it over the full size of the widget. The window is resizable and shows how the image gets repeated.

### 23.1.72 tree

The `tree` demo shows the features of the `Fl_Tree` widget.

### 23.1.73 twowin

The `twowin` program tests focus transfer from one window to another window.

### 23.1.74 unittests

`unittests` exercises all of FLTK's drawing features (e.g., text, lines, circles, images), as well as scrollbars and schemes.

### 23.1.75 utf8

`utf8` shows all fonts available to the platform that runs it, and how each font draws each of the Unicode code points ranging between U+0020 and U+FFFF.

### 23.1.76 valuator

`valuators` shows all of FLTK's nifty widgets to change numeric values.

### 23.1.77 windowfocus

`windowfocus` shows a very special case when a new window is shown while the focus stays in the original window.

### 23.1.78 FLUID

FLUID is not only a big test program, but also a very useful visual UI designer. Many parts of FLUID were created using FLUID. Check out the FLUID User Manual and the tutorials that come with it at <https://www.fltk.org/documentation.php>.

## 23.2 Example Applications: Images

This chapter contains a few selected images of the test and example applications listed above. It is not meant to be complete or a full reference. The reason some images are included here is to show how the display **should** look when running the example programs.

### 23.2.1 cairo\_test

The `cairo_test` demo program shows three shiny buttons drawn with Cairo in an [Fl\\_Cairo\\_Window](#).



Figure 23.1 Buttons drawn with Cairo

### 23.2.2 icon

The `icon` program lets you set the program icon from an image (here an [Fl\\_RGB\\_Image](#)).

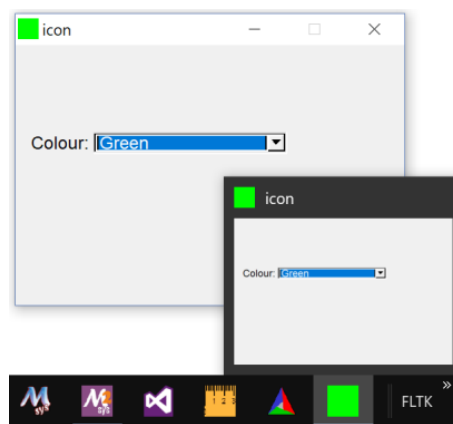


Figure 23.2 Green icon (Windows 10)

### 23.2.3 unittests

Select "drawing images" in the browser at the left side to see the image drawing example:

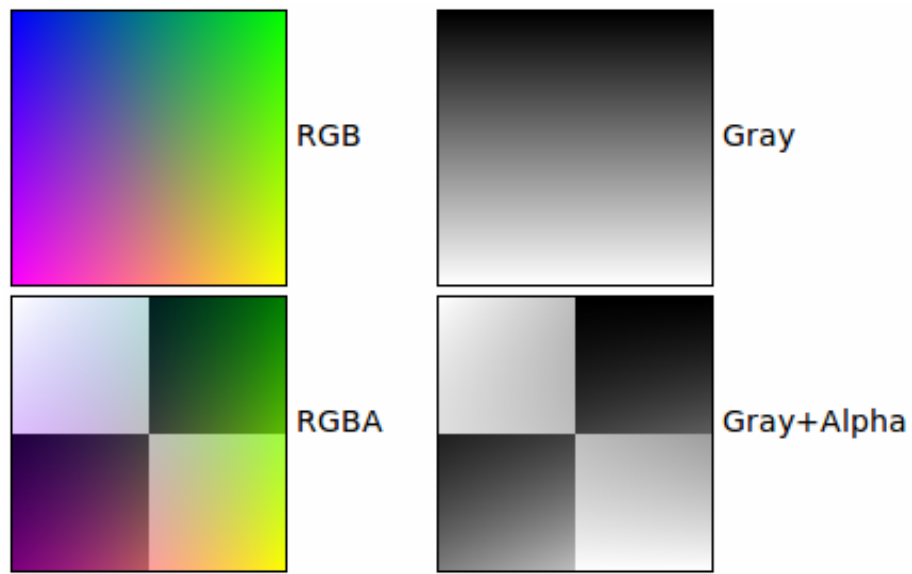


Figure 23.3 Image Drawing



## Chapter 24

# FAQ (Frequently Asked Questions)

A list of frequently asked questions about FLTK.

This appendix describes various frequently asked questions regarding FLTK.

- [Where do I start learning FLTK?](#)
- [How do I make a box with text?](#)
- [Can I use FLTK to make closed-source commercial applications?](#)
- [Hitting the 'Escape' key closes windows - how do I prevent this?](#)

### 24.1 Where do I start learning FLTK?

It is assumed you know C++, which is the language all FLTK programs are written in, including FLTK itself.

If you like reading manuals to work your way into things, a good start is the FLTK documentation's [Introduction to FLTK](#). Under the [FLTK Basics](#) section there's an example 'hello world' program that includes a line-by-line description.

If you like looking at simple code first to pique your interest, and then read up from there, start with the example programs in the test/ and examples/ directory that is included with the source code. A good place to start is the 'hello world' program in test/hello.cxx. Also do a google search for "FLTK example programs". "Erco's Cheat Page" is one that shows many simple examples of how to do specific things.

If you like to run example programs and look for ones that are like yours and then read them, download and build FLTK from the source, then run the test/demo program. Also, go into the 'examples/' directory and run 'make', then run some of those programs.

If you prefer watching TV to reading books and code, google search for "FLTK video tutorials" which has some introductory examples of how to write FLTK programs in C++ and build them.

### 24.2 How do I make a box with text?

The 'hello world' program shows how to make a box with text. All widgets have labels, so picking a simple widget like [Fl\\_Box](#) and setting its label() and using align() to align the label and labelfont() to set the font, and labelsize() to set the size, you can get text just how you want.

Labels are not selectable though; if you want selectable text, you can use [Fl\\_Output](#) or [Fl\\_Multiline\\_Output](#) for simple text that doesn't include scrollbars. For more complex text that might want scrollbars and multiple colors/fonts, use either [Fl\\_Text\\_Display](#) which handles plain text, or [Fl\\_Help\\_View](#) which handles simple HTML formatted text.

### 24.3 Can I use FLTK to make closed-source commercial applications?

Yes. The FLTK [Software License](#) is standard LGPL, but also includes a special clause ("exception") to allow for static linking. Specifically:

```
[from the top of the FLTK LGPL License section on exceptions]
```

```
3. Static linking of applications and widgets to the FLTK library does
```

not constitute a derivative work and does not require the author to provide source code for the application or widget, use the shared FLTK libraries, or link their applications or widgets against a user-supplied version of FLTK.

If you link the application or widget to a modified version of FLTK, then the changes to FLTK must be provided under the terms of the LGPL in sections 1, 2, and 4.

4. You do not have to provide a copy of the FLTK license with programs that are linked to the FLTK library, nor do you have to identify the FLTK license in your program or documentation as required by section 6 of the LGPL.

However, programs must still identify their use of FLTK. The following example statement can be included in user documentation to satisfy this requirement:

```
[program/widget] is based in part on the work of the
FLTK project (https://www.fltk.org).
```

## 24.4 Hitting the 'Escape' key closes windows - how do I prevent this?

[From FLTK article #378]

1. FLTK has a "global event handler" that makes Escape try to close the window, the same as clicking the close box. To disable this everywhere you can install your own that pretends it wants the escape key and thus stops the default one from seeing it (this may not be what you want, see below about the callbacks):

```
static int my_handler(int event) {
    if (event == FL_SHORTCUT) return 1; // eat all shortcut keys
    return 0;
}
...in main():
    Fl::add_handler(my_handler);
...
```

1. Attempts to close a window (both clicking the close box or typing Escape) call that window's callback. The default version of the callback does `hide()`. To make the window not close or otherwise do something different you replace the callback. To make the main window exit the program:

```
void my_callback(Fl_Widget*, void*) {
    exit(0);
}
...
main_window->callback(my_callback);
...
```

If you don't want Escape to close the main window and exit you can check for and ignore it. This is better than replacing the global handler because Escape will still close pop-up windows:

```
void my_callback(Fl_Widget*, void*) {
    if (Fl::event() == FL_SHORTCUT && Fl::event_key() == FL_Escape)
        return; // ignore Escape
    exit(0);
}
```

The reason for calling a window callback can also be found using using the `Fl::callback_reason()` method:

```
void my_callback(Fl_Widget*, void*) {
    if (Fl::callback_reason() == FL_REASON_CANCELLED)
        return; // ignore that the user pressed the Escape key
    if (Fl::callback_reason() == FL_REASON_CLOSED)
        save_and_exit(); // user clicked the Close button in the window decoration
    exit(0); // fallback for other callback reasons
}
```

It is very common to ask for confirmation before exiting, this can be done with:

```
void my_callback(Fl_Widget*, void*) {
    if (fl_choice("Are you sure you want to quit?",
                  "continue", "quit", NULL))
        exit(0);
}
```

## Chapter 25

# Development of the FLTK library

- [The Wayland backend for its developer](#)
- [Developer info for bundled libs](#)
- [Developer Information](#)

### 25.1 The Wayland backend for its developer

This chapter describes how the Wayland backend of FLTK works from a developer's viewpoint.

#### 25.1.1 Introduction to Wayland

Wayland usage involves communication via a Unix domain socket between a client application and another process called the Wayland compositor which creates, moves, resizes and draws windows on the display. Diverse Wayland compositors exist. They can follow rather diverse logics. For example, FreeBSD offers Sway which is a tiling compositor where the display is always entirely filled with whatever resizable windows are mapped at any given time. Compositors follow either the client-side decoration (CSD) rule where client apps draw window titlebars, or the server-side decoration (SSD) rule where the compositor draws titlebars. FLTK supports both CSD and SSD compositors. It uses a library called `libdecor` charged of determining whether a CSD or a SSD compositor is active, and of drawing titlebars in the first case.

Wayland is divided in various protocols that a given compositor may or may not support, although they all support the `core` protocol. Each protocol adds functionality not available in the core protocol. [Wayland Explorer](#) lists all protocols. The core protocol allows a client app to discover what protocols the connected compositor supports. Protocols can be stable, which means they have a defined API that will not change but can be expanded, or unstable. For example, mapping a window on a display is not done by the core protocol but by the `xdg_shell` protocol which is stable. The names of symbols used by unstable protocols always begin with letter 'z'. For example, FLTK uses unstable protocol `Text input` to support CJK input methods; its symbol names begin with `zwp_text_input_v3`.

Wayland makes intensive use of the *listener* mechanism. A listener is a small array of pointers to FLTK-defined callback functions associated to a Wayland-defined object; Wayland calls these functions when defined events occur (more at [Listeners](#) below).

Wayland differs noticeably from X11 in that rendering is left to clients: Wayland provides no drawing API. Instead, Wayland provides objects of type `struct wl_buffer` which encapsulate a memory array of pixel values shared between the client and the compositor. The client app is expected to draw to that memory buffer with whatever means it chooses, and to instruct the compositor to map those pixels to the display when the drawing is complete. The Wayland platform of FLTK draws with the Cairo library to `Fl_Window`'s and `Fl_Image_Surface`'s, and with OpenGL to `Fl_Gl_Window`'s.

Wayland differs also from X11 in that the position of a window in the display is completely hidden to the client app. This prevents function `Fl_Window::position()` from having any effect on a top-level window. Wayland also prevents a client app from knowing whether a window is minimized: `Fl_Window::show()` has no effect on a minimized window. Subwindows can be positioned as usual relatively to their parent window. Wayland allows to create popup windows positioned relatively to a previously mapped other window. This allows FLTK to position adequately menu and tooltip windows (see [Menu windows and other popups](#)). FLTK uses also popups for the small,

yellow windows that display the new scale factor value when it's changed: these are created as short-lived popups centered above `Fl::first_window()`.

Wayland uses a trick of its own to handle lists of linked records. It defines type `struct wl_list` and a few macros (`wl_list_init()`, `wl_list_for_each()`, `wl_list_insert()`, `wl_list_for_each_safe()`, `wl_list_remove()`) to manage linked lists. Records put in these lists must contain a member variable of type `struct wl_list` used to link records together and often named 'link'. Access to such a list is possible memorizing a value of type `struct wl_list` computed by macro `wl_list_init()`. Macro `wl_list_for_each(arg1, arg2, arg3)` allows to run through all list elements with:

- `arg1` is a pointer variable of the type of elements of the linked list;
- `arg2` is the address of a variable of type `struct wl_list` identifying the targeted list;
- `arg3` is the name of the member variable of these elements used to link them together.

For example, `wl_list_for_each()` can be used as follows to scan the linked list of all displays of the system (see `Fl_Wayland_Screen_Driver::output`):

```
Fl_Wayland_Screen_Driver::output *output;
Fl_Wayland_Screen_Driver *scr_driver = (Fl_Wayland_Screen_Driver*)Fl::screen_driver();
wl_list_for_each(output, &(scr_driver->outputs), link) {
    // ... work with output, an item of the linked list of all displays in the system ...
}
```

Overall, and ignoring for now OpenGL usage, FLTK interacts with Wayland as follows :

- When opening the display: FLTK calls `Fl::add_fd()` in `FL_READ` mode to associate a callback function called `wayland_socket_callback` to the socket connecting the client and the compositor.
- Client to compositor: FLTK calls C functions of the `libwayland-client.so`, `libwayland-cursor.so` and `libxkbcommon.so` shared libraries and of the `libdecor` library. These send suitable messages to the compositor writing to the socket. The names of these functions begin with `wl_`, `xkb_` or `libdecor_`.
- Compositor to client: the callback function `wayland_socket_callback` runs when there are data to read in the socket; it calls `wl_display_dispatch()` which interprets the read data and calls corresponding listeners.

The core protocol defines also a number of mostly opaque structures whose names begin with `wl_`. The names of symbols and types defined by the other protocols FLTK uses begin with `xdg_`, `zwp_text_input_v3`, `zxdg_toplevel_decoration_`, `gtk_shell1_` and `gtk_surface1_`. FLTK defines a few structures holding Wayland-related data. The names of FLTK-defined structures don't begin with `wl_`. For example, `struct wld_window` (see `wld_window`) is used to store all Wayland-specific data associated to a mapped `Fl_Window`.

### 25.1.2 Building libfltk as a Wayland client

Classes `Fl_Wayland_Window_Driver`, `Fl_Wayland_Screen_Driver`, `Fl_Wayland_Graphics_Driver`, `Fl_Wayland_Copy_Surface_Driver`, `Fl_Wayland_Image_Surface_Driver` and `Fl_Wayland_Gl_Window_Driver` and file `fl_wayland_platform_init.cxx` contain all the Wayland-specific code of the FLTK library. This code is located at `src/drivers/Wayland/` in the FLTK source tree. A single C++ source file generally contains all the code of a given class. The code related to copy, paste and drag-and-drop operations, however, is gathered in file `fl_wayland_clipboard_dnd.cxx` and contains a few member functions of class `Fl_Wayland_Screen_Driver`. Furthermore, class `Fl_UNIX_System_Driver` is used by both the Wayland and the X11 FLTK platforms. File `FL/fl_config.h` defines preprocessor variables `FLTK_USE_WAYLAND` and `FLTK_USE_CAIRO`.

The public C API to Wayland, xkb, EGL and libdecor libraries are obtained with

```
#include <wayland-client.h>
#include <wayland-cursor.h>
#include <xkbcommon/xkbcommon.h>
#include <xkbcommon/xkbcommon-compose.h>
#include <linux/input.h> // for BTN_LEFT, BTN_RIGHT, BTN_MIDDLE
#include "../../libdecor/src/libdecor.h"
#include "../../libdecor/src/libdecor-plugin.h"
#ifdef HAVE_GL
# include <wayland-egl.h>
# include <EGL/egl.h>
#endif // HAVE_GL
```

as necessary.

File `README.Wayland.txt` details what software packages are needed on Debian-based, Fedora and FreeBSD systems for FLTK to use Wayland. Wayland protocols are packaged as XML files accompanied by a utility program, `wayland-scanner`, able to generate a header file and a necessary glue C source file from a

given XML file. For example, for FLTK to use the `xdg-shell` protocol, these commands are run at build time to generate a `.c` file (`xdg-shell-protocol.c`) that will be compiled into `libfltk` and a header file (`xdg-shell-client-protocol.h`) that the FLTK code will include:

```
PROTOCOLS='pkg-config --variable=pkgdatadir wayland-protocols'
wayland-scanner private-code $PROTOCOLS/stable/xdg-shell/xdg-shell.xml xdg-shell-protocol.c
wayland-scanner client-header $PROTOCOLS/stable/xdg-shell/xdg-shell.xml xdg-shell-client-protocol.h
```

Similar operations are performed for FLTK to use protocols `xdg-decoration`, `Text input` and `GTK Shell`.

### 25.1.3 The hybrid Wayland/X11 platform

The Wayland platform of FLTK is normally a two-legged hybrid able to use either Wayland or X11 and to choose between these possibilities at run-time, without any change to the client application. The Wayland/X11 hybrid is essentially a version of the FLTK library containing both all Wayland-specific and all X11-specific code. That's reflected in file `FL/fl_config.h` which defines both `FLTK_USE_WAYLAND` and `FLTK_USE_X11`. This creates the constraint that Wayland and X11 cannot use the same type name for different purposes or the same symbol name. That is why function `fl_xid(const Fl_Window*)` is deprecated in FLTK 1.4 and replaced by `fl_wl_xid()` for Wayland and `fl_x11_xid()` for X11. Also, global variable `Window fl_window` is not used by the Wayland platform which instead uses static struct `wld_window *Fl_Wayland_Window_Driver:: wld_window`. The FLTK library contains also a short source file, `fl_wayland_platform_init.cxx`, that determines, at startup time, whether the app will run as a Wayland or as an X11 client. Function `attempt_wayland()` therein performs this choice as follows :

- if the app defines a global bool variable called `fl_disable_wayland` and this variable is true, the X11 leg is chosen;
- if environment variable `FLTK_BACKEND` is defined to string "wayland", the Wayland leg is chosen;
- if environment variable `FLTK_BACKEND` is defined to string "x11", the X11 leg is chosen;
- otherwise, a connection to a Wayland compositor is attempted; if it's successful, the Wayland leg is chosen; if it's not, the X11 leg is chosen.

The first condition listed above is meant to facilitate transition to FLTK 1.4 of source code written for FLTK 1.3 and containing X11-specific code : it's enough to put

```
FL_EXPORT bool fl_disable_wayland = true;
```

anywhere in the source code, for the app to run with 1.4, using the x11 leg of the hybrid platform, without any other change in the source code nor to the application's environment.

Function `attempt_wayland()` must be called before the very first platform-dependent operation FLTK performs so that operation is done the Wayland or the X11 way, as appropriate. That's why 4 locations of the FLTK source code call `attempt_wayland()`: `Fl_Graphics_Driver::newMainGraphicsDriver()`, `Fl_Screen_Driver::newScreenDriver()`, `Fl_Window_Driver::newWindowDriver(Fl_Window*)`, and `Fl_Image_Surface_Driver::newImageSurfaceDriver()`.

In special situations, such as with embedded systems equipped with the Wayland software but lacking the X11 library, it's possible to build the FLTK library such as it contains only the Wayland backend. This is achieved building FLTK with `cmake -DFLTK_BACKEND_X11=OFF` or with `configure -disable-x11`. In that case, `FL/fl_config.h` does not define `FLTK_USE_X11`.

The rest of this chapter describes what happens when the Wayland leg has been chosen.

### 25.1.4 Listeners

A Wayland 'listener' is a small array of pointers to FLTK-defined callback functions associated to a Wayland-defined object, usually right after creation of this object, by a call to a specific Wayland function named following the form `wl_XXX_add_listener()`. After defined events have occurred, the Wayland compositor sends appropriate commands to the client through the socket; the event loop detects the availability of data in the socket and calls function `wayland_socket_callback()`; this function calls the appropriate member of the listener and transmits relevant information to the client app as parameters of this call. For example, this code:

```
static void surface_enter(.....) { ..... } // called when a surface enters a display
static void surface_leave(.....) { ..... } // called when a surface leaves a display
static struct wl_surface_listener surface_listener = {
    surface_enter,
    surface_leave,
};
some_pointer_type pter_to_data;
```

```
struct wl_surface *my_wl_surface;
my_wl_surface = wl_compositor_create_surface(scr_driver->wl_compositor);
wl_surface_add_listener(my_wl_surface, &surface_listener, pter_to_data);
```

creates a Wayland object of type `struct wl_surface` (roughly, a window), and associates it with a 2-member listener called `surface_listener`. After this, Wayland is expected to call the 2 listener members, `surface_listener_enter` or `surface_leave`, each time `my_wl_surface` will enter or leave, respectively, a display. The arguments of these calls, not detailed here, allow the member functions to identify which surface enters or leaves which display. The `wl_surface_add_listener()` call above also associates `pter_to_data` to `my_wl_surface` as *user data*. The `wl_surface` object's "user data" can be obtained later calling function `wl_surface_get_user_data()`.

Wayland function `wl_proxy_get_listener()` returns a pointer to a Wayland object's listener provided that object is transmitted cast to type `struct wl_proxy *`. This gives a handy way to distinguish FLTK-created Wayland objects from objects of other origin: the listener of an FLTK-created object is a known FLTK listener. For example, function `Fl_Wayland_Window_Driver::surface_to_window()` uses this possibility calling `wl_proxy_get_listener( (struct wl_proxy *)wl_surface )` for any object of type `struct wl_surface`: if that object was created as in the example above, this call returns a pointer to FLTK's `surface_listener` static variable.

### 25.1.5 Opening a Wayland connection

Establishing a Wayland connection requires environment variable `XDG_RUNTIME_DIR` to be defined and to point to a directory containing a socket connected to a Wayland compositor. This variable is usually set by the login procedure of Wayland-friendly desktops. Which socket-file to use within that directory is determined as follows:

- the client may call `Fl::display(const char *display_name)` before `fl_open_display()` runs or use the `-display` command line argument and transmit there the socket name;
- environment variable `WAYLAND_DISPLAY` can be defined to the socket name;
- otherwise, "wayland-0" is used.

Which socket is selected determines the compositor used by the client application: that at the other end of the socket.

Establishing the connection begins with a call to `wl_display_connect(const char *display_name)`. That call is done inside function `attempt_wayland()` mentioned before with a NULL argument, or when a non default Wayland display name is specified as explained above. That call returns a `struct wl_display` pointer or NULL in case of failure. Such NULL return is the hint that allows the FLTK display opening procedure of the Wayland/X11 hybrid to recognize when Wayland access is not possible and to fallback to X11. If the call is successful, its non-NULL return is assigned to class variable `Fl_Wayland_Screen_Driver::wl_display`. The rest of the work is done in function `Fl_Wayland_Screen_Driver::open_display_platform()`. A call to `wl_registry_add_listener()` associates a 2-member listener, whose 1st member, `registry_handle_global()`, will be called by Wayland a number of times to indicate each time a protocol supported by the compositor or a system feature such as displays and keyboards.

FLTK runs this code to receive calls to `registry_handle_global()`:

```
static void sync_done(void *data, struct wl_callback *cb, uint32_t time) {
    *(struct wl_callback **)data = NULL;
    wl_callback_destroy(cb);
}
static const struct wl_callback_listener sync_listener = {
    sync_done
};
struct wl_callback *registry_cb = wl_display_sync(wl_display);
wl_callback_add_listener(registry_cb, &sync_listener, &registry_cb);
while (registry_cb) wl_display_dispatch(wl_display);
```

A pointer to an object of type `struct wl_callback` created by function `wl_display_sync()` is assigned to variable `registry_cb`. Then a 1-member listener is attached to this object. Wayland will run this listener's member function, `sync_done()`, after all calls to `registry_handle_global()` have occurred. Function `sync_done()` sets to null variable `registry_cb` and destroys the `wl_callback`. Finally, function `wl_display_dispatch()` is called as long as variable `registry_cb` is not null. Thus, when `sync_done()` runs, FLTK has received all due calls to `registry_handle_global()`.

The prototype of function `registry_handle_global` is:

```
static void registry_handle_global(void *user_data, struct wl_registry *wl_registry,
    uint32_t id, const char *interface, uint32_t version)
```

Each time Wayland calls `registry_handle_global()`, `interface` and `version` give the name and version of a component or feature of the Wayland system. Here is the list of the `interface` value for all protocols

and system features FLTK uses:

interface	use
wl_compositor	create wl_surface objects
wl_subcompositor	create subwindows
wl_shm	create buffers and buffer factories
wl_seat	create the unique "seat"
wl_data_device	support of copy/paste/drag-n-drop
wl_output	received once for each display
xdg_wm_base	create mapped windows
gtk_shell1	signals Mutter is in use + titlebar gestures
weston_desktop_shell	signals Weston is in use
org_kde_plasma_shell	signals KDE/Plasma is in use
zwp_text_input_manager_v3	interface with Text Input Methods
zxdg_decoration_manager_v1	select between CSD and SSD modes

Wayland compositors typically support several other protocols (e.g., `zxdg_output_manager_v1`) that FLTK does not use.

Each time `registry_handle_global` runs with an interface from the table above, FLTK calls `wl_registry_bind()` which returns a pointer to a Wayland structure that will be the client's access point to the corresponding Wayland protocol or system feature. This pointer is stored in a dedicated member variable of the unique `Fl_Wayland_Screen_Driver` object of an FLTK app, or of another object accessible from this object. For example, when interface equals `"wl_compositor"`, the value returned by `wl_registry_bind()` is stored as member `wl_compositor` of the `Fl_Wayland_Screen_Driver` object. Function `registry_handle_global()` also identifies whether the Mutter, Weston, or KWin compositor is connected and stores this information in static member variable `Fl_Wayland_Screen_Driver::compositor`. Other compositors (e.g., `sway`, `labwc`) are not specifically identified by FLTK and store value unspecified in member variable `compositor`.

Wayland calls `registry_handle_global()` with its parameter `interface` equals to `"wl_output"` once for each screen connected to the system. Each time, a pointer to a Wayland object of type `struct wl_output` is obtained by a call to `wl_registry_bind()` and an FLTK record of type `Fl_Wayland_Screen_Driver::output` is created. This FLTK record is added to the end of the linked list of known screens that starts at member `outputs` of the `Fl_Wayland_Screen_Driver` object. A 4-member listener is associated to the `struct wl_output` by function `wl_output_add_listener()`. The 3rd member of this 4-function listener, `output_done()`, runs after all initialization steps of the screen have completed and turns to `true` member `done` of the record of type `Fl_Wayland_Screen_Driver::output`. Function `sync_done()` mentioned above therefore also calls `wl_display_dispatch()` until the `done` member of all `Fl_Wayland_Screen_Driver::output` records are `true`. Overall, after return from function `sync_done()`, FLTK has been made aware of all optional protocols and features of its connected Wayland compositor, and has initialized all screens of the system.

Finally, function `wl_display_get_fd()` is called to obtain the file descriptor of the Wayland socket and a call to `Fl::add_fd()` makes FLTK listen to this descriptor in `FL_READ` mode and associates function `wayland_socket_callback()` from file `Fl_Wayland_Screen_Driver.cxx` with it. This function calls `wl_display_dispatch()` which reads and interprets data available from the file descriptor, and calls corresponding listeners. Function `wayland_socket_callback()` repeats the `wl_display_dispatch()` call as long as data are available for reading.

The event loop is run by function `Fl_Unix_System_Driver::wait()` which is used by both the Wayland and X11 FLTK backends. Among various tasks, this function waits for data arriving on the file descriptors FLTK is listening. Overall, the Wayland backend's event loop differs from that of the X11 backend only in the callback function handling data read from the Wayland connection socket and in overridden functions `Fl_Wayland_Screen_Driver::poll_or_select_with_delay()` and `Fl_Wayland_Screen_Driver::poll_or_select()`.

### 25.1.6 Wayland windows and surfaces

Wayland defines objects called surfaces of type `struct wl_surface`. A Wayland surface "has a rectangular area which may be displayed on zero or more displays, present buffers, receive user input, and define a local

coordinate system". In short, surface is the name Wayland uses for a window. Buffers allow the client app to define the graphical content of surfaces (see [Wayland buffers](#)). FLTK creates a surface each time an [Fl\\_Window](#) is shown() in calling function `wl_compositor_create_surface()`. Static member function `Fl_Wayland_Window_Driver::surface_to_window(struct wl_surface *)` gives the `Fl_Window*` corresponding to the surface given in argument.

FLTK recognizes 4 mutually exclusive kinds of surfaces :

- DECORATED are toplevel windows with a titlebar;
- UNFRAMED are toplevel windows without titlebar;
- POPUP correspond to menus and tooltips;
- SUBWINDOW correspond to an [Fl\\_Window](#) embedded in another [Fl\\_Window](#).

Function `Fl_Wayland_Window_Driver::makeWindow()` creates all these surfaces, creates for each a record of type `struct wld_window` (see [wld\\_window](#)), and stores the window kind in member variable `kind` of this record. Member variable `xid` of the window's `Fl_X` record stores the address of this record.

Except for SUBWINDOW's, each surface needs a Wayland object of type `struct xdg_surface` used to make it become a mapped window and stored in member `xdg_surface` of the window's `wld_window` record. For DECORATED windows, this object is created inside `libdecor` and transmitted to FLTK by function `libdecor_frame_get_xdg_surface()`. For UNFRAMED and POPUP windows, it's created by function `xdg_wm_base_get_xdg_surface()`. Finally, each surface is also associated to one more Wayland object whose type varies with the window's kind. These explain this part of the `wld_window` record:

```
union {
    struct libdecor_frame *frame; // created for DECORATED by libdecor_decorate()
    struct wl_subsurface *subsurface; // created for SUBWINDOW by wl_subcompositor_get_subsurface()
    struct xdg_popup *xdg_popup; // created for POPUP by xdg_surface_get_popup()
    struct xdg_toplevel *xdg_toplevel; // created for UNFRAMED by xdg_surface_get_toplevel()
};
```

Except for SUBWINDOW's, each surface is associated to a 'configure' function that Wayland calls one or more times when the window is going to be mapped on the display. The 'configure' function of DECORATED surfaces is `handle_configure()` which is the 1st member of a 4-member listener named `libdecor_frame_iface` associated to a decorated window when it's created calling `libdecor_decorate()`. Finally, a call to `libdecor_frame_map()` triggers the process of mapping the newly created DECORATED surface on a display. Wayland calls `handle_configure()` twice during this process. The first `handle_configure()` run allows to set the window's `xdg_surface` object which is returned by function `libdecor_frame_get_xdg_surface()`. FLTK distinguishes the first from the second run of `handle_configure()` by looking at the `xdg_surface` member variable that's NULL at the beginning of the 1st run and not NULL later. Wayland calls `handle_configure()` also during operations such as resizing, minimizing (see below). With the help of a few calls to `libdecor` functions, FLTK obtains in this function all needed information about the size and state of the mapped window. The 'configure' functions of UNFRAMED and POPUP surfaces are `xdg_surface_configure()`, `xdg_toplevel_configure()` and `popup_configure()`. The mapping process of these surfaces is triggered by a call to `wl_surface_commit()`. These 'configure' functions transmit effective window size information to FLTK. Also, they are where the window's `Fl_Window_Driver::wait_for_expose_value` member variable is set to 0 to indicate that the window has been mapped to display. **Caution**: there are some small differences between how and when the various Wayland compositors call `handle_configure()`.

When a decorated window changes size, whatever the cause of it, Wayland calls `handle_configure()` which sets member variable `Fl_Wayland_Window_Driver::in_handle_configure` to true and calls the window's virtual `resize()` function which ultimately runs `Fl_Wayland_Window_Driver::resize()` which calls `Fl_Group::resize()` to perform FLTK's resize operations and `Fl_Wayland_Graphics_Driver::buffer_release()` to delete the existing window buffer that's not adequate for the new window size. At the end of the run of `handle_configure()`, `in_handle_configure` is set back to false. When the window size change is caused by the app itself calling the window's `resize()` function, `Fl_Wayland_Window_Driver::in_handle_configure` is false. This allows `Fl_Wayland_Window_Driver::resize()` to detect that Wayland needs be informed of the desired size change, which gets done by a call to `libdecor_frame_commit()`. Wayland later calls `handle_configure()` and events described above unfold.

Wayland generally does not provide a way to control where the compositor should map a window in the system displays. Nevertheless, for multi-display systems, Wayland allows to control on what display should the compositor map a fullscreen window. That is done inside function `handle_configure()` which calls `libdecor_frame_set_fullscreen()` for DECORATED windows and inside function `xdg_toplevel_configure()` which

calls `xdg_toplevel_set_fullscreen()` for UNFRAMED. The struct `wl_output` pointer for the targeted display is transmitted as 2nd argument of these calls.

### 25.1.7 Menu windows and other popups

Menu windows, tiny menu title windows, and tooltip windows are implemented using Wayland's popup mechanism which allows to position a popup window relatively to a previously mapped window, itself a popup or another kind of window, with the restriction that any popup must overlap or at least touch that other window. Member function `Fl_Wayland_Window_Driver::makeWindow` calls member function `Fl_Wayland_Window_Driver::process_menu_or_tooltip` to create all popups.

This function gets called after FLTK has computed using a given algorithm the desired (x,y) position of the popup window's top-left corner, using coordinates centered on the top-left corner of the toplevel window from which the popup originates. This algorithm is able to prevent popups from being positioned beyond the screen borders under the assumption that the position of a toplevel window inside a screen is known. While this assumption holds for other platforms, it does not for the Wayland platform. The FLTK code for the Wayland platform therefore modifies the algorithm that FLTK uses to compute the position of menu windows. The key information used by this algorithm is obtained by member function `Fl_Window_Driver::menu_window_area` which computes the coordinates of the rectangle where menu windows are allowed to be positioned. Under other platforms, this function just returns the origin and size of the work area of the screen in use. In contrast, the Wayland platform handles two situations differently :

- For menu windows that are not taller than the display in use, the Wayland-overridden member function `Fl_Wayland_Window_Driver::menu_window_area` returns large negative origin and large width and height values. This lets the standard FLTK algorithm position the menu relatively to its window of origin without concern about screen limits, and relies on Wayland's constraint mechanism described below to prevent the menu from going beyond these limits, without FLTK having to know where they are.
- Menu windows taller than the screen where they are mapped need special handling described in detail in a comment above the source code of function `Fl_Wayland_Window_Driver::process_menu_or_tooltip`.

Function `Fl_Wayland_Window_Driver::process_menu_or_tooltip` first computes `origin_win`, pointer to the `Fl_Window` relatively to which the popup is to be positioned. Window `origin_win` is the parent menu window when the popup is a sub-menu; it's the tiny windowtitle when the popup is a menu with a title; otherwise, it's the window containing the point of origin of the popup. An object of type struct `xdg_positioner` created by function `xdg_wm_base_create_positioner()` is used to express the rules that will determine the popup position relatively to `origin_win` as follows:

- Function `xdg_positioner_set_anchor_rect()` determines a rectangle in `origin_win` relatively to which the popup is to be positioned. When the popup to be created is a menu window spawned by an `Fl_Menu_Bar`, that rectangle is the full area of the menu title window. Otherwise, that rectangle is an adequately located point.
- Function `xdg_positioner_set_size()` sets the popup size.
- The `xdg_positioner_set_anchor(positioner, XDG_POSITIONER_ANCHOR_BOTTOM_LEFT);` and `xdg_positioner_set_gravity(positioner, XDG_POSITIONER_GRAVITY_BOTTOM_RIGHT);` calls position the popup so that its top-left corner is initially below and at right of the bottom-left corner of the `origin_win`'s anchor rectangle.
- The call to `xdg_positioner_set_offset()` further changes the popup vertical position.
- The call to `xdg_positioner_set_constraint_adjustment()` uses constraint flags `XDG_POSITIONER_CONSTRAINT_ADJUSTMENT_SLIDE_X` and `XDG_POSITIONER_CONSTRAINT_ADJUSTMENT_SLIDE_Y` which mean that the compositor will move the popup horizontally and vertically if its initial position would make it expand beyond the edges of the screen. Furthermore, flag `XDG_POSITIONER_CONSTRAINT_ADJUSTMENT_FLIP_Y` is added when the popup is a menu window spawned by an `Fl_Menu_Bar`; this has the popup flipped above the `Fl_Menu_Bar` if there's not enough screen room below it for the popup.
- Finally, a call to function `xdg_surface_get_popup()` creates the popup accounting for position rules listed above. The positioner is then deleted by `xdg_positioner_destroy()`, a listener is associated

to the popup surface with `xdg_popup_add_listener()`, and a call to `wl_surface_commit()` triggers the mapping of the popup on the display.

Overall, the expected coordinates of the top-left corner of the popup relatively to `origin_win` are `popup_x`, `popup_y`. They are memorized in a record of FLTK-defined type `struct win_positioner` that's associated to the popup listener. When the compositor maps the popup, function `popup_configure`, the first element of the popup listener, runs and receives as arguments the coordinates of the popup top left and its size. These values account for the positioning constraints of the popup which may have moved it to avoid screen borders. This function can therefore detect whether constraints applied have modified the effective popup location in comparison to the expected coordinates which are available as member variables of the `struct win_positioner` record mentioned above. That's key to the handling by FLTK of tall menu windows.

Groups of popups containing a menutitle, the associated menuwindow, and optionally a submenu window and that don't belong to an `Fl_Menu_Bar` are mapped in a different order: the menuwindow is mapped first, and the menutitle is mapped second above it as a child popup. Function `Fl_Window_Driver::is_floating_title()` detects when such a menutitle is created, static member variable `previous_floating_title` is assigned the value of this menutitle, and the menutitle is mapped only after the menuwindow has been mapped, as a child of it. This positions better the popup group in the display relatively to where the popup was created.

### 25.1.8 Fl\_Wayland\_Graphics\_Driver and Fl\_Cairo\_Graphics\_Driver

The Wayland platform of FLTK uses an `Fl_Wayland_Graphics_Driver` object for all its on-screen drawing operations. This object is created by function `Fl_Graphics_Driver::newMainGraphicsDriver()` called by `Fl_Display_Device::display_device()` when the library opens the display. New `Fl_Wayland_Graphics_Driver` objects are also created for each `Fl_Image_Surface` and each `Fl_Copy_Surface` used, and deleted when these objects are deleted.

Class `Fl_Wayland_Graphics_Driver` derives from class `Fl_Cairo_Graphics_Driver` which implements all the FLTK drawing API for a Cairo surface. Function `Fl_Wayland_Graphics_Driver::cairo_init()` creates the Cairo surface used by each `Fl_Wayland_Graphics_Driver` object by calling `cairo_image_surface_create_for_data()` for the window's or offscreen's `draw_buffer` (see below).

Class `Fl_Cairo_Graphics_Driver` is also used by the X11 leg of the hybrid Wayland-X11 platform because this leg draws to the display with an `Fl_X11_Cairo_Graphics_Driver` object which derives from class `Fl_Cairo_Graphics_Driver`. Finally, `Fl_Cairo_Graphics_Driver` is also used, in the form of an object from its derived class `Fl_PostScript_Graphics_Driver`, when the hybrid Wayland-X11 platform draws PDF or PostScript, or when the classic X11 platform uses Pango and draws PDF or PostScript. This happens when classes `Fl_PDF_File_Surface`, `Fl_PostScript_File_Device` and `Fl_Printer` are used.

### 25.1.9 Wayland buffers

Wayland uses buffers, objects of type `struct wl_buffer`, to draw to surfaces. In principle, one or more buffers can be associated to a surface, and functions `wl_surface_attach()` and `wl_surface_commit()` are called to first attach one such buffer to the surface and then inform the compositor to map this buffer's graphics content on the display. Wayland buffers can use various memory layouts. FLTK uses `WL_SHM_FORMAT_ARGB8888`, which is the same layout as what Cairo calls `CAIRO_FORMAT_ARGB32`.

FLTK calls function `Fl_Wayland_Window_Driver::make_current()` before drawing to any `Fl_Window`. Member `buffer` of this `Fl_Window`'s `struct wld_window` (see [wld\\_window](#)) is NULL when the window has just been created or resized. In that case, FLTK calls `Fl_Wayland_Graphics_Driver::create_wld_buffer()` which returns a pointer to a `struct wld_buffer` containing

- a Wayland buffer, member `wl_buffer`;
- a Cairo image surface, created by a call to `Fl_Wayland_Graphics_Driver::cairo_init()`.

Each of these two objects encapsulates a byte array of the same size and the same memory layout destined to contain the `Fl_Window`'s graphics. The Cairo image surface object is where FLTK draws. The Wayland buffer is what Wayland maps on the display. FLTK copies the Cairo surface's byte array to the Wayland buffer's byte array before beginning the mapping operation. If `width` and `height` are a window's dimensions in pixels,

```
int stride = cairo_format_stride_for_width(CAIRO_FORMAT_ARGB32, width);
int size = stride * height;
```

give `size`, the common size of both byte arrays.

The effective creation of the `wl_buffer` object is delayed until function `Fl_Wayland_Graphics_Driver::buffer_commit()` gets called. Section [Buffer factories](#) below details how FLTK creates `wl_buffer` objects.

The struct `Fl_Wayland_Graphics_Driver::wld_buffer` (see [wld\\_buffer](#)) contains a pointer to the byte array of the Cairo image surface (member `draw_buffer.buffer`), information about the Wayland buffer (members `wl_buffer` and `data`), the common size of the Cairo surface's and Wayland buffer's byte arrays (member `draw_buffer.data_size`), and other information. A pointer to this struct `Fl_Wayland_Graphics_Driver::wld_buffer` is memorized as member `buffer` of the [Fl\\_Window](#)'s `wld_window`. All drawing operations to the [Fl\\_Window](#) then modify the content of the Cairo image surface.

Function `Fl_Wayland_Window_Driver::flush()` is in charge of sending FLTK graphics data to the display. That is done by calling function `Fl_Wayland_Graphics_Driver::buffer_commit()` which creates the struct `wl_buffer` object calling `create_shm_buffer()` if that was not done before, copies the byte array of the Cairo surface to the Wayland buffer's starting memory address, and calls functions `wl_surface_attach()` and `wl_surface_commit()`. Before calling [Fl\\_Window::flush\(\)](#), FLTK has computed a damaged region. If that region is not null, `Fl_Wayland_Graphics_Driver::buffer_commit()` copies only the damaged parts of the Cairo surface to the Wayland buffer and calls function `wl_surface_damage_buffer()` for these parts to inform the compositor of what parts of the surface need its attention.

### Wayland buffer deletion

Each [wld\\_buffer](#) record contains boolean member `in_use` which is set to `true` just before the buffer gets committed, and boolean member `released` which is set to `true` when FLTK no longer needs the buffer and calls `Fl_Wayland_Graphics_Driver::buffer_release()`. FLTK's buffer-creating function, `Fl_Wayland_Graphics_Driver::create_shm_buffer()`, attaches a 1-member listener to each buffer which Wayland calls after a commit operation to indicate the client is allowed to re-use the buffer. This listener's member function, `buffer_release_listener()`, turns to false member `in_use` of the buffer's [wld\\_buffer](#) record. Since the two events 'FLTK no longer needs the buffer' and 'the client is allowed to re-use the buffer' can arrive in any order, FLTK deletes the struct `wl_buffer` object by running `do_buffer_release()` only after both events happened, that is, when `in_use` is false and `released` is true. That's why function `do_buffer_release()` is called by both functions `Fl_Wayland_Graphics_Driver::buffer_release()` and `buffer_release_listener()`.

#### 25.1.10 Throttling window redraws

FLTK uses Wayland's synchronization mechanism to make sure any committed `wl_buffer` is not changed while the compositor is using it and to refrain from calling `wl_surface_commit()` more frequently than the system can process it. Firstly, as seen above, Wayland calls function `buffer_release_listener()` when the client is free to reuse or destroy a given `wl_buffer`. FLTK won't change or destroy a committed `wl_buffer` before that call. Second, this 2-step mechanism prevents Wayland clients from committing new buffer states too frequently:

- `Fl_Wayland_Graphics_Driver::buffer_commit()` first calls function `wl_surface_frame()` to obtain a pointer to a struct `wl_callback` object and stores it as member `frame_cb` of the surface's [wld\\_window](#). Then it calls `wl_callback_add_listener()` to associate this object to the FLTK-defined, callback function `surface_frame_done()`. It next calls `wl_surface_commit()`. Together, these 3 calls instruct Wayland to start mapping the buffer content to the display and to call `surface_frame_done()` later, when it will have become ready for another mapping operation.
- Later, `surface_frame_done()` runs and destroys the `wl_callback` object by function `wl_callback_destroy()` and sets member `frame_cb` to NULL.

Member variable `draw_buffer_needs_commit` of the [wld\\_buffer](#) is also important in this mechanism : it informs FLTK that the graphics buffer has changed and needs being committed. This variable is turned `true` every time a graphics operation changes the buffer content and turned `false` when the buffer gets committed.

This procedure ensures that FLTK never calls `wl_surface_commit()` before the compositor becomes ready for a new commit because `Fl_Wayland_Window_Driver::flush()` calls `Fl_Wayland_Graphics_Driver::buffer_commit()` only if `frame_cb` is NULL. If it's not NULL, the exact content of function `surface_frame_done()` :

```
static void surface_frame_done(void *data, struct wl_callback *cb, uint32_t time) {
    struct wld_window *window = (struct wld_window *)data;
    wl_callback_destroy(cb);
}
```

```

window->frame_cb = NULL;
if (window->buffer && window->buffer->draw_buffer_needs_commit) {
    Fl_Wayland_Graphics_Driver::buffer_commit(window);
}
}

```

has the effect that when the mapping operation eventually completes, Wayland runs `surface_frame_done()`, which, if the buffer's `draw_buffer_needs_commit` member is true, calls `Fl_Wayland_Graphics_Driver::buffer_commit()` anew. The net result is that the screen shows the most recent surface content. This synchronization mechanism is also used when performing an interactive window resize operation. During such operation, the compositor informs the client an interactive resize is being performed and sends window resize commands at high rate (~60 Hz) to the client via the socket. Libdecor turns on flag `LIBDECOR_WINDOW_STATE_RESIZING` to inform the client, and runs function `handle_configure()` for each received resize command. Before calling `Fl_Group::resize()` and later `Fl_Window::draw()`, `handle_configure()` tests whether `window->frame_cb` is NULL. When it's not because a previous resize operation is being performed, the current resize command is skipped. At the end of the interactive resize, flag `LIBDECOR_WINDOW_STATE_RESIZING` is off and Wayland sends a final resize command which is not skipped. Overall, this ensures the client program resizes its window as frequently as it can without falling behind resize commands sent by the compositor. To account for a bug in Mutter (issue #878), the `window->frame_cb` object is not created when a toplevel window is being resized and is entirely covered by one subwindow.

### Progressive window drawing

FLTK supports progressive drawing when an app calls function `Fl_Window::make_current()` at any time and then calls the FLTK drawing API. This is made possible in function `Fl_Wayland_Window_Driver::make_current()` with

```

// to support progressive drawing
if ( (!Fl_Wayland_Window_Driver::in_flush) && window->buffer && (!window->frame_cb)
    && window->buffer->draw_buffer_needs_commit && (!wait_for_expose_value) ) {
    Fl_Wayland_Graphics_Driver::buffer_commit(window);
}

```

Thus, `buffer_commit()` runs only when `frame_cb` is NULL. If an app rapidly performs calls to `Fl_Window::make_current()` and to drawing functions, FLTK will copy `draw_buffer` to the Wayland buffer and instruct Wayland to map it to the display when `frame_cb` is NULL which means that the compositor is ready to start performing a mapping operation. This occurs when the progressive drawing operation begins. Later, `frame_cb` is generally found non NULL when `Fl_Wayland_Window_Driver::make_current()` runs because the compositor is busy processing the previous Wayland buffer. When the compositor has completed this processing, the client app runs `surface_frame_done()` which, provided member variable `draw_buffer_needs_commit` is true, calls `Fl_Wayland_Graphics_Driver::buffer_commit()`. This makes the compositor map the Wayland buffer in its new, more advanced, state.

An example of progressive drawing is given by FLTK's mandelbrot test app. When set to fullscreen, this app can be seen to progressively fill its window from top to bottom by blocks of lines, each block appearing when the compositor is ready to map a new buffer. When the compositor is not ready, the app does not block but continues computing and drawing in memory but not on display more lines of the desired Mandelbrot graph.

### 25.1.11 Buffer factories

Wayland names *buffer factory* a software procedure that constructs objects of type `struct wl_buffer` for use by a client application. FLTK creates a `wl_buffer` object each time an `Fl_Window` is mapped on a display or resized. That's done by member function `Fl_Wayland_Graphics_Driver::create_shm_buffer()` which follows this 3-step procedure to create a "buffer factory" for FLTK and to construct Wayland buffers from it:

- Libdecor function `libdecor_os_create_anonymous_file(off_t size)` creates an adequate file and mmap's it. This file lives in RAM because it is created by function `memfd_create()`. FLTK sets this file size to 10 MB unless the size of the buffer to be created is larger; in that case the anonymous file is sized to twice the buffer size.
- Wayland function `wl_shm_create_pool()` shares this mmap'ed memory with the Wayland compositor and returns an object of type `struct wl_shm_pool` which encapsulates this memory. A record of type `struct Fl_Wayland_Graphics_Driver::wld_shm_pool_data` is created and associated to the newly created `wl_shm_pool` by `wl_shm_pool_set_user_data()`. This record stores the starting address (`pool_memory`) and size (`pool_size`) of the pool's encapsulated memory. The record also contains member buffers of type `struct wl_list` which stores the access point to the linked list of `wl_buffer` objects that will be created from the `wl_shm_pool`.

- A variable named `chunk_offset` represents the offset within the pool's shared memory available for the buffer being constructed. It equals 0 when the pool has just been created and is updated as detailed below each time a buffer is created from the pool. A record of type `struct Fl_Wayland_Graphics_Driver::wld_buffer` is created. This record will contain (member `wl_buffer`) the address of a `wl_buffer` object that's created by function `wl_shm_pool_create_buffer()`. This `wl_buffer` object encapsulates a section of a given size of the pool's shared memory beginning at offset `chunk_offset` in it. Quantity `pool_memory + chunk_offset` is therefore the address of the beginning of the mmap'ed memory section encapsulated by this `wl_buffer`. Member `shm_pool` of the newly constructed `Fl_Wayland_Graphics_Driver::wld_buffer` object is set to the address of the current `wl_shm_pool` object. This record is added to the head of the linked list of current pool's buffers by a call to `wl_list_insert()`. At that point, a `struct Fl_Wayland_Graphics_Driver::wld_buffer` record is part of the linked list of all such records corresponding to `wl_buffer` objects created from the same `wl_shm_pool` object, and member `shm_pool` of this record gives the address of this `wl_shm_pool`. When a new `struct Fl_Wayland_Graphics_Driver::wld_buffer` record is to be created,

```
struct wld_shm_pool_data *pool_data =
    (struct wld_shm_pool_data *)wl_shm_pool_get_user_data(pool);
struct Fl_Wayland_Graphics_Driver::wld_buffer *record = wl_container_of(pool_data->buffers.next,
    record, link);
int chunk_offset = ((char*)record->data - pool_data->pool_memory) + record->data_size;
```

gives the offset within the current pool's mmap'ed memory available for a new `wl_buffer`. Macro `wl_container_of()` gives the address of a record belonging to a linked list of records of the same type.

A window's `wl_buffer` is re-filled by graphics data and committed each time the window gets redrawn, and is set to be destroyed by function `Fl_Wayland_Graphics_Driver::buffer_release()` when `Fl_Window::hide()` runs or the window is resized. When the `wl_buffer` is no longer in use, function `do_buffer_release()` gets called as explained above. It destroys the `wl_buffer` with `wl_buffer->destroy()`, and removes the corresponding `Fl_Wayland_Graphics_Driver::wld_buffer` record from the linked list of buffers from the same `wl_shm_pool`. Since new `Fl_Wayland_Graphics_Driver::wld_buffer` records are added at the head of the linked list, and since the record at the head of this list is used to compute the offset within the pool's mmap'ed memory available for a new `wl_buffer`, destruction of the last created `wl_buffer` allows to re-use the destroyed buffer's pool's memory for a new `wl_buffer`.

When function `do_buffer_release()` finds the list of buffers from a given pool empty, two situations can occur. 1) This pool is the current pool. Its mmap'ed memory will be re-used from offset 0 to create future `wl_buffer` objects. 2) This pool is not current. It gets destroyed with `wl_shm_pool_destroy()`, the pool's mmap'ed memory is munmap'ed, and the pool's associated `struct wld_shm_pool_data` is freed. In situation 1) above, the next `wl_buffer` to be created can need more memory than the current pool's memory size. If so, the current pool gets destroyed and replaced by a new, larger pool.

If the sum of `chunk_offset` plus the buffer size is larger than the current pool's size when function `create_shm_buffer()` is called, `chunk_offset` is reset to 0, and a new `wl_shm_pool` object is created and used by FLTK's "buffer factory". This mechanism allows to access new mmap'ed memory when `chunk_offset` reaches the end of the previous mmap'ed section.

Wayland uses also `wl_buffer` objects to support cursors. FLTK uses the "buffer factory" described here when creating custom cursors (see [custom-cursor](#)) with function `Fl_Wayland_Window_Driver::set_cursor(const Fl_RGB_Image *, ...)` which calls `create_shm_buffer()` via `set_cursor_4args()`, `custom_offscreen()` and `create_wld_buffer()`. In contrast, standard shaped-cursors (e.g., `FL_CURSOR_INSERT`) use their own "buffer factory" inside Wayland functions such as `wl_cursor_theme_get_cursor()`. Therefore, the fact that the `wl_buffer` objects behind standard cursors are never destroyed doesn't prevent disused `struct wl_shm_pool` objects from being freed because those buffers come from a distinct "buffer factory". The "buffer factory" described here is also used by function `offscreen_from_text()` when displaying dragged text in a DnD operation.

### 25.1.12 Displays and HighDPI support

Wayland uses the concept of *seat* of type `struct wl_seat` which encompasses displays, a keyboard, a mouse, and a trackpad. Although Wayland may be in principle able to deal with several seats, FLTK's Wayland platform is conceived for one seat only. That seat may contain one or more displays, which Wayland calls *outputs*, of type `struct wl_output`.

As written above, function `registry_handle_global()` discovers the available seat at start-up time. This function also associates a listener to each display connected to the system by calling function `wl_output_`

`add_listener()`. This listener's member functions run at program startup when Wayland discovers its displays (see [Opening a Wayland connection](#)). Member `output_mode` runs also when the display is resized and member `output_scale` also when the Wayland scale factor (see below) is changed. FLTK defines type `struct Fl_Wayland_Screen_Driver::output` to store display size and scaling information. One such record is created for each display. These records are put in a `struct wl_list` accessible from member `outputs` of the single `Fl_Wayland_Screen_Driver` object.

FLTK uses 2 distinct scaling parameters for each display:

- `int wld_scale;` This member variable of the `struct Fl_Wayland_Screen_Driver::output` record typically equals 1 for standard, and 2 for HighDPI displays. The effect of value `n` of variable `wld_scale` is that 1 Wayland graphics unit represents a block of  $n \times n$  pixels. Another effect is that a drawing buffer for a surface of size  $W \times H$  units contains  $W * n * H * n * 4$  bytes. Member function `output_scale()` mentioned above sets this value for each system's display at startup time. Member function `Fl_Wayland_Graphics_Driver::buffer_commit()` informs the Wayland compositor of the value of `wld_scale` calling `wl_surface_set_buffer_scale()` which is enough to make FLTK apps HighDPI-aware. Under the gnome and KDE desktops, this parameter is visible in the "Settings" app, "Displays" section, "Scale" parameter which is 200% on HighDPI displays.
- `float gui_scale;` This other member variable is where FLTK's own GUI scaling mechanism with `ctrl+/-/0/` keystrokes and with environment variable `FLTK_SCALING_FACTOR` operates: when FLTK is scaled at 150%, `gui_scale` is assigned value 1.5. Function `Fl_Wayland_Screen_Driver::scale(int n, float f)` assigns value `f` to the `gui_scale` member variable of display # `n`. This variable is used by function `Fl_Wayland_Window_Driver::make_current()` when it calls `Fl_Wayland_Graphics_Driver::set_buffer()` that scales the graphics driver by this factor with `cairo_scale()`.

Overall, an FLTK object, say an `Fl_Window`, of size  $W \times H$  FLTK units occupies `int(W * gui_scale) * wld_scale x int(H * gui_scale) * wld_scale` pixels on the display.

When an `Fl_Window` is to be shown, `Fl_Wayland_Window_Driver::makeWindow()` creates a `struct wl_surface` with `wl_compositor_create_surface()` and associates it calling `wl_surface_add_listener()` with a 2-member listener called `surface_listener` encharged of managing as follows the list of displays where this `wl_surface` will map. The `Fl_Window` possesses an initially empty linked list of displays accessible at member `outputs` of the window's `wld_window` record. When the `Fl_Window`, or more exactly its associated `struct wl_surface` is mapped on a display, member `surface_enter()` of `surface_listener` runs. This function adds the display where the surface belongs to the end of the linked list of displays for this surface. When a surface is dragged or enlarged across the edge of a display in a multi-display system and expands on a second display, `surface_enter()` runs again, and this surface's list of displays contains 2 items. When a surface leaves a display, member `surface_leave()` of `surface_listener` runs. It removes that display from the surface's list of displays. Each time the first item of a surface's list of displays changes, function `change_scale()` is called and applies that display's `gui_scale` value to that surface calling `Fl_Window_Driver::screen_num(int)`. When a window is unmapped by function `Fl_Wayland_Window_Driver::hide()`, the surface's list of displays is emptied.

## Fractional scaling

The KWin and gnome compositors allow to use *fractional scaling* that can take values between 100% and 400% that are not a multiple of 100%. Wayland implements this rendering all `wl_surface`'s as if the scaling had the next value above that is a multiple of 100% (e.g., 175% --> 200%), and downsizing them to the desired fractional scale value at the compositing stage. Seen from FLTK, everything runs with `wld_scale` having an integer value (1, 2, 3 or 4).

Some gnome versions may natively support fractional scaling. Others require to use these commands to make them accept/refuse fractional scaling:

```
gsettings set org.gnome.mutter experimental-features "['scale-monitor-framebuffer']"
gsettings reset org.gnome.mutter experimental-features
```

## 25.1.13 Mouse and trackpad handling

FLTK receives information about mouse and pointer events via a 'listener' made up of 5 pointers to functions which Wayland calls when events listed in table below occur. These functions receive from Wayland enough information in their parameters to generate corresponding FLTK events, that is, calls to `Fl::handle(int event_type, Fl_Window *)`.

listener function	called by Wayland when	resulting FLTK events
pointer_enter	pointer enters a window	FL_ENTER
pointer_leave	pointer leaves a window	FL_LEAVE
pointer_motion	pointer moves inside a window	FL_MOVE
pointer_button	state of mouse buttons changes	FL_PUSH, FL_RELEASE
pointer_axis	trackpad is moved vertically or horizontally	FL_MOUSEWHEEL

pointer\_listener is installed by a call to function `wl_pointer_add_listener()` made by function `seat_capabilities()` which is itself another 'listener' made up of 2 function pointers

```
static struct wl_seat_listener seat_listener = {
    seat_capabilities,
    seat_name
};
```

installed by a call to function `wl_seat_add_listener()` made by function `registry_handle_global()` when it receives a "wl\_seat" interface.

### Handling middle mouse button clicks on window titlebars

The gnome desktop, via its `gnome-tweaks` application, allows to determine what happens when a middle mouse button click occurs on a window titlebar. To obey this setting, FLTK implements part of the `GTK Shell` protocol as follows. Mutter, gnome's Wayland compositor, declares its support of the `GTK Shell` protocol calling `registry_handle_global()` with its interface argument equal to "gtk\_shell1". FLTK initializes then member variable `seat->gtk_shell` of type `struct gtk_shell1*`.

Member functions of `pointer_listener` mentioned above run for all mouse events on all `wl_surface` objects. The table above describes what these functions do for mouse events on FLTK-created `wl_surface` objects. But they also run for the `libdecor`-created `wl_surface` objects corresponding to window titlebars. Thus, member function `pointer_enter()` runs when the mouse enters a titlebar. It calls `Fl_Wayland_Screen_Driver::event_coords_from_surface()` which calls `Fl_Wayland_Window_Driver::surface_to_window()` which, as mentioned above, can distinguish FLTK-created from non FLTK-created `wl_surface` objects. This allows `pointer_enter()` to identify the entered surface as a titlebar and to assign static global variable `gtk_shell_surface` with the titlebar's `wl_surface` when the mouse enters a titlebar. Similarly, member function `pointer_leave()` sets `gtk_shell_surface` to NULL when the mouse leaves this titlebar. When there's a click on a titlebar, member function `pointer_button()` runs this code

```
if (gtk_shell_surface && state == WL_POINTER_BUTTON_STATE_PRESSED && button == BTN_MIDDLE) {
    struct gtk_surface1 *gtk_surface = gtk_shell1_get_gtk_surface(seat->gtk_shell, gtk_shell_surface);
    gtk_surface1_titlebar_gesture(gtk_surface, serial, seat->wl_seat, GTK_SURFACE1_GESTURE_MIDDLE_CLICK);
    gtk_surface1_release(gtk_surface);
    return;
}
```

which ensures that what `gnome-tweaks` has assigned to middle-click events is executed. At this point, FLTK obeys what `libdecor` decides for right-click (display the window menu) and double-click (maximize the window) events on titlebars which may diverge from `gnome-tweaks` settings.

#### 25.1.14 Wayland cursors

Wayland defines types `struct wl_cursor` and `struct wl_cursor_theme` to hold cursor-related data. FLTK uses function `init_cursors()` from file `Fl_Wayland_Screen_Driver.cxx` to obtain the 'cursor theme' name using function `libdecor_get_cursor_settings()` of library `libdecor`. Function `wl_cursor_theme_load()` then returns a pointer to an object of type `struct wl_cursor_theme` stored in member variable `cursor_theme` of the `Fl_Wayland_Screen_Driver::seat` record. Function `init_cursors()` is itself called by a 'listener' called `seat_capabilities()` installed when function `registry_handle_global()` receives a "wl\_seat" interface, at program startup. It is also called when the value of the Wayland scaling factor changes: `output_done()` calls `try_update_cursor()` calls `init_cursors()`. Function `output_done()` belongs to a 'listener' installed when function `registry_handle_global()` receives a "wl\_output" interface.

Each time `Fl_Window::cursor(Fl_Cursor)` runs, FLTK calls `Fl_Wayland_Window_Driver::set_cursor(Fl_Cursor)` which calls `wl_cursor_theme_get_cursor()` to set the current cursor shape to one of the standard shapes from the `Fl_Cursor` enumeration. This Wayland function selects a cursor shape based on the current `wl_cursor_theme` object and a cursor name and returns a pointer to a `struct wl_cursor`. Under the gnome desktop, cursor names are the files of directory `/usr/share/icons/XXXX/cursors/` where XXXX is the 'gnome cursor theme' (default= Adwaita). For example, what FLTK calls

FL\_CURSOR\_INSERT corresponds to file `xterm` therein. The full correspondance between `Fl_Cursor` values and names of files therein is found in function `Fl_Wayland_Window_Driver::set_cursor(Fl_Cursor)`. FLTK stores in member variable `default_cursor` of the `Fl_Wayland_Screen_Driver::seat` record a pointer to the currently used `wl_cursor` object, and the current `Fl_Cursor` value in member `standard_cursor` of the `Fl_Wayland_Window_Driver` object.

Finally, function `do_set_cursor()` of file `Fl_Wayland_Screen_Driver.cxx` makes the system pointer use the current `wl_cursor` object to draw its shape on screen. That's done with a call to `wl_pointer_set_cursor()` and a few other functions.

### Custom cursor shapes

To support custom cursors, FLTK presently uses a non-public type, `struct cursor_image`, defined in file `Fl_Wayland_Window_Driver.cxx` as follows:

```
struct cursor_image {
    struct wl_cursor_image image;
    struct wl_cursor_theme *theme;
    struct wl_buffer *buffer;
    int offset;
};
```

This definition has been copied to the FLTK source code from file `wayland-cursor.c` of the Wayland project source code because it's not accessible via Wayland header files. It shows that a pointer to a `cursor_image` object can also be viewed as a pointer to the embedded `struct wl_cursor_image` object, this one being part of the public Wayland API. It also shows that a `struct cursor_image` object has an associated `struct wl_buffer` object used to contain the cursor's graphics.

Function `Fl_Wayland_Window_Driver::set_cursor(const Fl_RGB_Image *rgb, int hotx, int hoty)` gives FLTK support of custom cursor shapes. It calls `Fl_Wayland_Window_Driver::set_cursor_4args()` that creates a `cursor_image` object, allocates the corresponding `wl_buffer` by a call to `Fl_Wayland_Graphics_Driver::create_shm_buffer()` via `custom_offscreen()` and `create_wld_buffer()` and draws the cursor shape into that buffer using the offscreen-drawing method of FLTK.

The public type `struct wl_cursor` is essentially an array of `wl_cursor_image` objects and a name:

```
struct wl_cursor {
    unsigned int image_count;
    struct wl_cursor_image **images;
    char *name;
};
```

Function `Fl_Wayland_Window_Driver::set_cursor_4args()` also creates a `struct wl_cursor` object containing a single `wl_cursor_image`, which is in fact the `cursor_image`. Finally, a `struct Fl_Wayland_Window_Driver::custom_cursor` (see [wld\\_window](#)) is allocated and used to memorize the `struct wl_cursor` and the cursor's image and hotspot. A pointer to this `struct Fl_Wayland_Window_Driver::custom_cursor` object is stored in member `custom_cursor` of the window's [wld\\_window](#).

Function `Fl_Wayland_Window_Driver::set_cursor_4args()` is also called when a window with a custom cursor is moved between distinct displays or when a display is rescaled to adapt the cursor size to the new display's scale factor.

Static member function `Fl_Wayland_Window_Driver::delete_cursor()` is used to delete any custom cursor shape. This occurs when a window associated to a custom cursor is un-mapped and when such a window gets associated to a standard cursor or to a new custom cursor.

## 25.1.15 Keyboard support

The "Mouse handling" section above mentioned function `seat_capabilities()` that Wayland calls when the app discovers its "seat". Presence of flag `WL_SEAT_CAPABILITY_KEYBOARD` in argument `capabilities` of this function indicates that a keyboard is available. In that case, a call to `wl_seat_get_keyboard()` returns a pointer stored in member `wl_keyboard` of the `Fl_Wayland_Screen_Driver::seat` object, and a call to `wl_keyboard_add_listener()` installs a 6-member listener of type `struct wl_keyboard_listener`. These 6 FLTK-defined, callback functions are used as follows.

1) Function `wl_keyboard_keymap()` runs when the app starts and also if the keyboard layout is changed during run-time. It allows initialization of access to this keyboard. Noticeably, member `xkb_state` of type `struct xkb_state*` of the current `Fl_Wayland_Screen_Driver::seat` record is adequately initialized.

2-3) Functions `wl_keyboard_enter()` and `wl_keyboard_leave()`, called when focus enters and leaves a surface, send `FL_FOCUS` and `FL_UNFOCUS` events to the [Fl\\_Window](#) object corresponding to this surface.

4) Function `wl_keyboard_key()` runs each time a keyboard key is pressed or released. Its argument `key`, to which 8 must be added, provides the keycode via function `xkb_state_key_get_one_sym()` and then the corresponding text via function `xkb_state_key_get_utf8()` which is put in `Fl::e_text`. Then, a few calls to functions whose name begin with `xkb_compose_` are necessary to support dead and compose keys. Finally a call to `Fl::handle()` sends an `FL_KEYDOWN` or `FL_KEYUP` event to the appropriate `Fl_Window`. Also, function `wl_keyboard_key()` uses global variable `Fl_Int_Vector key_vector` to record all currently pressed keys. This is the base of the implementation of `Fl_Wayland_Screen_Driver::event_key(int)`.

5) Function `wl_keyboard_modifiers()` runs when a modifier key (e.g., shift, control) is pressed or released. Calls to functions `xkb_state_update_mask()` and `xkb_state_mod_name_is_active()` allow FLTK to set `Fl::e_state` adequately.

6) Function `wl_keyboard_repeat_info()` does not run, for now, because this would require version 4 of the `wl_keyboard` object which is at version 2 in all tested Wayland compositors.

### 25.1.16 Support of text input methods

When the connected Wayland compositor supports text input methods, function `registry_handle_global()` gets called with its interface argument equal to `zwp_text_input_manager_v3` interface.name. The following call to `wl_registry_bind()` returns a pointer to type struct `zwp_text_input_manager_v3` that is stored as member `text_input_base` of the `Fl_Wayland_Screen_Driver` object.

Later, when function `seat_capabilities()` runs, `text_input_base` is found not NULL, which triggers a call to function `zwp_text_input_manager_v3_get_text_input()` returning a value of type struct `zwp_text_input_v3 *` and stored as member `text_input` of the `Fl_Wayland_Screen_Driver::seat` object. Next, a call to `zwp_text_input_v3_add_listener()` associates this `text_input` with a 6-member listener of type struct `zwp_text_input_v3_listener`. These 6 FLTK-defined, callback functions are used as follows.

1-2) Functions `text_input_enter()` and `text_input_leave()` run when text input enters or leaves a surface.

3-4) Functions `text_input_preedit_string()` and `text_input_commit_string()` are called when the text input method prepares the client app to later insert 'marked' text or regular text, respectively. Complex text input often begins by inserting temporary text which is said to be 'marked' before replacing it with the text that will stay in the document. FLTK underlines marked text to distinguish it from regular text.

5) Function `text_input_done()` runs when it's time to send either regular or marked text to the client app. This is done by function `send_text_to_fltk()` which uses static variables `current_pre_edit`, `pending_pre_edit` and `pending_commit` to determine the sent text.

6) Function `text_input_delete_surrounding_text()` has no effect at present, without this preventing input methods that have been tested with FLTK from working satisfactorily.

It's necessary to inform the running text input method of the current location of the insertion point in the active surface. This information allows the input method to map its auxiliary window close to the insertion point. The flow of information on this topic is as follows:

- The two FLTK widgets supporting text input, `Fl_Input` and `Fl_Text_Display`, transmit to FLTK the window coordinates of the bottom of the current insertion point and the line height each time they change calling function `fl_set_spot()`.
- `fl_set_spot()` calls the platform override of virtual member function `Fl_Screen_Driver::set_spot()`. Under Wayland, this just calls `Fl_Wayland_Screen_Driver::insertion_point_location(int x, int y, int height)` which calls `zwp_text_input_v3_set_cursor_rectangle()` to inform the text input method about the surface position and size of the insertion point and also memorizes this information in static member variables of class `Fl_Wayland_Screen_Driver`.
- Callback function `text_input_enter()` calls `Fl_Wayland_Screen_Driver::insertion_point_location(int *x, int *y, int *height)` which gives it the stored position information, and then calls `zwp_text_input_v3_set_cursor_rectangle()` to inform the text input method about the position of the insertion point.

### 25.1.17 Interface with libdecor

FLTK uses a library called `libdecor` to determine whether the Wayland compositor uses CSD or SSD mode, and also to draw window titlebars when in CSD mode (see [libdecor](#)). `libdecor` is conceived to be present in a shared library linked to the Wayland client application which itself, and if the running Wayland compositor uses CSD mode, loads another shared library intended to draw titlebars in a way that best matches the Desktop. As of late 2023, `libdecor` contains two titlebar-drawing plugins:

- `libdecor-gtk` intended for the Gnome desktop;
- `libdecor-cairo` for other situations.

On recent Linux distributions, FLTK uses the system `libdecor` shared library available via packages `libdecor-0-dev` and `libdecor-0-plugin-1-gtk`. On earlier Linux versions, or if CMake option `FLTK_USE_SYSTEM_LIBDECOR` is set to OFF, FLTK bundles the most recent source code of `libdecor` and its plugins. The `libdecor` code bundled inside FLTK is compiled and put in `libfltk`. FLTK uses `libdecor-gtk` when software package `libgtk-3-dev` is present in the build system, and `libdecor-cairo` otherwise. FLTK prefixes all symbols of its bundled `libdecor` with "fl\_". This allows an FLTK client app to link to other libraries which may use the system version of `libdecor`.

`libdecor` uses the Wayland protocol `XDG decoration` to request being decorated by a supporting compositor. If the running compositor supports SSD, `libdecor` doesn't draw window titlebars because the compositor does it. That is what happens with the KWin and Sway compositors. However, if environment variable `LIBDECOR_FORCE_CSD` is defined to value 1 when an FLTK app runs, `libdecor` instructs an SSD-able compositor to refrain from decorating its windows and decorates windows itself.

Whatever the value of `FLTK_USE_SYSTEM_LIBDECOR`, FLTK and `libdecor` use environment variable `LIBDECOR_PLUGIN_DIR` as follows: if this variable is defined and points to the name of a directory, this directory is searched for a potential `libdecor` plugin in the form of a shared library; if one is found, FLTK and `libdecor` load it and use it.

The `libdecor` source code bundled in FLTK is identical to that of the `libdecor` repository. Nevertheless, FLTK uses this code with some minor changes. For example, except if `FLTK_USE_SYSTEM_LIBDECOR` is 1, FLTK needs to modify function `libdecor_new()` charged of loading the plugin, to make it use the plugin code that is included in `libfltk` if none is found as a dynamic library. This is done as follows in file `libdecor/build/fl_`

```
libdecor.c:
#define libdecor_new libdecor_new_orig
#include "../src/libdecor.c"
#undef libdecor_new
void libdecor_new() { // FLTK rewrite of this function
    .....
}
```

FLTK compiles file `fl_libdecor.c` which includes `libdecor.c` to the effect that all of the `libdecor` code becomes part of `libfltk` except that function `libdecor_new()` is substituted by its FLTK rewrite, without file `libdecor.c` being modified at all. This trick is also used to modify function `libdecor_frame_set_minimized()` to bypass a bug in the Weston compositor before version 10. Similarly, FLTK compiles file `fl_` `libdecor-plugins.c` which includes either `libdecor-gtk.c` or `libdecor-cairo.c` to the effect that the desired plugin becomes part of `libfltk`.

To support function `Fl_Widget_Surface::draw_decorated_window()` that draws a mapped window and its titlebar, FLTK needs to perform two operations: 1) identify what plugin is operating, and 2) call a function that is specific of that plugin and that returns the pixels of the drawn titlebar.

FLTK performs operation 1) above using its function `get_libdecor_plugin_description()` of file `fl_` `libdecor-plugins.c` that returns a human readable string describing the running plugin. Each plugin puts its own string in member description of a record of type `struct libdecor_plugin_description`. Although this type is public in header file `libdecor-plugin.h`, accessing the symbol defined by the plugin to store a pointer to a value of this type is complicated for a reason and solved by a method detailed in a comment before function `get_libdecor_plugin_description()`.

Operation 2) above is done by FLTK-defined function `fl_libdecor_titlebar_buffer()` from file `fl_` `libdecor-plugins.c`. This function calls `get_libdecor_plugin_description()` seen above to get the running plugin's descriptive string. That is "GTK3 plugin" with `libdecor-gtk`. FLTK function `gtk_titlebar_buffer()` is then called, and returns a pointer to the start of a byte buffer containing the titlebar graphics. That is, again, not possible with the public `libdecor` API. Therefore, FLTK copies to `fl_libdecor-plugins.c` the definitions of several types given in `libdecor-gtk.c` or `libdecor-cairo.c` such as type `struct border_component`.

### 25.1.18 Copy/Paste/Drag-n-Drop

FLTK follows the procedure that is very well described in item "Wayland clipboard and drag & drop" of the [Documentation resources](#). All corresponding source code is in file `src/drivers/Wayland/fl_wayland_↵_clipboard_dnd.cxx`.

This part of the `Fl_Wayland_Screen_Driver::seat` record stores pointers to Wayland objects used for clipboard and D-n-D operations:

```
struct wl_data_device_manager *data_device_manager;
struct wl_data_device *data_device;
struct wl_data_source *data_source;
```

FLTK can copy or paste plain UTF-8 text or image data to/from the clipboard. Images are copied to the clipboard as image/bmp mime type. Images in image/bmp or image/png mime types from the clipboard can be pasted to FLTK apps.

Files dropped are received one pathname per line, with no '\n' after the last pathname.

### 25.1.19 EGL as support for OpenGL

Wayland uses [EGL™](#) to interface OpenGL with the underlying native platform window system. OpenGL-using FLTK apps are therefore linked to `libwayland-egl.so` and `libEGL.so` in addition to `libGL.so` and `libGLU.↵so`.

EGL completely hides the `wl_buffer` objects it uses to draw to GL windows. The `wld_buffer` structure and the 'buffer factory' described previously are not used for `Fl_Gl_Window`'s: the `buffer` member of an `Fl_Gl_Window`'s `wld_window` structure is always NULL.

EGL is initialized calling member function `Fl_Wayland_Gl_Window_Driver::init()` once, the first time the `Fl_Wayland_Gl_Window_Driver` c'tor runs. That is done with calls to `eglGetDisplay()`, `egl↵Initialize()`, and `eglBindAPI()`.

Member function `Fl_Wayland_Gl_Window_Driver::find()` calls `eglChooseConfig()` to filter the set of GL configurations that match the `Fl_Gl_Window`'s `mode()`, and puts in the returned `Fl_Gl_Choice` object the first matching configuration. The filtering gets done with bits `EGL_WINDOW_BIT`, to support the creation of window surfaces, and `EGL_OPENGL_BIT`, to support the creation of OpenGL contexts.

EGL needs 2 more objects created for each `Fl_Gl_Window`. They have types `struct wl_egl_window` and `EGLSurface`, and are created by member function `Fl_Wayland_Gl_Window_Driver::make_↵current_before()` which runs at the beginning of `Fl_Gl_Window::make_current()`. The first argument of the call to `wl_egl_window_create()` therein has type `struct wl_surface *` and is what connects EGL with the targeted Wayland window.

EGL creates with `eglCreateContext()` an object of type `EGLContext` via member function `Fl_↵Wayland_Gl_Window_Driver::create_gl_context()` called by `Fl_Gl_Window::make_current()`. Types `EGLContext` and `GLContext` are 2 names for the same object. The call to `eglCreateContext()` is made asking for a GL context of version at least 2. This does not prevent from obtaining contexts of higher versions, namely above 3.2, which are compatible with version 2 (the so-called compatibility profile) under all tested Linux systems.

FLTK function `Fl_Gl_Window::make_current()` calls overridden function `Fl_Wayland_Gl_Window_↵Driver::set_gl_context()` which calls EGL function `eglMakeCurrent()` when the cached context changes.

FLTK calls function `Fl_Wayland_Gl_Window_Driver::swap_buffers()` each time it wants a GL context to be sent to the display. This function contains some pure GL code to emulate an overlay buffer to support `Fl_Gl_Window` objects overriding their `draw_overlay()` member function. Then, it calls function `eglSwap_↵Buffers()`.

The overridden `Fl_Wayland_Gl_Window_Driver::resize()` function is implemented with calls to `wl_↵_egl_window_get_attached_size()` and `wl_egl_window_resize()`.

Class `Fl_Wayland_Gl_Plugin` exists to allow `libfltk` to call functions from `libfltk_gl`, `libwayland-egl.so` or `libEGL.so` and without having `libfltk` force linking any FLTK app with these GL-related libraries. For example, `Fl_Wayland_Window_Driver::flush()` needs to call `Fl_Gl_↵Window::valid(0)`.

### Throttling GL window redraws

Although no documentation covering this subject was found, the EGL library internally uses `wl_callback` objects to throttle GL window redraws, and FLTK needs not interfere with these operations. Nevertheless FLTK creates and uses `wl_callback` objects for GL windows in 2 cases:

- when a decorated GL window is being interactively resized. Function `Fl_Wayland_Gl_Window_Driver::resize()` creates a `wl_callback` object, assigns it to `xid->frame_cb` and calls `wl_callback_add_listener()` before calling `wl_egl_window_resize()`. This allows the mechanism described above that prevents surfaces from being resized too frequently to operate with decorated `Fl_GL_Window`'s too.
- when a GL subwindow is being refreshed by `Fl_Wayland_Gl_Window_Driver::swap_buffers()`. FLTK checks that `xid->frame_cb` is NULL and if so creates a `wl_callback` calling `wl_surface_frame()` before calling `eglSwapBuffers()`. This is useful if the GL subwindow becomes entirely out from the screen area. In that case, the Mutter compositor stops signaling that the subwindow is ready for new commits which FLTK detects because `xid->frame_cb` remains non-NULL. If the subwindow eventually re-appears partially on-screen, `xid->frame_cb` becomes NULL and FLTK calls `eglSwapBuffers()` to redraw the GL scene.

## 25.1.20 FLTK-defined, Wayland-specific types

### struct `wld_window`

Defined in `Fl_Wayland_Window_Driver.H`. One such record is created for each `show()` `Fl_Window` by `Fl_Wayland_Window_Driver::makeWindow()`. Function `fl_wl_xid(Fl_Window*)` returns a pointer to the struct `wld_window` of its argument.

```
struct wld_window {
    Fl_Window *fl_win;
    struct wl_list outputs; // linked list of displays where part or whole of window maps
    struct wl_surface *wl_surface; // the window's surface
    struct wl_callback *frame_cb; // non-NULL until Wayland can process new surface commit
    struct Fl_Wayland_Graphics_Driver::wld_buffer *buffer; // see \ref wld_buffer
    struct xdg_surface *xdg_surface;
    enum Fl_Wayland_Window_Driver::kind kind; // DECORATED or POPUP or SUBWINDOW or UNFRAMED
    union {
        struct libdecor_frame *frame; // for DECORATED windows
        struct wl_subsurface *subsurface; // for SUBWINDOW windows
        struct xdg_popup *xdg_popup; // for POPUP windows
        struct xdg_toplevel *xdg_toplevel; // for UNFRAMED windows
    };
    struct Fl_Wayland_Window_Driver::custom_cursor {
        struct wl_cursor *wl_cursor;
        const Fl_RGB_Image *rgb;
        int hotx, hoty;
    } *custom_cursor; // non-null when using custom cursor
    int configured_width; // used when negotiating window size with the compositor
    int configured_height;
    int floating_width; // helps restoring size after un-maximizing
    int floating_height;
    int state; // indicates whether window is fullscreen, maximized. Used otherwise for POPUPs
    bool covered; // specially for Mutter and issue #878
}
```

### struct `Fl_Wayland_Graphics_Driver::draw_buffer`

Defined in file `Fl_Wayland_Graphics_Driver.H`. One such record is created when an `Fl_Image_Surface` object is created. One such record is also embedded inside each struct `Fl_Wayland_Graphics_Driver::wld_buffer` record (see `wld_buffer`).

```
struct Fl_Wayland_Graphics_Driver::draw_buffer {
    unsigned char *buffer; // address of the beginning of the Cairo image surface's byte array
    cairo_t *cairo; // used when drawing to the Cairo image surface
    size_t data_size; // of buffer and wl_buffer, in bytes
    int stride; // bytes per line
    int width; // in pixels
};
```

FLTK gives offscreen buffers the platform-dependent type `Fl_Offscreen` which is in fact member `cairo_` of struct `Fl_Wayland_Graphics_Driver::draw_buffer`. Thus, a variable with type `Fl_Offscreen` needs be cast to type `cairo_t*`. Static member function `struct draw_buffer *offscreen_buffer(Fl_Offscreen)` of class `Fl_Wayland_Graphics_Driver` returns the `draw_buffer` record corresponding to an `Fl_Offscreen` value.

### struct `Fl_Wayland_Graphics_Driver::wld_buffer`

Defined in file `Fl_Wayland_Graphics_Driver.H`. One such record is created by `Fl_Wayland_Graphics_Driver::create_wld_buffer()` when an `Fl_Window` is `show()` or resized, when a custom cursor shape is created, or when text is dragged.

```

struct Fl_Wayland_Graphics_Driver::wld_buffer {
    struct draw_buffer draw_buffer; // see draw_buffer
    struct wl_list link; // links all buffers from the same wl_shm_pool
    struct wl_buffer *wl_buffer; // the Wayland buffer
    void *data; // address of the beginning of the Wayland buffer's byte array
    struct wl_shm_pool *shm_pool; // pter to wl_shm_pool from which this wl_buffer comes
    bool draw_buffer_needs_commit; // true when draw_buffer has been modified but not yet committed
    bool in_use; // true while being committed
    bool released; // true after buffer_release() was called
};

```

### struct Fl\_Wayland\_Screen\_Driver::output

Defined in `Fl_Wayland_Screen_Driver.H`. One such record is created for each display of the system by function `registry_handle_global()` when it receives a "wl\_output" interface. These records are kept in a linked list of them all, and an identifier of this linked list is stored in member `outputs` of the unique `Fl_Wayland_Screen_Driver` object `FLTK` uses. Thus,

```

Fl_Wayland_Screen_Driver *scr_driver = (Fl_Wayland_Screen_Driver*)Fl::screen_driver();
struct wl_list list_of_all_displays = scr_driver->outputs;

```

gives access, the Wayland way, to the linked list of displays in the system.

```

struct Fl_Wayland_Screen_Driver::output { // one record for each display
    uint32_t id; // an identifier of the display
    int x, y; // logical position of the top-left of display
    int pixel_width; // in pixels
    int pixel_height; // in pixels
    int width; // in pixels, account for fractional scaling
    int height; // in pixels, account for fractional scaling
    float dpi; // at this point, always 96.
    struct wl_output *wl_output; // the Wayland object for this display
    int wld_scale; // Wayland scale factor
    float gui_scale; // FLTK scale factor
    bool done; // true means record members have been initialized
    struct wl_list link; // links these records together
};

```

It's possible to get the FLTK-defined record associated to a display from the Wayland-associated object for the same display, say `struct wl_output *wl_output`, by this call: `(struct Fl_Wayland_Screen_Driver::output *)wl_output_get_user_data(wl_output)`.

### struct Fl\_Wayland\_Screen\_Driver::seat

Defined in file `Fl_Wayland_Screen_Driver.H`. One record is created by function `registry_handle_global()` when it receives a "wl\_seat" or `wl_data_device_manager_interface.name` interface. A pointer to this struct is stored in member `seat` of the client's unique `Fl_Wayland_Screen_Driver` object.

```

struct Fl_Wayland_Screen_Driver::seat {
    struct wl_seat *wl_seat;
    struct wl_pointer *wl_pointer;
    struct wl_keyboard *wl_keyboard;
    uint32_t keyboard_enter_serial;
    struct wl_surface *keyboard_surface;
    struct wl_list pointer_outputs;
    struct wl_cursor_theme *cursor_theme;
    struct wl_cursor *default_cursor;
    struct wl_surface *cursor_surface;
    struct wl_surface *pointer_focus;
    int pointer_scale;
    uint32_t serial;
    uint32_t pointer_enter_serial;
    struct wl_data_device_manager *data_device_manager;
    struct wl_data_device *data_device;
    struct wl_data_source *data_source;
    struct xkb_state *xkb_state;
    struct xkb_context *xkb_context;
    struct xkb_keymap *xkb_keymap;
    struct xkb_compose_state *xkb_compose_state;
    char *name;
    struct zwtp_text_input_v3 *text_input;
};

```

## 25.1.21 Documentation resources

The Wayland book	Extensive introduction to Wayland programming written by the author of the sway compositor, unfortunately unachieved.
------------------	---

Wayland Explorer	Documentation of all Wayland protocols, both stable and unstable. A language-independent syntax is used which makes function names usable from C or C++ not always obvious. Some useful functions seem undocumented here for an unclear reason.
Wayland Protocol Specification	Documentation for all functions of the Wayland core protocol.
Wayland clipboard and drag & drop	Detailed explanation of how clipboard and drag-and-drop work under Wayland.
Wayland and input methods	Blog article introducing to the issue of text input methods under Wayland.
Input Method Hub	Entry page for input method support giving newcomers a first understanding of what input methods are and how they are implemented in Wayland.

## 25.2 Developer info for bundled libs

This chapter details the procedure to update the libraries which are bundled inside FLTK.

### 25.2.1 Introduction

This file is mainly intended for FLTK developers and contains information about the current versions of all bundled libraries and about how to upgrade these bundled libraries.

Starting with FLTK 1.4.0 the bundled libraries jpeg, png, and zlib use "symbol prefixing" with the prefix 'fltk\_' for all external symbols to distinguish the bundled libraries from existing system libraries and to avoid runtime errors.

User code compiled correctly with the header files provided by the bundled image libraries need not be changed.

The nanosvg library is not affected.

### 25.2.2 Current status

Current versions of bundled libraries (as of April 4, 2025):

Library	Version/git commit	Release date	FLTK Version
jpeg	jpeg-9f	2024-01-14	1.4.0
nanosvg	7aeda550a8 [1]	2023-12-02	1.4.0
png	libpng-1.6.44	2024-09-12	1.4.1
zlib	zlib-1.3.1	2024-01-22	1.4.0
libdecor	5974b6d4 [2]	2025-04-03	1.5.0

Previous versions of bundled libraries (FLTK 1.3.x):

Library	Version	Release date	FLTK Version
jpeg	jpeg-9e	2022-01-16	1.3.9
png	libpng-1.6.40	2023-06-21	1.3.9
zlib	zlib-1.3	2023-08-18	1.3.9
jpeg	jpeg-9d	2020-01-12	1.3.6 - 1.3.8
png	libpng-1.6.37	2019-04-14	1.3.6 - 1.3.8
zlib	zlib-1.2.11	2017-01-15	1.3.6 - 1.3.8

[1] Git commit in branch 'fltk' of <https://github.com/fltk/nanosvg>  
See also git tag 'fltk\_yyyy-mm-dd' where yyyy-mm-dd == "Release date" and file nanosvg/README.txt.

[2] Git commit in <https://gitlab.freedesktop.org/libdecor/libdecor>

### General information:

FLTK does not include the entire library distributions. We only provide the source files necessary to build the FLTK library and some README and/or CHANGELOG files. There are no test programs or other contributed files.

We use our own build files, hence a few files MUST NOT be upgraded when the library source files are upgraded. We strive to keep changes to the library source files as small as possible. Patching library code to work with FLTK should be a rare exception. Symbol prefixing with prefix 'fltk\_' is one such exception to the rule.

If patches are necessary all changes in the library files should be marked with "FLTK" in a comment so a developer who upgrades the library later is aware of changes in the source code for FLTK. Look for 'FLTK' and/or 'fltk\_' to find the differences.

Additional comments should be added to show the rationale, i.e. why a particular change was necessary. If applicable, add a reference to a Software Trouble Report, GitHub Issue or Pull Request (PR) like "STR 3456", "Issue #123", or "PR #234".

### 25.2.3 How to update the bundled libraries

It is generally advisable to use a graphical merge program. I'm using 'meld' under Linux, but YMMV.

Do not add any source files unless they are required to build the library.

Some config header files may be pre-generated in the FLTK sources. These header files should be left untouched, but it may be necessary to update these files if new items were added to the new library version. In this case the new header should be pre-generated on a Linux system with default options unless otherwise mentioned below for a specific library. Currently there are no known exceptions.

#### Merging source files:

Please check if some source and header files contain "FLTK" comments and/or 'fltk\_' symbol prefixing to be aware of necessary merges. It is also good to download the distribution tar ball or Git source files of the previous version and to run a (graphical) diff or merge tool on the previous version and the bundled version of FLTK to see the "previous" differences.

Files that were not patched in previous versions should be copied to the new version w/o changes. Files that had FLTK specific patches must be merged manually. FLTK patches should be verified (if still necessary) and should be kept in the new source files.

Source and header files that have been added in the new library version should be added in FLTK as well if they are necessary to build the library. A simple "trial and error" should be sufficient to find files that need to be added. Added files must be added to FLTK's build files as well, usually to both 'Makefile' and 'CMakeLists.txt' to be used in configure/make and in CMake based builds, respectively.

#### Upgrade order:

There is only one dependency between all bundled libraries: libpng depends on zlib. Hence zlib should be upgraded first, then all other libs can be upgraded in arbitrary order.

#### Tests after merge:

Tests should be done on as many platforms as possible, both with autotools (configure/make) and CMake. Windows (Visual Studio) and macOS (Xcode) builds need CMake to generate the IDE files.

#### Upgrade notes for specific libraries:

The following chapters contain informations about specific files and how they are upgraded. Since the changes in all bundled libraries are not known in advance this information may change in the future. Please verify that no other changes are necessary.

### 25.2.4 zlib:

Website: <https://zlib.net/>

Download: See website and follow links.

Repository: git clone <https://github.com/madler/zlib.git>

zlib should be upgraded first because libpng depends on zlib.

Download the latest zlib sources, 'cd' to /path-to/zlib and run

```
$ ./configure --zprefix
```

This creates the header file 'zconf.h' with definitions to enable the standard 'z\_' symbol prefix.

Unfortunately zlib requires patching some source and header files to convert this 'z\_' prefix to 'fltk\_z\_' to be more specific. As of this writing (Nov. 2021) three files need symbol prefix patches:

- gzread.c
- zconf.h
- zlib.h

You may want to compare these files and/or the previous version to find out which changes are required. The general rule is to change all occurrences of 'z\_' to 'fltk\_z\_' but there *are* exceptions. The following files need special handling:

- CMakeLists.txt: Keep FLTK version, update manually if necessary.
- Makefile: Same as CMakeLists.txt.
- gzread.c: Merge changes (see above, manual merge recommended).
- zconf.h: Merge changes (see above, manual merge recommended).
- zlib.h: Merge changes (see above, manual merge recommended).
- makedepend: Keep this file.

Run 'make depend' in the zlib folder on a Linux system after the upgrade to update this file.

### 25.2.5 png:

Website: <http://libpng.org/pub/png/libpng.html>

Download: See website and follow links.

Repository: git clone <https://git.code.sf.net/p/libpng/code> libpng

libpng should be upgraded after zlib because it depends on zlib.

Download the latest libpng sources, 'cd' to /path-to/libpng and run

```
$ ./configure --with-libpng-prefix=fltk_
$ make
```

This creates the header files 'pnglibconf.h' and 'pngprefix.h' with the 'fltk\_' symbol prefix.

The following files need special handling:

- CMakeLists.txt: Keep FLTK version, update manually if necessary.
- Makefile: Same as CMakeLists.txt.
- pnglibconf.h: Generate on a Linux system and merge (see above).
- pngprefix.h: Generate on a Linux system and merge (see above).
- makedepend: Keep this file.

Run 'make depend' in the png folder on a Linux system after the upgrade to update this file.

### 25.2.6 jpeg:

Website: <https://ijg.org/>

Download: See website and follow links.

Repository: N/A

Download the latest jpeg-xy sources on a Linux (or Unix) system, 'cd' to /path-to/jpeg-xy and run

```
$ ./configure
$ make [-jN]
```

This builds the library and should create the static library file '.libs/libjpeg.a'.

Execute the following command to extract the libjpeg symbol names used to build the 'prefixed' libfltk\_jpeg library:

```
$ nm --extern-only --defined-only .libs/libjpeg.a | awk '{print $3}' \
| sed '/^$/d' | sort -u | awk '{print "#define \"$1\" fltk_\"$1\"}' \
> fltk_jpeg_prefix.h
```

This creates the header file 'fltk\_jpeg\_prefix.h' with the '# define' statements using the 'fltk\_' symbol prefix.

The following files need special handling:

- CMakeLists.txt: Keep FLTK version, update manually if necessary.
- Makefile: Same as CMakeLists.txt.
- fltk\_jpeg\_prefix.h: Generate on a Linux system and merge (see above).
- jconfig.h: keep changes flagged with

```
/* FLTK */
```

Note: more to come...

- `make` depend: Keep this file.

Run 'make depend' in the jpeg folder on a Linux system after the upgrade to update this file.

### 25.2.7 nanosvg:

Website: <https://github.com/memononen/nanosvg>

Download: See website and follow links.

Repository: `git clone https://github.com/memononen/nanosvg.git`

FLTK Fork: `git clone https://github.com/fltk/nanosvg.git`

FLTK has its own GitHub fork of the original repository (see above).

The intention is to update this fork from time to time so the FLTK specific patches are up-to-date with the original library. Hopefully the FLTK patches will be accepted upstream at some time in the future so we no longer need our own patches. AlbrechtS, 04 Feb 2018.

Update (Feb 22, 2021): The upstream library is officially no longer maintained (see README.md) although updates appear from time to time.

Use this fork (branch 'fltk') to get the nanosvg library with FLTK specific patches:

```
$ git clone https://github.com/fltk/nanosvg.git nanosvg-fltk
$ cd nanosvg-fltk
$ git checkout fltk
$ cd src
$ cp nanosvg.h nanosvgrast.h /path/to/fltk-1.4/nanosvg/
```

This library does not have its own build files since it is a header-only library. The headers are included in FLTK where necessary.

The following files need special handling:

`nanosvg.h`: Merge or download from FLTK's fork (see above).

`nanosvgrast.h`: Merge or download from FLTK's fork (see above).

Maintaining branch 'fltk' in FLTK's fork of nanosvg (fltk/nanosvg):

Only maintainers with write access on fltk/nanosvg can do this. Others can fork our fltk/nanosvg fork in their own GitHub account and either open a PR on fltk/nanosvg or tell us about their changes in fltk.development.

Use something similar to the following commands to update FLTK's fork of nanosvg to the latest version. Commands are only examples, you may need to change more or less, depending on the outstanding updates.

Step 1: clone the fltk/nanosvg fork, set the remote 'upstream', and update the 'master' branch:

```
$ cd /to/your/dev/dir
$ git clone https://github.com/fltk/nanosvg.git nanosvg-fltk
$ cd nanosvg-fltk
$ git remote add upstream https://github.com/memononen/nanosvg
$ git checkout master
$ git pull upstream master
```

Note: the 'master' branch must never be changed, i.e. it must always be the same as 'upstream/master'. Never commit your own (FLTK specific) changes to branch 'master'.

Step 2: rebase branch 'fltk' on the new master (upstream/master), fix potential conflicts, and tag the new branch.

It is important to keep the individual FLTK specific patches intact (one commit per patch) because this will preserve the history and the committer and make it easier to skip single patches when they are accepted upstream.

```
$ git checkout fltk
$ git rebase upstream/master
```

At this point you may need to fix conflicts! Do whatever is necessary to update the branch 'fltk'.

Now 'git tag' the 'fltk' branch for later reference.

Hint: use 'git show <any-older-tag-name>' to see its contents. I like to write a summary of commits in the tag comment.

```
$ git tag -a fltk_yyyy-mm-dd fltk
```

Replace 'yyyy-mm-dd' with the current date and add a comment when asked for it (your editor will open an empty file).

Step 3: at this point it is recommended to copy the changed header files to your working copy of the FLTK library and test the changes. If anything is wrong, go back, fix the bugs and change the git tag (delete and create a new one).

Step 4: push the new branch 'fltk' and the tag to the fltk/nanosvg repository:

```
$ git push -f origin fltk
$ git push origin fltk_yyyy-mm-dd
```

Step 5: copy the changed files to your working copy of the FLTK repository (if not done already), update this file accordingly, and commit/push the update to the fltk/fltk repository.

### 25.2.8 libdecor:

Website: <https://gitlab.freedesktop.org/libdecor/libdecor>

Download: See website and follow links.

Repository: git clone <https://gitlab.freedesktop.org/libdecor/libdecor.git>

libdecor is used by the Wayland/X11 hybrid platform to draw window titlebars when FLTK apps run as Wayland clients and the running Wayland compositor uses client-side decoration. In the future, when libdecor will have made its way into Linux packages, FLTK will use the system version of libdecor. libdecor will remain as an FLTK bundle to support Linux configurations where the libdecor package is not available or not installed.

FLTK uses libdecor source files without any modification. This part of the libdecor source tree is copied to directory libdecor/ of the FLTK source tree:

```
LICENSE
README.md
src/      ... and files below except meson.build files
```

Furthermore, directory libdecor/build/ of the FLTK source tree does not originate from the libdecor source tree but contains 3 FLTK-created files. File build/Makefile may need changes if a libdecor update adds or renames source files.

## 25.3 Developer Information

This chapter describes FLTK development and documentation.

### Example

```
/** \file
    Fl_Clock, Fl_Clock_Output widgets. */

/**
    \class Fl_Clock_Output
    \brief This widget can be used to display a program-supplied time.

    The time shown on the clock is not updated. To display the current time,
    use Fl_Clock instead.

    \image html clock.png
    \image latex clock.png "" width=10cm
    \image html round_clock.png
    \image latex clock.png "" width=10cm
    \image html round_clock.png "" width=10cm */

/**
    Returns the displayed time.
    Returns the time in seconds since the UNIX epoch (January 1, 1970).
    \see value(ulong)
    */
ulong value() const {return value_;}

/**
    Set the displayed time.
    Set the time in seconds since the UNIX epoch (January 1, 1970).
    \param[in] v seconds since epoch
    \see value()
    */
void Fl_Clock_Output::value(ulong v) {
    [...]
}

/**
    Create an Fl_Clock widget using the given position, size, and label string.
    The default boxtype is \c FL_NO_BOX.
    \param[in] X, Y, W, H position and size of the widget
    \param[in] L widget label, default is no label
    */
Fl_Clock::Fl_Clock(int X, int Y, int W, int H, const char *L)
    : Fl_Clock_Output(X, Y, W, H, L) {}
```

```

/**
 * Create an Fl_Clock widget using the given boxtype, position, size, and
 * label string.
 * \param[in] t boxtype
 * \param[in] X, Y, W, H position and size of the widget
 * \param[in] L widget label, default is no label
 */
Fl_Clock::Fl_Clock(uchar t, int X, int Y, int W, int H, const char *L)
: Fl_Clock_Output(X, Y, W, H, L) {
    type(t);
    box(t==FL_ROUND_CLOCK ? FL_NO_BOX : FL_UP_BOX);
}

```

### Note

From Duncan: (will be removed later, just for now as a reminder)

I've just added comments for the `fl_color_chooser()` functions, and in order to keep them and the general Function Reference information for them together, I created a new doxygen group, and used `\ingroup` in the three comment blocks. This creates a new Modules page (which may not be what we want) with links to it from the File Members and `Fl_Color_Chooser.H` pages. It needs a bit more experimentation on my part unless someone already knows how this should be handled. (Maybe we can add it to a `functions.dox` file that defines a functions group and do that for all of the function documentation?)

**Update:** the trick is not to create duplicate entries in a new group, but to move the function information into the doxygen comments for the class, and use the navigation links provided. Simply using `\relatesalso` as the first doxygen command in the function's comment puts it in the appropriate place. There is no need to have `\defgroup` and `\ingroup` as well, and indeed they don't work. So, to summarize:

```

Gizmo.H
/** \class Gizmo
 * A gizmo that does everything
 */
class Gizmo {
    etc
};
extern int popup_gizmo(...);

Gizmo.cxx:
/** \relatesalso Gizmo
 * Pops up a gizmo dialog with a Gizmo in it
 */
int popup_gizmo(...);

```

### Comments Within Doxygen Comment Blocks

You can use HTML comment statements to embed comments in doxygen comment blocks. These comments will not be visible in the generated document.

The following text is a developer comment.  
`<!-- *** This *** is *** invisible *** -->`  
 This will be visible again.

will be shown as:

The following text is a developer comment.  
 This will be visible again.

### Note

Since an unknown Doxygen version indentation by four or more bytes is automatically displayed as if it was framed by `\code` and `\endcode`. You need to take care that "normal" text is not indented that much to avoid mis-interpretation and formatting as code.

### Different Headlines

You can use HTML tags `<H1>` ... `<H4>` for headlines with different sizes. As of doxygen 1.8.x there must not be more than three spaces at the beginning of the line for this to work. Currently (doxygen 1.8.6) there seems to be no difference in the font sizes of `<H3>` and `<H4>` in the pdf output, whereas the html output uses different font sizes.

```
<H1>Headline in big text (H1)</H1>
<H2>Headline in big text (H2)</H2>
<H3>Headline in big text (H3)</H3>
<H4>Headline in big text (H4)</H4>
```

## Headline in big text (H1)

### Headline in big text (H2)

#### Headline in big text (H3)

#### Headline in big text (H4)

### 25.3.1 Non-ASCII Characters

Doxygen understands many HTML quoting characters like `&quot;`, `&uuml;`, `&cedil;`, `&Ccedil;`, but not all HTML quoting characters.

This will appear in the document:

Doxygen understands many HTML quoting characters like `"`, `ü`, `ç`, `Ç`, but not all HTML quoting characters.

For further informations about HTML quoting characters see

<http://www.doxygen.org/manual/htmlcmds.html>

Alternatively you can use **UTF-8** encoding within Doxygen comments.

### 25.3.2 Document Structure

- `\page` creates a named page
- `\section` creates a named section within that page
- `\subsection` creates a named subsection within the current section
- `\subsubsection` creates a named subsubsection within the current subsection

All these statements take a "name" as their first argument, and a title as their second argument. The title can contain spaces.

The page, section, and subsection titles are formatted in blue color and a size like "`<H1>`", "`<H2>`", and "`<H3>`", and "`<H4>`", respectively.

By **FLTK documentation convention**, a file like this one with a doxygen documentation chapter has the name "`<chapter>.dox`". The `\page` statement at the top of the page is "`\page <chapter> This is the title`". Sections within a documentation page must be called "`<chapter>_<section>`", where "`<chapter>`" is the name part of the file, and "`<section>`" is a unique section name within the page that can be referenced in links. The same for subsections and subsubsections.

These doxygen page and section commands work only in special documentation chapters, not within normal source or header documentation blocks. However, links **from** normal (e.g. class) documentation **to** documentation sections **do work**.

This page has

```
\page development Developer Information
```

at its top.

This section is

```
\section development_structure Document Structure
```

The following section is

```
\section development_links Creating Links
```

### 25.3.3 Creating Links

Links to other documents and external links can be embedded with

- doxygen `\ref` links to other doxygen `\page`, `\section`, `\subsection` and `\anchor` locations
- HTML links without markup - doxygen creates "`http://...`" links automatically
- standard, non-Doxygen, HTML links

- see chapter `\ref unicode` creates a link to the named chapter unicode that has been created with a `\\page` statement.
- For further informations about quoting see <http://www.doxygen.org/manual/htmlcmds.html>
- see `<a href="https://www.fltk.org/">FLTK Library</a>` creates a standard HTML link

appears as:

- see chapter [Unicode and UTF-8 Support](#) creates a link to the named chapter unicode that has been created with a `\page` statement.
- For further informations about quoting see <http://www.doxygen.org/manual/htmlcmds.html>
- see [FLTK Library](#) creates a standard HTML link

### 25.3.4 Paragraph Layout

There is no real need to use HTML `<P>` and `</P>` tags within the text to tell doxygen to start or stop a paragraph. In most cases, when doxygen encounters a blank line or some, but not all, `\commands` in the text it knows that it has reached the start or end of a paragraph. Doxygen also offers the `\par` command for special paragraph handling. It can be used to provide a paragraph title and also to indent a paragraph. Unfortunately `\par` won't do what you expect if you want to have doxygen links and sometimes html tags don't work either.

```
\par Normal Paragraph with title

This paragraph will have a title, but because there is a blank line
between the \par and the text, it will have the normal layout.

\par Indented Paragraph with title
This paragraph will also have a title, but because there is no blank
line between the \par and the text, it will be indented.

\par
It is also possible to have an indented paragraph without title.
This is how you indent subsequent paragraphs.

\par No link to Fl_Widget::draw()
Note that the paragraph title is treated as plain text.
Doxygen type links will not work.
HTML characters and tags may or may not work.

Fl_Widget::draw() links and "html" tags work<br>
\par
Use a single line ending with <br> for complicated paragraph titles.
```

The above code produces the following paragraphs:

#### Normal Paragraph with title

This paragraph will have a title, but because there is a blank line between the `\par` and the text, it will have the normal layout.

#### Indented Paragraph with title

This paragraph will also have a title, but because there is no blank line between the `\par` and the text, it will be indented.

It is also possible to have an indented paragraph without title. This is how you indent subsequent paragraphs.

#### No link to `Fl_Widget::draw()`

Note that the paragraph title is treated as plain text. Doxygen type links will not work. HTML characters and tags may or may not work.

[Fl\\_Widget::draw\(\)](#) links and "html" tags work

Use a single line ending with `<br>` for complicated paragraph titles.

### 25.3.5 Navigation Elements

Each introduction (tutorial) page ends with navigation elements. These elements must only be included in the html documentation, therefore they must be separated with `\htmlonly` and `\endhtmlonly`.

The following code creates the navigation bar at the bottom of the [FLTK Basics](#) HTML page as an example of all pages in the "FLTK Programming Manual" section. Note that **this page** is one of the appendices w/o navigation bar.

```
\htmlonly


---



|                                                                                   |                                             |                                                                                             |
|-----------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------|
| <a class="el" href="intro.html">       [Prev]       Introduction to FLTK     </a> | <a class="el" href="index.html">[Index]</a> | <a class="el" href="common.html">       Common Widgets and Attributes       [Next]     </a> |
|-----------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------|


\endhtmlonly
```

# Chapter 26

## Todo List

### Page [Adding and Extending Widgets](#)

Clarify [FI\\_Window::damage\(uchar\)](#) handling - seems confused/wrong? ORing value doesn't match setting behavior in [FI\\_Widget.H](#)!

### Member [FI::now](#) (double offset=0)

[FI::system\\_driver\(\)](#)->gettime() was implemented for the Forms library and has a limited resolution (on Windows: milliseconds). On POSIX platforms it uses gettimeofday() with microsecond resolution. A new function could use a better resolution on Windows with its multimedia timers which requires a new dependency: winmm.lib (dll). This could be a future improvement, maybe set as a build option or generally (requires Win95 or 98?).

### Member [FI\\_Browser::scrollbar\\_width](#) () const

This method should eventually be removed in 1.4+

### Member [FI\\_Browser::scrollbar\\_width](#) (int width)

This method should eventually be removed in 1.4+

### Class [FI\\_Chart](#)

Refactor [FI\\_Chart::type\(\)](#) information.

### Member [FI\\_File\\_Input::errorcolor](#) (FI\_Color c)

Remove [FI\\_File\\_Input::errorcolor\(FI\\_Color\)](#) in FLTK 1.5.0 or higher.

### Member [FI\\_File\\_Input::errorcolor](#) () const

Remove [FI\\_File\\_Input::errorcolor\(\)](#) in FLTK 1.5.0 or higher.

### Member [fl\\_filename\\_list](#) (const char \*d, struct dirent \*\*\*l, FI\_File\_Sort\_F \*s=fl\_numericsort)

should support returning OS error messages

### Class [FI\\_Grid](#)

This (relative group coordinates of nested groups of [FI\\_Grid](#)) needs explanation and maybe an example.

### Member [FI\\_Grid::Cell::~~Cell](#) ()

[FI\\_Grid](#)'s cell destructor should remove the cell from the grid. Currently it does nothing!

### Member [FI\\_Grid::clear\\_layout](#) ()

[FI\\_Grid::clear\(\)](#) needs to be implemented as documented above!

### Member [FI\\_Grid::debug](#) (int level=127)

Add more information about cells and children.

Control output by using `level`.

### Member [FI\\_Grid::FI\\_Grid](#) (int X, int Y, int W, int H, const char \*L=0)

More documentation of [FI\\_Grid](#) constructor?

### Member [FI\\_Grid::layout](#) (int rows, int cols, int margin=-1, int gap=-1)

Document when and why to call [layout\(\)](#) w/o args. See [FI\\_Flex::layout\(\)](#)

**Member `FI_Grid::layout()`**

Document when and why to call `layout()` w/o args. See `FI_Flex::layout()`

**Member `FI_Group::delete_child(int n)`**

Reimplementation of `FI_Group::delete_child(int)` in more FLTK subclasses. This is not yet complete.

**Member `fl_height(int font, int size)`**

In the future, when the XFT issues are resolved, this function should simply return the 'size' value.

**Member `FI_Input_::handle_mouse(int, int, int, int, int keepmark=0)`**

Add comment and parameters

**Member `FI_Input_::handletext(int e, int, int, int, int)`**

Add comment and parameters

**Class `FI_Label`**

There is an aspiration that the `FI_Label` type will become a widget by itself. That way we will be avoiding a lot of code duplication by handling labels in a similar fashion to widgets containing text. We also provide an easy interface for very complex labels, containing html or vector graphics. However, this re-factoring is not in place in this release.

**Member `FI_Menu_::add(const char *, int shortcut, FI_Callback *, void *=0, int=0)`**

Raw integer shortcut needs examples. Dependent on responses to <https://www.fltk.↵org/newsgroups.php?gfltk.coredev+v:10086> and results of STR#2344

**Member `FI_Shortcut`**

Discuss and decide whether we can "shift" these special keyboard flags to the upper byte to enable full 21-bit Unicode characters (U+0000 . . . U+10FFFF) plus the keyboard indicator bits as this was originally intended. This would be possible if we could rely on **all** programs being coded with symbolic names and not hard coded bit values.

**Member `FI_Terminal::scrollbar`**

Support scrollbar\_left/right() - See `FI_Browser_::scrollbar` docs

Support new ScrollbarStyle

**Member `FI_Text_Display::extend_range_for_styles(int *start, int *end)`**

Unicode?

**Member `FI_Text_Display::handle_vline(int mode, int lineStart, int lineLen, int leftChar, int rightChar, int topClip, int bottomClip, int leftClip, int rightClip) const`**

we need to handle hidden hyphens and tabs here!

we handle all styles and selections

we must provide code to get pixel positions of the middle of a character as well

**Member `FI_Text_Display::overstrike(const char *text)`**

Unicode? Find out exactly what we do here and simplify.

**Member `FI_Text_Display::position_to_linecol(int pos, int *lineNum, int *column) const`**

a column number makes little sense in the UTF-8/variable font width environment. We will have to further define what exactly we want to return. Please check the functions that call this particular function.

**Member `FI_Text_Display::scroll(int topLineNum, int horizOffset)`**

Column numbers make little sense here.

**Member `FI_Text_Display::scrollbar_width(int width)`**

This method should eventually be removed

**Member `FI_Text_Display::scrollbar_width() const`**

This method should eventually be removed.

**Member `FI_Text_Display::shortcut(int s)`**

FIXME : get set methods pointing on shortcut\_ have no effects as shortcut\_ is unused in this class and derived!

**Member `Fl_Text_Display::shortcut () const`**

FIXME : get set methods pointing on `shortcut_` have no effects as `shortcut_` is unused in this class and derived!

**Member `Fl_Text_Display::wrapped_column (int row, int column) const`**

What does this do and how is it useful? Column numbers mean little in this context. Which functions depend on this one? Function `TextDXYToUnconstrainedPosition` does not exist (nedit port?)

Unicode?

**Member `Fl_Text_Display::wrapped_row (int row) const`**

What does this do and how is it useful? Column numbers mean little in this context. Which functions depend on this one? Function `TextDXYToUnconstrainedPosition` does not exist (nedit port?)

**Member `Fl_Tiled_Image::Fl_Tiled_Image (Fl_Image *i, int W=0, int H=0)`**

Fix `Fl_Tiled_Image` as background image for widgets and windows and fix the implementation of `Fl::scheme(const char *)`.

**Member `Fl_Tree::handle (int e) FL_OVERRIDE`**

add `Fl_Widget_Tracker` (see `Fl_Browser_.cxx::handle()`)

**Member `Fl_Tree::is_scrollbar (Fl_Widget *w)`**

should be const

**Member `Fl_Tree::show_self ()`**

should be const

**Member `Fl_Window::show () FL_OVERRIDE`**

Check if we can remove resetting the current group in a later FLTK version (after 1.3.x). This may break "already broken" programs though if they rely on this "feature".

**Page `FLTK Basics`**

This section needs a major rework. Add a chapter "Building FLTK with CMake".

**Page `Handling Events`**

Add details on how to detect repeating keys, since on some X servers a repeating key will generate both `FL_KEYUP` and `FL_KEYDOWN`, such that to tell if a key is held, you need `Fl::event_key(int)` to detect if the key is being held down during `FL_KEYUP` or not.

**Page `Unicode and UTF-8 Support`**

Verify 16/24 bit Unicode limit for different character sets? OksiD's code appears limited to 16-bit whereas the FLTK2 code appears to handle a wider set. What about illegal characters? See comments in `fl_utf8fromwc()` and `fl_utf8toUtf16()`.

Work through the code and this documentation to harmonize the `[OksiD]` and `[fltk2]` functions.

FLTK 1.3 and later supports the full Unicode range (21 bits), but there are a few exceptions, for instance binary shortcut values in menus (`Fl_Shortcut`) can only be used with characters from the BMP (16 bits). This may be extended in a future FLTK version.



## Chapter 27

# Deprecated List

### Member [Fl::release](#) ()

Use [Fl::grab\(0\)](#) instead.

### Member [Fl::set\\_idle](#) ([Fl\\_Old\\_Idle\\_Handler](#) cb)

This method is obsolete - use the [add\\_idle\(\)](#) method instead.

### Member [Fl::version](#) ()

Use [int Fl::api\\_version\(\)](#) instead.

### Member [fl\\_ask](#) (const char \*fmt,...)

[fl\\_ask\(\)](#) is deprecated since it uses "Yes" and "No" for the buttons which does not conform to the current FLTK Human Interface Guidelines. Use [fl\\_choice\(\)](#) with the appropriate verbs instead.

### Member [Fl\\_Browser::position](#) () const

"since 1.4.0 - use [vposition\(\)](#) instead"

### Member [Fl\\_Browser::position](#) (int pos)

"since 1.4.0 - use [vposition\(pos\)](#) instead"

### Member [Fl\\_Browser::scrollbar\\_width](#) () const

Use [scrollbar\\_size\(\)](#) instead.

### Member [Fl\\_Browser::scrollbar\\_width](#) (int width)

Use [scrollbar\\_size\(\)](#) instead.

### Member [fl\\_clip](#) (int x, int y, int w, int h)

Please use [fl\\_push\\_clip\(int x, int y, int w, int h\)](#) instead. [fl\\_clip\(int, int, int, int\)](#) will be removed in FLTK 1.5.

### Member [Fl\\_File\\_Input::errorcolor](#) () const

Will be removed in FLTK 1.5.0 or higher.

### Member [Fl\\_File\\_Input::errorcolor](#) ([Fl\\_Color](#) c)

Will be removed in FLTK 1.5.0 or higher.

### Member [fl\\_find](#) (Window xid)

Kept in the X11, Windows, and macOS platforms for compatibility with FLTK versions before 1.4. Please use [fl\\_x11\\_find\(Window\)](#), [fl\\_wl\\_find\(struct wld\\_window\\*\)](#), [fl\\_win32\\_find\(HWND\)](#) or [fl\\_mac\\_find\(FLWindow\\*\)](#) with FLTK 1.4.0 and above.

### Member [Fl\\_GIF\\_Image::Fl\\_GIF\\_Image](#) (const char \*imagename, const unsigned char \*data)

Please use [Fl\\_GIF\\_Image\(const char \\*imagename, const unsigned char \\*data, const size\\_t length\)](#) instead.

### Member [Fl\\_Group::focus](#) ([Fl\\_Widget](#) \*W)

This is for backwards compatibility only. You should use *W->take\_focus()* instead.

### Member [Fl\\_Group::sizes](#) ()

Deprecated since 1.4.0. Please use [bounds\(\)](#) instead.

**Member `Fl_Image::draw_scaled` (int X, int Y, int W, int H)**

Only for API compatibility with FLTK 1.3.4.

**Member `Fl_Image::label` (`Fl_Menu_Item` \*m)**

Please use `Fl_Menu_Item::image()` instead.

**Member `Fl_Image::label` (`Fl_Widget` \*w)**

Please use `Fl_Widget::image()` or `Fl_Widget::deimage()` instead.

**Member `Fl_Image_Surface::highres_image` ()**

Use `image()` instead.

**Member `Fl_Input::position` (int p)**

"since 1.4.0 - use `insert_position(p)` instead"

**Member `Fl_Input::position` (int p, int m)**

"since 1.4.0 - use `insert_position(p, m)` or `Fl_Widget::position(x, y)` instead"

**Member `Fl_Input::position` () const**

"since 1.4.0 - use `insert_position()` instead"

**Member `Fl_Menu_Item::check` ()**

Please use `Fl_Menu_Item::set()` instead. This method will be removed in FLTK 1.5.0 or later.

**Member `Fl_Menu_Item::checked` () const**

Please use `Fl_Menu_Item::value()` instead. This method will be removed in FLTK 1.5.0 or later.

**Member `Fl_Menu_Item::unchecked` ()**

Please use `Fl_Menu_Item::clear()` instead. This method will be removed in FLTK 1.5.0 or later.

**Member `Fl_Multi_Label::label` (`Fl_Menu_Item` \*)**

since 1.4.0: please use `Fl_Menu_Item::label(Fl_Multi_Label *)`

**Member `Fl_Preferences::Fl_Preferences` (const char \*path, const char \*vendor, const char \*application)**

"since 1.4.0 - use `Fl_Preferences(path, vendor, application, flags)` instead"

**Member `Fl_Text_Display::scrollbar_width` (int width)**

Use `scrollbar_size()` instead.

**Member `Fl_Text_Display::scrollbar_width` () const**

Use `scrollbar_size()` instead.

**Member `Fl_Text_Selection::position` (int \*startpos, int \*endpos) const**

"since 1.4.0 - use `selected(startpos, endpos)` instead"

**Member `Fl_Tile::position` (int oldx, int oldy, int newx, int newy)**

"since 1.4.0 - use `move_intersection(p)` instead"

**Member `Fl_Tree::first_visible` ()**

in 1.3.3 ABI – use `first_visible_item()` instead.

**Member `Fl_Tree::item_clicked` (`Fl_Tree_Item` \*val)**

in 1.3.3 ABI – use `callback_item()` instead.

**Member `Fl_Tree::item_clicked` ()**

in 1.3.3 ABI – use `callback_item()` instead.

**Member `Fl_Tree::last_visible` ()**

in 1.3.3 – use `last_visible_item()` instead.

**Member `Fl_Tree_Item::Fl_Tree_Item` (`const Fl_Tree_Prefs &prefs`)**

in 1.3.3 ABI – you must use `Fl_Tree_Item(Fl_Tree*)` for proper horizontal scrollbar behavior.

**Member `Fl_Tree_Item::next_displayed` (`Fl_Tree_Prefs &prefs`)**

in 1.3.3 for confusing name, use `next_visible()` instead

**Member `Fl_Tree_Item::prev_displayed` (`Fl_Tree_Prefs &prefs`)**

in 1.3.3 for confusing name, use `prev_visible()`

**Member `FL_VERSION`**

This `double` version number is retained for compatibility with existing program code. New code should use `int FL_API_VERSION` instead. `FL_VERSION` is deprecated because comparisons of floating point values may fail due to rounding errors. However, there are currently no plans to remove this deprecated constant.

**Member `Fl_Widget::color2` (`unsigned a`)**

Use `selection_color(unsigned)` instead.

**Member `Fl_Widget::color2` () `const`**

Use `selection_color()` instead.

**Member `Fl_Window::free_position` ()**

please use `force_position(0)` instead

**Member `Fl_Window::icon` () `const`**

in 1.3.3

**Member `Fl_Window::icon` (`const void *ic`)**

in 1.3.3 in favor of platform-independent methods `Fl_Window::icon(const Fl_RGB_Image *icon)` and `Fl_Window::icons(const Fl_RGB_Image *icons[], int count)`.

**Page `Operating System Issues`**

Kept for compatibility with FLTK versions before 1.4. Use preferentially `fl_x11_xid(const Fl_Window *)` with versions 1.4 and above.

Kept for compatibility with FLTK versions before 1.4. Use preferentially `fl_x11_find(Window)` with versions 1.4 and above.



## Chapter 28

# Module Index

### 28.1 Modules

Here is a list of all modules:

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## Chapter 29

# Hierarchical Index

### 29.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

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## Chapter 32

# Module Documentation

### 32.1 Callback Function Typedefs

Typedefs defined in `<FL/FL.H>` for callback or handler functions passed as function parameters.

#### Typedefs

- typedef void(\* **FL\_Abort\_Handler**) (const char \*format,...)  
*Signature of set\_abort functions passed as parameters.*
- typedef int(\* **FL\_Args\_Handler**) (int argc, char \*\*argv, int &i)  
*Signature of args functions passed as parameters.*
- typedef void(\* **FL\_Atclose\_Handler**) ([FL\\_Window](#) \*window, void \*data)  
*Signature of set\_atclose functions passed as parameters.*
- typedef void(\* **FL\_Awake\_Handler**) (void \*data)  
*Signature of some wakeup callback functions passed as parameters.*
- typedef void() **FL\_Box\_Draw\_F**(int x, int y, int w, int h, [FL\\_Color](#) color)  
*Signature of some box drawing functions passed as parameters.*
- typedef void() **FL\_Box\_Draw\_Focus\_F**([FL\\_Boxtype](#) bt, int x, int y, int w, int h, [FL\\_Color](#) fg, [FL\\_Color](#) bg)  
*Signature of box focus frame drawing functions.*
- typedef void(\* **FL\_Clipboard\_Notify\_Handler**) (int source, void \*data)  
*Signature of add\_clipboard\_notify functions passed as parameters.*
- typedef int(\* [FL\\_Event\\_Dispatch](#)) (int event, [FL\\_Window](#) \*w)  
*Signature of event\_dispatch functions passed as parameters.*
- typedef int(\* **FL\_Event\_Handler**) (int event)  
*Signature of add\_handler functions passed as parameters.*
- typedef void(\* **FL\_FD\_Handler**) ([FL\\_SOCKET](#) fd, void \*data)  
*Signature of add\_fd functions passed as parameters.*
- typedef void(\* **FL\_Idle\_Handler**) (void \*data)  
*Signature of add\_idle callback functions passed as parameters.*
- typedef void() **FL\_Label\_Draw\_F**(const [FL\\_Label](#) \*label, int x, int y, int w, int h, [FL\\_Align](#) align)  
*Signature of some label drawing functions passed as parameters.*
- typedef void() **FL\_Label\_Measure\_F**(const [FL\\_Label](#) \*label, int &width, int &height)  
*Signature of some label measurement functions passed as parameters.*
- typedef void(\* **FL\_Old\_Idle\_Handler**) ()  
*Signature of set\_idle callback functions passed as parameters.*
- typedef int(\* **FL\_System\_Handler**) (void \*event, void \*data)  
*Signature of add\_system\_handler functions passed as parameters.*
- typedef void(\* [FL\\_Timeout\\_Handler](#)) (void \*data)  
*Signature of timeout callback functions passed as parameters.*

### 32.1.1 Detailed Description

Typedefs defined in [<FL/Fl.H>](#) for callback or handler functions passed as function parameters.

FLTK uses callback functions as parameters for some function calls, e.g. to set up global event handlers ([Fl::add\\_handler\(\)](#)), to add a timeout handler ([Fl::add\\_timeout\(\)](#)), and many more.

The typedefs defined in this group describe the function parameters used to set up or clear the callback functions and should also be referenced to define the callback function to handle such events in the user's code.

See also

[Fl::add\\_handler\(\)](#), [Fl::add\\_timeout\(\)](#), [Fl::repeat\\_timeout\(\)](#), [Fl::remove\\_timeout\(\)](#) and others

### 32.1.2 Typedef Documentation

#### 32.1.2.1 Fl\_Event\_Dispatch

```
typedef int (* Fl_Event_Dispatch) (int event, Fl_Window *w)
```

Signature of event\_dispatch functions passed as parameters.

See also

[Fl::event\\_dispatch\(Fl\\_Event\\_Dispatch\)](#)

#### 32.1.2.2 Fl\_Timeout\_Handler

```
typedef void (* Fl_Timeout_Handler) (void *data)
```

Signature of timeout callback functions passed as parameters.

Please see [Fl::add\\_timeout\(\)](#) for details.

## 32.2 Windows handling functions

Windows and standard dialogs handling declared in [<FL/Fl.H>](#)

### Functions

- static void [Fl::default\\_atclose](#) ([Fl\\_Window](#) \*, void \*)  
*Default callback for window widgets.*
- static [Fl\\_Window](#) \* [Fl::first\\_window](#) ()  
*Returns the first top-level window in the list of shown() windows.*
- static void [Fl::first\\_window](#) ([Fl\\_Window](#) \*)  
*Sets the window that is returned by [first\\_window\(\)](#).*
- static [Fl\\_Window](#) \* [Fl::grab](#) ()  
*Returns the window that currently receives all events.*
- static void [Fl::grab](#) ([Fl\\_Window](#) \*)  
*Selects the window to grab.*
- static [Fl\\_Window](#) \* [Fl::modal](#) ()  
*Returns the top-most [modal\(\)](#) window currently shown.*
- static [Fl\\_Window](#) \* [Fl::next\\_window](#) (const [Fl\\_Window](#) \*)  
*Returns the next top-level window in the list of shown() windows.*
- static void [Fl::set\\_abort](#) ([Fl\\_Abort\\_Handler](#) f)  
*For back compatibility, sets the void [Fl::fatal](#) handler callback.*
- static void [Fl::set\\_atclose](#) ([Fl\\_Atclose\\_Handler](#) f)  
*For back compatibility, sets the [Fl::atclose](#) handler callback.*

## Variables

- static void(\* [Fl::atclose](#) )(Fl\_Window \*, void \*)  
*Back compatibility: default window callback handler.*

### 32.2.1 Detailed Description

Windows and standard dialogs handling declared in <[FL/FL.H](#)>

### 32.2.2 Function Documentation

#### 32.2.2.1 default\_atclose()

```
void Fl::default_atclose (
    Fl_Window * window,
    void * v ) [static]
```

Default callback for window widgets.

It hides the window and then calls the default widget callback.

#### 32.2.2.2 first\_window() [1/2]

```
Fl_Window * Fl::first_window ( ) [static]
```

Returns the first top-level window in the list of shown() windows.

If a [modal\(\)](#) window is shown this is the top-most modal window, otherwise it is the most recent window to get an event.

#### 32.2.2.3 first\_window() [2/2]

```
void Fl::first_window (
    Fl_Window * window ) [static]
```

Sets the window that is returned by [first\\_window\(\)](#).

The window is removed from wherever it is in the list and inserted at the top. This is not done if [Fl::modal\(\)](#) is on or if the window is not shown(). Because the first window is used to set the "parent" of modal windows, this is often useful.

#### 32.2.2.4 grab() [1/2]

```
static Fl_Window * Fl::grab ( ) [inline], [static]
```

Returns the window that currently receives all events.

##### Returns

The window that currently receives all events, or NULL if event grabbing is currently OFF.

#### 32.2.2.5 grab() [2/2]

```
void Fl::grab (
    Fl_Window * win ) [static]
```

Selects the window to grab.

This is used when pop-up menu systems are active.

Send all events to the passed window no matter where the pointer or focus is (including in other programs). The window *does not have to be shown()*, this lets the [handle\(\)](#) method of a "dummy" window override all event handling and allows you to map and unmap a complex set of windows (under both X and Windows *some* window must be mapped because the system interface needs a window id).

If [grab\(\)](#) is on it will also affect show() of windows by doing system-specific operations (on X it turns on override-redirect). These are designed to make menus popup reliably and faster on the system.

To turn off grabbing do `Fl::grab(0)`.

*Be careful that your program does not enter an infinite loop while `grab()` is on. On X this will lock up your screen!*

To avoid this potential lockup, all newer operating systems seem to limit mouse pointer grabbing to the time during which a mouse button is held down. Some OS's may not support grabbing at all.

### 32.2.2.6 modal()

```
static Fl_Window * Fl::modal ( ) [inline], [static]
```

Returns the top-most `modal()` window currently shown.

This is the most recently shown() window with `modal()` true, or NULL if there are no `modal()` windows shown(). The `modal()` window has its `handle()` method called for all events, and no other windows will have `handle()` called (`grab()` overrides this).

### 32.2.2.7 next\_window()

```
Fl_Window * Fl::next_window (
    const Fl_Window * window ) [static]
```

Returns the next top-level window in the list of shown() windows.

You can use this call to iterate through all the windows that are shown().

#### Parameters

in	<i>window</i>	must be shown and not NULL
----	---------------	----------------------------

### 32.2.2.8 set\_atclose()

```
static void Fl::set_atclose (
    Fl_Atclose_Handler f ) [inline], [static]
```

For back compatibility, sets the `Fl::atclose` handler callback.

You can now simply change the callback for the window instead.

See also

[Fl\\_Window::callback\(Fl\\_Callback\\*\)](#)

## 32.2.3 Variable Documentation

### 32.2.3.1 atclose

```
void(* Fl::atclose)(Fl_Window *, void *)=default_atclose [static], [default]
```

Back compatibility: default window callback handler.

See also

[Fl::set\\_atclose\(\)](#)

## 32.3 Events handling functions

`Fl` class events handling API declared in `<FL/Fl.H>`

### Functions

- static void [Fl::add\\_handler](#) ([Fl\\_Event\\_Handler](#) ha)  
*Install a function to parse unrecognized events.*
- static void [Fl::add\\_handler](#) ([Fl\\_Event\\_Handler](#) ha, [Fl\\_Event\\_Handler](#) before)

- Install a function to parse unrecognized events with less priority than another function.*

  - static void [Fl::add\\_system\\_handler](#) ([Fl\\_System\\_Handler](#) h, void \*data)

*Install a function to intercept system events.*
- static [Fl\\_Widget](#) \* [Fl::belowmouse](#) ()

*Gets the widget that is below the mouse.*
- static void [Fl::belowmouse](#) ([Fl\\_Widget](#) \*)

*Sets the widget that is below the mouse.*
- static [Fl\\_Callback\\_Reason](#) [Fl::callback\\_reason](#) ()

*Give the reason for calling a callback.*
- static int [Fl::compose](#) (int &del)

*Any text editing widget should call this for each FL\_KEYBOARD event.*
- static void [Fl::compose\\_reset](#) ()

*If the user moves the cursor, be sure to call [Fl::compose\\_reset\(\)](#).*
- static void [Fl::disable\\_im](#) ()

*Disables the system input methods facilities.*
- static void [Fl::enable\\_im](#) ()

*Enables the system input methods facilities.*
- static int [Fl::event](#) ()

*Returns the last event that was processed.*
- static int [Fl::event\\_alt](#) ()

*Returns non-zero if the Alt key is pressed.*
- static int [Fl::event\\_button](#) ()

*Gets which particular mouse button caused the current event.*
- static int [Fl::event\\_button1](#) ()

*Returns non-zero if mouse button 1 is currently held down.*
- static int [Fl::event\\_button2](#) ()

*Returns non-zero if mouse button 2 is currently held down.*
- static int [Fl::event\\_button3](#) ()

*Returns non-zero if mouse button 3 is currently held down.*
- static int [Fl::event\\_button4](#) ()

*Returns non-zero if mouse button 4 is currently held down.*
- static int [Fl::event\\_button5](#) ()

*Returns non-zero if mouse button 5 is currently held down.*
- static int [Fl::event\\_buttons](#) ()

*Returns the mouse buttons state bits; if non-zero, then at least one button is pressed now.*
- static int [Fl::event\\_clicks](#) ()

*Returns non zero if we had a double click event.*
- static void [Fl::event\\_clicks](#) (int i)

*Manually sets the number returned by [Fl::event\\_clicks\(\)](#).*
- static void \* [Fl::event\\_clipboard](#) ()

*During an FL\_PASTE event of non-textual data, returns a pointer to the pasted data.*
- static const char \* [Fl::event\\_clipboard\\_type](#) ()

*Returns the type of the pasted data during an FL\_PASTE event.*
- static int [Fl::event\\_command](#) ()

*Returns non-zero if the FL\_COMMAND key is pressed, either FL\_CTRL or on OSX FL\_META.*
- static int [Fl::event\\_ctrl](#) ()

*Returns non-zero if the Control key is pressed.*
- static [Fl\\_Event\\_Dispatch](#) [Fl::event\\_dispatch](#) ()

*Return the current event dispatch function.*
- static void [Fl::event\\_dispatch](#) ([Fl\\_Event\\_Dispatch](#) d)

*Set a new event dispatch function.*

- static int [Fl::event\\_dx](#) ()  
*Returns the current horizontal mouse scrolling associated with the `FL_MOUSEWHEEL` event.*
- static int [Fl::event\\_dy](#) ()  
*Returns the current vertical mouse scrolling associated with the `FL_MOUSEWHEEL` event.*
- static int [Fl::event\\_inside](#) (const [Fl\\_Widget](#) \*)  
*Returns whether or not the mouse event is inside a given child widget.*
- static int [Fl::event\\_inside](#) (int, int, int, int)  
*Returns whether or not the mouse event is inside the given rectangle.*
- static int [Fl::event\\_is\\_click](#) ()  
*Returns non-zero if the mouse has not moved far enough and not enough time has passed since the last `FL_PUSH` or `FL_KEYBOARD` event for it to be considered a "drag" rather than a "click".*
- static void [Fl::event\\_is\\_click](#) (int i)  
*Clears the value returned by [Fl::event\\_is\\_click](#)().*
- static int [Fl::event\\_key](#) ()  
*Gets which key on the keyboard was last pushed.*
- static int [Fl::event\\_key](#) (int key)  
*Returns true if the given `key` was held down (or pressed) during the last event.*
- static int [Fl::event\\_length](#) ()  
*Returns the length of the text in [Fl::event\\_text](#)().*
- static int [Fl::event\\_original\\_key](#) ()  
*Returns the keycode of the last key event, regardless of the NumLock state.*
- static int [Fl::event\\_shift](#) ()  
*Returns non-zero if the Shift key is pressed.*
- static int [Fl::event\\_state](#) ()  
*Returns the keyboard and mouse button states of the last event.*
- static int [Fl::event\\_state](#) (int mask)  
*Returns non-zero if any of the passed event state bits are turned on.*
- static const char \* [Fl::event\\_text](#) ()  
*Returns the text associated with the current event, including `FL_PASTE` or `FL_DND_RELEASE` events.*
- static int [Fl::event\\_x](#) ()  
*Returns the mouse position of the event relative to the [Fl\\_Window](#) it was passed to.*
- static int [Fl::event\\_x\\_root](#) ()  
*Returns the mouse position on the screen of the event.*
- static int [Fl::event\\_y](#) ()  
*Returns the mouse position of the event relative to the [Fl\\_Window](#) it was passed to.*
- static int [Fl::event\\_y\\_root](#) ()  
*Returns the mouse position on the screen of the event.*
- static [Fl\\_Widget](#) \* [Fl::focus](#) ()  
*Gets the current [Fl::focus](#)() widget.*
- static void [Fl::focus](#) ([Fl\\_Widget](#) \*)  
*Sets the widget that will receive `FL_KEYBOARD` events.*
- static int [Fl::get\\_key](#) (int key)  
*Returns true if the given `key` is held down now.*
- static void [Fl::get\\_mouse](#) (int &, int &)  
*Return where the mouse is on the screen by doing a round-trip query to the server.*
- static int [Fl::handle](#) (int, [Fl\\_Window](#) \*)  
*Handle events from the window system.*
- static int [Fl::handle\\_](#) (int, [Fl\\_Window](#) \*)  
*Handle events from the window system.*
- static [Fl\\_Event\\_Handler](#) [Fl::last\\_handler](#) ()  
*Returns the last function installed by a call to [Fl::add\\_handler](#)().*

- static `Fl_Widget * Fl::pushed ()`  
*Gets the widget that is being pushed.*
- static void `Fl::pushed (Fl_Widget *)`  
*Sets the widget that is being pushed.*
- static void `Fl::remove_handler (Fl_Event_Handler h)`  
*Removes a previously added event handler.*
- static void `Fl::remove_system_handler (Fl_System_Handler h)`  
*Removes a previously added system event handler.*
- static int `Fl::test_shortcut (Fl_Shortcut)`  
*Tests the current event, which must be an `FL_KEYBOARD` or `FL_SHORTCUT`, against a shortcut value (described in [Fl\\_Button](#)).*

## Variables

- const char \*const `fl_callback_reason_names []`  
*This is an array of callback reason names you can use to convert callback reasons into names.*
- const char \*const `fl_eventnames []`  
*This is an array of event names you can use to convert event numbers into names.*
- const char \*const `fl_fontnames []`  
*This is an array of font names you can use to convert font numbers into names.*

### 32.3.1 Detailed Description

`Fl` class events handling API declared in `<FL/Fl.H>`

### 32.3.2 Function Documentation

#### 32.3.2.1 `add_handler()` [1/2]

```
void Fl::add_handler (
    Fl_Event_Handler ha ) [static]
```

Install a function to parse unrecognized events.

If FLTK cannot figure out what to do with an event, it calls each of these functions (most recent first) until one of them returns non-zero. If none of them returns non-zero then the event is ignored. Events that cause this to be called are:

- `FL_SHORTCUT` events that are not recognized by any widget. This lets you provide global shortcut keys.
- `FL_SCREEN_CONFIGURATION_CHANGED` events. Under X11, this event requires the `libXrandr.so` shared library to be loadable at run-time and the X server to implement the RandR extension.
- `FL_ZOOM_EVENT` events.
- System events that FLTK does not recognize. See `fl_xevent`.
- Some other events when the widget FLTK selected returns zero from its `handle()` method. Exactly which ones may change in future versions, however.

See also

[Fl::remove\\_handler\(Fl\\_Event\\_Handler\)](#)  
[Fl::event\\_dispatch\(Fl\\_Event\\_Dispatch d\)](#)  
[Fl::handle\(int, Fl\\_Window\\*\)](#)

### 32.3.2.2 `add_handler()` [2/2]

```
void Fl::add_handler (
    Fl_Event_Handler ha,
    Fl_Event_Handler before ) [static]
```

Install a function to parse unrecognized events with less priority than another function.

Install function `ha` to handle unrecognized events giving it the priority just lower than that of function `before` which was previously installed.

See also

[Fl::add\\_handler\(Fl\\_Event\\_Handler\)](#)  
[Fl::last\\_handler\(\)](#)

Since

1.4.0

### 32.3.2.3 `add_system_handler()`

```
void Fl::add_system_handler (
    Fl_System_Handler ha,
    void * data ) [static]
```

Install a function to intercept system events.

FLTK calls each of these functions as soon as a new system event is received. The processing will stop at the first function to return non-zero. If all functions return zero then the event is passed on for normal handling by FLTK.

Each function will be called with a pointer to the system event as the first argument and `data` as the second argument. The system event pointer will always be `void *`, but will point to different objects depending on the platform:

- X11: XEvent
- Windows: MSG
- OS X: NSEvent
- Wayland: NULL (FLTK runs the event handler(s) just before calling `wl_display_dispatch()`)

Parameters

<i>ha</i>	The event handler function to register
<i>data</i>	User data to include on each call

See also

[Fl::remove\\_system\\_handler\(Fl\\_System\\_Handler\)](#)

### 32.3.2.4 `belowmouse()` [1/2]

```
static Fl_Widget * Fl::belowmouse ( ) [inline], [static]
```

Gets the widget that is below the mouse.

See also

[belowmouse\(Fl\\_Widget\\*\)](#)

**32.3.2.5 belowmouse()** [2/2]

```
void Fl::belowmouse (
    Fl_Widget * o ) [static]
```

Sets the widget that is below the mouse.

This is for highlighting buttons. It is not used to send FL\_PUSH or FL\_MOVE directly, for several obscure reasons, but those events typically go to this widget. This is also the first widget tried for FL\_SHORTCUT events.

If you change the belowmouse widget, the previous one and all parents (that don't contain the new widget) are sent FL\_LEAVE events. Changing this does *not* send FL\_ENTER to this or any widget, because sending FL\_ENTER is supposed to *test* if the widget wants the mouse (by it returning non-zero from [handle\(\)](#)).

**32.3.2.6 callback\_reason()**

```
Fl_Callback_Reason Fl::callback_reason ( ) [static]
```

Give the reason for calling a callback.

Returns

the reason for the current callback

See also

[Fl\\_Widget::when\(\)](#), [Fl\\_Widget::do\\_callback\(\)](#), [Fl\\_Widget::callback\(\)](#)

Since

1.4.0

**32.3.2.7 compose()**

```
int Fl::compose (
    int & del ) [static]
```

Any text editing widget should call this for each FL\_KEYBOARD event.

Use of this function is very simple.

If *true* is returned, then it has modified the [Fl::event\\_text\(\)](#) and [Fl::event\\_length\(\)](#) to a set of *bytes* to insert (it may be of zero length!). It will also set the "del" parameter to the number of *bytes* to the left of the cursor to delete, this is used to delete the results of the previous call to [Fl::compose\(\)](#).

If *false* is returned, the keys should be treated as function keys, and del is set to zero. You could insert the text anyways, if you don't know what else to do.

Text editing widgets can preferentially call [fl\\_set\\_spot\(\)](#) to indicate the window coordinates of the bottom of the current insertion point and the line height. This way, auxiliary windows that help choosing among alternative characters with some text input methods appear just below or above the insertion point. If widgets don't do that, such auxiliary windows appear at the widget's bottom.

On some platforms, text input can involve marked text, that is, temporary text replaced by other text during the input process. This occurs, e.g., under Wayland or macOS when using dead keys or when entering CJK characters. Text editing widgets should preferentially signal marked text, usually underlining it. Widgets can use `int Fl::compose_state` after having called [Fl::compose\(int&\)](#) to obtain the length in bytes of marked text that always finishes at the current insertion point. Widgets should also call `void fl_reset_spot()` when processing FL\_UNFOCUS events. The [Fl\\_Input](#) and [Fl\\_Text\\_Editor](#) widgets underline marked text. If none of this is done by a user-defined text editing widget, text input will work, but will not signal to the user what text is marked.

Finally, text editing widgets should call `set_flag(MAC_USE_ACCENTS_MENU)` ; in their constructor if they want to use, on the macOS platform, the feature introduced with Mac OS 10.7 "Lion" where pressing and holding certain keys on the keyboard opens a diacritic marks popup window.

Note

For compatibility with FLTK 1.3, text editing widgets can call `Fl::insertion_point_location(int x, int y, int height)` and `Fl::reset_marked_text()` only under the macOS platform to indicate/reset the coordinates of the current insertion point. This is deprecated in version 1.4 because redundant with the platform-independent [fl\\_set\\_spot\(\)](#) and [fl\\_reset\\_spot\(\)](#) functions.

**32.3.2.8 compose\_reset()**

```
void Fl::compose_reset ( ) [static]
```

If the user moves the cursor, be sure to call [Fl::compose\\_reset\(\)](#).

The next call to [Fl::compose\(\)](#) will start out in an initial state. In particular it will not set "del" to non-zero. This call is very fast so it is ok to call it many times and in many places.

**32.3.2.9 disable\_im()**

```
void Fl::disable_im ( ) [static]
```

Disables the system input methods facilities.

See also

[enable\\_im\(\)](#)

**32.3.2.10 enable\_im()**

```
void Fl::enable_im ( ) [static]
```

Enables the system input methods facilities.

This is the default.

See also

[disable\\_im\(\)](#)

**32.3.2.11 event()**

```
static int Fl::event ( ) [inline], [static]
```

Returns the last event that was processed.

This can be used to determine if a callback is being done in response to a keypress, mouse click, etc.

**32.3.2.12 event\_button()**

```
static int Fl::event_button ( ) [inline], [static]
```

Gets which particular mouse button caused the current event.

This returns garbage if the most recent event was not a FL\_PUSH or FL\_RELEASE event.

Return values

<i>FL_LEFT_MOUSE</i>	
<i>FL_MIDDLE_MOUSE</i>	
<i>FL_RIGHT_MOUSE</i>	
<i>FL_BACK_MOUSE</i>	
<i>FL_FORWARD_MOUSE</i>	

See also

[Fl::event\\_buttons\(\)](#), [Fl::event\\_state\(\)](#)

**32.3.2.13 event\_button1()**

```
static int Fl::event_button1 ( ) [inline], [static]
```

Returns non-zero if mouse button 1 is currently held down.

For more details, see [Fl::event\\_buttons\(\)](#).

**32.3.2.14 event\_button2()**

```
static int Fl::event_button2 ( ) [inline], [static]
```

Returns non-zero if mouse button 2 is currently held down.

For more details, see [Fl::event\\_buttons\(\)](#).

**32.3.2.15 event\_button3()**

```
static int Fl::event_button3 ( ) [inline], [static]
```

Returns non-zero if mouse button 3 is currently held down.

For more details, see [Fl::event\\_buttons\(\)](#).

**32.3.2.16 event\_button4()**

```
static int Fl::event_button4 ( ) [inline], [static]
```

Returns non-zero if mouse button 4 is currently held down.

For more details, see [Fl::event\\_buttons\(\)](#).

**32.3.2.17 event\_button5()**

```
static int Fl::event_button5 ( ) [inline], [static]
```

Returns non-zero if mouse button 5 is currently held down.

For more details, see [Fl::event\\_buttons\(\)](#).

**32.3.2.18 event\_buttons()**

```
static int Fl::event_buttons ( ) [inline], [static]
```

Returns the mouse buttons state bits; if non-zero, then at least one button is pressed now.

This function returns the button state at the time of the event. During an FL\_RELEASE event, the state of the released button will be 0. To find out, which button caused an FL\_RELEASE event, you can use [Fl::event\\_button\(\)](#) instead.

**Returns**

a bit mask value like { [FL\_BUTTON1] | [FL\_BUTTON2] | ... | [FL\_BUTTON5] }

**32.3.2.19 event\_clicks() [1/2]**

```
static int Fl::event_clicks ( ) [inline], [static]
```

Returns non zero if we had a double click event.

**Return values**

<i>Non-zero</i>	if the most recent FL_PUSH or FL_KEYBOARD was a "double click".
<i>N-1</i>	for N clicks. A double click is counted if the same button is pressed again while <a href="#">event_is_click()</a> is true.

**32.3.2.20 event\_clicks() [2/2]**

```
static void Fl::event_clicks (
    int i ) [inline], [static]
```

Manually sets the number returned by [Fl::event\\_clicks\(\)](#).

This can be used to set it to zero so that later code does not think an item was double-clicked.

**Parameters**

in	<i>i</i>	corresponds to no double-click if 0, i+1 mouse clicks otherwise
----	----------	---

See also

[int event\\_clicks\(\)](#)

### 32.3.2.21 event\_clipboard()

```
static void * Fl::event_clipboard ( ) [inline], [static]
```

During an FL\_PASTE event of non-textual data, returns a pointer to the pasted data.

The returned data is an [Fl\\_RGB\\_Image \\*](#) when the result of [Fl::event\\_clipboard\\_type\(\)](#) is [Fl::clipboard\\_image](#).

### 32.3.2.22 event\_clipboard\_type()

```
static const char * Fl::event_clipboard_type ( ) [inline], [static]
```

Returns the type of the pasted data during an FL\_PASTE event.

This type can be [Fl::clipboard\\_plain\\_text](#) or [Fl::clipboard\\_image](#).

### 32.3.2.23 event\_dispatch()

```
void Fl::event_dispatch (
    Fl_Event_Dispatch d ) [static]
```

Set a new event dispatch function.

The event dispatch function is called after native events are converted to FLTK events, but before they are handled by FLTK. If the dispatch function `Fl_Event_Dispatch d` is set, it is up to the dispatch function to call [Fl::handle\\_\(int, Fl\\_Window\\*\)](#) or to ignore the event.

The dispatch function itself must return 0 if it ignored the event, or non-zero if it used the event. If you call [Fl::handle\\_\(\)](#), then this will return the correct value.

The event dispatch can be used to handle exceptions in FLTK events and callbacks before they reach the native event handler:

```
int myHandler(int e, Fl_Window *w) {
    try {
        return Fl::handle_(e, w);
    } catch ( ) {
        ...
    }
}
main() {
    Fl::event_dispatch(myHandler);
    ...
    Fl::run();
}
```

#### Parameters

<i>d</i>	new dispatch function, or NULL
----------	--------------------------------

See also

[Fl::add\\_handler\(Fl\\_Event\\_Handler\)](#)

[Fl::handle\(int, Fl\\_Window\\*\)](#)

[Fl::handle\\_\(int, Fl\\_Window\\*\)](#)

### 32.3.2.24 event\_dx()

```
static int Fl::event_dx ( ) [inline], [static]
```

Returns the current horizontal mouse scrolling associated with the FL\_MOUSEWHEEL event.

Right is positive.

### 32.3.2.25 event\_dy()

```
static int Fl::event_dy ( ) [inline], [static]
```

Returns the current vertical mouse scrolling associated with the `FL_MOUSEWHEEL` event.  
Down is positive.

### 32.3.2.26 `event_inside()` [1/2]

```
int Fl::event_inside (
    const Fl_Widget * o ) [static]
```

Returns whether or not the mouse event is inside a given child widget.

Returns non-zero if the current `Fl::event_x()` and `Fl::event_y()` put it inside the given child widget's bounding box.

This method can only be used to check whether the mouse event is inside a **child** widget of the window that handles the event, and there must not be an intermediate subwindow (i.e. the widget must not be inside a subwindow of the current window). However, it is valid if the widget is inside a nested `Fl_Group`.

You must not use it with the window itself as the `o` argument in a window's `handle()` method.

#### Note

The mentioned restrictions are necessary, because this method does not transform coordinates of child widgets, and thus the given widget `o` must be within the *same* window that is handling the current event. Otherwise the results are undefined.

You should always call this rather than doing your own comparison so you are consistent about edge effects.

#### See also

`Fl::event_inside(int, int, int, int)`

#### Parameters

in	o	child widget to be tested
----	---	---------------------------

#### Returns

non-zero, if mouse event is inside the widget

### 32.3.2.27 `event_inside()` [2/2]

```
int Fl::event_inside (
    int xx,
    int yy,
    int ww,
    int hh ) [static]
```

Returns whether or not the mouse event is inside the given rectangle.

Returns non-zero if the current `Fl::event_x()` and `Fl::event_y()` put it inside the given arbitrary bounding box.

You should always call this rather than doing your own comparison so you are consistent about edge effects.

To find out, whether the event is inside a child widget of the current window, you can use `Fl::event_inside(const Fl_Widget *)`.

#### Parameters

in	xx,yy,ww,hh	bounding box
----	-------------	--------------

#### Returns

non-zero, if mouse event is inside

### 32.3.2.28 `event_is_click()` [1/2]

```
static int Fl::event_is_click ( ) [inline], [static]
```

Returns non-zero if the mouse has not moved far enough and not enough time has passed since the last FL\_PUSH or FL\_KEYBOARD event for it to be considered a "drag" rather than a "click". You can test this on FL\_DRAG, FL\_RELEASE, and FL\_MOVE events.

### 32.3.2.29 event\_is\_click() [2/2]

```
static void Fl::event_is_click (
    int i ) [inline], [static]
```

Clears the value returned by [Fl::event\\_is\\_click\(\)](#).

Useful to prevent the *next* click from being counted as a double-click or to make a popup menu pick an item with a single click. Don't pass non-zero to this.

### 32.3.2.30 event\_key() [1/2]

```
static int Fl::event_key ( ) [inline], [static]
```

Gets which key on the keyboard was last pushed.

The returned integer 'key code' is not necessarily a text equivalent for the keystroke. For instance: if someone presses '5' on the numeric keypad with numlock on, [Fl::event\\_key\(\)](#) may return the 'key code' for this key, and NOT the character '5'. To always get the '5', use [Fl::event\\_text\(\)](#) instead.

#### Returns

an integer 'key code', or 0 if the last event was not a key press or release.

#### See also

[int event\\_key\(int\)](#), [event\\_text\(\)](#), [compose\(int&\)](#).

### 32.3.2.31 event\_key() [2/2]

```
int Fl::event_key (
    int key ) [static]
```

Returns true if the given *key* was held down (or pressed) *during* the last event.

This is constant until the next event is read from the server.

[Fl::get\\_key\(int\)](#) returns true if the given key is held down *now*. Under X this requires a round-trip to the server and is *much* slower than [Fl::event\\_key\(int\)](#).

Keys are identified by the *unshifted* values. FLTK defines a set of symbols that should work on most modern machines for every key on the keyboard:

- All keys on the main keyboard producing a printable ASCII character use the value of that ASCII character (as though shift, ctrl, and caps lock were not on). The space bar is 32.
- All keys on the numeric keypad producing a printable ASCII character use the value of that ASCII character plus FL\_KP (e.g., FL\_KP + '4', FL\_KP + '/'). The highest possible value is FL\_KP\_Last so you can range-check to see if something is on the keypad.
- All numbered function keys use the number on the function key plus FL\_F. The highest possible number is FL\_F\_Last, so you can range-check a value.
- Buttons on the mouse are considered keys, and use the button number (where the left button is 1) plus FL\_Button.
- All other keys on the keypad have a symbol: FL\_Escape, FL\_BackSpace, FL\_Tab, FL\_Enter, FL\_Print, FL\_Scroll\_Lock, FL\_Pause, FL\_Insert, FL\_Home, FL\_Page\_Up, FL\_Delete, FL\_End, FL\_Page\_Down, FL\_Left, FL\_Up, FL\_Right, FL\_Down, FL\_Iso\_Key, FL\_Shift\_L, FL\_Shift\_R, FL\_Control\_L, FL\_Control\_R, FL\_Caps\_Lock, FL\_Alt\_L, FL\_Alt\_R, FL\_Meta\_L, FL\_Meta\_R, FL\_Menu, FL\_Num\_Lock, FL\_KP\_Enter. Be careful not to confuse these with the very similar, but all-caps, symbols used by [Fl::event\\_state\(\)](#).

On X [Fl::get\\_key\(FL\\_Button+n\)](#) does not work.

On Windows [Fl::get\\_key\(FL\\_KP\\_Enter\)](#) and [Fl::event\\_key\(FL\\_KP\\_Enter\)](#) do not work.

**32.3.2.32 event\_length()**

```
static int Fl::event_length ( ) [inline], [static]
```

Returns the length of the text in [Fl::event\\_text\(\)](#).

There will always be a nul at this position in the text. However there may be a nul before that if the keystroke translates to a nul character or you paste a nul character.

**32.3.2.33 event\_original\_key()**

```
static int Fl::event_original_key ( ) [inline], [static]
```

Returns the keycode of the last key event, regardless of the NumLock state.

If NumLock is deactivated, FLTK translates events from the numeric keypad into the corresponding arrow key events. [event\\_key\(\)](#) returns the translated key code, whereas [event\\_original\\_key\(\)](#) returns the keycode before NumLock translation.

**32.3.2.34 event\_state() [1/2]**

```
static int Fl::event_state ( ) [inline], [static]
```

Returns the keyboard and mouse button states of the last event.

This is a bitfield of what shift states were on and what mouse buttons were held down during the most recent event.

**Note**

FLTK platforms differ in what [Fl::event\\_state\(\)](#) returns when it is called while a modifier key or mouse button is being pressed or released.

- Under X11 and Wayland, [Fl::event\\_state\(\)](#) indicates the state of the modifier keys and mouse buttons just **prior** to the event. Thus, during the `FL_KEYDOWN` event generated when pressing the shift key, for example, the `FL_SHIFT` bit of [event\\_state\(\)](#) is 0 and becomes 1 only at the next event which can be any other event, including e.g. `FL_MOVE`.
- Under other platforms the reported state of modifier keys or mouse buttons includes that of the key or button being pressed or released.
- [Fl::event\\_state\(\)](#) returns the same value under all platforms when it's called while a non-modifier key (e.g. a letter or function key) is being pressed or released.
- X servers do not agree on shift states, and `FL_NUM_LOCK`, `FL_META`, and `FL_SCROLL_LOCK` may not work.
- The values were selected to match the XFree86 server on Linux.

**Note**

This inconsistency **may** be fixed (on X11 and Wayland) in a later release.

The legal event state bits are:

Device	State Bit	Key or Button	Since
Keyboard	<code>FL_SHIFT</code>	Shift	
Keyboard	<code>FL_CAPS_LOCK</code>	Caps Lock	
Keyboard	<code>FL_CTRL</code>	Ctrl	
Keyboard	<code>FL_ALT</code>	Alt	
Keyboard	<code>FL_NUM_LOCK</code>	Num Lock	
Keyboard	<code>FL_META</code>	Meta, e.g. "Windows"	
Keyboard	<code>FL_SCROLL_LOCK</code>	Scroll Lock	
Mouse	<code>FL_BUTTON1</code>	left button	
Mouse	<code>FL_BUTTON2</code>	middle button	
Mouse	<code>FL_BUTTON3</code>	right button	
Mouse	<code>FL_BUTTON4</code>	side button 1 (back)	1.3.10
Mouse	<code>FL_BUTTON5</code>	side button 2 (forward)	1.3.10

**32.3.2.35 event\_state()** [2/2]

```
static int Fl::event_state (
    int mask ) [inline], [static]
```

Returns non-zero if any of the passed event state bits are turned on.

Use `mask` to pass the event states you're interested in. The legal event state bits are defined in [Fl::event\\_state\(\)](#).

**32.3.2.36 event\_text()**

```
static const char * Fl::event_text ( ) [inline], [static]
```

Returns the text associated with the current event, including `FL_PASTE` or `FL_DND_RELEASE` events.

This can be used in response to `FL_KEYUP`, `FL_KEYDOWN`, `FL_PASTE`, and `FL_DND_RELEASE`.

When responding to `FL_KEYUP`/`FL_KEYDOWN`, use this function instead of [Fl::event\\_key\(\)](#) to get the text equivalent of keystrokes suitable for inserting into strings and text widgets.

The returned string is guaranteed to be NULL terminated. However, see [Fl::event\\_length\(\)](#) for the actual length of the string, in case the string itself contains NULLs that are part of the text data.

**Returns**

A NULL terminated text string equivalent of the last keystroke.

**32.3.2.37 event\_x\_root()**

```
static int Fl::event_x_root ( ) [inline], [static]
```

Returns the mouse position on the screen of the event.

To find the absolute position of an [Fl\\_Window](#) on the screen, use the difference between [event\\_x\\_root\(\)](#), [event\\_y\\_root\(\)](#) and [event\\_x\(\)](#), [event\\_y\(\)](#).

**32.3.2.38 event\_y\_root()**

```
static int Fl::event_y_root ( ) [inline], [static]
```

Returns the mouse position on the screen of the event.

To find the absolute position of an [Fl\\_Window](#) on the screen, use the difference between [event\\_x\\_root\(\)](#), [event\\_y\\_root\(\)](#) and [event\\_x\(\)](#), [event\\_y\(\)](#).

**32.3.2.39 focus()** [1/2]

```
static Fl_Widget * Fl::focus ( ) [inline], [static]
```

Gets the current [Fl::focus\(\)](#) widget.

**See also**

[Fl::focus\(Fl\\_Widget\\*\)](#)

**32.3.2.40 focus()** [2/2]

```
void Fl::focus (
    Fl_Widget * o ) [static]
```

Sets the widget that will receive `FL_KEYBOARD` events.

Use this function inside the `handle(int)` member function of a widget of yours to give focus to the widget, for example when it receives the `FL_FOCUS` or the `FL_PUSH` event. Otherwise, use [Fl\\_Widget::take\\_focus\(\)](#) to give focus to a widget;

If you change [Fl::focus\(\)](#), the previous widget and all parents (that don't contain the new widget) are sent `FL_UNFOCUS` events. Changing the focus does *not* send `FL_FOCUS` to this or any widget, because sending `FL_FOCUS` is supposed to *test* if the widget wants the focus (by it returning non-zero from [handle\(\)](#)).

Since FLTK 1.4.0 widgets can set the `NEEDS_KEYBOARD` flag to indicate that a keyboard is essential for the widget to function. Touchscreen devices will be sent a request to show an on-screen keyboard if no hardware keyboard is connected.

See also

[Fl\\_Widget::take\\_focus\(\)](#)  
[Fl\\_Widget::needs\\_keyboard\(\) const](#)  
[Fl\\_Widget::needs\\_keyboard\(bool\)](#)

#### 32.3.2.41 get\_key()

```
int Fl::get_key (
    int key ) [static]
```

Returns true if the given `key` is held down *now*.

Under X this requires a round-trip to the server and is *much* slower than [Fl::event\\_key\(int\)](#).

See also

[event\\_key\(int\)](#)

#### 32.3.2.42 get\_mouse()

```
void Fl::get_mouse (
    int & x,
    int & y ) [static]
```

Return where the mouse is on the screen by doing a round-trip query to the server.

You should use [Fl::event\\_x\\_root\(\)](#) and [Fl::event\\_y\\_root\(\)](#) if possible, but this is necessary if you are not sure if a mouse event has been processed recently (such as to position your first window). If the display is not open, this will open it.

#### 32.3.2.43 handle()

```
int Fl::handle (
    int e,
    Fl_Window * window ) [static]
```

Handle events from the window system.

This is called from the native event dispatch after native events have been converted to FLTK notation. This function calls [Fl::handle\\_\(int, Fl\\_Window\\*\)](#) unless the user sets a dispatch function. If a user dispatch function is set, the user must make sure that [Fl::handle\\_\(\)](#) is called, or the event will be ignored.

Parameters

<i>e</i>	the event type ( <a href="#">Fl::event_number()</a> is not yet set)
<i>window</i>	the window that caused this event

Returns

0 if the event was not handled

See also

[Fl::add\\_handler\(Fl\\_Event\\_Handler\)](#)  
[Fl::event\\_dispatch\(Fl\\_Event\\_Dispatch\)](#)

**32.3.2.44 `handle_()`**

```
int Fl::handle_ (
    int e,
    Fl_Window * window ) [static]
```

Handle events from the window system.

This function is called from the native event dispatch, unless the user sets another dispatch function. In that case, the user dispatch function must decide when to call [Fl::handle\\_\(int, Fl\\_Window\\*\)](#)

Callbacks can set `FL_REASON_CLOSED` and `FL_REASON_CANCELLED`.

**Parameters**

<i>e</i>	the event type ( <code>Fl::event_number()</code> is not yet set)
<i>window</i>	the window that caused this event

**Returns**

0 if the event was not handled

**See also**

[Fl::event\\_dispatch\(Fl\\_Event\\_Dispatch\)](#)

**32.3.2.45 `last_handler()`**

```
Fl_Event_Handler Fl::last_handler ( ) [static]
```

Returns the last function installed by a call to [Fl::add\\_handler\(\)](#).

**Since**

1.4.0

**32.3.2.46 `pushed()` [1/2]**

```
static Fl_Widget * Fl::pushed ( ) [inline], [static]
```

Gets the widget that is being pushed.

**See also**

`void pushed\(Fl\_Widget\*\)`

**32.3.2.47 `pushed()` [2/2]**

```
void Fl::pushed (
    Fl_Widget * o ) [static]
```

Sets the widget that is being pushed.

`FL_DRAG` or `FL_RELEASE` (and any more `FL_PUSH`) events will be sent to this widget.

If you change the pushed widget, the previous one and all parents (that don't contain the new widget) are sent `FL_RELEASE` events. Changing this does *not* send `FL_PUSH` to this or any widget, because sending `FL_PUSH` is supposed to *test* if the widget wants the mouse (by it returning non-zero from [handle\(\)](#)).

**32.3.2.48 `remove_handler()`**

```
void Fl::remove_handler (
    Fl_Event_Handler ha ) [static]
```

Removes a previously added event handler.

See also

[Fl::handle\(int, Fl\\_Window\\*\)](#)

### 32.3.2.49 remove\_system\_handler()

```
void Fl::remove_system_handler (
    Fl\_System\_Handler ha ) [static]
```

Removes a previously added system event handler.

Parameters

<i>ha</i>	The event handler function to remove
-----------	--------------------------------------

See also

[Fl::add\\_system\\_handler\(Fl\\_System\\_Handler\)](#)

### 32.3.2.50 test\_shortcut()

```
int Fl::test_shortcut (
    Fl\_Shortcut shortcut ) [static]
```

Tests the current event, which must be an FL\_KEYBOARD or FL\_SHORTCUT, against a shortcut value (described in [Fl\\_Button](#)).

Not to be confused with [Fl\\_Widget::test\\_shortcut\(\)](#).

Returns

non-zero if there is a match.

## 32.3.3 Variable Documentation

### 32.3.3.1 fl\_callback\_reason\_names

```
const char* const fl_callback_reason_names[]
```

Initial value:

```
=
{
    "FL_REASON_UNKNOWN",
    "FL_REASON_SELECTED",
    "FL_REASON_DESELECTED",
    "FL_REASON_RESELECTED",
    "FL_REASON_OPENED",
    "FL_REASON_CLOSED",
    "FL_REASON_DRAGGED",
    "FL_REASON_CANCELLED",
    "FL_REASON_CHANGED",
    "FL_REASON_GOT_FOCUS",
    "FL_REASON_LOST_FOCUS",
    "FL_REASON_RELEASED",
    "FL_REASON_ENTER_KEY",
    NULL, NULL, NULL,
    NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
    NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
    "FL_REASON_USER", "FL_REASON_USER+1", "FL_REASON_USER+2", "FL_REASON_USER+3",
}
```

This is an array of callback reason names you can use to convert callback reasons into names.

The array gets defined inline wherever your `#include <FL/names.h>` appears.

### 32.3.3.2 fl\_eventnames

```
const char* const fl_eventnames[]
```

This is an array of event names you can use to convert event numbers into names.

The array gets defined inline wherever your `#include <FL/names.h>` appears.

#### Example:

```
#include <FL/names.h>           // array will be defined here
int MyClass::handle(int e) {
    printf("Event was %s (%d)\n", fl_eventnames[e], e);
    // ..resulting output might be e.g.  "Event was FL_PUSH (1)"..
    [..]
}
```

### 32.3.3.3 fl\_fontnames

```
const char* const fl_fontnames[]
```

#### Initial value:

```
=
{
    "FL_HELVETICA",
    "FL_HELVETICA_BOLD",
    "FL_HELVETICA_ITALIC",
    "FL_HELVETICA_BOLD_ITALIC",
    "FL_COURIER",
    "FL_COURIER_BOLD",
    "FL_COURIER_ITALIC",
    "FL_COURIER_BOLD_ITALIC",
    "FL_TIMES",
    "FL_TIMES_BOLD",
    "FL_TIMES_ITALIC",
    "FL_TIMES_BOLD_ITALIC",
    "FL_SYMBOL",
    "FL_SCREEN",
    "FL_SCREEN_BOLD",
    "FL_ZAPF_DINGBATS",
}
```

This is an array of font names you can use to convert font numbers into names.

The array gets defined inline wherever your `#include <FL/names.h>` appears.

#### Example:

```
#include <FL/names.h>           // array will be defined here
int MyClass::my_callback(FL_Widget *w, void*) {
    int fnum = w->labelfont();
    // Resulting output might be e.g.  "Label's font is FL_HELVETICA (0)"
    printf("Label's font is %s (%d)\n", fl_fontnames[fnum], fnum);
    // ..resulting output might be e.g.  "Label's font is FL_HELVETICA (0)"..
    [..]
}
```

## 32.4 Selection & Clipboard functions

FLTK global copy/cut/paste functions declared in `<FL/Fl.H>`

### Functions

- static void `Fl::add_clipboard_notify` (`Fl_Clipboard_Notify_Handler h`, `void *data=0`)  
*FLTK will call the registered callback whenever there is a change to the selection buffer or the clipboard.*
- static int `Fl::clipboard_contains` (`const char *type`)  
*Returns non 0 if the clipboard contains data matching type.*
- static void `Fl::copy` (`const char *stuff`, `int len`, `int destination=0`, `const char *type=Fl::clipboard_plain_text`)  
*Copies data to the selection buffer, the clipboard, or both.*
- static int `Fl::dnd` ()  
*Initiate a Drag And Drop operation.*
- static void `Fl::paste` (`Fl_Widget &receiver`)  
*Backward compatibility only.*
- static void `Fl::paste` (`Fl_Widget &receiver`, `int source`, `const char *type=Fl::clipboard_plain_text`)  
*Pastes the data from the selection buffer (source is 0) or the clipboard (source is 1) into receiver.*

- static void **Fl::remove\_clipboard\_notify** ([Fl\\_Clipboard\\_Notify\\_Handler](#) h)  
*Stop calling the specified callback when there are changes to the selection buffer or the clipboard.*
- static void **Fl::selection** ([Fl\\_Widget](#) &owner, const char \*, int len)  
*Changes the current selection.*
- static [Fl\\_Widget](#) \* **Fl::selection\_owner** ()  
*back-compatibility only: Gets the widget owning the current selection*
- static void **Fl::selection\_owner** ([Fl\\_Widget](#) \*)  
*Back-compatibility only: The single-argument call can be used to move the selection to another widget or to set the owner to NULL, without changing the actual text of the selection.*
- static int **Fl::selection\_to\_clipboard** ()  
*Returns the current selection\_to\_clipboard mode.*
- static void **Fl::selection\_to\_clipboard** (int mode)  
*Copies selections on X11 directly to the clipboard if enabled.*

## Variables

- static char const \*const **Fl::clipboard\_image** = "image"  
*Denotes image data.*
- static char const \*const **Fl::clipboard\_plain\_text** = "text/plain"  
*Denotes plain textual data.*

### 32.4.1 Detailed Description

FLTK global copy/cut/paste functions declared in [<FL/Fl.H>](#)

### 32.4.2 Function Documentation

#### 32.4.2.1 add\_clipboard\_notify()

```
void Fl::add_clipboard_notify (
    Fl\_Clipboard\_Notify\_Handler h,
    void * data = 0 ) [static]
```

FLTK will call the registered callback whenever there is a change to the selection buffer or the clipboard. The source argument indicates which of the two has changed. Only changes by other applications are reported.

Example:

```
void clip_callback(int source, void *data) {
    if ( source == 0 ) printf("CLIP CALLBACK: selection buffer changed\n");
    if ( source == 1 ) printf("CLIP CALLBACK: clipboard changed\n");
}
[...]
```

```
int main() {
    [...]
    Fl::add\_clipboard\_notify(clip_callback);
    [...]
}
```

#### Note

Some systems require polling to monitor the clipboard and may therefore have some delay in detecting changes.

#### 32.4.2.2 clipboard\_contains()

```
int Fl::clipboard_contains (
    const char * type ) [static]
```

Returns non 0 if the clipboard contains data matching type.

The clipboard can contain both text and image data; in that situation this function returns non 0 to both requests. This function is *not* meant to check whether the clipboard is empty. This function does not allow to query the selection buffer because FLTK allows to copy/paste non-textual data only from/to the clipboard.

## Parameters

<i>type</i>	can be <a href="#">Fl::clipboard_plain_text</a> or <a href="#">Fl::clipboard_image</a> .
-------------	--

**32.4.2.3 copy()**

```
void Fl::copy (
    const char * stuff,
    int len,
    int destination = 0,
    const char * type = Fl::clipboard\_plain\_text ) [static]
```

Copies data to the selection buffer, the clipboard, or both.

The *destination* can be:

- 0: selection buffer (see note below)
- 1: clipboard
- 2: both

The selection buffer exists only on the X11 platform and is used for middle-mouse pastes and for drag-and-drop selections. The clipboard is used for traditional copy/cut/paste operations. On all other platforms the selection buffer (*destination* = 0) is mapped to the clipboard, i.e. on platforms other than X11 all *destinations* are equivalent and the data is always copied to the clipboard.

**Note**

Please see [Fl::selection\\_to\\_clipboard\(\)](#) to enable duplication of the selection buffer to the clipboard on X11, i.e. if *destination* = 0 (selection buffer) **and** [Fl::selection\\_to\\_clipboard\(\)](#) is enabled, then the data is copied to both the selection buffer and the clipboard. This makes the X11 behavior similar to other platforms but keeps the selection buffer for X11 specific inter process communication.

*type* should always be [Fl::clipboard\\_plain\\_text](#) which is the default. Other values are ignored and reserved for future extensions.

**Note**

This function is, at present, intended only to copy UTF-8 encoded textual data. To copy graphical data, use the [FL\\_Copy\\_Surface](#) class. The *type* argument may allow to copy other kinds of data in the future.

## Parameters

in	<i>stuff</i>	text data to be copied
in	<i>len</i>	the number of relevant bytes in <i>stuff</i>
in	<i>destination</i>	0 = selection, 1 = clipboard, 2 = both (see description)
in	<i>type</i>	usually plain text (see description)

**32.4.2.4 dnd()**

```
int Fl::dnd ( ) [static]
```

Initiate a Drag And Drop operation.

The selection buffer should be filled with relevant data before calling this method. FLTK will then initiate the system wide drag and drop handling. Dropped data will be marked as *text*.

Create a selection first using: `Fl::copy(const char *stuff, int len, 0)`

### 32.4.2.5 `paste()` [1/2]

```
void Fl::paste (
    Fl_Widget & receiver ) [static]
```

Backward compatibility only.

This calls `Fl::paste(receiver, 0)`;

See also

[Fl::paste\(Fl\\_Widget &receiver, int clipboard, const char\\* type\)](#)

### 32.4.2.6 `paste()` [2/2]

```
void Fl::paste (
    Fl_Widget & receiver,
    int source,
    const char * type = Fl::clipboard_plain_text ) [static]
```

Pastes the data from the selection buffer (`source` is 0) or the clipboard (`source` is 1) into `receiver`.

The selection buffer (`source` is 0) is used for middle-mouse pastes and for drag-and-drop selections. The clipboard (`source` is 1) is used for copy/cut/paste operations.

If `source` is 1, the optional `type` argument indicates what type of data is requested from the clipboard. At present, [Fl::clipboard\\_plain\\_text](#) (requesting text data) and [Fl::clipboard\\_image](#) (requesting image data) are possible. Set things up so the handle function of the `receiver` widget will be called with an `FL_PASTE` event some time in the future if the clipboard does contain data of the requested type.

The handle function of `receiver` can process the `FL_PASTE` event as follows:

- If the `receiver` widget is known to only receive text data, the text string from the specified `source` is in [Fl::event\\_text\(\)](#) with UTF-8 encoding, and the number of bytes is in [Fl::event\\_length\(\)](#). If [Fl::paste\(\)](#) gets called during the drop step of a files-drag-and-drop operation, [Fl::event\\_text\(\)](#) contains a list of filenames (see [Drag and Drop Events](#)).
- If the `receiver` widget can potentially receive non-text data, use [Fl::event\\_clipboard\\_type\(\)](#) to determine what sort of data is being sent. If [Fl::event\\_clipboard\\_type\(\)](#) returns [Fl::clipboard\\_plain\\_text](#), proceed as above. If it returns [Fl::clipboard\\_image](#), the pointer returned by [Fl::event\\_clipboard\(\)](#) can be safely cast to type [Fl\\_RGB\\_Image \\*](#) to obtain a pointer to the pasted image. If `receiver` accepts the clipboard image, `receiver.handle()` should return 1 and the application should take ownership of this image (that is, delete it after use). Conversely, if `receiver.handle()` returns 0, the application must not use the image.

The receiver should be prepared to be called *directly* by this, or for it to happen *later*, or possibly *not at all*. This allows the window system to take as long as necessary to retrieve the paste buffer (or even to screw up completely) without complex and error-prone synchronization code in FLTK.

Platform details for image data:

- Unix/Linux platform: Clipboard images in PNG or BMP formats are recognized. Requires linking with the `fltk_images` library.
- Windows platform: Both bitmap and vectorial (Enhanced metafile) data from clipboard can be pasted as image data.
- Mac OS X platform: Both bitmap (TIFF) and vectorial (PDF) data from clipboard can be pasted as image data.

### 32.4.2.7 `selection()`

```
void Fl::selection (
    Fl_Widget & owner,
    const char * text,
    int len ) [static]
```

Changes the current selection.

The block of text is copied to an internal buffer by FLTK (be careful if doing this in response to an `FL_PASTE` as this may be the same buffer returned by [event\\_text\(\)](#)). The [selection\\_owner\(\)](#) widget is set to the passed owner.

**32.4.2.8 selection\_owner()** [1/2]

static [Fl\\_Widget](#) \* [Fl::selection\\_owner](#) ( ) [inline], [static]  
 back-compatibility only: Gets the widget owning the current selection

See also

[Fl\\_Widget\\*](#) [selection\\_owner\(Fl\\_Widget\\*\)](#)

**32.4.2.9 selection\_owner()** [2/2]

void [Fl::selection\\_owner](#) (   
     [Fl\\_Widget](#) \* owner ) [static]

Back-compatibility only: The single-argument call can be used to move the selection to another widget or to set the owner to NULL, without changing the actual text of the selection.

FL\_SELECTIONCLEAR is sent to the previous selection owner, if any.

*Copying the buffer every time the selection is changed is obviously wasteful, especially for large selections. An interface will probably be added in a future version to allow the selection to be made by a callback function. The current interface will be emulated on top of this.*

**32.4.2.10 selection\_to\_clipboard()** [1/2]

static int [Fl::selection\\_to\\_clipboard](#) ( ) [inline], [static]  
 Returns the current [selection\\_to\\_clipboard](#) mode.

See also

void [selection\\_to\\_clipboard\(int\)](#)

**32.4.2.11 selection\_to\_clipboard()** [2/2]

static void [Fl::selection\\_to\\_clipboard](#) (   
     int mode ) [inline], [static]

Copies selections on X11 directly to the clipboard if enabled.

This method can be called on all platforms. Other platforms than X11 are not affected by this feature.

If this is switched on (`mode = 1`), [Fl::copy\(\)](#) copies all data to the clipboard regardless of its `destination` argument. If the destination is 0 (selection buffer) data is copied to both the selection buffer and the clipboard.

Drag and drop is also affected since drag-and-drop data is copied to the selection buffer.

You can use this to make the experience of data selection and copying more like that on other platforms (Windows, macOS, and even Wayland).

The default operation mode is the standard X11 behavior (disabled).

Note

This feature is experimental and enabling it may have unexpected side effects. It is your own responsibility if you enable it.

Since

1.4.0

Parameters

in	mode	1 = enable <a href="#">selection_to_clipboard</a> , 0 = disable <a href="#">selection_to_clipboard</a>
----	------	--

See also

`copy(const char *, int, int, const char *)`

## 32.5 Screen functions

Fl global screen functions declared in `<FL/FL.H>`.

### Functions

- static int **Fl::h** ()  
*Returns the height in pixels of the main screen work area.*
- static void **Fl::keyboard\_screen\_scaling** (int value)  
*Controls the possibility to scale all windows by ctrl+/-/0/ or cmd+/-/0/.*
- static int **Fl::screen\_count** ()  
*Gets the total count of available screens.*
- static void **Fl::screen\_dpi** (float &h, float &v, int n=0)  
*Gets the screen resolution in dots-per-inch for the given screen.*
- static int **Fl::screen\_num** (int x, int y)  
*Gets the screen number of a screen that contains the specified screen position x, y.*
- static int **Fl::screen\_num** (int x, int y, int w, int h)  
*Gets the screen number of the screen which intersects the most with the rectangle defined by x, y, w, h.*
- static float **Fl::screen\_scale** (int n)  
*Gets the GUI scaling factor of screen number n.*
- static void **Fl::screen\_scale** (int n, float factor)  
*Sets the GUI scaling factor of screen number n.*
- static int **Fl::screen\_scaling\_supported** ()  
*Returns whether scaling factors are supported by this platform.*
- static void **Fl::screen\_work\_area** (int &X, int &Y, int &W, int &H)  
*Gets the bounding box of the work area of the screen that contains the mouse pointer.*
- static void **Fl::screen\_work\_area** (int &X, int &Y, int &W, int &H, int mx, int my)  
*Gets the bounding box of the work area of a screen that contains the specified screen position mx, my.*
- static void **Fl::screen\_work\_area** (int &X, int &Y, int &W, int &H, int n)  
*Gets the bounding box of the work area of the given screen.*
- static void **Fl::screen\_xywh** (int &X, int &Y, int &W, int &H)  
*Gets the bounding box of a screen that contains the mouse pointer.*
- static void **Fl::screen\_xywh** (int &X, int &Y, int &W, int &H, int mx, int my)  
*Gets the bounding box of a screen that contains the specified screen position mx, my.*
- static void **Fl::screen\_xywh** (int &X, int &Y, int &W, int &H, int mx, int my, int mw, int mh)  
*Gets the screen bounding rect for the screen which intersects the most with the rectangle defined by mx, my, mw, mh.*
- static void **Fl::screen\_xywh** (int &X, int &Y, int &W, int &H, int n)  
*Gets the screen bounding rect for the given screen.*
- static int **Fl::w** ()  
*Returns the width in pixels of the main screen work area.*
- static int **Fl::x** ()  
*Returns the leftmost x coordinate of the main screen work area.*
- static int **Fl::y** ()  
*Returns the topmost y coordinate of the main screen work area.*

### 32.5.1 Detailed Description

[Fl](#) global screen functions declared in [<FL/Fl.H>](#).

FLTK supports high-DPI screens using a screen scaling factor. The scaling factor is initialized by the library to a value based on information obtained from the OS. If this initial value is not satisfactory, the `FLTK_SCALING_FACTOR` environment variable can be set to a value FLTK will multiply to the OS-given value. The 2 variants of functions [Fl::screen\\_scale\(\)](#) allow to programmatically get and set scaling factor values. The scaling factor value can be further changed at runtime by typing `Ctrl/+/-/0/` (`Cmd/+/-/0/` under macOS). See [FL\\_SHORTCUT](#) for more details about these shortcuts.

### 32.5.2 Function Documentation

#### 32.5.2.1 keyboard\_screen\_scaling()

```
void Fl::keyboard_screen_scaling (
    int value ) [static]
```

Controls the possibility to scale all windows by `ctrl/+/-/0/` or `cmd/+/-/0/`.

This function **should** be called before [fl\\_open\\_display\(\)](#) runs. If it is not called, the default is to handle these keys for window scaling.

##### Note

This function can currently only be used to switch the internal handler **off**, i.e. `value` must be 0 (zero) - all other values result in undefined behavior and are reserved for future extension.

##### Parameters

<i>value</i>	0 to stop recognition of <code>ctrl/+/-/0/</code> (or <code>cmd/+/-/0/</code> under macOS) keys as window scaling.
--------------	--

##### Since

1.4.0

#### 32.5.2.2 screen\_count()

```
int Fl::screen_count ( ) [static]
```

Gets the total count of available screens.

##### Note

Screen numbers range from 0 to [Fl::screen\\_count\(\)](#) - 1 in the FLTK API.

#### 32.5.2.3 screen\_dpi()

```
void Fl::screen_dpi (
    float & h,
    float & v,
    int n = 0 ) [static]
```

Gets the screen resolution in dots-per-inch for the given screen.

##### Parameters

out	<i>h,v</i>	horizontal and vertical resolution
in	<i>n</i>	the screen number (0 to <a href="#">Fl::screen_count()</a> - 1)

See also

`void screen_xywh(int &x, int &y, int &w, int &h, int mx, int my)`

#### 32.5.2.4 screen\_num() [1/2]

```
int Fl::screen_num (
    int x,
    int y ) [static]
```

Gets the screen number of a screen that contains the specified screen position *x*, *y*.

Parameters

in	<i>x,y</i>	the absolute screen position
----	------------	------------------------------

Returns

a screen number [0 , [Fl::screen\\_count\(\)](#)-1]

Attention

When the running system contains screens with different scaling factors, this API may become ambiguous because a given value pair (*x*, *y*) may belong to distinct screens. In that situation other APIs should be preferred, e.g. [Fl\\_Window::screen\\_num\(\)](#) and [Fl::screen\\_scale\(int\)](#).

#### 32.5.2.5 screen\_num() [2/2]

```
int Fl::screen_num (
    int x,
    int y,
    int w,
    int h ) [static]
```

Gets the screen number of the screen which intersects the most with the rectangle defined by *x*, *y*, *w*, *h*.

Parameters

in	<i>x,y,w,h</i>	the rectangle to search for intersection with
----	----------------	---

Returns

a screen number [0 , [Fl::screen\\_count\(\)](#)-1]

#### 32.5.2.6 screen\_scale() [1/2]

```
float Fl::screen_scale (
    int n ) [static]
```

Gets the GUI scaling factor of screen number *n*.

The valid range of *n* is 0 .. [Fl::screen\\_count\(\)](#) - 1.

The return value is 1.0 if screen scaling is not supported or *n* is outside the valid range.

Returns

Current screen scaling factor (default: 1.0)

See also

[Fl::screen\\_count\(\)](#)

[Fl::screen\\_scaling\\_supported\(\)](#)

Since

1.4.0

### 32.5.2.7 screen\_scale() [2/2]

```
void Fl::screen_scale (
    int n,
    float factor ) [static]
```

Sets the GUI scaling factor of screen number *n*.

The valid range of *n* is 0 .. [Fl::screen\\_count\(\)](#) - 1.

This method does nothing if *n* is out of range or screen scaling is not supported by this platform.

Otherwise it also sets the scaling factor of all windows mapped to screen number *n* or all screens, depending on the type of screen scaling support on the platform.

Parameters

in	<i>n</i>	screen number
in	<i>factor</i>	scaling factor of screen <i>n</i>

See also

[Fl::screen\\_scaling\\_supported\(\)](#)

Since

1.4.0

### 32.5.2.8 screen\_scaling\_supported()

```
int Fl::screen_scaling_supported ( ) [static]
```

Returns whether scaling factors are supported by this platform.

Return values

0	scaling factors are not supported by this platform
1	a single scaling factor is shared by all screens
2	each screen can have its own scaling factor

See also

[Fl::screen\\_scale\(int\)](#)

Since

1.4.0

**32.5.2.9 screen\_work\_area()** [1/3]

```
void Fl::screen_work_area (
    int & X,
    int & Y,
    int & W,
    int & H ) [static]
```

Gets the bounding box of the work area of the screen that contains the mouse pointer.

**Parameters**

out	<i>X,Y,W,H</i>	the work area bounding box
-----	----------------	----------------------------

**See also**

void [screen\\_work\\_area\(int &x, int &y, int &w, int &h, int n\)](#)

**32.5.2.10 screen\_work\_area()** [2/3]

```
void Fl::screen_work_area (
    int & X,
    int & Y,
    int & W,
    int & H,
    int mx,
    int my ) [static]
```

Gets the bounding box of the work area of a screen that contains the specified screen position *mx*, *my*.

**Parameters**

out	<i>X,Y,W,H</i>	the work area bounding box
in	<i>mx,my</i>	the absolute screen position

**See also**

void [screen\\_work\\_area\(int &x, int &y, int &w, int &h, int n\)](#)

**32.5.2.11 screen\_work\_area()** [3/3]

```
void Fl::screen_work_area (
    int & X,
    int & Y,
    int & W,
    int & H,
    int n ) [static]
```

Gets the bounding box of the work area of the given screen.

**Parameters**

out	<i>X,Y,W,H</i>	the work area bounding box
in	<i>n</i>	the screen number (0 to <a href="#">Fl::screen_count()</a> - 1)

## See also

```
void screen_xywh(int &x, int &y, int &w, int &h, int mx, int my)
```

## Note

Under X11 and Wayland, the screen work area is given values that differ from that screen's bounding box only if the system contains a single screen.

Like all quantities accessible via public APIs of FLTK, values of *x*,*y*,*w*,*h* are given in FLTK units, that is, in drawing units divided by the scaling factor of screen *n*.

**32.5.2.12 screen\_xywh()** [1/4]

```
void Fl::screen_xywh (
    int & X,
    int & Y,
    int & W,
    int & H ) [static]
```

Gets the bounding box of a screen that contains the mouse pointer.

## Parameters

out	<i>X,Y,W,H</i>	the corresponding screen bounding box
-----	----------------	---------------------------------------

## See also

```
void screen_xywh(int &x, int &y, int &w, int &h, int mx, int my)
```

**32.5.2.13 screen\_xywh()** [2/4]

```
void Fl::screen_xywh (
    int & X,
    int & Y,
    int & W,
    int & H,
    int mx,
    int my ) [static]
```

Gets the bounding box of a screen that contains the specified screen position *mx*, *my*.

## Parameters

out	<i>X,Y,W,H</i>	the corresponding screen bounding box
in	<i>mx,my</i>	the absolute screen position

**32.5.2.14 screen\_xywh()** [3/4]

```
void Fl::screen_xywh (
    int & X,
    int & Y,
    int & W,
    int & H,
    int mx,
    int my,
```

```
int mw,
int mh ) [static]
```

Gets the screen bounding rect for the screen which intersects the most with the rectangle defined by `mx`, `my`, `mw`, `mh`.

#### Parameters

out	<i>X,Y,W,H</i>	the corresponding screen bounding box
in	<i>mx,my,mw,mh</i>	the rectangle to search for intersection with

#### See also

void [screen\\_xywh](#)(int &X, int &Y, int &W, int &H, int n)

### 32.5.2.15 screen\_xywh() [4/4]

```
void Fl::screen_xywh (
    int & X,
    int & Y,
    int & W,
    int & H,
    int n ) [static]
```

Gets the screen bounding rect for the given screen.

Under Windows, Mac OS X, and X11 + the Gnome desktop, screen #0 contains the menubar/taskbar

#### Parameters

out	<i>X,Y,W,H</i>	the corresponding screen bounding box
in	<i>n</i>	the screen number (0 to <a href="#">Fl::screen_count()</a> - 1)

#### Note

Like all quantities accessible via public APIs of FLTK, values of `X,Y,W,H` are given in FLTK units, that is, in drawing units divided by the scaling factor of screen `n`.

#### See also

void [screen\\_xywh](#)(int &x, int &y, int &w, int &h, int mx, int my)

## 32.6 Color & Font functions

fl global color, font functions.

### Functions

- [Fl\\_Color fl\\_color](#) ()  
*Return the last [fl\\_color\(\)](#) that was set.*
- void [fl\\_color](#) ([Fl\\_Color](#) c)  
*Set the color for all subsequent drawing operations.*
- void [fl\\_color](#) (int c)  
*for back compatibility - use [fl\\_color\(Fl\\_Color c\)](#) instead*
- void [fl\\_color](#) ([uchar](#) r, [uchar](#) g, [uchar](#) b)  
*Set the color for all subsequent drawing operations.*
- [Fl\\_Color fl\\_color\\_average](#) ([Fl\\_Color](#) color1, [Fl\\_Color](#) color2, float weight)

- Returns the weighted average color between the two given colors.*

  - `FI_Color fl_contrast (FI_Color fg, FI_Color bg, int context, int size)`
- Returns a color that contrasts with the background color.*

  - `void fl_contrast_function (FI_Contrast_Function *f)`
- Register a custom contrast function.*

  - `int fl_contrast_level ()`
- Get the contrast level (sensitivity) of the `fl_contrast()` method.*

  - `void fl_contrast_level (int level)`
- Set the contrast level (sensitivity) of the `fl_contrast()` method.*

  - `int fl_contrast_mode ()`
- Return the current contrast algorithm (mode).*

  - `void fl_contrast_mode (int mode)`
- Set the contrast algorithm (mode).*

  - `int fl_descent ()`
- Return the recommended distance above the bottom of a `fl_height()` tall box to draw the text at so it looks centered vertically in that box.*

  - `FI_Font fl_font ()`
- Return the *face* set by the most recent call to `fl_font()`.*

  - `void fl_font (FI_Font face, FI_Fontsize fsize)`
- Sets the current font, which is then used in various drawing routines.*

  - `int fl_height ()`
- Return the recommended minimum line spacing for the current font.*

  - `int fl_height (int font, int size)`
- This function returns the actual height of the specified *font* and *size*.*

  - `FI_Color fl_inactive (FI_Color c)`
- Returns the inactive, dimmed version of the given color.*

  - `const char * fl_latin1_to_local (const char *t, int n=-1)`
- Convert text from Windows/X11 latin1 character set to local encoding.*

  - `double fl_lightness (FI_Color color)`
- Return the perceived lightness of a color.*

  - `const char * fl_local_to_latin1 (const char *t, int n=-1)`
- Convert text from local encoding to Windows/X11 latin1 character set.*

  - `const char * fl_local_to_mac_roman (const char *t, int n=-1)`
- Convert text from local encoding to Mac Roman character set.*

  - `double fl_luminance (FI_Color color)`
- Return the raw / physical luminance of a color.*

  - `const char * fl_mac_roman_to_local (const char *t, int n=-1)`
- Convert text from Mac Roman character set to local encoding.*

  - `FI_Color fl_show_colormap (FI_Color oldcol)`
- Pops up a window to let the user pick a colormap entry.*

  - `FI_Fontsize fl_size ()`
- Return the *size* set by the most recent call to `fl_font()`.*

  - `void fl_text_extents (const char *, int &dx, int &dy, int &w, int &h)`
- Determine the minimum pixel dimensions of a nul-terminated string using the current `fl_font()`.*

  - `void fl_text_extents (const char *t, int n, int &dx, int &dy, int &w, int &h)`
- Determine the minimum pixel dimensions of a sequence of *n* characters (bytes) using the current `fl_font()`.*

  - `double fl_width (const char *txt)`
- Return the typographical width of a nul-terminated string using the current font face and size.*

  - `double fl_width (const char *txt, int n)`
- Return the typographical width of a sequence of *n* characters using the current font face and size.*

  - `double fl_width (unsigned int c)`

- Return the typographical width of a single character using the current font face and size.*
- static void `Fl::free_color (Fl_Color i, int overlay=0)`  
*Frees the specified color from the colormap, if applicable.*
  - static unsigned `Fl::get_color (Fl_Color i)`  
*Returns the RGB value(s) for the given FLTK color index.*
  - static void `Fl::get_color (Fl_Color i, uchar &red, uchar &green, uchar &blue)`  
*Returns the RGB value(s) for the given FLTK color index.*
  - static void `Fl::get_color (Fl_Color i, uchar &red, uchar &green, uchar &blue, uchar &alpha)`  
*Returns the RGBA value(s) for the given FLTK color index.*
  - static const char \* `Fl::get_font (Fl_Font)`  
*Gets the string for this face.*
  - static const char \* `Fl::get_font_name (Fl_Font, int *attributes=0)`  
*Get a human-readable string describing the family of this face.*
  - static int `Fl::get_font_sizes (Fl_Font, int *&sizep)`  
*Return an array of sizes in sizep.*
  - static void `Fl::set_color (Fl_Color i, unsigned c)`  
*Sets an entry in the fl\_color index table.*
  - static void `Fl::set_color (Fl_Color, uchar, uchar, uchar)`  
*Sets an entry in the fl\_color index table.*
  - static void `Fl::set_color (Fl_Color, uchar, uchar, uchar, uchar)`  
*Sets an entry in the fl\_color index table.*
  - static void `Fl::set_font (Fl_Font, const char *)`  
*Changes a face.*
  - static void `Fl::set_font (Fl_Font, Fl_Font)`  
*Copies one face to another.*
  - static `Fl_Font Fl::set_fonts (const char *=0)`  
*FLTK will open the display, and add every fonts on the server to the face table.*

### 32.6.1 Detailed Description

fl global color, font functions.

These functions are declared in `<FL/Fl.H>` or `<FL/fl_draw.H>`.

### 32.6.2 Function Documentation

#### 32.6.2.1 fl\_color() [1/3]

```
Fl_Color fl_color ( ) [inline]
```

Return the last `fl_color()` that was set.

This can be used for state save/restore.

#### 32.6.2.2 fl\_color() [2/3]

```
void fl_color (
    Fl_Color c ) [inline]
```

Set the color for all subsequent drawing operations.

For color-mapped displays, a color cell will be allocated out of `fl_colormap` the first time you use a color. If the colormap fills up then a least-squares algorithm is used to find the closest color. If no valid graphical context (`fl_gc`) is available, the foreground is not set for the current window.

#### Parameters

in	c	color
----	---	-------

**32.6.2.3 fl\_color()** [3/3]

```
void fl_color (
    uchar r,
    uchar g,
    uchar b ) [inline]
```

Set the color for all subsequent drawing operations.

The closest possible match to the RGB color is used. The RGB color is used directly on TrueColor displays. For colormap visuals the nearest index in the gray ramp or color cube is used. If no valid graphical context (`fl_gc`) is available, the foreground is not set for the current window.

**Parameters**

in	<i>r,g,b</i>	color components
----	--------------	------------------

**32.6.2.4 fl\_color\_average()**

```
Fl_Color fl_color_average (
    Fl_Color color1,
    Fl_Color color2,
    float weight )
```

Returns the weighted average color between the two given colors.

The red, green and blue values are averages using the following formula:

```
color = color1 * weight + color2 * (1 - weight)
```

Thus, a `weight` value of 1.0 will return the first color, while a value of 0.0 will return the second color.

**Parameters**

in	<i>color1,color2</i>	boundary colors
in	<i>weight</i>	weighting factor

**32.6.2.5 fl\_contrast()**

```
Fl_Color fl_contrast (
    Fl_Color fg,
    Fl_Color bg,
    int context,
    int size )
```

Returns a color that contrasts with the background color.

This will be the foreground color if it contrasts sufficiently with the background color. Otherwise, returns `FL_WHITE` or `FL_BLACK` depending on which color provides the best contrast.

FLTK 1.4.0 uses a different default contrast function than earlier releases (1.3.x) but you can use the old "legacy" contrast function by calling

```
fl_contrast_mode(FL_CONTRAST_LEGACY);
```

early in your main program.

**Note**

It is a known issue that static initialization using `fl_contrast()` may already have been executed before you call this function in `main()`. You should be aware of this and, if necessary, write your own (static) contrast initialization function. This should rarely be necessary.

You can change the behavior of `fl_contrast()` in several ways:

- Change the "level" (sensitivity) for contrast calculation, see [fl\\_contrast\\_level\(\)](#). Valid levels are 0 - 100, the default "medium" value depends on the contrast mode. If you raise the level above the default value the overall contrast will generally be higher, i.e. the required contrast to return the foreground color is raised and therefore the calculated color switches "earlier" to either black or white. In other words, using the following values:
  - 0 always uses the foreground color
  - the default, unmodified algorithm allows a sufficient contrast such that the text is readable
  - 100 will always use black or white

Changing the `level` is particularly useful and intended for the "legacy mode" to improve the results partially. Values slightly above 50 (50 - 70) will likely return the best results (50 is the default, as used in FLTK 1.3.x).

#### Note

Different contrast modes (algorithms) can use their own values and defaults of [fl\\_contrast\\_level\(\)](#).

- Change the used contrast calculation function. You can either use the old (FLTK 1.3.x) function or use the better but slower function based on the CIELAB ( $L^*a^*b^*$ ) color model, or you can define your own custom contrast function if you need even better contrast results.

The following contrast functions are available:

- `FL_CONTRAST_LEGACY`, the old FLTK 1.3.x compatible function. This is the fastest function (using integer arithmetic) but it provides worse results in border cases. You may want to use this on embedded or otherwise CPU constrained systems or if you need strict backwards compatibility. For slightly better results you may utilize the new [fl\\_contrast\\_level\(int\)](#) function (since 1.4.0) to increase the contrast sensitivity. This will provide slightly better results than FLTK 1.3.x and earlier but we recommend to use the new default function:
- `FL_CONTRAST_CIELAB`, based on the CIELAB ( $L^*a^*b^*$ ) color model. This function is superior regarding the human contrast perception but may be slightly slower - which should not matter on a modern CPU. The default contrast level in this mode is 39 which results in a very similar experience as the old contrast function but avoids unreadable border cases. **This is the default since FLTK 1.4.0.**
- `FL_CONTRAST_CUSTOM`, your own contrast calculation function.

In the future we **may** provide even more (and superior) contrast algorithms.

The new parameters `context` and `size` (since 1.4.0) are defined for future extensions and are currently not used. Default values are 0.

- The `context` is intended to differentiate text and other kinds of objects, e.g. radio buttons, check marks, or icon types.
- The `size` parameter is an unspecified (object) size that may be used to calculate the required contrast. In text mode this must be the font size. Rule: the larger the object (font), the lower the required contrast.

#### Note

These new optional parameters must be provided in the custom contrast function which is the reason why they are added now. In the future we may use the (font) size to adjust the calculated contrast, and users defining their own contrast functions may use them in their functions.

#### Parameters

in	<i>fg</i>	foreground (text) color
in	<i>bg</i>	background color
in	<i>context</i>	graphical context (optional, default = 0 == text)
in	<i>size</i>	unspecified size (optional, default = 0 == undefined)

**Returns**

contrasting color: `fg`, `FL_BLACK`, or `FL_WHITE`

**See also**

[fl\\_contrast\\_level\(int\)](#)  
[fl\\_contrast\\_mode\(int\)](#)  
[fl\\_contrast\\_function\(\)](#)

**32.6.2.6 fl\_contrast\_function()**

```
void fl_contrast_function (
    Fl_Contrast_Function * f )
```

Register a custom contrast function.

Your custom contrast function will be called when [fl\\_contrast\(\)](#) is called if and only if you previously registered your function and called `fl_contrast_mode(FL_CONTRAST_CUSTOM)`.

Your custom contrast function must provide the signature

```
Fl_Color my_contrast_function(Fl_Color fg, Fl_Color bg, int context, int size)
```

The arguments are the same as for the full [fl\\_contrast\(\)](#) function since FLTK 1.4. You can use the supplied `size` to modify the result. Depending on the caller the `size` parameter can be 0 (default) or a valid size. In the context of text, i.e. `context == 0`, the `size` parameter is the fontsize.

The `context` parameter is not yet used and will always be 0 unless included in a call to [fl\\_contrast\(\)](#). The value 0 must be interpreted as text. In the future the `context` argument will be used to supply a different context than text (small icons, large icons, etc.). The exact usage is not yet specified.

Your function may also use [fl\\_contrast\\_level\(\)](#) to modify the result accordingly.

**Since**

1.4.0

**See also**

[fl\\_contrast\\_mode\(int\)](#)  
[fl\\_contrast\\_level\(int\)](#)  
[fl\\_contrast\(\)](#)

**32.6.2.7 fl\_contrast\_level() [1/2]**

```
int fl_contrast_level ( )
```

Get the contrast level (sensitivity) of the [fl\\_contrast\(\)](#) method.

This returns the level of the currently selected contrast mode.

**Returns**

The current contrast level.

**See also**

[fl\\_contrast\\_level\(int level\)](#)  
[fl\\_contrast\\_mode\(int mode\)](#)

**Since**

1.4.0

### 32.6.2.8 fl\_contrast\_level() [2/2]

```
void fl_contrast_level (
    int level )
```

Set the contrast level (sensitivity) of the [fl\\_contrast\(\)](#) method.

This can be used to tune the legacy [fl\\_contrast\(\)](#) function to achieve slightly better results. The default value is defined per contrast mode (see below). Values between 50 and 70 may be useful for the legacy contrast mode but you can raise it up to 100. Lower values than 50 are probably not useful.

The contrast `level` affects not only the legacy (1.3.x) [fl\\_contrast\(\)](#) function but also the new CIELAB contrast mode which is the default since FLTK 1.4.0. See default value below.

Other contrast modes are currently not affected by the contrast level.

You may use the contrast level if you define your own custom contrast function in mode `FL_CONTRAST_CUSTOM`.

#### Note

All contrast modes store their own contrast level because the behavior is slightly different. You must change the contrast mode [fl\\_contrast\\_mode\(\)](#) **before** you set or get the contrast level.

The default contrast level is

- 50 in mode `FL_CONTRAST_LEGACY` (compatible with FLTK 1.3.x)
- 39 in mode `FL_CONTRAST_CIELAB` (similar threshold as in FLTK 1.3.x)
- 0 (undefined) for all other modes

See the description of [fl\\_contrast\\_mode\(int mode\)](#) for more information about the contrast level per mode.

Example:

```
fl_contrast_mode(FL_CONTRAST_LEGACY);
fl_contrast_level(60);
```

A `level` greater than 50 (probably best in the range 50 to 70) may achieve better results of the legacy [fl\\_contrast\(\)](#) function in some border cases of low contrast between foreground and background colors but we recommend to use the new default algorithm `FL_CONTRAST_CIELAB` unless you need strict backwards compatibility or use a CPU constrained embedded system.

#### Parameters

<code>in</code>	<i>level</i>	valid range is 0 to 100
-----------------	--------------	-------------------------

#### Since

1.4.0

### 32.6.2.9 fl\_contrast\_mode() [1/2]

```
int fl_contrast_mode ( )
```

Return the current contrast algorithm (mode).

#### Returns

Contrast algorithm (mode).

#### Since

1.4.0

#### See also

[fl\\_contrast\\_mode\(int\)](#)

**32.6.2.10 fl\_contrast\_mode()** [2/2]

```
void fl_contrast_mode (
    int mode )
```

Set the contrast algorithm (mode).

You can use one of

- FL\_CONTRAST\_NONE (not recommended: returns the foreground color)
- FL\_CONTRAST\_LEGACY (same as in FLTK 1.3.x)
- FL\_CONTRAST\_CIELAB (better, this is the default since FLTK 1.4.0)
- FL\_CONTRAST\_CUSTOM (you must define your own contrast algorithm)

If you set FL\_CONTRAST\_CUSTOM you must also register your custom contrast function by calling [fl\\_contrast\\_function\(\)](#).

You may set the contrast level [fl\\_contrast\\_level\(int\)](#) after setting the contrast mode. This affects the contrast algorithm as described below:

- FL\_CONTRAST\_LEGACY: default level is 50 which is compatible with FLTK 1.3.x and older. This mode is no longer the default and is not recommended because it doesn't take human contrast perception into account and doesn't properly handle sRGB color values. You may get better contrasts if you set the level higher than 50. Values in the range 50 to 70 may be useful. Higher values result in higher contrast, i.e. the algorithm switches "earlier" to black or white mode.
- FL\_CONTRAST\_CIELAB: default level is 39 which appears to be a good value. The higher the level is, the more contrast is to be expected. Values in the range below 39 accept lower contrast and values above 39 switch "earlier" to black or white. Values between 36 and 46 may yield usable contrast experience.

**Note**

The goal of [fl\\_contrast\(\)](#) is to achieve a "sufficient" contrast between text and background. Level 39 in CIELAB mode means that the accepted contrast is about 39% of the lightness difference between both colors. This can be perceived as very low contrast in some cases, but the text should at least be readable. Note that the highest possible contrast value on a medium gray background is 50% (either black or white). Bill Spitzak wrote on May 16, 2024 in fltk.general in thread "FLTK 1.4 Menu Bar Style": *"I would certainly aim for a function that does not alter color combinations where it is physically possible to read the text, even if squinting is needed."* See <https://groups.google.com/g/fltkgeneral/c/EkWI4HTHSLA/m/rsZunZ1vAwAJ>

**Parameters**

in	mode	if invalid, FL_CONTRAST_CIELAB will be selected
----	------	---

**Since**

1.4.0

**See also**

[fl\\_contrast\\_function\(Fl\\_Contrast\\_Function \\*\)](#)

[fl\\_contrast\\_level\(int\)](#)

**32.6.2.11 fl\_font()** [1/2]

```
Fl_Font fl_font ( ) [inline]
```

Return the *face* set by the most recent call to [fl\\_font\(\)](#).

This can be used to save/restore the font.

**32.6.2.12 fl\_font()** [2/2]

```
void fl_font (
    Fl_Font face,
    Fl_Fonsize fsize )
```

Sets the current font, which is then used in various drawing routines.

You may call this outside a draw context if necessary to measure text, for instance by calling [fl\\_width\(\)](#), [fl\\_measure\(\)](#), or [fl\\_text\\_extents\(\)](#), but on X this will open the display.

The font is identified by a *face* and a *size*. The size of the font is measured in pixels and not "points". Lines should be spaced *size* pixels apart or more.

**32.6.2.13 fl\_height()** [1/2]

```
int fl_height ( ) [inline]
```

Return the recommended minimum line spacing for the current font.

You can also use the value of *size* passed to [fl\\_font\(\)](#).

**32.6.2.14 fl\_height()** [2/2]

```
int fl_height (
    int font,
    int size )
```

This function returns the actual height of the specified *font* and *size*.

Normally the font height should always be 'size', but with the advent of XFT, there are (currently) complexities that seem to only be solved by asking the font what its actual font height is. (See STR#2115)

This function was originally undocumented in 1.1.x, and was used only by [Fl\\_Text\\_Display](#). We're now documenting it in 1.3.x so that apps that need precise height info can get it with this function.

**Returns**

the height of the font in pixels.

**Todo** In the future, when the XFT issues are resolved, this function should simply return the 'size' value.

**32.6.2.15 fl\_latin1\_to\_local()**

```
const char * fl_latin1_to_local (
    const char * t,
    int n = -1 )
```

Convert text from Windows/X11 latin1 character set to local encoding.

**Parameters**

in	<i>t</i>	character string (latin1 encoding)
in	<i>n</i>	optional number of characters (bytes) to convert (default is all)

**Returns**

pointer to internal buffer containing converted characters

**32.6.2.16 fl\_lightness()**

```
double fl_lightness (
    Fl_Color color )
```

Return the perceived lightness of a color.

This function calculates the perceived lightness of `Fl_Color color`.

The returned lightness value `Lstar` according to the CIELAB ( $L^*a^*b^*$ ) color model is almost linear with respect to human perception. It is in the range 0 (black) to 100 (white).

The result values of two colors can be compared directly and the difference is their perceived contrast.

#### Parameters

in	<i>color</i>	Fl_Color value
----	--------------	----------------

#### Returns

perceived lightness (0 .. 100)

#### Since

1.4.0

### 32.6.2.17 fl\_local\_to\_latin1()

```
const char * fl_local_to_latin1 (
    const char * t,
    int n = -1 )
```

Convert text from local encoding to Windows/X11 latin1 character set.

#### Parameters

in	<i>t</i>	character string (local encoding)
in	<i>n</i>	optional number of characters (bytes) to convert (default is all)

#### Returns

pointer to internal buffer containing converted characters

### 32.6.2.18 fl\_local\_to\_mac\_roman()

```
const char * fl_local_to_mac_roman (
    const char * t,
    int n = -1 )
```

Convert text from local encoding to Mac Roman character set.

#### Parameters

in	<i>t</i>	character string (local encoding)
in	<i>n</i>	optional number of characters to convert (default is all)

#### Returns

pointer to internal buffer containing converted characters

### 32.6.2.19 fl\_luminance()

```
double fl_luminance (
    Fl_Color color )
```

Return the raw / physical luminance of a color.

This function calculates the physical luminance of `FI_Color color`.

The returned luminance value (aka  $Y$ ) is the physical luminance of the `FI_Color color`.

The result is in the range 0.0 (black) to 1.0 (white).

#### Note

This is probably not what you want if you are interested in perceived contrast or lightness calculation because the luminance  $Y$  is **not** linear with respect to human perception.

See [fl\\_lightness\(FI\\_Color\)](#) for a function that returns the perceived lightness of a color which can be used directly for contrast calculation.

#### Parameters

in	<i>color</i>	FI_Color value
----	--------------	----------------

#### Returns

Raw (physical) luminance (0.0 .. 1.0)

#### Since

1.4.0

#### See also

[fl\\_lightness\(FI\\_Color\)](#)

### 32.6.2.20 fl\_mac\_roman\_to\_local()

```
const char * fl_mac_roman_to_local (
    const char * t,
    int n = -1 )
```

Convert text from Mac Roman character set to local encoding.

#### Parameters

in	<i>t</i>	character string (Mac Roman encoding)
in	<i>n</i>	optional number of characters to convert (default is all)

## Returns

pointer to internal buffer containing converted characters

32.6.2.21 `fl_show_colormap()`

```
Fl_Color fl_show_colormap (
    Fl_Color oldcol )
```

Pops up a window to let the user pick a colormap entry.



Figure 32.1 `fl_show_colormap`

## Parameters

in	<i>oldcol</i>	color to be highlighted when grid is shown.
----	---------------	---

## Return values

<i>Fl_Color</i>	value of the chosen colormap entry.
-----------------	-------------------------------------

## See also

[Fl\\_Color\\_Chooser](#)

32.6.2.22 `fl_size()`

```
Fl_Fontsize fl_size ( ) [inline]
```

Return the `size` set by the most recent call to `fl_font()`.

This can be used to save/restore the font.

**32.6.2.23 fl\_text\_extents()** [1/2]

```
void fl_text_extents (
    const char * c,
    int & dx,
    int & dy,
    int & w,
    int & h )
```

Determine the minimum pixel dimensions of a nul-terminated string using the current [fl\\_font\(\)](#).

Usage: given a string "txt" drawn using `fl_draw(txt, x, y)` you would determine its pixel extents on the display using `fl_text_extents(txt, dx, dy, wo, ho)` such that a bounding box that exactly fits around the text could be drawn with `fl_rect(x+dx, y+dy, wo, ho)`. Note the dx, dy values hold the offset of the first "colored in" pixel of the string, from the draw origin.

Note the desired font and font size must be set with [fl\\_font\(\)](#) before calling this function.

This differs slightly from [fl\\_measure\(\)](#) in that the dx/dy values are also returned.

No FLTK symbol expansion will be performed.

Example use:

```
int dx, dy, W, H;
fl_font(FL_HELVETICA, 12);           // set font face+size first
fl_text_extents("Some text", dx, dy, W, H); // get width and height of string
printf("text's width=%d, height=%d\n", W, H);
```

**32.6.2.24 fl\_text\_extents()** [2/2]

```
void fl_text_extents (
    const char * t,
    int n,
    int & dx,
    int & dy,
    int & w,
    int & h ) [inline]
```

Determine the minimum pixel dimensions of a sequence of n characters (bytes) using the current [fl\\_font\(\)](#).

**Note**

The string length is measured in bytes, not (UTF-8) characters.

**See also**

[fl\\_text\\_extents\(const char\\*, int& dx, int& dy, int& w, int& h\)](#)

**32.6.2.25 fl\_width()**

```
double fl_width (
    unsigned int c ) [inline]
```

Return the typographical width of a single character using the current font face and size.

**Note**

If a valid `fl_gc` is NOT found then it uses the first window gc, or the screen gc if no fltk window is available when called.

**32.6.2.26 free\_color()**

```
void Fl::free_color (
    Fl_Color i,
    int overlay = 0 ) [static]
```

Frees the specified color from the colormap, if applicable.

If overlay is non-zero then the color is freed from the overlay colormap.

**32.6.2.27 `get_color()` [1/3]**

```
unsigned Fl::get_color (
    Fl_Color i ) [static]
```

Returns the RGB value(s) for the given FLTK color index.

This form returns the RGB values packed in a 32-bit unsigned integer with the red value in the upper 8 bits, the green value in the next 8 bits, and the blue value in bits 8-15. The lower 8 bits will always be 0.

**32.6.2.28 `get_color()` [2/3]**

```
void Fl::get_color (
    Fl_Color i,
    uchar & red,
    uchar & green,
    uchar & blue ) [static]
```

Returns the RGB value(s) for the given FLTK color index.

This form returns the red, green, and blue values separately in referenced variables.

See also

unsigned [get\\_color\(Fl\\_Color c\)](#)

**32.6.2.29 `get_color()` [3/3]**

```
void Fl::get_color (
    Fl_Color i,
    uchar & red,
    uchar & green,
    uchar & blue,
    uchar & alpha ) [static]
```

Returns the RGBA value(s) for the given FLTK color index.

This form returns the red, green, blue, and alpha values separately in referenced variables.

See also

unsigned [get\\_color\(Fl\\_Color c\)](#)

**32.6.2.30 `get_font()`**

```
const char * Fl::get_font (
    Fl_Font fnum ) [static]
```

Gets the string for this face.

This string is different for each face. Under X this value is passed to XListFonts to get all the sizes of this face.

**32.6.2.31 `get_font_name()`**

```
const char * Fl::get_font_name (
    Fl_Font fnum,
    int * attributes = 0 ) [static]
```

Get a human-readable string describing the family of this face.

This is useful if you are presenting a choice to the user. There is no guarantee that each face has a different name. The return value points to a static buffer that is overwritten each call.

The integer pointed to by `attributes` (if the pointer is not zero) is set to zero, `FL_BOLD` or `FL_ITALIC` or `FL_↔_BOLD | FL_ITALIC`. To locate a "family" of fonts, search forward and back for a set with non-zero attributes, these faces along with the face with a zero attribute before them constitute a family.

**32.6.2.32 get\_font\_sizes()**

```
int Fl::get_font_sizes (
    Fl_Font fnum,
    int *& sizes ) [static]
```

Return an array of sizes in `sizes`.

The return value is the length of this array. The sizes are sorted from smallest to largest and indicate what sizes can be given to `fl_font()` that will be matched exactly (`fl_font()` will pick the closest size for other sizes). A zero in the first location of the array indicates a scalable font, where any size works, although the array may list sizes that work "better" than others. Warning: the returned array points at a static buffer that is overwritten each call. Under X this will open the display.

**32.6.2.33 set\_color() [1/3]**

```
void Fl::set_color (
    Fl_Color i,
    unsigned c ) [static]
```

Sets an entry in the `fl_color` index table.

You can set it to any 8-bit RGB color. The color is not allocated until `fl_color(i)` is used.

**32.6.2.34 set\_color() [2/3]**

```
void Fl::set_color (
    Fl_Color i,
    uchar red,
    uchar green,
    uchar blue ) [static]
```

Sets an entry in the `fl_color` index table.

You can set it to any 8-bit RGB color. The color is not allocated until `fl_color(i)` is used.

**32.6.2.35 set\_color() [3/3]**

```
void Fl::set_color (
    Fl_Color i,
    uchar red,
    uchar green,
    uchar blue,
    uchar alpha ) [static]
```

Sets an entry in the `fl_color` index table.

You can set it to any 8-bit RGBA color.

**Note**

The color transparency is effective under the Wayland, hybrid Wayland/X11 and macOS platforms, whereas it has no effect under the X11 and Windows platforms. It's also effective for widgets added to an [Fl\\_Gl\\_Window](#).

**Version**

1.4

**32.6.2.36 set\_font()**

```
void Fl::set_font (
    Fl_Font fnum,
    const char * name ) [static]
```

Changes a face.

## Parameters

<i>fnum</i>	The font number to be assigned a new face
<i>name</i>	Name of the font to assign. The string pointer is simply stored, the string is not copied, so the string must be in static memory. The exact name to be used depends on the platform :

- Windows, X11, Xft: use the family name prefixed by one character to indicate the desired font variant. Characters ' ', 'I', 'B', 'P' denote plain, italic, bold, and bold-italic variants, respectively. For example, string "IGabriola" is to be used to denote the "Gabriola italic" font. The "Oblique" suffix, in whatever case, is to be treated as "italic", that is, prefix the family name with 'I'.
- Other platforms, i.e., X11 + Pango, Wayland, macOS: use the full font name as returned by function [Fl::get\\_font\\_name\(\)](#) or as listed by applications test/fonts or test/utf8. No prefix is to be added.

**32.6.2.37 set\_fonts()**

```
Fl_Font Fl::set_fonts (
    const char * xstarname = 0 ) [static]
```

FLTK will open the display, and add every fonts on the server to the face table.

It will attempt to put "families" of faces together, so that the normal one is first, followed by bold, italic, and bold italic. The only argument to this function is somewhat obsolete since FLTK and most underlying operating systems move to support Unicode. For completeness, following is the original documentation and a few updates:

On X11, the optional argument is a string to describe the set of fonts to add. Passing NULL will select only fonts that have the ISO8859-1 character set (and are thus usable by normal text). Passing "-" will select all fonts with any encoding as long as they have normal X font names with dashes in them. Passing "\*" will list every font that exists (on X this may produce some strange output). Other values may be useful but are system dependent.

With the Xft option on Linux, this parameter is ignored.

With Windows, NULL selects fonts with ANSI\_CHARSET encoding and non-NULL selects all fonts.

On macOS, this parameter is ignored.

The return value is how many faces are in the table after this is done.

**32.7 Drawing functions**

FLTK global graphics and GUI drawing functions.

**Enumerations**

- enum {  
[FL\\_SOLID](#) = 0 , [FL\\_DASH](#) = 1 , [FL\\_DOT](#) = 2 , [FL\\_DASHDOT](#) = 3 ,  
[FL\\_DASHDOTDOT](#) = 4 , [FL\\_CAP\\_FLAT](#) = 0x100 , [FL\\_CAP\\_ROUND](#) = 0x200 , [FL\\_CAP\\_SQUARE](#) = 0x300 ,  
[FL\\_JOIN\\_MITER](#) = 0x1000 , [FL\\_JOIN\\_ROUND](#) = 0x2000 , [FL\\_JOIN\\_BEVEL](#) = 0x3000 }

**Functions**

- int [fl\\_add\\_symbol](#) (const char \*name, void(\*drawit)([Fl\\_Color](#)), int scalable)  
*Adds a symbol to the system.*
- int [fl\\_antialias](#) ()  
*Return whether line drawings are currently antialiased.*
- void [fl\\_antialias](#) (int state)  
*Turn antialiased line drawings ON or OFF, if supported by platform.*
- void [fl\\_arc](#) (double x, double y, double r, double start, double end)  
*Add a series of points to the current path on the arc of a circle.*

- void [fl\\_arc](#) (int x, int y, int w, int h, double a1, double a2)  
*Draw ellipse sections using integer coordinates.*
- void [fl\\_begin\\_complex\\_polygon](#) ()  
*Start drawing a complex filled polygon.*
- void [fl\\_begin\\_line](#) ()  
*Start drawing a list of lines.*
- void [fl\\_begin\\_loop](#) ()  
*Start drawing a closed sequence of lines.*
- void [fl\\_begin\\_offscreen](#) ([FL\\_Offscreen](#) ctx)  
*Send all subsequent drawing commands to this offscreen buffer.*
- void [fl\\_begin\\_points](#) ()  
*Start drawing a list of points.*
- void [fl\\_begin\\_polygon](#) ()  
*Start drawing a convex filled polygon.*
- char [fl\\_can\\_do\\_alpha\\_blending](#) ()  
*Check whether platform supports true alpha blending for RGBA images.*
- [FL\\_RGB\\_Image](#) \* [fl\\_capture\\_window](#) ([FL\\_Window](#) \*win, int x, int y, int w, int h)  
*Captures the content of a rectangular zone of a mapped window.*
- void [fl\\_chord](#) (int x, int y, int w, int h, double a1, double a2)  
*fl\_chord declaration is a place holder - the function does not yet exist*
- void [fl\\_circle](#) (double x, double y, double r)  
*fl\_circle(x,y,r) is equivalent to fl\_arc(x,y,r,0,360), but may be faster.*
- void [fl\\_clip](#) (int x, int y, int w, int h)  
*Intersect the current clip region with a rectangle and push this new region onto the stack (deprecated).*
- int [fl\\_clip\\_box](#) (int x, int y, int w, int h, int &X, int &Y, int &W, int &H)  
*Intersect a rectangle with the current clip region and return the bounding box of the result.*
- [FL\\_Region](#) [fl\\_clip\\_region](#) ()  
*Return the current clipping region.*
- void [fl\\_clip\\_region](#) ([FL\\_Region](#) r)  
*Replace the top of the clipping stack with a clipping region of any shape.*
- void [fl\\_copy\\_offscreen](#) (int x, int y, int w, int h, [FL\\_Offscreen](#) pixmap, int srcx, int srcy)  
*Copy a rectangular area of the given offscreen buffer into the current drawing destination.*
- [FL\\_Offscreen](#) [fl\\_create\\_offscreen](#) (int w, int h)  
*Creation of an offscreen graphics buffer.*
- void [fl\\_cursor](#) ([FL\\_Cursor](#))  
*Sets the cursor for the current window to the specified shape and colors.*
- void [fl\\_cursor](#) ([FL\\_Cursor](#), [FL\\_Color](#) fg, [FL\\_Color](#) bg=[FL\\_WHITE](#))
- void [fl\\_curve](#) (double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double Y3)  
*Add a series of points on a Bézier curve to the path.*
- void [fl\\_delete\\_offscreen](#) ([FL\\_Offscreen](#) ctx)  
*Deletion of an offscreen graphics buffer.*
- void [fl\\_draw](#) (const char \*str, int n, int x, int y)  
*Draws starting at the given x, y location a UTF-8 string of length n bytes.*
- void [fl\\_draw](#) (const char \*str, int x, int y)  
*Draw a nul-terminated UTF-8 string starting at the given x, y location.*
- void [fl\\_draw](#) (const char \*str, int x, int y, int w, int h, [FL\\_Align](#) align, [FL\\_Image](#) \*img=0, int draw\_symbols=1, int spacing=0)  
*Fancy string drawing function which is used to draw all the labels.*
- void [fl\\_draw](#) (const char \*str, int x, int y, int w, int h, [FL\\_Align](#) align, void(\*callthis)(const char \*, int, int, int), [FL\\_Image](#) \*img=0, int draw\_symbols=1, int spacing=0)

- The same as `fl_draw(const char*,int,int,int,int,FL_Align,FL_Image*,int)` with the addition of the `callthis` parameter, which is a pointer to a text drawing function such as `fl_draw(const char*, int, int, int)` to do the real work.
- `void fl_draw` (int angle, const char \*str, int n, int x, int y)  
*Draw at the given x, y location a UTF-8 string of length n bytes rotating angle degrees counter-clockwise.*
  - `void fl_draw` (int angle, const char \*str, int x, int y)  
*Draw a nul-terminated UTF-8 string starting at the given x, y location and rotating angle degrees counter-clockwise.*
  - `void fl_draw_arrow` (FL\_Rect bb, FL\_Arrow\_Type t, FL\_Orientation o, FL\_Color color)  
*Draw an "arrow like" GUI element for the selected scheme.*
  - `void fl_draw_box` (FL\_Boxtype, int x, int y, int w, int h, FL\_Color)  
*Draws a box using given type, position, size and color.*
  - `void fl_draw_box_focus` (FL\_Boxtype, int x, int y, int w, int h, FL\_Color, FL\_Color)  
*Draws the focus rectangle inside a box using given type, position, size and color.*
  - `void fl_draw_check` (FL\_Rect bb, FL\_Color col)  
*Draw a check mark inside the given bounding box.*
  - `void fl_draw_circle` (int x, int y, int d, FL\_Color color)  
*Draw a potentially small, filled circle using a given color.*
  - `void fl_draw_image` (const uchar \*buf, int X, int Y, int W, int H, int D=3, int L=0)  
*Draw an 8-bit per color RGB or luminance image.*
  - `void fl_draw_image` (FL\_Draw\_Image\_Cb cb, void \*data, int X, int Y, int W, int H, int D=3)  
*Draw an image using a callback function to generate image data.*
  - `void fl_draw_image_mono` (const uchar \*buf, int X, int Y, int W, int H, int D=1, int L=0)  
*Draw a gray-scale (1 channel) image.*
  - `void fl_draw_image_mono` (FL\_Draw\_Image\_Cb cb, void \*data, int X, int Y, int W, int H, int D=1)  
*Draw a gray-scale image using a callback function to generate image data.*
  - `int fl_draw_pixmap` (char \*const \*data, int x, int y, FL\_Color bg=FL\_GRAY)  
*Draw XPM image data, with the top-left corner at the given position.*
  - `int fl_draw_pixmap` (const char \*const \*data, int x, int y, FL\_Color bg=FL\_GRAY)  
*Draw XPM image data, with the top-left corner at the given position.*
  - `void fl_draw_radio` (int x, int y, int d, FL\_Color color)  
*Draw a round check mark (circle) of a radio button.*
  - `int fl_draw_symbol` (const char \*label, int x, int y, int w, int h, FL\_Color)  
*Draw the named symbol in the given rectangle using the given color.*
  - `void fl_end_complex_polygon` ()  
*End complex filled polygon, and draw.*
  - `void fl_end_line` ()  
*End list of lines, and draw.*
  - `void fl_end_loop` ()  
*End closed sequence of lines, and draw.*
  - `void fl_end_offscreen` ()  
*Quit sending drawing commands to the current offscreen buffer.*
  - `void fl_end_points` ()  
*End list of points, and draw.*
  - `void fl_end_polygon` ()  
*End convex filled polygon, and draw.*
  - `const char * fl_expand_text` (const char \*from, char \*buf, int maxbuf, double maxw, int &n, double &width, int wrap, int draw\_symbols=0)  
*Copy from to buf, replacing control characters with ^X.*
  - `void fl_focus_rect` (int x, int y, int w, int h)  
*Draw a dotted rectangle, used to indicate keyboard focus on a widget.*
  - `void fl_frame` (const char \*s, int x, int y, int w, int h)  
*Draws a series of line segments around the given box.*

- void [fl\\_frame2](#) (const char \*s, int x, int y, int w, int h)  
*Draws a series of line segments around the given box.*
- void [fl\\_gap](#) ()  
*Separate loops of the path.*
- void [fl\\_line](#) (int x, int y, int x1, int y1)  
*Draw a line from (x,y) to (x1,y1)*
- void [fl\\_line](#) (int x, int y, int x1, int y1, int x2, int y2)  
*Draw a line from (x,y) to (x1,y1) and another from (x1,y1) to (x2,y2)*
- void [fl\\_line\\_style](#) (int style, int width=0, char \*dashes=0)  
*Set how to draw lines (the "pen").*
- void [fl\\_load\\_identity](#) ()  
*Set the transformation matrix to identity.*
- void [fl\\_load\\_matrix](#) (double a, double b, double c, double d, double x, double y)  
*Set the current transformation matrix.*
- void [fl\\_loop](#) (int x, int y, int x1, int y1, int x2, int y2)  
*Outline a 3-sided polygon with lines.*
- void [fl\\_loop](#) (int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)  
*Outline a 4-sided polygon with lines.*
- void [fl\\_measure](#) (const char \*str, int &x, int &y, int draw\_symbols=1)  
*Measure how wide and tall the string will be when printed by the [fl\\_draw\(\)](#) function with `align` parameter.*
- int [fl\\_measure\\_pixmap](#) (char \*const \*data, int &w, int &h)  
*Get the dimensions of a pixmap.*
- int [fl\\_measure\\_pixmap](#) (const char \*const \*cdata, int &w, int &h)  
*Get the dimensions of a pixmap.*
- void [fl\\_mult\\_matrix](#) (double a, double b, double c, double d, double x, double y)  
*Concatenate another transformation onto the current one.*
- int [fl\\_not\\_clipped](#) (int x, int y, int w, int h)  
*Does the rectangle intersect the current clip region?*
- unsigned int [fl\\_old\\_shortcut](#) (const char \*s)  
*Emulation of XForms named shortcuts.*
- void [fl\\_overlay\\_clear](#) ()  
*Erase a selection rectangle without drawing a new one.*
- void [fl\\_overlay\\_rect](#) (int x, int y, int w, int h)  
*Draw a transient dotted selection rectangle.*
- float [fl\\_override\\_scale](#) ()  
*Removes any GUI scaling factor in subsequent drawing operations.*
- void [fl\\_pie](#) (int x, int y, int w, int h, double a1, double a2)  
*Draw filled ellipse sections using integer coordinates.*
- void [fl\\_point](#) (int x, int y)  
*Draw a single pixel at the given coordinates.*
- void [fl\\_polygon](#) (int x, int y, int x1, int y1, int x2, int y2)  
*Fill a 3-sided polygon.*
- void [fl\\_polygon](#) (int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)  
*Fill a 4-sided polygon.*
- void [fl\\_pop\\_clip](#) ()  
*Restore the previous clip region.*
- void [fl\\_pop\\_matrix](#) ()  
*Restore the current transformation matrix from the stack.*
- void [fl\\_push\\_clip](#) (int x, int y, int w, int h)  
*Intersect the current clip region with a rectangle and push this new region onto the stack.*
- void [fl\\_push\\_matrix](#) ()

- Save the current transformation matrix on the stack.*

  - void **fl\_push\_no\_clip** ()

*Push an empty clip region onto the stack so nothing will be clipped.*
- **uchar** \* **fl\_read\_image** (**uchar** \*p, int X, int Y, int W, int H, int alpha=0)

*Reads an RGB(A) image from the current window or off-screen buffer.*
- void **fl\_rect** (**FI\_Rect** r)

*Draw a border inside the given bounding box.*
- void **fl\_rect** (int x, int y, int w, int h)

*Draw a border inside the given bounding box.*
- void **fl\_rect** (int x, int y, int w, int h, **FI\_Color** c)

*Draw with passed color a border inside the given bounding box.*
- void **fl\_rectf** (**FI\_Rect** bb, **uchar** r, **uchar** g, **uchar** b)

*Color a rectangle with "exactly" the passed  $r, g, b$  color.*
- void **fl\_rectf** (**FI\_Rect** r)

*Color with current color a rectangle that exactly fills the given bounding box.*
- void **fl\_rectf** (**FI\_Rect** r, **FI\_Color** c)

*Color with passed color a rectangle that exactly fills the given bounding box.*
- void **fl\_rectf** (int x, int y, int w, int h)

*Color with current color a rectangle that exactly fills the given bounding box.*
- void **fl\_rectf** (int x, int y, int w, int h, **FI\_Color** c)

*Color with passed color a rectangle that exactly fills the given bounding box.*
- void **fl\_rectf** (int x, int y, int w, int h, **uchar** r, **uchar** g, **uchar** b)

*Color a rectangle with "exactly" the passed  $r, g, b$  color.*
- void **fl\_rescale\_offscreen** (**FI\_Offscreen** &ctx)

*Adapts an offscreen buffer to a changed value of the scale factor.*
- void **fl\_reset\_spot** (void)

*Resets marked text.*
- void **fl\_restore\_clip** ()

*Undo any clobbering of the clip region done by your program.*
- void **fl\_restore\_scale** (float s)

*Restores the GUI scaling factor in subsequent drawing operations.*
- void **fl\_rotate** (double d)

*Concatenate rotation transformation onto the current one.*
- void **fl\_rounded\_rect** (int x, int y, int w, int h, int r)

*Draw a rounded border inside the given bounding box.*
- void **fl\_rounded\_rectf** (int x, int y, int w, int h, int r)

*Color with current color a rounded rectangle that exactly fills the given bounding box.*
- void **fl\_rtl\_draw** (const char \*str, int n, int x, int y)

*Draw a UTF-8 string of length  $n$  bytes right to left starting at the given  $x, y$  location.*
- void **fl\_scale** (double x)

*Concatenate scaling transformation onto the current one.*
- void **fl\_scale** (double x, double y)

*Concatenate scaling transformation onto the current one.*
- void **fl\_scroll** (int X, int Y, int W, int H, int dx, int dy, void(\*draw\_area)(void \*, int, int, int, int), void \*data)

*Scroll a rectangle and draw the newly exposed portions.*
- void **fl\_set\_spot** (int font, int size, int X, int Y, int W, int H, **FI\_Window** \*win=0)

*Inform text input methods about the current text insertion cursor.*
- void **fl\_set\_status** (int X, int Y, int W, int H)

*Related to text input methods under X11.*
- const char \* **fl\_shortcut\_label** (unsigned int shortcut)

*Get a human-readable string from a shortcut value.*

- `const char * fl_shortcut_label` (unsigned int shortcut, const char \*\*eom)  
*Get a human-readable string from a shortcut value.*
- `double fl_transform_dx` (double x, double y)  
*Transform distance using current transformation matrix.*
- `double fl_transform_dy` (double x, double y)  
*Transform distance using current transformation matrix.*
- `double fl_transform_x` (double x, double y)  
*Transform coordinate using the current transformation matrix.*
- `double fl_transform_y` (double x, double y)  
*Transform coordinate using the current transformation matrix.*
- `void fl_transformed_vertex` (double xf, double yf)  
*Add coordinate pair to the vertex list without further transformations.*
- `void fl_translate` (double x, double y)  
*Concatenate translation transformation onto the current one.*
- `void fl_vertex` (double x, double y)  
*Add a single vertex to the current path.*
- `void fl_xylene` (int x, int y, int x1)  
*Draw a horizontal line from (x,y) to (x1,y).*
- `void fl_xyline` (int x, int y, int x1, int y2)  
*Draw a horizontal line from (x,y) to (x1,y), then vertical from (x1,y) to (x1,y2).*
- `void fl_xyline` (int x, int y, int x1, int y2, int x3)  
*Draw a horizontal line from (x,y) to (x1,y), then a vertical from (x1,y) to (x1,y2) and then another horizontal from (x1,y2) to (x3,y2).*
- `void fl_yxline` (int x, int y, int y1)  
*Draw a vertical line from (x,y) to (x,y1).*
- `void fl_xyline` (int x, int y, int y1, int x2)  
*Draw a vertical line from (x,y) to (x,y1), then a horizontal from (x,y1) to (x2,y1).*
- `void fl_yxline` (int x, int y, int y1, int x2, int y3)  
*Draw a vertical line from (x,y) to (x,y1), then a horizontal from (x,y1) to (x2,y1), then another vertical from (x2,y1) to (x2,y3).*

### 32.7.1 Detailed Description

FLTK global graphics and GUI drawing functions.

These functions are declared in `<FL/fl_draw.H>`, and in `<FL/platform.H>` for offscreen buffer-related ones.

### 32.7.2 Enumeration Type Documentation

### 32.7.2.1 anonymous enum

anonymous enum

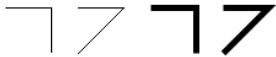
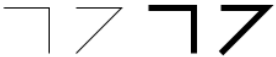
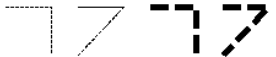
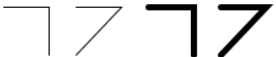
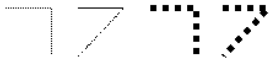
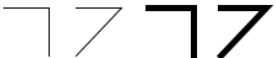
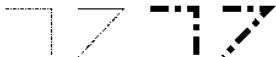
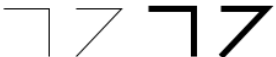
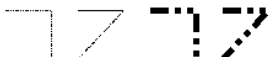
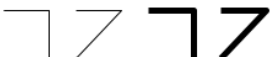
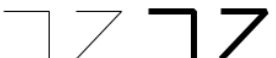
FL_SOLID		FL_CAP_FLAT	
FL_DASH		FL_CAP_ROUND	
FL_DOT		FL_CAP_SQUARE	
FL_DASHDOT		FL_JOIN_MITER	
FL_DASHDOTDOT		FL_JOIN_ROUND	
		FL_JOIN_BEVEL	

Figure 32.2 `fl_line_style()` styles

#### Enumerator

FL_SOLID	line style: solid line
FL_DASH	line style: 75% dashed line
FL_DOT	line style: 50% pixel dotted
FL_DASHDOT	line style: dash / dot pattern
FL_DASHDOTDOT	line style: dash / two dot pattern
FL_CAP_FLAT	cap style: end is flat
FL_CAP_ROUND	cap style: end is round
FL_CAP_SQUARE	cap style: end wraps end point
FL_JOIN_MITER	join style: line join extends to a point
FL_JOIN_ROUND	join style: line join is rounded
FL_JOIN_BEVEL	join style: line join is tidied

## 32.7.3 Function Documentation

### 32.7.3.1 `fl_add_symbol()`

```
int fl_add_symbol (
    const char * name,
    void(*) (Fl_Color) drawit,
    int scalable )
```

Adds a symbol to the system.

#### Parameters

in	<i>name</i>	name of symbol (without the "@")
in	<i>drawit</i>	function to draw symbol
in	<i>scalable</i>	set to 1 if <i>drawit</i> uses scalable vector drawing

**Returns**

1 on success, 0 on failure

**32.7.3.2 fl\_antialias()**

```
void fl_antialias (
    int state ) [inline]
```

Turn antialiased line drawings ON or OFF, if supported by platform.

Currently, only the Windows platform allows to change whether line drawings are antialiased. Turning it OFF may accelerate heavy drawing operations.

**32.7.3.3 fl\_arc() [1/2]**

```
void fl_arc (
    double x,
    double y,
    double r,
    double start,
    double end ) [inline]
```

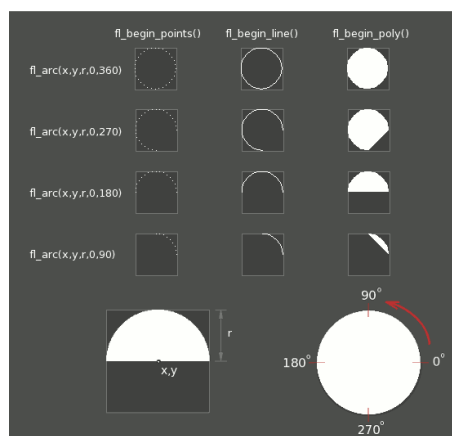
Add a series of points to the current path on the arc of a circle.

The arc is drawn counter-clockwise from 3 o'clock. If *end* is less than *start* then it draws the arc in a clockwise direction. To draw an arc across the 3 o'clock line, *start* and *end* can be greater than 360 or less than 0. For example, to draw a counter-clockwise arc from 6 to 12 o'clock, *start* would be -90 deg, and *end* would be at +90 deg.

You can get elliptical paths by using *scale* and *rotate* before calling [fl\\_arc\(\)](#).

**Parameters**

in	<i>x,y,r</i>	center and radius of circular arc
in	<i>start,end</i>	angles of start and end of arc measured in degrees



**Figure 32.3 fl\_arc(x,y,r,a1,a2)**

**Examples:**

```
// Draw an arc of points
fl_begin_points();
fl_arc(100.0, 100.0, 50.0, 0.0, 180.0);
fl_end_points();
// Draw arc with a line
fl_begin_line();
fl_arc(200.0, 100.0, 50.0, 0.0, 180.0);
fl_end_line();
// Draw filled arc
fl_begin_polygon();
fl_arc(300.0, 100.0, 50.0, 0.0, 180.0);
```

```
fl_end_polygon();
```

### 32.7.3.4 fl\_arc() [2/2]

```
void fl_arc (
    int x,
    int y,
    int w,
    int h,
    double a1,
    double a2 ) [inline]
```

Draw ellipse sections using integer coordinates.

These functions match the rather limited circle drawing code provided by X and Windows. The advantage over using `fl_arc` with floating point coordinates is that they are faster because they often use the hardware, and they draw much nicer small circles, since the small sizes are often hard-coded bitmaps.

If a complete circle is drawn it will fit inside the passed bounding box. The two angles are measured in degrees counter-clockwise from 3 o'clock and are the starting and ending angle of the arc, `a2` must be greater or equal to `a1`.

`fl_arc()` draws a series of lines to approximate the arc. Notice that the integer version of `fl_arc()` has a different number of arguments than the double version `fl_arc(double x, double y, double r, double start, double end)`

#### Parameters

in	<code>x,y,w,h</code>	bounding box of complete circle
in	<code>a1,a2</code>	start and end angles of arc measured in degrees counter-clockwise from 3 o'clock. <code>a2</code> must be greater than or equal to <code>a1</code> .

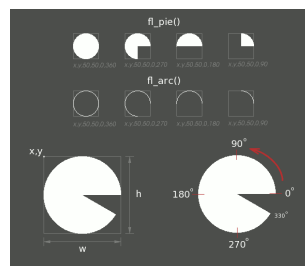


Figure 32.4 `fl_pie()` and `fl_arc()`

### 32.7.3.5 fl\_begin\_complex\_polygon()

```
void fl_begin_complex_polygon ( ) [inline]
```

Start drawing a complex filled polygon.

The polygon may be concave, may have holes in it, or may be several disconnected pieces. Call `fl_gap()` to separate loops of the path.

To outline the polygon, use `fl_begin_loop()` and replace each `fl_gap()` with `fl_end_loop();fl_begin_loop()` pairs.

#### Note

For portability, you should only draw polygons that appear the same whether "even/odd" or "non-zero" winding rules are used to fill them. Holes should be drawn in the opposite direction to the outside loop.

### 32.7.3.6 fl\_begin\_offscreen()

```
void fl_begin_offscreen (
    Fl_Offscreen ctx )
```

Send all subsequent drawing commands to this offscreen buffer.

#### Parameters

<code>ctx</code>	the offscreen buffer.
------------------	-----------------------

#### Note

The `ctx` argument must have been created by [fl\\_create\\_offscreen\(\)](#).

#### 32.7.3.7 fl\_begin\_points()

```
void fl_begin_points ( ) [inline]
```

Start drawing a list of points.

Points are added to the list with [fl\\_vertex\(\)](#).

#### 32.7.3.8 fl\_can\_do\_alpha\_blending()

```
char fl_can_do_alpha_blending ( ) [inline]
```

Check whether platform supports true alpha blending for RGBA images.

#### Returns

1 if true alpha blending supported by platform

0 not supported so FLTK will use screen door transparency

#### 32.7.3.9 fl\_capture\_window()

```
Fl_RGB_Image * fl_capture_window (
    Fl_Window * win,
    int x,
    int y,
    int w,
    int h )
```

Captures the content of a rectangular zone of a mapped window.

#### Parameters

<code>win</code>	a mapped <a href="#">Fl_Window</a> (derived types including <a href="#">Fl_Gl_Window</a> are also possible)
<code>x,y,w,h</code>	window area to be captured. Intersecting sub-windows are captured too.

#### Returns

The captured pixels as an [Fl\\_RGB\\_Image](#). The raw and drawing sizes of the image can differ. Returns NULL when capture was not successful. The image depth may differ between platforms.

#### Version

1.4

#### 32.7.3.10 fl\_circle()

```
void fl_circle (
    double x,
```

```
double y,
double r ) [inline]
```

`fl_circle(x,y,r)` is equivalent to `fl_arc(x,y,r,0,360)`, but may be faster.

#### Parameters

in	<i>x,y,r</i>	center and radius of circle
----	--------------	-----------------------------

#### Note

`fl_circle()` is best used as part of the [Drawing Complex Shapes](#) API, that is, flanked by `fl_begin_XXX()` and `fl_end_XXX()` calls where XXX can be 'loop' or 'polygon' to draw, respectively a circle or a disk. Transformation functions (e.g., `fl_scale(double, double)`) can be also used for `fl_circle()` to draw empty or filled ellipses. It must be the *only* thing in the path: if you want a circle as part of a complex polygon you must use `fl_arc()`.

Nevertheless, `fl_circle()` can also be used by itself to draw circles.

#### 32.7.3.11 fl\_clip()

```
void fl_clip (
    int x,
    int y,
    int w,
    int h ) [inline]
```

Intersect the current clip region with a rectangle and push this new region onto the stack (deprecated).

#### Parameters

in	<i>x,y,w,h</i>	position and size
----	----------------	-------------------

**Deprecated** Please use `fl_push_clip(int x, int y, int w, int h)` instead. `fl_clip(int, int, int, int)` will be removed in FLTK 1.5.

#### 32.7.3.12 fl\_clip\_box()

```
int fl_clip_box (
    int x,
    int y,
    int w,
    int h,
    int & X,
    int & Y,
    int & W,
    int & H ) [inline]
```

Intersect a rectangle with the current clip region and return the bounding box of the result.

Returns non-zero if the resulting rectangle is different to the original. The given rectangle (*x*, *y*, *w*, *h*) *should* be entirely inside its window, otherwise the result may be unexpected, i.e. this function *may* not clip the rectangle to the window coordinates and size. In particular *x* and *y* *should* not be negative.

The resulting bounding box can be used to limit the necessary drawing to this rectangle.

Example:

```
void MyGroup::draw() {
    int X = 0, Y = 0, W = 0, H = 0;
    int ret = fl_clip_box(x(), y(), w(), h(), X, Y, W, H);
    if (ret == 0) { // entire group is visible (not clipped)
        // full drawing code here
    } else { // parts of this group are clipped
        // partial drawing code here (uses X, Y, W, and H to test)
    }
}
```

```

}
}

```

W and H are set to zero if the rectangle is completely outside the clipping region. In this case X and Y are undefined and should not be used. Possible values are (0, 0), (x, y), or anything else (platform dependent).

#### Note

This function is platform-dependent. If the given rectangle is not entirely inside the window, the results are not guaranteed to be the same on all platforms.

#### Parameters

in	x,y,w,h	position and size of rectangle
out	X,Y,W,H	position and size of resulting bounding box.

#### Returns

Non-zero if the resulting rectangle is different to the original.

#### See also

[fl\\_not\\_clipped\(\)](#)

### 32.7.3.13 fl\_clip\_region() [1/2]

```
Fl_Region fl_clip_region ( ) [inline]
```

Return the current clipping region.

#### Note

This function is mostly intended for internal use by the FLTK library when drawing to the display. Its return value can be always NULL if the current drawing surface is not the display.

### 32.7.3.14 fl\_clip\_region() [2/2]

```
void fl_clip_region (
    Fl_Region r ) [inline]
```

Replace the top of the clipping stack with a clipping region of any shape.

Fl\_Region is an operating system specific type.

#### Note

This function is mostly intended for internal use by the FLTK library when drawing to the display. Its effect can be null if the current drawing surface is not the display.

#### Parameters

in	r	clipping region
----	---	-----------------

### 32.7.3.15 fl\_copy\_offscreen()

```
void fl_copy_offscreen (
    int x,
    int y,
```

```

int w,
int h,
Fl_Offscreen pixmap,
int srcx,
int srcy ) [inline]

```

Copy a rectangular area of the given offscreen buffer into the current drawing destination.

#### Parameters

<i>x,y</i>	position where to draw the copied rectangle
<i>w,h</i>	size of the copied rectangle
<i>pixmap</i>	offscreen buffer containing the rectangle to copy
<i>srcx,srcy</i>	origin in offscreen buffer of rectangle to copy

#### 32.7.3.16 fl\_create\_offscreen()

```

Fl_Offscreen fl_create_offscreen (
    int w,
    int h )

```

Creation of an offscreen graphics buffer.

#### Parameters

<i>w,h</i>	width and height in FLTK units of the buffer.
------------	---

#### Returns

the created graphics buffer.

The pixel size of the created graphics buffer is equal to the number of pixels in an area of the screen containing the current window sized at *w,h* FLTK units. This pixel size varies with the value of the scale factor of this screen.

#### Note

Work with the `fl_XXX_offscreen()` functions is equivalent to work with an [Fl\\_Image\\_Surface](#) object, as follows :

Fl_Offscreen-based approach	Fl_Image_Surface-based approach
<code>Fl_Offscreen off = fl_create_offscreen(w, h)</code>	<code>Fl_Image_Surface *surface = new Fl_Image_Surface(w, h, 1)</code>
<code>fl_begin_offscreen(off)</code>	<code>Fl_Surface_Device::push_current(surface)</code>
<code>fl_end_offscreen()</code>	<code>Fl_Surface_Device::pop_current()</code>
<code>fl_copy_offscreen(x,y,w,h, off, sx,sy)</code>	<code>fl_copy_offscreen(x,y,w,h, surface-&gt;offscreen(), sx,sy)</code>
<code>fl_rescale_offscreen(off)</code>	<code>surface-&gt;rescale()</code>
<code>fl_delete_offscreen(off)</code>	delete surface

#### 32.7.3.17 fl\_cursor()

```

void fl_cursor (
    Fl_Cursor c )

```

Sets the cursor for the current window to the specified shape and colors.

The cursors are defined in the [<FL/Enumerations.H>](#) header file.

**32.7.3.18 fl\_curve()**

```
void fl_curve (
    double x0,
    double y0,
    double x1,
    double y1,
    double x2,
    double y2,
    double x3,
    double y3 ) [inline]
```

Add a series of points on a Bézier curve to the path.

The curve ends (and two of the points) are at X0,Y0 and X3,Y3.

**Parameters**

in	X0,Y0	curve start point
in	X1,Y1	curve control point
in	X2,Y2	curve control point
in	X3,Y3	curve end point

**32.7.3.19 fl\_delete\_offscreen()**

```
void fl_delete_offscreen (
    Fl_Offscreen ctx )
```

Deletion of an offscreen graphics buffer.

**Parameters**

ctx	the buffer to be deleted.
-----	---------------------------

**Note**

The `ctx` argument must have been created by [fl\\_create\\_offscreen\(\)](#).

**32.7.3.20 fl\_draw() [1/5]**

```
void fl_draw (
    const char * str,
    int x,
    int y )
```

Draw a nul-terminated UTF-8 string starting at the given `x`, `y` location.

Text is aligned to the left and to the baseline of the font. To align to the bottom, subtract [fl\\_descent\(\)](#) from `y`. To align to the top, subtract [fl\\_descent\(\)](#) and add [fl\\_height\(\)](#). This version of `fl_draw` provides direct access to the text drawing function of the underlying OS. It does not apply any special handling to control characters.

**32.7.3.21 fl\_draw() [2/5]**

```
void fl_draw (
    const char * str,
    int x,
    int y,
    int w,
    int h,
```

```

    Fl_Align align,
    Fl_Image * img = 0,
    int draw_symbols = 1,
    int spacing = 0 )

```

Fancy string drawing function which is used to draw all the labels.

The string is formatted and aligned inside the passed box. Handles '\t' and '\n', expands all other control characters to '^X', and aligns inside or against the edges of the box. See [Fl\\_Widget::align\(\)](#) for values of `align`. The value `FL_ALIGN_INSIDE` is ignored, as this function always prints inside the box. If `img` is provided and is not `NULL`, the image is drawn above or below the text as specified by the `align` value. The `draw_symbols` argument specifies whether or not to look for symbol names starting with the '@' character

#### Parameters

in	<i>str</i>	UTF-8 string, can start and end with an '@sym' symbol, can contain '\n'
in	<i>x,y,w,h</i>	bounding box
in	<i>align</i>	label and image alignment in bounding box
in	<i>img</i>	pointer to image
in	<i>draw_symbols</i>	if true, interpret leading and trailing '@sym' as graphical symbols
in	<i>spacing</i>	spacing between text and image

#### 32.7.3.22 fl\_draw() [3/5]

```

void fl_draw (
    const char * str,
    int x,
    int y,
    int w,
    int h,
    Fl_Align align,
    void(*) (const char *, int, int, int) callthis,
    Fl_Image * img = 0,
    int draw_symbols = 1,
    int spacing = 0 )

```

The same as `fl_draw(const char*,int,int,int,int,Fl_Align,Fl_Image*,int)` with the addition of the `callthis` parameter, which is a pointer to a text drawing function such as `fl_draw(const char*, int, int, int)` to do the real work.

#### Parameters

in	<i>str</i>	UTF-8 string, can start and end with an '@sym' symbol, can contain '\n'
in	<i>x,y,w,h</i>	bounding box
in	<i>align</i>	label and image alignment in bounding box
in	<i>callthis</i>	pointer to text drawing function
in	<i>img</i>	pointer to image
in	<i>draw_symbols</i>	if true, interpret leading and trailing '@sym' as graphical symbols
in	<i>spacing</i>	spacing between text and image

#### 32.7.3.23 fl\_draw() [4/5]

```

void fl_draw (
    int angle,
    const char * str,
    int n,

```

```

        int x,
        int y ) [inline]

```

Draw at the given *x*, *y* location a UTF-8 string of length *n* bytes rotating *angle* degrees counter-clockwise.

#### Note

When using X11 (Unix, Linux, Cygwin et al.) this needs Xft to work. Under plain X11 (w/o Xft) rotated text is not supported by FLTK. A warning will be issued to stderr at runtime (only once) if you use this method with an angle other than 0.

### 32.7.3.24 fl\_draw() [5/5]

```

void fl_draw (
    int angle,
    const char * str,
    int x,
    int y )

```

Draw a nul-terminated UTF-8 string starting at the given *x*, *y* location and rotating *angle* degrees counter-clockwise.

This version of `fl_draw` provides direct access to the text drawing function of the underlying OS and is supported by all fltk platforms except X11 without Xft.

### 32.7.3.25 fl\_draw\_arrow()

```

void fl_draw_arrow (
    Fl_Rect r,
    Fl_Arrow_Type t,
    Fl_Orientation o,
    Fl_Color col )

```

Draw an "arrow like" GUI element for the selected scheme.

In the future this function should be integrated in [Fl\\_Scheme](#) as a virtual method, i.e. it would call a method like ...

```
Fl_Scheme::current()->draw_arrow(r, t, o, col);
```

#### Parameters

in	<i>r</i>	bounding box
in	<i>t</i>	arrow type
in	<i>o</i>	orientation
in	<i>col</i>	arrow color

#### Since

1.4.0

### 32.7.3.26 fl\_draw\_box()

```

void fl_draw_box (
    Fl_Boxtype t,
    int x,
    int y,
    int w,
    int h,
    Fl_Color c )

```

Draws a box using given type, position, size and color.

## Parameters

in	<i>t</i>	box type
in	<i>x,y,w,h</i>	position and size
in	<i>c</i>	color

**32.7.3.27 fl\_draw\_box\_focus()**

```
void fl_draw_box_focus (
    Fl_Boxtype bt,
    int x,
    int y,
    int w,
    int h,
    Fl_Color fg,
    Fl_Color bg )
```

Draws the focus rectangle inside a box using given type, position, size and color.

Boxes can set their own focus drawing callback. The focus frame does not need to be a rectangle at all, but should fit inside the shape of the box.

## Parameters

in	<i>bt</i>	box type
in	<i>x,y,w,h</i>	position and size
in	<i>fg,bg</i>	foreground and background color

**32.7.3.28 fl\_draw\_check()**

```
void fl_draw_check (
    Fl_Rect bb,
    Fl_Color col )
```

Draw a check mark inside the given bounding box.

The check mark is allowed to fill the entire box but the algorithm used makes sure that a 1-pixel border is kept free if the box is large enough. You need to calculate margins for box borders etc. yourself.

The check mark size is limited (minimum and maximum size) and the check mark is always centered in the given box.

## Note

If the box is too small (bad GUI design) the check mark will be drawn over the box borders. This is intentional for better user experience. Otherwise users might not be able to recognize if a box is checked.

The size limits are implementation details and may be changed at any time.

## Parameters

in	<i>bb</i>	rectangle that defines the bounding box
in	<i>col</i>	Fl_Color to draw the check mark

## Since

1.4.0

**32.7.3.29 fl\_draw\_circle()**

```
void fl_draw_circle (
    int x,
    int y,
    int d,
    Fl_Color color )
```

Draw a potentially small, filled circle using a given color.

This function draws a filled circle bounded by rectangle  $(x, y, d, d)$  using color `color`

This function is the same as `fl_pie(x, y, d, d, 0, 360)` except with some systems that don't draw small circles well. In that situation, the circle diameter `d` is converted from FLTK units to pixels and this function approximates a filled circle by drawing several filled rectangles if the converted diameter is 6 pixels.

The current drawing color `fl_color()` is preserved across the call.

**Parameters**

in	<i>x,y</i>	coordinates of top left of the bounding box
in	<i>d</i>	diameter == width and height of the bounding box in FLTK units
in	<i>color</i>	the color used to draw the circle

**Since**

1.4.0

**32.7.3.30 fl\_draw\_image() [1/2]**

```
void fl_draw_image (
    const uchar * buf,
    int X,
    int Y,
    int W,
    int H,
    int D = 3,
    int L = 0 ) [inline]
```

Draw an 8-bit per color RGB or luminance image.

**Parameters**

in	<i>buf</i>	points at the "r" data of the top-left pixel. Color data must be in <i>r, g, b</i> order. Luminance data is only one <i>gray</i> byte.
in	<i>X,Y</i>	position where to put top-left corner of image
in	<i>W,H</i>	size of the image
in	<i>D</i>	delta to add to the pointer between pixels. It may be any value greater than or equal to 1, or it can be negative to flip the image horizontally
in	<i>L</i>	delta to add to the pointer between lines (if 0 is passed it uses $W * D$ ), and may be larger than $W * D$ to crop data, or negative to flip the image vertically

It is highly recommended that you put the following code before the first `show()` of *any* window in your program to get rid of the dithering if possible:

```
Fl::visual(FL_RGB);
```

Gray scale (1-channel) images may be drawn. This is done if `abs(D)` is less than 3, or by calling `fl_draw_image_mono()`. Only one 8-bit sample is used for each pixel, and on screens with different numbers of bits for red, green, and blue only gray colors are used. Setting `D` greater than 1 will let you display one channel of a color image.

**Note:**

The X version does not support all possible visuals. If FLTK cannot draw the image in the current visual it will abort. FLTK supports any visual of 8 bits or less, and all common TrueColor visuals up to 32 bits.

**32.7.3.31 fl\_draw\_image()** [2/2]

```
void fl_draw_image (
    Fl_Draw_Image_Cb cb,
    void * data,
    int X,
    int Y,
    int W,
    int H,
    int D = 3 ) [inline]
```

Draw an image using a callback function to generate image data.

You can generate the image as it is being drawn, or do arbitrary decompression of stored data, provided it can be decompressed to individual scan lines.

**Parameters**

in	<i>cb</i>	callback function to generate scan line data
in	<i>data</i>	user data passed to callback function
in	<i>X,Y</i>	screen position of top left pixel
in	<i>W,H</i>	image width and height
in	<i>D</i>	data size per pixel in bytes (must be greater than 0)

**See also**

[fl\\_draw\\_image\(const uchar\\* buf, int X, int Y, int W, int H, int D, int L\)](#)

The callback function *cb* is called with the `void* data` user data pointer to allow access to a structure of information about the image, and the *x*, *y*, and *w* of the scan line desired from the image. 0,0 is the upper-left corner of the image, not *x*, *y*. A pointer to a buffer to put the data into is passed. You must copy *w* pixels from scanline *y*, starting at pixel *x*, to this buffer.

Due to cropping, less than the whole image may be requested. So *x* may be greater than zero, the first *y* may be greater than zero, and *w* may be less than *W*. The buffer is long enough to store the entire *W* \* *D* pixels, this is for convenience with some decompression schemes where you must decompress the entire line at once: decompress it into the buffer, and then if *x* is not zero, copy the data over so the *x*'th pixel is at the start of the buffer.

You can assume the *y*'s will be consecutive, except the first one may be greater than zero.

If *D* is 4 or more, you must fill in the unused bytes with zero.

**32.7.3.32 fl\_draw\_image\_mono()** [1/2]

```
void fl_draw_image_mono (
    const uchar * buf,
    int X,
    int Y,
    int W,
    int H,
    int D = 1,
    int L = 0 ) [inline]
```

Draw a gray-scale (1 channel) image.

**See also**

[fl\\_draw\\_image\(const uchar\\* buf, int X,int Y,int W,int H, int D, int L\)](#)

**32.7.3.33 fl\_draw\_image\_mono()** [2/2]

```
void fl_draw_image_mono (
    Fl_Draw_Image_Cb cb,
    void * data,
    int X,
    int Y,
    int W,
    int H,
    int D = 1 ) [inline]
```

Draw a gray-scale image using a callback function to generate image data.

See also

[fl\\_draw\\_image\(Fl\\_Draw\\_Image\\_Cb cb, void\\* data, int X,int Y,int W,int H, int D\)](#)

**32.7.3.34 fl\_draw\_pixmap()** [1/2]

```
int fl_draw_pixmap (
    char *const * data,
    int x,
    int y,
    Fl_Color bg = FL_GRAY ) [inline]
```

Draw XPM image data, with the top-left corner at the given position.

See also

[fl\\_draw\\_pixmap\(const char\\* const\\* data, int x, int y, Fl\\_Color bg\)](#)

**32.7.3.35 fl\_draw\_pixmap()** [2/2]

```
int fl_draw_pixmap (
    const char *const * data,
    int x,
    int y,
    Fl_Color bg = FL_GRAY )
```

Draw XPM image data, with the top-left corner at the given position.

The image is dithered on 8-bit displays so you won't lose color space for programs displaying both images and pixmaps.

Parameters

in	<i>data</i>	pointer to XPM image data
in	<i>x,y</i>	position of top-left corner
in	<i>bg</i>	background color

Returns

0 if there was any error decoding the XPM data.

**32.7.3.36 fl\_draw\_radio()**

```
void fl_draw_radio (
    int x,
    int y,
```

```
int d,
Fl_Color color )
```

Draw a round check mark (circle) of a radio button.

This draws only the round "radio button mark", it does not draw the (also typically round) box of the radio button.

Call this only if the radio button is ON.

This method draws a scheme specific "circle" with a particular light effect if the scheme is gtk+. For all other schemes this function draws a simple, small circle.

The `color` must be chosen by the caller so it has enough contrast with the background.

The bounding box of the circle is the rectangle (`x`, `y`, `d`, `d`).

The current drawing color `fl_color()` is preserved across the call.

#### Parameters

in	<i>x,y</i>	coordinates of top left of the bounding box
in	<i>d</i>	diameter == width and height of the bounding box in FLTK units
in	<i>color</i>	the base color used to draw the circle

Since

1.4.0

#### 32.7.3.37 fl\_draw\_symbol()

```
int fl_draw_symbol (
    const char * label,
    int x,
    int y,
    int w,
    int h,
    Fl_Color col )
```

Draw the named symbol in the given rectangle using the given color.

#### Parameters

in	<i>label</i>	name of symbol
in	<i>x,y</i>	position of symbol
in	<i>w,h</i>	size of symbol
in	<i>col</i>	color of symbox

#### Returns

1 on success, 0 on failure

#### 32.7.3.38 fl\_expand\_text()

```
const char * fl_expand_text (
    const char * from,
    char * buf,
    int maxbuf,
    double maxw,
    int & n,
    double & width,
    int wrap,
    int draw_symbols )
```

Copy *from* to *buf*, replacing control characters with ^X.

Stop at a newline or if *maxbuf* characters written to buffer. Also word-wrap if width exceeds *maxw*. Returns a pointer to the start of the next line of characters. Sets *n* to the number of characters put into the buffer. Sets width to the width of the string in the [current font](#).

#### Parameters

in	<i>from</i>	input text, can contain ' ' and single or double '@' characters
out	<i>buf</i>	buffer for the output text segment
in	<i>maxbuf</i>	size of the buffer, or 0 to use the internal buffer allocated in this function
in	<i>maxw</i>	maximum width in pixels of the output text
out	<i>n</i>	number of characters in the output text segment
out	<i>width</i>	actual width in pixels of the output text
in	<i>wrap</i>	if true, wrap at <i>maxw</i> , else wrap at newlines
in	<i>draw_symbols</i>	if true, double '@' characters are escaped into a single '@'

#### Returns

pointer to the next character in the input text

### 32.7.3.39 fl\_focus\_rect()

```
void fl_focus_rect (
    int x,
    int y,
    int w,
    int h ) [inline]
```

Draw a dotted rectangle, used to indicate keyboard focus on a widget.

This method draws the rectangle in the current color and independent of the [Fl::visible\\_focus\(\)](#) option. You may need to set the current color with [fl\\_color\(\)](#) before you call this.

### 32.7.3.40 fl\_frame()

```
void fl_frame (
    const char * s,
    int x,
    int y,
    int w,
    int h )
```

Draws a series of line segments around the given box.

The string *s* must contain groups of 4 letters which specify one of 24 standard grayscale values, where 'A' is black and 'X' is white. The order of each set of 4 characters is: top, left, bottom, right. The result of calling [fl\\_frame\(\)](#) with a string that is not a multiple of 4 characters in length is undefined. The only difference between this function and [fl\\_frame2\(\)](#) is the order of the line segments.

#### Parameters

in	<i>s</i>	sets of 4 grayscale values in top, left, bottom, right order
in	<i>x,y,w,h</i>	position and size

**32.7.3.41 fl\_frame2()**

```
void fl_frame2 (
    const char * s,
    int x,
    int y,
    int w,
    int h )
```

Draws a series of line segments around the given box.

The string *s* must contain groups of 4 letters which specify one of 24 standard grayscale values, where 'A' is black and 'X' is white. The order of each set of 4 characters is: bottom, right, top, left. The result of calling [fl\\_frame2\(\)](#) with a string that is not a multiple of 4 characters in length is undefined. The only difference between this function and [fl\\_frame\(\)](#) is the order of the line segments.

**Parameters**

in	<i>s</i>	sets of 4 grayscale values in bottom, right, top, left order
in	<i>x,y,w,h</i>	position and size

**32.7.3.42 fl\_gap()**

```
void fl_gap ( ) [inline]
```

Separate loops of the path.

It is unnecessary but harmless to call [fl\\_gap\(\)](#) before the first vertex, after the last vertex, or several times in a row.

**32.7.3.43 fl\_line\_style()**

```
void fl_line_style (
    int style,
    int width = 0,
    char * dashes = 0 ) [inline]
```

Set how to draw lines (the "pen").

If you change this it is your responsibility to set it back to the default using [fl\\_line\\_style\(0\)](#).

FL_SOLID		FL_CAP_FLAT	
FL_DASH		FL_CAP_ROUND	
FL_DOT		FL_CAP_SQUARE	
FL_DASHDOT		FL_JOIN_MITER	
FL_DASHDOTDOT		FL_JOIN_ROUND	
		FL_JOIN_BEVEL	

Figure 32.5 [fl\\_line\\_style\(\)](#) styles

## Parameters

in	<i>style</i>	A bitmask which is a bitwise-OR of <a href="#">Line Styles</a> , a cap style, and a join style. If you don't specify a dash type you will get a solid line. If you don't specify a cap or join type you will get a system-defined default of whatever value is fastest.
in	<i>width</i>	The thickness of the lines in pixels. Zero results in the system defined default, which on both X and Windows is somewhat different and nicer than 1.
in	<i>dashes</i>	A pointer to an array of dash lengths, measured in pixels. The first location is how long to draw a solid portion, the next is how long to draw the gap, then the solid, etc. It is terminated with a zero-length entry. A <code>NULL</code> pointer or a zero-length array results in a solid line. Odd array sizes are not supported and result in undefined behavior.

## Note

Because of how line styles are implemented on Win32 systems, you *must* set the line style *after* setting the drawing color. If you set the color after the line style you will lose the line style settings.

The `dashes` array does not work under the (unsupported!) operating systems Windows 95, 98 or Me, since those operating systems do not support complex line styles.

32.7.3.44 `fl_load_matrix()`

```
void fl_load_matrix (
    double a,
    double b,
    double c,
    double d,
    double x,
    double y ) [inline]
```

Set the current transformation matrix.

## Parameters

in	<i>a,b,c,d,x,y</i>	transformation matrix elements
----	--------------------	--------------------------------

32.7.3.45 `fl_measure()`

```
void fl_measure (
    const char * str,
    int & w,
    int & h,
    int draw_symbols )
```

Measure how wide and tall the string will be when printed by the [fl\\_draw\(\)](#) function with `align` parameter.

If the incoming `w` is non-zero it will wrap to that width.

The [current font](#) is used to do the width/height calculations, so unless its value is known at the time `fl_measure()` is called, it is advised to first set the current font with [fl\\_font\(\)](#). With event-driven GUI programming you can never be sure which widget was exposed and redrawn last, nor which font it used. If you have not called [fl\\_font\(\)](#) explicitly in your own code, the width and height may be set to unexpected values, even zero!

**Note:** In the general use case, it's a common error to forget to set `w` to 0 before calling `fl_measure()` when wrap behavior isn't needed.

## Parameters

in	<i>str</i>	nul-terminated string
----	------------	-----------------------

## Parameters

in, out	<i>w</i>	call with w=0, or with the preferred width for word wrapping, returns with the width of the string in current font
out	<i>h</i>	height of string in current font
in	<i>draw_symbols</i>	non-zero to enable @symbol handling [default=1]

```
// Example: Common use case for fl_measure()
const char *s = "This is a test";
int wi=0, hi=0;           // initialize to zero before calling fl_measure()
fl_font(FL_HELVETICA, 14); // set current font face/size to be used for measuring
fl_measure(s, wi, hi);    // returns pixel width/height of string in current font
```

**32.7.3.46 fl\_measure\_pixmap() [1/2]**

```
int fl_measure_pixmap (
    char *const * data,
    int & w,
    int & h )
```

Get the dimensions of a pixmap.

An XPM image contains the dimensions in its data. This function returns the width and height.

## Parameters

in	<i>data</i>	pointer to XPM image data.
out	<i>w,h</i>	width and height of image

## Returns

non-zero if the dimensions were parsed OK

0 if there were any problems

**32.7.3.47 fl\_measure\_pixmap() [2/2]**

```
int fl_measure_pixmap (
    const char *const * cdata,
    int & w,
    int & h )
```

Get the dimensions of a pixmap.

## See also

[fl\\_measure\\_pixmap\(char\\* const\\* data, int &w, int &h\)](#)

**32.7.3.48 fl\_mult\_matrix()**

```
void fl_mult_matrix (
    double a,
    double b,
    double c,
    double d,
    double x,
    double y ) [inline]
```

Concatenate another transformation onto the current one.

## Parameters

in	$a, b, c, d, x, y$	transformation matrix elements such that $X' = aX + cY + x$ and $Y' = bX + dY + y$
----	--------------------	--

**32.7.3.49 fl\_not\_clipped()**

```
int fl_not_clipped (
    int x,
    int y,
    int w,
    int h ) [inline]
```

Does the rectangle intersect the current clip region?

## Parameters

in	$x, y, w, h$	position and size of rectangle
----	--------------	--------------------------------

## Returns

non-zero if any of the rectangle intersects the current clip region. If this returns 0 you don't have to draw the object.

## Note

Under X this returns 2 if the rectangle is partially clipped and 1 if it is entirely inside the clip region.

## See also

[fl\\_clip\\_box\(\)](#)

**32.7.3.50 fl\_old\_shortcut()**

```
unsigned int fl_old_shortcut (
    const char * s )
```

Emulation of XForms named shortcuts.

Converts ASCII shortcut specifications (eg. " $\wedge c$ ") into the FLTK integer equivalent (eg. FL\_CTRL+'c')

These ASCII characters are used to specify the various keyboard modifier keys:

```
# - Alt
+ - Shift
^ - Control
! - Meta
@ - Command (Ctrl on linux/win, Meta on OSX)
```

These special characters can be combined to form chords of modifier keys. (See 'Remarks' below)

After the optional modifier key prefixes listed above, one can either specify a single keyboard character to use as the shortcut, or a numeric sequence in hex, decimal or octal.

Examples:

```
"c"      -- Uses 'c' as the shortcut
"#^c"    -- Same as FL_ALT|FL_CTRL|'c'
"#^!c"   -- Same as FL_ALT|FL_CTRL|FL_META|'c'
"@c"     -- Same as FL_COMMAND|'c' (see FL_COMMAND for platform specific behavior)
"0x63"   -- Same as "c" (hex 63=='c')
"99"     -- Same as "c" (dec 99=='c')
"0143"   -- Same as "c" (octal 0143=='c')
"^0x63"  -- Same as (FL_CTRL|'c'), or (FL_CTRL|0x63)
"^99"    -- Same as (FL_CTRL|'c'), or (FL_CTRL|99)
"^0143"  -- Same as (FL_CTRL|'c'), or (FL_CTRL|0143)
```

## Remarks

Due to XForms legacy, there are some odd things to consider when using the modifier characters.

(1) You can use the special modifier keys for chords *only* if the modifiers are provided in this order: #, +, ^, !, @. Other ordering can yield undefined results.

So for instance, Ctrl-Alt-c must be specified as "#^c" (and not "^#c"), due to the above ordering rule.

(2) If you want to make a shortcut that uses one of the special modifier characters (as the character being modified), then to avoid confusion, specify the numeric equivalent, e.g.

If you want..	Then use..
'#' as the shortcut..	"0x23" (instead of just "#").
'+' as the shortcut..	"0x2b" (instead of just "+").
'^' as the shortcut..	"0x5e" (instead of just "^").
Alt-+ as the shortcut..	"#0x2b" (instead of "#+").
Alt-^ as the shortcut..	"#0x5e" (instead of "#^").
..etc..	

As a general rule that's easy to remember, unless the shortcut key to be modified is a single alpha-numeric character [A-Z,a-z,0-9), it's probably best to use the numeric equivalents.

Don't fix these silly legacy issues in a future release. Nobody is using this anymore.

### 32.7.3.51 fl\_overlay\_clear()

```
void fl_overlay_clear ( )
```

Erase a selection rectangle without drawing a new one.

See also

[fl\\_overlay\\_rect\(int x, int y, int w, int h\)](#)

### 32.7.3.52 fl\_overlay\_rect()

```
void fl_overlay_rect (
    int x,
    int y,
    int w,
    int h )
```

Draw a transient dotted selection rectangle.

This function saves the current screen content and then draws a dotted selection rectangle into the front screen buffer. If another selection rectangle was drawn earlier, the previous screen graphics are restored first.

To clear the selection rectangle, call [fl\\_overlay\\_clear\(\)](#).

The typical (and only) use for this function is to draw a selection rectangle during a mouse drag event sequence without having to redraw the entire content of the widget.

Your event handle should look similar to this (also see `test/mandelbrot.cxx`):

```
int MyWidget::handle(int event) {
    static int ix, iy;
    switch (event) {
        case FL_PUSH:
            ix = Fl::event_x(); iy = Fl::event_y();
            return 1;
        case FL_DRAG:
            this->make_current();
            fl_overlay_rect(ix, iy, ix-Fl::event_x(), iy-Fl::event_y());
            return 1;
        case FL_RELEASE:
            this->make_current();
            fl_overlay_clear();
            // select the element under the rectangle
            return 1;
    }
    return MySuperWidget::handle(event);
}
```

**Note**

Between drawing an overlay rect and clearing it, the content of the widget must not change.

[fl\\_overlay\\_rect\(\)](#) and [fl\\_overlay\\_clear\(\)](#) should be called when the actual event occurs, and *not* within `MyWidget::draw()`.

[fl\\_overlay\\_rect\(\)](#) and [fl\\_overlay\\_clear\(\)](#) should not be mixed with [Fl\\_Overlay\\_Window](#). [Fl\\_Overlay\\_Window](#) provides an entirely different way of drawing selection outlines and is not limited to rectangles.

**Parameters**

<code>x,y,w,h</code>	position and size of the overlay rectangle.
----------------------	---

**See also**

[fl\\_overlay\\_clear\(\)](#)

**32.7.3.53 fl\_override\_scale()**

```
float fl_override_scale ( )
```

Removes any GUI scaling factor in subsequent drawing operations.

This must be matched by a later call to [fl\\_restore\\_scale\(\)](#). This function can be used to transiently perform drawing operations that are not rescaled by the current value of the GUI scaling factor. It's not supported to call [fl\\_push\\_clip\(\)](#) while transiently removing scaling.

**Returns**

The GUI scaling factor value that was in place when the function started.

**32.7.3.54 fl\_pie()**

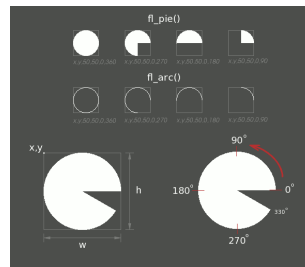
```
void fl_pie (
    int x,
    int y,
    int w,
    int h,
    double a1,
    double a2 ) [inline]
```

Draw filled ellipse sections using integer coordinates.

Like [fl\\_arc\(\)](#), but [fl\\_pie\(\)](#) draws a filled-in pie slice. This slice may extend outside the line drawn by [fl\\_arc\(\)](#); to avoid this use `w - 1` and `h - 1`.

**Parameters**

in	<code>x,y,w,h</code>	bounding box of complete circle
in	<code>a1,a2</code>	start and end angles of arc measured in degrees counter-clockwise from 3 o'clock. <code>a2</code> must be greater than or equal to <code>a1</code> .

Figure 32.6 `fl_pie()` and `fl_arc()`**32.7.3.55 `fl_polygon()`**

```
void fl_polygon (
    int x,
    int y,
    int x1,
    int y1,
    int x2,
    int y2,
    int x3,
    int y3 ) [inline]
```

Fill a 4-sided polygon.

The polygon must be convex.

**32.7.3.56 `fl_pop_clip()`**

```
void fl_pop_clip ( ) [inline]
```

Restore the previous clip region.

You must call `fl_pop_clip()` once for every time you call `fl_push_clip()`. Unpredictable results may occur if the clip stack is not empty when you return to FLTK.

**32.7.3.57 `fl_push_clip()`**

```
void fl_push_clip (
    int x,
    int y,
    int w,
    int h ) [inline]
```

Intersect the current clip region with a rectangle and push this new region onto the stack.

**Parameters**

in	$x, y, w, h$	position and size
----	--------------	-------------------

**32.7.3.58 `fl_push_matrix()`**

```
void fl_push_matrix ( ) [inline]
```

Save the current transformation matrix on the stack.

The maximum depth of the stack is 32.

**32.7.3.59 `fl_read_image()`**

```
uchar * fl_read_image (
    uchar * p,
```

```

    int X,
    int Y,
    int w,
    int h,
    int alpha )

```

Reads an RGB(A) image from the current window or off-screen buffer.

#### Parameters

in	<i>p</i>	pixel buffer, or NULL to allocate one
in	<i>X,Y</i>	position of top-left of image to read
in	<i>w,h</i>	width and height of image to read
in	<i>alpha</i>	alpha value for image (0 for none)

#### Returns

pointer to pixel buffer, or NULL if allocation failed.

The *p* argument points to a buffer that can hold the image and must be at least *w\*h\*3* bytes when reading RGB images, or *w\*h\*4* bytes when reading RGBA images. If NULL, [fl\\_read\\_image\(\)](#) will create an array of the proper size which can be freed using `delete[]`.

The *alpha* parameter controls whether an alpha channel is created and the value that is placed in the alpha channel. If 0, no alpha channel is generated.

#### See also

[fl\\_capture\\_window\(\)](#)

#### 32.7.3.60 fl\_rect() [1/3]

```

void fl_rect (
    Fl_Rect r ) [inline]

```

Draw a border *inside* the given bounding box.

This is the same as [fl\\_rect\(int x, int y, int w, int h\)](#) but with [Fl\\_Rect r](#) as input argument.

#### 32.7.3.61 fl\_rect() [2/3]

```

void fl_rect (
    int x,
    int y,
    int w,
    int h ) [inline]

```

Draw a border *inside* the given bounding box.

This function is meant for quick drawing of simple boxes. The behavior is undefined for line widths that are not 1.

#### 32.7.3.62 fl\_rect() [3/3]

```

void fl_rect (
    int x,
    int y,
    int w,
    int h,
    Fl_Color c ) [inline]

```

Draw with passed color a border *inside* the given bounding box.

#### Warning

The current color is changed to *c* upon return.

**32.7.3.63 fl\_rectf() [1/4]**

```
void fl_rectf (
    Fl_Rect bb,
    uchar r,
    uchar g,
    uchar b ) [inline]
```

Color a rectangle with "exactly" the passed *r*, *g*, *b* color.

This is the same as `fl_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b)` but with `Fl_Rect bb` (bounding box) as argument instead of (*x*, *y*, *w*, *h*).

See also

`fl_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b)`

**32.7.3.64 fl\_rectf() [2/4]**

```
void fl_rectf (
    Fl_Rect r,
    Fl_Color c ) [inline]
```

Color with passed color a rectangle that exactly fills the given bounding box.

Warning

The current color is changed to *c* upon return.

**32.7.3.65 fl\_rectf() [3/4]**

```
void fl_rectf (
    int x,
    int y,
    int w,
    int h,
    Fl_Color c ) [inline]
```

Color with passed color a rectangle that exactly fills the given bounding box.

Warning

The current color is changed to *c* upon return.

**32.7.3.66 fl\_rectf() [4/4]**

```
void fl_rectf (
    int x,
    int y,
    int w,
    int h,
    uchar r,
    uchar g,
    uchar b ) [inline]
```

Color a rectangle with "exactly" the passed *r*, *g*, *b* color.

On screens with less than 24 bits of color this is done by drawing a solid-colored block using `fl_draw_image()` so that the correct color shade is produced. On other screens, the current color is changed to `fl_color(r, g, b)` upon return.

**32.7.3.67 fl\_rescale\_offscreen()**

```
void fl_rescale_offscreen (
    Fl_Offscreen & ctx )
```

Adapts an offscreen buffer to a changed value of the scale factor.

The `ctx` argument must have been created by [fl\\_create\\_offscreen\(\)](#) and the calling context must not be between [fl\\_begin\\_offscreen\(\)](#) and [fl\\_end\\_offscreen\(\)](#). The graphical content of the offscreen is preserved. The current scale factor value is given by `Fl_Graphics_Driver::default_driver().scale()`.

**Version**

1.4

**32.7.3.68 fl\_reset\_spot()**

```
void fl_reset_spot (
    void )
```

Resets marked text.

In many languages, typing a character can involve multiple keystrokes. For example, the Å can be composed of two dots (") on top of the character, followed by the letter A (on a Mac with U.S. keyboard, you'd type Alt-U, Shift-A. To inform the user that the dots may be followed by another character, the " is underlined).

Call this function if character composition needs to be aborted for some reason. One such example would be the text input widget losing focus.

**32.7.3.69 fl\_restore\_scale()**

```
void fl_restore_scale (
    float s )
```

Restores the GUI scaling factor in subsequent drawing operations.

**Parameters**

<code>s</code>	Value returned by a previous call to <a href="#">fl_override_scale()</a> .
----------------	--

**32.7.3.70 fl\_rotate()**

```
void fl_rotate (
    double d ) [inline]
```

Concatenate rotation transformation onto the current one.

**Parameters**

<code>in</code>	<code>d</code>	- rotation angle, counter-clockwise in degrees (not radians)
-----------------	----------------	--

**32.7.3.71 fl\_rounded\_rect()**

```
void fl_rounded_rect (
    int x,
    int y,
    int w,
    int h,
    int r ) [inline]
```

Draw a rounded border *inside* the given bounding box.

The radius code is optimized for speed and works best for values between 5 and 15 units.

**32.7.3.72 fl\_rounded\_rectf()**

```
void fl_rounded_rectf (
    int x,
    int y,
    int w,
    int h,
    int r ) [inline]
```

Color with current color a rounded rectangle that exactly fills the given bounding box. The radius code is optimized for speed and works best for values between 5 and 15 units.

**32.7.3.73 fl\_scale() [1/2]**

```
void fl_scale (
    double x ) [inline]
```

Concatenate scaling transformation onto the current one.

**Parameters**

in	x	scale factor in both x-direction and y-direction
----	---	--

**32.7.3.74 fl\_scale() [2/2]**

```
void fl_scale (
    double x,
    double y ) [inline]
```

Concatenate scaling transformation onto the current one.

**Parameters**

in	x,y	scale factors in x-direction and y-direction
----	-----	--

**32.7.3.75 fl\_scroll()**

```
void fl_scroll (
    int X,
    int Y,
    int W,
    int H,
    int dx,
    int dy,
    void(*) (void *, int, int, int, int) draw_area,
    void * data )
```

Scroll a rectangle and draw the newly exposed portions.

**Parameters**

in	X,Y	position of top-left of rectangle
in	W,H	size of rectangle
in	dx,dy	pixel offsets for shifting rectangle
in	draw_area	callback function to draw rectangular areas
in	data	pointer to user data for callback The contents of the rectangular area is first shifted by dx and dy pixels. The draw_area callback is then called for every newly exposed rectangular area.

**Warning**

With FLTK 1.4 and above, it's recommended to put graphical elements in an [Fl\\_Scroll](#) widget rather than use function [fl\\_scroll\(\)](#) to update those elements. That's because [fl\\_scroll\(\)](#) may not produce a pixel-accurate result when the GUI scaling factor value is not a multiple of 100%. Alternatively, use [fl\\_scroll\(\)](#) when the scaling factor value is a multiple of 100% and perform a full redraw of the graphical elements otherwise. Statement `float s = Fl::screen\_scale(win->screen_num());` gives the current scaling factor value given [Fl\\_Window](#) \*win.

**32.7.3.76 fl\_set\_spot()**

```
void fl_set_spot (
    int font,
    int size,
    int X,
    int Y,
    int W,
    int H,
    Fl_Window * win = 0 )
```

Inform text input methods about the current text insertion cursor.

**Parameters**

<i>font</i>	Font currently in use in text input.
<i>size</i>	Size of the current font.
<i>X,Y</i>	Position of the bottom of the current text insertion cursor.
<i>W,H</i>	Width and height of the current text insertion cursor.
<i>win</i>	Points to the <a href="#">Fl_Window</a> object containing the current text widget, or NULL.

**32.7.3.77 fl\_set\_status()**

```
void fl_set_status (
    int X,
    int Y,
    int W,
    int H )
```

Related to text input methods under X11.

This function is presently used only by the `utf8` test application and only for the X11 platform. This function is apparently not indispensable for text input to work correctly as suggested by other apps that don't use it (e.g., editor).

**32.7.3.78 fl\_shortcut\_label() [1/2]**

```
const char * fl_shortcut_label (
    unsigned int shortcut )
```

Get a human-readable string from a shortcut value.

Unparse a shortcut value as used by [Fl\\_Button](#) or [Fl\\_Menu\\_Item](#) into a human-readable string like "Alt+N". This only works if the shortcut is a character key or a numbered function key. If the shortcut is zero then an empty string is returned. The return value points at a static buffer that is overwritten with each call.

**Since**

FLTK 1.3.4 modifier key names can be localized, but key names can not yet be localized. This may be added to a future FLTK version.

Modifier key names (human-readable shortcut names) can be defined with the following global `const char *` pointer variables:

- `fl_local_ctrl` => name of FL\_CTRL
- `fl_local_alt` => name of FL\_ALT
- `fl_local_shift` => name of FL\_SHIFT
- `fl_local_meta` => name of FL\_META

```
fl_local_ctrl = "Strg";      // German for "Ctrl"
fl_local_shift = "Umschalt"; // German for "Shift"
```

#### Note

Due to **random** static initialization order this should always be done from code in `main()` or called by `main()` as opposed to static initialization since the default strings in the FLTK library are set by static initializers. Otherwise this **might** result in the wrong order so FLTK's internal initialization overwrites your strings.

The shortcut name will be constructed by adding all modifier names in the order defined above plus the name of the key. A '+' character is added to each modifier name unless it has a trailing '\' or a trailing '+'.

Example:

Ctrl+Alt+Shift+Meta+F12

The default values for modifier key names are as given above for all platforms except macOS. macOS uses graphical characters that represent the typical macOS modifier names in menus, e.g. cloverleaf, saucepan, etc. You may, however, redefine macOS modifier names as well.

#### Parameters

in	<i>shortcut</i>	the integer value containing the ASCII character or extended keystroke plus modifiers
----	-----------------	---

#### Returns

a pointer to a static buffer containing human readable text for the shortcut

### 32.7.3.79 `fl_shortcut_label()` [2/2]

```
const char * fl_shortcut_label (
    unsigned int shortcut,
    const char ** eom )
```

Get a human-readable string from a shortcut value.

#### Parameters

in	<i>shortcut</i>	the integer value containing the ASCII character or extended keystroke plus modifiers
in	<i>eom</i>	if this pointer is set, it will receive a pointer to the end of the modifier text

#### Returns

a pointer to a static buffer containing human readable text for the shortcut

#### See also

[fl\\_shortcut\\_label\(unsigned int shortcut\)](#)

### 32.7.3.80 `fl_transform_dx()`

```
double fl_transform_dx (
    double x,
    double y ) [inline]
```

Transform distance using current transformation matrix.

## Parameters

in	$x,y$	coordinate
----	-------	------------

**32.7.3.81 fl\_transform\_dy()**

```
double fl_transform_dy (  
    double x,  
    double y ) [inline]
```

Transform distance using current transformation matrix.

## Parameters

in	$x,y$	coordinate
----	-------	------------

**32.7.3.82 fl\_transform\_x()**

```
double fl_transform_x (  
    double x,  
    double y ) [inline]
```

Transform coordinate using the current transformation matrix.

## Parameters

in	$x,y$	coordinate
----	-------	------------

**32.7.3.83 fl\_transform\_y()**

```
double fl_transform_y (  
    double x,  
    double y ) [inline]
```

Transform coordinate using the current transformation matrix.

## Parameters

in	$x,y$	coordinate
----	-------	------------

**32.7.3.84 fl\_transformed\_vertex()**

```
void fl_transformed_vertex (  
    double xf,  
    double yf ) [inline]
```

Add coordinate pair to the vertex list without further transformations.

## Parameters

in	$xf,yf$	transformed coordinate
----	---------	------------------------

**32.7.3.85 fl\_translate()**

```
void fl_translate (
    double x,
    double y ) [inline]
```

Concatenate translation transformation onto the current one.

**Parameters**

in	x,y	translation factor in x-direction and y-direction
----	-----	---

**32.7.3.86 fl\_vertex()**

```
void fl_vertex (
    double x,
    double y ) [inline]
```

Add a single vertex to the current path.

**Parameters**

in	x,y	coordinate
----	-----	------------

**32.8 Multithreading support functions**

fl multithreading support functions declared in <FL/Fl.H>

**Functions**

- static int [Fl::awake](#) ([Fl\\_Awake\\_Handler](#) cb, void \*message=0)  
*See void awake(void\* message=0).*
- static void [Fl::awake](#) (void \*message=0)  
*Sends a message pointer to the main thread, causing any pending [Fl::wait\(\)](#) call to terminate so that the main thread can retrieve the message and any pending redraws can be processed.*
- static int [Fl::lock](#) ()  
*The [lock\(\)](#) method blocks the current thread until it can safely access FLTK widgets and data.*
- static void \* [Fl::thread\\_message](#) ()  
*The [thread\\_message\(\)](#) method returns the last message that was sent from a child by the [awake\(\)](#) method.*
- static void [Fl::unlock](#) ()  
*The [unlock\(\)](#) method releases the lock that was set using the [lock\(\)](#) method.*

**32.8.1 Detailed Description**

fl multithreading support functions declared in <FL/Fl.H>

**32.8.2 Function Documentation****32.8.2.1 awake() [1/2]**

```
int Fl::awake (
    Fl\_Awake\_Handler func,
    void * data = 0 ) [static]
```

See `void awake(void* message=0)`.

Let the main thread know an update is pending and have it call a specific function.

Registers a function that will be called by the main thread during the next message handling cycle. Returns 0 if the callback function was registered, and -1 if registration failed. Over a thousand awake callbacks can be registered simultaneously.

See also

[Fl::awake\(void\\* message=0\)](#)

### 32.8.2.2 awake() [2/2]

```
void Fl::awake (
    void * msg = 0 ) [static]
```

Sends a message pointer to the main thread, causing any pending [Fl::wait\(\)](#) call to terminate so that the main thread can retrieve the message and any pending redraws can be processed.

Multiple calls to [Fl::awake\(\)](#) will queue multiple pointers for the main thread to process, up to a system-defined (typically several thousand) depth. The default message handler saves the last message which can be accessed using the [Fl::thread\\_message\(\)](#) function.

In the context of a threaded application, a call to [Fl::awake\(\)](#) with no argument will trigger event loop handling in the main thread. Since it is not possible to call [Fl::flush\(\)](#) from a subsidiary thread, [Fl::awake\(\)](#) is the best (and only, really) substitute.

It's *not* necessary to wrap calls to any form of [Fl::awake\(\)](#) by [Fl::lock\(\)](#) and [Fl::unlock\(\)](#). Nevertheless, the early, single call to [Fl::lock\(\)](#) used to initialize threading support is necessary.

Function [Fl::awake\(\)](#) in all its forms is typically called by worker threads, but it can be used safely by the main thread too, as a means to break the event loop.

See also

[Multithreading](#)

### 32.8.2.3 lock()

```
int Fl::lock ( ) [static]
```

The [lock\(\)](#) method blocks the current thread until it can safely access FLTK widgets and data.

Child threads should call this method prior to updating any widgets or accessing data. The main thread must call [lock\(\)](#) to initialize the threading support in FLTK. [lock\(\)](#) will return non-zero if threading is not available on the platform.

Child threads must call [unlock\(\)](#) when they are done accessing FLTK.

When the [wait\(\)](#) method is waiting for input or timeouts, child threads are given access to FLTK. Similarly, when the main thread needs to do processing, it will wait until all child threads have called [unlock\(\)](#) before processing additional data.

Returns

0 if threading is available on the platform; non-zero otherwise.

See also: [Multithreading](#)

### 32.8.2.4 thread\_message()

```
void * Fl::thread_message ( ) [static]
```

The [thread\\_message\(\)](#) method returns the last message that was sent from a child by the [awake\(\)](#) method.

See also: [Multithreading](#)

### 32.8.2.5 unlock()

```
void Fl::unlock ( ) [static]
```

The [unlock\(\)](#) method releases the lock that was set using the [lock\(\)](#) method.

Child threads should call this method as soon as they are finished accessing FLTK.

See also: [Multithreading](#)

## 32.9 Safe widget deletion support functions

These functions, declared in `<FL/Fl.H>`, support deletion of widgets inside callbacks.

### Functions

- static void `Fl::clear_widget_pointer` (`Fl_Widget` const \*w)  
*Clears a widget pointer in the watch list.*
- static void `Fl::delete_widget` (`Fl_Widget` \*w)  
*Schedules a widget for deletion at the next call to the event loop.*
- static void `Fl::do_widget_deletion` ()  
*Deletes widgets previously scheduled for deletion.*
- static void `Fl::release_widget_pointer` (`Fl_Widget` \*&w)  
*Releases a widget pointer from the watch list.*
- static void `Fl::watch_widget_pointer` (`Fl_Widget` \*&w)  
*Adds a widget pointer to the widget watch list.*

### 32.9.1 Detailed Description

These functions, declared in `<FL/Fl.H>`, support deletion of widgets inside callbacks.

`Fl::delete_widget()` should be called when deleting widgets or complete widget trees (`Fl_Group`, `Fl_Window`, ...) inside callbacks.

The other functions are intended for internal use. The preferred way to use them is by using the helper class `Fl_Widget_Tracker`.

The following is to show how it works ...

There are three groups of related methods:

1. scheduled widget deletion
  - `Fl::delete_widget()` schedules widgets for deletion
  - `Fl::do_widget_deletion()` deletes all scheduled widgets
2. widget watch list ("smart pointers")
  - `Fl::watch_widget_pointer()` adds a widget pointer to the watch list
  - `Fl::release_widget_pointer()` removes a widget pointer from the watch list
  - `Fl::clear_widget_pointer()` clears a widget pointer *in* the watch list
3. the class `Fl_Widget_Tracker`:
  - the constructor calls `Fl::watch_widget_pointer()`
  - the destructor calls `Fl::release_widget_pointer()`
  - the access methods can be used to test, if a widget has been deleted

See also

`Fl_Widget_Tracker`.

### 32.9.2 Function Documentation

#### 32.9.2.1 `clear_widget_pointer()`

```
void Fl::clear_widget_pointer (
    Fl_Widget const * w ) [static]
```

Clears a widget pointer *in* the watch list.

This is called when a widget is destroyed (by its destructor). You should never call this directly.

**Note**

Internal use only !

This method searches the widget watch list for pointers to the widget and clears each pointer that points to it. Widget pointers can be added to the widget watch list by calling [Fl::watch\\_widget\\_pointer\(\)](#) or by using the helper class [Fl\\_Widget\\_Tracker](#) (recommended).

**See also**

[Fl::watch\\_widget\\_pointer\(\)](#)

class [Fl\\_Widget\\_Tracker](#)

**32.9.2.2 delete\_widget()**

```
void Fl::delete_widget (
    Fl_Widget * wi ) [static]
```

Schedules a widget for deletion at the next call to the event loop.

Use this method to delete a widget inside a callback function.

To avoid early deletion of widgets, this function should be called toward the end of a callback and only after any call to the event loop ([Fl::wait\(\)](#), [Fl::flush\(\)](#), [Fl::check\(\)](#), [fl\\_ask\(\)](#), etc.).

When deleting groups or windows, you must only delete the group or window widget and not the individual child widgets.

**Since**

FLTK 1.3.4 the widget will be hidden immediately, but the actual destruction will be delayed until the event loop is finished. Up to FLTK 1.3.3 windows wouldn't be hidden before the event loop was done, hence you had to `hide()` a window in your window close callback if you called [Fl::delete\\_widget\(\)](#) to destroy (and hide) the window.

FLTK 1.3.0 it is not necessary to remove widgets from their parent groups or windows before calling this, because it will be done in the widget's destructor, but it is not a failure to do this nevertheless.

**Note**

In FLTK 1.1 you **must** remove widgets from their parent group (or window) before deleting them.

**See also**

[Fl\\_Widget::~~Fl\\_Widget\(\)](#)

**32.9.2.3 do\_widget\_deletion()**

```
void Fl::do_widget_deletion ( ) [static]
```

Deletes widgets previously scheduled for deletion.

This is for internal use only. You should never call this directly.

[Fl::do\\_widget\\_deletion\(\)](#) is called from the FLTK event loop or whenever you call [Fl::wait\(\)](#). The previously scheduled widgets are deleted in the same order they were scheduled by calling [Fl::delete\\_widget\(\)](#).

**See also**

[Fl::delete\\_widget\(Fl\\_Widget \\*wi\)](#)

### 32.9.2.4 `release_widget_pointer()`

```
void Fl::release_widget_pointer (
    Fl_Widget *& w ) [static]
```

Releases a widget pointer from the watch list.

This is used to remove a widget pointer that has been added to the watch list with [Fl::watch\\_widget\\_pointer\(\)](#), when it is not needed anymore.

#### Note

Internal use only, please use class [Fl\\_Widget\\_Tracker](#) instead.

#### See also

[Fl::watch\\_widget\\_pointer\(\)](#)

### 32.9.2.5 `watch_widget_pointer()`

```
void Fl::watch_widget_pointer (
    Fl_Widget *& w ) [static]
```

Adds a widget pointer to the widget watch list.

#### Note

Internal use only, please use class [Fl\\_Widget\\_Tracker](#) instead.

This can be used, if it is possible that a widget might be deleted during a callback or similar function. The widget pointer must be added to the watch list before calling the callback. After the callback the widget pointer can be queried, if it is NULL. If it is NULL, then the widget has been deleted during the callback and must not be accessed anymore. If the widget pointer is *not* NULL, then the widget has not been deleted and can be accessed safely.

After accessing the widget, the widget pointer must be released from the watch list by calling [Fl::release\\_widget\\_pointer\(\)](#).

Example for a button that is clicked (from its [handle\(\)](#) method):

```
Fl_Widget *wp = this;           // save 'this' in a pointer variable
Fl::watch_widget_pointer(wp);    // add the pointer to the watch list
set_changed();                  // set the changed flag
do_callback();                  // call the callback
if (!wp) {                      // the widget has been deleted
    // DO NOT ACCESS THE DELETED WIDGET !
} else {                        // the widget still exists
    clear_changed();            // reset the changed flag
}
Fl::release_widget_pointer(wp);  // remove the pointer from the watch list
```

This works, because all widgets call [Fl::clear\\_widget\\_pointer\(\)](#) in their destructors.

#### See also

[Fl::release\\_widget\\_pointer\(\)](#)

[Fl::clear\\_widget\\_pointer\(\)](#)

An easier and more convenient method to control widget deletion during callbacks is to use the class [Fl\\_Widget\\_Tracker](#) with a local (automatic) variable.

#### See also

class [Fl\\_Widget\\_Tracker](#)

## 32.10 Cairo Support Functions and Classes

### Classes

- class [Fl\\_Cairo\\_State](#)  
*Contains all the necessary info on the current cairo context.*
- class [Fl\\_Cairo\\_Window](#)  
*This defines an FLTK window with Cairo support.*

## Functions

- static bool [Fl::cairo\\_autolink\\_context](#) ()  
*Gets the current autolink mode for Cairo support.*
- static void [Fl::cairo\\_autolink\\_context](#) (bool alink)  
*When FLTK\_HAVE\_CAIRO is defined and [cairo\\_autolink\\_context\(\)](#) is true, any current window dc is linked to a current Cairo context.*
- static cairo\_t \* [Fl::cairo\\_cc](#) ()  
*Gets the current Cairo context linked with a fltk window.*
- static void [Fl::cairo\\_cc](#) (cairo\_t \*c, bool own=false)  
*Sets the current Cairo context to c.*
- static void [Fl::cairo\\_flush](#) (cairo\_t \*c)  
*Flush Cairo drawings on Cairo context c.*
- static cairo\_t \* [Fl::cairo\\_make\\_current](#) (Fl\_Window \*w)  
*Provides a Cairo context for window wi.*

### 32.10.1 Detailed Description

### 32.10.2 Function Documentation

#### 32.10.2.1 [cairo\\_autolink\\_context\(\)](#) [1/2]

```
static bool Fl::cairo_autolink_context ( ) [inline], [static]
```

Gets the current autolink mode for Cairo support.

##### Return values

<i>false</i>	if no Cairo context autolink is made for each window.
<i>true</i>	if any fltk window is attached a Cairo context when it is current.

##### See also

void [cairo\\_autolink\\_context\(bool alink\)](#)

##### Note

Only available if built with CMake option FLTK\_OPTION\_CAIRO\_EXT=ON.

#### 32.10.2.2 [cairo\\_autolink\\_context\(\)](#) [2/2]

```
static void Fl::cairo_autolink_context (
    bool alink ) [inline], [static]
```

When FLTK\_HAVE\_CAIRO is defined and [cairo\\_autolink\\_context\(\)](#) is true, any current window dc is linked to a current Cairo context.

This is not the default, because it may not be necessary to add Cairo support to all fltk supported windows. When you wish to associate a Cairo context in this mode, you need to call explicitly in your draw() overridden method, [Fl::cairo\\_make\\_current\(Fl\\_Window\\*\)](#). This will create a Cairo context only for this Window. Still in custom Cairo application it is possible to handle completely this process automatically by setting `alink` to true. In this last case, you don't need anymore to call [Fl::cairo\\_make\\_current\(\)](#). You can use [Fl::cairo\\_cc\(\)](#) to get the current Cairo context anytime.

##### Note

Only available if built with CMake option FLTK\_OPTION\_CAIRO\_WINDOW=ON.

### 32.10.2.3 `cairo_cc()`

```
static void Fl::cairo_cc (
    cairo_t * c,
    bool own = false ) [inline], [static]
```

Sets the current Cairo context to `c`.

Set `own` to true if you want fltk to handle this cc deletion.

#### Note

Only available if built with CMake option `FLTK_OPTION_CAIRO_WINDOW=ON`.

### 32.10.2.4 `cairo_flush()`

```
static void Fl::cairo_flush (
    cairo_t * c ) [inline], [static]
```

Flush Cairo drawings on Cairo context `c`.

This is **required** on Windows if you use the Cairo context provided by the "Cairo autolink" option. Call this when all your drawings on the Cairo context are finished. This is maybe not necessary on other platforms than Windows but it does no harm if you call it always.

You don't need to use this if you use an [Fl\\_Cairo\\_Window](#) which does this automatically after the draw callback returns.

Code example for "Cairo autolink" mode:

In the overridden `draw()` method of your subclass of [Fl\\_Window](#) or any widget:

```
cairo_t *cc = Fl::cairo_cc(); // get the "autolink" Cairo context
// ... your Cairo drawings are here ...
Fl::cairo_flush(cc); // flush Cairo drawings to the device
```

If you configure FLTK with CMake option `'FLTK_OPTION_CAIRO_WINDOW'` (i.e. without CMake option `'FLTK_OPTION_CAIRO_EXT'`) or if you don't enable the `'autolink'` Cairo context you may do the equivalent to use Cairo drawings in an overridden `draw()` method of derived classes by using

```
// get the Cairo context for the \c window
cairo_t *cc = Fl::cairo_make_current(window);
// ... your Cairo drawings are here ...
Fl::cairo_flush(cc); // flush Cairo drawings to the device
```

#### See also

```
Fl::cairo_autolink_context(bool)
Fl::cairo_make_current(Fl_Window*);
```

### 32.10.2.5 `cairo_make_current()`

```
cairo_t * Fl::cairo_make_current (
    Fl_Window * wi ) [static]
```

Provides a Cairo context for window `wi`.

This is needed in a `draw()` override if [Fl::cairo\\_autolink\\_context\(\)](#) returns false, which is the default. The `cairo_↔context()` does not need to be freed as it is freed every time a new Cairo context is created. When the program terminates, a call to `Fl::cairo_make_current(0)` will destroy any residual context.

#### Note

A new Cairo context is not always re-created when this method is used. In particular, if the current graphical context and the current window didn't change between two calls, the previous gc is internally kept, thus optimizing the drawing performances. Also, after this call, [Fl::cairo\\_cc\(\)](#) is adequately updated with this Cairo context.

Only available when CMake option `'-D FLTK_OPTION_CAIRO_WINDOW'` is set.

#### Returns

The valid `cairo_t *cairo` context associated to this window.

## Return values

NULL	if <i>wi</i> is NULL or maybe with GL windows under Wayland
------	---

## 32.11 Unicode and UTF-8 functions

fl global Unicode and UTF-8 handling functions declared in [<FL/fl\\_utf8.h>](#)

### Macros

- `#define ERRORS_TO_CP1252 1`  
*Set to 1 to turn bad UTF-8 bytes in the 0x80-0x9f range into the Unicode index for Microsoft's CP1252 character set.*
- `#define ERRORS_TO_ISO8859_1 1`  
*Set to 1 to turn bad UTF-8 bytes into ISO-8859-1.*
- `#define NBC 0xFFFF + 1`
- `#define STRICT_RFC3629 0`  
*A number of Unicode code points are in fact illegal and should not be produced by a UTF-8 converter.*

### Functions

- `int fl_access (const char *f, int mode)`  
*Cross-platform function to test a files access() with a UTF-8 encoded name or value.*
- `int fl_chdir (const char *path)`  
*Cross-platform function to change the current working directory, given as a UTF-8 encoded string.*
- `int fl_chmod (const char *f, int mode)`  
*Cross-platform function to set a files mode() with a UTF-8 encoded name or value.*
- `int fl_close_fd (int fd)`  
*Cross-platform function to close a file descriptor.*
- `int fl_execvp (const char *file, char *const *argv)`
- `FILE * fl_fopen (const char *f, const char *mode)`  
*Cross-platform function to open files with a UTF-8 encoded name.*
- `char * fl_getcwd (char *buf, int len)`  
*Cross-platform function to get the current working directory as a UTF-8 encoded value.*
- `char * fl_getenv (const char *v)`  
*Cross-platform function to get environment variables with a UTF-8 encoded name or value.*
- `char fl_make_path (const char *path)`  
*Cross-platform function to recursively create a path in the file system.*
- `void fl_make_path_for_file (const char *path)`  
*Cross-platform function to create a path for the file in the file system.*
- `int fl_mkdir (const char *f, int mode)`  
*Cross-platform function to create a directory with a UTF-8 encoded name.*
- `unsigned int fl_nonspacing (unsigned int ucs)`  
*Returns true if the Unicode character `ucs` is non-spacing.*
- `int fl_open (const char *fname, int oflags,...)`  
*Cross-platform function to open files with a UTF-8 encoded name.*
- `int fl_open_ext (const char *fname, int binary, int oflags,...)`  
*Cross-platform function to open files with a UTF-8 encoded name.*
- `int fl_putenv (const char *var)`  
*Cross-platform function to write environment variables with a UTF-8 encoded name or value.*
- `int fl_rename (const char *f, const char *n)`  
*Cross-platform function to rename a filesystem object using UTF-8 encoded names.*

- `int fl_rmdir (const char *f)`  
*Cross-platform function to remove a directory with a UTF-8 encoded name.*
- `int fl_stat (const char *f, struct stat *b)`  
*Cross-platform function to stat() a file using a UTF-8 encoded name or value.*
- `int fl_system (const char *cmd)`  
*Cross-platform function to run a system command with a UTF-8 encoded string.*
- `int fl_tolower (unsigned int ucs)`  
*Returns the Unicode lower case value of ucs.*
- `int fl_toupper (unsigned int ucs)`  
*Returns the Unicode upper case value of ucs.*
- `unsigned fl_ucs_to_Utf16 (const unsigned ucs, unsigned short *dst, const unsigned dstlen)`  
*Convert a single 32-bit Unicode codepoint into an array of 16-bit characters.*
- `int fl_unlink (const char *fname)`  
*Cross-platform function to unlink() (that is, delete) a file using a UTF-8 encoded filename.*
- `char * fl_utf2mbcs (const char *s)`  
*Converts UTF-8 string s to a local multi-byte character string.*
- `const char * fl_utf8back (const char *p, const char *start, const char *end)`  
*Move p backward until it points to the start of a UTF-8 character.*
- `int fl_utf8bytes (unsigned ucs)`  
*Return the number of bytes needed to encode the given UCS4 character in UTF-8.*
- `unsigned fl_utf8decode (const char *p, const char *end, int *len)`  
*Decode a single UTF-8 encoded character starting at p.*
- `int fl_utf8encode (unsigned ucs, char *buf)`  
*Write the UTF-8 encoding of ucs into buf and return the number of bytes written.*
- `unsigned fl_utf8from_mb (char *dst, unsigned dstlen, const char *src, unsigned srclen)`  
*Convert a filename from the locale-specific multibyte encoding used by Windows to UTF-8 as used by FLTK.*
- `unsigned fl_utf8froma (char *dst, unsigned dstlen, const char *src, unsigned srclen)`  
*Convert an ISO-8859-1 (ie normal c-string) byte stream to UTF-8.*
- `unsigned fl_utf8fromwc (char *dst, unsigned dstlen, const wchar_t *src, unsigned srclen)`  
*Turn "wide characters" as returned by some system calls (especially on Windows) into UTF-8.*
- `const char * fl_utf8fwd (const char *p, const char *start, const char *end)`  
*Move p forward until it points to the start of a UTF-8 character.*
- `int fl_utf8len (char c)`  
*Returns the byte length of the UTF-8 sequence with first byte c, or -1 if c is not valid.*
- `int fl_utf8len1 (char c)`  
*Returns the byte length of the UTF-8 sequence with first byte c, or 1 if c is not valid.*
- `int fl_utf8locale ()`  
*Return true if the "locale" seems to indicate that UTF-8 encoding is used.*
- `int fl_utf8strlen (const char *text, int len)`  
*Return the length in bytes of a UTF-8 string.*
- `int fl_utf8test (const char *src, unsigned srclen)`  
*Examines the first srclen bytes in src and returns a verdict on whether it is UTF-8 or not.*
- `unsigned fl_utf8to_mb (const char *src, unsigned srclen, char *dst, unsigned dstlen)`  
*Convert the UTF-8 used by FLTK to the locale-specific encoding used for filenames (and sometimes used for data in files).*
- `unsigned fl_utf8toa (const char *src, unsigned srclen, char *dst, unsigned dstlen)`  
*Convert a UTF-8 sequence into an array of 1-byte characters.*
- `unsigned fl_utf8toUtf16 (const char *src, unsigned srclen, unsigned short *dst, unsigned dstlen)`  
*Convert a UTF-8 sequence into an array of 16-bit characters.*
- `unsigned fl_utf8towc (const char *src, unsigned srclen, wchar_t *dst, unsigned dstlen)`  
*Converts a UTF-8 string into a wide character string.*

- `int fl_utf_nb_char` (const unsigned char \*buf, int len)  
*Returns the number of Unicode chars in the UTF-8 string.*
- `int fl_utf_strcasecmp` (const char \*s1, const char \*s2)  
*UTF-8 aware strcasecmp - converts to Unicode and tests.*
- `int fl_utf_strncasecmp` (const char \*s1, const char \*s2, int n)  
*UTF-8 aware strncasecmp - converts to lower case Unicode and tests.*
- `int fl_utf_tolower` (const unsigned char \*str, int len, char \*buf)  
*Converts the string str to its lower case equivalent into buf.*
- `int fl_utf_toupper` (const unsigned char \*str, int len, char \*buf)  
*Converts the string str to its upper case equivalent into buf.*
- `int fl_wcwidth` (const char \*src)  
*extended wrapper around fl\_wcwidth\_(unsigned int ucs) function.*
- `int fl_wcwidth_` (unsigned int ucs)  
*Wrapper to adapt Markus Kuhn's implementation of wcwidth() for FLTK.*

### 32.11.1 Detailed Description

fl global Unicode and UTF-8 handling functions declared in `<FL/fl_utf8.h>`

### 32.11.2 Macro Definition Documentation

#### 32.11.2.1 ERRORS\_TO\_CP1252

```
#define ERRORS_TO_CP1252 1
```

Set to 1 to turn bad UTF-8 bytes in the 0x80-0x9f range into the Unicode index for Microsoft's CP1252 character set.

You should also set `ERRORS_TO_ISO8859_1`. With this a huge amount of more available text (such as all web pages) are correctly converted to Unicode.

#### 32.11.2.2 ERRORS\_TO\_ISO8859\_1

```
#define ERRORS_TO_ISO8859_1 1
```

Set to 1 to turn bad UTF-8 bytes into ISO-8859-1.

If this is zero they are instead turned into the Unicode REPLACEMENT CHARACTER, of value 0xfffd. If this is on `fl_utf8decode()` will correctly map most (perhaps all) human-readable text that is in ISO-8859-1. This may allow you to completely ignore character sets in your code because virtually everything is either ISO-8859-1 or UTF-8.

#### 32.11.2.3 STRICT\_RFC3629

```
#define STRICT_RFC3629 0
```

A number of Unicode code points are in fact illegal and should not be produced by a UTF-8 converter.

Turn this on will replace the bytes in those encodings with errors. If you do this then converting arbitrary 16-bit data to UTF-8 and then back is not an identity, which will probably break a lot of software.

### 32.11.3 Function Documentation

#### 32.11.3.1 fl\_access()

```
int fl_access (
    const char * f,
    int mode )
```

Cross-platform function to test a files access() with a UTF-8 encoded name or value.

This function is especially useful on the Windows platform where the standard `access()` function fails with UTF-8 encoded non-ASCII filenames.

Windows defines the mode values 0 for existence, 2 for writable, 4 for readable, and 6 of readable and writable. On other systems, the modes `X_OK`, `W_OK`, and `R_OK` are usually defined as 1, 2, and 4.

Upon successful completion, the value 0 is returned on all platforms.

#### Parameters

in	<i>f</i>	the UTF-8 encoded filename
in	<i>mode</i>	the mode to test

#### Returns

the return value of `_waccess()` on Windows or `access()` on other platforms.

### 32.11.3.2 fl\_chdir()

```
int fl_chdir (
    const char * path )
```

Cross-platform function to change the current working directory, given as a UTF-8 encoded string.

This function is especially useful on the Windows platform where the standard `_wchdir()` function needs a `path` in UTF-16 encoding.

The `path` is converted to a system specific encoding if necessary and the system specific `chdir(converted↵_path)` function is called.

The function returns 0 on success and -1 on error. Depending on the platform, `errno` **may** be set if an error occurs.

#### Note

The possible `errno` values are platform specific. Refer to the documentation of the platform specific `chdir()` function.

If the function is not implemented on a particular platform the default implementation returns -1 and `errno` is **not** set.

If the `path` is `NULL` the function returns -1, but `errno` is **not** changed. This is a convenience feature of `fl_chdir()` as opposed to `chdir()`.

#### Parameters

in	<i>path</i>	the target directory for <code>chdir</code> (may be <code>NULL</code> )
----	-------------	---

#### Returns

0 if successful, -1 on error (`errno` may be set)

### 32.11.3.3 fl\_chmod()

```
int fl_chmod (
    const char * f,
    int mode )
```

Cross-platform function to set a files `mode()` with a UTF-8 encoded name or value.

This function is especially useful on the Windows platform where the standard `chmod()` function fails with UTF-8 encoded non-ASCII filenames.

#### Parameters

in	<i>f</i>	the UTF-8 encoded filename
in	<i>mode</i>	the mode to set

**Returns**

the return value of `_wchmod()` on Windows or `chmod()` on other platforms.

**32.11.3.4 `fl_close_fd()`**

```
int fl_close_fd (
    int fd )
```

Cross-platform function to close a file descriptor.

**Returns**

0 in case of success, or -1 in case of error.

**32.11.3.5 `fl_fopen()`**

```
FILE * fl_fopen (
    const char * f,
    const char * mode )
```

Cross-platform function to open files with a UTF-8 encoded name.

This function is especially useful on the Windows platform where the standard `fopen()` function fails with UTF-8 encoded non-ASCII filenames.

**Parameters**

<i>f</i>	the UTF-8 encoded filename
<i>mode</i>	same as the second argument of the standard <code>fopen()</code> function

**Returns**

a FILE pointer upon successful completion, or NULL in case of error.

**See also**

[fl\\_open\(\)](#).

**32.11.3.6 `fl_getcwd()`**

```
char * fl_getcwd (
    char * buf,
    int len )
```

Cross-platform function to get the current working directory as a UTF-8 encoded value.

This function is especially useful on the Windows platform where the standard `_wgetcwd()` function returns UTF-16 encoded non-ASCII filenames.

If `buf` is NULL a buffer of size `(len+1)` is allocated, filled with the current working directory, and returned. In this case the buffer must be released by the caller with `free()` to prevent memory leaks.

**Parameters**

in	<i>buf</i>	the buffer to populate (may be NULL)
in	<i>len</i>	the length of the buffer

**Returns**

the CWD encoded as UTF-8

**32.11.3.7 fl\_getenv()**

```
char * fl_getenv (
    const char * v )
```

Cross-platform function to get environment variables with a UTF-8 encoded name or value.

This function is especially useful on the Windows platform where non-ASCII environment variables are encoded as wide characters. The returned value of the variable is encoded in UTF-8 as well.

On platforms other than Windows this function calls getenv directly. The return value is returned as-is.

The return value is a pointer to an implementation defined buffer:

- an internal buffer that is (re)allocated as needed (Windows) or
- the string in the environment itself (Unix, Linux, MacOS) or
- any other implementation (other platforms). This string must be considered read-only and must not be freed by the caller.

If the resultant string is to be used later it must be copied to a safe place. The next call to [fl\\_getenv\(\)](#) or any other environment changes may overwrite the string.

**Note**

This function is not thread-safe.

**Parameters**

in	<i>v</i>	the UTF-8 encoded environment variable
----	----------	--

**Returns**

the environment variable in UTF-8 encoding, or NULL in case of error.

**32.11.3.8 fl\_make\_path()**

```
char fl_make_path (
    const char * path )
```

Cross-platform function to recursively create a path in the file system.

This function creates a *path* in the file system by recursively creating all directories.

**Parameters**

in	<i>path</i>	a Unix style ('/' forward slashes) absolute or relative pathname
----	-------------	--

**Returns**

1 if the path was created, 0 if creating the path failed at some point

**32.11.3.9 fl\_make\_path\_for\_file()**

```
void fl_make_path_for_file (
    const char * path )
```

Cross-platform function to create a path for the file in the file system.

This function strips the filename from the given `path` and creates a path in the file system by recursively creating all directories.

### 32.11.3.10 `fl_mkdir()`

```
int fl_mkdir (
    const char * f,
    int mode )
```

Cross-platform function to create a directory with a UTF-8 encoded name.

This function is especially useful on the Windows platform where the standard `_wmkdir()` function expects UTF-16 encoded non-ASCII filenames.

#### Parameters

in	<i>f</i>	the UTF-8 encoded filename
in	<i>mode</i>	the mode of the directory

#### Returns

the return value of `_wmkdir()` on Windows or `mkdir()` on other platforms.

### 32.11.3.11 `fl_nonspacing()`

```
unsigned int fl_nonspacing (
    unsigned int ucs )
```

Returns true if the Unicode character `ucs` is non-spacing.

Non-spacing characters in Unicode are typically combining marks like tilde (~), diaeresis (¨), or other marks that are added to a base character, for instance 'a' (base character) + '¨' (combining mark) = 'ä' (German Umlaut).

- [http://unicode.org/glossary/#base\\_character](http://unicode.org/glossary/#base_character)
- [http://unicode.org/glossary/#nonspacing\\_mark](http://unicode.org/glossary/#nonspacing_mark)
- [http://unicode.org/glossary/#combining\\_character](http://unicode.org/glossary/#combining_character)

### 32.11.3.12 `fl_open()`

```
int fl_open (
    const char * fname,
    int oflags,
    ... )
```

Cross-platform function to open files with a UTF-8 encoded name.

This function is especially useful on the Windows platform where the standard `open()` function fails with UTF-8 encoded non-ASCII filenames.

#### Parameters

in	<i>fname</i>	the UTF-8 encoded filename
in	<i>oflags</i>	other arguments are as in the standard <code>open()</code> function

#### Returns

a file descriptor upon successful completion, or -1 in case of error.

See also

[fl\\_fopen\(\)](#), [fl\\_open\\_ext\(\)](#), [fl\\_close\\_fd\(int fd\)](#).

### 32.11.3.13 fl\_open\_ext()

```
int fl_open_ext (
    const char * fname,
    int binary,
    int oflags,
    ... )
```

Cross-platform function to open files with a UTF-8 encoded name.

In comparison with [fl\\_open\(\)](#), this function allows to control whether the file is opened in binary (a.k.a. untranslated) mode. This is especially useful on the Windows platform where files are by default opened in text (translated) mode.

#### Parameters

in	<i>fname</i>	the UTF-8 encoded filename
in	<i>binary</i>	if non-zero, the file is to be accessed in binary (a.k.a. untranslated) mode.
in	<i>oflags</i> ,...	these arguments are as in the standard <code>open()</code> function. Setting <code>oflags</code> to zero opens the file for reading.

#### Returns

a file descriptor upon successful completion, or -1 in case of error.

### 32.11.3.14 fl\_putenv()

```
int fl_putenv (
    const char * var )
```

Cross-platform function to write environment variables with a UTF-8 encoded name or value.

This function is especially useful on the Windows platform where non-ASCII environment variables are encoded as wide characters.

The given argument `var` must be encoded in UTF-8 in the form "name=value". The 'name' part must conform to platform dependent restrictions on environment variable names.

The string given in `var` is copied and optionally converted to the required encoding for the platform. On platforms other than Windows this function calls `putenv` directly.

The return value is zero on success and non-zero in case of error. The value in case of error is platform specific and returned as-is.

#### Note

The copied string is allocated on the heap and "lost" on some platforms, i.e. calling [fl\\_putenv\(\)](#) to change environment variables frequently may cause memory leaks. There may be an option to avoid this in a future implementation.

This function is not thread-safe.

#### Parameters

in	<i>var</i>	the UTF-8 encoded environment variable 'name=value'
----	------------	---

#### Returns

0 on success, non-zero in case of error.

**32.11.3.15 fl\_rename()**

```
int fl_rename (
    const char * f,
    const char * n )
```

Cross-platform function to rename a filesystem object using UTF-8 encoded names.

This function is especially useful on the Windows platform where the standard `_wrename()` function expects UTF-16 encoded non-ASCII filenames.

**Parameters**

in	<i>f</i>	the UTF-8 encoded filename to change
in	<i>n</i>	the new UTF-8 encoded filename to set

**Returns**

the return value of `_wrename()` on Windows or `rename()` on other platforms.

**32.11.3.16 fl\_rmdir()**

```
int fl_rmdir (
    const char * f )
```

Cross-platform function to remove a directory with a UTF-8 encoded name.

This function is especially useful on the Windows platform where the standard `_wrmdir()` function expects UTF-16 encoded non-ASCII filenames.

**Parameters**

in	<i>f</i>	the UTF-8 encoded filename to remove
----	----------	--------------------------------------

**Returns**

the return value of `_wrmdir()` on Windows or `rmdir()` on other platforms.

**32.11.3.17 fl\_stat()**

```
int fl_stat (
    const char * f,
    struct stat * b )
```

Cross-platform function to `stat()` a file using a UTF-8 encoded name or value.

This function is especially useful on the Windows platform where the standard `stat()` function fails with UTF-8 encoded non-ASCII filenames.

**Parameters**

in	<i>f</i>	the UTF-8 encoded filename
	<i>b</i>	the stat struct to populate

**Returns**

the return value of `_wstat()` on Windows or `stat()` on other platforms.

**32.11.3.18 fl\_system()**

```
int fl_system (
    const char * cmd )
```

Cross-platform function to run a system command with a UTF-8 encoded string.

This function is especially useful on the Windows platform where non-ASCII program (file) names must be encoded as wide characters.

On platforms other than Windows this function calls `system()` directly.

**Parameters**

<i>in</i>	<i>cmd</i>	the UTF-8 encoded command string
-----------	------------	----------------------------------

**Returns**

the return value of `_wsystem()` on Windows or `system()` on other platforms.

**32.11.3.19 fl\_ucs\_to\_Utf16()**

```
unsigned fl_ucs_to_Utf16 (
    const unsigned ucs,
    unsigned short * dst,
    const unsigned dstlen )
```

Convert a single 32-bit Unicode codepoint into an array of 16-bit characters.

These are used by some system calls, especially on Windows.

`ucs` is the value to convert.

`dst` points at an array to write, and `dstlen` is the number of locations in this array. At most `dstlen` words will be written, and a 0 terminating word will be added if `dstlen` is large enough. Thus this function will never overwrite the buffer and will attempt return a zero-terminated string if space permits. If `dstlen` is zero then `dst` can be set to NULL and no data is written, but the length is returned.

The return value is the number of 16-bit words that *would* be written to `dst` if it is large enough, not counting any terminating zero.

If the return value is greater than `dstlen` it indicates truncation, you should then allocate a new array of size `return+1` and call this again.

Unicode characters in the range 0x10000 to 0x10ffff are converted to "surrogate pairs" which take two words each (in UTF-16 encoding). Typically, setting `dstlen` to 2 will ensure that any valid Unicode value can be converted, and setting `dstlen` to 3 or more will allow a NULL terminated sequence to be returned.

**32.11.3.20 fl\_unlink()**

```
int fl_unlink (
    const char * fname )
```

Cross-platform function to `unlink()` (that is, delete) a file using a UTF-8 encoded filename.

This function is especially useful on the Windows platform where the standard function expects UTF-16 encoded non-ASCII filenames.

**Parameters**

<i>fname</i>	the filename to unlink
--------------	------------------------

**Returns**

the return value of `_wunlink()` on Windows or `unlink()` on other platforms.

**32.11.3.21 fl\_utf8back()**

```
const char * fl_utf8back (
    const char * p,
    const char * start,
    const char * end )
```

Move `p` backward until it points to the start of a UTF-8 character.

If it already points at the start of one then it is returned unchanged. Any UTF-8 errors are treated as though each byte of the error is an individual character.

`start` is the start of the string and is used to limit the backwards search for the start of a UTF-8 character.

`end` is the end of the string and is assumed to be a break between characters. It is assumed to be greater than `p`.

If you wish to decrement a UTF-8 pointer, pass `p-1` to this.

**32.11.3.22 fl\_utf8bytes()**

```
int fl_utf8bytes (
    unsigned ucs )
```

Return the number of bytes needed to encode the given UCS4 character in UTF-8.

Returns number of bytes that `utf8encode()` will use to encode the character `ucs`.

**Parameters**

in	<code>ucs</code>	UCS4 encoded character
----	------------------	------------------------

**Returns**

number of bytes required

**32.11.3.23 fl\_utf8decode()**

```
unsigned fl_utf8decode (
    const char * p,
    const char * end,
    int * len )
```

Decode a single UTF-8 encoded character starting at `p`.

The resulting Unicode value (in the range 0-0x10ffff) is returned, and `len` is set to the number of bytes in the UTF-8 encoding (adding `len` to `p` will point at the next character).

If `p` points at an illegal UTF-8 encoding, including one that would go past `end`, or where a code uses more bytes than necessary, then `*(unsigned char*)p` is translated as though it is in the Microsoft CP1252 character set and `len` is set to 1. Treating errors this way allows this to decode almost any ISO-8859-1 or CP1252 text that has been mistakenly placed where UTF-8 is expected, and has proven very useful.

If you want errors to be converted to error characters (as the standards recommend), adding a test to see if the length is unexpectedly 1 will work:

```
if (*p & 0x80) { // what should be a multibyte encoding
    code = fl_utf8decode(p,end,&len);
    if (len<2) code = 0xFFFD; // Turn errors into REPLACEMENT CHARACTER
} else { // handle the 1-byte UTF-8 encoding:
    code = *p;
    len = 1;
}
```

Direct testing for the 1-byte case (as shown above) will also speed up the scanning of strings where the majority of characters are ASCII.

**32.11.3.24 fl\_utf8encode()**

```
int fl_utf8encode (
    unsigned ucs,
    char * buf )
```

Write the UTF-8 encoding of *ucs* into *buf* and return the number of bytes written.

Up to 4 bytes may be written. If you know that *ucs* is less than 0x10000 then at most 3 bytes will be written. If you wish to speed this up, remember that anything less than 0x80 is written as a single byte.

If *ucs* is greater than 0x10ffff this is an illegal character according to RFC 3629. These are converted as though they are 0xFFFF (REPLACEMENT CHARACTER).

RFC 3629 also says many other values for *ucs* are illegal (in the range 0xd800 to 0xdfff, or ending with 0xfffe or 0xffff). However I encode these as though they are legal, so that *utf8encode/fl\_utf8decode* will be the identity for all codes between 0 and 0x10ffff.

**32.11.3.25 fl\_utf8from\_mb()**

```
unsigned fl_utf8from_mb (
    char * dst,
    unsigned dstlen,
    const char * src,
    unsigned srclen )
```

Convert a filename from the locale-specific multibyte encoding used by Windows to UTF-8 as used by FLTK.

Up to *dstlen* bytes are written to *dst*, including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to *dstlen* then if you malloc a new array of size *n*+1 you will have the space needed for the entire string. If *dstlen* is zero then nothing is written and this call just measures the storage space needed.

On Unix or on Windows when a UTF-8 locale is in effect, this does not change the data. You may also want to check if *fl\_utf8test()* returns non-zero, so that the filesystem can store filenames in UTF-8 encoding regardless of the locale.

**32.11.3.26 fl\_utf8froma()**

```
unsigned fl_utf8froma (
    char * dst,
    unsigned dstlen,
    const char * src,
    unsigned srclen )
```

Convert an ISO-8859-1 (ie normal c-string) byte stream to UTF-8.

It is possible this should convert Microsoft's CP1252 to UTF-8 instead. This would translate the codes in the range 0x80-0x9f to different characters. Currently it does not do this.

Up to *dstlen* bytes are written to *dst*, including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to *dstlen* then if you malloc a new array of size *n*+1 you will have the space needed for the entire string. If *dstlen* is zero then nothing is written and this call just measures the storage space needed.

*srclen* is the number of bytes in *src* to convert.

If the return value equals *srclen* then this indicates that no conversion is necessary, as only ASCII characters are in the string.

**32.11.3.27 fl\_utf8fromwc()**

```
unsigned fl_utf8fromwc (
    char * dst,
    unsigned dstlen,
    const wchar_t * src,
    unsigned srclen )
```

Turn "wide characters" as returned by some system calls (especially on Windows) into UTF-8.

Up to *dstlen* bytes are written to *dst*, including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to *dstlen* then if you malloc a new array of

size `n+1` you will have the space needed for the entire string. If `dstlen` is zero then nothing is written and this call just measures the storage space needed.

`srcLen` is the number of words in `src` to convert. On Windows this is not necessarily the number of characters, due to there possibly being "surrogate pairs" in the UTF-16 encoding used. On Unix `wchar_t` is 32 bits and each location is a character.

On Unix if a `src` word is greater than 0x10ffff then this is an illegal character according to RFC 3629. These are converted as though they are 0xFFFFD (REPLACEMENT CHARACTER). Characters in the range 0xd800 to 0xdfff, or ending with 0xfffe or 0xffff are also illegal according to RFC 3629. However I encode these as though they are legal, so that `fl_utf8towc` will return the original data.

On Windows "surrogate pairs" are converted to a single character and UTF-8 encoded (as 4 bytes). Mismatched halves of surrogate pairs are converted as though they are individual characters.

### 32.11.3.28 fl\_utf8fwd()

```
const char * fl_utf8fwd (
    const char * p,
    const char * start,
    const char * end )
```

Move `p` forward until it points to the start of a UTF-8 character.

If it already points at the start of one then it is returned unchanged. Any UTF-8 errors are treated as though each byte of the error is an individual character.

`start` is the start of the string and is used to limit the backwards search for the start of a UTF-8 character.

`end` is the end of the string and is assumed to be a break between characters. It is assumed to be greater than `p`.

This function is for moving a pointer that was jumped to the middle of a string, such as when doing a binary search for a position. You should use either this or [fl\\_utf8back\(\)](#) depending on which direction your algorithm can handle the pointer moving. Do not use this to scan strings, use [fl\\_utf8decode\(\)](#) instead.

### 32.11.3.29 fl\_utf8len()

```
int fl_utf8len (
    char c )
```

Returns the byte length of the UTF-8 sequence with first byte `c`, or -1 if `c` is not valid.

This function is helpful for finding faulty UTF-8 sequences.

See also

[fl\\_utf8len1](#)

### 32.11.3.30 fl\_utf8len1()

```
int fl_utf8len1 (
    char c )
```

Returns the byte length of the UTF-8 sequence with first byte `c`, or 1 if `c` is not valid.

This function can be used to scan faulty UTF-8 sequences, albeit ignoring invalid codes.

See also

[fl\\_utf8len](#)

### 32.11.3.31 fl\_utf8locale()

```
int fl_utf8locale (
    void )
```

Return true if the "locale" seems to indicate that UTF-8 encoding is used.

If true the `fl_utf8to_mb` and `fl_utf8from_mb` don't do anything useful.

*It is highly recommended that you change your system so this does return true.* On Windows this is done by setting the "codepage" to CP\_UTF8. On Unix this is done by setting `$LC_CTYPE` to a string containing the letters "utf" or "UTF" in it, or by deleting all `$LC*` and `$LANG` environment variables. In the future it is likely that all non-Asian Unix systems will return true, due to the compatibility of UTF-8 with ISO-8859-1.

**32.11.3.32 fl\_utf8strlen()**

```
int fl_utf8strlen (
    const char * text,
    int len )
```

Return the length in bytes of a UTF-8 string.

**Parameters**

in	<i>text</i>	encoded in UTF-8
in	<i>len</i>	number of Unicode characters, -1 to test until the end of text

**Returns**

number of bytes that make up the Unicode string

**See also**

[fl\\_utf\\_nb\\_char\(const unsigned char \\*buf, int len\)](#)

**32.11.3.33 fl\_utf8test()**

```
int fl_utf8test (
    const char * src,
    unsigned srclen )
```

Examines the first *srclen* bytes in *src* and returns a verdict on whether it is UTF-8 or not.

- Returns 0 if there is any illegal UTF-8 sequences, using the same rules as [fl\\_utf8decode\(\)](#). Note that some UCS values considered illegal by RFC 3629, such as 0xffff, are considered legal by this.
- Returns 1 if there are only single-byte characters (ie no bytes have the high bit set). This is legal UTF-8, but also indicates plain ASCII. It also returns 1 if *srclen* is zero.
- Returns 2 if there are only characters less than 0x800.
- Returns 3 if there are only characters less than 0x10000.
- Returns 4 if there are characters in the 0x10000 to 0x10ffff range.

Because there are many illegal sequences in UTF-8, it is almost impossible for a string in another encoding to be confused with UTF-8. This is very useful for transitioning Unix to UTF-8 filenames, you can simply test each filename with this to decide if it is UTF-8 or in the locale encoding. My hope is that if this is done we will be able to cleanly transition to a locale-less encoding.

**32.11.3.34 fl\_utf8to\_mb()**

```
unsigned fl_utf8to_mb (
    const char * src,
    unsigned srclen,
    char * dst,
    unsigned dstlen )
```

Convert the UTF-8 used by FLTK to the locale-specific encoding used for filenames (and sometimes used for data in files).

Unfortunately due to stupid design you will have to do this as needed for filenames. This is a bug on both Unix and Windows.

Up to *dstlen* bytes are written to *dst*, including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to *dstlen* then if you malloc a new array of size *n*+1 you will have the space needed for the entire string. If *dstlen* is zero then nothing is written and this call just measures the storage space needed.

If [fl\\_utf8locale\(\)](#) returns true then this does not change the data.

**32.11.3.35 fl\_utf8toa()**

```
unsigned fl_utf8toa (
    const char * src,
    unsigned srclen,
    char * dst,
    unsigned dstlen )
```

Convert a UTF-8 sequence into an array of 1-byte characters.

If the UTF-8 decodes to a character greater than 0xff then it is replaced with '?'.  
 Errors in the UTF-8 sequence are converted as individual bytes, same as `fl_utf8decode()` does. This allows ISO-8859-1 text mistakenly identified as UTF-8 to be printed correctly (and possibly CP1252 on Windows).

`src` points at the UTF-8 sequence, and `srclen` is the number of bytes to convert.

`dst` points at the UTF-8 sequence, and `srclen` is the number of bytes to convert.

Up to `dstlen` bytes are written to `dst`, including a null terminator. The return value is the number of bytes that would be written, not counting the null terminator. If greater or equal to `dstlen` then if you malloc a new array of size `n+1` you will have the space needed for the entire string. If `dstlen` is zero then nothing is written and this call just measures the storage space needed.

**32.11.3.36 fl\_utf8toUtf16()**

```
unsigned fl_utf8toUtf16 (
    const char * src,
    unsigned srclen,
    unsigned short * dst,
    unsigned dstlen )
```

Convert a UTF-8 sequence into an array of 16-bit characters.

These are used by some system calls, especially on Windows.

`src` points at the UTF-8, and `srclen` is the number of bytes to convert.

`dst` points at an array to write, and `dstlen` is the number of locations in this array. At most `dstlen-1` words will be written there, plus a 0 terminating word. Thus this function will never overwrite the buffer and will always return a zero-terminated string. If `dstlen` is zero then `dst` can be null and no data is written, but the length is returned. The return value is the number of 16-bit words that *would* be written to `dst` if it were long enough, not counting the terminating zero. If the return value is greater or equal to `dstlen` it indicates truncation, you can then allocate a new array of size `return+1` and call this again.

Errors in the UTF-8 are converted as though each byte in the erroneous string is in the Microsoft CP1252 encoding. This allows ISO-8859-1 text mistakenly identified as UTF-8 to be printed correctly.

Unicode characters in the range 0x10000 to 0x10ffff are converted to "surrogate pairs" which take two words each (this is called UTF-16 encoding).

**32.11.3.37 fl\_utf8towc()**

```
unsigned fl_utf8towc (
    const char * src,
    unsigned srclen,
    wchar_t * dst,
    unsigned dstlen )
```

Converts a UTF-8 string into a wide character string.

This function generates 32-bit `wchar_t` (e.g. "ucs4" as it were) except on Windows where it is equivalent to `fl_utf8toUtf16` and returns UTF-16.

`src` points at the UTF-8, and `srclen` is the number of bytes to convert.

`dst` points at an array to write, and `dstlen` is the number of locations in this array. At most `dstlen-1` `wchar_t` will be written there, plus a 0 terminating `wchar_t`.

The return value is the number of `wchar_t` that *would* be written to `dst` if it were long enough, not counting the terminating zero. If the return value is greater or equal to `dstlen` it indicates truncation, you can then allocate a new array of size `return+1` and call this again.

Notice that `sizeof(wchar_t)` is 2 on Windows and is 4 on Linux and most other systems. Where `wchar_t` is 16 bits, Unicode characters in the range 0x10000 to 0x10ffff are converted to "surrogate pairs" which take two words each (this is called UTF-16 encoding). If `wchar_t` is 32 bits this rather nasty problem is avoided.

Note that Windows includes Cygwin, i.e. compiled with Cygwin's POSIX layer (cygwin1.dll, `-enable-cygwin`), either native (GDI) or X11.

**32.11.3.38 fl\_utf\_nb\_char()**

```
int fl_utf_nb_char (
    const unsigned char * buf,
    int len )
```

Returns the number of Unicode chars in the UTF-8 string.

See also

[fl\\_utf8strlen\(const char \\*text, int len\)](#)

**32.11.3.39 fl\_utf\_strcasecmp()**

```
int fl_utf_strcasecmp (
    const char * s1,
    const char * s2 )
```

UTF-8 aware strcasecmp - converts to Unicode and tests.

Returns

result of comparison

Return values

0	if the strings are equal
1	if s1 is greater than s2
-1	if s1 is less than s2

**32.11.3.40 fl\_utf\_strncasecmp()**

```
int fl_utf_strncasecmp (
    const char * s1,
    const char * s2,
    int n )
```

UTF-8 aware strncasecmp - converts to lower case Unicode and tests.

Parameters

s1,s2	the UTF-8 strings to compare
n	the maximum number of UTF-8 characters to compare

Returns

result of comparison

Return values

0	if the strings are equal
>0	if s1 is greater than s2
<0	if s1 is less than s2

**32.11.3.41 fl\_utf\_tolower()**

```
int fl_utf_tolower (
    const unsigned char * str,
    int len,
    char * buf )
```

Converts the string *str* to its lower case equivalent into *buf*.

Warning: to be safe *buf* length must be at least 3 \* *len* [for 16-bit Unicode]

**32.11.3.42 fl\_utf\_toupper()**

```
int fl_utf_toupper (
    const unsigned char * str,
    int len,
    char * buf )
```

Converts the string *str* to its upper case equivalent into *buf*.

Warning: to be safe *buf* length must be at least 3 \* *len* [for 16-bit Unicode]

**32.11.3.43 fl\_wcwidth()**

```
int fl_wcwidth (
    const char * src )
```

extended wrapper around [fl\\_wcwidth\\_\(unsigned int ucs\)](#) function.

**Parameters**

in	<i>src</i>	pointer to start of UTF-8 byte sequence
----	------------	---

**Returns**

width of character in columns

Depending on build options, this function may map C1 control characters (0x80 to 0x9f) to CP1252, and return the width of that character instead. This is not the same behaviour as [fl\\_wcwidth\\_\(unsigned int ucs\)](#) .

Note that other control characters and DEL will still return -1, so if you want different behaviour, you need to test for those characters before calling [fl\\_wcwidth\(\)](#), and handle them separately.

**32.11.3.44 fl\_wcwidth\_()**

```
int fl_wcwidth_ (
    unsigned int ucs )
```

Wrapper to adapt Markus Kuhn's implementation of `wcwidth()` for FLTK.

**Parameters**

in	<i>ucs</i>	Unicode character value
----	------------	-------------------------

**Returns**

width of character in columns

See <http://www.cl.cam.ac.uk/~mgk25/ucs/wcwidth.c> for Markus Kuhn's original implementation of `wcwidth()` and `wcswidth()` (defined in IEEE Std 1002.1-2001) for Unicode.

**WARNING:** this function returns widths for "raw" Unicode characters. It does not even try to map C1 control characters (0x80 to 0x9F) to CP1252, and C0/C1 control characters and DEL will return -1. You are advised to use `fl_width(const char* src)` instead.

## 32.12 String handling functions

String handling functions declared in `<FL/fl_string_functions.h>`

### Functions

- `char * fl_strdup (const char *s)`  
*Cross platform interface to POSIX function `strdup()`.*
- `size_t fl_strlcpy (char *, const char *, size_t)`

#### 32.12.1 Detailed Description

String handling functions declared in `<FL/fl_string_functions.h>`

#### 32.12.2 Function Documentation

##### 32.12.2.1 fl\_strdup()

```
char * fl_strdup (
    const char * s )
```

Cross platform interface to POSIX function `strdup()`.

The `fl_strdup()` function returns a pointer to a new string which is a duplicate of the string 's'. Memory for the new string is obtained with `malloc(3)`, and can be freed with `free(3)`.

Implementation:

- POSIX: `strdup()`
- WinAPI: `_strdup()`

## 32.13 Mac OS X-specific symbols

Mac OS X-specific symbols declared in `<FL/platform.H>`

### Classes

- class `FL_Mac_App_Menu`

### Functions

- `FL_Window * fl_mac_find (FL_Window *)`  
*Returns the `FL_Window` corresponding to the given macOS-specific window reference.*
- `CGContextRef fl_mac_gc ()`  
*Returns the macOS-specific graphics context for the current window.*
- `void fl_mac_set_about (FL_Callback *cb, void *user_data, int shortcut=0)`  
*Attaches a callback to the "About myprog" item of the system application menu.*

- `FLWindow * fl_mac_xid (const FL\_Window *win)`  
*Returns the macOS-specific window reference corresponding to the given [FL\\_Window](#) object.*
- `void fl_open_callback (void(*cb)(const char *))`  
*Register a function called for each file dropped onto an application icon.*

## Variables

- `int fl_mac_os_version`  
*The version number of the running Mac OS X (e.g., 100604 for 10.6.4, 101300 for 10.13, 140102 for 14.1.2).*

### 32.13.1 Detailed Description

Mac OS X-specific symbols declared in `<FL/platform.H>`

See also

[The Apple OS X Interface](#)

### 32.13.2 Function Documentation

#### 32.13.2.1 fl\_mac\_set\_about()

```
void fl_mac_set_about (
    FL\_Callback * cb,
    void * user_data,
    int shortcut = 0 )
```

Attaches a callback to the "About myprog" item of the system application menu.

For back-compatibility. Equivalent to `FL\_Sys\_Menu\_Bar::about\(FL\_Callback \*cb, void \*user\_data\)`.

#### 32.13.2.2 fl\_open\_callback()

```
void fl_open_callback (
    void(*) (const char *) cb )
```

Register a function called for each file dropped onto an application icon.

This function is effective only on the Mac OS X platform. `cb` will be called with a single Unix-style file name and path. If multiple files were dropped, `cb` will be called multiple times.

This function should be called before `fl\_open\_display\(\)` is called, either directly or indirectly (this happens at the first `show()` of a window), to be effective for files dropped on the application icon at launch time. It can also be called at any point to change the function used to open dropped files. A call with a NULL argument, after a previous call, makes the app ignore files dropped later.

### 32.13.3 Variable Documentation

#### 32.13.3.1 fl\_mac\_os\_version

```
int fl_mac_os_version [extern]
```

The version number of the running Mac OS X (e.g., 100604 for 10.6.4, 101300 for 10.13, 140102 for 14.1.2).

FLTK initializes this global variable before `main()` begins running. If the value is needed in a static initializer, a previous call to `FL::system\_driver\(\)` makes sure `fl\_mac\_os\_version` has been initialized.

## 32.14 Common Dialog Classes and Functions

Common dialog functions for file selection, message output, and more.

## Files

- file [fl\\_ask.cxx](#)  
*Utility functions for common dialogs.*

## Classes

- class [FL\\_Color\\_Chooser](#)  
*The [FL\\_Color\\_Chooser](#) widget provides a standard RGB color chooser.*
- class [FL\\_File\\_Chooser](#)  
*The [FL\\_File\\_Chooser](#) widget displays a standard file selection dialog that supports various selection modes.*

## Functions

- void [fl\\_alert](#) (const char \*fmt,...)  
*Shows an alert message dialog box.*
- int [fl\\_ask](#) (const char \*fmt,...)  
*Shows a dialog displaying the *fmt* message, this dialog features 2 yes/no buttons.*
- void [fl\\_beep](#) (int type)  
*Emits a system beep.*
- int [fl\\_choice](#) (const char \*fmt, const char \*b0, const char \*b1, const char \*b2,...)  
*Shows a dialog displaying the printf style *fmt* message.*
- int [fl\\_choice\\_n](#) (const char \*fmt, const char \*b0, const char \*b1, const char \*b2,...)  
*Shows a dialog displaying the printf style *fmt* message.*
- int [fl\\_color\\_chooser](#) (const char \*name, double &r, double &g, double &b, int cmode)  
*Pops up a window to let the user pick an arbitrary RGB color.*
- int [fl\\_color\\_chooser](#) (const char \*name, uchar &r, uchar &g, uchar &b, int cmode)  
*Pops up a window to let the user pick an arbitrary RGB color.*
- char \* [fl\\_dir\\_chooser](#) (const char \*message, const char \*fname, int relative)  
*Shows a file chooser dialog and gets a directory.*
- char \* [fl\\_file\\_chooser](#) (const char \*message, const char \*pat, const char \*fname, int relative)  
*Shows a file chooser dialog and gets a filename.*
- void [fl\\_file\\_chooser\\_callback](#) (void(\*cb)(const char \*))  
*Set the file chooser callback.*
- void [fl\\_file\\_chooser\\_ok\\_label](#) (const char \*l)  
*Set the "OK" button label.*
- const char \* [fl\\_input](#) (const char \*fmt, const char \*defstr,...)  
*Shows an input dialog displaying the *fmt* message with variable arguments.*
- const char \* [fl\\_input](#) (int maxchar, const char \*fmt, const char \*defstr,...)  
*Shows an input dialog displaying the *fmt* message with variable arguments.*
- std::string [fl\\_input\\_str](#) (int &ret, int maxchar, const char \*fmt, const char \*defstr,...)  
*Shows an input dialog displaying the *fmt* message with variable arguments.*
- std::string [fl\\_input\\_str](#) (int maxchar, const char \*fmt, const char \*defstr,...)  
*Shows an input dialog displaying the *fmt* message with variable arguments.*
- void [fl\\_message](#) (const char \*fmt,...)  
*Shows an information message dialog box.*
- int [fl\\_message\\_hotspot](#) ()  
*Gets whether or not to move the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#) to follow the mouse pointer.*
- void [fl\\_message\\_hotspot](#) (int enable)  
*Sets whether or not to move the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#) to follow the mouse pointer.*
- [FL\\_Widget](#) \* [fl\\_message\\_icon](#) ()

- Gets the `FL_Box` icon container of the current default dialog used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*
- void `fl_message_icon_label` (const char \*str)

*Sets the icon label of the dialog window used in many common dialogs.*
- void `fl_message_position` (const int x, const int y, const int center)

*Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*
- void `fl_message_position` (FL\_Widget \*widget)

*Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*
- int `fl_message_position` (int \*x, int \*y)

*Gets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*
- void `fl_message_title` (const char \*title)

*Sets the title of the dialog window used in many common dialogs.*
- void `fl_message_title_default` (const char \*title)

*Sets the default title of the dialog window used in many common dialogs.*
- const char \* `fl_password` (const char \*fmt, const char \*defstr,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*
- const char \* `fl_password` (int maxchar, const char \*fmt, const char \*defstr,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*
- std::string `fl_password_str` (int &ret, int maxchar, const char \*fmt, const char \*defstr,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*
- std::string `fl_password_str` (int maxchar, const char \*fmt, const char \*defstr,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

## Variables

- static void(\* `FL::error` )(const char \*,...) = FL\_System\_Driver::error

*FLTK calls `FL::error()` to output a normal error message.*
- static void(\* `FL::fatal` )(const char \*,...) = FL\_System\_Driver::fatal

*FLTK calls `FL::fatal()` to output a fatal error message.*
- const char \* `fl_cancel` = "Cancel"

*string pointer used in common dialogs, you can change it to another language*
- const char \* `fl_close` = "Close"

*string pointer used in common dialogs, you can change it to another language*
- `FL_Font` `fl_message_font` = `FL_HELVETICA`
- `FL_Fontsize` `fl_message_size` = -1
- const char \* `fl_no` = "No"

*string pointer used in common dialogs, you can change it to another language*
- const char \* `fl_ok` = "OK"

*string pointer used in common dialogs, you can change it to another language*
- const char \* `fl_yes` = "Yes"

*string pointer used in common dialogs, you can change it to another language*
- static void(\* `FL::warning` )(const char \*,...) = FL\_System\_Driver::warning

*FLTK calls `FL::warning()` to output a warning message.*

### 32.14.1 Detailed Description

Common dialog functions for file selection, message output, and more.

### 32.14.2 Function Documentation

**32.14.2.1 fl\_alert()**

```
void fl_alert (
    const char * fmt,
    ... )
```

Shows an alert message dialog box.

```
#include <FL/fl_ask.H>
```

**Parameters**

<i>in</i>	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
-----------	------------	--

**32.14.2.2 fl\_ask()**

```
int fl_ask (
    const char * fmt,
    ... )
```

Shows a dialog displaying the *fmt* message, this dialog features 2 yes/no buttons.

```
#include <FL/fl_ask.H>
```

**Parameters**

<i>in</i>	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
-----------	------------	--

**Return values**

<i>0</i>	if the no button is selected
<i>1</i>	if yes is selected

**Deprecated** [fl\\_ask\(\)](#) is deprecated since it uses "Yes" and "No" for the buttons which does not conform to the current FLTK Human Interface Guidelines. Use [fl\\_choice\(\)](#) with the appropriate verbs instead.

**32.14.2.3 fl\_beep()**

```
void fl_beep (
    int type )
```

Emits a system beep.

This function is platform specific. Depending on the input *type* a different sound may be played or the system speaker may beep with a different volume.

On X the system speaker is used which may not work at all on newer systems that don't have a speaker. Since 1.4.0 `FL_BEEP_DEFAULT` and other types honor the system or user settings whereas `FL_BEEP_ERROR` uses 100% volume. This may be changed in a future version.

On Wayland an ASCII BEL (0x07) is output to stderr.

On Windows the `MessageBeep()` function is used to play different sounds depending on the *type* argument.

On macOS the system beep function `NSBeep()` is used for `FL_BEEP_DEFAULT` and `FL_BEEP_ERROR`. Other types are ignored.

On other platforms the behavior is undefined and may change in the future.

**Parameters**

<i>in</i>	<i>type</i>	The beep type from the <a href="#">FL_Beep</a> enumeration (optional)
-----------	-------------	---

```
#include <FL/fl_ask.H>
```

### 32.14.2.4 fl\_choice()

```
int fl_choice (
    const char * fmt,
    const char * b0,
    const char * b1,
    const char * b2,
    ... )
```

Shows a dialog displaying the printf style `fmt` message.

This dialog features up to 3 customizable choice buttons which are specified in order of *right-to-left* in the dialog, e.g.

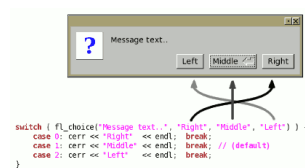


Figure 32.7 `fl_choice()` button ordering

```
#include <FL/fl_ask.H>
```

Three choices with printf() style formatting:

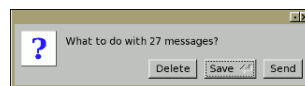


Figure 32.8 `fl_choice()` three choices with printf formatting

```
int num_msgs = GetNumberOfMessages();
switch ( fl_choice("What to do with %d messages?", "Send", "Save", "Delete", num_msgs) ) {
    case 0: .. // Send
    case 1: .. // Save (default)
    case 2: .. // Delete
    ..
}
```

Three choice example:

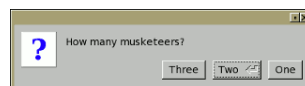


Figure 32.9 `fl_choice()` three choices

```
switch ( fl_choice("How many bedrooms?", "Zero", "One", "Two") ) {
    case 0: .. // "Zero"
    case 1: .. // "One" (default)
    case 2: .. // "Two"
}
```

Two choice example:

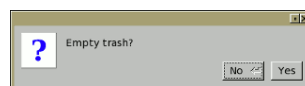


Figure 32.10 `fl_choice()` two choices

```
switch ( fl_choice("Empty trash?", "Yes", "No", 0) ) {
    case 0: .. // Yes
    case 1: .. // No (default)
}
```

One choice example:

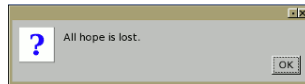


Figure 32.11 fl\_choice() one choice

```
fl_choice("All hope is lost.", "OK", 0, 0); // "OK" default
```

#### Parameters

in	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
in	<i>b0</i>	text label for right button 0
in	<i>b1</i>	text label for middle button 1 (can be 0)
in	<i>b2</i>	text label for left button 2 (can be 0)

#### Return values

0	if the button with <i>b0</i> text is pushed or the user pressed the <code>Escape</code> key or clicked the window close button
1	if the button with <i>b1</i> text is pushed or the user pressed the <code>Return</code> key
2	if the button with <i>b2</i> text is pushed

#### 32.14.2.5 fl\_choice\_n()

```
int fl_choice_n (
    const char * fmt,
    const char * b0,
    const char * b1,
    const char * b2,
    ... )
```

Shows a dialog displaying the printf style *fmt* message.

This function is like [fl\\_choice\(\)](#) but returns `-1` if the dialog window was closed by pressing the `Escape` key or the window close button rather than pushing one of the dialog buttons.

#### See also

[fl\\_choice\(\)](#)

#### Parameters

in	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
in	<i>b0</i>	text label for right button 0
in	<i>b1</i>	text label for middle button 1 (can be 0)
in	<i>b2</i>	text label for left button 2 (can be 0)

#### Return values

-3	reserved, FLTK 1.3 only: another dialog is still open (not possible in 1.4)
-2	if the dialog was closed by pushing the window close button
-1	if the dialog was closed by hitting <code>Escape</code>
0	if the button with <i>b0</i> text is pushed
1	if the button with <i>b1</i> text is pushed
2	if the button with <i>b2</i> text is pushed

**32.14.2.6 fl\_color\_chooser() [1/2]**

```
int fl_color_chooser (
    const char * name,
    double & r,
    double & g,
    double & b,
    int cmode ) [related]
```

Pops up a window to let the user pick an arbitrary RGB color.

**Note**

```
#include <FL/Fl_Color_Chooser.H>
```

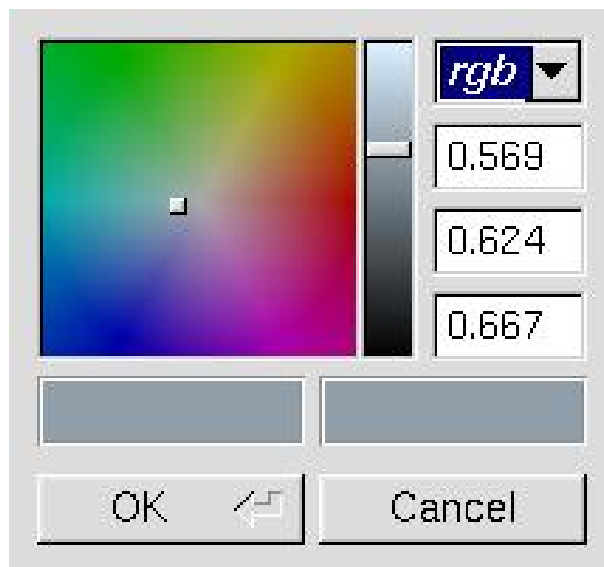


Figure 32.12 fl\_color\_chooser

**Parameters**

in	<i>name</i>	Title label for the window
in, out	<i>r,g,b</i>	Color components in the range 0.0 to 1.0.
in	<i>cmode</i>	Optional mode for color chooser. See <a href="#">mode(int)</a> . Default -1 if none (rgb mode).

**Return values**

1	if user confirms the selection
0	if user cancels the dialog

**32.14.2.7 fl\_color\_chooser() [2/2]**

```
int fl_color_chooser (
    const char * name,
    uchar & r,
    uchar & g,
    uchar & b,
```

```
int cmode ) [related]
```

Pops up a window to let the user pick an arbitrary RGB color.

#### Note

```
#include <FL/Fl_Color_Chooser.H>
```

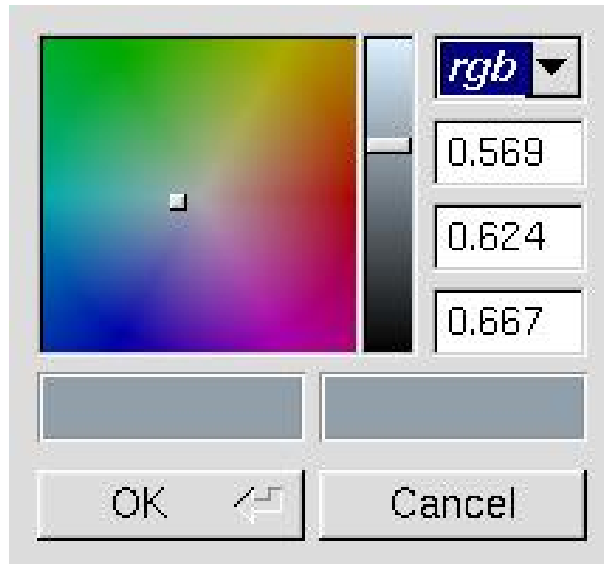


Figure 32.13 fl\_color\_chooser

#### Parameters

in	<i>name</i>	Title label for the window
in, out	<i>r,g,b</i>	Color components in the range 0 to 255.
in	<i>cmode</i>	Optional mode for color chooser. See <a href="#">mode(int)</a> . Default -1 if none (rgb mode).

#### Return values

1	if user confirms the selection
0	if user cancels the dialog

#### 32.14.2.8 fl\_dir\_chooser()

```
char * fl_dir_chooser (
    const char * message,
    const char * fname,
    int relative ) [related]
```

Shows a file chooser dialog and gets a directory.

#### Note

```
#include <FL/Fl_File_Chooser.H>
```

#### Parameters

in	<i>message</i>	title bar text
in	<i>fname</i>	initial/default directory name
in	<i>relative</i>	0 for absolute path return, relative otherwise

## Returns

the directory path string chosen by the user or NULL if user cancels

## 32.14.2.9 fl\_file\_chooser()

```
char * fl_file_chooser (
    const char * message,
    const char * pat,
    const char * fname,
    int relative ) [related]
```

Shows a file chooser dialog and gets a filename.

## Note

#include <FL/Fl\_File\_Chooser.H>

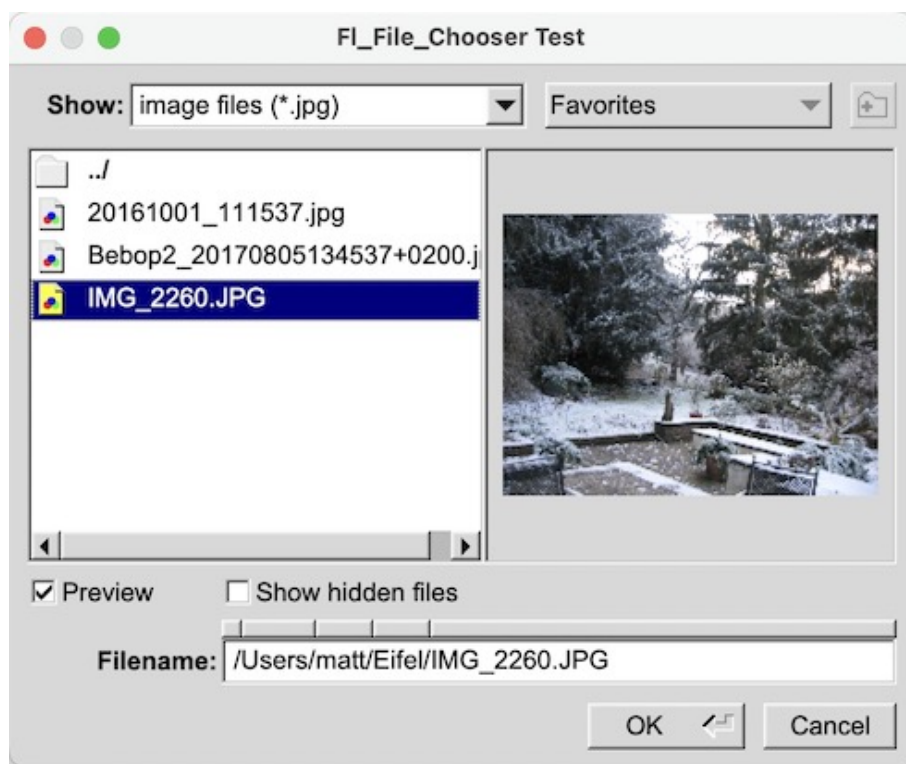


Figure 32.14 FL\_File\_Chooser

## Parameters

in	<i>message</i>	text in title bar
in	<i>pat</i>	filename pattern filter
in	<i>fname</i>	initial/default filename selection
in	<i>relative</i>	0 for absolute path name, relative path name otherwise

## Returns

the user selected filename, in absolute or relative format or NULL if user cancels

**32.14.2.10 fl\_file\_chooser\_callback()**

```
void fl_file_chooser_callback (
    void(*) (const char *) cb ) [related]
```

Set the file chooser callback.

**Note**

```
#include <FL/Fl_File_Chooser.H>
```

**32.14.2.11 fl\_file\_chooser\_ok\_label()**

```
void fl_file_chooser_ok_label (
    const char * l ) [related]
```

Set the "OK" button label.

**Note**

```
#include <FL/Fl_File_Chooser.H>
```

**32.14.2.12 fl\_input() [1/2]**

```
const char * fl_input (
    const char * fmt,
    const char * defstr,
    ... )
```

Shows an input dialog displaying the *fmt* message with variable arguments.

Returns the string in an internally allocated buffer that may be changed later. You **must** copy the string immediately after return from this method - at least before the next execution of the event loop.

```
#include <FL/fl_ask.H>
```

**Parameters**

in	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
in	<i>defstr</i>	defines the default returned string if no text is entered

**Returns**

the user string input if OK was pushed

**Return values**

<i>NULL</i>	if Cancel was pushed or the window was closed by the user
-------------	---

**32.14.2.13 fl\_input() [2/2]**

```
const char * fl_input (
    int maxchar,
    const char * fmt,
    const char * defstr,
    ... )
```

Shows an input dialog displaying the *fmt* message with variable arguments.

This is the same as `const char *fl_input(const char *fmt, const char *defstr, ...)` except that it has an additional parameter to limit the number of characters the user can input.

Returns the string in an internally allocated buffer that may be changed later. You **must** copy the string immediately after return from this method - at least before the next execution of the event loop.

```
#include <FL/fl_ask.H>
```

#### Parameters

in	<i>maxchar</i>	maximum number of characters the user can input (UTF-8 aware)
in	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
in	<i>defstr</i>	defines the default returned string if no text is entered

#### Returns

the user string input if OK was pushed

#### Return values

<i>NULL</i>	if Cancel was pushed or the window was closed by the user
-------------	---

#### 32.14.2.14 fl\_input\_str() [1/2]

```
std::string fl_input_str (
    int & ret,
    int maxchar,
    const char * fmt,
    const char * defstr,
    ... )
```

Shows an input dialog displaying the *fmt* message with variable arguments.

Like `fl_input()`, but this method has the additional argument *maxchar* that limits the number of **characters** that can be input. Since the string is encoded in UTF-8 it is possible that the number of bytes in the string is larger than *maxchar*.

Other than the deprecated `fl_input()` method w/o the *maxchar* argument, this one returns the string in an `std::string` object that must be released after use. This can be a local/automatic variable.

The *ret* variable is set to 0 if the user clicked OK, and to a negative value if the user canceled the dialog. If the dialog was canceled, the returned string will be empty.

```
#include <FL/fl_ask.H>
```

#### Example:

```
{ int ret;
  std::string str = fl_input_str(ret, 0, "Enter text:", "");
  if (ret < 0)
    printf("Text input was canceled.\n");
  else
    printf("Text is: '%s'\n", str.c_str());
} // (str goes out of scope)
```

#### Parameters

out	<i>ret</i>	0 if user clicked OK, negative if dialog was canceled
in	<i>maxchar</i>	input size limit in characters (not bytes), use 0 for no limit
in	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
in	<i>defstr</i>	defines the default returned string if no text is entered

#### Returns

the user string input if OK was clicked which can be empty

an empty string and set *ret* to a negative value if the user canceled the dialog

Since

1.4.0

### 32.14.2.15 fl\_input\_str() [2/2]

```
std::string fl_input_str (
    int maxchar,
    const char * fmt,
    const char * defstr,
    ... )
```

Shows an input dialog displaying the `fmt` message with variable arguments.

Note

No information is given if the user canceled the dialog or clicked OK.

See also

[fl\\_input\\_str](#)(int &ret, int maxchar, const char \*label, const char \*deflt = 0, ...)

### 32.14.2.16 fl\_message()

```
void fl_message (
    const char * fmt,
    ... )
```

Shows an information message dialog box.

```
#include <FL/fl_ask.H>
```

Parameters

<code>in</code>	<code>fmt</code>	can be used as an sprintf-like format and variables for the message text
-----------------	------------------	--

### 32.14.2.17 fl\_message\_hotspot() [1/2]

```
int fl_message_hotspot (
    void )
```

Gets whether or not to move the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#) to follow the mouse pointer.

This is a permanent setting. It remains active and affects the window position unless overridden by an explicit positioning request by means of one of the [fl\\_message\\_position\(\)](#) variants.

```
#include <FL/fl_ask.H>
```

Returns

0 if disabled, non-zero otherwise

See also

[void fl\\_message\\_hotspot\(int\)](#)  
[int fl\\_message\\_position\(int \\*x, int \\*y\)](#)  
[void fl\\_message\\_position\(FL\\_Widget \\*\)](#)  
[fl\\_message\\_position\(\)](#)

**32.14.2.18 fl\_message\_hotspot()** [2/2]

```
void fl_message_hotspot (
    int enable )
```

Sets whether or not to move the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#) to follow the mouse pointer.

The default is *enabled*, so that the default button is the hotspot and appears at the mouse position.

```
#include <FL/fl_ask.H>
```

**Parameters**

<code>in</code>	<code>enable</code>	non-zero enables hotspot behavior, 0 disables hotspot
-----------------	---------------------	---

**32.14.2.19 fl\_message\_icon()**

```
Fl_Widget * fl_message_icon ( )
```

Gets the [FL\\_Box](#) icon container of the current default dialog used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#).

The return value cannot be Null. The object pointed to is an [FL\\_Box](#) widget. The returned pointer ([Fl\\_Widget \\*](#)) can be safely cast to an [FL\\_Box\\*](#) pointer.

**Note**

You can set some attributes of this **default** icon box. These attributes are sticky, i.e. they will be used in all subsequent common dialogs unless overridden by specific "one shot" variables. Setting any attribute except those mentioned below causes undefined behavior.

Supported icon attributes:

- [box\(\)](#)
- [labelfont\(\)](#)
- [labelsize\(\)](#)
- [color\(\)](#)
- [labelcolor\(\)](#)
- [image\(\)](#)
- [align\(\)](#)

The icon size can not be changed. If you set an [image\(\)](#) you should scale it to the available size, i.e. [w\(\)](#) and [h\(\)](#) of the icon box.

```
#include <FL/fl_ask.H>
```

**32.14.2.20 fl\_message\_icon\_label()**

```
void fl_message_icon_label (
    const char * str )
```

Sets the icon label of the dialog window used in many common dialogs.

This icon label will be used in the next call of one of the common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#).

The label `str` is stored internally as a reference, it must be in scope until the dialog function (e.g. [fl\\_choice\(\)](#)) is called.

It applies only to the **next** call of one of the common dialogs and will be reset after that call so the next dialog will use its default label unless set again.

**Note**

This label string must be short, usually only one character so it fits in the icon box. You can use any valid UTF-8 character, e.g. the Euro sign ("€") which is three bytes in UTF-8 encoding.

```
#include <FL/fl_ask.H>
```

## Parameters

in	<i>str</i>	icon label
----	------------	------------

**32.14.2.21 fl\_message\_position()** [1/3]

```
void fl_message_position (
    const int x,
    const int y,
    const int center )
```

Sets the preferred position for the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#).

The position set with this method overrides the hotspot setting, i.e. setting a position has higher priority than the hotspot mode set by [fl\\_message\\_hotspot\(int\)](#).

The preferred position set by any of the [fl\\_message\\_position\(\)](#) variants affects only the next call of one of the common dialogs. The preferred position is reset to 0 (unset) as soon as the dialog is shown.

If the optional argument *center* is non-zero (true) the message box will be centered at the given coordinates rather than using the X/Y position as the window position (top left corner).

```
#include <FL/fl_ask.H>
```

## Parameters

in	<i>x</i>	Preferred X position
in	<i>y</i>	Preferred Y position
in	<i>center</i>	1 = centered, 0 = absolute

## See also

```
int fl_message_position(int *x, int *y)
```

**32.14.2.22 fl\_message\_position()** [2/3]

```
void fl_message_position (
    Fl_Widget * widget )
```

Sets the preferred position for the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#).

The message box will be centered over the given widget or window extensions.

Everything else is like [fl\\_message\\_position\(int, int, int\)](#) with argument 'center' set to 1.

```
#include <FL/fl_ask.H>
```

## Parameters

in	<i>widget</i>	Widget or window to position the message box over.
----	---------------	--

## See also

```
int fl_message_position(int x, int y, int center)
```

**32.14.2.23 fl\_message\_position()** [3/3]

```
int fl_message_position (
    int * x,
    int * y )
```

Gets the preferred position for the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#).

```
#include <FL/fl_ask.H>
```

The position set with this method overrides the hotspot setting, i.e. setting a position has higher priority than the hotspot mode set by [fl\\_message\\_hotspot\(int\)](#).

The preferred position set by any of the [fl\\_message\\_position\(\)](#) variants affects only the next call of one of the common dialogs. The preferred position is reset to 0 (unset) as soon as the dialog is shown.

#### Parameters

out	x	Preferred X position, returns -1 if not set
out	y	Preferred Y position, returns -1 if not set

#### Returns

whether position is currently set or not

#### Return values

0	position is not set (hotspot may be enabled or not)
1	position is set (window position)
2	position is set (message box centered)

#### See also

[fl\\_message\\_hotspot\(\)](#)  
[fl\\_message\\_hotspot\(int\)](#)  
[fl\\_message\\_position\(int, int\)](#)  
[fl\\_message\\_position\(const int x, const int y, const int center\)](#)  
[fl\\_message\\_position\(Fl\\_Widget \\*\)](#)

### 32.14.2.24 fl\_message\_title()

```
void fl_message_title (
    const char * title )
```

Sets the title of the dialog window used in many common dialogs.

This window *title* will be used in the next call of one of the common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#).

The *title* string is copied internally, so that you can use a local variable or free the string immediately after this call. It applies only to the **next** call of one of the common dialogs and will be reset to an empty title (the default for all dialogs) after that call.

```
#include <FL/fl_ask.H>
```

#### Parameters

in	<i>title</i>	window label, string copied internally
----	--------------	--

### 32.14.2.25 fl\_message\_title\_default()

```
void fl_message_title_default (
    const char * title )
```

Sets the default title of the dialog window used in many common dialogs.

This `window title` will be used in all subsequent calls of one of the common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`, unless a specific title has been set with `fl_message_title(const char *title)`. The default is no title. You can override the default title for a single dialog with `fl_message_title(const char *title)`. The `title` string is copied internally, so that you can use a local variable or free the string immediately after this call.

```
#include <FL/fl_ask.H>
```

#### Parameters

in	<i>title</i>	default window label, string copied internally
----	--------------	--

#### 32.14.2.26 fl\_password() [1/2]

```
const char * fl_password (
    const char * fmt,
    const char * defstr,
    ... )
```

Shows an input dialog displaying the `fmt` message with variable arguments.

Like `fl_input()` except the input text is not shown, '\*' or similar replacement characters are displayed instead.

```
#include <FL/fl_ask.H>
```

#### Parameters

in	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
in	<i>defstr</i>	defines the default returned string if no text is entered

#### Returns

the user string input if OK was pushed

#### Return values

<code>NULL</code>	if Cancel was pushed or the window was closed by the user
-------------------	---

#### 32.14.2.27 fl\_password() [2/2]

```
const char * fl_password (
    int maxchar,
    const char * fmt,
    const char * defstr,
    ... )
```

Shows an input dialog displaying the `fmt` message with variable arguments.

Like `fl_input()` except the input text is not shown, '\*' or similar replacement characters are displayed instead.

```
#include <FL/fl_ask.H>
```

#### Parameters

in	<i>maxchar</i>	input lenght limit in chars, 0 = no limit
in	<i>fmt</i>	can be used as an sprintf-like format and variables for the message text
in	<i>defstr</i>	defines the default returned string if no text is entered

**Returns**

the user string input if OK was pushed

**Return values**

<i>NULL</i>	if Cancel was pushed or the window was closed by the user
-------------	---

**32.14.2.28 fl\_password\_str() [1/2]**

```
std::string fl_password_str (
    int & ret,
    int maxchar,
    const char * fmt,
    const char * defstr,
    ... )
```

Shows an input dialog displaying the *fmt* message with variable arguments.

Like [fl\\_input\\_str\(\)](#) except the input text is not shown, '\*' or similar replacement characters are displayed instead.

Other than the [fl\\_password\(\)](#) method w/o the *maxchar* argument, this one returns the string in an `std::string` object that must be released after use. This can be a local/automatic variable.

For an example see [fl\\_input\\_str\(\)](#)

```
#include <FL/fl_ask.H>
```

**Parameters**

out	<i>ret</i>	0 if user clicked OK, negative if dialog was canceled
in	<i>maxchar</i>	input size limit in characters (not bytes), use 0 for no limit
in	<i>fmt</i>	can be used as an <code>sprintf</code> -like format and variables for the message text
in	<i>defstr</i>	defines the default returned string if no text is entered

**Returns**

the user string input if OK was clicked which can be empty

an empty string and set *ret* to a negative value if the user canceled the dialog

**Since**

1.4.0

**32.14.2.29 fl\_password\_str() [2/2]**

```
std::string fl_password_str (
    int maxchar,
    const char * fmt,
    const char * defstr,
    ... )
```

Shows an input dialog displaying the *fmt* message with variable arguments.

**Note**

No information is given if the user canceled the dialog or clicked OK.

**See also**

[fl\\_password\\_str\(int &ret, int maxchar, const char \\*label, const char \\*deflt = 0, ...\)](#)

### 32.14.3 Variable Documentation

#### 32.14.3.1 error

```
void(* Fl::error)(const char *format,...) = Fl_System_Driver::error [static]
```

FLTK calls [Fl::error\(\)](#) to output a normal error message.

The default version on Windows displays the error message in a MessageBox window.

The default version on all other platforms prints the error message to stderr.

You can override the behavior by setting the function pointer to your own routine.

[Fl::error\(\)](#) means there is a recoverable error such as the inability to read an image file. The default implementation returns after displaying the message.

Note

```
#include <FL/Fl.H>
```

#### 32.14.3.2 fatal

```
void(* Fl::fatal)(const char *format,...) = Fl_System_Driver::fatal [static]
```

FLTK calls [Fl::fatal\(\)](#) to output a fatal error message.

The default version on Windows displays the error message in a MessageBox window.

The default version on all other platforms prints the error message to stderr.

You can override the behavior by setting the function pointer to your own routine.

[Fl::fatal\(\)](#) must not return, as FLTK is in an unusable state, however your version may be able to use longjmp or an exception to continue, as long as it does not call FLTK again. The default implementation exits with status 1 after displaying the message.

Note

```
#include <FL/Fl.H>
```

#### 32.14.3.3 warning

```
void(* Fl::warning)(const char *format,...) = Fl_System_Driver::warning [static]
```

FLTK calls [Fl::warning\(\)](#) to output a warning message.

The default version on Windows returns *without* printing a warning message, because Windows programs normally don't have stderr (a console window) enabled.

The default version on all other platforms prints the warning message to stderr.

You can override the behavior by setting the function pointer to your own routine.

[Fl::warning\(\)](#) means that there was a recoverable problem, the display may be messed up, but the user can probably keep working - all X protocol errors call this, for example. The default implementation returns after displaying the message.

Note

```
#include <FL/Fl.H>
```

## 32.15 File names and URI utility functions

File names and URI functions defined in [<FL/filename.H>](#)

### Macros

- `#define FL_PATH_MAX 2048`  
*all path buffers should use this length*

## Typedefs

- typedef int() `Fl_File_Sort_F`(struct dirent \*\*, struct dirent \*\*)  
*File sorting function.*

## Functions

- void `fl_decode_uri` (char \*uri)  
*Decodes a URL-encoded string.*
- int `fl_filename_absolute` (char \*to, int tolen, const char \*from)  
*Makes a filename absolute from a relative filename to the current working directory.*
- int `fl_filename_absolute` (char \*to, int tolen, const char \*from, const char \*cwd)  
*Concatenate the absolute path *base* with *from* to form the new absolute path in *to*.*
- std::string `fl_filename_absolute_str` (const std::string &from)  
*Makes a filename absolute from a filename relative to the current working directory.*
- std::string `fl_filename_absolute_str` (const std::string &from, const std::string &base)  
*Append the relative filename *from* to the absolute filename *base* to form the new absolute path.*
- int `fl_filename_expand` (char \*to, int tolen, const char \*from)  
*Expands a filename containing shell variables and tilde (~).*
- std::string `fl_filename_expand_str` (const std::string &from)  
*Expands a filename containing shell variables and tilde (~).*
- const char \* `fl_filename_ext` (const char \*buf)  
*Gets the extension of a filename.*
- std::string `fl_filename_ext_str` (const std::string &filename)  
*Return a new string that contains the filename extension.*
- void `fl_filename_free_list` (struct dirent \*\*l, int n)  
*Free the list of filenames that is generated by `fl_filename_list()`.*
- int `fl_filename_isdir` (const char \*name)  
*Determines if a file exists and is a directory from its filename.*
- int `fl_filename_list` (const char \*d, struct dirent \*\*l, `Fl_File_Sort_F` \*s=`fl_numeric_sort`)  
*Portable and const-correct wrapper for the `scandir()` function.*
- int `fl_filename_match` (const char \*name, const char \*pattern)  
*Checks if a string *s* matches a pattern *p*.*
- const char \* `fl_filename_name` (const char \*filename)  
*Gets the file name from a path.*
- std::string `fl_filename_name_str` (const std::string &filename)  
*Return a new string that contains the name part of the filename.*
- std::string `fl_filename_path_str` (const std::string &filename)  
*Return a new string that contains the path part of the filename.*
- int `fl_filename_relative` (char \*to, int tolen, const char \*from)  
*Makes a filename relative to the current working directory.*
- int `fl_filename_relative` (char \*to, int tolen, const char \*from, const char \*cwd)  
*Makes a filename relative to any other directory.*
- std::string `fl_filename_relative_str` (const std::string &from)  
*Makes a filename relative to the current working directory.*
- std::string `fl_filename_relative_str` (const std::string &from, const std::string &base)  
*Makes a filename relative to any directory.*
- char \* `fl_filename_setext` (char \*to, int tolen, const char \*ext)  
*Replaces the extension in *buf* of *max*.*
- std::string `fl_filename_setext_str` (const std::string &filename, const std::string &new\_extension)  
*Return a copy of the old filename with the new extension.*
- std::string `fl_getcwd_str` ()

*Cross-platform function to get the current working directory as a UTF-8 encoded value in an `std::string`.*

- `int fl_open_uri (const char *uri, char *msg, int msglen)`

*Opens the specified Uniform Resource Identifier (URI).*

### 32.15.1 Detailed Description

File names and URI functions defined in `<FL/filename.H>`

### 32.15.2 Typedef Documentation

#### 32.15.2.1 FI\_File\_Sort\_F

```
typedef int() Fl_File_Sort_F(struct dirent **, struct dirent **)
```

File sorting function.

See also

[fl\\_filename\\_list\(\)](#)

### 32.15.3 Function Documentation

#### 32.15.3.1 fl\_decode\_uri()

```
void fl_decode_uri (
    char * uri )
```

Decodes a URL-encoded string.

In a Uniform Resource Identifier (URI), all non-ASCII bytes and several others (e.g., '<', '"', ''') are URL-encoded using 3 bytes by "%XY" where XY is the hexadecimal value of the byte. This function decodes the URI restoring its original UTF-8 encoded content. Decoding is done in-place.

#### 32.15.3.2 fl\_filename\_absolute() [1/2]

```
int fl_filename_absolute (
    char * to,
    int tolen,
    const char * from )
```

Makes a filename absolute from a relative filename to the current working directory.

```
#include <FL/filename.H>
[...
fl_chdir("/var/tmp");
fl_filename_absolute(out, sizeof(out), "foo.txt");           // out="/var/tmp/foo.txt"
fl_filename_absolute(out, sizeof(out), "../foo.txt");        // out="/var/tmp/foo.txt"
fl_filename_absolute(out, sizeof(out), "../log/messages");   // out="/var/log/messages"
```

#### Parameters

out	to	resulting absolute filename
in	tolen	size of the absolute filename buffer
in	from	relative filename

**Returns**

0 if no change, non zero otherwise

**32.15.3.3 fl\_filename\_absolute() [2/2]**

```
int fl_filename_absolute (
    char * to,
    int tolen,
    const char * from,
    const char * base )
```

Concatenate the absolute path *base* with *from* to form the new absolute path in *to*.

```
#include <FL/filename.H>
char out[FL_PATH_MAX];
fl_filename_absolute(out, sizeof(out), "../foo.txt", "/var/tmp"); // out="/var/foo.txt"
fl_filename_absolute(out, sizeof(out), "../local/bin", "/usr/bin"); // out="/usr/local/bin"
```

**Parameters**

out	<i>to</i>	resulting absolute filename
in	<i>tolen</i>	size of the absolute filename buffer
in	<i>from</i>	relative filename
in	<i>base</i>	<i>from</i> is relative to this absolute file path

**Returns**

0 if no change, non zero otherwise

**32.15.3.4 fl\_filename\_absolute\_str() [1/2]**

```
std::string fl_filename_absolute_str (
    const std::string & from )
```

Makes a filename absolute from a filename relative to the current working directory.

**Parameters**

in	<i>from</i>	relative filename
----	-------------	-------------------

**Returns**

the new, absolute filename

**See also**

[fl\\_filename\\_absolute\(char \\*to, int tolen, const char \\*from\)](#)

**32.15.3.5 fl\_filename\_absolute\_str() [2/2]**

```
std::string fl_filename_absolute_str (
    const std::string & from,
    const std::string & base )
```

Append the relative filename *from* to the absolute filename *base* to form the new absolute path.

## Parameters

in	<i>from</i>	relative filename
in	<i>base</i>	from is relative to this absolute file path

## Returns

the new, absolute filename

## See also

[fl\\_filename\\_absolute\(char \\*to, int tolen, const char \\*from, const char \\*base\)](#)

## 32.15.3.6 fl\_filename\_expand()

```
int fl_filename_expand (
    char * to,
    int tolen,
    const char * from )
```

Expands a filename containing shell variables and tilde (~).

Currently handles these variants:

```
"~username"           // if 'username' does not exist, result will be unchanged
"~/file"
"${VARNAME}"           // does NOT handle ${VARNAME}
```

## Examples:

```
#include <FL/filename.H>
[...
putenv("TMPDIR=/var/tmp");
fl_filename_expand(out, sizeof(out), "~fred/.cshrc");    // out="/usr/fred/.cshrc"
fl_filename_expand(out, sizeof(out), "~/cshrc");         // out="/usr/<yourname>/cshrc"
fl_filename_expand(out, sizeof(out), "$TMPDIR/foo.txt"); // out="/var/tmp/foo.txt"
```

## Parameters

out	<i>to</i>	resulting expanded filename
in	<i>tolen</i>	size of the expanded filename buffer
in	<i>from</i>	filename containing shell variables

## Returns

0 if no change, non zero otherwise

## 32.15.3.7 fl\_filename\_expand\_str()

```
std::string fl_filename_expand_str (
    const std::string & from )
```

Expands a filename containing shell variables and tilde (~).

## Parameters

in	<i>from</i>	file path and name
----	-------------	--------------------

## Returns

the new, expanded filename

See also

[fl\\_filename\\_expand\(char \\*to, int tolen, const char \\*from\)](#)

### 32.15.3.8 fl\_filename\_ext()

```
const char * fl_filename_ext (
    const char * buf )
```

Gets the extension of a filename.

```
#include <FL/filename.H>
[...]
```

```
const char *out;
out = fl_filename_ext("/some/path/foo.txt"); // result: ".txt"
out = fl_filename_ext("/some/path/foo");    // result: NULL
```

Parameters

in	<i>buf</i>	the filename to be parsed
----	------------	---------------------------

Returns

a pointer to the extension (including '.') if any or NULL otherwise

### 32.15.3.9 fl\_filename\_ext\_str()

```
std::string fl_filename_ext_str (
    const std::string & filename )
```

Return a new string that contains the filename extension.

Parameters

in	<i>filename</i>	file path and name
----	-----------------	--------------------

Returns

the filename extension including the prepending '.', or an empty string if the filename has no extension

See also

[fl\\_filename\\_ext\(const char \\*buf\)](#)

### 32.15.3.10 fl\_filename\_free\_list()

```
void fl_filename_free_list (
    struct dirent *** list,
    int n )
```

Free the list of filenames that is generated by [fl\\_filename\\_list\(\)](#).

Free everything that was allocated by a previous call to [fl\\_filename\\_list\(\)](#). Use the return values as parameters for this function.

Parameters

in, out	<i>list</i>	table containing the resulting directory listing
in	<i>n</i>	number of entries in the list

**32.15.3.11 fl\_filename\_isdir()**

```
int fl_filename_isdir (
    const char * n )
```

Determines if a file exists and is a directory from its filename.

```
#include <FL/filename.H>
[...]  
fl_filename_isdir("/etc");           // returns non-zero  
fl_filename_isdir("/etc/hosts");    // returns 0
```

**Parameters**

in	<i>n</i>	the filename to parse
----	----------	-----------------------

**Returns**

non zero if file exists and is a directory, zero otherwise

**32.15.3.12 fl\_filename\_list()**

```
int fl_filename_list (
    const char * d,
    dirent *** list,
    Fl_File_Sort_F * sort )
```

Portable and const-correct wrapper for the scandir() function.

For each file in that directory a "dirent" structure is created. The only portable thing about a dirent is that dirent->d\_name is the nul-terminated file name. A pointers array to these dirent's is created and a pointer to the array is returned in \*list. The number of entries is given as a return value. If there is an error reading the directory a number less than zero is returned, and errno has the reason; errno does not work under Windows.

**Include:**

```
#include <FL/filename.H>
```

**Parameters**

in	<i>d</i>	the name of the directory to list. It does not matter if it has a trailing slash.
out	<i>list</i>	table containing the resulting directory listing
in	<i>sort</i>	sorting functor: <ul style="list-style-type: none"> <li>• fl_alphasort: The files are sorted in ascending alphabetical order; upper and lowercase letters are compared according to their ASCII ordering uppercase before lowercase.</li> <li>• fl_casealphasort: The files are sorted in ascending alphabetical order; upper and lowercase letters are compared equally case is not significant.</li> <li>• fl_casenumERICsort: The files are sorted in ascending "alphanumeric" order, where an attempt is made to put unpadding numbers in consecutive order; upper and lowercase letters are compared equally case is not significant.</li> <li>• fl_numericSORT: The files are sorted in ascending "alphanumeric" order, where an attempt is made to put unpadding numbers in consecutive order; upper and lowercase letters are compared according to their ASCII ordering - uppercase before lowercase.</li> </ul>

**Returns**

the number of entries if no error, a negative value otherwise.

**Todo** should support returning OS error messages

### 32.15.3.13 fl\_filename\_match()

```
int fl_filename_match (
    const char * s,
    const char * p )
```

Checks if a string *s* matches a pattern *p*.

The following syntax is used for the pattern:

- `*` matches any sequence of 0 or more characters.
- `?` matches any single character.
- `[set]` matches any character in the set. Set can contain any single characters, or a-z to represent a range. To match `^` or `!` they must not be the first characters.
- `[^set]` or `[!set]` matches any character not in the set.
- `{X|Y|Z}` or `{X,Y,Z}` matches any one of the subexpressions literally.
- `\x` quotes the character *x* so it has no special meaning.
- *x* all other characters are matched "exactly" on a **case-insensitive** basis.

Notes:

- *s* and *p* are matched on a char/byte basis, not as UCS codepoints or UTF-8 sequences.
- `[set]` ranges must run from low to high, i.e. `[a-z]` and not `[z-a]`
- `[set]` comparison is **case-sensitive**, i.e. `[a-z]` won't match `"A"`.
- `\x` only applies to the `fl_filename_match` special characters `* ? [ {`
- `\x` needs a double `\` or the compiler will complain about non-standard escape sequences.

**Include:**

```
#include <FL/filename.H>
```

**Parameters**

in	<i>s</i>	the string to check for a match
in	<i>p</i>	the string pattern

**Returns**

non zero if the string matches the pattern

### 32.15.3.14 fl\_filename\_name()

```
const char * fl_filename_name (
    const char * filename )
```

Gets the file name from a path.

Similar to `basename(3)`, exceptions shown below.

```
#include <FL/filename.H>
[...]
```

<code>const char *out;</code>		
<code>out = fl_filename_name("/usr/lib");</code>	<code>// out="lib"</code>	
<code>out = fl_filename_name("/usr/");</code>	<code>// out=""</code>	<code>(basename(3) returns "usr" instead)</code>
<code>out = fl_filename_name("/usr");</code>	<code>// out="usr"</code>	
<code>out = fl_filename_name("/");</code>	<code>// out=""</code>	<code>(basename(3) returns "/" instead)</code>
<code>out = fl_filename_name(".");</code>	<code>// out="."</code>	
<code>out = fl_filename_name("../");</code>	<code>// out=".."</code>	

**Returns**

a pointer to the char after the last slash, or to `filename` if there is none.

**32.15.3.15 fl\_filename\_name\_str()**

```
std::string fl_filename_name_str (
    const std::string & filename )
```

Return a new string that contains the name part of the filename.

**Parameters**

in	<i>filename</i>	file path and name
----	-----------------	--------------------

**Returns**

the name part of a filename

**See also**

[fl\\_filename\\_name\(const char \\*filename\)](#)

**32.15.3.16 fl\_filename\_path\_str()**

```
std::string fl_filename_path_str (
    const std::string & filename )
```

Return a new string that contains the path part of the filename.

**Parameters**

in	<i>filename</i>	file path and name
----	-----------------	--------------------

**Returns**

the path part of a filename without the name

**See also**

[fl\\_filename\\_name\(const char \\*filename\)](#)

**32.15.3.17 fl\_filename\_relative() [1/2]**

```
int fl_filename_relative (
    char * to,
    int tolen,
    const char * from )
```

Makes a filename relative to the current working directory.

Return the *from* path made relative to the working directory, similar to C++17 `std::filesystem::path::lexically_relative`. This function can also be called with a fourth argument for a user supplied *base* directory path

These conversions are purely lexical. They do not check that the paths exist, do not follow symlinks, and do not access the filesystem at all.

Path arguments must be absolute (start at the root directory) and must not contain `.` or `..` segments, or double separators. A single trailing separator is ok.

On Windows, path arguments must start with a drive name, e.g. `c:\`. Windows network paths and other special paths starting with a double separator are not supported (`\\cloud\drive\path`, `\\?\`, etc.) . Separators can be `\` and `/` and will be preserved. Newly created separators are always the forward slash `/`.

On Windows and macOS, the path segment tests are case insensitive.

If the path can not be generated, *from* path is copied into the *to* buffer and 0 is returned.

```
#include <FL/filename.H>
[...]
fl_chdir("/var/tmp/somedir");          // set cwd to /var/tmp/somedir
[...]
char out[FL_PATH_MAX];
fl_filename_relative(out, sizeof(out), "/var/tmp/somedir/foo.txt"); // out="foo.txt", return=1
fl_filename_relative(out, sizeof(out), "/var/tmp/foo.txt");         // out="../foo.txt", return=1
fl_filename_relative(out, sizeof(out), "foo.txt");                  // out="foo.txt", return=0 (no
change)
fl_filename_relative(out, sizeof(out), "../foo.txt");               // out="../foo.txt", return=0 (no
change)
fl_filename_relative(out, sizeof(out), "../foo.txt");               // out="../foo.txt", return=0 (no
change)
```

#### Parameters

out	<i>to</i>	resulting relative filename
in	<i>tolen</i>	size of the relative filename buffer
in	<i>from</i>	absolute filename

#### Returns

0 if no change, non zero otherwise

#### See also

[fl\\_filename\\_relative\(char \\*to, int tolen, const char \\*from, const char \\*base\)](#)

### 32.15.3.18 fl\_filename\_relative() [2/2]

```
int fl_filename_relative (
    char * to,
    int tolen,
    const char * from,
    const char * base )
```

Makes a filename relative to any other directory.

#### Parameters

out	<i>to</i>	resulting relative filepath
in	<i>tolen</i>	size of the relative filename buffer
in	<i>from</i>	absolute filepath
in	<i>base</i>	generate filepath relative to this absolute filepath

#### Returns

0 if no change, non zero otherwise

#### See also

[fl\\_filename\\_relative\(char \\*to, int tolen, const char \\*from\)](#)

**32.15.3.19 fl\_filename\_relative\_str()** [1/2]

```
std::string fl_filename_relative_str (
    const std::string & from )
```

Makes a filename relative to the current working directory.

**Parameters**

in	<i>from</i>	file path and name
----	-------------	--------------------

**Returns**

the new, relative filename

**See also**

[fl\\_filename\\_relative\(char \\*to, int tolen, const char \\*from\)](#)

**32.15.3.20 fl\_filename\_relative\_str()** [2/2]

```
std::string fl_filename_relative_str (
    const std::string & from,
    const std::string & base )
```

Makes a filename relative to any directory.

**Parameters**

in	<i>from</i>	file path and name
in	<i>base</i>	relative to this absolute path

**Returns**

the new, relative filename

**See also**

[fl\\_filename\\_relative\(char \\*to, int tolen, const char \\*from, const char \\*base\)](#)

**32.15.3.21 fl\_filename\_setext()**

```
char * fl_filename_setext (
    char * buf,
    int buflen,
    const char * ext )
```

Replaces the extension in *buf* of max.

size *buflen* with the extension in *ext*.

If there's no '.' in *buf*, *ext* is appended.

If *ext* is NULL, behaves as if it were an empty string ("").

**Example**

```
#include <FL/filename.H>
[...
char buf[FL_PATH_MAX] = "/path/myfile.cxx";
fl_filename_setext(buf, sizeof(buf), ".txt");           // buf[] becomes "/path/myfile.txt"
```

**Returns**

*buf* itself for calling convenience.

**32.15.3.22 fl\_filename\_setext\_str()**

```
std::string fl_filename_setext_str (
    const std::string & filename,
    const std::string & new_extension )
```

Return a copy of the old filename with the new extension.

**Parameters**

in	<i>filename</i>	file path and name
in	<i>new_extension</i>	new filename extension, starts with a '.'

**Returns**

the new filename

**See also**

[fl\\_filename\\_setext\(char \\*to, int tolen, const char \\*ext\)](#)

**32.15.3.23 fl\_getcwd\_str()**

```
std::string fl_getcwd_str ( )
```

Cross-platform function to get the current working directory as a UTF-8 encoded value in an std::string.

**Returns**

the CWD encoded as UTF-8

**32.15.3.24 fl\_open\_uri()**

```
int fl_open_uri (
    const char * uri,
    char * msg,
    int msglen )
```

Opens the specified Uniform Resource Identifier (URI).

Uses an operating-system dependent program or interface. For URIs using the "ftp", "http", or "https" schemes, the system default web browser is used to open the URI, while "mailto" and "news" URIs are typically opened using the system default mail reader and "file" URIs are opened using the file system navigator.

On success, the (optional) msg buffer is filled with the command that was run to open the URI; on Windows, this will always be "open uri".

On failure, the msg buffer is filled with an English error message.

**Note****Platform Specific Issues: Windows**

With "file:" based URIs on Windows, you may encounter issues with anchors being ignored. Example: "file↵:///c:/some/index.html#anchor" may open in the browser without the "#anchor" suffix. The behavior seems to vary across different Windows versions. Workaround: open a link to a separate html file that redirects to the desired "file:" URI.

**Example**

```
#include <FL/filename.H>
[... ]
char errmsg[512];
if ( !fl_open_uri("http://google.com/", errmsg, sizeof(errmsg)) ) {
    char warnmsg[768];
    sprintf(warnmsg, "Error:  %s", errmsg);
    fl_alert(warnmsg);
}
```

## Parameters

<i>uri</i>	The URI to open
<i>msg</i>	Optional buffer which contains the command or error message
<i>msglen</i>	Length of optional buffer

## Returns

1 on success, 0 on failure



## Chapter 33

# Class Documentation

### 33.1 `Fl_Grid::Cell` Class Reference

#### Public Member Functions

- `Fl_Grid_Align align ()` const
- void `align (Fl_Grid_Align align)`
- `Cell (Fl_Widget *w, int row, int col)`
- `Cell (int row, int col)`
- void `Cell_ ()`
- short `col ()` const
- short `colspan ()` const
- void `colspan (short v)`
- void `minimum_size (int *w, int *h)` const
- void `minimum_size (int w, int h)`
- `Cell * next ()`  
*Returns the next widget cell of the same row of this cell.*
- void `next (Cell *c)`  
*Sets the next pointer of a grid's cell.*
- short `row ()` const
- short `rowspan ()` const
- void `rowspan (short v)`
- `Fl_Widget * widget ()` const
- `~Cell ()`  
*The destructor deletes the cell.*

#### Friends

- class `Fl_Grid`

#### 33.1.1 Constructor & Destructor Documentation

##### 33.1.1.1 `~Cell()`

```
Fl_Grid::Cell::~Cell ( ) [inline]
```

The destructor deletes the cell.

**Todo** `Fl_Grid`'s cell destructor should remove the cell from the grid. Currently it does nothing!

#### 33.1.2 Member Function Documentation

### 33.1.2.1 next()

```
void Fl_Grid::Cell::next (
    Cell * c ) [inline]
```

Sets the `next` pointer of a grid's cell.

**Internal** use only!

Do not use this method, it may corrupt the allocated memory.

The documentation for this class was generated from the following file:

- [Fl\\_Grid.H](#)

## 33.2 Fl\_Terminal::CharStyle Class Reference

### Public Member Functions

- void **attrib** ([uchar](#) val)
- [uchar](#) **attrib** (void) const
- void **bgcolor** ([Fl\\_Color](#) val)
- void **bgcolor** (int r, int g, int b)
- [Fl\\_Color](#) **bgcolor** (void) const
- void **bgcolor\_xterm** ([Fl\\_Color](#) val)
- void **bgcolor\_xterm** ([uchar](#) val)
- void **charflags** ([uchar](#) val)
- [uchar](#) **charflags** (void) const
- **CharStyle** (bool fontsize\_defer)
- int **charwidth** (void) const
- void **clr\_charflag** ([uchar](#) val)
- [uchar](#) **colorbits\_only** ([uchar](#) inflags) const
- void **defaultbgcolor** ([Fl\\_Color](#) val)
- [Fl\\_Color](#) **defaultbgcolor** (void) const
- void **defaultfgcolor** ([Fl\\_Color](#) val)
- [Fl\\_Color](#) **defaultfgcolor** (void) const
- void **fgcolor** ([Fl\\_Color](#) val)
- void **fgcolor** (int r, int g, int b)
- [Fl\\_Color](#) **fgcolor** (void) const
- void **fgcolor\_xterm** ([Fl\\_Color](#) val)
- void **fgcolor\_xterm** ([uchar](#) val)
- [Fl\\_Color](#) **fltk\_bg\_color** ([uchar](#) ci)
- [Fl\\_Color](#) **fltk\_fg\_color** ([uchar](#) ci)
- int **fontdescent** (void) const
- void **fontface** ([Fl\\_Font](#) val)
- [Fl\\_Font](#) **fontface** (void) const
- int **fontheight** (void) const
- void **fontsize** ([Fl\\_Fontsize](#) val)
- [Fl\\_Fontsize](#) **fontsize** (void) const
- int **onoff** (bool flag, [Attrib](#) a)
- void **set\_charflag** ([uchar](#) val)
- void **sgr\_blink** (bool val)
- void **sgr\_bold** (bool val)
- void **sgr\_dbl\_under** (bool val)
- void **sgr\_dim** (bool val)
- void **sgr\_inverse** (bool val)
- void **sgr\_italic** (bool val)
- void **sgr\_reset** (void)
- void **sgr\_strike** (bool val)
- void **sgr\_underline** (bool val)

- void **update** (void)
- void **update\_fake** (void)

The documentation for this class was generated from the following files:

- [FI\\_Terminal.H](#)
- FI\_Terminal.cxx

## 33.3 FI\_GIF\_Image::GIF\_FRAME::CPAL Struct Reference

### Public Attributes

- [uchar](#) **b**
- [uchar](#) **g**
- [uchar](#) **r**

The documentation for this struct was generated from the following file:

- FI\_GIF\_Image.H

## 33.4 FI\_Terminal::Cursor Class Reference

### Public Member Functions

- void **bgcolor** ([FI\\_Color](#) val)
- [FI\\_Color](#) **bgcolor** (void) const
- void **col** (int val)
- int **col** (void) const
- int **down** (void)
- void **fgcolor** ([FI\\_Color](#) val)
- [FI\\_Color](#) **fgcolor** (void) const
- void **h** (int val)
- int **h** (void) const
- void **home** (void)
- bool **is\_rowcol** (int drow, int dcol) const
- int **left** (void)
- int **right** (void)
- void **row** (int val)
- int **row** (void) const
- void **scroll** (int nrow)
- int **up** (void)

The documentation for this class was generated from the following files:

- [FI\\_Terminal.H](#)
- FI\_Terminal.cxx

## 33.5 FI\_Preferences::Entry Struct Reference

### Public Attributes

- char \* **name**
- char \* **value**

The documentation for this struct was generated from the following file:

- FI\_Preferences.H

## 33.6 FI\_Terminal::EscapeSeq Class Reference

### Public Member Functions

- int **defvalmax** (int dval, int max) const
- void **esc\_mode** (char val)
- char **esc\_mode** (void) const
- bool **is\_csi** (void) const
- int **parse** (char c)
- bool **parse\_in\_progress** (void) const
- void **reset** (void)
- void **restore\_cursor** (int &row, int &col)
- void **save\_cursor** (int row, int col)
- int **total\_vals** (void) const
- int **val** (int i) const

### Static Public Attributes

- static const int **completed** = 1
- static const int **fail** = -1
- static const int **maxbuff** = 80
- static const int **maxvals** = 20
- static const int **success** = 0

The documentation for this class was generated from the following files:

- [FI\\_Terminal.H](#)
- [FI\\_Terminal.cxx](#)

## 33.7 FI Class Reference

The [FI](#) is the FLTK global (static) class containing state information and global methods for the current application.  
`#include <Fl.H>`

### Public Types

- enum [FI\\_Option](#) {  
[OPTION\\_ARROW\\_FOCUS](#) = 0, [OPTION\\_VISIBLE\\_FOCUS](#), [OPTION\\_DND\\_TEXT](#), [OPTION\\_SHOW\\_TOOLTIPS](#),  
[OPTION\\_FNFC\\_USES\\_GTK](#), [OPTION\\_FNFC\\_USES\\_ZENITY](#), [OPTION\\_FNFC\\_USES\\_KDIALOG](#),  
[OPTION\\_PRINTER\\_USES\\_GTK](#),  
[OPTION\\_SHOW\\_SCALING](#), [OPTION\\_SIMPLE\\_ZOOM\\_SHORTCUT](#), [OPTION\\_LAST](#) }  
*Enumerator for global FLTK options.*

### Static Public Member Functions

- static int [abi\\_check](#) (const int val=[FL\\_ABI\\_VERSION](#))  
*Returns whether the runtime library ABI version is correct.*
- static int [abi\\_version](#) ()  
*Returns the compiled-in value of the [FL\\_ABI\\_VERSION](#) constant.*
- static int [add\\_awake\\_handler\\_](#) ([FI\\_Awake\\_Handler](#), void \*)  
*Adds an awake handler for use in [awake\(\)](#).*
- static void [add\\_check](#) ([FI\\_Timeout\\_Handler](#), void (\*)(void))  
*FLTK will call this callback just before it flushes the display and waits for events.*
- static void [add\\_clipboard\\_notify](#) ([FI\\_Clipboard\\_Notify\\_Handler](#) h, void \*data=0)  
*FLTK will call the registered callback whenever there is a change to the selection buffer or the clipboard.*

- static void `add_fd` (int fd, `FI_FD_Handler` cb, void \*=0)  
*Adds file descriptor fd to listen to.*
- static void `add_fd` (int fd, int when, `FI_FD_Handler` cb, void \*=0)  
*Adds file descriptor fd to listen to.*
- static void `add_handler` (`FI_Event_Handler` ha)  
*Install a function to parse unrecognized events.*
- static void `add_handler` (`FI_Event_Handler` ha, `FI_Event_Handler` before)  
*Install a function to parse unrecognized events with less priority than another function.*
- static void `add_idle` (`FI_Idle_Handler` cb, void \*data=0)  
*Adds a callback function that is called every time by `FI::wait()` and also makes it act as though the timeout is zero (this makes `FI::wait()` return immediately, so if it is in a loop it is called repeatedly, and thus the idle function is called repeatedly).*
- static void `add_system_handler` (`FI_System_Handler` h, void \*data)  
*Install a function to intercept system events.*
- static void `add_timeout` (double t, `FI_Timeout_Handler` cb, void \*data=0)  
*Adds a one-shot timeout callback.*
- static int `api_version` ()  
*Returns the compiled-in value of the `FL_API_VERSION` constant.*
- static int `arg` (int argc, char \*\*argv, int &i)  
*Parse a single switch from argv, starting at word i.*
- static void `args` (int argc, char \*\*argv)  
*Parse all command line switches matching standard FLTK options only.*
- static int `args` (int argc, char \*\*argv, int &i, `FI_Args_Handler` cb=0)  
*Parse command line switches using the cb argument handler.*
- static int `args_to_utf8` (int argc, char \*\*&argv)  
*Convert Windows commandline arguments to UTF-8.*
- static int `awake` (`FI_Awake_Handler` cb, void \*message=0)  
*See void awake(void\* message=0).*
- static void `awake` (void \*message=0)  
*Sends a message pointer to the main thread, causing any pending `FI::wait()` call to terminate so that the main thread can retrieve the message and any pending redraws can be processed.*
- static void `background` (uchar, uchar, uchar)  
*Changes fl\_color(FL\_BACKGROUND\_COLOR) to the given color, and changes the gray ramp from 32 to 56 to black to white.*
- static void `background2` (uchar, uchar, uchar)  
*Changes the alternative background color.*
- static `FI_Widget` \* `belowmouse` ()  
*Gets the widget that is below the mouse.*
- static void `belowmouse` (`FI_Widget` \*)  
*Sets the widget that is below the mouse.*
- static int `box_border_radius_max` ()  
*Get the maximum border radius of all "rounded" boxtypes in pixels.*
- static void `box_border_radius_max` (int R)  
*Set the maximum border radius of all "rounded" boxtypes in pixels.*
- static `FI_Color` `box_color` (`FI_Color`)  
*Gets the drawing color to be used for the background of a box.*
- static int `box_dh` (`FI_Boxtype`)  
*Returns the height offset for the given boxtype.*
- static int `box_dw` (`FI_Boxtype`)  
*Returns the width offset for the given boxtype.*
- static int `box_dx` (`FI_Boxtype`)

- Returns the X offset for the given boxtype.*

  - static int `box_dy` (`Fl_Boxtype`)
- Returns the Y offset for the given boxtype.*

  - static int `box_shadow_width` ()
- Get the box shadow width of all "shadow" boxtypes in pixels.*

  - static void `box_shadow_width` (int W)
- Set the box shadow width of all "shadow" boxtypes in pixels.*

  - static bool `cairo_autolink_context` ()
- Gets the current autolink mode for Cairo support.*

  - static void `cairo_autolink_context` (bool alink)
- When FLTK\_HAVE\_CAIRO is defined and `cairo_autolink_context()` is true, any current window dc is linked to a current Cairo context.*

  - static cairo\_t \* `cairo_cc` ()
- Gets the current Cairo context linked with a fltk window.*

  - static void `cairo_cc` (cairo\_t \*c, bool own=false)
- Sets the current Cairo context to c.*

  - static void `cairo_flush` (cairo\_t \*c)
- Flush Cairo drawings on Cairo context c.*

  - static cairo\_t \* `cairo_make_current` (`Fl_Window` \*w)
- Provides a Cairo context for window wi.*

  - static `Fl_Callback_Reason` `callback_reason` ()
- Give the reason for calling a callback.*

  - static int `check` ()
- Same as Fl::wait(0).*

  - static void `clear_widget_pointer` (`Fl_Widget` const \*w)
- Clears a widget pointer in the watch list.*

  - static int `clipboard_contains` (const char \*type)
- Returns non 0 if the clipboard contains data matching type.*

  - static int `compose` (int &del)
- Any text editing widget should call this for each FL\_KEYBOARD event.*

  - static void `compose_reset` ()
- If the user moves the cursor, be sure to call Fl::compose\_reset().*

  - static void `copy` (const char \*stuff, int len, int destination=0, const char \*type=`Fl::clipboard_plain_text`)
- Copies data to the selection buffer, the clipboard, or both.*

  - static int `damage` ()
- If true then flush() will do something.*

  - static void `damage` (int d)
- If true then flush() will do something.*

  - static void `default_atclose` (`Fl_Window` \*, void \*)
- Default callback for window widgets.*

  - static void `delete_widget` (`Fl_Widget` \*w)
- Schedules a widget for deletion at the next call to the event loop.*

  - static void `disable_im` ()
- Disables the system input methods facilities.*

  - static void `display` (const char \*)
- Sets the X or Wayland display to use for all windows.*

  - static int `dnd` ()
- Initiate a Drag And Drop operation.*

  - static int `dnd_text_ops` ()
- Gets whether drag and drop text operations are supported.*

  - static void `dnd_text_ops` (int v)

- Sets whether drag and drop text operations are supported.*

  - static void `do_widget_deletion` ()

*Deletes widgets previously scheduled for deletion.*
- static int `draw_box_active` ()

*Determines if the currently drawn box is active or inactive.*
- static int `draw_GL_text_with_textures` ()

*returns whether whether OpenGL uses textures to draw all text.*
- static void `draw_GL_text_with_textures` (int val)

*sets whether OpenGL uses textures to draw all text.*
- static void `enable_im` ()

*Enables the system input methods facilities.*
- static int `event` ()

*Returns the last event that was processed.*
- static int `event_alt` ()

*Returns non-zero if the Alt key is pressed.*
- static int `event_button` ()

*Gets which particular mouse button caused the current event.*
- static int `event_button1` ()

*Returns non-zero if mouse button 1 is currently held down.*
- static int `event_button2` ()

*Returns non-zero if mouse button 2 is currently held down.*
- static int `event_button3` ()

*Returns non-zero if mouse button 3 is currently held down.*
- static int `event_button4` ()

*Returns non-zero if mouse button 4 is currently held down.*
- static int `event_button5` ()

*Returns non-zero if mouse button 5 is currently held down.*
- static int `event_buttons` ()

*Returns the mouse buttons state bits; if non-zero, then at least one button is pressed now.*
- static int `event_clicks` ()

*Returns non zero if we had a double click event.*
- static void `event_clicks` (int i)

*Manually sets the number returned by `FL::event_clicks()`.*
- static void \* `event_clipboard` ()

*During an FL\_PASTE event of non-textual data, returns a pointer to the pasted data.*
- static const char \* `event_clipboard_type` ()

*Returns the type of the pasted data during an FL\_PASTE event.*
- static int `event_command` ()

*Returns non-zero if the FL\_COMMAND key is pressed, either FL\_CTRL or on OSX FL\_META.*
- static int `event_ctrl` ()

*Returns non-zero if the Control key is pressed.*
- static `FL_Event_Dispatch` `event_dispatch` ()

*Return the current event dispatch function.*
- static void `event_dispatch` (`FL_Event_Dispatch` d)

*Set a new event dispatch function.*
- static int `event_dx` ()

*Returns the current horizontal mouse scrolling associated with the FL\_MOUSEWHEEL event.*
- static int `event_dy` ()

*Returns the current vertical mouse scrolling associated with the FL\_MOUSEWHEEL event.*
- static int `event_inside` (const `FL_Widget` \*)

*Returns whether or not the mouse event is inside a given child widget.*

- static int [event\\_inside](#) (int, int, int, int)  
*Returns whether or not the mouse event is inside the given rectangle.*
- static int [event\\_is\\_click](#) ()  
*Returns non-zero if the mouse has not moved far enough and not enough time has passed since the last `FL_PUSH` or `FL_KEYBOARD` event for it to be considered a "drag" rather than a "click".*
- static void [event\\_is\\_click](#) (int i)  
*Clears the value returned by `Fl::event_is_click()`.*
- static int [event\\_key](#) ()  
*Gets which key on the keyboard was last pushed.*
- static int [event\\_key](#) (int key)  
*Returns true if the given `key` was held down (or pressed) during the last event.*
- static int [event\\_length](#) ()  
*Returns the length of the text in `Fl::event_text()`.*
- static int [event\\_original\\_key](#) ()  
*Returns the keycode of the last key event, regardless of the NumLock state.*
- static int [event\\_shift](#) ()  
*Returns non-zero if the Shift key is pressed.*
- static int [event\\_state](#) ()  
*Returns the keyboard and mouse button states of the last event.*
- static int [event\\_state](#) (int mask)  
*Returns non-zero if any of the passed event state bits are turned on.*
- static const char \* [event\\_text](#) ()  
*Returns the text associated with the current event, including `FL_PASTE` or `FL_DND_RELEASE` events.*
- static int [event\\_x](#) ()  
*Returns the mouse position of the event relative to the `Fl_Window` it was passed to.*
- static int [event\\_x\\_root](#) ()  
*Returns the mouse position on the screen of the event.*
- static int [event\\_y](#) ()  
*Returns the mouse position of the event relative to the `Fl_Window` it was passed to.*
- static int [event\\_y\\_root](#) ()  
*Returns the mouse position on the screen of the event.*
- static `Fl_Window` \* [first\\_window](#) ()  
*Returns the first top-level window in the list of `shown()` windows.*
- static void [first\\_window](#) (`Fl_Window` \*)  
*Sets the window that is returned by `first_window()`.*
- static void [flush](#) ()  
*Causes all the windows that need it to be redrawn and graphics forced out through the pipes.*
- static `Fl_Widget` \* [focus](#) ()  
*Gets the current `Fl::focus()` widget.*
- static void [focus](#) (`Fl_Widget` \*)  
*Sets the widget that will receive `FL_KEYBOARD` events.*
- static void [foreground](#) (uchar, uchar, uchar)  
*Changes `fl_color(FL_FOREGROUND_COLOR)`.*
- static void [free\\_color](#) (`Fl_Color` i, int overlay=0)  
*Frees the specified color from the colormap, if applicable.*
- static int [get\\_awesome\\_handler\\_](#) (`Fl_Awake_Handler` &, void \*&)  
*Gets the last stored awake handler for use in `awake()`.*
- static `Fl_Box_Draw_F` \* [get\\_boxtype](#) (`Fl_Boxtype`)  
*Gets the current box drawing function for the specified box type.*
- static unsigned [get\\_color](#) (`Fl_Color` i)  
*Returns the RGB value(s) for the given FLTK color index.*

- static void [get\\_color](#) ([FL\\_Color](#) i, [uchar](#) &red, [uchar](#) &green, [uchar](#) &blue)
 

*Returns the RGB value(s) for the given FLTK color index.*
- static void [get\\_color](#) ([FL\\_Color](#) i, [uchar](#) &red, [uchar](#) &green, [uchar](#) &blue, [uchar](#) &alpha)
 

*Returns the RGBA value(s) for the given FLTK color index.*
- static const char \* [get\\_font](#) ([FL\\_Font](#))
 

*Gets the string for this face.*
- static const char \* [get\\_font\\_name](#) ([FL\\_Font](#), int \*attributes=0)
 

*Get a human-readable string describing the family of this face.*
- static int [get\\_font\\_sizes](#) ([FL\\_Font](#), int \*&sizep)
 

*Return an array of sizes in sizep.*
- static int [get\\_key](#) (int key)
 

*Returns true if the given key is held down now.*
- static void [get\\_mouse](#) (int &, int &)
 

*Return where the mouse is on the screen by doing a round-trip query to the server.*
- static void [get\\_system\\_colors](#) ()
 

*Read the user preference colors from the system and use them to call [Fl::foreground\(\)](#), [Fl::background\(\)](#), and [Fl::background2\(\)](#).*
- static int [gl\\_visual](#) (int, int \*alist=0)
 

*This does the same thing as [Fl::visual\(int\)](#) but also requires OpenGL drawing to work.*
- static [FL\\_Window](#) \* [grab](#) ()
 

*Returns the window that currently receives all events.*
- static void [grab](#) ([FL\\_Window](#) &win)
 

*See [grab\(FL\\_Window\\*\)](#)*
- static void [grab](#) ([FL\\_Window](#) \*)
 

*Selects the window to grab.*
- static int [h](#) ()
 

*Returns the height in pixels of the main screen work area.*
- static int [handle](#) (int, [FL\\_Window](#) \*)
 

*Handle events from the window system.*
- static int [handle\\_](#) (int, [FL\\_Window](#) \*)
 

*Handle events from the window system.*
- static int [has\\_check](#) ([FL\\_Timeout\\_Handler](#), void \*=0)
 

*Returns 1 if the check exists and has not been called yet, 0 otherwise.*
- static int [has\\_idle](#) ([FL\\_Idle\\_Handler](#) cb, void \*data=0)
 

*Returns true if the specified idle callback is currently installed.*
- static int [has\\_timeout](#) ([FL\\_Timeout\\_Handler](#) cb, void \*data=0)
 

*Returns true if the timeout exists and has not been called yet.*
- static void [hide\\_all\\_windows](#) ()
 

*Hide all visible windows to make FLTK leave [Fl::run\(\)](#).*
- static int [is\\_scheme](#) (const char \*name)
 

*Returns whether the current scheme is the given name.*
- static void [keyboard\\_screen\\_scaling](#) (int value)
 

*Controls the possibility to scale all windows by ctrl+/-/0/ or cmd+/-/0/.*
- static [FL\\_Event\\_Handler](#) [last\\_handler](#) ()
 

*Returns the last function installed by a call to [Fl::add\\_handler\(\)](#).*
- static int [lock](#) ()
 

*The [lock\(\)](#) method blocks the current thread until it can safely access FLTK widgets and data.*
- static int [menu\\_linespacing](#) ()
 

*Gets the default line spacing used by menus.*
- static void [menu\\_linespacing](#) (int H)
 

*Sets the default line spacing used by menus.*

- static [FL\\_Window](#) \* [modal](#) ()  
*Returns the top-most [modal\(\)](#) window currently shown.*
- static [FL\\_Window](#) \* [next\\_window](#) (const [FL\\_Window](#) \*)  
*Returns the next top-level window in the list of shown() windows.*
- static [FL\\_Timestamp](#) [now](#) (double offset=0)  
*Set a time stamp at this point in time with optional signed offset in seconds.*
- static bool [option](#) ([FL\\_Option](#) opt)  
*FLTK library options management.*
- static void [option](#) ([FL\\_Option](#) opt, bool val)  
*Override an option while the application is running.*
- static void [own\\_colormap](#) ()  
*Makes FLTK use its [own colormap](#).*
- static void [paste](#) ([FL\\_Widget](#) &receiver)  
*Backward compatibility only.*
- static void [paste](#) ([FL\\_Widget](#) &receiver, int source, const char \*type=[FL::clipboard\\_plain\\_text](#))  
*Pastes the data from the selection buffer (*source is 0*) or the clipboard (*source is 1*) into receiver.*
- static int [program\\_should\\_quit](#) ()  
*Returns non-zero when a request for program termination was received and accepted.*
- static void [program\\_should\\_quit](#) (int should\_i)  
*Indicate to the FLTK library whether a program termination request was received and accepted.*
- static [FL\\_Widget](#) \* [pushed](#) ()  
*Gets the widget that is being pushed.*
- static void [pushed](#) ([FL\\_Widget](#) \*)  
*Sets the widget that is being pushed.*
- static [FL\\_Widget](#) \* [readqueue](#) ()  
*Reads the default callback queue and returns the first widget.*
- static int [ready](#) ()  
*This is similar to [FL::check\(\)](#) except this does not call [FL::flush\(\)](#) or any callbacks, which is useful if your program is in a state where such callbacks are illegal.*
- static void [redraw](#) ()  
*Redraws all widgets.*
- static void [release](#) ()  
*Releases the current grabbed window, equals [grab\(0\)](#).*
- static void [release\\_widget\\_pointer](#) ([FL\\_Widget](#) \*&w)  
*Releases a widget pointer from the watch list.*
- static int [reload\\_scheme](#) ()  
*Called internally when setting a new scheme according to scheme name.*
- static void [remove\\_check](#) ([FL\\_Timeout\\_Handler](#), void \*=0)  
*Removes a check callback.*
- static void [remove\\_clipboard\\_notify](#) ([FL\\_Clipboard\\_Notify\\_Handler](#) h)  
*Stop calling the specified callback when there are changes to the selection buffer or the clipboard.*
- static void [remove\\_fd](#) (int)  
*Removes a file descriptor handler.*
- static void [remove\\_fd](#) (int, int when)  
*Removes a file descriptor handler.*
- static void [remove\\_handler](#) ([FL\\_Event\\_Handler](#) h)  
*Removes a previously added event handler.*
- static void [remove\\_idle](#) ([FL\\_Idle\\_Handler](#) cb, void \*data=0)  
*Removes the specified idle callback, if it is installed.*
- static int [remove\\_next\\_timeout](#) ([FL\\_Timeout\\_Handler](#) cb, void \*data=0, void \*\*data\_return=0)  
*Remove the next matching timeout callback and return its *data* pointer.*

- static void [remove\\_system\\_handler](#) (FI\_System\_Handler h)  
*Removes a previously added system event handler.*
- static void [remove\\_timeout](#) (FI\_Timeout\_Handler cb, void \*data=0)  
*Remove one or more matching timeout callbacks from the timer queue.*
- static void [repeat\\_timeout](#) (double t, FI\_Timeout\_Handler cb, void \*data=0)  
*Repeats a timeout callback from the expiration of the previous timeout, allowing for more accurate timing.*
- static int [run](#) ()  
*Calls [FI::wait\(\)](#) repeatedly as long as any windows are displayed.*
- static void [run\\_checks](#) ()
- static void [run\\_idle](#) ()
- static const char \* [scheme](#) ()  
*See void [scheme\(const char \\*name\)](#)*
- static int [scheme](#) (const char \*name)  
*Sets the current widget scheme.*
- static int [screen\\_count](#) ()  
*Gets the total count of available screens.*
- static void [screen\\_dpi](#) (float &h, float &v, int n=0)  
*Gets the screen resolution in dots-per-inch for the given screen.*
- static FI\_Screen\_Driver \* [screen\\_driver](#) ()  
*Returns a pointer to the unique FI\_Screen\_Driver object of the platform.*
- static int [screen\\_num](#) (int x, int y)  
*Gets the screen number of a screen that contains the specified screen position x, y.*
- static int [screen\\_num](#) (int x, int y, int w, int h)  
*Gets the screen number of the screen which intersects the most with the rectangle defined by x, y, w, h.*
- static float [screen\\_scale](#) (int n)  
*Gets the GUI scaling factor of screen number n.*
- static void [screen\\_scale](#) (int n, float factor)  
*Sets the GUI scaling factor of screen number n.*
- static int [screen\\_scaling\\_supported](#) ()  
*Returns whether scaling factors are supported by this platform.*
- static void [screen\\_work\\_area](#) (int &X, int &Y, int &W, int &H)  
*Gets the bounding box of the work area of the screen that contains the mouse pointer.*
- static void [screen\\_work\\_area](#) (int &X, int &Y, int &W, int &H, int mx, int my)  
*Gets the bounding box of the work area of a screen that contains the specified screen position mx, my.*
- static void [screen\\_work\\_area](#) (int &X, int &Y, int &W, int &H, int n)  
*Gets the bounding box of the work area of the given screen.*
- static void [screen\\_xywh](#) (int &X, int &Y, int &W, int &H)  
*Gets the bounding box of a screen that contains the mouse pointer.*
- static void [screen\\_xywh](#) (int &X, int &Y, int &W, int &H, int mx, int my)  
*Gets the bounding box of a screen that contains the specified screen position mx, my.*
- static void [screen\\_xywh](#) (int &X, int &Y, int &W, int &H, int mx, int my, int mw, int mh)  
*Gets the screen bounding rect for the screen which intersects the most with the rectangle defined by mx, my, mw, mh.*
- static void [screen\\_xywh](#) (int &X, int &Y, int &W, int &H, int n)  
*Gets the screen bounding rect for the given screen.*
- static int [scrollbar\\_size](#) ()  
*Gets the default scrollbar size used by [FI\\_Browser](#), [FI\\_Help\\_View](#), [FI\\_Scroll](#), and [FI\\_Text\\_Display](#) widgets.*
- static void [scrollbar\\_size](#) (int W)  
*Sets the default scrollbar size that is used by the [FI\\_Browser](#), [FI\\_Help\\_View](#), [FI\\_Scroll](#), and [FI\\_Text\\_Display](#) widgets.*
- static double [seconds\\_between](#) (FI\_Timestamp &back, FI\_Timestamp &further\_back)  
*Return the time in seconds between two time stamps.*
- static double [seconds\\_since](#) (FI\_Timestamp &then)

- Return the time in seconds between now and a previously taken time stamp.*

  - static void [selection](#) ([Fl\\_Widget](#) &owner, const char \*, int len)

*Changes the current selection.*
- static [Fl\\_Widget](#) \* [selection\\_owner](#) ()

*back-compatibility only: Gets the widget owning the current selection*
- static void [selection\\_owner](#) ([Fl\\_Widget](#) \*)

*Back-compatibility only: The single-argument call can be used to move the selection to another widget or to set the owner to NULL, without changing the actual text of the selection.*
- static int [selection\\_to\\_clipboard](#) ()

*Returns the current selection\_to\_clipboard mode.*
- static void [selection\\_to\\_clipboard](#) (int mode)

*Copies selections on X11 directly to the clipboard if enabled.*
- static void **set\_abort** ([Fl\\_Abort\\_Handler](#) f)

*For back compatibility, sets the void [Fl::fatal](#) handler callback.*
- static void [set\\_atclose](#) ([Fl\\_Atclose\\_Handler](#) f)

*For back compatibility, sets the [Fl::atclose](#) handler callback.*
- static void [set\\_box\\_color](#) ([Fl\\_Color](#))

*Sets the drawing color for the box that is currently drawn.*
- static void [set\\_boxtype](#) ([Fl\\_Boxtype](#), [Fl\\_Box\\_Draw\\_F](#) \*, [uchar](#), [uchar](#), [uchar](#), [uchar](#), [Fl\\_Box\\_Draw\\_Focus\\_F](#) \*[=NULL](#))

*Sets the function to call to draw a specific box type.*
- static void **set\_boxtype** ([Fl\\_Boxtype](#), [Fl\\_Boxtype](#) from)

*Copies the from boxtype.*
- static void [set\\_color](#) ([Fl\\_Color](#) i, unsigned c)

*Sets an entry in the fl\_color index table.*
- static void [set\\_color](#) ([Fl\\_Color](#), [uchar](#), [uchar](#), [uchar](#))

*Sets an entry in the fl\_color index table.*
- static void [set\\_color](#) ([Fl\\_Color](#), [uchar](#), [uchar](#), [uchar](#), [uchar](#))

*Sets an entry in the fl\_color index table.*
- static void [set\\_font](#) ([Fl\\_Font](#), const char \*)

*Changes a face.*
- static void **set\_font** ([Fl\\_Font](#), [Fl\\_Font](#))

*Copies one face to another.*
- static [Fl\\_Font](#) [set\\_fonts](#) (const char \*[=0](#))

*FLTK will open the display, and add every fonts on the server to the face table.*
- static void [set\\_idle](#) ([Fl\\_Old\\_Idle\\_Handler](#) cb)

*Sets an idle callback.*
- static void **set\_labeltype** ([Fl\\_Labeltype](#), [Fl\\_Label\\_Draw\\_F](#) \*, [Fl\\_Label\\_Measure\\_F](#) \*)

*Sets the functions to call to draw and measure a specific labeltype.*
- static void **set\_labeltype** ([Fl\\_Labeltype](#), [Fl\\_Labeltype](#) from)

*Sets the functions to call to draw and measure a specific labeltype.*
- static int **system** (const char \*command)

*Run a command line on the computer.*
- static [Fl\\_System\\_Driver](#) \* **system\_driver** ()

*Returns a pointer to the unique [Fl\\_System\\_Driver](#) object of the platform.*
- static int [test\\_shortcut](#) ([Fl\\_Shortcut](#))

*Tests the current event, which must be an [FL\\_KEYBOARD](#) or [FL\\_SHORTCUT](#), against a shortcut value (described in [Fl\\_Button](#)).*
- static void \* [thread\\_message](#) ()

*The [thread\\_message\(\)](#) method returns the last message that was sent from a child by the [awake\(\)](#) method.*
- static long [ticks\\_between](#) ([Fl\\_Timestamp](#) &back, [Fl\\_Timestamp](#) &further\_back)

- Return the time in ticks (60Hz) between two time stamps.*

  - static long `ticks_since` (`FI_Timestamp` &then)

*Return the time in ticks (60Hz) between now and a previously taken time stamp.*
- static void `unlock` ()

*The `unlock()` method releases the lock that was set using the `lock()` method.*
- static int `use_high_res_GL` ()

*returns whether GL windows should be drawn at high resolution on Apple computers with retina displays.*
- static void `use_high_res_GL` (int val)

*sets whether GL windows should be drawn at high resolution on Apple computers with retina displays*
- static double `version` ()

*Returns the compiled-in value of the `FL_VERSION` constant.*
- static int `visible_focus` ()

*Gets or sets the visible keyboard focus on buttons and other non-text widgets.*
- static void `visible_focus` (int v)

*Gets or sets the visible keyboard focus on buttons and other non-text widgets.*
- static int `visual` (int)

*Selects a visual so that your graphics are drawn correctly.*
- static int `w` ()

*Returns the width in pixels of the main screen work area.*
- static int `wait` ()

*Waits until "something happens" and then returns.*
- static double `wait` (double time)

*Waits a maximum of `time_to_wait` seconds or until "something happens".*
- static void `watch_widget_pointer` (`FI_Widget` \*&w)

*Adds a widget pointer to the widget watch list.*
- static int `x` ()

*Returns the leftmost x coordinate of the main screen work area.*
- static int `y` ()

*Returns the topmost y coordinate of the main screen work area.*

## Static Public Attributes

- static void(\* `atclose` )(`FI_Window` \*, void \*)

*Back compatibility: default window callback handler.*
- static char const \*const `clipboard_image` = "image"

*Denotes image data.*
- static char const \*const `clipboard_plain_text` = "text/plain"

*Denotes plain textual data.*
- static void(\* `error` )(const char \*,...) = `FI_System_Driver::error`

*FLTK calls `Fl::error()` to output a normal error message.*
- static void(\* `fatal` )(const char \*,...) = `FI_System_Driver::fatal`

*FLTK calls `Fl::fatal()` to output a fatal error message.*
- static const char \*const `help` = `helpmsg+13`

*Usage string displayed if `Fl::args()` detects an invalid argument.*
- static void(\* `idle` )()

*The currently executing idle callback function: DO NOT USE THIS DIRECTLY!*
- static void(\* `warning` )(const char \*,...) = `FI_System_Driver::warning`

*FLTK calls `Fl::warning()` to output a warning message.*

## Friends

- class `FI_System_Driver`

### 33.7.1 Detailed Description

The [Fl](#) is the FLTK global (static) class containing state information and global methods for the current application.

### 33.7.2 Member Enumeration Documentation

#### 33.7.2.1 Fl\_Option

enum [Fl::Fl\\_Option](#)

Enumerator for global FLTK options.

These options can be set system wide, per user, or for the running application only.

See also

[Fl::option\(Fl\\_Option, bool\)](#)

[Fl::option\(Fl\\_Option\)](#)

Enumerator

OPTION_ARROW_FOCUS	When switched on, moving the text cursor beyond the start or end of a text in a text widget will change focus to the next text widget. (This is considered 'old' behavior) When switched off (default), the cursor will stop at the end of the text. Pressing Tab or Ctrl-Tab will advance the keyboard focus. See also: <a href="#">Fl_Input::tab_nav()</a>
OPTION_VISIBLE_FOCUS	If visible focus is switched on (default), FLTK will draw a dotted rectangle inside the widget that will receive the next keystroke. If switched off, no such indicator will be drawn and keyboard navigation is disabled.
OPTION_DND_TEXT	If text drag-and-drop is enabled (default), the user can select and drag text from any text widget. If disabled, no dragging is possible, however dropping text from other applications still works.
OPTION_SHOW_TOOLTIPS	If tooltips are enabled (default), hovering the mouse over a widget with a tooltip text will open a little tooltip window until the mouse leaves the widget. If disabled, no tooltip is shown.
OPTION_FNFC_USES_GTK	When switched on (default), <a href="#">Fl_Native_File_Chooser</a> runs GTK file dialogs if the GTK library is available on the platform (linux/unix only). When switched off, GTK file dialogs aren't used even if the GTK library is available.
OPTION_FNFC_USES_ZENITY	Meaningful for the Wayland/X11 platform only. When switched on, the library uses a Zenity-based file dialog. When switched off (default), no zenity-based file dialog is used.
OPTION_FNFC_USES_KDIALOG	Meaningful for the Wayland/X11 platform only. When switched on, the library uses a kdialog-based file dialog if command 'kdialog' is available on the running system. When switched off (default), no kdialog-based file dialog is used.
OPTION_PRINTER_USES_GTK	When switched on (default), <a href="#">Fl_Printer</a> runs the GTK printer dialog if the GTK library is available on the platform (linux/unix only). When switched off, the GTK printer dialog isn't used even if the GTK library is available.
OPTION_SHOW_SCALING	When switched on (default), the library shows in a transient yellow window the zoom factor value. When switched off, no such window gets displayed.

## Enumerator

OPTION_SIMPLE_ZOOM_SHORTCUT	When switched on and when the keyboard in use has '+' in the shifted position of its key, pressing that key and ctrl triggers the zoom-in operation. When switched off (default), the zoom-in operation requires that also the shift key is pressed. Under macOS, this option has no effect because the OS itself generates = followed by + when pressing and the '= +' key without pressing shift.
OPTION_LAST	For internal use only.

### 33.7.3 Member Function Documentation

#### 33.7.3.1 `abi_check()`

```
static int Fl::abi_check (
    const int val = FL_ABI_VERSION ) [inline], [static]
```

Returns whether the runtime library ABI version is correct.

This enables you to check the ABI version of the linked FLTK library at runtime.

Returns 1 (true) if the compiled ABI version (in the header files) and the linked library ABI version (used at runtime) are the same, 0 (false) otherwise.

Argument `val` can be used to query a particular library ABI version. Use for instance 10303 to query if the runtime library is compatible with FLTK ABI version 1.3.3. This is rarely useful.

The default `val` argument is `FL_ABI_VERSION`, which checks the version defined at configure time (i.e. in the header files at program compilation time) against the linked library version used at runtime. This is particularly useful if you linked with a shared object library, but it also concerns static linking.

See also

[Fl::abi\\_version\(\)](#)

#### 33.7.3.2 `abi_version()`

```
int Fl::abi_version ( ) [static]
```

Returns the compiled-in value of the `FL_ABI_VERSION` constant.

This is useful for checking the version of a shared library.

#### 33.7.3.3 `add_check()`

```
void Fl::add_check (
    Fl_Timeout_Handler cb,
    void * argp = 0 ) [static]
```

FLTK will call this callback just before it flushes the display and waits for events.

This is different than an idle callback because it is only called once, then FLTK calls the system and tells it not to return until an event happens.

This can be used by code that wants to monitor the application's state, such as to keep a display up to date. The advantage of using a check callback is that it is called only when no events are pending. If events are coming in quickly, whole blocks of them will be processed before this is called once. This can save significant time and avoid the application falling behind the events.

Sample code:

```
bool state_changed; // anything that changes the display turns this on
void callback(void*) {
    if (!state_changed) return;
    state_changed = false;
    do_expensive_calculation();
    widget->redraw();
}
main() {
```

```

    Fl::add_check(callback);
    return Fl::run();
}

```

### 33.7.3.4 add\_fd() [1/2]

```

void Fl::add_fd (
    int fd,
    Fl_FD_Handler cb,
    void * d = 0 ) [static]

```

Adds file descriptor `fd` to listen to.

See [Fl::add\\_fd\(int fd, int when, Fl\\_FD\\_Handler cb, void\\* = 0\)](#) for details

### 33.7.3.5 add\_fd() [2/2]

```

void Fl::add_fd (
    int fd,
    int when,
    Fl_FD_Handler cb,
    void * d = 0 ) [static]

```

Adds file descriptor `fd` to listen to.

When the `fd` becomes ready for reading [Fl::wait\(\)](#) will call the callback and then return. The callback is passed the `fd` and the arbitrary `void*` argument.

This version takes a `when` bitfield, with the bits `FL_READ`, `FL_WRITE`, and `FL_EXCEPT` defined, to indicate when the callback should be done.

There can only be one callback of each type for a file descriptor. [Fl::remove\\_fd\(\)](#) gets rid of *all* the callbacks for a given file descriptor.

Under UNIX/Linux/macOS *any* file descriptor can be monitored (files, devices, pipes, sockets, etc.). Due to limitations in Microsoft Windows, Windows applications can only monitor sockets.

Under macOS, [Fl::add\\_fd\(\)](#) opens the display if that's not been done before.

### 33.7.3.6 add\_idle()

```

void Fl::add_idle (
    Fl_Idle_Handler cb,
    void * data = 0 ) [static]

```

Adds a callback function that is called every time by [Fl::wait\(\)](#) and also makes it act as though the timeout is zero (this makes [Fl::wait\(\)](#) return immediately, so if it is in a loop it is called repeatedly, and thus the idle function is called repeatedly).

The idle function can be used to get background processing done.

You can have multiple idle callbacks. To remove an idle callback use [Fl::remove\\_idle\(\)](#).

[Fl::wait\(\)](#) and [Fl::check\(\)](#) call idle callbacks, but [Fl::ready\(\)](#) does not.

The idle callback can call any FLTK functions, including [Fl::wait\(\)](#), [Fl::check\(\)](#), and [Fl::ready\(\)](#).

FLTK will not recursively call the idle callback.

### 33.7.3.7 add\_timeout()

```

void Fl::add_timeout (
    double time,
    Fl_Timeout_Handler cb,
    void * data = 0 ) [static]

```

Adds a one-shot timeout callback.

The callback function `cb` will be called by [Fl::wait\(\)](#) at `time` seconds after this function is called. The callback function must have the signature [Fl\\_Timeout\\_Handler](#). The optional `data` argument is passed to the callback (default: `NULL`).

The timer is removed from the timer queue before the callback function is called. It is safe to reschedule the timeout inside the callback function.

You can have multiple timeout callbacks, even the same timeout callback with different timeout values and/or different `data` values. They are all considered different timer objects.

To remove a timeout while it is active (pending) use [Fl::remove\\_timeout\(\)](#).

If you need more accurate, repeated timeouts, use [Fl::repeat\\_timeout\(\)](#) to reschedule the subsequent timeouts. Please see [Fl::repeat\\_timeout\(\)](#) for an example.

Since version 1.4, a timeout can be started from a child thread under the condition that the call to [Fl::add\\_timeout](#) is wrapped in [Fl::lock\(\)](#) and [Fl::unlock\(\)](#).

#### Parameters

in	<i>time</i>	delta time in seconds until the timer expires
in	<i>cb</i>	callback function
in	<i>data</i>	optional user data (default: NULL)

#### See also

[Fl\\_Timeout\\_Handler](#)

[Fl::repeat\\_timeout\(double time, Fl\\_Timeout\\_Handler cb, void \\*data\)](#)

[Fl::remove\\_timeout\(Fl\\_Timeout\\_Handler cb, void \\*data\)](#)

[Fl::has\\_timeout\(Fl\\_Timeout\\_Handler cb, void \\*data\)](#)

#### 33.7.3.8 api\_version()

```
int Fl::api_version ( ) [static]
```

Returns the compiled-in value of the FL\_API\_VERSION constant.

This is useful for checking the version of a shared library.

#### 33.7.3.9 arg()

```
int Fl::arg (
    int argc,
    char ** argv,
    int & i ) [static]
```

Parse a single switch from *argv*, starting at word *i*.

Returns the number of words eaten (1 or 2, or 0 if it is not recognized) and adds the same value to *i*.

This is the default argument handler used internally by [Fl::args\(...\)](#), but you can use this function if you prefer to step through the standard FLTK switches yourself.

All standard FLTK switches except -bg2 may be abbreviated to just one letter and case is ignored:

- -bg color or -background color  
Sets the background color using [Fl::background\(\)](#).
- -bg2 color or -background2 color  
Sets the secondary background color using [Fl::background2\(\)](#).
- -display host:n.n  
Sets the X display to use; this option is silently ignored under Windows and MacOS.
- -dnd and -nodnd  
Enables or disables drag and drop text operations using [Fl::dnd\\_text\\_ops\(\)](#).
- -fg color or -foreground color  
Sets the foreground color using [Fl::foreground\(\)](#).
- -geometry WxH+X+Y  
Sets the initial window position and size according to the standard X geometry string.
- -iconic  
Iconifies the window using [Fl\\_Window::iconize\(\)](#).

- `-kbd` and `-nokbd`  
Enables or disables visible keyboard focus for non-text widgets using [Fl::visible\\_focus\(\)](#).
- `-name` string  
Sets the window class using [Fl\\_Window::xclass\(\)](#).
- `-scheme` string  
Sets the widget scheme using [Fl::scheme\(\)](#).
- `-title` string  
Sets the window title using [Fl\\_Window::label\(\)](#).
- `-tooltips` and `-notooltips`  
Enables or disables tooltips using [Fl\\_Tooltip::enable\(\)](#).

Color values are commonly given as three digit or six digit hex numbers.

- The order of fg, bg, and bg2 in the command line does not matter
- There is no way at the moment to set the selection color.
- Setting the bg2 color also changes the fg color to have sufficient contrast
- Explicitly setting fg color overrides the bg2/contrast constraint.
- Setting the bg color will update the color lookup table for the gray ramp, so color index values can stay the same for all apps, it's just mapped to different RGB values.
- The calculation of the gray ramp is only based on the bg color, so there is no way at the moment to create an inverted (dark mode) ramp.
- Consequently, setting bg to black creates a an all-black ramp, setting a somewhat dark bg color creates a extremely dark ramp.
- Setting the bg has no influence on bg2 or fg.

If your program requires other switches in addition to the standard FLTK options, you will need to pass your own argument handler to [Fl::args\(int,char\\*\\*,int&,Fl\\_Args\\_Handler\)](#) explicitly.

See also

[fl\\_parse\\_color\(const char\\* p, uchar& r, uchar& g, uchar& b\)](#) to see how color values can be defined

### 33.7.3.10 args() [1/2]

```
void Fl::args (
    int argc,
    char ** argv ) [static]
```

Parse all command line switches matching standard FLTK options only.

It parses all the switches, and if any are not recognized it calls `Fl::abort(Fl::help)`, i.e. unlike the long form, an unrecognized switch generates an error message and causes the program to exit.

### 33.7.3.11 args() [2/2]

```
int Fl::args (
    int argc,
    char ** argv,
    int & i,
    Fl_Args_Handler cb = 0 ) [static]
```

Parse command line switches using the `cb` argument handler.

Returns 0 on error, or the number of words processed.

FLTK provides this as an *entirely optional* command line switch parser. You don't have to call it if you don't want to. Everything it can do can be done with other calls to FLTK.

To use the switch parser, call `Fl::args(...)` near the start of your program. This does **not** open the display, instead switches that need the display open are stashed into static variables. Then you **must** display your first window by calling `window->show(argc, argv)`, which will do anything stored in the static variables.

Providing an argument handler callback `cb` lets you define your own switches. It is called with the same `argc` and `argv`, and with `i` set to the index of the switch to be processed. The `cb` handler should return zero if the switch is unrecognized, and not change `i`. It should return non-zero to indicate the number of words processed if the switch is recognized, i.e. 1 for just the switch, and more than 1 for the switch plus associated parameters. `i` should be incremented by the same amount.

The `cb` handler is called **before** any other tests, so *you can also override any standard FLTK switch* (this is why FLTK can use very short switches instead of the long ones all other toolkits force you to use). See [Fl::arg\(\)](#) for descriptions of the standard switches.

On return `i` is set to the index of the first non-switch. This is either:

- The first word that does not start with '-'.
- The word '-' (used by many programs to name stdin as a file)
- The first unrecognized switch (return value is 0).
- `argc`

The return value is `i` unless an unrecognized switch is found, in which case it is zero. If your program takes no arguments other than switches you should produce an error if the return value is less than `argc`.

A usage string is displayed if [Fl::args\(\)](#) detects an invalid argument on the command-line. You can change the message by setting the [Fl::help](#) pointer.

A very simple command line parser can be found in `examples/howto-parse-args.cxx`

The simpler [Fl::args\(int argc, char \\*\\*argv\)](#) form is useful if your program does not have command line switches of its own.

### 33.7.3.12 args\_to\_utf8()

```
int Fl::args_to_utf8 (
    int argc,
    char **& argv ) [static]
```

Convert Windows commandline arguments to UTF-8.

#### Note

This function does nothing on other (non-Windows) platforms, hence you may call it on all platforms or only on Windows by using platform specific code like `'#ifdef _WIN32'` etc. - it's your choice. Calling it on other platforms returns quickly w/o wasting much CPU time.

This function *must be called on Windows platforms* in `main()` before the array `argv` is used if your program uses any commandline argument strings (these should be UTF-8 encoded). This applies also to standard FLTK commandline arguments like `"-name"` (class name) and `"-title"` (window title in the title bar).

Unfortunately Windows **neither** provides commandline arguments in UTF-8 encoding **nor** as Windows "Wide Character" strings in the standard `main()` and/or the Windows specific `WinMain()` function.

On Windows platforms (no matter which build system) this function calls a Windows specific function to retrieve commandline arguments as Windows "Wide Character" strings, converts these strings to an internally allocated buffer (or multiple buffers) and returns the result in `argv`. For implementation details please refer to the source code; however these details may be changed in the future.

Note that `argv` is provided by reference so it can be overwritten.

In the recommended simple form the function overwrites the variable `argv` and allocates a new array of strings pointed to by `argv`. You may use this form on all platforms and it is as simple as adding one line to old programs to make them work with international (UTF-8) commandline arguments.

```
int main(int argc, char **argv) {
    Fl::args_to_utf8(argc, argv); // add this line
    // ... use argc and argv, e.g. for commandline parsing
    window->show(argc, argv);
    return Fl::run();
}
```

For an example see 'examples/howto-parse-args.cxx' in the FLTK sources.

If you want to retain the original `argc` and `argv` variables the following slightly longer and more complicated code works as well on all platforms.

```
int main(int argc, char **argv) {
    char **argvn = argv;           // must copy argv to work on all platforms
    int argcn = Fl::args_to_utf8(argc, argvn);
    // ... use argcn and argvn, e.g. for commandline parsing
    window->show(argcn, argvn);
    return Fl::run();
}
```

#### Parameters

in	<code>argc</code>	used only on non-Windows platforms
out	<code>argv</code>	modified only on Windows platforms

#### Returns

argument count (always the same as `argc`)

#### Since

1.4.0

### 33.7.3.13 `background()`

```
void Fl::background (
    uchar r,
    uchar g,
    uchar b ) [static]
```

Changes `fl_color(FL_BACKGROUND_COLOR)` to the given color, and changes the gray ramp from 32 to 56 to black to white.

These are the colors used as backgrounds by almost all widgets and used to draw the edges of all the boxtypes.

### 33.7.3.14 `background2()`

```
void Fl::background2 (
    uchar r,
    uchar g,
    uchar b ) [static]
```

Changes the alternative background color.

This color is used as a background by [Fl\\_Input](#) and other text widgets.

This call may change `fl_color(FL_FOREGROUND_COLOR)` if it does not provide sufficient contrast to `FL_BACKGROUND2_COLOR`.

### 33.7.3.15 `box_border_radius_max()` [1/2]

```
static int Fl::box_border_radius_max ( ) [inline], [static]
```

Get the maximum border radius of all "rounded" boxtypes in pixels.

#### Since

1.4.0

### 33.7.3.16 `box_border_radius_max()` [2/2]

```
static void Fl::box_border_radius_max (
    int R ) [inline], [static]
```

Set the maximum border radius of all "rounded" boxtypes in pixels.

Must be at least 5, default = 15.

**Note**

This does **not** apply to the "round" boxtypes which have really round sides (i.e. composed of half circles) as opposed to "rounded" boxtypes that have only rounded corners with a straight border between corners.

The box border radius of "rounded" boxtypes is typically calculated as about 2/5 of the box height or width, whichever is smaller. The upper limit can be set by this method for all "rounded" boxtypes.

**Since**

1.4.0

**33.7.3.17 box\_color()**

```
Fl_Color Fl::box_color (
    Fl_Color c ) [static]
```

Gets the drawing color to be used for the background of a box.

This method is only useful inside box drawing code. It returns the color to be used, either `fl_inactive(c)` if the widget is `!active_r()` or `c` otherwise.

**33.7.3.18 box\_dh()**

```
int Fl::box_dh (
    Fl_Boxtype t ) [static]
```

Returns the height offset for the given boxtype.

**See also**

[box\\_dy\(\)](#).

**33.7.3.19 box\_dw()**

```
int Fl::box_dw (
    Fl_Boxtype t ) [static]
```

Returns the width offset for the given boxtype.

**See also**

[box\\_dy\(\)](#).

**33.7.3.20 box\_dx()**

```
int Fl::box_dx (
    Fl_Boxtype t ) [static]
```

Returns the X offset for the given boxtype.

**See also**

[box\\_dy\(\)](#)

**33.7.3.21 box\_dy()**

```
int Fl::box_dy (
    Fl_Boxtype t ) [static]
```

Returns the Y offset for the given boxtype.

These functions return the offset values necessary for a given boxtype, useful for computing the area inside a box's borders, to prevent overdrawing the borders.

For instance, in the case of a boxtype like FL\_DOWN\_BOX where the border width might be 2 pixels all around, the above functions would return 2, 2, 4, and 4 for box\_dx, box\_dy, box\_dw, and box\_dh respectively.

An example to compute the area inside a widget's box():

```
int X = yourwidget->x() + Fl::box_dx(yourwidget->box());
int Y = yourwidget->y() + Fl::box_dy(yourwidget->box());
int W = yourwidget->w() - Fl::box_dw(yourwidget->box());
int H = yourwidget->h() - Fl::box_dh(yourwidget->box());
```

These functions are mainly useful in the draw() code for deriving custom widgets, where one wants to avoid drawing over the widget's own border box().

### 33.7.3.22 box\_shadow\_width() [1/2]

```
static int Fl::box_shadow_width ( ) [inline], [static]
```

Get the box shadow width of all "shadow" boxtypes in pixels.

Since

1.4.0

### 33.7.3.23 box\_shadow\_width() [2/2]

```
static void Fl::box_shadow_width (
    int W ) [inline], [static]
```

Set the box shadow width of all "shadow" boxtypes in pixels.

Must be at least 1, default = 3. There is no upper limit.

Since

1.4.0

### 33.7.3.24 check()

```
int Fl::check ( ) [static]
```

Same as Fl::wait(0).

Calling this during a big calculation will keep the screen up to date and the interface responsive:

```
while (!calculation_done()) {
    calculate();
    Fl::check();
    if (user_hit_abort_button()) break;
}
```

This returns non-zero if any windows are displayed, and 0 if no windows are displayed (this is likely to change in future versions of FLTK).

### 33.7.3.25 display()

```
void Fl::display (
    const char * d ) [static]
```

Sets the X or Wayland display to use for all windows.

This sets the environment variable \$DISPLAY or \$WAYLAND\_DISPLAY to the passed string, so this only works before you show() the first window or otherwise open the display.

This does nothing on other platforms.

### 33.7.3.26 dnd\_text\_ops() [1/2]

```
static int Fl::dnd_text_ops ( ) [inline], [static]
```

Gets whether drag and drop text operations are supported.

This returns whether selected text can be dragged from text fields or dragged within a text field as a cut/paste shortcut.

**33.7.3.27 dnd\_text\_ops()** [2/2]

```
static void Fl::dnd_text_ops (
    int v ) [inline], [static]
```

Sets whether drag and drop text operations are supported.

This specifically affects whether selected text can be dragged from text fields or dragged within a text field as a cut/paste shortcut.

**33.7.3.28 draw\_box\_active()**

```
int Fl::draw_box_active ( ) [static]
```

Determines if the currently drawn box is active or inactive.

If inactive, the box color should be changed to the inactive color.

See also

[Fl::box\\_color\(Fl\\_Color c\)](#)

**33.7.3.29 draw\_GL\_text\_with\_textures()** [1/2]

```
static int Fl::draw_GL_text_with_textures ( ) [inline], [static]
```

returns whether whether OpenGL uses textures to draw all text.

Default is yes.

See also

[draw\\_GL\\_text\\_with\\_textures\(int val\)](#)

Version

1.4.0

**33.7.3.30 draw\_GL\_text\_with\_textures()** [2/2]

```
static void Fl::draw_GL_text_with_textures (
    int val ) [inline], [static]
```

sets whether OpenGL uses textures to draw all text.

By default, FLTK draws OpenGL text using textures, if the necessary hardware support is available. Call `Fl::draw_GL_text_with_textures(0)` once in your program before the first call to [gl\\_font\(\)](#) to have FLTK draw instead OpenGL text using a legacy, platform-dependent procedure. It's recommended not to deactivate textures under the MacOS platform because the MacOS legacy procedure is extremely rudimentary.

Parameters

<i>val</i>	use 0 to prevent FLTK from drawing GL text with textures
------------	--

See also

[gl\\_texture\\_pile\\_height\(int max\)](#)

Version

1.4.0

**33.7.3.31 flush()**

```
void Fl::flush ( ) [static]
```

Causes all the windows that need it to be redrawn and graphics forced out through the pipes.

This is what [wait\(\)](#) does before looking for events.

Note: in multi-threaded applications you should only call [Fl::flush\(\)](#) from the main thread. If a child thread needs to trigger a redraw event, it should instead call [Fl::awake\(\)](#) to get the main thread to process the event queue.

### 33.7.3.32 [get\\_system\\_colors\(\)](#)

```
void Fl::get_system_colors ( ) [static]
```

Read the user preference colors from the system and use them to call [Fl::foreground\(\)](#), [Fl::background\(\)](#), and [Fl::background2\(\)](#).

This is done by [Fl\\_Window::show\(argc,argv\)](#) before applying the -fg and -bg switches.

On X this reads some common values from the Xdefaults database. KDE users can set these values by running the "krdb" program, and newer versions of KDE set this automatically if you check the "apply style to other X programs" switch in their control panel.

### 33.7.3.33 [gl\\_visual\(\)](#)

```
static int Fl::gl_visual (
    int ,
    int * alist = 0 ) [static]
```

This does the same thing as [Fl::visual\(int\)](#) but also requires OpenGL drawing to work.

This *must* be done if you want to draw in normal windows with OpenGL with [gl\\_start\(\)](#) and [gl\\_end\(\)](#). It may be useful to call this so your X windows use the same visual as an [Fl\\_Gl\\_Window](#), which on some servers will reduce colormap flashing.

See [Fl\\_Gl\\_Window](#) for a list of additional values for the argument.

### 33.7.3.34 [has\\_timeout\(\)](#)

```
int Fl::has_timeout (
    Fl_Timeout_Handler cb,
    void * data = 0 ) [static]
```

Returns true if the timeout exists and has not been called yet.

Both arguments *cb* and *data* must match with at least one timer in the queue of active timers to return true (1).

#### Note

It is a known inconsistency that [Fl::has\\_timeout\(\)](#) does not use the *data* argument as a wildcard (match all) if it is zero (NULL) which [Fl::remove\\_timeout\(\)](#) does. This is so for backwards compatibility with FLTK 1.3.x. Therefore using 0 (zero, NULL) as the timeout *data* value is discouraged unless you're sure that you don't need to use [Fl::has\\_timeout\(callback, \(void \\*\)0\)](#); or [Fl::remove\\_timeout\(callback, \(void \\*\)0\)](#);

#### Parameters

in	<i>cb</i>	Timer callback
in	<i>data</i>	User data

#### Returns

whether the timer was found in the queue

#### Return values

0	not found
1	found

### 33.7.3.35 `hide_all_windows()`

```
void Fl::hide_all_windows ( ) [static]
```

Hide all visible windows to make FLTK leave `Fl::run()`.

`Fl::run()` will run as long as there are visible windows. Call `Fl::hide_all_windows()` to hide (close) all currently shown (visible) windows, effectively terminating the `Fl::run()` loop.

See also

[Fl::run\(\)](#)

Since

1.4.0

### 33.7.3.36 `is_scheme()`

```
static int Fl::is_scheme (
    const char * name ) [inline], [static]
```

Returns whether the current scheme is the given name.

This is a fast inline convenience function to support scheme-specific code in widgets, e.g. in their `draw()` methods, if required.

Use a valid scheme name, not `NULL` (although `NULL` is allowed, this is not a useful argument - see below).

If `Fl::scheme()` has not been set or has been set to the default scheme ("none" or "base"), then this will always return 0 regardless of the argument, because `Fl::scheme()` is `NULL` in this case.

Note

The stored scheme name is always lowercase, and this method will do a case-sensitive compare, so you **must** provide a lowercase string to return the correct value. This is intentional for performance reasons.

Example:

```
if (Fl::is_scheme("gtk+")) { your_code_here(); }
```

Parameters

in	name	lowercase string of requested scheme name.
----	------	--

Returns

1 if the given scheme is active, 0 otherwise.

See also

[Fl::scheme\(const char \\*name\)](#)

### 33.7.3.37 `menu_linespacing()` [1/2]

```
int Fl::menu_linespacing ( ) [static]
```

Gets the default line spacing used by menus.

Returns

The default line spacing, in pixels.

Since

1.4.0

**33.7.3.38 menu\_linespacing()** [2/2]

```
void Fl::menu_linespacing (
    int H ) [static]
```

Sets the default line spacing used by menus.  
Default is 4.

**Parameters**

<i>in</i>	<i>H</i>	The new default line spacing between menu items, in pixels.
-----------	----------	---

**Since**

1.4.0

**33.7.3.39 now()**

```
Fl_Timestamp Fl::now (
    double offset = 0 ) [static]
```

Set a time stamp at this point in time with optional signed offset in seconds.

The time stamp is an opaque type and does not represent the time of day or some time and date in the calendar. It is used with [Fl::seconds\\_between\(\)](#) and [Fl::seconds\\_since\(\)](#) to measure elapsed time.

```
Fl_Timestamp start = Fl::now();
// do something
double s = Fl::seconds_since(start);
printf("That operation took %g seconds\n", s);
```

Depending on the system the resolution may be milliseconds or microseconds. Under certain conditions (particularly on Windows) the value in member `sec` may wrap around and does not represent a real time (maybe runtime of the system). Function [seconds\\_since\(\)](#) below uses this to subtract two timestamps which is always a correct delta time with milliseconds or microseconds resolution.

**Parameters**

<i>offset</i>	optional signed offset in seconds added to the current time
---------------	---

**Returns**

this moment in time offset by `offset` as an opaque time stamp

**Todo** [Fl::system\\_driver\(\)](#)->[gettime\(\)](#) was implemented for the Forms library and has a limited resolution (on Windows: milliseconds). On POSIX platforms it uses [gettimeofday\(\)](#) with microsecond resolution. A new function could use a better resolution on Windows with its multimedia timers which requires a new dependency: `winmm.lib` (dll). This could be a future improvement, maybe set as a build option or generally (requires Win95 or 98?).

**See also**

[Fl::seconds\\_since\(Fl\\_Timestamp& then\)](#)  
[Fl::seconds\\_between\(Fl\\_Timestamp& back, Fl\\_Timestamp& further\\_back\)](#)  
[Fl::ticks\\_since\(Fl\\_Timestamp& then\)](#)  
[Fl::ticks\\_between\(Fl\\_Timestamp& back, Fl\\_Timestamp& further\\_back\)](#)

**33.7.3.40 option()** [1/2]

```
bool Fl::option (
    Fl_Option opt ) [static]
```

FLTK library options management.

Options provide a way for the user to modify the behavior of an FLTK application. For example, clearing the `OPTION_SHOW_TOOLTIPS` will disable tooltips for all FLTK applications.

Options are set by the user or the administrator on user or machine level. In 1.3, FLUID has an Options dialog for that. In 1.4, there is an app named `fltk-options` that can be used from the command line or as a GUI tool. The machine level setting is read first, and the user setting can override the machine setting.

This function is used throughout FLTK to quickly query the user's wishes. There are options for using a native file chooser instead of the FLTK one wherever possible, disabling tooltips, disabling visible focus, disabling FLTK file chooser preview, etc. .

See `Fl::Fl_Option` for a list of available options.

Example:

```
if ( Fl::option(Fl::OPTION_ARROW_FOCUS) )
{ ..on.. }
else
{ ..off.. }
```

#### Note

Since FLTK 1.4.0 options can be managed with the `fltk-options` program. In FLTK 1.3.x options can be set in FLUID.

#### Parameters

<i>opt</i>	which option
------------	--------------

#### Returns

true or false

#### See also

enum `Fl::Fl_Option`

`Fl::option(Fl_Option, bool)`

`fltk-options` application in command line and GUI mode

#### Since

FLTK 1.3.0

### 33.7.3.41 option() [2/2]

```
void Fl::option (
    Fl_Option opt,
    bool val ) [static]
```

Override an option while the application is running.

Apps can override the machine settings and the user settings by calling `Fl::option(option, bool)`. The override takes effect immediately for this option for all widgets in the app for the life time of the app.

The override is not saved anywhere, and relaunching the app will restore the old settings.

Example:

```
Fl::option(Fl::OPTION_ARROW_FOCUS, true);    // on
Fl::option(Fl::OPTION_ARROW_FOCUS, false);   // off
```

#### Parameters

<i>opt</i>	which option
<i>val</i>	set to true or false

See also

enum [Fl::Fl\\_Option](#)

bool [Fl::option\(Fl\\_Option\)](#)

### 33.7.3.42 own\_colormap()

```
void Fl::own_colormap ( ) [static]
```

Makes FLTK use its [own colormap](#).

This may make FLTK display better and will reduce conflicts with other programs that want lots of colors. However the colors may flash as you move the cursor between windows.

This does nothing if the current visual is not colormapped.

### 33.7.3.43 program\_should\_quit() [1/2]

```
static int Fl::program_should_quit ( ) [inline], [static]
```

Returns non-zero when a request for program termination was received and accepted.

On the MacOS platform, the "Quit xxx" item of the application menu is such a request, that is considered accepted when all windows are closed. On other platforms, this function returns 0 until [Fl::program\\_should\\_quit\(1\)](#) is called.

Version

1.4.0

### 33.7.3.44 program\_should\_quit() [2/2]

```
static void Fl::program_should_quit (
    int should_i ) [inline], [static]
```

Indicate to the FLTK library whether a program termination request was received and accepted.

A program may set this to 1, for example, while performing a platform-independent command asking the program to cleanly terminate, similarly to the "Quit xxx" item of the application menu under MacOS.

Version

1.4.0

### 33.7.3.45 readqueue()

```
Fl_Widget * Fl::readqueue ( ) [static]
```

Reads the default callback queue and returns the first widget.

All [Fl\\_Widget](#)s that don't have a callback defined use the default callback [static Fl\\_Widget::default\\_callback\(\)](#) that puts a pointer to the widget in a queue. This method reads the oldest widget out of this queue.

The queue (FIFO) is limited (currently 20 items). If the queue overflows, the oldest entry ([Fl\\_Widget \\*](#)) is discarded. Relying on the default callback and reading the callback queue with [Fl::readqueue\(\)](#) is not recommended. If you need a callback, you should set one with [Fl\\_Widget::callback\(Fl\\_Callback \\*cb, void \\*data\)](#) or one of its variants.

See also

[Fl\\_Widget::callback\(\)](#)

[Fl\\_Widget::callback\(Fl\\_Callback \\*cb, void \\*data\)](#)

[Fl\\_Widget::default\\_callback\(\)](#)

**33.7.3.46 ready()**

```
int Fl::ready ( ) [static]
```

This is similar to [Fl::check\(\)](#) except this does *not* call [Fl::flush\(\)](#) or any callbacks, which is useful if your program is in a state where such callbacks are illegal.

This returns true if [Fl::check\(\)](#) would do anything (it will continue to return true until you call [Fl::check\(\)](#) or [Fl::wait\(\)](#)).

```
while (!calculation_done()) {
    calculate();
    if (Fl::ready()) {
        do_expensive_cleanup();
        Fl::check();
        if (user_hit_abort_button()) break;
    }
}
```

**33.7.3.47 release()**

```
static void Fl::release ( ) [inline], [static]
```

Releases the current grabbed window, equals [grab\(0\)](#).

**Deprecated** Use [Fl::grab\(0\)](#) instead.

See also

[grab\(Fl\\_Window\\*\)](#)

**33.7.3.48 reload\_scheme()**

```
int Fl::reload_scheme ( ) [static]
```

Called internally when setting a new scheme according to scheme name.

Loads or reloads the current scheme selection.

**Returns**

Always 1 (this may change in the future)

See void [Fl::scheme\(const char \\*name\)](#)

**33.7.3.49 remove\_check()**

```
void Fl::remove_check (
    Fl_Timeout_Handler cb,
    void * argp = 0 ) [static]
```

Removes a check callback.

It is harmless to remove a check callback that no longer exists.

**33.7.3.50 remove\_next\_timeout()**

```
int Fl::remove_next_timeout (
    Fl_Timeout_Handler cb,
    void * data = 0,
    void ** data_return = 0 ) [static]
```

Remove the next matching timeout callback and return its `data` pointer.

This method removes only the next matching timeout and returns in `data_return` (if non-NULL) the `data` member given when the timeout was scheduled.

This method is useful if you remove a timeout before it is scheduled and you need to get and use its data value, for instance to `free()` or delete the data associated with the timeout.

This method returns non-zero if a matching timeout was found and zero if no timeout matched the request.

If the return value is `N > 1` then there are `N - 1` more matching timeouts pending.

If you need to remove all timeouts with a particular callback `cb` you must repeat this call until it returns 1 (all timeouts removed) or zero (no matching timeout), whichever occurs first.

**Parameters**

in	<i>cb</i>	Timer callback to be removed (must match)
in	<i>data</i>	Wildcard if NULL, must match otherwise
in, out	<i>data_return</i>	Pointer to (void *) to receive the data value

**Returns**

non-zero if a timer was found and removed

**Return values**

0	no matching timer was found
1	the last matching timeout was found and removed
$N > 1$	a matching timeout was removed and there are (N - 1) matching timeouts pending

**See also**

[Fl::remove\\_timeout\(Fl\\_Timeout\\_Handler cb, void \\*data\)](#)

**Since**

1.4.0

**33.7.3.51 remove\_timeout()**

```
void Fl::remove_timeout (
    Fl_Timeout_Handler cb,
    void * data = 0 ) [static]
```

Remove one or more matching timeout callbacks from the timer queue.

This method removes **all** matching timeouts, not just the first one.

If the *data* argument is NULL (the default!) only the callback *cb* must match, i.e. all timer entries with this callback are removed.

It is harmless to remove a timeout callback that no longer exists.

If you want to remove only the next matching timeout you can use [Fl::remove\\_next\\_timeout\(Fl\\_Timeout\\_Handler cb, void \\*data, void \\*\\*data\\_return\)](#) (available since FLTK 1.4.0).

**Parameters**

in	<i>cb</i>	Timer callback to be removed (must match)
in	<i>data</i>	Wildcard if NULL (default), must match otherwise

**See also**

[Fl::remove\\_next\\_timeout\(Fl\\_Timeout\\_Handler cb, void \\*data, void \\*\\*data\\_return\)](#)

**33.7.3.52 repeat\_timeout()**

```
void Fl::repeat_timeout (
    double time,
    Fl_Timeout_Handler cb,
    void * data = 0 ) [static]
```

Repeats a timeout callback from the expiration of the previous timeout, allowing for more accurate timing. You should call this method only inside a timeout callback of the same or a logically related timer from whose expiration time the new timeout shall be scheduled. Otherwise the timing accuracy can't be improved and the exact behavior is undefined.

If you call this outside a timeout callback the behavior is the same as [Fl::add\\_timeout\(\)](#).

Example: The following code will print "TICK" each second on stdout with a fair degree of accuracy:

```
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <stdio.h>
void callback(void *) {
    printf("TICK\n");
    Fl::repeat_timeout(1.0, callback); // retrigger timeout
}
int main() {
    Fl_Window win(100, 100);
    win.show();
    Fl::add_timeout(1.0, callback); // set up first timeout
    return Fl::run();
}
```

#### Parameters

in	<i>time</i>	delta time in seconds until the timer expires
in	<i>cb</i>	callback function
in	<i>data</i>	optional user data (default: NULL)

#### 33.7.3.53 run()

```
int Fl::run ( ) [static]
```

Calls [Fl::wait\(\)](#) repeatedly as long as any windows are displayed.

When all the windows are closed it returns zero (supposedly it would return non-zero on any errors, but FLTK calls exit directly for these). A normal program will end main() with return [Fl::run\(\)](#);

#### Note

[Fl::run\(\)](#) and [Fl::wait\(\)](#) (but not [Fl::wait\(double\)](#)) both return when all FLTK windows are closed. Therefore, a MacOS FLTK application possessing [Fl\\_Sys\\_Menu\\_Bar](#) items able to create new windows and expected to keep running without any open window cannot use these two functions. One solution is to run the event loop as follows:

```
while (!Fl::program_should_quit()) Fl::wait(1e20);
```

#### 33.7.3.54 scheme()

```
int Fl::scheme (
    const char * s ) [static]
```

Sets the current widget scheme.

NULL will use the scheme defined in the FLTK\_SCHEME environment variable or the scheme resource under X11. Otherwise, any of the following schemes can be used:

- "none" - This is the default look-n-feel which resembles old Windows (95/98/Me/NT/2000) and old GTK/KDE
- "base" - This is an alias for "none"
- "plastic" - This scheme is inspired by the Aqua user interface on macOS
- "gtk+" - This scheme is inspired by the Red Hat Bluecurve theme
- "gleam" - This scheme is inspired by the Clearlooks Glossy scheme. (Colin Jones and Edmanuel Torres).
- "oxy" - This is a subset of Dmitrij K's oxy scheme (STR 2675, 3477)

If the given scheme name is unknown, the default scheme will be used.

Setting the scheme (name) is case insensitive, but the stored scheme name will always be lowercase and `Fl::scheme()` will return this lowercase name or `NULL` if no scheme or the default scheme ("none" or "base") was set.

## Parameters

<i>in</i>	<i>s</i>	Scheme name of NULL
-----------	----------	---------------------

## Return values

<i>0</i>	if the scheme has not been set or is the default scheme
<i>1</i>	if a scheme other than "none"/"base" was set

## See also

[Fl::scheme\(\)](#) to get the name of the current [scheme](#)

[Fl::is\\_scheme\(const char\\*\)](#) to test if the specified [scheme](#) is set

**33.7.3.55 scrollbar\_size()** [1/2]

```
int Fl::scrollbar_size ( ) [static]
```

Gets the default scrollbar size used by [Fl\\_Browser\\_](#), [Fl\\_Help\\_View](#), [Fl\\_Scroll](#), and [Fl\\_Text\\_Display](#) widgets.

## Returns

The default size for widget scrollbars, in pixels.

**33.7.3.56 scrollbar\_size()** [2/2]

```
void Fl::scrollbar_size (
    int W ) [static]
```

Sets the default scrollbar size that is used by the [Fl\\_Browser\\_](#), [Fl\\_Help\\_View](#), [Fl\\_Scroll](#), and [Fl\\_Text\\_Display](#) widgets.

## Parameters

<i>in</i>	<i>W</i>	The new default size for widget scrollbars, in pixels.
-----------	----------	--

**33.7.3.57 seconds\_between()**

```
double Fl::seconds_between (
    Fl_Timestamp & back,
    Fl_Timestamp & further_back ) [static]
```

Return the time in seconds between two time stamps.

## Parameters

<i>in</i>	<i>back</i>	a previously taken time stamp
<i>in</i>	<i>further_back</i>	an even earlier time stamp

## Returns

elapsed seconds and fractions of a second

See also

[Fl::seconds\\_since\(Fl\\_Timestamp& then\)](#)  
[Fl::now\(\)](#)

### 33.7.3.58 seconds\_since()

```
double Fl::seconds_since (
    Fl_Timestamp & then ) [static]
```

Return the time in seconds between now and a previously taken time stamp.

Parameters

<code>in</code>	<code>then</code>	a previously taken time stamp
-----------------	-------------------	-------------------------------

Returns

elapsed seconds and fractions of a second

See also

[Fl::seconds\\_between\(Fl\\_Timestamp& back, Fl\\_Timestamp& further\\_back\)](#)  
[Fl::now\(\)](#)  
[Fl::distant\\_past\(\)](#)

### 33.7.3.59 set\_box\_color()

```
void Fl::set_box_color (
    Fl_Color c ) [static]
```

Sets the drawing color for the box that is currently drawn.

This method sets the current drawing color [fl\\_color\(\)](#) depending on the widget's state to either `c` or `fl_inactive(c)`.

It should be used whenever a box background is drawn in the box (type) drawing code instead of calling [fl\\_color\(Fl\\_Color bg\)](#) with the background color `bg`, usually [Fl\\_Widget::color\(\)](#).

This method is only useful inside box drawing code. Whenever a box is drawn with one of the standard box drawing methods, a static variable is set depending on the widget's current state - if the widget is `!active_r()` then the internal variable is false (0), otherwise it is true (1). This is faster than calling [Fl\\_Widget::active\\_r\(\)](#) because the state is cached.

See also

[Fl::draw\\_box\\_active\(\)](#)  
[Fl::box\\_color\(Fl\\_Color\)](#)

### 33.7.3.60 set\_boxtype()

```
void Fl::set_boxtype (
    Fl_Boxtype t,
    Fl_Box_Draw_F * f,
    uchar dx,
    uchar dy,
    uchar dw,
    uchar dh,
    Fl_Box_Draw_Focus_F * ff = NULL ) [static]
```

Sets the function to call to draw a specific box type.

## Parameters

in	<i>t</i>	index of the box type between 0 (FL_NO_BOX) and up to and including FL_MAX_BOXTYPE
in	<i>f</i>	callback function that draws the box
in	<i>dx,dy</i>	top left frame width, distance in pixels to box contents
in	<i>dw,dh</i>	left plus right frame width, top plus bottom frame width
in	<i>ff</i>	optional callback that draws the box focus, defaults to a rectangle, inset by dx, dy, dw, dh

**33.7.3.61 set\_idle()**

```
static void Fl::set_idle (
    Fl_Old_Idle_Handler cb ) [inline], [static]
```

Sets an idle callback.

**Deprecated** This method is obsolete - use the [add\\_idle\(\)](#) method instead.

**33.7.3.62 ticks\_between()**

```
long Fl::ticks_between (
    Fl_Timestamp & back,
    Fl_Timestamp & further_back ) [static]
```

Return the time in ticks (60Hz) between two time stamps.

## Parameters

in	<i>back</i>	a previously taken time stamp
in	<i>further_back</i>	an even earlier time stamp

## Returns

elapsed ticks in 60th of a second

## See also

[Fl::ticks\\_since\(Fl\\_Timestamp& then\)](#)

[Fl::now\(\)](#)

**33.7.3.63 ticks\_since()**

```
long Fl::ticks_since (
    Fl_Timestamp & then ) [static]
```

Return the time in ticks (60Hz) between now and a previously taken time stamp.

Ticks are a convenient way to time animations 'per frame'. Even though modern computers use all kinds of screen refresh rates, 60Hz is a very good base for animation that is typically shown in user interface graphics.

## Parameters

in	<i>then</i>	a previously taken time stamp
----	-------------	-------------------------------

**Returns**

elapsed ticks in 60th of a second

**See also**

[Fl::ticks\\_between\(Fl\\_Timestamp& back, Fl\\_Timestamp& further\\_back\)](#)

[Fl::now\(\)](#)

**33.7.3.64 use\_high\_res\_GL() [1/2]**

```
static int Fl::use_high_res_GL ( ) [inline], [static]
```

returns whether GL windows should be drawn at high resolution on Apple computers with retina displays.

Default is no.

**Version**

1.3.4

**33.7.3.65 use\_high\_res\_GL() [2/2]**

```
static void Fl::use_high_res_GL (
    int val ) [inline], [static]
```

sets whether GL windows should be drawn at high resolution on Apple computers with retina displays

**Version**

1.3.4

**33.7.3.66 version()**

```
double Fl::version ( ) [static]
```

Returns the compiled-in value of the FL\_VERSION constant.

This is useful for checking the version of a shared library.

**Deprecated** Use int [Fl::api\\_version\(\)](#) instead.

**33.7.3.67 visible\_focus() [1/2]**

```
static int Fl::visible_focus ( ) [inline], [static]
```

Gets or sets the visible keyboard focus on buttons and other non-text widgets.

The default mode is to enable keyboard focus for all widgets.

**33.7.3.68 visible\_focus() [2/2]**

```
static void Fl::visible_focus (
    int v ) [inline], [static]
```

Gets or sets the visible keyboard focus on buttons and other non-text widgets.

The default mode is to enable keyboard focus for all widgets.

**33.7.3.69 visual()**

```
int Fl::visual (
    int flags ) [static]
```

Selects a visual so that your graphics are drawn correctly.

This is only allowed before you call `show()` on any windows. This does nothing if the default visual satisfies the capabilities, or if no visual satisfies the capabilities, or on systems that don't have such brain-dead notions.

Only the following combinations do anything useful:

- `Fl::visual(FL_RGB)`  
Full/true color (if there are several depths FLTK chooses the largest). Do this if you use `fl_draw_image` for much better (non-dithered) output.
- `Fl::visual(FL_RGB8)`  
Full color with at least 24 bits of color. `FL_RGB` will always pick this if available, but if not it will happily return a less-than-24 bit deep visual. This call fails if 24 bits are not available.

This returns true if the system has the capabilities by default or FLTK succeeded in turning them on. Your program will still work even if this returns false (it just won't look as good).

**33.7.3.70 wait() [1/2]**

```
int Fl::wait ( ) [static]
```

Waits until "something happens" and then returns.

Call this repeatedly to "run" your program. You can also check what happened each time after this returns, which is quite useful for managing program state.

What this really does is call all idle callbacks, all elapsed timeouts, call [Fl::flush\(\)](#) to get the screen to update, and then wait some time (zero if there are idle callbacks, the shortest of all pending timeouts, or infinity), for any events from the user or any [Fl::add\\_fd\(\)](#) callbacks. It then handles the events and calls the callbacks and then returns.

**Returns**

non-zero if there are any visible windows - this may change in future versions of FLTK.

**33.7.3.71 wait() [2/2]**

```
double Fl::wait (
    double time_to_wait ) [static]
```

Waits a maximum of `time_to_wait` seconds or until "something happens".

See [Fl::wait\(\)](#) for the description of operations performed when "something happens".

**Returns**

Always 1 on Windows. Otherwise, it is positive if an event or fd happens before the time elapsed. It is zero if nothing happens. It is negative if an error occurs (this will happen on X11 if a signal happens).

**33.7.4 Member Data Documentation****33.7.4.1 help**

```
const char *const Fl::help = helpmsg+13 [static]
```

Usage string displayed if [Fl::args\(\)](#) detects an invalid argument.

This may be changed to point to customized text at run-time.

### 33.7.4.2 idle

```
void(* Fl::idle)() [static]
```

The currently executing idle callback function: DO NOT USE THIS DIRECTLY!

This is now used as part of a higher level system allowing multiple idle callback functions to be called.

See also

[add\\_idle\(\)](#), [remove\\_idle\(\)](#)

The documentation for this class was generated from the following files:

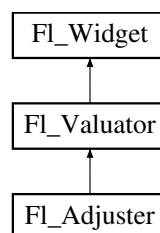
- [Fl.H](#)
- [Fl.cxx](#)
- [Fl\\_abort.cxx](#)
- [Fl\\_add\\_idle.cxx](#)
- [Fl\\_arg.cxx](#)
- [fl\\_boxttype.cxx](#)
- [Fl\\_Cairo.cxx](#)
- [fl\\_color.cxx](#)
- [Fl\\_compose.cxx](#)
- [Fl\\_display.cxx](#)
- [Fl\\_get\\_system\\_colors.cxx](#)
- [Fl\\_grab.cxx](#)
- [fl\\_labeltype.cxx](#)
- [Fl\\_lock.cxx](#)
- [Fl\\_own\\_colormap.cxx](#)
- [fl\\_set\\_font.cxx](#)
- [fl\\_shortcut.cxx](#)
- [Fl\\_Timeout.cxx](#)
- [Fl\\_visual.cxx](#)
- [Fl\\_Widget.cxx](#)
- [Fl\\_Window.cxx](#)
- [screen\\_xywh.cxx](#)

## 33.8 Fl\_Adjuster Class Reference

The [Fl\\_Adjuster](#) widget was stolen from Prisms, and has proven to be very useful for values that need a large dynamic range.

```
#include <Fl_Adjuster.H>
```

Inheritance diagram for Fl\_Adjuster:



### Public Member Functions

- [Fl\\_Adjuster](#) (int X, int Y, int W, int H, const char \*l=0)  
Creates a new [Fl\\_Adjuster](#) widget using the given position, size, and label string.
- int [soft](#) () const  
If "soft" is turned on, the user is allowed to drag the value outside the range.
- void [soft](#) (int s)  
If "soft" is turned on, the user is allowed to drag the value outside the range.

## Protected Member Functions

- void `draw ()` [FL\\_OVERRIDE](#)  
*Draws the widget.*
- int `handle (int)` [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- void `value_damage ()` [FL\\_OVERRIDE](#)  
*Asks for partial redraw.*

## Additional Inherited Members

### 33.8.1 Detailed Description

The [Fl\\_Adjuster](#) widget was stolen from Prisms, and has proven to be very useful for values that need a large dynamic range.

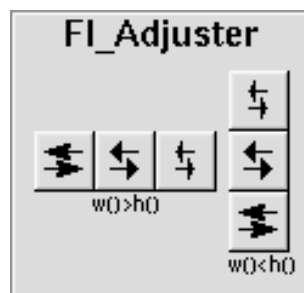


Figure 33.1 Fl\_Adjuster

When you press a button and drag to the right the value increases. When you drag to the left it decreases. The largest button adjusts by  $100 * \text{step}()$ , the next by  $10 * \text{step}()$  and that smallest button by  $\text{step}()$ . Clicking on the buttons increments by 10 times the amount dragging by a pixel does. Shift + click decrements by 10 times the amount.

### 33.8.2 Constructor & Destructor Documentation

#### 33.8.2.1 Fl\_Adjuster()

```
Fl_Adjuster::Fl_Adjuster (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Adjuster](#) widget using the given position, size, and label string. It looks best if one of the dimensions is 3 times the other. Inherited destructor destroys the Valuator.

### 33.8.3 Member Function Documentation

#### 33.8.3.1 draw()

```
void Fl_Adjuster::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.8.3.2 [handle\(\)](#)

```
int Fl_Adjuster::handle (
    int event ) [protected], [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

<code>in</code>	<code>event</code>	the kind of event received
-----------------	--------------------	----------------------------

#### Return values

<code>0</code>	if the event was not used or understood
<code>1</code>	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

### 33.8.3.3 [soft\(\)](#) [1/2]

```
int Fl_Adjuster::soft ( ) const [inline]
```

If "soft" is turned on, the user is allowed to drag the value outside the range.

If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.

Default is one.

### 33.8.3.4 [soft\(\)](#) [2/2]

```
void Fl_Adjuster::soft (
    int s ) [inline]
```

If "soft" is turned on, the user is allowed to drag the value outside the range.

If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.

Default is one.

### 33.8.3.5 [value\\_damage\(\)](#)

```
void Fl_Adjuster::value_damage ( ) [protected], [virtual]
```

Asks for partial redraw.

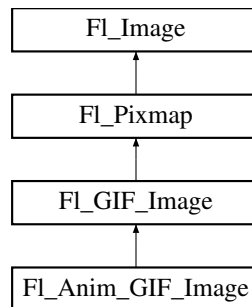
Reimplemented from [FI\\_Valuator](#).

The documentation for this class was generated from the following files:

- [FI\\_Adjuster.H](#)
- [FI\\_Adjuster.cxx](#)

## 33.9 FI\_Anim\_GIF\_Image Class Reference

The [FI\\_Anim\\_GIF\\_Image](#) class supports loading, caching, and drawing of animated Compuserve GIF<sup>SM</sup> images. Inheritance diagram for [FI\\_Anim\\_GIF\\_Image](#):



### Public Types

- enum [Flags](#) {  
[DONT\\_START](#) = 1 , [DONT\\_RESIZE\\_CANVAS](#) = 2 , [DONT\\_SET\\_AS\\_IMAGE](#) = 4 , [OPTIMIZE\\_MEMORY](#) = 8 ,  
[LOG\\_FLAG](#) = 64 , [DEBUG\\_FLAG](#) = 128 }

*When opening an [FI\\_Anim\\_GIF\\_Image](#) there are some options that can be passed in a `flags` value.*

### Public Member Functions

- [FI\\_Widget](#) \* [canvas](#) () const  
*Gets the current widget, that is used to display the frame images.*
- void [canvas](#) ([FI\\_Widget](#) \*[canvas](#), unsigned short [flags](#)=0)  
*Link the image back to a widget for automated animation.*
- int [canvas\\_h](#) () const  
*Return the height of the animation canvas.*
- int [canvas\\_w](#) () const  
*Return the width of the animation canvas.*
- void [color\\_average](#) ([FI\\_Color](#) [c](#), float [i](#)) [FL\\_OVERRIDE](#)  
*Applies a color average to all frames.*
- [FI\\_Image](#) \* [copy](#) () const
- [FI\\_Image](#) \* [copy](#) (int [W](#), int [H](#)) const [FL\\_OVERRIDE](#)  
*Copy and resize the animation frames.*
- int [debug](#) () const
- void [delay](#) (int [frame](#), double [delay](#))  
*Set the delay of frame [0-frames() -1] in seconds.*
- double [delay](#) (int [frame\\_](#)) const  
*Return the delay of frame [0-frames() -1] in seconds.*
- void [desaturate](#) () [FL\\_OVERRIDE](#)  
*Desaturate to all frames of the animation.*
- void [draw](#) (int [x](#), int [y](#), int [w](#), int [h](#), int [cx](#)=0, int [cy](#)=0) [FL\\_OVERRIDE](#)

- Draw the current frame of the animation.*
- **FI\_Anim\_GIF\_Image** ()
  - Create an empty animated GIF image shell.*
- **FI\_Anim\_GIF\_Image** (const char \*filename, **FI\_Widget** \*canvas=0, unsigned short flags=0)
  - Load an animated GIF image from a file.*
- **FI\_Anim\_GIF\_Image** (const char \*imagename, const unsigned char \*data, const size\_t length, **FI\_Widget** \*canvas=0, unsigned short flags=0)
  - Load an animated GIF image from memory.*
- int **frame** () const
  - Return the current frame.*
- void **frame** (int frame)
  - Set the current frame.*
- int **frame\_h** (int frame) const
  - Return the frame dimensions of a frame.*
- bool **frame\_uncache** () const
  - Return the active **frame\_uncache()** setting.*
- void **frame\_uncache** (bool uncache)
  - Use **frame\_uncache()** to set or forbid frame image uncaching.*
- int **frame\_w** (int frame) const
  - Return the frame dimensions of a frame.*
- int **frame\_x** (int frame) const
  - Return the frame position of a frame.*
- int **frame\_y** (int frame) const
  - Return the frame position of a frame.*
- int **frames** () const
  - Get the number of frames in the animation.*
- **FI\_Image** \* **image** () const
  - Return the current frame image.*
- **FI\_Image** \* **image** (int frame) const
  - Return the image of the given frame index.*
- bool **is\_animated** () const
  - Check if this is a valid animation with more than one frame.*
- bool **load** (const char \*name, const unsigned char \*imgdata=NULL, size\_t imglength=0)
  - Load an animation from a file or from a memory block.*
- const char \* **name** () const
  - Return the name of the played file as specified in the constructor.*
- bool **next** ()
  - Show the next frame if the animation is stopped.*
- bool **playing** () const
  - Return if the animation is currently running or stopped.*
- **FI\_Anim\_GIF\_Image** & **resize** (double scale)
  - Resizes the image to the specified size, replacing the current image.*
- **FI\_Anim\_GIF\_Image** & **resize** (int w, int h)
  - Resizes the image to the specified size, replacing the current image.*
- double **speed** () const
  - Get the animation speed factor.*
- void **speed** (double speed)
  - Set the animation speed factor.*
- bool **start** ()
  - The **start()** method (re-)starts the playing of the frames.*
- bool **stop** ()

The `stop()` method stops the playing of the frames.

- void `uncache()` `FL_OVERRIDE`

Uncache all cached image data now.

- bool `valid()` const

Check if animation is valid.

- `~Fl_Anim_GIF_Image()` `FL_OVERRIDE`

Release the image and all cached data.

## Static Public Member Functions

- static int `frame_count` (const char \*`name`, const unsigned char \*`imgdata`=NULL, size\_t `imglength`=0)

Get the number of frames in a GIF file or in a GIF compressed data block.

## Static Public Attributes

- static bool `loop` = true

The loop flag can be used to (dis-)allow loop count.

- static double `min_delay` = 0.

The `min_delay` value can be used to set a minimum value for the frame delay for playback.

## Protected Member Functions

- void `clear_frames()`
- bool `next_frame()`
- void `on_extension_data` (Fl\_GIF\_Image::GIF\_FRAME &`f`) `FL_OVERRIDE`
- void `on_frame_data` (Fl\_GIF\_Image::GIF\_FRAME &`f`) `FL_OVERRIDE`
- void `scale_frame()`
- void `set_frame()`
- void `set_frame` (int `frame`)

## Static Protected Member Functions

- static void `cb_animate` (void \*`d`)

## Additional Inherited Members

### 33.9.1 Detailed Description

The `Fl_Anim_GIF_Image` class supports loading, caching, and drawing of animated Compuserve GIF<sup>SM</sup> images.

The class loads all images contained in the file and animates them by cycling through them as defined by the delay times in the image file.

The user must supply an FLTK widget as "container" in order to see the animation by specifying it in the constructor or later using the `canvas()` method.

### 33.9.2 Member Enumeration Documentation

#### 33.9.2.1 Flags

enum `Fl_Anim_GIF_Image::Flags`

When opening an `Fl_Anim_GIF_Image` there are some options that can be passed in a `flags` value.

## Enumerator

DONT_START	This flag indicates to the loader that it should not start the animation immediately after successful load, which is the default. It can be started later using the <a href="#">start()</a> method.
DONT_RESIZE_CANVAS	This flag indicates to the loader that it should not resize the canvas widget of the animation to the dimensions of the animation, which is the default. Needed for special use cases.
DONT_SET_AS_IMAGE	This flag indicates to the loader that it should not set the animation as <a href="#">image()</a> member of the canvas widget, which is the default. Needed for special use cases.
OPTIMIZE_MEMORY	Often frames change just a small area of the animation canvas. This flag indicates to the loader to try using less memory by storing frame data not as canvas-sized images but use the sizes defined in the GIF file. The drawbacks are higher cpu usage during playback and maybe minor artifacts when resized.
LOG_FLAG	This flag can be used to print informations about the decoding process to the console.
DEBUG_FLAG	This flag can be used to print even more informations about the decoding process to the console.

### 33.9.3 Constructor & Destructor Documentation

#### 33.9.3.1 Fl\_Anim\_GIF\_Image() [1/2]

```
Fl_Anim_GIF_Image::Fl_Anim_GIF_Image (
    const char * filename,
    Fl_Widget * canvas = 0,
    unsigned short flags = 0 )
```

Load an animated GIF image from a file.

This constructor creates an animated image from a GIF-formatted file. Optionally it applies the [canvas\(\)](#) method after successful load. If [DONT\\_START](#) is not specified in the `flags` parameter it calls [start\(\)](#) after successful load.

## Parameters

in	<i>filename</i>	path and name of GIF file in the file system
in	<i>canvas</i>	a widget that will show and animate the GIF, or NULL
in	<i>flags</i>	see <a href="#">Flags</a> for details, or 0

## Note

The GIF image must be decoupled from the canvas by calling `myGif->canvas (NULL) ;` before deleting the canvas.

#### 33.9.3.2 Fl\_Anim\_GIF\_Image() [2/2]

```
Fl_Anim_GIF_Image::Fl_Anim_GIF_Image (
    const char * imagename,
    const unsigned char * data,
    const size_t length,
    Fl_Widget * canvas = 0,
    unsigned short flags = 0 )
```

Load an animated GIF image from memory.

This constructor creates an animated image from a GIF-formatted block in memory. Optionally it applies the [canvas\(\)](#) method after successful load. If [DONT\\_START](#) is not specified in the `flags` parameter it calls [start\(\)](#) after successful load.

`imagename` can be `NULL`. If a name is given, the image is added to the list of shared images and will be available by that name.

#### Parameters

in	<i>imagename</i>	a name given to this image or <code>NULL</code>
in	<i>data</i>	pointer to the start of the GIF image in memory
in	<i>length</i>	length of the GIF image in memory
in	<i>canvas</i>	a widget that will show and animate the GIF, or <code>NULL</code>
in	<i>flags</i>	see <a href="#">Flags</a> for details, or 0

#### Note

The GIF image must be decoupled from the canvas by calling `myGif->canvas (NULL) ;` before deleting the canvas.

#### 33.9.3.3 ~Fl\_Anim\_GIF\_Image()

```
Fl_Anim_GIF_Image::~Fl_Anim_GIF_Image ( )
```

Release the image and all cached data.

Also removes the animation timer.

### 33.9.4 Member Function Documentation

#### 33.9.4.1 canvas() [1/2]

```
Fl_Widget * Fl_Anim_GIF_Image::canvas ( ) const
```

Gets the current widget, that is used to display the frame images.

#### Returns

a pointer to a widget

#### 33.9.4.2 canvas() [2/2]

```
void Fl_Anim_GIF_Image::canvas (
    Fl_Widget * canvas,
    unsigned short flags = 0 )
```

Link the image back to a widget for automated animation.

This method sets current widget, that is used to display the frame images. The `flags` parameter specifies whether the canvas widget is resized to the animation dimensions and/or its [image\(\)](#) method will be used to set the current frame image during animation.

#### Parameters

in	<i>canvas</i>	a pointer to the widget that will show the animation
in	<i>flags</i>	see <a href="#">Flags</a>

**Note**

The GIF image must be decoupled from the canvas by calling `myGif->canvas(NULL)` ; before deleting the canvas.

**33.9.4.3 canvas\_h()**

```
int Fl_Anim_GIF_Image::canvas_h ( ) const
```

Return the height of the animation canvas.

**Returns**

the width in pixel units

**33.9.4.4 canvas\_w()**

```
int Fl_Anim_GIF_Image::canvas_w ( ) const
```

Return the width of the animation canvas.

**Returns**

the width in pixel units

**33.9.4.5 color\_average()**

```
void Fl_Anim_GIF_Image::color_average (
    Fl_Color c,
    float i ) [virtual]
```

Applies a color average to all frames.

The `color_average()` method averages the colors in the image with the provided FLTK color value.

**Parameters**

in	<i>c</i>	blend color
in	<i>i</i>	a value between 0.0 and 1.0 where 0 results in the blend color, and 1 returns the original image

Reimplemented from [Fl\\_Image](#).

**33.9.4.6 copy()**

```
Fl_Image * Fl_Anim_GIF_Image::copy (
    int W,
    int H ) const [virtual]
```

Copy and resize the animation frames.

The virtual `copy()` method makes a copy of the animated image and resizes all of its frame images to W x H using the current resize method.

**Parameters**

in	<i>W,H</i>	new size in FLTK pixel units
----	------------	------------------------------

**Returns**

the resized copy of the animation

Reimplemented from [Fl\\_Image](#).

**33.9.4.7 delay() [1/2]**

```
void Fl_Anim_GIF_Image::delay (
    int frame,
    double delay )
```

Set the delay of frame [0-[frames\(\)](#) -1] in seconds.

**Parameters**

in	<i>frame</i>	index into frame list
in	<i>delay</i>	to next frame in seconds

**33.9.4.8 delay() [2/2]**

```
double Fl_Anim_GIF_Image::delay (
    int frame ) const
```

Return the delay of frame [0-[frames\(\)](#) -1] in seconds.

**Parameters**

in	<i>frame</i>	index into frame list
----	--------------	-----------------------

**Returns**

delay to next frame in seconds

**33.9.4.9 desaturate()**

```
void Fl_Anim_GIF_Image::desaturate ( ) [virtual]
```

Desaturate to all frames of the animation.

Reimplemented from [Fl\\_Image](#).

**33.9.4.10 draw()**

```
void Fl_Anim_GIF_Image::draw (
    int x,
    int y,
    int w,
    int h,
    int cx = 0,
    int cy = 0 ) [virtual]
```

Draw the current frame of the animation.

**Parameters**

in	<i>x,y,w,h</i>	target rectangle
in	<i>cx,cy</i>	source offset

Reimplemented from [Fl\\_Image](#).

#### 33.9.4.11 `frame()` [1/2]

```
int Fl_Anim_GIF_Image::frame ( ) const
```

Return the current frame.

##### Returns

the current frame index in the range for 0 to `frames()` - 1.  
-1 if the image has no frames.

#### 33.9.4.12 `frame()` [2/2]

```
void Fl_Anim_GIF_Image::frame (
    int frame )
```

Set the current frame.

##### Parameters

in	<i>frame</i>	index into list of frames
----	--------------	---------------------------

#### 33.9.4.13 `frame_count()`

```
int Fl_Anim_GIF_Image::frame_count (
    const char * name,
    const unsigned char * imgdata = NULL,
    size_t imglength = 0 ) [static]
```

Get the number of frames in a GIF file or in a GIF compressed data block.

The static `frame_count()` method is just a convenience method for getting the number of images (frames) stored in a GIF file.

As this count is not readily available in the GIF header, the whole GIF file has be parsed (which is done here by using a temporary [Fl\\_Anim\\_GIF\\_Image](#) object for simplicity). So this call may be slow with large files.

If `imgdata` is `NULL`, the image will be read from the file. Otherwise, it will be read from memory.

##### Parameters

in	<i>name</i>	path and name of GIF file in the file system, ignored when reading from memeory
in	<i>imgdata</i>	pointer to the start of the GIF image in memory, or <code>NULL</code> to read from a file
in	<i>imglength</i>	length of the GIF image in memory, or 0

##### Returns

the number of frames in the animation

#### 33.9.4.14 `frame_h()`

```
int Fl_Anim_GIF_Image::frame_h (
    int frame ) const
```

Return the frame dimensions of a frame.

Usefull only if loaded with 'optimize\_mem' and the animation also has size optimized frames.

## Parameters

in	<i>frame</i>	index into frame list
----	--------------	-----------------------

## Returns

height in FLTK pixle units

**33.9.4.15 frame\_uncache() [1/2]**

```
bool Fl_Anim_GIF_Image::frame_uncache ( ) const
```

Return the active [frame\\_uncache\(\)](#) setting.

## Returns

true if caching is disabled

**33.9.4.16 frame\_uncache() [2/2]**

```
void Fl_Anim_GIF_Image::frame_uncache (
    bool uncache )
```

Use [frame\\_uncache\(\)](#) to set or forbid frame image uncaching.

If frame uncaching is set, frame images are not offscreen cached for re-use and will be re-created every time they are displayed. This saves a lot of memory on the expense of cpu usage and should be carefully considered. Per default frame caching will be done.

## Parameters

in	<i>uncache</i>	true to disable caching
----	----------------	-------------------------

**33.9.4.17 frame\_w()**

```
int Fl_Anim_GIF_Image::frame_w (
    int frame ) const
```

Return the frame dimensions of a frame.

Usefull only if loaded with 'optimize\_mem' and the animation also has size optimized frames.

## Parameters

in	<i>frame</i>	index into frame list
----	--------------	-----------------------

## Returns

width in FLTK pixle units

**33.9.4.18 frame\_x()**

```
int Fl_Anim_GIF_Image::frame_x (
    int frame ) const
```

Return the frame position of a frame.

Usefull only if loaded with 'optimize\_mem' and the animation also has size optimized frames.

## Parameters

in	<i>frame</i>	index into frame list
----	--------------	-----------------------

## Returns

x position in FLTK pixle units

**33.9.4.19 frame\_y()**

```
int Fl_Anim_GIF_Image::frame_y (
    int frame ) const
```

Return the frame position of a frame.

Usefull only if loaded with 'optimize\_mem' and the animation also has size optimized frames.

## Parameters

in	<i>frame</i>	index into frame list
----	--------------	-----------------------

## Returns

y position in FLTK pixle units

**33.9.4.20 frames()**

```
int Fl_Anim_GIF_Image::frames ( ) const
```

Get the number of frames in the animation.

## Returns

the number of frames

**33.9.4.21 image() [1/2]**

```
Fl_Image * Fl_Anim_GIF_Image::image ( ) const
```

Return the current frame image.

## Returns

a pointer to the image or NULL if this is not an animation.

**33.9.4.22 image() [2/2]**

```
Fl_Image * Fl_Anim_GIF_Image::image (
    int frame_ ) const
```

Return the image of the given frame index.

## Parameters

in	<i>frame</i> ↔	index into list of frames
	—	

**Returns**

image data or NULL if the frame number is not valid.

**33.9.4.23 is\_animated()**

```
bool Fl_Anim_GIF_Image::is_animated ( ) const
```

Check if this is a valid animation with more than one frame.

The `is_animated()` method is just a convenience method for testing the valid flag and the frame count being greater 1.

**Returns**

true if the animation is valid and has multiple frames.

**33.9.4.24 load()**

```
bool Fl_Anim_GIF_Image::load (
    const char * name,
    const unsigned char * imgdata = NULL,
    size_t imglength = 0 )
```

Load an animation from a file or from a memory block.

The `load()` method is either used from the constructor to load the image from the given file, or to re-load an existing animation from another file.

**Parameters**

in	<i>name</i>	path and name of GIF file in the file system, or the image name when reading from memory
in	<i>imgdata</i>	pointer to the start of the GIF image in memory, or NULL to read from a file
in	<i>imglength</i>	length of the GIF image in memory, or 0

**Returns**

true if the animation loaded correctly

**33.9.4.25 name()**

```
const char * Fl_Anim_GIF_Image::name ( ) const
```

Return the name of the played file as specified in the constructor.

If read from a memory block, this returns the name of the animation.

**Returns**

pointer to a C string

**33.9.4.26 next()**

```
bool Fl_Anim_GIF_Image::next ( )
```

Show the next frame if the animation is stopped.

**Returns**

true if the animation has frames

**33.9.4.27 on\_extension\_data()**

```
void Fl_Anim_GIF_Image::on_extension_data (
    Fl_GIF_Image::GIF_FRAME & f ) [protected], [virtual]
```

Reimplemented from [Fl\\_GIF\\_Image](#).

**33.9.4.28 on\_frame\_data()**

```
void Fl_Anim_GIF_Image::on_frame_data (
    Fl_GIF_Image::GIF_FRAME & f ) [protected], [virtual]
```

Reimplemented from [Fl\\_GIF\\_Image](#).

**33.9.4.29 playing()**

```
bool Fl_Anim_GIF_Image::playing ( ) const [inline]
```

Return if the animation is currently running or stopped.

**Returns**

true if the animation is running

**33.9.4.30 resize() [1/2]**

```
Fl_Anim_GIF_Image & Fl_Anim_GIF_Image::resize (
    double scale )
```

Resizes the image to the specified size, replacing the current image.

If [DONT\\_RESIZE\\_CANVAS](#) is not set, the canvas widget will also be resized.

**Parameters**

in	<i>scale</i>	rescale factor in relation to current size
----	--------------	--

**33.9.4.31 resize() [2/2]**

```
Fl_Anim_GIF_Image & Fl_Anim_GIF_Image::resize (
    int w,
    int h )
```

Resizes the image to the specified size, replacing the current image.

If [DONT\\_RESIZE\\_CANVAS](#) is not set, the canvas widget will also be resized.

**Parameters**

in	<i>w,h</i>	new size of teh naimtion frames
----	------------	---------------------------------

**33.9.4.32 speed() [1/2]**

```
double Fl_Anim_GIF_Image::speed ( ) const
```

Get the animation speed factor.

**Returns**

the current speed factor

**33.9.4.33 speed()** [2/2]

```
void Fl_Anim_GIF_Image::speed (
    double speed )
```

Set the animation speed factor.

The [speed\(\)](#) method changes the playing speed to `speed` x original speed. E.g. to play at half speed call it with 0.5, for double speed with 2.

**Parameters**

in	<i>speed</i>	floating point speed factor
----	--------------	-----------------------------

**33.9.4.34 start()**

```
bool Fl_Anim_GIF_Image::start ( )
```

The [start\(\)](#) method (re-)starts the playing of the frames.

**Returns**

true if the animation has frames

**33.9.4.35 stop()**

```
bool Fl_Anim_GIF_Image::stop ( )
```

The [stop\(\)](#) method stops the playing of the frames.

**Returns**

true if the animation has frames

**33.9.4.36 uncache()**

```
void Fl_Anim_GIF_Image::uncache ( ) [virtual]
```

Uncache all cached image data now.

Re-implemented from [Fl\\_Pixmap](#).

Reimplemented from [Fl\\_Image](#).

**33.9.4.37 valid()**

```
bool Fl_Anim_GIF_Image::valid ( ) const
```

Check if animation is valid.

**Returns**

true if the class has successfully loaded and the image has at least one frame.

**33.9.5 Member Data Documentation****33.9.5.1 loop**

```
bool Fl_Anim_GIF_Image::loop = true [static]
```

The loop flag can be used to (dis-)allow loop count.

If set (which is the default), the animation will be stopped after the number of repeats specified in the GIF file (typically this count is set to 'forever' anyway). If cleared the animation will always be 'forever', regardless of what is specified in the GIF file.

### 33.9.5.2 min\_delay

```
double Fl_Anim_GIF_Image::min_delay = 0. [static]
```

The `min_delay` value can be used to set a minimum value for the frame delay for playback.

This is to prevent CPU hogs caused by images with very low delay rates. This is a global value for all `Fl_Anim_GIF_Image` objects.

The documentation for this class was generated from the following files:

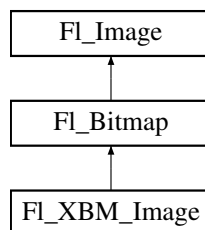
- `Fl_Anim_GIF_Image.H`
- `Fl_Anim_GIF_Image.cxx`

## 33.10 Fl\_Bitmap Class Reference

The `Fl_Bitmap` class supports caching and drawing of mono-color (bitmap) images.

```
#include <Fl_Bitmap.H>
```

Inheritance diagram for `Fl_Bitmap`:



### Public Member Functions

- `int cache_h ()`
- `int cache_w ()`
- `Fl_Image * copy () const`
- `Fl_Image * copy (int W, int H) const FL_OVERRIDE`  
*Creates a resized copy of the image.*
- `void draw (int X, int Y)`
- `void draw (int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE`  
*Draws the image to the current drawing surface with a bounding box.*
- `Fl_Bitmap (const char *bits, int bits_length, int W, int H)`  
*The constructors create a new bitmap from the specified bitmap data.*
- `Fl_Bitmap (const char *bits, int W, int H)`  
*The constructors create a new bitmap from the specified bitmap data.*
- `Fl_Bitmap (const uchar *bits, int bits_length, int W, int H)`  
*The constructors create a new bitmap from the specified bitmap data.*
- `Fl_Bitmap (const uchar *bits, int W, int H)`  
*The constructors create a new bitmap from the specified bitmap data.*
- `void label (Fl_Menu_Item *m) FL_OVERRIDE`  
*This method is an obsolete way to set the image attribute of a menu item.*
- `void label (Fl_Widget *w) FL_OVERRIDE`  
*This method is an obsolete way to set the image attribute of a widget or menu item.*
- `void uncache () FL_OVERRIDE`  
*If the image has been cached for display, delete the cache data.*
- `virtual ~Fl_Bitmap ()`  
*The destructor frees all memory and server resources that are used by the bitmap.*

## Public Attributes

- `int alloc_array`  
*Non-zero if array points to bitmap data allocated internally.*
- `const uchar * array`  
*pointer to raw bitmap data*

## Friends

- `class Fl_Graphics_Driver`

## Additional Inherited Members

### 33.10.1 Detailed Description

The `Fl_Bitmap` class supports caching and drawing of mono-color (bitmap) images. Images are drawn using the current color.

### 33.10.2 Constructor & Destructor Documentation

#### 33.10.2.1 Fl\_Bitmap() [1/4]

```
Fl_Bitmap::Fl_Bitmap (
    const uchar * bits,
    int W,
    int H ) [inline]
```

The constructors create a new bitmap from the specified bitmap data.

See also

[Fl\\_Bitmap\(const uchar \\*bits, int bits\\_length, int W, int H\)](#)

#### 33.10.2.2 Fl\_Bitmap() [2/4]

```
Fl_Bitmap::Fl_Bitmap (
    const char * bits,
    int W,
    int H ) [inline]
```

The constructors create a new bitmap from the specified bitmap data.

See also

[Fl\\_Bitmap\(const char \\*bits, int bits\\_length, int W, int H\)](#)

#### 33.10.2.3 Fl\_Bitmap() [3/4]

```
Fl_Bitmap::Fl_Bitmap (
    const uchar * bits,
    int bits_length,
    int W,
    int H )
```

The constructors create a new bitmap from the specified bitmap data.

If the provided array is too small to contain all the image data, the constructor will not generate the bitmap to avoid illegal memory read access and instead set `data` to `NULL` and `ld` to `ERR_MEMORY_ACCESS`.

## Parameters

<i>bits</i>	bitmap data, one pixel per bit, rows are rounded to the next byte
<i>bits_length</i>	length of the <i>bits</i> array in bytes
<i>W</i>	image width in pixels
<i>H</i>	image height in pixels

## See also

[Fl\\_Bitmap\(const char \\*bits, int bits\\_length, int W, int H\)](#), [Fl\\_Bitmap\(const uchar \\*bits, int W, int H\)](#)

**33.10.2.4 Fl\_Bitmap() [4/4]**

```
Fl_Bitmap::Fl_Bitmap (
    const char * bits,
    int bits_length,
    int W,
    int H )
```

The constructors create a new bitmap from the specified bitmap data.

If the provided array is too small to contain all the image data, the constructor will not generate the bitmap to avoid illegal memory read access and instead set *data* to NULL and *ld* to `ERR_MEMORY_ACCESS`.

## Parameters

<i>bits</i>	bitmap data, one pixel per bit, rows are rounded to the next byte
<i>bits_length</i>	length of the <i>bits</i> array in bytes
<i>W</i>	image width in pixels
<i>H</i>	image height in pixels

## See also

[Fl\\_Bitmap\(const uchar \\*bits, int bits\\_length, int W, int H\)](#), [Fl\\_Bitmap\(const char \\*bits, int W, int H\)](#)

**33.10.3 Member Function Documentation****33.10.3.1 copy()**

```
Fl_Image * Fl_Bitmap::copy (
    int W,
    int H ) const [virtual]
```

Creates a resized copy of the image.

It is recommended not to call this member function to reduce the size of an image to the size of the area where this image will be drawn, and to use [Fl\\_Image::scale\(\)](#) instead.

The new image should be released when you are done with it.

Note: since FLTK 1.4.0 you can use [Fl\\_Image::release\(\)](#) for all types of images (i.e. all subclasses of [Fl\\_Image](#)) instead of operator *delete* for [Fl\\_Image](#)'s and [Fl\\_Image::release\(\)](#) for [Fl\\_Shared\\_Image](#)'s.

The new image data will be converted to the requested size. RGB images are resized using the algorithm set by [Fl\\_Image::RGB\\_scaling\(\)](#).

For the new image the following equations are true:

- `w() == data_w() == W`
- `h() == data_h() == H`

## Parameters

in	<i>W,H</i>	Requested width and height of the new image
----	------------	---

## Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of [Fl\\_RGB\\_Image](#), [Fl\\_SVG\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Bitmap](#), [Fl\\_Tiled\\_Image](#), [Fl\\_Anim\\_GIF\\_Image](#) and [Fl\\_Shared\\_Image](#). Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an [Fl\\_GIF\\_Image](#) is an object of class [Fl\\_Pixmap](#).

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from [Fl\\_Image](#) or any subclass your overridden methods of '[Fl\\_Image::copy\(\) const](#)' and '[Fl\\_Image::copy\(int, int\) const](#)' **must** also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from [Fl\\_Image](#).

**33.10.3.2 draw()**

```
void Fl_Bitmap::draw (
    int X,
    int Y,
    int W,
    int H,
    int cx = 0,
    int cy = 0 ) [virtual]
```

Draws the image to the current drawing surface with a bounding box.

Arguments *X*, *Y*, *W*, *H* specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the *cx* and *cy* arguments.

In other words: `fl_push_clip(X,Y,W,H)` is applied, the image is drawn with its upper-left corner at *X-cx*, *Y-cy* and its own width and height, `fl_pop_clip()` is applied.

Reimplemented from [Fl\\_Image](#).

**33.10.3.3 label()** [1/2]

```
void Fl_Bitmap::label (
    Fl_Menu_Item * m ) [virtual]
```

This method is an obsolete way to set the image attribute of a menu item.

**Deprecated** Please use [Fl\\_Menu\\_Item::image\(\)](#) instead.

Reimplemented from [Fl\\_Image](#).

**33.10.3.4 label()** [2/2]

```
void Fl_Bitmap::label (
    Fl_Widget * widget ) [virtual]
```

This method is an obsolete way to set the image attribute of a widget or menu item.

**Deprecated** Please use [Fl\\_Widget::image\(\)](#) or [Fl\\_Widget::deimage\(\)](#) instead.

Reimplemented from [Fl\\_Image](#).

### 33.10.3.5 `uncache()`

```
void Fl_Bitmap::uncache ( ) [virtual]
```

If the image has been cached for display, delete the cache data.

This allows you to change the data used for the image and then redraw it without recreating an image object.

Reimplemented from [Fl\\_Image](#).

The documentation for this class was generated from the following files:

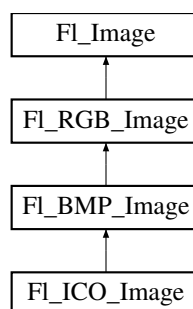
- `Fl_Bitmap.H`
- `Fl_Bitmap.cxx`

## 33.11 `Fl_BMP_Image` Class Reference

The [Fl\\_BMP\\_Image](#) class supports loading, caching, and drawing of Windows Bitmap (BMP) image files.

```
#include <Fl_BMP_Image.H>
```

Inheritance diagram for `Fl_BMP_Image`:



### Public Member Functions

- [Fl\\_BMP\\_Image](#) (const char \*filename)  
*This constructor loads the named BMP image from the given BMP filename.*
- [Fl\\_BMP\\_Image](#) (const char \*imagename, const unsigned char \*data, const long length=-1)  
*This constructor loads a BMP image from memory.*

### Protected Member Functions

- void `load_bmp_` (class [Fl\\_Image\\_Reader](#) &rdr, int ico\_height=0, int ico\_width=0)

### Additional Inherited Members

#### 33.11.1 Detailed Description

The [Fl\\_BMP\\_Image](#) class supports loading, caching, and drawing of Windows Bitmap (BMP) image files.

#### 33.11.2 Constructor & Destructor Documentation

##### 33.11.2.1 `Fl_BMP_Image()` [1/2]

```
Fl_BMP_Image::Fl_BMP_Image (
    const char * filename )
```

This constructor loads the named BMP image from the given BMP filename.

The destructor frees all memory and server resources that are used by the image.

Use [Fl\\_Image::fail\(\)](#) to check if [Fl\\_BMP\\_Image](#) failed to load. `fail()` returns `ERR_FILE_ACCESS` if the file could not be opened or read, `ERR_FORMAT` if the BMP format could not be decoded, and `ERR_NO_IMAGE` if the image could not be loaded for another reason.

## Parameters

in	<i>filename</i>	a full path and name pointing to a BMP file.
----	-----------------	--

## See also

[Fl\\_BMP\\_Image::Fl\\_BMP\\_Image](#)(const char\* imagename, const unsigned char \*data, const long length = -1);

## 33.11.2.2 Fl\_BMP\_Image() [2/2]

```
Fl_BMP_Image::Fl_BMP_Image (
    const char * imagename,
    const unsigned char * data,
    const long length = -1 )
```

This constructor loads a BMP image from memory.

Construct an image from a block of memory inside the application. Fluid offers "binary data" chunks as a great way to add image data into the C++ source code. *imagename* can be NULL. If a name is given, the image is added to the list of shared images and will be available by that name.

The destructor frees all memory and server resources that are used by the image.

The (new and optional) third parameter *length* **should** be used so buffer overruns (i.e. truncated images) can be checked. See note below.

If *length* is not used

- it defaults to -1 (unlimited size)
- buffer overruns will not be checked.

## Note

The optional parameter *length* is available since FLTK 1.4.0. Not using it is deprecated and old code should be modified to use it. This parameter will likely become mandatory in a future FLTK version.

Use [Fl\\_Image::fail\(\)](#) to check if [Fl\\_BMP\\_Image](#) failed to load. *fail()* returns ERR\_FILE\_ACCESS if the image could not be read from memory, ERR\_FORMAT if the BMP format could not be decoded, and ERR\_NO\_IMAGE if the image could not be loaded for another reason.

## Parameters

in	<i>imagename</i>	A name given to this image or NULL
in	<i>data</i>	Pointer to the start of the BMP image in memory.
in	<i>length</i>	Length of the BMP image in memory.

## See also

[Fl\\_BMP\\_Image::Fl\\_BMP\\_Image](#)(const char \*filename)

[Fl\\_Shared\\_Image](#)

The documentation for this class was generated from the following files:

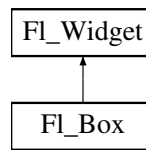
- Fl\_BMP\_Image.H
- Fl\_BMP\_Image.cxx

## 33.12 Fl\_Box Class Reference

This widget simply draws its box, and possibly its label.

```
#include <Fl_Box.H>
```

Inheritance diagram for `Fl_Box`:



## Public Member Functions

- `Fl_Box (Fl_Boxtype B, int X, int Y, int W, int H, const char *L)`  
Creates a new `Fl_Box` widget with the given boxtype, coordinates, size, and label.
- `Fl_Box (int X, int Y, int W, int H, const char *L=0)`  
Creates a new `Fl_Box` widget with the given coordinates, size, and label.
- `int handle (int) FL_OVERRIDE`  
Handles the specified event.

## Protected Member Functions

- `void draw () FL_OVERRIDE`  
Draws the widget.

## Additional Inherited Members

### 33.12.1 Detailed Description

This widget simply draws its box, and possibly its label.

Putting it before some other widgets and making it big enough to surround them will let you draw a frame around them.

### 33.12.2 Constructor & Destructor Documentation

#### 33.12.2.1 `Fl_Box()` [1/2]

```

Fl_Box::Fl_Box (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )

```

Creates a new `Fl_Box` widget with the given coordinates, size, and label.

This constructor sets `box()` to `FL_NO_BOX`, which means it is invisible.

However such widgets are useful as placeholders or `Fl_Group::resizable()` values. To change the box to something visible, use `box(Fl_Boxtype)`.

The destructor removes the box from its parent group.

#### Parameters

in	<i>X,Y</i>	the position of the widget relative to the enclosing window
in	<i>W,H</i>	size of the widget in pixels
in	<i>L</i>	optional text for the widget label (default: no label)

See also

[Fl\\_Box\(Fl\\_Boxtype b, int X, int Y, int W, int H, const char \\*L\)](#)

### 33.12.2.2 Fl\_Box() [2/2]

```
Fl_Box::Fl_Box (
    Fl_Boxtype B,
    int X,
    int Y,
    int W,
    int H,
    const char * L )
```

Creates a new [Fl\\_Box](#) widget with the given boxtype, coordinates, size, and label.

This constructor sets [box\(\)](#) to the given Fl\_Boxtype B.

You must also specify a label but it can be `nullptr` (0, NULL) if you don't want or need a visible label.

The destructor removes the box from its parent group.

#### Parameters

in	<i>B</i>	boxtype of the widget
in	<i>X,Y</i>	the position of the widget relative to the enclosing window
in	<i>W,H</i>	size of the widget in pixels
in	<i>L</i>	optional text for the widget label (see description)

See also

[Fl\\_Box\(int X, int Y, int W, int H, const char \\*L\)](#)

## 33.12.3 Member Function Documentation

### 33.12.3.1 draw()

```
void Fl_Box::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.12.3.2 handle()

```
int Fl_Box::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

<code>in</code>	<code>event</code>	the kind of event received
-----------------	--------------------	----------------------------

#### Return values

<code>0</code>	if the event was not used or understood
<code>1</code>	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

The documentation for this class was generated from the following files:

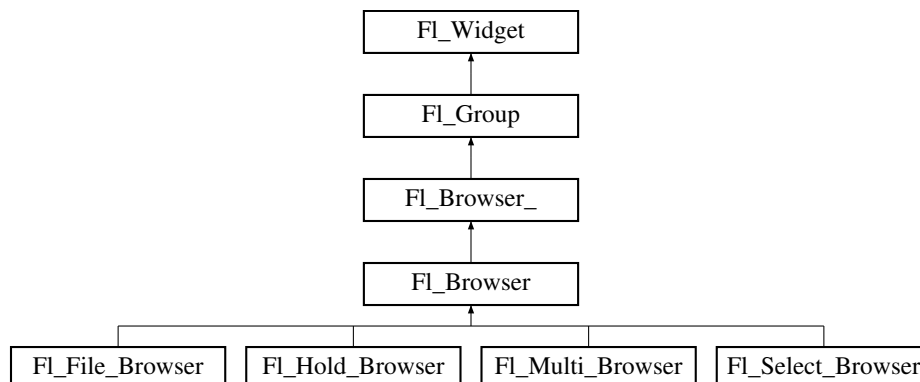
- [Fl\\_Box.H](#)
- [Fl\\_Box.cxx](#)

## 33.13 Fl\_Browser Class Reference

The [Fl\\_Browser](#) widget displays a scrolling list of text lines, and manages all the storage for the text.

```
#include <Fl_Browser.H>
```

Inheritance diagram for [Fl\\_Browser](#):



### Public Types

- enum [Fl\\_Line\\_Position](#) { **TOP** , **BOTTOM** , **MIDDLE** }

*For internal use only?*

### Public Member Functions

- void [add](#) (const char \*newtext, void \*d=0)  
*Adds a new line to the end of the browser.*
- void [bottomline](#) (int line)  
*Scrolls the browser so the bottom item in the browser is showing the specified `line`.*

- void `clear` ()  
*Removes all the lines in the browser.*
- char `column_char` () const  
*Gets the current column separator character.*
- void `column_char` (char c)  
*Sets the column separator to c.*
- const int \* `column_widths` () const  
*Gets the current column width array.*
- void `column_widths` (const int \*arr)  
*Sets the current array to arr.*
- void \* `data` (int line) const  
*Returns the user data() for specified line.*
- void `data` (int line, void \*d)  
*Sets the user data for specified line to d.*
- void `display` (int line, int val=1)  
*For back compatibility.*
- int `displayed` (int line) const  
*Returns non-zero if line has been scrolled to a position where it is being displayed.*
- `FL_Browser` (int X, int Y, int W, int H, const char \*L=0)  
*The constructor makes an empty browser.*
- char `format_char` () const  
*Gets the current format code prefix character, which by default is '@'.*
- void `format_char` (char c)  
*Sets the current format code prefix character to c.*
- void `hide` () `FL_OVERRIDE`  
*Hides the entire FL\_Browser widget – opposite of show().*
- void `hide` (int line)  
*Makes line invisible, preventing selection by the user.*
- `FL_Image` \* `icon` (int line) const  
*Returns the icon currently defined for line.*
- void `icon` (int line, `FL_Image` \*icon)  
*Set the image icon for line to the value icon.*
- void `insert` (int line, const char \*newtext, void \*d=0)  
*Insert a new entry whose label is newtext above given line, optional data d.*
- void `lineposition` (int line, `FL_Line_Position` pos)  
*Updates the browser so that line is shown at position pos.*
- int `load` (const char \*filename)  
*Clears the browser and reads the file, adding each line from the file to the browser.*
- void `make_visible` (int line)  
*Make the item at the specified line visible().*
- void `middleline` (int line)  
*Scrolls the browser so the middle item in the browser is showing the specified line.*
- void `move` (int to, int from)  
*Line from is removed and reinserted at to.*
- void `remove` (int line)  
*Remove entry for given line number, making the browser one line shorter.*
- void `remove_icon` (int line)  
*Removes the icon for line.*
- void `replace` (int a, const char \*b)  
*For back compatibility only.*
- int `select` (int line, int val=1)

- Sets the selection state of the item at `line` to the value `val`.*

  - int `selected` (int `line`) const

*Returns 1 if specified `line` is selected, 0 if not.*
- void `show` () `FL_OVERRIDE`

*Shows the entire `FL_Browser` widget – opposite of `hide()`.*
- void `show` (int `line`)

*Makes `line` visible, and available for selection by user.*
- int `size` () const

*Returns how many lines are in the browser.*
- void `size` (int `W`, int `H`)
- void `swap` (int `a`, int `b`)

*Swaps two browser lines `a` and `b`.*
- const char \* `text` (int `line`) const

*Returns the label text for the specified `line`.*
- void `text` (int `line`, const char \*`newtext`)

*Sets the text for the specified `line` to `newtext`.*
- `FL_Fontsize` `textsize` () const

*Gets the default text size (in pixels) for the lines in the browser.*
- void `textsize` (`FL_Fontsize` `newSize`)

*Sets the default text size (in pixels) for the lines in the browser to `newSize`.*
- int `topline` () const

*Returns the line that is currently visible at the top of the browser.*
- void `topline` (int `line`)

*Scrolls the browser so the top item in the browser is showing the specified `line`.*
- int `value` () const

*Returns the line number of the currently selected line, or 0 if none selected.*
- void `value` (int `line`)

*Sets the browser's `value()`, which selects the specified `line`.*
- int `visible` (int `line`) const

*Returns non-zero if the specified `line` is visible, 0 if hidden.*
- ~`FL_Browser` ()

*The destructor deletes all list items and destroys the browser.*

## Protected Member Functions

- `FL_BLINE` \* `_remove` (int `line`)

*Removes the item at the specified `line`.*
- `FL_BLINE` \* `find_line` (int `line`) const

*Returns the item for specified `line`.*
- int `full_height` () const `FL_OVERRIDE`

*The height of the entire list of all `visible()` items in pixels.*
- int `incr_height` () const `FL_OVERRIDE`

*The default 'average' item height (including inter-item spacing) in pixels.*
- void `insert` (int `line`, `FL_BLINE` \*`item`)

*Insert specified `item` above `line`.*
- void \* `item_at` (int `line`) const `FL_OVERRIDE`

*Return the item at specified `line`.*
- void `item_draw` (void \*`item`, int `X`, int `Y`, int `W`, int `H`) const `FL_OVERRIDE`

*Draws `item` at the position specified by `X Y W H`.*
- void \* `item_first` () const `FL_OVERRIDE`

*Returns the very first item in the list.*

- `int item_height (void *item) const` [FL\\_OVERRIDE](#)  
*Returns height of `item` in pixels.*
- `void * item_last () const` [FL\\_OVERRIDE](#)  
*Returns the very last item in the list.*
- `void * item_next (void *item) const` [FL\\_OVERRIDE](#)  
*Returns the next item after `item`.*
- `void * item_prev (void *item) const` [FL\\_OVERRIDE](#)  
*Returns the previous item before `item`.*
- `void item_select (void *item, int val)` [FL\\_OVERRIDE](#)  
*Change the selection state of `item` to the value `val`.*
- `int item_selected (void *item) const` [FL\\_OVERRIDE](#)  
*See if `item` is selected.*
- `void item_swap (void *a, void *b)` [FL\\_OVERRIDE](#)  
*Swap the items `a` and `b`.*
- `const char * item_text (void *item) const` [FL\\_OVERRIDE](#)  
*Returns the label text for `item`.*
- `int item_width (void *item) const` [FL\\_OVERRIDE](#)  
*Returns width of `item` in pixels.*
- `int lineno (void *item) const`  
*Returns line number corresponding to `item`, or zero if not found.*
- `void swap (FL_BLINE *a, FL_BLINE *b)`  
*Swap the two items `a` and `b`.*

## Additional Inherited Members

### 33.13.1 Detailed Description

The [FI\\_Browser](#) widget displays a scrolling list of text lines, and manages all the storage for the text. This is not a text editor or spreadsheet! But it is useful for showing a vertical list of named objects to the user.



Figure 33.2 [FI\\_Hold\\_Browser](#)

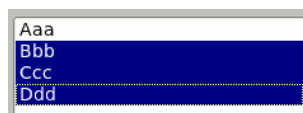


Figure 33.3 [FI\\_Multi\\_Browser](#)

Each line in the browser is identified by number. *The numbers start at one* (this is so that zero can be reserved for "no line" in the selective browsers). *Unless otherwise noted, the methods do not check to see if the passed line number is in range and legal. It must always be greater than zero and  $\leq$  [size\(\)](#).*

Each line contains a null-terminated string of text and a `void *` data pointer. The text string is displayed, the `void *` pointer can be used by the callbacks to reference the object the text describes.

The base class does nothing when the user clicks on it. The subclasses [FI\\_Select\\_Browser](#), [FI\\_Hold\\_Browser](#), and [FI\\_Multi\\_Browser](#) react to user clicks to select lines in the browser and do callbacks.

The base class [FI\\_Browser\\_](#) provides the scrolling and selection mechanisms of this and all the subclasses, but the dimensions and appearance of each item are determined by the subclass. You can use [FI\\_Browser\\_](#) to display

information other than text, or text that is dynamically produced from your own data structures. If you find that loading the browser is a lot of work or is inefficient, you may want to make a subclass of [Fl\\_Browser\\_](#).

Some common coding patterns used for working with [Fl\\_Browser](#):

```
// How to loop through all the items in the browser
for ( int t=1; t<=browser->size(); t++ ) {           // index 1 based..!
    printf("item #%d, label='%s'\n", t, browser->text(t));
}
```

Note: If you are *subclassing* [Fl\\_Browser](#), it's more efficient to use the protected methods [item\\_first\(\)](#) and [item\\_next\(\)](#), since [Fl\\_Browser](#) internally uses linked lists to manage the browser's items. For more info, see [find\\_item\(int\)](#).

### 33.13.2 Constructor & Destructor Documentation

#### 33.13.2.1 Fl\_Browser()

```
Fl_Browser::Fl_Browser (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

The constructor makes an empty browser.

##### Parameters

in	<i>X,Y,W,H</i>	position and size.
in	<i>L</i>	label string, may be NULL.

### 33.13.3 Member Function Documentation

#### 33.13.3.1 \_remove()

```
FL_BLINE * Fl_Browser::_remove (
    int line ) [protected]
```

Removes the item at the specified *line*.

Caveat: See efficiency note in [find\\_line\(\)](#). You must call [redraw\(\)](#) to make any changes visible.

##### Parameters

in	<i>line</i>	The line number to be removed. (1 based) Must be in range!
----	-------------	--

##### Returns

Pointer to browser item that was removed (and is no longer valid).

##### See also

[add\(\)](#), [insert\(\)](#), [remove\(\)](#), [swap\(int,int\)](#), [clear\(\)](#)

#### 33.13.3.2 add()

```
void Fl_Browser::add (
    const char * newtext,
    void * d = 0 )
```

Adds a new line to the end of the browser.

The text string `newtext` may contain format characters; see [format\\_char\(\)](#) for details. `newtext` is copied using the `strdup()` function, and can be `NULL` to make a blank line.

The optional `void*` argument `d` will be the [data\(\)](#) for the new item.

#### Parameters

in	<i>newtext</i>	The label text used for the added item
in	<i>d</i>	Optional user <a href="#">data()</a> for the item (0 if unspecified)

#### See also

[add\(\)](#), [insert\(\)](#), [remove\(\)](#), [swap\(int,int\)](#), [clear\(\)](#)

### 33.13.3.3 [bottomline\(\)](#)

```
void Fl_Browser::bottomline (
    int line ) [inline]
```

Scrolls the browser so the bottom item in the browser is showing the specified `line`.

#### Parameters

in	<i>line</i>	The line to be displayed at the bottom.
----	-------------	---

#### See also

[topline\(\)](#), [middleline\(\)](#), [bottomline\(\)](#), [displayed\(\)](#), [lineposition\(\)](#)

### 33.13.3.4 [clear\(\)](#)

```
void Fl_Browser::clear ( )
```

Removes all the lines in the browser.

#### See also

[add\(\)](#), [insert\(\)](#), [remove\(\)](#), [swap\(int,int\)](#), [clear\(\)](#)

### 33.13.3.5 [column\\_char\(\)](#) [1/2]

```
char Fl_Browser::column_char ( ) const [inline]
```

Gets the current column separator character.

The default is `'\t'` (tab).

#### See also

[column\\_char\(\)](#), [column\\_widths\(\)](#)

### 33.13.3.6 [column\\_char\(\)](#) [2/2]

```
void Fl_Browser::column_char (
    char c ) [inline]
```

Sets the column separator to `c`.

This will only have an effect if you also set [column\\_widths\(\)](#). The default is `'\t'` (tab).

See also

[column\\_char\(\)](#), [column\\_widths\(\)](#)

### 33.13.3.7 column\_widths() [1/2]

```
const int * Fl_Browser::column_widths ( ) const [inline]
```

Gets the current column width array.

This array is zero-terminated and specifies the widths in pixels of each column. The text is split at each [column\\_char\(\)](#) and each part is formatted into it's own column. After the last column any remaining text is formatted into the space between the last column and the right edge of the browser, even if the text contains instances of [column\\_char\(\)](#). The default value is a one-element array of just a zero, which means there are no columns.

Example:

```
Fl_Browser *b = new Fl_Browser(..);
static int widths[] = { 50, 50, 50, 70, 70, 40, 40, 70, 70, 50, 0 }; // widths for each column
b->column_widths(widths); // assign array to widget
b->column_char('\t'); // use tab as the column character
b->add("USER\tPID\tCPU\tMEM\tVSZ\tRSS\tTTY\tSTAT\tSTART\tTIME\tCOMMAND");
b->add("root\t2888\t0.0\t0.0\t1352\t0\ttty3\tSW\tAug15\t0:00\tb@f/sbin/mingetty tty3");
b->add("root\t13115\t0.0\t0.0\t1352\t0\ttty2\tSW\tAug30\t0:00\tb@f/sbin/mingetty tty2");
[...]
```

See also

[column\\_char\(\)](#), [column\\_widths\(\)](#)

### 33.13.3.8 column\_widths() [2/2]

```
void Fl_Browser::column_widths (
    const int * arr ) [inline]
```

Sets the current array to `arr`.

Make sure the last entry is zero.

See also

[column\\_char\(\)](#), [column\\_widths\(\)](#)

### 33.13.3.9 data() [1/2]

```
void * Fl_Browser::data (
    int line ) const
```

Returns the user [data\(\)](#) for specified `line`.

Return value can be NULL if `line` is out of range or no user [data\(\)](#) was defined. The parameter `line` is 1 based (1 will be the first item in the list).

Parameters

in	<i>line</i>	The line number of the item whose <a href="#">data()</a> is returned. (1 based)
----	-------------	---

Returns

The user data pointer (can be NULL)

### 33.13.3.10 data() [2/2]

```
void Fl_Browser::data (
    int line,
    void * d )
```

Sets the user data for specified `line` to `d`.  
Does nothing if `line` is out of range.

#### Parameters

in	<i>line</i>	The line of the item whose <a href="#">data()</a> is to be changed. (1 based)
in	<i>d</i>	The new data to be assigned to the item. (can be NULL)

#### 33.13.3.11 display()

```
void Fl_Browser::display (
    int line,
    int val = 1 )
```

For back compatibility.

This calls `show(line)` if `val` is true, and `hide(line)` otherwise. If `val` is not specified, the default is 1 (makes the line visible).

#### See also

[show\(int\)](#), [hide\(int\)](#), [display\(\)](#), [visible\(\)](#), [make\\_visible\(\)](#)

#### 33.13.3.12 displayed()

```
int Fl_Browser::displayed (
    int line ) const [inline]
```

Returns non-zero if `line` has been scrolled to a position where it is being displayed.

Checks to see if the item's vertical position is within the top and bottom edges of the display window. This does NOT take into account the [hide\(\)](#)/[show\(\)](#) status of the widget or item.

#### Parameters

in	<i>line</i>	The line to be checked
----	-------------	------------------------

#### Returns

1 if visible, 0 if not visible.

#### See also

[topline\(\)](#), [middleline\(\)](#), [bottomline\(\)](#), [displayed\(\)](#), [lineposition\(\)](#)

#### 33.13.3.13 find\_line()

```
FL_BLINE * Fl_Browser::find_line (
    int line ) const [protected]
```

Returns the item for specified `line`.

Note: This call is slow. It's fine for e.g. responding to user clicks, but slow if called often, such as in a tight sorting loop. Finding an item 'by line' involves a linear lookup on the internal linked list. The performance hit can be significant if the browser's contents is large, and the method is called often (e.g. during a sort). If you're writing a subclass, use the protected methods [item\\_first\(\)](#), [item\\_next\(\)](#), etc. to access the internal linked list more efficiently.

#### Parameters

in	<i>line</i>	The line number of the item to return. (1 based)
----	-------------	--

## Return values

<i>item</i>	that was found.
<i>NULL</i>	if line is out of range.

## See also

[item\\_at\(\)](#), [find\\_line\(\)](#), [lineno\(\)](#)

**33.13.3.14 format\_char()** [1/2]

```
char Fl_Browser::format_char ( ) const [inline]
```

Gets the current format code prefix character, which by default is '@'.

A string of formatting codes at the start of each column are stripped off and used to modify how the rest of the line is printed:

- '@.' Print rest of line, don't look for more '@' signs
- '@@' Doubling the format character prints the format character once, followed by the rest of line
- '@l' Use a LARGE (24 point) font
- '@m' Use a medium large (18 point) font
- '@s' Use a small (11 point) font
- '@b' Use a **bold** font (adds FL\_BOLD to font)
- '@i' Use an *italic* font (adds FL\_ITALIC to font)
- '@f' or '@t' Use a fixed-pitch font (sets font to FL\_COURIER)
- '@c' Center the line horizontally
- '@r' Right-justify the text
- '@N' Use fl\_inactive\_color() to draw the text
- '@B0', '@B1', ... '@B255' Fill the background with fl\_color(n)
- '@C0', '@C1', ... '@C255' Use fl\_color(n) to draw the text
- '@F0', '@F1', ... Use fl\_font(n) to draw the text
- '@S1', '@S2', ... Use point size n to draw the text
- '@u' or '@\_' Underline the text.
- '@-' draw an engraved line through the middle.

Notice that the '@.' command can be used to reliably terminate the parsing. To print a random string in a random color, use `sprintf("@C%d@.%s", color, string)` and it will work even if the string starts with a digit or has the format character in it.

**33.13.3.15 format\_char()** [2/2]

```
void Fl_Browser::format_char (
    char c ) [inline]
```

Sets the current format code prefix character to c.

The default prefix is '@'. Set the prefix to 0 to disable formatting.

## See also

[format\\_char\(\)](#) for list of '@' codes

**33.13.3.16 full\_height()**

```
int Fl_Browser::full_height ( ) const [protected], [virtual]
```

The height of the entire list of all [visible\(\)](#) items in pixels.

This returns the accumulated height of *all* the items in the browser that are not hidden with [hide\(\)](#), including items scrolled off screen.

**Returns**

The accumulated size of all the visible items in pixels.

**See also**

[item\\_height\(\)](#), [item\\_width\(\)](#),  
[incr\\_height\(\)](#), [full\\_height\(\)](#)

Reimplemented from [Fl\\_Browser\\_](#).

**33.13.3.17 hide() [1/2]**

```
void Fl_Browser::hide ( ) [inline], [virtual]
```

Hides the entire [Fl\\_Browser](#) widget – opposite of [show\(\)](#).

Reimplemented from [Fl\\_Widget](#).

**33.13.3.18 hide() [2/2]**

```
void Fl_Browser::hide (
    int line )
```

Makes *line* invisible, preventing selection by the user.

The line can still be selected under program control. This changes the [full\\_height\(\)](#) if the state was changed. When a line is made invisible, lines below it are moved up in the display. [redraw\(\)](#) is called automatically if a change occurred.

**Parameters**

<i>in</i>	<i>line</i>	The line to be hidden. (1 based)
-----------	-------------	----------------------------------

**See also**

[show\(int\)](#), [hide\(int\)](#), [display\(\)](#), [visible\(\)](#), [make\\_visible\(\)](#)

**33.13.3.19 icon() [1/2]**

```
Fl_Image * Fl_Browser::icon (
    int line ) const
```

Returns the icon currently defined for *line*.

If no icon is defined, NULL is returned.

**Parameters**

<i>in</i>	<i>line</i>	The line whose icon is returned.
-----------	-------------	----------------------------------

**Returns**

The icon defined, or NULL if none.

**33.13.3.20 icon()** [2/2]

```
void Fl_Browser::icon (
    int line,
    Fl_Image * icon )
```

Set the image icon for `line` to the value `icon`.

Caller is responsible for keeping the icon allocated. The `line` is automatically redrawn.

**Parameters**

in	<i>line</i>	The line to be modified. If out of range, nothing is done.
in	<i>icon</i>	The image icon to be assigned to the <code>line</code> . If NULL, any previous icon is removed.

**33.13.3.21 incr\_height()**

```
int Fl_Browser::incr_height ( ) const [protected], [virtual]
```

The default 'average' item height (including inter-item spacing) in pixels.

This currently returns `textsize() + 2`.

**Returns**

The value in pixels.

**See also**

[item\\_height\(\)](#), [item\\_width\(\)](#),  
[incr\\_height\(\)](#), [full\\_height\(\)](#)

Reimplemented from [Fl\\_Browser\\_](#).

**33.13.3.22 insert()** [1/2]

```
void Fl_Browser::insert (
    int line,
    const char * newtext,
    void * d = 0 )
```

Insert a new entry whose label is `newtext` *above* given `line`, optional data `d`.

Text may contain format characters; see [format\\_char\(\)](#) for details. `newtext` is copied using the `strdup()` function, and can be NULL to make a blank line.

The optional void \* argument `d` will be the [data\(\)](#) of the new item.

**Parameters**

in	<i>line</i>	Line position for insert. (1 based) If <code>line &gt; size()</code> , the entry will be added at the end.
in	<i>newtext</i>	The label text for the new line.
in	<i>d</i>	Optional pointer to user data to be associated with the new line.

**33.13.3.23 insert()** [2/2]

```
void Fl_Browser::insert (
    int line,
    FL_BLINE * item ) [protected]
```

Insert specified `item` above `line`.

If `line > size()` then the line is added to the end.

Caveat: See efficiency note in [find\\_line\(\)](#).

#### Parameters

in	<i>line</i>	The new line will be inserted above this line (1 based).
in	<i>item</i>	The item to be added.

#### 33.13.3.24 item\_at()

```
void * Fl_Browser::item_at (
    int line ) const [inline], [protected], [virtual]
```

Return the item at specified `line`.

#### Parameters

in	<i>line</i>	The line of the item to return. (1 based)
----	-------------	---

#### Returns

The item, or NULL if line out of range.

#### See also

[item\\_at\(\)](#), [find\\_line\(\)](#), [lineno\(\)](#)

Reimplemented from [Fl\\_Browser\\_](#).

#### 33.13.3.25 item\_draw()

```
void Fl_Browser::item_draw (
    void * item,
    int X,
    int Y,
    int W,
    int H ) const [protected], [virtual]
```

Draws `item` at the position specified by X Y W H.

The W and H values are used for clipping. Should only be called within the context of an FLTK [draw\(\)](#).

#### Parameters

in	<i>item</i>	The item to be drawn
in	<i>X,Y,W,H</i>	position and size.

Implements [Fl\\_Browser\\_](#).

#### 33.13.3.26 item\_first()

```
void * Fl_Browser::item_first ( ) const [protected], [virtual]
```

Returns the very first item in the list.

Example of use:

```
// Walk the browser from beginning to end
for ( void *i=item_first(); i; i=item_next(i) ) {
    printf("item label='%s'\n", item_text(i));
}
```

**Returns**

The first item, or NULL if list is empty.

**See also**

[item\\_first\(\)](#), [item\\_last\(\)](#), [item\\_next\(\)](#), [item\\_prev\(\)](#)

Implements [Fl\\_Browser\\_](#).

**33.13.3.27 item\_height()**

```
int Fl_Browser::item_height (
    void * item ) const [protected], [virtual]
```

Returns height of *item* in pixels.

This takes into account embedded @ codes within the [text\(\)](#) label.

**Parameters**

<i>in</i>	<i>item</i>	The item whose height is returned.
-----------	-------------	------------------------------------

**Returns**

The height of the item in pixels.

**See also**

[item\\_height\(\)](#), [item\\_width\(\)](#),  
[incr\\_height\(\)](#), [full\\_height\(\)](#)

Implements [Fl\\_Browser\\_](#).

**33.13.3.28 item\_last()**

```
void * Fl_Browser::item_last ( ) const [protected], [virtual]
```

Returns the very last item in the list.

Example of use:

```
// Walk the browser in reverse, from end to start
for ( void *i=item_last(); i; i=item_prev(i) ) {
    printf("item label='%s'\n", item_text(i));
}
```

**Returns**

The last item, or NULL if list is empty.

**See also**

[item\\_first\(\)](#), [item\\_last\(\)](#), [item\\_next\(\)](#), [item\\_prev\(\)](#)

Reimplemented from [Fl\\_Browser\\_](#).

**33.13.3.29 item\_next()**

```
void * Fl_Browser::item_next (
    void * item ) const [protected], [virtual]
```

Returns the next item after *item*.

## Parameters

in	<i>item</i>	The 'current' item
----	-------------	--------------------

## Returns

The next item after *item*, or NULL if there are none after this one.

## See also

[item\\_first\(\)](#), [item\\_last\(\)](#), [item\\_next\(\)](#), [item\\_prev\(\)](#)

Implements [Fl\\_Browser\\_](#).

**33.13.3.30 item\_prev()**

```
void * Fl_Browser::item_prev (
    void * item ) const [protected], [virtual]
```

Returns the previous item before *item*.

## Parameters

in	<i>item</i>	The 'current' item
----	-------------	--------------------

## Returns

The previous item before *item*, or NULL if there are none before this one.

## See also

[item\\_first\(\)](#), [item\\_last\(\)](#), [item\\_next\(\)](#), [item\\_prev\(\)](#)

Implements [Fl\\_Browser\\_](#).

**33.13.3.31 item\_select()**

```
void Fl_Browser::item_select (
    void * item,
    int val ) [protected], [virtual]
```

Change the selection state of *item* to the value *val*.

## Parameters

in	<i>item</i>	The item to be changed.
in	<i>val</i>	The new selection state: 1 selects, 0 de-selects.

## See also

[select\(\)](#), [selected\(\)](#), [value\(\)](#), [item\\_select\(\)](#), [item\\_selected\(\)](#)

Reimplemented from [Fl\\_Browser\\_](#).

**33.13.3.32 item\_selected()**

```
int Fl_Browser::item_selected (
    void * item ) const [protected], [virtual]
```

See if `item` is selected.

## Parameters

in	<i>item</i>	The item whose selection state is to be checked.
----	-------------	--

## Returns

1 if selected, 0 if not.

## See also

[select\(\)](#), [selected\(\)](#), [value\(\)](#), [item\\_select\(\)](#), [item\\_selected\(\)](#)

Reimplemented from [Fl\\_Browser\\_](#).

**33.13.3.33 item\_swap()**

```
void Fl_Browser::item_swap (
    void * a,
    void * b ) [inline], [protected], [virtual]
```

Swap the items a and b.

You must call [redraw\(\)](#) to make any changes visible.

## Parameters

in	<i>a,b</i>	the items to be swapped.
----	------------	--------------------------

## See also

[swap\(int,int\)](#), [item\\_swap\(\)](#)

Reimplemented from [Fl\\_Browser\\_](#).

**33.13.3.34 item\_text()**

```
const char * Fl_Browser::item_text (
    void * item ) const [protected], [virtual]
```

Returns the label text for *item*.

## Parameters

in	<i>item</i>	The item whose label text is returned.
----	-------------	--

## Returns

The item's text string. (Can be NULL)

Reimplemented from [Fl\\_Browser\\_](#).

**33.13.3.35 item\_width()**

```
int Fl_Browser::item_width (
    void * item ) const [protected], [virtual]
```

Returns width of *item* in pixels.

This takes into account embedded @ codes within the [text\(\)](#) label.

## Parameters

in	<i>item</i>	The item whose width is returned.
----	-------------	-----------------------------------

## Returns

The width of the item in pixels.

## See also

[item\\_height\(\)](#), [item\\_width\(\)](#),  
[incr\\_height\(\)](#), [full\\_height\(\)](#)

Implements [Fl\\_Browser\\_](#).

**33.13.3.36 lineno()**

```
int Fl_Browser::lineno (
    void * item ) const [protected]
```

Returns line number corresponding to *item*, or zero if not found.

Caveat: See efficiency note in [find\\_line\(\)](#).

## Parameters

in	<i>item</i>	The item to be found
----	-------------	----------------------

## Returns

The line number of the item, or 0 if not found.

## See also

[item\\_at\(\)](#), [find\\_line\(\)](#), [lineno\(\)](#)

**33.13.3.37 lineposition()**

```
void Fl_Browser::lineposition (
    int line,
    Fl\_Line\_Position pos )
```

Updates the browser so that *line* is shown at position *pos*.

## Parameters

in	<i>line</i>	line number. (1 based)
in	<i>pos</i>	position.

## See also

[topline\(\)](#), [middleline\(\)](#), [bottomline\(\)](#)

**33.13.3.38 load()**

```
int Fl_Browser::load (
    const char * filename )
```

Clears the browser and reads the file, adding each line from the file to the browser.

If the filename is NULL or a zero-length string then this just clears the browser. This returns zero if there was any error in opening or reading the file, in which case `errno` is set to the system error. The `data()` of each line is set to NULL.

#### Parameters

<code>in</code>	<code>filename</code>	The filename to load
-----------------	-----------------------	----------------------

#### Returns

1 if OK, 0 on error (`errno` has reason)

#### See also

[add\(\)](#)

#### 33.13.3.39 make\_visible()

```
void Fl_Browser::make_visible (
    int line ) [inline]
```

Make the item at the specified `line` [visible\(\)](#).

Functionally similar to [show\(int line\)](#). If `line` is out of range, redisplay top or bottom of list as appropriate.

#### Parameters

<code>in</code>	<code>line</code>	The line to be made visible.
-----------------	-------------------	------------------------------

#### See also

[show\(int\)](#), [hide\(int\)](#), [display\(\)](#), [visible\(\)](#), [make\\_visible\(\)](#)

#### 33.13.3.40 middleline()

```
void Fl_Browser::middleline (
    int line ) [inline]
```

Scrolls the browser so the middle item in the browser is showing the specified `line`.

#### Parameters

<code>in</code>	<code>line</code>	The line to be displayed in the middle.
-----------------	-------------------	---

#### See also

[topline\(\)](#), [middleline\(\)](#), [bottomline\(\)](#), [displayed\(\)](#), [lineposition\(\)](#)

#### 33.13.3.41 move()

```
void Fl_Browser::move (
    int to,
    int from )
```

Line `from` is removed and reinserted at `to`.

Note: `to` is calculated *after* line `from` gets removed.

## Parameters

in	<i>to</i>	Destination line number (calculated <i>after</i> line <i>from</i> is removed)
in	<i>from</i>	Line number of item to be moved

**33.13.3.42 remove()**

```
void Fl_Browser::remove (
    int line )
```

Remove entry for given *line* number, making the browser one line shorter.  
You must call [redraw\(\)](#) to make any changes visible.

## Parameters

in	<i>line</i>	Line to be removed. (1 based) If <i>line</i> is out of range, no action is taken.
----	-------------	--

## See also

[add\(\)](#), [insert\(\)](#), [remove\(\)](#), [swap\(int,int\)](#), [clear\(\)](#)

**33.13.3.43 remove\_icon()**

```
void Fl_Browser::remove_icon (
    int line )
```

Removes the icon for *line*.  
It's ok to remove an icon if none has been defined.

## Parameters

in	<i>line</i>	The line whose icon is to be removed.
----	-------------	---------------------------------------

**33.13.3.44 select()**

```
int Fl_Browser::select (
    int line,
    int val = 1 )
```

Sets the selection state of the item at *line* to the value *val*.  
If *val* is not specified, the default is 1 (selects the item).

## Parameters

in	<i>line</i>	The line number of the item to be changed. (1 based)
in	<i>val</i>	The new selection state (1=select, 0=de-select).

## Returns

1 if the state changed, 0 if not.

See also

[select\(\)](#), [selected\(\)](#), [value\(\)](#), [item\\_select\(\)](#), [item\\_selected\(\)](#)

### 33.13.3.45 selected()

```
int Fl_Browser::selected (
    int line ) const
```

Returns 1 if specified `line` is selected, 0 if not.

Parameters

<code>in</code>	<code>line</code>	The line being checked (1 based)
-----------------	-------------------	----------------------------------

Returns

1 if item selected, 0 if not.

See also

[select\(\)](#), [selected\(\)](#), [value\(\)](#), [item\\_select\(\)](#), [item\\_selected\(\)](#)

### 33.13.3.46 show() [1/2]

```
void Fl_Browser::show ( ) [inline], [virtual]
```

Shows the entire [Fl\\_Browser](#) widget – opposite of [hide\(\)](#).

Reimplemented from [Fl\\_Widget](#).

### 33.13.3.47 show() [2/2]

```
void Fl_Browser::show (
    int line )
```

Makes `line` visible, and available for selection by user.

Opposite of [hide\(int\)](#). This changes the [full\\_height\(\)](#) if the state was changed. [redraw\(\)](#) is called automatically if a change occurred.

Parameters

<code>in</code>	<code>line</code>	The line to be shown. (1 based)
-----------------	-------------------	---------------------------------

See also

[show\(int\)](#), [hide\(int\)](#), [display\(\)](#), [visible\(\)](#), [make\\_visible\(\)](#)

### 33.13.3.48 size()

```
int Fl_Browser::size ( ) const [inline]
```

Returns how many lines are in the browser.

The last line number is equal to this. Returns 0 if browser is empty.

### 33.13.3.49 swap() [1/2]

```
void Fl_Browser::swap (
```

```

        FL_BLINE * a,
        FL_BLINE * b )  [protected]

```

Swap the two items `a` and `b`.

Uses [swapping\(\)](#) to ensure list updates correctly.

#### Parameters

in	<i>a,b</i>	The two items to be swapped.
----	------------	------------------------------

#### See also

[swap\(int,int\)](#), [item\\_swap\(\)](#)

### 33.13.3.50 [swap\(\)](#) [2/2]

```

void Fl_Browser::swap (
    int a,
    int b )

```

Swaps two browser lines `a` and `b`.

You must call [redraw\(\)](#) to make any changes visible.

#### Parameters

in	<i>a,b</i>	The two lines to be swapped. (both 1 based)
----	------------	---

#### See also

[swap\(int,int\)](#), [item\\_swap\(\)](#)

### 33.13.3.51 [text\(\)](#) [1/2]

```

const char * Fl_Browser::text (
    int line ) const

```

Returns the label text for the specified `line`.

Return value can be NULL if `line` is out of range or unset. The parameter `line` is 1 based.

#### Parameters

in	<i>line</i>	The line number of the item whose text is returned. (1 based)
----	-------------	---

#### Returns

The text string (can be NULL)

### 33.13.3.52 [text\(\)](#) [2/2]

```

void Fl_Browser::text (
    int line,
    const char * newtext )

```

Sets the text for the specified `line` to `newtext`.

Text may contain format characters; see [format\\_char\(\)](#) for details. `newtext` is copied using the `strdup()` function, and can be NULL to make a blank line.

Does nothing if `line` is out of range.

## Parameters

in	<i>line</i>	The line of the item whose text will be changed. (1 based)
in	<i>newtext</i>	The new string to be assigned to the item.

**33.13.3.53** `textsize()`

```
void Fl_Browser::textsize (
    Fl_Fontsize newSize )
```

Sets the default text size (in pixels) for the lines in the browser to `newSize`.

This method recalculates all item heights and caches the total height internally for optimization of later item changes.

This can be slow if there are many items in the browser.

It returns immediately (w/o recalculation) if `newSize` equals the current `textsize()`.

You *may* need to call `redraw()` to see the effect and to have the scrollbar positions recalculated.

You should set the text size *before* populating the browser with items unless you really need to *change* the size later.

**33.13.3.54** `topline()` [1/2]

```
int Fl_Browser::topline ( ) const
```

Returns the line that is currently visible at the top of the browser.

If there is no vertical scrollbar then this will always return 1.

## Returns

The `lineno()` of the `top()` of the browser.

**33.13.3.55** `topline()` [2/2]

```
void Fl_Browser::topline (
    int line ) [inline]
```

Scrolls the browser so the top item in the browser is showing the specified `line`.

## Parameters

in	<i>line</i>	The line to be displayed at the top.
----	-------------	--------------------------------------

## See also

[topline\(\)](#), [middleline\(\)](#), [bottomline\(\)](#), [displayed\(\)](#), [lineposition\(\)](#)

**33.13.3.56** `value()` [1/2]

```
int Fl_Browser::value ( ) const
```

Returns the line number of the currently selected line, or 0 if none selected.

## Returns

The line number of current selection, or 0 if none selected.

## See also

[select\(\)](#), [selected\(\)](#), [value\(\)](#), [item\\_select\(\)](#), [item\\_selected\(\)](#)

**33.13.3.57 value()** [2/2]

```
void Fl_Browser::value (
    int line ) [inline]
```

Sets the browser's [value\(\)](#), which selects the specified `line`.  
This is the same as calling `select(line)`.

See also

[select\(\)](#), [selected\(\)](#), [value\(\)](#), [item\\_select\(\)](#), [item\\_selected\(\)](#)

**33.13.3.58 visible()**

```
int Fl_Browser::visible (
    int line ) const
```

Returns non-zero if the specified `line` is visible, 0 if hidden.  
Use [show\(int\)](#), [hide\(int\)](#), or [make\\_visible\(int\)](#) to change an item's visible state.

Parameters

<code>in</code>	<code>line</code>	The line in the browser to be tested. (1 based)
-----------------	-------------------	---

See also

[show\(int\)](#), [hide\(int\)](#), [display\(\)](#), [visible\(\)](#), [make\\_visible\(\)](#)

The documentation for this class was generated from the following files:

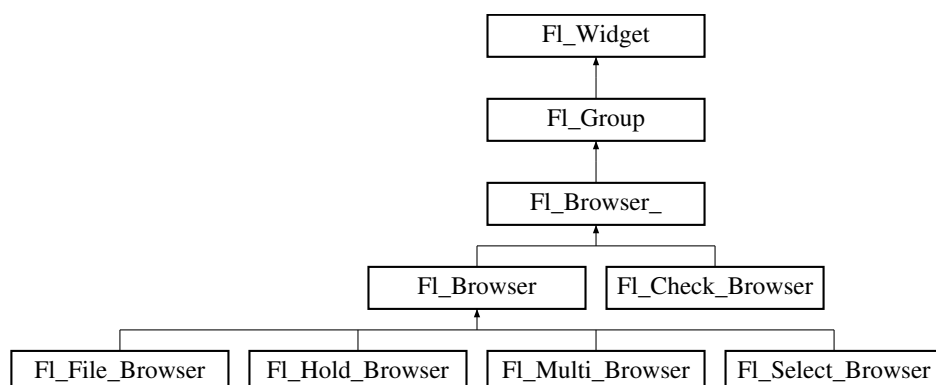
- `Fl_Browser.H`
- `Fl_Browser.cxx`
- `Fl_Browser_load.cxx`

**33.14 Fl\_Browser\_ Class Reference**

This is the base class for browsers.

```
#include <Fl_Browser_.H>
```

Inheritance diagram for `Fl_Browser_`:

**Public Types**

- enum {  
[HORIZONTAL](#) = 1 , [VERTICAL](#) = 2 , [BOTH](#) = 3 , [ALWAYS\\_ON](#) = 4 ,  
[HORIZONTAL\\_ALWAYS](#) = 5 , [VERTICAL\\_ALWAYS](#) = 6 , [BOTH\\_ALWAYS](#) = 7 }  
*Values for [has\\_scrollbar\(\)](#).*

## Public Member Functions

- int [deselect](#) (int docallbacks=0)  
*Deselects all items in the list and returns 1 if the state changed or 0 if it did not.*
- void [display](#) (void \*item)  
*Displays the *item*, scrolling the list as necessary.*
- int [handle](#) (int event) [FL\\_OVERRIDE](#)  
*Handles the *event* within the normal widget bounding box.*
- [uchar](#) [has\\_scrollbar](#) () const  
*Returns the current scrollbar mode, see [FL\\_Browser\\_::has\\_scrollbar\(uchar\)](#)*
- void [has\\_scrollbar](#) ([uchar](#) mode)  
*Sets whether the widget should have scrollbars or not (default [FL\\_Browser\\_::BOTH](#)).*
- int [hposition](#) () const  
*Gets the horizontal scroll position of the list as a pixel position *pos*.*
- void [hposition](#) (int)  
*Sets the horizontal scroll position of the list to pixel position *pos*.*
- int [linespacing](#) () const  
*Return the height of additional spacing between browser lines.*
- void [linespacing](#) (int pixels)  
*Add some space between browser lines.*
- int [position](#) () const
- void [position](#) (int pos)
- void [position](#) (int x, int y)
- void [resize](#) (int X, int Y, int W, int H) [FL\\_OVERRIDE](#)  
*Repositions and/or resizes the browser.*
- void [scrollbar\\_left](#) ()  
*Moves the vertical scrollbar to the lefthand side of the list.*
- void [scrollbar\\_right](#) ()  
*Moves the vertical scrollbar to the righthand side of the list.*
- int [scrollbar\\_size](#) () const  
*Gets the current size of the scrollbars' troughs, in pixels.*
- void [scrollbar\\_size](#) (int newSize)  
*Sets the pixel size of the scrollbars' troughs to *newSize*, in pixels.*
- int [scrollbar\\_width](#) () const  
*Returns the global value [Fl::scrollbar\\_size\(\)](#).*
- void [scrollbar\\_width](#) (int width)  
*Sets the global [Fl::scrollbar\\_size\(\)](#), and forces this instance of the widget to use it.*
- int [select](#) (void \*item, int val=1, int docallbacks=0)  
*Sets the selection state of *item* to *val*, and returns 1 if the state changed or 0 if it did not.*
- int [select\\_only](#) (void \*item, int docallbacks=0)  
*Selects *item* and returns 1 if the state changed or 0 if it did not.*
- void [sort](#) (int flags=0)  
*Sort the items in the browser based on *flags*.*
- [FL\\_Color](#) [textcolor](#) () const  
*Gets the default text color for the lines in the browser.*
- void [textcolor](#) ([FL\\_Color](#) col)  
*Sets the default text color for the lines in the browser to color *col*.*
- [FL\\_Font](#) [textfont](#) () const  
*Gets the default text font for the lines in the browser.*
- void [textfont](#) ([FL\\_Font](#) font)  
*Sets the default text font for the lines in the browser to *font*.*

- [Fl\\_Fontsize](#) **textsize** () const  
*Gets the default text size (in pixels) for the lines in the browser.*
- void **textsize** ([Fl\\_Fontsize](#) newSize)  
*Sets the default text size (in pixels) for the lines in the browser to *size*.*
- int [vposition](#) () const  
*Gets the vertical scroll position of the list as a pixel position *pos*.*
- void [vposition](#) (int pos)  
*Sets the vertical scroll position of the list to pixel position *pos*.*

## Public Attributes

- [Fl\\_Scrollbar](#) hscrollbar  
*Horizontal scrollbar.*
- [Fl\\_Scrollbar](#) scrollbar  
*Vertical scrollbar.*

## Protected Member Functions

- void [bbox](#) (int &X, int &Y, int &W, int &H) const  
*Returns the bounding box for the interior of the list's display window, inside the scrollbars.*
- void [deleting](#) (void \*item)  
*This method should be used when *item* is being deleted from the list.*
- int [displayed](#) (void \*item) const  
*Returns non-zero if *item* has been scrolled to a position where it is being displayed.*
- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the list within the normal widget bounding box.*
- void \* [find\\_item](#) (int ypos)  
*This method returns the item under mouse y position *ypos*.*
- [Fl\\_Browser\\_](#) (int X, int Y, int W, int H, const char \*L=0)  
*The constructor makes an empty browser.*
- virtual int [full\\_height](#) () const  
*This method may be provided by the subclass to indicate the full height of the item list, in pixels.*
- virtual int [full\\_width](#) () const  
*This method may be provided by the subclass to indicate the full width of the item list, in pixels.*
- virtual int [incr\\_height](#) () const  
*This method may be provided to return the average height of all items to be used for scrolling.*
- void [inserting](#) (void \*a, void \*b)  
*This method should be used when an item is in the process of being inserted into the list.*
- virtual void \* [item\\_at](#) (int index) const  
*This method must be provided by the subclass to return the item for the specified *index*.*
- virtual void [item\\_draw](#) (void \*item, int X, int Y, int W, int H) const =0  
*This method must be provided by the subclass to draw the *item* in the area indicated by X, Y, W, H.*
- virtual void \* [item\\_first](#) () const =0  
*This method must be provided by the subclass to return the first item in the list.*
- virtual int [item\\_height](#) (void \*item) const =0  
*This method must be provided by the subclass to return the height of *item* in pixels.*
- virtual void \* [item\\_last](#) () const  
*This method must be provided by the subclass to return the last item in the list.*
- virtual void \* [item\\_next](#) (void \*item) const =0  
*This method must be provided by the subclass to return the item in the list after *item*.*
- virtual void \* [item\\_prev](#) (void \*item) const =0

- This method must be provided by the subclass to return the item in the list before `item`.*
- virtual int `item_quick_height` (void \*item) const
- This method may be provided by the subclass to return the height of the `item`, in pixels.*
- virtual void `item_select` (void \*item, int val=1)
- This method must be implemented by the subclass if it supports multiple selections; sets the selection state to `val` for the `item`.*
- virtual int `item_selected` (void \*item) const
- This method must be implemented by the subclass if it supports multiple selections; returns the selection state for `item`.*
- virtual void `item_swap` (void \*a, void \*b)
- This optional method should be provided by the subclass to efficiently swap browser items `a` and `b`, such as for sorting.*
- virtual const char \* `item_text` (void \*item) const
- This optional method returns a string (label) that may be used for sorting.*
- virtual int `item_width` (void \*item) const =0
- This method must be provided by the subclass to return the width of the `item` in pixels.*
- int `leftedge` () const
- This method returns the X position of the left edge of the list area after adjusting for the scrollbar and border, if any.*
- void `new_list` ()
- This method should be called when the list data is completely replaced or cleared.*
- void `redraw_line` (void \*item)
- This method should be called when the contents of `item` has changed, but not its height.*
- void `redraw_lines` ()
- This method will cause the entire list to be redrawn.*
- void `replacing` (void \*a, void \*b)
- This method should be used when item `a` is being replaced by item `b`.*
- void \* `selection` () const
- Returns the item currently selected, or NULL if there is no selection.*
- void `swapping` (void \*a, void \*b)
- This method should be used when two items `a` and `b` are being swapped.*
- void \* `top` () const
- Returns the item that appears at the top of the list.*

## Additional Inherited Members

### 33.14.1 Detailed Description

This is the base class for browsers.

To be useful it must be subclassed and several virtual functions defined. The Forms-compatible browser and the file chooser's browser are subclassed off of this.

This has been designed so that the subclass has complete control over the storage of the data, although because `next()` and `prev()` functions are used to index, it works best as a linked list or as a large block of characters in which the line breaks must be searched for.

A great deal of work has been done so that the "height" of a data object does not need to be determined until it is drawn. This is useful if actually figuring out the size of an object requires accessing image data or doing `stat()` on a file or doing some other slow operation.

Callbacks are called when the value changes with `FL_REASON_CHANGED`. If `FL_WHEN_RELEASE` is set, callbacks are called when the mouse button is released with `FL_REASON_CHANGED` or `FL_REASON_RESELECTED` if the selection did not change. If `FL_WHEN_ENTER_KEY` is set, callbacks are also called when key presses or double clicks change the selection.

### Keyboard navigation of browser items

The keyboard navigation of browser items is only possible if [visible\\_focus\(\)](#) is enabled. If disabled, the widget rejects keyboard focus; Tab and Shift-Tab focus navigation will skip the widget.

In 'Select' and 'Normal' mode, the widget rejects keyboard focus; no navigation keys are supported (other than scrollbar positioning).

In 'Hold' mode, the widget accepts keyboard focus, and Up/Down arrow keys can navigate the selected item.

In 'Multi' mode, the widget accepts keyboard focus, and Up/Down arrow keys navigate the focus box; Space toggles the current item's selection, Enter selects only the current item (deselects all others). If Shift (or Ctrl) is combined with Up/Down arrow keys, the current item's selection state is extended to the next item. In this way one can extend a selection or de-selection.

## 33.14.2 Member Enumeration Documentation

### 33.14.2.1 anonymous enum

anonymous enum

Values for [has\\_scrollbar\(\)](#).

Anonymous enum bit flags for [has\\_scrollbar\(\)](#).

- bit 0: horizontal
- bit 1: vertical
- bit 2: 'always' (to be combined with bits 0 and 1)
- bit 3-31: reserved for future use

#### Enumerator

HORIZONTAL	Only show horizontal scrollbar.
VERTICAL	Only show vertical scrollbar.
BOTH	Show both scrollbars. (default)
ALWAYS_ON	Specified scrollbar(s) should 'always' be shown (to be used with HORIZONTAL/VERTICAL)
HORIZONTAL_ALWAYS	Horizontal scrollbar always on.
VERTICAL_ALWAYS	Vertical scrollbar always on.
BOTH_ALWAYS	Both scrollbars always on.

## 33.14.3 Constructor & Destructor Documentation

### 33.14.3.1 Fl\_Browser\_()

```
Fl_Browser_::Fl_Browser_ (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 ) [protected]
```

The constructor makes an empty browser.

#### Parameters

in	X,Y,W,H	position and size.
----	---------	--------------------

## Parameters

in	<i>L</i>	The label string, may be NULL.
----	----------	--------------------------------

### 33.14.4 Member Function Documentation

#### 33.14.4.1 bbox()

```
void Fl_Browser_::bbox (
    int & X,
    int & Y,
    int & W,
    int & H ) const [protected]
```

Returns the bounding box for the interior of the list's display window, inside the scrollbars.

## Parameters

out	<i>X,Y,W,H</i>	The returned bounding box. (The original contents of these parameters are overwritten)
-----	----------------	---

#### 33.14.4.2 deleting()

```
void Fl_Browser_::deleting (
    void * item ) [protected]
```

This method should be used when *item* is being deleted from the list.

It allows the [Fl\\_Browser\\_](#) to discard any cached data it has on the item. This method does not actually delete the item, but handles the follow up bookkeeping after the item has just been deleted.

## Parameters

in	<i>item</i>	The item being deleted.
----	-------------	-------------------------

#### 33.14.4.3 deselect()

```
int Fl_Browser_::deselect (
    int docalbacks = 0 )
```

Deselects all items in the list and returns 1 if the state changed or 0 if it did not.

If the optional *docalbacks* parameter is non-zero, deselect tries to call the callback function for the widget.

## Parameters

in	<i>docalbacks</i>	If non-zero, invokes widget callback if item changed. If 0, doesn't do callback (default).
----	-------------------	---

#### 33.14.4.4 display()

```
void Fl_Browser_::display (
    void * item )
```

Displays the *item*, scrolling the list as necessary.

## Parameters

in	<i>item</i>	The item to be displayed.
----	-------------	---------------------------

## See also

[display\(\)](#), [displayed\(\)](#)

**33.14.4.5 displayed()**

```
int Fl_Browser_::displayed (
    void * item ) const [protected]
```

Returns non-zero if *item* has been scrolled to a position where it is being displayed.

Checks to see if the item's vertical position is within the top and bottom edges of the display window. This does NOT take into account the [hide\(\)](#)/[show\(\)](#) status of the widget or item.

## Parameters

in	<i>item</i>	The item to check
----	-------------	-------------------

## Returns

1 if visible, 0 if not visible.

## See also

[display\(\)](#), [displayed\(\)](#)

**33.14.4.6 draw()**

```
void Fl_Browser_::draw (
    void ) [protected], [virtual]
```

Draws the list within the normal widget bounding box.

Implements [FL\\_Widget](#).

**33.14.4.7 find\_item()**

```
void * Fl_Browser_::find_item (
    int ypos ) [protected]
```

This method returns the item under mouse y position *ypos*.

NULL is returned if no item is displayed at that position.

## Parameters

in	<i>ypos</i>	The y position (eg. <a href="#">Fl::event_y()</a> ) to find an item under.
----	-------------	--

## Returns

The item, or NULL if not found

**33.14.4.8 full\_height()**

```
int Fl_Browser_::full_height ( ) const [protected], [virtual]
```

This method may be provided by the subclass to indicate the full height of the item list, in pixels. The default implementation computes the full height from the item heights. Includes the items that are scrolled off screen.

#### Returns

The height of the entire list, in pixels.

Reimplemented in [Fl\\_Browser](#).

#### 33.14.4.9 full\_width()

```
int Fl_Browser_::full_width ( ) const [protected], [virtual]
```

This method may be provided by the subclass to indicate the full width of the item list, in pixels. The default implementation computes the full width from the item widths.

#### Returns

The maximum width of all the items, in pixels.

#### 33.14.4.10 handle()

```
int Fl_Browser_::handle (
    int event ) [virtual]
```

Handles the `event` within the normal widget bounding box.

#### Parameters

in	<i>event</i>	The event to process.
----	--------------	-----------------------

#### Returns

1 if event was processed, 0 if not.

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Check\\_Browser](#).

#### 33.14.4.11 has\_scrollbar()

```
void Fl_Browser_::has_scrollbar (
    uchar mode ) [inline]
```

Sets whether the widget should have scrollbars or not (default [Fl\\_Browser\\_::BOTH](#)).

By default you can scroll in both directions, and the scrollbars disappear if the data will fit in the widget.

[has\\_scrollbar\(\)](#) changes this based on the value of `mode`:

- 0 - No scrollbars.
- [Fl\\_Browser\\_::HORIZONTAL](#) - Only a horizontal scrollbar.
- [Fl\\_Browser\\_::VERTICAL](#) - Only a vertical scrollbar.
- [Fl\\_Browser\\_::BOTH](#) - The default is both scrollbars.
- [Fl\\_Browser\\_::HORIZONTAL\\_ALWAYS](#) - Horizontal scrollbar always on, vertical always off.
- [Fl\\_Browser\\_::VERTICAL\\_ALWAYS](#) - Vertical scrollbar always on, horizontal always off.
- [Fl\\_Browser\\_::BOTH\\_ALWAYS](#) - Both always on.

**33.14.4.12 hposition()** [1/2]

```
int Fl_Browser_::hposition ( ) const [inline]
```

Gets the horizontal scroll position of the list as a pixel position `pos`.

The position returned is how many pixels of the list are scrolled off the left edge of the screen. Example: A position of '18' indicates the left 18 pixels of the list are scrolled off the left edge of the screen.

See also

[position\(\)](#), [hposition\(\)](#)

**33.14.4.13 hposition()** [2/2]

```
void Fl_Browser_::hposition (
    int pos )
```

Sets the horizontal scroll position of the list to pixel position `pos`.

The position is how many pixels of the list are scrolled off the left edge of the screen. Example: A position of '18' scrolls the left 18 pixels of the list off the left edge of the screen.

Parameters

in	<i>pos</i>	The horizontal position (in pixels) to scroll the browser to.
----	------------	---

See also

[vposition\(\)](#), [hposition\(\)](#)

**33.14.4.14 incr\_height()**

```
int Fl_Browser_::incr_height ( ) const [protected], [virtual]
```

This method may be provided to return the average height of all items to be used for scrolling.

The default implementation uses the height of the first item.

Returns

The average height of items, in pixels.

Reimplemented in [Fl\\_Browser](#).

**33.14.4.15 inserting()**

```
void Fl_Browser_::inserting (
    void * a,
    void * b ) [protected]
```

This method should be used when an item is in the process of being inserted into the list.

It allows the [Fl\\_Browser\\_](#) to update its cache data as needed, scheduling a redraw for the affected lines. This method does not actually insert items, but handles the follow up bookkeeping after items have been inserted.

Parameters

in	<i>a</i>	The starting item position
in	<i>b</i>	The new item being inserted

**33.14.4.16 item\_at()**

```
virtual void * Fl_Browser_::item_at (
    int index ) const [inline], [protected], [virtual]
```

This method must be provided by the subclass to return the item for the specified `index`.

**Parameters**

<code>in</code>	<code>index</code>	The <code>index</code> of the item to be returned
-----------------	--------------------	---

**Returns**

The item at the specified `index`.

Reimplemented in [Fl\\_Check\\_Browser](#), and [Fl\\_Browser](#).

**33.14.4.17 item\_draw()**

```
virtual void Fl_Browser_::item_draw (
    void * item,
    int X,
    int Y,
    int W,
    int H ) const [protected], [pure virtual]
```

This method must be provided by the subclass to draw the `item` in the area indicated by `X`, `Y`, `W`, `H`. Implemented in [Fl\\_Check\\_Browser](#), and [Fl\\_Browser](#).

**33.14.4.18 item\_first()**

```
virtual void * Fl_Browser_::item_first ( ) const [protected], [pure virtual]
```

This method must be provided by the subclass to return the first item in the list.

**See also**

[item\\_first\(\)](#), [item\\_next\(\)](#), [item\\_last\(\)](#), [item\\_prev\(\)](#)

Implemented in [Fl\\_Browser](#), and [Fl\\_Check\\_Browser](#).

**33.14.4.19 item\_height()**

```
virtual int Fl_Browser_::item_height (
    void * item ) const [protected], [pure virtual]
```

This method must be provided by the subclass to return the height of `item` in pixels. Allow for two additional pixels for the list selection box.

**Parameters**

<code>in</code>	<code>item</code>	The item whose height is returned.
-----------------	-------------------	------------------------------------

**Returns**

The height of the specified `item` in pixels.

**See also**

[item\\_height\(\)](#), [item\\_width\(\)](#), [item\\_quick\\_height\(\)](#)

Implemented in [Fl\\_Check\\_Browser](#), and [Fl\\_Browser](#).

**33.14.4.20 item\_last()**

```
virtual void * Fl_Browser_::item_last ( ) const [inline], [protected], [virtual]
```

This method must be provided by the subclass to return the last item in the list.

See also

[item\\_first\(\)](#), [item\\_next\(\)](#), [item\\_last\(\)](#), [item\\_prev\(\)](#)

Reimplemented in [Fl\\_Browser](#).

**33.14.4.21 item\_next()**

```
virtual void * Fl_Browser_::item_next (
    void * item ) const [protected], [pure virtual]
```

This method must be provided by the subclass to return the item in the list after *item*.

See also

[item\\_first\(\)](#), [item\\_next\(\)](#), [item\\_last\(\)](#), [item\\_prev\(\)](#)

Implemented in [Fl\\_Check\\_Browser](#), and [Fl\\_Browser](#).

**33.14.4.22 item\_prev()**

```
virtual void * Fl_Browser_::item_prev (
    void * item ) const [protected], [pure virtual]
```

This method must be provided by the subclass to return the item in the list before *item*.

See also

[item\\_first\(\)](#), [item\\_next\(\)](#), [item\\_last\(\)](#), [item\\_prev\(\)](#)

Implemented in [Fl\\_Check\\_Browser](#), and [Fl\\_Browser](#).

**33.14.4.23 item\_quick\_height()**

```
int Fl_Browser_::item_quick_height (
    void * item ) const [protected], [virtual]
```

This method may be provided by the subclass to return the height of the *item*, in pixels.

Allow for two additional pixels for the list selection box. This method differs from *item\_height* in that it is only called for selection and scrolling operations. The default implementation calls *item\_height*.

Parameters

in	<i>item</i>	The item whose height to return.
----	-------------	----------------------------------

Returns

The height, in pixels.

**33.14.4.24 item\_select()**

```
void Fl_Browser_::item_select (
    void * item,
    int val = 1 ) [protected], [virtual]
```

This method must be implemented by the subclass if it supports multiple selections; sets the selection state to *val* for the *item*.

Sets the selection state for `item`, where optional `val` is 1 (select, the default) or 0 (de-select).

#### Parameters

in	<i>item</i>	The item to be selected
in	<i>val</i>	The optional selection state; 1=select, 0=de-select. The default is to select the item (1).

Reimplemented in [Fl\\_Check\\_Browser](#), and [Fl\\_Browser](#).

#### 33.14.4.25 item\_selected()

```
int Fl_Browser_::item_selected (
    void * item ) const [protected], [virtual]
```

This method must be implemented by the subclass if it supports multiple selections; returns the selection state for `item`.

The method should return 1 if `item` is selected, or 0 otherwise.

#### Parameters

in	<i>item</i>	The item to test.
----	-------------	-------------------

Reimplemented in [Fl\\_Check\\_Browser](#), and [Fl\\_Browser](#).

#### 33.14.4.26 item\_swap()

```
virtual void Fl_Browser_::item_swap (
    void * a,
    void * b ) [inline], [protected], [virtual]
```

This optional method should be provided by the subclass to efficiently swap browser items `a` and `b`, such as for sorting.

#### Parameters

in	<i>a,b</i>	The two items to be swapped.
----	------------	------------------------------

Reimplemented in [Fl\\_Browser](#), and [Fl\\_Check\\_Browser](#).

#### 33.14.4.27 item\_text()

```
virtual const char * Fl_Browser_::item_text (
    void * item ) const [inline], [protected], [virtual]
```

This optional method returns a string (label) that may be used for sorting.

#### Parameters

in	<i>item</i>	The item whose label text is returned.
----	-------------	--

#### Returns

The item's text label. (Can be NULL if blank)

Reimplemented in [Fl\\_Browser](#), and [Fl\\_Check\\_Browser](#).

**33.14.4.28 item\_width()**

```
virtual int Fl_Browser_::item_width (
    void * item ) const [protected], [pure virtual]
```

This method must be provided by the subclass to return the width of the *item* in pixels. Allow for two additional pixels for the list selection box.

**Parameters**

in	<i>item</i>	The item whose width is returned.
----	-------------	-----------------------------------

**Returns**

The width of the item in pixels.

Implemented in [Fl\\_Check\\_Browser](#), and [Fl\\_Browser](#).

**33.14.4.29 leftedge()**

```
int Fl_Browser_::leftedge ( ) const [protected]
```

This method returns the X position of the left edge of the list area after adjusting for the scrollbar and border, if any.

**Returns**

The X position of the left edge of the list, in pixels.

**See also**

[Fl\\_Browser\\_::bbox\(\)](#)

**33.14.4.30 linespacing() [1/2]**

```
int Fl_Browser_::linespacing ( ) const [inline]
```

Return the height of additional spacing between browser lines.

**Returns**

spacing height in pixel units.

**33.14.4.31 linespacing() [2/2]**

```
void Fl_Browser_::linespacing (
    int pixels ) [inline]
```

Add some space between browser lines.

**Parameters**

in	<i>pixels</i>	number of additional pixels between lines.
----	---------------	--

**33.14.4.32 new\_list()**

```
void Fl_Browser_::new_list ( ) [protected]
```

This method should be called when the list data is completely replaced or cleared.

It informs the [Fl\\_Browser\\_](#) widget that any cached information it has concerning the items is invalid. This method

does not clear the list, it just handles the follow up bookkeeping after the list has been cleared.

#### 33.14.4.33 position() [1/2]

```
int Fl_Browser_::position ( ) const [inline]
```

**Deprecated** "since 1.4.0 - use vposition() instead"

#### 33.14.4.34 position() [2/2]

```
void Fl_Browser_::position (
    int pos ) [inline]
```

**Deprecated** "since 1.4.0 - use vposition(pos) instead"

#### 33.14.4.35 redraw\_line()

```
void Fl_Browser_::redraw_line (
    void * item ) [protected]
```

This method should be called when the contents of `item` has changed, but not its height.

##### Parameters

in	<i>item</i>	The item that needs to be redrawn.
----	-------------	------------------------------------

##### See also

[redraw\\_lines\(\)](#), [redraw\\_line\(\)](#)

#### 33.14.4.36 redraw\_lines()

```
void Fl_Browser_::redraw_lines ( ) [inline], [protected]
```

This method will cause the entire list to be redrawn.

##### See also

[redraw\\_lines\(\)](#), [redraw\\_line\(\)](#)

#### 33.14.4.37 replacing()

```
void Fl_Browser_::replacing (
    void * a,
    void * b ) [protected]
```

This method should be used when item `a` is being replaced by item `b`.

It allows the [Fl\\_Browser\\_](#) to update its cache data as needed, schedules a redraw for the item being changed, and tries to maintain the selection. This method does not actually replace the item, but handles the follow up bookkeeping after the item has just been replaced.

##### Parameters

in	<i>a</i>	Item being replaced
in	<i>b</i>	Item to replace 'a'

**33.14.4.38** `resize()`

```
void Fl_Browser_::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Repositions and/or resizes the browser.

**Parameters**

<code>in</code>	<code>X,Y,W,H</code>	The new position and size for the browser, in pixels.
-----------------	----------------------	---

Reimplemented from [Fl\\_Widget](#).

**33.14.4.39** `scrollbar_left()`

```
void Fl_Browser_::scrollbar_left ( ) [inline]
```

Moves the vertical scrollbar to the lefthand side of the list.  
For back compatibility.

**33.14.4.40** `scrollbar_right()`

```
void Fl_Browser_::scrollbar_right ( ) [inline]
```

Moves the vertical scrollbar to the righthand side of the list.  
For back compatibility.

**33.14.4.41** `scrollbar_size()` [1/2]

```
int Fl_Browser_::scrollbar_size ( ) const [inline]
```

Gets the current size of the scrollbars' troughs, in pixels.  
If this value is zero (default), this widget will use the [Fl::scrollbar\\_size\(\)](#) value as the scrollbar's width.

**Returns**

Scrollbar size in pixels, or 0 if the global [Fl::scrollbar\\_size\(\)](#) is being used.

**See also**

[Fl::scrollbar\\_size\(int\)](#)

**33.14.4.42** `scrollbar_size()` [2/2]

```
void Fl_Browser_::scrollbar_size (
    int newSize ) [inline]
```

Sets the pixel size of the scrollbars' troughs to `newSize`, in pixels.

Normally you should not need this method, and should use [Fl::scrollbar\\_size\(int\)](#) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally what you want.

Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare. Setting `newSize` to the special value of 0 causes the widget to track the global [Fl::scrollbar\\_size\(\)](#), which is the default.

## Parameters

in	<i>newSize</i>	Sets the scrollbar size in pixels. If 0 (default), scrollbar size tracks the global <a href="#">Fl::scrollbar_size()</a>
----	----------------	---

## See also

[Fl::scrollbar\\_size\(\)](#)

**33.14.4.43 scrollbar\_width()** [1/2]

```
int Fl_Browser_::scrollbar_width ( ) const [inline]
```

Returns the global value [Fl::scrollbar\\_size\(\)](#).

**Deprecated** Use [scrollbar\\_size\(\)](#) instead.

**Todo** This method should eventually be removed in 1.4+

**33.14.4.44 scrollbar\_width()** [2/2]

```
void Fl_Browser_::scrollbar_width (
    int width ) [inline]
```

Sets the global [Fl::scrollbar\\_size\(\)](#), and forces this instance of the widget to use it.

**Deprecated** Use [scrollbar\\_size\(\)](#) instead.

**Todo** This method should eventually be removed in 1.4+

**33.14.4.45 select()**

```
int Fl_Browser_::select (
    void * item,
    int val = 1,
    int docallbacks = 0 )
```

Sets the selection state of *item* to *val*, and returns 1 if the state changed or 0 if it did not. If *docallbacks* is non-zero, *select* tries to call the callback function for the widget.

## Parameters

in	<i>item</i>	The item whose selection state is to be changed
in	<i>val</i>	The new selection state (1=select, 0=de-select)
in	<i>docallbacks</i>	If non-zero, invokes widget callback if item changed. If 0, doesn't do callback (default).

## Returns

1 if state was changed, 0 if not.

**33.14.4.46 select\_only()**

```
int Fl_Browser_::select_only (
```

```
void * item,
int docallbacks = 0 )
```

Selects `item` and returns 1 if the state changed or 0 if it did not.  
Any other items in the list are deselected.

#### Parameters

in	<i>item</i>	The item to select.
in	<i>docallbacks</i>	If non-zero, invokes widget callback if item changed. If 0, doesn't do callback (default).

#### 33.14.4.47 selection()

```
void * Fl_Browser_::selection ( ) const [inline], [protected]
```

Returns the item currently selected, or NULL if there is no selection.

For multiple selection browsers this call returns the currently focused item, even if it is not selected. To find all selected items, call [Fl\\_Multi\\_Browser::selected\(\)](#) for every item in question.

#### 33.14.4.48 sort()

```
void Fl_Browser_::sort (
int flags = 0 )
```

Sort the items in the browser based on `flags`.

[item\\_swap\(void\\*, void\\*\)](#) and [item\\_text\(void\\*\)](#) must be implemented for this call.

#### Parameters

in	<i>flags</i>	FL_SORT_ASCENDING – sort in ascending order FL_SORT_DESCENDING – sort in descending order FL_SORT_CASEINSENSITIVE – add this to sort case-insensitively Values other than the above will cause undefined behavior Other flags may appear in the future.
----	--------------	---

#### 33.14.4.49 swapping()

```
void Fl_Browser_::swapping (
void * a,
void * b ) [protected]
```

This method should be used when two items `a` and `b` are being swapped.

It allows the [Fl\\_Browser\\_](#) to update its cache data as needed, schedules a redraw for the two items, and tries to maintain the current selection. This method does not actually swap items, but handles the follow up bookkeeping after items have been swapped.

#### Parameters

in	<i>a,b</i>	Items being swapped.
----	------------	----------------------

#### 33.14.4.50 textfont()

```
Fl_Font Fl_Browser_::textfont ( ) const [inline]
```

Gets the default text font for the lines in the browser.

See also

[textfont\(\)](#), [textsize\(\)](#), [textcolor\(\)](#)

#### 33.14.4.51 vposition() [1/2]

```
int Fl_Browser_::vposition ( ) const [inline]
```

Gets the vertical scroll position of the list as a pixel position `pos`.

The position returned is how many pixels of the list are scrolled off the top edge of the screen. Example: A position of '3' indicates the top 3 pixels of the list are scrolled off the top edge of the screen.

See also

[position\(\)](#), [hposition\(\)](#)

#### 33.14.4.52 vposition() [2/2]

```
void Fl_Browser_::vposition (
    int pos )
```

Sets the vertical scroll position of the list to pixel position `pos`.

The position is how many pixels of the list are scrolled off the top edge of the screen. Example: A position of '3' scrolls the top three pixels of the list off the top edge of the screen.

Parameters

<code>in</code>	<code>pos</code>	The vertical position (in pixels) to scroll the browser to.
-----------------	------------------	---

See also

[vposition\(\)](#), [hposition\(\)](#)

### 33.14.5 Member Data Documentation

#### 33.14.5.1 hscrollbar

```
Fl_Scrollbar Fl_Browser_::hscrollbar
```

Horizontal scrollbar.

Public, so that it can be accessed directly.

#### 33.14.5.2 scrollbar

```
Fl_Scrollbar Fl_Browser_::scrollbar
```

Vertical scrollbar.

Public, so that it can be accessed directly.

Use [scrollbar\\_left\(\)](#) or [scrollbar\\_right\(\)](#) to change what side the vertical scrollbar is drawn on.

Use [scrollbar.align\(int\)](#) (see [Fl\\_Widget::align\(Fl\\_Align\)](#)) to change what side either of the scrollbars is drawn on.

If the `FL_ALIGN_LEFT` bit is on, the vertical scrollbar is on the left. If the `FL_ALIGN_TOP` bit is on, the horizontal scrollbar is on the top. Note that only the alignment flags in scrollbar are considered. The flags in hscrollbar however are ignored.

The documentation for this class was generated from the following files:

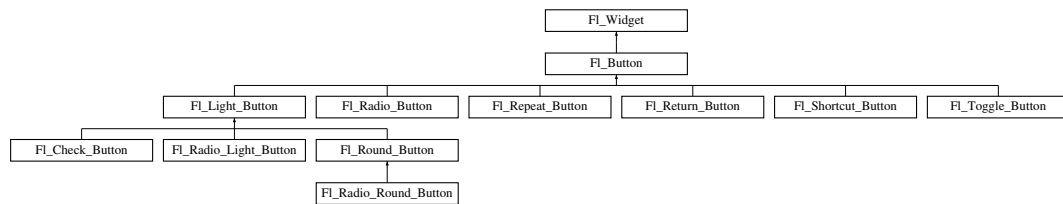
- `Fl_Browser_.H`
- `Fl_Browser_.cxx`

## 33.15 Fl\_Button Class Reference

Buttons generate callbacks when they are clicked by the user.

```
#include <Fl_Button.H>
```

Inheritance diagram for Fl\_Button:



### Public Member Functions

- `int clear ()`  
*Same as `value (0)`.*
- `uchar compact ()`  
*Return true if buttons are rendered as compact buttons.*
- `void compact (uchar v)`  
*Decide if buttons should be rendered in compact mode.*
- `Fl_Boxtype down_box () const`  
*Returns the current down box type, which is drawn when `value()` is non-zero.*
- `void down_box (Fl_Boxtype b)`  
*Sets the down box type.*
- `Fl_Color down_color () const`  
*(for backwards compatibility)*
- `void down_color (unsigned c)`  
*(for backwards compatibility)*
- `Fl_Button (int X, int Y, int W, int H, const char *L=0)`  
*The constructor creates the button using the given position, size, and label.*
- `int handle (int) FL_OVERRIDE`  
*Handles the specified event.*
- `int set ()`  
*Same as `value (1)`.*
- `void setonly ()`  
*Turns on this button and turns off all other radio buttons in the group (calling `value (1)` or `set ()` does not do this).*
- `int shortcut () const`  
*Returns the current shortcut key for the button.*
- `void shortcut (const char *s)`  
*(for backwards compatibility)*
- `void shortcut (int s)`  
*Sets the shortcut key to `s`.*
- `char value () const`  
*Returns the current value of the button (0 or 1).*
- `int value (int v)`  
*Sets the current value of the button.*

### Protected Member Functions

- `void draw () FL_OVERRIDE`  
*Draws the widget.*
- `void simulate_key_action ()`

## Static Protected Member Functions

- static void **key\_release\_timeout** (void \*)

## Static Protected Attributes

- static [Fl\\_Widget\\_Tracker](#) \* **key\_release\_tracker** = 0

## Additional Inherited Members

### 33.15.1 Detailed Description

Buttons generate callbacks when they are clicked by the user.

You control exactly when and how by changing the values for [type\(uchar\)](#) and [when\(uchar\)](#). Buttons can also generate callbacks in response to `FL_SHORTCUT` events. The button can either have an explicit [shortcut\(int s\)](#) value or a letter shortcut can be indicated in the [label\(\)](#) with an '&' character before it. For the label shortcut it does not matter if *Alt* is held down, but if you have an input field in the same window, the user will have to hold down the *Alt* key so that the input field does not eat the event first as an `FL_KEYBOARD` event.

See also

[Fl\\_Widget::shortcut\\_label\(int\)](#)

For an [Fl\\_Button](#) object, the [type\(\)](#) call returns one of:

- `FL_NORMAL_BUTTON` (0): [value\(\)](#) remains unchanged after button press.
- `FL_TOGGLE_BUTTON`: [value\(\)](#) is inverted after button press.
- `FL_RADIO_BUTTON`: [value\(\)](#) is set to 1 after button press, and all other buttons in the current group with `type() == FL_RADIO_BUTTON` are set to zero.

For an [Fl\\_Button](#) object, the following [when\(\)](#) values are useful, the default being `FL_WHEN_RELEASE`:

- 0: The callback is not done, instead [changed\(\)](#) is turned on.
- `FL_WHEN_RELEASE`: The callback is done after the user successfully clicks the button, or when a shortcut is typed. The reason is `FL_REASON_RELEASED`.
- `FL_WHEN_CHANGED`: The callback is done each time the [value\(\)](#) changes (when the user pushes and releases the button, and as the mouse is dragged around in and out of the button). The reason is set to `FL_REASON_CHANGED`
- `FL_WHEN_NOT_CHANGED`: The callback is done when the mouse button is released, but the value did not change. The reason is set to `FL_REASON_SELECTED`

### 33.15.2 Constructor & Destructor Documentation

#### 33.15.2.1 Fl\_Button()

```
Fl_Button::Fl_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

The constructor creates the button using the given position, size, and label.

The default box type is `box(FL_UP_BOX)`.

You can control how the button is drawn when ON by setting [down\\_box\(\)](#). The default is `FL_NO_BOX` (0) which will select an appropriate box type using the normal (OFF) box type by using [fl\\_down\(box\(\)\)](#).

Derived classes may handle this differently.

A button may request callbacks with `when()` `FL_WHEN_CHANGED`, `FL_WHEN_NOT_CHANGED`, and `FL↔_WHEN_RELEASE`, triggering the callback reasons `FL_REASON_CHANGED`, `FL_REASON_SELECTED`, and `FL_REASON_DESELECTED`.

## Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

### 33.15.3 Member Function Documentation

#### 33.15.3.1 clear()

```
int Fl_Button::clear ( ) [inline]
Same as value(0).
```

See also

[value\(int v\)](#)

#### 33.15.3.2 compact() [1/2]

```
uchar Fl_Button::compact ( ) [inline]
Return true if buttons are rendered as compact buttons.
```

Returns

0 if compact mode is off, 1 if it is on

See also

[compact\(bool\)](#)

#### 33.15.3.3 compact() [2/2]

```
void Fl_Button::compact (
    uchar v )
```

Decide if buttons should be rendered in compact mode.



Figure 33.4 compact button keypad using GTK+ Scheme

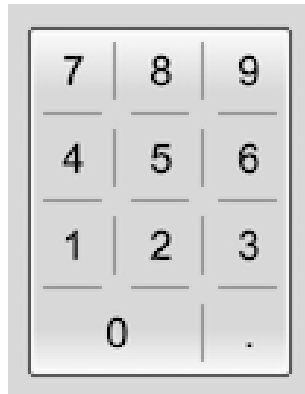


Figure 33.5 compact buttons in Glem

In compact mode, the button's surrounding border is altered to visually signal that multiple buttons are functionally linked together. To ensure the correct rendering of buttons in compact mode, all buttons must be part of the same group, positioned close to each other, and aligned with the edges of the group. Any button outlines not in contact with the parent group's outline will be displayed as separators.

## Parameters

in	v	switch compact mode on (1) or off (0)
----	---	---------------------------------------

## 33.15.3.4 down\_box() [1/2]

```
Fl_Boxtype Fl_Button::down_box ( ) const [inline]
```

Returns the current down box type, which is drawn when [value\(\)](#) is non-zero.

## Return values

Fl_Boxtype	
------------	--

## 33.15.3.5 down\_box() [2/2]

```
void Fl_Button::down_box (
    Fl_Boxtype b ) [inline]
```

Sets the down box type.

The default value of 0 causes FLTK to figure out the correct matching down version of [box\(\)](#).

Some derived classes (e.g. [Fl\\_Round\\_Button](#) and [Fl\\_Light\\_Button](#) use [down\\_box\(\)](#) for special purposes. See docs of these classes.

## Parameters

in	b	down box type
----	---	---------------

## 33.15.3.6 draw()

```
void Fl_Button::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

Reimplemented in [Fl\\_Light\\_Button](#), [Fl\\_Return\\_Button](#), and [Fl\\_Shortcut\\_Button](#).

### 33.15.3.7 handle()

```
int Fl_Button::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Light\\_Button](#), [Fl\\_Repeat\\_Button](#), [Fl\\_Return\\_Button](#), and [Fl\\_Shortcut\\_Button](#).

### 33.15.3.8 set()

```
int Fl_Button::set ( ) [inline]
```

Same as [value\(1\)](#).

#### See also

[value\(int v\)](#)

### 33.15.3.9 shortcut() [1/2]

```
int Fl_Button::shortcut ( ) const [inline]
```

Returns the current shortcut key for the button.

## Return values

<i>int</i>	
------------	--

**33.15.3.10 shortcut()** [2/2]

```
void Fl_Button::shortcut (
    int s ) [inline]
```

Sets the shortcut key to *s*.

Setting this overrides the use of '&' in the [label\(\)](#). The value is a bitwise OR of a key and a set of shift flags, for example: `FL_ALT | 'a'`, or `FL_ALT | (FL_F + 10)`, or just `'a'`. A value of 0 disables the shortcut.

The key can be any value returned by [Fl::event\\_key\(\)](#), but will usually be an ASCII letter. Use a lower-case letter unless you require the shift key to be held down.

The shift flags can be any set of values accepted by [Fl::event\\_state\(\)](#). If the bit is on, that shift key must be pushed. Meta, Alt, Ctrl, and Shift must be off if they are not in the shift flags (zero for the other bits indicates a "don't care" setting).

## Parameters

<i>in</i>	<i>s</i>	bitwise OR of key and shift flags
-----------	----------	-----------------------------------

**33.15.3.11 value()**

```
int Fl_Button::value (
    int v )
```

Sets the current value of the button.

A non-zero value sets the button to 1 (ON), and zero sets it to 0 (OFF).

## Parameters

<i>in</i>	<i>v</i>	button value.
-----------	----------	---------------

## See also

[set\(\)](#), [clear\(\)](#)

The documentation for this class was generated from the following files:

- `Fl_Button.H`
- `Fl_Button.cxx`

**33.16 Fl\_Cairo\_State Class Reference**

Contains all the necessary info on the current cairo context.

```
#include <Fl_Cairo.H>
```

**Public Member Functions**

- `bool autolink () const`  
*Gets the autolink option. See [Fl::cairo\\_autolink\\_context\(bool\)](#)*
- `void autolink (bool b)`  
*Sets the autolink option, only available with `--enable-cairoext`.*
- `cairo_t* cc () const`

- Gets the current cairo context.*
- void **cc** (cairo\_t \*c, bool own=true)
- Sets the current cairo context.*
- void \* **gc** () const
- Gets the last gc attached to a cc.*
- void **gc** (void \*c)
- Sets the gc c to keep track on.*
- void \* **window** () const
- Gets the last window attached to a cc.*
- void **window** (void \*w)
- Sets the window w to keep track on.*

### 33.16.1 Detailed Description

Contains all the necessary info on the current cairo context.

A private internal & unique corresponding object is created to permit cairo context state handling while keeping it opaque. For internal use only.

#### Note

Only available if one or both of the CMake options FLTK\_OPTION\_CAIRO\_WINDOW or FLTK\_OPTION\_CAIRO\_EXT is set (ON).

### 33.16.2 Member Function Documentation

#### 33.16.2.1 cc()

```
void Fl_Cairo_State::cc (
    cairo_t * c,
    bool own = true ) [inline]
```

Sets the current cairo context.

`own == true` (the default) indicates that the cairo context `c` will be deleted by FLTK internally when another `cc` is set later.

`own == false` indicates `cc` deletion is handled externally by the user program.

The documentation for this class was generated from the following files:

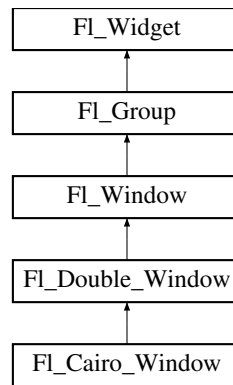
- [Fl\\_Cairo.H](#)
- [Fl\\_Cairo.cxx](#)

## 33.17 Fl\_Cairo\_Window Class Reference

This defines an FLTK window with Cairo support.

```
#include <Fl_Cairo_Window.H>
```

Inheritance diagram for Fl\_Cairo\_Window:



## Public Types

- typedef void(\* **cairo\_draw\_cb**) ([Fl\\_Cairo\\_Window](#) \*self, cairo\_t \*cr)  
*The Cairo draw callback prototype you need to implement.*

## Public Member Functions

- **Fl\_Cairo\_Window** (int W, int H, const char \*L=0)
- **Fl\_Cairo\_Window** (int X, int Y, int W, int H, const char \*L=0)
- void **set\_draw\_cb** ([cairo\\_draw\\_cb](#) cb)  
*You must provide a draw callback that implements your Cairo rendering.*

## Protected Member Functions

- void **draw** () [FL\\_OVERRIDE](#)  
*Overloaded to provide Cairo callback support.*

## Additional Inherited Members

### 33.17.1 Detailed Description

This defines an FLTK window with Cairo support.

This class overloads the virtual [draw\(\)](#) method for you, so that the only thing you have to do is to provide your Cairo code. All Cairo context handling is achieved transparently.

The default coordinate system for Cairo drawing commands within [Fl\\_Cairo\\_Window](#) is FLTK's coordinate system, where the x, y, w, h values are relative to the top/left corner of the [Fl\\_Cairo\\_Window](#), as one would expect with regular FLTK drawing commands, e.g.: (0 x w-1), (0 y h-1). **Example:**

```

static void my_cairo_draw_cb(Fl\_Cairo\_Window *window, cairo_t *cr) {
    // Draw an "X"
    const double xmax = (window->w() - 1);
    const double ymax = (window->h() - 1);
    cairo_set_line_width(cr, 1.00); // line width for drawing
    cairo_set_source_rgb(cr, 1.0, 0.5, 0.0); // orange
    cairo_move_to(cr, 0.0, 0.0); cairo_line_to(cr, xmax, ymax); // draw diagonal "\"
    cairo_move_to(cr, 0.0, ymax); cairo_line_to(cr, xmax, 0.0); // draw diagonal "/"
    cairo_stroke(cr); // stroke the lines
}

```

The FLTK coordinate system differs from the default native Cairo coordinate system which uses normalized (0.0 ... 1.0) values for x and y, e.g.: (0 x 1.0), (0 y 1.0). So beware of this when copy/pasting Cairo example programs that assume normalized values. If need be, you can revert to the Cairo coordinate system by simply calling `cairo_scale()` with the widget's `w()` and `h()` values. **Example:**

```

static void my_cairo_draw_cb(Fl\_Cairo\_Window *window, cairo_t *cr) {
    cairo_scale(cr, window->w(), window->h()); // use Cairo's default coordinate system
    [...use 0.0 to 1.0 values from here on...]
}

```

## See also

examples/cairo-draw-x.cxx  
test/cairo\_test.cxx

## Note

Class [Fl\\_Cairo\\_Window](#) requires the FLTK library to have been built with CMake option `FLTK_OPTION_CAIRO_WINDOW` or `FLTK_OPTION_CAIRO_EXT`.

You can alternatively define your custom Cairo FLTK window, and thus at least override the [draw\(\)](#) method to provide custom Cairo support. In this case you will probably use [Fl::cairo\\_make\\_current\(Fl\\_Window\\*\)](#) to attach a context to your window. You should do this only when your window is the current window.

## See also

[Fl\\_Window::current\(\)](#)

## 33.17.2 Member Function Documentation

### 33.17.2.1 draw()

```
void Fl_Cairo_Window::draw (
    void ) [inline], [protected], [virtual]
```

Overloaded to provide Cairo callback support.

Implements [Fl\\_Widget](#).

### 33.17.2.2 set\_draw\_cb()

```
void Fl_Cairo_Window::set_draw_cb (
    cairo_draw_cb cb ) [inline]
```

You must provide a draw callback that implements your Cairo rendering.

This method permits you to set your Cairo callback to `cb`.

The documentation for this class was generated from the following file:

- [Fl\\_Cairo\\_Window.H](#)

## 33.18 Fl\_Callback\_User\_Data Class Reference

A class prototype that allows for additional data in callbacks.

```
#include <Fl_Widget.H>
```

### Public Member Functions

- `virtual ~Fl_Callback_User_Data ()`  
*Destructor.*

### Protected Member Functions

- `Fl_Callback_User_Data ()`  
*Protected constructor.*

### 33.18.1 Detailed Description

A class prototype that allows for additional data in callbacks.

Users can derive this class and pass objects of such derived classes to widget callbacks. Widgets can take ownership of the callback data, deleting the data when the widget itself is deleted.

The destructor of this class is virtual, allowing for additional code to deallocate resources when the user data is deleted.

See also

[FL\\_FUNCTION\\_CALLBACK\\_3](#), [FL\\_METHOD\\_CALLBACK\\_1](#), [FL\\_INLINE\\_CALLBACK\\_2](#)  
[Fl\\_Widget::callback\(Fl\\_Callback\\*, Fl\\_Callback\\_User\\_Data\\*, bool\)](#)  
[Fl\\_Widget::user\\_data\(Fl\\_Callback\\_User\\_Data\\*, bool\)](#)

The documentation for this class was generated from the following file:

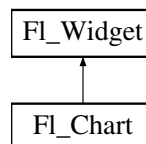
- [Fl\\_Widget.H](#)

## 33.19 Fl\_Chart Class Reference

[Fl\\_Chart](#) displays simple charts.

```
#include <Fl_Chart.H>
```

Inheritance diagram for [Fl\\_Chart](#):



### Public Member Functions

- void [add](#) (double val, const char \*str=0, unsigned col=0)  
*Adds the data value `val` with optional label `str` and color `col` to the chart.*
- [uchar autosize](#) () const  
*Gets whether the chart will automatically adjust the bounds of the chart.*
- void [autosize](#) (uchar n)  
*Sets whether the chart will automatically adjust the bounds of the chart.*
- void [bounds](#) (double \*a, double \*b) const  
*Gets the lower and upper bounds of the chart values.*
- void [bounds](#) (double a, double b)  
*Sets the lower and upper bounds of the chart values.*
- void [clear](#) ()  
*Removes all values from the chart.*
- [Fl\\_Chart](#) (int X, int Y, int W, int H, const char \*L=0)  
*Create a new [Fl\\_Chart](#) widget using the given position, size and label string.*
- void [insert](#) (int ind, double val, const char \*str=0, unsigned col=0)  
*Inserts a data value `val` at the given position `ind`.*
- int [maxsize](#) () const  
*Gets the maximum number of data values for a chart.*
- void [maxsize](#) (int m)  
*Sets the maximum number of data values for a chart.*
- void [replace](#) (int ind, double val, const char \*str=0, unsigned col=0)  
*Replaces a data value `val` at the given position `ind`.*
- int [size](#) () const

- Returns the number of data values in the chart.*
- void **size** (int W, int H)  
*Sets the widget size (width, height).*
- FL\_Color **textcolor** () const  
*Gets the chart's text color.*
- void **textcolor** (FL\_Color n)  
*Sets the chart's text color to n.*
- FL\_Font **textfont** () const  
*Gets the chart's text font.*
- void **textfont** (FL\_Font s)  
*Sets the chart's text font to s.*
- FL\_Fontsize **textsize** () const  
*Gets the chart's text size.*
- void **textsize** (FL\_Fontsize s)  
*Sets the chart's text size to s.*
- ~FL\_Chart ()  
*Destroys the FL\_Chart widget and all of its data.*

## Protected Member Functions

- void **draw** () **FL\_OVERRIDE**  
*Draws the FL\_Chart widget.*

## Static Protected Member Functions

- static void **draw\_barchart** (int x, int y, int w, int h, int numb, FL\_CHART\_ENTRY entries[], double min, double max, int **autosize**, int maxnumb, FL\_Color **textcolor**)  
*Draws a bar chart.*
- static void **draw\_horbarchart** (int x, int y, int w, int h, int numb, FL\_CHART\_ENTRY entries[], double min, double max, int **autosize**, int maxnumb, FL\_Color **textcolor**)  
*Draws a horizontal bar chart.*
- static void **draw\_linechart** (int type, int x, int y, int w, int h, int numb, FL\_CHART\_ENTRY entries[], double min, double max, int **autosize**, int maxnumb, FL\_Color **textcolor**)  
*Draws a line chart.*
- static void **draw\_piechart** (int x, int y, int w, int h, int numb, FL\_CHART\_ENTRY entries[], int special, FL\_Color **textcolor**)  
*Draws a pie chart.*

## Additional Inherited Members

### 33.19.1 Detailed Description

FL\_Chart displays simple charts.  
It is provided for Forms compatibility.

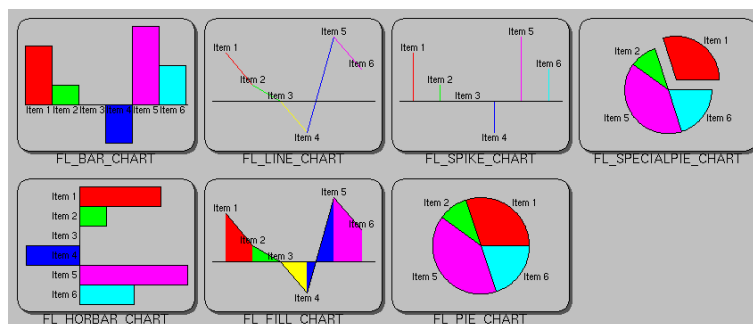


Figure 33.6 FL\_Chart

**Todo** Refactor `Fl_Chart::type()` information.

The type of an `Fl_Chart` object can be set using `type(uchar t)` to:

Chart Type	Description
FL_BAR_CHART	Each sample value is drawn as a vertical bar.
FL_FILLED_CHART	The chart is filled from the bottom of the graph to the sample values.
FL_HORBAR_CHART	Each sample value is drawn as a horizontal bar.
FL_LINE_CHART	The chart is drawn as a polyline with vertices at each sample value.
FL_PIE_CHART	A pie chart is drawn with each sample value being drawn as a proportionate slice in the circle.
FL_SPECIALPIE_CHART	Like <code>FL_PIE_CHART</code> , but the first slice is separated from the pie.
FL_SPIKE_CHART	Each sample value is drawn as a vertical line.

## 33.19.2 Constructor & Destructor Documentation

### 33.19.2.1 Fl\_Chart()

```
Fl_Chart::Fl_Chart (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Create a new `Fl_Chart` widget using the given position, size and label string.

The default boxstyle is `FL_NO_BOX`.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

## 33.19.3 Member Function Documentation

### 33.19.3.1 add()

```
void Fl_Chart::add (
    double val,
    const char * str = 0,
    unsigned col = 0 )
```

Adds the data value `val` with optional label `str` and color `col` to the chart.

#### Parameters

in	<i>val</i>	data value
in	<i>str</i>	optional data label
in	<i>col</i>	optional data color

**33.19.3.2 autosize()** [1/2]

```
uchar Fl_Chart::autosize ( ) const [inline]
```

Gets whether the chart will automatically adjust the bounds of the chart.

**Returns**

non-zero if auto-sizing is enabled and zero if disabled.

**33.19.3.3 autosize()** [2/2]

```
void Fl_Chart::autosize (
    uchar n ) [inline]
```

Sets whether the chart will automatically adjust the bounds of the chart.

**Parameters**

in	<i>n</i>	non-zero to enable automatic resizing, zero to disable.
----	----------	---

**33.19.3.4 bounds()** [1/2]

```
void Fl_Chart::bounds (
    double * a,
    double * b ) const [inline]
```

Gets the lower and upper bounds of the chart values.

**Parameters**

out	<i>a, b</i>	are set to lower, upper
-----	-------------	-------------------------

**33.19.3.5 bounds()** [2/2]

```
void Fl_Chart::bounds (
    double a,
    double b )
```

Sets the lower and upper bounds of the chart values.

**Parameters**

in	<i>a, b</i>	are used to set lower, upper
----	-------------	------------------------------

**33.19.3.6 draw()**

```
void Fl_Chart::draw (
    void ) [protected], [virtual]
```

Draws the [Fl\\_Chart](#) widget.

Implements [Fl\\_Widget](#).

**33.19.3.7 draw\_barchart()**

```
void Fl_Chart::draw_barchart (
```

```

    int x,
    int y,
    int w,
    int h,
    int numb,
    FL_CHART_ENTRY entries[],
    double min,
    double max,
    int autosize,
    int maxnumb,
    Fl_Color textcolor ) [static], [protected]

```

Draws a bar chart.

*x*, *y*, *w*, *h* is the bounding box, *entries* the array of *numb* entries, and *min* and *max* the boundaries.

#### Parameters

in	<i>x,y,w,h</i>	Widget position and size
in	<i>numb</i>	Number of values
in	<i>entries</i>	Array of values
in	<i>min</i>	Lower boundary
in	<i>max</i>	Upper boundary
in	<i>autosize</i>	Whether the chart autosizes
in	<i>maxnumb</i>	Maximal number of entries
in	<i>textcolor</i>	Text color

### 33.19.3.8 draw\_horbarchart()

```

void Fl_Chart::draw_horbarchart (
    int x,
    int y,
    int w,
    int h,
    int numb,
    FL_CHART_ENTRY entries[],
    double min,
    double max,
    int autosize,
    int maxnumb,
    Fl_Color textcolor ) [static], [protected]

```

Draws a horizontal bar chart.

*x*, *y*, *w*, *h* is the bounding box, *entries* the array of *numb* entries, and *min* and *max* the boundaries.

#### Parameters

in	<i>x,y,w,h</i>	Widget position and size
in	<i>numb</i>	Number of values
in	<i>entries</i>	Array of values
in	<i>min</i>	Lower boundary
in	<i>max</i>	Upper boundary
in	<i>autosize</i>	Whether the chart autosizes
in	<i>maxnumb</i>	Maximal number of entries
in	<i>textcolor</i>	Text color

**33.19.3.9 draw\_linechart()**

```
void Fl_Chart::draw_linechart (
    int type,
    int x,
    int y,
    int w,
    int h,
    int numb,
    FL_CHART_ENTRY entries[],
    double min,
    double max,
    int autosize,
    int maxnumb,
    Fl_Color textcolor ) [static], [protected]
```

Draws a line chart.

`x`, `y`, `w`, `h` is the bounding box, `entries` the array of `numb` entries, and `min` and `max` the boundaries.

**Parameters**

in	<i>type</i>	Chart type
in	<i>x,y,w,h</i>	Widget position and size
in	<i>numb</i>	Number of values
in	<i>entries</i>	Array of values
in	<i>min</i>	Lower boundary
in	<i>max</i>	Upper boundary
in	<i>autosize</i>	Whether the chart autosizes
in	<i>maxnumb</i>	Maximal number of entries
in	<i>textcolor</i>	Text color

**33.19.3.10 draw\_piechart()**

```
void Fl_Chart::draw_piechart (
    int x,
    int y,
    int w,
    int h,
    int numb,
    FL_CHART_ENTRY entries[],
    int special,
    Fl_Color textcolor ) [static], [protected]
```

Draws a pie chart.

**Parameters**

in	<i>x,y,w,h</i>	bounding box
in	<i>numb</i>	number of chart entries
in	<i>entries</i>	array of chart entries
in	<i>special</i>	special (?)
in	<i>textcolor</i>	text color

**33.19.3.11 insert()**

```
void Fl_Chart::insert (
    int ind,
    double val,
    const char * str = 0,
    unsigned col = 0 )
```

Inserts a data value `val` at the given position `ind`.  
Position 1 is the first data value.

**Parameters**

in	<i>ind</i>	insertion position
in	<i>val</i>	data value
in	<i>str</i>	optional data label
in	<i>col</i>	optional data color

**33.19.3.12 maxsize()**

```
void Fl_Chart::maxsize (
    int m )
```

Sets the maximum number of data values for a chart.  
If you do not call this method then the chart will be allowed to grow to any size depending on available memory.

**Parameters**

in	<i>m</i>	maximum number of data values allowed.
----	----------	--

**33.19.3.13 replace()**

```
void Fl_Chart::replace (
    int ind,
    double val,
    const char * str = 0,
    unsigned col = 0 )
```

Replaces a data value `val` at the given position `ind`.  
Position 1 is the first data value.

**Parameters**

in	<i>ind</i>	insertion position
in	<i>val</i>	data value
in	<i>str</i>	optional data label
in	<i>col</i>	optional data color

**33.19.3.14 size()**

```
void Fl_Chart::size (
    int W,
    int H ) [inline]
```

Sets the widget size (width, height).  
This is the same as calling `FL_Widget::size(int W, int H);`

## Parameters

in	W,H	new width and height of the widget
----	-----	------------------------------------

The documentation for this class was generated from the following files:

- [Fl\\_Chart.H](#)
- [Fl\\_Chart.cxx](#)

## 33.20 FL\_CHART\_ENTRY Struct Reference

For internal use only.

```
#include <Fl_Chart.H>
```

### Public Attributes

- unsigned **col**  
*For internal use only.*
- char **str** [[FL\\_CHART\\_LABEL\\_MAX](#)+1]  
*For internal use only.*
- float **val**  
*For internal use only.*

### 33.20.1 Detailed Description

For internal use only.

The documentation for this struct was generated from the following file:

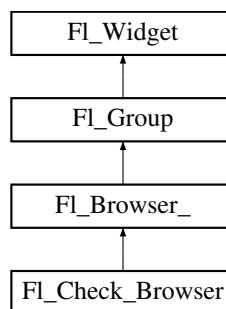
- [Fl\\_Chart.H](#)

## 33.21 Fl\_Check\_Browser Class Reference

The [Fl\\_Check\\_Browser](#) widget displays a scrolling list of text lines that may be selected and/or checked by the user.

```
#include <Fl_Check_Browser.H>
```

Inheritance diagram for [Fl\\_Check\\_Browser](#):



### Public Member Functions

- int [add](#) (char \*s)  
*Add a new unchecked line to the end of the browser.*
- int [add](#) (char \*s, int b)  
*Add a new line to the end of the browser.*
- int [add](#) (const char \*s)  
*See int [Fl\\_Check\\_Browser::add\(char \\*s\)](#)*

- int **add** (const char \*s, int b)  
*See int [Fl\\_Check\\_Browser::add\(char \\*s\)](#)*
- void **check\_all** ()  
*Sets all the items checked.*
- void **check\_none** ()  
*Sets all the items unchecked.*
- int **checked** (int item) const  
*Gets the current status of item item.*
- void **checked** (int item, int b)  
*Sets the check status of item item to b.*
- void **clear** ()  
*Remove every item from the browser.*
- **Fl\_Check\_Browser** (int x, int y, int w, int h, const char \*l=0)  
*The constructor makes an empty browser.*
- void \* **item\_at** (int index) const [FL\\_OVERRIDE](#)  
*This method must be provided by the subclass to return the item for the specified index.*
- void **item\_swap** (int ia, int ib)
- void **item\_swap** (void \*a, void \*b) [FL\\_OVERRIDE](#)  
*This optional method should be provided by the subclass to efficiently swap browser items a and b, such as for sorting.*
- int **nchecked** () const  
*Returns how many items are currently checked.*
- int **nitems** () const  
*Returns how many lines are in the browser.*
- int **remove** (int item)  
*Remove line n and make the browser one line shorter.*
- void **set\_checked** (int item)  
*Equivalent to `Fl_Check_Browser::checked(item, 1)`.*
- char \* **text** (int item) const  
*Return a pointer to an internal buffer holding item item's text.*
- int **value** () const  
*Returns the index of the currently selected item.*
- ~**Fl\_Check\_Browser** ()  
*The destructor deletes all list items and destroys the browser.*

## Protected Member Functions

- int **handle** (int) [FL\\_OVERRIDE](#)  
*Handles the event within the normal widget bounding box.*
- void **item\_draw** (void \*, int, int, int, int) const [FL\\_OVERRIDE](#)  
*This method must be provided by the subclass to draw the item in the area indicated by X, Y, W, H.*
- void \* **item\_first** () const [FL\\_OVERRIDE](#)  
*This method must be provided by the subclass to return the first item in the list.*
- int **item\_height** (void \*) const [FL\\_OVERRIDE](#)  
*This method must be provided by the subclass to return the height of item in pixels.*
- void \* **item\_next** (void \*) const [FL\\_OVERRIDE](#)  
*This method must be provided by the subclass to return the item in the list after item.*
- void \* **item\_prev** (void \*) const [FL\\_OVERRIDE](#)  
*This method must be provided by the subclass to return the item in the list before item.*
- void **item\_select** (void \*, int) [FL\\_OVERRIDE](#)  
*This method must be implemented by the subclass if it supports multiple selections; sets the selection state to val for the item.*

- `int item_selected (void *) const` [FL\\_OVERRIDE](#)

*This method must be implemented by the subclass if it supports multiple selections; returns the selection state for `item`.*

- `const char * item_text (void *item) const` [FL\\_OVERRIDE](#)

*This optional method returns a string (label) that may be used for sorting.*

- `int item_width (void *) const` [FL\\_OVERRIDE](#)

*This method must be provided by the subclass to return the width of the `item` in pixels.*

## Additional Inherited Members

### 33.21.1 Detailed Description

The [Fl\\_Check\\_Browser](#) widget displays a scrolling list of text lines that may be selected and/or checked by the user.

### 33.21.2 Member Function Documentation

#### 33.21.2.1 `add()` [1/2]

```
int Fl_Check_Browser::add (
    char * s )
```

Add a new unchecked line to the end of the browser.

See also

[add\(char \\*s, int b\)](#)

#### 33.21.2.2 `add()` [2/2]

```
int Fl_Check_Browser::add (
    char * s,
    int b )
```

Add a new line to the end of the browser.

The text is copied using the `strdup()` function. It may also be `NULL` to make a blank line. It can set the item checked if `b` is not 0.

#### 33.21.2.3 `handle()`

```
int Fl_Check_Browser::handle (
    int event ) [protected], [virtual]
```

Handles the `event` within the normal widget bounding box.

Parameters

<code>in</code>	<code>event</code>	The event to process.
-----------------	--------------------	-----------------------

Returns

1 if event was processed, 0 if not.

Reimplemented from [Fl\\_Browser\\_](#).

#### 33.21.2.4 `item_at()`

```
void * Fl_Check_Browser::item_at (
    int index ) const [virtual]
```

This method must be provided by the subclass to return the item for the specified `index`.

#### Parameters

<code>in</code>	<i>index</i>	The <code>index</code> of the item to be returned
-----------------	--------------	---

#### Returns

The item at the specified `index`.

Reimplemented from [Fl\\_Browser\\_](#).

### 33.21.2.5 item\_draw()

```
void Fl_Check_Browser::item_draw (
    void * item,
    int X,
    int Y,
    int W,
    int H ) const [protected], [virtual]
```

This method must be provided by the subclass to draw the `item` in the area indicated by `X`, `Y`, `W`, `H`.

Implements [Fl\\_Browser\\_](#).

### 33.21.2.6 item\_first()

```
void * Fl_Check_Browser::item_first ( ) const [protected], [virtual]
```

This method must be provided by the subclass to return the first item in the list.

#### See also

[item\\_first\(\)](#), [item\\_next\(\)](#), [item\\_last\(\)](#), [item\\_prev\(\)](#)

Implements [Fl\\_Browser\\_](#).

### 33.21.2.7 item\_height()

```
int Fl_Check_Browser::item_height (
    void * item ) const [protected], [virtual]
```

This method must be provided by the subclass to return the height of `item` in pixels.

Allow for two additional pixels for the list selection box.

#### Parameters

<code>in</code>	<i>item</i>	The item whose height is returned.
-----------------	-------------	------------------------------------

#### Returns

The height of the specified `item` in pixels.

#### See also

[item\\_height\(\)](#), [item\\_width\(\)](#), [item\\_quick\\_height\(\)](#)

Implements [Fl\\_Browser\\_](#).

**33.21.2.8 item\_next()**

```
void * Fl_Check_Browser::item_next (
    void * item ) const [protected], [virtual]
```

This method must be provided by the subclass to return the item in the list after *item*.

See also

[item\\_first\(\)](#), [item\\_next\(\)](#), [item\\_last\(\)](#), [item\\_prev\(\)](#)

Implements [Fl\\_Browser\\_](#).

**33.21.2.9 item\_prev()**

```
void * Fl_Check_Browser::item_prev (
    void * item ) const [protected], [virtual]
```

This method must be provided by the subclass to return the item in the list before *item*.

See also

[item\\_first\(\)](#), [item\\_next\(\)](#), [item\\_last\(\)](#), [item\\_prev\(\)](#)

Implements [Fl\\_Browser\\_](#).

**33.21.2.10 item\_select()**

```
void Fl_Check_Browser::item_select (
    void * item,
    int val ) [protected], [virtual]
```

This method must be implemented by the subclass if it supports multiple selections; sets the selection state to *val* for the *item*.

Sets the selection state for *item*, where optional *val* is 1 (select, the default) or 0 (de-select).

**Parameters**

in	<i>item</i>	The item to be selected
in	<i>val</i>	The optional selection state; 1=select, 0=de-select. The default is to select the item (1).

Reimplemented from [Fl\\_Browser\\_](#).

**33.21.2.11 item\_selected()**

```
int Fl_Check_Browser::item_selected (
    void * item ) const [protected], [virtual]
```

This method must be implemented by the subclass if it supports multiple selections; returns the selection state for *item*.

The method should return 1 if *item* is selected, or 0 otherwise.

**Parameters**

in	<i>item</i>	The item to test.
----	-------------	-------------------

Reimplemented from [Fl\\_Browser\\_](#).

**33.21.2.12 item\_swap()**

```
void Fl_Check_Browser::item_swap (
    void * a,
    void * b ) [virtual]
```

This optional method should be provided by the subclass to efficiently swap browser items *a* and *b*, such as for sorting.

**Parameters**

in	<i>a,b</i>	The two items to be swapped.
----	------------	------------------------------

Reimplemented from [Fl\\_Browser\\_](#).

**33.21.2.13 item\_text()**

```
const char * Fl_Check_Browser::item_text (
    void * item ) const [protected], [virtual]
```

This optional method returns a string (label) that may be used for sorting.

**Parameters**

in	<i>item</i>	The item whose label text is returned.
----	-------------	--

**Returns**

The item's text label. (Can be NULL if blank)

Reimplemented from [Fl\\_Browser\\_](#).

**33.21.2.14 item\_width()**

```
int Fl_Check_Browser::item_width (
    void * item ) const [protected], [virtual]
```

This method must be provided by the subclass to return the width of the *item* in pixels. Allow for two additional pixels for the list selection box.

**Parameters**

in	<i>item</i>	The item whose width is returned.
----	-------------	-----------------------------------

**Returns**

The width of the item in pixels.

Implements [Fl\\_Browser\\_](#).

**33.21.2.15 nitems()**

```
int Fl_Check_Browser::nitems ( ) const [inline]
```

Returns how many lines are in the browser.

The last line number is equal to this.

**33.21.2.16 remove()**

```
int Fl_Check_Browser::remove (
    int item )
```

Remove line *n* and make the browser one line shorter.

Returns the number of lines left in the browser.

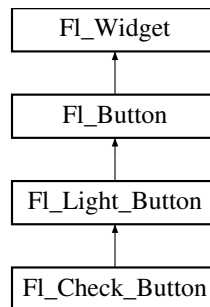
The documentation for this class was generated from the following files:

- Fl\_Check\_Browser.H
- Fl\_Check\_Browser.cxx

## 33.22 Fl\_Check\_Button Class Reference

A button with a "checkmark" to show its status.

Inheritance diagram for Fl\_Check\_Button:



### Public Member Functions

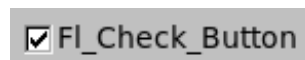
- [Fl\\_Check\\_Button](#) (int X, int Y, int W, int H, const char \*L=0)

*Creates a new [Fl\\_Check\\_Button](#) widget using the given position, size, and label string.*

### Additional Inherited Members

#### 33.22.1 Detailed Description

A button with a "checkmark" to show its status.



**Figure 33.7 Fl\_Check\_Button**

Buttons generate callbacks when they are clicked by the user. You control exactly when and how by changing the values for [type\(\)](#) and [when\(\)](#).

The [Fl\\_Check\\_Button](#) subclass displays its "ON" state by showing a "checkmark" rather than drawing itself pushed in.

#### 33.22.2 Constructor & Destructor Documentation

##### 33.22.2.1 Fl\_Check\_Button()

```

Fl_Check_Button::Fl_Check_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
  
```

Creates a new [Fl\\_Check\\_Button](#) widget using the given position, size, and label string.

The default box type is FL\_NO\_BOX, which draws the label w/o a box right of the checkmark.

The `selection_color()` sets the color of the checkmark. Default is `FL_FOREGROUND_COLOR` (usually black). You can use `down_box()` to change the box type of the checkmark. Default is `FL_DOWN_BOX`.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

The documentation for this class was generated from the following files:

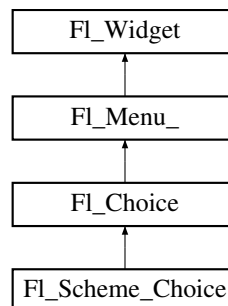
- `Fl_Check_Button.H`
- `Fl_Check_Button.cxx`

## 33.23 Fl\_Choice Class Reference

A button that is used to pop up a menu.

```
#include <Fl_Choice.H>
```

Inheritance diagram for `Fl_Choice`:



### Public Member Functions

- `Fl_Choice` (int *X*, int *Y*, int *W*, int *H*, const char \**L*=0)  
*Create a new `Fl_Choice` widget using the given position, size and label string.*
- int `handle` (int) `FL_OVERRIDE`  
*Handles the specified event.*
- int `value` () const  
*Gets the index of the last item chosen by the user.*
- int `value` (const `Fl_Menu_Item` \**v*)  
*Sets the currently selected value using a pointer to menu item.*
- int `value` (int *v*)  
*Sets the currently selected value using the index into the menu item array.*

### Protected Member Functions

- void `draw` () `FL_OVERRIDE`  
*Draws the widget.*

### Additional Inherited Members

#### 33.23.1 Detailed Description

A button that is used to pop up a menu.

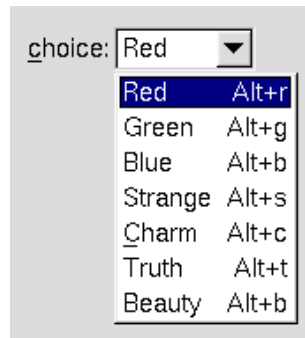


Figure 33.8 Fl\_Choice

This is a button that, when pushed, pops up a menu (or hierarchy of menus) defined by an array of [Fl\\_Menu\\_Item](#) objects. Motif calls this an `OptionButton`.

The only difference between this and a [Fl\\_Menu\\_Button](#) is that the name of the most recent chosen menu item is displayed inside the box, while the label is displayed outside the box. However, since the use of this is most often to control a single variable rather than do individual callbacks, some of the [Fl\\_Menu\\_Button](#) methods are redescribed here in those terms.

When the user clicks a menu item, `value()` is set to that item and then:

- The item's callback is done if one has been set; the `Fl_Choice` is passed as the `Fl_Widget*` argument, along with any userdata configured for the callback.
- If the item does not have a callback, the `Fl_Choice` widget's callback is done instead, along with any userdata configured for it. The callback can determine which item was picked using `value()`, `mvalue()`, `item_pathname()`, etc.

All three mouse buttons pop up the menu. The Forms behavior of the first two buttons to increment/decrement the choice is not implemented. This could be added with a subclass, however.

The menu will also pop up in response to shortcuts indicated by putting a '&' character in the `label()`. See [Fl\\_Button::shortcut\(int s\)](#) for a description of this.

Typing the `shortcut()` of any of the items will do exactly the same as when you pick the item with the mouse. The '&' character in item names are only looked at when the menu is popped up, however.

The inherited [Fl\\_Widget::changed\(\)](#) and related methods can be used as follows:

- `int Fl_Widget::changed() const` This value is true when the user picks a different value. *It is turned off by `value()` and just before doing a callback (the callback can turn it back on if desired).*
- `void Fl_Widget::set_changed()` This method sets the `changed()` flag.
- `void Fl_Widget::clear_changed()` This method clears the `changed()` flag.

The inherited [Fl\\_Menu::down\\_box\(\)](#) methods can be used as follows:

- `Fl_Boxtype Fl_Menu::down_box() const` Gets the current down box, which is used when the menu is popped up. The default down box type is `FL_DOWN_BOX`.
- `void Fl_Menu::down_box(Fl_Boxtype b)` Sets the current down box type to `b`.

Simple example:

```
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Choice.H>
int main() {
    Fl_Window *win = new Fl_Window(300,200);
    Fl_Choice *choice = new Fl_Choice(100,10,100,25,"Choice:");
    choice->add("Zero");
    choice->add("One");
    choice->add("Two");
    choice->add("Three");
    choice->value(2); // make "Two" selected by default (zero based!)
    win->end();
    win->show();
    return Fl::run();
}
```

FLTK triggers an `FL_BEFORE_MENU` event for this widget right before displaying the menu. This event provides an opportunity to update menu item states and activation. See `test/menubar.cxx`, class `Dynamic_Choice` "Flip" and "Flop" for a usage example.

## 33.23.2 Constructor & Destructor Documentation

### 33.23.2.1 Fl\_Choice()

```
Fl_Choice::Fl_Choice (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Create a new [Fl\\_Choice](#) widget using the given position, size and label string.

The default boxtype is `FL_UP_BOX`.

The constructor sets [menu\(\)](#) to `NULL`. See [Fl\\_Menu\\_](#) for the methods to set or change the menu.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

## 33.23.3 Member Function Documentation

### 33.23.3.1 draw()

```
void Fl_Choice::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.23.3.2 handle()

```
int Fl_Choice::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In

such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Scheme\\_Choice](#).

#### 33.23.3.3 value() [1/3]

```
int Fl_Choice::value ( ) const [inline]
```

Gets the index of the last item chosen by the user.

The index is -1 initially.

#### 33.23.3.4 value() [2/3]

```
int Fl_Choice::value (
    const Fl_Menu_Item * v )
```

Sets the currently selected value using a pointer to menu item.

Changing the selected value causes a [redraw\(\)](#).

#### Parameters

in	<i>v</i>	pointer to menu item in the menu item array.
----	----------	--

#### Returns

non-zero if the new value is different to the old one.

#### 33.23.3.5 value() [3/3]

```
int Fl_Choice::value (
    int v )
```

Sets the currently selected value using the index into the menu item array.

Changing the selected value causes a [redraw\(\)](#).

#### Parameters

in	<i>v</i>	index of value in the menu item array.
----	----------	--

**Returns**

non-zero if the new value is different to the old one.

The documentation for this class was generated from the following files:

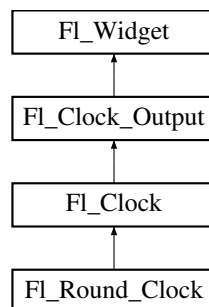
- `Fl_Choice.H`
- `Fl_Choice.cxx`

## 33.24 Fl\_Clock Class Reference

This widget provides a round analog clock display.

```
#include <Fl_Clock.H>
```

Inheritance diagram for `Fl_Clock`:

**Public Member Functions**

- `Fl_Clock` (int X, int Y, int W, int H, const char \*L=0)  
*Create an `Fl_Clock` widget using the given position, size, and label string.*
- `Fl_Clock` (uchar t, int X, int Y, int W, int H, const char \*L)  
*Create an `Fl_Clock` widget using the given clock type t, position, size, and label string.*
- int `handle` (int) `FL_OVERRIDE`  
*Handles the specified event.*
- `~Fl_Clock` ()  
*The destructor removes the clock.*

**Additional Inherited Members**

### 33.24.1 Detailed Description

This widget provides a round analog clock display.

`Fl_Clock` is provided for Forms compatibility. It installs a 1-second timeout callback using `Fl::add_timeout()`. You can choose the rounded or square type of the clock with `type()`. Please see `Fl_Clock_Output` widget for applicable values.

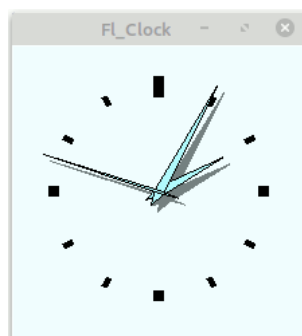


Figure 33.9 FL\_SQUARE\_CLOCK type

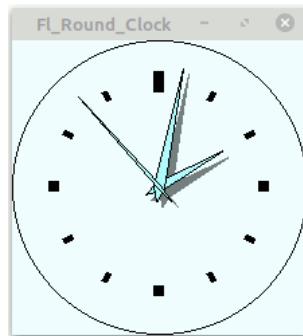


Figure 33.10 FL\_ROUND\_CLOCK type

See also

class [Fl\\_Clock\\_Output](#)

## 33.24.2 Constructor & Destructor Documentation

### 33.24.2.1 Fl\_Clock() [1/2]

```
Fl_Clock::Fl_Clock (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Create an [Fl\\_Clock](#) widget using the given position, size, and label string.

The default clock type is FL\_SQUARE\_CLOCK and the default boxtype is FL\_UP\_BOX.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

### 33.24.2.2 Fl\_Clock() [2/2]

```
Fl_Clock::Fl_Clock (
    uchar t,
    int X,
    int Y,
    int W,
    int H,
    const char * L )
```

Create an [Fl\\_Clock](#) widget using the given clock type *t*, position, size, and label string.

The default clock type *t* is FL\_SQUARE\_CLOCK. You can set the clock type to FL\_ROUND\_CLOCK or any other valid clock type. See [Fl\\_Clock\\_Output](#) widget for applicable values.

The default boxtype is FL\_UP\_BOX for FL\_SQUARE\_CLOCK and FL\_NO\_BOX for FL\_ROUND\_CLOCK, if set by the constructor. If you change the clock type with [type\(\)](#) later you should also set the boxtype with [box\(\)](#).

#### Parameters

in	<i>t</i>	type of clock: FL_ROUND_CLOCK or FL_SQUARE_CLOCK (0)
in	<i>X,Y,W,H</i>	position and size of the widget

## Parameters

in	<i>L</i>	widget label, default is no label
----	----------	-----------------------------------

## See also

class [Fl\\_Clock\\_Output](#)

### 33.24.3 Member Function Documentation

#### 33.24.3.1 `handle()`

```
int Fl_Clock::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

## Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

## Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

## See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

The documentation for this class was generated from the following files:

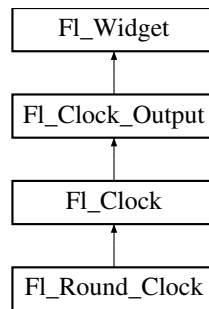
- `Fl_Clock.H`
- `Fl_Clock.cxx`

## 33.25 `Fl_Clock_Output` Class Reference

This widget can be used to display a program-supplied time.

```
#include <Fl_Clock.H>
```

Inheritance diagram for `Fl_Clock_Output`:



## Public Member Functions

- [Fl\\_Clock\\_Output](#) (int X, int Y, int W, int H, const char \*L=0)  
*Create a new [Fl\\_Clock\\_Output](#) widget with the given position, size and label.*
- int [hour](#) () const  
*Returns the displayed hour (0 to 23).*
- int [minute](#) () const  
*Returns the displayed minute (0 to 59).*
- int [second](#) () const  
*Returns the displayed second (0 to 60, 60=leap second).*
- int [shadow](#) () const  
*Returns the shadow drawing mode of the hands.*
- void [shadow](#) (int mode)  
*Sets the shadow drawing mode of the hands.*
- [ulong value](#) () const  
*Returns the displayed time.*
- void [value](#) (int H, int m, int s)  
*Set the displayed time.*
- void [value](#) (ulong v)  
*Set the displayed time.*

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draw clock with current position and size.*
- void [draw](#) (int X, int Y, int W, int H)  
*Draw clock with the given position and size.*

## Additional Inherited Members

### 33.25.1 Detailed Description

This widget can be used to display a program-supplied time.

The time shown on the clock is not updated. To display the current time, use [Fl\\_Clock](#) instead.

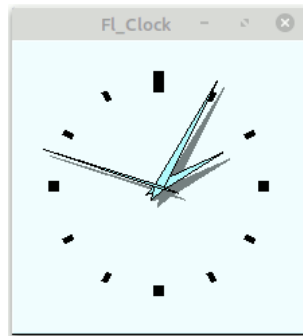


Figure 33.11 FL\_SQUARE\_CLOCK type

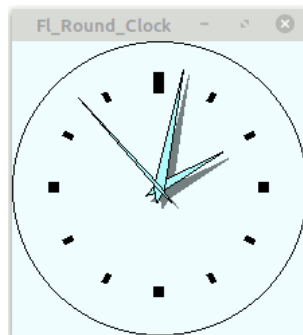


Figure 33.12 FL\_ROUND\_CLOCK type

Values for clock [type\(\)](#) (#include <FL/Clock.H>):

```
#define FL_SQUARE_CLOCK      0      // Square Clock variant
#define FL_ROUND_CLOCK      1      // Round Clock variant
#define FL_ANALOG_CLOCK FL_SQUARE_CLOCK // An analog clock is square
#define FL_DIGITAL_CLOCK FL_SQUARE_CLOCK // Not yet implemented
```

## 33.25.2 Constructor & Destructor Documentation

### 33.25.2.1 Fl\_Clock\_Output()

```
Fl_Clock_Output::Fl_Clock_Output (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Create a new [Fl\\_Clock\\_Output](#) widget with the given position, size and label.

The default clock type is FL\_SQUARE\_CLOCK and the default boxtype is FL\_UP\_BOX.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

## 33.25.3 Member Function Documentation

**33.25.3.1 draw()** [1/2]

```
void Fl_Clock_Output::draw (
    void ) [protected], [virtual]
```

Draw clock with current position and size.

Implements [Fl\\_Widget](#).

**33.25.3.2 draw()** [2/2]

```
void Fl_Clock_Output::draw (
    int X,
    int Y,
    int W,
    int H ) [protected]
```

Draw clock with the given position and size.

Parameters

in	X,Y,W,H	position and size
----	---------	-------------------

**33.25.3.3 hour()**

```
int Fl_Clock_Output::hour ( ) const [inline]
```

Returns the displayed hour (0 to 23).

See also

[value\(\)](#), [minute\(\)](#), [second\(\)](#)

**33.25.3.4 minute()**

```
int Fl_Clock_Output::minute ( ) const [inline]
```

Returns the displayed minute (0 to 59).

See also

[value\(\)](#), [hour\(\)](#), [second\(\)](#)

**33.25.3.5 second()**

```
int Fl_Clock_Output::second ( ) const [inline]
```

Returns the displayed second (0 to 60, 60=leap second).

See also

[value\(\)](#), [hour\(\)](#), [minute\(\)](#)

**33.25.3.6 shadow()** [1/2]

```
int Fl_Clock_Output::shadow ( ) const [inline]
```

Returns the shadow drawing mode of the hands.

Returns

shadow drawing mode of the hands

## Return values

0	no shadows
1	draw shadows of hands (default)

**33.25.3.7 shadow()** [2/2]

```
void Fl_Clock_Output::shadow (
    int mode ) [inline]
```

Sets the shadow drawing mode of the hands.

Enables (1) or disables (0) drawing the hands with shadows.

Values except 0 and 1 are reserved for future extensions and yield undefined behavior.

The default is to draw the shadows (1).

## Parameters

in	mode	1 = shadows (default), 0 = no shadows
----	------	---------------------------------------

**33.25.3.8 value()** [1/3]

```
ulong Fl_Clock_Output::value ( ) const [inline]
```

Returns the displayed time.

Returns the time in seconds since the UNIX epoch (January 1, 1970).

## See also

[value\(ulong\)](#)

**33.25.3.9 value()** [2/3]

```
void Fl_Clock_Output::value (
    int H,
    int m,
    int s )
```

Set the displayed time.

Set the time in hours, minutes, and seconds.

## Parameters

in	H,m,s	displayed time
----	-------	----------------

## See also

[hour\(\)](#), [minute\(\)](#), [second\(\)](#)

**33.25.3.10 value()** [3/3]

```
void Fl_Clock_Output::value (
    ulong v )
```

Set the displayed time.

Set the time in seconds since the UNIX epoch (January 1, 1970).

## Parameters

in	v	seconds since epoch
----	---	---------------------

## See also

[value\(\)](#)

The documentation for this class was generated from the following files:

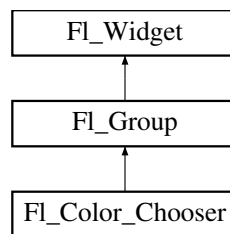
- [Fl\\_Clock.H](#)
- [Fl\\_Clock.cxx](#)

## 33.26 Fl\_Color\_Chooser Class Reference

The [Fl\\_Color\\_Chooser](#) widget provides a standard RGB color chooser.

```
#include <Fl_Color_Chooser.H>
```

Inheritance diagram for [Fl\\_Color\\_Chooser](#):



### Public Member Functions

- double [b](#) () const  
*Returns the current blue value.*
- [Fl\\_Color\\_Chooser](#) (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [Fl\\_Color\\_Chooser](#) widget using the given position, size, and label string.*
- double [g](#) () const  
*Returns the current green value.*
- int [handle](#) (int e) [FL\\_OVERRIDE](#)  
*Handles all events received by this widget.*
- int [hsv](#) (double H, double S, double V)  
*Set the hsv values.*
- double [hue](#) () const  
*Returns the current hue.*
- int [mode](#) ()  
*Returns which [Fl\\_Color\\_Chooser](#) variant is currently active.*
- void [mode](#) (int newMode)  
*Set which [Fl\\_Color\\_Chooser](#) variant is currently active.*
- double [r](#) () const  
*Returns the current red value.*
- int [rgb](#) (double R, double G, double B)  
*Sets the current rgb color values.*
- double [saturation](#) () const  
*Returns the saturation.*
- double [value](#) () const  
*Returns the value/brightness.*

## Static Public Member Functions

- static void [hsv2rgb](#) (double H, double S, double V, double &R, double &G, double &B)  
*This static method converts HSV colors to RGB colorspace.*
- static void [rgb2hsv](#) (double R, double G, double B, double &H, double &S, double &V)  
*This static method converts RGB colors to HSV colorspace.*

## Related Functions

(Note that these are not member functions.)

- int [fl\\_color\\_chooser](#) (const char \*name, double &r, double &g, double &b, int cmode)  
*Pops up a window to let the user pick an arbitrary RGB color.*
- int [fl\\_color\\_chooser](#) (const char \*name, uchar &r, uchar &g, uchar &b, int cmode)  
*Pops up a window to let the user pick an arbitrary RGB color.*

## Additional Inherited Members

### 33.26.1 Detailed Description

The [Fl\\_Color\\_Chooser](#) widget provides a standard RGB color chooser.

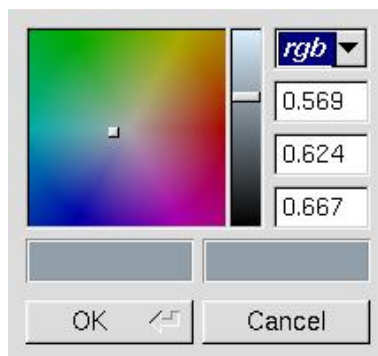


Figure 33.13 [fl\\_color\\_chooser\(\)](#)

You can place any number of the widgets into a panel of your own design. The diagram shows the widget as part of a color chooser dialog created by the [fl\\_color\\_chooser\(\)](#) function. The [Fl\\_Color\\_Chooser](#) widget contains the hue box, value slider, and rgb input fields from the above diagram (it does not have the color chips or the Cancel or OK buttons). The callback is done every time the user changes the rgb value. It is not done if they move the hue control in a way that produces the *same* rgb value, such as when saturation or value is zero.

The [fl\\_color\\_chooser\(\)](#) function pops up a window to let the user pick an arbitrary RGB color. They can pick the hue and saturation in the "hue box" on the left (hold down CTRL to just change the saturation), and the brightness using the vertical slider. Or they can type the 8-bit numbers into the RGB [Fl\\_Value\\_Input](#) fields, or drag the mouse across them to adjust them. The pull-down menu lets the user set the input fields to show RGB, HSV, or 8-bit RGB (0 to 255).

The user can press CTRL-C to copy the currently selected color value as text in RGB hex format with leading zeroes to the clipboard, for instance `FL_GREEN` would be '00FF00' (since FLTK 1.4.0).

[fl\\_color\\_chooser\(\)](#) returns non-zero if the user picks ok, and updates the RGB values. If the user picks cancel or closes the window this returns zero and leaves RGB unchanged.

If you use the color chooser on an 8-bit screen, it will allocate all the available colors, leaving you no space to exactly represent the color the user picks! You can however use [fl\\_rectf\(\)](#) to fill a region with a simulated color using dithering.

Callback reasons can be `FL_REASON_DRAGGED`, `FL_REASON_CHANGED`, or `FL_REASON_RESELECTED`.

### 33.26.2 Constructor & Destructor Documentation

### 33.26.2.1 Fl\_Color\_Chooser()

```
Fl_Color_Chooser::Fl_Color_Chooser (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [Fl\\_Color\\_Chooser](#) widget using the given position, size, and label string. The recommended dimensions are 200x95. The color is initialized to black.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

## 33.26.3 Member Function Documentation

### 33.26.3.1 b()

```
double Fl_Color_Chooser::b ( ) const [inline]
```

Returns the current blue value.

0 <= b <= 1.

### 33.26.3.2 g()

```
double Fl_Color_Chooser::g ( ) const [inline]
```

Returns the current green value.

0 <= g <= 1.

### 33.26.3.3 handle()

```
int Fl_Color_Chooser::handle (
    int e ) [virtual]
```

Handles all events received by this widget.

This specific [handle\(\)](#) method processes the standard 'copy' function as seen in other input widgets. It copies the current color value to the clipboard as a string in RGB format ('RRGGBB').

This format is independent of the [Fl\\_Color\\_Chooser](#) display format setting. No other formats are supplied.

The keyboard events handled are:

- ctrl-c
- ctrl-x
- ctrl-Insert

All other events are processed by the parent class [Fl\\_Group](#).

This enables the **user** to choose a color value, press `ctrl-c` to copy the value to the clipboard and paste it into a color selection widget in another application window or any other text input (e.g. a preferences dialog or an editor).

#### Note

Keyboard event handling by the current focus widget has priority, hence moving the focus to one of the buttons or selecting text in one of the input widgets effectively disables this special method.

#### Parameters

in	<i>e</i>	current event
----	----------	---------------

**Returns**

1 if event has been handled, 0 otherwise

**See also**

[Fl\\_Group::handle\(int\)](#)

Reimplemented from [Fl\\_Widget](#).

**33.26.3.4 hsv()**

```
int Fl_Color_Chooser::hsv (
    double H,
    double S,
    double V )
```

Set the hsv values.

The passed values are clamped (or for hue, modulus 6 is used) to get legal values. Does not do the callback.

**Parameters**

in	<i>H,S,V</i>	color components.
----	--------------	-------------------

**Returns**

1 if a new hsv value was set, 0 if the hsv value was the previous one.

**33.26.3.5 hsv2rgb()**

```
void Fl_Color_Chooser::hsv2rgb (
    double H,
    double S,
    double V,
    double & R,
    double & G,
    double & B ) [static]
```

This *static* method converts HSV colors to RGB colorspace.

**Parameters**

in	<i>H,S,V</i>	color components
out	<i>R,G,B</i>	color components

**33.26.3.6 hue()**

```
double Fl_Color_Chooser::hue ( ) const [inline]
```

Returns the current hue.

$0 \leq \text{hue} < 6$ . Zero is red, one is yellow, two is green, etc. *This value is convenient for the internal calculations - some other systems consider hue to run from zero to one, or from 0 to 360.*

**33.26.3.7 mode() [1/2]**

```
int Fl_Color_Chooser::mode ( ) [inline]
```

Returns which [Fl\\_Color\\_Chooser](#) variant is currently active.

**Returns**

color modes are rgb(0), byte(1), hex(2), or hsv(3)

**33.26.3.8 mode() [2/2]**

```
void Fl_Color_Chooser::mode (
    int newMode )
```

Set which [Fl\\_Color\\_Chooser](#) variant is currently active.

**Parameters**

in	<i>newMode</i>	color modes are rgb(0), byte(1), hex(2), or hsv(3)
----	----------------	--

**33.26.3.9 r()**

```
double Fl_Color_Chooser::r ( ) const [inline]
```

Returns the current red value.

$0 \leq r \leq 1$ .

**33.26.3.10 rgb()**

```
int Fl_Color_Chooser::rgb (
    double R,
    double G,
    double B )
```

Sets the current rgb color values.

Does not do the callback. Does not clamp (but out of range values will produce psychedelic effects in the hue selector).

**Parameters**

in	<i>R,G,B</i>	color components.
----	--------------	-------------------

**Returns**

1 if a new rgb value was set, 0 if the rgb value was the previous one.

**33.26.3.11 rgb2hsv()**

```
void Fl_Color_Chooser::rgb2hsv (
    double R,
    double G,
    double B,
    double & H,
    double & S,
    double & V ) [static]
```

This *static* method converts RGB colors to HSV colorspace.

**Parameters**

in	<i>R,G,B</i>	color components
out	<i>H,S,V</i>	color components

### 33.26.3.12 saturation()

```
double Fl_Color_Chooser::saturation ( ) const [inline]
```

Returns the saturation.

0 <= saturation <= 1.

### 33.26.3.13 value()

```
double Fl_Color_Chooser::value ( ) const [inline]
```

Returns the value/brightness.

0 <= value <= 1.

The documentation for this class was generated from the following files:

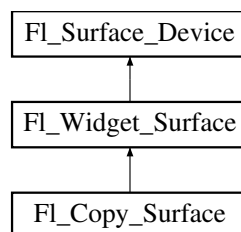
- [Fl\\_Color\\_Chooser.H](#)
- [Fl\\_Color\\_Chooser.cxx](#)

## 33.27 Fl\_Copy\_Surface Class Reference

Supports copying of graphical data to the clipboard.

```
#include <Fl_Copy_Surface.H>
```

Inheritance diagram for Fl\_Copy\_Surface:



### Public Member Functions

- [Fl\\_Copy\\_Surface](#) (int **w**, int **h**)  
*the constructor*
- int **h** ()  
*Returns the pixel height of the copy surface.*
- bool **is\_current** () [FL\\_OVERRIDE](#)  
*Is this surface the current drawing surface?*
- void **origin** (int \*x, int \*y) [FL\\_OVERRIDE](#)  
*Computes the coordinates of the current origin of graphics functions.*
- void **origin** (int x, int y) [FL\\_OVERRIDE](#)  
*Sets the position of the origin of graphics in the drawable part of the drawing surface.*
- int **printable\_rect** (int \*w, int \*h) [FL\\_OVERRIDE](#)  
*Computes the width and height of the drawable area of the drawing surface.*
- void **set\_current** () [FL\\_OVERRIDE](#)  
*Make this surface the current drawing surface.*
- int **w** ()  
*Returns the pixel width of the copy surface.*
- [~Fl\\_Copy\\_Surface](#) ()  
*the destructor*

## Protected Member Functions

- void [translate](#) (int x, int y) [FL\\_OVERRIDE](#)  
*Translates the current graphics origin accounting for the current rotation.*
- void [untranslate](#) () [FL\\_OVERRIDE](#)  
*Undoes the effect of a previous [translate\(\)](#) call.*

## Additional Inherited Members

### 33.27.1 Detailed Description

Supports copying of graphical data to the clipboard.

After creation of an [Fl\\_Copy\\_Surface](#) object, make it the current drawing surface calling [Fl\\_Surface\\_Device::push\\_current\(\)](#), and all subsequent graphics requests will be recorded in the clipboard. It's possible to draw widgets (using [Fl\\_Copy\\_Surface::draw\(\)](#) ) or to use any of the [Drawing functions](#) or the [Color & Font functions](#). Finally, delete the [Fl\\_Copy\\_Surface](#) object to load the clipboard with the graphical data. [Fl\\_Gl\\_Window](#) 's can be copied to the clipboard as well.

Usage example:

```
Fl_Widget *g = ...; // a widget you want to copy to the clipboard
Fl_Copy_Surface *copy_surf = new Fl_Copy_Surface(g->w(), g->h()); // create an Fl_Copy_Surface object
Fl_Surface_Device::push_current(copy_surf); // direct graphics requests to the clipboard
fl_color(FL_WHITE); fl_rectf(0, 0, g->w(), g->h()); // draw a white background
copy_surf->draw(g); // draw the g widget in the clipboard
Fl_Surface_Device::pop_current(); // direct graphics requests back to their previous destination
delete copy_surf; // after this, the clipboard is loaded
```

Platform details:

- Windows: Transparent RGB images copy without transparency. The graphical data are copied to the clipboard in two formats: 1) as an 'enhanced metafile'; 2) as a color bitmap. Applications to which the clipboard content is pasted can use the format that suits them best.
- Mac OS: The graphical data are copied to the clipboard (a.k.a. pasteboard) in two 'flavors': 1) in vectorial form as PDF data; 2) in bitmap form as a TIFF image. Applications to which the clipboard content is pasted can use the flavor that suits them best.
- X11 and Wayland: the graphical data are copied to the clipboard as an image in BMP format.

### 33.27.2 Constructor & Destructor Documentation

#### 33.27.2.1 Fl\_Copy\_Surface()

```
Fl_Copy_Surface::Fl_Copy_Surface (
    int w,
    int h )
```

the constructor

Parameters

<i>w,h</i>	Width and height of the drawing surface in FLTK units
------------	---

### 33.27.3 Member Function Documentation

#### 33.27.3.1 is\_current()

```
bool Fl_Copy_Surface::is_current ( ) [virtual]
```

Is this surface the current drawing surface?

Reimplemented from [Fl\\_Surface\\_Device](#).

### 33.27.3.2 origin() [1/2]

```
void Fl_Copy_Surface::origin (
    int * x,
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

#### Parameters

out	x,y	If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.
-----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.27.3.3 origin() [2/2]

```
void Fl_Copy_Surface::origin (
    int x,
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous [printable\\_rect\(\)](#) call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive [origin\(\)](#) calls don't combine their effects. Origin() calls are not affected by [rotate\(\)](#) calls (for classes derived from [Fl\\_Paged\\_Device](#)).

#### Parameters

in	x,y	Horizontal and vertical positions in the drawing surface of the desired origin of graphics.
----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.27.3.4 printable\_rect()

```
int Fl_Copy_Surface::printable_rect (
    int * w,
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to [origin\(\)](#). If the object is derived from class [Fl\\_Paged\\_Device](#), values account for the user-selected paper type and print orientation and are changed by [scale\(\)](#) calls.

#### Returns

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.27.3.5 set\_current()

```
void Fl_Copy_Surface::set_current (
    void ) [virtual]
```

Make this surface the current drawing surface.

This surface will receive all future graphics requests.

Since FLTK 1.4.0 the preferred API to change the current drawing surface is [Fl\\_Surface\\_Device::push\\_current\(\)](#) / [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

**Note**

It is recommended to use this function only as follows :

- The current drawing surface is the display;
- make current another surface, e.g., an [Fl\\_Printer](#) or an [Fl\\_Image\\_Surface](#) object, calling [set\\_current\(\)](#) on this object;
- draw to that surface;
- make the display current again with [Fl\\_Display\\_Device::display\\_device\(\)->set\\_current\(\)](#); don't do any other call to [set\\_current\(\)](#) before this one.

Other scenarios of drawing surface changes should be performed via [Fl\\_Surface\\_Device::push\\_current\(\)](#) and [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

Reimplemented from [Fl\\_Surface\\_Device](#).

**33.27.3.6 translate()**

```
void Fl_Copy_Surface::translate (
    int x,
    int y ) [protected], [virtual]
```

Translates the current graphics origin accounting for the current rotation.

Each [translate\(\)](#) call must be matched by an [untranslate\(\)](#) call. Successive [translate\(\)](#) calls add up their effects.

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.27.3.7 untranslate()**

```
void Fl_Copy_Surface::untranslate (
    void ) [protected], [virtual]
```

Undoes the effect of a previous [translate\(\)](#) call.

Reimplemented from [Fl\\_Widget\\_Surface](#).

The documentation for this class was generated from the following files:

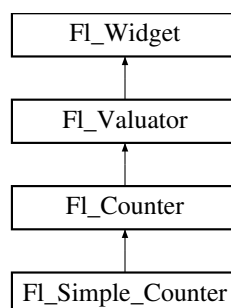
- [Fl\\_Copy\\_Surface.H](#)
- [Fl\\_Copy\\_Surface.cxx](#)

**33.28 Fl\_Counter Class Reference**

Controls a single floating point value with button (or keyboard) arrows.

```
#include <Fl_Counter.H>
```

Inheritance diagram for [Fl\\_Counter](#):

**Public Member Functions**

- [Fl\\_Counter](#) (int X, int Y, int W, int H, const char \*L=0)

*Creates a new [Fl\\_Counter](#) widget using the given position, size, and label string.*

- `int handle (int) FL_OVERRIDE`  
*Handles the specified event.*
- `void lstep (double a)`  
*Sets the increment for the large step buttons.*
- `double step () const`  
*Returns the increment for normal step buttons.*
- `void step (double a)`  
*Sets the increment for the normal step buttons.*
- `void step (double a, double b)`  
*Sets the increments for the normal and large step buttons.*
- `FL_Color textcolor () const`  
*Gets the font color.*
- `void textcolor (FL_Color s)`  
*Sets the font color to s.*
- `FL_Font textfont () const`  
*Gets the text font.*
- `void textfont (FL_Font s)`  
*Sets the text font to s.*
- `FL_Fontsize textsize () const`  
*Gets the font size.*
- `void textsize (FL_Fontsize s)`  
*Sets the font size to s.*
- `~FL_Counter ()`  
*Destroys the valuator.*

## Protected Member Functions

- `void arrow_widths (int &w1, int &w2)`  
*Compute sizes (widths) of arrow boxes.*
- `void draw () FL_OVERRIDE`  
*Draws the widget.*

## Additional Inherited Members

### 33.28.1 Detailed Description

Controls a single floating point value with button (or keyboard) arrows. Double arrows buttons achieve larger steps than simple arrows.

See also

[FL\\_Spinner](#) for *value* input with vertical *step* arrows.

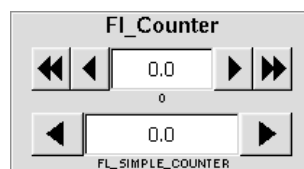


Figure 33.14 FL\_Counter

The type of an [FL\\_Counter](#) object can be set using [FL\\_Widget::type\(uchar\)](#) to:

- `FL_NORMAL_COUNTER`: Displays a counter with 4 arrow buttons.
- `FL_SIMPLE_COUNTER`: Displays a counter with only 2 arrow buttons.

## 33.28.2 Constructor & Destructor Documentation

### 33.28.2.1 Fl\_Counter()

```
Fl_Counter::Fl_Counter (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [Fl\\_Counter](#) widget using the given position, size, and label string. The default type is FL\_NORMAL\_COUNTER.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

## 33.28.3 Member Function Documentation

### 33.28.3.1 arrow\_widths()

```
void Fl_Counter::arrow_widths (
    int & w1,
    int & w2 ) [protected]
```

Compute sizes (widths) of arrow boxes.

This method computes the two sizes of the arrow boxes of [Fl\\_Counter](#). You can override it in a subclass if you want to draw fancy arrows or change the layout. However, the basic layout is fixed and can't be changed w/o overriding the [draw\(\)](#) and [handle\(\)](#) methods.

Basic layout:

```
+-----+-----+-----+-----+-----+
| « | < |      value      | > | » |
+-----+-----+-----+-----+-----+
```

The returned value w2 should be zero if the counter [type\(\)](#) is FL\_SIMPLE\_COUNTER.

#### Parameters

out	<i>w1</i>	width of single arrow box
out	<i>w2</i>	width of double arrow box

### 33.28.3.2 draw()

```
void Fl_Counter::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.28.3.3 `handle()`

```
int Fl_Counter::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

### 33.28.3.4 `lstep()`

```
void Fl_Counter::lstep (
    double a ) [inline]
```

Sets the increment for the large step buttons.

The default value is 1.0.

#### Parameters

in	<i>a</i>	large step increment.
----	----------	-----------------------

### 33.28.3.5 `step()` [1/2]

```
void Fl_Counter::step (
    double a ) [inline]
```

Sets the increment for the normal step buttons.

#### Parameters

in	<i>a</i>	normal step increment.
----	----------	------------------------

### 33.28.3.6 step() [2/2]

```
void Fl_Counter::step (
    double a,
    double b ) [inline]
```

Sets the increments for the normal and large step buttons.

#### Parameters

in	a,b	normal and large step increments.
----	-----	-----------------------------------

The documentation for this class was generated from the following files:

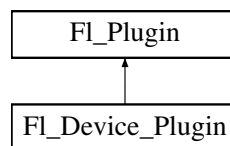
- Fl\_Counter.H
- Fl\_Counter.cxx

## 33.29 FI\_Device\_Plugin Class Reference

This plugin socket allows the integration of new device drivers for special window or screen types.

```
#include <Fl_Device.H>
```

Inheritance diagram for FI\_Device\_Plugin:



### Public Member Functions

- **FI\_Device\_Plugin** (const char \*pluginName)  
*The constructor.*
- virtual const char \* **klass** ()  
*Returns the class name.*
- virtual const char \* **name** ()=0  
*Returns the plugin name.*
- virtual int **print** (Fl\_Widget \*w)=0  
*Prints a widget.*
- virtual Fl\_RGB\_Image \* **rectangle\_capture** (Fl\_Widget \*widget, int x, int y, int w, int h)=0  
*Captures a rectangle of a widget as an image.*

### Static Public Member Functions

- static Fl\_Device\_Plugin \* **opengl\_plugin** ()  
*Returns the OpenGL plugin.*

### 33.29.1 Detailed Description

This plugin socket allows the integration of new device drivers for special window or screen types.

This class is not intended for use outside the FLTK library. It is currently used to provide an automated printing service and screen capture for OpenGL windows, if linked with fltk\_gl.

### 33.29.2 Member Function Documentation

### 33.29.2.1 rectangle\_capture()

```
virtual Fl\_RGB\_Image * Fl_Device_Plugin::rectangle_capture (
    Fl\_Widget * widget,
    int x,
    int y,
    int w,
    int h ) [pure virtual]
```

Captures a rectangle of a widget as an image.

#### Returns

The captured pixels as an RGB image

The documentation for this class was generated from the following files:

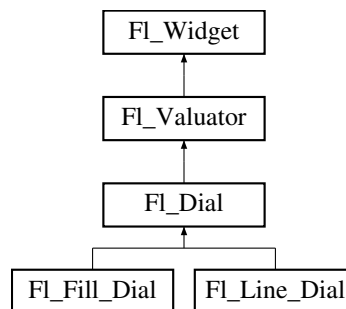
- [Fl\\_Device.H](#)
- [Fl\\_Device.cxx](#)

## 33.30 Fl\_Dial Class Reference

The [Fl\\_Dial](#) widget provides a circular dial to control a single floating point value.

```
#include <Fl_Dial.H>
```

Inheritance diagram for [Fl\\_Dial](#):



### Public Member Functions

- short [angle1](#) () const  
*Sets Or gets the angles used for the minimum and maximum values.*
- void **angle1** (short a)  
*See short [angle1\(\)](#) const.*
- short **angle2** () const  
*See short [angle1\(\)](#) const.*
- void **angle2** (short a)  
*See short [angle1\(\)](#) const.*
- void **angles** (short a, short b)  
*See short [angle1\(\)](#) const.*
- [Fl\\_Dial](#) (int [x](#), int [y](#), int [w](#), int [h](#), const char \*l=0)  
*Creates a new [Fl\\_Dial](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Allow subclasses to handle event based on current position and size.*

## Protected Member Functions

- void `draw ()` [FL\\_OVERRIDE](#)  
*Draws dial at current position and size.*
- void `draw (int X, int Y, int W, int H)`  
*Draws dial at given position and size.*
- int `handle (int event, int X, int Y, int W, int H)`  
*Allows subclasses to handle event based on given position and size.*

## Additional Inherited Members

### 33.30.1 Detailed Description

The [Fl\\_Dial](#) widget provides a circular dial to control a single floating point value.

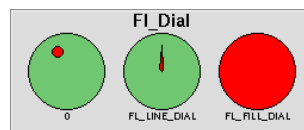


Figure 33.15 Fl\_Dial

Use `type()` to set the type of the dial to:

- `FL_NORMAL_DIAL` - Draws a normal dial with a knob.
- `FL_LINE_DIAL` - Draws a dial with a line.
- `FL_FILL_DIAL` - Draws a dial with a filled arc.

### 33.30.2 Constructor & Destructor Documentation

#### 33.30.2.1 Fl\_Dial()

```
Fl_Dial::Fl_Dial (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Dial](#) widget using the given position, size, and label string. The default type is `FL_NORMAL_DIAL`.

### 33.30.3 Member Function Documentation

#### 33.30.3.1 angle1()

```
short Fl_Dial::angle1 ( ) const [inline]
```

Sets Or gets the angles used for the minimum and maximum values.

The default values are 45 and 315 (0 degrees is straight down and the angles progress clockwise). Normally `angle1` is less than `angle2`, but if you reverse them the dial moves counter-clockwise.

**33.30.3.2 draw() [1/2]**

```
void Fl_Dial::draw (
    void ) [protected], [virtual]
```

Draws dial at current position and size.

Implements [Fl\\_Widget](#).

**33.30.3.3 draw() [2/2]**

```
void Fl_Dial::draw (
    int X,
    int Y,
    int W,
    int H ) [protected]
```

Draws dial at given position and size.

**Parameters**

in	<i>X,Y,W,H</i>	position and size
----	----------------	-------------------

**33.30.3.4 handle() [1/2]**

```
int Fl_Dial::handle (
    int event,
    int X,
    int Y,
    int W,
    int H ) [protected]
```

Allows subclasses to handle event based on given position and size.

**Parameters**

in	<i>event,X,Y,W,H</i>	event to handle, related position and size.
----	----------------------	---

**33.30.3.5 handle() [2/2]**

```
int Fl_Dial::handle (
    int e ) [virtual]
```

Allow subclasses to handle event based on current position and size.

Reimplemented from [Fl\\_Widget](#).

The documentation for this class was generated from the following files:

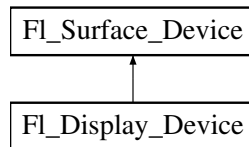
- [Fl\\_Dial.H](#)
- [Fl\\_Dial.cxx](#)

**33.31 Fl\_Display\_Device Class Reference**

The computer's display.

```
#include <Fl_Device.H>
```

Inheritance diagram for Fl\_Display\_Device:



## Static Public Member Functions

- static [Fl\\_Display\\_Device](#) \* **display\_device** ()  
*Returns a pointer to the unique display device.*

## Additional Inherited Members

### 33.31.1 Detailed Description

The computer's display.

When FLTK begins to access the computer's display, it creates an object of class [Fl\\_Display\\_Device](#) and makes it the current drawing surface.

The documentation for this class was generated from the following files:

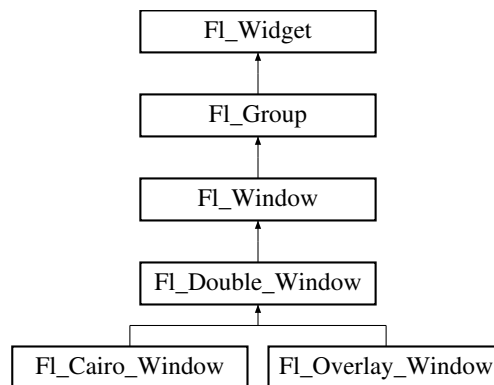
- [Fl\\_Device.H](#)
- [Fl\\_Device.cxx](#)

## 33.32 Fl\_Double\_Window Class Reference

The [Fl\\_Double\\_Window](#) provides a double-buffered window.

```
#include <Fl_Double_Window.H>
```

Inheritance diagram for [Fl\\_Double\\_Window](#):



## Public Member Functions

- [Fl\\_Double\\_Window](#) \* **as\_double\_window** () **FL\_OVERRIDE**  
*Return non-null if this is an [Fl\\_Double\\_Window](#) object.*
- **Fl\_Double\_Window** (int W, int H, const char \*l=0)  
*Creates a new [Fl\\_Double\\_Window](#) widget using the given position, size, and label (title) string.*
- **Fl\_Double\_Window** (int X, int Y, int W, int H, const char \*l=0)  
*See [Fl\\_Double\\_Window::Fl\\_Double\\_Window\(int w, int h, const char \\*label = 0\)](#)*
- void **flush** () **FL\_OVERRIDE**  
*Forces the window to be drawn, this window is also made current and calls [draw\(\)](#).*
- void **hide** () **FL\_OVERRIDE**  
*Makes a widget invisible.*
- void **resize** (int, int, int, int) **FL\_OVERRIDE**

- Changes the size or position of the widget.*

  - void `show` () `FL_OVERRIDE`

*Makes a widget visible.*
- void `show` (int a, char \*\*b)

*Same as `Fl_Window::show(int a, char **b)`*
- `~Fl_Double_Window` ()

*The destructor also deletes all the children.*

## Additional Inherited Members

### 33.32.1 Detailed Description

The `Fl_Double_Window` provides a double-buffered window. It will draw the window data into an off-screen pixmap, and then copy it to the on-screen window.

### 33.32.2 Constructor & Destructor Documentation

#### 33.32.2.1 `~Fl_Double_Window()`

```
Fl_Double_Window::~~Fl_Double_Window ( )
```

The destructor *also deletes all the children*.

This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code.

### 33.32.3 Member Function Documentation

#### 33.32.3.1 `as_double_window()`

```
Fl_Double_Window * Fl_Double_Window::as_double_window ( ) [inline], [virtual]
```

Return non-null if this is an `Fl_Double_Window` object.

Reimplemented from `Fl_Window`.

#### 33.32.3.2 `flush()`

```
void Fl_Double_Window::flush ( ) [virtual]
```

Forces the window to be drawn, this window is also made current and calls `draw()`.

Reimplemented from `Fl_Window`.

Reimplemented in `Fl_Overlay_Window`.

#### 33.32.3.3 `hide()`

```
void Fl_Double_Window::hide ( ) [virtual]
```

Makes a widget invisible.

See also

`show()`, `visible()`, `visible_r()`

Reimplemented from `Fl_Widget`.

Reimplemented in `Fl_Overlay_Window`.

### 33.32.3.4 `resize()`

```
void Fl_Double_Window::resize (
    int x,
    int y,
    int w,
    int h ) [virtual]
```

Changes the size or position of the widget.

This is a virtual function so that the widget may implement its own handling of resizing. The default version does *not* call the `redraw()` method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.

Some window managers under X11 call `resize()` a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations.

`position(X, Y)` is a shortcut for `resize(X, Y, w(), h())`, and `size(W, H)` is a shortcut for `resize(x(), y(), W, H)`.

#### Parameters

in	<code>x,y</code>	new position relative to the parent window
in	<code>w,h</code>	new size

#### See also

[position\(int,int\)](#), [size\(int,int\)](#)

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Overlay\\_Window](#).

### 33.32.3.5 `show()`

```
void Fl_Double_Window::show ( ) [virtual]
```

Makes a widget visible.

An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like `FL_SHOW`.

The `visible()` method returns true if the widget is set to be visible. The `visible_r()` method returns true if the widget and all of its parents are visible. A widget is only visible if `visible()` is true on it *and all of its parents*.

Changing it will send `FL_SHOW` or `FL_HIDE` events to the widget. *Do not change it if the parent is not visible, as this will send false `FL_SHOW` or `FL_HIDE` events to the widget.* `redraw()` is called if necessary on this or the parent.

#### See also

[hide\(\)](#), [visible\(\)](#), [visible\\_r\(\)](#)

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Overlay\\_Window](#).

The documentation for this class was generated from the following files:

- [Fl\\_Double\\_Window.H](#)
- [Fl\\_Double\\_Window.cxx](#)

## 33.33 Fl\_End Class Reference

This is a dummy class that allows you to end a [Fl\\_Group](#) in a constructor list of a class:

```
#include <Fl_Group.H>
```

### Public Member Functions

- [Fl\\_End\(\)](#)

*All it does is calling `Fl_Group::current()->end()`*

### 33.33.1 Detailed Description

This is a dummy class that allows you to end a [Fl\\_Group](#) in a constructor list of a class:

```
class MyClass {
    Fl_Group group;
    Fl_Button button_in_group;
    Fl_End end;
    Fl_Button button_outside_group;
    MyClass();
};

MyClass::MyClass() :
    group(10,10,100,100),
    button_in_group(20,20,60,30),
    end(),
    button_outside_group(10,120,60,30) {
    [...ctor code...]
```

The documentation for this class was generated from the following file:

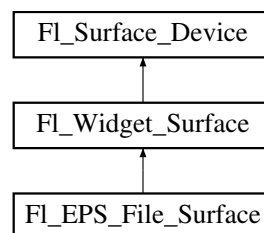
- [Fl\\_Group.H](#)

## 33.34 Fl\_EPS\_File\_Surface Class Reference

Encapsulated PostScript drawing surface.

```
#include <Fl_PostScript.H>
```

Inheritance diagram for Fl\_EPS\_File\_Surface:



### Public Member Functions

- `int close ()`  
*Completes all EPS output.*
- `FILE * file ()`  
*Returns the underlying FILE pointer.*
- `Fl_EPS_File_Surface (int width, int height, FILE *eps_output, Fl\_Color background=FL_WHITE, Fl\_PostScript\_Close\_Command closef=NULL)`  
*Constructor.*
- `void origin (int *px, int *py) FL\_OVERRIDE`  
*Computes the coordinates of the current origin of graphics functions.*
- `void origin (int x, int y) FL\_OVERRIDE`  
*Sets the position of the origin of graphics in the drawable part of the drawing surface.*
- `int printable_rect (int *w, int *h) FL\_OVERRIDE`  
*Computes the width and height of the drawable area of the drawing surface.*
- `void translate (int x, int y) FL\_OVERRIDE`  
*Translates the current graphics origin accounting for the current rotation.*
- `void untranslate () FL\_OVERRIDE`  
*Undoes the effect of a previous [translate\(\)](#) call.*
- `~Fl_EPS_File_Surface ()`  
*Destructor.*

## Protected Member Functions

- `Fl_PostScript_Graphics_Driver * driver ()`

*Returns the PostScript driver of this drawing surface.*

## Additional Inherited Members

### 33.34.1 Detailed Description

Encapsulated PostScript drawing surface.

This drawing surface allows to store any FLTK graphics in vectorial form in an "Encapsulated PostScript" file.

Usage example:

```
Fl_Window *win = ...// Window to draw to an .eps file
int ww = win->decorated_w();
int wh = win->decorated_h();
FILE *eps = fl_fopen("/path/to/mywindow.eps", "w");
if (eps) {
    Fl_EPS_File_Surface *surface = new Fl_EPS_File_Surface(ww, wh, eps, win->color());
    Fl_Surface_Device::push_current(surface);
    surface->draw_decorated_window(win);
    Fl_Surface_Device::pop_current();
    delete surface; // the .eps file is not complete until the destructor was run
}
```

### 33.34.2 Constructor & Destructor Documentation

#### 33.34.2.1 Fl\_EPS\_File\_Surface()

```
Fl_EPS_File_Surface::Fl_EPS_File_Surface (
    int width,
    int height,
    FILE * eps_output,
    Fl_Color background = FL_WHITE,
    Fl_PostScript_Close_Command closef = NULL )
```

Constructor.

#### Parameters

<i>width,height</i>	Width and height of the EPS drawing area
<i>eps_output</i>	A writable FILE pointer where the Encapsulated PostScript data will be sent
<i>background</i>	Color expected to cover the background of the EPS drawing area. This parameter affects only the drawing of transparent <a href="#">Fl_RGB_Image</a> objects: transparent areas of RGB images are blended with the <code>background</code> color. Under the X11 + pango platform, transparent RGB images are correctly blended to their background, thus this parameter has no effect.
<i>closef</i>	If not NULL, the destructor or <a href="#">close()</a> will call <code>closef(eps_output)</code> after all EPS data has been sent. If NULL, <code>fclose(eps_output)</code> is called instead. This allows to close the FILE pointer by, e.g., <code>pclose</code> , or, using a function such as <code>"int keep_open(FILE*) {return 0;}"</code> , to keep it open after completion of all output to <code>eps_output</code> . Function <code>closef</code> should return non zero to indicate an error.

#### 33.34.2.2 ~Fl\_EPS\_File\_Surface()

```
Fl_EPS_File_Surface::~~Fl_EPS_File_Surface ( )
```

Destructor.

By default, the destructor closes with function `fclose()` the underlying FILE. See the constructor for how to close it differently or to keep it open. Use [close\(\)](#) before object destruction to receive the status code of output operations. If [close\(\)](#) is not used and if EPS output results in error, the destructor displays an alert message with [fl\\_alert\(\)](#).

### 33.34.3 Member Function Documentation

#### 33.34.3.1 close()

```
int Fl_EPS_File_Surface::close ( )
```

Completes all EPS output.

The only operation possible with the [Fl\\_EPS\\_File\\_Surface](#) object after calling [close\(\)](#) is its destruction.

##### Returns

The status code of output operations to the FILE object. 0 indicates success.

#### 33.34.3.2 origin() [1/2]

```
void Fl_EPS_File_Surface::origin (
    int * x,
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

##### Parameters

out	x,y	If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.
-----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

#### 33.34.3.3 origin() [2/2]

```
void Fl_EPS_File_Surface::origin (
    int x,
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous [printable\\_rect\(\)](#) call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive [origin\(\)](#) calls don't combine their effects. [Origin\(\)](#) calls are not affected by [rotate\(\)](#) calls (for classes derived from [Fl\\_Paged\\_Device](#)).

##### Parameters

in	x,y	Horizontal and vertical positions in the drawing surface of the desired origin of graphics.
----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

#### 33.34.3.4 printable\_rect()

```
int Fl_EPS_File_Surface::printable_rect (
    int * w,
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to [origin\(\)](#). If the object is derived from class [Fl\\_Paged\\_Device](#), values account for the user-selected paper type and print orientation and are changed by [scale\(\)](#) calls.

**Returns**

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.34.3.5 translate()**

```
void Fl_EPS_File_Surface::translate (
    int x,
    int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation.

Each [translate\(\)](#) call must be matched by an [untranslate\(\)](#) call. Successive [translate\(\)](#) calls add up their effects.

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.34.3.6 untranslate()**

```
void Fl_EPS_File_Surface::untranslate (
    void ) [virtual]
```

Undoes the effect of a previous [translate\(\)](#) call.

Reimplemented from [Fl\\_Widget\\_Surface](#).

The documentation for this class was generated from the following file:

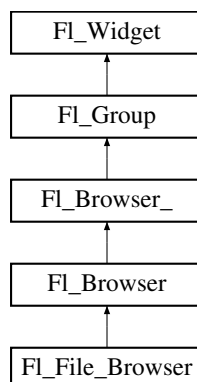
- [Fl\\_PostScript.H](#)

**33.35 Fl\_File\_Browser Class Reference**

The [Fl\\_File\\_Browser](#) widget displays a list of filenames, optionally with file-specific icons.

```
#include <Fl_File_Browser.H>
```

Inheritance diagram for [Fl\\_File\\_Browser](#):

**Public Types**

- enum { **FILES** , **DIRECTORIES** }

**Public Member Functions**

- const char \* [errmsg](#) () const  
*Returns OS error messages, or NULL if none.*
- void [errmsg](#) (const char \*emsg)  
*Sets OS error message to a string, which can be NULL.*
- int [filetype](#) () const  
*Sets or gets the file browser type, FILES or DIRECTORIES.*

- void `filetype` (int t)  
*Sets or gets the file browser type, FILES or DIRECTORIES.*
- const char \* `filter` () const  
*Sets or gets the filename filter.*
- void `filter` (const char \*pattern)  
*Sets or gets the filename filter.*
- `Fl_File_Browser` (int, int, int, int, const char \*s=0)  
*The constructor creates the `Fl_File_Browser` widget at the specified position and size.*
- uchar `iconsize` () const  
*Sets or gets the size of the icons.*
- void `iconsize` (uchar s)  
*Sets or gets the size of the icons.*
- int `load` (const char \*directory, `Fl_File_Sort_F` \*sort=`fl_numericsort`)  
*Loads the specified directory into the browser.*
- `Fl_Fontsize` `textsize` () const
- void `textsize` (`Fl_Fontsize` s)

## Additional Inherited Members

### 33.35.1 Detailed Description

The `Fl_File_Browser` widget displays a list of filenames, optionally with file-specific icons.

### 33.35.2 Constructor & Destructor Documentation

#### 33.35.2.1 `Fl_File_Browser()`

```
Fl_File_Browser::Fl_File_Browser (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

The constructor creates the `Fl_File_Browser` widget at the specified position and size.  
The destructor destroys the widget and frees all memory that has been allocated.

### 33.35.3 Member Function Documentation

#### 33.35.3.1 `errmsg()` [1/2]

```
const char * Fl_File_Browser::errmsg ( ) const [inline]
```

Returns OS error messages, or NULL if none.  
Use when advised.

#### 33.35.3.2 `errmsg()` [2/2]

```
void Fl_File_Browser::errmsg (
    const char * emsg )
```

Sets OS error message to a string, which can be NULL.  
Frees previous if any. void `errmsg(const char *emsg);`

**33.35.3.3 filetype()** [1/2]

```
int Fl_File_Browser::filetype ( ) const [inline]
```

Sets or gets the file browser type, FILES or DIRECTORIES.

When set to FILES, both files and directories are shown. Otherwise only directories are shown.

**33.35.3.4 filetype()** [2/2]

```
void Fl_File_Browser::filetype (
    int t ) [inline]
```

Sets or gets the file browser type, FILES or DIRECTORIES.

When set to FILES, both files and directories are shown. Otherwise only directories are shown.

**33.35.3.5 filter()** [1/2]

```
const char * Fl_File_Browser::filter ( ) const [inline]
```

Sets or gets the filename filter.

The pattern matching uses the [fl\\_filename\\_match\(\)](#) function in FLTK.

**33.35.3.6 filter()** [2/2]

```
void Fl_File_Browser::filter (
    const char * pattern )
```

Sets or gets the filename filter.

The pattern matching uses the [fl\\_filename\\_match\(\)](#) function in FLTK.

**33.35.3.7 iconsize()** [1/2]

```
uchar Fl_File_Browser::iconsize ( ) const [inline]
```

Sets or gets the size of the icons.

The default size is 20 pixels.

**33.35.3.8 iconsize()** [2/2]

```
void Fl_File_Browser::iconsize (
    uchar s ) [inline]
```

Sets or gets the size of the icons.

The default size is 20 pixels.

**33.35.3.9 load()**

```
int Fl_File_Browser::load (
    const char * directory,
    Fl_File_Sort_F * sort = fl_numericsort )
```

Loads the specified directory into the browser.

If icons have been loaded then the correct icon is associated with each file in the list.

If directory is "", all mount points (unix) or drive letters (Windows) are listed.

The sort argument specifies a sort function to be used with [fl\\_filename\\_list\(\)](#).

Return value is the number of filename entries, or 0 if none. On error, 0 is returned, and [errmsg\(\)](#) has OS error string if non-NULL.

The documentation for this class was generated from the following files:

- Fl\_File\_Browser.H
- Fl\_File\_Browser.cxx

**33.36 Fl\_File\_Chooser Class Reference**

The [Fl\\_File\\_Chooser](#) widget displays a standard file selection dialog that supports various selection modes.

## Public Types

- enum [Type](#) { [SINGLE](#) = 0 , [MULTI](#) = 1 , [CREATE](#) = 2 , [DIRECTORY](#) = 4 }
- Determines the type of file chooser presented to the user.*

## Public Member Functions

- [FI\\_Widget](#) \* [add\\_extra](#) ([FI\\_Widget](#) \*gr)  
*Adds an extra widget at the bottom of the [FI\\_File\\_Chooser](#) window.*
- void [callback](#) (void(\*cb)([FI\\_File\\_Chooser](#) \*, void \*), void \*d=0)  
*Sets the file chooser callback cb and associated data d.*
- [FI\\_Color](#) [color](#) ()  
*Gets the background color of the [FI\\_File\\_Browser](#) list.*
- void [color](#) ([FI\\_Color](#) c)  
*Sets the background color of the [FI\\_File\\_Browser](#) list.*
- int [count](#) ()  
*Returns the number of selected files.*
- char \* [directory](#) ()  
*Gets the current directory.*
- void [directory](#) (const char \*d)  
*Sets the current directory.*
- const char \* [filter](#) ()  
*Gets the current filename filter patterns.*
- void [filter](#) (const char \*p)  
*Sets the current filename filter patterns.*
- int [filter\\_value](#) ()  
*Gets the current filename filter selection.*
- void [filter\\_value](#) (int f)  
*Sets the current filename filter selection.*
- [FI\\_File\\_Chooser](#) (const char \*pathname, const char \*pattern, int type\_val, const char \*title)  
*The constructor creates the [FI\\_File\\_Chooser](#) dialog shown.*
- int [h](#) () const
- void [hide](#) ()  
*Hides the [FI\\_File\\_Chooser](#) window.*
- uchar [iconsize](#) ()  
*Gets the size of the icons in the [FI\\_File\\_Browser](#).*
- void [iconsize](#) (uchar s)  
*Sets the size of the icons in the [FI\\_File\\_Browser](#).*
- const char \* [label](#) ()  
*Gets the title bar text for the [FI\\_File\\_Chooser](#).*
- void [label](#) (const char \*l)  
*Sets the title bar text for the [FI\\_File\\_Chooser](#).*
- const char \* [ok\\_label](#) ()  
*Gets the label for the "ok" button in the [FI\\_File\\_Chooser](#).*
- void [ok\\_label](#) (const char \*l)  
*Sets the label for the "ok" button in the [FI\\_File\\_Chooser](#).*
- void [position](#) (int x, int y)
- int [preview](#) () const  
*Returns the current state of the preview box.*
- void [preview](#) (int e)  
*Enable or disable the preview tile.*
- void [rescan](#) ()

- Reloads the current directory in the [FL\\_File\\_Browser](#).*
- void **rescan\_keep\_filename** ()
  - Rescan the current directory without clearing the filename, then select the file if it is in the list.*
- void **resize** (int x, int y, int w, int h)
- void **show** ()
  - Shows the [FL\\_File\\_Chooser](#) window.*
- int **shown** ()
  - Returns non-zero if the file chooser main window [show\(\)](#) has been called, but not [hide\(\)](#).*
- void **size** (int w, int h)
- [FL\\_Color](#) **textcolor** ()
  - Gets the current [FL\\_File\\_Browser](#) text color.*
- void **textcolor** ([FL\\_Color](#) c)
  - Sets the current [FL\\_File\\_Browser](#) text color.*
- [FL\\_Font](#) **textfont** ()
  - Gets the current [FL\\_File\\_Browser](#) text font.*
- void **textfont** ([FL\\_Font](#) f)
  - Sets the current [FL\\_File\\_Browser](#) text font.*
- [FL\\_Fontsize](#) **textsize** ()
  - Gets the current [FL\\_File\\_Browser](#) text size.*
- void **textsize** ([FL\\_Fontsize](#) s)
  - Sets the current [FL\\_File\\_Browser](#) text size.*
- int **type** ()
  - Gets the current type of [FL\\_File\\_Chooser](#).*
- void **type** (int t)
  - Sets the current type of [FL\\_File\\_Chooser](#).*
- void \* **user\_data** () const
  - Gets the file chooser user data.*
- void **user\_data** (void \*d)
  - Sets the file chooser user data d.*
- void **value** (const char \*filename)
  - Sets the current value of the selected file.*
- const char \* **value** (int f=1)
  - Gets the current value of the selected file(s).*
- int **visible** ()
  - Returns 1 if the [FL\\_File\\_Chooser](#) window is visible.*
- int **w** () const
- int **x** () const
- int **y** () const
- ~[FL\\_File\\_Chooser](#) ()
  - Destroys the widget and frees all memory used by it.*

## Public Attributes

- [FL\\_Button](#) \* **newButton**
  - The "new directory" button is exported so that application developers can control the appearance and use.*
- [FL\\_Check\\_Button](#) \* **previewButton**
  - The "preview" button is exported so that application developers can control the appearance and use.*
- [FL\\_Check\\_Button](#) \* **showHiddenButton**
  - When checked, hidden files (i.e., filename begins with dot) are displayed.*

## Static Public Attributes

- static const char \* **add\_favorites\_label** = "Add to Favorites"  
*[standard text may be customized at run-time]*
- static const char \* **all\_files\_label** = "All Files (\*)"  
*[standard text may be customized at run-time]*
- static const char \* **custom\_filter\_label** = "Custom Filter"  
*[standard text may be customized at run-time]*
- static const char \* **existing\_file\_label** = "Please choose an existing file!"  
*[standard text may be customized at run-time]*
- static const char \* **favorites\_label** = "Favorites"  
*[standard text may be customized at run-time]*
- static const char \* **filename\_label** = "Filename:"  
*[standard text may be customized at run-time]*
- static const char \* **filesystems\_label** = [Fl::system\\_driver\(\)](#)->filesystems\_label()  
*[standard text may be customized at run-time]*
- static const char \* **hidden\_label** = "Show hidden files"  
*[standard text may be customized at run-time]*
- static const char \* **manage\_favorites\_label** = "Manage Favorites"  
*[standard text may be customized at run-time]*
- static const char \* **new\_directory\_label** = "New Directory?"  
*[standard text may be customized at run-time]*
- static const char \* **new\_directory\_tooltip** = "Create a new directory."  
*[standard text may be customized at run-time]*
- static const char \* **preview\_label** = "Preview"  
*[standard text may be customized at run-time]*
- static const char \* **save\_label** = "Save"  
*[standard text may be customized at run-time]*
- static const char \* **show\_label** = "Show:"  
*[standard text may be customized at run-time]*
- static [Fl\\_File\\_Sort\\_F](#) \* **sort** = [fl\\_numericsort](#)  
*the sort function that is used when loading the contents of a directory.*

## Protected Member Functions

- void **show\_error\_box** (int val)  
*Show error box if val=1, hide if val=0.*

## Related Functions

(Note that these are not member functions.)

- char \* [fl\\_dir\\_chooser](#) (const char \*message, const char \*fname, int relative)  
*Shows a file chooser dialog and gets a directory.*
- char \* [fl\\_file\\_chooser](#) (const char \*message, const char \*pat, const char \*fname, int relative)  
*Shows a file chooser dialog and gets a filename.*
- void [fl\\_file\\_chooser\\_callback](#) (void(\*cb)(const char \*))  
*Set the file chooser callback.*
- void [fl\\_file\\_chooser\\_ok\\_label](#) (const char \*l)  
*Set the "OK" button label.*

### 33.36.1 Detailed Description

The [FI\\_File\\_Chooser](#) widget displays a standard file selection dialog that supports various selection modes.

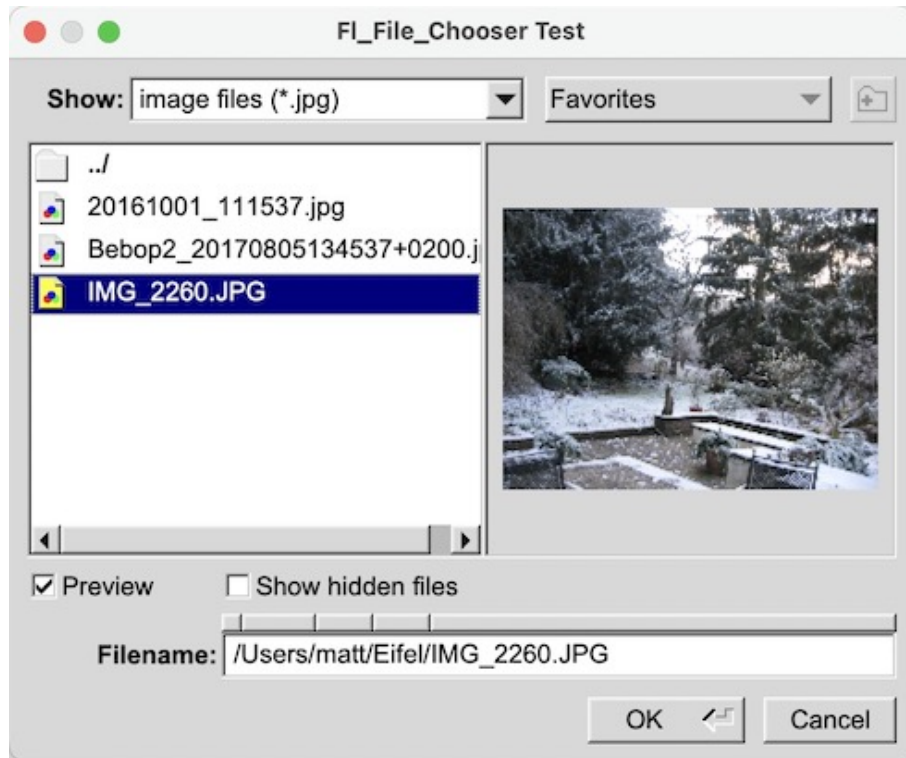


Figure 33.16 FI\_File\_Chooser

Features include:

- Multiple filter patterns can be specified, with parenthesis around filters, and tabs to separate each pattern, e.g.:  

```
char pattern[] = "Image Files (*.bmp,gif,jpg,png,xbm,xpm)\\t"
                "Web Files (*.htm,html,php)\\t"
                "All Files (*)";
```
- If no "\*" pattern is provided, then an entry for "All Files (\*)" is automatically added.
- An optional file preview box is provided which can be toggled by programmer or user showing images, or the first 2048 bytes of printable text.
- Preview image loading functions can be registered to provide custom file previews.
- The favorites button shows up to 100 user-saved favorite directories, the user's home directory, and a filesystems item.
- A simple dialog is provided for managing saved directories.
- Shortcut keys are provided:

Shortcut	Description
Alt+a	Adds a directory to the favorites list
Alt+m	Manages the favorites list
Alt+f	Shows the filesystem list
Alt+h	Go to the home directory
Alt+0..9	going to any of the first 10 favorites

The [Fl\\_File\\_Chooser](#) widget transmits UTF-8 encoded filenames to its user. It is recommended to open files that may have non-ASCII names with the [fl\\_fopen\(\)](#) or [fl\\_open\(\)](#) utility functions that handle these names in a cross-platform way (whereas the standard `fopen()/open()` functions fail on the Windows platform to open files with a non-ASCII name).

The [Fl\\_File\\_Chooser](#) class also exports several static values that may be used to localize or customize the appearance of all file chooser dialogs:

Member	Default value
<code>add_favorites_label</code>	"Add to Favorites"
<code>all_files_label</code>	"All Files (*)"
<code>custom_filter_label</code>	"Custom Filter"
<code>existing_file_label</code>	"Please choose an existing file!"
<code>favorites_label</code>	"Favorites"
<code>filename_label</code>	"Filename:"
<code>filesystems_label</code>	"My Computer" (Windows) "File Systems" (all others)
<code>hidden_label</code>	"Show hidden files:"
<code>manage_favorites_label</code>	"Manage Favorites"
<code>new_directory_label</code>	"New Directory?"
<code>new_directory_tooltip</code>	"Create a new directory."
<code>preview_label</code>	"Preview"
<code>save_label</code>	"Save"
<code>show_label</code>	"Show:"
<code>sort</code>	<code>fl_numericsort</code>

The [Fl\\_File\\_Chooser::sort](#) member specifies the sort function that is used when loading the contents of a directory and can be customized at run-time.

The [Fl\\_File\\_Chooser](#) class also exports the [Fl\\_File\\_Chooser::newButton](#) and [Fl\\_File\\_Chooser::previewButton](#) widgets so that application developers can control their appearance and use.

## 33.36.2 Member Enumeration Documentation

### 33.36.2.1 Type

enum [Fl\\_File\\_Chooser::Type](#)

Determines the type of file chooser presented to the user.

#### Enumerator

SINGLE	Select a single, existing file.
MULTI	Select one or more existing files.
CREATE	When used alone, select a single, existing file or specify a new filename. Can be combined with DIRECTORY (e.g. CREATE DIRECTORY) to have the same effect for directories.
DIRECTORY	Select a single, existing directory. Can be combined with CREATE.

### 33.36.3 Constructor & Destructor Documentation

#### 33.36.3.1 `Fl_File_Chooser()`

```
Fl_File_Chooser::Fl_File_Chooser (
    const char * pathname,
    const char * pattern,
    int type_val,
    const char * title )
```

The constructor creates the `Fl_File_Chooser` dialog shown.

- The `pathname` argument can be a directory name or a complete file name (in which case the corresponding file is highlighted in the list and in the filename input field.)
- The `pattern` argument can be a NULL string or "\*" to list all files, or it can be a series of descriptions and filter strings separated by tab characters (`\t`). The format of filters is either "Description text (patterns)" or just "patterns". A file chooser that provides filters for HTML and image files might look like:  
`"HTML Files (*.html)\tImage Files (*.{bmp,gif,jpg,png})"`  
 The file chooser will automatically add the "All Files (\*)" pattern to the end of the string you pass if you do not provide one. The first filter in the string is the default filter. See the FLTK documentation on `fl_filename_match()` for the kinds of pattern strings that are supported.
- The `type_val` argument can be one of the `Fl_File_Chooser::Type` values.
- The `title` argument is used to set the title bar text for the `Fl_File_Chooser` window.

### 33.36.4 Member Function Documentation

#### 33.36.4.1 `add_extra()`

```
Fl_Widget * Fl_File_Chooser::add_extra (
    Fl_Widget * extra )
```

Adds an extra widget at the bottom of the `Fl_File_Chooser` window.

You can use any `Fl_Widget` or `Fl_Group`. If you use an `Fl_Group`, set its (x, y) coordinates to (0, 0) and position its children relative to (0, 0) inside the `Fl_Group` container widget. Make sure that all child widgets of the `Fl_Group` are entirely included inside the bounding box of their parents, i.e. the `Fl_Group` widget, and the `Fl_File_Chooser` window, respectively.

##### Note

The width of the `Fl_File_Chooser` window is an undocumented implementation detail and may change in the future.

If `extra` is NULL any previous extra widget is removed.

##### Parameters

in	<code>extra</code>	Custom widget or group to be added to the <code>Fl_File_Chooser</code> window.
----	--------------------	--

##### Returns

Pointer to previous extra widget or NULL if not set previously.

##### Note

`Fl_File_Chooser` does **not** delete the extra widget in its destructor! The extra widget is removed from the `Fl_File_Chooser` window before the `Fl_File_Chooser` widget gets destroyed. To prevent memory leakage, don't forget to delete unused extra widgets.

### 33.36.4.2 filter()

```
void Fl_File_Chooser::filter (
    const char * p )
```

Sets the current filename filter patterns.

The filter patterns use [fl\\_filename\\_match\(\)](#). Multiple patterns can be used by separating them with tabs, like `"*.jpg\t*.png\t*.gif\t*"`. In addition, you can provide human-readable labels with the patterns inside parenthesis, like `"JPEG Files (*.jpg)\tPNG Files (*.png)\tGIF Files (*.gif)\tAll Files (*)"`.

Use `filter(NULL)` to show all files.

### 33.36.4.3 iconsize() [1/2]

```
uchar Fl_File_Chooser::iconsize ( )
```

Gets the size of the icons in the [Fl\\_File\\_Browser](#).

By default the icon size is set to 1.5 times the [textsize\(\)](#).

### 33.36.4.4 iconsize() [2/2]

```
void Fl_File_Chooser::iconsize (
    uchar s )
```

Sets the size of the icons in the [Fl\\_File\\_Browser](#).

By default the icon size is set to 1.5 times the [textsize\(\)](#).

### 33.36.4.5 preview()

```
void Fl_File_Chooser::preview (
    int e )
```

Enable or disable the preview tile.

1 = enable preview, 0 = disable preview.

### 33.36.4.6 shown()

```
int Fl_File_Chooser::shown ( )
```

Returns non-zero if the file chooser main window [show\(\)](#) has been called, but not [hide\(\)](#).

See also

[Fl\\_Window::shown\(\)](#)

### 33.36.4.7 value() [1/2]

```
void Fl_File_Chooser::value (
    const char * filename )
```

Sets the current value of the selected file.

If a relative path is provided in `filename` it is converted to an absolute path.

If `NULL` or an empty string is provided, the working directory is changed to the user's current directory and the filename is set to "".

After assigning the filename the entire string (if any) is selected, i.e.

- `insert_position()` is 0 (zero)
- `mark()` is `strlen(<expanded filename>)`.

Note

The selection of the entire string may not always be desired but it is kept for backwards compatibility.

## Parameters

in	<i>filename</i>	relative or absolute filename, may be NULL or ""
----	-----------------	--

**33.36.4.8 value() [2/2]**

```
const char * Fl_File_Chooser::value (
    int f = 1 )
```

Gets the current value of the selected file(s).

*f* is a 1-based index into a list of file names. The number of selected files is returned by [Fl\\_File\\_Chooser::count\(\)](#).

This sample code loops through all selected files:

```
// Get list of filenames user selected from a MULTI chooser
for ( int t=1; t<=chooser->count(); t++ ) {
    const char *filename = chooser->value(t);
    ...
}
```

**33.36.5 Member Data Documentation****33.36.5.1 showHiddenButton**

```
Fl_File_Chooser::showHiddenButton
```

When checked, hidden files (i.e., filename begins with dot) are displayed.

The "showHiddenButton" button is exported so that application developers can control its appearance.

The documentation for this class was generated from the following files:

- [Fl\\_File\\_Chooser.H](#)
- [Fl\\_File\\_Chooser.cxx](#)
- [Fl\\_File\\_Chooser2.cxx](#)
- [fl\\_file\\_dir.cxx](#)

**33.37 Fl\_File\_Icon Class Reference**

The [Fl\\_File\\_Icon](#) class manages icon images that can be used as labels in other widgets and as icons in the [FileBrowser](#) widget.

```
#include <Fl_File_Icon.H>
```

**Public Types**

- enum {  
    **ANY** , **PLAIN** , **FIFO** , **DEVICE** ,  
    **LINK** , **DIRECTORY** }
- enum {  
    **END** , **COLOR** , **LINE** , **CLOSEDLINE** ,  
    **POLYGON** , **OUTLINEPOLYGON** , **VERTEX** }

**Public Member Functions**

- short \* [add](#) (short d)  
    *Adds a keyword value to the icon array, returning a pointer to it.*
- short \* [add\\_color](#) ([Fl\\_Color](#) c)  
    *Adds a color value to the icon array, returning a pointer to it.*
- short \* [add\\_vertex](#) (float x, float y)  
    *Adds a vertex value to the icon array, returning a pointer to it.*

- short \* [add\\_vertex](#) (int x, int y)  
*Adds a vertex value to the icon array, returning a pointer to it.*
- void **clear** ()  
*Clears all icon data from the icon.*
- void [draw](#) (int x, int y, int w, int h, [FL\\_Color](#) ic, int active=1)  
*Draws an icon in the indicated area.*
- [FL\\_File\\_Icon](#) (const char \*p, int t, int nd=0, short \*d=0)  
*Creates a new [FL\\_File\\_Icon](#) with the specified information.*
- void [label](#) ([FL\\_Widget](#) \*w)  
*Applies the icon to the widget, registering the [FL\\_File\\_Icon](#) label type as needed.*
- void [load](#) (const char \*f)  
*Loads the specified icon image.*
- int [load\\_fti](#) (const char \*fti)  
*Loads an SGI icon file.*
- int [load\\_image](#) (const char \*i)  
*Load an image icon file from an image filename.*
- [FL\\_File\\_Icon](#) \* [next](#) ()  
*Returns next file icon object.*
- const char \* **pattern** ()  
*Returns the filename matching pattern for the icon.*
- int **size** ()  
*Returns the number of words of data used by the icon.*
- int [type](#) ()  
*Returns the filetype associated with the icon, which can be one of the following:*
- short \* **value** ()  
*Returns the data array for the icon.*
- ~[FL\\_File\\_Icon](#) ()  
*The destructor destroys the icon and frees all memory that has been allocated for it.*

## Static Public Member Functions

- static [FL\\_File\\_Icon](#) \* [find](#) (const char \*filename, int filetype=ANY)  
*Finds an icon that matches the given filename and file type.*
- static [FL\\_File\\_Icon](#) \* **first** ()  
*Returns a pointer to the first icon in the list.*
- static void [labeltype](#) (const [FL\\_Label](#) \*o, int x, int y, int w, int h, [FL\\_Align](#) a)  
*Draw the icon label.*
- static void [load\\_system\\_icons](#) (void)  
*Loads all system-defined icons.*

### 33.37.1 Detailed Description

The [FL\\_File\\_Icon](#) class manages icon images that can be used as labels in other widgets and as icons in the [FileBrowser](#) widget.

### 33.37.2 Constructor & Destructor Documentation

### 33.37.2.1 Fl\_File\_Icon()

```
Fl_File_Icon::Fl_File_Icon (
    const char * p,
    int t,
    int nd = 0,
    short * d = 0 )
```

Creates a new [Fl\\_File\\_Icon](#) with the specified information.

#### Parameters

in	<i>p</i>	filename pattern
in	<i>t</i>	file type
in	<i>nd</i>	number of data values
in	<i>d</i>	data values

## 33.37.3 Member Function Documentation

### 33.37.3.1 add()

```
short * Fl_File_Icon::add (
    short d )
```

Adds a keyword value to the icon array, returning a pointer to it.

#### Parameters

in	<i>d</i>	data value
----	----------	------------

### 33.37.3.2 add\_color()

```
short * Fl_File_Icon::add_color (
    Fl\_Color c ) [inline]
```

Adds a color value to the icon array, returning a pointer to it.

#### Parameters

in	<i>c</i>	color value
----	----------	-------------

### 33.37.3.3 add\_vertex() [1/2]

```
short * Fl_File_Icon::add_vertex (
    float x,
    float y ) [inline]
```

Adds a vertex value to the icon array, returning a pointer to it.

The floating point version goes from 0.0 to 1.0. The origin (0.0) is in the lower-lefthand corner of the icon.

#### Parameters

in	<i>x,y</i>	vertex coordinates
----	------------	--------------------

**33.37.3.4 add\_vertex()** [2/2]

```
short * Fl_File_Icon::add_vertex (
    int x,
    int y ) [inline]
```

Adds a vertex value to the icon array, returning a pointer to it.

The integer version accepts coordinates from 0 to 10000. The origin (0.0) is in the lower-lefthand corner of the icon.

**Parameters**

in	<i>x,y</i>	vertex coordinates
----	------------	--------------------

**33.37.3.5 draw()**

```
void Fl_File_Icon::draw (
    int x,
    int y,
    int w,
    int h,
    Fl_Color ic,
    int active = 1 )
```

Draws an icon in the indicated area.

**Parameters**

in	<i>x,y,w,h</i>	position and size
in	<i>ic</i>	icon color
in	<i>active</i>	status, default is active [non-zero]

**33.37.3.6 find()**

```
Fl_File_Icon * Fl_File_Icon::find (
    const char * filename,
    int filetype = ANY ) [static]
```

Finds an icon that matches the given filename and file type.

**Parameters**

in	<i>filename</i>	name of file
in	<i>filetype</i>	enumerated file type

**Returns**

matching file icon or NULL

**33.37.3.7 label()**

```
void Fl_File_Icon::label (
    Fl_Widget * w )
```

Applies the icon to the widget, registering the [Fl\\_File\\_Icon](#) label type as needed.

## Parameters

in	<i>w</i>	widget for which this icon will become the label
----	----------	--

**33.37.3.8 labeltype()**

```
void Fl_File_Icon::labeltype (
    const Fl_Label * o,
    int x,
    int y,
    int w,
    int h,
    Fl_Align a ) [static]
```

Draw the icon label.

## Parameters

in	<i>o</i>	label data
in	<i>x,y,w,h</i>	position and size of label
in	<i>a</i>	label alignment [not used]

**33.37.3.9 load()**

```
void Fl_File_Icon::load (
    const char * f )
```

Loads the specified icon image.

The format is deduced from the filename.

## Parameters

in	<i>f</i>	filename
----	----------	----------

**33.37.3.10 load\_fti()**

```
int Fl_File_Icon::load_fti (
    const char * fti )
```

Loads an SGI icon file.

## Parameters

in	<i>fti</i>	icon filename
----	------------	---------------

## Returns

0 on success, non-zero on error

**33.37.3.11 load\_image()**

```
int Fl_File_Icon::load_image (
    const char * ifile )
```

Load an image icon file from an image filename.

## Parameters

<code>in</code>	<code>ifile</code>	image filename
-----------------	--------------------	----------------

## Returns

0 on success, non-zero on error

**33.37.3.12 load\_system\_icons()**

```
void Fl_File_Icon::load_system_icons (
    void ) [static]
```

Loads all system-defined icons.

This call is useful when using the FileChooser widget and should be used when the application starts:

```
Fl_File_Icon::load_system_icons();
```

**33.37.3.13 next()**

```
Fl_File_Icon * Fl_File_Icon::next ( ) [inline]
```

Returns next file icon object.

See [Fl\\_File\\_Icon::first\(\)](#)

**33.37.3.14 type()**

```
int Fl_File_Icon::type ( ) [inline]
```

Returns the filetype associated with the icon, which can be one of the following:

- `Fl_File_Icon::ANY`, any kind of file.
- `Fl_File_Icon::PLAIN`, plain files.
- `Fl_File_Icon::FIFO`, named pipes.
- `Fl_File_Icon::DEVICE`, character and block devices.
- `Fl_File_Icon::LINK`, symbolic links.
- `Fl_File_Icon::DIRECTORY`, directories.

The documentation for this class was generated from the following files:

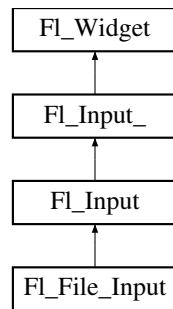
- `Fl_File_Icon.H`
- `Fl_File_Icon.cxx`
- `Fl_File_Icon2.cxx`

**33.38 Fl\_File\_Input Class Reference**

This widget displays a pathname in a text input field.

```
#include <Fl_File_Input.H>
```

Inheritance diagram for `Fl_File_Input`:



## Public Member Functions

- `Fl_Boxtype down_box () const`  
*Gets the box type used for the navigation bar.*
- `void down_box (Fl_Boxtype b)`  
*Sets the box type to use for the navigation bar.*
- `Fl_Color errorcolor () const`  
*Gets the current error color.*
- `void errorcolor (Fl_Color c)`  
*Sets the current error color to c.*
- `Fl_File_Input (int X, int Y, int W, int H, const char *L=0)`  
*Creates a new Fl\_File\_Input widget using the given position, size, and label string.*
- `int handle (int event) FL_OVERRIDE`  
*Handle events in the widget.*
- `const char * value ()`  
*Returns the current value, which is a pointer to an internal buffer and is valid only until the next event is handled.*
- `int value (const char *str)`  
*Sets the value of the widget given a new string value.*
- `int value (const char *str, int len)`  
*Sets the value of the widget given a new string value and its length.*

## Protected Member Functions

- `void draw () FL_OVERRIDE`  
*Draws the file input widget.*

## Additional Inherited Members

### 33.38.1 Detailed Description

This widget displays a pathname in a text input field.

A navigation bar located above the input field allows the user to navigate upward in the directory tree. You may want to handle `FL_WHEN_CHANGED` events for tracking text changes and also `FL_WHEN_RELEASE` for button release when changing to parent dir. `FL_WHEN_RELEASE` callback won't be called if the directory clicked is the same as the current one.



Figure 33.17 Fl\_File\_Input

#### Note

As all `Fl_Input` derived objects, `Fl_File_Input` may call its callback when losing focus (see `FL_UNFOCUS`) to update its state like its cursor shape. One resulting side effect is that you should call `clear_changed()` early in your callback to avoid reentrant calls if you plan to show another window or dialog box in the callback.

## 33.38.2 Constructor & Destructor Documentation

### 33.38.2.1 Fl\_File\_Input()

```
Fl_File_Input::Fl_File_Input (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [Fl\\_File\\_Input](#) widget using the given position, size, and label string. The default boxtype is FL\_DOWN\_BOX.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

## 33.38.3 Member Function Documentation

### 33.38.3.1 down\_box()

```
void Fl_File_Input::down_box (
    Fl_Boxtype b ) [inline]
```

Sets the box type to use for the navigation bar.

### 33.38.3.2 draw()

```
void Fl_File_Input::draw (
    void ) [protected], [virtual]
```

Draws the file input widget.

Implements [Fl\\_Widget](#).

### 33.38.3.3 errorcolor() [1/2]

```
Fl_Color Fl_File_Input::errorcolor ( ) const [inline]
```

Gets the current error color.

Returns FL\_RED since FLTK 1.4.0 (default in 1.3.x). Retained for backwards compatibility.

**Deprecated** Will be removed in FLTK 1.5.0 or higher.

**Todo** Remove [Fl\\_File\\_Input::errorcolor\(\)](#) in FLTK 1.5.0 or higher.

### 33.38.3.4 errorcolor() [2/2]

```
void Fl_File_Input::errorcolor (
    Fl_Color c ) [inline]
```

Sets the current error color to *c*.

Does nothing since FLTK 1.4.0. Retained for backwards compatibility.

**Deprecated** Will be removed in FLTK 1.5.0 or higher.

**Todo** Remove `Fl_File_Input::errorcolor(Fl_Color)` in FLTK 1.5.0 or higher.

### 33.38.3.5 `handle()`

```
int Fl_File_Input::handle (
    int event ) [virtual]
```

Handle events in the widget.

Return non zero if event is handled.

#### Parameters

in	<i>event</i>	
----	--------------	--

Reimplemented from [Fl\\_Widget](#).

### 33.38.3.6 `value()` [1/2]

```
int Fl_File_Input::value (
    const char * str )
```

Sets the value of the widget given a new string value.

Returns non 0 on success.

#### Parameters

in	<i>str</i>	new string value
----	------------	------------------

### 33.38.3.7 `value()` [2/2]

```
int Fl_File_Input::value (
    const char * str,
    int len )
```

Sets the value of the widget given a new string value and its length.

Returns non 0 on success.

#### Parameters

in	<i>str</i>	new string value
in	<i>len</i>	length of value

The documentation for this class was generated from the following files:

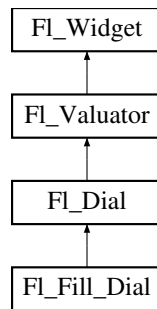
- `Fl_File_Input.H`
- `Fl_File_Input.cxx`

## 33.39 `Fl_Fill_Dial` Class Reference

Draws a dial with a filled arc.

```
#include <Fl_Fill_Dial.H>
```

Inheritance diagram for `Fl_Fill_Dial`:



## Public Member Functions

- **Fl\_Fill\_Dial** (int X, int Y, int W, int H, const char \*L=NULL)  
*Creates a filled dial, also setting its type to FL\_FILL\_DIAL.*

## Additional Inherited Members

### 33.39.1 Detailed Description

Draws a dial with a filled arc.

The documentation for this class was generated from the following files:

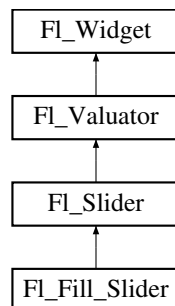
- Fl\_Fill\_Dial.H
- Fl\_Dial.cxx

## 33.40 Fl\_Fill\_Slider Class Reference

Widget that draws a filled horizontal slider, useful as a progress or value meter.

```
#include <Fl_Fill_Slider.H>
```

Inheritance diagram for Fl\_Fill\_Slider:



## Public Member Functions

- **Fl\_Fill\_Slider** (int X, int Y, int W, int H, const char \*L=0)  
*Creates the slider from its position, size and optional title.*

## Additional Inherited Members

### 33.40.1 Detailed Description

Widget that draws a filled horizontal slider, useful as a progress or value meter.

The documentation for this class was generated from the following files:

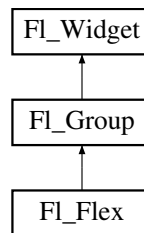
- Fl\_Fill\_Slider.H
- Fl\_Slider.cxx

## 33.41 FL\_Flex Class Reference

[FL\\_Flex](#) is a container (layout) widget for one row or one column of widgets.

```
#include <FL_Flex.H>
```

Inheritance diagram for [FL\\_Flex](#):



### Public Types

- enum { [VERTICAL](#) = 0 , [HORIZONTAL](#) = 1 , [COLUMN](#) = 0 , [ROW](#) = 1 }

### Public Member Functions

- virtual void [end](#) ()  
*Ends automatic child addition and resizes all children.*
- void [fixed](#) ([FL\\_Widget](#) &[w](#), int [size](#))  
*Set the horizontal or vertical size of a child widget.*
- int [fixed](#) ([FL\\_Widget](#) \*[w](#)) const  
*Return whether the given widget has a fixed size or resizes dynamically.*
- void [fixed](#) ([FL\\_Widget](#) \*[w](#), int [size](#))  
*Set the horizontal or vertical size of a child widget.*
- [FL\\_Flex](#) (int [direction](#))  
*Construct a new [FL\\_Flex](#) widget specifying its layout.*
- [FL\\_Flex](#) (int [w](#), int [h](#), int [direction](#))  
*Construct a new [FL\\_Flex](#) widget specifying its layout and size.*
- [FL\\_Flex](#) (int [X](#), int [Y](#), int [W](#), int [H](#), const char \*[L](#)=0)  
*Construct a new [FL\\_Flex](#) widget with the given position, size, and label.*
- [FL\\_Flex](#) (int [x](#), int [y](#), int [w](#), int [h](#), int [direction](#))  
*Construct a new [FL\\_Flex](#) widget specifying its layout, position, and size.*
- int [gap](#) () const  
*Return the gap size of the widget.*
- void [gap](#) (int [g](#))  
*Set the gap size of the widget.*
- int [horizontal](#) () const  
*Returns non-zero (true) if [FL\\_Flex](#) alignment is horizontal (row mode).*
- void [layout](#) ()  
*Calculates the layout of the widget and redraws it.*
- int [margin](#) () const  
*Returns the left margin size of the widget.*
- int [margin](#) (int \*[left](#), int \*[top](#), int \*[right](#), int \*[bottom](#)) const  
*Returns all (four) margin sizes of the widget.*
- void [margin](#) (int [left](#), int [top](#), int [right](#), int [bottom](#))  
*Set the margin sizes at all four edges of the [FL\\_Flex](#) widget.*
- void [margin](#) (int [m](#), int [g](#)=-1)  
*Set the margin and optionally the gap size of the widget.*

- bool `need_layout` () const  
*Returns whether layout calculation is required.*
- void `need_layout` (int set)  
*Set or reset the request to calculate the layout of children.*
- void `resize` (int x, int y, int w, int h) `FL_OVERRIDE`  
*Resize the container and calculate all child positions and sizes.*
- int `spacing` () const  
*Gets the number of extra pixels of blank space that are added between the children.*
- void `spacing` (int i)  
*Sets the number of extra pixels of blank space that are added between the children.*

## Protected Member Functions

- virtual int `alloc_size` (int size) const  
*Return new size to be allocated for array of fixed size widgets.*
- void `draw` () `FL_OVERRIDE`  
*Draw the widget.*
- void `init` (int t=`VERTICAL`)
- void `on_remove` (int) `FL_OVERRIDE`  
*Allow derived groups to act when a child widget is removed from the group.*

## Additional Inherited Members

### 33.41.1 Detailed Description

`Fl_Flex` is a container (layout) widget for one row or one column of widgets.

It provides flexible positioning of its children either in one row or in one column.

`Fl_Flex` is designed to be as simple as possible. You can set individual widget sizes or let `Fl_Flex` position and size the widgets to fit in the container. All "flexible" (i.e. non-fixed size) widgets are assigned the same width or height, respectively. For details see below.

You can set the margins **around** all children at the inner side of the box frame (if any). `Fl_Flex` supports setting different margin sizes on top, bottom, left, and right sides. The default margin size is 0 on all edges of the container. You can set the gap size **between** all children. The gap size is always the same between all of its children. This is similar to the 'spacing' of `Fl_Pack`. The default gap size is 0.

`Fl_Flex` can either consist of a single row, i.e. `type(Fl_Flex::HORIZONTAL)` or a single column, i.e. `type(Fl_Flex::VERTICAL)`. The default value is `Fl_Flex::VERTICAL` for consistency with `Fl_Pack` but you can use `type()` to assign a row (`Fl_Flex::HORIZONTAL`) layout.

If `type() == Fl_Flex::HORIZONTAL` widgets are resized horizontally to fit in the container and their height is the full `Fl_Flex` height minus border size and margins. You can set a fixed widget width by using `fixed()`.

If `type() == Fl_Flex::VERTICAL` widgets are resized vertically to fit in the container and their width is the full `Fl_Flex` width minus border size and margins. You can set a fixed widget height by using `fixed()`.

To create arbitrary spacing you can use invisible boxes of flexible or fixed sizes (see example below).

Alternate constructors let you specify the layout as `Fl_Flex::HORIZONTAL` or `Fl_Flex::VERTICAL` directly. `Fl_Flex::ROW` is an alias of `Fl_Flex::HORIZONTAL` and `Fl_Flex::COLUMN` is an alias of `Fl_Flex::VERTICAL`.

The default box type is `FL_NO_BOX` as inherited from `Fl_Group`. You **may** need to set a box type with a solid background depending on your layout.

**Important:** You should always make sure that the `Fl_Flex` container cannot be resized smaller than its designed minimal size. This can usually be done by setting a `size_range()` on the window as shown in the example below. `Fl_Flex` does not take care of sensible sizes. If it is resized too small the behavior is undefined, i.e. widgets may overlap and/or shrink to zero size.

**Hint:** In many cases `Fl_Flex` can be used as a drop-in replacement for `Fl_Pack`. This is the recommended single row/column container since FLTK 1.4.0. Its resizing behavior is much more predictable than that of `Fl_Pack` which "resizes itself to shrink-wrap itself around all of the children".

`Fl_Flex` containers can be nested so you can create flexible layouts with multiple columns and rows. However, if your UI design is more complex you may want to use `Fl_Grid` instead.

Example:

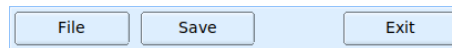


Figure 33.18 Fl\_Flex

**Example code:**

```
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Flex.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_Button.H>
int main(int argc, char **argv) {
    Fl_Double_Window window(410, 40, "Simple Fl_Flex Demo");
    Fl_Flex flex(5, 5, 400, 30, Fl_Flex::HORIZONTAL);
    Fl_Button b1(0, 0, 0, 0, "File");
    Fl_Button b2(0, 0, 0, 0, "Save");
    Fl_Box bx(0, 0, 0, 0);
    Fl_Button b3(0, 0, 0, 0, "Exit");
    flex.fixed(bx, 60); // set fix width of invisible box
    flex.gap(10);
    flex.end();
    window.resizable(flex);
    window.end();
    window.size_range(300, 30);
    window.show(argc, argv);
    return Fl::run();
}
```

Since

1.4.0

**33.41.2 Member Enumeration Documentation****33.41.2.1 anonymous enum**

anonymous enum

Enumerator

VERTICAL	vertical layout (one column)
HORIZONTAL	horizontal layout (one row)
COLUMN	alias for VERTICAL
ROW	alias for HORIZONTAL

**33.41.3 Constructor & Destructor Documentation****33.41.3.1 Fl\_Flex() [1/4]**

```
Fl_Flex::Fl_Flex (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Construct a new [Fl\\_Flex](#) widget with the given position, size, and label.

You can set type ([Fl\\_Flex::HORIZONTAL](#)) or type ([Fl\\_Flex::VERTICAL](#)). The default is type ([Fl\\_Flex::VERTICAL](#)).

Alternate constructors let you specify the layout as [Fl\\_Flex::HORIZONTAL](#) or [Fl\\_Flex::VERTICAL](#) directly. [Fl\\_Flex::ROW](#) is an alias of [Fl\\_Flex::HORIZONTAL](#) and [Fl\\_Flex::COLUMN](#) is an alias of [Fl\\_Flex::VERTICAL](#).

## Parameters

in	<i>X,Y</i>	position
in	<i>W,H</i>	size (width and height)
in	<i>L</i>	label (optional)

## See also

[FI\\_Flex::FI\\_Flex\(int direction\)](#)  
[FI\\_Flex::FI\\_Flex\(int w, int h, int direction\)](#)  
[FI\\_Flex::FI\\_Flex\(int x, int y, int w, int h, int direction\)](#)  
[FI\\_Flex::FI\\_Flex\(int x, int y, int w, int h, const char \\*L\)](#)

## 33.41.3.2 FI\_Flex() [2/4]

```
FI_Flex::FI_Flex (
    int direction )
```

Construct a new [FI\\_Flex](#) widget specifying its layout.

Use [FI\\_Flex::HORIZONTAL](#) (aka [FI\\_Flex::ROW](#)) or [FI\\_Flex::VERTICAL](#) (aka [FI\\_Flex::COLUMN](#)) as the *direction* argument.

This constructor sets the position and size to (0, 0, 0, 0) which is suitable for nested [FI\\_Flex](#) widgets. Use one of the other constructors to set the desired position and size as well.

## Parameters

in	<i>direction</i>	horizontal (row) or vertical (column) layout
----	------------------	--

## See also

[FI\\_Flex::FI\\_Flex\(int w, int h, int direction\)](#)  
[FI\\_Flex::FI\\_Flex\(int x, int y, int w, int h, int direction\)](#)  
[FI\\_Flex::FI\\_Flex\(int x, int y, int w, int h, const char \\*L\)](#)

## 33.41.3.3 FI\_Flex() [3/4]

```
FI_Flex::FI_Flex (
    int w,
    int h,
    int direction )
```

Construct a new [FI\\_Flex](#) widget specifying its layout and size.

Use [FI\\_Flex::HORIZONTAL](#) (aka [FI\\_Flex::ROW](#)) or [FI\\_Flex::VERTICAL](#) (aka [FI\\_Flex::COLUMN](#)) as the *direction* argument.

This constructor sets the position to (x = 0, y = 0) which is suitable for nested [FI\\_Flex](#) widgets. Use one of the other constructors to set the desired position as well.

## Parameters

in	<i>w,h</i>	widget size
in	<i>direction</i>	horizontal (row) or vertical (column) layout

## See also

[FI\\_Flex::FI\\_Flex\(int direction\)](#)

[FI\\_Flex::FI\\_Flex\(int x, int y, int w, int h, int direction\)](#)

[FI\\_Flex::FI\\_Flex\(int x, int y, int w, int h, const char \\*L\)](#)

**33.41.3.4 FI\_Flex()** [4/4]

```
Fl_Flex::Fl_Flex (
    int x,
    int y,
    int w,
    int h,
    int direction )
```

Construct a new [FI\\_Flex](#) widget specifying its layout, position, and size.

Use [FI\\_Flex::HORIZONTAL](#) (aka [FI\\_Flex::ROW](#)) or [FI\\_Flex::VERTICAL](#) (aka [FI\\_Flex::COLUMN](#)) as the *direction* argument.

This constructor sets the position and size of the widget which is suitable for top level [FI\\_Flex](#) widgets but does not set a widget label. Use [FI\\_Widget::label\(\)](#) to set one if desired.

## Parameters

in	<i>x,y</i>	widget position
in	<i>w,h</i>	widget size
in	<i>direction</i>	horizontal (row) or vertical (column) layout

## See also

[FI\\_Flex::FI\\_Flex\(int direction\)](#)

[FI\\_Flex::FI\\_Flex\(int w, int h, int direction\)](#)

[FI\\_Flex::FI\\_Flex\(int x, int y, int w, int h, const char \\*L\)](#)

**33.41.4 Member Function Documentation****33.41.4.1 alloc\_size()**

```
int Fl_Flex::alloc_size (
    int size ) const [protected], [virtual]
```

Return new size to be allocated for array of fixed size widgets.

This method is called when the array of fixed size widgets needs to be expanded. The current *size* is provided (size can be 0). The default method adds 8 to the current size.

This can be used in derived classes to change the allocation strategy. Note that this method only *queries* the new size which shall be allocated but does not allocate the memory.

## Parameters

in	<i>size</i>	current size
----	-------------	--------------

## Returns

int new size (to be allocated)

**33.41.4.2 draw()**

```
void Fl_Flex::draw (
    void ) [protected], [virtual]
```

Draw the widget.

This will finally calculate the layout of the widget and of all its children if necessary and draw the widget.

Some changes of included children may require a new layout to be calculated. If this is the case the user may need to call [layout\(\)](#) to make sure everything is calculated properly.

See also

[layout\(\)](#)

Implements [Fl\\_Widget](#).

**33.41.4.3 end()**

```
void Fl_Flex::end ( ) [virtual]
```

Ends automatic child addition and resizes all children.

This marks the [Fl\\_Flex](#) widget as changed (`need_layout(1)`) which forces the widget to calculate its layout depending on all children and whether they have been assigned fix sizes or not right before it is drawn.

See also

[need\\_layout\(int\)](#)

[draw\(\)](#)

**33.41.4.4 fixed() [1/3]**

```
void Fl_Flex::fixed (
    Fl_Widget & w,
    int size ) [inline]
```

Set the horizontal or vertical size of a child widget.

Parameters

in	<i>w</i>	widget to be affected
in	<i>size</i>	width ( <a href="#">Fl_Flex::HORIZONTAL</a> ) or height ( <a href="#">Fl_Flex::VERTICAL</a> )

See also

[fixed\(Fl\\_Widget \\*w, int size\)](#)

**33.41.4.5 fixed() [2/3]**

```
int Fl_Flex::fixed (
    Fl_Widget * w ) const
```

Return whether the given widget has a fixed size or resizes dynamically.

Parameters

in	<i>w</i>	widget
----	----------	--------

**Returns**

whether the widget has a fixed size

**Return values**

1	the widget has a fixed size
0	the widget resizes dynamically

**33.41.4.6 fixed() [3/3]**

```
void Fl_Flex::fixed (
    Fl_Widget * child,
    int size )
```

Set the horizontal or vertical size of a child widget.

This sets either the width or height of a child widget, depending on the `type()` of the `Fl_Flex` container (`Fl_Flex::HORIZONTAL` or `Fl_Flex::VERTICAL`). The other dimension is set to the full width or height of the `Fl_Flex` widget minus border and margin sizes.

This can be used to set a fixed widget width or height of children of `Fl_Flex` so they are not resized dynamically.

If `size` is 0 (zero) or negative the widget size is reset to flexible size.

**Parameters**

in	<i>child</i>	widget to be affected
in	<i>size</i>	width ( <code>Fl_Flex::HORIZONTAL</code> ) or height ( <code>Fl_Flex::VERTICAL</code> )

**33.41.4.7 gap() [1/2]**

```
int Fl_Flex::gap ( ) const [inline]
```

Return the gap size of the widget.

**Returns**

gap size between all child widgets.

**33.41.4.8 gap() [2/2]**

```
void Fl_Flex::gap (
    int g ) [inline]
```

Set the gap size of the widget.

The gap size is some free space **between** child widgets. The size must be  $\geq 0$ . Negative values are clamped to 0.

**Parameters**

in	<i>g</i>	gap size
----	----------	----------

**33.41.4.9 horizontal()**

```
int Fl_Flex::horizontal ( ) const [inline]
```

Returns non-zero (true) if `Fl_Flex` alignment is horizontal (row mode).

**Returns**

non-zero if [Fl\\_Flex](#) alignment is horizontal

**Return values**

1	if <a href="#">type()</a> == <a href="#">Fl_Flex::HORIZONTAL</a>
0	if <a href="#">type()</a> == <a href="#">Fl_Flex::VERTICAL</a>

See class [Fl\\_Flex](#) documentation for details.

**33.41.4.10 layout()**

```
void Fl_Flex::layout ( )
```

Calculates the layout of the widget and redraws it.

If you change widgets in the [Fl\\_Flex](#) container you should call this method to force recalculation of child widget sizes and positions. This can be useful (necessary) if you [hide\(\)](#), [show\(\)](#), [add\(\)](#) or [remove\(\)](#) children.

Call this method if you need to recalculate widget positions for usage in an algorithm that places widgets at certain positions or when you need to display (show) or hide one or more children depending on the current layout (for instance a side bar).

This method also calls [redraw\(\)](#) on the [Fl\\_Flex](#) widget.

**33.41.4.11 margin() [1/4]**

```
int Fl_Flex::margin ( ) const [inline]
```

Returns the left margin size of the widget.

This returns the **left** margin of the widget which is not necessarily the same as all other margins.

**Note**

This method is useful if you never set different margin sizes.

**See also**

[int margin\(int \\*left, int \\*top, int \\*right, int \\*bottom\)](#) to get all four [margin](#) values.

**Returns**

size of left margin.

**33.41.4.12 margin() [2/4]**

```
int Fl_Flex::margin (
    int * left,
    int * top,
    int * right,
    int * bottom ) const [inline]
```

Returns all (four) margin sizes of the widget.

All margin sizes are returned in the given arguments. If any argument is `NULL` the respective value is not returned.

**Parameters**

in	<i>left</i>	returns left margin if not <code>NULL</code>
in	<i>top</i>	returns top margin if not <code>NULL</code>
in	<i>right</i>	returns right margin if not <code>NULL</code>
in	<i>bottom</i>	returns bottom margin if not <code>NULL</code>

**Returns**

whether all margins are equal

**Return values**

1	all margins have the same size
0	at least one margin has a different size

**33.41.4.13 margin() [3/4]**

```
void Fl_Flex::margin (
    int left,
    int top,
    int right,
    int bottom ) [inline]
```

Set the margin sizes at all four edges of the [Fl\\_Flex](#) widget.

The margin is the free space inside the widget border **around** all child widgets.

You must use all four parameters of this method to set the four margins in the order `left, top, right, bottom`.

Negative values are set to 0 (zero).

To set all margins to equal sizes, use `margin(int m)` which sets all four margins to the same size.

**Parameters**

in	<i>left, top, right, bottom</i>	margin sizes, must be $\geq 0$
----	---------------------------------	--------------------------------

**See also**

[margin\(int, int\)](#)

**33.41.4.14 margin() [4/4]**

```
void Fl_Flex::margin (
    int m,
    int g = -1 ) [inline]
```

Set the margin and optionally the gap size of the widget.

This method can be used to set both the margin and the gap size.

If you don't use the second parameter `g` or supply a negative value the gap size is not changed.

The margin is the free space inside the widget border **around** all child widgets.

This method sets the margin to the same size at all four edges of the [Fl\\_Flex](#) widget.

The gap size `g` is the free space **between** child widgets. Negative values do not change the gap value. This is the default if this argument is omitted.

**Parameters**

in	<i>m</i>	margin size, must be $\geq 0$
in	<i>g</i>	gap size (ignored, if negative)

**See also**

[gap\(int\)](#)

**33.41.4.15 need\_layout()** [1/2]

```
bool Fl_Flex::need_layout ( ) const [inline]
```

Returns whether layout calculation is required.

This should rarely be needed by user code. Used internally in [draw\(\)](#).

**33.41.4.16 need\_layout()** [2/2]

```
void Fl_Flex::need_layout (
    int set ) [inline]
```

Set or reset the request to calculate the layout of children.

This is intended for internal use but can also be used by user code to request layout calculation before the widget is drawn.

Call this if you changed attributes or sizes of children to ensure that the layout is calculated properly. Changing other [Fl\\_Flex](#) attributes or resizing the widget does this automatically.

**Note**

Never call this with 'set == 0' because this would defeat its purpose to recalculate the layout before the widget is drawn.

**33.41.4.17 on\_remove()**

```
void Fl_Flex::on_remove (
    int index ) [protected], [virtual]
```

Allow derived groups to act when a child widget is removed from the group.

Widgets derived from [Fl\\_Group](#) may store additional data for their children. Overriding this method will allow derived classes to remove these data structures just before the child is removed.

**Parameters**

<i>index</i>	remove the child at this position
--------------	-----------------------------------

Reimplemented from [Fl\\_Group](#).

**33.41.4.18 resize()**

```
void Fl_Flex::resize (
    int x,
    int y,
    int w,
    int h ) [virtual]
```

Resize the container and calculate all child positions and sizes.

**Parameters**

in	<i>x,y</i>	position
in	<i>w,h</i>	width and height

Reimplemented from [Fl\\_Widget](#).

**33.41.4.19 spacing()** [1/2]

```
int Fl_Flex::spacing ( ) const [inline]
```

Gets the number of extra pixels of blank space that are added between the children.

This method is the same as 'int [gap\(\)](#)' and is defined to enable using [Fl\\_Flex](#) as a drop-in replacement of [Fl\\_Pack](#).

See also

int [gap\(\)](#)

#### 33.41.4.20 spacing() [2/2]

```
void Fl_Flex::spacing (
    int i ) [inline]
```

Sets the number of extra pixels of blank space that are added between the children.

This method is the same as '[gap\(int\)](#)' and is defined to enable using [Fl\\_Flex](#) as a drop-in replacement of [Fl\\_Pack](#).

See also

void [gap\(int\)](#)

The documentation for this class was generated from the following files:

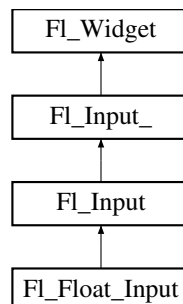
- [Fl\\_Flex.H](#)
- [Fl\\_Flex.cxx](#)

## 33.42 Fl\_Float\_Input Class Reference

The [Fl\\_Float\\_Input](#) class is a subclass of [Fl\\_Input](#) that only allows the user to type floating point numbers (sign, digits, decimal point, more digits, 'E' or 'e', sign, digits).

```
#include <Fl_Float_Input.H>
```

Inheritance diagram for [Fl\\_Float\\_Input](#):



### Public Member Functions

- [Fl\\_Float\\_Input](#) (int X, int Y, int W, int H, const char \*l=0)  
Creates a new [Fl\\_Float\\_Input](#) widget using the given position, size, and label string.

### Additional Inherited Members

#### 33.42.1 Detailed Description

The [Fl\\_Float\\_Input](#) class is a subclass of [Fl\\_Input](#) that only allows the user to type floating point numbers (sign, digits, decimal point, more digits, 'E' or 'e', sign, digits).

#### 33.42.2 Constructor & Destructor Documentation

### 33.42.2.1 Fl\_Float\_Input()

```
Fl_Float_Input::Fl_Float_Input (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Float\\_Input](#) widget using the given position, size, and label string.

The default boxtype is FL\_DOWN\_BOX.

Inherited destructor destroys the widget and any value associated with it.

The documentation for this class was generated from the following files:

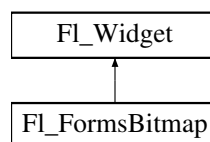
- [Fl\\_Float\\_Input.H](#)
- [Fl\\_Input.cxx](#)

## 33.43 Fl\_FormsBitmap Class Reference

Forms compatibility Bitmap Image Widget.

```
#include <Fl_FormsBitmap.H>
```

Inheritance diagram for Fl\_FormsBitmap:



### Public Member Functions

- [Fl\\_Bitmap](#) \* **bitmap** () const  
*Gets a the current associated [Fl\\_Bitmap](#) objects.*
- void **bitmap** ([Fl\\_Bitmap](#) \*B)  
*Sets a new bitmap.*
- **Fl\_FormsBitmap** ([Fl\\_Boxtype](#), int, int, int, int, const char \* = 0)  
*Creates a bitmap widget from a box type, position, size and optional label specification.*
- void **set** (int W, int H, const [uchar](#) \*bits)  
*Sets a new bitmap bits with size W,H.*

### Protected Member Functions

- void **draw** () [FL\\_OVERRIDE](#)  
*Draws the bitmap and its associated box.*

### Additional Inherited Members

#### 33.43.1 Detailed Description

Forms compatibility Bitmap Image Widget.

#### 33.43.2 Member Function Documentation

### 33.43.2.1 draw()

```
void Fl_FormsBitmap::draw (
    void ) [protected], [virtual]
```

Draws the bitmap and its associated box.

Implements [Fl\\_Widget](#).

### 33.43.2.2 set()

```
void Fl_FormsBitmap::set (
    int W,
    int H,
    const uchar * bits )
```

Sets a new bitmap bits with size W,H.

Deletes the previous one.

The documentation for this class was generated from the following files:

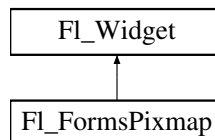
- [Fl\\_FormsBitmap.H](#)
- [forms\\_bitmap.cxx](#)

## 33.44 Fl\_FormsPixmap Class Reference

Forms pixmap drawing routines.

```
#include <Fl_FormsPixmap.H>
```

Inheritance diagram for [Fl\\_FormsPixmap](#):



### Public Member Functions

- [Fl\\_FormsPixmap](#) ([Fl\\_Boxtype](#) t, int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [Fl\\_FormsPixmap](#) widget using the given box type, position, size and label string.*
- [Fl\\_Pixmap](#) \* [Pixmap](#) () const  
*Get the internal pixmap pointer.*
- void [Pixmap](#) ([Fl\\_Pixmap](#) \*B)  
*Set the internal pixmap pointer to an existing pixmap.*
- void [set](#) (char \*const \*bits)  
*Set/create the internal pixmap using raw data.*

### Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*

### Additional Inherited Members

#### 33.44.1 Detailed Description

Forms pixmap drawing routines.

## 33.44.2 Constructor & Destructor Documentation

### 33.44.2.1 Fl\_FormsPixmap()

```
Fl_FormsPixmap::Fl_FormsPixmap (
    Fl_Boxtype t,
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [Fl\\_FormsPixmap](#) widget using the given box type, position, size and label string.

#### Parameters

in	<i>t</i>	box type
in	<i>X,Y,W,H</i>	position and size
in	<i>L</i>	widget label, default is no label

## 33.44.3 Member Function Documentation

### 33.44.3.1 draw()

```
void Fl_FormsPixmap::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.44.3.2 Pixmap()

```
void Fl_FormsPixmap::Pixmap (
    Fl_Pixmap * B ) [inline]
```

Set the internal pixmap pointer to an existing pixmap.

#### Parameters

in	<i>B</i>	existing pixmap
----	----------	-----------------

### 33.44.3.3 set()

```
void Fl_FormsPixmap::set (
    char *const * bits )
```

Set/create the internal pixmap using raw data.

## Parameters

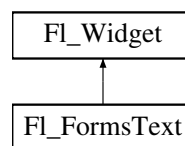
in	bits	raw data
----	------	----------

The documentation for this class was generated from the following files:

- `Fl_FormsPixmap.H`
- `forms_pixmap.cxx`

## 33.45 Fl\_FormsText Class Reference

Inheritance diagram for `Fl_FormsText`:



### Public Member Functions

- `Fl_FormsText` ([Fl\\_Boxtype](#) b, int X, int Y, int W, int H, const char \*l=0)

### Protected Member Functions

- void `draw` () [FL\\_OVERRIDE](#)  
*Draws the widget.*

### Additional Inherited Members

#### 33.45.1 Member Function Documentation

##### 33.45.1.1 draw()

```
void Fl_FormsText::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

The documentation for this class was generated from the following file:

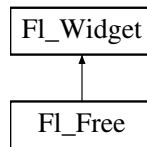
- `forms.H`

## 33.46 Fl\_Free Class Reference

Emulation of the Forms "free" widget.

```
#include <Fl_Free.H>
```

Inheritance diagram for `Fl_Free`:



## Public Member Functions

- `Fl_Free` (`uchar t`, `int X`, `int Y`, `int W`, `int H`, `const char *L`, `FL_HANDLEPTR hdl`)  
Create a new `Fl_Free` widget with type, position, size, label and handler.
- `int handle` (`int e`) `FL_OVERRIDE`  
Handles the specified event.
- `~Fl_Free` ()  
The destructor will call the handle function with the event `FL_FREE_MEM`.

## Protected Member Functions

- `void draw` () `FL_OVERRIDE`  
Draws the widget.

## Additional Inherited Members

### 33.46.1 Detailed Description

Emulation of the Forms "free" widget.

This emulation allows the free demo to run, and appears to be useful for porting programs written in Forms which use the free widget or make subclasses of the Forms widgets.

There are five types of free, which determine when the handle function is called:

- `FL_NORMAL_FREE` normal event handling.
- `FL_SLEEPING_FREE` deactivates event handling (widget is inactive).
- `FL_INPUT_FREE` accepts `FL_FOCUS` events.
- `FL_CONTINUOUS_FREE` sets a timeout callback 100 times a second and provides an `FL_STEP` event. This has obvious detrimental effects on machine performance.
- `FL_ALL_FREE` same as `FL_INPUT_FREE` and `FL_CONTINUOUS_FREE`.

### 33.46.2 Constructor & Destructor Documentation

#### 33.46.2.1 Fl\_Free()

```

Fl_Free::Fl_Free (
    uchar t,
    int X,
    int Y,
    int W,
    int H,
    const char * L,
    FL_HANDLEPTR hdl )

```

Create a new `Fl_Free` widget with type, position, size, label and handler.

#### Parameters

<code>in</code>	<code>t</code>	type
-----------------	----------------	------

## Parameters

in	<i>X,Y,W,H</i>	position and size
in	<i>L</i>	widget label
in	<i>hdl</i>	handler function

The constructor takes both the type and the handle function. The handle function should be declared as follows:

```
int handle_function(Fl_Widget *w,
                   int      event,
                   float    event_x,
                   float    event_y,
                   char      key)
```

This function is called from the [handle\(\)](#) method in response to most events, and is called by the [draw\(\)](#) method.

The event argument contains the event type:

```
// old event names for compatibility:
#define FL_MOUSE      FL_DRAG
#define FL_DRAW       0
#define FL_STEP       9
#define FL_FREEMEM    12
#define FL_FREEZE     FL_UNMAP
#define FL_THAW       FL_MAP
```

### 33.46.3 Member Function Documentation

#### 33.46.3.1 draw()

```
void Fl_Free::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

#### 33.46.3.2 handle()

```
int Fl_Free::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

## Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

## Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

## See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

The documentation for this class was generated from the following files:

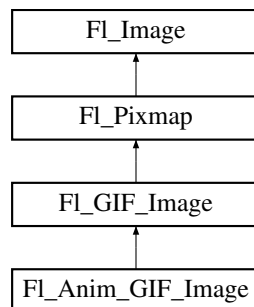
- [Fl\\_Free.H](#)
- [forms\\_free.cxx](#)

## 33.47 Fl\_GIF\_Image Class Reference

The [Fl\\_GIF\\_Image](#) class supports loading, caching, and drawing of Compuserve GIF<sup>SM</sup> images.

```
#include <Fl_GIF_Image.H>
```

Inheritance diagram for [Fl\\_GIF\\_Image](#):



### Classes

- struct [GIF\\_FRAME](#)

### Public Member Functions

- [Fl\\_GIF\\_Image](#) (const char \*filename)  
*This constructor loads a GIF image from the given file.*
- [Fl\\_GIF\\_Image](#) (const char \*imagename, const unsigned char \*data)  
*This constructor loads a GIF image from memory (deprecated).*
- [Fl\\_GIF\\_Image](#) (const char \*imagename, const unsigned char \*data, const size\_t length)  
*This constructor loads a GIF image from memory.*

### Static Public Member Functions

- static bool [is\\_animated](#) (const char \*name\_)

### Static Public Attributes

- static bool [animate](#) = false  
*Sets how the shared image core routine should treat animated GIF files.*

## Protected Member Functions

- **FI\_GIF\_Image ()**  
*The default constructor creates an empty GIF image.*
- **FI\_GIF\_Image** (const char \*filename, bool anim)
- **FI\_GIF\_Image** (const char \*imagename, const unsigned char \*data, const size\_t length, bool anim)
- void **load** (const char \*filename, bool anim)  
*The protected [load\(\)](#) methods are used by [FI\\_Anim\\_GIF\\_Image](#) to request loading of animated GIF's.*
- void **load** (const char \*imagename, const unsigned char \*data, const size\_t length, bool anim)
- void **load\_gif\_** (class [FI\\_Image\\_Reader](#) &rdr, bool anim=false)
- virtual void **on\_extension\_data** ([GIF\\_FRAME](#) &)
- virtual void **on\_frame\_data** ([GIF\\_FRAME](#) &)

## Additional Inherited Members

### 33.47.1 Detailed Description

The [FI\\_GIF\\_Image](#) class supports loading, caching, and drawing of Compuserve GIF<sup>SM</sup> images. The class loads the first image and supports transparency.

### 33.47.2 Constructor & Destructor Documentation

#### 33.47.2.1 FI\_GIF\_Image() [1/3]

```
FI_GIF_Image::FI_GIF_Image (
    const char * filename )
```

This constructor loads a GIF image from the given file.

If a GIF image is animated, [FI\\_GIF\\_Image](#) will only read and display the first frame of the animation.

The destructor frees all memory and server resources that are used by the image.

Use [FI\\_Image::fail\(\)](#) to check if [FI\\_GIF\\_Image](#) failed to load. [fail\(\)](#) returns `ERR_FILE_ACCESS` if the file could not be opened or read, `ERR_FORMAT` if the GIF format could not be decoded, and `ERR_NO_IMAGE` if the image could not be loaded for another reason.

#### Parameters

in	<i>filename</i>	a full path and name pointing to a GIF image file.
----	-----------------	--

#### See also

`FI_GIF_Image::FI_GIF_Image(const char *imagename, const unsigned char *data, const long length)`

#### 33.47.2.2 FI\_GIF\_Image() [2/3]

```
FI_GIF_Image::FI_GIF_Image (
    const char * imagename,
    const unsigned char * data )
```

This constructor loads a GIF image from memory (deprecated).

**Deprecated** Please use `FI_GIF_Image(const char *imagename, const unsigned char *data, const size_t length)` instead.

**Note**

Buffer overruns will not be checked.

This constructor should not be used because the caller can't supply the memory size and the image reader can't check for "end of memory" errors.

**Note**

A new constructor with parameter `length` is available since FLTK 1.4.0.

**Parameters**

in	<i>imagename</i>	A name given to this image or NULL
in	<i>data</i>	Pointer to the start of the GIF image in memory.

**See also**

[Fl\\_GIF\\_Image\(const char \\*filename\)](#)

[Fl\\_GIF\\_Image\(const char \\*imagename, const unsigned char \\*data, const size\\_t length\)](#)

**33.47.2.3 Fl\_GIF\_Image() [3/3]**

```
Fl_GIF_Image::Fl_GIF_Image (
    const char * imagename,
    const unsigned char * data,
    const size_t length )
```

This constructor loads a GIF image from memory.

Construct an image from a block of memory inside the application. Fluid offers "binary data" chunks as a great way to add image data into the C++ source code. `imagename` can be `NULL`. If a name is given, the image is added to the list of shared images and will be available by that name.

If a GIF image is animated, [Fl\\_GIF\\_Image](#) will only read and display the first frame of the animation.

The destructor frees all memory and server resources that are used by the image.

The third parameter `length` is used to test for buffer overruns, i.e. truncated images.

Use [Fl\\_Image::fail\(\)](#) to check if [Fl\\_GIF\\_Image](#) failed to load. [fail\(\)](#) returns `ERR_FILE_ACCESS` if the file could not be opened or read, `ERR_FORMAT` if the GIF format could not be decoded, and `ERR_NO_IMAGE` if the image could not be loaded for another reason.

**Parameters**

in	<i>imagename</i>	A name given to this image or NULL
in	<i>data</i>	Pointer to the start of the GIF image in memory.
in	<i>length</i>	Length of the GIF image in memory.

**See also**

[Fl\\_GIF\\_Image::Fl\\_GIF\\_Image\(const char \\*filename\)](#)

[Fl\\_Shared\\_Image](#)

**Since**

1.4.0

**33.47.3 Member Data Documentation**

### 33.47.3.1 animate

```
bool Fl_GIF_Image::animate = false [static]
```

Sets how the shared image core routine should treat animated GIF files.

The default is to treat them as ordinary GIF's e.g. it creates a [Fl\\_GIF\\_Image](#) object. If this variable is set, then an animated GIF object [Fl\\_Anim\\_GIF\\_Image](#) is created.

The documentation for this class was generated from the following files:

- [Fl\\_GIF\\_Image.H](#)
- [Fl\\_Anim\\_GIF\\_Image.cxx](#)
- [Fl\\_GIF\\_Image.cxx](#)

## 33.48 Fl\_Gl\_Choice Class Reference

### Public Member Functions

- [Fl\\_Gl\\_Choice](#) (int m, const int \*alistp, [Fl\\_Gl\\_Choice](#) \*n)

### Friends

- class [Fl\\_Gl\\_Window\\_Driver](#)

The documentation for this class was generated from the following file:

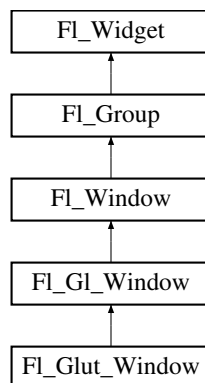
- [Fl\\_Gl\\_Choice.H](#)

## 33.49 Fl\_Gl\_Window Class Reference

The [Fl\\_Gl\\_Window](#) widget sets things up so OpenGL works.

```
#include <Fl_Gl_Window.H>
```

Inheritance diagram for [Fl\\_Gl\\_Window](#):



### Public Member Functions

- [Fl\\_Gl\\_Window](#) const \* [as\\_gl\\_window](#) () const [FL\\_OVERRIDE](#)
- [Fl\\_Gl\\_Window](#) \* [as\\_gl\\_window](#) () [FL\\_OVERRIDE](#)  
Returns an [Fl\\_Gl\\_Window](#) pointer if this widget is an [Fl\\_Gl\\_Window](#).
- int [can\\_do](#) ()  
Returns non-zero if the hardware supports the current OpenGL mode.
- int [can\\_do\\_overlay](#) ()  
Returns true if the hardware overlay is possible.
- [GLContext](#) [context](#) () const  
Returns a pointer to the window's OpenGL rendering context.

- void [context](#) (GLContext, int destroy\_flag=0)  
*Sets a pointer to the GLContext that this window is using.*
- char [context\\_valid](#) () const  
*Will only be set if the OpenGL context is created or recreated.*
- void [context\\_valid](#) (char v)  
*See char [FL\\_GI\\_Window::context\\_valid\(\)](#) const.*
- [FL\\_GI\\_Window](#) (int W, int H, const char \*l=0)  
*Creates a new [FL\\_GI\\_Window](#) widget using the given size, and label string.*
- [FL\\_GI\\_Window](#) (int X, int Y, int W, int H, const char \*l=0)  
*Creates a new [FL\\_GI\\_Window](#) widget using the given position, size, and label string.*
- void [flush](#) () [FL\\_OVERRIDE](#)  
*Forces the window to be drawn, this window is also made current and calls [draw\(\)](#).*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handle some FLTK events as needed.*
- void [hide](#) () [FL\\_OVERRIDE](#)  
*Hides the window and destroys the OpenGL context.*
- void [hide\\_overlay](#) ()  
*Hides the window if it is not this window, does nothing in Windows.*
- void [invalidate](#) ()  
*The [invalidate\(\)](#) method turns off [valid\(\)](#) and is equivalent to calling [value\(0\)](#).*
- void [make\\_current](#) ()  
*The [make\\_current\(\)](#) method selects the OpenGL context for the widget.*
- void [make\\_overlay\\_current](#) ()  
*Selects the OpenGL context for the widget's overlay.*
- [FL\\_Mode mode](#) () const  
*Returns the current OpenGL capabilities of the window.*
- int [mode](#) (const int \*a)  
*Set the OpenGL capabilities of the window using platform-specific data.*
- int [mode](#) (int a)  
*Set or change the OpenGL capabilities of the window.*
- void [ortho](#) ()  
*Sets the projection so 0,0 is in the lower left of the window and each pixel is 1 unit wide/tall.*
- int [pixel\\_h](#) ()  
*Gives the window height in OpenGL pixels.*
- int [pixel\\_w](#) ()  
*Gives the window width in OpenGL pixels.*
- float [pixels\\_per\\_unit](#) ()  
*The number of pixels per FLTK unit of length for the window.*
- void [redraw\\_overlay](#) ()  
*Causes [draw\\_overlay\(\)](#) to be called at a later time.*
- void [resize](#) (int, int, int, int) [FL\\_OVERRIDE](#)  
*Changes the size or position of the widget.*
- void [show](#) () [FL\\_OVERRIDE](#)  
*Makes a widget visible.*
- void [show](#) (int a, char \*\*b)  
*Same as [FL\\_Window::show\(int a, char \\*\\*b\)](#)*
- void [swap\\_buffers](#) ()  
*The [swap\\_buffers\(\)](#) method swaps the back and front buffers.*
- int [swap\\_interval](#) () const  
*Gets the rate at which the GL windows swaps buffers.*
- void [swap\\_interval](#) (int)

*Sets the rate at which the GL windows swaps buffers.*

- char [valid](#) () const

*Is turned off when FLTK creates a new context for this window or when the window resizes, and is turned on after [draw\(\)](#) is called.*

- void **valid** (char v)

*See char [FL\\_Gl\\_Window::valid\(\)](#) const.*

- [~FI\\_Gl\\_Window](#) ()

*The destructor removes the widget and destroys the OpenGL context associated with it.*

## Static Public Member Functions

- static int [can\\_do](#) (const int \*m)

*Returns non-zero if the hardware supports the given OpenGL mode.*

- static int **can\_do** (int m)

*Returns non-zero if the hardware supports the given OpenGL mode.*

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)

*Draws the [FL\\_Gl\\_Window](#).*

- void [draw\\_begin](#) ()

*Supports drawing to an [FL\\_Gl\\_Window](#) with the FLTK 2D drawing API.*

- void [draw\\_end](#) ()

*To be used as a match for a previous call to [FL\\_Gl\\_Window::draw\\_begin\(\)](#).*

## Friends

- class [FI\\_Gl\\_Window\\_Driver](#)

## Additional Inherited Members

### 33.49.1 Detailed Description

The [FL\\_Gl\\_Window](#) widget sets things up so OpenGL works.

It also keeps an OpenGL "context" for that window, so that changes to the lighting and projection may be reused between redraws. [FL\\_Gl\\_Window](#) also flushes the OpenGL streams and swaps buffers after [draw\(\)](#) returns.

OpenGL hardware typically provides some overlay bit planes, which are very useful for drawing UI controls atop your 3D graphics. If the overlay hardware is not provided, FLTK tries to simulate the overlay. This works pretty well if your graphics are double buffered, but not very well for single-buffered.

Please note that the FLTK drawing and clipping functions will not work inside an [FL\\_Gl\\_Window](#). All drawing should be done using OpenGL calls exclusively.

See also

[OpenGL and support of HighDPI displays](#)

#### Note

FLTK 1.4 introduces a driver system for graphic calls. It is now possible to add a selection of widgets to an OpenGL window. The widgets will draw on top of any OpenGL rendering. The number of supported widgets will increase as the driver development improves. Program `test/cube.cxx` illustrates how to do that.

FLTK expects that when an [FL\\_Gl\\_Window](#) is a child of a parent [FL\\_Window](#), the child window lies entirely inside its parent window. If that's not the case, what happens to the part of the GL subwindow which leaks outside its parent is undefined and susceptible to be platform-specific.

### 33.49.2 Constructor & Destructor Documentation

**33.49.2.1 Fl\_Gl\_Window()** [1/2]

```
Fl_Gl_Window::Fl_Gl_Window (
    int W,
    int H,
    const char * l = 0 ) [inline]
```

Creates a new [Fl\\_Gl\\_Window](#) widget using the given size, and label string.

The default boxtype is FL\_NO\_BOX. The default mode is FL\_RGB|FL\_DOUBLE|FL\_DEPTH.

**33.49.2.2 Fl\_Gl\_Window()** [2/2]

```
Fl_Gl_Window::Fl_Gl_Window (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 ) [inline]
```

Creates a new [Fl\\_Gl\\_Window](#) widget using the given position, size, and label string.

The default boxtype is FL\_NO\_BOX. The default mode is FL\_RGB|FL\_DOUBLE|FL\_DEPTH.

**33.49.3 Member Function Documentation****33.49.3.1 as\_gl\_window()** [1/2]

```
Fl\_Gl\_Window const * Fl_Gl_Window::as_gl_window ( ) const [inline], [virtual]
```

Reimplemented from [Fl\\_Widget](#).

**33.49.3.2 as\_gl\_window()** [2/2]

```
Fl\_Gl\_Window * Fl_Gl_Window::as_gl_window ( ) [inline], [virtual]
```

Returns an [Fl\\_Gl\\_Window](#) pointer if this widget is an [Fl\\_Gl\\_Window](#).

Use this method if you have a widget (pointer) and need to know whether this widget is derived from [Fl\\_Gl\\_Window](#).

If it returns non-NULL, then the widget in question is derived from [Fl\\_Gl\\_Window](#).

**Return values**

NULL	if this widget is not derived from <a href="#">Fl_Gl_Window</a> .
------	---

**Note**

This method is provided to avoid dynamic\_cast.

**See also**

[Fl\\_Widget::as\\_group\(\)](#), [Fl\\_Widget::as\\_window\(\)](#)

Reimplemented from [Fl\\_Widget](#).

**33.49.3.3 can\_do()**

```
static int Fl_Gl_Window::can_do (
    const int * m ) [inline], [static]
```

Returns non-zero if the hardware supports the given OpenGL mode.

**See also**

[Fl\\_Gl\\_Window::mode\(const int \\*a\)](#)

### 33.49.3.4 can\_do\_overlay()

```
int Fl_Gl_Window::can_do_overlay ( )
```

Returns true if the hardware overlay is possible.

If this is false, FLTK will try to simulate the overlay, with significant loss of update speed. Calling this will cause FLTK to open the display.

### 33.49.3.5 context() [1/2]

```
GLContext Fl_Gl_Window::context ( ) const [inline]
```

Returns a pointer to the window's OpenGL rendering context.

See also

```
void context(GLContext c, int destroy_flag)
```

### 33.49.3.6 context() [2/2]

```
void Fl_Gl_Window::context (
    GLContext v,
    int destroy_flag = 0 )
```

Sets a pointer to the GLContext that this window is using.

This is a system-dependent structure, but it is portable to copy the context from one window to another. You can also set it to NULL, which will force FLTK to recreate the context the next time [make\\_current\(\)](#) is called, this is useful for getting around bugs in OpenGL implementations.

If *destroy\_flag* is true the context will be destroyed by fltk when the window is destroyed, or when the [mode\(\)](#) is changed, or the next time [context\(x\)](#) is called.

### 33.49.3.7 context\_valid()

```
char Fl_Gl_Window::context_valid ( ) const [inline]
```

Will only be set if the OpenGL context is created or recreated.

It differs from [Fl\\_Gl\\_Window::valid\(\)](#) which is also set whenever the context changes size.

### 33.49.3.8 draw()

```
void Fl_Gl_Window::draw (
    void ) [protected], [virtual]
```

Draws the [Fl\\_Gl\\_Window](#).

You **must subclass** [Fl\\_Gl\\_Window](#) and provide an implementation for [draw\(\)](#). You may also provide an implementation of [draw\\_overlay\(\)](#) if you want to draw into the overlay planes. You can avoid reinitializing the viewport and lights and other things by checking [valid\(\)](#) at the start of [draw\(\)](#) and only doing the initialization if it is false.

The [draw\(\)](#) method can *only* use OpenGL calls. Do not attempt to call X, any of the functions in [<FL/fl\\_draw.H>](#), or glX directly. Do not call [gl\\_start\(\)](#) or [gl\\_finish\(\)](#).

If double-buffering is enabled in the window, the back and front buffers are swapped after this function is completed.

The following pseudo-code shows how to use "if (!valid())" to initialize the viewport:

```
void mywindow::draw() {
    if (!valid()) {
        glViewport(0,0,pixel_w(),pixel_h());
        glFrustum(...) or glOrtho(...)
        ...other initialization...
    }
    if (!context_valid()) {
        ...load textures, etc. ...
    }
    // clear screen
    glClearColor(...);
    glClear(...);
    ... draw your geometry here ...
}
```

Actual example code to clear screen to black and draw a 2D white "X":

```
void mywindow::draw() {
    if (!valid()) {
        glLoadIdentity();
```

```

        glViewport(0,0,pixel_w(),pixel_h());
        glOrtho(-w(),w(),-h(),h(),-1,1);
    }
    // Clear screen
    glClear(GL_COLOR_BUFFER_BIT);
    // Draw white 'X'
    glColor3f(1.0, 1.0, 1.0);
    glBegin(GL_LINE_STRIP); glVertex2f(w(), h()); glVertex2f(-w(),-h()); glEnd();
    glBegin(GL_LINE_STRIP); glVertex2f(w(),-h()); glVertex2f(-w(), h()); glEnd();
}

```

Regular FLTK widgets can be added as children to the [Fl\\_Gl\\_Window](#). To correctly overlay the widgets, [Fl\\_Gl\\_Window::draw\(\)](#) must be called after rendering the main scene.

```

void mywindow::draw() {
    // draw 3d graphics scene
    Fl_Gl_Window::draw();
    // -- or --
    draw_begin();
    Fl_Window::draw();
    // other 2d drawing calls, overlays, etc.
    draw_end();
}

```

Implements [Fl\\_Widget](#).

Reimplemented in [Fl\\_Glut\\_Window](#).

### 33.49.3.9 draw\_begin()

```
void Fl_Gl_Window::draw_begin ( ) [protected]
```

Supports drawing to an [Fl\\_Gl\\_Window](#) with the FLTK 2D drawing API.

See also

[Using FLTK widgets in OpenGL Windows](#)

### 33.49.3.10 draw\_end()

```
void Fl_Gl_Window::draw_end ( ) [protected]
```

To be used as a match for a previous call to [Fl\\_Gl\\_Window::draw\\_begin\(\)](#).

See also

[Using FLTK widgets in OpenGL Windows](#)

### 33.49.3.11 flush()

```
void Fl_Gl_Window::flush ( ) [virtual]
```

Forces the window to be drawn, this window is also made current and calls [draw\(\)](#).

Reimplemented from [Fl\\_Window](#).

### 33.49.3.12 handle()

```
int Fl_Gl_Window::handle (
    int event ) [virtual]
```

Handle some FLTK events as needed.

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Glut\\_Window](#).

### 33.49.3.13 hide()

```
void Fl_Gl_Window::hide ( ) [virtual]
```

Hides the window and destroys the OpenGL context.

Reimplemented from [Fl\\_Widget](#).

**33.49.3.14 make\_current()**

```
void Fl_Gl_Window::make_current ( )
```

The [make\\_current\(\)](#) method selects the OpenGL context for the widget.

It is called automatically prior to the [draw\(\)](#) method being called and can also be used to implement feedback and/or selection within the [handle\(\)](#) method.

**33.49.3.15 make\_overlay\_current()**

```
void Fl_Gl_Window::make_overlay_current ( )
```

Selects the OpenGL context for the widget's overlay.

This method is called automatically prior to the [draw\\_overlay\(\)](#) method being called and can also be used to implement feedback and/or selection within the [handle\(\)](#) method.

**33.49.3.16 mode() [1/3]**

```
Fl_Mode Fl_Gl_Window::mode ( ) const [inline]
```

Returns the current OpenGL capabilities of the window.

Don't use this if capabilities were set through [Fl\\_Gl\\_Window::mode\(const int \\*a\)](#).

**33.49.3.17 mode() [2/3]**

```
int Fl_Gl_Window::mode (
    const int * a ) [inline]
```

Set the OpenGL capabilities of the window using platform-specific data.

**Parameters**

<b>a</b>	zero-ending array of platform-specific attributes and attribute values
----------	--

**Unix/Linux platform:** attributes are GLX attributes adequate for the 3rd argument of the `glXChooseVisual()` function (e.g., `GLX_DOUBLEBUFFER`, defined by including `<GL/glx.h>`).

**Note**

What attributes are adequate here is subject to change. The preferred, stable public API is [Fl\\_Gl\\_Window::mode\(int a\)](#).

**Windows platform:** this member function is of no use.

**Mac OS X platform:** attributes belong to the `CGLPixelFormatAttribute` enumeration (defined by including `<OpenGL/OpenGL.h>`, e.g., `kCGLPFADoubleBuffer`) and may be followed by adequate attribute values.

**33.49.3.18 mode() [3/3]**

```
int Fl_Gl_Window::mode (
    int a ) [inline]
```

Set or change the OpenGL capabilities of the window.

The value can be any of the following OR'd together:

- `FL_RGB` - RGB color (not indexed)
- `FL_RGB8` - RGB color with at least 8 bits of each color
- `FL_INDEX` - Indexed mode
- `FL_SINGLE` - not double buffered
- `FL_DOUBLE` - double buffered
- `FL_ACCUM` - accumulation buffer
- `FL_ALPHA` - alpha channel in color

- `FL_DEPTH` - depth buffer
- `FL_STENCIL` - stencil buffer
- `FL_MULTISAMPLE` - multisample antialiasing
- `FL_OPENGL3` - use OpenGL version 3.0 or more.

`FL_RGB` and `FL_SINGLE` have a value of zero, so they are "on" unless you give `FL_INDEX` or `FL_DOUBLE`.

If the desired combination cannot be done, FLTK will try turning off `FL_MULTISAMPLE`. If this also fails the `show()` will call `Fl::error()` and not show the window.

You can change the mode while the window is displayed. This is most useful for turning double-buffering on and off. Under X this will cause the old X window to be destroyed and a new one to be created. If this is a top-level window this will unfortunately also cause the window to blink, raise to the top, and be de-iconized, and the `xid()` will change, possibly breaking other code. It is best to make the GL window a child of another window if you wish to do this! `mode()` must not be called within `draw()` since it changes the current context.

The `FL_OPENGL3` flag is recommended to use OpenGL version 3 or more. This flag is required (not just recommended) if GL 3.0 is in use and at least one of these conditions applies:

- the program runs on the macOS platform;
- the `Fl_Gl_Window` has child widgets.

See more details in [Using OpenGL 3.0 \(or higher versions\)](#).

#### Version

the `FL_OPENGL3` flag appeared in version 1.3.4

#### 33.49.3.19 ortho()

```
void Fl_Gl_Window::ortho ( )
```

Sets the projection so 0,0 is in the lower left of the window and each pixel is 1 unit wide/tall.

If you are drawing 2D images, your `draw()` method may want to call this if `valid()` is false.

#### 33.49.3.20 pixel\_h()

```
int Fl_Gl_Window::pixel_h ( ) [inline]
```

Gives the window height in OpenGL pixels.

When an `Fl_Gl_Window` is mapped to a HighDPI display, the value given by `Fl_Gl_Window::h()` which is expressed in FLTK units, may differ from the window height in pixels. Calls to OpenGL functions expecting pixel values (e.g., `glViewport`) should therefore use `pixel_h()` rather than `h()`. Method `pixel_h()` detects when the GUI is rescaled or when the window has been moved between low and high resolution displays and automatically adjusts the returned value.

#### Version

1.3.4

#### 33.49.3.21 pixel\_w()

```
int Fl_Gl_Window::pixel_w ( ) [inline]
```

Gives the window width in OpenGL pixels.

When an `Fl_Gl_Window` is mapped to a HighDPI display, the value given by `Fl_Gl_Window::w()` which is expressed in FLTK units, may differ from the window width in pixels. Calls to OpenGL functions expecting pixel values (e.g., `glViewport`) should therefore use `pixel_w()` rather than `w()`. Method `pixel_w()` detects when the GUI is rescaled or when the window has been moved between low and high resolution displays and automatically adjusts the returned value.

#### Version

1.3.4

**33.49.3.22 pixels\_per\_unit()**

```
float Fl_Gl_Window::pixels_per_unit ( )
```

The number of pixels per FLTK unit of length for the window.

This method dynamically adjusts its value when the GUI is rescaled or when the window is moved to/from displays of distinct resolutions. This method is useful, e.g., to convert, in a window's [handle\(\)](#) method, the FLTK units returned by [Fl::event\\_x\(\)](#) and [Fl::event\\_y\(\)](#) to the pixel units used by the OpenGL source code.

Version

1.3.4

**33.49.3.23 redraw\_overlay()**

```
void Fl_Gl_Window::redraw_overlay ( )
```

Causes [draw\\_overlay\(\)](#) to be called at a later time.

Initially the overlay is clear. If you want the window to display something in the overlay when it first appears, you must call this immediately after you [show\(\)](#) your window.

**33.49.3.24 resize()**

```
void Fl_Gl_Window::resize (
    int x,
    int y,
    int w,
    int h ) [virtual]
```

Changes the size or position of the widget.

This is a virtual function so that the widget may implement its own handling of resizing. The default version does *not* call the [redraw\(\)](#) method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.

Some window managers under X11 call [resize\(\)](#) a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations.

[position\(X, Y\)](#) is a shortcut for [resize\(X, Y, w\(\), h\(\)\)](#), and [size\(W, H\)](#) is a shortcut for [resize\(x\(\), y\(\), W, H\)](#).

Parameters

in	<i>x,y</i>	new position relative to the parent window
in	<i>w,h</i>	new size

See also

[position\(int,int\)](#), [size\(int,int\)](#)

Reimplemented from [Fl\\_Widget](#).

**33.49.3.25 show()**

```
void Fl_Gl_Window::show ( ) [virtual]
```

Makes a widget visible.

An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like `FL_SHOW`.

The [visible\(\)](#) method returns true if the widget is set to be visible. The [visible\\_r\(\)](#) method returns true if the widget and all of its parents are visible. A widget is only visible if [visible\(\)](#) is true on it *and all of its parents*.

Changing it will send `FL_SHOW` or `FL_HIDE` events to the widget. *Do not change it if the parent is not visible, as this will send false `FL_SHOW` or `FL_HIDE` events to the widget.* [redraw\(\)](#) is called if necessary on this or the parent.

See also

[hide\(\)](#), [visible\(\)](#), [visible\\_r\(\)](#)

Reimplemented from [Fl\\_Widget](#).

### 33.49.3.26 swap\_buffers()

```
void Fl_Gl_Window::swap_buffers ( )
```

The [swap\\_buffers\(\)](#) method swaps the back and front buffers.

It is called automatically after the [draw\(\)](#) method is called.

### 33.49.3.27 swap\_interval() [1/2]

```
int Fl_Gl_Window::swap_interval ( ) const
```

Gets the rate at which the GL windows swaps buffers.

This method can be called after the OpenGL context was created, typically within the user overridden [Fl\\_Gl\\_Window::draw\(\)](#) method that will be overridden by the user.

#### Note

This method depends highly on the underlying OpenGL contexts and driver implementation. Some drivers return no information, most drivers don't support intervals with multiple frames and return only 0 or 1.

Some drivers have the ability to set the swap interval but no way to query it, hence this method may return -1 even though the interval was set correctly. Conversely a return value greater zero does not guarantee that the driver actually honors the setting.

#### Returns

- an integer greater zero if vertical blanking is taken into account when swapping OpenGL buffers
- 0 if the vertical blanking is ignored
- 1 if the information can not be retrieved

### 33.49.3.28 swap\_interval() [2/2]

```
void Fl_Gl_Window::swap_interval (
    int frames )
```

Sets the rate at which the GL windows swaps buffers.

This method can be called after the OpenGL context was created, typically within the user overridden [Fl\\_Gl\\_Window::draw\(\)](#) method that will be overridden by the user.

#### Note

This method depends highly on the underlying OpenGL contexts and driver implementation. Most driver seem to accept only 0 and 1 to swap buffer asynchronously or in sync with the vertical blank.

#### Parameters

<i>in</i>	<i>frames</i>	set the number of vertical frame blanks between OpenGL buffer swaps
-----------	---------------	---

### 33.49.3.29 valid()

```
char Fl_Gl_Window::valid ( ) const [inline]
```

Is turned off when FLTK creates a new context for this window or when the window resizes, and is turned on *after* [draw\(\)](#) is called.

You can use this inside your `draw()` method to avoid unnecessarily initializing the OpenGL context. Just do this:

```
void mywindow::draw() {
    if (!valid()) {
        glViewport(0,0,pixel_w(),pixel_h());
        glFrustum(...);
        ...other initialization...
    }
    if (!context_valid()) {
        ...load textures, etc. ...
    }
    ... draw your geometry here ...
}
```

You can turn `valid()` on by calling `valid(1)`. You should only do this after fixing the transformation inside a `draw()` or after `make_current()`. This is done automatically after `draw()` returns.

The documentation for this class was generated from the following files:

- `FI_Gl_Window.H`
- `FI_Gl_Overlay.cxx`
- `FI_Gl_Window.cxx`

## 33.50 FI\_Glut\_Bitmap\_Font Struct Reference

fttk glut font/size attributes used in the glutXXX functions

```
#include <glut.H>
```

### Public Attributes

- `FI_Font` font
- `FI_Fontsize` size

#### 33.50.1 Detailed Description

fttk glut font/size attributes used in the glutXXX functions

The documentation for this struct was generated from the following file:

- `glut.H`

## 33.51 FI\_Glut\_StrokeChar Struct Reference

### Public Attributes

- int **Number**
- GLfloat **Right**
- const `FI_Glut_StrokeStrip` \* **Strips**

The documentation for this struct was generated from the following file:

- `glut.H`

## 33.52 FI\_Glut\_StrokeFont Struct Reference

### Public Attributes

- const `FI_Glut_StrokeChar` \*\* **Characters**
- GLfloat **Height**
- char \* **Name**
- int **Quantity**

The documentation for this struct was generated from the following file:

- `glut.H`

## 33.53 Fl\_Glut\_StrokeStrip Struct Reference

### Public Attributes

- int **Number**
- const [Fl\\_Glut\\_StrokeVertex](#) \* **Vertices**

The documentation for this struct was generated from the following file:

- glut.H

## 33.54 Fl\_Glut\_StrokeVertex Struct Reference

### Public Attributes

- GLfloat **X**
- GLfloat **Y**

The documentation for this struct was generated from the following file:

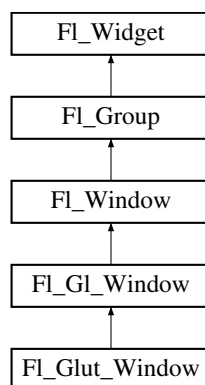
- glut.H

## 33.55 Fl\_Glut\_Window Class Reference

GLUT is emulated using this window class and these static variables (plus several more static variables hidden in glut\_compatibility.cxx):

```
#include <glut.H>
```

Inheritance diagram for Fl\_Glut\_Window:



### Public Member Functions

- **Fl\_Glut\_Window** (int **w**, int **h**, const char \*t=0)  
*Creates a glut window, registers to the glut windows list.*
- **Fl\_Glut\_Window** (int **x**, int **y**, int **w**, int **h**, const char \*t=0)  
*Creates a glut window, registers to the glut windows list.*
- void **make\_current** ()
- ~**Fl\_Glut\_Window** ()  
*Destroys the glut window, first unregister it from the glut windows list.*

### Public Attributes

- void(\* **display** )()
- void(\* **entry** )(int)

- void(\* **keyboard** )(uchar, int x, int y)
- int **menu** [3]
- void(\* **motion** )(int x, int y)
- void(\* **mouse** )(int b, int state, int x, int y)
- int **number**
- void(\* **overlaydisplay** )()
- void(\* **passivemotion** )(int x, int y)
- void(\* **reshape** )(int w, int h)
- void(\* **special** )(int, int x, int y)
- void(\* **visibility** )(int)

## Protected Member Functions

- void **draw** () [FL\\_OVERRIDE](#)  
*Draws the [FL\\_Gl\\_Window](#).*
- void **draw\_overlay** () [FL\\_OVERRIDE](#)  
*You must implement this virtual function if you want to draw into the overlay.*
- int **handle** (int) [FL\\_OVERRIDE](#)  
*Handle some FLTK events as needed.*

## Additional Inherited Members

### 33.55.1 Detailed Description

GLUT is emulated using this window class and these static variables (plus several more static variables hidden in glut\_compatibility.cxx):

### 33.55.2 Member Function Documentation

#### 33.55.2.1 draw()

```
void Fl_Glut_Window::draw (
    void ) [protected], [virtual]
```

Draws the [FL\\_Gl\\_Window](#).

You **must** subclass [FL\\_Gl\\_Window](#) and provide an implementation for [draw\(\)](#). You may also provide an implementation of [draw\\_overlay\(\)](#) if you want to draw into the overlay planes. You can avoid reinitializing the viewport and lights and other things by checking [valid\(\)](#) at the start of [draw\(\)](#) and only doing the initialization if it is false.

The [draw\(\)](#) method can *only* use OpenGL calls. Do not attempt to call X, any of the functions in [<FL/fl\\_draw.H>](#), or GLX directly. Do not call [gl\\_start\(\)](#) or [gl\\_finish\(\)](#).

If double-buffering is enabled in the window, the back and front buffers are swapped after this function is completed.

The following pseudo-code shows how to use "if (!valid())" to initialize the viewport:

```
void mywindow::draw() {
    if (!valid()) {
        glViewport(0,0,pixel_w(),pixel_h());
        glFrustum(...) or glOrtho(...)
        ...other initialization...
    }
    if (!context_valid()) {
        ...load textures, etc. ...
    }
    // clear screen
    glClearColor(...);
    glClear(...);
    ... draw your geometry here ...
}
```

Actual example code to clear screen to black and draw a 2D white "X":

```
void mywindow::draw() {
    if (!valid()) {
        glLoadIdentity();
        glViewport(0,0,pixel_w(),pixel_h());
        glOrtho(-w(),w(),-h(),h(),-1,1);
    }
}
```

```

// Clear screen
glClear(GL_COLOR_BUFFER_BIT);
// Draw white 'X'
glColor3f(1.0, 1.0, 1.0);
glBegin(GL_LINE_STRIP); glVertex2f(w(), h()); glVertex2f(-w(),-h()); glEnd();
glBegin(GL_LINE_STRIP); glVertex2f(w(),-h()); glVertex2f(-w(), h()); glEnd();
}

```

Regular FLTK widgets can be added as children to the [Fl\\_Gl\\_Window](#). To correctly overlay the widgets, [Fl\\_Gl\\_Window::draw\(\)](#) must be called after rendering the main scene.

```

void mywindow::draw() {
    // draw 3d graphics scene
    Fl_Gl_Window::draw();
    // -- or --
    draw_begin();
    Fl_Window::draw();
    // other 2d drawing calls, overlays, etc.
    draw_end();
}

```

Reimplemented from [Fl\\_Gl\\_Window](#).

### 33.55.2.2 draw\_overlay()

```
void Fl_Glut_Window::draw_overlay ( ) [protected], [virtual]
```

You must implement this virtual function if you want to draw into the overlay.

The overlay is cleared before this is called. You should draw anything that is not clear using OpenGL. You must use `gl_color(i)` to choose colors (it allocates them from the colormap using system-specific calls), and remember that you are in an indexed OpenGL mode and drawing anything other than flat-shaded will probably not work.

Both this function and [Fl\\_Gl\\_Window::draw\(\)](#) should check [Fl\\_Gl\\_Window::valid\(\)](#) and set the same transformation. If you don't your code may not work on other systems. Depending on the OS, and on whether overlays are real or simulated, the OpenGL context may be the same or different between the overlay and main window.

Reimplemented from [Fl\\_Gl\\_Window](#).

### 33.55.2.3 handle()

```
int Fl_Glut_Window::handle (
    int event ) [protected], [virtual]
```

Handle some FLTK events as needed.

Reimplemented from [Fl\\_Gl\\_Window](#).

The documentation for this class was generated from the following files:

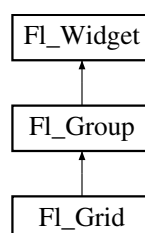
- glut.H
- glut\_compatibility.cxx

## 33.56 Fl\_Grid Class Reference

[Fl\\_Grid](#) is a container (layout) widget with multiple columns and rows.

```
#include <Fl_Grid.H>
```

Inheritance diagram for [Fl\\_Grid](#):



### Classes

- class [Cell](#)

## Public Member Functions

- [FL\\_Grid::Cell \\* cell](#) ([FL\\_Widget \\*widget](#)) const  
*Get the grid cell of widget `widget`.*
- [FL\\_Grid::Cell \\* cell](#) (int row, int col) const  
*Get the grid cell of row `row` and column `col`.*
- virtual void [clear\\_layout](#) ()  
*Reset the layout w/o removing widgets.*
- void [col\\_gap](#) (const int \*value, [size\\_t size](#))  
*Set more than one column gaps at once.*
- int [col\\_gap](#) (int col) const
- void [col\\_gap](#) (int col, int value)  
*Set the gap of column `col`.*
- void [col\\_weight](#) (const int \*value, [size\\_t size](#))  
*Set the weight of more than one column.*
- int [col\\_weight](#) (int col) const
- void [col\\_weight](#) (int col, int value)  
*Set the weight of a column.*
- void [col\\_width](#) (const int \*value, [size\\_t size](#))  
*Set minimal widths of more than one column.*
- int [col\\_width](#) (int col) const
- void [col\\_width](#) (int col, int value)  
*Set the minimal width of a column.*
- short [cols](#) () const
- int [computed\\_col\\_width](#) (int col) const
- int [computed\\_row\\_height](#) (int row) const
- void [debug](#) (int level=127)  
*Output layout information of this [FL\\_Grid](#) to stderr.*
- [FL\\_Grid](#) (int X, int Y, int W, int H, const char \*L=0)  
*Create a new [FL\\_Grid](#) widget.*
- void [gap](#) (int \*row\_gap, int \*col\_gap) const  
*Get the default gaps for rows and columns.*
- virtual void [gap](#) (int row\_gap, int col\_gap=-1)  
*Set default gaps for rows and columns.*
- virtual void [layout](#) ()  
*Calculate the grid layout and resize and position all widgets.*
- virtual void [layout](#) (int rows, int cols, int margin=-1, int gap=-1)  
*Set the basic layout parameters of the [FL\\_Grid](#) widget.*
- int [margin](#) (int \*left, int \*top, int \*right, int \*bottom) const  
*Returns all outside margin sizes of the grid.*
- virtual void [margin](#) (int left, int top=-1, int right=-1, int bottom=-1)  
*Set all margins (left, top, right, bottom).*
- bool [need\\_layout](#) () const  
*Return whether layout calculation is required.*
- void [need\\_layout](#) (int set)  
*Request or reset the request to calculate the layout of children.*
- virtual void [resize](#) (int X, int Y, int W, int H) [FL\\_OVERRIDE](#)  
*Recalculate the layout and position and resize all widgets.*
- void [row\\_gap](#) (const int \*value, [size\\_t size](#))  
*Set more than one row gaps at once.*
- int [row\\_gap](#) (int row) const
- void [row\\_gap](#) (int row, int value)

- Set the gap of row `row`.*
  - void `row_height` (const int \*value, size\_t size)
  - Set the minimal row height of more than one row.*
  - int `row_height` (int row) const
  - void `row_height` (int row, int value)
  - Set the minimal row height of row `row`.*
  - void `row_weight` (const int \*value, size\_t size)
  - Set the weight of more than one row.*
  - int `row_weight` (int row) const
  - void `row_weight` (int row, int value)
  - Set the row weight of row `row`.*
  - short `rows` () const
  - void `show_grid` (int set)
  - Enable or disable drawing of the grid helper lines for visualization.*
  - void `show_grid` (int set, FL\_Color col)
  - Enable or disable drawing of the grid helper lines for visualization.*
  - FL\_Grid::Cell \* `widget` (FL\_Widget \*wi, int row, int col, FL\_Grid\_Align align=FL\_GRID\_FILL)
  - Assign a widget to a grid cell and set its alignment.*
  - FL\_Grid::Cell \* `widget` (FL\_Widget \*wi, int row, int col, int rowspan, int colspan, FL\_Grid\_Align align=FL\_GRID\_FILL)
  - Assign a widget to a grid cell and set cell spanning and alignment.*

## Protected Member Functions

- Cell \* `add_cell` (int row, int col)
- virtual void `draw` () FL\_OVERRIDE
- Draws the FL\_Grid widget and all children.*
- virtual void `draw_grid` ()
- Draws the grid helper lines for design and debugging purposes.*
- void `init` ()
- void `on_remove` (int) FL\_OVERRIDE
- FL\_Group calls this method when a child widget is about to be removed.*
- void `remove_cell` (int row, int col)

## Protected Attributes

- bool `draw_grid_`
- FL\_Color `grid_color`

## Friends

- class FL\_Grid\_Type

## Additional Inherited Members

### 33.56.1 Detailed Description

FL\_Grid is a container (layout) widget with multiple columns and rows.

This container widget features very flexible layouts in columns and rows w/o the need to position each child widget in x/y coordinates.

Widgets are assigned to grid cells (column, row) with their minimal sizes in `w()` and `h()`. The `x()` and `y()` positions are ignored and can be (0, 0). FL\_Grid calculates widget positions and resizes the widgets to fit into the grid. It is possible to create a single row or column of widgets with FL\_Grid.

You should design your grid with the smallest possible sizes of all widgets in mind. FL\_Grid will automatically assign additional space to cells according to some rules (described later) when resizing the FL\_Grid widget.

**Hint:** You should set a minimum window size to make sure the `Fl_Grid` is never resized below its minimal sizes. Resizing below the given widget sizes results in undefined behavior.

`Fl_Grid` and other container widgets (e.g. `Fl_Group`) can be nested. One main advantage of this usage is that widget coordinates in embedded `Fl_Group` widgets become relative to the group and will be positioned as expected.

**Todo** This (relative group coordinates of nested groups of `Fl_Grid`) needs explanation and maybe an example.

`Fl_Grid` child widgets are handled by its base class `Fl_Group` but `Fl_Grid` stores additional data corresponding to each widget in internal grid cells.

`Fl_Grid` children are allowed to span multiple columns and rows like HTML `<table>` cells. Individual children can have fixed sizes or be aligned inside their cells (left, right, top, bottom, and more) and/or follow their cell sizes when the `Fl_Grid` container is resized.

Note to resizing: since `Fl_Grid` uses its own layout algorithm the normal `Fl_Group::resizable()` widget is ignored (if set). Calling `init_sizes()` is not necessary.

#### Note

`Fl_Grid` is, as of FLTK 1.4.x, still in experimental state and should be used with caution. The API can still be changed although it is assumed to be almost stable - as stable as possible for a first release.

Example: Simple 3x3 `Fl_Grid` with five buttons:

```
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Grid.H>
#include <FL/Fl_Button.H>

int main(int argc, char **argv) {
    Fl_Double_Window *win = new Fl_Double_Window(320, 180, "3x3 Fl_Grid with Buttons");
    // create the Fl_Grid container with five buttons
    Fl_Grid *grid = new Fl_Grid(0, 0, win->w(), win->h());
    grid->layout(3, 3, 10, 10);
    grid->color(FL_WHITE);
    Fl_Button *b0 = new Fl_Button(0, 0, 0, 0, "New");
    Fl_Button *b1 = new Fl_Button(0, 0, 0, 0, "Options");
    Fl_Button *b3 = new Fl_Button(0, 0, 0, 0, "About");
    Fl_Button *b4 = new Fl_Button(0, 0, 0, 0, "Help");
    Fl_Button *b6 = new Fl_Button(0, 0, 0, 0, "Quit");
    // assign buttons to grid positions
    grid->widget(b0, 0, 0);
    grid->widget(b1, 0, 2);
    grid->widget(b3, 1, 1);
    grid->widget(b4, 2, 0);
    grid->widget(b6, 2, 2);
    grid->show_grid(0); // 1 to display grid helper lines
    grid->end();
    win->end();
    win->resizable(grid);
    win->size_range(300, 100);
    win->show(argc, argv);
    return Fl::run();
}
```

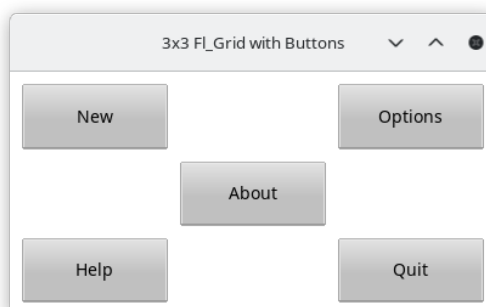


Figure 33.19 Simple 3x3 `Fl_Grid`

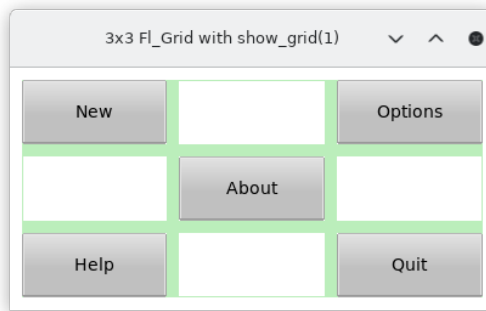


Figure 33.20 show\_grid() set to 1

## 33.56.2 Constructor & Destructor Documentation

### 33.56.2.1 Fl\_Grid()

```
Fl_Grid::Fl_Grid (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Create a new [Fl\\_Grid](#) widget.

**Todo** More documentation of [Fl\\_Grid](#) constructor?

## 33.56.3 Member Function Documentation

### 33.56.3.1 cell() [1/2]

```
Fl_Grid::Cell * Fl_Grid::cell (
    Fl_Widget * widget ) const
```

Get the grid cell of widget `widget`.

The pointer to the cell can be used for further assignment of properties like alignment etc.

Hint: If you know the row and column index of the cell you should use `Fl_Grid::cell(int row, int col)` instead because it is **much** faster.

Please see `Fl_Grid::cell(int row, int col)` for details and the validity of cell pointers.

#### Parameters

in	<i>widget</i>	widget whose cell is requested
----	---------------	--------------------------------

#### Return values

<i>NULL</i>	if <code>widget</code> is not assigned to a cell
-------------	--

### 33.56.3.2 cell() [2/2]

```
Fl_Grid::Cell * Fl_Grid::cell (
    int row,
```

```
int col ) const
```

Get the grid cell of row `row` and column `col`.

Widgets and other attributes are organized in cells ([Fl\\_Grid::Cell](#)).

This cell is an opaque structure (class) with some public methods. **Don't** assume anything about grid cell sizes and ordering in memory. These are implementation details that can be changed without notice.

The validity of an [Fl\\_Grid::Cell](#) pointer is limited. It will definitely be invalidated when the overall grid layout is changed, for instance by calling `layout(int, int)`.

Adding new cells beyond the current layout limits will also invalidate cell pointers but this is not (yet) implemented. Attempts to assign widgets to out-of-bounds cells are currently ignored.

The only well-defined usage of cell pointers is to set one or more properties like widget alignment of a cell after retrieving the cell pointer. Don't store cell pointers in your program for later reference.

#### Parameters

in	<i>row</i>	row index
in	<i>col</i>	column index

#### Returns

pointer to cell

#### Return values

<i>NULL</i>	if <code>row</code> or <code>col</code> is out of bounds or no widget was assigned
-------------	--

### 33.56.3.3 clear\_layout()

```
void Fl_Grid::clear_layout ( ) [virtual]
```

Reset the layout w/o removing widgets.

Removes all cells and sets rows and cols to zero. Existing widgets are kept as children of the [Fl\\_Group](#) (base class) but are hidden.

This method should be rarely used. You may want to call [Fl\\_Grid::clear\(\)](#) to remove all widgets and reset the layout to zero rows and columns.

You must call `layout(int rows, int cols, ...)` to set a new layout, allocate new cells, and assign widgets to new cells.

**Todo** [Fl\\_Grid::clear\(\)](#) needs to be implemented as documented above!

### 33.56.3.4 col\_gap() [1/2]

```
void Fl_Grid::col_gap (
    const int * value,
    size_t size )
```

Set more than one column gaps at once.

#### See also

[Fl\\_Grid::col\\_weight\(const int \\*value, size\\_t size\)](#) for handling of the value [array](#) and [size](#).

### 33.56.3.5 col\_gap() [2/2]

```
void Fl_Grid::col_gap (
    int col,
    int value )
```

Set the gap of column `col`.

Note that the gap is right of each column except the last one which is ignored. Use `margin()` for the right most column.

#### Parameters

in	<i>col</i>	column
in	<i>value</i>	gap size after the column

### 33.56.3.6 `col_weight()` [1/2]

```
void Fl_Grid::col_weight (
    const int * value,
    size_t size )
```

Set the weight of more than one column.

The values are taken from the array `value` and assigned sequentially to columns, starting from column 0. If the array `size` is too large extraneous values are ignored.

Negative values in the array are not assigned to their columns, i.e. the existing value for the corresponding column is not changed.

Example:

```
int val[] = { 0, 0, 50, -1, -1, 50, 0 };
grid->col_weight(val, sizeof(val)/sizeof(val[0]));
```

#### Parameters

in	<i>value</i>	an array of column weights
in	<i>size</i>	the size of the array (number of values)

### 33.56.3.7 `col_weight()` [2/2]

```
void Fl_Grid::col_weight (
    int col,
    int value )
```

Set the weight of a column.

Column and row weights are used to distribute additional space when the grid is resized beyond its defined (minimal) size. All weight values are relative and can be chosen freely. Suggested weights are in the range {0 .. 100}, 0 (zero) disables resizing of the column.

How does it work?

Whenever additional space (say: `SPACE` in pixels) is to be distributed to a set of columns the weights of all columns are added to a value `SUM`, then every single column width is increased by the value (in pseudo code):

```
col.width += SPACE * col.weight / SUM
```

Resulting pixel values are rounded to the next integer and rounding differences are added to or subtracted from the column with the highest weight. If more columns have the same weight one of them is chosen.

#### Note

If none of the columns considered for resizing have weights  $> 0$  then `Fl_Grid` assigns the remaining space to an arbitrary column or to all considered columns evenly. This is implementation defined and can be changed without notice. You can avoid this situation by designing your grid with sensible sizes and weights.

#### Parameters

in	<i>col</i>	column number (counting from 0)
in	<i>value</i>	weight, must be $\geq 0$

**33.56.3.8 col\_width()** [1/2]

```
void Fl_Grid::col_width (
    const int * value,
    size_t size )
```

Set minimal widths of more than one column.

The values are taken from the array `value` and assigned sequentially to columns, starting from column 0. If the array `size` is too large extraneous values are ignored.

Negative values in the array are not assigned to their columns, i.e. the existing value for the corresponding column is not changed.

Example:

```
int widths[] = { 0, 0, 50, -1, -1, 50, 0 };
grid->col_width(widths, sizeof(width)/sizeof(width[0]));
```

**Parameters**

in	<i>value</i>	an array of column widths
in	<i>size</i>	the size of the array (number of values)

**33.56.3.9 col\_width()** [2/2]

```
void Fl_Grid::col_width (
    int col,
    int value )
```

Set the minimal width of a column.

Column widths are calculated by using the maximum of all widget widths in that column and the given column width.

After calculating the width additional space is added when resizing according to the `weight` of the column.

You can set one or more column widths in one call by using [Fl\\_Grid::col\\_width\(const int \\*value, size\\_t size\)](#).

**Parameters**

in	<i>col</i>	column number (counting from 0)
in	<i>value</i>	minimal column width, must be $\geq 0$

**See also**

[Fl\\_Grid::col\\_width\(const int \\*value, size\\_t size\)](#)

**33.56.3.10 debug()**

```
void Fl_Grid::debug (
    int level = 127 )
```

Output layout information of this [Fl\\_Grid](#) to stderr.

Parameter `level` will be used to define the amount of output.

- 0 = nothing
- 127 = everything
- other values not yet defined

**Note**

It is not yet defined which kind of values `level` will have, either a numerical value (127 = maximum, 0 = nothing) or a bit mask that determines what to output.

**Todo** Add more information about cells and children.

Control output by using `level`.

**Parameters**

<code>in</code>	<code>level</code>	not yet used (0-127, default = 127)
-----------------	--------------------	-------------------------------------

**33.56.3.11 draw()**

```
void Fl_Grid::draw (
    void ) [protected], [virtual]
```

Draws the [Fl\\_Grid](#) widget and all children.

If the layout has been changed [layout\(\)](#) is called before the widget is drawn so all children are arranged as designed.

**See also**

[layout\(\)](#)

[need\\_layout\(\)](#)

Implements [Fl\\_Widget](#).

**33.56.3.12 draw\_grid()**

```
void Fl_Grid::draw_grid ( ) [protected], [virtual]
```

Draws the grid helper lines for design and debugging purposes.

This method is protected so it can be modified in subclasses.

**33.56.3.13 gap() [1/2]**

```
void Fl_Grid::gap (
    int * row_gap,
    int * col_gap ) const
```

Get the default gaps for rows and columns.

**Parameters**

<code>out</code>	<code>row_gap</code>	pointer to int to receive column gap, may be NULL
<code>out</code>	<code>col_gap</code>	pointer to int to receive column gap, may be NULL

**33.56.3.14 gap() [2/2]**

```
void Fl_Grid::gap (
    int row_gap,
    int col_gap = -1 ) [virtual]
```

Set default gaps for rows and columns.

All gaps are positioned below the rows and right of their columns.

The bottom row and the right-most column don't have a gap, i.e. the gap sizes of these columns and rows are ignored. You can use a right or bottom margin instead.

You have to specify at least one argument, `col_gap` is optional. If you don't specify an argument or use a negative value (e.g. -1) then that margin is not affected.

You can also initialize the default gaps with `layout(int, int, int, int)`.

#### Parameters

in	<i>row_gap</i>	default gap for all rows
in	<i>col_gap</i>	default gap for all columns

#### See also

[Fl\\_Grid::layout\(int rows, int cols, int margin, int gap\)](#)

### 33.56.3.15 layout() [1/2]

```
void Fl_Grid::layout ( ) [virtual]
```

Calculate the grid layout and resize and position all widgets.

This is called automatically when the [Fl\\_Grid](#) is resized. You need to call it once after you added widgets or moved widgets between cells.

Calling it once after all modifications are completed is enough.

**Todo** Document when and why to call `layout()` w/o args. See [Fl\\_Flex::layout\(\)](#)

#### See also

[Fl\\_Grid::layout\(int rows, int cols, int margin, int gap\)](#)

### 33.56.3.16 layout() [2/2]

```
void Fl_Grid::layout (
    int rows,
    int cols,
    int margin = -1,
    int gap = -1 ) [virtual]
```

Set the basic layout parameters of the [Fl\\_Grid](#) widget.

You need to specify at least `rows` and `cols` to define a layout before you can add widgets to the grid.

Parameters `margin` and `gap` are optional.

You can call `layout(int rows, int cols, int margin, int gap)` again to change the layout but this is inefficient since all cells are reallocated if the layout changed.

Calling this with the same values of `rows` and `cols` is fast and can be used to change `margin` and `gap` w/o reallocating the cells.

`margin` sets all margins (left, top, right, bottom) to the same value. Negative values (e.g. -1) don't change the established margins. The default value set by the constructor is 0.

`gap` sets row and column gaps to the same value. Negative values (e.g. -1) do not affect the established gaps. The default value set by the constructor is 0.

After you added all widgets you must call `layout()` once without arguments to calculate the actual layout and to position and resize all widgets.

**Todo** Document when and why to call `layout()` w/o args. See [Fl\\_Flex::layout\(\)](#)

#### Parameters

in	<i>rows</i>	number of rows
in	<i>cols</i>	number of columns
in	<i>margin</i>	margin size inside the <a href="#">Fl_Grid</a> 's border
in	<i>gap</i>	gap size between cells

See also

[Fl\\_Grid::layout\(\)](#)

### 33.56.3.17 margin() [1/2]

```
int Fl_Grid::margin (
    int * left,
    int * top,
    int * right,
    int * bottom ) const
```

Returns all outside margin sizes of the grid.

All margin sizes are returned in the given arguments. If any argument is `NULL` the respective value is not returned.

#### Parameters

out	<i>left</i>	returns left margin if not <code>NULL</code>
out	<i>top</i>	returns top margin if not <code>NULL</code>
out	<i>right</i>	returns right margin if not <code>NULL</code>
out	<i>bottom</i>	returns bottom margin if not <code>NULL</code>

#### Returns

whether all margins are equal

#### Return values

1	all margins have the same size
0	at least one margin has a different size

### 33.56.3.18 margin() [2/2]

```
void Fl_Grid::margin (
    int left,
    int top = -1,
    int right = -1,
    int bottom = -1 ) [virtual]
```

Set all margins (left, top, right, bottom).

All margins are measured in pixels inside the box borders. You need to specify at least one argument, all other arguments are optional. If you don't specify an argument or use a negative value (e.g. -1) then that particular margin is not affected.

#### Parameters

in	<i>left</i>	left margin
in	<i>top</i>	top margin
in	<i>right</i>	right margin
in	<i>bottom</i>	bottom margin

**33.56.3.19 need\_layout()**

```
void Fl_Grid::need_layout (
    int set ) [inline]
```

Request or reset the request to calculate the layout of children.

If called with `true` (1) this calls [redraw\(\)](#) to schedule a full [draw\(\)](#). When draw is eventually called, the layout is (re)calculated before actually drawing the widget.

**Parameters**

in	set	1 to request layout calculation, 0 to reset the request
----	-----	--

**33.56.3.20 on\_remove()**

```
void Fl_Grid::on_remove (
    int index ) [protected], [virtual]
```

[Fl\\_Group](#) calls this method when a child widget is about to be removed.

Make sure that the widget is also removed from our internal list of children.

Reimplemented from [Fl\\_Group](#).

**33.56.3.21 resize()**

```
void Fl_Grid::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Recalculate the layout and position and resize all widgets.

This method overrides [Fl\\_Group::resize\(\)](#) and calculates all positions and sizes of its children according to its own rules.

**Parameters**

in	X,Y	new widget position
in	W,H	new widget size

Reimplemented from [Fl\\_Widget](#).

**33.56.3.22 row\_gap() [1/2]**

```
void Fl_Grid::row_gap (
    const int * value,
    size_t size )
```

Set more than one row gaps at once.

See also

[Fl\\_Grid::col\\_weight\(const int \\*value, size\\_t size\)](#) for handling of the value [array](#) and [size](#).

**33.56.3.23 row\_gap() [2/2]**

```
void Fl_Grid::row_gap (
    int row,
    int value )
```

Set the gap of row `row`.

Note that the gap is below each row except the last one which is ignored. Use [margin\(\)](#) for the bottom row.

#### Parameters

in	<i>row</i>	row
in	<i>value</i>	gap size below the row

### 33.56.3.24 `row_height()` [1/2]

```
void Fl_Grid::row_height (
    const int * value,
    size_t size )
```

Set the minimal row height of more than one row.

#### Parameters

in	<i>value</i>	array of height values
in	<i>size</i>	size of array value

#### See also

[Fl\\_Grid::col\\_weight\(const int \\*value, size\\_t size\)](#) for handling of the value [array](#) and [size](#).

### 33.56.3.25 `row_height()` [2/2]

```
void Fl_Grid::row_height (
    int row,
    int value )
```

Set the minimal row height of row `row`.

#### Parameters

in	<i>row</i>	row
in	<i>value</i>	minimal height of the row

### 33.56.3.26 `row_weight()` [1/2]

```
void Fl_Grid::row_weight (
    const int * value,
    size_t size )
```

Set the weight of more than one row.

#### Parameters

in	<i>value</i>	array of height values
in	<i>size</i>	size of array value

See also

[Fl\\_Grid::col\\_weight\(const int \\*value, size\\_t size\)](#) for handling of the `value` array and `size`.

### 33.56.3.27 row\_weight() [2/2]

```
void Fl_Grid::row_weight (
    int row,
    int value )
```

Set the row weight of row `row`.

Parameters

in	<i>row</i>	row
in	<i>value</i>	weight of the row

### 33.56.3.28 show\_grid() [1/2]

```
void Fl_Grid::show_grid (
    int set ) [inline]
```

Enable or disable drawing of the grid helper lines for visualization.

Use this method during the design stage of your [Fl\\_Grid](#) widget or for debugging if widgets are not positioned as intended.

The default is a light green color but you can change it for better contrast if needed, see [show\\_grid\(int set, Fl\\_Color col\)](#).

Note

You can define the environment variable `FLTK_GRID_DEBUG=1` to set `show_grid(1)` for all [Fl\\_Grid](#) widgets at construction time. This enables you to debug the grid layout w/o changing code.

Parameters

in	<i>set</i>	1 (true) = draw, 0 = don't draw the grid
----	------------	--

See also

[show\\_grid\(int set, Fl\\_Color col\)](#)

### 33.56.3.29 show\_grid() [2/2]

```
void Fl_Grid::show_grid (
    int set,
    Fl_Color col ) [inline]
```

Enable or disable drawing of the grid helper lines for visualization.

This method also sets the color used for the helper lines.

The default is a light green color but you can change it to any color for better contrast if needed.

Parameters

in	<i>set</i>	1 (true) = draw, 0 = don't draw the grid
in	<i>col</i>	color to use for the grid helper lines

See also

[show\\_grid\(int set\)](#)

### 33.56.3.30 widget() [1/2]

```
Fl_Grid::Cell * Fl_Grid::widget (
    Fl_Widget * wi,
    int row,
    int col,
    Fl_Grid_Align align = FL_GRID_FILL )
```

Assign a widget to a grid cell and set its alignment.

This short form sets row and column spanning attributes to (1, 1).

For more information see [Fl\\_Grid::widget\(Fl\\_Widget \\*wi, int row, int col, int rowspan, int colspan, Fl\\_Grid\\_Align align\)](#)

#### Parameters

in	<i>wi</i>	widget to be assigned to the cell
in	<i>row</i>	row
in	<i>col</i>	column
in	<i>align</i>	widget alignment inside the cell

#### Returns

assigned cell

#### Return values

<i>NULL</i>	if row or col is out of bounds
-------------	--------------------------------

See also

[Fl\\_Grid::widget\(Fl\\_Widget \\*wi, int row, int col, int rowspan, int colspan, Fl\\_Grid\\_Align align\)](#)

### 33.56.3.31 widget() [2/2]

```
Fl_Grid::Cell * Fl_Grid::widget (
    Fl_Widget * wi,
    int row,
    int col,
    int rowspan,
    int colspan,
    Fl_Grid_Align align = FL_GRID_FILL )
```

Assign a widget to a grid cell and set cell spanning and alignment.

Default alignment is `FL_GRID_FILL` which stretches the widget in horizontal and vertical directions to fill the whole cell(s) given by `colspan` and `rowspan`.

You can use this method to move a widget from one cell to another; it is automatically removed from its old cell. If the new cell is already assigned to another widget that widget is deassigned but kept as a child of the group.

Before you can assign a widget to a cell it must have been created as a child of the [Fl\\_Grid](#) widget (i.e. its [Fl\\_Group](#)).

#### Parameters

in	<i>wi</i>	widget to be assigned to the cell
in	<i>row</i>	row

**Parameters**

in	<i>col</i>	column
in	<i>rowspan</i>	vertical span in cells, default 1
in	<i>colspan</i>	horizontal span in cells, default 1
in	<i>align</i>	widget alignment inside the cell

**Returns**

assigned cell

**Return values**

<i>NULL</i>	if <code>row</code> or <code>col</code> is out of bounds or <code>wi</code> is not a child
-------------	--

The documentation for this class was generated from the following files:

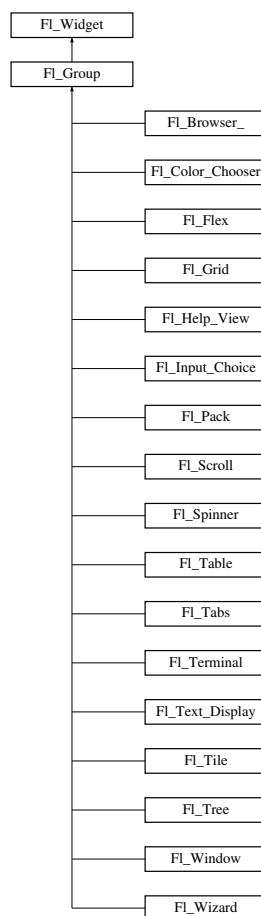
- [Fl\\_Grid.H](#)
- [Fl\\_Grid.cxx](#)

## 33.57 Fl\_Group Class Reference

The [Fl\\_Group](#) class is the main FLTK container widget.

```
#include <Fl_Group.H>
```

Inheritance diagram for Fl\_Group:



## Public Member Functions

- [FL\\_Widget](#) \*& **\_ddfdesign\_kludge** ()  
*This is for forms compatibility only.*
- void **add** ([FL\\_Widget](#) &)  
*The widget is removed from its current group (if any) and then added to the end of this group.*
- void **add** ([FL\\_Widget](#) \*o)  
*See void [FL\\_Group::add\(FL\\_Widget &w\)](#)*
- void **add\_resizable** ([FL\\_Widget](#) &o)  
*Adds a widget to the group and makes it the resizable widget.*
- [FL\\_Widget](#) \*const \* **array** () const  
*Returns a pointer to the internal array of children.*
- [FL\\_Group](#) const \* **as\_group** () const [FL\\_OVERRIDE](#)
- [FL\\_Group](#) \* **as\_group** () [FL\\_OVERRIDE](#)  
*Returns an [FL\\_Group](#) pointer if this widget is an [FL\\_Group](#).*
- void **begin** ()  
*Sets the current group so you can build the widget tree by just constructing the widgets.*
- [FL\\_Widget](#) \* **child** (int n) const  
*Returns the n'th child.*
- int **children** () const  
*Returns how many child widgets the group has.*
- void **clear** ()  
*Deletes all child widgets from memory recursively.*
- unsigned int **clip\_children** ()  
*Returns the current clipping mode.*
- void **clip\_children** (int c)  
*Controls whether the group widget clips the drawing of child widgets to its bounding box.*
- virtual int **delete\_child** (int n)  
*Removes the widget at *index* from the group and deletes it.*
- void **end** ()  
*Exactly the same as *current(this->parent())*.*
- int **find** (const [FL\\_Widget](#) &o) const  
*See int [FL\\_Group::find\(const FL\\_Widget \\*w\)](#) const.*
- int **find** (const [FL\\_Widget](#) \*) const  
*Searches the children for the widget and returns the index.*
- [FL\\_Group](#) (int, int, int, int, const char \* = 0)  
*Creates a new [FL\\_Group](#) widget using the given position, size, and label string.*
- void **focus** ([FL\\_Widget](#) \*W)
- void **forms\_end** ()  
*This is for forms compatibility only.*
- int **handle** (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- void **init\_sizes** ()  
*Resets the internal array of widget sizes and positions.*
- void **insert** ([FL\\_Widget](#) &, int i)  
*The widget is removed from its current group (if any) and then inserted into this group.*
- void **insert** ([FL\\_Widget](#) &o, [FL\\_Widget](#) \*before)  
*This does *insert(w, find(before))*.*
- void **remove** ([FL\\_Widget](#) &)  
*Removes a widget from the group but does not delete it.*
- void **remove** ([FL\\_Widget](#) \*o)

- Removes the widget `o` from the group.*
  - void `remove` (int index)
- Removes the widget at `index` from the group but does not delete it.*
  - `FL_Widget * resizable` () const
- Returns the group's resizable widget.*
  - void `resizable` (`FL_Widget &o`)
- Sets the group's resizable widget.*
  - void `resizable` (`FL_Widget *o`)
- The resizable widget defines both the resizing box and the resizing behavior of the group and its children.*
  - void `resize` (int, int, int, int) `FL_OVERRIDE`
- Resizes the `FL_Group` widget and all of its children.*
  - virtual `~FL_Group` ()
- The destructor also deletes all the children.*

## Static Public Member Functions

- static `FL_Group * current` ()
- Returns the currently active group.*
- static void `current` (`FL_Group *g`)
- Sets the current group.*

## Protected Member Functions

- `FL_Rect * bounds` ()
- Returns the internal array of widget sizes and positions.*
- void `draw` () `FL_OVERRIDE`
- Draws the widget.*
- void `draw_child` (`FL_Widget &widget`) const
- Forces a child to redraw.*
- void `draw_children` ()
- Draws all children of the group.*
- void `draw_outside_label` (const `FL_Widget &widget`) const
- Parents normally call this to draw outside labels of child widgets.*
- virtual int `on_insert` (`FL_Widget *`, int)
- Allow derived groups to act when a widget is added as a child.*
- virtual int `on_move` (int, int)
- Allow derived groups to act when a widget is moved within the group.*
- virtual void `on_remove` (int)
- Allow derived groups to act when a child widget is removed from the group.*
- int \* `sizes` ()
- Returns the internal array of widget sizes and positions.*
- void `update_child` (`FL_Widget &widget`) const
- Draws a child only if it needs it.*

## Additional Inherited Members

### 33.57.1 Detailed Description

The `FL_Group` class is the main FLTK container widget.

It maintains an ordered list of child widgets. These children can themselves be any widget including `FL_Group`. The most important subclass of `FL_Group` is `FL_Window`, however groups can also be used to control radio buttons, to enforce resize behavior, or to manage layout of widgets, see `FL_Pack`, `FL_Flex`, `FL_Grid`.

The tab and arrow keys are used to move the focus between widgets of this group, and to other groups. The only modifier grabbed is shift (for shift-tab), so that ctrl-tab, alt-up, and such are free for the app to use as shortcuts.

To remove a widget from the group and destroy it, in 1.3.x (and up) you can simply use:

```
delete some_widget;
```

..and this will trigger proper scheduling of the widget's removal from its parent group.

If used as a child of [Fl\\_Tabs](#), setting `when (FL_WHEN_CLOSED)` will enable the Close button in the corresponding tab. If the user clicks the Close button, the callback of this group will be called with the callback reason `FL_REASON_CLOSED`.

## 33.57.2 Constructor & Destructor Documentation

### 33.57.2.1 Fl\_Group()

```
Fl_Group::Fl_Group (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [Fl\\_Group](#) widget using the given position, size, and label string.

The default boxtype is `FL_NO_BOX`.

### 33.57.2.2 ~Fl\_Group()

```
Fl_Group::~Fl_Group ( ) [virtual]
```

The destructor *also deletes all the children*.

This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code.

It is allowed that the [Fl\\_Group](#) and all of its children are automatic (local) variables, but you must declare the [Fl\\_Group](#) *first*, so that it is destroyed last.

If you add static or automatic (local) variables to an [Fl\\_Group](#), then it is your responsibility to remove (or delete) all such static or automatic child widgets *before destroying* the group - otherwise the group will attempt to call delete operator on them leading to undefined behavior!

## 33.57.3 Member Function Documentation

### 33.57.3.1 array()

```
Fl_Widget *const * Fl_Group::array ( ) const
```

Returns a pointer to the internal array of children.

#### Note

This pointer is only valid until the next time a child is added or removed.

### 33.57.3.2 as\_group() [1/2]

```
Fl_Group const * Fl_Group::as_group ( ) const [inline], [virtual]
```

Reimplemented from [Fl\\_Widget](#).

### 33.57.3.3 as\_group() [2/2]

```
Fl_Group * Fl_Group::as_group ( ) [inline], [virtual]
```

Returns an [Fl\\_Group](#) pointer if this widget is an [Fl\\_Group](#).

Use this method if you have a widget (pointer) and need to know whether this widget is derived from [Fl\\_Group](#). If it returns non-NULL, then the widget in question is derived from [Fl\\_Group](#), and you can use the returned pointer to access its children or other [Fl\\_Group](#)-specific methods.

Example:

```
void my_callback (Fl_Widget *w, void *) {
    Fl_Group *g = w->as_group();
    if (g)
        printf ("This group has %d children\n", g->children());
    else
        printf ("This widget is not a group!\n");
}
```

Return values

NULL	if this widget is not derived from <a href="#">Fl_Group</a> .
------	---

Note

This method is provided to avoid `dynamic_cast`.

See also

[Fl\\_Widget::as\\_window\(\)](#), [Fl\\_Widget::as\\_gl\\_window\(\)](#)

Reimplemented from [Fl\\_Widget](#).

### 33.57.3.4 begin()

```
void Fl_Group::begin ( )
```

Sets the current group so you can build the widget tree by just constructing the widgets.

[begin\(\)](#) is automatically called by the constructor for [Fl\\_Group](#) (and thus for [Fl\\_Window](#) as well). [begin\(\)](#) is *exactly the same as* `current(this)`. *Don't forget to [end\(\)](#) the group or window!*

### 33.57.3.5 bounds()

```
Fl_Rect * Fl_Group::bounds ( ) [protected]
```

Returns the internal array of widget sizes and positions.

If the [bounds\(\)](#) array does not exist, it will be allocated and filled with the current widget sizes and positions.

The [bounds\(\)](#) array stores the initial positions of widgets as [Fl\\_Rect](#)'s. The size of the array is [children\(\)](#) + 2.

- The first [Fl\\_Rect](#) is the group,
- the second is the resizable (clipped to the group),
- the rest are the children.

This is a convenient order for the resize algorithm.

If the group and/or the [resizable\(\)](#) is a [Fl\\_Window](#) (or subclass) then the `x()` and `y()` coordinates of their respective [Fl\\_Rect](#)'s are zero.

Note

You should never need to use this *protected* method directly, unless you have special needs to rearrange the children of a [Fl\\_Group](#). [Fl\\_Tile](#) uses this to rearrange its widget positions. The returned array should be considered read-only. Do not change its contents. If you need to rearrange children in a group, do so by resizing the children and call [init\\_sizes\(\)](#).

`#include <FL/Fl_Rect.H>` if you want to access the [bounds\(\)](#) array in your derived class. [Fl\\_Rect.H](#) is intentionally not included by [Fl\\_Group.H](#) to avoid unnecessary dependencies.

Returns

Array of [Fl\\_Rect](#)'s with widget positions and sizes. The returned array is only valid until [init\\_sizes\(\)](#) is called or widgets are added to or removed from the group.

See also

[init\\_sizes\(\)](#)

Since

FLTK 1.4.0

### 33.57.3.6 child()

```
Fl_Widget * Fl_Group::child (
    int n ) const [inline]
```

Returns the n'th child.

Returns `nullptr` if `n` is out of range (since FLTK 1.4.0).

*No range checking was done in FLTK 1.3 and older versions!*

Parameters

in	<i>n</i>	index of child (0 .. <a href="#">children()</a> - 1)
----	----------	--

Returns

pointer to the n'th child or `nullptr` if out of range

### 33.57.3.7 clear()

```
void Fl_Group::clear (
    void )
```

Deletes all child widgets from memory recursively.

This method differs from the [remove\(\)](#) method in that it affects all child widgets and deletes them from memory.

The [resizable\(\)](#) widget of the [Fl\\_Group](#) is set to the [Fl\\_Group](#) itself.

### 33.57.3.8 clip\_children() [1/2]

```
unsigned int Fl_Group::clip_children ( ) [inline]
```

Returns the current clipping mode.

Returns

true, if clipping is enabled, false otherwise.

See also

void [Fl\\_Group::clip\\_children\(int c\)](#)

### 33.57.3.9 clip\_children() [2/2]

```
void Fl_Group::clip_children (
    int c ) [inline]
```

Controls whether the group widget clips the drawing of child widgets to its bounding box.

Set `c` to 1 if you want to clip the child widgets to the bounding box.

The default is to not clip (0) the drawing of child widgets.

**33.57.3.10 current() [1/2]**

```
Fl_Group * Fl_Group::current ( ) [static]
```

Returns the currently active group.

The [Fl\\_Widget](#) constructor automatically does [current\(\)](#)->add(widget) if this is not null. To prevent new widgets from being added to a group, call [Fl\\_Group::current\(0\)](#).

**33.57.3.11 current() [2/2]**

```
void Fl_Group::current (
    Fl_Group * g ) [static]
```

Sets the current group.

See also

[Fl\\_Group::current\(\)](#)

**33.57.3.12 delete\_child()**

```
int Fl_Group::delete_child (
    int index ) [virtual]
```

Removes the widget at `index` from the group and deletes it.

This method does nothing if `index` is out of bounds.

This method differs from the [remove\(\)](#) method in that it deletes the widget from memory. Since this method is virtual it can be reimplemented in subclasses with additional requirements and consequences. See the documentation of subclasses.

Many subclasses don't need to reimplement this method.

Note

This method **may** refuse to remove and delete the widget if it is an essential part of the [Fl\\_Group](#), for instance a scrollbar in an [Fl\\_Scroll](#) group. In this case the widget is neither removed nor deleted.

This method does not call [init\\_sizes\(\)](#) or [redraw\(\)](#). This is left to user code if necessary.

Returns 0 if the widget was removed and deleted. Return values > 0 are reserved for use by FLTK core widgets. Return values < 0 are free to be used by user defined widgets.

**Todo** Reimplementation of [Fl\\_Group::delete\\_child\(int\)](#) in more FLTK subclasses. This is not yet complete.

**Parameters**

<code>in</code>	<code>index</code>	index of child to be removed
-----------------	--------------------	------------------------------

**Returns**

success (0) or error code

**Return values**

0	success
1	index out of range
2	widget not allowed to be removed (see note)
>2	reserved for FLTK use

Since

FLTK 1.4.0

Reimplemented in [Fl\\_Scroll](#).

### 33.57.3.13 draw()

```
void Fl_Group::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

Reimplemented in [Fl\\_Help\\_View](#), [Fl\\_Input\\_Choice](#), [Fl\\_Pack](#), [Fl\\_Scroll](#), [Fl\\_Spinner](#), [Fl\\_Table](#), [Fl\\_Tabs](#), [Fl\\_Text\\_Display](#), [Fl\\_Tree](#), [Fl\\_Window](#), [Fl\\_Wizard](#), [Fl\\_Glut\\_Window](#), and [Fl\\_Terminal](#).

### 33.57.3.14 draw\_child()

```
void Fl_Group::draw_child (
    Fl_Widget & widget ) const [protected]
```

Forces a child to redraw.

This draws a child widget, if it is not clipped. The damage bits are cleared after drawing.

### 33.57.3.15 draw\_children()

```
void Fl_Group::draw_children ( ) [protected]
```

Draws all children of the group.

This is useful, if you derived a widget from [Fl\\_Group](#) and want to draw a special border or background. You can call [draw\\_children\(\)](#) from the derived [draw\(\)](#) method after drawing the box, border, or background.

### 33.57.3.16 end()

```
void Fl_Group::end ( )
```

*Exactly the same as* [current\(this->parent\(\)\)](#).

Any new widgets added to the widget tree will be added to the parent of the group.

### 33.57.3.17 find()

```
int Fl_Group::find (
    const Fl_Widget * o ) const
```

Searches the children for the widget and returns the index.

Returns [children\(\)](#) if the widget is NULL or not found.

### 33.57.3.18 focus()

```
void Fl_Group::focus (
    Fl_Widget * W ) [inline]
```

**Deprecated** This is for backwards compatibility only. You should use *W->take\_focus()* instead.

See also

[Fl\\_Widget::take\\_focus\(\)](#);

**33.57.3.19 handle()**

```
int Fl_Group::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

**Parameters**

<code>in</code>	<code>event</code>	the kind of event received
-----------------	--------------------	----------------------------

**Return values**

<code>0</code>	if the event was not used or understood
<code>1</code>	if the event was used and can be deleted

**See also**

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Table](#), [Fl\\_Terminal](#), [Fl\\_Text\\_Display](#), [Fl\\_Text\\_Editor](#), [Fl\\_Tree](#), [Fl\\_Spinner](#), [Fl\\_Table\\_Row](#), [Fl\\_Tile](#), [Fl\\_Help\\_View](#), [Fl\\_Scroll](#), [Fl\\_Tabs](#), [Fl\\_Window](#), and [Fl\\_Glut\\_Window](#).

**33.57.3.20 init\_sizes()**

```
void Fl_Group::init_sizes ( )
```

Resets the internal array of widget sizes and positions.

The [Fl\\_Group](#) widget keeps track of the original widget sizes and positions when resizing occurs so that if you resize a window back to its original size the widgets will be in the correct places. If you rearrange the widgets in your group, call this method to register the new arrangement with the [Fl\\_Group](#) that contains them.

If you add or remove widgets, this will be done automatically.

**Note**

The internal array of widget sizes and positions will be allocated and filled when the next [resize\(\)](#) occurs. For more information on the contents and structure of the [bounds\(\)](#) array see [bounds\(\)](#).

**See also**

[bounds\(\)](#)

[sizes\(\)](#) (deprecated)

**33.57.3.21 insert() [1/2]**

```
void Fl_Group::insert (
    Fl_Widget & o,
    int index )
```

The widget is removed from its current group (if any) and then inserted into this group.

It is put at index *n* - or at the end, if *n* >= [children\(\)](#). This can also be used to rearrange the widgets inside a group.

**33.57.3.22 insert() [2/2]**

```
void Fl_Group::insert (
    Fl_Widget & o,
    Fl_Widget * before ) [inline]
```

This does `insert(w, find(before))`.

This will append the widget if *before* is not in the group.

**33.57.3.23 on\_insert()**

```
int Fl_Group::on_insert (
    Fl_Widget * candidate,
    int index ) [protected], [virtual]
```

Allow derived groups to act when a widget is added as a child.

Widgets derived from [Fl\\_Group](#) may store additional data for their children. Overriding this method will allow derived classes to generate these data structures just before the child is added.

This method usually returns the same index that was given in the parameters. By setting a new index, the position of other widgets in the list of children can be preserved (e.g. [Fl\\_Scroll](#) keeps its scroll bars as the last two children).

By returning -1, [Fl\\_Group::insert](#) will not add the child to the group. This is not recommended, but [Fl\\_Table](#) does something similar to forward children to a hidden group.

**Parameters**

<i>candidate</i>	the candidate will be added to the child vector after this method returns.
<i>index</i>	add the child at this position in the list of children

**Returns**

index to position the child as planned

a new index to force the child to a different position

-1 to keep the group from adding the candidate

Reimplemented in [Fl\\_Scroll](#), [Fl\\_Tabs](#), and [Fl\\_Tile](#).

**33.57.3.24 on\_move()**

```
int Fl_Group::on_move (
    int oldIndex,
    int newIndex ) [protected], [virtual]
```

Allow derived groups to act when a widget is moved within the group.

Widgets derived from [Fl\\_Group](#) may store additional data for their children. Overriding this method will allow derived classes to move these data structures just before the child itself is moved.

This method usually returns the new index that was given in the parameters. By setting a different destination index, the position of other widgets in the list of children can be preserved.

By returning -1, [Fl\\_Group::insert](#) will not move the child.

**Parameters**

<i>oldIndex</i>	the current index of the child that will be moved
<i>newIndex</i>	the new index of the child

**Returns**

`newIndex` to position the child as planned  
 a different index to force the child to a different position  
 -1 to keep the group from moving the child

Reimplemented in [Fl\\_Scroll](#), [Fl\\_Tabs](#), and [Fl\\_Tile](#).

**33.57.3.25 on\_remove()**

```
void Fl_Group::on_remove (
    int index ) [protected], [virtual]
```

Allow derived groups to act when a child widget is removed from the group.  
 Widgets derived from [Fl\\_Group](#) may store additional data for their children. Overriding this method will allow derived classes to remove these data structures just before the child is removed.

**Parameters**

<i>index</i>	remove the child at this position
--------------	-----------------------------------

Reimplemented in [Fl\\_Flex](#), [Fl\\_Grid](#), [Fl\\_Tabs](#), and [Fl\\_Tile](#).

**33.57.3.26 remove() [1/3]**

```
void Fl_Group::remove (
    Fl_Widget & o )
```

Removes a widget from the group but does not delete it.  
 This method does nothing if the widget is not a child of the group.  
 This method differs from the [clear\(\)](#) method in that it only affects a single widget and does not delete it from memory.

**Note**

If you have the child's index anyway, use [remove\(int index\)](#) instead, because this doesn't need a child lookup in the group's table of children. This can be much faster, if there are lots of children.

**33.57.3.27 remove() [2/3]**

```
void Fl_Group::remove (
    Fl_Widget * o ) [inline]
```

Removes the widget `o` from the group.

**See also**

void [remove\(Fl\\_Widget&\)](#)

**33.57.3.28 remove() [3/3]**

```
void Fl_Group::remove (
    int index )
```

Removes the widget at `index` from the group but does not delete it.  
 This method does nothing if `index` is out of bounds.  
 This method differs from the [clear\(\)](#) method in that it only affects a single widget and does not delete it from memory.

**Since**

FLTK 1.3.0

**33.57.3.29 resizable()** [1/3]

```
Fl_Widget * Fl_Group::resizable ( ) const [inline]
```

Returns the group's resizable widget.

See void [Fl\\_Group::resizable\(Fl\\_Widget \\*o\)](#)

**33.57.3.30 resizable()** [2/3]

```
void Fl_Group::resizable (
    Fl_Widget & o ) [inline]
```

Sets the group's resizable widget.

See void [Fl\\_Group::resizable\(Fl\\_Widget \\*o\)](#)

**33.57.3.31 resizable()** [3/3]

```
void Fl_Group::resizable (
    Fl_Widget * o ) [inline]
```

The resizable widget defines both the resizing box and the resizing behavior of the group and its children.

If the resizable is NULL the group's size is fixed and all of the widgets in the group remain a fixed size and distance from the top-left corner. This is the default for groups derived from [Fl\\_Window](#) and [Fl\\_Pack](#).

The resizable may be set to the group itself, in which case all of the widgets that are its direct children are resized proportionally. This is the default value for [Fl\\_Group](#).

The resizable widget defines the resizing box for the group, which could be the group itself or one of the group's direct children. When the group is resized it calculates a new size and position for all of its children. Widgets that are horizontally or vertically inside the dimensions of the box are scaled to the new size. Widgets outside the box are moved.

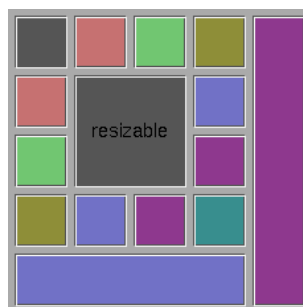
**Note**

The resizable of a group **must** be one of

- NULL
- the group itself
- a direct child of the group.

If you set any other widget that is not a direct child of the group as its resizable then the behavior is undefined. This is **not** checked by [Fl\\_Group](#) for historical reasons.

In these examples the gray area is the resizable:



**Figure 33.21 before resize**



Figure 33.22 after resize

It is possible to achieve any type of resize behavior by using an invisible [Fl\\_Box](#) as the resizable and/or by using a hierarchy of [Fl\\_Group](#) widgets, each with their own resizing strategies.

See the [How Does Resizing Work?](#) chapter for more examples and detailed explanation.

#### Note

The [resizable\(\)](#) widget of a window can also affect the window's resizing behavior if [Fl\\_Window::size\\_range\(\)](#) is not called. Please see [Fl\\_Window::default\\_size\\_range\(\)](#) for more information on how the default size range is calculated.

#### See also

[Fl\\_Window::size\\_range\(\)](#)

[Fl\\_Window::default\\_size\\_range\(\)](#)

### 33.57.3.32 [resize\(\)](#)

```
void Fl_Group::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Resizes the [Fl\\_Group](#) widget and all of its children.

The [Fl\\_Group](#) widget first resizes itself, and then it moves and resizes all its children according to the rules documented for [Fl\\_Group::resizable\(Fl\\_Widget\\*\)](#)

#### See also

[Fl\\_Group::resizable\(Fl\\_Widget\\*\)](#)

[Fl\\_Group::resizable\(\)](#)

[Fl\\_Widget::resize\(int,int,int,int\)](#)

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Input\\_Choice](#), [Fl\\_Pack](#), [Fl\\_Scroll](#), [Fl\\_Spinner](#), [Fl\\_Table](#), [Fl\\_Terminal](#), [Fl\\_Text\\_Display](#), [Fl\\_Tile](#), [Fl\\_Window](#), [Fl\\_Help\\_View](#), [Fl\\_Overlay\\_Window](#), [Fl\\_Tabs](#), and [Fl\\_Tree](#).

### 33.57.3.33 [sizes\(\)](#)

```
int * Fl_Group::sizes ( ) [protected]
```

Returns the internal array of widget sizes and positions.

For backward compatibility with FLTK versions before 1.4.

The [sizes\(\)](#) array stores the initial positions of widgets as (left, right, top, bottom) quads. The first quad is the group, the second is the resizable (clipped to the group), and the rest are the children. If the group and/or the [resizable\(\)](#) is a [Fl\\_Window](#), then the first (left) and third (top) entries of their respective quads (x,y) are zero.

**Deprecated** Deprecated since 1.4.0. Please use [bounds\(\)](#) instead.

#### Note

This method will be removed in a future FLTK version (1.5.0 or higher).

#### Returns

Array of int's with widget positions and sizes. The returned array is only valid until [init\\_sizes\(\)](#) is called or widgets are added to or removed from the group.

#### Note

Since FLTK 1.4.0 the returned array is a **read-only** and re-ordered copy of the internal [bounds\(\)](#) array. Do not change its contents. If you need to rearrange children in a group, do so by resizing the children and call [init\\_sizes\(\)](#).

#### See also

[bounds\(\)](#)

### 33.57.3.34 update\_child()

```
void Fl_Group::update_child (
    Fl_Widget & widget ) const [protected]
```

Draws a child only if it needs it.

This draws a child widget, if it is not clipped *and* if any [damage\(\)](#) bits are set. The damage bits are cleared after drawing.

#### See also

[Fl\\_Group::draw\\_child\(Fl\\_Widget& widget\) const](#)

The documentation for this class was generated from the following files:

- [Fl\\_Group.H](#)
- [Fl\\_Group.cxx](#)
- [forms\\_compatibility.cxx](#)

## 33.58 Fl\_Help\_Block Struct Reference

### Public Attributes

- [Fl\\_Color](#) **bgcolor**
- [uchar](#) **border**
- const char \* **end**
- int **h**
- int **line** [32]
- int **ol**
- int **ol\_num**
- const char \* **start**
- int **w**
- int **x**
- int **y**

The documentation for this struct was generated from the following file:

- [Fl\\_Help\\_View.H](#)

## 33.59 FI\_Help\_Dialog Class Reference

The [FI\\_Help\\_Dialog](#) widget displays a standard help dialog window using the [FI\\_Help\\_View](#) widget.

### Public Member Functions

- **FI\_Help\_Dialog** ()  
*The constructor creates the dialog pictured above.*
- int **h** ()  
*Returns the position and size of the help dialog.*
- void **hide** ()  
*Hides the [FI\\_Help\\_Dialog](#) window.*
- int **load** (const char \*f)  
*Loads the specified HTML file into the [FI\\_Help\\_View](#) widget.*
- void **position** (int xx, int yy)  
*Set the screen position of the dialog.*
- void **resize** (int xx, int yy, int ww, int hh)  
*Change the position and size of the dialog.*
- void **show** ()  
*Shows the [FI\\_Help\\_Dialog](#) window.*
- void **show** (int argc, char \*\*argv)  
*Shows the main Help Dialog Window Delegates call to encapsulated window\_ void [FI\\_Window::show](#)(int argc, char \*\*argv) instance method.*
- [FI\\_Fontsize](#) **textsize** ()  
*Sets or gets the default text size for the help view.*
- void **textsize** ([FI\\_Fontsize](#) s)  
*Sets or gets the default text size for the help view.*
- void **topline** (const char \*n)  
*Sets the top line in the [FI\\_Help\\_View](#) widget to the named or numbered line.*
- void **topline** (int n)  
*Sets the top line in the [FI\\_Help\\_View](#) widget to the named or numbered line.*
- const char \* **value** () const  
*The first form sets the current buffer to the string provided and reformats the text.*
- void **value** (const char \*f)  
*The first form sets the current buffer to the string provided and reformats the text.*
- int **visible** ()  
*Returns 1 if the [FI\\_Help\\_Dialog](#) window is visible.*
- int **w** ()  
*Returns the position and size of the help dialog.*
- int **x** ()  
*Returns the position and size of the help dialog.*
- int **y** ()  
*Returns the position and size of the help dialog.*
- ~**FI\_Help\_Dialog** ()  
*The destructor destroys the widget and frees all memory that has been allocated for the current file.*

### 33.59.1 Detailed Description

The [Fl\\_Help\\_Dialog](#) widget displays a standard help dialog window using the [Fl\\_Help\\_View](#) widget.

The [Fl\\_Help\\_Dialog](#) class is not part of the FLTK core library, but instead of *fltk\_images*. Use `--use-images` when compiling with `fltk-config`.

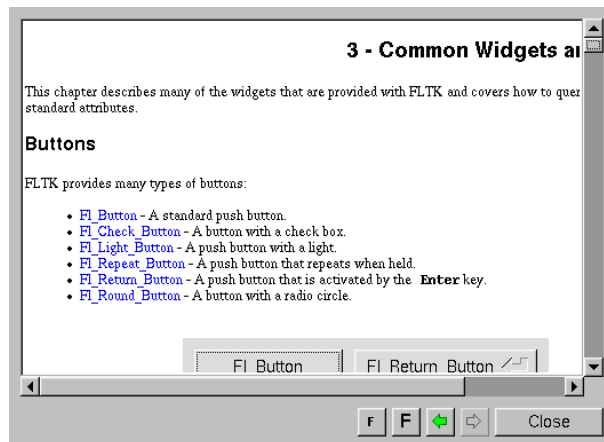


Figure 33.23 [Fl\\_Help\\_Dialog](#)

### 33.59.2 Member Function Documentation

#### 33.59.2.1 load()

```
int Fl_Help_Dialog::load (
    const char * f )
```

Loads the specified HTML file into the [Fl\\_Help\\_View](#) widget.

The filename can also contain a target name ("filename.html#target"). Always use forward slashes as path delimiters, Windows-style backslashes are not supported here.

##### Parameters

<code>in</code>	<code>f</code>	the name and path of an HTML file
-----------------	----------------	-----------------------------------

##### Returns

0 on success, -1 on error

##### See also

[Fl\\_Help\\_View::load\(\)](#), [fl\\_load\\_uri\(\)](#)

#### 33.59.2.2 show()

```
void Fl_Help_Dialog::show ( )
```

Shows the [Fl\\_Help\\_Dialog](#) window.

Shows the main Help Dialog Window Delegates call to encapsulated window\_ void [Fl\\_Window::show\(\)](#) method.

#### 33.59.2.3 textsize()

```
void Fl_Help_Dialog::textsize (
    Fl_Fontsize s )
```

Sets or gets the default text size for the help view.

Sets the internal [Fl\\_Help\\_View](#) instance text size.

Delegates call to encapsulated view\_ void [Fl\\_Help\\_View::textsize\(Fl\\_Fontsize s\)](#) instance method

#### 33.59.2.4 value() [1/2]

```
const char * Fl_Help_Dialog::value ( ) const
```

The first form sets the current buffer to the string provided and reformats the text.

It also clears the history of the "back" and "forward" buttons. The second form returns the current buffer contents.

#### 33.59.2.5 value() [2/2]

```
void Fl_Help_Dialog::value (
    const char * v )
```

The first form sets the current buffer to the string provided and reformats the text.

It also clears the history of the "back" and "forward" buttons. The second form returns the current buffer contents.

The documentation for this class was generated from the following files:

- [Fl\\_Help\\_Dialog.H](#)
- [Fl\\_Help\\_Dialog.cxx](#)
- [Fl\\_Help\\_Dialog\\_Dox.cxx](#)

## 33.60 Fl\_Help\_Font\_Stack Struct Reference

### Public Member Functions

- `size_t count ( ) const`  
*Gets the current count of font style elements in the stack.*
- `Fl_Help_Font_Stack ( )`  
*font stack construction, initialize attributes.*
- `void init (Fl_Font f, Fl_Fontsize s, Fl_Color c)`
- `void pop (Fl_Font &f, Fl_Fontsize &s, Fl_Color &c)`  
*Pops from the stack the font style triplet and calls [fl\\_font\(\)](#) & [fl\\_color\(\)](#) adequately.*
- `void push (Fl_Font f, Fl_Fontsize s, Fl_Color c)`  
*Pushes the font style triplet on the stack, also calls [fl\\_font\(\)](#) & [fl\\_color\(\)](#) adequately.*
- `void top (Fl_Font &f, Fl_Fontsize &s, Fl_Color &c)`  
*Gets the top (current) element on the stack.*

### Protected Attributes

- `Fl_Help_Font_Style elts_ [MAX_FL_HELP_FS_ELTS]`  
*font elements*
- `size_t nfonts_`  
*current number of fonts in stack*

The documentation for this struct was generated from the following file:

- [Fl\\_Help\\_View.H](#)

## 33.61 Fl\_Help\_Font\_Style Struct Reference

[Fl\\_Help\\_View](#) font stack element definition.

```
#include <Fl_Help_View.H>
```

## Public Member Functions

- **FI\_Help\_Font\_Style** ([FI\\_Font](#) afont, [FI\\_Fontsize](#) asize, [FI\\_Color](#) acolor)
- void **get** ([FI\\_Font](#) &afont, [FI\\_Fontsize](#) &asize, [FI\\_Color](#) &acolor)  
*Gets current font attributes.*
- void **set** ([FI\\_Font](#) afont, [FI\\_Fontsize](#) asize, [FI\\_Color](#) acolor)  
*Sets current font attributes.*

## Public Attributes

- [FI\\_Color](#) **c**  
*Font Color.*
- [FI\\_Font](#) **f**  
*Font.*
- [FI\\_Fontsize](#) **s**  
*Font Size.*

### 33.61.1 Detailed Description

[FI\\_Help\\_View](#) font stack element definition.

The documentation for this struct was generated from the following file:

- FI\_Help\_View.H

## 33.62 FI\_Help\_Link Struct Reference

Definition of a link for the html viewer.

```
#include <FI_Help_View.H>
```

## Public Attributes

- char **filename** [192]  
*Reference filename.*
- int **h**  
*Height of link text.*
- char **name** [32]  
*Link target (blank if none)*
- int **w**  
*Width of link text.*
- int **x**  
*X offset of link text.*
- int **y**  
*Y offset of link text.*

### 33.62.1 Detailed Description

Definition of a link for the html viewer.

The documentation for this struct was generated from the following file:

- FI\_Help\_View.H

## 33.63 FI\_Help\_Target Struct Reference

[FI\\_Help\\_Target](#) structure.

```
#include <FI_Help_View.H>
```

## Public Attributes

- char **name** [32]  
*Target name.*
- int **y**  
*Y offset of target.*

### 33.63.1 Detailed Description

[Fl\\_Help\\_Target](#) structure.

The documentation for this struct was generated from the following file:

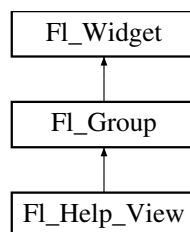
- [Fl\\_Help\\_View.H](#)

## 33.64 Fl\_Help\_View Class Reference

The [Fl\\_Help\\_View](#) widget displays HTML text.

```
#include <Fl_Help_View.H>
```

Inheritance diagram for [Fl\\_Help\\_View](#):



## Public Member Functions

- void **clear\_selection** ()  
*Removes the current text selection.*
- int **copy** (int clipboard=1)  
*If text is selected in this view, copy it to a clipboard.*
- const char \* **directory** () const  
*Returns the current directory for the text in the buffer.*
- const char \* **filename** () const  
*Returns the current filename for the text in the buffer.*
- int **find** (const char \*s, int p=0)  
*Finds the specified string s at starting position p.*
- **Fl\_Help\_View** (int xx, int yy, int ww, int hh, const char \*l=0)  
*The constructor creates the [Fl\\_Help\\_View](#) widget at the specified position and size.*
- int **handle** (int) [FL\\_OVERRIDE](#)  
*Handles events in the widget.*
- int **leftline** () const  
*Gets the left position in pixels.*
- void **leftline** (int)  
*Scrolls the text to the indicated position, given a pixel column.*
- void **link** (Fl\_Help\_Func \*fn)  
*This method assigns a callback function to use when a link is followed or a file is loaded (via [Fl\\_Help\\_View::load\(\)](#)) that requires a different file or path.*
- int **load** (const char \*f)  
*Loads the specified file.*

- void **resize** (int, int, int, int) [FL\\_OVERRIDE](#)  
*Resizes the help widget.*
- int **scrollbar\_size** () const  
*Gets the current size of the scrollbars' troughs, in pixels.*
- void **scrollbar\_size** (int newSize)  
*Sets the pixel size of the scrollbars' troughs to newSize, in pixels.*
- void **select\_all** ()  
*Selects all the text in the view.*
- int **size** () const  
*Gets the size of the help view.*
- void **size** (int W, int H)
- int **text\_selected** ()  
*Check if the user selected text in this view.*
- [FL\\_Color](#) **textcolor** () const  
*Returns the current default text color.*
- void **textcolor** ([FL\\_Color](#) c)  
*Sets the default text color.*
- [FL\\_Font](#) **textfont** () const  
*Returns the current default text font.*
- void **textfont** ([FL\\_Font](#) f)  
*Sets the default text font.*
- [FL\\_Fontsize](#) **textsize** () const  
*Gets the default text size.*
- void **textsize** ([FL\\_Fontsize](#) s)  
*Sets the default text size.*
- const char \* **title** ()  
*Returns the current document title, or NULL if there is no title.*
- int **topline** () const  
*Returns the current top line in pixels.*
- void **topline** (const char \*n)  
*Scrolls the text to the indicated position, given a named destination.*
- void **topline** (int)  
*Scrolls the text to the indicated position, given a pixel line.*
- const char \* **value** () const  
*Returns the current buffer contents.*
- void **value** (const char \*val)  
*Sets the current help text buffer to the string provided and reformats the text.*
- [~FL\\_Help\\_View](#) ()  
*Destroys the [FL\\_Help\\_View](#) widget.*

### Static Public Attributes

- static const char \* **copy\_menu\_text** = "Copy"  
*[this text may be customized at run-time]*

### Protected Member Functions

- void **draw** () [FL\\_OVERRIDE](#)  
*Draws the [FL\\_Help\\_View](#) widget.*

## Additional Inherited Members

### 33.64.1 Detailed Description

The [Fl\\_Help\\_View](#) widget displays HTML text.

Most HTML 2.0 elements are supported, as well as a primitive implementation of tables. GIF, JPEG, and PNG images are displayed inline.

Supported HTML tags:

- A: HREF/NAME
- B
- BODY: BGCOLOR/TEXT/LINK
- BR
- CENTER
- CODE
- DD
- DL
- DT
- EM
- FONT: COLOR/SIZE/FACE=(helvetica/arial/sans/times/serif/symbol/courier)
- H1/H2/H3/H4/H5/H6
- HEAD
- HR
- I
- IMG: SRC/WIDTH/HEIGHT/ALT
- KBD
- LI
- OL
- P
- PRE
- STRONG
- TABLE: TH/TD/TR/BORDER/BGCOLOR/COLSPAN/ALIGN=CENTER|RIGHT|LEFT
- TITLE
- TT
- U
- UL
- VAR

Supported color names:

- black,red,green,yellow,blue,magenta,fuchsia,cyan,aqua,white,gray,grey,lime,maroon,navy,olive,purple,silver,teal.

Supported urls:

- Internal: file:
- External: http: ftp: https: ipp: mailto: news:

Quoted char names:

- Aacute aacute Acirc acirc acute AElig aelig Agrave agrave amp Aring aring Atilde atilde Auml auml
- brvbar bull
- Ccedil ccedil cedil cent copy curren
- dagger deg divide
- Eacute eacute Ecirc ecirc Egrave egrave ETH eth Euml euml euro
- frac12 frac14 frac34
- gt
- Iacute iacute Icirc icirc Iexcl Igrave igrave Iquest luml iuml
- laquo lt
- macr micro middot
- nbsp not Ntilde ntilde
- Oacute oacute Ocirc ocirc Ograve ograve ordf ordm Oslash oslash Otilde otilde Ouml ouml
- para permil plusmn pound
- quot
- raquo reg
- sect shy sup1 sup2 sup3 szlig
- THORN thorn times trade
- Uacute uacute Ucirc ucirc Ugrave ugrave uml Uuml uuml
- Yacute yacute
- yen Yuml yuml

#### Note

You can't effectively set the `box()` to `FL_NO_BOX`, this would result in `FL_DOWN_BOX` being used as the boxtype of the widget. This is unexpected but can't be changed for backwards compatibility. If you don't want a frame around the widget you can use `FL_FLAT_BOX` instead.

## 33.64.2 Constructor & Destructor Documentation

### 33.64.2.1 ~Fl\_Help\_View()

```
Fl_Help_View::~Fl_Help_View ( )
```

Destroys the `Fl_Help_View` widget.

The destructor destroys the widget and frees all memory that has been allocated for the current document.

## 33.64.3 Member Function Documentation

**33.64.3.1 copy()**

```
int Fl_Help_View::copy (
    int clipboard = 1 )
```

If text is selected in this view, copy it to a clipboard.

## Parameters

in	<i>clipboard</i>	for x11 only, 0=selection buffer, 1=clipboard, 2=both
----	------------------	---

## Returns

1 if text is selected, 0 if no text is selected

**33.64.3.2 draw()**

```
void Fl_Help_View::draw (
    void ) [protected], [virtual]
```

Draws the [Fl\\_Help\\_View](#) widget.

Reimplemented from [Fl\\_Group](#).

**33.64.3.3 find()**

```
int Fl_Help_View::find (
    const char * s,
    int p = 0 )
```

Finds the specified string *s* at starting position *p*.

The argument *p* and the return value are offsets in [Fl\\_Help\\_View::value\(\)](#), counting from 0. If *p* is out of range, 0 is used.

The string comparison is simple but honors some special cases:

- the specified string *s* must be in UTF-8 encoding
- HTML tags in [value\(\)](#) are filtered (not compared as such, they never match)
- HTML entities like '&lt;' or '&#20ac;' are converted to Unicode (UTF-8)
- ASCII characters (7-bit, < 0x80) are compared case insensitive
- every newline (LF, '\n') in [value\(\)](#) is treated like a single space
- all other strings are compared as-is (byte by byte)

## Parameters

in	<i>s</i>	search string in UTF-8 encoding
in	<i>p</i>	starting position for search (0,...), Default = 0

## Returns

the matching position or -1 if not found

**33.64.3.4 handle()**

```
int Fl_Help_View::handle (
    int event ) [virtual]
```

Handles events in the widget.

Reimplemented from [Fl\\_Group](#).

### 33.64.3.5 leftline()

```
void Fl_Help_View::leftline (
    int left )
```

Scrolls the text to the indicated position, given a pixel column.

If the given pixel value `left` is out of range, then the text is scrolled to the left or right side of the document, resp.

#### Parameters

in	<i>left</i>	left column number in pixels (0 = left side)
----	-------------	--

### 33.64.3.6 link()

```
void Fl_Help_View::link (
    Fl_Help_Func * fn ) [inline]
```

This method assigns a callback function to use when a link is followed or a file is loaded (via [Fl\\_Help\\_View::load\(\)](#)) that requires a different file or path.

The callback function receives a pointer to the [Fl\\_Help\\_View](#) widget and the URI or full pathname for the file in question. It must return a pathname that can be opened as a local file or NULL:

```
const char *fn(Fl_Widget *w, const char *uri);
```

The link function can be used to retrieve remote or virtual documents, returning a temporary file that contains the actual data. If the link function returns NULL, the value of the [Fl\\_Help\\_View](#) widget will remain unchanged.

If the link callback cannot handle the URI scheme, it should return the uri value unchanged or set the [value\(\)](#) of the widget before returning NULL.

### 33.64.3.7 load()

```
int Fl_Help_View::load (
    const char * f )
```

Loads the specified file.

This method loads the specified file or URL. The filename may end in a `#name` style target.

If the URL starts with *ftp*, *http*, *https*, *ipp*, *mailto*, or *news*, followed by a colon, FLTK will use [fl\\_open\\_uri\(\)](#) to show the requested page in an external browser.

In all other cases, the URL is interpreted as a filename. The file is read and displayed in this browser. Note that Windows style backslashes are not supported in the file name.

#### Parameters

in	<i>f</i>	filename or URL
----	----------	-----------------

#### Returns

0 on success, -1 on error

#### See also

[fl\\_open\\_uri\(\)](#)

### 33.64.3.8 resize()

```
void Fl_Help_View::resize (
    int xx,
    int yy,
    int ww,
    int hh ) [virtual]
```

Resizes the help widget.

Reimplemented from [Fl\\_Group](#).

### 33.64.3.9 scrollbar\_size() [1/2]

```
int Fl_Help_View::scrollbar_size ( ) const [inline]
```

Gets the current size of the scrollbars' troughs, in pixels.

If this value is zero (default), this widget will use the [Fl::scrollbar\\_size\(\)](#) value as the scrollbar's width.

#### Returns

Scrollbar size in pixels, or 0 if the global [Fl::scrollbar\\_size\(\)](#) is being used.

#### See also

[Fl::scrollbar\\_size\(int\)](#)

### 33.64.3.10 scrollbar\_size() [2/2]

```
void Fl_Help_View::scrollbar_size (
    int newSize ) [inline]
```

Sets the pixel size of the scrollbars' troughs to `newSize`, in pixels.

Normally you should not need this method, and should use [Fl::scrollbar\\_size\(int\)](#) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally what you want.

Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare.

Setting `newSize` to the special value of 0 causes the widget to track the global [Fl::scrollbar\\_size\(\)](#), which is the default.

#### Parameters

in	<i>newSize</i>	Sets the scrollbar size in pixels. If 0 (default), scrollbar size tracks the global <a href="#">Fl::scrollbar_size()</a>
----	----------------	---

#### See also

[Fl::scrollbar\\_size\(\)](#)

### 33.64.3.11 text\_selected()

```
int Fl_Help_View::text_selected ( )
```

Check if the user selected text in this view.

#### Returns

1 if text is selected, 0 if no text is selected

### 33.64.3.12 topline() [1/2]

```
void Fl_Help_View::topline (
    const char * n )
```

Scrolls the text to the indicated position, given a named destination.

#### Parameters

in	<i>n</i>	target name
----	----------	-------------

**33.64.3.13 topline()** [2/2]

```
void Fl_Help_View::topline (
    int top )
```

Scrolls the text to the indicated position, given a pixel line.

If the given pixel value `top` is out of range, then the text is scrolled to the top or bottom of the document, resp.

**Parameters**

<code>in</code>	<code>top</code>	top line number in pixels (0 = start of document)
-----------------	------------------	---

**33.64.3.14 value()**

```
void Fl_Help_View::value (
    const char * val )
```

Sets the current help text buffer to the string provided and reformats the text.

The provided character string `val` is copied internally and will be freed when [value\(\)](#) is called again, or when the widget is destroyed.

If `val` is NULL, then the widget is cleared.

The documentation for this class was generated from the following files:

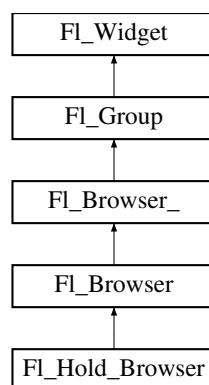
- `Fl_Help_View.H`
- `Fl_Help_View.cxx`

**33.65 Fl\_Hold\_Browser Class Reference**

The [Fl\\_Hold\\_Browser](#) is a subclass of [Fl\\_Browser](#) which lets the user select a single item, or no items by clicking on the empty space.

```
#include <Fl_Hold_Browser.H>
```

Inheritance diagram for `Fl_Hold_Browser`:

**Public Member Functions**

- [Fl\\_Hold\\_Browser](#) (int X, int Y, int W, int H, const char \*L=0)

*Creates a new [Fl\\_Hold\\_Browser](#) widget using the given position, size, and label string.*

## Additional Inherited Members

### 33.65.1 Detailed Description

The [Fl\\_Hold\\_Browser](#) is a subclass of [Fl\\_Browser](#) which lets the user select a single item, or no items by clicking on the empty space.



Figure 33.24 Fl\_Hold\_Browser

As long as the mouse button is held down the item pointed to by it is highlighted, and this highlighting remains on when the mouse button is released. Normally the callback is done when the user releases the mouse, but you can change this with [when\(\)](#).

See [Fl\\_Browser](#) for methods to add and remove lines from the browser.

### 33.65.2 Constructor & Destructor Documentation

#### 33.65.2.1 Fl\_Hold\_Browser()

```
Fl_Hold_Browser::Fl_Hold_Browser (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [Fl\\_Hold\\_Browser](#) widget using the given position, size, and label string.

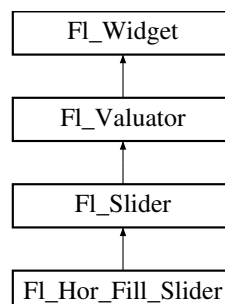
The default boxtype is FL\_DOWN\_BOX. The constructor specializes [Fl\\_Browser\(\)](#) by setting the type to FL\_HOLD\_BROWSER. The destructor destroys the widget and frees all memory that has been allocated.

The documentation for this class was generated from the following files:

- Fl\_Hold\_Browser.H
- Fl\_Browser.cxx

## 33.66 Fl\_Hor\_Fill\_Slider Class Reference

Inheritance diagram for Fl\_Hor\_Fill\_Slider:



## Public Member Functions

- **Fl\_Hor\_Fill\_Slider** (int X, int Y, int W, int H, const char \*L=0)

## Additional Inherited Members

The documentation for this class was generated from the following files:

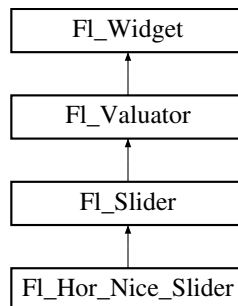
- `Fl_Hor_Fill_Slider.H`
- `Fl_Slider.cxx`

## 33.67 `Fl_Hor_Nice_Slider` Class Reference

Single thumb tab slider.

```
#include <Fl_Hor_Nice_Slider.H>
```

Inheritance diagram for `Fl_Hor_Nice_Slider`:



## Public Member Functions

- `Fl_Hor_Nice_Slider` (int X, int Y, int W, int H, const char \*L=0)

## Additional Inherited Members

### 33.67.1 Detailed Description

Single thumb tab slider.

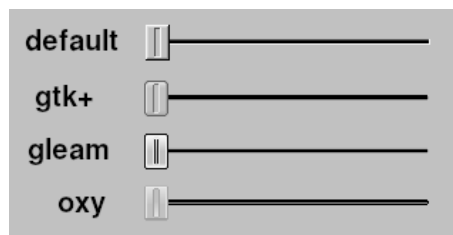


Figure 33.25 `Fl_Hor_Nice_Slider` with various `Fl::scheme()` values

The documentation for this class was generated from the following files:

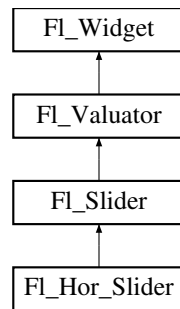
- `Fl_Hor_Nice_Slider.H`
- `Fl_Slider.cxx`

## 33.68 `Fl_Hor_Slider` Class Reference

Horizontal Slider class.

```
#include <Fl_Hor_Slider.H>
```

Inheritance diagram for `Fl_Hor_Slider`:



## Public Member Functions

- **Fl\_Hor\_Slider** (int X, int Y, int W, int H, const char \*l=0)  
Creates a new [Fl\\_Hor\\_Slider](#) widget using the given position, size, and label string.

## Additional Inherited Members

### 33.68.1 Detailed Description

Horizontal Slider class.

See also

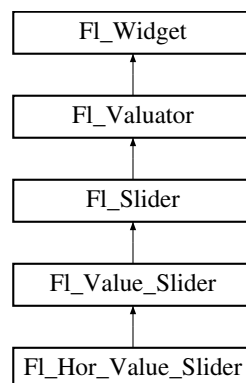
class [Fl\\_Slider](#).

The documentation for this class was generated from the following files:

- Fl\_Hor\_Slider.H
- Fl\_Slider.cxx

## 33.69 Fl\_Hor\_Value\_Slider Class Reference

Inheritance diagram for Fl\_Hor\_Value\_Slider:



## Public Member Functions

- **Fl\_Hor\_Value\_Slider** (int X, int Y, int W, int H, const char \*l=0)

## Additional Inherited Members

The documentation for this class was generated from the following files:

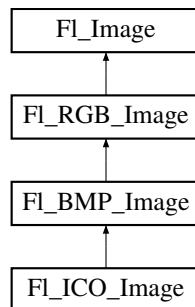
- Fl\_Hor\_Value\_Slider.H
- Fl\_Value\_Slider.cxx

## 33.70 FI\_ICO\_Image Class Reference

The [FI\\_ICO\\_Image](#) class supports loading, caching, and drawing of Windows icon (.ico) files.

```
#include <FI_ICO_Image.H>
```

Inheritance diagram for FI\_ICO\_Image:



### Classes

- struct [IconDirEntry](#)  
*Windows ICONDIRENTRY structure*

### Public Member Functions

- [FI\\_ICO\\_Image](#) (const char \*filename, int id=-1, const unsigned char \*data=NULL, const size\_t datasize=0)  
*Loads the named icon image from the given .ico filename or from memory.*
- const [IconDirEntry](#) \* [icondirent](#) () const  
*Returns the array of [idcount\(\)](#) loaded [IconDirEntry](#) structures.*
- int [idcount](#) () const  
*Returns the number of icons of various resolutions present in the ICO object.*
- ~[FI\\_ICO\\_Image](#) ()  
*Destructor.*

### Additional Inherited Members

#### 33.70.1 Detailed Description

The [FI\\_ICO\\_Image](#) class supports loading, caching, and drawing of Windows icon (.ico) files.

#### 33.70.2 Constructor & Destructor Documentation

##### 33.70.2.1 FI\_ICO\_Image()

```
FI_ICO_Image::FI_ICO_Image (
    const char * filename,
    int id = -1,
    const unsigned char * data = NULL,
    const size_t datasize = 0 )
```

Loads the named icon image from the given .ico filename or from memory.

#### Parameters

<i>filename</i>	Name of a .ico file, or of the in-memory image
-----------------	--

## Parameters

<i>id</i>	When <i>id</i> is -1 (default), the highest-resolution icon is loaded; when <i>id</i> 0, load the icon with this ID; when <i>id</i> = -2, load all <a href="#">IconDirEntry</a> structures but no image.
<i>data</i>	NULL, or in-memory icon data
<i>datasize</i>	Size in bytes of the <i>data</i> byte array (used when <i>data</i> is not NULL)

The documentation for this class was generated from the following files:

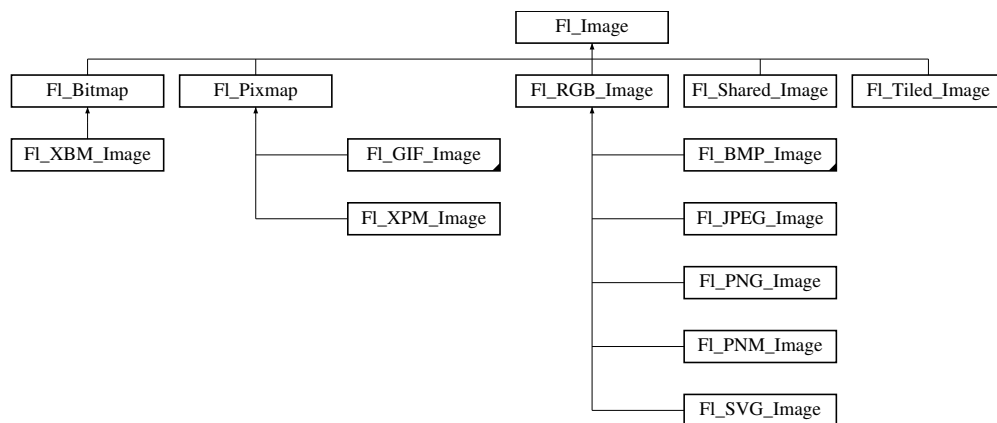
- `Fl_ICO_Image.H`
- `Fl_ICO_Image.cxx`

## 33.71 Fl\_Image Class Reference

Base class for image caching, scaling and drawing.

```
#include <Fl_Image.H>
```

Inheritance diagram for `Fl_Image`:



### Public Member Functions

- virtual class `Fl_Shared_Image * as_shared_image ()`  
*Returns whether an image is an `Fl_Shared_Image` or not.*
- virtual void `color_average (Fl_Color c, float i)`  
*The `color_average()` method averages the colors in the image with the provided FLTK color value.*
- `Fl_Image * copy () const`  
*Creates a copy of the image in the same size.*
- virtual `Fl_Image * copy (int W, int H) const`  
*Creates a resized copy of the image.*
- int `count () const`  
*Returns the number of data values associated with the image.*
- int `d () const`  
*Returns the image depth.*
- const char \*const \* `data () const`  
*Returns a pointer to the current image data array.*
- int `data_h () const`  
*Returns the height of the image data.*
- int `data_w () const`  
*Returns the width of the image data.*
- virtual void `desaturate ()`

- The *desaturate()* method converts an image to grayscale.
- void **draw** (int X, int Y)
 

Draws the image to the current drawing surface.
  - virtual void **draw** (int X, int Y, int W, int H, int cx=0, int cy=0)
 

Draws the image to the current drawing surface with a bounding box.
  - int **fail** () const
 

Returns a value that is not 0 if there is currently no image available.
  - **FI\_Image** (int W, int H, int D)
 

The constructor creates an empty image with the specified width, height, and depth.
  - int **h** () const
 

Returns the current image drawing height in FLTK units.
  - void **inactive** ()
 

The *inactive()* method calls *color\_average(FL\_BACKGROUND\_COLOR, 0.33f)* to produce an image that appears grayed out.
  - virtual void **label** (**FI\_Menu\_Item** \*m)
 

This method is an obsolete way to set the image attribute of a menu item.
  - virtual void **label** (**FI\_Widget** \*w)
 

This method is an obsolete way to set the image attribute of a widget or menu item.
  - int **ld** () const
 

Returns the current line data size in bytes.
  - virtual void **release** ()
 

Releases an *FI\_Image* - the same as 'delete this'.
  - virtual void **scale** (int width, int height, int proportional=1, int can\_expand=0)
 

Sets the drawing size of the image.
  - virtual void **uncache** ()
 

If the image has been cached for display, delete the cache data.
  - int **w** () const
 

Returns the current image drawing width in FLTK units.
  - virtual ~**FI\_Image** ()
 

The destructor is a virtual method that frees all memory used by the image.

## Static Public Member Functions

- static **FI\_Labeltype** **define\_FL\_IMAGE\_LABEL** ()
- static **FI\_RGB\_Scaling** **RGB\_scaling** ()
 

Returns the currently used RGB image scaling method.
- static void **RGB\_scaling** (**FI\_RGB\_Scaling**)
 

Sets the RGB image scaling method used for copy(int, int).
- static **FI\_RGB\_Scaling** **scaling\_algorithm** ()
 

Gets what algorithm is used when resizing a source image to draw it.
- static void **scaling\_algorithm** (**FI\_RGB\_Scaling** algorithm)
 

Sets what algorithm is used when resizing a source image to draw it.

## Static Public Attributes

- static const int **ERR\_FILE\_ACCESS** = -2
- static const int **ERR\_FORMAT** = -3
- static const int **ERR\_MEMORY\_ACCESS** = -4
- static const int **ERR\_NO\_IMAGE** = -1
- static bool **register\_images\_done** = false
 

True after *fl\_register\_images()* was called, false before.

## Protected Member Functions

- void **d** (int D)  
*Sets the current image depth.*
- void **data** (const char \*const \*p, int c)  
*Sets the current data pointer and count of pointers in the array.*
- void **draw\_empty** (int X, int Y)  
*The protected method `draw_empty()` draws a box with an X in it.*
- int **draw\_scaled** (int X, int Y, int W, int H)  
*Draw the image to the current drawing surface rescaled to a given width and height.*
- void **h** (int H)  
*Sets the height of the image data.*
- void **ld** (int LD)  
*Sets the current line data size in bytes.*
- void **w** (int W)  
*Sets the width of the image data.*

## Static Protected Member Functions

- static void **labeltype** (const [FI\\_Label](#) \*lo, int lx, int ly, int lw, int lh, [FI\\_Align](#) la)
- static void **measure** (const [FI\\_Label](#) \*lo, int &lw, int &lh)

## Friends

- class **FI\_Graphics\_Driver**

### 33.71.1 Detailed Description

Base class for image caching, scaling and drawing.

[FI\\_Image](#) is the base class used for caching, scaling and drawing all kinds of images in FLTK. This class keeps track of common image data such as the pixels, colormap, width, height, and depth. Virtual methods are used to provide type-specific image handling.

Each image possesses two (width, height) pairs:

1. The width and height of the raw image data are returned by [data\\_w\(\)](#) and [data\\_h\(\)](#). These values are set when the image is created and remain unchanged.
2. The width and height of the area filled by the image when it gets drawn are returned by [w\(\)](#) and [h\(\)](#). These values are equal to [data\\_w\(\)](#) and [data\\_h\(\)](#) when the image is created and can be changed by the [scale\(\)](#) member function.

Since the [FI\\_Image](#) class does not support image drawing by itself, calling the [FI\\_Image::draw\(\)](#) method results in a box with an X in it being drawn instead.

### 33.71.2 Constructor & Destructor Documentation

#### 33.71.2.1 FI\_Image()

```
FI_Image::FI_Image (
    int W,
    int H,
    int D )
```

The constructor creates an empty image with the specified width, height, and depth.

The width and height are in pixels. The depth is 0 for bitmaps, 1 for pixmap (colormap) images, and 1 to 4 for color images.

### 33.71.3 Member Function Documentation

#### 33.71.3.1 `as_shared_image()`

```
virtual class Fl_Shared_Image * Fl_Image::as_shared_image ( ) [inline], [virtual]
```

Returns whether an image is an [Fl\\_Shared\\_Image](#) or not.

This virtual method returns a pointer to an [Fl\\_Shared\\_Image](#) if this object is an instance of [Fl\\_Shared\\_Image](#) or NULL if not. This can be used to detect if a given [Fl\\_Image](#) object is a shared image, i.e. derived from [Fl\\_Shared\\_Image](#).

Since

1.4.0

Reimplemented in [Fl\\_Shared\\_Image](#).

#### 33.71.3.2 `color_average()`

```
void Fl_Image::color_average (
    Fl_Color c,
    float i ) [virtual]
```

The `color_average()` method averages the colors in the image with the provided FLTK color value.

The first argument specifies the FLTK color to be used.

The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented in [Fl\\_Anim\\_GIF\\_Image](#), [Fl\\_RGB\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Shared\\_Image](#), [Fl\\_SVG\\_Image](#), and [Fl\\_Tiled\\_Image](#).

#### 33.71.3.3 `copy()` [1/2]

```
Fl_Image * Fl_Image::copy ( ) const [inline]
```

Creates a copy of the image in the same size.

The new image should be released when you are done with it.

This does exactly the same as '[Fl\\_Image::copy\(int W, int H\) const](#)' where W and H are the width and height of the source image, respectively. This applies also to all subclasses of [Fl\\_Image](#) in the FLTK library.

The following two `copy()` calls are equivalent:

```
Fl_Image *img1 = new Fl_Image(...);
// ...
Fl_Image *img2 = img1->copy();
Fl_Image *img3 = img1->copy(img1->w(), img1->h());
```

For details see '[Fl\\_Image::copy\(int w, int h\) const](#)'.

See also

[Fl\\_Image::release\(\)](#)

Note

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from [Fl\\_Image](#) or any subclass your overridden methods of '[Fl\\_Image::copy\(\) const](#)' and '[Fl\\_Image::copy\(int, int\) const](#)' **must** also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

### 33.71.3.4 copy() [2/2]

```
Fl_Image * Fl_Image::copy (
    int W,
    int H ) const [virtual]
```

Creates a resized copy of the image.

It is recommended not to call this member function to reduce the size of an image to the size of the area where this image will be drawn, and to use [Fl\\_Image::scale\(\)](#) instead.

The new image should be released when you are done with it.

Note: since FLTK 1.4.0 you can use [Fl\\_Image::release\(\)](#) for all types of images (i.e. all subclasses of [Fl\\_Image](#)) instead of operator *delete* for [Fl\\_Image](#)'s and [Fl\\_Image::release\(\)](#) for [Fl\\_Shared\\_Image](#)'s.

The new image data will be converted to the requested size. RGB images are resized using the algorithm set by [Fl\\_Image::RGB\\_scaling\(\)](#).

For the new image the following equations are true:

- `w() == data_w() == W`
- `h() == data_h() == H`

#### Parameters

in	<i>W,H</i>	Requested width and height of the new image
----	------------	---

#### Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of [Fl\\_RGB\\_Image](#), [Fl\\_SVG\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Bitmap](#), [Fl\\_Tiled\\_Image](#), [Fl\\_Anim\\_GIF\\_Image](#) and [Fl\\_Shared\\_Image](#). Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an [Fl\\_GIF\\_Image](#) is an object of class [Fl\\_Pixmap](#).

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from [Fl\\_Image](#) or any subclass your overridden methods of '[Fl\\_Image::copy\(\) const](#)' and '[Fl\\_Image::copy\(int, int\) const](#)' **must** also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented in [Fl\\_Anim\\_GIF\\_Image](#), [Fl\\_Bitmap](#), [Fl\\_RGB\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Shared\\_Image](#), [Fl\\_SVG\\_Image](#), and [Fl\\_Tiled\\_Image](#).

### 33.71.3.5 count()

```
int Fl_Image::count ( ) const [inline]
```

Returns the number of data values associated with the image.

The value will be 0 for images with no associated data, 1 for bitmap and color images, and greater than 2 for pixmap images.

See also

[data\(\)](#)

### 33.71.3.6 d()

```
int Fl_Image::d ( ) const [inline]
```

Returns the image depth.

The return value will be 0 for bitmaps, 1 for pixmaps, and 1 to 4 for color images.

### 33.71.3.7 data() [1/2]

```
const char *const * Fl_Image::data ( ) const [inline]
```

Returns a pointer to the current image data array.

There can be 0, 1, or more pointers to actual image data in an image.

Use the [count\(\)](#) method to find the size of the data array. You must not dereference the [data\(\)](#) pointer if [count\(\)](#) equals zero.

#### Note

[data\(\)](#) may return NULL.

Example:

[Fl\\_RGB\\_Image](#) has exactly one pointer which points at the R, G, B [, A] data array of the image. The total size of this array depends on several attributes like [data\\_w\(\)](#), [data\\_h\(\)](#), [d\(\)](#) and [ld\(\)](#) and is basically [data\\_w\(\)](#) \* [data\\_h\(\)](#) \* [d\(\)](#) but there are exceptions if [ld\(\)](#) is non-zero: see description of [ld\(\)](#). Since FLTK 1.4.0 [w\(\)](#) and [h\(\)](#) are no longer significant for the image data size if [scale\(\)](#) has been called on the image to set a different display size.

Other image types have different numbers and types of data pointers which are implementation details and not documented here.

See also

[count\(\)](#), [w\(\)](#), [h\(\)](#), [data\\_w\(\)](#), [data\\_h\(\)](#), [d\(\)](#), [ld\(\)](#)

### 33.71.3.8 data() [2/2]

```
void Fl_Image::data (
    const char *const * p,
    int c ) [inline], [protected]
```

Sets the current data pointer and count of pointers in the array.

There can be 0, 1, or more pointers to actual image data in an image.

See also

const char\* const\* [data\(\)](#), [count\(\)](#), [w\(\)](#), [h\(\)](#), [data\\_w\(\)](#), [data\\_h\(\)](#), [d\(\)](#), [ld\(\)](#)

### 33.71.3.9 desaturate()

```
void Fl_Image::desaturate ( ) [virtual]
```

The [desaturate\(\)](#) method converts an image to grayscale.

If the image contains an alpha channel (depth = 4), the alpha channel is preserved.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented in [Fl\\_Anim\\_GIF\\_Image](#), [Fl\\_RGB\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Shared\\_Image](#), [Fl\\_SVG\\_Image](#), and [Fl\\_Tiled\\_Image](#).

### 33.71.3.10 draw() [1/2]

```
void Fl_Image::draw (
    int X,
    int Y ) [inline]
```

Draws the image to the current drawing surface.

#### Parameters

X,Y	specify the upper-lefthand corner of the image.
-----	---

**33.71.3.11 draw()** [2/2]

```
void Fl_Image::draw (
    int X,
    int Y,
    int W,
    int H,
    int cx = 0,
    int cy = 0 ) [virtual]
```

Draws the image to the current drawing surface with a bounding box.

Arguments *X*, *Y*, *W*, *H* specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the *cx* and *cy* arguments.

In other words: `fl_push_clip(X,Y,W,H)` is applied, the image is drawn with its upper-left corner at *X-cx*, *Y-cy* and its own width and height, `fl_pop_clip()` is applied.

Reimplemented in [Fl\\_Anim\\_GIF\\_Image](#), [Fl\\_Bitmap](#), [Fl\\_RGB\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Shared\\_Image](#), [Fl\\_SVG\\_Image](#), and [Fl\\_Tiled\\_Image](#).

**33.71.3.12 draw\_empty()**

```
void Fl_Image::draw_empty (
    int X,
    int Y ) [protected]
```

The protected method [draw\\_empty\(\)](#) draws a box with an X in it.

It can be used to draw any image that lacks image data.

**33.71.3.13 draw\_scaled()**

```
int Fl_Image::draw_scaled (
    int X,
    int Y,
    int W,
    int H ) [protected]
```

Draw the image to the current drawing surface rescaled to a given width and height.

Intended for internal use by the FLTK library.

**Parameters**

<i>X,Y</i>	position of the image's top-left
<i>W,H</i>	width and height for the drawn image

**Returns**

1

**Deprecated** Only for API compatibility with FLTK 1.3.4.

**33.71.3.14 fail()**

```
int Fl_Image::fail ( ) const
```

Returns a value that is not 0 if there is currently no image available.

Example use:

```
// [...]
Fl_Box box(X, Y, W, H);
Fl_JPEG_Image jpg("/tmp/foo.jpg");
switch (jpg.fail()) {
case Fl_Image::ERR_NO_IMAGE:
case Fl_Image::ERR_FILE_ACCESS:
    fl_alert("/tmp/foo.jpg: %s", strerror(errno)); // shows actual os error to user
    exit(1);
```

```

    case Fl_Image::ERR_FORMAT:
        fl_alert("/tmp/foo.jpg: couldn't decode image");
        exit(1);
    }
    box.image(jpg);

```

### Returns

Image load failure if non-zero

### Return values

<i>0</i>	the image was loaded successfully
<i>ERR_NO_IMAGE</i>	no image was found
<i>ERR_FILE_ACCESS</i>	there was a file access related error (errno should be set)
<i>ERR_FORMAT</i>	image decoding failed
<i>ERR_MEMORY_ACCESS</i>	image decoder tried to access memory outside of given memory block

### 33.71.3.15 h() [1/2]

```
int Fl_Image::h ( ) const [inline]
```

Returns the current image drawing height in FLTK units.

The values of [h\(\)](#) and [data\\_h\(\)](#) are identical unless [scale\(\)](#) has been called after which they may differ.

### 33.71.3.16 h() [2/2]

```
void Fl_Image::h (
    int H ) [inline], [protected]
```

Sets the height of the image data.

This protected function sets both image heights: the height of the image data returned by [data\\_h\(\)](#) and the image drawing height in FLTK units returned by [h\(\)](#).

### 33.71.3.17 inactive()

```
void Fl_Image::inactive ( ) [inline]
```

The [inactive\(\)](#) method calls [color\\_average\(FL\\_BACKGROUND\\_COLOR, 0.33f\)](#) to produce an image that appears grayed out.

An internal copy is made of the original image before changes are applied, to avoid modifying the original image.

### Note

The RGB color of [FL\\_BACKGROUND\\_COLOR](#) may change when the connection to the display is made. See [fl\\_open\\_display\(\)](#).

### 33.71.3.18 label() [1/2]

```
void Fl_Image::label (
    Fl_Menu_Item * m ) [virtual]
```

This method is an obsolete way to set the image attribute of a menu item.

**Deprecated** Please use [Fl\\_Menu\\_Item::image\(\)](#) instead.

Reimplemented in [Fl\\_Bitmap](#), [Fl\\_RGB\\_Image](#), and [Fl\\_Pixmap](#).

**33.71.3.19 label()** [2/2]

```
void Fl_Image::label (
    Fl_Widget * widget ) [virtual]
```

This method is an obsolete way to set the image attribute of a widget or menu item.

**Deprecated** Please use [Fl\\_Widget::image\(\)](#) or [Fl\\_Widget::deimage\(\)](#) instead.

Reimplemented in [Fl\\_Bitmap](#), [Fl\\_RGB\\_Image](#), and [Fl\\_Pixmap](#).

**33.71.3.20 ld()** [1/2]

```
int Fl_Image::ld ( ) const [inline]
```

Returns the current line data size in bytes.

See also

[ld\(int\)](#)

**33.71.3.21 ld()** [2/2]

```
void Fl_Image::ld (
    int LD ) [inline], [protected]
```

Sets the current line data size in bytes.

Color images may contain extra data (padding) that is included after every line of color image data and is normally not present.

If LD is zero, then line data size is assumed to be [data\\_w\(\)](#) \* [d\(\)](#) bytes.

If LD is non-zero, then it must be positive and larger than [data\\_w\(\)](#) \* [d\(\)](#) to account for the extra data per line.

**33.71.3.22 release()**

```
virtual void Fl_Image::release ( ) [inline], [virtual]
```

Releases an [Fl\\_Image](#) - the same as 'delete this'.

This virtual method is for almost all image classes the same as calling `delete image;`

where image is an [Fl\\_Image](#) \* pointer.

However, for subclass [Fl\\_Shared\\_Image](#) and its subclasses this virtual method is reimplemented and maintains shared images.

This virtual method makes it possible to destroy all image types in the same way by calling

```
image->release();
```

Reasoning: If you have an '[Fl\\_Image](#) \*' base class pointer and don't know if the object is one of the class [Fl\\_Shared\\_Image](#) or any other subclass of [Fl\\_Image](#) (for instance [Fl\\_RGB\\_Image](#)) then you can't just use operator delete since this is not appropriate for [Fl\\_Shared\\_Image](#) objects.

The virtual method [release\(\)](#) handles this properly.

Since

1.4.0 in the base class [Fl\\_Image](#) and virtual in [Fl\\_Shared\\_Image](#)

Reimplemented in [Fl\\_Shared\\_Image](#).

**33.71.3.23 RGB\_scaling()**

```
void Fl_Image::RGB_scaling (
    Fl_RGB_Scaling method ) [static]
```

Sets the RGB image scaling method used for copy(int, int).

Applies to all RGB images, defaults to FL\_RGB\_SCALING\_NEAREST.

### 33.71.3.24 scale()

```
void Fl_Image::scale (
    int width,
    int height,
    int proportional = 1,
    int can_expand = 0 ) [virtual]
```

Sets the drawing size of the image.

This function controls the values returned by member functions [w\(\)](#) and [h\(\)](#) which in turn control how the image is drawn: the full image data (whose size is given by [data\\_w\(\)](#) and [data\\_h\(\)](#)) are drawn scaled to an area of the drawing surface sized at [w\(\)](#) x [h\(\)](#) FLTK units. This can make a difference if the drawing surface has more than 1 pixel per FLTK unit because the image can be drawn at the full resolution of the drawing surface. Examples of such drawing surfaces: HiDPI displays, laser printers, PostScript files, PDF printers.

#### Parameters

<i>width,height</i>	maximum values, in FLTK units, that <a href="#">w()</a> and <a href="#">h()</a> should return
<i>proportional</i>	if not null, keep the values returned by <a href="#">w()</a> and <a href="#">h()</a> proportional to <a href="#">data_w()</a> and <a href="#">data_h()</a>
<i>can_expand</i>	if null, the values returned by <a href="#">w()</a> and <a href="#">h()</a> will not be larger than <a href="#">data_w()</a> and <a href="#">data_h()</a> , respectively

#### Note

This function generally changes the values returned by the [w\(\)](#) and [h\(\)](#) member functions. In contrast, the values returned by [data\\_w\(\)](#) and [data\\_h\(\)](#) remain unchanged.

#### Version

1.4 (1.3.4 and FL\_ABI\_VERSION for [Fl\\_Shared\\_Image](#) only)

Example code: scale an image to fit in a box

```
Fl_Box *b = ... // a box
Fl_Image *img = new Fl_PNG_Image("/path/to/picture.png"); // read a picture file
// set the drawing size of the image to the size of the box keeping its aspect ratio
img->scale(b->w(), b->h());
b->image(img); // use the image as the box image
```

### 33.71.3.25 scaling\_algorithm()

```
static void Fl_Image::scaling_algorithm (
    Fl_RGB_Scaling algorithm ) [inline], [static]
```

Sets what algorithm is used when resizing a source image to draw it.

The default algorithm is FL\_RGB\_SCALING\_BILINEAR. Drawing an [Fl\\_Image](#) is sometimes performed by first resizing the source image and then drawing the resized copy. This occurs, e.g., when drawing to screen under X11 without Xrender support after having called [scale\(\)](#). This function controls what method is used when the image to be resized is an [Fl\\_RGB\\_Image](#).

#### Version

1.4

### 33.71.3.26 uncache()

```
void Fl_Image::uncache ( ) [virtual]
```

If the image has been cached for display, delete the cache data.

This allows you to change the data used for the image and then redraw it without recreating an image object.

Reimplemented in [Fl\\_Anim\\_GIF\\_Image](#), [Fl\\_Bitmap](#), [Fl\\_RGB\\_Image](#), [Fl\\_Pixmap](#), and [Fl\\_Shared\\_Image](#).

**33.71.3.27 w()** [1/2]

```
int Fl_Image::w ( ) const [inline]
```

Returns the current image drawing width in FLTK units.

The values of [w\(\)](#) and [data\\_w\(\)](#) are identical unless [scale\(\)](#) has been called after which they may differ.

**33.71.3.28 w()** [2/2]

```
void Fl_Image::w (
    int W ) [inline], [protected]
```

Sets the width of the image data.

This protected function sets both image widths: the width of the image data returned by [data\\_w\(\)](#) and the image drawing width in FLTK units returned by [w\(\)](#).

The documentation for this class was generated from the following files:

- [Fl\\_Image.H](#)
- [Fl\\_Image.cxx](#)

**33.72 Fl\_Image\_Reader Class Reference****Public Member Functions**

- int **error** () const
- const char \* **name** () const
- int **open** (const char \*filename)
- int **open** (const char \*imagename, const unsigned char \*data)
- int **open** (const char \*imagename, const unsigned char \*data, const size\_t datasize)
- unsigned char **read\_byte** ()
- unsigned int **read\_dword** ()
- int **read\_long** ()
- unsigned short **read\_word** ()
- void **seek** (unsigned int n)
- void **skip** (unsigned int n)
- long **tell** () const

The documentation for this class was generated from the following files:

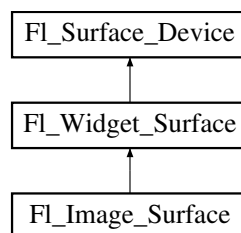
- [Fl\\_Image\\_Reader.h](#)
- [Fl\\_Image\\_Reader.cxx](#)

**33.73 Fl\_Image\_Surface Class Reference**

Directs all graphics requests to an [Fl\\_Image](#).

```
#include <Fl_Image_Surface.H>
```

Inheritance diagram for [Fl\\_Image\\_Surface](#):



## Public Member Functions

- [Fl\\_Image\\_Surface](#) (int w, int h, int high\_res=0, [Fl\\_Offscreen](#) off=0)  
*Constructor with optional high resolution.*
- [Fl\\_Shared\\_Image](#) \* [highres\\_image](#) ()  
*Returns a possibly high resolution image made of all drawings sent to the [Fl\\_Image\\_Surface](#) object.*
- [Fl\\_RGB\\_Image](#) \* [image](#) ()  
*Returns a depth-3 image made of all drawings sent to the [Fl\\_Image\\_Surface](#) object.*
- bool [is\\_current](#) () [FL\\_OVERRIDE](#)  
*Is this surface the current drawing surface?*
- void [mask](#) (const [Fl\\_RGB\\_Image](#) \*)  
*Defines a mask applied to drawings made after use of this function.*
- [Fl\\_Offscreen](#) [offscreen](#) ()  
*Returns the [Fl\\_Offscreen](#) object associated to the image surface.*
- void [origin](#) (int \*x, int \*y) [FL\\_OVERRIDE](#)  
*Computes the coordinates of the current origin of graphics functions.*
- void [origin](#) (int x, int y) [FL\\_OVERRIDE](#)  
*Sets the position of the origin of graphics in the drawable part of the drawing surface.*
- int [printable\\_rect](#) (int \*w, int \*h) [FL\\_OVERRIDE](#)  
*Computes the width and height of the drawable area of the drawing surface.*
- void [rescale](#) ()  
*Adapts the [Fl\\_Image\\_Surface](#) object to the new value of the GUI scale factor.*
- void [set\\_current](#) () [FL\\_OVERRIDE](#)  
*Make this surface the current drawing surface.*
- ~[Fl\\_Image\\_Surface](#) ()  
*The destructor.*

## Protected Member Functions

- void [translate](#) (int x, int y) [FL\\_OVERRIDE](#)  
*Translates the current graphics origin accounting for the current rotation.*
- void [untranslate](#) () [FL\\_OVERRIDE](#)  
*Undoes the effect of a previous [translate\(\)](#) call.*

## Friends

- class [Fl\\_Graphics\\_Driver](#)

## Additional Inherited Members

### 33.73.1 Detailed Description

Directs all graphics requests to an [Fl\\_Image](#).

After creation of an [Fl\\_Image\\_Surface](#) object, make it the current drawing surface calling [Fl\\_Surface\\_Device::push\\_current\(\)](#), and all subsequent graphics requests will be recorded in the image. It's possible to draw widgets (using [Fl\\_Image\\_Surface::draw\(\)](#)) or to use any of the [Drawing functions](#) or the [Color & Font functions](#). Finally, call [image\(\)](#) on the object to obtain a newly allocated [Fl\\_RGB\\_Image](#) object. [Fl\\_Gl\\_Window](#) objects can be drawn in the image as well.

Usage example:

```
// this is the widget that you want to draw into an image
Fl_Widget *g = ...;
// create an Fl_Image_Surface object
Fl_Image_Surface *image_surface = new Fl_Image_Surface(g->w(), g->h());
// direct all further graphics requests to the image
Fl_Surface_Device::push_current(image_surface);
// draw a white background
fl_color(FL_WHITE);
fl_rectf(0, 0, g->w(), g->h());
```

```
// draw the g widget in the image
image_surface->draw(g);
// get the resulting image
Fl_RGB_Image* image = image_surface->image();
// direct graphics requests back to their previous destination
Fl_Surface_Device::pop_current();
// delete the image_surface object, but not the image itself
delete image_surface;
```

## 33.73.2 Constructor & Destructor Documentation

### 33.73.2.1 Fl\_Image\_Surface()

```
Fl_Image_Surface::Fl_Image_Surface (
    int w,
    int h,
    int high_res = 0,
    Fl_Offscreen off = 0 )
```

Constructor with optional high resolution.

#### Parameters

<i>w,h</i>	Width and height of the resulting image. The value of the <code>high_res</code> parameter controls whether <code>w</code> and <code>h</code> are interpreted as pixels or FLTK units.
<i>high_res</i>	If zero, the created image surface is sized at <code>w</code> x <code>h</code> pixels. If non-zero, the pixel size of the created image surface depends on the value of the display scale factor (see <a href="#">Fl::screen_scale(int)</a> ): the resulting image has the same number of pixels as an area of the display of size <code>w</code> x <code>h</code> expressed in FLTK units.
<i>off</i>	If not null, the image surface is constructed around a pre-existing <code>Fl_Offscreen</code> . The caller is responsible for both construction and destruction of this <code>Fl_Offscreen</code> object. Is mostly intended for internal use by FLTK.

#### Version

1.3.4 (1.3.3 without the `highres` parameter)

## 33.73.3 Member Function Documentation

### 33.73.3.1 highres\_image()

```
Fl_Shared_Image * Fl_Image_Surface::highres_image ( )
```

Returns a possibly high resolution image made of all drawings sent to the [Fl\\_Image\\_Surface](#) object.

The [Fl\\_Image\\_Surface](#) object should have been constructed with [Fl\\_Image\\_Surface\(W, H, 1\)](#). The returned [Fl\\_Shared\\_Image](#) object is scaled to a size of `W`x`H` FLTK units and may have a pixel size larger than these values. The returned object should be deallocated with [Fl\\_Shared\\_Image::release\(\)](#) after use.

**Deprecated** Use [image\(\)](#) instead.

#### Version

1.4 (1.3.4 for MacOS platform only)

### 33.73.3.2 image()

```
Fl_RGB_Image * Fl_Image_Surface::image ( )
```

Returns a depth-3 image made of all drawings sent to the [Fl\\_Image\\_Surface](#) object.

The returned object contains its own copy of the RGB data; the caller is responsible for deleting it.

See also

`Fl_Image_Surface::mask(Fl_RGB_Image*)`

### 33.73.3.3 is\_current()

```
bool Fl_Image_Surface::is_current ( ) [virtual]
```

Is this surface the current drawing surface?

Reimplemented from [Fl\\_Surface\\_Device](#).

### 33.73.3.4 mask()

```
void Fl_Image_Surface::mask (
    const Fl_RGB_Image * mask )
```

Defines a mask applied to drawings made after use of this function.

The mask is an [Fl\\_RGB\\_Image](#) made of a white scene drawn on a solid black background; the drawable part of the image surface is reduced to the white areas of the mask after this member function gets called. If necessary, the `mask` image is internally replaced by a copy resized to the surface's pixel size. Overall, the image returned by [Fl\\_Image\\_Surface::image\(\)](#) contains all drawings made until the `mask()` method assigned a mask, at which point subsequent drawing operations to the image surface were passed through the white areas of the mask. On some platforms, shades of gray in the mask image control the blending of foreground and background pixels; mask pixels closer in color to white produce image pixels closer to the image surface pixel, those closer to black produce image pixels closer to what the image surface pixel was before the call to `mask()`.

The mask is easily constructed using an [Fl\\_Image\\_Surface](#) object, drawing white areas on a black background there, and calling [Fl\\_Image\\_Surface::image\(\)](#).

#### Parameters

<i>mask</i>	A depth-3 image determining the drawable areas of the image surface. The <code>mask</code> object is not used after return from this member function.
-------------	---

#### Note

- The image surface must not be the current drawing surface when this function gets called.
- The mask can have any size but is best when it has the size of the image surface.
- It's possible to use several masks in succession on the same image surface provided member function [Fl\\_Image\\_Surface::image\(\)](#) is called between successive calls to [Fl\\_Image\\_Surface::mask\(const Fl\\_RGB\\_Image\\*\)](#).

Example of procedure to construct a masked image:

```
int W = ..., H = ...; // width and height of the image under construction
Fl_Image_Surface *surf = new Fl_Image_Surface(W, H, 1);
// first, construct the mask
Fl_Surface_Device::push_current(surf);
fl_color(FL_BLACK); // draw a black background
fl_rectf(0, 0, W, H);
fl_color(FL_WHITE); // next, draw in white what the mask should not filter out
fl_pie(0, 0, W, H, 0, 360); // here, an ellipse with axes lengths WxH
Fl_RGB_Image *mask = surf->image(); // get the mask
// second, draw the image background
fl_color(FL_YELLOW); // here, draw a yellow background
fl_rectf(0, 0, W, H);
// third, apply the mask
Fl_Surface_Device::pop_current();
surf->mask(mask);
delete mask; // the mask image can be safely deleted at this point
Fl_Surface_Device::push_current(surf);
// fourth, draw the image foreground, part of which will be filtered out by the mask
surf->draw(widget, 0, 0); // here the foreground is a drawn widget
// fifth, get the final result, masked_image, as a depth-3 Fl_RGB_Image
Fl_RGB_Image *masked_image = surf->image();
// Only the part of the foreground, here a drawn widget, that has not been
// filtered out by the mask, here the white ellipse, is in masked_image;
// the background, here solid yellow, shows up in the remaining areas of masked_image.
Fl_Surface_Device::pop_current();
delete surf;
```

Since

1.4.0

### 33.73.3.5 offscreen()

```
Fl_Offscreen Fl_Image_Surface::offscreen ( )
```

Returns the Fl\_Offscreen object associated to the image surface.

The returned Fl\_Offscreen object is deleted when the [Fl\\_Image\\_Surface](#) object is deleted, unless the [Fl\\_Image\\_Surface](#) was constructed with non-null Fl\_Offscreen argument.

### 33.73.3.6 origin() [1/2]

```
void Fl_Image_Surface::origin (
    int * x,
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

Parameters

out	x,y	If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.
-----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.73.3.7 origin() [2/2]

```
void Fl_Image_Surface::origin (
    int x,
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous [printable\\_rect\(\)](#) call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive [origin\(\)](#) calls don't combine their effects. Origin() calls are not affected by [rotate\(\)](#) calls (for classes derived from [Fl\\_Paged\\_Device](#)).

Parameters

in	x,y	Horizontal and vertical positions in the drawing surface of the desired origin of graphics.
----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.73.3.8 printable\_rect()

```
int Fl_Image_Surface::printable_rect (
    int * w,
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to [origin\(\)](#). If the object is derived from class [Fl\\_Paged\\_Device](#), values account for the user-selected paper type and print orientation and are changed by [scale\(\)](#) calls.

Returns

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.73.3.9 rescale()**

```
void Fl_Image_Surface::rescale ( )
```

Adapts the [Fl\\_Image\\_Surface](#) object to the new value of the GUI scale factor.

The [Fl\\_Image\\_Surface](#) object must not be the current drawing surface. This function is useful only for an object constructed with non-zero `high_res` parameter.

Version

1.4

**33.73.3.10 set\_current()**

```
void Fl_Image_Surface::set_current (
    void ) [virtual]
```

Make this surface the current drawing surface.

This surface will receive all future graphics requests.

Since FLTK 1.4.0 the preferred API to change the current drawing surface is [Fl\\_Surface\\_Device::push\\_current\(\)](#) / [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

Note

It is recommended to use this function only as follows :

- The current drawing surface is the display;
- make current another surface, e.g., an [Fl\\_Printer](#) or an [Fl\\_Image\\_Surface](#) object, calling [set\\_current\(\)](#) on this object;
- draw to that surface;
- make the display current again with [Fl\\_Display\\_Device::display\\_device\(\)->set\\_current\(\)](#);  
don't do any other call to [set\\_current\(\)](#) before this one.

Other scenarios of drawing surface changes should be performed via [Fl\\_Surface\\_Device::push\\_current\(\)](#) and [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

Reimplemented from [Fl\\_Surface\\_Device](#).

**33.73.3.11 translate()**

```
void Fl_Image_Surface::translate (
    int x,
    int y ) [protected], [virtual]
```

Translates the current graphics origin accounting for the current rotation.

Each [translate\(\)](#) call must be matched by an [untranslate\(\)](#) call. Successive [translate\(\)](#) calls add up their effects.

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.73.3.12 untranslate()**

```
void Fl_Image_Surface::untranslate (
    void ) [protected], [virtual]
```

Undoes the effect of a previous [translate\(\)](#) call.

Reimplemented from [Fl\\_Widget\\_Surface](#).

The documentation for this class was generated from the following files:

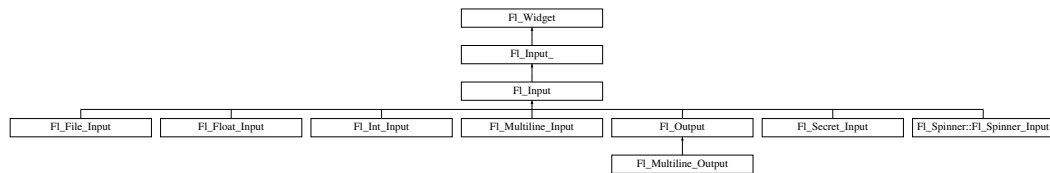
- [Fl\\_Image\\_Surface.H](#)
- [Fl\\_Image\\_Surface.cxx](#)

## 33.74 FI\_Input Class Reference

This is the FLTK text input widget.

```
#include <Fl_Input.H>
```

Inheritance diagram for FI\_Input:



### Public Member Functions

- [FI\\_Input](#) (int, int, int, int, const char \*=0)  
*Creates a new [FI\\_Input](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*

### Static Public Attributes

- static const char \* **copy\_menu\_text** = "Copy"  
*[this text may be customized at run-time]*
- static const char \* **cut\_menu\_text** = "Cut"  
*[this text may be customized at run-time]*
- static const char \* **paste\_menu\_text** = "Paste"  
*[this text may be customized at run-time]*

### Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*
- int [handle\\_key](#) ()  
*Handles a keystroke.*
- int [handle\\_rmb](#) ()  
*Handle right mouse button down events.*

### Friends

- class **FI\_Cocoa\_Screen\_Driver**
- class **FI\_Screen\_Driver**

### Additional Inherited Members

#### 33.74.1 Detailed Description

This is the FLTK text input widget.

It displays a single line of text and lets the user edit it. Normally it is drawn with an inset box and a white background. The text may contain any characters, and will correctly display any UTF text, using ^X notation for unprintable control characters. It assumes the font can draw any characters of the used scripts, which is true for standard fonts under Windows and Mac OS X. Characters can be input using the keyboard or the character palette/map. Character composition is done using dead keys and/or a compose key as defined by the operating system.

**Table 33.304 Keyboard and mouse bindings.**

<b>Mouse button 1</b>	Moves the cursor to this point. Drag selects characters. Double click selects words. Triple click selects all line. Shift+click extends the selection. When you select text it is automatically copied to the selection buffer.
<b>Mouse button 2</b>	Insert the selection buffer at the point clicked. You can also select a region and replace it with the selection buffer by selecting the region with mouse button 2.
<b>Mouse button 3</b>	Currently acts like button 1.
<b>Backspace</b>	Deletes one character to the left, or deletes the selected region.
<b>Delete</b>	Deletes one character to the right, or deletes the selected region. Combine with Shift for equivalent of ^X (copy+cut).
<b>Enter</b>	May cause the callback, see <a href="#">when()</a> .

Table 33.305 Platform specific keyboard bindings.

Windows/Linux	Mac	Function
<b>^A</b>	<b>Command-A</b>	<b>Selects all text in the widget.</b>
<b>^C</b>	<b>Command-C</b>	<b>Copy the current selection to the clipboard.</b>
<b>^I</b>	<b>^I</b>	<b>Insert a tab.</b>
<b>^J</b>	<b>^J</b>	<b>Insert a Line Feed.</b> (Similar to literal 'Enter' character)
<b>^L</b>	<b>^L</b>	<b>Insert a Form Feed.</b>
<b>^M</b>	<b>^M</b>	<b>Insert a Carriage Return.</b>
<b>^V, Shift-Insert</b>	<b>Command-V</b>	<b>Paste the clipboard.</b> (Macs keyboards don't have "Insert" keys, but if they did, Shift-Insert would work)
<b>^X, Shift-Delete</b>	<b>Command-X, Shift-Delete</b>	<b>Cut.</b> Copy the selection to the clipboard and delete it. (If there's no selection, Shift-Delete acts like Delete)
<b>^Z</b>	<b>Command-Z</b>	<b>Undo.</b> This is a single-level undo mechanism, but all adjacent deletions and insertions are concatenated into a single "undo". Often this will undo a lot more than you expected.
<b>Shift-^Z</b>	<b>Shift-Command-Z</b>	<b>Redo.</b> Currently same behavior as ^Z. Reserved for future multilevel undo/redo.
<b>Arrow Keys</b>	<b>Arrow Keys</b>	<b>Standard cursor movement.</b> Can be combined with Shift to extend selection.
<b>Home</b>	<b>Command-Up, Command-Left</b>	<b>Move to start of line.</b> Can be combined with Shift to extend selection.
<b>End</b>	<b>Command-Down, Command-Right</b>	<b>Move to end of line.</b> Can be combined with Shift to extend selection.
<b>Ctrl-Home</b>	<b>Command-Up, Command-PgUp, Ctrl-Left</b>	<b>Move to top of document/field.</b> In single line input, moves to start of line. In multiline input, moves to start of top line. Can be combined with Shift to extend selection.

<b>Ctrl-End</b>	<b>Command-End, Command-PgDn, Ctrl-Right</b>	<b>Move to bottom of document/field.</b> In single line input, moves to end of line. In multiline input, moves to end of last line. Can be combined with Shift to extend selection.
<b>Ctrl-Left</b>	<b>Alt-Left</b>	<b>Word left.</b> Can be combined with Shift to extend selection.
<b>Ctrl-Right</b>	<b>Alt-Right</b>	<b>Word right.</b> Can be combined with Shift to extend selection.
<b>Ctrl-Backspace</b>	<b>Alt-Backspace</b>	<b>Delete word left.</b>
<b>Ctrl-Delete</b>	<b>Alt-Delete</b>	<b>Delete word right.</b>

## 33.74.2 Constructor & Destructor Documentation

### 33.74.2.1 Fl\_Input()

```
Fl_Input::Fl_Input (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Input](#) widget using the given position, size, and label string. The default boxtype is FL\_DOWN\_BOX.

## 33.74.3 Member Function Documentation

### 33.74.3.1 draw()

```
void Fl_Input::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.74.3.2 handle()

```
int Fl_Input::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses)

in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

<code>in</code>	<code>event</code>	the kind of event received
-----------------	--------------------	----------------------------

#### Return values

<code>0</code>	if the event was not used or understood
<code>1</code>	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Spinner::Fl\\_Spinner\\_Input](#), and [Fl\\_Secret\\_Input](#).

### 33.74.3.3 `handle_key()`

```
int Fl_Input::handle_key ( ) [protected]
```

Handles a keystroke.

This `protected` method handles a keystroke in an [Fl\\_Input](#) or derived class. It handles compose key sequences and can also be used e.g. in [Fl\\_Multiline\\_Input](#), [Fl\\_Float\\_Input](#) and several more derived classes.

The method first checks in [Fl::compose](#) if the keystroke is a text entry or a control key. If it is text, the method inserts the composed characters into the input field, taking into account the input type (e.g., numeric fields).

If the keystroke is a control key as determined by [Fl::compose](#), the method handles key combinations for Insert, Enter, and Tab depending on the widget's [input\\_type\(\)](#).

The method then checks for Ctrl key combinations, such as Ctrl-A, Ctrl-C, Ctrl-V, Ctrl-X, and Ctrl-Z, which are commonly used for select all, copy, paste, cut, and undo operations.

Finally, the method checks for ASCII control characters, such as Ctrl-H, Ctrl-I, Ctrl-J, Ctrl-L, and Ctrl-M, which can be used to insert literal control characters into the input field.

If none of the above cases match, the method returns 0, indicating that the keystroke was not handled.

#### Returns

1 if the keystroke is handled by us, 0 if not.

### 33.74.3.4 `handle_rmb()`

```
int Fl_Input::handle_rmb ( ) [protected]
```

Handle right mouse button down events.

#### Returns

1

The documentation for this class was generated from the following files:

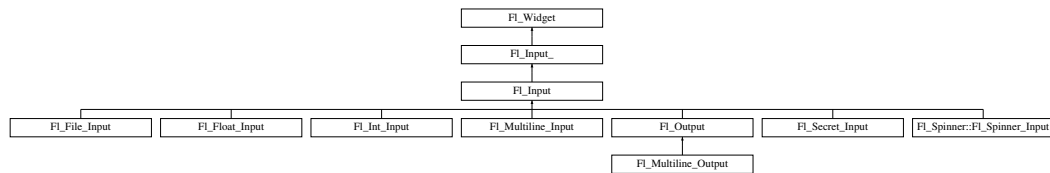
- [Fl\\_Input.H](#)
- [Fl\\_Input.cxx](#)

## 33.75 Fl\_Input\_ Class Reference

This class provides a low-overhead text input field.

```
#include <Fl_Input_.H>
```

Inheritance diagram for Fl\_Input\_:



### Public Member Functions

- int [append](#) (const char \*t, int l=0, char keep\_selection=0)  
*Append text at the end.*
- bool [can\\_redo](#) () const  
*Check if there is a redo action available.*
- bool [can\\_undo](#) () const  
*Check if the last operation can be undone.*
- int [copy](#) (int clipboard)  
*Put the current selection into the clipboard.*
- int [copy\\_cuts](#) ()  
*Copies the yank buffer to the clipboard.*
- [Fl\\_Color](#) [cursor\\_color](#) () const  
*Gets the color of the cursor.*
- void [cursor\\_color](#) ([Fl\\_Color](#) n)  
*Sets the color of the cursor.*
- int [cut](#) ()  
*Deletes the current selection.*
- int [cut](#) (int a, int b)  
*Deletes all characters between index a and b.*
- int [cut](#) (int n)  
*Deletes the next n bytes rounded to characters before or after the cursor.*
- double [dvalue](#) () const  
*Returns the widget text interpreted as a floating point number.*
- [Fl\\_Input\\_](#) (int, int, int, int, const char \*s=0)  
*Creates a new [Fl\\_Input\\_](#) widget.*
- unsigned int [index](#) (int i) const  
*Returns the character at index i.*
- int [input\\_type](#) () const  
*Gets the input field type.*
- void [input\\_type](#) (int t)  
*Sets the input field type.*
- int [insert](#) (const char \*t, int l=0)  
*Inserts text at the cursor position.*
- int [insert\\_position](#) () const  
*Gets the position of the text cursor.*
- int [insert\\_position](#) (int p)  
*Sets the cursor position and mark.*
- int [insert\\_position](#) (int p, int m)

- Sets the index for the cursor and mark.*

  - int `ivalue` () const
- Returns the widget text interpreted as a signed integer.*

  - int `mark` () const
- Gets the current selection mark.*

  - int `mark` (int m)
- Sets the current selection mark.*

  - int `maximum_size` () const
- Gets the maximum length of the input field in characters.*

  - void `maximum_size` (int m)
- Sets the maximum length of the input field in characters.*

  - int `position` () const
  - int `position` (int p)
  - int `position` (int p, int m)
  - int `readonly` () const
- Gets the read-only state of the input field.*

  - void `readonly` (int b)
- Sets the read-only state of the input field.*

  - int `redo` ()
- Redo previous undo operation.*

  - int `replace` (int b, int e, const char \*text, int llen=0)
- Deletes text from b to e and inserts the new string text.*

  - void `resize` (int, int, int, int) `FL_OVERRIDE`
- Changes the size of the widget.*

  - int `shortcut` () const
- Return the shortcut key associated with this widget.*

  - void `shortcut` (int s)
- Sets the shortcut key associated with this widget.*

  - int `size` () const
- Returns the number of bytes in value().*

  - void `size` (int W, int H)
- Sets the width and height of this widget.*

  - int `static_value` (const char \*)
- Changes the widget text.*

  - int `static_value` (const char \*, int)
- Changes the widget text.*

  - int `tab_nav` () const
- Gets whether the Tab key causes focus navigation in multiline input fields or not.*

  - void `tab_nav` (int val)
- Sets whether the Tab key does focus navigation, or inserts tab characters into `FL_Multiline_Input`.*

  - `FL_Color` `textcolor` () const
- Gets the color of the text in the input field.*

  - void `textcolor` (`FL_Color` n)
- Sets the color of the text in the input field.*

  - `FL_Font` `textfont` () const
- Gets the font of the text in the input field.*

  - void `textfont` (`FL_Font` s)
- Sets the font of the text in the input field.*

  - `FL_Fontsize` `textsize` () const
- Gets the size of the text in the input field.*

  - void `textsize` (`FL_Fontsize` s)

- *Sets the size of the text in the input field.*
- int `undo` ()
- *Undoes previous changes to the text buffer.*
- const char \* `value` () const
- *Returns the text displayed in the widget.*
- int `value` (const char \*)
- *Changes the widget text.*
- int `value` (const char \*, int)
- *Changes the widget text.*
- int `value` (double value)
- *Changes the widget text to a floating point number ("%g").*
- int `value` (int value)
- *Changes the widget text to a signed integer number.*
- int `wrap` () const
- *Gets the word wrapping state of the input field.*
- void `wrap` (int b)
- *Sets the word wrapping state of the input field.*
- ~`Fl_Input_` ()
- *Destroys the widget.*

## Protected Member Functions

- int `apply_undo` ()
- *Apply the current undo/redo operation.*
- void `drawtext` (int, int, int, int)
- *Draws the text in the passed bounding box.*
- void `drawtext` (int, int, int, int, bool draw\_active)
- *Draws the text in the passed bounding box.*
- void `handle_mouse` (int, int, int, int, int keepmark=0)
- *Handles mouse clicks and mouse moves.*
- int `handletext` (int e, int, int, int, int)
- *Handles all kinds of text field related events.*
- int `line_end` (int i) const
- *Finds the end of a line.*
- int `line_start` (int i) const
- *Finds the start of a line.*
- int `linesPerPage` ()
- void `maybe_do_callback` (`Fl_Callback_Reason` reason=`FL_REASON_UNKNOWN`)
- int `up_down_position` (int, int keepmark=0)
- *Moves the cursor to the column given by `up_down_pos`.*
- int `word_end` (int i) const
- *Finds the end of a word.*
- int `word_start` (int i) const
- *Finds the start of a word.*
- int `xscroll` () const
- int `yscroll` () const
- void `yscroll` (int yOffset)

## Additional Inherited Members

### 33.75.1 Detailed Description

This class provides a low-overhead text input field.

This is a virtual base class below [Fl\\_Input](#). It has all the same interfaces, but lacks the [handle\(\)](#) and [draw\(\)](#) method. You may want to subclass it if you are one of those people who likes to change how the editing keys work. It may also be useful for adding scrollbars to the input field.

This can act like any of the subclasses of [Fl\\_Input](#), by setting [type\(\)](#) to one of the following values:

```
#define FL_NORMAL_INPUT      0
#define FL_FLOAT_INPUT       1
#define FL_INT_INPUT         2
#define FL_MULTILINE_INPUT   4
#define FL_SECRET_INPUT      5
#define FL_INPUT_TYPE        7
#define FL_INPUT_READONLY    8
#define FL_NORMAL_OUTPUT     (FL_NORMAL_INPUT | FL_INPUT_READONLY)
#define FL_MULTILINE_OUTPUT  (FL_MULTILINE_INPUT | FL_INPUT_READONLY)
#define FL_INPUT_WRAP        16
#define FL_MULTILINE_INPUT_WRAP (FL_MULTILINE_INPUT | FL_INPUT_WRAP)
#define FL_MULTILINE_OUTPUT_WRAP (FL_MULTILINE_INPUT | FL_INPUT_READONLY | FL_INPUT_WRAP)
```

All variables that represent an index into a text buffer are byte-oriented, not character oriented, counting from 0 (at or before the first character) to [size\(\)](#) (at the end of the buffer, after the last byte). Since UTF-8 characters can be up to six bytes long, simply incrementing such an index will not reliably advance to the next character in the text buffer. Indices and pointers into the text buffer should always point at a 7 bit ASCII character or the beginning of a UTF-8 character sequence. Behavior for false UTF-8 sequences and pointers into the middle of a sequence are undefined.

See also

[Fl\\_Text\\_Display](#), [Fl\\_Text\\_Editor](#) for more powerful text handling widgets

[Fl\\_Widget::shortcut\\_label\(int\)](#)

### 33.75.2 Constructor & Destructor Documentation

#### 33.75.2.1 [Fl\\_Input\\_\(\)](#)

```
Fl_Input_::Fl_Input_ (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Input\\_](#) widget.

This function creates a new [Fl\\_Input\\_](#) widget and adds it to the current [Fl\\_Group](#). The [value\(\)](#) is set to `NULL`. The default boxtype is `FL_DOWN_BOX`.

Parameters

<i>X,Y,W,H</i>	the dimensions of the new widget
<i>l</i>	an optional label text

#### 33.75.2.2 [~Fl\\_Input\\_\(\)](#)

```
Fl_Input_::~~Fl_Input_ ( )
```

Destroys the widget.

The destructor clears all allocated buffers and removes the widget from the parent [Fl\\_Group](#).

### 33.75.3 Member Function Documentation

### 33.75.3.1 append()

```
int Fl_Input_::append (
    const char * t,
    int l = 0,
    char keep_selection = 0 )
```

Append text at the end.

This function appends the string in `t` to the end of the text. It does not moves the new position or mark.

#### Parameters

in	<i>t</i>	text that will be appended
in	<i>l</i>	length of text, or 0 if the string is terminated by <code>nul</code> .
in	<i>keep_selection</i>	if this is 1, the current text selection will remain, if 0, the cursor will move to the end of the inserted text.

#### Returns

0 if no text was appended

### 33.75.3.2 apply\_undo()

```
int Fl_Input_::apply_undo ( ) [protected]
```

Apply the current undo/redo operation.

It's up to [undo\(\)](#) and [redo\(\)](#) to push and pop actions to and from the lists.

#### Returns

1 if the current action changed any text.

#### See also

[undo\(\)](#), [redo\(\)](#)

### 33.75.3.3 can\_redo()

```
bool Fl_Input_::can_redo ( ) const
```

Check if there is a redo action available.

#### Returns

true if the widget can redo the last undo action

### 33.75.3.4 can\_undo()

```
bool Fl_Input_::can_undo ( ) const
```

Check if the last operation can be undone.

#### Returns

true if the widget can undo the last change

**33.75.3.5 copy()**

```
int Fl_Input_::copy (
    int clipboard )
```

Put the current selection into the clipboard.

This function copies the current selection between [mark\(\)](#) and [position\(\)](#) into the specified `clipboard`. This does not replace the old clipboard contents if [position\(\)](#) and [mark\(\)](#) are equal. Clipboard 0 maps to the current text selection and clipboard 1 maps to the cut/paste clipboard.

**Parameters**

<i>clipboard</i>	the clipboard destination 0 or 1
------------------	----------------------------------

**Returns**

0 if no text is selected, 1 if the selection was copied

**See also**

`Fl::copy(const char *, int, int)`

**33.75.3.6 copy\_cuts()**

```
int Fl_Input_::copy_cuts ( )
```

Copies the *yank* buffer to the clipboard.

This method copies all the previous contiguous cuts from the undo information to the clipboard. This function implements the <sup>^</sup>K shortcut key.

**Returns**

0 if the operation did not change the clipboard

**See also**

[copy\(int\)](#), [cut\(\)](#)

**33.75.3.7 cursor\_color()** [1/2]

```
Fl_Color Fl_Input_::cursor_color ( ) const [inline]
```

Gets the color of the cursor.

**Returns**

the current cursor color

**33.75.3.8 cursor\_color()** [2/2]

```
void Fl_Input_::cursor_color (
    Fl_Color n ) [inline]
```

Sets the color of the cursor.

The default color for the cursor is `FL_BLACK`.

**Parameters**

<i>in</i>	<i>n</i>	the new cursor color
-----------	----------	----------------------

**33.75.3.9 cut()** [1/3]

```
int Fl_Input_::cut ( ) [inline]
```

Deletes the current selection.

This function deletes the currently selected text *without* storing it in the clipboard. To use the clipboard, you may call [copy\(\)](#) first or [copy\\_cuts\(\)](#) after this call.

**Returns**

0 if no data was copied

**33.75.3.10 cut()** [2/3]

```
int Fl_Input_::cut (
    int a,
    int b ) [inline]
```

Deletes all characters between index *a* and *b*.

This function deletes the currently selected text *without* storing it in the clipboard. To use the clipboard, you may call [copy\(\)](#) first or [copy\\_cuts\(\)](#) after this call.

**Parameters**

<i>a,b</i>	range of bytes rounded to full characters and clamped to the buffer
------------	---

**Returns**

0 if no data was copied

**33.75.3.11 cut()** [3/3]

```
int Fl_Input_::cut (
    int n ) [inline]
```

Deletes the next *n* bytes rounded to characters before or after the cursor.

This function deletes the currently selected text *without* storing it in the clipboard. To use the clipboard, you may call [copy\(\)](#) first or [copy\\_cuts\(\)](#) after this call.

**Parameters**

<i>n</i>	number of bytes rounded to full characters and clamped to the buffer. A negative number will cut characters to the left of the cursor.
----------	--

**Returns**

0 if no data was copied

**33.75.3.12 drawtext()** [1/2]

```
void Fl_Input_::drawtext (
    int X,
    int Y,
    int W,
    int H ) [protected]
```

Draws the text in the passed bounding box.

If `damage()` & `FL_DAMAGE_ALL` is true, this assumes the area has already been erased to `color()`. Otherwise it does minimal update and erases the area itself.

#### Parameters

<code>X,Y,W,H</code>	area that must be redrawn
----------------------	---------------------------

### 33.75.3.13 `drawtext()` [2/2]

```
void Fl_Input_::drawtext (
    int X,
    int Y,
    int W,
    int H,
    bool draw_active ) [protected]
```

Draws the text in the passed bounding box.

This version of `drawtext` allows the user to control whether the widget is drawn as active, i.e. with the text cursor, or inactive. This is useful for compound widgets where the input should be shown as active when actually the container widget is the active one.

A caller should not draw the widget with `active` set if another text widget may indeed be the active widget.

#### Parameters

<code>X,Y,W,H</code>	area that must be redrawn
<code>draw_active</code>	if set, the cursor will be drawn, even if the widget is not active

#### See also

[Fl\\_Input\\_::drawtext\(int X, int Y, int W, int H\)](#)

### 33.75.3.14 `dvalue()`

```
double Fl_Input_::dvalue ( ) const
```

Returns the widget text interpreted as a floating point number.

#### Returns

double precision floating point value

#### See also

[Fl\\_Input\\_::ivalue\(\)](#)

[Fl\\_Input\\_::value\(double\)](#)

### 33.75.3.15 `handle_mouse()`

```
void Fl_Input_::handle_mouse (
    int X,
    int Y,
    int ,
    int ,
    int drag = 0 ) [protected]
```

Handles mouse clicks and mouse moves.

**Todo** Add comment and parameters

### 33.75.3.16 handletext()

```
int Fl_Input_::handletext (
    int event,
    int X,
    int Y,
    int W,
    int H ) [protected]
```

Handles all kinds of text field related events.

This is called by derived classes.

**Todo** Add comment and parameters

### 33.75.3.17 index()

```
unsigned int Fl_Input_::index (
    int i ) const
```

Returns the character at index *i*.

This function returns the UTF-8 character at *i* as a ucs4 character code.

#### Parameters

in	<i>i</i>	index into the value field
----	----------	----------------------------

#### Returns

the character at index *i*

### 33.75.3.18 input\_type() [1/2]

```
int Fl_Input_::input_type ( ) const [inline]
```

Gets the input field type.

#### Returns

the current input type

### 33.75.3.19 input\_type() [2/2]

```
void Fl_Input_::input_type (
    int t ) [inline]
```

Sets the input field type.

A [redraw\(\)](#) is required to reformat the input field.

#### Parameters

in	<i>t</i>	new input type
----	----------	----------------

**33.75.3.20 insert()**

```
int Fl_Input_::insert (
    const char * t,
    int l = 0 ) [inline]
```

Inserts text at the cursor position.

This function inserts the string in `t` at the cursor [position\(\)](#) and moves the new position and mark to the end of the inserted text.

**Parameters**

in	<i>t</i>	text that will be inserted
in	<i>l</i>	length of text, or 0 if the string is terminated by nul.

**Returns**

0 if no text was inserted

**33.75.3.21 insert\_position() [1/3]**

```
int Fl_Input_::insert_position ( ) const [inline]
```

Gets the position of the text cursor.

**Returns**

the cursor position as an index in the range 0..[size\(\)](#)

**See also**

[insert\\_position\(int, int\)](#)

**33.75.3.22 insert\_position() [2/3]**

```
int Fl_Input_::insert_position (
    int p ) [inline]
```

Sets the cursor position and mark.

`position(n)` is the same as `position(n, n)`.

**Parameters**

<i>p</i>	new index for cursor and mark
----------	-------------------------------

**Returns**

0 if no positions changed

**See also**

[insert\\_position\(int, int\)](#), [insert\\_position\(\)](#), [mark\(int\)](#)

**33.75.3.23 insert\_position() [3/3]**

```
int Fl_Input_::insert_position (
    int p,
    int m )
```

Sets the index for the cursor and mark.

The input widget maintains two pointers into the string. The *position* (*p*) is where the cursor is. The *mark* (*m*) is the other end of the selected text. If they are equal then there is no selection. Changing this does not affect the clipboard (use [copy\(\)](#) to do that).

Changing these values causes a [redraw\(\)](#). The new values are bounds checked.

#### Parameters

<i>p</i>	index for the cursor position
<i>m</i>	index for the mark

#### Returns

0 if no positions changed

#### See also

[position\(int\)](#), [position\(\)](#), [mark\(int\)](#)

#### 33.75.3.24 ivalue()

```
int Fl_Input_::ivalue ( ) const
```

Returns the widget text interpreted as a signed integer.

#### Returns

signed integer value

#### See also

[Fl\\_Input\\_::dvalue\(\)](#)

[Fl\\_Input\\_::value\(int\)](#)

#### 33.75.3.25 line\_end()

```
int Fl_Input_::line_end (
    int i ) const [protected]
```

Finds the end of a line.

This call calculates the end of a line based on the given index *i*.

#### Parameters

in	<i>i</i>	starting index for the search
----	----------	-------------------------------

#### Returns

end of the line

#### 33.75.3.26 line\_start()

```
int Fl_Input_::line_start (
    int i ) const [protected]
```

Finds the start of a line.

This call calculates the start of a line based on the given index  $i$ .

## Parameters

<code>in</code>	<code>i</code>	starting index for the search
-----------------	----------------	-------------------------------

## Returns

start of the line

**33.75.3.27 mark()** [1/2]

```
int Fl_Input_::mark ( ) const [inline]
```

Gets the current selection mark.

## Returns

index into the text

**33.75.3.28 mark()** [2/2]

```
int Fl_Input_::mark (
    int m ) [inline]
```

Sets the current selection mark.

mark(n) is the same as `insert_position(insert_position(),n)`.

## Parameters

<code>m</code>	new index of the mark
----------------	-----------------------

## Returns

0 if the mark did not change

## See also

[insert\\_position\(\)](#), [insert\\_position\(int, int\)](#)

**33.75.3.29 maximum\_size()** [1/2]

```
int Fl_Input_::maximum_size ( ) const [inline]
```

Gets the maximum length of the input field in characters.

## See also

[maximum\\_size\(int\)](#).

**33.75.3.30 maximum\_size()** [2/2]

```
void Fl_Input_::maximum_size (
    int m ) [inline]
```

Sets the maximum length of the input field in characters.

This limits the number of **characters** that can be inserted in the widget.

Since FLTK 1.3 this is different than the buffer size, since one character can be more than one byte in UTF-8 encoding. In FLTK 1.1 this was the same (one byte = one character).

**33.75.3.31 position()** [1/3]

```
int Fl_Input_::position ( ) const [inline]
```

**Deprecated** "since 1.4.0 - use insert\_position() instead"

**33.75.3.32 position()** [2/3]

```
int Fl_Input_::position (
    int p ) [inline]
```

**Deprecated** "since 1.4.0 - use insert\_position(p) instead"

**33.75.3.33 position()** [3/3]

```
int Fl_Input_::position (
    int p,
    int m ) [inline]
```

**Deprecated** "since 1.4.0 - use insert\_position(p, m) or Fl\_Widget::position(x, y) instead"

**33.75.3.34 readonly()** [1/2]

```
int Fl_Input_::readonly ( ) const [inline]
```

Gets the read-only state of the input field.

**Returns**

non-zero if this widget is read-only

**33.75.3.35 readonly()** [2/2]

```
void Fl_Input_::readonly (
    int b ) [inline]
```

Sets the read-only state of the input field.

**Parameters**

in	<i>b</i>	if <i>b</i> is 0, the text in this widget can be edited by the user
----	----------	---

**33.75.3.36 redo()**

```
int Fl_Input_::redo ( )
```

Redo previous undo operation.

This call reapplies previously executed undo operations.

**Returns**

non-zero if any change was made.

**33.75.3.37 replace()**

```
int Fl_Input_::replace (
    int b,
    int e,
    const char * text,
    int ilen = 0 )
```

Deletes text from `b` to `e` and inserts the new string `text`.

All changes to the text buffer go through this function. It deletes the region between `b` and `e` (either one may be less or equal to the other), and then inserts the string `text` at that point and moves the [mark\(\)](#) and [position\(\)](#) to the end of the insertion. Does the callback if [when\(\)](#) & `FL_WHEN_CHANGED` and there is a change.

Set `b` and `e` equal to not delete anything. Set `text` to `NULL` to not insert anything.

`ilen` can be zero or `strlen(text)`, which saves a tiny bit of time if you happen to already know the length of the insertion, or can be used to insert a portion of a string. If `ilen` is zero, `strlen(text)` is used instead.

`b` and `e` are clamped to the `0..size()` range, so it is safe to pass any values. `b`, `e`, and `ilen` are used as numbers of bytes (not characters), where `b` and `e` count from 0 to [size\(\)](#) (end of buffer).

If `b` and/or `e` don't point to a valid UTF-8 character boundary, they are adjusted to the previous (`b`) or the next (`e`) valid UTF-8 character boundary, resp..

If the current number of characters in the buffer minus deleted characters plus inserted characters in `text` would overflow the number of allowed characters ([maximum\\_size\(\)](#)), then only the first characters of the string are inserted, so that [maximum\\_size\(\)](#) is not exceeded.

[cut\(\)](#) and [insert\(\)](#) are just inline functions that call [replace\(\)](#).

**Parameters**

in	<i>b</i>	beginning index of text to be deleted
in	<i>e</i>	ending index of text to be deleted and insertion position
in	<i>text</i>	string that will be inserted
in	<i>ilen</i>	length of <code>text</code> or 0 for nul terminated strings

**Returns**

0 if nothing changed

**Note**

If `text` does not point to a valid UTF-8 character or includes invalid UTF-8 sequences, the text is inserted nevertheless (counting invalid UTF-8 bytes as one character each).

**33.75.3.38 resize()**

```
void Fl_Input_::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Changes the size of the widget.

This call updates the text layout so that the cursor is visible.

**Parameters**

in	<i>X,Y,W,H</i>	new size of the widget
----	----------------	------------------------

See also

[Fl\\_Widget::resize\(int, int, int, int\)](#)

Reimplemented from [Fl\\_Widget](#).

### 33.75.3.39 shortcut() [1/2]

```
int Fl_Input_::shortcut ( ) const [inline]
```

Return the shortcut key associated with this widget.

Returns

shortcut keystroke

See also

[Fl\\_Button::shortcut\(\)](#)

### 33.75.3.40 shortcut() [2/2]

```
void Fl_Input_::shortcut (
    int s ) [inline]
```

Sets the shortcut key associated with this widget.

Pressing the shortcut key gives text editing focus to this widget.

Parameters

in	s	new shortcut keystroke
----	---	------------------------

See also

[Fl\\_Button::shortcut\(\)](#)

### 33.75.3.41 size() [1/2]

```
int Fl_Input_::size ( ) const [inline]
```

Returns the number of bytes in [value\(\)](#).

This may be greater than `strlen(value())` if there are nul characters in the text.

Returns

number of bytes in the text

### 33.75.3.42 size() [2/2]

```
void Fl_Input_::size (
    int W,
    int H ) [inline]
```

Sets the width and height of this widget.

Parameters

in	W,H	new width and height
----	-----	----------------------

See also

[Fl\\_Widget::size\(int, int\)](#)

### 33.75.3.43 static\_value() [1/2]

```
int Fl_Input_::static_value (
    const char * str )
```

Changes the widget text.

This function changes the text and sets the mark and the point to the end of it. The string is *not* copied. If the user edits the string it is copied to the internal buffer then. This can save a great deal of time and memory if your program is rapidly changing the values of text fields, but this will only work if the passed string remains unchanged until either the [Fl\\_Input](#) is destroyed or [value\(\)](#) is called again.

Parameters

in	<i>str</i>	the new text
----	------------	--------------

Returns

non-zero if the new value is different than the current one

### 33.75.3.44 static\_value() [2/2]

```
int Fl_Input_::static_value (
    const char * str,
    int len )
```

Changes the widget text.

This function changes the text and sets the mark and the point to the end of it. The string is *not* copied. If the user edits the string it is copied to the internal buffer then. This can save a great deal of time and memory if your program is rapidly changing the values of text fields, but this will only work if the passed string remains unchanged until either the [Fl\\_Input](#) is destroyed or [value\(\)](#) is called again.

You can use the `len` parameter to directly set the length if you know it already or want to put `nul` characters in the text.

Parameters

in	<i>str</i>	the new text
in	<i>len</i>	the length of the new text

Returns

non-zero if the new value is different than the current one

### 33.75.3.45 tab\_nav() [1/2]

```
int Fl_Input_::tab_nav ( ) const [inline]
```

Gets whether the Tab key causes focus navigation in multiline input fields or not.

If enabled (default), hitting Tab causes focus navigation to the next widget.

If disabled, hitting Tab inserts a tab character into the text field.

Returns

1 if Tab advances focus (default), 0 if Tab inserts tab characters.

See also

[tab\\_nav\(int\)](#), [Fl::OPTION\\_ARROW\\_FOCUS](#).

### 33.75.3.46 tab\_nav() [2/2]

```
void Fl_Input_::tab_nav (
    int val ) [inline]
```

Sets whether the Tab key does focus navigation, or inserts tab characters into [Fl\\_Multiline\\_Input](#).

By default this flag is enabled to provide the 'normal' behavior most users expect; Tab navigates focus to the next widget. To inserting an actual Tab character, users can use Ctrl-I or copy/paste.

Disabling this flag gives the old FLTK behavior where Tab inserts a tab character into the text field, in which case only the mouse can be used to navigate to the next field.

History: This flag was provided for backwards support of FLTK's old 1.1.x behavior where Tab inserts a tab character instead of navigating focus to the next widget. This behavior was unique to [Fl\\_Multiline\\_Input](#). With the advent of [Fl\\_Text\\_Editor](#), this old behavior has been deprecated.

#### Parameters

in	val	If val is 1, Tab advances focus (default). If val is 0, Tab inserts a tab character (old FLTK behavior).
----	-----	---

See also

[tab\\_nav\(\)](#), [Fl::OPTION\\_ARROW\\_FOCUS](#).

### 33.75.3.47 textcolor() [1/2]

```
Fl_Color Fl_Input_::textcolor ( ) const [inline]
```

Gets the color of the text in the input field.

#### Returns

the text color

See also

[textcolor\(Fl\\_Color\)](#)

### 33.75.3.48 textcolor() [2/2]

```
void Fl_Input_::textcolor (
    Fl_Color n ) [inline]
```

Sets the color of the text in the input field.

The text color defaults to `FL_FOREGROUND_COLOR`.

#### Parameters

in	n	new text color
----	---	----------------

See also

[textcolor\(\)](#)

**33.75.3.49 textfont()** [1/2]

```
Fl_Font Fl_Input_::textfont ( ) const [inline]
```

Gets the font of the text in the input field.

**Returns**

the current Fl\_Font index

**33.75.3.50 textfont()** [2/2]

```
void Fl_Input_::textfont (
    Fl_Font s ) [inline]
```

Sets the font of the text in the input field.

The text font defaults to FL\_HELVETICA.

**Parameters**

in	s	the new text font
----	---	-------------------

**33.75.3.51 textsize()** [1/2]

```
Fl_Fontsize Fl_Input_::textsize ( ) const [inline]
```

Gets the size of the text in the input field.

**Returns**

the text height in pixels

**33.75.3.52 textsize()** [2/2]

```
void Fl_Input_::textsize (
    Fl_Fontsize s ) [inline]
```

Sets the size of the text in the input field.

The text height defaults to FL\_NORMAL\_SIZE.

**Parameters**

in	s	the new font height in pixel units
----	---	------------------------------------

**33.75.3.53 undo()**

```
int Fl_Input_::undo ( )
```

Undoes previous changes to the text buffer.

This call undoes a number of previous calls to [replace\(\)](#).

**Returns**

non-zero if any change was made.

**33.75.3.54 up\_down\_position()**

```
int Fl_Input_::up_down_position (
```

```
int i,
int keepmark = 0 ) [protected]
```

Moves the cursor to the column given by `up_down_pos`.

This function is helpful when implementing up and down cursor movement. It moves the cursor from the beginning of a line to the column indicated by the global variable `up_down_pos` in pixel units.

#### Parameters

in	<i>i</i>	index into the beginning of a line of text
in	<i>keepmark</i>	if set, move only the cursor, but not the mark

#### Returns

index to new cursor position

#### 33.75.3.55 value() [1/5]

```
const char * Fl_Input_::value ( ) const [inline]
```

Returns the text displayed in the widget.

This function returns the current value, which is a pointer to the internal buffer and is valid only until the next event is handled.

#### Returns

pointer to an internal buffer - do not free() this

#### See also

[Fl\\_Input\\_::value\(const char\\*\)](#)

#### 33.75.3.56 value() [2/5]

```
int Fl_Input_::value (
    const char * str )
```

Changes the widget text.

This function changes the text and sets the mark and the point to the end of it. The string is copied to the internal buffer. Passing NULL is the same as "".

#### Parameters

in	<i>str</i>	the new text
----	------------	--------------

#### Returns

non-zero if the new value is different than the current one

#### See also

[Fl\\_Input\\_::value\(const char\\* str, int len\), Fl\\_Input\\_::value\(\)](#)

#### 33.75.3.57 value() [3/5]

```
int Fl_Input_::value (
    const char * str,
    int len )
```

Changes the widget text.

This function changes the text and sets the mark and the point to the end of it. The string is copied to the internal buffer. Passing `NULL` is the same as `""`.

You can use the `length` parameter to directly set the length if you know it already or want to put `nul` characters in the text.

#### Parameters

in	<i>str</i>	the new text
in	<i>len</i>	the length of the new text

#### Returns

non-zero if the new value is different than the current one

#### See also

[Fl\\_Input\\_::value\(const char\\* str\)](#), [Fl\\_Input\\_::value\(\)](#)

#### 33.75.3.58 value() [4/5]

```
int Fl_Input_::value (
    double v )
```

Changes the widget text to a floating point number ("%g").

#### Parameters

in	<i>v</i>	the new value
----	----------	---------------

#### Returns

non-zero if the new value is different than the current one

#### See also

[Fl\\_Input\\_::value\(const char\\* str\)](#), [Fl\\_Input\\_::ivalue\(\)](#)

#### 33.75.3.59 value() [5/5]

```
int Fl_Input_::value (
    int v )
```

Changes the widget text to a signed integer number.

#### Parameters

in	<i>v</i>	the new value
----	----------	---------------

#### Returns

non-zero if the new value is different than the current one

#### See also

[Fl\\_Input\\_::value\(const char\\* str\)](#), [Fl\\_Input\\_::ivalue\(\)](#)

**33.75.3.60 word\_end()**

```
int Fl_Input_::word_end (
    int i ) const [protected]
```

Finds the end of a word.

Returns the index after the last byte of a word. If the index is already at the end of a word, it will find the end of the following word, so if you call it repeatedly you will move forwards to the end of the text.

Note that this is inconsistent with [line\\_end\(\)](#).

**Parameters**

in	i	starting index for the search
----	---	-------------------------------

**Returns**

end of the word

**33.75.3.61 word\_start()**

```
int Fl_Input_::word_start (
    int i ) const [protected]
```

Finds the start of a word.

Returns the index of the first byte of a word. If the index is already at the beginning of a word, it will find the beginning of the previous word, so if you call it repeatedly you will move backwards to the beginning of the text.

Note that this is inconsistent with [line\\_start\(\)](#).

**Parameters**

in	i	starting index for the search
----	---	-------------------------------

**Returns**

start of the word, or previous word

**33.75.3.62 wrap() [1/2]**

```
int Fl_Input_::wrap ( ) const [inline]
```

Gets the word wrapping state of the input field.

Word wrap is only functional with multi-line input fields.

**33.75.3.63 wrap() [2/2]**

```
void Fl_Input_::wrap (
    int b ) [inline]
```

Sets the word wrapping state of the input field.

Word wrap is only functional with multi-line input fields.

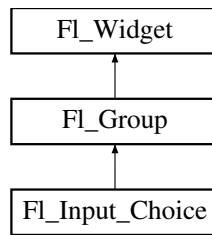
The documentation for this class was generated from the following files:

- Fl\_Input\_.H
- Fl\_Input\_.cxx

**33.76 Fl\_Input\_Choice Class Reference**

A combination of the input widget and a menu button.

Inheritance diagram for Fl\_Input\_Choice:



## Public Member Functions

- void **add** (const char \*s)  
*Adds an item to the menu.*
- int **changed** () const  
*Returns the combined [changed\(\)](#) state of the input and menu button widget.*
- void **clear** ()  
*Removes all items from the menu.*
- void **clear\_changed** ()  
*Clears the [changed\(\)](#) state of both input and menu button widgets.*
- [Fl\\_Boxtype](#) **down\_box** () const  
*Gets the box type of the menu button.*
- void **down\_box** ([Fl\\_Boxtype](#) b)  
*Sets the box type of the menu button.*
- [Fl\\_Input\\_Choice](#) (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [Fl\\_Input\\_Choice](#) widget using the given position, size, and label string.*
- [Fl\\_Input](#) \* **input** ()  
*Returns a pointer to the internal [Fl\\_Input](#) widget.*
- const [Fl\\_Menu\\_Item](#) \* **menu** ()  
*Gets the [Fl\\_Menu\\_Item](#) array used for the menu.*
- void **menu** (const [Fl\\_Menu\\_Item](#) \*m)  
*Sets the [Fl\\_Menu\\_Item](#) array used for the menu.*
- [Fl\\_Menu\\_Button](#) \* **menubutton** ()  
*Returns a pointer to the internal [Fl\\_Menu\\_Button](#) widget.*
- void **resize** (int X, int Y, int W, int H) [FL\\_OVERRIDE](#)  
*Resizes the [Fl\\_Input\\_Choice](#) widget.*
- void **set\_changed** ()  
*Sets the [changed\(\)](#) state of both input and menu button widgets to the specified value.*
- [Fl\\_Color](#) **textcolor** () const  
*Gets the [Fl\\_Input](#) text field's text color.*
- void **textcolor** ([Fl\\_Color](#) c)  
*Sets the [Fl\\_Input](#) text field's text color to c.*
- [Fl\\_Font](#) **textfont** () const  
*Gets the [Fl\\_Input](#) text field's font style.*
- void **textfont** ([Fl\\_Font](#) f)  
*Sets the [Fl\\_Input](#) text field's font style to f.*
- [Fl\\_Fontsize](#) **textsize** () const  
*Gets the [Fl\\_Input](#) text field's font size.*
- void **textsize** ([Fl\\_Fontsize](#) s)  
*Sets the [Fl\\_Input](#) text field's font size to s.*
- int **update\_menubutton** ()  
*Updates the menubutton with the string value in [Fl\\_Input](#).*
- const char \* **value** () const

- Returns the [FL\\_Input](#) text field's current contents.
- void [value](#) (const char \*val)  
Sets the [FL\\_Input](#) text field's contents to *val*.
- void [value](#) (int val)  
Chooses item# *val* in the menu, and sets the [FL\\_Input](#) text field to that value.

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
Draws the widget.
- virtual int [inp\\_h](#) () const  
See [inp\\_x\(\)](#) for info.
- virtual int [inp\\_w](#) () const  
See [inp\\_x\(\)](#) for info.
- virtual int [inp\\_x](#) () const  
The methods [inp\\_x\(\)](#), [inp\\_y\(\)](#), [inp\\_w\(\)](#) and [inp\\_h\(\)](#) return the desired position and size of the internal [FL\\_Input](#) widget.
- virtual int [inp\\_y](#) () const  
See [inp\\_x\(\)](#) for info.
- virtual int [menu\\_h](#) () const  
See [menu\\_x\(\)](#) for info.
- virtual int [menu\\_w](#) () const  
See [menu\\_x\(\)](#) for info.
- virtual int [menu\\_x](#) () const  
The methods [menu\\_x\(\)](#), [menu\\_y\(\)](#), [menu\\_w\(\)](#) and [menu\\_h\(\)](#) return the desired position and size of the internal [FL\\_Menu\\_Button](#) widget.
- virtual int [menu\\_y](#) () const  
See [menu\\_x\(\)](#) for info.

## Additional Inherited Members

### 33.76.1 Detailed Description

A combination of the input widget and a menu button.

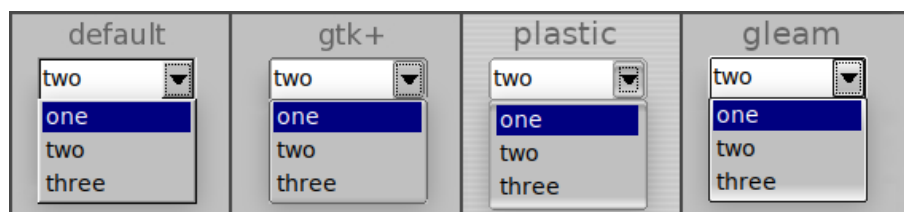


Figure 33.26 FL\_Input\_Choice widget

The user can either type into the input area, or use the menu button chooser on the right to choose an item which loads the input area with the selected text.

The application can directly access both the internal [FL\\_Input](#) and [FL\\_Menu\\_Button](#) widgets respectively using the [input\(\)](#) and [menubutton\(\)](#) accessor methods.

The default behavior is to invoke the [FL\\_Input\\_Choice::callback\(\)](#) if the user changes the input field's contents, either by typing, pasting, or clicking a different item in the choice menu.

The callback can determine if an item was picked vs. typing into the input field by checking the value of [menubutton\(\)->changed\(\)](#), which will be:

- 1: the user picked a different item in the choice menu
- 0: the user typed or pasted directly into the input field

FLTK triggers an [FL\\_BEFORE\\_MENU](#) event for this widget right before displaying the menu. This event provides an opportunity to update menu item states and activation.

## Example Use of Fl\_Input\_Choice

```

#include <stdio.h>
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
#include <FL/Fl_Input_Choice.H>
// Fl_Input_Choice callback()
void choice_cb(Fl_Widget *w, void *userdata) {
    // Show info about the picked item
    Fl_Input_Choice *choice = (Fl_Input_Choice*)w;
    printf("*** Choice Callback:\n");
    printf("    widget's text value='%s'\n", choice->value()); // normally all you need
    // Access the menu via menubutton()..
    const Fl_Menu_Item *item = choice->menubutton()->mvalue();
    printf("    item label()=' %s'\n", item ? item->label() : " (No item)");
    printf("    item value()=%d\n", choice->menubutton()->value());
    printf("    input value()=' %s'\n", choice->input()->value());
    printf("    The user %s\n", choice->menubutton()->changed()
        ? "picked a menu item"
        : "typed text");
}

int main() {
    Fl_Double_Window win(200,100,"Input Choice");
    win.begin();
    Fl_Input_Choice choice(10,10,100,30);
    choice.callback(choice_cb, 0);
    choice.add("Red");
    choice.add("Orange");
    choice.add("Yellow");
    //choice.value("Red"); // uncomment to make "Red" default
    win.end();
    win.show();
    return Fl::run();
}

```

## Subclassing Example

One can subclass `Fl_Input_Choice` to override the virtual methods `inp_x/y/w/h()` and `menu_x/y/w/h()` to take control of the internal `Fl_Input` and `Fl_Menu_Button` widget positioning. In this example, input and menubutton's positions are swapped:

```

#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Input_Choice.H>
class MyInputChoice : public Fl_Input_Choice {
protected:
    virtual int inp_x()const { return x() + Fl::box_dx(box()) + menu_w(); } // override to reposition
    virtual int menu_x()const { return x() + Fl::box_dx(box()); } // override to reposition
public:
    MyInputChoice(int X,int Y,int W,int H,const char*L=0) : Fl_Input_Choice(X,Y,W,H,L) {
        resize(X,Y,W,H); // necessary for ctor to trigger our overrides
    }
};

int main(int argc, char **argv) {
    Fl_Window *win = new Fl_Window(400,300);
    MyInputChoice *mychoice = new MyInputChoice(150,40,150,25,"Right Align Input");
    mychoice->add("Aaa");
    mychoice->add("Bbb");
    mychoice->add("Ccc");
    win->end();
    win->resizable(win);
    win->show();
    return Fl::run();
}

```

## 33.76.2 Constructor &amp; Destructor Documentation

## 33.76.2.1 Fl\_Input\_Choice()

```

Fl_Input_Choice::Fl_Input_Choice (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )

```

Creates a new `Fl_Input_Choice` widget using the given position, size, and label string. Inherited destructor destroys the widget and any values associated with it.

### 33.76.3 Member Function Documentation

#### 33.76.3.1 add()

```
void Fl_Input_Choice::add (
    const char * s ) [inline]
```

Adds an item to the menu.

When any item is selected, the [Fl\\_Input\\_Choice callback\(\)](#) is invoked, which can do something with the selected item.

You can access the more complex [Fl\\_Menu\\_Button::add\(\)](#) methods (setting item-specific callbacks, userdata, etc), via [menubutton\(\)](#). Example:

```
Fl_Input_Choice *choice = new Fl_Input_Choice(100,10,120,25,"Fonts");
Fl_Menu_Button *mb = choice->menubutton(); // use Fl_Input_Choice's Fl_Menu_Button
mb->add("Helvetica", 0, MyFont_CB, (void*)mydata); // use Fl_Menu_Button's add() methods
mb->add("Courier", 0, MyFont_CB, (void*)mydata);
mb->add("More...", 0, FontDialog_CB, (void*)mydata);
```

#### 33.76.3.2 draw()

```
void Fl_Input_Choice::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own draw() method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw(); // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Group](#).

#### 33.76.3.3 inp\_x()

```
virtual int Fl_Input_Choice::inp_x ( ) const [inline], [protected], [virtual]
```

The methods [inp\\_x\(\)](#), [inp\\_y\(\)](#), [inp\\_w\(\)](#) and [inp\\_h\(\)](#) return the desired position and size of the internal [Fl\\_Input](#) widget. These can be overridden by a subclass to redefine positioning. See code example in the Description for subclassing details.

#### 33.76.3.4 input()

```
Fl_Input * Fl_Input_Choice::input ( ) [inline]
```

Returns a pointer to the internal [Fl\\_Input](#) widget.

This can be used to directly access all of the [Fl\\_Input](#) widget's methods.

#### 33.76.3.5 menu\_x()

```
virtual int Fl_Input_Choice::menu_x ( ) const [inline], [protected], [virtual]
```

The methods [menu\\_x\(\)](#), [menu\\_y\(\)](#), [menu\\_w\(\)](#) and [menu\\_h\(\)](#) return the desired position and size of the internal [Fl\\_Menu\\_Button](#) widget.

These can be overridden by a subclass to redefine positioning. See code example in the Description for subclassing details.

#### 33.76.3.6 menubutton()

```
Fl_Menu_Button * Fl_Input_Choice::menubutton ( ) [inline]
```

Returns a pointer to the internal [Fl\\_Menu\\_Button](#) widget.

This can be used to access any of the methods of the menu button, e.g.

```
Fl_Input_Choice *choice = new Fl_Input_Choice(100,10,120,25,"Choice:");
[...]
```

// Print all the items in the choice menu

```
for ( int t=0; t<choice->menubutton()->size(); t++ ) {
    const Fl_Menu_Item &item = choice->menubutton()->menu()[t];
    printf("item %d -- label=%s\n", t, item.label() ? item.label() : "(Null)");
}
```

### 33.76.3.7 resize()

```
void Fl_Input_Choice::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Resizes the [Fl\\_Input\\_Choice](#) widget.

Reimplemented from [Fl\\_Group](#).

### 33.76.3.8 update\_menubutton()

```
int Fl_Input_Choice::update_menubutton ( )
```

Updates the menubutton with the string value in [Fl\\_Input](#).

If the string value currently in [Fl\\_Input](#) matches one of the menu items in [menubutton\(\)](#), that menu item will become the current item selected.

Call this method after setting [value\(const char\\*\)](#) if you need the [menubutton\(\)](#) to be synchronized with the [Fl\\_Input](#) field.

```
// Add items
choice->add(".25");
choice->add(".50");
choice->add("1.0");
choice->add("2.0");
choice->add("4.0");
choice->value("1.0");           // sets Fl_Input to "1.0"
choice->update_menubutton();    // cause menubutton to reflect this value too
                                // (returns 1 if match was found, 0 if not)

// Verify menubutton()'s value.
printf("menu button choice index=%d, value=%s\n",
    choice->menubutton()->value(),    // would be -1 if update not done
    choice->menubutton()->text());    // would be NULL if update not done
```

#### Returns

1 if a matching menuitem was found and value set, 0 if not.

#### Version

1.4.0

### 33.76.3.9 value() [1/2]

```
void Fl_Input_Choice::value (
    const char * val ) [inline]
```

Sets the [Fl\\_Input](#) text field's contents to val.

Note it is possible to set the [value\(\)](#) to one that is not in the menubutton's list of choices.

Setting the [value\(\)](#) does NOT affect the menubutton's selection. If that's needed, call [update\\_menubutton\(\)](#) after setting [value\(\)](#).

#### See also

[void value\(int val\)](#), [update\\_menubutton\(\)](#)

### 33.76.3.10 value() [2/2]

```
void Fl_Input_Choice::value (
    int val )
```

Chooses item# `val` in the menu, and sets the `Fl_Input` text field to that value. Any previous text is cleared.

See also

```
void value(const char *val)
```

The documentation for this class was generated from the following files:

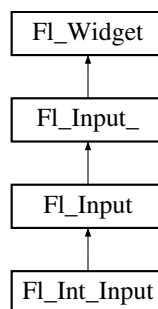
- `Fl_Input_Choice.H`
- `Fl_Input_Choice.cxx`

## 33.77 Fl\_Int\_Input Class Reference

The `Fl_Int_Input` class is a subclass of `Fl_Input` that only allows the user to type decimal digits (or hex numbers of the form `0xae`).

```
#include <Fl_Int_Input.H>
```

Inheritance diagram for `Fl_Int_Input`:



### Public Member Functions

- `Fl_Int_Input` (int X, int Y, int W, int H, const char \*l=0)  
Creates a new `Fl_Int_Input` widget using the given position, size, and label string.

### Additional Inherited Members

#### 33.77.1 Detailed Description

The `Fl_Int_Input` class is a subclass of `Fl_Input` that only allows the user to type decimal digits (or hex numbers of the form `0xae`).

#### 33.77.2 Constructor & Destructor Documentation

##### 33.77.2.1 Fl\_Int\_Input()

```
Fl_Int_Input::Fl_Int_Input (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new `Fl_Int_Input` widget using the given position, size, and label string.

The default boxtype is FL\_DOWN\_BOX.

Inherited destructor destroys the widget and any value associated with it.

The documentation for this class was generated from the following files:

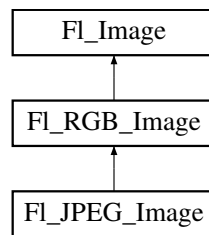
- FI\_Int\_Input.H
- FI\_Input.cxx

## 33.78 FI\_JPEG\_Image Class Reference

The [FI\\_JPEG\\_Image](#) class supports loading, caching, and drawing of Joint Photographic Experts Group (JPEG) File Interchange Format (JFIF) images.

```
#include <FI_JPEG_Image.H>
```

Inheritance diagram for FI\_JPEG\_Image:



### Public Member Functions

- [FI\\_JPEG\\_Image](#) (const char \*filename)  
*The constructor loads the JPEG image from the given jpeg filename.*
- [FI\\_JPEG\\_Image](#) (const char \*name, const unsigned char \*data, int data\_length=-1)  
*The constructor loads the JPEG image from memory.*

### Protected Member Functions

- void **load\_jpg\_** (const char \*filename, const char \*sharename, const unsigned char \*data, int data\_length=-1)

### Additional Inherited Members

#### 33.78.1 Detailed Description

The [FI\\_JPEG\\_Image](#) class supports loading, caching, and drawing of Joint Photographic Experts Group (JPEG) File Interchange Format (JFIF) images.

The class supports grayscale and color (RGB) JPEG image files.

#### 33.78.2 Constructor & Destructor Documentation

##### 33.78.2.1 FI\_JPEG\_Image() [1/2]

```
FI_JPEG_Image::FI_JPEG_Image (
    const char * filename )
```

The constructor loads the JPEG image from the given jpeg filename.

The inherited destructor frees all memory and server resources that are used by the image.

Use [FI\\_Image::fail\(\)](#) to check if [FI\\_JPEG\\_Image](#) failed to load. [fail\(\)](#) returns ERR\_FILE\_ACCESS if the file could not be opened or read, ERR\_FORMAT if the JPEG format could not be decoded, and ERR\_NO\_IMAGE if the image could not be loaded for another reason. If the image has loaded correctly, [w\(\)](#), [h\(\)](#), and [d\(\)](#) should return values greater than zero.

## Parameters

<code>in</code>	<code>filename</code>	a full path and name pointing to a valid jpeg file.
-----------------	-----------------------	---

## See also

`FI_JPEG_Image::FI_JPEG_Image(const char *imagename, const unsigned char *data)`

**33.78.2.2 FI\_JPEG\_Image()** [2/2]

```
FI_JPEG_Image::FI_JPEG_Image (
    const char * name,
    const unsigned char * data,
    int data_length = -1 )
```

The constructor loads the JPEG image from memory.

Construct an image from a block of memory inside the application. Fluid offers "binary Data" chunks as a great way to add image data into the C++ source code. `name_png` can be NULL. If a name is given, the image is added to the list of shared images (see: [FI\\_Shared\\_Image](#)) and will be available by that name.

The inherited destructor frees all memory and server resources that are used by the image.

Use `FI_Image::fail()` to check if `FI_JPEG_Image` failed to load. `fail()` returns `ERR_FILE_ACCESS` if the file could not be opened or read, `ERR_FORMAT` if the JPEG format could not be decoded, and `ERR_NO_IMAGE` if the image could not be loaded for another reason. If the image has loaded correctly, `w()`, `h()`, and `d()` should return values greater than zero.

## Parameters

<code>name</code>	A unique name or NULL
<code>data</code>	A pointer to the memory location of the JPEG image
<code>data_length</code>	optional length of <code>data</code> . This will protect memory outside of the <code>data</code> array from illegal read operations

## See also

[FI\\_JPEG\\_Image::FI\\_JPEG\\_Image\(const char \\*filename\)](#)

[FI\\_Shared\\_Image](#)

The documentation for this class was generated from the following files:

- `FI_JPEG_Image.H`
- `FI_JPEG_Image.cxx`

**33.79 FI\_Label Struct Reference**

This struct stores all information for a text or mixed graphics label.

```
#include <Fl_Widget.H>
```

**Public Member Functions**

- void [draw](#) (int, int, int, int, [FI\\_Align](#)) const  
*Draws the label aligned to the given box.*
- void [measure](#) (int &w, int &h) const  
*Measures the size of the label.*

## Public Attributes

- [Fl\\_Align](#) **align\_**  
*alignment of label*
- [Fl\\_Color](#) **color**  
*text color*
- [Fl\\_Image](#) \* **deimage**  
*optional image for a deactivated label*
- [Fl\\_Font](#) **font**  
*label font used in text*
- signed char **h\_margin\_**  
*Spacing between label and the horizontally aligned side of the widget.*
- [Fl\\_Image](#) \* **image**  
*optional image for an active label*
- [Fl\\_Fontsize](#) **size**  
*size of label font*
- [uchar](#) **spacing**  
*Spacing between an image and the label text.*
- [uchar](#) **type**  
*type of label.*
- signed char **v\_margin\_**  
*Spacing between label and the vertically aligned side of the widget.*
- const char \* **value**  
*label text*

### 33.79.1 Detailed Description

This struct stores all information for a text or mixed graphics label.

**Todo** There is an aspiration that the [Fl\\_Label](#) type will become a widget by itself. That way we will be avoiding a lot of code duplication by handling labels in a similar fashion to widgets containing text. We also provide an easy interface for very complex labels, containing html or vector graphics. However, this re-factoring is not in place in this release.

### 33.79.2 Member Function Documentation

#### 33.79.2.1 draw()

```
void Fl_Label::draw (
    int X,
    int Y,
    int W,
    int H,
    Fl\_Align align ) const
```

Draws the label aligned to the given box.

Draws a label with arbitrary alignment in an arbitrary box.

#### 33.79.2.2 measure()

```
void Fl_Label::measure (
    int & W,
    int & H ) const
```

Measures the size of the label.

## Parameters

<code>in, out</code>	<code>W,H</code>	: this is the requested size for the label text plus image; on return, this will contain the size needed to fit the label
----------------------	------------------	---

### 33.79.3 Member Data Documentation

#### 33.79.3.1 type

`uchar Fl_Label::type`  
type of label.

See also

[Fl\\_Labeltype](#)

The documentation for this struct was generated from the following files:

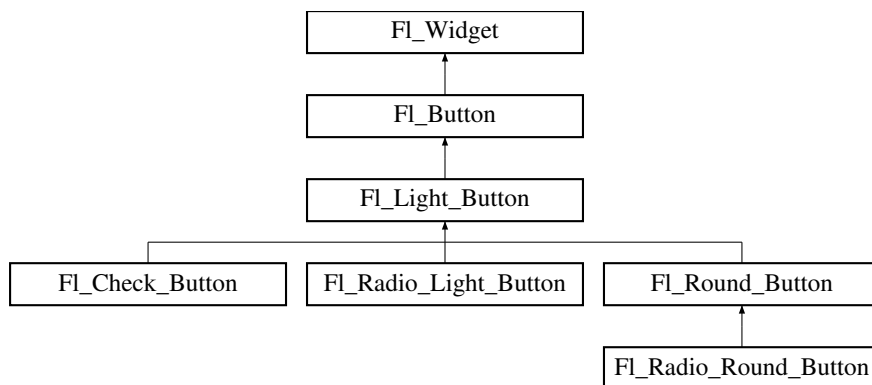
- [Fl\\_Widget.H](#)
- [fl\\_labeltype.cxx](#)

## 33.80 Fl\_Light\_Button Class Reference

This subclass displays the "on" state by turning on a light, rather than drawing pushed in.

```
#include <Fl_Light_Button.H>
```

Inheritance diagram for `Fl_Light_Button`:



### Public Member Functions

- `Fl_Light_Button` (int `x`, int `y`, int `w`, int `h`, const char \*`l`=0)  
*Creates a new [Fl\\_Light\\_Button](#) widget using the given position, size, and label string.*
- int `handle` (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*

### Protected Member Functions

- void `draw` () [FL\\_OVERRIDE](#)  
*Draws the widget.*

## Additional Inherited Members

### 33.80.1 Detailed Description

This subclass displays the "on" state by turning on a light, rather than drawing pushed in.

The shape of the "light" is initially set to FL\_DOWN\_BOX. The color of the light when on is controlled with [selection\\_color\(\)](#), which defaults to FL\_YELLOW.

Buttons generate callbacks when they are clicked by the user. You control exactly when and how by changing the values for [type\(\)](#) and [when\(\)](#).



Figure 33.27 Fl\_Light\_Button

### 33.80.2 Constructor & Destructor Documentation

#### 33.80.2.1 Fl\_Light\_Button()

```
Fl_Light_Button::Fl_Light_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Light\\_Button](#) widget using the given position, size, and label string.

The default box type is FL\_UP\_BOX and the default down box type [down\\_box\(\)](#) is FL\_NO\_BOX (0).

The [selection\\_color\(\)](#) sets the color of the "light". Default is FL\_YELLOW.

The default label alignment is 'FL\_ALIGN\_LEFT|FL\_ALIGN\_INSIDE' so the label is drawn inside the button area right of the "light".

#### Note

Do not change the default box types of [Fl\\_Light\\_Button](#). The box types determine how the button is drawn. If you change the [down\\_box\(\)](#) type the drawing behavior is undefined.

### 33.80.3 Member Function Documentation

#### 33.80.3.1 draw()

```
void Fl_Light_Button::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Button](#).

#### 33.80.3.2 handle()

```
int Fl_Light_Button::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget. When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise. Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval. One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class. In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

<code>in</code>	<code>event</code>	the kind of event received
-----------------	--------------------	----------------------------

#### Return values

<code>0</code>	if the event was not used or understood
<code>1</code>	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

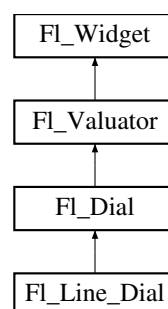
Reimplemented from [Fl\\_Button](#).

The documentation for this class was generated from the following files:

- [Fl\\_Light\\_Button.H](#)
- [Fl\\_Light\\_Button.cxx](#)

## 33.81 Fl\_Line\_Dial Class Reference

Inheritance diagram for [Fl\\_Line\\_Dial](#):



### Public Member Functions

- [Fl\\_Line\\_Dial](#) (int X, int Y, int W, int H, const char \*L=0)

### Additional Inherited Members

The documentation for this class was generated from the following files:

- [Fl\\_Line\\_Dial.H](#)
- [Fl\\_Dial.cxx](#)

## 33.82 Fl\_Mac\_App\_Menu Class Reference

### Static Public Member Functions

- static void [custom\\_application\\_menu\\_items](#) (const [Fl\\_Menu\\_Item](#) \*m)  
*Adds custom menu item(s) to the application menu of the system menu bar.*

### Static Public Attributes

- static const char \* **about**  
*Localizable text for the "About xxx" application menu item.*
- static const char \* **hide**  
*Localizable text for the "Hide xxx" application menu item.*
- static const char \* **hide\_others**  
*Localizable text for the "Hide Others" application menu item.*
- static const char \* [print](#)  
*Localizable text for the "Print Front Window" application menu item.*
- static const char \* **print\_no\_titlebar**  
*Localizable text for the "Print Front Window" application menu item.*
- static const char \* **quit**  
*Localizable text for the "Quit xxx" application menu item.*
- static const char \* **services**  
*Localizable text for the "Services" application menu item.*
- static const char \* **show**  
*Localizable text for the "Show All" application menu item.*
- static const char \* **toggle\_print\_titlebar**  
*Localizable text for the "Toggle print titlebar" application menu item.*

### 33.82.1 Member Function Documentation

#### 33.82.1.1 custom\_application\_menu\_items()

```
static void Fl_Mac_App_Menu::custom_application_menu_items (
    const Fl\_Menu\_Item * m ) [static]
```

Adds custom menu item(s) to the application menu of the system menu bar.

They are positioned after the "Print Front Window / Toggle printing of titlebar" items, or at their place if they were removed with [Fl\\_Mac\\_App\\_Menu::print](#) = "".

#### Parameters

<i>m</i>	zero-ending array of <a href="#">Fl_Menu_Item</a> 's.
----------	---

### 33.82.2 Member Data Documentation

#### 33.82.2.1 print

```
const char* Fl_Mac_App_Menu::print [static]
```

Localizable text for the "Print Front Window" application menu item.

This menu item and next one won't be displayed if [Fl\\_Mac\\_App\\_Menu::print](#) is set to an empty string.

The documentation for this class was generated from the following file:

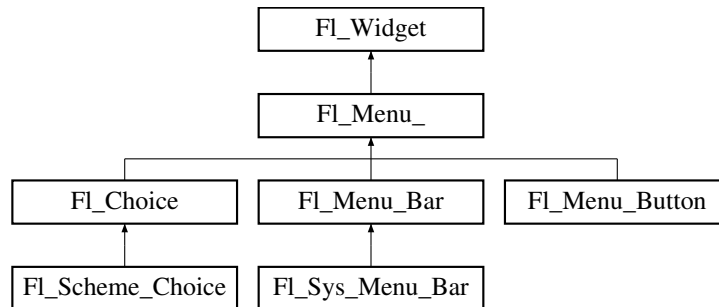
- [mac.H](#)

### 33.83 Fl\_Menu\_ Class Reference

Base class of all widgets that have a menu in FLTK.

```
#include <Fl_Menu_.H>
```

Inheritance diagram for Fl\_Menu\_:



#### Public Member Functions

- `int add (const char *)`  
*This is a Forms (and SGI GL library) compatible add function, it adds many menu items, with '|' separating the menu items, and tab separating the menu item names from an optional shortcut string.*
- `int add (const char *, int shortcut, Fl_Callback *, void *=0, int=0)`  
*Adds a new menu item.*
- `int add (const char *a, const char *b, Fl_Callback *c, void *d=0, int e=0)`  
*See int Fl\_Menu\_::add(const char\* label, int shortcut, Fl\_Callback\*, void \*user\_data=0, int flags=0)*
- `void clear ()`  
*Same as menu(NULL), set the array pointer to null, indicating a zero-length menu.*
- `int clear_submenu (int index)`  
*Clears the specified submenu pointed to by index of all menu items.*
- `void copy (const Fl_Menu_Item *m, void *user_data=0)`  
*Sets the menu array pointer with a copy of m that will be automatically deleted.*
- `Fl_Boxtype down_box () const`  
*This box type is used to surround the currently-selected items in the menus.*
- `void down_box (Fl_Boxtype b)`  
*Sets the box type used to surround the currently-selected items in the menus.*
- `Fl_Color down_color () const`  
*For back compatibility, same as selection\_color()*
- `void down_color (unsigned c)`  
*For back compatibility, same as selection\_color()*
- `int find_index (const char *name) const`  
*Find the menu item index for a given menu pathname, such as "Edit/Copy".*
- `int find_index (const Fl_Menu_Item *item) const`  
*Find the index into the menu array for a given item.*
- `int find_index (Fl_Callback *cb) const`  
*Find the index into the menu array for a given callback cb.*
- `const Fl_Menu_Item * find_item (const char *name)`  
*Find the menu item for a given menu pathname, such as "Edit/Copy".*
- `const Fl_Menu_Item * find_item (Fl_Callback *)`  
*Find the menu item for the given callback cb.*

- const [FI\\_Menu\\_Item](#) \* [find\\_item\\_with\\_argument](#) (long)
 

*Find the menu item for the given user argument *v*.*
- const [FI\\_Menu\\_Item](#) \* [find\\_item\\_with\\_user\\_data](#) (void \*)
 

*Find the menu item for the given user data *v*.*
- [FI\\_Menu\\_](#) (int, int, int, int, const char \*=0)
 

*Creates a new [FI\\_Menu\\_](#) widget using the given position, size, and label string.*
- void [global](#) ()
 

*Make the shortcuts for this menu work no matter what window has the focus when you type it.*
- int [insert](#) (int index, const char \*, int [shortcut](#), [FI\\_Callback](#) \*, void \*=0, int=0)
 

*Inserts a new menu item at the specified *index* position.*
- int [insert](#) (int index, const char \*a, const char \*b, [FI\\_Callback](#) \*c, void \*d=0, int e=0)
 

*See int [FI\\_Menu\\_::insert](#)(const char\* label, int shortcut, [FI\\_Callback](#)\*, void \*user\_data=0, int flags=0)*
- int [item\\_pathname](#) (char \*name, int namelen, const [FI\\_Menu\\_Item](#) \*finditem=0) const
 

*Get the menu 'pathname' for the specified menuitem.*
- const [FI\\_Menu\\_Item](#) \* [menu](#) () const
 

*Returns a pointer to the array of [FI\\_Menu\\_Items](#).*
- void [menu](#) (const [FI\\_Menu\\_Item](#) \*m)
 

*Sets the menu array pointer directly.*
- [FI\\_Boxtype](#) [menu\\_box](#) () const
 

*Get the box type for the menu popup windows.*
- void [menu\\_box](#) ([FI\\_Boxtype](#) b)
 

*Set the box type for the menu popup windows.*
- const [FI\\_Menu\\_Item](#) \* [menu\\_end](#) ()
 

*Finishes menu modifications and returns [menu\(\)](#).*
- int [mode](#) (int i) const
 

*Get the flags of item *i*.*
- void [mode](#) (int i, int fl)
 

*Set the flags of item *i*.*
- const [FI\\_Menu\\_Item](#) \* [mvalue](#) () const
 

*Return a pointer to the last menu item that was picked.*
- const [FI\\_Menu\\_Item](#) \* [picked](#) (const [FI\\_Menu\\_Item](#) \*)
 

*When user picks a menu item, call this.*
- const [FI\\_Menu\\_Item](#) \* [prev\\_mvalue](#) () const
 

*Return a pointer to the menu item that was picked before the current one was picked.*
- void [remove](#) (int)
 

*Deletes item *i* from the menu.*
- void [replace](#) (int, const char \*)
 

*Changes the text of item *i*.*
- void [setonly](#) ([FI\\_Menu\\_Item](#) \*item)
 

*Turns the radio item "on" for the menu item and turns "off" adjacent radio items of the same group.*
- void [shortcut](#) (int i, int s)
 

*Change the shortcut of item *i* to *s*.*
- int [size](#) () const
 

*This returns the number of [FI\\_Menu\\_Item](#) structures that make up the menu, correctly counting submenus.*
- void [size](#) (int W, int H)
- const [FI\\_Menu\\_Item](#) \* [test\\_shortcut](#) ()
 

*Returns the menu item with the entered shortcut (key value).*
- const char \* [text](#) () const
 

*Returns the title of the last item chosen.*
- const char \* [text](#) (int i) const
 

*Returns the title of item *i*.*

- [FL\\_Color](#) `textcolor` () const  
*Get the current color of menu item labels.*
- void `textcolor` ([FL\\_Color](#) c)  
*Sets the current color of menu item labels.*
- [FL\\_Font](#) `textfont` () const  
*Gets the current font of menu item labels.*
- void `textfont` ([FL\\_Font](#) c)  
*Sets the current font of menu item labels.*
- [FL\\_Fontsize](#) `textsize` () const  
*Gets the font size of menu item labels.*
- void `textsize` ([FL\\_Fontsize](#) c)  
*Sets the font size of menu item labels.*
- int `value` () const  
*Return the index into the [menu\(\)](#) of the last item chosen by the user.*
- int `value` (const [FL\\_Menu\\_Item](#) \*)  
*Set the value of a menu to the menu item m.*
- int `value` (int i)  
*Set the value of the menu to index i.*

## Protected Member Functions

- int `item_pathname_` (char \*name, int namelen, const [FL\\_Menu\\_Item](#) \*finditem, const [FL\\_Menu\\_Item](#) \*menu=0) const

## Protected Attributes

- [uchar](#) `alloc`
- [uchar](#) `down_box_`
- [FL\\_Boxtype](#) `menu_box_`
- [FL\\_Color](#) `textcolor_`
- [FL\\_Font](#) `textfont_`
- [FL\\_Fontsize](#) `textsize_`

## Additional Inherited Members

### 33.83.1 Detailed Description

Base class of all widgets that have a menu in FLTK.

Currently FLTK provides you with [FL\\_Menu\\_Button](#), [FL\\_Menu\\_Bar](#), and [FL\\_Choice](#).

The class contains a pointer to an array of structures of type [FL\\_Menu\\_Item](#). The array may either be supplied directly by the user program, or it may be "private": a dynamically allocated array managed by the [FL\\_Menu\\_](#).

When the user clicks a menu item, `value()` is set to that item and then:

- If the [FL\\_Menu\\_Item](#) has a callback set, that callback is invoked with any userdata configured for it. (The [FL\\_Menu\\_](#) widget's callback is NOT invoked.)
- For any [FL\\_Menu\\_Items](#) that **don't** have a callback set, the [FL\\_Menu\\_](#) widget's callback is invoked with any userdata configured for it. The callback can determine which item was picked using `value()`, `mvalue()`, `item_pathname()`, etc.

The line spacing between menu items can be controlled with the global setting [FL::menu\\_linespacing\(\)](#).

See also

[FL\\_Widget::shortcut\\_label\(int\)](#)

## 33.83.2 Constructor & Destructor Documentation

### 33.83.2.1 Fl\_Menu\_()

```
Fl_Menu_::Fl_Menu_ (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Menu\\_](#) widget using the given position, size, and label string. [menu\(\)](#) is initialized to null.

## 33.83.3 Member Function Documentation

### 33.83.3.1 add() [1/2]

```
int Fl_Menu_::add (
    const char * str )
```

This is a Forms (and SGI GL library) compatible add function, it adds many menu items, with '|' separating the menu items, and tab separating the menu item names from an optional shortcut string.

The passed string is split at any '|' characters and then `add(s,0,0,0,0)` is done with each section. This is often useful if you are just using the value, and is compatible with Forms and other GL programs. The section strings use the same special characters as described for the long version of [add\(\)](#).

No items must be added to a menu during a callback to the same menu.

#### Parameters

<i>str</i>	string containing multiple menu labels as described above
------------	---

#### Returns

the index into the [menu\(\)](#) array, where the entry was added

### 33.83.3.2 add() [2/2]

```
int Fl_Menu_::add (
    const char * label,
    int shortcut,
    Fl_Callback * callback,
    void * userdata = 0,
    int flags = 0 )
```

Adds a new menu item.

#### Parameters

in	<i>label</i>	The text label for the menu item.
in	<i>shortcut</i>	Optional keyboard shortcut that can be an int or string: (FL_CTRL+'a') or "^a". Default 0 if none.
in	<i>callback</i>	Optional callback invoked when user clicks the item. Default 0 if none.
in	<i>userdata</i>	Optional user data passed as an argument to the callback. Default 0 if none.
in	<i>flags</i>	Optional flags that control the type of menu item; see below. Default is 0 for none.

### Returns

The index into the `menu()` array, where the entry was added.

### Description

If the menu array was directly set with `menu(x)`, then `copy()` is done to make a private array.

Since this method can change the internal menu array, any menu item pointers or indices the application may have cached can become stale, and should be recalculated/refreshed.

A menu item's callback must not `add()` items to its parent menu during the callback.

Due to backwards compatibility and historical restrictions we recommend to use either

- static menu arrays that are not extended during runtime or
- dynamic, extendable menu item arrays that are entirely created by using `add()` or `insert()`.

This ensures that all menu arrays and strings are copied to internal storage and released when required.

### Note

If you create menus from static `Fl_Menu_Item` arrays and `add()` or `insert()` more menu items later, then the menu array is copied to local storage but some local (static) strings may appear to "leak memory". This is a known issue and discouraged usage (see description above) but the impact on memory usage should typically be small.

### Detailed Description of Parameters

#### label

The menu item's label. This argument is required and must not be NULL.

The characters "&", "/", "\", and "\_" are treated as special characters in the label string. The "&" character specifies that the following character is an accelerator and will be underlined. The "\"" character is used to escape the next character in the string. Labels starting with the "\_" character cause a divider to be placed after that menu item.

A label of the form "File/Quit" will create the submenu "File" with a menu item called "Quit".

The label string is copied to new memory and can be freed. The other arguments (including the shortcut) are copied into the menu item unchanged.

If an item exists already with that name then it is replaced with this new one. Otherwise this new one is added to the end of the correct menu or submenu. The return value is the offset into the array that the new entry was placed at.

#### shortcut

The keyboard shortcut for this menu item.

This parameter is optional, and defaults to 0 to indicate no shortcut.

The shortcut can either be a raw integer value (eg. `FL_CTRL+'A'`) or a string (eg. `"^c"` or `"^97"`).

Raw integer shortcuts can be a combination of keyboard chars (eg. `'A'`) and optional keyboard modifiers (see [Fl::event\\_state\(\)](#), e.g. `FL_SHIFT`, etc). In addition, `FL_COMMAND` can be used to denote `FL_META` under Mac OS X and `FL_CTRL` under other platforms.

String shortcuts can be specified in one of two ways:

```
[#+^]<ascii_value>    e.g. "97", "^97", "+97", "#97"
[#+^]<ascii_char>     e.g. "a", "^a", "+a", "#a"
```

..where `<ascii_value>` is a decimal value representing an ASCII character (eg. 97 is the ascii code for 'a'), and the optional prefixes enhance the value that follows. Multiple prefixes must appear in the order below.

```
# - Alt
+ - Shift
^ - Control
```

Internally, the text shortcuts are converted to integer values using [fl\\_old\\_shortcut\(const char\\*\)](#).

#### callback

The callback to invoke when this menu item is selected.

This parameter is optional, and defaults to 0 for no callback.

#### userdata

The callback's 'user data' that is passed to the callback.

This parameter is optional, and defaults to 0.

#### flags

These are bit flags to define what kind of menu item this is.

This parameter is optional, and defaults to 0 to define a 'regular' menu item.

These flags can be 'OR'ed together:

```
FL_MENU_INACTIVE    // Deactivate menu item (gray out)
FL_MENU_TOGGLE      // Item is a checkbox toggle (shows checkbox for on/off state)
FL_MENU_VALUE       // The on/off state for checkbox/radio buttons (if set, state is 'on')
FL_MENU_RADIO       // Item is a radio button (one checkbox of many can be on)
FL_MENU_INVISIBLE   // Item will not show up (shortcut will work)
FL_SUBMENU_POINTER  // Indicates user_data() is a pointer to another menu array
FL_SUBMENU          // This item is a submenu to other items
FL_MENU_DIVIDER     // Creates divider line below this item. Also ends a group of radio buttons.
```

**All other bits in 'flags' are reserved and must not be used.**

If FL\_SUBMENU is set in an item's flags, then actually two items are added:

- the first item is the menu item (submenu title), as expected, and
- the second item is the submenu terminating item with the label and all other members set to 0.

If you add submenus with the 'path' technique, then the corresponding submenu terminators (maybe more than one) are added as well.

**Todo** Raw integer shortcut needs examples. Dependent on responses to <https://www.fltk.org/newsgroups.php?gfltk.coredev+v:10086> and results of STR#2344

### 33.83.3.3 clear()

```
void Fl_Menu_::clear (
    void )
```

Same as menu(NULL), set the array pointer to null, indicating a zero-length menu. Menus must not be cleared during a callback to the same menu.

### 33.83.3.4 clear\_submenu()

```
int Fl_Menu_::clear_submenu (
    int index )
```

Clears the specified submenu pointed to by `index` of all menu items.

This method is useful for clearing a submenu so that it can be re-populated with new items. Example: a "File/Recent Files/..." submenu that shows the last few files that have been opened.

The specified `index` must point to a submenu.

The submenu is cleared with [remove\(\)](#). If the menu array was directly set with `menu(x)`, then [copy\(\)](#) is done to make a private array.

#### Warning

Since this method can change the internal menu array, any menu item pointers or indices the application may have cached can become stale, and should be recalculated/refreshed.

#### Example:

```
int index = menubar->find_index("File/Recent"); // get index of "File/Recent" submenu
if ( index != -1 ) menubar->clear_submenu(index); // clear the submenu
menubar->add("File/Recent/Aaa");
menubar->add("File/Recent/Bbb");
[...]
```

#### Parameters

<i>index</i>	The index of the submenu to be cleared
--------------	--

#### Returns

0 on success, -1 if the index is out of range or not a submenu

#### See also

[remove\(int\)](#)

### 33.83.3.5 copy()

```
void Fl_Menu_::copy (
```

```
const Fl_Menu_Item * m,
void * ud = 0 )
```

Sets the menu array pointer with a copy of *m* that will be automatically deleted.

If userdata *ud* is not NULL, then all user data pointers are changed in the menus as well. See `void Fl_Menu_::menu(const Fl_Menu_Item* m)`.

### 33.83.3.6 down\_box()

```
void Fl_Menu_::down_box (
    Fl_Boxtype b ) [inline]
```

Sets the box type used to surround the currently-selected items in the menus.

### 33.83.3.7 find\_index() [1/3]

```
int Fl_Menu_::find_index (
    const char * pathname ) const
```

Find the menu item index for a given menu *pathname*, such as "Edit/Copy".

This method finds a menu item's index position for the given menu *pathname*, also traversing submenus, but **not** submenu pointers (FL\_SUBMENU\_POINTER).

To get the menu item pointer for a *pathname*, use `find_item()`

#### Parameters

in	<i>pathname</i>	The path and name of the menu item to find
----	-----------------	--

#### Returns

The index of the matching item, or -1 if not found.

#### See also

[item\\_pathname\(\)](#)

### 33.83.3.8 find\_index() [2/3]

```
int Fl_Menu_::find_index (
    const Fl_Menu_Item * item ) const
```

Find the index into the menu array for a given *item*.

A way to convert a menu item pointer into an index.

Does **not** handle items that are in submenu pointers (FL\_SUBMENU\_POINTER).

-1 is returned if the item is not in this menu or is part of an FL\_SUBMENU\_POINTER submenu.

Current implementation is fast and not expensive.

```
// Convert an index-to-item
int index = 12;
const Fl_Menu_Item *item = mymenu->menu() + index;
// Convert an item-to-index
int index = mymenu->find_index(item);
if ( index == -1 ) { ..error.. }
```

#### Parameters

in	<i>item</i>	The item to be found
----	-------------	----------------------

#### Returns

The index of the item, or -1 if not found.

See also

[menu\(\)](#)

### 33.83.3.9 find\_index() [3/3]

```
int Fl_Menu_::find_index (
    Fl_Callback * cb ) const
```

Find the index into the menu array for a given callback `cb`.

This method finds a menu item's index position, also traversing submenus, but **not** submenu pointers (FL\_↔SUBMENU\_POINTER). This is useful if an application uses internationalisation and a menu item can not be found using its label. This search is also much faster.

Parameters

<code>cb</code>	Find the first item with this callback
-----------------	--

Returns

The index of the item with the specific callback, or -1 if not found

See also

[find\\_index\(const char\\*\)](#)

### 33.83.3.10 find\_item() [1/2]

```
const Fl_Menu_Item * Fl_Menu_::find_item (
    const char * pathname )
```

Find the menu item for a given menu `pathname`, such as "Edit/Copy".

This method finds a menu item in the menu array, also traversing submenus, but not submenu pointers (FL\_↔SUBMENU\_POINTER).

To get the menu item's index, use [find\\_index\(const char\\*\)](#)

**Example:**

```
Fl_Menu_Bar *menubar = new Fl_Menu_Bar(..);
menubar->add("File/&Open");
menubar->add("File/&Save");
menubar->add("Edit/&Copy");
// [...]
Fl_Menu_Item *item;
if ( ( item = (Fl_Menu_Item*)menubar->find_item("File/&Open") ) != NULL ) {
    item->labelcolor(FL_RED);
}
if ( ( item = (Fl_Menu_Item*)menubar->find_item("Edit/&Copy") ) != NULL ) {
    item->labelcolor(FL_GREEN);
}
```

Parameters

<code>pathname</code>	The path and name of the menu item
-----------------------	------------------------------------

Returns

The item found, or NULL if not found

See also

[find\\_index\(const char\\*\)](#), [find\\_item\(Fl\\_Callback\\*\)](#), [item\\_pathname\(\)](#)

### 33.83.3.11 find\_item() [2/2]

```
const Fl_Menu_Item * Fl_Menu_::find_item (
    Fl_Callback * cb )
```

Find the menu item for the given callback *cb*.

This method finds a menu item in a menu array, also traversing submenus, but not submenu pointers. This is useful if an application uses internationalisation and a menu item can not be found using its label. This search is also much faster.

#### Parameters

in	cb	find the first item with this callback
----	----	--

#### Returns

The item found, or NULL if not found

#### See also

[find\\_item\(const char\\*\)](#)

### 33.83.3.12 find\_item\_with\_argument()

```
const Fl_Menu_Item * Fl_Menu_::find_item_with_argument (
    long v )
```

Find the menu item for the given user argument *v*.

#### Parameters

in	v	find the first item with this user argument
----	---	---

#### Returns

The item found, or NULL if not found

#### See also

[find\\_item\(const char\\*\)](#)

### 33.83.3.13 find\_item\_with\_user\_data()

```
const Fl_Menu_Item * Fl_Menu_::find_item_with_user_data (
    void * v )
```

Find the menu item for the given user data *v*.

#### Parameters

in	v	find the first item with this user data
----	---	---

#### Returns

The item found, or NULL if not found

See also

[find\\_item\(const char\\*\)](#)

### 33.83.3.14 global()

```
void Fl_Menu_::global ( )
```

Make the shortcuts for this menu work no matter what window has the focus when you type it.

This is done by using [Fl::add\\_handler\(\)](#). This [Fl\\_Menu\\_](#) widget does not have to be visible (ie the window it is in can be hidden, or it does not have to be put in a window at all).

Currently there can be only one [global\(\)](#) menu. Setting a new one will replace the old one. There is no way to remove the [global\(\)](#) setting (so don't destroy the widget!)

### 33.83.3.15 insert()

```
int Fl_Menu_::insert (
    int index,
    const char * label,
    int shortcut,
    Fl_Callback * callback,
    void * userdata = 0,
    int flags = 0 )
```

Inserts a new menu item at the specified `index` position.

If `index` is -1, the menu item is appended; same behavior as [add\(\)](#).

To properly insert a menu item, `label` must be the name of the item (eg. "Quit"), and not a 'menu pathname' (eg. "File/Quit"). If a menu pathname is specified, the value of `index` is *ignored*, the new item's position defined by the pathname.

For more details, see [add\(\)](#). Except for the `index` parameter, [add\(\)](#) has more detailed information on parameters and behavior, and is functionally equivalent.

#### Parameters

in	<i>index</i>	The menu array's index position where the new item is inserted. If -1, behavior is the same as <a href="#">add()</a> .
in	<i>label</i>	The text label for the menu item. If the label is a menu pathname, <code>index</code> is ignored, and the pathname indicates the position of the new item.
in	<i>shortcut</i>	Optional keyboard shortcut. Can be an int (FL_CTRL+'a') or a string ("^a"). Default is 0.
in	<i>callback</i>	Optional callback invoked when user clicks the item. Default 0 if none.
in	<i>userdata</i>	Optional user data passed as an argument to the callback. Default 0 if none.
in	<i>flags</i>	Optional flags that control the type of menu item; see <a href="#">add()</a> for more info. Default is 0 for none.

#### Returns

The index into the [menu\(\)](#) array, where the entry was added.

See also

[add\(\)](#)

### 33.83.3.16 item\_pathname()

```
int Fl_Menu_::item_pathname (
    char * name,
    int namelen,
    const Fl_Menu_Item * finditem = 0 ) const
```

Get the menu 'pathname' for the specified menuitem.

If finditem==NULL, [mvalue\(\)](#) is used (the most recently picked menuitem).

#### Example:

```
Fl_Menu_Bar *menubar = 0;
void my_menu_callback(Fl_Widget*,void*) {
    char name[80];
    if ( menubar->item_pathname(name, sizeof(name)-1) == 0 ) { // recently picked item
        if ( strcmp(name, "File/Save") == 0 ) { .. } // open invoked
        if ( strcmp(name, "File/Save") == 0 ) { .. } // save invoked
        if ( strcmp(name, "Edit/Undo") == 0 ) { .. } // copy invoked
    }
}
int main() {
    [...]
    menubar = new Fl_Menu_Bar(..);
    menubar->add("File/Open", 0, my_menu_callback);
    menubar->add("File/Save", 0, my_menu_callback);
    menubar->add("Edit/Undo", 0, my_menu_callback);
    [...]
}
```

#### Returns

- 0 : OK (name has menuitem's pathname)
- -1 : item not found (name=="")
- -2 : 'name' not large enough (name=="")

#### See also

[find\\_item\(\)](#)

### 33.83.3.17 menu() [1/2]

```
const Fl_Menu_Item * Fl_Menu_::menu ( ) const [inline]
```

Returns a pointer to the array of [Fl\\_Menu\\_Items](#).

This will either be the value passed to menu(value) or the private copy or an internal (temporary) location (see note below).

#### Note

**Implementation details - may be changed in the future.** All modifications of the menu array are done by copying the entire menu array to an internal storage for optimization of memory allocations, for instance when using [add\(\)](#) or [insert\(\)](#). While this is done, [menu\(\)](#) returns the pointer to this internal location. The entire menu will be copied back to private storage when needed, i.e. when **another** [Fl\\_Menu\\_](#) is modified. You can force this reallocation after you're done with all menu modifications by calling [Fl\\_Menu\\_::menu\\_end\(\)](#) to make sure [menu\(\)](#) returns a permanent pointer to private storage (until the menu is modified again). Note also that some menu methods (e.g. [Fl\\_Menu\\_Button::popup\(\)](#)) call [menu\\_end\(\)](#) internally to ensure a consistent menu array while the menu is open.

#### See also

[size\(\)](#) – returns the [size](#) of the [Fl\\_Menu\\_Item](#) array.

[menu\\_end\(\)](#) – finish menu modifications (optional)

#### Example: How to walk the array:

```
for ( int t=0; t<menubar->size(); t++ ) { // walk array of items
    const Fl_Menu_Item &item = menubar->menu()[t]; // get each item
    fprintf(stderr, "item #%d -- label=%s, value=%s type=%s\n",
        t,
        item.label() ? item.label() : "(Null)", // menu terminators have NULL labels
        (item.flags & FL_MENU_VALUE) ? "set" : "clear", // value of toggle or radio items
        (item.flags & FL_SUBMENU) ? "Submenu" : "Item"); // see if item is a submenu or actual item
}
```

**33.83.3.18 menu()** [2/2]

```
void Fl_Menu_::menu (
    const Fl_Menu_Item * m )
```

Sets the menu array pointer directly.

If the old menu is private it is deleted. NULL is allowed and acts the same as a zero-length menu. If you try to modify the array (with [add\(\)](#), [replace\(\)](#), or [remove\(\)](#)) a private copy is automatically done.

**33.83.3.19 menu\_box()** [1/2]

```
Fl_Boxtype Fl_Menu_::menu_box ( ) const [inline]
```

Get the box type for the menu popup windows.

**Returns**

the box type, or FL\_NO\_BOX if [Fl\\_Menu\\_::box\(\)](#) is to be used instead

**33.83.3.20 menu\_box()** [2/2]

```
void Fl_Menu_::menu_box (
    Fl_Boxtype b ) [inline]
```

Set the box type for the menu popup windows.

If menu\_box set to FL\_NO\_BOX, the menu window will use [Fl\\_Menu\\_::box\(\)](#) instead.

**Parameters**

in	<i>b</i>	new box type or FL_NO_BOX
----	----------	---------------------------

**33.83.3.21 menu\_end()**

```
const Fl_Menu_Item * Fl_Menu_::menu_end ( )
```

Finishes menu modifications and returns [menu\(\)](#).

Call [menu\\_end\(\)](#) after using [add\(\)](#), [insert\(\)](#), [remove\(\)](#), or any other methods that may change the menu array if you want to access the menu array anytime later with [menu\(\)](#). This should be called only once after the **last** menu modification for performance reasons.

Does nothing if the menu array is already in a private location.

Some methods like [Fl\\_Menu\\_Button::popup\(\)](#) call this method before their menu is opened.

**Note**

After menu changes like [add\(\)](#), [insert\(\)](#), etc. [menu\(\)](#) would return a pointer to a temporary internal menu array that may be relocated at unexpected times. This is due to performance considerations and may be changed w/o further notice.

**Since**

1.4.0

**Returns**

New [Fl\\_Menu\\_Item](#) array pointer.

**See also**

[Fl\\_Menu\\_::menu\(\)](#)

**33.83.3.22 mode()** [1/2]

```
int Fl_Menu_::mode (
    int i ) const [inline]
```

Get the flags of item *i*.

For a list of the flags, see [Fl\\_Menu\\_Item](#).

**33.83.3.23 mode()** [2/2]

```
void Fl_Menu_::mode (
    int i,
    int fl ) [inline]
```

Set the flags of item *i*.

For a list of the flags, see [Fl\\_Menu\\_Item](#).

**33.83.3.24 mvalue()**

```
const Fl_Menu_Item * Fl_Menu_::mvalue ( ) const [inline]
```

Return a pointer to the last menu item that was picked.

**33.83.3.25 picked()**

```
const Fl_Menu_Item * Fl_Menu_::picked (
    const Fl_Menu_Item * v )
```

When user picks a menu item, call this.

It will do the callback.

Unfortunately this also casts away `const` for the checkboxes, but this was necessary so non-checkbox menus can really be declared 'const'.

**Parameters**

<i>in</i>	<i>v</i>	The menu item that was picked by the user.
-----------	----------	--

**Returns**

The same `Fl_Menu_Item*` that was set (*v*).

**33.83.3.26 prev\_mvalue()**

```
const Fl_Menu_Item * Fl_Menu_::prev_mvalue ( ) const [inline]
```

Return a pointer to the menu item that was picked before the current one was picked.

This call gives developers additional details how a user changed a choice in the [Fl\\_Choice](#) widget.

**33.83.3.27 remove()**

```
void Fl_Menu_::remove (
    int i )
```

Deletes item *i* from the menu.

If the menu array was directly set with `menu(x)` then `copy()` is done to make a private array.

No items must be removed from a menu during a callback to the same menu.

**Parameters**

<i>i</i>	index into menu array
----------	-----------------------

**33.83.3.28 replace()**

```
void Fl_Menu_::replace (
    int i,
    const char * str )
```

Changes the text of item *i*.

This is the only way to get slash into an [add\(\)](#)'ed menu item. If the menu array was directly set with `menu(x)` then [copy\(\)](#) is done to make a private array.

**Parameters**

<i>i</i>	index into menu array
<i>str</i>	new label for menu item at index <i>i</i>

**33.83.3.29 size()**

```
int Fl_Menu_::size ( ) const
```

This returns the number of [Fl\\_Menu\\_Item](#) structures that make up the menu, correctly counting submenus.

This includes the "terminator" item at the end. To copy a menu array you need to copy `size()*sizeof(Fl_Menu_Item)` bytes. If the menu is NULL this returns zero (an empty menu will return 1).

**33.83.3.30 test\_shortcut()**

```
const Fl_Menu_Item * Fl_Menu_::test_shortcut ( ) [inline]
```

Returns the menu item with the entered shortcut (key value).

This searches the complete [menu\(\)](#) for a shortcut that matches the entered key value. It must be called for a `FL_KEYBOARD` or `FL_SHORTCUT` event.

If a match is found, the menu's callback will be called.

**Returns**

matched [Fl\\_Menu\\_Item](#) or NULL.

**33.83.3.31 text() [1/2]**

```
const char * Fl_Menu_::text ( ) const [inline]
```

Returns the title of the last item chosen.

**33.83.3.32 text() [2/2]**

```
const char * Fl_Menu_::text (
    int i ) const [inline]
```

Returns the title of item *i*.

**33.83.3.33 textcolor()**

```
Fl_Color Fl_Menu_::textcolor ( ) const [inline]
```

Get the current color of menu item labels.

**33.83.3.34** `textfont()` [1/2]

```
Fl_Font Fl_Menu_::textfont ( ) const [inline]
```

Gets the current font of menu item labels.

**33.83.3.35** `textfont()` [2/2]

```
void Fl_Menu_::textfont (
    Fl_Font c ) [inline]
```

Sets the current font of menu item labels.

**33.83.3.36** `textsize()` [1/2]

```
Fl_Fontsize Fl_Menu_::textsize ( ) const [inline]
```

Gets the font size of menu item labels.

**33.83.3.37** `textsize()` [2/2]

```
void Fl_Menu_::textsize (
    Fl_Fontsize c ) [inline]
```

Sets the font size of menu item labels.

**33.83.3.38** `value()` [1/3]

```
int Fl_Menu_::value ( ) const
```

Return the index into the `menu()` of the last item chosen by the user.

The *value* of the menu is the index into the `menu()` of the last item chosen by the user or -1.

It is -1 initially (if no item has been chosen) or if the chosen menu item is part of a submenu addressed by an `FL_SUBMENU_POINTER`.

**Note**

All menu items are located in a contiguous array of `Fl_Menu_Item`'s unless an item has the `FL_SUBMENU_POINTER` flag which redirects the submenu to an independent submenu array. This submenu array is not counted in the `size()` of the menu, and menu items in this submenu can't return a valid index into the **main** menu. Therefore menu items that are located in such a submenu return -1 when `value()` is called. This may be changed in a future version.

You can use `mvalue()` instead to retrieve the last picked menu item directly.

**Returns**

Index of the last chosen menu item or -1 (see description).

**See also**

```
const Fl_Menu_Item *mvalue()
```

**33.83.3.39 value()** [2/3]

```
int Fl_Menu_::value (
    const Fl_Menu_Item * m )
```

Set the value of a menu to the menu item *m*.

The *value* of the menu is the index into the [menu\(\)](#) of the last item chosen by the user or -1.

It is -1 initially (if no item has been chosen) or if the chosen menu item is part of a submenu addressed by an FL\_SUBMENU\_POINTER.

**Note**

All menu items are located in a contiguous array of [Fl\\_Menu\\_Item](#)'s unless an item has the FL\_SUBMENU\_POINTER flag which redirects the submenu to an independent submenu array. This submenu array is not counted in the [size\(\)](#) of the menu, and menu items in this submenu can't return a valid index into the **main** menu. Therefore menu items that are located in such a submenu return -1 when [value\(\)](#) is called. This may be changed in a future version.

The menu item can be any menu item, even one in a detached submenu (see note about FL\_SUBMENU\_POINTER above).

**Parameters**

<i>in</i>	<i>m</i>	Pointer to any menu item.
-----------	----------	---------------------------

**Returns**

Whether the new value is different than the old one.

**Return values**

0	The value didn't change.
1	The value was changed.

**See also**

```
int value(int)
int value()
const Fl_Menu_Item *mvalue()
```

**33.83.3.40 value()** [3/3]

```
int Fl_Menu_::value (
    int i ) [inline]
```

Set the value of the menu to index *i*.

The *value* of the menu is the index into the [menu\(\)](#) of the last item chosen by the user or -1.

It is -1 initially (if no item has been chosen) or if the chosen menu item is part of a submenu addressed by an FL\_SUBMENU\_POINTER.

**Note**

All menu items are located in a contiguous array of [Fl\\_Menu\\_Item](#)'s unless an item has the FL\_SUBMENU\_POINTER flag which redirects the submenu to an independent submenu array. This submenu array is not counted in the [size\(\)](#) of the menu, and menu items in this submenu can't return a valid index into the **main** menu. Therefore menu items that are located in such a submenu return -1 when [value\(\)](#) is called. This may be changed in a future version.

You can set the value as an integer or with a pointer to a menu item. The integer value is restricted to the main menu array (0..[size\(\)](#)-1) whereas the menu item can be any menu item, even one in a detached submenu (see note about FL\_SUBMENU\_POINTER above).

## Parameters

<code>in</code>	<code>i</code>	Index of the menu item in the main menu array. Values outside 0.. <code>size()</code> -1 are ignored (return 0).
-----------------	----------------	---

## Returns

Whether the new value is different than the old one.

## Return values

<code>0</code>	The value didn't change.
<code>1</code>	The value was changed.

## See also

int [value\(const Fl\\_Menu\\_Item\\*\)](#)  
 int [value\(\)](#)  
 const [Fl\\_Menu\\_Item](#) \*mvalue()

The documentation for this class was generated from the following files:

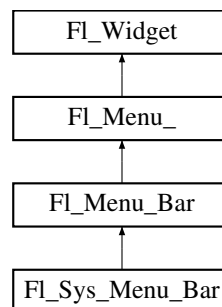
- `Fl_Menu_.H`
- `Fl_Menu_.cxx`
- `Fl_Menu_add.cxx`
- `Fl_Menu_global.cxx`

## 33.84 Fl\_Menu\_Bar Class Reference

This widget provides a standard menubar interface.

```
#include <Fl_Menu_Bar.H>
```

Inheritance diagram for `Fl_Menu_Bar`:



### Public Member Functions

- [Fl\\_Menu\\_Bar](#) (int X, int Y, int W, int H, const char \*l=0)  
*Creates a new [Fl\\_Menu\\_Bar](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- virtual void [play\\_menu](#) (const [Fl\\_Menu\\_Item](#) \*item)  
*Opens the 1st level submenu of the menubar corresponding to *item*.*
- virtual void [update](#) ()  
*Updates the menu bar after any change to its items.*

## Protected Member Functions

- void `draw ()` [FL\\_OVERRIDE](#)  
*Draws the widget.*

## Friends

- class `Fl_Sys_Menu_Bar_Driver`

## Additional Inherited Members

### 33.84.1 Detailed Description

This widget provides a standard menubar interface.

Usually you will put this widget along the top edge of your window. The height of the widget should be 30 for the menu titles to draw correctly with the default font.

The items on the bar and the menus they bring up are defined by a single [Fl\\_Menu\\_Item](#) array. Because a [Fl\\_Menu\\_Item](#) array defines a hierarchy, the top level menu defines the items in the menubar, while the submenus define the pull-down menus. Sub-sub menus and lower pop up to the right of the submenus.

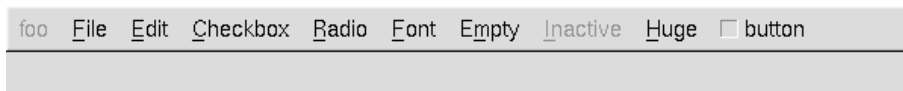


Figure 33.28 menubar

If there is an item in the top menu that is not a title of a submenu, then it acts like a "button" in the menubar. Clicking on it will pick it.

When the user clicks a menu item, `value()` is set to that item and then:

- The item's callback is done if one has been set; the [Fl\\_Menu\\_Bar](#) is passed as the `Fl_Widget*` argument, along with any userdata configured for the callback.
- If the item does not have a callback, the [Fl\\_Menu\\_Bar](#)'s callback is done instead, along with any userdata configured for the callback. The callback can determine which item was picked using `value()`, `mvalue()`, `item_pathname()`, etc.

Submenus will also pop up in response to shortcuts indicated by putting a '&' character in the name field of the menu item. If you put a '&' character in a top-level "button" then the shortcut picks it. The '&' character in submenus is ignored until the menu is popped up.

Typing the [shortcut\(\)](#) of any of the menu items will cause callbacks exactly the same as when you pick the item with the mouse.

FLTK triggers an `FL_BEFORE_MENU` event for this widget right before displaying the menu. This event provides an opportunity to update menu item states and activation.

### 33.84.2 Constructor & Destructor Documentation

#### 33.84.2.1 `Fl_Menu_Bar()`

```
Fl_Menu_Bar::Fl_Menu_Bar (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Menu\\_Bar](#) widget using the given position, size, and label string.

The default boxtype is `FL_UP_BOX`.

The constructor sets `menu()` to `NULL`. See [Fl\\_Menu\\_](#) for the methods to set or change the menu.

[labelsize\(\)](#), [labelfont\(\)](#), and [labelcolor\(\)](#) are used to control how the menubar items are drawn. They are initialized from the `Fl_Menu` static variables, but you can change them if desired.

[label\(\)](#) is ignored unless you change [align\(\)](#) to put it outside the menubar.

The destructor removes the `Fl_Menu_Bar` widget and all of its menu items.

### 33.84.3 Member Function Documentation

#### 33.84.3.1 `draw()`

```
void Fl_Menu_Bar::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

Reimplemented in [Fl\\_Sys\\_Menu\\_Bar](#).

#### 33.84.3.2 `handle()`

```
int Fl_Menu_Bar::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

##### Parameters

<code>in</code>	<code>event</code>	the kind of event received
-----------------	--------------------	----------------------------

##### Return values

<code>0</code>	if the event was not used or understood
<code>1</code>	if the event was used and can be deleted

See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

### 33.84.3.3 play\_menu()

```
void Fl_Menu_Bar::play_menu (
    const Fl\_Menu\_Item * item ) [virtual]
```

Opens the 1st level submenu of the menubar corresponding to *item*.

Since

1.4.0

Reimplemented in [Fl\\_Sys\\_Menu\\_Bar](#).

### 33.84.3.4 update()

```
virtual void Fl_Menu_Bar::update ( ) [inline], [virtual]
```

Updates the menu bar after any change to its items.

This is useful when the menu bar can be an [Fl\\_Sys\\_Menu\\_Bar](#) object.

Reimplemented in [Fl\\_Sys\\_Menu\\_Bar](#).

The documentation for this class was generated from the following files:

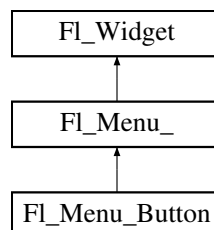
- [Fl\\_Menu\\_Bar.H](#)
- [Fl\\_Menu\\_Bar.cxx](#)

## 33.85 Fl\_Menu\_Button Class Reference

This is a button that when pushed pops up a menu (or hierarchy of menus) defined by an array of [Fl\\_Menu\\_Item](#) objects.

```
#include <Fl_Menu_Button.H>
```

Inheritance diagram for [Fl\\_Menu\\_Button](#):



### Public Types

- enum [popup\\_buttons](#) {  
[POPUP1](#) = 1 , [POPUP2](#) , [POPUP12](#) , [POPUP3](#) ,  
[POPUP13](#) , [POPUP23](#) , [POPUP123](#) }

*indicate what mouse buttons pop up the menu.*

### Public Member Functions

- [Fl\\_Menu\\_Button](#) (int, int, int, int, const char \*=0)  
*Creates a new [Fl\\_Menu\\_Button](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)

*Handles the specified event.*

- const [FI\\_Menu\\_Item](#) \* [popup](#) ()

*Act exactly as though the user clicked the button or typed the shortcut key.*

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)

*Draws the widget.*

## Static Protected Attributes

- static [FI\\_Menu\\_Button](#) \* [pressed\\_menu\\_button\\_](#) = NULL

## Additional Inherited Members

### 33.85.1 Detailed Description

This is a button that when pushed pops up a menu (or hierarchy of menus) defined by an array of [FI\\_Menu\\_Item](#) objects.



Figure 33.29 menu\_button

Normally any mouse button will pop up a menu and it is lined up below the button as shown in the picture. However an [FI\\_Menu\\_Button](#) may also control a pop-up menu. This is done by setting the [type\(\)](#). If [type\(\)](#) is zero a normal menu button is produced. If it is nonzero then this is a pop-up menu. The bits in [type\(\)](#) indicate what mouse buttons pop up the menu (see [FI\\_Menu\\_Button::popup\\_buttons](#)).

The menu will also pop up in response to shortcuts indicated by putting a '&' character in the [label\(\)](#).

Typing the [shortcut\(\)](#) of any of the menu items will cause callbacks exactly the same as when you pick the item with the mouse. The '&' character in menu item names are only looked at when the menu is popped up, however.

When the user clicks a menu item, [value\(\)](#) is set to that item and then:

- The item's callback is done if one has been set; the [FI\\_Menu\\_Button](#) is passed as the [FI\\_Widget\\*](#) argument, along with any userdata configured for the callback.
- If the item does not have a callback, the [FI\\_Menu\\_Button](#)'s callback is done instead, along with any userdata configured for it. The callback can determine which item was picked using [value\(\)](#), [mvalue\(\)](#), [item\\_pathname\(\)](#), etc.

FLTK triggers an [FL\\_BEFORE\\_MENU](#) event for this widget right before displaying the menu. This event provides an opportunity to update menu item states and activation.

## 33.85.2 Member Enumeration Documentation

### 33.85.2.1 popup\_buttons

enum [Fl\\_Menu\\_Button::popup\\_buttons](#)

indicate what mouse buttons pop up the menu.

Values for [type\(\)](#) used to indicate what mouse buttons pop up the menu. [Fl\\_Menu\\_Button::POPUP3](#) is usually what you want.

Enumerator

POPUP1	pops up with the mouse 1st button.
POPUP2	pops up with the mouse 2nd button.
POPUP12	pops up with the mouse 1st or 2nd buttons.
POPUP3	pops up with the mouse 3rd button.
POPUP13	pops up with the mouse 1st or 3rd buttons.
POPUP23	pops up with the mouse 2nd or 3rd buttons.
POPUP123	pops up with any mouse button.

## 33.85.3 Constructor & Destructor Documentation

### 33.85.3.1 Fl\_Menu\_Button()

```
Fl_Menu_Button::Fl_Menu_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Menu\\_Button](#) widget using the given position, size, and label string.

The default boxtype is `FL_UP_BOX`.

The constructor sets [menu\(\)](#) to `NULL`. See [Fl\\_Menu\\_](#) for the methods to set or change the menu.

## 33.85.4 Member Function Documentation

### 33.85.4.1 draw()

```
void Fl_Menu_Button::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.85.4.2 handle()

```
int Fl_Menu_Button::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee's return value.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

### 33.85.4.3 popup()

```
const Fl_Menu_Item * Fl_Menu_Button::popup ( )
```

Act exactly as though the user clicked the button or typed the shortcut key.

The menu appears, it waits for the user to pick an item, and if they pick one it sets [value\(\)](#) and does the callback or sets [changed\(\)](#) as described above. The menu item is returned or NULL if the user dismisses the menu.

#### Note

Since FLTK 1.4.0 [Fl\\_Menu\\_::menu\\_end\(\)](#) is called before the menu pops up to make sure the menu array is located in private storage.

#### See also

[Fl\\_Menu\\_::menu\\_end\(\)](#)

The documentation for this class was generated from the following files:

- [Fl\\_Menu\\_Button.H](#)
- [Fl\\_Menu\\_Button.cxx](#)

## 33.86 Fl\_Menu\_Item Struct Reference

The [Fl\\_Menu\\_Item](#) structure defines a single menu item that is used by the [Fl\\_Menu\\_](#) class.

```
#include <Fl_Menu_Item.H>
```

## Public Member Functions

- void **activate** ()  
*Allows a menu item to be picked.*
- int **active** () const  
*Gets whether or not the item can be picked.*
- int **activevisible** () const  
*Returns non 0 if FL\_INACTIVE and FL\_INVISIBLE are cleared, 0 otherwise.*
- int **add** (const char \*, int **shortcut**, **FI\_Callback** \*, void \*=0, int=0)  
*Adds a menu item.*
- int **add** (const char \*a, const char \*b, **FI\_Callback** \*c, void \*d=0, int e=0)  
*See int [add\(const char\\*, int shortcut, FI\\_Callback\\*, void\\*, int\)](#)*
- long **argument** () const  
*Gets the [user\\_data\(\)](#) argument that is sent to the callback function.*
- void **argument** (long v)  
*Sets the [user\\_data\(\)](#) argument that is sent to the callback function.*
- **FI\_Callback\_p** **callback** () const  
*Returns the callback function that is set for the menu item.*
- void **callback** (**FI\_Callback** \*c)  
*Sets the menu item's callback function.*
- void **callback** (**FI\_Callback** \*c, void \*p)  
*Sets the menu item's callback function and userdata() argument.*
- void **callback** (**FI\_Callback0** \*c)  
*Sets the menu item's callback function.*
- void **callback** (**FI\_Callback1** \*c, long p=0)  
*Sets the menu item's callback function and userdata() argument.*
- void **check** ()  
*Back compatibility only.*
- int **checkbox** () const  
*Returns true if a checkbox will be drawn next to this item.*
- int **checked** () const  
*Back compatibility only.*
- void **clear** ()  
*Turns the check or radio item "off" for the menu item.*
- void **deactivate** ()  
*Prevents a menu item from being picked.*
- void **do\_callback** (**FI\_Widget** \*o, **FI\_Callback\_Reason** reason=**FL\_REASON\_UNKNOWN**) const  
*Calls the [FI\\_Menu\\_Item](#) item's callback, and provides the [FI\\_Widget](#) argument.*
- void **do\_callback** (**FI\_Widget** \*o, long arg, **FI\_Callback\_Reason** reason=**FL\_REASON\_UNKNOWN**) const  
*Calls the [FI\\_Menu\\_Item](#) item's callback, and provides the [FI\\_Widget](#) argument.*
- void **do\_callback** (**FI\_Widget** \*o, void \*arg, **FI\_Callback\_Reason** reason=**FL\_REASON\_UNKNOWN**) const  
*Calls the [FI\\_Menu\\_Item](#) item's callback, and provides the [FI\\_Widget](#) argument.*
- void **draw** (int x, int y, int w, int h, const **FI\_Menu\_\***, int t=0) const  
*Draws the menu item in bounding box x,y,w,h, optionally selects the item.*
- const **FI\_Menu\_Item** \* **find\_shortcut** (int \*ip=0, const bool require\_alt=false) const  
*Search only the top level menu for a shortcut.*
- **FI\_Menu\_Item** \* **first** ()  
*Returns the first menu item, same as next(0).*
- const **FI\_Menu\_Item** \* **first** () const  
*Returns the first menu item, same as next(0).*
- void **hide** ()

- Hides an item in the menu.*
- void [image](#) ([FI\\_Image](#) &image)  
*Compatibility API for FLUID, same as image.label(this).*
- void [image](#) ([FI\\_Image](#) \*image)  
*Compatibility API for FLUID, same as image->label(this).*
- void [image\\_label](#) (const [FI\\_Image](#) \*image)  
*Sets the title (label()) to an icon or image.*
- int [insert](#) (int, const char \*, int, [FI\\_Callback](#) \*, void \*=0, int=0)  
*Inserts an item at position index.*
- const char \* [label](#) () const  
*Returns the title (label) of the menu item.*
- void [label](#) (const char \*a)  
*Sets the title (label) of the menu item.*
- void [label](#) ([FI\\_Labeltype](#) a, const char \*b)  
*Sets the title (label) and the label type of the menu item.*
- [FI\\_Color](#) [labelcolor](#) () const  
*Gets the menu item's label color.*
- void [labelcolor](#) ([FI\\_Color](#) a)  
*Sets the menu item's label color.*
- [FI\\_Font](#) [labelfont](#) () const  
*Gets the menu item's label font.*
- void [labelfont](#) ([FI\\_Font](#) a)  
*Sets the menu item's label font.*
- [FI\\_Fonsize](#) [labelsize](#) () const  
*Gets the label font pixel size/height.*
- void [labelsize](#) ([FI\\_Fonsize](#) a)  
*Sets the label font pixel size/height.*
- [FI\\_Labeltype](#) [labeltype](#) () const  
*Returns the menu item's labeltype.*
- void [labeltype](#) ([FI\\_Labeltype](#) a)  
*Sets the menu item's labeltype.*
- int [measure](#) (int \*h, const [FI\\_Menu\\_](#) \*) const  
*Measures width of label, including effect of & characters.*
- void [multi\\_label](#) (const [FI\\_Multi\\_Label](#) \*ml)  
*Sets the title (label()) and labeltype() to an FI\_Multi\_Label.*
- [FI\\_Menu\\_Item](#) \* [next](#) (int i=1)  
*Advances a pointer by n items through a menu array, skipping the contents of submenus and invisible items.*
- const [FI\\_Menu\\_Item](#) \* [next](#) (int=1) const  
*Advance a pointer by n items through a menu array, skipping the contents of submenus and invisible items.*
- const [FI\\_Menu\\_Item](#) \* [popup](#) (int X, int Y, const char \*title=0, const [FI\\_Menu\\_Item](#) \*picked=0, const [FI\\_Menu\\_](#) \*=0) const  
*This method is called by widgets that want to display menus.*
- const [FI\\_Menu\\_Item](#) \* [pulldown](#) (int X, int Y, int W, int H, const [FI\\_Menu\\_Item](#) \*picked=0, const [FI\\_Menu\\_](#) \*=0, const [FI\\_Menu\\_Item](#) \*title=0, int menubar=0) const  
*Pulldown() is similar to popup(), but a rectangle is provided to position the menu.*
- int [radio](#) () const  
*Returns true if this item is a radio item.*
- void [set](#) ()  
*Turns the check or radio item "on" for the menu item.*
- void [setonly](#) ([FI\\_Menu\\_Item](#) const \*first=NULL)  
*Turns the radio item "on" for the menu item and turns "off" adjacent radio items set.*

- int **shortcut** () const  
*Gets what key combination shortcut will trigger the menu item.*
- void **shortcut** (int s)  
*Sets exactly what key combination will trigger the menu item.*
- void **show** ()  
*Makes an item visible in the menu.*
- int **size** () const  
*Size of the menu starting from this menu item.*
- int **submenu** () const  
*Returns true if either FL\_SUBMENU or FL\_SUBMENU\_POINTER is on in the flags.*
- const **FI\_Menu\_Item** \* **test\_shortcut** () const  
*This is designed to be called by a widgets handle() method in response to a FL\_SHORTCUT event.*
- void **uncheck** ()  
*Back compatibility only.*
- void \* **user\_data** () const  
*Gets the [user\\_data\(\)](#) argument that is sent to the callback function.*
- void **user\_data** (void \*v)  
*Sets the [user\\_data\(\)](#) argument that is sent to the callback function.*
- int **value** () const  
*Returns the current value of the check or radio item.*
- void **value** (int v)  
*Sets the current value of the check or radio item.*
- int **visible** () const  
*Gets the visibility of an item.*

## Public Attributes

- **FI\_Callback** \* **callback\_**  
*menu item callback*
- int **flags**  
*menu item flags like FL\_MENU\_TOGGLE, FL\_MENU\_RADIO*
- **FI\_Color** **labelcolor\_**  
*menu item text color*
- **FI\_Font** **labelfont\_**  
*which font for this menu item text*
- **FI\_Fonsize** **labelsize\_**  
*size of menu item text*
- **uchar** **labeltype\_**  
*how the menu item text looks like*
- int **shortcut\_**  
*menu item shortcut*
- const char \* **text**  
*menu item text, returned by [label\(\)](#)*
- void \* **user\_data\_**  
*menu item user\_data for the menu's callback*

### 33.86.1 Detailed Description

The `Fl_Menu_Item` structure defines a single menu item that is used by the `Fl_Menu_` class.

```
struct Fl_Menu_Item {
    const char*   text;           // label()
    int           shortcut_;
    Fl_Callback*  callback_;
    void*         user_data_;
    int           flags;
    uchar         labeltype_;
    uchar         labelfont_;
    uchar         labelsize_;
    uchar         labelcolor_;
};

enum { // values for flags:
    FL_MENU_INACTIVE   = 1,        // Deactivate menu item (gray out)
    FL_MENU_TOGGLE     = 2,        // Item is a checkbox toggle (shows checkbox for on/off state)
    FL_MENU_VALUE      = 4,        // The on/off state for checkbox/radio buttons (if set, state is 'on')
    FL_MENU_RADIO      = 8,        // Item is a radio button (one checkbox of many can be on)
    FL_MENU_INVISIBLE  = 0x10,     // Item will not show up (shortcut will work)
    FL_SUBMENU_POINTER = 0x20,     // Indicates user_data() is a pointer to another menu array
    FL_SUBMENU         = 0x40,     // This item is a submenu to other items
    FL_MENU_DIVIDER    = 0x80,     // Creates divider line below this item. Also ends a group of radio
                                buttons.
    FL_MENU_HORIZONTAL = 0x100     // reserved, do not use
    FL_MENU_CHATTY     = 0x200
};
```

#### Note

**All** other bits in `flags` are reserved for FLTK usage, do not use any bits of the `flags` variable for your own purposes. Even **undocumented** bits can be used for internal purposes in this or any future FLTK version.

Some `flags` bits may be changed during runtime by user code, particularly if you need to change the value of a menu item (ON/OFF) or make it active or inactive. Such changes must be done with caution so they don't affect other (maybe undocumented) bits, i.e. you need to make proper bit operations to set or clear only these particular bits.

Typically menu items are statically defined; for example:

```
Fl_Menu_Item popup[] = {
    {"&alpha",    FL_ALT+'a', the_cb, (void*)1},
    {"&beta",     FL_ALT+'b', the_cb, (void*)2},
    {"&gamma",    FL_ALT+'c', the_cb, (void*)3, FL_MENU_DIVIDER},
    {"&strange",  0,          strange_cb},
    {"&charm",    0,          charm_cb},
    {"&truth",    0,          truth_cb},
    {"&beauty",   0,          beauty_cb},
    {"sub&menu",  0,          0, 0, FL_SUBMENU},
    {"one"},
    {"two"},
    {"three"},
    {0},
    {"inactive",  FL_ALT+'i', 0, 0, FL_MENU_INACTIVE|FL_MENU_DIVIDER},
    {"invisible", FL_ALT+'i', 0, 0, FL_MENU_INVISIBLE},
    {"check",     FL_ALT+'i', 0, 0, FL_MENU_TOGGLE|FL_MENU_VALUE},
    {"box",       FL_ALT+'i', 0, 0, FL_MENU_TOGGLE},
    {0}};
```

produces:

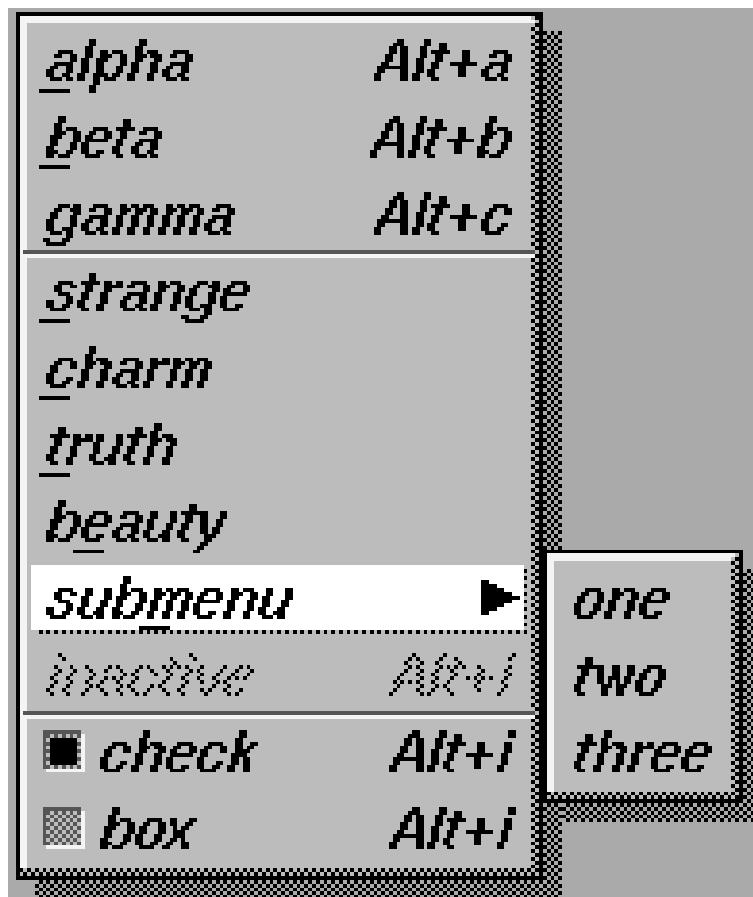


Figure 33.30 menu

A submenu title is identified by the bit `FL_SUBMENU` in the flags field, and ends with a `label()` that is `NULL`. You can nest menus to any depth. A pointer to the first item in the submenu can be treated as an `Fl_Menu` array itself. It is also possible to make separate submenu arrays with `FL_SUBMENU_POINTER` flags. You should use the method functions to access structure members and not access them directly to avoid compatibility problems with future releases of FLTK.

#### Note

Adding menu items with `insert()`, `add()`, or any of its overloaded variants copies the entire menu to internal storage. Using the memory of a static menu array after that would access unused (but not released) memory and thus have no effect.

When a menu item is selected by the user and a callback is set, the callback will be called with `FL_REASON_SELECTED`. The `Fl_Widget` pointer is set to the widget that opened the menu, a copy of the menu item's user data. If no menu item callback is set, the callback of the managing widget is called instead. If the `FL_MENU_CHATTY` flag is set, the menu item callback may be called for additional reasons. When a menu item is highlighted, the callback is called with `FL_REASON_GOT_FOCUS`. If it is no longer highlighted, `FL_REASON_LOST_FOCUS` is sent.

## 33.86.2 Member Function Documentation

### 33.86.2.1 `add()`

```
int Fl_Menu_Item::add (
    const char * mytext,
    int sc,
    Fl_Callback * cb,
```

```
void * data = 0,
int myflags = 0 )
```

Adds a menu item.

The text is split at '/' characters to automatically produce submenus (actually a totally unnecessary feature as you can now add submenu titles directly by setting FL\_SUBMENU in the flags).

#### Returns

the index into the menu() array, where the entry was added

#### See also

[Fl\\_Menu\\_Item::insert\(int, const char\\*, int, Fl\\_Callback\\*, void\\*, int\)](#)

### 33.86.2.2 argument() [1/2]

```
long Fl_Menu_Item::argument ( ) const [inline]
```

Gets the [user\\_data\(\)](#) argument that is sent to the callback function.

For convenience you can also define the callback as taking a long argument. This method casts the stored user\_data() argument to long and returns it as a *long* value.

### 33.86.2.3 argument() [2/2]

```
void Fl_Menu_Item::argument (
    long v ) [inline]
```

Sets the [user\\_data\(\)](#) argument that is sent to the callback function.

For convenience you can also define the callback as taking a long argument. This method casts the given argument *v* to void\* and stores it in the menu item's userdata() member. This may not be portable to some machines.

### 33.86.2.4 callback() [1/5]

```
Fl_Callback_p Fl_Menu_Item::callback ( ) const [inline]
```

Returns the callback function that is set for the menu item.

Each item has space for a callback function and an argument for that function. Due to back compatibility, the [Fl\\_Menu\\_Item](#) itself is not passed to the callback, instead you have to get it by calling ((Fl\_Menu\_\*)w)->mvalue() where *w* is the widget argument.

### 33.86.2.5 callback() [2/5]

```
void Fl_Menu_Item::callback (
    Fl_Callback * c ) [inline]
```

Sets the menu item's callback function.

This method does not set the userdata() argument.

#### See also

[Fl\\_Callback\\_p Fl\\_MenuItem::callback\(\) const](#)

### 33.86.2.6 callback() [3/5]

```
void Fl_Menu_Item::callback (
    Fl_Callback * c,
    void * p ) [inline]
```

Sets the menu item's callback function and userdata() argument.

#### See also

[Fl\\_Callback\\_p Fl\\_MenuItem::callback\(\) const](#)

**33.86.2.7 callback()** [4/5]

```
void Fl_Menu_Item::callback (
    Fl\_Callback0 * c ) [inline]
```

Sets the menu item's callback function.

This method does not set the `userdata()` argument.

See also

[Fl\\_Callback\\_p](#) `Fl_MenuItem::callback()` const

**33.86.2.8 callback()** [5/5]

```
void Fl_Menu_Item::callback (
    Fl\_Callback1 * c,
    long p = 0 ) [inline]
```

Sets the menu item's callback function and `userdata()` argument.

The argument `is` cast to `void*` and stored as the `userdata()` for the menu item's callback function.

See also

[Fl\\_Callback\\_p](#) `Fl_MenuItem::callback()` const

**33.86.2.9 check()**

```
void Fl_Menu_Item::check ( ) [inline]
```

Back compatibility only.

**Deprecated** Please use [Fl\\_Menu\\_Item::set\(\)](#) instead. This method will be removed in FLTK 1.5.0 or later.

See also

[set\(\)](#)

**33.86.2.10 checkbox()**

```
int Fl_Menu_Item::checkbox ( ) const [inline]
```

Returns true if a checkbox will be drawn next to this item.

This is true if `FL_MENU_TOGGLE` or `FL_MENU_RADIO` is set in the flags.

**33.86.2.11 checked()**

```
int Fl_Menu_Item::checked ( ) const [inline]
```

Back compatibility only.

**Deprecated** Please use [Fl\\_Menu\\_Item::value\(\)](#) instead. This method will be removed in FLTK 1.5.0 or later.

See also

[value\(\)](#)

**33.86.2.12 deactivate()**

```
void Fl_Menu_Item::deactivate ( ) [inline]
```

Prevents a menu item from being picked.

Note that this will also cause the menu item to appear grayed-out.

**33.86.2.13 do\_callback()** [1/3]

```
void Fl_Menu_Item::do_callback (
    Fl_Widget * o,
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN ) const [inline]
```

Calls the [Fl\\_Menu\\_Item](#) item's callback, and provides the [Fl\\_Widget](#) argument.

The callback is called with the stored [user\\_data\(\)](#) as its second argument. You must first check that [callback\(\)](#) is non-zero before calling this.

**33.86.2.14 do\_callback()** [2/3]

```
void Fl_Menu_Item::do_callback (
    Fl_Widget * o,
    long arg,
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN ) const [inline]
```

Calls the [Fl\\_Menu\\_Item](#) item's callback, and provides the [Fl\\_Widget](#) argument.

This call overrides the callback's second argument with the given value `arg`. `long arg` is cast to `void*` when calling the callback. You must first check that [callback\(\)](#) is non-zero before calling this.

**33.86.2.15 do\_callback()** [3/3]

```
void Fl_Menu_Item::do_callback (
    Fl_Widget * o,
    void * arg,
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN ) const [inline]
```

Calls the [Fl\\_Menu\\_Item](#) item's callback, and provides the [Fl\\_Widget](#) argument.

This call overrides the callback's second argument with the given value `arg`. You must first check that [callback\(\)](#) is non-zero before calling this.

**33.86.2.16 find\_shortcut()**

```
const Fl_Menu_Item * Fl_Menu_Item::find_shortcut (
    int * ip = 0,
    const bool require_alt = false ) const
```

Search only the top level menu for a shortcut.

Either `&x` in the label or the shortcut fields are used.

This tests the current event, which must be an `FL_KEYBOARD` or `FL_SHORTCUT`, against a shortcut value.

**Parameters**

<i>ip</i>	returns the index of the item, if <i>ip</i> is not NULL.
<i>require_alt</i>	if true: match only if Alt key is pressed.

**Returns**

found [Fl\\_Menu\\_Item](#) or NULL

**33.86.2.17 image()** [1/2]

```
void Fl_Menu_Item::image (
    Fl_Image & image ) [inline]
```

Compatibility API for FLUID, same as `image.label(this)`.

**Note**

This method is intended for internal use by fluid and may not do what you expect.

**33.86.2.18 image()** [2/2]

```
void Fl_Menu_Item::image (
    Fl\_Image * image ) [inline]
```

Compatibility API for FLUID, same as `image->label(this)`.

**Note**

This method is intended for internal use by fluid and may not do what you expect.

**33.86.2.19 image\_label()**

```
void Fl_Menu_Item::image_label (
    const Fl\_Image * image ) [inline]
```

Sets the title (`label()`) to an icon or image.

This sets the `labeltype()` to `_FL_IMAGE_LABEL` (note the leading underscore).

**See also**

`const char* Fl\_Menu\_Item::label\(\) const`

**Since**

1.4.0

**33.86.2.20 insert()**

```
int Fl_Menu_Item::insert (
    int index,
    const char * mytext,
    int sc,
    Fl\_Callback * cb,
    void * data = 0,
    int myflags = 0 )
```

Inserts an item at position `index`.

If `index` is -1, the item is added the same way as `Fl\_Menu\_Item::add\(\)`.

If 'mytext' contains any un-escaped front slashes (/), it's assumed a menu pathname is being specified, and the value of `index` will be ignored.

In all other aspects, the behavior of `insert\(\)` is the same as `add\(\)`.

**Parameters**

in	<i>index</i>	insert new items here
in	<i>mytext</i>	new label string, details see above
in	<i>sc</i>	keyboard shortcut for new item
in	<i>cb</i>	callback function for new item
in	<i>data</i>	user data for new item
in	<i>myflags</i>	menu flags as described in <a href="#">Fl_Menu_Item</a>

**Returns**

the index into the menu() array, where the entry was added

**33.86.2.21 label() [1/3]**

```
const char * Fl_Menu_Item::label ( ) const [inline]
```

Returns the title (label) of the menu item.

A NULL here indicates the end of the menu (or of a submenu). A '&' in the item will print an underscore under the next letter, and if the menu is popped up that letter will be a "shortcut" to pick that item. To get a real '&' put two in a row.

The returned value depends on the [labeltype\(\)](#) that has been used to store the label.

**Returns**

A pointer to the label cast to (const char \*)

**Return values**

<i>(a)</i>	A pointer to text (const char *)
<i>(b)</i>	A pointer to an image ( <a href="#">Fl_Image</a> *)
<i>(c)</i>	A pointer to a "multi label" ( <a href="#">Fl_Multi_Label</a> *)
<i>NULL</i>	End of menu or submenu

**See also**

[Fl\\_Menu\\_Item::label\(const char \\*\)](#)  
[Fl\\_Menu\\_Item::label\(Fl\\_Labeltype, const char \\*\)](#)  
[Fl\\_Menu\\_Item::image\\_label\(const Fl\\_Image \\*\)](#)  
[Fl\\_Menu\\_Item::multi\\_label\(const Fl\\_Multi\\_Label \\*\)](#)  
[Fl\\_Multi\\_Label::label\(Fl\\_Menu\\_Item \\*\)](#)

**33.86.2.22 label() [2/3]**

```
void Fl_Menu_Item::label (
    const char * a ) [inline]
```

Sets the title (label) of the menu item.

**Note**

This does **not** change the [labeltype\(\)](#) for backwards compatibility. Take care to assign the correct [labeltype\(\)](#) if you assign different label types to the same menu item sequentially.

The default [labeltype\(\)](#) is FL\_NORMAL\_LABEL.

**See also**

[label\(Fl\\_Labeltype, const char\\*\)](#)  
const char\* [Fl\\_Menu\\_Item::label\(\)](#) const

**33.86.2.23 label() [3/3]**

```
void Fl_Menu_Item::label (
    Fl_Labeltype a,
    const char * b ) [inline]
```

Sets the title (label) and the label type of the menu item.

The default `Fl_Labeltype` when using `Fl_Menu_Item::label(const char* a)` is `FL_NORMAL_LABEL` but you can set any other label type, for instance `FL_EMBOSSED_LABEL`.

Special labeltypes are:

- `FL_ICON_LABEL`: draws the icon ([Fl\\_Image](#)) associated with the text
- `FL_IMAGE_LABEL`: draws the image ([Fl\\_Image](#)) associated with the text
- `FL_MULTI_LABEL`: draws multiple parts side by side, see [Fl\\_Multi\\_Label](#)

See also

`const char* Fl\_Menu\_Item::label\(\) const`

### 33.86.2.24 `labelcolor()` [1/2]

```
Fl_Color Fl_Menu_Item::labelcolor ( ) const [inline]
```

Gets the menu item's label color.

This color is passed to the labeltype routine, and is typically the color of the label text. This defaults to `FL_BLACK`. If this color is not black fltk will **not** use overlay bitplanes to draw the menu - this is so that images put in the menu draw correctly.

### 33.86.2.25 `labelcolor()` [2/2]

```
void Fl_Menu_Item::labelcolor (
    Fl_Color a ) [inline]
```

Sets the menu item's label color.

See also

`Fl_Color Fl\_Menu\_Item::labelcolor\(\) const`

### 33.86.2.26 `labelfont()` [1/2]

```
Fl_Font Fl_Menu_Item::labelfont ( ) const [inline]
```

Gets the menu item's label font.

Fonts are identified by small 8-bit indexes into a table. See the enumeration list for predefined fonts. The default value is a Helvetica font. The function `Fl::set_font()` can define new fonts.

### 33.86.2.27 `labelfont()` [2/2]

```
void Fl_Menu_Item::labelfont (
    Fl_Font a ) [inline]
```

Sets the menu item's label font.

Fonts are identified by small 8-bit indexes into a table. See the enumeration list for predefined fonts. The default value is a Helvetica font. The function `Fl::set_font()` can define new fonts.

### 33.86.2.28 `labeltype()` [1/2]

```
Fl_Labeltype Fl_Menu_Item::labeltype ( ) const [inline]
```

Returns the menu item's labeltype.

A labeltype identifies a routine that draws the label of the widget. This can be used for special effects such as emboss, or to use the `label()` pointer as another form of data such as a bitmap. The value `FL_NORMAL_LABEL` prints the label as text.

**33.86.2.29 labeltype()** [2/2]

```
void Fl_Menu_Item::labeltype (
    Fl_Labeltype a ) [inline]
```

Sets the menu item's labeltype.

A labeltype identifies a routine that draws the label of the widget. This can be used for special effects such as emboss, or to use the [label\(\)](#) pointer as another form of data such as a bitmap. The value FL\_NORMAL\_LABEL prints the label as text.

**33.86.2.30 measure()**

```
int Fl_Menu_Item::measure (
    int * hp,
    const Fl_Menu_ * m ) const
```

Measures width of label, including effect of & characters.

Optionally, can get height if hp is not NULL.

**33.86.2.31 multi\_label()**

```
void Fl_Menu_Item::multi_label (
    const Fl_Multi_Label * ml ) [inline]
```

Sets the title ([label\(\)](#)) and [labeltype\(\)](#) to an [Fl\\_Multi\\_Label](#).

This sets the [labeltype\(\)](#) to \_FL\_MULTI\_LABEL (note the leading underscore).

See also

```
const char* Fl_Menu_Item::label() const
```

Since

1.4.0

**33.86.2.32 next()** [1/2]

```
Fl_Menu_Item * Fl_Menu_Item::next (
    int i = 1 ) [inline]
```

Advances a pointer by n items through a menu array, skipping the contents of submenus and invisible items.

There are two calls so that you can advance through const and non-const data.

**33.86.2.33 next()** [2/2]

```
const Fl_Menu_Item * Fl_Menu_Item::next (
    int n = 1 ) const
```

Advance a pointer by n items through a menu array, skipping the contents of submenus and invisible items.

There are two calls so that you can advance through const and non-const data.

**33.86.2.34 popup()**

```
const Fl_Menu_Item * Fl_Menu_Item::popup (
    int X,
    int Y,
    const char * title = 0,
    const Fl_Menu_Item * picked = 0,
    const Fl_Menu_ * menu_button = 0 ) const
```

This method is called by widgets that want to display menus.

The menu stays up until the user picks an item or dismisses it. The selected item (or NULL if none) is returned. *This does not do the callbacks or change the state of check or radio items.*

The menu is positioned so the cursor is centered over the item picked. This will work even if picked is in a submenu. If picked is zero or not in the menu item table the menu is positioned with the cursor in the top-left corner.

## Parameters

in	<i>X,Y</i>	the position of the mouse cursor, relative to the window that got the most recent event (usually you can pass <a href="#">Fl::event_x()</a> and <a href="#">Fl::event_y()</a> unchanged here).
in	<i>title</i>	a character string title for the menu. If non-zero a small box appears above the menu with the title in it.
in	<i>picked</i>	if this pointer is not NULL, the popup menu will appear so that the picked menu is under the mouse pointer.
in	<i>menu_button</i>	is a pointer to an <a href="#">Fl_Menu_</a> from which the color and boxtypes for the menu are pulled. If NULL then defaults are used.

## Returns

a pointer to the menu item selected by the user, or NULL

**33.86.2.35 pulldown()**

```
const Fl_Menu_Item * Fl_Menu_Item::pulldown (
    int X,
    int Y,
    int W,
    int H,
    const Fl_Menu_Item * initial_item = 0,
    const Fl_Menu_ * pbutton = 0,
    const Fl_Menu_Item * title = 0,
    int menubar = 0 ) const
```

Pulldown() is similar to [popup\(\)](#), but a rectangle is provided to position the menu.

The menu is made at least W wide, and the picked item `initial_item` is centered over the rectangle (like [Fl\\_Choice](#) uses).

If `initial_item` is NULL or not found, the menu is aligned just below the rectangle (like a pulldown menu).

The `title` and `menubar` arguments are used internally by the [Fl\\_Menu\\_Bar](#) widget.

**33.86.2.36 radio()**

```
int Fl_Menu_Item::radio ( ) const [inline]
```

Returns true if this item is a radio item.

When a radio button is selected all "adjacent" radio buttons are turned off. A set of radio items is delimited by an item that has [radio\(\)](#) false, or by an item with `FL_MENU_DIVIDER` turned on.

**33.86.2.37 set()**

```
void Fl_Menu_Item::set ( ) [inline]
```

Turns the check or radio item "on" for the menu item.

Note that this does not turn off any adjacent radio items like [setonly\(\)](#) does.

**33.86.2.38 setonly()**

```
void Fl_Menu_Item::setonly (
    Fl_Menu_Item const * first = NULL )
```

Turns the radio item "on" for the menu item and turns "off" adjacent radio items set.

## Note

This method is dangerous if radio items are first in the menu. Make sure that `first` is set correctly or use [Fl\\_Menu\\_::setonly\(Fl\\_Menu\\_\\*\)](#) instead.

## Parameters

<code>in</code>	<code>first</code>	start of menu array or NULL (default) if the radio group is not the first item
-----------------	--------------------	--

**33.86.2.39 shortcut()**

```
void Fl_Menu_Item::shortcut (
    int s ) [inline]
```

Sets exactly what key combination will trigger the menu item.

The value is a logical 'or' of a key and a set of shift flags, for instance FL\_ALT+'a' or FL\_ALT+FL\_F+10 or just 'a'. A value of zero disables the shortcut.

The key can be any value returned by [Fl::event\\_key\(\)](#), but will usually be an ASCII letter. Use a lower-case letter unless you require the shift key to be held down.

The shift flags can be any set of values accepted by [Fl::event\\_state\(\)](#). If the bit is on that shift key must be pushed. Meta, Alt, Ctrl, and Shift must be off if they are not in the shift flags (zero for the other bits indicates a "don't care" setting).

**33.86.2.40 size()**

```
int Fl_Menu_Item::size ( ) const
```

Size of the menu starting from this menu item.

This method counts all menu items starting with `this` menu item, including all menu items in the same (sub)menu level, all nested submenus, **and** the terminating empty (0) menu item.

It does **not** count menu items referred to by FL\_SUBMENU\_POINTER menu items (except the single menu item with FL\_SUBMENU\_POINTER).

All menu items counted are consecutive in memory (one array).

Example:

```
schemechoice = new Fl_Choice(X+125,Y,140,25,"FLTK Scheme");
schemechoice->add("none");
schemechoice->add("plastic");
schemechoice->add("gtk+");
schemechoice->add("gleam");
printf("schemechoice->menu()->size() = %d\n", schemechoice->menu()->size());
```

Output:

```
schemechoice->menu()->size() = 5
```

**33.86.2.41 submenu()**

```
int Fl_Menu_Item::submenu ( ) const [inline]
```

Returns true if either FL\_SUBMENU or FL\_SUBMENU\_POINTER is on in the flags.

FL\_SUBMENU indicates an embedded submenu that goes from the next item through the next one with a NULL [label\(\)](#). FL\_SUBMENU\_POINTER indicates that [user\\_data\(\)](#) is a pointer to another menu array.

**33.86.2.42 test\_shortcut()**

```
const Fl_Menu_Item * Fl_Menu_Item::test_shortcut ( ) const
```

This is designed to be called by a widget's `handle()` method in response to a FL\_SHORTCUT event.

If the current event matches one of the items shortcut, that item is returned. If the keystroke does not match any shortcuts then NULL is returned. This only matches the [shortcut\(\)](#) fields, not the letters in the title preceeded by ' '

**33.86.2.43 uncheck()**

```
void Fl_Menu_Item::uncheck ( ) [inline]
```

Back compatibility only.

**Deprecated** Please use [Fl\\_Menu\\_Item::clear\(\)](#) instead. This method will be removed in FLTK 1.5.0 or later.

See also

[clear\(\)](#)

### 33.86.2.44 value()

```
int Fl_Menu_Item::value ( ) const [inline]
```

Returns the current value of the check or radio item.

This is zero (0) if the menu item is not checked and non-zero otherwise.

Since

1.4.0 this method returns 1 if the item is checked but you should not rely on a particular value, only zero or non-zero.

Note

The returned value for a checked menu item was FL\_MENU\_VALUE (4) before FLTK 1.4.0.

The documentation for this struct was generated from the following files:

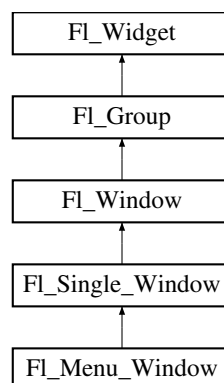
- [Fl\\_Menu\\_Item.H](#)
- [Fl\\_Menu.cxx](#)
- [Fl\\_Menu\\_.cxx](#)
- [Fl\\_Menu\\_add.cxx](#)

## 33.87 Fl\_Menu\_Window Class Reference

The [Fl\\_Menu\\_Window](#) widget is a window type used for menus.

```
#include <Fl_Menu_Window.H>
```

Inheritance diagram for [Fl\\_Menu\\_Window](#):



### Public Member Functions

- **Fl\_Menu\_Window** (int W, int H, const char \*l=0)  
*Creates a new [Fl\\_Menu\\_Window](#) widget using the given size, and label string.*
- **Fl\_Menu\_Window** (int X, int Y, int W, int H, const char \*l=0)  
*Creates a new [Fl\\_Menu\\_Window](#) widget using the given position, size, and label string.*
- **~Fl\_Menu\_Window** ()  
*Destroys the window and all of its children.*

## Additional Inherited Members

### 33.87.1 Detailed Description

The [Fl\\_Menu\\_Window](#) widget is a window type used for menus.

By default the window is drawn in the hardware overlay planes if they are available so that the menu don't force the rest of the window to redraw.

The documentation for this class was generated from the following files:

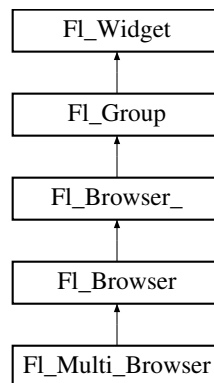
- [Fl\\_Menu\\_Window.H](#)
- [Fl\\_Menu\\_Window.cxx](#)

## 33.88 Fl\_Multi\_Browser Class Reference

The [Fl\\_Multi\\_Browser](#) class is a subclass of [Fl\\_Browser](#) which lets the user select any set of the lines.

```
#include <Fl_Multi_Browser.H>
```

Inheritance diagram for [Fl\\_Multi\\_Browser](#):



## Public Member Functions

- [Fl\\_Multi\\_Browser](#) (int X, int Y, int W, int H, const char \*L=0)  
Creates a new [Fl\\_Multi\\_Browser](#) widget using the given position, size, and label string.

## Additional Inherited Members

### 33.88.1 Detailed Description

The [Fl\\_Multi\\_Browser](#) class is a subclass of [Fl\\_Browser](#) which lets the user select any set of the lines.

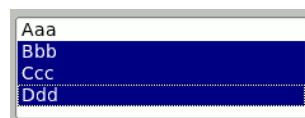


Figure 33.31 [Fl\\_Multi\\_Browser](#)

The user interface is Macintosh style: clicking an item turns off all the others and selects that one, dragging selects all the items the mouse moves over, and ctrl + click (Cmd+click on the Mac OS platform) toggles the items. Shift + click extends the selection until the clicked item. This is different from how forms did it. Normally the callback is done when the user releases the mouse, but you can change this with [when\(\)](#).

See [Fl\\_Browser](#) for methods to add and remove lines from the browser.

### 33.88.2 Constructor & Destructor Documentation

### 33.88.2.1 FI\_Multi\_Browser()

```
Fl_Multi_Browser::Fl_Multi_Browser (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [FI\\_Multi\\_Browser](#) widget using the given position, size, and label string.

The default boxtype is FL\_DOWN\_BOX. The constructor specializes [FI\\_Browser\(\)](#) by setting the type to FL\_↔MULTI\_BROWSER. The destructor destroys the widget and frees all memory that has been allocated.

The documentation for this class was generated from the following files:

- [FI\\_Multi\\_Browser.H](#)
- [FI\\_Browser.cxx](#)

## 33.89 FI\_Multi\_Label Struct Reference

Allows a mixed text and/or graphics label to be applied to an [FI\\_Menu\\_Item](#) or [FI\\_Widget](#).

```
#include <Fl_Multi_Label.H>
```

### Public Member Functions

- void [label](#) ([FI\\_Menu\\_Item](#) \*)  
*Associate an [FI\\_Multi\\_Label](#) with an [FI\\_Menu\\_Item](#).*
- void [label](#) ([FI\\_Widget](#) \*)  
*Associate an [FI\\_Multi\\_Label](#) with an [FI\\_Widget](#).*

### Public Attributes

- const char \* [labela](#)  
*Holds the "leftmost" of the two elements in the composite label.*
- const char \* [labelb](#)  
*Holds the "rightmost" of the two elements in the composite label.*
- uchar [typea](#)  
*Holds the "type" of [labela](#).*
- uchar [typeb](#)  
*Holds the "type" of [labelb](#).*

### 33.89.1 Detailed Description

Allows a mixed text and/or graphics label to be applied to an [FI\\_Menu\\_Item](#) or [FI\\_Widget](#).

Most regular FLTK widgets now support the ability to associate both images and text with a label but some special cases, notably the non-widget [FI\\_Menu\\_Item](#) objects, do not. [FI\\_Multi\\_Label](#) may be used to create menu items that have an icon and text, which would not normally be possible for an [FI\\_Menu\\_Item](#). For example, [FI\\_Multi\\_Label](#) is used in the New->Code submenu in fluid, and others.

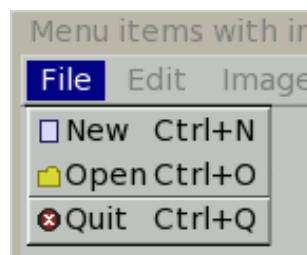


Figure 33.32 Menu items with icons using [FI\\_Multi\\_Label](#)

Each [Fl\\_Multi\\_Label](#) holds two elements, `labela` and `labelb`; each may hold either a text label (`const char*`) or an image (`Fl_Image*`). When displayed, `labela` is drawn first and `labelb` is drawn immediately to its right. More complex labels can be constructed by setting `labelb` as another [Fl\\_Multi\\_Label](#) and thus chaining up a series of label elements.

When assigning a label element to one of `labela` or `labelb`, they should be explicitly cast to (`const char*`) if they are not of that type already.

#### Note

An [Fl\\_Multi\\_Label](#) object and all its components (label text, images, chained [Fl\\_Multi\\_Label](#)'s and their linked objects) must exist during the lifetime of the widget or menu item they are assigned to. It is the responsibility of the user's code to release these linked objects if necessary after the widget or menu is deleted.

#### Example Use: [Fl\\_Menu\\_Bar](#)

```
Fl_Pixmap *image = new Fl_Pixmap(..); // image for menu item; any Fl_Image based widget
Fl_Menu_Bar *menu = new Fl_Menu_Bar(..); // can be any Fl_Menu_ oriented widget (Fl_Choice,
    Fl_Menu_Button..)
// Create a menu item
int i = menu->add("File/New", ..);
Fl_Menu_Item *item = (Fl_Menu_Item*)&(menu->menu()[i]);
// Create a multi label, assign it an image + text
Fl_Multi_Label *ml = new Fl_Multi_Label;
// Left side of label is an image
ml->typea = FL_IMAGE_LABEL;
ml->labela = (const char*)image; // any Fl_Image widget: Fl_Pixmap, Fl_PNG_Image, etc..
// Right side of label is label text
ml->typeb = FL_NORMAL_LABEL;
ml->labelb = item->label();
// Assign the multilabel to the menu item
// ml->label(item); // deprecated since 1.4.0; backwards compatible with 1.3.x
item->label(ml); // new method since 1.4.0
```

#### See also

[Fl\\_Label](#) and [Fl\\_Labeltype](#) and [examples/howto-menu-with-images.cxx](#)

## 33.89.2 Member Function Documentation

### 33.89.2.1 `label()` [1/2]

```
void Fl_Multi_Label::label (
    Fl_Menu_Item * o )
```

Associate an [Fl\\_Multi\\_Label](#) with an [Fl\\_Menu\\_Item](#).

This uses [Fl\\_Menu\\_Item::label\(Fl\\_Labeltype a, const char \\*b\)](#) internally to set the *label* and the label type of the menu item, i.e. it stores a *pointer* to the [Fl\\_Multi\\_Label](#) object (*this*). An existing label (pointer) will be overwritten.

This sets the type of the menu item's label to `_FL_MULTI_LABEL` - note the leading underscore ('\_').

There is no way to use a method like [Fl\\_Widget::copy\\_label\(\)](#) that transfers ownership of the [Fl\\_Multi\\_Label](#) and its linked objects (images, text, and chained [Fl\\_Multi\\_Label](#)'s) to the menu item.

The [Fl\\_Multi\\_Label](#) and all linked images, text labels, or chained [Fl\\_Multi\\_Label](#) objects must exist during the lifetime of the menu and will not be released when the menu item is destroyed.

#### Note

The user's code is responsible for releasing the [Fl\\_Multi\\_Label](#) and all linked objects (images, text, chained [Fl\\_Multi\\_Label](#)'s) after the menu has been deleted. This may cause memory leaks if [Fl\\_Multi\\_Label](#) is used and reassigned w/o releasing the objects assigned to it.

**Deprecated** since 1.4.0: please use [Fl\\_Menu\\_Item::label\(Fl\\_Multi\\_Label \\*\)](#)

#### See also

[Fl\\_Menu\\_Item::label\(Fl\\_Multi\\_Label \\*\)](#)

### 33.89.2.2 `label()` [2/2]

```
void Fl_Multi_Label::label (
    Fl_Widget * o )
```

Associate an `Fl_Multi_Label` with an `Fl_Widget`.

This method uses `Fl_Widget::label(Fl_Labeltype, const char *)` internally to set the *label* of the widget, i.e. it stores a *pointer* to the `Fl_Multi_Label` object (*this*). An existing label that has been set using `Fl_Widget::copy_label()` will be released prior to the assignment of the new label.

This sets the type of the widget's label to `_FL_MULTI_LABEL` - note the leading underscore ('\_').

There is no way to use a method like `Fl_Widget::copy_label()` that transfers ownership of the `Fl_Multi_Label` and its linked objects (images, text, and chained `Fl_Multi_Label`'s) to the widget.

The `Fl_Multi_Label` and all linked images, text labels, or chained `Fl_Multi_Label` objects must exist during the lifetime of the widget and will not be released when the widget is destroyed.

#### Note

The user's code is responsible for releasing the `Fl_Multi_Label` and all linked objects (images, text, chained `Fl_Multi_Label`'s) after the widget has been deleted. This may cause memory leaks if `Fl_Multi_Label` is used and reassigned w/o releasing the objects assigned to it.

## 33.89.3 Member Data Documentation

### 33.89.3.1 `labela`

```
const char* Fl_Multi_Label::labela
```

Holds the "leftmost" of the two elements in the composite label.

Typically this would be assigned either a text string (`const char*`), a (`Fl_Image*`) or a (`Fl_Multi_Label*`).

### 33.89.3.2 `labelb`

```
const char* Fl_Multi_Label::labelb
```

Holds the "rightmost" of the two elements in the composite label.

Typically this would be assigned either a text string (`const char*`), a (`Fl_Image*`) or a (`Fl_Multi_Label*`).

### 33.89.3.3 `typea`

```
uchar Fl_Multi_Label::typea
```

Holds the "type" of `labela`.

Typically this is set to `FL_NORMAL_LABEL` for a text label, `FL_IMAGE_LABEL` for an image (based on `Fl_image`) or `FL_MULTI_LABEL` if "chaining" multiple `Fl_Multi_Label` elements together.

### 33.89.3.4 `typeb`

```
uchar Fl_Multi_Label::typeb
```

Holds the "type" of `labelb`.

Typically this is set to `FL_NORMAL_LABEL` for a text label, `FL_IMAGE_LABEL` for an image (based on `Fl_image`) or `FL_MULTI_LABEL` if "chaining" multiple `Fl_Multi_Label` elements together.

The documentation for this struct was generated from the following files:

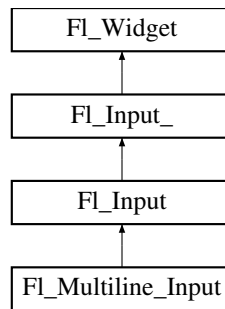
- `Fl_Multi_Label.H`
- `Fl_Multi_Label.cxx`

## 33.90 `Fl_Multiline_Input` Class Reference

This input field displays '\n' characters as new lines rather than ^J, and accepts the Return, Tab, and up and down arrow keys.

```
#include <Fl_Multiline_Input.H>
```

Inheritance diagram for `Fl_Multiline_Input`:



## Public Member Functions

- [Fl\\_Multiline\\_Input](#) (int X, int Y, int W, int H, const char \*l=0)

*Creates a new [Fl\\_Multiline\\_Input](#) widget using the given position, size, and label string.*

## Additional Inherited Members

### 33.90.1 Detailed Description

This input field displays '\n' characters as new lines rather than ^J, and accepts the Return, Tab, and up and down arrow keys.

This is for editing multiline text.

This is far from the nirvana of text editors, and is probably only good for small bits of text, 10 lines at most. Note that this widget does not support scrollbars or per-character color control.

If you are presenting large amounts of text and need scrollbars or full color control of characters, you probably want [Fl\\_Text\\_Editor](#) instead.

In FLTK 1.3.x, the default behavior of the 'Tab' key was changed to support consistent focus navigation. To get the older FLTK 1.1.x behavior, set [Fl\\_Input\\_::tab\\_nav\(\)](#) to 0. Newer programs should consider using [Fl\\_Text\\_Editor](#).

### 33.90.2 Constructor & Destructor Documentation

#### 33.90.2.1 Fl\_Multiline\_Input()

```

Fl_Multiline_Input::Fl_Multiline_Input (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )

```

Creates a new [Fl\\_Multiline\\_Input](#) widget using the given position, size, and label string.

The default boxtype is FL\_DOWN\_BOX.

Inherited destructor destroys the widget and any value associated with it.

The documentation for this class was generated from the following files:

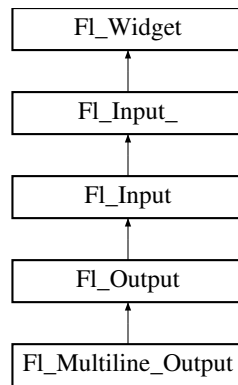
- Fl\_Multiline\_Input.H
- Fl\_Input.cxx

## 33.91 Fl\_Multiline\_Output Class Reference

This widget is a subclass of [Fl\\_Output](#) that displays multiple lines of text.

```
#include <Fl_Multiline_Output.H>
```

Inheritance diagram for Fl\_Multiline\_Output:



## Public Member Functions

- [Fl\\_Multiline\\_Output](#) (int X, int Y, int W, int H, const char \*l=0)  
Creates a new [Fl\\_Multiline\\_Output](#) widget using the given position, size, and label string.

## Additional Inherited Members

### 33.91.1 Detailed Description

This widget is a subclass of [Fl\\_Output](#) that displays multiple lines of text. It also displays tab characters as whitespace to the next column. Note that this widget does not support scrollbars, or per-character color control. If you are presenting large amounts of read-only text and need scrollbars, or full color control of characters, then use [Fl\\_Text\\_Display](#). If you want to display HTML text, use [Fl\\_Help\\_View](#). A caret cursor (^) shows the keyboard navigation mark for keyboard selection of the output text, e.g. Arrow Keys to move the cursor, Shift + Arrow Keys to create a text selection, and '^C' to copy the selected text to the paste buffer. The caret cursor can be disabled by disabling the widget's "visible focus" using [clear\\_visible\\_focus\(\)](#), inherited from the [Fl\\_Widget](#) base class. Doing this also disables the widget's keyboard navigation.

### 33.91.2 Constructor & Destructor Documentation

#### 33.91.2.1 Fl\_Multiline\_Output()

```

Fl_Multiline_Output::Fl_Multiline_Output (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
  
```

Creates a new [Fl\\_Multiline\\_Output](#) widget using the given position, size, and label string. The default boxtype is `FL_DOWN_BOX`. Inherited destructor destroys the widget and any value associated with it. The documentation for this class was generated from the following files:

- [Fl\\_Multiline\\_Output.H](#)
- [Fl\\_Input.cxx](#)

## 33.92 Fl\_Native\_File\_Chooser Class Reference

This class lets an FLTK application easily and consistently access the operating system's native file chooser.

```
#include <Fl_Native_File_Chooser.H>
```

## Public Types

- enum [Option](#) {  
[NO\\_OPTIONS](#) = 0x0000 , [SAVEAS\\_CONFIRM](#) = 0x0001 , [NEW\\_FOLDER](#) = 0x0002 , [PREVIEW](#) = 0x0004 ,  
[USE\\_FILTER\\_EXT](#) = 0x0008 }
- enum [Type](#) {  
[BROWSE\\_FILE](#) = 0 , [BROWSE\\_DIRECTORY](#) , [BROWSE\\_MULTI\\_FILE](#) , [BROWSE\\_MULTI\\_DIRECTORY](#) ,  
[BROWSE\\_SAVE\\_FILE](#) , [BROWSE\\_SAVE\\_DIRECTORY](#) }

## Public Member Functions

- int [count](#) () const  
*Returns the number of filenames (or directory names) the user selected.*
- const char \* [directory](#) () const  
*Returns the current preset [directory\(\)](#) value.*
- void [directory](#) (const char \*val)  
*Preset the directory the browser will show when opened.*
- const char \* [errmsg](#) () const  
*Returns a system dependent error message for the last method that failed.*
- const char \* [filename](#) () const  
*Return the filename the user chose.*
- const char \* [filename](#) (int i) const  
*Return one of the filenames the user selected.*
- const char \* [filter](#) () const  
*Returns the filter string last set.*
- void [filter](#) (const char \*f)  
*Sets the filename filters used for browsing.*
- int [filter\\_value](#) () const  
*Returns which filter value was last selected by the user.*
- void [filter\\_value](#) (int i)  
*Sets which filter will be initially selected.*
- int [filters](#) () const  
*Gets how many filters were available, not including "All Files".*
- [FI\\_Native\\_File\\_Chooser](#) (int val=[BROWSE\\_FILE](#))  
*The constructor.*
- int [options](#) () const  
*Gets the platform specific [FI\\_Native\\_File\\_Chooser::Option](#) flags.*
- void [options](#) (int o)  
*Sets the platform specific chooser options to *val*.*
- const char \* [preset\\_file](#) () const  
*Get the preset filename.*
- void [preset\\_file](#) (const char \*f)  
*Sets the default filename for the chooser.*
- int [show](#) ()  
*Post the chooser's dialog.*
- const char \* [title](#) () const  
*Get the title of the file chooser's dialog window.*
- void [title](#) (const char \*t)  
*Set the title of the file chooser's dialog window.*
- int [type](#) () const  
*Gets the current [FI\\_Native\\_File\\_Chooser::Type](#) of browser.*
- void [type](#) (int t)  
*Sets the current [FI\\_Native\\_File\\_Chooser::Type](#) of browser.*
- [~FI\\_Native\\_File\\_Chooser](#) ()  
*Destructor.*

## Static Public Attributes

- static const char \* **file\_exists\_message** = "File exists. Are you sure you want to overwrite?"  
*Localizable message.*

### 33.92.1 Detailed Description

This class lets an FLTK application easily and consistently access the operating system's native file chooser. Some operating systems have very complex and specific file choosers that many users want access to specifically, instead of FLTK's default file chooser(s).

In cases where there is no native file browser, FLTK's own file browser is used instead.

To use this widget, use the following include in your code:

```
#include <FL/Fl_Native_File_Chooser.H>
```

The following example shows how to pick a single file:

```
// Create and post the local native file chooser
#include <FL/Fl_Native_File_Chooser.H>
[...]
```

```
Fl_Native_File_Chooser fnfc;
fnfc.title("Pick a file");
fnfc.type(Fl_Native_File_Chooser::BROWSE_FILE);
fnfc.filter("Text\t*.txt\n"
           "C Files\t*.{cxx,h,c}");
fnfc.directory("/var/tmp"); // default directory to use
// Show native chooser
switch ( fnfc.show() ) {
    case -1: printf("ERROR: %s\n", fnfc.errmsg()); break; // ERROR
    case 1:  printf("CANCEL\n"); break; // CANCEL
    default: printf("PICKED: %s\n", fnfc.filename()); break; // FILE CHOSEN
}
```

The `Fl_Native_File_Chooser` widget transmits UTF-8 encoded filenames to its user. It is recommended to open files that may have non-ASCII names with the `fl_fopen()` or `fl_open()` utility functions that handle these names in a cross-platform way (whereas the standard `fopen()/open()` functions fail on the Windows platform to open files with a non-ASCII name).

#### Platform Specific Caveats

- Under X11/Wayland the dialog is chosen as follows:
  1. If command `zenity` is available at run-time and if `Fl::option(OPTION_FNFC_USES_ZENITY)` is turned on, the `zenity`-based dialog opens. This is expected to be more appropriate than other dialog forms for sandboxed apps, but member function `filter_value()` is not effective.
  2. Else if the app runs under the KDE desktop and if `Fl::option(OPTION_FNFC_USES_KDIALOG)` is turned on, and if command `kdiallog` is available at run-time, the `kdiallog`-based dialog opens. Member function `filter_value()` is not effective with this dialog.
  3. Else if the GTK library is available at run-time on the computer and if `Fl::option(OPTION_FNFC_USES_GTK)` is not turned off, the GTK-styled dialog opens. Call `fl_register_images()` to add a "Preview" button to this dialog. Use the static public attributes of class `Fl_File_Chooser` to localize the browser.
  4. Otherwise, FLTK's own dialog produced by the `Fl_File_Chooser` class opens. Call `fl_register_images()` to add a "Preview" button to it. It's best if you also call `Fl_File_Icon::load_system_icons()` at the start of `main()`, to enable the nicer looking file browser widgets. Use the static public attributes of class `Fl_File_Chooser` to localize the browser.
- Some operating systems support certain OS specific options; see `Fl_Native_File_Chooser::options()` for a list.



Figure 33.33 The FI\_Native\_File\_Chooser on different platforms

## 33.92.2 Member Enumeration Documentation

### 33.92.2.1 Option

```
enum FI_Native_File_Chooser::Option
```

Enumerator

NO_OPTIONS	no options enabled
SAVEAS_CONFIRM	Show native 'Save As' overwrite confirm dialog.
NEW_FOLDER	Show 'New Folder' icon (if supported)
PREVIEW	enable preview mode (if supported)
USE_FILTER_EXT	Chooser filter presets the output file extension (if supported)

### 33.92.2.2 Type

```
enum FI_Native_File_Chooser::Type
```

Enumerator

BROWSE_FILE	browse files (lets user choose one file)
BROWSE_DIRECTORY	browse directories (lets user choose one directory)
BROWSE_MULTI_FILE	browse files (lets user choose multiple files)
BROWSE_MULTI_DIRECTORY	browse directories (lets user choose multiple directories)

## Enumerator

BROWSE_SAVE_FILE	browse to save a file
BROWSE_SAVE_DIRECTORY	browse to save a directory

### 33.92.3 Constructor & Destructor Documentation

#### 33.92.3.1 Fl\_Native\_File\_Chooser()

```
Fl_Native_File_Chooser::Fl_Native_File_Chooser (
    int val = BROWSE_FILE )
```

The constructor.

Internally allocates the native widgets. Optional `val` presets the type of browser this will be, which can also be changed with `type()`.

#### 33.92.3.2 ~Fl\_Native\_File\_Chooser()

```
Fl_Native_File_Chooser::~Fl_Native_File_Chooser ( )
```

Destructor.

Deallocates any resources allocated to this widget.

### 33.92.4 Member Function Documentation

#### 33.92.4.1 count()

```
int Fl_Native_File_Chooser::count ( ) const
```

Returns the number of filenames (or directory names) the user selected.

##### Example:

```
if ( fnfc->show() == 0 ) {
    // Print all filenames user selected
    for (int n=0; n<fnfc->count(); n++) {
        printf("%d) '%s'\n", n, fnfc->filename(n));
    }
}
```

#### 33.92.4.2 directory()

```
void Fl_Native_File_Chooser::directory (
    const char * val )
```

Preset the directory the browser will show when opened.

If `val` is NULL, or no directory is specified, the chooser will attempt to use the last non-cancelled folder.

#### 33.92.4.3 errmsg()

```
const char * Fl_Native_File_Chooser::errmsg ( ) const
```

Returns a system dependent error message for the last method that failed.

This message should at least be flagged to the user in a dialog box, or to some kind of error log. Contents will be valid only for methods that document `errmsg()` will have info on failures.

#### 33.92.4.4 filename() [1/2]

```
const char * Fl_Native_File_Chooser::filename ( ) const
```

Return the filename the user chose.

Use this if only expecting a single filename. If more than one filename is expected, use `filename(int)` instead. Return value may be "" if no filename was chosen (eg. user cancelled).

**33.92.4.5 filename()** [2/2]

```
const char * Fl_Native_File_Chooser::filename (
    int i ) const
```

Return one of the filenames the user selected.

Use [count\(\)](#) to determine how many filenames the user selected.

**Example:**

```
if ( fnfc->show() == 0 ) {
    // Print all filenames user selected
    for (int n=0; n<fnfc->count(); n++ ) {
        printf("%d) '%s'\n", n, fnfc->filename(n));
    }
}
```

**33.92.4.6 filter()** [1/2]

```
const char * Fl_Native_File_Chooser::filter ( ) const
```

Returns the filter string last set.

Can be NULL if no filter was set.

**33.92.4.7 filter()** [2/2]

```
void Fl_Native_File_Chooser::filter (
    const char * f )
```

Sets the filename filters used for browsing.

The default is NULL, which browses all files.

The filter string can be any of:

- A single wildcard (eg. "\*.txt")
- Multiple wildcards (eg. ".\*{cxx,h,H}")
- A descriptive name followed by a "\t" and a wildcard (eg. "Text Files\t\*.txt")
- A list of separate wildcards with a "\n" between each (eg. ".\*{cxx,H}\n\*.txt")
- A list of descriptive names and wildcards (eg. "C++ Files\t\*.{cxx,H}\nTxt Files\t\*.txt")

The format of each filter is a wildcard, or an optional user description followed by '\t' and the wildcard.

On most platforms, each filter is available to the user via a pulldown menu in the file chooser. The 'All Files' option is always available to the user.

**33.92.4.8 filter\_value()** [1/2]

```
int Fl_Native_File_Chooser::filter_value ( ) const
```

Returns which filter value was last selected by the user.

This is only valid if the chooser returns success and if the particular file chooser supports it. Otherwise the value is not changed.

Some "native" file choosers don't support returning the filter selection by the user, particularly the system dialog based browsers:

- kdialog (KDE system dialog)
- zenity (another system dialog based chooser).

Note: this list may not be complete.

These system file chooser dialogs don't return the filter value chosen by the user.

See also

[filter\(const char \\*f\)](#)

**33.92.4.9 filter\_value()** [2/2]

```
void Fl_Native_File_Chooser::filter_value (
    int i )
```

Sets which filter will be initially selected.

The first filter is indexed as 0. If `filter_value() == filters()`, then "All Files" was chosen. If `filter_value() > filters()`, then a custom filter was set.

Some "native" file choosers don't support this way to set the initial filter type, particularly the system dialog based browsers:

- kdialog (KDE system dialog)
- zenity (another system dialog based chooser).

Note: this list may not be complete.

As far as we know these dialogs use the **first** item in the list of filter values as the initial filter presented to the user.

See also

[filter\(const char \\*f\)](#)

**33.92.4.10 options()**

```
void Fl_Native_File_Chooser::options (
    int o )
```

Sets the platform specific chooser options to `val`.

`val` is expected to be one or more [Fl\\_Native\\_File\\_Chooser::Option](#) flags ORed together. Some platforms have OS-specific functions that can be enabled/disabled via this method.

Flag	Description	Win	Mac	Other	
-----	-----	-----	-----	-----	-----
<a href="#">NEW_FOLDER</a> Used	Shows the 'New Folder' button.			Ignored	Used
<a href="#">PREVIEW</a>	Enables the 'Preview' mode by default.		Ignored	Ignored	Used
<a href="#">SAVEAS_CONFIRM</a>	Confirm dialog if <a href="#">BROWSE_SAVE_FILE</a> file exists.	Used	Used	Used	
<a href="#">USE_FILTER_EXT</a>	Chooser <a href="#">filter</a> presets the output file extension.	Ignored	Used	Used (GTK)	

**33.92.4.11 preset\_file()**

```
void Fl_Native_File_Chooser::preset_file (
    const char * f )
```

Sets the default filename for the chooser.

Use [directory\(\)](#) to set the default directory. Mainly used to preset the filename for save dialogs, and on most platforms can be used for opening files as well.

**33.92.4.12 show()**

```
int Fl_Native_File_Chooser::show ( )
```

Post the chooser's dialog.

Blocks until dialog has been completed or cancelled.

Returns

- 0 – user picked a file
- 1 – user cancelled
- -1 – failed; [errmsg\(\)](#) has reason

**33.92.4.13 title()** [1/2]

```
const char * Fl_Native_File_Chooser::title ( ) const
```

Get the title of the file chooser's dialog window.

Return value may be NULL if no title was set.

**33.92.4.14 title() [2/2]**

```
void Fl_Native_File_Chooser::title (
    const char * t )
```

Set the title of the file chooser's dialog window.

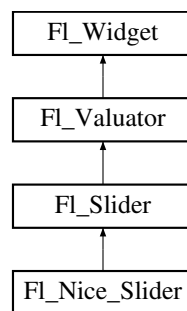
Can be NULL if no title desired. The default title varies according to the platform, so you are advised to set the title explicitly.

The documentation for this class was generated from the following files:

- [Fl\\_Native\\_File\\_Chooser.H](#)
- [Fl\\_Native\\_File\\_Chooser.cxx](#)
- [Fl\\_Native\\_File\\_Chooser\\_GTK.cxx](#)

**33.93 Fl\_Nice\_Slider Class Reference**

Inheritance diagram for Fl\_Nice\_Slider:

**Public Member Functions**

- **Fl\_Nice\_Slider** (int X, int Y, int W, int H, const char \*L=0)

**Additional Inherited Members**

The documentation for this class was generated from the following files:

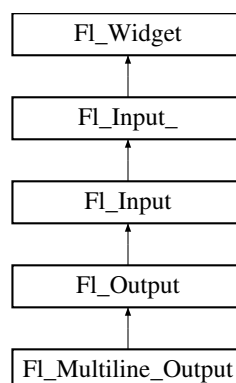
- [Fl\\_Nice\\_Slider.H](#)
- [Fl\\_Slider.cxx](#)

**33.94 Fl\_Output Class Reference**

This widget displays a piece of text.

```
#include <Fl_Output.H>
```

Inheritance diagram for Fl\_Output:



## Public Member Functions

- [Fl\\_Output](#) (int X, int Y, int W, int H, const char \*l=0)  
*Creates a new [Fl\\_Output](#) widget using the given position, size, and label string.*

## Additional Inherited Members

### 33.94.1 Detailed Description

This widget displays a piece of text.

When you set the [value\(\)](#) , [Fl\\_Output](#) does a strcpy() to its own storage, which is useful for program-generated values. The user may select portions of the text using the mouse and paste the contents into other fields or programs.

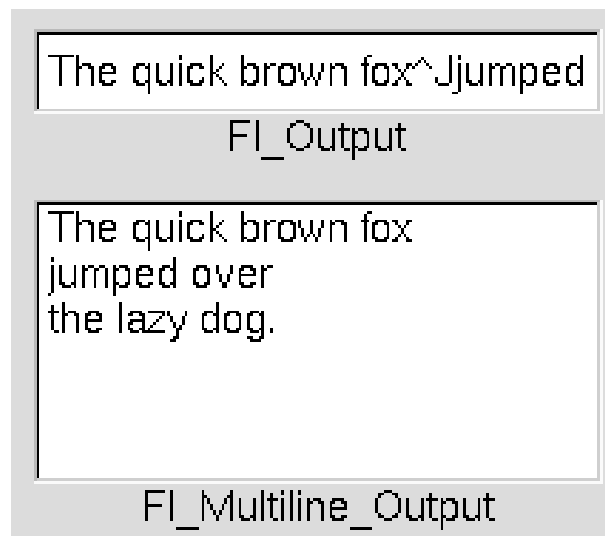


Figure 33.34 [Fl\\_Output](#)

There is a single subclass, [Fl\\_Multiline\\_Output](#), which allows you to display multiple lines of text. [Fl\\_Multiline\\_Output](#) does not provide scroll bars. If a more complete text editing widget is needed, use [Fl\\_Text\\_Display](#) instead.

The text may contain any characters except \0, and will correctly display anything, using ^X notation for unprintable control characters and \nnn notation for unprintable characters with the high bit set. It assumes the font can draw any characters in the ISO-Latin1 character set.

### 33.94.2 Constructor & Destructor Documentation

#### 33.94.2.1 [Fl\\_Output\(\)](#)

```
Fl_Output::Fl_Output (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Output](#) widget using the given position, size, and label string.

The default boxtype is `FL_DOWN_BOX`.

Inherited destructor destroys the widget and any value associated with it.

The documentation for this class was generated from the following files:

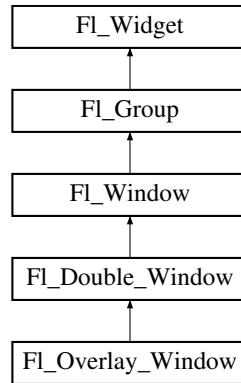
- [Fl\\_Output.H](#)
- [Fl\\_Input.cxx](#)

## 33.95 FL\_Overlay\_Window Class Reference

This window provides double buffering and also the ability to draw the "overlay" which is another picture placed on top of the main image.

```
#include <FL_Overlay_Window.H>
```

Inheritance diagram for FL\_Overlay\_Window:



### Public Member Functions

- [FL\\_Overlay\\_Window \\* as\\_overlay\\_window \(\)](#) **FL\_OVERRIDE**  
Return non-null if this is an [FL\\_Overlay\\_Window](#) object.
- `int can_do_overlay ()`  
Returns non-zero if there's hardware overlay support.
- `virtual void draw_overlay ()=0`  
You must subclass [FL\\_Overlay\\_Window](#) and provide this method.
- `void flush ()` **FL\_OVERRIDE**  
Forces the window to be drawn, this window is also made current and calls [draw\(\)](#).
- `void hide ()` **FL\_OVERRIDE**  
Makes a widget invisible.
- `void redraw_overlay ()`  
Call this to indicate that the overlay data has changed and needs to be redrawn.
- `void resize (int, int, int, int)` **FL\_OVERRIDE**  
Changes the size or position of the widget.
- `void show ()` **FL\_OVERRIDE**  
Makes a widget visible.
- `void show (int a, char **b)`  
Same as [FL\\_Window::show\(int a, char \\*\\*b\)](#)
- `~FL_Overlay_Window ()`  
Destroys the window and all child widgets.

### Protected Member Functions

- **FL\_Overlay\_Window** (int W, int H, const char \*l=0)  
See [FL\\_Overlay\\_Window::FL\\_Overlay\\_Window\(int X, int Y, int W, int H, const char \\*l=0\)](#)
- [FL\\_Overlay\\_Window](#) (int X, int Y, int W, int H, const char \*l=0)  
Creates a new [FL\\_Overlay\\_Window](#) widget using the given position, size, and label (title) string.

## Additional Inherited Members

### 33.95.1 Detailed Description

This window provides double buffering and also the ability to draw the "overlay" which is another picture placed on top of the main image.

The overlay is designed to be a rapidly-changing but simple graphic such as a mouse selection box. [Fl\\_Overlay\\_Window](#) uses the overlay planes provided by your graphics hardware if they are available.

If no hardware support is found the overlay is simulated by drawing directly into the on-screen copy of the double-buffered window, and "erased" by copying the backbuffer over it again. This means the overlay will blink if you change the image in the window.

### 33.95.2 Constructor & Destructor Documentation

#### 33.95.2.1 Fl\_Overlay\_Window()

```
Fl_Overlay_Window::Fl_Overlay_Window (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 ) [protected]
```

Creates a new [Fl\\_Overlay\\_Window](#) widget using the given position, size, and label (title) string.

If the positions (x,y) are not given, then the window manager will choose them.

### 33.95.3 Member Function Documentation

#### 33.95.3.1 as\_overlay\_window()

```
Fl_Overlay_Window * Fl_Overlay_Window::as_overlay_window ( ) [inline], [virtual]
```

Return non-null if this is an [Fl\\_Overlay\\_Window](#) object.

Reimplemented from [Fl\\_Window](#).

#### 33.95.3.2 draw\_overlay()

```
virtual void Fl_Overlay_Window::draw_overlay ( ) [pure virtual]
```

You must subclass [Fl\\_Overlay\\_Window](#) and provide this method.

It is just like a [draw\(\)](#) method, except it draws the overlay. The overlay will have already been "cleared" when this is called. You can use any of the routines described in [<FL/fl\\_draw.H>](#).

#### 33.95.3.3 flush()

```
void Fl_Overlay_Window::flush ( ) [virtual]
```

Forces the window to be drawn, this window is also made current and calls [draw\(\)](#).

Reimplemented from [Fl\\_Double\\_Window](#).

#### 33.95.3.4 hide()

```
void Fl_Overlay_Window::hide ( ) [virtual]
```

Makes a widget invisible.

See also

[show\(\)](#), [visible\(\)](#), [visible\\_r\(\)](#)

Reimplemented from [Fl\\_Double\\_Window](#).

### 33.95.3.5 redraw\_overlay()

```
void Fl_Overlay_Window::redraw_overlay ( )
```

Call this to indicate that the overlay data has changed and needs to be redrawn.

The overlay will be clear until the first time this is called, so if you want an initial display you must call this after calling [show\(\)](#).

### 33.95.3.6 resize()

```
void Fl_Overlay_Window::resize (
    int x,
    int y,
    int w,
    int h ) [virtual]
```

Changes the size or position of the widget.

This is a virtual function so that the widget may implement its own handling of resizing. The default version does *not* call the [redraw\(\)](#) method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.

Some window managers under X11 call [resize\(\)](#) a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations.

position(X, Y) is a shortcut for [resize\(X, Y, w\(\), h\(\)\)](#), and size(W, H) is a shortcut for [resize\(x\(\), y\(\), W, H\)](#).

Parameters

in	<i>x,y</i>	new position relative to the parent window
in	<i>w,h</i>	new size

See also

[position\(int,int\)](#), [size\(int,int\)](#)

Reimplemented from [Fl\\_Double\\_Window](#).

### 33.95.3.7 show()

```
void Fl_Overlay_Window::show ( ) [virtual]
```

Makes a widget visible.

An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like FL\_SHOW.

The [visible\(\)](#) method returns true if the widget is set to be visible. The [visible\\_r\(\)](#) method returns true if the widget and all of its parents are visible. A widget is only visible if [visible\(\)](#) is true on it *and all of its parents*.

Changing it will send FL\_SHOW or FL\_HIDE events to the widget. *Do not change it if the parent is not visible, as this will send false FL\_SHOW or FL\_HIDE events to the widget.* [redraw\(\)](#) is called if necessary on this or the parent.

See also

[hide\(\)](#), [visible\(\)](#), [visible\\_r\(\)](#)

Reimplemented from [Fl\\_Double\\_Window](#).

The documentation for this class was generated from the following files:

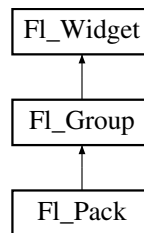
- Fl\_Overlay\_Window.H
- Fl\_Overlay\_Window.cxx

## 33.96 FI\_Pack Class Reference

This widget was designed to add the functionality of compressing and aligning widgets.

```
#include <FI_Pack.H>
```

Inheritance diagram for FI\_Pack:



### Public Types

- enum { **VERTICAL** = 0 , **HORIZONTAL** = 1 }

### Public Member Functions

- void **clear** ()  
*Deletes all child widgets with [FI\\_Group::clear\(\)](#).*
- FI\_Pack** (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [FI\\_Pack](#) widget using the given position, size, and label string.*
- uchar **horizontal** () const  
*Returns non-zero if [FI\\_Pack](#) alignment is horizontal.*
- void **resize** (int X, int Y, int W, int H) **FL\_OVERRIDE**  
*Override [FI\\_Group](#) resize behavior.*
- int **spacing** () const  
*Gets the number of extra pixels of blank space that are added between the children.*
- void **spacing** (int i)  
*Sets the number of extra pixels of blank space that are added between the children.*

### Protected Member Functions

- void **draw** () **FL\_OVERRIDE**  
*Draws the widget.*

### Additional Inherited Members

#### 33.96.1 Detailed Description

This widget was designed to add the functionality of compressing and aligning widgets.

If [type\(\)](#) is FI\_Pack::HORIZONTAL all the children are resized to the height of the [FI\\_Pack](#), and are moved next to each other horizontally. If [type\(\)](#) is not FI\_Pack::HORIZONTAL then the children are resized to the width and are stacked below each other. Then the [FI\\_Pack](#) resizes itself to surround the child widgets.

You may want to put the [FI\\_Pack](#) inside an [FI\\_Scroll](#).

The '[resizable\(\)](#)' for [FI\\_Pack](#) is set to NULL by default. Its behavior is slightly different than in a normal [FI\\_Group](#) widget: only if the [resizable\(\)](#) widget is the last widget in the group it is extended to take the full available width or height, respectively, of the [FI\\_Pack](#) group.

**Note**

You can nest [FI\\_Pack](#) widgets or put them inside [FI\\_Scroll](#) widgets or inside other group widgets but their behavior can sometimes be *"surprising"*. This is partly due to the fact that [FI\\_Pack](#) widgets resize themselves during their [draw\(\)](#) operation, trying to react on their child widgets resizing themselves during **their** [draw\(\)](#) operations which can be confusing. If you want to achieve special resize behavior of nested group widgets it can sometimes be easier to derive your own specialized group widget than to try to make nested [FI\\_Pack](#) widgets behave as expected.

**See also**

[FI\\_Group::resizable\(\)](#)

**33.96.2 Constructor & Destructor Documentation****33.96.2.1 FI\_Pack()**

```
FI_Pack::FI_Pack (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [FI\\_Pack](#) widget using the given position, size, and label string.

The default boxtype is FL\_NO\_BOX.

The default [type\(\)](#) is FI\_Pack::VERTICAL.

The destructor *also deletes all the children*. This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code. A kludge has been done so the [FI\\_Pack](#) and all of its children can be automatic (local) variables, but you must declare the [FI\\_Pack](#) *first*, so that it is destroyed last.

**Parameters**

in	<i>X,Y</i>	X and Y coordinates (position)
in	<i>W,H</i>	width and height, respectively
in	<i>L</i>	label (optional)

**33.96.3 Member Function Documentation****33.96.3.1 clear()**

```
void FI_Pack::clear (
    void ) [inline]
```

Deletes all child widgets with [FI\\_Group::clear\(\)](#).

And sets to NULL the [resizable\(\)](#) widget.

**33.96.3.2 draw()**

```
void FI_Pack::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Group](#).

### 33.96.3.3 horizontal()

```
uchar Fl_Pack::horizontal ( ) const [inline]
```

Returns non-zero if [Fl\\_Pack](#) alignment is horizontal.

#### Returns

non-zero if [Fl\\_Pack](#) alignment is horizontal ([Fl\\_Pack::HORIZONTAL](#))

#### Note

Currently the return value is the same as [Fl\\_Group::type\(\)](#), but this may change in the future. Do not set any other values than the following with [Fl\\_Pack::type\(\)](#):

- [Fl\\_Pack::VERTICAL](#) (Default)
- [Fl\\_Pack::HORIZONTAL](#)

See class [Fl\\_Pack](#) documentation for details.

### 33.96.3.4 resize()

```
void Fl_Pack::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Override [Fl\\_Group](#) resize behavior.

Resizing an [Fl\\_Pack](#) will not resize any of its children, but trigger a redraw, which in turn recalculates the dimensions of all children.

#### Parameters

in	X,Y,W,H	new position and size of the <a href="#">Fl_Pack</a> widget
----	---------	---

Reimplemented from [Fl\\_Group](#).

The documentation for this class was generated from the following files:

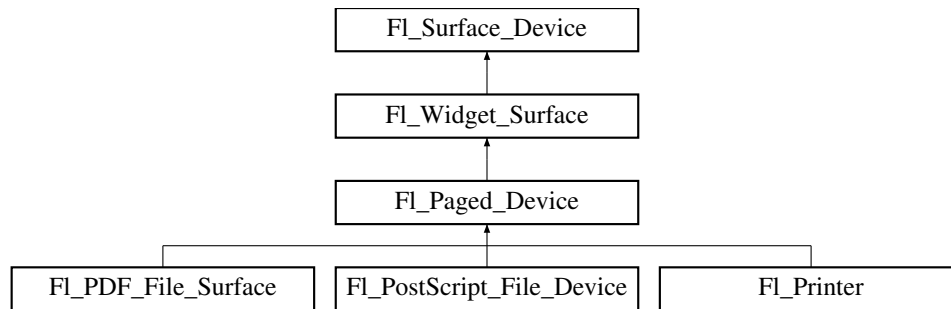
- [Fl\\_Pack.H](#)
- [Fl\\_Pack.cxx](#)

## 33.97 Fl\_Paged\_Device Class Reference

Represents page-structured drawing surfaces.

```
#include <Fl_Paged_Device.H>
```

Inheritance diagram for [Fl\\_Paged\\_Device](#):



## Classes

- struct [page\\_format](#)  
*width, height and name of a page format*

## Public Types

- enum [Page\\_Format](#) {  
A0 = 0 , A1 , A2 , A3 ,  
A4 , A5 , A6 , A7 ,  
A8 , A9 , B0 , B1 ,  
B2 , B3 , B4 , B5 ,  
B6 , B7 , B8 , B9 ,  
B10 , C5E , DLE , EXECUTIVE ,  
FOLIO , LEDGER , LEGAL , LETTER ,  
TABLOID , ENVELOPE , MEDIA = 0x1000 }  
*Possible page formats.*
- enum [Page\\_Layout](#) { PORTRAIT = 0 , LANDSCAPE = 0x100 , REVERSED = 0x200 , ORIENTATION = 0x300 }  
*Possible page layouts.*

## Public Member Functions

- virtual int [begin\\_job](#) (int pagecount=0, int \*frompage=NULL, int \*topage=NULL, char \*\*perr\_↵ message=NULL)  
*Begins a print job.*
- virtual int [begin\\_page](#) (void)  
*Begins a new printed page.*
- virtual void [end\\_job](#) (void)  
*To be called at the end of a print job.*
- virtual int [end\\_page](#) (void)  
*To be called at the end of each page.*
- virtual void [margins](#) (int \*left, int \*top, int \*right, int \*bottom)  
*Computes the dimensions of margins that lie between the printable page area and the full page.*
- void [print\\_widget](#) ([Fl\\_Widget](#) \*widget, int delta\_x=0, int delta\_y=0)  
*Synonym of [draw\(Fl\\_Widget\\*, int, int\)](#)*
- void [print\\_window](#) ([Fl\\_Window](#) \*win, int x\_off=0, int y\_off=0)  
*Synonym of [draw\\_decorated\\_window\(Fl\\_Window\\*, int, int\)](#)*
- virtual void [rotate](#) (float angle)  
*Rotates the graphics operations relatively to paper.*
- virtual void [scale](#) (float scale\_x, float scale\_y=0.)  
*Changes the scaling of page coordinates.*
- int [start\\_job](#) (int pagecount=0, int \*frompage=NULL, int \*topage=NULL, char \*\*perr\_message=NULL)

Synonym of [begin\\_job\(int pagecount, int \\*frompage, int \\*topage, char \\*\\*perr\\_message\)](#).

- int [start\\_page](#) ()

Synonym of [begin\\_page\(\)](#).

- virtual [~FI\\_Paged\\_Device](#) ()

The destructor.

## Static Public Attributes

- static const [page\\_format](#) [page\\_formats](#) [[NO\\_PAGE\\_FORMATS](#)]

width, height and name of all elements of the enum [Page\\_Format](#).

## Protected Member Functions

- [FI\\_Paged\\_Device](#) ()

The constructor.

## Additional Inherited Members

### 33.97.1 Detailed Description

Represents page-structured drawing surfaces.

This class has no public constructor: don't instantiate it; use [FI\\_Printer](#) or [FI\\_PostScript\\_File\\_Device](#) instead.

### 33.97.2 Member Enumeration Documentation

#### 33.97.2.1 Page\_Format

enum [FI\\_Paged\\_Device::Page\\_Format](#)

Possible page formats.

All paper formats with pre-defined width and height. The [FI\\_Paged\\_Device::page\\_formats](#) array gives these widths and heights.

#### Enumerator

A0	A0 format.
A1	A1 format.
A2	A2 format.
A3	A3 format.
A4	A4 format.
A5	A5 format.
A6	A6 format.
A7	A7 format.
A8	A8 format.
A9	A9 format.
B0	B0 format.
B1	B1 format.
B2	B2 format.
B3	B3 format.
B4	B4 format.
B5	B5 format.
B6	B6 format.
B7	B7 format.
B8	B8 format.
B9	B9 format.

## Enumerator

B10	B10 format.
EXECUTIVE	Executive format.
FOLIO	Folio format.
LEDGER	Ledger format.
LEGAL	Legal format.
LETTER	Letter format.
TABLOID	Tabloid format.

## 33.97.2.2 Page\_Layout

enum [Fl\\_Paged\\_Device::Page\\_Layout](#)

Possible page layouts.

## Enumerator

PORTRAIT	Portrait orientation.
LANDSCAPE	Landscape orientation.
REVERSED	Reversed orientation.
ORIENTATION	orientation

## 33.97.3 Member Function Documentation

## 33.97.3.1 begin\_job()

```
int Fl_Paged_Device::begin_job (
    int pagecount = 0,
    int * frompage = NULL,
    int * topage = NULL,
    char ** perr_message = NULL ) [virtual]
```

Begins a print job.

## Parameters

in	<i>pagecount</i>	the total number of pages of the job (or 0 if you don't know the number of pages)
out	<i>frompage</i>	if non-null, *frompage is set to the first page the user wants printed
out	<i>topage</i>	if non-null, *topage is set to the last page the user wants printed
out	<i>perr_message</i>	if non-null and if the returned value is 2, *perr_message is set to a string describing the error. That string can be deleted after use.

## Returns

0 if OK, 1 if user cancelled the job, 2 if any error.

Reimplemented in [Fl\\_PostScript\\_File\\_Device](#), [Fl\\_Printer](#), and [Fl\\_PDF\\_File\\_Surface](#).

## 33.97.3.2 begin\_page()

```
int Fl_Paged_Device::begin_page (
    void ) [virtual]
```

Begins a new printed page.

The page coordinates are initially in points, i.e., 1/72 inch, and with origin at the top left of the printable page area. This function also makes this surface the current drawing surface with [FI\\_Surface\\_Device::push\\_current\(\)](#).

#### Note

[begin\\_page\(\)](#) calls [FI\\_Surface\\_Device::push\\_current\(\)](#) and leaves this device as the active surface. If any calls between [begin\\_page\(\)](#) and [end\\_page\(\)](#) open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to [FI\\_Surface\\_Device::pop\\_current\(\)](#) and a call to [FI\\_Surface\\_Device::push\\_current\(\)](#), or the content of the dialog box will be rendered to the printer instead of the screen.

#### Returns

0 if OK, non-zero if any error

Reimplemented in [FI\\_PDF\\_File\\_Surface](#), [FI\\_PostScript\\_File\\_Device](#), and [FI\\_Printer](#).

### 33.97.3.3 end\_job()

```
void Fl_Paged_Device::end_job (
    void ) [virtual]
```

To be called at the end of a print job.

Reimplemented in [FI\\_PDF\\_File\\_Surface](#), [FI\\_PostScript\\_File\\_Device](#), and [FI\\_Printer](#).

### 33.97.3.4 end\_page()

```
int Fl_Paged_Device::end_page (
    void ) [virtual]
```

To be called at the end of each page.

This function also stops this surface from being the current drawing surface with [FI\\_Surface\\_Device::pop\\_current\(\)](#).

#### Note

[end\\_page\(\)](#) calls [FI\\_Surface\\_Device::pop\\_current\(\)](#). If any calls between [begin\\_page\(\)](#) and [end\\_page\(\)](#) open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to [FI\\_Surface\\_Device::pop\\_current\(\)](#) and a call to [FI\\_Surface\\_Device::push\\_current\(\)](#).

#### Returns

0 if OK, non-zero if any error.

Reimplemented in [FI\\_PDF\\_File\\_Surface](#), [FI\\_PostScript\\_File\\_Device](#), and [FI\\_Printer](#).

### 33.97.3.5 margins()

```
void Fl_Paged_Device::margins (
    int * left,
    int * top,
    int * right,
    int * bottom ) [virtual]
```

Computes the dimensions of margins that lie between the printable page area and the full page.

Values are in the same unit as that used by FLTK drawing functions. They are changed by [scale\(\)](#) calls.

#### Parameters

out	<i>left</i>	If non-null, *left is set to the left margin size.
out	<i>top</i>	If non-null, *top is set to the top margin size.
out	<i>right</i>	If non-null, *right is set to the right margin size.
out	<i>bottom</i>	If non-null, *bottom is set to the bottom margin size.

Reimplemented in [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), and [Fl\\_Printer](#).

### 33.97.3.6 rotate()

```
void Fl_Paged_Device::rotate (
    float angle ) [virtual]
```

Rotates the graphics operations relatively to paper.

The rotation is centered on the current graphics origin. Successive [rotate\(\)](#) calls don't combine their effects.

#### Parameters

<i>angle</i>	Rotation angle in counter-clockwise degrees.
--------------	--

Reimplemented in [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), and [Fl\\_Printer](#).

### 33.97.3.7 scale()

```
void Fl_Paged_Device::scale (
    float scale_x,
    float scale_y = 0. ) [virtual]
```

Changes the scaling of page coordinates.

This function also resets the origin of graphics functions at top left of printable page area. After a [scale\(\)](#) call, do a [printable\\_rect\(\)](#) call to get the new dimensions of the printable page area. Successive [scale\(\)](#) calls don't combine their effects.

#### Parameters

<i>scale_x</i>	Horizontal dimensions of plot are multiplied by this quantity.
<i>scale_y</i>	Same as above, vertically. The value 0. is equivalent to setting <code>scale_y = scale_x</code> . Thus, <code>scale(factor);</code> is equivalent to <code>scale(factor, factor);</code>

Reimplemented in [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), and [Fl\\_Printer](#).

### 33.97.3.8 start\_job()

```
int Fl_Paged_Device::start_job (
    int pagecount = 0,
    int * frompage = NULL,
    int * topage = NULL,
    char ** perr_message = NULL ) [inline]
```

Synonym of [begin\\_job\(int pagecount, int \\*frompage, int \\*topage, char \\*\\*perr\\_message\)](#).

For API compatibility with FLTK 1.3.x

### 33.97.3.9 start\_page()

```
int Fl_Paged_Device::start_page ( ) [inline]
```

Synonym of [begin\\_page\(\)](#).

For API compatibility with FLTK 1.3.x

The documentation for this class was generated from the following files:

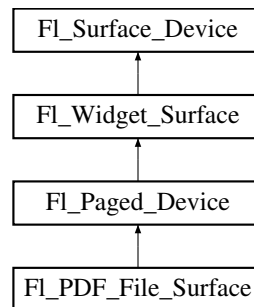
- [Fl\\_Paged\\_Device.H](#)
- [Fl\\_Paged\\_Device.cxx](#)

## 33.98 FL\_PDF\_File\_Surface Class Reference

To send graphical output to a PDF file.

```
#include <FL_PDF_File_Surface.H>
```

Inheritance diagram for FL\_PDF\_File\_Surface:



### Public Member Functions

- int [begin\\_document](#) (const char \*pathname, enum [FL\\_Paged\\_Device::Page\\_Format](#) format=[FL\\_Paged\\_Device::A4](#), enum [FL\\_Paged\\_Device::Page\\_Layout](#) layout=[FL\\_Paged\\_Device::PORTRAIT](#), char \*\*perr=NULL)  
*Prepare to draw to a PDF document identified by its pathname.*
- int [begin\\_job](#) (const char \*defaultfilename, char \*\*perr=NULL)  
*Prepare to draw to a PDF document identified with a file chooser.*
- int [begin\\_job](#) (int, int \*, int \*, char \*\*) [FL\\_OVERRIDE](#)  
*Don't use for this class.*
- int [begin\\_page](#) (void) [FL\\_OVERRIDE](#)  
*Begins a new printed page.*
- void [end\\_job](#) (void) [FL\\_OVERRIDE](#)  
*To be called at the end of a print job.*
- int [end\\_page](#) (void) [FL\\_OVERRIDE](#)  
*To be called at the end of each page.*
- bool [is\\_current](#) () [FL\\_OVERRIDE](#)  
*Is this surface the current drawing surface?*
- void [margins](#) (int \*left, int \*top, int \*right, int \*bottom) [FL\\_OVERRIDE](#)  
*Computes the dimensions of margins that lie between the printable page area and the full page.*
- void [origin](#) (int \*x, int \*y) [FL\\_OVERRIDE](#)  
*Computes the coordinates of the current origin of graphics functions.*
- void [origin](#) (int x, int y) [FL\\_OVERRIDE](#)  
*Sets the position of the origin of graphics in the drawable part of the drawing surface.*
- const char \* [pdf\\_filename](#) ()  
*Returns the name of the PDF document.*
- int [printable\\_rect](#) (int \*w, int \*h) [FL\\_OVERRIDE](#)  
*Computes the width and height of the drawable area of the drawing surface.*
- void [rotate](#) (float angle) [FL\\_OVERRIDE](#)  
*Rotates the graphics operations relatively to paper.*
- void [scale](#) (float s\_x, float s\_y=0) [FL\\_OVERRIDE](#)  
*Changes the scaling of page coordinates.*
- void [set\\_current](#) () [FL\\_OVERRIDE](#)  
*Make this surface the current drawing surface.*
- void [translate](#) (int x, int y) [FL\\_OVERRIDE](#)  
*Translates the current graphics origin accounting for the current rotation.*
- void [untranslate](#) () [FL\\_OVERRIDE](#)  
*Undoes the effect of a previous [translate\(\)](#) call.*

## Static Public Attributes

These attributes are useful for the Wayland/X11 platform only.

- static const char \* **format\_dialog\_title** = "PDF document settings"  
*Localizable text of the "PDF document settings" dialog.*
- static const char \* **format\_dialog\_page\_size** = "Page Size:"  
*Localizable text of the "PDF document settings" dialog.*
- static const char \* **format\_dialog\_orientation** = "Orientation:"  
*Localizable text of the "PDF document settings" dialog.*
- static const char \* **format\_dialog\_default** = "Set as default"  
*Localizable text of the "PDF document settings" dialog.*

## Additional Inherited Members

### 33.98.1 Detailed Description

To send graphical output to a PDF file.

Class [Fl\\_PDF\\_File\\_Surface](#) is used exactly as the [Fl\\_Printer](#) class except for its 2 member functions [begin\\_job\(\)](#) and [begin\\_document\(\)](#).

**Platform notes:**

- Windows: requires "Microsoft Print to PDF" available in Windows 10 and later.
- Wayland/X11: requires the FLTK library was built with FLTK\_USE\_PANGO=1.
- macOS: requires macOS 10.9 or later.

If the running platform doesn't fulfill the requirement above, the program runs but doesn't output any PDF.

### 33.98.2 Member Function Documentation

#### 33.98.2.1 begin\_document()

```
int Fl_PDF_File_Surface::begin_document (
    const char * pathname,
    enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
    enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT,
    char ** perr = NULL )
```

Prepare to draw to a PDF document identified by its pathname.

**Parameters**

<i>pathname</i>	Path name for the PDF document
<i>format</i>	The paper format for the PDF document
<i>layout</i>	The orientation for the PDF document
<i>perr</i>	NULL or address of a string that receives a message in case of error. To be deleted[] after use.

**Returns**

0 for success, 2 when an error occurred.

#### 33.98.2.2 begin\_job() [1/2]

```
int Fl_PDF_File_Surface::begin_job (
    const char * defaultfilename,
    char ** perr = NULL )
```

Prepare to draw to a PDF document identified with a file chooser.

A dialog opens to select the location and name of the output PDF document as well as its page format and orientation.

#### Parameters

<i>defaultfilename</i>	Default name for the PDF document
<i>perr</i>	NULL or address of a string that receives a message in case of error. To be deleted[] after use.

#### Returns

0 for success, 1 when the user cancelled the operation, 2 when an error occurred.

#### 33.98.2.3 begin\_job() [2/2]

```
int Fl_PDF_File_Surface::begin_job (
    int ,
    int * ,
    int * ,
    char ** ) [inline], [virtual]
```

Don't use for this class.

Reimplemented from [Fl\\_Paged\\_Device](#).

#### 33.98.2.4 begin\_page()

```
int Fl_PDF_File_Surface::begin_page (
    void ) [inline], [virtual]
```

Begins a new printed page.

The page coordinates are initially in points, i.e., 1/72 inch, and with origin at the top left of the printable page area.

This function also makes this surface the current drawing surface with [Fl\\_Surface\\_Device::push\\_current\(\)](#).

#### Note

[begin\\_page\(\)](#) calls [Fl\\_Surface\\_Device::push\\_current\(\)](#) and leaves this device as the active surface. If any calls between [begin\\_page\(\)](#) and [end\\_page\(\)](#) open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to [Fl\\_Surface\\_Device::pop\\_current\(\)](#) and a call to [Fl\\_Surface\\_Device::push\\_current\(\)](#), or the content of the dialog box will be rendered to the printer instead of the screen.

#### Returns

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Paged\\_Device](#).

#### 33.98.2.5 end\_job()

```
void Fl_PDF_File_Surface::end_job (
    void ) [inline], [virtual]
```

To be called at the end of a print job.

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.98.2.6 end\_page()**

```
int Fl_PDF_File_Surface::end_page (
    void ) [inline], [virtual]
```

To be called at the end of each page.

This function also stops this surface from being the current drawing surface with [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

**Note**

[end\\_page\(\)](#) calls [Fl\\_Surface\\_Device::pop\\_current\(\)](#). If any calls between [begin\\_page\(\)](#) and [end\\_page\(\)](#) open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to [Fl\\_Surface\\_Device::pop\\_current\(\)](#) and a call to [Fl\\_Surface\\_Device::push\\_current\(\)](#).

**Returns**

0 if OK, non-zero if any error.

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.98.2.7 is\_current()**

```
bool Fl_PDF_File_Surface::is_current ( ) [inline], [virtual]
```

Is this surface the current drawing surface?

Reimplemented from [Fl\\_Surface\\_Device](#).

**33.98.2.8 margins()**

```
void Fl_PDF_File_Surface::margins (
    int * left,
    int * top,
    int * right,
    int * bottom ) [inline], [virtual]
```

Computes the dimensions of margins that lie between the printable page area and the full page.

Values are in the same unit as that used by FLTK drawing functions. They are changed by [scale\(\)](#) calls.

**Parameters**

out	<i>left</i>	If non-null, *left is set to the left margin size.
out	<i>top</i>	If non-null, *top is set to the top margin size.
out	<i>right</i>	If non-null, *right is set to the right margin size.
out	<i>bottom</i>	If non-null, *bottom is set to the bottom margin size.

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.98.2.9 origin() [1/2]**

```
void Fl_PDF_File_Surface::origin (
    int * x,
    int * y ) [inline], [virtual]
```

Computes the coordinates of the current origin of graphics functions.

**Parameters**

out	<i>x,y</i>	If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.
-----	------------	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.98.2.10 origin()** [2/2]

```
void Fl_PDF_File_Surface::origin (
    int x,
    int y ) [inline], [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous [printable\\_rect\(\)](#) call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive [origin\(\)](#) calls don't combine their effects. [Origin\(\)](#) calls are not affected by [rotate\(\)](#) calls (for classes derived from [Fl\\_Paged\\_Device](#)).

**Parameters**

in	x,y	Horizontal and vertical positions in the drawing surface of the desired origin of graphics.
----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.98.2.11 printable\_rect()**

```
int Fl_PDF_File_Surface::printable_rect (
    int * w,
    int * h ) [inline], [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to [origin\(\)](#). If the object is derived from class [Fl\\_Paged\\_Device](#), values account for the user-selected paper type and print orientation and are changed by [scale\(\)](#) calls.

**Returns**

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.98.2.12 rotate()**

```
void Fl_PDF_File_Surface::rotate (
    float angle ) [inline], [virtual]
```

Rotates the graphics operations relatively to paper.

The rotation is centered on the current graphics origin. Successive [rotate\(\)](#) calls don't combine their effects.

**Parameters**

angle	Rotation angle in counter-clockwise degrees.
-------	--

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.98.2.13 scale()**

```
void Fl_PDF_File_Surface::scale (
    float scale_x,
    float scale_y = 0 ) [inline], [virtual]
```

Changes the scaling of page coordinates.

This function also resets the origin of graphics functions at top left of printable page area. After a [scale\(\)](#) call, do a [printable\\_rect\(\)](#) call to get the new dimensions of the printable page area. Successive [scale\(\)](#) calls don't combine

their effects.

#### Parameters

<code>scale_x</code>	Horizontal dimensions of plot are multiplied by this quantity.
<code>scale_y</code>	Same as above, vertically. The value 0. is equivalent to setting <code>scale_y = scale_x</code> . Thus, <code>scale(factor)</code> ; is equivalent to <code>scale(factor, factor)</code> ;

Reimplemented from [Fl\\_Paged\\_Device](#).

### 33.98.2.14 set\_current()

```
void Fl_PDF_File_Surface::set_current (
    void ) [inline], [virtual]
```

Make this surface the current drawing surface.

This surface will receive all future graphics requests.

Since FLTK 1.4.0 the preferred API to change the current drawing surface is [Fl\\_Surface\\_Device::push\\_current\(\)](#) / [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

#### Note

It is recommended to use this function only as follows :

- The current drawing surface is the display;
- make current another surface, e.g., an [Fl\\_Printer](#) or an [Fl\\_Image\\_Surface](#) object, calling [set\\_current\(\)](#) on this object;
- draw to that surface;
- make the display current again with [Fl\\_Display\\_Device::display\\_device\(\)->set\\_current\(\)](#);  
don't do any other call to [set\\_current\(\)](#) before this one.

Other scenarios of drawing surface changes should be performed via [Fl\\_Surface\\_Device::push\\_current\(\)](#) and [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

Reimplemented from [Fl\\_Surface\\_Device](#).

### 33.98.2.15 translate()

```
void Fl_PDF_File_Surface::translate (
    int x,
    int y ) [inline], [virtual]
```

Translates the current graphics origin accounting for the current rotation.

Each [translate\(\)](#) call must be matched by an [untranslate\(\)](#) call. Successive [translate\(\)](#) calls add up their effects.

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.98.2.16 untranslate()

```
void Fl_PDF_File_Surface::untranslate (
    void ) [inline], [virtual]
```

Undoes the effect of a previous [translate\(\)](#) call.

Reimplemented from [Fl\\_Widget\\_Surface](#).

The documentation for this class was generated from the following files:

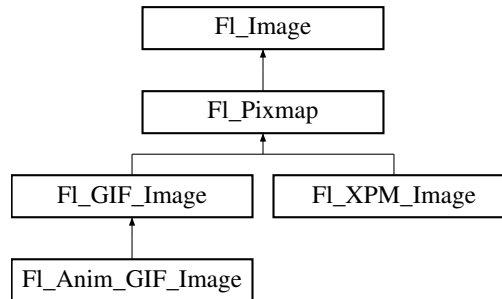
- [Fl\\_PDF\\_File\\_Surface.H](#)
- [Fl\\_Device.cxx](#)

## 33.99 FI\_Pixmap Class Reference

The [FI\\_Pixmap](#) class supports caching and drawing of colormap (pixmap) images, including transparency.

```
#include <FI_Pixmap.H>
```

Inheritance diagram for [FI\\_Pixmap](#):



### Public Member Functions

- int **cache\_h** ()
- int **cache\_w** ()
- void **color\_average** ([FI\\_Color](#) c, float i) [FL\\_OVERRIDE](#)  
*The [color\\_average\(\)](#) method averages the colors in the image with the provided FLTK color value.*
- [FI\\_Image](#) \* **copy** () const
- [FI\\_Image](#) \* **copy** (int W, int H) const [FL\\_OVERRIDE](#)  
*Creates a resized copy of the image.*
- void **desaturate** () [FL\\_OVERRIDE](#)  
*The [desaturate\(\)](#) method converts an image to grayscale.*
- void **draw** (int X, int Y)
- void **draw** (int X, int Y, int W, int H, int cx=0, int cy=0) [FL\\_OVERRIDE](#)  
*Draws the image to the current drawing surface with a bounding box.*
- [FI\\_Pixmap](#) (char \*const \*D)  
*The constructors create a new pixmap from the specified XPM data.*
- [FI\\_Pixmap](#) (const char \*const \*D)  
*The constructors create a new pixmap from the specified XPM data.*
- [FI\\_Pixmap](#) (const [uchar](#) \*const \*D)  
*The constructors create a new pixmap from the specified XPM data.*
- [FI\\_Pixmap](#) ([uchar](#) \*const \*D)  
*The constructors create a new pixmap from the specified XPM data.*
- void **label** ([FI\\_Menu\\_Item](#) \*m) [FL\\_OVERRIDE](#)  
*This method is an obsolete way to set the image attribute of a menu item.*
- void **label** ([FI\\_Widget](#) \*w) [FL\\_OVERRIDE](#)  
*This method is an obsolete way to set the image attribute of a widget or menu item.*
- void **uncache** () [FL\\_OVERRIDE](#)  
*If the image has been cached for display, delete the cache data.*
- virtual ~**FI\_Pixmap** ()  
*The destructor frees all memory and server resources that are used by the pixmap.*

### Public Attributes

- int **alloc\_data**

### Protected Member Functions

- void **measure** ()

## Friends

- class `Fl_Graphics_Driver`

## Additional Inherited Members

### 33.99.1 Detailed Description

The `Fl_Pixmap` class supports caching and drawing of colormap (pixmap) images, including transparency.

### 33.99.2 Constructor & Destructor Documentation

#### 33.99.2.1 `Fl_Pixmap()` [1/4]

```
Fl_Pixmap::Fl_Pixmap (
    char *const * D ) [inline], [explicit]
```

The constructors create a new pixmap from the specified XPM data.

#### 33.99.2.2 `Fl_Pixmap()` [2/4]

```
Fl_Pixmap::Fl_Pixmap (
    uchar *const * D ) [inline], [explicit]
```

The constructors create a new pixmap from the specified XPM data.

#### 33.99.2.3 `Fl_Pixmap()` [3/4]

```
Fl_Pixmap::Fl_Pixmap (
    const char *const * D ) [inline], [explicit]
```

The constructors create a new pixmap from the specified XPM data.

#### 33.99.2.4 `Fl_Pixmap()` [4/4]

```
Fl_Pixmap::Fl_Pixmap (
    const uchar *const * D ) [inline], [explicit]
```

The constructors create a new pixmap from the specified XPM data.

### 33.99.3 Member Function Documentation

#### 33.99.3.1 `color_average()`

```
void Fl_Pixmap::color_average (
    Fl_Color c,
    float i ) [virtual]
```

The `color_average()` method averages the colors in the image with the provided FLTK color value.

The first argument specifies the FLTK color to be used.

The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from [Fl\\_Image](#).

### 33.99.3.2 copy()

```
Fl_Image * Fl_Pixmap::copy (
    int W,
    int H ) const [virtual]
```

Creates a resized copy of the image.

It is recommended not to call this member function to reduce the size of an image to the size of the area where this image will be drawn, and to use [Fl\\_Image::scale\(\)](#) instead.

The new image should be released when you are done with it.

Note: since FLTK 1.4.0 you can use [Fl\\_Image::release\(\)](#) for all types of images (i.e. all subclasses of [Fl\\_Image](#)) instead of operator *delete* for [Fl\\_Image](#)'s and [Fl\\_Image::release\(\)](#) for [Fl\\_Shared\\_Image](#)'s.

The new image data will be converted to the requested size. RGB images are resized using the algorithm set by [Fl\\_Image::RGB\\_scaling\(\)](#).

For the new image the following equations are true:

- `w() == data_w() == W`
- `h() == data_h() == H`

#### Parameters

in	<i>W,H</i>	Requested width and height of the new image
----	------------	---

#### Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of [Fl\\_RGB\\_Image](#), [Fl\\_SVG\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Bitmap](#), [Fl\\_Tiled\\_Image](#), [Fl\\_Anim\\_GIF\\_Image](#) and [Fl\\_Shared\\_Image](#). Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an [Fl\\_GIF\\_Image](#) is an object of class [Fl\\_Pixmap](#).

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from [Fl\\_Image](#) or any subclass your overridden methods of '[Fl\\_Image::copy\(\) const](#)' and '[Fl\\_Image::copy\(int, int\) const](#)' **must** also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from [Fl\\_Image](#).

### 33.99.3.3 desaturate()

```
void Fl_Pixmap::desaturate ( ) [virtual]
```

The [desaturate\(\)](#) method converts an image to grayscale.

If the image contains an alpha channel (depth = 4), the alpha channel is preserved.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from [Fl\\_Image](#).

### 33.99.3.4 draw()

```
void Fl_Pixmap::draw (
    int X,
    int Y,
    int W,
    int H,
```

```
int cx = 0,
int cy = 0 ) [virtual]
```

Draws the image to the current drawing surface with a bounding box.

Arguments *X*, *Y*, *W*, *H* specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the *cx* and *cy* arguments.

In other words: `fl_push_clip(X,Y,W,H)` is applied, the image is drawn with its upper-left corner at *X-cx*, *Y-cy* and its own width and height, `fl_pop_clip()` is applied.

Reimplemented from [Fl\\_Image](#).

### 33.99.3.5 label() [1/2]

```
void Fl_Pixmap::label (
    Fl_Menu_Item * m ) [virtual]
```

This method is an obsolete way to set the image attribute of a menu item.

**Deprecated** Please use [Fl\\_Menu\\_Item::image\(\)](#) instead.

Reimplemented from [Fl\\_Image](#).

### 33.99.3.6 label() [2/2]

```
void Fl_Pixmap::label (
    Fl_Widget * widget ) [virtual]
```

This method is an obsolete way to set the image attribute of a widget or menu item.

**Deprecated** Please use [Fl\\_Widget::image\(\)](#) or [Fl\\_Widget::deimage\(\)](#) instead.

Reimplemented from [Fl\\_Image](#).

### 33.99.3.7 uncache()

```
void Fl_Pixmap::uncache ( ) [virtual]
```

If the image has been cached for display, delete the cache data.

This allows you to change the data used for the image and then redraw it without recreating an image object.

Reimplemented from [Fl\\_Image](#).

The documentation for this class was generated from the following files:

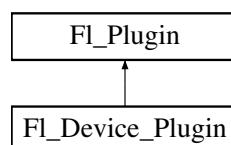
- [Fl\\_Pixmap.H](#)
- [Fl\\_Pixmap.cxx](#)

## 33.100 Fl\_Plugin Class Reference

[Fl\\_Plugin](#) allows link-time and run-time integration of binary modules.

```
#include <Fl_Plugin.H>
```

Inheritance diagram for [Fl\\_Plugin](#):



## Public Member Functions

- [Fl\\_Plugin](#) (const char \*class, const char \*name)  
*Create a plugin.*
- virtual ~[Fl\\_Plugin](#) ()  
*Clear the plugin and remove it from the database.*

### 33.100.1 Detailed Description

[Fl\\_Plugin](#) allows link-time and run-time integration of binary modules.

[Fl\\_Plugin](#) and [Fl\\_Plugin\\_Manager](#) provide a small and simple solution for linking C++ classes at run-time, or optionally linking modules at compile time without the need to change the main application.

[Fl\\_Plugin\\_Manager](#) uses static initialization to create the plugin interface early during startup. Plugins are stored in a temporary database, organized in classes.

Plugins should derive a new class from [Fl\\_Plugin](#) as a base:

```
class My_Plugin : public Fl_Plugin {
public:
    My_Plugin() : Fl_Plugin("effects", "blur") { }
    void do_something(...);
};
My_Plugin blur_plugin();
```

Plugins can be put into modules and either linked before distribution, or loaded from dynamically linkable files. An

[Fl\\_Plugin\\_Manager](#) is used to list and access all currently loaded plugins.

```
Fl_Plugin_Manager mgr("effects");
int i, n = mgr.plugins();
for (i=0; i<n; i++) {
    My_Plugin *pin = (My_Plugin*)mgr.plugin(i);
    pin->do_something();
}
```

### 33.100.2 Constructor & Destructor Documentation

#### 33.100.2.1 Fl\_Plugin()

```
Fl_Plugin::Fl_Plugin (
    const char * class,
    const char * name )
```

Create a plugin.

#### Parameters

in	<i>class</i>	plugins are grouped in classes
in	<i>name</i>	every plugin should have a unique name

The documentation for this class was generated from the following files:

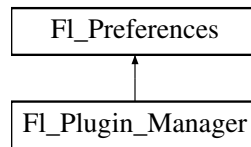
- [Fl\\_Plugin.H](#)
- [Fl\\_Preferences.cxx](#)

## 33.101 Fl\_Plugin\_Manager Class Reference

[Fl\\_Plugin\\_Manager](#) manages link-time and run-time plugin binaries.

```
#include <Fl_Plugin.H>
```

Inheritance diagram for [Fl\\_Plugin\\_Manager](#):



## Public Member Functions

- [FI\\_Preferences::ID](#) **addPlugin** (const char \*name, [FI\\_Plugin](#) \*plugin)  
*This function adds a new plugin to the database.*
- **FI\_Plugin\_Manager** (const char \*klass)  
*Manage all plugins belonging to one class.*
- [FI\\_Plugin](#) \* **plugin** (const char \*name)  
*Return the address of a plugin by name.*
- [FI\\_Plugin](#) \* **plugin** (int index)  
*Return the address of a plugin by index.*
- int **plugins** ()  
*Return the number of plugins in the klass.*
- [~FI\\_Plugin\\_Manager](#) ()  
*Remove the plugin manager.*

## Static Public Member Functions

- static int **load** (const char \*filename)  
*Load a module from disk.*
- static int **loadAll** (const char \*dirpath, const char \*pattern=0)  
*Use this function to load a whole directory full of modules.*
- static void **removePlugin** ([FI\\_Preferences::ID](#) id)  
*Remove any plugin.*

## Additional Inherited Members

### 33.101.1 Detailed Description

[FI\\_Plugin\\_Manager](#) manages link-time and run-time plugin binaries.

See also

[FI\\_Plugin](#)

### 33.101.2 Constructor & Destructor Documentation

#### 33.101.2.1 [~FI\\_Plugin\\_Manager](#)()

```
FI_Plugin_Manager::~FI_Plugin_Manager ( )
```

Remove the plugin manager.

Calling this does not remove the database itself or any plugins. It just removes the reference to the database.

### 33.101.3 Member Function Documentation

### 33.101.3.1 addPlugin()

```
Fl_Preferences::ID Fl_Plugin_Manager::addPlugin (
    const char * name,
    Fl_Plugin * plugin )
```

This function adds a new plugin to the database.

There is no need to call this function explicitly. Every [Fl\\_Plugin](#) constructor will call this function at initialization time.

### 33.101.3.2 load()

```
int Fl_Plugin_Manager::load (
    const char * filename ) [static]
```

Load a module from disk.

A module must be a dynamically linkable file for the given operating system. When loading a module, its +init function will be called which in turn calls the constructor of all statically initialized [Fl\\_Plugin](#) classes and adds them to the database.

### 33.101.3.3 loadAll()

```
int Fl_Plugin_Manager::loadAll (
    const char * dirpath,
    const char * pattern = 0 ) [static]
```

Use this function to load a whole directory full of modules.

#### Parameters

<i>dirpath</i>	Pathname of a directory. It <b>must</b> end with the platform's directory separator character (i.e., '\ ' under Windows, '/' otherwise).
<i>pattern</i>	A filename pattern to catch all modules of interest in the targeted directory (e.g., "{*.so,*.dll,*.dylib}"), or NULL to catch all files in the directory.

### 33.101.3.4 removePlugin()

```
void Fl_Plugin_Manager::removePlugin (
    Fl_Preferences::ID id ) [static]
```

Remove any plugin.

There is no need to call this function explicitly. Every [Fl\\_Plugin](#) destructor will call this function at destruction time.

The documentation for this class was generated from the following files:

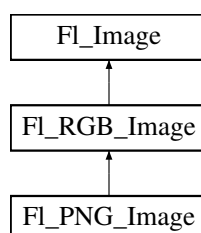
- [Fl\\_Plugin.H](#)
- [Fl\\_Preferences.cxx](#)

## 33.102 FI\_PNG\_Image Class Reference

The [Fl\\_PNG\\_Image](#) class supports loading, caching, and drawing of Portable Network Graphics (PNG) image files.

```
#include <Fl_PNG_Image.H>
```

Inheritance diagram for [Fl\\_PNG\\_Image](#):



## Public Member Functions

- [FI\\_PNG\\_Image](#) (const char \*filename)  
*The constructor loads the named PNG image from the given png filename.*
- [FI\\_PNG\\_Image](#) (const char \*name\_png, const unsigned char \*buffer, int datasize)  
*Constructor that reads a PNG image from memory.*

## Friends

- class [FI\\_ICO\\_Image](#)

## Additional Inherited Members

### 33.102.1 Detailed Description

The [FI\\_PNG\\_Image](#) class supports loading, caching, and drawing of Portable Network Graphics (PNG) image files. The class loads color-mapped and full-color images and handles color- and alpha-based transparency.

### 33.102.2 Constructor & Destructor Documentation

#### 33.102.2.1 FI\_PNG\_Image() [1/2]

```
FI_PNG_Image::FI_PNG_Image (
    const char * filename )
```

The constructor loads the named PNG image from the given png filename.

The destructor frees all memory and server resources that are used by the image.

Use [FI\\_Image::fail\(\)](#) to check if [FI\\_PNG\\_Image](#) failed to load. [fail\(\)](#) returns `ERR_FILE_ACCESS` if the file could not be opened or read, `ERR_FORMAT` if the PNG format could not be decoded, and `ERR_NO_IMAGE` if the image could not be loaded for another reason.

#### Parameters

<code>in</code>	<code>filename</code>	Name of PNG file to read
-----------------	-----------------------	--------------------------

#### 33.102.2.2 FI\_PNG\_Image() [2/2]

```
FI_PNG_Image::FI_PNG_Image (
    const char * name_png,
    const unsigned char * buffer,
    int maxsize )
```

Constructor that reads a PNG image from memory.

Construct an image from a block of memory inside the application. Fluid offers "binary Data" chunks as a great way to add image data into the C++ source code. `name_png` can be NULL. If a name is given, the image is added to the list of shared images (see: [FI\\_Shared\\_Image](#)) and will be available by that name.

#### Parameters

<code>name_png</code>	A name given to this image or NULL
<code>buffer</code>	Pointer to the start of the PNG image in memory
<code>maxsize</code>	Size in bytes of the memory buffer containing the PNG image

The documentation for this class was generated from the following files:

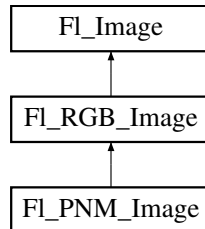
- [FI\\_PNG\\_Image.H](#)
- [FI\\_PNG\\_Image.cxx](#)

### 33.103 Fl\_PNM\_Image Class Reference

The [Fl\\_PNM\\_Image](#) class supports loading, caching, and drawing of Portable Anymap (PNM, PBM, PGM, PPM) image files.

```
#include <Fl_PNM_Image.H>
```

Inheritance diagram for [Fl\\_PNM\\_Image](#):



#### Public Member Functions

- [Fl\\_PNM\\_Image](#) (const char \*filename)  
*The constructor loads the named PNM image.*

#### Additional Inherited Members

##### 33.103.1 Detailed Description

The [Fl\\_PNM\\_Image](#) class supports loading, caching, and drawing of Portable Anymap (PNM, PBM, PGM, PPM) image files.

The class loads bitmap, grayscale, and full-color images in both ASCII and binary formats.

##### 33.103.2 Constructor & Destructor Documentation

###### 33.103.2.1 Fl\_PNM\_Image()

```
Fl_PNM_Image::Fl_PNM_Image (
    const char * filename )
```

The constructor loads the named PNM image.

The destructor frees all memory and server resources that are used by the image.

Use [Fl\\_Image::fail\(\)](#) to check if [Fl\\_PNM\\_Image](#) failed to load. [fail\(\)](#) returns `ERR_FILE_ACCESS` if the file could not be opened or read, `ERR_FORMAT` if the PNM format could not be decoded, and `ERR_NO_IMAGE` if the image could not be loaded for another reason.

#### Parameters

in	<i>filename</i>	a full path and name pointing to a valid jpeg file.
----	-----------------	---

The documentation for this class was generated from the following files:

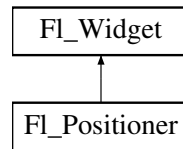
- [Fl\\_PNM\\_Image.H](#)
- [Fl\\_PNM\\_Image.cxx](#)

### 33.104 Fl\_Positioner Class Reference

This class is provided for Forms compatibility.

```
#include <Fl_Positioner.H>
```

Inheritance diagram for [Fl\\_Positioner](#):



## Public Member Functions

- `Fl_Positioner` (int `x`, int `y`, int `w`, int `h`, const char \*`l`=0)
  - Creates a new `Fl_Positioner` widget using the given position, size, and label string.*
- int `handle` (int) `FL_OVERRIDE`
  - Handles the specified event.*
- int `value` (double, double)
  - Returns the current position in `x` and `y`.*
- void `xbounds` (double, double)
  - Sets the `X` axis bounds.*
- double `xmaximum` () const
  - Gets the `X` axis maximum.*
- void `xmaximum` (double `a`)
  - Same as `xbounds(xminimum(), a)`*
- double `xminimum` () const
  - Gets the `X` axis minimum.*
- void `xminimum` (double `a`)
  - Same as `xbounds(a, xmaximum())`*
- void `xstep` (double `a`)
  - Sets the stepping value for the `X` axis.*
- double `xvalue` () const
  - Gets the `X` axis coordinate.*
- int `xvalue` (double)
  - Sets the `X` axis coordinate.*
- void `ybounds` (double, double)
  - Sets the `Y` axis bounds.*
- double `ymaximum` () const
  - Gets the `Y` axis maximum.*
- void `ymaximum` (double `a`)
  - Same as `ybounds(yminimum(), a)`*
- double `yminimum` () const
  - Gets the `Y` axis minimum.*
- void `yminimum` (double `a`)
  - Same as `ybounds(a, ymaximum())`*
- void `ystep` (double `a`)
  - Sets the stepping value for the `Y` axis.*
- double `yvalue` () const
  - Gets the `Y` axis coordinate.*
- int `yvalue` (double)
  - Sets the `Y` axis coordinate.*

## Protected Member Functions

- void `draw` () `FL_OVERRIDE`
  - Draws the widget.*
- void `draw` (int, int, int, int)
- int `handle` (int, int, int, int, int)

## Additional Inherited Members

### 33.104.1 Detailed Description

This class is provided for Forms compatibility.

It provides 2D input. It would be useful if this could be put atop another widget so that the crosshairs are on top, but this is not implemented. The color of the crosshairs is `selection_color()`.



Figure 33.35 Fl\_Positioner

### 33.104.2 Constructor & Destructor Documentation

#### 33.104.2.1 Fl\_Positioner()

```
Fl_Positioner::Fl_Positioner (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new `Fl_Positioner` widget using the given position, size, and label string. The default boxtype is `FL_NO_BOX`.

### 33.104.3 Member Function Documentation

#### 33.104.3.1 draw()

```
void Fl_Positioner::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own `draw()` method*, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements `Fl_Widget`.

#### 33.104.3.2 handle()

```
int Fl_Positioner::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited `handle()` method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your `handle()` method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the `handle()` method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

<code>in</code>	<code>event</code>	the kind of event received
-----------------	--------------------	----------------------------

#### Return values

<code>0</code>	if the event was not used or understood
<code>1</code>	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

The documentation for this class was generated from the following files:

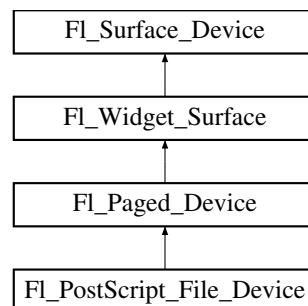
- `Fl_Positioner.H`
- `Fl_Positioner.cxx`

## 33.105 Fl\_PostScript\_File\_Device Class Reference

To send graphical output to a PostScript file.

```
#include <Fl_PostScript.H>
```

Inheritance diagram for `Fl_PostScript_File_Device`:



### Public Member Functions

- `int begin_job` (`FILE *ps_output`, `int pagecount=0`, `enum Fl_Paged_Device::Page_Format format=Fl_Paged_Device::A4`, `enum Fl_Paged_Device::Page_Layout layout=Fl_Paged_Device::PORTRAIT`)  
*Begins the session where all graphics requests will go to FILE pointer.*
- `int begin_job` (`int pagecount`, `int *from`, `int *to`, `char **perr_message`) [FL\\_OVERRIDE](#)  
*Don't use with this class.*
- `int begin_job` (`int pagecount=0`, `enum Fl_Paged_Device::Page_Format format=Fl_Paged_Device::A4`, `enum Fl_Paged_Device::Page_Layout layout=Fl_Paged_Device::PORTRAIT`)  
*Begins the session where all graphics requests will go to a local PostScript file.*
- `int begin_page` (`void`) [FL\\_OVERRIDE](#)

- Begins a new printed page.*

  - void **close\_command** ([FI\\_PostScript\\_Close\\_Command](#) cmd)

*Sets the function [end\\_job\(\)](#) calls to close the [file\(\)](#)*
- void [end\\_current](#) () [FL\\_OVERRIDE](#)

*FLTK calls this each time a surface ceases to be the current drawing surface.*
- void [end\\_job](#) (void) [FL\\_OVERRIDE](#)

*Completes all PostScript output.*
- int [end\\_page](#) (void) [FL\\_OVERRIDE](#)

*To be called at the end of each page.*
- FILE \* **file** ()

*Returns the underlying FILE\* receiving all PostScript data.*
- **FI\_PostScript\_File\_Device** ()

*The constructor.*
- void [margins](#) (int \*left, int \*top, int \*right, int \*bottom) [FL\\_OVERRIDE](#)

*Computes the dimensions of margins that lie between the printable page area and the full page.*
- void [origin](#) (int \*x, int \*y) [FL\\_OVERRIDE](#)

*Computes the coordinates of the current origin of graphics functions.*
- void [origin](#) (int x, int y) [FL\\_OVERRIDE](#)

*Sets the position of the origin of graphics in the drawable part of the drawing surface.*
- int [printable\\_rect](#) (int \*w, int \*h) [FL\\_OVERRIDE](#)

*Computes the width and height of the drawable area of the drawing surface.*
- void [rotate](#) (float angle) [FL\\_OVERRIDE](#)

*Rotates the graphics operations relatively to paper.*
- void [scale](#) (float scale\_x, float scale\_y=0.) [FL\\_OVERRIDE](#)

*Changes the scaling of page coordinates.*
- void [set\\_current](#) () [FL\\_OVERRIDE](#)

*Make this surface the current drawing surface.*
- int [start\\_job](#) (FILE \*ps\_output, int pagecount=0, enum [FI\\_Paged\\_Device::Page\\_Format](#) format=[FI\\_Paged\\_Device::A4](#), enum [FI\\_Paged\\_Device::Page\\_Layout](#) layout=[FI\\_Paged\\_Device::PORTRAIT](#))

*Synonym of [begin\\_job\(\)](#).*
- int [start\\_job](#) (int pagecount=0, enum [FI\\_Paged\\_Device::Page\\_Format](#) format=[FI\\_Paged\\_Device::A4](#), enum [FI\\_Paged\\_Device::Page\\_Layout](#) layout=[FI\\_Paged\\_Device::PORTRAIT](#))

*Synonym of [begin\\_job\(\)](#).*
- void [translate](#) (int x, int y) [FL\\_OVERRIDE](#)

*Translates the current graphics origin accounting for the current rotation.*
- void [untranslate](#) (void) [FL\\_OVERRIDE](#)

*Undoes the effect of a previous [translate\(\)](#) call.*
- ~**FI\_PostScript\_File\_Device** ()

*The destructor.*

## Static Public Attributes

- static const char \* **file\_chooser\_title**

*Label of the PostScript file chooser window.*

## Protected Member Functions

- [FI\\_PostScript\\_Graphics\\_Driver](#) \* **driver** ()

*Returns the PostScript driver of this drawing surface.*

## Additional Inherited Members

### 33.105.1 Detailed Description

To send graphical output to a PostScript file.

This class is used exactly as the [Fl\\_Printer](#) class except for the [begin\\_job\(\)](#) call, two variants of which are usable and allow to specify what page format and layout are desired.

**Processing of text:** Text uses vectorial fonts under the X11 + Pango and the Wayland platforms. With other platforms, only text restricted to the Latin alphabet (and a few other characters listed in the table below) and to FLTK standard fonts is vectorized. All other unicode characters or all other fonts (FL\_FREE\_FONT and above) are output as a bitmap. FLTK standard fonts are output using the corresponding PostScript standard fonts. The latin alphabet means all unicode characters between U+0020 and U+017F, or, in other words, the ASCII, Latin-1 Supplement and Latin Extended-A charts.

Char	Codepoint	Name	Char	Codepoint	Name	Char	Codepoint	Name
<i>f</i>	U+0192	florin	,	U+201A	quotesinglbase	™	U+2122	trademark
^	U+02C6	circumflex	“	U+201C	quotedblleft	∂	U+2202	partialdiff
ˇ	U+02C7	caron	”	U+201D	quotedblright	Δ	U+2206	Delta
˘	U+02D8	breve	„	U+201E	quotedblbase	Σ	U+2211	summation
˙	U+02D9	dotaccent	†	U+2020	dagger	√	U+221A	radical
°	U+02DA	ring	‡	U+2021	daggerdbl	∞	U+221E	infinity
ć	U+02DB	ogonek	•	U+2022	bullet	≠	U+2260	notequal
˜	U+02DC	tilde	…	U+2026	ellipsis	≤	U+2264	lessequal
˝	U+02DD	hungarumlaut	‰	U+2030	perthousand	≥	U+2265	greaterequal
—	U+2013	endash	‹	U+2039	guilsinglleft	◊	U+25CA	lozenge
—	U+2014	emdash	›	U+203A	guilsinglright	fi	U+FB01	fi
‘	U+2018	quoteleft	/	U+2044	fraction	fl	U+FB02	fl
’	U+2019	quoteright	€	U+20AC	Euro	🍏	U+F8FF	apple (macOS only)

Figure 33.36 Extra characters supported by standard PostScript fonts

**Processing of transparent [Fl\\_RGB\\_Image](#) objects:** Under the X11 + Pango and the Wayland platforms, these objects are output with their exact transparency. With other platforms, these objects are drawn blended to white color. Class [Fl\\_EPS\\_File\\_Surface](#) 's constructor allows to set another background color for blending.

### 33.105.2 Member Function Documentation

#### 33.105.2.1 [begin\\_job\(\)](#) [1/3]

```
int Fl_PostScript_File_Device::begin_job (
    FILE * ps_output,
    int pagecount = 0,
    enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
    enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT )
```

Begins the session where all graphics requests will go to FILE pointer.

This member function prevents [end\\_job\(\)](#) from closing `ps_output`, so the user can check with `ferror(ps_output)` for output errors.

## Parameters

## Parameters

<i>ps_output</i>	A writable FILE pointer that will receive PostScript output and that should not be closed until after <a href="#">end_job()</a> has been called.
<i>pagecount</i>	The total number of pages to be created. Use 0 if this number is unknown when this function is called.
<i>format</i>	Desired page format.
<i>layout</i>	Desired page layout.

## Returns

always 0.

**33.105.2.2 begin\_job() [2/3]**

```
int Fl_PostScript_File_Device::begin_job (
    int pagecount,
    int * from,
    int * to,
    char ** perr_message ) [virtual]
```

Don't use with this class.

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.105.2.3 begin\_job() [3/3]**

```
int Fl_PostScript_File_Device::begin_job (
    int pagecount = 0,
    enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
    enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT )
```

Begins the session where all graphics requests will go to a local PostScript file.

Opens a file dialog to select an output PostScript file. This member function makes [end\\_job\(\)](#) close the resulting PostScript file and display an alert message with [fl\\_alert\(\)](#) in case of any output error.

## Parameters

<i>pagecount</i>	The total number of pages to be created. Use 0 if this number is unknown when this function is called.
<i>format</i>	Desired page format.
<i>layout</i>	Desired page layout.

## Returns

0 if OK, 1 if user cancelled the file dialog, 2 if fopen failed on user-selected output file.

**33.105.2.4 begin\_page()**

```
int Fl_PostScript_File_Device::begin_page (
    void ) [virtual]
```

Begins a new printed page.

The page coordinates are initially in points, i.e., 1/72 inch, and with origin at the top left of the printable page area. This function also makes this surface the current drawing surface with [Fl\\_Surface\\_Device::push\\_current\(\)](#).

**Note**

`begin_page()` calls `Fl_Surface_Device::push_current()` and leaves this device as the active surface. If any calls between `begin_page()` and `end_page()` open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to `Fl_Surface_Device::pop_current()` and a call to `Fl_Surface_Device::push_current()`, or the content of the dialog box will be rendered to the printer instead of the screen.

**Returns**

0 if OK, non-zero if any error

Reimplemented from `Fl_Paged_Device`.

**33.105.2.5 end\_current()**

```
void Fl_PostScript_File_Device::end_current ( ) [virtual]
```

FLTK calls this each time a surface ceases to be the current drawing surface.

This member function is mostly of interest to developers of new `Fl_Surface_Device` derived classes. It allows to perform surface-specific operations necessary when this surface ceases to be current. Each implementation should end with a call to `Fl_Surface_Device::end_current()`.

Reimplemented from `Fl_Surface_Device`.

**33.105.2.6 end\_job()**

```
void Fl_PostScript_File_Device::end_job (
    void ) [virtual]
```

Completes all PostScript output.

This also closes with `fclose()` the underlying `file()` unless `close_command()` was used to set another function.

Reimplemented from `Fl_Paged_Device`.

**33.105.2.7 end\_page()**

```
int Fl_PostScript_File_Device::end_page (
    void ) [virtual]
```

To be called at the end of each page.

This function also stops this surface from being the current drawing surface with `Fl_Surface_Device::pop_current()`.

**Note**

`end_page()` calls `Fl_Surface_Device::pop_current()`. If any calls between `begin_page()` and `end_page()` open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to `Fl_Surface_Device::pop_current()` and a call to `Fl_Surface_Device::push_current()`.

**Returns**

0 if OK, non-zero if any error.

Reimplemented from `Fl_Paged_Device`.

**33.105.2.8 margins()**

```
void Fl_PostScript_File_Device::margins (
    int * left,
    int * top,
    int * right,
    int * bottom ) [virtual]
```

Computes the dimensions of margins that lie between the printable page area and the full page.

Values are in the same unit as that used by FLTK drawing functions. They are changed by `scale()` calls.

## Parameters

out	<i>left</i>	If non-null, *left is set to the left margin size.
out	<i>top</i>	If non-null, *top is set to the top margin size.
out	<i>right</i>	If non-null, *right is set to the right margin size.
out	<i>bottom</i>	If non-null, *bottom is set to the bottom margin size.

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.105.2.9 origin() [1/2]**

```
void Fl_PostScript_File_Device::origin (
    int * x,
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

## Parameters

out	<i>x,y</i>	If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.
-----	------------	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.105.2.10 origin() [2/2]**

```
void Fl_PostScript_File_Device::origin (
    int x,
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous [printable\\_rect\(\)](#) call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive [origin\(\)](#) calls don't combine their effects. [Origin\(\)](#) calls are not affected by [rotate\(\)](#) calls (for classes derived from [Fl\\_Paged\\_Device](#)).

## Parameters

in	<i>x,y</i>	Horizontal and vertical positions in the drawing surface of the desired origin of graphics.
----	------------	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.105.2.11 printable\_rect()**

```
int Fl_PostScript_File_Device::printable_rect (
    int * w,
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to [origin\(\)](#). If the object is derived from class [Fl\\_Paged\\_Device](#), values account for the user-selected paper type and print orientation and are changed by [scale\(\)](#) calls.

## Returns

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.105.2.12 rotate()**

```
void Fl_PostScript_File_Device::rotate (
    float angle ) [virtual]
```

Rotates the graphics operations relatively to paper.

The rotation is centered on the current graphics origin. Successive [rotate\(\)](#) calls don't combine their effects.

**Parameters**

<i>angle</i>	Rotation angle in counter-clockwise degrees.
--------------	--

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.105.2.13 scale()**

```
void Fl_PostScript_File_Device::scale (
    float scale_x,
    float scale_y = 0. ) [virtual]
```

Changes the scaling of page coordinates.

This function also resets the origin of graphics functions at top left of printable page area. After a [scale\(\)](#) call, do a [printable\\_rect\(\)](#) call to get the new dimensions of the printable page area. Successive [scale\(\)](#) calls don't combine their effects.

**Parameters**

<i>scale_x</i>	Horizontal dimensions of plot are multiplied by this quantity.
<i>scale_y</i>	Same as above, vertically. The value 0. is equivalent to setting <code>scale_y = scale_x</code> . Thus, <code>scale(factor);</code> is equivalent to <code>scale(factor, factor);</code>

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.105.2.14 set\_current()**

```
void Fl_PostScript_File_Device::set_current (
    void ) [virtual]
```

Make this surface the current drawing surface.

This surface will receive all future graphics requests.

Since FLTK 1.4.0 the preferred API to change the current drawing surface is [Fl\\_Surface\\_Device::push\\_current\(\)](#) / [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

**Note**

It is recommended to use this function only as follows :

- The current drawing surface is the display;
- make current another surface, e.g., an [Fl\\_Printer](#) or an [Fl\\_Image\\_Surface](#) object, calling [set\\_current\(\)](#) on this object;
- draw to that surface;
- make the display current again with [Fl\\_Display\\_Device::display\\_device\(\)->set\\_current\(\)](#); don't do any other call to [set\\_current\(\)](#) before this one.

Other scenarios of drawing surface changes should be performed via [Fl\\_Surface\\_Device::push\\_current\(\)](#) and [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

Reimplemented from [Fl\\_Surface\\_Device](#).

**33.105.2.15 start\_job()** [1/2]

```
int Fl_PostScript_File_Device::start_job (
    FILE * ps_output,
    int pagecount = 0,
    enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
    enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT ) [inline]
```

Synonym of [begin\\_job\(\)](#).

For API compatibility with FLTK 1.3.x

**33.105.2.16 start\_job()** [2/2]

```
int Fl_PostScript_File_Device::start_job (
    int pagecount = 0,
    enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
    enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT ) [inline]
```

Synonym of [begin\\_job\(\)](#).

For API compatibility with FLTK 1.3.x

**33.105.2.17 translate()**

```
void Fl_PostScript_File_Device::translate (
    int x,
    int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation.

Each [translate\(\)](#) call must be matched by an [untranslate\(\)](#) call. Successive [translate\(\)](#) calls add up their effects.

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.105.2.18 untranslate()**

```
void Fl_PostScript_File_Device::untranslate (
    void ) [virtual]
```

Undoes the effect of a previous [translate\(\)](#) call.

Reimplemented from [Fl\\_Widget\\_Surface](#).

The documentation for this class was generated from the following file:

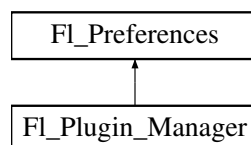
- [Fl\\_PostScript.H](#)

**33.106 Fl\_Preferences Class Reference**

[Fl\\_Preferences](#) store user settings between application starts.

```
#include <Fl_Preferences.H>
```

Inheritance diagram for [Fl\\_Preferences](#):

**Classes**

- struct [Entry](#)
- class [Name](#)

*'Name' provides a simple method to create numerical or more complex procedural names for entries and groups on the fly.*

- class [Node](#)
- class [RootNode](#)

## Public Types

- typedef void \* ID  
*Every FI\_Preferences-Group has a unique ID.*
- enum Root {  
UNKNOWN\_ROOT\_TYPE = -1 , SYSTEM = 0 , USER , MEMORY ,  
ROOT\_MASK = 0x00FF , CORE = 0x0100 , C\_LOCALE = 0x1000 , CLEAR = 0x2000 ,  
SYSTEM\_L = SYSTEM | C\_LOCALE , USER\_L = USER | C\_LOCALE , CORE\_SYSTEM\_L = CORE |  
SYSTEM\_L , CORE\_USER\_L = CORE | USER\_L ,  
CORE\_SYSTEM = CORE | SYSTEM , CORE\_USER = CORE | USER }  
*Define the scope of the preferences.*

## Public Member Functions

- char clear ()  
*Delete all groups and all entries.*
- char delete\_all\_entries ()  
*Delete all entries.*
- char delete\_all\_groups ()  
*Delete all groups.*
- char delete\_entry (const char \*entry)  
*Deletes a single name/value pair.*
- char delete\_group (const char \*group)  
*Deletes a group.*
- int dirty ()  
*Check if there were changes to the database that need to be written to disk.*
- int entries ()  
*Returns the number of entries (name/value pairs) in a group.*
- const char \* entry (int index)  
*Returns the name of an entry.*
- char entry\_exists (const char \*key)  
*Returns non-zero if an entry with this name exists.*
- Root filename (char \*buffer, size\_t buffer\_size)  
*Return the file name and path to the preference file.*
- FI\_Preferences (const char \*path, const char \*vendor, const char \*application)  
*Deprecated: Use this constructor to create or read a preference file at an arbitrary position in the file system.*
- FI\_Preferences (const char \*path, const char \*vendor, const char \*application, Root flags)  
*Use this constructor to create or read a preference file at an arbitrary position in the file system.*
- FI\_Preferences (const FI\_Preferences &)  
*Create another reference to a Preferences group.*
- FI\_Preferences (FI\_Preferences &parent, const char \*group)  
*Generate or read a new group of entries within another group.*
- FI\_Preferences (FI\_Preferences &parent, int groupIndex)  
*Open a child group using a given index.*
- FI\_Preferences (FI\_Preferences \*parent, const char \*group)  
*Create or access a group of preferences using a name.*
- FI\_Preferences (FI\_Preferences \*parent, int groupIndex)
- FI\_Preferences (ID id)  
*Create a new dataset access point using a dataset ID.*
- FI\_Preferences (Root root, const char \*vendor, const char \*application)  
*The constructor creates a group that manages key/value pairs and child groups.*
- int flush ()

- Writes preferences to disk if they were modified.*

  - char **get** (const char \***entry**, char \*&value, const char \*defaultValue)

*Reads an entry from the group.*
- char **get** (const char \***entry**, char \*value, const char \*defaultValue, int maxSize)

*Reads an entry from the group.*
- char **get** (const char \***entry**, double &value, double defaultValue)

*Reads an entry from the group.*
- char **get** (const char \***entry**, float &value, float defaultValue)

*Reads an entry from the group.*
- char **get** (const char \***entry**, int &value, int defaultValue)

*Reads an entry from the group.*
- char **get** (const char \***entry**, std::string &value, const std::string &defaultValue)

*Reads an entry from the group.*
- char **get** (const char \***entry**, void \*&value, const void \*defaultValue, int defaultSize)

*Reads an entry from the group.*
- char **get** (const char \***entry**, void \*value, const void \*defaultValue, int defaultSize, int \*size)

*Reads a binary entry from the group, encoded in hexadecimal blocks.*
- char **get** (const char \***entry**, void \*value, const void \*defaultValue, int defaultSize, int maxSize)

*Reads a binary entry from the group, encoded in hexadecimal blocks.*
- char **get\_userdata\_path** (char \***path**, int pathlen)

*Creates a path that is related to the preference file and that is usable for additional application data.*
- const char \* **group** (int num\_group)

*Returns the name of the Nth (num\_group) group.*
- char **group\_exists** (const char \*key)

*Returns non-zero if a group with this name exists.*
- int **groups** ()

*Returns the number of groups that are contained within a group.*
- **ID id** ()

*Return an ID that can later be reused to open more references to this dataset.*
- const char \* **name** ()

*Return the name of this entry.*
- const char \* **path** ()

*Return the full path to this entry.*
- char **set** (const char \***entry**, const char \*value)

*Sets an entry (name/value pair).*
- char **set** (const char \***entry**, const std::string &value)

*Sets an entry (name/value pair).*
- char **set** (const char \***entry**, const void \*value, int size)

*Sets an entry (name/value pair).*
- char **set** (const char \***entry**, double value)

*Sets an entry (name/value pair).*
- char **set** (const char \***entry**, double value, int precision)

*Sets an entry (name/value pair).*
- char **set** (const char \***entry**, float value)

*Sets an entry (name/value pair).*
- char **set** (const char \***entry**, float value, int precision)

*Sets an entry (name/value pair).*
- char **set** (const char \***entry**, int value)

*Sets an entry (name/value pair).*
- int **size** (const char \***entry**)

*Returns the size of the value part of an entry.*
- virtual **~FI\_Preferences** ()

*The destructor removes allocated resources.*

## Static Public Member Functions

- static unsigned int [file\\_access](#) ()  
*Return the current file access permissions for the FLTK preferences system.*
- static void [file\\_access](#) (unsigned int flags)  
*Tell the FLTK preferences system which files in the file system it may read, create, or write.*
- static [Root filename](#) (char \*buffer, size\_t buffer\_size, [Root](#) root, const char \*vendor, const char \*application)  
*Determine the file name and path to preferences that would be opened with these parameters.*
- static const char \* [new\\_UUID](#) ()  
*Returns a UUID as generated by the system.*
- static char [remove](#) (ID id\_)  
*Remove the group with this ID from a database.*

## Static Public Attributes

- static const unsigned int **ALL** = [ALL\\_READ\\_OK](#) | [ALL\\_WRITE\\_OK](#)  
*Set this to give FLTK and applications permission to read, write, and create preference files.*
- static const unsigned int **ALL\_READ\_OK** = [USER\\_READ\\_OK](#) | [SYSTEM\\_READ\\_OK](#) | [CORE\\_READ\\_OK](#)  
*Set this to allow FLTK and applications to read preference files.*
- static const unsigned int **ALL\_WRITE\_OK** = [USER\\_WRITE\\_OK](#) | [SYSTEM\\_WRITE\\_OK](#) | [CORE\\_WRITE\\_OK](#)  
*Set this to allow FLTK and applications to create and write preference files.*
- static const unsigned int **APP\_OK** = [SYSTEM\\_OK](#) | [USER\\_OK](#)  
*Set this if it is OK for applications to read, create, and write any kind of preference files.*
- static const unsigned int **CORE\_OK** = [CORE\\_READ\\_OK](#) | [CORE\\_WRITE\\_OK](#)  
*Set this if it is OK for FLTK to read, create, or write preference files.*
- static const unsigned int [CORE\\_READ\\_OK](#) = 0x0010  
*Set this if it is OK for FLTK to read preference files.*
- static const unsigned int [CORE\\_WRITE\\_OK](#) = 0x0020  
*Set this if it is OK for FLTK to create or write preference files.*
- static const unsigned int [NONE](#) = 0x0000  
*Set this if no call to [FI\\_Preferences](#) shall access the file system.*
- static const unsigned int **SYSTEM\_OK** = [SYSTEM\\_READ\\_OK](#) | [SYSTEM\\_WRITE\\_OK](#)  
*Set this if it is OK for applications to read, create, and write system wide preference files.*
- static const unsigned int **SYSTEM\_READ\_OK** = 0x0004  
*Set this if it is OK for applications to read system wide preference files.*
- static const unsigned int **SYSTEM\_WRITE\_OK** = 0x0008  
*Set this if it is OK for applications to create and write system wide preference files.*
- static const unsigned int **USER\_OK** = [USER\\_READ\\_OK](#) | [USER\\_WRITE\\_OK](#)  
*Set this if it is OK for applications to read, create, and write user preference files.*
- static const unsigned int **USER\_READ\_OK** = 0x0001  
*Set this if it is OK for applications to read user preference files.*
- static const unsigned int **USER\_WRITE\_OK** = 0x0002  
*Set this if it is OK for applications to create and write user preference files.*

## Protected Attributes

- [Node](#) \* **node**
- [RootNode](#) \* **rootNode**

## Friends

- class **Node**
- class **RootNode**

### 33.106.1 Detailed Description

[Fl\\_Preferences](#) store user settings between application starts.

FLTK Preferences are similar to the Registry on Windows and Preferences on MacOS, providing a simple method to store customizable user settings between application launches. A typical use is storing the last window position or a history of previously used documents.

Preferences are organized in a hierarchy of groups. Every group can contain more groups and any number of key/value pairs. Keys can be text strings containing ASCII letters, digits, periods, and underscores. Forward slashes in a key name are treated as subgroups, i.e. the key 'window/width' would actually refer to the key 'width' inside the group 'window'.

Keys have a unique name within their group. A value can be any string including control characters 0x00 to 0x1f, 0x7f, and UTF-8 octets.

Several methods allow setting and getting numerical values and binary data.

Preferences files are the same across platforms. User comments in preference files are preserved. Filenames are unique for each application by using a vendor/application naming scheme. The developer app must provide default values for all entries to ensure proper operation should preferences be corrupted or not yet exist.

#### Note

The format of preferences files is not part of the FLTK specification and intentionally undocumented. The only valid way to read or write prefs files is via the API from your app. The fact that the current implementation looks like human-readable text is purely coincidental and may change at any time. Preferences files are not meant to be created or edited "by hand."

FLTK preferences are not meant to replace a fully featured database. No merging of data takes place. If several instances of an app access the same database at the same time, only the most recent changes will persist.

Preferences should not be used to store document data. The .prefs file should be kept small for performance reasons. One application can have multiple preferences files. Extensive binary data however should be stored in separate files: see [Fl\\_Preferences::get\\_userdata\\_path\(\)](#).

[Fl\\_Preferences](#) are not thread-safe. They can temporarily change the locale on some platforms during read and write access, which also changes it temporarily in other threads of the same app.

Typically a preferences database is read at startup, and then reopened and written at app shutdown:

```
int appWindowWidth, appWindowHeight;
void launch() {
    Fl_Preferences app(Fl_Preferences::USER_L, "matthiasm.com", "hello");
    // 'app' constructor will be called, reading data from .prefs file
    Fl_Preferences window(app, "window");
    window.get("width", appWindowWidth, 800);
    window.get("height", appWindowHeight, 600);
    // 'app' destructor will be called. This will write data to the
    // .prefs file if any preferences were changed or added
}
void quit() {
    Fl_Preferences app(Fl_Preferences::USER_L, "matthiasm.com", "hello");
    Fl_Preferences window(app, "window");
    window.set("width", appWindowWidth);
    window.set("height", appWindowHeight);
}
```

#### See also

[Fl\\_Preferences::Fl\\_Preferences\(Root root, const char \\*vendor, const char \\*application\)](#)

As a special case, [Fl\\_Preferences](#) can be memory mapped and not be associated with a file on disk. See [Fl\\_Preferences::Fl\\_Preferences\(Fl\\_Preferences \\*parent, const char \\*group\)](#) and [Fl\\_Preferences::MEMORY](#) for more details on memory mapped preferences.

#### Note

Starting with FLTK 1.3, preferences databases are expected to be in UTF-8 encoding. Previous databases were stored in the current character set or code page which renders them incompatible for text entries using international characters.

Starting with FLTK 1.4, searching a valid path to store the preference files has changed slightly. Please see [Fl\\_Preferences::Fl\\_Preferences\(Root, const char\\*, const char\\*\)](#) for details.

Starting with FLTK 1.4, preference files should be created with `SYSTEM_L` or `USER_L` to be interchangeable between computers with differing locale settings. The legacy modes, `LOCAL` and `SYSTEM`, will read and write floating point values using the decimal point of the current locale. As a result, a fp-value would be written

'3,1415' on a German machine, and would be read back as '3.0' on a US machine because the comma would not be recognized as an alternative decimal point.

## 33.106.2 Member Typedef Documentation

### 33.106.2.1 ID

```
typedef void* Fl_Preferences::ID
```

Every Fl\_Preferences-Group has a unique ID.

ID's can be retrieved from an Fl\_Preferences-Group and can then be used to create more Fl\_Preference references to the same data set, as long as the database remains open.

## 33.106.3 Member Enumeration Documentation

### 33.106.3.1 Root

```
enum Fl_Preferences::Root
```

Define the scope of the preferences.

#### Enumerator

UNKNOWN_ROOT_TYPE	Returned if storage could not be determined.
SYSTEM	Preferences are used system-wide. Deprecated, see SYSTEM_L.
USER	Preferences apply only to the current user. Deprecated, see USER_L.
MEMORY	Returned if querying memory mapped preferences.
ROOT_MASK	Mask for the values above.
CORE	OR'd by FLTK to read and write core library preferences and options.
C_LOCALE	This flag should always be set to ensure that floating point values are written and read correctly independently of the current locale.
CLEAR	Don't read a possibly existing database. Instead, start with an empty set of preferences.
SYSTEM_L	Preferences are used system-wide, locale independent.
USER_L	Preferences apply only to the current user, locale independent.
CORE_SYSTEM_L	Same as CORE   SYSTEM   C_LOCALE.
CORE_USER_L	Same as CORE   USER   C_LOCALE.
CORE_SYSTEM	Deprecated, same as CORE   SYSTEM. Use CORE_SYSTEM_L instead.
CORE_USER	Deprecated, same as CORE   USER. Use CORE_USER_L instead.

## 33.106.4 Constructor & Destructor Documentation

### 33.106.4.1 Fl\_Preferences() [1/8]

```
Fl_Preferences::Fl_Preferences (
    Root root,
    const char * vendor,
    const char * application )
```

The constructor creates a group that manages key/value pairs and child groups.

Preferences can be stored per user using the root type `Fl_Preferences::USER_L`, or stored system-wide using `Fl_Preferences::SYSTEM_L`.

Groups and key/value pairs can be read and written randomly. Reading undefined values will return the default value. Writing undefined values will create all required groups and key/value pairs.

This constructor creates the *base* instance for all following entries and reads the database from disk into memory if it exists. The vendor argument is a unique text string identifying the development team or vendor of an application. A domain name or an EMail address (replacing the '@' with a '.') are great unique names, e.g. "research.matthiasm.com" or "fluid.fltk.org". The application argument can be the working title or final name of your application. Both vendor and application must be valid UNIX path segments as they become parts of the preference file path and may contain forward slashes to create deeper file structures.

#### Note

On **Windows**, the directory is constructed by querying the *Common AppData* or *AppData* key of the `Software\Microsoft\Windows\CurrentVersion\Explorer\Shell Folders` registry entry. The filename and path is then constructed as `$(query)/$(vendor)/$(application).prefs`. If the query call fails, data will be stored in RAM only. It will be lost when the app exits.

In FLTK versions before 1.4.0, if querying the registry failed,

preferences would be written to `C:\FLTK\$(vendor)\$(application).prefs`.

#### Note

On **Linux**, the `USER` directory is constructed by reading `$HOME`. If `$HOME` is not set or not pointing to an existing directory, FLTK will check the path member of the `passwd` struct returned by `getpwuid(getuid())`. If all attempts fail, data will be stored in RAM only and be lost when the app exits.

The `SYSTEM` preference filename is hardcoded as `/etc/fltk/$(vendor)/$(application).prefs`.

For backward compatibility, the old `USER` .prefs file naming scheme `$(directory)/.fltk/$(vendor)/$(application).prefs` is checked first. If that file does not exist, the environment variable `$XDG_CONFIG_HOME` is read as a base directory. If `$XDG_CONFIG_HOME` is not set, the base directory defaults to `$HOME/.config/`.

The user preferences will be stored in `$(directory)/$(vendor)/$(application).prefs`. The user data path will be `$(directory)/$(vendor)/$(application)/`.

In FLTK versions before 1.4.0, if `$HOME` was not set, the `USER` path would be empty, generating `$(vendor)/$(application).prefs`, which was used relative to the current working directory.

#### Note

On **macOS**, the `USER` directory is constructed by reading `$HOME`. If `$HOME` is not set or not pointing to an existing directory, we check the path returned by `NSHomeDirectory()`, and finally checking the path member of the `passwd` struct returned by `getpwuid(getuid())`. If all attempts fail, data will be stored in RAM only and be lost when the app exits. The filename and path is then constructed as `$(directory)/Library/Preferences/$(vendor)/$(application).prefs`. The `SYSTEM` directory is hardcoded as `/Library/Preferences/$(vendor)/$(application).prefs`.

In FLTK versions before 1.4.0, if `$HOME` was not set, the `USER` path

would be `NULL`, generating `<null>/Library/Preferences/$(vendor)/$(application).prefs`, which would silently fail to create a preference file.

#### Parameters

in	<i>root</i>	can be <code>USER_L</code> or <code>SYSTEM_L</code> for user specific or system wide preferences, add the <code>CLEAR</code> flag to start with a clean set of preferences instead of reading them from a preexisting database
in	<i>vendor</i>	unique text describing the company or author of this file, must be a valid filepath segment
in	<i>application</i>	unique text describing the application, must be a valid filepath segment

See also

[Fl\\_Preferences\(Fl\\_Preferences \\*parent, const char \\*group\)](#) with parent set to NULL

#### 33.106.4.2 Fl\_Preferences() [2/8]

```
Fl_Preferences::Fl_Preferences (
    const char * path,
    const char * vendor,
    const char * application,
    Root flags )
```

Use this constructor to create or read a preference file at an arbitrary position in the file system.

The file name is generated in the form \$(path)/\$(application).prefs. If application is NULL, path is taken literally as the file path and name.

```
// Example: read from an existing database and write modifications when flushed
// or destructor is called
Fl_Preferences database("/user/matt/test.prefs", "org.fltk.test", NULL,
    Fl_Preferences::C_LOCALE);
// Example: create a new preferences file with an empty data set
Fl_Preferences database("/user/matt/test.prefs", "org.fltk.test", NULL,
    (Fl_Preferences::Root) (Fl_Preferences::C_LOCALE|Fl_Preferences::CLEAR));
```

#### Note

the C\_LOCALE flag is is not set by default for backward compatibility, but it is highly recommended to set it when opening a database.

#### Parameters

in	<i>path</i>	path to the directory that contains the preference file
in	<i>vendor</i>	unique text describing the company or author of this file, must be a valid file path segment
in	<i>application</i>	unique text describing the application, must be a valid filename or NULL
in	<i>flags</i>	C_LOCALE to make the preferences file independent of the current locale, add the CLEAR flag to start with a clean set of preferences instead of reading from the database

#### 33.106.4.3 Fl\_Preferences() [3/8]

```
Fl_Preferences::Fl_Preferences (
    Fl_Preferences & parent,
    const char * group )
```

Generate or read a new group of entries within another group.

Use the group argument to name the group that you would like to access. Group can also contain a path to a group further down the hierarchy by separating group names with a forward slash '/'.

#### Parameters

in	<i>parent</i>	reference object for the new group
in	<i>group</i>	name of the group to access (may contain '/'s)

#### 33.106.4.4 Fl\_Preferences() [4/8]

```
Fl_Preferences::Fl_Preferences (
    Fl_Preferences * parent,
    const char * group )
```

Create or access a group of preferences using a name.

Parent should point to a previously created parent preferences group to create a preferences hierarchy. If `parent` is set to `NULL`, an unnamed database will be accessed that exists only in local memory and is not associated with a file on disk. The root type of this database is set to `Fl_Preferences::MEMORY`.

- the memory database is *not* shared among multiple instances of the same app
- memory databases are *not* thread safe
- all data will be lost when the app quits

```
void some_function() {
    Fl_Preferences guide( NULL, "Guide" );
    guide.set("answer", 42);
}
void other_function() {
    int x;
    Fl_Preferences guide( NULL, "Guide" );
    guide.get("answer", x, -1);
}
```

FLTK uses the memory database to manage plugins. See [Fl\\_Plugin](#).

#### Parameters

in	<i>parent</i>	the parameter <code>parent</code> is a pointer to the parent group. If <code>parent</code> is <code>NULL</code> , the new preferences item refers to an application internal database ("runtime prefs") which exists only once, and remains in RAM only until the application quits. This database is used to manage plugins and other data indexes by strings. Runtime prefs are <i>not</i> thread-safe.
in	<i>group</i>	a group name that is used as a key into the database

#### See also

[Fl\\_Preferences\( Fl\\_Preferences&, const char \\*group \)](#)

#### 33.106.4.5 Fl\_Preferences() [5/8]

```
Fl_Preferences::Fl_Preferences (
    Fl_Preferences & parent,
    int groupIndex )
```

Open a child group using a given index.

Use the `groupIndex` argument to find the group that you would like to access. If the given index is invalid (negative or too high), a new group is created with a UUID as a name.

The index needs to be fixed. It is currently backward. Index 0 points to the last member in the 'list' of preferences.

#### Parameters

in	<i>parent</i>	reference object for the new group
in	<i>groupIndex</i>	zero based index into child groups

#### 33.106.4.6 Fl\_Preferences() [6/8]

```
Fl_Preferences::Fl_Preferences (
    Fl_Preferences * parent,
    int groupIndex )
```

#### See also

[Fl\\_Preferences\( Fl\\_Preferences&, int groupIndex \)](#)

**33.106.4.7 Fl\_Preferences()** [7/8]

```
Fl_Preferences::Fl_Preferences (
    Fl_Preferences::ID id )
```

Create a new dataset access point using a dataset ID.

ID's are a great way to remember shortcuts to database entries that are deeply nested in a preferences database, as long as the database root is not deleted. An ID can be retrieved from any [Fl\\_Preferences](#) dataset, and can then be used to create multiple new references to the same dataset.

ID's can be very helpful when put into the `user_data()` field of widget callbacks.

**33.106.4.8 ~Fl\_Preferences()**

```
Fl_Preferences::~~Fl_Preferences ( ) [virtual]
```

The destructor removes allocated resources.

When used on the *base* preferences group, the destructor flushes all changes to the preference file and deletes all internal databases.

The destructor does not remove any data from the database. It merely deletes your reference to the database.

**33.106.4.9 Fl\_Preferences()** [8/8]

```
Fl_Preferences::Fl_Preferences (
    const char * path,
    const char * vendor,
    const char * application )
```

Deprecated: Use this constructor to create or read a preference file at an arbitrary position in the file system.

**Deprecated** "since 1.4.0 - use `Fl_Preferences(path, vendor, application, flags)` instead"

This constructor should no longer be used because the generated database uses the current locale, making it impossible to exchange floating point settings between machines with different language settings.

Use `Fl_Preferences(path, vendor, application, Fl_Preferences::C_LOCALE)` in new projects and `Fl_Preferences(path, vendor, application, 0)` if you must keep backward compatibility.

See also

[Fl\\_Preferences\( const char \\*path, const char \\*vendor, const char \\*application, Root flags \)](#)

**33.106.5 Member Function Documentation****33.106.5.1 delete\_entry()**

```
char Fl_Preferences::delete_entry (
    const char * key )
```

Deletes a single name/value pair.

This function removes the entry *key* from the database.

Parameters

in	key	name of entry to delete
----	-----	-------------------------

**Returns**

0 if deleting the entry failed

**33.106.5.2 delete\_group()**

```
char Fl_Preferences::delete_group (
    const char * group )
```

Deletes a group.

Removes a group and all keys and groups within that group from the database.

**Parameters**

in	<i>group</i>	name of the group to delete
----	--------------	-----------------------------

**Returns**

0 if call failed

**33.106.5.3 dirty()**

```
int Fl_Preferences::dirty ( )
```

Check if there were changes to the database that need to be written to disk.

**Returns**

1 if the database will be written to disk by `flush` or destructor.

0 if the database is unchanged since the last write operation.

-1 if there is an internal database error.

**33.106.5.4 entries()**

```
int Fl_Preferences::entries ( )
```

Returns the number of entries (name/value pairs) in a group.

**Returns**

number of entries

**33.106.5.5 entry()**

```
const char * Fl_Preferences::entry (
    int index )
```

Returns the name of an entry.

There is no guaranteed order of entry names. The index must be within the range given by [entries\(\)](#).

**Parameters**

in	<i>index</i>	number indexing the requested entry
----	--------------	-------------------------------------

**Returns**

pointer to value cstring

**33.106.5.6 entry\_exists()**

```
char Fl_Preferences::entry_exists (
    const char * key )
```

Returns non-zero if an entry with this name exists.

**Parameters**

in	key	name of entry that is searched for
----	-----	------------------------------------

**Returns**

0 if entry was not found

**33.106.5.7 file\_access() [1/2]**

```
unsigned int Fl_Preferences::file_access ( ) [static]
```

Return the current file access permissions for the FLTK preferences system.

**See also**

[Fl\\_Preferences::file\\_access\(unsigned int\)](#)

**33.106.5.8 file\_access() [2/2]**

```
void Fl_Preferences::file_access (
    unsigned int flags ) [static]
```

Tell the FLTK preferences system which files in the file system it may read, create, or write.

The FLTK core library will try to read or even create or write preference files when calling [Fl::option\(\)](#), [Fl\\_File\\_Chooser](#), the printing panel, and possibly some other internal functions. If your application wants to keep FLTK from touching the file system, call this function before making any other FLTK calls:

```
// neither FLTK nor the app may read, create, or write preference files
Fl_Preferences::file_access( Fl_Preferences::NONE );
```

or

```
// FLTK may not read, create, or write preference files, but the application may
Fl_Preferences::file_access( Fl_Preferences::APP_OK );
```

All flags can be combined using an OR operator. If flags are not set, that specific access to the file system will not be allowed. By default, all access is granted. To clear one or more flags from the default setting, use:

```
Fl_Preferences::file_access( Fl_Preferences::file_access()
    &~ Fl_Preferences::SYSTEM_WRITE );
```

If preferences are created using a filename (instead of [Fl\\_Preferences::USER](#) or [Fl\\_Preferences::SYSTEM](#)), file access is handled as if the [Fl\\_Preferences::USER](#) flag was set.

**See also**

[Fl\\_Preferences::NONE](#) and others for a list of flags.

[Fl\\_Preferences::file\\_access\(\)](#)

**33.106.5.9 filename() [1/2]**

```
Fl_Preferences::Root Fl_Preferences::filename (
    char * buffer,
    size_t buffer_size )
```

Return the file name and path to the preference file.

If the preferences have not changed or have not been flushed, the file or directory may not have been created yet.

#### Parameters

out	<i>buffer</i>	write the resulting path into this buffer
in	<i>buffer_size</i>	size of the <i>buffer</i> in bytes

#### Returns

the root type at creation type, or MEMORY for runtime prefs, it does not return CORE or LOCALE flags.

### 33.106.5.10 filename() [2/2]

```
Fl_Preferences::Root Fl_Preferences::filename (
    char * buffer,
    size_t buffer_size,
    Root root,
    const char * vendor,
    const char * application ) [static]
```

Determine the file name and path to preferences that would be opened with these parameters.

Find the possible location of a preference file on disk without touching any of the pathname components. This can be used to check if a preference file already exists.

#### Parameters

out	<i>buffer</i>	write the resulting path into this buffer
in	<i>buffer_size</i>	size of the <i>buffer</i> in bytes
in	<i>root</i>	can be USER_L or SYSTEM_L for user specific or system wide preferences
in	<i>vendor</i>	unique text describing the company or author of this file, must be a valid filepath segment
in	<i>application</i>	unique text describing the application, must be a valid filepath segment

#### Returns

the input root value, or [Fl\\_Preferences::UNKNOWN\\_ROOT\\_TYPE](#) if the path could not be determined.

#### See also

[Fl\\_Preferences\( Root root, const char \\*vendor, const char \\*application \)](#)

### 33.106.5.11 flush()

```
int Fl_Preferences::flush ( )
```

Writes preferences to disk if they were modified.

This method can be used to verify that writing a preference file went well. Deleting the base preferences object will also write the contents of the database to disk.

#### Returns

-1 if anything went wrong, i.e. file could not be opened, permissions blocked writing, etc.

0 if the file was written to disk. This does not check if the disk ran out of space and the file is truncated.

1 if no data was written to the database and no write attempt to disk was made.

**33.106.5.12 get() [1/9]**

```
char Fl_Preferences::get (
    const char * key,
    char *& text,
    const char * defaultValue )
```

Reads an entry from the group.

A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). [get\(\)](#) allocates memory of sufficient size to hold the value. The buffer must be free'd by the developer using 'free(value)'.

**Parameters**

in	<i>key</i>	name of entry
out	<i>text</i>	returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value to be used if no preference was set

**Returns**

0 if the default value was used

**33.106.5.13 get() [2/9]**

```
char Fl_Preferences::get (
    const char * key,
    char * text,
    const char * defaultValue,
    int maxSize )
```

Reads an entry from the group.

A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). 'maxSize' is the maximum length of text that will be read. The text buffer must allow for one additional byte for a trailing zero.

**Parameters**

in	<i>key</i>	name of entry
out	<i>text</i>	returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value to be used if no preference was set
in	<i>maxSize</i>	maximum length of value plus one byte for a trailing zero

**Returns**

0 if the default value was used

**33.106.5.14 get() [3/9]**

```
char Fl_Preferences::get (
    const char * key,
    double & value,
    double defaultValue )
```

Reads an entry from the group.

A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0).

**Parameters**

in	<i>key</i>	name of entry
out	<i>value</i>	returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value to be used if no preference was set

**Returns**

0 if the default value was used

**33.106.5.15 get() [4/9]**

```
char Fl_Preferences::get (
    const char * key,
    float & value,
    float defaultValue )
```

Reads an entry from the group.

A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0).

**Parameters**

in	<i>key</i>	name of entry
out	<i>value</i>	returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value to be used if no preference was set

**Returns**

0 if the default value was used

**33.106.5.16 get() [5/9]**

```
char Fl_Preferences::get (
    const char * key,
    int & value,
    int defaultValue )
```

Reads an entry from the group.

A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0).

**Parameters**

in	<i>key</i>	name of entry
out	<i>value</i>	returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value to be used if no preference was set

**Returns**

0 if the default value was used

**33.106.5.17 get() [6/9]**

```
char Fl_Preferences::get (
    const char * key,
    std::string & value,
    const std::string & defaultValue )
```

Reads an entry from the group.

A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). NUL characters in std::string are treated as the end of the text.

**Parameters**

in	<i>key</i>	name of entry
out	<i>value</i>	returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value to be used if no preference was set

**Returns**

0 if the default value was used

**33.106.5.18 get() [7/9]**

```
char Fl_Preferences::get (
    const char * key,
    void *& data,
    const void * defaultValue,
    int defaultSize )
```

Reads an entry from the group.

A default value must be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). [get\(\)](#) allocates memory of sufficient size to hold the value. The buffer must be free'd by the developer using 'free(value)'.

**Parameters**

in	<i>key</i>	name of entry
out	<i>data</i>	returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value to be used if no preference was set
in	<i>defaultSize</i>	size of default value array

**Returns**

0 if the default value was used

**33.106.5.19 get() [8/9]**

```
char Fl_Preferences::get (
    const char * key,
    void * data,
    const void * defaultValue,
```

```
int defaultSize,
int * maxSize )
```

Reads a binary entry from the group, encoded in hexadecimal blocks.

A binary (not hex) default value can be supplied. The return value indicates if the value was available (non-zero) or the default was used (0). `maxSize` is the maximum length of text that will be read and returns the actual number of bytes read.

#### Parameters

in	<i>key</i>	name of entry
out	<i>data</i>	value returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value to be used if no preference was set
in	<i>defaultSize</i>	size of default value array
in, out	<i>maxSize</i>	maximum length of value and actual number of bytes set

#### Returns

0 if the default value was used

### 33.106.5.20 `get()` [9/9]

```
char Fl_Preferences::get (
    const char * key,
    void * data,
    const void * defaultValue,
    int defaultSize,
    int maxSize )
```

Reads a binary entry from the group, encoded in hexadecimal blocks.

#### Parameters

in	<i>key</i>	name of entry
out	<i>data</i>	value returned from preferences or default value if none was set
in	<i>defaultValue</i>	default value
in	<i>defaultSize</i>	size of default value array
in	<i>maxSize</i>	maximum length of value, to receive the number of bytes read, use the function below instead.

#### Returns

0 if the default value was used

#### See also

[Fl\\_Preferences::get\( const char \\*key, void \\*data, const void \\*defaultValue, int defaultSize, int \\*maxSize \)](#)

### 33.106.5.21 `get_userdata_path()`

```
char Fl_Preferences::get_userdata_path (
    char * path,
    int pathlen )
```

Creates a path that is related to the preference file and that is usable for additional application data.

This function creates a directory that is named after the preferences database without the .prefs extension and located in the same directory. It then fills the given buffer with the complete path name.

There is no way to verify that the path name fit into the buffer. If the name is too long, it will be clipped.  
 This function can be used with direct paths that don't end in .prefs . *getUserDataPath()* will remove any extension and end the path with a / . If the file name has no extension, *getUserDataPath()* will append .data/ to the path name.

Example:

```
Fl_Preferences prefs( USER, "matthiasm.com", "test" );
char path[FL_PATH_MAX];
prefs.getUserdataPath( path, FL_PATH_MAX );
creates the preferences database in the directory (User 'matt' on Linux):
/Users/matt/.fltk/matthiasm.com/test.prefs
..and returns the userdata path:
/Users/matt/.fltk/matthiasm.com/test/
```

#### Parameters

out	<i>path</i>	buffer for user data path
in	<i>pathlen</i>	size of path buffer (should be at least FL_PATH_MAX )

#### Returns

- 1 if there is no filename (*path* will be unmodified)
- 1 if *pathlen* is 0 (*path* will be unmodified)
- 1 if a path was created successfully, *path* will contain the path name ending in a '/'
- 0 if path was not created for some reason; *path* will contain the pathname that could not be created

#### See also

[Fl\\_Preferences::Fl\\_Preferences\(Root, const char\\*, const char\\*\)](#)

### 33.106.5.22 group()

```
const char * Fl_Preferences::group (
    int num_group )
```

Returns the name of the Nth (num\_group) group.

There is no guaranteed order of group names. The index must be within the range given by [groups\(\)](#).

#### Parameters

in	<i>num_group</i>	number indexing the requested group
----	------------------	-------------------------------------

#### Returns

'C' string pointer to the group name

### 33.106.5.23 group\_exists()

```
char Fl_Preferences::group_exists (
    const char * key )
```

Returns non-zero if a group with this name exists.

Group names are relative to the [Fl\\_Preferences](#) node and can contain a path. "." describes the current node, "/" describes the topmost node. By preceding a groupname with a "/" its path becomes relative to the topmost node.

#### Parameters

in	<i>key</i>	name of group that is searched for
----	------------	------------------------------------

**Returns**

0 if no group by that name was found

**33.106.5.24 groups()**

```
int Fl_Preferences::groups ( )
```

Returns the number of groups that are contained within a group.

**Returns**

0 for no groups at all

**33.106.5.25 new\_UUID()**

```
const char * Fl_Preferences::new_UUID ( ) [static]
```

Returns a UUID as generated by the system.

A UUID is a "universally unique identifier" which is commonly used in configuration files to create identities. A UUID in ASCII looks like this: 937C4900-51AA-4C11-8DD3-7AB59944F03E. It has always 36 bytes plus a trailing zero.

**Returns**

a pointer to a static buffer containing the new UUID in ASCII format. The buffer is overwritten during every call to this function!

**33.106.5.26 set() [1/8]**

```
char Fl_Preferences::set (
    const char * key,
    const char * text )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

**Parameters**

in	<i>key</i>	name of entry
in	<i>text</i>	set this entry to value

**Returns**

0 if setting the value failed

**33.106.5.27 set() [2/8]**

```
char Fl_Preferences::set (
    const char * entry,
    const std::string & value )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file. NUL characters in std::string are treated as the end of the text.

**Parameters**

in	<i>entry</i>	name of entry
in	<i>value</i>	set this entry to value (stops at the first nul character).

**Returns**

0 if setting the value failed

**33.106.5.28 set() [3/8]**

```
char Fl_Preferences::set (
    const char * key,
    const void * data,
    int dsize )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

**Parameters**

in	<i>key</i>	name of entry
in	<i>data</i>	set this entry to value
in	<i>dsize</i>	size of data array

**Returns**

0 if setting the value failed

**33.106.5.29 set() [4/8]**

```
char Fl_Preferences::set (
    const char * key,
    double value )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

**Parameters**

in	<i>key</i>	name of entry
in	<i>value</i>	set this entry to value

**Returns**

0 if setting the value failed

**33.106.5.30 set() [5/8]**

```
char Fl_Preferences::set (
    const char * key,
```

```
double value,
int precision )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

#### Parameters

in	<i>key</i>	name of entry
in	<i>value</i>	set this entry to <i>value</i>
in	<i>precision</i>	number of decimal digits to represent value

#### Returns

0 if setting the value failed

### 33.106.5.31 set() [6/8]

```
char Fl_Preferences::set (
    const char * key,
    float value )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

#### Parameters

in	<i>key</i>	name of entry
in	<i>value</i>	set this entry to <i>value</i>

#### Returns

0 if setting the value failed

### 33.106.5.32 set() [7/8]

```
char Fl_Preferences::set (
    const char * key,
    float value,
    int precision )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

#### Parameters

in	<i>key</i>	name of entry
in	<i>value</i>	set this entry to <i>value</i>
in	<i>precision</i>	number of decimal digits to represent value

**Returns**

0 if setting the value failed

**33.106.5.33 set() [8/8]**

```
char Fl_Preferences::set (
    const char * key,
    int value )
```

Sets an entry (name/value pair).

The return value indicates if there was a problem storing the data in memory. However it does not reflect if the value was actually stored in the preference file.

**Parameters**

in	<i>key</i>	name of entry
in	<i>value</i>	set this entry to value

**Returns**

0 if setting the value failed

**33.106.5.34 size()**

```
int Fl_Preferences::size (
    const char * key )
```

Returns the size of the value part of an entry.

**Parameters**

in	<i>key</i>	name of entry
----	------------	---------------

**Returns**

size of value

**33.106.6 Member Data Documentation****33.106.6.1 CORE\_READ\_OK**

```
const unsigned int Fl_Preferences::CORE_READ_OK = 0x0010 [static]
```

Set this if it is OK for FLTK to read preference files.

USER\_READ\_OK and/or SYSTEM\_READ\_OK must also be set.

**33.106.6.2 CORE\_WRITE\_OK**

```
const unsigned int Fl_Preferences::CORE_WRITE_OK = 0x0020 [static]
```

Set this if it is OK for FLTK to create or write preference files.

USER\_WRITE\_OK and/or SYSTEM\_WRITE\_OK must also be set.

**33.106.6.3 NONE**

```
const unsigned int Fl_Preferences::NONE = 0x0000 [static]
```

Set this if no call to [Fl\\_Preferences](#) shall access the file system.

See also

[Fl\\_Preferences::file\\_access\(unsigned int\)](#)  
[Fl\\_Preferences::file\\_access\(\)](#)

The documentation for this class was generated from the following files:

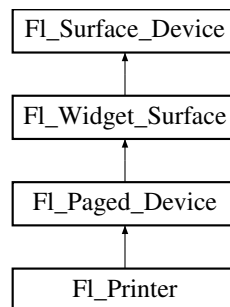
- `Fl_Preferences.H`
- `Fl_Preferences.cxx`

## 33.107 Fl\_Printer Class Reference

OS-independent print support.

```
#include <Fl_Printer.H>
```

Inheritance diagram for `Fl_Printer`:



### Public Member Functions

- `int begin_job` (int pagecount=0, int \*frompage=NULL, int \*topage=NULL, char \*\*perr\_message=NULL) [FL\\_OVERRIDE](#)  
*Begins a print job.*
- `int begin_page` (void) [FL\\_OVERRIDE](#)  
*Begins a new printed page.*
- `void end_job` (void) [FL\\_OVERRIDE](#)  
*To be called at the end of a print job.*
- `int end_page` (void) [FL\\_OVERRIDE](#)  
*To be called at the end of each page.*
- `Fl_Printer` (void)  
*The constructor.*
- `bool is_current` () [FL\\_OVERRIDE](#)  
*Is this surface the current drawing surface?*
- `void margins` (int \*left, int \*top, int \*right, int \*bottom) [FL\\_OVERRIDE](#)  
*Computes the dimensions of margins that lie between the printable page area and the full page.*
- `void origin` (int \*x, int \*y) [FL\\_OVERRIDE](#)  
*Computes the coordinates of the current origin of graphics functions.*
- `void origin` (int x, int y) [FL\\_OVERRIDE](#)  
*Sets the position of the origin of graphics in the drawable part of the drawing surface.*
- `int printable_rect` (int \*w, int \*h) [FL\\_OVERRIDE](#)  
*Computes the width and height of the drawable area of the drawing surface.*
- `void rotate` (float angle) [FL\\_OVERRIDE](#)  
*Rotates the graphics operations relatively to paper.*
- `void scale` (float scale\_x, float scale\_y=0.) [FL\\_OVERRIDE](#)  
*Changes the scaling of page coordinates.*

- void `set_current` (void) `FL_OVERRIDE`  
*Make this surface the current drawing surface.*
- void `translate` (int x, int y) `FL_OVERRIDE`  
*Translates the current graphics origin accounting for the current rotation.*
- void `untranslate` (void) `FL_OVERRIDE`  
*Undoes the effect of a previous `translate()` call.*
- `~FI_Printer` (void)  
*The destructor.*

## Static Public Attributes

These attributes are useful for the Linux/Unix platform only.

- static const char \* `dialog_title` = "Print"  
*[this text may be customized at run-time]*
- static const char \* `dialog_printer` = "Printer:"  
*[this text may be customized at run-time]*
- static const char \* `dialog_range` = "Print Range"  
*[this text may be customized at run-time]*
- static const char \* `dialog_copies` = "Copies"  
*[this text may be customized at run-time]*
- static const char \* `dialog_all` = "All"  
*[this text may be customized at run-time]*
- static const char \* `dialog_pages` = "Pages"  
*[this text may be customized at run-time]*
- static const char \* `dialog_from` = "From:"  
*[this text may be customized at run-time]*
- static const char \* `dialog_to` = "To:"  
*[this text may be customized at run-time]*
- static const char \* `dialog_properties` = "Properties..."  
*[this text may be customized at run-time]*
- static const char \* `dialog_copyNo` = "# Copies:"  
*[this text may be customized at run-time]*
- static const char \* `dialog_print_button` = "Print"  
*[this text may be customized at run-time]*
- static const char \* `dialog_cancel_button` = "Cancel"  
*[this text may be customized at run-time]*
- static const char \* `dialog_print_to_file` = "Print To File"  
*[this text may be customized at run-time]*
- static const char \* `property_title` = "Printer Properties"  
*[this text may be customized at run-time]*
- static const char \* `property_pagesize` = "Page Size:"  
*[this text may be customized at run-time]*
- static const char \* `property_mode` = "Output Mode:"  
*[this text may be customized at run-time]*
- static const char \* `property_use` = "Use"  
*[this text may be customized at run-time]*
- static const char \* `property_save` = "Save"  
*[this text may be customized at run-time]*
- static const char \* `property_cancel` = "Cancel"  
*[this text may be customized at run-time]*

## Additional Inherited Members

### 33.107.1 Detailed Description

OS-independent print support.

[Fl\\_Printer](#) allows to use all drawing, color, text, image, and clip FLTK functions, and to have them operate on printed page(s). There are two main, non exclusive, ways to use it.

- Print any widget (standard, custom, [Fl\\_Window](#), [Fl\\_Gl\\_Window](#)) as it appears on screen, with optional translation, scaling and rotation. This is done by calling [print\\_widget\(\)](#), [print\\_window\(\)](#) or [print\\_window\\_part\(\)](#).
- Use a series of FLTK graphics commands (e.g., font, text, lines, colors, clip, image) to compose a page appropriately shaped for printing.

In both cases, begin by [begin\\_job\(\)](#), [begin\\_page\(\)](#), [printable\\_rect\(\)](#) and [origin\(\)](#) calls and finish by [end\\_page\(\)](#) and [end\\_job\(\)](#) calls.

Example of use: print a widget centered in a page

```
#include <FL/Fl_Printer.H>
#include <FL/fl_draw.H>
int width, height;
Fl_Widget *widget = ... // a widget we want printed
Fl_Printer *printer = new Fl_Printer();
if (printer->begin_job(1) == 0) {
    printer->begin_page();
    printer->printable_rect(&width, &height);
    fl_color(FL_BLACK);
    fl_line_style(FL_SOLID, 2);
    fl_rect(0, 0, width, height);
    fl_font(FL_COURIER, 12);
    time_t now; time(&now); fl_draw(ctime(&now), 0, fl_height());
    printer->origin(width/2, height/2);
    printer->print_widget(widget, -widget->w()/2, -widget->h()/2);
    printer->end_page();
    printer->end_job();
}
delete printer;
```

Recommended method to refresh GUI while printing :

```
printer->begin_job(0);
.....
Fl_Surface_Device::push_current(Fl_Display_Device::display_device());
Fl::check(); // or any operation that draws to display
Fl_Surface_Device::pop_current();
.....
printer->end_job();
```

#### Platform specifics

- X11 and Wayland platforms:
  - FLTK expresses all graphics data using (Level 2) PostScript and sends that to the selected printer. See class [Fl\\_PostScript\\_File\\_Device](#) for a description of how text and transparent images appear in print.
  - If the GTK library is available at run-time, class [Fl\\_Printer](#) runs GTK's printer dialog which allows to set printer, paper size and orientation.
  - If the GTK library is not available, or if `Fl::option(Fl::OPTION_PRINTER_USES_GTK)` has been turned off, class [Fl\\_Printer](#) runs FLTK's print dialog.
    - \* Unless it has been previously changed, the default paper size is A4. To change that, press the "Properties" button of the "Print" dialog window opened by an [Fl\\_Printer::begin\\_job\(\)](#) call. This opens a "Printer Properties" window where it's possible to select the adequate paper size. Finally press the "Save" button therein to assign the chosen paper size to the chosen printer for this and all further print operations.
    - \* Use the static public attributes of this class to set the print dialog to other languages than English. For example, the "Printer:" dialog item [Fl\\_Printer::dialog\\_printer](#) can be set to French with:
 

```
Fl_Printer::dialog_printer = "Imprimante:";
```

 before creation of the [Fl\\_Printer](#) object.
    - \* Use [Fl\\_PostScript\\_File\\_Device::file\\_chooser\\_title](#) to customize the title of the file chooser dialog that opens when using the "Print To File" option of the print dialog.
- Windows platform: Transparent [Fl\\_RGB\\_Image](#) 's don't print with exact transparency on most printers (a workaround is to use [print\\_window\\_part\(\)](#) ). [Fl\\_RGB\\_Image](#) 's don't [rotate\(\)](#) well.
- Mac OS X platform: all graphics requests print as on display and accept rotation and scaling.

## 33.107.2 Member Function Documentation

### 33.107.2.1 begin\_job()

```
int Fl_Printer::begin_job (
    int pagecount = 0,
    int * frompage = NULL,
    int * topage = NULL,
    char ** perr_message = NULL ) [virtual]
```

Begins a print job.

#### Parameters

in	<i>pagecount</i>	the total number of pages of the job (or 0 if you don't know the number of pages)
out	<i>frompage</i>	if non-null, *frompage is set to the first page the user wants printed
out	<i>topage</i>	if non-null, *topage is set to the last page the user wants printed
out	<i>perr_message</i>	if non-null and if the returned value is 2, *perr_message is set to a string describing the error. That string can be delete[]'d after use.

#### Returns

0 if OK, 1 if user cancelled the job, 2 if any error.

Reimplemented from [Fl\\_Paged\\_Device](#).

### 33.107.2.2 begin\_page()

```
int Fl_Printer::begin_page (
    void ) [virtual]
```

Begins a new printed page.

The page coordinates are initially in points, i.e., 1/72 inch, and with origin at the top left of the printable page area. This function also makes this surface the current drawing surface with [Fl\\_Surface\\_Device::push\\_current\(\)](#).

#### Note

[begin\\_page\(\)](#) calls [Fl\\_Surface\\_Device::push\\_current\(\)](#) and leaves this device as the active surface. If any calls between [begin\\_page\(\)](#) and [end\\_page\(\)](#) open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to [Fl\\_Surface\\_Device::pop\\_current\(\)](#) and a call to [Fl\\_Surface\\_Device::push\\_current\(\)](#), or the content of the dialog box will be rendered to the printer instead of the screen.

#### Returns

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Paged\\_Device](#).

### 33.107.2.3 end\_job()

```
void Fl_Printer::end_job (
    void ) [virtual]
```

To be called at the end of a print job.

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.107.2.4 end\_page()**

```
int Fl_Printer::end_page (
    void ) [virtual]
```

To be called at the end of each page.

This function also stops this surface from being the current drawing surface with [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

**Note**

[end\\_page\(\)](#) calls [Fl\\_Surface\\_Device::pop\\_current\(\)](#). If any calls between [begin\\_page\(\)](#) and [end\\_page\(\)](#) open dialog boxes or will otherwise draw into FLTK windows, those calls must be put between a call to [Fl\\_Surface\\_Device::pop\\_current\(\)](#) and a call to [Fl\\_Surface\\_Device::push\\_current\(\)](#).

**Returns**

0 if OK, non-zero if any error.

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.107.2.5 is\_current()**

```
bool Fl_Printer::is_current ( ) [virtual]
```

Is this surface the current drawing surface?

Reimplemented from [Fl\\_Surface\\_Device](#).

**33.107.2.6 margins()**

```
void Fl_Printer::margins (
    int * left,
    int * top,
    int * right,
    int * bottom ) [virtual]
```

Computes the dimensions of margins that lie between the printable page area and the full page.

Values are in the same unit as that used by FLTK drawing functions. They are changed by [scale\(\)](#) calls.

**Parameters**

out	<i>left</i>	If non-null, *left is set to the left margin size.
out	<i>top</i>	If non-null, *top is set to the top margin size.
out	<i>right</i>	If non-null, *right is set to the right margin size.
out	<i>bottom</i>	If non-null, *bottom is set to the bottom margin size.

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.107.2.7 origin() [1/2]**

```
void Fl_Printer::origin (
    int * x,
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

**Parameters**

out	<i>x,y</i>	If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.
-----	------------	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.107.2.8 origin()** [2/2]

```
void Fl_Printer::origin (
    int x,
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous [printable\\_rect\(\)](#) call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive [origin\(\)](#) calls don't combine their effects. [Origin\(\)](#) calls are not affected by [rotate\(\)](#) calls (for classes derived from [Fl\\_Paged\\_Device](#)).

**Parameters**

in	x,y	Horizontal and vertical positions in the drawing surface of the desired origin of graphics.
----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.107.2.9 printable\_rect()**

```
int Fl_Printer::printable_rect (
    int * w,
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to [origin\(\)](#). If the object is derived from class [Fl\\_Paged\\_Device](#), values account for the user-selected paper type and print orientation and are changed by [scale\(\)](#) calls.

**Returns**

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Widget\\_Surface](#).

**33.107.2.10 rotate()**

```
void Fl_Printer::rotate (
    float angle ) [virtual]
```

Rotates the graphics operations relatively to paper.

The rotation is centered on the current graphics origin. Successive [rotate\(\)](#) calls don't combine their effects.

**Parameters**

angle	Rotation angle in counter-clockwise degrees.
-------	--

Reimplemented from [Fl\\_Paged\\_Device](#).

**33.107.2.11 scale()**

```
void Fl_Printer::scale (
    float scale_x,
    float scale_y = 0. ) [virtual]
```

Changes the scaling of page coordinates.

This function also resets the origin of graphics functions at top left of printable page area. After a [scale\(\)](#) call, do a [printable\\_rect\(\)](#) call to get the new dimensions of the printable page area. Successive [scale\(\)](#) calls don't combine

their effects.

#### Parameters

<code>scale_x</code>	Horizontal dimensions of plot are multiplied by this quantity.
<code>scale_y</code>	Same as above, vertically. The value 0. is equivalent to setting <code>scale_y = scale_x</code> . Thus, <code>scale(factor)</code> ; is equivalent to <code>scale(factor, factor)</code> ;

Reimplemented from [Fl\\_Paged\\_Device](#).

#### 33.107.2.12 `set_current()`

```
void Fl_Printer::set_current (
    void ) [virtual]
```

Make this surface the current drawing surface.

This surface will receive all future graphics requests.

Since FLTK 1.4.0 the preferred API to change the current drawing surface is [Fl\\_Surface\\_Device::push\\_current\(\)](#) / [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

#### Note

It is recommended to use this function only as follows :

- The current drawing surface is the display;
- make current another surface, e.g., an [Fl\\_Printer](#) or an [Fl\\_Image\\_Surface](#) object, calling [set\\_current\(\)](#) on this object;
- draw to that surface;
- make the display current again with [Fl\\_Display\\_Device::display\\_device\(\)->set\\_current\(\)](#);  
don't do any other call to [set\\_current\(\)](#) before this one.

Other scenarios of drawing surface changes should be performed via [Fl\\_Surface\\_Device::push\\_current\(\)](#) and [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

Reimplemented from [Fl\\_Surface\\_Device](#).

#### 33.107.2.13 `translate()`

```
void Fl_Printer::translate (
    int x,
    int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation.

Each [translate\(\)](#) call must be matched by an [untranslate\(\)](#) call. Successive [translate\(\)](#) calls add up their effects.

Reimplemented from [Fl\\_Widget\\_Surface](#).

#### 33.107.2.14 `untranslate()`

```
void Fl_Printer::untranslate (
    void ) [virtual]
```

Undoes the effect of a previous [translate\(\)](#) call.

Reimplemented from [Fl\\_Widget\\_Surface](#).

The documentation for this class was generated from the following files:

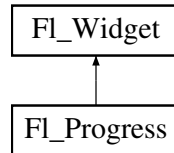
- [Fl\\_Printer.H](#)
- [Fl\\_Printer.cxx](#)

## 33.108 Fl\_Progress Class Reference

Displays a progress bar for the user.

```
#include <Fl_Progress.H>
```

Inheritance diagram for Fl\_Progress:



### Public Member Functions

- `Fl_Progress` (int *x*, int *y*, int *w*, int *h*, const char \**l*=0)  
*The constructor creates the progress bar using the position, size, and label.*
- float `maximum` () const  
*Gets the maximum value in the progress widget.*
- void `maximum` (float *v*)  
*Sets the maximum value in the progress widget.*
- float `minimum` () const  
*Gets the minimum value in the progress widget.*
- void `minimum` (float *v*)  
*Sets the minimum value in the progress widget.*
- float `value` () const  
*Gets the current value in the progress widget.*
- void `value` (float *v*)  
*Sets the current value in the progress widget.*

### Protected Member Functions

- void `draw` () `FL_OVERRIDE`  
*Draws the progress bar.*

### Additional Inherited Members

#### 33.108.1 Detailed Description

Displays a progress bar for the user.

#### 33.108.2 Constructor & Destructor Documentation

##### 33.108.2.1 Fl\_Progress()

```

Fl_Progress::Fl_Progress (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )

```

The constructor creates the progress bar using the position, size, and label.

You can set the background color with `color()` and the progress bar color with `selection_color()`, or you can set both colors together with `color(unsigned bg, unsigned sel)`.

The default colors are `FL_BACKGROUND2_COLOR` and `FL_YELLOW`, resp.

### 33.108.3 Member Function Documentation

#### 33.108.3.1 draw()

```
void Fl_Progress::draw (
    void ) [protected], [virtual]
```

Draws the progress bar.

Implements [Fl\\_Widget](#).

#### 33.108.3.2 maximum() [1/2]

```
float Fl_Progress::maximum ( ) const [inline]
```

Gets the maximum value in the progress widget.

#### 33.108.3.3 maximum() [2/2]

```
void Fl_Progress::maximum (
    float v ) [inline]
```

Sets the maximum value in the progress widget.

#### 33.108.3.4 minimum() [1/2]

```
float Fl_Progress::minimum ( ) const [inline]
```

Gets the minimum value in the progress widget.

#### 33.108.3.5 minimum() [2/2]

```
void Fl_Progress::minimum (
    float v ) [inline]
```

Sets the minimum value in the progress widget.

#### 33.108.3.6 value() [1/2]

```
float Fl_Progress::value ( ) const [inline]
```

Gets the current value in the progress widget.

#### 33.108.3.7 value() [2/2]

```
void Fl_Progress::value (
    float v ) [inline]
```

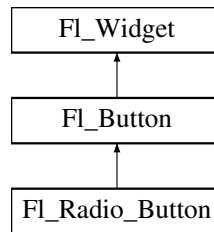
Sets the current value in the progress widget.

The documentation for this class was generated from the following files:

- [Fl\\_Progress.H](#)
- [Fl\\_Progress.cxx](#)

## 33.109 Fl\_Radio\_Button Class Reference

Inheritance diagram for Fl\_Radio\_Button:



### Public Member Functions

- [Fl\\_Radio\\_Button](#) (int X, int Y, int W, int H, const char \*L=0)

*The constructor creates the button using the given position, size, and label.*

### Additional Inherited Members

#### 33.109.1 Constructor & Destructor Documentation

##### 33.109.1.1 Fl\_Radio\_Button()

```

Fl_Radio_Button::Fl_Radio_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
  
```

The constructor creates the button using the given position, size, and label. The Button [type\(\)](#) is set to FL\_RADIO\_BUTTON.

#### Parameters

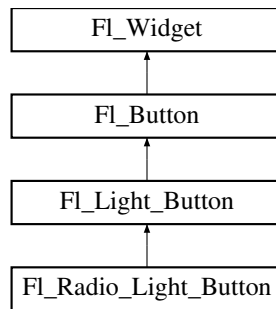
in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

The documentation for this class was generated from the following files:

- Fl\_Radio\_Button.H
- Fl\_Button.cxx

## 33.110 Fl\_Radio\_Light\_Button Class Reference

Inheritance diagram for Fl\_Radio\_Light\_Button:



## Public Member Functions

- **Fl\_Radio\_Light\_Button** (int X, int Y, int W, int H, const char \*l=0)

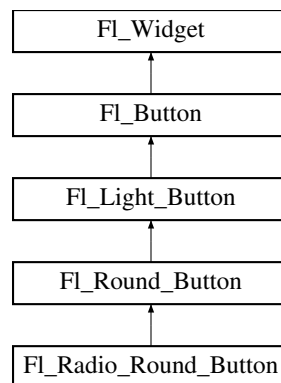
## Additional Inherited Members

The documentation for this class was generated from the following files:

- `Fl_Radio_Light_Button.H`
- `Fl_Light_Button.cxx`

## 33.111 Fl\_Radio\_Round\_Button Class Reference

Inheritance diagram for `Fl_Radio_Round_Button`:



## Public Member Functions

- **Fl\_Radio\_Round\_Button** (int X, int Y, int W, int H, const char \*L=0)  
Creates a new [Fl\\_Radio\\_Button](#) widget using the given position, size, and label string.

## Additional Inherited Members

### 33.111.1 Constructor & Destructor Documentation

#### 33.111.1.1 Fl\_Radio\_Round\_Button()

```

Fl_Radio_Round_Button::Fl_Radio_Round_Button (
    int X,
    int Y,
    int W,

```

```
int H,
const char * L = 0 )
```

Creates a new [Fl\\_Radio\\_Button](#) widget using the given position, size, and label string. The button [type\(\)](#) is set to FL\_RADIO\_BUTTON.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

The documentation for this class was generated from the following files:

- [Fl\\_Radio\\_Round\\_Button.H](#)
- [Fl\\_Round\\_Button.cxx](#)

## 33.112 Fl\_Rect Class Reference

Rectangle with standard FLTK coordinates (X, Y, W, H).

```
#include <Fl_Rect.H>
```

### Public Member Functions

- [int b \(\) const](#)  
*gets the bottom edge (y + h).*
- [void b \(int B\)](#)  
*sets the height based on B and y*
- [Fl\\_Rect \(\)](#)  
*The default constructor creates an empty rectangle (x = y = w = h = 0).*
- [Fl\\_Rect \(const \[Fl\\\_Widget\]\(#\) &widget\)](#)  
*This constructor creates a rectangle based on a widget's position and size.*
- [Fl\\_Rect \(const \[Fl\\\_Widget\]\(#\) \\*const widget\)](#)  
*This constructor creates a rectangle based on a widget's position and size.*
- [Fl\\_Rect \(int W, int H\)](#)  
*This constructor creates a rectangle with x = y = 0 and the given width and height.*
- [Fl\\_Rect \(int X, int Y, int W, int H\)](#)  
*This constructor creates a rectangle with the given x,y coordinates and the given width and height.*
- [Fl\\_Rect \(int X, int Y, int W, int H, \[Fl\\\_Boxtype\]\(#\) bt\)](#)  
*This constructor creates a rectangle with the given x,y coordinates and the given width and height reduced by the box frame size.*
- [int h \(\) const](#)  
*gets the height*
- [void h \(int H\)](#)  
*sets the height*
- [void inset \(\[Fl\\\_Boxtype\]\(#\) bt\)](#)  
*Move all edges in by the frame size of box type bt.*
- [void inset \(int d\)](#)  
*Move all edges in by d.*
- [void inset \(int left, int top, int right, int bottom\)](#)  
*Move all edges in by left, top, right, bottom.*
- [int r \(\) const](#)  
*gets the right edge (x + w).*
- [void r \(int R\)](#)  
*sets the width based on R and x*

- `int w () const`  
*gets the width*
- `void w (int W)`  
*sets the width*
- `int x () const`  
*gets the x coordinate (left edge)*
- `void x (int X)`  
*sets the x coordinate (left edge)*
- `int y () const`  
*gets the y coordinate (top edge)*
- `void y (int Y)`  
*sets the y coordinate (top edge)*

## Friends

- `bool operator!= (const Fl\_Rect &lhs, const Fl\_Rect &rhs)`
- `bool operator== (const Fl\_Rect &lhs, const Fl\_Rect &rhs)`

### 33.112.1 Detailed Description

Rectangle with standard FLTK coordinates (X, Y, W, H).

This may be used internally, for overloaded widget constructors and other overloaded methods like [fl\\_measure\(\)](#), [fl\\_text\\_extents\(\)](#), [fl\\_rect\(\)](#), [fl\\_rectf\(\)](#), and maybe more.

### 33.112.2 Constructor & Destructor Documentation

#### 33.112.2.1 [Fl\\_Rect\(\)](#)

```
Fl_Rect::Fl_Rect (
    int X,
    int Y,
    int W,
    int H,
    Fl\_Boxtype bt ) [inline]
```

This constructor creates a rectangle with the given x,y coordinates and the given width and height reduced by the box frame size.

This is the same as using the constructor w/o `bt` and subsequently calling `inset(bt)`.

### 33.112.3 Member Function Documentation

#### 33.112.3.1 `b()`

```
int Fl_Rect::b ( ) const [inline]
```

gets the bottom edge (y + h).

#### Note

[r\(\)](#) and [b\(\)](#) are coordinates **outside** the area of the rectangle.

**33.112.3.2 inset()** [1/3]

```
void Fl_Rect::inset (
    Fl_Boxtype bt ) [inline]
```

Move all edges in by the frame size of box type `bt`.

Shrinks the rectangle at all sides by the frame width or height of the given box type `bt`.

This method uses the frame sizes given by the box type `bt` using

- `Fl::box_dx(bt)`
- `Fl::box_dy(bt)`
- `Fl::box_dw(bt)`
- `Fl::box_dh(bt)`

If the rectangle is smaller than the frame sizes the result is undefined, i.e. an invalid or empty rectangle.

**33.112.3.3 inset()** [2/3]

```
void Fl_Rect::inset (
    int d ) [inline]
```

Move all edges in by `d`.

Shrinks the rectangle by `d` at all sides keeping the center of the rectangle at the same spot.

If `d` is negative, the rectangle is enlarged.

If `d`  $\geq$  `w()` or `h()` the result is undefined, i.e. an invalid or empty rectangle.

**33.112.3.4 inset()** [3/3]

```
void Fl_Rect::inset (
    int left,
    int top,
    int right,
    int bottom ) [inline]
```

Move all edges in by `left`, `top`, `right`, `bottom`.

Shrinks the rectangle on all sides keeping the center of the rectangle at the same spot.

If any value is negative, the rectangle is enlarged.

Values are not range checked; it is possible to create an invalid or empty rectangle.

**33.112.3.5 r()**

```
int Fl_Rect::r ( ) const [inline]
```

gets the right edge (`x + w`).

Note

`r()` and `b()` are coordinates **outside** the area of the rectangle.

The documentation for this class was generated from the following file:

- `Fl_Rect.H`

**33.113 Fl\_Scroll::Fl\_Region\_LRTB Struct Reference**

A local struct to manage a region defined by left/right/top/bottom.

```
#include <Fl_Scroll.H>
```

**Public Attributes**

- `int b`  
(bottom "y" position, aka `y2`)

- int **l**  
*(l)eft "x" position, aka x1*
- int **r**  
*(r)ight "x" position, aka x2*
- int **t**  
*(t)op "y" position, aka y1*

### 33.113.1 Detailed Description

A local struct to manage a region defined by left/right/top/bottom.  
The documentation for this struct was generated from the following file:

- `Fl_Scroll.H`

## 33.114 `Fl_Scroll::Fl_Region_XYWH` Struct Reference

A local struct to manage a region defined by xywh.  
`#include <Fl_Scroll.H>`

### Public Attributes

- int **h**
- int **w**
- int **x**
- int **y**

### 33.114.1 Detailed Description

A local struct to manage a region defined by xywh.  
The documentation for this struct was generated from the following file:

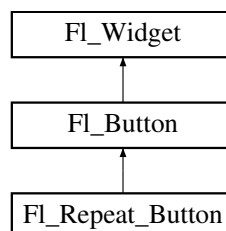
- `Fl_Scroll.H`

## 33.115 `Fl_Repeat_Button` Class Reference

The `Fl_Repeat_Button` is a subclass of `Fl_Button` that generates a callback when it is pressed and then repeatedly generates callbacks as long as it is held down.

`#include <Fl_Repeat_Button.H>`

Inheritance diagram for `Fl_Repeat_Button`:



### Public Member Functions

- void **deactivate** ()
- `Fl_Repeat_Button` (int X, int Y, int W, int H, const char \*l=0)  
*Creates a new `Fl_Repeat_Button` widget using the given position, size, and label string.*
- int **handle** (int) `FL_OVERRIDE`  
*Handles the specified event.*

## Additional Inherited Members

### 33.115.1 Detailed Description

The [Fl\\_Repeat\\_Button](#) is a subclass of [Fl\\_Button](#) that generates a callback when it is pressed and then repeatedly generates callbacks as long as it is held down.

The speed of the repeat is fixed and depends on the implementation.

### 33.115.2 Constructor & Destructor Documentation

#### 33.115.2.1 Fl\_Repeat\_Button()

```
Fl_Repeat_Button::Fl_Repeat_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Repeat\\_Button](#) widget using the given position, size, and label string.

The default boxtype is FL\_UP\_BOX. Deletes the button.

### 33.115.3 Member Function Documentation

#### 33.115.3.1 handle()

```
int Fl_Repeat_Button::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Button](#).

The documentation for this class was generated from the following files:

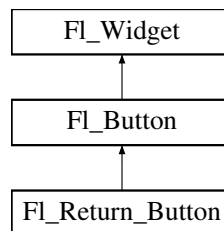
- `Fl_Repeat_Button.H`
- `Fl_Repeat_Button.cxx`

### 33.116 Fl\_Return\_Button Class Reference

The `Fl_Return_Button` is a subclass of `Fl_Button` that generates a callback when it is pressed or when the user presses the Enter key.

```
#include <Fl_Return_Button.H>
```

Inheritance diagram for `Fl_Return_Button`:



#### Public Member Functions

- `Fl_Return_Button` (int X, int Y, int W, int H, const char \*l=0)  
Creates a new `Fl_Return_Button` widget using the given position, size, and label string.
- int `handle` (int) `FL_OVERRIDE`  
Handles the specified event.

#### Protected Member Functions

- void `draw` () `FL_OVERRIDE`  
Draws the widget.

#### Additional Inherited Members

##### 33.116.1 Detailed Description

The `Fl_Return_Button` is a subclass of `Fl_Button` that generates a callback when it is pressed or when the user presses the Enter key.

A carriage-return symbol is drawn next to the button label.

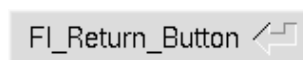


Figure 33.37 `Fl_Return_Button`

##### 33.116.2 Constructor & Destructor Documentation

###### 33.116.2.1 Fl\_Return\_Button()

```

Fl_Return_Button::Fl_Return_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
  
```

Creates a new `Fl_Return_Button` widget using the given position, size, and label string.

The default boxtype is FL\_UP\_BOX.

The inherited destructor deletes the button.

### 33.116.3 Member Function Documentation

#### 33.116.3.1 draw()

```
void Fl_Return_Button::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Button](#).

#### 33.116.3.2 handle()

```
int Fl_Return_Button::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Button](#).

The documentation for this class was generated from the following files:

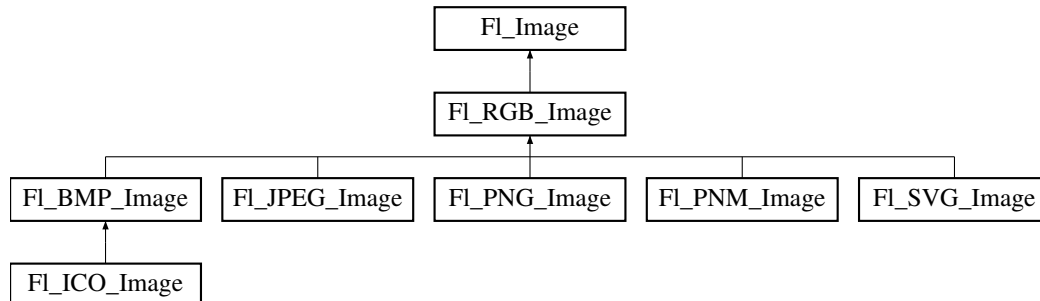
- [Fl\\_Return\\_Button.H](#)
- [Fl\\_Return\\_Button.cxx](#)

### 33.117 FI\_RGB\_Image Class Reference

The [FI\\_RGB\\_Image](#) class supports caching and drawing of full-color images with 1 to 4 channels of color information.

```
#include <Fl_Image.H>
```

Inheritance diagram for [FI\\_RGB\\_Image](#):



#### Public Member Functions

- virtual [FI\\_SVG\\_Image](#) \* [as\\_svg\\_image](#) ()  
*Returns whether an image is an [FI\\_SVG\\_Image](#) or not.*
- int **cache\_h** ()
- int **cache\_w** ()
- void [color\\_average](#) ([FI\\_Color](#) c, float i) [FL\\_OVERRIDE](#)  
*The [color\\_average\(\)](#) method averages the colors in the image with the provided FLTK color value.*
- [FI\\_Image](#) \* **copy** () const
- [FI\\_Image](#) \* **copy** (int W, int H) const [FL\\_OVERRIDE](#)  
*Creates a resized copy of the image.*
- void [desaturate](#) () [FL\\_OVERRIDE](#)  
*The [desaturate\(\)](#) method converts an image to grayscale.*
- void **draw** (int X, int Y)
- void [draw](#) (int X, int Y, int W, int H, int cx=0, int cy=0) [FL\\_OVERRIDE](#)  
*Draws the image to the current drawing surface with a bounding box.*
- [FI\\_RGB\\_Image](#) (const [FI\\_Pixmap](#) \*pxm, [FI\\_Color](#) bg=[FL\\_GRAY](#))  
*The constructor creates a new RGBA image from the specified [FI\\_Pixmap](#).*
- [FI\\_RGB\\_Image](#) (const [uchar](#) \*bits, int bits\_length, int W, int H, int D, int LD)  
*The constructor creates a new image from the specified data.*
- [FI\\_RGB\\_Image](#) (const [uchar](#) \*bits, int W, int H, int D=3, int LD=0)  
*The constructor creates a new image from the specified data.*
- void [label](#) ([FI\\_Menu\\_Item](#) \*m) [FL\\_OVERRIDE](#)  
*This method is an obsolete way to set the image attribute of a menu item.*
- void [label](#) ([FI\\_Widget](#) \*w) [FL\\_OVERRIDE](#)  
*This method is an obsolete way to set the image attribute of a widget or menu item.*
- virtual void [normalize](#) ()  
*Makes sure the object is fully initialized.*
- void [uncache](#) () [FL\\_OVERRIDE](#)  
*If the image has been cached for display, delete the cache data.*
- ~[FI\\_RGB\\_Image](#) () [FL\\_OVERRIDE](#)  
*The destructor frees all memory and server resources that are used by the image.*

## Static Public Member Functions

- static `size_t max_size ()`  
Returns the maximum allowed image size in bytes when creating an [FI\\_RGB\\_Image](#) object.
- static void `max_size (size_t size)`  
Sets the maximum allowed image size in bytes when creating an [FI\\_RGB\\_Image](#) object.

## Public Attributes

- int `alloc_array`  
If non-zero, the object's data array is delete[]'d when deleting the object.
- const `uchar * array`  
Points to the start of the object's data array.

## Friends

- class `FI_Graphics_Driver`

## Additional Inherited Members

### 33.117.1 Detailed Description

The [FI\\_RGB\\_Image](#) class supports caching and drawing of full-color images with 1 to 4 channels of color information.

Images with an even number of channels are assumed to contain alpha information, which is used to blend the image with the contents of the screen.

[FI\\_RGB\\_Image](#) is defined in `<FI/Image.H>`, however for compatibility reasons `<FI/Image.H>` should be included.

### 33.117.2 Constructor & Destructor Documentation

#### 33.117.2.1 FI\_RGB\_Image() [1/3]

```
FI_RGB_Image::FI_RGB_Image (
    const uchar * bits,
    int W,
    int H,
    int D = 3,
    int LD = 0 )
```

The constructor creates a new image from the specified data.

The data array `bits` must contain sufficient data to provide  $W * H * D$  image bytes and optional line padding, see `LD`.

`W` and `H` are the width and height of the image in pixels, resp.

`D` is the image depth and can be:

- `D=1`: each `uchar` in `bits[]` is a grayscale pixel value
- `D=2`: each `uchar` pair in `bits[]` is a grayscale + alpha pixel value
- `D=3`: each `uchar` triplet in `bits[]` is an R/G/B pixel value
- `D=4`: each `uchar` quad in `bits[]` is an R/G/B/A pixel value

`LD` specifies the line data size of the array, see [FI\\_Image::ld\(int\)](#). If `LD` is zero, then  $W * D$  is assumed, otherwise `LD` must be greater than or equal to  $W * D$  to account for (unused) extra data per line (padding).

The caller is responsible that the image data array `bits` persists as long as the image is used.

This constructor sets [FI\\_RGB\\_Image::alloc\\_array](#) to 0. To have the image object control the deallocation of the data array `bits`, set `alloc_array` to non-zero after construction.

## Parameters

in	<i>bits</i>	The image data array.
in	<i>W</i>	The width of the image in pixels.
in	<i>H</i>	The height of the image in pixels.
in	<i>D</i>	The image depth, or 'number of channels' (default=3).
in	<i>LD</i>	Line data size (default=0).

## See also

[Fl\\_Image::data\(\)](#), [Fl\\_Image::w\(\)](#), [Fl\\_Image::h\(\)](#), [Fl\\_Image::d\(\)](#), [Fl\\_Image::ld\(int\)](#)

**33.117.2.2 Fl\_RGB\_Image()** [2/3]

```
Fl_RGB_Image::Fl_RGB_Image (
    const uchar * bits,
    int bits_length,
    int W,
    int H,
    int D,
    int LD )
```

The constructor creates a new image from the specified data.

If the provided array is too small to contain all the image data, the constructor will not generate the image to avoid illegal memory read access and instead set `data` to NULL and `ld` to `ERR_MEMORY_ACCESS`.

## Parameters

<i>bits</i>	image data
<i>bits_length</i>	length of the <code>bits</code> array in bytes
<i>W</i>	image width in pixels
<i>H</i>	image height in pixels
<i>D</i>	image depth in bytes, 1 for gray scale, 2 for gray with alpha, 3 for RGB, and 4 for RGB plus alpha
<i>LD</i>	line length in bytes, or 0 to use <code>W*D</code> .

## See also

[Fl\\_RGB\\_Image\(const uchar \\*bits, int W, int H, int D, int LD\)](#)

**33.117.2.3 Fl\_RGB\_Image()** [3/3]

```
Fl_RGB_Image::Fl_RGB_Image (
    const Fl_Pixmap * pxm,
    Fl_Color bg = FL_GRAY )
```

The constructor creates a new RGBA image from the specified [Fl\\_Pixmap](#).

The RGBA image is built fully opaque except for the transparent area of the pixmap that is assigned the `bg` color with full transparency.

This constructor creates a new internal data array and sets [Fl\\_RGB\\_Image::alloc\\_array](#) to 1 so the data array is deleted when the image is destroyed.

**33.117.3 Member Function Documentation**

### 33.117.3.1 as\_svg\_image()

```
virtual FI_SVG_Image * FI_RGB_Image::as_svg_image ( ) [inline], [virtual]
```

Returns whether an image is an [FI\\_SVG\\_Image](#) or not.

This virtual method returns a pointer to the [FI\\_SVG\\_Image](#) if this object is an instance of [FI\\_SVG\\_Image](#) or NULL if not.

Reimplemented in [FI\\_SVG\\_Image](#).

### 33.117.3.2 color\_average()

```
void FI_RGB_Image::color_average (
    FI_Color c,
    float i ) [virtual]
```

The [color\\_average\(\)](#) method averages the colors in the image with the provided FLTK color value.

The first argument specifies the FLTK color to be used.

The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from [FI\\_Image](#).

Reimplemented in [FI\\_SVG\\_Image](#).

### 33.117.3.3 copy()

```
FI_Image * FI_RGB_Image::copy (
    int W,
    int H ) const [virtual]
```

Creates a resized copy of the image.

It is recommended not to call this member function to reduce the size of an image to the size of the area where this image will be drawn, and to use [FI\\_Image::scale\(\)](#) instead.

The new image should be released when you are done with it.

Note: since FLTK 1.4.0 you can use [FI\\_Image::release\(\)](#) for all types of images (i.e. all subclasses of [FI\\_Image](#)) instead of operator *delete* for [FI\\_Image](#)'s and [FI\\_Image::release\(\)](#) for [FI\\_Shared\\_Image](#)'s.

The new image data will be converted to the requested size. RGB images are resized using the algorithm set by [FI\\_Image::RGB\\_scaling\(\)](#).

For the new image the following equations are true:

- `w() == data_w() == W`
- `h() == data_h() == H`

#### Parameters

in	<i>W,H</i>	Requested width and height of the new image
----	------------	---

#### Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of [FI\\_RGB\\_Image](#), [FI\\_SVG\\_Image](#), [FI\\_Pixmap](#), [FI\\_Bitmap](#), [FI\\_Tiled\\_Image](#), [FI\\_Anim\\_GIF\\_Image](#) and [FI\\_Shared\\_Image](#). Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an [FI\\_GIF\\_Image](#) is an object of class [FI\\_Pixmap](#).

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from [FI\\_Image](#) or any subclass your overridden methods of '[FI\\_Image::copy\(\) const](#)' and '[FI\\_Image::copy\(int, int\) const](#)' **must** also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from [FI\\_Image](#).

Reimplemented in [Fl\\_SVG\\_Image](#).

### 33.117.3.4 desaturate()

```
void Fl_RGB_Image::desaturate ( ) [virtual]
```

The [desaturate\(\)](#) method converts an image to grayscale.

If the image contains an alpha channel (depth = 4), the alpha channel is preserved.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from [Fl\\_Image](#).

Reimplemented in [Fl\\_SVG\\_Image](#).

### 33.117.3.5 draw()

```
void Fl_RGB_Image::draw (
    int X,
    int Y,
    int W,
    int H,
    int cx = 0,
    int cy = 0 ) [virtual]
```

Draws the image to the current drawing surface with a bounding box.

Arguments X, Y, W, H specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the cx and cy arguments.

In other words: `fl_push_clip(X,Y,W,H)` is applied, the image is drawn with its upper-left corner at X-cx, Y-cy and its own width and height, `fl_pop_clip()` is applied.

Reimplemented from [Fl\\_Image](#).

Reimplemented in [Fl\\_SVG\\_Image](#).

### 33.117.3.6 label() [1/2]

```
void Fl_RGB_Image::label (
    Fl_Menu_Item * m ) [virtual]
```

This method is an obsolete way to set the image attribute of a menu item.

**Deprecated** Please use [Fl\\_Menu\\_Item::image\(\)](#) instead.

Reimplemented from [Fl\\_Image](#).

### 33.117.3.7 label() [2/2]

```
void Fl_RGB_Image::label (
    Fl_Widget * widget ) [virtual]
```

This method is an obsolete way to set the image attribute of a widget or menu item.

**Deprecated** Please use [Fl\\_Widget::image\(\)](#) or [Fl\\_Widget::deimage\(\)](#) instead.

Reimplemented from [Fl\\_Image](#).

### 33.117.3.8 max\_size() [1/2]

```
static size_t Fl_RGB_Image::max_size ( ) [inline], [static]
```

Returns the maximum allowed image size in bytes when creating an [Fl\\_RGB\\_Image](#) object.

See also

void [Fl\\_RGB\\_Image::max\\_size\(size\\_t\)](#)

### 33.117.3.9 max\_size() [2/2]

```
static void Fl_RGB_Image::max_size (
    size_t size ) [inline], [static]
```

Sets the maximum allowed image size in bytes when creating an [Fl\\_RGB\\_Image](#) object.

The image size in bytes of an [Fl\\_RGB\\_Image](#) object is the value of the product `w() * h() * d()`. If this product exceeds size, the created object of a derived class of [Fl\\_RGB\\_Image](#) won't be loaded with the image data. This does not apply to direct RGB image creation with [Fl\\_RGB\\_Image::Fl\\_RGB\\_Image\(const uchar \\*bits, int W, int H, int D, int LD\)](#). The default [max\\_size\(\)](#) value is essentially infinite.

### 33.117.3.10 normalize()

```
virtual void Fl_RGB_Image::normalize ( ) [inline], [virtual]
```

Makes sure the object is fully initialized.

In particular, makes sure member variable [array](#) is non-null.

Reimplemented in [Fl\\_SVG\\_Image](#).

### 33.117.3.11 uncache()

```
void Fl_RGB_Image::uncache ( ) [virtual]
```

If the image has been cached for display, delete the cache data.

This allows you to change the data used for the image and then redraw it without recreating an image object.

Reimplemented from [Fl\\_Image](#).

## 33.117.4 Member Data Documentation

### 33.117.4.1 array

```
const uchar* Fl_RGB_Image::array
```

Points to the start of the object's data array.

See also

class [Fl\\_SVG\\_Image](#) which delays initialization of this member variable.

The documentation for this class was generated from the following files:

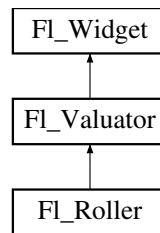
- [Fl\\_Image.H](#)
- [Fl\\_Image.cxx](#)

## 33.118 Fl\_Roller Class Reference

The [Fl\\_Roller](#) widget is a "dolly" control commonly used to move 3D objects.

```
#include <Fl_Roller.H>
```

Inheritance diagram for [Fl\\_Roller](#):



## Public Member Functions

- [Fl\\_Roller](#) (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [Fl\\_Roller](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*

## Additional Inherited Members

### 33.118.1 Detailed Description

The [Fl\\_Roller](#) widget is a "dolly" control commonly used to move 3D objects.

The roller can be controlled by clicking and dragging the mouse, by the corresponding arrow keys when the roller has the keyboard focus, or by the mouse wheels when the mouse pointer is positioned over the roller widget.

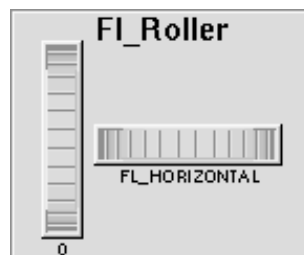


Figure 33.38 [Fl\\_Roller](#)

### 33.118.2 Constructor & Destructor Documentation

#### 33.118.2.1 [Fl\\_Roller\(\)](#)

```

Fl_Roller::Fl_Roller (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
  
```

Creates a new [Fl\\_Roller](#) widget using the given position, size, and label string.

The default boxtype is [FL\\_NO\\_BOX](#).

Inherited destructor destroys the valuator.

### 33.118.3 Member Function Documentation

### 33.118.3.1 draw()

```
void Fl_Roller::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.118.3.2 handle()

```
int Fl_Roller::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

The documentation for this class was generated from the following files:

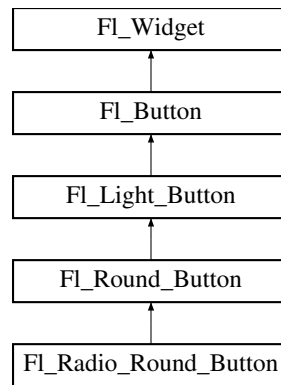
- [Fl\\_Roller.H](#)
- [Fl\\_Roller.cxx](#)

## 33.119 Fl\_Round\_Button Class Reference

Buttons generate callbacks when they are clicked by the user.

```
#include <Fl_Round_Button.H>
```

Inheritance diagram for [Fl\\_Round\\_Button](#):



## Public Member Functions

- [Fl\\_Round\\_Button](#) (int *x*, int *y*, int *w*, int *h*, const char \**l*=0)  
Creates a new [Fl\\_Round\\_Button](#) widget using the given position, size, and label string.

## Additional Inherited Members

### 33.119.1 Detailed Description

Buttons generate callbacks when they are clicked by the user.  
You control exactly when and how by changing the values for [type\(\)](#) and [when\(\)](#).

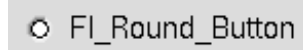


Figure 33.39 [Fl\\_Round\\_Button](#)

The [Fl\\_Round\\_Button](#) subclass displays the "on" state by turning on a light, rather than drawing pushed in. The shape of the "light" is initially set to `FL_ROUND_DOWN_BOX`. The color of the light when on is controlled with [selection\\_color\(\)](#), which defaults to `FL_FOREGROUND_COLOR`.

### 33.119.2 Constructor & Destructor Documentation

#### 33.119.2.1 [Fl\\_Round\\_Button\(\)](#)

```

Fl_Round_Button::Fl_Round_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )

```

Creates a new [Fl\\_Round\\_Button](#) widget using the given position, size, and label string.



Figure 33.40 [Fl\\_Round\\_Button](#)

The [Fl\\_Round\\_Button](#) subclass displays the "ON" state by turning on a light, rather than drawing pushed in. The default box type is `FL_NO_BOX`, which draws the label w/o a box right of the checkmark. The shape of the "light" is set with [down\\_box\(\)](#) and its default value is `FL_ROUND_DOWN_BOX`. The color of the light when on is controlled with [selection\\_color\(\)](#), which defaults to `FL_FOREGROUND_COLOR` (usually black).

## Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

The documentation for this class was generated from the following files:

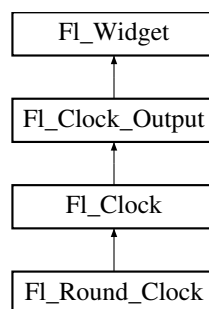
- `Fl_Round_Button.H`
- `Fl_Round_Button.cxx`

## 33.120 Fl\_Round\_Clock Class Reference

A clock widget of type `FL_ROUND_CLOCK`.

```
#include <Fl_Round_Clock.H>
```

Inheritance diagram for `Fl_Round_Clock`:



### Public Member Functions

- [Fl\\_Round\\_Clock](#) (int *X*, int *Y*, int *W*, int *H*, const char \**L*=0)  
*Creates the clock widget, setting his type and box.*

### Additional Inherited Members

#### 33.120.1 Detailed Description

A clock widget of type `FL_ROUND_CLOCK`.

Has no box.

#### 33.120.2 Constructor & Destructor Documentation

##### 33.120.2.1 Fl\_Round\_Clock()

```

Fl_Round_Clock::Fl_Round_Clock (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )

```

Creates the clock widget, setting his type and box.

Create an [Fl\\_Round\\_Clock](#) widget using the given position, size, and label string.

The clock type is `FL_ROUND_CLOCK` and the boxtype is `FL_NO_BOX`.

This constructor is the same as [Fl\\_Clock\(FL\\_ROUND\\_CLOCK, X, Y, W, H, L\)](#).

See also

[Fl\\_Clock\(uchar, int, int, int, int, const char \\*\)](#)

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

The documentation for this class was generated from the following files:

- [Fl\\_Round\\_Clock.H](#)
- [Fl\\_Clock.cxx](#)

## 33.121 Fl\_Scheme Class Reference

### Static Public Member Functions

- static int [add\\_scheme\\_name](#) (const char \*name)  
*Add a scheme name to the list of known schemes.*
- static const char \*\* [names](#) ()  
*Return a list of all known scheme names.*
- static int [num\\_schemes](#) ()  
*Return the number of currently registered schemes.*

### 33.121.1 Member Function Documentation

#### 33.121.1.1 add\_scheme\_name()

```
int Fl_Scheme::add_scheme_name (
    const char * name ) [static]
```

Add a scheme name to the list of known schemes.

This method is public in FLTK 1.4.0 because derived classes of [Fl\\_Scheme](#) are not yet implemented. Thus, users implementing their own schemes can use this method to add the scheme name to the list of known schemes which is for instance used in [Fl\\_Scheme::names\(\)](#).

#### Note

**Attention!** In a future version, when subclasses of [Fl\\_Scheme](#) will be implemented, this method will either be replaced by another `protected` method or it will no longer do anything (kept only for ABI reasons).

The new scheme name must consist of valid ASCII characters as described below:

- lowercase letters 'a' - 'z'
- numbers '0' - '9'
- any character in "\$+\_. " (w/o the quotes).

The name must not be longer than 12 ASCII characters (bytes). The new scheme name is added to the **end** of the **unordered** list.

#### Note

Call this method only once for each scheme name. If the returned value is  $\leq 0$  you should check the scheme name.

The given scheme `name` is copied and may be freed directly after the call to [add\\_scheme\\_name\(\)](#).

**Parameters**

<i>in</i>	<i>name</i>	New scheme name
-----------	-------------	-----------------

**Returns**

The new number of schemes if the name was successfully added. This is the same as the index of the scheme + 1.

**Return values**

0	Scheme <i>name</i> already exists
-1	Invalid character(s) in <i>name</i>
-2	The <i>name</i> is too long

**Since**

1.4.0

**33.121.1.2 names()**

```
const char ** Fl_Scheme::names ( ) [static]
```

Return a list of all known scheme names.

This list is only valid until a new scheme is added or one is removed. It is possible that scheme names are appended to the list during the runtime of the program but schemes can't be removed.

Getting the list of known schemes can be useful to populate a menu of scheme choices to let the user select a scheme. You should process the names immediately and you should never store a pointer to the list or any individual name for later reference because the location of the list can be changed (reallocated) when schemes are added.

The list of scheme names is nul-terminated.

**Note**

Currently (in FLTK 1.4.0) schemes can only be added to the list and not removed from the list. This may change in a later version.

**Returns**

List of currently known scheme names.

**33.121.1.3 num\_schemes()**

```
static int Fl_Scheme::num_schemes ( ) [inline], [static]
```

Return the number of currently registered schemes.

**Returns**

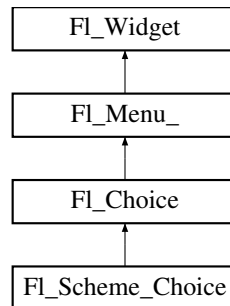
Number of registered schemes.

The documentation for this class was generated from the following files:

- Fl\_Scheme.H
- Fl\_Scheme.cxx

## 33.122 FI\_Scheme\_Choice Class Reference

Inheritance diagram for FI\_Scheme\_Choice:



### Public Member Functions

- [FI\\_Scheme\\_Choice](#) (int X, int Y, int W, int H, const char \*L=0)  
The constructor initializes the [FI\\_Scheme\\_Choice](#) object with all known schemes.
- int [handle](#) (int event) [FL\\_OVERRIDE](#)  
Handle FLTK events.
- virtual void [init\\_value](#) ()  
Public method to initialize the value of the [FI\\_Scheme\\_Choice](#) widget.

### Static Protected Member Functions

- static void [scheme\\_cb\\_](#) ([FI\\_Widget](#) \*w, void \*)  
Internal [FI\\_Scheme\\_Choice](#) callback function (protected).

### Additional Inherited Members

#### 33.122.1 Constructor & Destructor Documentation

##### 33.122.1.1 FI\_Scheme\_Choice()

```

FI_Scheme_Choice::FI_Scheme_Choice (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )

```

The constructor initializes the [FI\\_Scheme\\_Choice](#) object with all known schemes.

#### Parameters

in	<i>X,Y</i>	Widget coordinates
in	<i>W,H</i>	Widget size (width, height)
in	<i>L</i>	Widget label (default: NULL, no label)

#### 33.122.2 Member Function Documentation

### 33.122.2.1 handle()

```
int Fl_Scheme_Choice::handle (
    int event ) [virtual]
```

Handle FLTK events.

This widget uses FL\_SHOW and some other events to initialize its [value\(\)](#) according to the current scheme.

All events are also handled by the base class [Fl\\_Choice](#).

#### Parameters

in	<i>event</i>	
----	--------------	--

#### Returns

1 if the event was used, 0 otherwise

Reimplemented from [Fl\\_Choice](#).

### 33.122.2.2 init\_value()

```
void Fl_Scheme_Choice::init_value ( ) [virtual]
```

Public method to initialize the value of the [Fl\\_Scheme\\_Choice](#) widget.

Normally you don't need to call this unless you change the current scheme by calling [Fl::scheme\(const char \\*\)](#).

The [Fl\\_Scheme\\_Choice](#) widget does this automatically when the widget is shown (when receiving the FL\_SHOW event) which should always be after [Fl\\_Window::show\(argc, argv\)](#) which may set the current scheme by interpreting the commandline.

#### Since

1.4.0

### 33.122.2.3 scheme\_cb\_()

```
void Fl_Scheme_Choice::scheme_cb_ (
    Fl_Widget * w,
    void * ) [static], [protected]
```

Internal [Fl\\_Scheme\\_Choice](#) callback function (protected).

You don't need to set a callback for this widget. The default callback changes the scheme ([Fl::scheme\(\)](#)) and redraws all open windows.

You may override the callback if changing the scheme shall redraw other windows or don't redraw the window at all.

#### Parameters

in	<i>w</i>	The <a href="#">Fl_Scheme_Choice</a> widget
----	----------	---

The documentation for this class was generated from the following files:

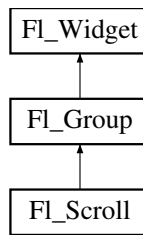
- [Fl\\_Scheme\\_Choice.H](#)
- [Fl\\_Scheme\\_Choice.cxx](#)

## 33.123 Fl\_Scroll Class Reference

This container widget lets you maneuver around a set of widgets much larger than your window.

```
#include <Fl_Scroll.H>
```

Inheritance diagram for [Fl\\_Scroll](#):



## Classes

- struct [Fl\\_Region\\_LRTB](#)  
*A local struct to manage a region defined by left/right/top/bottom.*
- struct [Fl\\_Region\\_XYWH](#)  
*A local struct to manage a region defined by xywh.*
- struct [Fl\\_Scrollbar\\_Data](#)  
*A local struct to manage a scrollbar's xywh region and tab values.*
- struct [ScrollInfo](#)  
*Structure to manage scrollbar and widget interior sizes.*

## Public Types

- enum {  
**HORIZONTAL** = 1 , **VERTICAL** = 2 , **BOTH** = 3 , **ALWAYS\_ON** = 4 ,  
**HORIZONTAL\_ALWAYS** = 5 , **VERTICAL\_ALWAYS** = 6 , **BOTH\_ALWAYS** = 7 }

## Public Member Functions

- void **clear** ()  
*Clear all but the scrollbars...*
- int **delete\_child** (int n) [FL\\_OVERRIDE](#)  
*Removes the widget at *index* from the group and deletes it.*
- [Fl\\_Scroll](#) (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [Fl\\_Scroll](#) widget using the given position, size, and label string.*
- int **handle** (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- void **resize** (int X, int Y, int W, int H) [FL\\_OVERRIDE](#)  
*Resizes the [Fl\\_Scroll](#) widget and moves its children if necessary.*
- void **scroll\_to** (int, int)  
*Moves the contents of the scroll group to a new position.*
- int **scrollbar\_size** () const  
*Gets the current size of the scrollbars' troughs, in pixels.*
- void **scrollbar\_size** (int newSize)  
*Sets the pixel size of the scrollbars' troughs to *newSize*, in pixels.*
- int **xposition** () const  
*Gets the current horizontal scrolling position.*
- int **yposition** () const  
*Gets the current vertical scrolling position.*
- virtual **~Fl\_Scroll** ()  
*The destructor also deletes all the children.*

## Public Attributes

- [Fl\\_Scrollbar](#) **hscrollbar**
- [Fl\\_Scrollbar](#) **scrollbar**

## Protected Member Functions

- void `bbox` (int &, int &, int &, int &) const  
*Returns the bounding box for the interior of the scrolling area, inside the scrollbars.*
- void `draw` () `FL_OVERRIDE`  
*Draws the widget.*
- void `fix_scrollbar_order` ()  
*Ensure the scrollbars are the last children.*
- int `on_insert` (`FL_Widget` \*, int) `FL_OVERRIDE`  
*Change insert position of a child before it is added.*
- int `on_move` (int, int) `FL_OVERRIDE`  
*Change new position of a child before it is moved.*
- void `recalc_scrollbars` (`ScrollInfo` &si) const  
*Calculate visibility/size/position of scrollbars, find children's bounding box.*

## Additional Inherited Members

### 33.123.1 Detailed Description

This container widget lets you maneuver around a set of widgets much larger than your window.

If the child widgets are larger than the size of this object then scrollbars will appear so that you can scroll over to them:

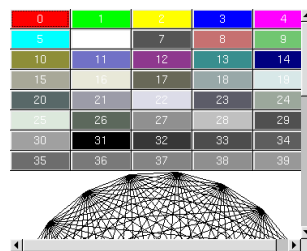


Figure 33.41 FL\_Scroll

If all of the child widgets are packed together into a solid rectangle then you want to set `box()` to `FL_NO_BOX` or one of the `_FRAME` types. This will result in the best output. However, if the child widgets are a sparse arrangement you must set `box()` to a real `_BOX` type. This can result in some blinking during redrawing, but that can be solved by using a `FL_Double_Window`.

The `FL_Scroll` widget calculates the bounding box of all its children by using their widget positions and sizes (x, y, w, h). Outside labels are not considered. If you need outside labels of any widgets or free space outside of this bounding box you can add a tiny invisible `FL_Box` at the relevant corner(s) of the `FL_Scroll` widget, for instance:

```
FL_Scroll scroll(100, 100, 200, 200); // FL_Scroll at (100, 100)
FL_Box(100, 100, 1, 1);             // FL_Box in top left corner
FL_Input(150, 120, 60, 30, "Input:"); // left most widget with label
// ... more widgets ...
scroll.end();
```

By default you can scroll in both directions, and the scrollbars disappear if the data will fit in the area of the scroll.

Use `FL_Scroll::type()` to change this as follows :

- 0 - No scrollbars
- `FL_Scroll::HORIZONTAL` - Only a horizontal scrollbar.
- `FL_Scroll::VERTICAL` - Only a vertical scrollbar.
- `FL_Scroll::BOTH` - The default is both scrollbars.
- `FL_Scroll::HORIZONTAL_ALWAYS` - Horizontal scrollbar always on, vertical always off.
- `FL_Scroll::VERTICAL_ALWAYS` - Vertical scrollbar always on, horizontal always off.
- `FL_Scroll::BOTH_ALWAYS` - Both always on.

Use `scrollbar.align(int)` ( see void [Fl\\_Widget::align\(Fl\\_Align\)](#) ) : to change what side the scrollbars are drawn on.

If the `FL_ALIGN_LEFT` bit is on, the vertical scrollbar is on the left. If the `FL_ALIGN_TOP` bit is on, the horizontal scrollbar is on the top. Note that only the alignment flags in scrollbar are considered. The flags in `hscrollbar` however are ignored.

This widget can also be used to pan around a single child widget "canvas". This child widget should be of your own class, with a `draw()` method that draws the contents. The scrolling is done by changing the `x()` and `y()` of the widget, so this child must use the `x()` and `y()` to position its drawing. To speed up drawing it should test `fl_not_clipped(int x,int y,int w,int h)` to find out if a particular area of the widget must be drawn.

Another very useful child is a single [Fl\\_Pack](#), which is itself a group that packs its children together and changes size to surround them. Filling the [Fl\\_Pack](#) with [Fl\\_Tabs](#) groups (and then putting normal widgets inside those) gives you a very powerful scrolling list of individually-openable panels.

Fluid lets you create these, but you can only lay out objects that fit inside the [Fl\\_Scroll](#) without scrolling. Be sure to leave space for the scrollbars, as Fluid won't show these either.

*You cannot use [Fl\\_Window](#) as a child of this since the clipping is not conveyed to it when drawn, and it will draw over the scrollbars and neighboring objects.*

## 33.123.2 Constructor & Destructor Documentation

### 33.123.2.1 Fl\_Scroll()

```
Fl_Scroll::Fl_Scroll (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [Fl\\_Scroll](#) widget using the given position, size, and label string.

The default boxtype is `FL_NO_BOX`.

The destructor *also deletes all the children*. This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code. A kludge has been done so the [Fl\\_Scroll](#) and all of its children can be automatic (local) variables, but you must declare the [Fl\\_Scroll](#) *first*, so that it is destroyed last.

### 33.123.2.2 ~Fl\_Scroll()

```
Fl_Scroll::~~Fl_Scroll ( ) [virtual]
```

The destructor also deletes all the children.

See also

[Fl\\_Group::~~Fl\\_Group\(\)](#)

## 33.123.3 Member Function Documentation

### 33.123.3.1 bbox()

```
void Fl_Scroll::bbox (
    int & X,
    int & Y,
    int & W,
    int & H ) const [protected]
```

Returns the bounding box for the interior of the scrolling area, inside the scrollbars.

This method does not change the scrollbars or their visibility. First the scrollbar positions and visibility are calculated as they **should** be, according to the positions and sizes of the children. Then the bounding box is calculated.

You may need to call [redraw\(\)](#) to make sure the widget gets updated.

See also

[recalc\\_scrollbars\(\)](#)

### 33.123.3.2 delete\_child()

```
int Fl_Scroll::delete_child (
    int index ) [virtual]
```

Removes the widget at `index` from the group and deletes it.

This method does nothing if `index` is out of bounds or if `Fl_Group::child(index)` is one of the scrollbars.

#### Parameters

in	<i>index</i>	index of child to be removed
----	--------------	------------------------------

#### Returns

success (0) or error code

#### Return values

0	success
1	index out of range
2	widget not allowed to be removed (see note)

See also

[Fl\\_Group::delete\\_child\(int index\)](#)

Since

FLTK 1.4.0

Reimplemented from [Fl\\_Group](#).

### 33.123.3.3 draw()

```
void Fl_Scroll::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Group](#).

### 33.123.3.4 fix\_scrollbar\_order()

```
void Fl_Scroll::fix_scrollbar_order ( ) [protected]
```

Ensure the scrollbars are the last children.

When [Fl\\_Scroll](#) is instantiated the first child of the [Fl\\_Group](#) is the vertical scrollbar `scrollbar` and the second child is the horizontal scrollbar `hscrollbar`.

These two widgets must always be the last two widgets and in this order to guarantee the correct drawing order and event delivery.

Since FLTK 1.4.0 the new method [on\\_insert\(\)](#) modifies the insert position of other children if it would be after the scrollbars.

### 33.123.3.5 [handle\(\)](#)

```
int Fl_Scroll::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Group](#).

### 33.123.3.6 [on\\_insert\(\)](#)

```
int Fl_Scroll::on_insert (
    Fl_Widget * candidate,
    int index ) [protected], [virtual]
```

Change insert position of a child before it is added.

Fix insert position if the new child is planned to be inserted after the scrollbars. We can assume that the scrollbars are always the last two children!

[Fl\\_Group](#) calls this when a new widget is added. We return the new index if the new widget would be added after the scrollbars.

#### Parameters

in	<i>candidate</i>	the candidate will be added to the child array_ after this method returns.
in	<i>index</i>	add the child at this position in the array_

#### Returns

index to position the child as planned

a new index to force the child to a different position

-1 to keep the group from adding the candidate

## Version

1.4.0

## See also

[Fl\\_Group::on\\_insert\(Fl\\_Widget \\*candidate, int index\)](#)Reimplemented from [Fl\\_Group](#).**33.123.3.7 on\_move()**

```
int Fl_Scroll::on_move (
    int old_index,
    int new_index ) [protected], [virtual]
```

Change new position of a child before it is moved.

Fix new position if the new child is planned to be moved after the scrollbars. We can assume that the scrollbars are always the last two children!

[Fl\\_Group](#) calls this when a widget is moved within the list of children. We return a new index if the widget would be moved after the scrollbars.

## Parameters

<i>old_index</i>	the current index of the child that will be moved
<i>new_index</i>	the new index of the child

## Returns

new index, possibly corrected to avoid last two scrollbar entries

Reimplemented from [Fl\\_Group](#).

**33.123.3.8 recalc\_scrollbars()**

```
void Fl_Scroll::recalc_scrollbars (
    ScrollInfo & si ) const [protected]
```

Calculate visibility/size/position of scrollbars, find children's bounding box.

The *si* parameter will be filled with data from the calculations. Derived classes can make use of this call to figure out the scrolling area eg. during [resize\(\)](#) handling.

This method does not change the scrollbars or their visibility. It calculates the scrollbar positions and visibility as they **should** be, according to the positions and sizes of the children.

You may need to call [redraw\(\)](#) to make sure the widget gets updated.

## Parameters

<i>in, out</i>	<i>si</i>	– <a href="#">ScrollInfo</a> structure, filled with data
----------------	-----------	--

## See also

[bbox\(\)](#)**33.123.3.9 resize()**

```
void Fl_Scroll::resize (
    int X,
    int Y,
```

```
int W,
int H ) [virtual]
```

Resizes the [Fl\\_Scroll](#) widget and moves its children if necessary.

The [Fl\\_Scroll](#) widget first resizes itself, and then it moves all its children if (and only if) the [Fl\\_Scroll](#) widget has been moved. The children are moved by the same amount as the [Fl\\_Scroll](#) widget has been moved, hence all children keep their relative positions.

#### Note

[Fl\\_Scroll::resize\(\)](#) does **not** call [Fl\\_Group::resize\(\)](#), and child widgets are **not** resized.

Since children of an [Fl\\_Scroll](#) are not resized, the [resizable\(\)](#) widget is ignored (if it is set).

The scrollbars are moved to their proper positions, as given by [Fl\\_Scroll::scrollbar.align\(\)](#), and switched on or off as necessary.

#### Note

Due to current (FLTK 1.3.x) implementation constraints some of this may effectively be postponed until the [Fl\\_Scroll](#) is drawn the next time. This may change in a future release.

#### See also

[Fl\\_Group::resizable\(\)](#)  
[Fl\\_Widget::resize\(int,int,int,int\)](#)

Reimplemented from [Fl\\_Group](#).

### 33.123.3.10 scroll\_to()

```
void Fl_Scroll::scroll_to (
    int X,
    int Y )
```

Moves the contents of the scroll group to a new position.

This is like moving the scrollbars of the [Fl\\_Scroll](#) around. For instance:

```
Fl_Scroll scroll (10,10,200,200);
Fl_Box b1 ( 10, 10,50,50,"b1"); // relative (x,y) = (0,0)
Fl_Box b2 ( 60, 60,50,50,"b2"); // relative (x,y) = (50,50)
Fl_Box b3 ( 60,110,50,50,"b3"); // relative (x,y) = (50,100)
// populate scroll with more children ...
scroll.end();
scroll.scroll_to(50,100);
```

will move the logical origin of the internal scroll area to (-50,-100) relative to the origin of the [Fl\\_Scroll](#) (10,10), i.e. [Fl\\_Box](#) b3 will be visible in the top left corner of the scroll area.

### 33.123.3.11 scrollbar\_size() [1/2]

```
int Fl_Scroll::scrollbar_size ( ) const [inline]
```

Gets the current size of the scrollbars' troughs, in pixels.

If this value is zero (default), this widget will use the [Fl::scrollbar\\_size\(\)](#) value as the scrollbar's width.

#### Returns

Scrollbar size in pixels, or 0 if the global [Fl::scrollbar\\_size\(\)](#) is being used.

#### See also

[Fl::scrollbar\\_size\(int\)](#)

**33.123.3.12 scrollbar\_size() [2/2]**

```
void Fl_Scroll::scrollbar_size (
    int newSize ) [inline]
```

Sets the pixel size of the scrollbars' troughs to `newSize`, in pixels.

Normally you should not need this method, and should use [Fl::scrollbar\\_size\(int\)](#) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally what you want.

Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare.

Setting `newSize` to the special value of 0 causes the widget to track the global [Fl::scrollbar\\_size\(\)](#), which is the default.

**Parameters**

<code>in</code>	<code>newSize</code>	Sets the scrollbar size in pixels. If 0 (default), scrollbar size tracks the global <a href="#">Fl::scrollbar_size()</a>
-----------------	----------------------	---

**See also**

[Fl::scrollbar\\_size\(\)](#)

**33.123.3.13 xposition()**

```
int Fl_Scroll::xposition ( ) const [inline]
```

Gets the current horizontal scrolling position.

**33.123.3.14 yposition()**

```
int Fl_Scroll::yposition ( ) const [inline]
```

Gets the current vertical scrolling position.

The documentation for this class was generated from the following files:

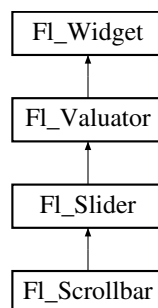
- `Fl_Scroll.H`
- `Fl_Scroll.cxx`

**33.124 Fl\_Scrollbar Class Reference**

The [Fl\\_Scrollbar](#) widget displays a slider with arrow buttons at the ends of the scrollbar.

```
#include <Fl_Scrollbar.H>
```

Inheritance diagram for `Fl_Scrollbar`:



## Public Member Functions

- [Fl\\_Scrollbar](#) (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [Fl\\_Scrollbar](#) widget with given position, size, and label.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- int [linesize](#) () const  
*Get the size of step, in lines, that the arrow keys move.*
- void [linesize](#) (int i)  
*This number controls how big the steps are that the arrow keys do.*
- int [value](#) () const  
*Gets the integer value (position) of the slider in the scrollbar.*
- int [value](#) (int p)  
*Sets the value (position) of the slider in the scrollbar.*
- int [value](#) (int pos, int windowSize, int first\_line, int total\_lines)  
*Sets the position, size and range of the slider in the scrollbar.*
- ~[Fl\\_Scrollbar](#) ()  
*Destroys the Scrollbar.*

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*

## Additional Inherited Members

### 33.124.1 Detailed Description

The [Fl\\_Scrollbar](#) widget displays a slider with arrow buttons at the ends of the scrollbar.

Clicking on the arrows move up/left and down/right by [linesize\(\)](#). Scrollbars also accept [FL\\_SHORTCUT](#) events: the arrows move by [linesize\(\)](#), and vertical scrollbars take Page Up/Down (they move by the page size minus [linesize\(\)](#)) and Home/End (they jump to the top or bottom).

Scrollbars have [step\(1\)](#) preset (they always return integers). If desired you can set the [step\(\)](#) to non-integer values. You will then have to use casts to get at the floating-point versions of [value\(\)](#) from [Fl\\_Slider](#).

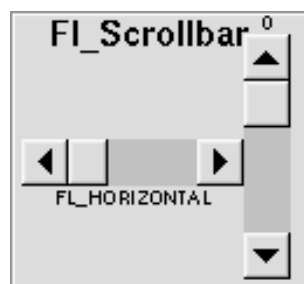


Figure 33.42 [Fl\\_Scrollbar](#)

### 33.124.2 Constructor & Destructor Documentation

#### 33.124.2.1 [Fl\\_Scrollbar\(\)](#)

```
Fl_Scrollbar::Fl_Scrollbar (
    int X,
    int Y,
    int W,
```

```
int H,
const char * L = 0 )
```

Creates a new [Fl\\_Scrollbar](#) widget with given position, size, and label.

You need to do type(FL\_HORIZONTAL) if you want a horizontal scrollbar.

### 33.124.3 Member Function Documentation

#### 33.124.3.1 draw()

```
void Fl_Scrollbar::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

#### 33.124.3.2 handle()

```
int Fl_Scrollbar::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

##### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

##### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

##### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

#### 33.124.3.3 linesize()

```
void Fl_Scrollbar::linesize (
```

```
int i ) [inline]
```

This number controls how big the steps are that the arrow keys do.

In addition page up/down move by the size last sent to [value\(\)](#) minus one [linesize\(\)](#). The default is 16.

#### 33.124.3.4 [value\(\)](#) [1/3]

```
int Fl_Scrollbar::value ( ) const [inline]
```

Gets the integer value (position) of the slider in the scrollbar.

You can get the floating point value with [Fl\\_Slider::value\(\)](#).

See also

[Fl\\_Scrollbar::value\(int p\)](#)

[Fl\\_Scrollbar::value\(int pos, int size, int first, int total\)](#)

#### 33.124.3.5 [value\(\)](#) [2/3]

```
int Fl_Scrollbar::value (
    int p ) [inline]
```

Sets the value (position) of the slider in the scrollbar.

See also

[Fl\\_Scrollbar::value\(\)](#)

[Fl\\_Scrollbar::value\(int pos, int size, int first, int total\)](#)

#### 33.124.3.6 [value\(\)](#) [3/3]

```
int Fl_Scrollbar::value (
    int pos,
    int windowSize,
    int first_line,
    int total_lines ) [inline]
```

Sets the position, size and range of the slider in the scrollbar.

##### Parameters

in	<i>pos</i>	position, first line displayed
in	<i>windowSize</i>	number of lines displayed
in	<i>first_line</i>	number of first line
in	<i>total_lines</i>	total number of lines

You should call this every time your window changes size, your data changes size, or your scroll position changes (even if in response to a callback from this scrollbar). All necessary calls to [redraw\(\)](#) are done.

Calls [Fl\\_Slider::scrollvalue\(int pos, int size, int first, int total\)](#).

The documentation for this class was generated from the following files:

- [Fl\\_Scrollbar.H](#)
- [Fl\\_Scrollbar.cxx](#)

## 33.125 [Fl\\_Scroll::Fl\\_Scrollbar\\_Data](#) Struct Reference

A local struct to manage a scrollbar's xywh region and tab values.

```
#include <Fl_Scroll.H>
```

## Public Attributes

- int **first**  
*scrollbar tab's "number of first line"*
- int **h**
- int **pos**  
*scrollbar tab's "position of first line displayed"*
- int **size**  
*scrollbar tab's "size of window in lines"*
- int **total**  
*scrollbar tab's "total number of lines"*
- int **w**
- int **x**
- int **y**

### 33.125.1 Detailed Description

A local struct to manage a scrollbar's xywh region and tab values.

The documentation for this struct was generated from the following file:

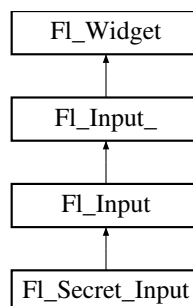
- Fl\_Scroll.H

## 33.126 Fl\_Secret\_Input Class Reference

The [Fl\\_Secret\\_Input](#) class is a subclass of [Fl\\_Input](#) that displays its input as a string of placeholders.

```
#include <Fl_Secret_Input.H>
```

Inheritance diagram for [Fl\\_Secret\\_Input](#):



## Public Member Functions

- [Fl\\_Secret\\_Input](#) (int X, int Y, int W, int H, const char \*l=0)  
*Creates a new [Fl\\_Secret\\_Input](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*

## Additional Inherited Members

### 33.126.1 Detailed Description

The [Fl\\_Secret\\_Input](#) class is a subclass of [Fl\\_Input](#) that displays its input as a string of placeholders.

Depending on the platform this placeholder is either the asterisk ('\*') or the Unicode bullet character (U+2022).

This subclass is usually used to receive passwords and other "secret" information.

### 33.126.2 Constructor & Destructor Documentation

### 33.126.2.1 Fl\_Secret\_Input()

```
Fl_Secret_Input::Fl_Secret_Input (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Secret\\_Input](#) widget using the given position, size, and label string.

The default boxtype is FL\_DOWN\_BOX.

Inherited destructor destroys the widget and any value associated with it.

## 33.126.3 Member Function Documentation

### 33.126.3.1 handle()

```
int Fl_Secret_Input::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Input](#).

The documentation for this class was generated from the following files:

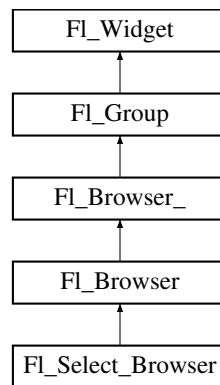
- Fl\_Secret\_Input.H
- Fl\_Input.cxx

## 33.127 Fl\_Select\_Browser Class Reference

The class is a subclass of [Fl\\_Browser](#) which lets the user select a single item, or no items by clicking on the empty space.

```
#include <Fl_Select_Browser.H>
```

Inheritance diagram for Fl\_Select\_Browser:



## Public Member Functions

- [Fl\\_Select\\_Browser](#) (int X, int Y, int W, int H, const char \*L=0)  
Creates a new [Fl\\_Select\\_Browser](#) widget using the given position, size, and label string.

## Additional Inherited Members

### 33.127.1 Detailed Description

The class is a subclass of [Fl\\_Browser](#) which lets the user select a single item, or no items by clicking on the empty space.

As long as the mouse button is held down on an unselected item it is highlighted. Normally the callback is done when the user presses the mouse, but you can change this with [when\(\)](#).

See [Fl\\_Browser](#) for methods to add and remove lines from the browser.

### 33.127.2 Constructor & Destructor Documentation

#### 33.127.2.1 Fl\_Select\_Browser()

```

Fl_Select_Browser::Fl_Select_Browser (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
  
```

Creates a new [Fl\\_Select\\_Browser](#) widget using the given position, size, and label string.

The default boxtype is FL\_DOWN\_BOX. The constructor specializes [Fl\\_Browser\(\)](#) by setting the type to FL\_SELECT\_BROWSER. The destructor destroys the widget and frees all memory that has been allocated.

The documentation for this class was generated from the following files:

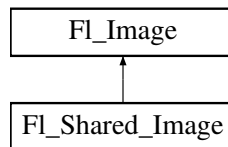
- Fl\_Select\_Browser.H
- Fl\_Browser.cxx

## 33.128 Fl\_Shared\_Image Class Reference

This class supports caching, loading, and drawing of image files.

```
#include <Fl_Shared_Image.H>
```

Inheritance diagram for Fl\_Shared\_Image:



## Public Member Functions

- [FI\\_Shared\\_Image \\* as\\_shared\\_image \(\)](#) [FL\\_OVERRIDE](#)  
Returns whether an image is an [FI\\_Shared\\_Image](#) or not.
- void [color\\_average](#) ([FI\\_Color](#) c, float i) [FL\\_OVERRIDE](#)  
Averages the colors in the image with the provided FLTK color value.
- [FI\\_Image \\* copy \(\)](#)  
Increments the reference counter and returns a pointer to itself.
- [FI\\_Image \\* copy \(\)](#) const
- [FI\\_Image \\* copy](#) (int W, int H) const [FL\\_OVERRIDE](#)  
Return a shared image of this image with the requested size.
- void [desaturate \(\)](#) [FL\\_OVERRIDE](#)  
Convert the image to gray scale.
- void **draw** (int X, int Y)
- void [draw](#) (int X, int Y, int W, int H, int cx=0, int cy=0) [FL\\_OVERRIDE](#)  
Draw this image to the current graphics context.
- const [FI\\_Image \\* image \(\)](#) const  
Returns a pointer to the internal [FI\\_Image](#) object.
- const char \* **name** ()  
Returns the filename of the shared image.
- int [original](#) ()  
Returns whether this is an original image.
- int [refcount](#) ()  
Returns the number of references of this shared image.
- void [release](#) () [FL\\_OVERRIDE](#)  
Releases and possibly destroys (if refcount <= 0) a shared image.
- virtual void **reload** ()  
Reloads the shared image from disk.
- void [uncache](#) () [FL\\_OVERRIDE](#)  
Remove the cached device specific image data.

## Static Public Member Functions

- static void [add\\_handler](#) ([FI\\_Shared\\_Handler](#) f)  
Adds a shared image handler, which is basically a test function for adding new image formats.
- static [FI\\_Shared\\_Image \\* find](#) (const char \*name, int W=0, int H=0)  
Finds a shared image from its name and size specifications.
- static [FI\\_Shared\\_Image \\* get](#) (const char \*name, int W=0, int H=0)  
Find or load an image that can be shared by multiple widgets.
- static [FI\\_Shared\\_Image \\* get](#) ([FI\\_RGB\\_Image](#) \*rgb, int own\_it=1)  
Builds a shared image from a pre-existing [FI\\_RGB\\_Image](#).
- static [FI\\_Shared\\_Image \\*\\* images](#) ()  
Returns the [FI\\_Shared\\_Image\\*](#) array.
- static int [num\\_images](#) ()  
Number of shared images in their various cached sizes.
- static void **remove\_handler** ([FI\\_Shared\\_Handler](#) f)  
Removes a shared image handler.

## Protected Member Functions

- void [add](#) ()  
*Adds a shared image to the image pool.*
- [FI\\_Shared\\_Image](#) \* [copy](#) \_ (int W, int H) const  
*Create a resized copy of the image and wrap it into the share image class.*
- [FI\\_Shared\\_Image](#) ()  
*Creates an empty shared image.*
- [FI\\_Shared\\_Image](#) (const char \*n, [FI\\_Image](#) \*img=0)  
*Creates a shared image from its filename and its corresponding FI\_Image\* img.*
- void [update](#) ()  
*Update the dimensions of the shared images.*
- virtual ~[FI\\_Shared\\_Image](#) ()  
*The destructor frees all memory and server resources that are used by the image.*

## Static Protected Member Functions

- static int [compare](#) ([FI\\_Shared\\_Image](#) \*\*i0, [FI\\_Shared\\_Image](#) \*\*i1)  
*Compares two shared images.*

## Protected Attributes

- int [alloc\\_image\\_](#)
- [FI\\_Image](#) \* [image\\_](#)
- const char \* [name\\_](#)
- int [original\\_](#)
- int [refcount\\_](#)

## Static Protected Attributes

- static int [alloc\\_handlers\\_](#) = 0
- static int [alloc\\_images\\_](#) = 0
- static [FI\\_Shared\\_Handler](#) \* [handlers\\_](#) = 0
- static [FI\\_Shared\\_Image](#) \*\* [images\\_](#) = 0
- static int [num\\_handlers\\_](#) = 0
- static int [num\\_images\\_](#) = 0

## Friends

- class [FI\\_Graphics\\_Driver](#)
- class [FI\\_JPEG\\_Image](#)
- class [FI\\_PNG\\_Image](#)
- class [FI\\_SVG\\_Image](#)

## Additional Inherited Members

### 33.128.1 Detailed Description

This class supports caching, loading, and drawing of image files.

Most applications will also want to link against the fltk\_images library and call the [fl\\_register\\_images\(\)](#) function to support standard image formats such as BMP, GIF, JPEG, PNG, and SVG (unless the library was built with the option removing SVG support).

Images can be requested (loaded) with [FI\\_Shared\\_Image::get\(\)](#), [find\(\)](#), and some other methods. All images are cached in an internal list of shared images and should be released when they are no longer needed. A refcount is used to determine if a released image is to be destroyed with delete.

See also

[fl\\_register\\_image\(\)](#)  
[Fl\\_Shared\\_Image::get\(\)](#)  
[Fl\\_Shared\\_Image::find\(\)](#)  
[Fl\\_Shared\\_Image::release\(\)](#)

## 33.128.2 Constructor & Destructor Documentation

### 33.128.2.1 Fl\_Shared\_Image() [1/2]

```
Fl_Shared_Image::Fl_Shared_Image ( ) [protected]
```

Creates an empty shared image.

The constructors create a new shared image record in the image cache.

The constructors are protected and cannot be used directly from a program. Use the [get\(\)](#) method instead.

### 33.128.2.2 Fl\_Shared\_Image() [2/2]

```
Fl_Shared_Image::Fl_Shared_Image (
    const char * n,
    Fl_Image * img = 0 ) [protected]
```

Creates a shared image from its filename and its corresponding `Fl_Image*` `img`.

The constructors create a new shared image record in the image cache.

The constructors are protected and cannot be used directly from a program. Use the [get\(\)](#) method instead.

#### Parameters

in	<i>n</i>	filename or pool name of the image, must be unique among shared images
in	<i>img</i>	the image that is made available using the name

### 33.128.2.3 ~Fl\_Shared\_Image()

```
Fl_Shared_Image::~~Fl_Shared_Image ( ) [protected], [virtual]
```

The destructor frees all memory and server resources that are used by the image.

The destructor is protected and cannot be used directly from a program. Use the [Fl\\_Shared\\_Image::release\(\)](#) method instead.

## 33.128.3 Member Function Documentation

### 33.128.3.1 add()

```
void Fl_Shared_Image::add ( ) [protected]
```

Adds a shared image to the image pool.

This **protected** method adds an image to the pool, an ordered list of shared images. The pool is searched for a matching image whenever one is requested, for instance with [Fl\\_Shared\\_Image::get\(\)](#) or [Fl\\_Shared\\_Image::find\(\)](#).

This method does not increase or decrease reference counts!

### 33.128.3.2 add\_handler()

```
void Fl_Shared_Image::add_handler (
    Fl_Shared_Handler f ) [static]
```

Adds a shared image handler, which is basically a test function for adding new image formats.

This function will be called when an [Fl\\_Shared\\_Image](#) is to be loaded (for instance with [Fl\\_Shared\\_Image::get\(\)](#)) and the image type is not known to FLTK.

All registered image handlers will be called in the order of registration. You should always call [fl\\_register\\_images\(\)](#) before adding your own handlers - unless you need to override a known image file type which should be rare.

See also

[Fl\\_Shared\\_Handler](#) for more information of the function you need to define.

### 33.128.3.3 as\_shared\_image()

```
Fl_Shared_Image * Fl_Shared_Image::as_shared_image ( ) [inline], [virtual]
```

Returns whether an image is an [Fl\\_Shared\\_Image](#) or not.

This virtual method returns a pointer to an [Fl\\_Shared\\_Image](#) if this object is an instance of [Fl\\_Shared\\_Image](#) or NULL if not. This can be used to detect if a given [Fl\\_Image](#) object is a shared image, i.e. derived from [Fl\\_Shared\\_Image](#).

Since

1.4.0

Reimplemented from [Fl\\_Image](#).

### 33.128.3.4 color\_average()

```
void Fl_Shared_Image::color_average (
    Fl_Color c,
    float i ) [virtual]
```

Averages the colors in the image with the provided FLTK color value.

This method changes the pixel data of this specific image.

Note

It does not change any of the resized copies of this image, nor does it necessarily apply the color changes if this image is resized later.

Parameters

in	<i>c</i>	blend with this color
in	<i>i</i>	blend fraction

See also

[Fl\\_Image::color\\_average\(Fl\\_Color c, float i\)](#)

Reimplemented from [Fl\\_Image](#).

### 33.128.3.5 compare()

```
int Fl_Shared_Image::compare (
    Fl_Shared_Image ** i0,
    Fl_Shared_Image ** i1 ) [static], [protected]
```

Compares two shared images.

The order of comparison is:

1. Image name, usually the filename used to load it
2. Image width

### 3. Image height

Binary search in a sorted array works only if we search for the same parameters that were also used for sorting. No special cases are possible here.

[Fl\\_Shared\\_Image::find\(\)](#) requires a search for an element with a matching name and the `original_` flags set. This is not implemented via binary search, but by a simple run of the array inside [Fl\\_Shared\\_Image::find\(\)](#).

#### Parameters

in	<i>i0,i1</i>	image pointer pointer for sorting
----	--------------	-----------------------------------

#### Returns

Whether the images match or their relative sort order (see text).

#### Return values

0	the images match
<0	Image <i>i0</i> is <i>less</i> than image <i>i1</i>
>0	Image <i>i0</i> is <i>greater</i> than image <i>i1</i>

#### 33.128.3.6 copy() [1/2]

```
Fl_Image * Fl_Shared_Image::copy ( )
```

Increments the reference counter and returns a pointer to itself.

When the image is no longer used, call [Fl\\_Shared\\_Image::release\(\)](#).

To get a copy of the image data, call `this->image()->copy()` instead.

#### Returns

pointer to an [Fl\\_Shared\\_Image](#) that can be safely cast

#### 33.128.3.7 copy() [2/2]

```
Fl_Image * Fl_Shared_Image::copy (
    int W,
    int H ) const [virtual]
```

Return a shared image of this image with the requested size.

This is the same as calling [Fl\\_Shared\\_Image::get\(this->name\(\), W, H\)](#).

If a shared image of the desired size already exists in the shared image pool, the existing image is returned and no copy is made. But the reference counter is incremented. When the image is no longer used, call [Fl\\_Shared\\_Image::release\(\)](#).

To get a copy of the image data, call `this->image()->copy(W, H)` instead.

#### Parameters

in	<i>W,H</i>	size of requested image
----	------------	-------------------------

#### Returns

pointer to an [Fl\\_Shared\\_Image](#) that can be safely cast, or NULL if the image can't be found and can't be created.

Reimplemented from [Fl\\_Image](#).

**33.128.3.8 copy\_()**

```
Fl_Shared_Image * Fl_Shared_Image::copy_ (
    int W,
    int H ) const [protected]
```

Create a resized copy of the image and wrap it into the share image class.

This function is usually followed by a call to `returned_image->add()` to add the image to the pool, and `this->refcounter_++` to make sure that the original shared image keeps a reference to the copy. Don't call this function if an image of the given size is already in the pool.

**Parameters**

in	<i>W,H</i>	new image size
----	------------	----------------

**Returns**

a new shared image pointer that is not yet in the pool

**33.128.3.9 desaturate()**

```
void Fl_Shared_Image::desaturate ( ) [virtual]
```

Convert the image to gray scale.

This method changes the pixel data of this specific image.

**Note**

It does not change any of the resized copies of this image, nor does it necessarily apply the color changes if this image is resized later.

**See also**

[Fl\\_Image::desaturate\(\)](#)

Reimplemented from [Fl\\_Image](#).

**33.128.3.10 draw()**

```
void Fl_Shared_Image::draw (
    int X,
    int Y,
    int W,
    int H,
    int cx = 0,
    int cy = 0 ) [virtual]
```

Draw this image to the current graphics context.

**Parameters**

in	<i>X,Y,W,H</i>	draw at this position and size
in	<i>cx,cy</i>	image origin

Reimplemented from [Fl\\_Image](#).

**33.128.3.11 find()**

```
Fl_Shared_Image * Fl_Shared_Image::find (
```

```
const char * name,
int W = 0,
int H = 0 ) [static]
```

Finds a shared image from its name and size specifications.

This uses a binary search in the image cache.

If the image `name` exists with the exact width `W` and height `H`, then it is returned.

If `W == 0` and the image `name` exists with another size, then the **original** image with that `name` is returned.

In either case the refcount of the returned image is increased. The found image should be released with [FI\\_Shared\\_Image::release\(\)](#) when no longer needed.

An image is marked `original` if it was directly loaded from a file or from memory as opposed to copied and resized images.

This comparison is used in [FI\\_Shared\\_Image::find\(\)](#) to find an image that matches the requested one or to find the position where a new image should be entered into the sorted list of shared images.

It is used in two steps by [FI\\_Shared\\_Image::add\(\)](#):

1. search with exact width and height
2. if not found, search again with width = 0 (and height = 0)

The first step will only return a match if the image exists with the same width and height. The second step will match if there is an image marked `original` with the same name, regardless of width and height.

### 33.128.3.12 get() [1/2]

```
FI_Shared_Image * FI_Shared_Image::get (
const char * name,
int W = 0,
int H = 0 ) [static]
```

Find or load an image that can be shared by multiple widgets.

If the image exists with the requested size, this image will be returned.

If the image exists, but only with another size, then a new copy with the requested size (width `W` and height `H`) will be created as a resized copy of the original image. The new image is added to the internal list of shared images.

If the image does not yet exist, then a new image of the proper dimension is created from the filename `name`. The original image from filename `name` is always added to the list of shared images in its original size. If the requested size differs, then the resized copy with width `W` and height `H` is also added to the list of shared images.

#### Note

If the sizes differ, then *two* images are created as mentioned above. This is intentional so the original image is cached and preserved. If you request the same image with another size later, then the **original** image will be found, copied, resized, and returned.

Shared JPEG and PNG images can also be created from memory by using their named memory access constructor. You should [release\(\)](#) the image when you're done with it.

#### Parameters

<i>name</i>	name of the image
<i>W,H</i>	desired size

#### Returns

the image at the requested size, or NULL if the image could not be found or generated

#### See also

[FI\\_Shared\\_Image::find\(const char \\*name, int W, int H\)](#)

[FI\\_Shared\\_Image::release\(\)](#)

[FI\\_JPEG\\_Image::FI\\_JPEG\\_Image\(const char \\*name, const unsigned char \\*data\)](#)

[FI\\_PNG\\_Image::FI\\_PNG\\_Image](#) (const char \*name\_png, const unsigned char \*buffer, int maxsize)

**33.128.3.13 get() [2/2]**

```
Fl_Shared_Image * Fl_Shared_Image::get (
    Fl_RGB_Image * rgb,
    int own_it = 1 ) [static]
```

Builds a shared image from a pre-existing [Fl\\_RGB\\_Image](#).

**Parameters**

in	<i>rgb</i>	an <a href="#">Fl_RGB_Image</a> used to build a new shared image.
in	<i>own_it</i>	1 if the shared image should delete <i>rgb</i> when it is itself deleted, 0 otherwise

**Version**

1.3.4

**33.128.3.14 image()**

```
const Fl_Image * Fl_Shared_Image::image ( ) const [inline]
```

Returns a pointer to the internal [Fl\\_Image](#) object.

The output is a pointer to the `internal` image ('[Fl\\_Image](#)' or subclass) which can be used to inspect or copy the image.

**Do not try to modify the image!** You can copy the image though if you want or need to change any attributes, size etc. If all you need to do is to resize the image you should use `Fl_Shared_Image::copy(int, int)` instead.

**Note**

The internal image (pointer) is protected for good reasons, e.g. to prevent access to the image so it can't be modified by user code. **DO NOT** cast away the 'const' attribute to modify the image.

User code should rarely need this method. Use with caution.

**Returns**

const [Fl\\_Image](#)\* image, the internal [Fl\\_Image](#)

**Since**

1.4.0

**33.128.3.15 images()**

```
Fl_Shared_Image ** Fl_Shared_Image::images ( ) [static]
```

Returns the [Fl\\_Shared\\_Image](#)\* array.

**Returns**

a pointer to an array of shared image pointers, sorted by name and size

**See also**

[Fl\\_Shared\\_Image::num\\_images\(\)](#)

### 33.128.3.16 num\_images()

```
int Fl_Shared_Image::num_images ( ) [static]
```

Number of shared images in their various cached sizes.

#### Returns

number of entries in the array

#### See also

[Fl\\_Shared\\_Image::images\(\)](#)

### 33.128.3.17 original()

```
int Fl_Shared_Image::original ( ) [inline]
```

Returns whether this is an original image.

Images loaded from a file or from memory are marked `original` as opposed to images created as a copy of another image with different size (width or height).

#### Note

This is useful for debugging (rarely used in user code).

#### Since

FLTK 1.4.0

### 33.128.3.18 refcount()

```
int Fl_Shared_Image::refcount ( ) [inline]
```

Returns the number of references of this shared image.

When reference is below 1, the image is deleted.

### 33.128.3.19 release()

```
void Fl_Shared_Image::release ( ) [virtual]
```

Releases and possibly destroys (if `refcount <= 0`) a shared image.

In the latter case, it will reorganize the shared image array so that no hole will occur.

Reimplemented from [Fl\\_Image](#).

### 33.128.3.20 uncache()

```
void Fl_Shared_Image::uncache ( ) [virtual]
```

Remove the cached device specific image data.

#### See also

[Fl\\_Image::uncache\(\)](#)

Reimplemented from [Fl\\_Image](#).

### 33.128.3.21 update()

```
void Fl_Shared_Image::update ( ) [protected]
```

Update the dimensions of the shared images.

Internal method to synchronize shared image data with the actual image data.

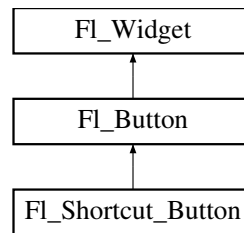
The documentation for this class was generated from the following files:

- [Fl\\_Shared\\_Image.H](#)
- [Fl\\_Shared\\_Image.cxx](#)

## 33.129 Fl\_Shortcut\_Button Class Reference

A button that allows the user to type a key combination to create shortcuts.

Inheritance diagram for Fl\_Shortcut\_Button:



### Public Member Functions

- [Fl\\_Shortcut\\_Button](#) (int X, int Y, int W, int H, const char \*l=0)  
*Construct a shortcut button.*
- [Fl\\_Shortcut value](#) ()  
*Return the user selected shortcut.*
- void [value](#) ([Fl\\_Shortcut shortcut](#))  
*Set the displayed shortcut.*

### Protected Member Functions

- void [do\\_end\\_hot\\_callback](#) ()  
*Call the callback if the user is interested.*
- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draw the textual representation of the shortcut button.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handle keystrokes to catch the user's shortcut.*

### Protected Attributes

- [Fl\\_Shortcut shortcut\\_value](#)

### Additional Inherited Members

#### 33.129.1 Detailed Description

A button that allows the user to type a key combination to create shortcuts.

After clicked once, the button catches the following keyboard events and records the pressed keys and all modifiers. It draws a text representation of the shortcut.

The backspace key deletes the current shortcut. A second click on the button or moving focus makes the last shortcut permanent.

The Shortcut button calls the user callback after every change if FL\_WHEN\_CHANGED is set, and when the button is no longer recording shortcuts if FL\_WHEN\_RELEASE is set.

#### 33.129.2 Constructor & Destructor Documentation

**33.129.2.1 Fl\_Shortcut\_Button()**

```
Fl_Shortcut_Button::Fl_Shortcut_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Construct a shortcut button.

**Parameters**

<i>X,Y,W,H</i>	position and size of the button
<i>l</i>	label text when no shortcut is set

**33.129.3 Member Function Documentation****33.129.3.1 draw()**

```
void Fl_Shortcut_Button::draw (
    void ) [protected], [virtual]
```

Draw the textual representation of the shortcut button.

When the button can receive shortcut key events, it's "hot". A hot button is drawn in selection color. A cold button is drawn as a regular text box containing a human readable version of the shortcut key.

Reimplemented from [Fl\\_Button](#).

**33.129.3.2 handle()**

```
int Fl_Shortcut_Button::handle (
    int e ) [protected], [virtual]
```

Handle keystrokes to catch the user's shortcut.

Reimplemented from [Fl\\_Button](#).

**33.129.3.3 value() [1/2]**

```
Fl\_Shortcut Fl_Shortcut_Button::value ( )
```

Return the user selected shortcut.

**Returns**

shortcut encoded as key and modifier

**33.129.3.4 value() [2/2]**

```
void Fl_Shortcut_Button::value (
    Fl\_Shortcut shortcut )
```

Set the displayed shortcut.

**Parameters**

in	<i>shortcut</i>	encoded as key and modifier
----	-----------------	-----------------------------

The documentation for this class was generated from the following files:

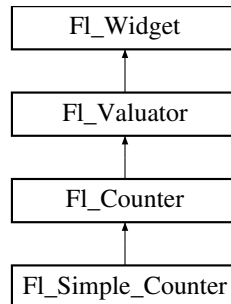
- Fl\_Shortcut\_Button.H
- Fl\_Shortcut\_Button.cxx

## 33.130 Fl\_Simple\_Counter Class Reference

This widget creates a counter with only 2 arrow buttons.

```
#include <Fl_Simple_Counter.H>
```

Inheritance diagram for Fl\_Simple\_Counter:



### Public Member Functions

- **Fl\_Simple\_Counter** (int X, int Y, int W, int H, const char \*L=0)

### Additional Inherited Members

#### 33.130.1 Detailed Description

This widget creates a counter with only 2 arrow buttons.

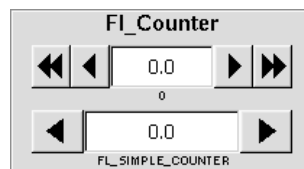


Figure 33.43 Fl\_Simple\_Counter

The documentation for this class was generated from the following files:

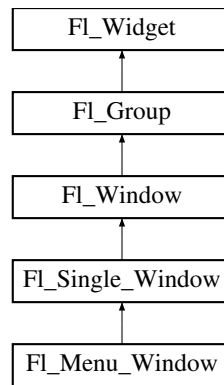
- Fl\_Simple\_Counter.H
- Fl\_Counter.cxx

## 33.131 Fl\_Single\_Window Class Reference

This is the same as [Fl\\_Window](#).

```
#include <Fl_Single_Window.H>
```

Inheritance diagram for Fl\_Single\_Window:



## Public Member Functions

- **Fl\_Single\_Window** (int W, int H, const char \*l=0)  
*Creates a new [Fl\\_Single\\_Window](#) widget using the given size, and label (title) string.*
- **Fl\_Single\_Window** (int X, int Y, int W, int H, const char \*l=0)  
*Creates a new [Fl\\_Single\\_Window](#) widget using the given position, size, and label (title) string.*
- void **flush** () [FL\\_OVERRIDE](#)  
*Same as [Fl\\_Window::flush\(\)](#)*
- void **make\_current** ()  
*Same as [Fl\\_Window::make\\_current\(\)](#)*
- void **show** () [FL\\_OVERRIDE](#)  
*Makes a widget visible.*
- void **show** (int argc, char \*\*argv)  
*Same as [Fl\\_Window::show\(int argc, char \\*\\*argv\)](#)*

## Additional Inherited Members

### 33.131.1 Detailed Description

This is the same as [Fl\\_Window](#).

However, it is possible that some implementations will provide double-buffered windows by default. This subclass can be used to force single-buffering. This may be useful for modifying existing programs that use incremental update, or for some types of image data, such as a movie flipbook.

### 33.131.2 Member Function Documentation

#### 33.131.2.1 flush()

```
void Fl_Single_Window::flush ( ) [inline], [virtual]
```

Same as [Fl\\_Window::flush\(\)](#)

Reimplemented from [Fl\\_Window](#).

#### 33.131.2.2 show()

```
void Fl_Single_Window::show ( ) [virtual]
```

Makes a widget visible.

An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like FL\_SHOW.

The [visible\(\)](#) method returns true if the widget is set to be visible. The [visible\\_r\(\)](#) method returns true if the widget and all of its parents are visible. A widget is only visible if [visible\(\)](#) is true on it *and all of its parents*.

Changing it will send FL\_SHOW or FL\_HIDE events to the widget. *Do not change it if the parent is not visible, as this will send false FL\_SHOW or FL\_HIDE events to the widget.* `redraw()` is called if necessary on this or the parent.

See also

`hide()`, `visible()`, `visible_r()`

Reimplemented from `FL_Widget`.

The documentation for this class was generated from the following files:

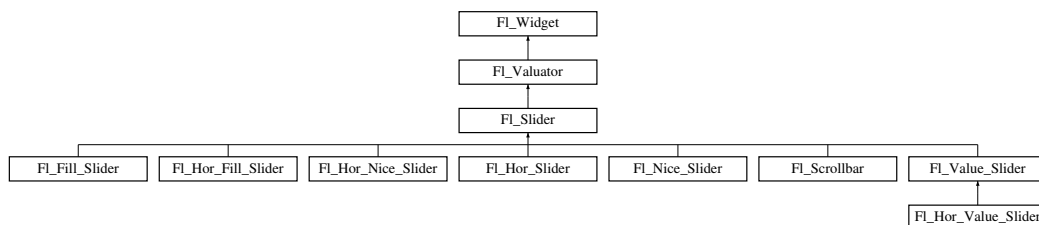
- `FL_Single_Window.H`
- `FL_Single_Window.cxx`

## 33.132 FL\_Slider Class Reference

The `FL_Slider` widget contains a sliding knob inside a box.

```
#include <FL_Slider.H>
```

Inheritance diagram for `FL_Slider`:



### Public Member Functions

- void `bounds` (double a, double b)  
*Sets the minimum (a) and maximum (b) values for the valuator widget.*
- `FL_Slider` (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new FL\_Slider widget using the given position, size, and label string.*
- `FL_Slider` (uchar t, int X, int Y, int W, int H, const char \*L)  
*Creates a new FL\_Slider widget using the given type, position, size, and label string.*
- int `handle` (int) `FL_OVERRIDE`  
*Handles the specified event.*
- int `scrollvalue` (int pos, int size, int first, int total)  
*Sets the size and position of the sliding knob in the box.*
- `FL_Boxtype slider` () const  
*Gets the slider box type.*
- void `slider` (FL\_Boxtype c)  
*Sets the slider box type.*
- float `slider_size` () const  
*Get the dimensions of the moving piece of slider.*
- void `slider_size` (double v)  
*Set the dimensions of the moving piece of slider.*

### Protected Member Functions

- void `draw` () `FL_OVERRIDE`  
*Draws the widget.*
- void `draw` (int, int, int, int)
- int `handle` (int, int, int, int, int)

## Additional Inherited Members

### 33.132.1 Detailed Description

The [Fl\\_Slider](#) widget contains a sliding knob inside a box.

It is often used as a scrollbar. Moving the box all the way to the top/left sets it to the [minimum\(\)](#), and to the bottom/right to the [maximum\(\)](#). The [minimum\(\)](#) may be greater than the [maximum\(\)](#) to reverse the slider direction.

Use `void Fl_Widget::type(int)` to set how the slider is drawn, which can be one of the following:

- `FL_VERTICAL` - Draws a vertical slider (this is the default).
- `FL_HORIZONTAL` - Draws a horizontal slider.
- `FL_VERT_FILL_SLIDER` - Draws a filled vertical slider, useful as a progress or value meter.
- `FL_HOR_FILL_SLIDER` - Draws a filled horizontal slider, useful as a progress or value meter.
- `FL_VERT_NICE_SLIDER` - Draws a vertical slider with a nice looking control knob.
- `FL_HOR_NICE_SLIDER` - Draws a horizontal slider with a nice looking control knob.

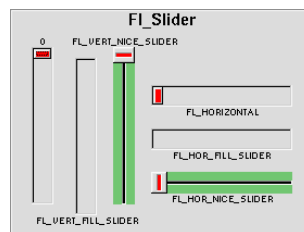


Figure 33.44 `Fl_Slider`

### 33.132.2 Constructor & Destructor Documentation

#### 33.132.2.1 `Fl_Slider()`

```
Fl_Slider::Fl_Slider (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [Fl\\_Slider](#) widget using the given position, size, and label string. The default boxtype is `FL_DOWN_BOX`.

### 33.132.3 Member Function Documentation

#### 33.132.3.1 `bounds()`

```
void Fl_Slider::bounds (
    double a,
    double b )
```

Sets the minimum (a) and maximum (b) values for the valuator widget. if at least one of the values is changed, a partial redraw is asked.

**33.132.3.2 draw()**

```
void Fl_Slider::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

Reimplemented in [Fl\\_Value\\_Slider](#).

**33.132.3.3 handle()**

```
int Fl_Slider::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited handle() method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your handle() method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the handle() method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

**Parameters**

<code>in</code>	<code>event</code>	the kind of event received
-----------------	--------------------	----------------------------

**Return values**

<code>0</code>	if the event was not used or understood
<code>1</code>	if the event was used and can be deleted

**See also**

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

Reimplemented in [Fl\\_Value\\_Slider](#).

**33.132.3.4 scrollvalue()**

```
int Fl_Slider::scrollvalue (
    int pos,
    int size,
    int first,
    int total )
```

Sets the size and position of the sliding knob in the box.

## Parameters

in	<i>pos</i>	position of first line displayed
in	<i>size</i>	size of window in lines
in	<i>first</i>	number of first line
in	<i>total</i>	total number of lines Returns <code>Fl_Valuator::value(p)</code>

**33.132.3.5 slider\_size()**

```
void Fl_Slider::slider_size (
    double v )
```

Set the dimensions of the moving piece of slider.

This is the fraction of the size of the entire widget. If you set this to 1 then the slider cannot move. The default value is .08.

For the "fill" sliders this is the size of the area around the end that causes a drag effect rather than causing the slider to jump to the mouse.

The documentation for this class was generated from the following files:

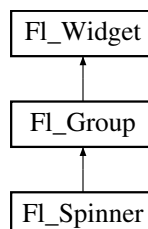
- `Fl_Slider.H`
- `Fl_Slider.cxx`

**33.133 Fl\_Spinner Class Reference**

This widget is a combination of a numerical input widget and repeat buttons.

```
#include <Fl_Spinner.H>
```

Inheritance diagram for `Fl_Spinner`:

**Classes**

- class [Fl\\_Spinner\\_Input](#)

**Public Member Functions**

- [Fl\\_Color](#) **color** () const  
*Returns the background color of the spinner widget's input field.*
- void **color** ([Fl\\_Color](#) v)  
*Sets the background color of the spinner widget's input field.*
- [Fl\\_Spinner](#) (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [Fl\\_Spinner](#) widget using the given position, size, and label string.*
- const char \* **format** () const  
*Returns the format string for the value.*
- void **format** (const char \*f)  
*Sets the format string for the value.*
- int [handle](#) (int event) [FL\\_OVERRIDE](#)

- Handles the specified event.*
- double **maximum** () const
  - Gets the maximum value of the widget.*
- void **maximum** (double m)
  - Sets the maximum value of the widget.*
- int **maximum\_size** () const
  - Returns the maximum width of the input field.*
- void **maximum\_size** (int m)
  - Sets the maximum width of the input field.*
- double **minimum** () const
  - Gets the minimum value of the widget.*
- void **minimum** (double m)
  - Sets the minimum value of the widget.*
- void **range** (double a, double b)
  - Sets the minimum and maximum values for the widget.*
- void **resize** (int X, int Y, int W, int H) **FL\_OVERRIDE**
  - Resizes the [FL\\_Group](#) widget and all of its children.*
- **FL\_Color** **selection\_color** () const
  - Returns the selection color of the spinner widget's input field.*
- void **selection\_color** (**FL\_Color** val)
  - Sets the selection color of the spinner widget's input field.*
- double **step** () const
  - Gets the amount to change the value when the user clicks a button.*
- void **step** (double s)
  - Sets or returns the amount to change the value when the user clicks a button.*
- **FL\_Color** **textcolor** () const
  - Gets the color of the text in the input field.*
- void **textcolor** (**FL\_Color** c)
  - Sets the color of the text in the input field.*
- **FL\_Font** **textfont** () const
  - Gets the font of the text in the input field.*
- void **textfont** (**FL\_Font** f)
  - Sets the font of the text in the input field.*
- **FL\_Fontsize** **textsize** () const
  - Gets the size of the text in the input field.*
- void **textsize** (**FL\_Fontsize** s)
  - Sets the size of the text in the input field.*
- **uchar** **type** () const
  - Gets the numeric representation in the input field.*
- void **type** (**uchar** v)
  - Sets the numeric representation in the input field.*
- double **value** () const
  - Gets the current value of the widget.*
- void **value** (double v)
  - Sets the current value of the input widget.*
- int **wrap** () const
  - Gets the wrap mode of the [FL\\_Spinner](#) widget.*
- void **wrap** (int set)
  - Sets whether the spinner wraps around at upper and lower bounds.*

## Protected Member Functions

- void `draw()` `FL_OVERRIDE`

*Draws the widget.*

## Protected Attributes

- `Fl_Repeat_Button` `down_button_`
- `Fl_Spinner_Input` `input_`
- `Fl_Repeat_Button` `up_button_`

## Additional Inherited Members

### 33.133.1 Detailed Description

This widget is a combination of a numerical input widget and repeat buttons. The user can either type into the input area or use the buttons to change the value.

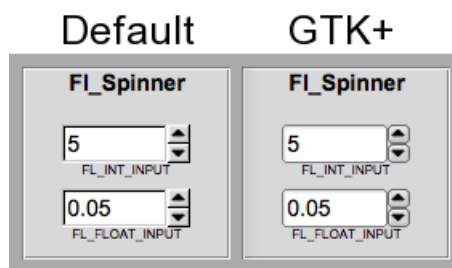


Figure 33.45 `Fl_Spinner` widget

### 33.133.2 Constructor & Destructor Documentation

#### 33.133.2.1 `Fl_Spinner()`

```
Fl_Spinner::Fl_Spinner (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new `Fl_Spinner` widget using the given position, size, and label string. The inherited destructor destroys the widget and any value associated with it.

### 33.133.3 Member Function Documentation

#### 33.133.3.1 `draw()`

```
void Fl_Spinner::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call `redraw()` instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own `draw()` method*, e.g. for an embedded scrollbar, you can do it (because `draw()` is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                  // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Group](#).

### 33.133.3.2 handle()

```
int Fl_Spinner::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Group](#).

### 33.133.3.3 resize()

```
void Fl_Spinner::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Resizes the [Fl\\_Group](#) widget and all of its children.

The [Fl\\_Group](#) widget first resizes itself, and then it moves and resizes all its children according to the rules documented for [Fl\\_Group::resizable\(Fl\\_Widget\\*\)](#)

#### See also

[Fl\\_Group::resizable\(Fl\\_Widget\\*\)](#)

[Fl\\_Group::resizable\(\)](#)

[Fl\\_Widget::resize\(int,int,int,int\)](#)

Reimplemented from [Fl\\_Group](#).

### 33.133.3.4 step() [1/2]

```
double Fl_Spinner::step ( ) const [inline]
```

Gets the amount to change the value when the user clicks a button.

See also

[Fl\\_Spinner::step\(double\)](#)

### 33.133.3.5 step() [2/2]

```
void Fl_Spinner::step (
    double s )
```

Sets or returns the amount to change the value when the user clicks a button.

Before setting step to a non-integer value, the spinner [type\(\)](#) should be changed to floating point.

See also

double [Fl\\_Spinner::step\(\) const](#)

### 33.133.3.6 type() [1/2]

```
uchar Fl_Spinner::type ( ) const [inline]
```

Gets the numeric representation in the input field.

See also

[Fl\\_Spinner::type\(uchar\)](#)

### 33.133.3.7 type() [2/2]

```
void Fl_Spinner::type (
    uchar v )
```

Sets the numeric representation in the input field.

Valid values are FL\_INT\_INPUT and FL\_FLOAT\_INPUT. Also changes the [format\(\)](#) template. Setting a new spinner type via a superclass pointer will not work.

Note

[type\(\)](#) is not a virtual function.

### 33.133.3.8 value()

```
void Fl_Spinner::value (
    double v ) [inline]
```

Sets the current value of the input widget.

Before setting value to a non-integer value, the spinner [type\(\)](#) should be changed to floating point.

### 33.133.3.9 wrap() [1/2]

```
int Fl_Spinner::wrap ( ) const [inline]
```

Gets the wrap mode of the [Fl\\_Spinner](#) widget.

See also

void [wrap\(int\)](#)

Since

1.4.0

**33.133.3.10 wrap()** [2/2]

```
void Fl_Spinner::wrap (
    int set ) [inline]
```

Sets whether the spinner wraps around at upper and lower bounds.

If wrap mode is on the spinner value is set to the [minimum\(\)](#) or [maximum\(\)](#) if the value exceeds the upper or lower bounds, resp., if it was changed by one of the buttons or the FL\_Up or FL\_Down keys.

The spinner stops at the upper and lower bounds if wrap mode is off.

The default wrap mode is on for backwards compatibility with FLTK 1.3.x and older versions.

**Note**

Wrap mode does not apply to the input field if the input value is edited directly as a number. The input value is always clipped to the allowed range as if wrap mode was off when the input field is left (i.e. loses focus).

**See also**

[minimum\(\)](#), [maximum\(\)](#)

**Parameters**

<code>in</code>	<code>set</code>	non-zero sets wrap mode, zero resets wrap mode
-----------------	------------------	--

**Since**

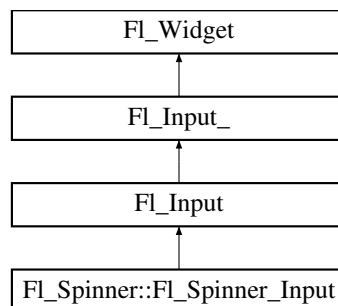
1.4.0

The documentation for this class was generated from the following files:

- `Fl_Spinner.H`
- `Fl_Spinner.cxx`

**33.134 Fl\_Spinner::Fl\_Spinner\_Input Class Reference**

Inheritance diagram for Fl\_Spinner::Fl\_Spinner\_Input:

**Public Member Functions**

- **Fl\_Spinner\_Input** (int X, int Y, int W, int H)
- int [handle](#) (int event) [FL\\_OVERRIDE](#)  
*Handles events of [Fl\\_Spinner](#)'s embedded input widget.*

**Additional Inherited Members****33.134.1 Member Function Documentation**

### 33.134.1.1 handle()

```
int Fl_Spinner::Fl_Spinner_Input::handle (
    int event ) [virtual]
```

Handles events of [Fl\\_Spinner](#)'s embedded input widget.

Works like [Fl\\_Input::handle\(\)](#) but ignores FL\_Up and FL\_Down keys so they can be handled by the parent widget ([Fl\\_Spinner](#)).

Reimplemented from [Fl\\_Input](#).

The documentation for this class was generated from the following files:

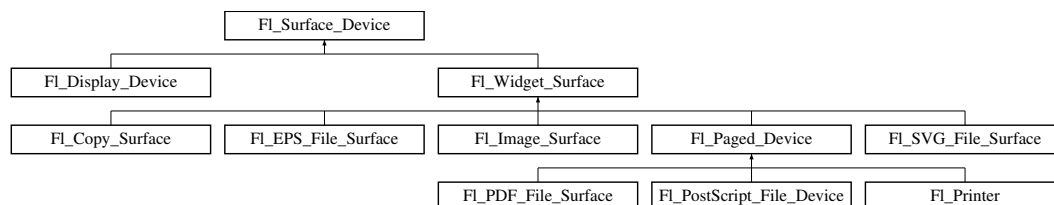
- [Fl\\_Spinner.H](#)
- [Fl\\_Spinner.cxx](#)

## 33.135 Fl\_Surface\_Device Class Reference

A drawing surface that's susceptible to receive graphical output.

```
#include <Fl_Device.H>
```

Inheritance diagram for [Fl\\_Surface\\_Device](#):



### Public Member Functions

- [Fl\\_Graphics\\_Driver \\* driver](#) ()  
*Returns the graphics driver of this drawing surface.*
- virtual bool [is\\_current](#) ()  
*Is this surface the current drawing surface?*
- virtual void [set\\_current](#) (void)  
*Make this surface the current drawing surface.*
- virtual [~Fl\\_Surface\\_Device](#) ()  
*The destructor.*

### Static Public Member Functions

- static [Fl\\_Surface\\_Device \\* pop\\_current](#) ()  
*Removes the top element from the current drawing surface stack, and makes the new top element current.*
- static void [push\\_current](#) ([Fl\\_Surface\\_Device \\*new\\_current](#))  
*Pushes new\_current on top of the stack of current drawing surfaces, and makes it current.*
- static [Fl\\_Surface\\_Device \\* surface](#) ()  
*The current drawing surface.*

### Protected Member Functions

- void [driver](#) ([Fl\\_Graphics\\_Driver \\*graphics\\_driver](#))  
*Sets the graphics driver of this drawing surface.*
- virtual void [end\\_current](#) ()  
*FLTK calls this each time a surface ceases to be the current drawing surface.*
- [Fl\\_Surface\\_Device](#) ([Fl\\_Graphics\\_Driver \\*graphics\\_driver](#))  
*Constructor that sets the graphics driver to use for the created surface.*

### 33.135.1 Detailed Description

A drawing surface that's susceptible to receive graphical output.

Any FLTK application has at any time a current drawing surface to which all drawing requests are directed. The current surface is given by [Fl\\_Surface\\_Device::surface\(\)](#). When `main()` begins running, the current drawing surface has been set to the computer's display, an instance of the [Fl\\_Display\\_Device](#) class.

A drawing surface other than the computer's display, is typically used as follows:

1. Create `surface`, an object from an [Fl\\_Surface\\_Device](#) derived class (e.g., [Fl\\_Image\\_Surface](#), [Fl\\_Printer](#), [Fl\\_Copy\\_Surface](#)).
2. Call `Fl_Surface_Device::push_current(surface)`; to redirect all graphics requests to `surface` which becomes the new current drawing surface (not necessary with classes [Fl\\_Printer](#) / [Fl\\_PostScript\\_File\\_Device](#) / [Fl\\_PDF\\_File\\_Surface](#) because it is done by [Fl\\_Paged\\_Device::begin\\_page\(\)](#)).
3. At this point all of the [Drawing functions](#) (e.g., [fl\\_rect\(\)](#)) or the [Color & Font functions](#) or [Drawing Images functions](#) (e.g., [fl\\_draw\\_image\(\)](#), [Fl\\_Image::draw\(\)](#)) operate on the new current drawing surface. It's also possible to draw to the current surface any widget with [Fl\\_Widget\\_Surface::draw\(Fl\\_Widget\\*, int, int\)](#), a window and its titlebar with [Fl\\_Widget\\_Surface::draw\\_decorated\\_window\(\)](#), or the content of a rectangular zone of a window with [Fl\\_Widget\\_Surface::print\\_window\\_part\(\)](#).
4. After all drawing requests have been performed, redirect graphics requests back to their previous destination with [Fl\\_Surface\\_Device::pop\\_current\(\)](#); (not necessary with classes [Fl\\_Printer](#) / [Fl\\_PostScript\\_File\\_Device](#) / [Fl\\_PDF\\_File\\_Surface](#)).
5. Delete `surface`.

For back-compatibility, it is also possible to use the [Fl\\_Surface\\_Device::set\\_current\(\)](#) member function to change the current drawing surface, once to the new surface, once to the previous one.

### 33.135.2 Member Function Documentation

#### 33.135.2.1 end\_current()

```
virtual void Fl_Surface_Device::end_current ( ) [inline], [protected], [virtual]
```

FLTK calls this each time a surface ceases to be the current drawing surface.

This member function is mostly of interest to developers of new [Fl\\_Surface\\_Device](#) derived classes. It allows to perform surface-specific operations necessary when this surface ceases to be current. Each implementation should end with a call to [Fl\\_Surface\\_Device::end\\_current\(\)](#).

Reimplemented in [Fl\\_PostScript\\_File\\_Device](#).

#### 33.135.2.2 is\_current()

```
bool Fl_Surface_Device::is_current ( ) [virtual]
```

Is this surface the current drawing surface?

Reimplemented in [Fl\\_Copy\\_Surface](#), [Fl\\_Image\\_Surface](#), [Fl\\_PDF\\_File\\_Surface](#), and [Fl\\_Printer](#).

#### 33.135.2.3 pop\_current()

```
Fl_Surface_Device * Fl_Surface_Device::pop_current ( ) [static]
```

Removes the top element from the current drawing surface stack, and makes the new top element current.

#### Returns

A pointer to the new current drawing surface.

See also

[Fl\\_Surface\\_Device::push\\_current\(Fl\\_Surface\\_Device \\*\)](#)

Version

1.4.0

### 33.135.2.4 push\_current()

```
void Fl_Surface_Device::push_current (
    Fl_Surface_Device * new_current ) [static]
```

Pushes `new_current` on top of the stack of current drawing surfaces, and makes it current.

`new_current` will receive all future graphics requests.

Any call to [push\\_current\(\)](#) must be matched by a subsequent call to [Fl\\_Surface\\_Device::pop\\_current\(\)](#). The max height of this stack is 16.

Version

1.4.0

### 33.135.2.5 set\_current()

```
void Fl_Surface_Device::set_current (
    void ) [virtual]
```

Make this surface the current drawing surface.

This surface will receive all future graphics requests.

Since FLTK 1.4.0 the preferred API to change the current drawing surface is [Fl\\_Surface\\_Device::push\\_current\(\)](#) / [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

Note

It is recommended to use this function only as follows :

- The current drawing surface is the display;
  - make current another surface, e.g., an [Fl\\_Printer](#) or an [Fl\\_Image\\_Surface](#) object, calling [set\\_current\(\)](#) on this object;
  - draw to that surface;
  - make the display current again with [Fl\\_Display\\_Device::display\\_device\(\)->set\\_current\(\)](#);
- don't do any other call to [set\\_current\(\)](#) before this one.

Other scenarios of drawing surface changes should be performed via [Fl\\_Surface\\_Device::push\\_current\(\)](#) and [Fl\\_Surface\\_Device::pop\\_current\(\)](#).

Reimplemented in [Fl\\_Copy\\_Surface](#), [Fl\\_Image\\_Surface](#), [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), and [Fl\\_Printer](#).

### 33.135.2.6 surface()

```
static Fl_Surface_Device * Fl_Surface_Device::surface ( ) [inline], [static]
```

The current drawing surface.

In other words, the [Fl\\_Surface\\_Device](#) object that currently receives all graphics requests.

Note

It's possible to transiently remove the GUI scaling factor in place in the current drawing surface with [fl\\_override\\_scale\(\)](#).

The documentation for this class was generated from the following files:

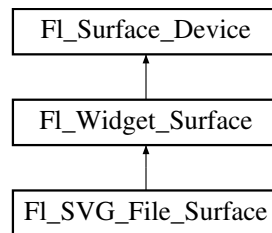
- [Fl\\_Device.H](#)
- [Fl\\_Device.cxx](#)

## 33.136 Fl\_SVG\_File\_Surface Class Reference

A drawing surface producing a Scalable Vector Graphics (SVG) file.

```
#include <Fl_SVG_File_Surface.H>
```

Inheritance diagram for Fl\_SVG\_File\_Surface:



### Public Member Functions

- `int close ()`  
*Closes the FILE pointer where SVG data is output.*
- `FILE * file ()`  
*Returns the underlying FILE pointer.*
- `Fl_SVG_File_Surface (int width, int height, FILE *svg, int(*closef)(FILE *)=NULL)`  
*Constructor of the SVG drawing surface.*
- `void origin (int *x, int *y) FL_OVERRIDE`  
*Computes the coordinates of the current origin of graphics functions.*
- `void origin (int x, int y) FL_OVERRIDE`  
*Sets the position of the origin of graphics in the drawable part of the drawing surface.*
- `int printable_rect (int *w, int *h) FL_OVERRIDE`  
*Computes the width and height of the drawable area of the drawing surface.*
- `void translate (int x, int y) FL_OVERRIDE`  
*Translates the current graphics origin accounting for the current rotation.*
- `void untranslate () FL_OVERRIDE`  
*Undoes the effect of a previous translate() call.*
- `~Fl_SVG_File_Surface ()`  
*Destructor.*

### Additional Inherited Members

#### 33.136.1 Detailed Description

A drawing surface producing a Scalable Vector Graphics (SVG) file.

This drawing surface allows to store any FLTK graphics in vectorial form in a "Scalable Vector Graphics" file.

Usage example:

```

Fl_Window *win = ...// Window to draw to a .svg file
int ww = win->decorated_w();
int wh = win->decorated_h();
FILE *svg = fl_fopen("/path/to/mywindow.svg", "w");
if (svg) {
    Fl_SVG_File_Surface *surface = new Fl_SVG_File_Surface(ww, wh, svg);
    Fl_Surface_Device::push_current(surface);
    fl_color(FL_WHITE);
    fl_rectf(0, 0, ww, wh);
    surface->draw_decorated_window(win);
    Fl_Surface_Device::pop_current();
    delete surface; // the .svg file is not complete until the destructor was run
    fclose(svg);
}
  
```

**Note**

FLTK uses the PNG and JPEG libraries to encode images to the SVG format. For this reason, class [Fl\\_SVG\\_File\\_Surface](#) is placed in the fltk\_images library. If JPEG is not available at application build time, PNG is enough (but produces a quite larger output). If PNG isn't available either, images don't appear in the SVG output.

**33.136.2 Constructor & Destructor Documentation****33.136.2.1 Fl\_SVG\_File\_Surface()**

```
Fl_SVG_File_Surface::Fl_SVG_File_Surface (
    int width,
    int height,
    FILE * svg,
    int(*) (FILE *) closef = NULL )
```

Constructor of the SVG drawing surface.

**Parameters**

<i>width,height</i>	Width and height of the graphics area in FLTK drawing units
<i>svg</i>	A writable FILE pointer where the SVG data are to be sent. The resulting SVG data are not complete until after destruction of the <a href="#">Fl_SVG_File_Surface</a> object or after calling <a href="#">close()</a> .
<i>closef</i>	If not NULL, the destructor and <a href="#">close()</a> will call <code>closef(svg)</code> after all SVG data has been sent. If NULL, <code>fclose(svg)</code> is called instead. This allows to close the FILE pointer by, e.g., <code>pclose</code> , or, using a function such as <code>"int keep_open(FILE*) {return 0;}"</code> , to keep it open after completion of all output to <code>svg</code> . Function <code>closef</code> should return non zero to indicate an error.

**33.136.2.2 ~Fl\_SVG\_File\_Surface()**

```
Fl_SVG_File_Surface::~~Fl_SVG_File_Surface ( )
```

Destructor.

The underlying FILE pointer is processed as by [close\(\)](#).

**33.136.3 Member Function Documentation****33.136.3.1 close()**

```
int Fl_SVG_File_Surface::close ( )
```

Closes the FILE pointer where SVG data is output.

The underlying FILE is closed by function `fclose()` unless another function was set at object's construction time. The only operation possible after this on the [Fl\\_SVG\\_File\\_Surface](#) object is its destruction.

**Returns**

The value returned by the closing function call.

**33.136.3.2 origin() [1/2]**

```
void Fl_SVG_File_Surface::origin (
    int * x,
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

#### Parameters

out	x,y	If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.
-----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.136.3.3 origin() [2/2]

```
void Fl_SVG_File_Surface::origin (
    int x,
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous [printable\\_rect\(\)](#) call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive [origin\(\)](#) calls don't combine their effects. Origin() calls are not affected by [rotate\(\)](#) calls (for classes derived from [Fl\\_Paged\\_Device](#)).

#### Parameters

in	x,y	Horizontal and vertical positions in the drawing surface of the desired origin of graphics.
----	-----	---

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.136.3.4 printable\_rect()

```
int Fl_SVG_File_Surface::printable_rect (
    int * w,
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to [origin\(\)](#). If the object is derived from class [Fl\\_Paged\\_Device](#), values account for the user-selected paper type and print orientation and are changed by [scale\(\)](#) calls.

#### Returns

0 if OK, non-zero if any error

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.136.3.5 translate()

```
void Fl_SVG_File_Surface::translate (
    int x,
    int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation.

Each [translate\(\)](#) call must be matched by an [untranslate\(\)](#) call. Successive [translate\(\)](#) calls add up their effects.

Reimplemented from [Fl\\_Widget\\_Surface](#).

### 33.136.3.6 untranslate()

```
void Fl_SVG_File_Surface::untranslate (
    void ) [virtual]
```

Undoes the effect of a previous [translate\(\)](#) call.

Reimplemented from [Fl\\_Widget\\_Surface](#).

The documentation for this class was generated from the following file:

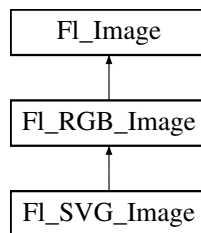
- `Fl_SVG_File_Surface.H`

### 33.137 Fl\_SVG\_Image Class Reference

The [Fl\\_SVG\\_Image](#) class supports loading, caching and drawing of scalable vector graphics (SVG) images.

```
#include <Fl_SVG_Image.H>
```

Inheritance diagram for [Fl\\_SVG\\_Image](#):



#### Public Member Functions

- [Fl\\_SVG\\_Image \\* as\\_svg\\_image \(\)](#) **FL\_OVERRIDE**  
Returns whether an image is an [Fl\\_SVG\\_Image](#) or not.
- void [color\\_average \(Fl\\_Color c, float i\)](#) **FL\_OVERRIDE**  
The [color\\_average\(\)](#) method averages the colors in the image with the provided FLTK color value.
- [Fl\\_Image \\* copy \(\)](#) const
- [Fl\\_Image \\* copy \(int W, int H\)](#) const **FL\_OVERRIDE**  
Creates a resized copy of the image.
- void [desaturate \(\)](#) **FL\_OVERRIDE**  
The [desaturate\(\)](#) method converts an image to grayscale.
- void **draw** (int X, int Y)
- void [draw](#) (int X, int Y, int W, int H, int cx=0, int cy=0) **FL\_OVERRIDE**  
Draws the image to the current drawing surface with a bounding box.
- [Fl\\_SVG\\_Image](#) (const char \*filename)  
Load an SVG image from a file.
- [Fl\\_SVG\\_Image](#) (const char \*sharedname, const char \*svg\_data)  
Load an SVG image from memory.
- [Fl\\_SVG\\_Image](#) (const char \*sharedname, const unsigned char \*svg\_data, size\_t length)  
Load an SVG image from memory.
- void [normalize \(\)](#) **FL\_OVERRIDE**  
Makes sure the object is fully initialized.
- void [resize](#) (int width, int height)  
Have the svg data (re-)rasterized using the given width and height values.
- virtual **~Fl\_SVG\_Image ()**  
The destructor frees all memory and server resources that are used by the SVG image.

#### Public Attributes

- bool [proportional](#)  
Set this to `false` to allow image re-scaling that alters the image aspect ratio.

## Additional Inherited Members

### 33.137.1 Detailed Description

The `Fl_SVG_Image` class supports loading, caching and drawing of scalable vector graphics (SVG) images.

The FLTK library performs parsing and rasterization of SVG data using a modified version of the `nanosvg` software (<https://github.com/memononen/nanosvg>). The software modification allows the option to change the image ratio while performing rasterization.

Use `Fl_Image::fail()` to check if the `Fl_SVG_Image` failed to load. `fail()` returns `ERR_FILE_ACCESS` if the file could not be opened or read, and `ERR_FORMAT` if the SVG format could not be decoded. If the image has loaded correctly, `w()`, `h()`, and `d()` should return values greater than zero.

Rasterization is not done until the image is first drawn or `resize()` or `normalize()` is called. Therefore, `array` is NULL until then. The delayed rasterization ensures an `Fl_SVG_Image` is always rasterized to the exact screen resolution at which it is drawn.

The `Fl_SVG_Image` class draws images computed by `nanosvg` with the following known limitations

- text between `<text>` and `</text>` marks,
- image elements, and
- `<use>` statements

are not rendered.

The FLTK library can optionally be built without SVG support; in that case, class `Fl_SVG_Image` is unavailable.

Example of displaying a hard-coded svg file:

```
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_SVG_Image.H>
// A black rotated rectangle
const char *svg_data = "<svg viewBox=\"0 0 200 200\" version = \"1.1\">\n"
    "<rect x=\"25\" y=\"50\" width=\"150\" height=\"100\" fill=\"black\" \"\n"
    "transform=\"rotate(45 100 100)\"> </svg>\n";

int main(int argc, char **argv) {
    Fl_SVG_Image *svg = new Fl_SVG_Image(0, svg_data); // create SVG object
    Fl_Window *win = new Fl_Window(720, 486, "svg test");
    Fl_Box *box = new Fl_Box(0, 0, win->w(), win->h());
    box->image(svg); // assign svg object to Fl_Box
    win->end();
    win->show(argc, argv);
    return(Fl::run());
}
```

Example of displaying an svg image from a file:

```
#include <errno.h> // errno
#include <string.h> // strerror
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_SVG_Image.H>
#include <FL/fl_message.H>

int main(int argc, char **argv) {
    Fl_Window *win = new Fl_Window(720, 486, "svg test");
    Fl_Box *box = new Fl_Box(0, 0, win->w(), win->h());
    // Load svg image from disk, assign to a box
    const char *svgpath = "/var/tmp/simple.svg";
    Fl_SVG_Image *svg = new Fl_SVG_Image(svgpath); // load SVG object from disk
    switch (svg->fail()) {
        case Fl_Image::ERR_FILE_ACCESS:
            // File couldn't load? show path + os error to user
            fl_alert("%s: %s", svgpath, strerror(errno));
            return 1;
        case Fl_Image::ERR_FORMAT:
            // Parsing error
            fl_alert("%s: couldn't decode image", svgpath);
            return 1;
    }
    box->image(svg); // assign svg object to box
    win->end();
    win->show(argc, argv);
    return(Fl::run());
}
```

Example of fitting an svg image to a resizable `Fl_Box`:

```
#include <FL/Fl_Window.H>
#include <FL/Fl_SVG_Image.H>
#include <FL/Fl_Box.H>
class resizable_box : public Fl_Box {
public:
```

```

resizable_box(int w, int h) : Fl_Box(0, 0, w, h, NULL) {}
virtual void resize(int x, int y, int w, int h) {
    image()->scale(w, h, 1, 1); // p3 = proportional, p4 = can_expand
    Fl_Box::resize(x, y, w, h);
}
};
int main(int argc, char **argv) {
    Fl_Window *win = new Fl_Window(130, 130);
    resizable_box *box = new resizable_box(win->w(), win->h());
    Fl_SVG_Image *svg = new Fl_SVG_Image("/path/to/image.svg");
    box->image(svg);
    svg->scale(box->w(), box->h());
    win->end();
    win->resizable(win);
    win->show(argc, argv);
    return Fl::run();
}

```

## 33.137.2 Constructor & Destructor Documentation

### 33.137.2.1 Fl\_SVG\_Image() [1/3]

```

Fl_SVG_Image::Fl_SVG_Image (
    const char * filename )

```

Load an SVG image from a file.

This constructor loads the SVG image from a .svg or .svgz file. The reader recognizes if the data is compressed, and decompresses it if zlib is available (HAVE\_LIBZ).

#### Parameters

<i>filename</i>	the filename for a .svg or .svgz file
-----------------	---------------------------------------

### 33.137.2.2 Fl\_SVG\_Image() [2/3]

```

Fl_SVG_Image::Fl_SVG_Image (
    const char * sharedname,
    const char * svg_data )

```

Load an SVG image from memory.

This constructor loads the SVG image from a block of memory. This version is commonly used for uncompressed text data, but the reader recognizes if the data is compressed, and decompresses it if zlib is available (HAVE\_LIBZ).

#### Parameters

<i>sharedname</i>	if not NULL, a shared image will be generated with this name
<i>svg_data</i>	a pointer to the memory location of the SVG image data

#### Note

In-memory SVG data is parsed by the object constructor and is no longer needed after construction.

### 33.137.2.3 Fl\_SVG\_Image() [3/3]

```

Fl_SVG_Image::Fl_SVG_Image (
    const char * name,
    const unsigned char * svg_data,
    size_t length )

```

Load an SVG image from memory.

This constructor loads the SVG image from a block of memory. This version is commonly used for compressed binary data, but the reader recognizes if the data is uncompressed, and reads it as a text block.

#### Parameters

<i>name</i>	if not NULL, a shared image will be generated with this name
<i>svg_data</i>	a pointer to the memory location of the SVG image data
<i>length</i>	of <i>svg_data</i> or 0 if the length is unknown. This will protect memory outside of the <i>svg_data</i> array from illegal read operations for compressed SVG data

#### Note

In-memory SVG data is parsed by the object constructor and is no longer needed after construction.

### 33.137.3 Member Function Documentation

#### 33.137.3.1 `as_svg_image()`

```
Fl_SVG_Image * Fl_SVG_Image::as_svg_image ( ) [inline], [virtual]
```

Returns whether an image is an [Fl\\_SVG\\_Image](#) or not.

This virtual method returns a pointer to the [Fl\\_SVG\\_Image](#) if this object is an instance of [Fl\\_SVG\\_Image](#) or NULL if not.

Reimplemented from [Fl\\_RGB\\_Image](#).

#### 33.137.3.2 `color_average()`

```
void Fl_SVG_Image::color_average (
    Fl_Color c,
    float i ) [virtual]
```

The [color\\_average\(\)](#) method averages the colors in the image with the provided FLTK color value.

The first argument specifies the FLTK color to be used.

The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from [Fl\\_RGB\\_Image](#).

#### 33.137.3.3 `copy()`

```
Fl_Image * Fl_SVG_Image::copy (
    int W,
    int H ) const [virtual]
```

Creates a resized copy of the image.

It is recommended not to call this member function to reduce the size of an image to the size of the area where this image will be drawn, and to use [Fl\\_Image::scale\(\)](#) instead.

The new image should be released when you are done with it.

Note: since FLTK 1.4.0 you can use [Fl\\_Image::release\(\)](#) for all types of images (i.e. all subclasses of [Fl\\_Image](#)) instead of operator *delete* for [Fl\\_Image](#)'s and [Fl\\_Image::release\(\)](#) for [Fl\\_Shared\\_Image](#)'s.

The new image data will be converted to the requested size. RGB images are resized using the algorithm set by [Fl\\_Image::RGB\\_scaling\(\)](#).

For the new image the following equations are true:

- `w() == data_w() == W`
- `h() == data_h() == H`

## Parameters

in	<i>W,H</i>	Requested width and height of the new image
----	------------	---

## Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of [Fl\\_RGB\\_Image](#), [Fl\\_SVG\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Bitmap](#), [Fl\\_Tiled\\_Image](#), [Fl\\_Anim\\_GIF\\_Image](#) and [Fl\\_Shared\\_Image](#). Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an [Fl\\_GIF\\_Image](#) is an object of class [Fl\\_Pixmap](#).

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from [Fl\\_Image](#) or any subclass your overridden methods of '[Fl\\_Image::copy\(\) const](#)' and '[Fl\\_Image::copy\(int, int\) const](#)' **must** also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from [Fl\\_RGB\\_Image](#).

**33.137.3.4 desaturate()**

```
void Fl_SVG_Image::desaturate ( ) [virtual]
```

The [desaturate\(\)](#) method converts an image to grayscale.

If the image contains an alpha channel (depth = 4), the alpha channel is preserved.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from [Fl\\_RGB\\_Image](#).

**33.137.3.5 draw()**

```
void Fl_SVG_Image::draw (
    int X,
    int Y,
    int W,
    int H,
    int cx = 0,
    int cy = 0 ) [virtual]
```

Draws the image to the current drawing surface with a bounding box.

Arguments X, Y, W, H specify a bounding box for the image, with the origin (upper-left corner) of the image offset by the cx and cy arguments.

In other words: `fl_push_clip(X,Y,W,H)` is applied, the image is drawn with its upper-left corner at X-cx, Y-cy and its own width and height, `fl_pop_clip()` is applied.

Reimplemented from [Fl\\_RGB\\_Image](#).

**33.137.3.6 normalize()**

```
void Fl_SVG_Image::normalize ( ) [virtual]
```

Makes sure the object is fully initialized.

This function rasterizes the SVG image, and consequently initializes its [array](#) member, if that was not done before.

Reimplemented from [Fl\\_RGB\\_Image](#).

**33.137.3.7 resize()**

```
void Fl_SVG_Image::resize (
    int width,
    int height )
```

Have the svg data (re-)rasterized using the given width and height values.

By default, the resulting image `w()` and `h()` will be close to `width` and `height` while preserving the width/height ratio of the SVG data. If `proportional` was set to `false`, the image is rasterized to the exact `width` and `height` values. In both cases, `data_w()` and `data_h()` values are set to `w()` and `h()`, respectively.

### 33.137.4 Member Data Documentation

#### 33.137.4.1 `proportional`

```
bool Fl_SVG_Image::proportional
```

Set this to `false` to allow image re-scaling that alters the image aspect ratio.

Upon object creation, `proportional` is set to `true`, and the aspect ratio is kept constant.

The documentation for this class was generated from the following files:

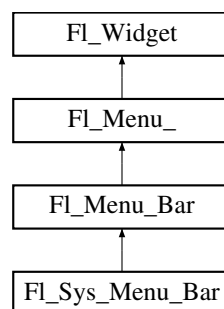
- `Fl_SVG_Image.H`
- `Fl_SVG_Image.cxx`

## 33.138 Fl\_Sys\_Menu\_Bar Class Reference

A class to create and modify menus that appear on macOS in the menu bar at the top of the screen.

```
#include <Fl_Sys_Menu_Bar.H>
```

Inheritance diagram for `Fl_Sys_Menu_Bar`:



### Public Types

- enum `window_menu_style_enum` { `no_window_menu` = 0, `tabbing_mode_none`, `tabbing_mode_automatic`, `tabbing_mode_preferred` }

*Possible styles of the Window menu in the system menu bar.*

### Public Member Functions

- int `add` (const char \*label, const char \*shortcut, `Fl_Callback` \*cb, void \*user\_data=0, int flags=0)  
*Adds a new menu item.*
- int `add` (const char \*label, int shortcut, `Fl_Callback` \*, void \*user\_data=0, int flags=0)  
*Add a new menu item to the system menu bar.*
- int `add` (const char \*str)  
*Forms-compatible procedure to add items to the system menu bar.*
- void `clear` ()  
*Set the `Fl_Menu_Item` array pointer to null, indicating a zero-length menu.*
- int `clear_submenu` (int index)  
*Clears the specified submenu pointed to by index of all menu items.*
- `Fl_Sys_Menu_Bar` (int x, int y, int w, int h, const char \*l=0)  
*The constructor.*

- int [insert](#) (int index, const char \*[label](#), const char \*[shortcut](#), [FI\\_Callback](#) \*cb, void \*[user\\_data](#)=0, int [flags](#)=0)  
*Insert a new menu item.*
- int [insert](#) (int index, const char \*[label](#), int [shortcut](#), [FI\\_Callback](#) \*cb, void \*[user\\_data](#)=0, int [flags](#)=0)  
*insert in the system menu bar a new menu item*
- const [FI\\_Menu\\_Item](#) \* [menu](#) () const  
*Return the system menu's array of [FI\\_Menu\\_Item](#)'s.*
- void [menu](#) (const [FI\\_Menu\\_Item](#) \*m)  
*create a system menu bar using the given list of menu structs*
- int [mode](#) (int i) const  
*Gets the flags of item i.*
- void [mode](#) (int i, int fl)  
*Sets the flags of item i.*
- void [play\\_menu](#) (const [FI\\_Menu\\_Item](#) \*) [FL\\_OVERRIDE](#)  
*Opens the 1st level submenu of the menubar corresponding to *item*.*
- void [remove](#) (int n)  
*remove an item from the system menu bar*
- void [replace](#) (int index, const char \*name)  
*rename an item from the system menu bar*
- void [setonly](#) ([FI\\_Menu\\_Item](#) \*item)  
*Turns the radio item "on" for the menu item and turns "off" adjacent radio items of the same group.*
- void [shortcut](#) (int i, int s)  
*Changes the shortcut of item i to n.*
- void [update](#) () [FL\\_OVERRIDE](#)  
*Updates the menu bar after any change to its items.*
- virtual ~[FI\\_Sys\\_Menu\\_Bar](#) ()  
*The destructor.*

## Static Public Member Functions

- static void [about](#) ([FI\\_Callback](#) \*cb, void \*data)  
*Attaches a callback to the "About myprog" item of the system application menu.*
- static void [create\\_window\\_menu](#) ()  
*Adds a Window menu, to the end of the system menu bar.*
- static [window\\_menu\\_style\\_enum](#) [window\\_menu\\_style](#) ()  
*Get the style of the Window menu in the system menu bar.*
- static void [window\\_menu\\_style](#) ([window\\_menu\\_style\\_enum](#) style)  
*Set the desired style of the Window menu in the system menu bar.*

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*

## Additional Inherited Members

### 33.138.1 Detailed Description

A class to create and modify menus that appear on macOS in the menu bar at the top of the screen.

On other than macOS platforms, [FI\\_Sys\\_Menu\\_Bar](#) is a synonym of class [FI\\_Menu\\_Bar](#).

On the macOS platform, replace [FI\\_Menu\\_Bar](#) with [FI\\_Sys\\_Menu\\_Bar](#), and a system menu at the top of the screen will be available. This menu will match an array of [FI\\_Menu\\_Item](#)'s exactly as in all other FLTK menus (except for the submenu with the application's own name and the 'Window' menu; see below). There is, though, an important difference between an [FI\\_Sys\\_Menu\\_Bar](#) object under macOS and under other platforms: only a single object from

this class can be created, because macOS uses a single system menu bar. Therefore, porting to macOS an app that creates, on other platforms, several `Fl_Menu_Bar` objects, one for each of several windows, is more complex than just replacing `Fl_Menu_Bar` by `Fl_Sys_Menu_Bar`.

On the macOS platform, the system menu bar of any FLTK app begins with the Application menu which the FLTK library automatically constructs. Functions `Fl_Mac_App_Menu::custom_application_menu_items()` and `Fl_Sys_Menu_Bar::about()` can be used to further customize the Application menu. The FLTK library also automatically constructs and handles a Window menu which can be further customized (or even removed) calling `Fl_Sys_Menu_Bar::window_menu_style(window_menu_style_enum style)`. Other member functions of this class allow the app to generate the rest of the system menu bar. It is recommended to localize the system menu bar using the standard Mac OS X localization procedure (see [Internationalization](#)).

Changes to the menu state are immediately visible in the menubar when they are made using member functions of the `Fl_Sys_Menu_Bar` class. Other changes (e.g., by a call to `Fl_Menu_Item::set()`) should be followed by a call to `update()` to be visible in the menubar across all platforms. macOS global variable `fl_sys_menu_bar` points to the unique, current system menu bar.

A few FLTK menu features are not supported by the Mac System menu:

- no symbolic labels
- no embossed labels
- no font sizes

As described above, the submenu with the application's own name (usually the second submenu from the left, immediately following the "Apple" submenu) is a special case, and can be managed with `Fl_Mac_App_Menu::custom_application_menu_items()`. For example, to make your own "Appname -> Preferences" dialog, you might use:

```
#include <FL/platform.H> // for Fl_Mac_App_Menu class
#include <FL/Fl_Sys_Menu_Bar.H> // for Fl_Menu_Item
:
void prefs_cb(Fl_Widget *w, void *data) {
    // ..Open your preferences dialog here..
}
:
int main(..) {
    :
    // Items to add to the application menu
    static Fl_Menu_Item appitems[] = {
        { "Preferences", 0, prefs_cb, 0, 0 },
        { 0 }, { 0 }
    };
    Fl_Mac_App_Menu::custom_application_menu_items(appitems); // adds it
}
```

..the result being:

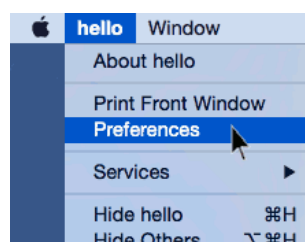


Figure 33.46 Mac Application submenu

## 33.138.2 Member Enumeration Documentation

### 33.138.2.1 window\_menu\_style\_enum

```
enum Fl_Sys_Menu_Bar::window_menu_style_enum
```

Possible styles of the Window menu in the system menu bar.

#### Enumerator

<code>no_window_menu</code>	No Window menu in the system menu bar.
-----------------------------	--

## Enumerator

<code>tabbing_mode_none</code>	No tabbed windows, but the system menu bar contains a Window menu.
<code>tabbing_mode_automatic</code>	Windows are created by themselves but can be tabbed later.
<code>tabbing_mode_preferred</code>	Windows are tabbed when created.

### 33.138.3 Constructor & Destructor Documentation

#### 33.138.3.1 Fl\_Sys\_Menu\_Bar()

```
Fl_Sys_Menu_Bar::Fl_Sys_Menu_Bar (
    int x,
    int y,
    int w,
    int h,
    const char * l = 0 )
```

The constructor.

On Mac OS X, all arguments are unused. On other platforms they are used as by [Fl\\_Menu\\_Bar::Fl\\_Menu\\_Bar\(\)](#).

### 33.138.4 Member Function Documentation

#### 33.138.4.1 about()

```
void Fl_Sys_Menu_Bar::about (
    Fl_Callback * cb,
    void * data ) [static]
```

Attaches a callback to the "About myprog" item of the system application menu.

This cross-platform function is effective only under the MacOS platform.

## Parameters

<i>cb</i>	a callback that will be called by "About myprog" menu item with NULL 1st argument.
<i>data</i>	a pointer transmitted as 2nd argument to the callback.

#### 33.138.4.2 add() [1/3]

```
int Fl_Sys_Menu_Bar::add (
    const char * label,
    const char * shortcut,
    Fl_Callback * cb,
    void * user_data = 0,
    int flags = 0 ) [inline]
```

Adds a new menu item.

See also

[Fl\\_Menu\\_::add](#)(const char\* [label](#), int [shortcut](#), [Fl\\_Callback\\*](#), void \*[user\\_data](#)=0, int [flags](#)=0)

#### 33.138.4.3 add() [2/3]

```
int Fl_Sys_Menu_Bar::add (
```

```

    const char * label,
    int shortcut,
    Fl_Callback * cb,
    void * user_data = 0,
    int flags = 0 )

```

Add a new menu item to the system menu bar.

Add to the system menu bar a new menu item, with a title string, shortcut int, callback, argument to the callback, and flags.

#### Parameters

<i>label</i>	- new menu item's label
<i>shortcut</i>	- new menu item's integer shortcut (can be 0 for none, or e.g. FL_ALT+'x')
<i>cb</i>	- callback to be invoked when item selected (can be 0 for none, in which case the menubar's <a href="#">callback()</a> can be used instead)
<i>user_data</i>	- argument to the callback
<i>flags</i>	- item's flags, e.g. <a href="#">FL_MENU_TOGGLE</a> , etc.

#### Returns

the index into the [menu\(\)](#) array, where the entry was added

#### See also

[Fl\\_Menu\\_::add\(const char\\* label, int shortcut, Fl\\_Callback \\*cb, void \\*user\\_data, int flags\)](#)

#### 33.138.4.4 add() [3/3]

```

int Fl_Sys_Menu_Bar::add (
    const char * str )

```

Forms-compatible procedure to add items to the system menu bar.

#### Returns

the index into the [menu\(\)](#) array, where the entry was added

#### See also

[Fl\\_Menu\\_::add\(const char\\* str\)](#)

#### 33.138.4.5 clear()

```

void Fl_Sys_Menu_Bar::clear (
    void )

```

Set the [Fl\\_Menu\\_Item](#) array pointer to null, indicating a zero-length menu.

#### See also

[Fl\\_Menu\\_::clear\(\)](#)

#### 33.138.4.6 clear\_submenu()

```

int Fl_Sys_Menu_Bar::clear_submenu (
    int index )

```

Clears the specified submenu pointed to by index of all menu items.

See also

[Fl\\_Menu\\_::clear\\_submenu\(int index\)](#)

### 33.138.4.7 create\_window\_menu()

```
void Fl_Sys_Menu_Bar::create_window_menu ( ) [static]
```

Adds a Window menu, to the end of the system menu bar.

FLTK apps typically don't need to call this function which is automatically called by the library the first time a window is shown. The default system menu bar contains a Window menu with a "Merge All Windows" item. Other Window menu styles can be obtained calling [Fl\\_Sys\\_Menu\\_Bar::window\\_menu\\_style\(window\\_menu\\_style\\_enum\)](#) before the first [Fl\\_Window::show\(\)](#). Alternatively, an app can call [create\\_window\\_menu\(\)](#) after having populated the system menu bar, for example with [menu\(const Fl\\_Menu\\_Item \\*\)](#), and before the first [Fl\\_Window::show\(\)](#). This function does nothing on non MacOS platforms.

Version

1.4

### 33.138.4.8 draw()

```
void Fl_Sys_Menu_Bar::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                  // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Menu\\_Bar](#).

### 33.138.4.9 insert() [1/2]

```
int Fl_Sys_Menu_Bar::insert (
    int index,
    const char * label,
    const char * shortcut,
    Fl_Callback * cb,
    void * user_data = 0,
    int flags = 0 ) [inline]
```

Insert a new menu item.

See also

[Fl\\_Menu\\_::insert\(int index, const char\\* label, const char\\* shortcut, Fl\\_Callback \\*cb, void \\*user\\_data=0, int flags=0\)](#)

### 33.138.4.10 insert() [2/2]

```
int Fl_Sys_Menu_Bar::insert (
    int index,
    const char * label,
    int shortcut,
    Fl_Callback * cb,
```

```
void * user_data = 0,
int flags = 0 )
```

insert in the system menu bar a new menu item

Insert in the system menu bar a new menu item, with a title string, shortcut int, callback, argument to the callback, and flags.

#### Returns

the index into the [menu\(\)](#) array, where the entry was inserted

#### See also

[Fl\\_Menu\\_::insert\(int index, const char\\* label, int shortcut, Fl\\_Callback \\*cb, void \\*user\\_data, int flags\)](#)

### 33.138.4.11 menu()

```
void Fl_Sys_Menu_Bar::menu (
    const Fl_Menu_Item * m )
```

create a system menu bar using the given list of menu structs

#### Author

Matthias Melcher

#### Parameters

<i>m</i>	Zero-ending list of <a href="#">Fl_Menu_Item</a> 's
----------	---

### 33.138.4.12 mode()

```
void Fl_Sys_Menu_Bar::mode (
    int i,
    int fl )
```

Sets the flags of item i.

#### See also

[Fl\\_Menu\\_::mode\(int i, int fl\)](#)

### 33.138.4.13 play\_menu()

```
void Fl_Sys_Menu_Bar::play_menu (
    const Fl_Menu_Item * item ) [virtual]
```

Opens the 1st level submenu of the menubar corresponding to item.

#### Since

1.4.0

Reimplemented from [Fl\\_Menu\\_Bar](#).

### 33.138.4.14 remove()

```
void Fl_Sys_Menu_Bar::remove (
    int index )
```

remove an item from the system menu bar

## Parameters

<i>index</i>	the index of the item to remove
--------------	---------------------------------

**33.138.4.15 replace()**

```
void Fl_Sys_Menu_Bar::replace (
    int index,
    const char * name )
```

rename an item from the system menu bar

## Parameters

<i>index</i>	the index of the item to rename
<i>name</i>	the new item name as a UTF8 string

**33.138.4.16 update()**

```
void Fl_Sys_Menu_Bar::update ( ) [virtual]
```

Updates the menu bar after any change to its items.

This is useful when the menu bar can be an [Fl\\_Sys\\_Menu\\_Bar](#) object.

Reimplemented from [Fl\\_Menu\\_Bar](#).

**33.138.4.17 window\_menu\_style()**

```
void Fl_Sys_Menu_Bar::window_menu_style (
    Fl\_Sys\_Menu\_Bar::window\_menu\_style\_enum style ) [static]
```

Set the desired style of the Window menu in the system menu bar.

This function, to be called before the first call to [Fl\\_Window::show\(\)](#), allows to control whether the system menu bar should contain a Window menu, and if yes, whether new windows should be displayed in tabbed form. These are the effects of various values for *style*:

- `no_window_menu`: don't add a Window menu to the system menu bar
- `tabbing_mode_none`: add a simple Window menu to the system menu bar
- `tabbing_mode_automatic`: the window menu also contains "Merge All Windows" to group all windows in a single tabbed display mode. This is the **default** Window menu style for FLTK apps.
- `tabbing_mode_preferred`: new windows are displayed in tabbed mode when first created

The Window menu, if present, is entirely created and controlled by the FLTK library. Mac OS version 10.12 or later must be running for windows to be displayed in tabbed form. Under non MacOS platforms, this function does nothing.

## Version

1.4

The documentation for this class was generated from the following files:

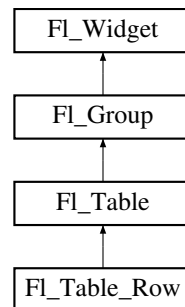
- [Fl\\_Sys\\_Menu\\_Bar.H](#)
- [Fl\\_Sys\\_Menu\\_Bar.cxx](#)

## 33.139 Fl\_Table Class Reference

A table of widgets or other content.

```
#include <Fl_Table.H>
```

Inheritance diagram for Fl\_Table:



### Public Types

- enum [TableContext](#) {  
[CONTEXT\\_NONE](#) = 0 , [CONTEXT\\_STARTPAGE](#) = 0x01 , [CONTEXT\\_ENDPAGE](#) = 0x02 , [CONTEXT\\_ROW\\_HEADER](#) = 0x04 ,  
[CONTEXT\\_COL\\_HEADER](#) = 0x08 , [CONTEXT\\_CELL](#) = 0x10 , [CONTEXT\\_TABLE](#) = 0x20 , [CONTEXT\\_RC\\_RESIZE](#) = 0x40 }

The context bit flags for [Fl\\_Table](#) related callbacks.

### Public Member Functions

- void **add** ([Fl\\_Widget](#) &wgt)  
The specified widget is removed from its current group (if any) and added to the end of [Fl\\_Table](#)'s group.
- void **add** ([Fl\\_Widget](#) \*wgt)  
The specified widget is removed from its current group (if any) and added to the end of [Fl\\_Table](#)'s group.
- [Fl\\_Widget](#) \*const \* **array** ()  
Returns a pointer to the array of children.
- void **begin** ()
- void **callback** ([Fl\\_Widget](#) \*, void \*)  
Callbacks will be called depending on the setting of [Fl\\_Widget::when\(\)](#).
- int **callback\_col** ()  
Returns the current column the event occurred on.
- [TableContext](#) **callback\_context** ()  
Returns the current 'table context'.
- int **callback\_row** ()  
Returns the current row the event occurred on.
- [Fl\\_Widget](#) \* **child** (int n) const  
Returns the child widget by an index.
- int **children** () const  
Returns the number of children in the table.
- virtual void **clear** ()  
Clears the table to zero rows ([rows\(0\)](#)), zero columns ([cols\(0\)](#)), and clears any widgets ([table->clear\(\)](#)) that were added with [begin\(\)/end\(\)](#) or [add\(\)/insert\(\)/etc.](#)
- int **col\_header** ()  
Returns if column headers are enabled or not.
- void **col\_header** (int flag)  
Enable or disable column headers.

- [FI\\_Color](#) **col\_header\_color** ()  
*Gets the color for column headers.*
- void **col\_header\_color** ([FI\\_Color](#) val)  
*Sets the color for column headers and redraws the table.*
- int **col\_header\_height** ()  
*Gets the column header height.*
- void **col\_header\_height** (int height)  
*Sets the height in pixels for column headers and redraws the table.*
- int **col\_position** ()  
*Returns the current column scroll position as a column number.*
- void **col\_position** (int col)  
*Sets the horizontal scroll position so 'col' is at the left, and causes the screen to redraw.*
- int **col\_resize** ()  
*Returns if column resizing by the user is allowed.*
- void **col\_resize** (int flag)  
*Allows/disallows column resizing by the user.*
- int **col\_resize\_min** ()  
*Returns the current column minimum resize value.*
- void **col\_resize\_min** (int val)  
*Sets the current column minimum resize value.*
- int **col\_width** (int col)  
*Returns the current width of the specified column in pixels.*
- void **col\_width** (int col, int width)  
*Sets the width of the specified column in pixels, and the table is redrawn.*
- void **col\_width\_all** (int width)  
*Convenience method to set the width of all columns to the same value, in pixels.*
- int **cols** ()  
*Get the number of columns in the table.*
- virtual void **cols** (int val)  
*Set the number of columns in the table and redraw.*
- void **do\_callback** ([TableContext](#) context, int row, int col)  
*Calls the widget callback.*
- void **end** ()
- int **find** (const [FI\\_Widget](#) &wgt) const
- int **find** (const [FI\\_Widget](#) \*wgt) const
- [FI\\_Table](#) (int X, int Y, int W, int H, const char \*l=0)  
*The constructor for [FI\\_Table](#).*
- void **get\_selection** (int &row\_top, int &col\_left, int &row\_bot, int &col\_right)  
*Gets the region of cells selected (highlighted).*
- void **init\_sizes** ()  
*Resets the internal array of widget sizes and positions.*
- void **insert** ([FI\\_Widget](#) &wgt, [FI\\_Widget](#) \*w2)  
*The specified widget is removed from its current group (if any) and inserted into [FI\\_Table](#)'s group before widget 'w2'.*
- void **insert** ([FI\\_Widget](#) &wgt, int n)  
*The specified widget is removed from its current group (if any) and inserted into the [FI\\_Table](#)'s group at position 'n'.*
- int **is\_interactive\_resize** ()  
*Returns 1 if someone is interactively resizing a row or column.*
- int **is\_selected** (int r, int c)  
*See if the cell at row *r* and column *c* is selected.*
- int **move\_cursor** (int R, int C)  
*Same as `move_cursor(R,C,1);`.*

- int [move\\_cursor](#) (int R, int C, int shiftselect)  
*Moves the selection cursor a relative number of rows/columns specified by R/C.*
- void [remove](#) ([FL\\_Widget](#) &wgt)  
*The specified widget is removed from [FL\\_Table](#)'s group.*
- void [resize](#) (int X, int Y, int W, int H) [FL\\_OVERRIDE](#)  
*Handle resize events if user resizes parent window.*
- int [row\\_header](#) ()  
*Returns if row headers are enabled or not.*
- void [row\\_header](#) (int flag)  
*Enables/disables showing the row headers.*
- [FL\\_Color](#) [row\\_header\\_color](#) ()  
*Returns the current row header color.*
- void [row\\_header\\_color](#) ([FL\\_Color](#) val)  
*Sets the row header color and causes the screen to redraw.*
- int [row\\_header\\_width](#) ()  
*Returns the current row header width (in pixels).*
- void [row\\_header\\_width](#) (int width)  
*Sets the row header width to n and causes the screen to redraw.*
- int [row\\_height](#) (int row)  
*Returns the current height of the specified row as a value in pixels.*
- void [row\\_height](#) (int row, int height)  
*Sets the height of the specified row in pixels, and the table is redrawn.*
- void [row\\_height\\_all](#) (int height)  
*Convenience method to set the height of all rows to the same value, in pixels.*
- int [row\\_position](#) ()  
*Returns the current row scroll position as a row number.*
- void [row\\_position](#) (int row)  
*Sets the vertical scroll position so 'row' is at the top, and causes the screen to redraw.*
- int [row\\_resize](#) ()  
*Returns if row resizing by the user is allowed.*
- void [row\\_resize](#) (int flag)  
*Allows/disallows row resizing by the user.*
- int [row\\_resize\\_min](#) ()  
*Returns the current row minimum resize value.*
- void [row\\_resize\\_min](#) (int val)  
*Sets the current row minimum resize value.*
- int [rows](#) ()  
*Returns the number of rows in the table.*
- virtual void [rows](#) (int val)  
*Sets the number of rows in the table, and the table is redrawn.*
- int [scrollbar\\_size](#) () const  
*Gets the current size of the scrollbars' troughs, in pixels.*
- void [scrollbar\\_size](#) (int newSize)  
*Sets the pixel size of the scrollbars' troughs to newSize, in pixels.*
- void [set\\_selection](#) (int row\_top, int col\_left, int row\_bot, int col\_right)  
*Sets the region of cells to be selected (highlighted).*
- int [tab\\_cell\\_nav](#) () const  
*Get state of table's 'Tab' key cell navigation flag.*
- void [tab\\_cell\\_nav](#) (int val)  
*Flag to control if Tab navigates table cells or not.*
- void [table\\_box](#) ([FL\\_Boxtype](#) val)

- Sets the kind of box drawn around the data table, the default being FL\_NO\_BOX.*
- [Fl\\_Boxtype](#) **table\_box** (void)
  - Returns the current box type used for the data table.*
- int [top\\_row](#) ()
  - Returns the current top row shown in the table.*
- void [top\\_row](#) (int row)
  - Sets which row should be at the top of the table, scrolling as necessary, and the table is redrawn.*
- void [visible\\_cells](#) (int &r1, int &r2, int &c1, int &c2)
  - Returns the range of row and column numbers for all visible and partially visible cells in the table.*
- void [when](#) (FL\_When flags)
  - The [FL\\_Widget::when\(\)](#) function is used to set a group of flags, determining when the widget callback is called:*
- [~Fl\\_Table](#) ()
  - The destructor for [Fl\\_Table](#).*

## Protected Types

- enum **ResizeFlag** {
  - RESIZE\_NONE** = 0 , **RESIZE\_COL\_LEFT** = 1 , **RESIZE\_COL\_RIGHT** = 2 , **RESIZE\_ROW\_ABOVE** = 3 ,
  - RESIZE\_ROW\_BELOW** = 4 }

## Protected Member Functions

- void **change\_cursor** ([Fl\\_Cursor](#) newcursor)
  - Change mouse cursor to different type.*
- long **col\_scroll\_position** (int col)
  - Returns the scroll position (in pixels) of the specified column 'col'.*
- [TableContext](#) **cursor2rowcol** (int &R, int &C, ResizeFlag &resizeflag)
  - Find row/col for the recent mouse event.*
- void **damage\_zone** (int r1, int c1, int r2, int c2, int r3=0, int c3=0)
  - Sets the damage zone to the specified row/col values.*
- void **draw** () [FL\\_OVERRIDE](#)
  - Draws the entire [Fl\\_Table](#).*
- virtual void **draw\_cell** ([TableContext](#) context, int R=0, int C=0, int X=0, int Y=0, int W=0, int H=0)
  - Subclass should override this method to handle drawing the cells.*
- int **find\_cell** ([TableContext](#) context, int R, int C, int &X, int &Y, int &W, int &H)
  - Find a cell's X/Y/W/H region for the specified cell in row 'R', column 'C'.*
- void **get\_bounds** ([TableContext](#) context, int &X, int &Y, int &W, int &H)
  - Returns the (X,Y,W,H) bounding region for the specified 'context'.*
- int **handle** (int e) [FL\\_OVERRIDE](#)
  - Handle FLTK events.*
- int **is\_fltk\_container** ()
  - Does the table contain any child fltk widgets?*
- void **recalc\_dimensions** ()
  - Recalculate the dimensions of the table, and affect any children.*
- void **redraw\_range** (int topRow, int botRow, int leftCol, int rightCol)
  - Define region of cells to be redrawn by specified range of rows/cols, and then sets damage(DAMAGE\_CHILD).*
- int **row\_col\_clamp** ([TableContext](#) context, int &R, int &C)
  - Return specified row/col values R and C to within the table's current row/col limits.*
- long **row\_scroll\_position** (int row)
  - Returns the scroll position (in pixels) of the specified 'row'.*
- void **table\_resized** ()
  - Call this if table was resized, to recalculate internal data.*
- void **table\_scrolled** ()
  - Recalculate internals after a scroll.*

## Static Protected Member Functions

- static void **scroll\_cb** ([FI\\_Widget](#) \*, void \*)  
*Callback for when someone moves a scrollbar.*

## Protected Attributes

- int **botrow**  
*bottom row# of currently visible table on screen*
- int **current\_col**  
*selection cursor's current column (-1 if none)*
- int **current\_row**  
*selection cursor's current row (-1 if none)*
- [FI\\_Scrollbar](#) \* **hscrollbar**  
*child horizontal scrollbar widget*
- int **leftcol**  
*left column# of currently visible table on screen*
- int **leftcol\_scrollpos**  
*precomputed scroll position for left column*
- int **rightcol**  
*right column# of currently visible table on screen*
- int **select\_col**  
*extended selection column (-1 if none)*
- int **select\_row**  
*extended selection row (-1 if none)*
- [FI\\_Scroll](#) \* **table**  
*child [FI\\_Scroll](#) widget container for child fltk widgets (if any)*
- int **table\_h**  
*table's virtual height (in pixels)*
- int **table\_w**  
*table's virtual width (in pixels)*
- int **tih**  
*Data table's inner h dimension, inside bounding box. See [Table Dimension Diagram](#).*
- int **tiw**  
*Data table's inner w dimension, inside bounding box. See [Table Dimension Diagram](#).*
- int **tix**  
*Data table's inner x dimension, inside bounding box. See [Table Dimension Diagram](#).*
- int **tiy**  
*Data table's inner y dimension, inside bounding box. See [Table Dimension Diagram](#).*
- int **toh**  
*Data table's outer h dimension, outside bounding box. See [Table Dimension Diagram](#).*
- int **toprow**  
*top row# of currently visible table on screen*
- int **toprow\_scrollpos**  
*precomputed scroll position for top row*
- int **tow**  
*Data table's outer w dimension, outside bounding box. See [Table Dimension Diagram](#).*
- int **tox**  
*Data table's outer x dimension, outside bounding box. See [Table Dimension Diagram](#).*
- int **toy**  
*Data table's outer y dimension, outside bounding box. See [Table Dimension Diagram](#).*
- [FI\\_Scrollbar](#) \* **vscrollbar**

*child vertical scrollbar widget*

- int **wih**

*Table widget's inner h dimension, inside bounding box. See [Table Dimension Diagram](#).*

- int **wiw**

*Table widget's inner w dimension, inside bounding box. See [Table Dimension Diagram](#).*

- int **wix**

*Table widget's inner x dimension, inside bounding box. See [Table Dimension Diagram](#).*

- int **wiy**

*Table widget's inner y dimension, inside bounding box. See [Table Dimension Diagram](#).*

## Additional Inherited Members

### 33.139.1 Detailed Description

A table of widgets or other content.

This is the base class for table widgets.

To be useful it must be subclassed and several virtual functions defined. Normally applications use widgets derived from this widget, and do not use this widget directly; this widget is usually too low level to be used directly by applications.

This widget does *not* handle the data in the table. The [draw\\_cell\(\)](#) method must be overridden by a subclass to manage drawing the contents of the cells.

This widget can be used in several ways:

- As a custom widget; see examples/table-simple.cxx and test/table.cxx. Very optimal for even extremely large tables.
- As a table made up of a single FLTK widget instanced all over the table, simulating a numeric spreadsheet. See examples/table-spreadsheet.cxx and examples/table-spreadsheet-with-keyboard-nav.cxx. Optimal for large tables.
- As a regular container of FLTK widgets, one widget per cell. See examples/table-as-container.cxx. *Not* recommended for large tables.

	A	B	C	D	E
000:	1000	1001	1002	1003	1004
001:	2000	2001	2002	2003	2004
002:	3000	3001	3002	3003	3004
003:	4000	4001	4002	4003	4004
004:	5000	5001	5002	5003	5004
005:	6000	6001	6002	6003	6004
006:	7000	7001	7002	7003	7004
007:	8000	8001	8002	8003	8004
008:	9000	9001	9002	9003	9004
009:	10000	10001	10002	10003	10004

Figure 33.47 table-simple example

	Column 0	Column 1	Column 2	Column 3	Column 4	Column 5
Row 0	0/0	0.1	0/2	0.3	0/4	0.5
Row 1	1/0	1.1	1/2	1.3	1/4	1.5
Row 2	2/0	2.1	2/2	2.3	2/4	2.5
Row 3	3/0	3.1	3/2	3.3	3/4	3.5
Row 4	4/0	4.1	4/2	4.3	4/4	4.5
Row 5	5/0	5.1	5/2	5.3	5/4	5.5
Row 6	6/0	6.1	6/2	6.3	6/4	6.5
Row 7	7/0	7.1	7/2	7.3	7/4	7.5

Figure 33.48 table-as-container example

When acting as part of a custom widget, events on the cells and/or headings generate callbacks when they are clicked by the user. You control when events are generated based on the setting for [Fl\\_Table::when\(\)](#).

When acting as a container for FLTK widgets, the FLTK widgets maintain themselves. Although the `draw_cell()` method must be overridden, its contents can be very simple. See the `draw_cell()` code in `examples/table-simple.cxx`.

The following variables are available to classes deriving from `FI_Table`:

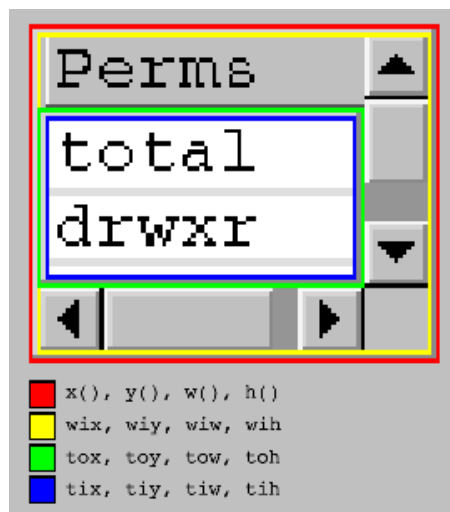


Figure 33.49 FI\_Table Dimensions

<code>x()/y()/w()/h()</code>	<code>FI_Table</code> widget's outer dimension. The outer edge of the border of the <code>FI_Table</code> . (Red in the diagram above)
<code>wix/wiy/wiw/wih</code>	<code>FI_Table</code> widget's inner dimension. The inner edge of the border of the <code>FI_Table</code> . eg. if the <code>FI_Table</code> 's <code>box()</code> is <code>FL_NO_BOX</code> , these values are the same as <code>x()/y()/w()/h()</code> . (Yellow in the diagram above)
<code>tox/toy/tow/toh</code>	The table's outer dimension. The outer edge of the border around the cells, but inside the row/col headings and scrollbars. (Green in the diagram above)
<code>tix/tiy/tiw/tih</code>	The table's inner dimension. The inner edge of the border around the cells, but inside the row/col headings and scrollbars. AKA the table's clip region. eg. if the <code>table_box()</code> is <code>FL_↔NO_BOX</code> , these values are the same as <code>tox/toy/tow/toh</code> . (Blue in the diagram above)

#### CORE DEVELOPERS

- Greg Ercolano : 12/16/2002 - initial implementation 12/16/02. `FI_Table`, `FI_Table_Row`, docs.
- Jean-Marc Lienher : 02/22/2004 - added keyboard nav + mouse selection, and ported `FI_Table` into `fltk-utf8-1.1.4`

#### OTHER CONTRIBUTORS

- Inspired by the Feb 2000 version of FLVW's `Flvw_Table` widget. Mucho thanks to those folks.
- Mister Satan : 04/07/2003 - MinGW porting mods, and `singleinput.cxx`; a cool `FI_Input` oriented spreadsheet example
- Marek Paliwoda : 01/08/2003 - Porting mods for Borland
- Ori Berger : 03/16/2006 - Optimizations for >500k rows/cols

#### LICENSE

Greg kindly gave his permission to integrate `FI_Table` and `FI_Table_Row` into FLTK, allowing FLTK license to apply while his widgets are part of the library. [updated by Greg, 04/26/17]

## 33.139.2 Member Enumeration Documentation

### 33.139.2.1 TableContext

enum `Fl_Table::TableContext`

The context bit flags for `Fl_Table` related callbacks.

Should be used in `draw_cell()` to determine what's being drawn, or in a `callback()` to determine where a recent event occurred.

Enumerator

CONTEXT_NONE	no known context
CONTEXT_STARTPAGE	before the table is redrawn
CONTEXT_ENDPAGE	after the table is redrawn
CONTEXT_ROW_HEADER	drawing or event occurred in the row header
CONTEXT_COL_HEADER	drawing or event occurred in the col header
CONTEXT_CELL	drawing or event occurred in a cell
CONTEXT_TABLE	drawing or event occurred in a dead zone of table
CONTEXT_RC_RESIZE	column or row is being resized

## 33.139.3 Constructor & Destructor Documentation

### 33.139.3.1 Fl\_Table()

```
Fl_Table::Fl_Table (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

The constructor for `Fl_Table`.

This creates an empty table with no rows or columns, with headers and row/column resize behavior disabled.

### 33.139.3.2 ~Fl\_Table()

```
Fl_Table::~Fl_Table ( )
```

The destructor for `Fl_Table`.

Destroys the table and its associated widgets.

## 33.139.4 Member Function Documentation

### 33.139.4.1 array()

```
Fl_Widget *const * Fl_Table::array ( ) [inline]
```

Returns a pointer to the array of children.

*This pointer is only valid until the next time a child is added or removed.*

### 33.139.4.2 callback()

```
void Fl_Table::callback (
    Fl_Widget * ,
```

```
void * )
```

Callbacks will be called depending on the setting of `Fl_Widget::when()`.

Callback functions should use the following functions to determine the context/row/column:

- `Fl_Table::callback_row()` returns current row
- `Fl_Table::callback_col()` returns current column
- `Fl_Table::callback_context()` returns current table context

`callback_row()` and `callback_col()` will be set to the row and column number the event occurred on. If someone clicked on a row header, `col` will be 0. If someone clicked on a column header, `row` will be 0.

`callback_context()` will return one of the following:

<code>Fl_Table::CONTEXT_ROW_HEADER</code>	Someone clicked on a row header. Excludes resizing.
<code>Fl_Table::CONTEXT_COL_HEADER</code>	Someone clicked on a column header. Excludes resizing.
<code>Fl_Table::CONTEXT_CELL</code>	Someone clicked on a cell. To receive callbacks for FL_RELEASE events, you must set <code>when(FL_WHEN_RELEASE)</code> .
<code>Fl_Table::CONTEXT_RC_RESIZE</code>	Someone is resizing rows/columns either interactively, or via the <code>col_width()</code> or <code>row_height()</code> API. Use <code>is_interactive_resize()</code> to determine interactive resizing. If resizing a column, <code>R=0</code> and <code>C=column</code> being resized. If resizing a row, <code>C=0</code> and <code>R=row</code> being resized. NOTE: To receive resize events, you must set <code>when(FL_WHEN↵_CHANGED)</code> .

```
class MyTable : public Fl_Table {
[...]
```

```
private:
// Handle events that happen on the table
void event_callback2() {
    int R = callback_row(),           // row where event occurred
        C = callback_col();           // column where event occurred
    TableContext context = callback_context(); // which part of table
    fprintf(stderr, "callback: Row=%d Col=%d Context=%d Event=%d\n",
        R, C, (int)context, (int)Fl::event());
}

// Actual static callback
static void event_callback(Fl_Widget*, void* data) {
    MyTable *o = (MyTable*)data;
    o->event_callback2();
}

public:
// Constructor
MyTable() {
[...]
```

```
    table.callback(&event_callback, (void*)this); // setup callback
    table.when(FL_WHEN_CHANGED|FL_WHEN_RELEASE); // when to call it
}
};
```

### 33.139.4.3 callback\_col()

```
int Fl_Table::callback_col ( ) [inline]
```

Returns the current column the event occurred on.

This function should only be used from within the user's callback function.

### 33.139.4.4 callback\_context()

```
TableContext Fl_Table::callback_context ( ) [inline]
```

Returns the current 'table context'.

This function should only be used from within the user's callback function.

**33.139.4.5 callback\_row()**

```
int Fl_Table::callback_row ( ) [inline]
```

Returns the current row the event occurred on.

This function should only be used from within the user's callback function.

**33.139.4.6 child()**

```
Fl_Widget * Fl_Table::child (
    int n ) const [inline]
```

Returns the child widget by an index.

When using the [Fl\\_Table](#) as a container for FLTK widgets, this method returns the widget pointer from the internal array of widgets in the container.

Typically used in loops, eg:

```
for ( int i=0; i<children(); i++ ) {
    Fl_Widget *w = child(i);
    [...]
}
```

**33.139.4.7 children()**

```
int Fl_Table::children ( ) const [inline]
```

Returns the number of children in the table.

When using the [Fl\\_Table](#) as a container for FLTK widgets, this method returns how many child widgets the table has.

See also

[child\(int\)](#)

**33.139.4.8 clear()**

```
virtual void Fl_Table::clear (
    void ) [inline], [virtual]
```

Clears the table to zero rows ([rows\(0\)](#)), zero columns ([cols\(0\)](#)), and clears any widgets ([table->clear\(\)](#)) that were added with [begin\(\)/end\(\)](#) or [add\(\)/insert\(\)/etc.](#)

See also

[rows\(int\)](#), [cols\(int\)](#)

Reimplemented in [Fl\\_Table\\_Row](#).

**33.139.4.9 col\_header()**

```
void Fl_Table::col_header (
    int flag ) [inline]
```

Enable or disable column headers.

If changed, the table is redrawn.

**33.139.4.10 col\_resize()**

```
void Fl_Table::col_resize (
    int flag ) [inline]
```

Allows/disallows column resizing by the user.

1=allow interactive resizing, 0=disallow interactive resizing. Since interactive resizing is done via the column headers, [col\\_header \( \)](#) must also be enabled to allow resizing.

**33.139.4.11 col\_resize\_min()**

```
void Fl_Table::col_resize_min (
    int val ) [inline]
```

Sets the current column minimum resize value.

This is used to prevent the user from interactively resizing any column to be smaller than 'pixels'. Must be a value  $\geq 1$ .

**33.139.4.12 col\_width()**

```
void Fl_Table::col_width (
    int col,
    int width )
```

Sets the width of the specified column in pixels, and the table is redrawn.

[callback\(\)](#) will be invoked with CONTEXT\_RC\_RESIZE if the column's width was actually changed, and [when\(\)](#) is FL\_WHEN\_CHANGED.

**33.139.4.13 col\_width\_all()**

```
void Fl_Table::col_width_all (
    int width ) [inline]
```

Convenience method to set the width of all columns to the same value, in pixels.

The screen is redrawn.

**33.139.4.14 cursor2rowcol()**

```
Fl_Table::TableContext Fl_Table::cursor2rowcol (
    int & R,
    int & C,
    ResizeFlag & resizeflag ) [protected]
```

Find row/col for the recent mouse event.

Returns the context, and the row/column values in R/C. Also returns 'resizeflag' if mouse is hovered over a resize boundary.

**33.139.4.15 damage\_zone()**

```
void Fl_Table::damage_zone (
    int r1,
    int c1,
    int r2,
    int c2,
    int r3 = 0,
    int c3 = 0 ) [protected]
```

Sets the damage zone to the specified row/col values.

Calls [redraw\\_range\(\)](#).

**33.139.4.16 do\_callback()**

```
void Fl_Table::do_callback (
    TableContext context,
    int row,
    int col ) [inline]
```

Calls the widget callback.

Saves the specified 'context', 'row', and 'col' values, so that the user's callback can then access them with the member functions [callback\\_context\(\)](#), [callback\\_row\(\)](#) and [callback\\_col\(\)](#).

**33.139.4.17 draw()**

```
void Fl_Table::draw (
    void ) [protected], [virtual]
```

Draws the entire [Fl\\_Table](#).

Lets fltk widgets draw themselves first, followed by the cells via calls to [draw\\_cell\(\)](#).

Reimplemented from [Fl\\_Group](#).

### 33.139.4.18 draw\_cell()

```
virtual void Fl_Table::draw_cell (
    TableContext context,
    int R = 0,
    int C = 0,
    int X = 0,
    int Y = 0,
    int W = 0,
    int H = 0 ) [inline], [protected], [virtual]
```

Subclass should override this method to handle drawing the cells.

This method will be called whenever the table is redrawn, once per cell.

Only cells that are completely (or partially) visible will be told to draw.

context will be one of the following:

<a href="#">Fl_Table::CONTEXT_STARTPAGE</a>	When table, or parts of the table, are about to be redrawn. Use to initialize static data, such as font selections. R/C will be zero, X/Y/W/H will be the dimensions of the table's entire data area. (Useful for locking a database before accessing; see also <a href="#">visible_cells()</a> )
<a href="#">Fl_Table::CONTEXT_ENDPAGE</a>	When table has completed being redrawn. R/C will be zero, X/Y/W/H dimensions of table's data area. (Useful for unlocking a database after accessing)
<a href="#">Fl_Table::CONTEXT_ROW_HEADER</a>	Whenever a row header cell needs to be drawn. R will be the row number of the header being redrawn, C will be zero, X/Y/W/H will be the fltk drawing area of the row header in the window
<a href="#">Fl_Table::CONTEXT_COL_HEADER</a>	Whenever a column header cell needs to be drawn. R will be zero, C will be the column number of the header being redrawn, X/Y/W/H will be the fltk drawing area of the column header in the window
<a href="#">Fl_Table::CONTEXT_CELL</a>	Whenever a data cell in the table needs to be drawn. R/C will be the row/column of the cell to be drawn, X/Y/W/H will be the fltk drawing area of the cell in the window
<a href="#">Fl_Table::CONTEXT_RC_RESIZE</a>	Whenever table or row/column is resized or scrolled, either interactively or via <a href="#">col_width()</a> or <a href="#">row_height()</a> . R/C/X/Y/W/H will all be zero. Useful for fltk containers that need to resize or move the child fltk widgets.

R and C will be set to the row and column number of the cell being drawn. In the case of row headers, C will be 0. In the case of column headers, R will be 0.

X/Y/W/H will be the position and dimensions of where the cell should be drawn.

In the case of custom widgets, a minimal [draw\\_cell\(\)](#) override might look like the following. With custom widgets it is up to the caller to handle drawing everything within the dimensions of the cell, including handling the selection color. Note all clipping must be handled as well; this allows drawing outside the dimensions of the cell if so desired for 'custom effects'.

```
// This is called whenever Fl_Table wants you to draw a cell
void MyTable::draw_cell(TableContext context, int R=0, int C=0, int X=0, int Y=0, int W=0, int H=0) {
    static char s[40];
    sprintf(s, "%d/%d", R, C);          // text for each cell
    switch ( context ) {
```

```

case CONTEXT_STARTPAGE:                                // Fl_Table telling us it's starting to draw page
    fl_font(FL_HELVETICA, 16);
    return;
case CONTEXT_ROW_HEADER:                                // Fl_Table telling us to draw row/col headers
case CONTEXT_COL_HEADER:
    fl_push_clip(X, Y, W, H);
    {
        fl_draw_box(FL_THIN_UP_BOX, X, Y, W, H, color());
        fl_color(FL_BLACK);
        fl_draw(s, X, Y, W, H, FL_ALIGN_CENTER);
    }
    fl_pop_clip();
    return;
case CONTEXT_CELL:                                      // Fl_Table telling us to draw cells
    fl_push_clip(X, Y, W, H);
    {
        // BG COLOR
        fl_color(is_selected(R, C) ? selection_color() : FL_WHITE);
        fl_rectf(X, Y, W, H);
        // TEXT
        fl_color(FL_BLACK);
        fl_draw(s, X, Y, W, H, FL_ALIGN_CENTER);
        // BORDER
        fl_color(FL_LIGHT2);
        fl_rect(X, Y, W, H);
    }
    fl_pop_clip();
    return;
default:
    return;
}
//NOTREACHED
}

```

#### 33.139.4.19 find\_cell()

```

int Fl_Table::find_cell (
    TableContext context,
    int R,
    int C,
    int & X,
    int & Y,
    int & W,
    int & H ) [protected]

```

Find a cell's X/Y/W/H region for the specified cell in row 'R', column 'C'.

##### Returns

- 0 – on success, XYWH returns the region of the specified cell.
- -1 – if R or C are out of range, and X/Y/W/H will be set to zero.

#### 33.139.4.20 get\_selection()

```

void Fl_Table::get_selection (
    int & row_top,
    int & col_left,
    int & row_bot,
    int & col_right )

```

Gets the region of cells selected (highlighted).

##### Parameters

in	<i>row_top</i>	Returns the top row of selection area
in	<i>col_left</i>	Returns the left column of selection area
in	<i>row_bot</i>	Returns the bottom row of selection area
in	<i>col_right</i>	Returns the right column of selection area

**33.139.4.21 handle()**

```
int Fl_Table::handle (
    int e ) [protected], [virtual]
```

Handle FLTK events.

Reimplemented from [Fl\\_Group](#).

Reimplemented in [Fl\\_Table\\_Row](#).

**33.139.4.22 init\_sizes()**

```
void Fl_Table::init_sizes ( ) [inline]
```

Resets the internal array of widget sizes and positions.

See also

[Fl\\_Group::init\\_sizes\(\)](#)

**33.139.4.23 insert()**

```
void Fl_Table::insert (
    Fl_Widget & wgt,
    Fl_Widget * w2 ) [inline]
```

The specified widget is removed from its current group (if any) and inserted into [Fl\\_Table](#)'s group before widget 'w2'. This will append if 'w2' is not in [Fl\\_Table](#)'s group.

**33.139.4.24 is\_interactive\_resize()**

```
int Fl_Table::is_interactive_resize ( ) [inline]
```

Returns 1 if someone is interactively resizing a row or column.

You can currently call this only from within your [callback\(\)](#).

**33.139.4.25 is\_selected()**

```
int Fl_Table::is_selected (
    int r,
    int c )
```

See if the cell at row *r* and column *c* is selected.

Returns

1 if the cell is selected, 0 if not.

**33.139.4.26 move\_cursor()**

```
int Fl_Table::move_cursor (
    int R,
    int C,
    int shiftselect )
```

Moves the selection cursor a relative number of rows/columns specified by R/C.

R/C can be positive or negative, depending on the direction to move. A value of 0 for R or C prevents cursor movement on that axis.

If shiftselect is set, the selection range is extended to the new cursor position. If clear, the cursor is simply moved, and any previous selection is cancelled.

Used mainly by keyboard events (e.g. [Fl\\_Right](#), [FL\\_Home](#), [FL\\_End](#)..) to let the user keyboard navigate the selection cursor around.

The scroll positions may be modified if the selection cursor traverses into cells off the screen's edge. Internal variables `select_row/select_col` and `current_row/current_col` are modified, among others.

Examples:

```
R=1, C=0 -- moves the selection cursor one row downward.
R=5, C=0 -- moves the selection cursor 5 rows downward.
R=-5, C=0 -- moves the cursor 5 rows upward.
R=2, C=2 -- moves the cursor 2 rows down and 2 columns to the right.
```

#### 33.139.4.27 recalc\_dimensions()

```
void Fl_Table::recalc_dimensions ( ) [protected]
```

Recalculate the dimensions of the table, and affect any children. Internally, `Fl_Group::resize()` and `init_sizes()` are called.

#### 33.139.4.28 redraw\_range()

```
void Fl_Table::redraw_range (
    int topRow,
    int botRow,
    int leftCol,
    int rightCol ) [inline], [protected]
```

Define region of cells to be redrawn by specified range of rows/cols, and then sets damage(DAMAGE\_CHILD). Extends any previously defined range to redraw.

#### 33.139.4.29 resize()

```
void Fl_Table::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Handle resize events if user resizes parent window. This changes the size of `Fl_Table`, causing it to redraw. Reimplemented from `Fl_Group`.

#### 33.139.4.30 row\_col\_clamp()

```
int Fl_Table::row_col_clamp (
    TableContext context,
    int & R,
    int & C ) [protected]
```

Return specified row/col values R and C to within the table's current row/col limits.

Returns

0 if no changes were made, or 1 if they were.

#### 33.139.4.31 row\_header()

```
void Fl_Table::row_header (
    int flag ) [inline]
```

Enables/disables showing the row headers. 1=enabled, 0=disabled. If changed, the table is redrawn.

#### 33.139.4.32 row\_height()

```
void Fl_Table::row_height (
    int row,
    int height )
```

Sets the height of the specified row in pixels, and the table is redrawn.

[callback\(\)](#) will be invoked with `CONTEXT_RC_RESIZE` if the row's height was actually changed, and [when\(\)](#) is `FL_WHEN_CHANGED`.

#### 33.139.4.33 `row_height_all()`

```
void Fl_Table::row_height_all (
    int height ) [inline]
```

Convenience method to set the height of all rows to the same value, in pixels.  
The screen is redrawn.

#### 33.139.4.34 `row_resize()`

```
void Fl_Table::row_resize (
    int flag ) [inline]
```

Allows/disallows row resizing by the user.

1=allow interactive resizing, 0=disallow interactive resizing. Since interactive resizing is done via the row headers, [row\\_header\(\)](#) must also be enabled to allow resizing.

#### 33.139.4.35 `row_resize_min()`

```
void Fl_Table::row_resize_min (
    int val ) [inline]
```

Sets the current row minimum resize value.

This is used to prevent the user from interactively resizing any row to be smaller than 'pixels'. Must be a value  $\geq 1$ .

#### 33.139.4.36 `rows()`

```
void Fl_Table::rows (
    int val ) [virtual]
```

Sets the number of rows in the table, and the table is redrawn.

Reimplemented in [Fl\\_Table\\_Row](#).

#### 33.139.4.37 `scrollbar_size()` [1/2]

```
int Fl_Table::scrollbar_size ( ) const [inline]
```

Gets the current size of the scrollbars' troughs, in pixels.

If this value is zero (default), this widget will use the [Fl::scrollbar\\_size\(\)](#) value as the scrollbar's width.

Returns

Scrollbar size in pixels, or 0 if the global [Fl::scrollbar\\_size\(\)](#) is being used.

See also

[Fl::scrollbar\\_size\(int\)](#)

#### 33.139.4.38 `scrollbar_size()` [2/2]

```
void Fl_Table::scrollbar_size (
    int newSize ) [inline]
```

Sets the pixel size of the scrollbars' troughs to `newSize`, in pixels.

Normally you should not need this method, and should use [Fl::scrollbar\\_size\(int\)](#) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally what you want.

Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare.

Setting `newSize` to the special value of 0 causes the widget to track the global [Fl::scrollbar\\_size\(\)](#), which is the default.

## Parameters

in	<i>newSize</i>	Sets the scrollbar size in pixels. If 0 (default), scrollbar size tracks the global <a href="#">Fl::scrollbar_size()</a>
----	----------------	---

## See also

[Fl::scrollbar\\_size\(\)](#)

**33.139.4.39 set\_selection()**

```
void Fl_Table::set_selection (
    int row_top,
    int col_left,
    int row_bot,
    int col_right )
```

Sets the region of cells to be selected (highlighted).

So for instance, `set_selection(0,0,0,0)` selects the top/left cell in the table. And `set_selection(0,0,1,1)` selects the four cells in rows 0 and 1, column 0 and 1.

To deselect all cells, use `set_selection(-1,-1,-1,-1)`;

## Parameters

in	<i>row_top</i>	Top row of selection area
in	<i>col_left</i>	Left column of selection area
in	<i>row_bot</i>	Bottom row of selection area
in	<i>col_right</i>	Right column of selection area

**33.139.4.40 tab\_cell\_nav()** [1/2]

```
int Fl_Table::tab_cell_nav ( ) const [inline]
```

Get state of table's 'Tab' key cell navigation flag.

## Returns

1 if Tab configured to navigate cells in table  
0 to navigate widget focus (default)

## See also

[tab\\_cell\\_nav\(int\)](#)

**33.139.4.41 tab\_cell\_nav()** [2/2]

```
void Fl_Table::tab_cell_nav (
    int val ) [inline]
```

Flag to control if Tab navigates table cells or not.

If on, Tab key navigates table cells. If off, Tab key navigates fltk widget focus. (default)

As of fltk 1.3, the default behavior of the Tab key is to navigate focus off of the current widget, and on to the next one. But in some applications, it's useful for Tab to be used to navigate cells in the [Fl\\_Table](#).

## Parameters

in	val	If val is 1, Tab key navigates cells in table, not fltk widgets. If val is 0, Tab key will advance focus to the next fltk widget (default), and does not navigate cells in table.
----	-----	--

**33.139.4.42 table\_box()**

```
void Fl_Table::table_box (
    Fl_Boxtype val ) [inline]
```

Sets the kind of box drawn around the data table, the default being FL\_NO\_BOX.  
Changing this value will cause the table to redraw.

**33.139.4.43 table\_resized()**

```
void Fl_Table::table_resized ( ) [protected]
```

Call this if table was resized, to recalculate internal data.  
Calls `recall_dimensions()`, and recalculates scrollbar sizes.

**33.139.4.44 table\_scrolled()**

```
void Fl_Table::table_scrolled ( ) [protected]
```

Recalculate internals after a scroll.

Call this if table has been scrolled or resized. Does not handle `redraw()`. TODO: Assumes `ti[xywh]` has already been recalculated.

**33.139.4.45 top\_row() [1/2]**

```
int Fl_Table::top_row ( ) [inline]
```

Returns the current top row shown in the table.  
This row may be partially obscured.

**33.139.4.46 top\_row() [2/2]**

```
void Fl_Table::top_row (
    int row ) [inline]
```

Sets which row should be at the top of the table, scrolling as necessary, and the table is redrawn.  
If the table cannot be scrolled that far, it is scrolled as far as possible.

**33.139.4.47 visible\_cells()**

```
void Fl_Table::visible_cells (
    int & r1,
    int & r2,
    int & c1,
    int & c2 ) [inline]
```

Returns the range of row and column numbers for all visible and partially visible cells in the table.

These values can be used e.g. by your `draw_cell()` routine during CONTEXT\_STARTPAGE to figure out what cells are about to be redrawn for the purposes of locking the data from a database before it's drawn.

```

leftcol      rightcol
:
:
toprow .. :-----:
|         |         |
|  V I S I B L E  |
|         |         |
|   T A B L E     |
|         |         |
botrow .. :-----:

```

e.g. in a table where the visible rows are 5-20, and the visible columns are 100-120, then those variables would be:

- `toprow = 5`

- botrow = 20
- leftcol = 100
- rightcol = 120

#### 33.139.4.48 when()

```
void Fl_Table::when (
    Fl_When flags )
```

The `Fl_Widget::when()` function is used to set a group of flags, determining when the widget callback is called:

FL_WHEN_CHANGED	<code>callback()</code> will be called when rows or columns are resized (interactively or via <code>col_width()</code> or <code>row_height()</code> ), passing <code>CONTEXT_RC_RESIZE</code> via <code>callback_context()</code> .
FL_WHEN_RELEASE	<code>callback()</code> will be called during <code>FL_RELEASE</code> events, such as when someone releases a mouse button somewhere on the table.

The `callback()` routine is sent a `TableContext` that indicates the context the event occurred in, such as in a cell, in a header, or elsewhere on the table. When an event occurs in a cell or header, `callback_row()` and `callback_col()` can be used to determine the row and column. The callback can also look at the regular fltk event values (ie. `Fl::event()` and `Fl::event_button()`) to determine what kind of event is occurring.

The documentation for this class was generated from the following files:

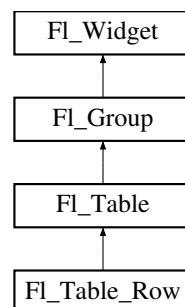
- `Fl_Table.H`
- `Fl_Table.cxx`

## 33.140 Fl\_Table\_Row Class Reference

A table with row selection capabilities.

```
#include <Fl_Table_Row.H>
```

Inheritance diagram for `Fl_Table_Row`:



### Public Types

- enum `TableRowSelectMode` { `SELECT_NONE` , `SELECT_SINGLE` , `SELECT_MULTI` }

### Public Member Functions

- void `clear ()` `FL_OVERRIDE`  
*Clears the table to zero rows (`rows(0)`), zero columns (`cols(0)`), and clears any widgets (`table->clear()`) that were added with `begin()/end()` or `add()/insert()/etc.`*
- `Fl_Table_Row` (int X, int Y, int W, int H, const char \*l=0)  
*The constructor for the `Fl_Table_Row`.*
- int `row_selected` (int row)

- Checks to see if 'row' is selected.*
- int **rows** ()
- void **rows** (int val) [FL\\_OVERRIDE](#)
- Sets the number of rows in the table, and the table is redrawn.*
- void **select\_all\_rows** (int flag=1)
- This convenience function changes the selection state for all rows based on 'flag'.*
- int **select\_row** (int row, int flag=1)
- Changes the selection state for 'row', depending on the value of 'flag'.*
- TableRowSelectMode **type** () const
- void **type** (TableRowSelectMode val)
- Sets the table selection mode.*
- [~Fl\\_Table\\_Row](#) ()
- The destructor for the [Fl\\_Table\\_Row](#).*

## Protected Member Functions

- int **find\_cell** ([TableContext](#) context, int R, int C, int &X, int &Y, int &W, int &H)
  - int **handle** (int event) [FL\\_OVERRIDE](#)
- Handle FLTK events.*

## Additional Inherited Members

### 33.140.1 Detailed Description

A table with row selection capabilities.

This class implements a simple table with the ability to select rows. This widget is similar to an [Fl\\_Browser](#) with columns. Most methods of importance will be found in the [Fl\\_Table](#) widget, such as [Fl\\_Table::rows\(\)](#) and [Fl\\_Table::cols\(\)](#).

To be useful it must be subclassed and at minimum the [draw\\_cell\(\)](#) method must be overridden to provide the content of the cells. This widget does *not* manage the cell's data content; it is up to the parent class's [draw\\_cell\(\)](#) method override to provide this.

Events on the cells and/or headings generate callbacks when they are clicked by the user. You control when events are generated based on the values you supply for [Fl\\_Table::when\(\)](#).

### 33.140.2 Constructor & Destructor Documentation

#### 33.140.2.1 [Fl\\_Table\\_Row\(\)](#)

```
Fl_Table_Row::Fl_Table_Row (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 ) [inline]
```

The constructor for the [Fl\\_Table\\_Row](#).

This creates an empty table with no rows or columns, with headers and row/column resize behavior disabled.

#### 33.140.2.2 [~Fl\\_Table\\_Row\(\)](#)

```
Fl_Table_Row::~Fl_Table_Row ( ) [inline]
```

The destructor for the [Fl\\_Table\\_Row](#).

Destroys the table and its associated widgets.

### 33.140.3 Member Function Documentation

**33.140.3.1 clear()**

```
void Fl_Table_Row::clear (
    void ) [inline], [virtual]
```

Clears the table to zero rows (rows(0)), zero columns (cols(0)), and clears any widgets (table->clear()) that were added with begin()/end() or add()/insert()/etc.

See also

[rows\(int\)](#), [cols\(int\)](#)

Reimplemented from [Fl\\_Table](#).

**33.140.3.2 handle()**

```
int Fl_Table_Row::handle (
    int e ) [protected], [virtual]
```

Handle FLTK events.

Reimplemented from [Fl\\_Table](#).

**33.140.3.3 row\_selected()**

```
int Fl_Table_Row::row_selected (
    int row )
```

Checks to see if 'row' is selected.

Returns 1 if selected, 0 if not. You can change the selection of a row by clicking on it, or by using select\_row(row, flag)

row **should** be a valid row. If the row is out of range the return value is 0 (zero).

**Parameters**

in	row	row to be checked
----	-----	-------------------

**Returns**

whether given row is selected

**Return values**

1	row is selected
0	row is not selected or row is out of range

**33.140.3.4 rows()**

```
void Fl_Table_Row::rows (
    int val ) [virtual]
```

Sets the number of rows in the table, and the table is redrawn.

Reimplemented from [Fl\\_Table](#).

**33.140.3.5 select\_all\_rows()**

```
void Fl_Table_Row::select_all_rows (
    int flag = 1 )
```

This convenience function changes the selection state for *all* rows based on 'flag'.

0=deselect, 1=select, 2=toggle existing state.

### 33.140.3.6 select\_row()

```
int Fl_Table_Row::select_row (
    int row,
    int flag = 1 )
```

Changes the selection state for 'row', depending on the value of 'flag'.  
The optional flag can be:

- 0: clear selection
- 1: set selection (default)
- 2: toggle selection

#### Parameters

in	<i>row</i>	row to be selected, deselected, or toggled
in	<i>flag</i>	change mode, see description

#### Returns

result of modification, see description

#### Return values

0	selection state did not change
1	selection state changed
-1	row out of range or incorrect selection mode (flag)

### 33.140.3.7 type()

```
void Fl_Table_Row::type (
    TableRowSelectionMode val )
```

Sets the table selection mode.

- `Fl_Table_Row::SELECT_NONE` - No selection allowed
- `Fl_Table_Row::SELECT_SINGLE` - Only single rows can be selected
- `Fl_Table_Row::SELECT_MULTI` - Multiple rows can be selected

The documentation for this class was generated from the following files:

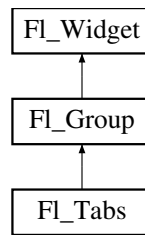
- `Fl_Table_Row.H`
- `Fl_Table_Row.cxx`

## 33.141 Fl\_Tabs Class Reference

The [Fl\\_Tabs](#) widget is a container widget that displays a set of tabs, with each tab representing a different child widget.

```
#include <Fl_Tabs.H>
```

Inheritance diagram for `Fl_Tabs`:



## Public Types

- enum { [OVERFLOW\\_COMPRESS](#) = 0 , [OVERFLOW\\_CLIP](#) , [OVERFLOW\\_PULLDOWN](#) , [OVERFLOW\\_DRAG](#) }

## Public Member Functions

- void [client\\_area](#) (int &rx, int &ry, int &rw, int &rh, int tabh=0)  
*Returns the position and size available to be used by its children.*
- [Fl\\_Tabs](#) (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [Fl\\_Tabs](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handle all events in the tabs area and forward the rest to the selected child.*
- void [handle\\_overflow](#) (int ov)  
*Set a method to handle an overflowing tab bar.*
- [Fl\\_Widget](#) \* [push](#) () const  
*Returns the tab group for the tab the user has currently down-clicked on and remains over until [FL\\_RELEASE](#).*
- int [push](#) ([Fl\\_Widget](#) \*)  
*This is called by the tab widget's [handle\(\)](#) method to set the tab group widget the user last [FL\\_PUSH](#)'ed on.*
- void [resize](#) (int, int, int, int) [FL\\_OVERRIDE](#)  
*Make sure that we redraw all tabs when the widget size changes.*
- void [show](#) () [FL\\_OVERRIDE](#)  
*Ensure proper placement of selected tab.*
- [Fl\\_Align](#) [tab\\_align](#) () const  
*Gets the tab label alignment.*
- void [tab\\_align](#) ([Fl\\_Align](#) a)  
*Sets the tab label alignment.*
- [Fl\\_Widget](#) \* [value](#) ()  
*Gets the currently visible widget/tab.*
- int [value](#) ([Fl\\_Widget](#) \*)  
*Sets the widget to become the currently visible widget/tab.*
- virtual [Fl\\_Widget](#) \* [which](#) (int event\_x, int event\_y)  
*Return a pointer to the child widget with a tab at the given coordinates.*
- ~[Fl\\_Tabs](#) () [FL\\_OVERRIDE](#)  
*Delete allocated resources and destroy all children.*

## Protected Member Functions

- void [check\\_overflow\\_menu](#) ()  
*Check if the tabs overflow and sets the [has\\_overflow\\_menu](#) flag accordingly.*
- virtual void [clear\\_tab\\_positions](#) ()  
*Clear internal array of tab positions and widths.*
- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draw the tabs area, the optional pulldown button, and all children.*

- void **draw\_overflow\_menu\_button** ()  
*Draw square button-like graphics with a down arrow in the top or bottom right corner.*
- virtual void **draw\_tab** (int x1, int x2, int W, int H, [Fl\\_Widget](#) \*o, int flags, int sel)  
*Draw a tab in the top or bottom tabs area.*
- void **handle\_overflow\_menu** ()  
*This is called when the user clicks the overflow pulldown menu button.*
- virtual int **hit\_close** ([Fl\\_Widget](#) \*o, int event\_x, int event\_y)  
*Check whether the coordinates fall within the "close" button area of the tab.*
- virtual int **hit\_overflow\_menu** (int event\_x, int event\_y)  
*Determine if the coordinates are in the area of the overflow menu button.*
- virtual int **hit\_tabs\_area** (int event\_x, int event\_y)  
*Determine if the coordinates are within the tabs area.*
- int **maybe\_do\_callback** ([Fl\\_Widget](#) \*o)  
*Set tab o as selected and call callbacks if needed.*
- int **on\_insert** ([Fl\\_Widget](#) \*, int) [FL\\_OVERRIDE](#)  
*Make sure that we redraw all tabs when new children are added.*
- int **on\_move** (int, int) [FL\\_OVERRIDE](#)  
*Make sure that we redraw all tabs when children are moved.*
- void **on\_remove** (int) [FL\\_OVERRIDE](#)  
*Make sure that we redraw all tabs when new children are removed.*
- virtual void **redraw\_tabs** ()  
*Redraw all tabs (and only the tabs).*
- virtual int **tab\_height** ()  
*Return space (height) in pixels usable for tabs.*
- virtual int **tab\_positions** ()  
*Calculate tab positions and widths.*
- void **take\_focus** ([Fl\\_Widget](#) \*o)  
*Take keyboard focus if o is not NULL.*

## Protected Attributes

- int **has\_overflow\_menu**  
*set in OVERFLOW\_PULLDOWN mode if tabs overflow. The actual menu array is created only on demand*
- int **overflow\_type**
- [Fl\\_Align](#) **tab\_align\_**  
*tab label alignment*
- int **tab\_count**  
*Array size of tab positions etc.*
- int \* **tab\_flags**  
*Array of tab flag of tabs per child.*
- int **tab\_offset**  
*for pulldown and drag overflow, this is the horizontal offset when the tabs bar is dragged by the user*
- int \* **tab\_pos**  
*Array of x-offsets of tabs per child + 1.*
- int \* **tab\_width**  
*Array of widths of tabs per child.*

## Additional Inherited Members

### 33.141.1 Detailed Description

The [Fl\\_Tabs](#) widget is a container widget that displays a set of tabs, with each tab representing a different child widget.

The user can select a tab by clicking on it, and the corresponding child widget will be displayed. The [Fl\\_Tabs](#) widget is useful for organizing a large number of controls or other widgets into a compact space, allowing the user to switch between different sets of controls as needed.

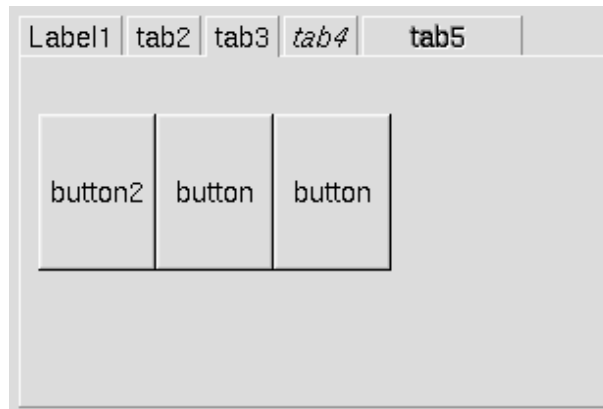


Figure 33.50 [Fl\\_Tabs](#)

Clicking the tab makes a child [visible\(\)](#) by calling [show\(\)](#) on it, and all other children are made invisible by calling [hide\(\)](#) on them. Usually the children are [Fl\\_Group](#) widgets containing several widgets themselves.

Each child makes a card, and its [label\(\)](#) is printed on the card tab, including the label font and style. The selection color of that child is used to color the tab, while the color of the child determines the background color of the pane. '&' in labels are used to prefix a shortcut that is drawn underlined and that activates the corresponding tab; repeated '&&' avoids that.

The size of the tabs is controlled by the bounding box of the children (there should be some space between the children and the edge of the [Fl\\_Tabs](#)), and the tabs may be placed "inverted" on the bottom - this is determined by which gap is larger. It is easiest to lay this out in FLUID, using the FLUID browser to select each child group and resize them until the tabs look the way you want them to.

**Note:** The widgets contained in each child should leave some clear space (five pixels as of FLTK 1.4.x) at the top or bottom of the group (where the tabs are displayed). Otherwise drawing the children may interfere with the selection border between the tabs and the children. This is particularly important if the child group is an [Fl\\_Scroll](#) widget: either the [Fl\\_Scroll](#) widget must be inset by five pixels relative to other children or it can be wrapped inside another [Fl\\_Group](#) and inset by five pixels within this group so the contents of the [Fl\\_Scroll](#) widget are kept away from the tabs by this amount.

The background area behind and to the right of the tabs is "transparent", exposing the background detail of the parent. The value of [Fl\\_Tabs::box\(\)](#) does not affect this area. So if [Fl\\_Tabs](#) is resized by itself without the parent, force the appropriate parent (visible behind the tabs) to [redraw\(\)](#) to prevent artifacts.

See "Resizing Caveats" below on how to keep tab heights constant. See "Callback's Use Of when()" on how to control the details of how clicks invoke the [callback\(\)](#).

A typical use of the [Fl\\_Tabs](#) widget:

```
// Typical use of Fl_Tabs
Fl_Tabs *tabs = new Fl_Tabs(10,10,300,200);
{
    Fl_Group *grp1 = new Fl_Group(20,30,280,170,"Tab1");
    {
        ..widgets that go in tab#1..
    }
    grp1->end();
    Fl_Group *grp2 = new Fl_Group(20,30,280,170,"Tab2");
    {
        ..widgets that go in tab#2..
    }
    grp2->end();
}
tabs->end();
```

### Default Appearance

The appearance of each "tab" is taken from the `label()` and `color()` of the child group corresponding to that "tab" and panel. Where the "tabs" appear depends on the position and size of the child groups that make up the panels within the `Fl_Tabs` widget, i.e. whether there is more space above or below them. The height of the "tabs" depends on how much free space is available.

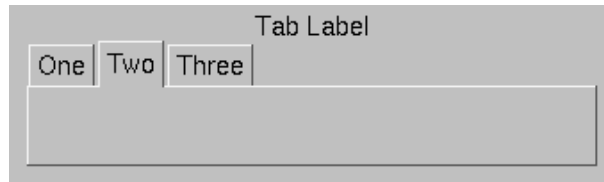


Figure 33.51 `Fl_Tabs` Default Appearance

### Highlighting The Selected Tab

The selected "tab" can be highlighted further by setting the `selection_color()` of the `Fl_Tab` itself, e.g.

```
..
tabs = new Fl_Tabs(..);
tabs->selection_color(FL_DARK3);
..
```

The result of the above looks like:

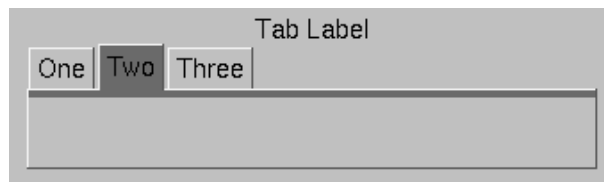


Figure 33.52 Highlighting the selected tab

### Uniform Tab and Panel Appearance

In order to have uniform tab and panel appearance, not only must the `color()` and `selection_color()` for each child group be set, but also the `selection_color()` of the `Fl_Tab` itself any time a new "tab" is selected. This can be achieved within the `Fl_Tab` callback, e.g.

```
void MyTabCallback(Fl_Widget *w, void*) {
    Fl_Tabs *tabs = (Fl_Tabs*)w;
    // When tab changed, make sure it has same color as its group
    tabs->selection_color( tabs->value()->color() );
}

..
int main(..) {
    // Define tabs widget
    tabs = new Fl_Tabs(..);
    tabs->callback(MyTabCallback);
    // Create three tabs each colored differently
    grp1 = new Fl_Group(.. "One");
    grp1->color(9);
    grp1->selection_color(9);
    grp1->end();
    grp2 = new Fl_Group(.. "Two");
    grp2->color(10);
    grp2->selection_color(10);
    grp2->end();
    grp3 = new Fl_Group(.. "Three");
    grp3->color(14);
    grp3->selection_color(14);
    grp3->end();
    ..
    // Make sure default tab has same color as its group
    tabs->selection_color( tabs->value()->color() );
    ..
    return Fl::run();
}
```

The result of the above looks like:

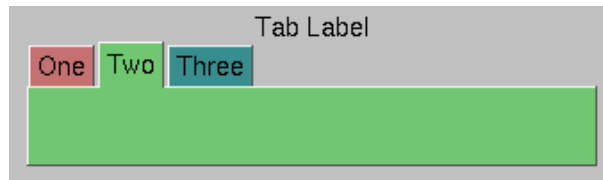


Figure 33.53 Fl\_Tabs with uniform colors

If `Fl_Tabs` has no children, the widget will be drawn as a flat rectangle in the background color set by `color()`.

#### Close Button on Tabs

The `Fl_Tabs` widget allows you to specify that a child widget should display a close button in its tab. If the `FL_WHEN_CLOSED` flag is set for the child widget, an "X" symbol will be displayed to the left of the label text in the tab. When the close button is clicked, the child widget's callback function will be called with the `FL_REASON_CLOSED` reason. It is then the responsibility of the child widget to remove itself from the `Fl_Tabs` container.

Tabs that are in a compressed state will not display a close button until they are fully expanded.

#### Overflowing Tabs

When the combined width of the tabs exceeds that of the `Fl_Tabs` widget, the tabs will overflow. `Fl_Tabs` provides four options for managing tabs overflow:

- `Fl_Tabs::OVERFLOW_COMPRESS`: proportionally compress the tabs to the left and right of the selected tab until they all fit within the widget.
- `Fl_Tabs::OVERFLOW_CLIP`: clip any tabs that extend beyond the right edge of the `Fl_Tabs` widget, making some tabs unreachable.
- `Fl_Tabs::OVERFLOW_PULLDOWN`: don't compress the tabs but instead generate a pulldown menu at the right end of the tabs area, displaying all available tabs.
- `Fl_Tabs::OVERFLOW_DRAG`: maintain the tabs' original sizes, allowing horizontal dragging of the tabs area using the mouse, a horizontal mouse wheel, or the horizontal scrolling gesture on touchpads.

#### Resizing Caveats

When `Fl_Tabs` is resized vertically, the default behavior scales the tab's height as well as its children. To keep the tab height constant during resizing, set the tab widget's `resizable()` to one of the tab's child groups, i.e.

```
tabs = new Fl_Tabs(...);
grp1 = new Fl_Group(...);
..
grp2 = new Fl_Group(...);
..
tabs->end();
tabs->resizable(grp1);    // keeps tab height constant
```

#### Callback's Use Of when()

As of FLTK 1.3.3, `Fl_Tabs()` supports the following flags for `when()`:

- `FL_WHEN_NEVER` – callback never invoked (all flags off)
- `FL_WHEN_CHANGED` – if flag set, invokes callback when a tab has been changed (on click or keyboard navigation)
- `FL_WHEN_NOT_CHANGED` – if flag set, invokes callback when the tabs remain unchanged (on click or keyboard navigation)
- `FL_WHEN_RELEASE` – if flag set, invokes callback on RELEASE of mouse button or keyboard navigation

Notes:

1. The above flags can be logically OR-ed (|) or added (+) to combine behaviors.

2. The default value for `when()` is `FL_WHEN_RELEASE` (inherited from `Fl_Widget`).
3. If `FL_WHEN_RELEASE` is the *only* flag specified, the behavior will be as if `(FL_WHEN_RELEASE|FL_WHEN_CHANGED)` was specified.
4. The value of `changed()` will be valid during the callback.
5. If both `FL_WHEN_CHANGED` and `FL_WHEN_NOT_CHANGED` are specified, the callback is invoked whether the tab has been changed or not. The `changed()` method can be used to determine the cause.
6. `FL_WHEN_NOT_CHANGED` can happen if someone clicks on an already selected tab, or if a keyboard navigation attempt results in no change to the tabs, such as using the arrow keys while at the left or right end of the tabs.
7. `Fl::callback_reason()` returns `FL_REASON_SELECTED` or `FL_REASON_RESELECTED`

### 33.141.2 Member Enumeration Documentation

#### 33.141.2.1 anonymous enum

anonymous enum

Enumerator

OVERFLOW_COMPRESS	Tabs will be compressed and overlaid on top of each other.
OVERFLOW_CLIP	Only the first tabs that fit will be displayed.
OVERFLOW_PULLDOWN	Tabs that do not fit will be placed in a pull-down menu.
OVERFLOW_DRAG	The tab bar can be dragged horizontally to reveal additional tabs.

### 33.141.3 Constructor & Destructor Documentation

#### 33.141.3.1 Fl\_Tabs()

```
Fl_Tabs::Fl_Tabs (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new `Fl_Tabs` widget using the given position, size, and label string.

The default boxtype is `FL_THIN_UP_BOX`.

Use `add(Fl_Widget*)` to add each child, which are usually `Fl_Group` widgets. The children should be sized to stay away from the top or bottom edge of the `Fl_Tabs` widget, which is where the tabs will be drawn.

All children of `Fl_Tabs` should have the same size and exactly fit on top of each other. They should only leave space above or below where the tabs will go, but not on the sides. If the first child of `Fl_Tabs` is set to `"resizable()"`, the riders will not resize when the tabs are resized.

The destructor *also deletes all the children*. This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code. A kludge has been done so the `Fl_Tabs` and all of its children can be automatic (local) variables, but you must declare the `Fl_Tabs` widget *first* so that it is destroyed last.

### 33.141.4 Member Function Documentation

**33.141.4.1 clear\_tab\_positions()**

```
void Fl_Tabs::clear_tab_positions ( ) [protected], [virtual]
```

Clear internal array of tab positions and widths.

See also

[tab\\_positions\(\)](#).

**33.141.4.2 client\_area()**

```
void Fl_Tabs::client_area (
    int & rx,
    int & ry,
    int & rw,
    int & rh,
    int tabh = 0 )
```

Returns the position and size available to be used by its children.

If there isn't any child yet the `tabh` parameter will be used to calculate the return values. This assumes that the children's labelsize is the same as the [Fl\\_Tabs](#)' labelsize and adds a small border.

If there are already children, the values of `child(0)` are returned, and `tabh` is ignored.

**Note**

Children should always use the same positions and sizes.

This function requires access to the display drivers to determine the selected font height. If `client_area` is invoked before the first window is displayed, ensure that [fl\\_open\\_display\(\)](#) is called beforehand.

`tabh` can be one of

- 0: calculate label size, tabs on top
- -1: calculate label size, tabs on bottom
- > 0: use given `tabh` value, tabs on top (height = `tabh`)
- < -1: use given `tabh` value, tabs on bottom (height = `-tabh`)

**Parameters**

in	<i>tabh</i>	position and optional height of tabs (see above)
out	<i>rx,ry,rw,rh</i>	(x,y,w,h) of client area for children

**Since**

FLTK 1.3.0

**33.141.4.3 draw()**

```
void Fl_Tabs::draw (
    void ) [protected], [virtual]
```

Draw the tabs area, the optional pulldown button, and all children.

Reimplemented from [Fl\\_Group](#).

**33.141.4.4 draw\_tab()**

```
void Fl_Tabs::draw_tab (
```

```

    int x1,
    int x2,
    int W,
    int H,
    Fl_Widget * o,
    int flags,
    int what ) [protected], [virtual]

```

Draw a tab in the top or bottom tabs area.

Tabs can be selected, or on the left or right side of the selected tab. If overlapping, left tabs are drawn bottom to top using clipping. The selected tab is then the topmost, followed by the right side tabs drawn top to bottom.

Tabs with the FL\_WHEN\_CLOSE bit set will draw a cross on their left side only if they are not compressed/overlapping.

#### Parameters

in	<i>x1</i>	horizontal position of the left visible edge of the tab
in	<i>x2</i>	horizontal position of the following tab
in	<i>W,H</i>	width and height of the tab
in	<i>o</i>	the child widget that corresponds to this tab
in	<i>flags</i>	if bit 1 is set, this tab is overlapped by another tab
in	<i>what</i>	can be LEFT, SELECTED, or RIGHT to indicate if the tab is to the left side or the right side of the selected tab, or the selected tab itself

#### 33.141.4.5 handle()

```

int Fl_Tabs::handle (
    int event ) [virtual]

```

Handle all events in the tabs area and forward the rest to the selected child.

#### Parameters

in	<i>event</i>	handle this event
----	--------------	-------------------

#### Returns

1 if the event was handled

Reimplemented from [Fl\\_Group](#).

#### 33.141.4.6 handle\_overflow()

```

void Fl_Tabs::handle_overflow (
    int ov )

```

Set a method to handle an overflowing tab bar.

The [Fl\\_Tabs](#) widget allows you to specify how to handle the situation where there are more tabs than can be displayed at once. The available options are:

- `OVERFLOW_COMPRESS` : Tabs will be compressed and overlaid on top of each other.
- `OVERFLOW_CLIP` : Only the first tabs that fit will be displayed.
- `OVERFLOW_PULLDOWN` : Tabs that do not fit will be placed in a pull-down menu.
- `OVERFLOW_DRAG` : The tab bar can be dragged horizontally to reveal additional tabs.

You can set the desired behavior using the `overflow()` method.

## Parameters

<i>ov</i>	overflow type
-----------	---------------

## See also

[OVERFLOW\\_COMPRESS](#), [OVERFLOW\\_CLIP](#), [OVERFLOW\\_PULLDOWN](#), [OVERFLOW\\_DRAG](#)

**33.141.4.7 handle\_overflow\_menu()**

```
void Fl_Tabs::handle_overflow_menu ( ) [protected]
```

This is called when the user clicks the overflow pulldown menu button.

This method creates a menu item array that contains the titles of all tabs in the [Fl\\_Tabs](#) group. Visible and invisible tabs are separated by dividers to indicate their state.

The menu is then presented until the user selects an item or cancels. The chosen tab is then selected and made visible.

The menu item array is then deleted.

**33.141.4.8 hit\_close()**

```
int Fl_Tabs::hit_close (
    Fl_Widget * o,
    int event_x,
    int event_y ) [protected], [virtual]
```

Check whether the coordinates fall within the "close" button area of the tab.

The [Fl\\_Tabs::hit\\_close\(\)](#) method checks whether the given event coordinates fall within the area of the "close" button on the tab of the specified child widget. This method should be called after the [Fl\\_Tabs::which\(\)](#) method, which updates a lookup table used to determine the width of each tab.

## Parameters

<i>o</i>	check the tab of this widget
<i>event_x, event_y</i>	event coordinates

## Returns

1 if we hit the close button, and 0 otherwise

**33.141.4.9 hit\_overflow\_menu()**

```
int Fl_Tabs::hit_overflow_menu (
    int event_x,
    int event_y ) [protected], [virtual]
```

Determine if the coordinates are in the area of the overflow menu button.

## Parameters

<i>event_x, event_y</i>	event coordinates
-------------------------	-------------------

**Returns**

1 if we hit the overflow menu button, and 0 otherwise

**33.141.4.10 hit\_tabs\_area()**

```
int Fl_Tabs::hit_tabs_area (
    int event_x,
    int event_y ) [protected], [virtual]
```

Determine if the coordinates are within the tabs area.

**Parameters**

<i>event_x, event_y</i>	event coordinates
-------------------------	-------------------

**Returns**

1 if we hit the tabs area, and 0 otherwise

**33.141.4.11 maybe\_do\_callback()**

```
int Fl_Tabs::maybe_do_callback (
    Fl_Widget * o ) [protected]
```

Set tab o as selected and call callbacks if needed.

**Parameters**

in	<i>o</i>	the newly selected tab
----	----------	------------------------

**Returns**

0 if o is invalid or was deleted by the callback and must no longer be used

**33.141.4.12 on\_insert()**

```
int Fl_Tabs::on_insert (
    Fl_Widget * candidate,
    int index ) [protected], [virtual]
```

Make sure that we redraw all tabs when new children are added.

Reimplemented from [Fl\\_Group](#).

**33.141.4.13 on\_move()**

```
int Fl_Tabs::on_move (
    int a,
    int b ) [protected], [virtual]
```

Make sure that we redraw all tabs when children are moved.

Reimplemented from [Fl\\_Group](#).

**33.141.4.14 on\_remove()**

```
void Fl_Tabs::on_remove (
```

```
int index ) [protected], [virtual]
```

Make sure that we redraw all tabs when new children are removed.

Reimplemented from [Fl\\_Group](#).

#### 33.141.4.15 push() [1/2]

```
Fl_Widget * Fl_Tabs::push ( ) const [inline]
```

Returns the tab group for the tab the user has currently down-clicked on and remains over until FL\_RELEASE.

Otherwise, returns NULL.

While the user is down-clicked on a tab, the return value is the tab group for that tab. But as soon as the user releases, or drags off the tab with the button still down, the return value will be NULL.

See also

[push\(Fl\\_Widget\\*\)](#).

#### 33.141.4.16 push() [2/2]

```
int Fl_Tabs::push (
    Fl_Widget * o )
```

This is called by the tab widget's [handle\(\)](#) method to set the tab group widget the user last FL\_PUSH'ed on.

Set back to zero on FL\_RELEASE.

As of this writing, the value is mainly used by [draw\\_tab\(\)](#) to determine whether or not to draw a 'down' box for the tab when it's clicked, and to turn it off if the user drags off it.

See also

[push\(\)](#).

#### 33.141.4.17 redraw\_tabs()

```
void Fl_Tabs::redraw_tabs ( ) [protected], [virtual]
```

Redraw all tabs (and only the tabs).

This method sets the Fl\_Tab's damage flags so the tab area is redrawn.

#### 33.141.4.18 resize()

```
void Fl_Tabs::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Make sure that we redraw all tabs when the widget size changes.

Reimplemented from [Fl\\_Group](#).

#### 33.141.4.19 show()

```
void Fl_Tabs::show ( ) [virtual]
```

Ensure proper placement of selected tab.

Reimplemented from [Fl\\_Widget](#).

#### 33.141.4.20 tab\_align() [1/2]

```
Fl_Align Fl_Tabs::tab_align ( ) const [inline]
```

Gets the tab label alignment.

See also

[tab\\_align\(Fl\\_Align\)](#)

### 33.141.4.21 tab\_align() [2/2]

```
void Fl_Tabs::tab_align (
    Fl_Align a ) [inline]
```

Sets the tab label alignment.

The default is FL\_ALIGN\_CENTER so tab labels are centered, but since the label space is measured (per label) to fit the labels, there wouldn't be any difference if labels were aligned left or right.

If you want to show an image (icon) next to the group's label you can set a different label alignment. FL\_ALIGN\_↔IMAGE\_NEXT\_TO\_TEXT is the recommended alignment to show the icon left of the text.

### 33.141.4.22 tab\_height()

```
int Fl_Tabs::tab_height ( ) [protected], [virtual]
```

Return space (height) in pixels usable for tabs.

The calculated height is the largest space between all children and the upper and lower widget boundaries, respectively. If the space at the bottom is larger than at the top, the value will be negative and the tabs should be placed at the bottom.

#### Returns

Vertical space that can be used for the tabs.

#### Return values

>0	To put the tabs at the top of the widget.
<0	To put the tabs on the bottom.
Full	height, if <a href="#">children()</a> == 0.

### 33.141.4.23 tab\_positions()

```
int Fl_Tabs::tab_positions ( ) [protected], [virtual]
```

Calculate tab positions and widths.

This protected method calculates the horizontal display positions and widths of all tabs. If the number of children 'nc' (see below) is > 0 three internal arrays are allocated, otherwise the arrays are free'd and the pointers are set to NULL. Note that the first array is larger (nc+1).

- tab\_pos[nc+1] : The left edges of each tab plus a fake left edge for a tab past the right-hand one.
- tab\_width[nc] : The width of each tab
- tab\_flags[nc] : Flags, bit 0 is set if the tab is compressed

If needed, these arrays are (re)allocated.

These positions are actually of the left edge of the slope. They are either separated by the correct distance or by EXTRASPACE or by zero.

In OVERFLOW\_COMPRESS mode, tab positions and widths are compressed to make the entire tabs bar fit into the width of [Fl\\_Tabs](#) while keeping the selected tab fully visible.

In other overflow modes, the tabs area may be dragged horizontally using [tab\\_offset](#). The tab\_pos array is not adjusted to the horizontal offset, but starts at this->x() plus the box's left margin.

The protected variable tab\_count is set to the currently allocated size, i.e. the number of children (nc).

**Returns**

Index of the selected item

**Return values**

-1	If the number of children is 0 (zero).
----	--

**Note**

Return values in 1.3 were not documented. Return values before Sep 2023 were documented as 1 based index and 0 if there were no children. This was actually never the case. It always returned a 0 based index and the (useless) value of also 0 if there were no children. The current version returns -1 if there are no children.

For this method to work, only a single child should be selected. Calling the method [value\(\)](#) before calling [tab\\_positions\(\)](#) will ensure that exactly one child is selected and return a pointer to that child.

**See also**

[clear\\_tab\\_positions\(\)](#)

**33.141.4.24 take\_focus()**

```
void Fl_Tabs::take_focus (
    Fl_Widget * o ) [protected]
```

Take keyboard focus if o is not NULL.

**Parameters**

in	o	selected tab
----	---	--------------

**33.141.4.25 value() [1/2]**

```
Fl_Widget * Fl_Tabs::value ( )
```

Gets the currently visible widget/tab.

The [Fl\\_Tabs::value\(\)](#) method returns a pointer to the currently visible child widget of the [Fl\\_Tabs](#) container. The visible child is the first child that is currently being displayed, or the last child if none of the children are being displayed.

If child widgets have been added, moved, or deleted, this method ensures that only one tab is visible at a time.

**Returns**

a pointer to the currently visible child

**33.141.4.26 value() [2/2]**

```
int Fl_Tabs::value (
    Fl_Widget * newvalue )
```

Sets the widget to become the currently visible widget/tab.

The [Fl\\_Tabs::value\(\)](#) method allows you to set a particular child widget of the [Fl\\_Tabs](#) container to be the currently visible widget. If the specified widget is a child of the [Fl\\_Tabs](#) container, it will be made visible and all other children will be hidden. The method returns 1 if the value was changed, and 0 if the specified value was already set.

## Parameters

<code>in</code>	<code>newvalue</code>	a pointer to a child widget
-----------------	-----------------------	-----------------------------

## Returns

- 1 if a different tab was chosen
- 0 if there was no change (new value already set)

**33.141.4.27 which()**

```
Fl_Widget * Fl_Tabs::which (
    int event_x,
    int event_y ) [virtual]
```

Return a pointer to the child widget with a tab at the given coordinates.

The [Fl\\_Tabs::which\(\)](#) method returns a pointer to the child widget of the [Fl\\_Tabs](#) container that corresponds to the tab at the given event coordinates. If the event coordinates are outside the area of the tabs or if the [Fl\\_Tabs](#) container has no children, the method returns NULL.

## Parameters

<code>event_x, event_y</code>	event coordinates
-------------------------------	-------------------

## Returns

- pointer to the selected child widget, or NULL

**33.141.5 Member Data Documentation****33.141.5.1 overflow\_type**

```
int Fl_Tabs::overflow_type [protected]
```

## See also

[OVERFLOW\\_COMPRESS](#), [OVERFLOW\\_CLIP](#), etc.

**33.141.5.2 tab\_count**

```
int Fl_Tabs::tab_count [protected]
```

Array size of tab positions etc.

## See also

[tab\\_positions\(\)](#)

**33.141.5.3 tab\_flags**

```
int* Fl_Tabs::tab_flags [protected]
```

Array of tab flag of tabs per child.

## See also

[tab\\_positions\(\)](#)

#### 33.141.5.4 tab\_pos

`int* Fl_Tabs::tab_pos [protected]`  
 Array of x-offsets of tabs per child + 1.

See also

[tab\\_positions\(\)](#)

#### 33.141.5.5 tab\_width

`int* Fl_Tabs::tab_width [protected]`  
 Array of widths of tabs per child.

See also

[tab\\_positions\(\)](#)

The documentation for this class was generated from the following files:

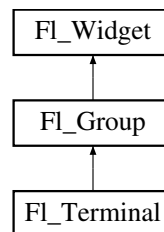
- `Fl_Tabs.H`
- `Fl_Tabs.cxx`

## 33.142 Fl\_Terminal Class Reference

Terminal widget supporting Unicode/utf-8, ANSI/xterm escape codes with full RGB color control.

`#include <Fl_Terminal.H>`

Inheritance diagram for `Fl_Terminal`:



### Classes

- class [CharStyle](#)
- class [Cursor](#)
- class [EscapeSeq](#)
- class [Margin](#)
- class [PartialUtf8Buf](#)
- class [RingBuffer](#)
- class [Selection](#)
- class [Utf8Char](#)

### Public Types

- enum `Attrib` {  
`NORMAL` = 0x00 , `BOLD` = 0x01 , `DIM` = 0x02 , `ITALIC` = 0x04 ,  
`UNDERLINE` = 0x08 , `_RESERVED_1` = 0x10 , `INVERSE` = 0x20 , `_RESERVED_2` = 0x40 ,  
`STRIKEOUT` = 0x80 }

*Bits for the per-character attributes, which control text features such as italic, bold, underlined text, etc.*

- enum `CharFlags` {  
`FG_XTERM` = 0x01 , `BG_XTERM` = 0x02 , `EOL` = 0x04 , `RESV_A` = 0x08 ,  
`RESV_B` = 0x10 , `RESV_C` = 0x20 , `RESV_D` = 0x40 , `RESV_E` = 0x80 ,  
`COLORMASK` = (`FG_XTERM` | `BG_XTERM`) }  
*Per-character 8 bit flags (uchar) used to manage special states for characters.*
- enum `OutFlags` { `OFF` = 0x00 , `CR_TO_LF` = 0x01 , `LF_TO_CR` = 0x02 , `LF_TO_CRLF` = 0x04 }  
*Output translation flags for special control character translations.*
- enum `RedrawStyle` { `NO_REDRAW` = 0 , `RATE_LIMITED` , `PER_WRITE` }  
*Determines when `Fl_Terminal` calls `redraw()` if new text is added.*
- enum `ScrollbarStyle` { `SCROLLBAR_OFF` = 0x00 , `SCROLLBAR_AUTO` = 0x01 , `SCROLLBAR_ON` = 0x02 }  
*Behavior of scrollbars.*

## Public Member Functions

- void `ansi` (bool val)  
*Enable/disable the ANSI mode flag.*
- bool `ansi` (void) const  
*Return the state of the ANSI flag.*
- void `append` (const char \*s, int len=-1)  
*Appends string s to the terminal at the current cursor position using the current text color/attributes.*
- void `append_ascii` (const char \*s)  
*Append NULL terminated ASCII string to terminal, slightly more efficient than `append_utf8()`.*
- void `append_utf8` (const char \*buf, int len=-1)  
*Append NULL terminated UTF-8 string to terminal.*
- void `box` (`Fl_Boxtype` val)  
*Sets the box type, updates terminal margins et al.*
- `Fl_Boxtype` `box` (void) const  
*Returns the current box type.*
- void `clear` (`Fl_Color` val)  
*Clears the screen to a specific color val and homes the cursor.*
- void `clear` (void)  
*Clears the screen to the current `textbgcolor()`, and homes the cursor.*
- void `clear_history` (void)  
*Clears the scroll history buffer and adjusts scrollbar, forcing it to `redraw()`.*
- void `clear_screen` (bool scroll\_to\_hist=true)  
*Clear the terminal screen only; does not affect the cursor position.*
- void `clear_screen_home` (bool scroll\_to\_hist=true)  
*Clear the terminal screen and home the cursor.*
- void `color` (`Fl_Color` val)  
*Sets the background color for the terminal's `Fl_Group::box()`.*
- `Fl_Color` `color` (void) const  
*Return base widget `Fl_Group`'s `box()` color()*
- int `cursor_col` (void) const  
*Return the cursor's current column position on the screen.*
- void `cursor_home` (void)  
*Move cursor to the home position (top/left).*
- int `cursor_row` (void) const  
*Return the cursor's current row position on the screen.*
- void `cursorbgcolor` (`Fl_Color` val)  
*Set the cursor's background color used for the cursor itself.*
- `Fl_Color` `cursorbgcolor` (void) const

- Get the cursor's background color used for the cursor itself.*

  - void **cursorfgcolor** ([FL\\_Color](#) val)
- Set the cursor's foreground color used for text under the cursor.*

  - [FL\\_Color](#) **cursorfgcolor** (void) const
- Get the cursor's foreground color used for text under the cursor.*

  - void [display\\_columns](#) (int val)
- Set terminal's display width in columns of text characters.*

  - int [display\\_columns](#) (void) const
- Return terminal's display width in columns of text characters.*

  - void [display\\_rows](#) (int val)
- Set terminal's display height in lines of text (rows).*

  - int [display\\_rows](#) (void) const
- Return terminal's display height in lines of text (rows).*

  - void [draw](#) (void) [FL\\_OVERRIDE](#)
- Draws the entire [FL\\_Terminal](#).*

  - void [error\\_char](#) (const char \*val)
- Sets the "error character" utf8 string shown for invalid utf8 or bad ANSI sequences if [show\\_unknown\(\)](#) is true.*

  - const char \* [error\\_char](#) (void) const
- Returns the "error character" utf8 string, which is shown for invalid utf8 or bad ANSI sequences if [show\\_unknown\(\)](#) is true.*

  - [FL\\_Terminal](#) (int X, int Y, int W, int H, const char \*L, int rows, int cols, int hist)
- Same as the default FLTK constructor, but lets the user force the rows, columns and history to specific sizes on creation.*

  - [FL\\_Terminal](#) (int X, int Y, int W, int H, const char \*L=0)
- The constructor for [FL\\_Terminal](#).*

  - int [handle](#) (int e) [FL\\_OVERRIDE](#)
- Handle FLTK events.*

  - void [history\\_lines](#) (int val)
- Set the number of lines of screen history.*

  - int **history\_lines** (void) const
- Return the number of lines of screen history.*

  - void **history\_rows** (int val)
- Set terminal's scrollbar history buffer size in lines of text (rows).*

  - int **history\_rows** (void) const
- Return terminal's scrollbar history buffer size in lines of text (rows).*

  - int [history\\_use](#) (void) const
- Returns how many lines are "in use" by the screen history buffer.*

  - void [hscrollbar\\_style](#) ([ScrollbarStyle](#) val)
- Set the horizontal scrollbar behavior style.*

  - [ScrollbarStyle](#) [hscrollbar\\_style](#) (void) const
- Get the horizontal scrollbar behavior style.*

  - void **margin\_bottom** (int val)
- Set the bottom margin; see [Margins](#).*

  - int **margin\_bottom** (void) const
- Return the bottom margin; see [Margins](#).*

  - void **margin\_left** (int val)
- Set the left margin; see [Margins](#).*

  - int **margin\_left** (void) const
- Return the left margin; see [Margins](#).*

  - void **margin\_right** (int val)
- Set the right margin; see [Margins](#).*

- `int margin_right (void) const`  
*Return the right margin; see [Margins](#).*
- `void margin_top (int val)`  
*Set the top margin; see [Margins](#).*
- `int margin_top (void) const`  
*Return the top margin; see [Margins](#).*
- `void output_translate (FL_Terminal::OutFlags val)`  
*Sets the combined output translation flags to `val`.*
- `FL_Terminal::OutFlags output_translate (void) const`  
*Return the current combined output translation flags.*
- `void plot_char (char c, int drow, int dcol)`  
*Plot the ASCII character `c` at the terminal's display position (`drow,dcol`).*
- `void plot_char (const char *text, int len, int drow, int dcol)`  
*Plot the UTF-8 character `text` of length `len` at display position (`drow,dcol`).*
- `void print_char (char c)`  
*Prints single ASCII char `c` at current cursor position, and advances the cursor.*
- `void print_char (const char *text, int len=-1)`  
*Prints single UTF-8 char `text` of optional byte length `len` at current cursor position, and advances the cursor if the character is printable.*
- `void printf (const char *fmt,...)`  
*Appends printf formatted messages to the terminal.*
- `void redraw_rate (float val)`  
*Set the maximum rate redraw speed in floating point seconds if [redraw\\_style\(\)](#) is set to `RATE_LIMITED`.*
- `float redraw_rate (void) const`  
*Get max rate redraw speed in floating point seconds.*
- `void redraw_style (RedrawStyle val)`  
*Set how [FL\\_Terminal](#) manages screen redrawing.*
- `RedrawStyle redraw_style (void) const`  
*Get the redraw style.*
- `void reset_terminal (void)`  
*Resets terminal to default colors, clears screen, history and mouse selection, homes cursor, resets tabstops.*
- `void resize (int X, int Y, int W, int H) FL_OVERRIDE`  
*Handle widget resizing, such as if user resizes parent window.*
- `int scrollbar_actual_size (void) const`  
*Returns the scrollbar's actual "trough size", which is the width of `FL_VERTICAL` scrollbars, or height of `FL_HORIZONTAL` scrollbars.*
- `void scrollbar_size (int val)`  
*Set the pixel size of both horizontal and vertical scrollbar's "trough" to `val`.*
- `int scrollbar_size (void) const`  
*Get current pixel size of all the scrollbar's troughs for this widget, or zero if the global [Fl::scrollbar\\_size\(\)](#) is being used (default).*
- `const char * selection_text (void) const`  
*Return text selection (for copy()/paste() operations)*
- `int selection_text_len (void) const`  
*Return byte length of all UTF-8 chars in selection, or 0 if no selection.*
- `void selectionbgcolor (FL_Color val)`  
*Set mouse selection background color.*
- `FL_Color selectionbgcolor (void) const`  
*Get mouse selection background color.*
- `void selectionfgcolor (FL_Color val)`  
*Set mouse selection foreground color.*

- [FI\\_Color](#) **selectionfgcolor** (void) const  
*Get mouse selection foreground color.*
- void [show\\_unknown](#) (bool val)  
*Set the "show unknown" flag.*
- bool [show\\_unknown](#) (void) const  
*Return the "show unknown" flag.*
- const char \* [text](#) (bool lines\_below\_cursor=false) const  
*Return a string copy of all lines in the terminal (including history).*
- [uchar](#) [textattrib](#) () const  
*Get text attribute bits (underline, inverse, etc).*
- void [textattrib](#) ([uchar](#) val)  
*Set text attribute bits (underline, inverse, etc).*
- void [textbgcolor](#) ([FI\\_Color](#) val)  
*Set text background color to fltk color `val` used by any new text added.*
- [FI\\_Color](#) [textbgcolor](#) (void) const  
*Return text's current background color.*
- void [textbgcolor\\_default](#) ([FI\\_Color](#) val)  
*Set the default text background color used by any new text added after a reset (`<ESC>c`, `<ESC>[0m`, or [reset\\_terminal\(\)](#)).*
- [FI\\_Color](#) [textbgcolor\\_default](#) (void) const  
*Return text's default background color.*
- void [textbgcolor\\_xterm](#) ([uchar](#) val)  
*Sets the background text color as one of the 8 'xterm color' values.*
- void [textcolor](#) ([FI\\_Color](#) val)  
*Set the text color for the terminal.*
- [FI\\_Color](#) [textcolor](#) (void) const  
*Return [textcolor\(\)](#). This is a convenience method that returns [textfgcolor\\_default\(\)](#)*
- void [textfgcolor](#) ([FI\\_Color](#) val)  
*Set text foreground drawing color to fltk color `val` used by any new text added.*
- [FI\\_Color](#) [textfgcolor](#) (void) const  
*Return text's current foreground color.*
- void [textfgcolor\\_default](#) ([FI\\_Color](#) val)  
*Set the default text foreground color used by `<ESC>c`, `<ESC>[0m`, and [reset\\_terminal\(\)](#).*
- [FI\\_Color](#) [textfgcolor\\_default](#) (void) const  
*Return text's default foreground color.*
- void [textfgcolor\\_xterm](#) ([uchar](#) val)  
*Sets the foreground text color as one of the 8 'xterm color' values.*
- void [textfont](#) ([FI\\_Font](#) val)  
*Sets the font used for all text displayed in the terminal.*
- [FI\\_Font](#) [textfont](#) (void) const  
*Return text font used to draw all text in the terminal.*
- void [textsize](#) ([FI\\_Fontsize](#) val)  
*Sets the font size used for all text displayed in the terminal.*
- [FI\\_Fontsize](#) [textsize](#) (void) const  
*Return text font size used to draw all text in the terminal.*
- void [vprintf](#) (const char \*fmt, va\_list ap)  
*Appends printf formatted messages to the terminal.*
- [~FI\\_Terminal](#) (void)  
*The destructor for [FI\\_Terminal](#).*

## Public Attributes

- [Fl\\_Scrollbar](#) \* [hscrollbar](#)  
*Horizontal scrollbar.*
- [Fl\\_Scrollbar](#) \* [scrollbar](#)  
*Vertical scrollbar.*

## Protected Member Functions

- void **clear\_eod** (void)  
*Clear from cursor to End Of Display (EOD), like "<ESC> [J<ESC> [0J".*
- void **clear\_eol** (void)  
*Clear from cursor to End Of Line (EOL), like "<ESC> [K".*
- void **clear\_line** (int row)  
*Clear entire line for specified row.*
- void **clear\_line** (void)  
*Clear entire line cursor is currently on.*
- void **clear\_mouse\_selection** (void)  
*Clear any current mouse selection.*
- void **clear\_sod** (void)  
*Clear from cursor to Start Of Display (EOD), like "<ESC> [1J".*
- void **clear\_sol** (void)  
*Clear from cursor to Start Of Line (SOL), like "<ESC> [1K".*
- void **current\_style** (const [CharStyle](#) &sty)  
*Set current style for rendering text.*
- [CharStyle](#) & **current\_style** (void) const  
*Return reference to internal current style for rendering text.*
- void **cursor\_col** (int col)  
*Move cursor to the specified column *col*.*
- void **cursor\_cr** (void)  
*Move cursor as if a CR (\r) was received.*
- void **cursor\_crlf** (int count=1)  
*Move cursor as if a CR/LF pair (\r\n) was received.*
- void **cursor\_down** (int count=1, bool do\_scroll=false)  
*Moves cursor down *count* lines.*
- void **cursor\_eol** (void)  
*Move cursor to the last column (at the far right) on the current line.*
- void **cursor\_left** (int count=1)  
*Moves cursor left *count* columns, and cursor stops (does not wrap) if it hits screen edge.*
- void **cursor\_right** (int count=1, bool do\_scroll=false)  
*Moves cursor right *count* columns.*
- void **cursor\_row** (int row)  
*Move cursor to the specified row *row*.*
- void **cursor\_sol** (void)  
*Move cursor to the first column (at the far left) on the current line.*
- void **cursor\_tab\_left** (int count=1)  
*Tab left, do not wrap beyond left edge.*
- void **cursor\_tab\_right** (int count=1)  
*Tab right, do not wrap beyond right edge.*
- void **cursor\_up** (int count=1, bool do\_scroll=false)  
*Moves cursor up *count* lines.*
- void **delete\_chars** (int drow, int dcol, int rep)

- Delete char(s) at (drow,dcol) for 'rep' times.*

  - void **delete\_chars** (int rep)
- Delete char(s) at cursor position for 'rep' times.*

  - void **delete\_rows** (int count)
- Delete (count) rows at cursor position.*

  - int **disp\_cols** (void) const
- Return the number of columns in the display area.*

  - int **disp\_erow** (void) const
- Return the ending row# in the display area.*

  - int **disp\_rows** (void) const
- Return the number of rows in the display area.*

  - int **disp\_srow** (void) const
- Return the starting row# in the display area.*

  - void **draw\_buff** (int Y) const
- Draws the buffer position we are scrolled to onto the FLTK screen starting at pixel position Y.*

  - void **draw\_row** (int grow, int Y) const
- Draw the specified global row, which is the row in ring\_chars[].*

  - void **draw\_row\_bg** (int grow, int X, int Y) const
- Draw the background for the specified ring\_chars[] global row grow starting at FLTK coords X and Y.*

  - bool **get\_selection** (int &srow, int &scol, int &erow, int &ecol) const
- Return mouse selection's start/end position in the ring buffer, if any.*

  - int **h\_to\_row** (int H) const
- Given a height in pixels, return number of rows that "fits" into that area.*

  - int **handle\_unknown\_char** (int drow, int dcol)
- Handle an unknown char by either emitting an error symbol to the tty, or do nothing, depending on the user configurable value of show\_unknown().*

  - int **handle\_unknown\_char** (void)
- Handle an unknown char by either emitting an error symbol to the tty, or do nothing, depending on the user configurable value of show\_unknown().*

  - int **hist\_cols** (void) const
- Return the number of columns in the scrollbar history.*

  - int **hist\_erow** (void) const
- Return the ending row# of the scrollbar history.*

  - int **hist\_rows** (void) const
- Return the number of rows in the scrollbar history.*

  - int **hist\_srow** (void) const
- Return the starting row# of the scrollbar history.*

  - int **hist\_use** (void) const
- Return number of rows in use by the scrollbar history.*

  - int **hist\_use\_srow** (void) const
- Return the starting row of the "in use" scrollbar history.*

  - void **insert\_char** (char c, int rep)
- Insert char 'c' at the current cursor position for 'rep' times.*

  - void **insert\_char\_eol** (char c, int drow, int dcol, int rep)
- Insert char 'c' for 'rep' times at display row 'drow' and column 'dcol'.*

  - void **insert\_rows** (int count)
- Insert (count) rows at current cursor position.*

  - bool **is\_inside\_selection** (int row, int col) const
- Is global row/column inside the current mouse selection?*

  - bool **is\_selection** (void) const
- Returns true if there's a mouse selection.*

- int **offset** (void) const  
*Returns the current offset into the ring buffer.*
- void **restore\_cursor** (void)  
*Restore previously saved cursor position, if any. Used by ESC [ u.*
- int **ring\_cols** (void) const  
*Return the number of columns in the ring buffer.*
- int **ring\_erow** (void) const  
*Return the ending row# in the ring buffer (Always [ring\\_rows\(\)](#)-1)*
- int **ring\_rows** (void) const  
*Return the number of rows in the ring buffer.*
- int **ring\_srow** (void) const  
*Return the starting row# in the ring buffer. (Always 0)*
- void **save\_cursor** (void)  
*Save current cursor position. Used by ESC [ s.*
- void **scroll** (int rows)  
*Scroll the display up(+) or down(-) the specified rows.*
- void **select\_line** (int grow)  
*Select the entire row.*
- void **select\_word** (int grow, int gcol)  
*Select the word around the given row and column.*
- bool **selection\_extend** (int X, int Y)  
*Extend selection to FLTK coords X,Y.*
- [Utf8Char](#) \* **u8c\_cursor** (void)  
*Return the Utf8Char\* for character under cursor.*
- [Utf8Char](#) \* **u8c\_disp\_row** (int drow)  
*Return pointer to the first u8c character in row drow of the display.*
- const [Utf8Char](#) \* **u8c\_disp\_row** (int drow) const  
*See docs for non-const version of [u8c\\_disp\\_row\(int\)](#)*
- [Utf8Char](#) \* **u8c\_hist\_row** (int hrow)  
*Return u8c for beginning of a row inside the scrollbar history.*
- const [Utf8Char](#) \* **u8c\_hist\_row** (int hrow) const  
*See docs for non-const version of [u8c\\_hist\\_row\(int\)](#)*
- const [Utf8Char](#) \* **u8c\_hist\_use\_row** (int hrow) const  
*See docs for non-const version of [u8c\\_hist\\_use\\_row\(int\)](#)*
- [Utf8Char](#) \* **u8c\_hist\_use\_row** (int hurow)  
*Return u8c for beginning of row hurow inside the 'in use' part of the scrollbar history.*
- [Utf8Char](#) \* **u8c\_ring\_row** (int grow)  
*Return UTF-8 char for row grow in the ring buffer.*
- const [Utf8Char](#) \* **u8c\_ring\_row** (int grow) const  
*See docs for non-const version of [u8c\\_ring\\_row\(int\)](#)*
- int **w\_to\_col** (int W) const  
*Given a width in pixels, return number of columns that "fits" into that area.*
- const [Utf8Char](#) \* **walk\_selection** (const [Utf8Char](#) \*u8c, int &row, int &col) const  
*Walk the mouse selection one character at a time from beginning to end, returning a Utf8Char\* to the next character in the selection, or NULL if the end was reached, or if there's no selection.*

## Additional Inherited Members

### 33.142.1 Detailed Description

Terminal widget supporting Unicode/utf-8, ANSI/xterm escape codes with full RGB color control.

### 33.142.2 FI\_Terminal

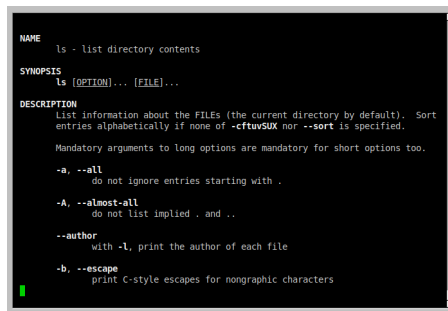


Figure 33.54 FI\_Terminal widget showing a linux manual page

[FI\\_Terminal](#) is an output-only text widget supporting ASCII and UTF-8/Unicode. It supports most terminal text features, such as most VT100/xterm style escape sequences (see [The Escape Codes FI\\_Terminal Supports](#)), text colors/attributes, scrollback history, mouse selection, etc.

It is recommended that accessing features such as setting text colors and cursor positioning is best done with ANSI/XTERM escape sequences. But if one sets `ansi(false)` then this is not possible, so the public API can be used for common operations, e.g.

Public API	ESC code equivalent	Description
<a href="#">clear_screen_home()</a>	ESC [ H ESC [ 2 J	Clear screen, home cursor
<a href="#">cursor_home()</a>	ESC [ H	Home the cursor
<a href="#">clear_history()</a>	ESC [ 3 J	Clear scrollback history
<a href="#">reset_terminal()</a>	ESC [ c	Reset terminal

To access more advanced API calls, one can derive a class from [FI\\_Terminal](#) to access protected methods manipulate the terminal more directly, e.g.

Protected API	ESC code equiv.	Description
<a href="#">current_style()</a>	ESC [ # m	Set text attributes
<a href="#">clear_eod()</a>	ESC [ 0 J	Clear from cursor to end of display
<a href="#">clear_sod()</a>	ESC [ 1 J	Clear from cursor to start of display
<a href="#">clear_eol()</a>	ESC [ 0 K	Clear from cursor to end of line
<a href="#">clear_sol()</a>	ESC [ 1 K	Clear from cursor to start of line
<a href="#">clear_line()</a>	ESC [ 2 K	Clear line cursor is on
<a href="#">scroll(int)</a> // >0 for up	ESC [ 1 S	Scroll up one line
<a href="#">scroll(int)</a> // <0 for down	ESC [ 1 T	Scroll down one line
<a href="#">cursor_left()</a>	ESC [ 1 D	Move cursor left (no wrap)
<a href="#">cursor_right()</a>	ESC [ 1 C	Move cursor right (no wrap)
<a href="#">cursor_up()</a>	ESC [ 1 B	Move cursor up (no scroll or wrap)
<a href="#">cursor_down()</a>	ESC [ 1 A	Move cursor down (no scroll or wrap)
<a href="#">cursor_row()</a> <a href="#">cursor_col()</a>	ESC [ # ; # H	Move cursor to row# / column#
<a href="#">insert_char()</a>	ESC [ # @	Insert a char at cursor position
<a href="#">delete_chars()</a>	ESC [ # P	Delete chars at cursor position
<a href="#">insert_rows()</a>	ESC [ # L	Insert rows at cursor position
<a href="#">delete_rows()</a>	ESC [ # M	Delete rows at cursor position
etc...	etc...	etc...

Many commonly used API functions are public, such as `textfgcolor()` for setting text colors. Others, such as `cursor_up()` are protected to prevent common misuse, and are available only to subclasses.

Some common operations:

- Set the terminal's background color, see `color(Fl_Color)`
- Set the terminal's default text color, see `textfgcolor_default(Fl_Color)`
- Printing text to the terminal, see `Fl_Terminal::printf()` and `Fl_Terminal::append()`
- Clearing the screen, see `clear()`
- Getting the terminal's buffer contents, see `text()`
- Getting single utf8 characters by row/col from the terminal display, see `utf8_char_at_disp()`
- Getting the text from a text selection, see `get_selection()`

For applications that need input support, the widget can be subclassed to provide keyboard input, and advanced features like pseudo ttys, termio, serial port I/O, etc., as such features are beyond the scope of FLTK.

### 33.142.2.1 Examples

```
//
// Fl_Terminal: Simple Use
//
Fl_Terminal *tty = new Fl_Terminal(...);
:
tty->append("Hello world.\n"); // simple strings
tty->append("\033[31mThis text is red.\033[0m\n"); // colored text
tty->append("\033[32mThis text is green.\033[0m\n");
tty->printf("The value of x is %.02f\n", x); // printf() formatting
```

There are also public methods for doing what most "\033[" escape codes do, so that if `ansi(bool)` is set to "false", one can still change text colors or clear the screen via application control, e.g.

```
tty->home(); // home the cursor
tty->clear_screen(); // clear the screen
tty->textfgcolor(0xff000000); // change the text color to RED
tty->textbgcolor(0x0000ff00); // change the background color to BLUE
//
// R G B
```

When creating the widget, the width/height determine the default column and row count for the terminal's display based on the current font size. The column width determines where text will wrap.

You can specify wider column sizes than the screen using `display_columns(colwidth)`. When this value is larger than the widget's width, text will wrap off-screen, and can be revealed by resizing the widget wider.

### 33.142.2.2 Writing To Terminal From Applications

An application needing terminal output as part of its user interface can instance `Fl_Terminal`, and write text strings with:

- `append()` to append strings
- `printf()` to append formatted strings

Single character output can be done with:

- `print_char()` to print a single ASCII/UTF-8 char at the cursor
- `plot_char()` to put single ASCII/UTF-8 char at an x,y position

### 33.142.2.3 Text Attributes

The terminal's text supports these attributes:

- Italic - italicized text: `\033[3m`
- Bold - brighter/thicker text: `\033[1m`
- Dim - lower brightness text: `\033[2m`
- Underline - text that is underlined: `\033[4m`
- Strikeout - text that has a line through the text: `\033[9m`
- Inverse - text whose background and foreground colors are swapped: `\033[7m`
- Normal - normal text: `\033[0m`

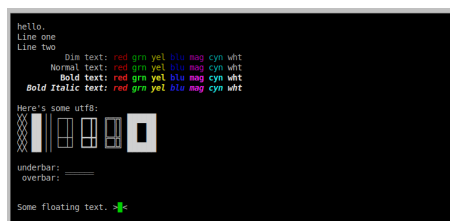


Figure 33.55 FI\_Terminal screen

### 33.142.2.4 Text and Background Colors

There's at least two ways to specify colors for text and background colors:

- 3 bit / 8 Color Values
- Full 24 bit R/G/B colors

Example of 3 bit colors:

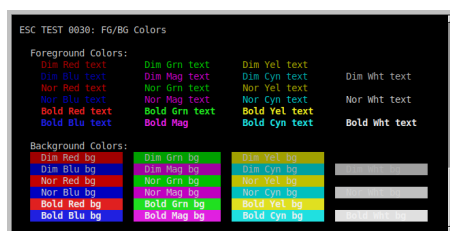


Figure 33.56 FI\_Terminal 3 bit colors

Example application source code using 3 bit colors:

```
//
// Text colors
//
tty->append("\033[31m Red text.\033[0m\n"); // Print red text..
tty->append("\033[32m Green text.\033[0m\n");
:
tty->append("\033[36m Cyan text.\033[0m\n");
tty->append("\033[37m White text.\033[0m\n");
//
// Background colors
//
tty->append("\033[41m Red Background.\033[0m\n"); // background will be red
tty->append("\033[42m Green Background.\033[0m\n");
:
tty->append("\033[46m Cyan Background.\033[0m\n");
tty->append("\033[47m White Background.\033[0m\n");
```

Example of 24 bit colors:

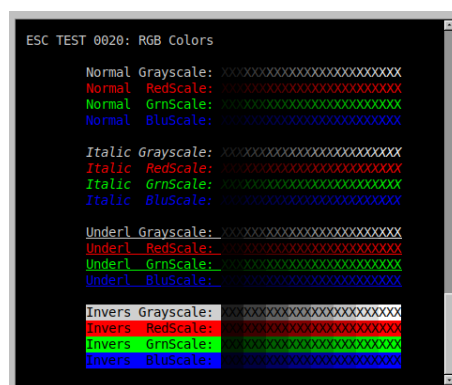


Figure 33.57 FI\_Terminal 24 bit colors

Example application source code using 24 bit colors:

```
//
// 24 bit Text Color
//
tty->append("\033[38;2;0;0;255m Text is BLUE.\033[0m\n"); // RGB: R=0, G=0, B=255
tty->append("\033[38;2;255;0;0m Text is RED.\033[0m\n"); // RGB: R=255, G=0, B=0
tty->append("\033[38;2;127;64;0m Text is DARK ORANGE.\033[0m\n"); // RGB: R=127, G=64, B=0
//
// 24 bit Background Color
//
tty->append("\033[48;2;0;0;255m Background is BLUE.\033[0m\n"); // RGB: R=0, G=0, B=255
tty->append("\033[48;2;255;0;0m Background is RED.\033[0m\n"); // RGB: R=255, G=0, B=0
tty->append("\033[48;2;127;64;0m Background is DARK ORANGE.\033[0m\n"); // RGB: R=127, G=64, B=0
```

For more on the ANSI escape codes, see [The Escape Codes FI\\_Terminal Supports](#).

### 33.142.2.5 Features

Most standard terminal behaviors are supported, e.g.

- ASCII + UTF-8/Unicode
- scrollback history management
- mouse selection + copy/paste (^C, ^A)
- autoscroll during selection

Most popular ANSI/DEC VT100/Xterm escape sequences are supported (see [The Escape Codes Fl\\_Terminal Supports](#)), including:

- per-character colors for text and background
- per-character text attributes: bold/dim, underline, strikeouts
- scrolling up/down
- character insert/delete for characters/rows/screen
- clearing characters/rows/screen

Does not (yet) support:

- programmable regions (scroll regions and attribute blocks)
- dynamic line wrap (where resizing display dynamically re-wraps long lines)

Will likely never implement as part of this widget:

- pty/termio management (such features should be *subclassed*)
- Different per-character font family + sizes (font family/size is global only)
- variable width fonts

Regarding the font family+size; the way the terminal is currently designed, the font family and size must not vary within text; rows have to be consistent height. Varying widths are tricky too, esp. when it comes to moving the cursor up/down within a column; varying *widths* are supported (due to Unicode characters sometimes being "wide", but not heights).

### 33.142.2.6 Margins

The margins define the amount of space (in pixels) around the outside of the text display area, the space between the widget's inner edge (inside the [box\(\)](#)) and the text display area's outer edge. The margins can be inspected and changed with the [margin\\_left\(\)](#), [margin\\_right\(\)](#), [margin\\_top\(\)](#) and [margin\\_bottom\(\)](#) methods.



```

::###:###:###:
::###:###:###:
::###:###:###:
::###:###:###:
::###:###:###:
::###:###:###:
::###:###:###:
Fl_Terminal::textbgcolor()

Fl_Terminal::textfgcolor()

```

### 33.142.2.7 Caveats

- This widget is not a full terminal emulator; it does not do stdio redirection, pseudo ttys/termios/character cooking, keyboard input processing, full curses(3) support. However, such features CAN be implemented with subclassing.
- The `printf()` and `vprintf()` functions are limited to strings no longer than 1024 characters (including NULL). For printing longer strings, use `append()` which has no string limits.
- For background colors `textbgcolor()` and `textbgcolor_default()`, the special color value 0xffffffff lets the widget's `box()` `color()` show through behind the text.

## 33.142.3 Member Enumeration Documentation

### 33.142.3.1 Attrib

enum `Fl_Terminal::Attrib`

Bits for the per-character attributes, which control text features such as italic, bold, underlined text, etc.

NOTE: enum names with a leading underbar must not be used, and are reserved for future use.

#### Enumerator

NORMAL	all attributes off
BOLD	bold text: uses bold font, color brighter than normal
DIM	dim text; color slightly darker than normal
ITALIC	italic font text
UNDERLINE	underlined text
<code>_RESERVED↵ _1</code>	<i>(reserved for internal future use)</i>
INVERSE	inverse text; fg/bg color are swapped
<code>_RESERVED↵ _2</code>	<i>(reserved for internal future use)</i>
STRIKEOUT	strikeout text

### 33.142.3.2 CharFlags

enum `Fl_Terminal::CharFlags`

Per-character 8 bit flags (uchar) used to manage special states for characters.

#### Enumerator

FG_XTERM	this char's fg color is an XTERM color; can be affected by Dim+Bold
----------	---

## Enumerator

BG_XTERM	this char's bg color is an XTERM color; can be affected by Dim+Bold
EOL	TODO: char at EOL, used for line re-wrap during screen resizing.

## 33.142.3.3 OutFlags

enum [Fl\\_Terminal::OutFlags](#)

Output translation flags for special control character translations.

## Enumerator

OFF	no output translation
CR_TO_LF	carriage return generates a vertical line-feed ( <code>\r -&gt; \n</code> )
LF_TO_CR	line-feed generates a carriage return ( <code>\n -&gt; \r</code> )
LF_TO_CRLF	line-feed generates a carriage return line-feed ( <code>\n -&gt; \r\n</code> )

## 33.142.3.4 RedrawStyle

enum [Fl\\_Terminal::RedrawStyle](#)

Determines when [Fl\\_Terminal](#) calls [redraw\(\)](#) if new text is added.

RATE\_LIMITED is the recommended setting, using [redraw\\_rate\(float\)](#) to determine the maximum rate of redraws.

See also

[redraw\\_style\(\)](#), [redraw\\_rate\(\)](#)

## Enumerator

NO_REDRAW	app must call <a href="#">redraw()</a> as needed to update text to screen
RATE_LIMITED	timer controlled redraws. (DEFAULT)
PER_WRITE	redraw triggered after <i>every</i> <a href="#">append()</a> / <a href="#">printf()</a> / etc. operation

## 33.142.3.5 ScrollbarStyle

enum [Fl\\_Terminal::ScrollbarStyle](#)

Behavior of scrollbars.

## Enumerator

SCROLLBAR_OFF	scrollbar always invisible
SCROLLBAR_AUTO	scrollbar visible if widget resized in a way that hides columns (default)
SCROLLBAR_ON	scrollbar always visible

## 33.142.4 Constructor &amp; Destructor Documentation

**33.142.4.1 Fl\_Terminal() [1/2]**

```
Fl_Terminal::Fl_Terminal (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

The constructor for [Fl\\_Terminal](#).

This creates an empty terminal with defaults:

- white on black text; see [textfgcolor\(Fl\\_Color\)](#), [textbgcolor\(Fl\\_Color\)](#)
- rows/cols based on the W and H values, see [display\\_rows\(\)](#), [display\\_columns\(\)](#)
- scrollbar history of 100 lines, see [history\\_rows\(\)](#)
- [redraw\\_style\(\)](#) set to RATE\_LIMITED, [redraw\\_rate\(\)](#) set to 0.10 seconds

Note: While [Fl\\_Terminal](#) derives from [Fl\\_Group](#), it's not intended for user code to use it as a parent for other widgets, so [end\(\)](#) is called.

**Parameters**

in	<i>X,Y,W,H</i>	position and size.
in	<i>L</i>	label string (optional), may be NULL.

**33.142.4.2 Fl\_Terminal() [2/2]**

```
Fl_Terminal::Fl_Terminal (
    int X,
    int Y,
    int W,
    int H,
    const char * L,
    int rows,
    int cols,
    int hist )
```

Same as the default FLTK constructor, but lets the user force the rows, columns and history to specific sizes on creation.

Since the row/cols/hist are specified directly, this prevents the widget from auto-calculating the initial text buffer size based on the widget's pixel width/height, bypassing calls to the font system before the widget is displayed.

**Note**

fluid uses this constructor internally to avoid font calculations that opens the display, useful for when running in a headless context. (issue 837)

**33.142.4.3 ~Fl\_Terminal()**

```
Fl_Terminal::~~Fl_Terminal (
    void )
```

The destructor for [Fl\\_Terminal](#).

Destroys the terminal display, scroll history, and associated widgets.

**33.142.5 Member Function Documentation**

**33.142.5.1 ansi() [1/2]**

```
void Fl_Terminal::ansi (
    bool val )
```

Enable/disable the ANSI mode flag.

If true, ANSI and VT100/xterm codes will be processed. If false, these codes won't be processed and will either be ignored or print the error character "¿", depending on the value of [show\\_unknown\(\)](#).

See also

[show\\_unknown\(\)](#), [The Escape Codes Fl\\_Terminal Supports](#)

**33.142.5.2 ansi() [2/2]**

```
bool Fl_Terminal::ansi (
    void ) const
```

Return the state of the ANSI flag.

See also

[ansi\(bool\)](#)

**33.142.5.3 append()**

```
void Fl_Terminal::append (
    const char * s,
    int len = -1 )
```

Appends string *s* to the terminal at the current cursor position using the current text color/attributes.

If *s* is NULL, the UTF-8 character cache is cleared, which is recommended before starting a block reading loop, and again after the block loop has completed.

If *len* is not specified, it's assumed *s* is a NULL terminated string. If *len* IS specified, it can be used for writing strings that aren't NULL terminated, such as block reads on a pipe, network, or other block oriented data source.

Redraws of the terminal widget are by default handled automatically, but can be changed with [redraw\\_rate\(\)](#) and [redraw\\_style\(\)](#).

**Block I/O**

When reading block oriented sources (such as pipes), [append\(\)](#) will handle partial UTF-8 chars straddling the block boundaries. It does this using an internal byte cache, which should be cleared before and after block I/O loops by calling `append(NULL)` as shown in the example below, to prevent the possibilities of partial UTF-8 characters left behind by an interrupted or incomplete block loop.

```
// Example block reading a command pipe in Unix
// Run command and read as a pipe
FILE *fp = popen("ls -la", "r");
if (!fp) { ..error_handling.. }
// Enable non-blocking I/O
int fd = fileno(fp);
fcntl(fd, F_SETFL, O_NONBLOCK);
// Clear UTF-8 character cache before starting block loop
G_tty->append(NULL); // prevents leftover partial UTF-8 bytes
// Block read loop
while (1) {
    Fl::wait(0.05); // give fltk .05 secs of cpu to manage UI
    ssize_t bytes = read(fd, s, sizeof(s)); // read block from pipe
    if (bytes == -1 && errno == EAGAIN) continue; // no data yet? continue
    if (bytes > 0) G_tty->append(s); // append output to terminal
    else break; // end of pipe?
}
// Flush cache again after block loop completes
G_tty->append(NULL);
// Close pipe, done
pclose(fp);
```

## Note

- String can contain ASCII or UTF-8 chars
- `len` is optional; if unspecified, expects `s` to be a NULL terminated string
- Handles partial UTF-8 chars split between calls (e.g. block oriented writes)
- If `s` is NULL, this clears the "partial UTF-8" character cache
- Redraws are managed automatically by default; see [redraw\\_style\(\)](#)

**33.142.5.4 `append_ascii()`**

```
void Fl_Terminal::append_ascii (
    const char * s )
```

Append NULL terminated ASCII string to terminal, slightly more efficient than [append\\_utf8\(\)](#).

- If `s` is NULL, behavior is to do nothing
- Redraws are triggered automatically, depending on [redraw\\_style\(\)](#)

**33.142.5.5 `append_utf8()`**

```
void Fl_Terminal::append_utf8 (
    const char * buf,
    int len = -1 )
```

Append NULL terminated UTF-8 string to terminal.

- If `buf` is NULL, UTF-8 cache buffer is cleared
- If optional `len` isn't specified or is -1, `strlen(text)` is used.
- If `len` is 0 or <-1, no changes are made
- Handles UTF-8 chars split across calls (e.g. block writes from pipes, etc)
- Redraws are triggered automatically, depending on [redraw\\_style\(\)](#)

**33.142.5.6 `box()`**

```
void Fl_Terminal::box (
    Fl_Boxtype val ) [inline]
```

Sets the box type, updates terminal margins et al.

Default is `FL_DOWN_FRAME`.

`FL_XXX_FRAME` types are handled in a special way by this widget, and guarantee the background is a flat field.

`FL_XXX_BOX` may draw gradients as inherited by [Fl::scheme\(\)](#).

**33.142.5.7 `clear()` [1/2]**

```
void Fl_Terminal::clear (
    Fl_Color val )
```

Clears the screen to a specific color `val` and homes the cursor.

See also

[clear\\_screen\(\)](#), [clear\\_screen\\_home\(\)](#), [cursor\\_home\(\)](#)

**33.142.5.8 clear() [2/2]**

```
void Fl_Terminal::clear (
    void )
```

Clears the screen to the current [textbgcolor\(\)](#), and homes the cursor.

See also

[clear\\_screen\(\)](#), [clear\\_screen\\_home\(\)](#), [cursor\\_home\(\)](#)

**33.142.5.9 clear\_screen()**

```
void Fl_Terminal::clear_screen (
    bool scroll_to_hist = true )
```

Clear the terminal screen only; does not affect the cursor position.

Also clears the current mouse selection.

If 'scroll\_to\_hist' is true, the screen is cleared by scrolling the contents into the scrollbar history, where it can be retrieved with the scrollbar. This is the default behavior. If false, the screen is cleared and the scrollbar history is unchanged.

Similar to the escape sequence "<ESC>[2J".

See also

[clear\\_screen\\_home\(\)](#)

**33.142.5.10 clear\_screen\_home()**

```
void Fl_Terminal::clear_screen_home (
    bool scroll_to_hist = true )
```

Clear the terminal screen and home the cursor.

Also clears the current mouse selection.

If 'scroll\_to\_hist' is true, the screen is cleared by scrolling the contents into the scrollbar history, where it can be retrieved with the scrollbar. This is the default behavior. If false, the screen is cleared and the scrollbar history is unchanged.

Similar to the escape sequence "<ESC>[2J<ESC>[H".

See also

[clear\\_screen\(\)](#)

**33.142.5.11 color()**

```
void Fl_Terminal::color (
    Fl_Color val )
```

Sets the background color for the terminal's [Fl\\_Group::box\(\)](#).

If the [textbgcolor\(\)](#) and [textbgcolor\\_default\(\)](#) are set to the special "see through" color 0xffffffff when any text was added, changing [color\(\)](#) affects the color that shows through behind that existing text.

Otherwise, whatever specific background color was set for existing text will persist after changing [color\(\)](#).

To see the effects of a change to [color\(\)](#), follow up with a call to [redraw\(\)](#).

The default value is 0x0.

**33.142.5.12 cursor\_col()**

```
void Fl_Terminal::cursor_col (
    int col ) [protected]
```

Move cursor to the specified column [col](#).

This value is clamped to the range (0..[display\\_columns\(\)](#)-1).

**33.142.5.13 cursor\_cr()**

```
void Fl_Terminal::cursor_cr (
    void ) [protected]
```

Move cursor as if a CR (\r) was received.

Same as [cursor\\_sol\(\)](#)

**33.142.5.14 cursor\_down()**

```
void Fl_Terminal::cursor_down (
    int count = 1,
    bool do_scroll = false ) [protected]
```

Moves cursor down count lines.

If cursor hits screen bottom, it either stops (does not wrap) if `do_scroll` is false, or wraps and scrolls up if `do_scroll` is true.

**Parameters**

<i>count</i>	Number of lines to move cursor down
<i>do_scroll</i>	Enable scrolling if set to true

**33.142.5.15 cursor\_right()**

```
void Fl_Terminal::cursor_right (
    int count = 1,
    bool do_scroll = false ) [protected]
```

Moves cursor right count columns.

If cursor hits right edge of screen, it either stops (does not wrap) if `do_scroll` is false, or wraps and scrolls up one line if `do_scroll` is true.

**33.142.5.16 cursor\_row()**

```
void Fl_Terminal::cursor_row (
    int row ) [protected]
```

Move cursor to the specified row `row`.

This value is clamped to the range (0..[display\\_rows\(\)](#)-1).

**33.142.5.17 cursor\_up()**

```
void Fl_Terminal::cursor_up (
    int count = 1,
    bool do_scroll = false ) [protected]
```

Moves cursor up count lines.

If cursor hits screen top, it either stops (does not wrap) if `do_scroll` is false, or scrolls down if `do_scroll` is true.

**33.142.5.18 delete\_rows()**

```
void Fl_Terminal::delete_rows (
    int count ) [protected]
```

Delete (count) rows at cursor position.

Causes rows to scroll up, and empty lines created at bottom of screen. Lines deleted by scroll up are NOT moved into the scroll history.

**33.142.5.19 display\_columns() [1/2]**

```
void Fl_Terminal::display_columns (
    int dcols )
```

Set terminal's display width in columns of text characters.

This value is normally managed automatically by [resize\(\)](#) based on the current font size, and should not be changed. You CAN make the [display\\_columns\(\)](#) larger than the width of the widget; text in the terminal will simply run off the screen edge and be clipped; the only way to reveal that text is if the user enlarges the widget, or the font size made smaller.

To change the display width, it is best to use [resize\(\)](#) instead.

#### 33.142.5.20 [display\\_columns\(\)](#) [2/2]

```
int Fl_Terminal::display_columns (
    void ) const
```

Return terminal's display width in columns of text characters.

This value is normally managed automatically by [resize\(\)](#) based on the current font size.

#### 33.142.5.21 [display\\_rows\(\)](#) [1/2]

```
void Fl_Terminal::display_rows (
    int drows )
```

Set terminal's display height in lines of text (rows).

This value is normally managed automatically by [resize\(\)](#) based on the current font size, and should not be changed.

To change the display height, use [resize\(\)](#) instead.

#### 33.142.5.22 [display\\_rows\(\)](#) [2/2]

```
int Fl_Terminal::display_rows (
    void ) const
```

Return terminal's display height in lines of text (rows).

This value is normally managed automatically by [resize\(\)](#) based on the current font size.

#### 33.142.5.23 [draw\(\)](#)

```
void Fl_Terminal::draw (
    void ) [virtual]
```

Draws the entire [Fl\\_Terminal](#).

Lets the group draw itself first (scrollbars should be only members), followed by the terminal's screen contents.

Reimplemented from [Fl\\_Group](#).

#### 33.142.5.24 [draw\\_buff\(\)](#)

```
void Fl_Terminal::draw_buff (
    int Y ) const [protected]
```

Draws the buffer position we are scrolled to onto the FLTK screen starting at pixel position Y.

This can be anywhere in the ring buffer, not just the 'active display'; depends on what position the scrollbar is set to.

Handles attributes, colors, text selections, cursor.

##### Parameters

in	Y	top position of top left character in the window in FLTK coordinates
----	---	--

#### 33.142.5.25 [draw\\_row\(\)](#)

```
void Fl_Terminal::draw_row (
    int grow,
    int Y ) const [protected]
```

Draw the specified global row, which is the row in `ring_chars[]`.

The global row includes history + display buffers.

## Parameters

in	<i>grow</i>	row number
in	<i>Y</i>	top position of characters in the row in FLTK coordinates

**33.142.5.26 draw\_row\_bg()**

```
void Fl_Terminal::draw_row_bg (
    int grow,
    int X,
    int Y ) const [protected]
```

Draw the background for the specified `ring_chars[]` global row `grow` starting at FLTK coords `X` and `Y`.

Note we may be called to draw display, or even history if we're scrolled back. If there's any change in bg color, we draw the filled rects here.

If the bg color for a character is the special "see through" color 0xffffffff, no pixels are drawn.

## Parameters

in	<i>grow</i>	row number
in	<i>X,Y</i>	top left corner of the row in FLTK coordinates

**33.142.5.27 error\_char() [1/2]**

```
void Fl_Terminal::error_char (
    const char * val ) [inline]
```

Sets the "error character" utf8 string shown for invalid utf8 or bad ANSI sequences if [show\\_unknown\(\)](#) is true. Default: "¿".

See also

[show\\_unknown\(bool\)](#)

**33.142.5.28 error\_char() [2/2]**

```
const char * Fl_Terminal::error_char (
    void ) const [inline]
```

Returns the "error character" utf8 string, which is shown for invalid utf8 or bad ANSI sequences if [show\\_unknown\(\)](#) is true.

See also

[show\\_unknown\(bool\)](#)

**33.142.5.29 get\_selection()**

```
bool Fl_Terminal::get_selection (
    int & srow,
    int & scol,
    int & erow,
    int & ecol ) const [protected]
```

Return mouse selection's start/end position in the ring buffer, if any.

Ensures (start < end) to allow walking 'forward' thru selection, left-to-right, top-to-bottom. The row/col values are indexes into the entire ring buffer.

Example: walk the characters of the mouse selection:

```

// Get selection
int srow,scol,erow,ecol;
if (get_selection(srow,scol,erow,ecol)) { // mouse selection exists?
    // Walk entire selection from start to end
    for (int row=srow; row<=erow; row++) { // walk rows of selection
        const Utf8Char *u8c = u8c_ring_row(row); // ptr to first character in row
        int col_start = (row==srow) ? scol : 0; // start row? start at scol
        int col_end = (row==erow) ? ecol : ring_cols(); // end row? end at ecol
        u8c += col_start; // include col offset (if any)
        for (int col=col_start; col<=col_end; col++,u8c++) { // walk columns
            ..do something with each char at *u8c..
        }
    }
}
}

```

Returns:

- true – valid selection values returned
- false – no selection was made, returned values undefined

See also

[walk\\_selection\(\)](#), [is\\_selection\(\)](#)

Parameters

<i>srow</i>	starting row for selection
<i>scol</i>	starting column for selection
<i>erow</i>	ending row for selection
<i>ecol</i>	ending column for selection

### 33.142.5.30 h\_to\_row()

```

int Fl_Terminal::h_to_row (
    int H ) const [protected]

```

Given a height in pixels, return number of rows that "fits" into that area.

This is used by the constructor to size the row/cols to fit the widget size.

### 33.142.5.31 handle()

```

int Fl_Terminal::handle (
    int e ) [virtual]

```

Handle FLTK events.

Reimplemented from [Fl\\_Group](#).

### 33.142.5.32 handle\_unknown\_char() [1/2]

```

int Fl_Terminal::handle_unknown_char (
    int drow,
    int dcol ) [protected]

```

Handle an unknown char by either emitting an error symbol to the tty, or do nothing, depending on the user configurable value of [show\\_unknown\(\)](#).

This writes the "unknown" character to the display position (drow,dcol) if [show\\_unknown\(\)](#) is true.

Returns 1 if tty modified, 0 if not.

See also

[show\\_unknown\(\)](#)

**33.142.5.33 handle\_unknown\_char()** [2/2]

```
int Fl_Terminal::handle_unknown_char (
    void ) [protected]
```

Handle an unknown char by either emitting an error symbol to the tty, or do nothing, depending on the user configurable value of [show\\_unknown\(\)](#).

This writes the "unknown" character to the output stream if [show\\_unknown\(\)](#) is true.

Returns 1 if tty modified, 0 if not.

See also

[show\\_unknown\(\)](#)

**33.142.5.34 history\_lines()**

```
void Fl_Terminal::history_lines (
    int val )
```

Set the number of lines of screen history.

Large values can be briefly heavy on cpu and memory usage.

**33.142.5.35 history\_use()**

```
int Fl_Terminal::history_use (
    void ) const
```

Returns how many lines are "in use" by the screen history buffer.

This value will be 0 if history was recently cleared with e.g. [clear\\_history\(\)](#) or "<ESC>c".

Return value will be in the range 0 .. ([history\\_lines\(\)](#)-1).

**33.142.5.36 hscrollbar\_style()** [1/2]

```
void Fl_Terminal::hscrollbar_style (
    ScrollbarStyle val )
```

Set the horizontal scrollbar behavior style.

This determines when the scrollbar is visible.

ScrollbarStyle enum	Description
<a href="#">SCROLLBAR_ON</a>	Horizontal scrollbar always displayed.
<a href="#">SCROLLBAR_OFF</a>	Horizontal scrollbar never displayed.
<a href="#">SCROLLBAR_AUTO</a>	Horizontal scrollbar displayed whenever widget width hides columns.

The default style is SCROLLBAR\_AUTO.

See also

[ScrollbarStyle](#)

**33.142.5.37 hscrollbar\_style()** [2/2]

```
Fl_Terminal::ScrollbarStyle Fl_Terminal::hscrollbar_style (
    void ) const
```

Get the horizontal scrollbar behavior style.

This determines when the scrollbar is visible.

Value will be one of the [Fl\\_Terminal::ScrollbarStyle](#) enum values.

See also

[hscrollbar\\_style\(Fl\\_Terminal::ScrollbarStyle\)](#)

### 33.142.5.38 insert\_char()

```
void Fl_Terminal::insert_char (
    char c,
    int rep ) [protected]
```

Insert char 'c' at the current cursor position for 'rep' times.  
Does not wrap; characters at end of line are lost.

### 33.142.5.39 insert\_rows()

```
void Fl_Terminal::insert_rows (
    int count ) [protected]
```

Insert (count) rows at current cursor position.

Causes rows below to scroll down, and empty lines created. Lines deleted by scroll down are NOT moved into the scroll history.

### 33.142.5.40 is\_inside\_selection()

```
bool Fl_Terminal::is_inside_selection (
    int grow,
    int gcol ) const [protected]
```

Is global row/column inside the current mouse selection?

Returns

- true – (grow, gcol) is inside a valid selection.
- false – (grow, gcol) is outside, or no valid selection.

### 33.142.5.41 output\_translate()

```
void Fl_Terminal::output_translate (
    Fl_Terminal::OutFlags val )
```

Sets the combined output translation flags to val.

val can be sensible combinations of the OutFlags bit flags.

The default is LF\_TO\_CRLF, so that \n will generate both carriage-return (CR) and line-feed (LF).

For \r and \n to be handled literally, use output\_translate(Fl\_Terminal::OutFlags::OFF);

To disable all output translations, use 0 or Fl\_Terminal::OutFlags::OFF.

### 33.142.5.42 plot\_char() [1/2]

```
void Fl_Terminal::plot_char (
    char c,
    int drow,
    int dcol )
```

Plot the ASCII character c at the terminal's display position (drow,dcol).

The character MUST be printable (in range 0x20 - 0x7e), and is displayed using the current text color/attributes.

Characters outside that range are either ignored or print the error character (¿), depending on [show\\_unknown\(bool\)](#).

This is a very low level method.

No range checking is done on drow,dcol:

- drow must be in range 0..[\(display\\_rows\(\)-1\)](#)
- dcol must be in range 0..[\(display\\_columns\(\)-1\)](#)

- Does not trigger redraws
- Does NOT handle control codes, ANSI or XTERM escape sequences.

See also

[show\\_unknown\(bool\)](#), [handle\\_unknown\\_char\(\)](#), [is\\_printable\(\)](#)

### 33.142.5.43 `plot_char()` [2/2]

```
void Fl_Terminal::plot_char (
    const char * text,
    int len,
    int drow,
    int dcol )
```

Plot the UTF-8 character `text` of length `len` at display position (`drow`,`dcol`).

The character is displayed using the current text color/attributes.

This is a very low level method.

No range checking is done on `drow`,`dcol`:

- `drow` must be in range 0..[\(display\\_rows\(\)-1\)](#)
- `dcol` must be in range 0..[\(display\\_columns\(\)-1\)](#)
- Does not trigger redraws
- Does not handle control codes, ANSI or XTERM escape sequences.
- Invalid UTF-8 chars show the error character (`¿`) depending on [show\\_unknown\(bool\)](#).

See also

[handle\\_unknown\\_char\(\)](#)

### 33.142.5.44 `print_char()` [1/2]

```
void Fl_Terminal::print_char (
    char c )
```

Prints single ASCII char `c` at current cursor position, and advances the cursor.

The character is displayed at the current cursor position using the current text color/attributes.

- `c` must be ASCII, not utf-8
- Does not trigger redraws

### 33.142.5.45 `print_char()` [2/2]

```
void Fl_Terminal::print_char (
    const char * text,
    int len = -1 )
```

Prints single UTF-8 char `text` of optional byte length `len` at current cursor position, and advances the cursor if the character is printable.

Handles ASCII and control codes (CR, LF, etc).

The character is displayed at the current cursor position using the current text color/attributes.

Handles control codes and can be used to construct ANSI/XTERM escape sequences.

- If optional `len` isn't specified or `<0`, `strlen(text)` is used.

- `text` must not be `NULL`.
- `len` must not be 0.
- `text` must be a single char only (whether UTF-8 or ASCII)
- `text` can be an ASCII character, though not as efficient as [print\\_char\(\)](#)
- Invalid UTF-8 chars show the error character (¿) depending on [show\\_unknown\(bool\)](#).
- Does not trigger redraws

See also

[show\\_unknown\(bool\)](#), [handle\\_unknown\\_char\(\)](#)

### 33.142.5.46 printf()

```
void Fl_Terminal::printf (
    const char * fmt,
    ... )
```

Appends `printf` formatted messages to the terminal.

The string can contain UTF-8, `cr`'s, and ANSI sequences are also supported. Example:

```
#include <FL/Fl_Terminal.H>
int main(..) {
    :
    // Create a terminal, and append some messages to it
    Fl_Terminal *tty = new Fl_Terminal(..);
    :
    // Append three lines of formatted text to the buffer
    tty->printf("The current date is:  %s.\nThe time is:  %s\n", date_str, time_str);
    tty->printf("The current PID is %ld.\n", (long) getpid());
    :
}
```

#### Note

The expanded string is currently limited to 1024 characters (including `NULL`). For longer strings use [append\(\)](#) which has no string limits.

### 33.142.5.47 redraw\_rate()

```
void Fl_Terminal::redraw_rate (
    float val )
```

Set the maximum rate redraw speed in floating point seconds if [redraw\\_style\(\)](#) is set to `RATE_LIMITED`.

When output is sent to the terminal, rather than calling [redraw\(\)](#) right away, a timer is started with this value indicating how long to wait before calling [redraw\(\)](#), causing the output to be shown. 0.10 is recommended (1/10th of a second), to limit redraws to no more than 10 redraws per second.

The value that works best depends on how fast data arrives, and how fast the font system can draw text at runtime. Values too small cause too many redraws to occur, causing the terminal to get backlogged if large bursts of data arrive quickly. Values too large cause realtime output to be too "choppy".

### 33.142.5.48 redraw\_style() [1/2]

```
void Fl_Terminal::redraw_style (
    RedrawStyle val )
```

Set how [Fl\\_Terminal](#) manages screen redrawing.

This setting is relevant when [Fl\\_Terminal](#) is used for high bandwidth data; too many redraws will slow things down, too few cause redraws to be 'choppy' when realtime data comes in.

Redrawing can be cpu intensive, depending on how many rows/cols are being displayed; worst case: large display + small font. Speed largely depends on the end user's graphics hardware and font drawing system.

RedrawStyle enum	Description
<a href="#">NO_REDRAW</a>	App must call <a href="#">redraw()</a> as needed to update text to screen
<a href="#">RATE_LIMITED</a>	Rate limited, timer controlled redraws. (DEFAULT) See <a href="#">redraw_rate()</a>
<a href="#">PER_WRITE</a>	Redraw triggered <i>every</i> call to <a href="#">append()</a> / <a href="#">printf()</a> / etc.

The default style is RATE\_LIMITED, which is the easiest to use, and automates redrawing to be capped at 10 redraws per second max. See [redraw\\_rate\(float\)](#) to control this automated redraw speed.

See also

[redraw\\_rate\(\)](#), [RedrawStyle](#)

### 33.142.5.49 redraw\_style() [2/2]

```
Fl_Terminal::RedrawStyle Fl_Terminal::redraw_style (
    void ) const
```

Get the redraw style.

This determines when the terminal redraws itself while text is being added to it.

Value will be one of the [Fl\\_Terminal::RedrawStyle](#) enum values.

See also

[redraw\\_style\(Fl\\_Terminal::RedrawStyle\)](#)

### 33.142.5.50 reset\_terminal()

```
void Fl_Terminal::reset_terminal (
    void )
```

Resets terminal to default colors, clears screen, history and mouse selection, homes cursor, resets tabstops.

Same as "<ESC>c"

### 33.142.5.51 resize()

```
void Fl_Terminal::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Handle widget resizing, such as if user resizes parent window.

This may increase the column width of the widget if the width of the widget is made larger than it was.

Note

Resizing currently does not rewrap existing text. Currently enlarging makes room for longer lines, and shrinking the size lets long lines run off the right edge of the display, hidden from view. This behavior may change in the future to rewrap.

Reimplemented from [Fl\\_Group](#).

### 33.142.5.52 scroll()

```
void Fl_Terminal::scroll (
    int rows ) [protected]
```

Scroll the display up(+) or down(-) the specified rows.

- Negative value scrolls "down", clearing top line, and history unaffected.
- Postive value scrolls "up", clearing bottom line, rotating top line into history.

### 33.142.5.53 scrollbar\_actual\_size()

```
int Fl_Terminal::scrollbar_actual_size (
    void ) const
```

Returns the scrollbar's actual "trough size", which is the width of FL\_VERTICAL scrollbars, or height of FL\_↔ HORIZONTAL scrollbars.

If [scrollbar\\_size\(\)](#) is zero (default), then the value of the global [Fl::scrollbar\\_size\(\)](#) is returned, which is the default global scrollbar size for the entire application.

### 33.142.5.54 scrollbar\_size() [1/2]

```
void Fl_Terminal::scrollbar_size (
    int val )
```

Set the pixel size of both horizontal and vertical scrollbar's "trough" to `val`.

Setting `val` to the special value 0 causes the widget to track the global [Fl::scrollbar\\_size\(\)](#).

Use non-zero values *only* if you need to override the global [Fl::scrollbar\\_size\(\)](#) size.

See also

[Fl::scrollbar\\_size\(\)](#), [scrollbar\\_actual\\_size\(\)](#)

### 33.142.5.55 scrollbar\_size() [2/2]

```
int Fl_Terminal::scrollbar_size (
    void ) const
```

Get current pixel size of all the scrollbar's troughs for this widget, or zero if the global [Fl::scrollbar\\_size\(\)](#) is being used (default).

If this value returns *zero*, this widget's scrollbars are using the global [Fl::scrollbar\\_size\(\)](#), in which case use [scrollbar\\_actual\\_size\(\)](#) to get the actual (effective) pixel scrollbar size being used.

Returns

Scrollbar trough size in pixels, or 0 if the global [Fl::scrollbar\\_size\(\)](#) is being used.

See also

[Fl::scrollbar\\_size\(int\)](#), [scrollbar\\_actual\\_size\(\)](#)

### 33.142.5.56 selection\_extend()

```
bool Fl_Terminal::selection_extend (
    int X,
    int Y ) [protected]
```

Extend selection to FLTK coords X,Y.

Returns true if extended, false if nothing done (X,Y offscreen)

### 33.142.5.57 selection\_text()

```
const char * Fl_Terminal::selection_text (
    void ) const
```

Return text selection (for copy()/paste() operations)

- Returns allocated NULL terminated string for entire selection.

- Caller must free() this memory when done.
- Unicode safe.

### 33.142.5.58 selection\_text\_len()

```
int Fl_Terminal::selection_text_len (
    void ) const
```

Return byte length of all UTF-8 chars in selection, or 0 if no selection.

NOTE: Length includes trailing white on each line.

### 33.142.5.59 show\_unknown() [1/2]

```
void Fl_Terminal::show_unknown (
    bool val )
```

Set the "show unknown" flag.

If true, invalid utf8 and invalid ANSI sequences will be shown with the error character "¿".

If false, errors characters won't be shown.

See also

[handle\\_unknown\\_char\(\)](#), [error\\_char\(const char\\*\)](#).

### 33.142.5.60 show\_unknown() [2/2]

```
bool Fl_Terminal::show_unknown (
    void ) const
```

Return the "show unknown" flag.

See also

[show\\_unknown\(bool\)](#), [error\\_char\(const char\\*\)](#).

### 33.142.5.61 text()

```
const char * Fl_Terminal::text (
    bool lines_below_cursor = false ) const
```

Return a string copy of all lines in the terminal (including history).

The returned string is allocated with strdup(3), which the caller must free.

If 'lines\_below\_cursor' is false (default), lines below the cursor on down to the bottom of the display are ignored, and not included in the returned string.

If 'lines\_below\_cursor' is true, then all lines in the display are returned including any below the cursor, even if all are blank.

Example use:

```
Fl_Terminal *tty = new Fl_Terminal(..);
:
const char *s = tty->text(); // get a copy of the terminal's contents
printf("Terminal's contents is:\n%s\n", s);
free((void*)s); // free() the copy when done!
```

#### Parameters

in	<i>lines_below_cursor</i>	include lines below cursor, default: false
----	---------------------------	--

## Returns

A string allocated with `strdup(3)` which must be free'd, text is UTF-8.

**33.142.5.62 textattrib()** [1/2]

```
uchar Fl_Terminal::textattrib ( ) const
```

Get text attribute bits (underline, inverse, etc).

This is the default attribute used for all newly printed text.

## See also

[textattrib\(uchar\)](#), [Fl\\_Terminal::Attrib](#)

**33.142.5.63 textattrib()** [2/2]

```
void Fl_Terminal::textattrib (
    uchar val )
```

Set text attribute bits (underline, inverse, etc).

This will be the default attribute used for all newly printed text.

## See also

[Fl\\_Terminal::Attrib](#)

**33.142.5.64 textbgcolor()**

```
void Fl_Terminal::textbgcolor (
    Fl_Color val )
```

Set text background color to fltk color `val` used by any new text added.

Use this for temporary color changes, similar to `<ESC>[48;2;<R>;<G>;<B>m`

Colors set this way will NOT be influenced by the xterm Dim/Bold color intensity attributes. For that, use [textbgcolor\\_xterm\(uchar\)](#) instead.

This setting does *not* affect the 'default' text colors used by `<ESC>[0m`, `<ESC>c`, [reset\\_terminal\(\)](#), etc. To set that too, also set [textbgcolor\\_default\(Fl\\_Color\)](#), e.g.

```
// Set both 'current' and 'default' colors
Fl_Color darkamber = 0x20100000;
tty->textbgcolor(darkamber);           // set 'current' bg color
tty->textbgcolor_default(darkamber);    // set 'default' bg color used by ESC[0m reset
```

The special color value `0xffffffff` (all ff's) is the "see through" color, which lets the widget's own [Fl\\_Group::color\(\)](#) show through behind the text. This special text background color is the *default*, and is what most situations need.

## See also

[textbgcolor\\_default\(Fl\\_Color\)](#), [textbgcolor\\_xterm\(uchar\)](#)

**33.142.5.65 textbgcolor\_default()** [1/2]

```
void Fl_Terminal::textbgcolor_default (
    Fl_Color val )
```

Set the default text background color used by any new text added after a reset (`<ESC>c`, `<ESC>[0m`, or [reset\\_terminal\(\)](#)).

Does not affect the 'current' text background color; use [textbgcolor\(Fl\\_Color\)](#) to set that.

The special color value `0xffffffff` (all ff's) is the "see through" color, which lets the widget's own [Fl\\_Group::color\(\)](#) show through behind the text. This special text background color is the *default*, and is what most situations need.

See also

[textbgcolor\(Fl\\_Color\)](#)

### 33.142.5.66 textbgcolor\_default() [2/2]

```
Fl_Color Fl_Terminal::textbgcolor_default (
    void ) const [inline]
```

Return text's default background color.

See also

[textbgcolor\(\)](#)

### 33.142.5.67 textbgcolor\_xterm()

```
void Fl_Terminal::textbgcolor_xterm (
    uchar val )
```

Sets the background text color as one of the 8 'xterm color' values.

This will be the foreground color used for all newly printed text, similar to the `<ESC>[#m` escape sequence, where `#` is between 40 and 47.

This color will be reset to the default bg color if [reset\\_terminal\(\)](#) is called, or by `<ESC>c`, `<ESC>[0m`, etc.

The xterm color intensity values can be influenced by the Dim/Bold/Normal modes (which can be set with e.g. `<ESC>[1m`, [textattrib\(\)](#), etc), so the actual RGB values of these colors allow room for Dim/Bold to influence their brightness. For instance, "Normal Red" is not full brightness to allow "Bold Red" to be brighter. This goes for all colors except 'Black', which is not influenced by Dim or Bold; Black is always Black.

The 8 color xterm values are:

- 0 = Black
- 1 = Red
- 2 = Green
- 3 = Yellow
- 4 = Blue
- 5 = Magenta
- 6 = Cyan
- 7 = White

See also

[textbgcolor\\_default\(Fl\\_Color\)](#)

### 33.142.5.68 textcolor()

```
void Fl_Terminal::textcolor (
    Fl_Color val )
```

Set the text color for the terminal.

This is a convenience method that sets *both* [textfgcolor\(\)](#) and [textfgcolor\\_default\(\)](#), ensuring both are set to the same value.

Colors set this way will NOT be influenced by the xterm Dim/Bold color intensity attributes. For that, use [textcolor↔\\_xterm\(\)](#) instead.

See also

[textfgcolor\(Fl\\_Color\)](#), [textfgcolor\\_default\(Fl\\_Color\)](#), [textbgcolor\\_xterm\(uchar\)](#)

**33.142.5.69 textfgcolor()**

```
void Fl_Terminal::textfgcolor (
    Fl_Color val )
```

Set text foreground drawing color to fltk color `val` used by any new text added.

Use this for temporary color changes, similar to `<ESC>[38;2;<R>;<G>;<B>m`

Colors set this way will NOT be influenced by the xterm Dim/Bold color intensity attributes. For that, use [textfgcolor\\_xterm\(uchar\)](#) instead.

This setting does *not* affect the 'default' text colors used by `<ESC>[0m`, `<ESC>c`, [reset\\_terminal\(\)](#), etc. To change both the current *and* default fg color, also use [textfgcolor\\_default\(Fl\\_Color\)](#). Example:

```
// Set both 'current' and 'default' colors
Fl_Color amber = 0xd0704000;
tty->textfgcolor(amber);           // set 'current' fg color
tty->textfgcolor_default(amber);   // set 'default' fg color used by ESC[0m reset
```

See also

[textfgcolor\\_default\(Fl\\_Color\)](#), [textfgcolor\\_xterm\(uchar\)](#)

**33.142.5.70 textfgcolor\_default()** [1/2]

```
void Fl_Terminal::textfgcolor_default (
    Fl_Color val )
```

Set the default text foreground color used by `<ESC>c`, `<ESC>[0m`, and [reset\\_terminal\(\)](#).

Does not affect the 'current' text foreground color; use [textfgcolor\(Fl\\_Color\)](#) to set that.

See also

[textfgcolor\(Fl\\_Color\)](#)

**33.142.5.71 textfgcolor\_default()** [2/2]

```
Fl_Color Fl_Terminal::textfgcolor_default (
    void ) const [inline]
```

Return text's default foreground color.

See also

[textfgcolor\(\)](#)

**33.142.5.72 textfgcolor\_xterm()**

```
void Fl_Terminal::textfgcolor_xterm (
    uchar val )
```

Sets the foreground text color as one of the 8 'xterm color' values.

This will be the foreground color used for all newly printed text, similar to the `<ESC>[#m` escape sequence, where `#` is between 30 and 37.

This color will be reset to the default fg color if [reset\\_terminal\(\)](#) is called, or by `<ESC>c`, `<ESC>[0m`, etc.

The xterm color intensity values can be influenced by the Dim/Bold/Normal modes (which can be set with e.g. `<ESC>[1m`, [textattrib\(\)](#), etc), so the actual RGB values of these colors allow room for Dim/Bold to influence their brightness. For instance, "Normal Red" is not full brightness to allow "Bold Red" to be brighter. This goes for all colors except 'Black', which is not influenced by Dim or Bold; Black is always Black.

The 8 color xterm values are:

- 0 = Black
- 1 = Red

- 2 = Green
- 3 = Yellow
- 4 = Blue
- 5 = Magenta
- 6 = Cyan
- 7 = White

See also

[textfgcolor\\_default\(Fl\\_Color\)](#)

### 33.142.5.73 `textfont()`

```
void Fl_Terminal::textfont (
    Fl_Font val )
```

Sets the font used for all text displayed in the terminal.

This affects all existing text (in display and history) as well as any newly printed text.

Only monospace fonts are recommended, such as `FL_COURIER` or `FL_SCREEN`. Custom fonts configured with [Fl::set\\_font\(\)](#) will also work, as long as they are monospace.

### 33.142.5.74 `textsize()`

```
void Fl_Terminal::textsize (
    Fl_Fontsize val )
```

Sets the font size used for all text displayed in the terminal.

This affects all existing text (in display and history) as well as any newly printed text.

Changing this will affect the [display\\_rows\(\)](#) and [display\\_columns\(\)](#).

### 33.142.5.75 `u8c_disp_row()`

```
Fl_Terminal::Utf8Char * Fl_Terminal::u8c_disp_row (
    int drow ) [protected]
```

Return pointer to the first u8c character in row `drow` of the display.

- 'drow' is indexed relative to the beginning of the display buffer.
- This can be used to walk all columns in the specified row, e.g.  

```
// Print all chars in first row of display (ASCII and UTF-8)
Utf8Char *u8c = u8c_disp_row(0);           // first char of first display row
int scol = 0, ecol = disp_cols();          // start/end for column loop
for (int col=scol; col<ecol; col++,u8c++) { // loop from first char to last
    char *text = u8c->text_utf8();          // text string for char
    int len = u8c->length();                // text string length for char
    ::printf("<%.*s>", len, text);          // print potentially multibyte char
}
```

### 33.142.5.76 `u8c_hist_row()`

```
Fl_Terminal::Utf8Char * Fl_Terminal::u8c_hist_row (
    int hrow ) [protected]
```

Return u8c for beginning of a row inside the scrollbar history.

'hrow' is indexed relative to the beginning of the scrollbar history buffer.

See also

[u8c\\_disp\\_row\(int\)](#) for example use.

**33.142.5.77 u8c\_hist\_use\_row()**

```
Fl_Terminal::Utf8Char * Fl_Terminal::u8c_hist_use_row (
    int hurow ) [protected]
```

Return u8c for beginning of row `hurow` inside the 'in use' part of the scrollbar history. 'hurow' is indexed relative to the beginning of the 'in use' part of the scrollbar history buffer. This may be a different from `u8c_hist_row(int)` if the history was recently cleared, and there aren't many (or any) rows in the history buffer that have been populated with scrollbar text yet.

See also

`u8c_disp_row(int)` for example use.

**33.142.5.78 u8c\_ring\_row()**

```
Fl_Terminal::Utf8Char * Fl_Terminal::u8c_ring_row (
    int grow ) [protected]
```

Return UTF-8 char for row `grow` in the ring buffer.

`grow` is globally indexed relative to the beginning of the ring buffer, so this method can access ANY character in the entire ring buffer (hist or disp) by the global index.

Scrolling offset is NOT applied; this is raw access to the ring's rows.

Should really ONLY be used for making a complete copy of the ring.

Example:

```
// Walk ALL rows and cols in the ring buffer..
for (int row=0; row<ring.rows(); row++) {
    Utf8Char *u8c = ring.u8c_ring_row(row);
    for (int col=0; col<ring.cols(); col++,u8c++) {
        ..make use of u8c->xxx() methods..
    }
}
```

**33.142.5.79 vprintf()**

```
void Fl_Terminal::vprintf (
    const char * fmt,
    va_list ap )
```

Appends printf formatted messages to the terminal.

Subclasses can use this to implement their own `printf()` functionality.

The string can contain UTF-8, crlf's, and ANSI sequences are also supported when `ansi(bool)` is set to 'true'.

Note

The expanded string is currently limited to 1024 characters (including NULL). For longer strings use `append()` which has no string limits.

**Parameters**

<i>fmt</i>	is a printf format string for the message text.
<i>ap</i>	is a <code>va_list</code> created by <code>va_start()</code> and closed with <code>va_end()</code> , which the caller is responsible for handling.

**33.142.5.80 w\_to\_col()**

```
int Fl_Terminal::w_to_col (
    int W ) const [protected]
```

Given a width in pixels, return number of columns that "fits" into that area.

This is used by the constructor to size the row/cols to fit the widget size.

### 33.142.5.81 walk\_selection()

```
const Fl_Terminal::Utf8Char * Fl_Terminal::walk_selection (
    const Utf8Char * u8c,
    int & row,
    int & col ) const [protected]
```

Walk the mouse selection one character at a time from beginning to end, returning a Utf8Char\* to the next character in the selection, or NULL if the end was reached, or if there's no selection.

This is easier to use for walking the selection than [get\\_selection\(\)](#).

u8c should start out as NULL, rewinding to the beginning of the selection. If the returned Utf8Char\* is not NULL, row and col return the character's row/column position in the ring buffer.

```
// EXAMPLE: Walk the entire mouse selection, if any
int row,col;                                // the returned row/col for each char
Utf8Char *u8c = NULL;                       // start with NULL to begin walk
while ((u8c = walk_selection(u8c, row, col))) { // loop until end char reached
    ..do something with *u8c..
}
```

See also

[get\\_selection\(\)](#), [is\\_selection\(\)](#)

#### Parameters

<i>u8c</i>	NULL on first iter
<i>row</i>	returned row#
<i>col</i>	returned col#

## 33.142.6 Member Data Documentation

### 33.142.6.1 hscrollbar

```
Fl_Scrollbar* Fl_Terminal::hscrollbar
```

Horizontal scrollbar.

This is public so it can be accessed directly, e.g.

- [hscrollbar->value\(\)](#) returns the column offset position from the left edge of the display; 0 being the left edge (default).
- [hscrollbar->value\(int\)](#) similarly sets the column offset, which should be in the range [0 .. [Fl\\_Scrollbar::maximum\(\)](#)].
- [hscrollbar->step\(double\)](#) sets the smoothness of scrolling, default is 0.25 for 4 steps of motion per column.

### 33.142.6.2 scrollbar

```
Fl_Scrollbar* Fl_Terminal::scrollbar
```

Vertical scrollbar.

This is public so it can be accessed directly, e.g.

- [scrollbar->value\(\)](#) returns the row offset from the bottom of the display, 0 being the bottom (default).
- [scrollbar->value\(int\)](#) similarly sets the row offset, which should be in the range [0 .. [Fl\\_Scrollbar::maximum\(\)](#)].
- [scrollbar->step\(double\)](#) sets the smoothness of scrolling, default is 0.25 for 4 steps of motion per column.

**Todo** Support scrollbar\_left/right() - See [FI\\_Browser\\_::scrollbar](#) docs  
Support new ScrollbarStyle

The documentation for this class was generated from the following files:

- [FI\\_Terminal.H](#)
- [FI\\_Terminal.cxx](#)

## 33.143 FI\_Text\_Buffer Class Reference

This class manages Unicode text displayed in one or more [FI\\_Text\\_Display](#) widgets.

```
#include <FI_Text_Buffer.H>
```

### Public Member Functions

- void [add\\_modify\\_callback](#) (FI\_Text\_Modify\_Cb bufModifiedCB, void \*cbArg)  
*Adds a callback function that is called whenever the text buffer is modified.*
- void [add\\_predelete\\_callback](#) (FI\_Text\_Predelete\_Cb bufPreDelCB, void \*cbArg)  
*Adds a callback routine to be called before text is deleted from the buffer.*
- char \* [address](#) (int pos)  
*Convert a byte offset in buffer into a memory address.*
- const char \* [address](#) (int pos) const  
*Convert a byte offset in buffer into a memory address.*
- void [append](#) (const char \*t, int addedLength=-1)  
*Appends the text string to the end of the buffer.*
- int [appendfile](#) (const char \*file, int buflen=128 \* 1024)  
*Appends the named file to the end of the buffer.*
- char [byte\\_at](#) (int pos) const  
*Returns the raw byte at the specified position pos in the buffer.*
- void [call\\_modify\\_callbacks](#) ()  
*Calls all modify callbacks that have been registered using the [add\\_modify\\_callback\(\)](#) method.*
- void [call\\_predelete\\_callbacks](#) ()  
*Calls the stored pre-delete callback procedure(s) for this buffer to update the changed area(s) on the screen and any other listeners.*
- bool [can\\_redo](#) () const  
*Check if undo is enabled and if the last undo action can be redone.*
- bool [can\\_undo](#) () const  
*Check if undo is enabled and if the last action can be undone.*
- void [canUndo](#) (char flag=1)  
*Enable or disable undo actions for this text buffer.*
- unsigned int [char\\_at](#) (int pos) const  
*Returns the character at the specified position pos in the buffer.*
- void [copy](#) ([FI\\_Text\\_Buffer](#) \*fromBuf, int fromStart, int fromEnd, int toPos)  
*Copies text from another [FI\\_Text\\_Buffer](#) to this one.*
- int [count\\_displayed\\_characters](#) (int lineStartPos, int targetPos) const  
*Count the number of displayed characters between buffer position lineStartPos and targetPos.*
- int [count\\_lines](#) (int startPos, int endPos) const  
*Counts the number of newlines between startPos and endPos in buffer.*
- int [estimate\\_lines](#) (int startPos, int endPos, int lineLen) const  
*Estimate the number of newlines between startPos and endPos in buffer.*
- int [findchar\\_backward](#) (int startPos, unsigned int searchChar, int \*foundPos) const  
*Search backwards in buffer buf for character searchChar, starting with the character before startPos, returning the result in foundPos.*

- `int findchar_forward` (int startPos, unsigned searchChar, int \*foundPos) const  
*Finds the next occurrence of the specified character.*
- `FI_Text_Buffer` (int requestedSize=0, int preferredGapSize=1024)  
*Create an empty text buffer of a pre-determined size.*
- `int highlight` ()  
*Returns a non-zero value if text has been highlighted, 0 otherwise.*
- `void highlight` (int start, int end)  
*Highlights the specified text within the buffer.*
- `int highlight_position` (int \*start, int \*end)  
*Highlights the specified text between *start* and *end* within the buffer.*
- `const FI_Text_Selection * highlight_selection` () const  
*Returns the current highlight selection.*
- `char * highlight_text` ()  
*Returns the highlighted text.*
- `void insert` (int pos, const char \*text, int insertedLength=-1)  
*Inserts null-terminated string *text* at position *pos*.*
- `int insertfile` (const char \*file, int pos, int buflen=128 \*1024)  
*Inserts a file at the specified position.*
- `bool is_word_separator` (int pos) const  
*Returns whether character at position *pos* is a word separator.*
- `int length` () const  
*Returns the number of bytes in the buffer.*
- `int line_end` (int pos) const  
*Finds and returns the position of the end of the line containing position *pos* (which is either a pointer to the newline character ending the line or a pointer to one character beyond the end of the buffer).*
- `int line_start` (int pos) const  
*Returns the position of the start of the line containing position *pos*.*
- `char * line_text` (int pos) const  
*Returns the text from the entire line containing the specified character position.*
- `int loadfile` (const char \*file, int buflen=128 \*1024)  
*Loads a text file into the buffer.*
- `int next_char` (int ix) const  
*Returns the index of the next character.*
- `int next_char_clipped` (int ix) const
- `int outfile` (const char \*file, int start, int end, int buflen=128 \*1024)  
*Writes the specified portions of the text buffer to a file.*
- `int prev_char` (int ix) const  
*Returns the index of the previous character.*
- `int prev_char_clipped` (int ix) const
- `FI_Text_Selection * primary_selection` ()  
*Returns the primary selection.*
- `const FI_Text_Selection * primary_selection` () const  
*Returns the primary selection.*
- `void printf` (const char \*fmt,...)  
*Appends printf formatted messages to the end of the buffer.*
- `int redo` (int \*cp=0)  
*Redo previous undo action.*
- `void remove` (int start, int end)  
*Deletes a range of characters in the buffer.*
- `void remove_modify_callback` (FI\_Text\_Modify\_Cb bufModifiedCB, void \*cbArg)  
*Removes a modify callback.*

- void **remove\_predelete\_callback** (FI\_Text\_Predelete\_Cb predelCB, void \*cbArg)  
*Removes a callback routine `bufPreDeleteCB` associated with argument `cbArg` to be called before text is deleted from the buffer.*
- void **remove\_secondary\_selection** ()  
*Removes the text from the buffer corresponding to the secondary text selection object.*
- void **remove\_selection** ()  
*Removes the text in the primary selection.*
- void **replace** (int start, int end, const char \*text, int insertedLength=-1)  
*Deletes the characters between `start` and `end`, and inserts the null-terminated string `text` in their place in the buffer.*
- void **replace\_secondary\_selection** (const char \*text)  
*Replaces the text from the buffer corresponding to the secondary text selection object with the new string `text`.*
- void **replace\_selection** (const char \*text)  
*Replaces the text in the primary selection.*
- int **rewind\_lines** (int startPos, int nLines)  
*Finds and returns the position of the first character of the line `nLines` backwards from `startPos` (not counting the character pointed to by `startpos` if that is a newline) in the buffer.*
- int **savefile** (const char \*file, int buflen=128 \* 1024)  
*Saves a text file from the current buffer.*
- int **search\_backward** (int startPos, const char \*searchString, int \*foundPos, int matchCase=0) const  
*Search backwards in buffer for string `searchString`, starting with the character at `startPos`, returning the result in `foundPos`.*
- int **search\_forward** (int startPos, const char \*searchString, int \*foundPos, int matchCase=0) const  
*Search forwards in buffer for string `searchString`, starting with the character `startPos`, and returning the result in `foundPos`.*
- void **secondary\_select** (int start, int end)  
*Selects a range of characters in the secondary selection.*
- int **secondary\_selected** ()  
*Returns a non-zero value if text has been selected in the secondary text selection, 0 otherwise.*
- const FI\_Text\_Selection \* **secondary\_selection** () const  
*Returns the secondary selection.*
- int **secondary\_selection\_position** (int \*start, int \*end)  
*Returns the current selection in the secondary text selection object.*
- char \* **secondary\_selection\_text** ()  
*Returns the text in the secondary selection.*
- void **secondary\_unselect** ()  
*Clears any selection in the secondary text selection object.*
- void **select** (int start, int end)  
*Selects a range of characters in the buffer.*
- int **selected** () const  
*Returns a non-zero value if text has been selected, 0 otherwise.*
- int **selection\_position** (int \*start, int \*end)  
*Gets the selection position.*
- char \* **selection\_text** ()  
*Returns the currently selected text.*
- int **skip\_displayed\_characters** (int lineStartPos, int nChars)  
*Count forward from buffer position `startPos` in displayed characters.*
- int **skip\_lines** (int startPos, int nLines)  
*Finds the first character of the line `nLines` forward from `startPos` in the buffer and returns its position.*
- int **tab\_distance** () const  
*Gets the tab width.*
- void **tab\_distance** (int tabDist)

Set the hardware tab distance (width) used by all displays for this buffer, and used in computing offsets for rectangular selection operations.

- char \* [text](#) () const  
Get a copy of the entire contents of the text buffer.
- void [text](#) (const char \*text)  
Replaces the entire contents of the text buffer.
- char \* [text\\_range](#) (int start, int end) const  
Get a copy of a part of the text buffer.
- int [undo](#) (int \*cp=0)  
Undo text modification according to the undo variables or insert text from the undo buffer.
- void [unhighlight](#) ()  
Unhighlights text in the buffer.
- void [unselect](#) ()  
Cancels any previous selection on the primary text selection object.
- int [utf8\\_align](#) (int) const  
Align an index into the buffer to the current or previous UTF-8 boundary.
- void [vprintf](#) (const char \*fmt, va\_list ap)  
Can be used by subclasses that need their own [printf\(\)](#) style functionality.
- int [word\\_end](#) (int pos) const  
Returns the position corresponding to the end of the word.
- int [word\\_start](#) (int pos) const  
Returns the position corresponding to the start of the word.
- ~[FI\\_Text\\_Buffer](#) ()  
Frees a text buffer.

## Public Attributes

- int [input\\_file\\_was\\_transcoded](#)  
true if the loaded file has been transcoded to UTF-8.
- void(\* [transcoding\\_warning\\_action](#) )([FI\\_Text\\_Buffer](#) \*)  
Pointer to a function called after reading a non UTF-8 encoded file.

## Static Public Attributes

- static const char \* [file\\_encoding\\_warning\\_message](#)  
This message may be displayed using the [fl\\_alert\(\)](#) function when a file which was not UTF-8 encoded is input.

## Protected Member Functions

- int [apply\\_undo](#) ([FI\\_Text\\_Undo\\_Action](#) \*action, int \*cursorPos)  
Apply the current undo/redo operation, called from [undo\(\)](#) or [redo\(\)](#).
- void [call\\_modify\\_callbacks](#) (int pos, int nDeleted, int nInserted, int nRestyled, const char \*deletedText) const  
Calls the stored modify callback procedure(s) for this buffer to update the changed area(s) on the screen and any other listeners.
- void [call\\_predelete\\_callbacks](#) (int pos, int nDeleted) const  
Calls the stored pre-delete callback procedure(s) for this buffer to update the changed area(s) on the screen and any other listeners.
- int [insert\\_](#) (int pos, const char \*text, int insertedLength=-1)  
Internal (non-redisplaying) version of [insert\(\)](#).
- void [move\\_gap](#) (int pos)  
Move the gap to start at a new position.
- void [reallocate\\_with\\_gap](#) (int newGapStart, int newGapLen)

Reallocates the text storage in the buffer to have a gap starting at *newGapStart* and a gap size of *newGapLen*, preserving the buffer's current contents.

- void **redisplay\_selection** ([Fl\\_Text\\_Selection](#) \*oldSelection, [Fl\\_Text\\_Selection](#) \*newSelection) const  
Calls the stored redisplay procedure(s) for this buffer to update the screen for a change in a selection.
- void **remove\_** (int start, int end)  
Internal (non-redisplaying) version of [remove\(\)](#).
- void **remove\_selection\_** ([Fl\\_Text\\_Selection](#) \*sel)  
Removes the text from the buffer corresponding to *sel*.
- void **replace\_selection\_** ([Fl\\_Text\\_Selection](#) \*sel, const char \*text)  
Replaces the *text* in selection *sel*.
- char \* **selection\_text\_** ([Fl\\_Text\\_Selection](#) \*sel) const
- void **update\_selections** (int pos, int nDeleted, int nInserted)  
Updates all of the selections in the buffer for changes in the buffer's text.

## Protected Attributes

- char \* **mBuf**  
allocated memory where the text is stored
- char **mCanUndo**  
if this buffer is used for attributes, it must not do any undo calls
- void \*\* **mCbArgs**  
caller arguments for modifyProcs above
- int **mCursorPosHint**  
hint for reasonable cursor position after a buffer modification operation
- int **mGapEnd**  
points to the first character after the gap
- int **mGapStart**  
points to the first character of the gap
- [Fl\\_Text\\_Selection](#) **mHighlight**  
highlighted areas
- int **mLength**  
length of the text in the buffer (the length of the buffer itself must be calculated: *gapEnd* - *gapStart* + *length*)
- [Fl\\_Text\\_Modify\\_Cb](#) \* **mModifyProcs**  
procedures to call when buffer is modified to redisplay contents
- int **mNModifyProcs**  
number of modify-redisplay procs attached
- int **mNPredeleteProcs**  
number of pre-delete procs attached
- void \*\* **mPredeleteCbArgs**  
caller argument for pre-delete proc above
- [Fl\\_Text\\_Predelete\\_Cb](#) \* **mPredeleteProcs**  
procedure to call before text is deleted from the buffer; at most one is supported.
- int **mPreferredGapSize**  
the default allocation for the text gap is 1024 bytes and should only be increased if frequent and large changes in buffer size are expected
- [Fl\\_Text\\_Selection](#) **mPrimary**  
highlighted areas
- [Fl\\_Text\\_Undo\\_Action\\_List](#) \* **mRedoList**  
List of redo event.
- [Fl\\_Text\\_Selection](#) **mSecondary**  
highlighted areas
- int **mTabDist**

- equiv.*
- `Fl_Text_Undo_Action * mUndo`  
*local undo event*
- `Fl_Text_Undo_Action_List * mUndoList`  
*List of undo event.*

### 33.143.1 Detailed Description

This class manages Unicode text displayed in one or more [Fl\\_Text\\_Display](#) widgets.

All text in [Fl\\_Text\\_Buffer](#) must be encoded in UTF-8. All indices used in the function calls must be aligned to the start of a UTF-8 sequence. All indices and pointers returned will be aligned. All functions that return a single character will return that in an unsigned int in UCS-4 encoding.

The [Fl\\_Text\\_Buffer](#) class is used by the [Fl\\_Text\\_Display](#) and [Fl\\_Text\\_Editor](#) to manage complex text data and is based upon the excellent NEdit text editor engine - see <https://sourceforge.net/projects/nedit/>.

### 33.143.2 Constructor & Destructor Documentation

#### 33.143.2.1 Fl\_Text\_Buffer()

```
Fl_Text_Buffer::Fl_Text_Buffer (
    int requestedSize = 0,
    int preferredGapSize = 1024 )
```

Create an empty text buffer of a pre-determined size.

##### Parameters

<i>requestedSize</i>	use this to avoid unnecessary re-allocation if you know exactly how much the buffer will need to hold
<i>preferredGapSize</i>	Initial size for the buffer gap (empty space in the buffer where text might be inserted if the user is typing sequential characters)

### 33.143.3 Member Function Documentation

#### 33.143.3.1 add\_modify\_callback()

```
void Fl_Text_Buffer::add_modify_callback (
    Fl_Text_Modify_Cb bufModifiedCB,
    void * cbArg )
```

Adds a callback function that is called whenever the text buffer is modified.

The callback function is declared as follows:

```
typedef void (*Fl_Text_Modify_Cb)(int pos, int nInserted, int nDeleted,
    int nRestyled, const char* deletedText,
    void* cbArg);
```

#### 33.143.3.2 address() [1/2]

```
char * Fl_Text_Buffer::address (
    int pos ) [inline]
```

Convert a byte offset in buffer into a memory address.

## Parameters

<i>pos</i>	byte offset into buffer
------------	-------------------------

## Returns

byte offset converted to a memory address

**33.143.3.3 address()** [2/2]

```
const char * Fl_Text_Buffer::address (
    int pos ) const [inline]
```

Convert a byte offset in buffer into a memory address.

## Parameters

<i>pos</i>	byte offset into buffer
------------	-------------------------

## Returns

byte offset converted to a memory address

**33.143.3.4 append()**

```
void Fl_Text_Buffer::append (
    const char * t,
    int addedLength = -1 ) [inline]
```

Appends the text string to the end of the buffer.

## Parameters

<i>t</i>	UTF-8 encoded text
<i>addedLength</i>	number of bytes to append, or -1 to indicate <i>t</i> is null-terminated

**33.143.3.5 appendfile()**

```
int Fl_Text_Buffer::appendfile (
    const char * file,
    int buflen = 128*1024 ) [inline]
```

Appends the named file to the end of the buffer.

See also [insertfile\(\)](#).

**33.143.3.6 byte\_at()**

```
char Fl_Text_Buffer::byte_at (
    int pos ) const
```

Returns the raw byte at the specified position *pos* in the buffer.

Positions start at 0.

## Parameters

<i>pos</i>	byte offset into buffer
------------	-------------------------

**Returns**

unencoded raw byte

**33.143.3.7 can\_redo()**

```
bool Fl_Text_Buffer::can_redo ( ) const
```

Check if undo is enabled and if the last undo action can be redone.

Check if undo is anabled and if the last undo action can be redone.

**See also**

[canUndo\(\)](#)

**33.143.3.8 can\_undo()**

```
bool Fl_Text_Buffer::can_undo ( ) const
```

Check if undo is enabled and if the last action can be undone.

**See also**

[canUndo\(\)](#)

**33.143.3.9 canUndo()**

```
void Fl_Text_Buffer::canUndo (
    char flag = 1 )
```

Enable or disable undo actions for this text buffer.

Undo actions are enable for text buffer by default. If used as a style buffer in [Fl\\_Text\\_Display](#), undo actions are disabled as they are handled by the text buffer.

**See also**

[can\\_undo\(\)](#)

**33.143.3.10 char\_at()**

```
unsigned int Fl_Text_Buffer::char_at (
    int pos ) const
```

Returns the character at the specified position *pos* in the buffer.

Positions start at 0.

**Parameters**

<i>pos</i>	byte offset into buffer, <i>pos</i> must be at a UTF-8 character boundary
------------	---

**Returns**

Unicode UCS-4 encoded character

**33.143.3.11 copy()**

```
void Fl_Text_Buffer::copy (
    Fl_Text_Buffer * fromBuf,
```

```
int fromStart,
int fromEnd,
int toPos )
```

Copies text from another [Fl\\_Text\\_Buffer](#) to this one.

#### Parameters

<i>fromBuf</i>	source text buffer, may be the same as this
<i>fromStart</i>	byte offset into buffer
<i>fromEnd</i>	byte offset into buffer
<i>toPos</i>	destination byte offset into buffer

#### 33.143.3.12 count\_displayed\_characters()

```
int Fl_Text_Buffer::count_displayed_characters (
    int lineStartPos,
    int targetPos ) const
```

Count the number of displayed characters between buffer position `lineStartPos` and `targetPos`. Displayed characters are the characters shown on the screen to represent characters in the buffer, where tabs and control characters are expanded.

#### 33.143.3.13 count\_lines()

```
int Fl_Text_Buffer::count_lines (
    int startPos,
    int endPos ) const
```

Counts the number of newlines between `startPos` and `endPos` in buffer. The character at position `endPos` is not counted.

#### 33.143.3.14 estimate\_lines()

```
int Fl_Text_Buffer::estimate_lines (
    int startPos,
    int endPos,
    int lineLen ) const
```

Estimate the number of newlines between `startPos` and `endPos` in buffer. This call takes line wrapping into account. It assumes a line break at every `lineLen` characters after the beginning of a line.

#### 33.143.3.15 findchar\_backward()

```
int Fl_Text_Buffer::findchar_backward (
    int startPos,
    unsigned int searchChar,
    int * foundPos ) const
```

Search backwards in buffer `buf` for character `searchChar`, starting with the character *before* `startPos`, returning the result in `foundPos`.

Returns 1 if found, 0 if not. The difference between this and [search\\_backward\(\)](#) is that it's optimized for single characters. The overall performance of the text widget is dependent on its ability to count lines quickly, hence searching for a single character: newline.

#### Parameters

<i>startPos</i>	byte offset to start position
<i>searchChar</i>	UCS-4 character that we want to find
<i>foundPos</i>	byte offset where the character was found

**Returns**

1 if found, 0 if not

**33.143.3.16 findchar\_forward()**

```
int Fl_Text_Buffer::findchar_forward (
    int startPos,
    unsigned searchChar,
    int * foundPos ) const
```

Finds the next occurrence of the specified character.

Search forwards in buffer for character `searchChar`, starting with the character `startPos`, and returning the result in `foundPos`. Returns 1 if found, 0 if not. The difference between this and [search\\_forward\(\)](#) is that it's optimized for single characters. The overall performance of the text widget is dependent on its ability to count lines quickly, hence searching for a single character: `newline`.

**Parameters**

<i>startPos</i>	byte offset to start position
<i>searchChar</i>	UCS-4 character that we want to find
<i>foundPos</i>	byte offset where the character was found

**Returns**

1 if found, 0 if not

**33.143.3.17 highlight\_text()**

```
char * Fl_Text_Buffer::highlight_text ( )
```

Returns the highlighted text.

When you are done with the text, free it using the `free()` function.

**33.143.3.18 insert()**

```
void Fl_Text_Buffer::insert (
    int pos,
    const char * text,
    int insertedLength = -1 )
```

Inserts null-terminated string `text` at position `pos`.

**Parameters**

<i>pos</i>	insertion position as byte offset (must be UTF-8 character aligned)
<i>text</i>	UTF-8 encoded text
<i>insertedLength</i>	number of bytes to insert, or -1 to indicate <code>text</code> is null-terminated

**33.143.3.19 insert\_()**

```
int Fl_Text_Buffer::insert_ (
    int pos,
    const char * text,
    int insertedLength = -1 ) [protected]
```

Internal (non-redisplaying) version of [insert\(\)](#).

Returns the length of text inserted (this is just `strlen(text)` if `insertedLength == -1`, however this calculation can be expensive and the length will be required by any caller who will continue on to call `redisplay`). `pos` must be contiguous with the existing text in the buffer (i.e. not past the end).

#### Returns

the number of bytes inserted

### 33.143.3.20 insertfile()

```
int Fl_Text_Buffer::insertfile (
    const char * file,
    int pos,
    int buflen = 128*1024 )
```

Inserts a file at the specified position.

#### Returns

- 0 on success
- non-zero on error (`strerror()` contains reason)
- 1 indicates open for read failed (no data loaded)
- 2 indicates error occurred while reading data (data was partially loaded)

File can be UTF-8 or CP1252 encoded. If the input file is not UTF-8 encoded, the `Fl_Text_Buffer` widget will contain data transcoded to UTF-8. By default, the message `Fl_Text_Buffer::file_encoding_warning_message` will warn the user about this.

#### See also

[input\\_file\\_was\\_transcoded](#) and [transcoding\\_warning\\_action](#).

### 33.143.3.21 is\_word\_separator()

```
bool Fl_Text_Buffer::is_word_separator (
    int pos ) const
```

Returns whether character at position `pos` is a word separator.

Pos must be at a character boundary.

### 33.143.3.22 length()

```
int Fl_Text_Buffer::length (
    void ) const [inline]
```

Returns the number of bytes in the buffer.

#### Returns

size of text in bytes

### 33.143.3.23 line\_end()

```
int Fl_Text_Buffer::line_end (
    int pos ) const
```

Finds and returns the position of the end of the line containing position `pos` (which is either a pointer to the newline character ending the line or a pointer to one character beyond the end of the buffer).

## Parameters

<i>pos</i>	byte index into buffer
------------	------------------------

## Returns

byte offset to line end

**33.143.3.24 line\_start()**

```
int Fl_Text_Buffer::line_start (  
    int pos ) const
```

Returns the position of the start of the line containing position *pos*.

## Parameters

<i>pos</i>	byte index into buffer
------------	------------------------

## Returns

byte offset to line start

**33.143.3.25 line\_text()**

```
char * Fl_Text_Buffer::line_text (  
    int pos ) const
```

Returns the text from the entire line containing the specified character position. When you are done with the text, free it using the `free()` function.

## Parameters

<i>pos</i>	byte index into buffer
------------	------------------------

## Returns

copy of UTF-8 text, must be free'd

**33.143.3.26 loadfile()**

```
int Fl_Text_Buffer::loadfile (  
    const char * file,  
    int buflen = 128*1024 ) [inline]
```

Loads a text file into the buffer.

See also [insertfile\(\)](#).

**33.143.3.27 next\_char()**

```
int Fl_Text_Buffer::next_char (  
    int ix ) const
```

Returns the index of the next character.

## Parameters

<i>ix</i>	index to the current character
-----------	--------------------------------

**33.143.3.28** `outputfile()`

```
int Fl_Text_Buffer::outputfile (
    const char * file,
    int start,
    int end,
    int buflen = 128*1024 )
```

Writes the specified portions of the text buffer to a file.

Returns

- 0 on success
- non-zero on error (strerror() contains reason)
- 1 indicates open for write failed (no data saved)
- 2 indicates error occurred while writing data (data was partially saved)

See also

[savefile\(const char \\*file, int buflen\)](#)

**33.143.3.29** `prev_char()`

```
int Fl_Text_Buffer::prev_char (
    int ix ) const
```

Returns the index of the previous character.

## Parameters

<i>ix</i>	index to the current character
-----------	--------------------------------

**33.143.3.30** `printf()`

```
void Fl_Text_Buffer::printf (
    const char * fmt,
    ... )
```

Appends printf formatted messages to the end of the buffer.

Example:

```
#include <FL/Fl_Text_Display.H>
int main(..) {
    :
    // Create a text display widget and assign it a text buffer
    Fl_Text_Display *tdsp = new Fl_Text_Display(..);
    Fl_Text_Buffer *tbuf = new Fl_Text_Buffer();
    tdsp->buffer(tbuf);
    :
    // Append three lines of formatted text to the buffer
    tbuf->printf("The current date is: %s.\nThe time is: %s\n", date_str, time_str);
    tbuf->printf("The current PID is %ld.\n", (long) getpid());
    :
}
```

**Note**

The expanded string is currently limited to 1024 characters.

**Parameters**

<i>in</i>	<i>fmt</i>	is a printf format string for the message text.
-----------	------------	---

**33.143.3.31 remove()**

```
void Fl_Text_Buffer::remove (
    int start,
    int end )
```

Deletes a range of characters in the buffer.

**Parameters**

<i>start</i>	byte offset to first character to be removed
<i>end</i>	byte offset to character after last character to be removed

**33.143.3.32 remove\_()**

```
void Fl_Text_Buffer::remove_ (
    int start,
    int end ) [protected]
```

Internal (non-redisplaying) version of [remove\(\)](#).

Removes the contents of the buffer between *start* and *end* (and moves the gap to the site of the delete).

**33.143.3.33 replace()**

```
void Fl_Text_Buffer::replace (
    int start,
    int end,
    const char * text,
    int insertedLength = -1 )
```

Deletes the characters between *start* and *end*, and inserts the null-terminated string *text* in their place in the buffer.

**Parameters**

<i>start</i>	byte offset to first character to be removed and new insert position
<i>end</i>	byte offset to character after last character to be removed
<i>text</i>	UTF-8 encoded text
<i>insertedLength</i>	number of bytes to insert, or -1 to indicate <i>text</i> is null-terminated

**33.143.3.34 rewind\_lines()**

```
int Fl_Text_Buffer::rewind_lines (
    int startPos,
    int nLines )
```

Finds and returns the position of the first character of the line *nLines* backwards from *startPos* (not counting

the character pointed to by `startpos` if that is a newline) in the buffer.  
`nLines == 0` means find the beginning of the line.

### 33.143.3.35 `savefile()`

```
int Fl_Text_Buffer::savefile (
    const char * file,
    int buflen = 128*1024 ) [inline]
```

Saves a text file from the current buffer.

Returns

- 0 on success
- non-zero on error (`strerror()` contains reason)
- 1 indicates open for write failed (no data saved)
- 2 indicates error occurred while writing data (data was partially saved)

See also

[outputfile\(const char \\*file, int start, int end, int buflen\)](#)

### 33.143.3.36 `search_backward()`

```
int Fl_Text_Buffer::search_backward (
    int startPos,
    const char * searchString,
    int * foundPos,
    int matchCase = 0 ) const
```

Search backwards in buffer for string `searchString`, starting with the character *at* `startPos`, returning the result in `foundPos`.

Returns 1 if found, 0 if not.

Parameters

<i>startPos</i>	byte offset to start position
<i>searchString</i>	UTF-8 string that we want to find
<i>foundPos</i>	byte offset where the string was found
<i>matchCase</i>	if set, match character case

Returns

1 if found, 0 if not

### 33.143.3.37 `search_forward()`

```
int Fl_Text_Buffer::search_forward (
    int startPos,
    const char * searchString,
    int * foundPos,
    int matchCase = 0 ) const
```

Search forwards in buffer for string `searchString`, starting with the character `startPos`, and returning the result in `foundPos`.

Returns 1 if found, 0 if not.

**Parameters**

<i>startPos</i>	byte offset to start position
<i>searchString</i>	UTF-8 string that we want to find
<i>foundPos</i>	byte offset where the string was found
<i>matchCase</i>	if set, match character case

**Returns**

1 if found, 0 if not

**33.143.3.38 secondary\_selection\_text()**

```
char * Fl_Text_Buffer::secondary_selection_text ( )
```

Returns the text in the secondary selection.

When you are done with the text, free it using the free() function.

**33.143.3.39 selection\_text()**

```
char * Fl_Text_Buffer::selection_text (
    void )
```

Returns the currently selected text.

When you are done with the text, free it using the free() function.

**33.143.3.40 skip\_displayed\_characters()**

```
int Fl_Text_Buffer::skip_displayed_characters (
    int lineStartPos,
    int nChars )
```

Count forward from buffer position *startPos* in displayed characters.

Displayed characters are the characters shown on the screen to represent characters in the buffer, where tabs and control characters are expanded.

**Parameters**

<i>lineStartPos</i>	byte offset into buffer
<i>nChars</i>	number of bytes that are sent to the display

**Returns**

byte offset in input after all output bytes are sent

**33.143.3.41 tab\_distance()**

```
int Fl_Text_Buffer::tab_distance ( ) const [inline]
```

Gets the tab width.

The tab width is measured in characters. The pixel position is calculated using an average character width.

**33.143.3.42 text() [1/2]**

```
char * Fl_Text_Buffer::text ( ) const
```

Get a copy of the entire contents of the text buffer.

Memory is allocated to contain the returned string, which the caller must free.

**Returns**

newly allocated text buffer - must be free'd, text is UTF-8

**33.143.3.43 text()** [2/2]

```
void Fl_Text_Buffer::text (
    const char * text )
```

Replaces the entire contents of the text buffer.

**Parameters**

<i>text</i>	Text must be valid UTF-8. If null, an empty string is substituted.
-------------	--

**33.143.3.44 text\_range()**

```
char * Fl_Text_Buffer::text_range (
    int start,
    int end ) const
```

Get a copy of a part of the text buffer.

Return a copy of the text between *start* and *end* character positions from text buffer *buf*. Positions start at 0, and the range does not include the character pointed to by *end*. When you are done with the text, free it using the *free()* function.

**Parameters**

<i>start</i>	byte offset to first character
<i>end</i>	byte offset after last character in range

**Returns**

newly allocated text buffer - must be free'd, text is UTF-8

**33.143.3.45 undo()**

```
int Fl_Text_Buffer::undo (
    int * cursorPos = 0 )
```

Undo text modification according to the undo variables or insert text from the undo buffer.

Take the previous changes and undo them.

Return the previous cursor position in *cursorPos*. Returns 1 if the undo was applied. *CursorPos* will be at a character boundary.

**33.143.3.46 vprintf()**

```
void Fl_Text_Buffer::vprintf (
    const char * fmt,
    va_list ap )
```

Can be used by subclasses that need their own [printf\(\)](#) style functionality.

**Note**

The expanded string is currently limited to 1024 characters.

## Parameters

in	<i>fmt</i>	is a printf format string for the message text.
in	<i>ap</i>	is a <code>va_list</code> created by <code>va_start()</code> and closed with <code>va_end()</code> , which the caller is responsible for handling.

**33.143.3.47 word\_end()**

```
int Fl_Text_Buffer::word_end (
    int pos ) const
```

Returns the position corresponding to the end of the word.

## Parameters

<i>pos</i>	byte index into buffer
------------	------------------------

## Returns

byte offset to word end

**33.143.3.48 word\_start()**

```
int Fl_Text_Buffer::word_start (
    int pos ) const
```

Returns the position corresponding to the start of the word.

## Parameters

<i>pos</i>	byte index into buffer
------------	------------------------

## Returns

byte offset to word start

**33.143.4 Member Data Documentation****33.143.4.1 file\_encoding\_warning\_message**

```
const char * Fl_Text_Buffer::file_encoding_warning_message [static]
```

**Initial value:**

```
=
"Displayed text contains the UTF-8 transcoding\n"
"of the input file which was not UTF-8 encoded.\n"
"Some changes may have occurred."
```

This message may be displayed using the [fl\\_alert\(\)](#) function when a file which was not UTF-8 encoded is input.

**33.143.4.2 mTabDist**

```
int Fl_Text_Buffer::mTabDist [protected]
```

equiv.

number of characters in a tab

### 33.143.4.3 transcoding\_warning\_action

```
void(* Fl_Text_Buffer::transcoding_warning_action) (Fl_Text_Buffer *)
```

Pointer to a function called after reading a non UTF-8 encoded file.

This function is called after reading a file if the file content was transcoded to UTF-8. Its default implementation calls [fl\\_alert\(\)](#) with the text of [file\\_encoding\\_warning\\_message](#). No warning message is displayed if this pointer is set to NULL. Use [input\\_file\\_was\\_transcoded](#) to be informed if file input required transcoding to UTF-8.

The documentation for this class was generated from the following files:

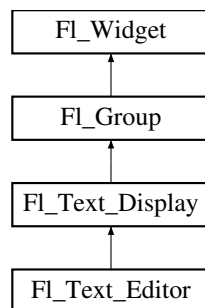
- [Fl\\_Text\\_Buffer.H](#)
- [Fl\\_Text\\_Buffer.cxx](#)

## 33.144 Fl\_Text\_Display Class Reference

Rich text display widget.

```
#include <Fl_Text_Display.H>
```

Inheritance diagram for [Fl\\_Text\\_Display](#):



### Classes

- struct [Style\\_Table\\_Entry](#)

*This structure associates the color, font, and font size of a string to draw with an attribute mask matching [attr](#).*

### Public Types

- enum {  
[NORMAL\\_CURSOR](#) , [CARET\\_CURSOR](#) , [DIM\\_CURSOR](#) , [BLOCK\\_CURSOR](#) ,  
[HEAVY\\_CURSOR](#) , [SIMPLE\\_CURSOR](#) }  
*text display cursor shapes enumeration*
- enum { [CURSOR\\_POS](#) , [CHARACTER\\_POS](#) }  
*the character position is the left edge of a character, whereas the cursor is thought to be between the centers of two consecutive characters.*
- enum {  
[DRAG\\_NONE](#) = -2 , [DRAG\\_START\\_DND](#) = -1 , [DRAG\\_CHAR](#) = 0 , [DRAG\\_WORD](#) = 1 ,  
[DRAG\\_LINE](#) = 2 }  
*drag types - they match [Fl::event\\_clicks\(\)](#) so that single clicking to start a collection selects by character, double clicking selects by word and triple clicking selects by line.*
- enum { [WRAP\\_NONE](#) , [WRAP\\_AT\\_COLUMN](#) , [WRAP\\_AT\\_PIXEL](#) , [WRAP\\_AT\\_BOUNDS](#) }  
*wrap types - used in [wrap\\_mode\(\)](#)*
- enum {  
[ATTR\\_BGCOLOR](#) = 0x0001 , [ATTR\\_BGCOLOR\\_EXT\\_](#) = 0x0002 , [ATTR\\_BGCOLOR\\_EXT](#) = 0x0003 ,  
[ATTR\\_UNDERLINE](#) = 0x0004 ,  
[ATTR\\_GRAMMAR](#) = 0x0008 , [ATTR\\_SPELLING](#) = 0x000C , [ATTR\\_STRIKE\\_THROUGH](#) = 0x0010 ,  
[ATTR\\_LINES\\_MASK](#) = 0x001C }  
*attribute flags in [Style\\_Table\\_Entry.attr](#)*
- typedef void(\* [Unfinished\\_Style\\_Cb](#)) (int, void \*)

## Public Member Functions

- [Fl\\_Text\\_Buffer](#) \* [buffer](#) () const  
*Gets the current text buffer associated with the text widget.*
- void [buffer](#) ([Fl\\_Text\\_Buffer](#) &buf)  
*Sets the current text buffer associated with the text widget.*
- void [buffer](#) ([Fl\\_Text\\_Buffer](#) \*buf)  
*Attach a text buffer to display, replacing the current buffer (if any).*
- double [col\\_to\\_x](#) (double col) const  
*Convert a column number into an x pixel position.*
- int [count\\_lines](#) (int start, int end, bool start\_pos\_is\_line\_start) const  
*Count the number of lines between two positions.*
- [Fl\\_Color](#) [cursor\\_color](#) () const  
*Gets the text cursor color.*
- void [cursor\\_color](#) ([Fl\\_Color](#) n)  
*Sets the text cursor color.*
- int [cursor\\_style](#) () const
- void [cursor\\_style](#) (int style)  
*Sets the text cursor style.*
- virtual void [display\\_needs\\_recalc](#) ()  
*Schedule a [recalc\\_display\(\)](#) to be done on next [draw\(\)](#).*
- [Fl\\_Text\\_Display](#) (int X, int Y, int W, int H, const char \*l=0)  
*Creates a new text display widget.*
- int [get\\_absolute\\_top\\_line\\_number](#) () const  
*Returns the absolute (non-wrapped) line number of the first line displayed.*
- [Fl\\_Color](#) [grammar\\_underline\\_color](#) () const  
*Gets the underline color for style attribute ATTR\_GRAMMAR.*
- void [grammar\\_underline\\_color](#) ([Fl\\_Color](#) color)  
*Sets the underline color for style attribute ATTR\_GRAMMAR.*
- int [handle](#) (int e) [FL\\_OVERRIDE](#)  
*Event handling.*
- void [hide\\_cursor](#) ()  
*Hides the text cursor.*
- void [highlight\\_data](#) ([Fl\\_Text\\_Buffer](#) \*styleBuffer, const [Style\\_Table\\_Entry](#) \*styleTable, int nStyles, char unfinishedStyle, Unfinished\_Style\_Cb unfinishedHighlightCB, void \*cbArg)  
*Attach (or remove) highlight information in text display and redisplay.*
- int [in\\_selection](#) (int x, int y) const  
*Check if a pixel position is within the primary selection.*
- void [insert](#) (const char \*text)  
*Inserts "text" at the current cursor location.*
- int [insert\\_position](#) () const  
*Gets the position of the text insertion cursor for text display.*
- void [insert\\_position](#) (int newPos)  
*Sets the position of the text insertion cursor for text display.*
- int [line\\_end](#) (int startPos, bool startPosIsLineStart) const  
*Returns the end of a line.*
- int [line\\_start](#) (int pos) const  
*Return the beginning of a line.*
- [Fl\\_Align](#) [linenumber\\_align](#) () const  
*Returns the alignment used for line numbers (if enabled).*
- void [linenumber\\_align](#) ([Fl\\_Align](#) val)

- Set alignment for line numbers (if enabled).*

  - [FI\\_Color](#) **linenumber\_bgcolor** () const

*Returns the background color used for line numbers (if enabled).*
- void **linenumber\_bgcolor** ([FI\\_Color](#) val)

*Set the background color used for line numbers (if enabled).*
- [FI\\_Color](#) **linenumber\_fgcolor** () const

*Return the foreground color used for line numbers (if enabled).*
- void **linenumber\_fgcolor** ([FI\\_Color](#) val)

*Set the foreground color used for line numbers (if enabled).*
- [FI\\_Font](#) **linenumber\_font** () const

*Return the font used for line numbers (if enabled).*
- void **linenumber\_font** ([FI\\_Font](#) val)

*Set the font used for line numbers (if enabled).*
- const char \* **linenumber\_format** () const

*Returns the line number printf() format string.*
- void **linenumber\_format** (const char \*val)

*Sets the printf() style format string used for line numbers.*
- [FI\\_Fontsize](#) **linenumber\_size** () const

*Return the font size used for line numbers (if enabled).*
- void **linenumber\_size** ([FI\\_Fontsize](#) val)

*Set the font size used for line numbers (if enabled).*
- int **linenumber\_width** () const

*Return the screen area width provided for line numbers.*
- void **linenumber\_width** (int width)

*Set width of screen area for line numbers.*
- int **move\_down** ()

*Moves the current insert position down one line.*
- int **move\_left** ()

*Moves the current insert position left one character.*
- int **move\_right** ()

*Moves the current insert position right one character.*
- int **move\_up** ()

*Moves the current insert position up one line.*
- void **next\_word** (void)

*Moves the current insert position right one word.*
- void **overstrike** (const char \*text)

*Replaces text at the current insert position.*
- int **position\_style** (int lineStartPos, int lineLen, int lineIndex) const

*Find the correct style for a character.*
- int **position\_to\_xy** (int pos, int \*x, int \*y) const

*Convert a character index into a pixel position.*
- void **previous\_word** (void)

*Moves the current insert position left one word.*
- virtual void **recalc\_display** ()

*Recalculate the display's visible lines and scrollbar sizes.*
- void **redisplay\_range** (int start, int end)

*Marks text from start to end as needing a redraw.*
- void **resize** (int X, int Y, int W, int H) [FL\\_OVERRIDE](#)

*Change the size of the displayed text area.*
- int **rewind\_lines** (int startPos, int nLines)

*Skip a number of lines back.*

- void [scroll](#) (int topLineNum, int horizOffset)  
*Scrolls the current buffer to start at the specified line and column.*
- int [scroll\\_col](#) ()
- int [scroll\\_row](#) ()
- [Fl\\_Align scrollbar\\_align](#) () const  
*Gets the scrollbar alignment type.*
- void [scrollbar\\_align](#) ([Fl\\_Align](#) a)  
*Sets the scrollbar alignment type.*
- int [scrollbar\\_size](#) () const  
*Gets the current size of the scrollbars' troughs, in pixels.*
- void [scrollbar\\_size](#) (int newSize)  
*Sets the pixel size of the scrollbars' troughs to `newSize`, in pixels.*
- int [scrollbar\\_width](#) () const  
*Returns the global value [Fl::scrollbar\\_size\(\)](#) unless a specific `scrollbar_width_` has been set.*
- void [scrollbar\\_width](#) (int width)  
*Sets the global [Fl::scrollbar\\_size\(\)](#), and forces this instance of the widget to use it.*
- [Fl\\_Color secondary\\_selection\\_color](#) () const  
*Gets the background color for the secondary selection block.*
- void [secondary\\_selection\\_color](#) ([Fl\\_Color](#) color)  
*Sets the background color for the secondary selection block.*
- int [shortcut](#) () const
- void [shortcut](#) (int s)
- void [show\\_cursor](#) (int b=1)  
*Shows the text cursor.*
- void [show\\_insert\\_position](#) ()  
*Scrolls the text buffer to show the current insert position.*
- int [skip\\_lines](#) (int startPos, int nLines, bool startPosIsLineStart)  
*Skip a number of lines forward.*
- [Fl\\_Color spelling\\_underline\\_color](#) () const  
*Gets the underline color for style attribute `ATTR_SPELLING`.*
- void [spelling\\_underline\\_color](#) ([Fl\\_Color](#) color)  
*Sets the underline color for style attribute `ATTR_SPELLING`.*
- [Fl\\_Text\\_Buffer \\* style\\_buffer](#) () const  
*Gets the current style buffer associated with the text widget.*
- [Fl\\_Color textcolor](#) () const  
*Gets the default color of text in the widget.*
- void [textcolor](#) ([Fl\\_Color](#) n)  
*Sets the default color of text in the widget.*
- [Fl\\_Font textfont](#) () const  
*Gets the default font used when drawing text in the widget.*
- void [textfont](#) ([Fl\\_Font](#) s)  
*Sets the default font used when drawing text in the widget.*
- [Fl\\_Fonsize textsize](#) () const  
*Gets the default size of text in the widget.*
- void [textsize](#) ([Fl\\_Fonsize](#) s)  
*Sets the default size of text in the widget.*
- int [word\\_end](#) (int pos) const  
*Moves the insert position to the end of the current word.*
- int [word\\_start](#) (int pos) const  
*Moves the insert position to the beginning of the current word.*
- void [wrap\\_mode](#) (int wrap, int wrap\_margin)

- *Set the new text wrap mode.*
- int [wrapped\\_column](#) (int row, int column) const  
*Nobody knows what this function does.*
- int [wrapped\\_row](#) (int row) const  
*Nobody knows what this function does.*
- double [x\\_to\\_col](#) (double x) const  
*Convert an x pixel position into a column number.*
- [~Fl\\_Text\\_Display](#) ()  
*Free a text display and release its associated memory.*

## Protected Types

- enum {  
    **DRAW\_LINE** , **FIND\_INDEX** , **FIND\_INDEX\_FROM\_ZERO** , **GET\_WIDTH** ,  
    **FIND\_CURSOR\_INDEX** }

## Protected Member Functions

- void [absolute\\_top\\_line\\_number](#) (int oldFirstChar)  
*Re-calculate absolute top line number for a change in scroll position.*
- void [calc\\_last\\_char](#) ()  
*Update last display character index.*
- void [calc\\_line\\_starts](#) (int startLine, int endLine)  
*Update the line starts array.*
- void [clear\\_rect](#) (int style, int x, int y, int width, int height) const  
*Clear a rectangle with the appropriate background color for *style*.*
- void [display\\_insert](#) ()  
*Scroll the display to bring insertion cursor into view.*
- void [draw](#) () **FL\_OVERRIDE**  
*Draw the widget.*
- void [draw\\_cursor](#) (int, int)  
*Draw a cursor with top center at X, Y.*
- void [draw\\_line\\_numbers](#) (bool clearAll)  
*Refresh the line number area.*
- void [draw\\_range](#) (int start, int end)  
*Draw a range of text.*
- void [draw\\_string](#) (int style, int x, int y, int toX, const char \*string, int nChars) const  
*Draw a text segment in a single style.*
- void [draw\\_text](#) (int X, int Y, int W, int H)  
*Refresh a rectangle of the text display.*
- void [draw\\_vline](#) (int visLineNum, int leftClip, int rightClip, int leftCharIndex, int rightCharIndex)  
*Draw a single line of text.*
- int [empty\\_vlines](#) () const  
*Return true if there are lines visible with no corresponding buffer text.*
- void [extend\\_range\\_for\\_styles](#) (int \*start, int \*end)  
*I don't know what this does!*
- void [find\\_line\\_end](#) (int pos, bool start\_pos\_is\_line\_start, int \*lineEnd, int \*nextLineStart) const  
*Finds both the end of the current line and the start of the next line.*
- void [find\\_wrap\\_range](#) (const char \*deletedText, int pos, int nInserted, int nDeleted, int \*modRangeStart, int \*modRangeEnd, int \*linesInserted, int \*linesDeleted)  
*Wrapping calculations.*
- int [find\\_x](#) (const char \*s, int len, int style, int x) const

- Find the index of the character that lies at the given x position / closest cursor position.*

  - int [handle\\_rmb](#) (int readonly)

*Handle right mouse button down events.*
- int [handle\\_vline](#) (int mode, int lineStart, int lineLen, int leftChar, int rightChar, int topClip, int bottomClip, int leftClip, int rightClip) const

*Universal pixel machine.*
- int [longest\\_vline](#) () const

*Find the longest line of all visible lines.*
- void [maintain\\_absolute\\_top\\_line\\_number](#) (int state)

*Line numbering stuff, currently unused.*
- int [maintaining\\_absolute\\_top\\_line\\_number](#) () const

*Returns true if a separate absolute top line number is being maintained.*
- void [measure\\_deleted\\_lines](#) (int pos, int nDeleted)

*Wrapping calculations.*
- double [measure\\_proportional\\_character](#) (const char \*s, int colNum, int pos) const

*Wrapping calculations.*
- int [measure\\_vline](#) (int visLineNum) const

*Returns the width in pixels of the displayed line pointed to by "visLineNum".*
- void [offset\\_line\\_starts](#) (int newTopLineNum)

*Offset line start counters for a new vertical scroll position.*
- int [position\\_to\\_line](#) (int pos, int \*lineNum) const

*Convert a position index into a line number offset.*
- int [position\\_to\\_linecol](#) (int pos, int \*lineNum, int \*column) const

*Find the line and column number of position pos.*
- void [reset\\_absolute\\_top\\_line\\_number](#) ()

*Reestablish the absolute (non-wrapped) top line number.*
- int [scroll\\_](#) (int topLineNum, int horizOffset)

*Scrolls the current buffer to start at the specified line and column.*
- double [string\\_width](#) (const char \*string, int length, int style) const

*Find the width of a string in the font of a particular style.*
- void [update\\_h\\_scrollbar](#) ()

*Update horizontal scrollbar.*
- void [update\\_line\\_starts](#) (int pos, int charsInserted, int charsDeleted, int linesInserted, int linesDeleted, int \*scrolled)

*Update line start arrays and variables.*
- void [update\\_v\\_scrollbar](#) ()

*Update vertical scrollbar.*
- int [vline\\_length](#) (int visLineNum) const

*Count number of bytes in a visible line.*
- int [wrap\\_uses\\_character](#) (int lineEndPos) const

*Check if the line break is caused by a newline or by line wrapping.*
- void [wrapped\\_line\\_counter](#) ([Fl\\_Text\\_Buffer](#) \*buf, int startPos, int maxPos, int maxLines, bool startPosIs↵LineStart, int styleBufOffset, int \*retPos, int \*retLines, int \*retLineStart, int \*retLineEnd, bool countLast↵LineMissingNewLine=true) const

*Wrapping calculations.*
- int [xy\\_to\\_position](#) (int x, int y, int PosType=CHARACTER\_POS) const

*Translate a pixel position into a character index.*
- void [xy\\_to\\_rowcol](#) (int x, int y, int \*row, int \*column, int PosType=CHARACTER\_POS) const

*Translate pixel coordinates into row and column.*

## Static Protected Member Functions

- static void [buffer\\_modified\\_cb](#) (int pos, int nInserted, int nDeleted, int nRestyled, const char \*deletedText, void \*cbArg)  
*This is called whenever the buffer is modified.*
- static void [buffer\\_predelete\\_cb](#) (int pos, int nDeleted, void \*cbArg)  
*This is called before any characters are deleted.*
- static void [h\\_scrollbar\\_cb](#) ([FI\\_Scrollbar](#) \*w, [FI\\_Text\\_Display](#) \*d)  
*Callback for drag or valueChanged on horizontal scrollbar.*
- static void [scroll\\_timer\\_cb](#) (void \*)  
*Timer callback for scroll events.*
- static void [v\\_scrollbar\\_cb](#) ([FI\\_Scrollbar](#) \*w, [FI\\_Text\\_Display](#) \*d)  
*Callback for drag or valueChanged on vertical scrollbar.*

## Protected Attributes

- int **damage\_range1\_end**
- int **damage\_range1\_start**
- int **damage\_range2\_end**
- int **damage\_range2\_start**
- int **display\_insert\_position\_hint**
- bool **display\_needs\_recalc\_**
- int **dragging**
- int **dragPos**
- int **dragType**
- [FI\\_Color](#) **grammar\_underline\_color\_**
- [FI\\_Align](#) **linenumber\_align\_**
- [FI\\_Color](#) **linenumber\_bgcolor\_**
- [FI\\_Color](#) **linenumber\_fgcolor\_**
- [FI\\_Font](#) **linenumber\_font\_**
- const char \* **linenumber\_format\_**
- [FI\\_Fontsize](#) **linenumber\_size\_**
- int **mAbsTopLineNum**
- [FI\\_Text\\_Buffer](#) \* **mBuffer**
- double **mColumnScale**
- int **mContinuousWrap**
- [FI\\_Color](#) **mCursor\_color**
- int **mCursorOldY**
- int **mCursorOn**
- int **mCursorPos**
- int **mCursorPreferredXPos**
- int **mCursorStyle**
- int **mCursorToHint**
- int **mFirstChar**
- void \* **mHighlightCBArg**
- int **mHorizOffset**
- int **mHorizOffsetHint**
- [FI\\_Scrollbar](#) \* **mHScrollBar**
- int **mLastChar**
- int **mLineNumLeft**
- int **mLineNumWidth**
- int \* **mLineStarts**
- int **mMaxsize**
- int **mModifyingTabDistance**
- int **mNBufferLines**

- int **mNeedAbsTopLineNum**
- int **mNLinesDeleted**
- int **mNStyles**
- int **mNVisibleLines**
- [Fl\\_Text\\_Buffer](#) \* **mStyleBuffer**
- const [Style\\_Table\\_Entry](#) \* **mStyleTable**
- int **mSuppressResync**
- int **mTopLineNum**
- int **mTopLineNumHint**
- Unfinished\_Style\_Cb **mUnfinishedHighlightCB**
- char **mUnfinishedStyle**
- [Fl\\_Scrollbar](#) \* **mVScrollBar**
- int **mWrapMarginPix**
- [Fl\\_Align](#) **scrollbar\_align\_**
- int **scrollbar\_width\_**
- [Fl\\_Color](#) **secondary\_selection\_color\_**
- int **shortcut\_**
- [Fl\\_Color](#) **spelling\_underline\_color\_**
- 

```
struct {
    int h
    int w
    int x
    int y
} text_area
```

- [Fl\\_Color](#) **textcolor\_**
- [Fl\\_Font](#) **textfont\_**
- [Fl\\_Fonsize](#) **textsize\_**

## Friends

- void **fl\_text\_drag\_me** (int pos, [Fl\\_Text\\_Display](#) \*d)
- int **fl\_text\_drag\_prepare** (int pos, int key, [Fl\\_Text\\_Display](#) \*d)

## Additional Inherited Members

### 33.144.1 Detailed Description

Rich text display widget.

This is the FLTK text display widget. It allows the user to view multiple lines of text and supports highlighting, word wrap, mixes of font faces and colors, line numbers and scrolling. The buffer that is displayed in the widget is managed by the [Fl\\_Text\\_Buffer](#) class. A single Text Buffer can be displayed by multiple Text Displays.

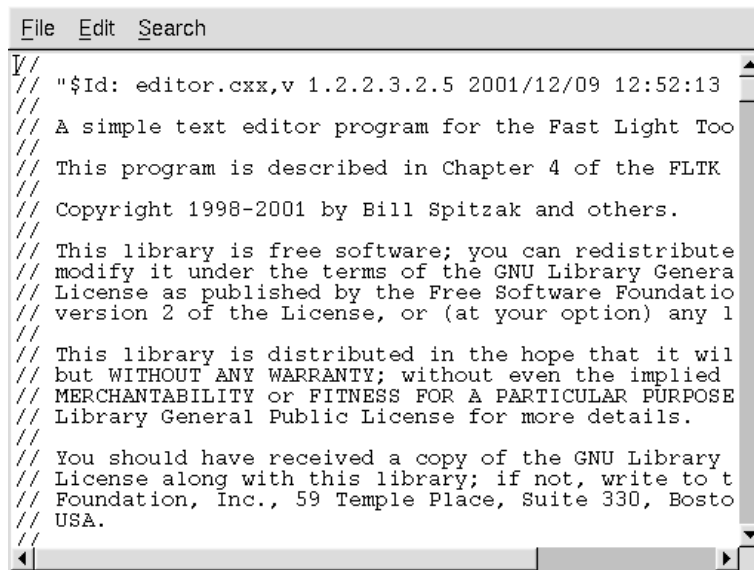


Figure 33.58 Fl\_Text\_Display widget

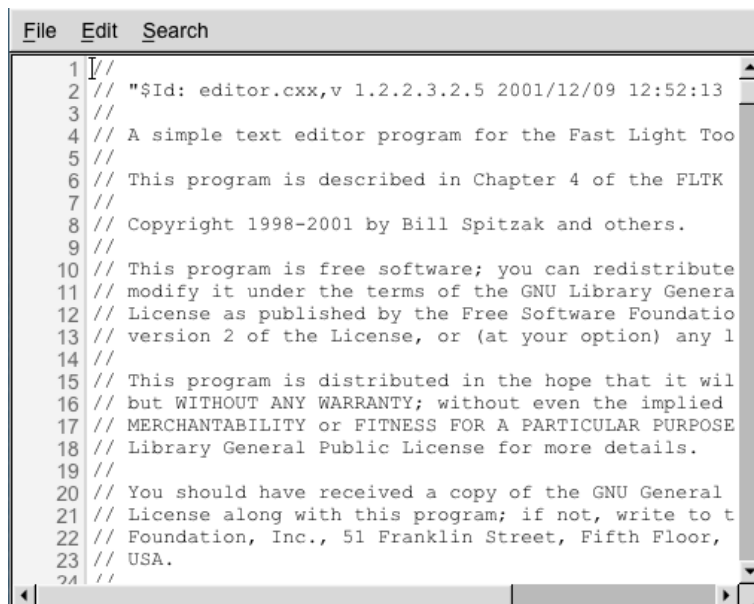


Figure 33.59 Fl\_Text\_Display widget with line numbers enabled

### Example Use

```
#include <FL/Fl_Text_Display.H>
..
int main() {
    ..
    Fl_Text_Buffer *buff = new Fl_Text_Buffer();
    Fl_Text_Display *disp = new Fl_Text_Display(10, 10, 640, 480);
    disp->buffer(buff);           // attach text buffer to display widget
    buff->text("line one\nline two"); // add some text to buffer
    ..
}
```

### Features

- Word wrap: [wrap\\_mode\(\)](#), [wrapped\\_column\(\)](#), [wrapped\\_row\(\)](#)
- Font control: [textfont\(\)](#), [textsize\(\)](#), [textcolor\(\)](#)

- Font styling: [highlight\\_data\(\)](#)
- Cursor: [cursor\\_style\(\)](#), [show\\_cursor\(\)](#), [hide\\_cursor\(\)](#), [cursor\\_color\(\)](#)
- Line numbers: [linenumber\\_width\(\)](#), [linenumber\\_font\(\)](#), [linenumber\\_size\(\)](#), [linenumber\\_fgcolor\(\)](#), [linenumber\\_bgcolor\(\)](#), [linenumber\\_align\(\)](#), [linenumber\\_format\(\)](#)

Note that other features may be available via [Fl\\_Text\\_Editor](#) and [Fl\\_Text\\_Buffer](#) classes.

#### Note

Line numbers were added in FLTK 1.3.3.

#### See also

[Fl\\_Widget::shortcut\\_label\(int\)](#)

## 33.144.2 Member Enumeration Documentation

### 33.144.2.1 anonymous enum

anonymous enum

text display cursor shapes enumeration

#### Enumerator

NORMAL_CURSOR	I-beam.
CARET_CURSOR	caret under the text
DIM_CURSOR	dim I-beam
BLOCK_CURSOR	unfill box under the current character
HEAVY_CURSOR	thick I-beam
SIMPLE_CURSOR	as cursor as <a href="#">Fl_Input</a> cursor

### 33.144.2.2 anonymous enum

anonymous enum

wrap types - used in [wrap\\_mode\(\)](#)

#### Enumerator

WRAP_NONE	don't wrap text at all
WRAP_AT_COLUMN	wrap text at the given text column
WRAP_AT_PIXEL	wrap text at a pixel position
WRAP_AT_BOUNDS	wrap text so that it fits into the widget width

### 33.144.2.3 anonymous enum

anonymous enum

attribute flags in [Style\\_Table\\_Entry.attr](#)

#### Enumerator

ATTR_BGCOLOR	use the background color in the <code>bgcolor</code> field
--------------	--

## Enumerator

ATTR_BGCOLOR_EXT_	(internal use)
ATTR_BGCOLOR_EXT	extend background color to the end of the line
ATTR_UNDERLINE	a single underline, underline types are mutually exclusive
ATTR_GRAMMAR	grammar suggestion (blue dotted underline)
ATTR_SPELLING	spelling suggestion (red dotted underline)
ATTR_STRIKE_THROUGH	line through the middle of the text
ATTR_LINES_MASK	the mask for all underline and strike through types

### 33.144.3 Constructor & Destructor Documentation

#### 33.144.3.1 Fl\_Text\_Display()

```
Fl_Text_Display::Fl_Text_Display (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new text display widget.

## Parameters

<i>X,Y,W,H</i>	position and size of widget
<i>l</i>	label text, defaults to none

#### 33.144.3.2 ~Fl\_Text\_Display()

```
Fl_Text_Display::~~Fl_Text_Display ( )
```

Free a text display and release its associated memory.

## Note

The text buffer that the text display displays is a separate entity and is not freed, nor are the style buffer or style table.

## See also

[Fl\\_Text\\_Display::buffer\(Fl\\_Text\\_Buffer\\* buf\)](#)

### 33.144.4 Member Function Documentation

#### 33.144.4.1 absolute\_top\_line\_number()

```
void Fl_Text_Display::absolute_top_line_number (
    int oldFirstChar ) [protected]
```

Re-calculate absolute top line number for a change in scroll position.  
Does nothing if the absolute top line number is not being maintained.

**33.144.4.2 buffer()** [1/3]

```
Fl_Text_Buffer * Fl_Text_Display::buffer ( ) const [inline]
```

Gets the current text buffer associated with the text widget.

Multiple text widgets can be associated with the same text buffer.

**Returns**

current text buffer

**See also**

[Fl\\_Text\\_Display::buffer\(Fl\\_Text\\_Buffer\\* buf\)](#)

[Fl\\_Text\\_Display::buffer\(Fl\\_Text\\_Buffer& buf\)](#)

**33.144.4.3 buffer()** [2/3]

```
void Fl_Text_Display::buffer (
    Fl_Text_Buffer & buf ) [inline]
```

Sets the current text buffer associated with the text widget.

Multiple text widgets can be associated with the same text buffer.

**Parameters**

<i>buf</i>	new text buffer
------------	-----------------

**See also**

[Fl\\_Text\\_Display::buffer\(Fl\\_Text\\_Buffer\\* buf\)](#)

**33.144.4.4 buffer()** [3/3]

```
void Fl_Text_Display::buffer (
    Fl_Text_Buffer * buf )
```

Attach a text buffer to display, replacing the current buffer (if any).

Multiple text widgets can be associated with the same text buffer.

**Note**

The caller is responsible for the old (replaced) buffer (if any). This method does not delete the old buffer.

**Parameters**

<i>buf</i>	attach this text buffer
------------	-------------------------

**33.144.4.5 buffer\_modified\_cb()**

```
void Fl_Text_Display::buffer_modified_cb (
    int pos,
    int nInserted,
    int nDeleted,
    int nRestyled,
    const char * deletedText,
    void * cbArg ) [static], [protected]
```

This is called whenever the buffer is modified.

Callback attached to the text buffer to receive modification information.

This callback can be used to adjust the display or update other setting. It is not advisable to change any buffers or text in this callback, or line counting may get out of sync.

#### Parameters

<i>pos</i>	starting index of modification
<i>nInserted</i>	number of bytes we inserted (must be UTF-8 aligned!)
<i>nDeleted</i>	number of bytes deleted (must be UTF-8 aligned!)
<i>nRestyled</i>	??
<i>deletedText</i>	this is what was removed, must not be NULL if nDeleted is set
<i>cbArg</i>	"this" pointer for static callback function

#### 33.144.4.6 buffer\_predelete\_cb()

```
void Fl_Text_Display::buffer_predelete_cb (
    int pos,
    int nDeleted,
    void * cbArg ) [static], [protected]
```

This is called before any characters are deleted.

Callback attached to the text buffer to receive delete information before the modifications are actually made.

This callback can be used to adjust the display or update other setting. It is not advisable to change any buffers or text in this callback, or line counting may get out of sync.

#### Parameters

<i>pos</i>	starting index of deletion
<i>nDeleted</i>	number of bytes we will delete (must be UTF-8 aligned!)
<i>cbArg</i>	"this" pointer for static callback function

#### 33.144.4.7 calc\_last\_char()

```
void Fl_Text_Display::calc_last_char ( ) [protected]
```

Update last display character index.

Given a [Fl\\_Text\\_Display](#) with a complete, up-to-date lineStarts array, update the lastChar entry to point to the last buffer position displayed.

#### 33.144.4.8 calc\_line\_starts()

```
void Fl_Text_Display::calc_line_starts (
    int startLine,
    int endLine ) [protected]
```

Update the line starts array.

Scan through the text in the Text Display's buffer and recalculate the line starts array values beginning at index "startLine" and continuing through (including) "endLine". It assumes that the line starts entry preceding "startLine" (or mFirstChar if startLine is 0) is good, and re-counts newlines to fill in the requested entries. Out of range values for "startLine" and "endLine" are acceptable.

#### Parameters

<i>startLine,endLine</i>	range of lines to scan as line numbers
--------------------------	--

#### 33.144.4.9 clear\_rect()

```
void Fl_Text_Display::clear_rect (
    int style,
    int X,
    int Y,
    int width,
    int height ) const [protected]
```

Clear a rectangle with the appropriate background color for `style`.

##### Parameters

<i>style</i>	index into style table
<i>X,Y,width,height</i>	size and position of background area

#### 33.144.4.10 col\_to\_x()

```
double Fl_Text_Display::col_to_x (
    double col ) const
```

Convert a column number into an x pixel position.

##### Parameters

<i>col</i>	an approximate column number based on the main font
------------	---

##### Returns

number of pixels from the left margin to the left of an average sized character

##### See also

[x\\_to\\_col\(\)](#)

#### 33.144.4.11 count\_lines()

```
int Fl_Text_Display::count_lines (
    int startPos,
    int endPos,
    bool startPosIsLineStart ) const
```

Count the number of lines between two positions.

Same as [Fl\\_Text\\_Buffer::count\\_lines\(\)](#), but takes into account wrapping if wrapping is turned on. If the caller knows that `startPos` is at a line start, it can pass `startPosIsLineStart` as `True` to make the call more efficient by avoiding the additional step of scanning back to the last newline.

##### Parameters

<i>startPos</i>	index to first character
<i>endPos</i>	index after last character
<i>startPosIsLineStart</i>	avoid scanning back to the line start

**Returns**

number of lines

**33.144.4.12 cursor\_color()** [1/2]

```
Fl_Color Fl_Text_Display::cursor_color ( ) const [inline]
```

Gets the text cursor color.

**Returns**

cursor color

**33.144.4.13 cursor\_color()** [2/2]

```
void Fl_Text_Display::cursor_color (
    Fl_Color n ) [inline]
```

Sets the text cursor color.

**Parameters**

<i>n</i>	new cursor color
----------	------------------

**33.144.4.14 cursor\_style()**

```
void Fl_Text_Display::cursor_style (
    int style )
```

Sets the text cursor style.

Sets the text cursor style to one of the following:

- [Fl\\_Text\\_Display::NORMAL\\_CURSOR](#) - Shows an I beam.
- [Fl\\_Text\\_Display::CARET\\_CURSOR](#) - Shows a caret under the text.
- [Fl\\_Text\\_Display::DIM\\_CURSOR](#) - Shows a dimmed I beam.
- [Fl\\_Text\\_Display::BLOCK\\_CURSOR](#) - Shows an unfilled box around the current character.
- [Fl\\_Text\\_Display::HEAVY\\_CURSOR](#) - Shows a thick I beam.

This call also switches the cursor on and may trigger a redraw.

**Parameters**

<i>style</i>	new cursor style
--------------	------------------

**33.144.4.15 display\_insert()**

```
void Fl_Text_Display::display_insert ( ) [protected]
```

Scroll the display to bring insertion cursor into view.

Note: it would be nice to be able to do this without counting lines twice ([scroll\\_\(\)](#) counts them too) and/or to count from the most efficient starting point, but the efficiency of this routine is not as important to the overall performance of the text display.

**33.144.4.16 display\_needs\_recalc()**

```
void Fl_Text_Display::display_needs_recalc ( ) [virtual]
```

Schedule a [recalc\\_display\(\)](#) to be done on next [draw\(\)](#).

Call this from methods that might be called repeatedly, to defers potentially CPU intensive [recalc\\_display\(\)](#) until it's actually needed just before [draw\(\)](#).

**33.144.4.17 draw()**

```
void Fl_Text_Display::draw (
    void ) [protected], [virtual]
```

Draw the widget.

This function tries to limit drawing to smaller areas if possible.

Reimplemented from [Fl\\_Group](#).

**33.144.4.18 draw\_cursor()**

```
void Fl_Text_Display::draw_cursor (
    int X,
    int Y ) [protected]
```

Draw a cursor with top center at X, Y.

**Parameters**

X,Y	cursor position in pixels
-----	---------------------------

**33.144.4.19 draw\_line\_numbers()**

```
void Fl_Text_Display::draw_line_numbers (
    bool clearAll ) [protected]
```

Refresh the line number area.

**Parameters**

<i>clearAll</i>	– (currently unused) If False, only draws the line number text, does not clear the area behind it. If True, clears the area and redraws the text. Use False to avoid a 'flash' for single buffered windows.
-----------------	---

**33.144.4.20 draw\_range()**

```
void Fl_Text_Display::draw_range (
    int startpos,
    int endpos ) [protected]
```

Draw a range of text.

Refresh all of the text between buffer positions *startpos* and *endpos* not including the character at the position *endpos*.

If *endpos* points beyond the end of the buffer, refresh the whole display after *startpos*, including blank lines which are not technically part of any range of characters.

**Parameters**

<i>startpos</i>	index of first character to draw
<i>endpos</i>	index after last character to draw

**33.144.4.21 draw\_string()**

```
void Fl_Text_Display::draw_string (
    int style,
    int X,
    int Y,
    int toX,
    const char * string,
    int nChars ) const [protected]
```

Draw a text segment in a single style.

Draw a string or blank area according to parameter `style`, using the appropriate colors and drawing method for that style, with top left corner at `X`, `Y`. If style says to draw text, use `string` as source of characters, and draw `nChars`, if style is FILL, erase rectangle where text would have drawn from `X` to `toX` and from `Y` to the maximum y extent of the current font(s).

**Parameters**

<i>style</i>	index into style lookup table
<i>X,Y</i>	drawing origin
<i>toX</i>	rightmost position if this is a fill operation
<i>string</i>	text if this is a drawing operation
<i>nChars</i>	number of characters to draw

**33.144.4.22 draw\_text()**

```
void Fl_Text_Display::draw_text (
    int left,
    int top,
    int width,
    int height ) [protected]
```

Refresh a rectangle of the text display.

**Parameters**

<i>left,top</i>	are in coordinates of the text drawing window.
<i>width,height</i>	size in pixels

**33.144.4.23 draw\_vline()**

```
void Fl_Text_Display::draw_vline (
    int visLineNum,
    int leftClip,
    int rightClip,
    int leftCharIndex,
    int rightCharIndex ) [protected]
```

Draw a single line of text.

Draw the text on a single line represented by `visLineNum` (the number of lines down from the top of the display), limited by `leftClip` and `rightClip` window coordinates and `leftCharIndex` and `rightCharIndex` character positions (not including the character at position `rightCharIndex`).

## Parameters

<i>visLineNum</i>	index of line in the visible line number lookup
<i>leftClip, rightClip</i>	pixel position of clipped area
<i>leftCharIndex, rightCharIndex</i>	index into line of segment that we want to draw

**33.144.4.24 empty\_vlines()**

```
int Fl_Text_Display::empty_vlines ( ) const [protected]
```

Return true if there are lines visible with no corresponding buffer text.

## Returns

1 if there are empty lines

**33.144.4.25 extend\_range\_for\_styles()**

```
void Fl_Text_Display::extend_range_for_styles (
    int * startpos,
    int * endpos ) [protected]
```

I don't know what this does!

Extend the range of a redraw request (from \*start to \*end) with additional redraw requests resulting from changes to the attached style buffer (which contains auxiliary information for coloring or styling text).

## Parameters

<i>startpos</i>	??
<i>endpos</i>	??

**Todo** Unicode?

**33.144.4.26 find\_line\_end()**

```
void Fl_Text_Display::find_line_end (
    int startPos,
    bool startPosIsLineStart,
    int * lineEnd,
    int * nextLineStart ) const [protected]
```

Finds both the end of the current line and the start of the next line.

Why? In continuous wrap mode, if you need to know both, figuring out one from the other can be expensive or error prone. The problem comes when there's a trailing space or tab just before the end of the buffer. To translate an end of line value to or from the next lines start value, you need to know whether the trailing space or tab is being used as a line break or just a normal character, and to find that out would otherwise require counting all the way back to the beginning of the line.

## Parameters

	<i>startPos</i>	
	<i>startPosIsLineStart</i>	
out	<i>lineEnd</i>	
out	<i>nextLineStart</i>	

**33.144.4.27 find\_wrap\_range()**

```
void Fl_Text_Display::find_wrap_range (
    const char * deletedText,
    int pos,
    int nInserted,
    int nDeleted,
    int * modRangeStart,
    int * modRangeEnd,
    int * linesInserted,
    int * linesDeleted ) [protected]
```

Wrapping calculations.

When continuous wrap is on, and the user inserts or deletes characters, wrapping can happen before and beyond the changed position. This routine finds the extent of the changes, and counts the deleted and inserted lines over that range. It also attempts to minimize the size of the range to what has to be counted and re-displayed, so the results can be useful both for delimiting where the line starts need to be recalculated, and for deciding what part of the text to redisplay.

**Parameters**

<i>deletedText</i>	
<i>pos</i>	
<i>nInserted</i>	
<i>nDeleted</i>	
<i>modRangeStart</i>	
<i>modRangeEnd</i>	
<i>linesInserted</i>	
<i>linesDeleted</i>	

**33.144.4.28 find\_x()**

```
int Fl_Text_Display::find_x (
    const char * s,
    int len,
    int style,
    int x ) const [protected]
```

Find the index of the character that lies at the given x position / closest cursor position.

**Parameters**

<i>s</i>	UTF-8 text string
<i>len</i>	length of string
<i>style</i>	index into style lookup table
<i>x</i>	position in pixels - negative returns closest cursor position

**Returns**

index into buffer

**33.144.4.29 get\_absolute\_top\_line\_number()**

```
int Fl_Text_Display::get_absolute_top_line_number ( ) const
```

Returns the absolute (non-wrapped) line number of the first line displayed.  
Returns 0 if the absolute top line number is not being maintained.

#### 33.144.4.30 `grammar_underline_color()` [1/2]

`Fl_Color` `Fl_Text_Display::grammar_underline_color ( ) const` [inline]  
Gets the underline color for style attribute ATTR\_GRAMMAR.

##### Returns

underline color

#### 33.144.4.31 `grammar_underline_color()` [2/2]

`void` `Fl_Text_Display::grammar_underline_color (`  
    `Fl_Color color )` [inline]  
Sets the underline color for style attribute ATTR\_GRAMMAR.

##### Parameters

<i>color</i>	underline color
--------------	-----------------

#### 33.144.4.32 `handle()`

`int` `Fl_Text_Display::handle (`  
    `int e )` [virtual]

Event handling.

Reimplemented from [Fl\\_Group](#).

Reimplemented in [Fl\\_Text\\_Editor](#).

#### 33.144.4.33 `handle_rmb()`

`int` `Fl_Text_Display::handle_rmb (`  
    `int readonly )` [protected]

Handle right mouse button down events.

##### Returns

0 for no op, 1 to cut, 2 to copy, 3 to paste

#### 33.144.4.34 `handle_vline()`

`int` `Fl_Text_Display::handle_vline (`  
    `int mode,`  
    `int lineStartPos,`  
    `int lineLen,`  
    `int leftChar,`  
    `int rightChar,`  
    `int Y,`  
    `int bottomClip,`  
    `int leftClip,`  
    `int rightClip ) const` [protected]

Universal pixel machine.

We use a single function that handles all line layout, measuring, and drawing

- draw a text range
- return the width of a text range in pixels
- return the index of a character that is at a pixel position

## Parameters

in	<i>mode</i>	DRAW_LINE, GET_WIDTH, FIND_INDEX, FIND_INDEX_FROM_ZERO, or FIND_CURSOR_INDEX
in	<i>lineStartPos</i>	index of first character
in	<i>lineLen</i>	size of string in bytes
in	<i>leftChar, rightChar</i>	
in	<i>Y</i>	drawing position
in	<i>bottomClip, leftClip, rightClip</i>	stop work when we reach the clipped area. rightClip is the X position that we search in FIND_INDEX.

## Return values

<i>DRAW_LINE</i>	index of last drawn character
<i>GET_WIDTH</i>	width in pixels of text segment if we would draw it
<i>FIND_INDEX</i>	index of character at given x position in window coordinates
<i>FIND_INDEX_FROM_ZERO</i>	index of character at given x position without scrolling and widget offsets

**Todo** we need to handle hidden hyphens and tabs here!  
 we handle all styles and selections  
 we must provide code to get pixel positions of the middle of a character as well

## 33.144.4.35 highlight\_data()

```
void Fl_Text_Display::highlight_data (
    Fl_Text_Buffer * styleBuffer,
    const Style_Table_Entry * styleTable,
    int nStyles,
    char unfinishedStyle,
    Unfinished_Style_Cb unfinishedHighlightCB,
    void * cbArg )
```

Attach (or remove) highlight information in text display and redisplay.

Highlighting information consists of a style buffer which parallels the normal text buffer, but codes font and color information for the display; a style table which translates style buffer codes (indexed by buffer character - 'A') into fonts and colors; and a callback mechanism for as-needed highlighting, triggered by a style buffer entry of "unfinished↵ Style". Style buffer can trigger additional redisplay during a normal buffer modification if the buffer contains a primary [Fl\\_Text\\_Selection](#) (see [extend\\_range\\_for\\_styles\(\)](#) for more information on this protocol).

Style buffers, tables and their associated memory are managed by the caller.

Styles are ranged from 65 ('A') to 126.

## Note

Style information in the style buffer must have the same byte offset as the corresponding character in the text buffer. UTF-8 characters can have a maximum length of four bytes. Style information must take this into account and fill the unused bytes with 0. See [fl\\_utf8len\(\)](#).

Text: "*\*g\* r ü \*n\**", where normal style is 'A', and bold is 'B'

```
Text Buffer(hex):  67 72 c3 bc 6e :  gr..n
Style Buffer(hex): 42 41 41 00 42 :  BAA.B
```

## Parameters

<i>styleBuffer</i>	this buffer works in parallel to the text buffer. For every character in the text buffer, the style buffer has a byte at the same offset that contains an index into an array of possible styles.
<i>styleTable</i>	a list of styles indexed by the style buffer
<i>nStyles</i>	number of styles in the style table
<i>unfinishedStyle</i>	if this style is found, the callback below is called
<i>unfinishedHighlightCB</i>	if a character with an unfinished style is found, this callback will be called
<i>cbArg</i>	an optional argument for the callback above, usually a pointer to the Text Display.

## See also

[Fl\\_Text\\_Display::style\\_buffer\(\)](#)

**33.144.4.36 in\_selection()**

```
int Fl_Text_Display::in_selection (
    int X,
    int Y ) const
```

Check if a pixel position is within the primary selection.

## Parameters

<i>X,Y</i>	pixel position to test
------------	------------------------

## Returns

1 if position (X, Y) is inside of the primary [Fl\\_Text\\_Selection](#)

**33.144.4.37 insert()**

```
void Fl_Text_Display::insert (
    const char * text )
```

Inserts "text" at the current cursor location.

This has the same effect as inserting the text into the buffer using `insert(insert_position(),text)` and then moving the insert position after the newly inserted text, except that it's optimized to do less redrawing.

## Parameters

<i>text</i>	new text in UTF-8 encoding.
-------------	-----------------------------

**33.144.4.38 insert\_position()** [1/2]

```
int Fl_Text_Display::insert_position ( ) const [inline]
```

Gets the position of the text insertion cursor for text display.

The insert position is the byte count (offset) from the beginning of the text buffer (starting with 0). Returns 0 (zero) if no buffer is associated to the text display. Returns `buffer()->length()` if the insert position is at the end of the buffer.

**Returns**

insert position index into text buffer

**See also**

[insert\\_position\(int\)](#)

**33.144.4.39 insert\_position() [2/2]**

```
void Fl_Text_Display::insert_position (
    int newPos )
```

Sets the position of the text insertion cursor for text display.

Moves the insertion cursor in front of the character at `newPos`. This function may trigger a redraw.

**Parameters**

<i>newPos</i>	new caret position
---------------	--------------------

**33.144.4.40 line\_end()**

```
int Fl_Text_Display::line_end (
    int startPos,
    bool startPosIsLineStart ) const
```

Returns the end of a line.

Same as [buffer\(\)](#)->`line_end(startPos)`, but takes into account line breaks when wrapping is turned on. If the caller knows that `startPos` is at a line start, it can pass `startPosIsLineStart` as `True` to make the call more efficient by avoiding the additional step of scanning back to the last newline.

Note that the definition of the end of a line is less clear when continuous wrap is on. With continuous wrap off, it's just a pointer to the newline that ends the line. When it's on, it's the character beyond the last **displayable** character on the line, where a whitespace character which has been "converted" to a newline for wrapping is not considered displayable. Also note that a line can be wrapped at a non-whitespace character if the line had no whitespace. In this case, this routine returns a pointer to the start of the next line. This is also consistent with the model used by `visLineLength`.

**Parameters**

<i>startPos</i>	index to starting character
<i>startPosIsLineStart</i>	avoid scanning back to the line start

**Returns**

new position as index

**33.144.4.41 line\_start()**

```
int Fl_Text_Display::line_start (
    int pos ) const
```

Return the beginning of a line.

Same as [buffer\(\)](#)->`line_start(pos)`, but returns the character after last wrap point rather than the last newline.

**Parameters**

<i>pos</i>	index to starting character
------------	-----------------------------

**Returns**

new position as index

**33.144.4.42   linenumber\_align()**

```
void Fl_Text_Display::linenumber_align (
    Fl_Align val )
```

Set alignment for line numbers (if enabled).

Valid values are FL\_ALIGN\_LEFT, FL\_ALIGN\_CENTER or FL\_ALIGN\_RIGHT.

**Version**

1.3.3

**33.144.4.43   linenumber\_bgcolor()**

```
void Fl_Text_Display::linenumber_bgcolor (
    Fl_Color val )
```

Set the background color used for line numbers (if enabled).

**Version**

1.3.3

**33.144.4.44   linenumber\_fgcolor()**

```
void Fl_Text_Display::linenumber_fgcolor (
    Fl_Color val )
```

Set the foreground color used for line numbers (if enabled).

**Version**

1.3.3

**33.144.4.45   linenumber\_font()**

```
void Fl_Text_Display::linenumber_font (
    Fl_Font val )
```

Set the font used for line numbers (if enabled).

**Version**

1.3.3

**33.144.4.46   linenumber\_format()**

```
void Fl_Text_Display::linenumber_format (
    const char * val )
```

Sets the printf() style format string used for line numbers.

Default is "%d" for normal unpadded decimal integers.

An internal copy of *val* is allocated and managed; it is automatically freed whenever a new value is assigned, or when the widget is destroyed.

The value of *val* must *not* be NULL.

Example values:

```
- "%d"    -- For normal line numbers without padding (Default)
- "%03d"  -- For 000 padding
- "%x"    -- For hexadecimal line numbers
- "%o"    -- For octal line numbers
```

**Version**

1.3.3

**33.144.4.47 linenumber\_size()**

```
void Fl_Text_Display::linenumber_size (
    Fl_Fontsize val )
```

Set the font size used for line numbers (if enabled).

**Version**

1.3.3

**33.144.4.48 linenumber\_width()**

```
void Fl_Text_Display::linenumber_width (
    int width )
```

Set width of screen area for line numbers.

Use to also enable/disable line numbers. A value of 0 disables line numbering, values >0 enable the line number display.

**Parameters**

<i>width</i>	The new width of the area for line numbers to appear, in pixels. 0 disables line numbers (default)
--------------	--

**33.144.4.49 longest\_vline()**

```
int Fl_Text_Display::longest_vline ( ) const [protected]
```

Find the longest line of all visible lines.

**Returns**

the width of the longest visible line in pixels

**33.144.4.50 maintain\_absolute\_top\_line\_number()**

```
void Fl_Text_Display::maintain_absolute_top_line_number (
    int state ) [protected]
```

Line numbering stuff, currently unused.

In continuous wrap mode, internal line numbers are calculated after wrapping. A separate non-wrapped line count is maintained when line numbering is turned on. There is some performance cost to maintaining this line count, so normally absolute line numbers are not tracked if line numbering is off. This routine allows callers to specify that they still want this line count maintained (for use via [Fl\\_Text\\_Display::position\\_to\\_linecol\(\)](#)). More specifically, this allows the line number reported in the statistics line to be calibrated in absolute lines, rather than post-wrapped lines.

**33.144.4.51 maintaining\_absolute\_top\_line\_number()**

```
int Fl_Text_Display::maintaining_absolute_top_line_number ( ) const [protected]
```

Returns true if a separate absolute top line number is being maintained.

The absolute top line number is used for displaying line numbers in continuous wrap mode or showing in the statistics line (the latter is currently not available in FLTK).

#### 33.144.4.52 `measure_deleted_lines()`

```
void Fl_Text_Display::measure_deleted_lines (
    int pos,
    int nDeleted ) [protected]
```

Wrapping calculations.

This is a stripped-down version of the `findWrapRange()` function above, intended to be used to calculate the number of "deleted" lines during a buffer modification. It is called *before* the modification takes place.

This function should only be called in continuous wrap mode with a non-fixed font width. In that case, it is impossible to calculate the number of deleted lines, because the necessary style information is no longer available *after* the modification. In other cases, we can still perform the calculation afterwards (possibly even more efficiently).

##### Parameters

<i>pos</i>	
<i>nDeleted</i>	

#### 33.144.4.53 `measure_proportional_character()`

```
double Fl_Text_Display::measure_proportional_character (
    const char * s,
    int xPix,
    int pos ) const [protected]
```

Wrapping calculations.

Measure the width in pixels of the first character of string "s" at a particular column "colNum" and buffer position "pos". This is for measuring characters in proportional or mixed-width highlighting fonts.

A note about proportional and mixed-width fonts: the mixed width and proportional font code in nedit does not get much use in general editing, because nedit doesn't allow per-language-mode fonts, and editing programs in a proportional font is usually a bad idea, so very few users would choose a proportional font as a default. There are still probably mixed-width syntax highlighting cases where things don't redraw properly for insertion/deletion, though static display and wrapping and resizing should now be solid because they are now used for online help display.

##### Parameters

<i>s</i>	text string
<i>xPix</i>	x pixel position needed for calculating tab widths
<i>pos</i>	offset within string

##### Returns

width of character in pixels

#### 33.144.4.54 `measure_vline()`

```
int Fl_Text_Display::measure_vline (
    int visLineNum ) const [protected]
```

Returns the width in pixels of the displayed line pointed to by "visLineNum".

## Parameters

<i>visLineNum</i>	index into visible lines array
-------------------	--------------------------------

## Returns

width of line in pixels

**33.144.4.55 move\_down()**

```
int Fl_Text_Display::move_down ( )
```

Moves the current insert position down one line.

## Returns

1 if the cursor moved, 0 if the beginning of the text was reached

**33.144.4.56 move\_left()**

```
int Fl_Text_Display::move_left ( )
```

Moves the current insert position left one character.

## Returns

1 if the cursor moved, 0 if the beginning of the text was reached

**33.144.4.57 move\_right()**

```
int Fl_Text_Display::move_right ( )
```

Moves the current insert position right one character.

## Returns

1 if the cursor moved, 0 if the end of the text was reached

**33.144.4.58 move\_up()**

```
int Fl_Text_Display::move_up ( )
```

Moves the current insert position up one line.

## Returns

1 if the cursor moved, 0 if the beginning of the text was reached

**33.144.4.59 offset\_line\_starts()**

```
void Fl_Text_Display::offset_line_starts (
    int newTopLineNum ) [protected]
```

Offset line start counters for a new vertical scroll position.

Offset the line starts array, mTopLineNum, mFirstChar and lastChar, for a new vertical scroll position given by new↔TopLineNum. If any currently displayed lines will still be visible, salvage the line starts values, otherwise, count lines from the nearest known line start (start or end of buffer, or the closest value in the mLineStarts array)

## Parameters

<i>newTopLineNum</i>	index into buffer
----------------------	-------------------

**33.144.4.60 `overstrike()`**

```
void Fl_Text_Display::overstrike (
    const char * text )
```

Replaces text at the current insert position.

## Parameters

<i>text</i>	new text in UTF-8 encoding
-------------	----------------------------

**Todo** Unicode? Find out exactly what we do here and simplify.

**33.144.4.61 `position_style()`**

```
int Fl_Text_Display::position_style (
    int lineStartPos,
    int lineLen,
    int lineIndex ) const
```

Find the correct style for a character.

Determine the drawing method to use to draw a specific character from "buf".

`lineStartPos` gives the character index where the line begins, `lineIndex`, the number of characters past the beginning of the line, and `lineLen` the number of displayed characters past the beginning of the line. Passing `lineStartPos` of -1 returns the drawing style for "no text".

Why not just: `position_style(pos)`? Because style applies to blank areas of the window beyond the text boundaries, and because this routine must also decide whether a position is inside of a rectangular [Fl\\_Text\\_Selection](#), and do so efficiently, without re-counting character positions from the start of the line.

Note that style is a somewhat incorrect name, drawing method would be more appropriate.

If `lineIndex` is pointing to the last character in a line, and the second to last character has the `ATTR_BGCOLOR_EXT` set, the background color will extend into the remaining line.

## Parameters

<i>lineStartPos</i>	beginning of this line
<i>lineLen</i>	number of bytes in line
<i>lineIndex</i>	position of character within line

## Returns

style for the given character

**33.144.4.62 `position_to_line()`**

```
int Fl_Text_Display::position_to_line (
    int pos,
    int * lineNum ) const [protected]
```

Convert a position index into a line number offset.

Find the line number of position `pos` relative to the first line of displayed text, counting from 0 to *visible lines* - 1. The line number is returned in `lineNum`.

Returns 0 if the line is not displayed. In this case `lineNum` is 0 as well.  
 Returns 1 if the line is displayed. In this case `lineNum` is the relative line number.

**Parameters**

in	<i>pos</i>	byte position in buffer
out	<i>lineNum</i>	relative line number of byte <i>pos</i> in buffer

**Returns**

whether the character at byte position *pos* is currently displayed

**Return values**

0	<i>pos</i> is not displayed; <i>lineNum</i> is invalid (zero)
1	<i>pos</i> is displayed; <i>lineNum</i> is valid

**33.144.4.63 position\_to\_linecol()**

```
int Fl_Text_Display::position_to_linecol (
    int pos,
    int * lineNum,
    int * column ) const [protected]
```

Find the line and column number of position *pos*.

This only works for displayed lines. If the line is not displayed, the function returns 0 (without the `mLineStarts` array it could turn in to very long calculation involving scanning large amounts of text in the buffer). If continuous wrap mode is on, returns the absolute line number (as opposed to the wrapped line number which is used for scrolling).

**Parameters**

	<i>pos</i>	character index
out	<i>lineNum</i>	absolute (unwrapped) line number
out	<i>column</i>	character offset to the beginning of the line

**Returns**

0 if *pos* is off screen, line number otherwise

**Todo** a column number makes little sense in the UTF-8/variable font width environment. We will have to further define what exactly we want to return. Please check the functions that call this particular function.

**33.144.4.64 position\_to\_xy()**

```
int Fl_Text_Display::position_to_xy (
    int pos,
    int * X,
    int * Y ) const
```

Convert a character index into a pixel position.

Translate a buffer text position to the XY location where the top left of the cursor would be positioned to point to that character. Returns 0 if the position is not displayed because it is **vertically out** of view. If the position is horizontally out of view, returns the X coordinate where the position would be if it were visible.

## Parameters

	<i>pos</i>	character index
out	<i>X, Y</i>	pixel position of character on screen

## Returns

0 if character vertically out of view, X & Y positions otherwise

**33.144.4.65 recalc\_display()**

```
void Fl_Text_Display::recalc_display ( ) [virtual]
```

Recalculate the display's visible lines and scrollbar sizes.

Beware calling this directly may cause a lot of CPU if called repeatedly (issue 300). Better to call [display\\_needs\\_recalc\(\)](#) to flag a recalc to be done during next [draw\(\)](#).

**33.144.4.66 redisplay\_range()**

```
void Fl_Text_Display::redisplay_range (
    int startpos,
    int endpos )
```

Marks text from start to end as needing a redraw.

This function will trigger a damage event and later a redraw of parts of the widget.

## Parameters

<i>startpos</i>	index of first character needing redraw
<i>endpos</i>	index after last character needing redraw

**33.144.4.67 reset\_absolute\_top\_line\_number()**

```
void Fl_Text_Display::reset_absolute_top_line_number ( ) [protected]
```

Reestablish the absolute (non-wrapped) top line number.

Count lines from the beginning of the buffer to reestablish the absolute (non-wrapped) top line number. If mode is not continuous wrap, or the number is not being maintained, does nothing.

**33.144.4.68 resize()**

```
void Fl_Text_Display::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Change the size of the displayed text area.

Calling this function will trigger a recalculation of all visible lines and of all scrollbar sizes.

## Parameters

<i>X, Y, W, H</i>	new position and size of this widget
-------------------	--------------------------------------

Reimplemented from [Fl\\_Group](#).

**33.144.4.69 rewind\_lines()**

```
int Fl_Text_Display::rewind_lines (
    int startPos,
    int nLines )
```

Skip a number of lines back.

Same as [buffer\(\)](#)->rewind\_lines(startPos, nLines), but takes into account line breaks when wrapping is turned on.

**Parameters**

<i>startPos</i>	index to starting character
<i>nLines</i>	number of lines to skip back

**Returns**

new position as index

**33.144.4.70 scroll()**

```
void Fl_Text_Display::scroll (
    int topLineNum,
    int horizOffset )
```

Scrolls the current buffer to start at the specified line and column.

**Parameters**

<i>topLineNum</i>	top line number
<i>horizOffset</i>	column number

**Todo** Column numbers make little sense here.

**33.144.4.71 scroll\_()**

```
int Fl_Text_Display::scroll_ (
    int topLineNum,
    int horizOffset ) [protected]
```

Scrolls the current buffer to start at the specified line and column.

**Parameters**

<i>topLineNum</i>	top line number
<i>horizOffset</i>	in pixels

**Returns**

0 if nothing changed, 1 if we scrolled

**33.144.4.72 scroll\_timer\_cb()**

```
void Fl_Text_Display::scroll_timer_cb (
    void * user_data ) [static], [protected]
```

Timer callback for scroll events.

This timer event scrolls the text view proportionally to how far the mouse pointer has left the text area. This allows for smooth scrolling without "wiggeling" the mouse.

#### 33.144.4.73 scrollbar\_align() [1/2]

```
Fl_Align Fl_Text_Display::scrollbar_align ( ) const [inline]
```

Gets the scrollbar alignment type.

##### Returns

scrollbar alignment

#### 33.144.4.74 scrollbar\_align() [2/2]

```
void Fl_Text_Display::scrollbar_align (
    Fl_Align a ) [inline]
```

Sets the scrollbar alignment type.

##### Parameters

<i>a</i>	new scrollbar alignment
----------	-------------------------

#### 33.144.4.75 scrollbar\_size() [1/2]

```
int Fl_Text_Display::scrollbar_size (
    void ) const [inline]
```

Gets the current size of the scrollbars' troughs, in pixels.

If this value is zero (default), this widget will use the [Fl::scrollbar\\_size\(\)](#) value as the scrollbar's width.

##### Returns

Scrollbar size in pixels, or 0 if the global [Fl::scrollbar\\_size\(\)](#) is being used.

##### See also

[Fl::scrollbar\\_size\(int\)](#)

#### 33.144.4.76 scrollbar\_size() [2/2]

```
void Fl_Text_Display::scrollbar_size (
    int newSize ) [inline]
```

Sets the pixel size of the scrollbars' troughs to *newSize*, in pixels.

Normally you should not need this method, and should use [Fl::scrollbar\\_size\(int\)](#) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, is the default behavior, and is normally what you want.

Only use THIS method if you really need to override the global scrollbar size. The need for this should be rare.

Setting *newSize* to the special value of 0 causes the widget to track the global [Fl::scrollbar\\_size\(\)](#), which is the default.

##### Parameters

<i>in</i>	<i>newSize</i>	Sets the scrollbar size in pixels. If 0 (default), scrollbar size tracks the global <a href="#">Fl::scrollbar_size()</a>
-----------	----------------	---

See also

[Fl::scrollbar\\_size\(\)](#)

#### 33.144.4.77 scrollbar\_width() [1/2]

```
int Fl_Text_Display::scrollbar_width ( ) const [inline]
```

Returns the global value [Fl::scrollbar\\_size\(\)](#) unless a specific scrollbar\_width\_ has been set.

**Deprecated** Use [scrollbar\\_size\(\)](#) instead.

**Todo** This method should eventually be removed.

#### 33.144.4.78 scrollbar\_width() [2/2]

```
void Fl_Text_Display::scrollbar_width (
    int width ) [inline]
```

Sets the global [Fl::scrollbar\\_size\(\)](#), and forces this instance of the widget to use it.

**Deprecated** Use [scrollbar\\_size\(\)](#) instead.

**Todo** This method should eventually be removed

#### 33.144.4.79 secondary\_selection\_color() [1/2]

```
Fl_Color Fl_Text_Display::secondary_selection_color ( ) const [inline]
```

Gets the background color for the secondary selection block.

Returns

background color color

#### 33.144.4.80 secondary\_selection\_color() [2/2]

```
void Fl_Text_Display::secondary_selection_color (
    Fl_Color color ) [inline]
```

Sets the background color for the secondary selection block.

Parameters

<i>color</i>	background color
--------------	------------------

#### 33.144.4.81 shortcut() [1/2]

```
int Fl_Text_Display::shortcut ( ) const [inline]
```

**Todo** FIXME : get set methods pointing on shortcut\_ have no effects as shortcut\_ is unused in this class and derived!

Returns

the current shortcut key

**33.144.4.82 shortcut()** [2/2]

```
void Fl_Text_Display::shortcut (
    int s ) [inline]
```

**Todo** FIXME : get set methods pointing on `shortcut_` have no effects as `shortcut_` is unused in this class and derived!

**Parameters**

<i>s</i>	the new shortcut key
----------	----------------------

**33.144.4.83 show\_cursor()**

```
void Fl_Text_Display::show_cursor (
    int b = 1 )
```

Shows the text cursor.

This function may trigger a redraw.

**Parameters**

<i>b</i>	show(1) or hide(0) the text cursor (caret).
----------	---

**33.144.4.84 show\_insert\_position()**

```
void Fl_Text_Display::show_insert_position ( )
```

Scrolls the text buffer to show the current insert position.

This function triggers a complete recalculation, ending in a call to [Fl\\_Text\\_Display::display\\_insert\(\)](#)

**33.144.4.85 skip\_lines()**

```
int Fl_Text_Display::skip_lines (
    int startPos,
    int nLines,
    bool startPosIsLineStart )
```

Skip a number of lines forward.

Same as `Fl_Text_Buffer::skip_lines(startPos, nLines)`, but takes into account line breaks when wrapping is turned on. If the caller knows that `startPos` is at a line start, it can pass `startPosIsLineStart` as `True` to make the call more efficient by avoiding the additional step of scanning back to the last newline.

**Parameters**

<i>startPos</i>	index to starting character
<i>nLines</i>	number of lines to skip ahead
<i>startPosIsLineStart</i>	avoid scanning back to the line start

**Returns**

new position as index

**33.144.4.86 spelling\_underline\_color()** [1/2]

```
Fl_Color Fl_Text_Display::spelling_underline_color ( ) const [inline]
```

Gets the underline color for style attribute ATTR\_SPELLING.

Returns

underline color

#### 33.144.4.87 spelling\_underline\_color() [2/2]

```
void Fl_Text_Display::spelling_underline_color (
    Fl_Color color ) [inline]
```

Sets the underline color for style attribute ATTR\_SPELLING.

Parameters

<i>color</i>	underline color
--------------	-----------------

#### 33.144.4.88 string\_width()

```
double Fl_Text_Display::string_width (
    const char * string,
    int length,
    int style ) const [protected]
```

Find the width of a string in the font of a particular style.

Parameters

<i>string</i>	the text
<i>length</i>	number of bytes in string
<i>style</i>	index into style table

Returns

width of text segment in pixels

#### 33.144.4.89 style\_buffer()

```
Fl_Text_Buffer * Fl_Text_Display::style_buffer ( ) const [inline]
```

Gets the current style buffer associated with the text widget.

Multiple text widgets can be associated with the same style buffer.

Returns

current style buffer

See also

[Fl\\_Text\\_Display::highlight\\_data\(\)](#)

#### 33.144.4.90 textcolor() [1/2]

```
Fl_Color Fl_Text_Display::textcolor (
    void ) const [inline]
```

Gets the default color of text in the widget.

**Returns**

text color unless overridden by a style

**33.144.4.91 textcolor() [2/2]**

```
void Fl_Text_Display::textcolor (
    Fl_Color n ) [inline]
```

Sets the default color of text in the widget.

**Parameters**

<i>n</i>	new text color
----------	----------------

**33.144.4.92 textfont() [1/2]**

```
Fl_Font Fl_Text_Display::textfont (
    void ) const [inline]
```

Gets the default font used when drawing text in the widget.

**Returns**

current text font face unless overridden by a style

**33.144.4.93 textfont() [2/2]**

```
void Fl_Text_Display::textfont (
    Fl_Font s ) [inline]
```

Sets the default font used when drawing text in the widget.

**Parameters**

<i>s</i>	default text font face
----------	------------------------

**33.144.4.94 textsize() [1/2]**

```
Fl_Fontsize Fl_Text_Display::textsize (
    void ) const [inline]
```

Gets the default size of text in the widget.

**Returns**

current text height unless overridden by a style

**33.144.4.95 textsize() [2/2]**

```
void Fl_Text_Display::textsize (
    Fl_Fontsize s ) [inline]
```

Sets the default size of text in the widget.

**Parameters**

<i>s</i>	new text size
----------	---------------

**33.144.4.96 update\_h\_scrollbar()**

```
void Fl_Text_Display::update_h_scrollbar ( ) [protected]
```

Update horizontal scrollbar.

Update the minimum, maximum, slider size, page increment, and value for the horizontal scrollbar.

**33.144.4.97 update\_line\_starts()**

```
void Fl_Text_Display::update_line_starts (
    int pos,
    int charsInserted,
    int charsDeleted,
    int linesInserted,
    int linesDeleted,
    int * scrolled ) [protected]
```

Update line start arrays and variables.

Update the line starts array, mTopLineNum, mFirstChar and lastChar for this text display after a modification to the text buffer, given by the position *pos* where the change began, and the numbers of characters and lines inserted and deleted.

**Parameters**

	<i>pos</i>	index into buffer of recent changes
	<i>charsInserted</i>	number of bytes(!) inserted
	<i>charsDeleted</i>	number of bytes(!) deleted
	<i>linesInserted</i>	number of lines
	<i>linesDeleted</i>	number of lines
out	<i>scrolled</i>	set to 1 if the text display needs to be scrolled

**33.144.4.98 update\_v\_scrollbar()**

```
void Fl_Text_Display::update_v_scrollbar ( ) [protected]
```

Update vertical scrollbar.

Update the minimum, maximum, slider size, page increment, and value for the vertical scrollbar.

**33.144.4.99 vline\_length()**

```
int Fl_Text_Display::vline_length (
    int visLineNum ) const [protected]
```

Count number of bytes in a visible line.

Return the length of a line (number of bytes) by examining entries in the line starts array rather than by scanning for newlines.

**Parameters**

<i>visLineNum</i>	index of line in visible line array
-------------------	-------------------------------------

**Returns**

number of bytes in this line

**33.144.4.100 word\_end()**

```
int Fl_Text_Display::word_end (
    int pos ) const [inline]
```

Moves the insert position to the end of the current word.

**Parameters**

<i>pos</i>	start calculation at this index
------------	---------------------------------

**Returns**

index of first character after the end of the word

**33.144.4.101 word\_start()**

```
int Fl_Text_Display::word_start (
    int pos ) const [inline]
```

Moves the insert position to the beginning of the current word.

**Parameters**

<i>pos</i>	start calculation at this index
------------	---------------------------------

**Returns**

beginning of the words

**33.144.4.102 wrap\_mode()**

```
void Fl_Text_Display::wrap_mode (
    int wrap,
    int wrapMargin )
```

Set the new text wrap mode.

If `wrap` mode is not zero, this call enables automatic word wrapping at column `wrapMargin`. Word-wrapping does not change the text buffer itself, only the way the text is displayed. Different Text Displays can have different wrap modes, even if they share the same Text Buffer.

Valid wrap modes are:

- `WRAP_NONE` : don't wrap text at all
- `WRAP_AT_COLUMN` : wrap text at the given text column
- `WRAP_AT_PIXEL` : wrap text at a pixel position
- `WRAP_AT_BOUNDS` : wrap text so that it fits into the widget width

**Parameters**

<i>wrap</i>	new wrap mode (see above)
-------------	---------------------------

## Parameters

<i>wrapMargin</i>	in WRAP_AT_COLUMN mode, text will wrap at the n'th character. For variable width fonts, an average character width is calculated. The column width is calculated using the current textfont or the first style when this function is called. If the font size changes, this function must be called again. In WRAP_AT_PIXEL mode, this is the pixel position.
-------------------	---

**33.144.4.103 wrap\_uses\_character()**

```
int Fl_Text_Display::wrap_uses_character (
    int lineEndPos ) const [protected]
```

Check if the line break is caused by a newline or by line wrapping.

Line breaks in continuous wrap mode usually happen at newlines (\n) or whitespace. This line-terminating character is not included in line width measurements and has a special status as a non-visible character. However, lines with no whitespace are wrapped without the benefit of a line terminating character, and this distinction causes endless trouble with all of the text display code which was originally written without continuous wrap mode and always expects to wrap at a newline character.

Given the position of the end of the line, as returned by [Fl\\_Text\\_Display::line\\_end\(\)](#) or [Fl\\_Text\\_Buffer::line\\_end\(\)](#), this returns true if there is a line terminating character, and false if there's not. On the last character in the buffer, this function can't tell for certain whether a trailing space was used as a wrap point, and just guesses that it wasn't. So if an exact accounting is necessary, don't use this function.

## Parameters

<i>lineEndPos</i>	index of character where the line wraps
-------------------	---

## Returns

1 if a \n character causes the line wrap

**33.144.4.104 wrapped\_column()**

```
int Fl_Text_Display::wrapped_column (
    int row,
    int column ) const
```

Nobody knows what this function does.

Correct a column number based on an unconstrained position (as returned by [TextDXYToUnconstrainedPosition](#)) to be relative to the last actual newline in the buffer before the row and column position given, rather than the last line start created by line wrapping. This is an adapter for rectangular selections and code written before continuous wrap mode, which thinks that the unconstrained column is the number of characters from the last newline. Obviously this is time consuming, because it involves character re-counting.

## Parameters

<i>row</i>	
<i>column</i>	

## Returns

something unknown

**Todo** What does this do and how is it useful? Column numbers mean little in this context. Which functions depend on this one? Function [TextDXYToUnconstrainedPosition](#) does not exist (nedit port?)

**Todo** Unicode?

**33.144.4.105 wrapped\_line\_counter()**

```
void Fl_Text_Display::wrapped_line_counter (
    Fl_Text_Buffer * buf,
    int startPos,
    int maxPos,
    int maxLines,
    bool startPosIsLineStart,
    int styleBufOffset,
    int * retPos,
    int * retLines,
    int * retLineStart,
    int * retLineEnd,
    bool countLastLineMissingNewLine = true ) const [protected]
```

Wrapping calculations.

Count forward from startPos to either maxPos or maxLines (whichever is reached first), and return all relevant positions and line count. The provided textBuffer may differ from the actual text buffer of the widget. In that case it must be a (partial) copy of the actual text buffer and the styleBufOffset argument must indicate the starting position of the copy, to take into account the correct style information.

**Parameters**

in	<i>buf</i>	The text buffer to operate on
in	<i>startPos</i>	Starting index position into the buffer
in	<i>maxPos</i>	Maximum index position into the buffer we'll reach
in	<i>maxLines</i>	Maximum number of lines we'll reach
in	<i>startPosIsLineStart</i>	Flag indicating if startPos is start of line. (If set, prevents our having to find the line start)
in	<i>styleBufOffset</i>	Offset index position into style buffer.
out	<i>retPos</i>	Position where counting ended. When counting lines, the position returned is the start of the line "maxLines" lines beyond "startPos".
out	<i>retLines</i>	Number of line breaks counted
out	<i>retLineStart</i>	Start of the line where counting ended
out	<i>retLineEnd</i>	End position of the last line traversed
out	<i>countLastLineMissingNewLine</i>	

**33.144.4.106 wrapped\_row()**

```
int Fl_Text_Display::wrapped_row (
    int row ) const
```

Nobody knows what this function does.

Correct a row number from an unconstrained position (as returned by TextDXYToUnconstrainedPosition) to a straight number of newlines from the top line of the display. Because rectangular selections are based on newlines, rather than display wrapping, and anywhere a rectangular selection needs a row, it needs it in terms of un-wrapped lines.

**Parameters**

<i>row</i>	
------------	--

**Returns**

something unknown

**Todo** What does this do and how is it useful? Column numbers mean little in this context. Which functions depend on this one? Function TextDXYToUnconstrainedPosition does not exist (nedit port?)

**33.144.4.107 x\_to\_col()**

```
double Fl_Text_Display::x_to_col (
    double x ) const
```

Convert an x pixel position into a column number.

**Parameters**

x	number of pixels from the left margin
---	---------------------------------------

**Returns**

an approximate column number based on the main font

**33.144.4.108 xy\_to\_position()**

```
int Fl_Text_Display::xy_to_position (
    int X,
    int Y,
    int posType = CHARACTER_POS ) const [protected]
```

Translate a pixel position into a character index.

Translate window coordinates to the nearest (insert cursor or character cell) text position. The parameter `posType` specifies how to interpret the position: `CURSOR_POS` means translate the coordinates to the nearest cursor position, and `CHARACTER_POS` means return the position of the character closest to (X, Y).

**Parameters**

X,Y	pixel position
posType	CURSOR_POS or CHARACTER_POS

**Returns**

index into text buffer

**33.144.4.109 xy\_to\_rowcol()**

```
void Fl_Text_Display::xy_to_rowcol (
    int X,
    int Y,
    int * row,
    int * column,
    int posType = CHARACTER_POS ) const [protected]
```

Translate pixel coordinates into row and column.

Translate window coordinates to the nearest row and column number for positioning the cursor. This, of course, makes no sense when the font is proportional, since there are no absolute columns. The parameter `posType` specifies how to interpret the position: `CURSOR_POS` means translate the coordinates to the nearest position between characters, and `CHARACTER_POS` means translate the position to the nearest character cell.

## Parameters

	<i>X,Y</i>	pixel coordinates
out	<i>row,column</i>	nearest row and column
	<i>posType</i>	CURSOR_POS or CHARACTER_POS

The documentation for this class was generated from the following files:

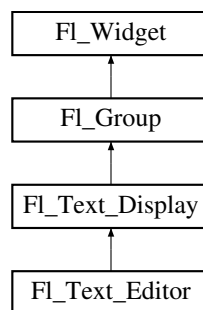
- `Fl_Text_Display.H`
- `Fl_Text_Display.cxx`

### 33.145 Fl\_Text\_Editor Class Reference

This is the FLTK text editor widget.

```
#include <Fl_Text_Editor.H>
```

Inheritance diagram for `Fl_Text_Editor`:



#### Classes

- struct [Key\\_Binding](#)  
*Simple linked list item associating a key/state to a function.*

#### Public Types

- typedef `int(* Key_Func) (int key, Fl\_Text\_Editor *editor)`  
*Key function binding callback type.*

#### Public Member Functions

- void **add\_default\_key\_bindings** ([Key\\_Binding](#) \*\*list)  
*Adds all of the default editor key bindings to the specified key binding list.*
- void **add\_key\_binding** (int key, int state, [Key\\_Func](#) f)  
*Adds a key of state state with the function f.*
- void **add\_key\_binding** (int key, int state, [Key\\_Func](#) f, [Key\\_Binding](#) \*\*list)  
*Adds a key of state state with the function function to an arbitrary key binding list list.*
- [Key\\_Func](#) **bound\_key\_function** (int key, int state) const  
*Returns the function associated with a key binding.*
- [Key\\_Func](#) **bound\_key\_function** (int key, int state, [Key\\_Binding](#) \*list) const  
*Returns the function associated with a key binding.*
- void **default\_key\_function** ([Key\\_Func](#) f)  
*Sets the default key function for unassigned keys.*
- **Fl\_Text\_Editor** (int X, int Y, int W, int H, const char \*l=0)  
*The constructor creates a new text editor widget.*

- int [handle](#) (int e) [FL\\_OVERRIDE](#)  
*Event handling.*
- int [insert\\_mode](#) ()  
*Gets the current insert mode; if non-zero, new text is inserted before the current cursor position.*
- void [insert\\_mode](#) (int b)  
*Sets the current insert mode; if non-zero, new text is inserted before the current cursor position.*
- void [remove\\_all\\_key\\_bindings](#) ()  
*Removes all of the key bindings associated with the text editor or list.*
- void [remove\\_all\\_key\\_bindings](#) ([Key\\_Binding](#) \*\*list)  
*Removes all of the key bindings associated with the text editor or list.*
- void [remove\\_key\\_binding](#) (int key, int state)  
*Removes the key binding associated with the key "key" of state "state".*
- void [remove\\_key\\_binding](#) (int key, int state, [Key\\_Binding](#) \*\*list)  
*Removes the key binding associated with the key key of state state from the Key\_Binding list list.*
- int [tab\\_nav](#) () const  
*Check if Tab focus navigation is enabled.*
- void [tab\\_nav](#) (int val)  
*Enables or disables Tab key focus navigation.*

## Static Public Member Functions

- static int [kf\\_backspace](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Does a backspace for key 'c' in the current buffer of editor 'e'.*
- static int [kf\\_c\\_s\\_move](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Extends the current selection in the direction indicated by control key 'c' in editor 'e'.*
- static int [kf\\_copy](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Does a copy of selected text or the current character in the current buffer of editor 'e'.*
- static int [kf\\_ctrl\\_move](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the current text cursor in the direction indicated by control key 'c' in editor 'e'.*
- static int [kf\\_cut](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Does a cut of selected text in the current buffer of editor 'e'.*
- static int [kf\\_default](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Inserts the text associated with key 'c' in editor 'e'.*
- static int [kf\\_delete](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Does a delete of selected text or the current character in the current buffer of editor 'e'.*
- static int [kf\\_down](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor one line down for editor 'e'.*
- static int [kf\\_end](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor to the end of the current line in editor 'e'.*
- static int [kf\\_enter](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Inserts a newline for key 'c' at the current cursor position in editor 'e'.*
- static int [kf\\_home](#) (int, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor to the beginning of the current line in editor 'e'.*
- static int [kf\\_ignore](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Ignores the key 'c' in editor 'e'.*
- static int [kf\\_insert](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Toggles the insert mode for editor 'e'.*
- static int [kf\\_left](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor one character to the left in editor 'e'.*
- static int [kf\\_m\\_s\\_move](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Extends the current selection in the direction indicated by meta key 'c' in editor 'e'.*

- static int [kf\\_meta\\_move](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the current text cursor in the direction indicated by meta key 'c' in editor 'e'.*
- static int [kf\\_move](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor in the direction indicated by key 'c' in editor 'e'.*
- static int [kf\\_page\\_down](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor down one page for editor 'e'.*
- static int [kf\\_page\\_up](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor up one page for editor 'e'.*
- static int [kf\\_paste](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Does a paste of selected text in the current buffer of editor 'e'.*
- static int [kf\\_redo](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Redo last undo action.*
- static int [kf\\_right](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor one character to the right for editor 'e'.*
- static int [kf\\_select\\_all](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Selects all text in the current buffer in editor 'e'.*
- static int [kf\\_shift\\_move](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Extends the current selection in the direction of key 'c' in editor 'e'.*
- static int [kf\\_undo](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Undo last edit in the current buffer of editor 'e'.*
- static int [kf\\_up](#) (int c, [Fl\\_Text\\_Editor](#) \*e)  
*Moves the text cursor one line up for editor 'e'.*

## Protected Member Functions

- int [handle\\_key](#) ()  
*Handles a key press in the editor.*
- void [maybe\\_do\\_callback](#) ([Fl\\_Callback\\_Reason](#) reason=[FL\\_REASON\\_CHANGED](#))  
*does or does not a callback according to [changed\(\)](#) and [when\(\)](#) settings*

## Static Protected Attributes

- static [Key\\_Binding](#) \* [global\\_key\\_bindings](#)  
*Global key binding list.*

## Additional Inherited Members

### 33.145.1 Detailed Description

This is the FLTK text editor widget.

It allows the user to edit multiple lines of text and supports highlighting and scrolling. The buffer that is displayed in the widget is managed by the [Fl\\_Text\\_Buffer](#) class.

### 33.145.2 Member Function Documentation

#### 33.145.2.1 [add\\_key\\_binding\(\)](#)

```
void Fl_Text_Editor::add_key_binding (
    int key,
    int state,
    Key_Func function,
    Key_Binding ** list )
```

Adds a key of state `state` with the function `function` to an arbitrary key binding list `list`.

This can be used in derived classes to add global key bindings by using the global (static) [Key\\_Binding](#) list [Fl\\_Text\\_Editor::global\\_key\\_bindings](#).

**33.145.2.2 handle()**

```
int Fl_Text_Editor::handle (
    int e ) [virtual]
```

Event handling.

Reimplemented from [Fl\\_Text\\_Display](#).

**33.145.2.3 insert\_mode() [1/2]**

```
int Fl_Text_Editor::insert_mode ( ) [inline]
```

Gets the current insert mode; if non-zero, new text is inserted before the current cursor position.

Otherwise, new text replaces text at the current cursor position.

**33.145.2.4 insert\_mode() [2/2]**

```
void Fl_Text_Editor::insert_mode (
    int b ) [inline]
```

Sets the current insert mode; if non-zero, new text is inserted before the current cursor position.

Otherwise, new text replaces text at the current cursor position.

**33.145.2.5 kf\_backspace()**

```
int Fl_Text_Editor::kf_backspace (
    int c,
    Fl_Text_Editor * e ) [static]
```

Does a backspace for key 'c' in the current buffer of editor 'e'.

Any current selection is deleted. Otherwise, the character left is deleted and the cursor moved. The key value 'c' is currently unused.

**33.145.2.6 kf\_c\_s\_move()**

```
int Fl_Text_Editor::kf_c_s_move (
    int c,
    Fl_Text_Editor * e ) [static]
```

Extends the current selection in the direction indicated by control key 'c' in editor 'e'.

See also

[kf\\_ctrl\\_move\(\)](#).

**33.145.2.7 kf\_copy()**

```
int Fl_Text_Editor::kf_copy (
    int c,
    Fl_Text_Editor * e ) [static]
```

Does a copy of selected text or the current character in the current buffer of editor 'e'.

The key value 'c' is currently unused.

**33.145.2.8 kf\_ctrl\_move()**

```
int Fl_Text_Editor::kf_ctrl_move (
    int c,
    Fl_Text_Editor * e ) [static]
```

Moves the current text cursor in the direction indicated by control key 'c' in editor 'e'.

Supported values for 'c' are currently:

```
FL_Home    -- moves the cursor to the beginning of the document
FL_End     -- moves the cursor to the end of the document
FL_Left    -- moves the cursor left one word
FL_Right   -- moves the cursor right one word
```

```

FL_Up      -- scrolls up one line, without moving cursor
FL_Down    -- scrolls down one line, without moving cursor
FL_Page_Up -- moves the cursor to the beginning of the top line on the current page
FL_Page_Down -- moves the cursor to the beginning of the last line on the current page

```

### 33.145.2.9 kf\_cut()

```

int Fl_Text_Editor::kf_cut (
    int c,
    Fl_Text_Editor * e ) [static]

```

Does a cut of selected text in the current buffer of editor 'e'.  
The key value 'c' is currently unused.

### 33.145.2.10 kf\_default()

```

int Fl_Text_Editor::kf_default (
    int c,
    Fl_Text_Editor * e ) [static]

```

Inserts the text associated with key 'c' in editor 'e'.  
Honors the current selection and insert/overstrike mode.

### 33.145.2.11 kf\_delete()

```

int Fl_Text_Editor::kf_delete (
    int c,
    Fl_Text_Editor * e ) [static]

```

Does a delete of selected text or the current character in the current buffer of editor 'e'.  
The key value 'c' is currently unused.

### 33.145.2.12 kf\_down()

```

int Fl_Text_Editor::kf_down (
    int c,
    Fl_Text_Editor * e ) [static]

```

Moves the text cursor one line down for editor 'e'.  
Same as kf\_move(FL\_Down, e). The key value 'c' is currently unused.

### 33.145.2.13 kf\_end()

```

int Fl_Text_Editor::kf_end (
    int c,
    Fl_Text_Editor * e ) [static]

```

Moves the text cursor to the end of the current line in editor 'e'.  
Same as kf\_move(FL\_End, e). The key value 'c' is currently unused.

### 33.145.2.14 kf\_enter()

```

int Fl_Text_Editor::kf_enter (
    int c,
    Fl_Text_Editor * e ) [static]

```

Inserts a newline for key 'c' at the current cursor position in editor 'e'.  
The key value 'c' is currently unused.

### 33.145.2.15 kf\_home()

```

int Fl_Text_Editor::kf_home (
    int ,
    Fl_Text_Editor * e ) [static]

```

Moves the text cursor to the beginning of the current line in editor 'e'.  
Same as kf\_move(FL\_Home, e). The key value 'c' is currently unused.

**33.145.2.16 kf\_ignore()**

```
int Fl_Text_Editor::kf_ignore (
    int c,
    Fl_Text_Editor * e ) [static]
```

Ignores the key 'c' in editor 'e'.

This method can be used as a keyboard binding to disable a key that might otherwise be handled or entered as text. An example would be disabling FL\_Escape, so that it isn't added to the buffer when invoked by the user.

**33.145.2.17 kf\_insert()**

```
int Fl_Text_Editor::kf_insert (
    int c,
    Fl_Text_Editor * e ) [static]
```

Toggles the insert mode for editor 'e'.

The key value 'c' is currently unused.

**33.145.2.18 kf\_left()**

```
int Fl_Text_Editor::kf_left (
    int c,
    Fl_Text_Editor * e ) [static]
```

Moves the text cursor one character to the left in editor 'e'.

Same as kf\_move(FL\_Left, e). The key value 'c' is currently unused.

**33.145.2.19 kf\_m\_s\_move()**

```
int Fl_Text_Editor::kf_m_s_move (
    int c,
    Fl_Text_Editor * e ) [static]
```

Extends the current selection in the direction indicated by meta key 'c' in editor 'e'.

See also

[kf\\_meta\\_move\(\)](#).

**33.145.2.20 kf\_meta\_move()**

```
int Fl_Text_Editor::kf_meta_move (
    int c,
    Fl_Text_Editor * e ) [static]
```

Moves the current text cursor in the direction indicated by meta key 'c' in editor 'e'.

Supported values for 'c' are currently:

```
FL_Up      -- moves cursor to the beginning of the current document
FL_Down    -- moves cursor to the end of the current document
FL_Left    -- moves the cursor to the beginning of the current line
FL_Right   -- moves the cursor to the end of the current line
```

**33.145.2.21 kf\_move()**

```
int Fl_Text_Editor::kf_move (
    int c,
    Fl_Text_Editor * e ) [static]
```

Moves the text cursor in the direction indicated by key 'c' in editor 'e'.

Supported values for 'c' are currently:

```
FL_Home    -- moves the cursor to the beginning of the current line
FL_End     -- moves the cursor to the end of the current line
FL_Left    -- moves the cursor left one character
FL_Right   -- moves the cursor right one character
FL_Up      -- moves the cursor up one line
FL_Down    -- moves the cursor down one line
```

```
FL_Page_Up    -- moves the cursor up one page
FL_Page_Down  -- moves the cursor down one page
```

### 33.145.2.22 kf\_page\_down()

```
int Fl_Text_Editor::kf_page_down (
    int c,
    Fl_Text_Editor * e ) [static]
```

Moves the text cursor down one page for editor 'e'.

Same as kf\_move(FL\_Page\_Down, e). The key value 'c' is currently unused.

### 33.145.2.23 kf\_page\_up()

```
int Fl_Text_Editor::kf_page_up (
    int c,
    Fl_Text_Editor * e ) [static]
```

Moves the text cursor up one page for editor 'e'.

Same as kf\_move(FL\_Page\_Up, e). The key value 'c' is currently unused.

### 33.145.2.24 kf\_paste()

```
int Fl_Text_Editor::kf_paste (
    int c,
    Fl_Text_Editor * e ) [static]
```

Does a paste of selected text in the current buffer of editor 'e'.

Any current selection is replaced with the pasted content. The key value 'c' is currently unused.

### 33.145.2.25 kf\_redo()

```
int Fl_Text_Editor::kf_redo (
    int c,
    Fl_Text_Editor * e ) [static]
```

Redo last undo action.

Also deselects previous selection. The key value 'c' is currently unused.

### 33.145.2.26 kf\_right()

```
int Fl_Text_Editor::kf_right (
    int c,
    Fl_Text_Editor * e ) [static]
```

Moves the text cursor one character to the right for editor 'e'.

Same as kf\_move(FL\_Right, e). The key value 'c' is currently unused.

### 33.145.2.27 kf\_select\_all()

```
int Fl_Text_Editor::kf_select_all (
    int c,
    Fl_Text_Editor * e ) [static]
```

Selects all text in the current buffer in editor 'e'.

The key value 'c' is currently unused.

### 33.145.2.28 kf\_shift\_move()

```
int Fl_Text_Editor::kf_shift_move (
    int c,
    Fl_Text_Editor * e ) [static]
```

Extends the current selection in the direction of key 'c' in editor 'e'.

See also

[kf\\_move\(\)](#)

### 33.145.2.29 kf\_undo()

```
int Fl_Text_Editor::kf_undo (
    int c,
    Fl_Text_Editor * e ) [static]
```

Undo last edit in the current buffer of editor 'e'.

Also deselects previous selection. The key value 'c' is currently unused.

### 33.145.2.30 kf\_up()

```
int Fl_Text_Editor::kf_up (
    int c,
    Fl_Text_Editor * e ) [static]
```

Moves the text cursor one line up for editor 'e'.

Same as `kf_move(FL_Up, e)`. The key value 'c' is currently unused.

### 33.145.2.31 remove\_key\_binding()

```
void Fl_Text_Editor::remove_key_binding (
    int key,
    int state,
    Key_Binding ** list )
```

Removes the key binding associated with the key `key` of state `state` from the [Key\\_Binding](#) list `list`.

This can be used in derived classes to remove global key bindings by using the global (static) [Key\\_Binding](#) list `Fl_Text_Editor::global_key_bindings`.

### 33.145.2.32 tab\_nav() [1/2]

```
int Fl_Text_Editor::tab_nav ( ) const
```

Check if Tab focus navigation is enabled.

If disabled (default), hitting Tab inserts a tab character into the editor buffer.

If enabled, hitting Tab navigates focus to the next widget, and Shift-Tab navigates focus to the previous widget.

Returns

if Tab inserts tab characters or moves the focus

Return values

0	Tab inserts tab characters (default)
1	Tab navigation is enabled.

See also

[tab\\_nav\(int\)](#), `Fl::OPTION_ARROW_FOCUS`.

Version

1.3.4 ABI feature

### 33.145.2.33 tab\_nav() [2/2]

```
void Fl_Text_Editor::tab_nav (
    int val )
```

Enables or disables Tab key focus navigation.

When disabled (default), tab characters are inserted into [Fl\\_Text\\_Editor](#). Only the mouse can change focus. This behavior is desirable when [Fl\\_Text\\_Editor](#) is used, e.g. in a source code editor.

When enabled, Tab navigates focus to the next widget, and Shift-Tab navigates focus to the previous widget. This behavior is desirable when [Fl\\_Text\\_Editor](#) is used e.g. in a database input form.

Currently, this method is implemented as a convenience method that adjusts the key bindings for the Tab key. This implementation detail may change in the future. Know that changing the editor's key bindings for Tab and Shift-Tab may affect tab navigation.

#### Parameters

in	val	If val is 0, Tab inserts a tab character (default). If val is 1, Tab navigates widget focus.
----	-----	---

#### See also

[tab\\_nav\(\)](#), [Fl::OPTION\\_ARROW\\_FOCUS](#).

#### Version

1.3.4 ABI feature

## 33.145.3 Member Data Documentation

### 33.145.3.1 global\_key\_bindings

[Key\\_Binding\\*](#) [Fl\\_Text\\_Editor::global\\_key\\_bindings](#) [static], [protected]

Global key binding list.

Derived classes can add key bindings for all [Fl\\_Text\\_Editor](#) widgets by adding a [Key\\_Binding](#) to this list.

#### See also

[add\\_key\\_binding\(int key, int state, Key\\_Func f, Key\\_Binding\\*\\* list\);](#)

The documentation for this class was generated from the following files:

- [Fl\\_Text\\_Editor.H](#)
- [Fl\\_Text\\_Editor.cxx](#)

## 33.146 Fl\_Text\_Selection Class Reference

This is an internal class for [Fl\\_Text\\_Buffer](#) to manage text selections.

```
#include <Fl_Text_Buffer.H>
```

### Public Member Functions

- int [end](#) () const  
*Returns the byte offset to the character after the last selected character.*
- int [includes](#) (int pos) const  
*Returns true if position *pos* is in the [Fl\\_Text\\_Selection](#).*
- int [length](#) () const  
*Returns the size in bytes of the selection.*
- int [position](#) (int \*startpos, int \*endpos) const
- bool [selected](#) () const  
*Returns true if any text is selected.*
- void [selected](#) (bool b)

- Modifies the 'selected' flag.*
- `int selected (int *startpos, int *endpos) const`  
*Returns the status and the positions of this selection.*
- `void set (int startpos, int endpos)`  
*Sets the selection range.*
- `int start () const`  
*Returns the byte offset to the first selected character.*
- `void update (int pos, int nDeleted, int nInserted)`  
*Updates a selection after text was modified.*

## Protected Attributes

- `int mEnd`  
*byte offset to the character after the last selected character*
- `bool mSelected`  
*this flag is set if any text is selected*
- `int mStart`  
*byte offset to the first selected character*

## Friends

- `class Fl_Text_Buffer`

### 33.146.1 Detailed Description

This is an internal class for `Fl_Text_Buffer` to manage text selections.

All methods use byte (not UTF-8 character) offsets and start at 0. This class works correctly with UTF-8 strings assuming that the parameters for all calls are on character boundaries.

If the selection is inactive (not currently used), then `selected()` returns `false` and `start()` and `end()` return 0 (zero).

The stored offsets are in ascending order, hence the following conditions are true (pseudo code):

```
if ( !selected() ) :      (start() == 0) && (end() == 0) && (start() == end())
if ( selected() ) :      start() < end()
always              :      0 <= start() <= end()
always              :      length() == end() - start()
```

The selection size in bytes can always (unconditionally) be computed by

```
int size = sel->end() - sel->start();
```

See also

`length()`

Note

The **protected** member variables `mStart` and `mEnd` are not necessarily 0 (zero) if `mSelected == false` because they are not cleared when `selected(false)` is called (as of Jul 2017). This may be changed in the future.

### 33.146.2 Member Function Documentation

#### 33.146.2.1 end()

```
int Fl_Text_Selection::end (
    void ) const [inline]
```

Returns the byte offset to the character after the last selected character.

The returned offset is only valid if `selected()` returns true (non-zero). The offset is 0 if no text is selected (since FLTK 1.4.0).

**Note**

In FLTK 1.3.x the returned offset could be non-zero even if `selected()` would have returned 0.

**Returns**

byte offset or 0 if not selected.

**33.146.2.2 includes()**

```
int Fl_Text_Selection::includes (
    int pos ) const
```

Returns true if position `pos` is in the `Fl_Text_Selection`.  
`pos` must be at a character boundary.

**33.146.2.3 length()**

```
int Fl_Text_Selection::length (
    void ) const [inline]
```

Returns the size in bytes of the selection.  
This is a convenience method. It always returns the same as  
`end() - start()`  
and it returns 0 if `selected() == false`.

**Returns**

size in bytes or 0 if not selected.

**Since**

FLTK 1.4.0

**33.146.2.4 position()**

```
int Fl_Text_Selection::position (
    int * startpos,
    int * endpos ) const [inline]
```

**Deprecated** "since 1.4.0 - use `selected(startpos, endpos)` instead"

**33.146.2.5 selected() [1/3]**

```
bool Fl_Text_Selection::selected ( ) const [inline]
```

Returns true if any text is selected.

**Returns**

true if any text has been selected, or false if no text is selected.

**33.146.2.6 selected() [2/3]**

```
void Fl_Text_Selection::selected (
    bool b ) [inline]
```

Modifies the 'selected' flag.

## Parameters

<i>b</i>	new flag
----------	----------

**33.146.2.7 selected()** [3/3]

```
int Fl_Text_Selection::selected (
    int * startpos,
    int * endpos ) const
```

Returns the status and the positions of this selection.

This method returns the same as [selected\(\)](#) as an `int` (0 or 1) in its return value and the offsets to the start of the selection in `startpos` and to the byte after the last selected character in `endpos`, if [selected\(\)](#) is `true`. If [selected\(\)](#) is `false`, both offsets are set to 0.

## Note

In FLTK 1.3.x `startpos` and `endpos` were **not modified** if [selected\(\)](#) was `false`.

## Parameters

<i>startpos</i>	return byte offset to first selected character
<i>endpos</i>	return byte offset pointing after last selected character

## Returns

whether the selection is active ([selected\(\)](#)) or not

## Return values

<i>0</i>	if not selected
<i>1</i>	if selected

## See also

[selected\(\)](#), [start\(\)](#), [end\(\)](#)

**33.146.2.8 set()**

```
void Fl_Text_Selection::set (
    int startpos,
    int endpos )
```

Sets the selection range.

`startpos` and `endpos` must be at a character boundary.

If `startpos != endpos` [selected\(\)](#) is set to `true`, else to `false`.

If `startpos` is greater than `endpos` they are swapped so that `startpos <= endpos`.

## Parameters

in	<i>startpos</i>	byte offset to first selected character
in	<i>endpos</i>	byte offset pointing after last selected character

**33.146.2.9 start()**

```
int Fl_Text_Selection::start ( ) const [inline]
```

Returns the byte offset to the first selected character.

The returned offset is only valid if [selected\(\)](#) returns true. If the selection is not valid the returned offset is 0 since FLTK 1.4.0.

**Note**

In FLTK 1.3.x the returned offset could be non-zero even if [selected\(\)](#) would have returned 0.

**Returns**

byte offset or 0 if not selected.

**33.146.2.10 update()**

```
void Fl_Text_Selection::update (
    int pos,
    int nDeleted,
    int nInserted )
```

Updates a selection after text was modified.

Updates an individual selection for changes in the corresponding text.

**Parameters**

<i>pos</i>	byte offset into text buffer at which the change occurred
<i>nDeleted</i>	number of bytes deleted from the buffer
<i>nInserted</i>	number of bytes inserted into the buffer

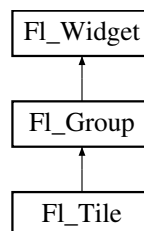
The documentation for this class was generated from the following files:

- [Fl\\_Text\\_Buffer.H](#)
- [Fl\\_Text\\_Buffer.cxx](#)

**33.147 Fl\_Tile Class Reference**

The [Fl\\_Tile](#) class lets you resize its children by dragging the border between them.

Inheritance diagram for [Fl\\_Tile](#):

**Classes**

- struct [Size\\_Range](#)

**Public Member Functions**

- virtual void [drag\\_intersection](#) (int oldx, int oldy, int newx, int newy)  
*Drags the intersection at (oldx,oldy) to (newx,newy).*

- [FL\\_Tile](#) (int X, int Y, int W, int H, const char \*L=0)  
*Creates a new [FL\\_Tile](#) widget using the given position, size, and label string.*
- int [handle](#) (int event) [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- void [init\\_size\\_range](#) (int default\_min\_w=-1, int default\_min\_h=-1)  
*Initialize the size range mode of [FL\\_Tile](#) and set the default minimum width and height.*
- virtual void [move\\_intersection](#) (int oldx, int oldy, int newx, int newy)  
*Drags the intersection at (*oldx,oldy*) to (*newx,newy*).*
- void [position](#) (int oldx, int oldy, int newx, int newy)
- void **position** (int x, int y)
- void [resize](#) (int X, int Y, int W, int H) [FL\\_OVERRIDE](#)  
*Resizes the [FL\\_Tile](#) widget and its children.*
- void [size\\_range](#) ([FL\\_Widget](#) \*w, int minw, int minh, int maxw=0x7FFFFFFF, int maxh=0x7FFFFFFF)  
*Set the allowed size range for the give child widget.*
- void [size\\_range](#) (int index, int minw, int minh, int maxw=0x7FFFFFFF, int maxh=0x7FFFFFFF)  
*Set the allowed size range for the child at the given index.*
- ~[FL\\_Tile](#) () [FL\\_OVERRIDE](#)  
*Destructor.*

## Protected Member Functions

- [FL\\_Cursor](#) [cursor](#) (int n)  
*Returns the cursor for cursor index n.*
- int [on\\_insert](#) ([FL\\_Widget](#) \*, int) [FL\\_OVERRIDE](#)  
*Insert a new entry in the size range list.*
- int [on\\_move](#) (int, int) [FL\\_OVERRIDE](#)  
*Move the entry in the size range list.*
- void [on\\_remove](#) (int) [FL\\_OVERRIDE](#)  
*Remove the entry from the size range list.*
- void [request\\_grow\\_b](#) (int old\_b, int &new\_b, [FL\\_Rect](#) \*final\_size)  
*Request for children to change their layout.*
- void [request\\_grow\\_l](#) (int old\_l, int &new\_l, [FL\\_Rect](#) \*final\_size)  
*Request for children to change their layout.*
- void [request\\_grow\\_r](#) (int old\_r, int &new\_r, [FL\\_Rect](#) \*final\_size)  
*Request for children to change their layout.*
- void [request\\_grow\\_t](#) (int old\_t, int &new\_t, [FL\\_Rect](#) \*final\_size)  
*Request for children to change their layout.*
- void [request\\_shrink\\_b](#) (int old\_b, int &new\_b, [FL\\_Rect](#) \*final\_size)  
*Request for children to change their layout.*
- void [request\\_shrink\\_l](#) (int old\_l, int &new\_l, [FL\\_Rect](#) \*final\_size)  
*Request for children to change their layout.*
- void [request\\_shrink\\_r](#) (int old\_r, int &new\_r, [FL\\_Rect](#) \*final\_size)  
*Request for children to change their layout.*
- void [request\\_shrink\\_t](#) (int old\_t, int &new\_t, [FL\\_Rect](#) \*final\_size)  
*Request for children to change their layout.*
- void [set\\_cursor](#) (int n)  
*Set one of four cursors used for dragging etc. . .*

## Protected Attributes

- int **cursor\_**  
*current cursor index (0..3)*
- [Fl\\_Cursor](#) \* **cursors\_**  
*points at the array of 4 cursors (may be overridden)*
- int **default\_min\_h\_**
- int **default\_min\_w\_**
- [Size\\_Range](#) \* **size\_range\_**
- int **size\_range\_capacity\_**
- int **size\_range\_size\_**

## Additional Inherited Members

### 33.147.1 Detailed Description

The [Fl\\_Tile](#) class lets you resize its children by dragging the border between them.

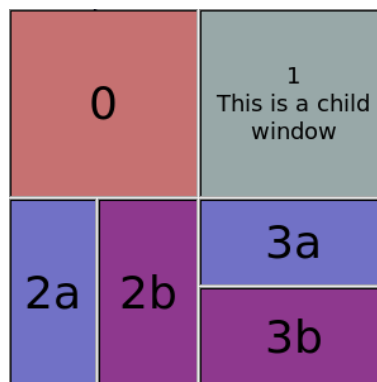


Figure 33.60 [Fl\\_Tile](#)

For the tiling to work correctly, the children of an [Fl\\_Tile](#) **must** cover the entire area of the widget, but **must not** overlap. This means that all children must touch each other at their edges, and no gaps can be left inside the [Fl\\_Tile](#).

[Fl\\_Tile](#) does not normally draw any graphics of its own. The "borders" which can be seen in the snapshot above are actually part of the children. Their boxtypes have been set to `FL_DOWN_BOX` creating the impression of "ridges" where the boxes touch. What you see are actually two adjacent `FL_DOWN_BOX`'s drawn next to each other. All neighboring widgets share the same edge - the widget's thick borders make it appear as though the widgets aren't actually touching, but they are. If the edges of adjacent widgets do not touch, then it will be impossible to drag the corresponding edges.

#### Note

[Fl\\_Tile](#) works in two distinctive modes. In classic mode, the range of motion for edges and intersections is controlled using an invisible child that is marked as the `resizable()` widget of the tile group. Classic mode is described in detail a few paragraphs down.

#### [Fl\\_Tile](#) size\_range mode

By assigning a default minimum size to all children with `Fl_Tile::init_size_range(int default_minimum_width,` or by assigning minimal sizes to individual children with `size_range(Fl_Widget *child, int minimum_width, int` the tile group is put into size\_range operation mode.

In this mode, the child that is marked `resizable()` will behave as it would in a regular [Fl\\_Group](#) widget. When dragging edges or intersections with the mouse, [Fl\\_Tile](#) will ensure that none of the children shrinks to a size that is smaller than requested. When resizing the [Fl\\_Tile](#) group, size ranges are not enforced by the tile. Instead, the size range of the enclosing window should be limited to a valid range.

Tile does not differentiate between visible and invisible children. If children are created smaller than their assigned minimum size, dragging intersections may cause unexpected jumps in size. Zero width or height widget are not harmful, but should be avoided.

Example for a center document tile and two tool boxes on the left and right

```
Fl_Window win(400, 300, "My App");
Fl_Tile tile(0, 0, 400, 300);
Fl_Box left_tool_box(0, 0, 100, 300, "Tools");
left_tool_box.box(FL_DOWN_BOX);
tile.size_range(&left_tool_box, 50, 50);
Fl_Box document(100, 0, 200, 300, "Document");
document.box(FL_DOWN_BOX);
tile.size_range(&document, 100, 50);
Fl_Box right_tool_box(300, 0, 100, 300, "More\nTools");
right_tool_box.box(FL_DOWN_BOX);
tile.size_range(&right_tool_box, 50, 50);
tile.end();
tile.resizable(document);
win.end();
win.resizable(tile);
win.show(argc, argv);
win.size_range(200, 50);
```

### Fl\_Tile classic mode

Fl\_Tile allows objects to be resized to zero dimensions. To prevent this you can use the [resizable\(\)](#) to limit where corners can be dragged to. For more information see note below.

Even though objects can be resized to zero sizes, they must initially have non-zero sizes so the Fl\_Tile can figure out their layout. If desired, call [position\(\)](#) after creating the children but before displaying the window to set the borders where you want.

**Note on [resizable\(Fl\\_Widget &w\)](#):** The "resizable" child widget (which should be invisible) limits where the borders can be dragged to. All dragging will be limited inside the resizable widget's borders. If you don't set it, it will be possible to drag the borders right to the edges of the Fl\_Tile widget, and thus resize objects on the edges to zero width or height. When the entire Fl\_Tile widget is resized, the [resizable\(\)](#) widget will keep its border distance to all borders the same (this is normal resize behavior), so that you can effectively set a border width that will never change. To ensure correct event delivery to all child widgets the [resizable\(\)](#) widget must be the first child of the Fl\_Tile widget group. Otherwise some events (e.g. FL\_MOVE and FL\_ENTER) might be consumed by the [resizable\(\)](#) widget so that they are lost for widgets covered (overlapped) by the [resizable\(\)](#) widget.

#### Note

You can still resize widgets **inside** the [resizable\(\)](#) to zero width and/or height, i.e. box **2b** above to zero width and box **3a** to zero height.

#### See also

void [Fl\\_Group::resizable\(Fl\\_Widget &w\)](#)

Example for resizable with 20 pixel border distance:

```
int dx = 20, dy = dx;
Fl_Tile tile(50, 50, 300, 300);
// create resizable() box first
Fl_Box r(tile.x()+dx, tile.y()+dy, tile.w()-2*dx, tile.h()-2*dy);
tile.resizable(r);
// ... create widgets inside tile (see test/tile.cxx) ...
tile.end();
```

See also the complete example program in test/tile.cxx.

## 33.147.2 Constructor & Destructor Documentation

### 33.147.2.1 Fl\_Tile()

```
Fl_Tile::Fl_Tile (
    int X,
    int Y,
    int W,
```

```
int H,
const char * L = 0 )
```

Creates a new [Fl\\_Tile](#) widget using the given position, size, and label string.

The default boxtype is `FL_NO_BOX`.

The destructor *also deletes all the children*. This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code. A kludge has been done so the [Fl\\_Tile](#) and all of its children can be automatic (local) variables, but you must declare the [Fl\\_Tile](#) *first*, so that it is destroyed last.

See also

class [Fl\\_Group](#)

### 33.147.3 Member Function Documentation

#### 33.147.3.1 cursor()

```
Fl_Cursor Fl_Tile::cursor (
    int n ) [inline], [protected]
```

Returns the cursor for cursor index n.

See also

[Fl\\_Tile::set\\_cursor\(int\)](#)

#### 33.147.3.2 drag\_intersection()

```
void Fl_Tile::drag_intersection (
    int oldx,
    int oldy,
    int newx,
    int newy ) [virtual]
```

Drags the intersection at (oldx,oldy) to (newx,newy).

See also

[Fl\\_Tile::move\\_intersection\(int oldx, int oldy, int newx, int newy\)](#) , but this method does not call [init\\_sizes\(\)](#) and is used for interactive [children](#) layout using the mouse.

#### Parameters

in	<i>oldx,oldy</i>	move the intersection at this coordinate, pass zero to disable drag in that direction.
in	<i>newx,newy</i>	move the intersection as close to this new coordinate as possible

#### 33.147.3.3 handle()

```
int Fl_Tile::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Group](#).

#### 33.147.3.4 init\_size\_range()

```
void Fl_Tile::init_size_range (
    int default_min_w = -1,
    int default_min_h = -1 )
```

Initialize the size range mode of [Fl\\_Tile](#) and set the default minimum width and height.

The default minimum width and height is the size of the mouse pointer grab area at about 4 pixel units.

#### Parameters

in	<i>default_min_w, default_min_h</i>	default size range for widgets that don't have an individual range assigned
----	-------------------------------------	---

#### 33.147.3.5 move\_intersection()

```
void Fl_Tile::move_intersection (
    int oldx,
    int oldy,
    int newx,
    int newy ) [virtual]
```

Drags the intersection at (oldx,oldy) to (newx,newy).

This redraws all the necessary children.

If no size ranges are set, the new intersection position is limited to the size of the tile group. The [resizable\(\)](#) option is not taken into account here.

If size ranges are set, the actual new position of the intersection will depend on the size range of every individual child. No child will be smaller than their minw and minh. After the new position is found, [move\\_intersection\(\)](#) will call [init\\_sizes\(\)](#). The [resizable\(\)](#) range is ignored.

#### Parameters

in	<i>oldx, oldy</i>	move the intersection at this coordinate, pass zero to disable drag in that direction.
in	<i>newx, newy</i>	move the intersection as close to this new coordinate as possible

**33.147.3.6 on\_insert()**

```
int Fl_Tile::on_insert (
    Fl_Widget * candidate,
    int index ) [protected], [virtual]
```

Insert a new entry in the size range list.

Reimplemented from [Fl\\_Group](#).

**33.147.3.7 on\_move()**

```
int Fl_Tile::on_move (
    int oldIndex,
    int newIndex ) [protected], [virtual]
```

Move the entry in the size range list.

Reimplemented from [Fl\\_Group](#).

**33.147.3.8 on\_remove()**

```
void Fl_Tile::on_remove (
    int index ) [protected], [virtual]
```

Remove the entry from the size range list.

Reimplemented from [Fl\\_Group](#).

**33.147.3.9 position()**

```
void Fl_Tile::position (
    int oldx,
    int oldy,
    int newx,
    int newy ) [inline]
```

**Deprecated** "since 1.4.0 - use `move_intersection(p)` instead"

**33.147.3.10 request\_grow\_b()**

```
void Fl_Tile::request_grow_b (
    int old_b,
    int & new_b,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

**Parameters**

in	<i>old_b</i>	grow all children with this current bottom edge toward the bottom edge of this tile
in, out	<i>new_b</i>	try to grow to this coordinate, return the maximum possible growth (currently maxh is ignored, so we always grow to new_b)
in, out	<i>final_size</i>	write the new position and size of all affected children into this list of <a href="#">Fl_Rect</a>

**33.147.3.11 request\_grow\_l()**

```
void Fl_Tile::request_grow_l (
    int old_l,
    int & new_l,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

**Parameters**

in	<i>old_l</i>	grow all children with this current left edge toward the left edge of this tile
in, out	<i>new_l</i>	try to grow to this coordinate, return the maximum possible growth (currently maxw is ignored, so we always grow to new_l)
in, out	<i>final_size</i>	write the new position and size of all affected children into this list of <a href="#">Fl_Rect</a>

**33.147.3.12 request\_grow\_r()**

```
void Fl_Tile::request_grow_r (
    int old_r,
    int & new_r,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

**Parameters**

in	<i>old_r</i>	grow all children with this current right edge toward the right edge of this tile
in, out	<i>new_r</i>	try to grow to this coordinate, return the maximum possible growth (currently maxw is ignored, so we always grow to new_r)
in, out	<i>final_size</i>	write the new position and size of all affected children into this list of <a href="#">Fl_Rect</a>

**33.147.3.13 request\_grow\_t()**

```
void Fl_Tile::request_grow_t (
    int old_t,
    int & new_t,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

**Parameters**

in	<i>old_t</i>	grow all children with this current top edge toward the top edge of this tile
in, out	<i>new_t</i>	try to grow to this coordinate, return the maximum possible growth (currently maxh is ignored, so we always grow to new_t)
in, out	<i>final_size</i>	write the new position and size of all affected children into this list of <a href="#">Fl_Rect</a>

**33.147.3.14 request\_shrink\_b()**

```
void Fl_Tile::request_shrink_b (
    int old_b,
    int & new_b,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

See also

[Fl\\_Tile::request\\_shrink\\_l\(int old\\_l, int &new\\_l, Fl\\_Rect \\*final\\_size\)](#)

#### Parameters

in	<i>old_b</i>	shrink all children with this current bottom edge toward the top edge of this tile
in, out	<i>new_b</i>	try to shrink to this coordinate, return the maximum possible shrinkage
in, out	<i>final_size</i>	if not NULL, write the new position and size of all affected children into this list of <a href="#">Fl_Rect</a>

### 33.147.3.15 request\_shrink\_l()

```
void Fl_Tile::request_shrink_l (
    int old_l,
    int & new_l,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

`drag_intersection` requests that all children with the left edge at `old_l` to shrink to `new_l` towards the right side of the tile. If the child can not shrink by that amount, it will ask all other children that touch its right side to shrink by the remainder (recursion). `new_l` will return the the maximum possible value while maintaining minimum width for all children involved.

`request_shrink_r` asks children to shrink toward the left, so that their right edge is as close as possible to `new_r`.

`request_shrink_t` and `request_shrink_b` provide the same functionality for vertical resizing.

#### Parameters

in	<i>old_l</i>	shrink all children with this current left edge
in, out	<i>new_l</i>	try to shrink to this coordinate, return the maximum possible shrinkage
in, out	<i>final_size</i>	if not NULL, write the new position and size of all affected children into this list of <a href="#">Fl_Rect</a>

### 33.147.3.16 request\_shrink\_r()

```
void Fl_Tile::request_shrink_r (
    int old_r,
    int & new_r,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

See also

[Fl\\_Tile::request\\_shrink\\_l\(int old\\_l, int &new\\_l, Fl\\_Rect \\*final\\_size\)](#)

#### Parameters

in	<i>old_r</i>	shrink all children with this current right edge toward the left edge of this tile
in, out	<i>new_r</i>	try to shrink to this coordinate, return the maximum possible shrinkage
in, out	<i>final_size</i>	if not NULL, write the new position and size of all affected children into this list of <a href="#">Fl_Rect</a>

**33.147.3.17 request\_shrink\_t()**

```
void Fl_Tile::request_shrink_t (
    int old_t,
    int & new_t,
    Fl_Rect * final_size ) [protected]
```

Request for children to change their layout.

See also

[Fl\\_Tile::request\\_shrink\\_l\(int old\\_l, int &new\\_l, Fl\\_Rect \\*final\\_size\)](#)

**Parameters**

in	<i>old_t</i>	shrink all children with this current top edge toward the bottom edge of this tile
in, out	<i>new_t</i>	try to shrink to this coordinate, return the maximum possible shrinkage
in, out	<i>final_size</i>	if not NULL, write the new position and size of all affected children into this list of <a href="#">Fl_Rect</a>

**33.147.3.18 resize()**

```
void Fl_Tile::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Resizes the [Fl\\_Tile](#) widget and its children.

[Fl\\_Tile](#) implements its own [resize\(\)](#) method. It does not use [Fl\\_Group::resize\(\)](#) to resize itself and its children.

In [size\\_range](#) mode, the child marked [resizable\(\)](#) is resized first. Only if its minimum size is reached, other widgets in the tile will resize too.

In classic mode or when no resizable child is set, enlarging works by moving the lower-right corner and resizing the bottom and right border widgets accordingly.

Shrinking the [Fl\\_Tile](#) works in the opposite way by shrinking the bottom and right border widgets, unless they are reduced to zero width or height, resp. or to their minimal sizes defined by the [resizable\(\)](#) widget. In this case other widgets will be shrunk as well.

See the [Fl\\_Tile](#) class documentation about how the [resizable\(\)](#) works.

Reimplemented from [Fl\\_Group](#).

**33.147.3.19 set\_cursor()**

```
void Fl_Tile::set_cursor (
    int n ) [protected]
```

Set one of four cursors used for dragging etc...

[Fl\\_Tile](#) uses an array of four cursors that are set depending on user actions:

- 0: normal cursor
- 1: horizontal dragging
- 2: vertical dragging
- 3: dragging an intersection

This method sets the window cursor for the given index *n*.

**33.147.3.20 size\_range() [1/2]**

```
void Fl_Tile::size_range (
    Fl_Widget * w,
```

```

    int minw,
    int minh,
    int maxw = 0x7FFFFFFF,
    int maxh = 0x7FFFFFFF )

```

Set the allowed size range for the give child widget.

[Fl\\_Tile](#) currently supports only the minimal width and height setting.

#### Parameters

in	<i>w</i>	set the range for this child widget
in	<i>minw,minh</i>	minimum width and height for that child
in	<i>maxw,maxh</i>	maximum size, defaults to infinite, currently ignored

### 33.147.3.21 size\_range() [2/2]

```

void Fl_Tile::size_range (
    int index,
    int minw,
    int minh,
    int maxw = 0x7FFFFFFF,
    int maxh = 0x7FFFFFFF )

```

Set the allowed size range for the child at the given index.

[Fl\\_Tile](#) currently supports only the minimal width and height setting.

#### Parameters

in	<i>index</i>	set the range for the child at this index
in	<i>minw,minh</i>	minimum width and height for that child
in	<i>maxw,maxh</i>	maximum size, defaults to infinite, currently ignored

The documentation for this class was generated from the following files:

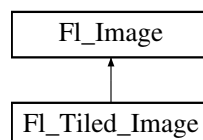
- [Fl\\_Tile.H](#)
- [Fl\\_Tile.cxx](#)

## 33.148 Fl\_Tiled\_Image Class Reference

This class supports tiling of images over a specified area.

```
#include <Fl_Tiled_Image.H>
```

Inheritance diagram for [Fl\\_Tiled\\_Image](#):



### Public Member Functions

- void [color\\_average](#) ([Fl\\_Color](#) c, float i) [FL\\_OVERRIDE](#)  
*The [color\\_average\(\)](#) method averages the colors in the image with the provided FLTK color value.*
- [Fl\\_Image](#) \* [copy](#) () const
- [Fl\\_Image](#) \* [copy](#) (int W, int H) const [FL\\_OVERRIDE](#)

- Creates a resized copy of the image.
- void `desaturate` () `FL_OVERRIDE`  
The `desaturate()` method converts an image to grayscale.
- void `draw` (int X, int Y)
- void `draw` (int X, int Y, int W, int H, int cx=0, int cy=0) `FL_OVERRIDE`  
Draws a tiled image.
- `Fl_Tiled_Image` (`Fl_Image` \*i, int W=0, int H=0)  
The constructors create a new tiled image containing the specified image.
- `Fl_Image` \* `image` ()  
Gets The image that is tiled.
- virtual `~Fl_Tiled_Image` ()  
The destructor frees all memory and server resources that are used by the tiled image.

## Protected Attributes

- int `alloc_image_`
- `Fl_Image` \* `image_`

## Additional Inherited Members

### 33.148.1 Detailed Description

This class supports tiling of images over a specified area.

The source (tile) image is **not** copied unless you call the `color_average()`, `desaturate()`, or `inactive()` methods.

### 33.148.2 Constructor & Destructor Documentation

#### 33.148.2.1 Fl\_Tiled\_Image()

```
Fl_Tiled_Image::Fl_Tiled_Image (
    Fl_Image * i,
    int W = 0,
    int H = 0 )
```

The constructors create a new tiled image containing the specified image.

Use a width and height of 0 to tile the whole window/widget.

#### Note

Due to implementation constraints in FLTK 1.3.3 and later width and height of 0 may not work as expected when used as background image in widgets other than windows. You may need to center and clip the image (label) and set the label type to `FL_NORMAL_LABEL`. Doing so will let the tiled image fill the whole widget as its background image. Other combinations of label flags may or may not work.

```
#include "bg.xpm"
Fl_Pixmap *bg_xpm = new Fl_Pixmap(bg_xpm);
Fl_Tiled_Image *bg_tiled = new Fl_Tiled_Image(bg_xpm, 0, 0);
Fl_Box *box = new Fl_Box(40, 40, 300, 100, "");
box->box(FL_UP_BOX);
box->labeltype(FL_NORMAL_LABEL);
box->align(FL_ALIGN_INSIDE | FL_ALIGN_CENTER | FL_ALIGN_CLIP);
box->image(bg_tiled);
```

#### Note

Setting an image (label) for a window may not work as expected due to implementation constraints in FLTK 1.3.x and maybe later. The reason is the way `Fl::scheme()` initializes the window's label type and image. A possible workaround is to use another `Fl_Group` as the only child widget and to set the background image for this group as described above.

**Todo** Fix `Fl_Tiled_Image` as background image for widgets and windows and fix the implementation of `Fl::scheme(const char *)`.

### 33.148.3 Member Function Documentation

#### 33.148.3.1 color\_average()

```
void Fl_Tiled_Image::color_average (
    Fl_Color c,
    float i ) [virtual]
```

The [color\\_average\(\)](#) method averages the colors in the image with the provided FLTK color value.

The first argument specifies the FLTK color to be used.

The second argument specifies the amount of the original image to combine with the color, so a value of 1.0 results in no color blend, and a value of 0.0 results in a constant image of the specified color.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from [Fl\\_Image](#).

#### 33.148.3.2 copy()

```
Fl_Image * Fl_Tiled_Image::copy (
    int W,
    int H ) const [virtual]
```

Creates a resized copy of the image.

It is recommended not to call this member function to reduce the size of an image to the size of the area where this image will be drawn, and to use [Fl\\_Image::scale\(\)](#) instead.

The new image should be released when you are done with it.

Note: since FLTK 1.4.0 you can use [Fl\\_Image::release\(\)](#) for all types of images (i.e. all subclasses of [Fl\\_Image](#)) instead of operator *delete* for [Fl\\_Image](#)'s and [Fl\\_Image::release\(\)](#) for [Fl\\_Shared\\_Image](#)'s.

The new image data will be converted to the requested size. RGB images are resized using the algorithm set by [Fl\\_Image::RGB\\_scaling\(\)](#).

For the new image the following equations are true:

- `w() == data_w() == W`
- `h() == data_h() == H`

#### Parameters

in	<i>W,H</i>	Requested width and height of the new image
----	------------	---

#### Note

The returned image can be safely cast to the same image type as that of the source image provided this type is one of [Fl\\_RGB\\_Image](#), [Fl\\_SVG\\_Image](#), [Fl\\_Pixmap](#), [Fl\\_Bitmap](#), [Fl\\_Tiled\\_Image](#), [Fl\\_Anim\\_GIF\\_Image](#) and [Fl\\_Shared\\_Image](#). Returned objects copied from images of other, derived, image classes belong to the parent class appearing in this list. For example, the copy of an [Fl\\_GIF\\_Image](#) is an object of class [Fl\\_Pixmap](#).

Since FLTK 1.4.0 this method is 'const'. If you derive your own class from [Fl\\_Image](#) or any subclass your overridden methods of '[Fl\\_Image::copy\(\) const](#)' and '[Fl\\_Image::copy\(int, int\) const](#)' **must** also be 'const' for inheritance to work properly. This is different than in FLTK 1.3.x and earlier where these methods have not been 'const'.

Reimplemented from [Fl\\_Image](#).

#### 33.148.3.3 desaturate()

```
void Fl_Tiled_Image::desaturate ( ) [virtual]
```

The [desaturate\(\)](#) method converts an image to grayscale.

If the image contains an alpha channel (depth = 4), the alpha channel is preserved.

An internal copy is made of the original image data before changes are applied, to avoid modifying the original image data in memory.

Reimplemented from [Fl\\_Image](#).

### 33.148.3.4 draw()

```
void Fl_Tiled_Image::draw (
    int X,
    int Y,
    int W,
    int H,
    int cx = 0,
    int cy = 0 ) [virtual]
```

Draws a tiled image.

Tiled images can be used as background images for widgets and windows. However, due to implementation constraints, you must take care when setting label types and alignment flags. Only certain combinations work as expected, others may yield unexpected results and undefined behavior.

This draw method can draw multiple copies of one image in an area given by X, Y, W, H.

The optional arguments `cx` and `cy` can be used to crop the image starting at offsets (cx, cy). `cx` and `cy` must be  $\geq 0$  (negative values are ignored). If one of the values is greater than the image width or height resp. (`cx`  $\geq$  `image()->w()` or `cy`  $\geq$  `image()->h()`) nothing is drawn, because the resulting image would be empty.

After calculating the resulting image size the image is drawn as often as necessary to fill the given area, starting at the top left corner.

If both W and H are 0 the image is repeated as often as necessary to fill the entire window, unless there is a valid clip region. If you want to fill only one particular widget's background, then you should either set a clip region in your `draw()` method or use the label alignment flags `FL_ALIGN_INSIDE`|`FL_ALIGN_CLIP` to make sure the image is clipped.

This may be improved in a later version of the library.

Reimplemented from [Fl\\_Image](#).

The documentation for this class was generated from the following files:

- `Fl_Tiled_Image.H`
- `Fl_Tiled_Image.cxx`

## 33.149 Fl\_Timeout Class Reference

The internal class [Fl\\_Timeout](#) handles all timeout related functions.

```
#include <Fl_Timeout.h>
```

### Static Public Member Functions

- static void [add\\_timeout](#) (double time, [Fl\\_Timeout\\_Handler](#) cb, void \*data)  
*Adds a one-shot timeout callback.*
- static void [do\\_timeouts](#) ()  
*Elapse timers and call their callbacks if any timers are expired.*
- static void [elapse\\_timeouts](#) ()  
*Elapse all timers w/o calling their callbacks.*
- static int [has\\_timeout](#) ([Fl\\_Timeout\\_Handler](#) cb, void \*data)  
*Returns true if the timeout exists and has not been called yet.*
- static int [remove\\_next\\_timeout](#) ([Fl\\_Timeout\\_Handler](#) cb, void \*data=NULL, void \*\*data\_return=NULL)  
*Remove the next matching timeout callback and return its data pointer.*
- static void [remove\\_timeout](#) ([Fl\\_Timeout\\_Handler](#) cb, void \*data)  
*Remove a timeout callback.*
- static void [repeat\\_timeout](#) (double time, [Fl\\_Timeout\\_Handler](#) cb, void \*data)

*Repeats a timeout callback from the expiration of the previous timeout, allowing for more accurate timing.*

- static double `time_to_wait` (double `ttw`)

*Returns the delay in seconds until the next timer expires, limited by `ttw`.*

## Protected Member Functions

- double `delay` ()

*Get the timer's delay in seconds.*

- void `delay` (double `t`)

*Set the timer's delay in seconds.*

- void `insert` ()

*Insert this timer entry into the active timer queue.*

- void `make_current` ()

*Remove the timeout from the active timer queue and push it onto the stack of currently running callbacks.*

- void `release` ()

*Remove the top-most timeout from the stack of currently running timeout callbacks and insert it into the list of free timers.*

## Static Protected Member Functions

- static `FI_Timeout * current` ()

*Returns the first (top-most) timeout from the current timeout stack.*

- static `FI_Timeout * get` (double `time`, `FI_Timeout_Handler` `cb`, void `*data`)

*Get an `FI_Timeout` instance for further handling.*

## Protected Attributes

- `FI_Timeout_Handler` `callback`
- void `* data`
- `FI_Timeout * next`
- int `skip`
- double `time`

## Static Protected Attributes

- static `FI_Timeout * current_timeout` = 0

*The list of current timeouts is used to store the timeout whose callback is called while the callback is executed.*

- static `FI_Timeout * first_timeout` = 0

*List of active timeouts.*

- static `FI_Timeout * free_timeout` = 0

*List of free timeouts after use.*

### 33.149.1 Detailed Description

The internal class `FI_Timeout` handles all timeout related functions.

All code is platform independent except retrieving a timestamp which requires calling a system driver function and potentially results in different timer resolutions (from milliseconds to microseconds).

Related user documentation:

- `FI_Timeout_Handler`
- `FI::add_timeout(double time, FI_Timeout_Handler cb, void *data)`
- `FI::repeat_timeout(double time, FI_Timeout_Handler cb, void *data)`
- `FI::has_timeout(FI_Timeout_Handler cb, void *data)`
- `FI::remove_timeout(FI_Timeout_Handler cb, void *data)`
- `FI::remove_next_timeout(FI_Timeout_Handler cb, void *data, void **data_return)`

## 33.149.2 Member Function Documentation

### 33.149.2.1 add\_timeout()

```
void Fl_Timeout::add_timeout (
    double time,
    Fl_Timeout_Handler cb,
    void * data ) [static]
```

Adds a one-shot timeout callback.

The callback function `cb` will be called by [Fl::wait\(\)](#) at `time` seconds after this function is called.

#### Parameters

in	<i>time</i>	delta time in seconds until the timer expires
in	<i>cb</i>	callback function
in	<i>data</i>	optional user data (default: NULL)

#### Implements:

```
void Fl::add_timeout(double time, Fl_Timeout_Handler cb, void *data)
```

#### See also

[Fl::add\\_timeout\(double time, Fl\\_Timeout\\_Handler cb, void \\*data\)](#)

### 33.149.2.2 current()

```
Fl_Timeout * Fl_Timeout::current ( ) [static], [protected]
```

Returns the first (top-most) timeout from the current timeout stack.

This returns a pointer to the timeout but does not remove it from the list of current timeouts. This should be the timeout that is currently executing its callback.

#### Returns

`Fl_Timeout*` The current timeout whose callback is running.

#### Return values

<code>NULL</code>	if no callback is currently running.
-------------------	--------------------------------------

### 33.149.2.3 elapse\_timeouts()

```
void Fl_Timeout::elapse_timeouts ( ) [static]
```

Elapse all timers w/o calling their callbacks.

All timer values are adjusted by the delta time since the last call. This method does **NOT** call timer callbacks if timers are expired.

This must be called before new timers are added to the timer queue to make sure that the next timer decrement does not count down too much time.

#### See also

[Fl\\_Timeout::do\\_timeouts\(\)](#)

### 33.149.2.4 `get()`

```
Fl_Timeout * Fl_Timeout::get (
    double time,
    Fl_Timeout_Handler cb,
    void * data ) [static], [protected]
```

Get an `Fl_Timeout` instance for further handling.

The timer object will be initialized with the input parameters as given by `Fl::add_timeout()` or `Fl::repeat_timeout()`.

`Fl_Timeout` objects are maintained in three queues:

- active timer queue
- list (stack, i.e. LIFO) of currently executing timer callbacks
- free timer entries.

When the FLTK program is launched all queues are empty. Whenever a new timer object is required the `get()` method is called and a timer object is either found in the queue of free timer entries or a new timer object is created (operator new).

Active timer entries are inserted into the "active timer queue" until they expire and their callback is called.

Before the callback is called the timer entry is inserted into the list of current timers, i.e. it becomes the `Fl_Timeout::current()` timeout. This can be used in `Fl::repeat_timeout()` to find out if and how long the current timeout has been delayed.

When a timer is no longer used it is popped from the `current` list and inserted into the "free timer" list so it can be reused later.

Timer queue entries are never returned to the system, there's no garbage collection. The total number of timer objects is determined by the largest number of concurrently active timers.

#### Parameters

in	<i>time</i>	requested delta time
in	<i>cb</i>	timer callback
in	<i>data</i>	userdata for timer callback

#### Returns

`Fl_Timeout*` Timer entry

#### See also

[Fl::add\\_timeout\(\)](#), [Fl::repeat\\_timeout\(\)](#)

### 33.149.2.5 `has_timeout()`

```
int Fl_Timeout::has_timeout (
    Fl_Timeout_Handler cb,
    void * data ) [static]
```

Returns true if the timeout exists and has not been called yet.

#### Parameters

in	<i>cb</i>	Timer callback (must match)
in	<i>data</i>	Callback user data (must match)

#### Returns

whether the timer was found in the queue

## Return values

0	not found
1	found

## Implements:

```
int Fl::has_timeout(Fl_Timeout_Handler cb, void *data)
```

## See also

[Fl::has\\_timeout\(Fl\\_Timeout\\_Handler cb, void \\*data\)](#)

**33.149.2.6 insert()**

```
void Fl_Timeout::insert ( ) [protected]
```

Insert this timer entry into the active timer queue.

The timer is inserted at the required position so the timer queue is always ordered by due time.

**33.149.2.7 make\_current()**

```
void Fl_Timeout::make_current ( ) [protected]
```

Remove the timeout from the active timer queue and push it onto the stack of currently running callbacks.

This becomes the [current\(\)](#) timeout which can be used in [Fl::repeat\\_timeout\(\)](#).

## See also

[Fl\\_Timeout::current\(\)](#)

**33.149.2.8 release()**

```
void Fl_Timeout::release ( ) [protected]
```

Remove the top-most timeout from the stack of currently running timeout callbacks and insert it into the list of free timers.

Typical code in the library would look like:

```
// The timeout \p Fl_Timeout *t has expired, run its callback
t->make_current();
(t->callback)(t->data);
t->release();
```

**33.149.2.9 remove\_next\_timeout()**

```
int Fl_Timeout::remove_next_timeout (
    Fl_Timeout_Handler cb,
    void * data = NULL,
    void ** data_return = NULL ) [static]
```

Remove the next matching timeout callback and return its data pointer.

## Implements:

```
int Fl::remove_next_timeout(Fl_Timeout_Handler cb, void *data, void **data_return)
```

## Parameters

in	<i>cb</i>	Timer callback to be removed (must match)
in	<i>data</i>	Wildcard if NULL, must match otherwise
in, out	<i>data_return</i>	pointer to void * to receive the data value

**Returns**

non-zero if a timer was found and removed

**Return values**

0	no matching timer was found
1	the last matching timeout was found and removed
$N > 1$	a matching timeout was removed and there are (N - 1) matching timeouts pending

For details

**See also**

[Fl::remove\\_next\\_timeout\(Fl\\_Timeout\\_Handler cb, void \\*data, void \\*\\*data\\_return\)](#)

**33.149.2.10 remove\_timeout()**

```
void Fl_Timeout::remove_timeout (
    Fl_Timeout_Handler cb,
    void * data ) [static]
```

Remove a timeout callback.

This method removes all matching timeouts, not just the first one. This may change in the future.

**Parameters**

in	<i>cb</i>	Timer callback to be removed (must match)
in	<i>data</i>	Wildcard if NULL, must match otherwise

Implements:

```
void Fl::remove_timeout(Fl_Timeout_Handler cb, void *data)
```

**See also**

[Fl::remove\\_timeout\(Fl\\_Timeout\\_Handler cb, void \\*data\)](#)

**33.149.2.11 repeat\_timeout()**

```
void Fl_Timeout::repeat_timeout (
    double time,
    Fl_Timeout_Handler cb,
    void * data ) [static]
```

Repeats a timeout callback from the expiration of the previous timeout, allowing for more accurate timing.

**Parameters**

in	<i>time</i>	delta time in seconds until the timer expires
in	<i>cb</i>	callback function
in	<i>data</i>	optional user data (default: NULL)

Implements:

```
void Fl::repeat_timeout(double time, Fl_Timeout_Handler cb, void *data)
```

See also

[Fl::repeat\\_timeout\(double time, Fl\\_Timeout\\_Handler cb, void \\*data\)](#)

### 33.149.2.12 time\_to\_wait()

```
double Fl_Timeout::time_to_wait (
    double ttw ) [static]
```

Returns the delay in seconds until the next timer expires, limited by `ttw`.

This function calculates the time to wait for the FLTK event queue processing, depending on the given value `ttw`.

If at least one timer is active and its timeout value is smaller than `ttw` then this value is returned. [Fl::wait\(\)](#) will wait no longer than until the next timer expires.

If no timer is active this returns the input value `ttw` unchanged.

If at least one timer is expired this returns 0.0 so the event processing does not wait.

#### Parameters

<code>in</code>	<code>ttw</code>	time to wait from <a href="#">Fl::wait()</a> etc. (upper limit)
-----------------	------------------	---

#### Returns

delay until next timeout or 0.0 (see description)

## 33.149.3 Member Data Documentation

### 33.149.3.1 current\_timeout

```
Fl_Timeout * Fl_Timeout::current_timeout = 0 [static], [protected]
```

The list of current timeouts is used to store the timeout whose callback is called while the callback is executed.

This is used like a stack, the current timeout is pushed to the front of the list and once the callback is finished, that timeout is removed and entered into the free list.

Background: [Fl::repeat\\_timeout\(\)](#) needs to know which timeout triggered it and the exact schedule time and/or the delay of that timeout, i.e. how long the scheduled time was missed before the callback was called. A static, global variable is not sufficient since the user code can call other functions, e.g. dialogs, that run a nested event loop which can run another timeout callback. Hence this list of "current" timeouts is used like a stack (last in, first out).

See also

[Fl\\_Timeout::push\(\)](#) Member function (method)

### 33.149.3.2 first\_timeout

```
Fl_Timeout * Fl_Timeout::first_timeout = 0 [static], [protected]
```

List of active timeouts.

These timeouts can be triggered when due, which calls their callbacks. The lifetime of a timeout:

- active, in this queue
- callback running, in queue `current_timeout`
- done, in list of free timeouts, ready to be reused.

### 33.149.3.3 free\_timeout

```
Fl_Timeout * Fl_Timeout::free_timeout = 0 [static], [protected]
```

List of free timeouts after use.

Timeouts can be reused many times.

The documentation for this class was generated from the following files:

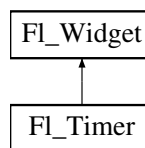
- [Fl\\_Timeout.h](#)
- [Fl\\_Timeout.cxx](#)

## 33.150 Fl\_Timer Class Reference

This is provided only to emulate the Forms Timer widget.

```
#include <Fl_Timer.H>
```

Inheritance diagram for Fl\_Timer:



### Public Member Functions

- char [direction](#) () const  
*Gets or sets the direction of the timer.*
- void [direction](#) (char d)  
*Gets or sets the direction of the timer.*
- [Fl\\_Timer](#) (uchar t, int x, int y, int w, int h, const char \*l)  
*Creates a new [Fl\\_Timer](#) widget using the given type, position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- char [suspended](#) () const  
*Gets or sets whether the timer is suspended.*
- void [suspended](#) (char d)  
*Gets or sets whether the timer is suspended.*
- double [value](#) () const  
*See void [Fl\\_Timer::value\(double\)](#)*
- void [value](#) (double)  
*Sets the current timer value.*
- ~[Fl\\_Timer](#) ()  
*Destroys the timer and removes the timeout.*

### Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*

### Additional Inherited Members

#### 33.150.1 Detailed Description

This is provided only to emulate the Forms Timer widget.

It works by making a timeout callback every 1/5 second. This is wasteful and inaccurate if you just want something to happen a fixed time in the future. You should directly call [Fl::add\\_timeout\(\)](#) instead.

## 33.150.2 Constructor & Destructor Documentation

### 33.150.2.1 Fl\_Timer()

```
Fl_Timer::Fl_Timer (
    uchar t,
    int X,
    int Y,
    int W,
    int H,
    const char * l )
```

Creates a new [Fl\\_Timer](#) widget using the given type, position, size, and label string.

The type parameter can be any of the following symbolic constants:

- `FL_NORMAL_TIMER` - The timer just does the callback and displays the string "Timer" in the widget.
- `FL_VALUE_TIMER` - The timer does the callback and displays the current timer value in the widget.
- `FL_HIDDEN_TIMER` - The timer just does the callback and does not display anything.

## 33.150.3 Member Function Documentation

### 33.150.3.1 direction() [1/2]

```
char Fl_Timer::direction ( ) const [inline]
```

Gets or sets the direction of the timer.

If the direction is zero then the timer will count up, otherwise it will count down from the initial [value\(\)](#).

### 33.150.3.2 direction() [2/2]

```
void Fl_Timer::direction (
    char d ) [inline]
```

Gets or sets the direction of the timer.

If the direction is zero then the timer will count up, otherwise it will count down from the initial [value\(\)](#).

### 33.150.3.3 draw()

```
void Fl_Timer::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.150.3.4 handle()

```
int Fl_Timer::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

### 33.150.3.5 suspended()

```
char Fl_Timer::suspended ( ) const [inline]
```

Gets or sets whether the timer is suspended.

The documentation for this class was generated from the following files:

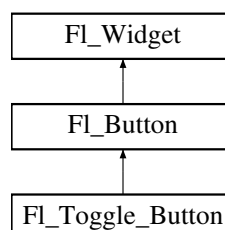
- [Fl\\_Timer.H](#)
- [forms\\_timer.cxx](#)

## 33.151 Fl\_Toggle\_Button Class Reference

The toggle button is a push button that needs to be clicked once to toggle on, and one more time to toggle off.

```
#include <Fl_Toggle_Button.H>
```

Inheritance diagram for [Fl\\_Toggle\\_Button](#):



### Public Member Functions

- [Fl\\_Toggle\\_Button](#) (int X, int Y, int W, int H, const char \*l=0)

*Creates a new [Fl\\_Toggle\\_Button](#) widget using the given position, size, and label string.*

## Additional Inherited Members

### 33.151.1 Detailed Description

The toggle button is a push button that needs to be clicked once to toggle on, and one more time to toggle off.

The [FL\\_Toggle\\_Button](#) subclass displays the "on" state by drawing a pushed-in button.

Buttons generate callbacks when they are clicked by the user. You control exactly when and how by changing the values for [type\(\)](#) and [when\(\)](#).

### 33.151.2 Constructor & Destructor Documentation

#### 33.151.2.1 FL\_Toggle\_Button()

```
FL_Toggle_Button::FL_Toggle_Button (
    int X,
    int Y,
    int W,
    int H,
    const char * L = 0 )
```

Creates a new [FL\\_Toggle\\_Button](#) widget using the given position, size, and label string.

The constructor creates the button using the given position, size, and label.

The inherited destructor deletes the toggle button.

The Button [type\(\)](#) is set to FL\_TOGGLE\_BUTTON.

#### Parameters

in	<i>X,Y,W,H</i>	position and size of the widget
in	<i>L</i>	widget label, default is no label

The documentation for this class was generated from the following files:

- [FL\\_Toggle\\_Button.H](#)
- [FL\\_Button.cxx](#)

## 33.152 FL\_Tooltip Class Reference

The [FL\\_Tooltip](#) class provides tooltip support for all FLTK widgets.

```
#include <FL_Tooltip.H>
```

### Static Public Member Functions

- static [FL\\_Color](#) [color](#) ()  
*Gets the background color for tooltips.*
- static void [color](#) ([FL\\_Color](#) c)  
*Sets the background color for tooltips.*
- static [FL\\_Widget](#) \* **current** ()  
*Gets the current widget target.*
- static void [current](#) ([FL\\_Widget](#) \*)  
*Sets the current widget target.*
- static [FL\\_Window](#) \* **current\_window** (void)  
*Returns the window that is used for tooltips.*
- static float [delay](#) ()  
*Gets the tooltip delay.*
- static void [delay](#) (float f)

- Sets the tooltip delay.*

  - static void `disable` ()

*Same as `enable(0)`, disables tooltips on all widgets.*
- static void `enable` (int b=1)

*Enables tooltips on all widgets (or disables if b is false).*
- static int `enabled` ()

*Returns non-zero if tooltips are enabled.*
- static void `enter_area` (FL\_Widget \*w, int X, int Y, int W, int H, const char \*tip)

*You may be able to use this to provide tooltips for internal pieces of your widget.*
- static FL\_Font font ()

*Gets the typeface for the tooltip text.*
- static void `font` (FL\_Font i)

*Sets the typeface for the tooltip text.*
- static float `hidedelay` ()

*Gets the time until an open tooltip hides again.*
- static void `hidedelay` (float f)

*Sets the time until an open tooltip hides again.*
- static float `hoverdelay` ()

*Gets the tooltip hover delay, the delay between tooltips.*
- static void `hoverdelay` (float f)

*Sets the tooltip hover delay, the delay between tooltips.*
- static int `margin_height` ()

*Gets the amount of extra space above and below the tooltip's text.*
- static void `margin_height` (int v)

*Sets the amount of extra space above and below the tooltip's text.*
- static int `margin_width` ()

*Gets the amount of extra space left/right of the tooltip's text.*
- static void `margin_width` (int v)

*Sets the amount of extra space left/right of the tooltip's text.*
- static int `override_text` (const char \*new\_text)

*Temporarily Override Tooltip Text during an FL\_BEFORE\_TOOLTIP event.*
- static FL\_Fontsize size ()

*Gets the size of the tooltip text.*
- static void `size` (FL\_Fontsize s)

*Sets the size of the tooltip text.*
- static FL\_Color textcolor ()

*Gets the color of the text in the tooltip.*
- static void `textcolor` (FL\_Color c)

*Sets the color of the text in the tooltip.*
- static int `wrap_width` ()

*Gets the maximum width for tooltip's text before it word wraps.*
- static void `wrap_width` (int v)

*Sets the maximum width for tooltip's text before it word wraps.*

## Static Public Attributes

- static void(\* `enter` )(FL\_Widget \*w) = nothing
- static void(\* `exit` )(FL\_Widget \*w) = nothing

## Friends

- class **Fl\_TooltipBox**
- void **Fl\_Widget::copy\_tooltip** (const char \*)
- void **Fl\_Widget::tooltip** (const char \*)

### 33.152.1 Detailed Description

The **Fl\_Tooltip** class provides tooltip support for all FLTK widgets. It contains only static methods.

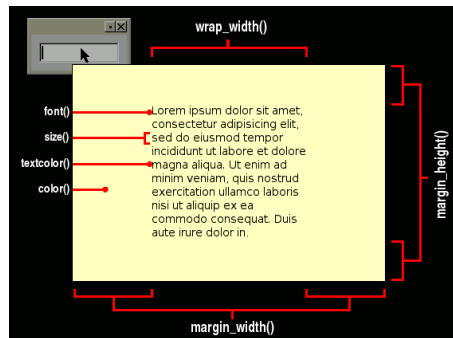


Figure 33.61 Fl\_Tooltip Options

### 33.152.2 Member Function Documentation

#### 33.152.2.1 color() [1/2]

```
static Fl_Color Fl_Tooltip::color (
    void ) [inline], [static]
```

Gets the background color for tooltips.

The default background color is a pale yellow.

#### 33.152.2.2 color() [2/2]

```
static void Fl_Tooltip::color (
    Fl_Color c ) [inline], [static]
```

Sets the background color for tooltips.

The default background color is a pale yellow.

#### 33.152.2.3 current()

```
void Fl_Tooltip::current (
    Fl_Widget * w ) [static]
```

Sets the current widget target.

Acts as though enter(widget) was done but does not pop up a tooltip. This is useful to prevent a tooltip from reappearing when a modal overlapping window is deleted. FLTK does this automatically when you click the mouse button.

#### 33.152.2.4 delay() [1/2]

```
static float Fl_Tooltip::delay ( ) [inline], [static]
```

Gets the tooltip delay.

The default delay is 1.0 seconds.

### 33.152.2.5 delay() [2/2]

```
static void Fl_Tooltip::delay (
    float f ) [inline], [static]
```

Sets the tooltip delay.

The default delay is 1.0 seconds.

### 33.152.2.6 disable()

```
static void Fl_Tooltip::disable ( ) [inline], [static]
```

Same as enable(0), disables tooltips on all widgets.

### 33.152.2.7 enable()

```
static void Fl_Tooltip::enable (
    int b = 1 ) [inline], [static]
```

Enables tooltips on all widgets (or disables if *b* is false).

### 33.152.2.8 enabled()

```
static int Fl_Tooltip::enabled ( ) [inline], [static]
```

Returns non-zero if tooltips are enabled.

### 33.152.2.9 enter\_area()

```
void Fl_Tooltip::enter_area (
    Fl_Widget * wid,
    int x,
    int y,
    int w,
    int h,
    const char * t ) [static]
```

You may be able to use this to provide tooltips for internal pieces of your widget.

Call this after setting [Fl::belowmouse\(\)](#) to your widget (because that calls the above enter() method). Then figure out what thing the mouse is pointing at, and call this with the widget (this pointer is used to remove the tooltip if the widget is deleted or hidden, and to locate the tooltip), the rectangle surrounding the area, relative to the top-left corner of the widget (used to calculate where to put the tooltip), and the text of the tooltip (which must be a pointer to static data as it is not copied).

### 33.152.2.10 font() [1/2]

```
static Fl_Font Fl_Tooltip::font ( ) [inline], [static]
```

Gets the typeface for the tooltip text.

### 33.152.2.11 font() [2/2]

```
static void Fl_Tooltip::font (
    Fl_Font i ) [inline], [static]
```

Sets the typeface for the tooltip text.

**33.152.2.12 hidedelay() [1/2]**

```
static float Fl_Tooltip::hidedelay ( ) [inline], [static]
```

Gets the time until an open tooltip hides again.

The default delay is 12.0 seconds.

**33.152.2.13 hidedelay() [2/2]**

```
static void Fl_Tooltip::hidedelay (
    float f ) [inline], [static]
```

Sets the time until an open tooltip hides again.

The default delay is 12.0 seconds.

**33.152.2.14 hoverdelay() [1/2]**

```
static float Fl_Tooltip::hoverdelay ( ) [inline], [static]
```

Gets the tooltip hover delay, the delay between tooltips.

The default delay is 0.2 seconds.

**33.152.2.15 hoverdelay() [2/2]**

```
static void Fl_Tooltip::hoverdelay (
    float f ) [inline], [static]
```

Sets the tooltip hover delay, the delay between tooltips.

The default delay is 0.2 seconds.

**33.152.2.16 margin\_height() [1/2]**

```
static int Fl_Tooltip::margin_height ( ) [inline], [static]
```

Gets the amount of extra space above and below the tooltip's text.

Default is 3.

**33.152.2.17 margin\_height() [2/2]**

```
static void Fl_Tooltip::margin_height (
    int v ) [inline], [static]
```

Sets the amount of extra space above and below the tooltip's text.

Default is 3.

**33.152.2.18 margin\_width() [1/2]**

```
static int Fl_Tooltip::margin_width ( ) [inline], [static]
```

Gets the amount of extra space left/right of the tooltip's text.

Default is 3.

**33.152.2.19 margin\_width() [2/2]**

```
static void Fl_Tooltip::margin_width (
    int v ) [inline], [static]
```

Sets the amount of extra space left/right of the tooltip's text.

Default is 3.

**33.152.2.20 override\_text()**

```
int Fl_Tooltip::override_text (
    const char * new_text ) [static]
```

Temporarily Override Tooltip Text during an FL\_BEFORE\_TOOLTIP event.

Use this method to temporarily change the tooltip text before it is displayed.

When FLTK sends an `FL_BEFORE_TOOLTIP` event to the widget under the mouse pointer, you can handle this event to modify the tooltip text dynamically. The provided text will be copied into a local buffer. To apply the override, the event handler must return 1.

To disable the tooltip for the current event, set the override text to `nullptr` or an empty string (`""`) and return 1.

#### Parameters

<code>in</code>	<code>new_text</code>	a C string that will be copied into a buffer
-----------------	-----------------------	--

#### Returns

always 1, so this call can finish the `FL_BEFORE_TOOLTIP` event handling.

#### See also

void [Fl\\_Widget::tooltip\(const char \\*text\)](#).  
[test/color\\_chooser.cxx](#) for a usage example.

#### 33.152.2.21 size() [1/2]

```
static Fl\_Fontsize Fl_Tooltip::size ( ) [inline], [static]
```

Gets the size of the tooltip text.

#### 33.152.2.22 size() [2/2]

```
static void Fl_Tooltip::size (
    Fl\_Fontsize s ) [inline], [static]
```

Sets the size of the tooltip text.

#### 33.152.2.23 textcolor() [1/2]

```
static Fl\_Color Fl_Tooltip::textcolor (
    void ) [inline], [static]
```

Gets the color of the text in the tooltip.

The default is black.

#### 33.152.2.24 textcolor() [2/2]

```
static void Fl_Tooltip::textcolor (
    Fl\_Color c ) [inline], [static]
```

Sets the color of the text in the tooltip.

The default is black.

#### 33.152.2.25 wrap\_width() [1/2]

```
static int Fl_Tooltip::wrap_width ( ) [inline], [static]
```

Gets the maximum width for tooltip's text before it word wraps.

Default is 400.

**33.152.2.26 wrap\_width() [2/2]**

```
static void Fl_Tooltip::wrap_width (
    int v ) [inline], [static]
```

Sets the maximum width for tooltip's text before it word wraps.

Default is 400.

The documentation for this class was generated from the following files:

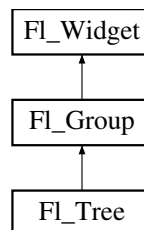
- Fl\_Tooltip.H
- [Fl.cxx](#)
- Fl\_Tooltip.cxx

**33.153 Fl\_Tree Class Reference**

Tree widget.

```
#include <Fl_Tree.H>
```

Inheritance diagram for Fl\_Tree:

**Public Member Functions**

- [Fl\\_Tree\\_Item](#) \* [add](#) (const char \*path, [Fl\\_Tree\\_Item](#) \*newitem=0)  
*Adds a new item, given a menu style 'path'.*
- [Fl\\_Tree\\_Item](#) \* [add](#) ([Fl\\_Tree\\_Item](#) \*parent\_item, const char \*name)  
*Add a new child item labeled 'name' to the specified 'parent\_item'.*
- void [calc\\_dimensions](#) ()  
*Recalculate widget dimensions and scrollbar visibility, normally managed automatically.*
- void [calc\\_tree](#) ()  
*Recalculates the tree's sizes and scrollbar visibility, normally managed automatically.*
- [Fl\\_Tree\\_Item](#) \* [callback\\_item](#) ()  
*Gets the item that caused the callback.*
- void [callback\\_item](#) ([Fl\\_Tree\\_Item](#) \*item)  
*Sets the item that was changed for this callback.*
- [Fl\\_Tree\\_Reason](#) [callback\\_reason](#) () const  
*Gets the reason for this callback.*
- void [callback\\_reason](#) ([Fl\\_Tree\\_Reason](#) reason)  
*Sets the reason for this callback.*
- void [clear](#) ()  
*Clear the entire tree's children, including the root.*
- void [clear\\_children](#) ([Fl\\_Tree\\_Item](#) \*item)  
*Clear all the children for 'item'.*
- int [close](#) (const char \*path, int docallback=1)  
*Closes the item specified by 'path'.*
- int [close](#) ([Fl\\_Tree\\_Item](#) \*item, int docallback=1)  
*Closes the specified 'item'.*
- [Fl\\_Image](#) \* [closeicon](#) () const

- Returns the icon to be used as the 'close' icon.*

  - void [closeicon](#) ([FI\\_Image](#) \*val)

*Sets the icon to be used as the 'close' icon.*
- [FI\\_Color](#) **connectorcolor** () const

*Get the connector color used for tree connection lines.*
- void **connectorcolor** ([FI\\_Color](#) val)

*Set the connector color used for tree connection lines.*
- [FI\\_Tree\\_Connector](#) **connectorstyle** () const

*Returns the line drawing style for inter-connecting items.*
- void **connectorstyle** ([FI\\_Tree\\_Connector](#) val)

*Sets the line drawing style for inter-connecting items.*
- int **connectorwidth** () const

*Gets the width of the horizontal connection lines (in pixels) that appear to the left of each tree item's label.*
- void **connectorwidth** (int val)

*Sets the width of the horizontal connection lines (in pixels) that appear to the left of each tree item's label.*
- int **deselect** (const char \*path, int docallback=1)

*Deselect an item specified by 'path'.*
- int **deselect** ([FI\\_Tree\\_Item](#) \*item, int docallback=1)

*Deselect the specified item.*
- int **deselect\_all** ([FI\\_Tree\\_Item](#) \*item=0, int docallback=1)

*Deselect 'item' and all its children.*
- void **display** ([FI\\_Tree\\_Item](#) \*item)

*Displays 'item', scrolling the tree as necessary.*
- int **displayed** ([FI\\_Tree\\_Item](#) \*item)

*See if 'item' is currently displayed on-screen (visible within the widget).*
- int **extend\_selection** ([FI\\_Tree\\_Item](#) \*from, [FI\\_Tree\\_Item](#) \*to, int val=1, bool visible=false)

*Extend a selection between 'from' and 'to' depending on 'visible'.*
- int **extend\_selection\_dir** ([FI\\_Tree\\_Item](#) \*from, [FI\\_Tree\\_Item](#) \*to, int dir, int val, bool visible)

*Extend the selection between and including 'from' and 'to' depending on direction 'dir', 'val', and 'visible'.*
- [FI\\_Tree\\_Item](#) \* **find\_clicked** (int yonly=0)

*Non-const version of [FI\\_Tree::find\\_clicked\(int yonly\)](#) const.*
- const [FI\\_Tree\\_Item](#) \* **find\_clicked** (int yonly=0) const

*Find the item that was last clicked on.*
- [FI\\_Tree\\_Item](#) \* **find\_item** (const char \*path)

*Non-const version of [FI\\_Tree::find\\_item\(const char \\*path\)](#) const.*
- const [FI\\_Tree\\_Item](#) \* **find\_item** (const char \*path) const

*Find the item, given a menu style path, e.g.*
- [FI\\_Tree\\_Item](#) \* **first** ()

*Returns the first item in the tree, or 0 if none.*
- [FI\\_Tree\\_Item](#) \* **first\_selected\_item** ()

*Returns the first selected item in the tree.*
- [FI\\_Tree\\_Item](#) \* **first\_visible** ()

*Returns the first [open\(\)](#), visible item in the tree, or 0 if none.*
- [FI\\_Tree\\_Item](#) \* **first\_visible\_item** ()

*Returns the first [open\(\)](#), visible item in the tree, or 0 if none.*
- **FI\_Tree** (int X, int Y, int W, int H, const char \*L=0)

*Constructor.*
- [FI\\_Tree\\_Item](#) \* **get\_item\_focus** () const

*Get the item that currently has keyboard focus.*
- int **get\_selected\_items** ([FI\\_Tree\\_Item\\_Array](#) &items)

- Returns the currently selected items as an array of 'ret\_items'.*
- `int handle (int e) FL_OVERRIDE`  
*Standard FLTK event handler for this widget.*
- `int hposition () const`  
*Returns the horizontal scroll position as a pixel offset.*
- `void hposition (int pos)`  
*Sets the horizontal scroll offset to position 'pos'.*
- `FL_Tree_Item * insert (FL_Tree_Item *item, const char *name, int pos)`  
*Insert a new item 'name' into 'item's children at position 'pos'.*
- `FL_Tree_Item * insert_above (FL_Tree_Item *above, const char *name)`  
*Inserts a new item 'name' above the specified FL\_Tree\_Item 'above'.*
- `int is_close (const char *path) const`  
*See if item specified by 'path' is closed.*
- `int is_close (FL_Tree_Item *item) const`  
*See if the specified 'item' is closed.*
- `int is_hscroll_visible () const`  
*See if the horizontal scrollbar is currently visible.*
- `int is_open (const char *path) const`  
*See if item specified by 'path' is open.*
- `int is_open (FL_Tree_Item *item) const`  
*See if 'item' is open.*
- `int is_scrollbar (FL_Widget *w)`  
*See if widget 'w' is one of the FL\_Tree widget's scrollbars.*
- `int is_selected (const char *path)`  
*See if item specified by 'path' is selected.*
- `int is_selected (FL_Tree_Item *item) const`  
*See if the specified 'item' is selected.*
- `int is_vscroll_visible () const`  
*See if the vertical scrollbar is currently visible.*
- `FL_Tree_Item * item_clicked ()`  
*Return the item that was last clicked.*
- `FL_Tree_Item_Draw_Mode item_draw_mode () const`  
*Get the 'item draw mode' used for the tree.*
- `void item_draw_mode (FL_Tree_Item_Draw_Mode mode)`  
*Set the 'item draw mode' used for the tree to 'mode'.*
- `void item_draw_mode (int mode)`  
*Set the 'item draw mode' used for the tree to integer 'mode'.*
- `void item_labelbgcolor (FL_Color val)`  
*Set the default label background color used for creating new items.*
- `FL_Color item_labelbgcolor (void) const`  
*Get the default label background color used for creating new items.*
- `void item_labelfgcolor (FL_Color val)`  
*Set the default label foreground color used for creating new items.*
- `FL_Color item_labelfgcolor (void) const`  
*Get the default label foreground color used for creating new items.*
- `FL_Font item_labelfont () const`  
*Get the default font face used for creating new items.*
- `void item_labelfont (FL_Font val)`  
*Set the default font face used for creating new items.*
- `FL_Fontsize item_labelsize () const`  
*Get the default label fontsize used for creating new items.*

- void **item\_labelsize** (FI\_Fontsize val)  
*Set the default label font size used for creating new items.*
- int **item\_pathname** (char \*pathname, int pathnamelen, const FI\_Tree\_Item \*item) const  
*Return 'pathname' of size 'pathnamelen' for the specified 'item'.*
- FI\_Tree\_Item\_Reselect\_Mode **item\_reselect\_mode** () const  
*Returns the current item re/selection mode.*
- void **item\_reselect\_mode** (FI\_Tree\_Item\_Reselect\_Mode mode)  
*Sets the item re/selection mode.*
- int **labelmarginleft** () const  
*Get the amount of white space (in pixels) that should appear to the left of the label text.*
- void **labelmarginleft** (int val)  
*Set the amount of white space (in pixels) that should appear to the left of the label text.*
- FI\_Tree\_Item \* **last** ()  
*Returns the last item in the tree.*
- FI\_Tree\_Item \* **last\_selected\_item** ()  
*Returns the last selected item in the tree.*
- FI\_Tree\_Item \* **last\_visible** ()  
*Returns the last [open\(\)](#), visible item in the tree.*
- FI\_Tree\_Item \* **last\_visible\_item** ()  
*Returns the last [open\(\)](#), visible item in the tree.*
- int **linespacing** () const  
*Get the amount of white space (in pixels) that should appear between items in the tree.*
- void **linespacing** (int val)  
*Sets the amount of white space (in pixels) that should appear between items in the tree.*
- void **load** (class FI\_Preferences &)  
*Load FLTK preferences.*
- int **marginbottom** () const  
*Get the amount of white space (in pixels) that should appear below the last visible item when the vertical scroller is scrolled to the bottom.*
- void **marginbottom** (int val)  
*Sets the amount of white space (in pixels) that should appear below the last visible item when the vertical scroller is scrolled to the bottom.*
- int **marginleft** () const  
*Get the amount of white space (in pixels) that should appear between the widget's left border and the tree's contents.*
- void **marginleft** (int val)  
*Set the amount of white space (in pixels) that should appear between the widget's left border and the left side of the tree's contents.*
- int **margintop** () const  
*Get the amount of white space (in pixels) that should appear between the widget's top border and the top of the tree's contents.*
- void **margintop** (int val)  
*Sets the amount of white space (in pixels) that should appear between the widget's top border and the top of the tree's contents.*
- FI\_Tree\_Item \* **next** (FI\_Tree\_Item \*item=0)  
*Return the next item after 'item', or 0 if no more items.*
- FI\_Tree\_Item \* **next\_item** (FI\_Tree\_Item \*item, int dir=FL\_Down, bool visible=false)  
*Returns next item after 'item' in direction 'dir' depending on 'visible'.*
- FI\_Tree\_Item \* **next\_selected\_item** (FI\_Tree\_Item \*item=0, int dir=FL\_Down)  
*Returns the next selected item above or below 'item', depending on 'dir'.*
- FI\_Tree\_Item \* **next\_visible\_item** (FI\_Tree\_Item \*start, int dir)  
*Returns next [open\(\)](#), visible item above (dir==FL\_Up) or below (dir==FL\_Down) the specified 'item', or 0 if no more items.*

- int [open](#) (const char \*path, int docallback=1)  
*Opens the item specified by 'path'.*
- int [open](#) (FI\_Tree\_Item \*item, int docallback=1)  
*Open the specified 'item'.*
- void [open\\_toggle](#) (FI\_Tree\_Item \*item, int docallback=1)  
*Toggle the open state of 'item'.*
- int [openchild\\_marginbottom](#) () const  
*Get the amount of white space (in pixels) that should appear below an open child tree's contents.*
- void [openchild\\_marginbottom](#) (int val)  
*Set the amount of white space (in pixels) that should appear below an open child tree's contents.*
- FI\_Image \* [openicon](#) () const  
*Returns the icon to be used as the 'open' icon.*
- void [openicon](#) (FI\_Image \*val)  
*Sets the icon to be used as the 'open' icon.*
- const FI\_Tree\_Prefs & [prefs](#) () const
- FI\_Tree\_Item \* [prev](#) (FI\_Tree\_Item \*item=0)  
*Return the previous item before 'item', or 0 if no more items.*
- void [recalc\\_tree](#) ()  
*Schedule tree to recalc the entire tree size.*
- int [remove](#) (FI\_Tree\_Item \*item)  
*Remove the specified 'item' from the tree.*
- void [resize](#) (int, int, int, int) [FL\\_OVERRIDE](#)  
*Resizes the FI\_Group widget and all of its children.*
- FI\_Tree\_Item \* [root](#) ()  
*Returns the root item.*
- void [root](#) (FI\_Tree\_Item \*newitem)  
*Sets the root item to 'newitem'.*
- void [root\\_label](#) (const char \*new\_label)  
*Set the label for the root item to 'new\_label'.*
- int [scrollbar\\_size](#) () const  
*Gets the default size of scrollbars' troughs for this widget in pixels.*
- void [scrollbar\\_size](#) (int size)  
*Sets the pixel size of the scrollbars' troughs to 'size' for this widget, in pixels.*
- int [select](#) (const char \*path, int docallback=1)  
*Select the item specified by 'path'.*
- int [select](#) (FI\_Tree\_Item \*item, int docallback=1)  
*Select the specified 'item'.*
- int [select\\_all](#) (FI\_Tree\_Item \*item=0, int docallback=1)  
*Select 'item' and all its children.*
- int [select\\_only](#) (FI\_Tree\_Item \*selitem, int docallback=1)  
*Select only the specified item, deselecting all others that might be selected.*
- void [select\\_toggle](#) (FI\_Tree\_Item \*item, int docallback=1)  
*Toggle the select state of the specified 'item'.*
- FI\_Boxtype [selectbox](#) () const  
*Sets the style of box used to draw selected items.*
- void [selectbox](#) (FI\_Boxtype val)  
*Gets the style of box used to draw selected items.*
- FI\_Tree\_Select [selectmode](#) () const  
*Gets the tree's current selection mode.*
- void [selectmode](#) (FI\_Tree\_Select val)  
*Sets the tree's selection mode.*

- void [set\\_item\\_focus](#) ([Fl\\_Tree\\_Item](#) \*item)  
*Set the item that currently should have keyboard focus.*
- void [show\\_item](#) ([Fl\\_Tree\\_Item](#) \*item)  
*Adjust the vertical scrollbar to show 'item' at the top of the display IF it is currently off-screen (for instance [show\\_item\\_top\(\)](#)).*
- void [show\\_item](#) ([Fl\\_Tree\\_Item](#) \*item, int yoff)  
*Adjust the vertical scrollbar so that 'item' is visible 'yoff' pixels from the top of the [Fl\\_Tree](#) widget's display.*
- void [show\\_item\\_bottom](#) ([Fl\\_Tree\\_Item](#) \*item)  
*Adjust the vertical scrollbar so that 'item' is at the bottom of the display.*
- void [show\\_item\\_middle](#) ([Fl\\_Tree\\_Item](#) \*item)  
*Adjust the vertical scrollbar so that 'item' is in the middle of the display.*
- void [show\\_item\\_top](#) ([Fl\\_Tree\\_Item](#) \*item)  
*Adjust the vertical scrollbar so that 'item' is at the top of the display.*
- void [show\\_self](#) ()  
*Print the tree as 'ascii art' to stdout.*
- int [showcollapse](#) () const  
*Returns 1 if the collapse icon is enabled, 0 if not.*
- void [showcollapse](#) (int val)  
*Set if we should show the collapse icon or not.*
- int [showroot](#) () const  
*Returns 1 if the root item is to be shown, or 0 if not.*
- void [showroot](#) (int val)  
*Set if the root item should be shown or not.*
- [Fl\\_Tree\\_Sort](#) sortorder () const  
*Set the default sort order used when items are added to the tree.*
- void [sortorder](#) ([Fl\\_Tree\\_Sort](#) val)  
*Gets the sort order used to add items to the tree.*
- [Fl\\_Image](#) \* [usericon](#) () const  
*Returns the [Fl\\_Image](#) being used as the default user icon for all newly created items.*
- void [usericon](#) ([Fl\\_Image](#) \*val)  
*Sets the [Fl\\_Image](#) to be used as the default user icon for all newly created items.*
- int [usericonmarginleft](#) () const  
*Get the amount of white space (in pixels) that should appear to the left of the usericon.*
- void [usericonmarginleft](#) (int val)  
*Set the amount of white space (in pixels) that should appear to the left of the usericon.*
- int [vposition](#) () const  
*Returns the vertical scroll position as a pixel offset.*
- void [vposition](#) (int pos)  
*Sets the vertical scroll offset to position 'pos'.*
- int [widgetmarginleft](#) () const  
*Get the amount of white space (in pixels) that should appear to the left of the child fltk widget (if any).*
- void [widgetmarginleft](#) (int val)  
*Set the amount of white space (in pixels) that should appear to the left of the child fltk widget (if any).*
- ~[Fl\\_Tree](#) ()  
*Destructor.*

## Protected Member Functions

- void [do\\_callback\\_for\\_item](#) ([Fl\\_Tree\\_Item](#) \*item, [Fl\\_Tree\\_Reason](#) reason)  
*Do the callback for the specified 'item' using 'reason', setting the [callback\\_item\(\)](#) and [callback\\_reason\(\)](#).*
- void [draw](#) () [FL\\_OVERRIDE](#)  
*Standard FLTK [draw\(\)](#) method, handles drawing the tree widget.*
- void [item\\_clicked](#) ([Fl\\_Tree\\_Item](#) \*val)  
*Set the item that was last clicked.*

## Protected Attributes

- [Fl\\_Scrollbar](#) \* **\_hscroll**  
*Horizontal scrollbar.*
- int **\_tih**  
*Tree widget inner xywh dimension: inside borders + scrollbars.*
- int **\_tiw**
- int **\_tix**
- int **\_tiy**
- int **\_toh**  
*Tree widget outer xywh dimension: outside scrollbars, inside widget border.*
- int **\_tow**
- int **\_tox**
- int **\_toy**
- int **\_tree\_h**  
*the calculated height of the entire tree hierarchy. See [calc\\_tree\(\)](#)*
- int **\_tree\_w**  
*the calculated width of the entire tree hierarchy. See [calc\\_tree\(\)](#)*
- [Fl\\_Scrollbar](#) \* **\_vscroll**  
*Vertical scrollbar.*

## Friends

- class [Fl\\_Tree\\_Item](#)

## Additional Inherited Members

### 33.153.1 Detailed Description

Tree widget.



Figure 33.62 Fl\_Tree example program

```
Fl_Tree                                     // Top level widget
|--- Fl_Tree_Item                          // Items in the tree
|--- Fl_Tree_Prefs                         // Preferences for the tree
|   |--- Fl_Tree_Connector (enum)         // Connection modes
|   |--- Fl_Tree_Select (enum)           // Selection modes
|   |--- Fl_Tree_Sort (enum)             // Sort behavior
```

Similar to [Fl\\_Browser](#), [Fl\\_Tree](#) is a browser of [Fl\\_Tree\\_Item](#)'s arranged in a parented hierarchy, or 'tree'. Subtrees can be expanded or closed. Items can be added, deleted, inserted, sorted and re-ordered.

The tree items may also contain other FLTK widgets, like buttons, input fields, or even "custom" widgets.

The [callback\(\)](#) is invoked depending on the value of [when\(\)](#):

- `FL_WHEN_RELEASE` – callback invoked when left mouse button is released on an item

- `FL_WHEN_CHANGED` – callback invoked when left mouse changes selection state

The simple way to define a tree:

```
#include <FL/Fl_Tree.H>
[... ]
Fl_Tree tree(X,Y,W,H);
tree.begin();
    tree.add("Flintstones/Fred");
    tree.add("Flintstones/Wilma");
    tree.add("Flintstones/Pebbles");
    tree.add("Simpsons/Homer");
    tree.add("Simpsons/Marge");
    tree.add("Simpsons/Bart");
    tree.add("Simpsons/Lisa");
tree.end();
```

## FEATURES

Items can be added with `add()`, removed with `remove()`, completely cleared with `clear()`, inserted with `insert()` and `insert_above()`, selected/deselected with `select()` and `deselect()`, open/closed with `open()` and `close()`, positioned on the screen with `show_item_top()`, `show_item_middle()` and `show_item_bottom()`, item children can be swapped around with `Fl_Tree_Item::swap_children()`, items can be moved around with `Fl_Tree_Item::move()`, an item's children can be walked with `Fl_Tree_Item::first()` and `Fl_Tree_Item::next()`, an item's children can be indexed directly with `Fl_Tree_Item::child()` and `Fl_Tree_Item::children()`, items can be moved from one subtree to another with `Fl_Tree_Item::deparent()` and `Fl_Tree_Item::reparent()`, sorting can be controlled when items are `add()`ed via `sortorder()`. You can walk the entire tree with `first()` and `next()`. You can walk visible items with `first_visible_item()` and `next_visible_item()`. You can walk selected items with `first_selected_item()` and `next_selected_item()`. Items can be found by their pathname using `find_item(const char*)`, and an item's pathname can be found with `item_pathname()`. The selected items' colors are controlled by `selection_color()` (inherited from `Fl_Widget`). A hook is provided to allow you to redefine how item's labels are drawn via `Fl_Tree::item_draw_callback()`. Items can be interactively dragged using `FL_TREE_SELECT_SINGLE_DRAGGABLE`.

## SELECTION OF ITEMS

The tree can have different selection behaviors controlled by `selectmode()`. The background color used for selected items is the `Fl_Tree::selection_color()`. The foreground color for selected items is controlled internally with `fl_contrast()`.

## CHILD WIDGETS

FLTK widgets (including custom widgets) can be assigned to tree items via `Fl_Tree_Item::widget()`.

When an `Fl_Tree_Item::widget()` is defined, the default behavior is for the `widget()` to be shown in place of the item's label (if it has one). Only the `widget()`'s width will be used; the `widget()`'s `x()` and `y()` position will be managed by the tree, and the `h()` will track the item's height. This default behavior can be altered (ABI 1.3.1): Setting `Fl_Tree::item_draw_mode()`'s `FL_TREE_ITEM_DRAW_LABEL_AND_WIDGET` flag causes the label + widget to be displayed together in that order, and adding the `FL_TREE_ITEM_HEIGHT_FROM_WIDGET` flag causes widget's height to define the `widget()`'s height.

## ICONS

The tree's open/close icons can be redefined with `Fl_Tree::openicon()`, `Fl_Tree::closeicon()`. User icons can either be changed globally with `Fl_Tree::usericon()`, or on a per-item basis with `Fl_Tree_Item::usericon()`.

Various default preferences can be globally manipulated via [Fl\\_Tree\\_Prefs](#), including colors, margins, icons, connection lines, etc.

## FONTS AND COLORS

When adding new items to the tree, the new items get the defaults for fonts and colors from:

- [Fl\\_Tree::item\\_labelfont\(\)](#) – The default item label font (default: FL\_HELVETICA)
- [Fl\\_Tree::item\\_labelsize\(\)](#) – The default item label size (default: FL\_NORMAL\_SIZE)
- [Fl\\_Tree::item\\_labelfgcolor\(\)](#) – The default item label foreground color (default: FL\_FOREGROUND\_COLOR)
- [Fl\\_Tree::item\\_labelbgcolor\(\)](#) – The default item label background color (default: 0xffffffff, which tree uses as 'transparent')

Each item ([Fl\\_Tree\\_Item](#)) inherits a copy of these font/color attributes when created, and each item has its own methods to let the app change these values on a per-item basis using methods of the same name:

- [Fl\\_Tree\\_Item::labelfont\(\)](#) – The item's label font (default: FL\_HELVETICA)
- [Fl\\_Tree\\_Item::labelsize\(\)](#) – The item's label size (default: FL\_NORMAL\_SIZE)
- [Fl\\_Tree\\_Item::labelfgcolor\(\)](#) – The item's label foreground color (default: FL\_FOREGROUND\_COLOR)
- [Fl\\_Tree\\_Item::labelbgcolor\(\)](#) – The item's label background color (default: 0xffffffff, which uses the tree's own bg color)

## CALLBACKS

The tree's [callback\(\)](#) will be invoked when items change state or are open/closed. [when\(\)](#) controls when mouse/keyboard events invoke the callback. [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) can be used to determine the cause of the callback. e.g.

```
void MyTreeCallback(Fl_Widget *w, void *data) {
    Fl_Tree *tree = (Fl_Tree*)w;
    Fl_Tree_Item *item = (Fl_Tree_Item*)tree->callback_item(); // get selected item
    switch ( tree->callback_reason() ) {
        case FL_TREE_REASON_SELECTED:  [...]
        case FL_TREE_REASON_DESELECTED: [...]
        case FL_TREE_REASON_RESELECTED: [...]
        case FL_TREE_REASON_OPENED:    [...]
        case FL_TREE_REASON_CLOSED:    [...]
    }
}
```

## SIMPLE EXAMPLES

To find all the selected items:

```
for ( Fl_Tree_Item *i=first_selected_item(); i; i=next_selected_item(i) )
    printf("Item %s is selected\n", i->label());
```

To get an item's full menu pathname, use [Fl\\_Tree::item\\_pathname\(\)](#), e.g.



The following shows the protected dimension variables 'tree inner' (tix..) and 'tree outer' (tox..):

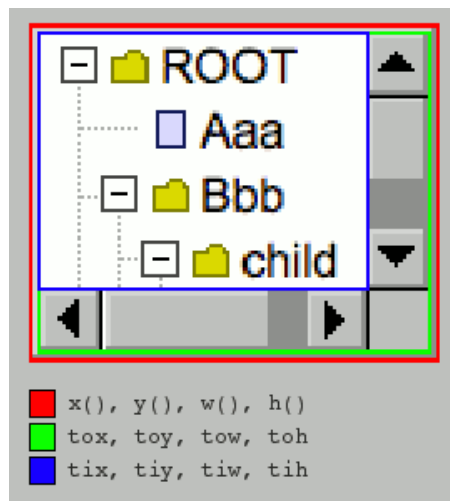


Figure 33.64 Fl\_Tree inner/outer dimensions

#### KEYBOARD BINDINGS

The following table lists keyboard bindings for navigating the tree:

Keyboard	FL_TREE_SELECT↔ _MULTI	FL_TREE_SELECT↔ _SINGLE	FL_TREE_SELECT↔ _NONE
Ctrl-A (Linux/Windows)	Select all items	N/A	N/A
Command-A (Mac)	Select all items	N/A	N/A
Space	Selects item	Selects item	N/A
Ctrl-Space	Toggle item	Toggle item	N/A
Shift-Space	Extends selection	Selects item	N/A
Enter	Toggles open/close	Toggles open/close	Toggles open/close
Ctrl-Enter	Toggles open/close	Toggles open/close	Toggles open/close
Shift-Enter	Toggles open/close	Toggles open/close	Toggles open/close
Right / Left	Open/Close item	Open/Close item	Open/Close item
Up / Down	Move focus box up/down	Move focus box up/down	N/A
Shift-Up / Shift-Down	Extend selection up/down	Move focus up/down	N/A
Home / End	Move to top/bottom of tree	Move to top/bottom of tree	Move to top/bottom of tree
PageUp / PageDown	Page up/down	Page up/down	Page up/down

### 33.153.2 Member Function Documentation

#### 33.153.2.1 add() [1/2]

```
Fl_Tree_Item * Fl_Tree::add (
    const char * path,
```

```
Fl_Tree_Item * item = 0 )
```

Adds a new item, given a menu style 'path'.

Any parent nodes that don't already exist are created automatically. Adds the item based on the value of [sortorder\(\)](#).

If 'item' is NULL, a new item is created.

To specify items or submenus that contain slashes ('/' or '\') use an escape character to protect them, e.g.

```
:
tree->add("/Holidays/Photos/12\\/25\\/2010");           // Adds item "12/25/2010"
tree->add("/Pathnames/c:\\\\Program Files\\\\MyApp"); // Adds item "c:\Program Files\MyApp"
:
```

#### Parameters

in	<i>path</i>	The path to the item, e.g. "Flintstone/Fred".
in	<i>item</i>	The new item to be added. If NULL, a new item is created with a name that is the last element in 'path'.

#### Returns

The new item added, or 0 on error.

#### Version

1.3.3

### 33.153.2.2 add() [2/2]

```
Fl_Tree_Item * Fl_Tree::add (
    Fl_Tree_Item * parent_item,
    const char * name )
```

Add a new child item labeled 'name' to the specified 'parent\_item'.

#### Parameters

in	<i>parent_item</i>	The parent item the new child item will be added to. Must not be NULL.
in	<i>name</i>	The label for the new item

#### Returns

The new item added.

#### Version

1.3.0 release

### 33.153.2.3 calc\_dimensions()

```
void Fl_Tree::calc_dimensions ( )
```

Recalculate widget dimensions and scrollbar visibility, normally managed automatically.

Low overhead way to update the tree widget's outer/inner dimensions and re-determine scrollbar visibility based on these changes without recalculating the entire size of the tree data.

Assumes that either the tree's size in \_tree\_w/\_tree\_h are correct so that scrollbar visibility can be calculated easily, or are both zero indicating scrollbar visibility can't be calculated yet.

This method is called when the widget is [resize\(\)](#)ed or if the scrollbar's sizes are changed (affects tree widget's inner dimensions tix/y/w/h), and also used by [calc\\_tree\(\)](#).

## Version

1.3.3 ABI feature

**33.153.2.4 calc\_tree()**

```
void Fl_Tree::calc_tree ( )
```

Recalculates the tree's sizes and scrollbar visibility, normally managed automatically.

On return:

- `_tree_w` will be the overall pixel width of the entire viewable tree
- `_tree_h` will be the overall pixel height ""
- scrollbar visibility and pan sizes are updated
- internal `_tix/_tiy/_tiw/_tih` dimensions are updated

`_tree_w/_tree_h` include the tree's margins (e.g. [marginleft\(\)](#)), whether items are open or closed, label contents and font sizes, etc.

The tree hierarchy's size is managed separately from the widget's size as an optimization; this way [resize\(\)](#) on the widget doesn't involve recalculating the tree's hierarchy needlessly, as widget size has no bearing on the tree hierarchy.

The tree hierarchy's size only changes when items are added/removed, open/closed, label contents or font sizes changed, margins changed, etc.

This calculation involves walking the *entire* tree from top to bottom, potentially a slow calculation if the tree has many items (potentially hundreds of thousands), and should therefore be called sparingly.

For this reason, [recalc\\_tree\(\)](#) is used as a way to /schedule/ calculation when changes affect the tree hierarchy's size.

Apps may want to call this method directly if the app makes changes to the tree's geometry, then immediately needs to work with the tree's new dimensions before an actual redraw (and recalc) occurs. (This use by an app should only rarely be needed)

**33.153.2.5 callback\_item() [1/2]**

```
Fl_Tree_Item * Fl_Tree::callback_item ( )
```

Gets the item that caused the callback.

The [callback\(\)](#) can use this value to see which item changed.

**33.153.2.6 callback\_item() [2/2]**

```
void Fl_Tree::callback_item (
    Fl_Tree_Item * item )
```

Sets the item that was changed for this callback.

Used internally to pass the item that invoked the callback.

**33.153.2.7 callback\_reason() [1/2]**

```
Fl_Tree_Reason Fl_Tree::callback_reason ( ) const
```

Gets the reason for this callback.

The [callback\(\)](#) can use this value to see why it was called. Example:

```

:
void MyTreeCallback(Fl_Widget *w, void *userdata) {
    Fl_Tree *tree = (Fl_Tree*)w;
    Fl_Tree_Item *item = tree->callback_item();    // the item changed (can be NULL if more than one
    item was changed!)
    switch ( tree->callback_reason() ) {           // reason callback was invoked
    case FL_TREE_REASON_OPENED:  ..item was opened..
    case FL_TREE_REASON_CLOSED:  ..item was closed..
    case FL_TREE_REASON_SELECTED: ..item was selected..
    case FL_TREE_REASON_RESELECTED: ..item was reselected (double-clicked, etc)..
    case FL_TREE_REASON_DESELECTED: ..item was deselected..
    }
```

```

    }
}
:

```

See also

[item\\_reselect\\_mode\(\)](#) – enables [FL\\_TREE\\_REASON\\_RESELECTED](#) events

### 33.153.2.8 [callback\\_reason\(\)](#) [2/2]

```

void Fl_Tree::callback_reason (
    Fl\_Tree\_Reason reason )

```

Sets the reason for this callback.

Used internally to pass the reason the callback was invoked.

### 33.153.2.9 [clear\(\)](#)

```

void Fl_Tree::clear (
    void )

```

Clear the entire tree's children, including the root.

The tree will be left completely empty.

### 33.153.2.10 [clear\\_children\(\)](#)

```

void Fl_Tree::clear_children (
    Fl\_Tree\_Item * item )

```

Clear all the children for 'item'.

Item may not be NULL.

### 33.153.2.11 [close\(\)](#) [1/2]

```

int Fl_Tree::close (
    const char * path,
    int docallback = 1 )

```

Closes the item specified by 'path'.

Invokes the callback depending on the value of optional parameter 'docallback'.

Handles calling [redraw\(\)](#) if anything changed.

Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. `close("Holidays/12\25\2010")`.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

#### Parameters

in	<i>path</i>	– the tree item's pathname (e.g. "Flintstones/Fred")
in	<i>docallback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - <a href="#">callback()</a> is not invoked</li> <li>• 1 - <a href="#">callback()</a> is invoked if item changed (default), <a href="#">callback_reason()</a> will be <code>FL_TREE_REASON_CLOSED</code></li> </ul>

#### Returns

- 1 – OK: item closed
- 0 – OK: item was already closed, no change
- -1 – ERROR: item was not found

See also

[open\(\)](#), [close\(\)](#), [is\\_open\(\)](#), [is\\_close\(\)](#), [callback\\_item\(\)](#), [callback\\_reason\(\)](#)

### 33.153.2.12 close() [2/2]

```
int Fl_Tree::close (
    Fl_Tree_Item * item,
    int docallback = 1 )
```

Closes the specified 'item'.

Invokes the callback depending on the value of optional parameter 'docallback'.

Handles calling [redraw\(\)](#) if anything changed.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

#### Parameters

in	<i>item</i>	– the item to be closed. Must not be NULL.
in	<i>docallback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - <a href="#">callback()</a> is not invoked</li> <li>• 1 - <a href="#">callback()</a> is invoked if item changed (default), <a href="#">callback_reason()</a> will be FL_TREE_REASON_CLOSED</li> </ul>

#### Returns

- 1 – item was closed
- 0 – item was already closed, no change

See also

[open\(\)](#), [close\(\)](#), [is\\_open\(\)](#), [is\\_close\(\)](#), [callback\\_item\(\)](#), [callback\\_reason\(\)](#)

### 33.153.2.13 closeicon() [1/2]

```
Fl_Image * Fl_Tree::closeicon ( ) const
```

Returns the icon to be used as the 'close' icon.

If none was set, the internal default is returned, a simple '[-]' icon.

### 33.153.2.14 closeicon() [2/2]

```
void Fl_Tree::closeicon (
    Fl_Image * val )
```

Sets the icon to be used as the 'close' icon.

This overrides the built in default '[-]' icon.

#### Parameters

in	<i>val</i>	– The new image, or zero to use the default '[-]' icon.
----	------------	---

**33.153.2.15 connectorstyle()**

```
void Fl_Tree::connectorstyle (
    Fl_Tree_Connector val )
```

Sets the line drawing style for inter-connecting items.

See [Fl\\_Tree\\_Connector](#) for possible values.

**33.153.2.16 deselect() [1/2]**

```
int Fl_Tree::deselect (
    const char * path,
    int dcallback = 1 )
```

Deselect an item specified by 'path'.

Invokes the callback depending on the value of optional parameter 'dcallback'.

Handles calling [redraw\(\)](#) if anything changed.

Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. `deselect("← Holidays/12\V25\V2010")`.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

**Parameters**

in	<i>path</i>	– the tree item's pathname (e.g. "Flintstones/Fred")
in	<i>dcallback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - the <a href="#">callback()</a> is not invoked</li> <li>• 1 - the <a href="#">callback()</a> is invoked if item changed state (default), <a href="#">callback_reason()</a> will be FL_TREE_REASON_DESELECTED</li> </ul>

**Returns**

- 1 - OK: item's state was changed
- 0 - OK: item was already deselected, no change was made
- -1 - ERROR: item was not found

**33.153.2.17 deselect() [2/2]**

```
int Fl_Tree::deselect (
    Fl_Tree_Item * item,
    int dcallback = 1 )
```

Deselect the specified *item*.

Invokes the callback depending on the value of optional parameter 'dcallback'.

Handles calling [redraw\(\)](#) if anything changed.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

**Parameters**

in	<i>item</i>	– the item to be deselected. Must not be NULL.
in	<i>dcallback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - the <a href="#">callback()</a> is not invoked</li> <li>• 1 - the <a href="#">callback()</a> is invoked if item changed state (default), <a href="#">callback_reason()</a> will be FL_TREE_REASON_DESELECTED</li> </ul>

## Returns

- 0 - item was already deselected, no change was made
- 1 - item's state was changed

**33.153.2.18** `deselect_all()`

```
int Fl_Tree::deselect_all (
    Fl_Tree_Item * item = 0,
    int docallback = 1 )
```

Deselect 'item' and all its children.

If item is NULL, `first()` is used.

Invokes the callback depending on the value of optional parameter 'docallback'.

Handles calling `redraw()` if anything changed.

The callback can use `callback_item()` and `callback_reason()` respectively to determine the item changed and the reason the callback was called.

## Parameters

in	<i>item</i>	The item that will be deselected (along with all its children). If NULL, <code>first()</code> is used.
in	<i>docallback</i>	– A flag that determines if the <code>callback()</code> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - the <code>callback()</code> is not invoked</li> <li>• 1 - the <code>callback()</code> is invoked for each item that changed state (default), <code>callback_reason()</code> will be <code>FL_TREE_REASON_DESELECTED</code></li> </ul>

## Returns

Count of how many items were actually changed to the deselected state.

**33.153.2.19** `display()`

```
void Fl_Tree::display (
    Fl_Tree_Item * item )
```

Displays 'item', scrolling the tree as necessary.

## Parameters

in	<i>item</i>	The item to be displayed. If NULL, <code>first()</code> is used.
----	-------------	--

**33.153.2.20** `displayed()`

```
int Fl_Tree::displayed (
    Fl_Tree_Item * item )
```

See if 'item' is currently displayed on-screen (visible within the widget).

This can be used to detect if the item is scrolled off-screen. Checks to see if the item's vertical position is within the top and bottom edges of the display window. This does NOT take into account the `hide()` / `show()` or `open()` / `close()` status of the item.

## Parameters

in	<i>item</i>	The item to be checked. If NULL, <code>first()</code> is used.
----	-------------	--

**Returns**

1 if displayed, 0 if scrolled off screen or no items are in tree.

**33.153.2.21 draw()**

```
void Fl_Tree::draw (
    void ) [protected], [virtual]
```

Standard FLTK [draw\(\)](#) method, handles drawing the tree widget.

Reimplemented from [Fl\\_Group](#).

**33.153.2.22 extend\_selection()**

```
int Fl_Tree::extend_selection (
    Fl_Tree_Item * from,
    Fl_Tree_Item * to,
    int val = 1,
    bool visible = false )
```

Extend a selection between 'from' and 'to' depending on 'visible'.

Similar to the more efficient [extend\\_selection\\_dir\(Fl\\_Tree\\_Item\\*,Fl\\_Tree\\_Item\\*,int dir,int val,bool vis\)](#) method, but direction (up or down) doesn't need to be known.

We're less efficient because we search the tree for to/from, then operate on items in between. The more efficient method avoids the "search", but necessitates a direction to be specified to find 'to'.

Used by SHIFT-click to extend a selection between two items inclusive.

Handles calling [redraw\(\)](#) if anything changed.

**Parameters**

in	<i>from</i>	Starting item
in	<i>to</i>	Ending item
in	<i>val</i>	Select or deselect items (0=deselect, 1=select, 2=toggle)
in	<i>visible</i>	true=affect only <a href="#">open()</a> , visible items, false=affect open or closed items (default)

**Returns**

The number of items whose selection states were changed, if any.

**Version**

1.3.3 ABI feature

**33.153.2.23 extend\_selection\_dir()**

```
int Fl_Tree::extend_selection_dir (
    Fl_Tree_Item * from,
    Fl_Tree_Item * to,
    int dir,
    int val,
    bool visible )
```

Extend the selection between and including 'from' and 'to' depending on direction 'dir', 'val', and 'visible'.

Efficient: does not walk entire tree; starts with 'from' and stops at 'to' while moving in direction 'dir'. Dir must be specified though.

If dir cannot be known in advance, such as during SHIFT-click operations, the method [extend\\_selection\(Fl\\_Tree\\_Item\\*,Fl\\_Tree\\_Item\\*,int\)](#) should be used.

Handles calling [redraw\(\)](#) if anything changed.

#### Parameters

in	<i>from</i>	Starting item
in	<i>to</i>	Ending item
in	<i>dir</i>	Direction to extend selection (FL_Up or FL_Down)
in	<i>val</i>	0=deselect, 1=select, 2=toggle
in	<i>visible</i>	true=affect only <a href="#">open()</a> , visible items, false=affect open or closed items (default)

#### Returns

The number of items whose selection states were changed, if any.

#### Version

1.3.3

#### 33.153.2.24 find\_clicked()

```
const Fl_Tree_Item * Fl_Tree::find_clicked (
    int yonly = 0 ) const
```

Find the item that was last clicked on.

You should use [callback\\_item\(\)](#) instead, which is fast, and is meant to be used within a callback to determine the item clicked.

This method walks the entire tree looking for the first item that is under the mouse. (The value of the 'yonly' flag affects whether both x and y events are checked, or just y)

Use this method /only/ if you've subclassed [Fl\\_Tree](#), and are receiving events before [Fl\\_Tree](#) has been able to process and update [callback\\_item\(\)](#).

#### Parameters

in	<i>yonly</i>	– 0: check both event's X and Y values. – 1: only check event's Y value, don't care about X.
----	--------------	--

#### Returns

The item clicked, or NULL if no item was under the current event.

#### Version

1.3.0

1.3.3 ABI feature: added yonly parameter

#### 33.153.2.25 find\_item()

```
const Fl_Tree_Item * Fl_Tree::find_item (
    const char * path ) const
```

Find the item, given a menu style path, e.g.

"/Parent/Child/item". There is both a const and non-const version of this method. Const version allows pure const methods to use this method to do lookups without causing compiler errors.

To specify items or submenus that contain slashes ('/' or '\') use an escape character to protect them, e.g.

```

:
tree->add("/Holidays/Photos/12\\25\\2010"); // Adds item "12/25/2010"
tree->add("/Pathnames/c:\\\\Program Files\\\\MyApp"); // Adds item "c:\Program Files\MyApp"
:

```

#### Parameters

<i>in</i>	<i>path</i>	– the tree item's pathname to be found (e.g. "Flintstones/Fred")
-----------	-------------	--

#### Returns

The item, or NULL if not found.

#### See also

[item\\_pathname\(\)](#)

### 33.153.2.26 first()

```
Fl_Tree_Item * Fl_Tree::first ( )
```

Returns the first item in the tree, or 0 if none.

Use this to walk the tree in the forward direction, e.g.

```

:
for ( Fl_Tree_Item *item = tree->first(); item; item = tree->next(item) )
    printf("Item:  %s\n", item->label());
:

```

#### Returns

First item in tree, or 0 if none (tree empty).

#### See also

[first\(\)](#), [next\(\)](#), [last\(\)](#), [prev\(\)](#)

### 33.153.2.27 first\_selected\_item()

```
Fl_Tree_Item * Fl_Tree::first_selected_item ( )
```

Returns the first selected item in the tree.

Use this to walk the tree from top to bottom looking for all the selected items, e.g.

```

:
// Walk tree forward, from top to bottom
for ( Fl_Tree_Item *i=tree->first_selected_item(); i; i=tree->next_selected_item(i) )
    printf("Selected item:  %s\n", i->label());
:

```

#### Returns

The first selected item, or 0 if none.

#### See also

[first\\_selected\\_item\(\)](#), [last\\_selected\\_item\(\)](#), [next\\_selected\\_item\(\)](#)

**33.153.2.28 first\_visible()**

`Fl_Tree_Item * Fl_Tree::first_visible ( )`

Returns the first [open\(\)](#), visible item in the tree, or 0 if none.

**Deprecated** in 1.3.3 ABI – use [first\\_visible\\_item\(\)](#) instead.

**33.153.2.29 first\_visible\_item()**

`Fl_Tree_Item * Fl_Tree::first_visible_item ( )`

Returns the first [open\(\)](#), visible item in the tree, or 0 if none.

**Returns**

First visible item in tree, or 0 if none.

**See also**

[first\\_visible\\_item\(\)](#), [last\\_visible\\_item\(\)](#), [next\\_visible\\_item\(\)](#)

**Version**

1.3.3

**33.153.2.30 get\_selected\_items()**

`int Fl_Tree::get_selected_items (`  
     `Fl_Tree_Item_Array & ret_items )`

Returns the currently selected items as an array of 'ret\_items'.

Example:

```

:
// Get selected items as an array
Fl_Tree_Item_Array items;
tree->get_selected_items(items);
// Manipulate the returned array
for ( int t=0; t<items.total(); t++ ) {
    Fl_Tree_Item &item = items[t];
    ..do stuff with each selected item..
}
:

```

**Parameters**

out	<i>ret_items</i>	The returned array of selected items.
-----	------------------	---------------------------------------

**Returns**

The number of items in the returned array.

**See also**

[first\\_selected\\_item\(\)](#), [next\\_selected\\_item\(\)](#)

**Version**

1.3.3 ABI feature

**33.153.2.31 handle()**

```
int Fl_Tree::handle (
    int e ) [virtual]
```

Standard FLTK event handler for this widget.

**Todo** add [Fl\\_Widget\\_Tracker](#) (see [Fl\\_Browser\\_.cxx::handle\(\)](#))

Reimplemented from [Fl\\_Group](#).

**33.153.2.32 hposition()** [1/2]

```
int Fl_Tree::hposition ( ) const
```

Returns the horizontal scroll position as a pixel offset.

The position returned is how many pixels of the tree are scrolled off the left edge of the screen.

See also

[hposition\(int\)](#), [vposition\(\)](#), [vposition\(int\)](#)

Note

Must be using FLTK ABI 1.3.3 or higher for this to be effective.

**33.153.2.33 hposition()** [2/2]

```
void Fl_Tree::hposition (
    int pos )
```

Sets the horizontal scroll offset to position 'pos'.

The position is how many pixels of the tree are scrolled off the left edge of the screen.

Parameters

in	pos	The vertical position (in pixels) to scroll the tree to.
----	-----	--

See also

[hposition\(\)](#), [vposition\(\)](#), [vposition\(int\)](#)

Note

Must be using FLTK ABI 1.3.3 or higher for this to be effective.

**33.153.2.34 insert()**

```
Fl_Tree_Item * Fl_Tree::insert (
    Fl_Tree_Item * item,
    const char * name,
    int pos )
```

Insert a new item 'name' into 'item's children at position 'pos'.

If pos is out of range the new item is

- prepended if pos < 0 or
- appended if pos > item->[children\(\)](#).

Note: pos == [children\(\)](#) is not considered out of range: the item is appended to the child list.

Example:

```

:
tree->add("Aaa/000");      // "000" is index 0 in Aaa's children
tree->add("Aaa/111");      // "111" is index 1 in Aaa's children
tree->add("Aaa/222");      // "222" is index 2 in Aaa's children
:
// How to use insert() to insert a new item between Aaa/111 + Aaa/222
Fl_Tree_Item *item = tree->find_item("Aaa"); // get parent item Aaa
if (item) tree->insert(item, "New item", 2); // insert as a child of Aaa at index #2
:

```

**Parameters**

in	<i>item</i>	The existing item to insert new child into. Must not be NULL.
in	<i>name</i>	The label for the new item
in	<i>pos</i>	The position of the new item in the child list

**Returns**

The new item added.

**See also**

[insert\\_above\(\)](#)

**33.153.2.35 insert\_above()**

```

Fl_Tree_Item * Fl_Tree::insert_above (
    Fl_Tree_Item * above,
    const char * name )

```

Inserts a new item 'name' above the specified [Fl\\_Tree\\_Item](#) 'above'.

Example:

```

:
tree->add("Aaa/000");      // "000" is index 0 in Aaa's children
tree->add("Aaa/111");      // "111" is index 1 in Aaa's children
tree->add("Aaa/222");      // "222" is index 2 in Aaa's children
..
// How to use insert_above() to insert a new item above Aaa/222
Fl_Tree_Item *item = tree->find_item("Aaa/222"); // get item Aaa/222
if (item) tree->insert_above(item, "New item"); // insert new item above it
:

```

**Parameters**

in	<i>above</i>	– the item above which to insert the new item. Must not be NULL.
in	<i>name</i>	– the name of the new item

**Returns**

The new item added, or 0 if 'above' could not be found.

**See also**

[insert\(\)](#)

**33.153.2.36 is\_close() [1/2]**

```

int Fl_Tree::is_close (
    const char * path ) const

```

See if item specified by 'path' is closed.

Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. `is_close("← Holidays/12\\25\\2010")`.

#### Parameters

in	<i>path</i>	– the tree item's pathname (e.g. "Flintstones/Fred")
----	-------------	--

#### Returns

- 1 - OK: item is closed
- 0 - OK: item is open
- -1 - ERROR: item was not found

### 33.153.2.37 `is_close()` [2/2]

```
int Fl_Tree::is_close (
    Fl_Tree_Item * item ) const
```

See if the specified 'item' is closed.

#### Parameters

in	<i>item</i>	– the item to be tested. Must not be NULL.
----	-------------	--

#### Returns

- 1 : item is closed
- 0 : item is open

### 33.153.2.38 `is_hscroll_visible()`

```
int Fl_Tree::is_hscroll_visible ( ) const
```

See if the horizontal scrollbar is currently visible.

#### Returns

1 if scrollbar visible, 0 if not.

#### Note

Must be using FLTK ABI 1.3.3 or higher for this to be effective.

### 33.153.2.39 `is_open()` [1/2]

```
int Fl_Tree::is_open (
    const char * path ) const
```

See if item specified by 'path' is open.

Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. `is_open("← Holidays/12\\25\\2010")`.

Items that are 'open' are themselves not necessarily visible; one of the item's parents might be closed.

#### Parameters

in	<i>path</i>	– the tree item's pathname (e.g. "Flintstones/Fred")
----	-------------	--

## Returns

- 1 - OK: item is open
- 0 - OK: item is closed
- -1 - ERROR: item was not found

## See also

[Fl\\_Tree\\_Item::visible\\_r\(\)](#)

**33.153.2.40 is\_open()** [2/2]

```
int Fl_Tree::is_open (
    Fl_Tree_Item * item ) const
```

See if 'item' is open.

Items that are 'open' are themselves not necessarily visible; one of the item's parents might be closed.

## Parameters

in	<i>item</i>	– the item to be tested. Must not be NULL.
----	-------------	--

## Returns

- 1 : item is open
- 0 : item is closed

**33.153.2.41 is\_scrollbar()**

```
int Fl_Tree::is_scrollbar (
    Fl_Widget * w )
```

See if widget 'w' is one of the [Fl\\_Tree](#) widget's scrollbars.

Use this to skip over the scrollbars when walking the [child\(\)](#) array. Example:

```
:
for ( int i=0; i<tree->children(); i++ ) {    // walk children
    Fl_Widget *w = tree->child(i);
    if ( tree->is_scrollbar(w) ) continue;    // skip scrollbars
    ..do work here..
}
:
```

## Parameters

in	<i>w</i>	Widget to test
----	----------	----------------

## Returns

1 if w is a scrollbar, 0 if not.

[Todo](#) should be const

**33.153.2.42 is\_selected()** [1/2]

```
int Fl_Tree::is_selected (
    const char * path )
```

See if item specified by 'path' is selected.

Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. `is_selected("← Holidays/12\25\2010")`.

#### Parameters

in	<i>path</i>	– the tree item's pathname (e.g. "Flintstones/Fred")
----	-------------	--

#### Returns

- 1 : item selected
- 0 : item deselected
- -1 : item was not found

### 33.153.2.43 `is_selected()` [2/2]

```
int Fl_Tree::is_selected (
    Fl_Tree_Item * item ) const
```

See if the specified 'item' is selected.

#### Parameters

in	<i>item</i>	– the item to be tested. Must not be NULL.
----	-------------	--

#### Returns

- 1 : item selected
- 0 : item deselected

### 33.153.2.44 `is_vscroll_visible()`

```
int Fl_Tree::is_vscroll_visible ( ) const
```

See if the vertical scrollbar is currently visible.

#### Returns

1 if scrollbar visible, 0 if not.

### 33.153.2.45 `item_clicked()` [1/2]

```
Fl_Tree_Item * Fl_Tree::item_clicked ( )
```

Return the item that was last clicked.

Valid only from within the [callback\(\)](#).

#### Returns

The item clicked, or 0 if none. 0 may also be used to indicate several items were clicked/changed.

**Deprecated** in 1.3.3 ABI – use [callback\\_item\(\)](#) instead.

**33.153.2.46 item\_clicked()** [2/2]

```
void Fl_Tree::item_clicked (
    Fl\_Tree\_Item * item ) [protected]
```

Set the item that was last clicked.

Should only be used by subclasses needing to change this value. Normally [Fl\\_Tree](#) manages this value.

**Deprecated** in 1.3.3 ABI – use [callback\\_item\(\)](#) instead.

**33.153.2.47 item\_draw\_mode()** [1/3]

```
Fl\_Tree\_Item\_Draw\_Mode Fl_Tree::item_draw_mode ( ) const
```

Get the 'item draw mode' used for the tree.

**Version**

1.3.1 ABI feature

**33.153.2.48 item\_draw\_mode()** [2/3]

```
void Fl_Tree::item_draw_mode (
    Fl\_Tree\_Item\_Draw\_Mode mode )
```

Set the 'item draw mode' used for the tree to 'mode'.

This affects how items in the tree are drawn, such as when a widget() is defined. See [Fl\\_Tree\\_Item\\_Draw\\_Mode](#) for possible values.

**Version**

1.3.1 ABI feature

**33.153.2.49 item\_draw\_mode()** [3/3]

```
void Fl_Tree::item_draw_mode (
    int mode )
```

Set the 'item draw mode' used for the tree to integer 'mode'.

This affects how items in the tree are drawn, such as when a widget() is defined. See [Fl\\_Tree\\_Item\\_Draw\\_Mode](#) for possible values.

**Version**

1.3.1 ABI feature

**33.153.2.50 item\_labelbgcolor()** [1/2]

```
void Fl_Tree::item_labelbgcolor (
    Fl\_Color val )
```

Set the default label background color used for creating new items.

A special case is made for color 0xffffffff (default) which is treated as 'transparent'. To change the background color on a per-item basis, use [Fl\\_Tree\\_Item::labelbgcolor\(Fl\\_Color\)](#)

**33.153.2.51 item\_labelbgcolor()** [2/2]

```
Fl\_Color Fl_Tree::item_labelbgcolor (
    void ) const
```

Get the default label background color used for creating new items.

If the color is 0xffffffff, it is 'transparent'.

**33.153.2.52 item\_labelbgcolor()**

```
void Fl_Tree::item_labelbgcolor (
    Fl_Color val )
```

Set the default label foreground color used for creating new items.

To change the foreground color on a per-item basis, use [Fl\\_Tree\\_Item::labelbgcolor\(Fl\\_Color\)](#)

**33.153.2.53 item\_labelfont()**

```
void Fl_Tree::item_labelfont (
    Fl_Font val )
```

Set the default font face used for creating new items.

To change the font face on a per-item basis, use [Fl\\_Tree\\_Item::labelfont\(Fl\\_Font\)](#)

**33.153.2.54 item\_labelsize()**

```
void Fl_Tree::item_labelsize (
    Fl_Fonsize val )
```

Set the default label font size used for creating new items.

To change the font size on a per-item basis, use [Fl\\_Tree\\_Item::labelsizesize\(Fl\\_Fonsize\)](#)

**33.153.2.55 item\_pathname()**

```
int Fl_Tree::item_pathname (
    char * pathname,
    int pathnamelen,
    const Fl_Tree_Item * item ) const
```

Return 'pathname' of size 'pathnamelen' for the specified 'item'.

If 'item' is NULL, [root\(\)](#) is used.

The tree's root will be included in the pathname if [showroot\(\)](#) is on.

Menu items or submenus that contain slashes ('/' or '\') in their names will be escaped with a backslash. This is symmetrical with the [add\(\)](#) function which uses the same escape pattern to set names.

**Parameters**

out	<i>pathname</i>	The string to use to return the pathname
in	<i>pathnamelen</i>	The maximum length of the string (including NULL). Must not be zero.
in	<i>item</i>	The item whose pathname is to be returned.

**Returns**

- 0 : OK (*pathname* returns the item's pathname)
- -1 : item not found (*pathname*="")
- -2 : *pathname* not large enough (*pathname*="")

**See also**

[find\\_item\(\)](#)

**33.153.2.56 item\_reselect\_mode()** [1/2]

```
Fl_Tree_Item_Reselect_Mode Fl_Tree::item_reselect_mode ( ) const
```

Returns the current item re/selection mode.

**Version**

1.3.1 ABI feature

**33.153.2.57 item\_reselect\_mode()** [2/2]

```
void Fl_Tree::item_reselect_mode (
    Fl_Tree_Item_Reselect_Mode mode )
```

Sets the item re/selection mode.

See [Fl\\_Tree\\_Item\\_Reselect\\_Mode](#) for possible values.

Version

1.3.1 ABI feature

**33.153.2.58 last()**

```
Fl_Tree_Item * Fl_Tree::last ( )
```

Returns the last item in the tree.

This can be used to walk the tree in reverse, e.g.

```
for ( Fl_Tree_Item *item = tree->last(); item; item = tree->prev() )
    printf("Item:  %s\n", item->label());
```

Returns

Last item in the tree, or 0 if none (tree empty).

See also

[first\(\)](#), [next\(\)](#), [last\(\)](#), [prev\(\)](#)

**33.153.2.59 last\_selected\_item()**

```
Fl_Tree_Item * Fl_Tree::last_selected_item ( )
```

Returns the last selected item in the tree.

Use this to walk the tree in reverse from bottom to top looking for all the selected items, e.g.

```
:
// Walk tree in reverse, from bottom to top
for ( Fl_Tree_Item *i=tree->last_selected_item(); i; i=tree->next_selected_item(i, FL_Up) )
    printf("Selected item:  %s\n", i->label());
:
```

Returns

The last selected item, or 0 if none.

See also

[first\\_selected\\_item\(\)](#), [last\\_selected\\_item\(\)](#), [next\\_selected\\_item\(\)](#)

Version

1.3.3

**33.153.2.60 last\_visible()**

```
Fl_Tree_Item * Fl_Tree::last_visible ( )
```

Returns the last [open\(\)](#), visible item in the tree.

**Deprecated** in 1.3.3 – use [last\\_visible\\_item\(\)](#) instead.

**33.153.2.61 last\_visible\_item()**

```
Fl_Tree_Item * Fl_Tree::last_visible_item ( )
```

Returns the last [open\(\)](#), visible item in the tree.

**Returns**

Last visible item in the tree, or 0 if none.

**See also**

[first\\_visible\\_item\(\)](#), [last\\_visible\\_item\(\)](#), [next\\_visible\\_item\(\)](#)

**Version**

1.3.3

**33.153.2.62 load()**

```
void Fl_Tree::load (
    class Fl_Preferences & prefs )
```

Load FLTK preferences.

Read a preferences database into the tree widget.

A preferences database is a hierarchical collection of data which can be directly loaded into the tree view for inspection.

**Parameters**

<code>in</code>	<code>prefs</code>	the <a href="#">Fl_Preferences</a> database
-----------------	--------------------	---

**33.153.2.63 next()**

```
Fl_Tree_Item * Fl_Tree::next (
    Fl_Tree_Item * item = 0 )
```

Return the next item after 'item', or 0 if no more items.

Use this code to walk the entire tree:

```
:
for ( Fl_Tree_Item *i = tree->first(); i; i = tree->next(i) )
    printf("Item:  %s\n", i->label());
:
```

**Parameters**

<code>in</code>	<code>item</code>	The item to use to find the next item. If NULL, returns 0.
-----------------	-------------------	--

**Returns**

Next item in tree, or 0 if at last item.

**See also**

[first\(\)](#), [next\(\)](#), [last\(\)](#), [prev\(\)](#)

## 33.153.2.64 next\_item()

```
Fl_Tree_Item * Fl_Tree::next_item (
    Fl_Tree_Item * item,
    int dir = FL_Down,
    bool visible = false )
```

Returns next item after 'item' in direction 'dir' depending on 'visible'.

Next item will be above (if dir==FL\_Up) or below (if dir==FL\_Down). If 'visible' is true, only items whose parents are [open\(\)](#) will be returned. If 'visible' is false, even items whose parents are [close\(\)](#)ed will be returned.

If item is 0, the return value will be the result of this truth table:

	visible=true	visible=false
	-----	-----
dir=FL_Up:	<a href="#">last_visible_item()</a>	<a href="#">last()</a>
dir=FL_Down:	<a href="#">first_visible_item()</a>	<a href="#">first()</a>

Example use:

```
:
// Walk down the tree showing open(), visible items
for ( Fl_Tree_Item *i=tree->first_visible_item(); i; i=tree->next_item(i, FL_Down, true) )
    printf("Item:  %s\n", i->label());
// Walk up the tree showing open(), visible items
for ( Fl_Tree_Item *i=tree->last_visible_item(); i; i=tree->next_item(i, FL_Up, true) )
    printf("Item:  %s\n", i->label());
// Walk down the tree showing all items (open or closed)
for ( Fl_Tree_Item *i=tree->first(); i; i=tree->next_item(i, FL_Down, false) )
    printf("Item:  %s\n", i->label());
// Walk up the tree showing all items (open or closed)
for ( Fl_Tree_Item *i=tree->last(); i; i=tree->next_item(i, FL_Up, false) )
    printf("Item:  %s\n", i->label());
:
```

## Parameters

in	<i>item</i>	The item to use to find the next item. If NULL, returns 0.
in	<i>dir</i>	Can be FL_Up or FL_Down (default=FL_Down or 'next')
in	<i>visible</i>	true=return only <a href="#">open()</a> , visible items, false=return open or closed items (default)

## Returns

Next item in tree in the direction and visibility specified, or 0 if no more items of specified visibility in that direction.

## See also

[first\(\)](#), [last\(\)](#), [next\(\)](#),  
[first\\_visible\\_item\(\)](#), [last\\_visible\\_item\(\)](#), [next\\_visible\\_item\(\)](#),  
[first\\_selected\\_item\(\)](#), [last\\_selected\\_item\(\)](#), [next\\_selected\\_item\(\)](#)

## Version

1.3.3

## 33.153.2.65 next\_selected\_item()

```
Fl_Tree_Item * Fl_Tree::next_selected_item (
    Fl_Tree_Item * item = 0,
    int dir = FL_Down )
```

Returns the next selected item above or below 'item', depending on 'dir'.

If 'item' is 0, search starts at either [first\(\)](#) or [last\(\)](#), depending on 'dir': [first\(\)](#) if 'dir' is FL\_Down (default), [last\(\)](#) if 'dir' is FL\_Up.

Use this to walk the tree looking for all the selected items, e.g.

```

:
// Walk down the tree (forwards)
for ( Fl_Tree_Item *i=tree->first_selected_item(); i; i=tree->next_selected_item(i, FL_Down) )
    printf("Item:  %s\n", i->label());
// Walk up the tree (backwards)
for ( Fl_Tree_Item *i=tree->last_selected_item(); i; i=tree->next_selected_item(i, FL_Up) )
    printf("Item:  %s\n", i->label());
:

```

#### Parameters

in	<i>item</i>	The item above or below which we'll find the next selected item. If NULL, <a href="#">first()</a> is used if FL_Down, <a href="#">last()</a> if FL_Up. (default=NULL)
in	<i>dir</i>	The direction to go. FL_Up for moving up the tree, FL_Down for down the tree (default)

#### Returns

The next selected item, or 0 if there are no more selected items.

#### See also

[first\\_selected\\_item\(\)](#), [last\\_selected\\_item\(\)](#), [next\\_selected\\_item\(\)](#)

#### Version

1.3.3

### 33.153.2.66 next\_visible\_item()

```

Fl_Tree_Item * Fl_Tree::next_visible_item (
    Fl_Tree_Item * item,
    int dir )

```

Returns next [open\(\)](#), visible item above (dir==FL\_Up) or below (dir==FL\_Down) the specified 'item', or 0 if no more items.

If 'item' is 0, returns [last\(\)](#) if 'dir' is FL\_Up, or [first\(\)](#) if dir is FL\_Down.

```

:
// Walk down the tree (forwards)
for ( Fl_Tree_Item *i=tree->first_visible_item(); i; i=tree->next_visible_item(i, FL_Down) )
    printf("Item:  %s\n", i->label());
// Walk up the tree (backwards)
for ( Fl_Tree_Item *i=tree->last_visible_item(); i; i=tree->next_visible_item(i, FL_Up) )
    printf("Item:  %s\n", i->label());
:

```

#### Parameters

in	<i>item</i>	The item above/below which we'll find the next visible item
in	<i>dir</i>	The direction to search. Can be FL_Up or FL_Down.

#### Returns

The item found, or 0 if there's no visible items above/below the specified item.

## Version

1.3.3

**33.153.2.67 open() [1/2]**

```
int Fl_Tree::open (
    const char * path,
    int docallback = 1 )
```

Opens the item specified by 'path'.

This causes the item's children (if any) to be shown.

Invokes the callback depending on the value of optional parameter 'docallback'.

Handles calling [redraw\(\)](#) if anything changed.

Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. `open("Holidays/12\25\2010")`.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

## Parameters

in	<i>path</i>	– the tree item's pathname (e.g. "Flintstones/Fred")
in	<i>docallback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - <a href="#">callback()</a> is not invoked</li> <li>• 1 - <a href="#">callback()</a> is invoked if item changed (default), <a href="#">callback_reason()</a> will be <code>FL_TREE_REASON_OPENED</code></li> </ul>

## Returns

- 1 – OK: item opened
- 0 – OK: item was already open, no change
- -1 – ERROR: item was not found

## See also

[open\(\)](#), [close\(\)](#), [is\\_open\(\)](#), [is\\_close\(\)](#), [callback\\_item\(\)](#), [callback\\_reason\(\)](#)

**33.153.2.68 open() [2/2]**

```
int Fl_Tree::open (
    Fl_Tree_Item * item,
    int docallback = 1 )
```

Open the specified 'item'.

This causes the item's children (if any) to be shown.

Invokes the callback depending on the value of optional parameter 'docallback'.

Handles calling [redraw\(\)](#) if anything changed.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

## Parameters

in	<i>item</i>	– the item to be opened. Must not be NULL.
in	<i>docallback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - <a href="#">callback()</a> is not invoked</li> <li>• 1 - <a href="#">callback()</a> is invoked if item changed (default), <a href="#">callback_reason()</a> will be <code>FL_TREE_REASON_OPENED</code></li> </ul>
Generated by Doxygen		

**Returns**

- 1 – item was opened
- 0 – item was already open, no change

**See also**

[open\(\)](#), [close\(\)](#), [is\\_open\(\)](#), [is\\_close\(\)](#), [callback\\_item\(\)](#), [callback\\_reason\(\)](#)

**33.153.2.69 open\_toggle()**

```
void Fl_Tree::open_toggle (
    Fl_Tree_Item * item,
    int docallback = 1 )
```

Toggle the open state of 'item'.

Invokes the callback depending on the value of optional parameter 'docallback'.

Handles calling [redraw\(\)](#) if anything changed.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

**Parameters**

in	<i>item</i>	– the item whose open state is to be toggled. Must not be NULL.
in	<i>docallback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - <a href="#">callback()</a> is not invoked</li> <li>• 1 - <a href="#">callback()</a> is invoked (default), <a href="#">callback_reason()</a> will be either FL_TREE_REASON_OPENED or FL_TREE_REASON_CLOSED</li> </ul>

**See also**

[open\(\)](#), [close\(\)](#), [is\\_open\(\)](#), [is\\_close\(\)](#), [callback\\_item\(\)](#), [callback\\_reason\(\)](#)

**33.153.2.70 openicon() [1/2]**

```
Fl_Image * Fl_Tree::openicon ( ) const
```

Returns the icon to be used as the 'open' icon.

If none was set, the internal default is returned, a simple '[+]' icon.

**33.153.2.71 openicon() [2/2]**

```
void Fl_Tree::openicon (
    Fl_Image * val )
```

Sets the icon to be used as the 'open' icon.

This overrides the built in default '[+]' icon.

**Parameters**

in	<i>val</i>	– The new image, or zero to use the default '[+]' icon.
----	------------	---

**33.153.2.72 prev()**

```
Fl_Tree_Item * Fl_Tree::prev (
    Fl_Tree_Item * item = 0 )
```

Return the previous item before 'item', or 0 if no more items.  
This can be used to walk the tree in reverse, e.g.

```
:
for ( Fl_Tree_Item *item = tree->first(); item; item = tree->prev(item) )
    printf("Item:  %s\n", item->label());
:
```

**Parameters**

in	<i>item</i>	The item to use to find the previous item. If NULL, returns 0.
----	-------------	--

**Returns**

Previous item in tree, or 0 if at first item.

**See also**

[first\(\)](#), [next\(\)](#), [last\(\)](#), [prev\(\)](#)

**33.153.2.73 recalc\_tree()**

```
void Fl_Tree::recalc_tree ( )
```

Schedule tree to recalc the entire tree size.

**Note**

Must be using FLTK ABI 1.3.3 or higher for this to be effective.

**33.153.2.74 remove()**

```
int Fl_Tree::remove (
    Fl_Tree_Item * item )
```

Remove the specified 'item' from the tree.

item may not be NULL. If it has children, all those are removed too. If item being removed has focus, no item will have focus.

**Returns**

0 if done, -1 if 'item' not found.

**33.153.2.75 resize()**

```
void Fl_Tree::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Resizes the [Fl\\_Group](#) widget and all of its children.

The [Fl\\_Group](#) widget first resizes itself, and then it moves and resizes all its children according to the rules documented for [Fl\\_Group::resizable\(Fl\\_Widget\\*\)](#)

See also

[Fl\\_Group::resizable\(Fl\\_Widget\\*\)](#)

[Fl\\_Group::resizable\(\)](#)

[Fl\\_Widget::resize\(int,int,int,int\)](#)

Reimplemented from [Fl\\_Group](#).

### 33.153.2.76 root()

```
void Fl_Tree::root (
    Fl_Tree_Item * newitem )
```

Sets the root item to 'newitem'.

If a root item already exists, [clear\(\)](#) is called first to clear it before replacing it with newitem.

Use this to install a custom item (derived from [Fl\\_Tree\\_Item](#)) as the root of the tree. This allows the derived class to implement custom drawing by overriding [Fl\\_Tree\\_Item::draw\\_item\\_content\(\)](#).

Version

1.3.3

### 33.153.2.77 root\_label()

```
void Fl_Tree::root_label (
    const char * new_label )
```

Set the label for the root item to 'new\_label'.

Makes an internally managed copy of 'new\_label'.

### 33.153.2.78 scrollbar\_size() [1/2]

```
int Fl_Tree::scrollbar_size (
    void ) const
```

Gets the default size of scrollbars' troughs for this widget in pixels.

If this value is zero (default), this widget will use the global [Fl::scrollbar\\_size\(\)](#) value as the scrollbar's width.

Returns

Scrollbar size in pixels, or 0 if the global [Fl::scrollbar\\_size\(\)](#) is being used.

See also

[Fl::scrollbar\\_size\(int\)](#)

### 33.153.2.79 scrollbar\_size() [2/2]

```
void Fl_Tree::scrollbar_size (
    int size )
```

Sets the pixel size of the scrollbars' troughs to 'size' for this widget, in pixels.

Normally you should not need this method, and should use the global [Fl::scrollbar\\_size\(int\)](#) instead to manage the size of ALL your widgets' scrollbars. This ensures your application has a consistent UI, and is the default behavior. Normally this is what you want.

Only use this method if you really need to override just THIS instance of the widget's scrollbar size. (This need should be rare.)

Setting *size* to the special value of 0 causes the widget to track the global [Fl::scrollbar\\_size\(\)](#), which is the default.

## Parameters

in	<i>size</i>	Sets the scrollbar size in pixels. If 0 (default), scrollbar size tracks the global <a href="#">Fl::scrollbar_size()</a>
----	-------------	---

## See also

[Fl::scrollbar\\_size\(\)](#)

**33.153.2.80 select()** [1/2]

```
int Fl_Tree::select (
    const char * path,
    int dcallback = 1 )
```

Select the item specified by 'path'.

Invokes the callback depending on the value of optional parameter 'dcallback'.

Handles calling [redraw\(\)](#) if anything changed.

Items or submenus that themselves contain slashes ('/' or '\') should be escaped, e.g. `select("← Holidays/12\25\2010")`.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

## Parameters

in	<i>path</i>	– the tree item's pathname (e.g. "Flintstones/Fred")
in	<i>dcallback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - the <a href="#">callback()</a> is not invoked</li> <li>• 1 - the <a href="#">callback()</a> is invoked if item changed state (default), <a href="#">callback_reason()</a> will be <code>FL_TREE_REASON_SELECTED</code></li> </ul>

## Returns

- 1 : OK: item's state was changed
- 0 : OK: item was already selected, no change was made
- -1 : ERROR: item was not found

**33.153.2.81 select()** [2/2]

```
int Fl_Tree::select (
    Fl_Tree_Item * item,
    int dcallback = 1 )
```

Select the specified 'item'.

Use '[deselect\(\)](#)' to deselect it.

Invokes the callback depending on the value of optional parameter `dcallback`.

Handles calling [redraw\(\)](#) if anything changed.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

## Parameters

in	<i>item</i>	– the item to be selected. Must not be NULL.
----	-------------	--

## Parameters

in	<i>docalldback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - the <a href="#">callback()</a> is not invoked</li> <li>• 1 - the <a href="#">callback()</a> is invoked if item changed state, <a href="#">callback_reason()</a> will be FL_TREE_REASON_SELECTED</li> </ul>
----	--------------------	---

## Returns

- 1 - item's state was changed
- 0 - item was already selected, no change was made

**33.153.2.82 select\_all()**

```
int Fl_Tree::select_all (
    Fl_Tree_Item * item = 0,
    int docalldback = 1 )
```

Select 'item' and all its children.

If item is NULL, [first\(\)](#) is used.

Invokes the callback depending on the value of optional parameter 'docalldback'.

Handles calling [redraw\(\)](#) if anything changed.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

## Parameters

in	<i>item</i>	The item that will be selected (along with all its children). If NULL, <a href="#">first()</a> is used.
in	<i>docalldback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - the <a href="#">callback()</a> is not invoked</li> <li>• 1 - the <a href="#">callback()</a> is invoked for each item that changed state (default), <a href="#">callback_reason()</a> will be FL_TREE_REASON_SELECTED</li> </ul>

## Returns

Count of how many items were actually changed to the selected state.

**33.153.2.83 select\_only()**

```
int Fl_Tree::select_only (
    Fl_Tree_Item * selitem,
    int docalldback = 1 )
```

Select only the specified item, deselecting all others that might be selected.

If 'selitem' is 0, [first\(\)](#) is used.

Invokes the callback depending on the value of optional parameter 'docalldback'.

Handles calling [redraw\(\)](#) if anything changed.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

## Parameters

in	<i>selitem</i>	The item to be selected. If NULL, <a href="#">first()</a> is used.
----	----------------	--

## Parameters

in	<i>docalldback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - the <a href="#">callback()</a> is not invoked</li> <li>• 1 - the <a href="#">callback()</a> is invoked for each item that changed state (default), <a href="#">callback_reason()</a> will be either FL_TREE_REASON_SELECTED or FL_TREE_REASON_DESELECTED</li> </ul>
----	--------------------	--

## Returns

The number of items whose selection states were changed, if any.

**33.153.2.84 select\_toggle()**

```
void Fl_Tree::select_toggle (
    Fl_Tree_Item * item,
    int docalldback = 1 )
```

Toggle the select state of the specified 'item'.

Invokes the callback depending on the value of optional parameter 'docalldback'.

Handles calling [redraw\(\)](#) if anything changed.

The callback can use [callback\\_item\(\)](#) and [callback\\_reason\(\)](#) respectively to determine the item changed and the reason the callback was called.

## Parameters

in	<i>item</i>	– the item to be selected. Must not be NULL.
in	<i>docalldback</i>	– A flag that determines if the <a href="#">callback()</a> is invoked or not: <ul style="list-style-type: none"> <li>• 0 - the <a href="#">callback()</a> is not invoked</li> <li>• 1 - the <a href="#">callback()</a> is invoked (default), <a href="#">callback_reason()</a> will be either FL_TREE_REASON_SELECTED or FL_TREE_REASON_DESELECTED</li> </ul>

**33.153.2.85 selectbox()** [1/2]

```
Fl_Boxtype Fl_Tree::selectbox ( ) const
```

Sets the style of box used to draw selected items.

This is an fltk [Fl\\_Boxtype](#). The default is influenced by FLTK's current [Fl::scheme\(\)](#)

**33.153.2.86 selectbox()** [2/2]

```
void Fl_Tree::selectbox (
    Fl_Boxtype val )
```

Gets the style of box used to draw selected items.

This is an fltk [Fl\\_Boxtype](#). The default is influenced by FLTK's current [Fl::scheme\(\)](#)

**33.153.2.87 selectmode()** [1/2]

```
Fl_Tree_Select Fl_Tree::selectmode ( ) const
```

Gets the tree's current selection mode.

See [Fl\\_Tree\\_Select](#) for possible values.

**33.153.2.88 selectmode()** [2/2]

```
void Fl_Tree::selectmode (
    Fl_Tree_Select val )
```

Sets the tree's selection mode.

See [Fl\\_Tree\\_Select](#) for possible values.

**33.153.2.89 set\_item\_focus()**

```
void Fl_Tree::set_item_focus (
    Fl_Tree_Item * item )
```

Set the item that currently should have keyboard focus.

Handles calling [redraw\(\)](#) to update the focus box (if it is visible).

**Parameters**

in	<i>item</i>	The item that should take focus. If NULL, none will have focus.
----	-------------	---

**33.153.2.90 show\_item()** [1/2]

```
void Fl_Tree::show_item (
    Fl_Tree_Item * item )
```

Adjust the vertical scrollbar to show '*item*' at the top of the display IF it is currently off-screen (for instance [show\\_item\\_top\(\)](#)).

If it is already on-screen, no change is made.

**Parameters**

in	<i>item</i>	The item to be shown. If NULL, <a href="#">first()</a> is used.
----	-------------	---

**See also**

[show\\_item\\_top\(\)](#), [show\\_item\\_middle\(\)](#), [show\\_item\\_bottom\(\)](#)

**33.153.2.91 show\_item()** [2/2]

```
void Fl_Tree::show_item (
    Fl_Tree_Item * item,
    int yoff )
```

Adjust the vertical scrollbar so that '*item*' is visible '*yoff*' pixels from the top of the [Fl\\_Tree](#) widget's display. For instance, *yoff*=0 will position the item at the top.

If *yoff* is larger than the vertical scrollbar's limit, the value will be clipped. So if *yoff*=100, but scrollbar's max is 50, then 50 will be used.

**Parameters**

in	<i>item</i>	The item to be shown. If NULL, <a href="#">first()</a> is used.
in	<i>yoff</i>	The pixel offset from the top for the displayed position.

**See also**

[show\\_item\\_top\(\)](#), [show\\_item\\_middle\(\)](#), [show\\_item\\_bottom\(\)](#)

**33.153.2.92 show\_item\_bottom()**

```
void Fl_Tree::show_item_bottom (
    Fl_Tree_Item * item )
```

Adjust the vertical scrollbar so that 'item' is at the bottom of the display.

**Parameters**

in	item	The item to be shown. If NULL, <a href="#">first()</a> is used.
----	------	---

**33.153.2.93 show\_item\_middle()**

```
void Fl_Tree::show_item_middle (
    Fl_Tree_Item * item )
```

Adjust the vertical scrollbar so that 'item' is in the middle of the display.

**Parameters**

in	item	The item to be shown. If NULL, <a href="#">first()</a> is used.
----	------	---

**33.153.2.94 show\_item\_top()**

```
void Fl_Tree::show_item_top (
    Fl_Tree_Item * item )
```

Adjust the vertical scrollbar so that 'item' is at the top of the display.

**Parameters**

in	item	The item to be shown. If NULL, <a href="#">first()</a> is used.
----	------	---

**33.153.2.95 show\_self()**

```
void Fl_Tree::show_self ( )
```

Print the tree as 'ascii art' to stdout.

Used mainly for debugging.

**Todo** should be const

**Version**

1.3.0

**33.153.2.96 showcollapse()** [1/2]

```
int Fl_Tree::showcollapse ( ) const
```

Returns 1 if the collapse icon is enabled, 0 if not.

**See also**

[showcollapse\(int\)](#)

**33.153.2.97 showcollapse()** [2/2]

```
void Fl_Tree::showcollapse (
    int val )
```

Set if we should show the collapse icon or not.

If collapse icons are disabled, the user will not be able to interactively collapse items in the tree, unless the application provides some other means via [open\(\)](#) and [close\(\)](#).

**Parameters**

in	val	1: shows collapse icons (default), 0: hides collapse icons.
----	-----	--

**33.153.2.98 showroot()**

```
void Fl_Tree::showroot (
    int val )
```

Set if the root item should be shown or not.

**Parameters**

in	val	1 – show the root item (default) 0 – hide the root item.
----	-----	---

**33.153.2.99 sortorder()**

```
Fl_Tree_Sort Fl_Tree::sortorder ( ) const
```

Set the default sort order used when items are added to the tree.

See [Fl\\_Tree\\_Sort](#) for possible values.

**33.153.2.100 usericon()** [1/2]

```
Fl_Image * Fl_Tree::usericon ( ) const
```

Returns the [Fl\\_Image](#) being used as the default user icon for all newly created items.

Returns zero if no icon has been set, which is the default.

**33.153.2.101 usericon()** [2/2]

```
void Fl_Tree::usericon (
    Fl_Image * val )
```

Sets the [Fl\\_Image](#) to be used as the default user icon for all newly created items.

If you want to specify user icons on a per-item basis, use [Fl\\_Tree\\_Item::usericon\(\)](#) instead.

**Parameters**

in	val	– The new image to be used, or zero to disable user icons.
----	-----	--

**33.153.2.102 vposition()** [1/2]

```
int Fl_Tree::vposition ( ) const
```

Returns the vertical scroll position as a pixel offset.

The position returned is how many pixels of the tree are scrolled off the top edge of the screen.

See also

[vposition\(int\)](#), [hposition\(\)](#), [hposition\(int\)](#)

### 33.153.2.103 vposition() [2/2]

```
void Fl_Tree::vposition (
    int pos )
```

Sets the vertical scroll offset to position 'pos'.

The position is how many pixels of the tree are scrolled off the top edge of the screen.

Parameters

in	pos	The vertical position (in pixels) to scroll the tree to.
----	-----	--

See also

[vposition\(\)](#), [hposition\(\)](#), [hposition\(int\)](#)

The documentation for this class was generated from the following files:

- [Fl\\_Tree.H](#)
- [Fl\\_Tree.cxx](#)

## 33.154 Fl\_Tree\_Item Class Reference

Tree widget item.

```
#include <Fl_Tree_Item.H>
```

### Public Member Functions

- void [activate](#) (int val=1)  
*Change the item's activation state to the optionally specified 'val'.*
- [Fl\\_Tree\\_Item](#) \* [add](#) (const [Fl\\_Tree\\_Prefs](#) &prefs, char \*\*arr)  
*Descend into the path specified by 'arr', and add a new child there.*
- [Fl\\_Tree\\_Item](#) \* [add](#) (const [Fl\\_Tree\\_Prefs](#) &prefs, char \*\*arr, [Fl\\_Tree\\_Item](#) \*newitem)  
*Descend into path specified by 'arr' and add 'newitem' there.*
- [Fl\\_Tree\\_Item](#) \* [add](#) (const [Fl\\_Tree\\_Prefs](#) &prefs, const char \*new\_label)  
*Add a new child to this item with the name 'new\_label' and defaults from 'prefs'.*
- [Fl\\_Tree\\_Item](#) \* [add](#) (const [Fl\\_Tree\\_Prefs](#) &prefs, const char \*new\_label, [Fl\\_Tree\\_Item](#) \*newitem)  
*Add 'item' as immediate child with 'new\_label' and defaults from 'prefs'.*
- [Fl\\_Tree\\_Item](#) \* [child](#) (int index)  
*Return the child item for the given 'index'.*
- const [Fl\\_Tree\\_Item](#) \* [child](#) (int t) const  
*Return the const child item for the given 'index'.*
- int [children](#) () const  
*Return the number of children this item has.*
- void [clear\\_children](#) ()  
*Clear all the children for this item.*
- void [close](#) ()  
*Close this item and all its children.*
- void [deactivate](#) ()  
*Deactivate the item; the callback() won't be invoked when clicked.*
- [Fl\\_Tree\\_Item](#) \* [deparent](#) (int index)

- Deparent child at index position 'pos'.*

  - int **depth** () const

*Returns how many levels deep this item is in the hierarchy.*
- void **deselect** ()

*Disable the item's selection state.*
- int **deselect\_all** ()

*Deselect item and all its children.*
- void **draw** (int X, int &Y, int W, [FI\\_Tree\\_Item](#) \*itemfocus, int &tree\_item\_xmax, int lastchild=1, int render=1)

*Draw this item and its children.*
- virtual int **draw\_item\_content** (int render)

*Draw the item content.*
- int **event\_on\_collapse\_icon** (const [FI\\_Tree\\_Prefs](#) &prefs) const

*Was the event on the 'collapse' button of this item?*
- int **event\_on\_item** (const [FI\\_Tree\\_Prefs](#) &prefs) const

*Was event anywhere on the item?*
- int **event\_on\_label** (const [FI\\_Tree\\_Prefs](#) &prefs) const

*Was event on the [label\(\)](#) of this item?*
- int **event\_on\_user\_icon** (const [FI\\_Tree\\_Prefs](#) &prefs) const

*Was the event on the 'user icon' of this item, if any?*
- int **find\_child** (const char \*name)

*Return the index of the immediate child of this item that has the label 'name'.*
- int **find\_child** ([FI\\_Tree\\_Item](#) \*item)

*Find the index number for the specified 'item' in the current item's list of children.*
- [FI\\_Tree\\_Item](#) \* **find\_child\_item** (char \*\*arr)

*Non-const version of [FI\\_Tree\\_Item::find\\_child\\_item\(char \\*\\*arr\)](#) const.*
- const [FI\\_Tree\\_Item](#) \* **find\_child\_item** (char \*\*arr) const

*Find child item by descending array 'arr' of names.*
- [FI\\_Tree\\_Item](#) \* **find\_child\_item** (const char \*name)

*Non-const version of [FI\\_Tree\\_Item::find\\_child\\_item\(const char \\*name\)](#) const.*
- const [FI\\_Tree\\_Item](#) \* **find\_child\_item** (const char \*name) const

*Return the /immediate/ child of current item that has the label 'name'.*
- [FI\\_Tree\\_Item](#) \* **find\_clicked** (const [FI\\_Tree\\_Prefs](#) &prefs, int yonly=0)

*Non-const version of [FI\\_Tree\\_Item::find\\_clicked\(const FI\\_Tree\\_Prefs&,int\)](#) const.*
- const [FI\\_Tree\\_Item](#) \* **find\_clicked** (const [FI\\_Tree\\_Prefs](#) &prefs, int yonly=0) const

*Find the item that the last event was over.*
- [FI\\_Tree\\_Item](#) \* **find\_item** (char \*\*arr)

*Non-const version of [FI\\_Tree\\_Item::find\\_item\(char \\*\\*names\)](#) const.*
- const [FI\\_Tree\\_Item](#) \* **find\_item** (char \*\*arr) const

*Find item by descending array of 'names'.*
- [FI\\_Tree\\_Item](#) (const [FI\\_Tree\\_Item](#) \*o)

*Copy constructor.*
- [FI\\_Tree\\_Item](#) (const [FI\\_Tree\\_Prefs](#) &prefs)

*Constructor.*
- [FI\\_Tree\\_Item](#) ([FI\\_Tree](#) \*tree)

*Constructor.*
- int **h** () const

*The item's height.*
- int **has\_children** () const

*See if this item has children.*
- [FI\\_Tree\\_Item](#) \* **insert** (const [FI\\_Tree\\_Prefs](#) &prefs, const char \*new\_label, int pos=0)

*Insert a new item named 'new\_label' into current item's children at a specified position 'pos'.*

- [FI\\_Tree\\_Item](#) \* [insert\\_above](#) (const [FI\\_Tree\\_Prefs](#) &prefs, const char \*new\_label)  
*Insert a new item named 'new\_label' above this item.*
- char [is\\_activated](#) () const  
*See if the item is activated.*
- char [is\\_active](#) () const  
*See if the item is activated. Alias for [is\\_activated\(\)](#).*
- int [is\\_close](#) () const  
*See if the item is 'closed'.*
- int [is\\_open](#) () const  
*See if the item is 'open'.*
- int [is\\_root](#) () const  
*Is this item the root of the tree?*
- char [is\\_selected](#) () const  
*See if the item is selected.*
- int [is\\_visible](#) () const  
*See if the item is visible.*
- int [is\\_visible\\_r](#) () const  
*See if item and all its parents are [open\(\)](#) and [visible\(\)](#).*
- const char \* [label](#) () const  
*Return the label.*
- void [label](#) (const char \*val)  
*Set the label to 'name'.*
- int [label\\_h](#) () const  
*The item's label height.*
- int [label\\_w](#) () const  
*The item's maximum label width to right edge of [FI\\_Tree](#)'s inner width within scrollbars.*
- int [label\\_x](#) () const  
*The item's label x position relative to the window.*
- int [label\\_y](#) () const  
*The item's label y position relative to the window.*
- [FI\\_Color](#) [labelbgcolor](#) () const  
*Return item's label background text color.*
- void [labelbgcolor](#) ([FI\\_Color](#) val)  
*Set item's label background color.*
- [FI\\_Color](#) [labelcolor](#) () const  
*Return item's label text color. Alias for [labelfgcolor\(\)](#) const).*
- void [labelcolor](#) ([FI\\_Color](#) val)  
*Set item's label text color. Alias for [labelfgcolor\(FI\\_Color\)](#).*
- [FI\\_Color](#) [labelfgcolor](#) () const  
*Return item's label foreground text color.*
- void [labelfgcolor](#) ([FI\\_Color](#) val)  
*Set item's label foreground text color.*
- [FI\\_Font](#) [labelfont](#) () const  
*Get item's label font face.*
- void [labelfont](#) ([FI\\_Font](#) val)  
*Set item's label font face.*
- [FI\\_Fontsize](#) [labelsize](#) () const  
*Get item's label font size.*
- void [labelsize](#) ([FI\\_Fontsize](#) val)  
*Set item's label font size.*
- int [move](#) ([FI\\_Tree\\_Item](#) \*item, int op=0, int pos=0)

- Move the current item above/below/into the specified 'item', where 'op' determines the type of move:*
- int **move** (int to, int from)  
*Move an item within its parent using index numbers.*
  - int **move\_above** (FI\_Tree\_Item \*item)  
*Move the current item above the specified 'item'.*
  - int **move\_below** (FI\_Tree\_Item \*item)  
*Move the current item below the specified 'item'.*
  - int **move\_into** (FI\_Tree\_Item \*item, int pos=0)  
*Parent the current item as a child of the specified 'item'.*
  - FI\_Tree\_Item \* **next** ()  
*Return the next item in the tree.*
  - FI\_Tree\_Item \* **next\_displayed** (FI\_Tree\_Prefs &prefs)  
*Same as [next\\_visible\(\)](#).*
  - FI\_Tree\_Item \* **next\_sibling** ()  
*Return this item's next sibling.*
  - FI\_Tree\_Item \* **next\_visible** (FI\_Tree\_Prefs &prefs)  
*Return the next [open\(\)](#), [visible\(\)](#) item.*
  - void **open** ()  
*Open this item and all its children.*
  - void **open\_toggle** ()  
*Toggle the item's open/closed state.*
  - FI\_Tree\_Item \* **parent** ()  
*Return the parent for this item. Returns NULL if we are the root.*
  - const FI\_Tree\_Item \* **parent** () const  
*Return the const parent for this item. Returns NULL if we are the root.*
  - void **parent** (FI\_Tree\_Item \*val)  
*Set the parent for this item.*
  - const FI\_Tree\_Prefs & **prefs** () const  
*Return the parent tree's prefs.*
  - FI\_Tree\_Item \* **prev** ()  
*Return the previous item in the tree.*
  - FI\_Tree\_Item \* **prev\_displayed** (FI\_Tree\_Prefs &prefs)  
*Same as [prev\\_visible\(\)](#).*
  - FI\_Tree\_Item \* **prev\_sibling** ()  
*Return this item's previous sibling.*
  - FI\_Tree\_Item \* **prev\_visible** (FI\_Tree\_Prefs &prefs)  
*Return the previous [open\(\)](#), [visible\(\)](#) item.*
  - int **remove\_child** (const char \*new\_label)  
*Remove immediate child (and its children) by its label 'name'.*
  - int **remove\_child** (FI\_Tree\_Item \*item)  
*Remove 'item' from the current item's children.*
  - int **reparent** (FI\_Tree\_Item \*newchild, int index)  
*Reparent specified item as a child of ourself at position 'pos'.*
  - FI\_Tree\_Item \* **replace** (FI\_Tree\_Item \*new\_item)  
*Replace the current item with a new item.*
  - FI\_Tree\_Item \* **replace\_child** (FI\_Tree\_Item \*olditem, FI\_Tree\_Item \*newitem)  
*Replace existing child 'olditem' with 'newitem'.*
  - void **select** (int val=1)  
*Change the item's selection state to the optionally specified 'val'.*
  - int **select\_all** ()  
*Select item and all its children.*

- void **select\_toggle** ()  
*Toggle the item's selection state.*
- void **show\_self** (const char \*indent="") const  
*Print the tree as 'ascii art' to stdout.*
- int **swap\_children** (FI\_Tree\_Item \*a, FI\_Tree\_Item \*b)  
*Swap two of our immediate children, given item pointers.*
- void **swap\_children** (int ax, int bx)  
*Swap two of our children, given two child index values 'ax' and 'bx'.*
- FI\_Tree \* **tree** ()  
*Return the tree for this item.*
- const FI\_Tree \* **tree** () const  
*Return the tree for this item.*
- void **update\_prev\_next** (int index)  
*Update our \_prev\_sibling and \_next\_sibling pointers to point to neighbors given index as being our current position in the parent's item array.*
- void \* **user\_data** () const  
*Retrieve the user-data value that has been assigned to the item.*
- void **user\_data** (void \*data)  
*Set a user-data value for the item.*
- FI\_Image \* **userdeicon** () const  
*Return the deactivated version of the user icon, if any.*
- void **userdeicon** (FI\_Image \*val)  
*Set the usericon to draw when the item is deactivated.*
- FI\_Image \* **usericon** () const  
*Get the item's user icon as an FI\_Image. Returns '0' if disabled.*
- void **usericon** (FI\_Image \*val)  
*Set the item's user icon to an FI\_Image.*
- int **visible** () const  
*See if the item is visible. Alias for is\_visible().*
- int **visible\_r** () const  
*See if item and all its parents are open() and visible().*
- int **w** () const  
*The entire item's width to right edge of FI\_Tree's inner width within scrollbars.*
- FI\_Widget \* **widget** () const  
*Return FLTK widget assigned to this item.*
- void **widget** (FI\_Widget \*val)  
*Assign an FLTK widget to this item.*
- int **x** () const  
*The item's x position relative to the window.*
- int **y** () const  
*The item's y position relative to the window.*

## Protected Member Functions

- void **\_Init** (const FI\_Tree\_Prefs &prefs, FI\_Tree \*tree)
- int **calc\_item\_height** (const FI\_Tree\_Prefs &prefs) const  
*Return the item's 'visible' height.*
- virtual void **draw\_horizontal\_connector** (int x1, int x2, int y, const FI\_Tree\_Prefs &prefs)  
*Horizontal connector line based on preference settings.*
- virtual void **draw\_vertical\_connector** (int x, int y1, int y2, const FI\_Tree\_Prefs &prefs)  
*Vertical connector line based on preference settings.*

- `FL_Color drawbgcolor () const`  
*Returns the recommended background color used for drawing this item.*
- `FL_Color drawfgcolor () const`  
*Returns the recommended foreground color used for drawing this item.*
- `void hide_widgets ()`  
*Internal: Hide the FLTK [widget\(\)](#) for this item and all children.*
- `int is_flag (unsigned short val) const`  
*See if flag set. Returns 0 or 1.*
- `void recalc_tree ()`  
*Call this when our geometry is changed.*
- `void set_flag (unsigned short flag, int val)`  
*Set a flag to an on or off value. val is 0 or 1.*
- `void show_widgets ()`  
*Internal: Show the FLTK [widget\(\)](#) for this item and all children.*

### 33.154.1 Detailed Description

Tree widget item.

This class is a single tree item, and manages all of the item's attributes. `FL_Tree_Item` is used by `FL_Tree`, which is comprised of many instances of `FL_Tree_Item`.

`FL_Tree_Item` is hierarchical; it dynamically manages an `FL_Tree_Item_Array` of children that are themselves instances of `FL_Tree_Item`. Each item can have zero or more children. When an item has children, `close()` and `open()` can be used to hide or show them.

Items have their own attributes; font size, face, color. Items maintain their own hierarchy of children.

When you make changes to items, you'll need to tell the tree to `redraw()` for the changes to show up.

New 1.3.3 ABI feature: You can define custom items by either adding a custom widget to the item with `FL_Tree_Item::widget()`, or override the `draw_item_content()` method if you want to just redefine how the label is drawn.

The following shows the `FL_Tree_Item`'s dimensions, useful when overriding the `draw_item_content()` method:

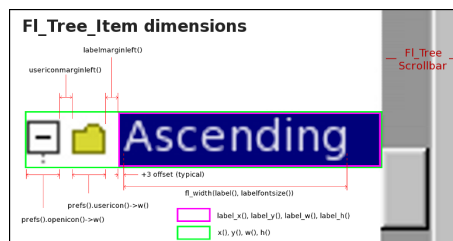


Figure 33.65 `FL_Tree_Item`'s internal dimensions.

### 33.154.2 Constructor & Destructor Documentation

#### 33.154.2.1 `FL_Tree_Item()` [1/2]

```
FL_Tree_Item::FL_Tree_Item (
    const FL_Tree_Prefs & prefs )
```

Constructor.

Makes a new instance of `FL_Tree_Item` using defaults from 'prefs'.

**Deprecated** in 1.3.3 ABI – you must use `FL_Tree_Item(FL_Tree*)` for proper horizontal scrollbar behavior.

**33.154.2.2 Fl\_Tree\_Item()** [2/2]

```
Fl_Tree_Item::Fl_Tree_Item (
    Fl_Tree * tree )
```

Constructor.

Makes a new instance of [Fl\\_Tree\\_Item](#) for 'tree'.

This must be used instead of the older, deprecated [Fl\\_Tree\\_Item\(Fl\\_Tree\\_Prefs\)](#) constructor for proper horizontal scrollbar calculation.

**Version**

1.3.3 ABI feature

**33.154.3 Member Function Documentation****33.154.3.1 activate()**

```
void Fl_Tree_Item::activate (
    int val = 1 ) [inline]
```

Change the item's activation state to the optionally specified 'val'.

When deactivated, the item will be 'grayed out'; the callback() won't be invoked if the user clicks on the label. If a [widget\(\)](#) is associated with the item, its activation state will be changed as well.

If 'val' is not specified, the item will be activated.

**33.154.3.2 add()** [1/4]

```
Fl_Tree_Item * Fl_Tree_Item::add (
    const Fl_Tree_Prefs & prefs,
    char ** arr )
```

Descend into the path specified by 'arr', and add a new child there.

Should be used only by [Fl\\_Tree](#)'s internals. Adds the item based on the value of prefs.sortorder().

**Returns**

the item added.

**Version**

1.3.0 release

**33.154.3.3 add()** [2/4]

```
Fl_Tree_Item * Fl_Tree_Item::add (
    const Fl_Tree_Prefs & prefs,
    char ** arr,
    Fl_Tree_Item * newitem )
```

Descend into path specified by 'arr' and add 'newitem' there.

Should be used only by [Fl\\_Tree](#)'s internals. If item is NULL, a new item is created. Adds the item based on the value of prefs.sortorder().

**Returns**

the item added.

**Version**

1.3.3 ABI feature

**33.154.3.4 add() [3/4]**

```
Fl_Tree_Item * Fl_Tree_Item::add (
    const Fl_Tree_Prefs & prefs,
    const char * new_label )
```

Add a new child to this item with the name 'new\_label' and defaults from 'prefs'.

An internally managed copy is made of the label string. Adds the item based on the value of prefs.sortorder().

**Returns**

the item added

**Version**

1.3.0 release

**33.154.3.5 add() [4/4]**

```
Fl_Tree_Item * Fl_Tree_Item::add (
    const Fl_Tree_Prefs & prefs,
    const char * new_label,
    Fl_Tree_Item * item )
```

Add 'item' as immediate child with 'new\_label' and defaults from 'prefs'.

If 'item' is NULL, a new item is created. An internally managed copy is made of the label string. Adds the item based on the value of prefs.sortorder().

**Returns**

the item added

**Version**

1.3.3

**33.154.3.6 calc\_item\_height()**

```
int Fl_Tree_Item::calc_item_height (
    const Fl_Tree_Prefs & prefs ) const [protected]
```

Return the item's 'visible' height.

Takes into account the item's:

- visibility (if lis\_visible(), returns 0)
- labelfont() height: if label() != NULL
- widget() height: if widget() != NULL
- openicon() height (if has children)
- usericon() height (if not NULL) Does NOT include Fl\_Tree::linespacing();

**Returns**

maximum pixel height

**33.154.3.7 child()**

```
const Fl_Tree_Item * Fl_Tree_Item::child (
    int t ) const
```

Return the const child item for the given 'index'.

Return const child item for the specified 'index'.

**33.154.3.8 deactivate()**

```
void Fl_Tree_Item::deactivate ( ) [inline]
```

Deactivate the item; the callback() won't be invoked when clicked.

Same as activate(0)

**33.154.3.9 deparent()**

```
Fl_Tree_Item * Fl_Tree_Item::deparent (
    int pos )
```

Deparent child at index position 'pos'.

This creates an "orphaned" item that is still allocated, but has no parent or siblings. Normally the caller would want to immediately reparent the orphan elsewhere.

A successfully orphaned item will have its [parent\(\)](#) and [prev\\_sibling\(\)/next\\_sibling\(\)](#) set to NULL.

**Returns**

- pointer to orphaned item on success
- NULL on error (could not deparent the item)

**See also**

[reparent\(\)](#)

**33.154.3.10 depth()**

```
int Fl_Tree_Item::depth ( ) const
```

Returns how many levels deep this item is in the hierarchy.

For instance; root has a depth of zero, and its immediate children would have a depth of 1, and so on. Use e.g. for determining the horizontal indent of this item during drawing.

**33.154.3.11 deselect\_all()**

```
int Fl_Tree_Item::deselect_all ( ) [inline]
```

Deselect item and all its children.

Returns count of how many items were in the 'selected' state, ie. how many items were "changed".

**33.154.3.12 draw()**

```
void Fl_Tree_Item::draw (
    int X,
    int & Y,
    int W,
    Fl_Tree_Item * itemfocus,
    int & tree_item_xmax,
    int lastchild = 1,
    int render = 1 )
```

Draw this item and its children.

**Parameters**

in	<i>X</i>	Horizontal position for item being drawn
in, out	<i>Y</i>	Vertical position for item being drawn, returns new position for next item
in	<i>W</i>	Recommended width for item
in	<i>itemfocus</i>	The tree's current focus item (if any)
in, out	<i>tree_item_xmax</i>	The tree's running xmax (right-most edge so far). Mainly used by parent tree when render==0 to calculate tree's max width.
in	<i>lastchild</i>	Is this item the last child in a subtree?
in	<i>render</i>	Whether or not to render the item: 0: no rendering, just calculate size w/out drawing. 1: render item as well as size calc
Generated by Doxygen		

## Version

## 1.3.3 ABI feature: modified parameters

**33.154.3.13 draw\_horizontal\_connector()**

```
void Fl_Tree_Item::draw_horizontal_connector (
    int x1,
    int x2,
    int y,
    const Fl_Tree_Prefs & prefs ) [protected], [virtual]
```

Horizontal connector line based on preference settings.

This method can be overridden to implement custom connection line drawing.

## Parameters

in	<i>x1</i>	The left hand X position of the horizontal connector
in	<i>x2</i>	The right hand X position of the horizontal connector
in	<i>y</i>	The vertical position of the horizontal connector
in	<i>prefs</i>	The <a href="#">Fl_Tree</a> prefs

**33.154.3.14 draw\_item\_content()**

```
int Fl_Tree_Item::draw_item_content (
    int render ) [virtual]
```

Draw the item content.

This method can be overridden to implement custom drawing by filling the `label_xywh()` area with content.

A minimal example of how to override `draw_item_content()` and draw just a normal item's background and label ourselves:

```
class MyTreeItem : public Fl_Tree_Item {
public:
    MyTreeItem() { }
    ~MyTreeItem() { }
    // DRAW OUR CUSTOM CONTENT FOR THE ITEM
    int draw_item_content(int render) {
        // Our item's dimensions + text content
        int X=label_x(), Y=label_y(), W=label_w(), H=label_h();
        const char *text = label() ? label() : "";
        // Rendering? Do any drawing that's needed
        if ( render ) {
            // Draw bg -- a filled rectangle
            fl_color(drawbgcolor()); fl_rectf(X,Y,W,H);
            // Draw label
            fl_font(labelfont(), labelsize()); // use item's label font/size
            fl_color(drawfgcolor()); // use recommended fg color
            fl_draw(text, X,Y,W,H, FL_ALIGN_LEFT); // draw the item's label
        }
        // Rendered or not, we must calculate content's max X position
        int lw=0, lh=0;
        fl_measure(text, lw, lh); // get width of label text
        return X + lw; // return X + label width
    }
};
```

You can draw anything you want inside `draw_item_content()` using any of the [fl\\_draw.H](#) functions, as long as it's within the label's xywh area.

To add instances of your custom item to the tree, you can use:

```
// Example #1: using add()
MyTreeItem *bart = new MyTreeItem(..); // class derived from Fl_Tree_Item
tree->add("/Simpsons/Bart", bart); // Add item as /Simpsons/Bart
```

..or you can insert or replace existing items:

```
// Example #2: using replace()
MyTreeItem *marge = new MyTreeItem(..); // class derived from Fl_Tree_Item
item = tree->add("/Simpsons/Marge"); // create item
item->replace(mi); // replace it with our own
```

## Parameters

in	<i>render</i>	Whether we should render content (1), or just tally the geometry (0). <a href="#">Fl_Tree</a> may want only to find the widest item in the tree for scrollbar calculations.
----	---------------	---

## Returns

the right-most X coordinate, or 'xmax' of content we drew, i.e. the "scrollable" content. The tree uses the largest xmax to determine the maximum width of the tree's content (needed for e.g. computing the horizontal scrollbar's size).

## Version

1.3.3 ABI feature

**33.154.3.15 draw\_vertical\_connector()**

```
void Fl_Tree_Item::draw_vertical_connector (
    int x,
    int y1,
    int y2,
    const Fl_Tree_Prefs & prefs ) [protected], [virtual]
```

Vertical connector line based on preference settings.

This method can be overridden to implement custom connection line drawing.

## Parameters

in	<i>x</i>	The x position of the vertical connector
in	<i>y1</i>	The top of the vertical connector
in	<i>y2</i>	The bottom of the vertical connector
in	<i>prefs</i>	The <a href="#">Fl_Tree</a> prefs

**33.154.3.16 drawbgcolor()**

```
Fl_Color Fl_Tree_Item::drawbgcolor ( ) const [protected]
```

Returns the recommended background color used for drawing this item.

## See also

[draw\\_item\\_content\(\)](#)

## Version

1.3.3 ABI

**33.154.3.17 drawfgcolor()**

```
Fl_Color Fl_Tree_Item::drawfgcolor ( ) const [protected]
```

Returns the recommended foreground color used for drawing this item.

## See also

[draw\\_item\\_content\(\)](#)

## Version

1.3.3 ABI ABI

**33.154.3.18 find\_child()** [1/2]

```
int Fl_Tree_Item::find_child (
    const char * name )
```

Return the index of the immediate child of this item that has the label 'name'.

## Returns

index of found item, or -1 if not found.

## Version

1.3.0 release

**33.154.3.19 find\_child()** [2/2]

```
int Fl_Tree_Item::find_child (
    Fl_Tree_Item * item )
```

Find the index number for the specified 'item' in the current item's list of children.

## Returns

the index, or -1 if not found.

**33.154.3.20 find\_child\_item()** [1/2]

```
const Fl_Tree_Item * Fl_Tree_Item::find_child_item (
    char ** arr ) const
```

Find child item by descending array 'arr' of names.

Does not include self in search. Only [Fl\\_Tree](#) should need this method.

## Returns

item, or 0 if not found

## Version

1.3.0 release

**33.154.3.21 find\_child\_item()** [2/2]

```
const Fl_Tree_Item * Fl_Tree_Item::find_child_item (
    const char * name ) const
```

Return the /immediate/ child of current item that has the label 'name'.

## Returns

const found item, or 0 if not found.

## Version

1.3.3

**33.154.3.22 find\_clicked()**

```
const Fl_Tree_Item * Fl_Tree_Item::find_clicked (
    const Fl_Tree_Prefs & prefs,
    int yonly = 0 ) const
```

Find the item that the last event was over.

If 'yonly' is 1, only check event's y value, don't care about x.

**Parameters**

in	<i>prefs</i>	The parent tree's <a href="#">Fl_Tree_Prefs</a>
in	<i>yonly</i>	– 0: check both event's X and Y values. – 1: only check event's Y value, don't care about X.

**Returns**

pointer to clicked item, or NULL if none found

**Version**

1.3.3 ABI feature

**33.154.3.23 find\_item()**

```
const Fl_Tree_Item * Fl_Tree_Item::find_item (
    char ** names ) const
```

Find item by descending array of 'names'.

Includes self in search. Only [Fl\\_Tree](#) should need this method. Use [Fl\\_Tree::find\\_item\(\)](#) instead.

**Returns**

const item, or 0 if not found

**33.154.3.24 hide\_widgets()**

```
void Fl_Tree_Item::hide_widgets ( ) [protected]
```

Internal: Hide the FLTK [widget\(\)](#) for this item and all children.

Used by [close\(\)](#) to hide widgets.

**33.154.3.25 insert()**

```
Fl_Tree_Item * Fl_Tree_Item::insert (
    const Fl_Tree_Prefs & prefs,
    const char * new_label,
    int pos = 0 )
```

Insert a new item named 'new\_label' into current item's children at a specified position 'pos'.

If pos is out of range the new item is

- prepended if pos < 0 or
- appended if pos > item->[children\(\)](#).

**Returns**

the new item inserted

**See also**

[Fl\\_Tree::insert\(\)](#)

### 33.154.3.26 insert\_above()

```
Fl_Tree_Item * Fl_Tree_Item::insert_above (
    const Fl_Tree_Prefs & prefs,
    const char * new_label )
```

Insert a new item named 'new\_label' above this item.

#### Returns

the new item inserted, or 0 if an error occurred.

### 33.154.3.27 is\_visible\_r()

```
int Fl_Tree_Item::is_visible_r ( ) const
```

See if item and all its parents are [open\(\)](#) and [visible\(\)](#).

#### Returns

1 – item and its parents are [open\(\)](#) and [visible\(\)](#) 0 – item or one of its parents are either not [visible\(\)](#) or [close\(\)](#)ed.

### 33.154.3.28 label()

```
void Fl_Tree_Item::label (
    const char * name )
```

Set the label to 'name'.

Makes and manages an internal copy of 'name'.

### 33.154.3.29 label\_h()

```
int Fl_Tree_Item::label_h ( ) const [inline]
```

The item's label height.

#### Version

1.3.3

### 33.154.3.30 label\_w()

```
int Fl_Tree_Item::label_w ( ) const [inline]
```

The item's maximum label width to right edge of [Fl\\_Tree](#)'s inner width within scrollbars.

#### Version

1.3.3

### 33.154.3.31 label\_x()

```
int Fl_Tree_Item::label_x ( ) const [inline]
```

The item's label x position relative to the window.

#### Version

1.3.3

**33.154.3.32 label\_y()**

```
int Fl_Tree_Item::label_y ( ) const [inline]
```

The item's label y position relative to the window.

Version

1.3.3

**33.154.3.33 labelbgcolor() [1/2]**

```
Fl_Color Fl_Tree_Item::labelbgcolor ( ) const [inline]
```

Return item's label background text color.

If the color is 0xffffffff, the default behavior is the parent tree's bg color will be used. (An overloaded [draw\\_item\\_content\(\)](#) can override this behavior.)

**33.154.3.34 labelbgcolor() [2/2]**

```
void Fl_Tree_Item::labelbgcolor (
    Fl_Color val ) [inline]
```

Set item's label background color.

A special case is made for color 0xffffffff which uses the parent tree's bg color.

**33.154.3.35 move() [1/2]**

```
int Fl_Tree_Item::move (
    Fl_Tree_Item * item,
    int op = 0,
    int pos = 0 )
```

Move the current item above/below/into the specified 'item', where 'op' determines the type of move:

- 0: move above 'item' ('pos' ignored)
- 1: move below 'item' ('pos' ignored)
- 2: move into 'item' as a child (at optional position 'pos')

..and 'pos' determines an optional index position after the move.

Returns

0 on success. a negative number on error:

- -1: one of the items has no parent
- -2: item's index could not be determined
- -3: bad 'op'
- -4: index range error
- -5: could not deparent
- -6: could not reparent at 'pos'
- (Other return values reserved for future use.)

See also

[move\\_above\(\)](#), [move\\_below\(\)](#), [move\\_into\(\)](#), [move\(int,int\)](#)

**33.154.3.36 move() [2/2]**

```
int Fl_Tree_Item::move (
    int to,
    int from )
```

Move an item within its parent using index numbers.

Item is moved 'to' its new position 'from' its old position.

**Returns**

- 0: Success
- -1: range error (e.g. if 'to' or 'from' out of range).
- (Other return values reserved for future use)

**See also**

[move\\_above\(\)](#), [move\\_below\(\)](#), [move\\_into\(\)](#), [move\(Fl\\_Tree\\_Item\\*,int,int\)](#)

**33.154.3.37 move\_above()**

```
int Fl_Tree_Item::move_above (
    Fl_Tree_Item * item )
```

Move the current item above the specified 'item'.

This is the equivalent of calling `move(item,0,0)`.

**Returns**

0 on success.

On error returns a negative value; see [move\(Fl\\_Tree\\_Item\\*,int,int\)](#) for possible error codes.

**See also**

[move\\_below\(\)](#), [move\\_into\(\)](#), [move\(int,int\)](#), [move\(Fl\\_Tree\\_Item\\*,int,int\)](#)

**33.154.3.38 move\_below()**

```
int Fl_Tree_Item::move_below (
    Fl_Tree_Item * item )
```

Move the current item below the specified 'item'.

This is the equivalent of calling `move(item,1,0)`.

**Returns**

0 on success.

On error returns a negative value; see [move\(Fl\\_Tree\\_Item\\*,int,int\)](#) for possible error codes.

**See also**

[move\\_above\(\)](#), [move\\_into\(\)](#), [move\(int,int\)](#), [move\(Fl\\_Tree\\_Item\\*,int,int\)](#)

**33.154.3.39 move\_into()**

```
int Fl_Tree_Item::move_into (
    Fl_Tree_Item * item,
    int pos = 0 )
```

Parent the current item as a child of the specified 'item'.

This is the equivalent of calling `move(item,2,pos)`.

**Returns**

0 on success.

On error returns a negative value; see [move\(Fl\\_Tree\\_Item\\*,int,int\)](#) for possible error codes.

**See also**

[move\\_above\(\)](#), [move\\_below\(\)](#), [move\(int,int\)](#), [move\(Fl\\_Tree\\_Item\\*,int,int\)](#)

**33.154.3.40 next()**

```
Fl_Tree_Item * Fl_Tree_Item::next ( )
```

Return the next item in the tree.

This method can be used to walk the tree forward. For an example of how to use this method, see [Fl\\_Tree::first\(\)](#).

**Returns**

the next item in the tree, or 0 if there's no more items.

**33.154.3.41 next\_displayed()**

```
Fl_Tree_Item * Fl_Tree_Item::next_displayed (
    Fl_Tree_Prefs & prefs )
```

Same as [next\\_visible\(\)](#).

**Deprecated** in 1.3.3 for confusing name, use [next\\_visible\(\)](#) instead

**33.154.3.42 next\_sibling()**

```
Fl_Tree_Item * Fl_Tree_Item::next_sibling ( )
```

Return this item's next sibling.

Moves to the next item below us at the same level (sibling). Use this to move down the tree without changing [depth\(\)](#). effectively skipping over this item's children/descendents.

**Returns**

item's next sibling, or 0 if none.

**33.154.3.43 next\_visible()**

```
Fl_Tree_Item * Fl_Tree_Item::next_visible (
    Fl_Tree_Prefs & prefs )
```

Return the next [open\(\)](#), [visible\(\)](#) item.

(If this item has children and is closed, children are skipped)

This method can be used to walk the tree forward, skipping items that are not currently open/visible to the user.

**Returns**

the next [open\(\)](#) [visible\(\)](#) item below us, or 0 if there's no more items.

**Version**

1.3.3

**33.154.3.44 parent()**

```
void Fl_Tree_Item::parent (
    Fl_Tree_Item * val ) [inline]
```

Set the parent for this item.

Should only be used by [Fl\\_Tree](#)'s internals.

**33.154.3.45 prefs()**

```
const Fl_Tree_Prefs & Fl_Tree_Item::prefs ( ) const
```

Return the parent tree's prefs.

**Returns**

a reference to the parent tree's [Fl\\_Tree\\_Prefs](#)

**Version**

1.3.3 ABI feature

**33.154.3.46 prev()**

```
Fl_Tree_Item * Fl_Tree_Item::prev ( )
```

Return the previous item in the tree.

This method can be used to walk the tree backwards. For an example of how to use this method, see [Fl\\_Tree::last\(\)](#).

**Returns**

the previous item in the tree, or 0 if there's no item above this one (hit the root).

**33.154.3.47 prev\_displayed()**

```
Fl_Tree_Item * Fl_Tree_Item::prev_displayed (
    Fl_Tree_Prefs & prefs )
```

Same as [prev\\_visible\(\)](#).

**Deprecated** in 1.3.3 for confusing name, use [prev\\_visible\(\)](#)

**33.154.3.48 prev\_sibling()**

```
Fl_Tree_Item * Fl_Tree_Item::prev_sibling ( )
```

Return this item's previous sibling.

Moves to the previous item above us at the same level (sibling). Use this to move up the tree without changing [depth\(\)](#).

**Returns**

This item's previous sibling, or 0 if none.

**33.154.3.49 prev\_visible()**

```
Fl_Tree_Item * Fl_Tree_Item::prev_visible (
    Fl_Tree_Prefs & prefs )
```

Return the previous [open\(\)](#), [visible\(\)](#) item.

(If this item above us has children and is closed, its children are skipped)

This method can be used to walk the tree backward, skipping items that are not currently open/visible to the user.

**Returns**

the previous [open\(\)](#) [visible\(\)](#) item above us, or 0 if there's no more items.

**33.154.3.50 recalc\_tree()**

```
void Fl_Tree_Item::recalc_tree ( ) [protected]
```

Call this when our geometry is changed.

(Font size, label contents, etc) Schedules tree to recalculate itself, as changes to us may affect tree widget's scrollbar visibility and tab sizes.

**Version**

1.3.3 ABI

**33.154.3.51 remove\_child() [1/2]**

```
int Fl_Tree_Item::remove_child (
    const char * name )
```

Remove immediate child (and its children) by its label 'name'.

If more than one item matches 'name', only the first matching item is removed.

**Parameters**

<code>in</code>	<code>name</code>	The label name of the immediate child to remove
-----------------	-------------------	---

**Returns**

0 if removed, -1 if not found.

**Version**

1.3.3

**33.154.3.52 remove\_child() [2/2]**

```
int Fl_Tree_Item::remove_child (
    Fl_Tree_Item * item )
```

Remove 'item' from the current item's children.

**Returns**

0 if removed, -1 if item not an immediate child.

**33.154.3.53 reparent()**

```
int Fl_Tree_Item::reparent (
    Fl_Tree_Item * newchild,
    int pos )
```

Reparent specified item as a child of ourself at position 'pos'.

Typically 'newchild' was recently orphaned with [deparent\(\)](#).

**Returns**

- 0: on success
- -1: on error (e.g. if 'pos' out of range) with no changes made.

See also

[deparent\(\)](#)

### 33.154.3.54 replace()

```
Fl_Tree_Item * Fl_Tree_Item::replace (
    Fl_Tree_Item * newitem )
```

Replace the current item with a new item.

The current item is destroyed if successful. No checks are made to see if an item with the same name exists.

This method can be used to, for example, install 'custom' items into the tree derived from [Fl\\_Tree\\_Item](#); see [draw\\_item\\_content\(\)](#).

#### Parameters

in	<i>newitem</i>	The new item to replace the current item
----	----------------	--

#### Returns

*newitem* on success, NULL if could not be replaced.

See also

[Fl\\_Tree\\_Item::draw\\_item\\_content\(\)](#), [Fl\\_Tree::root\(Fl\\_Tree\\_Item\\*\)](#)

#### Version

1.3.3 ABI feature

### 33.154.3.55 replace\_child()

```
Fl_Tree_Item * Fl_Tree_Item::replace_child (
    Fl_Tree_Item * olditem,
    Fl_Tree_Item * newitem )
```

Replace existing child 'olditem' with 'newitem'.

The 'olditem' is destroyed if successful. Can be used to put custom items (derived from [Fl\\_Tree\\_Item](#)) into the tree. No checks are made to see if an item with the same name exists.

#### Parameters

in	<i>olditem</i>	The item to be found and replaced
in	<i>newitem</i>	The new item to take the place of 'olditem'

#### Returns

*newitem* on success and 'olditem' is destroyed. NULL on error if 'olditem' was not found as an immediate child.

See also

[replace\(\)](#), [Fl\\_Tree\\_Item::draw\(\)](#)

#### Version

1.3.3 ABI feature

**33.154.3.56 select()**

```
void Fl_Tree_Item::select (
    int val = 1 ) [inline]
```

Change the item's selection state to the optionally specified 'val'.  
If 'val' is not specified, the item will be selected.

**33.154.3.57 select\_all()**

```
int Fl_Tree_Item::select_all ( ) [inline]
```

Select item and all its children.

Returns count of how many items were in the 'deselected' state, ie. how many items were "changed".

**33.154.3.58 show\_self()**

```
void Fl_Tree_Item::show_self (
    const char * indent = "" ) const
```

Print the tree as 'ascii art' to stdout.

Used mainly for debugging.

**33.154.3.59 show\_widgets()**

```
void Fl_Tree_Item::show_widgets ( ) [protected]
```

Internal: Show the FLTK [widget\(\)](#) for this item and all children.

Used by [open\(\)](#) to re-show widgets that were hidden by a previous [close\(\)](#)

**33.154.3.60 swap\_children() [1/2]**

```
int Fl_Tree_Item::swap_children (
    Fl_Tree_Item * a,
    Fl_Tree_Item * b )
```

Swap two of our immediate children, given item pointers.

Use e.g. for sorting.

This method is SLOW because it involves linear lookups.

For speed, use [swap\\_children\(int,int\)](#) instead.

**Parameters**

in	<i>a,b</i>	The item ptrs of the two items to swap. Both must be immediate children of the current item.
----	------------	--

**Returns**

- 0 : OK
- -1 : failed: item 'a' or 'b' is not our child.

**33.154.3.61 swap\_children() [2/2]**

```
void Fl_Tree_Item::swap_children (
    int ax,
    int bx )
```

Swap two of our children, given two child index values 'ax' and 'bx'.

Use e.g. for sorting.

This method is FAST, and does not involve lookups.

No range checking is done on either index value.

**Parameters**

in	<i>ax,bx</i>	the index of the items to swap
----	--------------	--------------------------------

**33.154.3.62 tree()** [1/2]

```
Fl_Tree * Fl_Tree_Item::tree ( ) [inline]
```

Return the tree for this item.

Version

1.3.4

**33.154.3.63 tree()** [2/2]

```
const Fl_Tree * Fl_Tree_Item::tree ( ) const [inline]
```

Return the tree for this item.

Version

1.3.3

**33.154.3.64 update\_prev\_next()**

```
void Fl_Tree_Item::update_prev_next (
    int index )
```

Update our `_prev_sibling` and `_next_sibling` pointers to point to neighbors given `index` as being our current position in the parent's item array.

Call this whenever items in the array are added/removed/moved/swapped/etc.

**Parameters**

in	<i>index</i>	Our index# in the parent. Special case if <code>index=-1</code> : become an orphan; null out all parent/sibling associations.
----	--------------	--

**33.154.3.65 userdeicon()** [1/2]

```
Fl_Image * Fl_Tree_Item::userdeicon ( ) const [inline]
```

Return the deactivated version of the user icon, if any.

Returns 0 if none.

**33.154.3.66 userdeicon()** [2/2]

```
void Fl_Tree_Item::userdeicon (
    Fl_Image * val ) [inline]
```

Set the usericon to draw when the item is deactivated.

Use '0' to disable. No internal copy is made; caller must manage icon's memory.

To create a typical 'grayed out' version of your usericon image, you can do the following:

```
// Create tree + usericon for items
Fl_Tree *tree = new Fl_Tree(..);
Fl_Image *usr_icon = new Fl_Pixmap(..); // your usericon
Fl_Image *de_icon = usr_icon->copy(); // make a copy, and..
de_icon->inactive(); // make it 'grayed out'
...
for ( .. ) { // item loop..
    item = tree->add("..."); // create new item
    item->usericon(usr_icon); // assign usericon to items
    item->userdeicon(de_icon); // assign userdeicon to items
    ..
}
```

In the above example, the app should 'delete' the two icons when they're no longer needed (e.g. after the tree is destroyed)

Version

1.3.4

### 33.154.3.67 usericon()

```
void Fl_Tree_Item::usericon (
    Fl_Image * val ) [inline]
```

Set the item's user icon to an [Fl\\_Image](#).

Use '0' to disable. No internal copy is made, caller must manage icon's memory.

Note, if you expect your items to be deactivated(), use [userdeicon\(Fl\\_Image\\*\)](#) to set up a 'grayed out' version of your icon to be used for display.

See also

[userdeicon\(Fl\\_Image\\*\)](#)

### 33.154.3.68 visible\_r()

```
int Fl_Tree_Item::visible_r ( ) const [inline]
```

See if item and all its parents are [open\(\)](#) and [visible\(\)](#).

Alias for [is\\_visible\\_r\(\)](#).

Returns

1 – item and its parents are [open\(\)](#) and [visible\(\)](#) 0 – item (or one of its parents) are not visible or [close\(\)](#)ed.

The documentation for this class was generated from the following files:

- [Fl\\_Tree\\_Item.H](#)
- [Fl\\_Tree\\_Item.cxx](#)

## 33.155 Fl\_Tree\_Item\_Array Class Reference

Manages an array of [Fl\\_Tree\\_Item](#) pointers.

```
#include <Fl_Tree_Item_Array.H>
```

### Public Member Functions

- void [add](#) ([Fl\\_Tree\\_Item](#) \*val)  
*Add an item\* to the end of the array.*
- void [clear](#) ()  
*Clear the entire array.*
- int [deparent](#) (int pos)  
*Deparent item at 'pos' from our list of children.*
- [Fl\\_Tree\\_Item\\_Array](#) (const [Fl\\_Tree\\_Item\\_Array](#) \*o)  
*Copy constructor. Makes new copy of array, with new instances of each item.*
- [Fl\\_Tree\\_Item\\_Array](#) (int new\_chunksize=10)  
*Constructor; creates an empty array.*
- void [insert](#) (int pos, [Fl\\_Tree\\_Item](#) \*new\_item)  
*Insert an item at index position pos.*
- int [manage\\_item\\_destroy](#) () const
- void [manage\\_item\\_destroy](#) (int val)

- Option to control if `Fl_Tree_Item_Array`'s destructor will also destroy the `Fl_Tree_Item`'s.
- `int move` (int to, int from)  
Move item at 'from' to new position 'to' in the array.
- `Fl_Tree_Item * operator[]` (int i)  
Return the item and index *i*.
- `const Fl_Tree_Item * operator[]` (int i) const  
Const version of `operator[]`(int i)
- `int remove` (`Fl_Tree_Item *item`)  
Remove the item from the array.
- `void remove` (int index)  
Remove the item at.
- `int reparent` (`Fl_Tree_Item *item`, `Fl_Tree_Item *newparent`, int pos)  
Reparent specified item as a child of ourself.
- `void replace` (int pos, `Fl_Tree_Item *new_item`)  
Replace the item at *index* with *newitem*.
- `void swap` (int ax, int bx)  
Swap the two items at index positions *ax* and *bx*.
- `int total` () const  
Return the total items in the array, or 0 if empty.
- `~Fl_Tree_Item_Array` ()  
Destructor. Calls each item's destructor, destroys internal `_items` array.

### 33.155.1 Detailed Description

Manages an array of `Fl_Tree_Item` pointers.

Because FLTK 1.x.x. has mandated that templates and STL not be used, we use this class to dynamically manage the arrays.

None of the methods do range checking on index values; the caller must be sure that index values are within the range  $0 < \text{index} < \text{total}()$  (unless otherwise noted).

### 33.155.2 Constructor & Destructor Documentation

#### 33.155.2.1 Fl\_Tree\_Item\_Array()

```
Fl_Tree_Item_Array::Fl_Tree_Item_Array (
    int new_chunksize = 10 )
```

Constructor; creates an empty array.

The optional 'chunksize' can be specified to optimize memory allocation for potentially large arrays. Default chunksize is 10.

### 33.155.3 Member Function Documentation

#### 33.155.3.1 add()

```
void Fl_Tree_Item_Array::add (
    Fl_Tree_Item * val )
```

Add an item\* to the end of the array.

Assumes the item was created with 'new', and will remain allocated.. `Fl_Tree_Item_Array` will handle calling the item's destructor when the array is cleared or the item `remove()`'ed.

**33.155.3.2 clear()**

```
void Fl_Tree_Item_Array::clear (
    void )
```

Clear the entire array.

Each item will be deleted (destructors will be called), and the array will be cleared. `total()` will return 0.

**33.155.3.3 deparent()**

```
int Fl_Tree_Item_Array::deparent (
    int pos )
```

Deparent item at 'pos' from our list of children.

Similar to a [remove\(\)](#) without the destruction of the item. This creates an orphaned item (still allocated, has no parent) which soon after is typically reparented elsewhere.

\returns 0 on success, -1 on error (e.g. if \p 'pos' out of range)

**33.155.3.4 insert()**

```
void Fl_Tree_Item_Array::insert (
    int pos,
    Fl_Tree_Item * new_item )
```

Insert an item at index position pos.

Handles enlarging array if needed, total increased by 1.

If \p pos \>= total(), the item is appended to the array.

If \p pos \< 0, the item is prepended (works like pos == 0).

**33.155.3.5 manage\_item\_destroy()**

```
void Fl_Tree_Item_Array::manage_item_destroy (
    int val ) [inline]
```

Option to control if [Fl\\_Tree\\_Item\\_Array](#)'s destructor will also destroy the [Fl\\_Tree\\_Item](#)'s.

If set: items and item array is destroyed. If clear: only the item array is destroyed, not items themselves.

**33.155.3.6 move()**

```
int Fl_Tree_Item_Array::move (
    int to,
    int from )
```

Move item at 'from' to new position 'to' in the array.

Due to how the moving an item shuffles the array around, a positional 'move' implies things that may not be obvious:

- When 'from' moved lower in tree, appears BELOW item that was at 'to'.
- When 'from' moved higher in tree, appears ABOVE item that was at 'to'.

**Returns**

0 on success, -1 on range error (e.g. if 'to' or 'from' out of range)

**33.155.3.7 remove() [1/2]**

```
int Fl_Tree_Item_Array::remove (
    Fl_Tree_Item * item )
```

Remove the item from the array.

\returns 0 if removed, or -1 if the item was not in the array.

**33.155.3.8 remove() [2/2]**

```
void Fl_Tree_Item_Array::remove (
    int index )
```

Remove the item at.

**Parameters**

in	index	from the array.
		The item will be delete'd (if non-NULL), so its destructor will be called.

**33.155.3.9 reparent()**

```
int Fl_Tree_Item_Array::reparent (
    Fl_Tree_Item * item,
    Fl_Tree_Item * newparent,
    int pos )
```

Reparent specified item as a child of ourself.

Typically 'newchild' was recently orphaned with [deparent\(\)](#).

\returns 0 on success, -1 on error (e.g. if \p 'pos' out of range)

**33.155.3.10 replace()**

```
void Fl_Tree_Item_Array::replace (
    int index,
    Fl_Tree_Item * newitem )
```

Replace the item at index with newitem.

Old item at index position will be destroyed, and the new item will take it's place, and stitched into the linked list.

The documentation for this class was generated from the following files:

- [Fl\\_Tree\\_Item\\_Array.H](#)
- [Fl\\_Tree\\_Item\\_Array.cxx](#)

**33.156 Fl\_Tree\_Prefs Class Reference**

Tree widget's preferences.

```
#include <Fl_Tree_Prefs.H>
```

**Public Member Functions**

- [Fl\\_Image](#) \* [closedeicon](#) () const  
*Return the deactivated version of the close icon, if any.*
- [Fl\\_Image](#) \* [closeicon](#) () const

- Gets the default 'close' icon Returns the FI\_Image\* of the icon, or 0 if none.*

  - void [closeicon](#) ([FI\\_Image](#) \*val)

*Sets the icon to be used as the 'close' icon.*

  - int **closeicon\_h** () const
  - int **closeicon\_w** () const
  - [FI\\_Color](#) **connectorcolor** () const

*Get the connector color used for tree connection lines.*

  - void **connectorcolor** ([FI\\_Color](#) val)

*Set the connector color used for tree connection lines.*

  - [FI\\_Tree\\_Connector](#) **connectorstyle** () const

*Get the connector style.*

  - void **connectorstyle** ([FI\\_Tree\\_Connector](#) val)

*Set the connector style.*

  - void **connectorstyle** (int val)

*Set the connector style [integer].*

  - int **connectorwidth** () const

*Get the tree connection line's width.*

  - void **connectorwidth** (int val)

*Set the tree connection line's width.*

  - void **do\_item\_draw\_callback** ([FI\\_Tree\\_Item](#) \*o) const
  - **FI\_Tree\_Prefs** ()

*FI\_Tree\_Prefs constructor.*

  - [FI\\_Tree\\_Item\\_Draw\\_Callback](#) \* **item\_draw\_callback** () const
  - void **item\_draw\_callback** ([FI\\_Tree\\_Item\\_Draw\\_Callback](#) \*cb, void \*data=0)
  - [FI\\_Tree\\_Item\\_Draw\\_Mode](#) **item\_draw\_mode** () const

*Get the 'item draw mode' used for the tree.*

  - void **item\_draw\_mode** ([FI\\_Tree\\_Item\\_Draw\\_Mode](#) val)

*Set the 'item draw mode' used for the tree to val.*

  - void \* **item\_draw\_user\_data** () const
  - [FI\\_Color](#) **item\_labelbgcolor** () const

*Get the default label background color.*

  - void **item\_labelbgcolor** ([FI\\_Color](#) val)

*Set the default label background color.*

  - [FI\\_Color](#) **item\_labelfgcolor** () const

*Get the default label foreground color.*

  - void **item\_labelfgcolor** ([FI\\_Color](#) val)

*Set the default label foreground color.*

  - [FI\\_Font](#) **item\_labelfont** () const

*Return the label's font.*

  - void **item\_labelfont** ([FI\\_Font](#) val)

*Set the label's font to val.*

  - [FI\\_Fontsize](#) **item\_labelsize** () const

*Return the label's size in pixels.*

  - void **item\_labelsize** ([FI\\_Fontsize](#) val)

*Set the label's size in pixels to val.*

  - [FI\\_Tree\\_Item\\_Reselect\\_Mode](#) **item\_reselect\_mode** () const

*Returns the current item re/selection mode.*

  - void **item\_reselect\_mode** ([FI\\_Tree\\_Item\\_Reselect\\_Mode](#) mode)

*Sets the item re/selection mode.*

  - [FI\\_Color](#) **labelbgcolor** () const

*Obsolete: Get the default label background color. Please use [item\\_labelbgcolor\(\)](#) instead.*

- void **labelbgcolor** ([FI\\_Color](#) val)
 

*Obsolete: Set the default label background color. Please use [item\\_labelbgcolor\(FI\\_Color\)](#) instead.*
- [FI\\_Color](#) **labelfgcolor** () const
 

*Obsolete: Get the default label foreground color. Please use [item\\_labelfgcolor\(\)](#) instead.*
- void **labelfgcolor** ([FI\\_Color](#) val)
 

*Obsolete: Set the default label foreground color. Please use [item\\_labelfgcolor\(FI\\_Color\)](#) instead.*
- [FI\\_Font](#) **labelfont** () const
 

*Obsolete: Return the label's font. Please use [item\\_labelfont\(\)](#) instead.*
- void **labelfont** ([FI\\_Font](#) val)
 

*Obsolete: Set the label's font to val. Please use [item\\_labelfont\(FI\\_Font\)](#) instead.*
- int **labelmarginleft** () const
 

*Get the label's left margin value in pixels.*
- void **labelmarginleft** (int val)
 

*Set the label's left margin value in pixels.*
- [FI\\_Fontsize](#) **labelsize** () const
 

*Obsolete: Return the label's size in pixels. Please use [item\\_labelsize\(\)](#) instead.*
- void **labelsize** ([FI\\_Fontsize](#) val)
 

*Obsolete: Set the label's size in pixels to val. Please use [item\\_labelsize\(FI\\_Fontsize\)](#) instead.*
- int **linespacing** () const
 

*Get the line spacing value in pixels.*
- void **linespacing** (int val)
 

*Set the line spacing value in pixels.*
- int **marginbottom** () const
 

*Get the bottom margin's value in pixels.*
- void **marginbottom** (int val)
 

*Set the bottom margin's value in pixels This is the extra distance the vertical scroller lets you travel.*
- int **marginleft** () const
 

*Get the left margin's value in pixels.*
- void **marginleft** (int val)
 

*Set the left margin's value in pixels.*
- int **margintop** () const
 

*Get the top margin's value in pixels.*
- void **margintop** (int val)
 

*Set the top margin's value in pixels.*
- int **openchild\_marginbottom** () const
 

*Get the margin below an open child in pixels.*
- void **openchild\_marginbottom** (int val)
 

*Set the margin below an open child in pixels.*
- [FI\\_Image](#) \* **opendeicon** () const
 

*Return the deactivated version of the open icon, if any.*
- [FI\\_Image](#) \* **openicon** () const
 

*Get the current default 'open' icon.*
- void **openicon** ([FI\\_Image](#) \*val)
 

*Sets the default icon to be used as the 'open' icon when items are add()ed to the tree.*
- int **openicon\_h** () const
- int **openicon\_w** () const
- [FI\\_Boxtype](#) **selectbox** () const
 

*Get the default selection box's box drawing style as an FI\_Boxtype.*
- void **selectbox** ([FI\\_Boxtype](#) val)
 

*Set the default selection box's box drawing style to val.*
- [FI\\_Tree\\_Select](#) **selectmode** () const

- Get the selection mode used for the tree.*

  - void [selectmode](#) ([Fl\\_Tree\\_Select](#) val)

*Set the selection mode used for the tree to val.*
- char **showcollapse** () const

*Returns 1 if the collapse icon is enabled, 0 if not.*
- void [showcollapse](#) (int val)

*Set if we should show the collapse icon or not.*
- int **showroot** () const

*Returns 1 if the root item is to be shown, or 0 if not.*
- void [showroot](#) (int val)

*Set if the root item should be shown or not.*
- [Fl\\_Tree\\_Sort](#) **sortorder** () const

*Get the default sort order value.*
- void [sortorder](#) ([Fl\\_Tree\\_Sort](#) val)

*Set the default sort order value.*
- [Fl\\_Image](#) \* [userdeicon](#) () const

*Return the deactivated version of the user icon, if any.*
- [Fl\\_Image](#) \* **usericon** () const

*Gets the default 'user icon' (default is 0)*
- void **usericon** ([Fl\\_Image](#) \*val)

*Sets the default 'user icon' Returns the Fl\_Image\* of the icon, or 0 if none (default).*
- int **usericonmarginleft** () const

*Get the user icon's left margin value in pixels.*
- void **usericonmarginleft** (int val)

*Set the user icon's left margin value in pixels.*
- int **widgetmarginleft** () const

*Get the widget()'s left margin value in pixels.*
- void **widgetmarginleft** (int val)

*Set the widget's left margin value in pixels.*
- ~[Fl\\_Tree\\_Prefs](#) ()

*[Fl\\_Tree\\_Prefs](#) destructor.*

### 33.156.1 Detailed Description

Tree widget's preferences.

[Fl\\_Tree](#)'s Preferences class.

This class manages the [Fl\\_Tree](#)'s defaults. You should probably be using the methods in [Fl\\_Tree](#) instead of trying to accessing tree's preferences settings directly.

### 33.156.2 Member Function Documentation

#### 33.156.2.1 closedeicon()

```
Fl\_Image * Fl_Tree_Prefs::closedeicon ( ) const [inline]
```

Return the deactivated version of the close icon, if any.

Returns 0 if none.

#### 33.156.2.2 closeicon()

```
void Fl_Tree_Prefs::closeicon (
    Fl\_Image * val )
```

Sets the icon to be used as the 'close' icon.

This overrides the built in default '[-]' icon.

## Parameters

in	val	– The new image, or zero to use the default [-] icon.
----	-----	---

**33.156.2.3 item\_draw\_mode()**

```
void Fl_Tree_Prefs::item_draw_mode (
    Fl_Tree_Item_Draw_Mode val ) [inline]
```

Set the 'item draw mode' used for the tree to `val`.

This affects how items in the tree are drawn, such as when a `widget()` is defined. See `Fl_Tree_Item_Draw_Mode` for possible values.

**33.156.2.4 item\_labelbgcolor() [1/2]**

```
Fl_Color Fl_Tree_Prefs::item_labelbgcolor (
    void ) const [inline]
```

Get the default label background color.

This returns the `Fl_Tree::color()` unless `item_labelbgcolor()` has been set explicitly.

**33.156.2.5 item\_labelbgcolor() [2/2]**

```
void Fl_Tree_Prefs::item_labelbgcolor (
    Fl_Color val ) [inline]
```

Set the default label background color.

Once set, overrides the default behavior of using `Fl_Tree::color()`.

**33.156.2.6 marginbottom()**

```
int Fl_Tree_Prefs::marginbottom ( ) const [inline]
```

Get the bottom margin's value in pixels.

This is the extra distance the vertical scroller lets you travel.

**33.156.2.7 opendeicon()**

```
Fl_Image * Fl_Tree_Prefs::opendeicon ( ) const [inline]
```

Return the deactivated version of the open icon, if any.

Returns 0 if none.

**33.156.2.8 openicon() [1/2]**

```
Fl_Image * Fl_Tree_Prefs::openicon ( ) const [inline]
```

Get the current default 'open' icon.

Returns the `Fl_Image*` of the icon, or 0 if none.

**33.156.2.9 openicon() [2/2]**

```
void Fl_Tree_Prefs::openicon (
    Fl_Image * val )
```

Sets the default icon to be used as the 'open' icon when items are add()ed to the tree.

This overrides the built in default '[+]' icon.

## Parameters

in	val	– The new image, or zero to use the default [+] icon.
----	-----	---

**33.156.2.10 selectmode()**

```
void Fl_Tree_Prefs::selectmode (
    Fl_Tree_Select val ) [inline]
```

Set the selection mode used for the tree to `val`.

This affects how items in the tree are selected when clicked on and dragged over by the mouse. See `Fl_Tree_Select` for possible values.

**33.156.2.11 showcollapse()**

```
void Fl_Tree_Prefs::showcollapse (
    int val ) [inline]
```

Set if we should show the collapse icon or not.

If collapse icons are disabled, the user will not be able to interactively collapse items in the tree, unless the application provides some other means via `open()` and `close()`.

**Parameters**

in	val	1: shows collapse icons (default), 0: hides collapse icons.
----	-----	--

**33.156.2.12 showroot()**

```
void Fl_Tree_Prefs::showroot (
    int val ) [inline]
```

Set if the root item should be shown or not.

**Parameters**

in	val	1 – show the root item (default) 0 – hide the root item.
----	-----	---

**33.156.2.13 sortorder()**

```
void Fl_Tree_Prefs::sortorder (
    Fl_Tree_Sort val ) [inline]
```

Set the default sort order value.

Defines the order new items appear when `add()`ed to the tree. See `Fl_Tree_Sort` for possible values.

**33.156.2.14 userdeicon()**

```
Fl_Image * Fl_Tree_Prefs::userdeicon ( ) const [inline]
```

Return the deactivated version of the user icon, if any.

Returns 0 if none.

The documentation for this class was generated from the following files:

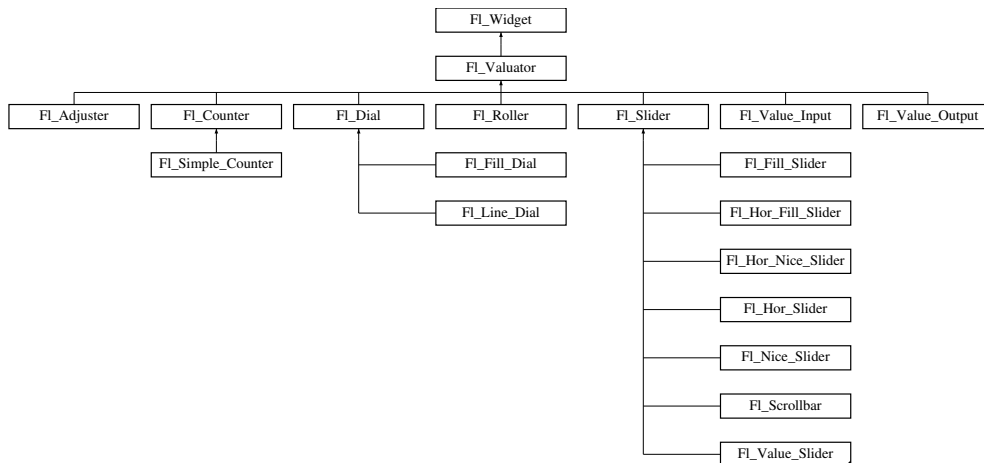
- [Fl\\_Tree\\_Prefs.H](#)
- [Fl\\_Tree\\_Prefs.cxx](#)

**33.157 FI\_Valuator Class Reference**

The `Fl_Valuator` class controls a single floating-point value and provides a consistent interface to set the value, range, and step, and insures that callbacks are done the same for every object.

```
#include <Fl_Valuator.H>
```

Inheritance diagram for `Fl_Valuator`:



## Public Member Functions

- void **bounds** (double a, double b)  
*Sets the minimum (a) and maximum (b) values for the valuator widget.*
- double **clamp** (double)  
*Clamps the passed value to the valuator range.*
- virtual int **format** (char \*)  
*Uses internal rules to format the fields numerical value into the character array pointed to by the passed parameter.*
- double **increment** (double, int)  
*Adds n times the step value to the passed value.*
- double **maximum** () const  
*Gets the maximum value for the valuator.*
- void **maximum** (double a)  
*Sets the maximum value for the valuator.*
- double **minimum** () const  
*Gets the minimum value for the valuator.*
- void **minimum** (double a)  
*Sets the minimum value for the valuator.*
- void **precision** (int digits)  
*Sets the step value to  $1.0 / 10^{\text{digits}}$ .*
- void **range** (double a, double b)  
*Sets the minimum and maximum values for the valuator.*
- double **round** (double)  
*Round the passed value to the nearest step increment.*
- double **step** () const  
*Gets or sets the step value.*
- void **step** (double a, int b)  
*See double [FL\\_Valuator::step\(\)](#) const*
- void **step** (double s)  
*See double [FL\\_Valuator::step\(\)](#) const.*
- void **step** (int a)  
*See double [FL\\_Valuator::step\(\)](#) const*
- double **value** () const  
*Gets the floating point(double) value.*
- int **value** (double)

*Sets the current value.*

- `~FL_Valuator ()` [FL\\_OVERRIDE](#)

*Destructor is accessible despite protected constructor.*

## Protected Member Functions

- [FL\\_Valuator](#) (int X, int Y, int W, int H, const char \*L)  
*Creates a new [FL\\_Valuator](#) widget using the given position, size, and label string.*
- void **handle\_drag** (double newvalue)  
*Called during a drag operation, after an `FL_WHEN_CHANGED` event is received and before the callback.*
- void **handle\_push** ()  
*Stores the current value in the previous value.*
- void **handle\_release** ()  
*Called after an `FL_WHEN_RELEASE` event is received and before the callback.*
- int **horizontal** () const  
*Tells if the valuator is an `FL_HORIZONTAL` one.*
- double **previous\_value** () const  
*Gets the previous floating point value before an event changed it.*
- void **set\_value** (double v)  
*Sets the current floating point value.*
- double **softclamp** (double)  
*Clamps the value, but accepts v if the previous value is not already out of range.*
- virtual void [value\\_damage](#) ()  
*Asks for partial redraw.*

## Additional Inherited Members

### 33.157.1 Detailed Description

The [FL\\_Valuator](#) class controls a single floating-point value and provides a consistent interface to set the value, range, and step, and insures that callbacks are done the same for every object. There are probably more of these classes in FLTK than any others:

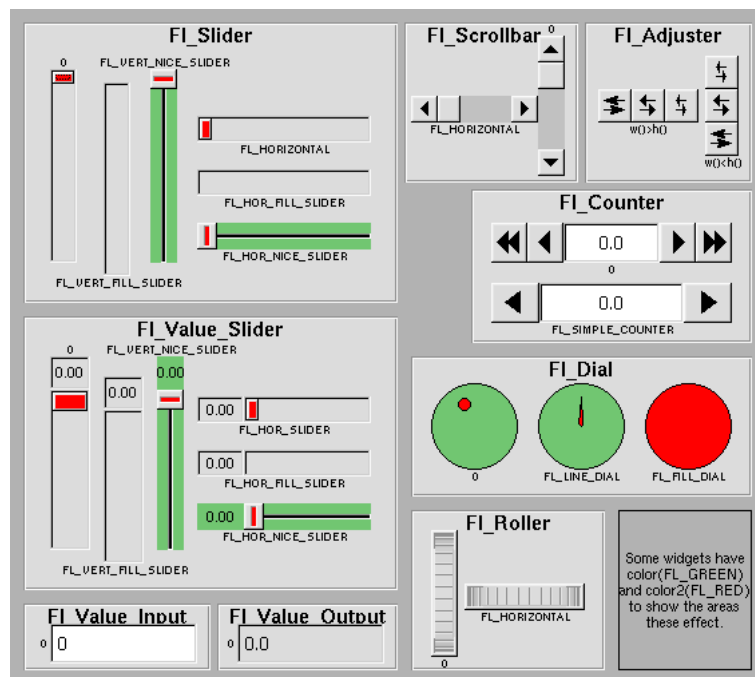


Figure 33.66 Valuator derived from FL\_Valuator

In the above diagram each box surrounds an actual subclass. These are further differentiated by setting the `type()` of the widget to the symbolic value labeling the widget. The ones labelled "0" are the default versions with a `type(0)`. For consistency the symbol `FL_VERTICAL` is defined as zero.

## 33.157.2 Constructor & Destructor Documentation

### 33.157.2.1 Fl\_Valuator()

```
Fl_Valuator::Fl_Valuator (
    int X,
    int Y,
    int W,
    int H,
    const char * L ) [protected]
```

Creates a new `Fl_Valuator` widget using the given position, size, and label string. The default boxtype is `FL_NO_BOX`.

## 33.157.3 Member Function Documentation

### 33.157.3.1 format()

```
int Fl_Valuator::format (
    char * buffer ) [virtual]
```

Uses internal rules to format the fields numerical value into the character array pointed to by the passed parameter. The actual format used depends on the current step value. If the step value has been set to zero then a `%g` format is used. If the step value is non-zero, then a `%.*f` format is used, where the precision is calculated to show sufficient digits for the current step value. An integer step value, such as 1 or 1.0, gives a precision of 0, so the formatted value will appear as an integer.

This method is used by the `Fl_Valuator_...` group of widgets to format the current value into a text string. The return value is the length of the formatted text. The formatted value is written into `buffer`. `buffer` should have space for at least 128 bytes.

You may override this function to create your own text formatting.

### 33.157.3.2 increment()

```
double Fl_Valuator::increment (
    double v,
    int n )
```

Adds `n` times the step value to the passed value.

If step was set to zero it uses `fabs(maximum() - minimum()) / 100`.

### 33.157.3.3 maximum() [1/2]

```
double Fl_Valuator::maximum ( ) const [inline]
```

Gets the maximum value for the valuator.

### 33.157.3.4 maximum() [2/2]

```
void Fl_Valuator::maximum (
    double a ) [inline]
```

Sets the maximum value for the valuator.

### 33.157.3.5 minimum() [1/2]

```
double Fl_Valuator::minimum ( ) const [inline]
```

Gets the minimum value for the valuator.

### 33.157.3.6 minimum() [2/2]

```
void Fl_Valuator::minimum (
    double a ) [inline]
```

Sets the minimum value for the valuator.

### 33.157.3.7 precision()

```
void Fl_Valuator::precision (
    int digits )
```

Sets the step value to  $1.0 / 10^{\text{digits}}$ .

Precision `digits` is limited to 0...9 to avoid internal overflow errors. Values outside this range are clamped.

#### Note

For negative values of `digits` the step value is set to  $A = 1.0$  and  $B = 1$ , i.e.  $1.0/1 = 1$ .

### 33.157.3.8 range()

```
void Fl_Valuator::range (
    double a,
    double b ) [inline]
```

Sets the minimum and maximum values for the valuator.

When the user manipulates the widget, the value is limited to this range. This clamping is done *after* rounding to the step value (this makes a difference if the range is not a multiple of the step).

The minimum may be greater than the maximum. This has the effect of "reversing" the object so the larger values are in the opposite direction. This also switches which end of the filled sliders is filled.

Some widgets consider this a "soft" range. This means they will stop at the range, but if the user releases and grabs the control again and tries to move it further, it is allowed.

The range may affect the display. You must [redraw\(\)](#) the widget after changing the range.

### 33.157.3.9 round()

```
double Fl_Valuator::round (
    double v )
```

Round the passed value to the nearest step increment.

Does nothing if step is zero.

### 33.157.3.10 step()

```
double Fl_Valuator::step ( ) const [inline]
```

Gets or sets the step value.

As the user moves the mouse the value is rounded to the nearest multiple of the step value. This is done *before* clamping it to the range. For most widgets the default step is zero.

For precision the step is stored as the ratio of a double  $A$  and an integer  $B = A/B$ . You can set these values directly. Currently setting a floating point value sets the nearest  $A/1$  or  $1/B$  value possible.

**33.157.3.11 value()** [1/2]

```
double Fl_Valuator::value ( ) const [inline]
```

Gets the floating point(double) value.

See int [value\(double\)](#)

**33.157.3.12 value()** [2/2]

```
int Fl_Valuator::value (
    double v )
```

Sets the current value.

The new value is *not* clamped or otherwise changed before storing it. Use [clamp\(\)](#) or [round\(\)](#) to modify the value before calling [value\(\)](#). The widget is redrawn if the new value is different than the current one. The initial value is zero.

[changed\(\)](#) will return true if the user has moved the slider, but it will be turned off by [value\(x\)](#) and just before doing a callback (the callback can turn it back on if desired).

**33.157.3.13 value\_damage()**

```
void Fl_Valuator::value_damage ( ) [protected], [virtual]
```

Asks for partial redraw.

Reimplemented in [Fl\\_Adjuster](#).

The documentation for this class was generated from the following files:

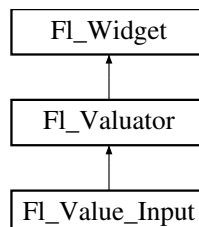
- [Fl\\_Valuator.H](#)
- [Fl\\_Valuator.cxx](#)

**33.158 Fl\_Value\_Input Class Reference**

The [Fl\\_Value\\_Input](#) widget displays a numeric value.

```
#include <Fl_Value_Input.H>
```

Inheritance diagram for [Fl\\_Value\\_Input](#):

**Public Member Functions**

- [Fl\\_Color](#) [cursor\\_color](#) ( ) const  
*Gets the color of the text cursor.*
- void [cursor\\_color](#) ([Fl\\_Color](#) n)  
*Sets the color of the text cursor.*
- [Fl\\_Value\\_Input](#) (int x, int y, int w, int h, const char \*l=0)  
*Creates a new [Fl\\_Value\\_Input](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- void [resize](#) (int, int, int, int) [FL\\_OVERRIDE](#)  
*Changes the size or position of the widget.*
- int [shortcut](#) ( ) const  
*Returns the current shortcut key for the Input.*

- void [shortcut](#) (int s)  
*Sets the shortcut key to s.*
- char [soft](#) () const  
*If "soft" is turned on, the user is allowed to drag the value outside the range.*
- void [soft](#) (char s)  
*See void [FI\\_Value\\_Input::soft\(char s\)](#)*
- [FI\\_Color](#) [textcolor](#) () const  
*Gets the color of the text in the value box.*
- void [textcolor](#) ([FI\\_Color](#) n)  
*Sets the color of the text in the value box.*
- [FI\\_Font](#) [textfont](#) () const  
*Gets the typeface of the text in the value box.*
- void [textfont](#) ([FI\\_Font](#) s)  
*Sets the typeface of the text in the value box.*
- [FI\\_Fontsize](#) [textsize](#) () const  
*Gets the size of the text in the value box.*
- void [textsize](#) ([FI\\_Fontsize](#) s)  
*Sets the size of the text in the value box.*

## Public Attributes

- [FI\\_Input](#) input

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*

## Additional Inherited Members

### 33.158.1 Detailed Description

The [FI\\_Value\\_Input](#) widget displays a numeric value.

The user can click in the text field and edit it - there is in fact a hidden [FI\\_Input](#) widget with type([FL\\_FLOAT\\_INPUT](#)) or type([FL\\_INT\\_INPUT](#)) in there - and when they hit return or tab the value updates to what they typed and the callback is done.

If [step\(\)](#) is non-zero and integral, then the range of numbers is limited to integers instead of floating point numbers. As well as displaying the value as an integer, typed input is also limited to integer values, even if the hidden [FI\\_Input](#) widget is of type([FL\\_FLOAT\\_INPUT](#)).

If [step\(\)](#) is non-zero, the user can also drag the mouse across the object and thus slide the value. The left button moves one [step\(\)](#) per pixel, the middle by 10 [step\(\)](#), and the right button by 100 \* [step\(\)](#). It is therefore impossible to select text by dragging across it, although clicking can still move the insertion cursor.

If [step\(\)](#) is non-zero and integral, then the range of numbers are limited to integers instead of floating point values.



Figure 33.67 FI\_Value\_Input

See also

[FI\\_Widget::shortcut\\_label\(int\)](#)

## 33.158.2 Constructor & Destructor Documentation

### 33.158.2.1 Fl\_Value\_Input()

```
Fl_Value_Input::Fl_Value_Input (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Value\\_Input](#) widget using the given position, size, and label string. The default boxtype is FL\_DOWN\_BOX.

## 33.158.3 Member Function Documentation

### 33.158.3.1 cursor\_color() [1/2]

```
Fl_Color Fl_Value_Input::cursor_color ( ) const [inline]
```

Gets the color of the text cursor.

The text cursor is black by default.

### 33.158.3.2 cursor\_color() [2/2]

```
void Fl_Value_Input::cursor_color (
    Fl_Color n ) [inline]
```

Sets the color of the text cursor.

The text cursor is black by default.

### 33.158.3.3 draw()

```
void Fl_Value_Input::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.158.3.4 handle()

```
int Fl_Value_Input::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In

such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

#### Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

#### See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

### 33.158.3.5 [resize\(\)](#)

```
void Fl_Value_Input::resize (
    int x,
    int y,
    int w,
    int h ) [virtual]
```

Changes the size or position of the widget.

This is a virtual function so that the widget may implement its own handling of resizing. The default version does *not* call the [redraw\(\)](#) method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.

Some window managers under X11 call [resize\(\)](#) a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations.

[position\(X, Y\)](#) is a shortcut for [resize\(X, Y, w\(\), h\(\)\)](#), and [size\(W, H\)](#) is a shortcut for [resize\(x\(\), y\(\), W, H\)](#).

#### Parameters

in	<i>x,y</i>	new position relative to the parent window
in	<i>w,h</i>	new size

#### See also

[position\(int,int\)](#), [size\(int,int\)](#)

Reimplemented from [Fl\\_Widget](#).

### 33.158.3.6 [shortcut\(\)](#) [1/2]

```
int Fl_Value_Input::shortcut ( ) const [inline]
```

Returns the current shortcut key for the Input.

#### See also

[Fl\\_Value\\_Input::shortcut\(int\)](#)

**33.158.3.7 shortcut()** [2/2]

```
void Fl_Value_Input::shortcut (
    int s ) [inline]
```

Sets the shortcut key to *s*.

Setting this overrides the use of '&' in the [label\(\)](#). The value is a bitwise OR of a key and a set of shift flags, for example `FL_ALT | 'a'`, `FL_ALT | (FL_F + 10)`, or just `'a'`. A value of 0 disables the shortcut.

The key can be any value returned by [Fl::event\\_key\(\)](#), but will usually be an ASCII letter. Use a lower-case letter unless you require the shift key to be held down.

The shift flags can be any set of values accepted by [Fl::event\\_state\(\)](#). If the bit is on that shift key must be pushed. Meta, Alt, Ctrl, and Shift must be off if they are not in the shift flags (zero for the other bits indicates a "don't care" setting).

**33.158.3.8 soft()**

```
char Fl_Value_Input::soft ( ) const [inline]
```

If "soft" is turned on, the user is allowed to drag the value outside the range.

If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value. The default is true.

**33.158.3.9 textcolor()**

```
Fl_Color Fl_Value_Input::textcolor (
    void ) const [inline]
```

Gets the color of the text in the value box.

**33.158.3.10 textfont()** [1/2]

```
Fl_Font Fl_Value_Input::textfont (
    void ) const [inline]
```

Gets the typeface of the text in the value box.

**33.158.3.11 textfont()** [2/2]

```
void Fl_Value_Input::textfont (
    Fl_Font s ) [inline]
```

Sets the typeface of the text in the value box.

**33.158.3.12 textsize()** [1/2]

```
Fl_Fontsize Fl_Value_Input::textsize (
    void ) const [inline]
```

Gets the size of the text in the value box.

**33.158.3.13 textsize()** [2/2]

```
void Fl_Value_Input::textsize (
    Fl_Fontsize s ) [inline]
```

Sets the size of the text in the value box.

The documentation for this class was generated from the following files:

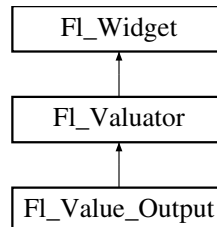
- [Fl\\_Value\\_Input.H](#)
- [Fl\\_Value\\_Input.cxx](#)

## 33.159 Fl\_Value\_Output Class Reference

The [Fl\\_Value\\_Output](#) widget displays a floating point value.

```
#include <Fl_Value_Output.H>
```

Inheritance diagram for [Fl\\_Value\\_Output](#):



### Public Member Functions

- [Fl\\_Value\\_Output](#) (int *x*, int *y*, int *w*, int *h*, const char \**l*=0)  
*Creates a new [Fl\\_Value\\_Output](#) widget using the given position, size, and label string.*
- int [handle](#) (int) [FL\\_OVERRIDE](#)  
*Handles the specified event.*
- [uchar](#) [soft](#) () const  
*If "soft" is turned on, the user is allowed to drag the value outside the range.*
- void [soft](#) ([uchar](#) *s*)  
*If "soft" is turned on, the user is allowed to drag the value outside the range.*
- [Fl\\_Color](#) [textcolor](#) () const  
*Sets the color of the text in the value box.*
- void [textcolor](#) ([Fl\\_Color](#) *s*)  
*Gets the color of the text in the value box.*
- [Fl\\_Font](#) [textfont](#) () const  
*Gets the typeface of the text in the value box.*
- void [textfont](#) ([Fl\\_Font](#) *s*)  
*Sets the typeface of the text in the value box.*
- [Fl\\_Fontsize](#) [textsize](#) () const  
*Gets the size of the text in the value box.*
- void [textsize](#) ([Fl\\_Fontsize](#) *s*)

### Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*

### Additional Inherited Members

#### 33.159.1 Detailed Description

The [Fl\\_Value\\_Output](#) widget displays a floating point value.

If [step\(\)](#) is not zero, the user can adjust the value by dragging the mouse left and right. The left button moves one [step\(\)](#) per pixel, the middle by 10 \* [step\(\)](#), and the right button by 100 \* [step\(\)](#).

This is much lighter-weight than [Fl\\_Value\\_Input](#) because it contains no text editing code or character buffer.

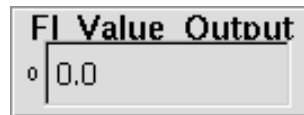


Figure 33.68 Fl\_Value\_Output

## 33.159.2 Constructor & Destructor Documentation

### 33.159.2.1 Fl\_Value\_Output()

```
Fl_Value_Output::Fl_Value_Output (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Value\\_Output](#) widget using the given position, size, and label string.

The default boxtype is FL\_NO\_BOX.

Inherited destructor destroys the Valuator.

## 33.159.3 Member Function Documentation

### 33.159.3.1 draw()

```
void Fl_Value_Output::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implements [Fl\\_Widget](#).

### 33.159.3.2 handle()

```
int Fl_Value_Output::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

#### Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

## Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

## See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Widget](#).

**33.159.3.3 soft()** [1/2]

```
uchar Fl_Value_Output::soft ( ) const [inline]
```

If "soft" is turned on, the user is allowed to drag the value outside the range.

If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.

Default is one.

**33.159.3.4 soft()** [2/2]

```
void Fl_Value_Output::soft (
    uchar s ) [inline]
```

If "soft" is turned on, the user is allowed to drag the value outside the range.

If they drag the value to one of the ends, let go, then grab again and continue to drag, they can get to any value.

Default is one.

**33.159.3.5 textcolor()** [1/2]

```
Fl_Color Fl_Value_Output::textcolor (
    void ) const [inline]
```

Sets the color of the text in the value box.

**33.159.3.6 textcolor()** [2/2]

```
void Fl_Value_Output::textcolor (
    Fl_Color s ) [inline]
```

Gets the color of the text in the value box.

**33.159.3.7 textfont()** [1/2]

```
Fl_Font Fl_Value_Output::textfont (
    void ) const [inline]
```

Gets the typeface of the text in the value box.

**33.159.3.8 textfont()** [2/2]

```
void Fl_Value_Output::textfont (
    Fl_Font s ) [inline]
```

Sets the typeface of the text in the value box.

### 33.159.3.9 `textsize()`

```
Fl_Fontsize Fl_Value_Output::textsize (
    void ) const [inline]
```

Gets the size of the text in the value box.

The documentation for this class was generated from the following files:

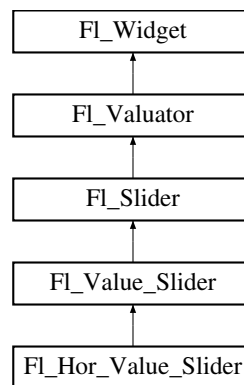
- `Fl_Value_Output.H`
- `Fl_Value_Output.cxx`

## 33.160 `Fl_Value_Slider` Class Reference

The `Fl_Value_Slider` widget is a `Fl_Slider` widget with a box displaying the current value.

```
#include <Fl_Value_Slider.H>
```

Inheritance diagram for `Fl_Value_Slider`:



### Public Member Functions

- `Fl_Value_Slider` (int `x`, int `y`, int `w`, int `h`, const char \*`l`=0)  
*Creates a new `Fl_Value_Slider` widget using the given position, size, and label string.*
- int `handle` (int) `FL_OVERRIDE`  
*Handles the specified event.*
- `Fl_Color` `textcolor` () const  
*Gets the color of the text in the value box.*
- void `textcolor` (`Fl_Color` `s`)  
*Sets the color of the text in the value box.*
- `Fl_Font` `textfont` () const  
*Gets the typeface of the text in the value box.*
- void `textfont` (`Fl_Font` `s`)  
*Sets the typeface of the text in the value box.*
- `Fl_Fontsize` `textsize` () const  
*Gets the size of the text in the value box.*
- void `textsize` (`Fl_Fontsize` `s`)  
*Sets the size of the text in the value box.*
- int `value_height` () const  
*Gets the height of the value box in pixels (vertical mode only).*
- void `value_height` (int `s`)  
*Sets the height of the value box in pixels (vertical mode only).*
- int `value_width` () const

*Gets the width of the value box in pixels (horizontal mode only).*

- void [value\\_width](#) (int s)

*Sets the width of the value box in pixels (horizontal mode only).*

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)

*Draws the widget.*

## Additional Inherited Members

### 33.160.1 Detailed Description

The [Fl\\_Value\\_Slider](#) widget is a [Fl\\_Slider](#) widget with a box displaying the current value.

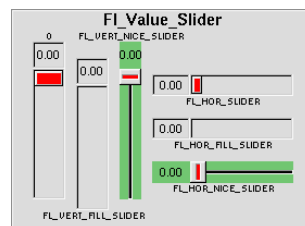


Figure 33.69 [Fl\\_Value\\_Slider](#)

### 33.160.2 Constructor & Destructor Documentation

#### 33.160.2.1 Fl\_Value\_Slider()

```
Fl_Value_Slider::Fl_Value_Slider (
    int X,
    int Y,
    int W,
    int H,
    const char * l = 0 )
```

Creates a new [Fl\\_Value\\_Slider](#) widget using the given position, size, and label string. The default boxtype is `FL_DOWN_BOX`.

### 33.160.3 Member Function Documentation

#### 33.160.3.1 draw()

```
void Fl_Value_Slider::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Slider](#).

**33.160.3.2 handle()**

```
int Fl_Value_Slider::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

**Parameters**

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

**Return values**

0	if the event was not used or understood
1	if the event was used and can be deleted

**See also**

[Fl\\_Event](#)

Reimplemented from [Fl\\_Slider](#).

**33.160.3.3 value\_height() [1/2]**

```
int Fl_Value_Slider::value_height ( ) const [inline]
```

Gets the height of the value box in pixels (vertical mode only).

**Since**

1.4.0

**33.160.3.4 value\_height() [2/2]**

```
void Fl_Value_Slider::value_height (
    int s ) [inline]
```

Sets the height of the value box in pixels (vertical mode only).

Limited range checking is applied but drawing errors may occur if the size *s* is set too high or too low, particularly if the widget is resized (later).

The programmer is responsible for setting sensible values and widget sizes.

The default value set by the constructor is 25.

**Parameters**

in	<i>s</i>	new height of the value box
----	----------	-----------------------------

Since

1.4.0

### 33.160.3.5 value\_width() [1/2]

```
int Fl_Value_Slider::value_width ( ) const [inline]
```

Gets the width of the value box in pixels (horizontal mode only).

Since

1.4.0

### 33.160.3.6 value\_width() [2/2]

```
void Fl_Value_Slider::value_width (
    int s ) [inline]
```

Sets the width of the value box in pixels (horizontal mode only).

Limited range checking is applied but drawing errors may occur if the size *s* is set too high or too low, particularly if the widget is resized (later).

The programmer is responsible for setting sensible values and widget sizes.

The default value set by the constructor is 35.

Parameters

in	s	new width of the value box
----	---	----------------------------

Since

1.4.0

The documentation for this class was generated from the following files:

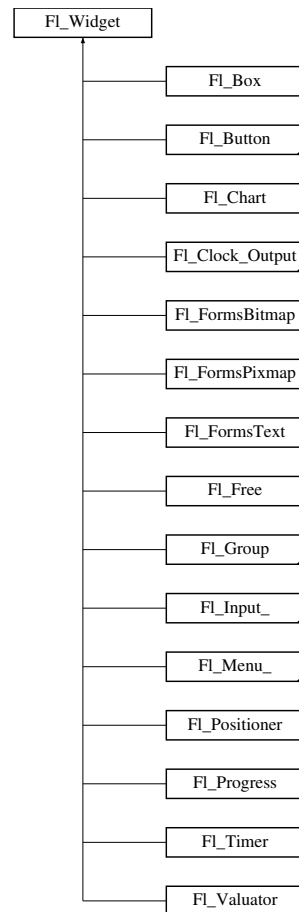
- Fl\_Value\_Slider.H
- Fl\_Value\_Slider.cxx

## 33.161 Fl\_Widget Class Reference

[Fl\\_Widget](#) is the base class for all widgets in FLTK.

```
#include <Fl_Widget.H>
```

Inheritance diagram for Fl\_Widget:



## Public Member Functions

- void **\_clear\_fullscreen** ()
- void **\_set\_fullscreen** ()
- void **activate** ()  
*Activates the widget.*
- unsigned int **active** () const  
*Returns whether the widget is active.*
- int **active\_r** () const  
*Returns whether the widget and all of its parents are active.*
- **FL\_Align** align () const  
*Gets the label alignment.*
- void **align** (**FL\_Align** alignment)
- Sets the label alignment.*
- long **argument** () const  
*Gets the current user data (long) argument that is passed to the callback function.*
- void **argument** (long v)  
*Sets the current user data (long) argument that is passed to the callback function.*
- virtual class **FL\_Gl\_Window** \* **as\_gl\_window** ()  
*Returns an FL\_Gl\_Window pointer if this widget is an FL\_Gl\_Window.*
- virtual class **FL\_Gl\_Window** const \* **as\_gl\_window** () const
- virtual **FL\_Group** \* **as\_group** ()  
*Returns an FL\_Group pointer if this widget is an FL\_Group.*
- virtual **FL\_Group** const \* **as\_group** () const
- virtual **FL\_Window** \* **as\_window** ()

- Returns an [FL\\_Window](#) pointer if this widget is an [FL\\_Window](#).*

  - virtual [FL\\_Window](#) const \* **as\_window** () const
- void [bind\\_deimage](#) ([FL\\_Image](#) \*img)

*Sets the image to use as part of the widget label when in the inactive state.*
- void [bind\\_deimage](#) (int f)

*Bind the inactive image to the widget, so the widget will delete the image when it is no longer needed.*
- void [bind\\_image](#) ([FL\\_Image](#) \*img)

*Sets the image to use as part of the widget label when in the active state.*
- void [bind\\_image](#) (int f)

*Bind the image to the widget, so the widget will delete the image when it is no longer needed.*
- [FL\\_Boxtype](#) **box** () const

*Gets the box type of the widget.*
- void [box](#) ([FL\\_Boxtype](#) new\_box)

*Sets the box type for the widget.*
- [FL\\_Callback\\_p](#) **callback** () const

*Gets the current callback function for the widget.*
- void [callback](#) ([FL\\_Callback](#) \*cb)

*Sets the current callback function for the widget.*
- void [callback](#) ([FL\\_Callback](#) \*cb, [FL\\_Callback\\_User\\_Data](#) \*p, bool auto\_free)

*Sets the current callback function and managed user data for the widget.*
- void [callback](#) ([FL\\_Callback](#) \*cb, void \*p)

*Sets the current callback function and data for the widget.*
- void [callback](#) ([FL\\_Callback0](#) \*cb)

*Sets the current callback function for the widget.*
- void [callback](#) ([FL\\_Callback1](#) \*cb, long p=0)

*Sets the current callback function for the widget.*
- unsigned int [changed](#) () const

*Checks if the widget value changed since the last callback.*
- void [clear\\_active](#) ()

*Marks the widget as inactive without sending events or changing focus.*
- void [clear\\_changed](#) ()

*Marks the value of the widget as unchanged.*
- void [clear\\_damage](#) (uchar c=0)

*Clears or sets the damage flags.*
- void [clear\\_output](#) ()

*Sets a widget to accept input.*
- void [clear\\_visible](#) ()

*Hides the widget.*
- void [clear\\_visible\\_focus](#) ()

*Disables keyboard focus navigation with this widget.*
- [FL\\_Color](#) **color** () const

*Gets the background color of the widget.*
- void [color](#) ([FL\\_Color](#) bg)

*Sets the background color of the widget.*
- void [color](#) ([FL\\_Color](#) bg, [FL\\_Color](#) sel)

*Sets the background and selection color of the widget.*
- [FL\\_Color](#) **color2** () const

*For back compatibility only.*
- void [color2](#) (unsigned a)

*For back compatibility only.*
- int [contains](#) (const [FL\\_Widget](#) \*w) const

- Checks if w is a child of this widget.*

  - void [copy\\_label](#) (const char \*new\_label)

*Sets the current label.*
- void [copy\\_tooltip](#) (const char \*text)

*Sets the current tooltip text.*
- [uchar damage](#) () const

*Returns non-zero if [draw\(\)](#) needs to be called.*
- void [damage](#) (uchar c)

*Sets the damage bits for the widget.*
- void [damage](#) (uchar c, int x, int y, int w, int h)

*Sets the damage bits for an area inside the widget.*
- int [damage\\_resize](#) (int, int, int, int)

*Internal use only.*
- void [deactivate](#) ()

*Deactivates the widget.*
- [FL\\_Image \\* deimage](#) ()

*Gets the image that is used as part of the widget label when in the inactive state.*
- const [FL\\_Image \\* deimage](#) () const

*Gets the image that is used as part of the widget label when in the inactive state.*
- void [deimage](#) ([FL\\_Image](#) &img)

*Sets the image to use as part of the widget label when in the inactive state.*
- void [deimage](#) ([FL\\_Image](#) \*img)

*Sets the image to use as part of the widget label when in the inactive state.*
- int [deimage\\_bound](#) () const

*Returns whether the inactive image is managed by the widget.*
- void [do\\_callback](#) ([FL\\_Callback\\_Reason](#) reason=[FL\\_REASON\\_UNKNOWN](#))

*Calls the widget callback function with default arguments.*
- void [do\\_callback](#) ([FL\\_Widget](#) \*widget, long arg, [FL\\_Callback\\_Reason](#) reason=[FL\\_REASON\\_UNKNOWN](#))

*Calls the widget callback function with arbitrary arguments.*
- void [do\\_callback](#) ([FL\\_Widget](#) \*widget, void \*arg=0, [FL\\_Callback\\_Reason](#) reason=[FL\\_REASON\\_UNKNOWN](#))

*Calls the widget callback function with arbitrary arguments.*
- virtual void [draw](#) ()=0

*Draws the widget.*
- void [draw\\_label](#) (int, int, int, int, [FL\\_Align](#)) const

*Draws the label in an arbitrary bounding box with an arbitrary alignment.*
- int [h](#) () const

*Gets the widget height.*
- virtual int [handle](#) (int event)

*Handles the specified event.*
- virtual void [hide](#) ()

*Makes a widget invisible.*
- int [horizontal\\_label\\_margin](#) ()

*Get the spacing between the label and the horizontal edge of the widget.*
- void [horizontal\\_label\\_margin](#) (int px)

*Set the spacing between the label and the horizontal edge of the widget.*
- [FL\\_Image \\* image](#) ()

*Gets the image that is used as part of the widget label when in the active state.*
- const [FL\\_Image \\* image](#) () const

*Gets the image that is used as part of the widget label when in the active state.*
- void [image](#) ([FL\\_Image](#) &img)

*Sets the image to use as part of the widget label when in the active state.*

- void [image](#) ([FL\\_Image](#) \*img)  
*Sets the image to use as part of the widget label when in the active state.*
- int [image\\_bound](#) () const  
*Returns whether the image is managed by the widget.*
- int [inside](#) (const [FL\\_Widget](#) \*wgt) const  
*Checks if this widget is a child of wgt.*
- int [is\\_label\\_copied](#) () const  
*Returns whether the current label was assigned with [copy\\_label\(\)](#).*
- const char \* [label](#) () const  
*Gets the current label text.*
- void [label](#) (const char \*text)  
*Sets the current label pointer.*
- void [label](#) ([FL\\_Labeltype](#) a, const char \*b)  
*Shortcut to set the label text and type in one call.*
- int [label\\_image\\_spacing](#) ()  
*Return the gap size between the label and the image.*
- void [label\\_image\\_spacing](#) (int gap)  
*Set the gap between the label and the image in pixels.*
- [FL\\_Color](#) [labelcolor](#) () const  
*Gets the label color.*
- void [labelcolor](#) ([FL\\_Color](#) c)  
*Sets the label color.*
- [FL\\_Font](#) [labelfont](#) () const  
*Gets the font to use.*
- void [labelfont](#) ([FL\\_Font](#) f)  
*Sets the font to use.*
- [FL\\_Fonsize](#) [labelsize](#) () const  
*Gets the font size in pixels.*
- void [labelsize](#) ([FL\\_Fonsize](#) pix)  
*Sets the font size in pixels.*
- [FL\\_Labeltype](#) [labeltype](#) () const  
*Gets the label type.*
- void [labeltype](#) ([FL\\_Labeltype](#) a)  
*Sets the label type.*
- void [measure\\_label](#) (int &ww, int &hh) const  
*Sets width ww and height hh accordingly with the label size.*
- bool [needs\\_keyboard](#) () const  
*Returns whether this widget needs a keyboard.*
- void [needs\\_keyboard](#) (bool needs)  
*Sets whether this widget needs a keyboard.*
- unsigned int [output](#) () const  
*Returns if a widget is used for output only.*
- [FL\\_Group](#) \* [parent](#) () const  
*Returns a pointer to the parent widget.*
- void [parent](#) ([FL\\_Group](#) \*p)  
*Internal use only - "for hacks only".*
- void [position](#) (int X, int Y)  
*Repositions the window or widget.*
- void [redraw](#) ()  
*Schedules the drawing of the widget.*
- void [redraw\\_label](#) ()

- Schedules the drawing of the label.*

  - virtual void **resize** (int x, int y, int w, int h)

*Changes the size or position of the widget.*
- **Fl\_Color selection\_color** () const

*Gets the selection color.*
- void **selection\_color** (**Fl\_Color** a)

*Sets the selection color.*
- void **set\_active** ()

*Marks the widget as active without sending events or changing focus.*
- void **set\_changed** ()

*Marks the value of the widget as changed.*
- void **set\_output** ()

*Sets a widget to output only.*
- void **set\_visible** ()

*Makes the widget visible.*
- void **set\_visible\_focus** ()

*Enables keyboard focus navigation with this widget.*
- int **shortcut\_label** () const

*Returns whether the widget's label uses '&' to indicate shortcuts.*
- void **shortcut\_label** (int value)

*Sets whether the widget's label uses '&' to indicate shortcuts.*
- virtual void **show** ()

*Makes a widget visible.*
- void **size** (int W, int H)

*Changes the size of the widget.*
- int **take\_focus** ()

*Gives the widget the keyboard focus.*
- unsigned int **takeevents** () const

*Returns if the widget is able to take events.*
- int **test\_shortcut** ()

*Returns true if the widget's label contains the entered '&x' shortcut.*
- const char \* **tooltip** () const

*Gets the current tooltip text.*
- void **tooltip** (const char \*text)

*Sets the Tooltip Text for a Widget.*
- **Fl\_Window \* top\_window** () const

*Returns a pointer to the top-level window for the widget.*
- **Fl\_Window \* top\_window\_offset** (int &xoff, int &yoff) const

*Finds the x/y offset of the current widget relative to the top-level window.*
- **uchar type** () const

*Gets the widget type.*
- void **type** (**uchar** t)

*Sets the widget type.*
- int **use\_accents\_menu** ()

*Returns non zero if MAC\_USE\_ACCENTS\_MENU flag is set, 0 otherwise.*
- void \* **user\_data** () const

*Gets the user data for this widget.*
- void **user\_data** (**Fl\_Callback\_User\_Data** \*v, bool auto\_free)

*Sets the user data for this widget.*
- void **user\_data** (void \*v)

*Sets the user data for this widget.*

- int `vertical_label_margin` ()  
*Get the spacing between the label and the vertical edge of the widget.*
- void `vertical_label_margin` (int px)  
*Set the spacing between the label and the vertical edge of the widget.*
- unsigned int `visible` () const  
*Returns whether a widget is visible.*
- unsigned int `visible_focus` () const  
*Checks whether this widget has a visible focus.*
- void `visible_focus` (int v)  
*Modifies keyboard focus navigation.*
- int `visible_r` () const  
*Returns whether a widget and all its parents are visible.*
- int `w` () const  
*Gets the widget width.*
- `Fl_When` `when` () const  
*Returns the conditions under which the callback is called.*
- void `when` (uchar i)  
*Sets the flags used to decide when a callback is called.*
- `Fl_Window` \* `window` () const  
*Returns a pointer to the nearest parent window up the widget hierarchy.*
- int `x` () const  
*Gets the widget position in its window.*
- int `y` () const  
*Gets the widget position in its window.*
- virtual `~Fl_Widget` ()  
*Destroys the widget.*

## Static Public Member Functions

- static void `default_callback` (`Fl_Widget` \*widget, void \*data)  
*The default callback for all widgets that don't set a callback.*
- static unsigned int `label_shortcut` (const char \*t)  
*Returns the Unicode value of the '&x' shortcut in a given text.*
- static int `test_shortcut` (const char \*, const bool require\_alt=false)  
*Returns true if the given text t contains the entered '&x' shortcut.*

## Protected Types

- enum {  
`INACTIVE` = 1<<0 , `INVISIBLE` = 1<<1 , `OUTPUT` = 1<<2 , `NOBORDER` = 1<<3 ,  
`FORCE_POSITION` = 1<<4 , `NON_MODAL` = 1<<5 , `SHORTCUT_LABEL` = 1<<6 , `CHANGED` = 1<<7  
, `OVERRIDE` = 1<<8 , `VISIBLE_FOCUS` = 1<<9 , `COPIED_LABEL` = 1<<10 , `CLIP_CHILDREN` = 1<<11  
, `MENU_WINDOW` = 1<<12 , `TOOLTIP_WINDOW` = 1<<13 , `MODAL` = 1<<14 , `NO_OVERLAY` = 1<<15  
, `GROUP_RELATIVE` = 1<<16 , `COPIED_TOOLTIP` = 1<<17 , `FULLSCREEN` = 1<<18 , `MAC_USE_ACCENTS_MENU`  
= 1<<19 ,  
`NEEDS_KEYBOARD` = 1<<20 , `IMAGE_BOUND` = 1<<21 , `DEIMAGE_BOUND` = 1<<22 ,  
`AUTO_DELETE_USER_DATA` = 1<<23 ,  
`MAXIMIZED` = 1<<24 , `POPUP` = 1<<25 , `USERFLAG3` = 1<<29 , `USERFLAG2` = 1<<30 ,  
`USERFLAG1` = 1<<31 }  
*flags possible values enumeration.*

## Protected Member Functions

- void **clear\_flag** (unsigned int c)  
*Clears a flag in the flags mask.*
- void **draw\_backdrop** () const  
*If FL\_ALIGN\_IMAGE\_BACKDROP is set, the image or deimage will be drawn.*
- void **draw\_box** () const  
*Draws the widget box according its box style.*
- void **draw\_box** (FI\_Boxtype t, FI\_Color c) const  
*Draws a box of type t, of color c at the widget's position and size.*
- void **draw\_box** (FI\_Boxtype t, int x, int y, int w, int h, FI\_Color c) const  
*Draws a box of type t, of color c at the position X,Y and size W,H.*
- void **draw\_focus** () const  
*Draws a focus rectangle around the widget.*
- void **draw\_focus** (FI\_Boxtype t, int X, int Y, int W, int H) const  
*Draws a focus rectangle around the widget.*
- void **draw\_focus** (FI\_Boxtype t, int x, int y, int w, int h, FI\_Color bg) const  
*Draws a focus box for the widget at the given position and size.*
- void **draw\_label** () const  
*Draws the widget's label at the defined label position.*
- void **draw\_label** (int, int, int, int) const  
*Draws the label in an arbitrary bounding box.*
- **FI\_Widget** (int x, int y, int w, int h, const char \*label=0L)  
*Creates a widget at the given position and size.*
- unsigned int **flags** () const  
*Gets the widget flags mask.*
- void **h** (int v)  
*Internal use only.*
- void **set\_flag** (unsigned int c)  
*Sets a flag in the flags mask.*
- void **w** (int v)  
*Internal use only.*
- void **x** (int v)  
*Internal use only.*
- void **y** (int v)  
*Internal use only.*

## Friends

- class **FI\_Group**

### 33.161.1 Detailed Description

**FI\_Widget** is the base class for all widgets in FLTK.

You can't create one of these because the constructor is not public. However you can subclass it.

All "property" accessing methods, such as **color()**, **parent()**, or **argument()** are implemented as trivial inline functions and thus are as fast and small as accessing fields in a structure. Unless otherwise noted, the property setting methods such as **color(n)** or **label(s)** are also trivial inline functions, even if they change the widget's appearance. It is up to the user code to call **redraw()** after these.

### 33.161.2 Member Enumeration Documentation

## 33.161.2.1 anonymous enum

anonymous enum [protected]

flags possible values enumeration.

See [activate\(\)](#), [output\(\)](#), [visible\(\)](#), [changed\(\)](#), [set\\_visible\\_focus\(\)](#)

## Enumerator

INACTIVE	the widget can't receive focus, and is disabled but potentially visible
INVISIBLE	the widget is not drawn, but can receive a few special events
OUTPUT	for output only
NOBORDER	don't draw a decoration ( <a href="#">FI_Window</a> )
FORCE_POSITION	don't let the window manager position the window ( <a href="#">FI_Window</a> )
NON_MODAL	this is a hovering toolbar window ( <a href="#">FI_Window</a> )
SHORTCUT_LABEL	the label contains a shortcut we need to draw
CHANGED	the widget value changed
OVERRIDE	position window on top ( <a href="#">FI_Window</a> )
VISIBLE_FOCUS	accepts keyboard focus navigation if the widget can have the focus
COPIED_LABEL	the widget label is internally copied, its destruction is handled by the widget
CLIP_CHILDREN	all drawing within this widget will be clipped ( <a href="#">FI_Group</a> )
MENU_WINDOW	a temporary popup window, dismissed by clicking outside ( <a href="#">FI_Window</a> )
TOOLTIP_WINDOW	a temporary popup, transparent to events, and dismissed easily ( <a href="#">FI_Window</a> )
MODAL	a window blocking input to all other windows ( <a href="#">FI_Window</a> )
NO_OVERLAY	window not using a hardware overlay plane ( <a href="#">FI_Menu_Window</a> )
GROUP_RELATIVE	Reserved, not implemented. DO NOT USE.
COPIED_TOOLTIP	the widget tooltip is internally copied, its destruction is handled by the widget
FULLSCREEN	a fullscreen window ( <a href="#">FI_Window</a> )
MAC_USE_ACCENTS_MENU	On the macOS platform, pressing and holding a key on the keyboard opens an accented-character menu window ( <a href="#">FI_Input_</a> , <a href="#">FI_Text_Editor</a> )
NEEDS_KEYBOARD	set on touch screen devices if a widget needs a keyboard when it gets the focus. Reserved, not yet used in 1.4.0.  See also  <a href="#">FI_Widget::needs_keyboard()</a>
IMAGE_BOUND	binding the image to the widget will transfer ownership, so that the widget will delete the image when it is no longer needed
DEIMAGE_BOUND	bind the inactive image to the widget, so the widget deletes the image when it is no longer needed
AUTO_DELETE_USER_DATA	automatically call <code>delete</code> on the <code>user_data</code> pointer when destroying this widget; if set, <code>user_data</code> must point to a class derived from the class <a href="#">FI_Callback_User_Data</a>
MAXIMIZED	a maximized <a href="#">FI_Window</a>
POPUP	popup window (i.e., positioned relatively to another mapped window)
USERFLAG3	reserved for 3rd party extensions
USERFLAG2	reserved for 3rd party extensions
USERFLAG1	reserved for 3rd party extensions

## 33.161.3 Constructor &amp; Destructor Documentation

**33.161.3.1 Fl\_Widget()**

```
Fl_Widget::Fl_Widget (
    int x,
    int y,
    int w,
    int h,
    const char * label = 0L ) [protected]
```

Creates a widget at the given position and size.

The [Fl\\_Widget](#) is a protected constructor, but all derived widgets have a matching public constructor. It takes a value for [x\(\)](#), [y\(\)](#), [w\(\)](#), [h\(\)](#), and an optional value for [label\(\)](#).

**Parameters**

in	<i>x,y</i>	the position of the widget relative to the enclosing window
in	<i>w,h</i>	size of the widget in pixels
in	<i>label</i>	optional text for the widget label

**33.161.3.2 ~Fl\_Widget()**

```
Fl_Widget::~~Fl_Widget ( ) [virtual]
```

Destroys the widget.

Destroys the widget, taking care of throwing focus before if any.

Destroying single widgets is not very common. You almost always want to destroy the parent group instead, which will destroy all of the child widgets and groups in that group.

**Since**

FLTK 1.3, the widget's destructor removes the widget from its parent group, if it is member of a group.

Destruction removes the widget from any parent group! And groups when destroyed destroy all their children. This is convenient and fast.

**33.161.4 Member Function Documentation****33.161.4.1 activate()**

```
void Fl_Widget::activate ( )
```

Activates the widget.

Changing this value will send FL\_ACTIVATE to the widget if [active\\_r\(\)](#) is true.

**See also**

[active\(\)](#), [active\\_r\(\)](#), [deactivate\(\)](#)

**33.161.4.2 active()**

```
unsigned int Fl_Widget::active ( ) const [inline]
```

Returns whether the widget is active.

**Return values**

0	if the widget is inactive
---	---------------------------

See also

[active\\_r\(\)](#), [activate\(\)](#), [deactivate\(\)](#)

#### 33.161.4.3 active\_r()

```
int Fl_Widget::active_r ( ) const
```

Returns whether the widget and all of its parents are active.

Return values

0	if this or any of the parent widgets are inactive
---	---

See also

[active\(\)](#), [activate\(\)](#), [deactivate\(\)](#)

#### 33.161.4.4 align() [1/2]

```
Fl_Align Fl_Widget::align ( ) const [inline]
```

Gets the label alignment.

Returns

label alignment

See also

[label\(\)](#), [align\(Fl\\_Align\)](#), [Fl\\_Align](#)

#### 33.161.4.5 align() [2/2]

```
void Fl_Widget::align (
    Fl_Align alignment ) [inline]
```

Sets the label alignment.

This controls how the label is displayed next to or inside the widget. The default value is FL\_ALIGN\_CENTER, which centers the label inside the widget.

Parameters

in	<i>alignment</i>	new label alignment
----	------------------	---------------------

See also

[align\(\)](#), [Fl\\_Align](#)

#### 33.161.4.6 argument() [1/2]

```
long Fl_Widget::argument ( ) const [inline]
```

Gets the current user data (long) argument that is passed to the callback function.

**Note**

On platforms with `sizeof(long) < sizeof(void*)`, particularly on Windows 64-bit platforms, this method can truncate stored addresses (`void*`) to the size of a `long` value. Use with care and only if you are sure that the stored `user_data` value fits in a `long` value because it was stored with [argument\(long\)](#) or another method using only `long` values. You may want to use [user\\_data\(\)](#) instead.

**See also**

[user\\_data\(\)](#)

**33.161.4.7 argument()** [2/2]

```
void Fl_Widget::argument (
    long v ) [inline]
```

Sets the current user data (long) argument that is passed to the callback function.

**See also**

[argument\(\)](#)

**33.161.4.8 as\_gl\_window()**

```
virtual class Fl_Gl_Window * Fl_Widget::as_gl_window ( ) [inline], [virtual]
```

Returns an [Fl\\_Gl\\_Window](#) pointer if this widget is an [Fl\\_Gl\\_Window](#).

Use this method if you have a widget (pointer) and need to know whether this widget is derived from [Fl\\_Gl\\_Window](#).

If it returns non-NULL, then the widget in question is derived from [Fl\\_Gl\\_Window](#).

**Return values**

<b>NULL</b>	if this widget is not derived from <a href="#">Fl_Gl_Window</a> .
-------------	---

**Note**

This method is provided to avoid `dynamic_cast`.

**See also**

[Fl\\_Widget::as\\_group\(\)](#), [Fl\\_Widget::as\\_window\(\)](#)

Reimplemented in [Fl\\_Gl\\_Window](#).

**33.161.4.9 as\_group()**

```
virtual Fl_Group * Fl_Widget::as_group ( ) [inline], [virtual]
```

Returns an [Fl\\_Group](#) pointer if this widget is an [Fl\\_Group](#).

Use this method if you have a widget (pointer) and need to know whether this widget is derived from [Fl\\_Group](#). If it returns non-NULL, then the widget in question is derived from [Fl\\_Group](#), and you can use the returned pointer to access its children or other [Fl\\_Group](#)-specific methods.

Example:

```
void my_callback (Fl_Widget *w, void *) {
    Fl_Group *g = w->as_group();
    if (g)
        printf ("This group has %d children\n", g->children());
    else
        printf ("This widget is not a group!\n");
}
```

## Return values

<code>NULL</code>	if this widget is not derived from <a href="#">Fl_Group</a> .
-------------------	---

## Note

This method is provided to avoid `dynamic_cast`.

## See also

[Fl\\_Widget::as\\_window\(\)](#), [Fl\\_Widget::as\\_gl\\_window\(\)](#)

Reimplemented in [Fl\\_Group](#).

**33.161.4.10 as\_window()**

```
virtual Fl\_Window * Fl_Widget::as_window ( ) [inline], [virtual]
```

Returns an [Fl\\_Window](#) pointer if this widget is an [Fl\\_Window](#).

Use this method if you have a widget (pointer) and need to know whether this widget is derived from [Fl\\_Window](#). If it returns non-NULL, then the widget in question is derived from [Fl\\_Window](#), and you can use the returned pointer to access its children or other [Fl\\_Window](#)-specific methods.

## Return values

<code>NULL</code>	if this widget is not derived from <a href="#">Fl_Window</a> .
-------------------	--

## Note

This method is provided to avoid `dynamic_cast`.

## See also

[Fl\\_Widget::as\\_group\(\)](#), [Fl\\_Widget::as\\_gl\\_window\(\)](#)

Reimplemented in [Fl\\_Window](#).

**33.161.4.11 bind\_deimage()** [1/2]

```
void Fl_Widget::bind_deimage (
    Fl\_Image * img )
```

Sets the image to use as part of the widget label when in the inactive state.

## Parameters

<code>in</code>	<code><i>img</i></code>	the new image for the deactivated widget
-----------------	-------------------------	--

## Note

The image will be bound to the widget. When the widget is deleted, the image will be deleted as well.

## See also

void [deimage](#)([Fl\\_Image](#)\* *img*)

**33.161.4.12 bind\_deimage() [2/2]**

```
void Fl_Widget::bind_deimage (
    int f ) [inline]
```

Bind the inactive image to the widget, so the widget will delete the image when it is no longer needed.

**Parameters**

<i>f</i>	1: mark the image as bound, 0: mark the image as managed by the user
----------	--

**See also**

[deimage\\_bound\(\)](#), [bind\\_image\(\)](#)

**33.161.4.13 bind\_image() [1/2]**

```
void Fl_Widget::bind_image (
    Fl_Image * img )
```

Sets the image to use as part of the widget label when in the active state.

The image will be bound to the widget. When the widget is deleted, the image will be deleted as well.

Calling [bind\\_image\(\)](#) with a new image will delete the old image if it was bound, and then set the new image, and bind that. If old and new image are the same, nothing happens.

Calling [bind\\_image\(\)](#) with NULL will delete the old image if it was bound and not set a new image.

**Parameters**

<i>in</i>	<i>img</i>	the new image for the label
-----------	------------	-----------------------------

**See also**

[void image\(Fl\\_Image\\* img\)](#)

**33.161.4.14 bind\_image() [2/2]**

```
void Fl_Widget::bind_image (
    int f ) [inline]
```

Bind the image to the widget, so the widget will delete the image when it is no longer needed.

**Parameters**

<i>f</i>	1: mark the image as bound, 0: mark the image as managed by the user
----------	--

**See also**

[image\\_bound\(\)](#), [bind\\_deimage\(\)](#)

**33.161.4.15 box() [1/2]**

```
Fl_Boxtype Fl_Widget::box (
    void ) const [inline]
```

Gets the box type of the widget.

**Returns**

the current box type

**See also**

[box\(Fl\\_Boxtype\)](#), [Fl\\_Boxtype](#)

**33.161.4.16 box() [2/2]**

```
void Fl_Widget::box (
    Fl_Boxtype new_box ) [inline]
```

Sets the box type for the widget.

This identifies a routine that draws the background of the widget. See [Fl\\_Boxtype](#) for the available types. The default depends on the widget, but is usually `FL_NO_BOX` or `FL_UP_BOX`.

**Parameters**

in	<i>new_box</i>	the new box type
----	----------------	------------------

**See also**

[box\(\)](#), [Fl\\_Boxtype](#)

**33.161.4.17 callback() [1/6]**

```
Fl_Callback_p Fl_Widget::callback ( ) const [inline]
```

Gets the current callback function for the widget.

Each widget has a single callback.

**Returns**

current callback

**33.161.4.18 callback() [2/6]**

```
void Fl_Widget::callback (
    Fl_Callback * cb ) [inline]
```

Sets the current callback function for the widget.

Each widget has a single callback.

**Parameters**

in	<i>cb</i>	new callback
----	-----------	--------------

**33.161.4.19 callback() [3/6]**

```
void Fl_Widget::callback (
    Fl_Callback * cb,
    Fl_Callback_User_Data * p,
    bool auto_free ) [inline]
```

Sets the current callback function and managed user data for the widget.

Setting `auto_free` will transfer ownership of the callback user data to the widget. Deleting the widget will then also delete the user data.

#### Parameters

in	<i>cb</i>	new callback
in	<i>p</i>	user data
in	<i>auto_free</i>	if set, the widget will free user data when destroyed

#### 33.161.4.20 callback() [4/6]

```
void Fl_Widget::callback (
    Fl_Callback * cb,
    void * p ) [inline]
```

Sets the current callback function and data for the widget.  
Each widget has a single callback.

#### Parameters

in	<i>cb</i>	new callback
in	<i>p</i>	user data

#### 33.161.4.21 callback() [5/6]

```
void Fl_Widget::callback (
    Fl_Callback0 * cb ) [inline]
```

Sets the current callback function for the widget.  
Each widget has a single callback.

#### Parameters

in	<i>cb</i>	new callback
----	-----------	--------------

#### 33.161.4.22 callback() [6/6]

```
void Fl_Widget::callback (
    Fl_Callback1 * cb,
    long p = 0 ) [inline]
```

Sets the current callback function for the widget.  
Each widget has a single callback.

#### Parameters

in	<i>cb</i>	new callback
in	<i>p</i>	user data

#### 33.161.4.23 changed()

```
unsigned int Fl_Widget::changed ( ) const [inline]
```

Checks if the widget value changed since the last callback.

"Changed" is a flag that is turned on when the user changes the value stored in the widget. This is only used by subclasses of [Fl\\_Widget](#) that store values, but is in the base class so it is easier to scan all the widgets in a panel and [do\\_callback\(\)](#) on the changed ones in response to an "OK" button.

Most widgets turn this flag off when they do the callback, and when the program sets the stored value.

#### Note

[do\\_callback\(\)](#) turns this flag off after the callback.

#### Return values

0	if the value did not change
---	-----------------------------

#### See also

[set\\_changed\(\)](#), [clear\\_changed\(\)](#)

[do\\_callback\(Fl\\_Widget \\*widget, void \\*data\)](#)

#### 33.161.4.24 clear\_active()

```
void Fl_Widget::clear_active ( ) [inline]
```

Marks the widget as inactive without sending events or changing focus.

This is mainly for specialized use, for normal cases you want [deactivate\(\)](#).

#### See also

[deactivate\(\)](#)

#### 33.161.4.25 clear\_changed()

```
void Fl_Widget::clear_changed ( ) [inline]
```

Marks the value of the widget as unchanged.

#### See also

[changed\(\)](#), [set\\_changed\(\)](#)

#### 33.161.4.26 clear\_damage()

```
void Fl_Widget::clear_damage (
    uchar c = 0 ) [inline]
```

Clears or sets the damage flags.

Damage flags are cleared when parts of the widget drawing is repaired.

The optional argument `c` specifies the bits that **are set** after the call (default: 0) and **not** the bits that are cleared!

#### Note

Therefore it is possible to set damage bits with this method, but this should be avoided. Use [damage\(uchar\)](#) instead.

#### Parameters

in	c	new bitmask of damage flags (default: 0)
----	---	--

See also

[damage\(uchar\)](#), [damage\(\)](#)

### 33.161.4.27 clear\_output()

```
void Fl_Widget::clear_output ( ) [inline]
```

Sets a widget to accept input.

See also

[set\\_output\(\)](#), [output\(\)](#)

### 33.161.4.28 clear\_visible()

```
void Fl_Widget::clear_visible ( ) [inline]
```

Hides the widget.

You must still redraw the parent to see a change in the window. Normally you want to use the [hide\(\)](#) method instead.

### 33.161.4.29 clear\_visible\_focus()

```
void Fl_Widget::clear_visible_focus ( ) [inline]
```

Disables keyboard focus navigation with this widget.

Normally, all widgets participate in keyboard focus navigation.

See also

[set\\_visible\\_focus\(\)](#), [visible\\_focus\(\)](#), [visible\\_focus\(int\)](#)

### 33.161.4.30 color() [1/3]

```
Fl_Color Fl_Widget::color (
    void ) const [inline]
```

Gets the background color of the widget.

Returns

current background color

See also

[color\(Fl\\_Color\)](#), [color\(Fl\\_Color, Fl\\_Color\)](#)

### 33.161.4.31 color() [2/3]

```
void Fl_Widget::color (
    Fl_Color bg ) [inline]
```

Sets the background color of the widget.

The color is passed to the box routine. The color is either an index into an internal table of RGB colors or an RGB color value generated using [fl\\_rgb\\_color\(\)](#).

The default for most widgets is FL\_BACKGROUND\_COLOR. Use [Fl::set\\_color\(\)](#) to redefine colors in the color map.

Parameters

in	bg	background color
----	----	------------------

See also

[color\(\)](#), [color\(Fl\\_Color, Fl\\_Color\)](#), [selection\\_color\(Fl\\_Color\)](#)

### 33.161.4.32 color() [3/3]

```
void Fl_Widget::color (
    Fl_Color bg,
    Fl_Color sel ) [inline]
```

Sets the background and selection color of the widget.  
The two color form sets both the background and selection colors.

Parameters

in	<i>bg</i>	background color
in	<i>sel</i>	selection color

See also

[color\(unsigned\)](#), [selection\\_color\(unsigned\)](#)

### 33.161.4.33 color2() [1/2]

```
Fl_Color Fl_Widget::color2 ( ) const [inline]
```

For back compatibility only.

**Deprecated** Use [selection\\_color\(\)](#) instead.

### 33.161.4.34 color2() [2/2]

```
void Fl_Widget::color2 (
    unsigned a ) [inline]
```

For back compatibility only.

**Deprecated** Use [selection\\_color\(unsigned\)](#) instead.

### 33.161.4.35 contains()

```
int Fl_Widget::contains (
    const Fl_Widget * w ) const
```

Checks if w is a child of this widget.

Parameters

in	<i>w</i>	potential child widget
----	----------	------------------------

**Returns**

Returns 1 if *w* is a child of this widget, or is equal to this widget. Returns 0 if *w* is NULL.

**33.161.4.36 copy\_label()**

```
void Fl_Widget::copy_label (
    const char * new_label )
```

Sets the current label.

Unlike [label\(\)](#), this method allocates a copy of the label string instead of using the original string pointer.

The internal copy will automatically be freed whenever you assign a new label or when the widget is destroyed.

**Parameters**

in	<i>new_label</i>	the new label text
----	------------------	--------------------

**See also**

[label\(\)](#)

**33.161.4.37 copy\_tooltip()**

```
void Fl_Widget::copy_tooltip (
    const char * text )
```

Sets the current tooltip text.

Unlike [tooltip\(\)](#), this method allocates a copy of the tooltip string instead of using the original string pointer.

The internal copy will automatically be freed whenever you assign a new tooltip or when the widget is destroyed.

If no tooltip is set, the tooltip of the parent is inherited. Setting a tooltip for a group and setting no tooltip for a child will show the group's tooltip instead. To avoid this behavior, you can set the child's tooltip to an empty string ("").

**Parameters**

in	<i>text</i>	New tooltip text (an internal copy is made and managed)
----	-------------	---

**See also**

[tooltip\(const char\\*\)](#), [tooltip\(\)](#)

**33.161.4.38 damage() [1/3]**

```
uchar Fl_Widget::damage ( ) const [inline]
```

Returns non-zero if [draw\(\)](#) needs to be called.

The damage value is actually a bit field that the widget subclass can use to figure out what parts to draw.

**Returns**

a bitmap of flags describing the kind of damage to the widget

**See also**

[damage\(uchar\)](#), [clear\\_damage\(uchar\)](#)

**33.161.4.39 damage()** [2/3]

```
void Fl_Widget::damage (
    uchar c )
```

Sets the damage bits for the widget.

Setting damage bits will schedule the widget for the next redraw.

**Parameters**

in	c	bitmask of flags to set
----	---	-------------------------

**See also**

[damage\(\)](#), [clear\\_damage\(uchar\)](#)

**33.161.4.40 damage()** [3/3]

```
void Fl_Widget::damage (
    uchar c,
    int x,
    int y,
    int w,
    int h )
```

Sets the damage bits for an area inside the widget.

Setting damage bits will schedule the widget for the next redraw.

**Parameters**

in	c	bitmask of flags to set
in	x,y,w,h	size of damaged area

**See also**

[damage\(\)](#), [clear\\_damage\(uchar\)](#)

**33.161.4.41 deactivate()**

```
void Fl_Widget::deactivate ( )
```

Deactivates the widget.

Inactive widgets will be drawn "grayed out", e.g. with less contrast than the active widget. Inactive widgets will not receive any keyboard or mouse button events. Other events (including FL\_ENTER, FL\_MOVE, FL\_LEAVE, FL\_SHORTCUT, and others) will still be sent. A widget is only active if [active\(\)](#) is true on it *and all of its parents*.

Changing this value will send FL\_DEACTIVATE to the widget if [active\\_r\(\)](#) is true.

Currently you cannot deactivate [Fl\\_Window](#) widgets.

**See also**

[activate\(\)](#), [active\(\)](#), [active\\_r\(\)](#)

**33.161.4.42 default\_callback()**

```
void Fl_Widget::default_callback (
    Fl_Widget * widget,
    void * data ) [static]
```

The default callback for all widgets that don't set a callback.

This callback function puts a pointer to the widget on the queue returned by [Fl::readqueue\(\)](#). This is the default for all widgets if you don't set a callback.

You can avoid the overhead of this default handling if you set the callback to `NULL` explicitly.

Relying on the default callback and reading the callback queue with [Fl::readqueue\(\)](#) is not recommended. If you need a callback, you should set one with [Fl\\_Widget::callback\(Fl\\_Callback \\*cb, void \\*data\)](#) or one of its variants.

#### Parameters

in	<i>widget</i>	the <a href="#">Fl_Widget</a> given to the callback
in	<i>data</i>	user data associated with that callback

#### See also

[callback\(\)](#), [Fl::readqueue\(\)](#)

[do\\_callback\(Fl\\_Widget \\*widget, void \\*data\)](#)

#### 33.161.4.43 [deimage\(\)](#) [1/4]

```
Fl_Image * Fl_Widget::deimage ( ) [inline]
```

Gets the image that is used as part of the widget label when in the inactive state.

#### Returns

the current image for the deactivated widget

#### 33.161.4.44 [deimage\(\)](#) [2/4]

```
const Fl_Image * Fl_Widget::deimage ( ) const [inline]
```

Gets the image that is used as part of the widget label when in the inactive state.

#### Returns

the current image for the deactivated widget

#### 33.161.4.45 [deimage\(\)](#) [3/4]

```
void Fl_Widget::deimage (
    Fl_Image & img )
```

Sets the image to use as part of the widget label when in the inactive state.

#### Parameters

in	<i>img</i>	the new image for the deactivated widget
----	------------	--

#### See also

[void deimage\(Fl\\_Image\\* img\)](#)

#### 33.161.4.46 [deimage\(\)](#) [4/4]

```
void Fl_Widget::deimage (
    Fl_Image * img )
```

Sets the image to use as part of the widget label when in the inactive state.

#### Parameters

<code>in</code>	<code>img</code>	the new image for the deactivated widget
-----------------	------------------	--

#### Note

The caller is responsible for making sure `img` is not deleted while it's used by the widget, and, if appropriate, for deleting it after the widget's deletion.

#### See also

void [bind\\_deimage\(Fl\\_Image\\* img\)](#)

### 33.161.4.47 deimage\_bound()

```
int Fl_Widget::deimage_bound ( ) const [inline]
```

Returns whether the inactive image is managed by the widget.

#### Return values

<code>0</code>	if the image is not bound to the widget
<code>1</code>	if the image will be deleted when the widget is deleted

#### See also

[image\\_bound\(\)](#), [bind\\_deimage\(\)](#)

### 33.161.4.48 do\_callback() [1/3]

```
void Fl_Widget::do_callback (
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN ) [inline]
```

Calls the widget callback function with default arguments.

This is the same as calling

```
do_callback(this, user_data(), reason);
```

#### Parameters

<code>in</code>	<code>reason</code>	give a reason to why this callback was called, defaults to <a href="#">FL_REASON_UNKNOWN</a>
-----------------	---------------------	--

#### See also

[callback\(\)](#)

[do\\_callback\(Fl\\_Widget \\*widget, void \\*data, Fl\\_Callback\\_Reason reason\), Fl\\_Callback\\_Reason](#)

### 33.161.4.49 do\_callback() [2/3]

```
void Fl_Widget::do_callback (
    Fl_Widget * widget,
    long arg,
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN ) [inline]
```

Calls the widget callback function with arbitrary arguments.

## Parameters

in	<i>widget</i>	call the callback with <i>widget</i> as the first argument
in	<i>arg</i>	call the callback with <i>arg</i> as the user data (second) argument
in	<i>reason</i>	give a reason to why this callback was called, defaults to <a href="#">FL_REASON_UNKNOWN</a>

## See also

[callback\(\)](#)[do\\_callback\(Fl\\_Widget \\*widget, void \\*data\), \[Fl\\\_Callback\\\_Reason\]\(#\)](#)**33.161.4.50 do\_callback()** [3/3]

```
void Fl_Widget::do_callback (
    Fl_Widget * widget,
    void * arg = 0,
    Fl_Callback_Reason reason = FL_REASON_UNKNOWN )
```

Calls the widget callback function with arbitrary arguments.

All overloads of [do\\_callback\(\)](#) call this method. It does nothing if the widget's [callback\(\)](#) is NULL. It clears the widget's *changed* flag **after** the callback was called unless the callback is the default callback. Hence it is not necessary to call [clear\\_changed\(\)](#) after calling [do\\_callback\(\)](#) in your own widget's [handle\(\)](#) method.

A *reason* must be set for widgets if different actions can trigger the same callback.

## Note

It is legal to delete the widget in the callback (i.e. in user code), but you must not access the widget in the [handle\(\)](#) method after calling [do\\_callback\(\)](#) if the widget was deleted in the callback. We recommend to use [Fl\\_Widget\\_Tracker](#) to check whether the widget was deleted in the callback.

## Parameters

in	<i>widget</i>	call the callback with <i>widget</i> as the first argument
in	<i>arg</i>	use <i>arg</i> as the user data (second) argument
in	<i>reason</i>	give a reason to why this callback was called, defaults to <a href="#">FL_REASON_UNKNOWN</a>

## See also

[default\\_callback\(\)](#)[callback\(\)](#)class [Fl\\_Widget\\_Tracker](#)[Fl::callback\\_reason\(\)](#)**33.161.4.51 draw()**

```
virtual void Fl_Widget::draw ( ) [pure virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Implemented in [Fl\\_Adjuster](#), [Fl\\_Box](#), [Fl\\_Browser](#), [Fl\\_Button](#), [Fl\\_Cairo\\_Window](#), [Fl\\_Chart](#), [Fl\\_Choice](#), [Fl\\_Clock\\_Output](#), [Fl\\_Counter](#), [Fl\\_Dial](#), [Fl\\_File\\_Input](#), [Fl\\_Flex](#), [Fl\\_FormsBitmap](#), [Fl\\_FormsPixmap](#), [Fl\\_Free](#), [Fl\\_Gl\\_Window](#), [Fl\\_Grid](#), [Fl\\_Group](#), [Fl\\_Help\\_View](#), [Fl\\_Input](#), [Fl\\_Input\\_Choice](#), [Fl\\_Light\\_Button](#), [Fl\\_Menu\\_Bar](#), [Fl\\_Menu\\_Button](#), [Fl\\_Pack](#), [Fl\\_Positioner](#), [Fl\\_Progress](#), [Fl\\_Return\\_Button](#), [Fl\\_Roller](#), [Fl\\_Scroll](#), [Fl\\_Scrollbar](#), [Fl\\_Shortcut\\_Button](#), [Fl\\_Slider](#), [Fl\\_Spinner](#), [Fl\\_Sys\\_Menu\\_Bar](#), [Fl\\_Table](#), [Fl\\_Tabs](#), [Fl\\_Text\\_Display](#), [Fl\\_Timer](#), [Fl\\_Tree](#), [Fl\\_Value\\_Input](#), [Fl\\_Value\\_Output](#), [Fl\\_Value\\_Slider](#), [Fl\\_Window](#), [Fl\\_Wizard](#), [Fl\\_FormsText](#), [Fl\\_Glut\\_Window](#), and [Fl\\_Terminal](#).

#### 33.161.4.52 `draw_focus()` [1/3]

```
void Fl_Widget::draw_focus ( ) const [inline], [protected]
```

Draws a focus rectangle around the widget.

This method uses the widget's boxtype and coordinates and its background color [color\(\)](#).

See also

[Fl\\_Widget::draw\\_focus\(Fl\\_Boxtype, int, int, int, int, Fl\\_Color\) const](#)

#### 33.161.4.53 `draw_focus()` [2/3]

```
void Fl_Widget::draw_focus (
    Fl_Boxtype t,
    int X,
    int Y,
    int W,
    int H ) const [inline], [protected]
```

Draws a focus rectangle around the widget.

This method uses the given boxtype and coordinates and the widget's background color [color\(\)](#).

See also

[Fl\\_Widget::draw\\_focus\(Fl\\_Boxtype, int, int, int, int, Fl\\_Color\) const](#)

#### 33.161.4.54 `draw_focus()` [3/3]

```
void Fl_Widget::draw_focus (
    Fl_Boxtype bt,
    int X,
    int Y,
    int W,
    int H,
    Fl_Color bg ) const [protected]
```

Draws a focus box for the widget at the given position and size.

This method does nothing if

- the global option [Fl::visible\\_focus\(\)](#) or
- the per-widget option [visible\\_focus\(\)](#) is false (off).

This means that [Fl\\_Widget::draw\\_focus\(\)](#) or one of the more specialized methods can be called without checking these visible focus options.

Note

This method must only be called if the widget has the focus. This is not tested internally.

The boxtype `bt` is used to calculate the inset so the focus box is drawn inside the box borders.

The default focus box drawing color is black. The background color `bg` is used to determine a better visible color if necessary by using [fl\\_contrast\(\)](#) with the given background color.

## Parameters

in	<i>bt</i>	Boxtype that needs to be considered (frame width)
in	<i>X,Y,W,H</i>	Bounding box
in	<i>bg</i>	Background color

## See also

[Fl\\_Widget::draw\\_focus\(\)](#)

[Fl\\_Widget::draw\\_focus\(Fl\\_Boxtype, int, int, int, int\) const](#)

**33.161.4.55 draw\_label()** [1/3]

```
void Fl_Widget::draw_label ( ) const [protected]
```

Draws the widget's label at the defined label position.

This is the normal call for a widget's [draw\(\)](#) method.

**33.161.4.56 draw\_label()** [2/3]

```
void Fl_Widget::draw_label (
    int X,
    int Y,
    int W,
    int H ) const [protected]
```

Draws the label in an arbitrary bounding box.

[draw\(\)](#) can use this instead of [draw\\_label\(void\)](#) to change the bounding box

**33.161.4.57 draw\_label()** [3/3]

```
void Fl_Widget::draw_label (
    int X,
    int Y,
    int W,
    int H,
    Fl_Align a ) const
```

Draws the label in an arbitrary bounding box with an arbitrary alignment.

Anybody can call this to force the label to draw anywhere.

**33.161.4.58 h()** [1/2]

```
int Fl_Widget::h (
    void ) const [inline]
```

Gets the widget height.

## Returns

the height of the widget in pixels.

**33.161.4.59 h()** [2/2]

```
void Fl_Widget::h (
    int v ) [inline], [protected]
```

Internal use only.

Use [position\(int,int\)](#), [size\(int,int\)](#) or [resize\(int,int,int,int\)](#) instead.

**33.161.4.60 handle()**

```
int Fl_Widget::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

**Parameters**

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

**Return values**

0	if the event was not used or understood
1	if the event was used and can be deleted

**See also**

[Fl\\_Event](#)

Reimplemented in [Fl\\_Color\\_Chooser](#), [Fl\\_Free](#), [Fl\\_Table](#), [Fl\\_Terminal](#), [Fl\\_Text\\_Display](#), [Fl\\_Text\\_Editor](#), [Fl\\_Tree](#), [Fl\\_Browser\\_](#), [Fl\\_File\\_Input](#), [Fl\\_Scheme\\_Choice](#), [Fl\\_Spinner::Fl\\_Spinner\\_Input](#), [Fl\\_Spinner](#), [Fl\\_Table\\_Row](#), [Fl\\_Tile](#), [Fl\\_Adjuster](#), [Fl\\_Box](#), [Fl\\_Button](#), [Fl\\_Check\\_Browser](#), [Fl\\_Choice](#), [Fl\\_Clock](#), [Fl\\_Counter](#), [Fl\\_Dial](#), [Fl\\_Gl\\_Window](#), [Fl\\_Group](#), [Fl\\_Help\\_View](#), [Fl\\_Input](#), [Fl\\_Light\\_Button](#), [Fl\\_Menu\\_Bar](#), [Fl\\_Menu\\_Button](#), [Fl\\_Positioner](#), [Fl\\_Repeat\\_Button](#), [Fl\\_Return\\_Button](#), [Fl\\_Roller](#), [Fl\\_Scroll](#), [Fl\\_Scrollbar](#), [Fl\\_Secret\\_Input](#), [Fl\\_Shortcut\\_Button](#), [Fl\\_Slider](#), [Fl\\_Tabs](#), [Fl\\_Timer](#), [Fl\\_Value\\_Input](#), [Fl\\_Value\\_Output](#), [Fl\\_Value\\_Slider](#), [Fl\\_Window](#), and [Fl\\_Glut\\_Window](#).

**33.161.4.61 hide()**

```
void Fl_Widget::hide ( ) [virtual]
```

Makes a widget invisible.

**See also**

[show\(\)](#), [visible\(\)](#), [visible\\_r\(\)](#)

Reimplemented in [Fl\\_Browser](#), [Fl\\_Double\\_Window](#), [Fl\\_Gl\\_Window](#), [Fl\\_Overlay\\_Window](#), and [Fl\\_Window](#).

**33.161.4.62 horizontal\_label\_margin() [1/2]**

```
int Fl_Widget::horizontal_label_margin ( ) [inline]
```

Get the spacing between the label and the horizontal edge of the widget.

**Returns**

px gap in pixels

**33.161.4.63 horizontal\_label\_margin()** [2/2]

```
void Fl_Widget::horizontal_label_margin (
    int px ) [inline]
```

Set the spacing between the label and the horizontal edge of the widget.

**Parameters**

in	px	gap in pixels
----	----	---------------

**33.161.4.64 image()** [1/4]

```
Fl_Image * Fl_Widget::image ( ) [inline]
```

Gets the image that is used as part of the widget label when in the active state.

**Returns**

the current image

**33.161.4.65 image()** [2/4]

```
const Fl_Image * Fl_Widget::image ( ) const [inline]
```

Gets the image that is used as part of the widget label when in the active state.

**Returns**

the current image

**33.161.4.66 image()** [3/4]

```
void Fl_Widget::image (
    Fl_Image & img )
```

Sets the image to use as part of the widget label when in the active state.

**Parameters**

in	img	the new image for the label
----	-----	-----------------------------

**See also**

void [image\(Fl\\_Image\\* img\)](#)

**33.161.4.67 image()** [4/4]

```
void Fl_Widget::image (
    Fl_Image * img )
```

Sets the image to use as part of the widget label when in the active state.

The caller is responsible for making sure `img` is not deleted while it's used by the widget, and, if appropriate, for deleting it after the widget's deletion.

Calling [image\(\)](#) with a new image will delete the old image if it was bound, and set the new image without binding it. If old and new are the same, the image will not be deleted, but it will be unbound.

Calling [image\(\)](#) with NULL will delete the old image if it was bound and not set a new image.

## Parameters

in	<i>img</i>	the new image for the label
----	------------	-----------------------------

## See also

[bind\\_image\(Fl\\_Image\\* img\)](#)

**33.161.4.68 image\_bound()**

```
int Fl_Widget::image_bound ( ) const [inline]
```

Returns whether the image is managed by the widget.

## Return values

0	if the image is not bound to the widget
1	if the image will be deleted when the widget is deleted

## See also

[deimage\\_bound\(\)](#), [bind\\_image\(\)](#)

**33.161.4.69 inside()**

```
int Fl_Widget::inside (
    const Fl_Widget * wgt ) const [inline]
```

Checks if this widget is a child of *wgt*.

Returns 1 if this widget is a child of *wgt*, or is equal to *wgt*. Returns 0 if *wgt* is NULL.

## Parameters

in	<i>wgt</i>	the possible parent widget.
----	------------	-----------------------------

## See also

[contains\(\)](#)

**33.161.4.70 is\_label\_copied()**

```
int Fl_Widget::is_label_copied ( ) const [inline]
```

Returns whether the current label was assigned with [copy\\_label\(\)](#).

This can be useful for temporarily overwriting the widget's label and restoring it later.

## Return values

0	current label was assigned with <a href="#">label()</a> .
1	current label was assigned with <a href="#">copy_label()</a> .

**33.161.4.71 label()** [1/3]

```
const char * Fl_Widget::label ( ) const [inline]
```

Gets the current label text.

**Returns**

a pointer to the current label text

**See also**

[label\(const char \\*\)](#), [copy\\_label\(const char \\*\)](#)

**33.161.4.72 label()** [2/3]

```
void Fl_Widget::label (
    const char * text )
```

Sets the current label pointer.

The label is shown somewhere on or next to the widget. See [Labels and Label Types](#) for details about what can be put in a label. The passed pointer is stored unchanged in the widget (the string is *not* copied), so if you need to set the label to a formatted value, make sure the buffer is static, global, or allocated. The [copy\\_label\(\)](#) method can be used to make a copy of the label string automatically.

**Parameters**

<i>in</i>	<i>text</i>	pointer to new label text
-----------	-------------	---------------------------

**See also**

[copy\\_label\(\)](#)

**33.161.4.73 label()** [3/3]

```
void Fl_Widget::label (
    Fl_Labeltype a,
    const char * b ) [inline]
```

Shortcut to set the label text and type in one call.

**See also**

[label\(const char \\*\)](#), [labeltype\(Fl\\_Labeltype\)](#)

**33.161.4.74 label\_image\_spacing()** [1/2]

```
int Fl_Widget::label_image_spacing ( ) [inline]
```

Return the gap size between the label and the image.

**Returns**

spacing in pixels

**33.161.4.75 label\_image\_spacing()** [2/2]

```
void Fl_Widget::label_image_spacing (
    int gap ) [inline]
```

Set the gap between the label and the image in pixels.

This value is limited to 0..255.

## Parameters

in	<i>gap</i>	spacing in pixels
----	------------	-------------------

**33.161.4.76 label\_shortcut()**

```
unsigned int Fl_Widget::label_shortcut (
    const char * t ) [static]
```

Returns the Unicode value of the '&x' shortcut in a given text.

The given text *t* (usually a widget's label or a menu text) is searched for a '&x' shortcut label, and if found, the Unicode value (code point) of the '&x' shortcut is returned.

## Parameters

<i>t</i>	text or label to search for '&x' shortcut.
----------	--

## Returns

Unicode (UCS-4) value of shortcut in *t* or 0.

## Note

Internal use only.

**33.161.4.77 labelcolor() [1/2]**

```
Fl_Color Fl_Widget::labelcolor ( ) const [inline]
```

Gets the label color.

The default color is FL\_FOREGROUND\_COLOR.

## Returns

the current label color

**33.161.4.78 labelcolor() [2/2]**

```
void Fl_Widget::labelcolor (
    Fl_Color c ) [inline]
```

Sets the label color.

The default color is FL\_FOREGROUND\_COLOR.

## Parameters

in	<i>c</i>	the new label color
----	----------	---------------------

**33.161.4.79 labelfont() [1/2]**

```
Fl_Font Fl_Widget::labelfont ( ) const [inline]
```

Gets the font to use.

Fonts are identified by indexes into a table. The default value uses a Helvetica typeface (Arial for Microsoft® Windows®). The function [Fl::set\\_font\(\)](#) can define new typefaces.

**Returns**

current font used by the label

**See also**

[Fl\\_Font](#)

**33.161.4.80 labelfont() [2/2]**

```
void Fl_Widget::labelfont (
    Fl_Font f ) [inline]
```

Sets the font to use.

Fonts are identified by indexes into a table. The default value uses a Helvetica typeface (Arial for Microsoft® Windows®). The function [Fl::set\\_font\(\)](#) can define new typefaces.

**Parameters**

in	<i>f</i>	the new font for the label
----	----------	----------------------------

**See also**

[Fl\\_Font](#)

**33.161.4.81 labelsize() [1/2]**

```
Fl_Fontsize Fl_Widget::labelsize ( ) const [inline]
```

Gets the font size in pixels.

The default size is 14 pixels.

**Returns**

the current font size

**33.161.4.82 labelsize() [2/2]**

```
void Fl_Widget::labelsize (
    Fl_Fontsize pix ) [inline]
```

Sets the font size in pixels.

**Parameters**

in	<i>pix</i>	the new font size
----	------------	-------------------

**See also**

[Fl\\_Fontsize labelsize\(\)](#)

**33.161.4.83 labeltype() [1/2]**

```
Fl_Labeltype Fl_Widget::labeltype ( ) const [inline]
```

Gets the label type.

**Returns**

the current label type.

**See also**

[Fl\\_Labeltype](#)

**33.161.4.84 labeltype() [2/2]**

```
void Fl_Widget::labeltype (
    Fl_Labeltype a ) [inline]
```

Sets the label type.

The label type identifies the function that draws the label of the widget. This is generally used for special effects such as embossing or for using the [label\(\)](#) pointer as another form of data such as an icon. The value FL\_NORMAL\_LABEL prints the label as plain text.

**Parameters**

in	a	new label type
----	---	----------------

**See also**

[Fl\\_Labeltype](#)

**33.161.4.85 measure\_label()**

```
void Fl_Widget::measure_label (
    int & ww,
    int & hh ) const [inline]
```

Sets width ww and height hh accordingly with the label size.

Labels with images will return [w\(\)](#) and [h\(\)](#) of the image.

This calls [fl\\_measure\(\)](#) internally. For more information about the arguments ww and hh and word wrapping

**See also**

[fl\\_measure\(const char\\*, int&, int&, int\)](#)

**33.161.4.86 needs\_keyboard() [1/2]**

```
bool Fl_Widget::needs_keyboard ( ) const [inline]
```

Returns whether this widget needs a keyboard.

**Returns**

true or false

**See also**

[needs\\_keyboard\(bool\)](#)

**33.161.4.87 needs\_keyboard()** [2/2]

```
void Fl_Widget::needs_keyboard (
    bool needs ) [inline]
```

Sets whether this widget needs a keyboard.

Set this on touch screen devices if a widget needs a keyboard when it gets the focus.

**Note**

This flag can be set but is not yet **used** in FLTK 1.4.0. It is intended to be used in the future on real touch devices.

**Parameters**

in	<i>needs</i>	Set this to true or false
----	--------------	---------------------------

**33.161.4.88 output()**

```
unsigned int Fl_Widget::output ( ) const [inline]
```

Returns if a widget is used for output only.

[output\(\)](#) means the same as [lactive\(\)](#) except it does not change how the widget is drawn. The widget will not receive any events. This is useful for making scrollbars or buttons that work as displays rather than input devices.

**Return values**

0	if the widget is used for input and output
---	--

**See also**

[set\\_output\(\)](#), [clear\\_output\(\)](#)

**33.161.4.89 parent()** [1/2]

```
Fl_Group * Fl_Widget::parent ( ) const [inline]
```

Returns a pointer to the parent widget.

Usually this is a [Fl\\_Group](#) or [Fl\\_Window](#).

**Return values**

NULL	if the widget has no parent
------	-----------------------------

**See also**

[Fl\\_Group::add\(Fl\\_Widget\\*\)](#)

**33.161.4.90 parent()** [2/2]

```
void Fl_Widget::parent (
    Fl_Group * p ) [inline]
```

Internal use only - "for hacks only".

It is **STRONGLY recommended** not to use this method, because it short-circuits [Fl\\_Group](#)'s normal widget adding and removing methods, if the widget is already a child widget of another [Fl\\_Group](#).

Use [Fl\\_Group::add\(Fl\\_Widget\\*\)](#) and/or [Fl\\_Group::remove\(Fl\\_Widget\\*\)](#) instead.

**33.161.4.91 position()**

```
void Fl_Widget::position (
    int X,
    int Y ) [inline]
```

Repositions the window or widget.

position(X, Y) is a shortcut for [resize\(X, Y, w\(\), h\(\)\)](#).

**Parameters**

in	X,Y	new position relative to the parent window
----	-----	--

**See also**

[resize\(int,int,int,int\)](#), [size\(int,int\)](#)

**33.161.4.92 redraw()**

```
void Fl_Widget::redraw ( )
```

Schedules the drawing of the widget.

Marks the widget as needing its [draw\(\)](#) routine called.

**33.161.4.93 redraw\_label()**

```
void Fl_Widget::redraw_label ( )
```

Schedules the drawing of the label.

Marks the widget or the parent as needing a redraw for the label area of a widget.

**33.161.4.94 resize()**

```
void Fl_Widget::resize (
    int x,
    int y,
    int w,
    int h ) [virtual]
```

Changes the size or position of the widget.

This is a virtual function so that the widget may implement its own handling of resizing. The default version does *not* call the [redraw\(\)](#) method, but instead relies on the parent widget to do so because the parent may know a faster way to update the display, such as scrolling from the old position.

Some window managers under X11 call [resize\(\)](#) a lot more often than needed. Please verify that the position or size of a widget did actually change before doing any extensive calculations.

position(X, Y) is a shortcut for [resize\(X, Y, w\(\), h\(\)\)](#), and [size\(W, H\)](#) is a shortcut for [resize\(x\(\), y\(\), W, H\)](#).

**Parameters**

in	x,y	new position relative to the parent window
in	w,h	new size

**See also**

[position\(int,int\)](#), [size\(int,int\)](#)

Reimplemented in [Fl\\_Browser\\_](#), [Fl\\_Flex](#), [Fl\\_Grid](#), [Fl\\_Input\\_Choice](#), [Fl\\_Pack](#), [Fl\\_Scroll](#), [Fl\\_Spinner](#), [Fl\\_Table](#), [Fl\\_Terminal](#), [Fl\\_Text\\_Display](#), [Fl\\_Tile](#), [Fl\\_Window](#), [Fl\\_Double\\_Window](#), [Fl\\_Gl\\_Window](#), [Fl\\_Group](#), [Fl\\_Help\\_View](#), [Fl\\_Input\\_](#), [Fl\\_Overlay\\_Window](#), [Fl\\_Tabs](#), [Fl\\_Tree](#), and [Fl\\_Value\\_Input](#).

**33.161.4.95 selection\_color()** [1/2]

```
Fl_Color Fl_Widget::selection_color ( ) const [inline]
```

Gets the selection color.

Returns

the current selection color

See also

[selection\\_color\(Fl\\_Color\)](#), [color\(Fl\\_Color, Fl\\_Color\)](#)

**33.161.4.96 selection\_color()** [2/2]

```
void Fl_Widget::selection_color (
    Fl_Color a ) [inline]
```

Sets the selection color.

The selection color is defined for Forms compatibility and is usually used to color the widget when it is selected, although some widgets use this color for other purposes. You can set both colors at once with [color\(Fl\\_Color bg, Fl\\_Color sel\)](#).

Parameters

in	<i>a</i>	the new selection color
----	----------	-------------------------

See also

[selection\\_color\(\)](#), [color\(Fl\\_Color, Fl\\_Color\)](#)

**33.161.4.97 set\_active()**

```
void Fl_Widget::set_active ( ) [inline]
```

Marks the widget as active without sending events or changing focus.

This is mainly for specialized use, for normal cases you want [activate\(\)](#).

See also

[activate\(\)](#)

**33.161.4.98 set\_changed()**

```
void Fl_Widget::set_changed ( ) [inline]
```

Marks the value of the widget as changed.

See also

[changed\(\)](#), [clear\\_changed\(\)](#)

**33.161.4.99 set\_output()**

```
void Fl_Widget::set_output ( ) [inline]
```

Sets a widget to output only.

See also

[output\(\)](#), [clear\\_output\(\)](#)

**33.161.4.100 set\_visible()**

```
void Fl_Widget::set_visible ( ) [inline]
```

Makes the widget visible.

You must still redraw the parent widget to see a change in the window. Normally you want to use the [show\(\)](#) method instead.

**33.161.4.101 set\_visible\_focus()**

```
void Fl_Widget::set_visible_focus ( ) [inline]
```

Enables keyboard focus navigation with this widget.

Note, however, that this will not necessarily mean that the widget will accept focus, but for widgets that can accept focus, this method enables it if it has been disabled.

See also

[visible\\_focus\(\)](#), [clear\\_visible\\_focus\(\)](#), [visible\\_focus\(int\)](#)

**33.161.4.102 shortcut\_label()** [1/2]

```
int Fl_Widget::shortcut_label ( ) const [inline]
```

Returns whether the widget's label uses '&' to indicate shortcuts.

See also

void [shortcut\\_label\(int value\)](#)

**33.161.4.103 shortcut\_label()** [2/2]

```
void Fl_Widget::shortcut_label (
    int value ) [inline]
```

Sets whether the widget's label uses '&' to indicate shortcuts.

By default, all objects of classes [Fl\\_Menu\\_](#) (and derivatives), [Fl\\_Button](#) (and derivatives), [Fl\\_Text\\_Display](#), [Fl\\_Value\\_Input](#), and [Fl\\_Input\\_](#) (and derivatives) use character '&' in their label, unless '&' is repeated, to indicate shortcuts: '&' does not appear in the drawn label, the next character after '&' in the label is drawn underlined, and typing this character triggers the corresponding menu window, button, or other widget. If the label contains 2 consecutive '&', only one is drawn and the next character is not underlined and not used as a shortcut. If `value` is set to 0, all these labels don't process character '&' as indicating a shortcut: '&' is drawn in the label, the next character is not underlined and does not define a shortcut.

**33.161.4.104 show()**

```
void Fl_Widget::show ( ) [virtual]
```

Makes a widget visible.

An invisible widget never gets redrawn and does not get keyboard or mouse events, but can receive a few other events like `FL_SHOW`.

The [visible\(\)](#) method returns true if the widget is set to be visible. The [visible\\_r\(\)](#) method returns true if the widget and all of its parents are visible. A widget is only visible if [visible\(\)](#) is true on it *and all of its parents*.

Changing it will send `FL_SHOW` or `FL_HIDE` events to the widget. *Do not change it if the parent is not visible, as this will send false `FL_SHOW` or `FL_HIDE` events to the widget.* [redraw\(\)](#) is called if necessary on this or the parent.

See also

[hide\(\)](#), [visible\(\)](#), [visible\\_r\(\)](#)

Reimplemented in [Fl\\_Browser](#), [Fl\\_Double\\_Window](#), [Fl\\_Gl\\_Window](#), [Fl\\_Overlay\\_Window](#), [Fl\\_Single\\_Window](#), [Fl\\_Tabs](#), and [Fl\\_Window](#).

**33.161.4.105 size()**

```
void Fl_Widget::size (
    int W,
    int H ) [inline]
```

Changes the size of the widget.

size(W, H) is a shortcut for [resize\(x\(\), y\(\), W, H\)](#).

**Parameters**

in	W,H	new size
----	-----	----------

**See also**

[position\(int,int\)](#), [resize\(int,int,int,int\)](#)

**33.161.4.106 take\_focus()**

```
int Fl_Widget::take_focus ( )
```

Gives the widget the keyboard focus.

Tries to make this widget be the [Fl::focus\(\)](#) widget, by first sending it an FL\_FOCUS event, and if it returns non-zero, setting [Fl::focus\(\)](#) to this widget. You should use this method to assign the focus to a widget.

**Returns**

true if the widget accepted the focus.

**33.161.4.107 takesevents()**

```
unsigned int Fl_Widget::takesevents ( ) const [inline]
```

Returns if the widget is able to take events.

This is the same as ([active\(\)](#) && [!output\(\)](#) && [visible\(\)](#)) but is faster.

**Return values**

0	if the widget takes no events
---	-------------------------------

**33.161.4.108 test\_shortcut() [1/2]**

```
int Fl_Widget::test_shortcut ( )
```

Returns true if the widget's label contains the entered '&x' shortcut.

This method must only be called in [handle\(\)](#) methods or callbacks after a keypress event (usually FL\_KEYDOWN or FL\_SHORTCUT). The widget's label is searched for a '&x' shortcut, and if found, this is compared with the entered key value.

[Fl::event\\_text\(\)](#) is used to get the entered key value.

**Returns**

true, if the entered text matches the widget's '&x' shortcut, false (0) otherwise.

**Note**

Useful when a widget's [handle\(int\)](#) method needs dedicated processing of FL\_SHORTCUT.

**33.161.4.109 test\_shortcut()** [2/2]

```
int Fl_Widget::test_shortcut (
    const char * t,
    const bool require_alt = false ) [static]
```

Returns true if the given text *t* contains the entered '&x' shortcut.

This method must only be called in [handle\(\)](#) methods or callbacks after a keypress event (usually FL\_KEYDOWN or FL\_SHORTCUT). The given text *t* (usually a widget's label or menu text) is searched for a '&x' shortcut, and if found, this is compared with the entered key value.

[Fl::event\\_text\(\)](#) is used to get the entered key value. [Fl::event\\_state\(\)](#) is used to get the Alt modifier, if *require\_alt* is true.

**Parameters**

<i>t</i>	text or label to search for '&x' shortcut.
<i>require_alt</i>	if true: match only if Alt key is pressed.

**Returns**

true, if the entered text matches the '&x' shortcut in *t* false (0) otherwise.

**Note**

Useful when a widget's [handle\(int\)](#) method needs dedicated processing of FL\_SHORTCUT.

**33.161.4.110 tooltip()** [1/2]

```
const char * Fl_Widget::tooltip ( ) const [inline]
```

Gets the current tooltip text.

**Returns**

a pointer to the tooltip text or NULL

**See also**

[tooltip\(const char\\*\)](#), [copy\\_tooltip\(const char\\*\)](#)

**33.161.4.111 tooltip()** [2/2]

```
void Fl_Widget::tooltip (
    const char * text )
```

Sets the Tooltip Text for a Widget.

Assigns a tooltip string that appears in a popup when the user hovers over the widget. The provided string is not copied. The caller must ensure it remains valid by storing it in a static, global, or dynamically allocated buffer. If you need the tooltip string to be copied and managed automatically, use [copy\\_tooltip\(\)](#).

By default, a widget inherits the tooltip of its parent if none is explicitly set. If you assign a tooltip to a group but not to its child widgets, the child widgets will display the group's tooltip. To prevent inheritance, set the child's tooltip to an empty string ("").

Tooltips can be updated dynamically before they are displayed. When a tooltip is about to be shown, FLTK sends an FL\_BEFORE\_TOOLTIP event to the widget's [handle\(\)](#) method. Developers can override the tooltip text temporarily using [Fl\\_Tooltip::override\\_text\(const char\\* new\\_text\)](#) and returning 1 from [handle\(\)](#) to apply the change.

**Parameters**

<i>in</i>	<i>text</i>	New tooltip text (no copy is made)
-----------	-------------	------------------------------------

See also

[copy\\_tooltip\(const char\\*\)](#), [tooltip\(\)](#)

#### 33.161.4.112 top\_window()

```
Fl_Window * Fl_Widget::top_window ( ) const
```

Returns a pointer to the top-level window for the widget.

In other words, the 'window manager window' that contains this widget. This method differs from [window\(\)](#) in that it won't return sub-windows (if there are any).

Returns

the top-level window, or NULL if no top-level window is associated with this widget.

See also

[window\(\)](#)

#### 33.161.4.113 top\_window\_offset()

```
Fl_Window * Fl_Widget::top_window_offset (
    int & xoff,
    int & yoff ) const
```

Finds the x/y offset of the current widget relative to the top-level window.

Parameters

out	<i>xoff,yoff</i>	Returns the x/y offset
-----	------------------	------------------------

Returns

the top-level window (or NULL for a widget that's not in any window)

#### 33.161.4.114 type() [1/2]

```
uchar Fl_Widget::type ( ) const [inline]
```

Gets the widget type.

Returns the widget type value, which gives some information about the derived widget class to which the object belongs. Noticeably, the condition `type() >= FL_WINDOW` indicates a widget is an [Fl\\_Window](#) or derived object.

#### 33.161.4.115 type() [2/2]

```
void Fl_Widget::type (
    uchar t ) [inline]
```

Sets the widget type.

See also

[type\(\)](#)

**33.161.4.116 user\_data()**

```
void * Fl_Widget::user_data ( ) const [inline]
```

Gets the user data for this widget.

Gets the current user data (void \*) argument that is passed to the callback function.

**Returns**

user data as a pointer

**33.161.4.117 vertical\_label\_margin() [1/2]**

```
int Fl_Widget::vertical_label_margin ( ) [inline]
```

Get the spacing between the label and the vertical edge of the widget.

**Returns**

px gap in pixels

**33.161.4.118 vertical\_label\_margin() [2/2]**

```
void Fl_Widget::vertical_label_margin (
    int px ) [inline]
```

Set the spacing between the label and the vertical edge of the widget.

**Parameters**

in	px	gap in pixels
----	----	---------------

**33.161.4.119 visible()**

```
unsigned int Fl_Widget::visible ( ) const [inline]
```

Returns whether a widget is visible.

**Return values**

0	if the widget is not drawn and hence invisible.
---	---

**See also**

[show\(\)](#), [hide\(\)](#), [visible\\_r\(\)](#)

**33.161.4.120 visible\_focus() [1/2]**

```
unsigned int Fl_Widget::visible_focus ( ) const [inline]
```

Checks whether this widget has a visible focus.

**Return values**

0	if this widget has no visible focus.
---	--------------------------------------

See also

[visible\\_focus\(int\)](#), [set\\_visible\\_focus\(\)](#), [clear\\_visible\\_focus\(\)](#)

#### 33.161.4.121 visible\_focus() [2/2]

```
void Fl_Widget::visible_focus (
    int v ) [inline]
```

Modifies keyboard focus navigation.

Parameters

in	v	set or clear visible focus
----	---	----------------------------

See also

[set\\_visible\\_focus\(\)](#), [clear\\_visible\\_focus\(\)](#), [visible\\_focus\(\)](#)

#### 33.161.4.122 visible\_r()

```
int Fl_Widget::visible_r ( ) const
```

Returns whether a widget and all its parents are visible.

Return values

0	if the widget or any of its parents are invisible.
---	--

See also

[show\(\)](#), [hide\(\)](#), [visible\(\)](#)

#### 33.161.4.123 w() [1/2]

```
int Fl_Widget::w ( ) const [inline]
```

Gets the widget width.

Returns

the width of the widget in pixels.

#### 33.161.4.124 w() [2/2]

```
void Fl_Widget::w (
    int v ) [inline], [protected]
```

Internal use only.

Use [position\(int,int\)](#), [size\(int,int\)](#) or [resize\(int,int,int,int\)](#) instead.

#### 33.161.4.125 when() [1/2]

```
Fl_When Fl_Widget::when ( ) const [inline]
```

Returns the conditions under which the callback is called.

You can set the flags with [when\(uchar\)](#), the default value is FL\_WHEN\_RELEASE.

**Returns**

set of flags

**See also**

[when\(uchar\)](#), [FL\\_When](#), [do\\_callback\(\)](#), [Fl::callback\\_reason\(\)](#)

**33.161.4.126 when() [2/2]**

```
void Fl_Widget::when (
    uchar i ) [inline]
```

Sets the flags used to decide when a callback is called.

This controls when callbacks are done. The following values are useful, the default value is FL\_WHEN\_RELEASE:

- 0: The callback is not done, but [changed\(\)](#) is turned on.
- FL\_WHEN\_CHANGED: The callback is done each time the text is changed by the user.
- FL\_WHEN\_RELEASE: The callback will be done when this widget loses the focus, including when the window is unmapped. This is a useful value for text fields in a panel where doing the callback on every change is wasteful. However the callback will also happen if the mouse is moved out of the window, which means it should not do anything visible (like pop up an error message). You might do better setting this to zero, and scanning all the items for [changed\(\)](#) when the OK button on a panel is pressed.
- FL\_WHEN\_ENTER\_KEY: If the user types the Enter key, the entire text is selected, and the callback is done if the text has changed. Normally the Enter key will navigate to the next field (or insert a newline for a [Fl\\_Multiline\\_Input](#)) - this changes the behavior.
- FL\_WHEN\_ENTER\_KEY|FL\_WHEN\_NOT\_CHANGED: The Enter key will do the callback even if the text has not changed. Useful for command fields.
- FL\_WHEN\_CLOSED : If the user requests that the widget is closed, the callback is called with [FL\\_REASON\\_CLOSED](#). The [Fl\\_Tabs](#) widget checks this flag on its children to determine whether to display a close button on the tab of that widget.

[Fl\\_Widget::when\(\)](#) is a set of bitflags used by subclasses of [Fl\\_Widget](#) to decide when to do the callback.

If the value is zero then the callback is never done. Other values are described in the individual widgets. This field is in the base class so that you can scan a panel and [do\\_callback\(\)](#) on all the ones that don't do their own callbacks in response to an "OK" button.

**Parameters**

in	i	set of flags
----	---	--------------

**See also**

[Fl\\_When](#), [do\\_callback\(\)](#), [Fl::callback\\_reason\(\)](#)

**33.161.4.127 window()**

```
Fl_Window * Fl_Widget::window ( ) const
```

Returns a pointer to the nearest parent window up the widget hierarchy.

This will return sub-windows if there are any, or the parent window if there's no sub-windows. If this widget IS the top-level window, NULL is returned.

## Return values

<code>NULL</code>	if no window is associated with this widget.
-------------------	--

## Note

for an [Fl\\_Window](#) widget, this returns its *parent* window (if any), not *this* window.

## See also

[top\\_window\(\)](#)

**33.161.4.128 x()** [1/2]

```
int Fl_Widget::x ( ) const [inline]
```

Gets the widget position in its window.

## Returns

the x position relative to the window

**33.161.4.129 x()** [2/2]

```
void Fl_Widget::x (
    int v ) [inline], [protected]
```

Internal use only.

Use [position\(int,int\)](#), [size\(int,int\)](#) or [resize\(int,int,int,int\)](#) instead.

**33.161.4.130 y()** [1/2]

```
int Fl_Widget::y ( ) const [inline]
```

Gets the widget position in its window.

## Returns

the y position relative to the window

**33.161.4.131 y()** [2/2]

```
void Fl_Widget::y (
    int v ) [inline], [protected]
```

Internal use only.

Use [position\(int,int\)](#), [size\(int,int\)](#) or [resize\(int,int,int,int\)](#) instead.

The documentation for this class was generated from the following files:

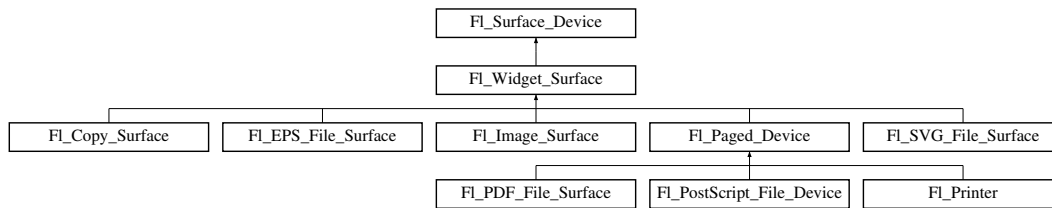
- [Fl\\_Widget.H](#)
- [Fl.cxx](#)
- [fl\\_boxtype.cxx](#)
- [fl\\_labeltype.cxx](#)
- [fl\\_shortcut.cxx](#)
- [Fl\\_Tooltip.cxx](#)
- [Fl\\_Widget.cxx](#)
- [Fl\\_Window.cxx](#)

## 33.162 Fl\_Widget\_Surface Class Reference

A surface on which any FLTK widget can be drawn.

```
#include <Fl_Widget_Surface.H>
```

Inheritance diagram for Fl\_Widget\_Surface:



### Public Member Functions

- void [draw](#) ([Fl\\_Widget](#) \*widget, int delta\_x=0, int delta\_y=0)  
*Draws the widget on the drawing surface.*
- void [draw\\_decorated\\_window](#) ([Fl\\_Window](#) \*win, int x\_offset=0, int y\_offset=0)  
*Draws a window with its title bar and frame if any.*
- virtual void [origin](#) (int \*x, int \*y)  
*Computes the coordinates of the current origin of graphics functions.*
- virtual void [origin](#) (int x, int y)  
*Sets the position of the origin of graphics in the drawable part of the drawing surface.*
- void [print\\_window\\_part](#) ([Fl\\_Window](#) \*win, int x, int y, int w, int h, int delta\_x=0, int delta\_y=0)  
*Draws a rectangular part of an on-screen window.*
- virtual int [printable\\_rect](#) (int \*w, int \*h)  
*Computes the width and height of the drawable area of the drawing surface.*
- virtual void [translate](#) (int x, int y)  
*Translates the current graphics origin accounting for the current rotation.*
- virtual void [untranslate](#) ()  
*Undoes the effect of a previous [translate\(\)](#) call.*

### Protected Member Functions

- [Fl\\_Widget\\_Surface](#) ([Fl\\_Graphics\\_Driver](#) \*d)  
*The constructor.*

### Protected Attributes

- int [x\\_offset](#)  
*horizontal offset to the origin of graphics coordinates*
- int [y\\_offset](#)  
*vertical offset to the origin of graphics coordinates*

### Additional Inherited Members

#### 33.162.1 Detailed Description

A surface on which any FLTK widget can be drawn.

#### 33.162.2 Constructor & Destructor Documentation

### 33.162.2.1 Fl\_Widget\_Surface()

```
Fl_Widget_Surface::Fl_Widget_Surface (
    Fl_Graphics_Driver * d ) [protected]
```

The constructor.

#### Parameters

<i>d</i>	can be nul.
----------	-------------

## 33.162.3 Member Function Documentation

### 33.162.3.1 draw()

```
void Fl_Widget_Surface::draw (
    Fl_Widget * widget,
    int delta_x = 0,
    int delta_y = 0 )
```

Draws the widget on the drawing surface.

The widget's position on the surface is determined by the last call to [origin\(\)](#) and by the optional delta\_x and delta\_y arguments. Its dimensions are in points unless there was a previous call to [scale\(\)](#).

#### Parameters

in	<i>widget</i>	Any FLTK widget (e.g., standard, custom, window).
in	<i>delta_x, delta_y</i>	Optional horizontal and vertical offsets for positioning the widget top left relatively to the current origin of graphics.

### 33.162.3.2 draw\_decorated\_window()

```
void Fl_Widget_Surface::draw_decorated_window (
    Fl_Window * win,
    int win_offset_x = 0,
    int win_offset_y = 0 )
```

Draws a window with its title bar and frame if any.

*win\_offset\_x* and *win\_offset\_y* are optional coordinates of where to position the window top left. Equivalent to [draw\(\)](#) if *win* is a subwindow or has no border. Use [Fl\\_Window::decorated\\_w\(\)](#) and [Fl\\_Window::decorated\\_h\(\)](#) to get the size of the framed window.

### 33.162.3.3 origin() [1/2]

```
void Fl_Widget_Surface::origin (
    int * x,
    int * y ) [virtual]
```

Computes the coordinates of the current origin of graphics functions.

#### Parameters

out	<i>x, y</i>	If non-null, *x and *y are set to the horizontal and vertical coordinates of the graphics origin.
-----	-------------	---

Reimplemented in [Fl\\_EPS\\_File\\_Surface](#), [Fl\\_Copy\\_Surface](#), [Fl\\_Image\\_Surface](#), [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), [Fl\\_Printer](#), and [Fl\\_SVG\\_File\\_Surface](#).

**33.162.3.4 origin()** [2/2]

```
void Fl_Widget_Surface::origin (
    int x,
    int y ) [virtual]
```

Sets the position of the origin of graphics in the drawable part of the drawing surface.

Arguments should be expressed relatively to the result of a previous [printable\\_rect\(\)](#) call. That is, `printable_rect(&w, &h); origin(w/2, 0);` sets the graphics origin at the top center of the drawable area. Successive [origin\(\)](#) calls don't combine their effects. [Origin\(\)](#) calls are not affected by [rotate\(\)](#) calls (for classes derived from [Fl\\_Paged\\_Device](#)).

**Parameters**

in	x,y	Horizontal and vertical positions in the drawing surface of the desired origin of graphics.
----	-----	---

Reimplemented in [Fl\\_Copy\\_Surface](#), [Fl\\_Image\\_Surface](#), [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), [Fl\\_EPS\\_File\\_Surface](#), [Fl\\_Printer](#), and [Fl\\_SVG\\_File\\_Surface](#).

**33.162.3.5 print\_window\_part()**

```
void Fl_Widget_Surface::print_window_part (
    Fl_Window * win,
    int x,
    int y,
    int w,
    int h,
    int delta_x = 0,
    int delta_y = 0 )
```

Draws a rectangular part of an on-screen window.

**Parameters**

<i>win</i>	The window from where to capture. Can be an <a href="#">Fl_Gl_Window</a> . Sub-windows that intersect the rectangle are also captured.
<i>x</i>	The rectangle left
<i>y</i>	The rectangle top
<i>w</i>	The rectangle width
<i>h</i>	The rectangle height
<i>delta_x, delta_y</i>	Optional horizontal and vertical offsets from current graphics origin where to draw the top left of the captured rectangle.

**33.162.3.6 printable\_rect()**

```
int Fl_Widget_Surface::printable_rect (
    int * w,
    int * h ) [virtual]
```

Computes the width and height of the drawable area of the drawing surface.

Values are in the same unit as that used by FLTK drawing functions and are unchanged by calls to [origin\(\)](#). If the object is derived from class [Fl\\_Paged\\_Device](#), values account for the user-selected paper type and print orientation and are changed by [scale\(\)](#) calls.

**Returns**

0 if OK, non-zero if any error

Reimplemented in [Fl\\_Copy\\_Surface](#), [Fl\\_Image\\_Surface](#), [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), [Fl\\_EPS\\_File\\_Surface](#), [Fl\\_Printer](#), and [Fl\\_SVG\\_File\\_Surface](#).

**33.162.3.7 translate()**

```
void Fl_Widget_Surface::translate (
    int x,
    int y ) [virtual]
```

Translates the current graphics origin accounting for the current rotation.

Each [translate\(\)](#) call must be matched by an [untranslate\(\)](#) call. Successive [translate\(\)](#) calls add up their effects.

Reimplemented in [Fl\\_Copy\\_Surface](#), [Fl\\_Image\\_Surface](#), [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), [Fl\\_EPS\\_File\\_Surface](#), [Fl\\_Printer](#), and [Fl\\_SVG\\_File\\_Surface](#).

**33.162.3.8 untranslate()**

```
void Fl_Widget_Surface::untranslate (
    void ) [virtual]
```

Undoes the effect of a previous [translate\(\)](#) call.

Reimplemented in [Fl\\_Copy\\_Surface](#), [Fl\\_Image\\_Surface](#), [Fl\\_PDF\\_File\\_Surface](#), [Fl\\_EPS\\_File\\_Surface](#), [Fl\\_SVG\\_File\\_Surface](#), [Fl\\_PostScript\\_File\\_Device](#), and [Fl\\_Printer](#).

The documentation for this class was generated from the following files:

- [Fl\\_Widget\\_Surface.H](#)
- [Fl\\_Widget\\_Surface.cxx](#)

**33.163 Fl\_Widget\_Tracker Class Reference**

This class should be used to control safe widget deletion.

```
#include <Fl.H>
```

**Public Member Functions**

- int [deleted](#) ()  
*Returns 1, if the watched widget has been deleted.*
- int [exists](#) ()  
*Returns 1, if the watched widget exists (has not been deleted).*
- **Fl\_Widget\_Tracker** ([Fl\\_Widget](#) \*wi)  
*The constructor adds a widget to the watch list.*
- [Fl\\_Widget](#) \* [widget](#) ()  
*Returns a pointer to the watched widget.*
- **~Fl\_Widget\_Tracker** ()  
*The destructor removes a widget from the watch list.*

**33.163.1 Detailed Description**

This class should be used to control safe widget deletion.

You can use an [Fl\\_Widget\\_Tracker](#) object to watch another widget, if you need to know whether this widget has been deleted during a callback.

This simplifies the use of the "safe widget deletion" methods [Fl::watch\\_widget\\_pointer\(\)](#) and [Fl::release\\_widget\\_pointer\(\)](#) and makes their use more reliable, because the destructor automatically releases the widget pointer from the widget watch list.

[Fl\\_Widget\\_Tracker](#) is intended to be used as an automatic (local/stack) variable, such that its destructor is called when the object's scope is left. This ensures that no stale widget pointers are left in the widget watch list (see example below).

You can also create [Fl\\_Widget\\_Tracker](#) objects with `new`, but then it is your responsibility to delete the object (and thus remove the widget pointer from the watch list) when it is no longer needed.

Example:

```
int MyClass::handle (int event) {
    if (...) {
        Fl_Widget_Tracker wp(this);           // watch myself
        do_callback();                         // call the callback
        if (wp.deleted()) return 1;           // exit, if deleted
        // Now we are sure that the widget has not been deleted,
        // and it is safe to access the widget:
        box(FL_FLAT_BOX);
        color(FL_WHITE);
        redraw();
    }
}
```

### 33.163.2 Member Function Documentation

#### 33.163.2.1 deleted()

```
int Fl_Widget_Tracker::deleted ( ) [inline]
```

Returns 1, if the watched widget has been deleted.

This is a convenience method. You can also use something like

```
if (wp.widget() == 0) // ...
```

where `wp` is an [Fl\\_Widget\\_Tracker](#) object.

#### 33.163.2.2 exists()

```
int Fl_Widget_Tracker::exists ( ) [inline]
```

Returns 1, if the watched widget exists (has not been deleted).

This is a convenience method. You can also use something like

```
if (wp.widget() != 0) // ...
```

where `wp` is an [Fl\\_Widget\\_Tracker](#) object.

#### 33.163.2.3 widget()

```
Fl_Widget * Fl_Widget_Tracker::widget ( ) [inline]
```

Returns a pointer to the watched widget.

This pointer is NULL, if the widget has been deleted.

The documentation for this class was generated from the following files:

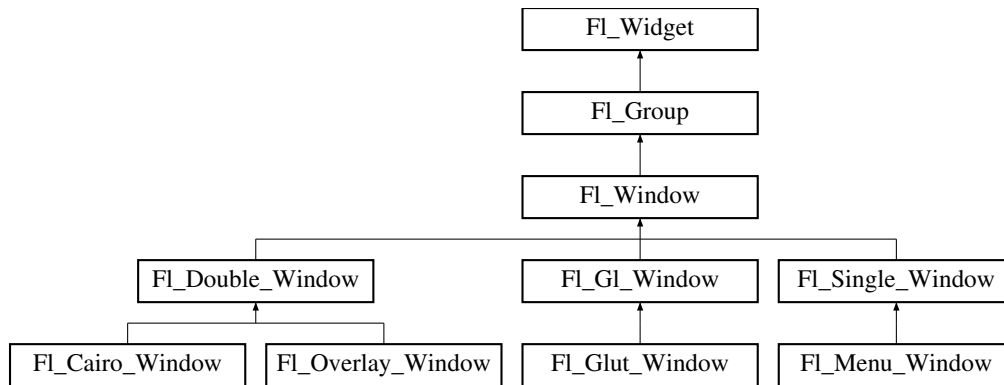
- [Fl.H](#)
- [Fl.cxx](#)

## 33.164 Fl\_Window Class Reference

This widget produces an actual window.

```
#include <Fl_Window.H>
```

Inheritance diagram for [Fl\\_Window](#):



## Public Types

- typedef struct HICON\_\_ \* **HICON**

## Public Member Functions

- void [allow\\_expand\\_outside\\_parent](#) ()  
*Allow this subwindow to expand outside the area of its parent window.*
- virtual class [FL\\_Double\\_Window](#) \* [as\\_double\\_window](#) ()  
*Return non-null if this is an [FL\\_Double\\_Window](#) object.*
- virtual class [FL\\_Overlay\\_Window](#) \* [as\\_overlay\\_window](#) ()  
*Return non-null if this is an [FL\\_Overlay\\_Window](#) object.*
- [FL\\_Window](#) const \* [as\\_window](#) () const **FL\_OVERRIDE**
- [FL\\_Window](#) \* [as\\_window](#) () **FL\_OVERRIDE**  
*Returns an [FL\\_Window](#) pointer if this widget is an [FL\\_Window](#).*
- unsigned int **border** () const  
*Returns whether the window possesses a border.*
- void [border](#) (int b)  
*Sets whether or not the window manager border is around the window.*
- void [clear\\_border](#) ()  
*Fast inline function to turn the window manager border off.*
- void [clear\\_modal\\_states](#) ()  
*Clears the "modal" flags and converts a "modal" or "non-modal" window back into a "normal" window.*
- void **copy\_label** (const char \*a)  
*Sets the window titlebar label to a copy of a character string.*
- void [cursor](#) (const [FL\\_RGB\\_Image](#) \*, int, int)  
*Changes the cursor for this window using the provided image as cursor's shape.*
- void [cursor](#) ([FL\\_Cursor](#) c, [FL\\_Color](#), [FL\\_Color](#)=[FL\\_WHITE](#))  
*For back compatibility only.*
- void [cursor](#) ([FL\\_Cursor](#))  
*Changes the cursor for this window.*
- int [decorated\\_h](#) () const  
*Returns the window height including any window title bar and any frame added by the window manager.*
- int [decorated\\_w](#) () const  
*Returns the window width including any frame added by the window manager.*
- void [default\\_cursor](#) ([FL\\_Cursor](#) c, [FL\\_Color](#), [FL\\_Color](#)=[FL\\_WHITE](#))  
*For back compatibility only.*
- void [default\\_cursor](#) ([FL\\_Cursor](#))  
*Sets the default window cursor.*

- void **draw\_backdrop** ()  
*Draw the background image if one is set and is aligned inside.*
- **FL\_Window** (int **w**, int **h**, const char \***title**=0)  
*Creates a window from the given width **w**, height **h**, and **title**.*
- **FL\_Window** (int **x**, int **y**, int **w**, int **h**, const char \***title**=0)  
*Creates a window from the given position (**x**, **y**), size (**w**, **h**) and **title**.*
- virtual void **flush** ()  
*Forces the window to be drawn, this window is also made current and calls **draw()**.*
- void **free\_position** ()  
*Undoes the effect of a previous **resize()** or **show()** so that the next time **show()** is called the window manager is free to position the window.*
- void **fullscreen** ()  
*Makes the window completely fill one or more screens, without any window manager border visible.*
- unsigned int **fullscreen\_active** () const  
*Returns non zero if FULLSCREEN flag is set, 0 otherwise.*
- void **fullscreen\_off** ()  
*Turns off any side effects of **fullscreen()***
- void **fullscreen\_off** (int **X**, int **Y**, int **W**, int **H**)  
*Turns off any side effects of **fullscreen()** and does **resize(x,y,w,h)**.*
- void **fullscreen\_screens** (int **top**, int **bottom**, int **left**, int **right**)  
*Sets which screens should be used when this window is in fullscreen mode.*
- **uchar get\_size\_range** (int \***minw**, int \***minh**, int \***maxw**=NULL, int \***maxh**=NULL, int \***dw**=NULL, int \***dh**=NULL, int \***aspect**=NULL)  
*Gets the allowable range to which the user can resize this window.*
- int **handle** (int) **FL\_OVERRIDE**  
*Handles the specified event.*
- void **hide** () **FL\_OVERRIDE**  
*Removes the window from the screen.*
- void **hotspot** (const **FL\_Widget** &**p**, int **offscreen**=0)  
*See void **FL\_Window::hotspot**(int **x**, int **y**, int **offscreen** = 0)*
- void **hotspot** (const **FL\_Widget** \*, int **offscreen**=0)  
*See void **FL\_Window::hotspot**(int **x**, int **y**, int **offscreen** = 0)*
- void **hotspot** (int **x**, int **y**, int **offscreen**=0)  
*Positions the window so that the mouse is pointing at the given position, or at the center of the given widget, which may be the window itself.*
- const void \* **icon** () const  
*Gets the current icon window target dependent data.*
- void **icon** (const **FL\_RGB\_Image** \*)  
*Sets or resets a single window icon.*
- void **icon** (const void \***ic**)  
*Platform-specific method to set the window icon usable on Windows and X11 only.*
- void **iconize** ()  
*Iconifies the window.*
- const char \* **iconlabel** () const  
*See void **FL\_Window::iconlabel**(const char\*)*
- void **iconlabel** (const char \*)  
*Sets the icon label.*
- void **icons** (const **FL\_RGB\_Image** \*[], int)  
*Sets the window icons.*
- void **icons** (**HICON** **big\_icon**, **HICON** **small\_icon**)

- Sets the window icons using HICON handles (Windows platform only).*

  - const char \* **label** () const  
*See void [FL\\_Window::label\(const char\\*\)](#)*
- void **label** (const char \*)  
*Sets the window title bar label.*
- void **label** (const char \*label, const char \*iconlabel)  
*Sets the icon label.*
- void **make\_current** ()  
*Sets things up so that the drawing functions in [<FL/fl\\_draw.H>](#) will go into this window.*
- void **maximize** ()  
*Maximizes a top-level window to its current screen.*
- unsigned int **maximize\_active** () const  
*Returns whether the window is currently maximized.*
- unsigned int **menu\_window** () const  
*Returns true if this window is a menu window.*
- unsigned int **modal** () const  
*Returns true if this window is modal.*
- unsigned int **non\_modal** () const  
*Returns true if this window is modal or non-modal.*
- **fl\_uintptr\_t os\_id** ()  
*Returns a platform-specific identification of a shown window, or 0 if not shown.*
- unsigned int **override** () const  
*Returns non zero if OVERRIDE flag is set, 0 otherwise.*
- void **resize** (int X, int Y, int W, int H) **FL\_OVERRIDE**  
*Changes the size and position of the window.*
- int **screen\_num** ()  
*The number of the screen containing the mapped window.*
- void **screen\_num** (int screen\_num)  
*Set the number of the screen where to map the window.*
- void **set\_menu\_window** ()  
*Marks the window as a menu window.*
- void **set\_modal** ()  
*A "modal" window, when [shown\(\)](#), will prevent any events from being delivered to other windows in the same program, and will also remain on top of the other windows (if the X window manager supports the "transient for" property).*
- void **set\_non\_modal** ()  
*A "non-modal" window (terminology borrowed from Microsoft Windows) acts like a [modal\(\)](#) one in that it remains on top, but it has no effect on event delivery.*
- void **set\_override** ()  
*Activates the flags NOBORDER|OVERRIDE.*
- void **set\_tooltip\_window** ()  
*Marks the window as a tooltip window.*
- const **FL\_Image** \* **shape** ()  
*Returns the image controlling the window shape or NULL.*
- void **shape** (const **FL\_Image** &b)  
*Set the window's shape with an [FL\\_Image](#).*
- void **shape** (const **FL\_Image** \*img)  
*Assigns a non-rectangular shape to the window.*
- void **show** () **FL\_OVERRIDE**  
*Puts the window on the screen.*
- void **show** (int argc, char \*\*argv)

- Puts the window on the screen with [show\(\)](#) and parses command-line arguments.*
- int [shown](#) ()
  - Returns non-zero if [show\(\)](#) has been called (but not [hide\(\)](#) ).*
- void [size\\_range](#) (int minw, int minh, int maxw=0, int maxh=0, int dw=0, int dh=0, int aspect=0)
  - Sets the allowable range to which the user can resize this window.*
- unsigned int [tooltip\\_window](#) () const
  - Returns true if this window is a tooltip window.*
- void [un\\_maximize](#) ()
  - Returns a previously maximized top-level window to its previous size.*
- void [wait\\_for\\_expose](#) ()
  - Waits for the window to be displayed after calling [show\(\)](#).*
- int [x\\_root](#) () const
  - Gets the x position of the window on the screen.*
- const char \* [xclass](#) () const
  - Returns the xclass for this window, or a default.*
- void [xclass](#) (const char \*c)
  - Sets the xclass for this window.*
- int [y\\_root](#) () const
  - Gets the y position of the window on the screen.*
- virtual [~FI\\_Window](#) ()
  - The destructor also deletes all the children.*

## Static Public Member Functions

- static [FI\\_Window](#) \* [current](#) ()
  - Returns the last window that was made current.*
- static void [default\\_callback](#) ([FI\\_Window](#) \*, void \*v)
  - Back compatibility: Sets the default callback v for win to call on close event.*
- static void [default\\_icon](#) (const [FI\\_RGB\\_Image](#) \*)
  - Sets a single default window icon.*
- static void [default\\_icons](#) (const [FI\\_RGB\\_Image](#) \*[], int)
  - Sets the default window icons.*
- static void [default\\_icons](#) (HICON big\_icon, HICON small\_icon)
  - Sets the default window icons (Windows platform only).*
- static const char \* [default\\_xclass](#) ()
  - Returns the default xclass.*
- static void [default\\_xclass](#) (const char \*)
  - Sets the default window xclass.*
- static bool [is\\_a\\_rescale](#) ()
  - Returns true when a window is being rescaled.*
- static char [show\\_next\\_window\\_iconic](#) ()
  - Returns the static flag whether the next window should be opened iconified.*
- static void [show\\_next\\_window\\_iconic](#) (char stat)
  - Sets a static flag whether the next window should be opened iconified.*

## Protected Member Functions

- void [default\\_size\\_range](#) ()  
*Protected method to calculate the default size range of a window.*
- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the widget.*
- int [force\\_position](#) () const  
*Returns the internal state of the window's FORCE\_POSITION flag.*
- void [force\\_position](#) (int force)  
*Sets an internal flag that tells FLTK and the window manager to honor position requests.*
- void [free\\_icons](#) ()  
*Deletes all icons previously attached to the window.*
- int [is\\_resizable](#) ()  
*Protected method to determine whether a window is resizable.*

## Static Protected Attributes

- static [Fl\\_Window](#) \* [current\\_](#)  
*Stores the last window that was made current.*

## Friends

- class [Fl\\_Window\\_Driver](#)
- class [Fl\\_X](#)

## Additional Inherited Members

### 33.164.1 Detailed Description

This widget produces an actual window.

This can either be a main window, with a border and title and all the window management controls, or a "subwindow" inside a window. This is controlled by whether or not the window has a [parent\(\)](#).

Once you create a window, you usually add children [Fl\\_Widget](#)'s to it by using `window->add(child)` for each new widget. See [Fl\\_Group](#) for more information on how to add and remove children.

There are several subclasses of [Fl\\_Window](#) that provide double-buffering, overlay, menu, and OpenGL support.

The window's callback is done if the user tries to close a window using the window manager and [Fl::modal\(\)](#) is zero or equal to the window. [Fl\\_Window](#) has a default callback that calls [Fl\\_Window::hide\(\)](#). Callback reasons can be `FL_REASON_CANCELLED` if the Escape key was pressed, or `FL_REASON_CLOSED` when the close button is clicked. `FL_WHEN_...` flags are ignored.

### 33.164.2 Constructor & Destructor Documentation

#### 33.164.2.1 [Fl\\_Window\(\)](#) [1/2]

```
Fl_Window::Fl_Window (
    int w,
    int h,
    const char * title = 0 )
```

Creates a window from the given width `w`, height `h`, and `title`.

If [Fl\\_Group::current\(\)](#) is not NULL, the window is created as a subwindow of the parent window.

The `(w, h)` form of the constructor creates a top-level window and asks the window manager to position the window.

The `(x, y, w, h)` form of the constructor either creates a subwindow or a top-level window at the specified location `(x, y)`, subject to window manager configuration. If you do not specify the position of the window, the window manager will pick a place to show the window or allow the user to pick a location. Use `position(x, y)` or [hotspot\(\)](#) before calling [show\(\)](#) to request a position on the screen. See [Fl\\_Window::resize\(\)](#) for some more details on positioning windows.

Top-level windows initially have `visible()` set to 0 and `parent()` set to NULL. Subwindows initially have `visible()` set to 1 and `parent()` set to the parent window pointer.

`Fl_Widget::box()` defaults to `FL_FLAT_BOX`. If you plan to completely fill the window with children widgets you should change this to `FL_NO_BOX`. If you turn the window border off you may want to change this to `FL_UP_BOX`.

See also

[Fl\\_Window\(int x, int y, int w, int h, const char \\*title\)](#)

### 33.164.2.2 Fl\_Window() [2/2]

```
Fl_Window::Fl_Window (
    int x,
    int y,
    int w,
    int h,
    const char * title = 0 )
```

Creates a window from the given position (x, y), size (w, h) and title.

On a multi-screen system, the values computed by [Fl::screen\\_xywh\(int &X, int &Y, int &W, int &H, int n\)](#) can be used to discover the coordinates of the area of screen #n. When these screens have various scale factor values, an (x, y) pair may not be enough to specify the targeted screen for the window, because the same (x,y) pair can belong to several screens. In that situation, a call to [Fl\\_Window::screen\\_num\(int\)](#) is to be used to identify unambiguously the targeted screen.

See also

[Fl\\_Window\(int w, int h, const char \\*title\)](#)

[Fl::screen\\_xywh\(int &X, int &Y, int &W, int &H, int n\)](#)

Note

Under Wayland, it's generally not possible for the client app to control the position of a window in the system. It's possible to specify on what screen should the compositor place a fullscreen window. It's also possible to make an [Fl\\_Window](#) the child of another window or group and control with `x` and `y` its screen position relatively to the enclosing window. Apply member function [Fl\\_Window::allow\\_expand\\_outside\\_parent\(\)](#) to the child window to allow it to expand partially or totally outside its parent.

### 33.164.2.3 ~Fl\_Window()

```
Fl_Window::~~Fl_Window ( ) [virtual]
```

The destructor *also deletes all the children*.

This allows a whole tree to be deleted at once, without having to keep a pointer to all the children in the user code. A kludge has been done so the [Fl\\_Window](#) and all of its children can be automatic (local) variables, but you must declare the [Fl\\_Window](#) *first* so that it is destroyed last.

## 33.164.3 Member Function Documentation

### 33.164.3.1 allow\_expand\_outside\_parent()

```
void Fl_Window::allow_expand_outside_parent ( )
```

Allow this subwindow to expand outside the area of its parent window.

This is presently implemented only for the Wayland platform to help support window docking.

Since

1.4.0

**33.164.3.2 as\_double\_window()**

```
virtual class Fl_Double_Window * Fl_Window::as_double_window ( ) [inline], [virtual]
```

Return non-null if this is an [Fl\\_Double\\_Window](#) object.

Reimplemented in [Fl\\_Double\\_Window](#).

**33.164.3.3 as\_overlay\_window()**

```
virtual class Fl_Overlay_Window * Fl_Window::as_overlay_window ( ) [inline], [virtual]
```

Return non-null if this is an [Fl\\_Overlay\\_Window](#) object.

Reimplemented in [Fl\\_Overlay\\_Window](#).

**33.164.3.4 as\_window() [1/2]**

```
Fl_Window const * Fl_Window::as_window ( ) const [inline], [virtual]
```

Reimplemented from [Fl\\_Widget](#).

**33.164.3.5 as\_window() [2/2]**

```
Fl_Window * Fl_Window::as_window ( ) [inline], [virtual]
```

Returns an [Fl\\_Window](#) pointer if this widget is an [Fl\\_Window](#).

Use this method if you have a widget (pointer) and need to know whether this widget is derived from [Fl\\_Window](#). If it returns non-NULL, then the widget in question is derived from [Fl\\_Window](#), and you can use the returned pointer to access its children or other [Fl\\_Window](#)-specific methods.

**Return values**

NULL	if this widget is not derived from <a href="#">Fl_Window</a> .
------	--

**Note**

This method is provided to avoid `dynamic_cast`.

**See also**

[Fl\\_Widget::as\\_group\(\)](#), [Fl\\_Widget::as\\_gl\\_window\(\)](#)

Reimplemented from [Fl\\_Widget](#).

**33.164.3.6 border()**

```
void Fl_Window::border (
    int b )
```

Sets whether or not the window manager border is around the window.

The default value is true. The macOS platform ignores requests to change the border state of a fullscreen or maximized window. *With some X window managers, this does not work after [show\(\)](#) has been called.*

**33.164.3.7 clear\_border()**

```
void Fl_Window::clear_border ( ) [inline]
```

Fast inline function to turn the window manager border off.

It only works before [show\(\)](#) is called.

**33.164.3.8 clear\_modal\_states()**

```
void Fl_Window::clear_modal_states ( ) [inline]
```

Clears the "modal" flags and converts a "modal" or "non-modal" window back into a "normal" window.

Note that there are *three* states for a window: modal, non-modal, and normal.

You can not change the "modality" of a window whilst it is shown, so it is necessary to first [hide\(\)](#) the window, change its "modality" as required, then re-show the window for the new state to take effect.

This method can also be used to change a "modal" window into a "non-modal" one. On several supported platforms, the "modal" state over-rides the "non-modal" state, so the "modal" state must be cleared before the window can be set into the "non-modal" state. In general, the following sequence should work:

```
win->hide();
win->clear_modal_states();
// Set win to new state as desired, or leave "normal", e.g...
win->set_non_modal();
win->show();
```

#### Note

Under some window managers, the sequence of hiding the window and changing its modality will often cause it to be re-displayed at a different position when it is subsequently shown. This is an irritating feature but appears to be unavoidable at present. As a result we would advise to use this method only when absolutely necessary.

#### See also

void [set\\_modal\(\)](#), void [set\\_non\\_modal\(\)](#)

### 33.164.3.9 [current\(\)](#)

```
Fl_Window * Fl_Window::current ( ) [static]
```

Returns the last window that was made current.

#### See also

[Fl\\_Window::make\\_current\(\)](#)

### 33.164.3.10 [cursor\(\)](#) [1/3]

```
void Fl_Window::cursor (
    const Fl_RGB_Image * image,
    int hotx,
    int hoty )
```

Changes the cursor for this window using the provided image as cursor's shape.

The window must be [show\(\)](#)'n for this function to have any effect. This always calls the system. If you are changing the cursor a lot you may want to keep track of how you set it in a static variable and call this only if the new cursor is different.

The default cursor will be used if the provided image cannot be used as a cursor.

#### Parameters

<i>image</i>	Sets the cursor size and shape
<i>hotx,hoty</i>	Sets the cursor's active location relatively to top-left of <i>image</i> when clicking

#### See also

[cursor\(Fl\\_Cursor\)](#), [default\\_cursor\(\)](#)

### 33.164.3.11 [cursor\(\)](#) [2/3]

```
void Fl_Window::cursor (
    Fl_Cursor c,
```

```

    Fl_Color ,
    Fl_Color = FL_WHITE )

```

For back compatibility only.

Same as [Fl\\_Window::cursor\(Fl\\_Cursor\)](#)

### 33.164.3.12 cursor() [3/3]

```

void Fl_Window::cursor (
    Fl_Cursor c )

```

Changes the cursor for this window.

The window must be [show\(\)](#)'n for this function to have any effect. This always calls the system. If you are changing the cursor a lot you may want to keep track of how you set it in a static variable and call this only if the new cursor is different.

The type `Fl_Cursor` is an enumeration defined in [<FL/Enumerations.H>](#).

See also

[cursor\(const Fl\\_RGB\\_Image\\*, int, int\), default\\_cursor\(\)](#)

### 33.164.3.13 decorated\_h()

```

int Fl_Window::decorated_h ( ) const

```

Returns the window height including any window title bar and any frame added by the window manager.

Same as [h\(\)](#) if applied to a subwindow, or if window is not yet mapped.

Note

Under X11, FLTK is able to compute the size of window titlebars and borders only if these decoration elements are strictly X11-based. When that's not the case, [decorated\\_h\(\)](#) returns the same value as [h\(\)](#) and [decorated\\_w\(\)](#) as [w\(\)](#), and FLTK cannot access window decorations.

Under X11 again, the values returned by [decorated\\_h\(\)](#) and [decorated\\_w\(\)](#) may not be reliable **during a resize operation**. The size of decoration elements of a window is best computed when the window is first mapped.

### 33.164.3.14 decorated\_w()

```

int Fl_Window::decorated_w ( ) const

```

Returns the window width including any frame added by the window manager.

Same as [w\(\)](#) if applied to a subwindow, or if window is not yet mapped.

See also

[decorated\\_h\(\)](#).

### 33.164.3.15 default\_cursor() [1/2]

```

void Fl_Window::default_cursor (
    Fl_Cursor c,
    Fl_Color ,
    Fl_Color = FL_WHITE )

```

For back compatibility only.

same as [Fl\\_Window::default\\_cursor\(Fl\\_Cursor\)](#)

**33.164.3.16 default\_cursor()** [2/2]

```
void Fl_Window::default_cursor (
    Fl_Cursor c )
```

Sets the default window cursor.

This is the cursor that will be used after the mouse pointer leaves a widget with a custom cursor set.

See also

[cursor\(const Fl\\_RGB\\_Image\\*, int, int\), default\\_cursor\(\)](#)

**33.164.3.17 default\_icon()**

```
void Fl_Window::default_icon (
    const Fl_RGB_Image * icon ) [static]
```

Sets a single default window icon.

If *icon* is NULL the current default icons are removed.

Parameters

in	<i>icon</i>	default icon for all windows subsequently created or NULL
----	-------------	---

See also

[Fl\\_Window::default\\_icons\(const Fl\\_RGB\\_Image \\*\[\], int\)](#)

[Fl\\_Window::icon\(const Fl\\_RGB\\_Image \\*\)](#)

[Fl\\_Window::icons\(const Fl\\_RGB\\_Image \\*\[\], int\)](#)

Note

See [Window icons](#) for the Wayland platform.

**33.164.3.18 default\_icons()** [1/2]

```
void Fl_Window::default_icons (
    const Fl_RGB_Image * icons[],
    int count ) [static]
```

Sets the default window icons.

The default icons are used for all windows that don't have their own icons set before [show\(\)](#) is called. You can change the default icons whenever you want, but this only affects windows that are created (and shown) after this call.

The given images in *icons* are copied. You can use a local variable or free the images immediately after this call.

Parameters

in	<i>icons</i>	default icons for all windows subsequently created
in	<i>count</i>	number of images in <i>icons</i> . Set to 0 to remove the current default icons

See also

[Fl\\_Window::default\\_icon\(const Fl\\_RGB\\_Image \\*\)](#)

[Fl\\_Window::icon\(const Fl\\_RGB\\_Image \\*\)](#)

[Fl\\_Window::icons\(const Fl\\_RGB\\_Image \\*\[\], int\)](#)

## Note

See [Window icons](#) for the Wayland platform.

**33.164.3.19 default\_icons()** [2/2]

```
static void Fl_Window::default_icons (
    HICON big_icon,
    HICON small_icon ) [static]
```

Sets the default window icons (Windows platform only).

Convenience function to set the default icons using Windows' native HICON icon handles.

The given icons are copied. You can free the icons immediately after this call.

## Parameters

in	<i>big_icon</i>	default large icon for all windows subsequently created
in	<i>small_icon</i>	default small icon for all windows subsequently created

## See also

[Fl\\_Window::default\\_icon\(const Fl\\_RGB\\_Image \\*\)](#)  
[Fl\\_Window::default\\_icons\(const Fl\\_RGB\\_Image \\*\[\], int\)](#)  
[Fl\\_Window::icon\(const Fl\\_RGB\\_Image \\*\)](#)  
[Fl\\_Window::icons\(const Fl\\_RGB\\_Image \\*\[\], int\)](#)  
[Fl\\_Window::icons\(HICON, HICON\)](#)

**33.164.3.20 default\_size\_range()**

```
void Fl_Window::default_size_range ( ) [protected]
```

Protected method to calculate the default size range of a window.

This method is called internally prior to showing a window to ensure that the window's size range values are calculated if a [resizable\(\)](#) widget has been set but [size\\_range\(\)](#) has not been called explicitly.

This method does nothing if [size\\_range\(\)](#) has been called before.

Otherwise FLTK tries to figure out the window's size range from the setting of the window's [resizable\(\)](#) widget as follows and roughly in the given order.

1. If [resizable\(\)](#) is NULL (this is the default) then the window cannot be resized and the resize border and max-size control will not be displayed for the window.
2. If either dimension of [resizable\(\)](#) is zero, then the window cannot resize in that direction.
3. The [resizable\(\)](#) widget is clipped to the window area.
4. The non-resizable portion of the window is calculated as the difference of the window's size and the clipped [resizable\(\)](#) widget's size.
5. If either dimension of the clipped [resizable\(\)](#) widget is greater than 100, then 100 is considered its minimum width/height. This allows the resizable widget to shrink below its original size.
6. Finally the minimum width/height of the window is set to the non-resizable portion plus the width/height of the [resizable\(\)](#) widget as calculated above.

In simple words:

- It is assumed that the [resizable\(\)](#) widget can be indefinitely enlarged and/or shrunk to a minimum width/height of 100 unless it is smaller than that, which is then considered the minimum.

- The window's `size_range()` minimum values are set to the sum of the non-resizable portion of the window and the previously calculated minimum size of the `resizable()` widget.

#### Examples:

```
Fl_Window win(400, 400);
win.resizable(win);
// win.size_range(100, 100, 0, 0);
```

The minimum size of the resizable is 100, hence the minimum size of the total window is also 100 in both directions.

```
Fl_Window win(400, 400);
Fl_Box box(20, 20, 360, 360);
win.resizable(box);
// win.size_range(140, 140, 0, 0);
```

The calculated minimum width and height would be 20 + 100 + 20 in both dimensions.

```
Fl_Window win(400, 400);
Fl_Box box(200, 0, 500, 300); // note: width 500 too large: clipped
win.resizable(box);
// win.size_range(300, 200, 0, 0);
```

The width of the resizable is clipped to 200, hence the minimum size of the total window is also 200 (fix) + 100 (min. resizable) in x direction. The minimum value in y direction is 100 (resizable) + 100 (fixed part).

The calculation is based on clipping the resizable widget to the window area to prevent programming errors and the assumption that the resizable widget can be shrunk to 100x100 or its original size, whichever is smaller.

If this is not what you want, please use `Fl_Window::size_range()` explicitly so you can set any appropriate range.

#### Since

1.4.0

### 33.164.3.21 `default_xclass()` [1/2]

```
const char * Fl_Window::default_xclass ( ) [static]
```

Returns the default xclass.

#### See also

[Fl\\_Window::default\\_xclass\(const char \\*\)](#)

### 33.164.3.22 `default_xclass()` [2/2]

```
void Fl_Window::default_xclass (
    const char * xc ) [static]
```

Sets the default window xclass.

The default xclass is used for all windows that don't have their own xclass set before `show()` is called. You can change the default xclass whenever you want, but this only affects windows that are created (and shown) after this call.

The given string `xc` is copied. You can use a local variable or free the string immediately after this call.

If you don't call this, the default xclass for all windows will be "FLTK". You can reset the default xclass by specifying NULL for `xc`.

If you call `Fl_Window::xclass(const char *)` for any window, then this also sets the default xclass, unless it has been set before.

#### Parameters

in	xc	default xclass for all windows subsequently created
----	----	---

See also

[Fl\\_Window::xclass\(const char \\*\)](#)

### 33.164.3.23 draw()

```
void Fl_Window::draw ( ) [protected], [virtual]
```

Draws the widget.

Never call this function directly. FLTK will schedule redrawing whenever needed. If your widget must be redrawn as soon as possible, call [redraw\(\)](#) instead.

Override this function to draw your own widgets.

If you ever need to call another widget's draw method *from within your own [draw\(\)](#) method*, e.g. for an embedded scrollbar, you can do it (because [draw\(\)](#) is virtual) like this:

```
Fl_Widget *s = &scrollbar; // scrollbar is an embedded Fl_Scrollbar
s->draw();                 // calls Fl_Scrollbar::draw()
```

Reimplemented from [Fl\\_Group](#).

Reimplemented in [Fl\\_Glut\\_Window](#).

### 33.164.3.24 flush()

```
void Fl_Window::flush ( ) [virtual]
```

Forces the window to be drawn, this window is also made current and calls [draw\(\)](#).

Reimplemented in [Fl\\_Double\\_Window](#), [Fl\\_Gl\\_Window](#), [Fl\\_Overlay\\_Window](#), and [Fl\\_Single\\_Window](#).

### 33.164.3.25 force\_position() [1/2]

```
int Fl_Window::force_position ( ) const [inline], [protected]
```

Returns the internal state of the window's FORCE\_POSITION flag.

Return values

1	if flag is set
0	otherwise

See also

[force\\_position\(int\)](#)

### 33.164.3.26 force\_position() [2/2]

```
void Fl_Window::force_position (
    int force ) [inline], [protected]
```

Sets an internal flag that tells FLTK and the window manager to honor position requests.

This is used internally and should not be needed by user code.

Parameters

in	force	1 to set the FORCE_POSITION flag, 0 to clear it
----	-------	---

### 33.164.3.27 free\_icons()

```
void Fl_Window::free_icons ( ) [protected]
```

Deletes all icons previously attached to the window.

See also

[Fl\\_Window::icons\(const Fl\\_RGB\\_Image \\*icons\[\], int count\)](#)

### 33.164.3.28 free\_position()

```
void Fl_Window::free_position ( ) [inline]
```

Undoes the effect of a previous [resize\(\)](#) or [show\(\)](#) so that the next time [show\(\)](#) is called the window manager is free to position the window.

This is for Forms compatibility only.

**Deprecated** please use [force\\_position\(0\)](#) instead

### 33.164.3.29 fullscreen()

```
void Fl_Window::fullscreen ( )
```

Makes the window completely fill one or more screens, without any window manager border visible.

You must use [fullscreen\\_off\(\)](#) to undo this.

Note

On some platforms, this can result in the keyboard being grabbed. The window may also be recreated, meaning [hide\(\)](#) and [show\(\)](#) will be called.

See also

[void Fl\\_Window::fullscreen\\_screens\(\)](#)

### 33.164.3.30 fullscreen\_screens()

```
void Fl_Window::fullscreen_screens (
    int top,
    int bottom,
    int left,
    int right )
```

Sets which screens should be used when this window is in fullscreen mode.

The window will be resized to the top of the screen with index `top`, the bottom of the screen with index `bottom`, etc.

If this method is never called, or if any argument is  $< 0$ , then the window will be resized to fill the screen it is currently on.

See also

[void Fl\\_Window::fullscreen\(\)](#)

### 33.164.3.31 get\_size\_range()

```
uchar Fl_Window::get_size_range (
    int * minWidth,
    int * minHeight,
    int * maxWidth = NULL,
    int * maxHeight = NULL,
    int * deltaX = NULL,
    int * deltaY = NULL,
    int * aspectRatio = NULL )
```

Gets the allowable range to which the user can resize this window.

## Parameters

out	<i>minWidth,minHeight,maxWidth,maxHeight,deltaX,deltaY,aspectRatio</i>	are all pointers to integers that will receive the current respective value during the call. Every pointer can be NULL if that value is not needed.
-----	--	---

## Return values

0	if size range not set
1	if the size range was explicitly set by a call to <a href="#">Fl_Window::size_range()</a> or has been calculated

## See also

[Fl\\_Window::size\\_range\(int minWidth, int minHeight, int maxWidth, int maxHeight, int deltaX, int deltaY, int aspectRatio\)](#)

## Since

1.4.0

## 33.164.3.32 handle()

```
int Fl_Window::handle (
    int event ) [virtual]
```

Handles the specified event.

You normally don't call this method directly, but instead let FLTK do it when the user interacts with the widget.

When implemented in a widget, this function must return 0 if the widget does not use the event or 1 otherwise.

Most of the time, you want to call the inherited [handle\(\)](#) method in your overridden method so that you don't short-circuit events that you don't handle. In this last case you should return the callee retval.

One exception to the rule in the previous paragraph is if you really want to *override* the behavior of the base class. This requires knowledge of the details of the inherited class.

In rare cases you may want to return 1 from your [handle\(\)](#) method although you don't really handle the event. The effect would be to *filter* event processing, for instance if you want to dismiss non-numeric characters (keypresses) in a numeric input widget. You may "ring the bell" or show another visual indication or drop the event silently. In such a case you must not call the [handle\(\)](#) method of the base class and tell FLTK that you *consumed* the event by returning 1 even if you didn't *do* anything with it.

## Parameters

in	<i>event</i>	the kind of event received
----	--------------	----------------------------

## Return values

0	if the event was not used or understood
1	if the event was used and can be deleted

See also

[Fl\\_Event](#)

Reimplemented from [Fl\\_Group](#).

Reimplemented in [Fl\\_Glut\\_Window](#).

### 33.164.3.33 `hide()`

```
void Fl_Window::hide ( ) [virtual]
```

Removes the window from the screen.

If the window is already hidden or has not been shown then this does nothing and is harmless.

Reimplemented from [Fl\\_Widget](#).

### 33.164.3.34 `hotspot()`

```
void Fl_Window::hotspot (
    int x,
    int y,
    int offscreen = 0 )
```

Positions the window so that the mouse is pointing at the given position, or at the center of the given widget, which may be the window itself.

If the optional offscreen parameter is non-zero, then the window is allowed to extend off the screen (this does not work with some X window managers).

See also

[position\(\)](#)

### 33.164.3.35 `icon()` [1/3]

```
const void * Fl_Window::icon ( ) const
```

Gets the current icon window target dependent data.

**Deprecated** in 1.3.3

### 33.164.3.36 `icon()` [2/3]

```
void Fl_Window::icon (
    const Fl\_RGB\_Image * icon )
```

Sets or resets a single window icon.

A window icon *can* be changed while the window is shown, but this *may* be platform and/or window manager dependent. To be sure that the window displays the correct window icon you should always set the icon before the window is shown.

If a window icon has not been set for a particular window, then the default window icon (see links below) or the system default icon will be used.

This method makes an internal copy of the `icon` pixel buffer, so once set, the [Fl\\_RGB\\_Image](#) instance can be freed by the caller.

Parameters

in	<i>icon</i>	icon for this window, NULL to reset window icon.
----	-------------	--

See also

[Fl\\_Window::default\\_icon\(const Fl\\_RGB\\_Image \\*\)](#)  
[Fl\\_Window::default\\_icons\(const Fl\\_RGB\\_Image \\*\[\], int\)](#)  
[Fl\\_Window::icons\(const Fl\\_RGB\\_Image \\*\[\], int\)](#)

Note

See [Window icons](#) for the Wayland platform.

### 33.164.3.37 icon() [3/3]

```
void Fl_Window::icon (
    const void * ic )
```

Platform-specific method to set the window icon usable on Windows and X11 only.

See [Setting the Icon of a Window](#) for its use under X11, and [Setting the Icon of a Window](#) under Windows.

**Deprecated** in 1.3.3 in favor of platform-independent methods [Fl\\_Window::icon\(const Fl\\_RGB\\_Image \\*icon\)](#) and [Fl\\_Window::icons\(const Fl\\_RGB\\_Image \\*icons\[\], int count\)](#).

### 33.164.3.38 iconize()

```
void Fl_Window::iconize ( )
```

Iconifies the window.

If you call this when [shown\(\)](#) is false it will [show\(\)](#) it as an icon. If the window is already iconified this does nothing. Call [show\(\)](#) to restore the window.

When a window is iconified/restored (either by these calls or by the user) the [handle\(\)](#) method is called with FL\_HIDE and FL\_SHOW events and [visible\(\)](#) is turned on and off.

There is no way to control what is drawn in the icon except with the string passed to [Fl\\_Window::xclass\(\)](#). You should not rely on window managers displaying the icons.

### 33.164.3.39 icons() [1/2]

```
void Fl_Window::icons (
    const Fl_RGB_Image * icons[],
    int count )
```

Sets the window icons.

You may set multiple window icons with different sizes. Dependent on the platform and system settings the best (or the first) icon will be chosen.

The given images in `icons` are copied. You can use a local variable or free the images immediately after this call. If `count` is zero, current icons are removed. If `count` is greater than zero (must not be negative), then `icons[]` must contain at least `count` valid image pointers (not NULL). Otherwise the behavior is undefined.

Parameters

in	<i>icons</i>	icons for this window
in	<i>count</i>	number of images in <i>icons</i> . Set to 0 to remove the current icons

See also

[Fl\\_Window::default\\_icon\(const Fl\\_RGB\\_Image \\*\)](#)  
[Fl\\_Window::default\\_icons\(const Fl\\_RGB\\_Image \\*\[\], int\)](#)  
[Fl\\_Window::icon\(const Fl\\_RGB\\_Image \\*\)](#)

## Note

See [Window icons](#) for the Wayland platform.

**33.164.3.40 icons()** [2/2]

```
void Fl_Window::icons (
    HICON big_icon,
    HICON small_icon )
```

Sets the window icons using HICON handles (Windows platform only).  
The given icons are copied. You can free the icons immediately after this call.

## Parameters

in	<i>big_icon</i>	large window icon
in	<i>small_icon</i>	small window icon

**33.164.3.41 is\_a\_rescale()**

```
bool Fl_Window::is_a_rescale ( ) [static]
```

Returns true when a window is being rescaled.

## Since

1.4.0

**33.164.3.42 is\_resizable()**

```
int Fl_Window::is_resizable ( ) [protected]
```

Protected method to determine whether a window is resizable.

If [size\\_range\(\)](#) has not yet been called this method calculates the default size range values by calling [default\\_size\\_range\(\)](#).

This method is for internal use only. The returned value is a bit mask and non-zero if the window is resizable in at least one direction.

## Returns

non-zero if the window is resizable

## Return values

0	the window is not resizable
1	the window is resizable in horizontal direction (w)
2	the window is resizable in vertical direction (h)
3	the window is resizable in both directions (w and h)

## See also

[default\\_size\\_range\(\)](#)

## Since

1.4.0

### 33.164.3.43 make\_current()

```
void Fl_Window::make_current ( )
```

Sets things up so that the drawing functions in [<FL/fl\\_draw.H>](#) will go into this window.

This is useful for incremental update of windows, such as in an idle callback, which will make your program behave much better if it draws a slow graphic. **Danger: incremental update is very hard to debug and maintain!**

This method only works for the [Fl\\_Window](#) and [Fl\\_Gl\\_Window](#) derived classes.

### 33.164.3.44 maximize()

```
void Fl_Window::maximize ( )
```

Maximizes a top-level window to its current screen.

This function is effective only with a [show\(\)](#)'n, resizable, top-level window. Bordered and borderless windows can be used. Fullscreen windows can't be used.

See also

[Fl\\_Window::un\\_maximize\(\)](#), [Fl\\_Window::maximize\\_active\(\)](#)

Since

1.4.0

### 33.164.3.45 modal()

```
unsigned int Fl_Window::modal ( ) const [inline]
```

Returns true if this window is modal.

### 33.164.3.46 os\_id()

```
fl_uintptr_t Fl_Window::os_id ( )
```

Returns a platform-specific identification of a shown window, or 0 if not shown.

Note

This identification may differ from the platform-specific reference of an [Fl\\_Window](#) object used by functions [fl\\_x11\\_xid\(\)](#), [fl\\_mac\\_xid\(\)](#), [fl\\_x11\\_find\(\)](#), and [fl\\_mac\\_find\(\)](#).

- X11 platform: the window's XID.
- macOS platform: The window number of the window's window device.
- other platforms: 0.

Since

1.4.0

### 33.164.3.47 resize()

```
void Fl_Window::resize (
    int X,
    int Y,
    int W,
    int H ) [virtual]
```

Changes the size and position of the window.

If [shown\(\)](#) is true, these changes are communicated to the window server (which may refuse that size and cause a further resize). If [shown\(\)](#) is false, the size and position are used when [show\(\)](#) is called. See [Fl\\_Group](#) for the effect of resizing on the child widgets.

You can also call the [Fl\\_Widget](#) methods [size\(x,y\)](#) and [position\(w,h\)](#), which are inline wrappers for this virtual function.

A top-level window can not force, but merely suggest a position and size to the operating system. The window manager may not be willing or able to display a window at the desired position or with the given dimensions. It is up to the application developer to verify window parameters after the resize request.

Reimplemented from [Fl\\_Group](#).

### 33.164.3.48 [screen\\_num\(\)](#) [1/2]

```
int Fl_Window::screen_num ( )
```

The number of the screen containing the mapped window.

This method returns the screen number (0 .. n) of the window if it is shown, otherwise the result value is undefined.

#### Note

The return value is undefined before the window is shown and if the window has been hidden after it was previously shown.

To position a window on a particular screen, use [Fl\\_Window::screen\\_num\(int\)](#) **before** you [show\(\)](#) it.

#### Returns

screen number of the window if it is shown

#### See also

[Fl\\_Window::screen\\_num\(int\)](#)

#### Since

1.4.0

### 33.164.3.49 [screen\\_num\(\)](#) [2/2]

```
void Fl_Window::screen_num (
    int screen_num )
```

Set the number of the screen where to map the window.

Call this and set also the window's desired x/y position before [show\(\)](#)'ing the window. This can be necessary if a system has several screens with distinct scaling factors because the window's [x\(\)](#) and [y\(\)](#) may not suffice to uniquely identify one screen.

Consider a system with two screens where the left screen is A pixels wide and has a scaling factor of 1 whereas the right screen has a scaling factor of 2. For the sake of simplicity, consider only the X coordinate of the window. FLTK coordinates translate directly to pixel coordinates on the left screen, whereas FLTK coordinates multiplied by 2 correspond to pixel coordinates on the right screen. Consequently, FLTK coordinates between A/2 + 1 and A-1 can map to both screens. Therefore both the window coordinates and the screen number are necessary to uniquely identify where a window is to be mapped.

The valid range of [screen\\_num](#) is 0 .. [Fl::screen\\_count\(\)](#) - 1.

This method does nothing if

- the window is already [shown\(\)](#) or
- the given screen number is out of range.

#### Parameters

in	<a href="#">screen_num</a>	screen number where the window is to be mapped
----	----------------------------	--

See also

[Fl\\_Window::screen\\_num\(\)](#)  
[Fl::screen\\_count\(\)](#)

Since

1.4.0

### 33.164.3.50 set\_menu\_window()

```
void Fl_Window::set_menu_window ( ) [inline]
```

Marks the window as a menu window.

This is intended for internal use, but it can also be used if you write your own menu handling. However, this is not recommended.

This flag is used for correct "parenting" of windows in communication with the windowing system. Modern X window managers can use different flags to distinguish menu and tooltip windows from normal windows.

This must be called before the window is shown and cannot be changed later.

### 33.164.3.51 set\_modal()

```
void Fl_Window::set_modal ( ) [inline]
```

A "modal" window, when [shown\(\)](#), will prevent any events from being delivered to other windows in the same program, and will also remain on top of the other windows (if the X window manager supports the "transient for" property).

Several modal windows may be shown at once, in which case only the last one shown gets events. You can see which window (if any) is modal by calling [Fl::modal\(\)](#).

### 33.164.3.52 set\_non\_modal()

```
void Fl_Window::set_non_modal ( ) [inline]
```

A "non-modal" window (terminology borrowed from Microsoft Windows) acts like a [modal\(\)](#) one in that it remains on top, but it has no effect on event delivery.

There are *three* states for a window: modal, non-modal, and normal.

### 33.164.3.53 set\_tooltip\_window()

```
void Fl_Window::set_tooltip_window ( ) [inline]
```

Marks the window as a tooltip window.

This is intended for internal use, but it can also be used if you write your own tooltip handling. However, this is not recommended.

This flag is used for correct "parenting" of windows in communication with the windowing system. Modern X window managers can use different flags to distinguish menu and tooltip windows from normal windows.

This must be called before the window is shown and cannot be changed later.

Note

Since [Fl\\_Tooltip\\_Window](#) is derived from [Fl\\_Menu\\_Window](#), this also **clears** the [menu\\_window\(\)](#) state.

### 33.164.3.54 shape() [1/3]

```
const Fl_Image * Fl_Window::shape ( )
```

Returns the image controlling the window shape or NULL.

Since

1.4.0

**33.164.3.55 shape()** [2/3]

```
void Fl_Window::shape (
    const Fl_Image & img )
```

Set the window's shape with an [Fl\\_Image](#).

See also

```
void shape(const Fl_Image* img)
```

**33.164.3.56 shape()** [3/3]

```
void Fl_Window::shape (
    const Fl_Image * img )
```

Assigns a non-rectangular shape to the window.

This function gives an arbitrary shape (not just a rectangular region) to an [Fl\\_Window](#). An [Fl\\_Image](#) of any dimension can be used as mask; it is rescaled to the window's dimension as needed.

The layout and widgets inside are unaware of the mask shape, and most will act as though the window's rectangular bounding box is available to them. It is up to you to make sure they adhere to the bounds of their masking shape.

The `img` argument can be an [Fl\\_Bitmap](#), [Fl\\_Pixmap](#), [Fl\\_RGB\\_Image](#) or [Fl\\_Shared\\_Image](#):

- With [Fl\\_Bitmap](#) or [Fl\\_Pixmap](#), the shaped window covers the image part where bitmap bits equal one, or where the pixmap is not fully transparent.
- With an [Fl\\_RGB\\_Image](#) with an alpha channel (depths 2 or 4), the shaped window covers the image part that is not fully transparent.
- With an [Fl\\_RGB\\_Image](#) of depth 1 (gray-scale) or 3 (RGB), the shaped window covers the non-black image part.
- With an [Fl\\_Shared\\_Image](#), the shape is determined by rules above applied to the underlying image. The shared image should not have been scaled through [Fl\\_Image::scale\(\)](#).

Platform details:

- On the unix/linux platform, the SHAPE extension of the X server is required. This function does control the shape of [Fl\\_Gl\\_Window](#) instances.
- On the Windows platform, this function does nothing with class [Fl\\_Gl\\_Window](#).
- On the Mac platform, OS version 10.4 or above is required. An 8-bit shape-mask is used when `img` is an [Fl\\_RGB\\_Image](#): with depths 2 or 4, the image alpha channel becomes the shape mask such that areas with alpha = 0 are out of the shaped window; with depths 1 or 3, white and black are in and out of the shaped window, respectively, and other colors give intermediate masking scores. This function does nothing with class [Fl\\_Gl\\_Window](#).

The window borders and caption created by the window system are turned off by default. They can be re-enabled by calling `Fl_Window::border(1)`.

A usage example is found at `example/shapedwindow.cxx`.

Version

1.3.3

**33.164.3.57 show()** [1/2]

```
void Fl_Window::show ( ) [virtual]
```

Puts the window on the screen.

This has the side effect of opening the display, if not done before.

If the window is already shown then it is restored and raised to the top. This is really convenient because your program can call [show\(\)](#) at any time, even if the window is already up. It also means that [show\(\)](#) serves the purpose of [raise\(\)](#) in other toolkits.

[Fl\\_Window::show\(int argc, char \\*\\*argv\)](#) is used for top-level windows and allows standard arguments to be parsed from the command-line.

**Note**

For some obscure reasons [Fl\\_Window::show\(\)](#) resets the current group by calling [Fl\\_Group::current\(0\)](#). The comments in the code say "get rid of very common user bug: forgot end()". Although this is true it may have unwanted side effects if you [show\(\)](#) an unrelated window (maybe for an error message or warning) while building a window or any other group widget.

**Todo** Check if we can remove resetting the current group in a later FLTK version (after 1.3.x). This may break "already broken" programs though if they rely on this "feature".

**See also**

[Fl\\_Window::show\(int argc, char \\*\\*argv\)](#)

Reimplemented from [Fl\\_Widget](#).

**33.164.3.58 show()** [2/2]

```
void Fl_Window::show (
    int argc,
    char ** argv )
```

Puts the window on the screen with [show\(\)](#) and parses command-line arguments.

This call should be used for top-level windows, at least for the first (main) window. It allows standard arguments to be parsed, as done by [Fl::args\(int, char \\*\\*\)](#), from the command-line. You can use `argc` and `argv` from `main(int argc, char **argv)` for this call.

This call also sets up some system-specific internal variables, that is, it sets `FL_SELECTION_COLOR` and calls [Fl::background\(\)](#), [Fl::background2\(\)](#), [Fl::foreground\(\)](#) with default or X resources-given values, and calls [Fl::scheme\(const char \\*\)](#) for the current scheme. On X11, it also calls [Fl::dnd\\_text\\_ops\(int\)](#), [Fl\\_Tooltip::enable\(int\)](#), [Fl::visible\\_focus\(int\)](#) with X resources-given values.

**Parameters**

<i>argc</i>	command-line argument count, usually from <code>main()</code>
<i>argv</i>	command-line argument vector, usually from <code>main()</code>

**See also**

virtual void [Fl\\_Window::show\(\)](#)

[Fl::args\(int, char \\*\\*\)](#)

**33.164.3.59 show\_next\_window\_iconic()** [1/2]

```
static char Fl_Window::show_next_window_iconic ( ) [inline], [static]
```

Returns the static flag whether the next window should be opened iconified.

**Note**

This is an **internal function**, you should not use this in user code.

Please use [Fl\\_Window::iconize\(\)](#) to iconify a window.

**33.164.3.60 show\_next\_window\_iconic()** [2/2]

```
static void Fl_Window::show_next_window_iconic (
    char stat ) [inline], [static]
```

Sets a static flag whether the next window should be opened iconified.

**Note**

This is an **internal function**, you should not use this in user code.

Please use [Fl\\_Window::iconize\(\)](#) instead.

**33.164.3.61 shown()**

```
int Fl_Window::shown ( ) [inline]
```

Returns non-zero if [show\(\)](#) has been called (but not [hide\(\)](#) ).

You can tell if a window is iconified with (w->[shown\(\)](#) && lw->[visible\(\)](#)).

**33.164.3.62 size\_range()**

```
void Fl_Window::size_range (
    int minWidth,
    int minHeight,
    int maxWidth = 0,
    int maxHeight = 0,
    int deltaX = 0,
    int deltaY = 0,
    int aspectRatio = 0 )
```

Sets the allowable range to which the user can resize this window.

We recommend to call [size\\_range\(\)](#) if you have a [resizable\(\)](#) widget in a main window, and to call it after setting the [resizable\(\)](#) and before [show\(\)](#)'ing the window for best cross platform compatibility.

If this function is **not** called, FLTK tries to figure out the range when the window is shown. Please see the protected method [default\\_size\\_range\(\)](#) for details.

It is undefined what happens if the current window size does not fit in the constraints passed to [size\\_range\(\)](#).

**Note**

This only works for top-level windows and the exact behavior can be platform specific. To work correctly across all platforms [size\\_range\(\)](#) must be called after setting the [resizable\(\)](#) widget of the window and before the window is [show\(\)](#)'n.

Calling [size\\_range\(\)](#) after the window has been shown may work on some but not all platforms. If you need to change the [size\\_range\(\)](#) after the window has been shown, then you should consider to [hide\(\)](#) and [show\(\)](#) the window again, i.e. call [hide\(\)](#), [size\\_range\(\)](#), and [show\(\)](#) in this order.

Typical usage: call

```
size\_range(minWidth, minHeight);
```

after setting the resizable widget and before calling [show\(\)](#). This ensures that the window cannot be resized smaller than the given values by user interaction.

`maxWidth` and `maxHeight` might be useful in some special cases but less frequently used.

The other optional parameters `deltaX`, `deltaY`, and `aspectRatio` are not recommended because they may not work on all platforms and may even under X11 not be supported by all Window Managers.

**Parameters**

in	<i>minWidth,minHeight</i>	The smallest the window can be. Either value must be greater than 0.
in	<i>maxWidth,maxHeight</i>	The largest the window can be. If either is equal to the minimum then you cannot resize in that direction. If either is zero then FLTK picks a maximum size in that direction such that the window will fill the screen.
in	<i>deltaX,deltaY</i>	These are size increments. The window will be constrained to widths of <code>minWidth + N * deltaX</code> , where N is any non-negative integer. If these are less or equal to 1 they are ignored (this is always ignored on Windows).
in	<i>aspectRatio</i>	A flag that indicates that the window should preserve its aspect ratio. This only works if both the maximum and minimum have the same aspect ratio (ignored on Windows and by many X window managers).

**33.164.3.63 un\_maximize()**

```
void Fl_Window::un_maximize ( )
```

Returns a previously maximized top-level window to its previous size.

See also

[Fl\\_Window::maximize\(\)](#)

Since

1.4.0

**33.164.3.64 wait\_for\_expose()**

```
void Fl_Window::wait_for_expose ( )
```

Waits for the window to be displayed after calling [show\(\)](#).

[Fl\\_Window::show\(\)](#) is not guaranteed to show and draw the window on all platforms immediately. Instead this is done in the background; particularly on X11 it will take a few messages (client server roundtrips) to display the window. Usually this small delay doesn't matter, but in some cases you may want to have the window instantiated and displayed synchronously.

Currently (as of FLTK 1.3.4) this method has an effect on X11 and Mac OS. On Windows, [show\(\)](#) is always synchronous. The effect of [show\(\)](#) varies with versions of Mac OS X: early versions have the window appear on the screen when [show\(\)](#) returns, later versions don't. If you want to write portable code and need this synchronous [show\(\)](#) feature, add `win->wait_for_expose()` on all platforms, and FLTK will just do the right thing.

This method can be used for displaying splash screens before calling [Fl::run\(\)](#) or for having exact control over which window has the focus after calling [show\(\)](#).

If the window is not [shown\(\)](#), this method does nothing.

Note

Depending on the platform and window manager [wait\\_for\\_expose\(\)](#) may not guarantee that the window is fully drawn when it is called. Under X11 it may only make sure that the window is **mapped**, i.e. the internal (OS dependent) window object was created (and maybe shown on the desktop as an empty frame or something like that). You may need to call [Fl::flush\(\)](#) after [wait\\_for\\_expose\(\)](#) to make sure the window and all its widgets are drawn and thus visible.

FLTK does the best it can do to make sure that all widgets get drawn if you call [wait\\_for\\_expose\(\)](#) and [Fl::flush\(\)](#). However, dependent on the window manager it can not be guaranteed that this does always happen synchronously. The only guaranteed behavior that all widgets are eventually drawn is if the FLTK event loop is run continuously, for instance with [Fl::run\(\)](#).

See also

virtual void [Fl\\_Window::show\(\)](#)

Example code for displaying a window before calling [Fl::run\(\)](#)

```
Fl_Double_Window win = new Fl_Double_Window(...);
// do more window initialization here ...
win->show();                // show window
win->wait_for_expose();      // wait, until displayed
Fl::flush();                // make sure everything gets drawn
// do more initialization work that needs some time here ...
Fl::run();                  // start FLTK event loop
```

Note that the window will not be responsive until the event loop is started with [Fl::run\(\)](#).

**33.164.3.65 xclass()** [1/2]

```
const char * Fl_Window::xclass ( ) const
```

Returns the xclass for this window, or a default.

See also

[Fl\\_Window::default\\_xclass\(const char \\*\)](#)

[Fl\\_Window::xclass\(const char \\*\)](#)

**33.164.3.66 xclass()** [2/2]

```
void Fl_Window::xclass (
    const char * xc )
```

Sets the xclass for this window.

A string used to tell the system what type of window this is. Mostly this identifies the picture to draw in the icon. This only works if called *before* calling [show\(\)](#).

*Under X*, this is turned into a XA\_WM\_CLASS pair by truncating at the first non-alphanumeric character and capitalizing the first character, and the second one if the first is 'x'. Thus "foo" turns into "foo, Foo", and "xprog.1" turns into "xprog, XProg".

*Under Microsoft Windows*, this string is used as the name of the WNDCLASS structure, though it is not clear if this can have any visible effect.

Since

FLTK 1.3 the passed string is copied. You can use a local variable or free the string immediately after this call. Note that FLTK 1.1 stores the *pointer* without copying the string.

If the default xclass has not yet been set, this also sets the default xclass for all windows created subsequently.

See also

[Fl\\_Window::default\\_xclass\(const char \\*\)](#)

**33.164.4 Member Data Documentation****33.164.4.1 current\_**

```
Fl_Window * Fl_Window::current_ [static], [protected]
```

Stores the last window that was made current.

See [current\(\)](#) const

The documentation for this class was generated from the following files:

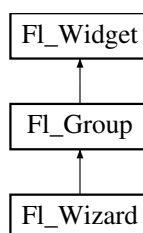
- [Fl\\_Window.H](#)
- [Fl\\_arg.cxx](#)
- [fl\\_cursor.cxx](#)
- [Fl\\_Window.cxx](#)
- [Fl\\_Window\\_fullscreen.cxx](#)
- [Fl\\_Window\\_hotspot.cxx](#)
- [Fl\\_Window\\_iconize.cxx](#)

**33.165 Fl\_Wizard Class Reference**

This widget is based off the [Fl\\_Tabs](#) widget, but instead of displaying tabs it only changes "tabs" under program control.

```
#include <Fl_Wizard.H>
```

Inheritance diagram for Fl\_Wizard:



## Public Member Functions

- [Fl\\_Wizard](#) (int, int, int, int, const char \* = 0)  
*The constructor creates the [Fl\\_Wizard](#) widget at the specified position and size.*
- void [next](#) ()  
*This method shows the next child of the wizard.*
- void [prev](#) ()  
*Shows the previous child.*
- [Fl\\_Widget](#) \* [value](#) ()  
*Gets the current visible child widget.*
- void [value](#) ([Fl\\_Widget](#) \*)  
*Sets the child widget that is visible.*

## Protected Member Functions

- void [draw](#) () [FL\\_OVERRIDE](#)  
*Draws the wizard border and visible child.*

## Additional Inherited Members

### 33.165.1 Detailed Description

This widget is based off the [Fl\\_Tabs](#) widget, but instead of displaying tabs it only changes "tabs" under program control.

Its primary purpose is to support "wizards" that step a user through configuration or troubleshooting tasks.

As with [Fl\\_Tabs](#), wizard panes are composed of child (usually [Fl\\_Group](#)) widgets. Navigation buttons must be added separately.

### 33.165.2 Constructor & Destructor Documentation

#### 33.165.2.1 Fl\_Wizard()

```
Fl_Wizard::Fl_Wizard (
    int xx,
    int yy,
    int ww,
    int hh,
    const char * l = 0 )
```

The constructor creates the [Fl\\_Wizard](#) widget at the specified position and size.

The inherited destructor destroys the widget and its children.

### 33.165.3 Member Function Documentation

#### 33.165.3.1 draw()

```
void Fl_Wizard::draw (
    void ) [protected], [virtual]
```

Draws the wizard border and visible child.

Reimplemented from [Fl\\_Group](#).

### 33.165.3.2 next()

```
void Fl_Wizard::next ( )
```

This method shows the next child of the wizard.

If the last child is already visible, this function does nothing.

The documentation for this class was generated from the following files:

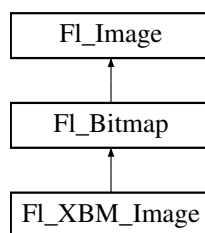
- Fl\_Wizard.H
- Fl\_Wizard.cxx

## 33.166 Fl\_XBM\_Image Class Reference

The [Fl\\_XBM\\_Image](#) class supports loading, caching, and drawing of X Bitmap (XBM) bitmap files.

```
#include <Fl_XBM_Image.H>
```

Inheritance diagram for Fl\_XBM\_Image:



### Public Member Functions

- [Fl\\_XBM\\_Image](#) (const char \*filename)

*The constructor loads the named XBM file from the given name filename.*

### Additional Inherited Members

#### 33.166.1 Detailed Description

The [Fl\\_XBM\\_Image](#) class supports loading, caching, and drawing of X Bitmap (XBM) bitmap files.

#### 33.166.2 Constructor & Destructor Documentation

##### 33.166.2.1 Fl\_XBM\_Image()

```
Fl_XBM_Image::Fl_XBM_Image (
    const char * name )
```

The constructor loads the named XBM file from the given name filename.

The destructor frees all memory and server resources that are used by the image.

The documentation for this class was generated from the following files:

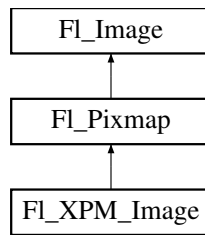
- Fl\_XBM\_Image.H
- Fl\_XBM\_Image.cxx

## 33.167 Fl\_XPM\_Image Class Reference

The [Fl\\_XPM\\_Image](#) class supports loading, caching, and drawing of X Pixmap (XPM) images, including transparency.

```
#include <Fl_XPM_Image.H>
```

Inheritance diagram for Fl\_XPM\_Image:



## Public Member Functions

- [Fl\\_XPM\\_Image](#) (const char \*filename)

*The constructor loads the XPM image from the name filename.*

## Additional Inherited Members

### 33.167.1 Detailed Description

The [Fl\\_XPM\\_Image](#) class supports loading, caching, and drawing of X Pixmap (XPM) images, including transparency.

### 33.167.2 Constructor & Destructor Documentation

#### 33.167.2.1 Fl\_XPM\_Image()

```
Fl_XPM_Image::Fl_XPM_Image (
    const char * name )
```

The constructor loads the XPM image from the name filename.

The destructor frees all memory and server resources that are used by the image.

The documentation for this class was generated from the following files:

- Fl\_XPM\_Image.H
- Fl\_XPM\_Image.cxx

## 33.168 FI\_GIF\_Image::GIF\_FRAME Struct Reference

### Classes

- struct [CPAL](#)

### Public Member Functions

- void **colors** (int nclrs, int bg, int tp)
- void **disposal** (int mode, int time)
- **GIF\_FRAME** (int frame, int W, int H, int fx, int fy, int fw, int fh, [uchar](#) \*data)
- **GIF\_FRAME** (int frame, [uchar](#) \*data)

### Public Attributes

- int **bkgd**
- const [uchar](#) \* **bptr**
- int **clrs**
- const struct [FI\\_GIF\\_Image::GIF\\_FRAME::CPAL](#) \* **cpal**
- int **delay**
- int **dispose**

- int **h**
- int **height**
- int **ifrm**
- int **trans**
- int **w**
- int **width**
- int **x**
- int **y**

The documentation for this struct was generated from the following file:

- Fl\_GIF\_Image.H

## 33.169 Fl\_ICO\_Image::IconDirEntry Struct Reference

Windows ICONDIRENTRY structure

```
#include <Fl_ICO_Image.H>
```

### Public Attributes

- int **bColorCount**  
*Number of colors (0 if 8bpp)*
- int **bHeight**  
*Image height.*
- int **bReserved**  
*Reserved.*
- int **bWidth**  
*Image width.*
- int **dwBytesInRes**  
*Resource size in bytes.*
- int **dwImageOffset**  
*Offset to the image.*
- int **wBitCount**  
*Bits per pixel.*
- int **wPlanes**  
*Color Planes.*

### 33.169.1 Detailed Description

Windows ICONDIRENTRY structure

The documentation for this struct was generated from the following file:

- Fl\_ICO\_Image.H

## 33.170 Fl\_Text\_Editor::Key\_Binding Struct Reference

Simple linked list item associating a key/state to a function.

```
#include <Fl_Text_Editor.H>
```

## Public Attributes

- [Key\\_Func](#) function  
*associated function*
- int **key**  
*the key pressed*
- [Key\\_Binding](#) \* **next**  
*next key binding in the list*
- int **state**  
*the state of key modifiers*

### 33.170.1 Detailed Description

Simple linked list item associating a key/state to a function.

The documentation for this struct was generated from the following file:

- [Fl\\_Text\\_Editor.H](#)

## 33.171 Fl\_Terminal::Margin Class Reference

### Public Member Functions

- void **bottom** (int val)
- int **bottom** (void) const
- void **left** (int val)
- int **left** (void) const
- void **right** (int val)
- int **right** (void) const
- void **top** (int val)
- int **top** (void) const

The documentation for this class was generated from the following file:

- [Fl\\_Terminal.H](#)

## 33.172 Fl\_Preferences::Name Class Reference

'[Name](#)' provides a simple method to create numerical or more complex procedural names for entries and groups on the fly.

```
#include <Fl_Preferences.H>
```

### Public Member Functions

- [Name](#) (const char \*format,...)  
*Creates a group name or entry name on the fly.*
- [Name](#) (unsigned int n)  
*Creates a group name or entry name on the fly.*
- **operator const char \*** ()  
*Return the [Name](#) as a "C" string.*

### 33.172.1 Detailed Description

'[Name](#)' provides a simple method to create numerical or more complex procedural names for entries and groups on the fly.

Example: `prefs.set(Fl_Preferences::Name("File%d",i),file[i]);`.

See `test/preferences.cxx` as a sample for writing arrays into preferences.

'[Name](#)' is actually implemented as a class inside [Fl\\_Preferences](#). It casts into `const char*` and gets automatically destroyed after the enclosing call ends.

## 33.172.2 Constructor & Destructor Documentation

### 33.172.2.1 Name() [1/2]

```
Fl_Preferences::Name::Name (
    unsigned int n )
```

Creates a group name or entry name on the fly.

This version creates a simple unsigned integer as an entry name.

```
int n, i;
Fl_Preferences prev( appPrefs, "PreviousFiles" );
prev.get( "n", 0 );
for ( i=0; i<n; i++ )
    prev.get( Fl_Preferences::Name(i), prevFile[i], "" );
```

### 33.172.2.2 Name() [2/2]

```
Fl_Preferences::Name::Name (
    const char * format,
    ... )
```

Creates a group name or entry name on the fly.

This version creates entry names as in 'printf'.

```
int n, i;
Fl_Preferences prefs( USER, "matthiasm.com", "test" );
prev.get( "nFiles", 0 );
for ( i=0; i<n; i++ )
    prev.get( Fl_Preferences::Name( "File%d", i ), prevFile[i], "" );
```

The documentation for this class was generated from the following files:

- Fl\_Preferences.H
- Fl\_Preferences.cxx

## 33.173 Fl\_Preferences::Node Class Reference

### Public Member Functions

- void **add** (const char \*line)
- [Node](#) \* **addChild** (const char \*path)
- const char \* **child** (int ix)
- [Node](#) \* **childNodes** (int ix)
- void **clearDirtyFlags** ()
- void **deleteAllChildren** ()
- void **deleteAllEntries** ()
- char **deleteEntry** (const char \*name)
- char **dirty** ()
- [Entry](#) & **entry** (int i)
- [Node](#) \* **find** (const char \*path)
- [RootNode](#) \* **findRoot** ()
- const char \* **get** (const char \*name)
- int **getEntry** (const char \*name)
- const char \* **name** ()
- int **nChildren** ()
- int **nEntry** ()
- [Node](#) (const char \*path)
- [Node](#) \* **parent** ()
- const char \* **path** ()
- char **remove** ()
- [Node](#) \* **search** (const char \*path, int offset=0)
- void **set** (const char \*line)

- void **set** (const char \*name, const char \*value)
- void **setParent** ([Node](#) \*parent)
- void **setRoot** ([RootNode](#) \*r)
- int **write** (FILE \*f)

### Static Public Attributes

- static int **lastEntrySet** = -1

The documentation for this class was generated from the following files:

- FI\_Preferences.H
- FI\_Preferences.cxx

## 33.174 FI\_Paged\_Device::page\_format Struct Reference

width, height and name of a page format

```
#include <FI_Paged_Device.H>
```

### Public Attributes

- int **height**  
*height in points*
- const char \* **name**  
*format name*
- int **width**  
*width in points*

#### 33.174.1 Detailed Description

width, height and name of a page format

The documentation for this struct was generated from the following file:

- [FI\\_Paged\\_Device.H](#)

## 33.175 FI\_Terminal::PartialUtf8Buf Class Reference

### Public Member Functions

- bool **append** (const char \*p, int len)
- const char \* **buf** (void) const
- int **buflen** (void) const
- void **clear** (void)
- bool **is\_complete** (void) const
- bool **is\_continuation** (char c)

The documentation for this class was generated from the following file:

- [FI\\_Terminal.H](#)

## 33.176 FI\_Terminal::RingBuffer Class Reference

### Public Member Functions

- void **change\_disp\_cols** (int dcols, const [CharStyle](#) &style)
- void **change\_disp\_rows** (int drows, const [CharStyle](#) &style)

- void **clear** (void)
- void **clear\_disp\_rows** (int sdrow, int edrow, const [CharStyle](#) &style)
- void **clear\_hist** (void)
- void **create** (int drows, int dcols, int hrows)
- int **disp\_cols** (void) const
- int **disp\_erow** (void) const
- void **disp\_rows** (int val)
- int **disp\_rows** (void) const
- int **disp\_srow** (void) const
- int **hist\_cols** (void) const
- int **hist\_erow** (void) const
- void **hist\_rows** (int val)
- int **hist\_rows** (void) const
- int **hist\_srow** (void) const
- void **hist\_use** (int val)
- int **hist\_use** (void) const
- int **hist\_use\_srow** (void) const
- bool **is\_disp\_ring\_row** (int grow) const
- bool **is\_hist\_ring\_row** (int grow) const
- void **move\_disp\_row** (int src\_row, int dst\_row)
- int **offset** (void) const
- void **offset\_adjust** (int rows)
- void **resize** (int drows, int dcols, int hrows, const [CharStyle](#) &style)
- [Utf8Char](#) \* **ring\_chars** (void)
- [Utf8Char](#) \* **ring\_chars** (void) const
- int **ring\_cols** (void) const
- int **ring\_erow** (void) const
- int **ring\_rows** (void) const
- int **ring\_srow** (void) const
- **RingBuffer** (int drows, int dcols, int hrows)
- void **scroll** (int rows, const [CharStyle](#) &style)
- [Utf8Char](#) \* **u8c\_disp\_row** (int drow)
- const [Utf8Char](#) \* **u8c\_disp\_row** (int drow) const
- [Utf8Char](#) \* **u8c\_hist\_row** (int hrow)
- const [Utf8Char](#) \* **u8c\_hist\_row** (int hrow) const
- [Utf8Char](#) \* **u8c\_hist\_use\_row** (int hurow)
- const [Utf8Char](#) \* **u8c\_hist\_use\_row** (int hurow) const
- [Utf8Char](#) \* **u8c\_ring\_row** (int row)
- const [Utf8Char](#) \* **u8c\_ring\_row** (int row) const

The documentation for this class was generated from the following files:

- [FI\\_Terminal.H](#)
- [FI\\_Terminal.cxx](#)

### 33.177 FI\_Preferences::RootNode Class Reference

#### Public Member Functions

- char \* **filename** ()
- char **getPath** (char \*[path](#), int pathlen)
- int **read** ()
- [Root](#) **root** ()
- **RootNode** ([FI\\_Preferences](#) \*)
- **RootNode** ([FI\\_Preferences](#) \*, const char \*[path](#), const char \*vendor, const char \*application, [Root](#) flags)

- **RootNode** ([FI\\_Preferences](#) \*, [Root](#) root, const char \*vendor, const char \*application)
- int **write** ()

The documentation for this class was generated from the following files:

- FI\_Preferences.H
- FI\_Preferences.cxx

## 33.178 FI\_Scroll::ScrollInfo Struct Reference

Structure to manage scrollbar and widget interior sizes.

```
#include <FI_Scroll.H>
```

### Public Attributes

- [FI\\_Region\\_LRTB](#) **child**  
*child bounding box: left/right/top/bottom*
- int **hneeded**  
*horizontal scrollbar visibility*
- [FI\\_Scrollbar\\_Data](#) **hscroll**  
*horizontal scrollbar region + values*
- [FI\\_Region\\_XYWH](#) **innerbox**  
*widget's inner box, excluding scrollbars*
- [FI\\_Region\\_XYWH](#) **innerchild**  
*widget's inner box, including scrollbars*
- int **scrollsize**  
*the effective scrollbar thickness (local or global)*
- int **vneeded**  
*vertical scrollbar visibility*
- [FI\\_Scrollbar\\_Data](#) **vscroll**  
*vertical scrollbar region + values*

### 33.178.1 Detailed Description

Structure to manage scrollbar and widget interior sizes.

This is filled out by [recalc\\_scrollbars\(\)](#) for use in calculations that need to know the visible scroll area size, etc.

Version

1.3.3

The documentation for this struct was generated from the following file:

- FI\_Scroll.H

## 33.179 FI\_Terminal::Selection Class Reference

### Public Member Functions

- bool **clear** (void)
- bool **dragged\_off** (int row, int col, bool char\_right)
- int **ecol** (void) const
- void **end** (void)
- int **erow** (void) const
- bool **extend** (int row, int col, bool char\_right)
- bool [get\\_selection](#) (int &srow, int &scol, int &erow, int &ecol) const

*Return selection start/end.*

- bool **is\_selection** (void) const
- void **push\_clear** ()
- void **push\_rowcol** (int row, int col, bool char\_right)
- int **scol** (void) const
- void **scroll** (int nrows)
- void **select** (int srow, int scol, int erow, int ecol)
- **Selection** ([Fl\\_Terminal](#) \*terminal)
- void **selectionbgcolor** ([Fl\\_Color](#) val)
- [Fl\\_Color](#) **selectionbgcolor** (void) const
- void **selectionfgcolor** ([Fl\\_Color](#) val)
- [Fl\\_Color](#) **selectionfgcolor** (void) const
- int **srow** (void) const
- bool **start** (int row, int col, bool char\_right)
- void **start\_push** ()
- int **state** (void) const

### 33.179.1 Member Function Documentation

#### 33.179.1.1 get\_selection()

```
bool Fl_Terminal::Selection::get_selection (
    int & srow,
    int & scol,
    int & erow,
    int & ecol ) const
```

Return selection start/end.

Ensures (start < end) to allow walking 'forward' thru selection, left-to-right, top-to-bottom.

Returns:

- true – valid selection values returned
- false – no selection was made, returned values undefined

The documentation for this class was generated from the following files:

- [Fl\\_Terminal.H](#)
- [Fl\\_Terminal.cxx](#)

## 33.180 Fl\_Tile::Size\_Range Struct Reference

### Public Attributes

- int **maxh**
- int **maxw**
- int **minh**
- int **minw**

The documentation for this struct was generated from the following file:

- [Fl\\_Tile.H](#)

## 33.181 Fl\_Text\_Display::Style\_Table\_Entry Struct Reference

This structure associates the color, font, and font size of a string to draw with an attribute mask matching attr.

```
#include <Fl_Text_Display.H>
```

## Public Attributes

- unsigned **attr**  
*further attributes for the text style (see ATTR\_BGCOLOR, etc.)*
- [FI\\_Color](#) **bgcolor**  
*text background color if ATTR\_BGCOLOR or ATTR\_BGCOLOR\_EXT is set*
- [FI\\_Color](#) **color**  
*text color*
- [FI\\_Font](#) **font**  
*text font*
- [FI\\_Fonsize](#) **size**  
*text font size*

### 33.181.1 Detailed Description

This structure associates the color, font, and font size of a string to draw with an attribute mask matching attr. There must be one entry for each style that can be used in an [FI\\_Text\\_Display](#) for displaying text. The style table is an array of struct [Style\\_Table\\_Entry](#).

The style table is associated with an [FI\\_Text\\_Display](#) by using [FI\\_Text\\_Display::highlight\\_data\(\)](#).

See also

[FI\\_Text\\_Display::highlight\\_data\(\)](#)

The documentation for this struct was generated from the following file:

- [FI\\_Text\\_Display.H](#)

## 33.182 FI\_Terminal::Utf8Char Class Reference

### Public Member Functions

- [FI\\_Color](#) **attr\_bg\_color** (const [FI\\_Widget](#) \*grp) const
- [FI\\_Color](#) **attr\_fg\_color** (const [FI\\_Widget](#) \*grp) const
- [uchar](#) **attrib** (void) const
- [FI\\_Color](#) **bgcolor** (void) const
- [uchar](#) **charflags** (void) const
- void **clear** (const [CharStyle](#) &style)
- [FI\\_Color](#) **fgcolor** (void) const
- void **fl\_font\_set** (const [CharStyle](#) &style) const
- bool **is\_char** (char c) const
- int **length** (void) const
- int **max\_utf8** () const
- [Utf8Char](#) & **operator=** (const [Utf8Char](#) &o)
- double **pwidth** (void) const
- int **pwidth\_int** (void) const
- void **show\_char** (void) const
- void **show\_char\_info** (void) const
- void **text\_ascii** (char c, const [CharStyle](#) &style)
- void **text\_utf8** (const char \*text, int len, const [CharStyle](#) &style)
- const char \* **text\_utf8** (void) const
- [Utf8Char](#) (const [Utf8Char](#) &o)

The documentation for this class was generated from the following files:

- [FI\\_Terminal.H](#)
- [FI\\_Terminal.cxx](#)



# Chapter 34

## File Documentation

### 34.1 Enumerations.H File Reference

This file contains type definitions and general enumerations.

```
#include <FL/fl_config.h>
#include "Fl_Export.H"
#include "fl_types.h"
#include <FL/platform_types.h>
```

#### Macros

- `#define FL_IMAGE_WITH_ALPHA 0x40000000`

#### Version Numbers

FLTK defines some constants to help the programmer to find out, for which FLTK version a program is compiled.

The following constants are defined:

- `#define FL_ABI_VERSION FL_API_VERSION + 1`  
*The FLTK ABI (Application Binary Interface) version number as an int.*
- `#define FL_API_VERSION (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100 + FL_PATCH_VERSION)`  
*The FLTK API version number as an int.*
- `#define FL_MAJOR_VERSION 1`  
*The major release version of this FLTK library.*
- `#define FL_MINOR_VERSION 5`  
*The minor release version for this library.*
- `#define FL_PATCH_VERSION 0`  
*The patch version for this library.*
- `#define FL_VERSION`  
*The FLTK version number as a double.*

#### Names of Non-ASCII keys and mouse buttons

The following constants define the names of non-ASCII keys on the keyboard and of mouse buttons for `FL_KEYBOARD` and `FL_SHORTCUT` events.

See also

`Fl::event_key()` and `Fl::get_key(int)` (use ASCII letters for all other keys):

- `#define FL_Alt_Gr 0xfe03`  
*The AltGr key on some international keyboards.*
- `#define FL_Alt_L 0xfe09`  
*The left alt key.*
- `#define FL_Alt_R 0xfe0a`  
*The right alt key.*

- **#define FL\_Back** 0xEF26  
*Like back on a browser.*
- **#define FL\_BackSpace** 0xff08  
*The backspace key.*
- **#define FL\_Button** 0xfe8  
*A mouse button; use FL\_Button + n for mouse button n.*
- **#define FL\_Caps\_Lock** 0xfe5  
*The caps lock key.*
- **#define FL\_Control\_L** 0xfe3  
*The lefthand control key.*
- **#define FL\_Control\_R** 0xfe4  
*The righthand control key.*
- **#define FL\_Delete** 0xffff  
*The delete key.*
- **#define FL\_Down** 0xff54  
*The down arrow key.*
- **#define FL\_Eisu** 0xff2f  
*The Eisu key of JIS keyboards.*
- **#define FL\_End** 0xff57  
*The end key.*
- **#define FL\_Enter** 0xff0d  
*The enter key.*
- **#define FL\_Escape** 0xff1b  
*The escape key.*
- **#define FL\_F** 0xffbd  
*One of the function keys; use FL\_F + n for function key n.*
- **#define FL\_F\_Last** 0xfe0  
*The last function key; use to range-check function keys.*
- **#define FL\_Favorites** 0xEF30  
*Show favorite locations.*
- **#define FL\_Forward** 0xEF27  
*Like forward on a browser.*
- **#define FL\_Help** 0xff68  
*The 'help' key on Mac keyboards.*
- **#define FL\_Home** 0xff50  
*The home key.*
- **#define FL\_Home\_Page** 0xEF18  
*Display user's home page.*
- **#define FL\_Insert** 0xff63  
*The insert key.*
- **#define FL\_Iso\_Key** 0xff0c  
*The additional key of ISO keyboards.*
- **#define FL\_JIS\_Underscore** 0xff31  
*The underscore key of JIS keyboards.*
- **#define FL\_Kana** 0xff2e  
*The Kana key of JIS keyboards.*
- **#define FL\_KP** 0xff80  
*One of the keypad numbers; use FL\_KP + 'n' for digit n.*
- **#define FL\_KP\_Enter** 0xff8d  
*The enter key on the keypad, same as FL\_KP + '\r'.*
- **#define FL\_KP\_Last** 0xffbd  
*The last keypad key; use to range-check keypad.*
- **#define FL\_Left** 0xff51  
*The left arrow key.*
- **#define FL\_Mail** 0xEF19  
*Invoke user's mail program.*
- **#define FL\_Media\_Next** 0xEF17  
*Next track.*
- **#define FL\_Media\_Play** 0xEF14

- *Start playing of audio.*
- **#define FL\_Media\_Prev** 0xEF16
- *Previous track.*
- **#define FL\_Media\_Stop** 0xEF15
- *Stop playing audio.*
- **#define FL\_Menu** 0xff67
- *The menu key.*
- **#define FL\_Meta\_L** 0xffe7
- *The left meta/Windows key.*
- **#define FL\_Meta\_R** 0xffe8
- *The right meta/Windows key.*
- **#define FL\_Num\_Lock** 0xff7f
- *The num lock key.*
- **#define FL\_Page\_Down** 0xff56
- *The page-down key.*
- **#define FL\_Page\_Up** 0xff55
- *The page-up key.*
- **#define FL\_Pause** 0xff13
- *The pause key.*
- **#define FL\_Print** 0xff61
- *The print (or print-screen) key.*
- **#define FL\_Refresh** 0xEF29
- *Refresh the page.*
- **#define FL\_Right** 0xff53
- *The right arrow key.*
- **#define FL\_Scroll\_Lock** 0xff14
- *The scroll lock key.*
- **#define FL\_Search** 0xEF1B
- *Search.*
- **#define FL\_Shift\_L** 0xffe1
- *The lefthand shift key.*
- **#define FL\_Shift\_R** 0xffe2
- *The righthand shift key.*
- **#define FL\_Sleep** 0xEF2F
- *Put system to sleep.*
- **#define FL\_Stop** 0xEF28
- *Stop current operation.*
- **#define FL\_Tab** 0xff09
- *The tab key.*
- **#define FL\_Up** 0xff52
- *The up arrow key.*
- **#define FL\_Volume\_Down** 0xEF11
- *Volume control down.*
- **#define FL\_Volume\_Mute** 0xEF12
- *Mute sound from the system.*
- **#define FL\_Volume\_Up** 0xEF13
- *Volume control up.*
- **#define FL\_Yen** 0xff30
- *The Yen key of JIS keyboards.*

### Mouse Buttons

*These constants define the button numbers for FL\_PUSH and FL\_RELEASE events.*

See also

[Fl::event\\_button\(\)](#)

- **#define FL\_BACK\_MOUSE** 4  
*The back mouse button (side button 1)*
- **#define FL\_FORWARD\_MOUSE** 5  
*The forward mouse button (side button 2)*
- **#define FL\_LEFT\_MOUSE** 1  
*The left mouse button.*
- **#define FL\_MIDDLE\_MOUSE** 2  
*The middle mouse button.*
- **#define FL\_RIGHT\_MOUSE** 3  
*The right mouse button.*

## Event States

The following constants define bits in the `Fl::event_state()` value.

- **#define FL\_ALT** 0x00080000  
*One of the alt keys is down.*
- **#define FL\_BUTTON(n)** (0x00800000<<(n))  
*Mouse button n (n = 1..5) is pushed, undefined if n outside 1..5.*
- **#define FL\_BUTTON1** 0x01000000  
*Mouse button 1 is pushed (L)*
- **#define FL\_BUTTON2** 0x02000000  
*Mouse button 2 is pushed (M)*
- **#define FL\_BUTTON3** 0x04000000  
*Mouse button 3 is pushed (R)*
- **#define FL\_BUTTON4** 0x08000000  
*Mouse button 4 is pushed (BACK)*
- **#define FL\_BUTTON5** 0x10000000  
*Mouse button 5 is pushed (FORWARD)*
- **#define FL\_BUTTONS** 0x1f000000  
*Bitmask: any mouse button (1-5) is pushed.*
- **#define FL\_CAPS\_LOCK** 0x00020000  
*The caps lock is on.*
- **#define FL\_CTRL** 0x00040000  
*One of the ctrl keys is down.*
- **#define FL\_KEY\_MASK** 0x0000ffff  
*All keys are 16 bit for now.*
- **#define FL\_META** 0x00400000  
*One of the meta/Windows keys is down.*
- **#define FL\_NUM\_LOCK** 0x00100000  
*The num lock is on.*
- **#define FL\_SCROLL\_LOCK** 0x00800000  
*The scroll lock is on.*
- **#define FL\_SHIFT** 0x00010000  
*One of the shift keys is down.*

## Typedefs

- typedef int [Fl\\_Fontsize](#)  
*Size of a font in pixels.*

## Enumerations

- enum { `FL_READ` = 1 , `FL_WRITE` = 4 , `FL_EXCEPT` = 8 }  
*FD "when" conditions.*
- enum `Fl_Arrow_Type` { `FL_ARROW_SINGLE` = 0x01 , `FL_ARROW_DOUBLE` = 0x02 , `FL_ARROW_CHOICE` = 0x03 , `FL_ARROW_RETURN` = 0x04 }  
*Arrow types define the type of arrow drawing function.*
- enum `Fl_Damage` {  
`FL_DAMAGE_CHILD` = 0x01 , `FL_DAMAGE_EXPOSE` = 0x02 , `FL_DAMAGE_SCROLL` = 0x04 ,  
`FL_DAMAGE_OVERLAY` = 0x08 ,  
`FL_DAMAGE_USER1` = 0x10 , `FL_DAMAGE_USER2` = 0x20 , `FL_DAMAGE_ALL` = 0x80 }  
*Damage masks.*
- enum `Fl_Event` {  
`FL_NO_EVENT` = 0 , `FL_PUSH` = 1 , `FL_RELEASE` = 2 , `FL_ENTER` = 3 ,  
`FL_LEAVE` = 4 , `FL_DRAG` = 5 , `FL_FOCUS` = 6 , `FL_UNFOCUS` = 7 ,  
`FL_KEYDOWN` = 8 , `FL_KEYBOARD` = 8 , `FL_KEYUP` = 9 , `FL_CLOSE` = 10 ,  
`FL_MOVE` = 11 , `FL_SHORTCUT` = 12 , `FL_DEACTIVATE` = 13 , `FL_ACTIVATE` = 14 ,  
`FL_HIDE` = 15 , `FL_SHOW` = 16 , `FL_PASTE` = 17 , `FL_SELECTIONCLEAR` = 18 ,  
`FL_MOUSEWHEEL` = 19 , `FL_DND_ENTER` = 20 , `FL_DND_DRAG` = 21 , `FL_DND_LEAVE` = 22 ,  
`FL_DND_RELEASE` = 23 , `FL_SCREEN_CONFIGURATION_CHANGED` = 24 , `FL_FULLSCREEN` = 25 ,  
`FL_ZOOM_GESTURE` = 26 ,  
`FL_ZOOM_EVENT` = 27 , `FL_BEFORE_TOOLTIP` = 28 , `FL_BEFORE_MENU` = 29 }  
*Every time a user moves the mouse pointer, clicks a button, or presses a key, an event is generated and sent to your application.*
- enum `Fl_Labeltype` {  
`FL_NORMAL_LABEL` = 0 , `FL_NO_LABEL` , `_FL_SHADOW_LABEL` , `_FL_ENGRAVED_LABEL` ,  
`_FL_EMBOSSSED_LABEL` , `_FL_MULTI_LABEL` , `_FL_ICON_LABEL` , `_FL_IMAGE_LABEL` ,  
`FL_FREE_LABELTYPE` }  
*The `labeltype()` method sets the type of the label.*
- enum `Fl_Mode` {  
`FL_RGB` = 0 , `FL_INDEX` = 1 , `FL_SINGLE` = 0 , `FL_DOUBLE` = 2 ,  
`FL_ACCUM` = 4 , `FL_ALPHA` = 8 , `FL_DEPTH` = 16 , `FL_STENCIL` = 32 ,  
`FL_RGB8` = 64 , `FL_MULTISAMPLE` = 128 , `FL_STEREO` = 256 , `FL_FAKE_SINGLE` = 512 ,  
`FL_OPENGL3` = 1024 }  
*visual types and `Fl_Gl_Window::mode()` (values match Glut)*
- enum `Fl_Orientation` {  
`FL_ORIENT_NONE` = 0x00 , `FL_ORIENT_RIGHT` = 0x00 , `FL_ORIENT_NE` = 0x01 , `FL_ORIENT_UP` = 0x02 ,  
`FL_ORIENT_NW` = 0x03 , `FL_ORIENT_LEFT` = 0x04 , `FL_ORIENT_SW` = 0x05 , `FL_ORIENT_DOWN` = 0x06 ,  
`FL_ORIENT_SE` = 0x07 }  
*`Fl_Orientation` describes the orientation of a GUI element.*

## When Conditions

- enum `Fl_When` {  
`FL_WHEN_NEVER` = 0 , `FL_WHEN_CHANGED` = 1 , `FL_WHEN_NOT_CHANGED` = 2 , `FL_WHEN_RELEASE` = 4 ,  
`FL_WHEN_RELEASE_ALWAYS` = 6 , `FL_WHEN_ENTER_KEY` = 8 , `FL_WHEN_ENTER_KEY_ALWAYS` = 10 , `FL_WHEN_ENTER_KEY_CHANGED` = 11 ,  
`FL_WHEN_CLOSED` = 16 }  
*These constants determine when a callback is performed.*

## Callback Reasons

- enum `Fl_Callback_Reason` {  
`FL_REASON_UNKNOWN` = 0 , `FL_REASON_SELECTED` , `FL_REASON_DESELECTED` , `FL_REASON_RESELECTED`

```
,
FL_REASON_OPENED , FL_REASON_CLOSED , FL_REASON_DRAGGED , FL_REASON_CANCELLED
,
FL_REASON_CHANGED , FL_REASON_GOT_FOCUS , FL_REASON_LOST_FOCUS , FL_REASON_RELEASED
,
FL_REASON_ENTER_KEY , FL_REASON_USER = 32 }
```

*These constants describe why a callback is performed.*

## Cursors

- enum `Fl_Cursor` {  
`FL_CURSOR_DEFAULT` = 0 , `FL_CURSOR_ARROW` = 35 , `FL_CURSOR_CROSS` = 66 ,  
`FL_CURSOR_WAIT` = 76 ,  
`FL_CURSOR_INSERT` = 77 , `FL_CURSOR_HAND` = 31 , `FL_CURSOR_HELP` = 47 , `FL_CURSOR_MOVE`  
= 27 ,  
`FL_CURSOR_NS` = 78 , `FL_CURSOR_WE` = 79 , `FL_CURSOR_NWSE` = 80 , `FL_CURSOR_NESW` =  
81 ,  
`FL_CURSOR_N` = 70 , `FL_CURSOR_NE` = 69 , `FL_CURSOR_E` = 49 , `FL_CURSOR_SE` = 8 ,  
`FL_CURSOR_S` = 9 , `FL_CURSOR_SW` = 7 , `FL_CURSOR_W` = 36 , `FL_CURSOR_NW` = 68 ,  
`FL_CURSOR_NONE` = 255 }

*The following constants define the mouse cursors that are available in FLTK.*

## Variables

- `Fl_Fontsize FL_NORMAL_SIZE`

*normal font size*

## Box Types

FLTK standard box types

This enum defines the standard box types included with FLTK.

### Note

The documented `enum Fl_Boxtype` contains some values (names) with leading underscores, e.g. `_FL_SHADOW_BOX`. This is due to technical reasons - please use the same values (names) without the leading underscore in your code! Enum values with leading underscores are reserved for internal use and subject to change without notice!

`FL_NO_BOX` means nothing is drawn at all, so whatever is already on the screen remains. The `FL_..._FRAME` types only draw their edges, leaving the interior unchanged. The blue color in the image below is the area that is

not drawn by the frame types.

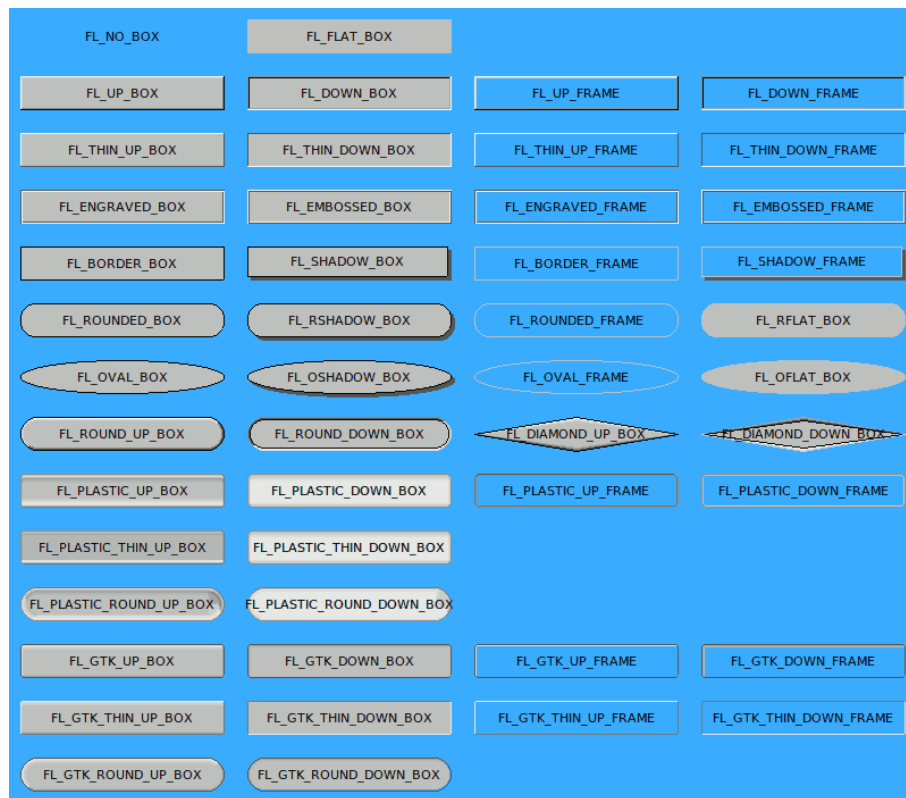


Figure 34.1 FLTK Standard Box Types

#### Note

Not all box types are depicted in the figure above. See enum [Fl\\_Boxtype](#) below for the complete list of box types.

#### See also

[Fl::get\\_system\\_colors\(\)](#)

- [Fl\\_Boxtype fl\\_box](#) ([Fl\\_Boxtype b](#))  
*Get the filled version of a frame.*
- enum [Fl\\_Boxtype](#) {  
[FL\\_NO\\_BOX](#) = 0, [FL\\_FLAT\\_BOX](#), [FL\\_UP\\_BOX](#), [FL\\_DOWN\\_BOX](#),  
[FL\\_UP\\_FRAME](#), [FL\\_DOWN\\_FRAME](#), [FL\\_THIN\\_UP\\_BOX](#), [FL\\_THIN\\_DOWN\\_BOX](#),  
[FL\\_THIN\\_UP\\_FRAME](#), [FL\\_THIN\\_DOWN\\_FRAME](#), [FL\\_ENGRAVED\\_BOX](#), [FL\\_EMBOSSSED\\_BOX](#),  
[FL\\_ENGRAVED\\_FRAME](#), [FL\\_EMBOSSSED\\_FRAME](#), [FL\\_BORDER\\_BOX](#), [FL\\_SHADOW\\_BOX](#),  
[FL\\_BORDER\\_FRAME](#), [FL\\_SHADOW\\_FRAME](#), [FL\\_ROUNDED\\_BOX](#), [FL\\_RSHADOW\\_BOX](#),  
[FL\\_ROUNDED\\_FRAME](#), [FL\\_RFLAT\\_BOX](#), [FL\\_ROUND\\_UP\\_BOX](#), [FL\\_ROUND\\_DOWN\\_BOX](#),  
[FL\\_DIAMOND\\_UP\\_BOX](#), [FL\\_DIAMOND\\_DOWN\\_BOX](#), [FL\\_OVAL\\_BOX](#), [FL\\_OSHADOW\\_BOX](#),  
[FL\\_OVAL\\_FRAME](#), [FL\\_OFLAT\\_BOX](#), [FL\\_PLASTIC\\_UP\\_BOX](#), [FL\\_PLASTIC\\_DOWN\\_BOX](#),  
[FL\\_PLASTIC\\_UP\\_FRAME](#), [FL\\_PLASTIC\\_DOWN\\_FRAME](#), [FL\\_PLASTIC\\_THIN\\_UP\\_BOX](#),  
[FL\\_PLASTIC\\_THIN\\_DOWN\\_BOX](#),  
[FL\\_PLASTIC\\_ROUND\\_UP\\_BOX](#), [FL\\_PLASTIC\\_ROUND\\_DOWN\\_BOX](#), [FL\\_GTK\\_UP\\_BOX](#),  
[FL\\_GTK\\_DOWN\\_BOX](#),  
[FL\\_GTK\\_UP\\_FRAME](#), [FL\\_GTK\\_DOWN\\_FRAME](#), [FL\\_GTK\\_THIN\\_UP\\_BOX](#), [FL\\_GTK\\_THIN\\_DOWN\\_BOX](#),  
[FL\\_GTK\\_THIN\\_UP\\_FRAME](#), [FL\\_GTK\\_THIN\\_DOWN\\_FRAME](#), [FL\\_GTK\\_ROUND\\_UP\\_BOX](#),  
[FL\\_GTK\\_ROUND\\_DOWN\\_BOX](#),  
[FL\\_GLEAM\\_UP\\_BOX](#), [FL\\_GLEAM\\_DOWN\\_BOX](#), [FL\\_GLEAM\\_UP\\_FRAME](#), [FL\\_GLEAM\\_DOWN\\_FRAME](#)

```

,
_FL_GLEAM_THIN_UP_BOX , _FL_GLEAM_THIN_DOWN_BOX , _FL_GLEAM_ROUND_UP_BOX ,
_FL_GLEAM_ROUND_DOWN_BOX ,
_FL_OXY_UP_BOX , _FL_OXY_DOWN_BOX , _FL_OXY_UP_FRAME , _FL_OXY_DOWN_FRAME ,
_FL_OXY_THIN_UP_BOX , _FL_OXY_THIN_DOWN_BOX , _FL_OXY_THIN_UP_FRAME , _FL_OXY_THIN_DOWN_FRAME
,
_FL_OXY_ROUND_UP_BOX , _FL_OXY_ROUND_DOWN_BOX , _FL_OXY_BUTTON_UP_BOX ,
_FL_OXY_BUTTON_DOWN_BOX ,
FL_FREE_BOXTYPE , FL_MAX_BOXTYPE = 255 }

    FLTK standard box types.
• #define FL_CIRCLE_BOX FL_ROUND_DOWN_BOX
• #define FL_DIAMOND_BOX FL_DIAMOND_DOWN_BOX
• Fl\_Boxtype fl\_down (Fl\_Boxtype b)
    Get the "pressed" or "down" version of a box.
• Fl\_Boxtype fl\_frame (Fl\_Boxtype b)
    Get the unfilled, frame only version of a box.
• #define FL_FRAME FL\_ENGRAVED\_FRAME
• #define FL_FRAME_BOX FL\_ENGRAVED\_BOX

• Fl\_Labeltype fl\_define\_FL\_EMBOSSED\_LABEL ()
    Initializes the internal table entry for FL_EMBOSSED_LABEL and returns its internal value.
• Fl\_Labeltype fl\_define\_FL\_ENGRAVED\_LABEL ()
    Initializes the internal table entry for FL_ENGRAVED_LABEL and returns its internal value.
• Fl\_Labeltype fl\_define\_FL\_ICON\_LABEL ()
    Initializes the internal table entry for FL_ICON_LABEL and returns its internal value.
• Fl\_Labeltype fl\_define\_FL\_IMAGE\_LABEL ()
    Initializes the internal table entry for FL_IMAGE_LABEL and returns its internal value.
• Fl\_Labeltype fl\_define\_FL\_MULTI\_LABEL ()
    Initializes the internal table entry for FL_MULTI_LABEL and returns its internal value.
• Fl\_Labeltype fl\_define\_FL\_SHADOW\_LABEL ()
    Initializes the internal table entry for FL_SHADOW_LABEL and returns its internal value.
• #define FL_EMBOSSED_LABEL fl\_define\_FL\_EMBOSSED\_LABEL()
    Draws a label with embossed text.
• #define FL_ENGRAVED_LABEL fl\_define\_FL\_ENGRAVED\_LABEL()
    Draws a label with engraved text.
• #define FL_ICON_LABEL fl\_define\_FL\_ICON\_LABEL()
    Draws an icon as the label.
• #define FL_IMAGE_LABEL fl\_define\_FL\_IMAGE\_LABEL()
    Draws an image (Fl\_Image) as the label.
• #define FL_MULTI_LABEL fl\_define\_FL\_MULTI\_LABEL()
    Draws a label that can comprise several parts like text and images.
• #define FL_SHADOW_LABEL fl\_define\_FL\_SHADOW\_LABEL()
    Draws a label with shadows behind the text.
• #define FL_SYMBOL_LABEL FL\_NORMAL\_LABEL
    Sets the current label type and returns its corresponding Fl_Labeltype value.

```

## Colors

The `Fl_Color` type holds an FLTK color value.

Colors are either 8-bit indexes into a [virtual colormap](#) or 24-bit RGB color values. (See [Colors](#) for the default FLTK colormap)

Color indices occupy the lower 8 bits of the value, while RGB colors occupy the upper 24 bits, for a byte organization of RGBI.

```

Fl_Color => 0xrrggbbii
          | | | |
          | | | +--- index between 0 and 255
          | | +----- blue color component (8 bit)
          | +----- green component (8 bit)
          +----- red component (8 bit)

```

A color can have either an index or an rgb value. Colors with rgb set and an index >0 are reserved for special use.

- const [Fl\\_Color](#) **FL\_BACKGROUND2\_COLOR** = 7  
*the default background color for text, list, and valuator widgets*
- const [Fl\\_Color](#) **FL\_BACKGROUND\_COLOR** = 49  
*Default background color.*
- const [Fl\\_Color](#) **FL\_BLACK** = 56
- const [Fl\\_Color](#) **FL\_BLUE** = 216
- typedef unsigned int **Fl\_Color**  
*An FLTK color value; see also [Colors](#)*
- [Fl\\_Color](#) **fl\_color\_average** ([Fl\\_Color](#) c1, [Fl\\_Color](#) c2, float weight)  
*Returns the weighted average color between the two given colors.*
- #define **FL\_COLOR\_CUBE** ([Fl\\_Color](#))56
- [Fl\\_Color](#) **fl\_color\_cube** (int r, int g, int b)  
*Returns a color out of the color cube.*
- [Fl\\_Color](#) **fl\_contrast** ([Fl\\_Color](#) fg, [Fl\\_Color](#) bg, int context=0, int size=0)  
*Returns a color that contrasts with the background color.*
- typedef [Fl\\_Color](#)() **Fl\_Contrast\_Function**([Fl\\_Color](#), [Fl\\_Color](#), int, int)  
*Type of a custom [fl\\_contrast\(\)](#) function.*
- void **fl\_contrast\_function** (**Fl\_Contrast\_Function** \*f)  
*Register a custom contrast function.*
- int **fl\_contrast\_level** ()  
*Get the contrast level (sensitivity) of the [fl\\_contrast\(\)](#) method.*
- void **fl\_contrast\_level** (int level)  
*Set the contrast level (sensitivity) of the [fl\\_contrast\(\)](#) method.*
- enum **Fl\_Contrast\_Mode** {  
    **FL\_CONTRAST\_NONE** = 0, **FL\_CONTRAST\_LEGACY**, **FL\_CONTRAST\_CIELAB**, **FL\_CONTRAST\_CUSTOM**,  
    **FL\_CONTRAST\_LAST** }  
*Define the possible modes to calculate [fl\\_contrast\(\)](#).*
- int **fl\_contrast\_mode** ()  
*Return the current contrast algorithm (mode).*
- void **fl\_contrast\_mode** (int mode)  
*Set the contrast algorithm (mode).*
- const [Fl\\_Color](#) **FL\_CYAN** = 223
- const [Fl\\_Color](#) **FL\_DARK1** = 47
- const [Fl\\_Color](#) **FL\_DARK2** = 45
- const [Fl\\_Color](#) **FL\_DARK3** = 39
- const [Fl\\_Color](#) **FL\_DARK\_BLUE** = 136
- const [Fl\\_Color](#) **FL\_DARK\_CYAN** = 140
- const [Fl\\_Color](#) **FL\_DARK\_GREEN** = 60
- const [Fl\\_Color](#) **FL\_DARK\_MAGENTA** = 152
- const [Fl\\_Color](#) **FL\_DARK\_RED** = 72
- const [Fl\\_Color](#) **FL\_DARK\_YELLOW** = 76
- [Fl\\_Color](#) **fl\_darker** ([Fl\\_Color](#) c)

- Returns a darker version of the specified color.*
- const `FI_Color FL_FOREGROUND_COLOR` = 0  
*the default foreground color (0) used for labels and text*
- #define `FL_FREE_COLOR (FI_Color)` 16  
*Colors numbered between FL\_FREE\_COLOR and FL\_FREE\_COLOR + FL\_NUM\_FREE\_COLOR - 1 are free for the user to be given any value using FI::set\_color().*
- #define `FL_GRAY FL_BACKGROUND_COLOR`
- const `FI_Color FL_GRAY0` = 32
- #define `FL_GRAY_RAMP (FI_Color)` 32
- `FI_Color fl_gray_ramp` (int i)  
*Returns a gray color value from black (i == 0) to white (i == FL\_NUM\_GRAY - 1).*
- const `FI_Color FL_GREEN` = 63
- `FI_Color fl_inactive` (FI\_Color c)  
*Returns the inactive, dimmed version of the given color.*
- const `FI_Color FL_INACTIVE_COLOR` = 8  
*the inactive foreground color*
- const `FI_Color FL_LIGHT1` = 50
- const `FI_Color FL_LIGHT2` = 52
- const `FI_Color FL_LIGHT3` = 54
- `FI_Color fl_lighter` (FI\_Color c)  
*Returns a lighter version of the specified color.*
- double `fl_lightness` (FI\_Color color)  
*Return the perceived lightness of a color.*
- double `fl_luminance` (FI\_Color color)  
*Return the raw / physical luminance of a color.*
- const `FI_Color FL_MAGENTA` = 248
- #define `FL_NUM_BLUE` 5
- #define `FL_NUM_FREE_COLOR` 16
- #define `FL_NUM_GRAY` 24
- #define `FL_NUM_GREEN` 8
- #define `FL_NUM_RED` 5
- const `FI_Color FL_RED` = 88
- `FI_Color fl_rgb_color` (uchar g)  
*Returns the 24-bit color value closest to g (grayscale).*
- `FI_Color fl_rgb_color` (uchar r, uchar g, uchar b)  
*Returns the 24-bit color value closest to r, g, b.*
- const `FI_Color FL_SELECTION_COLOR` = 15  
*the default selection/highlight color*
- const `FI_Color FL_WHITE` = 255
- const `FI_Color FL_YELLOW` = 95

## Alignment Flags

Flags to control the label alignment.

This controls how the label is displayed next to or inside the widget. The default value is FL\_ALIGN\_CENTER (0) for most widgets, which centers the label inside the widget.

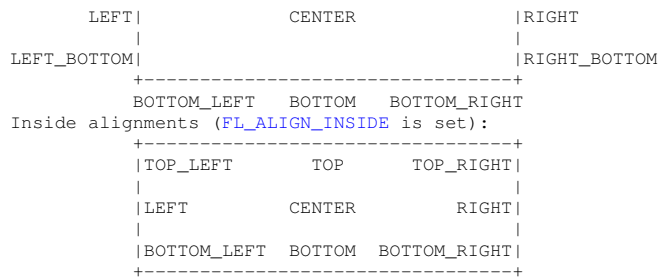
All alignment flags use the common prefix "FL\_ALIGN\_". In the following descriptions this prefix is sometimes omitted for brevity.

Flags can be or'd to achieve a combination of alignments, but there are some "magic values" (e.g. combinations of TOP and BOTTOM and of LEFT and RIGHT) that have special meanings (see below). For instance:

`FL_ALIGN_TOP_LEFT == (FL_ALIGN_TOP | FL_ALIGN_LEFT) != FL_ALIGN_LEFT_TOP.`

Outside alignments (`FL_ALIGN_INSIDE` is not set):

TOP_LEFT	TOP	TOP_RIGHT
+-----+		
LEFT_TOP		RIGHT_TOP



See also

[Fl\\_Align](#), [FL\\_ALIGN\\_CENTER](#), etc.

#### Note

1. Bit positions not defined in the following constants of type `Fl_Align` are reserved for future extensions. Do not use.
2. The "magic values" (`FL_ALIGN_`)`LEFT_TOP`, `RIGHT_TOP`, `LEFT_BOTTOM`, and `RIGHT_BOTTOM` must not be used together with `FL_ALIGN_INSIDE`. Use `TOP_LEFT`, `TOP_RIGHT`, `BOTTOM_LEFT`, or `BOTTOM_RIGHT` instead.
3. Although bits can be or'd together there are some unused/illegal combinations, for instance:
  - setting both `FL_ALIGN_TOP` and `FL_ALIGN_BOTTOM` in combinations other than those given in the `Fl_Align` constants below (magic values)
  - setting both `FL_ALIGN_LEFT` and `FL_ALIGN_RIGHT` in combinations other than those given in the `Fl_Align` constants below (magic values)
  - using one of the "magic values" (2) together with `FL_ALIGN_INSIDE`

Using illegal bit combinations or undefined bits may yield unexpected behavior, and this behavior may be changed without notice in future FLTK versions.

- typedef unsigned **Fl\_Align**  
*FLTK type for alignment control.*
- const [Fl\\_Align](#) **FL\_ALIGN\_BOTTOM** = 0x0002  
*Align the label at the bottom of the widget.*
- const [Fl\\_Align](#) **FL\_ALIGN\_BOTTOM\_LEFT** = [FL\\_ALIGN\\_BOTTOM](#) | [FL\\_ALIGN\\_LEFT](#)
- const [Fl\\_Align](#) **FL\_ALIGN\_BOTTOM\_RIGHT** = [FL\\_ALIGN\\_BOTTOM](#) | [FL\\_ALIGN\\_RIGHT](#)
- const [Fl\\_Align](#) **FL\_ALIGN\_CENTER** = 0x0000  
*Align the label horizontally in the middle.*
- const [Fl\\_Align](#) **FL\_ALIGN\_CLIP** = 0x0040  
*All parts of the label that are larger than the widget will not be drawn.*
- const [Fl\\_Align](#) **FL\_ALIGN\_IMAGE\_BACKDROP** = 0x0200  
*If the label contains an image, draw the image or deimage in the background.*
- const [Fl\\_Align](#) **FL\_ALIGN\_IMAGE\_MASK** = 0x0320  
*Mask value to test for image alignment flags.*
- const [Fl\\_Align](#) **FL\_ALIGN\_IMAGE\_NEXT\_TO\_TEXT** = 0x0100  
*If the label contains an image, draw the text to the right of the image.*
- const [Fl\\_Align](#) **FL\_ALIGN\_IMAGE\_OVER\_TEXT** = 0x0000  
*If the label contains an image, draw the text below the image.*
- const [Fl\\_Align](#) **FL\_ALIGN\_INSIDE** = 0x0010  
*Draw the label inside of the widget.*
- const [Fl\\_Align](#) **FL\_ALIGN\_LEFT** = 0x0004  
*Align the label at the left of the widget.*
- const [Fl\\_Align](#) **FL\_ALIGN\_LEFT\_BOTTOM** = 0x000d  
*Outside only, left of widget, bottom position, magic value: `TOP` | `LEFT` | `RIGHT`.*
- const [Fl\\_Align](#) **FL\_ALIGN\_LEFT\_TOP** = 0x0007

- Outside only, left of widget, top position, magic value: TOP | BOTTOM | LEFT.*

  - const [Fl\\_Align](#) **FL\_ALIGN\_NOWRAP** = 0x0000
  - Nothing, same as FL\_ALIGN\_CENTER, for back compatibility.*
  - const [Fl\\_Align](#) **FL\_ALIGN\_POSITION\_MASK** = 0x000f
  - Mask value to test for TOP, BOTTOM, LEFT, and RIGHT flags.*
  - const [Fl\\_Align](#) **FL\_ALIGN\_RIGHT** = 0x0008
  - Align the label to the right of the widget.*
  - const [Fl\\_Align](#) **FL\_ALIGN\_RIGHT\_BOTTOM** = 0x000e
  - Outside only, right of widget, bottom position, magic value: BOTTOM | LEFT | RIGHT.*
  - const [Fl\\_Align](#) **FL\_ALIGN\_RIGHT\_TOP** = 0x000b
  - Outside only, right of widget, top position, magic value: TOP | BOTTOM | RIGHT.*
  - const [Fl\\_Align](#) **FL\_ALIGN\_TEXT\_NEXT\_TO\_IMAGE** = 0x0120
  - If the label contains an image, draw the text to the left of the image.*
  - const [Fl\\_Align](#) **FL\_ALIGN\_TEXT\_OVER\_IMAGE** = 0x0020
  - If the label contains an image, draw the text on top of the image.*
  - const [Fl\\_Align](#) **FL\_ALIGN\_TOP** = 0x0001
  - Align the label at the top of the widget.*
  - const [Fl\\_Align](#) **FL\_ALIGN\_TOP\_LEFT** = [FL\\_ALIGN\\_TOP](#) | [FL\\_ALIGN\\_LEFT](#)
  - const [Fl\\_Align](#) **FL\_ALIGN\_TOP\_RIGHT** = [FL\\_ALIGN\\_TOP](#) | [FL\\_ALIGN\\_RIGHT](#)
  - const [Fl\\_Align](#) **FL\_ALIGN\_WRAP** = 0x0080
  - Wrap text that does not fit the width of the widget.*

## Font Numbers

The following constants define the standard FLTK fonts:

- const [Fl\\_Font](#) **FL\_BOLD** = 1
- add this to Helvetica, Courier, or Times*
- const [Fl\\_Font](#) **FL\_BOLD\_ITALIC** = 3
- add this to Helvetica, Courier, or Times*
- const [Fl\\_Font](#) **FL\_COURIER** = 4
- Courier normal.*
- const [Fl\\_Font](#) **FL\_COURIER\_BOLD** = 5
- Courier bold.*
- const [Fl\\_Font](#) **FL\_COURIER\_BOLD\_ITALIC** = 7
- Courier bold-italic.*
- const [Fl\\_Font](#) **FL\_COURIER\_ITALIC** = 6
- Courier italic.*
- typedef int **Fl\_Font**
- A font number is an index into the internal font table.*
- const [Fl\\_Font](#) **FL\_FREE\_FONT** = 16
- first one to allocate*
- const [Fl\\_Font](#) **FL\_HELVETICA** = 0
- Helvetica (or Arial) normal (0)*
- const [Fl\\_Font](#) **FL\_HELVETICA\_BOLD** = 1
- Helvetica (or Arial) bold.*
- const [Fl\\_Font](#) **FL\_HELVETICA\_BOLD\_ITALIC** = 3
- Helvetica (or Arial) bold-oblique.*
- const [Fl\\_Font](#) **FL\_HELVETICA\_ITALIC** = 2
- Helvetica (or Arial) oblique.*
- const [Fl\\_Font](#) **FL\_ITALIC** = 2
- add this to Helvetica, Courier, or Times*

- const `Fl_Font FL_SCREEN` = 13  
*Default monospaced screen font.*
- const `Fl_Font FL_SCREEN_BOLD` = 14  
*Default monospaced bold screen font.*
- const `Fl_Font FL_SYMBOL` = 12  
*Standard symbol font.*
- const `Fl_Font FL_TIMES` = 8  
*Times roman.*
- const `Fl_Font FL_TIMES_BOLD` = 9  
*Times roman bold.*
- const `Fl_Font FL_TIMES_BOLD_ITALIC` = 11  
*Times roman bold-italic.*
- const `Fl_Font FL_TIMES_ITALIC` = 10  
*Times roman italic.*
- const `Fl_Font FL_ZAPF_DINGBATS` = 15  
*Zapf-dingbats font.*

### 34.1.1 Detailed Description

This file contains type definitions and general enumerations.

### 34.1.2 Macro Definition Documentation

#### 34.1.2.1 FL\_ABI\_VERSION

```
#define FL_ABI_VERSION FL_API_VERSION + 1
```

The FLTK ABI (Application Binary Interface) version number as an *int*.

FL\_ABI\_VERSION is an *int* that describes the major, minor, and patch ABI version numbers in the same format as FL\_API\_VERSION.

The ABI version number FL\_ABI\_VERSION is usually the same as the API version FL\_API\_VERSION with the last two digits set to '00'.

FLTK retains the ABI (Application Binary Interface) during patch releases of the same major and minor versions. Examples:

FLTK Version	FL_API_VERSION	FL_ABI_VERSION	FL_VERSION (deprecated)
1.3.0	10300	10300	1.0300
1.3.4	10304	10300	1.0304

Version 1.2.3 is actually stored as 10203 to allow for more than 9 minor and patch releases.

The FL\_MAJOR\_VERSION, FL\_MINOR\_VERSION, and FL\_PATCH\_VERSION constants give the integral values for the major, minor, and patch releases respectively.

To enable new ABI-breaking features in patch releases you can configure FLTK to use a higher FL\_ABI\_VERSION.

See also

README.abi-version.txt

#### 34.1.2.2 FL\_API\_VERSION

```
#define FL_API_VERSION (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100 + FL_PATCH_VERSION)
```

The FLTK API version number as an *int*.

FL\_API\_VERSION is an *int* that describes the major, minor, and patch version numbers.

Version 1.2.3 is actually stored as 10203 to allow for more than 9 minor and patch releases.

The FL\_MAJOR\_VERSION, FL\_MINOR\_VERSION, and FL\_PATCH\_VERSION constants give the integral values for the major, minor, and patch releases respectively.

**Note**

FL\_API\_VERSION is intended to replace the deprecated *double* FL\_VERSION.

**See also**

[Fl::api\\_version\(\)](#)

**34.1.2.3 FL\_IMAGE\_LABEL**

```
#define FL_IMAGE_LABEL fl_define_FL_IMAGE_LABEL()
```

Draws an image ([Fl\\_Image](#)) as the label.

This is useful for one particular part of an [Fl\\_Multi\\_Label](#). Use [Fl\\_Widget::image\(\)](#) and/or [Fl\\_Widget::deimage\(\)](#) for normal widgets with images as labels.

**34.1.2.4 FL\_MAJOR\_VERSION**

```
#define FL_MAJOR_VERSION 1
```

The major release version of this FLTK library.

**See also**

[FL\\_VERSION](#)

**34.1.2.5 FL\_MINOR\_VERSION**

```
#define FL_MINOR_VERSION 5
```

The minor release version for this library.

FLTK remains mostly source-code compatible between minor version changes.

**34.1.2.6 FL\_MULTI\_LABEL**

```
#define FL_MULTI_LABEL fl_define_FL_MULTI_LABEL()
```

Draws a label that can comprise several parts like text and images.

**See also**

[Fl\\_Multi\\_Label](#)

**34.1.2.7 FL\_PATCH\_VERSION**

```
#define FL_PATCH_VERSION 0
```

The patch version for this library.

FLTK remains binary compatible between patches.

**34.1.2.8 FL\_SYMBOL\_LABEL**

```
#define FL_SYMBOL_LABEL FL_NORMAL_LABEL
```

Sets the current label type and returns its corresponding [Fl\\_Labeltype](#) value.

FL\_SYMBOL\_LABEL is an alias for FL\_NORMAL\_LABEL.

'@' symbols can be drawn with normal labels as well.

This definition is for historical reasons only (forms compatibility). You should use FL\_NORMAL\_LABEL instead.

### 34.1.2.9 FL\_VERSION

```
#define FL_VERSION
```

**Value:**

```
( (double)FL_MAJOR_VERSION + \
(double)FL_MINOR_VERSION * 0.01 + \
(double)FL_PATCH_VERSION * 0.0001 )
```

The FLTK version number as a *double*.

FL\_VERSION is a *double* that describes the major, minor, and patch version numbers.

Version 1.2.3 is actually stored as 1.0203 to allow for more than 9 minor and patch releases.

**Deprecated** This *double* version number is retained for compatibility with existing program code. New code should use *int* FL\_API\_VERSION instead. FL\_VERSION is deprecated because comparisons of floating point values may fail due to rounding errors. However, there are currently no plans to remove this deprecated constant.

FL\_VERSION is equivalent to *(double)FL\_API\_VERSION / 10000*.

See also

[Fl::version\(\)](#) (deprecated as well)

[FL\\_API\\_VERSION](#)

[Fl::api\\_version\(\)](#)

## 34.1.3 Typedef Documentation

### 34.1.3.1 Fl\_Contrast\_Function

```
typedef Fl_Color() Fl_Contrast_Function(Fl_Color, Fl_Color, int, int)
```

Type of a custom [fl\\_contrast\(\)](#) function.

Use this signature to define your own custom [fl\\_contrast\(\)](#) function together with [fl\\_contrast\\_mode\(FL\\_↵ CONTRAST\\_CUSTOM\)](#). Example:

```
Fl_Color my_contrast(Fl_Color fg, Fl_Color bg, int context, int size) {
    // calculate contrast and ...
    return color;
}
// call this early in your main() program:
fl_contrast_function(my_contrast);
fl_contrast_mode(FL_CONTRAST_CUSTOM);
fl_contrast_level(50); // optional, must be called after fl_contrast_mode()
```

For parameters and types see [fl\\_contrast\(Fl\\_Color, Fl\\_Color, int, int\)](#).

See also

[fl\\_contrast\(Fl\\_Color, Fl\\_Color, int, int\)](#)

[fl\\_contrast\\_mode\(int\)](#)

### 34.1.3.2 Fl\_Fontsize

```
typedef int Fl_Fontsize
```

Size of a font in pixels.

This is the approximate height of a font in pixels.

## 34.1.4 Enumeration Type Documentation

### 34.1.4.1 anonymous enum

```
anonymous enum
```

FD "when" conditions.

## Enumerator

FL_READ	Call the callback when there is data to be read.
FL_WRITE	Call the callback when data can be written without blocking.
FL_EXCEPT	Call the callback if an exception occurs on the file.

**34.1.4.2 Fl\_Arrow\_Type**

enum [Fl\\_Arrow\\_Type](#)

Arrow types define the type of arrow drawing function.

FLTK schemes can draw several graphical elements in their particular way. One of these elements is an arrow type that can be in different GUI elements like scrollbars, choice buttons, and FLTK's [Fl\\_Return\\_Button](#).

## Note

This enum is not yet stable (as of FLTK 1.4.0) and may be changed without notice as necessary.

## Since

1.4.0

## Enumerator

FL_ARROW_SINGLE	Single arrow, e.g. in <a href="#">Fl_Scrollbar</a> .
FL_ARROW_DOUBLE	Double arrow, e.g. in <a href="#">Fl_Counter</a> .
FL_ARROW_CHOICE	Dropdown box, e.g. in <a href="#">Fl_Choice</a> .
FL_ARROW_RETURN	Return arrow, e.g. in <a href="#">Fl_Return_Button</a> .

**34.1.4.3 Fl\_Boxtype**

enum [Fl\\_Boxtype](#)

FLTK standard box types.

This enum defines the standard box types included with FLTK.

## Note

The documented enum `Fl_Boxtype` contains some values (names) with leading underscores, e.g. `_FL_SHADOW_BOX`. This is due to technical reasons - please use the same values (names) without the leading underscore in your code! Enum values with leading underscores are reserved for internal use and subject to change without notice!

## Enumerator

FL_NO_BOX	nothing is drawn at all, this box is invisible
FL_FLAT_BOX	a flat box
FL_UP_BOX	see figure <a href="#">Standard Box Types</a>
FL_DOWN_BOX	see figure <a href="#">Standard Box Types</a>
FL_UP_FRAME	see figure <a href="#">Standard Box Types</a>
FL_DOWN_FRAME	see figure <a href="#">Standard Box Types</a>
FL_THIN_UP_BOX	see figure <a href="#">Standard Box Types</a>
FL_THIN_DOWN_BOX	see figure <a href="#">Standard Box Types</a>
FL_THIN_UP_FRAME	see figure <a href="#">Standard Box Types</a>

## Enumerator

FL_THIN_DOWN_FRAME	see figure <a href="#">Standard Box Types</a>
FL_ENGRAVED_BOX	see figure <a href="#">Standard Box Types</a>
FL_EMBOSSSED_BOX	see figure <a href="#">Standard Box Types</a>
FL_ENGRAVED_FRAME	see figure <a href="#">Standard Box Types</a>
FL_EMBOSSSED_FRAME	see figure <a href="#">Standard Box Types</a>
FL_BORDER_BOX	see figure <a href="#">Standard Box Types</a>
_FL_SHADOW_BOX	see figure <a href="#">Standard Box Types</a> , use FL_SHADOW_BOX
FL_BORDER_FRAME	see figure <a href="#">Standard Box Types</a>
_FL_SHADOW_FRAME	see figure <a href="#">Standard Box Types</a> , use FL_SHADOW_FRAME
_FL_ROUNDED_BOX	see figure <a href="#">Standard Box Types</a> , use FL_ROUNDED_BOX
_FL_RSHADOW_BOX	see figure <a href="#">Standard Box Types</a> , use FL_RSHADOW_BOX
_FL_ROUNDED_FRAME	see figure <a href="#">Standard Box Types</a> , use FL_ROUNDED_FRAME
_FL_RFLAT_BOX	see figure <a href="#">Standard Box Types</a> , use FL_RFLAT_BOX
_FL_ROUND_UP_BOX	see figure <a href="#">Standard Box Types</a> , use FL_ROUND_UP_BOX
_FL_ROUND_DOWN_BOX	see figure <a href="#">Standard Box Types</a> , use FL_ROUND_DOWN_BOX
_FL_DIAMOND_UP_BOX	see figure <a href="#">Standard Box Types</a> , use FL_DIAMOND_UP_BOX
_FL_DIAMOND_DOWN_BOX	see figure <a href="#">Standard Box Types</a> , use FL_DIAMOND_DOWN_BOX
_FL_OVAL_BOX	see figure <a href="#">Standard Box Types</a> , use FL_OVAL_BOX
_FL_OSHADOW_BOX	see figure <a href="#">Standard Box Types</a> , use FL_OSHADOW_BOX
_FL_OVAL_FRAME	see figure <a href="#">Standard Box Types</a> , use FL_OVAL_FRAME
_FL_OFLAT_BOX	see figure <a href="#">Standard Box Types</a> , use FL_OFLAT_BOX
_FL_PLASTIC_UP_BOX	plastic version of FL_UP_BOX, use FL_PLASTIC_UP_BOX
_FL_PLASTIC_DOWN_BOX	plastic version of FL_DOWN_BOX, use FL_PLASTIC_DOWN_BOX
_FL_PLASTIC_UP_FRAME	plastic version of FL_UP_FRAME, use FL_PLASTIC_UP_FRAME
_FL_PLASTIC_DOWN_FRAME	plastic version of FL_DOWN_FRAME, use FL_PLASTIC_DOWN_FRAME
_FL_PLASTIC_THIN_UP_BOX	plastic version of FL_THIN_UP_BOX, use FL_PLASTIC_THIN_UP_BOX
_FL_PLASTIC_THIN_DOWN_BOX	plastic version of FL_THIN_DOWN_BOX, use FL_PLASTIC_THIN_DOWN_BOX
_FL_PLASTIC_ROUND_UP_BOX	plastic version of FL_ROUND_UP_BOX, use FL_PLASTIC_ROUND_UP_BOX
_FL_PLASTIC_ROUND_DOWN_BOX	plastic version of FL_ROUND_DOWN_BOX, use FL_PLASTIC_ROUND_DOWN_BOX
_FL_GTK_UP_BOX	gtk+ version of FL_UP_BOX, use FL_GTK_UP_BOX
_FL_GTK_DOWN_BOX	gtk+ version of FL_DOWN_BOX, use FL_GTK_DOWN_BOX
_FL_GTK_UP_FRAME	gtk+ version of FL_UP_FRAME, use FL_GTK_UP_FRAME
_FL_GTK_DOWN_FRAME	gtk+ version of FL_DOWN_FRAME, use FL_GTK_DOWN_FRAME
_FL_GTK_THIN_UP_BOX	gtk+ version of FL_THIN_UP_BOX, use FL_GTK_THIN_UP_BOX
_FL_GTK_THIN_DOWN_BOX	gtk+ version of FL_THIN_DOWN_BOX, use FL_GTK_THIN_DOWN_BOX
_FL_GTK_THIN_UP_FRAME	gtk+ version of FL_THIN_UP_FRAME, use FL_GTK_THIN_UP_FRAME
_FL_GTK_THIN_DOWN_FRAME	gtk+ version of FL_THIN_DOWN_FRAME, use FL_GTK_THIN_DOWN_FRAME
_FL_GTK_ROUND_UP_BOX	gtk+ version of FL_ROUND_UP_BOX, use FL_GTK_ROUND_UP_BOX
_FL_GTK_ROUND_DOWN_BOX	gtk+ version of FL_ROUND_DOWN_BOX, use FL_GTK_ROUND_DOWN_BOX

## Enumerator

<code>_FL_GLEAM_UP_BOX</code>	gleam version of <code>FL_UP_BOX</code> , use <code>FL_GLEAM_UP_BOX</code>
<code>_FL_GLEAM_DOWN_BOX</code>	gleam version of <code>FL_DOWN_BOX</code> , use <code>FL_GLEAM_DOWN_BOX</code>
<code>_FL_GLEAM_UP_FRAME</code>	gleam version of <code>FL_UP_FRAME</code> , use <code>FL_GLEAM_UP_FRAME</code>
<code>_FL_GLEAM_DOWN_FRAME</code>	gleam version of <code>FL_DOWN_FRAME</code> , use <code>FL_GLEAM_DOWN_FRAME</code>
<code>_FL_GLEAM_THIN_UP_BOX</code>	gleam version of <code>FL_THIN_UP_BOX</code> , use <code>FL_GLEAM_THIN_UP_BOX</code>
<code>_FL_GLEAM_THIN_DOWN_BOX</code>	gleam version of <code>FL_THIN_DOWN_BOX</code> , use <code>FL_GLEAM_THIN_DOWN_BOX</code>
<code>_FL_GLEAM_ROUND_UP_BOX</code>	gleam version of <code>FL_ROUND_UP_BOX</code> , use <code>FL_GLEAM_ROUND_UP_BOX</code>
<code>_FL_GLEAM_ROUND_DOWN_BOX</code>	gleam version of <code>FL_ROUND_DOWN_BOX</code> , use <code>FL_GLEAM_ROUND_DOWN_BOX</code>
<code>_FL_OXY_UP_BOX</code>	oxy version of <code>FL_UP_BOX</code> , use <code>FL_OXY_UP_BOX</code>
<code>_FL_OXY_DOWN_BOX</code>	oxy version of <code>FL_DOWN_BOX</code> , use <code>FL_OXY_DOWN_BOX</code>
<code>_FL_OXY_UP_FRAME</code>	oxy version of <code>FL_UP_FRAME</code> , use <code>FL_OXY_UP_FRAME</code>
<code>_FL_OXY_DOWN_FRAME</code>	oxy version of <code>FL_DOWN_FRAME</code> , use <code>FL_OXY_DOWN_FRAME</code>
<code>_FL_OXY_THIN_UP_BOX</code>	oxy version of <code>FL_THIN_UP_BOX</code> , use <code>FL_OXY_THIN_UP_BOX</code>
<code>_FL_OXY_THIN_DOWN_BOX</code>	oxy version of <code>FL_THIN_DOWN_BOX</code> , use <code>FL_OXY_THIN_DOWN_BOX</code>
<code>_FL_OXY_THIN_UP_FRAME</code>	oxy version of <code>FL_THIN_UP_FRAME</code> , use <code>FL_OXY_THIN_UP_FRAME</code>
<code>_FL_OXY_THIN_DOWN_FRAME</code>	oxy version of <code>FL_THIN_DOWN_FRAME</code> , use <code>FL_OXY_THIN_DOWN_FRAME</code>
<code>_FL_OXY_ROUND_UP_BOX</code>	oxy version of <code>FL_ROUND_UP_BOX</code> , use <code>FL_OXY_ROUND_UP_BOX</code>
<code>_FL_OXY_ROUND_DOWN_BOX</code>	oxy version of <code>FL_ROUND_DOWN_BOX</code> , use <code>FL_OXY_ROUND_DOWN_BOX</code>
<code>_FL_OXY_BUTTON_UP_BOX</code>	<code>FL_OXY_BUTTON_UP_BOX</code> (new boxtype ?), use <code>FL_OXY_BUTTON_UP_BOX</code> .
<code>_FL_OXY_BUTTON_DOWN_BOX</code>	<code>FL_OXY_BUTTON_DOWN_BOX</code> (new boxtype ?), use <code>FL_OXY_BUTTON_DOWN_BOX</code> .
<code>FL_FREE_BOXTYPE</code>	the first free box type for creation of new box types
<code>FL_MAX_BOXTYPE</code>	highest legal index for a box type

34.1.4.4 `Fl_Callback_Reason`

enum `Fl_Callback_Reason`

These constants describe why a callback is performed.

See also

[`Fl::callback\_reason\(\)`](#), [`Fl\_Widget::when\(\)`](#), [`Fl\_When`](#)

## Enumerator

<code>FL_REASON_UNKNOWN</code>	unknown or unset reason
<code>FL_REASON_SELECTED</code>	an item was selected
<code>FL_REASON_DESELECTED</code>	an item was de-selected
<code>FL_REASON_RESELECTED</code>	an item was re-selected (double-clicked).

## Enumerator

FL_REASON_OPENED	an item was opened
FL_REASON_CLOSED	an item was closed
FL_REASON_DRAGGED	an item was dragged into a new place
FL_REASON_CANCELLED	a dialog was cancelled
FL_REASON_CHANGED	the value of the widget was modified
FL_REASON_GOT_FOCUS	a widget received focus
FL_REASON_LOST_FOCUS	a widget lost focus
FL_REASON_RELEASED	the mouse button was released
FL_REASON_ENTER_KEY	user finished input pressing Enter
FL_REASON_USER	user defined callback reasons

## 34.1.4.5 Fl\_Contrast\_Mode

enum [Fl\\_Contrast\\_Mode](#)

Define the possible modes to calculate [fl\\_contrast\(\)](#).

## Enumerator

FL_CONTRAST_NONE	always return foreground color
FL_CONTRAST_LEGACY	legacy (FLTK 1.3.x) contrast function
FL_CONTRAST_CIELAB	new (FLTK 1.4.0) default function
FL_CONTRAST_CUSTOM	optional custom contrast function
FL_CONTRAST_LAST	internal use only (invalid contrast mode)

## 34.1.4.6 Fl\_Cursor

enum [Fl\\_Cursor](#)

The following constants define the mouse cursors that are available in FLTK.

Cursors are provided by the system when available, or bitmaps built into FLTK as a fallback.

## Enumerator

FL_CURSOR_DEFAULT	the default cursor, usually an arrow:
FL_CURSOR_ARROW	an arrow pointer:
FL_CURSOR_CROSS	crosshair:
FL_CURSOR_WAIT	busy indicator (for instance hourglass): ,
FL_CURSOR_INSERT	I-beam:
FL_CURSOR_HAND	pointing hand:
FL_CURSOR_HELP	question mark pointer: ?
FL_CURSOR_MOVE	4-pointed arrow or hand: ,
FL_CURSOR_NS	up/down resize:
FL_CURSOR_WE	left/right resize:
FL_CURSOR_NWSE	diagonal resize:
FL_CURSOR_NESW	diagonal resize:
FL_CURSOR_N	upwards resize:
FL_CURSOR_NE	upwards, right resize:
FL_CURSOR_E	rightwards resize:

## Enumerator

FL_CURSOR_SE	downwards, right resize:
FL_CURSOR_S	downwards resize:
FL_CURSOR_SW	downwards, left resize:
FL_CURSOR_W	leftwards resize:
FL_CURSOR_NW	upwards, left resize:
FL_CURSOR_NONE	invisible.

**34.1.4.7 Fl\_Damage**

enum [Fl\\_Damage](#)

Damage masks.

## Enumerator

FL_DAMAGE_CHILD	A child needs to be redrawn.
FL_DAMAGE_EXPOSE	The window was exposed.
FL_DAMAGE_SCROLL	The <a href="#">Fl_Scroll</a> widget was scrolled. Used by other widgets for other widget specific damages.
FL_DAMAGE_OVERLAY	The overlay planes need to be redrawn.
FL_DAMAGE_USER1	First user-defined damage bit.
FL_DAMAGE_USER2	Second user-defined damage bit.
FL_DAMAGE_ALL	Everything needs to be redrawn.

**34.1.4.8 Fl\_Event**

enum [Fl\\_Event](#)

Every time a user moves the mouse pointer, clicks a button, or presses a key, an event is generated and sent to your application.

Events can also come from other programs like the window manager.

Events are identified by the integer argument passed to the [Fl\\_Widget::handle\(\)](#) virtual method. Other information about the most recent event is stored in static locations and acquired by calling the `Fl::event_*`() methods. This static information remains valid until the next event is read from the window system, so it is ok to look at it outside of the `handle()` method.

Event numbers can be converted to their actual names using the [fl\\_eventnames\[\]](#) array defined in `#include <FL/Names.h>`

## Enumerator

## See also

[Fl::event\\_text\(\)](#), [Fl::event\\_key\(\)](#), class [Fl::](#)

## Enumerator

FL_NO_EVENT	No event.
FL_PUSH	<p>A mouse button has gone down with the mouse pointing at this widget. You can find out what button by calling <a href="#">Fl::event_button()</a>. You find out the mouse position by calling <a href="#">Fl::event_x()</a> and <a href="#">Fl::event_y()</a>.</p> <p>A widget indicates that it "wants" the mouse click by returning non-zero from its <a href="#">Fl_Widget::handle()</a> method. It will then become the <a href="#">Fl::pushed()</a> widget and will get FL_DRAG and the matching FL_RELEASE events. If <a href="#">Fl_Widget::handle()</a> returns zero then FLTK will try sending the FL_PUSH to another widget.</p>
FL_RELEASE	<p>A mouse button has been released. You can find out what button by calling <a href="#">Fl::event_button()</a>.</p> <p>In order to receive the FL_RELEASE event, the widget must return non-zero when handling FL_PUSH.</p>
FL_ENTER	<p>The mouse has been moved to point at this widget. This can be used for highlighting feedback. If a widget wants to highlight or otherwise track the mouse, it indicates this by returning non-zero from its <a href="#">handle()</a> method. It then becomes the <a href="#">Fl::belowmouse()</a> widget and will receive FL_MOVE and FL_LEAVE events.</p>
FL_LEAVE	<p>The mouse has moved out of the widget. In order to receive the FL_LEAVE event, the widget must return non-zero when handling FL_ENTER.</p>
FL_DRAG	<p>The mouse has moved with a button held down. The current button state is in <a href="#">Fl::event_state()</a>. The mouse position is in <a href="#">Fl::event_x()</a> and <a href="#">Fl::event_y()</a>.</p> <p>In order to receive FL_DRAG events, the widget must return non-zero when handling FL_PUSH.</p>
FL_FOCUS	<p>This indicates an <i>attempt</i> to give a widget the keyboard focus. If a widget wants the focus, it should change itself to display the fact that it has the focus, and return non-zero from its <a href="#">handle()</a> method. It then becomes the <a href="#">Fl::focus()</a> widget and gets FL_KEYDOWN, FL_KEYUP, and FL_UNFOCUS events. The focus will change either because the window manager changed which window gets the focus, or because the user tried to navigate using tab, arrows, or other keys. You can check <a href="#">Fl::event_key()</a> to figure out why it moved. For navigation it will be the key pressed and for interaction with the window manager it will be zero.</p>
FL_UNFOCUS	<p>This event is sent to the previous <a href="#">Fl::focus()</a> widget when another widget gets the focus or the window loses focus.</p>

## Enumerator

FL_KEYDOWN	<p>A key was pressed (FL_KEYDOWN) or released (FL_KEYUP). FL_KEYBOARD is a synonym for FL_KEYDOWN. The key can be found in <a href="#">Fl::event_key()</a>. The text that the key should insert can be found with <a href="#">Fl::event_text()</a> and its length is in <a href="#">Fl::event_length()</a>. If you use the key handle() should return 1. If you return zero then FLTK assumes you ignored the key and will then attempt to send it to a parent widget. If none of them want it, it will change the event into a FL_SHORTCUT event.</p> <p>To receive FL_KEYBOARD events you must also respond to the FL_FOCUS and FL_UNFOCUS events.</p> <p>If you are writing a text-editing widget you may also want to call the <a href="#">Fl::compose()</a> function to translate individual keystrokes into non-ASCII characters.</p> <p>FL_KEYUP events are sent to the widget that currently has focus. This is not necessarily the same widget that received the corresponding FL_KEYDOWN event because focus may have changed between events.</p>
FL_KEYBOARD	<p>Equivalent to FL_KEYDOWN.</p> <p>See also</p> <p><a href="#">FL_KEYDOWN</a></p>
FL_KEYUP	<p>Key release event.</p> <p>See also</p> <p><a href="#">FL_KEYDOWN</a></p>
FL_CLOSE	<p>The user clicked the close button of a window. This event is used internally only to trigger the callback of <a href="#">Fl_Window</a> derived classed. The default callback closes the window calling <a href="#">Fl_Window::hide()</a>.</p>
FL_MOVE	<p>The mouse has moved without any mouse buttons held down. This event is sent to the <a href="#">Fl::belowmouse()</a> widget. In order to receive FL_MOVE events, the widget must return non-zero when handling FL_ENTER.</p>
FL_SHORTCUT	<p>If the <a href="#">Fl::focus()</a> widget is zero or ignores an FL_KEYBOARD event then FLTK tries sending this event to every widget it can, until one of them returns non-zero. FL_SHORTCUT is first sent to the <a href="#">Fl::belowmouse()</a> widget, then its parents and siblings, and eventually to every widget in the window, trying to find an object that returns non-zero. FLTK tries really hard to not to ignore any keystrokes!</p> <p>You can also make "global" shortcuts by using <a href="#">Fl::add_handler()</a>. A global shortcut will work no matter what windows are displayed or which one has the focus.</p>
FL_DEACTIVATE	<p>This widget is no longer active, due to <a href="#">Fl_Widget::deactivate()</a> being called on it or one of its parents. <a href="#">Fl_Widget::active()</a> may still be true after this, the widget is only active if <a href="#">Fl_Widget::active()</a> is true on it and all its parents (use <a href="#">Fl_Widget::active_r()</a> to check this).</p>
FL_ACTIVATE	<p>This widget is now active, due to <a href="#">Fl_Widget::activate()</a> being called on it or one of its parents.</p>

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FL_HIDE	This widget is no longer visible, due to <a href="#">Fl_Widget::hide()</a> being called on it or one of its parents, or due to a parent window being minimized. <a href="#">Fl_Widget::visible()</a> may still be true after this, but the widget is visible only if <a href="#">visible()</a> is true for it and all its parents (use <a href="#">Fl_Widget::visible_r()</a> to check this).
FL_SHOW	This widget is visible again, due to <a href="#">Fl_Widget::show()</a> being called on it or one of its parents, or due to a parent window being restored. Child <a href="#">Fl_Windows</a> respond to this by actually creating the window if not done already, so if you subclass a window, be sure to pass <a href="#">FL_SHOW</a> to the base class <a href="#">Fl_Widget::handle()</a> method!
FL_PASTE	You should get this event some time after you call <a href="#">Fl::paste()</a> . The contents of <a href="#">Fl::event_text()</a> is the text to insert and the number of characters is in <a href="#">Fl::event_length()</a> .
FL_SELECTIONCLEAR	The <a href="#">Fl::selection_owner()</a> will get this event before the selection is moved to another widget. This indicates that some other widget or program has claimed the selection. Motif programs used this to clear the selection indication. Most modern programs ignore this.
FL_MOUSEWHEEL	The user has moved the mouse wheel. The <a href="#">Fl::event_dx()</a> and <a href="#">Fl::event_dy()</a> methods can be used to find the amount to scroll horizontally and vertically.
FL_DND_ENTER	The mouse has been moved to point at this widget. A widget that is interested in receiving drag'n'drop data must return 1 to receive <a href="#">FL_DND_DRAG</a> , <a href="#">FL_DND_LEAVE</a> and <a href="#">FL_DND_RELEASE</a> events.
FL_DND_DRAG	The mouse has been moved inside a widget while dragging data. A widget that is interested in receiving drag'n'drop data should indicate the possible drop position.
FL_DND_LEAVE	The mouse has moved out of the widget.
FL_DND_RELEASE	The user has released the mouse button dropping data into the widget. If the widget returns 1, it will receive the data in the immediately following <a href="#">FL_PASTE</a> event.
FL_SCREEN_CONFIGURATION_CHANGED	The screen configuration (number, positions) was changed. Use <a href="#">Fl::add_handler()</a> to be notified of this event.
FL_FULLSCREEN	The fullscreen state of the window has changed. This event is sent to the window's handle method.
FL_ZOOM_GESTURE	The user has made a zoom/pinch/magnification gesture (Mac OS platform only). The <a href="#">Fl::event_dy()</a> method can be used to find magnification amount, <a href="#">Fl::event_x()</a> and <a href="#">Fl::event_y()</a> are set as well. This event is sent to the window's handle method.
FL_ZOOM_EVENT	A zoom event (ctrl/+/-/0/ or cmd/+/-/0/) was processed. Use <a href="#">Fl::add_handler()</a> to be notified of this event.
FL_BEFORE_TOOLTIP	A tooltip is about to pop up for this widget. The mouse coordinates are available in <a href="#">Fl::event_x()</a> and <a href="#">Fl::event_y()</a> . Change the widget tooltip as needed.
FL_BEFORE_MENU	Triggered just before a menu is displayed. Widgets derived from <a href="#">Fl_Menu_</a> receive this event right before the menu appears, providing an opportunity to update menu item states and activation.

### 34.1.4.9 Fl\_Labeltype

enum [Fl\\_Labeltype](#)

The `labeltype()` method sets the type of the label.

#### Note

The documented enum `Fl_Labeltype` contains some values (names) with leading underscores, e.g. `↔` `_FL_IMAGE_LABEL`. This is due to technical reasons - please use the same values (names) without the leading underscore in your code! Enum values with leading underscores are reserved for internal use and subject to change without notice!

The following standard label types are included:

#### Enumerator

<code>FL_NORMAL_LABEL</code>	draws the text (0)
<code>FL_NO_LABEL</code>	does nothing
<code>_FL_SHADOW_LABEL</code>	draws a drop shadow under the text
<code>_FL_ENGRAVED_LABEL</code>	draws edges as though the text is engraved
<code>_FL_EMBOSSSED_LABEL</code>	draws edges as though the text is raised
<code>_FL_MULTI_LABEL</code>	draws a composite label  See also  <a href="#">Fl_Multi_Label</a>
<code>_FL_ICON_LABEL</code>	draws the icon associated with the text
<code>_FL_IMAGE_LABEL</code>	the label displays an "icon" based on a <a href="#">Fl_Image</a>
<code>FL_FREE_LABELTYPE</code>	first free labeltype to use for creating own labeltypes

### 34.1.4.10 Fl\_Orientation

enum [Fl\\_Orientation](#)

`Fl_Orientation` describes the orientation of a GUI element.

FLTK schemes can draw several graphical elements, for instance arrows, pointing at different directions. This enum defines the direction to use for drawing a particular GUI element.

The definition of this enum was chosen such that the enum value can be multiplied by 45 to get a rotation angle in degrees starting at the horizontal axis (0 = right, 1 = NE, 2 = up, ...) that can be used with [fl\\_rotate\(\)](#). Note: angle is counter-clockwise in degrees.

The 'unspecified' value `FL_ORIENT_NONE` shall be used for elements that would usually not be rotated, like the return arrow of the [Fl\\_Return\\_Button](#). It can still be used as an angle though since it is the same value as `FL_↔` `ORIENT_RIGHT` (0 degrees).

#### Note

This enum is not yet stable (as of FLTK 1.4.0) and may be changed without notice as necessary.

#### Since

1.4.0

#### Enumerator

<code>FL_ORIENT_NONE</code>	GUI element direction is unspecified.
<code>FL_ORIENT_RIGHT</code>	GUI element pointing right ( 0°)
<code>FL_ORIENT_NE</code>	GUI element pointing NE ( 45°)

## Enumerator

FL_ORIENT_UP	GUI element pointing up ( 90°)
FL_ORIENT_NW	GUI element pointing NW (135°)
FL_ORIENT_LEFT	GUI element pointing left (180°)
FL_ORIENT_SW	GUI element pointing SW (225°)
FL_ORIENT_DOWN	GUI element pointing down (270°)
FL_ORIENT_SE	GUI element pointing SE (315°)

**34.1.4.11 Fl\_When**

enum [Fl\\_When](#)

These constants determine when a callback is performed.

Fl\_When is a bit field. Some values are merely shortcuts for common bit combinations. New flags may be added in the future, so it's important to mask the required bit when reading via `when()`.

## Note

Some widgets may not fully support `FL_WHEN_...` flags.

## See also

[Fl\\_Widget::when\(\)](#), [Fl::callback\\_reason\(\)](#), [Fl\\_Callback\\_Reason](#), [Fl\\_Widget::do\\_callback\(\)](#)

## Enumerator

FL_WHEN_NEVER	Never call the callback.
FL_WHEN_CHANGED	Do the callback only when the widget value changes.
FL_WHEN_NOT_CHANGED	Do the callback whenever the user interacts with the widget.
FL_WHEN_RELEASE	Do the callback when the button or key is released and the value changes.
FL_WHEN_RELEASE_ALWAYS	Do the callback when the button or key is released, even if the value doesn't change.
FL_WHEN_ENTER_KEY	Do the callback when the user presses the ENTER key and the value changes.
FL_WHEN_ENTER_KEY_ALWAYS	Do the callback when the user presses the ENTER key, even if the value doesn't change.
FL_WHEN_ENTER_KEY_CHANGED	Do callbacks whether the value changed or not, and when the ENTER key is pressed.
FL_WHEN_CLOSED	Do the callback when a child of <a href="#">Fl_Tabs</a> is closed.

**34.1.5 Function Documentation****34.1.5.1 fl\_box()**

```
Fl_Boxtype fl_box (
    Fl_Boxtype b ) [inline]
```

Get the filled version of a frame.

If no filled version of a given frame exists, the behavior of this function is undefined and some random box or frame is returned.

### 34.1.5.2 fl\_color\_cube()

```
Fl_Color fl_color_cube (
    int r,
    int g,
    int b ) [inline]
```

Returns a color out of the color cube.

*r* must be in the range 0 to FL\_NUM\_RED (5) minus 1, *g* must be in the range 0 to FL\_NUM\_GREEN (8) minus 1, *b* must be in the range 0 to FL\_NUM\_BLUE (5) minus 1.

To get the closest color to a 8-bit set of R,G,B values use:

```
fl_color_cube(R * (FL_NUM_RED - 1) / 255,
    G * (FL_NUM_GREEN - 1) / 255,
    B * (FL_NUM_BLUE - 1) / 255);
```

### 34.1.5.3 fl\_define\_FL\_EMBOSSED\_LABEL()

```
Fl_Labeltype fl_define_FL_EMBOSSED_LABEL ( )
```

Initializes the internal table entry for FL\_EMBOSSED\_LABEL and returns its internal value.

Internal use only.

### 34.1.5.4 fl\_define\_FL\_ENGRAVED\_LABEL()

```
Fl_Labeltype fl_define_FL_ENGRAVED_LABEL ( )
```

Initializes the internal table entry for FL\_ENGRAVED\_LABEL and returns its internal value.

Internal use only.

### 34.1.5.5 fl\_define\_FL\_ICON\_LABEL()

```
Fl_Labeltype fl_define_FL_ICON_LABEL ( )
```

Initializes the internal table entry for FL\_ICON\_LABEL and returns its internal value.

Internal use only.

### 34.1.5.6 fl\_define\_FL\_IMAGE\_LABEL()

```
Fl_Labeltype fl_define_FL_IMAGE_LABEL ( )
```

Initializes the internal table entry for FL\_IMAGE\_LABEL and returns its internal value.

Internal use only.

### 34.1.5.7 fl\_define\_FL\_MULTI\_LABEL()

```
Fl_Labeltype fl_define_FL_MULTI_LABEL ( )
```

Initializes the internal table entry for FL\_MULTI\_LABEL and returns its internal value.

Internal use only.

### 34.1.5.8 fl\_define\_FL\_SHADOW\_LABEL()

```
Fl_Labeltype fl_define_FL_SHADOW_LABEL ( )
```

Initializes the internal table entry for FL\_SHADOW\_LABEL and returns its internal value.

Internal use only.

### 34.1.5.9 fl\_down()

```
Fl_Boxtype fl_down (
    Fl_Boxtype b ) [inline]
```

Get the "pressed" or "down" version of a box.

If no "down" version of a given box exists, the behavior of this function is undefined and some random box or frame is returned.

### 34.1.5.10 fl\_frame()

```
Fl_Boxtype fl_frame (
    Fl_Boxtype b ) [inline]
```

Get the unfilled, frame only version of a box.

If no frame version of a given box exists, the behavior of this function is undefined and some random box or frame is returned.

### 34.1.5.11 fl\_gray\_ramp()

```
Fl_Color fl_gray_ramp (
    int i ) [inline]
```

Returns a gray color value from black (i == 0) to white (i == FL\_NUM\_GRAY - 1).

FL\_NUM\_GRAY is defined to be 24 in the current FLTK release. To get the closest FLTK gray value to an 8-bit grayscale color 'I' use:

```
fl_gray_ramp(I * (FL_NUM_GRAY - 1) / 255)
```

## 34.1.6 Variable Documentation

### 34.1.6.1 FL\_ALIGN\_LEFT

```
const Fl_Align FL_ALIGN_LEFT = 0x0004
```

Align the label at the left of the widget.

Inside labels appear left-justified starting at the left side of the widget, outside labels are right-justified and drawn to the left of the widget.

### 34.1.6.2 FL\_ALIGN\_TOP

```
const Fl_Align FL_ALIGN_TOP = 0x0001
```

Align the label at the top of the widget.

Inside labels appear below the top, outside labels are drawn on top of the widget.

### 34.1.6.3 FL\_NORMAL\_SIZE

```
Fl_Fontsize FL_NORMAL_SIZE [extern]
```

normal font size

normal font size

## 34.2 Enumerations.H

[Go to the documentation of this file.](#)

```
1 //
2 // Enumerations for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2025 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
21 #ifndef FL_ENUMERATIONS_H
22 #define FL_ENUMERATIONS_H
23
24 /*
25 *****
26 * FL_ABI_VERSION is defined by configure or CMake since FLTK 1.3.4.
27 * It is written to FL/fl_config.h and #included here.
28 *****
```

```

29 * For more informations on FL_ABI_VERSION see README.abi-version.txt.
30 ****
31 */
32
33 #include <FL/fl_config.h>
34
35 # include "Fl_Export.H"
36 # include "fl_types.h"
37 # include <FL/platform_types.h> // for FL_COMMAND and FL_CONTROL
38
39 // Keep the following comment in sync with the values below for searching
40 // Current FLTK version: 1.5.0
41
42 #define FL_MAJOR_VERSION      1
43
44 #define FL_MINOR_VERSION      5
45
46 #define FL_PATCH_VERSION      0
47
48 #define FL_VERSION            ( (double)FL_MAJOR_VERSION + \
49 (double)FL_MINOR_VERSION * 0.01 + \
50 (double)FL_PATCH_VERSION * 0.0001 )
51
52 #define FL_API_VERSION        (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100 + FL_PATCH_VERSION)
53
54 #ifndef FL_ABI_VERSION
55 #define FL_ABI_VERSION        (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100)
56 #endif
57
58 /*
59 Check if FL_ABI_VERSION is out of allowed range; redefine if necessary.
60 This is done to prevent users from defining an illegal ABI version.
61
62 Rule:  FL_MAJOR_VERSION * 10000 + FL_MINOR_VERSION * 100
63 <= FL_ABI_VERSION <= FL_API_VERSION + 1.
64
65 Since FLTK 1.4.2+ (Git commits after release 1.4.2) FL_ABI_VERSION is
66 allowed to be one higher than FL_API_VERSION so ABI changes in Git
67 targeted at the *next* release (e.g. 1.4.3) can be used.
68
69 Example:  Commits after release FLTK 1.4.2 (before release 1.4.3):
70
71 10400 <= FL_ABI_VERSION <= 10403
72
73 Note:  configure + CMake can be used to define FL_ABI_VERSION, but they
74 do not check validity.  This is done here.
75 */
76
77 #if FL_ABI_VERSION < FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100
78 # undef FL_ABI_VERSION
79 # define FL_ABI_VERSION (FL_MAJOR_VERSION*10000 + FL_MINOR_VERSION*100)
80
81 #elif FL_ABI_VERSION > FL_API_VERSION + 1
82 # undef FL_ABI_VERSION
83 # define FL_ABI_VERSION FL_API_VERSION + 1
84 #endif
85
86 // group:  Version Numbers
87
88 // DEV NOTE: Keep this list in sync with FL/names.h
89 enum Fl_Event { // events
90     FL_NO_EVENT      = 0,
91     FL_PUSH          = 1,
92     FL_RELEASE       = 2,
93     FL_ENTER         = 3,
94     FL_LEAVE         = 4,
95     FL_DRAG          = 5,
96     FL_FOCUS         = 6,
97     FL_UNFOCUS       = 7,
98     FL_KEYDOWN       = 8,
99     FL_KEYBOARD      = 8,
100    FL_KEYUP          = 9,
101    FL_CLOSE          = 10,

```

```

310
317     FL_MOVE                = 11,
318
331     FL_SHORTCUT            = 12,
332
338     FL_DEACTIVATE          = 13,
339
343     FL_ACTIVATE            = 14,
344
351     FL_HIDE                = 15,
352
359     FL_SHOW                = 16,
360
365     FL_PASTE                = 17,
366
372     FL_SELECTIONCLEAR      = 18,
373
377     FL_MOUSEWHEEL          = 19,
378
383     FL_DND_ENTER           = 20,
384
389     FL_DND_DRAG            = 21,
390
393     FL_DND_LEAVE           = 22,
394
399     FL_DND_RELEASE          = 23,
403     FL_SCREEN_CONFIGURATION_CHANGED = 24,
407     FL_FULLSCREEN           = 25,
413     FL_ZOOM_GESTURE         = 26,
417     FL_ZOOM_EVENT           = 27,
421     FL_BEFORE_TOOLTIP       = 28,
425     FL_BEFORE_MENU          = 29
426     // DEV NOTE: Keep this list in sync with FL/names.h
427 };
428
441 enum Fl_When { // Fl_Widget::when():
442     FL_WHEN_NEVER             = 0,
443     FL_WHEN_CHANGED           = 1,
444     FL_WHEN_NOT_CHANGED       = 2,
445     FL_WHEN_RELEASE           = 4,
446     FL_WHEN_RELEASE_ALWAYS    = 6,
447     FL_WHEN_ENTER_KEY         = 8,
448     FL_WHEN_ENTER_KEY_ALWAYS  = 10,
449     FL_WHEN_ENTER_KEY_CHANGED = 11,
450     FL_WHEN_CLOSED            = 16
451 }; // group: When Conditions
452
453
454
461 enum Fl_Callback_Reason {
462     FL_REASON_UNKNOWN=0,
463     FL_REASON_SELECTED,
464     FL_REASON_DESELECTED,
465     FL_REASON_RESELECTED,
466     FL_REASON_OPENED,
467     FL_REASON_CLOSED,
468     FL_REASON_DRAGGED,
469     FL_REASON_CANCELLED,
470     FL_REASON_CHANGED,
471     FL_REASON_GOT_FOCUS,
472     FL_REASON_LOST_FOCUS,
473     FL_REASON_RELEASED,
474     FL_REASON_ENTER_KEY,
475     FL_REASON_USER = 32
476 }; // group: Callback Reasons
477
478
479
490 // FIXME: These codes collide with valid Unicode keys
491
492 #define FL_Button            0xfee8
493 #define FL_BackSpace         0xff08
494 #define FL_Tab               0xff09
495 #define FL_Iso_Key           0xff0c
496 #define FL_Enter             0xff0d
497 #define FL_Pause             0xff13
498 #define FL_Scroll_Lock       0xff14
499 #define FL_Escape            0xff1b
500 #define FL_Kana              0xff2e
501 #define FL_Eisu              0xff2f
502 #define FL_Yen               0xff30
503 #define FL_JIS_Underscore    0xff31
504 #define FL_Home              0xff50
505 #define FL_Left              0xff51
506 #define FL_Up                0xff52
507 #define FL_Right             0xff53
508 #define FL_Down              0xff54
509 #define FL_Page_Up           0xff55
510 #define FL_Page_Down         0xff56

```

```

511 #define FL_End          0xff57
512 #define FL_Print        0xff61
513 #define FL_Insert        0xff63
514 #define FL_Menu          0xff67
515 #define FL_Help          0xff68
516 #define FL_Num_Lock      0xff7f
517 #define FL_KP            0xff80
518 #define FL_KP_Enter      0xff8d
519 #define FL_KP_Last       0xffbd
520 #define FL_F             0xffbd
521 #define FL_F_Last        0xffe0
522 #define FL_Shift_L        0xffe1
523 #define FL_Shift_R        0xffe2
524 #define FL_Control_L      0xffe3
525 #define FL_Control_R      0xffe4
526 #define FL_Caps_Lock      0xffe5
527 #define FL_Meta_L         0xffe7
528 #define FL_Meta_R         0xffe8
529 #define FL_Alt_L          0xffe9
530 #define FL_Alt_R          0xffea
531 #define FL_Delete         0xffff
532 #define FL_Alt_Gr         0xfe03
533
534 // These use the Private Use Area (PUA) of the Basic Multilingual Plane
535 // of Unicode. Guaranteed not to conflict with a proper Unicode character.
536
537 // These primarily map to the XFree86 keysym range
538 #define FL_Volume_Down    0xEF11
539 #define FL_Volume_Mute    0xEF12
540 #define FL_Volume_Up      0xEF13
541 #define FL_Media_Play     0xEF14
542 #define FL_Media_Stop     0xEF15
543 #define FL_Media_Prev     0xEF16
544 #define FL_Media_Next     0xEF17
545 #define FL_Home_Page      0xEF18
546 #define FL_Mail           0xEF19
547 #define FL_Search         0xEF1B
548 #define FL_Back           0xEF26
549 #define FL_Forward        0xEF27
550 #define FL_Stop           0xEF28
551 #define FL_Refresh        0xEF29
552 #define FL_Sleep          0xEF2F
553 #define FL_Favorites      0xEF30
554 // group: Non-ASCII key names
555
556 #define FL_LEFT_MOUSE     1
557 #define FL_MIDDLE_MOUSE   2
558 #define FL_RIGHT_MOUSE    3
559 #define FL_BACK_MOUSE     4
560 #define FL_FORWARD_MOUSE  5
561 // group: Mouse Buttons
562
563 // group: Event States
564
565 // FIXME: it would be nice to have the modifiers in the upper 8 bits so that
566 // a unicode key (21 bits) can be sent as an unsigned with the modifiers.
567
568 #define FL_SHIFT          0x00010000
569 #define FL_CAPS_LOCK      0x00020000
570 #define FL_CTRL           0x00040000
571 #define FL_ALT            0x00080000
572 #define FL_NUM_LOCK       0x00100000
573
574 // most X servers do this?
575 #define FL_META           0x00400000
576
577 // correct for XFree86
578 #define FL_SCROLL_LOCK    0x00800000
579
580 // correct for XFree86
581 // Mouse buttons
582
583 #define FL_BUTTON1        0x01000000
584 #define FL_BUTTON2        0x02000000
585 #define FL_BUTTON3        0x04000000
586 #define FL_BUTTON4        0x08000000
587 #define FL_BUTTON5        0x10000000
588 #define FL_BUTTONS        0x1f000000
589
590 #define FL_BUTTON(n)      (0x00800000«(n))
591
592 #define FL_KEY_MASK       0x0000ffff
593
594 // FIXME: Unicode needs 21 bits!
595
596 // group: Event States
597 // group: Box Types
598
599 enum Fl_Boxtype { // boxtypes (if you change these you must also change fl_boxtype.cxx):
600
601     FL_NO_BOX = 0,
602     FL_FLAT_BOX,

```

```

654 FL_UP_BOX,
655 FL_DOWN_BOX,
656 FL_UP_FRAME,
657 FL_DOWN_FRAME,
658 FL_THIN_UP_BOX,
659 FL_THIN_DOWN_BOX,
660 FL_THIN_UP_FRAME,
661 FL_THIN_DOWN_FRAME,
662 FL_ENGRAVED_BOX,
663 FL_EMBOSSSED_BOX,
664 FL_ENGRAVED_FRAME,
665 FL_EMBOSSSED_FRAME,
666 FL_BORDER_BOX,
667 _FL_SHADOW_BOX,
668 FL_BORDER_FRAME,
669 _FL_SHADOW_FRAME,
670 _FL_ROUNDED_BOX,
671 _FL_RSHADOW_BOX,
672 _FL_ROUNDED_FRAME,
673 _FL_RFLAT_BOX,
674 _FL_ROUND_UP_BOX,
675 _FL_ROUND_DOWN_BOX,
676 _FL_DIAMOND_UP_BOX,
677 _FL_DIAMOND_DOWN_BOX,
678 _FL_OVAL_BOX,
679 _FL_OSHADOW_BOX,
680 _FL_OVAL_FRAME,
681 _FL_OFLAT_BOX,
682 _FL_PLASTIC_UP_BOX,
683 _FL_PLASTIC_DOWN_BOX,
684 _FL_PLASTIC_UP_FRAME,
685 _FL_PLASTIC_DOWN_FRAME,
686 _FL_PLASTIC_THIN_UP_BOX,
687 _FL_PLASTIC_THIN_DOWN_BOX,
688 _FL_PLASTIC_ROUND_UP_BOX,
689 _FL_PLASTIC_ROUND_DOWN_BOX,
690 _FL_GTK_UP_BOX,
691 _FL_GTK_DOWN_BOX,
692 _FL_GTK_UP_FRAME,
693 _FL_GTK_DOWN_FRAME,
694 _FL_GTK_THIN_UP_BOX,
695 _FL_GTK_THIN_DOWN_BOX,
696 _FL_GTK_THIN_UP_FRAME,
697 _FL_GTK_THIN_DOWN_FRAME,
698 _FL_GTK_ROUND_UP_BOX,
699 _FL_GTK_ROUND_DOWN_BOX,
700 _FL_GLEAM_UP_BOX,
701 _FL_GLEAM_DOWN_BOX,
702 _FL_GLEAM_UP_FRAME,
703 _FL_GLEAM_DOWN_FRAME,
704 _FL_GLEAM_THIN_UP_BOX,
705 _FL_GLEAM_THIN_DOWN_BOX,
706 _FL_GLEAM_ROUND_UP_BOX,
707 _FL_GLEAM_ROUND_DOWN_BOX,
708 _FL_OXY_UP_BOX,
709 _FL_OXY_DOWN_BOX,
710 _FL_OXY_UP_FRAME,
711 _FL_OXY_DOWN_FRAME,
712 _FL_OXY_THIN_UP_BOX,
713 _FL_OXY_THIN_DOWN_BOX,
714 _FL_OXY_THIN_UP_FRAME,
715 _FL_OXY_THIN_DOWN_FRAME,
716 _FL_OXY_ROUND_UP_BOX,
717 _FL_OXY_ROUND_DOWN_BOX,
718 _FL_OXY_BUTTON_UP_BOX,
719 _FL_OXY_BUTTON_DOWN_BOX,
720 FL_FREE_BOXTYPE,
721 FL_MAX_BOXTYPE = 255
722 };
723
724 #ifndef FL_DOXYGEN
725
726 extern FL_EXPORT Fl_Boxtype fl_define_FL_ROUND_UP_BOX();
727 #define FL_ROUND_UP_BOX fl_define_FL_ROUND_UP_BOX()
728 #define FL_ROUND_DOWN_BOX (Fl_Boxtype)(fl_define_FL_ROUND_UP_BOX()+1)
729 extern FL_EXPORT Fl_Boxtype fl_define_FL_SHADOW_BOX();
730 #define FL_SHADOW_BOX fl_define_FL_SHADOW_BOX()
731 #define FL_SHADOW_FRAME (Fl_Boxtype)(fl_define_FL_SHADOW_BOX()+2)
732 extern FL_EXPORT Fl_Boxtype fl_define_FL_ROUNDED_BOX();
733 #define FL_ROUNDED_BOX fl_define_FL_ROUNDED_BOX()
734 #define FL_ROUNDED_FRAME (Fl_Boxtype)(fl_define_FL_ROUNDED_BOX()+2)
735 extern FL_EXPORT Fl_Boxtype fl_define_FL_RFLAT_BOX();
736 #define FL_RFLAT_BOX fl_define_FL_RFLAT_BOX()
737 extern FL_EXPORT Fl_Boxtype fl_define_FL_RSHADOW_BOX();
738 #define FL_RSHADOW_BOX fl_define_FL_RSHADOW_BOX()
739 extern FL_EXPORT Fl_Boxtype fl_define_FL_DIAMOND_BOX();
740 #define FL_DIAMOND_UP_BOX fl_define_FL_DIAMOND_BOX()

```

```

741 #define FL_DIAMOND_DOWN_BOX (Fl_Boxtype) (fl_define_FL_DIAMOND_BOX()+1)
742 extern FL_EXPORT Fl_Boxtype fl_define_FL_OVAL_BOX();
743 #define FL_OVAL_BOX fl_define_FL_OVAL_BOX()
744 #define FL_OSHADOW_BOX (Fl_Boxtype) (fl_define_FL_OVAL_BOX()+1)
745 #define FL_OVAL_FRAME (Fl_Boxtype) (fl_define_FL_OVAL_BOX()+2)
746 #define FL_OFLAT_BOX (Fl_Boxtype) (fl_define_FL_OVAL_BOX()+3)
747
748 extern FL_EXPORT Fl_Boxtype fl_define_FL_PLASTIC_UP_BOX();
749 #define FL_PLASTIC_UP_BOX fl_define_FL_PLASTIC_UP_BOX()
750 #define FL_PLASTIC_DOWN_BOX (Fl_Boxtype) (fl_define_FL_PLASTIC_UP_BOX()+1)
751 #define FL_PLASTIC_UP_FRAME (Fl_Boxtype) (fl_define_FL_PLASTIC_UP_BOX()+2)
752 #define FL_PLASTIC_DOWN_FRAME (Fl_Boxtype) (fl_define_FL_PLASTIC_UP_BOX()+3)
753 #define FL_PLASTIC_THIN_UP_BOX (Fl_Boxtype) (fl_define_FL_PLASTIC_UP_BOX()+4)
754 #define FL_PLASTIC_THIN_DOWN_BOX (Fl_Boxtype) (fl_define_FL_PLASTIC_UP_BOX()+5)
755 #define FL_PLASTIC_ROUND_UP_BOX (Fl_Boxtype) (fl_define_FL_PLASTIC_UP_BOX()+6)
756 #define FL_PLASTIC_ROUND_DOWN_BOX (Fl_Boxtype) (fl_define_FL_PLASTIC_UP_BOX()+7)
757
758 extern FL_EXPORT Fl_Boxtype fl_define_FL_GTK_UP_BOX();
759 #define FL_GTK_UP_BOX fl_define_FL_GTK_UP_BOX()
760 #define FL_GTK_DOWN_BOX (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+1)
761 #define FL_GTK_UP_FRAME (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+2)
762 #define FL_GTK_DOWN_FRAME (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+3)
763 #define FL_GTK_THIN_UP_BOX (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+4)
764 #define FL_GTK_THIN_DOWN_BOX (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+5)
765 #define FL_GTK_THIN_UP_FRAME (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+6)
766 #define FL_GTK_THIN_DOWN_FRAME (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+7)
767 #define FL_GTK_ROUND_UP_BOX (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+8)
768 #define FL_GTK_ROUND_DOWN_BOX (Fl_Boxtype) (fl_define_FL_GTK_UP_BOX()+9)
769
770 extern FL_EXPORT Fl_Boxtype fl_define_FL_GLEAM_UP_BOX();
771 #define FL_GLEAM_UP_BOX fl_define_FL_GLEAM_UP_BOX()
772 #define FL_GLEAM_DOWN_BOX (Fl_Boxtype) (fl_define_FL_GLEAM_UP_BOX()+1)
773 #define FL_GLEAM_UP_FRAME (Fl_Boxtype) (fl_define_FL_GLEAM_UP_BOX()+2)
774 #define FL_GLEAM_DOWN_FRAME (Fl_Boxtype) (fl_define_FL_GLEAM_UP_BOX()+3)
775 #define FL_GLEAM_THIN_UP_BOX (Fl_Boxtype) (fl_define_FL_GLEAM_UP_BOX()+4)
776 #define FL_GLEAM_THIN_DOWN_BOX (Fl_Boxtype) (fl_define_FL_GLEAM_UP_BOX()+5)
777 #define FL_GLEAM_ROUND_UP_BOX (Fl_Boxtype) (fl_define_FL_GLEAM_UP_BOX()+6)
778 #define FL_GLEAM_ROUND_DOWN_BOX (Fl_Boxtype) (fl_define_FL_GLEAM_UP_BOX()+7)
779
780 extern FL_EXPORT Fl_Boxtype fl_define_FL_OXY_UP_BOX();
781 #define FL_OXY_UP_BOX fl_define_FL_OXY_UP_BOX()
782 #define FL_OXY_DOWN_BOX (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+1)
783 #define FL_OXY_UP_FRAME (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+2)
784 #define FL_OXY_DOWN_FRAME (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+3)
785 #define FL_OXY_THIN_UP_BOX (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+4)
786 #define FL_OXY_THIN_DOWN_BOX (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+5)
787 #define FL_OXY_THIN_UP_FRAME (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+6)
788 #define FL_OXY_THIN_DOWN_FRAME (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+7)
789 #define FL_OXY_ROUND_UP_BOX (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+8)
790 #define FL_OXY_ROUND_DOWN_BOX (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+9)
791 #define FL_OXY_BUTTON_UP_BOX (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+10)
792 #define FL_OXY_BUTTON_DOWN_BOX (Fl_Boxtype) (fl_define_FL_OXY_UP_BOX()+11)
793
794 #endif // ! FL_DOXYGEN
795
796 // conversions of box types to other boxtypes:
797 inline Fl_Boxtype fl_box(Fl_Boxtype b) {
798     return (Fl_Boxtype) ((b<FL_UP_BOX||b%4>1)?b:(b-2));
799 }
800 inline Fl_Boxtype fl_down(Fl_Boxtype b) {
801     return (Fl_Boxtype) ((b<FL_UP_BOX)?b:(b|1));
802 }
803 inline Fl_Boxtype fl_frame(Fl_Boxtype b) {
804     return (Fl_Boxtype) ((b%4<2)?b:(b+2));
805 }
806
807 // back-compatibility box types:
808 #define FL_FRAME FL_ENGRAVED_FRAME
809 #define FL_FRAME_BOX FL_ENGRAVED_BOX
810 #define FL_CIRCLE_BOX FL_ROUND_DOWN_BOX
811 #define FL_DIAMOND_BOX FL_DIAMOND_DOWN_BOX
812 // group: Box Types
813
814 enum Fl_Labeltype { // labeltypes:
815     FL_NORMAL_LABEL = 0,
816     FL_NO_LABEL,
817     FL_SHADOW_LABEL,
818     FL_ENGRAVED_LABEL,
819     FL_EMBOSSED_LABEL,
820     FL_MULTI_LABEL,
821     FL_ICON_LABEL,
822     FL_IMAGE_LABEL,
823
824     FL_FREE_LABELTYPE
825 };
826
827 #define FL_SYMBOL_LABEL FL_NORMAL_LABEL

```

```

870 extern Fl_Labeltype FL_EXPORT fl_define_FL_SHADOW_LABEL();
874 #define FL_SHADOW_LABEL fl_define_FL_SHADOW_LABEL()
875
880 extern Fl_Labeltype FL_EXPORT fl_define_FL_ENGRAVED_LABEL();
884 #define FL_ENGRAVED_LABEL fl_define_FL_ENGRAVED_LABEL()
885
890 extern Fl_Labeltype FL_EXPORT fl_define_FL_EMBOSSED_LABEL();
894 #define FL_EMBOSSED_LABEL fl_define_FL_EMBOSSED_LABEL()
895
900 extern Fl_Labeltype FL_EXPORT fl_define_FL_MULTI_LABEL();
905 #define FL_MULTI_LABEL fl_define_FL_MULTI_LABEL()
906
911 extern Fl_Labeltype FL_EXPORT fl_define_FL_ICON_LABEL();
915 #define FL_ICON_LABEL fl_define_FL_ICON_LABEL()
916
921 extern Fl_Labeltype FL_EXPORT fl_define_FL_IMAGE_LABEL();
928 #define FL_IMAGE_LABEL fl_define_FL_IMAGE_LABEL()
929
992 typedef unsigned Fl_Align;
993
995 const Fl_Align FL_ALIGN_CENTER          = 0x0000;
996
999 const Fl_Align FL_ALIGN_TOP             = 0x0001;
1000
1002 const Fl_Align FL_ALIGN_BOTTOM          = 0x0002;
1003
1007 const Fl_Align FL_ALIGN_LEFT           = 0x0004;
1008
1010 const Fl_Align FL_ALIGN_RIGHT           = 0x0008;
1011
1013 const Fl_Align FL_ALIGN_INSIDE           = 0x0010;
1014
1016 const Fl_Align FL_ALIGN_TEXT_OVER_IMAGE = 0x0020;
1017
1019 const Fl_Align FL_ALIGN_IMAGE_OVER_TEXT = 0x0000;
1020
1022 const Fl_Align FL_ALIGN_CLIP             = 0x0040;
1023
1025 const Fl_Align FL_ALIGN_WRAP             = 0x0080;
1026
1028 const Fl_Align FL_ALIGN_IMAGE_NEXT_TO_TEXT = 0x0100;
1029
1031 const Fl_Align FL_ALIGN_TEXT_NEXT_TO_IMAGE = 0x0120;
1032
1034 const Fl_Align FL_ALIGN_IMAGE_BACKDROP  = 0x0200;
1035
1036 const Fl_Align FL_ALIGN_TOP_LEFT         = FL_ALIGN_TOP | FL_ALIGN_LEFT;
1037 const Fl_Align FL_ALIGN_TOP_RIGHT        = FL_ALIGN_TOP | FL_ALIGN_RIGHT;
1038 const Fl_Align FL_ALIGN_BOTTOM_LEFT      = FL_ALIGN_BOTTOM | FL_ALIGN_LEFT;
1039 const Fl_Align FL_ALIGN_BOTTOM_RIGHT     = FL_ALIGN_BOTTOM | FL_ALIGN_RIGHT;
1040
1042 const Fl_Align FL_ALIGN_LEFT_TOP         = 0x0007;
1043
1045 const Fl_Align FL_ALIGN_RIGHT_TOP        = 0x000b;
1046
1048 const Fl_Align FL_ALIGN_LEFT_BOTTOM      = 0x000d;
1049
1051 const Fl_Align FL_ALIGN_RIGHT_BOTTOM     = 0x000e;
1052
1054 const Fl_Align FL_ALIGN_NOWRAP           = 0x0000;
1055
1057 const Fl_Align FL_ALIGN_POSITION_MASK    = 0x000f;
1058
1060 const Fl_Align FL_ALIGN_IMAGE_MASK       = 0x0320;
1069 typedef int Fl_Font;
1070
1071 const Fl_Font FL_HELVETICA                = 0;
1072 const Fl_Font FL_HELVETICA_BOLD           = 1;
1073 const Fl_Font FL_HELVETICA_ITALIC         = 2;
1074 const Fl_Font FL_HELVETICA_BOLD_ITALIC   = 3;
1075 const Fl_Font FL_COURIER                  = 4;
1076 const Fl_Font FL_COURIER_BOLD             = 5;
1077 const Fl_Font FL_COURIER_ITALIC           = 6;
1078 const Fl_Font FL_COURIER_BOLD_ITALIC      = 7;
1079 const Fl_Font FL_TIMES                    = 8;
1080 const Fl_Font FL_TIMES_BOLD               = 9;
1081 const Fl_Font FL_TIMES_ITALIC             = 10;
1082 const Fl_Font FL_TIMES_BOLD_ITALIC        = 11;
1083 const Fl_Font FL_SYMBOL                   = 12;
1084 const Fl_Font FL_SCREEN                   = 13;
1085 const Fl_Font FL_SCREEN_BOLD              = 14;
1086 const Fl_Font FL_ZAPF_DINGBATS            = 15;
1087
1088 const Fl_Font FL_FREE_FONT                = 16;
1089 const Fl_Font FL_BOLD                     = 1;
1090 const Fl_Font FL_ITALIC                   = 2;
1091 const Fl_Font FL_BOLD_ITALIC              = 3;

```

```

1092
1098 typedef int Fl_Fontsize;
1099
1100 extern FL_EXPORT Fl_Fontsize FL_NORMAL_SIZE;
1101
1126 typedef unsigned int Fl_Color;
1127
1128 // Standard colors. These are used as default colors in widgets and altered as necessary
1129 const Fl_Color FL_FOREGROUND_COLOR = 0;
1130 const Fl_Color FL_BACKGROUND2_COLOR = 7;
1131 const Fl_Color FL_INACTIVE_COLOR = 8;
1132 const Fl_Color FL_SELECTION_COLOR = 15;
1133
1134 // boxtypes generally limit themselves to these colors so
1135 // the whole ramp is not allocated:
1136
1137 const Fl_Color FL_GRAY0 = 32; // 'A'
1138 const Fl_Color FL_DARK3 = 39; // 'H'
1139 const Fl_Color FL_DARK2 = 45; // 'N'
1140 const Fl_Color FL_DARK1 = 47; // 'P'
1142 const Fl_Color FL_BACKGROUND_COLOR = 49; // 'R' default background color
1143 const Fl_Color FL_LIGHT1 = 50; // 'S'
1144 const Fl_Color FL_LIGHT2 = 52; // 'U'
1145 const Fl_Color FL_LIGHT3 = 54; // 'W'
1146
1147 // FLTK provides a 5x8x5 color cube that is used with colormap visuals
1148
1149 const Fl_Color FL_BLACK = 56;
1150 const Fl_Color FL_RED = 88;
1151 const Fl_Color FL_GREEN = 63;
1152 const Fl_Color FL_YELLOW = 95;
1153 const Fl_Color FL_BLUE = 216;
1154 const Fl_Color FL_MAGENTA = 248;
1155 const Fl_Color FL_CYAN = 223;
1156 const Fl_Color FL_DARK_RED = 72;
1157
1158 const Fl_Color FL_DARK_GREEN = 60;
1159 const Fl_Color FL_DARK_YELLOW = 76;
1160 const Fl_Color FL_DARK_BLUE = 136;
1161 const Fl_Color FL_DARK_MAGENTA = 152;
1162 const Fl_Color FL_DARK_CYAN = 140;
1163
1164 const Fl_Color FL_WHITE = 255;
1165
1168 #define FL_FREE_COLOR (Fl_Color)16
1169 #define FL_NUM_FREE_COLOR 16
1170 #define FL_GRAY_RAMP (Fl_Color)32
1171 #define FL_NUM_GRAY 24
1172 #define FL_GRAY FL_BACKGROUND_COLOR
1173 #define FL_COLOR_CUBE (Fl_Color)56
1174 #define FL_NUM_RED 5
1175 #define FL_NUM_GREEN 8
1176 #define FL_NUM_BLUE 5
1177
1178 FL_EXPORT Fl_Color fl_inactive(Fl_Color c);
1179
1202 typedef Fl_Color (Fl_Contrast_Function)(Fl_Color, Fl_Color, int, int);
1203
1204 FL_EXPORT void fl_contrast_function(Fl_Contrast_Function *f);
1205
1209 enum Fl_Contrast_Mode {
1210     FL_CONTRAST_NONE = 0,
1211     FL_CONTRAST_LEGACY,
1212     FL_CONTRAST_CIELAB,
1213     FL_CONTRAST_CUSTOM,
1214     FL_CONTRAST_LAST
1215 };
1216
1217 // The following functions are defined and documented in src/fl_contrast.cxx
1218
1219 FL_EXPORT void fl_contrast_level(int level);
1220 FL_EXPORT int fl_contrast_level();
1221 FL_EXPORT void fl_contrast_mode(int mode);
1222 FL_EXPORT int fl_contrast_mode();
1223
1224 FL_EXPORT Fl_Color fl_contrast(Fl_Color fg, Fl_Color bg, int context = 0, int size = 0);
1225
1226 FL_EXPORT double fl_lightness(Fl_Color color);
1227 FL_EXPORT double fl_luminance(Fl_Color color);
1228
1229 // Other color functions are defined and documented in src/fl_color.cxx
1230
1231 FL_EXPORT Fl_Color fl_color_average(Fl_Color c1, Fl_Color c2, float weight);
1232
1234 inline Fl_Color fl_lighter(Fl_Color c) { return fl_color_average(c, FL_WHITE, .67f); }
1235
1237 inline Fl_Color fl_darker(Fl_Color c) { return fl_color_average(c, FL_BLACK, .67f); }

```

```

1238
1240 inline Fl_Color fl_rgb_color(uchar r, uchar g, uchar b) {
1241     if (!r && !g && !b) return FL_BLACK;
1242     else return (Fl_Color) (((r << 8) | g) << 8) | b << 8);
1243 }
1244
1246 inline Fl_Color fl_rgb_color(uchar g) {
1247     if (!g) return FL_BLACK;
1248     else return (Fl_Color) (((g << 8) | g) << 8) | g << 8);
1249 }
1250
1259 inline Fl_Color fl_gray_ramp(int i) {return (Fl_Color) (i+FL_GRAY_RAMP);}
1260
1275 inline Fl_Color fl_color_cube(int r, int g, int b) {
1276     return (Fl_Color) ((b*FL_NUM_RED + r) * FL_NUM_GREEN + g + FL_COLOR_CUBE);}
1277     // group: Colors
1279
1288 /* FIXME: We should renumber these, but that will break the ABI */
1289 enum Fl_Cursor {
1290     FL_CURSOR_DEFAULT = 0, // U+2196
1291     FL_CURSOR_ARROW = 35, // U+2196
1292     FL_CURSOR_CROSS = 66, // U+FF0B
1293     FL_CURSOR_WAIT = 76, // U+231A, U+231B
1294     FL_CURSOR_INSERT = 77, // U+2336
1295     FL_CURSOR_HAND = 31, // U+261C
1296     FL_CURSOR_HELP = 47,
1297     FL_CURSOR_MOVE = 27, // U+2725, U+270B
1298
1299     /* Resize indicators */
1300     FL_CURSOR_NS = 78, // U+21D5
1301     FL_CURSOR_WE = 79, // U+21D4
1302     FL_CURSOR_NWSE = 80, // U+2921
1303     FL_CURSOR_NESW = 81, // U+2922
1304     FL_CURSOR_N = 70, // U+2912
1305     FL_CURSOR_NE = 69, // U+2197
1306     FL_CURSOR_E = 49, // U+21E5
1307     FL_CURSOR_SE = 8, // U+21F2
1308     FL_CURSOR_S = 9, // U+2913
1309     FL_CURSOR_SW = 7, // U+2199
1310     FL_CURSOR_W = 36, // U+21E4
1311     FL_CURSOR_NW = 68, // U+21F1
1312
1313     FL_CURSOR_NONE = 255
1314 }; // group: Cursors
1316
1318 enum { // values for "when" passed to Fl::add_fd()
1319     FL_READ = 1,
1320     FL_WRITE = 4,
1321     FL_EXCEPT = 8
1322 };
1323
1325 enum Fl_Mode {
1326     FL_RGB = 0,
1327     FL_INDEX = 1,
1328     FL_SINGLE = 0,
1329     FL_DOUBLE = 2,
1330     FL_ACCUM = 4,
1331     FL_ALPHA = 8,
1332     FL_DEPTH = 16,
1333     FL_STENCIL = 32,
1334     FL_RGB8 = 64,
1335     FL_MULTISAMPLE = 128,
1336     FL_STEREO = 256,
1337     FL_FAKE_SINGLE = 512, // Fake single buffered windows using double-buffer
1338     FL_OPENGL3 = 1024
1339 };
1340
1341 // image alpha blending
1342
1343 #define FL_IMAGE_WITH_ALPHA 0x40000000
1344
1346 enum Fl_Damage {
1347     FL_DAMAGE_CHILD = 0x01,
1348     FL_DAMAGE_EXPOSE = 0x02,
1349     FL_DAMAGE_SCROLL = 0x04,
1350     FL_DAMAGE_OVERLAY = 0x08,
1351     FL_DAMAGE_USER1 = 0x10,
1352     FL_DAMAGE_USER2 = 0x20,
1353     FL_DAMAGE_ALL = 0x80
1354 };
1355
1356 // FLTK 1.0.x compatibility definitions (FLTK_1_0_COMPAT) dropped in 1.4.0
1357
1370 enum Fl_Arrow_Type {
1371     FL_ARROW_SINGLE = 0x01,
1372     FL_ARROW_DOUBLE = 0x02,
1373     FL_ARROW_CHOICE = 0x03,

```

```

1374     FL_ARROW_RETURN = 0x04
1375 };
1376
1399 enum Fl_Orientation {
1400     FL_ORIENT_NONE = 0x00,
1401     FL_ORIENT_RIGHT = 0x00,
1402     FL_ORIENT_NE = 0x01,
1403     FL_ORIENT_UP = 0x02,
1404     FL_ORIENT_NW = 0x03,
1405     FL_ORIENT_LEFT = 0x04,
1406     FL_ORIENT_SW = 0x05,
1407     FL_ORIENT_DOWN = 0x06,
1408     FL_ORIENT_SE = 0x07
1409 };
1410
1411 #endif

```

### 34.3 filename.H File Reference

File names and URI utility functions.

```

#include "Fl_Export.H"
#include <FL/platform_types.h>
#include <string>

```

#### Macros

- `#define FL_PATH_MAX 2048`  
*all path buffers should use this length*

#### Typedefs

- `typedef int() Fl_File_Sort_F(struct dirent **, struct dirent **)`  
*File sorting function.*

#### Functions

- `void fl_decode_uri (char *uri)`  
*Decodes a URL-encoded string.*
- `int fl_filename_absolute (char *to, int tolen, const char *from)`  
*Makes a filename absolute from a relative filename to the current working directory.*
- `int fl_filename_absolute (char *to, int tolen, const char *from, const char *cwd)`  
*Concatenate the absolute path base with from to form the new absolute path in to.*
- `std::string fl_filename_absolute_str (const std::string &from)`  
*Makes a filename absolute from a filename relative to the current working directory.*
- `std::string fl_filename_absolute_str (const std::string &from, const std::string &base)`  
*Append the relative filename from to the absolute filename base to form the new absolute path.*
- `int fl_filename_expand (char *to, int tolen, const char *from)`  
*Expands a filename containing shell variables and tilde (~).*
- `std::string fl_filename_expand_str (const std::string &from)`  
*Expands a filename containing shell variables and tilde (~).*
- `const char * fl_filename_ext (const char *buf)`  
*Gets the extension of a filename.*
- `std::string fl_filename_ext_str (const std::string &filename)`  
*Return a new string that contains the filename extension.*
- `void fl_filename_free_list (struct dirent **l, int n)`  
*Free the list of filenames that is generated by fl\_filename\_list().*
- `int fl_filename_isdir (const char *name)`  
*Determines if a file exists and is a directory from its filename.*

- `int fl_filename_list (const char *d, struct dirent **l, Fl_File_Sort_F *s=fl_numeric_sort)`  
*Portable and const-correct wrapper for the scandir() function.*
- `int fl_filename_match (const char *name, const char *pattern)`  
*Checks if a string s matches a pattern p.*
- `const char * fl_filename_name (const char *filename)`  
*Gets the file name from a path.*
- `std::string fl_filename_name_str (const std::string &filename)`  
*Return a new string that contains the name part of the filename.*
- `std::string fl_filename_path_str (const std::string &filename)`  
*Return a new string that contains the path part of the filename.*
- `int fl_filename_relative (char *to, int tolen, const char *from)`  
*Makes a filename relative to the current working directory.*
- `int fl_filename_relative (char *to, int tolen, const char *from, const char *cwd)`  
*Makes a filename relative to any other directory.*
- `std::string fl_filename_relative_str (const std::string &from)`  
*Makes a filename relative to the current working directory.*
- `std::string fl_filename_relative_str (const std::string &from, const std::string &base)`  
*Makes a filename relative to any directory.*
- `char * fl_filename_setext (char *to, int tolen, const char *ext)`  
*Replaces the extension in buf of max.*
- `std::string fl_filename_setext_str (const std::string &filename, const std::string &new_extension)`  
*Return a copy of the old filename with the new extension.*
- `std::string fl_getcwd_str ()`  
*Cross-platform function to get the current working directory as a UTF-8 encoded value in an std::string.*
- `int fl_open_uri (const char *uri, char *msg, int msglen)`  
*Opens the specified Uniform Resource Identifier (URI).*

### 34.3.1 Detailed Description

File names and URI utility functions.

## 34.4 filename.H

[Go to the documentation of this file.](#)

```

1 /*
2  * Filename header file for the Fast Light Tool Kit (FLTK).
3  *
4  * Copyright 1998-2023 by Bill Spitzak and others.
5  *
6  * This library is free software. Distribution and use rights are outlined in
7  * the file "COPYING" which should have been included with this file. If this
8  * file is missing or damaged, see the license at:
9  *
10 *      https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *      https://www.fltk.org/bugs.php
15 */
16
17 /*
18 * Note to devs:
19 * Under Windows, we include filename.H from numeric_sort.c; this should probably change.
20 * This implies that we need C-style comments and '#ifdef __cplusplus ... #endif'
21 */
22
23 #ifndef FL_FILENAME_H
24 #define FL_FILENAME_H
25
26 #include "Fl_Export.H"
27 #include <FL/platform_types.h>
28
29 #ifdef __cplusplus
30

```

```

35 // The following include is not (yet) used in FLTK 1.4
36 // In FLTK 1.5 or 4.0 using std::string would be default.
37 // #include <string>
38
39 #endif /* __cplusplus */
40
45 # define FL_PATH_MAX 2048
61 FL_EXPORT const char *fl_filename_name(const char * filename);
62 FL_EXPORT const char *fl_filename_ext(const char *buf);
63 FL_EXPORT char *fl_filename_setext(char *to, int tolen, const char *ext);
64 FL_EXPORT int fl_filename_expand(char *to, int tolen, const char *from);
65 FL_EXPORT int fl_filename_absolute(char *to, int tolen, const char *from);
66 FL_EXPORT int fl_filename_relative(char *to, int tolen, const char *from);
67 FL_EXPORT int fl_filename_match(const char *name, const char *pattern);
68 FL_EXPORT int fl_filename_isdir(const char *name);
69
70 # if defined(__cplusplus)
71
72 FL_EXPORT int fl_filename_absolute(char *to, int tolen, const char *from, const char *cwd);
73 FL_EXPORT int fl_filename_relative(char *to, int tolen, const char *from, const char *cwd);
74
75 #include <string>
76
77 FL_EXPORT std::string fl_filename_name_str(const std::string &filename);
78 FL_EXPORT std::string fl_filename_path_str(const std::string &filename);
79 FL_EXPORT std::string fl_filename_ext_str(const std::string &filename);
80 FL_EXPORT std::string fl_filename_setext_str(const std::string &filename, const std::string
&new_extension);
81 FL_EXPORT std::string fl_filename_expand_str(const std::string &from);
82 FL_EXPORT std::string fl_filename_absolute_str(const std::string &from);
83 FL_EXPORT std::string fl_filename_absolute_str(const std::string &from, const std::string &base);
84 FL_EXPORT std::string fl_filename_relative_str(const std::string &from);
85 FL_EXPORT std::string fl_filename_relative_str(const std::string &from, const std::string &base);
86 FL_EXPORT std::string fl_getcwd_str();
87
88 # endif /* defined(__cplusplus) */
89
90 # if defined(__cplusplus) && !defined(FL_DOXYGEN)
91 /*
92 * Under Windows, we include filename.H from numeric_sort.c; this should probably change...
93 */
94
95 inline char *fl_filename_setext(char *to, const char *ext) { return fl_filename_setext(to, FL_PATH_MAX,
ext); }
96 inline int fl_filename_expand(char *to, const char *from) { return fl_filename_expand(to, FL_PATH_MAX,
from); }
97 inline int fl_filename_absolute(char *to, const char *from) { return fl_filename_absolute(to,
FL_PATH_MAX, from); }
98 inline int fl_filename_relative(char *to, const char *from) { return fl_filename_relative(to,
FL_PATH_MAX, from); }
99 # endif /* __cplusplus */
100
101 # if defined (__cplusplus)
102 extern "C" {
103 # endif /* __cplusplus */
104
105 # if !defined(FL_DOXYGEN)
106 FL_EXPORT int fl_alphasort(struct dirent **, struct dirent **);
107 FL_EXPORT int fl_casealphasort(struct dirent **, struct dirent **);
108 FL_EXPORT int fl_casenumeric_sort(struct dirent **, struct dirent **);
109 FL_EXPORT int fl_numeric_sort(struct dirent **, struct dirent **);
110 # endif
111
112 typedef int (Fl_File_Sort_F)(struct dirent **, struct dirent **);
113 # if defined(__cplusplus)
114 }
115
116
117 /*
118 * Portable "scandir" function.    Ugly but necessary...
119 */
120
121 FL_EXPORT int fl_filename_list(const char *d, struct dirent ***l,
Fl_File_Sort_F *s = fl_numeric_sort);
122
123 FL_EXPORT void fl_filename_free_list(struct dirent ***l, int n);
124
125 /*
126 * Generic function to open a Uniform Resource Identifier (URI) using a
127 * system-defined program (added in FLTK 1.1.8)
128 */
129
130 FL_EXPORT int fl_open_uri(const char *uri, char *msg = (char *)0,
int msglen = 0);
131
132
133 FL_EXPORT void fl_decode_uri(char *uri);
134
135 # endif /* __cplusplus */
136

```

```

137 /*
138 * Note: FLTK 1.0.x compatibility definitions (FLTK_1_0_COMPAT) dropped in 1.4.0
139 */
140
141 #endif /* FL_FILENAME_H */
142

```

## 34.5 FL.H File Reference

**FL** static class.

```

#include <FL/fl_config.h>
#include <FL/Fl_Export.H>
#include <FL/platform_types.h>
#include <FL/fl_casts.H>
#include <FL/Fl_Cairo.H>
#include "fl_utf8.h"
#include "Enumerations.H"
#include <string.h>

```

### Classes

- class [FL](#)  
*The [FL](#) is the FLTK global (static) class containing state information and global methods for the current application.*
- class [FL\\_Widget\\_Tracker](#)  
*This class should be used to control safe widget deletion.*

### Macros

- #define [FL\\_Object](#) [FL\\_Widget](#)  
*for back compatibility - use [FL\\_Widget](#)!*

### Typedefs

- typedef void(\* [FL\\_Abort\\_Handler](#)) (const char \*format,...)  
*Signature of set\_abort functions passed as parameters.*
- typedef int(\* [FL\\_Args\\_Handler](#)) (int argc, char \*\*argv, int &i)  
*Signature of args functions passed as parameters.*
- typedef void(\* [FL\\_Atclose\\_Handler](#)) ([FL\\_Window](#) \*window, void \*data)  
*Signature of set\_atclose functions passed as parameters.*
- typedef void(\* [FL\\_Awake\\_Handler](#)) (void \*data)  
*Signature of some wakeup callback functions passed as parameters.*
- typedef void() [FL\\_Box\\_Draw\\_F](#)(int x, int y, int w, int h, [FL\\_Color](#) color)  
*Signature of some box drawing functions passed as parameters.*
- typedef void() [FL\\_Box\\_Draw\\_Focus\\_F](#)([FL\\_Boxtype](#) bt, int x, int y, int w, int h, [FL\\_Color](#) fg, [FL\\_Color](#) bg)  
*Signature of box focus frame drawing functions.*
- typedef void(\* [FL\\_Clipboard\\_Notify\\_Handler](#)) (int source, void \*data)  
*Signature of add\_clipboard\_notify functions passed as parameters.*
- typedef int(\* [FL\\_Event\\_Dispatch](#)) (int event, [FL\\_Window](#) \*w)  
*Signature of event\_dispatch functions passed as parameters.*
- typedef int(\* [FL\\_Event\\_Handler](#)) (int event)  
*Signature of add\_handler functions passed as parameters.*
- typedef void(\* [FL\\_FD\\_Handler](#)) ([FL\\_SOCKET](#) fd, void \*data)  
*Signature of add\_fd functions passed as parameters.*
- typedef void(\* [FL\\_Idle\\_Handler](#)) (void \*data)

*Signature of add\_idle callback functions passed as parameters.*

- typedef void() **FI\_Label\_Draw\_F**(const [FI\\_Label](#) \*label, int x, int y, int w, int h, [FI\\_Align](#) align)

*Signature of some label drawing functions passed as parameters.*

- typedef void() **FI\_Label\_Measure\_F**(const [FI\\_Label](#) \*label, int &width, int &height)

*Signature of some label measurement functions passed as parameters.*

- typedef void(\* **FI\_Old\_Idle\_Handler**) ()

*Signature of set\_idle callback functions passed as parameters.*

- typedef int(\* **FI\_System\_Handler**) (void \*event, void \*data)

*Signature of add\_system\_handler functions passed as parameters.*

- typedef void(\* [FI\\_Timeout\\_Handler](#)) (void \*data)

*Signature of timeout callback functions passed as parameters.*

## Variables

- const char \* **fl\_local\_alt**  
*string pointer used in shortcuts, you can change it to another language*
- const char \* **fl\_local\_ctrl**  
*string pointer used in shortcuts, you can change it to another language*
- const char \* **fl\_local\_meta**  
*string pointer used in shortcuts, you can change it to another language*
- const char \* **fl\_local\_shift**  
*string pointer used in shortcuts, you can change it to another language*

### 34.5.1 Detailed Description

[FI](#) static class.

## 34.6 FI.H

[Go to the documentation of this file.](#)

```

1 //
2 // Main header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2025 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
21 #ifndef FI_H
22 #   define FI_H
23
24 #include <FL/fl_config.h> // build configuration
25 #include <FL/Fl_Export.H>
26 #include <FL/platform_types.h> // for FL_SOCKET
27 #include <FL/fl_casts.H>      // experimental
28
29 #ifdef FLTK_HAVE_CAIRO
30 #   include <FL/Fl_Cairo.H>
31 #endif
32
33 #   include "fl_utf8.h"
34 #   include "Enumerations.H"
35 #   ifndef FI_Object
36 #       define FI_Object FI_Widget
37 #   endif
38
39 #   ifdef check
40 #       undef check
41 #   endif

```

```

42
43 #   ifdef BSD
44 #       undef BSD
45 #   endif
46
47 #include <string.h> // FIXME: Fl::is_scheme(): strcmp needs string.h
48
49 class Fl_Widget;
50 class Fl_Window;
51 class Fl_Image;
52 struct Fl_Label;
53 class Fl_Screen_Driver;
54 class Fl_System_Driver;
55
56 // Pointers you can use to change FLTK to another language.
57 // Note: Similar pointers are defined in FL/fl_ask.H and src/fl_ask.cxx
58
59 extern FL_EXPORT const char* fl_local_alt;
60 extern FL_EXPORT const char* fl_local_ctrl;
61 extern FL_EXPORT const char* fl_local_meta;
62 extern FL_EXPORT const char* fl_local_shift;
63
64 typedef void (Fl_Label_Draw_F)(const Fl_Label *label, int x, int y, int w, int h, Fl_Align align);
65
66 typedef void (Fl_Label_Measure_F)(const Fl_Label *label, int &width, int &height);
67
68 typedef void (Fl_Box_Draw_F)(int x, int y, int w, int h, Fl_Color color);
69
70 typedef void (Fl_Box_Draw_Focus_F)(Fl_Boxtype bt, int x, int y, int w, int h, Fl_Color fg, Fl_Color bg);
71
72 typedef void (*Fl_Timeout_Handler)(void *data);
73
74 typedef void (*Fl_Awake_Handler)(void *data);
75
76 typedef void (*Fl_Idle_Handler)(void *data);
77
78 typedef void (*Fl_Old_Idle_Handler)();
79
80 typedef void (*Fl_FD_Handler)(FL_SOCKET fd, void *data);
81
82 typedef int (*Fl_Event_Handler)(int event);
83
84 typedef int (*Fl_System_Handler)(void *event, void *data);
85
86 typedef void (*Fl_Abort_Handler)(const char *format,...);
87
88 typedef void (*Fl_Atclose_Handler)(Fl_Window *window, void *data);
89
90 typedef int (*Fl_Args_Handler)(int argc, char **argv, int &i);
91
92 typedef int (*Fl_Event_Dispatch)(int event, Fl_Window *w);
93
94 typedef void (*Fl_Clipboard_Notify_Handler)(int source, void *data);
95
96 /* group callback_functions */
97
98 class FL_EXPORT Fl {
99     friend class Fl_System_Driver;
100     Fl() {} // no constructor!
101
102 private:
103     static int use_high_res_GL;
104     static int draw_GL_text_with_textures;
105     static int box_shadow_width;
106     static int box_border_radius_max;
107     static int selection_to_clipboard;
108
109 public:
110     static Fl_Screen_Driver *screen_driver();
111     static Fl_System_Driver *system_driver();
112 #ifdef __APPLE__ // deprecated in 1.4 - only for compatibility with 1.3
113     static void reset_marked_text();
114     static void insertion_point_location(int x, int y, int height);
115 #endif
116
117     static int box_shadow_width() { return box_shadow_width; }
118     static void box_shadow_width(int W) { box_shadow_width_ = W < 1 ? 1 : W; }
119
120     static int box_border_radius_max() { return box_border_radius_max; }
121     static void box_border_radius_max(int R) { box_border_radius_max_ = R < 5 ? 5 : R; }
122
123 public: // should be private!
124
125 #ifndef FL_DOXYGEN

```

```

193 static int e_number;
194 static int e_x;
195 static int e_y;
196 static int e_x_root;
197 static int e_y_root;
198 static int e_dx;
199 static int e_dy;
200 static int e_state;
201 static int e_clicks;
202 static int e_is_click;
203 static int e_keysym;
204 static char* e_text;
205 static int e_length;
206 static void *e_clipboard_data;
207 static const char *e_clipboard_type;
208 static Fl_Event_Dispatch e_dispatch;
209 static Fl_Callback_Reason callback_reason_;
210 static Fl_Widget* belowmouse_;
211 static Fl_Widget* pushed_;
212 static Fl_Widget* focus_;
213 static int damage_;
214 static Fl_Widget* selection_owner_;
215 static Fl_Window* modal_;
216 static Fl_Window* grab_;
217 static int compose_state; // used for dead keys (Windows) or marked text (MacOS)
218 static void call_screen_init(); // recompute screen number and dimensions
219 #endif // FL_DOXYGEN
220
221
222
223 static void damage(int d) {damage_ = d;}
224
225 public:
226     typedef enum {
227         OPTION_ARROW_FOCUS = 0,
228         // When switched on, FLTK will use the file chooser dialog that comes
229         // with your operating system whenever possible. When switched off, FLTK
230         // will present its own file chooser.
231         // \todo implement me
232         // OPTION_NATIVE_FILECHOOSER,
233         // When Filechooser Preview is enabled, the FLTK or native file chooser
234         // will show a preview of a selected file (if possible) before the user
235         // decides to choose the file.
236         // \todo implement me
237         //OPTION_FILECHOOSER_PREVIEW,
238         OPTION_VISIBLE_FOCUS,
239         OPTION_DND_TEXT,
240         OPTION_SHOW_TOOLTIPS,
241         OPTION_FNFC_USES_GTK,
242         OPTION_FNFC_USES_ZENITY,
243         OPTION_FNFC_USES_KDIALOG,
244         OPTION_PRINTER_USES_GTK,
245         OPTION_SHOW_SCALING,
246         OPTION_SIMPLE_ZOOM_SHORTCUT,
247         // don't change this, leave it always as the last element
248         OPTION_LAST
249     } Fl_Option;
250
251 private:
252     static unsigned char options_[OPTION_LAST];
253     static unsigned char options_read_;
254     static int program_should_quit_; // non-zero means the program was asked to cleanly terminate
255
256 public:
257     /*
258     Return a global setting for all FLTK applications, possibly overridden
259     by a setting specifically for this application.
260     */
261     static bool option(Fl_Option opt);
262
263     /*
264     Override an option while the application is running.
265     */
266     static void option(Fl_Option opt, bool val);
267
268     static void (*idle)();
269
270 #ifndef FL_DOXYGEN
271 private:
272     static Fl_Awake_Handler *awake_ring_;
273     static void **awake_data_;
274     static int awake_ring_size_;
275     static int awake_ring_head_;
276     static int awake_ring_tail_;
277 public:
278     static const char* scheme_;
279     static Fl_Image* scheme_bg_;
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
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318
319
320
321
322
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331
332
333
334

```

```

335 static int e_original_keysym; // late addition
336 static int scrollbar_size_;
337 static int menu_linespacing_; // STR #2927
338 #endif
339
340
341 static int add_awake_handler_(Fl_Awake_Handler, void*);
342 static int get_awake_handler_(Fl_Awake_Handler&, void*&);
343
344 public:
345
346 // API version number
347 static double version();
348 static int api_version();
349
350 // ABI version number
351 static int abi_version();
352
375 static inline int abi_check(const int val = FL_ABI_VERSION) {
376     return val == abi_version();
377 }
378
379 // argument parsers:
380 static int arg(int argc, char **argv, int& i);
381 static int args(int argc, char **argv, int& i, Fl_Args_Handler cb = 0);
382 static void args(int argc, char **argv);
383 static const char* const help;
384
385 // things called by initialization:
386 static void display(const char*);
387 static int visual(int);
388 static int gl_visual(int, int *alist=0); // platform dependent
389 static void own_colormap();
390 static void get_system_colors();
391 static void foreground(uchar, uchar, uchar);
392 static void background(uchar, uchar, uchar);
393 static void background2(uchar, uchar, uchar);
394
395 // schemes:
396 static int scheme(const char *name);
397 static const char* scheme() {return scheme_;}
398
399 static int is_scheme(const char *name) {
400     return (scheme_ && name && !strcmp(name,scheme_));
401 }
402
403 static int reload_scheme(); // defined in 'src/Fl_get_system_colors.cxx'
404
405 static int scrollbar_size();
406 static void scrollbar_size(int W);
407 static int menu_linespacing();
408 static void menu_linespacing(int H);
409
410 // execution:
411 static int wait();
412 static double wait(double time);
413 static int check();
414 static int ready();
415 static int run();
416 static int program_should_quit() {return program_should_quit_;}
417 static void program_should_quit(int should_i) { program_should_quit_ = should_i; }
418 static void hide_all_windows();
419
420 static Fl_Widget* readqueue();
421
422 //
423 // cross-platform timer support
424 //
425
426 static void add_timeout(double t, Fl_Timeout_Handler cb, void *data = 0);
427 static void repeat_timeout(double t, Fl_Timeout_Handler cb, void *data = 0);
428 static int has_timeout(Fl_Timeout_Handler cb, void *data = 0);
429 static void remove_timeout(Fl_Timeout_Handler cb, void *data = 0);
430 static int remove_next_timeout(Fl_Timeout_Handler cb, void *data = 0, void **data_return = 0);
431
432 static void add_check(Fl_Timeout_Handler, void* = 0);
433 static int has_check(Fl_Timeout_Handler, void* = 0);
434 static void remove_check(Fl_Timeout_Handler, void* = 0);
435
436 static Fl_Timestamp now(double offset = 0);
437 static double seconds_since(Fl_Timestamp& then);
438 static double seconds_between(Fl_Timestamp& back, Fl_Timestamp& further_back);
439 static long ticks_since(Fl_Timestamp& then);
440 static long ticks_between(Fl_Timestamp& back, Fl_Timestamp& further_back);
441
442 // private
443 static void run_idle();

```

```

496 static void run_checks();
497 static void add_fd(int fd, int when, Fl_FD_Handler cb, void* = 0); // platform dependent
498 static void add_fd(int fd, Fl_FD_Handler cb, void* = 0); // platform dependent
500 static void remove_fd(int, int when); // platform dependent
502 static void remove_fd(int); // platform dependent
503
504 static void add_idle(Fl_Idle_Handler cb, void* data = 0);
505 static int has_idle(Fl_Idle_Handler cb, void* data = 0);
506 static void remove_idle(Fl_Idle_Handler cb, void* data = 0);
508 static int damage() {return damage_;}
509 static void redraw();
510 static void flush();
531 static void (*warning)(const char*, ...);
546 static void (*error)(const char*, ...);
563 static void (*fatal)(const char*, ...);
569 static Fl_Window* first_window();
570 static void first_window(Fl_Window*);
571 static Fl_Window* next_window(const Fl_Window*);
572
582 static Fl_Window* modal() {return modal_;}
588 static Fl_Window* grab() {return grab_;}
613 static void grab(Fl_Window*); // platform dependent
620 // event information:
626 static int event() {return e_number;}
631 static int event_x() {return e_x;}
636 static int event_y() {return e_y;}
643 static int event_x_root() {return e_x_root;}
650 static int event_y_root() {return e_y_root;}
655 static int event_dx() {return e_dx;}
660 static int event_dy() {return e_dy;}
669 static void get_mouse(int &,int &);
678 static int event_clicks() {return e_clicks;}
686 static void event_clicks(int i) {e_clicks = i;}
694 static int event_is_click() {return e_is_click;}
701 static void event_is_click(int i) {e_is_click = i;}
713 static int event_button() {return e_ksym - FL_Button;}
754 static int event_state() {return e_state;}
755
761 static int event_state(int mask) {return e_state&mask;}
773 static int event_key() {return e_ksym;}
782 static int event_original_key() {return e_original_ksym;}
822 static int event_key(int key);
828 static int get_key(int key); // platform dependent
843 static const char* event_text() {return e_text;}
850 static int event_length() {return e_length;}
851
855 static void *event_clipboard() {return e_clipboard_data;}
859 static const char *event_clipboard_type() {return e_clipboard_type;}
860
861
862 static int compose(int &del);
863 static void compose_reset();
864 static int event_inside(int,int,int,int);
865 static int event_inside(const Fl_Widget*);
866 static int test_shortcut(Fl_Shortcut);
867
868 static void enable_im();
869 static void disable_im();
870
871 // event destinations:
872 static int handle(int, Fl_Window*);
873 static int handle_(int, Fl_Window*);
876 static Fl_Widget* belowmouse() {return belowmouse_;}
877 static void belowmouse(Fl_Widget*);
880 static Fl_Widget* pushed() {return pushed_;}
881 static void pushed(Fl_Widget*);
883 static Fl_Widget* focus() {return focus_;}
884 static void focus(Fl_Widget*);
885 static void add_handler(Fl_Event_Handler ha);
886 static void add_handler(Fl_Event_Handler ha, Fl_Event_Handler before);
887 static Fl_Event_Handler last_handler();
888 static void remove_handler(Fl_Event_Handler h);
889 static void add_system_handler(Fl_System_Handler h, void *data);
890 static void remove_system_handler(Fl_System_Handler h);
891 static void event_dispatch(Fl_Event_Dispatch d);
892 static Fl_Event_Dispatch event_dispatch();
893 static Fl_Callback_Reason callback_reason();
939 static void copy(const char *stuff, int len, int destination = 0,
940                const char *type = Fl::clipboard_plain_text);
941
969 static void selection_to_clipboard(int mode) {
970     selection_to_clipboard_ = mode ? 1 : 0;
971 }
972
978 static int selection_to_clipboard() {return selection_to_clipboard_;}
979
1022 static void paste(Fl_Widget &receiver, int source, const char *type = Fl::clipboard_plain_text);

```

```

1023
1045 static void add_clipboard_notify(Fl_Clipboard_Notify_Handler h, void *data = 0);
1050 static void remove_clipboard_notify(Fl_Clipboard_Notify_Handler h);
1059 static int clipboard_contains(const char *type);
1062 static char const * const clipboard_plain_text;
1065 static char const * const clipboard_image;
1066
1076 static int dnd(); // platform dependent
1077
1078 // These are for back-compatibility only:
1081 static Fl_Widget* selection_owner() {return selection_owner;}
1082 static void selection_owner(Fl_Widget*);
1083 static void selection(Fl_Widget &owner, const char*, int len);
1084 static void paste(Fl_Widget &receiver);
1101 static int x(); // via screen driver
1102 static int y(); // via screen driver
1103 static int w(); // via screen driver
1104 static int h(); // via screen driver
1105
1106 // multi-head support:
1107 static int screen_count(); // via screen driver
1108 static void screen_xywh(int &X, int &Y, int &W, int &H); // via screen driver
1109 static void screen_xywh(int &X, int &Y, int &W, int &H, int mx, int my); // via screen driver
1110 static void screen_xywh(int &X, int &Y, int &W, int &H, int n); // via screen driver
1111 static void screen_xywh(int &X, int &Y, int &W, int &H, int mx, int my, int mw, int mh); // via
screen driver
1112 static int screen_num(int x, int y); // via screen driver
1113 static int screen_num(int x, int y, int w, int h); // via screen driver
1114 static void screen_dpi(float &h, float &v, int n=0); // via screen driver
1115 static void screen_work_area(int &X, int &Y, int &W, int &H, int mx, int my); // via screen driver
1116 static void screen_work_area(int &X, int &Y, int &W, int &H, int n); // via screen driver
1117 static void screen_work_area(int &X, int &Y, int &W, int &H); // via screen driver
1118 static float screen_scale(int n); // via screen driver
1119 static void screen_scale(int n, float factor); // via screen driver
1120 static int screen_scaling_supported();
1121 static void keyboard_screen_scaling(int value);
1122
1131 // color map:
1132 static void set_color(Fl_Color, uchar, uchar, uchar);
1133 static void set_color(Fl_Color, uchar, uchar, uchar, uchar);
1138 static void set_color(Fl_Color i, unsigned c); // platform dependent
1139 static unsigned get_color(Fl_Color i);
1140 static void get_color(Fl_Color i, uchar &red, uchar &green, uchar &blue);
1141 static void get_color(Fl_Color i, uchar &red, uchar &green, uchar &blue, uchar &alpha);
1147 static void free_color(Fl_Color i, int overlay = 0); // platform dependent
1148
1149 // fonts:
1150 static const char* get_font(Fl_Font);
1163 static const char* get_font_name(Fl_Font, int* attributes = 0);
1175 static int get_font_sizes(Fl_Font, int*& sizep);
1176 static void set_font(Fl_Font, const char*);
1177 static void set_font(Fl_Font, Fl_Font);
1205 static Fl_Font set_fonts(const char* = 0); // platform dependent
1206
1213 // <Hack to re-order the 'Drawing functions' group>
1216 // labeltypes:
1217 static void set_labeltype(Fl_Labeltype, Fl_Label_Draw_F*, Fl_Label_Measure_F*);
1219 static void set_labeltype(Fl_Labeltype, Fl_Labeltype from); // is it defined ?
1220
1221 // boxtypes:
1222 static Fl_Box_Draw_F *get_boxtype(Fl_Boxtype);
1223 static void set_boxtype(Fl_Boxtype, Fl_Box_Draw_F*,
1224                          uchar, uchar, uchar, uchar,
1225                          Fl_Box_Draw_Focus_F* =NULL);
1226 static void set_boxtype(Fl_Boxtype, Fl_Boxtype from);
1227 static int box_dx(Fl_Boxtype);
1228 static int box_dy(Fl_Boxtype);
1229 static int box_dw(Fl_Boxtype);
1230 static int box_dh(Fl_Boxtype);
1231
1232 static int draw_box_active();
1233 static Fl_Color box_color(Fl_Color);
1234 static void set_box_color(Fl_Color);
1235
1236 // back compatibility:
1240 static void set_abort(Fl_Abort_Handler f) {fatal = f;}
1241 static void (*atclose)(Fl_Window*, void*);
1242 static void default_atclose(Fl_Window*, void*);
1246 static void set_atclose(Fl_Atclose_Handler f) {atclose = f;}
1252 static int event_shift() {return e_state & FL_SHIFT;}
1254 static int event_ctrl() {return e_state & FL_CTRL;}
1256 static int event_command() {return e_state & FL_COMMAND;}
1258 static int event_alt() {return e_state & FL_ALT;}
1267 static int event_buttons() {return e_state & FL_BUTTONS;}
1272 static int event_button1() {return e_state & FL_BUTTON1;}
1277 static int event_button2() {return e_state & FL_BUTTON2;}
1282 static int event_button3() {return e_state & FL_BUTTON3;}

```

```

1287 static int event_button4() {return e_state & FL_BUTTON4;}
1292 static int event_button5() {return e_state & FL_BUTTON5;}
1300 static void set_idle(Fl_Old_Idle_Handler cb) {idle = cb;}
1302 static void grab(Fl_Window& win) {grab(&win);}
1306 static void release() {grab(0);}
1307
1308 // Visible focus methods...
1314 static void visible_focus(int v) { option(OPTION_VISIBLE_FOCUS, (v!=0)); }
1320 static int visible_focus() { return option(OPTION_VISIBLE_FOCUS); }
1321
1322 // Drag-n-drop text operation methods...
1329 static void dnd_text_ops(int v) { option(OPTION_DND_TEXT, (v!=0)); }
1336 static int dnd_text_ops() { return option(OPTION_DND_TEXT); }
1341 // Multithreading support:
1342 static int lock();
1343 static void unlock();
1344 static void awake(void* message = 0);
1346 static int awake(Fl_Awake_Handler cb, void* message = 0);
1353 static void* thread_message(); // platform dependent
1385 // Widget deletion:
1386 static void delete_widget(Fl_Widget *w);
1387 static void do_widget_deletion();
1388 static void watch_widget_pointer(Fl_Widget *w);
1389 static void release_widget_pointer(Fl_Widget *w);
1390 static void clear_widget_pointer(Fl_Widget const *w);
1397 static void use_high_res_GL(int val) { use_high_res_GL_ = val; }
1403 static int use_high_res_GL() { return use_high_res_GL_; }
1404
1416 static void draw_GL_text_with_textures(int val) { draw_GL_text_with_textures_ = val; }
1417
1423 static int draw_GL_text_with_textures() { return draw_GL_text_with_textures_; }
1424
1425 static int system(const char *command);
1426
1427 // Convert Windows commandline arguments to UTF-8 (documented in src/Fl.cxx)
1428 static int args_to_utf8(int argc, char ** &argv);
1429
1430 #ifndef FLTK_HAVE_CAIRO
1434 public:
1435 // Cairo support API
1436
1437 static cairo_t *cairo_make_current(Fl_Window *w);
1438
1444 static void cairo_autolink_context(bool alink) {
1445     cairo_state_.autolink(alink);
1446 }
1447
1448 static bool cairo_autolink_context() {
1449     return cairo_state_.autolink();
1450 }
1451
1452 static cairo_t *cairo_cc() {
1453     return cairo_state_.cc();
1454 }
1455
1456 static void cairo_cc(cairo_t *c, bool own=false) {
1457     cairo_state_.cc(c, own);
1458 }
1459
1460 static void cairo_flush(cairo_t *c) {
1461     // flush Cairo drawings: necessary at least for Windows
1462     cairo_surface_t *s = cairo_get_target(c);
1463     cairo_surface_flush(s);
1464 }
1465
1466 private:
1467 static cairo_t *cairo_make_current(void *gc);
1468 static cairo_t *cairo_make_current(void *gc, int W, int H);
1469 static Fl_Cairo_State cairo_state_;
1470
1471 public:
1472 #endif // FLTK_HAVE_CAIRO
1473 };
1474
1475 class FL_EXPORT Fl_Widget_Tracker {
1476
1477     Fl_Widget* wp_;
1478
1479 public:
1480     Fl_Widget_Tracker(Fl_Widget *wi);
1481     ~Fl_Widget_Tracker();
1482
1483     Fl_Widget *widget() {return wp_;}
1484
1485     int deleted() {return wp_ == 0;}

```

```

1603
1613     int exists() {return wp_ != 0;}
1614
1615 };
1616
1622 #endif // !Fl_H

```

## 34.7 Fl\_Adjuster.H

```

1 //
2 // Adjuster widget header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Adjuster widget . */
19
20 // 3-button "slider", made for Nuke
21
22 #ifndef Fl_Adjuster_H
23 #define Fl_Adjuster_H
24
25 #ifndef Fl_Valuator_H
26 #include "Fl_Valuator.H"
27 #endif
28
29 class FL_EXPORT Fl_Adjuster : public Fl_Valuator {
30     int drag;
31     int ix;
32     int soft_;
33 protected:
34     void draw() FL_OVERRIDE;
35     int handle(int) FL_OVERRIDE;
36     void value_damage() FL_OVERRIDE;
37 public:
38     Fl_Adjuster(int X,int Y,int W,int H,const char *l=0);
39     void soft(int s) {soft_ = s;}
40     int soft()const {return soft_;}
41 };
42
43 #endif

```

## 34.8 Fl\_Anim\_GIF\_Image.H

```

1 //
2 // Fl_Anim_GIF_Image class header for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2016-2023 by Christian Grabner <wcout@gmx.net>.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Anim_Gif_Image_H
18 #define Fl_Anim_Gif_Image_H
19
20 // forward declarations
21 class Fl_Image;
22 class Fl_Widget;
23
24 #include <FL/Fl_GIF_Image.H>
25
26 // Load and display animated GIF images
27 class FL_EXPORT Fl_Anim_GIF_Image : public Fl_GIF_Image {

```

```

28
29  class FrameInfo; // internal helper class
30
31 public:
32
33  enum Flags {
34      DONT_START = 1,
35      DONT_RESIZE_CANVAS = 2,
36      DONT_SET_AS_IMAGE = 4,
37      OPTIMIZE_MEMORY = 8,
38      LOG_FLAG = 64,
39      DEBUG_FLAG = 128
40  };
41
42  // -- constructors and destructor
43  Fl_Anim_GIF_Image(const char *filename, Fl_Widget *canvas = 0, unsigned short flags = 0);
44  Fl_Anim_GIF_Image(const char* imagename, const unsigned char *data,
45                  const size_t length, Fl_Widget *canvas = 0,
46                  unsigned short flags = 0);
47  Fl_Anim_GIF_Image();
48  ~Fl_Anim_GIF_Image() FL_OVERRIDE;
49
50  // -- file handling
51  bool load(const char *name, const unsigned char *imgdata=NULL, size_t imglength=0);
52  bool valid() const;
53
54  // -- getters and setters
55  void frame_uncache(bool uncache);
56  bool frame_uncache() const;
57  double delay(int frame_) const;
58  void delay(int frame, double delay);
59  void canvas(Fl_Widget *canvas, unsigned short flags = 0);
60  Fl_Widget *canvas() const;
61  int canvas_w() const;
62  int canvas_h() const;
63  bool is_animated() const;
64  const char *name() const;
65  void speed(double speed);
66  double speed() const;
67
68  // -- animation
69  int frames() const;
70  void frame(int frame);
71  int frame() const;
72  Fl_Image *image() const;
73  Fl_Image *image(int frame) const;
74  bool start();
75  bool stop();
76  bool next();
77
78  bool playing()const { return valid() && Fl::has_timeout(cb_animate, (void *)this); }
79
80  // -- image data
81  Fl_Anim_GIF_Image& resize(int w, int h);
82  Fl_Anim_GIF_Image& resize(double scale);
83  int frame_x(int frame) const;
84  int frame_y(int frame) const;
85  int frame_w(int frame) const;
86  int frame_h(int frame) const;
87
88  // -- overridden methods
89  void color_average(Fl_Color c, float i) FL_OVERRIDE;
90  Fl_Image *copy(int W, int H) const FL_OVERRIDE;
91  Fl_Image *copy()const { return Fl_Pixmap::copy(); }
92  void desaturate() FL_OVERRIDE;
93  void draw(int x, int y, int w, int h, int cx = 0, int cy = 0) FL_OVERRIDE;
94  void uncache() FL_OVERRIDE;
95
96  // -- debugging and logging
97  int debug() const;
98
99  // -- static methods
100  static int frame_count(const char *name, const unsigned char *imgdata = NULL, size_t imglength = 0);
101
102  static bool loop;
103
104  static double min_delay;
105
106 protected:
107  bool next_frame();
108  void clear_frames();
109  void set_frame(int frame);
110
111  static void cb_animate(void *d);
112  void scale_frame();
113  void set_frame();

```

```

170 void on_frame_data(Fl_GIF_Image::GIF_FRAME &f) FL_OVERRIDE;
171 void on_extension_data(Fl_GIF_Image::GIF_FRAME &f) FL_OVERRIDE;
172
173 private:
174
175 char *name_;
176 unsigned short flags_;
177 Fl_Widget *canvas_;
178 bool uncache_;
179 bool valid_;
180 int frame_; // current frame
181 double speed_;
182 FrameInfo *fi_;
183 };
184
185 #endif // Fl_Anim_Gif_Image_H

```

## 34.9 fl\_ask.H File Reference

API for common dialogs.

```

#include <FL/Enumerations.H>
#include <FL/fl_attr.h>
#include <string>

```

### Enumerations

- enum [Fl\\_Beep](#) {  
[FL\\_BEEP\\_DEFAULT](#) = 0 , [FL\\_BEEP\\_MESSAGE](#) , [FL\\_BEEP\\_ERROR](#) , [FL\\_BEEP\\_QUESTION](#) ,  
[FL\\_BEEP\\_PASSWORD](#) , [FL\\_BEEP\\_NOTIFICATION](#) }

*Defines the different system beeps available.*

### Functions

- void void [fl\\_alert](#) (const char \*,...) [\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_printf\\_\\_](#)
- void void int [fl\\_ask](#) (const char \*,...) [\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_printf\\_\\_](#)
- void [fl\\_beep](#) (int type=[FL\\_BEEP\\_DEFAULT](#))  
*Emits a system beep.*
- int [fl\\_choice](#) (const char \*q, const char \*b0, const char \*b1, const char \*b2,...) [\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_↵  
printf\\_\\_](#)
- int const char const char int [fl\\_choice\\_n](#) (const char \*q, const char \*b0, const char \*b1, const char \*b2,...)  
[\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_printf\\_\\_](#)
- int const char \* [fl\\_input](#) (const char \*label, const char \*deflt=0,...) [\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_printf\\_\\_](#)
- int const char const char int const char \* [fl\\_input](#) (int maxchar, const char \*label, const char \*deflt=0,...)  
[\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_printf\\_\\_](#)
- int const char const char int const char const char std::string std::string [fl\\_input\\_str](#) (int &ret, int maxchar,  
const char \*label, const char \*deflt=0,...) [\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_printf\\_\\_](#)
- int const char const char int const char const char std::string [fl\\_input\\_str](#) (int maxchar, const char \*label,  
const char \*deflt=0,...) [\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_printf\\_\\_](#)
- void [fl\\_message](#) (const char \*,...) [\\_\\_fl\\_attr\(\(\\_\\_format\\_\\_\(\\_\\_printf\\_\\_](#)
- void [fl\\_message\\_font](#) ([Fl\\_Font](#) f, [Fl\\_Fontsize](#) s)
- void [fl\\_message\\_hotspot](#) (int enable)  
*Sets whether or not to move the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#),  
[fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#) to follow the mouse pointer.*
- int [fl\\_message\\_hotspot](#) (void)  
*Gets whether or not to move the message box used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#), [fl\\_ask\(\)](#),  
[fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#) to follow the mouse pointer.*
- int const char const char int const char const char std::string std::string std::string std::string [Fl\\_Widget](#) \*  
[fl\\_message\\_icon](#) ()  
*Gets the [Fl\\_Box](#) icon container of the current default dialog used in many common dialogs like [fl\\_message\(\)](#), [fl\\_alert\(\)](#),  
[fl\\_ask\(\)](#), [fl\\_choice\(\)](#), [fl\\_input\(\)](#), [fl\\_password\(\)](#).*

- void `fl_message_icon_label` (const char \*str)  
*Sets the icon label of the dialog window used in many common dialogs.*
- void `fl_message_position` (const int x, const int y, const int center=0)  
*Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*
- void `fl_message_position` (FL\_Widget &widget)
- void `fl_message_position` (FL\_Widget \*widget)  
*Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*
- int `fl_message_position` (int \*x=0, int \*y=0)  
*Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*
- void `fl_message_title` (const char \*title)  
*Sets the title of the dialog window used in many common dialogs.*
- void `fl_message_title_default` (const char \*title)  
*Sets the default title of the dialog window used in many common dialogs.*
- int const char const char \* `fl_password` (const char \*label, const char \*deflt=0,...) `__fl_attr((__format__ (__printf__`
- int const char const char int const char const char \* `fl_password` (int maxchar, const char \*label, const char \*deflt=0,...) `__fl_attr((__format__ (__printf__`
- int const char const char int const char const char std::string std::string std::string std::string `fl_password_str` (int &ret, int maxchar, const char \*label, const char \*deflt=0,...) `__fl_attr((__format__ (__printf__`
- int const char const char int const char const char std::string std::string std::string `fl_password_str` (int maxchar, const char \*label, const char \*deflt=0,...) `__fl_attr((__format__ (__printf__`

## Variables

- void void int `__deprecated__`
- const char \* `fl_cancel`  
*string pointer used in common dialogs, you can change it to another language*
- const char \* `fl_close`  
*string pointer used in common dialogs, you can change it to another language*
- `FL_Font fl_message_font_`
- `FL_Fontsize fl_message_size_`
- const char \* `fl_no`  
*string pointer used in common dialogs, you can change it to another language*
- const char \* `fl_ok`  
*string pointer used in common dialogs, you can change it to another language*
- const char \* `fl_yes`  
*string pointer used in common dialogs, you can change it to another language*

### 34.9.1 Detailed Description

API for common dialogs.

### 34.9.2 Enumeration Type Documentation

### 34.9.2.1 Fl\_Beep

enum [Fl\\_Beep](#)

Defines the different system beeps available.

Some systems may play different sounds or use different sound volume depending on the `Fl_Beep` value. The implementation is platform dependent.

See also

[fl\\_beep\(int\)](#)

Enumerator

<code>FL_BEEP_DEFAULT</code>	Default beep.
<code>FL_BEEP_MESSAGE</code>	Message beep.
<code>FL_BEEP_ERROR</code>	Error beep.
<code>FL_BEEP_QUESTION</code>	Question beep.
<code>FL_BEEP_PASSWORD</code>	Password beep.
<code>FL_BEEP_NOTIFICATION</code>	Notification beep.

## 34.9.3 Function Documentation

### 34.9.3.1 fl\_message\_position()

```
void fl_message_position (
    Fl\_Widget & widget ) [inline]
```

See also

[fl\\_message\\_position\(Fl\\_Widget \\*widget\).](#)

## 34.10 fl\_ask.H

[Go to the documentation of this file.](#)

```
1 //
2 // Standard dialog header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2025 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
21 #ifndef _FL_fl_ask_H_
22 #define _FL_fl_ask_H_
23
24 #include <FL/Enumerations.H>
25 #include <FL/fl_attr.h>
26
27 #include <string>
28
29 class Fl\_Widget;
30
31 enum Fl\_Beep {
32     FL_BEEP_DEFAULT = 0,
33     FL_BEEP_MESSAGE,
34     FL_BEEP_ERROR,
35     FL_BEEP_QUESTION,
36 }
```

```

43  FL_BEEP_PASSWORD,
44  FL_BEEP_NOTIFICATION
45  };
46
47 FL_EXPORT void fl_bEEP(int type = FL_BEEP_DEFAULT);
48 FL_EXPORT void fl_message(const char *, ...) __fl_attr((__format__ (__printf__, 1, 2)));
49 FL_EXPORT void fl_alert(const char *, ...) __fl_attr((__format__ (__printf__, 1, 2)));
50
51 // fl_ask() is deprecated since it uses "Yes" and "No" for the buttons,
52 // which does not conform to the current FLTK Human Interface Guidelines.
53 // Use fl_choice() or fl_choice_n() with the appropriate verbs instead.
54
55 FL_EXPORT int fl_ask(const char *, ...) __fl_attr((__format__ (__printf__, 1, 2), __deprecated__));
56
57 FL_EXPORT int fl_choice(const char *q, const char *b0, const char *b1, const char *b2, ...)
58     __fl_attr((__format__ (__printf__, 1, 5)));
59 FL_EXPORT const char *fl_input(const char *label, const char *deflt = 0, ...)
60     __fl_attr((__format__ (__printf__, 1, 3)));
61 FL_EXPORT const char *fl_password(const char *label, const char *deflt = 0, ...)
62     __fl_attr((__format__ (__printf__, 1, 3)));
63
64 // since FLTK 1.3.8:
65 // - fl_choice_n() with extended return value (-2, -1, 0, 1, 2)
66
67 FL_EXPORT int fl_choice_n(const char *q, const char *b0, const char *b1, const char *b2, ...)
68     __fl_attr((__format__ (__printf__, 1, 5)));
69
70 // since FLTK 1.4.0: with 'maxchar' to limit input size
71
72 FL_EXPORT const char *fl_input(int maxchar, const char *label, const char *deflt = 0, ...)
73     __fl_attr((__format__ (__printf__, 2, 4)));
74 FL_EXPORT const char *fl_password(int maxchar, const char *label, const char *deflt = 0, ...)
75     __fl_attr((__format__ (__printf__, 2, 4)));
76
77 // since FLTK 1.4.0 -- optional
78 // since FLTK 1.5.0 -- always
79
80 // - fl_input_str() with limited input size, returns std::string
81 // - fl_password_str() with limited input size, returns std::string
82
83 FL_EXPORT std::string fl_input_str(int maxchar, const char *label, const char *deflt = 0, ...)
84     __fl_attr((__format__ (__printf__, 2, 4)));
85 FL_EXPORT std::string fl_input_str(int &ret, int maxchar, const char *label, const char *deflt = 0, ...)
86     __fl_attr((__format__ (__printf__, 3, 5)));
87 FL_EXPORT std::string fl_password_str(int maxchar, const char *label, const char *deflt = 0, ...)
88     __fl_attr((__format__ (__printf__, 2, 4)));
89 FL_EXPORT std::string fl_password_str(int &ret, int maxchar, const char *label, const char *deflt = 0,
90     ...)
91     __fl_attr((__format__ (__printf__, 3, 5)));
92
93 FL_EXPORT Fl_Widget *fl_message_icon();
94
95 extern FL_EXPORT Fl_Font fl_message_font_;
96 extern FL_EXPORT Fl_Fontsize fl_message_size_;
97 inline void fl_message_font(Fl_Font f, Fl_Fontsize s) {
98     fl_message_font_ = f;
99     fl_message_size_ = s;
100 }
101
102 FL_EXPORT void fl_message_hotspot(int enable);
103 FL_EXPORT int fl_message_hotspot(void);
104
105 // since FLTK 1.4.0: fl_message_position()
106
107 FL_EXPORT void fl_message_position(const int x, const int y, const int center = 0);
108 FL_EXPORT void fl_message_position(Fl_Widget *widget);
109 FL_EXPORT int fl_message_position(int *x = 0, int *y = 0);
110
111 inline void fl_message_position(Fl_Widget &widget) {
112     fl_message_position(&widget);
113 }
114
115 FL_EXPORT void fl_message_title(const char *title);
116 FL_EXPORT void fl_message_title_default(const char *title);
117
118 FL_EXPORT void fl_message_icon_label(const char *str);
119
120 // pointers you can use to change FLTK to another language:
121 extern FL_EXPORT const char *fl_no;
122 extern FL_EXPORT const char *fl_yes;
123 extern FL_EXPORT const char *fl_ok;
124 extern FL_EXPORT const char *fl_cancel;
125 extern FL_EXPORT const char *fl_close;
126

```

```
129 #endif // !_FL_fl_ask_H_
```

## 34.11 fl\_attr.h File Reference

This file defines compiler-specific macros.

### Macros

- `#define __fl_attr(x)`  
*This section lists macros for Doxygen documentation only.*
- `#define FL_DEPRECATED(msg, func)`  
*Enclosing a function or method in FL\_DEPRECATED marks it as no longer recommended.*
- `#define FL_OVERRIDE` override  
*This macro makes it safe to use the C++11 keyword `override` with older compilers.*

### 34.11.1 Detailed Description

This file defines compiler-specific macros.

### 34.11.2 Macro Definition Documentation

#### 34.11.2.1 \_\_fl\_attr

```
#define __fl_attr(  
    x )
```

This section lists macros for Doxygen documentation only.

The next section will define the actual macros based on the compiler used and based on the capabilities of the version of that compiler. To be used in prototypes with a variable list of arguments. This macro helps detection of mismatches between format string and argument list at compilation time.

Usage example: [FL/fl\\_ask.H](#)

#### 34.11.2.2 FL\_DEPRECATED

```
#define FL_DEPRECATED(  
    msg,  
    func )
```

##### Value:

```
/*##### \deprecated msg *##/ \  
func
```

Enclosing a function or method in FL\_DEPRECATED marks it as no longer recommended.

This macro syntax can not be used if the return type contains a comma, which is not the case in FLTK.

```
FL_DEPRECATED("Outdated, don't use", int position()) { return position; }
```

#### 34.11.2.3 FL\_OVERRIDE

```
#define FL_OVERRIDE override
```

This macro makes it safe to use the C++11 keyword `override` with older compilers.

Since FLTK 1.5.0 a C++11 capable compiler is required, hence we can safely define FL\_OVERRIDE unconditionally as 'override'.

This macro is kept for backwards compatibility with old (1.4.x) user code that uses the FL\_OVERRIDE macro.

We recommend to use 'override' explicitly if C++11 or higher is available.

## 34.12 fl\_attr.h

[Go to the documentation of this file.](#)

```

1 /*
2  * Function attribute declarations for the Fast Light Tool Kit (FLTK).
3  *
4  * Copyright 1998-2025 by Bill Spitzak and others.
5  *
6  * This library is free software. Distribution and use rights are outlined in
7  * the file "COPYING" which should have been included with this file. If this
8  * file is missing or damaged, see the license at:
9  *
10 *      https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *      https://www.fltk.org/bugs.php
15 */
16
17 #ifndef _FL_fl_attr_h_
18 #define _FL_fl_attr_h_
19
20 #define FL_OVERRIDE override
21
22 #ifdef FL_DOXYGEN
23
24 #define __fl_attr(x)
25
26 #define FL_DEPRECATED(msg, func) \
27 /##### \deprecated msg ####/ \
28 func
29
30 #else /* FL_DOXYGEN */
31
32 // If FL_NO_DEPRECATED is defined FLTK 1.4 can compile 1.3.x code without
33 // issuing several "deprecated" warnings (1.3 "compatibility" mode).
34 // FL_DEPRECATED will be defined as a no-op.
35
36 // If FL_NO_DEPRECATED is not defined (default) FLTK 1.4 will issue several
37 // "deprecated" warnings depending on the compiler in use: FL_DEPRECATED
38 // will be defined according to the capabilities of the compiler (below).
39 // The definition below this comment must match the one at the end of this file.
40
41 #if defined(FL_NO_DEPRECATED)
42 #define FL_DEPRECATED(msg, func) func
43 #endif
44
45 #ifdef __cplusplus
46
47 /*
48  * Declare macros specific to Visual Studio.
49  *
50  * Visual Studio defines __cplusplus = '199711L' in all its versions which is
51  * not helpful for us here. For VS version number encoding see:
52  * https://learn.microsoft.com/en-us/cpp/preprocessor/predefined-macros
53  *
54  * This document specifies that the macro _MSVC_LANG is defined since
55  * "Visual Studio 2015 Update 3" as 201402L (default) and undefined in
56  * earlier versions. It can be used to determine the C++ standard as
57  * specified by the /std:c++ compiler option:
58  *
59  * 101 - /std:c++14      201402L (also if /std:c++ is not used)
60  * 102 - /std:c++17      201703L
61  * 103 - /std:c++20      202002L
62  * 104 - /std:c++latest  a "higher, unspecified value" (docs of VS 2022)
63  *
64  * As of this writing (02/2023) _MSVC_LANG is not yet used in this file
65  * but it is documented for future use.
66  */
67
68 #if defined(_MSC_VER)
69
70 #if (_MSC_VER >= 1900) // Visual Studio 2015 (14.0)
71 #endif // Visual Studio 2015 (14.0)
72
73 #if (_MSC_VER >= 1400) // Visual Studio 2005 (8.0)
74 #endif
75
76 #ifndef FL_DEPRECATED
77 #define FL_DEPRECATED(msg, func) __declspec(deprecated(msg)) func
78 #endif
79 #endif // Visual Studio 2005 (8.0)
80
81 #endif
82

```

```

121 #if (_MSC_VER >= 1310) // Visual Studio .NET 2003 (7.1)
122 #ifndef FL_DEPRECATED
123 #define FL_DEPRECATED(msg, func) __declspec(deprecated) func
124 #endif
125 #endif // Visual Studio .NET 2003 (7.1)
126
127 #endif // Visual Studio
128
129
130 /*
131 Declare macros specific to the C++ standard used.
132
133 Macros may have been declared already in previous sections.
134 */
135 #if (__cplusplus >= 202002L) // C++20
136 #endif // C++20
137
138 #if (__cplusplus >= 201703L) // C++17
139 #endif // C++17
140
141 #if (__cplusplus >= 201402L) // C++14
142 #ifndef FL_DEPRECATED
143 #define FL_DEPRECATED(msg, func) [[deprecated(msg)]] func
144 #endif
145 #endif // C++14
146
147 #if (__cplusplus >= 201103L) // C++11
148 #endif // C++11
149
150 #if (__cplusplus >= 199711L) // C++89
151 #endif // C++89
152
153 #endif // __cplusplus
154
155 /*
156 Declare macros specific to clang
157
158 Macros may have been declared already in previous sections.
159 */
160 #if defined(__clang__)
161
162 #define FL_CLANG_VERSION (__clang_major__ * 10000 + __clang_minor__ * 100 + __clang_patchlevel__)
163
164 // -- nothing yet --
165
166 #endif /* __clang__ */
167
168
169 /*
170 Declare macros specific to gcc.
171
172 Macros may have been declared already in previous sections.
173 */
174 #if defined(__GNUC__)
175
176 #define FL_GCC_VERSION (__GNUC__ * 10000 + __GNUC_MINOR__ * 100 + __GNUC_PATCHLEVEL__)
177
178 #ifndef __fl_attr
179 #define __fl_attr(x) __attribute__(x)
180 #endif
181
182 #if FL_GCC_VERSION > 40500 /* gcc 4.5.0 */
183 #ifndef FL_DEPRECATED
184 #define FL_DEPRECATED(msg, func) func __attribute__((deprecated(msg)))
185 #endif
186 #endif /* gcc 4.5.0 */
187
188 #if FL_GCC_VERSION >= 30400 /* gcc 3.4.0 */
189 #ifndef FL_DEPRECATED
190 #define FL_DEPRECATED(msg, func) func __attribute__((deprecated))
191 #endif
192 #endif /* gcc 3.4.0 */
193
194 #endif /* __GNUC__ */
195
196
197 /*
198 If a macro was not defined in any of the sections above, set it to no-op here.
199 */
200
201 #ifndef __fl_attr
202 #define __fl_attr(x)
203 #endif
204
205 #ifndef FL_DEPRECATED
206 #define FL_DEPRECATED(msg, func) func
207 #endif

```

```

208
209
210 #endif /* FL_DOXYGEN */
211
212
213 #endif /* !_FL_fl_attr_h_ */

```

### 34.13 Fl\_Bitmap.H

```

1 //
2 // Bitmap header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2017 by Bill Spitzak and others.
5 //
6 // This library is free software.  Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file.  If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Bitmap widget . */
19
20 #ifndef Fl_Bitmap_H
21 #define Fl_Bitmap_H
22 #include "Fl_Image.H"
23 #include "Fl_Widget.H" // for fl_uintptr_t
24
25 class Fl_Widget;
26 struct Fl_Menu_Item;
27
28 class FL_EXPORT Fl_Bitmap : public Fl_Image {
29     friend class Fl_Graphics_Driver;
30 public:
31     const uchar *array;
32     int alloc_array;
33
34 private:
35     fl_uintptr_t id_;
36     int cache_w_, cache_h_; // size of bitmap when cached
37
38 public:
39     Fl_Bitmap(const uchar *bits, int W, int H) :
40         Fl_Image(W,H,0), array(bits), alloc_array(0), id_(0), cache_w_(0), cache_h_(0) {data((const char
41         **) &array, 1);}
42
43     Fl_Bitmap(const char *bits, int W, int H) :
44         Fl_Image(W,H,0), array((const uchar *)bits), alloc_array(0), id_(0), cache_w_(0), cache_h_(0)
45         {data((const char **) &array, 1);}
46
47     Fl_Bitmap(const uchar *bits, int bits_length, int W, int H);
48     Fl_Bitmap(const char *bits, int bits_length, int W, int H);
49     virtual ~Fl_Bitmap();
50     Fl_Image *copy(int W, int H) const FL_OVERRIDE;
51     Fl_Image *copy() const { return Fl_Image::copy(); }
52     void draw(int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE;
53     void draw(int X, int Y) {draw(X, Y, w(), h(), 0, 0);}
54     void label(Fl_Widget*w) FL_OVERRIDE;
55     void label(Fl_Menu_Item*m) FL_OVERRIDE;
56     void uncache() FL_OVERRIDE;
57     int cache_w() {return cache_w_;}
58     int cache_h() {return cache_h_;}
59 };
60
61 #endif

```

### 34.14 Fl\_BMP\_Image.H

```

1 //
2 // BMP image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software.  Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file.  If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //

```

```

12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_BMP_Image widget . */
19
20 #ifndef Fl_BMP_Image_H
21 #define Fl_BMP_Image_H
22 #  include "Fl_Image.H"
23
24 class FL_EXPORT Fl_BMP_Image : public Fl_RGB_Image {
25 public:
26     Fl_BMP_Image(const char* filename);
27     Fl_BMP_Image(const char* imagename, const unsigned char *data, const long length = -1);
28
29 protected:
30     void load_bmp_(class Fl_Image_Reader &rdr, int ico_height = 0, int ico_width = 0);
31 };
32
33 #endif

```

## 34.15 Fl\_Box.H File Reference

[Fl\\_Box](#) widget.

```
#include "Fl_Widget.H"
```

### Classes

- class [Fl\\_Box](#)

*This widget simply draws its box, and possibly its label.*

### 34.15.1 Detailed Description

[Fl\\_Box](#) widget.

## 34.16 Fl\_Box.H

[Go to the documentation of this file.](#)

```

1 //
2 // Box header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2025 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Box_H
18 #define Fl_Box_H
19
20 #ifndef Fl_Widget_H
21 #include "Fl_Widget.H"
22 #endif
23
24 class FL_EXPORT Fl_Box : public Fl_Widget {
25 protected:
26     void draw() FL_OVERRIDE;
27 public:
28     Fl_Box(int X, int Y, int W, int H, const char *L = 0);
29
30     Fl_Box(Fl_Boxtype B, int X, int Y, int W, int H, const char *L);

```

```

74
75  int handle(int) FL_OVERRIDE;
76  };
77
78  #endif

```

## 34.17 Fl\_Browser.H

```

1  //
2  // Browser header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2023 by Bill Spitzak and others.
5  //
6  // This library is free software.  Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file.  If this
8  // file is missing or damaged, see the license at:
9  //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Browser widget . */
19
20 // Forms-compatible browser.  Probably useful for other
21 // lists of textual data.  Notice that the line numbers
22 // start from 1, and 0 means "no line".
23
24 #ifndef Fl_Browser_H
25 #define Fl_Browser_H
26
27 #include "Fl_Browser_.H"
28 #include "Fl_Image.H"
29
30 struct FL_BLINE;
31
32 class FL_EXPORT Fl_Browser : public Fl_Browser_ {
33
34     FL_BLINE *first;           // the array of lines
35     FL_BLINE *last;
36     FL_BLINE *cache;
37     int cacheline;            // line number of cache
38     int lines;                // Number of lines
39     int full_height_;
40     const int* column_widths_;
41     char format_char_;        // alternative to @-sign
42     char column_char_;        // alternative to tab
43
44 protected:
45
46     // required routines for Fl_Browser_ subclass:
47     void* item_first() const FL_OVERRIDE;
48     void* item_next(void* item) const FL_OVERRIDE;
49     void* item_prev(void* item) const FL_OVERRIDE;
50     void* item_last() const FL_OVERRIDE;
51     int item_selected(void* item) const FL_OVERRIDE;
52     void item_select(void* item, int val) FL_OVERRIDE;
53     int item_height(void* item) const FL_OVERRIDE;
54     int item_width(void* item) const FL_OVERRIDE;
55     void item_draw(void* item, int X, int Y, int W, int H) const FL_OVERRIDE;
56     int full_height() const FL_OVERRIDE;
57     int incr_height() const FL_OVERRIDE;
58     const char* item_text(void* item) const FL_OVERRIDE;
59     void item_swap(void* a, void* b) FL_OVERRIDE { swap((FL_BLINE*)a, (FL_BLINE*)b); }
60     void* item_at(int line) const FL_OVERRIDE { return (void*)find_line(line); }
61
62     FL_BLINE* find_line(int line) const ;
63     FL_BLINE* _remove(int line) ;
64     void insert(int line, FL_BLINE* item);
65     int lineno(void* item) const ;
66     void swap(FL_BLINE* a, FL_BLINE* b);
67
68 public:
69
70     void remove(int line);
71     void add(const char* newtext, void* d = 0);
72     void insert(int line, const char* newtext, void* d = 0);
73     void move(int to, int from);
74     int load(const char* filename);
75     void swap(int a, int b);
76     void clear();
77
78 };

```

```

147 int size()const { return lines; }
148 void size(int W, int H) { Fl_Widget::size(W, H); }
149
153 Fl_Fontsize textsize()const { return Fl_Browser_::textsize(); }
154
155 /*
156 Sets the default text size for the lines in the browser to newSize.
157 Defined and documented in Fl_Browser.cxx
158 */
159 void textsize(Fl_Fontsize newSize);
160
161 int topline() const ;
163 enum Fl_Line_Position { TOP, BOTTOM, MIDDLE };
164 void lineposition(int line, Fl_Line_Position pos);
171 void topline(int line) { lineposition(line, TOP); }
178 void bottomline(int line) { lineposition(line, BOTTOM); }
185 void middleline(int line) { lineposition(line, MIDDLE); }
186
187 int select(int line, int val=1);
188 int selected(int line) const ;
189 void show(int line);
191 void show() FL_OVERRIDE { Fl_Widget::show(); }
192 void hide(int line);
194 void hide() FL_OVERRIDE { Fl_Widget::hide(); }
195 int visible(int line) const ;
196
197 int value() const ;
203 void value(int line) { select(line); }
204 const char* text(int line) const ;
205 void text(int line, const char* newtext);
206 void* data(int line) const ;
207 void data(int line, void* d);
208
209 Fl_Browser(int X, int Y, int W, int H, const char *L = 0);
213 ~Fl_Browser() { clear(); }
214
246 char format_char()const { return format_char_; }
252 void format_char(char c) { format_char_ = c; }
258 char column_char()const { return column_char_; }
265 void column_char(char c) { column_char_ = c; }
289 const int* column_widths()const { return column_widths_; }
294 void column_widths(const int* arr) { column_widths_ = arr; }
295
305 int displayed(int line)const { return Fl_Browser_::displayed(find_line(line)); }
306
314 void make_visible(int line) {
315     if (line < 1) Fl_Browser_::display(find_line(1));
316     else if (line > lines) Fl_Browser_::display(find_line(lines));
317     else Fl_Browser_::display(find_line(line));
318 }
319
320 // icon support
321 void icon(int line, Fl_Image* icon);
322 Fl_Image* icon(int line) const;
323 void remove_icon(int line);
324
326 void replace(int a, const char* b) { text(a, b); }
327 void display(int line, int val=1);
328 };
329
330 #endif

```

## 34.18 Fl\_Browser\_.H

```

1 //
2 // Common browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2016 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Browser_ widget . */
19
20 // Yes, I know this should be a template...
21

```

```

22 #ifndef Fl_Browser__H
23 #define Fl_Browser__H
24
25 #ifndef Fl_Group_H
26 #include "Fl_Group.H"
27 #endif
28 #include "Fl_Scrollbar.H"
29 #include <FL/Fl.H> // Fl::scrollbar_size()
30
31 #define FL_NORMAL_BROWSER 0
32 #define FL_SELECT_BROWSER 1
33 #define FL_HOLD_BROWSER 2
34 #define FL_MULTI_BROWSER 3
35 #define FL_SORT_ASCENDING 0
36 #define FL_SORT_DESCENDING 1
37 #define FL_SORT_CASEINSENSITIVE 0x2
38 #define FL_EXPORT Fl_Browser_ : public Fl_Group {
39
40     int position_; // where user wants it scrolled to
41     int real_position_; // the current vertical scrolling position
42     int hposition_; // where user wants it panned to
43     int real_hposition_; // the current horizontal scrolling position
44     int offset_; // how far down top_ item the real_position is
45     int max_width_; // widest object seen so far
46     uchar has_scrollbar_; // which scrollbars are enabled
47     Fl_Font textfont_;
48     Fl_Fontsize textsize_;
49     Fl_Color textcolor_;
50     void* top_; // which item scrolling position is in
51     void* selection_; // which is selected (except for FL_MULTI_BROWSER)
52     void *redrawl,*redraw2; // minimal update pointers
53     void* max_width_item; // which item has max_width_
54     int scrollbar_size_; // size of scrollbar trough
55     int linespacing_;
56
57     void update_top();
58
59 protected:
60
61     // All of the following must be supplied by the subclass:
62     virtual void *item_first() const = 0;
63     virtual void *item_next(void *item) const = 0;
64     virtual void *item_prev(void *item) const = 0;
65     virtual void *item_last() const { return 0L; }
66     virtual int item_height(void *item) const = 0;
67     virtual int item_width(void *item) const = 0;
68     virtual int item_quick_height(void *item) const ;
69     virtual void item_draw(void *item,int X,int Y,int W,int H) const = 0;
70     virtual const char *item_text(void *item) const { (void)item; return 0L; }
71     virtual void item_swap(void *a,void *b) { (void)a; (void)b; }
72     virtual void *item_at(int index) const { (void)index; return 0L; }
73     // you don't have to provide these but it may help speed it up:
74     virtual int full_width() const ; // current width of all items
75     virtual int full_height() const ; // current height of all items
76     virtual int incr_height() const ; // average height of an item
77     // These only need to be done by subclass if you want a multi-browser:
78     virtual void item_select(void *item,int val=1);
79     virtual int item_selected(void *item) const ;
80
81     // things the subclass may want to call:
82     void *top() const { return top_; }
83     void *selection() const { return selection_; }
84     void new_list(); // completely clobber all data, as though list replaced
85     void deleting(void *item); // get rid of any pointers to item
86     void replacing(void *a,void *b); // change a pointers to b
87     void swapping(void *a,void *b); // exchange pointers a and b
88     void inserting(void *a,void *b); // insert b near a
89     int displayed(void *item) const ; // true if this item is visible
90     void redraw_line(void *item); // minimal update, no change in size
91     void redraw_lines() { damage(FL_DAMAGE_SCROLL); } // redraw all of them
92     void bbox(int &X,int &Y,int &W,int &H) const;
93     int leftedge() const; // x position after scrollbar & border
94     void *find_item(int ypos); // item under mouse
95
96     void draw() FL_OVERRIDE;
97     Fl_Browser_(int X,int Y,int W,int H,const char *L=0);
98
99 public:
100
101     Fl_Scrollbar scrollbar;
102     Fl_Scrollbar hscrollbar;
103
104     int handle(int event) FL_OVERRIDE;
105     void resize(int X,int Y,int W,int H) FL_OVERRIDE;
106
107     int select(void *item,int val=1,int docallbacks=0);
108     int select_only(void *item,int docallbacks=0);
109     int deselect(int docallbacks=0);

```

```

248 int vposition()const { return position_; }
249 FL_DEPRECATED("since 1.4.0 - use vposition() instead",
250 int position() const) { return vposition(); }
251
252 void vposition(int pos); // scroll to here
253 FL_DEPRECATED("since 1.4.0 - use vposition(pos) instead",
254 void position(int pos)) { return vposition(pos); }
255 void position(int x, int y) { Fl_Group::position(x, y); }
256
264 int hposition()const { return hposition_; }
265 void hposition(int); // pan to here
266 void display(void *item); // scroll so this item is shown
267
277 enum { // values for has_scrollbar()
278     HORIZONTAL = 1,
279     VERTICAL = 2,
280     BOTH = 3,
281     ALWAYS_ON = 4,
282     HORIZONTAL_ALWAYS = 5,
283     VERTICAL_ALWAYS = 6,
284     BOTH_ALWAYS = 7
285 };
289 uchar has_scrollbar()const { return has_scrollbar_; }
312 void has_scrollbar(uchar mode) { has_scrollbar_ = mode; }
313
318 Fl_Font textfont()const { return textfont_; }
322 void textfont(Fl_Font font) { textfont_ = font; }
323
327 Fl_Fonsize textsize()const { return textsize_; }
331 void textsize(Fl_Fonsize newSize) { textsize_ = newSize; }
332
336 Fl_Color textcolor()const { return textcolor_; }
340 void textcolor(Fl_Color col) { textcolor_ = col; }
341
351 int scrollbar_size()const {
352     return(scrollbar_size_);
353 }
373 void scrollbar_size(int newSize) {
374     scrollbar_size_ = newSize;
375 }
381 int scrollbar_width()const {
382     return(Fl::scrollbar_size());
383 }
389 void scrollbar_width(int width) {
390     Fl::scrollbar_size(width);
391     scrollbar_size_ = 0;
392 }
397 void scrollbar_right() { scrollbar.align(FL_ALIGN_RIGHT); }
402 void scrollbar_left() { scrollbar.align(FL_ALIGN_LEFT); }
403 void sort(int flags=0);
404
409 void linespacing(int pixels) { linespacing_ = pixels; }
410
414 int linespacing()const { return linespacing_; }
415 };
416
417 #endif

```

## 34.19 Fl\_Button.H

```

1 //
2 // Button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2014 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Button widget . */
19
20 #ifndef Fl_Button_H
21 #define Fl_Button_H
22
23 #ifndef Fl_Widget_H
24 #include "Fl_Widget.H"
25 #endif

```

```

26
27 // values for type()
28 #define FL_NORMAL_BUTTON          0
29 #define FL_TOGGLE_BUTTON          1
30 #define FL_RADIO_BUTTON           (FL_RESERVED_TYPE+2)
31 #define FL_HIDDEN_BUTTON          3
32
33 extern FL_EXPORT Fl_Shortcut fl_old_shortcut(const char*);
34
35 class Fl_Widget_Tracker;
36
37 class FL_EXPORT Fl_Button : public Fl_Widget {
38
39     int shortcut_;
40     char value_;
41     char oldval;
42     uchar down_box_;
43     uchar compact_;
44
45 protected:
46
47     static Fl_Widget_Tracker *key_release_tracker;
48     static void key_release_timeout(void*);
49     void simulate_key_action();
50
51     void draw() FL_OVERRIDE;
52
53 public:
54
55     int handle(int) FL_OVERRIDE;
56
57     Fl_Button(int X, int Y, int W, int H, const char *L = 0);
58
59     int value(int v);
60
61     char value()const {return value_;}
62
63     int set() {return value(1);}
64
65     int clear() {return value(0);}
66
67     void setonly(); // this should only be called on FL_RADIO_BUTTONs
68
69     int shortcut()const {return shortcut_;}
70
71     void shortcut(int s) {shortcut_ = s;}
72
73     Fl_Boxtype down_box()const {return (Fl_Boxtype)down_box_;}
74
75     void down_box(Fl_Boxtype b) {down_box_ = b;}
76
77     void shortcut(const char *s) {shortcut(fl_old_shortcut(s));}
78
79     Fl_Color down_color()const {return selection_color();}
80
81     void down_color(unsigned c) {selection_color(c);}
82
83     // handle flag for compact buttons, documentation in source code
84     void compact(uchar v);
85
86     uchar compact() { return compact_; }
87 };
88 #endif

```

## 34.20 FL\_Cairo.H File Reference

Cairo is currently supported for the following platforms: Windows, macOS, Unix/Linux (X11 + Wayland).

```
#include <FL/Fl.H>
```

```
#include <cairo.h>
```

### Classes

- class [Fl\\_Cairo\\_State](#)

*Contains all the necessary info on the current cairo context.*

### 34.20.1 Detailed Description

Cairo is currently supported for the following platforms: Windows, macOS, Unix/Linux (X11 + Wayland).

#### Note

In FLTK 1.3.x this header file ([Fl\\_Cairo.H](#)) included the platform specific Cairo headers. This is no longer true since 1.4.0.

This header file is platform agnostic. If you need platform specific Cairo headers you need to `#include` them in your source file.

To use FLTK's builtin Cairo support you need to `#include <FL/Fl.H>` **before** you include any other FLTK header which is officially required anyway. Since FLTK 1.4.0 the preprocessor constants `FLTK_HAVE_CAIRO` and/or `FLTK_HAVE_CAIROEXT` are defined in `<FL/Fl.H>` by including `<FL/fl_config.h>`.

## 34.21 Fl\_Cairo.H

[Go to the documentation of this file.](#)

```

1 //
2 // Main Cairo support header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2025 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
33 #ifndef FL_CAIRO_H
34 #define FL_CAIRO_H
35
36 #include <FL/Fl.H>
37
38 # ifdef FLTK_HAVE_CAIRO
39
40 # include <cairo.h>
41
55 class FL_EXPORT Fl_Cairo_State {
56 public:
57     Fl_Cairo_State()
58         : cc_(0)
59         , own_cc_(false)
60         , autolink_(false)
61         , window_(0)
62         , gc_(0) {}
63
64     // access attributes
65     cairo_t *cc()const { return cc_; }
66     bool autolink()const { return autolink_; }
67     void cc(cairo_t *c, bool own = true) {
68         if (cc_ && own_cc_)
69             cairo_destroy(cc_);
70         cc_ = c;
71         if (!cc_)
72             window_ = 0;
73         own_cc_ = own;
74     }
75     void autolink(bool b);
76     void window(void *w) { window_ = w; }
77     void *window()const { return window_; }
78     void gc(void *c) { gc_ = c; }
79     void *gc()const { return gc_; }
80
81 private:
82     cairo_t *cc_; // contains the unique autoupdated cairo context
83     bool own_cc_; // indicates whether we must delete the cc, useful for internal cleanup
84     bool autolink_; // false by default, prevents the automatic cairo mapping on fltk windows
85     // for custom cairo implementations.
86     void *window_, *gc_; // for keeping track internally of last win+gc treated
87 };
88
99 #endif // FLTK_HAVE_CAIRO
100 #endif // FL_CAIRO_H

```

## 34.22 Fl\_Cairo\_Window.H File Reference

[Fl\\_Cairo\\_Window](#), an FLTK window incorporating a Cairo draw callback.

```
#include <FL/fl_config.h>
#include <FL/Fl.H>
#include <FL/Fl_Double_Window.H>
```

### Classes

- class [Fl\\_Cairo\\_Window](#)

*This defines an FLTK window with Cairo support.*

### 34.22.1 Detailed Description

[Fl\\_Cairo\\_Window](#), an FLTK window incorporating a Cairo draw callback.

## 34.23 Fl\_Cairo\_Window.H

[Go to the documentation of this file.](#)

```
1 //
2 // Fl_Cairo_Window header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2025 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
21 #ifndef FL_CAIRO_WINDOW_H
22 # define FL_CAIRO_WINDOW_H
23
24 #include <FL/fl_config.h>
25
26 # ifdef FLTK_HAVE_CAIRO
27
28 // Cairo is currently supported for the following platforms:
29 // Win32, Apple Quartz, X11, Wayland
30
31 #   include <FL/Fl.H>
32 #   include <FL/Fl_Double_Window.H>
33
34 class FL_EXPORT Fl_Cairo_Window : public Fl_Double_Window {
35 public:
36     Fl_Cairo_Window(int W, int H, const char *L = 0)
37         : Fl_Double_Window(W, H, L), draw_cb_(0) {}
38     Fl_Cairo_Window(int X, int Y, int W, int H, const char *L = 0)
39         : Fl_Double_Window(X, Y, W, H, L), draw_cb_(0) {}
40
41 protected:
42     void draw() FL_OVERRIDE {
43         Fl_Double_Window::draw();
44         if (draw_cb_) { // call the Cairo draw callback
45             // manual method ? if yes explicitly get a cairo_context here
46             if (!Fl::cairo_autolink_context())
47                 Fl::cairo_make_current(this);
48             draw_cb_(this, Fl::cairo_cc());
49             // flush Cairo drawings: necessary at least for Windows
50             Fl::cairo_flush(Fl::cairo_cc());
51         }
52     }
53
54 public:
55     typedef void (*cairo_draw_cb) (Fl_Cairo_Window* self, cairo_t* def);
56     void set_draw_cb(cairo_draw_cb cb) { draw_cb_ = cb; }
57 private:
58     cairo_draw_cb draw_cb_;
```

```

122 };
123
124
127 # endif // FLTK_HAVE_CAIRO
128 #endif // FL_CAIRO_WINDOW_H

```

## 34.24 fl\_callback\_macros.H File Reference

This file provides macros for easy function and method callbacks with multiple type safe arguments.

```
#include <stdlib.h>
```

### Macros

- `#define FL_FUNCTION_CALLBACK_3(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2)`  
*Declare a C function callback with custom parameters.*
- `#define FL_INLINE_CALLBACK_2(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, LAMBDA)`  
*Creates code to declare a callback function in line with instantiating a widget.*
- `#define FL_METHOD_CALLBACK_1(WIDGET, CLASS, SELF, METH, TYPE0, VALUE0)`  
*Declare a non-static class method callback with custom parameters.*

### 34.24.1 Detailed Description

This file provides macros for easy function and method callbacks with multiple type safe arguments.

### 34.24.2 Macro Definition Documentation

#### 34.24.2.1 FL\_FUNCTION\_CALLBACK\_3

```

#define FL_FUNCTION_CALLBACK_3(
    WIDGET,
    FUNC,
    TYPE0,
    VALUE0,
    TYPE1,
    VALUE1,
    TYPE2,
    VALUE2 )

```

Declare a C function callback with custom parameters.

You can declare a plain C function callback or a static method callback with custom parameters using this macro. It simplifies the process of calling arbitrary functions with up to five custom parameters. The macro generates code that ensures type safety and expands FLTK's standard callbacks, which are limited to a single `void*` or `long` argument.

To use the macro, you provide the widget that will handle the callback as the first argument. The second argument can be either a regular function or a static method in any class.

Following these arguments, you can include up to five pairs, where each pair consists of a type and a value. For example, `int, 3` specifies an integer parameter with a value of 3. If you need to pass two arguments, you can use two pairs, like this: `int, 3, int, 4`. The last digit of the macro name must be the same as the number of pairs (0..5)

Whenever the code generated by the macro is called, the custom parameters are duplicated and marked for automatic deallocation using `delete` when the callback widget is destroyed.

```

#include <FL/fl_callback_macros.H>
...
Fl_Button *btn1 = new Fl_Button(10, 10, 100, 20, "Beep");
FL_FUNCTION_CALLBACK_0(btn1, fl_beep);
...

```

```
Fl_Button *btn2 = new Fl_Button(10, 40, 100, 20, "Hello");
FL_FUNCTION_CALLBACK_5(btn2,
    fl_message,
    const char *, "Hello\n%d %d %d %d",
    int, 1, int, 2, int, 3, int, 4
);
```

You can find a small demonstration program showcasing the usage of `FL_*_CALLBACK_*` in the `examples/callbacks.cxx` file.

#### Parameters

<i>WIDGET</i>	the widget that will call the callback
<i>FUNC</i>	a C/C++ function or a static class method
<i>TYPE0,VALUE0,TYPE1,VALUE1,TYPE2,VALUE2</i>	a list of zero to five type/value pairs, all separated by commas

#### See also

[FL\\_METHOD\\_CALLBACK\\_1](#), [FL\\_INLINE\\_CALLBACK\\_2](#)

### 34.24.2.2 FL\_INLINE\_CALLBACK\_2

```
#define FL_INLINE_CALLBACK_2(
    WIDGET,
    TYPE0,
    NAME0,
    VALUE0,
    TYPE1,
    NAME1,
    VALUE1,
    LAMBDA )
```

Creates code to declare a callback function in line with instantiating a widget.

You can use this macro to create a function as a callback, allowing you to define the callback function right where the widget and callback are declared, similar to a Lambda function.

The first argument of the macro specifies the widget that will handle the callback. Next, you can include up to five triplets, where each triplet consists of a type, a parameter name, and a value. For example, `int, x, 3` specifies an integer parameter with a value of 3. If you need to pass two arguments, you can use two triplets, such as `int, x, 3, int, y, 4`. The last digit of the macro name must be the same as the number of triplets (0..5).

The last argument is the actual function body itself.

The function body is limited to a syntax that the macro preprocessor can handle. It should include the leading '{' and trailing '}' and may contain local variable declarations, use global variables and functions, and use also the variables listed and initialized in the argument triples of the macro. Very large function bodies should be avoided because they may exceed the admissible size of a macro argument.

Whenever the code generated by the macro is called, the custom parameters are duplicated and marked for automatic deallocation using `delete` when the callback widget is destroyed.

```
#include <FL/fl_callback_macros.H>
...
Fl_Button *btn = new Fl_Button(10, 10, 100, 20, "Test");
FL_INLINE_CALLBACK_1(btn,
    const char *, name, btn->label(),
    {
        fl_message("Greetings from the %s button", name);
    }
);
```

You can find a small demonstration program showcasing the usage of `FL_*_CALLBACK_*` in the `examples/callbacks.cxx` file.

#### Parameters

<i>WIDGET</i>	the widget that will call the callback
<i>TYPE0</i>	the type of the first parameter in the function call
<i>NAME0</i>	an arbitrary variable name that can be used as a parameter in the function body

## Parameters

<i>VALUE0</i>	a constant value or a variable; the value of the variable is copied when the callback is created
<i>TYPE1,NAME1,VALUE1</i>	as above; there are six macros that support 0 to 5 parameters
<i>LAMBDA</i>	the function body within the limits of the C macro preprocessor

## See also

[FL\\_METHOD\\_CALLBACK\\_1](#), [FL\\_FUNCTION\\_CALLBACK\\_3](#)

## 34.24.2.3 FL\_METHOD\_CALLBACK\_1

```
#define FL_METHOD_CALLBACK_1(
    WIDGET,
    CLASS,
    SELF,
    METH,
    TYPE0,
    VALUE0 )
```

Declare a non-static class method callback with custom parameters.

You can declare a callback for a non-static class method with custom parameters using this macro. It provides a convenient way to call arbitrary methods in any class, overcoming FLTK's limitation of passing only a single `void*` or `long` argument. Furthermore, it ensures type safety.

The first argument of the macro specifies the widget that will handle the callback. The second argument indicates the class type to be called. The third argument must be a pointer to an instance of that class. The fourth argument is the name of the method within the class. That method must be public and should not be static.

Following these arguments, you can include up to five pairs, where each pair consists of a type and a value. For example, `int, 3` specifies an integer parameter with a value of 3. If you need to pass two arguments, you can use two pairs, like this: `int, 3, int, 4`. The last digit of the macro name must be the same as the number of pairs (0..5)

Whenever the code generated by the macro is called, the custom parameters are duplicated and marked for automatic deallocation using `delete` when the callback widget is destroyed.

```
#include <FL/fl_callback_macros.H>
```

```
...
Fl_Button *btn = new Fl_Button(10, 10, 100, 20, "Test");
FL_METHOD_CALLBACK_1(btn, Fl_Button, btn, color, Fl_Color, FL_GREEN);
```

You can find a small demonstration program showcasing the usage of `FL*_CALLBACK_*` in the `examples/callbacks.cxx` file.

## Parameters

<i>WIDGET</i>	the widget that will call the callback
<i>CLASS</i>	the class type
<i>SELF</i>	a pointer to an instance of the class
<i>METH</i>	a C++ class method that must be public and not static
<i>TYPE0,VALUE0</i>	a list of zero to five type/value pairs, all separated by commas

## See also

[FL\\_FUNCTION\\_CALLBACK\\_3](#), [FL\\_INLINE\\_CALLBACK\\_2](#)

## 34.25 fl\_callback\_macros.H

[Go to the documentation of this file.](#)

1 /\*

```

2 * Macros for easy callbacks for the Fast Light Tool Kit (FLTK).
3 *
4 * Copyright 2023 by Bill Spitzak and others.
5 *
6 * This library is free software. Distribution and use rights are outlined in
7 * the file "COPYING" which should have been included with this file. If this
8 * file is missing or damaged, see the license at:
9 *
10 *      https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *      https://www.fltk.org/bugs.php
15 */
16
17 #ifndef _FL_FL_CALLBACK_MACROS_H_
18 #define _FL_FL_CALLBACK_MACROS_H_
19
20 #include <stdlib.h>
21
22 #ifdef FL_DOXYGEN
23
24 #define FL_FUNCTION_CALLBACK_3(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2)
25
26 #define FL_METHOD_CALLBACK_1(WIDGET, CLASS, SELF, METH, TYPE0, VALUE0)
27
28 #define FL_INLINE_CALLBACK_2(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, LAMBDA)
29
30 #else // FL_DOXYGEN
31
32 /*
33 These two macros make it possible to call macros with names that are created
34 by concatenating the name in x and (in this context) the number in y.
35 */
36 #define _FL_CBD_CONCAT_IMPL(x, y) x##y
37 #define _FL_CBD_CONCAT(x, y) _FL_CBD_CONCAT_IMPL(x, y)
38
39 /*
40 Create a unique name for the derived class based on the current source code
41 line number.
42 */
43 #define _FL_CBD_CLASS_NAME _FL_CBD_CONCAT(Fl_Callback_User_Data, __LINE__)
44
45 /*
46 These macros create boilerplate code for callbacks to functions and
47 static class methods with up to five arguments.
48
49 This macro invocation for example
50 ``
51 FL_FUNCTION_CALLBACK_2( func_cb_btn_2, hello_2_args_cb,
52 const char *, text, "FLTK",
53 int, number, 2 );
54 ``
55 will generate the following code:
56 ``
57 do {
58 class Fl_Callback_User_Data_92 : public Fl_Callback_User_Data {
59 public:
60 const char * p0_;
61 int p1_;
62 static void cb(Fl_Widget *w, void *user_data) {
63 Fl_Callback_User_Data_92 *d = (Fl_Callback_User_Data_92*)user_data;
64 hello_2_args_cb(d->p0_, d->p1_);
65 };
66 Fl_Callback_User_Data_92(const char * p0, int p1)
67 : p0_(p0),
68 p1_(p1)
69 { }
70 };
71 func_cb_btn_2->callback(Fl_Callback_User_Data_92::cb,
72 new Fl_Callback_User_Data_92("FLTK", 2),
73 true);
74 } while(0)
75 ``
76
77 Clicking the Fl_Button `func_cb_btn_2` will call `hello_2_args_cb("FLTK", 2)`.
78 Deleting the button will also delete the data that was created in our
79 boilerplate code.
80 */
81 #define FL_FUNCTION_CALLBACK_5(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2, TYPE3, VALUE3,
82 TYPE4, VALUE4) \
83 do { \
84 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
85 public: \
86 TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; TYPE4 p4_; \

```

```

235 static void cb(Fl_Widget *w, void *user_data) { \
236   _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
237   FUNC(d->p0_, d->p1_, d->p2_, d->p3_, d->p4_); \
238 }; \
239 _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1, TYPE2 p2, TYPE3 p3, TYPE4 p4) \
240 :   p0_(p0), p1_(p1), p2_(p2), p3_(p3), p4_(p4) { }; \
241 }; \
242 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2, VALUE3, VALUE4),
                true); \
243 } while(0)
244
245 #define FL_FUNCTION_CALLBACK_4(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2, TYPE3, VALUE3)
    \
246 do { \
247   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
248   public: \
249     TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; \
250     static void cb(Fl_Widget *w, void *user_data) { \
251       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
252       FUNC(d->p0_, d->p1_, d->p2_, d->p3_); \
253     }; \
254     _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1, TYPE2 p2, TYPE3 p3) \
255     :   p0_(p0), p1_(p1), p2_(p2), p3_(p3) { }; \
256   }; \
257   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2, VALUE3), true); \
258 } while(0)
259
260 #define FL_FUNCTION_CALLBACK_3(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2) \
261 do { \
262   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
263   public: \
264     TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; \
265     static void cb(Fl_Widget *w, void *user_data) { \
266       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
267       FUNC(d->p0_, d->p1_, d->p2_); \
268     }; \
269     _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1, TYPE2 p2) \
270     :   p0_(p0), p1_(p1), p2_(p2) { }; \
271   }; \
272   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2), true); \
273 } while(0)
274
275 #define FL_FUNCTION_CALLBACK_2(WIDGET, FUNC, TYPE0, VALUE0, TYPE1, VALUE1) \
276 do { \
277   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
278   public: \
279     TYPE0 p0_; TYPE1 p1_; \
280     static void cb(Fl_Widget *w, void *user_data) { \
281       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
282       FUNC(d->p0_, d->p1_); \
283     }; \
284     _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1) \
285     :   p0_(p0), p1_(p1) { }; \
286   }; \
287   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1), true); \
288 } while(0)
289
290 #define FL_FUNCTION_CALLBACK_1(WIDGET, FUNC, TYPE0, VALUE0) \
291 do { \
292   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
293   public: \
294     TYPE0 p0_; \
295     static void cb(Fl_Widget *w, void *user_data) { \
296       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
297       FUNC(d->p0_); \
298     }; \
299     _FL_CBD_CLASS_NAME(TYPE0 p0) \
300     :   p0_(p0) { }; \
301   }; \
302   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0), true); \
303 } while(0)
304
305 #define FL_FUNCTION_CALLBACK_0(WIDGET, FUNC) \
306 do { \
307   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
308   public: \
309     static void cb(Fl_Widget *w, void *user_data) { \
310       FUNC(); \
311     }; \
312     _FL_CBD_CLASS_NAME() { }; \
313   }; \
314   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(), true); \
315 } while(0)
316
317 /*
318 These macros create boilerplate code for callbacks to class methods

```

```

319 with up to five arguments.
320
321 This macro invocation for example
322 ``
323 FL_METHOD_CALLBACK_4(btn,
324 MyWindow, win, resize,
325 int, test_x+10,
326 int, test_y+10,
327 int, 320,
328 int, 400);
329 ``
330 will generate the following code:
331
332 ``
333 do {
334 class Fl_Callback_User_Data_73 : public Fl_Callback_User_Data {
335 public:
336 int p0_;
337 int p1_;
338 int p2_;
339 int p3_;
340 MyWindow *self_;
341 static void cb(Fl_Widget *w, void *user_data) {
342 Fl_Callback_User_Data_73 *d = (Fl_Callback_User_Data_73*)user_data;
343 d->self_->resize(d->p0_, d->p1_, d->p2_, d->p3_);
344 };
345 Fl_Callback_User_Data_73(MyWindow *self, int p0, int p1, int p2, int p3)
346 : self_(self), p0_(p0), p1_(p1), p2_(p2), p3_(p3) { }
347 };
348 btn->callback(Fl_Callback_User_Data_73::cb,
349 new Fl_Callback_User_Data_73(win, test_x+10, test_y+10, 320, 400),
350 true);
351 } while(0);
352 ``
353
354 Clicking the Fl_Button 'btn' will call
355 'win->resize(test_x+10, test_y+10, 320, 400);'.
356 Deleting the button will also delete the data that was created in our
357 boilerplate code.
358 */
359
360 #define FL_METHOD_CALLBACK_5(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2,
    TYPE3, VALUE3, TYPE4, VALUE4) \
361 do { \
362 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
363 public: \
364 CLASS *self_; \
365 TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; TYPE4 p4_; \
366 static void cb(Fl_Widget *w, void *user_data) { \
367 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
368 d->self_->METHOD(d->p0_, d->p1_, d->p2_, d->p3_, d->p4_); \
369 }; \
370 _FL_CBD_CLASS_NAME(CLASS *self, TYPE0 p0, TYPE1 p1, TYPE2 p2, TYPE3 p3, TYPE4 p4) \
371 : self_(self), p0_(p0), p1_(p1), p2_(p2), p3_(p3), p4_(p4) { }; \
372 }; \
373 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1, VALUE2, VALUE3,
    VALUE4), true); \
374 } while(0)
375
376 #define FL_METHOD_CALLBACK_4(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2,
    TYPE3, VALUE3) \
377 do { \
378 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
379 public: \
380 CLASS *self_; \
381 TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; \
382 static void cb(Fl_Widget *w, void *user_data) { \
383 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
384 d->self_->METHOD(d->p0_, d->p1_, d->p2_, d->p3_); \
385 }; \
386 _FL_CBD_CLASS_NAME(CLASS *self, TYPE0 p0, TYPE1 p1, TYPE2 p2, TYPE3 p3) \
387 : self_(self), p0_(p0), p1_(p1), p2_(p2), p3_(p3) { }; \
388 }; \
389 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1, VALUE2, VALUE3),
    true); \
390 } while(0)
391
392 #define FL_METHOD_CALLBACK_3(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0, TYPE1, VALUE1, TYPE2, VALUE2) \
393 do { \
394 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
395 public: \
396 CLASS *self_; \
397 TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; \
398 static void cb(Fl_Widget *w, void *user_data) { \
399 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
400 d->self_->METHOD(d->p0_, d->p1_, d->p2_); \
401 }; \

```

```

402 _FL_CBD_CLASS_NAME(CLASS *self, TYPE0 p0, TYPE1 p1, TYPE2 p2) \
403 : self_(self), p0_(p0), p1_(p1), p2_(p2) { }; \
404 }; \
405 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1, VALUE2), true); \
406 } while(0)
407
408 #define FL_METHOD_CALLBACK_2(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0, TYPE1, VALUE1) \
409 do { \
410 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
411 public: \
412 CLASS *self_; \
413 TYPE0 p0_; TYPE1 p1_; \
414 static void cb(Fl_Widget *w, void *user_data) { \
415 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
416 d->self_->METHOD(d->p0_, d->p1_); \
417 }; \
418 _FL_CBD_CLASS_NAME(CLASS *self, TYPE0 p0, TYPE1 p1) \
419 : self_(self), p0_(p0), p1_(p1) { }; \
420 }; \
421 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0, VALUE1), true); \
422 } while(0)
423
424 #define FL_METHOD_CALLBACK_1(WIDGET, CLASS, SELF, METHOD, TYPE0, VALUE0) \
425 do { \
426 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
427 public: \
428 CLASS *self_; \
429 TYPE0 p0_; \
430 static void cb(Fl_Widget *w, void *user_data) { \
431 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
432 d->self_->METHOD(d->p0_); \
433 }; \
434 _FL_CBD_CLASS_NAME(CLASS *self, TYPE0 p0) \
435 : self_(self), p0_(p0) { }; \
436 }; \
437 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF, VALUE0), true); \
438 } while(0)
439
440 #define FL_METHOD_CALLBACK_0(WIDGET, CLASS, SELF, METHOD) \
441 do { \
442 class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
443 public: \
444 CLASS *self_; \
445 static void cb(Fl_Widget *w, void *user_data) { \
446 _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
447 d->self_->METHOD(); \
448 }; \
449 _FL_CBD_CLASS_NAME(CLASS *self) \
450 : self_(self) { }; \
451 }; \
452 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(SELF), true); \
453 } while(0)
454
455 /*
456 These macros create boilerplate code for callback functions inlined into
457 the widget creation code (similar to lambda functions in C++11 and up)
458 with up to five arguments.
459
460 This macro invocation for example
461 ``
462 FL_INLINE_CALLBACK_2(          // callback has two parameters
463 btn,                          // attach callback to this button
464 const char *, text, "FLTK",    // first parameter (type, name, value)
465 int, number, 2,                // second parameter
466 {                               // function body
467 fl_message("We received the message %s with %d!", text, number);
468 }
469 );
470 ``
471 will generate the following code:
472 ``
473 do {
474 class Fl_Callback_User_Data_133 : public Fl_Callback_User_Data {
475 public:
476 const char * p0_;           // store first parameter here
477 int p1_;                    // store second parameter here
478 // lambda style function
479 static void fn(const char * text, int number) {
480 fl_message("We received the message %s with %d!", text, number);
481 };
482 // FLTK style callback
483 static void cb(Fl_Widget *w, void *user_data) {
484 Fl_Callback_User_Data_133 *d = (Fl_Callback_User_Data_133*)user_data;
485 fn(d->p0_, d->p1_);
486 };
487 // class constructor
488 Fl_Callback_User_Data_133(const char * p0, int p1)

```

```

489 : p0_(p0),                // copy parameter 0
490 p1_(p1)                  // copy parameter 1
491 { }                      // constructor body
492 };
493 // connect our class to the widget callback
494 btn->callback(Fl_Callback_User_Data_133::cb,
495 new Fl_Callback_User_Data_133("FLTK", 2),
496 true);
497 } while(0);                // user code adds semicolon
498 ``
499
500 Clicking the Fl_Button `btn` will call
501 `fl_message("We received the message %s with %d!", "FLTK", 2);`.
502 Deleting the button will also delete the data that was created in our
503 boilerplate code.
504 */
505
506 #define FL_INLINE_CALLBACK_5(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, TYPE2, NAME2, VALUE2,
    TYPE3, NAME3, VALUE3, TYPE4, NAME4, VALUE4, LAMBDA) \
507 do { \
508   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
509   public: \
510     TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; TYPE4 p4_; \
511     static void fn(TYPE0 NAME0, TYPE1 NAME1, TYPE2 NAME2, TYPE3 NAME3, TYPE4 NAME4) \
512     LAMBDA; \
513     static void cb(Fl_Widget *w, void *user_data) { \
514       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
515       _FL_CBD_CLASS_NAME::fn(d->p0_, d->p1_, d->p2_, d->p3_, d->p4_); \
516     }; \
517     _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1, TYPE2 p2, TYPE3 p3, TYPE4 p4) \
518     : p0_(p0), p1_(p1), p2_(p2), p3_(p3), p4_(p4) { }; \
519   }; \
520   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2, VALUE3, VALUE4),
    true); \
521 } while(0)
522
523 #define FL_INLINE_CALLBACK_4(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, TYPE2, NAME2, VALUE2,
    TYPE3, NAME3, VALUE3, LAMBDA) \
524 do { \
525   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
526   public: \
527     TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; TYPE3 p3_; \
528     static void fn(TYPE0 NAME0, TYPE1 NAME1, TYPE2 NAME2, TYPE3 NAME3) \
529     LAMBDA; \
530     static void cb(Fl_Widget *w, void *user_data) { \
531       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
532       _FL_CBD_CLASS_NAME::fn(d->p0_, d->p1_, d->p2_, d->p3_); \
533     }; \
534     _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1, TYPE2 p2, TYPE3 p3) \
535     : p0_(p0), p1_(p1), p2_(p2), p3_(p3) { }; \
536   }; \
537   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2, VALUE3), true); \
538 } while(0)
539
540 #define FL_INLINE_CALLBACK_3(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, TYPE2, NAME2, VALUE2,
    LAMBDA) \
541 do { \
542   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
543   public: \
544     TYPE0 p0_; TYPE1 p1_; TYPE2 p2_; \
545     static void fn(TYPE0 NAME0, TYPE1 NAME1, TYPE2 NAME2) \
546     LAMBDA; \
547     static void cb(Fl_Widget *w, void *user_data) { \
548       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
549       _FL_CBD_CLASS_NAME::fn(d->p0_, d->p1_, d->p2_); \
550     }; \
551     _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1, TYPE2 p2) \
552     : p0_(p0), p1_(p1), p2_(p2) { }; \
553   }; \
554   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1, VALUE2), true); \
555 } while(0)
556
557 #define FL_INLINE_CALLBACK_2(WIDGET, TYPE0, NAME0, VALUE0, TYPE1, NAME1, VALUE1, LAMBDA) \
558 do { \
559   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
560   public: \
561     TYPE0 p0_; TYPE1 p1_; \
562     static void fn(TYPE0 NAME0, TYPE1 NAME1) \
563     LAMBDA; \
564     static void cb(Fl_Widget *w, void *user_data) { \
565       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
566       _FL_CBD_CLASS_NAME::fn(d->p0_, d->p1_); \
567     }; \
568     _FL_CBD_CLASS_NAME(TYPE0 p0, TYPE1 p1) \
569     : p0_(p0), p1_(p1) { }; \
570   }; \

```

```

571 WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0, VALUE1), true); \
572 } while(0)
573
574 #define FL_INLINE_CALLBACK_1(WIDGET, TYPE0, NAME0, VALUE0, LAMBDA) \
575 do { \
576   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
577   public: \
578     TYPE0 p0_; \
579     static void fn(TYPE0 NAME0) \
580     LAMBDA; \
581     static void cb(Fl_Widget *w, void *user_data) { \
582       _FL_CBD_CLASS_NAME *d = (_FL_CBD_CLASS_NAME*)user_data; \
583       _FL_CBD_CLASS_NAME::fn(d->p0_); \
584     }; \
585     _FL_CBD_CLASS_NAME(TYPE0 p0) \
586     : p0_(p0) { }; \
587   }; \
588   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(VALUE0), true); \
589 } while(0)
590
591 #define FL_INLINE_CALLBACK_0(WIDGET, LAMBDA) \
592 do { \
593   class _FL_CBD_CLASS_NAME : public Fl_Callback_User_Data { \
594   public: \
595     static void fn() \
596     LAMBDA; \
597     static void cb(Fl_Widget *w, void *user_data) { \
598       _FL_CBD_CLASS_NAME::fn(); \
599     }; \
600     _FL_CBD_CLASS_NAME() { }; \
601   }; \
602   WIDGET->callback(_FL_CBD_CLASS_NAME::cb, new _FL_CBD_CLASS_NAME(), true); \
603 } while(0)
604
605 #endif // FL_DOXYGEN
606
607 #endif /* !_FL_FL_CALLBACK_MACROS_H_ */

```

## 34.26 fl\_casts.H

```

1 //
2 // Experimental inline "cast functions" for the Fast Light Toolkit (FLTK).
3 // See also issue #109: "VS2017 warnings when building fltk 1.4.x"
4 //
5 // Copyright 1998-2021 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
18 #ifndef _FL_fl_casts_H_
19 #define _FL_fl_casts_H_
20
21 #include <FL/platform_types.h>
22
23 inline char fl_char(void *v)      { return (char)(fl_intptr_t)v; }
24 inline int  fl_int(void *v)       { return (int)(fl_intptr_t)v; }
25 inline long fl_long(void *v)      { return (long)(fl_intptr_t)v; }
26
27 inline unsigned char fl_uchar(void *v) { return (unsigned char)(fl_uintptr_t)v; }
28 inline unsigned int  fl_uint(void *v)  { return (unsigned int)(fl_uintptr_t)v; }
29 inline unsigned long fl_ulong(void *v)  { return (unsigned long)(fl_uintptr_t)v; }
30
31 // the following conversions can be used to silence MSVC warning C4312:
32 // 'type cast': conversion from '<type>' to 'void *' of greater size
33
34 inline void *fl_voidptr(int v)      { return (void *) (fl_intptr_t)v; }
35 inline void *fl_voidptr(unsigned int v) { return (void *) (fl_uintptr_t)v; }
36 inline void *fl_voidptr(long v)      { return (void *) (fl_intptr_t)v; }
37 inline void *fl_voidptr(unsigned long v) { return (void *) (fl_uintptr_t)v; }
38
39 #endif /* !_FL_fl_casts_H_ */

```

## 34.27 FL\_Chart.H File Reference

[FL\\_Chart](#) widget.

```
#include "Fl_Widget.H"
```

### Classes

- class [FL\\_Chart](#)  
*FL\_Chart displays simple charts.*
- struct [FL\\_CHART\\_ENTRY](#)  
*For internal use only.*

### Macros

- `#define FL_BAR_CHART 0`  
*type() for Bar Chart variant*
- `#define FL_CHART_LABEL_MAX 18`  
*max label length for entry*
- `#define FL_CHART_MAX 128`  
*max entries per chart*
- `#define FL_FILL_CHART 3`  
*type() for Fill Line Chart variant*
- `#define FL_FILLED_CHART FL\_FILL\_CHART`  
*for compatibility*
- `#define FL_HORBAR_CHART 1`  
*type() for Horizontal Bar Chart variant*
- `#define FL_LINE_CHART 2`  
*type() for Line Chart variant*
- `#define FL_PIE_CHART 5`  
*type() for Pie Chart variant*
- `#define FL_SPECIALPIE_CHART 6`  
*type() for Special Pie Chart variant*
- `#define FL_SPIKE_CHART 4`  
*type() for Spike Chart variant*

### 34.27.1 Detailed Description

[FL\\_Chart](#) widget.

## 34.28 FL\_Chart.H

[Go to the documentation of this file.](#)

```
1 //
2 // FL_Chart widget header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
21 #ifndef FL_Chart_H
```

```

22 #define Fl_Chart_H
23
24 #ifndef Fl_Widget_H
25 #include "Fl_Widget.H"
26 #endif
27
28 // values for type()
29 #define FL_BAR_CHART 0
30 #define FL_HORBAR_CHART 1
31 #define FL_LINE_CHART 2
32 #define FL_FILL_CHART 3
33 #define FL_SPIKE_CHART 4
34 #define FL_PIE_CHART 5
35 #define FL_SPECIALPIE_CHART 6
36
37 #define FL_FILLED_CHART FL_FILL_CHART
38
39 #define FL_CHART_MAX 128
40 #define FL_CHART_LABEL_MAX 18
41
42 struct FL_CHART_ENTRY {
43     float val;
44     unsigned col;
45     char str[FL_CHART_LABEL_MAX + 1];
46 };
47
48
49 class FL_EXPORT Fl_Chart : public Fl_Widget {
50     int numb;
51     int maxnumb;
52     int sizenumb;
53     FL_CHART_ENTRY *entries;
54     double min, max;
55     uchar autosize;
56     Fl_Font textfont_;
57     Fl_Fontsize textsize_;
58     Fl_Color textcolor_;
59
60 protected:
61     void draw() FL_OVERRIDE;
62
63     // (static) protected draw methods (STR 2022)
64     // these methods are documented in src/Fl_Chart.cxx
65
66     static void draw_barchart(int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[],
67                             double min, double max, int autosize, int maxnumb, Fl_Color textcolor);
68
69     static void draw_horbarchart(int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[],
70                                double min, double max, int autosize, int maxnumb,
71                                Fl_Color textcolor);
72
73     static void draw_linechart(int type, int x, int y, int w, int h, int numb,
74                               FL_CHART_ENTRY entries[], double min, double max, int autosize,
75                               int maxnumb, Fl_Color textcolor);
76
77     static void draw_piechart(int x, int y, int w, int h, int numb, FL_CHART_ENTRY entries[],
78                              int special, Fl_Color textcolor);
79
80 public:
81     Fl_Chart(int X, int Y, int W, int H, const char *L = 0);
82
83     ~Fl_Chart();
84
85     void clear();
86
87     void add(double val, const char *str = 0, unsigned col = 0);
88
89     void insert(int ind, double val, const char *str = 0, unsigned col = 0);
90
91     void replace(int ind, double val, const char *str = 0, unsigned col = 0);
92
93     void bounds(double *a, double *b) const {
94         *a = min;
95         *b = max;
96     }
97
98     void bounds(double a, double b);
99
100     int size() const { return numb; }
101
102     void size(int W, int H) { Fl_Widget::size(W, H); }
103
104     int maxsize() const { return maxnumb; }
105
106     void maxsize(int m);
107
108     Fl_Font textfont() const { return textfont_; }
109
110

```

```

151 void textfont(Fl_Font s) { textfont_ = s; }
152
153 Fl_Fontsize textsize()const { return textsize_; }
154
155 void textsize(Fl_Fontsize s) { textsize_ = s; }
156
157 Fl_Color textcolor()const { return textcolor_; }
158
159 void textcolor(Fl_Color n) { textcolor_ = n; }
160
161 uchar autosize()const { return autosize_; }
162
163 void autosize(uchar n) { autosize_ = n; }
164 };
165
166 #endif

```

## 34.29 Fl\_Check\_Browser.H

```

1 //
2 // Fl_Check_Browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2020 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Check_Browser widget . */
19
20 #ifndef Fl_Check_Browser_H
21 #define Fl_Check_Browser_H
22
23 #include "Fl.H"
24 #include "Fl_Browser_.H"
25
26 class FL_EXPORT Fl_Check_Browser : public Fl_Browser_ {
27 public:
28     /* required routines for Fl_Browser_ subclass: */
29     void *item_first() const FL_OVERRIDE;
30     void *item_next(void *) const FL_OVERRIDE;
31     void *item_prev(void *) const FL_OVERRIDE;
32     int item_height(void *) const FL_OVERRIDE;
33     int item_width(void *) const FL_OVERRIDE;
34     void item_draw(void *, int, int, int, int) const FL_OVERRIDE;
35     void item_select(void *, int) FL_OVERRIDE;
36     int item_selected(void *) const FL_OVERRIDE;
37     const char *item_text(void *item) const FL_OVERRIDE;
38
39 public:
40     void *item_at(int index) const FL_OVERRIDE;
41     void item_swap(int ia, int ib);
42     void item_swap(void *a, void *b) FL_OVERRIDE;
43
44     /* private data */
45
46 public: // IRIX 5.3 C++ compiler doesn't support private structures...
47
48 #ifndef FL_DOXYGEN
49     struct cb_item {
50         cb_item *next;
51         cb_item *prev;
52         char checked;
53         char selected;
54         char *text;
55     };
56 #endif // !FL_DOXYGEN
57
58 private:
59     cb_item *first;
60     cb_item *last;
61     cb_item *cache;
62     int cached_item;
63     int nitems_;
64     int nchecked_;
65     cb_item *find_item(int) const;

```

```

72  int lineno(cb_item *) const;
73
74 public:
75  Fl_Check_Browser(int x, int y, int w, int h, const char *l = 0);
76  ~Fl_Check_Browser() { clear(); }
77  int add(char *s);           // add an (unchecked) item
78  int add(char *s, int b);    // add an item and set checked
79                               // both return the new nitems()
80  int remove(int item);       // delete an item. Returns nitems()
81
82  // inline const char * methods to avoid breaking binary compatibility...
83  int add(const char *s) { return add((char *)s); }
84  int add(const char *s, int b) { return add((char *)s, b); }
85
86  void clear();              // delete all items
87  int nitems()const { return nitems_; }
88  int nchecked()const { return nchecked_; }
89  int checked(int item) const;
90  void checked(int item, int b);
91  void set_checked(int item) { checked(item, 1); }
92  void check_all();
93  void check_none();
94  int value() const;         // currently selected item
95  char *text(int item) const; // returns pointer to internal buffer
96
97 protected:
98  int handle(int) FL_OVERRIDE;
99 };
100
101 #endif // Fl_Check_Browser_H

```

## 34.30 Fl\_Check\_Button.H

```

1 //
2 // Check button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2014 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Check_Button_H
18 #define Fl_Check_Button_H
19
20 #include "Fl_Light_Button.H"
21
22 /*
23 class:  Fl_Check_Button.
24
25 A button with a "checkmark" to show its status.
26 */
27
28 class FL_EXPORT Fl_Check_Button : public Fl_Light_Button {
29 public:
30  Fl_Check_Button(int X, int Y, int W, int H, const char *L = 0);
31 };
32
33 #endif

```

## 34.31 Fl\_Choice.H

```

1 //
2 // Choice header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //

```

```

14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Choice widget . */
19
20 #ifndef Fl_Choice_H
21 #define Fl_Choice_H
22
23 #include "Fl_Menu_.H"
24
25 class FL_EXPORT Fl_Choice : public Fl_Menu_ {
26 protected:
27     void draw() FL_OVERRIDE;
28 public:
29     int handle(int) FL_OVERRIDE;
30
31     Fl_Choice(int X, int Y, int W, int H, const char *L = 0);
32
33     int value()const {return Fl_Menu_::value();}
34
35     int value(int v);
36
37     int value(const Fl_Menu_Item* v);
38 };
39 #endif

```

## 34.32 Fl\_Clock.H

```

1 //
2 // Clock header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2017 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Clock, Fl_Clock_Output widgets . */
19
20 #ifndef Fl_Clock_H
21 #define Fl_Clock_H
22
23 #ifndef Fl_Widget_H
24 #include "Fl_Widget.H"
25 #endif
26
27 // Values for type():
28 // Please change doxygen documentation below (class Fl_Clock_Output)
29 // accordingly as well when changing the following type values:
30
31 #define FL_SQUARE_CLOCK      0
32 #define FL_ROUND_CLOCK      1
33 #define FL_ANALOG_CLOCK     FL_SQUARE_CLOCK
34 #define FL_DIGITAL_CLOCK    FL_SQUARE_CLOCK
35 // fabien: Please keep the horizontal formatting of both images in class desc,
36 // don't lose vertical space for nothing!
37
38 class FL_EXPORT Fl_Clock_Output : public Fl_Widget {
39     int hour_, minute_, second_;
40     ulong value_;
41     int shadow_; // draw shadows of hands
42     void drawhands(Fl_Color, Fl_Color); // part of draw
43 protected:
44     void draw() FL_OVERRIDE;
45     void draw(int X, int Y, int W, int H);
46 public:
47     Fl_Clock_Output(int X, int Y, int W, int H, const char *L = 0);
48
49     void value(ulong v); // set to this Unix time
50
51     void value(int H, int m, int s);
52
53     ulong value()const {return value_;}
54 };

```

```

92  int hour()const {return hour_;}
93
98  int minute()const {return minute_;}
99
104 int second()const {return second_;}
105
113 int shadow()const {return shadow_;}
114
127 void shadow(int mode) { shadow_ = mode ? 1 : 0; }
128 };
129
130 // a Fl_Clock displays the current time always by using a timeout:
131
152 class FL_EXPORT Fl_Clock : public Fl_Clock_Output {
153 public:
154     int handle(int) FL_OVERRIDE;
155
156     Fl_Clock(int X, int Y, int W, int H, const char *L = 0);
157
158     Fl_Clock(uchar t, int X, int Y, int W, int H, const char *L);
159
160     ~Fl_Clock();
161 };
162
163 #endif

```

## 34.33 Fl\_Color\_Chooser.H File Reference

[Fl\\_Color\\_Chooser](#) widget .

```

#include <FL/Fl_Group.H>
#include <FL/Fl_Box.H>
#include <FL/Fl_Return_Button.H>
#include <FL/Fl_Choice.H>
#include <FL/Fl_Value_Input.H>

```

### Classes

- class [Fl\\_Color\\_Chooser](#)

*The [Fl\\_Color\\_Chooser](#) widget provides a standard RGB color chooser.*

### 34.33.1 Detailed Description

[Fl\\_Color\\_Chooser](#) widget .

## 34.34 Fl\_Color\_Chooser.H

[Go to the documentation of this file.](#)

```

1 //
2 // Color chooser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2019 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
20 // The color chooser object and the color chooser popup. The popup
21 // is just a window containing a single color chooser and some boxes
22 // to indicate the current and cancelled color.
23
24 #ifndef Fl_Color_Chooser_H
25 #define Fl_Color_Chooser_H
26
27 #include <FL/Fl_Group.H>
28 #include <FL/Fl_Box.H>

```

```

29 #include <FL/Fl_Return_Button.H>
30 #include <FL/Fl_Choice.H>
31 #include <FL/Fl_Value_Input.H>
32
33 #ifndef FL_DOXYGEN
34
35 class FL_EXPORT Flcc_HueBox : public Fl_Widget {
36     int px, py;
37 protected:
38     void draw() FL_OVERRIDE;
39     int handle_key(int);
40 public:
41     int handle(int) FL_OVERRIDE;
42     Flcc_HueBox(int X, int Y, int W, int H) : Fl_Widget(X,Y,W,H) {
43         px = py = 0;
44     };
45
46 class FL_EXPORT Flcc_ValueBox : public Fl_Widget {
47     int py;
48 protected:
49     void draw() FL_OVERRIDE;
50     int handle_key(int);
51 public:
52     int handle(int) FL_OVERRIDE;
53     Flcc_ValueBox(int X, int Y, int W, int H) : Fl_Widget(X,Y,W,H) {
54         py = 0;
55     };
56
57 class FL_EXPORT Flcc_Value_Input : public Fl_Value_Input {
58 public:
59     int format(char*) FL_OVERRIDE;
60     Flcc_Value_Input(int X, int Y, int W, int H) : Fl_Value_Input(X,Y,W,H) {}
61 };
62
63 #endif // !FL_DOXYGEN
64
65 class FL_EXPORT Fl_Color_Chooser : public Fl_Group {
66     Flcc_HueBox huebox;
67     Flcc_ValueBox valuebox;
68     Fl_Choice choice;
69     Flcc_Value_Input rvalue;
70     Flcc_Value_Input gvalue;
71     Flcc_Value_Input bvalue;
72     Fl_Box resize_box;
73     double hue_, saturation_, value_;
74     double r_, g_, b_;
75     void set_valuators();
76     static void rgb_cb(Fl_Widget*, void*);
77     static void mode_cb(Fl_Widget*, void*);
78 public:
79     int handle(int e) FL_OVERRIDE;
80
81     int mode() {return choice.value();}
82
83     void mode(int newMode);
84
85     double hue()const {return hue_;}
86
87     double saturation()const {return saturation_;}
88
89     double value()const {return value_;}
90
91     double r()const {return r_;}
92
93     double g()const {return g_;}
94
95     double b()const {return b_;}
96
97     int hsv(double H, double S, double V);
98
99     int rgb(double R, double G, double B);
100
101     static void hsv2rgb(double H, double S, double V, double& R, double& G, double& B);
102
103     static void rgb2hsv(double R, double G, double B, double& H, double& S, double& V);
104
105     Fl_Color_Chooser(int X, int Y, int W, int H, const char *L = 0);
106 };
107
108 FL_EXPORT int fl_color_chooser(const char* name, double& r, double& g, double& b, int m=-1);
109 FL_EXPORT int fl_color_chooser(const char* name, uchar& r, uchar& g, uchar& b, int m=-1);
110
111 #endif

```

## 34.35 Fl\_Copy\_Surface.H

```

1 //
2 // Copy-to-clipboard code for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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12 // Please see the following page on how to report bugs and issues:
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14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Copy_Surface_H
18 #define Fl_Copy_Surface_H
19
20 #include <FL/Fl_Widget_Surface.H>
21
22 class FL_EXPORT Fl_Copy_Surface : public Fl_Widget_Surface {
23 private:
24     class Fl_Copy_Surface_Driver *platform_surface;
25 protected:
26     void translate(int x, int y) FL_OVERRIDE;
27     void untranslate() FL_OVERRIDE;
28 public:
29     Fl_Copy_Surface(int w, int h);
30     ~Fl_Copy_Surface();
31     void set_current() FL_OVERRIDE;
32     bool is_current() FL_OVERRIDE;
33     int w();
34     int h();
35     void origin(int *x, int *y) FL_OVERRIDE;
36     void origin(int x, int y) FL_OVERRIDE;
37     int printable_rect(int *w, int *h) FL_OVERRIDE;
38 };
39
40 class Fl_Copy_Surface_Driver : public Fl_Widget_Surface {
41     friend class Fl_Copy_Surface;
42 protected:
43     int width;
44     int height;
45     Fl_Copy_Surface_Driver(int w, int h) : Fl_Widget_Surface(NULL), width(w), height(h) {}
46     virtual ~Fl_Copy_Surface_Driver() {}
47     void set_current() FL_OVERRIDE = 0;
48     void translate(int x, int y) FL_OVERRIDE = 0;
49     void untranslate() FL_OVERRIDE = 0;
50     int printable_rect(int *w, int *h) FL_OVERRIDE;
51     static Fl_Copy_Surface_Driver *newCopySurfaceDriver(int w, int h);
52 };
53
54 #endif // Fl_Copy_Surface_H

```

## 34.36 Fl\_Counter.H

```

1 //
2 // Counter header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Counter widget . */
19
20 // A numerical value with up/down step buttons. From Forms.
21
22 #ifndef Fl_Counter_H
23 #define Fl_Counter_H
24

```

```

25 #ifndef FL_Valuator_H
26 #include "Fl_Valuator.H"
27 #endif
28
29 // values for type():
30 #define FL_NORMAL_COUNTER      0
31 #define FL_SIMPLE_COUNTER     1
32
33 class FL_EXPORT Fl_Counter : public Fl_Valuator {
34
35     Fl_Font textfont_;
36     Fl_Fontsize textsize_;
37     Fl_Color textcolor_;
38     double lstep_;
39     uchar mouseobj_;
40     static void repeat_callback(void *);
41     int calc_mouseobj();
42     void increment_cb();
43
44 protected:
45     void draw() FL_OVERRIDE;
46     // compute widths of arrow boxes
47     void arrow_widths(int &w1, int &w2);
48
49 public:
50     int handle(int) FL_OVERRIDE;
51
52     Fl_Counter(int X, int Y, int W, int H, const char* L = 0);
53     ~Fl_Counter();
54
55     void lstep(double a) {lstep_ = a;}
56
57     void step(double a,double b) {Fl_Valuator::step(a); lstep_ = b;}
58
59     void step(double a) {Fl_Valuator::step(a);}
60
61     double step()const {return Fl_Valuator::step();}
62
63     Fl_Font textfont()const {return textfont_;}
64     void textfont(Fl_Font s) {textfont_ = s;}
65
66     Fl_Fontsize textsize()const {return textsize_;}
67     void textsize(Fl_Fontsize s) {textsize_ = s;}
68
69     Fl_Color textcolor()const {return textcolor_;}
70     void textcolor(Fl_Color s) {textcolor_ = s;}
71
72 };
73
74 #endif

```

## 34.37 FI\_Device.H File Reference

declaration of classes [Fl\\_Surface\\_Device](#), [Fl\\_Display\\_Device](#), [Fl\\_Device\\_Plugin](#).

```

#include <FL/Fl_Plugin.H>
#include <FL/platform_types.h>

```

### Classes

- class [Fl\\_Device\\_Plugin](#)  
*This plugin socket allows the integration of new device drivers for special window or screen types.*
- class [Fl\\_Display\\_Device](#)  
*The computer's display.*
- class [Fl\\_Surface\\_Device](#)  
*A drawing surface that's susceptible to receive graphical output.*

### 34.37.1 Detailed Description

declaration of classes [Fl\\_Surface\\_Device](#), [Fl\\_Display\\_Device](#), [Fl\\_Device\\_Plugin](#).

## 34.38 Fl\_Device.H

Go to the documentation of this file.

```

1 //
2 // Definition of classes Fl_Surface_Device, Fl_Display_Device
3 // for the Fast Light Tool Kit (FLTK).
4 //
5 // Copyright 2010-2021 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
22 #ifndef Fl_Device_H
23 #define Fl_Device_H
24
25 #include <FL/Fl_Plugin.H>
26 #include <FL/platform_types.h>
27
28 class Fl_Graphics_Driver;
29 class Fl_RGB_Image;
30 class Fl_Widget;
31 class Fl_Image_Surface;
32
33 class FL_EXPORT Fl_Surface_Device {
34     Fl_Graphics_Driver *pGraphicsDriver;
35     static Fl_Surface_Device *surface_; // the surface that currently receives graphics requests
36     static Fl_Surface_Device *default_surface(); // create surface if none exists yet
37 protected:
38     virtual void end_current() { surface_ = 0; }
39     Fl_Surface_Device(Fl_Graphics_Driver *graphics_driver) {pGraphicsDriver = graphics_driver; }
40     inline void driver(Fl_Graphics_Driver *graphics_driver) {pGraphicsDriver = graphics_driver; }
41 public:
42     virtual void set_current(void);
43     virtual bool is_current();
44     inline Fl_Graphics_Driver *driver() {return pGraphicsDriver; }
45     static inline Fl_Surface_Device *surface() {
46         return surface_ ? surface_ : default_surface();
47     }
48     virtual ~Fl_Surface_Device();
49     static void push_current(Fl_Surface_Device *new_current);
50     static Fl_Surface_Device *pop_current();
51 };
52
53 class FL_EXPORT Fl_Display_Device : public Fl_Surface_Device {
54     Fl_Display_Device(Fl_Graphics_Driver *graphics_driver);
55 public:
56     static Fl_Display_Device *display_device();
57 };
58
59 class Fl_Device_Plugin : public Fl_Plugin {
60 public:
61     Fl_Device_Plugin(const char *pluginName)
62     : Fl_Plugin(klass(), pluginName) { }
63     virtual const char *klass() { return "fltk:device"; }
64     virtual const char *name() = 0;
65     virtual int print(Fl_Widget* w) = 0;
66     virtual Fl_RGB_Image* rectangle_capture(Fl_Widget *widget, int x, int y, int w, int h) = 0;
67     static Fl_Device_Plugin *opengl_plugin();
68 };
69
70 #endif // Fl_Device_H

```

## 34.39 Fl\_Dial.H

```

1 //
2 // Dial header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:

```

```

13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Dial widget . */
19
20 #ifndef Fl_Dial_H
21 #define Fl_Dial_H
22
23 #ifndef Fl_Valuator_H
24 #include "Fl_Valuator.H"
25 #endif
26
27 // values for type():
28 #define FL_NORMAL_DIAL 0
29 #define FL_LINE_DIAL 1
30 #define FL_FILL_DIAL 2
45 class FL_EXPORT Fl_Dial : public Fl_Valuator {
46
47     short a1,a2;
48
49 protected:
50
51     // these allow subclasses to put the dial in a smaller area:
52     void draw(int X, int Y, int W, int H);
53     int handle(int event, int X, int Y, int W, int H);
54     void draw() FL_OVERRIDE;
55
56 public:
57
58     int handle(int) FL_OVERRIDE;
63     Fl_Dial(int x,int y,int w,int h, const char *l = 0);
70     short angle1() const {return a1;}
72     void angle1(short a) {a1 = a;}
74     short angle2() const {return a2;}
76     void angle2(short a) {a2 = a;}
78     void angles(short a, short b) {a1 = a; a2 = b;}
79
80 };
81
82 #endif

```

## 34.40 Fl\_Double\_Window.H

```

1 //
2 // Double-buffered window header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Double_Window widget . */
19
20 #ifndef Fl_Double_Window_H
21 #define Fl_Double_Window_H
22
23 #include "Fl_Window.H"
24
30 class FL_EXPORT Fl_Double_Window : public Fl_Window
31 {
32 public:
33     Fl_Double_Window *as_double_window() FL_OVERRIDE {return this; }
34     void show() FL_OVERRIDE;
36     void show(int a, char **b) {Fl_Window::show(a,b);}
37     void resize(int,int,int,int) FL_OVERRIDE;
38     void hide() FL_OVERRIDE;
39     void flush() FL_OVERRIDE;
40     ~Fl_Double_Window();
41
46     Fl_Double_Window(int W, int H, const char *l = 0);
47
51     Fl_Double_Window(int X, int Y, int W, int H, const char *l = 0);
52
53 };

```

```
54
55 #endif
```

## 34.41 fl\_draw.H File Reference

utility header to pull drawing functions together

```
#include <FL/Enumerations.H>
#include <FL/Fl_Graphics_Driver.H>
#include <FL/Fl_Rect.H>
```

### Enumerations

- enum {  
[FL\\_SOLID](#) = 0 , [FL\\_DASH](#) = 1 , [FL\\_DOT](#) = 2 , [FL\\_DASHDOT](#) = 3 ,  
[FL\\_DASHDOTDOT](#) = 4 , [FL\\_CAP\\_FLAT](#) = 0x100 , [FL\\_CAP\\_ROUND](#) = 0x200 , [FL\\_CAP\\_SQUARE](#) = 0x300 ,  
[FL\\_JOIN\\_MITER](#) = 0x1000 , [FL\\_JOIN\\_ROUND](#) = 0x2000 , [FL\\_JOIN\\_BEVEL](#) = 0x3000 }

### Functions

- int [fl\\_add\\_symbol](#) (const char \*name, void(\*drawit)([Fl\\_Color](#)), int scalable)  
*Adds a symbol to the system.*
- int [fl\\_antialias](#) ()  
*Return whether line drawings are currently antialiased.*
- void [fl\\_antialias](#) (int state)  
*Turn antialiased line drawings ON or OFF, if supported by platform.*
- void [fl\\_arc](#) (double x, double y, double r, double start, double end)  
*Add a series of points to the current path on the arc of a circle.*
- void [fl\\_arc](#) (int x, int y, int w, int h, double a1, double a2)  
*Draw ellipse sections using integer coordinates.*
- void [fl\\_begin\\_complex\\_polygon](#) ()  
*Start drawing a complex filled polygon.*
- void [fl\\_begin\\_line](#) ()  
*Start drawing a list of lines.*
- void [fl\\_begin\\_loop](#) ()  
*Start drawing a closed sequence of lines.*
- void [fl\\_begin\\_offscreen](#) ([Fl\\_Offscreen](#) ctx)  
*Send all subsequent drawing commands to this offscreen buffer.*
- void [fl\\_begin\\_points](#) ()  
*Start drawing a list of points.*
- void [fl\\_begin\\_polygon](#) ()  
*Start drawing a convex filled polygon.*
- char [fl\\_can\\_do\\_alpha\\_blending](#) ()  
*Check whether platform supports true alpha blending for RGBA images.*
- [Fl\\_RGB\\_Image](#) \* [fl\\_capture\\_window](#) ([Fl\\_Window](#) \*win, int x, int y, int w, int h)  
*Captures the content of a rectangular zone of a mapped window.*
- void [fl\\_chord](#) (int x, int y, int w, int h, double a1, double a2)  
*fl\_chord declaration is a place holder - the function does not yet exist*
- void [fl\\_circle](#) (double x, double y, double r)  
*fl\_circle(x,y,r) is equivalent to fl\_arc(x,y,r,0,360), but may be faster.*
- void [fl\\_clip](#) (int x, int y, int w, int h)  
*Intersect the current clip region with a rectangle and push this new region onto the stack (deprecated).*

- `int fl_clip_box` (int x, int y, int w, int h, int &X, int &Y, int &W, int &H)  
*Intersect a rectangle with the current clip region and return the bounding box of the result.*
- `FL_Region fl_clip_region` ()  
*Return the current clipping region.*
- `void fl_clip_region` (FL\_Region r)  
*Replace the top of the clipping stack with a clipping region of any shape.*
- `FL_Color fl_color` ()  
*Return the last `fl_color()` that was set.*
- `void fl_color` (FL\_Color c)  
*Set the color for all subsequent drawing operations.*
- `void fl_color` (int c)  
*for back compatibility - use `fl_color(FL_Color c)` instead*
- `void fl_color` (uchar r, uchar g, uchar b)  
*Set the color for all subsequent drawing operations.*
- `void fl_copy_offscreen` (int x, int y, int w, int h, FL\_Offscreen pixmap, int srcx, int srcy)  
*Copy a rectangular area of the given offscreen buffer into the current drawing destination.*
- `FL_Offscreen fl_create_offscreen` (int w, int h)  
*Creation of an offscreen graphics buffer.*
- `void fl_cursor` (FL\_Cursor)  
*Sets the cursor for the current window to the specified shape and colors.*
- `void fl_cursor` (FL\_Cursor, FL\_Color fg, FL\_Color bg=FL\_WHITE)
- `void fl_curve` (double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double Y3)  
*Add a series of points on a Bézier curve to the path.*
- `void fl_delete_offscreen` (FL\_Offscreen ctx)  
*Deletion of an offscreen graphics buffer.*
- `int fl_descent` ()  
*Return the recommended distance above the bottom of a `fl_height()` tall box to draw the text at so it looks centered vertically in that box.*
- `void fl_draw` (const char \*str, int n, int x, int y)  
*Draws starting at the given x, y location a UTF-8 string of length n bytes.*
- `void fl_draw` (const char \*str, int x, int y)  
*Draw a nul-terminated UTF-8 string starting at the given x, y location.*
- `void fl_draw` (const char \*str, int x, int y, int w, int h, FL\_Align align, FL\_Image \*img=0, int draw\_symbols=1, int spacing=0)  
*Fancy string drawing function which is used to draw all the labels.*
- `void fl_draw` (const char \*str, int x, int y, int w, int h, FL\_Align align, void(\*callthis)(const char \*, int, int, int), FL\_Image \*img=0, int draw\_symbols=1, int spacing=0)  
*The same as `fl_draw(const char*,int,int,int,int,FL_Align,FL_Image*,int)` with the addition of the `callthis` parameter, which is a pointer to a text drawing function such as `fl_draw(const char*, int, int, int)` to do the real work.*
- `void fl_draw` (int angle, const char \*str, int n, int x, int y)  
*Draw at the given x, y location a UTF-8 string of length n bytes rotating angle degrees counter-clockwise.*
- `void fl_draw` (int angle, const char \*str, int x, int y)  
*Draw a nul-terminated UTF-8 string starting at the given x, y location and rotating angle degrees counter-clockwise.*
- `void fl_draw_arrow` (FL\_Rect bb, FL\_Arrow\_Type t, FL\_Orientation o, FL\_Color color)  
*Draw an "arrow like" GUI element for the selected scheme.*
- `void fl_draw_box` (FL\_Boxtype, int x, int y, int w, int h, FL\_Color)  
*Draws a box using given type, position, size and color.*
- `void fl_draw_box_focus` (FL\_Boxtype, int x, int y, int w, int h, FL\_Color, FL\_Color)  
*Draws the focus rectangle inside a box using given type, position, size and color.*
- `void fl_draw_check` (FL\_Rect bb, FL\_Color col)  
*Draw a check mark inside the given bounding box.*

- void [fl\\_draw\\_circle](#) (int x, int y, int d, [FL\\_Color](#) color)  
*Draw a potentially small, filled circle using a given color.*
- void [fl\\_draw\\_image](#) (const [uchar](#) \*buf, int X, int Y, int W, int H, int D=3, int L=0)  
*Draw an 8-bit per color RGB or luminance image.*
- void [fl\\_draw\\_image](#) (FL\_Draw\_Image\_Cb cb, void \*data, int X, int Y, int W, int H, int D=3)  
*Draw an image using a callback function to generate image data.*
- void [fl\\_draw\\_image\\_mono](#) (const [uchar](#) \*buf, int X, int Y, int W, int H, int D=1, int L=0)  
*Draw a gray-scale (1 channel) image.*
- void [fl\\_draw\\_image\\_mono](#) (FL\_Draw\_Image\_Cb cb, void \*data, int X, int Y, int W, int H, int D=1)  
*Draw a gray-scale image using a callback function to generate image data.*
- int [fl\\_draw\\_pixmap](#) (char \*const \*data, int x, int y, [FL\\_Color](#) bg=FL\_GRAY)  
*Draw XPM image data, with the top-left corner at the given position.*
- int [fl\\_draw\\_pixmap](#) (const char \*const \*data, int x, int y, [FL\\_Color](#) bg=FL\_GRAY)  
*Draw XPM image data, with the top-left corner at the given position.*
- void [fl\\_draw\\_radio](#) (int x, int y, int d, [FL\\_Color](#) color)  
*Draw a round check mark (circle) of a radio button.*
- int [fl\\_draw\\_symbol](#) (const char \*label, int x, int y, int w, int h, [FL\\_Color](#))  
*Draw the named symbol in the given rectangle using the given color.*
- void [fl\\_end\\_complex\\_polygon](#) ()  
*End complex filled polygon, and draw.*
- void [fl\\_end\\_line](#) ()  
*End list of lines, and draw.*
- void [fl\\_end\\_loop](#) ()  
*End closed sequence of lines, and draw.*
- void [fl\\_end\\_offscreen](#) ()  
*Quit sending drawing commands to the current offscreen buffer.*
- void [fl\\_end\\_points](#) ()  
*End list of points, and draw.*
- void [fl\\_end\\_polygon](#) ()  
*End convex filled polygon, and draw.*
- const char \* [fl\\_expand\\_text](#) (const char \*from, char \*buf, int maxbuf, double maxw, int &n, double &width, int wrap, int draw\_symbols=0)  
*Copy from to buf, replacing control characters with ^X.*
- void [fl\\_focus\\_rect](#) (int x, int y, int w, int h)  
*Draw a dotted rectangle, used to indicate keyboard focus on a widget.*
- [FL\\_Font](#) [fl\\_font](#) ()  
*Return the face set by the most recent call to [fl\\_font\(\)](#).*
- void [fl\\_font](#) ([FL\\_Font](#) face, [FL\\_Fontsize](#) fsize)  
*Sets the current font, which is then used in various drawing routines.*
- void [fl\\_frame](#) (const char \*s, int x, int y, int w, int h)  
*Draws a series of line segments around the given box.*
- void [fl\\_frame2](#) (const char \*s, int x, int y, int w, int h)  
*Draws a series of line segments around the given box.*
- void [fl\\_gap](#) ()  
*Separate loops of the path.*
- int [fl\\_height](#) ()  
*Return the recommended minimum line spacing for the current font.*
- int [fl\\_height](#) (int font, int size)  
*This function returns the actual height of the specified font and size.*
- const char \* [fl\\_latin1\\_to\\_local](#) (const char \*t, int n=-1)  
*Convert text from Windows/X11 latin1 character set to local encoding.*

- void **fl\_line** (int x, int y, int x1, int y1)  
*Draw a line from (x,y) to (x1,y1)*
- void **fl\_line** (int x, int y, int x1, int y1, int x2, int y2)  
*Draw a line from (x,y) to (x1,y1) and another from (x1,y1) to (x2,y2)*
- void **fl\_line\_style** (int style, int width=0, char \*dashes=0)  
*Set how to draw lines (the "pen").*
- void **fl\_load\_identity** ()  
*Set the transformation matrix to identity.*
- void **fl\_load\_matrix** (double a, double b, double c, double d, double x, double y)  
*Set the current transformation matrix.*
- const char \* **fl\_local\_to\_latin1** (const char \*t, int n=-1)  
*Convert text from local encoding to Windows/X11 latin1 character set.*
- const char \* **fl\_local\_to\_mac\_roman** (const char \*t, int n=-1)  
*Convert text from local encoding to Mac Roman character set.*
- void **fl\_loop** (int x, int y, int x1, int y1, int x2, int y2)  
*Outline a 3-sided polygon with lines.*
- void **fl\_loop** (int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)  
*Outline a 4-sided polygon with lines.*
- const char \* **fl\_mac\_roman\_to\_local** (const char \*t, int n=-1)  
*Convert text from Mac Roman character set to local encoding.*
- void **fl\_measure** (const char \*str, int &x, int &y, int draw\_symbols=1)  
*Measure how wide and tall the string will be when printed by the [fl\\_draw\(\)](#) function with *align* parameter.*
- int **fl\_measure\_pixmap** (char \*const \*data, int &w, int &h)  
*Get the dimensions of a pixmap.*
- int **fl\_measure\_pixmap** (const char \*const \*cdata, int &w, int &h)  
*Get the dimensions of a pixmap.*
- void **fl\_mult\_matrix** (double a, double b, double c, double d, double x, double y)  
*Concatenate another transformation onto the current one.*
- int **fl\_not\_clipped** (int x, int y, int w, int h)  
*Does the rectangle intersect the current clip region?*
- unsigned int **fl\_old\_shortcut** (const char \*s)  
*Emulation of XForms named shortcuts.*
- void **fl\_overlay\_clear** ()  
*Erase a selection rectangle without drawing a new one.*
- void **fl\_overlay\_rect** (int x, int y, int w, int h)  
*Draw a transient dotted selection rectangle.*
- float **fl\_override\_scale** ()  
*Removes any GUI scaling factor in subsequent drawing operations.*
- void **fl\_pie** (int x, int y, int w, int h, double a1, double a2)  
*Draw filled ellipse sections using integer coordinates.*
- void **fl\_point** (int x, int y)  
*Draw a single pixel at the given coordinates.*
- void **fl\_polygon** (int x, int y, int x1, int y1, int x2, int y2)  
*Fill a 3-sided polygon.*
- void **fl\_polygon** (int x, int y, int x1, int y1, int x2, int y2, int x3, int y3)  
*Fill a 4-sided polygon.*
- void **fl\_pop\_clip** ()  
*Restore the previous clip region.*
- void **fl\_pop\_matrix** ()  
*Restore the current transformation matrix from the stack.*
- void **fl\_push\_clip** (int x, int y, int w, int h)

- Intersect the current clip region with a rectangle and push this new region onto the stack.*
- void [fl\\_push\\_matrix](#) ()
  - Save the current transformation matrix on the stack.*
- void [fl\\_push\\_no\\_clip](#) ()
  - Push an empty clip region onto the stack so nothing will be clipped.*
- [uchar](#) \* [fl\\_read\\_image](#) ([uchar](#) \*p, int X, int Y, int W, int H, int alpha=0)
  - Reads an RGB(A) image from the current window or off-screen buffer.*
- void [fl\\_rect](#) ([Fl\\_Rect](#) r)
  - Draw a border inside the given bounding box.*
- void [fl\\_rect](#) (int x, int y, int w, int h)
  - Draw a border inside the given bounding box.*
- void [fl\\_rect](#) (int x, int y, int w, int h, [Fl\\_Color](#) c)
  - Draw with passed color a border inside the given bounding box.*
- void [fl\\_rectf](#) ([Fl\\_Rect](#) bb, [uchar](#) r, [uchar](#) g, [uchar](#) b)
  - Color a rectangle with "exactly" the passed  $r, g, b$  color.*
- void [fl\\_rectf](#) ([Fl\\_Rect](#) r)
  - Color with current color a rectangle that exactly fills the given bounding box.*
- void [fl\\_rectf](#) ([Fl\\_Rect](#) r, [Fl\\_Color](#) c)
  - Color with passed color a rectangle that exactly fills the given bounding box.*
- void [fl\\_rectf](#) (int x, int y, int w, int h)
  - Color with current color a rectangle that exactly fills the given bounding box.*
- void [fl\\_rectf](#) (int x, int y, int w, int h, [Fl\\_Color](#) c)
  - Color with passed color a rectangle that exactly fills the given bounding box.*
- void [fl\\_rectf](#) (int x, int y, int w, int h, [uchar](#) r, [uchar](#) g, [uchar](#) b)
  - Color a rectangle with "exactly" the passed  $r, g, b$  color.*
- void [fl\\_rescale\\_offscreen](#) ([Fl\\_Offscreen](#) &ctx)
  - Adapts an offscreen buffer to a changed value of the scale factor.*
- void [fl\\_reset\\_spot](#) (void)
  - Resets marked text.*
- void [fl\\_restore\\_clip](#) ()
  - Undo any clobbering of the clip region done by your program.*
- void [fl\\_restore\\_scale](#) (float s)
  - Restores the GUI scaling factor in subsequent drawing operations.*
- void [fl\\_rotate](#) (double d)
  - Concatenate rotation transformation onto the current one.*
- void [fl\\_rounded\\_rect](#) (int x, int y, int w, int h, int r)
  - Draw a rounded border inside the given bounding box.*
- void [fl\\_rounded\\_rectf](#) (int x, int y, int w, int h, int r)
  - Color with current color a rounded rectangle that exactly fills the given bounding box.*
- void [fl\\_rtl\\_draw](#) (const char \*str, int n, int x, int y)
  - Draw a UTF-8 string of length  $n$  bytes right to left starting at the given  $x, y$  location.*
- void [fl\\_scale](#) (double x)
  - Concatenate scaling transformation onto the current one.*
- void [fl\\_scale](#) (double x, double y)
  - Concatenate scaling transformation onto the current one.*
- void [fl\\_scroll](#) (int X, int Y, int W, int H, int dx, int dy, void(\*draw\_area)(void \*, int, int, int, int), void \*data)
  - Scroll a rectangle and draw the newly exposed portions.*
- void [fl\\_set\\_spot](#) (int font, int size, int X, int Y, int W, int H, [Fl\\_Window](#) \*win=0)
  - Inform text input methods about the current text insertion cursor.*
- void [fl\\_set\\_status](#) (int X, int Y, int W, int H)
  - Related to text input methods under X11.*

- `const char * fl_shortcut_label` (unsigned int shortcut)  
*Get a human-readable string from a shortcut value.*
- `const char * fl_shortcut_label` (unsigned int shortcut, const char \*\*eom)  
*Get a human-readable string from a shortcut value.*
- `FL_Fontsize fl_size` ()  
*Return the *size* set by the most recent call to *fl\_font()*.*
- `void fl_text_extents` (const char \*, int &dx, int &dy, int &w, int &h)  
*Determine the minimum pixel dimensions of a nul-terminated string using the current *fl\_font()*.*
- `void fl_text_extents` (const char \*t, int n, int &dx, int &dy, int &w, int &h)  
*Determine the minimum pixel dimensions of a sequence of *n* characters (bytes) using the current *fl\_font()*.*
- `double fl_transform_dx` (double x, double y)  
*Transform distance using current transformation matrix.*
- `double fl_transform_dy` (double x, double y)  
*Transform distance using current transformation matrix.*
- `double fl_transform_x` (double x, double y)  
*Transform coordinate using the current transformation matrix.*
- `double fl_transform_y` (double x, double y)  
*Transform coordinate using the current transformation matrix.*
- `void fl_transformed_vertex` (double xf, double yf)  
*Add coordinate pair to the vertex list without further transformations.*
- `void fl_translate` (double x, double y)  
*Concatenate translation transformation onto the current one.*
- `void fl_vertex` (double x, double y)  
*Add a single vertex to the current path.*
- `double fl_width` (const char \*txt)  
*Return the typographical width of a nul-terminated string using the current font face and size.*
- `double fl_width` (const char \*txt, int n)  
*Return the typographical width of a sequence of *n* characters using the current font face and size.*
- `double fl_width` (unsigned int c)  
*Return the typographical width of a single character using the current font face and size.*
- `void fl_xylene` (int x, int y, int x1)  
*Draw a horizontal line from (x,y) to (x1,y).*
- `void fl_xylene` (int x, int y, int x1, int y2)  
*Draw a horizontal line from (x,y) to (x1,y), then vertical from (x1,y) to (x1,y2).*
- `void fl_xylene` (int x, int y, int x1, int y2, int x3)  
*Draw a horizontal line from (x,y) to (x1,y), then a vertical from (x1,y) to (x1,y2) and then another horizontal from (x1,y2) to (x3,y2).*
- `void fl_yxline` (int x, int y, int y1)  
*Draw a vertical line from (x,y) to (x,y1)*
- `void fl_yxline` (int x, int y, int y1, int x2)  
*Draw a vertical line from (x,y) to (x,y1), then a horizontal from (x,y1) to (x2,y1).*
- `void fl_yxline` (int x, int y, int y1, int x2, int y3)  
*Draw a vertical line from (x,y) to (x,y1), then a horizontal from (x,y1) to (x2,y1), then another vertical from (x2,y1) to (x2,y3).*

## Variables

- `char fl_draw_shortcut`

### 34.41.1 Detailed Description

utility header to pull drawing functions together

## 34.42 fl\_draw.H

[Go to the documentation of this file.](#)

```

1 //
2 // Portable drawing function header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
22 #ifndef fl_draw_H
23 #define fl_draw_H
24
25 #include <FL/Enumerations.H> // color names
26 #include <FL/Fl_Graphics_Driver.H> // fl_graphics_driver + Fl_Region
27 #include <FL/Fl_Rect.H>
28
29 // Image class...
30 class Fl_Image;
31 class Fl_Window;
32
33 // Label flags...
34 FL_EXPORT extern char fl_draw_shortcut;
35
40 // Colors:
50 inline void fl_color(Fl_Color c) {
51     fl_graphics_driver->color(c);
52 } // select indexed color
54 inline void fl_color(int c) {
55     fl_color((Fl_Color)c);
56 }
67 inline void fl_color(uchar r, uchar g, uchar b) {
68     fl_graphics_driver->color(r, g, b);
69 }
74 inline Fl_Color fl_color() {
75     return fl_graphics_driver->color();
76 }
82 // clip:
88 inline void fl_push_clip(int x, int y, int w, int h) {
89     fl_graphics_driver->push_clip(x, y, w, h);
90 }
99 inline void fl_clip(int x, int y, int w, int h) {
100     fl_graphics_driver->push_clip(x, y, w, h);
101 }
105 inline void fl_push_no_clip() {
106     fl_graphics_driver->push_no_clip();
107 }
115 inline void fl_pop_clip() {
116     fl_graphics_driver->pop_clip();
117 }
118
132 inline int fl_not_clipped(int x, int y, int w, int h) {
133     return fl_graphics_driver->not_clipped(x, y, w, h);
134 }
135
178 inline int fl_clip_box(int x, int y, int w, int h, int &X, int &Y, int &W, int &H) {
179     return fl_graphics_driver->clip_box(x, y, w, h, X, Y, W, H);
180 }
181
183 inline void fl_restore_clip() {
184     fl_graphics_driver->restore_clip();
185 }
186
196 inline void fl_clip_region(Fl_Region r) {
197     fl_graphics_driver->clip_region(r);
198 }
199
206 inline Fl_Region fl_clip_region() {
207     return fl_graphics_driver->clip_region();
208 }
209
210
211 // points:
215 inline void fl_point(int x, int y) {
216     fl_graphics_driver->point(x, y);
217 }
218

```

```

219 // line type:
252 inline void fl_line_style(int style, int width = 0, char *dashes = 0) {
253     fl_graphics_driver->line_style(style, width, dashes);
254 }
255
261 enum {
262     FL_SOLID      = 0,
263     FL_DASH       = 1,
264     FL_DOT        = 2,
265     FL_DASHDOT    = 3,
266     FL_DASHDOTDOT = 4,
267
268     FL_CAP_FLAT   = 0x100,
269     FL_CAP_ROUND  = 0x200,
270     FL_CAP_SQUARE = 0x300,
271
272     FL_JOIN_MITER = 0x1000,
273     FL_JOIN_ROUND = 0x2000,
274     FL_JOIN_BEVEL = 0x3000
275 };
276
282 inline void fl_antialias(int state) {
283     fl_graphics_driver->antialias(state);
284 }
285
287 inline int fl_antialias() {
288     return fl_graphics_driver->antialias();
289 }
290
291 // rectangles tweaked to exactly fill the pixel rectangle:
292
298 inline void fl_rect(int x, int y, int w, int h) {
299     fl_graphics_driver->rect(x, y, w, h);
300 }
301
307 inline void fl_rounded_rect(int x, int y, int w, int h, int r) {
308     fl_graphics_driver->rounded_rect(x, y, w, h, r);
309 }
310
316 inline void fl_rect(Fl_Rect r) {
317     fl_rect(r.x(), r.y(), r.w(), r.h());
318 }
319
326 inline void fl_focus_rect(int x, int y, int w, int h) {
327     fl_graphics_driver->focus_rect(x, y, w, h);
328 }
329
333 inline void fl_rect(int x, int y, int w, int h, Fl_Color c) {
334     fl_color(c);
335     fl_rect(x, y, w, h);
336 }
337
339 inline void fl_rectf(int x, int y, int w, int h) {
340     fl_graphics_driver->rectf(x, y, w, h);
341 }
342
347 inline void fl_rounded_rectf(int x, int y, int w, int h, int r) {
348     fl_graphics_driver->rounded_rectf(x, y, w, h, r);
349 }
350
354 inline void fl_rectf(int x, int y, int w, int h, Fl_Color c) {
355     fl_color(c);
356     fl_rectf(x, y, w, h);
357 }
358
360 inline void fl_rectf(Fl_Rect r) {
361     fl_graphics_driver->rectf(r.x(), r.y(), r.w(), r.h());
362 }
363
367 inline void fl_rectf(Fl_Rect r, Fl_Color c) {
368     fl_color(c);
369     fl_rectf(r);
370 }
371
379 inline void fl_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b) {
380     fl_graphics_driver->colored_rectf(x, y, w, h, r, g, b);
381 }
382
389 inline void fl_rectf(Fl_Rect bb, uchar r, uchar g, uchar b) {
390     fl_graphics_driver->colored_rectf(bb.x(), bb.y(), bb.w(), bb.h(), r, g, b);
391 }
392
393 // line segments:
397 inline void fl_line(int x, int y, int x1, int y1) {
398     fl_graphics_driver->line(x, y, x1, y1);
399 }
403 inline void fl_line(int x, int y, int x1, int y1, int x2, int y2) {

```

```

404 fl_graphics_driver->line(x, y, x1, y1, x2, y2);
405 }
406
407 // closed line segments:
411 inline void fl_loop(int x, int y, int x1, int y1, int x2, int y2) {
412     fl_graphics_driver->loop(x, y, x1, y1, x2, y2);
413 }
417 inline void fl_loop(int x, int y, int x1, int y1, int x2, int y2, int x3, int y3) {
418     fl_graphics_driver->loop(x, y, x1, y1, x2, y2, x3, y3);
419 }
420
421 // filled polygons
425 inline void fl_polygon(int x, int y, int x1, int y1, int x2, int y2) {
426     fl_graphics_driver->polygon(x, y, x1, y1, x2, y2);
427 }
431 inline void fl_polygon(int x, int y, int x1, int y1, int x2, int y2, int x3, int y3) {
432     fl_graphics_driver->polygon(x, y, x1, y1, x2, y2, x3, y3);
433 }
434
435 // draw rectilinear lines, horizontal segment first:
439 inline void fl_xyline(int x, int y, int x1) {
440     fl_graphics_driver->xyline(x, y, x1);
441 }
445 inline void fl_xyline(int x, int y, int x1, int y2) {
446     fl_graphics_driver->xyline(x, y, x1, y2);
447 }
452 inline void fl_xyline(int x, int y, int x1, int y2, int x3) {
453     fl_graphics_driver->xyline(x, y, x1, y2, x3);
454 }
455
456 // draw rectilinear lines, vertical segment first:
460 inline void fl_yxline(int x, int y, int y1) {
461     fl_graphics_driver->yxline(x, y, y1);
462 }
466 inline void fl_yxline(int x, int y, int y1, int x2) {
467     fl_graphics_driver->yxline(x, y, y1, x2);
468 }
473 inline void fl_yxline(int x, int y, int y1, int x2, int y3) {
474     fl_graphics_driver->yxline(x, y, y1, x2, y3);
475 }
476
477 // circular lines and pie slices (code in fl_arci.C):
503 inline void fl_arc(int x, int y, int w, int h, double a1, double a2) {
504     fl_graphics_driver->arc(x, y, w, h, a1, a2);
505 }
521 inline void fl_pie(int x, int y, int w, int h, double a1, double a2) {
522     fl_graphics_driver->pie(x, y, w, h, a1, a2);
523 }
525 FL_EXPORT void fl_chord(int x, int y, int w, int h, double a1, double a2); // nyi
526
527 // scalable drawing code (code in fl_vertex.cxx and fl_arc.cxx):
532 inline void fl_push_matrix() {
533     fl_graphics_driver->push_matrix();
534 }
538 inline void fl_pop_matrix() {
539     fl_graphics_driver->pop_matrix();
540 }
545 inline void fl_scale(double x, double y) {
546     fl_graphics_driver->mult_matrix(x, 0, 0, y, 0, 0);
547 }
552 inline void fl_scale(double x) {
553     fl_graphics_driver->mult_matrix(x, 0, 0, x, 0, 0);
554 }
559 inline void fl_translate(double x, double y) {
560     fl_graphics_driver->translate(x, y);
561 }
566 inline void fl_rotate(double d) {
567     fl_graphics_driver->rotate(d);
568 }
572 inline void fl_load_identity() {
573     fl_graphics_driver->load_identity();
574 }
579 inline void fl_load_matrix(double a, double b, double c, double d, double x, double y) {
580     fl_graphics_driver->load_matrix(a, b, c, d, x, y);
581 }
588 inline void fl_mult_matrix(double a, double b, double c, double d, double x, double y) {
589     fl_graphics_driver->mult_matrix(a, b, c, d, x, y);
590 }
594 inline void fl_begin_points() {
595     fl_graphics_driver->begin_points();
596 }
600 inline void fl_begin_line() {
601     fl_graphics_driver->begin_line();
602 }
606 inline void fl_begin_loop() {
607     fl_graphics_driver->begin_loop();
608 }

```

```

612 inline void fl_begin_polygon() {
613     fl_graphics_driver->begin_polygon();
614 }
619 inline void fl_vertex(double x, double y) {
620     fl_graphics_driver->vertex(x, y);
621 }
630 inline void fl_curve(double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double
    Y3) {
631     fl_graphics_driver->curve(X0, Y0, X1, Y1, X2, Y2, X3, Y3);
632 }
668 inline void fl_arc(double x, double y, double r, double start, double end) {
669     fl_graphics_driver->arc(x, y, r, start, end);
670 }
683 inline void fl_circle(double x, double y, double r) {
684     fl_graphics_driver->circle(x, y, r);
685 }
689 inline void fl_end_points() {
690     fl_graphics_driver->end_points();
691 }
695 inline void fl_end_line() {
696     fl_graphics_driver->end_line();
697 }
701 inline void fl_end_loop() {
702     fl_graphics_driver->end_loop();
703 }
707 inline void fl_end_polygon() {
708     fl_graphics_driver->end_polygon();
709 }
723 inline void fl_begin_complex_polygon() {
724     fl_graphics_driver->begin_complex_polygon();
725 }
732 inline void fl_gap() {
733     fl_graphics_driver->gap();
734 }
738 inline void fl_end_complex_polygon() {
739     fl_graphics_driver->end_complex_polygon();
740 }
741 // get and use transformed positions:
746 inline double fl_transform_x(double x, double y) {
747     return fl_graphics_driver->transform_x(x, y);
748 }
753 inline double fl_transform_y(double x, double y) {
754     return fl_graphics_driver->transform_y(x, y);
755 }
760 inline double fl_transform_dx(double x, double y) {
761     return fl_graphics_driver->transform_dx(x, y);
762 }
767 inline double fl_transform_dy(double x, double y) {
768     return fl_graphics_driver->transform_dy(x, y);
769 }
774 inline void fl_transformed_vertex(double xf, double yf) {
775     fl_graphics_driver->transformed_vertex(xf, yf);
776 }
777
784 inline void fl_copy_offscreen(int x, int y, int w, int h, Fl_Offscreen pixmap, int srcx, int srcy) {
785     fl_graphics_driver->copy_offscreen(x, y, w, h, pixmap, srcx, srcy);
786 }
787
788 FL_EXPORT Fl_Offscreen fl_create_offscreen(int w, int h);
789 FL_EXPORT void fl_begin_offscreen(Fl_Offscreen b);
790 FL_EXPORT void fl_end_offscreen(void);
791 FL_EXPORT void fl_delete_offscreen(Fl_Offscreen bitmap);
792 FL_EXPORT void fl_rescale_offscreen(Fl_Offscreen &ctx);
793
798 /* NOTE: doxygen comments here to avoid triplcation in os-specific sources */
799
800 // Fonts:
801 /*
802 Set the current font, which is then used in various drawing routines.
803 Implemented and documented in src/fl_draw.cxx
804 */
805 FL_EXPORT void fl_font(Fl_Font face, Fl_Fontsize fsize);
806
811 inline Fl_Font fl_font() {
812     return fl_graphics_driver->font();
813 }
818 inline Fl_Fontsize fl_size() {
819     return fl_graphics_driver->size();
820 }
821
822 // Information you can get about the current font:
827 inline int fl_height() {
828     return fl_graphics_driver->height();
829 }
830 FL_EXPORT int fl_height(int font, int size);
835 inline int fl_descent() {
836     return fl_graphics_driver->descent();

```

```

837 }
841 FL_EXPORT double fl_width(const char *txt);
842
846 inline double fl_width(const char *txt, int n) {
847     return fl_graphics_driver->width(txt, n);
848 }
855 inline double fl_width(unsigned int c) {
856     return fl_graphics_driver->width(c);
857 }
883 FL_EXPORT void fl_text_extents(const char *, int &dx, int &dy, int &w, int &h);
884
891 inline void fl_text_extents(const char *t, int n, int &dx, int &dy, int &w, int &h) {
892     fl_graphics_driver->text_extents(t, n, dx, dy, w, h);
893 }
894
895 // font encoding:
896 // Note: doxygen comments here to avoid duplication for os-specific cases
903 FL_EXPORT const char *fl_latin1_to_local(const char *t, int n = -1);
910 FL_EXPORT const char *fl_local_to_latin1(const char *t, int n = -1);
917 FL_EXPORT const char *fl_mac_roman_to_local(const char *t, int n = -1);
924 FL_EXPORT const char *fl_local_to_mac_roman(const char *t, int n = -1);
930 FL_EXPORT float fl_override_scale();
931
932 FL_EXPORT void fl_restore_scale(float s);
933
944 FL_EXPORT void fl_draw(const char *str, int x, int y);
952 FL_EXPORT void fl_draw(int angle, const char *str, int x, int y);
956 inline void fl_draw(const char *str, int n, int x, int y) {
957     fl_graphics_driver->draw(str, n, x, y);
958 }
968 inline void fl_draw(int angle, const char *str, int n, int x, int y) {
969     fl_graphics_driver->draw(angle, str, n, x, y);
970 }
974 inline void fl_rtl_draw(const char *str, int n, int x, int y) {
975     fl_graphics_driver->rtl_draw(str, n, x, y);
976 }
977 FL_EXPORT void fl_measure(const char *str, int &x, int &y, int draw_symbols = 1);
1000 FL_EXPORT void fl_draw(const char *str, int x, int y, int w, int h,
1001                         Fl_Align align, Fl_Image *img = 0,
1002                         int draw_symbols = 1, int spacing = 0);
1018 FL_EXPORT void fl_draw(const char *str, int x, int y, int w, int h, Fl_Align align,
1019                         void (*callthis)(const char *, int, int, int),
1020                         Fl_Image *img = 0, int draw_symbols = 1, int spacing = 0);
1021
1022 // boxtypes:
1023
1024 FL_EXPORT void fl_frame(const char *s, int x, int y, int w, int h);
1025 FL_EXPORT void fl_frame2(const char *s, int x, int y, int w, int h);
1026 FL_EXPORT void fl_draw_box(Fl_Boxtype, int x, int y, int w, int h, Fl_Color);
1027 FL_EXPORT void fl_draw_box_focus(Fl_Boxtype, int x, int y, int w, int h, Fl_Color, Fl_Color);
1028
1029 // basic GUI objects (check marks, arrows, more to come ...):
1030
1031 // Draw a check mark in the given color inside the bounding box bb.
1032 void fl_draw_check(Fl_Rect bb, Fl_Color col);
1033
1034 // Draw one or more "arrows" (triangles)
1035 FL_EXPORT void fl_draw_arrow(Fl_Rect bb, Fl_Arrow_Type t, Fl_Orientation o, Fl_Color color);
1036
1037 // Draw a potentially small, filled circle
1038 FL_EXPORT void fl_draw_circle(int x, int y, int d, Fl_Color color);
1039
1040 // Draw the full "radio button" of a radio menu entry or radio button
1041 // This requires scheme specific handling (particularly gtk+ scheme)
1042 FL_EXPORT void fl_draw_radio(int x, int y, int d, Fl_Color color);
1043
1044 // images:
1045
1081 inline void fl_draw_image(const uchar *buf, int X, int Y, int W, int H, int D = 3, int L = 0) {
1082     fl_graphics_driver->draw_image_general_(buf, X, Y, W, H, D, L);
1083 }
1084
1089 inline void fl_draw_image_mono(const uchar *buf, int X, int Y, int W, int H, int D = 1, int L = 0) {
1090     fl_graphics_driver->draw_image_mono_general_(buf, X, Y, W, H, D, L);
1091 }
1092
1128 inline void fl_draw_image(Fl_Draw_Image_Cb cb, void *data, int X, int Y, int W, int H, int D = 3) {
1129     fl_graphics_driver->draw_image(cb, data, X, Y, W, H, D);
1130 }
1131
1136 inline void fl_draw_image_mono(Fl_Draw_Image_Cb cb, void *data, int X, int Y, int W, int H, int D = 1) {
1137     fl_graphics_driver->draw_image_mono(cb, data, X, Y, W, H, D);
1138 }
1139
1145 inline char fl_can_do_alpha_blending() {
1146     return Fl_Graphics_Driver::default_driver().can_do_alpha_blending();

```

```

1147 }
1148
1149 FL_EXPORT uchar *fl_read_image(uchar *p, int X, int Y, int W, int H, int alpha = 0);
1150 FL_EXPORT Fl_RGB_Image *fl_capture_window(Fl_Window *win, int x, int y, int w, int h);
1151
1152 // pixmaps:
1153 FL_EXPORT int fl_draw_pixmap(const char *const *data, int x, int y, Fl_Color bg = FL_GRAY);
1154 inline int fl_draw_pixmap(/*const*/ char *const *data, int x, int y, Fl_Color bg = FL_GRAY) {
1155     return fl_draw_pixmap((const char *const *)data, x, y, bg);
1156 }
1157
1158 FL_EXPORT int fl_measure_pixmap(/*const*/ char *const *data, int &w, int &h);
1159 FL_EXPORT int fl_measure_pixmap(const char *const *cdata, int &w, int &h);
1160
1161 // other:
1162 FL_EXPORT void fl_scroll(int X, int Y, int W, int H, int dx, int dy,
1163     void (*draw_area)(void *, int, int, int, int), void *data);
1164 FL_EXPORT const char *fl_shortcut_label(unsigned int shortcut);
1165 FL_EXPORT const char *fl_shortcut_label(unsigned int shortcut, const char **eom);
1166 FL_EXPORT unsigned int fl_old_shortcut(const char *s);
1167 FL_EXPORT void fl_overlay_rect(int x, int y, int w, int h);
1168 FL_EXPORT void fl_overlay_clear();
1169 FL_EXPORT void fl_cursor(Fl_Cursor);
1170 FL_EXPORT void fl_cursor(Fl_Cursor, Fl_Color fg, Fl_Color bg = FL_WHITE);
1171 FL_EXPORT const char *fl_expand_text(const char *from, char *buf, int maxbuf, double maxw,
1172     int &n, double &width, int wrap, int draw_symbols = 0);
1173
1174 // XIM:
1175 FL_EXPORT void fl_set_status(int X, int Y, int W, int H);
1176 FL_EXPORT void fl_set_spot(int font, int size, int X, int Y, int W, int H, Fl_Window *win = 0);
1177 FL_EXPORT void fl_reset_spot(void);
1178
1179 // XForms symbols:
1180 FL_EXPORT int fl_draw_symbol(const char *label, int x, int y, int w, int h, Fl_Color);
1181 FL_EXPORT int fl_add_symbol(const char *name, void (*drawit)(Fl_Color), int scalable);
1182 #endif

```

## 34.43 Fl\_Export.H

```

1 /*
2  * Windows DLL export .
3  *
4  * Copyright 1998-2018 by Bill Spitzak and others.
5  *
6  * This library is free software.  Distribution and use rights are outlined in
7  * the file "COPYING" which should have been included with this file.  If this
8  * file is missing or damaged, see the license at:
9  *
10 *      https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *      https://www.fltk.org/bugs.php
15 */
16
17 #ifndef Fl_Export_H
18 # define Fl_Export_H
19
20 /*
21 * The following is used when building DLLs under Windows
22 * and when building .so's under unix/linux.
23 */
24
25 # if defined(FL_DLL)
26 #   ifdef FL_LIBRARY
27 #     define FL_EXPORT __declspec(dllexport)
28 #   else
29 #     define FL_EXPORT __declspec(dllimport)
30 #   endif /* FL_LIBRARY */
31 # elif __GNUC__ >= 4
32 #   define FL_EXPORT __attribute__ ((visibility ("default")))
33 # else
34 #   define FL_EXPORT
35 # endif /* FL_DLL */
36
37 #endif /* !Fl_Export_H */

```

## 34.44 Fl\_File\_Browser.H

```

1 //
2 // FileBrowser definitions.
3 //

```

```

4 // Copyright 1999-2010 by Michael Sweet.
5 //
6 // This library is free software.  Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file.  If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_File_Browser widget . */
19
20 //
21 // Include necessary header files...
22 //
23
24 #ifndef _Fl_File_Browser_H_
25 # define _Fl_File_Browser_H_
26
27 # include "Fl_Browser.H"
28 # include "Fl_File_Icon.H"
29 # include "filename.H"
30
31
32 //
33 // Fl_File_Browser class...
34 //
35
36 class FL_EXPORT Fl_File_Browser : public Fl_Browser {
37
38     int             filetype_;
39     const char      *directory_;
40     uchar           iconsize_;
41     const char      *pattern_;
42     const char      *errmsg_;
43
44
45     int  full_height() const FL_OVERRIDE;
46     int  item_height(void *) const FL_OVERRIDE;
47     int  item_width(void *) const FL_OVERRIDE;
48     void item_draw(void *, int, int, int, int) const FL_OVERRIDE;
49     int  incr_height() const FL_OVERRIDE { return (item_height(0) + linespacing()); }
50
51 public:
52     enum { FILES, DIRECTORIES };
53
54     Fl_File_Browser(int, int, int, int, const char * = 0);
55     ~Fl_File_Browser();
56
57     uchar           iconsize()const { return (iconsize_); }
58     void            iconsize(uchar s) { iconsize_ = s; redraw(); }
59
60     void filter(const char *pattern);
61     const char      *filter()const { return (pattern_); }
62     int             load(const char *directory, Fl_File_Sort_F *sort = fl_numericsort);
63     Fl_Fontsize      textsize()const { return Fl_Browser::textsize(); }
64     void            textsize(Fl_Fontsize s) { Fl_Browser::textsize(s); iconsize_ = (uchar) (3 * s / 2); }
65
66     int             filetype()const { return (filetype_); }
67     void            filetype(int t) { filetype_ = t; }
68     void errmsg(const char *emsg);
69     const char* errmsg()const { return errmsg_; }
70 };
71
72 #endif // !_Fl_File_Browser_H_

```

## 34.45 Fl\_File\_Chooser.H

```

1 //
2 // Fl_File_Chooser dialog for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software.  Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file.  If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php

```

```

15 //
16 // =====
17 // DO NOT EDIT FL/Fl_File_Chooser.H and src/Fl_File_Chooser.cxx !!!
18 // =====
19 // Please use fluid to change src/Fl_File_Chooser.fl interactively
20 // and then use fluid to "write code" or edit and use fluid -c .
21 // =====
22 //
23
24 // generated by Fast Light User Interface Designer (fluid) version 1.0500
25
26 #ifndef FL_File_Chooser_H
27 #define FL_File_Chooser_H
28 #include <FL/Fl.H>
29 #include <FL/Fl_Double_Window.H>
30 #include <FL/Fl_Group.H>
31 #include <FL/Fl_Choice.H>
32 #include <FL/Fl_Menu_Button.H>
33 #include <FL/Fl_Button.H>
34 #include <FL/Fl_Preferences.H>
35 #include <FL/Fl_Tile.H>
36 #include <FL/Fl_File_Browser.H>
37 #include <FL/Fl_Box.H>
38 #include <FL/Fl_Check_Button.H>
39 #include <FL/Fl_File_Input.H>
40 #include <FL/Fl_Return_Button.H>
41 #include <FL/fl_ask.H>
42
43 class FL_EXPORT Fl_File_Chooser {
44 public:
45     enum Type {
46         SINGLE = 0,
47         MULTI = 1,
48         CREATE = 2,
49         DIRECTORY = 4
50     };
51 private:
52     static Fl_Preferences *prefs_;
53     void (*callback_)(Fl_File_Chooser*, void *);
54     void *data_;
55     char directory_[FL_PATH_MAX];
56     char pattern_[FL_PATH_MAX];
57     char preview_text_[2048];
58     int type_;
59     void favoritesButtonCB();
60     void favoritesCB(Fl_Widget *w);
61     void fileListCB();
62     void fileNameCB();
63     void newdir();
64     static void previewCB(Fl_File_Chooser *fc);
65     void showChoiceCB();
66     void update_favorites();
67     void update_preview();
68 public:
69     Fl_File_Chooser(const char *pathname, const char *pattern, int type_val, const char *title);
70 private:
71     Fl_Double_Window *window;
72     inline void cb_window_i(Fl_Double_Window*, void*);
73     static void cb_window(Fl_Double_Window*, void*);
74     Fl_Choice *showChoice;
75     inline void cb_showChoice_i(Fl_Choice*, void*);
76     static void cb_showChoice(Fl_Choice*, void*);
77     Fl_Menu_Button *favoritesButton;
78     inline void cb_favoritesButton_i(Fl_Menu_Button*, void*);
79     static void cb_favoritesButton(Fl_Menu_Button*, void*);
80 public:
81     Fl_Button *newButton;
82 private:
83     inline void cb_newButton_i(Fl_Button*, void*);
84     static void cb_newButton(Fl_Button*, void*);
85     inline void cb__i(Fl_Tile*, void*);
86     static void cb__(Fl_Tile*, void*);
87     Fl_File_Browser *fileList;
88     inline void cb_fileList_i(Fl_File_Browser*, void*);
89     static void cb_fileList(Fl_File_Browser*, void*);
90     Fl_Box *errorBox;
91     Fl_Box *previewBox;
92 public:
93     Fl_Check_Button *previewButton;
94 private:
95     inline void cb_previewButton_i(Fl_Check_Button*, void*);
96     static void cb_previewButton(Fl_Check_Button*, void*);
97 public:
98     Fl_Check_Button *showHiddenButton;
99 private:
100     inline void cb_showHiddenButton_i(Fl_Check_Button*, void*);
101     static void cb_showHiddenButton(Fl_Check_Button*, void*);

```

```

108 Fl_File_Input *fileName;
109 inline void cb_fileName_i(Fl_File_Input*, void*);
110 static void cb_fileName(Fl_File_Input*, void*);
111 Fl_Return_Button *okButton;
112 inline void cb_okButton_i(Fl_Return_Button*, void*);
113 static void cb_okButton(Fl_Return_Button*, void*);
114 Fl_Button *cancelButton;
115 inline void cb_cancelButton_i(Fl_Button*, void*);
116 static void cb_cancelButton(Fl_Button*, void*);
117 Fl_Double_Window *favWindow;
118 Fl_File_Browser *favList;
119 inline void cb_favList_i(Fl_File_Browser*, void*);
120 static void cb_favList(Fl_File_Browser*, void*);
121 Fl_Button *favUpButton;
122 inline void cb_favUpButton_i(Fl_Button*, void*);
123 static void cb_favUpButton(Fl_Button*, void*);
124 Fl_Button *favDeleteButton;
125 inline void cb_favDeleteButton_i(Fl_Button*, void*);
126 static void cb_favDeleteButton(Fl_Button*, void*);
127 Fl_Button *favDownButton;
128 inline void cb_favDownButton_i(Fl_Button*, void*);
129 static void cb_favDownButton(Fl_Button*, void*);
130 Fl_Button *favCancelButton;
131 inline void cb_favCancelButton_i(Fl_Button*, void*);
132 static void cb_favCancelButton(Fl_Button*, void*);
133 Fl_Return_Button *favOkButton;
134 inline void cb_favOkButton_i(Fl_Return_Button*, void*);
135 static void cb_favOkButton(Fl_Return_Button*, void*);
136 public:
137 ~Fl_File_Chooser();
138 void callback(void (*cb)(Fl_File_Chooser *, void *), void *d = 0);
139 void color(Fl_Color c);
140 Fl_Color color();
141 int count();
142 void directory(const char *d);
143 char * directory();
144 void filter(const char *p);
145 const char * filter();
146 int filter_value();
147 void filter_value(int f);
148 void iconsize(uchar s);
149 uchar iconsize();
150 void label(const char *l);
151 const char * label();
152 void ok_label(const char *l);
153 const char * ok_label();
154 void preview(int e);
155 int preview()const { return previewButton->value(); }
156 private:
157 void showHidden(int e);
158 void remove_hidden_files();
159 public:
160 void rescan();
161 void rescan_keep_filename();
162 void show();
163 void hide();
164 int shown();
165 void textcolor(Fl_Color c);
166 Fl_Color textcolor();
167 void textfont(Fl_Font f);
168 Fl_Font textfont();
169 void textsize(Fl_Fontsize s);
170 Fl_Fontsize textsize();
171 void type(int t);
172 int type();
173 void * user_data() const;
174 void user_data(void *d);
175 const char *value(int f = 1);
176 void value(const char *filename);
177 int visible();
178 void position(int x, int y);
179 int x() const;
180 int y() const;
181 int w() const;
182 int h() const;
183 void size(int w, int h);
184 void resize(int x, int y, int w, int h);
188 static const char *add_favorites_label;
192 static const char *all_files_label;
196 static const char *custom_filter_label;
200 static const char *existing_file_label;
204 static const char *favorites_label;
208 static const char *filename_label;
212 static const char *filesystems_label;
216 static const char *manage_favorites_label;
220 static const char *new_directory_label;
224 static const char *new_directory_tooltip;

```

```

228 static const char *preview_label;
232 static const char *save_label;
236 static const char *show_label;
240 static const char *hidden_label;
245 static Fl_File_Sort_F *sort;
246 private:
247     Fl_Widget* ext_group;
248 public:
249     Fl_Widget* add_extra(Fl_Widget* gr);
250 protected:
251     void show_error_box(int val);
252 };
253 FL_EXPORT char *fl_dir_chooser(const char *message, const char *fname, int relative=0);
254 FL_EXPORT char *fl_file_chooser(const char *message, const char *pat, const char *fname, int relative=0);
255 FL_EXPORT void fl_file_chooser_callback(void (*cb)(const char*));
256 FL_EXPORT void fl_file_chooser_ok_label(const char*l);
257 #endif

```

## 34.46 Fl\_File\_Icon.H

```

1 //
2 // Fl_File_Icon definitions.
3 //
4 // Copyright 1999-2010 by Michael Sweet.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_File_Icon widget . */
19
20 //
21 // Include necessary header files...
22 //
23
24 #ifndef _Fl_Fl_File_Icon_H_
25 # define _Fl_Fl_File_Icon_H_
26
27 # include "Fl.H"
28
29
30 //
31 // Special color value for the icon color.
32 //
33
34 # define FL_ICON_COLOR (Fl_Color)0xffffffff
35
36 // Fl_File_Icon class...
37 //
38
39
40
41 class FL_EXPORT Fl_File_Icon {
42
43     static Fl_File_Icon *first_; // Pointer to first icon/filetype
44     Fl_File_Icon *next_; // Pointer to next icon/filetype
45     const char *pattern_; // Pattern string
46     int type_; // Match only if directory or file?
47     int num_data_; // Number of data elements
48     int alloc_data_; // Number of allocated elements
49     short *data_; // Icon data
50
51 public:
52
53     enum // File types
54     {
55         ANY, // Any kind of file
56         PLAIN, // Only plain files
57         FIFO, // Only named pipes
58         DEVICE, // Only character and block devices
59         LINK, // Only symbolic links
60         DIRECTORY, // Only directories
61     };
62
63     enum // Data opcodes
64     {
65         END, // End of primitive/icon
66         COLOR, // Followed by color value (2 shorts)
67         LINE, // Start of line
68     };
69
70 };

```

```

72     CLOSEDLINE,                // Start of closed line
73     POLYGON,                  // Start of polygon
74     OUTLINEPOLYGON,          // Followed by outline color (2 shorts)
75     VERTEX                    // Followed by scaled X,Y
76 };
77
78 Fl_File_Icon(const char *p, int t, int nd = 0, short *d = 0);
79 ~Fl_File_Icon();
80
81 short      *add(short d);
82
83 short      *add_color(Fl_Color c)
84 { short *d = add((short)COLOR); add((short)(c » 16)); add((short)c); return (d); }
85
86 short      *add_vertex(int x, int y)
87 { short *d = add((short)VERTEX); add((short)x); add((short)y); return (d); }
88
89 short      *add_vertex(float x, float y)
90 { short *d = add((short)VERTEX); add((short)(x * 10000.0));
91   add((short)(y * 10000.0)); return (d); }
92
93 void      clear() { num_data_ = 0; }
94
95 void      draw(int x, int y, int w, int h, Fl_Color ic, int active = 1);
96
97 void      label(Fl_Widget *w);
98
99 static void labeltype(const Fl_Label *o, int x, int y, int w, int h, Fl_Align a);
100 void      load(const char *f);
101 int        load_fti(const char *fti);
102 int        load_image(const char *i);
103
104 Fl_File_Icon *next() { return (next_); }
105
106 const char *pattern() { return (pattern_); }
107
108 int        size() { return (num_data_); }
109
110 int        type() { return (type_); }
111
112 short      *value() { return (data_); }
113
114 static Fl_File_Icon *find(const char *filename, int filetype = ANY);
115
116 static Fl_File_Icon *first() { return (first_); }
117
118 static void load_system_icons(void);
119 };
120
121 #endif // !_Fl_File_Icon_H_

```

## 34.47 Fl\_File\_Input.H

```

1 //
2 // File_Input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 // Original version Copyright 1998 by Curtis Edwards.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
18 /* \file
19 Fl_File_Input widget . */
20
21 #ifndef Fl_File_Input_H
22 # define Fl_File_Input_H
23
24 # include <FL/Fl_Input.H>
25
26 class FL_EXPORT Fl_File_Input : public Fl_Input {
27
28     char      ok_entry_;
29     uchar     down_box_;
30     short     buttons_[200];
31     short     pressed_;
32
33     void      draw_buttons();

```

```

53     int             handle_button(int event);
54     void            update_buttons();
55
56 public:
57
58     Fl_File_Input(int X, int Y, int W, int H, const char *L=0);
59
60     int handle(int event) FL_OVERRIDE;
61
62 protected:
63     void draw() FL_OVERRIDE;
64
65 public:
66     Fl_Boxtype      down_box()const { return (Fl_Boxtype)down_box_; }
67     void            down_box(Fl_Boxtype b) { down_box_ = b; }
68
69     Fl_Color         errorcolor()const { return FL_RED; }
70
71     void            errorcolor(Fl_Color c) {(void)c;}
72
73     int value(const char *str);
74     int value(const char *str, int len);
75
76     const char      *value() { return Fl_Input_::value(); }
77 };
78
79 #endif // !Fl_File_Input_H

```

## 34.48 Fl\_Fill\_Dial.H

```

1 //
2 // Filled dial header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //     https://www.fltk.org/COPYING.php
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12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Fill_Dial widget . */
19
20 #ifndef Fl_Fill_Dial_H
21 #define Fl_Fill_Dial_H
22
23 #include "Fl_Dial.H"
24
25 class FL_EXPORT Fl_Fill_Dial : public Fl_Dial {
26 public:
27     Fl_Fill_Dial(int X,int Y,int W,int H, const char *L = NULL);
28 };
29
30 #endif

```

## 34.49 Fl\_Fill\_Slider.H

```

1 //
2 // Filled slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Fill_Slider widget . */
19

```

```

20 #ifndef Fl_Fill_Slider_H
21 #define Fl_Fill_Slider_H
22
23 #include "Fl_Slider.H"
24 class FL_EXPORT Fl_Fill_Slider : public Fl_Slider {
25 public:
26     Fl_Fill_Slider(int X,int Y,int W,int H,const char *L=0);
27 };
28
29 #endif

```

## 34.50 Fl\_Flex.H

```

1 //
2 // Fl_Flex widget header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2020 by Karsten Pedersen
5 // Copyright 2022-2024 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
18 #ifndef Fl_Flex_H
19 #define Fl_Flex_H
20
21 #include <FL/Fl_Group.H>
22
23 class FL_EXPORT Fl_Flex : public Fl_Group {
24 public:
25     int margin_left_;           // left margin
26     int margin_top_;           // top margin
27     int margin_right_;         // right margin
28     int margin_bottom_;        // bottom margin
29     int gap_;                  // gap between widgets
30     int fixed_size_size_;      // number of fixed size widgets in array
31     int fixed_size_alloc_;     // allocated size of fixed size array
32     Fl_Widget **fixed_size_;   // array of fixed size widgets
33     bool need_layout_;         // true if layout needs to be calculated
34
35 public:
36     enum { // values for type(int)
37         VERTICAL = 0,
38         HORIZONTAL = 1,
39         COLUMN = 0,
40         ROW = 1
41     };
42
43     // FLTK standard constructor
44     Fl_Flex(int X, int Y, int W, int H, const char *L = 0);
45
46     // original Fl_Flex constructors:
47     // backwards compatible if direction enums { ROW | COLUMN } are used
48     Fl_Flex(int direction);
49     Fl_Flex(int w, int h, int direction);
50     Fl_Flex(int x, int y, int w, int h, int direction);
51
52     virtual ~Fl_Flex();
53
54     virtual void end();
55     void resize(int x, int y, int w, int h) FL_OVERRIDE;
56
57     void fixed(Fl_Widget &w, int size) {
58         fixed(&w, size);
59     }
60
61     void fixed(Fl_Widget *w, int size);
62     int fixed(Fl_Widget *w) const;
63
64 protected:
65     void init(int t = VERTICAL);
66
67     virtual int alloc_size(int size) const;
68
69     void on_remove(int) FL_OVERRIDE;

```

```

172 void draw() FL_OVERRIDE;
173
174 public:
175
176 void need_layout(int set) {
177     if (set) need_layout_ = true;
178     else need_layout_ = false;
179 }
180
181 bool need_layout() const {
182     return need_layout_;
183 }
184
185 int margin() const { return margin_left_; }
186
187 int margin(int *left, int *top, int *right, int *bottom) const {
188     if (left) *left = margin_left_;
189     if (top) *top = margin_top_;
190     if (right) *right = margin_right_;
191     if (bottom) *bottom = margin_bottom_;
192     if (margin_left_ == margin_top_ && margin_top_ == margin_right_ && margin_right_ == margin_bottom_)
193         return 1;
194     return 0;
195 }
196
197 void margin(int m, int g = -1) {
198     if (m < 0)
199         m = 0;
200     margin_left_ = margin_top_ = margin_right_ = margin_bottom_ = m;
201     if (g >= 0)
202         gap_ = g;
203     need_layout(1);
204 }
205
206 void margin(int left, int top, int right, int bottom) {
207     margin_left_ = left < 0 ? 0 : left;
208     margin_top_ = top < 0 ? 0 : top;
209     margin_right_ = right < 0 ? 0 : right;
210     margin_bottom_ = bottom < 0 ? 0 : bottom;
211     need_layout(1);
212 }
213
214 int gap() const {
215     return gap_;
216 }
217
218 void gap(int g) {
219     gap_ = g < 0 ? 0 : g;
220     need_layout(1);
221 }
222
223 int horizontal() const {
224     return type() == Fl_Flex::HORIZONTAL ? 1 : 0;
225 }
226
227 // Calculate the layout of the widget and redraw it.
228 void layout();
229
230 int spacing() const {
231     return gap_;
232 }
233
234 void spacing(int i) {
235     gap(i);
236     need_layout(1);
237 }
238
239 };
240
241 #endif // Fl_Flex_H

```

## 34.51 Fl\_Float\_Input.H

```

1 //
2 // Floating point input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:

```

```

13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Float_Input widget . */
19
20 #ifndef Fl_Float_Input_H
21 #define Fl_Float_Input_H
22
23 #include "Fl_Input.H"
24
25
26 class FL_EXPORT Fl_Float_Input : public Fl_Input {
27 public:
28     Fl_Float_Input(int X,int Y,int W,int H,const char *l = 0);
29 };
30
31 #endif

```

## 34.52 Fl\_FormsBitmap.H

```

1 //
2 // Forms bitmap header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
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12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_FormsBitmap widget . */
19
20 #ifndef Fl_FormsBitmap_H
21 #define Fl_FormsBitmap_H
22
23 #include "Fl_Bitmap.H"
24
25
26 class FL_EXPORT Fl_FormsBitmap : public Fl_Widget {
27     Fl_Bitmap *b;
28 protected:
29     void draw() FL_OVERRIDE;
30 public:
31     Fl_FormsBitmap(Fl_Boxtype, int, int, int, int, const char * = 0);
32     void set(int W, int H, const uchar *bits);
33     void bitmap(Fl_Bitmap *B) {b = B;}
34     Fl_Bitmap *bitmap()const {return b;}
35 };
36
37 #endif

```

## 34.53 Fl\_FormsPixmap.H

```

1 //
2 // Forms pixmap header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_FormsPixmap widget . */
19
20 #ifndef Fl_FormsPixmap_H
21 #define Fl_FormsPixmap_H
22

```

```

23 #include "Fl_Pixmap.H"
24
25 class FL_EXPORT Fl_FormsPixmap : public Fl_Widget {
26     Fl_Pixmap *b;
27 protected:
28     void draw() FL_OVERRIDE;
29 public:
30     Fl_FormsPixmap(Fl_Boxtype t, int X, int Y, int W, int H, const char *L= 0);
31
32     void set(const char * const * bits);
33
34     void Pixmap(Fl_Pixmap *B) {b = B;}
35
36     Fl_Pixmap *Pixmap() const {return b;}
37 };
38 #endif

```

## 34.54 Fl\_Free.H

```

1 //
2 // Forms free header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Free widget . */
19
20 #ifndef Fl_Free_H
21 #define Fl_Free_H
22
23 #ifndef Fl_Widget_H
24 #include "Fl_Widget.H"
25 #endif
26
27 #define FL_NORMAL_FREE      1
28 #define FL_SLEEPING_FREE   2
29 #define FL_INPUT_FREE      3
30 #define FL_CONTINUOUS_FREE 4
31 #define FL_ALL_FREE        5
32
33 typedef int (*FL_HANDLEPTR)(Fl_Widget *, int, float, float, char);
34
35 class FL_EXPORT Fl_Free : public Fl_Widget {
36     FL_HANDLEPTR hfunc;
37     static void step(void *);
38 protected:
39     void draw() FL_OVERRIDE;
40 public:
41     int handle(int e) FL_OVERRIDE;
42     Fl_Free(uchar t, int X, int Y, int W, int H, const char *L, FL_HANDLEPTR hdl);
43     ~Fl_Free();
44 };
45
46 // old event names for compatibility:
47 #define FL_MOUSE      FL_DRAG
48 #define FL_DRAW       100
49 #define FL_STEP       101
50 #define FL_FREEMEM    102
51 #define FL_FREEZE     103
52 #define FL_THAW       104
53 #endif

```

## 34.55 Fl\_GIF\_Image.H

```

1 //
2 // GIF image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this

```

```

8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_GIF_Image widget . */
19
20 #ifndef Fl_GIF_Image_H
21 #define Fl_GIF_Image_H
22 # include "Fl_Pixmap.H"
23
24 class FL_EXPORT Fl_GIF_Image : public Fl_Pixmap {
25 public:
26     Fl_GIF_Image(const char* filename);
27     // deprecated constructor w/o length (for backwards compatibility)
28     Fl_GIF_Image(const char* imagename, const unsigned char *data);
29     // constructor with length (since 1.4.0)
30     Fl_GIF_Image(const char* imagename, const unsigned char *data, const size_t length);
31
32     static bool is_animated(const char *name_);
33     static bool animate;
34
35 protected:
36     // Protected constructors needed for animated GIF support through Fl_Anim_GIF_Image.
37     Fl_GIF_Image(const char* filename, bool anim);
38     Fl_GIF_Image(const char* imagename, const unsigned char *data, const size_t length, bool anim);
39     // Protected default constructor needed for Fl_Anim_GIF_Image.
40     Fl_GIF_Image();
41
42     void load_gif_(class Fl_Image_Reader &rdr, bool anim=false);
43
44     void load(const char* filename, bool anim);
45     void load(const char* imagename, const unsigned char *data, const size_t length, bool anim);
46
47     // Internal structure to "glue" animated GIF support into Fl_GIF_Image.
48     // This data is passed during decoding to the Fl_Anim_GIF_Image class.
49     struct GIF_FRAME {
50         int ifrm, width, height, x, y, w, h,
51         clr, bkgd, trans,
52         dispose, delay;
53         const uchar *bptr;
54         const struct CPAL {
55             uchar r, g, b;
56         } *cpal;
57         GIF_FRAME(int frame, uchar *data) : ifrm(frame), bptr(data) {}
58         GIF_FRAME(int frame, int W, int H, int fx, int fy, int fw, int fh, uchar *data) :
59             ifrm(frame), width(W), height(H), x(fx), y(fy), w(fw), h(fh), bptr(data) {}
60         void disposal(int mode, int time) { dispose = mode; this->delay = time; }
61         void colors(int nclr, int bg, int tp) { clr = nclr; bkgd = bg; trans = tp; }
62     };
63
64     // Internal virtual methods, which are called during decoding to pass data
65     // to the Fl_Anim_GIF_Image class.
66     virtual void on_frame_data(GIF_FRAME &) {}
67     virtual void on_extension_data(GIF_FRAME &) {}
68
69 private:
70     void lzw_decode(Fl_Image_Reader &rdr, uchar *Image, int Width, int Height, int CodeSize, int
71         ColorMapSize, int Interlace);
72 };
73
74 #endif

```

## 34.56 Fl\_GI\_Window.H

```

1 //
2 // OpenGL header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
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11 //

```

```

12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Gl_Window widget . */
19
20 #ifndef Fl_Gl_Window_H
21 #define Fl_Gl_Window_H
22
23 #include "Fl_Window.H"
24
25 class Fl_Gl_Choice; // structure to hold result of glXChooseVisual
26 class Fl_Gl_Window_Driver;
27 class FL_EXPORT Fl_Gl_Window : public Fl_Window {
28     friend class Fl_Gl_Window_Driver;
29     Fl_Gl_Window_Driver *pGlWindowDriver;
30
31     int mode_;
32     const int *alist;
33     Fl_Gl_Choice *g;
34     GLContext context_;
35     char valid_f_;
36     char damage1_; // damage() of back buffer
37     virtual void draw_overlay();
38     void init();
39
40     void *overlay;
41
42     static int can_do(int, const int *);
43     int mode(int, const int *);
44     static int gl_plugin_linkage();
45 protected:
46     void draw_begin();
47     void draw() FL_OVERRIDE;
48     void draw_end();
49
50 public:
51     void show() FL_OVERRIDE;
52     void show(int a, char **b) {Fl_Window::show(a,b);}
53     void flush() FL_OVERRIDE;
54     void hide() FL_OVERRIDE;
55     void resize(int,int,int,int) FL_OVERRIDE;
56     int handle(int) FL_OVERRIDE;
57
58     char valid()const {return valid_f_ & 1;}
59     void valid(char v) {if (v) valid_f_ |= 1; else valid_f_ &= 0xfe;}
60     void invalidate();
61
62     char context_valid()const {return valid_f_ & 2;}
63     void context_valid(char v) {if (v) valid_f_ |= 2; else valid_f_ &= 0xfd;}
64
65     static int can_do(int m) {return can_do(m,0);}
66     static int can_do(const int *m) {return can_do(0, m);}
67     int can_do() {return can_do(mode_,alist);}
68     FL_Mode mode()const {return (FL_Mode)mode_;}
69     int mode(int a) {return mode(a,0);}
70     int mode(const int *a) {return mode(0, a);}
71     GLContext context()const {return context_;}
72     void context(GLContext, int destroy_flag = 0);
73     void make_current();
74     void swap_buffers();
75     void swap_interval(int);
76     int swap_interval() const;
77     void ortho();
78
79     int can_do_overlay();
80     void redraw_overlay();
81     void hide_overlay();
82     void make_overlay_current();
83
84     // Note: Doxygen docs in Fl_Widget.H to avoid redundancy.
85     Fl_Gl_Window* as_gl_window() FL_OVERRIDE { return this; }
86     Fl_Gl_Window const* as_gl_window() const FL_OVERRIDE { return this; }
87
88     float pixels_per_unit();
89     int pixel_w() { return int(pixels_per_unit() * w() + 0.5f); }
90     int pixel_h() { return int(pixels_per_unit() * h() + 0.5f); }
91
92     ~Fl_Gl_Window();
93     Fl_Gl_Window(int W, int H, const char *l=0) : Fl_Window(W,H,l) {init();}
94     Fl_Gl_Window(int X, int Y, int W, int H, const char *l=0)
95         : Fl_Window(X,Y,W,H,l) {init();}
96 };
97
98 #endif // Fl_Gl_Window_H

```

## 34.57 Fl\_Graphics\_Driver.H

```

1 //
2 // Declaration of classes Fl_Graphics_Driver, Fl_Scalable_Graphics_Driver,
3 // and Fl_Font_Descriptor for the Fast Light Tool Kit (FLTK).
4 //
5 // Copyright 2010-2024 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
28 #ifndef FL_GRAPHICS_DRIVER_H
29 #define FL_GRAPHICS_DRIVER_H
30
31 #include <FL/Fl_Device.H>
32 #include <FL/Fl_Image.H>
33 #include <FL/Fl_Bitmap.H>
34 #include <FL/Fl_Pixmap.H>
35 #include <FL/Fl_RGB_Image.H>
36
37 class Fl_Graphics_Driver;
38 class Fl_Font_Descriptor;
39 class Fl_Image_Surface;
40 FL_EXPORT extern Fl_Graphics_Driver *fl_graphics_driver;
41
42 typedef void (*Fl_Draw_Image_Cb)(void* data,int x,int y,int w,uchar* buf);
43
44 struct Fl_Fontdesc;
45 typedef struct _PangoFontDescription PangoFontDescription;
46
47 // FIXME: The following constants are deprecated and will be removed in FLTK 1.5.0
48 // in favor of dynamic clipping stack allocation. This needs C++11 features.
49 // See issue #1139: "FL_REGION_STACK_SIZE could be increased"
50 // and issue #1140: "Fix static array allocation".
51
52 #if FL_ABI_VERSION >= 10401
53 # define FL_REGION_STACK_SIZE 64
54 #else
55 # define FL_REGION_STACK_SIZE 10
56 #endif
57
58 #define FL_MATRIX_STACK_SIZE 32
59
60 class FL_EXPORT Fl_Graphics_Driver {
61     friend class Fl_Surface_Device;
62     friend class Fl_Pixmap;
63     friend class Fl_Bitmap;
64     friend class Fl_RGB_Image;
65     friend class Fl_SVG_Image;
66     friend void fl_draw_image(const uchar* buf, int X,int Y,int W,int H, int D, int L);
67     friend void fl_draw_image_mono(const uchar* buf, int X,int Y,int W,int H, int D, int L);
68     friend void fl_draw_image_mono(Fl_Draw_Image_Cb cb, void* data, int X,int Y,int W,int H, int D);
69     friend void fl_draw_image(Fl_Draw_Image_Cb cb, void* data, int X,int Y,int W,int H, int D);
70     friend void fl_copy_offscreen(int x, int y, int w, int h, Fl_Offscreen pixmap, int srcx, int srcy);
71     friend int fl_convert_pixmap(const char*const* cdata, uchar* out, Fl_Color bg);
72     friend FL_EXPORT int fl_draw_pixmap(const char*const* cdata, int x, int y, Fl_Color bg);
73     friend FL_EXPORT void gl_start();
74     /* ===== Implementation note about image drawing =====
75     A graphics driver can implement up to 6 virtual member functions to draw images:
76     virtual void draw_pixmap(Fl_Pixmap *pxm,int XP, int YP, int WP, int HP, int cx, int cy)
77     virtual void draw_bitmap(Fl_Bitmap *bm,int XP, int YP, int WP, int HP, int cx, int cy)
78     virtual void draw_rgb(Fl_RGB_Image *rgb,int XP, int YP, int WP, int HP, int cx, int cy)
79     and
80     virtual void draw_fixed(Fl_Pixmap *pxm,int XP, int YP, int WP, int HP, int cx, int cy)
81     virtual void draw_fixed(Fl_Bitmap *bm,int XP, int YP, int WP, int HP, int cx, int cy)
82     virtual void draw_fixed(Fl_RGB_Image *rgb,int XP, int YP, int WP, int HP, int cx, int cy)
83     - The 1st group of functions is used when the driver can directly map the image data,
84     sized at data_w() x data_h(), to the image drawing area, sized at w()*scale x h()*scale
85     where scale is the current GUI scale factor.
86     - If the driver does not support such scale-and-draw operation for a given image type,
87     it should implement the draw_fixed() function which is called by the library after the
88     image has been internally resized to the drawing size and cached.
89     - The platform-independent Fl_Graphics_Driver class implements the 1st group of functions.
90     Each resizes the image, caches it, and calls the platform-specific implementation of
91     draw_fixed(image-class *,....) with the cached image.
92     - Consider an image object, say from class Fl_RGB_Image. Fl_RGB_Image::draw()
93     calls the virtual member function draw_rgb(Fl_RGB_Image *,....). If Fl_XXX_Graphics_Driver
94     re-implements this function, this code runs and is expected to draw the image
95     adequately scaled to its drawing size. If Fl_XXX_Graphics_Driver does not re-implement

```

```

122 this function, Fl_Graphics_Driver::draw_rgb(Fl_RGB_Image *,....) runs. It internally
123 resizes the image, caches it, and calls Fl_XXX_Graphics_Driver::draw_fixed(Fl_RGB_Image *,....)
124 that draws the image from its cached form which already has the adequate size.
125 - Some drivers implement, for a given image class, only the function of the 1st group or
126 only draw_fixed() as in these examples:
127 - Fl_Quartz_Graphics_Driver implements only draw_rgb(Fl_RGB_Image *,....) because it
128 can perform the scale-and-draw operation whatever the RGB image and the required scaling.
129 - Fl_Xlib_Graphics_Driver implements only draw_fixed(Fl_Pixmap *,....). The library
130 takes care of resizing and caching the Pixmap to the adequate drawing size.
131 - Some drivers implement, for a given image class, the function of both groups, e.g. :
132 Fl_GDI_Graphics_Driver implements both draw_rgb(Fl_RGB_Image *,....) and
133 draw_fixed(Fl_RGB_Image *,....) because scale-and-draw may require function Alphablend()
134 from MSIMG32.DLL. In the absence of that, the draw_rgb() implementation calls
135 Fl_Graphics_Driver::draw_rgb() which runs Fl_GDI_Graphics_Driver::draw_fixed(Fl_RGB_Image*,...).
136
137 Graphics drivers also implement cache(Fl_Pixmap*), cache(Fl_Bitmap*) and cache(Fl_RGB_Image*)
138 to compute the cached form of all image types, and uncache(Fl_RGB_Image *,...),
139 uncache_pixmap(fl_uintptr_t) and delete_bitmask(fl_uintptr_t) to destroy cached image forms.
140 Graphics drivers that use the mask_ variable of class Fl_Pixmap to cache an Fl_Pixmap
141 object also reimplement the uchar **Fl_Graphics_Driver::mask_bitmap() member function.
142 */
143 private:
144     virtual void draw_fixed(Fl_Pixmap *pxm,int XP, int YP, int WP, int HP, int cx, int cy);
145     virtual void draw_fixed(Fl_Bitmap *bm,int XP, int YP, int WP, int HP, int cx, int cy);
146     virtual void draw_fixed(Fl_RGB_Image *rgb,int XP, int YP, int WP, int HP, int cx, int cy);
147     // the default implementation of make_unused_color_() is most probably enough
148     virtual void make_unused_color_(unsigned char &r, unsigned char &g, unsigned char &b, int color_count,
149     void **data);
150     // some platforms may need to reimplement this
151     virtual void set_current_();
152     void draw_image_general_(const uchar *buf, int X, int Y, int W, int H, int D, int L);
153     void draw_image_mono_general_(const uchar *buf, int X, int Y, int W, int H, int D, int L);
154     float scale_; // scale between FLTK and drawing coordinates: drawing = FLTK * scale_
155 public:
156     static Fl_Graphics_Driver *newMainGraphicsDriver();
157     struct matrix {double a, b, c, d, x, y;};
158     typedef enum {
159         NATIVE = 1,
160         PRINTER = 2
161     } driver_feature;
162
163 protected:
164     int fl_clip_state_number;
165     static const matrix m0;
166     Fl_Font font_;
167     Fl_Fontsize size_;
168     Fl_Color color_;
169     int sptr;
170     static const int matrix_stack_size = FL_MATRIX_STACK_SIZE;
171     matrix stack[FL_MATRIX_STACK_SIZE];
172     matrix m;
173     int n;
174     int gap_;
175     enum SHAPE {NONE=0, LINE, LOOP, POLYGON, POINTS, COMPLEX_POLYGON} what;
176     int rstackptr;
177     static const int region_stack_max = FL_REGION_STACK_SIZE - 1;
178     Fl_Region rstack[FL_REGION_STACK_SIZE];
179     Fl_Font_Descriptor *font_descriptor_;
180     int p_size;
181     typedef struct { float x; float y; } XPOINT;
182     XPOINT *xpoint;
183     virtual void global_gc();
184     virtual void cache(Fl_Pixmap *img);
185     virtual void cache(Fl_Bitmap *img);
186     virtual void cache(Fl_RGB_Image *img);
187     virtual void uncache(Fl_RGB_Image *img, fl_uintptr_t &id_, fl_uintptr_t &mask_);
188     // --- implementation is in src/drivers/xxx/Fl_XXX_Graphics_Driver_image.cxx
189     virtual void draw_image(const uchar* buf, int X,int Y,int W,int H, int D=3, int L=0);
190     virtual void draw_image_mono(const uchar* buf, int X,int Y,int W,int H, int D=1, int L=0);
191     virtual void draw_image(Fl_Draw_Image_Cb cb, void* data, int X,int Y,int W,int H, int D=3);
192     virtual void draw_image_mono(Fl_Draw_Image_Cb cb, void* data, int X,int Y,int W,int H, int D=1);
193     virtual void draw_rgb(Fl_RGB_Image * rgb,int XP, int YP, int WP, int HP, int cx, int cy);
194     virtual void draw_pixmap(Fl_Pixmap * pxm,int XP, int YP, int WP, int HP, int cx, int cy);
195     virtual void draw_bitmap(Fl_Bitmap *bm, int XP, int YP, int WP, int HP, int cx, int cy);
196     virtual void copy_offscreen(int x, int y, int w, int h, Fl_Offscreen pixmap, int srcx, int srcy);
197
198     static void change_image_size(Fl_Image *img, int W, int H) {
199         img->w(W);
200         img->h(H);
201     }
202
203     // Support function for image drawing
204     virtual void uncache_pixmap(fl_uintptr_t p);
205     // accessor functions to protected image members
206     int start_image(Fl_Image *img, int XP, int YP, int WP, int HP, int &cx, int &cy,
207     int &X, int &Y, int &W, int &H);
208     static fl_uintptr_t* id(Fl_RGB_Image *rgb) {return &(rgb->id_);}
209     static fl_uintptr_t* id(Fl_Pixmap *pm) {return &(pm->id_);}

```

```

215 static fl_uintptr_t* id(Fl_Bitmap *bm) {return &(bm->id_);}
217 static fl_uintptr_t* mask(Fl_RGB_Image *rgb) {return &(rgb->mask_);}
219 static fl_uintptr_t* mask(Fl_Pixmap *pm) {return &(pm->mask_);}
221 static void cache_w_h(Fl_Pixmap *pm, int& pwidth, int& pheight) {
222     pwidth = &(pm->cache_w_);
223     pheight = &(pm->cache_h_);
224 }
226 static void cache_w_h(Fl_Bitmap *bm, int& pwidth, int& pheight) {
227     pwidth = &(bm->cache_w_);
228     pheight = &(bm->cache_h_);
229 }
231 static void cache_w_h(Fl_RGB_Image *rgb, int& pwidth, int& pheight) {
232     pwidth = &(rgb->cache_w_);
233     pheight = &(rgb->cache_h_);
234 }
235 static Fl_Offscreen get_offscreen_and_delete_image_surface(Fl_Image_Surface*);
237 static void draw_empty(Fl_Image* img, int X, int Y) {img->draw_empty(X, Y);}
238
239 Fl_Graphics_Driver();
240 virtual void cache_size(Fl_Image *img, int &width, int &height);
241 void cache_size_finalize(Fl_Image *img, int &width, int &height);
242 static unsigned need_pixmap_bg_color;
243 public:
244     virtual ~Fl_Graphics_Driver();
245     static Fl_Graphics_Driver &default_driver();
246     // support of "complex shapes"
247     void push_matrix();
248     void pop_matrix();
249     void load_identity();
250     void load_matrix(double a, double b, double c, double d, double x, double y);
251     void mult_matrix(double a, double b, double c, double d, double x, double y);
252     void rotate(double d);
253     void translate(double x, double y);
254     double transform_x(double x, double y);
255     double transform_y(double x, double y);
256     double transform_dx(double x, double y);
257     double transform_dy(double x, double y);
259     inline Fl_Font_Descriptor *font_descriptor() { return font_descriptor_;}
261     inline void font_descriptor(Fl_Font_Descriptor *d) { font_descriptor_ = d;}
263     float scale() { return scale_; }
265     virtual void scale(float f);
267     virtual char can_do_alpha_blending();
268     virtual void point(int x, int y);
269     virtual void rect(int x, int y, int w, int h);
270     virtual void focus_rect(int x, int y, int w, int h);
271     virtual void rectf(int x, int y, int w, int h);
272     virtual void _rbox(int fill, int x, int y, int w, int h, int r);
273     virtual void rounded_rect(int x, int y, int w, int h, int r);
274     virtual void rounded_rectf(int x, int y, int w, int h, int r);
275     // the default implementation is most likely enough
276     virtual void colored_rectf(int x, int y, int w, int h, uchar r, uchar g, uchar b);
277     virtual void line(int x, int y, int x1, int y1);
279     virtual void line(int x, int y, int x1, int y1, int x2, int y2);
281     virtual void xyline(int x, int y, int x1);
283     virtual void xyline(int x, int y, int x1, int y2);
285     virtual void xyline(int x, int y, int x1, int y2, int x3);
287     virtual void yxline(int x, int y, int y1);
289     virtual void yxline(int x, int y, int y1, int x2);
291     virtual void yxline(int x, int y, int y1, int x2, int y3);
293     virtual void loop(int x0, int y0, int x1, int y1, int x2, int y2);
295     virtual void loop(int x0, int y0, int x1, int y1, int x2, int y2, int x3, int y3);
296     virtual void polygon(int x0, int y0, int x1, int y1, int x2, int y2);
298     virtual void polygon(int x0, int y0, int x1, int y1, int x2, int y2, int x3, int y3);
299     // --- clipping
300     virtual void push_clip(int x, int y, int w, int h);
301     virtual int clip_box(int x, int y, int w, int h, int &X, int &Y, int &W, int &H);
302     virtual int not_clipped(int x, int y, int w, int h);
304     virtual void push_no_clip(); // has default implementation
306     virtual void pop_clip(); // has default implementation
307     virtual Fl_Region clip_region(); // has default implementation
308     virtual void clip_region(Fl_Region r); // has default implementation
309     virtual void restore_clip();
310     virtual void begin_points();
311     virtual void begin_line();
312     virtual void begin_loop();
313     virtual void begin_polygon();
314     virtual void begin_complex_polygon();
315     virtual void transformed_vertex(double xf, double yf);
316     virtual void transformed_vertex0(float x, float y);
317     virtual void vertex(double x, double y);
318     virtual void end_points();
319     virtual void end_line();
320     virtual void end_loop();
321     virtual void fixloop();
322     virtual void end_polygon();
323     virtual void end_complex_polygon();
324     // default implementation is most probably enough

```

```

325 virtual bool can_fill_non_convex_polygon() { return true; }
326 virtual void gap();
327 virtual void circle(double x, double y, double r);
328 virtual void arc(double x, double y, double r, double start, double end);
329 virtual void arc(int x, int y, int w, int h, double a1, double a2);
330 virtual void pie(int x, int y, int w, int h, double a1, double a2);
331 // To support fl_draw_circle(int x, int y, int d, Fl_Color color),
332 // the default implementation is most probably enough.
333 virtual void draw_circle(int x, int y, int d, Fl_Color c);
334 virtual void curve(double X0, double Y0, double X1, double Y1, double X2, double Y2, double X3, double
Y3);
335 virtual void line_style(int style, int width=0, char* dashes=0);
336 virtual void color(Fl_Color c);
337 virtual void set_color(Fl_Color i, unsigned int c);
338 virtual void free_color(Fl_Color i, int overlay);
339 virtual Fl_Color color();
340 virtual void color(uchar r, uchar g, uchar b);
341 virtual void draw(const char *str, int nChars, int x, int y);
342 virtual void draw(const char *str, int nChars, float x, float y);
343 virtual void draw(int angle, const char *str, int nChars, int x, int y);
344 virtual void rtl_draw(const char *str, int nChars, int x, int y);
345 virtual int has_feature(driver_feature feature);
346 virtual void font(Fl_Font face, Fl_Fontsize fsize);
347 virtual Fl_Font font();
348 virtual Fl_Fontsize size();
349 virtual double width(const char *str, int nChars);
350 virtual double width(unsigned int c);
351 virtual void text_extents(const char*, int n, int& dx, int& dy, int& w, int& h);
352 virtual int height();
353 virtual int descent();
354 virtual void gc(void*);
355 virtual void *gc(void);
356 virtual uchar **mask_bitmap();
357 // default implementation may be enough
358 virtual float scale_font_for_PostScript(Fl_Font_Descriptor *desc, int s);
359 // default implementation may be enough
360 virtual float scale_bitmap_for_PostScript();
361 // each platform implements these 3 functions its own way
362 virtual void add_rectangle_to_region(Fl_Region r, int x, int y, int w, int h);
363 virtual Fl_Region XRectangleRegion(int x, int y, int w, int h);
364 virtual void XDestroyRegion(Fl_Region r);
365 virtual const char* get_font_name(Fl_Font fnum, int* ap);
366 virtual int get_font_sizes(Fl_Font fnum, int*& sizep);
367 virtual Fl_Font set_fonts(const char *name);
368 virtual Fl_Fontdesc* calc_fl_fonts(void);
369 virtual unsigned font_desc_size();
370 virtual const char *font_name(int num);
371 virtual void font_name(int num, const char *name);
372 // Defaut implementation may be enough
373 virtual void overlay_rect(int x, int y, int w, int h);
374 virtual float override_scale();
375 virtual void restore_scale(float);
376 virtual PangoFontDescription* pango_font_description() { return NULL; }
377 virtual void antialias(int state);
378 virtual int antialias();
379 virtual void delete_bitmask(fl_uintptr_t bm);
380 };
381
382 #ifndef FL_DOXYGEN
383
384 /* This class is not part of FLTK's public API.
385 Platforms usually define a derived class called Fl_XXX_Font_Descriptor
386 containing extra platform-specific data/functions.
387 This is a class for an actual system font, with junk to
388 help choose it and info on character sizes. Each Fl_Fontdesc has a
389 linked list of these. These are created the first time each system
390 font/size combination is used.
391 */
392 class Fl_Font_Descriptor {
393 public:
394     Fl_Font_Descriptor *next;
395     Fl_Fontsize size;
396     Fl_Font_Descriptor(const char* fontname, Fl_Fontsize size);
397     virtual FL_EXPORT ~Fl_Font_Descriptor() {}
398     int ascent, descent;
399     unsigned int listbase; // base of display list, 0 = none
400 };
401
402
403 // This struct is not part of FLTK's public API.
404 struct Fl_Fontdesc {
405     const char *name;
406     char fontname[128]; // "Pretty" font name
407     Fl_Font_Descriptor *first; // linked list of sizes of this style
408 };
409
410 /* Abstract class Fl_Scalable_Graphics_Driver is platform-independent.
411 It supports the scaling of all graphics coordinates by a

```

```

412 float factor helpful to support HiDPI displays.
413 This class does :
414 - compute scaled coordinates
415 - scale the cached offscreen of image objects
416 - scale the pixel arrays used when performing direct image draws
417 - call the member functions of a platform-specific,
418 Fl_Scalable_Graphics_Driver-derived class that do the drawings with adequately
419 scaled coordinates. The member functions are named with the _unscaled suffix.
420 - scale and unscale the clipping region.
421
422 This class is presently used by the X11 and Windows platforms to support HiDPI displays.
423 In the future, it may also be used by other platforms.
424 */
425 class FL_EXPORT Fl_Scalable_Graphics_Driver : public Fl_Graphics_Driver {
426     Fl_Fontsize fontsize_; // scale-independent font size value
427 public:
428     Fl_Scalable_Graphics_Driver();
429     static int floor(int x, float s);
430     inline int floor(int x) { return Fl_Scalable_Graphics_Driver::floor(x, scale()); }
431 protected:
432     int line_width_;
433     bool is_solid_;
434     virtual Fl_Region scale_clip(float f);
435     void unscale_clip(Fl_Region r);
436     void point(int x, int y) FL_OVERRIDE;
437     virtual void point_unscaled(float x, float y);
438     void rect(int x, int y, int w, int h) FL_OVERRIDE;
439     void rectf(int x, int y, int w, int h) FL_OVERRIDE;
440     virtual void rect_unscaled(int x, int y, int w, int h);
441     virtual void rectf_unscaled(int x, int y, int w, int h);
442     void line(int x, int y, int x1, int y1) FL_OVERRIDE;
443     virtual void line_unscaled(int x, int y, int x1, int y1);
444     void line(int x, int y, int x1, int y1, int x2, int y2) FL_OVERRIDE;
445     virtual void line_unscaled(int x, int y, int x1, int y1, int x2, int y2);
446     void xyline(int x, int y, int x1) FL_OVERRIDE;
447     virtual void xyline_unscaled(int x, int y, int x1);
448     void xyline(int x, int y, int x1, int y2) FL_OVERRIDE {Fl_Graphics_Driver::xyline(x, y, x1, y2);}
449     void xyline(int x, int y, int x1, int y2, int x3) FL_OVERRIDE {Fl_Graphics_Driver::xyline(x, y, x1,
450     y2, x3);}
451     void yxline(int x, int y, int y1) FL_OVERRIDE;
452     virtual void yxline_unscaled(int x, int y, int y1);
453     void yxline(int x, int y, int y1, int x2) FL_OVERRIDE {Fl_Graphics_Driver::yxline(x, y, y1, x2);}
454     void yxline(int x, int y, int y1, int x2, int y3) FL_OVERRIDE {Fl_Graphics_Driver::yxline(x, y, y1,
455     x2, y3);}
456     void loop(int x0, int y0, int x1, int y1, int x2, int y2) FL_OVERRIDE;
457     virtual void loop_unscaled(int x0, int y0, int x1, int y1, int x2, int y2);
458     void loop(int x0, int y0, int x1, int y1, int x2, int y2, int x3, int y3) FL_OVERRIDE;
459     virtual void loop_unscaled(int x0, int y0, int x1, int y1, int x2, int y2, int x3, int y3);
460     void polygon(int x0, int y0, int x1, int y1, int x2, int y2) FL_OVERRIDE;
461     virtual void polygon_unscaled(int x0, int y0, int x1, int y1, int x2, int y2);
462     void polygon(int x0, int y0, int x1, int y1, int x2, int y2, int x3, int y3) FL_OVERRIDE;
463     virtual void polygon_unscaled(int x0, int y0, int x1, int y1, int x2, int y2, int x3, int y3);
464     void circle(double x, double y, double r) FL_OVERRIDE;
465     virtual void ellipse_unscaled(double xt, double yt, double rx, double ry);
466     void font(Fl_Font face, Fl_Fontsize size) FL_OVERRIDE;
467     Fl_Font font() FL_OVERRIDE;
468     virtual void font_unscaled(Fl_Font face, Fl_Fontsize size);
469     double width(const char *str, int n) FL_OVERRIDE;
470     double width(unsigned int c) FL_OVERRIDE;
471     virtual double width_unscaled(const char *str, int n);
472     virtual double width_unscaled(unsigned int c);
473     Fl_Fontsize size() FL_OVERRIDE;
474     virtual Fl_Fontsize size_unscaled();
475     void text_extents(const char *str, int n, int &dx, int &dy, int &w, int &h) FL_OVERRIDE;
476     virtual void text_extents_unscaled(const char *str, int n, int &dx, int &dy, int &w, int &h);
477     int height() FL_OVERRIDE;
478     int descent() FL_OVERRIDE;
479     virtual int height_unscaled();
480     virtual int descent_unscaled();
481     void draw(const char *str, int n, int x, int y) FL_OVERRIDE;
482     virtual void draw_unscaled(const char *str, int n, int x, int y);
483     void draw(int angle, const char *str, int n, int x, int y) FL_OVERRIDE;
484     virtual void draw_unscaled(int angle, const char *str, int n, int x, int y);
485     void draw(const char *str, int nChars, float x, float y) FL_OVERRIDE;
486     virtual void rtl_draw(const char* str, int n, int x, int y) FL_OVERRIDE;
487     virtual void rtl_draw_unscaled(const char* str, int n, int x, int y);
488     void arc(double x, double y, double r, double start, double end) FL_OVERRIDE;
489     void arc(int x, int y, int w, int h, double a1, double a2) FL_OVERRIDE;
490     virtual void arc_unscaled(int x, int y, int w, int h, double a1, double a2);
491     void pie(int x, int y, int w, int h, double a1, double a2) FL_OVERRIDE;
492     virtual void pie_unscaled(int x, int y, int w, int h, double a1, double a2);
493     void draw_circle(int x, int y, int d, Fl_Color c) FL_OVERRIDE;
494     void line_style(int style, int width=0, char* dashes=0) FL_OVERRIDE;
495     virtual void line_style_unscaled(int style, int width, char* dashes);
496     void draw_image_rescale(void *buf, Fl_Draw_Image_Cb cb, int X, int Y, int W, int H, int D, int L, bool
497     mono);
498     virtual void draw_image_unscaled(const uchar* buf, int X,int Y,int W,int H, int D=3, int L=0);

```

```

496 virtual void draw_image_unscaled(Fl_Draw_Image_Cb cb, void* data, int X,int Y,int W,int H, int D=3);
497 void draw_image(const uchar* buf, int X,int Y,int W,int H, int D=3, int L=0) FL_OVERRIDE;
498 void draw_image(Fl_Draw_Image_Cb cb, void* data, int X,int Y,int W,int H, int D=3) FL_OVERRIDE;
499 virtual void draw_image_mono_unscaled(const uchar* buf, int x, int y, int w, int h, int d, int l);
500 void draw_image_mono(const uchar* buf, int X,int Y,int W,int H, int D=1, int L=0) FL_OVERRIDE;
501 virtual void draw_image_mono_unscaled(Fl_Draw_Image_Cb cb, void* data, int X,int Y,int W,int H, int
D=1);
502 void draw_image_mono(Fl_Draw_Image_Cb cb, void* data, int X,int Y,int W,int H, int D=1) FL_OVERRIDE;
503
504 void transformed_vertex(double xf, double yf) FL_OVERRIDE;
505 void vertex(double x, double y) FL_OVERRIDE;
506 float override_scale() FL_OVERRIDE;
507 void restore_scale(float) FL_OVERRIDE;
508 virtual void *change_pen_width(int lwidth);
509 virtual void reset_pen_width(void *data);
510 };
511 #endif // FL_DOXYGEN
512
513 #endif // FL_GRAPHICS_DRIVER_H
514

```

## 34.58 FI\_Grid.H File Reference

[FI\\_Grid](#) container widget.

```

#include <FL/Fl_Group.H>
#include <FL/Fl_Rect.H>

```

### Classes

- class [FI\\_Grid::Cell](#)
- class [FI\\_Grid](#)

*[FI\\_Grid](#) is a container (layout) widget with multiple columns and rows.*

### Typedefs

- typedef unsigned short [FI\\_Grid\\_Align](#)  
*[FI\\_Grid](#) type for child widget alignment control.*

### Variables

- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_BOTTOM](#) = 0x0002  
*Align the widget at the bottom of the cell.*
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_BOTTOM\\_LEFT](#) = [FL\\_GRID\\_BOTTOM](#) | [FL\\_GRID\\_LEFT](#)
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_BOTTOM\\_RIGHT](#) = [FL\\_GRID\\_BOTTOM](#) | [FL\\_GRID\\_RIGHT](#)
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_CENTER](#) = 0x0000  
*Align the widget in the middle of the cell (default).*
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_FILL](#) = 0x0030  
*Stretch the widget in both directions to fill the cell.*
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_HORIZONTAL](#) = 0x0010  
*Stretch the widget horizontally to fill the cell.*
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_LEFT](#) = 0x0004  
*Align the widget at the left side of the cell.*
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_PROPORTIONAL](#) = 0x0040  
*Stretch the widget proportionally.*
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_RIGHT](#) = 0x0008  
*Align the widget at the right side of the cell.*
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_TOP](#) = 0x0001  
*Align the widget at the top of the cell.*
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_TOP\\_LEFT](#) = [FL\\_GRID\\_TOP](#) | [FL\\_GRID\\_LEFT](#)
- const [FI\\_Grid\\_Align](#) [FL\\_GRID\\_TOP\\_RIGHT](#) = [FL\\_GRID\\_TOP](#) | [FL\\_GRID\\_RIGHT](#)

- const `Fl_Grid_Align FL_GRID_VERTICAL` = 0x0020

*Stretch the widget vertically to fill the cell.*

### 34.58.1 Detailed Description

`Fl_Grid` container widget.

## 34.59 Fl\_Grid.H

[Go to the documentation of this file.](#)

```

1 //
2 // Fl_Grid widget header for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2021-2022 by Albrecht Schlosser.
5 // Copyright 2022-2025 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
18 #ifndef _FL_FL_GRID_H_
19 #define _FL_FL_GRID_H_
20
21 #include <FL/Fl_Group.H>
22 #include <FL/Fl_Rect.H>
23
24 typedef unsigned short Fl_Grid_Align;
25
26 const Fl_Grid_Align FL_GRID_CENTER      = 0x0000;
27
28 const Fl_Grid_Align FL_GRID_TOP         = 0x0001;
29
30 const Fl_Grid_Align FL_GRID_BOTTOM      = 0x0002;
31
32 const Fl_Grid_Align FL_GRID_LEFT        = 0x0004;
33
34 const Fl_Grid_Align FL_GRID_RIGHT       = 0x0008;
35
36 const Fl_Grid_Align FL_GRID_HORIZONTAL = 0x0010;
37
38 const Fl_Grid_Align FL_GRID_VERTICAL    = 0x0020;
39
40 const Fl_Grid_Align FL_GRID_FILL        = 0x0030;
41
42 const Fl_Grid_Align FL_GRID_PROPORTIONAL = 0x0040;
43
44 const Fl_Grid_Align FL_GRID_TOP_LEFT    = FL_GRID_TOP | FL_GRID_LEFT;
45 const Fl_Grid_Align FL_GRID_TOP_RIGHT   = FL_GRID_TOP | FL_GRID_RIGHT;
46 const Fl_Grid_Align FL_GRID_BOTTOM_LEFT = FL_GRID_BOTTOM | FL_GRID_LEFT;
47 const Fl_Grid_Align FL_GRID_BOTTOM_RIGHT = FL_GRID_BOTTOM | FL_GRID_RIGHT;
48
49 class FL_EXPORT Fl_Grid : public Fl_Group {
50     friend class Fl_Grid_Type;
51
52 public:
53     class Cell {
54         friend class Fl_Grid;
55     private:
56         Cell *next_;           // next cell in the same row
57         short row_;            // row number
58         short col_;            // column number
59         short rowspan_;        // row span (1 - n)
60         short colspan_;        // column span (1 - n)
61         Fl_Grid_Align align_;   // widget alignment in its cell
62         Fl_Widget *widget_;     // assigned widget
63         int w_;                // minimal widget width
64         int h_;                // minimal widget height
65
66     public:
67         void Cell_() {           // common initialization
68             next_ = NULL;
69             row_ = 0;
70             col_ = 0;
71         }
72     };
73
74     Cell *next_;               // next cell in the same row
75     short row_;                // row number
76     short col_;                // column number
77     short rowspan_;            // row span (1 - n)
78     short colspan_;            // column span (1 - n)
79     Fl_Grid_Align align_;      // widget alignment in its cell
80     Fl_Widget *widget_;        // assigned widget
81     int w_;                    // minimal widget width
82     int h_;                    // minimal widget height
83
84     void Cell_() {               // common initialization
85         next_ = NULL;
86         row_ = 0;
87         col_ = 0;
88     }
89
90     void SetCell(Cell *c) {
91         next_ = c;
92         row_ = c->row_;
93         col_ = c->col_;
94         rowspan_ = c->rowspan_;
95         colspan_ = c->colspan_;
96         align_ = c->align_;
97         widget_ = c->widget_;
98         w_ = c->w_;
99         h_ = c->h_;
100    }
101
102     void SetCell(short row, short col, short rowspan, short colspan,
103                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h) {
104         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h));
105     }
106
107     void SetCell(short row, short col, short rowspan, short colspan,
108                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
109                 int *x, int *y, int *w, int *h) {
110         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h));
111     }
112
113     void SetCell(short row, short col, short rowspan, short colspan,
114                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
115                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2) {
116         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2));
117     }
118
119     void SetCell(short row, short col, short rowspan, short colspan,
120                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
121                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
122                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4) {
123         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4));
124     }
125
126     void SetCell(short row, short col, short rowspan, short colspan,
127                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
128                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
129                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
130                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6) {
131         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6));
132     }
133
134     void SetCell(short row, short col, short rowspan, short colspan,
135                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
136                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
137                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
138                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
139                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8) {
140         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8));
141     }
142
143     void SetCell(short row, short col, short rowspan, short colspan,
144                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
145                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
146                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
147                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
148                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
149                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10) {
150         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10));
151     }
152
153     void SetCell(short row, short col, short rowspan, short colspan,
154                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
155                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
156                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
157                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
158                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
159                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
160                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12) {
161         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12));
162     }
163
164     void SetCell(short row, short col, short rowspan, short colspan,
165                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
166                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
167                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
168                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
169                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
170                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
171                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
172                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14) {
173         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14));
174     }
175
176     void SetCell(short row, short col, short rowspan, short colspan,
177                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
178                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
179                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
180                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
181                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
182                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
183                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
184                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
185                 int *x15, int *y15, int *w15, int *h15, int *x16, int *y16, int *w16, int *h16) {
186         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14, x15, y15, w15, h15, x16, y16, w16, h16));
187     }
188
189     void SetCell(short row, short col, short rowspan, short colspan,
190                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
191                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
192                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
193                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
194                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
195                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
196                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
197                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
198                 int *x15, int *y15, int *w15, int *h15, int *x16, int *y16, int *w16, int *h16,
199                 int *x17, int *y17, int *w17, int *h17, int *x18, int *y18, int *w18, int *h18) {
200         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14, x15, y15, w15, h15, x16, y16, w16, h16, x17, y17, w17, h17, x18, y18, w18, h18));
201     }
202
203     void SetCell(short row, short col, short rowspan, short colspan,
204                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
205                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
206                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
207                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
208                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
209                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
210                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
211                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
212                 int *x15, int *y15, int *w15, int *h15, int *x16, int *y16, int *w16, int *h16,
213                 int *x17, int *y17, int *w17, int *h17, int *x18, int *y18, int *w18, int *h18,
214                 int *x19, int *y19, int *w19, int *h19, int *x20, int *y20, int *w20, int *h20) {
215         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14, x15, y15, w15, h15, x16, y16, w16, h16, x17, y17, w17, h17, x18, y18, w18, h18, x19, y19, w19, h19, x20, y20, w20, h20));
216     }
217
218     void SetCell(short row, short col, short rowspan, short colspan,
219                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
220                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
221                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
222                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
223                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
224                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
225                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
226                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
227                 int *x15, int *y15, int *w15, int *h15, int *x16, int *y16, int *w16, int *h16,
228                 int *x17, int *y17, int *w17, int *h17, int *x18, int *y18, int *w18, int *h18,
229                 int *x19, int *y19, int *w19, int *h19, int *x20, int *y20, int *w20, int *h20,
230                 int *x21, int *y21, int *w21, int *h21, int *x22, int *y22, int *w22, int *h22) {
231         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14, x15, y15, w15, h15, x16, y16, w16, h16, x17, y17, w17, h17, x18, y18, w18, h18, x19, y19, w19, h19, x20, y20, w20, h20, x21, y21, w21, h21, x22, y22, w22, h22));
232     }
233
234     void SetCell(short row, short col, short rowspan, short colspan,
235                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
236                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
237                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
238                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
239                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
240                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
241                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
242                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
243                 int *x15, int *y15, int *w15, int *h15, int *x16, int *y16, int *w16, int *h16,
244                 int *x17, int *y17, int *w17, int *h17, int *x18, int *y18, int *w18, int *h18,
245                 int *x19, int *y19, int *w19, int *h19, int *x20, int *y20, int *w20, int *h20,
246                 int *x21, int *y21, int *w21, int *h21, int *x22, int *y22, int *w22, int *h22,
247                 int *x23, int *y23, int *w23, int *h23, int *x24, int *y24, int *w24, int *h24) {
248         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14, x15, y15, w15, h15, x16, y16, w16, h16, x17, y17, w17, h17, x18, y18, w18, h18, x19, y19, w19, h19, x20, y20, w20, h20, x21, y21, w21, h21, x22, y22, w22, h22, x23, y23, w23, h23, x24, y24, w24, h24));
249     }
250
251     void SetCell(short row, short col, short rowspan, short colspan,
252                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
253                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
254                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
255                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
256                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
257                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
258                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
259                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
260                 int *x15, int *y15, int *w15, int *h15, int *x16, int *y16, int *w16, int *h16,
261                 int *x17, int *y17, int *w17, int *h17, int *x18, int *y18, int *w18, int *h18,
262                 int *x19, int *y19, int *w19, int *h19, int *x20, int *y20, int *w20, int *h20,
263                 int *x21, int *y21, int *w21, int *h21, int *x22, int *y22, int *w22, int *h22,
264                 int *x23, int *y23, int *w23, int *h23, int *x24, int *y24, int *w24, int *h24,
265                 int *x25, int *y25, int *w25, int *h25, int *x26, int *y26, int *w26, int *h26) {
266         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14, x15, y15, w15, h15, x16, y16, w16, h16, x17, y17, w17, h17, x18, y18, w18, h18, x19, y19, w19, h19, x20, y20, w20, h20, x21, y21, w21, h21, x22, y22, w22, h22, x23, y23, w23, h23, x24, y24, w24, h24, x25, y25, w25, h25, x26, y26, w26, h26));
267     }
268
269     void SetCell(short row, short col, short rowspan, short colspan,
270                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
271                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
272                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
273                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
274                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
275                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
276                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
277                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
278                 int *x15, int *y15, int *w15, int *h15, int *x16, int *y16, int *w16, int *h16,
279                 int *x17, int *y17, int *w17, int *h17, int *x18, int *y18, int *w18, int *h18,
280                 int *x19, int *y19, int *w19, int *h19, int *x20, int *y20, int *w20, int *h20,
281                 int *x21, int *y21, int *w21, int *h21, int *x22, int *y22, int *w22, int *h22,
282                 int *x23, int *y23, int *w23, int *h23, int *x24, int *y24, int *w24, int *h24,
283                 int *x25, int *y25, int *w25, int *h25, int *x26, int *y26, int *w26, int *h26,
284                 int *x27, int *y27, int *w27, int *h27, int *x28, int *y28, int *w28, int *h28) {
285         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14, x15, y15, w15, h15, x16, y16, w16, h16, x17, y17, w17, h17, x18, y18, w18, h18, x19, y19, w19, h19, x20, y20, w20, h20, x21, y21, w21, h21, x22, y22, w22, h22, x23, y23, w23, h23, x24, y24, w24, h24, x25, y25, w25, h25, x26, y26, w26, h26, x27, y27, w27, h27, x28, y28, w28, h28));
286     }
287
288     void SetCell(short row, short col, short rowspan, short colspan,
289                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
290                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
291                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
292                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
293                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
294                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
295                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
296                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
297                 int *x15, int *y15, int *w15, int *h15, int *x16, int *y16, int *w16, int *h16,
298                 int *x17, int *y17, int *w17, int *h17, int *x18, int *y18, int *w18, int *h18,
299                 int *x19, int *y19, int *w19, int *h19, int *x20, int *y20, int *w20, int *h20,
300                 int *x21, int *y21, int *w21, int *h21, int *x22, int *y22, int *w22, int *h22,
301                 int *x23, int *y23, int *w23, int *h23, int *x24, int *y24, int *w24, int *h24,
302                 int *x25, int *y25, int *w25, int *h25, int *x26, int *y26, int *w26, int *h26,
303                 int *x27, int *y27, int *w27, int *h27, int *x28, int *y28, int *w28, int *h28,
304                 int *x29, int *y29, int *w29, int *h29, int *x30, int *y30, int *w30, int *h30) {
305         SetCell(new Cell(row, col, rowspan, colspan, align, widget, w, h, x, y, w, h, x2, y2, w2, h2, x3, y3, w3, h3, x4, y4, w4, h4, x5, y5, w5, h5, x6, y6, w6, h6, x7, y7, w7, h7, x8, y8, w8, h8, x9, y9, w9, h9, x10, y10, w10, h10, x11, y11, w11, h11, x12, y12, w12, h12, x13, y13, w13, h13, x14, y14, w14, h14, x15, y15, w15, h15, x16, y16, w16, h16, x17, y17, w17, h17, x18, y18, w18, h18, x19, y19, w19, h19, x20, y20, w20, h20, x21, y21, w21, h21, x22, y22, w22, h22, x23, y23, w23, h23, x24, y24, w24, h24, x25, y25, w25, h25, x26, y26, w26, h26, x27, y27, w27, h27, x28, y28, w28, h28, x29, y29, w29, h29, x30, y30, w30, h30));
306     }
307
308     void SetCell(short row, short col, short rowspan, short colspan,
309                 Fl_Grid_Align align, Fl_Widget *widget, int w, int h,
310                 int *x, int *y, int *w, int *h, int *x2, int *y2, int *w2, int *h2,
311                 int *x3, int *y3, int *w3, int *h3, int *x4, int *y4, int *w4, int *h4,
312                 int *x5, int *y5, int *w5, int *h5, int *x6, int *y6, int *w6, int *h6,
313                 int *x7, int *y7, int *w7, int *h7, int *x8, int *y8, int *w8, int *h8,
314                 int *x9, int *y9, int *w9, int *h9, int *x10, int *y10, int *w10, int *h10,
315                 int *x11, int *y11, int *w11, int *h11, int *x12, int *y12, int *w12, int *h12,
316                 int *x13, int *y13, int *w13, int *h13, int *x14, int *y14, int *w14, int *h14,
```

```

170     rowspan_ = 1;
171     colspan_ = 1;
172     widget_ = NULL;
173     w_ = 0;
174     h_ = 0;
175     align_ = 0;
176 }
177
178 Cell(int row, int col) {    // constructor
179     Cell_();
180     row_ = row;
181     col_ = col;
182 }
183
184 Cell(Fl_Widget *w, int row, int col) { // widget assignment
185     Cell_();
186     widget_ = w;
187     row_ = row;
188     col_ = col;
189 }
190
191 ~Cell() {}
192
193 Cell *next() {
194     return next_;
195 }
196
197 void next(Cell *c) {
198     next_ = c;
199 }
200
201 Fl_Widget *widget()const { return widget_; }
202
203 short row()const { return row_; }
204 short col()const { return col_; }
205
206 void rowspan(short v) { rowspan_ = v; }
207 void colspan(short v) { colspan_ = v; }
208 short rowspan()const { return rowspan_; }
209 short colspan()const { return colspan_; }
210
211 void align(Fl_Grid_Align align) { align_ = align; }
212 Fl_Grid_Align align()const { return align_; }
213
214 void minimum_size(int w, int h) { if (w>=0) w_ = w; if (h>=0) h_ = h; }
215 void minimum_size(int *w, int *h)const { if (w) *w = w_; if (h) *h = h_; }
216 }; // class Cell
217
218 private:
219     class Row;
220     class Col;
221     short rows_;
222     short cols_;
223
224     short margin_left_;    // left margin
225     short margin_top_;    // top margin
226     short margin_right_;  // right margin
227     short margin_bottom_; // bottom margin
228     short gap_row_;       // gap between rows
229     short gap_col_;       // gap between columns
230     Fl_Rect old_size;     // only for resize callback (TBD)
231     Col *Cols_;           // array of columns
232     Row *Rows_;           // array of rows
233     bool need_layout_;    // true if layout needs to be calculated
234
235 protected:
236     Fl_Color grid_color;   // color for drawing the grid lines (design helper)
237     bool draw_grid_;      // draw the grid for testing / design
238
239 protected:
240     void init();
241     Cell *add_cell(int row, int col);
242     void remove_cell(int row, int col);
243
244 public:
245     Fl_Grid(int X, int Y, int W, int H, const char *L = 0);
246     virtual ~Fl_Grid();
247
248     // define and manage the layout and resizing
249
250     virtual void layout(int rows, int cols, int margin = -1, int gap = -1);
251     virtual void layout();
252     virtual void clear_layout();
253     virtual void resize(int X, int Y, int W, int H) FL_OVERRIDE;
254
255     short rows()const { return rows_; }
256     short cols()const { return cols_; }

```

```

277
278 void need_layout(int set) {
279     if (set) {
280         need_layout_ = true;
281         redraw();
282     }
283     else {
284         need_layout_ = false;
285     }
286 }
287
288 bool need_layout()const {
289     return need_layout_;
290 }
291
292 protected:
293     virtual void draw() FL_OVERRIDE;
294     virtual void on_remove(int) FL_OVERRIDE;
295     virtual void draw_grid(); // draw grid lines for debugging
296
297 public:
298     // get and set individual margins
299
300     virtual void margin(int left, int top = -1, int right = -1, int bottom = -1);
301     int margin(int *left, int *top, int *right, int *bottom) const;
302
303     // get and set default row and column gaps for all rows and columns, respectively
304
305     virtual void gap(int row_gap, int col_gap = -1); // set default row and column gap(s)
306     void gap(int *row_gap, int *col_gap) const;
307
308     // find cells, get cell pointers
309
310     Fl_Grid::Cell* cell(int row, int col) const;
311     Fl_Grid::Cell* cell(Fl_Widget *widget) const;
312
313     // assign a widget to a cell
314
315     Fl_Grid::Cell* widget(Fl_Widget *wi, int row, int col, Fl_Grid_Align align = FL_GRID_FILL);
316     Fl_Grid::Cell* widget(Fl_Widget *wi, int row, int col, int rowspan, int colspan, Fl_Grid_Align align =
317     FL_GRID_FILL);
318
319     // set minimal column and row sizes (widths and heights, respectively),
320     // set row and column specific gaps and weights
321
322     void col_width(int col, int value);
323     void col_width(const int *value, size_t size);
324     int col_width(int col) const;
325
326     void col_weight(int col, int value);
327     void col_weight(const int *value, size_t size);
328     int col_weight(int col) const;
329
330     void col_gap(int col, int value);
331     void col_gap(const int *value, size_t size);
332     int col_gap(int col) const;
333
334     void row_height(int row, int value);
335     void row_height(const int *value, size_t size);
336     int row_height(int row) const;
337
338     void row_weight(int row, int value);
339     void row_weight(const int *value, size_t size);
340     int row_weight(int row) const;
341
342     void row_gap(int row, int value);
343     void row_gap(const int *value, size_t size);
344     int row_gap(int row) const;
345
346     int computed_col_width(int col) const;
347     int computed_row_height(int row) const;
348
349     void show_grid(int set) {
350         draw_grid_ = set ? true : false;
351     }
352
353     void show_grid(int set, Fl_Color col) {
354         draw_grid_ = set ? true : false;
355         grid_color = col;
356     }
357
358     void debug(int level = 127);
359 }; // class Fl_Grid
360
361 #endif // _FL_FL_GRID_H_

```

## 34.60 Fl\_Group.H File Reference

[Fl\\_Group](#) and [Fl\\_End](#) classes.

```
#include "Fl_Widget.H"
#include <vector>
```

### Classes

- class [Fl\\_End](#)

*This is a dummy class that allows you to end a [Fl\\_Group](#) in a constructor list of a class:*

- class [Fl\\_Group](#)

*The [Fl\\_Group](#) class is the main FLTK container widget.*

### 34.60.1 Detailed Description

[Fl\\_Group](#) and [Fl\\_End](#) classes.

## 34.61 Fl\_Group.H

[Go to the documentation of this file.](#)

```
1 //
2 // Group header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
21 #ifndef Fl_Group_H
22 #define Fl_Group_H
23
24 #include "Fl_Widget.H"
25
26 #include <vector>
27
28 // Don't #include Fl_Rect.H because this would introduce lots
29 // of unnecessary dependencies on Fl_Rect.H
30 class Fl_Rect;
31
32
59 class FL_EXPORT Fl_Group : public Fl_Widget {
60
61     std::vector<Fl_Widget*> child_; // vector of children
62     Fl_Widget* savedfocus_;
63     Fl_Widget* resizable_;
64     Fl_Rect *bounds_; // remembered initial sizes of children
65     int *sizes_; // remembered initial sizes of children (FLTK 1.3 compat.)
66
67     int navigation(int);
68     static Fl_Group *current_;
69
70     // unimplemented copy ctor and assignment operator
71     Fl_Group(const Fl_Group&);
72     Fl_Group& operator=(const Fl_Group&);
73
74 protected:
75     void draw() FL_OVERRIDE;
76     void draw_child(Fl_Widget& widget) const;
77     void draw_children();
78     void draw_outside_label(const Fl_Widget& widget) const;
79     void update_child(Fl_Widget& widget) const;
80     Fl_Rect *bounds();
81     int *sizes(); // FLTK 1.3 compatibility
82     virtual int on_insert(Fl_Widget*, int);
83     virtual int on_move(int, int);
84     virtual void on_remove(int);
```

```

85
86 public:
87
88     int handle(int) FL_OVERRIDE;
89     void begin();
90     void end();
91     static Fl_Group *current();
92     static void current(Fl_Group *g);
93
97     int children()const { return (int)child_.size(); }
98
109     Fl_Widget *child(int n)const {
110         if (n < 0 || n > children() - 1) return nullptr;
111         return child_[n];
112     }
113
114     int find(const Fl_Widget*) const;
118     int find(const Fl_Widget& o)const { return find(&o); }
119
120     Fl_Widget* const* array() const;
121
122     void resize(int,int,int,int) FL_OVERRIDE;
127     Fl_Group(int,int,int,int, const char * = 0);
128     virtual ~Fl_Group();
129     void add(Fl_Widget&);
133     void add(Fl_Widget* o) {add(*o);}
134     void insert(Fl_Widget&, int i);
139     void insert(Fl_Widget& o, Fl_Widget* before) {insert(o,find(before));}
140     void remove(int index);
141     void remove(Fl_Widget&);
146     void remove(Fl_Widget* o) {remove(*o);}
147     void clear();
148
149     /* delete child n (by index) */
150     virtual int delete_child(int n);
151
156     void resizable(Fl_Widget& o) {resizable_ = &o;}
210     void resizable(Fl_Widget* o) {resizable_ = o;}
215     Fl_Widget* resizable()const {return resizable_;}
219     void add_resizable(Fl_Widget& o) {resizable_ = &o; add(o);}
220     void init_sizes();
221
231     void clip_children(int c) { if (c) set_flag(CLIP_CHILDREN); else clear_flag(CLIP_CHILDREN); }
239     unsigned int clip_children() { return (flags() & CLIP_CHILDREN) != 0; }
240
241     // Note: Doxygen docs in Fl_Widget.H to avoid redundancy.
242     Fl_Group* as_group() FL_OVERRIDE { return this; }
243     Fl_Group const* as_group() const FL_OVERRIDE { return this; }
244
245     // back compatibility functions:
246
252     void focus(Fl_Widget* W) {W->take_focus();}
253
255     Fl_Widget* & _ddfdesign_kludge() {return resizable_;}
256
258     void forms_end();
259 };
260
261 // dummy class used to end child groups in constructors for complex
262 // subclasses of Fl_Group:
263 class FL_EXPORT Fl_End {
264 public:
266     Fl_End() {Fl_Group::current()->end();}
267 };
268
269 #endif

```

## 34.62 Fl\_Help\_Dialog.H

```

1 //
2 // Fl_Help_Dialog dialog for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2021 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16 // =====

```

```

17 // DO NOT EDIT FL/Fl_Help_Dialog.H and src/Fl_Help_Dialog.cxx !!!
18 // =====
19 // Please use fluid to change src/Fl_Help_Dialog.fl interactively
20 // and then use fluid to "write code" or edit and use fluid -c .
21 // =====
22 //
23
24 // generated by Fast Light User Interface Designer (fluid) version 1.0500
25
26 #ifndef FL_Help_Dialog_H
27 #define FL_Help_Dialog_H
28 #include <FL/Fl.H>
29 #include <FL/Fl_Double_Window.H>
30 #include <FL/Fl_Group.H>
31 #include <FL/Fl_Button.H>
32 #include <FL/Fl_Input.H>
33 #include <FL/Fl_Box.H>
34 #include <FL/Fl_Help_View.H>
35
36 class FL_EXPORT Fl_Help_Dialog {
37     int index_;
38     int max_;
39     int line_[100]; // FIXME: we must remove those static numbers
40     char file_[100][FL_PATH_MAX]; // FIXME: we must remove those static numbers
41     int find_pos_;
42 public:
43     Fl_Help_Dialog();
44 private:
45     Fl_Double_Window *window_;
46     Fl_Button *back_;
47     inline void cb_back__i(Fl_Button*, void*);
48     static void cb_back__(Fl_Button*, void*);
49     Fl_Button *forward_;
50     inline void cb_forward__i(Fl_Button*, void*);
51     static void cb_forward__(Fl_Button*, void*);
52     Fl_Button *smaller_;
53     inline void cb_smaller__i(Fl_Button*, void*);
54     static void cb_smaller__(Fl_Button*, void*);
55     Fl_Button *larger_;
56     inline void cb_larger__i(Fl_Button*, void*);
57     static void cb_larger__(Fl_Button*, void*);
58     Fl_Input *find_;
59     inline void cb_find__i(Fl_Input*, void*);
60     static void cb_find__(Fl_Input*, void*);
61     Fl_Help_View *view_;
62     inline void cb_view__i(Fl_Help_View*, void*);
63     static void cb_view__(Fl_Help_View*, void*);
64 public:
65     ~Fl_Help_Dialog();
66     int h();
67     void hide();
68     int load(const char *f);
69     void position(int xx, int yy);
70     void resize(int xx, int yy, int ww, int hh);
71     void show();
72     void show(int argc, char **argv);
73     void textsize(Fl_Fontsize s);
74     Fl_Fontsize textsize();
75     void topline(const char *n);
76     void topline(int n);
77     void value(const char *f);
78     const char * value() const;
79     int visible();
80     int w();
81     int x();
82     int y();
83 };
84 #endif

```

## 34.63 Fl\_Help\_View.H

```

1 //
2 // Help Viewer widget definitions.
3 //
4 // Copyright 1997-2010 by Easy Software Products.
5 // Image support by Matthias Melcher, Copyright 2000-2009.
6 // Copyright 2011-2024 by Bill Spitzak and others.
7 //
8 // This library is free software. Distribution and use rights are outlined in
9 // the file "COPYING" which should have been included with this file. If this
10 // file is missing or damaged, see the license at:
11 //
12 //     https://www.fltk.org/COPYING.php
13 //
14 // Please see the following page on how to report bugs and issues:

```

```

15 //
16 //      https://www.fltk.org/bugs.php
17 //
18
19 /* \file
20 Fl_Help_View widget . */
21
22 #ifndef Fl_Help_View_H
23 #define Fl_Help_View_H
24
25 //
26 // Include necessary header files...
27 //
28
29 #include "Fl.H"
30 #include "Fl_Group.H"
31 #include "Fl_Scrollbar.H"
32 #include "fl_draw.H"
33 #include "filename.H"
34
35 class Fl_Shared_Image;
36 //
37 // Fl_Help_Func type - link callback function for files...
38 //
39
40 typedef const char *(Fl_Help_Func) (Fl_Widget *, const char *);
41
42 //
43 // Fl_Help_Block structure...
44 //
45
46 struct Fl_Help_Block {
47     const char    *start,           // Start of text
48     const char    *end;             // End of text
49     uchar         border;           // Draw border?
50     Fl_Color      bgcolor;          // Background color
51     int           x,                // Indentation/starting X coordinate
52     int           y,                // Starting Y coordinate
53     int           w,                // Width
54     int           h;                // Height
55     int           line[32];         // Left starting position for each line
56     int           ol;               // is ordered list <OL> element
57     int           ol_num;           // item number in ordered list
58 };
59
60 //
61 // Fl_Help_Link structure...
62 //
63
64 struct Fl_Help_Link {
65     char          filename[192],
66     char          name[32];
67     int           x,
68     int           y,
69     int           w,
70     int           h;
71 };
72
73 /*
74 * Fl_Help_View font stack opaque implementation
75 */
76
77 struct FL_EXPORT Fl_Help_Font_Style {
78     Fl_Font      f;
79     Fl_Fontsize  s;
80     Fl_Color     c;
81     void get(Fl_Font &afont, Fl_Fontsize &asize, Fl_Color &acolor) {afont=f; asize=s; acolor=c;}
82     void set(Fl_Font afont, Fl_Fontsize asize, Fl_Color acolor) {f=afont; s=asize; c=acolor;}
83     Fl_Help_Font_Style(Fl_Font afont, Fl_Fontsize asize, Fl_Color acolor) {set(afont, asize, acolor);}
84     Fl_Help_Font_Style(){} // For in table use
85 };
86
87
88 const size_t MAX_FL_HELP_FS_ELTS = 100;
89
90 struct FL_EXPORT Fl_Help_Font_Stack {
91     Fl_Help_Font_Stack() {
92         nfonts_ = 0;
93     }
94
95     void init(Fl_Font f, Fl_Fontsize s, Fl_Color c) {
96         nfonts_ = 0;
97         elts_[nfonts_].set(f, s, c);
98         fl_font(f, s);
99         fl_color(c);
100     }
101
102     void top(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c) { elts_[nfonts_].get(f, s, c); }
103     void push(Fl_Font f, Fl_Fontsize s, Fl_Color c) {
104         if (nfonts_ < MAX_FL_HELP_FS_ELTS-1) nfonts_ ++;

```

```

108     elts_[nfonts_].set(f, s, c);
109     fl_font(f, s); fl_color(c);
110 }
111 void pop(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c) {
112     if (nfonts_ > 0) nfonts_--;
113     top(f, s, c);
114     fl_font(f, s); fl_color(c);
115 }
116 size_t count()const {return nfonts_;} // Gets the current number of fonts in the stack
117
118 protected:
119     size_t nfonts_;
120     Fl_Help_Font_Style elts_[MAX_FL_HELP_FSELTS];
121 };
122
123 struct Fl_Help_Target {
124     char    name[32];
125     int     y;
126 };
127
128 class FL_EXPORT Fl_Help_View : public Fl_Group {          // Help viewer widget
129     enum { RIGHT = -1, CENTER, LEFT };
130
131     char    title_[1024];
132     Fl_Color defcolor_,
133             bgcolor_,
134             textcolor_,
135             linkcolor_;
136     Fl_Font textfont_;
137     Fl_Fontsize textsize_;
138     const char *value_;
139     Fl_Help_Font_Stack fstack_;
140     int     nblocks_,
141            ablocks_;
142     Fl_Help_Block *blocks_;
143
144     Fl_Help_Func *link_;
145
146     int     nlinks_,
147            alinks_;
148     Fl_Help_Link *links_;
149
150     int     ntargets_,
151            atargets_;
152     Fl_Help_Target *targets_;
153
154 #if FL_ABI_VERSION >= 10401
155     char    directory_[2 * FL_PATH_MAX + 15];
156 #else
157     char    directory_[FL_PATH_MAX];
158 #endif
159
160     char    filename_[FL_PATH_MAX];
161     int     topline_,
162            leftline_,
163            size_,
164            hsize_,
165            scrollbar_size_;
166     Fl_Scrollbar scrollbar_,
167            hscrollbar_;
168
169     static int selection_first_;
170     static int selection_last_;
171     static int selection_push_first_;
172     static int selection_push_last_;
173     static int selection_drag_first_;
174     static int selection_drag_last_;
175     static int selected_;
176     static int draw_mode_;
177     static int mouse_x_;
178     static int mouse_y_;
179     static int current_pos_;
180     static Fl_Help_View *current_view_;
181     static Fl_Color hv_selection_color_;
182     static Fl_Color hv_selection_text_color_;
183
184     void initfont(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c) { f = textfont_; s = textsize_; c = textcolor_;
185         fstack_.init(f, s, c); }
186     void pushfont(Fl_Font f, Fl_Fontsize s) {fstack_.push(f, s, textcolor_);}
187     void pushfont(Fl_Font f, Fl_Fontsize s, Fl_Color c) {fstack_.push(f, s, c);}
188     void popfont(Fl_Font &f, Fl_Fontsize &s, Fl_Color &c) {fstack_.pop(f, s, c);}
189
190     Fl_Help_Block *add_block(const char *s, int xx, int yy, int ww, int hh, uchar border = 0);
191     void add_link(const char *n, int xx, int yy, int ww, int hh);
192     void add_target(const char *n, int yy);

```

```

267 static int    compare_targets(const Fl_Help_Target *t0, const Fl_Help_Target *t1);
268 int           do_align(Fl_Help_Block *block, int line, int xx, int a, int &l);
269 protected:
270 void          draw() FL_OVERRIDE;
271 private:
272 void          format();
273 void          format_table(int *table_width, int *columns, const char *table);
274 void          free_data();
275 int           get_align(const char *p, int a);
276 const char    *get_attr(const char *p, const char *n, char *buf, int bufsize);
277 Fl_Color      get_color(const char *n, Fl_Color c);
278 Fl_Shared_Image *get_image(const char *name, int W, int H);
279 int           get_length(const char *l);
280 public:
281 int           handle(int) FL_OVERRIDE;
282 private:
283
284 void          hv_draw(const char *t, int x, int y, int entity_extra_length = 0);
285 char          begin_selection();
286 char          extend_selection();
287 void          end_selection(int c=0);
288 void          clear_global_selection();
289 Fl_Help_Link  *find_link(int, int);
290 void          follow_link(Fl_Help_Link*);
291
292 public:
293
294 static const char *copy_menu_text;
295
296 Fl_Help_View(int xx, int yy, int ww, int hh, const char *l = 0);
297 ~Fl_Help_View();
298 const char    *directory()const { if (directory_[0]) return (directory_);
299                                     else return ((const char *)0); }
300 const char    *filename()const { if (filename_[0]) return (filename_);
301                                     else return ((const char *)0); }
302
303 int           find(const char *s, int p = 0);
304 void          link(Fl_Help_Func *fn) { link_ = fn; }
305 void          load(const char *f);
306 void          resize(int,int,int,int) FL_OVERRIDE;
307 int           size()const { return (size_); }
308 void          size(int W, int H) { Fl_Widget::size(W, H); }
309 void          textcolor(Fl_Color c) { if (textcolor_ == defcolor_) textcolor_ = c; defcolor_ = c; }
310 Fl_Color      textcolor()const { return (defcolor_); }
311 void          textfont(Fl_Font f) { textfont_ = f; format(); }
312 Fl_Font       textfont()const { return (textfont_); }
313 void          textsize(Fl_Fontsize s) { textsize_ = s; format(); }
314 Fl_Fontsize   textsize()const { return (textsize_); }
315 const char    *title() { return (title_); }
316 void          topline(const char *n);
317 void          topline(int);
318 int           topline()const { return (topline_); }
319 void          leftline(int);
320 int           leftline()const { return (leftline_); }
321 void          value(const char *val);
322 const char    *value()const { return (value_); }
323 void          clear_selection();
324 void          select_all();
325 int scrollbar_size()const {
326     return(scrollbar_size_);
327 }
328 void scrollbar_size(int newSize) {
329     scrollbar_size_ = newSize;
330 }
331
332 // Check if the user selected text in this view.
333 int text_selected();
334
335 // If text is selected in this view, copy it to a clipboard.
336 int copy(int clipboard=1);
337 };
338
339 #endif // !Fl_Help_View_H

```

## 34.64 Fl\_Hold\_Browser.H

```

1 //
2 // Hold browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php

```

```
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Hold_Browser widget . */
19
20 #ifndef Fl_Hold_Browser_H
21 #define Fl_Hold_Browser_H
22
23 #include "Fl_Browser.H"
24
25 class FL_EXPORT Fl_Hold_Browser : public Fl_Browser {
26 public:
27     Fl_Hold_Browser(int X,int Y,int W,int H,const char *L=0);
28 };
29
30 #endif
```

## 34.65 Fl\_Hor\_Fill\_Slider.H

```
1 //
2 // Horizontal fill slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Hor_Fill_Slider widget . */
19
20 #ifndef Fl_Hor_Fill_Slider_H
21 #define Fl_Hor_Fill_Slider_H
22
23 #include "Fl_Slider.H"
24
25 class FL_EXPORT Fl_Hor_Fill_Slider : public Fl_Slider {
26 public:
27     Fl_Hor_Fill_Slider(int X,int Y,int W,int H,const char *L=0);
28 };
29
30 #endif
```

## 34.66 Fl\_Hor\_Nice\_Slider.H

```
1 //
2 // Horizontal "nice" slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Hor_Nice_Slider widget . */
19
20 #ifndef Fl_Hor_Nice_Slider_H
21 #define Fl_Hor_Nice_Slider_H
22
23 #include "Fl_Slider.H"
24
25 class FL_EXPORT Fl_Hor_Nice_Slider : public Fl_Slider {
26 public:
```

```

36  Fl_Hor_Nice_Slider(int X,int Y,int W,int H,const char *L=0);
37  };
38
39  #endif

```

## 34.67 Fl\_Hor\_Slider.H

```

1  //
2  // Horizontal slider header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2011 by Bill Spitzak and others.
5  //
6  // This library is free software.  Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file.  If this
8  // file is missing or damaged, see the license at:
9  //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Hor_Slider widget .  */
19
20 #ifndef Fl_Hor_Slider_H
21 #define Fl_Hor_Slider_H
22
23 #include "Fl_Slider.H"
24
25 class FL_EXPORT Fl_Hor_Slider : public Fl_Slider {
26 public:
27     Fl_Hor_Slider(int X,int Y,int W,int H,const char *l=0);
28 };
29
30 #endif

```

## 34.68 Fl\_Hor\_Value\_Slider.H

```

1  //
2  // Horizontal value slider header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2010 by Bill Spitzak and others.
5  //
6  // This library is free software.  Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file.  If this
8  // file is missing or damaged, see the license at:
9  //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Hor_Value_Slider widget .  */
19
20 #ifndef Fl_Hor_Value_Slider_H
21 #define Fl_Hor_Value_Slider_H
22
23 #include "Fl_Value_Slider.H"
24
25 class FL_EXPORT Fl_Hor_Value_Slider : public Fl_Value_Slider {
26 public:
27     Fl_Hor_Value_Slider(int X,int Y,int W,int H,const char *l=0);
28 };
29
30 #endif

```

## 34.69 Fl\_ICO\_Image.H

```

1  //
2  // ICO image header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 2022-2023 by Bill Spitzak and others.
5  //

```

```

6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // http://www.fltk.org/COPYING.php
11 //
12 // Please report all bugs and problems on the following page:
13 //
14 // http://www.fltk.org/str.php
15 //
16
17 // https://en.wikipedia.org/wiki/ICO_(file_format)
18 // http://www.daubnet.com/en/file-format-ico
19
20 #ifndef FL_ICO_Image_H
21 # define FL_ICO_Image_H
22 # include "Fl_BMP_Image.H"
23
24
25
26
27 class FL_EXPORT Fl_ICO_Image : public Fl_BMP_Image {
28
29 public:
30     struct IconDirEntry {
31         int bWidth;
32         int bHeight;
33         int bColorCount;
34         int bReserved;
35         int wPlanes;
36         int wBitCount;
37         int dwBytesInRes;
38         int dwImageOffset;
39     };
40
41
42     Fl_ICO_Image(const char *filename, int id = -1, const unsigned char *data = NULL, const size_t datasize
43                 = 0);
44     ~Fl_ICO_Image();
45
46     int idcount()const { return idcount_; }
47
48     const IconDirEntry * icondirentary()const { return icondirentary_; }
49
50 private:
51     int idcount_;
52     struct IconDirEntry *icondirentary_;
53     void load_ico_(class Fl_Image_Reader &rdr, int id);
54 };
55
56
57 #endif // FL_ICO_Image_H

```

## 34.70 Fl\_Image.H File Reference

[Fl\\_Image](#), [Fl\\_RGB\\_Image](#) classes.

```
#include "Enumerations.H"
```

```
#include "Fl_Widget.H"
```

### Classes

- class [Fl\\_Image](#)

*Base class for image caching, scaling and drawing.*

- class [Fl\\_RGB\\_Image](#)

*The [Fl\\_RGB\\_Image](#) class supports caching and drawing of full-color images with 1 to 4 channels of color information.*

### Enumerations

- enum [Fl\\_RGB\\_Scaling](#) { [FL\\_RGB\\_SCALING\\_NEAREST](#) = 0 , [FL\\_RGB\\_SCALING\\_BILINEAR](#) }

*The scaling algorithm to use for RGB images.*

#### 34.70.1 Detailed Description

[Fl\\_Image](#), [Fl\\_RGB\\_Image](#) classes.

## 34.70.2 Enumeration Type Documentation

### 34.70.2.1 Fl\_RGB\_Scaling

enum [Fl\\_RGB\\_Scaling](#)

The scaling algorithm to use for RGB images.

Enumerator

FL_RGB_SCALING_NEAREST	default RGB image scaling algorithm
FL_RGB_SCALING_BILINEAR	more accurate, but slower RGB image scaling algorithm

## 34.71 Fl\_Image.H

[Go to the documentation of this file.](#)

```

1 //
2 // Image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
20 #ifndef Fl_Image_H
21 #define Fl_Image_H
22
23 #include "Enumerations.H"
24 #include "Fl_Widget.H" // for fl_uintptr_t
25
26 class Fl_Widget;
27 class Fl_Pixmap;
28 struct Fl_Menu_Item;
29 struct Fl_Label;
30 class Fl_RGB_Image;
31
32
36 enum Fl_RGB_Scaling {
37     FL_RGB_SCALING_NEAREST = 0,
38     FL_RGB_SCALING_BILINEAR
39 };
40
41
60 class FL_EXPORT Fl_Image {
61     friend class Fl_Graphics_Driver;
62 public:
63     static const int ERR_NO_IMAGE      = -1;
64     static const int ERR_FILE_ACCESS   = -2;
65     static const int ERR_FORMAT        = -3;
66     static const int ERR_MEMORY_ACCESS = -4;
67
68 private:
69     int w_, h_, d_, ld_, count_;
70     int data_w_, data_h_;
71     const char * const *data_;
72     static Fl_RGB_Scaling RGB_scaling_; // method used when copying RGB images
73     static Fl_RGB_Scaling scaling_algorithm_; // method used to rescale RGB source images before drawing
74     // Forbid use of copy constructor and assign operator
75     Fl_Image & operator=(const Fl_Image &);
76     Fl_Image(const Fl_Image &);
77     // Presently redefined in Fl_SVG_Image
78     virtual void cache_size_(int & /*width*/, int & /*height*/) {}
79
80 protected:
81
87     void w(int W) {w_ = W; data_w_ = W;}
93     void h(int H) {h_ = H; data_h_ = H;}
97     void d(int D) {d_ = D;}

```

```

109 void ld(int LD) {ld_ = LD;}
117 void data(const char * const *p, int c) {data_ = p; count_ = c;}
118 void draw_empty(int X, int Y);
119
120 static void labeltype(const Fl_Label *lo, int lx, int ly, int lw, int lh, Fl_Align la);
121 static void measure(const Fl_Label *lo, int &lw, int &lh);
122 int draw_scaled(int X, int Y, int W, int H);
123
124 public:
125
131 int w()const {return w_;}
137 int h()const {return h_;}
141 int data_w()const {return data_w_;}
145 int data_h()const {return data_h_;}
151 int d()const {return d_;}
156 int ld()const {return ld_;}
165 int count()const {return count_;}
191 const char * const *data()const {return data_;}
192 int fail() const;
220 virtual void release() {
221     delete this;
222 }
223
233 virtual class Fl_Shared_Image *as_shared_image() {
234     return 0;
235 }
236
237 Fl_Image(int W, int H, int D);
238 virtual ~Fl_Image();
239 virtual Fl_Image *copy(int W, int H) const;
266 Fl_Image *copy()const { return copy(w(), h()); }
267 virtual void color_average(Fl_Color c, float i);
279 void inactive() { color_average(FL_GRAY, .33f); }
280 virtual void desaturate();
281 virtual void label(Fl_Widget*w);
282 virtual void label(Fl_Menu_Item*m);
294 virtual void draw(int X, int Y, int W, int H, int cx=0, int cy=0); // platform dependent
299 void draw(int X, int Y) {draw(X, Y, w(), h(), 0, 0);} // platform dependent
300 virtual void uncache();
301
302 // used by fl_define_FL_IMAGE_LABEL() to avoid 'friend' declaration
303 static Fl_Labeltype define_FL_IMAGE_LABEL();
304
305 // set RGB image scaling method
306 static void RGB_scaling(Fl_RGB_Scaling);
307 // get RGB image scaling method
308 static Fl_RGB_Scaling RGB_scaling();
309
310 // set the image drawing size
311 virtual void scale(int width, int height, int proportional = 1, int can_expand = 0);
320 static void scaling_algorithm(Fl_RGB_Scaling algorithm) {scaling_algorithm_ = algorithm; }
322 static Fl_RGB_Scaling scaling_algorithm() {return scaling_algorithm_;}
323 static bool register_images_done;
324 };
325
326 class Fl_SVG_Image;
327
328 class FL_EXPORT Fl_RGB_Image : public Fl_Image {
329     friend class Fl_Graphics_Driver;
330     static size_t max_size_;
331 public:
332     const uchar *array;
333     int alloc_array;
334
335 private:
336     // These two variables are used to cache the image and mask for the main display graphics driver
337     fl_uintptr_t id_;
338     fl_uintptr_t mask_;
339     int cache_w_, cache_h_; // size of image when cached
340 public:
341
342     Fl_RGB_Image(const uchar *bits, int W, int H, int D=3, int LD=0);
343     Fl_RGB_Image(const uchar *bits, int bits_length, int W, int H, int D, int LD);
344     Fl_RGB_Image(const Fl_Pixmap *pixmap, Fl_Color bg=FL_GRAY);
345     ~Fl_RGB_Image() FL_OVERRIDE;
346     Fl_Image *copy(int W, int H) const FL_OVERRIDE;
347     Fl_Image *copy()const { return Fl_Image::copy(); }
348     void color_average(Fl_Color c, float i) FL_OVERRIDE;
349     void desaturate() FL_OVERRIDE;
350     void draw(int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE;
351     void draw(int X, int Y) {draw(X, Y, w(), h(), 0, 0);}
352     void label(Fl_Widget*w) FL_OVERRIDE;
353     void label(Fl_Menu_Item*m) FL_OVERRIDE;
354     void uncache() FL_OVERRIDE;
355     int cache_w() {return cache_w_;}
356     int cache_h() {return cache_h_;}

```

```

383 static void max_size(size_t size) { max_size_ = size;}
388 static size_t max_size() {return max_size_;}
391 virtual Fl_SVG_Image *as_svg_image() { return NULL; }
394 virtual void normalize() {}
395 };
396
397 #endif // !Fl_Image_H

```

## 34.72 Fl\_Image\_Surface.H

```

1 //
2 // Draw-to-image code for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2016 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Image_Surface_H
18 #define Fl_Image_Surface_H
19
20 #include <FL/Fl_Widget_Surface.H>
21 #include <FL/Fl_Image.H>
22 #include <FL/Fl_Shared_Image.H>
23 #include <FL/platform_types.h> // for Fl_Offscreen
24
25
65 class FL_EXPORT Fl_Image_Surface : public Fl_Widget_Surface {
66     friend class Fl_Graphics_Driver;
67 private:
68     class Fl_Image_Surface_Driver *platform_surface;
69     Fl_Offscreen get_offscreen_before_delete();
70 protected:
71     void translate(int x, int y) FL_OVERRIDE;
72     void untranslate() FL_OVERRIDE;
73 public:
74     Fl_Image_Surface(int w, int h, int high_res = 0, Fl_Offscreen off = 0);
75     ~Fl_Image_Surface();
76     void set_current() FL_OVERRIDE;
77     bool is_current() FL_OVERRIDE;
78     Fl_RGB_Image *image();
79     Fl_Shared_Image *highres_image();
80     void origin(int *x, int *y) FL_OVERRIDE;
81     void origin(int x, int y) FL_OVERRIDE;
82     int printable_rect(int *w, int *h) FL_OVERRIDE;
83     Fl_Offscreen offscreen();
84     void rescale();
85     void mask(const Fl_RGB_Image *);
86 };
87
88
100 class Fl_Image_Surface_Driver : public Fl_Widget_Surface {
101     friend class Fl_Image_Surface;
102 private:
103     Fl_Image_Surface *image_surface_;
104 protected:
105     int width;
106     int height;
107     Fl_Offscreen offscreen;
108     int external_offscreen;
109     Fl_Image_Surface_Driver(int w, int h, int /*high_res*/, Fl_Offscreen off) : Fl_Widget_Surface(NULL),
width(w), height(h), offscreen(off) {external_offscreen = (off != 0);}
110     virtual ~Fl_Image_Surface_Driver() {}
111     static void copy_with_mask(Fl_RGB_Image* mask, uchar *dib_dst, uchar *dib_src,
int line_size, bool bottom_to_top);
112     static Fl_RGB_Image *RGB3_to_RGB1(const Fl_RGB_Image *rgb3, int W, int H);
113     void set_current() FL_OVERRIDE = 0;
114     void translate(int x, int y) FL_OVERRIDE = 0;
115     void untranslate() FL_OVERRIDE = 0;
116     int printable_rect(int *w, int *h) FL_OVERRIDE;
117     virtual Fl_RGB_Image *image() = 0;
118     virtual void mask(const Fl_RGB_Image *) {}
119     static Fl_Image_Surface_Driver *newImageSurfaceDriver(int w, int h, int high_res, Fl_Offscreen off);
120 public:
121     Fl_Image_Surface *image_surface() { return image_surface_; }
122 };
123
124
125

```

```
135 #endif // Fl_Image_Surface_H
```

## 34.73 Fl\_Input.H

```
1 //
2 // Input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Input widget . */
19
20 #ifndef Fl_Input_H
21 #define Fl_Input_H
22
23 #include "Fl_Input_.H"
24
25 class FL_EXPORT Fl_Input : public Fl_Input_ {
26     friend class Fl_Screen_Driver;
27     friend class Fl_Cocoa_Screen_Driver; // Not ideal, but probably no other platform will use it
28     int shift_position(int p);
29     int shift_up_down_position(int p);
30     void handle_mouse(int keepmark=0);
31
32     // Private keyboard functions
33     int kf_lines_up(int repeat_num);
34     int kf_lines_down(int repeat_num);
35     int kf_page_up();
36     int kf_page_down();
37     int kf_insert_toggle();
38     int kf_delete_word_right();
39     int kf_delete_word_left();
40     int kf_delete_sol();
41     int kf_delete_eol();
42     int kf_delete_char_right();
43     int kf_delete_char_left();
44     int kf_move_sol();
45     int kf_move_eol();
46     int kf_clear_eol();
47     int kf_move_char_left();
48     int kf_move_char_right();
49     int kf_move_word_left();
50     int kf_move_word_right();
51     int kf_move_up_and_sol();
52     int kf_move_down_and_eol();
53     int kf_top();
54     int kf_bottom();
55     int kf_select_all();
56     int kf_undo();
57     int kf_redo();
58     int kf_copy();
59     int kf_paste();
60     int kf_copy_cut();
61
62 protected:
63     void draw() FL_OVERRIDE;
64     int handle_key();
65     int handle_rmb();
66
67 public:
68     int handle(int) FL_OVERRIDE;
69     Fl_Input(int,int,int,int,const char * = 0);
70     static const char *cut_menu_text;
71     static const char *copy_menu_text;
72     static const char *paste_menu_text;
73 };
74
75 #endif
```

## 34.74 Fl\_Input\_.H

```

1 //
2 // Input base class header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2015 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Input_ widget . */
19
20 #ifndef Fl_Input__H
21 #define Fl_Input__H
22
23 #ifndef Fl_Widget_H
24 #include "Fl_Widget.H"
25 #endif
26
27 #define FL_NORMAL_INPUT      0
28 #define FL_FLOAT_INPUT      1
29 #define FL_INT_INPUT        2
30 #define FL_HIDDEN_INPUT     3
31 #define FL_MULTILINE_INPUT  4
32 #define FL_SECRET_INPUT     5
33 #define FL_INPUT_TYPE       7
34 #define FL_INPUT_READONLY   8
35 #define FL_NORMAL_OUTPUT    (FL_NORMAL_INPUT | FL_INPUT_READONLY)
36 #define FL_MULTILINE_OUTPUT (FL_MULTILINE_INPUT | FL_INPUT_READONLY)
37 #define FL_INPUT_WRAP       16
38 #define FL_MULTILINE_INPUT_WRAP (FL_MULTILINE_INPUT | FL_INPUT_WRAP)
39 #define FL_MULTILINE_OUTPUT_WRAP (FL_MULTILINE_INPUT | FL_INPUT_READONLY | FL_INPUT_WRAP)
40
41 class Fl_Input_Undo_Action;
42 class Fl_Input_Undo_Action_List;
43
44 #class FL_EXPORT Fl_Input_ : public Fl_Widget {
45
46     const char* value_;
47     char* buffer;
48
49     int size_;
50     int bufsize;
51     int position_;
52     int mark_;
53     int tab_nav_;
54     int xscroll_, yscroll_;
55     int mu_p;
56     int maximum_size_;
57     int shortcut_;
58     uchar erase_cursor_only;
59     Fl_Font textfont_;
60     Fl_Fonsize textsize_;
61     Fl_Color textcolor_;
62     Fl_Color cursor_color_;
63
64     Fl_Input_Undo_Action* undo_;
65     Fl_Input_Undo_Action_List* undo_list_;
66     Fl_Input_Undo_Action_List* redo_list_;
67
68     static double up_down_pos;
69     static int was_up_down;
70
71 };

```

```

161  /* Convert a given text segment into the text that will be rendered on screen. */
162  const char* expand(const char*, char*) const;
163
164  /* Calculates the width in pixels of part of a text buffer. */
165  double expandpos(const char*, const char*, const char*, int*) const;
166
167  /* Mark a range of characters for update. */
168  void minimal_update(int, int);
169
170  /* Mark a range of characters for update. */
171  void minimal_update(int p);
172
173  /* Copy the value from a possibly static entry into the internal buffer. */
174  void put_in_buffer(int newsize);
175
176  /* Set the current font and font size. */
177  void setfont() const;
178
179 protected:
180
181  /* Find the start of a word. */
182  int word_start(int i) const;
183
184  /* Find the end of a word. */
185  int word_end(int i) const;
186
187  /* Find the start of a line. */
188  int line_start(int i) const;
189
190  /* Find the end of a line. */
191  int line_end(int i) const;
192
193  /* Draw the text in the passed bounding box. */
194  void drawtext(int, int, int, int);
195
196  /* Draw the text in the passed bounding box. */
197  void drawtext(int, int, int, int, bool draw_active);
198
199  /* Move the cursor to the column given by up_down_pos. */
200  int up_down_position(int, int keepmark=0);
201
202  /* Handle mouse clicks and mouse moves. */
203  void handle_mouse(int, int, int, int, int keepmark=0);
204
205  /* Handle all kinds of text field related events. */
206  int handletext(int e, int, int, int, int);
207
208  /* Check the when() field and do a callback if indicated. */
209  void maybe_do_callback(FL_Callback_Reason reason = FL_REASON_UNKNOWN);
210
211  int xscroll()const {return xscroll_;}
212
213  int yscroll()const {return yscroll_;}
214  void yscroll(int yOffset) { yscroll_ = yOffset; damage(FL_DAMAGE_EXPOSE);}
215
216  /* Return the number of lines displayed on a single page. */
217  int linesPerPage();
218
219  /* Apply the current undo/redo operation, called from undo() or redo() */
220  int apply_undo();
221
222 public:
223
224  /* Change the size of the widget. */
225  void resize(int, int, int, int) FL_OVERRIDE;
226
227  /* Constructor */
228  FL_Input_(int, int, int, int, const char* = 0);
229
230  /* Destructor */
231  ~FL_Input_();
232
233  /* Changes the widget text. */
234  int value(const char*);
235
236  /* Changes the widget text. */
237  int value(const char*, int);
238
239  /* Changes the widget text. */
240  int value(int value);
241
242  /* Changes the widget text. */
243  int value(double value);
244
245  /* Changes the widget text. */
246  int static_value(const char*);
247
248
249

```

```

250  /* Changes the widget text. */
251  int static_value(const char*, int);
252
253  const char* value()const {return value_;}
254
255  int ivalue() const;
256
257  double dvalue() const;
258
259  /* Returns the Unicode character at index \p i. */
260  unsigned int index(int i) const;
261
262  int size()const {return size_;}
263
264  void size(int W, int H) { Fl_Widget::size(W, H); }
265
266  int maximum_size()const {return maximum_size_;}
267
268  void maximum_size(int m) {maximum_size_ = m;}
269
270  int insert_position()const { return position_; }
271  FL_DEPRECATED("since 1.4.0 - use insert_position() instead",
272  int position() const ) { return insert_position(); }
273
274  int mark()const {return mark_;}
275
276  /* Sets the index for the cursor and mark. */
277  int insert_position(int p, int m);
278  FL_DEPRECATED("since 1.4.0 - use insert_position(p, m) or Fl_Widget::position(x, y) instead",
279  int position(int p, int m)) { return insert_position(p, m); }
280
281  int insert_position(int p) { return insert_position(p, p); }
282  FL_DEPRECATED("since 1.4.0 - use insert_position(p) instead",
283  int position(int p) ) { return insert_position(p); }
284
285  int mark(int m) {return insert_position(insert_position(), m);}
286
287  /* Deletes text from \p b to \p e and inserts the new string \p text. */
288  int replace(int b, int e, const char *text, int llen=0);
289
290  int cut() {return replace(insert_position(), mark(), 0);}
291
292  int cut(int n) {return replace(insert_position(), insert_position()+n, 0);}
293
294  int cut(int a, int b) {return replace(a, b, 0);}
295
296  int insert(const char* t, int l=0){return replace(position_, mark_, t, l);}
297
298  /* Append text at the end. */
299  int append(const char* t, int l=0, char keep_selection=0);
300
301  /* Put the current selection into the clipboard. */
302  int copy(int clipboard);
303
304  /* Undo previous changes to the text buffer. */
305  int undo();
306
307  /* Return true if the last operation can be undone. */
308  bool can_undo() const;
309
310  /* Redo previous undo operations. */
311  int redo();
312
313  /* Return true if there is a redo action in the list. */
314  bool can_redo() const;
315
316  /* Copy the yank buffer to the clipboard. */
317  int copy_cuts();
318
319  int shortcut()const {return shortcut_;}
320
321  void shortcut(int s) {shortcut_ = s;}
322
323  Fl_Font textfont()const {return textfont_;}
324
325  void textfont(Fl_Font s) {textfont_ = s;}
326
327  Fl_Fonsize textsize()const {return textsize_;}
328
329  void textsize(Fl_Fonsize s) {textsize_ = s;}
330
331  Fl_Color textcolor()const {return textcolor_;}
332
333  void textcolor(Fl_Color n) {textcolor_ = n;}
334
335  Fl_Color cursor_color()const {return cursor_color_;}
336
337

```

```

461 void cursor_color(Fl_Color n) {cursor_color_ = n;}
462
465 int input_type()const {return type() & FL_INPUT_TYPE; }
466
470 void input_type(int t) { type((uchar)(t | readonly())); }
471
474 int readonly()const { return type() & FL_INPUT_READONLY; }
475
478 void readonly(int b) { if (b) type((uchar)(type() | FL_INPUT_READONLY));
479                       else type((uchar)(type() & ~FL_INPUT_READONLY)); }
480
485 int wrap()const { return type() & FL_INPUT_WRAP; }
486
491 void wrap(int b) { if (b) type((uchar)(type() | FL_INPUT_WRAP));
492                  else type((uchar)(type() & ~FL_INPUT_WRAP)); }
493
517 void tab_nav(int val) {
518     tab_nav_ = val;
519 }
520
531 int tab_nav()const {
532     return tab_nav_;
533 }
534 };
535
536 #endif

```

## 34.75 Fl\_Input\_Choice.H

```

1 //
2 // An input/chooser widget.
3 //
4 //      |-----| |---|
5 //      | input area | | \ |
6 //      |-----| |---|
7 //
8 // Copyright 2004 by Greg Ercolano.
9 // Copyright 1998-2024 by Bill Spitzak and others.
10 //
11 // This library is free software. Distribution and use rights are outlined in
12 // the file "COPYING" which should have been included with this file. If this
13 // file is missing or damaged, see the license at:
14 //
15 //      https://www.fltk.org/COPYING.php
16 //
17 // Please see the following page on how to report bugs and issues:
18 //
19 //      https://www.fltk.org/bugs.php
20 //
21
22 /* \file
23 Fl_Input_Choice widget . */
24
25 #ifndef Fl_Input_Choice_H
26 #define Fl_Input_Choice_H
27
28 #include <FL/Fl.H>
29 #include <FL/Fl_Group.H>
30 #include <FL/Fl_Input.H>
31 #include <FL/Fl_Menu_Button.H>
32
33 /*
34 A combination of the input widget and a menu button.
35
36 The user can either type into the input area, or use the
37 menu button chooser on the right to choose an item which loads
38 the input area with the selected text.
39
40 Note: doxygen docs in src/Fl_Input_Choice.cxx
41 */
42
43 class FL_EXPORT Fl_Input_Choice : public Fl_Group {
44
45     // Private class to handle slightly 'special' behavior of menu button
46     class InputMenuButton : public Fl_Menu_Button {
47     public:
48         void draw() FL_OVERRIDE;
49         const Fl_Menu_Item* popup();
50         InputMenuButton(int X, int Y, int W, int H, const char *L=0);
51         int handle(int e) FL_OVERRIDE;
52     };
53
54     Fl_Input *inp_;
55     InputMenuButton *menu_;
56

```

```

57 // note: this is used by the Fl_Input_Choice ctor.
58 static void menu_cb(Fl_Widget*, void *data);
59
60 // note: this is used by the Fl_Input_Choice ctor.
61 static void inp_cb(Fl_Widget*, void *data);
62
63 protected:
64 // Custom resize behavior -- input stretches, menu button doesn't
65
66
67 virtual int inp_x()const { return(x() + Fl::box_dx(box())); }
68 virtual int inp_y()const { return(y() + Fl::box_dy(box())); }
69 virtual int inp_w()const { return(w() - Fl::box_dw(box()) - menu_w()); }
70 virtual int inp_h()const { return(h() - Fl::box_dh(box())); }
71
72 virtual int menu_x()const { return x() + w() - menu_w() - Fl::box_dx(box()); }
73 virtual int menu_y()const { return y() + Fl::box_dy(box()); }
74 virtual int menu_w()const { return 20; }
75 virtual int menu_h()const { return h() - Fl::box_dh(box()); }
76
77 void draw() FL_OVERRIDE;
78
79 public:
80
81 Fl_Input_Choice(int X, int Y, int W, int H, const char *L=0);
82
83 void resize(int X, int Y, int W, int H) FL_OVERRIDE;
84
85 void add(const char *s) { menu_>add(s); }
86
87 int changed()const { return inp_>changed() | Fl_Widget::changed(); }
88
89 // Clears the changed() state of both input and menu button widgets.
90 void clear_changed();
91
92 // Sets the changed() state of both input and menu button widgets.
93 void set_changed();
94
95 void clear() { menu_>clear(); }
96
97 Fl_Boxtype down_box()const { return (menu_>down_box()); }
98
99 void down_box(Fl_Boxtype b) { menu_>down_box(b); }
100
101 const Fl_Menu_Item *menu() { return (menu_>menu()); }
102
103 void menu(const Fl_Menu_Item *m) { menu_>menu(m); }
104
105 Fl_Color textcolor()const { return (inp_>textcolor()); }
106
107 void textcolor(Fl_Color c) { inp_>textcolor(c); }
108
109 Fl_Font textfont()const { return (inp_>textfont()); }
110
111 void textfont(Fl_Font f) { inp_>textfont(f); }
112
113 Fl_Fonsize textsize()const { return (inp_>textsize()); }
114
115 void textsize(Fl_Fonsize s) { inp_>textsize(s); }
116
117 const char* value()const { return (inp_>value()); }
118
119 void value(const char *val) { inp_>value(val); }
120
121 /* Chooses item# \p val in the menu, and sets the Fl_Input text field
122 to that value. Any previous text is cleared. */
123 void value(int val);
124
125 int update_menubutton();
126
127 Fl_Menu_Button *menubutton() { return menu_; }
128
129 Fl_Input *input() { return inp_; }
130 };
131
132 #endif // !Fl_Input_Choice_H

```

## 34.76 Fl\_Int\_Input.H

```

1 //
2 // Integer input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this

```

```
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Int_Input widget . */
19
20 #ifndef Fl_Int_Input_H
21 #define Fl_Int_Input_H
22
23 #include "Fl_Input.H"
24
25 class FL_EXPORT Fl_Int_Input : public Fl_Input {
26 public:
27     Fl_Int_Input(int X,int Y,int W,int H,const char *l = 0);
28 };
29
30 #endif
```

## 34.77 Fl\_JPEG\_Image.H

```
1 //
2 // JPEG image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_JPEG_Image class . */
19
20 #ifndef Fl_JPEG_Image_H
21 #define Fl_JPEG_Image_H
22 #include "Fl_Image.H"
23
24 class FL_EXPORT Fl_JPEG_Image : public Fl_RGB_Image {
25 public:
26     Fl_JPEG_Image(const char *filename);
27     Fl_JPEG_Image(const char *name, const unsigned char *data, int data_length=-1);
28 protected:
29     void load_jpg_(const char *filename, const char *sharename, const unsigned char *data, int
        data_length=-1);
30 };
31
32 #endif
```

## 34.78 Fl\_Light\_Button.H

```
1 //
2 // Lighted button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
```

```

16
17 /* \file
18 Fl_Light_Button widget . */
19
20 #ifndef Fl_Light_Button_H
21 #define Fl_Light_Button_H
22
23 #include "Fl_Button.H"
24
25
26 class FL_EXPORT Fl_Light_Button : public Fl_Button {
27 protected:
28     void draw() FL_OVERRIDE;
29 public:
30     int handle(int) FL_OVERRIDE;
31     Fl_Light_Button(int x,int y,int w,int h,const char *l = 0);
32 };
33
34 #endif

```

## 34.79 Fl\_Line\_Dial.H

```

1 //
2 // Line dial header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Line_Dial widget . */
19
20 #ifndef Fl_Line_Dial_H
21 #define Fl_Line_Dial_H
22
23 #include "Fl_Dial.H"
24
25
26 class FL_EXPORT Fl_Line_Dial : public Fl_Dial {
27 public:
28     Fl_Line_Dial(int X,int Y,int W,int H, const char *L = 0);
29 };
30
31 #endif

```

## 34.80 Fl\_Menu.H

```

1 //
2 // Old menu header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 // this include file is for back compatibility only
18 #include "Fl_Menu_Item.H"

```

## 34.81 Fl\_Menu\_.H

```

1 //
2 // Menu base class header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.

```

```

5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Menu_ widget . */
19
20 #ifndef Fl_Menu__H
21 #define Fl_Menu__H
22
23 #ifndef Fl_Widget_H
24 #include "Fl_Widget.H"
25 #endif
26 #include "Fl_Menu_Item.H"
27
28 class FL_EXPORT Fl_Menu_ : public Fl_Widget {
29
30     Fl_Menu_Item *menu_;
31     const Fl_Menu_Item *value_;
32     const Fl_Menu_Item *prev_value_;
33
34 protected:
35
36     uchar alloc; // flag indicates if menu_ is a dynamic copy (=1) or not (=0)
37     uchar down_box_;
38     Fl_Boxtype menu_box_;
39     Fl_Font textfont_;
40     Fl_Fonsize textsize_;
41     Fl_Color textcolor_;
42
43     int item_pathname(char *name, int namelen, const Fl_Menu_Item *finditem,
44                       const Fl_Menu_Item *menu=0) const;
45 public:
46     Fl_Menu_(int,int,int,int,const char * =0);
47     ~Fl_Menu_();
48
49     int item_pathname(char *name, int namelen, const Fl_Menu_Item *finditem=0) const;
50     const Fl_Menu_Item* picked(const Fl_Menu_Item*);
51     const Fl_Menu_Item* find_item(const char *name);
52     const Fl_Menu_Item* find_item(Fl_Callback*);
53     const Fl_Menu_Item* find_item_with_user_data(void*);
54     const Fl_Menu_Item* find_item_with_argument(long);
55     int find_index(const char *name) const;
56     int find_index(const Fl_Menu_Item *item) const;
57     int find_index(Fl_Callback *cb) const;
58
59     const Fl_Menu_Item* test_shortcut() {return picked(menu()->test_shortcut());}
60     void global();
61
62     const Fl_Menu_Item *menu()const {return menu_;}
63     const Fl_Menu_Item *menu_end(); // in src/Fl_Menu_add.cxx
64     void menu(const Fl_Menu_Item *m);
65     void copy(const Fl_Menu_Item *m, void* user_data = 0);
66     int insert(int index, const char*, int shortcut, Fl_Callback*, void* = 0, int = 0);
67     int add(const char*, int shortcut, Fl_Callback*, void* = 0, int = 0); // see src/Fl_Menu_add.cxx
68     int add(const char* a, const char* b, Fl_Callback* c, void* d = 0, int e = 0) {
69         return add(a,fl_old_shortcut(b),c,d,e);
70     }
71     int insert(int index, const char* a, const char* b, Fl_Callback* c, void* d = 0, int e = 0) {
72         return insert(index,a,fl_old_shortcut(b),c,d,e);
73     }
74     int add(const char *);
75     int size() const;
76     void size(int W, int H) { Fl_Widget::size(W, H); }
77     void clear();
78     int clear_submenu(int index);
79     void replace(int,const char *);
80     void remove(int);
81     void shortcut(int i, int s) {menu_[i].shortcut(s);}
82     void mode(int i,int fl) {menu_[i].flags = fl;}
83     int mode(int i)const {return menu_[i].flags;}
84
85     const Fl_Menu_Item *mvalue()const {return value_;}
86
87     const Fl_Menu_Item *prev_mvalue()const {return prev_value_;}
88     // Return the index into the menu() of the last item chosen by the user or -1.
89     int value() const;
90     // Set the internal value_ of the menu to the given Fl_Menu_Item.
91     int value(const Fl_Menu_Item*);

```

```

205 int value(int i) {
206     if (!menu_ || i < 0 || i >= size())
207         return 0;
208     return value(menu_ + i);
209 }
210
212 const char *text()const {return value_ ? value_->text : 0;}
214 const char *text(int i)const {return menu_[i].text;}
215
217 Fl_Font textfont()const {return textfont_;}
219 void textfont(Fl_Font c) {textfont_=c;}
221 Fl_Fontsize textsize()const {return textsize_;}
223 void textsize(Fl_Fontsize c) {textsize_=c;}
225 Fl_Color textcolor()const {return textcolor_;}
227 void textcolor(Fl_Color c) {textcolor_=c;}
228
233 Fl_Boxtype down_box()const {return (Fl_Boxtype)down_box_;}
235 void down_box(Fl_Boxtype b) {down_box_ = b;}
236
240 Fl_Boxtype menu_box()const { return menu_box_; }
245 void menu_box(Fl_Boxtype b) { menu_box_ = b; }
246
248 Fl_Color down_color()const {return selection_color();}
250 void down_color(unsigned c) {selection_color(c);}
251 void setonly(Fl_Menu_Item* item);
252 };
253
254 #endif

```

## 34.82 Fl\_Menu\_Bar.H

```

1 //
2 // Menu bar header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2017 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Menu_Bar widget . */
19
20 #ifndef Fl_Menu_Bar_H
21 #define Fl_Menu_Bar_H
22
23 #include "Fl_Menu_.H"
24
269 class FL_EXPORT Fl_Menu_Bar : public Fl_Menu_ {
270     friend class Fl_Sys_Menu_Bar_Driver;
271 protected:
272     void draw() FL_OVERRIDE;
273 public:
274     int handle(int) FL_OVERRIDE;
275     Fl_Menu_Bar(int X, int Y, int W, int H, const char *l=0);
276     virtual void update() {}
277     virtual void play_menu(const Fl_Menu_Item *item);
278 };
279
280 #endif

```

## 34.83 Fl\_Menu\_Button.H

```

1 //
2 // Menu button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:

```

```

13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Menu_Button widget . */
19
20 #ifndef Fl_Menu_Button_H
21 #define Fl_Menu_Button_H
22
23 #include "Fl_Menu_.H"
24
25 class FL_EXPORT Fl_Menu_Button : public Fl_Menu_ {
26 protected:
27     void draw() FL_OVERRIDE;
28     static Fl_Menu_Button* pressed_menu_button_;
29 public:
30     enum popup_buttons {POPUP1 = 1,
31         POPUP2,
32         POPUP12,
33         POPUP3,
34         POPUP13,
35         POPUP23,
36         POPUP123
37     };
38     int handle(int) FL_OVERRIDE;
39     const Fl_Menu_Item* popup();
40     Fl_Menu_Button(int,int,int,int,const char * =0);
41 };
42
43 #endif

```

## 34.84 Fl\_Menu\_Item.H File Reference

```

#include <FL/Fl_Widget.H>
#include <FL/Fl_Image.H>
#include <FL/Fl_Multi_Label.H>
#include <FL/platform_types.h>

```

### Classes

- struct [Fl\\_Menu\\_Item](#)

The *Fl\_Menu\_Item* structure defines a single menu item that is used by the *Fl\_Menu\_* class.

### Typedefs

- typedef [Fl\\_Menu\\_Item](#) **Fl\_Menu**

### Enumerations

- enum {  
[FL\\_MENU\\_INACTIVE](#) = 1 , [FL\\_MENU\\_TOGGLE](#) = 2 , [FL\\_MENU\\_VALUE](#) = 4 , [FL\\_MENU\\_RADIO](#) = 8 ,  
[FL\\_MENU\\_INVISIBLE](#) = 0x10 , [FL\\_SUBMENU\\_POINTER](#) = 0x20 , [FL\\_SUBMENU](#) = 0x40 , [FL\\_MENU\\_DIVIDER](#)  
= 0x80 ,  
[FL\\_MENU\\_HORIZONTAL](#) = 0x100 , [FL\\_MENU\\_CHATTY](#) = 0x200 }
- enum {  
**[FL\\_PUP\\_NONE](#)** = 0 , **[FL\\_PUP\\_GREY](#)** = [FL\\_MENU\\_INACTIVE](#) , **[FL\\_PUP\\_GRAY](#)** = [FL\\_MENU\\_INACTIVE](#) ,  
**[FL\\_MENU\\_BOX](#)** = [FL\\_MENU\\_TOGGLE](#) ,  
**[FL\\_PUP\\_BOX](#)** = [FL\\_MENU\\_TOGGLE](#) , **[FL\\_MENU\\_CHECK](#)** = [FL\\_MENU\\_VALUE](#) , **[FL\\_PUP\\_CHECK](#)** = [FL\\_MENU\\_VALUE](#) , **[FL\\_PUP\\_RADIO](#)** = [FL\\_MENU\\_RADIO](#) ,  
**[FL\\_PUP\\_INVISIBLE](#)** = [FL\\_MENU\\_INVISIBLE](#) , **[FL\\_PUP\\_SUBMENU](#)** = [FL\\_SUBMENU\\_POINTER](#) }

### Functions

- [Fl\\_Shortcut fl\\_old\\_shortcut](#) (const char \*)

Emulation of XForms named shortcuts.

## 34.84.1 Enumeration Type Documentation

### 34.84.1.1 anonymous enum

anonymous enum

Enumerator

FL_MENU_INACTIVE	Deactivate menu item (gray out)
FL_MENU_TOGGLE	Item is a checkbox toggle (shows checkbox for on/off state)
FL_MENU_VALUE	The on/off state for checkbox/radio buttons (if set, state is 'on')
FL_MENU_RADIO	Item is a radio button (one checkbox of many can be on)
FL_MENU_INVISIBLE	Item will not show up (shortcut will work)
FL_SUBMENU_POINTER	Indicates user_data() is a pointer to another menu array.
FL_SUBMENU	Item is a submenu to other items.
FL_MENU_DIVIDER	Creates divider line below this item. Also ends a group of radio buttons.
FL_MENU_HORIZONTAL	reserved, do not use
FL_MENU_CHATTY	Menu Item receives additional callbacks. Note: <b>ALL</b> other bits in <code>flags</code> are reserved: do not use them for your own purposes!

## 34.85 Fl\_Menu\_Item.H

[Go to the documentation of this file.](#)

```

1 //
2 // Menu item header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Menu_Item_H
18 #define Fl_Menu_Item_H
19
20 #include <FL/Fl_Widget.H>
21 #include <FL/Fl_Image.H>
22 #include <FL/Fl_Multi_Label.H>
23 #include <FL/platform_types.h> // for FL_COMMAND and FL_CONTROL
24
25 // doxygen needs the following line to enable e.g. ::FL_MENU_TOGGLE to link to the enums
26
27 enum { // values for flags:
28     FL_MENU_INACTIVE   = 1,
29     FL_MENU_TOGGLE     = 2,
30     FL_MENU_VALUE      = 4,
31     FL_MENU_RADIO      = 8,
32     FL_MENU_INVISIBLE  = 0x10,
33     FL_SUBMENU_POINTER = 0x20,
34     FL_SUBMENU         = 0x40,
35     FL_MENU_DIVIDER    = 0x80,
36     FL_MENU_HORIZONTAL = 0x100,
37     FL_MENU_CHATTY     = 0x200
38 };
39
40
41
42 extern FL_EXPORT Fl_Shortcut fl_old_shortcut(const char*);
43
44 class Fl_Menu_;
45
46 struct FL_EXPORT Fl_Menu_Item {
47     const char *text;

```

```

138 int shortcut_;
139 Fl_Callback *callback_;
140 void *user_data_;
141 int flags;
142 uchar labeltype_;
143 Fl_Font labelfont_;
144 Fl_Fonsize labelsize_;
145 Fl_Color labelcolor_;
146
147 // advance N items, skipping submenus:
148 const Fl_Menu_Item *next(int=1) const;
149
150 Fl_Menu_Item *next(int i=1) {
151     return (Fl_Menu_Item*)((const Fl_Menu_Item*)this)->next(i);}
152
153 const Fl_Menu_Item *first()const { return next(0); }
154
155 Fl_Menu_Item *first() { return next(0); }
156
157 // methods on menu items:
158 const char* label()const { return text; }
159
160 void label(const char* a) { text = a; }
161
162 void label(Fl_Labeltype a, const char* b) {
163     labeltype_ = a;
164     text = b;
165 }
166
167 void multi_label(const Fl_Multi_Label *ml) {
168     label(FL_MULTI_LABEL, (const char *)ml);
169 }
170
171 void image_label(const Fl_Image *image) {
172     label(FL_IMAGE_LABEL, (const char *)image);
173 }
174
175 Fl_Labeltype labeltype()const {return (Fl_Labeltype)labeltype_;}
176
177 void labeltype(Fl_Labeltype a) {labeltype_ = a;}
178
179 Fl_Color labelcolor()const {return labelcolor_;}
180
181 void labelcolor(Fl_Color a) {labelcolor_ = a;}
182 Fl_Font labelfont()const {return labelfont_;}
183
184 void labelfont(Fl_Font a) {labelfont_ = a;}
185
186 Fl_Fonsize labelsize()const {return labelsize_;}
187
188 void labelsize(Fl_Fonsize a) {labelsize_ = a;}
189
190 Fl_Callback_p callback()const {return callback_;}
191
192 void callback(Fl_Callback* c, void* p) {callback_=c; user_data_=p;}
193
194 void callback(Fl_Callback* c) {callback_=c;}
195
196 void callback(Fl_Callback0 *c) {
197     callback_ = (Fl_Callback *) (void *)c;
198 }
199
200 void callback(Fl_Callback1 *c, long p = 0) {
201     callback_ = (Fl_Callback *) (void *)c;
202     user_data_ = (void *) (fl_intptr_t)p;
203 }
204
205 void* user_data()const {return user_data_;}
206 void user_data(void* v) {user_data_ = v;}
207 long argument()const {return (long) (fl_intptr_t)user_data_;}
208 void argument(long v) {user_data_ = (void*) (fl_intptr_t)v;}
209
210 int shortcut()const {return shortcut_;}
211
212 void shortcut(int s) {shortcut_ = s;}
213 int submenu()const {return flags&(FL_SUBMENU|FL_SUBMENU_POINTER);}
214 int checkbox()const {return flags&FL_MENU_TOGGLE;}
215 int radio()const {return flags&FL_MENU_RADIO;}
216 int value()const {return (flags & FL_MENU_VALUE) ? 1 : 0;}
217
218 void value(int v) { v ? set() : clear(); }
219
220 void set() {flags |= FL_MENU_VALUE;}
221
222 void clear() {flags &= ~FL_MENU_VALUE;}
223
224 void setonly(Fl_Menu_Item const* first = NULL);

```

```

442
443 int visible()const {return !(flags&FL_MENU_INVISIBLE);}
444
445 void show() {flags &= ~FL_MENU_INVISIBLE;}
446
447 void hide() {flags |= FL_MENU_INVISIBLE;}
448
449 int active()const {return !(flags&FL_MENU_INACTIVE);}
450
451 void activate() {flags &= ~FL_MENU_INACTIVE;}
452 void deactivate() {flags |= FL_MENU_INACTIVE;}
453 int activevisible()const {return !(flags & (FL_MENU_INACTIVE|FL_MENU_INVISIBLE));}
454
455 // compatibility for FLUID so it can set the image of a menu item...
456
457 void image(Fl_Image* image) {image->label(this);}
458
459 void image(Fl_Image& image) {image.label(this);}
460
461 // used by menubar:
462 int measure(int* h, const Fl_Menu_*) const;
463 void draw(int x, int y, int w, int h, const Fl_Menu_*, int t=0) const;
464
465 // popup menus without using an Fl_Menu_ widget:
466 const Fl_Menu_Item* popup(
467     int X, int Y,
468     const char *title = 0,
469     const Fl_Menu_Item* picked=0,
470     const Fl_Menu_* = 0) const;
471 const Fl_Menu_Item* pulldown(
472     int X, int Y, int W, int H,
473     const Fl_Menu_Item* picked = 0,
474     const Fl_Menu_* = 0,
475     const Fl_Menu_Item* title = 0,
476     int menubar=0) const;
477 const Fl_Menu_Item* test_shortcut() const;
478 const Fl_Menu_Item* find_shortcut(int *ip=0, const bool require_alt = false) const;
479
480 void do_callback(Fl_Widget* o, Fl_Callback_Reason reason=FL_REASON_UNKNOWN)const {
481     Fl::callback_reason_ = reason; callback_(o, user_data_);
482 }
483
484 void do_callback(Fl_Widget* o, void* arg, Fl_Callback_Reason reason=FL_REASON_UNKNOWN)const {
485     Fl::callback_reason_ = reason; callback_(o, arg);
486 }
487
488 void do_callback(Fl_Widget* o, long arg, Fl_Callback_Reason reason=FL_REASON_UNKNOWN)const {
489     Fl::callback_reason_ = FL_REASON_SELECTED; callback_(o, (void*)(fl_intptr_t)arg);
490 }
491
492 inline int checked()const {return value();}
493
494 inline void check() {set();}
495
496 inline void uncheck() {clear();}
497
498 int insert(int,const char*,int,Fl_Callback*,void* =0, int =0);
499 int add(const char*, int shortcut, Fl_Callback*, void* =0, int = 0);
500
501 int add(const char*a, const char* b, Fl_Callback* c,
502         void* d = 0, int e = 0) {
503     return add(a,fl_old_shortcut(b),c,d,e);}
504
505 int size() const ;
506 };
507
508 typedef Fl_Menu_Item Fl_Menu; // back compatibility
509
510 enum { // back-compatibility enum:
511     FL_PUP_NONE = 0,
512     FL_PUP_GREY = FL_MENU_INACTIVE,
513     FL_PUP_GRAY = FL_MENU_INACTIVE,
514     FL_MENU_BOX = FL_MENU_TOGGLE,
515     FL_PUP_BOX = FL_MENU_TOGGLE,
516     FL_MENU_CHECK = FL_MENU_VALUE,
517     FL_PUP_CHECK = FL_MENU_VALUE,
518     FL_PUP_RADIO = FL_MENU_RADIO,
519     FL_PUP_INVISIBLE = FL_MENU_INVISIBLE,
520     FL_PUP_SUBMENU = FL_SUBMENU_POINTER
521 };
522
523 #endif

```

## 34.86 Fl\_Menu\_Window.H

```
1 //
2 // Menu window header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Menu_Window widget . */
19
20 #ifndef Fl_Menu_Window_H
21 #define Fl_Menu_Window_H
22
23 #include "Fl_Single_Window.H"
24
25 class FL_EXPORT Fl_Menu_Window : public Fl_Single_Window {
26 public:
27     ~Fl_Menu_Window();
28     Fl_Menu_Window(int W, int H, const char *l = 0);
29     Fl_Menu_Window(int X, int Y, int W, int H, const char *l = 0);
30 };
31
32 #endif
```

## 34.87 fl\_message.H

```
1 //
2 // Standard message header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef _FL_fl_message_H_
18 #define _FL_fl_message_H_
19
20 #include "fl_ask.H"
21
22 #endif
```

## 34.88 Fl\_Multi\_Browser.H

```
1 //
2 // Multi browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Multi_Browser widget . */
19
20 #ifndef Fl_Multi_Browser_H
```

```

21 #define Fl_Multi_Browser_H
22
23 #include "Fl_Browser.H"
24
41 class FL_EXPORT Fl_Multi_Browser : public Fl_Browser {
42 public:
49     Fl_Multi_Browser(int X,int Y,int W,int H,const char *L=0);
50 };
51
52 #endif

```

## 34.89 Fl\_Multi\_Label.H

```

1 //
2 // Multi-label header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Multi_Label_H
18 #define Fl_Multi_Label_H
19
20 class Fl_Widget;
21 struct Fl_Menu_Item;
22
76 struct FL_EXPORT Fl_Multi_Label {
80     const char* labela;
84     const char* labelb;
89     uchar typea;
94     uchar typeb;
95
96     // This method is used to associate a Fl_Multi_Label with a Fl_Widget.
97     void label(Fl_Widget*);
98
99     // This method is used to associate a Fl_Multi_Label with a Fl_Menu_Item.
100    void label(Fl_Menu_Item*);
101 };
102
103 #endif

```

## 34.90 Fl\_Multiline\_Input.H

```

1 //
2 // Multiline input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Multiline_Input widget . */
19
20 #ifndef Fl_Multiline_Input_H
21 #define Fl_Multiline_Input_H
22
23 #include "Fl_Input.H"
24
43 class FL_EXPORT Fl_Multiline_Input : public Fl_Input {
44 public:
51     Fl_Multiline_Input(int X,int Y,int W,int H,const char *l = 0);
52 };
53
54 #endif

```

## 34.91 Fl\_Multiline\_Output.H

```

1 //
2 // Multi line output header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Multiline_Output widget . */
19
20 #ifndef Fl_Multiline_Output_H
21 #define Fl_Multiline_Output_H
22
23 #include "Fl_Output.H"
24
25 class FL_EXPORT Fl_Multiline_Output : public Fl_Output {
26 public:
27     Fl_Multiline_Output(int X,int Y,int W,int H,const char *l = 0);
28 };
29 #endif

```

## 34.92 Fl\_Native\_File\_Chooser.H File Reference

[Fl\\_Native\\_File\\_Chooser](#) widget.

#include <FL/Fl\_Export.H>

#include <FL/Fl\_File\_Chooser.H>

### Classes

- class [Fl\\_Native\\_File\\_Chooser](#)

*This class lets an FLTK application easily and consistently access the operating system's native file chooser.*

### 34.92.1 Detailed Description

[Fl\\_Native\\_File\\_Chooser](#) widget.

## 34.93 Fl\_Native\_File\_Chooser.H

[Go to the documentation of this file.](#)

```

1 //
2 // FLTK native OS file chooser widget
3 //
4 // Copyright 2004 Greg Ercolano.
5 // Copyright 2005-2024 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //      https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //      https://www.fltk.org/bugs.php
16 //
17
21 /* Implementation note:
22
23 class Fl_Native_File_Chooser <== public API used by applications
24

```

```

25 class Fl_Native_File_Chooser_Driver    <== virtual API that a platform may implement
26 this API has a do-nothing default implementation
27
28 class Fl_Native_File_Chooser_Fltk_Driver    <== this API implementation is the default FLTK file chooser
29 class Fl_GTK_Native_File_Chooser_Driver    <== this API implementation runs a GTK file chooser
30 class Fl_Kdialog_Native_File_Chooser_Driver    <== this API implementation runs a KDE file chooser
31 it is determined at run-time if the GTK dynamic libraries are available
32 and the KDE file chooser runs under the KDE desktop
33
34 class Fl_Quartz_Native_File_Chooser_Driver    <== this API implementation runs a Mac OS X file chooser
35
36 class Fl_WinAPI_Native_File_Chooser_Driver    <== this API implementation runs a Windows file chooser
37
38
39 Each platform must implement the constructor of the Fl_Native_File_Chooser class.
40 This particular implementation:
41
42 Fl_Native_File_Chooser::Fl_Native_File_Chooser(int val) {
43     platform_fnfc = new Fl_Native_File_Chooser_Fltk_Driver(val);
44 }
45
46 can be used by any platform.
47 No more code is required. The cross-platform Fl_Native_File_Chooser_Fltk.cxx file must be compiled in
    libfltk,
48 and the default FLTK file chooser will be used.
49
50 This other implementation:
51 Fl_Native_File_Chooser::Fl_Native_File_Chooser(int val) {
52     platform_fnfc = 0;
53 }
54 can be used by a platform that needs no file chooser.
55 */
56
57 #ifndef FL_NATIVE_FILE_CHOOSER_H
58 #define FL_NATIVE_FILE_CHOOSER_H
59
60 #include <FL/Fl_Export.H>
61 #include <FL/Fl_File_Chooser.H>
62
63 class Fl_Native_File_Chooser_Driver;
64
65 class FL_EXPORT Fl_Native_File_Chooser {
66 private:
67     Fl_Native_File_Chooser_Driver *platform_fnfc;
68 public:
69     enum Type {
70         BROWSE_FILE = 0,
71         BROWSE_DIRECTORY,
72         BROWSE_MULTI_FILE,
73         BROWSE_MULTI_DIRECTORY,
74         BROWSE_SAVE_FILE,
75         BROWSE_SAVE_DIRECTORY
76     };
77     enum Option {
78         NO_OPTIONS = 0x0000,
79         SAVEAS_CONFIRM = 0x0001,
80         NEW_FOLDER = 0x0002,
81         PREVIEW = 0x0004,
82         USE_FILTER_EXT = 0x0008
83     };
84     static const char *file_exists_message;
85
86     Fl_Native_File_Chooser(int val = BROWSE_FILE); // each platform implements it
87     ~Fl_Native_File_Chooser();
88     void type(int t);
89     int type() const;
90     void options(int o);
91     int options() const;
92     int count() const;
93     const char *filename() const;
94     const char *filename(int i) const;
95     void directory(const char *val);
96     const char *directory() const;
97     void title(const char *t);
98     const char* title() const;
99     const char *filter() const;
100    void filter(const char *f);
101    int filters() const;
102    void filter_value(int i);
103    int filter_value() const;
104    void preset_file(const char*f);
105    const char* preset_file() const;
106    const char *errmsg() const;
107    int show();
108 };
109
110 class Fl_Native_File_Chooser_Driver {

```

```

193 protected:
194     static void chrcat(char *s, char c);
195     static char *strapp(char *s, const char *val);
196     static char *strfree(char *val);
197     static char *strnew(const char *val);
198 public:
199     Fl_Native_File_Chooser_Driver(int) {}
200     virtual ~Fl_Native_File_Chooser_Driver() {}
201     virtual void type(int) {}
202     virtual int type()const {return 0;}
203     virtual void options(int) {}
204     virtual int options()const {return 0;}
205     virtual int count()const {return 0;}
206     virtual const char *filename()const {return 0;}
207     virtual const char *filename(int)const {return 0;}
208     virtual void directory(const char *) {}
209     virtual const char *directory()const {return 0;}
210     virtual void title(const char *) {}
211     virtual const char* title()const {return 0;}
212     virtual const char *filter()const {return 0;}
213     virtual void filter(const char *) {}
214     virtual int filters()const {return 0;}
215     virtual void filter_value(int) {}
216     virtual int filter_value()const {return 0;}
217     virtual void preset_file(const char*) {}
218     virtual const char* preset_file()const {return 0;}
219     virtual const char *errmsg()const {return 0;}
220     virtual int show() {return 1;}
221 };
222
223
224 class Fl_Native_File_Chooser_FLTK_Driver : public Fl_Native_File_Chooser_Driver {
225 private:
226     void errmsg(const char *msg);
227     int type_fl_file(int val);
228     int exist_dialog();
229     void parse_filter();
230 protected:
231     int _btype; // kind-of browser to show()
232     int _options; // general options
233     int _nfilters;
234     char *_filter; // user supplied filter
235     char *_parsedfilt; // parsed filter
236     int _filtvalue; // selected filter
237     char *_preset_file;
238     char *_prevvalue; // Returned filename
239     char *_directory;
240     char *_errmsg; // error message
241     Fl_File_Chooser *_file_chooser;
242 public:
243     Fl_Native_File_Chooser_FLTK_Driver(int val);
244     virtual ~Fl_Native_File_Chooser_FLTK_Driver();
245     void type(int t) FL_OVERRIDE;
246     int type() const FL_OVERRIDE;
247     void options(int o) FL_OVERRIDE;
248     int options() const FL_OVERRIDE;
249     int count() const FL_OVERRIDE;
250     const char *filename() const FL_OVERRIDE;
251     const char *filename(int i) const FL_OVERRIDE;
252     void directory(const char *val) FL_OVERRIDE;
253     const char *directory() const FL_OVERRIDE;
254     void title(const char *t) FL_OVERRIDE;
255     const char* title() const FL_OVERRIDE;
256     const char *filter() const FL_OVERRIDE;
257     void filter(const char *f) FL_OVERRIDE;
258     int filters() const FL_OVERRIDE;
259     void filter_value(int i) FL_OVERRIDE;
260     int filter_value() const FL_OVERRIDE;
261     void preset_file(const char*f) FL_OVERRIDE;
262     const char* preset_file() const FL_OVERRIDE;
263     const char *errmsg() const FL_OVERRIDE;
264     int show() FL_OVERRIDE;
265 };
266
267
268 #endif /*FL_NATIVE_FILE_CHOOSER_H*/

```

## 34.94 FI\_Nice\_Slider.H

```

1 //
2 // "Nice" slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:

```

```

9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Nice_Slider widget . */
19
20 #ifndef Fl_Nice_Slider_H
21 #define Fl_Nice_Slider_H
22
23 #include "Fl_Slider.H"
24
25 class FL_EXPORT Fl_Nice_Slider : public Fl_Slider {
26 public:
27     Fl_Nice_Slider(int X,int Y,int W,int H,const char *L=0);
28 };
29
30 #endif

```

## 34.95 Fl\_Object.H

```

1 //
2 // Old Fl_Object header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 // This file is provided for back compatibility only. Please use Fl_Widget
18 #ifndef Fl_Object
19 #define Fl_Object Fl_Widget
20 #endif
21 #include "Fl_Widget.H"

```

## 34.96 Fl\_Output.H

```

1 //
2 // Output header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Output widget . */
19
20 #ifndef Fl_Output_H
21 #define Fl_Output_H
22
23 #include "Fl_Input.H"
24
25 class FL_EXPORT Fl_Output : public Fl_Input {
26 public:
27     Fl_Output(int X,int Y,int W,int H, const char *l = 0);
28 };
29
30 #endif

```

## 34.97 Fl\_Overlay\_Window.H

```

1 //
2 // Overlay window header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Overlay_Window class . */
19
20 #ifndef Fl_Overlay_Window_H
21 #define Fl_Overlay_Window_H
22
23 #include "Fl_Double_Window.H"
24
25 class FL_EXPORT Fl_Overlay_Window : public Fl_Double_Window {
26 #ifndef FL_DOXYGEN
27     friend class _Fl_Overlay;
28     friend class Fl_Window_Driver;
29 #endif
30 public:
31     virtual void draw_overlay() = 0;
32 private:
33     Fl_Window *overlay_;
34 public:
35     void show() FL_OVERRIDE;
36     void hide() FL_OVERRIDE;
37     void flush() FL_OVERRIDE;
38     void resize(int, int, int, int) FL_OVERRIDE;
39     ~Fl_Overlay_Window();
40     int can_do_overlay();
41     void redraw_overlay();
42 protected:
43     Fl_Overlay_Window(int W, int H, const char *l=0);
44     Fl_Overlay_Window(int X, int Y, int W, int H, const char *l=0);
45 public:
46     void show(int a, char **b) {Fl_Double_Window::show(a,b);}
47     Fl_Overlay_Window *as_overlay_window() FL_OVERRIDE {return this; }
48 };
49
50 #endif

```

## 34.98 Fl\_Pack.H

```

1 //
2 // Pack header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2020 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Pack widget . */
19
20 #ifndef Fl_Pack_H
21 #define Fl_Pack_H
22
23 #include <FL/Fl_Group.H>
24
25 class FL_EXPORT Fl_Pack : public Fl_Group {
26     int spacing_;
27 public:
28     enum { // values for type(int)

```

```

59     VERTICAL = 0,
60     HORIZONTAL = 1
61 };
62
63 protected:
64     void draw() FL_OVERRIDE;
65
66 public:
67     Fl_Pack(int X, int Y, int W, int H, const char *L = 0);
68
69     int spacing()const {return spacing_;}
70
71     void spacing(int i) {spacing_ = i;}
72
73     uchar horizontal()const {return type();}
74
75     void resize(int X, int Y, int W, int H) FL_OVERRIDE;
76     void clear() { Fl_Group::clear(); resizable(NULL); }
77 };
78
79 #endif

```

## 34.99 Fl\_Paged\_Device.H File Reference

declaration of class [Fl\\_Paged\\_Device](#).

```
#include <FL/Fl_Widget_Surface.H>
```

### Classes

- class [Fl\\_Paged\\_Device](#)  
*Represents page-structured drawing surfaces.*
- struct [Fl\\_Paged\\_Device::page\\_format](#)  
*width, height and name of a page format*

### Macros

- #define [NO\\_PAGE\\_FORMATS](#) 30 /\* MSVC6 compilation fix \*/  
*Number of elements in enum Page\_Format.*

### 34.99.1 Detailed Description

declaration of class [Fl\\_Paged\\_Device](#).

## 34.100 Fl\_Paged\_Device.H

[Go to the documentation of this file.](#)

```

1 //
2 // Printing support for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2010-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
21 #ifndef Fl_Paged_Device_H
22 #define Fl_Paged_Device_H
23
24 #include <FL/Fl_Widget_Surface.H>
25
26
27 #define NO_PAGE_FORMATS 30 /* MSVC6 compilation fix */
28
29

```

```

36 class FL_EXPORT Fl_Paged_Device : public Fl_Widget_Surface {
37 protected:
39   Fl_Paged_Device() : Fl_Widget_Surface(NULL) {}
40 public:
41   enum Page_Format {
42     A0 = 0,
43     A1,
44     A2,
45     A3,
46     A4,
47     A5,
48     A6,
49     A7,
50     A8,
51     A9,
52     B0,
53     B1,
54     B2,
55     B3,
56     B4,
57     B5,
58     B6,
59     B7,
60     B8,
61     B9,
62     B10,
63     C5E,
64     DLE,
65     EXECUTIVE,
66     FOLIO,
67     LEDGER,
68     LEGAL,
69     LETTER,
70     TABLOID,
71     ENVELOPE,
72     MEDIA = 0x1000
73   };
74   enum Page_Layout {
75     PORTRAIT = 0,
76     LANDSCAPE = 0x100,
77     REVERSED = 0x200,
78     ORIENTATION = 0x300
79   };
80   typedef struct {
81     int width;
82     int height;
83     const char *name;
84   } page_format;
85   static const page_format page_formats[NO_PAGE_FORMATS];
86   virtual ~Fl_Paged_Device() {}
87   virtual int begin_job(int pagecount = 0, int *frompage = NULL, int *topage = NULL, char **perr_message
= NULL);
88   int start_job(int pagecount = 0, int *frompage = NULL, int *topage = NULL, char **perr_message = NULL)
{
89     return begin_job(pagecount, frompage, topage, perr_message);
90   }
91   virtual int begin_page(void);
92   int start_page() {return begin_page();}
93   virtual void margins(int *left, int *top, int *right, int *bottom);
94   virtual void scale(float scale_x, float scale_y = 0.);
95   virtual void rotate(float angle);
96   void print_widget(Fl_Widget* widget, int delta_x = 0, int delta_y = 0) {draw(widget, delta_x,
delta_y);}
97   void print_window(Fl_Window *win, int x_off = 0, int y_off = 0) {
98     draw_decorated_window(win, x_off, y_off);
99   }
100   virtual int end_page (void);
101   virtual void end_job (void);
102 };
103 #endif // Fl_Paged_Device_H

```

## 34.101 Fl\_PDF\_File\_Surface.H

```

1 //
2 // Declaration of class Fl_PDF_File_Surface for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php

```

```

11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef PDF_FILE_SURFACE_H
18 #define PDF_FILE_SURFACE_H
19
20 #include <FL/Fl_Paged_Device.H>
21
22 class FL_EXPORT Fl_PDF_File_Surface : public Fl_Paged_Device {
23 private:
24     const char **out_filename_;
25     Fl_Paged_Device *platform_surface_;
26     static Fl_Paged_Device *new_platform_pdf_surface_(const char **);
27 public:
28     static const char * format_dialog_title;
29     static const char * format_dialog_page_size;
30     static const char * format_dialog_orientation;
31     static const char * format_dialog_default;
32     Fl_PDF_File_Surface();
33     ~Fl_PDF_File_Surface();
34     int begin_job(const char* defaultfilename, char **perr = NULL);
35     int begin_job(int, int *, int *, char **) FL_OVERRIDE {return 1;}
36     int begin_document(const char* pathname,
37                       enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
38                       enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT,
39                       char **perr = NULL);
40     int printable_rect(int *w, int *h) FL_OVERRIDE { return platform_surface_>printable_rect(w,h); }
41     void margins(int *left, int *top, int *right, int *bottom) FL_OVERRIDE {
42         platform_surface_>margins(left,top,right,bottom);
43     }
44     void origin(int x, int y) FL_OVERRIDE {platform_surface_>origin(x, y);}
45     void origin(int *x, int *y) FL_OVERRIDE {platform_surface_>origin(x, y);}
46     void scale(float s_x, float s_y = 0) FL_OVERRIDE {platform_surface_>scale(s_x, s_y);}
47     void rotate(float angle) FL_OVERRIDE {platform_surface_>rotate(angle);}
48     void translate(int x, int y) FL_OVERRIDE {platform_surface_>translate(x, y);}
49     void untranslate() FL_OVERRIDE {platform_surface_>untranslate();};
50     int begin_page(void) FL_OVERRIDE {return platform_surface_>begin_page();};
51     int end_page(void) FL_OVERRIDE {return platform_surface_>end_page();};
52     void end_job(void) FL_OVERRIDE {return platform_surface_>end_job();};
53     inline const char *pdf_filename() { return *out_filename_; }
54     void set_current() FL_OVERRIDE { if (platform_surface_) platform_surface_>set_current(); }
55     bool is_current() FL_OVERRIDE { return surface() == platform_surface_; }
56 };
57
58 #endif // PDF_FILE_SURFACE_H

```

## 34.102 Fl\_Pixmap.H

```

1 //
2 // Pixmap header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2017 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Pixmap widget . */
19
20 #ifndef Fl_Pixmap_H
21 #define Fl_Pixmap_H
22 # include "Fl_Image.H"
23
24 class Fl_Widget;
25 struct Fl_Menu_Item;
26
27 // Older C++ compilers don't support the explicit keyword... :(
28 # if defined(__sgi) && !defined(_COMPILER_VERSION)
29 #     define explicit
30 # endif // __sgi && !_COMPILER_VERSION
31
32 class FL_EXPORT Fl_Pixmap : public Fl_Image {
33     friend class Fl_Graphics_Driver;
34     void copy_data();

```

```

39 void delete_data();
40 void set_data(const char * const *p);
41
42 protected:
43 void measure();
44
45 public:
46
47 int alloc_data; // Non-zero if data was allocated
48
49 private:
50 // for internal use
51 fl_uintptr_t id_;
52 fl_uintptr_t mask_;
53 int cache_w_, cache_h_; // size of pixmap when cached
54
55 public:
56
57 explicit Fl_Pixmap(char * const * D) : Fl_Image(-1,0,1), alloc_data(0), id_(0), mask_(0)
58 {set_data((const char*const*)D); measure();}
59 explicit Fl_Pixmap(uchar* const * D) : Fl_Image(-1,0,1), alloc_data(0), id_(0), mask_(0)
60 {set_data((const char*const*)D); measure();}
61 explicit Fl_Pixmap(const char * const * D) : Fl_Image(-1,0,1), alloc_data(0), id_(0), mask_(0)
62 {set_data((const char*const*)D); measure();}
63 explicit Fl_Pixmap(const uchar* const * D) : Fl_Image(-1,0,1), alloc_data(0), id_(0), mask_(0)
64 {set_data((const char*const*)D); measure();}
65 virtual ~Fl_Pixmap();
66 Fl_Image *copy(int W, int H) const FL_OVERRIDE;
67 Fl_Image *copy() const { return Fl_Image::copy(); }
68 void color_average(Fl_Color c, float i) FL_OVERRIDE;
69 void desaturate() FL_OVERRIDE;
70 void draw(int X, int Y, int W, int H, int cx=0, int cy=0) FL_OVERRIDE;
71 void draw(int X, int Y) {draw(X, Y, w(), h(), 0, 0);}
72 void label(Fl_Widget*w) FL_OVERRIDE;
73 void label(Fl_Menu_Item*m) FL_OVERRIDE;
74 void uncache() FL_OVERRIDE;
75 int cache_w() {return cache_w_;}
76 int cache_h() {return cache_h_;}
77 };
78
79 #endif

```

## 34.103 Fl\_Plugin.H

```

1 //
2 // A Plugin system for FLTK, implemented in Fl_Preferences.cxx.
3 //
4 // Copyright 2002-2023 by Matthias Melcher.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Plugin class . */
19
20 #ifndef Fl_Plugin_H
21 # define Fl_Plugin_H
22
23 # include "Fl_Preferences.H"
24
25
26 class FL_EXPORT Fl_Plugin {
27     Fl_Preferences::ID id;
28 public:
29     Fl_Plugin(const char *klass, const char *name);
30     virtual ~Fl_Plugin();
31 };
32
33 class FL_EXPORT Fl_Plugin_Manager : public Fl_Preferences {
34 public:
35     Fl_Plugin_Manager(const char *klass);
36     ~Fl_Plugin_Manager();
37
38     int plugins() { return groups(); }
39     Fl_Plugin *plugin(int index);
40     Fl_Plugin *plugin(const char *name);

```

```

81  Fl_Preferences::ID addPlugin(const char *name, Fl_Plugin *plugin);
82
83  static void removePlugin(Fl_Preferences::ID id);
84  static int load(const char *filename);
85  static int loadAll(const char *dirpath, const char *pattern=0);
86 };
87
88
89 #endif // !Fl_Preferences_H

```

## 34.104 Fl\_PNG\_Image.H

```

1  //
2  // PNG image header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2023 by Bill Spitzak and others.
5  //
6  // This library is free software. Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file. If this
8  // file is missing or damaged, see the license at:
9  //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_PNG_Image class . */
19
20 #ifndef Fl_PNG_Image_H
21 #define Fl_PNG_Image_H
22 # include "Fl_Image.H"
23
24 class FL_EXPORT Fl_PNG_Image : public Fl_RGB_Image {
25 friend class Fl_ICO_Image;
26 public:
27
28 Fl_PNG_Image(const char* filename);
29 Fl_PNG_Image (const char *name_png, const unsigned char *buffer, int datasize);
30 private:
31 Fl_PNG_Image(const char *filename, int offset); // used by Fl_ICO_Image
32 void load_png(const char *name_png, int offset, const unsigned char *buffer_png, int datasize);
33 };
34
35 // Support functions to write PNG image files (since 1.4.0)
36
37 FL_EXPORT int fl_write_png(const char *filename, Fl_RGB_Image *img);
38 FL_EXPORT int fl_write_png(const char *filename, const char *pixels, int w, int h, int d=3, int ld=0);
39 FL_EXPORT int fl_write_png(const char *filename, const unsigned char *pixels, int w, int h, int d=3, int
40 ld=0);
41
42 #endif

```

## 34.105 Fl\_PNM\_Image.H

```

1  //
2  // PNM image header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2010 by Bill Spitzak and others.
5  //
6  // This library is free software. Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file. If this
8  // file is missing or damaged, see the license at:
9  //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_PNM_Image class . */
19
20 #ifndef Fl_PNM_Image_H
21 #define Fl_PNM_Image_H
22 # include "Fl_Image.H"
23
24 class FL_EXPORT Fl_PNM_Image : public Fl_RGB_Image {
25
26

```

```

32 public:
33
34 Fl_PNM_Image(const char* filename);
35 };
36
37 #endif

```

## 34.106 Fl\_Positioner.H

```

1 //
2 // Positioner header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Positioner widget . */
19
20 #ifndef Fl_Positioner_H
21 #define Fl_Positioner_H
22
23 #ifndef Fl_Widget_H
24 #include "Fl_Widget.H"
25 #endif
26
27 class FL_EXPORT Fl_Positioner : public Fl_Widget {
28
29     double xmin, ymin;
30     double xmax, ymax;
31     double xvalue_, yvalue_;
32     double xstep_, ystep_;
33
34 protected:
35
36     // these allow subclasses to put the dial in a smaller area:
37     void draw(int, int, int, int);
38     int handle(int, int, int, int, int, int);
39     void draw() FL_OVERRIDE;
40
41 public:
42
43     int handle(int) FL_OVERRIDE;
44     Fl_Positioner(int x,int y,int w,int h, const char *l=0);
45     double xvalue()const {return xvalue_;}
46     double yvalue()const {return yvalue_;}
47     int xvalue(double);
48     int yvalue(double);
49     int value(double,double);
50     void xbounds(double, double);
51     double xminimum()const {return xmin;}
52     void xminimum(double a) {xbounds(a,xmax);}
53     double xmaximum()const {return xmax;}
54     void xmaximum(double a) {xbounds(xmin,a);}
55     void ybounds(double, double);
56     double yminimum()const {return ymin;}
57     void yminimum(double a) {ybounds(a,ymax);}
58     double ymaximum()const {return ymax;}
59     void ymaximum(double a) {ybounds(ymin, a);}
60     void xstep(double a) {xstep_ = a;}
61     void ystep(double a) {ystep_ = a;}
62 };
63
64 #endif

```

## 34.107 Fl\_PostScript.H File Reference

declaration of classes [Fl\\_PostScript\\_File\\_Device](#) and [Fl\\_EPS\\_File\\_Surface](#).

```

#include <FL/Fl_Paged_Device.H>
#include <FL/fl_draw.H>
#include <stdarg.h>

```

## Classes

- class [Fl\\_EPS\\_File\\_Surface](#)  
*Encapsulated PostScript drawing surface.*
- class [Fl\\_PostScript\\_File\\_Device](#)  
*To send graphical output to a PostScript file.*

## Typedefs

- typedef int(\* [Fl\\_PostScript\\_Close\\_Command](#)) (FILE \*)  
*Signature of functions FLTK may use to close FILE variables after PostScript/EPS output.*

### 34.107.1 Detailed Description

declaration of classes [Fl\\_PostScript\\_File\\_Device](#) and [Fl\\_EPS\\_File\\_Surface](#).

### 34.107.2 Typedef Documentation

#### 34.107.2.1 Fl\_PostScript\_Close\_Command

```
typedef int (* Fl_PostScript_Close_Command) (FILE *)
```

Signature of functions FLTK may use to close FILE variables after PostScript/EPS output.

A non-null return value indicates output error.

See also

[Fl\\_PostScript\\_File\\_Device::close\\_command\(\)](#) and [Fl\\_EPS\\_File\\_Surface::Fl\\_EPS\\_File\\_Surface\(\)](#).

## 34.108 Fl\_PostScript.H

[Go to the documentation of this file.](#)

```
1 //
2 // Support for graphics output to PostScript file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2010-2020 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
21 #ifndef Fl_PostScript_H
22 #define Fl_PostScript_H
23
24 #include <FL/Fl_Paged_Device.H>
25 #include <FL/fl_draw.H>
26 #include <stdarg.h>
27
32 extern "C" {
33     typedef int (*Fl_PostScript_Close_Command) (FILE *);
34 }
35
36 class Fl_PostScript_Graphics_Driver;
37
38 class FL_EXPORT Fl_PostScript_File_Device : public Fl_Paged_Device {
39 private:
40     // memorize the display's current font to restore it when the object ceases being current
41     Fl_Font display_font_;
42     Fl_Fonsize display_size_;
```

```

83 protected:
87     inline Fl_PostScript_Graphics_Driver *driver() { return
      (Fl_PostScript_Graphics_Driver*)Fl_Surface_Device::driver(); }
88 public:
89     Fl_PostScript_File_Device();
90     ~Fl_PostScript_File_Device();
91     int begin_job(int pagecount, int* from, int* to, char **perr_message) FL_OVERRIDE;
92     int begin_job(int pagecount = 0, enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
93                   enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT);
94     int start_job(int pagecount = 0, enum Fl_Paged_Device::Page_Format format = Fl_Paged_Device::A4,
95                   enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT) {
96         return begin_job(pagecount, format, layout);
97     }
98     int begin_job(FILE *ps_output, int pagecount = 0, enum Fl_Paged_Device::Page_Format format =
99       Fl_Paged_Device::A4,
100                   enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT);
101     int start_job(FILE *ps_output, int pagecount = 0, enum Fl_Paged_Device::Page_Format format =
102       Fl_Paged_Device::A4,
103                   enum Fl_Paged_Device::Page_Layout layout = Fl_Paged_Device::PORTRAIT) {
104         return begin_job(ps_output, pagecount, format, layout);
105     }
106
107     int begin_page (void) FL_OVERRIDE;
108     int printable_rect(int *w, int *h) FL_OVERRIDE;
109     void margins(int *left, int *top, int *right, int *bottom) FL_OVERRIDE;
110     void origin(int *x, int *y) FL_OVERRIDE;
111     void origin(int x, int y) FL_OVERRIDE;
112     void scale (float scale_x, float scale_y = 0.) FL_OVERRIDE;
113     void rotate(float angle) FL_OVERRIDE;
114     void translate(int x, int y) FL_OVERRIDE;
115     void untranslate(void) FL_OVERRIDE;
116     int end_page (void) FL_OVERRIDE;
117     void end_job(void) FL_OVERRIDE;
118     static const char *file_chooser_title;
119     FILE *file();
120     void close_command(Fl_PostScript_Close_Command cmd);
121     void set_current() FL_OVERRIDE;
122     void end_current() FL_OVERRIDE;
123 };
124
125 class FL_EXPORT Fl_EPS_File_Surface : public Fl_Widget_Surface {
126 protected:
127     inline Fl_PostScript_Graphics_Driver *driver() { return
128       (Fl_PostScript_Graphics_Driver*)Fl_Surface_Device::driver(); }
129 public:
130     Fl_EPS_File_Surface(int width, int height, FILE *eps_output,
131                         Fl_Color background = FL_WHITE, Fl_PostScript_Close_Command closef = NULL);
132     ~Fl_EPS_File_Surface();
133     int printable_rect(int *w, int *h) FL_OVERRIDE;
134     FILE *file();
135     void origin(int x, int y) FL_OVERRIDE;
136     void origin(int *px, int *py) FL_OVERRIDE;
137     void translate(int x, int y) FL_OVERRIDE;
138     void untranslate() FL_OVERRIDE;
139     int close();
140 };
141
142 #endif // Fl_PostScript_H

```

## 34.109 Fl\_Preferences.H

```

1 //
2 // Preferences implementation for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2002-2023 by Matthias Melcher.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Preferences class . */
19
20 #ifndef Fl_Preferences_H
21 # define Fl_Preferences_H
22
23 # include <stdio.h>
24 # include "Fl_Export.H"

```

```

25 # include "fl_attr.h"
26
27 #include <string>
28
122 class FL_EXPORT Fl_Preferences {
123
124 public:
125     enum Root {
126         UNKNOWN_ROOT_TYPE = -1,
127         SYSTEM             = 0,
128         USER,
129         MEMORY,
130         ROOT_MASK          = 0x00FF,
131         CORE                = 0x0100,
132         C_LOCALE            = 0x1000,
133         CLEAR               = 0x2000,
134         SYSTEM_L            = SYSTEM | C_LOCALE,
135         USER_L              = USER | C_LOCALE,
136         CORE_SYSTEM_L       = CORE | SYSTEM_L,
137         CORE_USER_L         = CORE | USER_L,
138         CORE_SYSTEM         = CORE | SYSTEM,
139         CORE_USER           = CORE | USER
140     };
141
142     typedef void *ID;
143
144     static const char *new_UUID();
145
146     static const unsigned int NONE = 0x0000;
147     static const unsigned int USER_READ_OK = 0x0001;
148     static const unsigned int USER_WRITE_OK = 0x0002;
149     static const unsigned int USER_OK = USER_READ_OK | USER_WRITE_OK;
150     static const unsigned int SYSTEM_READ_OK = 0x0004;
151     static const unsigned int SYSTEM_WRITE_OK = 0x0008;
152     static const unsigned int SYSTEM_OK = SYSTEM_READ_OK | SYSTEM_WRITE_OK;
153     static const unsigned int APP_OK = SYSTEM_OK | USER_OK;
154     static const unsigned int CORE_READ_OK = 0x0010;
155     static const unsigned int CORE_WRITE_OK = 0x0020;
156     static const unsigned int CORE_OK = CORE_READ_OK | CORE_WRITE_OK;
157     static const unsigned int ALL_READ_OK = USER_READ_OK | SYSTEM_READ_OK | CORE_READ_OK;
158     static const unsigned int ALL_WRITE_OK = USER_WRITE_OK | SYSTEM_WRITE_OK | CORE_WRITE_OK;
159     static const unsigned int ALL = ALL_READ_OK | ALL_WRITE_OK;
160
161     static void file_access(unsigned int flags);
162     static unsigned int file_access();
163     static Root filename( char *buffer, size_t buffer_size, Root root, const char *vendor, const char
164         *application );
165
166     Fl_Preferences( Root root, const char *vendor, const char *application );
167     Fl_Preferences( const char *path, const char *vendor, const char *application, Root flags );
168     Fl_Preferences( Fl_Preferences &parent, const char *group );
169     Fl_Preferences( Fl_Preferences *parent, const char *group );
170     Fl_Preferences( Fl_Preferences &parent, int groupIndex );
171     Fl_Preferences( Fl_Preferences *parent, int groupIndex );
172     Fl_Preferences(const Fl_Preferences&);
173     Fl_Preferences( ID id );
174     virtual ~Fl_Preferences();
175
176     FL_DEPRECATED("since 1.4.0 - use Fl_Preferences(path, vendor, application, flags) instead",
177         Fl_Preferences( const char *path, const char *vendor, const char *application ) );
178
179     Root filename( char *buffer, size_t buffer_size);
180
181     ID id() { return (ID)node; }
182
183     static char remove(ID id_) { return ((Node*)id_)->remove(); }
184
185     const char *name() { return node->name(); }
186
187     const char *path() { return node->path(); }
188
189     int groups();
190     const char *group( int num_group );
191     char group_exists( const char *key );
192     char delete_group( const char *group );
193     char delete_all_groups();
194
195     int entries();
196     const char *entry( int index );
197     char entry_exists( const char *key );
198     char delete_entry( const char *entry );
199     char delete_all_entries();
200
201     char clear();
202
203     char set( const char *entry, int value );
204     char set( const char *entry, float value );

```

```

240 char set( const char *entry, float value, int precision );
241 char set( const char *entry, double value );
242 char set( const char *entry, double value, int precision );
243 char set( const char *entry, const char *value );
244 char set( const char *entry, const void *value, int size );
245 char set( const char *entry, const std::string &value );
246
247 char get( const char *entry, int &value, int defaultValue );
248 char get( const char *entry, float &value, float defaultValue );
249 char get( const char *entry, double &value, double defaultValue );
250 char get( const char *entry, char *&value, const char *defaultValue );
251 char get( const char *entry, char *value, const char *defaultValue, int maxSize );
252 char get( const char *entry, void *&value, const void *defaultValue, int defaultSize );
253 char get( const char *entry, void *value, const void *defaultValue, int defaultSize, int maxSize );
254 char get( const char *entry, void *value, const void *defaultValue, int defaultSize, int *size );
255 char get( const char *entry, std::string &value, const std::string &defaultValue );
256
257 int size( const char *entry );
258
259 char get_userdata_path( char *path, int pathlen );
260
261 int flush();
262
263 int dirty();
264
266 static const char *newUUID() { return new_UUID(); }
267 char groupExists( const char *key ) { return group_exists(key); }
268 char deleteGroup( const char *group ) { return delete_group(group); }
269 char deleteAllGroups() { return delete_all_groups(); }
270 char entryExists( const char *key ) { return entry_exists(key); }
271 char deleteEntry( const char *entry ) { return delete_entry(entry); }
272 char deleteAllEntries() { return delete_all_entries(); }
273 char getUserdataPath( char *path, int pathlen ) { return get_userdata_path(path, pathlen); }
288 class FL_EXPORT Name {
289     char *data_;
290
291 public:
292     Name( unsigned int n );
293     Name( const char *format, ... );
294
295     operator const char *() { return data_; }
296     ~Name();
297 };
298
299 struct Entry {
300     char *name, *value;
301 };
302
303 private:
304     Fl_Preferences() : node(0), rootNode(0) { }
305     Fl_Preferences &operator=(const Fl_Preferences&);
306
307     static char nameBuffer[128];
308     static char uuidBuffer[40];
309     static Fl_Preferences *runtimePrefs;
310     static unsigned int fileAccess_;
311
312 public: // older Sun compilers need this (public definition of the following classes)
313     class RootNode;
314
315     class FL_EXPORT Node { // a node contains a list to all its entries
316                             // and all means to manage the tree structure
317     public:
318         Node *first_child_, *next_;
319         union { // these two are mutually exclusive
320             Node *parent_; // top_bit clear
321             RootNode *root_node_; // top_bit set
322         };
323         char *path_;
324         Entry *entry_;
325         int nEntry_, NEntry_;
326         unsigned char dirty_:1;
327         unsigned char top_:1;
328         unsigned char indexed_:1;
329         // indexing routines
330         Node **index_;
331         int nIndex_, NIndex_;
332         void createIndex();
333         void updateIndex();
334         void deleteIndex();
335     public:
336         static int lastEntrySet;
337     public:
338         Node( const char *path );
339         ~Node();
340         // node methods
341         int write( FILE *f );

```

```

347     const char *name();
348     const char *path() { return path_; }
349     Node *find( const char *path );
350     Node *search( const char *path, int offset=0 );
351     Node *childNodes( int ix );
352     Node *addChild( const char *path );
353     void setParent( Node *parent );
354     Node *parent() { return top_?0L:parent_; }
355     void setRoot( RootNode *r ) { root_node_ = r; top_ = 1; }
356     RootNode *findRoot();
357     char remove();
358     char dirty();
359     void clearDirtyFlags();
360     void deleteAllChildren();
361     // entry methods
362     int nChildren();
363     const char *child( int ix );
364     void set( const char *name, const char *value );
365     void set( const char *line );
366     void add( const char *line );
367     const char *get( const char *name );
368     int getEntry( const char *name );
369     char deleteEntry( const char *name );
370     void deleteAllEntries();
371     int nEntry() { return nEntry_; }
372     Entry &entry(int i) { return entry_[i]; }
373 };
374 friend class Node;
375
376 class FL_EXPORT RootNode {    // the root node manages file paths and basic reading and writing
377     Fl_Preferences *prefs_;
378     char *filename_;
379     char *vendor_, *application_;
380     Root root_type_;
381 public:
382     RootNode( Fl_Preferences *, Root root, const char *vendor, const char *application );
383     RootNode( Fl_Preferences *, const char *path, const char *vendor, const char *application, Root
flags );
384     RootNode( Fl_Preferences * );
385     ~RootNode();
386     int read();
387     int write();
388     char getPath( char *path, int pathlen );
389     char *filename() { return filename_; }
390     Root root() { return root_type_; }
391 };
392 friend class RootNode;
393
394 protected:
395     Node *node;
396     RootNode *rootNode;
397 };
398
399 #endif // !Fl_Preferences_H

```

## 34.110 FI\_Printer.H File Reference

declaration of class [Fl\\_Printer](#).

#include <FL/Fl\_Paged\_Device.H>

### Classes

- class [Fl\\_Printer](#)

*OS-independent print support.*

### 34.110.1 Detailed Description

declaration of class [Fl\\_Printer](#).

## 34.111 FI\_Printer.H

[Go to the documentation of this file.](#)

```

1 //
2 // Printing support for the Fast Light Tool Kit (FLTK).

```

```

3 //
4 // Copyright 2010-2016 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
21 #ifndef Fl_Printer_H
22 #define Fl_Printer_H
23
24 #include <FL/Fl_Paged_Device.H>
25
101 class FL_EXPORT Fl_Printer : public Fl_Paged_Device {
102 private:
103     Fl_Paged_Device *printer;
105     static Fl_Paged_Device* newPrinterDriver(void);
106 public:
107     Fl_Printer(void);
108     int begin_job(int pagecount = 0, int *frompage = NULL, int *topage = NULL, char **perr_message = NULL)
109         FL_OVERRIDE;
110     int begin_page(void) FL_OVERRIDE;
111     int printable_rect(int *w, int *h) FL_OVERRIDE;
112     void margins(int *left, int *top, int *right, int *bottom) FL_OVERRIDE;
113     void origin(int *x, int *y) FL_OVERRIDE;
114     void origin(int x, int y) FL_OVERRIDE;
115     void scale(float scale_x, float scale_y = 0.) FL_OVERRIDE;
116     void rotate(float angle) FL_OVERRIDE;
117     void translate(int x, int y) FL_OVERRIDE;
118     void untranslate(void) FL_OVERRIDE;
119     int end_page(void) FL_OVERRIDE;
120     void end_job(void) FL_OVERRIDE;
121     void set_current(void) FL_OVERRIDE;
122     bool is_current() FL_OVERRIDE;
123
127     static const char *dialog_title;
128     static const char *dialog_printer;
129     static const char *dialog_range;
130     static const char *dialog_copies;
131     static const char *dialog_all;
132     static const char *dialog_pages;
133     static const char *dialog_from;
134     static const char *dialog_to;
135     static const char *dialog_properties;
136     static const char *dialog_copyNo;
137     static const char *dialog_print_button;
138     static const char *dialog_cancel_button;
139     static const char *dialog_print_to_file;
140     static const char *property_title;
141     static const char *property_pagesize;
142     static const char *property_mode;
143     static const char *property_use;
144     static const char *property_save;
145     static const char *property_cancel;
148     ~Fl_Printer(void);
149 };
150
151 #endif // Fl_Printer_H

```

## 34.112 Fl\_Progress.H

```

1 //
2 // Progress bar widget definitions.
3 //
4 // Copyright 2000-2010 by Michael Sweet.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Progress widget . */

```

```

19
20 #ifndef _Fl_Progress_H_
21 #   define _Fl_Progress_H_
22
23 //
24 // Include necessary headers.
25 //
26
27 #include "Fl_Widget.H"
28
29
30 //
31 // Progress class...
32 //
33 class FL_EXPORT Fl_Progress : public Fl_Widget {
34
35     float value_,
36           minimum_,
37           maximum_;
38
39     protected:
40
41     void draw() FL_OVERRIDE;
42
43     public:
44
45     Fl_Progress(int x, int y, int w, int h, const char *l = 0);
46
47     void maximum(float v) { maximum_ = v; redraw(); }
48     float maximum()const { return (maximum_); }
49
50     void minimum(float v) { minimum_ = v; redraw(); }
51     float minimum()const { return (minimum_); }
52
53     void value(float v) { value_ = v; redraw(); }
54     float value()const { return (value_); }
55 };
56
57 #endif // !_Fl_Progress_H_

```

## 34.113 Fl\_Radio\_Button.H

```

1 //
2 // Radio button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2014 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Radio_Button widget . */
19
20 #ifndef Fl_Radio_Button_H
21 #define Fl_Radio_Button_H
22
23 #include "Fl_Button.H"
24
25 class FL_EXPORT Fl_Radio_Button : public Fl_Button {
26 public:
27     Fl_Radio_Button(int X,int Y,int W,int H,const char *L=0);
28 };
29
30 #endif

```

## 34.114 Fl\_Radio\_Light\_Button.H

```

1 //
2 // Radio light button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2014 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this

```

```

8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Radio_Light_Button widget . */
19
20 #ifndef Fl_Radio_Light_Button_H
21 #define Fl_Radio_Light_Button_H
22
23 #include "Fl_Light_Button.H"
24
25 class FL_EXPORT Fl_Radio_Light_Button : public Fl_Light_Button {
26 public:
27     Fl_Radio_Light_Button(int X,int Y,int W,int H,const char *l=0);
28 };
29
30 #endif

```

### 34.115 Fl\_Radio\_Round\_Button.H

```

1 //
2 // Radio round button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2014 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Radio_Round_Button widget . */
19
20 #ifndef Fl_Radio_Round_Button_H
21 #define Fl_Radio_Round_Button_H
22
23 #include "Fl_Round_Button.H"
24
25 class FL_EXPORT Fl_Radio_Round_Button : public Fl_Round_Button {
26 public:
27     Fl_Radio_Round_Button(int X,int Y,int W,int H,const char *L=0);
28 };
29
30 #endif

```

### 34.116 Fl\_Rect.H

```

1 //
2 // Fl_Rect header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Rect_H
18 #define Fl_Rect_H
19
20 #include <FL/Fl_Widget.H>          // for c'tor based on Fl_Widget
21
22 class FL_EXPORT Fl_Rect {
23
24
25
26
27
28
29
30
31

```

```

32  int x_;
33  int y_;
34  int w_;
35  int h_;
36
37 public:
38
39  Fl_Rect()
40      : x_(0), y_(0), w_(0), h_(0) {}
41
42  Fl_Rect(int W, int H)
43      : x_(0), y_(0), w_(W), h_(H) {}
44
45  Fl_Rect(int X, int Y, int W, int H)
46      : x_(X), y_(Y), w_(W), h_(H) {}
47
48  Fl_Rect(int X, int Y, int W, int H, Fl_Boxtype bt)
49      : x_(X), y_(Y), w_(W), h_(H) {
50      inset(bt);
51      }
52
53  Fl_Rect (const Fl_Widget& widget)
54      : x_(widget.x()), y_(widget.y()), w_(widget.w()), h_(widget.h()) {}
55
56  Fl_Rect (const Fl_Widget* const widget)
57      : x_(widget->x()), y_(widget->y()), w_(widget->w()), h_(widget->h()) {}
58
59  int x()const { return x_; }
60  int y()const { return y_; }
61  int w()const { return w_; }
62  int h()const { return h_; }
63
64  int r()const { return x_ + w_; }
65  int b()const { return y_ + h_; }
66
67  void x(int X) { x_ = X; }
68  void y(int Y) { y_ = Y; }
69  void w(int W) { w_ = W; }
70  void h(int H) { h_ = H; }
71
72  void r(int R) { w_ = R - x_; }
73  void b(int B) { h_ = B - y_; }
74
75  void inset(int d) {
76      x_ += d;
77      y_ += d;
78      w_ -= 2 * d;
79      h_ -= 2 * d;
80  }
81
82  void inset(Fl_Boxtype bt) {
83      x_ += Fl::box_dx(bt);
84      y_ += Fl::box_dy(bt);
85      w_ -= Fl::box_dw(bt);
86      h_ -= Fl::box_dh(bt);
87  }
88
89  void inset(int left, int top, int right, int bottom) {
90      x_ += left;
91      y_ += top;
92      w_ -= (left + right);
93      h_ -= (top + bottom);
94  }
95
96  friend bool operator==(const Fl_Rect& lhs, const Fl_Rect& rhs) {
97      return (lhs.x_==rhs.x_) && (lhs.y_==rhs.y_) && (lhs.w_==rhs.w_) && (lhs.h_==rhs.h_);
98  }
99
100 friend bool operator!=(const Fl_Rect& lhs, const Fl_Rect& rhs) {
101     return !(lhs==rhs);
102 }
103
104 }; // class Fl_Rect
105
106 #endif // Fl_Rect_H

```

## 34.117 Fl\_Repeat\_Button.H

```

1 //
2 // Repeat button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this

```

```

8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Repeat_Button widget . */
19
20 #ifndef Fl_Repeat_Button_H
21 #define Fl_Repeat_Button_H
22 #include "Fl.H"
23 #include "Fl_Button.H"
24
25 class FL_EXPORT Fl_Repeat_Button : public Fl_Button {
26     static void repeat_callback(void *);
27 public:
28     int handle(int) FL_OVERRIDE;
29     Fl_Repeat_Button(int X,int Y,int W,int H,const char *l=0);
30
31     void deactivate() {
32         Fl::remove_timeout(repeat_callback,this);
33         Fl_Button::deactivate();
34     }
35 };
36
37 #endif

```

### 34.118 Fl\_Return\_Button.H

```

1 //
2 // Return button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Return_Button widget . */
19
20 #ifndef Fl_Return_Button_H
21 #define Fl_Return_Button_H
22 #include "Fl_Button.H"
23
24 class FL_EXPORT Fl_Return_Button : public Fl_Button {
25     protected:
26         void draw() FL_OVERRIDE;
27     public:
28         int handle(int) FL_OVERRIDE;
29         Fl_Return_Button(int X, int Y, int W, int H,const char *l=0);
30 };
31
32 #endif

```

### 34.119 Fl\_RGB\_Image.H

```

1 //
2 // RGB Image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php

```

```

15 //
16
17 #ifndef Fl_RGB_Image_H
18 # define Fl_RGB_Image_H
19 # include "Fl_Image.H"
20 #endif // !Fl_RGB_Image_H

```

## 34.120 Fl\_Roller.H

```

1 //
2 // Roller header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Roller widget . */
19
20 #ifndef Fl_Roller_H
21 #define Fl_Roller_H
22
23 #ifndef Fl_Valuator_H
24 #include "Fl_Valuator.H"
25 #endif
26
27 class FL_EXPORT Fl_Roller : public Fl_Valuator {
28 protected:
29     void draw() FL_OVERRIDE;
30 public:
31     int handle(int) FL_OVERRIDE;
32     Fl_Roller(int X,int Y,int W,int H,const char* L=0);
33 };
34
35 #endif

```

## 34.121 Fl\_Round\_Button.H

```

1 //
2 // Round button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Round_Button_H
18 #define Fl_Round_Button_H
19
20 #include "Fl_Light_Button.H"
21
22 class FL_EXPORT Fl_Round_Button : public Fl_Light_Button {
23 public:
24     Fl_Round_Button(int x,int y,int w,int h,const char *l = 0);
25 };
26
27 #endif

```

## 34.122 Fl\_Round\_Clock.H

```

1 //
2 // Round clock header file for the Fast Light Tool Kit (FLTK).

```

```

3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Round_Clock widget . */
19
20 #ifndef FL_ROUND_CLOCK_H
21 #define FL_ROUND_CLOCK_H
22
23 #include "Fl_Clock.H"
24
25 class FL_EXPORT Fl_Round_Clock : public Fl_Clock {
26 public:
27     Fl_Round_Clock(int X,int Y,int W,int H, const char *L = 0);
28 };
29
30 #endif

```

### 34.123 Fl\_Scheme.H

```

1 //
2 // Scheme header for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2022-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef FL_FL_SCHEME_H_
18 #define FL_FL_SCHEME_H_
19
20 #include <FL/Fl.H>
21
22 class Fl_Scheme {
23 private:
24     static const char **names_;           // registered scheme names
25     static int num_schemes_;              // number of registered schemes
26     static int alloc_size_;               // number of allocated scheme name entries
27
28 protected:
29     // const char *name_;                  // the scheme's name
30
31     // protected constructor - not yet implemented
32     // Fl_Scheme(const char *name);
33
34 public:
35     // Static methods.
36
37     // Some of these methods will replace the scheme related methods of class Fl,
38     // for instance Fl::scheme() and Fl::is_scheme().
39     // Backwards compatibility must be kept though.
40
41     static const char **names();
42
43     static int num_schemes() {
44         if (!names_) names(); // force initialization
45         return num_schemes_;
46     }
47
48     // Adding a scheme name must be a public static method in FLTK 1.4.0.
49     // This will later be protected or replaced by another method name.
50
51

```

```

60 static int add_scheme_name(const char *name);
61
62 }; // class Fl_Scheme
63
64 #endif // FL_Fl_Scheme_H_

```

## 34.124 Fl\_Scheme\_Choice.H

```

1 //
2 // Scheme Choice header for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2022-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 #ifndef FL_Fl_Scheme_Choice_H_
18 #define FL_Fl_Scheme_Choice_H_
19
20 #include <FL/Fl.H>
21 #include <FL/Fl_Scheme.H>
22 #include <FL/Fl_Choice.H>
23
24 class FL_EXPORT Fl_Scheme_Choice : public Fl_Choice {
25
26 protected:
27 static void scheme_cb(Fl_Widget *w, void *);
28
29 public:
30 Fl_Scheme_Choice(int X, int Y, int W, int H, const char *L = 0);
31 int handle(int event) FL_OVERRIDE;
32
33 // set the current value according to the active scheme
34 virtual void init_value();
35
36 }; // class Fl_Scheme_Choice
37
38 #endif // FL_Fl_Scheme_Choice_H_

```

## 34.125 Fl\_Scroll.H

```

1 //
2 // Fl_Scroll header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Scroll widget . */
19
20 #ifndef FL_Scroll_H
21 #define FL_Scroll_H
22
23 #include "Fl_Group.H"
24 #include "Fl_Scrollbar.H"
25
26 class FL_EXPORT Fl_Scroll : public Fl_Group {
27
28 public:
29 int xposition_, yposition_;
30 int oldx, oldy;
31 int scrollbar_size_;
32 static void hscrollbar_cb(Fl_Widget*, void*);
33 static void scrollbar_cb(Fl_Widget*, void*);
34 static void draw_clip(void*,int,int,int,int);
35
36 };
37
38 #endif

```

```

106
107 protected:          // (STR#1895)
108
109 typedef struct { int x,y,w,h; } Fl_Rgn_XYWH;
110
111 typedef struct {
112     int l;
113     int r;
114     int t;
115     int b;
116 } Fl_Rgn_LRTB;
117
118 typedef struct {
119     int x,y,w,h;
120     int pos;
121     int size;
122     int first;
123     int total;
124 } Fl_Scrollbar_Data;
125
126 typedef struct {
127     int scrollsize;
128     Fl_Rgn_XYWH innerbox;
129     Fl_Rgn_XYWH innerchild;
130     Fl_Rgn_LRTB child;
131     int hneeded;
132     int vneeded;
133     Fl_Scrollbar_Data hscroll;
134     Fl_Scrollbar_Data vscroll;
135 } ScrollInfo;
136 void recalc_scrollbars(ScrollInfo &si) const;
137
138 protected:
139
140 int on_insert(Fl_Widget*, int) FL_OVERRIDE;
141 int on_move(int, int) FL_OVERRIDE;
142 void fix_scrollbar_order();
143 void bbox(int&,int&,int&,int&) const;
144 void draw() FL_OVERRIDE;
145
146 public:
147
148 Fl_Scrollbar scrollbar;
149 Fl_Scrollbar hscrollbar;
150
151 void resize(int X, int Y, int W, int H) FL_OVERRIDE;
152 int handle(int) FL_OVERRIDE;
153
154 Fl_Scroll(int X, int Y, int W, int H, const char *L = 0);
155 virtual ~Fl_Scroll();
156
157 enum { // values for type()
158     HORIZONTAL = 1,
159     VERTICAL = 2,
160     BOTH = 3,
161     ALWAYS_ON = 4,
162     HORIZONTAL_ALWAYS = 5,
163     VERTICAL_ALWAYS = 6,
164     BOTH_ALWAYS = 7
165 };
166
167 int xposition()const {return xposition_;}
168 int yposition()const {return yposition_;}
169 void scroll_to(int, int);
170 void clear();
171
172 /* delete child n (by index) */
173 int delete_child(int n) FL_OVERRIDE;
174
175 int scrollbar_size()const {
176     return(scrollbar_size_);
177 }
178 void scrollbar_size(int newSize) {
179     if ( newSize != scrollbar_size_ ) redraw();
180     scrollbar_size_ = newSize;
181 }
182 };
183 #endif

```

## 34.126 Fl\_Scrollbar.H

```

1 //
2 // Scroll bar header file for the Fast Light Tool Kit (FLTK).
3 //

```

```

4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Scrollbar widget . */
19
20 #ifndef Fl_Scrollbar_H
21 #define Fl_Scrollbar_H
22
23 #include "Fl_Slider.H"
24
25 class FL_EXPORT Fl_Scrollbar : public Fl_Slider {
26
27     int linesize_;
28     int pushed_;
29     static void timeout_cb(void*);
30     void increment_cb();
31 protected:
32     void draw() FL_OVERRIDE;
33
34 public:
35     Fl_Scrollbar(int X,int Y,int W,int H, const char *L = 0);
36     ~Fl_Scrollbar();
37     int handle(int) FL_OVERRIDE;
38
39     int value()const {return int(Fl_Slider::value());}
40
41     int value(int p) {return int(Fl_Slider::value((double)p));}
42
43     int value(int pos, int windowSize, int first_line, int total_lines) {
44         return scrollvalue(pos, windowSize, first_line, total_lines);
45     }
46
47     int linesize()const {return linesize_;}
48
49     void linesize(int i) {linesize_ = i;}
50 };
51
52 #endif

```

## 34.127 Fl\_Secret\_Input.H

```

1 //
2 // Secret input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Secret_Input widget . */
19
20 #ifndef Fl_Secret_Input_H
21 #define Fl_Secret_Input_H
22
23 #include "Fl_Input.H"
24
25 class FL_EXPORT Fl_Secret_Input : public Fl_Input {
26 public:
27     Fl_Secret_Input(int X,int Y,int W,int H,const char *l = 0);
28     int handle(int) FL_OVERRIDE;
29 };
30
31 #endif

```

## 34.128 Fl\_Select\_Browser.H

```

1 //
2 // Select browser header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
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10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Select_Browser widget . */
19
20 #ifndef Fl_Select_Browser_H
21 #define Fl_Select_Browser_H
22
23 #include "Fl_Browser.H"
24
25 class FL_EXPORT Fl_Select_Browser : public Fl_Browser {
26 public:
27     Fl_Select_Browser(int X,int Y,int W,int H,const char *L=0);
28 };
29
30 #endif

```

## 34.129 Fl\_Shared\_Image.H File Reference

[Fl\\_Shared\\_Image](#) class.

```
#include "Fl_Image.H"
```

### Classes

- class [Fl\\_Shared\\_Image](#)

*This class supports caching, loading, and drawing of image files.*

### Typedefs

- typedef [Fl\\_Image](#) \*(\* [Fl\\_Shared\\_Handler](#)) (const char \*name, [uchar](#) \*header, int headerlen)

*Test function (typedef) for adding new shared image formats.*

### Functions

- void [fl\\_register\\_images](#) ()

*Register the known image formats.*

### 34.129.1 Detailed Description

[Fl\\_Shared\\_Image](#) class.

### 34.129.2 Typedef Documentation

#### 34.129.2.1 Fl\_Shared\_Handler

```
typedef Fl\_Image *(* Fl\_Shared\_Handler) (const char *name, uchar *header, int headerlen)
```

Test function (typedef) for adding new shared image formats.

This defines the function type you can use to add a handler for unknown image formats that can be opened and loaded as an [FI\\_Shared\\_Image](#).

[fl\\_register\\_images\(\)](#) adds all image formats known to FLTK. Call [FI\\_Shared\\_Image::add\\_handler\(\)](#) to add your own check function to the list of known image formats.

Your function will be passed the filename (*name*), some *header* bytes already read from the image file and the size *headerlen* of the data read. The max value of size is implementation dependent. If your handler function needs to check more bytes you must open the image file yourself.

The provided buffer *header* must not be overwritten.

If your handler function can identify the file type you must open the file and return a valid [FI\\_Image](#) or derived type, otherwise you must return NULL. Example:

```
static FI_Image *check_my_image(const char *name,
                               uchar *header,
                               int headerlen) {
    // (test image type using header and headerlen)
    if (known) {
        // (load image data from file \p name)
        return new FI_RGB_Image(data, ...);
    } else
        return 0;
}
// add your handler:
FI_Shared_Image::add_handler(check_my_image);
```

#### Parameters

in	<i>name</i>	filename to be checked and opened if applicable
in	<i>header</i>	portion of the file that has already been read
in	<i>headerlen</i>	length of provided <i>header</i> data

#### Returns

valid [FI\\_Image](#) or NULL.

#### See also

[FI\\_Shared\\_Image::add\\_handler\(\)](#)

### 34.129.3 Function Documentation

#### 34.129.3.1 fl\_register\_images()

```
void fl_register_images ( )
```

Register the known image formats.

This function is provided in the `fltk_images` library and registers all of the "extra" image file formats known to FLTK that are not part of the core FLTK library.

You may add your own image formats with [FI\\_Shared\\_Image::add\\_handler\(\)](#).

## 34.130 FI\_Shared\_Image.H

[Go to the documentation of this file.](#)

```
1 //
2 // Shared image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
```

```

15 //
16
20 #ifndef FL_Shared_Image_H
21 # define FL_Shared_Image_H
22
23 # include "Fl_Image.H"
24
25 #undef SHIM_DEBUG
26
71 typedef Fl_Image *(*Fl_Shared_Handler)(const char *name,
72                                         uchar *header,
73                                         int headerlen);
74
94 class FL_EXPORT Fl_Shared_Image : public Fl_Image {
95
96     friend class Fl_JPEG_Image;
97     friend class Fl_PNG_Image;
98     friend class Fl_SVG_Image;
99     friend class Fl_Graphics_Driver;
100
101 protected:
102
103     static Fl_Shared_Image **images_;           // Shared images
104     static int num_images_;                     // Number of shared images
105     static int alloc_images_;                   // Allocated shared images
106     static Fl_Shared_Handler *handlers_;        // Additional format handlers
107     static int num_handlers_;                   // Number of format handlers
108     static int alloc_handlers_;                 // Allocated format handlers
109
110     const char *name_;                         // Name of image file
111     int original_;                             // Original image?
112     int refcount_;                             // Number of times this image has been used
113     Fl_Image *image_;                          // The image that is shared
114     int alloc_image_;                          // Was the image allocated?
115
116     static int compare(Fl_Shared_Image **i0, Fl_Shared_Image **i1);
117
118     // Use get() and release() to load/delete images in memory...
119     Fl_Shared_Image();
120     Fl_Shared_Image(const char *n, Fl_Image *img = 0);
121     virtual ~Fl_Shared_Image();
122     void add();
123     void update();
124     Fl_Shared_Image *copy_(int W, int H) const;
125
126 public:
127 #ifdef SHIM_DEBUG
128     static void print_pool();
129 #endif
130
131     const char *name() { return name_; }
132
133     int refcount() { return refcount_; }
134
135     int original() { return original_; }
136
137     void release() FL_OVERRIDE;
138     virtual void reload();
139
140     Fl_Shared_Image *as_shared_image() FL_OVERRIDE {
141         return this;
142     }
143
144     Fl_Image *copy(int W, int H) const FL_OVERRIDE;
145     Fl_Image *copy() const;
146     Fl_Image *copy();
147
148     void color_average(Fl_Color c, float i) FL_OVERRIDE;
149     void desaturate() FL_OVERRIDE;
150     void draw(int X, int Y, int W, int H, int cx = 0, int cy = 0) FL_OVERRIDE;
151     void draw(int X, int Y, int W, int H, int cx = 0, int cy = 0, int w = 0, int h = 0) FL_OVERRIDE;
152     void uncache() FL_OVERRIDE;
153
154     static Fl_Shared_Image *find(const char *name, int W = 0, int H = 0);
155     static Fl_Shared_Image *get(const char *name, int W = 0, int H = 0);
156     static Fl_Shared_Image *get(Fl_RGB_Image *rgb, int own_it = 1);
157     static Fl_Shared_Image **images();
158     static int num_images();
159     static void add_handler(Fl_Shared_Handler f);
160     static void remove_handler(Fl_Shared_Handler f);
161
162     const Fl_Image *image()const { return image_; }
163
164 }; // class Fl_Shared_Image
165
166 //
167 // The following function is provided in the fltk_images library and

```

```

200 // registers all of the "extra" image file formats that are not part
201 // of the core FLTK library...
202 //
203
204 FL_EXPORT extern void fl_register_images();
205
206 #endif // !Fl_Shared_Image_H

```

## 34.131 Fl\_Shortcut\_Button.H

```

1 //
2 // Shortcut Button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Shortcut_Button_H
18 #define Fl_Shortcut_Button_H
19
20 #include <FL/Fl_Button.H>
21
22 class FL_EXPORT Fl_Shortcut_Button : public Fl_Button {
23 private:
24     bool hot_, pre_hot_, default_set_, handle_default_button_;
25     Fl_Shortcut pre_esc_;
26     Fl_Shortcut default_shortcut_;
27 protected:
28     Fl_Shortcut shortcut_value;
29     void do_end_hot_callback();
30     int handle(int) FL_OVERRIDE;
31     void draw() FL_OVERRIDE;
32 public:
33     Fl_Shortcut_Button(int X,int Y,int W,int H, const char* l = 0);
34     void value(Fl_Shortcut shortcut);
35     Fl_Shortcut value();
36 #if 0
37     // Default shortcut settings are disabled until successful review of the UI
38     void default_value(Fl_Shortcut shortcut);
39     Fl_Shortcut default_value();
40     void default_clear();
41 #endif
42 };
43
44 #endif // Fl_Shortcut_Button_H
45

```

## 34.132 fl\_show\_colormap.H File Reference

The `fl_show_colormap()` function hides the implementation classes used to provide the popup window and color selection mechanism.

### Functions

- `Fl_Color fl_show_colormap (Fl_Color oldcol)`  
*Pops up a window to let the user pick a colormap entry.*

#### 34.132.1 Detailed Description

The `fl_show_colormap()` function hides the implementation classes used to provide the popup window and color selection mechanism.

## 34.133 fl\_show\_colormap.H

[Go to the documentation of this file.](#)

```
1 //
2 // Colormap picker header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
22 #ifndef fl_show_colormap_H
23 #define fl_show_colormap_H
24
25 /* doxygen comment here to avoid exposing ColorMenu in fl_show_colormap.cxx
26 */
27
39 FL_EXPORT Fl_Color fl_show_colormap(Fl_Color oldcol);
40
43 #endif
```

## 34.134 fl\_show\_input.H

```
1 //
2 // Standard input dialog header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #include "fl_ask.H"
```

## 34.135 Fl\_Simple\_Counter.H

```
1 //
2 // Simple counter header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Simple_Counter widget . */
19
20 #ifndef Fl_Simple_Counter_H
21 #define Fl_Simple_Counter_H
22
23 #include "Fl_Counter.H"
24
29 class FL_EXPORT Fl_Simple_Counter : public Fl_Counter {
30 public:
31     Fl_Simple_Counter(int X,int Y,int W,int H, const char *L = 0);
32 };
33
34 #endif
```

## 34.136 Fl\_Single\_Window.H

```

1 //
2 // Single-buffered window header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Single_Window class . */
19
20 #ifndef Fl_Single_Window_H
21 #define Fl_Single_Window_H
22
23 #include "Fl_Window.H"
24
25 class FL_EXPORT Fl_Single_Window : public Fl_Window {
26 public:
27     void show() FL_OVERRIDE;
28     void show(int argc, char **argv) { Fl_Window::show(argc, argv); }
29
30     Fl_Single_Window(int W, int H, const char *l=0);
31
32     Fl_Single_Window(int X, int Y, int W, int H, const char *l=0);
33
34     void make_current() { Fl_Window::make_current(); }
35
36     void flush() FL_OVERRIDE { Fl_Window::flush(); }
37 };
38
39 #endif

```

## 34.137 Fl\_Slider.H

```

1 //
2 // Slider header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Slider widget . */
19
20 #ifndef Fl_Slider_H
21 #define Fl_Slider_H
22
23 #ifndef Fl_Valuator_H
24 #include "Fl_Valuator.H"
25 #endif
26
27 // values for type(), lowest bit indicate horizontal:
28 #define FL_VERT_SLIDER 0
29 #define FL_HOR_SLIDER 1
30 #define FL_VERT_FILL_SLIDER 2
31 #define FL_HOR_FILL_SLIDER 3
32 #define FL_VERT_NICE_SLIDER 4
33 #define FL_HOR_NICE_SLIDER 5
34
35 class FL_EXPORT Fl_Slider : public Fl_Valuator {
36 public:
37     float slider_size_;
38     uchar slider_;
39     void _Fl_Slider();
40     void draw_bg(int, int, int, int);

```

```

65
66 protected:
67
68 // these allow subclasses to put the slider in a smaller area:
69 void draw(int, int, int, int);
70 int handle(int, int, int, int, int);
71 void draw() FL_OVERRIDE;
72
73 public:
74
75 int handle(int) FL_OVERRIDE;
76 Fl_Slider(int X,int Y,int W,int H, const char *L = 0);
77 Fl_Slider(uchar t,int X,int Y,int W,int H, const char *L);
78
79 int scrollvalue(int pos,int size,int first,int total);
80 void bounds(double a, double b);
81
82 float slider_size()const {return slider_size_;}
83
84 void slider_size(double v);
85
86 Fl_Boxtype slider()const {return (Fl_Boxtype)slider_;}
87
88 void slider(Fl_Boxtype c) {slider_ = c;}
89 };
90
91 #endif

```

### 34.138 Fl\_Spinner.H

```

1 //
2 // Spinner widget for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Spinner widget . */
19
20 #ifndef Fl_Spinner_H
21 #define Fl_Spinner_H
22
23 #include <FL/Enumerations.H>
24 #include <FL/Fl_Group.H>
25 #include <FL/Fl_Input.H>
26 #include <FL/Fl_Repeat_Button.H>
27
28 class FL_EXPORT Fl_Spinner : public Fl_Group {
29
30     double value_; // Current value
31     double minimum_; // Minimum value
32     double maximum_; // Maximum value
33     double step_; // Amount to add/subtract for up/down
34     const char *format_; // Format string for input field
35     int wrap_; // wrap around at bounds (1/0)
36
37 private:
38     static void sb_cb(Fl_Widget *w, Fl_Spinner *sb); // internal callback
39     void update(); // update input field
40
41 protected:
42
43 // This class works like Fl_Input but ignores FL_Up and FL_Down key
44 // presses so they are handled by its parent, the Fl_Spinner widget.
45 // See STR #2989.
46
47 class FL_EXPORT Fl_Spinner_Input : public Fl_Input {
48 public:
49     Fl_Spinner_Input(int X, int Y, int W, int H)
50     : Fl_Input(X, Y, W, H) {}
51     int handle(int event) FL_OVERRIDE; // implemented in src/Fl_Spinner.cxx
52 };
53
54 Fl_Spinner_Input input_; // Input field for the value

```

```

65  Fl_Repeat_Button
66      up_button_,          // Up button
67      down_button_;        // Down button
68
69  void draw() FL_OVERRIDE;
70
71 public:
72
73  // Constructor
74  Fl_Spinner(int X, int Y, int W, int H, const char *L = 0);
75  // Event handling
76  int handle(int event) FL_OVERRIDE;
77  // Resize group and subwidgets
78  void resize(int X, int Y, int W, int H) FL_OVERRIDE;
79
81  const char *format()const { return (format_); }
82
84  void format(const char *f) { format_ = f; update(); }
85
87  double maximum()const { return (maximum_); }
88
90  void maximum(double m) { maximum_ = m; }
91
93  double minimum()const { return (minimum_); }
94
96  void minimum(double m) { minimum_ = m; }
97
99  void range(double a, double b) { minimum_ = a; maximum_ = b; }
100
101  // Sets the amount to change the value when the user clicks a button.
102  // Docs in src/Fl_Spinner.cxx
103  void step(double s);
104
105  double step()const { return (step_); }
106
107  void wrap(int set) { wrap_ = set ? 1 : 0; }
108
109  int wrap()const { return wrap_; }
110
112  Fl_Color textcolor()const { return (input_.textcolor()); }
113
114  void textcolor(Fl_Color c) { input_.textcolor(c); }
115
116  Fl_Font textfont()const { return (input_.textfont()); }
117
118  void textfont(Fl_Font f) { input_.textfont(f); }
119
120  Fl_Fonsize textsize()const { return (input_.textsize()); }
121
122  void textsize(Fl_Fonsize s) { input_.textsize(s); }
123
124  // Sets the numeric representation in the input field.
125  // Docs see src/Fl_Spinner.cxx
126  void type(uchar v);
127
128  uchar type()const { return (input_.type()); }
129
130  double value()const { return (value_); }
131
132  void value(double v) { value_ = v; update(); }
133
134  void color(Fl_Color v) { input_.color(v); }
135
136  Fl_Color color()const { return(input_.color()); }
137
138  void selection_color(Fl_Color val) { input_.selection_color(val); }
139
140  Fl_Color selection_color()const { return input_.selection_color(); }
141
142  void maximum_size(int m) { if (m > 0) input_.maximum_size(m); }
143
144  int maximum_size()const { return input_.maximum_size(); }
145 };
146
147 #endif // !Fl_Spinner_H

```

## 34.139 fl\_string\_functions.h File Reference

Public header for FLTK's platform-agnostic string handling.

```

#include "Fl_Export.H"
#include <stddef.h>

```

## Functions

- `char * fl_strdup` (`const char *s`)  
*Cross platform interface to POSIX function strdup().*
- `size_t fl_strlcpy` (`char *`, `const char *`, `size_t`)

### 34.139.1 Detailed Description

Public header for FLTK's platform-agnostic string handling.

## 34.140 fl\_string\_functions.h

[Go to the documentation of this file.](#)

```
1 /*
2  * Platform agnostic string portability functions for the Fast Light Tool Kit (FLTK).
3  *
4  * Copyright 2020-2022 by Bill Spitzak and others.
5  *
6  * This library is free software. Distribution and use rights are outlined in
7  * the file "COPYING" which should have been included with this file. If this
8  * file is missing or damaged, see the license at:
9  *
10 *      https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *      https://www.fltk.org/bugs.php
15 */
16
22 #ifndef _FL_fl_string_functions_h_
23 #define _FL_fl_string_functions_h_
24
25 #include "Fl_Export.H"
26
27 #ifdef __cplusplus
28 extern "C" {
29 #endif
30
31 #include <stddef.h> // size_t
32
33 FL_EXPORT char* fl_strdup(const char *s);
34
35 FL_EXPORT size_t fl_strlcpy(char *, const char *, size_t);
36
37 #ifdef __cplusplus
38 }
39 #endif /* __cplusplus */
40
41 #endif /* _FL_fl_string_functions_h_ */
```

## 34.141 Fl\_SVG\_File\_Surface.H

```
1 //
2 // Declaration of Fl_SVG_File_Surface in the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2020 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_SVG_File_Surface_H
18 #define Fl_SVG_File_Surface_H
19
20 #include <FL/Fl_Widget_Surface.H>
21 #include <stdio.h>
22
23 class FL_EXPORT Fl_SVG_File_Surface : public Fl_Widget_Surface {
24     int width_, height_;
25     int (*closef_)(FILE*);
26 }
```

```

50 public:
51     Fl_SVG_File_Surface(int width, int height, FILE *svg, int (*closef)(FILE*) = NULL);
52     ~Fl_SVG_File_Surface();
53     FILE *file();
54     void origin(int x, int y) FL_OVERRIDE;
55     void origin(int *x, int *y) FL_OVERRIDE;
56     void translate(int x, int y) FL_OVERRIDE;
57     void untranslate() FL_OVERRIDE;
58     int printable_rect(int *w, int *h) FL_OVERRIDE;
59     int close();
60 };
61
62 #endif /* Fl_SVG_File_Surface_H */

```

## 34.142 Fl\_SVG\_Image.H

```

1 //
2 // SVG Image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2017-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef FL_SVG_IMAGE_H
18 #define FL_SVG_IMAGE_H
19
20 #include <FL/Fl_Image.H>
21
22 struct NSVGImage;
23
24 class FL_EXPORT Fl_SVG_Image : public Fl_RGB_Image {
25 private:
26     typedef struct {
27         NSVGImage* svg_image;
28         int ref_count;
29     } counted_NSVGImage;
30     counted_NSVGImage* counted_svg_image_;
31     bool rasterized_;
32     int raster_w_, raster_h_;
33     bool to_desaturate_;
34     Fl_Color average_color_;
35     float average_weight_;
36     float svg_scaling_(int W, int H);
37     void rasterize_(int W, int H);
38     void cache_size_(int &width, int &height) FL_OVERRIDE;
39     void init_(const char *name, const unsigned char *filedata, size_t length);
40     Fl_SVG_Image(const Fl_SVG_Image *source);
41 public:
42     bool proportional;
43     Fl_SVG_Image(const char *filename);
44     Fl_SVG_Image(const char *sharedname, const char *svg_data);
45     Fl_SVG_Image(const char *sharedname, const unsigned char *svg_data, size_t length);
46     virtual ~Fl_SVG_Image();
47     Fl_Image *copy(int W, int H) const FL_OVERRIDE;
48     Fl_Image *copy() const {
49         return Fl_Image::copy();
50     }
51     void resize(int width, int height);
52     void desaturate() FL_OVERRIDE;
53     void color_average(Fl_Color c, float i) FL_OVERRIDE;
54     void draw(int X, int Y, int W, int H, int cx = 0, int cy = 0) FL_OVERRIDE;
55     void draw(int X, int Y) { draw(X, Y, w(), h(), 0, 0); }
56     Fl_SVG_Image *as_svg_image() FL_OVERRIDE { return this; }
57     void normalize() FL_OVERRIDE;
58 };
59
60 #endif // FL_SVG_IMAGE_H

```

## 34.143 Fl\_Sys\_Menu\_Bar.H File Reference

Definition of class [Fl\\_Sys\\_Menu\\_Bar](#).

```
#include <FL/Fl_Menu_Bar.H>
```

## Classes

- class [Fl\\_Sys\\_Menu\\_Bar](#)

*A class to create and modify menus that appear on macOS in the menu bar at the top of the screen.*

## Variables

- [Fl\\_Sys\\_Menu\\_Bar](#) \* `fl_sys_menu_bar`

*The system menu bar.*

### 34.143.1 Detailed Description

Definition of class [Fl\\_Sys\\_Menu\\_Bar](#).

## 34.144 Fl\_Sys\_Menu\_Bar.H

[Go to the documentation of this file.](#)

```
1 //
2 // MacOS system menu bar header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2017 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
22 #ifndef Fl_Sys_Menu_Bar_H
23 #define Fl_Sys_Menu_Bar_H
24
25 #include <FL/Fl_Menu_Bar.H>
26
27 class Fl_Sys_Menu_Bar_Driver;
28
29 class FL_EXPORT Fl_Sys_Menu_Bar : public Fl_Menu_Bar {
30     static Fl_Sys_Menu_Bar_Driver *driver();
31 protected:
32     void draw() FL_OVERRIDE;
33 public:
34     typedef enum {
35         no_window_menu = 0,
36         tabbing_mode_none,
37         tabbing_mode_automatic,
38         tabbing_mode_preferred
39     } window_menu_style_enum;
40     Fl_Sys_Menu_Bar(int x,int y,int w,int h,const char *l=0);
41     virtual ~Fl_Sys_Menu_Bar();
42     const Fl_Menu_Item *menu()const {return Fl_Menu_::menu();}
43     void menu(const Fl_Menu_Item *m);
44     void update() FL_OVERRIDE;
45     void play_menu(const Fl_Menu_Item *) FL_OVERRIDE;
46     int add(const char* label, int shortcut, Fl_Callback*, void *user_data=0, int flags=0);
47     int add(const char* label, const char* shortcut, Fl_Callback* cb, void *user_data=0, int flags=0) {
48         return add(label, fl_old_shortcut(shortcut), cb, user_data, flags);
49     }
50     int add(const char* str);
51     int insert(int index, const char* label, int shortcut, Fl_Callback *cb, void *user_data=0, int
52         flags=0);
53     int insert(int index, const char* label, const char* shortcut, Fl_Callback *cb, void *user_data=0, int
54         flags=0) {
55         return insert(index, label, fl_old_shortcut(shortcut), cb, user_data, flags);
56     }
57     void remove(int n);
58     void replace(int index, const char *name);
59     void clear();
60     int clear_submenu(int index);
61     void mode (int i, int fl);
62 }
```

```

137 int mode(int i) const { return Fl_Menu_::mode(i); }
138 void shortcut (int i, int s);
139 void setonly (Fl_Menu_Item *item);
140 static void about(Fl_Callback *cb, void *data);
141
142 static window_menu_style_enum window_menu_style();
143 static void window_menu_style(window_menu_style_enum style);
144 static void create_window_menu();
145 };
146
147 extern Fl_Sys_Menu_Bar *fl_sys_menu_bar;
148
149 #endif // Fl_Sys_Menu_Bar_H

```

## 34.145 Fl\_Table.H

```

1 //
2 // Fl_Table -- A table widget for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2002 by Greg Ercolano.
5 // Copyright (c) 2004 O'ksi'D
6 // Copyright 2023 by Bill Spitzak and others.
7 //
8 // This library is free software. Distribution and use rights are outlined in
9 // the file "COPYING" which should have been included with this file. If this
10 // file is missing or damaged, see the license at:
11 //
12 //     https://www.fltk.org/COPYING.php
13 //
14 // Please see the following page on how to report bugs and issues:
15 //
16 //     https://www.fltk.org/bugs.php
17 //
18
19 #ifndef _FL_TABLE_H
20 #define _FL_TABLE_H
21
22 #include <FL/Fl_Group.H>
23 #include <FL/Fl_Scroll.H>
24
25 #include <vector>
26
111 class FL_EXPORT Fl_Table : public Fl_Group {
112 public:
113     enum TableContext {
120         CONTEXT_NONE = 0,
121         CONTEXT_STARTPAGE = 0x01,
122         CONTEXT_ENDPAGE = 0x02,
123         CONTEXT_ROW_HEADER = 0x04,
124         CONTEXT_COL_HEADER = 0x08,
125         CONTEXT_CELL = 0x10,
126         CONTEXT_TABLE = 0x20,
127         CONTEXT_RC_RESIZE = 0x40
128     };
129
130 private:
131     int _rows, _cols; // total rows/cols
132     int _row_header_w; // width of row header
133     int _col_header_h; // height of column header
134     int _row_position; // last row_position set (not necessarily == toprow!)
135     int _col_position; // last col_position set (not necessarily == leftcol!)
136
137     char _row_header; // row header enabled?
138     char _col_header; // col header enabled?
139     char _row_resize; // row resizing enabled?
140     char _col_resize; // col resizing enabled?
141     int _row_resize_min; // row minimum resizing height (default=1)
142     int _col_resize_min; // col minimum resizing width (default=1)
143
144     // OPTIMIZATION: partial row/column redraw variables
145     int _redraw_toprow;
146     int _redraw_botrow;
147     int _redraw_leftcol;
148     int _redraw_rightcol;
149     Fl_Color _row_header_color;
150     Fl_Color _col_header_color;
151
152     int _auto_drag;
153     int _selecting;
154     int _scrollbar_size;
155     enum {
156         TABCELLNAV = 1<<0
157     };
158     unsigned int flags_;
159

```

```

160     std::vector<int> *_colwidths;           // column widths in pixels
161     std::vector<int> *_rowheights;         // row heights in pixels
162
163     // number of columns and rows == size of corresponding vectors
164     int col_size();                         // size of the column widths vector
165     int row_size();                         // size of the row heights vector
166
167     Fl_Cursor _last_cursor;                 // last mouse cursor before changed to 'resize' cursor
168
169     // EVENT CALLBACK DATA
170     TableContext _callback_context;         // event context
171     int _callback_row, _callback_col;       // event row/col
172
173     // handle() state variables.
174     // Put here instead of local statics in handle(), so more
175     // than one Fl_Table can exist without crosstalk between them.
176     //
177     int _resizing_col;                       // column being dragged
178     int _resizing_row;                       // row being dragged
179     int _dragging_x;                         // starting x position for horiz drag
180     int _dragging_y;                         // starting y position for vert drag
181     int _last_row;                          // last row we FL_PUSH'ed
182
183     // Redraw single cell
184     void _redraw_cell(TableContext context, int R, int C);
185
186     void _start_auto_drag();
187     void _stop_auto_drag();
188     void _auto_drag_cb();
189     static void _auto_drag_cb2(void *d);
190
191 protected:
192     enum ResizeFlag {
193         RESIZE_NONE = 0,
194         RESIZE_COL_LEFT = 1,
195         RESIZE_COL_RIGHT = 2,
196         RESIZE_ROW_ABOVE = 3,
197         RESIZE_ROW_BELOW = 4
198     };
199
200     int table_w;
201     int table_h;
202     int toprow;
203     int botrow;
204     int leftcol;
205     int rightcol;
206
207     // selection
208     int current_row;
209     int current_col;
210     int select_row;
211     int select_col;
212
213     // OPTIMIZATION: Precomputed scroll positions for the toprow/leftcol
214     int toprow_scrollpos;
215     int leftcol_scrollpos;
216
217     // Data table's inner dimension
218     int tix;
219     int tiy;
220     int tiw;
221     int tih;
222
223     // Data table's outer dimension
224     int tox;
225     int toy;
226     int tow;
227     int toh;
228
229     // Table widget's inner dimension
230     int wix;
231     int wiy;
232     int wiw;
233     int wih;
234
235     Fl_Scroll *table;
236     Fl_Scrollbar *vscrollbar;
237     Fl_Scrollbar *hscrollbar;
238
239     // Fltk
240     int handle(int e) FL_OVERRIDE;         // fltk handle() FL_OVERRIDE
241
242     // Class maintenance
243     void recalc_dimensions();
244     void table_resized();                  // table resized; recalc
245     void table_scrolled();                 // table scrolled; recalc
246     void get_bounds(TableContext context,  // return x/y/w/h bounds for context

```

```

247         int &X, int &Y, int &W, int &H);
248 void change_cursor(Fl_Cursor newcursor);           // change mouse cursor to some other shape
249 TableContext cursor2rowcol(int &R, int &C, ResizeFlag &resizeflag);
250 int find_cell(TableContext context,                // find cell's x/y/w/h given r/c
251             int R, int C, int &X, int &Y, int &W, int &H);
252 int row_col_clamp(TableContext context, int &R, int &C);
253 // clamp r/c to known universe
254
365 virtual void draw_cell(TableContext context, int R=0, int C=0,
366                     int X=0, int Y=0, int W=0, int H=0)
367 { (void)context; (void)R; (void)C; (void)X; (void)Y; (void)W; (void)H;}
368 // overridden by deriving class
369
369 long row_scroll_position(int row);                 // find scroll position of row (in pixels)
370 long col_scroll_position(int col);                 // find scroll position of col (in pixels)
371
375 int is_fltk_container() {                         // does table contain fltk widgets?
376     return( Fl_Group::children() > 3 );           // (ie. more than box and 2 scrollbars?)
377 }
378
379 static void scroll_cb(Fl_Widget*,void*);           // h/v scrollbar callback
380
381 void damage_zone(int r1, int c1, int r2, int c2, int r3 = 0, int c3 = 0);
382
387 void redraw_range(int topRow, int botRow, int leftCol, int rightCol) {
388     if ( _redraw_toprow == -1 ) {
389         // Initialize redraw range
390         _redraw_toprow = topRow;
391         _redraw_botrow = botRow;
392         _redraw_leftcol = leftCol;
393         _redraw_rightcol = rightCol;
394     } else {
395         // Extend redraw range
396         if ( topRow < _redraw_toprow ) _redraw_toprow = topRow;
397         if ( botRow > _redraw_botrow ) _redraw_botrow = botRow;
398         if ( leftCol < _redraw_leftcol ) _redraw_leftcol = leftCol;
399         if ( rightCol > _redraw_rightcol ) _redraw_rightcol = rightCol;
400     }
401     // Indicate partial redraw needed of some cells
402     damage(FL_DAMAGE_CHILD);
403 }
404
405 // draw() has to be protected per FLTK convention (was public in 1.3.x)
406 void draw() FL_OVERRIDE;
407
408 public:
409 Fl_Table(int X, int Y, int W, int H, const char *l=0);
410 ~Fl_Table();
411
417 virtual void clear() {
418     rows(0);
419     cols(0);
420     table->clear();
421 }
422
423 // \todo: add topline(), middleline(), bottomline()
424
430 inline void table_box(Fl_Boxtype val) {
431     table->box(val);
432     table_resized();
433 }
434
438 inline Fl_Boxtype table_box( void ) {
439     return(table->box());
440 }
441
442 virtual void rows(int val);                        // set number of rows
443
447 inline int rows() {
448     return(_rows);
449 }
450
451 virtual void cols(int val);                        // set number of columns
452
456 inline int cols() {
457     return(_cols);
458 }
459
488 inline void visible_cells(int& r1, int& r2, int& c1, int& c2) {
489     r1 = toprow;
490     r2 = botrow;
491     c1 = leftcol;
492     c2 = rightcol;
493 }
494
499 int is_interactive_resize() {
500     return(_resizing_row != -1 || _resizing_col != -1);

```

```

501 }
502
503 inline int row_resize() {
504     return(_row_resize);
505 }
506
507 void row_resize(int flag) { // enable row resizing
508     _row_resize = flag;
509 }
510
511 inline int col_resize() {
512     return(_col_resize);
513 }
514
515 void col_resize(int flag) { // enable col resizing
516     _col_resize = flag;
517 }
518
519 inline int col_resize_min() { // column minimum resizing width
520     return(_col_resize_min);
521 }
522
523 void col_resize_min(int val) {
524     _col_resize_min = ( val < 1 ) ? 1 : val;
525 }
526
527 inline int row_resize_min() { // column minimum resizing width
528     return(_row_resize_min);
529 }
530
531 void row_resize_min(int val) {
532     _row_resize_min = ( val < 1 ) ? 1 : val;
533 }
534
535 inline int row_header() { // set/get row header enable flag
536     return(_row_header);
537 }
538
539 void row_header(int flag) {
540     _row_header = flag;
541     table_resized();
542     redraw();
543 }
544
545 inline int col_header() { // set/get col header enable flag
546     return(_col_header);
547 }
548
549 void col_header(int flag) {
550     _col_header = flag;
551     table_resized();
552     redraw();
553 }
554
555 inline void col_header_height(int height) { // set/get col header height
556     _col_header_h = height;
557     table_resized();
558     redraw();
559 }
560
561 inline int col_header_height() {
562     return(_col_header_h);
563 }
564
565 inline void row_header_width(int width) { // set/get row header width
566     _row_header_w = width;
567     table_resized();
568     redraw();
569 }
570
571 inline int row_header_width() {
572     return(_row_header_w);
573 }
574
575 inline void row_header_color(Fl_Color val) { // set/get row header color
576     _row_header_color = val;
577     redraw();
578 }
579
580 inline Fl_Color row_header_color() {
581     return(_row_header_color);
582 }
583
584 inline void col_header_color(Fl_Color val) { // set/get col header color
585     _col_header_color = val;
586     redraw();
587 }

```

```

657
661 inline Fl_Color col_header_color() {
662     return(_col_header_color);
663 }
664
665 void row_height(int row, int height);          // set row height in pixels
666
667 // Returns the current height of the specified row as a value in pixels.
668 int row_height(int row);
669
670 void col_width(int col, int width);           // set a column's width in pixels
671
672 // Returns the current width of the specified column in pixels.
673 int col_width(int col);
674
675 void row_height_all(int height) {             // set all row/col heights
676     for ( int r=0; r<rows(); r++ ) {
677         row_height(r, height);
678     }
679 }
680
681 void col_width_all(int width) {
682     for ( int c=0; c<cols(); c++ ) {
683         col_width(c, width);
684     }
685 }
686
687 void row_position(int row);                   // set/get table's current scroll position
688 void col_position(int col);
689
690 int row_position() {
691     return(_row_position);
692 }
693
694 int col_position() {
695     return(_col_position);
696 }
697
698 inline void top_row(int row) {                // set/get top row (deprecated)
699     row_position(row);
700 }
701
702 inline int top_row() {
703     return(row_position());
704 }
705
706 int is_selected(int r, int c);               // selected cell
707 void get_selection(int &row_top, int &col_left, int &row_bot, int &col_right);
708 void set_selection(int row_top, int col_left, int row_bot, int col_right);
709 int move_cursor(int R, int C, int shiftselect);
710 int move_cursor(int R, int C);
711 void resize(int X, int Y, int W, int H) FL_OVERRIDE; // fltk resize() FL_OVERRIDE
712
713 // This crashes sortapp() during init.
714 // void box(Fl_Boxtype val) {
715 //     Fl_Group::box(val);
716 //     if ( table ) {
717 //         resize(x(), y(), w(), h());
718 //     }
719 // }
720 // Fl_Boxtype box(void) const {
721 //     return(Fl_Group::box());
722 // }
723
724 // Child group management
725
726 void init_sizes() {
727     table->init_sizes();
728     table->redraw();
729 }
730
731 void add(Fl_Widget& wgt) {
732     table->add(wgt);
733     if ( table->children() > 2 ) {
734         table->show();
735     } else {
736         table->hide();
737     }
738 }
739
740 void add(Fl_Widget* wgt) {
741     add(*wgt);
742 }
743
744 void insert(Fl_Widget& wgt, int n) {
745     table->insert(wgt,n);
746 }
747
748

```

```

791 void insert(Fl_Widget& wgt, Fl_Widget* w2) {
792     table->insert(wgt,w2);
793 }
794
795 void remove(Fl_Widget& wgt) {
796     table->remove(wgt);
797 }
798
799 // (doxygen will substitute Fl_Group's docs here)
800 void begin() {
801     table->begin();
802 }
803
804 // (doxygen will substitute Fl_Group's docs here)
805 void end() {
806     table->end();
807     // HACK: Avoid showing Fl_Scroll; seems to erase screen
808     // causing unnecessary flicker, even if its box() is FL_NO_BOX.
809     //
810     if ( table->children() > 2 ) {
811         table->show();
812     } else {
813         table->hide();
814     }
815     Fl_Group::current(Fl_Group::parent());
816 }
817
818 Fl_Widget*const* array() {
819     return(table->array());
820 }
821
822 Fl_Widget *child(int n)const {
823     return(table->child(n));
824 }
825
826 int children()const {
827     return(table->children()-2);    // -2: skip Fl_Scroll's h/v scrollbar widgets
828 }
829
830 // (doxygen will substitute Fl_Group's docs here)
831 int find(const Fl_Widget *wgt)const {
832     return(table->find(wgt));
833 }
834
835 // (doxygen will substitute Fl_Group's docs here)
836 int find(const Fl_Widget &wgt)const {
837     return(table->find(wgt));
838 }
839
840 // CALLBACKS
841
842 int callback_row() {
843     return(_callback_row);
844 }
845
846 int callback_col() {
847     return(_callback_col);
848 }
849
850 TableContext callback_context() {
851     return(_callback_context);
852 }
853
854 void do_callback(TableContext context, int row, int col) {
855     _callback_context = context;
856     _callback_row = row;
857     _callback_col = col;
858     Fl_Widget::do_callback();
859 }
860
861 #ifdef FL_DOXYGEN
862 void when(Fl_When flags);
863 #endif
864
865 #ifdef FL_DOXYGEN
866 void callback(Fl_Widget*, void*);
867 #endif
868
869 int scrollbar_size()const {
870     return(_scrollbar_size);
871 }
872
873 void scrollbar_size(int newSize) {
874     if ( newSize != _scrollbar_size ) redraw();
875     _scrollbar_size = newSize;
876 }

```

```

1074 void tab_cell_nav(int val) {
1075     if ( val ) flags_ |= TABCELLNAV;
1076     else       flags_ &= ~TABCELLNAV;
1077 }
1078
1086 int tab_cell_nav()const {
1087     return(flags_ & TABCELLNAV ? 1 : 0);
1088 }
1089 };
1090
1091 #endif /*_FL_TABLE_H*/

```

## 34.146 Fl\_Table\_Row.H

```

1 //
2
3 #ifndef _FL_TABLE_ROW_H
4 #define _FL_TABLE_ROW_H
5
6 //
7 // Fl_Table_Row -- A row oriented table widget for the Fast Light Tool Kit (FLTK).
8 //
9 //     A class specializing in a table of rows.
10 //     Handles row-specific selection behavior.
11 //
12 // Copyright 2002 by Greg Ercolano.
13 //
14 // This library is free software. Distribution and use rights are outlined in
15 // the file "COPYING" which should have been included with this file. If this
16 // file is missing or damaged, see the license at:
17 //
18 //     https://www.fltk.org/COPYING.php
19 //
20 // Please see the following page on how to report bugs and issues:
21 //
22 //     https://www.fltk.org/bugs.php
23 //
24
25 #include <FL/Fl_Table.H>
26
44 class FL_EXPORT Fl_Table_Row : public Fl_Table {
45 public:
46     enum TableRowSelectMode {
47         SELECT_NONE,           // no selection allowed
48         SELECT_SINGLE,         // single row selection
49         SELECT_MULTII           // multiple row selection (default)
50     };
51 private:
52     // An STL-ish vector without templates
53     class FL_EXPORT CharVector {
54     char *arr;
55     int _size;
56     void init() {
57         arr = 0;
58         _size = 0;
59     }
60     void copy(char *newarr, int newsz);
61 public:
62     CharVector() {                // CTOR
63         init();
64     }
65     ~CharVector();               // DTOR
66     CharVector(CharVector&o) {     // COPY CTOR
67         init();
68         copy(o.arr, o._size);
69     }
70     CharVector& operator=(CharVector&o) { // ASSIGN
71         init();
72         copy(o.arr, o._size);
73         return(*this);
74     }
75     char operator[](int x)const {
76         return(arr[x]);
77     }
78     char& operator[](int x) {
79         return(arr[x]);
80     }
81     int size() {
82         return(_size);
83     }
84     void size(int count);
85     char pop_back() {
86         char tmp = arr[_size-1];
87         _size--;
88         return(tmp);

```

```

89     }
90     void push_back(char val) {
91         int x = _size;
92         size(_size+1);
93         arr[x] = val;
94     }
95     char back() {
96         return(arr[_size-1]);
97     }
98 };
99
100 CharVector _rowselect;           // selection flag for each row
101
102 // handle() state variables.
103 // Put here instead of local statics in handle(), so more
104 // than one instance can exist without crosstalk between.
105 //
106 int _dragging_select;           // dragging out a selection?
107 int _last_row;
108 int _last_y;                    // last event's Y position
109 int _last_push_x;              // last PUSH event's X position
110 int _last_push_y;             // last PUSH event's Y position
111
112 TableRowSelectMode _selectmode;
113
114 protected:
115     int handle(int event) FL_OVERRIDE;
116     int find_cell(TableContext context,           // find cell's x/y/w/h given r/c
117                  int R, int C, int &X, int &Y, int &W, int &H) {
118         return(Fl_Table::find_cell(context, R, C, X, Y, W, H));
119     }
120
121 public:
122     Fl_Table_Row(int X, int Y, int W, int H, const char *l=0) : Fl_Table(X,Y,W,H,l) {
123         _dragging_select = 0;
124         _last_row        = -1;
125         _last_y          = -1;
126         _last_push_x     = -1;
127         _last_push_y     = -1;
128         _selectmode      = SELECT_MULTI;
129     }
130
131 ~Fl_Table_Row() { }
132
133 void rows(int val) FL_OVERRIDE; // set number of rows
134 int rows() {                  // get number of rows
135     return(Fl_Table::rows());
136 }
137
138 void type(TableRowSelectMode val); // set selection mode
139
140 TableRowSelectMode type() const { // get selection mode
141     return(_selectmode);
142 }
143
144 // Checks to see if 'row' is selected. Returns 1 if selected, 0 if not.
145 int row_selected(int row);
146
147 // Changes the selection state for 'row', depending on the value of 'flag'.
148 int select_row(int row, int flag = 1);
149
150 void select_all_rows(int flag=1); // all rows to a known state
151
152 void clear() FL_OVERRIDE {
153     rows(0);           // implies clearing selection
154     cols(0);
155     Fl_Table::clear(); // clear the table
156 }
157 };
158
159 #endif /*_FL_TABLE_ROW_H*/

```

## 34.147 Fl\_Tabs.H

```

1 //
2 // Tab header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //

```

```

12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Tabs widget . */
19
20 #ifndef Fl_Tabs_H
21 #define Fl_Tabs_H
22
23 #include "Fl_Group.H"
24
25 struct Fl_Menu_Item;
26
27 class FL_EXPORT Fl_Tabs : public Fl_Group {
28     Fl_Widget *push_;
29
30 protected:
31     int overflow_type;
32     int tab_offset;
33     int *tab_pos;
34     int *tab_width;
35     int *tab_flags;
36     int tab_count;
37     Fl_Align tab_align_;
38     int has_overflow_menu;
39
40     void take_focus(Fl_Widget *o);
41     int maybe_do_callback(Fl_Widget *o);
42     void check_overflow_menu();
43     void handle_overflow_menu();
44     void draw_overflow_menu_button();
45
46     int on_insert(Fl_Widget*, int) FL_OVERRIDE;
47     int on_move(int, int) FL_OVERRIDE;
48     void on_remove(int) FL_OVERRIDE;
49
50     virtual void redraw_tabs();
51     virtual int tab_positions(); // allocate and calculate tab positions
52     virtual void clear_tab_positions();
53     virtual void draw_tab(int x1, int x2, int W, int H, Fl_Widget* o, int flags, int sel);
54     virtual int tab_height();
55     virtual int hit_close(Fl_Widget *o, int event_x, int event_y);
56     virtual int hit_overflow_menu(int event_x, int event_y);
57     virtual int hit_tabs_area(int event_x, int event_y);
58
59     void draw() FL_OVERRIDE;
60
61 public:
62     Fl_Tabs(int X, int Y, int W, int H, const char *L = 0);
63     ~Fl_Tabs() FL_OVERRIDE;
64
65     void resize(int, int, int, int) FL_OVERRIDE;
66     void show() FL_OVERRIDE;
67
68     int handle(int) FL_OVERRIDE;
69     Fl_Widget *value();
70     int value(Fl_Widget *);
71
72     Fl_Widget *push() const { return push_; }
73     int push(Fl_Widget *);
74
75     virtual Fl_Widget *which(int event_x, int event_y);
76     void client_area(int &rx, int &ry, int &rw, int &rh, int tabh=0);
77
78     void tab_align(Fl_Align a) { tab_align_ = a; }
79
80     Fl_Align tab_align() const { return tab_align_; }
81
82     enum {
83         OVERFLOW_COMPRESS = 0,
84         OVERFLOW_CLIP,
85         OVERFLOW_PULLDOWN,
86         OVERFLOW_DRAG
87     };
88
89     void handle_overflow(int ov);
90 };
91
92 #endif

```

## 34.148 FL\_Terminal.H File Reference

[FL\\_Terminal](#) widget.

```
#include <FL/Fl.H>
#include <FL/Fl_Window.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Scrollbar.H>
#include <FL/Fl_Rect.H>
#include <stdarg.h>
```

### Classes

- class [FL\\_Terminal::CharStyle](#)
- class [FL\\_Terminal::Cursor](#)
- class [FL\\_Terminal::EscapeSeq](#)
- class [FL\\_Terminal](#)

*Terminal widget supporting Unicode/utf-8, ANSI/xterm escape codes with full RGB color control.*

- class [FL\\_Terminal::Margin](#)
- class [FL\\_Terminal::PartialUtf8Buf](#)
- class [FL\\_Terminal::RingBuffer](#)
- class [FL\\_Terminal::Selection](#)
- class [FL\\_Terminal::Utf8Char](#)

### 34.148.1 Detailed Description

[FL\\_Terminal](#) widget.

## 34.149 FL\_Terminal.H

[Go to the documentation of this file.](#)

```
1 //
2 // FL_Terminal - A terminal widget for Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2022 by Greg Ercolano.
5 // Copyright 2024-2025 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
22 #ifndef FL_Terminal_H
23 #define FL_Terminal_H
24
25 #include <FL/Fl.H>
26 #include <FL/Fl_Window.H>
27 #include <FL/Fl_Group.H>
28 #include <FL/Fl_Scrollbar.H>
29 #include <FL/Fl_Rect.H>
30
31 #include <stdarg.h> // va_list (MinGW)
32
320 class FL_EXPORT FL_Terminal : public FL_Group {
324 public:
332     enum RedrawStyle {
333         NO_REDRAW=0,
334         RATE_LIMITED,
335         PER_WRITE
336     };
337
346     enum Attrib {
347         NORMAL = 0x00,
348         BOLD = 0x01,
```

```

349     DIM          = 0x02,
350     ITALIC       = 0x04,
351     UNDERLINE   = 0x08,
352     _RESERVED_1  = 0x10,
353     INVERSE      = 0x20,
354     _RESERVED_2  = 0x40,
355     STRIKEOUT    = 0x80
356 };
357
362 enum CharFlags {
363     FG_XTERM    = 0x01,
364     BG_XTERM    = 0x02,
365     EOL         = 0x04,
366     RESV_A      = 0x08,
367     RESV_B      = 0x10,
368     RESV_C      = 0x20,
369     RESV_D      = 0x40,
370     RESV_E      = 0x80,
371     COLORMASK   = (FG_XTERM | BG_XTERM)
372 };
373
378 enum OutFlags {
379     OFF          = 0x00,
380     CR_TO_LF     = 0x01,
381     LF_TO_CR     = 0x02,
382     LF_TO_CRLF   = 0x04
383 };
384
389 enum ScrollbarStyle {
390     SCROLLBAR_OFF = 0x00,
391     SCROLLBAR_AUTO = 0x01,
392     SCROLLBAR_ON  = 0x02
393 };
394
400 protected:
401 // Margin Class //////////////////////////////////////
402 //
403 // Class to manage the terminal's margins
404 //
405 class FL_EXPORT Margin {
406     int left_, right_, top_, bottom_;
407 public:
408     Margin(void) { left_ = right_ = top_ = bottom_ = 3; }
409     int left(void) const { return left_; }
410     int right(void) const { return right_; }
411     int top(void) const { return top_; }
412     int bottom(void) const { return bottom_; }
413     void left(int val) { left_ = val; }
414     void right(int val) { right_ = val; }
415     void top(int val) { top_ = val; }
416     void bottom(int val) { bottom_ = val; }
417 };
418
419 // CharStyle Class //////////////////////////////////////
420 //
421 // Class to manage the terminal's character style
422 // This includes the font, color, and some cached internal
423 // info for optimized drawing speed.
424 //
425 class FL_EXPORT CharStyle {
426     uchar attrib_; // bold, underline..
427     uchar charflags_; // CharFlags (xterm color management)
428     Fl_Color fgcolor_; // foreground color for text
429     Fl_Color bgcolor_; // background color for text
430     Fl_Color defaultfgcolor_; // default fg color used by ESC[0m
431     Fl_Color defaultbgcolor_; // default bg color used by ESC[0m
432     Fl_Font fontface_; // font face
433     Fl_Fontsize fontsize_; // font size
434     int fontheight_; // font height (in pixels)
435     int fontdescent_; // font descent (pixels below font baseline)
436     int charwidth_; // width of a fixed width ASCII character
437 public:
438     CharStyle(bool fontsize_defer);
439     uchar attrib(void) const { return attrib_; }
440     uchar charflags(void) const { return charflags_; }
441     // Colors - All access to colors are by Fl_Color only.
442     // There are three ways to SET colors: Fl_Color, rgb, xterm(uchar)
443     //
444     Fl_Color fltk_fg_color(uchar ci);
445     Fl_Color fltk_bg_color(uchar ci);
446     Fl_Color fgcolor(void) const;
447     Fl_Color bgcolor(void) const;
448     Fl_Color defaultfgcolor(void) const { return defaultfgcolor_; }
449     Fl_Color defaultbgcolor(void) const { return defaultbgcolor_; }
450     Fl_Font fontface(void) const { return fontface_; }
451     Fl_Fontsize fontsize(void) const { return fontsize_; }
452     int fontheight(void) const { return fontheight_; }

```

```

453 int fontdescent(void) const { return fontdescent_; }
454 int charwidth(void) const { return charwidth_; }
455 uchar colorbits_only(uchar inflags) const;
456 void attrib(uchar val) { attrib_ = val; }
457 void charflags(uchar val) { charflags_ = val; }
458 void set_charflag(uchar val) { charflags_ |= val; }
459 void clr_charflag(uchar val) { charflags_ &= ~val; }
460 // Non-xterm colors
461 void fgcolor(int r,int g,int b) { fgcolor_ = (r<<24) | (g<<16) | (b<<8); clr_charflag(FG_XTERM); }
462 void bgcolor(int r,int g,int b) { bgcolor_ = (r<<24) | (g<<16) | (b<<8); clr_charflag(BG_XTERM); }
463 void fgcolor(Fl_Color val) { fgcolor_ = val; clr_charflag(FG_XTERM); }
464 void bgcolor(Fl_Color val) { bgcolor_ = val; clr_charflag(BG_XTERM); }
465 // Xterm colors
466 void fgcolor_xterm(Fl_Color val) { fgcolor_ = val; set_charflag(FG_XTERM); }
467 void bgcolor_xterm(Fl_Color val) { bgcolor_ = val; set_charflag(BG_XTERM); }
468 void fgcolor_xterm(uchar val);
469 void bgcolor_xterm(uchar val);
470 //
471 void defaultfgcolor(Fl_Color val) { defaultfgcolor_ = val; }
472 void defaultbgcolor(Fl_Color val) { defaultbgcolor_ = val; }
473 void fontface(Fl_Font val) { fontface_ = val; update(); }
474 void fontsize(Fl_Fonsize val) { fontsize_ = val; update(); }
475 void update(void);
476 void update_fake(void);
477 // SGR MODES: Set Graphics Rendition
478 void sgr_reset(void) { // e.g. ESC[0m
479     attrib(Fl_Terminal::NORMAL);
480     if (charflags() & FG_XTERM) fgcolor_xterm(defaultfgcolor_);
481     else fgcolor(defaultfgcolor_);
482     if (charflags() & BG_XTERM) bgcolor_xterm(defaultbgcolor_);
483     else bgcolor(defaultbgcolor_);
484 }
485 int onoff(bool flag, Attrib a) { return (flag ? (attrib_ | a) : (attrib_ & ~a)); }
486 void sgr_bold(bool val) { attrib_ = onoff(val, Fl_Terminal::BOLD); } // e.g. ESC[1m
487 void sgr_dim(bool val) { attrib_ = onoff(val, Fl_Terminal::DIM); } // e.g. ESC[2m
488 void sgr_italic(bool val) { attrib_ = onoff(val, Fl_Terminal::ITALIC); } // e.g. ESC[3m
489 void sgr_underline(bool val) { attrib_ = onoff(val, Fl_Terminal::UNDERLINE); } // e.g. ESC[3m
490 void sgr_dbl_under(bool val) { attrib_ = onoff(val, Fl_Terminal::UNDERLINE); } // e.g. ESC[21m
491 (TODO!)
492 void sgr_blink(bool val) { (void)val; /* NOT IMPLEMENTED */ } // e.g. ESC[5m
493 void sgr_inverse(bool val) { attrib_ = onoff(val, Fl_Terminal::INVERSE); } // e.g. ESC[7m
494 void sgr_strike(bool val) { attrib_ = onoff(val, Fl_Terminal::STRIKEOUT); } // e.g. ESC[9m
495 };
496 protected:
497 // Cursor Class //////////////////////////////////////
498 //
499 // Class to manage the terminal's cursor position, color, etc.
500 //
501 class FL_EXPORT Cursor {
502     int col_; // cursor's current col (x) position on display
503     int row_; // cursor's current row (y) position on display
504     int h_; // cursor's height (affected by font size)
505     Fl_Color fgcolor_; // cursor's fg color (color of text, if any)
506     Fl_Color bgcolor_; // cursor's bg color
507 public:
508     Cursor(void) {
509         col_ = 0;
510         row_ = 0;
511         h_ = 10;
512         fgcolor_ = 0xfffff000; // wht
513         bgcolor_ = 0x00d00000; // grn
514     }
515     int col(void) const { return col_; }
516     int row(void) const { return row_; }
517     int h(void) const { return h_; }
518     Fl_Color fgcolor(void) const { return fgcolor_; }
519     Fl_Color bgcolor(void) const { return bgcolor_; }
520     void col(int val) { col_ = val >= 0 ? val : 0; }
521     void row(int val) { row_ = val >= 0 ? val : 0; }
522     void h(int val) { h_ = val; }
523     void fgcolor(Fl_Color val) { fgcolor_ = val; }
524     void bgcolor(Fl_Color val) { bgcolor_ = val; }
525     int left(void) { col_ = (col_>0) ? (col_-1) : 0; return col_; }
526     int right(void) { return ++col_; }
527     int up(void) { row_ = (row_>0) ? (row_-1) : 0; return row_; }
528     int down(void) { return ++row_; }
529     bool is_rowcol(int drow,int dcol) const;
530     void scroll(int nrows);
531     void home(void) { row_ = 0; col_ = 0; }
532 };
533
534 // Utf8Char Class //////////////////////////////////////

```

```

535 //
536 // Class to manage the terminal's individual UTF-8 characters.
537 // Includes fg/bg color, attributes (BOLD, UNDERLINE..)
538 //
539 class FL_EXPORT Utf8Char {
540     static const int max_utf8_ = 4; // RFC 3629 paraphrased: In UTF-8, chars are encoded with 1 to 4
    octets
541     char    text_[max_utf8_];      // memory for actual ASCII or UTF-8 byte contents
542     uchar   len_;                  // length of bytes in text_[] buffer; 1 for ASCII, >1 for UTF-8
543     uchar   attrib_;               // attribute bits for this char (bold, underline..)
544     uchar   charflags_;            // CharFlags (xterm colors management)
545     Fl_Color fgcolor_;             // fltk fg color (supports 8color or 24bit color set
w/ESC[37;<r>;<g>;<b>m)
546     Fl_Color bgcolor_;             // fltk bg color (supports 8color or 24bit color set
w/ESC[47;<r>;<g>;<b>m)
547     // Private methods
548     void text_utf8(const char *text, int len);
549     Fl_Color attr_color_(Fl_Color col, const Fl_Widget *grp) const;
550 public:
551     // Public methods
552     Utf8Char(void);                // ctor
553     Utf8Char(const Utf8Char& o);    // copy ctor
554     ~Utf8Char(void);               // dtor
555     Utf8Char& operator=(const Utf8Char& o); // assignment
556     inline int max_utf8()const { return max_utf8_; }
557     void text_utf8(const char *text, int len, const CharStyle& style);
558     void text_ascii(char c, const CharStyle& style);
559     void fl_font_set(const CharStyle& style) const;
560
561     // Return the UTF-8 text string for this character.
562     // Use length() to get number of bytes in string, which will be 1 for ASCII chars.
563     //
564     const char* text_utf8(void)const { return text_; }
565     // Return the attribute for this char
566     uchar attrib(void)const { return attrib_; }
567     uchar charflags(void)const { return charflags_; }
568     Fl_Color fgcolor(void) const;
569     Fl_Color bgcolor(void) const;
570     // Return the length of this character in bytes (UTF-8 can be multibyte..)
571     int length(void)const { return int(len_); }
572     double pwidth(void) const;
573     int pwidth_int(void) const;
574     // Clear the character to a 'space'
575     void clear(const CharStyle& style) { text_utf8(" ", 1, style); charflags_ = 0; attrib_ = 0; }
576     bool is_char(char c)const { return *text_ == c; }
577     void show_char(void)const { ::printf("%.s", len_, text_); }
578     void show_char_info(void)const { ::fprintf(stderr, "UTF-8('%.s', len=%d)\n", len_, text_, len_); }
579     Fl_Color attr_fg_color(const Fl_Widget *grp) const;
580     Fl_Color attr_bg_color(const Fl_Widget *grp) const;
581 };
582
583 // RingBuffer Class //////////////////////////////////////
584 //
585 // Manages ring with indexed row/col and "history" vs. "display" concepts.
586 //
587 class FL_EXPORT RingBuffer {
588     Utf8Char *ring_chars_; // the ring UTF-8 char buffer
589     int ring_rows_;         // #rows in ring total
590     int ring_cols_;         // #columns in ring/hist/disp
591     int nchars_;            // #chars in ring (ring_rows*ring_cols)
592     int hist_rows_;         // #rows in history
593     int hist_use_;          // #rows in use by history
594     int disp_rows_;         // #rows in display
595     int offset_;            // index offset (used for 'scrolling')
596
597 private:
598     void new_copy(int drows, int dcols, int hrows, const CharStyle& style);
599     //DEBUG void write_row(FILE *fp, Utf8Char *u8c, int cols) const {
600     //DEBUG     cols = (cols != 0) ? cols : ring_cols();
601     //DEBUG     for ( int col=0; col<cols; col++, u8c++ ) {
602     //DEBUG         ::fprintf(fp, "%.s", u8c->length(), u8c->text_utf8());
603     //DEBUG     }
604     //DEBUG }
605 public:
606     void clear(void);
607     void clear_hist(void);
608     RingBuffer(void);
609     RingBuffer(int drows, int dcols, int hrows);
610     ~RingBuffer(void);
611
612     // Methods to access ring
613     //
614     // The 'offset' concept allows the 'history' and 'display'
615     // to be scrolled indefinitely. The 'offset' is applied
616     // to all the row accesses, and are clamped to within their bounds.
617     //
618     // For 'raw' access to the ring (without the offset concept),

```

```

619 // use the ring_chars() method, and walk from 0 - ring_rows().
620 //
621 //
622 //      |-----| <- hist_srow() <- ring_srow()
623 //      |   H i s t   |
624 //      |-----|
625 //      |-----| <- hist_erow()
626 //      |   D i s p   | <- disp_srow()
627 //      |-----|
628 //      |-----| <- disp_erow() <- ring_erow()
629 //
630 //
631 //      \-----/
632 //      ring_cols()
633 //      hist_cols()
634 //      disp_cols()
635 //
636 inline int ring_rows(void) const { return ring_rows_; }
637 inline int ring_cols(void) const { return ring_cols_; }
638 inline int ring_srow(void) const { return 0; }
639 inline int ring_erow(void) const { return (ring_rows_ - 1); }
640 inline int hist_rows(void) const { return hist_rows_; }
641 inline int hist_cols(void) const { return ring_cols_; }
642 inline int hist_srow(void) const { return ((offset_ + 0) % ring_rows_); }
643 inline int hist_erow(void) const { return ((offset_ + hist_rows_ - 1) % ring_rows_); }
644 inline int disp_rows(void) const { return disp_rows_; }
645 inline int disp_cols(void) const { return ring_cols_; }
646 inline int disp_srow(void) const { return ((offset_ + hist_rows_) % ring_rows_); }
647 inline int disp_erow(void) const { return ((offset_ + hist_rows_ + disp_rows_ - 1) % ring_rows_); }
648 inline int offset(void) const { return offset_; }
649 void offset_adjust(int rows);
650 void hist_rows(int val) { hist_rows_ = val; }
651 void disp_rows(int val) { disp_rows_ = val; }
652
653 // History use
654 inline int hist_use(void) const { return hist_use_; }
655 inline void hist_use(int val) { hist_use_ = val; }
656 inline int hist_use_srow(void) const { return ((offset_ + hist_rows_ - hist_use_) % ring_rows_); }
657 inline Utf8Char *ring_chars(void) { return ring_chars_; } // access ring buffer directly
658 inline Utf8Char *ring_chars(void) const { return ring_chars_; } // access ring buffer directly
659
660 bool is_hist_ring_row(int grow) const;
661 bool is_disp_ring_row(int grow) const;
662 //DEBUG void show_ring_info(void) const;
663 void move_disp_row(int src_row, int dst_row);
664 void clear_disp_rows(int sdrow, int edrow, const CharStyle& style);
665 void scroll(int rows, const CharStyle& style);
666
667 const Utf8Char* u8c_ring_row(int row) const;
668 const Utf8Char* u8c_hist_row(int hrow) const;
669 const Utf8Char* u8c_hist_use_row(int hurow) const;
670 const Utf8Char* u8c_disp_row(int drow) const;
671 // Non-const versions of the above methods
672 // Using "Effective C++" ugly-as-hell syntax technique.
673 //
674 Utf8Char* u8c_ring_row(int row);
675 Utf8Char* u8c_hist_row(int hrow);
676 Utf8Char* u8c_hist_use_row(int hurow);
677 Utf8Char* u8c_disp_row(int drow);
678
679 void create(int drows, int dcols, int hrows);
680 void resize(int drows, int dcols, int hrows, const CharStyle& style);
681
682 void change_disp_rows(int drows, const CharStyle& style);
683 void change_disp_cols(int dcols, const CharStyle& style);
684 };
685
686 // Selection Class //////////////////////////////////////
687 //
688 // Class to manage mouse selection
689 //
690 class FL_EXPORT Selection {
691     FL_Terminal *terminal_;
692     int srow_, scol_, erow_, ecol_; // selection start/end. NOTE: start *might* be > end
693     int push_row_, push_col_; // global row/col for last FL_PUSH
694     bool push_char_right_;
695     FL_Color selectionbgcolor_;
696     FL_Color selectionfgcolor_;
697     int state_; // 0=none, 1=started, 2=extended, 3=done
698     bool is_selection_; // false: no selection
699 public:
700     Selection(FL_Terminal *terminal);
701     int srow(void) const { return srow_; }
702     int scol(void) const { return scol_; }
703     int erow(void) const { return erow_; }
704     int ecol(void) const { return ecol_; }
705     void push_clear() { push_row_ = push_col_ = -1; push_char_right_ = false; }

```

```

706 void push_rowcol(int row,int col,bool char_right) {
707     push_row_ = row; push_col_ = col; push_char_right_ = char_right; }
708 void start_push() { start(push_row_, push_col_, push_char_right_); }
709 bool dragged_off(int row,int col,bool char_right) {
710     return (push_row_ != row) || (push_col_+push_char_right_ != col+char_right); }
711 void selectionfgcolor(Fl_Color val) { selectionfgcolor_ = val; }
712 void selectionbgcolor(Fl_Color val) { selectionbgcolor_ = val; }
713 Fl_Color selectionfgcolor(void) const { return selectionfgcolor_; }
714 Fl_Color selectionbgcolor(void) const { return selectionbgcolor_; }
715 bool is_selection(void) const { return is_selection_; }
716 bool get_selection(int &srow,int &scol,int &erow,int &ecol) const; // guarantees return (start <
end)
717 bool start(int row, int col, bool char_right);
718 bool extend(int row, int col, bool char_right);
719 void end(void);
720 void select(int srow, int scol, int erow, int ecol);
721 bool clear(void);
722 int state(void) const { return state_; }
723 void scroll(int nrows);
724 };
725
726 // EscapeSeq Class //////////////////////////////////////
727 //
728 // Class to handle parsing ESC sequences
729 //
730 // Holds all state information for parsing esc sequences,
731 // so sequences can span multiple block read(2) operations, etc.
732 // Handling of parsed sequences is NOT handled in this class,
733 // just the parsing of the sequences and managing generic integers.
734 //
735 class FL_EXPORT EscapeSeq {
736 public:
737     // EscapeSeq Constants
738     // Maximums
739     static const int maxbuff = 80; // character buffer
740     static const int maxvals = 20; // integer value buffer
741     // Return codes
742     static const int success = 0; // operation succeeded
743     static const int fail = -1; // operation failed
744     static const int completed = 1; // multi-step operation completed successfully
745 private:
746     char esc_mode_; // escape parsing mode state
747     char csi_; // This is an ESC[.. sequence (Ctrl Seq Introducer)
748     char buff_[maxbuff]; // escape sequence being parsed
749     char *buffp_; // parsing ptr into buff[]
750     char *buffendp_; // end of buff[] (ptr to last valid buff char)
751     char *valbuffp_; // pointer to first char in buff of integer being parsed
752     int vals_[maxvals]; // value array for parsing #'s in ESC[##;#..
753     int vali_; // parsing index into vals[], 0 if none
754     int save_row_, save_col_; // used by ESC[s/u for save/restore
755
756     int append_buff(char c);
757     int append_val(void);
758
759 public:
760     EscapeSeq(void);
761     void reset(void);
762     char esc_mode(void) const;
763     void esc_mode(char val);
764     int total_vals(void) const;
765     int val(int i) const;
766     int defvalmax(int dval, int max) const;
767     bool parse_in_progress(void) const;
768     bool is_csi(void) const;
769     int parse(char c);
770     void save_cursor(int row, int col);
771     void restore_cursor(int &row, int &col);
772 };
773
774 // Partial UTF-8 Buffer Class //////////////////////////////////////
775 //
776 // Class to manage buffering partial UTF-8 characters between write calls.
777 //
778 class FL_EXPORT PartialUtf8Buf {
779     char buf_[10]; // buffer partial UTF-8 encoded char
780     int buflen_; // length of buffered UTF-8 encoded char
781     int clen_; // final byte length of a UTF-8 char
782 public:
783     void clear(void) { buflen_ = clen_ = 0; } // clear the buffer
784     PartialUtf8Buf(void) { clear(); } // Ctor
785     // Is byte 'c' in the middle of a UTF-8 encoded byte sequence?
786     bool is_continuation(char c) {
787         //      Byte 1      Byte 2      Byte 3      ..etc..
788         // ASCII:  0xxxxxxx
789         // UTF8(2): 110xxxxx 10xxxxxx
790         // UTF8(3): 1110xxxx 10xxxxxx 10xxxxxx
791         // UTF8(4): 11110xxx 10xxxxxx 10xxxxxx 10xxxxxx

```

```

792 // UTF8(5): 111110xx 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx
793 // UTF8(6): 1111110x 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx 10xxxxxx
794 //           \_____/ \_____/ \_____/ \_____/ \_____/
795 //           Start byte Continuation bytes
796 //           (c & 0xc0) == 0x80
797 return ((c & 0xc0) == 0x80);
798 }
799 // Access buffer
800 const char* buf(void) const { return buf_; }
801 // Access buffer length
802 int buflen(void) const { return buflen_; }
803 // Append bytes of a partial UTF-8 string to the buffer.
804 //
805 // Returns:
806 // - true if done OK. Use is_complete() to see if a complete char received.
807 // - false if buffer overrun occurred, class is clear()ed.
808 //
809 // An appropriate response to 'false' would be to print the
810 // "unknown character" and skip all subsequent UTF-8 continuation chars.
811 //
812 bool append(const char* p, int len) {
813     if (len <= 0) return true; // ignore silly requests: say we did but dont
814     if (buflen_ + len >= (int)sizeof(buf_)) // overrun check
815         { clear(); return false; } // clear self, return false
816     if (!buflen_) clen_ = fl_utf8len(*p); // first byte? save char len for later
817     while (len > 0) { buf_[buflen_++] = *p++; len--; } // append byte to buffer
818     return true;
819 }
820 bool is_complete(void) const { return (buflen_ && (buflen_ == clen_)); }
821 };
822
823 public:
824 Fl_Scrollbar *scrollbar; // vertical scrollbar (value: rows above disp_chars[])
825 Fl_Scrollbar *hscrollbar; // horizontal scrollbar
826 private:
827 // Special utf8 symbols
828 const char *error_char_; // utf8 string shown for invalid utf8, bad ANSI, etc
829 bool fontsize_defer_; // flag defers font calcs until first draw() (issue 837)
830 int scrollbar_size_; // local preference for scrollbar size
831 ScrollbarStyle hscrollbar_style_;
832 CharStyle *current_style_; // current font, attrib, color..
833 OutFlags oflags_; // output translation flags (CR_TO_LF, LF_TO_CR, LF_TO_CRLF)
834
835 // A ring buffer is used for the terminal's history (hist) and display (disp) buffer.
836 // See README-Fl_Terminal.txt, section "RING BUFFER DESCRIPTION" for diagrams/info.
837 //
838 // Ring buffer
839 RingBuffer ring_; // terminal history/display ring buffer
840 Cursor cursor_; // terminal cursor (position, color, etc)
841 Margin margin_; // terminal margins (top,left,bottom,right)
842 Selection select_; // mouse selection
843 EscapeSeq escseq_; // Escape sequence parsing (ESC[ xterm/vt100)
844 bool show_unknown_; // if true, show unknown chars as '?' (default off)
845 bool ansi_; // if true, parse ansi codes (default on)
846 char *tabstops_; // array of tab stops (0|1) \__ TODO: This should probably
847 int tabstops_size_; // size of tabstops[] array / be a class "TabStops".
848 Fl_Rect scrn_; // terminal screen xywh inside box(), margins, and scrollbar
849 int autoscroll_dir_; // 0=autoscroll timer off, 3=scrolling up, 4=scrolling down
850 int autoscroll_amt_; // #pixels above or below edge, used for autoscroll speed
851 RedrawStyle redraw_style_; // NO_REDRAW, RATE_LIMITED, PER_WRITE
852 float redraw_rate_; // maximum redraw rate in seconds, default=0.10
853 bool redraw_modified_; // display modified; used by update_cb() to rate limit redraws
854 bool redraw_timer_; // if true, redraw timer is running
855 PartialUtf8Buf pub_; // handles Partial Utf8 Buffer (pub)
856
857 protected:
858 // Ring buffer management
859 const Utf8Char* u8c_ring_row(int grow) const;
860 const Utf8Char* u8c_hist_row(int hrow) const;
861 const Utf8Char* u8c_hist_use_row(int hrow) const;
862 const Utf8Char* u8c_disp_row(int drow) const;
863 // Non-const versions of the above.
864 // "Effective C++" says: implement non-const method to cast away const
865 //
866 Utf8Char* u8c_ring_row(int grow);
867 Utf8Char* u8c_hist_row(int hrow);
868 Utf8Char* u8c_hist_use_row(int hrow);
869 Utf8Char* u8c_disp_row(int drow);
870 Utf8Char* u8c_cursor(void);
871 private:
872 void create_ring(int drows, int dcols, int hrows);
873 void init_(int X, int Y, int W, int H, const char*L, int rows, int cols, int hist, bool fontsize_defer);
874 // Tabstops
875 void init_tabstops(int newsize);
876 void default_tabstops(void);
877 void clear_all_tabstops(void);
878 void set_tabstop(void);

```

```

907 void clear_tabstop(void);
908 // Updates
909 void update_screen_xywh(void);
910 void update_screen(bool font_changed);
911 void set_scrollbar_params(Fl_Scrollbar* scrollbar, int min, int max);
912 void update_scrollbar(void);
913 // Resize
914 void resize_display_rows(int drows);
915 void resize_display_columns(int dcols);
916 void refit_disp_to_screen(void);
917 // Callbacks
918 static void scrollbar_cb(Fl_Widget*, void*); // scrollbar manipulation
919 static void autoscroll_timer_cb(void*); // mouse drag autoscroll
920 void autoscroll_timer_cb2(void);
921 static void redraw_timer_cb(void*); // redraw rate limiting timer
922 void redraw_timer_cb2(void);
923
924 // Screen management
925 protected:
926 CharStyle& current_style(void) const;
927 void current_style(const CharStyle& sty);
928 private:
929 int x_to_glob_col(int X, int grow, int &gcol, bool &gcr) const;
930 int xy_to_glob_rowcol(int X, int Y, int &grow, int &gcol, bool &gcr) const;
931 protected:
932 int w_to_col(int W) const;
933 int h_to_row(int H) const;
934 // API: Display clear operations
935 void clear_sod(void);
936 void clear_eod(void);
937 void clear_eol(void);
938 void clear_sol(void);
939 void clear_line(int row);
940 void clear_line(void);
941 const Utf8Char* walk_selection(const Utf8Char *u8c, int &row, int &col) const;
942 bool get_selection(int &srow, int &scol, int &erow, int &ecol) const;
943 bool is_selection(void) const;
944 bool is_inside_selection(int row, int col) const;
945 private:
946 bool is_hist_ring_row(int grow) const;
947 bool is_disp_ring_row(int grow) const;
948 public:
949 int selection_text_len(void) const;
950 const char* selection_text(void) const;
951 protected:
952 void clear_mouse_selection(void);
953 bool selection_extend(int X, int Y);
954 void select_word(int grow, int gcol);
955 void select_line(int grow);
956 void scroll(int rows);
957 void insert_rows(int count);
958 void delete_rows(int count);
959 void insert_char_eol(char c, int drow, int dcol, int rep);
960 void insert_char(char c, int rep);
961 void delete_chars(int drow, int dcol, int rep);
962 void delete_chars(int rep);
963 public:
964 // API: Terminal operations
965 void clear(void);
966 void clear(Fl_Color val);
967 void clear_screen(bool scroll_to_hist=true); // ESC [ 2 J
968 void clear_screen_home(bool scroll_to_hist=true); // ESC [ H ESC [ 2 J
969 void clear_history(void); // ESC [ 3 J
970 void reset_terminal(void); // ESC c
971 void cursor_home(void); // ESC [ 0 H
972 // API: Cursor
973 void cursorfgcolor(Fl_Color val);
974 void cursorbgbcolor(Fl_Color val);
975 Fl_Color cursorfgcolor(void) const;
976 Fl_Color cursorbgbcolor(void) const;
977 protected:
978 void cursor_row(int row);
979 void cursor_col(int col);
980 public:
981 int cursor_row(void) const;
982 int cursor_col(void) const;
983 protected:
984 void cursor_up(int count=1, bool do_scroll=false);
985 void cursor_down(int count=1, bool do_scroll=false);
986 void cursor_left(int count=1);
987 void cursor_right(int count=1, bool do_scroll=false);
988 void cursor_eol(void);
989 void cursor_sol(void);
990 void cursor_cr(void);
991 void cursor_crlf(int count=1);
992 void cursor_tab_right(int count=1);
993 void cursor_tab_left(int count=1);

```

```

994 void save_cursor(void);
995 void restore_cursor(void);
996 // Output translation
997 public:
998 void output_translate(FL_Terminal::OutFlags val);
999 FL_Terminal::OutFlags output_translate(void) const;
1000 private:
1001 void handle_lf(void);
1002 void handle_cr(void);
1003 void handle_esc(void);
1004 // Printing
1005 void handle_ctrl(char c);
1006 bool is_printable(char c);
1007 bool is_ctrl(char c);
1008 void handle_SGR(void);
1009 void handle DECRARA(void);
1010 void handle_escseq(char c);
1011 // --
1012 void display_modified(void);
1013 void display_modified_clear(void);
1014 void clear_char_at_disp(int drow, int dcol);
1015 const Utf8Char* utf8_char_at_disp(int drow, int dcol) const;
1016 const Utf8Char* utf8_char_at_glob(int grow, int gcol) const;
1017 void repeat_char(char c, int rep);
1018 void utf8_cache_clear(void);
1019 void utf8_cache_flush(void);
1020 // API: Character display output
1021 public:
1022 void plot_char(const char *text, int len, int drow, int dcol);
1023 void plot_char(char c, int drow, int dcol);
1024 void print_char(const char *text, int len=-1);
1025 void print_char(char c);
1026 // API: String display output
1027 void append_utf8(const char *buf, int len=-1);
1028 void append_ascii(const char *s);
1029 void append(const char *s, int len=-1);
1030 protected:
1031 int handle_unknown_char(void);
1032 int handle_unknown_char(int drow, int dcol);
1033 // Drawing
1034 void draw_row_bg(int grow, int X, int Y) const;
1035 void draw_row(int grow, int Y) const;
1036 void draw_buff(int Y) const;
1037 private:
1038 void handle_selection_autoscroll(void);
1039 int handle_selection(int e);
1040 public:
1041 // FLTK: draw(), resize(), handle()
1042 void draw(void) FL_OVERRIDE;
1043 void resize(int X,int Y,int W,int H) FL_OVERRIDE;
1044 int handle(int e) FL_OVERRIDE;
1045 const char* text(bool lines_below_cursor=false) const;
1046
1047 protected:
1048 // Internal short names
1049 // Don't make these public, but allow internals and
1050 // derived classes to maintain brevity.
1051 //
1052 inline int ring_rows(void) const { return ring_.ring_rows(); }
1053 inline int ring_cols(void) const { return ring_.ring_cols(); }
1054 inline int ring_srow(void) const { return ring_.ring_srow(); }
1055 inline int ring_erow(void) const { return ring_.ring_erow(); }
1056 inline int hist_rows(void) const { return ring_.hist_rows(); }
1057 inline int hist_cols(void) const { return ring_.hist_cols(); }
1058 inline int hist_srow(void) const { return ring_.hist_srow(); }
1059 inline int hist_erow(void) const { return ring_.hist_erow(); }
1060 inline int hist_use(void) const { return ring_.hist_use(); }
1061 inline int hist_use_srow(void) const { return ring_.hist_use_srow(); }
1062 inline int disp_rows(void) const { return ring_.disp_rows(); }
1063 inline int disp_cols(void) const { return ring_.disp_cols(); }
1064 inline int disp_srow(void) const { return ring_.disp_srow(); }
1065 inline int disp_erow(void) const { return ring_.disp_erow(); }
1066 inline int offset(void) const { return ring_.offset(); }
1067
1068 // TODO: CLEAN UP WHAT'S PUBLIC, AND WHAT SHOULD BE 'PROTECTED' AND 'PRIVATE'
1069 // Some of the public stuff should, quite simply, "not be".
1070
1071 // API: Terminal features
1072 public:
1073 // API: Scrollbar
1074 int scrollbar_size(void) const;
1075 void scrollbar_size(int val);
1076 int scrollbar_actual_size(void) const;
1077 void hscrollbar_style(ScrollbarStyle val);
1078 ScrollbarStyle hscrollbar_style(void) const;
1079 // API: History
1080 int history_rows(void) const;

```

```

1096 void history_rows(int val);
1097 int history_use(void) const;
1098 // API: Display
1099 int display_rows(void) const;
1100 void display_rows(int val);
1101 int display_columns(void) const;
1102 void display_columns(int val);
1103 // API: Box
1111 void box(Fl_Boxtype val) { Fl_Group::box(val); update_screen(false); }
1113 Fl_Boxtype box(void) const { return Fl_Group::box(); }
1114 // API: Margins
1116 int margin_left(void) const { return margin_.left(); }
1118 int margin_right(void) const { return margin_.right(); }
1120 int margin_top(void) const { return margin_.top(); }
1122 int margin_bottom(void) const { return margin_.bottom(); }
1123 void margin_left(int val);
1124 void margin_right(int val);
1125 void margin_top(int val);
1126 void margin_bottom(int val);
1127 // API: Text font/size/color
1128 void textfont(Fl_Font val);
1129 void textsize(Fl_Fontsize val);
1130 void textcolor(Fl_Color val);
1131 void color(Fl_Color val);
1132 void textfgcolor(Fl_Color val);
1133 void textbgcolor(Fl_Color val);
1134 void textfgcolor_default(Fl_Color val);
1135 void textbgcolor_default(Fl_Color val);
1137 Fl_Font textfont(void) const { return current_style_>fontface(); }
1139 Fl_Fontsize textsize(void) const { return current_style_>fontsize(); }
1141 Fl_Color color(void) const { return Fl_Group::color(); }
1143 Fl_Color textcolor(void) const { return textfgcolor_default(); }
1145 Fl_Color textfgcolor(void) const { return current_style_>fgcolor(); }
1147 Fl_Color textbgcolor(void) const { return current_style_>bgcolor(); }
1149 Fl_Color textfgcolor_default(void) const { return current_style_>defaultfgcolor(); }
1151 Fl_Color textbgcolor_default(void) const { return current_style_>defaultbgcolor(); }
1152 void textfgcolor_xterm(uchar val);
1153 void textbgcolor_xterm(uchar val);
1155 void selectionfgcolor(Fl_Color val) { select_.selectionfgcolor(val); }
1157 void selectionbgcolor(Fl_Color val) { select_.selectionbgcolor(val); }
1159 Fl_Color selectionfgcolor(void) const { return select_.selectionfgcolor(); }
1161 Fl_Color selectionbgcolor(void) const { return select_.selectionbgcolor(); }
1162 // API: Text attrib
1163 void textattrib(uchar val);
1164 uchar textattrib() const;
1165 // API: Redraw style/rate
1166 RedrawStyle redraw_style(void) const;
1167 void redraw_style(RedrawStyle val);
1168 private:
1169 bool is_redraw_style(RedrawStyle val) { return redraw_style_ == val; }
1170 public:
1171 float redraw_rate(void) const;
1172 void redraw_rate(float val);
1173 // API: Show unknown/invalid utf8/ANSI sequences with an error character (z).
1174 bool show_unknown(void) const;
1175 void show_unknown(bool val);
1179 void error_char(const char* val) { error_char_ = val; }
1182 const char* error_char(void) const { return error_char_; }
1183 // API: ANSI sequences
1184 bool ansi(void) const;
1185 void ansi(bool val);
1186 // Fl_Simple_Terminal API compatibility
1187 int history_lines(void) const;
1188 void history_lines(int val);
1189 // API: printf()
1190 void printf(const char *fmt, ...);
1191 void vprintf(const char *fmt, va_list ap);
1192 // Ctor
1193 Fl_Terminal(int X,int Y,int W,int H,const char*L=0);
1194 Fl_Terminal(int X,int Y,int W,int H,const char*L,int rows,int cols,int hist);
1195 // Dtor
1196 ~Fl_Terminal(void);
1197 // Debugging features
1198 //DEBUG void show_ring_info() const { ring_.show_ring_info(); }
1199 //DEBUG void write_row(FILE *fp, Utf8Char *u8c, int cols) const;
1200 //DEBUG void show_buffers(RingBuffer *a, RingBuffer *b=0) const;
1201 };
1202 #endif

```

## 34.150 Fl\_Text\_Buffer.H

```

1 //
2 // Header file for Fl_Text_Buffer class.
3 //
4 // Copyright 2001-2023 by Bill Spitzak and others.

```

```

5 // Original code Copyright Mark Edel.    Permission to distribute under
6 // the LGPL for the FLTK library granted by Mark Edel.
7 //
8 // This library is free software.  Distribution and use rights are outlined in
9 // the file "COPYING" which should have been included with this file.    If this
10 // file is missing or damaged, see the license at:
11 //
12 //     https://www.fltk.org/COPYING.php
13 //
14 // Please see the following page on how to report bugs and issues:
15 //
16 //     https://www.fltk.org/bugs.php
17 //
18
19 /* \file
20 Fl_Text_Buffer, Fl_Text_Selection widget .  */
21
22 #ifndef FL_TEXT_BUFFER_H
23 #define FL_TEXT_BUFFER_H
24
25 #include <stdarg.h>    /* va_list */
26 #include "fl_attr.h"  /* Doxygen can't find <FL/fl_attr.h> */
27
28 #undef ASSERT_UTF8
29
30 #ifdef ASSERT_UTF8
31 # include <assert.h>
32 # define IS_UTF8_ALIGNED(a) if (a && *a) assert(fl_utf8len(*a)>0);
33 # define IS_UTF8_ALIGNED2(a, b) if (b>=0 && b<a->length()) assert(fl_utf8len(a->byte_at(b))>0);
34 #else
35 # define IS_UTF8_ALIGNED(a)
36 # define IS_UTF8_ALIGNED2(a, b)
37 #endif
38
39
40 /*
41 "character size" is the size of a UTF-8 character in bytes
42 "character width" is the width of a Unicode character in pixels
43 "column" was originally defined as a character offset from the left margin.
44 It was identical to the byte offset.  In UTF-8, we have neither a byte offset
45 nor truly fixed width fonts (*).  Column could be a pixel value multiplied with
46 an average character width (which is a bearable approximation).
47
48 * in Unicode, there are no fixed width fonts!  Even if the ASCII characters may
49 happen to be all the same width in pixels, Chinese characters surely are not.
50 There are plenty of exceptions, like ligatures, that make special handling of
51 "fixed" character widths a nightmare.  I decided to remove all references to
52 fixed fonts and see "columns" as a multiple of the average width of a
53 character in the main font.
54 - Matthias
55 */
56
57
58 /* Maximum length in characters of a tab or control character expansion
59 of a single buffer character */
60 #define FL_TEXT_MAX_EXP_CHAR_LEN 20
61
62 #include "Fl_Export.H"
63
64 class Fl_Text_Undo_Action_List;
65 class Fl_Text_Undo_Action;
66
67 class FL_EXPORT Fl_Text_Selection {
68     friend class Fl_Text_Buffer;
69
70 public:
71     // Sets the selection range and selected().
72     void set(int startpos, int endpos);
73
74     // Updates a selection after text was modified.
75     void update(int pos, int nDeleted, int nInserted);
76
77     int start()const { return mSelected ? mStart : 0; }
78
79     int end()const { return mSelected ? mEnd : 0; }
80
81     bool selected()const { return mSelected; }
82
83     void selected(bool b) { mSelected = b; }
84
85     int length()const { return mSelected ? mEnd - mStart : 0; }
86
87     // Returns true if position \p pos is in this Fl_Text_Selection.
88     int includes(int pos) const;
89
90     // Returns true if selected() and the positions of this selection.

```

```

169 int selected(int *startpos, int *endpos) const;
170 FL_DEPRECATED("since 1.4.0 - use selected(startpos, endpos) instead",
171 int position(int *startpos, int *endpos) const) { return selected(startpos, endpos); }
172
173 protected:
174
175 int mStart;
176 int mEnd;
177 bool mSelected;
178 };
179
180
181 typedef void (*Fl_Text_Modify_Cb)(int pos, int nInserted, int nDeleted,
182 int nRestyled, const char* deletedText,
183 void* cbArg);
184
185
186 typedef void (*Fl_Text_Predelete_Cb)(int pos, int nDeleted, void* cbArg);
187
188
201 class FL_EXPORT Fl_Text_Buffer {
202 public:
203
212 Fl_Text_Buffer(int requestedSize = 0, int preferredGapSize = 1024);
213
217 ~Fl_Text_Buffer();
218
223 int length()const { return mLength; }
224
231 char* text() const;
232
237 void text(const char* text);
238
249 char* text_range(int start, int end) const;
250
257 unsigned int char_at(int pos) const;
258
265 char byte_at(int pos) const;
266
272 const char *address(int pos)const
273 { return (pos < mGapStart) ? mBuf+pos : mBuf+pos+mGapEnd-mGapStart; }
274
280 char *address(int pos)
281 { return (pos < mGapStart) ? mBuf+pos : mBuf+pos+mGapEnd-mGapStart; }
282
289 void insert(int pos, const char* text, int insertedLength = -1);
290
296 void append(const char* t, int addedLength = -1) { insert(length(), t, addedLength); }
297
298 void vprintf(const char *fmt, va_list ap);
299 void printf(const char* fmt, ...);
300
306 void remove(int start, int end);
307
316 void replace(int start, int end, const char *text, int insertedLength = -1);
317
325 void copy(Fl_Text_Buffer* fromBuf, int fromStart, int fromEnd, int toPos);
326
331 int undo(int *cp=0);
332
337 bool can_undo() const;
338
342 int redo(int *cp=0);
343
348 bool can_redo() const;
349
357 void canUndo(char flag=1);
358
374 int insertfile(const char *file, int pos, int buflen = 128*1024);
375
379 int appendfile(const char *file, int buflen = 128*1024)
380 { return insertfile(file, length(), buflen); }
381
385 int loadfile(const char *file, int buflen = 128*1024)
386 { select(0, length()); remove_selection(); return appendfile(file, buflen); }
387
398 int outputfile(const char *file, int start, int end, int buflen = 128*1024);
399
410 int savefile(const char *file, int buflen = 128*1024)
411 { return outputfile(file, 0, length(), buflen); }
412
419 int tab_distance()const { return mTabDist; }
420
425 void tab_distance(int tabDist);
426
430 void select(int start, int end);
431

```

```
435 int selected()const { return mPrimary.selected(); }
436
440 void unselect();
441
445 int selection_position(int* start, int* end);
446
452 char* selection_text();
453
457 void remove_selection();
458
462 void replace_selection(const char* text);
463
467 void secondary_select(int start, int end);
468
473 int secondary_selected() { return mSecondary.selected(); }
474
478 void secondary_unselect();
479
483 int secondary_selection_position(int* start, int* end);
484
490 char* secondary_selection_text();
491
496 void remove_secondary_selection();
497
502 void replace_secondary_selection(const char* text);
503
507 void highlight(int start, int end);
508
512 int highlight() { return mHighlight.selected(); }
513
517 void unhighlight();
518
522 int highlight_position(int* start, int* end);
523
529 char* highlight_text();
530
542 void add_modify_callback(Fl_Text_Modify_Cb bufModifiedCB, void* cbArg);
543
547 void remove_modify_callback(Fl_Text_Modify_Cb bufModifiedCB, void* cbArg);
548
553 void call_modify_callbacks() { call_modify_callbacks(0, 0, 0, 0, 0); }
554
558 void add_predelete_callback(Fl_Text_Predelete_Cb bufPredelCB, void* cbArg);
559
564 void remove_predelete_callback(Fl_Text_Predelete_Cb predelCB, void* cbArg);
565
570 void call_predelete_callbacks() { call_predelete_callbacks(0, 0); }
571
580 char* line_text(int pos) const;
581
587 int line_start(int pos) const;
588
596 int line_end(int pos) const;
597
603 int word_start(int pos) const;
604
610 int word_end(int pos) const;
611
619 int count_displayed_characters(int lineStartPos, int targetPos) const;
620
630 int skip_displayed_characters(int lineStartPos, int nChars);
631
636 int count_lines(int startPos, int endPos) const;
637
643 int estimate_lines(int startPos, int endPos, int lineLen) const;
644
649 int skip_lines(int startPos, int nLines);
650
657 int rewind_lines(int startPos, int nLines);
658
673 int findchar_forward(int startPos, unsigned searchChar, int* foundPos) const;
674
688 int findchar_backward(int startPos, unsigned int searchChar, int* foundPos) const;
689
701 int search_forward(int startPos, const char* searchString, int* foundPos,
702                   int matchCase = 0) const;
703
715 int search_backward(int startPos, const char* searchString, int* foundPos,
716                   int matchCase = 0) const;
717
721 const Fl_Text_Selection* primary_selection()const { return &mPrimary; }
722
726 Fl_Text_Selection* primary_selection() { return &mPrimary; }
727
731 const Fl_Text_Selection* secondary_selection()const { return &mSecondary; }
732
736 const Fl_Text_Selection* highlight_selection()const { return &mHighlight; }
```

```

737
742 int prev_char(int ix) const;
743 int prev_char_clipped(int ix) const;
744
749 int next_char(int ix) const;
750 int next_char_clipped(int ix) const;
751
755 int utf8_align(int) const;
756
760 int input_file_was_transcoded;
761
765 static const char* file_encoding_warning_message;
766
776 void (*transcoding_warning_action)(Fl_Text_Buffer*);
777 bool is_word_separator(int pos) const;
778
779 protected:
780
785 void call_modify_callbacks(int pos, int nDeleted, int nInserted,
786                             int nRestyled, const char* deletedText) const;
787
792 void call_predelete_callbacks(int pos, int nDeleted) const;
793
804 int insert_(int pos, const char* text, int insertedLength = -1);
805
812 void remove_(int start, int end);
813
818 void redisplay_selection(Fl_Text_Selection* oldSelection,
819                          Fl_Text_Selection* newSelection) const;
820
824 void move_gap(int pos);
825
830 void reallocate_with_gap(int newGapStart, int newGapLen);
831
832 char* selection_text_(Fl_Text_Selection* sel) const;
833
837 void remove_selection_(Fl_Text_Selection* sel);
838
842 void replace_selection_(Fl_Text_Selection* sel, const char* text);
843
847 void update_selections(int pos, int nDeleted, int nInserted);
848
852 int apply_undo(Fl_Text_Undo_Action* action, int* cursorPos);
853
854 Fl_Text_Selection mPrimary;
855 Fl_Text_Selection mSecondary;
856 Fl_Text_Selection mHighlight;
857 int mLength;
860 char* mBuf;
861 int mGapStart;
862 int mGapEnd;
863 // The hardware tab distance used by all displays for this buffer,
864 // and used in computing offsets for rectangular selection operations.
865 int mTabDist;
866 int mNModifyProcs;
867 Fl_Text_Modify_Cb *mModifyProcs;
869 void** mCbArgs;
870 int mNPredeleteProcs;
871 Fl_Text_Predelete_Cb *mPredeleteProcs;
873 void **mPredeleteCbArgs;
874 int mCursorPosHint;
876 char mCanUndo;
878 int mPreferredGapSize;
881 Fl_Text_Undo_Action* mUndo;
882 Fl_Text_Undo_Action_List* mUndoList;
883 Fl_Text_Undo_Action_List* mRedoList;
884 };
885
886 #endif

```

## 34.151 Fl\_Text\_Display.H

```

1 //
2 // Header file for Fl_Text_Display class.
3 //
4 // Copyright 2001-2023 by Bill Spitzak and others.
5 // Original code Copyright Mark Edel.    Permission to distribute under
6 // the LGPL for the FLTK library granted by Mark Edel.
7 //
8 // This library is free software.  Distribution and use rights are outlined in
9 // the file "COPYING" which should have been included with this file.  If this
10 // file is missing or damaged, see the license at:
11 //
12 //     https://www.fltk.org/COPYING.php
13 //

```

```

14 // Please see the following page on how to report bugs and issues:
15 //
16 //      https://www.fltk.org/bugs.php
17 //
18
19 /* \file
20 Fl_Text_Display widget . */
21
22 #ifndef FL_TEXT_DISPLAY_H
23 #define FL_TEXT_DISPLAY_H
24
25 #include <FL/Fl.H>                // Fl::scrollbar_size()
26 #include "fl_draw.H"
27 #include "Fl_Group.H"
28 #include "Fl_Widget.H"
29 #include "Fl_Scrollbar.H"
30 #include "Fl_Text_Buffer.H"
31
32 class FL_EXPORT Fl_Text_Display: public Fl_Group {
33 public:
34     enum {
35         NORMAL_CURSOR,
36         CARET_CURSOR,
37         DIM_CURSOR,
38         BLOCK_CURSOR,
39         HEAVY_CURSOR,
40         SIMPLE_CURSOR
41     };
42
43     enum {
44         CURSOR_POS,
45         CHARACTER_POS
46     };
47
48     enum {
49         DRAG_NONE = -2,
50         DRAG_START_DND = -1,
51         DRAG_CHAR = 0,
52         DRAG_WORD = 1,
53         DRAG_LINE = 2
54     };
55
56     enum {
57         WRAP_NONE,
58         WRAP_AT_COLUMN,
59         WRAP_AT_PIXEL,
60         WRAP_AT_BOUNDS
61     };
62
63     friend int fl_text_drag_prepare(int pos, int key, Fl_Text_Display* d);
64     friend void fl_text_drag_me(int pos, Fl_Text_Display* d);
65
66     typedef void (*Unfinished_Style_Cb)(int, void *);
67
68     struct Style_Table_Entry {
69         Fl_Color    color;
70         Fl_Font     font;
71         Fl_Fontsize size;
72         unsigned    attr;
73         Fl_Color    bgcolor;
74     };
75
76     enum {
77         ATTR_BGCOLOR          = 0x0001,
78         ATTR_BGCOLOR_EXT_    = 0x0002,
79         ATTR_BGCOLOR_EXT     = 0x0003,
80         ATTR_UNDERLINE       = 0x0004,
81         ATTR_GRAMMAR          = 0x0008,
82         ATTR_SPELLING         = 0x000C,
83         ATTR_STRIKE_THROUGH  = 0x0010,
84         ATTR_LINES_MASK      = 0x001C
85     };
86
87     Fl_Text_Display(int X, int Y, int W, int H, const char *l = 0);
88     ~Fl_Text_Display();
89
90     int handle(int e) FL_OVERRIDE;
91
92     void buffer(Fl_Text_Buffer* buf);
93
94     void buffer(Fl_Text_Buffer& buf) { buffer(&buf); }
95
96     Fl_Text_Buffer* buffer()const { return mBuffer; }
97     Fl_Text_Buffer* style_buffer()const { return mStyleBuffer; }
98
99

```

```

198 void redisplay_range(int start, int end);
199 void scroll(int topLineNum, int horizOffset);
200 void insert(const char* text);
201 void overstrike(const char* text);
202 void insert_position(int newPos);
203
215 int insert_position()const { return mCursorPos; }
216 int position_to_xy(int pos, int* x, int* y) const;
217
218 int in_selection(int x, int y) const;
219 void show_insert_position();
220
221 int move_right();
222 int move_left();
223 int move_up();
224 int move_down();
225 int count_lines(int start, int end, bool start_pos_is_line_start) const;
226 int line_start(int pos) const;
227 int line_end(int startPos, bool startPosIsLineStart) const;
228 int skip_lines(int startPos, int nLines, bool startPosIsLineStart);
229 int rewind_lines(int startPos, int nLines);
230 void next_word(void);
231 void previous_word(void);
232
233 void show_cursor(int b = 1);
234
235 void hide_cursor() { show_cursor(0); }
236
237 void cursor_style(int style);
238 int cursor_style()const { return mCursorStyle; }
239
240 Fl_Color cursor_color()const {return mCursor_color;}
241
242 void cursor_color(Fl_Color n) {mCursor_color = n;}
243
244 int scrollbar_width()const {
245     return scrollbar_width_ ? scrollbar_width_ : Fl::scrollbar_size();
246 }
247
248 void scrollbar_width(int width) {
249     Fl::scrollbar_size(width);
250     scrollbar_width_ = 0;
251 }
252
253 int scrollbar_size()const {
254     return(scrollbar_width_);
255 }
256
257 void scrollbar_size(int newSize) {
258     scrollbar_width_ = newSize;
259 }
260
261 Fl_Align scrollbar_align()const { return scrollbar_align_; }
262
263 void scrollbar_align(Fl_Align a) { scrollbar_align_ = a; }
264
265 int word_start(int pos)const { return buffer()->word_start(pos); }
266
267 int word_end(int pos)const { return buffer()->word_end(pos); }
268
269 void highlight_data(Fl_Text_Buffer *styleBuffer,
270                    const Style_Table_Entry *styleTable,
271                    int nStyles, char unfinishedStyle,
272                    Unfinished_Style_Cb unfinishedHighlightCB,
273                    void *cbArg);
274
275 int position_style(int lineStartPos, int lineLen, int lineIndex) const;
276
277 int shortcut()const {return shortcut_;}
278
279 void shortcut(int s) {shortcut_ = s;}
280
281 Fl_Font textfont()const {return textfont_;}
282
283 void textfont(Fl_Font s) {textfont_ = s; mColumnScale = 0; }
284
285 Fl_Fontsize textsize()const {return textsize_;}
286
287 void textsize(Fl_Fontsize s) {textsize_ = s; mColumnScale = 0; }
288
289 Fl_Color textcolor()const {return textcolor_;}
290
291 void textcolor(Fl_Color n) {textcolor_ = n;}
292
293 void grammar_underline_color(Fl_Color color) { grammar_underline_color_ = color; }
294
295

```

```

405 Fl_Color grammar_underline_color()const { return grammar_underline_color_; }
406
411 void spelling_underline_color(Fl_Color color) { spelling_underline_color_ = color; }
412
417 Fl_Color spelling_underline_color()const { return spelling_underline_color_; }
418
423 void secondary_selection_color(Fl_Color color) { secondary_selection_color_ = color; }
424
429 Fl_Color secondary_selection_color()const { return secondary_selection_color_; }
430
431 int wrapped_column(int row, int column) const;
432 int wrapped_row(int row) const;
433 void wrap_mode(int wrap, int wrap_margin);
434
435 virtual void recalc_display();
436 virtual void display_needs_recalc();
437 void resize(int X, int Y, int W, int H) FL_OVERRIDE;
438
444 double x_to_col(double x) const;
445
452 double col_to_x(double col) const;
453
454 void linenum_width(int width);
455 int linenum_width() const;
456 void linenum_font(Fl_Font val);
457 Fl_Font linenum_font() const;
458 void linenum_size(Fl_Fontsize val);
459 Fl_Fontsize linenum_size() const;
460 void linenum_fgcolor(Fl_Color val);
461 Fl_Color linenum_fgcolor() const;
462 void linenum_bgcolor(Fl_Color val);
463 Fl_Color linenum_bgcolor() const;
464 void linenum_align(Fl_Align val);
465 Fl_Align linenum_align() const;
466 void linenum_format(const char* val);
467 const char* linenum_format() const;
468
469 protected:
470 // Most (all?) of this stuff should only be called from resize() or
471 // draw().
472 // Anything with "vline" indicates thats it deals with currently
473 // visible lines.
474
475 void draw() FL_OVERRIDE;
476 void draw_text(int X, int Y, int W, int H);
477 void draw_range(int start, int end);
478 void draw_cursor(int, int);
479
480 void draw_string(int style, int x, int y, int toX, const char *string,
481                 int nChars) const;
482
483 void draw_vline(int visLineNum, int leftClip, int rightClip,
484                int leftCharIndex, int rightCharIndex);
485
486 int find_x(const char *s, int len, int style, int x) const;
487
488 enum {
489     DRAW_LINE,
490     FIND_INDEX,
491     FIND_INDEX_FROM_ZERO,
492     GET_WIDTH,
493     FIND_CURSOR_INDEX    // STR #2788
494 };
495
496 int handle_vline(int mode,
497                  int lineStart, int lineLen, int leftChar, int rightChar,
498                  int topClip, int bottomClip,
499                  int leftClip, int rightClip) const;
500
501 int handle_rmb(int readonly);
502
503 void draw_line_numbers(bool clearAll);
504
505 void clear_rect(int style, int x, int y, int width, int height) const;
506 void display_insert();
507
508 void offset_line_starts(int newTopLineNum);
509
510 void calc_line_starts(int startLine, int endLine);
511
512 void update_line_starts(int pos, int charsInserted, int charsDeleted,
513                        int linesInserted, int linesDeleted, int *scrolled);
514
515 void calc_last_char();
516
517 int position_to_line( int pos, int* lineNum ) const;
518 double string_width(const char* string, int length, int style) const;

```

```

519
520     static void scroll_timer_cb(void*);
521
522     static void buffer_predelete_cb(int pos, int nDeleted, void* cbArg);
523     static void buffer_modified_cb(int pos, int nInserted, int nDeleted,
524                                   int nRestyled, const char* deletedText,
525                                   void* cbArg);
526
527     static void h_scrollbar_cb(Fl_Scrollbar* w, Fl_Text_Display* d);
528     static void v_scrollbar_cb( Fl_Scrollbar* w, Fl_Text_Display* d);
529     void update_v_scrollbar();
530     void update_h_scrollbar();
531     int measure_vline(int visLineNum) const;
532     int longest_vline() const;
533     int empty_vlines() const;
534     int vline_length(int visLineNum) const;
535     int xy_to_position(int x, int y, int PosType = CHARACTER_POS) const;
536
537     void xy_to_rowcol(int x, int y, int* row, int* column,
538                      int PosType = CHARACTER_POS) const;
539     void maintain_absolute_top_line_number(int state);
540 public:
541     int get_absolute_top_line_number() const;
542     int scroll_row() { return mTopLineNum; }
543     int scroll_col() { return mHorizOffset; }
544 protected:
545     void absolute_top_line_number(int oldFirstChar);
546     int maintaining_absolute_top_line_number() const;
547     void reset_absolute_top_line_number();
548     int position_to_linecol(int pos, int* lineNum, int* column) const;
549     int scroll_(int topLineNum, int horizOffset);
550
551     void extend_range_for_styles(int* start, int* end);
552
553     void find_wrap_range(const char *deletedText, int pos, int nInserted,
554                          int nDeleted, int *modRangeStart, int *modRangeEnd,
555                          int *linesInserted, int *linesDeleted);
556     void measure_deleted_lines(int pos, int nDeleted);
557     void wrapped_line_counter(Fl_Text_Buffer *buf, int startPos, int maxPos,
558                              int maxLines, bool startPosIsLineStart,
559                              int styleBufOffset, int *retPos, int *retLines,
560                              int *retLineStart, int *retLineEnd,
561                              bool countLastLineMissingNewLine = true) const;
562     void find_line_end(int pos, bool start_pos_is_line_start, int *lineEnd,
563                       int *nextLineStart) const;
564     double measure_proportional_character(const char *s, int colNum, int pos) const;
565     int wrap_uses_character(int lineEndPos) const;
566
567     int damage_range1_start, damage_range1_end;
568     int damage_range2_start, damage_range2_end;
569     int mCursorPos;
570     int mCursorOn;
571     int mCursorOldY;           /* Y pos. of cursor for blanking */
572     int mCursorToHint;        /* Tells the buffer modified callback
573 where to move the cursor, to reduce
574 the number of redraw calls */
575     int mCursorStyle;         /* One of enum cursorStyles above */
576     int mCursorPreferredXPos; /* Pixel position for vert. cursor movement */
577     int mNVisibleLines;       /* # of visible (displayed) lines. This is
578 also the size of the mLineStarts[] array. */
579     int mNBufferLines;        /* # of newlines in the buffer, or number of
580 wraps if line wrapping is enabled. Note that
581 partial lines at the end of the buffer are
582 not counted, so you may want to add 1. */
583     Fl_Text_Buffer* mBuffer;   /* Contains text to be displayed */
584     Fl_Text_Buffer* mStyleBuffer; /* Optional parallel buffer containing
585 color and font information */
586     int mFirstChar, mLastChar; /* Buffer positions of first and last
587 displayed character (lastChar points
588 either to a newline or one character
589 beyond the end of the buffer) */
590     int mContinuousWrap;      /* Wrap long lines when displaying */
591     int mWrapMarginPix;       /* Margin in # of pixels for
592 wrapping in continuousWrap mode */
593     int* mLineStarts;         /* Array of the size mNVisibleLines.
594 This array only keeps track of lines
595 within the display area. Each entry
596 contains the starting character offset
597 (from the beginning of the text buffer)
598 for each /visible/ line.
599 If wrap enabled, points to the beginning
600 of each wrap. So a long line wrapping
601 into 3 separate lines in the display
602 will take up 3 separate array entries. */
603     int mTopLineNum;          /* Line number of top displayed line
604 of file (first line of file is 1) */
605     int mAbsTopLineNum;       /* In continuous wrap mode, the line

```

```

606 number of the top line if the text
607 were not wrapped (note that this is
608 only maintained as needed). */
609 int mNeedAbsTopLineNum; /* Externally settable flag to continue
610 maintaining absTopLineNum even if
611 it isn't needed for line # display */
612 int mHorizOffset; /* Horizontal scroll pos. in pixels */
613 int mTopLineNumHint; /* Line number of top displayed line
614 of file (first line of file is 1) */
615 int mHorizOffsetHint; /* Horizontal scroll pos. in pixels */
616 int mNStyles; /* Number of entries in styleTable */
617 const Style_Table_Entry *mStyleTable; /* Table of fonts and colors for
618 coloring/syntax-highlighting */
619 char mUnfinishedStyle; /* Style buffer entry which triggers
620 on-the-fly reparsing of region */
621 Unfinished_Style_Cb mUnfinishedHighlightCB; /* Callback to parse "unfinished" */
622 /* regions */
623 void* mHighlightCBArg; /* Arg to unfinishedHighlightCB */
624
625 int mMaxsize;
626
627 int mSuppressResync; /* Suppress resynchronization of line
628 starts during buffer updates */
629 int mNLinesDeleted; /* Number of lines deleted during
630 buffer modification (only used
631 when resynchronization is suppressed) */
632 int mModifyingTabDistance; /* Whether tab distance is being modified XXX: UNUSED */
633
634 mutable double mColumnScale; /* Width in pixels of an average character. This
635 value is calculated as needed (lazy eval); it
636 needs to be mutable so that it can be calculated
637 within a method marked as "const" */
638
639 bool display_needs_recalc_; /* Set to true when the display needs
640 to be recalculated. */
641
642 Fl_Color mCursor_color;
643
644 Fl_Scrollbar* mHScrollBar;
645 Fl_Scrollbar* mVScrollBar;
646 int scrollbar_width_; // size of scrollbar trough (behavior changed in 1.4)
647 Fl_Align scrollbar_align_;
648 int dragPos, dragType, dragging;
649 int display_insert_position_hint;
650 struct { int x, y, w, h; } text_area;
651
652 int shortcut_;
653
654 Fl_Font textfont_;
655 Fl_Fonsize textsize_;
656 Fl_Color textcolor_;
657 Fl_Color grammar_underline_color_;
658 Fl_Color spelling_underline_color_;
659 Fl_Color secondary_selection_color_;
660
661 // Line number margin and width
662 int mLineNumLeft, mLineNumWidth;
663
664 // Line number font/colors
665 Fl_Font linenumber_font_;
666 Fl_Fonsize linenumber_size_;
667 Fl_Color linenumber_fgcolor_;
668 Fl_Color linenumber_bgcolor_;
669 Fl_Align linenumber_align_;
670 const char* linenumber_format_;
671 };
672
673 #endif

```

## 34.152 Fl\_Text\_Editor.H

```

1 //
2 // Header file for Fl_Text_Editor class.
3 //
4 // Copyright 2001-2023 by Bill Spitzak and others.
5 // Original code Copyright Mark Edel. Permission to distribute under
6 // the LGPL for the FLTK library granted by Mark Edel.
7 //
8 // This library is free software. Distribution and use rights are outlined in
9 // the file "COPYING" which should have been included with this file. If this
10 // file is missing or damaged, see the license at:
11 //
12 // https://www.fltk.org/COPYING.php
13 //
14 // Please see the following page on how to report bugs and issues:

```

```

15 //
16 //      https://www.fltk.org/bugs.php
17 //
18
19 /* \file
20 Fl_Text_Editor widget . */
21
22
23 #ifndef FL_TEXT_EDITOR_H
24 #define FL_TEXT_EDITOR_H
25
26 #include "Fl_Text_Display.H"
27
28 // key will match in any state
29 #define FL_TEXT_EDITOR_ANY_STATE (-1L)
30
31
32 class FL_EXPORT Fl_Text_Editor : public Fl_Text_Display {
33 public:
34     typedef int (*Key_Func)(int key, Fl_Text_Editor* editor);
35
36     struct Key_Binding {
37         int         key;
38         int         state;
39         Key_Func     function;
40         Key_Binding* next;
41     };
42
43     Fl_Text_Editor(int X, int Y, int W, int H, const char* l = 0);
44     ~Fl_Text_Editor() { remove_all_key_bindings(); }
45     int handle(int e) FL_OVERRIDE;
46     void insert_mode(int b) { insert_mode_ = b; }
47     int insert_mode() { return insert_mode_; }
48     void tab_nav(int val);
49     int tab_nav() const;
50     void add_key_binding(int key, int state, Key_Func f, Key_Binding** list);
51     void add_key_binding(int key, int state, Key_Func f)
52     { add_key_binding(key, state, f, &key_bindings); }
53     void remove_key_binding(int key, int state, Key_Binding** list);
54     void remove_key_binding(int key, int state)
55     { remove_key_binding(key, state, &key_bindings); }
56     void remove_all_key_bindings(Key_Binding** list);
57     void remove_all_key_bindings() { remove_all_key_bindings(&key_bindings); }
58     void add_default_key_bindings(Key_Binding** list);
59     Key_Func bound_key_function(int key, int state, Key_Binding* list) const;
60     Key_Func bound_key_function(int key, int state) const
61     { return bound_key_function(key, state, key_bindings); }
62     void default_key_function(Key_Func f) { default_key_function_ = f; }
63
64     // functions for the built in default bindings
65     static int kf_default(int c, Fl_Text_Editor* e);
66     static int kf_ignore(int c, Fl_Text_Editor* e);
67     static int kf_backspace(int c, Fl_Text_Editor* e);
68     static int kf_enter(int c, Fl_Text_Editor* e);
69     static int kf_move(int c, Fl_Text_Editor* e);
70     static int kf_shift_move(int c, Fl_Text_Editor* e);
71     static int kf_ctrl_move(int c, Fl_Text_Editor* e);
72     static int kf_c_s_move(int c, Fl_Text_Editor* e);
73     static int kf_meta_move(int c, Fl_Text_Editor* e);
74     static int kf_m_s_move(int c, Fl_Text_Editor* e);
75     static int kf_home(int, Fl_Text_Editor* e);
76     static int kf_end(int c, Fl_Text_Editor* e);
77     static int kf_left(int c, Fl_Text_Editor* e);
78     static int kf_up(int c, Fl_Text_Editor* e);
79     static int kf_right(int c, Fl_Text_Editor* e);
80     static int kf_down(int c, Fl_Text_Editor* e);
81     static int kf_page_up(int c, Fl_Text_Editor* e);
82     static int kf_page_down(int c, Fl_Text_Editor* e);
83     static int kf_insert(int c, Fl_Text_Editor* e);
84     static int kf_delete(int c, Fl_Text_Editor* e);
85     static int kf_copy(int c, Fl_Text_Editor* e);
86     static int kf_cut(int c, Fl_Text_Editor* e);
87     static int kf_paste(int c, Fl_Text_Editor* e);
88     static int kf_select_all(int c, Fl_Text_Editor* e);
89     static int kf_undo(int c, Fl_Text_Editor* e);
90     static int kf_redo(int c, Fl_Text_Editor* e);
91
92 protected:
93     int handle_key();
94     void maybe_do_callback(Fl_Callback_Reason reason = FL_REASON_CHANGED);
95
96 #ifndef FL_DOXYGEN
97     int insert_mode_;
98     Key_Binding* key_bindings;
99 #endif
100     static Key_Binding* global_key_bindings;
101
102

```

```

133 #ifndef FL_DOXYGEN
134     Key_Func default_key_function_;
135 #endif
136 };
137
138 #endif
139

```

## 34.153 Fl\_Tile.H

```

1 //
2 // Tile header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Tile_H
18 #define Fl_Tile_H
19
20 #include "Fl_Group.H"
21
22 /*
23 The Fl_Tile class lets you resize its children by dragging
24 the border between them.
25 */
26
27 class FL_EXPORT Fl_Tile : public Fl_Group {
28 public:
29     int handle(int event) FL_OVERRIDE;
30     Fl_Tile(int X, int Y, int W, int H, const char *L=0);
31     ~Fl_Tile() FL_OVERRIDE;
32     void resize(int X, int Y, int W, int H) FL_OVERRIDE;
33     virtual void move_intersection(int oldx, int oldy, int newx, int newy);
34     virtual void drag_intersection(int oldx, int oldy, int newx, int newy);
35     FL_DEPRECATED("since 1.4.0 - use move_intersection(p) instead",
36     void position(int oldx, int oldy, int newx, int newy) { move_intersection(oldx, oldy, newx, newy); }
37     void position(int x, int y) { Fl_Group::position(x, y); }
38     void size_range(int index, int minw, int minh, int maxw=0x7FFFFFFF, int maxh=0x7FFFFFFF);
39     void size_range(Fl_Widget *w, int minw, int minh, int maxw=0x7FFFFFFF, int maxh=0x7FFFFFFF);
40     void init_size_range(int default_min_w = -1, int default_min_h = -1);
41
42 protected:
43     int cursor_;
44     Fl_Cursor *cursors_;
45
46     Fl_Cursor cursor(int n) {
47         return cursors_[n];
48     }
49
50     void set_cursor(int n); // set one of n (0..3) cursors
51
52     typedef struct { int minw, minh, maxw, maxh; } Size_Range;
53
54     Size_Range *size_range_;
55     int size_range_size_, size_range_capacity_;
56     int default_min_w_, default_min_h_;
57     void request_shrink_l(int old_l, int &new_l, Fl_Rect *final_size);
58     void request_shrink_r(int old_r, int &new_r, Fl_Rect *final_size);
59     void request_shrink_t(int old_t, int &new_t, Fl_Rect *final_size);
60     void request_shrink_b(int old_b, int &new_b, Fl_Rect *final_size);
61     void request_grow_l(int old_l, int &new_l, Fl_Rect *final_size);
62     void request_grow_r(int old_r, int &new_r, Fl_Rect *final_size);
63     void request_grow_t(int old_t, int &new_t, Fl_Rect *final_size);
64     void request_grow_b(int old_b, int &new_b, Fl_Rect *final_size);
65
66     int on_insert(Fl_Widget*, int) FL_OVERRIDE;
67     int on_move(int, int) FL_OVERRIDE;
68     void on_remove(int) FL_OVERRIDE;
69 };
70
71 #endif

```

## 34.154 Fl\_Tiled\_Image.H

```

1 //
2 // Tiled image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2015 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Tiled_Image widget . */
19
20 #ifndef Fl_Tiled_Image_H
21 # define Fl_Tiled_Image_H
22
23 # include "Fl_Image.H"
24
25
26 class FL_EXPORT Fl_Tiled_Image : public Fl_Image {
27 protected:
28     Fl_Image      *image_;           // The image that is tiled
29     int            alloc_image_;     // Did we allocate this image?
30
31 public:
32     Fl_Tiled_Image(Fl_Image *i, int W = 0, int H = 0);
33     virtual ~Fl_Tiled_Image();
34
35     Fl_Image *copy(int W, int H) const FL_OVERRIDE;
36     Fl_Image *copy() const {
37         return Fl_Image::copy();
38     }
39     void color_average(Fl_Color c, float i) FL_OVERRIDE;
40     void desaturate() FL_OVERRIDE;
41     void draw(int X, int Y, int W, int H, int cx = 0, int cy = 0) FL_OVERRIDE;
42     void draw(int X, int Y) { draw(X, Y, w(), h(), 0, 0); }
43     Fl_Image *image() { return image_; }
44 };
45
46 #endif // !Fl_Tiled_Image_H

```

## 34.155 Fl\_Timer.H

```

1 //
2 // Timer header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Timer widget . */
19
20 #ifndef Fl_Timer_H
21 #define Fl_Timer_H
22
23 #ifndef Fl_Widget_H
24 #include "Fl_Widget.H"
25 #endif
26
27 // values for type():
28 #define FL_NORMAL_TIMER      0
29 #define FL_VALUE_TIMER      1
30 #define FL_HIDDEN_TIMER     2
31
32 class FL_EXPORT Fl_Timer : public Fl_Widget {

```

```

40  static void stepcb(void *);
41  void step();
42  char on, direction_;
43  double delay, total;
44  long lastsec,lastusec;
45  protected:
46  void draw() FL_OVERRIDE;
47  public:
48  int handle(int) FL_OVERRIDE;
49  Fl_Timer(uchar t,int x,int y,int w,int h, const char *l);
50  ~Fl_Timer();
51  void value(double);
53  double value()const {return delay>0.0?delay:0.0;}
59  char direction()const {return direction_;}
65  void direction(char d) {direction_ = d;}
67  char suspended()const {return !on;}
68  void suspended(char d);
69 };
70
71 #endif
72

```

## 34.156 Fl\_Toggle\_Button.H

```

1  //
2  // Toggle button header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2010 by Bill Spitzak and others.
5  //
6  // This library is free software.  Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file.  If this
8  // file is missing or damaged, see the license at:
9  //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Toggle_Button widget . */
19
20 #ifndef Fl_Toggle_Button_H
21 #define Fl_Toggle_Button_H
22
23 #include "Fl_Button.H"
24
25 class FL_EXPORT Fl_Toggle_Button : public Fl_Button {
26 public:
27     Fl_Toggle_Button(int X,int Y,int W,int H,const char *l=0);
28 };
29
30 #endif

```

## 34.157 Fl\_Toggle\_Light\_Button.H

```

1  //
2  // Toggle light button header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2010 by Bill Spitzak and others.
5  //
6  // This library is free software.  Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file.  If this
8  // file is missing or damaged, see the license at:
9  //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 // provided for back-compatibility only
18
19 #ifndef Fl_Toggle_Light_Button
20 #include "Fl_Light_Button.H"
21 #define Fl_Toggle_Light_Button Fl_Light_Button
22 #endif

```

## 34.158 Fl\_Toggle\_Round\_Button.H

```

1 //
2 // Toggle round button header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 // provided for back-compatibility only
18
19 #ifndef Fl_Toggle_Round_Button
20 #include "Fl_Round_Button.H"
21 #define Fl_Toggle_Round_Button Fl_Round_Button
22 #endif

```

## 34.159 Fl\_Tooltip.H

```

1 //
2 // Tooltip header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2011 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Tooltip widget . */
19
20 #ifndef Fl_Tooltip_H
21 #define Fl_Tooltip_H
22
23 #include <FL/Fl.H>
24 #include <FL/Fl_Widget.H>
25
26 class FL_EXPORT Fl_Tooltip {
27     friend class Fl_TooltipBox;
28 public:
29     static float delay() { return delay_; }
30     static void delay(float f) { delay_ = f; }
31     static float hidedelay() { return hidedelay_; }
32     static void hidedelay(float f) { hidedelay_ = f; }
33     static float hoverdelay() { return hoverdelay_; }
34     static void hoverdelay(float f) { hoverdelay_ = f; }
35     static int enabled() { return Fl::option(FL::OPTION_SHOW_TOOLTIPS); }
36     static void enable(int b = 1) { Fl::option(FL::OPTION_SHOW_TOOLTIPS, (b!=0)); }
37     static void disable() { enable(0); }
38     static void (*enter)(Fl_Widget* w);
39     static void enter_area(Fl_Widget* w, int X, int Y, int W, int H, const char* tip);
40     static void (*exit)(Fl_Widget *w);
41     static Fl_Widget* current() { return widget_; }
42     static void current(Fl_Widget*);
43
44     static Fl_Font font() { return font_; }
45     static void font(Fl_Font i) { font_ = i; }
46     static Fl_Fonsize size() { return (size_ == -1 ? FL_NORMAL_SIZE : size_); }
47     static void size(Fl_Fonsize s) { size_ = s; }
48     static Fl_Color color() { return color_; }
49     static void color(Fl_Color c) { color_ = c; }
50     static Fl_Color textcolor() { return textcolor_; }
51     static void textcolor(Fl_Color c) { textcolor_ = c; }
52     static int margin_width() { return margin_width_; }
53     static void margin_width(int v) { margin_width_ = v; }
54     static int margin_height() { return margin_height_; }
55     static void margin_height(int v) { margin_height_ = v; }
56     static int wrap_width() { return wrap_width_; }
57     static void wrap_width(int v) { wrap_width_ = v; }

```

```

97  static Fl_Window* current_window(void);
99  static int override_text(const char *new_text);
100
101  // These should not be public, but Fl_Widget::tooltip() needs them...
102  // fabien: made it private with only a friend function access
103 private:
104  friend void Fl_Widget::tooltip(const char *);
105  friend void Fl_Widget::copy_tooltip(const char *);
106  static void enter_(Fl_Widget* w);
107  static void exit_(Fl_Widget *w);
108  static void set_enter_exit_once_();
109  static void tooltip_timeout_(void*);
110
111 private:
112  static float delay_;
113  static float hidedelay_;
114  static float hoverdelay_;
115  static Fl_Color color_;
116  static Fl_Color textcolor_;
117  static Fl_Font font_;
118  static Fl_Fonsize size_;
119  static Fl_Widget* widget_;
120  static int margin_width_;
121  static int margin_height_;
122  static int wrap_width_;
123  static const int draw_symbols_; // 1 = draw @-symbols in tooltips, 0 = no
124  static char *override_text_;
125 };
126
127 #endif

```

## 34.160 Fl\_Tree.H File Reference

This file contains the definitions of the [Fl\\_Tree](#) class.

```

#include <FL/Fl.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Scrollbar.H>
#include <FL/fl_draw.H>
#include <FL/Fl_Tree_Item.H>
#include <FL/Fl_Tree_Prefs.H>

```

### Classes

- class [Fl\\_Tree](#)  
*Tree widget.*

### Enumerations

- enum [Fl\\_Tree\\_Reason](#) {  
[FL\\_TREE\\_REASON\\_NONE](#) = FL\_REASON\_UNKNOWN , [FL\\_TREE\\_REASON\\_SELECTED](#) = FL\_↔  
REASON\_SELECTED , [FL\\_TREE\\_REASON\\_DESELECTED](#) = FL\_REASON\_DESELECTED , [FL\\_TREE\\_REASON\\_RESELE](#)  
= FL\_REASON\_RESELECTED ,  
[FL\\_TREE\\_REASON\\_OPENED](#) = FL\_REASON\_OPENED , [FL\\_TREE\\_REASON\\_CLOSED](#) = FL\_↔  
REASON\_CLOSED , [FL\\_TREE\\_REASON\\_DRAGGED](#) = FL\_REASON\_DRAGGED }  
*The reason the callback was invoked.*

#### 34.160.1 Detailed Description

This file contains the definitions of the [Fl\\_Tree](#) class.

#### 34.160.2 Enumeration Type Documentation

### 34.160.2.1 Fl\_Tree\_Reason

```
enum Fl_Tree_Reason
```

The reason the callback was invoked.

## Enumerator

FL_TREE_REASON_NONE	unknown reason
FL_TREE_REASON_SELECTED	an item was selected
FL_TREE_REASON_DESELECTED	an item was de-selected
FL_TREE_REASON_RESELECTED	an item was re-selected (double-clicked). See <a href="#">Fl_Tree_Item_Reselect_Mode</a> to enable this.
FL_TREE_REASON_OPENED	an item was opened
FL_TREE_REASON_CLOSED	an item was closed
FL_TREE_REASON_DRAGGED	an item was dragged into a new place

## 34.161 Fl\_Tree.H

[Go to the documentation of this file.](#)

```

1 //
2
3 #ifndef FL_TREE_H
4 #define FL_TREE_H
5
6 #include <FL/Fl.H>
7 #include <FL/Fl_Group.H>
8 #include <FL/Fl_Scrollbar.H>
9 #include <FL/fl_draw.H>
10
11 #include <FL/Fl_Tree_Item.H>
12 #include <FL/Fl_Tree_Prefs.H>
13
14 // FL/Fl_Tree.H
15 //
16 //
17 // Fl_Tree -- This file is part of the Fl_Tree widget for FLTK
18 // Copyright (C) 2009-2010 by Greg Ercolano.
19 //
20 //
21 // This library is free software.  Distribution and use rights are outlined in
22 // the file "COPYING" which should have been included with this file.  If this
23 // file is missing or damaged, see the license at:
24 //
25 // https://www.fltk.org/COPYING.php
26 //
27 // Please see the following page on how to report bugs and issues:
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29 // https://www.fltk.org/bugs.php
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```

301 int _tox,_toy,_tow,_toh;
302 int _tix,_tiy,_tiw,_tih;
303
304
305 int _tree_w;
306 int _tree_h;
307 void item_clicked(Fl_Tree_Item* val);
308 void do_callback_for_item(Fl_Tree_Item* item, Fl_Tree_Reason reason);
309
310 // next_visible_item() and extend_selection() moved to 'public' in ABI 1.3.3
311 // undocumented draw_tree() dropped -- draw() does all the work now
312
313 // draw() has to be protected per FLTK convention (was public in 1.3.x)
314 void draw() FL_OVERRIDE;
315
316 public:
317 Fl_Tree(int X, int Y, int W, int H, const char *L=0);
318 ~Fl_Tree();
319 int handle(int e) FL_OVERRIDE;
320 void show_self();
321 void resize(int,int,int,int) FL_OVERRIDE;
322
323 // root methods
324 void root_label(const char *new_label);
325 Fl_Tree_Item* root();
326 void root(Fl_Tree_Item *newitem);
327 const Fl_Tree_Prefs& prefs()const { return _prefs; }
328
329 // Item creation/removal methods
330 Fl_Tree_Item *add(const char *path, Fl_Tree_Item *newitem=0);
331 Fl_Tree_Item* add(Fl_Tree_Item *parent_item, const char *name);
332 Fl_Tree_Item *insert_above(Fl_Tree_Item *above, const char *name);
333 Fl_Tree_Item* insert(Fl_Tree_Item *item, const char *name, int pos);
334 int remove(Fl_Tree_Item *item);
335 void clear();
336 void clear_children(Fl_Tree_Item *item);
337
338 // Item lookup methods
339 Fl_Tree_Item *find_item(const char *path);
340 const Fl_Tree_Item *find_item(const char *path) const;
341 int item_pathname(char *pathname, int pathnamelen, const Fl_Tree_Item *item) const;
342 const Fl_Tree_Item* find_clicked(int yonly=0) const;
343 Fl_Tree_Item* find_clicked(int yonly=0);
344 Fl_Tree_Item *item_clicked();
345 Fl_Tree_Item *first();
346 Fl_Tree_Item *first_visible(); // deprecated in ABI 10303
347 Fl_Tree_Item *first_visible_item();
348 Fl_Tree_Item *next(Fl_Tree_Item *item=0);
349 Fl_Tree_Item *prev(Fl_Tree_Item *item=0);
350 Fl_Tree_Item *last();
351 Fl_Tree_Item *last_visible(); // deprecated in ABI 10303
352 Fl_Tree_Item *last_visible_item();
353 Fl_Tree_Item *next_visible_item(Fl_Tree_Item *start, int dir); // made public in 1.3.3 ABI
354 Fl_Tree_Item *first_selected_item();
355 Fl_Tree_Item *last_selected_item();
356 Fl_Tree_Item *next_item(Fl_Tree_Item *item, int dir=FL_Down, bool visible=false);
357 Fl_Tree_Item *next_selected_item(Fl_Tree_Item *item=0, int dir=FL_Down);
358 int get_selected_items(Fl_Tree_Item_Array &items);
359
360 // Item open/close methods
361 int open(Fl_Tree_Item *item, int docallback=1);
362 int open(const char *path, int docallback=1);
363 void open_toggle(Fl_Tree_Item *item, int docallback=1);
364 int close(Fl_Tree_Item *item, int docallback=1);
365 int close(const char *path, int docallback=1);
366 int is_open(Fl_Tree_Item *item) const;
367 int is_open(const char *path) const;
368 int is_close(Fl_Tree_Item *item) const;
369 int is_close(const char *path) const;
370
371 // Item selection methods
372 int select(Fl_Tree_Item *item, int docallback=1);
373 int select(const char *path, int docallback=1);
374 void select_toggle(Fl_Tree_Item *item, int docallback=1);
375 int deselect(Fl_Tree_Item *item, int docallback=1);
376 int deselect(const char *path, int docallback=1);
377 int deselect_all(Fl_Tree_Item *item=0, int docallback=1);
378 int select_only(Fl_Tree_Item *selitem, int docallback=1);
379 int select_all(Fl_Tree_Item *item=0, int docallback=1);
380 int extend_selection_dir(Fl_Tree_Item *from,
381                          Fl_Tree_Item *to,
382                          int dir,
383                          int val,
384                          bool visible);
385 int extend_selection(Fl_Tree_Item *from,
386                     Fl_Tree_Item *to,
387                     int val=1,
388                     bool visible=false);

```

```

400 void set_item_focus(Fl_Tree_Item *item);
401 Fl_Tree_Item *get_item_focus() const;
402 int is_selected(Fl_Tree_Item *item) const;
403 int is_selected(const char *path);
404
405 // Item attribute related methods
406 Fl_Font item_labelfont() const;
407 void item_labelfont(Fl_Font val);
408 Fl_Fonsize item_labelsize() const;
409 void item_labelsize(Fl_Fonsize val);
410 Fl_Color item_labelfgcolor(void) const;
411 void item_labelfgcolor(Fl_Color val);
412 Fl_Color item_labelbgcolor(void) const;
413 void item_labelbgcolor(Fl_Color val);
414 Fl_Color connectorcolor() const;
415 void connectorcolor(Fl_Color val);
416 int marginleft() const;
417 void marginleft(int val);
418 int margintop() const;
419 void margintop(int val);
420 int marginbottom() const;
421 void marginbottom(int val);
422 int linespacing() const;
423 void linespacing(int val);
424 int openchild_marginbottom() const;
425 void openchild_marginbottom(int val);
426 int usericonmarginleft() const;
427 void usericonmarginleft(int val);
428 int labelmarginleft() const;
429 void labelmarginleft(int val);
430 int widgetmarginleft() const;
431 void widgetmarginleft(int val);
432 int connectorwidth() const;
433 void connectorwidth(int val);
434 Fl_Image* usericon() const;
435 void usericon(Fl_Image *val);
436 Fl_Image* openicon() const;
437 void openicon(Fl_Image *val);
438 Fl_Image* closeicon() const;
439 void closeicon(Fl_Image *val);
440 int showcollapse() const;
441 void showcollapse(int val);
442 int showroot() const;
443 void showroot(int val);
444 Fl_Tree_Connector connectorstyle() const;
445 void connectorstyle(Fl_Tree_Connector val);
446 Fl_Tree_Sort sortorder() const;
447 void sortorder(Fl_Tree_Sort val);
448 Fl_Boxtype selectbox() const;
449 void selectbox(Fl_Boxtype val);
450 Fl_Tree_Select selectmode() const;
451 void selectmode(Fl_Tree_Select val);
452 Fl_Tree_Item_Reselect_Mode item_reselect_mode() const;
453 void item_reselect_mode(Fl_Tree_Item_Reselect_Mode mode);
454 Fl_Tree_Item_Draw_Mode item_draw_mode() const;
455 void item_draw_mode(Fl_Tree_Item_Draw_Mode mode);
456 void item_draw_mode(int mode);
457 void calc_dimensions();
458 void calc_tree();
459 void recalc_tree();
460 int displayed(Fl_Tree_Item *item);
461 void show_item(Fl_Tree_Item *item, int yoff);
462 void show_item(Fl_Tree_Item *item);
463 void show_item_top(Fl_Tree_Item *item);
464 void show_item_middle(Fl_Tree_Item *item);
465 void show_item_bottom(Fl_Tree_Item *item);
466 void display(Fl_Tree_Item *item);
467 int vposition() const;
468 void vposition(int pos);
469 int hposition() const;
470 void hposition(int pos);
471
472 int is_scrollbar(Fl_Widget *w);
473 int scrollbar_size() const;
474 void scrollbar_size(int size);
475 int is_vscroll_visible() const;
476 int is_hscroll_visible() const;
477
478 // callback related
479 void callback_item(Fl_Tree_Item* item);
480 Fl_Tree_Item* callback_item();
481 void callback_reason(Fl_Tree_Reason reason);
482 Fl_Tree_Reason callback_reason() const;
483
484 void load(class Fl_Preferences&);
485 };
486

```

```
492 #endif /*FL_TREE_H*/
```

## 34.162 Fl\_Tree\_Item.H File Reference

This file contains the definitions for [Fl\\_Tree\\_Item](#).

```
#include <FL/Fl.H>
#include <FL/Fl_Widget.H>
#include <FL/Fl_Image.H>
#include <FL/fl_draw.H>
#include <FL/Fl_Tree_Item_Array.H>
#include <FL/Fl_Tree_Prefs.H>
```

### Classes

- class [Fl\\_Tree\\_Item](#)

*Tree widget item.*

### 34.162.1 Detailed Description

This file contains the definitions for [Fl\\_Tree\\_Item](#).

## 34.163 Fl\_Tree\_Item.H

[Go to the documentation of this file.](#)

```
1 //
2
3 #ifndef FL_TREE_ITEM_H
4 #define FL_TREE_ITEM_H
5
6 #include <FL/Fl.H>
7 #include <FL/Fl_Widget.H>
8 #include <FL/Fl_Image.H>
9 #include <FL/fl_draw.H>
10
11 #include <FL/Fl_Tree_Item_Array.H>
12 #include <FL/Fl_Tree_Prefs.H>
13
14 // FL/Fl_Tree_Item.H
15 //
16 //
17 // Fl_Tree -- This file is part of the Fl_Tree widget for FLTK
18 // Copyright (C) 2009-2010 by Greg Ercolano.
19 //
20 //
21 // This library is free software. Distribution and use rights are outlined in
22 // the file "COPYING" which should have been included with this file. If this
23 // file is missing or damaged, see the license at:
24 //
25 // https://www.fltk.org/COPYING.php
26 //
27 // Please see the following page on how to report bugs and issues:
28 //
29 // https://www.fltk.org/bugs.php
30 //
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52
53
54
55
56
57
58
59
60
61
62
63
64 class Fl_Tree;
65 class FL_EXPORT Fl_Tree_Item {
66     Fl_Tree *_tree; // parent tree
67     const char *_label; // label (memory managed)
68     Fl_Font _labelfont; // label's font face
69     Fl_Fontsize _labelsize; // label's font size
70     Fl_Color _labelfgcolor; // label's fg color
71     Fl_Color _labelbgcolor; // label's bg color (0xffffffff is 'transparent')
72
73     enum Fl_Tree_Item_Flags {
74         OPEN = 1<<0,
75         VISIBLE = 1<<1,
76         ACTIVE = 1<<2,
77         SELECTED = 1<<3
78     };
79     unsigned short _flags; // misc flags
80     int _xywh[4]; // xywh of this widget (if visible)
81     int _collapse_xywh[4]; // xywh of collapse icon (if visible)
```

```

82  int                _label_xywh[4];           // xywh of label
83  Fl_Widget           *_widget;                // item's label widget (optional)
84  Fl_Image            *_usericon;              // item's user-specific icon (optional)
85  Fl_Image            *_userdeicon;            // deactivated usericon
86  Fl_Tree_Item_Array  _children;               // array of child items
87  Fl_Tree_Item        *_parent;                // parent item (=0 if root)
88  void                *_userdata;              // user data that can be associated with an item
89  Fl_Tree_Item        *_prev_sibling;          // previous sibling (same level)
90  Fl_Tree_Item        *_next_sibling;          // next sibling (same level)
91  // Protected methods
92 protected:
93  void _Init(const Fl_Tree_Prefs &prefs, Fl_Tree *tree);
94  void show_widgets();
95  void hide_widgets();
96  virtual void draw_vertical_connector(int x, int y1, int y2, const Fl_Tree_Prefs &prefs);
97  virtual void draw_horizontal_connector(int x1, int x2, int y, const Fl_Tree_Prefs &prefs);
98  void recalc_tree();
99  int calc_item_height(const Fl_Tree_Prefs &prefs) const;
100 Fl_Color drawfgcolor() const;
101 Fl_Color drawbgcolor() const;
102
103 public:
104  Fl_Tree_Item(const Fl_Tree_Prefs &prefs);      // CTOR -- backwards compatible
105  Fl_Tree_Item(Fl_Tree *tree);                  // CTOR -- ABI 1.3.3+
106  virtual ~Fl_Tree_Item();                      // DTOR -- ABI 1.3.3+
107  Fl_Tree_Item(const Fl_Tree_Item *o);           // COPY CTOR
108  int x()const { return(_xywh[0]); }
109  int y()const { return(_xywh[1]); }
110  int w()const { return(_xywh[2]); }
111  int h()const { return(_xywh[3]); }
112  int label_x()const { return(_label_xywh[0]); }
113  int label_y()const { return(_label_xywh[1]); }
114  int label_w()const { return(_label_xywh[2]); }
115  int label_h()const { return(_label_xywh[3]); }
116  virtual int draw_item_content(int render);
117  void draw(int X, int &Y, int W, Fl_Tree_Item *itemfocus,
118           int &tree_item_xmax, int lastchild=1, int render=1);
119  void show_self(const char *indent = "") const;
120  void label(const char *val);
121  const char *label() const;
122
123  inline void user_data( void* data ) { _userdata = data; }
124
125  inline void* user_data()const { return _userdata; }
126
127  void labelfont(Fl_Font val) {
128      _labelfont = val;
129      recalc_tree();           // may change tree geometry
130  }
131  Fl_Font labelfont()const {
132      return(_labelfont);
133  }
134  void labelsz(Fl_Fontsize val) {
135      _labelsize = val;
136      recalc_tree();           // may change tree geometry
137  }
138  Fl_Fontsize labelsz()const {
139      return(_labelsize);
140  }
141  void labelfgcolor(Fl_Color val) {
142      _labelfgcolor = val;
143  }
144  Fl_Color labelfgcolor()const {
145      return(_labelfgcolor);
146  }
147  void labelcolor(Fl_Color val) {
148      labelfgcolor(val);
149  }
150  Fl_Color labelcolor()const {
151      return labelfgcolor();
152  }
153  void labelbgcolor(Fl_Color val) {
154      _labelbgcolor = val;
155  }
156  Fl_Color labelbgcolor()const {
157      return(_labelbgcolor);
158  }
159  void widget(Fl_Widget *val) {
160      _widget = val;
161      recalc_tree();           // may change tree geometry
162  }
163  Fl_Widget *widget()const {
164      return(_widget);
165  }
166  int children()const {
167      return(_children.total());
168  }
169

```

```

203 Fl_Tree_Item *child(int index) {
204     return(_children[index]);
205 }
206
207 const Fl_Tree_Item *child(int t) const;
208
209 int has_children()const {
210     return(children());
211 }
212
213 int find_child(const char *name);
214 int find_child(Fl_Tree_Item *item);
215 int remove_child(Fl_Tree_Item *item);
216 int remove_child(const char *new_label);
217 void clear_children();
218 void swap_children(int ax, int bx);
219 int swap_children(Fl_Tree_Item *a, Fl_Tree_Item *b);
220 const Fl_Tree_Item *find_child_item(const char *name) const;
221 Fl_Tree_Item *find_child_item(const char *name);
222 const Fl_Tree_Item *find_child_item(char **arr) const;
223 Fl_Tree_Item *find_child_item(char **arr);
224 const Fl_Tree_Item *find_item(char **arr) const;
225 Fl_Tree_Item *find_item(char **arr);
226 // Adding items
227
228 Fl_Tree_Item *add(const Fl_Tree_Prefs &prefs,
229                  const char *new_label,
230                  Fl_Tree_Item *newitem);
231 Fl_Tree_Item *add(const Fl_Tree_Prefs &prefs,
232                  const char *new_label);
233 Fl_Tree_Item *add(const Fl_Tree_Prefs &prefs,
234                  char **arr,
235                  Fl_Tree_Item *newitem);
236 Fl_Tree_Item *add(const Fl_Tree_Prefs &prefs,
237                  char **arr);
238 Fl_Tree_Item *replace(Fl_Tree_Item *new_item);
239 Fl_Tree_Item *replace_child(Fl_Tree_Item *olditem, Fl_Tree_Item *newitem);
240 Fl_Tree_Item *insert(const Fl_Tree_Prefs &prefs, const char *new_label, int pos=0);
241 Fl_Tree_Item *insert_above(const Fl_Tree_Prefs &prefs, const char *new_label);
242 Fl_Tree_Item *deparent(int index);
243 int reparent(Fl_Tree_Item *newchild, int index);
244 int move(int to, int from);
245 int move(Fl_Tree_Item *item, int op=0, int pos=0);
246 int move_above(Fl_Tree_Item *item);
247 int move_below(Fl_Tree_Item *item);
248 int move_into(Fl_Tree_Item *item, int pos=0);
249 int depth() const;
250 Fl_Tree_Item *prev();
251 Fl_Tree_Item *next();
252 Fl_Tree_Item *next_sibling();
253 Fl_Tree_Item *prev_sibling();
254 void update_prev_next(int index);
255 Fl_Tree_Item *next_displayed(Fl_Tree_Prefs &prefs); // deprecated
256 Fl_Tree_Item *prev_displayed(Fl_Tree_Prefs &prefs); // deprecated
257 Fl_Tree_Item *next_visible(Fl_Tree_Prefs &prefs);
258 Fl_Tree_Item *prev_visible(Fl_Tree_Prefs &prefs);
259
260 Fl_Tree_Item *parent() {
261     return(_parent);
262 }
263
264 const Fl_Tree_Item *parent()const {
265     return(_parent);
266 }
267
268 void parent(Fl_Tree_Item *val) {
269     _parent = val;
270 }
271
272 const Fl_Tree_Prefs & prefs() const;
273 const Fl_Tree *tree()const {
274     return(_tree);
275 }
276
277 Fl_Tree *tree() {
278     return(_tree);
279 }
280
281 // State
282 void open();
283 void close();
284
285 int is_open()const {
286     return(is_flag(OPEN));
287 }
288
289 int is_close()const {
290     return(is_flag(OPEN)?0:1);
291 }
292
293 void open_toggle() {
294     is_open()?close():open(); // handles calling recalc_tree()
295 }
296
297 void select(int val=1) {
298     set_flag(SELECTED, val);
299 }
300
301 void select_toggle() {
302     if ( is_selected() ) {
303         deselect(); // deselect if selected
304     }
305 }

```

```

312     } else {
313         select();          // select if deselected
314     }
315 }
320 int select_all() {
321     int count = 0;
322     if ( ! is_selected() ) {
323         select();
324         ++count;
325     }
326     for ( int t=0; t<children(); t++ ) {
327         count += child(t)->select_all();
328     }
329     return(count);
330 }
332 void deselect() {
333     set_flag(SELECTED, 0);
334 }
339 int deselect_all() {
340     int count = 0;
341     if ( is_selected() ) {
342         deselect();
343         ++count;
344     }
345     for ( int t=0; t<children(); t++ ) {
346         count += child(t)->deselect_all();
347     }
348     return(count);
349 }
351 char is_selected()const {
352     return(is_flag(SELECTED));
353 }
362 void activate(int val=1) {
363     set_flag(ACTIVE,val);
364     if ( _widget && val != (int)_widget->active() ) {
365         if ( val ) {
366             _widget->activate();
367         } else {
368             _widget->deactivate();
369         }
370         _widget->redraw();
371     }
372 }
376 void deactivate() {
377     activate(0);
378 }
380 char is_activated()const {
381     return(is_flag(ACTIVE));
382 }
384 char is_active()const {
385     return(is_activated());
386 }
388 int visible()const {
389     return(is_visible());
390 }
392 int is_visible()const {
393     return(is_flag(VISIBLE));
394 }
401 int visible_r()const {
402     return(is_visible_r());
403 }
404 int is_visible_r() const;
405
415 void usericon(Fl_Image *val) {
416     _usericon = val;
417     recalc_tree();          // may change tree geometry
418 }
420 Fl_Image *usericon()const {
421     return(_usericon);
422 }
449 void userdeicon(Fl_Image* val) {
450     _userdeicon = val;
451 }
454 Fl_Image* userdeicon()const {
455     return _userdeicon;
456 }
458 // Events
460 const Fl_Tree_Item* find_clicked(const Fl_Tree_Prefs &prefs, int yonly=0) const;
461 Fl_Tree_Item* find_clicked(const Fl_Tree_Prefs &prefs, int yonly=0);
462 int event_on_item(const Fl_Tree_Prefs &prefs) const;
463 int event_on_collapse_icon(const Fl_Tree_Prefs &prefs) const;
464 int event_on_user_icon(const Fl_Tree_Prefs &prefs) const;
465 int event_on_label(const Fl_Tree_Prefs &prefs) const;
467 int is_root()const {
468     return(_parent==0?1:0);
469 }
470

```

```

471 // Protected methods
472 // TODO: move these to top 'protected:' section
473 protected:
474 inline void set_flag(unsigned short flag,int val) {
475     if ( flag==OPEN || flag==VISIBLE ) {
476         recalc_tree(); // may change tree geometry
477     }
478     if ( val ) _flags |= flag; else _flags &= ~flag;
479 }
480 inline int is_flag(unsigned short val) const {
481     return(_flags & val ? 1 : 0);
482 }
483 };
484 #endif /*FL_TREE_ITEM_H*/

```

## 34.164 Fl\_Tree\_Item\_Array.H File Reference

This file defines a class that manages an array of [Fl\\_Tree\\_Item](#) pointers.

```
#include <FL/Fl.H>
```

```
#include "Fl_Export.H"
```

### Classes

- class [Fl\\_Tree\\_Item\\_Array](#)  
Manages an array of [Fl\\_Tree\\_Item](#) pointers.

### 34.164.1 Detailed Description

This file defines a class that manages an array of [Fl\\_Tree\\_Item](#) pointers.

## 34.165 Fl\_Tree\_Item\_Array.H

[Go to the documentation of this file.](#)

```

1 //
2
3 #ifndef _FL_TREE_ITEM_ARRAY_H
4 #define _FL_TREE_ITEM_ARRAY_H
5
6 #include <FL/Fl.H>
7 #include "Fl_Export.H"
8
9 class FL_EXPORT Fl_Tree_Item; // forward decl must *precede* first doxygen comment block
10 // or doxygen will not document our class..
11
12 // FL/Fl_Tree_Item_Array.H
13 //
14 // Fl_Tree -- This file is part of the Fl_Tree widget for FLTK
15 // Copyright (C) 2009-2010 by Greg Ercolano.
16 //
17 // This library is free software. Distribution and use rights are outlined in
18 // the file "COPYING" which should have been included with this file. If this
19 // file is missing or damaged, see the license at:
20 //
21 // https://www.fltk.org/COPYING.php
22 //
23 // Please see the following page on how to report bugs and issues:
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25 // https://www.fltk.org/bugs.php
26 //
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39
40
41
42
43
44
45 class FL_EXPORT Fl_Tree_Item_Array {
46     Fl_Tree_Item **_items; // items array
47     int _total; // #items in array
48     int _size; // #items *allocated* for array
49     int _chunksize; // #items to enlarge mem allocation
50     enum {
51         MANAGE_ITEM = 1
52     };
53     char _flags; // flags to control behavior

```

```

54 void enlarge(int count);
55 public:
56 Fl_Tree_Item_Array(int new_chunksize = 10);           // CTOR
57 ~Fl_Tree_Item_Array();                               // DTOR
58 Fl_Tree_Item_Array(const Fl_Tree_Item_Array *o);      // COPY CTOR
59 Fl_Tree_Item *operator[](int i) {
60     return(_items[i]);
61 }
62
63 const Fl_Tree_Item *operator[](int i) const {
64     return(_items[i]);
65 }
66
67 int total() const {
68     return(_total);
69 }
70
71 void swap(int ax, int bx);
72 int move(int to, int from);
73 int deparent(int pos);
74 int reparent(Fl_Tree_Item *item, Fl_Tree_Item *newparent, int pos);
75 void clear();
76 void add(Fl_Tree_Item *val);
77 void insert(int pos, Fl_Tree_Item *new_item);
78 void replace(int pos, Fl_Tree_Item *new_item);
79 void remove(int index);
80 int remove(Fl_Tree_Item *item);
81 void manage_item_destroy(int val) {
82     if ( val ) _flags |= MANAGE_ITEM; else _flags &= ~MANAGE_ITEM;
83 }
84 int manage_item_destroy() const {
85     return _flags & MANAGE_ITEM ? 1 : 0;
86 }
87 };
88
89 #endif /*_FL_TREE_ITEM_ARRAY_H*/

```

## 34.166 Fl\_Tree\_Prefs.H File Reference

This file contains the definitions for [Fl\\_Tree](#)'s preferences.

```
#include <FL/Fl.H>
```

### Classes

- class [Fl\\_Tree\\_Prefs](#)  
*Tree widget's preferences.*

### Typedefs

- typedef void() [Fl\\_Tree\\_Item\\_Draw\\_Callback](#)([Fl\\_Tree\\_Item](#) \*, void \*)

### Enumerations

- enum [Fl\\_Tree\\_Connector](#) { [FL\\_TREE\\_CONNECTOR\\_NONE](#) =0 , [FL\\_TREE\\_CONNECTOR\\_DOTTED](#) =1 , [FL\\_TREE\\_CONNECTOR\\_SOLID](#) =2 }
- Defines the style of connection lines between items.*
- enum [Fl\\_Tree\\_Item\\_Draw\\_Mode](#) { [FL\\_TREE\\_ITEM\\_DRAW\\_DEFAULT](#) =0 , [FL\\_TREE\\_ITEM\\_DRAW\\_LABEL\\_AND\\_WIDGET](#) =1 , [FL\\_TREE\\_ITEM\\_HEIGHT\\_FROM\\_WIDGET](#) =2 }
- Bit flags that control how item's labels and widget(s) are drawn in the tree via item\_draw\_mode().*
- enum [Fl\\_Tree\\_Item\\_Reselect\\_Mode](#) { [FL\\_TREE\\_SELECTABLE\\_ONCE](#) =0 , [FL\\_TREE\\_SELECTABLE\\_ALWAYS](#) }
- Defines the ways an item can be (re) selected via item\_reselect\_mode().*
- enum [Fl\\_Tree\\_Select](#) { [FL\\_TREE\\_SELECT\\_NONE](#) =0 , [FL\\_TREE\\_SELECT\\_SINGLE](#) =1 , [FL\\_TREE\\_SELECT\\_MULTI](#) =2 , [FL\\_TREE\\_SELECT\\_SINGLE\\_DRAGGABLE](#) =3 }
- Tree selection style.*
- enum [Fl\\_Tree\\_Sort](#) { [FL\\_TREE\\_SORT\\_NONE](#) =0 , [FL\\_TREE\\_SORT\\_ASCENDING](#) =1 , [FL\\_TREE\\_SORT\\_DESCENDING](#) =2 }
- Sort order options for items added to the tree.*

### 34.166.1 Detailed Description

This file contains the definitions for `Fl_Tree`'s preferences.

```
Fl_Tree_Prefs
:
.....
:
Fl_Tree :
|_____ Fl_Tree_Item
```

### 34.166.2 Enumeration Type Documentation

#### 34.166.2.1 Fl\_Tree\_Connector

enum `Fl_Tree_Connector`

Defines the style of connection lines between items.

Enumerator

FL_TREE_CONNECTOR_NONE	Use no lines connecting items.
FL_TREE_CONNECTOR_DOTTED	Use dotted lines connecting items (default)
FL_TREE_CONNECTOR_SOLID	Use solid lines connecting items.

#### 34.166.2.2 Fl\_Tree\_Item\_Draw\_Mode

enum `Fl_Tree_Item_Draw_Mode`

Bit flags that control how item's labels and widget()s are drawn in the tree via `item_draw_mode()`.

Enumerator

FL_TREE_ITEM_DRAW_DEFAULT	If widget() defined, draw in place of label, and widget() tracks item height (default)
FL_TREE_ITEM_DRAW_LABEL_AND_WIDGET	If widget() defined, include label to the left of the widget.
FL_TREE_ITEM_HEIGHT_FROM_WIDGET	If widget() defined, widget()'s height controls item's height.

#### 34.166.2.3 Fl\_Tree\_Item\_Reselect\_Mode

enum `Fl_Tree_Item_Reselect_Mode`

Defines the ways an item can be (re) selected via `item_reselect_mode()`.

Enumerator

FL_TREE_SELECTABLE_ONCE	Item can only be selected once (default)
FL_TREE_SELECTABLE_ALWAYS	Enables FL_TREE_REASON_RESELECTED events for callbacks.

#### 34.166.2.4 Fl\_Tree\_Select

enum `Fl_Tree_Select`

Tree selection style.

## Enumerator

FL_TREE_SELECT_NONE	Nothing selected when items are clicked.
FL_TREE_SELECT_SINGLE	Single item selected when item is clicked (default)
FL_TREE_SELECT_MULTI	Multiple items can be selected by clicking with SHIFT, CTRL or mouse drags.
FL_TREE_SELECT_SINGLE_DRAGGABLE	Single items may be selected, and they may be reordered by mouse drag.

## 34.166.2.5 Fl\_Tree\_Sort

enum [Fl\\_Tree\\_Sort](#)

Sort order options for items added to the tree.

## Enumerator

FL_TREE_SORT_NONE	No sorting; items are added in the order defined (default).
FL_TREE_SORT_ASCENDING	Add items in ascending sort order.
FL_TREE_SORT_DESCENDING	Add items in descending sort order.

## 34.167 Fl\_Tree\_Prefs.H

[Go to the documentation of this file.](#)

```

1 //
2
3 #ifndef FL_TREE_PREFS_H
4 #define FL_TREE_PREFS_H
5
6 #include <FL/Fl.H>          // needed for ABI version features (via Enumerations.H)
7
8 // FL/Fl_Tree_Prefs.H
9 //
10 //
11 // Fl_Tree_Prefs -- This file is part of the Fl_Tree widget for FLTK
12 // Copyright (C) 2009-2010 by Greg Ercolano.
13 //
14 //
15 // This library is free software. Distribution and use rights are outlined in
16 // the file "COPYING" which should have been included with this file.  If this
17 // file is missing or damaged, see the license at:
18 //
19 //     https://www.fltk.org/COPYING.php
20 //
21 // Please see the following page on how to report bugs and issues:
22 //
23 //     https://www.fltk.org/bugs.php
24 //
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47 enum Fl_Tree_Sort {
48     FL_TREE_SORT_NONE=0,
49     FL_TREE_SORT_ASCENDING=1,
50     FL_TREE_SORT_DESCENDING=2
51 };
52
53 enum Fl_Tree_Connector {
54     FL_TREE_CONNECTOR_NONE=0,
55     FL_TREE_CONNECTOR_DOTTED=1,
56     FL_TREE_CONNECTOR_SOLID=2
57 };
58
59 enum Fl_Tree_Select {
60     FL_TREE_SELECT_NONE=0,
61     FL_TREE_SELECT_SINGLE=1,
62     FL_TREE_SELECT_MULTI=2,
63     FL_TREE_SELECT_SINGLE_DRAGGABLE=3
64 };
65
66 enum Fl_Tree_Item_Reselect_Mode {

```

```

79  FL_TREE_SELECTABLE_ONCE=0,
80  FL_TREE_SELECTABLE_ALWAYS
81  };
82
83  enum Fl_Tree_Item_Draw_Mode {
84      FL_TREE_ITEM_DRAW_DEFAULT=0,
85      FL_TREE_ITEM_DRAW_LABEL_AND_WIDGET=1,
86      FL_TREE_ITEM_HEIGHT_FROM_WIDGET=2
87  };
88
89  class Fl_Tree_Item;
90  typedef void (Fl_Tree_Item_Draw_Callback) (Fl_Tree_Item*, void*);
91
92  class FL_EXPORT Fl_Tree_Prefs {
93  public:
94      Fl_Font _labelfont;           // label's font face
95      Fl_Fontsize _labelsize;       // label's font size
96      int _margintop;               // --
97      int _marginleft;              // -- tree's controllable margins
98      int _marginbottom;            // --
99      int _openchild_marginbottom;   // extra space below an open child tree
100     int _usericonmarginleft;       // space to left of user icon (if any)
101     int _labelmarginleft;          // space to left of label
102     int _widgetmarginleft;         // space to left of widget
103     int _connectorwidth;           // connector width (right of open/close icon)
104     int _linespacing;              // vertical space between lines
105     // Colors
106     Fl_Color _labelfgcolor;         // label's foreground color
107     Fl_Color _labelbgcolor;         // label's background color
108     Fl_Color _connectorcolor;       // connector dotted line color
109     Fl_Tree_Connector _connectorstyle; // connector line style
110     Fl_Image *_openimage;           // the 'open' icon [+]
111     Fl_Image *_closeimage;          // the 'close' icon [-]
112     Fl_Image *_userimage;           // user's own icon
113     Fl_Image *_opendeimage;         // deactivated 'open' icon
114     Fl_Image *_closedeimage;        // deactivated 'close' icon
115     Fl_Image *_userdeimage;         // deactivated user icon
116     char _showcollapse;            // 1=show collapse icons, 0=don't
117     char _showroot;                // show the root item as part of the tree
118     Fl_Tree_Sort _sortorder;        // none, ascending, descending, etc.
119     Fl_Boxtype _selectbox;          // selection box type
120     Fl_Tree_Select _selectmode;     // selection mode
121     Fl_Tree_Item_Reselect_Mode _itemreselectmode; // controls item selection callback() behavior
122     Fl_Tree_Item_Draw_Mode _itemdrawmode; // controls how items draw label + widget()
123     Fl_Tree_Item_Draw_Callback *_itemdrawcallback; // callback to handle drawing items (0=none)
124     void *_itemdrawuserdata;        // data for drawing items (0=none)
125 public:
126     Fl_Tree_Prefs();
127     ~Fl_Tree_Prefs();
128
129     // Labels
130     inline Fl_Font item_labelfont()const { return(_labelfont); }
131     inline void item_labelfont(Fl_Font val) { _labelfont = val; }
132     inline Fl_Fontsize item_labelsize()const { return(_labelsize); }
133     inline void item_labelsize(Fl_Fontsize val) { _labelsize = val; }
134     inline Fl_Color item_labelfgcolor()const { return(_labelfgcolor); }
135     inline void item_labelfgcolor(Fl_Color val) { _labelfgcolor = val; }
136     inline Fl_Color item_labelbgcolor()const {
137         return _labelbgcolor;
138     }
139     inline void item_labelbgcolor(Fl_Color val) {
140         _labelbgcolor = val;
141     }
142
143     // Obsolete names - for 1.3.0 backwards compat
144     inline Fl_Font labelfont()const { return(_labelfont); }
145     inline void labelfont(Fl_Font val) { _labelfont = val; }
146     inline Fl_Fontsize labelsize()const { return(_labelsize); }
147     inline void labelsize(Fl_Fontsize val) { _labelsize = val; }
148     inline Fl_Color labelfgcolor()const { return(_labelfgcolor); }
149     inline void labelfgcolor(Fl_Color val) { _labelfgcolor = val; }
150     inline Fl_Color labelbgcolor()const { return(item_labelbgcolor()); }
151     inline void labelbgcolor(Fl_Color val) { item_labelbgcolor(val); }
152
153     // Margins
154     inline int marginleft()const {
155         return(_marginleft);
156     }
157     inline void marginleft(int val) {
158         _marginleft = val;
159     }
160     inline int margintop()const {
161         return(_margintop);
162     }
163     inline void margintop(int val) {
164         _margintop = val;
165     }
166     inline int marginbottom()const {

```

```

212     return(_marginbottom);
213 }
216 inline void marginbottom(int val) {
217     _marginbottom = val;
218 }
220 inline int openchild_marginbottom()const {
221     return(_openchild_marginbottom);
222 }
224 inline void openchild_marginbottom(int val) {
225     _openchild_marginbottom = val;
226 }
228 inline int usericonmarginleft()const {
229     return(_usericonmarginleft);
230 }
232 inline void usericonmarginleft(int val) {
233     _usericonmarginleft = val;
234 }
236 inline int labelmarginleft()const {
237     return(_labelmarginleft);
238 }
240 inline void labelmarginleft(int val) {
241     _labelmarginleft = val;
242 }
244 inline int widgetmarginleft()const {
245     return(_widgetmarginleft);
246 }
248 inline void widgetmarginleft(int val) {
249     _widgetmarginleft = val;
250 }
252 inline int linespacing()const {
253     return(_linespacing);
254 }
256 inline void linespacing(int val) {
257     _linespacing = val;
258 }
259
261 // Colors and Styles
264 inline Fl_Color connectorcolor()const {
265     return(_connectorcolor);
266 }
268 inline void connectorcolor(Fl_Color val) {
269     _connectorcolor = val;
270 }
272 inline Fl_Tree_Connector connectorstyle()const {
273     return(_connectorstyle);
274 }
276 inline void connectorstyle(Fl_Tree_Connector val) {
277     _connectorstyle = val;
278 }
280 inline void connectorstyle(int val) {
281     _connectorstyle = Fl_Tree_Connector(val);
282 }
284 inline int connectorwidth()const {
285     return(_connectorwidth);
286 }
288 inline void connectorwidth(int val) {
289     _connectorwidth = val;
290 }
291
293 // Icons
298 inline Fl_Image *openicon()const {
299     return(_openimage);
300 }
301 inline int openicon_w()const { return _openimage ? _openimage->w() : 11; }
302 inline int openicon_h()const { return _openimage ? _openimage->h() : 11; }
303 void openicon(Fl_Image *val);
307 inline Fl_Image *closeicon()const {
308     return(_closeimage);
309 }
310 inline int closeicon_w()const { return _closeimage ? _closeimage->w() : 11; }
311 inline int closeicon_h()const { return _closeimage ? _closeimage->h() : 11; }
312 void closeicon(Fl_Image *val);
314 inline Fl_Image *usericon()const {
315     return(_userimage);
316 }
320 inline void usericon(Fl_Image *val) {
321     _userimage = val;
322     // Update deactivated version of icon..
323     if ( _userdeimage ) delete _userdeimage;
324     if ( _userimage ) {
325         _userdeimage = _userimage->copy();
326         _userdeimage->inactive();
327     } else {
328         _userdeimage = 0;
329     }
330 }
331

```

```

334 inline Fl_Image *opendeicon()const {
335     return _opendeimage;
336 }
339 inline Fl_Image *closedeicon()const {
340     return _closedeimage;
341 }
344 inline Fl_Image *userdeicon()const {
345     return _userdeimage;
346 }
347
349 // Options
352 inline char showcollapse()const {
353     return(_showcollapse);
354 }
363 inline void showcollapse(int val) {
364     _showcollapse = val;
365 }
367 inline Fl_Tree_Sort sortorder()const {
368     return(_sortorder);
369 }
374 inline void sortorder(Fl_Tree_Sort val) {
375     _sortorder = val;
376 }
378 inline Fl_Boxtype selectbox()const {
379     return(_selectbox);
380 }
382 inline void selectbox(Fl_Boxtype val) {
383     _selectbox = val;
384 }
386 inline int showroot()const {
387     return(int(_showroot));
388 }
393 inline void showroot(int val) {
394     _showroot = char(val);
395 }
397 inline Fl_Tree_Select selectmode()const {
398     return(_selectmode);
399 }
405 inline void selectmode(Fl_Tree_Select val) {
406     _selectmode = val;
407 }
409 Fl_Tree_Item_Reselect_Mode item_reselect_mode()const {
410     return _itemreselectmode;
411 }
413 void item_reselect_mode(Fl_Tree_Item_Reselect_Mode mode) {
414     _itemreselectmode = mode;
415 }
417 inline Fl_Tree_Item_Draw_Mode item_draw_mode()const {
418     return(_itemdrawmode);
419 }
425 inline void item_draw_mode(Fl_Tree_Item_Draw_Mode val) {
426     _itemdrawmode = val;
427 }
428 void item_draw_callback(Fl_Tree_Item_Draw_Callback *cb, void *data=0) {
429     _itemdrawcallback = cb;
430     _itemdrawuserdata = data;
431 }
432 Fl_Tree_Item_Draw_Callback* item_draw_callback()const {
433     return(_itemdrawcallback);
434 }
435 void* item_draw_user_data()const {
436     return(_itemdrawuserdata);
437 }
438 void do_item_draw_callback(Fl_Tree_Item *o)const {
439     _itemdrawcallback(o, _itemdrawuserdata);
440 }
441 };
442
443 #endif /*FL_TREE_PREFS_H*/

```

## 34.168 fl\_types.h File Reference

This file contains simple "C"-style type definitions.

#include "fl\_attr.h"

### Typedefs

#### Miscellaneous

- typedef unsigned int [Fl\\_Shortcut](#)

- *16-bit Unicode character + 8-bit indicator for keyboard flags.*  
typedef unsigned char **uchar**  
*unsigned char*
- typedef unsigned long **ulong**  
*unsigned long*

### 34.168.1 Detailed Description

This file contains simple "C"-style type definitions.

### 34.168.2 Typedef Documentation

#### 34.168.2.1 Fl\_Shortcut

```
typedef unsigned int Fl\_Shortcut
```

16-bit Unicode character + 8-bit indicator for keyboard flags.

#### Note

This **should** be 24-bit Unicode character + 8-bit indicator for keyboard flags. The upper 8 bits are currently unused but reserved.

Due to compatibility issues this type and all FLTK **shortcuts** can only be used with 16-bit Unicode characters (U+0000 .. U+FFFF) and not with the full range of unicode characters (U+0000 .. U+10FFFF).

This is caused by the bit flags FL\_SHIFT, FL\_CTRL, FL\_ALT, and FL\_META being all in the range 0x010000 .. 0x400000.

**Todo** Discuss and decide whether we can "shift" these special keyboard flags to the upper byte to enable full 21-bit Unicode characters (U+0000 .. U+10FFFF) plus the keyboard indicator bits as this was originally intended. This would be possible if we could rely on **all** programs being coded with symbolic names and not hard coded bit values.

## 34.169 fl\_types.h

[Go to the documentation of this file.](#)

```
1 /*
2  * Simple "C"-style types for the Fast Light Tool Kit (FLTK).
3  *
4  * Copyright 1998-2020 by Bill Spitzak and others.
5  *
6  * This library is free software. Distribution and use rights are outlined in
7  * the file "COPYING" which should have been included with this file. If this
8  * file is missing or damaged, see the license at:
9  *
10 *      https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *      https://www.fltk.org/bugs.php
15 */
16
21 #ifndef FL_TYPES_H
22 #define FL_TYPES_H
23
24 #include "fl_attr.h"
25 /* group: Miscellaneous */
26
30 typedef unsigned char uchar;
32 typedef unsigned long ulong;
33
55 typedef unsigned int Fl_Shortcut;
56 /* group: Miscellaneous */
57
59 #endif
```

## 34.170 fl\_utf8.h File Reference

header for Unicode and UTF-8 character handling

```
#include "Fl_Export.H"
#include "fl_types.h"
#include <stdio.h>
#include <sys/stat.h>
```

### Functions

- `int fl_access` (const char \*f, int mode)  
*Cross-platform function to test a files access() with a UTF-8 encoded name or value.*
- `int fl_chdir` (const char \*path)  
*Cross-platform function to change the current working directory, given as a UTF-8 encoded string.*
- `int fl_chmod` (const char \*f, int mode)  
*Cross-platform function to set a files mode() with a UTF-8 encoded name or value.*
- `int fl_close_fd` (int fd)  
*Cross-platform function to close a file descriptor.*
- `int fl_execvp` (const char \*file, char \*const \*argv)
- `FILE * fl_fopen` (const char \*f, const char \*mode)  
*Cross-platform function to open files with a UTF-8 encoded name.*
- `char * fl_getcwd` (char \*buf, int len)  
*Cross-platform function to get the current working directory as a UTF-8 encoded value.*
- `char * fl_getenv` (const char \*v)  
*Cross-platform function to get environment variables with a UTF-8 encoded name or value.*
- `char fl_make_path` (const char \*path)  
*Cross-platform function to recursively create a path in the file system.*
- `void fl_make_path_for_file` (const char \*path)  
*Cross-platform function to create a path for the file in the file system.*
- `int fl_mkdir` (const char \*f, int mode)  
*Cross-platform function to create a directory with a UTF-8 encoded name.*
- `unsigned int fl_nonspacing` (unsigned int ucs)  
*Returns true if the Unicode character ucs is non-spacing.*
- `int fl_open` (const char \*fname, int oflags,...)  
*Cross-platform function to open files with a UTF-8 encoded name.*
- `int fl_open_ext` (const char \*fname, int binary, int oflags,...)  
*Cross-platform function to open files with a UTF-8 encoded name.*
- `int fl_putenv` (const char \*var)  
*Cross-platform function to write environment variables with a UTF-8 encoded name or value.*
- `int fl_rename` (const char \*f, const char \*n)  
*Cross-platform function to rename a filesystem object using UTF-8 encoded names.*
- `int fl_rmdir` (const char \*f)  
*Cross-platform function to remove a directory with a UTF-8 encoded name.*
- `int fl_stat` (const char \*f, struct stat \*b)  
*Cross-platform function to stat() a file using a UTF-8 encoded name or value.*
- `int fl_system` (const char \*cmd)  
*Cross-platform function to run a system command with a UTF-8 encoded string.*
- `int fl_tolower` (unsigned int ucs)  
*Returns the Unicode lower case value of ucs.*
- `int fl_toupper` (unsigned int ucs)  
*Returns the Unicode upper case value of ucs.*

- unsigned [fl\\_ucs\\_to\\_Utf16](#) (const unsigned ucs, unsigned short \*dst, const unsigned dstlen)  
*Convert a single 32-bit Unicode codepoint into an array of 16-bit characters.*
- int [fl\\_unlink](#) (const char \*fname)  
*Cross-platform function to unlink() (that is, delete) a file using a UTF-8 encoded filename.*
- char \* [fl\\_utf2mbcs](#) (const char \*s)  
*Converts UTF-8 string *s* to a local multi-byte character string.*
- const char \* [fl\\_utf8back](#) (const char \*p, const char \*start, const char \*end)  
*Move *p* backward until it points to the start of a UTF-8 character.*
- int [fl\\_utf8bytes](#) (unsigned ucs)  
*Return the number of bytes needed to encode the given UCS4 character in UTF-8.*
- unsigned [fl\\_utf8decode](#) (const char \*p, const char \*end, int \*len)  
*Decode a single UTF-8 encoded character starting at *p*.*
- int [fl\\_utf8encode](#) (unsigned ucs, char \*buf)  
*Write the UTF-8 encoding of *ucs* into *buf* and return the number of bytes written.*
- unsigned [fl\\_utf8from\\_mb](#) (char \*dst, unsigned dstlen, const char \*src, unsigned srclen)  
*Convert a filename from the locale-specific multibyte encoding used by Windows to UTF-8 as used by FLTK.*
- unsigned [fl\\_utf8froma](#) (char \*dst, unsigned dstlen, const char \*src, unsigned srclen)  
*Convert an ISO-8859-1 (ie normal c-string) byte stream to UTF-8.*
- unsigned [fl\\_utf8fromwc](#) (char \*dst, unsigned dstlen, const wchar\_t \*src, unsigned srclen)  
*Turn "wide characters" as returned by some system calls (especially on Windows) into UTF-8.*
- const char \* [fl\\_utf8fwd](#) (const char \*p, const char \*start, const char \*end)  
*Move *p* forward until it points to the start of a UTF-8 character.*
- int [fl\\_utf8len](#) (char c)  
*Returns the byte length of the UTF-8 sequence with first byte *c*, or -1 if *c* is not valid.*
- int [fl\\_utf8len1](#) (char c)  
*Returns the byte length of the UTF-8 sequence with first byte *c*, or 1 if *c* is not valid.*
- int [fl\\_utf8locale](#) ()  
*Return true if the "locale" seems to indicate that UTF-8 encoding is used.*
- int [fl\\_utf8strlen](#) (const char \*text, int len)  
*Return the length in bytes of a UTF-8 string.*
- int [fl\\_utf8test](#) (const char \*src, unsigned srclen)  
*Examines the first *srclen* bytes in *src* and returns a verdict on whether it is UTF-8 or not.*
- unsigned [fl\\_utf8to\\_mb](#) (const char \*src, unsigned srclen, char \*dst, unsigned dstlen)  
*Convert the UTF-8 used by FLTK to the locale-specific encoding used for filenames (and sometimes used for data in files).*
- unsigned [fl\\_utf8toa](#) (const char \*src, unsigned srclen, char \*dst, unsigned dstlen)  
*Convert a UTF-8 sequence into an array of 1-byte characters.*
- unsigned [fl\\_utf8toUtf16](#) (const char \*src, unsigned srclen, unsigned short \*dst, unsigned dstlen)  
*Convert a UTF-8 sequence into an array of 16-bit characters.*
- unsigned [fl\\_utf8towc](#) (const char \*src, unsigned srclen, wchar\_t \*dst, unsigned dstlen)  
*Converts a UTF-8 string into a wide character string.*
- int [fl\\_utf\\_nb\\_char](#) (const unsigned char \*buf, int len)  
*Returns the number of Unicode chars in the UTF-8 string.*
- int [fl\\_utf\\_strcasecmp](#) (const char \*s1, const char \*s2)  
*UTF-8 aware strcasecmp - converts to Unicode and tests.*
- int [fl\\_utf\\_strncasecmp](#) (const char \*s1, const char \*s2, int n)  
*UTF-8 aware strncasecmp - converts to lower case Unicode and tests.*
- int [fl\\_utf\\_tolower](#) (const unsigned char \*str, int len, char \*buf)  
*Converts the string *str* to its lower case equivalent into *buf*.*
- int [fl\\_utf\\_toupper](#) (const unsigned char \*str, int len, char \*buf)  
*Converts the string *str* to its upper case equivalent into *buf*.*

- `int fl_wcwidth (const char *src)`  
*extended wrapper around `fl_wcwidth_(unsigned int ucs)` function.*
- `int fl_wcwidth_ (unsigned int ucs)`  
*Wrapper to adapt Markus Kuhn's implementation of `wcwidth()` for FLTK.*

### 34.170.1 Detailed Description

header for Unicode and UTF-8 character handling

## 34.171 fl\_utf8.h

[Go to the documentation of this file.](#)

```

1 /*
2  * Author: Jean-Marc Lienher ( http://oksid.ch )
3  * Copyright 2000-2010 by O'ksi'D.
4  * Copyright 2016-2021 by Bill Spitzak and others.
5  *
6  * This library is free software. Distribution and use rights are outlined in
7  * the file "COPYING" which should have been included with this file. If this
8  * file is missing or damaged, see the license at:
9  *
10 *      https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *      https://www.fltk.org/bugs.php
15 */
16
17 /* Merged in some functionality from the fltk-2 version. IMM.
18 * The following code is an attempt to merge the functions incorporated in FLTK2
19 * with the functions provided in Oksid's fltk-1.1.6-utf8 port
20 */
21
22 #ifndef _HAVE_FL_UTF8_HDR_
23 #define _HAVE_FL_UTF8_HDR_
24
25 #include "Fl_Export.H"
26 #include "fl_types.h"
27 #include <stdio.h> // FILE *fl_fopen()
28 #include <sys/stat.h> // struct stat
29
30 #ifdef __cplusplus
31 extern "C" {
32 #endif
33
34 /* F2: comes from FLTK2 */
35 /* OD: comes from Oksid */
36
37 FL_EXPORT int fl_utf8bytes(unsigned ucs);
38
39 /* OD: returns the byte length of the first UTF-8 char sequence (returns -1 if not valid) */
40 FL_EXPORT int fl_utf8len(char c);
41
42 /* OD: returns the byte length of the first UTF-8 char sequence (returns +1 if not valid) */
43 FL_EXPORT int fl_utf8len1(char c);
44
45 /* OD: returns the byte length of a UTF-8 text */
46 FL_EXPORT int fl_utf8strlen(const char *text, int len);
47
48 /* OD: returns the number of Unicode chars in the UTF-8 string */
49 FL_EXPORT int fl_utf_nb_char(const unsigned char *buf, int len);
50
51 /* F2: Convert the next UTF-8 char-sequence into a Unicode value (and say how many bytes were used) */
52 FL_EXPORT unsigned fl_utf8decode(const char *p, const char *end, int *len);
53
54 /* F2: Encode a Unicode value into a UTF-8 sequence, return the number of bytes used */
55 FL_EXPORT int fl_utf8encode(unsigned ucs, char *buf);
56
57 /* F2: Move forward to the next valid UTF-8 sequence start between start and end */
58 FL_EXPORT const char * fl_utf8fwd(const char *p, const char *start, const char *end);
59
60 /* F2: Move backward to the previous valid UTF-8 sequence start */
61 FL_EXPORT const char * fl_utf8back(const char *p, const char *start, const char *end);
62
63 /* XX: Convert a single 32-bit Unicode value into UTF16 */
64 FL_EXPORT unsigned fl_ucs_to_Utf16(const unsigned ucs, unsigned short *dst, const unsigned dstlen);
65
66 /* F2: Convert a UTF-8 string into UTF16 */
67 FL_EXPORT unsigned fl_utf8toUtf16(const char *src, unsigned srclen, unsigned short *dst, unsigned
dstlen);

```

```

82
83 /* F2: Convert a UTF-8 string into a wide character string - makes UTF16 on win32, "UCS4" elsewhere */
84 FL_EXPORT unsigned fl_utf8towc(const char *src, unsigned srclen, wchar_t *dst, unsigned dstlen);
85
86 /* F2: Convert a wide character string to UTF-8 - takes in UTF16 on win32, "UCS4" elsewhere */
87 FL_EXPORT unsigned fl_utf8fromwc(char *dst, unsigned dstlen, const wchar_t *src, unsigned srclen);
88
89 /* F2: Convert a UTF-8 string into ASCII, eliding untranslatable glyphs */
90 FL_EXPORT unsigned fl_utf8toa(const char *src, unsigned srclen, char *dst, unsigned dstlen);
91
92 /* F2: Convert 8859-1 string to UTF-8 */
93 FL_EXPORT unsigned fl_utf8froma(char *dst, unsigned dstlen, const char *src, unsigned srclen);
94
95 /* F2: Returns true if the current O/S locale is UTF-8 */
96 FL_EXPORT int fl_utf8locale(void);
97
98 /* F2: Examine the first len characters of src, to determine if the input text is UTF-8 or not
99 * NOTE: The value returned is not simply boolean - it contains information about the probable
100 * type of the src text. */
101 FL_EXPORT int fl_utf8test(const char *src, unsigned len);
102
103 /* XX: return width of "raw" ucs character in columns.
104 * for internal use only */
105 FL_EXPORT int fl_wcwidth(unsigned int ucs);
106
107 /* XX: return width of UTF-8 character string in columns.
108 * NOTE: this may also do C1 control character (0x80 to 0x9f) to CP1252 mapping,
109 * depending on original build options */
110 FL_EXPORT int fl_wcwidth(const char *src);
111
112 /* OD: Return true if the character is non-spacing */
113 FL_EXPORT unsigned int fl_nonspacing(unsigned int ucs);
114
115 /* F2: Convert UTF-8 to a local multi-byte encoding - mainly for win32? */
116 FL_EXPORT unsigned fl_utf8to_mb(const char *src, unsigned srclen, char *dst, unsigned dstlen);
117 /* OD: Convert UTF-8 to a local multi-byte encoding */
118 FL_EXPORT char* fl_utf2mbcs(const char *src);
119
120 /* F2: Convert a local multi-byte encoding to UTF-8 - mainly for win32? */
121 FL_EXPORT unsigned fl_utf8from_mb(char *dst, unsigned dstlen, const char *src, unsigned srclen);
122
123 /*****
124 #ifdef _WIN32
125 /* these two Windows-only functions are kept for API compatibility */
126 /* OD: Attempt to convert the UTF-8 string to the current locale */
127 FL_EXPORT char *fl_utf8_to_locale(const char *s, int len, unsigned int codepage);
128
129 /* OD: Attempt to convert a string in the current locale to UTF-8 */
130 FL_EXPORT char *fl_locale_to_utf8(const char *s, int len, unsigned int codepage);
131 #endif */
132
133 /*****
134 * The following functions are intended to provide portable, UTF-8 aware
135 * versions of standard functions
136 */
137
138 /* OD: UTF-8 aware strncasecmp - converts to lower case Unicode and tests */
139 FL_EXPORT int fl_utf_strncasecmp(const char *s1, const char *s2, int n);
140
141 /* OD: UTF-8 aware strcasecmp - converts to Unicode and tests */
142 FL_EXPORT int fl_utf_strcasecmp(const char *s1, const char *s2);
143
144 /* OD: return the Unicode lower case value of ucs */
145 FL_EXPORT int fl_tolower(unsigned int ucs);
146
147 /* OD: return the Unicode upper case value of ucs */
148 FL_EXPORT int fl_toupper(unsigned int ucs);
149
150 /* OD: converts the UTF-8 string to the lower case equivalent */
151 FL_EXPORT int fl_utf_tolower(const unsigned char *str, int len, char *buf);
152
153 /* OD: converts the UTF-8 string to the upper case equivalent */
154 FL_EXPORT int fl_utf_toupper(const unsigned char *str, int len, char *buf);
155
156 /* OD: Portable UTF-8 aware chmod wrapper */
157 FL_EXPORT int fl_chmod(const char *f, int mode);
158
159 /* OD: Portable UTF-8 aware access wrapper */
160 FL_EXPORT int fl_access(const char *f, int mode);
161
162 /* OD: Portable UTF-8 aware stat wrapper */
163 FL_EXPORT int fl_stat(const char *path, struct stat *buffer);
164
165 /* OD: Portable UTF-8 aware getcwd wrapper */
166 FL_EXPORT char *fl_getcwd(char *buf, int len);
167
168 /* Portable UTF-8 aware chdir wrapper */

```

```

169 FL_EXPORT int fl_chdir(const char *path);
170
171 /* OD: Portable UTF-8 aware fopen wrapper */
172 FL_EXPORT FILE *fl_fopen(const char *f, const char *mode);
173
174 /* OD: Portable UTF-8 aware system wrapper */
175 FL_EXPORT int fl_system(const char* f);
176
177 /* OD: Portable UTF-8 aware execvp wrapper */
178 FL_EXPORT int fl_execvp(const char *file, char *const *argv);
179
180 /* OD: Portable UTF-8 aware open wrapper */
181 FL_EXPORT int fl_open(const char *fname, int oflags, ...);
182
183 FL_EXPORT int fl_open_ext(const char *fname, int binary, int oflags, ...);
184
185 /* Portable wrapper around unix-style close() function */
186 FL_EXPORT int fl_close_fd(int fd);
187
188 /* OD: Portable UTF-8 aware unlink wrapper */
189 FL_EXPORT int fl_unlink(const char *fname);
190
191 /* OD: Portable UTF-8 aware rmdir wrapper */
192 FL_EXPORT int fl_rmdir(const char *f);
193
194 /* OD: Portable UTF-8 aware getenv wrapper */
195 FL_EXPORT char* fl_getenv(const char *name);
196
197 /* Portable UTF-8 aware putenv wrapper */
198 FL_EXPORT int fl_putenv(const char *var);
199
200 /* OD: Portable UTF-8 aware mkdir wrapper */
201 FL_EXPORT int fl_mkdir(const char* f, int mode);
202
203 /* OD: Portable UTF-8 aware rename wrapper */
204 FL_EXPORT int fl_rename(const char* f, const char *t);
205
206
207 /* OD: Given a full pathname, this will create the directory path needed to hold the file named */
208 FL_EXPORT void fl_make_path_for_file( const char *path );
209
210 /* OD: recursively create a path in the file system */
211 FL_EXPORT char fl_make_path( const char *path );
212
213
214 /*****
215  *
216  */
217
218 #ifdef __cplusplus
219 }
220 #endif /* __cplusplus */
221
222
223 #endif /* _HAVE_FL_UTF8_HDR_ */

```

## 34.172 Fl\_Valuator.H

```

1 //
2 // Valuator header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software.  Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file.  If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Valuator widget . */
19
20 #ifndef Fl_Valuator_H
21 #define Fl_Valuator_H
22
23 #ifndef Fl_Widget_H
24 #include "Fl_Widget.H"
25 #endif
26
27 // shared type() values for classes that work in both directions:
28 #define FL_VERTICAL 0
29 #define FL_HORIZONTAL 1

```

```

30
47 class FL_EXPORT Fl_Valuator : public Fl_Widget {
48
49     double value_;
50     double previous_value_;
51     double min, max; // truncates to this range *after* rounding
52     double A; int B; // rounds to multiples of A/B, or no rounding if A is zero
53
54 protected:
55     int horizontal() const {return type() & FL_HORIZONTAL;}
56     Fl_Valuator(int X, int Y, int W, int H, const char* L);
57
58
60     double previous_value() const {return previous_value_;}
62     void handle_push() {previous_value_ = value_;}
63     double softclamp(double);
64     void handle_drag(double newvalue);
65     void handle_release(); // use drag() value
66     virtual void value_damage(); // cause damage() due to value() changing
68     void set_value(double v) {value_ = v;}
69
70 public:
71
72 ~Fl_Valuator() FL_OVERRIDE { }
73     void bounds(double a, double b) {min=a; max=b;}
74     double minimum() const {return min;}
75     void minimum(double a) {min = a;}
76     double maximum() const {return max;}
77     void maximum(double a) {max = a;}
78     void range(double a, double b) {min = a; max = b;}
79     void step(int a) {A = a; B = 1;}
80     void step(double a, int b) {A = a; B = b;}
81     void step(double s);
82     double step() const {return A/B;}
83     void precision(int digits);
84
85     double value() const {return value_;}
86     int value(double);
87
88     virtual int format(char*);
89     double round(double); // round to nearest multiple of step
90     double clamp(double); // keep in range
91     double increment(double, int); // add n*step to value
92 };
93
94 #endif

```

## 34.173 Fl\_Value\_Input.H

```

1 //
2 // Value input header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Value_Input widget . */
19
20 #ifndef Fl_Value_Input_H
21 #define Fl_Value_Input_H
22
23 #include "Fl_Valuator.H"
24 #include "Fl_Input.H"
25
26 class FL_EXPORT Fl_Value_Input : public Fl_Valuator {
27 public:
28     /* This is the encapsulated Fl_input attribute to which
29     this class delegates the value font, color and shortcut */
30     Fl_Input input;
31 private:
32     char soft_;
33     static void input_cb(Fl_Widget*, void*);
34     void value_damage() FL_OVERRIDE; // cause damage() due to value() changing
35 public:
36     int handle(int) FL_OVERRIDE;
37 protected:

```

```

68 void draw() FL_OVERRIDE;
69 public:
70 void resize(int,int,int,int) FL_OVERRIDE;
71 Fl_Value_Input(int x,int y,int w,int h,const char *l=0);
72 ~Fl_Value_Input();
73
74 void soft(char s) {soft_ = s;}
75 char soft()const {return soft_;}
76 int shortcut()const {return input.shortcut();}
77 void shortcut(int s) {input.shortcut(s);}
78
79 Fl_Font textfont()const {return input.textfont();}
80 void textfont(Fl_Font s) {input.textfont(s);}
81 Fl_Fonsize textsize()const {return input.textsize();}
82 void textsize(Fl_Fonsize s) {input.textsize(s);}
83 Fl_Color textcolor()const {return input.textcolor();}
84 void textcolor(Fl_Color n) {input.textcolor(n);}
85 Fl_Color cursor_color()const {return input.cursor_color();}
86 void cursor_color(Fl_Color n) {input.cursor_color(n);}
87
88 };
89
90 #endif

```

## 34.174 Fl\_Value\_Output.H

```

1 //
2 // Value output header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Value_Output widget . */
19
20 #ifndef Fl_Value_Output_H
21 #define Fl_Value_Output_H
22
23 #ifndef Fl_Valuator_H
24 #include "Fl_Valuator.H"
25 #endif
26
27 class FL_EXPORT Fl_Value_Output : public Fl_Valuator {
28     Fl_Font textfont_;
29     Fl_Fonsize textsize_;
30     uchar soft_;
31     Fl_Color textcolor_;
32
33 protected:
34     void draw() FL_OVERRIDE;
35
36 public:
37     int handle(int) FL_OVERRIDE;
38     Fl_Value_Output(int x,int y,int w,int h,const char *l=0);
39
40     void soft(uchar s) {soft_ = s;}
41     uchar soft()const {return soft_;}
42
43     Fl_Font textfont()const {return textfont_;}
44     void textfont(Fl_Font s) {textfont_ = s;}
45     Fl_Fonsize textsize()const {return textsize_;}
46     void textsize(Fl_Fonsize s) {textsize_ = s;}
47     Fl_Color textcolor()const {return textcolor_;}
48     void textcolor(Fl_Color s) {textcolor_ = s;}
49 };
50
51 #endif

```

## 34.175 Fl\_Value\_Slider.H

```

1 //
2 // Value Slider header file for the Fast Light Tool Kit (FLTK).

```

```

3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_Value_Slider widget . */
19
20 #ifndef Fl_Value_Slider_H
21 #define Fl_Value_Slider_H
22
23 #include "Fl_Slider.H"
24
25 class FL_EXPORT Fl_Value_Slider : public Fl_Slider {
26     Fl_Font textfont_;
27     Fl_Fonsize textsize_;
28     Fl_Color textcolor_;
29     short value_width_;
30     short value_height_;
31
32 protected:
33     void draw() FL_OVERRIDE;
34
35 public:
36     int handle(int) FL_OVERRIDE;
37     Fl_Value_Slider(int x, int y, int w, int h, const char *l = 0);
38
39     Fl_Font textfont()const { return textfont_; }
40
41     void textfont(Fl_Font s) { textfont_ = s; }
42
43     Fl_Fonsize textsize()const { return textsize_; }
44
45     void textsize(Fl_Fonsize s) { textsize_ = s; }
46
47     Fl_Color textcolor()const { return textcolor_; }
48
49     void textcolor(Fl_Color s) { textcolor_ = s; }
50
51     void value_width(int s) {
52         if (s > w() - 10)
53             s = w() - 10;
54         if (s < 10)
55             s = 10;
56         value_width_ = (short)s;
57     }
58
59     int value_width()const { return (value_width_); }
60
61     void value_height(int s) {
62         if (s > h() - 10)
63             s = h() - 10;
64         if (s < 10)
65             s = 10;
66         value_height_ = (short)s;
67     }
68
69     int value_height()const { return (value_height_); }
70 };
71
72 #endif

```

## 34.176 Fl\_Widget.H File Reference

[Fl\\_Widget](#) and [Fl\\_Label](#) classes.

```
#include "Fl.H"
```

### Classes

- class [Fl\\_Callback\\_User\\_Data](#)

*A class prototype that allows for additional data in callbacks.*

- struct [Fl\\_Label](#)  
*This struct stores all information for a text or mixed graphics label.*
- class [Fl\\_Widget](#)  
*Fl\_Widget is the base class for all widgets in FLTK.*

## Macros

- `#define FL_RESERVED_TYPE 100`  
*Reserved type numbers (necessary for my cheapo RTTI) start here.*

## Typedefs

- `typedef void() Fl_Callback(Fl_Widget *, void *)`  
*Default callback type definition for all fltk widgets (by far the most used)*
- `typedef void() Fl_Callback0(Fl_Widget *)`  
*One parameter callback type definition passing only the widget.*
- `typedef void() Fl_Callback1(Fl_Widget *, long)`  
*Callback type definition passing the widget and a long data value.*
- `typedef Fl_Callback * Fl_Callback_p`  
*Default callback type pointer definition for all fltk widgets.*

### 34.176.1 Detailed Description

[Fl\\_Widget](#) and [Fl\\_Label](#) classes.

### 34.176.2 Macro Definition Documentation

#### 34.176.2.1 FL\_RESERVED\_TYPE

```
#define FL_RESERVED_TYPE 100
```

Reserved type numbers (necessary for my cheapo RTTI) start here.

Grep the header files for "RESERVED\_TYPE" to find the next available number.

## 34.177 Fl\_Widget.H

[Go to the documentation of this file.](#)

```
1 //
2 // Widget header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
22 #ifndef Fl_Widget_H
23 #define Fl_Widget_H
24
25 #include "Fl.H"
26
27 class Fl_Widget;
28 class Fl_Window;
29 class Fl_Group;
30 class Fl_Image;
31
33 typedef void (Fl_Callback ) (Fl_Widget*, void*);
```

```

35 typedef Fl_Callback* Fl_Callback_p; // needed for BORLAND
37 typedef void (Fl_Callback0)(Fl_Widget*);
39 typedef void (Fl_Callback1)(Fl_Widget*, long);
40
41 struct FL_EXPORT Fl_Label {
42     const char* value;
43     Fl_Image* image;
44     Fl_Image* deimage;
45     Fl_Font font;
46     Fl_Fonsize size;
47     Fl_Color color;
48     Fl_Align align_;
49     uchar type;
50     signed char h_margin_;
51     signed char v_margin_;
52     uchar spacing;
53
54     void draw(int,int,int,int, Fl_Align) const ;
55     void measure(int &w, int &h) const ;
56 };
57
58 class FL_EXPORT Fl_Callback_User_Data {
59 protected:
60     Fl_Callback_User_Data() {}
61 public:
62     virtual ~Fl_Callback_User_Data() { }
63 };
64
65 class FL_EXPORT Fl_Widget {
66     friend class Fl_Group;
67
68     Fl_Group* parent_;
69     Fl_Callback* callback_;
70     void* user_data_;
71     int x_, y_, w_, h_;
72     Fl_Label label_;
73     unsigned int flags_;
74     Fl_Color color_;
75     Fl_Color color2_;
76     uchar type_;
77     uchar damage_;
78     uchar box_;
79     uchar when_;
80
81     const char *tooltip_;
82
83     Fl_Widget(const Fl_Widget &);
84     Fl_Widget& operator=(const Fl_Widget &);
85
86 protected:
87     Fl_Widget(int x, int y, int w, int h, const char *label=0L);
88
89     void x(int v) {x_ = v;}
90     void y(int v) {y_ = v;}
91     void w(int v) {w_ = v;}
92     void h(int v) {h_ = v;}
93     unsigned int flags()const {return flags_;}
94     void set_flag(unsigned int c) {flags_ |= c;}
95     void clear_flag(unsigned int c) {flags_ &= ~c;}
96     enum {
97         INACTIVE          = 1<<0,
98         INVISIBLE          = 1<<1,
99         OUTPUT             = 1<<2,
100        NOBORDER            = 1<<3,
101        FORCE_POSITION      = 1<<4,
102        NON_MODAL           = 1<<5,
103        SHORTCUT_LABEL     = 1<<6,
104        CHANGED             = 1<<7,
105        OVERRIDE           = 1<<8,
106        VISIBLE_FOCUS      = 1<<9,
107        COPIED_LABEL       = 1<<10,
108        CLIP_CHILDREN       = 1<<11,
109        MENU_WINDOW        = 1<<12,
110        TOOLTIP_WINDOW     = 1<<13,
111        MODAL               = 1<<14,
112        NO_OVERLAY          = 1<<15,
113        GROUP_RELATIVE     = 1<<16,
114        COPIED_TOOLTIP     = 1<<17,
115        FULLSCREEN          = 1<<18,
116        MAC_USE_ACCENTS_MENU = 1<<19,
117        NEEDS_KEYBOARD     = 1<<20,
118        IMAGE_BOUND        = 1<<21,
119        DEIMAGE_BOUND      = 1<<22,
120        AUTO_DELETE_USER_DATA = 1<<23,

```

```

191     MAXIMIZED        = 1<<24,
192     POPUP            = 1<<25,
193     // Note to devs:  add new FLTK core flags above this line (up to 1<<28).
194
195     // Three more flags, reserved for user code
196
197     USERFLAG3        = 1<<29,
198     USERFLAG2        = 1<<30,
199     USERFLAG1        = 1<<31
200 };
201 void draw_box() const;
202 void draw_box(Fl_Boxtype t, Fl_Color c) const;
203 void draw_box(Fl_Boxtype t, int x,int y,int w,int h, Fl_Color c) const;
204 void draw_backdrop() const;
205
206 void draw_focus()const {
207     draw_focus(box(), x(), y(), w(), h(), color());
208 }
209
210 void draw_focus(Fl_Boxtype t, int X, int Y, int W, int H)const {
211     draw_focus(t, X, Y, W, H, color());
212 }
213
214 // See documentation in Fl_Widget.cxx
215 void draw_focus(Fl_Boxtype t, int x, int y, int w, int h, Fl_Color bg) const;
216
217 void draw_label() const;
218 void draw_label(int, int, int, int) const;
219
220 public:
221
222     virtual ~Fl_Widget();
223
224     virtual void draw() = 0;
225
226     virtual int handle(int event);
227
228     int is_label_copied()const {return ((flags_ & COPIED_LABEL) ? 1 : 0);}
229
230     void needs_keyboard(bool needs) {
231         if (needs) set_flag(NEEDS_KEYBOARD);
232         else clear_flag(NEEDS_KEYBOARD);
233     }
234
235     bool needs_keyboard()const {
236         return (flags_ & NEEDS_KEYBOARD);
237     }
238
239     Fl_Group* parent()const {return parent_;}
240
241     void parent(Fl_Group* p) {parent_ = p;} // for hacks only, use Fl_Group::add()
242
243     uchar type()const {return type_;}
244
245     void type(uchar t) {type_ = t;}
246
247     int x()const {return x_;}
248
249     int y()const {return y_;}
250
251     int w()const {return w_;}
252
253     int h()const {return h_;}
254
255     virtual void resize(int x, int y, int w, int h);
256
257     int damage_resize(int,int,int,int);
258
259     void position(int X,int Y) {resize(X,Y,w_,h_);}
260
261     void size(int W,int H) {resize(x_,y_,W,H);}
262
263     Fl_Align align()const {return label_.align_;}
264
265     void align(Fl_Align alignment) {label_.align_ = alignment;}
266
267     Fl_Boxtype box()const {return (Fl_Boxtype)box_;}
268
269     void box(Fl_Boxtype new_box) {box_ = new_box;}
270
271     Fl_Color color()const {return color_;}
272
273     void color(Fl_Color bg) {color_ = bg;}
274
275     Fl_Color selection_color()const {return color2_;}
276
277     void selection_color(Fl_Color a) {color2_ = a;}

```

```

484
492 void color(Fl_Color bg, Fl_Color sel) {color_=bg; color2_=sel;}
493
498 const char* label()const {return label_.value;}
499
511 void label(const char* text);
512
523 void copy_label(const char *new_label);
524
528 void label(Fl_Labeltype a, const char* b) {label_.type = a; label_.value = b;}
529
534 Fl_Labeltype labeltype()const {return (Fl_Labeltype)label_.type;}
535
544 void labeltype(Fl_Labeltype a) {label_.type = a;}
545
550 Fl_Color labelcolor()const {return label_.color;}
551
556 void labelcolor(Fl_Color c) {label_.color=c;}
557
565 Fl_Font labelfont()const {return label_.font;}
566
574 void labelfont(Fl_Font f) {label_.font=f;}
575
580 Fl_Fonsize labelsz()const {return label_.size;}
581
586 void labelsz(Fl_Fonsize pix) {label_.size=pix;}
587
591 Fl_Image* image() {return label_.image;}
592
596 const Fl_Image* image()const {return label_.image;}
597
613 void image(Fl_Image* img);
614
619 void image(Fl_Image& img);
620
636 void bind_image(Fl_Image* img);
637
642 void bind_image(int f) { if (f) set_flag(IMAGE_BOUND); else clear_flag(IMAGE_BOUND); }
643
649 int image_bound()const {return ((flags_ & IMAGE_BOUND) ? 1 : 0);}
650
654 Fl_Image* deimage() {return label_.deimage;}
655
659 const Fl_Image* deimage()const {return label_.deimage;}
660
667 void deimage(Fl_Image* img);
668
673 void deimage(Fl_Image& img);
674
681 void bind_deimage(Fl_Image* img);
682
688 int deimage_bound()const {return ((flags_ & DEIMAGE_BOUND) ? 1 : 0);}
689
694 void bind_deimage(int f) { if (f) set_flag(DEIMAGE_BOUND); else clear_flag(DEIMAGE_BOUND); }
695
700 void label_image_spacing(int gap) { label_.spacing = (uchar)gap; }
701
705 int label_image_spacing() { return label_.spacing; }
706
710 void horizontal_label_margin(int px) { label_.h_margin_ = (signed char)px; }
711
715 int horizontal_label_margin() { return label_.h_margin_; }
716
720 void vertical_label_margin(int px) { label_.v_margin_ = (signed char)px; }
721
725 int vertical_label_margin() { return label_.v_margin_; }
726
731 const char *tooltip()const {return tooltip_;}
732
733 void tooltip(const char *text); // see Fl_Tooltip
734 void copy_tooltip(const char *text); // see Fl_Tooltip
735
740 Fl_Callback_p callback()const {return callback_;}
741
747 void callback(Fl_Callback* cb, void* p) {
748     callback_ = cb;
749     user_data(p);
750 }
751
759 void callback(Fl_Callback* cb, Fl_Callback_User_Data* p, bool auto_free) {
760     callback_ = cb;
761     user_data(p, auto_free);
762 }
763
768 void callback(Fl_Callback* cb) {callback_ = cb;}
769
774 void callback(Fl_Callback0* cb) {

```

```

775     callback_ = (Fl_Callback*) (fl_intptr_t) (cb);
776 }
777
783 void callback(Fl_Callback1* cb, long p = 0) {
784     callback_ = (Fl_Callback*) (fl_intptr_t) (cb);
785     user_data((void*) (fl_intptr_t)p);
786 }
787
792 void* user_data() const {return user_data_;}
793
795 void user_data(void* v);
796
798 void user_data(Fl_Callback_User_Data* v, bool auto_free);
799
811 long argument() const {return (long) (fl_intptr_t)user_data_;}
812
817 void argument(long v) {user_data((void*) (fl_intptr_t)v);}
818
827 Fl_When when() const {return (Fl_When)when_;}
828
866 void when(uchar i) {when_ = i;}
867
872 unsigned int visible() const {return !(flags_ & INVISIBLE);}
873
878 int visible_r() const;
879
897 virtual void show();
898
902 virtual void hide();
903
908 void set_visible() {flags_ &= ~INVISIBLE;}
909
914 void clear_visible() {flags_ |= INVISIBLE;}
915
920 unsigned int active() const {return !(flags_ & INACTIVE);}
921
926 int active_r() const;
927
933 void activate();
934
949 void deactivate();
950
959 unsigned int output() const {return (flags_ & OUTPUT);}
960
964 void set_output() {flags_ |= OUTPUT;}
965
969 void clear_output() {flags_ &= ~OUTPUT;}
970
976 unsigned int takeevents() const {return !(flags_ & (INACTIVE|INVISIBLE|OUTPUT));}
977
996 unsigned int changed() const {return flags_ & CHANGED;}
997
1001 void set_changed() {flags_ |= CHANGED;}
1002
1006 void clear_changed() {flags_ &= ~CHANGED;}
1007
1012 void clear_active() {flags_ |= INACTIVE;}
1013
1018 void set_active() {flags_ &= ~INACTIVE;}
1019
1027 int take_focus();
1028
1035 void set_visible_focus() { flags_ |= VISIBLE_FOCUS; }
1036
1041 void clear_visible_focus() { flags_ &= ~VISIBLE_FOCUS; }
1042
1047 void visible_focus(int v) { if (v) set_visible_focus(); else clear_visible_focus(); }
1048
1053 unsigned int visible_focus() const { return flags_ & VISIBLE_FOCUS; }
1054
1075 static void default_callback(Fl_Widget *widget, void *data);
1076
1089 void do_callback(Fl_Callback_Reason reason=FL_REASON_UNKNOWN) {do_callback(this, user_data_,
reason);}
1090
1098 void do_callback(Fl_Widget *widget, long arg, Fl_Callback_Reason reason=FL_REASON_UNKNOWN) {
1099     do_callback(widget, (void*) (fl_intptr_t)arg, reason);
1100 }
1101
1102 void do_callback(Fl_Widget *widget, void *arg = 0, Fl_Callback_Reason reason=FL_REASON_UNKNOWN);
1103
1104 /* Internal use only. */
1105 int test_shortcut();
1106 /* Internal use only. */
1107 static unsigned int label_shortcut(const char *t);
1108 /* Internal use only. */
1109 static int test_shortcut(const char*, const bool require_alt = false);

```

```

1110  /* Internal use only. */
1111  void _set_fullscreen() {flags_ |= FULLSCREEN;}
1112  void _clear_fullscreen() {flags_ &= ~FULLSCREEN;}
1113
1119  int contains(const Fl_Widget *w) const ;
1120
1127  int inside(const Fl_Widget *wgt) const {return wgt ? wgt->contains(this) : 0;}
1128
1132  void redraw();
1133
1138  void redraw_label();
1139
1146  uchar damage() const {return damage_;}
1147
1160  void clear_damage(uchar c = 0) {damage_ = c;}
1161
1167  void damage(uchar c);
1168
1175  void damage(uchar c, int x, int y, int w, int h);
1176
1177  void draw_label(int, int, int, int, Fl_Align) const;
1178
1186  void measure_label(int& ww, int& hh) const {label_.measure(ww, hh);}
1187
1188  Fl_Window* window() const ;
1189  Fl_Window* top_window() const;
1190  Fl_Window* top_window_offset(int& xoff, int& yoff) const;
1191
1215  virtual Fl_Group* as_group() { return NULL; }
1216  virtual Fl_Group const* as_group() const { return NULL; }
1217
1230  virtual Fl_Window* as_window() { return 0; }
1231  virtual Fl_Window const* as_window() const { return NULL; }
1232
1243  virtual class Fl_Gl_Window* as_gl_window() { return NULL; }
1244  virtual class Fl_Gl_Window const* as_gl_window() const { return NULL; }
1245
1248  int use_accents_menu() { return flags() & MAC_USE_ACCENTS_MENU; }
1249
1253  Fl_Color color2() const {return (Fl_Color)color2_;}
1254
1258  void color2(unsigned a) {color2_ = a;}
1259
1271  void shortcut_label(int value) {
1272      if (value)
1273          set_flag(SHORTCUT_LABEL);
1274      else
1275          clear_flag(SHORTCUT_LABEL);
1276  }
1277
1280  int shortcut_label() const { return flags_ & SHORTCUT_LABEL; }
1281 };
1282
1288 #define FL_RESERVED_TYPE 100
1289
1290 #endif

```

## 34.178 Fl\_Widget\_Surface.H

```

1  //
2  // Drivers code for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2016 by Bill Spitzak and others.
5  //
6  // This library is free software. Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file. If this
8  // file is missing or damaged, see the license at:
9  //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Widget_Surface_h
18 #define Fl_Widget_Surface_h
19
20 #include <FL/Fl_Device.H>
21 #include <FL/Fl_Window.H>
22
23 class FL_EXPORT Fl_Widget_Surface : public Fl_Surface_Device {
24 private:
25     void traverse(Fl_Widget *widget); // finds subwindows of widget and prints them
26 protected:

```

```

30  int x_offset;
31  int y_offset;
32  Fl_Widget_Surface(Fl_Graphics_Driver *d);
33 public:
34  virtual void translate(int x, int y);
35  virtual void untranslate();
36  void draw(Fl_Widget* widget, int delta_x = 0, int delta_y = 0);
37  void draw_decorated_window(Fl_Window *win, int x_offset = 0, int y_offset = 0);
38  void print_window_part(Fl_Window *win, int x, int y, int w, int h, int delta_x = 0, int delta_y = 0);
39  virtual int printable_rect(int *w, int *h);
40  virtual void origin(int x, int y);
41  virtual void origin(int *x, int *y);
42 };
43
44
45 #endif /* Fl_Widget_Surface_h */

```

## 34.179 Fl\_Window.H File Reference

[Fl\\_Window](#) widget .

```

#include <FL/Fl.H>
#include <FL/Fl_Group.H>
#include <FL/Fl_Bitmap.H>

```

### Classes

- class [Fl\\_Window](#)

*This widget produces an actual window.*

### Macros

- #define **FL\_DOUBLE\_WINDOW** 0xF1  
*double window type id*
- #define **FL\_WINDOW** 0xF0  
*window type id: all subclasses have type() >= this*

### 34.179.1 Detailed Description

[Fl\\_Window](#) widget .

## 34.180 Fl\_Window.H

[Go to the documentation of this file.](#)

```

1 //
2 // Window header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file.  If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef FL_Window_H
18 #define FL_Window_H
19
20 #include <FL/Fl.H>
21 #include <FL/Fl_Group.H>
22 #include <FL/Fl_Bitmap.H>
23
24 #define FL_WINDOW 0xF0
25 #define FL_DOUBLE_WINDOW 0xF1
26
27 class Fl_X;

```

```

31 class Fl_Window_Driver;
32 class Fl_RGB_Image;
33 class Fl_Double_Window;
34
55 class FL_EXPORT Fl_Window : public Fl_Group {
56     friend class Fl_X;
57     friend class Fl_Window_Driver;
58 private:
59     static char *default_xclass_;
60     static char show_next_window_iconic_; // 1 means create next window in iconic form
61
62     int no_fullscreen_x;
63     int no_fullscreen_y;
64     int no_fullscreen_w;
65     int no_fullscreen_h;
66     int fullscreen_screen_top;
67     int fullscreen_screen_bottom;
68     int fullscreen_screen_left;
69     int fullscreen_screen_right;
70
71     // TODO: it would make sense to merge the use of Fl_X and Fl_Window_Driver, maybe simply by
72     // TODO: deriving Fl_Window_Driver from Fl_X. However, there are a lot of historic kludges
73     // TODO: for some platforms around Fl_X.
74     Fl_X *flx_; // points at the system-specific stuff, but exists only after the window is mapped
75     Fl_Window_Driver *pWindowDriver; // points at the system-specific stuff at window creation time
76
77     const char* iconlabel_;
78     char* xclass_;
79
80     // private size_range stuff:
81     int minw_, minh_, maxw_, maxh_;
82     int dw_, dh_, aspect_;
83     uchar size_range_set_; // true (1) if size_range() has been set or calculated
84
85     // cursor stuff
86     Fl_Cursor cursor_default;
87
88     void _Fl_Window(); // constructor innards
89
90     // unimplemented copy ctor and assignment operator
91     Fl_Window(const Fl_Window&);
92     Fl_Window& operator=(const Fl_Window&);
93
94     void is_maximized_(bool b);
95
96 protected:
97
99     static Fl_Window *current_;
100     void draw() FL_OVERRIDE;
101
102 public:
103
105     virtual void flush();
106
107 protected:
108
117     void force_position(int force) {
118         if (force) set_flag(FORCE_POSITION);
119         else clear_flag(FORCE_POSITION);
120     }
121
129     int force_position()const { return ((flags() & FORCE_POSITION)?1:0); }
130
131     void free_icons();
132
133     void default_size_range(); // calculate size_range() if not set explicitly
134     int is_resizable(); // calculate size_range() and return whether this is resizable
135
136 public:
137
166     Fl_Window(int w, int h, const char *title = 0);
169     Fl_Window(int x, int y, int w, int h, const char *title = 0);
198     virtual ~Fl_Window();
199
200     int handle(int) FL_OVERRIDE;
201
218     void resize(int X,int Y,int W,int H) FL_OVERRIDE;
225     void border(int b);
230     void clear_border() {set_flag(NO_BORDER);}
232     unsigned int border()const {return !(flags() & NO_BORDER);}
234     void set_override() {set_flag(NO_BORDER|OVERRIDE);}
236     unsigned int override()const {return flags()&OVERRIDE;}
245     void set_modal() {set_flag(MODAL);}
247     unsigned int modal()const {return flags() & MODAL;}
254     void set_non_modal() {set_flag(NON_MODAL);}
256     unsigned int non_modal()const {return flags() & (NON_MODAL|MODAL);}
257
295     void clear_modal_states() {clear_flag(NON_MODAL | MODAL);}

```

```

296
310 void set_menu_window()          {set_flag(MENU_WINDOW);}
311
313 unsigned int menu_window()const {return flags() & MENU_WINDOW;}
314
331 void set_tooltip_window()       { set_flag(TOOLTIP_WINDOW);
332                                 clear_flag(MENU_WINDOW); }
334 unsigned int tooltip_window()const {return flags() & TOOLTIP_WINDOW;}
335
343 void hotspot(int x, int y, int offscreen = 0);
345 void hotspot(const Fl_Widget*, int offscreen = 0);
347 void hotspot(const Fl_Widget& p, int offscreen = 0) {hotspot(&p,offscreen);}
348
357 void free_position() {clear_flag(FORCE_POSITION);}
358
359 void size_range(int minw, int minh, int maxw=0, int maxh=0, int dw=0, int dh=0, int aspect=0);
360
361 uchar get_size_range(int *minw, int *minh, int *maxw=NULL, int *maxh=NULL, int *dw=NULL, int *dh=NULL,
362 int *aspect=NULL);
363
364 const char* label()const        {return Fl_Widget::label();}
366 const char* iconlabel()const    {return iconlabel_;}
368 void label(const char*);
370 void iconlabel(const char*);
372 void label(const char* label, const char* iconlabel); // platform dependent
373 void copy_label(const char* a);
374
375 static void default_xclass(const char*);
376 static const char *default_xclass();
377 const char* xclass() const;
378 void xclass(const char* c);
379
380 static void default_icon(const Fl_RGB_Image*);
381 static void default_icons(const Fl_RGB_Image*[], int);
382 void icon(const Fl_RGB_Image*);
383 void icons(const Fl_RGB_Image*[], int);
384
385 #if defined(_WIN32) || defined(FL_DOXYGEN)
386 typedef struct HICON_ * HICON;
387 // These 2 member functions break the driver model but are kept for back compatibility.
388 // They are implemented in Fl_win32.cxx
389
409 static void default_icons(HICON big_icon, HICON small_icon);
410
419 void icons(HICON big_icon, HICON small_icon);
420 #endif // defined(_WIN32) || defined(FL_DOXYGEN)
421
422 /* for legacy compatibility */
423 const void* icon() const;
424 void icon(const void * ic);
425
431 int shown() {return flx_ != 0;}
458 void show() FL_OVERRIDE;
463 void hide() FL_OVERRIDE;
484 void show(int argc, char **argv);
485
486 // Enables synchronous show(), docs in Fl_Window.cxx
487 void wait_for_expose();
488
500 void fullscreen();
504 void fullscreen_off();
509 void fullscreen_off(int X,int Y,int W,int H);
513 unsigned int fullscreen_active()const { return flags() & FULLSCREEN; }
524 void fullscreen_screens(int top, int bottom, int left, int right);
525
526 void maximize();
527 void un_maximize();
529 unsigned int maximize_active()const { return flags() & MAXIMIZED; }
530 public:
546 void iconize();
547
548 int x_root() const ;
549 int y_root() const ;
550
551 static Fl_Window *current();
561 void make_current();
562
563 void cursor(Fl_Cursor);
564 void cursor(const Fl_RGB_Image*, int, int);
565 void default_cursor(Fl_Cursor);
566
567 /* for legacy compatibility */
568 void cursor(Fl_Cursor c, Fl_Color, Fl_Color=FL_WHITE);
569 void default_cursor(Fl_Cursor c, Fl_Color, Fl_Color=FL_WHITE);
570
571 static void default_callback(Fl_Window*, void* v);
572

```

```

578     int decorated_w() const;
579
593     int decorated_h() const;
594
595     // Note: Doxygen docs in Fl_Widget.H to avoid redundancy.
596     Fl_Window* as_window() FL_OVERRIDE { return this; }
597     Fl_Window const* as_window() const FL_OVERRIDE { return this; }
598
602     virtual class Fl_Overlay_Window *as_overlay_window() {return 0L; }
603
607     virtual class Fl_Double_Window *as_double_window() {return 0L; }
608
609     void shape(const Fl_Image* img);
610     void shape(const Fl_Image& b);
611     const Fl_Image *shape();
612     void draw_backdrop();
613     int screen_num();
614     void screen_num(int screen_num);
615     static bool is_a_rescale();
616     fl_uintptr_t os_id();
617
625     static void show_next_window_iconic(char stat) {
626         show_next_window_iconic_ = stat ? 1 : 0;
627     }
628
636     static char show_next_window_iconic() {
637         return show_next_window_iconic_;
638     }
639
640     void allow_expand_outside_parent();
641
642 };
643
644 #endif

```

## 34.181 Fl\_Wizard.H

```

1 //
2 // Fl_Wizard widget definitions.
3 //
4 // Copyright 1999-2010 by Easy Software Products.
5 // Copyright 2011-2020 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
18 /* \file
19 Fl_Wizard widget . */
20
21 //
22 // Include necessary header files...
23 //
24
25 #ifndef _Fl_Wizard_H_
26 #define _Fl_Wizard_H_
27
28 #include <FL/Fl_Group.H>
29
30 class FL_EXPORT Fl_Wizard : public Fl_Group {
31
32     Fl_Widget *value_;
33
34 protected:
35
36     void draw() FL_OVERRIDE;
37
38 public:
39
40     Fl_Wizard(int, int, int, int, const char * = 0);
41
42     void next();
43     void prev();
44     Fl_Widget *value();
45     void value(Fl_Widget *);
46 };
47
48 #endif // !_Fl_Wizard_H_

```

## 34.182 Fl\_XBM\_Image.H

```
1 //
2 // XBM image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_XBM_Image class . */
19
20 #ifndef Fl_XBM_Image_H
21 #define Fl_XBM_Image_H
22 # include "Fl_Bitmap.H"
23
24 class FL_EXPORT Fl_XBM_Image : public Fl_Bitmap {
25 public:
26     Fl_XBM_Image(const char* filename);
27 };
28
29 #endif // !Fl_XBM_Image_H
```

## 34.183 Fl\_XPM\_Image.H

```
1 //
2 // XPM image header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 /* \file
18 Fl_XPM_Image class . */
19
20 #ifndef Fl_XPM_Image_H
21 #define Fl_XPM_Image_H
22 # include "Fl_Pixmap.H"
23
24 class FL_EXPORT Fl_XPM_Image : public Fl_Pixmap {
25 public:
26     Fl_XPM_Image(const char* filename);
27 };
28
29 #endif // !Fl_XPM_Image
```

## 34.184 forms.H

```
1 //
2 // Forms emulation header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
```

```

12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef __FORMS_H__
18 #define __FORMS_H__
19
20 #include "Fl.H"
21 #include "Fl_Group.H"
22 #include "Fl_Window.H"
23 #include "fl_draw.H"
24
25 typedef Fl_Widget FL_OBJECT;
26 typedef Fl_Window FL_FORM;
27
28
29 // Random constants & symbols defined by forms.h file:
30
31 #ifndef NULL
32 #define NULL 0
33 #endif
34 #ifndef FALSE
35 #define FALSE 0
36 #define TRUE 1
37 #endif
38
39 #define FL_ON 1
40 #define FL_OK 1
41 #define FL_VALID 1
42 #define FL_PREEMPT 1
43 #define FL_AUTO 2
44 #define FL_WHEN_NEEDED FL_AUTO
45 #define FL_OFF 0
46 #define FL_NONE 0
47 #define FL_CANCEL 0
48 #define FL_INVALID 0
49 #define FL_IGNORE -1
50 // #define FL_CLOSE -2 // this variable is never used in FLTK Forms. It is removed
51 // because it conflicts with the window FL_CLOSE event
52
53 #define FL_LCOL FL_BLACK
54 #define FL_COL1 FL_GRAY
55 #define FL_MCOL FL_LIGHT1
56 #define FL_LEFT_BCOL FL_LIGHT3 // 53 is better match
57 #define FL_TOP_BCOL FL_LIGHT2 // 51
58 #define FL_BOTTOM_BCOL FL_DARK2 // 40
59 #define FL_RIGHT_BCOL FL_DARK3 // 36
60 #define FL_INACTIVE FL_INACTIVE_COLOR
61 #define FL_INACTIVE_COL FL_INACTIVE_COLOR
62 #define FL_FREE_COL1 FL_FREE_COLOR
63 #define FL_FREE_COL2 ((Fl_Color)(FL_FREE_COLOR+1))
64 #define FL_FREE_COL3 ((Fl_Color)(FL_FREE_COLOR+2))
65 #define FL_FREE_COL4 ((Fl_Color)(FL_FREE_COLOR+3))
66 #define FL_FREE_COL5 ((Fl_Color)(FL_FREE_COLOR+4))
67 #define FL_FREE_COL6 ((Fl_Color)(FL_FREE_COLOR+5))
68 #define FL_FREE_COL7 ((Fl_Color)(FL_FREE_COLOR+6))
69 #define FL_FREE_COL8 ((Fl_Color)(FL_FREE_COLOR+7))
70 #define FL_FREE_COL9 ((Fl_Color)(FL_FREE_COLOR+8))
71 #define FL_FREE_COL10 ((Fl_Color)(FL_FREE_COLOR+9))
72 #define FL_FREE_COL11 ((Fl_Color)(FL_FREE_COLOR+10))
73 #define FL_FREE_COL12 ((Fl_Color)(FL_FREE_COLOR+11))
74 #define FL_FREE_COL13 ((Fl_Color)(FL_FREE_COLOR+12))
75 #define FL_FREE_COL14 ((Fl_Color)(FL_FREE_COLOR+13))
76 #define FL_FREE_COL15 ((Fl_Color)(FL_FREE_COLOR+14))
77 #define FL_FREE_COL16 ((Fl_Color)(FL_FREE_COLOR+15))
78 #define FL_TOMATO ((Fl_Color)(131))
79 #define FL_INDIANRED ((Fl_Color)(164))
80 #define FL_SLATEBLUE ((Fl_Color)(195))
81 #define FL_DARKGOLD ((Fl_Color)(84))
82 #define FL_PALEGREEN ((Fl_Color)(157))
83 #define FL_ORCHID ((Fl_Color)(203))
84 #define FL_DARKCYAN ((Fl_Color)(189))
85 #define FL_DARKTOMATO ((Fl_Color)(113))
86 #define FL_WHEAT ((Fl_Color)(174))
87
88 #define FL_ALIGN_BESIDE FL_ALIGN_INSIDE
89
90 #define FL_PUP_TOGGLE 2 // FL_MENU_TOGGLE
91 #define FL_PUP_INACTIVE 1 // FL_MENU_INACTIVE
92 #define FL_NO_FRAME FL_NO_BOX
93 #define FL_ROUNDED3D_UPBOX FL_ROUND_UP_BOX
94 #define FL_ROUNDED3D_DOWNBOX FL_ROUND_DOWN_BOX
95 #define FL_OVAL3D_UPBOX FL_ROUND_UP_BOX
96 #define FL_OVAL3D_DOWNBOX FL_ROUND_DOWN_BOX
97
98 #define FL_MBUTTON1 1
99 #define FL_LEFTMOUSE 1

```

```

100 #define FL_MBUTTON2      2
101 #define FL_MIDDLEMOUSE   2
102 #define FL_MBUTTON3      3
103 #define FL_RIGHTMOUSE    3
104 #define FL_MBUTTON4      4
105 #define FL_MBUTTON5      5
106
107 #define FL_INVALID_STYLE  255
108 #define FL_NORMAL_STYLE   FL_HELVETICA
109 #define FL_BOLD_STYLE     FL_HELVETICA_BOLD
110 #define FL_ITALIC_STYLE   FL_HELVETICA_ITALIC
111 #define FL_BOLDITALIC_STYLE FL_HELVETICA_BOLD_ITALIC
112 #define FL_FIXED_STYLE    FL_COURIER
113 #define FL_FIXEDBOLD_STYLE FL_COURIER_BOLD
114 #define FL_FIXEDITALIC_STYLE FL_COURIER_ITALIC
115 #define FL_FIXEDBOLDITALIC_STYLE FL_COURIER_BOLD_ITALIC
116 #define FL_TIMES_STYLE    FL_TIMES
117 #define FL_TIMESBOLD_STYLE FL_TIMES_BOLD
118 #define FL_TIMESITALIC_STYLE FL_TIMES_ITALIC
119 #define FL_TIMESBOLDITALIC_STYLE FL_TIMES_BOLD_ITALIC
120
121 // hacks to change the labeltype() when passed to fl_set_object_lstyle():
122 #define FL_SHADOW_STYLE    (FL_SHADOW_LABEL<<8)
123 #define FL_ENGRAVED_STYLE  (FL_ENGRAVED_LABEL<<8)
124 #define FL_EMBOSSSED_STYLE (FL_EMBOSSSED_LABEL<<0)
125
126 // size values are different from XForms, match older Forms:
127 #define FL_TINY_SIZE      8
128 #define FL_SMALL_SIZE     11 // 10
129 // #define FL_NORMAL_SIZE  14 // 12
130 #define FL_MEDIUM_SIZE    18 // 14
131 #define FL_LARGE_SIZE     24 // 18
132 #define FL_HUGE_SIZE      32 // 24
133 #define FL_DEFAULT_SIZE   FL_SMALL_SIZE
134 #define FL_TINY_FONT      FL_TINY_SIZE
135 #define FL_SMALL_FONT     FL_SMALL_SIZE
136 #define FL_NORMAL_FONT    FL_NORMAL_SIZE
137 #define FL_MEDIUM_FONT    FL_MEDIUM_SIZE
138 #define FL_LARGE_FONT     FL_LARGE_SIZE
139 #define FL_HUGE_FONT      FL_HUGE_SIZE
140 #define FL_NORMAL_FONT1   FL_SMALL_FONT
141 #define FL_NORMAL_FONT2   FL_NORMAL_FONT
142 #define FL_DEFAULT_FONT   FL_SMALL_FONT
143
144 #define FL_RETURN_END_CHANGED FL_WHEN_RELEASE
145 #define FL_RETURN_CHANGED    FL_WHEN_CHANGED
146 #define FL_RETURN_END        FL_WHEN_RELEASE_ALWAYS
147 #define FL_RETURN_ALWAYS     (FL_WHEN_CHANGED|FL_WHEN_NOT_CHANGED)
148
149 #define FL_BOUND_WIDTH      3
150
151 typedef int FL_Coord;
152 typedef int FL_COLOR;
153
154 // fltk interaction:
155
156 #define FL_CMD_OPT void
157 extern FL_EXPORT void fl_initialize(int*, char*[], const char*, FL_CMD_OPT*, int);
158 inline void fl_finish() {}
159
160 typedef void (*FL_IO_CALLBACK) (FL_SOCKET, void*);
161 inline void fl_add_io_callback(int fd, short w, FL_IO_CALLBACK cb, void* v) {
162     Fl::add_fd(fd, w, cb, v);}
163 inline void fl_remove_io_callback(int fd, short, FL_IO_CALLBACK) {
164     Fl::remove_fd(fd);} // removes all the callbacks!
165
166 // type of callback is different and no "id" number is returned:
167 inline void fl_add_timeout(long msec, void (*cb)(void*), void* v) {
168     Fl::add_timeout(msec*.001, cb, v);}
169 inline void fl_remove_timeout(int) {}
170
171 // type of callback is different!
172 inline void fl_set_idle_callback(void (*cb)()) {Fl::set_idle(cb);}
173
174 FL_EXPORT Fl_Widget* fl_do_forms(void);
175 FL_EXPORT Fl_Widget* fl_check_forms();
176 inline Fl_Widget* fl_do_only_forms(void) {return fl_do_forms();}
177 inline Fl_Widget* fl_check_only_forms(void) {return fl_check_forms();}
178
179 // because of new redraw behavior, these are no-ops:
180 inline void fl_freeze_object(Fl_Widget*) {}
181 inline void fl_unfreeze_object(Fl_Widget*) {}
182 inline void fl_freeze_form(Fl_Window*) {}
183 inline void fl_unfreeze_form(Fl_Window*) {}
184 inline void fl_freeze_all_forms() {}
185 inline void fl_unfreeze_all_forms() {}
186
187

```

```

188 inline void fl_set_focus_object(Fl_Window*, Fl_Widget* o) {Fl::focus(o);}
189 inline void fl_reset_focus_object(Fl_Widget* o) {Fl::focus(o);}
190 #define fl_set_object_focus fl_set_focus_object
191
192 // void fl_set_form_atclose(Fl_Window*w,int (*cb)(Fl_Window*,void*),void* v)
193 // void fl_set_atclose(int (*cb)(Fl_Window*,void*),void*)
194 // fl_set_form_atactivate/atdeactivate not implemented!
195
197 // Fl_Widget:
198
199 inline void fl_set_object_boxtype(Fl_Widget* o, Fl_Boxtype a) {o->box(a);}
200 inline void fl_set_object_lsize(Fl_Widget* o,int s) {o->labelsize(s);}
201
202 /* forms lib font indexes must be byte sized - extract correct byte from style word */
203 inline void fl_set_object_lstyle(Fl_Widget* o,int a) {
204     o->labelfont((Fl_Font)(a&0xff)); o->labeltype((Fl_Labeltype)(a>>8));}
205 inline void fl_set_object_lcol(Fl_Widget* o, Fl_Color a) {o->labelcolor(a);}
206 #define fl_set_object_lcolor fl_set_object_lcol
207 inline void fl_set_object_lalign(Fl_Widget* o, Fl_Align a) {o->align(a);}
208 #define fl_set_object_align fl_set_object_lalign
209 inline void fl_set_object_color(Fl_Widget* o,Fl_Color a,Fl_Color b) {o->color(a,b);}
210 inline void fl_set_object_label(Fl_Widget* o, const char* a) {o->label(a); o->redraw();}
211 inline void fl_set_object_position(Fl_Widget*o,int x,int y) {o->position(x,y);}
212 inline void fl_set_object_size(Fl_Widget* o, int w, int h) {o->size(w,h);}
213 inline void fl_set_object_geometry(Fl_Widget* o,int x,int y,int w,int h) {o->resize(x,y,w,h);}
214
215 inline void fl_get_object_geometry(Fl_Widget* o,int*x,int*y,int*w,int*h) {
216     *x = o->x(); *y = o->y(); *w = o->w(); *h = o->h();}
217 inline void fl_get_object_position(Fl_Widget* o,int*x,int*y) {
218     *x = o->x(); *y = o->y();}
219
220 typedef void (*Forms_CB)(Fl_Widget*, long);
221 inline void fl_set_object_callback(Fl_Widget*o,Forms_CB c,long a) {o->callback(c,a);}
222 #define fl_set_call_back fl_set_object_callback
223 inline void fl_call_object_callback(Fl_Widget* o) {o->do_callback();}
224 inline void fl_trigger_object(Fl_Widget* o) {o->do_callback();}
225 inline void fl_set_object_return(Fl_Widget* o, int v) {
226     o->when((Fl_When)(v|FL_WHEN_RELEASE));}
227
228 inline void fl_redraw_object(Fl_Widget* o) {o->redraw();}
229 inline void fl_show_object(Fl_Widget* o) {o->show();}
230 inline void fl_hide_object(Fl_Widget* o) {o->hide();}
231 inline void fl_free_object(Fl_Widget* x) {delete x;}
232 inline void fl_delete_object(Fl_Widget* o) {o->parent()->remove(*o);}
233 inline void fl_activate_object(Fl_Widget* o) {o->activate();}
234 inline void fl_deactivate_object(Fl_Widget* o) {o->deactivate();}
235
236 inline void fl_add_object(Fl_Window* f, Fl_Widget* x) {f->add(x);}
237 inline void fl_insert_object(Fl_Widget* o, Fl_Widget* b) {b->parent()->insert(*o,b);}
238
239 inline Fl_Window* FL_ObjWin(Fl_Widget* o) {return o->window();}
240
242 // things that appered in the demos a lot that I don't emulate, but
243 // I did not want to edit out of all the demos...
244
245 inline int fl_get_border_width() {return 3;}
246 inline void fl_set_border_width(int) {}
247 inline void fl_set_object_dblbuffer(Fl_Widget*, int) {}
248 inline void fl_set_form_dblbuffer(Fl_Window*, int) {}
249
251 // Fl_Window:
252
253 inline void fl_free_form(Fl_Window* x) {delete x;}
254 inline void fl_redraw_form(Fl_Window* f) {f->redraw();}
255
256 inline Fl_Window* fl_bgn_form(Fl_Boxtype b,int w,int h) {
257     Fl_Window* g = new Fl_Window(w,h,0);
258     g->box(b);
259     return g;
260 }
261 FL_EXPORT void fl_end_form();
262 inline void fl_addto_form(Fl_Window* f) {f->begin();}
263 inline Fl_Group* fl_bgn_group() {return new Fl_Group(0,0,0,0,0);}
264 inline void fl_end_group() {Fl_Group::current()->forms_end();}
265 inline void fl_addto_group(Fl_Widget* o) {((Fl_Group*)o)->begin();}
266 #define resizebox _ddfdesign_kludge()
267
268 inline void fl_scale_form(Fl_Window* f, double x, double y) {
269     f->resizable(f); f->size(int(f->w()*x),int(f->h()*y));}
270 inline void fl_set_form_position(Fl_Window* f,int x,int y) {f->position(x,y);}
271 inline void fl_set_form_size(Fl_Window* f, int w, int h) {f->size(w,h);}
272 inline void fl_set_form_geometry(Fl_Window* f,int x,int y,int w,int h) {
273     f->resize(x,y,w,h);}
274 #define fl_set_initial_placement fl_set_form_geometry
275 inline void fl_adjust_form_size(Fl_Window*) {}
276
277 FL_EXPORT void fl_show_form(Fl_Window* f,int p,int b,const char* n);

```

```

278 enum { // "p" argument values:
279     FL_PLACE_FREE = 0, // make resizable
280     FL_PLACE_MOUSE = 1, // mouse centered on form
281     FL_PLACE_CENTER = 2, // center of the screen
282     FL_PLACE_POSITION = 4, // fixed position, resizable
283     FL_PLACE_SIZE = 8, // fixed size, normal fltk behavior
284     FL_PLACE_GEOMETRY = 16, // fixed size and position
285     FL_PLACE_ASPECT = 32, // keep aspect ratio (ignored)
286     FL_PLACE_FULLSCREEN = 64, // fill screen
287     FL_PLACE_HOTSPOT = 128, // enables hotspot
288     FL_PLACE_ICONIC = 256, // iconic (ignored)
289     FL_FREE_SIZE = (1<14), // force resizable
290     FL_FIX_SIZE = (1<15) // force off resizable
291 };
292 #define FL_PLACE_FREE_CENTER (FL_PLACE_CENTER|FL_FREE_SIZE)
293 #define FL_PLACE_CENTERFREE (FL_PLACE_CENTER|FL_FREE_SIZE)
294 enum { // "b" argument values:
295     FL_NOBORDER = 0,
296     FL_FULLBORDER,
297     FL_TRANSIENT
298 //FL_MODAL = (1<8) // not implemented yet in Forms
299 };
300 inline void fl_set_form_hotspot(Fl_Window* w, int x, int y) {w->hotspot(x,y);}
301 inline void fl_set_form_hotobject(Fl_Window* w, Fl_Widget* o) {w->hotspot(o);}
302 extern FL_EXPORT char fl_flip; // in forms.C
303 inline void fl_flip_yorigin() {fl_flip = 1;}
304
305 #define fl_prepare_form_window fl_show_form
306 inline void fl_show_form_window(Fl_Window*) {}
307
308 inline void fl_raise_form(Fl_Window* f) {f->show();}
309
310 inline void fl_hide_form(Fl_Window* f) {f->hide();}
311 inline void fl_pop_form(Fl_Window* f) {f->show();}
312
313 extern FL_EXPORT char fl_modal_next; // in forms.C
314 inline void fl_activate_all_forms() {}
315 inline void fl_deactivate_all_forms() {fl_modal_next = 1;}
316 inline void fl_deactivate_form(Fl_Window* w) {w->deactivate();}
317 inline void fl_activate_form(Fl_Window* w) {w->activate();}
318
319 inline void fl_set_form_title(Fl_Window* f, const char* s) {f->label(s);}
320 inline void fl_title_form(Fl_Window* f, const char* s) {f->label(s);}
321
322 typedef void (*Forms_FormCB)(Fl_Widget*);
323 inline void fl_set_form_callback(Fl_Window* f, Forms_FormCB c) {f->callback(c);}
324 #define fl_set_form_callback fl_set_form_callback
325
326 inline void fl_init() {}
327 FL_EXPORT void fl_set_graphics_mode(int, int);
328
329 inline int fl_form_is_visible(Fl_Window* f) {return f->visible();}
330
331 inline int fl_mouse_button() {return Fl::event_button();}
332 #define fl_mousebutton fl_mouse_button
333
334 #define fl_free free
335 #define fl_malloc malloc
336 #define fl_calloc calloc
337 #define fl_realloc realloc
338
339 // Drawing functions. Only usable inside an Fl_Free object?
340
341 inline void fl_drw_box(Fl_Boxtype b, int x, int y, int w, int h, Fl_Color bgc, int=3) {
342     fl_draw_box(b, x, y, w, h, bgc);}
343 inline void fl_drw_frame(Fl_Boxtype b, int x, int y, int w, int h, Fl_Color bgc, int=3) {
344     fl_draw_box(b, x, y, w, h, bgc);}
345
346 inline void fl_drw_text(Fl_Align align, int x, int y, int w, int h,
347     Fl_Color fgcolor, int size, Fl_Font style,
348     const char* s) {
349     fl_font(style, size);
350     fl_color(fgcolor);
351     fl_draw(s, x, y, w, h, align);
352 }
353
354 // this does not work except for CENTER...
355 inline void fl_drw_text_beside(Fl_Align align, int x, int y, int w, int h,
356     Fl_Color fgcolor, int size, Fl_Font style,
357     const char* s) {
358     fl_font(style, size);
359     fl_color(fgcolor);
360     fl_draw(s, x, y, w, h, align);
361 }
362
363 inline void fl_set_font_name(Fl_Font n, const char* s) {Fl::set_font(n, s);}
364
365

```

```

366 inline void fl_mapcolor(Fl_Color c, uchar r, uchar g, uchar b) {Fl::set_color(c,r,g,b);}
367
368 #define fl_set_clipping(x,y,w,h) fl_push_clip(x,y,w,h)
369 #define fl_unset_clipping() fl_pop_clip()
370
371 // Forms classes:
372
373 inline Fl_Widget* fl_add_new(Fl_Widget* p) {return p;}
374 inline Fl_Widget* fl_add_new(uchar t,Fl_Widget* p) {p->type(t); return p;}
375
376 #define forms_constructor(type,name) \
377 inline type* name(uchar t,int x,int y,int w,int h,const char* l) { \
378 return (type*)(fl_add_new(t, new type(x,y,w,h,l)));}
379 #define forms_constructor_t(type,name) \
380 inline type* name(uchar t,int x,int y,int w,int h,const char* l) { \
381 return (type*)(fl_add_new(new type(t,x,y,w,h,l)));}
382 #define forms_constructorrb(type,name) \
383 inline type* name(Fl_Boxtype t,int x,int y,int w,int h,const char* l) { \
384 return (type*)(fl_add_new(new type(t,x,y,w,h,l)));}
385
386 #include "Fl_FormsBitmap.H"
387 #define FL_NORMAL_BITMAP FL_NO_BOX
388 forms_constructorrb(Fl_FormsBitmap, fl_add_bitmap)
389 inline void fl_set_bitmap_data(Fl_Widget* o, int w, int h, const uchar* b) {
390     ((Fl_FormsBitmap*)o)->set(w,h,b);
391 }
392
393 #include "Fl_FormsPixmap.H"
394 #define FL_NORMAL_PIXMAP FL_NO_BOX
395 forms_constructorrb(Fl_FormsPixmap, fl_add_pixmap)
396 inline void fl_set_pixmap_data(Fl_Widget* o, char*const* b) {
397     ((Fl_FormsPixmap*)o)->set(b);
398 }
399
400 //inline void fl_set_pixmap_file(Fl_Widget*, const char*);
401 inline void fl_set_pixmap_align(Fl_Widget* o,Fl_Align a,int,int) {o->align(a);}
402 //inline void fl_set_pixmap_colorcloseness(int, int, int);
403
404 #include "Fl_Box.H"
405 forms_constructorrb(Fl_Box, fl_add_box)
406
407 #include "Fl_Browser.H"
408 forms_constructor(Fl_Browser, fl_add_browser)
409
410 inline void fl_clear_browser(Fl_Widget* o) {
411     ((Fl_Browser*)o)->clear();}
412 inline void fl_add_browser_line(Fl_Widget* o, const char* s) {
413     ((Fl_Browser*)o)->add(s);}
414 inline void fl_addto_browser(Fl_Widget* o, const char* s) {
415     ((Fl_Browser*)o)->add(s);} /* should also scroll to bottom */
416 //inline void fl_addto_browser_chars(Fl_Widget*, const char*)
417 //define fl_append_browser fl_addto_browser_chars
418 inline void fl_insert_browser_line(Fl_Widget* o, int n, const char* s) {
419     ((Fl_Browser*)o)->insert(n,s);}
420 inline void fl_delete_browser_line(Fl_Widget* o, int n) {
421     ((Fl_Browser*)o)->remove(n);}
422 inline void fl_replace_browser_line(Fl_Widget* o, int n, const char* s) {
423     ((Fl_Browser*)o)->replace(n,s);}
424 inline char* fl_get_browser_line(Fl_Widget* o, int n) {
425     return (char*)((Fl_Browser*)o)->text(n);}
426 inline int fl_load_browser(Fl_Widget* o, const char* f) {
427     return ((Fl_Browser*)o)->load(f);}
428 inline void fl_select_browser_line(Fl_Widget* o, int n) {
429     ((Fl_Browser*)o)->select(n,1);}
430 inline void fl_deselect_browser_line(Fl_Widget* o, int n) {
431     ((Fl_Browser*)o)->select(n,0);}
432 inline void fl_deselect_browser(Fl_Widget* o) {
433     ((Fl_Browser*)o)->deselect();}
434 inline int fl_isset_browser_line(Fl_Widget* o, int n) {
435     return ((Fl_Browser*)o)->selected(n);}
436 inline int fl_get_browser_topline(Fl_Widget* o) {
437     return ((Fl_Browser*)o)->topline();}
438 inline int fl_get_browser(Fl_Widget* o) {
439     return ((Fl_Browser*)o)->value();}
440 inline int fl_get_browser_maxline(Fl_Widget* o) {
441     return ((Fl_Browser*)o)->size();}
442 //inline int fl_get_browser_screenlines(Fl_Widget*);
443 inline void fl_set_browser_topline(Fl_Widget* o, int n) {
444     ((Fl_Browser*)o)->topline(n);}
445 inline void fl_set_browser_fontsize(Fl_Widget* o, int s) {
446     ((Fl_Browser*)o)->textsize(s);}
447 inline void fl_set_browser_fontstyle(Fl_Widget* o, Fl_Font s) {
448     ((Fl_Browser*)o)->textfont(s);}
449 inline void fl_set_browser_specialkey(Fl_Widget* o, char c) {
450     ((Fl_Browser*)o)->format_char(c);}
451 //inline void fl_set_browser_vscrollbar(Fl_Widget*, int);
452 //inline void fl_set_browser_hscrollbar(Fl_Widget*, int);
453 //inline void fl_set_browser_leftslider(Fl_Widget*, int);

```

```

454 //define fl_set_browser_leftscrollbar fl_set_browser_leftslider
455 //inline void fl_set_browser_line_selectable(Fl_Widget*, int, int);
456 //inline void fl_get_browser_dimension(Fl_Widget*,int*,int*,int*,int*);
457 //inline void fl_set_browser_dbclick_callback(Fl_Widget*,FL_CALLBACKPTR,long);
458 //inline void fl_set_browser_xoffset(Fl_Widget*, FL_Coord);
459 //inline void fl_set_browser_scrollbarsize(Fl_Widget*, int, int);
460 inline void fl_setdisplayed_browser_line(Fl_Widget* o, int n, int i) {
461     ((Fl_Browser*)o)->display(n,i);}
462 inline int fl_isdisplayed_browser_line(Fl_Widget* o, int n) {
463     return ((Fl_Browser*)o)->displayed(n);}
464
465 #include "Fl_Button.H"
466
467 #define FL_NORMAL_BUTTON      0
468 #define FL_TOUCH_BUTTON      4
469 #define FL_INOUT_BUTTON      5
470 #define FL_RETURN_BUTTON      6
471 #define FL_HIDDEN_RET_BUTTON  7
472 #define FL_PUSH_BUTTON        FL_TOGGLE_BUTTON
473 #define FL_MENU_BUTTON        9
474
475 FL_EXPORT Fl_Button* fl_add_button(uchar t,int x,int y,int w,int h,const char* l);
476 inline int fl_get_button(Fl_Widget* b) {return ((Fl_Button*)b)->value();}
477 inline void fl_set_button(Fl_Widget* b, int v) {((Fl_Button*)b)->value(v);}
478 inline int fl_get_button_num(Fl_Widget*) {return Fl::event_button();}
479 inline void fl_set_button_shortcut(Fl_Widget* b, const char* s,int=0) {
480     ((Fl_Button*)b)->shortcut(s);}
481 //define fl_set_object_shortcut(b,s) fl_set_button_shortcut(b,s)
482
483 #include "Fl_Light_Button.H"
484 forms_constructor(Fl_Light_Button, fl_add_lightbutton)
485
486 #include "Fl_Round_Button.H"
487 forms_constructor(Fl_Round_Button, fl_add_roundbutton)
488 forms_constructor(Fl_Round_Button, fl_add_round3dbutton)
489
490 #include "Fl_Check_Button.H"
491 forms_constructor(Fl_Check_Button, fl_add_checkbutton)
492
493 inline Fl_Widget* fl_add_bitmapbutton(int t,int x,int y,int w,int h,const char* l) {Fl_Widget* o =
    fl_add_button(t,x,y,w,h,l); return o;}
494 inline void fl_set_bitmapbutton_data(Fl_Widget* o,int a,int b,uchar* c) {
495     (new Fl_Bitmap(c,a,b))->label(o);} // does not delete old Fl_Bitmap!
496
497 inline Fl_Widget* fl_add_pixmapbutton(int t,int x,int y,int w,int h,const char* l) {Fl_Widget* o =
    fl_add_button(t,x,y,w,h,l); return o;}
498 inline void fl_set_pixmapbutton_data(Fl_Widget* o, const char*const* c) {
499     (new Fl_Pixmap(c))->label(o);} // does not delete old Fl_Pixmap!
500
501 // Fl_Canvas object not yet implemented!
502
503 #include "Fl_Chart.H"
504
505 forms_constructor(Fl_Chart, fl_add_chart)
506 inline void fl_clear_chart(Fl_Widget* o) {
507     ((Fl_Chart*)o)->clear();}
508 inline void fl_add_chart_value(Fl_Widget* o,double v,const char* s,uchar c){
509     ((Fl_Chart*)o)->add(v,s,c);}
510 inline void fl_insert_chart_value(Fl_Widget* o, int i, double v, const char* s, uchar c) {
511     ((Fl_Chart*)o)->insert(i,v,s,c);}
512 inline void fl_replace_chart_value(Fl_Widget* o, int i, double v, const char* s, uchar c) {
513     ((Fl_Chart*)o)->replace(i,v,s,c);}
514 inline void fl_set_chart_bounds(Fl_Widget* o, double a, double b) {
515     ((Fl_Chart*)o)->bounds(a,b);}
516 inline void fl_set_chart_maxnumb(Fl_Widget* o, int v) {
517     ((Fl_Chart*)o)->maxsize(v);}
518 inline void fl_set_chart_autosize(Fl_Widget* o, int v) {
519     ((Fl_Chart*)o)->autosize(v);}
520 inline void fl_set_chart_lstyle(Fl_Widget* o, Fl_Font v) {
521     ((Fl_Chart*)o)->textfont(v);}
522 inline void fl_set_chart_lsize(Fl_Widget* o, int v) {
523     ((Fl_Chart*)o)->textsize(v);}
524 inline void fl_set_chart_lcolor(Fl_Widget* o, Fl_Color v) {
525     ((Fl_Chart*)o)->textcolor(v);}
526 #define fl_set_chart_lcol    fl_set_chart_lcolor
527
528 #include "Fl_Choice.H"
529
530 #define FL_NORMAL_CHOICE      0
531 #define FL_NORMAL_CHOICE2     0
532 #define FL_DROPLIST_CHOICE    0
533
534 forms_constructor(Fl_Choice, fl_add_choice)
535 inline void fl_clear_choice(Fl_Widget* o) {
536     ((Fl_Choice*)o)->clear();}
537 inline void fl_addto_choice(Fl_Widget* o, const char* s) {
538     ((Fl_Choice*)o)->add(s);}

```

```

539 inline void fl_replace_choice(Fl_Widget* o, int i, const char* s) {
540     ((Fl_Choice*)o)->replace(i-1,s);}
541 inline void fl_delete_choice(Fl_Widget* o, int i) {
542     ((Fl_Choice*)o)->remove(i-1);}
543 inline void fl_set_choice(Fl_Widget* o, int i) {
544     ((Fl_Choice*)o)->value(i-1);}
545 // inline void fl_set_choice_text(Fl_Widget*, const char*);
546 inline int fl_get_choice(Fl_Widget* o) {
547     return ((Fl_Choice*)o)->value()+1;}
548 // inline const char* fl_get_choice_item_text(Fl_Widget*, int);
549 // inline int fl_get_choice_maxitems(Fl_Widget*);
550 inline const char* fl_get_choice_text(Fl_Widget* o) {
551     return ((Fl_Choice*)o)->text();}
552 inline void fl_set_choice_fontsize(Fl_Widget* o, int x) {
553     ((Fl_Choice*)o)->textsize(x);}
554 inline void fl_set_choice_fontstyle(Fl_Widget* o, Fl_Font x) {
555     ((Fl_Choice*)o)->textfont(x);}
556 // inline void fl_set_choice_item_mode(Fl_Widget*, int, unsigned);
557 // inline void fl_set_choice_item_shortcut(Fl_Widget*, int, const char*);
558
559 #include "Fl_Clock.H"
560 forms_constructor(Fl_Clock, fl_add_clock)
561 inline void fl_get_clock(Fl_Widget* o, int* h, int* m, int* s) {
562     *h = ((Fl_Clock*)o)->hour();
563     *m = ((Fl_Clock*)o)->minute();
564     *s = ((Fl_Clock*)o)->second();
565 }
566
567 #include "Fl_Counter.H"
568 forms_constructor(Fl_Counter, fl_add_counter)
569 inline void fl_set_counter_value(Fl_Widget* o, double v) {
570     ((Fl_Counter*)o)->value(v);}
571 inline void fl_set_counter_bounds(Fl_Widget* o, double a, double b) {
572     ((Fl_Counter*)o)->bounds(a,b);}
573 inline void fl_set_counter_step(Fl_Widget* o, double a, double b) {
574     ((Fl_Counter*)o)->step(a,b);}
575 inline void fl_set_counter_precision(Fl_Widget* o, int v) {
576     ((Fl_Counter*)o)->precision(v);}
577 inline void fl_set_counter_return(Fl_Widget* o, int v) {
578     ((Fl_Counter*)o)->when((Fl_When){v|FL_WHEN_RELEASE});}
579 inline double fl_get_counter_value(Fl_Widget* o) {
580     return ((Fl_Counter*)o)->value();}
581 inline void fl_get_counter_bounds(Fl_Widget* o, float* a, float* b) {
582     *a = float(((Fl_Counter*)o)->minimum());
583     *b = float(((Fl_Counter*)o)->maximum());
584 }
585 //inline void fl_set_counter_filter(Fl_Widget*,const char* (*)(Fl_Widget*,double,int));
586
587 // Cursor stuff cannot be emulated because it uses X stuff
588 inline void fl_set_cursor(Fl_Window* w, Fl_Cursor c) {w->cursor(c);}
589 #define FL_INVISIBLE_CURSOR FL_CURSOR_NONE
590 #define FL_DEFAULT_CURSOR FL_CURSOR_DEFAULT
591
592 #include "Fl_Dial.H"
593
594 #define FL_DIAL_COL1 FL_GRAY
595 #define FL_DIAL_COL2 37
596
597 forms_constructor(Fl_Dial, fl_add_dial)
598 inline void fl_set_dial_value(Fl_Widget* o, double v) {
599     ((Fl_Dial*)o)->value(v);}
600 inline double fl_get_dial_value(Fl_Widget* o) {
601     return ((Fl_Dial*)o)->value();}
602 inline void fl_set_dial_bounds(Fl_Widget* o, double a, double b) {
603     ((Fl_Dial*)o)->bounds(a, b);}
604 inline void fl_get_dial_bounds(Fl_Widget* o, float* a, float* b) {
605     *a = float(((Fl_Dial*)o)->minimum());
606     *b = float(((Fl_Dial*)o)->maximum());
607 }
608 inline void fl_set_dial_return(Fl_Widget* o, int i) {
609     ((Fl_Dial*)o)->when((Fl_When){i|FL_WHEN_RELEASE});}
610 inline void fl_set_dial_angles(Fl_Widget* o, int a, int b) {
611     ((Fl_Dial*)o)->angles((short)a, (short)b);}
612 //inline void fl_set_dial_cross(Fl_Widget* o, int);
613 // inline void fl_set_dial_direction(Fl_Widget* o, uchar d) {
614 //     ((Fl_Dial*)o)->direction(d);}
615 inline void fl_set_dial_step(Fl_Widget* o, double v) {
616     ((Fl_Dial*)o)->step(v);}
617
618 // Frames:
619
620 inline Fl_Widget* fl_add_frame(Fl_Boxtype i,int x,int y,int w,int h,const char* l) {
621     return fl_add_box(i,x-3,y-3,w+6,h+6,l);}
622
623 // labelframe nyi
624 inline Fl_Widget* fl_add_labelframe(Fl_Boxtype i,int x,int y,int w,int h,const char* l) {
625     Fl_Widget* o = fl_add_box(i,x-3,y-3,w+6,h+6,l);

```

```

626     o->align(FL_ALIGN_TOP_LEFT);
627     return o;
628 }
629
630 #include "Fl_Free.H"
631 inline Fl_Free*
632 fl_add_free(int t,double x,double y,double w,double h,const char* l,
633             FL_HANDLEPTR hdl) {
634     return (Fl_Free*)(fl_add_new(
635         new Fl_Free(t,int(x),int(y),int(w),int(h),l,hdl)));
636 }
637
638 #include "fl_ask.H"
639 #include "fl_show_colormap.H"
640
641 inline int fl_show_question(const char* c, int = 0) {return fl_choice("%s",fl_no,fl_yes,0L,c);}
642 FL_EXPORT void fl_show_message(const char *,const char *,const char *);
643 FL_EXPORT void fl_show_alert(const char *,const char *,const char *,int=0);
644 FL_EXPORT int fl_show_question(const char *,const char *,const char *);
645 inline const char *fl_show_input(const char *l,const char*d=0) {return fl_input("%s",d,l);}
646 FL_EXPORT /*const*/ char *fl_show_simple_input(const char *label, const char *deflt = 0);
647 FL_EXPORT int fl_show_choice(
648     const char *m1,
649     const char *m2,
650     const char *m3,
651     int numb,
652     const char *b0,
653     const char *b1,
654     const char *b2);
655
656 inline void fl_set_goodies_font(Fl_Font a, Fl_Fonsize b) {fl_message_font(a,b);}
657 #define fl_show_messages fl_message
658 inline int fl_show_choices(const char* c,int n,const char* b1,const char* b2,
659                           const char* b3, int) {
660     return fl_show_choice(0,c,0,n,b1,b2,b3);
661 }
662
663 #include "filename.H"
664 #include "Fl_File_Chooser.H"
665 inline int do_matching(char* a, const char* b) {return fl_filename_match(a,b);}
666
667 // Forms-compatible file chooser (implementation in fselect.C):
668 FL_EXPORT char* fl_show_file_selector(const char* message,const char* dir,
669                                       const char* pat,const char* fname);
670 FL_EXPORT char* fl_get_directory();
671 FL_EXPORT char* fl_get_pattern();
672 FL_EXPORT char* fl_get_filename();
673
674 #include "Fl_Input.H"
675 forms_constructor(Fl_Input, fl_add_input)
676 inline void fl_set_input(Fl_Widget* o, const char* v) {
677     ((Fl_Input*)o)->value(v);}
678 inline void fl_set_input_return(Fl_Widget* o, int x) {
679     ((Fl_Input*)o)->when((Fl_When)(x | FL_WHEN_RELEASE));}
680 inline void fl_set_input_color(Fl_Widget* o, Fl_Color a, Fl_Color b) {
681     ((Fl_Input*)o)->textcolor(a);
682     ((Fl_Input*)o)->cursor_color(b);
683 }
684 // inline void fl_set_input_scroll(Fl_Widget*, int);
685 inline void fl_set_input_cursorpos(Fl_Widget* o, int x, int /*y*/) {
686     ((Fl_Input*)o)->insert_position(x);}
687 // inline void fl_set_input_selected(Fl_Widget*, int);
688 // inline void fl_set_input_selected_range(Fl_Widget*, int, int);
689 // inline void fl_set_input_maxchars(Fl_Widget*, int);
690 // inline void fl_set_input_format(Fl_Widget*, int, int);
691 // inline void fl_set_input_hscrollbar(Fl_Widget*, int);
692 // inline void fl_set_input_vscrollbar(Fl_Widget*, int);
693 // inline void fl_set_input_xoffset(Fl_Widget*, int);
694 // inline void fl_set_input_topleft(Fl_Widget*, int);
695 // inline void fl_set_input_scrollbarsize(Fl_Widget*, int, int);
696 // inline int fl_get_input_topleft(Fl_Widget*);
697 // inline int fl_get_input_screenlines(Fl_Widget*);
698 inline int fl_get_input_cursorpos(Fl_Widget* o, int*x, int*y) {
699     *x = ((Fl_Input*)o)->insert_position(); *y = 0; return *x;}
700 // inline int fl_get_input_numberoflines(Fl_Widget*);
701 // inline void fl_get_input_format(Fl_Widget*, int*, int*);
702 inline const char* fl_get_input(Fl_Widget* o) {return ((Fl_Input*)o)->value();}
703
704 #include "Fl_Menu_Button.H"
705
706 // types are not implemented, they all act like FL_PUSH_MENU:
707 #define FL_TOUCH_MENU          0
708 #define FL_PUSH_MENU           1
709 #define FL_PULLDOWN_MENU       2
710 forms_constructor(Fl_Menu_Button, fl_add_menu)
711
712 inline void fl_clear_menu(Fl_Widget* o) {

```

```

713     ((Fl_Menu_Button*)o)->clear();}
714 inline void fl_set_menu(Fl_Widget* o, const char* s) {
715     ((Fl_Menu_Button*)o)->clear(); ((Fl_Menu_Button*)o)->add(s);}
716 inline void fl_addto_menu(Fl_Widget* o, const char* s) {
717     ((Fl_Menu_Button*)o)->add(s);}
718 inline void fl_replace_menu_item(Fl_Widget* o, int i, const char* s) {
719     ((Fl_Menu_Button*)o)->replace(i-1,s);}
720 inline void fl_delete_menu_item(Fl_Widget* o, int i) {
721     ((Fl_Menu_Button*)o)->remove(i-1);}
722 inline void fl_set_menu_item_shortcut(Fl_Widget* o, int i, const char* s) {
723     ((Fl_Menu_Button*)o)->shortcut(i-1,fl_old_shortcut(s));}
724 inline void fl_set_menu_item_mode(Fl_Widget* o, int i, long x) {
725     ((Fl_Menu_Button*)o)->mode(i-1,(int)x);}
726 inline void fl_show_menu_symbol(Fl_Widget*, int ) {
727     /* ((Fl_Menu_Button*)o)->show_menu_symbol(i); */}
728 // inline void fl_set_menu_popup(Fl_Widget*, int);
729 inline int fl_get_menu(Fl_Widget* o) {
730     return ((Fl_Menu_Button*)o)->value()+1;}
731 inline const char* fl_get_menu_item_text(Fl_Widget* o, int i) {
732     return ((Fl_Menu_Button*)o)->text(i);}
733 inline int fl_get_menu_maxitems(Fl_Widget* o) {
734     return ((Fl_Menu_Button*)o)->size();}
735 inline int fl_get_menu_item_mode(Fl_Widget* o, int i) {
736     return ((Fl_Menu_Button*)o)->mode(i);}
737 inline const char* fl_get_menu_text(Fl_Widget* o) {
738     return ((Fl_Menu_Button*)o)->text();}
739
740 #include "Fl_Positioner.H"
741 #define FL_NORMAL_POSITIONER 0
742 forms_constructor(Fl_Positioner, fl_add_positioner)
743 inline void fl_set_positioner_xvalue(Fl_Widget* o, double v) {
744     ((Fl_Positioner*)o)->xvalue(v);}
745 inline double fl_get_positioner_xvalue(Fl_Widget* o) {
746     return ((Fl_Positioner*)o)->xvalue();}
747 inline void fl_set_positioner_xbounds(Fl_Widget* o, double a, double b) {
748     ((Fl_Positioner*)o)->xbounds(a,b);}
749 inline void fl_get_positioner_xbounds(Fl_Widget* o, float* a, float* b) {
750     *a = float(((Fl_Positioner*)o)->xminimum());
751     *b = float(((Fl_Positioner*)o)->xmaximum());
752 }
753 inline void fl_set_positioner_yvalue(Fl_Widget* o, double v) {
754     ((Fl_Positioner*)o)->yvalue(v);}
755 inline double fl_get_positioner_yvalue(Fl_Widget* o) {
756     return ((Fl_Positioner*)o)->yvalue();}
757 inline void fl_set_positioner_ybounds(Fl_Widget* o, double a, double b) {
758     ((Fl_Positioner*)o)->ybounds(a,b);}
759 inline void fl_get_positioner_ybounds(Fl_Widget* o, float* a, float* b) {
760     *a = float(((Fl_Positioner*)o)->yminimum());
761     *b = float(((Fl_Positioner*)o)->ymaximum());
762 }
763 inline void fl_set_positioner_xstep(Fl_Widget* o, double v) {
764     ((Fl_Positioner*)o)->xstep(v);}
765 inline void fl_set_positioner_ystep(Fl_Widget* o, double v) {
766     ((Fl_Positioner*)o)->ystep(v);}
767 inline void fl_set_positioner_return(Fl_Widget* o, int v) {
768     ((Fl_Positioner*)o)->when((Fl_When)(v|FL_WHEN_RELEASE));}
769
770 #include "Fl_Slider.H"
771
772 #define FL_HOR_BROWSER_SLIDER FL_HOR_SLIDER
773 #define FL_VERT_BROWSER_SLIDER FL_VERT_SLIDER
774
775 forms_constructor(Fl_Slider, fl_add_slider)
776 #define FL_SLIDER_COL1 FL_GRAY
777 inline void fl_set_slider_value(Fl_Widget* o, double v) {
778     ((Fl_Slider*)o)->value(v);}
779 inline double fl_get_slider_value(Fl_Widget* o) {
780     return ((Fl_Slider*)o)->value();}
781 inline void fl_set_slider_bounds(Fl_Widget* o, double a, double b) {
782     ((Fl_Slider*)o)->bounds(a, b);}
783 inline void fl_get_slider_bounds(Fl_Widget* o, float* a, float* b) {
784     *a = float(((Fl_Slider*)o)->minimum());
785     *b = float(((Fl_Slider*)o)->maximum());
786 }
787 inline void fl_set_slider_return(Fl_Widget* o, int i) {
788     ((Fl_Slider*)o)->when((Fl_When)(i|FL_WHEN_RELEASE));}
789 inline void fl_set_slider_step(Fl_Widget* o, double v) {
790     ((Fl_Slider*)o)->step(v);}
791 // inline void fl_set_slider_increment(Fl_Widget* o, double v, double);
792 inline void fl_set_slider_size(Fl_Widget* o, double v) {
793     ((Fl_Slider*)o)->slider_size(v);}
794
795 #include "Fl_Value_Slider.H"
796 forms_constructor(Fl_Value_Slider, fl_add_valslider)
797
798 inline void fl_set_slider_precision(Fl_Widget* o, int i) {
799     ((Fl_Value_Slider*)o)->precision(i);}

```

```

800 // filter function!
801
802 // The forms text object was the same as an Fl_Box except it inverted the
803 // meaning of FL_ALIGN_INSIDE. Implementation in forms.cxx
804 class FL_EXPORT Fl_FormsText : public Fl_Widget {
805 protected:
806     void draw() FL_OVERRIDE;
807 public:
808     Fl_FormsText(Fl_Boxtype b, int X, int Y, int W, int H, const char* l=0)
809         : Fl_Widget(X,Y,W,H,l) {box(b); align(FL_ALIGN_LEFT);}
810 };
811 #define FL_NORMAL_TEXT FL_NO_BOX
812 forms_constructorb(Fl_FormsText, fl_add_text)
813
814 #include "Fl_Timer.H"
815 forms_constructort(Fl_Timer, fl_add_timer)
816 inline void fl_set_timer(Fl_Widget* o, double v) {((Fl_Timer*)o)->value(v);}
817 inline double fl_get_timer(Fl_Widget* o) {return ((Fl_Timer*)o)->value();}
818 inline void fl_suspend_timer(Fl_Widget* o) {((Fl_Timer*)o)->suspended(1);}
819 inline void fl_resume_timer(Fl_Widget* o) {((Fl_Timer*)o)->suspended(0);}
820 inline void fl_set_timer_countup(Fl_Widget* o, char d) {((Fl_Timer*)o)->direction(d);}
821 void FL_EXPORT fl_gettime(long* sec, long* usec);
822
823 // Fl_XYPlot nyl
824
825
826 // stuff from DDForms:
827
828 inline int fl_double_click() {return Fl::event_clicks();}
829 inline void fl_draw() {Fl::flush();}
830
831 #endif /* define __FORMS_H__ */

```

## 34.185 gl.h File Reference

This file defines wrapper functions for OpenGL in FLTK.

```

#include "Enumerations.H"
#include <GL/gl.h>

```

### Functions

- void **gl\_color** (Fl\_Color i)  
*Sets the current OpenGL color to an FLTK color.*
- void **gl\_color** (int c)  
*back compatibility*
- int **gl\_descent** ()  
*Returns the current font's descent.*
- void **gl\_draw** (const char \*)  
*Draws a nul-terminated string in the current font at the current position.*
- void **gl\_draw** (const char \*, float x, float y)  
*Draws a nul-terminated string in the current font at the given position.*
- void **gl\_draw** (const char \*, int n)  
*Draws an array of n characters of the string in the current font at the current position.*
- void **gl\_draw** (const char \*, int n, float x, float y)  
*Draws n characters of the string in the current font at the given position.*
- void **gl\_draw** (const char \*, int n, int x, int y)  
*Draws n characters of the string in the current font at the given position.*
- void **gl\_draw** (const char \*, int x, int y)  
*Draws a nul-terminated string in the current font at the given position.*
- void **gl\_draw** (const char \*, int x, int y, int w, int h, Fl\_Align)  
*Draws a string formatted into a box, with newlines and tabs expanded, other control characters changed to ^X.*
- void **gl\_draw\_image** (const uchar \*, int x, int y, int w, int h, int d=3, int ld=0)
- void **gl\_finish** ()  
*Releases an OpenGL context.*

- void [gl\\_font](#) (int fontid, int size)  
*Sets the current OpenGL font to the same font as calling [fl\\_font\(\)](#).*
- int [gl\\_height](#) ()  
*Returns the current font's height.*
- void [gl\\_measure](#) (const char \*, int &x, int &y)  
*Measure how wide and tall the string will be when drawn by the [gl\\_draw\(\)](#) function.*
- void [gl\\_rect](#) (int x, int y, int w, int h)  
*Outlines the given rectangle with the current color.*
- void [gl\\_rectf](#) (int x, int y, int w, int h)  
*Fills the given rectangle with the current color.*
- void [gl\\_start](#) ()  
*Creates an OpenGL context.*
- int [gl\\_texture\\_pile\\_height](#) ()  
*Returns the current maximum height of the pile of pre-computed string textures.*
- void [gl\\_texture\\_pile\\_height](#) (int max)  
*Changes the maximum height of the pile of pre-computed string textures.*
- void [gl\\_texture\\_reset](#) ()  
*To call after GL operations that may invalidate textures used to draw text in GL scenes (e.g., switch between [FL\\_DOUBLE](#) / [FL\\_SINGLE](#) modes).*
- double [gl\\_width](#) (const char \*)  
*Returns the width of the string in the current font.*
- double [gl\\_width](#) (const char \*, int n)  
*Returns the width of n characters of the string in the current font.*
- double [gl\\_width](#) ([uchar](#))  
*Returns the width of the character in the current font.*

### 34.185.1 Detailed Description

This file defines wrapper functions for OpenGL in FLTK.

To use OpenGL from within an FLTK application you MUST use [gl\\_visual\(\)](#) to select the default visual before doing [show\(\)](#) on any windows. Mesa will crash if you try to use a visual not returned by [glxChooseVisual](#).

Historically, this did not always work well with [FL\\_Double\\_Window](#)'s! It can try to draw into the front buffer. Depending on the system this might either crash or do nothing (when pixmaps are being used as back buffer and GL is being done by hardware), work correctly (when GL is done with software, such as Mesa), or draw into the front buffer and be erased when the buffers are swapped (when double buffer hardware is being used)

### 34.185.2 Function Documentation

#### 34.185.2.1 [gl\\_color\(\)](#)

```
void gl_color (
    Fl\_Color i )
```

Sets the current OpenGL color to an FLTK color.

For color-index modes it will use [fl\\_xpixel\(c\)](#), which is only right if the window uses the default colormap!

#### 34.185.2.2 [gl\\_draw\(\)](#) [1/7]

```
void gl_draw (
    const char * str )
```

Draws a nul-terminated string in the current font at the current position.

See also

[gl\\_texture\\_pile\\_height\(int\)](#)

**34.185.2.3 gl\_draw()** [2/7]

```
void gl_draw (
    const char * str,
    float x,
    float y )
```

Draws a nul-terminated string in the current font at the given position.

See also

[gl\\_texture\\_pile\\_height\(int\)](#)

**34.185.2.4 gl\_draw()** [3/7]

```
void gl_draw (
    const char * str,
    int n )
```

Draws an array of n characters of the string in the current font at the current position.

See also

[gl\\_texture\\_pile\\_height\(int\)](#)

**34.185.2.5 gl\_draw()** [4/7]

```
void gl_draw (
    const char * str,
    int n,
    float x,
    float y )
```

Draws n characters of the string in the current font at the given position.

See also

[gl\\_texture\\_pile\\_height\(int\)](#)

**34.185.2.6 gl\_draw()** [5/7]

```
void gl_draw (
    const char * str,
    int n,
    int x,
    int y )
```

Draws n characters of the string in the current font at the given position.

See also

[gl\\_texture\\_pile\\_height\(int\)](#)

**34.185.2.7 gl\_draw()** [6/7]

```
void gl_draw (
    const char * str,
    int x,
    int y )
```

Draws a nul-terminated string in the current font at the given position.

See also

[gl\\_texture\\_pile\\_height\(int\)](#)

### 34.185.2.8 gl\_draw() [7/7]

```
void gl_draw (
    const char * str,
    int x,
    int y,
    int w,
    int h,
    Fl_Align align )
```

Draws a string formatted into a box, with newlines and tabs expanded, other control characters changed to ^X. and aligned with the edges or center. Exactly the same output as [fl\\_draw\(\)](#).

### 34.185.2.9 gl\_font()

```
void gl_font (
    int fontid,
    int size )
```

Sets the current OpenGL font to the same font as calling [fl\\_font\(\)](#).

See also

[Fl::draw\\_GL\\_text\\_with\\_textures\(int val\)](#)

### 34.185.2.10 gl\_rect()

```
void gl_rect (
    int x,
    int y,
    int w,
    int h )
```

Outlines the given rectangle with the current color.

If [Fl\\_Gl\\_Window::ortho\(\)](#) has been called, then the rectangle will exactly fill the given pixel rectangle.

### 34.185.2.11 gl\_rectf()

```
void gl_rectf (
    int x,
    int y,
    int w,
    int h )
```

Fills the given rectangle with the current color.

See also

[gl\\_rect\(int x, int y, int w, int h\)](#)

### 34.185.2.12 gl\_texture\_pile\_height() [1/2]

```
int gl_texture_pile_height (
    void )
```

Returns the current maximum height of the pile of pre-computed string textures.  
The default value is 100

See also

[Fl::draw\\_GL\\_text\\_with\\_textures\(int\)](#)

### 34.185.2.13 gl\_texture\_pile\_height() [2/2]

```
void gl_texture_pile_height (
    int max )
```

Changes the maximum height of the pile of pre-computed string textures.

Strings that are often re-displayed can be processed much faster if this pile is set high enough to hold all of them.

Parameters

<i>max</i>	Maximum height of the texture pile
------------	------------------------------------

See also

[Fl::draw\\_GL\\_text\\_with\\_textures\(int\)](#)

## 34.186 gl.h

[Go to the documentation of this file.](#)

```
1 //
2 // OpenGL header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2018 by Bill Spitzak and others.
5 //
6 // You must include this instead of GL/gl.h to get the Microsoft
7 // APIENTRY stuff included (from <windows.h>) prior to the OpenGL
8 // header files.
9 //
10 // This file also provides "missing" OpenGL functions, and
11 // gl_start() and gl_finish() to allow OpenGL to be used in any window
12 //
13 // This library is free software. Distribution and use rights are outlined in
14 // the file "COPYING" which should have been included with this file. If this
15 // file is missing or damaged, see the license at:
16 //
17 //     https://www.fltk.org/COPYING.php
18 //
19 // Please see the following page on how to report bugs and issues:
20 //
21 //     https://www.fltk.org/bugs.php
22 //
23
42 #ifndef FL_gl_H
43 # define FL_gl_H
44
45 # include "Enumerations.H" // for color names
46 # ifdef _WIN32
47 #     include <windows.h>
48 # endif
49 # ifndef APIENTRY
50 #     if defined(__CYGWIN__)
51 #         define APIENTRY __attribute__((__stdcall__))
52 #     else
53 #         define APIENTRY
54 #     endif
55 # endif
56
57 # ifdef __APPLE__ // PORTME: OpenGL path abstraction
58 #     ifndef GL_SILENCE_DEPRECATED
59 #         define GL_SILENCE_DEPRECATED 1
60 #     endif
61 #     if !defined(__gl3_h_) // make sure OpenGL/gl3.h was not included before
62 #         include <OpenGL/gl.h>
63 #     endif
64 # else
65 #     include <GL/gl.h>
66 # endif // __APPLE__ // PORTME: OpenGL Path abstraction
67
68 FL_EXPORT void gl_start();
69 FL_EXPORT void gl_finish();
70
```

```

71 FL_EXPORT void gl_color(Fl_Color i);
73 inline void gl_color(int c) {gl_color((Fl_Color)c);}
74
75 FL_EXPORT void gl_rect(int x,int y,int w,int h);
76 FL_EXPORT void gl_rectf(int x,int y,int w,int h);
77
78 FL_EXPORT void gl_font(int fontid, int size);
79 FL_EXPORT int gl_height();
80 FL_EXPORT int gl_descent();
81 FL_EXPORT double gl_width(const char *);
82 FL_EXPORT double gl_width(const char *, int n);
83 FL_EXPORT double gl_width(uchar);
84
85 FL_EXPORT void gl_draw(const char*);
86 FL_EXPORT void gl_draw(const char*, int n);
87 FL_EXPORT void gl_draw(const char*, int x, int y);
88 FL_EXPORT void gl_draw(const char*, float x, float y);
89 FL_EXPORT void gl_draw(const char*, int n, int x, int y);
90 FL_EXPORT void gl_draw(const char*, int n, float x, float y);
91 FL_EXPORT void gl_draw(const char*, int x, int y, int w, int h, Fl_Align);
92 FL_EXPORT void gl_measure(const char*, int& x, int& y);
93 FL_EXPORT void gl_texture_pile_height(int max);
94 FL_EXPORT int gl_texture_pile_height();
95 FL_EXPORT void gl_texture_reset();
96
97 FL_EXPORT void gl_draw_image(const uchar *, int x,int y,int w,int h, int d=3, int ld=0);
98
99 #endif // !FL_gl_H

```

## 34.187 gl2opengl.h

```

1 /*      gl.h
2
3 GL to OpenGL translator.
4 If you include this, you might be able to port old GL programs.
5 There are also much better emulators available on the net.
6
7 */
8
9 #ifndef _FL_gl2opengl_h_
10 #define _FL_gl2opengl_h_
11
12 #include <FL/gl.h>
13 #include "gl_draw.H"
14
15 inline void clear() {glClear(GL_COLOR_BUFFER_BIT|GL_DEPTH_BUFFER_BIT);}
16 #define RGBcolor(r,g,b) glColor3ub(r,g,b)
17 #define bgnline() glBegin(GL_LINE_STRIP)
18 #define bgnpolygon() glBegin(GL_POLYGON)
19 #define bgnclosedline() glBegin(GL_LINE_LOOP)
20 #define endline() glEnd()
21 #define endpolygon() glEnd()
22 #define endclosedline() glEnd()
23 #define v2f(v) glVertex2fv(v)
24 #define v2s(v) glVertex2sv(v)
25 #define cmov(x,y,z) glRasterPos3f(x,y,z)
26 #define charstr(s) gl_draw(s)
27 #define fmprstr(s) gl_draw(s)
28 typedef float Matrix[4][4];
29 inline void pushmatrix() {glPushMatrix();}
30 inline void popmatrix() {glPopMatrix();}
31 inline void multmatrix(Matrix m) {glMultMatrixf((float *)m);}
32 inline void color(int n) {glIndexi(n);}
33 inline void rect(int x,int y,int r,int t) {gl_rect(x,y,r-x,t-y);}
34 inline void rectf(int x,int y,int r,int t) {glRectf(x,y,r+1,t+1);}
35 inline void recti(int x,int y,int r,int t) {gl_rect(x,y,r-x,t-y);}
36 inline void rectfi(int x,int y,int r,int t) {glRecti(x,y,r+1,t+1);}
37 inline void rects(int x,int y,int r,int t) {gl_rect(x,y,r-x,t-y);}
38 inline void rectfs(int x,int y,int r,int t) {glRects(x,y,r+1,t+1);}
39
40 #endif /* _FL_gl2opengl_h_ */

```

## 34.188 gl\_draw.H

```

1 //
2 // OpenGL header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:

```

```

9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #include "gl.h"
18
19 extern FL_EXPORT void gl_remove_displaylist_fonts();

```

## 34.189 glu.h

```

1 //
2 // GLu header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // You must include this instead of GL/gl.h to get the Microsoft
7 // APIENTRY stuff included (from <windows.h>) prior to the OpenGL
8 // header files.
9 //
10 // This file also provides "missing" OpenGL functions, and
11 // gl_start() and gl_finish() to allow OpenGL to be used in any window
12 //
13 // This library is free software. Distribution and use rights are outlined in
14 // the file "COPYING" which should have been included with this file. If this
15 // file is missing or damaged, see the license at:
16 //
17 //      https://www.fltk.org/COPYING.php
18 //
19 // Please see the following page on how to report bugs and issues:
20 //
21 //      https://www.fltk.org/bugs.php
22 //
23
24 #ifndef FL_glu_H
25 # define FL_glu_H
26
27 # include "Enumerations.H" // for color names
28 # ifdef _WIN32
29 #   include <windows.h>
30 # endif
31 # ifndef APIENTRY
32 #   if defined(__CYGWIN__)
33 #     define APIENTRY __attribute__((__stdcall__))
34 #   else
35 #     define APIENTRY
36 #   endif
37 # endif
38
39 # ifdef __APPLE__ // PORTME: OpenGL Path abstraction
40 #   include <OpenGL/glu.h>
41 # else
42 #   include <GL/glu.h>
43 # endif
44
45 #endif // !FL_glu_H

```

## 34.190 glut.H

```

1 //
2 // GLUT emulation header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 // Emulation of GLUT using fltk.
18
19 // GLUT is Copyright (c) Mark J. Kilgard, 1994, 1995, 1996:
20 // "This program is freely distributable without licensing fees and is

```

```

21 // provided without guarantee or warrantee expressed or implied. This
22 // program is -not- in the public domain."
23
24 // Although I have copied the GLUT API, none of my code is based on
25 // any GLUT implementation details and is therefore covered by the LGPL.
26
27 // Commented out lines indicate parts of GLUT that are not emulated.
28
29 // Notes: as pointed out in STR #3458 the current GLUT window,
30 // i.e. the global static variable 'glut_window' can be NULL ...
31 // (a) if not (yet) initialized
32 // (b) if the current GLUT window is deleted at any time.
33 // The FLTK implementation silently ignores function calls if the current
34 // window is NULL to avoid dereferencing a NULL pointer. This is obviously
35 // compatible with GLUT version 3.7 according to comment #5 on STR #3458.
36 // According to the same comment FreeGLUT 3.0 would issue an error message
37 // and quit.
38 // Albrecht-S, Oct 2023
39
40 #ifndef _FL_glut_H_
41 # define _FL_glut_H_
42
43 # include "gl.h"
44
45
46 # include "Fl.H"
47 # include "Fl_Gl_Window.H"
48
49 class FL_EXPORT Fl_Glut_Window : public Fl_Gl_Window {
50     void _init();
51     int mouse_down;
52 protected:
53     void draw() FL_OVERRIDE;
54     void draw_overlay() FL_OVERRIDE;
55     int handle(int) FL_OVERRIDE;
56 public: // so the inline functions work
57     int number;
58     int menu[3];
59     void make_current();
60     void (*display)();
61     void (*overlaydisplay)();
62     void (*reshape)(int w, int h);
63     void (*keyboard)(uchar, int x, int y);
64     void (*mouse)(int b, int state, int x, int y);
65     void (*motion)(int x, int y);
66     void (*passivemotion)(int x, int y);
67     void (*entry)(int);
68     void (*visibility)(int);
69     void (*special)(int, int x, int y);
70     Fl_Glut_Window(int w, int h, const char *t=0);
71     Fl_Glut_Window(int x, int y, int w, int h, const char *t=0);
72     ~Fl_Glut_Window();
73 };
74
75 extern FL_EXPORT Fl_Glut_Window *glut_window; // the current window
76 extern FL_EXPORT int glut_menu; // the current menu
77
78 // function pointers that are not per-window:
79 extern FL_EXPORT void (*glut_idle_function)();
80 extern FL_EXPORT void (*glut_menustate_function)(int);
81 extern FL_EXPORT void (*glut_menustatus_function)(int,int,int);
82
83
84 //## define GLUT_API_VERSION This does not match any version of GLUT exactly...
85
86 FL_EXPORT void glutInit(int *argcp, char **argv); // creates first window
87
88 FL_EXPORT void glutInitDisplayMode(unsigned int mode);
89 // the FL_ symbols have the same value as the GLUT ones:
90 # define GLUT_RGB FL_RGB
91 # define GLUT_RGBA FL_RGBA
92 # define GLUT_INDEX FL_INDEX
93 # define GLUT_SINGLE FL_SINGLE
94 # define GLUT_DOUBLE FL_DOUBLE
95 # define GLUT_ACCUM FL_ACCUM
96 # define GLUT_ALPHA FL_ALPHA
97 # define GLUT_DEPTH FL_DEPTH
98 # define GLUT_STENCIL FL_STENCIL
99 # define GLUT_MULTISAMPLE FL_MULTISAMPLE
100 # define GLUT_STEREO FL_STEREO
101 // # define GLUT_LUMINANCE 512
102
103 FL_EXPORT void glutInitWindowPosition(int x, int y);
104
105 FL_EXPORT void glutInitWindowSize(int w, int h);
106
107 FL_EXPORT void glutMainLoop();

```

```

113
114 FL_EXPORT int glutCreateWindow(char *title);
115 FL_EXPORT int glutCreateWindow(const char *title);
116
117 FL_EXPORT int glutCreateSubWindow(int win, int x, int y, int width, int height);
118
119 FL_EXPORT void glutDestroyWindow(int win);
120
121 inline void glutPostRedisplay() {
122     if (glut_window) glut_window->redraw();
123 }
124
125 FL_EXPORT void glutPostWindowRedisplay(int win);
126
127 FL_EXPORT void glutSwapBuffers();
128
129 inline int glutGetWindow() {
130     return glut_window ? glut_window->number : 0;
131 }
132
133 FL_EXPORT void glutSetWindow(int win);
134
135 inline void glutSetWindowTitle(char *t) {
136     if (glut_window) glut_window->label(t);
137 }
138
139 inline void glutSetIconTitle(char *t) {
140     if (glut_window) glut_window->iconlabel(t);
141 }
142
143 inline void glutPositionWindow(int x, int y) {
144     if (glut_window) glut_window->position(x,y);
145 }
146
147 inline void glutReshapeWindow(int w, int h) {
148     if (glut_window) glut_window->size(w,h);
149 }
150
151 inline void glutPopWindow() {
152     if (glut_window) glut_window->show();
153 }
154
155 inline void glutPushWindow() { /* do nothing */ }
156
157 inline void glutIconifyWindow() {
158     if (glut_window) glut_window->iconize();
159 }
160
161 inline void glutShowWindow() {
162     if (glut_window) glut_window->show();
163 }
164
165 inline void glutHideWindow() {
166     if (glut_window) glut_window->hide();
167 }
168
169 inline void glutFullScreen() {
170     if (glut_window) glut_window->fullscreen();
171 }
172
173 inline void glutSetCursor(Fl_Cursor cursor) {
174     if (glut_window) glut_window->cursor(cursor);
175 }
176
177 // notice that the numeric values are different than glut:
178 # define GLUT_CURSOR_RIGHT_ARROW ((Fl_Cursor)2)
179 # define GLUT_CURSOR_LEFT_ARROW ((Fl_Cursor)67)
180 # define GLUT_CURSOR_INFO FL_CURSOR_HAND
181 # define GLUT_CURSOR_DESTROY ((Fl_Cursor)45)
182 # define GLUT_CURSOR_HELP FL_CURSOR_HELP
183 # define GLUT_CURSOR_CYCLE ((Fl_Cursor)26)
184 # define GLUT_CURSOR_SPRAY ((Fl_Cursor)63)
185 # define GLUT_CURSOR_WAIT FL_CURSOR_WAIT
186 # define GLUT_CURSOR_TEXT FL_CURSOR_INSERT
187 # define GLUT_CURSOR_CROSSHAIR FL_CURSOR_CROSS
188 # define GLUT_CURSOR_UP_DOWN FL_CURSOR_NS
189 # define GLUT_CURSOR_LEFT_RIGHT FL_CURSOR_WE
190 # define GLUT_CURSOR_TOP_SIDE FL_CURSOR_N
191 # define GLUT_CURSOR_BOTTOM_SIDE FL_CURSOR_S
192 # define GLUT_CURSOR_LEFT_SIDE FL_CURSOR_W
193 # define GLUT_CURSOR_RIGHT_SIDE FL_CURSOR_E
194 # define GLUT_CURSOR_TOP_LEFT_CORNER FL_CURSOR_NW
195 # define GLUT_CURSOR_TOP_RIGHT_CORNER FL_CURSOR_NE
196 # define GLUT_CURSOR_BOTTOM_RIGHT_CORNER FL_CURSOR_SE
197 # define GLUT_CURSOR_BOTTOM_LEFT_CORNER FL_CURSOR_SW
198 # define GLUT_CURSOR_INHERIT FL_CURSOR_DEFAULT
199 # define GLUT_CURSOR_NONE FL_CURSOR_NONE

```

```

200 # define GLUT_CURSOR_FULL_CROSSHAIR          FL_CURSOR_CROSS
201
202 inline void glutWarpPointer(int, int) { /* do nothing */ }
203
204 inline void glutEstablishOverlay() {
205     if (glut_window) glut_window->make_overlay_current();
206 }
207
208 inline void glutRemoveOverlay() {
209     if (glut_window) glut_window->hide_overlay();
210 }
211
212 inline void glutUseLayer(GLenum layer) {
213     if (!glut_window)
214         return;
215     layer ? glut_window->make_overlay_current() : glut_window->make_current();
216 }
217
218 enum {GLUT_NORMAL, GLUT_OVERLAY};
219
220 inline void glutPostOverlayRedisplay() {
221     if (glut_window) glut_window->redraw_overlay();
222 }
223
224 inline void glutShowOverlay() {
225     if (glut_window) glut_window->redraw_overlay();
226 }
227
228 inline void glutHideOverlay() {
229     if (glut_window) glut_window->hide_overlay();
230 }
231
232 FL_EXPORT int glutCreateMenu(void (*)(int));
233
234 FL_EXPORT void glutDestroyMenu(int menu);
235
236 inline int glutGetMenu() {return glut_menu;}
237
238 inline void glutSetMenu(int m) {glut_menu = m;}
239
240 FL_EXPORT void glutAddMenuEntry(const char *label, int value);
241
242 FL_EXPORT void glutAddSubMenu(char *label, int submenu);
243
244 FL_EXPORT void glutChangeToMenuEntry(int item, char *labela, int value);
245
246 FL_EXPORT void glutChangeToSubMenu(int item, char *label, int submenu);
247
248 FL_EXPORT void glutRemoveMenuItem(int item);
249
250 inline void glutAttachMenu(int b) {
251     if (glut_window) glut_window->menu[b] = glut_menu;
252 }
253
254 inline void glutDetachMenu(int b) {
255     if (glut_window) glut_window->menu[b] = 0;
256 }
257
258 inline void glutDisplayFunc(void (*f)()) {
259     if (glut_window) glut_window->display = f;
260 }
261
262 inline void glutReshapeFunc(void (*f)(int w, int h)) {
263     if (glut_window) glut_window->reshape = f;
264 }
265
266 inline void glutKeyboardFunc(void (*f)(uchar key, int x, int y)) {
267     if (glut_window) glut_window->keyboard = f;
268 }
269
270 inline void glutMouseFunc(void (*f)(int b, int state, int x, int y)) {
271     if (glut_window) glut_window->mouse = f;
272 }
273
274 # define GLUT_LEFT_BUTTON          0
275 # define GLUT_MIDDLE_BUTTON        1
276 # define GLUT_RIGHT_BUTTON         2
277 # define GLUT_DOWN                  0
278 # define GLUT_UP                    1
279
280 inline void glutMotionFunc(void (*f)(int x, int y)) {
281     if (glut_window) glut_window->motion = f;
282 }
283
284 inline void glutPassiveMotionFunc(void (*f)(int x, int y)) {
285     if (glut_window) glut_window->passivemotion = f;
286 }

```

```

287
288 inline void glutEntryFunc(void (*f)(int s)) {
289     if (glut_window) glut_window->entry = f;
290 }
291
292 enum {GLUT_LEFT, GLUT_ENTERED};
293
294 inline void glutVisibilityFunc(void (*f)(int s)) {
295     if (glut_window) glut_window->visibility = f;
296 }
297 enum {GLUT_NOT_VISIBLE, GLUT_VISIBLE};
298
299 FL_EXPORT void glutIdleFunc(void (*f)());
300
301 inline void glutTimerFunc(unsigned int msec, void (*f)(int), int value) {
302     Fl::add_timeout(msec*.001, (void *) (void *) f, (void *) (fl_intptr_t) value);
303 }
304
305 inline void glutMenuStateFunc(void (*f)(int state)) {
306     glut_menustate_function = f;
307 }
308 inline void glutMenuStatusFunc(void (*f)(int status, int x, int y)) {
309     glut_menustatus_function = f;
310 }
311 enum {GLUT_MENU_NOT_IN_USE, GLUT_MENU_IN_USE};
312
313 inline void glutSpecialFunc(void (*f)(int key, int x, int y)) {
314     if (glut_window) glut_window->special = f;
315 }
316 # define GLUT_KEY_F1          1
317 # define GLUT_KEY_F2          2
318 # define GLUT_KEY_F3          3
319 # define GLUT_KEY_F4          4
320 # define GLUT_KEY_F5          5
321 # define GLUT_KEY_F6          6
322 # define GLUT_KEY_F7          7
323 # define GLUT_KEY_F8          8
324 # define GLUT_KEY_F9          9
325 # define GLUT_KEY_F10         10
326 # define GLUT_KEY_F11         11
327 # define GLUT_KEY_F12         12
328 // WARNING: Different values than GLUT uses:
329 # define GLUT_KEY_LEFT        FL_Left
330 # define GLUT_KEY_UP          FL_Up
331 # define GLUT_KEY_RIGHT       FL_Right
332 # define GLUT_KEY_DOWN        FL_Down
333 # define GLUT_KEY_PAGE_UP     FL_Page_Up
334 # define GLUT_KEY_PAGE_DOWN   FL_Page_Down
335 # define GLUT_KEY_HOME        FL_Home
336 # define GLUT_KEY_END          FL_End
337 # define GLUT_KEY_INSERT      FL_Insert
338
339 // inline void glutSpaceballMotionFunc(void (*)(int x, int y, int z));
340
341 // inline void glutSpaceballRotateFunc(void (*)(int x, int y, int z));
342
343 // inline void glutSpaceballButtonFunc(void (*)(int button, int state));
344
345 // inline void glutButtonBoxFunc(void (*)(int button, int state));
346
347 // inline void glutDialsFunc(void (*)(int dial, int value));
348
349 // inline void glutTabletMotionFunc(void (*)(int x, int y));
350
351 // inline void glutTabletButtonFunc(void (*)(int button, int state, int x, int y));
352
353 inline void glutOverlayDisplayFunc(void (*f)()) {
354     if (glut_window) glut_window->overlaydisplay = f;
355 }
356
357 // inline void glutWindowStatusFunc(void (*)(int state));
358 // enum {GLUT_HIDDEN, GLUT_FULLY_RETAINED, GLUT_PARTIALLY_RETAINED,
359 //        GLUT_FULLY_COVERED};
360
361 // inline void glutSetColor(int, GLfloat red, GLfloat green, GLfloat blue);
362
363 // inline GLfloat glutGetColor(int ndx, int component);
364 // #define GLUT_RED            0
365 // #define GLUT_GREEN          1
366 // #define GLUT_BLUE           2
367
368 // inline void glutCopyColormap(int win);
369
370 // Warning: values are changed from GLUT!
371 // Also relies on the GL_ symbols having values greater than 100
372 FL_EXPORT int glutGet(GLenum type);
373 enum {

```

```

374 GLUT_RETURN_ZERO = 0,
375 GLUT_WINDOW_X,
376 GLUT_WINDOW_Y,
377 GLUT_WINDOW_WIDTH,
378 GLUT_WINDOW_HEIGHT,
379 GLUT_WINDOW_PARENT,
380 GLUT_SCREEN_WIDTH,
381 GLUT_SCREEN_HEIGHT,
382 GLUT_MENU_NUM_ITEMS,
383 GLUT_DISPLAY_MODE_POSSIBLE,
384 GLUT_INIT_WINDOW_X,
385 GLUT_INIT_WINDOW_Y,
386 GLUT_INIT_WINDOW_WIDTH,
387 GLUT_INIT_WINDOW_HEIGHT,
388 GLUT_INIT_DISPLAY_MODE,
389 GLUT_WINDOW_BUFFER_SIZE,
390 GLUT_VERSION,
391 //GLUT_WINDOW_NUM_CHILDREN,
392 //GLUT_WINDOW_CURSOR,
393 //GLUT_SCREEN_WIDTH_MM,
394 //GLUT_SCREEN_HEIGHT_MM,
395 GLUT_ELAPSED_TIME
396 };
397
398 # define GLUT_WINDOW_STENCIL_SIZE      GL_STENCIL_BITS
399 # define GLUT_WINDOW_DEPTH_SIZE        GL_DEPTH_BITS
400 # define GLUT_WINDOW_RED_SIZE          GL_RED_BITS
401 # define GLUT_WINDOW_GREEN_SIZE        GL_GREEN_BITS
402 # define GLUT_WINDOW_BLUE_SIZE         GL_BLUE_BITS
403 # define GLUT_WINDOW_ALPHA_SIZE        GL_ALPHA_BITS
404 # define GLUT_WINDOW_ACCUM_RED_SIZE    GL_ACCUM_RED_BITS
405 # define GLUT_WINDOW_ACCUM_GREEN_SIZE  GL_ACCUM_GREEN_BITS
406 # define GLUT_WINDOW_ACCUM_BLUE_SIZE   GL_ACCUM_BLUE_BITS
407 # define GLUT_WINDOW_ACCUM_ALPHA_SIZE  GL_ACCUM_ALPHA_BITS
408 # define GLUT_WINDOW_DOUBLEBUFFER      GL_DOUBLEBUFFER
409 # define GLUT_WINDOW_RGBA              GL_RGBA
410 # define GLUT_WINDOW_COLORMAP_SIZE     GL_INDEX_BITS
411 # ifdef GL_SAMPLES_SGIS
412 #   define GLUT_WINDOW_NUM_SAMPLES     GL_SAMPLES_SGIS
413 # else
414 #   define GLUT_WINDOW_NUM_SAMPLES     GLUT_RETURN_ZERO
415 # endif
416 # define GLUT_WINDOW_STEREO            GL_STEREO
417
418 # define GLUT_HAS_KEYBOARD             600
419 # define GLUT_HAS_MOUSE                 601
420 # define GLUT_HAS_SPACEBALL             602
421 # define GLUT_HAS_DIAL_AND_BUTTON_BOX  603
422 # define GLUT_HAS_TABLET                604
423 # define GLUT_NUM_MOUSE_BUTTONS         605
424 # define GLUT_NUM_SPACEBALL_BUTTONS     606
425 # define GLUT_NUM_BUTTON_BOX_BUTTONS    607
426 # define GLUT_NUM_DIALS                 608
427 # define GLUT_NUM_TABLET_BUTTONS        609
428 FL_EXPORT int glutDeviceGet(GLenum type);
429
430 // WARNING: these values are different than GLUT uses:
431 # define GLUT_ACTIVE_SHIFT              FL_SHIFT
432 # define GLUT_ACTIVE_CTRL               FL_CTRL
433 # define GLUT_ACTIVE_ALT                FL_ALT
434
435 inline int glutGetModifiers() {
436     return FL::event_state() & (GLUT_ACTIVE_SHIFT | GLUT_ACTIVE_CTRL | GLUT_ACTIVE_ALT);
437 }
438
439 FL_EXPORT int glutLayerGet(GLenum);
440 # define GLUT_OVERLAY_POSSIBLE          800
441 // #define GLUT_LAYER_IN_USE             801
442 // #define GLUT_HAS_OVERLAY              802
443 # define GLUT_TRANSPARENT_INDEX         803
444 # define GLUT_NORMAL_DAMAGED            804
445 # define GLUT_OVERLAY_DAMAGED           805
446
447 extern "C" {
448     typedef void (*GLUTproc)();
449 }
450
451 FL_EXPORT GLUTproc glutGetProcAddress(const char *procName);
452
453 // inline int glutVideoResizeGet(GLenum param);
454 // #define GLUT_VIDEO_RESIZE_POSSIBLE    900
455 // #define GLUT_VIDEO_RESIZE_IN_USE      901
456 // #define GLUT_VIDEO_RESIZE_X_DELTA     902
457 // #define GLUT_VIDEO_RESIZE_Y_DELTA     903
458 // #define GLUT_VIDEO_RESIZE_WIDTH_DELTA 904
459 // #define GLUT_VIDEO_RESIZE_HEIGHT_DELTA 905
460 // #define GLUT_VIDEO_RESIZE_X          906

```

```

461 // #define GLUT_VIDEO_RESIZE_Y 907
462 // #define GLUT_VIDEO_RESIZE_WIDTH 908
463 // #define GLUT_VIDEO_RESIZE_HEIGHT 909
464
465 // inline void glutSetupVideoResizing();
466
467 // inline void glutStopVideoResizing();
468
469 // inline void glutVideoResize(int x, int y, int width, int height);
470
471 // inline void glutVideoPan(int x, int y, int width, int height);
472
473 // Font argument must be a void* for compatibility, so...
474 struct FL_Glut_Bitmap_Font {FL_Font font; FL_Fontsize size;};
475
476
477 extern FL_EXPORT struct FL_Glut_Bitmap_Font
478     glutBitmap9By15, glutBitmap8By13, glutBitmapTimesRoman10,
479     glutBitmapTimesRoman24, glutBitmapHelvetica10, glutBitmapHelvetica12,
480     glutBitmapHelvetica18;
481 # define GLUT_BITMAP_9_BY_15 (&glutBitmap9By15)
482 # define GLUT_BITMAP_8_BY_13 (&glutBitmap8By13)
483 # define GLUT_BITMAP_TIMES_ROMAN_10 (&glutBitmapTimesRoman10)
484 # define GLUT_BITMAP_TIMES_ROMAN_24 (&glutBitmapTimesRoman24)
485 # define GLUT_BITMAP_HELVETICA_10 (&glutBitmapHelvetica10)
486 # define GLUT_BITMAP_HELVETICA_12 (&glutBitmapHelvetica12)
487 # define GLUT_BITMAP_HELVETICA_18 (&glutBitmapHelvetica18)
488
489 FL_EXPORT void glutBitmapCharacter(void *font, int character);
490 FL_EXPORT int glutBitmapHeight(void *font);
491 FL_EXPORT int glutBitmapLength(void *font, const unsigned char *string);
492 FL_EXPORT void glutBitmapString(void *font, const unsigned char *string);
493 FL_EXPORT int glutBitmapWidth(void *font, int character);
494
495 FL_EXPORT int glutExtensionSupported(char *name);
496
497 /* GLUT stroked font sub-API */
498 struct FL_Glut_StrokeVertex {
499     GLfloat X, Y;
500 };
501
502 struct FL_Glut_StrokeStrip {
503     int Number;
504     const FL_Glut_StrokeVertex* Vertices;
505 };
506
507 struct FL_Glut_StrokeChar {
508     GLfloat Right;
509     int Number;
510     const FL_Glut_StrokeStrip* Strips;
511 };
512
513 struct FL_Glut_StrokeFont {
514     char* Name; // The source font name
515     int Quantity; // Number of chars in font
516     GLfloat Height; // Height of the characters
517     const FL_Glut_StrokeChar** Characters; // The characters mapping
518 };
519 extern FL_EXPORT FL_Glut_StrokeFont glutStrokeRoman;
520 extern FL_EXPORT FL_Glut_StrokeFont glutStrokeMonoRoman;
521 # define GLUT_STROKE_ROMAN (&glutStrokeRoman)
522 # define GLUT_STROKE_MONO_ROMAN (&glutStrokeMonoRoman)
523
524 FL_EXPORT void glutStrokeCharacter(void *font, int character);
525 FL_EXPORT GLfloat glutStrokeHeight(void *font);
526 FL_EXPORT int glutStrokeLength(void *font, const unsigned char *string);
527 FL_EXPORT void glutStrokeString(void *font, const unsigned char *string);
528 FL_EXPORT int glutStrokeWidth(void *font, int character);
529
530 /* GLUT pre-built models sub-API */
531 FL_EXPORT void glutWireSphere(GLdouble radius, GLint slices, GLint stacks);
532 FL_EXPORT void glutSolidSphere(GLdouble radius, GLint slices, GLint stacks);
533 FL_EXPORT void glutWireCone(GLdouble base, GLdouble height, GLint slices, GLint stacks);
534 FL_EXPORT void glutSolidCone(GLdouble base, GLdouble height, GLint slices, GLint stacks);
535 FL_EXPORT void glutWireCube(GLdouble size);
536 FL_EXPORT void glutSolidCube(GLdouble size);
537 FL_EXPORT void glutWireTorus(GLdouble innerRadius, GLdouble outerRadius, GLint sides, GLint rings);
538 FL_EXPORT void glutSolidTorus(GLdouble innerRadius, GLdouble outerRadius, GLint sides, GLint rings);
539 FL_EXPORT void glutWireDodecahedron();
540 FL_EXPORT void glutSolidDodecahedron();
541 FL_EXPORT void glutWireTeapot(GLdouble size);
542 FL_EXPORT void glutSolidTeapot(GLdouble size);
543 FL_EXPORT void glutWireOctahedron();
544 FL_EXPORT void glutSolidOctahedron();
545 FL_EXPORT void glutWireTetrahedron();
546 FL_EXPORT void glutSolidTetrahedron();
547 FL_EXPORT void glutWireIcosahedron();
548 FL_EXPORT void glutSolidIcosahedron();

```

```

549
550 #endif // !_FL_glut_H_

```

## 34.191 mac.H File Reference

Mac OS X-specific symbols.

### Classes

- class [FL\\_Mac\\_App\\_Menu](#)

### Functions

- [FL\\_Window](#) \* [fl\\_mac\\_find](#) (FLWindow \*)  
*Returns the [FL\\_Window](#) corresponding to the given macOS-specific window reference.*
- CGContextRef [fl\\_mac\\_gc](#) ()  
*Returns the macOS-specific graphics context for the current window.*
- void [fl\\_mac\\_set\\_about](#) ([FL\\_Callback](#) \*cb, void \*user\_data, int shortcut=0)  
*Attaches a callback to the "About myprog" item of the system application menu.*
- FLWindow \* [fl\\_mac\\_xid](#) (const [FL\\_Window](#) \*win)  
*Returns the macOS-specific window reference corresponding to the given [FL\\_Window](#) object.*

### Variables

- int [fl\\_mac\\_os\\_version](#)  
*The version number of the running Mac OS X (e.g., 100604 for 10.6.4, 101300 for 10.13, 140102 for 14.1.2).*

### 34.191.1 Detailed Description

Mac OS X-specific symbols.

## 34.192 mac.H

[Go to the documentation of this file.](#)

```

1 //
2 // Mac header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2018 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 // Do not directly include this file, instead use <FL/platform.H>. It will
18 // include this file if "__APPLE__" is defined. This is to encourage
19 // portability of even the system-specific code...
20 #ifndef FL_DOXYGEN
21
22 #if !defined(FL_PLATFORM_H)
23 #   error "Never use <FL/mac.H> directly; include <FL/platform.H> instead."
24 #endif // !FL_PLATFORM_H
25
26 #ifdef __OBJC__
27     @class NSOpenGLContext;
28 #   ifndef GL_SILENCE_DEPRECATION
29 #       define GL_SILENCE_DEPRECATION 1
30 #   endif
31 #elif defined(__cplusplus)
32     class NSOpenGLContext;
33 #endif /* __OBJC__ */

```

```

34 extern NSOpenGLContext *fl_mac_glcontext(GLContext rc);
35
36 #ifdef __OBJC__
37 @class FLWindow; // a subclass of the NSWindow Cocoa class
38 typedef FLWindow *Window;
39 #else
40 typedef class FLWindow *Window; // pointer to the FLWindow objective-c class
41 #endif // __OBJC__
42
43 #include <FL/Fl_Widget.H> // for Fl_Callback
44
45 #if (defined(FL_LIBRARY) || defined(FL_INTERNALS)) // this part must be compiled when building the FLTK
    libraries
46
47 // Standard MacOS C/C++ includes...
48 #include <ApplicationServices/ApplicationServices.h>
49 #undef check // because of Fl::check()
50
51 #ifndef MAC_OS_X_VERSION_10_4
52 #define MAC_OS_X_VERSION_10_4 1040
53 #endif
54 #ifndef MAC_OS_X_VERSION_10_5
55 #define MAC_OS_X_VERSION_10_5 1050
56 #endif
57 #ifndef MAC_OS_X_VERSION_10_6
58 #define MAC_OS_X_VERSION_10_6 1060
59 #endif
60 #ifndef MAC_OS_X_VERSION_10_7
61 #define MAC_OS_X_VERSION_10_7 1070
62 #endif
63 #ifndef MAC_OS_X_VERSION_10_8
64 #define MAC_OS_X_VERSION_10_8 1080
65 #endif
66 #ifndef MAC_OS_X_VERSION_10_9
67 #define MAC_OS_X_VERSION_10_9 1090
68 #endif
69 #ifndef MAC_OS_X_VERSION_10_10
70 #define MAC_OS_X_VERSION_10_10 101000
71 #endif
72 #ifndef MAC_OS_X_VERSION_10_11
73 #define MAC_OS_X_VERSION_10_11 101100
74 #endif
75 #ifndef MAC_OS_X_VERSION_10_12
76 #define MAC_OS_X_VERSION_10_12 101200
77 #endif
78 #ifndef MAC_OS_X_VERSION_10_13
79 #define MAC_OS_X_VERSION_10_13 101300
80 #endif
81 #ifndef MAC_OS_X_VERSION_10_14
82 #define MAC_OS_X_VERSION_10_14 101400
83 #endif
84 #ifndef MAC_OS_X_VERSION_10_15
85 #define MAC_OS_X_VERSION_10_15 101500
86 #endif
87 #ifndef MAC_OS_X_VERSION_10_16
88 #define MAC_OS_X_VERSION_10_16 101600
89 #endif
90 #ifndef MAC_OS_VERSION_11_0
91 #define MAC_OS_VERSION_11_0 110000
92 #endif
93 #ifndef MAC_OS_VERSION_12_0
94 #define MAC_OS_VERSION_12_0 120000
95 #endif
96 #ifndef MAC_OS_VERSION_13_0
97 #define MAC_OS_VERSION_13_0 130000
98 #endif
99 #ifndef MAC_OS_VERSION_14_0
100 #define MAC_OS_VERSION_14_0 140000
101 #endif
102 #ifndef MAC_OS_VERSION_15_0
103 #define MAC_OS_VERSION_15_0 150000
104 #endif
105
106
107 #ifndef NSINTEGER_DEFINED // appears with 10.5 in NSObjCRuntime.h
108 #if defined(__LP64__) && __LP64__
109 typedef long NSInteger;
110 typedef unsigned long NSUInteger;
111 #else
112 typedef int NSInteger;
113 typedef unsigned int NSUInteger;
114 #endif
115 #endif
116
117 #if MAC_OS_X_VERSION_MAX_ALLOWED < MAC_OS_X_VERSION_10_4
118 typedef CGImageAlphaInfo CGBitmapInfo;
119 #endif

```

```

120
121 struct flCocoaRegion {
122     int count;
123     CGRect *rects;
124 }; // a region is the union of a series of rectangles
125
126 #ifndef CGFLOAT_DEFINED //appears with 10.5 in CGBase.h
127 #if defined(__LP64__) && __LP64__
128     typedef double CGFloat;
129 #else
130     typedef float CGFloat;
131 #endif
132 #endif // CGFLOAT_DEFINED
133
134 #else
135
136 typedef struct CGContext* CGContextRef;
137
138 #endif // FL_LIBRARY || FL_INTERNALS
139
140 extern CGContextRef fl_gc;
141
142 #endif // FL_DOXYGEN
143
144 void fl_mac_set_about(Fl_Callback *cb, void *user_data, int shortcut = 0);
145
146 extern CGContextRef fl_mac_gc();
147 extern FLWindow *fl_mac_xid(const FL_Window *win);
148 extern FL_Window *fl_mac_find(FLWindow *);
149 class Fl_Gl_Window;
150
151 extern int fl_mac_os_version;
152
153 struct Fl_Menu_Item;
154
155 class Fl_Mac_App_Menu {
156 public:
157     static const char *about;
158     static const char *print;
159     static const char *print_no_titlebar;
160     static const char *toggle_print_titlebar;
161     static const char *services;
162     static const char *hide;
163     static const char *hide_others;
164     static const char *show;
165     static const char *quit;
166     static void custom_application_menu_items(const Fl_Menu_Item *m);
167 };
168
169
170

```

## 34.193 math.h

```

1 //
2 // Math header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2020 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 // Xcode on macOS includes files by recursing down into directories.
18 // This code catches the cycle and directly includes the required file.
19 #ifndef fl_math_h_cyclic_include
20 #    include "/usr/include/math.h"
21 #endif
22
23 #ifndef fl_math_h
24 #    define fl_math_h
25
26 #    define fl_math_h_cyclic_include
27 #    include <math.h>
28 #    undef fl_math_h_cyclic_include
29
30 #    ifndef M_PI
31 #        define M_PI                3.14159265358979323846
32 #    #    define M_PI_2              1.57079632679489661923
33 #    #    define M_PI_4              0.78539816339744830962
34 #    #    define M_1_PI              0.31830988618379067154

```

```

35 #   define M_2_PI           0.63661977236758134308
36 #   endif // !M_PI
37
38 #   ifndef M_SQRT2
39 #       define M_SQRT2       1.41421356237309504880
40 #       define M_SQRT1_2     0.70710678118654752440
41 #   endif // !M_SQRT2
42
43 #   if (defined(_WIN32) || defined(CRAY)) && !defined(__MINGW32__)
44
45 inline double rint(double v) {return floor(v+.5);}
46 inline double copysign(double a, double b) {return b<0 ? -a : a;}
47
48 #   endif // (_WIN32 || CRAY) && !__MINGW32__
49
50 #endif // !fl_math_h

```

## 34.194 names.h File Reference

This file defines arrays of human readable names for FLTK symbolic constants.

### Variables

- const char \*const [fl\\_callback\\_reason\\_names](#) []  
*This is an array of callback reason names you can use to convert callback reasons into names.*
- const char \*const [fl\\_eventnames](#) []  
*This is an array of event names you can use to convert event numbers into names.*
- const char \*const [fl\\_fontnames](#) []  
*This is an array of font names you can use to convert font numbers into names.*

### 34.194.1 Detailed Description

This file defines arrays of human readable names for FLTK symbolic constants.

## 34.195 names.h

[Go to the documentation of this file.](#)

```

1 //
2 // Event and other names header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 // Thanks to Greg Ercolano for this addition.
18
24 #ifndef FL_NAMES_H
25 #define FL_NAMES_H
26
46 const char * const fl_eventnames[] =
47 {
48     "FL_NO_EVENT",
49     "FL_PUSH",
50     "FL_RELEASE",
51     "FL_ENTER",
52     "FL_LEAVE",
53     "FL_DRAG",
54     "FL_FOCUS",
55     "FL_UNFOCUS",
56     "FL_KEYDOWN",
57     "FL_KEYUP",
58     "FL_CLOSE",
59     "FL_MOVE",
60     "FL_SHORTCUT",

```

```

61  "FL_DEACTIVATE",
62  "FL_ACTIVATE",
63  "FL_HIDE",
64  "FL_SHOW",
65  "FL_PASTE",
66  "FL_SELECTIONCLEAR",
67  "FL_MOUSEWHEEL",
68  "FL_DND_ENTER",
69  "FL_DND_DRAG",
70  "FL_DND_LEAVE",
71  "FL_DND_RELEASE",
72  "FL_SCREEN_CONFIGURATION_CHANGED",
73  "FL_FULLSCREEN",
74  "FL_ZOOM_GESTURE",
75  "FL_ZOOM_EVENT",
76  "FL_BEFORE_TOOLTIP",
77  "FL_BEFORE_MENU",
78  "FL_EVENT_30", // not yet defined, just in case it /will/ be defined ...
79  "FL_EVENT_31", // not yet defined, just in case it /will/ be defined ...
80  "FL_EVENT_32"  // not yet defined, just in case it /will/ be defined ...
81 };
82
100 const char * const fl_fontnames[] =
101 {
102     "FL_HELVETICA",
103     "FL_HELVETICA_BOLD",
104     "FL_HELVETICA_ITALIC",
105     "FL_HELVETICA_BOLD_ITALIC",
106     "FL_COURIER",
107     "FL_COURIER_BOLD",
108     "FL_COURIER_ITALIC",
109     "FL_COURIER_BOLD_ITALIC",
110     "FL_TIMES",
111     "FL_TIMES_BOLD",
112     "FL_TIMES_ITALIC",
113     "FL_TIMES_BOLD_ITALIC",
114     "FL_SYMBOL",
115     "FL_SCREEN",
116     "FL_SCREEN_BOLD",
117     "FL_ZAPF_DINGBATS",
118 };
119
125 const char * const fl_callback_reason_names[] =
126 {
127     "FL_REASON_UNKNOWN",
128     "FL_REASON_SELECTED",
129     "FL_REASON_DESELECTED",
130     "FL_REASON_RESELECTED",
131     "FL_REASON_OPENED",
132     "FL_REASON_CLOSED",
133     "FL_REASON_DRAGGED",
134     "FL_REASON_CANCELLED",
135     "FL_REASON_CHANGED",
136     "FL_REASON_GOT_FOCUS",
137     "FL_REASON_LOST_FOCUS",
138     "FL_REASON_RELEASED",
139     "FL_REASON_ENTER_KEY",
140     NULL, NULL, NULL,
141     NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
142     NULL, NULL, NULL, NULL, NULL, NULL, NULL, NULL,
143     "FL_REASON_USER", "FL_REASON_USER+1", "FL_REASON_USER+2", "FL_REASON_USER+3",
144 };
145
148 #endif /* FL_NAMES_H */

```

## 34.196 platform.H

```

1  //
2  // Platform header file for the Fast Light Tool Kit (FLTK).
3  //
4  // Copyright 1998-2023 by Bill Spitzak and others.
5  //
6  // This library is free software. Distribution and use rights are outlined in
7  // the file "COPYING" which should have been included with this file.  If this
8  // file is missing or damaged, see the license at:
9  //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 // These are FLTK symbols that are necessary or useful for calling
18 // platform specific functions.  This file #include's certain platform

```

```

19 // specific system header files that are necessary to declare platform
20 // specific FLTK functions, for instance "Windows.h" under Windows.
21
22 // You should include this file if (and ONLY if) you need to call
23 // platform specific functions directly.
24
25 // See FLTK documentation: chapter "Operating System Issues" on when
26 // you need to #include <FL/platform.H>
27
28 #if !defined(FL_PLATFORM_H) && !defined(FL_DOXYGEN)
29 #   define FL_PLATFORM_H
30
31 #   include <FL/Fl_Export.H>
32 #   include <FL/platform_types.h> // will bring in FL/fl_config.h
33 #   include <FL/fl_types.h> // for uchar
34 class Fl_Window;
35
36 #   ifdef _WIN32
37 #       include "win32.H"
38 #   elif defined(FLTK_USE_WAYLAND)
39 #       include "wayland.H"
40 #   elif defined(FLTK_USE_X11)
41 #       include "x11.H"
42 #   elif defined(__APPLE__)
43 #       include "mac.H"
44 #   endif // _WIN32
45
46 //
47 // cross-platform declarations
48 //
49 #if defined(FL_LIBRARY) || defined(FL_INTERNALS)
50 #   include <FL/Fl_Window.H>
51
52 class FL_EXPORT Fl_X {
53 public:
54     fl_uintptr_t xid;
55     Fl_Window* w;
56     Fl_Region region;
57     Fl_X *next;
58     // static variables, static functions and member functions
59     static Fl_X* first;
60     static Fl_X* flx(const Fl_Window* w) {return w ? (Fl_X*)w->flx_ : 0;}
61 #   if defined(FLTK_USE_X11) && FLTK_USE_X11 // for backward compatibility
62     static void make_xid(Fl_Window*, XVisualInfo* =fl_visual, Colormap=fl_colormap);
63     static Fl_X* set_xid(Fl_Window*, Window);
64     static inline Fl_X* i(const Fl_Window* w) {return flx(w);}
65 #   endif
66 };
67
68 inline Window fl_xid(const Fl_Window* w) { Fl_X *xTemp = Fl_X::flx(w); return xTemp ? (Window)xTemp->xid
69 : 0; }
69 #else
70 extern FL_EXPORT Window fl_xid(const Fl_Window* w);
71 #   define fl_xid(w) fl_xid(w)
72 #endif // FL_LIBRARY || FL_INTERNALS
73
74 extern FL_EXPORT Fl_Window* fl_find(Window xid);
75 extern FL_EXPORT void fl_open_display();
76 extern FL_EXPORT void fl_close_display();
77 extern FL_EXPORT Window fl_window;
78 extern FL_EXPORT int fl_parse_color(const char* p, uchar& r, uchar& g, uchar& b);
79 extern FL_EXPORT void fl_open_callback(void (*) (const char *));
80
81 #endif // !FL_PLATFORM_H

```

## 34.197 platform\_types.h File Reference

Definitions of platform-dependent types.

### Macros

- #define **FL\_COMMAND** opaque  
An alias for *FL\_CTRL* on Windows and X11, or *FL\_META* on MacOS X.
- #define **FL\_CONTROL** opaque  
An alias for *FL\_META* on Windows and X11, or *FL\_CTRL* on MacOS X.

## Typedefs

- typedef opaque [fl\\_intptr\\_t](#)  
*An integral type large enough to store a pointer or a long value.*
- typedef opaque [Fl\\_Offscreen](#)  
*Platform-specific value representing an offscreen drawing buffer.*
- typedef struct opaque \* [Fl\\_Region](#)  
*Pointer to a platform-specific structure representing a collection of rectangles.*
- typedef opaque **FL\_SOCKET**  
*socket or file descriptor*
- typedef opaque [Fl\\_Timestamp](#)  
*Platform-specific point in time, used for delta time calculation.*
- typedef opaque [fl\\_uintptr\\_t](#)  
*An unsigned integral type large enough to store a pointer or an unsigned long value.*
- typedef struct opaque \* [GLContext](#)  
*Pointer to a platform-specific structure representing the window's OpenGL rendering context.*

### 34.197.1 Detailed Description

Definitions of platform-dependent types.

The exact nature of these types varies with the platform. Therefore, portable FLTK applications should not assume these types have a specific size, or that they are pointers.

### 34.197.2 Typedef Documentation

#### 34.197.2.1 fl\_intptr\_t

```
typedef opaque fl_intptr_t
```

An integral type large enough to store a pointer or a long value.

A pointer value can be safely cast to `fl_intptr_t`, and later cast back to its initial pointer type without change to the pointer value. A variable of type `fl_intptr_t` can also store a long int value.

#### 34.197.2.2 Fl\_Offscreen

```
typedef opaque Fl_Offscreen
```

Platform-specific value representing an offscreen drawing buffer.

##### Note

This value can be safely cast to these types on each platform:

- X11: Pixmap
- Wayland: `cairo_t *`
- Windows: HBITMAP
- macOS: CGContextRef

#### 34.197.2.3 Fl\_Region

```
typedef struct opaque* Fl_Region
```

Pointer to a platform-specific structure representing a collection of rectangles.

**Note**

This pointer can be safely cast to these types on each platform:

- X11: Region as defined by X11
- Wayland: `cairo_region_t *`
- Windows: `HRGN`
- macOS: `struct flCocoaRegion *`

**34.197.2.4 Fl\_Timestamp**

```
typedef opaque Fl_Timestamp
```

Platform-specific point in time, used for delta time calculation.

**Note**

This type may be a struct. `sizeof(Fl_Timestamp)` may be different on different platforms. `Fl_Timestamp` may change with future ABI changes.

**34.197.2.5 fl\_uintptr\_t**

```
typedef opaque fl_uintptr_t
```

An unsigned integral type large enough to store a pointer or an unsigned long value.

A pointer value can be safely cast to `fl_uintptr_t`, and later cast back to its initial pointer type without change to the pointer value. A variable of type `fl_uintptr_t` can also store an unsigned long int value.

**34.197.2.6 GLContext**

```
typedef struct opaque* GLContext
```

Pointer to a platform-specific structure representing the window's OpenGL rendering context.

**Note**

This pointer can be safely cast to these types on each platform:

- X11: `GLXContext`
- Wayland: `EGLContext`
- Windows: `HGLRC`
- macOS: `NSOpenGLContext *`

**34.198 platform\_types.h**

[Go to the documentation of this file.](#)

```
1 /*
2  * Copyright 2016-2023 by Bill Spitzak and others.
3  *
4  * This library is free software. Distribution and use rights are outlined in
5  * the file "COPYING" which should have been included with this file. If this
6  * file is missing or damaged, see the license at:
7  *
8  *   https://www.fltk.org/COPYING.php
9  *
10 * Please see the following page on how to report bugs and issues:
11 *
12 *   https://www.fltk.org/bugs.php
13 */
14
15 #ifndef Fl_Platform_Types_H
16 #define Fl_Platform_Types_H
17
25 #ifdef FL_DOXYGEN
26
31 typedef opaque fl_intptr_t;
```

```

36 typedef opaque fl_uintptr_t;
37
46 typedef opaque Fl_Offscreen;
47
56 typedef struct opaque *Fl_Region;
57 typedef opaque FL_SOCKET;
66 typedef struct opaque *GLContext;
67
73 typedef opaque Fl_Timestamp;
74
75 # define FL_COMMAND opaque
76 # define FL_CONTROL opaque
78 #else /* FL_DOXYGEN */
79
80 #ifndef FL_PLATFORM_TYPES_H
81 #define FL_PLATFORM_TYPES_H
82
83 #include <FL/fl_config.h>
84 #include <time.h> // for time_t
85
86 /* Platform-dependent types are defined here.
87 These types must be defined by any platform:
88 FL_SOCKET, struct dirent, fl_intptr_t, fl_uintptr_t
89
90 NOTE: *FIXME* AlbrechtS 13 Apr 2016 (concerning FL_SOCKET)
91 -----
92 The Fl::add_fd() API is partially inconsistent because some of the methods
93 explicitly use 'int', but the callback typedefs use FL_SOCKET. With the
94 definition of FL_SOCKET below we can have different data sizes and
95 different signedness of socket numbers on *some* platforms.
96 */
97
98 #ifdef _WIN64
99
100 #if defined(_MSC_VER) && (_MSC_VER < 1600)
101 # include <stddef.h> /* stdint.h not available before VS 2010 (1600) */
102 #else
103 # include <stdint.h>
104 #endif
105
106 typedef intptr_t fl_intptr_t;
107 typedef uintptr_t fl_uintptr_t;
108
109 #else /* ! _WIN64 */
110
111 typedef long fl_intptr_t;
112 typedef unsigned long fl_uintptr_t;
113
114 #endif /* _WIN64 */
115
116 typedef void *GLContext;
117 typedef void *Fl_Region;
118 typedef fl_uintptr_t Fl_Offscreen;
119
120 /* Allows all hybrid combinations except WIN32 + X11 with MSVC */
121 #if defined(_WIN32) && !defined(__MINGW32__)
122     struct dirent {char d_name[1];};
123 #else
124 # include <dirent.h>
125 #endif
126
127 # if defined(_WIN64) && defined(_MSC_VER)
128 typedef unsigned __int64 FL_SOCKET; /* *FIXME* - FL_SOCKET (see above) */
129 # else
130 typedef int FL_SOCKET;
131 # endif
132
133 #include <FL/Fl_Export.H>
134 extern FL_EXPORT int fl_command_modifier();
135 extern FL_EXPORT int fl_control_modifier();
136 # define FL_COMMAND fl_command_modifier()
137 # define FL_CONTROL fl_control_modifier()
138
139 #endif /* FL_PLATFORM_TYPES_H */
140
141 /* This is currently the same for all platforms but may change in the future */
142 struct Fl_Timestamp_t {
143     time_t sec;
144     int usec;
145 };
146
147 typedef struct Fl_Timestamp_t Fl_Timestamp;
148
149 #endif /* FL_DOXYGEN */
150
151 #endif /* Fl_Platform_Types_H */
152

```

## 34.199 wayland.H File Reference

Definitions of functions specific to the Wayland platform.

### Typedefs

- typedef struct \_cairo **cairo\_t**
- typedef void \* **EGLContext**

### Functions

- int **fl\_wl\_buffer\_scale** ([FL\\_Window](#) \*window)  
*Returns the current buffer scaling factor for window.*
- struct wl\_compositor \* **fl\_wl\_compositor** ()  
*Returns the wl\_compositor of the current Wayland session.*
- struct wl\_display \* **fl\_wl\_display** ()  
*Returns the Wayland display in use.*
- [FL\\_Window](#) \* **fl\_wl\_find** (struct wld\_window \*)  
*Returns the [FL\\_Window](#) corresponding to a given the platform-specific window reference.*
- cairo\_t \* **fl\_wl\_gc** ()  
*Returns the cairo context associated to the current window or [FL\\_Image\\_Surface](#).*
- EGLContext **fl\_wl\_glcontext** ([GLContext](#) rc)  
*Returns the EGLContext corresponding to the given GLContext.*
- struct wl\_surface \* **fl\_wl\_surface** (struct wld\_window \*xid)  
*Returns the wl\_surface associated to a shown window.*
- struct wld\_window \* **fl\_wl\_xid** (const [FL\\_Window](#) \*win)  
*Returns a platform-specific reference associated to a shown window.*

### 34.199.1 Detailed Description

Definitions of functions specific to the Wayland platform.

### 34.199.2 Function Documentation

#### 34.199.2.1 fl\_wl\_compositor()

```
struct wl_compositor * fl_wl_compositor ( )
```

Returns the wl\_compositor of the current Wayland session.

This allows, for example, to create a wl\_surface with

```
struct wl_surface *my_wl_surface = wl_compositor_create_surface(fl_wl_compositor());
```

## 34.200 wayland.H

[Go to the documentation of this file.](#)

```
1 //
2 // Wayland/X11 hybrid platform header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
```

```

16
17 #if !defined(FL_PLATFORM_H)
18 #   error "Never use <FL/wayland.H> directly; include <FL/platform.H> instead."
19 #endif // !FL_PLATFORM_H
20
25 // ***** for Wayland component *****
26
27 typedef struct _cairo cairo_t;
28
30 extern FL_EXPORT struct wl_display *fl_wl_display();
32 extern FL_EXPORT struct wl_surface *fl_wl_surface(struct wld_window *xid);
34 extern FL_EXPORT struct wld_window *fl_wl_xid(const FL_Window *win);
36 extern FL_EXPORT FL_Window *fl_wl_find(struct wld_window *);
38 extern FL_EXPORT cairo_t *fl_wl_gc();
45 extern FL_EXPORT struct wl_compositor *fl_wl_compositor();
47 extern FL_EXPORT int fl_wl_buffer_scale(FL_Window *window);
48 typedef void *EGLContext;
50 extern FL_EXPORT EGLContext fl_wl_glcontext(GLContext rc);
51
52 #ifndef FL_DOXYGEN
53
54 #   ifdef FLTK_USE_X11
55 // ***** for X11 component *****
56 #       include "x11.H"
57 #   else
58         typedef struct wld_window *Window;
59 #   endif
60
61 #endif // FL_DOXYGEN

```

## 34.201 win32.H File Reference

Definitions of functions specific to the Windows platform.

### Functions

- **HINSTANCE fl\_win32\_display ()**  
*Returns the Windows-specific display in use*
- **FL\_Window \* fl\_win32\_find (HWND)**  
*Returns the [FL\\_Window](#) corresponding to the given Windows-specific window reference.*
- **HDC fl\_win32\_gc ()**  
*Returns the Windows-specific graphics context for the current window*
- **HGLRC fl\_win32\_glcontext (GLContext rc)**  
*Returns the Windows-specific GL rendering context corresponding to the given GLContext*
- **HWND fl\_win32\_xid (const FL\_Window \*win)**  
*Returns the Windows-specific window reference corresponding to the given [FL\\_Window](#) object.*

### 34.201.1 Detailed Description

Definitions of functions specific to the Windows platform.

## 34.202 win32.H

[Go to the documentation of this file.](#)

```

1 //
2 // Windows platform header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:

```

```

13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 // Do not directly include this file, instead use <FL/platform.H>.      It will
18 // include this file if _WIN32 is defined.      This is to encourage
19 // portability of even the system-specific code...
20
21 #ifdef FL_DOXYGEN
22
23 extern HWND fl_win32_xid(const Fl_Window *win);
24 extern Fl_Window *fl_win32_find(HWND);
25 extern HGLRC fl_win32_glcontext(GLContext rc);
26 extern HDC fl_win32_gc();
27 extern HINSTANCE fl_win32_display();
28
29 #else
30
31 #ifndef FL_PLATFORM_H
32 # error "Never use <FL/win32.H> directly; include <FL/platform.H> instead."
33 #endif // !FL_PLATFORM_H
34
35 #include <windows.h>
36 typedef HWND Window;
37
38 typedef struct HGLRC__ *HGLRC;
39 extern FL_EXPORT HGLRC fl_win32_glcontext(GLContext rc);
40 extern FL_EXPORT HWND fl_win32_xid(const Fl_Window *win);
41 extern FL_EXPORT Fl_Window *fl_win32_find(HWND);
42
43 // this part is included only when compiling the FLTK library or if requested explicitly
44 #if defined(FL_LIBRARY) || defined(FL_INTERNALS)
45
46 // In some of the distributions, the gcc header files are missing some stuff:
47 #ifndef LPMINMAXINFO
48 #define LPMINMAXINFO MINMAXINFO*
49 #endif
50 #ifndef VK_LWIN
51 #define VK_LWIN 0x5B
52 #define VK_RWIN 0x5C
53 #define VK_APPS 0x5D
54 #endif
55
56 extern FL_EXPORT UINT fl_wake_msg;
57 extern FL_EXPORT char fl_override_redirect; // hack into Fl_Window::make_xid()
58 extern FL_EXPORT HPALETTE fl_palette; // non-zero only on 8-bit displays!
59 extern void fl_release_dc(HWND w, HDC dc);
60 extern FL_EXPORT void fl_save_dc( HWND w, HDC dc);
61
62 #endif // FL_LIBRARY || FL_INTERNALS
63
64 // most recent fl_color() or fl_rgbcolor() points at one of these:
65 extern FL_EXPORT struct Fl_XMap {
66     COLORREF rgb; // this should be the type the RGB() macro returns
67     HPEN pen; // pen, 0 if none created yet
68     int brush; // ref to solid brush, 0 if none created yet
69     int pwidth; // the width of the pen, if present
70 } *fl_current_xmap;
71 inline COLORREF fl_RGB() {return fl_current_xmap->rgb;}
72 inline HPEN fl_pen() {return fl_current_xmap->pen;}
73 FL_EXPORT HBRUSH fl_brush(); // allocates a brush if necessary
74 FL_EXPORT HBRUSH fl_brush_action(int); // now does the real work
75
76 extern FL_EXPORT HINSTANCE fl_display;
77 extern FL_EXPORT HINSTANCE fl_win32_display();
78 extern FL_EXPORT HDC fl_gc;
79 extern FL_EXPORT HDC fl_win32_gc();
80 extern FL_EXPORT MSG fl_msg;
81 extern FL_EXPORT HDC fl_GetDC(Window);
82 extern FL_EXPORT HDC fl_makeDC(HBITMAP);
83
84 #endif // FL_DOXYGEN

```

## 34.203 x.H

```

1 //
2 // *Deprecated* platform header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2018 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php

```

```

11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 // IMPORTANT: This file is deprecated since FLTK 1.4.0. DO NOT include it.
18 // FL/x.H will be removed in a future FLTK release.
19
20 // Please #include <FL/platform.H> instead if you really need it. See
21 // documentation in FL/platform.H to decide whether you need that file.
22
23 #if !defined(FL_X_H) && !defined(FL_DOXYGEN)
24 #   define FL_X_H
25 #   include <FL/platform.H>
26 #endif // !FL_X_H

```

## 34.204 x11.H File Reference

Definitions of functions specific to the X11 platform.

### Functions

- `cairo_t * fl_cairo_gc ()`  
*Returns the Cairo-specific currently active graphics context (FLTK\_GRAPHICS\_CAIRO=On)*
- `Display * fl_x11_display ()`  
*Returns the X11 Display in use.*
- `Fl_Window * fl_x11_find (Window xid)`  
*Returns the [Fl\\_Window](#) corresponding to the given Window reference.*
- `GC fl_x11_gc ()`  
*Returns the X11-specific currently active graphics context.*
- `void fl_x11_use_display (Display *d)`  
*Have FLTK use a pre-established X11 connection.*
- `Window fl_x11_xid (const Fl\_Window *win)`  
*Returns the Window reference for the given [Fl\\_Window](#), or zero if not `shown()`.*

### 34.204.1 Detailed Description

Definitions of functions specific to the X11 platform.

### 34.204.2 Function Documentation

#### 34.204.2.1 fl\_x11\_find()

```

Fl\_Window * fl_x11_find (
    Window xid )

```

Returns the [Fl\\_Window](#) corresponding to the given Window reference.

#### 34.204.2.2 fl\_x11\_gc()

```

GC fl_x11_gc ( )

```

Returns the X11-specific currently active graphics context.

### 34.204.2.3 fl\_x11\_use\_display()

```
void fl_x11_use_display (
    Display * d )
```

Have FLTK use a pre-established X11 connection.

This function must be called before FLTK attempts to open its own X11 connection, that is, as long as [fl\\_x11\\_display\(\)](#) returns NULL.

#### Parameters

<i>d</i>	the X11 Display* value representing a valid, pre-established X11 connection
----------	---

### 34.204.2.4 fl\_x11\_xid()

```
Window fl_x11_xid (
    const Fl_Window * win )
```

Returns the Window reference for the given [Fl\\_Window](#), or zero if not shown().

## 34.205 x11.H

[Go to the documentation of this file.](#)

```
1 //
2 // X11 platform header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 // https://www.fltk.org/bugs.php
15 //
16
17 // Do not directly include this file, instead use <FL/platform.H>. It will
18 // include this file if FLTK_USE_X11 is defined. This is to encourage
19 // portability of even the system-specific code...
20
21 #ifdef FL_DOXYGEN
22
23 extern Display *fl_x11_display();
24 extern void fl_x11_use_display(Display *d);
25 extern Window fl_x11_xid(const Fl_Window *win);
26 extern Fl_Window *fl_x11_find(Window xid);
27 extern GC fl_x11_gc();
28 extern cairo_t* fl_cairo_gc();
29 #else // ! FL_DOXYGEN
30
31 #ifndef FL_PLATFORM_H
32 # error "Never use <FL/x11.H> directly; include <FL/platform.H> instead."
33 #endif // !FL_PLATFORM_H
34
35 #include <FL/Enumerations.H>
36
37 #if defined(_ABIN32) || defined(_ABI64) // fix for broken SGI Irix X .h files
38 # pragma set woff 3322
39 #endif
40
41 #include <X11/Xlib.h>
42 #include <X11/Xutil.h>
43 #if defined(_ABIN32) || defined(_ABI64)
44 # pragma reset woff 3322
45 #endif
46
47 #include <X11/Xatom.h>
48
49 typedef struct __GLXcontextRec *GLXContext;
50 extern GLXContext fl_x11_glcontext(GLContext rc);
51
52 #endif
```

```

64 // constant info about the X server connection:
65 extern FL_EXPORT Display *fl_display;
66 extern FL_EXPORT Display *fl_x11_display();
67 extern FL_EXPORT void fl_x11_use_display(Display *);
68 extern FL_EXPORT Window fl_x11_xid(const FL_Window *win);
69 extern FL_EXPORT FL_Window *fl_x11_find(Window);
70 extern FL_EXPORT int fl_screen;
71 extern FL_EXPORT XVisualInfo *fl_visual;
72 extern FL_EXPORT Colormap fl_colormap;
73
74 // drawing functions:
75 extern FL_EXPORT GC fl_gc;
76 #if FLTK_USE_CAIRO
77     typedef struct _cairo cairo_t;
78     extern FL_EXPORT cairo_t* fl_cairo_gc();
79 #endif
80 extern FL_EXPORT GC fl_x11_gc();
81 FL_EXPORT ulong fl_xpixel(FL_Color i);
82 FL_EXPORT ulong fl_xpixel(uchar r, uchar g, uchar b);
83
84 // feed events into fltk:
85 FL_EXPORT int fl_handle(const XEvent&);
86
87 // you can use these in Fl::add_handler() to look at events:
88 extern FL_EXPORT const XEvent* fl_xevent;
89 extern FL_EXPORT ulong fl_event_time;
90
91 #if defined(FL_LIBRARY) || defined(FL_INTERNALS)
92 extern FL_EXPORT Window fl_message_window;
93 extern FL_EXPORT void *fl_xftfont;
94
95 // access to core fonts:
96 // This class provides a "smart pointer" that returns a pointer to an XFontStruct.
97 // The global variable fl_xfont can be called wherever a bitmap "core" font is
98 // needed, e.g. when rendering to a GL context under X11.
99 // With Xlib / X11 fonts, fl_xfont will return the current selected font.
100 // With XFT / X11 fonts, fl_xfont will attempt to return the bitmap "core" font most
101 // similar to (usually the same as) the current XFT font.
102 class FL_EXPORT Fl_XFont_On_Demand
103 {
104 public:
105     Fl_XFont_On_Demand(XFontStruct* p = NULL) : ptr(p) { }
106     Fl_XFont_On_Demand& operator=(const Fl_XFont_On_Demand& x)
107     { ptr = x.ptr; return *this; }
108     Fl_XFont_On_Demand& operator=(XFontStruct* p)
109     { ptr = p; return *this; }
110     XFontStruct* value();
111     operator XFontStruct*() { return value(); }
112     XFontStruct& operator*() { return *value(); }
113     XFontStruct* operator->() { return value(); }
114     bool operator==(const Fl_XFont_On_Demand& x) { return ptr == x.ptr; }
115     bool operator!=(const Fl_XFont_On_Demand& x) { return ptr != x.ptr; }
116 private:
117     XFontStruct *ptr;
118 };
119 extern FL_EXPORT Fl_XFont_On_Demand fl_xfont;
120
121 extern FL_EXPORT char fl_override_redirect; // hack into Fl_X::make_xid()
122
123 #endif // FL_LIBRARY || FL_INTERNALS
124
125 #endif // FL_DOXYGEN

```

## 34.206 cgdebug.h

```

1 //
2 // macOS Core Graphics debugging help for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2025 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 // This file allows easier debugging of macOS Core Graphics
18 // code. This file is normally not included into any FLTK builds,
19 // but since it has proven to be tremendously useful in debugging
20 // the FLTK port to "Quartz", I decided to add this file in case

```

```

21 // more bugs show up.
22 //
23 // This header is activated by adding the following line to "config.h"
24 //
25 //     #include "src/cgdebug.h"
26 //
27 // Running "cmake" will remove this line from "config.h".
28 //
29 // When used erroneously, Core Graphics prints warnings to
30 // stderr. This is helpful, however it is not possible to
31 // associate a line number or source file with the warning message.
32 // This header file outputs a trace of CG calls, interweaving
33 // them with CG warnings.
34 //
35 // Matthias
36
37 #ifndef CGDEBUG
38 #define CGDEBUG
39
40 #include <stdio.h>
41 #include <Carbon/Carbon.h>
42
43 //+BitmapContextCreate
44 //+BitmapContextGetData
45 // ClipCGContextToRegion
46 // QDBeginCGContext
47 // QDEndCGContext
48
49 //+AddArc
50 //+AddLineToPoint
51 // ClipToRect
52 // ClosePath
53 //+ConcatCTM
54 //+DrawImage
55 // FillPath
56 // FillRect
57 // Flush
58 //+GetCTM
59 // MoveToPoint
60 //+Release
61 // RestoreGState
62 // SaveGState
63 //+ScaleCTM
64 //+SetLineCap
65 //+SetLineDash
66 //+SetLineJoin
67 //+SetLineWidth
68 //+SetRGBFillColor
69 //+SetRGBStrokeColor
70 //+SetShouldAntialias
71 //+SetTextMatrix
72 //+StrokePath
73 //+TranslateCTM
74
75 inline OSStatus dbgLocation(const char *file, int line)
76 {
77     fprintf(stderr, "%s:%d ", file, line);
78     return 0;
79 }
80
81 inline OSStatus dbgEndl()
82 {
83     fprintf(stderr, "\n");
84     return 0;
85 }
86
87
88 inline void dbgCGContextClipToRect(CGContextRef a, CGRect b)
89 {
90     CGContextClipToRect(a, b);
91 }
92
93 #define CGContextClipToRect(a, b) { \
94     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \
95     dbgCGContextClipToRect(a, b); \
96     fprintf(stderr, "\n"); }
97
98 inline void dbgCGContextFillRect(CGContextRef a, CGRect b)
99 {
100     CGContextFillRect(a, b);
101 }
102
103 #define CGContextFillRect(a, b) { \
104     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \
105     dbgCGContextFillRect(a, b); \
106     fprintf(stderr, "\n"); }
107

```

```

108 inline OSStatus dbgQDEndCGContext(CGrafPtr a, CGContextRef *b)
109 {
110     return QDEndCGContext(a, b);
111 }
112
113 #define QDEndCGContext(a, b) ( \
114     dbgLocation(__FILE__, __LINE__) + \
115     dbgQDEndCGContext(a, b) + \
116     dbgEndl() )
117
118 inline OSStatus dbgQDBeginCGContext(CGrafPtr a, CGContextRef *b)
119 {
120     return QDBeginCGContext(a, b);
121 }
122
123 #define QDBeginCGContext(a, b) ( \
124     dbgLocation(__FILE__, __LINE__) + \
125     dbgQDBeginCGContext(a, b) + \
126     dbgEndl() )
127
128 inline void dbgClipCGContextToRegion(CGContextRef a, const Rect *b, RgnHandle c)
129 {
130     ClipCGContextToRegion(a, b, c);
131 }
132
133 #define ClipCGContextToRegion(a, b, c) { \
134     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \
135     dbgClipCGContextToRegion(a, b, c); \
136     fprintf(stderr, "\n"); }
137
138 inline void dbgCGContextMoveToPoint(CGContextRef context, float x, float y)
139 {
140     CGContextMoveToPoint(context, x, y);
141 }
142
143 #define CGContextMoveToPoint(a, b, c) { \
144     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \
145     dbgCGContextMoveToPoint(a, b, c); \
146     fprintf(stderr, "\n"); }
147
148 inline void dbgCGContextFillPath(CGContextRef context)
149 {
150     CGContextFillPath(context);
151 }
152
153 #define CGContextFillPath(a) { \
154     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \
155     dbgCGContextFillPath(a); \
156     fprintf(stderr, "\n"); }
157
158 inline void dbgCGContextClosePath(CGContextRef context)
159 {
160     CGContextClosePath(context);
161 }
162
163 #define CGContextClosePath(a) { \
164     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \
165     dbgCGContextClosePath(a); \
166     fprintf(stderr, "\n"); }
167
168 inline void dbgCGContextFlush(CGContextRef context)
169 {
170     CGContextFlush(context);
171 }
172
173 #define CGContextFlush(a) { \
174     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \
175     dbgCGContextFlush(a); \
176     fprintf(stderr, "\n"); }
177
178 inline void dbgCGContextSaveGState(CGContextRef context)
179 {
180     CGContextSaveGState(context);
181 }
182
183 #define CGContextSaveGState(a) { \
184     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \
185     dbgCGContextSaveGState(a); \
186     fprintf(stderr, "\n"); }
187
188 inline void dbgCGContextRestoreGState(CGContextRef context)
189 {
190     CGContextRestoreGState(context);
191 }
192
193 #define CGContextRestoreGState(a) { \
194     fprintf(stderr, "%s:%d ", __FILE__, __LINE__); \

```

```

195     dbgCGContextRestoreGState(a); \
196     fprintf(stderr, "\n"); }
197
198
199 #endif // CGDEBUG

```

## 34.207 fastarrow.h

```

1 #define fastarrow_width 16
2 #define fastarrow_height 16
3 static const unsigned char fastarrow_bits[] = {
4     0x00, 0x00, 0x00, 0x07, 0xe0, 0x07, 0xfc, 0x03, 0xff, 0xff, 0xfc, 0x03,
5     0xe0, 0x07, 0x00, 0x07, 0xe0, 0x00, 0xe0, 0x07, 0xc0, 0x3f, 0xff, 0xff,
6     0xc0, 0x3f, 0xe0, 0x07, 0xe0, 0x00, 0x00, 0x00};

```

## 34.208 Fl.cxx File Reference

Implementation of the member functions of class [Fl](#).

```

#include <FL/Fl.H>
#include <FL/platform.H>
#include "Fl_Screen_Driver.H"
#include "Fl_Window_Driver.H"
#include "Fl_System_Driver.H"
#include "Fl_Timeout.h"
#include <FL/Fl_Window.H>
#include <FL/Fl_Tooltip.H>
#include <FL/fl_draw.H>
#include <ctype.h>
#include <stdlib.h>
#include "flstring.h"

```

### Macros

- `#define FOREVER 1e20`

### Functions

- `bool fl_clipboard_notify_empty (void)`
- `void fl_close_display ()`  
*Closes the connection to the windowing system when that's possible.*
- `const char * fl_filename_name (const char *name)`  
*Gets the file name from a path.*
- `Fl_Window * fl_find (Window xid)`  
*Returns the [Fl\\_Window](#) that corresponds to the given window reference, or `NULL` if not found.*
- `void fl_fix_focus ()`
- `void fl_open_callback (void(*cb)(const char *))`  
*Register a function called for each file dropped onto an application icon.*
- `void fl_open_display ()`  
*Opens the display.*
- `int fl_send_system_handlers (void *e)`
- `void fl_throw_focus (Fl_Widget *o)`
- `void fl_trigger_clipboard_notify (int source)`
- `Window fl_xid_ (const Fl\_Window *w)`

## Variables

- bool `fl_disable_wayland` = true  
*Prevent the FLTK library from using its Wayland backend and force it to use its X11 backend.*
- const char \* `fl_local_alt` = `Fl::system_driver()->alt_name()`  
*string pointer used in shortcuts, you can change it to another language*
- const char \* `fl_local_ctrl` = `Fl::system_driver()->control_name()`  
*string pointer used in shortcuts, you can change it to another language*
- int(\* `fl_local_grab`)(int)
- const char \* `fl_local_meta` = `Fl::system_driver()->meta_name()`  
*string pointer used in shortcuts, you can change it to another language*
- const char \* `fl_local_shift` = `Fl::system_driver()->shift_name()`  
*string pointer used in shortcuts, you can change it to another language*
- `Fl_Widget` \* `fl_oldfocus`
- `Fl_Widget` \* `fl_selection_requestor`

### 34.208.1 Detailed Description

Implementation of the member functions of class `Fl`.

### 34.208.2 Function Documentation

#### 34.208.2.1 `fl_close_display()`

```
void fl_close_display ( )
```

Closes the connection to the windowing system when that's possible.

You do *not* need to call this to exit, and in fact it is faster to not do so. It may be useful to call this if you want your program to continue without a GUI. You cannot open the display again, and cannot call any FLTK functions.

#### Note

Requires `#include <FL/platform.H>`

#### 34.208.2.2 `fl_find()`

```
Fl_Window * fl_find (
    Window xid )
```

Returns the `Fl_Window` that corresponds to the given window reference, or `NULL` if not found.

**Deprecated** Kept in the X11, Windows, and macOS platforms for compatibility with FLTK versions before 1.4. Please use `fl_x11_find(Window)`, `fl_wl_find(struct wld_window*)`, `fl_win32_find(HWND)` or `fl_mac_find(FLWindow*)` with FLTK 1.4.0 and above.

#### 34.208.2.3 `fl_open_display()`

```
void fl_open_display ( )
```

Opens the display.

Automatically called by the library when the first window is `show()`'n. Does nothing if the display is already open.

#### Note

Requires `#include <FL/platform.H>`

### 34.208.3 Variable Documentation

#### 34.208.3.1 fl\_disable\_wayland

```
bool fl_disable_wayland = true
```

Prevent the FLTK library from using its Wayland backend and force it to use its X11 backend.

Put this declaration somewhere in your source code outside the body of any function:

```
FL_EXPORT bool fl_disable_wayland = true;
```

This declaration makes sure that source code developed for FLTK 1.3, including X11-specific code, will build and run with FLTK 1.4 and its Wayland platform with a single line source code level change. This declaration has no effect on non-Wayland platforms. Don't add this declaration if you want the Wayland backend to be used when it's available.

#### Note

Please see also chapter 2.1 of README.Wayland.txt for further information on how to build your application to ensure that this declaration is effective.

#### Since

1.4.0

## 34.209 fl\_arc.cxx File Reference

Utility functions for drawing arcs and circles.

```
#include <FL/fl_draw.H>
```

```
#include <FL/math.h>
```

### 34.209.1 Detailed Description

Utility functions for drawing arcs and circles.

## 34.210 fl\_ask.cxx File Reference

Utility functions for common dialogs.

```
#include <FL/Fl.H>
```

```
#include <FL/Fl_Box.H>
```

```
#include <FL/Fl_Input_.H>
```

```
#include "flstring.h"
```

```
#include "Fl_Screen_Driver.H"
```

```
#include <FL/fl_ask.H>
```

```
#include "Fl_Message.h"
```

```
#include <stdio.h>
```

```
#include <stdarg.h>
```

## Functions

- void [fl\\_alert](#) (const char \*fmt,...)  
*Shows an alert message dialog box.*
- int [fl\\_ask](#) (const char \*fmt,...)  
*Shows a dialog displaying the *fmt* message, this dialog features 2 yes/no buttons.*
- void [fl\\_beep](#) (int type)  
*Emits a system beep.*
- int [fl\\_choice](#) (const char \*fmt, const char \*b0, const char \*b1, const char \*b2,...)

- Shows a dialog displaying the printf style `fmt` message.*

  - `int fl_choice_n` (`const char *fmt`, `const char *b0`, `const char *b1`, `const char *b2`,...)

*Shows a dialog displaying the printf style `fmt` message.*

  - `const char * fl_input` (`const char *fmt`, `const char *defstr`,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

  - `const char * fl_input` (`int maxchar`, `const char *fmt`, `const char *defstr`,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

  - `std::string fl_input_str` (`int &ret`, `int maxchar`, `const char *fmt`, `const char *defstr`,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

  - `std::string fl_input_str` (`int maxchar`, `const char *fmt`, `const char *defstr`,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

  - `void fl_message` (`const char *fmt`,...)

*Shows an information message dialog box.*

  - `int fl_message_hotspot` ()

*Gets whether or not to move the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()` to follow the mouse pointer.*

  - `void fl_message_hotspot` (`int enable`)

*Sets whether or not to move the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()` to follow the mouse pointer.*

  - `Fl_Widget * fl_message_icon` ()

*Gets the `Fl_Box` icon container of the current default dialog used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*

  - `void fl_message_icon_label` (`const char *str`)

*Sets the icon label of the dialog window used in many common dialogs.*

  - `void fl_message_position` (`const int x`, `const int y`, `const int center`)

*Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*

  - `void fl_message_position` (`Fl_Widget *widget`)

*Sets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*

  - `int fl_message_position` (`int *x`, `int *y`)

*Gets the preferred position for the message box used in many common dialogs like `fl_message()`, `fl_alert()`, `fl_ask()`, `fl_choice()`, `fl_input()`, `fl_password()`.*

  - `void fl_message_title` (`const char *title`)

*Sets the title of the dialog window used in many common dialogs.*

  - `void fl_message_title_default` (`const char *title`)

*Sets the default title of the dialog window used in many common dialogs.*

  - `const char * fl_password` (`const char *fmt`, `const char *defstr`,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

  - `const char * fl_password` (`int maxchar`, `const char *fmt`, `const char *defstr`,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

  - `std::string fl_password_str` (`int &ret`, `int maxchar`, `const char *fmt`, `const char *defstr`,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

  - `std::string fl_password_str` (`int maxchar`, `const char *fmt`, `const char *defstr`,...)

*Shows an input dialog displaying the `fmt` message with variable arguments.*

## Variables

- `const char * fl_cancel = "Cancel"`  
*string pointer used in common dialogs, you can change it to another language*
- `const char * fl_close = "Close"`  
*string pointer used in common dialogs, you can change it to another language*
- `FL_Font fl_message_font = FL_HELVETICA`
- `FL_Fontsize fl_message_size = -1`
- `const char * fl_no = "No"`  
*string pointer used in common dialogs, you can change it to another language*
- `const char * fl_ok = "OK"`  
*string pointer used in common dialogs, you can change it to another language*
- `const char * fl_yes = "Yes"`  
*string pointer used in common dialogs, you can change it to another language*

### 34.210.1 Detailed Description

Utility functions for common dialogs.

This file defines the functions

- `fl_alert()`
- `fl_beep()`
- `fl_message()`
- `fl_ask()`
- `fl_choice()`
- `fl_input()`
- `fl_input_str()`
- `fl_password()`
- `fl_password_str()`

and some more functions to change their behavior (positioning, window title, and more).  
 Since FLTK 1.4.0 a big part of these functions is implemented in class `FL_Message`.

## 34.211 fl\_boxtype.cxx File Reference

Drawing code for common box types.

```
#include <FL/Fl.H>
#include <FL/Fl_Widget.H>
#include <FL/fl_draw.H>
#include <config.h>
```

## Macros

- `#define D1 BORDER_WIDTH`
- `#define D2 (BORDER_WIDTH+BORDER_WIDTH)`
- `#define fl_border_box fl_rectbound`  
*allow consistent naming*

## Functions

- void **fl\_border\_frame** (int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a frame of type FL\_BORDER\_FRAME.*
- void **fl\_down\_box** (int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a box of type FL\_DOWN\_BOX.*
- void **fl\_down\_frame** (int x, int y, int w, int h, [FI\\_Color](#))  
*Draws a frame of type FL\_DOWN\_FRAME.*
- void **fl\_draw\_box** ([FI\\_Boxtype](#) t, int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a box using given type, position, size and color.*
- void **fl\_draw\_box\_focus** ([FI\\_Boxtype](#) bt, int x, int y, int w, int h, [FI\\_Color](#) fg, [FI\\_Color](#) bg)  
*Draws the focus rectangle inside a box using given type, position, size and color.*
- void **fl\_embossed\_box** (int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a box of type FL\_EMBOSSED\_BOX.*
- void **fl\_embossed\_frame** (int x, int y, int w, int h, [FI\\_Color](#))  
*Draws a frame of type FL\_EMBOSSED\_FRAME.*
- void **fl\_engraved\_box** (int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a box of type FL\_ENGRAVED\_BOX.*
- void **fl\_engraved\_frame** (int x, int y, int w, int h, [FI\\_Color](#))  
*Draws a frame of type FL\_ENGRAVED\_FRAME.*
- void **fl\_flat\_box** (int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a box of type FL\_FLAT\_BOX.*
- void **fl\_frame** (const char \*s, int x, int y, int w, int h)  
*Draws a series of line segments around the given box.*
- void **fl\_frame2** (const char \*s, int x, int y, int w, int h)  
*Draws a series of line segments around the given box.*
- const [uchar](#) \* **fl\_gray\_ramp** ()
- void **fl\_internal\_boxtype** ([FI\\_Boxtype](#) t, [FI\\_Box\\_Draw\\_F](#) \*f, [FI\\_Box\\_Draw\\_Focus\\_F](#) \*ff)  
*Sets the drawing function for a given box type.*
- void **fl\_no\_box** (int, int, int, int, [FI\\_Color](#))  
*Draws a box of type FL\_NO\_BOX.*
- void **fl\_rectbound** (int x, int y, int w, int h, [FI\\_Color](#) bgcolor)  
*Draws a bounded rectangle with a given position, size and color.*
- void **fl\_thin\_down\_box** (int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a box of type FL\_THIN\_DOWN\_BOX.*
- void **fl\_thin\_down\_frame** (int x, int y, int w, int h, [FI\\_Color](#))  
*Draws a frame of type FL\_THIN\_DOWN\_FRAME.*
- void **fl\_thin\_up\_box** (int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a box of type FL\_THIN\_UP\_BOX.*
- void **fl\_thin\_up\_frame** (int x, int y, int w, int h, [FI\\_Color](#))  
*Draws a frame of type FL\_THIN\_UP\_FRAME.*
- void **fl\_up\_box** (int x, int y, int w, int h, [FI\\_Color](#) c)  
*Draws a box of type FL\_UP\_BOX.*
- void **fl\_up\_frame** (int x, int y, int w, int h, [FI\\_Color](#))  
*Draws a frame of type FL\_UP\_FRAME.*

### 34.211.1 Detailed Description

Drawing code for common box types.

### 34.211.2 Function Documentation

### 34.211.2.1 fl\_internal\_boxtype()

```
void fl_internal_boxtype (
    Fl_Boxtype t,
    Fl_Box_Draw_F * f,
    Fl_Box_Draw_Focus_F * ff )
```

Sets the drawing function for a given box type.

#### Parameters

in	<i>t</i>	box type
in	<i>f</i>	box drawing function
in	<i>ff</i>	optional box focus rectangle drawing function

### 34.211.2.2 fl\_rectbound()

```
void fl_rectbound (
    int x,
    int y,
    int w,
    int h,
    Fl_Color bgcolor )
```

Draws a bounded rectangle with a given position, size and color.

Equivalent to drawing a box of type FL\_BORDER\_BOX.

## 34.212 fl\_cmap.h

```
1 //
2 // DO NOT EDIT THIS FILE !
3 //
4 // This file must be generated by "util/cmap.cxx".
5 // See instructions in this file.
6 //
7 // Copyright 1998-2022 by Bill Spitzak and others.
8 //
9 // This library is free software. Distribution and use rights are outlined in
10 // the file "COPYING" which should have been included with this file. If this
11 // file is missing or damaged, see the license at:
12 //
13 // https://www.fltk.org/COPYING.php
14 //
15 // Please see the following page on how to report bugs and issues:
16 //
17 // https://www.fltk.org/bugs.php
18 //
19 0x00000000, // 0
20 0xff000000, // 1
21 0x00ff0000, // 2
22 0xffff0000, // 3
23 0x0000ff00, // 4
24 0xff00ff00, // 5
25 0x00ffff00, // 6
26 0xffffffff, // 7
27 0x55555500, // 8
28 0xc6717100, // 9
29 0x71c67100, // 10
30 0x8e8e3800, // 11
31 0x7171c600, // 12
32 0x8e388e00, // 13
33 0x388e8e00, // 14
34 0x00008000, // 15
35 0xa8a89800, // 16
36 0xe8e8d800, // 17
37 0x68685800, // 18
38 0x98a8a800, // 19
39 0xd8e8e800, // 20
40 0x58686800, // 21
41 0x9c9ca800, // 22
42 0xdcde800, // 23
43 0x5c5c6800, // 24
```

```
44     0x9ca89c00, // 25
45     0xdce8dc00, // 26
46     0x5c685c00, // 27
47     0x90909000, // 28
48     0xc0c0c000, // 29
49     0x50505000, // 30
50     0xa0a0a000, // 31
51     0x00000000, // 32
52     0xd0d0d000, // 33
53     0x1a1a1a00, // 34
54     0x26262600, // 35
55     0x31313100, // 36
56     0x3d3d3d00, // 37
57     0x48484800, // 38
58     0x55555500, // 39
59     0x5f5f5f00, // 40
60     0x6a6a6a00, // 41
61     0x75757500, // 42
62     0x80808000, // 43
63     0x8a8a8a00, // 44
64     0x95959500, // 45
65     0xa0a0a000, // 46
66     0xaaaaaaaa00, // 47
67     0xb5b5b500, // 48
68     0xc0c0c000, // 49
69     0xcbcbcb00, // 50
70     0xd5d5d500, // 51
71     0xe0e0e000, // 52
72     0xeaeaea00, // 53
73     0xf5f5f500, // 54
74     0xffffffff00, // 55
75     0x00000000, // 56
76     0x00240000, // 57
77     0x00480000, // 58
78     0x006d0000, // 59
79     0x00910000, // 60
80     0x00b60000, // 61
81     0x00da0000, // 62
82     0x00ff0000, // 63
83     0x3f000000, // 64
84     0x3f240000, // 65
85     0x3f480000, // 66
86     0x3f6d0000, // 67
87     0x3f910000, // 68
88     0x3fb60000, // 69
89     0x3fda0000, // 70
90     0x3fff0000, // 71
91     0x7f000000, // 72
92     0x7f240000, // 73
93     0x7f480000, // 74
94     0x7f6d0000, // 75
95     0x7f910000, // 76
96     0x7fb60000, // 77
97     0x7fda0000, // 78
98     0x7fff0000, // 79
99     0xbf000000, // 80
100    0xbf240000, // 81
101    0xbf480000, // 82
102    0xbf6d0000, // 83
103    0xbf910000, // 84
104    0xbfb60000, // 85
105    0xbfda0000, // 86
106    0xbfff0000, // 87
107    0xff000000, // 88
108    0xff240000, // 89
109    0xff480000, // 90
110    0xff6d0000, // 91
111    0xff910000, // 92
112    0xffb60000, // 93
113    0xffda0000, // 94
114    0xffff0000, // 95
115    0x00003f00, // 96
116    0x00243f00, // 97
117    0x00483f00, // 98
118    0x006d3f00, // 99
119    0x00913f00, // 100
120    0x00b63f00, // 101
121    0x00da3f00, // 102
122    0x00ff3f00, // 103
123    0x3f003f00, // 104
124    0x3f243f00, // 105
125    0x3f483f00, // 106
126    0x3f6d3f00, // 107
127    0x3f913f00, // 108
128    0x3fb63f00, // 109
129    0x3fda3f00, // 110
130    0x3fff3f00, // 111
```

```
131 0x7f003f00, // 112
132 0x7f243f00, // 113
133 0x7f483f00, // 114
134 0x7f6d3f00, // 115
135 0x7f913f00, // 116
136 0x7fb63f00, // 117
137 0x7fda3f00, // 118
138 0x7fff3f00, // 119
139 0xbf003f00, // 120
140 0xbf243f00, // 121
141 0xbf483f00, // 122
142 0xbf6d3f00, // 123
143 0xbf913f00, // 124
144 0xbfb63f00, // 125
145 0xbfda3f00, // 126
146 0xbfff3f00, // 127
147 0xff003f00, // 128
148 0xff243f00, // 129
149 0xff483f00, // 130
150 0xff6d3f00, // 131
151 0xff913f00, // 132
152 0xffb63f00, // 133
153 0xffda3f00, // 134
154 0xffff3f00, // 135
155 0x00007f00, // 136
156 0x00247f00, // 137
157 0x00487f00, // 138
158 0x006d7f00, // 139
159 0x00917f00, // 140
160 0x00b67f00, // 141
161 0x00da7f00, // 142
162 0x00ff7f00, // 143
163 0x3f007f00, // 144
164 0x3f247f00, // 145
165 0x3f487f00, // 146
166 0x3f6d7f00, // 147
167 0x3f917f00, // 148
168 0x3fb67f00, // 149
169 0x3fda7f00, // 150
170 0x3fff7f00, // 151
171 0x7f007f00, // 152
172 0x7f247f00, // 153
173 0x7f487f00, // 154
174 0x7f6d7f00, // 155
175 0x7f917f00, // 156
176 0x7fb67f00, // 157
177 0x7fda7f00, // 158
178 0x7fff7f00, // 159
179 0xbf007f00, // 160
180 0xbf247f00, // 161
181 0xbf487f00, // 162
182 0xbf6d7f00, // 163
183 0xbf917f00, // 164
184 0xbfb67f00, // 165
185 0xbfda7f00, // 166
186 0xbfff7f00, // 167
187 0xff007f00, // 168
188 0xff247f00, // 169
189 0xff487f00, // 170
190 0xff6d7f00, // 171
191 0xff917f00, // 172
192 0xffb67f00, // 173
193 0xffda7f00, // 174
194 0xffff7f00, // 175
195 0x0000bf00, // 176
196 0x0024bf00, // 177
197 0x0048bf00, // 178
198 0x006dbf00, // 179
199 0x0091bf00, // 180
200 0x00b6bf00, // 181
201 0x00dabf00, // 182
202 0x00ffbf00, // 183
203 0x3f00bf00, // 184
204 0x3f24bf00, // 185
205 0x3f48bf00, // 186
206 0x3f6dbf00, // 187
207 0x3f91bf00, // 188
208 0x3fb6bf00, // 189
209 0x3fdabf00, // 190
210 0x3fffbf00, // 191
211 0x7f00bf00, // 192
212 0x7f24bf00, // 193
213 0x7f48bf00, // 194
214 0x7f6dbf00, // 195
215 0x7f91bf00, // 196
216 0x7fb6bf00, // 197
217 0x7fdabf00, // 198
```

```

218 0x7ffffbf00, // 199
219 0xbff00bf00, // 200
220 0xbff24bf00, // 201
221 0xbff48bf00, // 202
222 0xbff6dbf00, // 203
223 0xbff91bf00, // 204
224 0xbffb6bf00, // 205
225 0xbffdabf00, // 206
226 0xbffffbf00, // 207
227 0xff00bf00, // 208
228 0xff24bf00, // 209
229 0xff48bf00, // 210
230 0xff6dbf00, // 211
231 0xff91bf00, // 212
232 0xffb6bf00, // 213
233 0xffdafbf00, // 214
234 0xffffbf00, // 215
235 0x0000ff00, // 216
236 0x0024ff00, // 217
237 0x0048ff00, // 218
238 0x006dff00, // 219
239 0x0091ff00, // 220
240 0x00b6ff00, // 221
241 0x00daff00, // 222
242 0x00ffff00, // 223
243 0x3f00ff00, // 224
244 0x3f24ff00, // 225
245 0x3f48ff00, // 226
246 0x3f6dff00, // 227
247 0x3f91ff00, // 228
248 0x3fb6ff00, // 229
249 0x3fdaff00, // 230
250 0x3fffff00, // 231
251 0x7f00ff00, // 232
252 0x7f24ff00, // 233
253 0x7f48ff00, // 234
254 0x7f6dff00, // 235
255 0x7f91ff00, // 236
256 0x7fb6ff00, // 237
257 0x7fdaff00, // 238
258 0x7fffff00, // 239
259 0xbff00ff00, // 240
260 0xbff24ff00, // 241
261 0xbff48ff00, // 242
262 0xbff6dff00, // 243
263 0xbff91ff00, // 244
264 0xbffb6ff00, // 245
265 0xbffdaff00, // 246
266 0xbfffff00, // 247
267 0xff00ff00, // 248
268 0xff24ff00, // 249
269 0xff48ff00, // 250
270 0xff6dff00, // 251
271 0xff91ff00, // 252
272 0xffb6ff00, // 253
273 0xffdafbf00, // 254
274 0xffffff00 // 255
275 //
276 // End of fl_cmap.h - generated by cmap.cxx
277 //

```

## 34.213 fl\_color.cxx File Reference

Color handling.

```

#include <FL/Fl.H>
#include <FL/Fl_Device.H>
#include <FL/Fl_Graphics_Driver.H>
#include "fl_cmap.h"

```

### Functions

- [Fl\\_Color fl\\_color\\_average](#) ([Fl\\_Color](#) color1, [Fl\\_Color](#) color2, float weight)  
*Returns the weighted average color between the two given colors.*
- [Fl\\_Color fl\\_inactive](#) ([Fl\\_Color](#) c)  
*Returns the inactive, dimmed version of the given color.*

## Variables

- unsigned [fl\\_cmap](#) [256]

### 34.213.1 Detailed Description

Color handling.

### 34.213.2 Variable Documentation

#### 34.213.2.1 fl\_cmap

```
unsigned fl_cmap[256]
```

**Initial value:**

```
= {  
}
```

## 34.214 FL\_compose.cxx File Reference

Utility functions to support text input.

```
#include <FL/Fl.H>  
#include "Fl_Screen_Driver.H"
```

### 34.214.1 Detailed Description

Utility functions to support text input.

## 34.215 fl\_contrast.cxx File Reference

Color contrast handling.

```
#include <FL/Fl.H>  
#include <math.h>
```

## Macros

- #define **DEBUG\_CONTRAST\_LEGACY** 0

## Functions

- [Fl\\_Color](#) [fl\\_contrast](#) ([Fl\\_Color](#) fg, [Fl\\_Color](#) bg, int context, int size)  
*Returns a color that contrasts with the background color.*
- void [fl\\_contrast\\_function](#) ([Fl\\_Contrast\\_Function](#) \*f)  
*Register a custom contrast function.*
- int [fl\\_contrast\\_level](#) ()  
*Get the contrast level (sensitivity) of the [fl\\_contrast\(\)](#) method.*
- void [fl\\_contrast\\_level](#) (int level)  
*Set the contrast level (sensitivity) of the [fl\\_contrast\(\)](#) method.*
- int [fl\\_contrast\\_mode](#) ()  
*Return the current contrast algorithm (mode).*
- void [fl\\_contrast\\_mode](#) (int mode)  
*Set the contrast algorithm (mode).*
- double [fl\\_lightness](#) ([Fl\\_Color](#) color)

*Return the perceived lightness of a color.*

- double `fl_luminance` (`Fl_Color` color)

*Return the raw / physical luminance of a color.*

- unsigned `get_color` (`Fl_Color` i)

## Variables

- unsigned `fl_cmap` [256]

### 34.215.1 Detailed Description

Color contrast handling.

Implementation of `fl_contrast()` and its variants.

## 34.216 fl\_curve.cxx File Reference

Utility for drawing Bézier curves, adding the points to the current `fl_begin/fl_vertex/fl_end` path.

```
#include <FL/fl_draw.H>
```

```
#include <math.h>
```

### 34.216.1 Detailed Description

Utility for drawing Bézier curves, adding the points to the current `fl_begin/fl_vertex/fl_end` path.

Incremental math implementation: I very much doubt this is optimal! From Foley/vanDam page 511. If anybody has a better algorithm, please send it!

## 34.217 Fl\_Double\_Window.cxx File Reference

`Fl_Double_Window` implementation.

```
#include <FL/Fl.H>
```

```
#include <FL/platform.H>
```

```
#include <FL/Fl_Double_Window.H>
```

```
#include <FL/fl_draw.H>
```

```
#include "Fl_Window_Driver.H"
```

### 34.217.1 Detailed Description

`Fl_Double_Window` implementation.

## 34.218 Fl\_get\_system\_colors.cxx File Reference

System color support.

```
#include <FL/Fl.H>
```

```
#include "Fl_Screen_Driver.H"
```

```
#include "Fl_System_Driver.H"
```

```
#include <FL/fl_draw.H>
```

```
#include <FL/platform.H>
```

```
#include <FL/math.h>
```

```
#include <FL/fl_utf8.h>
```

```
#include <FL/fl_string_functions.h>
```

```
#include "flstring.h"
```

```
#include <stdio.h>
```

```
#include <stdlib.h>
```

```
#include <FL/Fl_Pixmap.H>
```

```
#include <FL/Fl_Tiled_Image.H>
#include "tile.xpm"
```

## Macros

- `#define D1 BORDER_WIDTH`
- `#define D2 (BORDER_WIDTH+BORDER_WIDTH)`

## Functions

- `void fl_down_box (int, int, int, int, Fl\_Color)`  
*Draws a box of type FL\_DOWN\_BOX.*
- `void fl_down_frame (int, int, int, int, Fl\_Color)`  
*Draws a frame of type FL\_DOWN\_FRAME.*
- `int fl_parse_color (const char *p, uchar &r, uchar &g, uchar &b)`  
*Parse a string containing a description of a color and write r, g, and b.*
- `void fl_round_down_box (int, int, int, int, Fl\_Color)`
- `void fl_round_focus (Fl\_Boxtype, int, int, int, int, Fl\_Color, Fl\_Color)`
- `void fl_round_up_box (int, int, int, int, Fl\_Color)`
- `void fl_thin_down_box (int, int, int, int, Fl\_Color)`  
*Draws a box of type FL\_THIN\_DOWN\_BOX.*
- `void fl_thin_down_frame (int, int, int, int, Fl\_Color)`  
*Draws a frame of type FL\_THIN\_DOWN\_FRAME.*
- `void fl_thin_up_box (int, int, int, int, Fl\_Color)`  
*Draws a box of type FL\_THIN\_UP\_BOX.*
- `void fl_thin_up_frame (int, int, int, int, Fl\_Color)`  
*Draws a frame of type FL\_THIN\_UP\_FRAME.*
- `void fl_up_box (int, int, int, int, Fl\_Color)`  
*Draws a box of type FL\_UP\_BOX.*
- `void fl_up_frame (int, int, int, int, Fl\_Color)`  
*Draws a frame of type FL\_UP\_FRAME.*

## Variables

- `const char * fl_bg = NULL`
- `const char * fl_bg2 = NULL`
- `const char * fl_fg = NULL`

### 34.218.1 Detailed Description

System color support.

### 34.218.2 Function Documentation

#### 34.218.2.1 fl\_parse\_color()

```
int fl_parse_color (
    const char * p,
    uchar & r,
    uchar & g,
    uchar & b )
```

Parse a string containing a description of a color and write r, g, and b.

This call is used by the Pixmap file format interpreter and by the command line arguments parser to set UI colors. RGB color triplets usually start with a '#' character, but it can be omitted if it does not conflict with the later rules. Color components are defined in hexadecimal notation with 1, 2, 3, or four hex digits per component, making color triplets 3, 6, 9, or 12 characters long. The interpreter is case insensitive. Valid code examples include "FF0000" for red, "#0F0" for green, and "000000004444" for a dark blue.

On the X11 platform, color values can also be given a color name like "red". The list of accepted color names is provided by the X11 server.

If none of the color interpretations work, `fl_parse_color` returns 0. The Pixmap reader interprets those as transparent, and are usually written as "None", "#transparent", or "bg".

#### Parameters

in	<i>p</i>	a C-string describing the color
out	<i>r,g,b</i>	the color components in the 0...255 range

#### Returns

0 if the color cannot be interpreted, 1 otherwise

## 34.219 Fl\_Gl\_Choice.H

```

1 //
2 // OpenGL definitions for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2018 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 // Internal interface to set up OpenGL.
18 //
19 // A "Fl_Gl_Choice" is created from an OpenGL mode and holds information
20 // necessary to create a window (on X) and to create an OpenGL "context"
21 // (on both X and Win32).
22 //
23 // create_gl_context takes a window (necessary only on Win32) and an
24 // Fl_Gl_Choice and returns a new OpenGL context. All contexts share
25 // display lists with each other.
26 //
27 // On X another create_gl_context is provided to create it for any
28 // X visual.
29 //
30 // set_gl_context makes the given OpenGL context current and makes
31 // it draw into the passed window. It tracks the current one context
32 // to avoid calling the context switching code when the same context
33 // is used, though it is a mystery to me why the GLX/WGL libraries
34 // don't do this themselves...
35 //
36 // delete_gl_context destroys the context.
37 //
38 // This code is used by Fl_Gl_Window, gl_start(), and gl_visual()
39
40 #ifndef Fl_Gl_Choice_H
41 #define Fl_Gl_Choice_H
42
43 // Describes the platform-independent part of data needed to create a GLContext.
44 class Fl_Gl_Choice {
45     friend class Fl_Gl_Window_Driver;
46     int mode;
47     const int *alist;
48     Fl_Gl_Choice *next;
49 public:
50     Fl_Gl_Choice(int m, const int *alistp, Fl_Gl_Choice *n) : mode(m), alist(alistp), next(n) {}
51 };
52
53 #endif // Fl_Gl_Choice_H

```

## 34.220 Fl\_Gl\_Window\_Driver.H

```

1 //
2 // Definition of class Fl_Gl_Window_Driver, and of its platform-specific derived classes
3 // for the Fast Light Tool Kit (FLTK).
4 //
5 // Copyright 2016-2018 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
24 #ifndef Fl_Gl_Window_Driver_H
25 #define Fl_Gl_Window_Driver_H
26
27 #include <FL/Fl_Gl_Window.H>
28 #include <FL/gl.h> // for GLint
29
30 class Fl_Gl_Choice;
31 class Fl_Font_Descriptor;
32
33 /* The constructor of each Fl_Gl_Window object creates also an object from a
34 platform-specific derived class from this class.
35 */
36 class Fl_Gl_Window_Driver {
37 protected:
38     GLint current_prog;
39     Fl_Gl_Window *pWindow;
40 public:
41     static Fl_Window* cached_window;
42     static int nContext;
43     static GLContext *context_list;
44     static Fl_Gl_Choice *first;
45     static int copy;
46     static float gl_scale;
47     static GLContext gl_start_context;
48     Fl_Gl_Choice* g() {return pWindow->g;}
49     void g(Fl_Gl_Choice *c) {pWindow->g = c;}
50     int mode() {return pWindow->mode_;}
51     void mode(int m) {pWindow->mode_ = m;}
52     const int *alist() {return pWindow->alist;}
53     void alist(const int *l) {pWindow->alist = l;}
54     void* overlay() {return pWindow->overlay;}
55     void draw_overlay() {pWindow->draw_overlay();}
56
57     Fl_Gl_Window_Driver(Fl_Gl_Window *win) : pWindow(win) {current_prog=0;}
58     virtual ~Fl_Gl_Window_Driver() {}
59     static Fl_Gl_Window_Driver *newGlWindowDriver(Fl_Gl_Window *w);
60     static Fl_Gl_Window_Driver *global();
61     virtual float pixels_per_unit() {return 1;}
62     virtual void before_show(int&) {}
63     virtual void after_show() {}
64     virtual void invalidate();
65     virtual int mode_(int /*m*/, const int * /*a*/) {return 0;}
66     virtual void make_current_before() {}
67     virtual void make_current_after() {}
68     virtual void swap_buffers() {}
69     virtual void resize(int /*is_a_resize*/, int /*w*/, int /*h*/) {}
70     virtual char swap_type();
71     virtual void swap_interval(int) {}
72     virtual int swap_interval() const { return -1; }
73     virtual int flush_begin(char&) {return 0;}
74     virtual void gl_hide_before(void *&) {} // the default implementation may be enough
75     static Fl_Gl_Choice *find_begin(int m, const int *alistp);
76     static void add_context(GLContext ctx);
77     static void del_context(GLContext ctx);
78     // Return one of these structures for a given gl mode.
79     // The second argument is a glX attribute list, and is used if mode is zero.
80     // This is not supported on Win32:
81     virtual Fl_Gl_Choice *find(int /*mode*/, const int * /*alistp*/) {return NULL;}
82     virtual GLContext create_gl_context(Fl_Window*, const Fl_Gl_Choice*) {return 0;}
83     virtual void set_gl_context(Fl_Window*, GLContext) {}
84     virtual void delete_gl_context(GLContext) {}
85     virtual void make_overlay(void* &o);
86     virtual void hide_overlay() {} // the default implementation may be enough
87     virtual void make_overlay_current() {}
88     virtual void redraw_overlay() {}
89     virtual int can_do_overlay() {return 0;}
90     virtual void waitGL() {} // support for gl_finish() function
91     virtual void gl_visual(Fl_Gl_Choice*); // support for Fl::gl_visual() function

```

```

92  virtual void gl_start() {} // support for gl_start() function
93  virtual void* GetProcAddress(const char *procName); // support for glutGetProcAddress()
94  virtual void draw_string_legacy(const char* str, int n); // support for gl_draw()
95  void draw_string_legacy_get_list(const char* str, int n); // support for gl_draw()
96  static void draw_string_legacy_glut(const char* str, int n); // support for gl_draw()
97  virtual void get_list(Fl_Font_Descriptor*, int) {} // support for gl_draw() without textures
98  virtual void gl_bitmap_font(Fl_Font_Descriptor *) {} // support for gl_font() without textures
99  virtual int overlay_color(Fl_Color) {return 0;} // support for gl_color() with HAVE_GL_OVERLAY
100 static void draw_string_with_texture(const char* str, int n); // cross-platform
101 // support for gl_draw(). The cross-platform version may be enough.
102 virtual char *alpha_mask_for_string(const char *str, int n, int w, int h, Fl_Fontsize fs);
103 virtual int genlistsize() { return 0; } // support for gl_draw()
104 virtual Fl_Font_Descriptor** fontnum_to_fontdescriptor(int fnum);
105 virtual Fl_RGB_Image* capture_gl_rectangle(int x, int y, int w, int h);
106 static inline Fl_Gl_Window_Driver* driver(const Fl_Gl_Window *win) {return win->pGlWindowDriver;}
107 // true means the platform uses glScissor() to make sure GL subwindows
108 // don't leak outside their parent window
109 virtual bool need_scissor() { return false; }
110 virtual void switch_to_GL1();
111 virtual void switch_back();
112 };
113
114 #endif /* Fl_Gl_Window_Driver_H */
115

```

## 34.221 Fl\_Graphics\_Driver.cxx File Reference

Implementation of class Fl\_Graphics\_Driver.

```

#include <config.h>
#include <FL/Fl_Graphics_Driver.H>

```

### Variables

- Fl\_Graphics\_Driver \* **fl\_graphics\_driver**  
Points to the driver that currently receives all graphics requests.

#### 34.221.1 Detailed Description

Implementation of class Fl\_Graphics\_Driver.

## 34.222 Fl\_Grid.cxx File Reference

Implements the Fl\_Grid container widget.

```

#include <FL/Fl_Grid.H>
#include <FL/fl_draw.H>

```

#### 34.222.1 Detailed Description

Implements the Fl\_Grid container widget.

Since

1.4.0

## 34.223 Fl\_Image\_Reader.h

```

1 //
2 // Internal (Image) Reader class for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2020-2021 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php

```

```

11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 /*
18 This internal (undocumented) class reads data chunks from a file or from
19 memory in LSB-first byte order.
20
21 This class is used in Fl_GIF_Image and Fl_BMP_Image to avoid code
22 duplication and may be extended to be used in similar cases. Future
23 options might be to read data in MSB-first byte order or to add more
24 methods.
25 */
26
27 #ifndef FL_IMAGE_READER_H
28 #define FL_IMAGE_READER_H
29
30 #include <stdio.h>
31
32 class Fl_Image_Reader {
33 public:
34     // Create the reader.
35     Fl_Image_Reader()
36         : is_file_(0)
37         , is_data_(0)
38         , file_(0L)
39         , data_(0L)
40         , start_(0L)
41         , end_((const unsigned char *)(-1L))
42         , name_(0L)
43         , error_(0) {}
44
45     // Initialize the reader to access the file system, filename is copied
46     // and stored.
47     int open(const char *filename);
48
49     // Initialize the reader for memory access, name is copied and stored
50     int open(const char *imagename, const unsigned char *data, const size_t datasize);
51     // Deprecated, DO NOT USE!
52     int open(const char *imagename, const unsigned char *data);
53
54     // Close and destroy the reader
55     ~Fl_Image_Reader();
56
57     // Read a single byte from memory or a file
58     unsigned char read_byte();
59
60     // Read a 16-bit unsigned integer, LSB-first
61     unsigned short read_word();
62
63     // Read a 32-bit unsigned integer, LSB-first
64     unsigned int read_dword();
65
66     // Read a 32-bit signed integer, LSB-first
67     int read_long() { return (int)read_dword(); }
68
69     // Move the current read position to a byte offset from the beginning
70     // of the file or the original start address in memory
71     void seek(unsigned int n);
72
73     // Get the current file or memory offset from the beginning
74     // of the file or the original start address in memory
75     long tell() const;
76
77     // Get the current EOF or error status of the file or data block
78     int error()const { return error_; }
79
80     // return the name or filename for this reader
81     const char *name()const { return name_; }
82
83     // skip a given number of bytes
84     void skip(unsigned int n) { seek((unsigned int)tell() + n); }
85
86 private:
87     // open() sets this if we read from a file
88     char is_file_;
89     // open() sets this if we read from memory
90     char is_data_;
91     // a pointer to the opened file
92     FILE *file_;
93     // a pointer to the current byte in memory
94     const unsigned char *data_;
95     // a pointer to the start of the image data
96     const unsigned char *start_;
97     // a pointer to the end of image data if reading from memory, otherwise undefined

```

```

98 // note: currently (const unsigned char *)(-1L) if end of memory is not available
99 // ... which means "unlimited"
100 const unsigned char *end_;
101 // a copy of the name associated with this reader
102 char *name_;
103 // a flag to store EOF or error status
104 int error_;
105 };
106
107 #endif // FL_IMAGE_READER_H

```

## 34.224 Fl\_Int\_Vector.H

```

1 //
2 // An STL-ish vector without templates for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2002 by Greg Ercolano.
5 // Copyright 2022-2023 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
18 #ifndef Fl_Int_Vector_H
19 #define Fl_Int_Vector_H
20
21 #include <FL/Fl_Export.H>
22
23 class FL_EXPORT Fl_Int_Vector {
24     int *arr_;
25     unsigned int size_;
26
27     void init() {
28         arr_ = 0;
29         size_ = 0;
30     }
31     void copy(int *newarr, unsigned int newsz);
32
33 public:
34     Fl_Int_Vector() {
35         init();
36     }
37     ~Fl_Int_Vector();
38
39     Fl_Int_Vector(Fl_Int_Vector &o) {
40         init();
41         copy(o.arr_, o.size_);
42     }
43
44     Fl_Int_Vector &operator=(Fl_Int_Vector &o) {
45         init();
46         copy(o.arr_, o.size_);
47         return *this;
48     }
49
50     int operator[](int x) const {
51         return arr_[x];
52     }
53
54     int &operator[](int x) {
55         return arr_[x];
56     }
57
58     unsigned int size() const {
59         return size_;
60     }
61
62     void size(unsigned int count);
63
64     int pop_back() {
65         int tmp = arr_[size_ - 1];
66         size--;
67         return tmp;
68     }
69
70     void push_back(int val) {
71         unsigned int x = size_;

```

```

152     size(size_ + 1);
153     arr_[x] = val;
154 }
155
161 int back()const {
162     return arr_[size_ - 1];
163 }
164
169 bool empty()const {
170     return (size_ == 0) ? true : false;
171 }
172 };
173
179 #endif // Fl_Int_Vector_H

```

## 34.225 Fl\_Message.h

```

1 //
2 // Common dialog header file for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef _src_Fl_Message_h_
18 #define _src_Fl_Message_h_
19
20 #include <FL/Fl_Window.H>
21 #include <FL/Fl_Box.H>
22 #include <FL/fl_ask.H>
23
24 class Fl_Button;
25 class Fl_Input;
26
42 /* Note: Do not FL_EXPORT this class, it's for internal use only */
43
44 class Fl_Message_Box : public Fl_Box {
45 public:
46     Fl_Message_Box(int X, int Y, int W, int H)
47         : Fl_Box(X, Y, W, H) {}
48     int handle(int e) FL_OVERRIDE;
49 }; // class Fl_Message_Box
50
72 /* Note: Do not FL_EXPORT this class, it's for internal use only */
73
74 class Fl_Message {
75
76     // static variables and methods
77
78 private:
79     static Fl_Box *message_icon_; // returned by Fl_Message::message_icon()
80
81     static const char *message_title_;
82     static const char *message_title_default_;
83
84     // icon label for next dialog (STR #2762)
85     static const char *message_icon_label_;
86
87     // Note: since Fl_Message objects are destroyed before fl_input()
88     // and fl_password() return their input text, we *need* to store
89     // the text in an internal (static) buffer. :-(
90
91     static char *input_buffer_; // points to the allocated text buffer
92     static int input_size_;     // size of allocated text buffer
93
94     // the callback for all buttons:
95     static void button_cb(Fl_Widget *w, void *d);
96
97     // the window callback:
98     static void window_cb(Fl_Widget *w, void *d);
99
100     // resize to make text and buttons fit
101     void resizeform();
102
103 public:
104     static Fl_Box *message_icon();

```

```

105 static void message_title(const char *title);
106 static void message_title_default(const char *title);
107 static void icon_label(const char *str);
108
109 static void message_position(const int x, const int y, const int center) {
110     form_x_ = x;
111     form_y_ = y;
112     form_position_ = center ? 2 : 1;
113 }
114
115 static void message_position(Fl_Widget *widget) {
116     int xo, yo;
117     Fl_Window *win = widget->top_window_offset(xo, yo);
118     form_x_ = xo + widget->w() / 2;
119     form_y_ = yo + widget->h() / 2;
120     if (win) {
121         form_x_ += win->x();
122         form_y_ += win->y();
123     }
124     form_position_ = 2;
125 }
126
127 static int message_position(int *x, int *y) {
128     if (x)
129         *x = form_position_ ? form_x_ : -1;
130     if (y)
131         *y = form_position_ ? form_y_ : -1;
132     return form_position_;
133 }
134
135 static void message_hotspot(int enable) { enable_hotspot_ = enable ? 1 : 0; }
136
137 static int message_hotspot() { return enable_hotspot_; }
138
139 int window_closed()const {
140     return window_closed_;
141 }
142
143 // member variables and methods
144
145 private:
146     Fl_Window *window_;
147     Fl_Message_Box *message_;
148     Fl_Box *icon_;
149     Fl_Button *button_[3];
150     Fl_Input *input_;
151     int retval_;
152     int window_closed_;
153
154     // static (private) variables
155
156     static int enable_hotspot_;
157     static int form_x_;
158     static int form_y_;
159     static int form_position_;
160
161 public:
162     // Constructor
163     Fl_Message(const char *iconlabel);
164     ~Fl_Message() { delete window_; }
165
166     int innards(const char *fmt, va_list ap, const char *b0, const char *b1, const char *b2);
167
168     const char *input_innards(const char *fmt, va_list ap, const char *defstr, uchar type, int maxchar =
169         -1, bool str = false);
170 };
171
172 #endif // _src_Fl_Message_h_

```

## 34.226 Fl\_Native\_File\_Chooser\_Kdialog.H

```

1 //
2 // FLTK native file chooser widget : KDE version
3 //
4 // Copyright 2021-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php

```

```

15 //
16
17 #ifndef FL_KDIALOG_NATIVE_FILE_CHOOSER_H
18 #define FL_KDIALOG_NATIVE_FILE_CHOOSER_H 1
19
26 #include <FL/Fl_Native_File_Chooser.H>
27 #include <string>
28
29 class Fl_Kdialog_Native_File_Chooser_Driver : public Fl_Native_File_Chooser_FLTK_Driver {
30     friend class Fl_Native_File_Chooser;
31     friend class Fl_Zenity_Native_File_Chooser_Driver;
32     struct fnfc_pipe_struct {
33         char *all_files;
34         int fd;
35     };
36     static void fnfc_fd_cb(int fd, fnfc_pipe_struct *data);
37     char **_pathnames;
38     int _tpathnames;
39     char *_directory;
40     char *_preset_file;
41     char *_title;
42     static bool did_find_kdialog;
43     static bool have_looked_for_kdialog;
44     Fl_Kdialog_Native_File_Chooser_Driver(int val);
45     ~Fl_Kdialog_Native_File_Chooser_Driver();
46     int count() const FL_OVERRIDE;
47     const char *filename() const FL_OVERRIDE;
48     const char *filename(int i) const FL_OVERRIDE;
49     virtual void build_command(std::string& command);
50     int show() FL_OVERRIDE;
51     char *parse_filter(const char *f);
52     const char *filter() const FL_OVERRIDE;
53     void filter(const char *f) FL_OVERRIDE;
54     int filters() const FL_OVERRIDE;
55     void preset_file(const char *val) FL_OVERRIDE;
56     const char *preset_file() const FL_OVERRIDE;
57     void directory(const char *val) FL_OVERRIDE;
58     const char *directory() const FL_OVERRIDE;
59     void title(const char *val) FL_OVERRIDE;
60     const char *title() const FL_OVERRIDE;
61     void shell_quote(std::string& s);
62 };
63
69 #endif // FL_KDIALOG_NATIVE_FILE_CHOOSER_H

```

## 34.227 Fl\_Native\_File\_Chooser\_Zenity.H

```

1 //
2 // FLTK native file chooser widget : Zenity version
3 //
4 // Copyright 2021-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef FL_ZENITY_NATIVE_FILE_CHOOSER_H
18 #define FL_ZENITY_NATIVE_FILE_CHOOSER_H 1
19
26 #include "Fl_Native_File_Chooser_Kdialog.H"
27
28 class Fl_Zenity_Native_File_Chooser_Driver : public Fl_Kdialog_Native_File_Chooser_Driver {
29     friend class Fl_Native_File_Chooser;
30     static bool did_find_zenity;
31     static bool have_looked_for_zenity;
32     Fl_Zenity_Native_File_Chooser_Driver(int val);
33     void append_filter(std::string& command);
34     void build_command(std::string& command) FL_OVERRIDE;
35 };
36
42 #endif // FL_ZENITY_NATIVE_FILE_CHOOSER_H

```

## 34.228 fl\_oxy.h

```

1 //

```

```

2 // "Oxy" Scheme drawing routines for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2011 by Dmitriy K. aka "kdiman"
5 // Copyright 2012-2022 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 // https://www.fltk.org/COPYING.php
12 //
13 // Please report all bugs and problems on the following page:
14 //
15 // https://www.fltk.org/str.php
16 //
17
18 #ifndef fl_oxy_h
19 #define fl_oxy_h
20
21 #include <FL/Fl.H>
22
23 // draw an arrow GUI element for the 'oxy' scheme
24 //
25 // bb bounding box
26 // t arrow type
27 // o orientation
28 // c arrow color
29
30 extern FL_EXPORT void oxy_arrow(Fl_Rect bb,
31                                Fl_Arrow_Type t, Fl_Orientation o,
32                                Fl_Color col);
33
34 #endif // fl_oxy_h

```

## 34.229 Fl\_Paged\_Device.cxx File Reference

implementation of class [Fl\\_Paged\\_Device](#).

```

#include <FL/Fl_Paged_Device.H>
#include <FL/Fl.H>
#include <FL/fl_draw.H>

```

### 34.229.1 Detailed Description

implementation of class [Fl\\_Paged\\_Device](#).

## 34.230 fl\_rect.cxx File Reference

Drawing and clipping routines for rectangles.

```

#include <FL/platform.H>
#include <FL/Fl_Graphics_Driver.H>

```

### 34.230.1 Detailed Description

Drawing and clipping routines for rectangles.

## 34.231 Fl\_Screen\_Driver.H

```

1 //
2 // All screen related calls in a driver style class.
3 //
4 // Copyright 1998-2024 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 // https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:

```

```

13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
23 #ifndef FL_SCREEN_DRIVER_H
24 #define FL_SCREEN_DRIVER_H
25
26 #include <FL/fl_types.h>
27 #include <FL/Fl.H> // for Fl_Timeout_Handler
28 #include <FL/Fl_Text_Editor.H>
29
30
31 // TODO: add text composition?
32 // TODO: add Fl::display
33 // TODO: add copy/paste, drag/drop?
34 // TODO: get key/get mouse?
35 // TODO: system colors/colormaps
36 // TODO: system menu?
37 // TODO: native filechooser
38 // TODO: native message boxes
39 // TODO: read screen to image
40 // TODO: application shortcuts
41
42 class Fl_Window;
43 class Fl_RGB_Image;
44 class Fl_Group;
45 class Fl_Input;
46 class Fl_System_Driver;
47
48 class Fl_Screen_Driver {
49
50 protected:
51     Fl_Screen_Driver();
52     virtual ~Fl_Screen_Driver();
53
54     static const int MAX_SCREEN = 16;
55
56     int num_screens;
57     static float fl_intersection(int x1, int y1, int w1, int h1,
58                                int x2, int y2, int w2, int h2);
59
60 public:
61     static int keyboard_screen_scaling; // true means ctrl+/-/0/ resize windows
62     static char bg_set;
63     static char bg2_set;
64     static char fg_set;
65     static Fl_System_Driver *system_driver;
66     // These flags are useful after calling XParseGeometry(). They indicate which of its
67     // arguments contain meaningful data upon return.
68     static const int fl_NoValue;
69     static const int fl_WidthValue;
70     static const int fl_HeightValue;
71     static const int fl_XValue;
72     static const int fl_YValue;
73     static const int fl_XNegative;
74     static const int fl_YNegative;
75     // Next 2 are used when transient scale windows are implemented as popups
76     static Fl_Window *transient_scale_parent;
77     static void del_transient_window(void *);
78     // key_table and key_table_size are used in fl_shortcut to translate key names
79     struct Keyname {
80         unsigned int key;
81         const char* name;
82     } *key_table;
83     int key_table_size;
84
85     virtual float scale(int) { return 1; }
86     virtual void scale(int /*n*/, float /*f*/) {}
87     static Fl_Screen_Driver *newScreenDriver();
88     // implement to process the -display argument and support the DISPLAY env var
89     virtual void display(const char *) {}
90     // default implementation should be enough
91     virtual int XParseGeometry(const char* string, int* x, int* y, unsigned int* width, unsigned int*
92                                height);
93     // the default implementation is most probably enough
94     virtual void own_colormap() {}
95     // the default implementation of shortcut_add_key_name() is in src/fl_shortcut.cxx
96     virtual const char *shortcut_add_key_name(unsigned key, char *p, char *buf, const char **);
97     // whether a platform uses additional code in Fl_Menu::handle_part1(int e)
98     virtual int need_menu_handle_part1_extra() {return 0;}
99     // whether a platform uses additional code in Fl_Menu::handle(int e)
100     virtual int need_menu_handle_part2() {return 0;}
101     // implement functions telling whether a key is pressed
102     virtual int event_key(int) {return 0;}
103     virtual int get_key(int) {return 0;}
104     virtual int visual(int flags);
105     // --- screen configuration

```

```

112 virtual void init() {}
113 virtual int x() { return 0; }
114 virtual int y() { return 0; }
115 virtual int w() { return 800; } // default, FL_OVERRIDE in driver!
116 virtual int h() { return 600; } // default, FL_OVERRIDE in driver!
117 virtual int screen_count();
118 void screen_xywh(int &X, int &Y, int &W, int &H, int mx, int my);
119 virtual void screen_xywh(int &X, int &Y, int &W, int &H, int /*n*/) {
120     X = 0;
121     Y = 0;
122     W = 800;
123     H = 600;
124 }
125 void screen_xywh(int &X, int &Y, int &W, int &H, int mx, int my, int mw, int mh);
126 virtual bool screen_boundaries_known() { return true; }
127 virtual int screen_num(int x, int y);
128 virtual int screen_num(int x, int y, int w, int h);
129 virtual void screen_dpi(float &h, float &v, int n = 0) { // FL_OVERRIDE in driver!
130     h = 72;
131     v = 72;
132     (void)n;
133 }
134 void screen_work_area(int &X, int &Y, int &W, int &H, int mx, int my);
135 virtual void screen_work_area(int &X, int &Y, int &W, int &H, int n) {
136     screen_xywh(X, Y, W, H, n);
137 }
138 // --- audible output
139 virtual void beep(int) {}
140 // --- global events
141 virtual void flush() {} // must FL_OVERRIDE
142 virtual void grab(Fl_Window *) {}
143 // --- global colors
144 /* the default implementation of parse_color() may be enough */
145 virtual int parse_color(const char *p, uchar &r, uchar &g, uchar &b);
146 virtual void get_system_colors();
147 /* the default implementation of get_system_scheme() may be enough */
148 virtual const char *get_system_scheme();
149
150 static int secret_input_character;
151 /* Implement to indicate whether complex text input may involve marked text.
152 When it does, has_marked_text returns non zero.
153 */
154 virtual int has_marked_text()const { return 0; }
155 // implement so text-editing widgets support dead keys
156 virtual int compose(int &del) {
157     del = 0;
158     return 0;
159 }
160 // default implementation may be enough
161 virtual void compose_reset();
162 // implement to support drag-n-drop. use_selection = 1 means the GUI is welcome to display
163 // the selected text during the D&D operation
164 virtual int dnd(int use_selection = 0) { (void)use_selection; return 0; }
165 // null means no platform-specific key bindings for Fl_Text_Editor
166 Fl_Text_Editor::Key_Binding *text_editor_extra_key_bindings;
167 // default implementation may be enough
168 virtual int text_display_can_leak()const { return 0; }
169
170 // if no keyboard is connected on a touch or pen device, the system on-screen keyboard is
171 // requested
172 virtual void request_keyboard() {}
173 // we no longer need the on-screen keyboard; it's up to the system to hide it
174 virtual void release_keyboard() {}
175
176 /* Member function read_win_rectangle() supports public functions
177 fl_read_image() and fl_capture_window() which capture pixel data from
178 a window (or also from an offscreen buffer with fl_read_image).
179
180 If 'may_capture_subwins' is true, an implementation may or may not capture
181 also the content of subwindows embedded in 'win'. If subwindows were captured,
182 *'did_capture_subwins' is returned set to true. If read_win_rectangle()
183 is called with 'may_capture_subwins' set to true, 'did_capture_subwins' should
184 be set before the call to the address of a boolean set to false.
185 The implementation of this virtual function for the macOS platform has the
186 capability of capturing subwindows when asked for.
187
188 A platform may also use its read_win_rectangle() implementation to capture
189 window decorations (e.g., title bar). In that case, it is called by
190 Fl_XXX_Window_Driver::capture_titlebar_and_borders().
191
192 win is the window to capture from, or NULL to capture from the current offscreen
193 */
194 virtual Fl_RGB_Image *read_win_rectangle(int /*X*/, int /*Y*/, int /*w*/, int /*h*/, Fl_Window *,
195     bool may_capture_subwins = false,
196     bool *did_capture_subwins = NULL) {
197     (void)may_capture_subwins;
198     (void)did_capture_subwins;

```

```

199     return NULL;
200 }
201 static void write_image_inside(Fl_RGB_Image *to, Fl_RGB_Image *from, int to_x, int to_y);
202 static Fl_RGB_Image *traverse_to_gl_subwindows(Fl_Group *g, int x, int y, int w, int h,
203                                             Fl_RGB_Image *full_img);
204 static size_t convert_crlf(char *s, size_t len);
205 // optional platform-specific key handling for Fl_Input widget
206 // the default implementation may be enough
207 virtual int input_widget_handle_key(int key, unsigned mods, unsigned shift, Fl_Input *input);
208 // implement to support Fl::get_mouse()
209 virtual int get_mouse(int & /*x*/, int & /*y*/) { return 0; }
210 // optional methods to enable/disable input methods for complex scripts
211 virtual void enable_im() {}
212 virtual void disable_im() {}
213 // calls open_display_platform() and then does platform-independent work
214 void open_display();
215 // implement to open access to the display
216 virtual void open_display_platform() {}
217 // optional method to close display access
218 virtual void close_display() {}
219 // compute dimensions of an Fl_Offscreen
220 virtual void offscreen_size(Fl_Offscreen, int & /*width*/, int & /*height*/) {}
221
222 void rescale_all_windows_from_screen(int screen, float f, float old_f);
223 static void transient_scale_display(float f, int nscreen);
224 // need export to fltk_gl.so because used in glut_compatibility.cxx
225 static FL_EXPORT int scale_handler(int event);
226 virtual void desktop_scale_factor() {}
227 void use_startup_scale_factor();
228 enum APP_SCALING_CAPABILITY {
229     NO_APP_SCALING = 0,
230     SYSTEMWIDE_APP_SCALING,
231     PER_SCREEN_APP_SCALING
232 };
233 virtual APP_SCALING_CAPABILITY rescalable() { return NO_APP_SCALING; }
234 // supports Fl_Window::default_icons()
235 virtual void default_icons(const Fl_RGB_Image *icons[], int count);
236 // implement to support copy-to-clipboard
237 virtual void copy(const char * /*stuff*/, int /*len*/, int /*clipboard*/, const char * /*type*/) {}
238 // implement to support paste-from-clipboard
239 virtual void paste(Fl_Widget &, int /*clipboard*/, const char * /*type*/) {}
240 // implement to support paste-from-clipboard
241 virtual void clipboard_notify_change() {}
242 // implement to support paste-from-clipboard
243 virtual int clipboard_contains(const char * /*type*/) { return 0; }
244 // implement to support paste-from-clipboard
245 virtual void clipboard_notify_change() {}
246 // next 3 are related to Input Methods
247 virtual void set_spot(int font, int size, int X, int Y, int W, int H, Fl_Window *win);
248 virtual void reset_spot();
249 virtual void set_status(int X, int Y, int W, int H);
250 virtual float base_scale(int numscreen);
251 };
252
253 #endif // !FL_SCREEN_DRIVER_H
254

```

## 34.232 Fl\_String.H

```

1 //
2 // Basic Fl_String header for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 2021-2023 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef _FL_Fl_String_H_
18 #define _FL_Fl_String_H_
19
20 #include <FL/Fl_Export.H>
21
22 #include <string>
23
24 #if 1
25
26 // Since fltk 1.5.0, Fl_String is no longer needed and now maps to std::string.
27 // Fl_String is not part of the public API. All occurrences of Fl_String in the
28 // core library and in Fluid should be replaced with std::string. When done,

```

```

39 // src/Fl_String.H and src/Fl_String.cxx can be deleted.
40 using Fl_String = std::string;
41
42 #else
43
44 // See: https://en.cppreference.com/w/cpp/string/basic\_string/basic\_string
45
46 class FL_EXPORT Fl_String {
47 private:
48     /*
49     FTLTK does no small string optimization.
50     If the string is empty and capacity is not set, buffer_ will be NULL.
51     */
52     char *buffer_;
53     int size_;
54     int capacity_;
55
56     void init_();
57     void grow_(int n);
58     void shrink_(int n);
59     Fl_String &replace_(int at, int n_del, const char *src, int n_ins);
60
61 protected:
62     static const char NUL;
63
64 public:
65     static const int npos;
66
67     // ---- Assignment
68     Fl_String();
69     Fl_String(const Fl_String &str);
70     Fl_String(const char *cstr);
71     Fl_String(const char *str, int size);
72     ~Fl_String();
73     Fl_String& operator=(const Fl_String &str);
74     Fl_String& operator=(const char *cstr);
75     Fl_String &assign(const Fl_String &str);
76     Fl_String &assign(const char *cstr);
77     Fl_String &assign(const char *str, int size);
78
79     // ---- Element Access
80     char at(int pos) const;
81     char operator[](int n) const;
82     char &operator[](int n);
83     const char *data() const;
84     char *data();
85     const char *c_str() const;
86
87     // ---- Capacity
88     bool empty() const;
89     int size() const;
90     void reserve(int n);
91     int capacity() const;
92     void shrink_to_fit();
93
94     // --- Operations
95     void clear();
96     Fl_String &insert(int at, const char *src, int n_ins=npow);
97     Fl_String &insert(int at, const Fl_String &src);
98     Fl_String &erase(int at, int n_del);
99     void push_back(char c);
100    void pop_back();
101    Fl_String &append(const char *src, int n_ins=npow);
102    Fl_String &append(const Fl_String &src);
103    Fl_String &append(char c);
104    Fl_String &operator+=(const char *src);
105    Fl_String &operator+=(const Fl_String &src);
106    Fl_String &operator+=(char c);
107    int find(const Fl_String &needle, int start_pos=0) const;
108    Fl_String &replace(int at, int n_del, const char *src, int n_ins=npow);
109    Fl_String &replace(int at, int n_del, const Fl_String &src);
110    Fl_String substr(int pos=0, int n=npow) const;
111    void resize(int n);
112
113    // --- Non Standard
114    int strlen() const;
115    void debug(const char *info = 0) const;
116    void hexdump(const char *info = 0) const;
117 }; // class Fl_String
118
119
120 // ---- Non-member functions
121 FL_EXPORT Fl_String operator+(const Fl_String& lhs, const Fl_String& rhs);
122 FL_EXPORT Fl_String operator+(const Fl_String& lhs, const char* rhs);
123 FL_EXPORT bool operator==(const Fl_String & lhs, const Fl_String & rhs);
124 FL_EXPORT bool operator!=(const Fl_String & lhs, const Fl_String & rhs);
125
126

```

```

152 #endif
153
159 #endif // _FL_Fl_String_H_

```

## 34.233 Fl\_Sys\_Menu\_Bar\_Driver.H

```

1 //
2 // system menu bar widget for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2017 by Bill Spitzak and others.
5 //
6 // This library is free software.  Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file.  If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //     https://www.fltk.org/bugs.php
15 //
16
17 #ifndef Fl_Sys_Menu_Bar_Driver_H
18 #define Fl_Sys_Menu_Bar_Driver_H
19
20 #if !defined(FL_DOXYGEN)
21
22 #include <FL/Fl_Sys_Menu_Bar.H>
23
24 class Fl_Sys_Menu_Bar_Driver {
25     friend class Fl_Sys_Menu_Bar;
26 public:
27     static Fl_Sys_Menu_Bar::window_menu_style_enum window_menu_style_;
28     static Fl_Sys_Menu_Bar_Driver *driver_; // to be assigned with a unique object of this class or of a
        derived class
29     Fl_Sys_Menu_Bar *bar;
30     Fl_Sys_Menu_Bar_Driver();
31     virtual ~Fl_Sys_Menu_Bar_Driver();
32     virtual void update() {}
33     virtual void draw() { bar->Fl_Menu_Bar::draw(); }
34     virtual void about(Fl_Callback *, void *) {}
35     virtual int add(const char* label, int shortcut, Fl_Callback *cb, void *user_data, int flags) {
36         return bar->Fl_Menu_Bar::add(label, shortcut, cb, user_data, flags);
37     }
38     virtual int add(const char* str) { return bar->Fl_Menu_Bar::add(str); }
39     virtual int insert(int index, const char* label, int shortcut, Fl_Callback *cb, void *user_data, int
        flags) {
40         return bar->Fl_Menu_Bar::insert(index, label, shortcut, cb, user_data, flags);
41     }
42     virtual void menu(const Fl_Menu_Item *m) { bar->Fl_Menu_Bar::menu(m); }
43     virtual void shortcut(int i, int s) { bar->Fl_Menu_Bar::shortcut(i, s); }
44     virtual void setonly(Fl_Menu_Item *item) { bar->Fl_Menu_Bar::setonly(item); }
45     virtual void clear() { bar->Fl_Menu_Bar::clear(); }
46     virtual int clear_submenu(int index) { return bar->Fl_Menu_Bar::clear_submenu(index); }
47     virtual void remove(int index) { bar->Fl_Menu_Bar::remove(index); }
48     virtual void replace(int index, const char *name) { bar->Fl_Menu_Bar::replace(index, name); }
49     virtual void mode(int i, int fl) { bar->Fl_Menu_Bar::mode(i, fl); }
50     virtual void create_window_menu() {}
51     virtual void play_menu(const Fl_Menu_Item *) {}
52     static Fl_Sys_Menu_Bar::window_menu_style_enum window_menu_style() { return window_menu_style_; }
53     static void window_menu_style(Fl_Sys_Menu_Bar::window_menu_style_enum style) { window_menu_style_ =
        style; }
54 };
55
56 #endif // !defined(FL_DOXYGEN)
57
58 #endif // Fl_Sys_Menu_Bar_Driver_H

```

## 34.234 Fl\_System\_Driver.H

```

1 //
2 // A base class for platform specific system calls
3 // for the Fast Light Tool Kit (FLTK).
4 //
5 // Copyright 2010-2022 by Bill Spitzak and others.
6 //
7 // This library is free software.  Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file.  If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //

```

```

13 // Please see the following page on how to report bugs and issues:
14 //
15 //      https://www.fltk.org/bugs.php
16 //
17
28 /* Class hierarchy
29 + Fl_System_Driver
30 | + Fl_Posix_System_Driver
31 | | + Fl_Unix_System_Driver
32 | | + Fl_Darwin_System_Driver
33 | + Fl_WinAPI_System_Driver
34 */
35
36 #ifndef FL_SYSTEM_DRIVER_H
37 #define FL_SYSTEM_DRIVER_H
38
39 #include <FL/Fl.H>
40 #include <FL/Fl_Export.H>
41 #include <FL/Fl_filename.H>
42 #include <FL/Fl_Preferences.H>
43 #include <stdio.h>
44 #include <stdlib.h>
45 #include <stdarg.h>
46 #include <string.h>
47 #include <time.h>
48
49 class Fl_File_Icon;
50 class Fl_File_Browser;
51 class Fl_Pixmap;
52 class Fl_Widget;
53 class Fl_Sys_Menu_Bar_Driver;
54
55 class Fl_System_Driver {
56     friend class Fl;
57 protected:
58     // implement once for each platform
59     static Fl_System_Driver *newSystemDriver();
60     Fl_System_Driver();
61     static bool awake_ring_empty();
62     int filename_relative(char *to, int tolen, const char *from, const char *base, bool case_sensitive);
63 public:
64     virtual ~Fl_System_Driver();
65     static int command_key;
66     static int control_key;
67
68     // implement if the system adds unwanted program argument(s)
69     virtual int single_arg(const char *) { return 0; }
70     // implement if the system adds unwanted program argument pair(s)
71     virtual int arg_and_value(const char * /*name*/, const char * /*value*/) { return 0; }
72     static void warning(const char* format, ...);
73     // implement to set the default effect of Fl::warning()
74     virtual void warning(const char* format, va_list args);
75     static void error(const char* format, ...);
76     // implement to set the default effect of Fl::error()
77     virtual void error(const char* format, va_list args);
78     static void fatal(const char* format, ...);
79     // implement to set the default effect of Fl::error()
80     virtual void fatal(const char* format, va_list args);
81
82     // implement these to support cross-platform file operations
83     virtual char *utf2mbcs(const char *s) { return (char*)s; }
84     virtual char *getenv(const char*) { return NULL; }
85     virtual int putenv(const char *) { return -1; }
86     virtual int open(const char * /*f*/, int /*oflags*/, int /*pmode*/) { return -1; }
87
88     // implement these to support cross-platform string operations
89     virtual char *strdup(const char *) { return NULL; }
90
91     // Note: the default implementation ignores the 'binary' argument.
92     // Some platforms (notably Windows) may use this argument.
93     virtual int open_ext(const char* f, int /*binary*/, int oflags, int pmode) {
94         return this->open(f, oflags, pmode);
95     }
96     virtual FILE *fopen(const char* f, const char *mode);
97     virtual int system(const char*) { return -1; }
98     virtual int execvp(const char * /*file*/, char *const * /*argv*/) { return -1; }
99     virtual int chmod(const char * /*f*/, int /*mode*/) { return -1; }
100    virtual int access(const char * /*f*/, int /*mode*/) { return -1; }
101    virtual int flstat(const char * /*f*/, struct stat *) { return -1; }
102    virtual char *getcwd(char * /*b*/, int /*sl*/) { return NULL; }
103    virtual int chdir(const char*) { return -1; }
104    virtual int unlink(const char*) { return -1; }
105    virtual int mkdir(const char * /*f*/, int /*mode*/) { return -1; }
106    virtual int rmdir(const char*) { return -1; }
107    virtual int rename(const char * /*f*/, const char * /*n*/) { return -1; }
108
109    // Windows commandline argument conversion to UTF-8.

```

```

115 // Default implementation: no-op, overridden only on Windows
116 virtual int args_to_utf8(int argc, char ** &argv) { return argc; }
117
118 // the default implementation of these utf8... functions should be enough
119 virtual unsigned utf8towc(const char* src, unsigned srclen, wchar_t* dst, unsigned dstlen);
120 virtual unsigned utf8fromwc(char* dst, unsigned dstlen, const wchar_t* src, unsigned srclen);
121 virtual int utf8locale() {return 1;}
122 virtual unsigned utf8to_mb(const char* src, unsigned srclen, char* dst, unsigned dstlen);
123 virtual unsigned utf8from_mb(char* dst, unsigned dstlen, const char* src, unsigned srclen);
124 // implement to shield fprintf() from locale changes in decimal point
125 virtual int clocale_vprintf(FILE *output, const char *format, va_list args);
126 virtual int clocale_vsnprintf(char *output, size_t output_size, const char *format, va_list args);
127 virtual int clocale_vsscanf(const char *input, const char *format, va_list args);
128 // implement scandir-like function
129 virtual int filename_list(const char * /*d*/, dirent **,
130                          int (* /*sort*/)(struct dirent **, struct dirent **),
131                          char *errmsg=NULL, int errmsg_sz=0) {
132     (void)errmsg; (void)errmsg_sz;
133     return -1;
134 }
135 // the default implementation of filename_expand() may be enough
136 virtual int filename_expand(char *to, int tolen, const char *from);
137 // to implement
138 virtual const char *getpwnam(const char *) {return NULL;}
139 // the default implementation of filename_relative() is in src/filename_absolute.cxx and may be enough
140 virtual int filename_relative(char *to, int tolen, const char *from, const char *base);
141 // the default implementation of filename_absolute() is in src/filename_absolute.cxx and may be enough
142 virtual int filename_absolute(char *to, int tolen, const char *from, const char *base);
143 // the default implementation of filename_isdir() is in src/filename_isdir.cxx and may be enough
144 virtual int filename_isdir(const char* n);
145 // the default implementation of filename_isdir_quick() is in src/filename_isdir.cxx and may be enough
146 virtual int filename_isdir_quick(const char* n);
147 // the default implementation of filename_ext() is in src/filename_ext.cxx and may be enough
148 virtual const char *filename_ext(const char *buf);
149 // implement to support fl_filename_name()
150 virtual const char *filename_name(const char *buf) {return buf;}
151 // implement to support fl_open_uri()
152 virtual int open_uri(const char * /*uri*/, char * /*msg*/, int /*msglen*/) {return 0;}
153 // the default implementation of use_tooltip_timeout_condition() may be enough
154 virtual int use_tooltip_timeout_condition() {return 0;}
155 // the default implementation of use_recent_tooltip_fix() may be enough
156 virtual int use_recent_tooltip_fix() {return 0;}
157 // the default implementation of need_test_shortcut_extra() may be enough
158 virtual int need_test_shortcut_extra() {return 0;}
159 // implement to support Fl_File_Browser::load()
160 virtual int file_browser_load_filesystem(Fl_File_Browser *, char * /*filename*/, int /**lname*/,
161 Fl_File_Icon *) {return 0;}
162 // the default implementation of file_browser_load_directory() should be enough
163 virtual int file_browser_load_directory(const char *directory, char *filename, size_t name_size,
164 dirent ***pfiles, Fl_File_Sort_F *sort,
165 char *errmsg=NULL, int errmsg_sz=0);
166 // implement to support Fl_Preferences
167 virtual void newUUID(char *uuidBuffer) { uuidBuffer[0] = 0; }
168 // implement to support Fl_Preferences
169 virtual char *preference_rootnode(Fl_Preferences *, Fl_Preferences::Root,
170 const char * /*vendor*/,
171 const char * /*application*/) {return NULL;}
172 // the default implementation of preferences_need_protection_check() may be enough
173 virtual int preferences_need_protection_check() {return 0;}
174 // implement to support Fl_Plugin_Manager::load()
175 virtual void *load(const char *) {return NULL;}
176 // the default implementation is most probably enough
177 virtual void png_extra_rgba_processing(unsigned char * /*array*/, int /*w*/, int /*h*/) {}
178 // the default implementation is most probably enough
179 virtual const char *next_dir_sep(const char *start) { return strchr(start, '/');}
180 // implement to support threading
181 virtual void awake(void*) {}
182 virtual int lock() {return 1;}
183 virtual void unlock() {}
184 virtual void* thread_message() {return NULL;}
185 // implement to support Fl_File_Icon
186 virtual int file_type(const char *filename);
187 // implement to return the user's home directory name
188 virtual const char *home_directory_name() { return ""; }
189 // the default implementation is most probably enough
190 virtual const char *filesystems_label() { return "File Systems"; }
191 // return TRUE means \ same as / in file names
192 virtual int backslash_as_slash() {return 0;}
193 // return TRUE means : indicates a drive letter in file names
194 virtual int colon_is_drive() {return 0;}
195 // return TRUE means that files whose name begins with dot are hidden
196 virtual int dot_file_hidden() {return 0;}
197 // return TRUE when file names are case insensitive
198 virtual int case_insensitive_filenames() {return 0;}
199 // the implementations of local_to_latin1() and latin1_to_local() are in fl_encoding_latin1.cxx
200 virtual const char *local_to_latin1(const char *t, int n);
201 virtual const char *latin1_to_local(const char *t, int n);

```

```

201 // the implementations of local_to_mac_roman() and mac_roman_to_local() are in
    fl_encoding_mac_roman.cxx
202 virtual const char *local_to_mac_roman(const char *t, int n);
203 virtual const char *mac_roman_to_local(const char *t, int n);
204 // draw default tree view expando button
205 virtual void tree_draw_expando_button(int x, int y, bool state, bool active);
206 // the default implementation of tree_connector_style() is in Fl_Tree_Prefs.cxx and can be enough
207 virtual int tree_connector_style();
208 virtual void add_fd(int fd, int when, Fl_FD_Handler cb, void* = 0);
209 virtual void add_fd(int fd, Fl_FD_Handler cb, void* = 0);
210 virtual void remove_fd(int, int when);
211 virtual void remove_fd(int);
212 // the default implementation of open_callback() may be enough
213 virtual void open_callback(void (*) (const char *));
214 // The default implementation may be enough.
215 virtual void gettime(time_t *sec, int *usec);
216 // The default implementation of the next 4 functions may be enough.
217 virtual const char *shift_name() { return "Shift"; }
218 virtual const char *meta_name() { return "Meta"; }
219 virtual const char *alt_name() { return "Alt"; }
220 virtual const char *control_name() { return "Ctrl"; }
221 virtual Fl_Sys_Menu_Bar_Driver *sys_menu_bar_driver() { return NULL; }
222 virtual void lock_ring() {}
223 virtual void unlock_ring() {}
224 virtual double wait(double); // must FL_OVERRIDE
225 virtual int ready() { return 0; } // must FL_OVERRIDE
226 virtual int close_fd(int) {return -1;} // to close a file descriptor
227 };
228
229 #endif // FL_SYSTEM_DRIVER_H
230

```

## 34.235 Fl\_Timeout.cxx File Reference

```

#include <config.h>
#include "Fl_Timeout.h"
#include "Fl_System_Driver.H"
#include <stdio.h>
#include <math.h>

```

## 34.236 Fl\_Timeout.h File Reference

Fl\_Timeout handling.

```
#include <FL/Fl.H>
```

### Classes

- class [Fl\\_Timeout](#)

*The internal class [Fl\\_Timeout](#) handles all timeout related functions.*

### Macros

- #define `FL_TIMEOUT_DEBUG` 0

### 34.236.1 Detailed Description

Fl\_Timeout handling.

This file contains implementations of:

- [Fl::add\\_timeout\(\)](#)
- [Fl::repeat\\_timeout\(\)](#)
- [Fl::has\\_timeout\(\)](#)
- [Fl::remove\\_timeout\(\)](#)

- [Fl::remove\\_next\\_timeout\(\)](#)

and related methods of class [Fl\\_Timeout](#).

## 34.237 Fl\_Timeout.h

[Go to the documentation of this file.](#)

```

1 //
2 // Header for timeout support functions for the Fast Light Tool Kit (FLTK).
3 //
4 // Author:  Albrecht Schlosser
5 // Copyright 2021-2024 by Bill Spitzak and others.
6 //
7 // This library is free software.  Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file.  If this
9 // file is missing or damaged, see the license at:
10 //
11 //     https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 //     https://www.fltk.org/bugs.php
16 //
17
18 #ifndef _src_Fl_Timeout_h_
19 #define _src_Fl_Timeout_h_
20
21 #include <FL/Fl.H>
22
23 #define FL_TIMEOUT_DEBUG 0          // 1 = include debugging features, 0 = no
24
25 class Fl_Timeout {
26 protected:
27
28     Fl_Timeout *next;               // ** Link to next timeout
29     Fl_Timeout_Handler callback;    // the user's callback
30     void *data;                     // the user's callback data
31     double time;                    // delay until timeout
32     int skip;                        // skip "new" (inserted) timers (issue #450)
33
34     // constructor
35     Fl_Timeout() {
36         next = 0;
37         callback = 0;
38         data = 0;
39         time = 0;
40         skip = 0;
41     }
42
43     // destructor
44     ~Fl_Timeout() {}
45
46     // get a new timer entry from the pool or allocate a new one
47     static Fl_Timeout *get(double time, Fl_Timeout_Handler cb, void *data);
48
49     // insert this timer into the active timer queue, sorted by expiration time
50     void insert();
51
52     // remove this timer from the active timer queue and
53     // add it to the "current" timer stack
54     void make_current();
55
56     // remove this timer from the current timer stack and
57     // add it to the list of free timers
58     void release();
59
60     double delay() {
61         return time;
62     }
63
64     void delay(double t) {
65         time = t;
66     }
67
68 public:
69     // Returns whether the given timeout is active.
70     static int has_timeout(Fl_Timeout_Handler cb, void *data);
71
72     // Add or remove timeouts
73
74     static void add_timeout(double time, Fl_Timeout_Handler cb, void *data);
75     static void repeat_timeout(double time, Fl_Timeout_Handler cb, void *data);
76     static void remove_timeout(Fl_Timeout_Handler cb, void *data);

```

```

111 static int remove_next_timeout(Fl_Timeout_Handler cb, void *data = NULL, void **data_return = NULL);
112
113 // Elapse timeouts, i.e. calculate new delay time of all timers.
114 // This does not call the timer callbacks.
115 static void elapse_timeouts();
116
117 // Elapse timeouts and call timer callbacks.
118 static void do_timeouts();
119
120 // Return the delay in seconds until the next timer expires.
121 static double time_to_wait(double ttw);
122
123 #if FL_TIMEOUT_DEBUG
124 // Write some statistics to stdout
125 static void debug(int level = 1);
126 #endif
127
128 protected:
129
130 static Fl_Timeout *current();
131
132 static Fl_Timeout *first_timeout;
133
134 static Fl_Timeout *free_timeout;
135
136 static Fl_Timeout *current_timeout; // list of "current" timeouts
137
138 }; // class Fl_Timeout
139
140 #endif // _src_Fl_Timeout_h_

```

## 34.238 fl\_vertex.cxx File Reference

Portable drawing code for drawing arbitrary shapes with simple 2D transformations.

```

#include <FL/Fl_Graphics_Driver.H>
#include <FL/Fl.H>
#include <FL/math.h>
#include <stdlib.h>

```

### 34.238.1 Detailed Description

Portable drawing code for drawing arbitrary shapes with simple 2D transformations.

## 34.239 Fl\_Window\_Driver.H

```

1 //
2 // A base class for platform specific window handling code
3 // for the Fast Light Tool Kit (FLTK).
4 //
5 // Copyright 2010-2025 by Bill Spitzak and others.
6 //
7 // This library is free software. Distribution and use rights are outlined in
8 // the file "COPYING" which should have been included with this file. If this
9 // file is missing or damaged, see the license at:
10 //
11 // https://www.fltk.org/COPYING.php
12 //
13 // Please see the following page on how to report bugs and issues:
14 //
15 // https://www.fltk.org/bugs.php
16 //
17
18 #ifndef FL_WINDOW_DRIVER_H
19 #define FL_WINDOW_DRIVER_H
20
21 #include <FL/Fl_Export.H>
22 #include <FL/Fl_Window.H>
23 #include <FL/Fl_Overlay_Window.H>
24
25 #include <stdlib.h>
26
27 class Fl_X;
28 class Fl_Image;
29 class Fl_RGB_Image;
30 class Fl_Image_Surface;
31
32

```

```

52 class Fl_Window_Driver
53 {
54     friend class Fl_Window;
55 private:
56     static bool is_a_rescale_; // true when a top-level window is being rescaled
57
58 protected:
59     Fl_Window *pWindow;
60     int screen_num_; // number of screen where window is mapped
61 public:
62     Fl_Window_Driver(Fl_Window *);
63     virtual ~Fl_Window_Driver();
64     static Fl_Window_Driver *newWindowDriver(Fl_Window *);
65     static fl_uintptr_t xid(const Fl_Window *win);
66     static Fl_Window *find(fl_uintptr_t xid);
67     int wait_for_expose_value;
68     Fl_Image_Surface *other_xid; // offscreen bitmap (overlay and double-buffered windows)
69     int screen_num();
70     void screen_num(int n) { screen_num_ = n; }
71
72
73     // --- frequently used accessors to public window data
74     int x()const { return pWindow->x(); }
75     int y()const { return pWindow->y(); }
76     int w()const { return pWindow->w(); }
77     int h()const { return pWindow->h(); }
78     int border()const { return pWindow->border(); }
79     int visible()const { return pWindow->visible(); }
80     int visible_r()const { return pWindow->visible_r(); }
81     int shown()const { return pWindow->shown(); }
82     Fl_Group *parent()const { return pWindow->parent(); }
83
84     // --- accessors to private window data
85     int is_resizable() { return pWindow->is_resizable(); }
86     void is_a_rescale(bool b) { is_a_rescale_ = b; }
87     int fullscreen_screen_top();
88     int fullscreen_screen_bottom();
89     int fullscreen_screen_left();
90     int fullscreen_screen_right();
91     int* no_fullscreen_x() { return &pWindow->no_fullscreen_x; }
92     int* no_fullscreen_y() { return &pWindow->no_fullscreen_y; }
93     int* no_fullscreen_w() { return &pWindow->no_fullscreen_w; }
94     int* no_fullscreen_h() { return &pWindow->no_fullscreen_h; }
95     int force_position();
96     void force_position(int c);
97     void x(int X);
98     void y(int Y);
99     void current(Fl_Window *c);
100     char show_iconic() { return Fl_Window::show_next_window_iconic(); }
101     void show_iconic(char c) { Fl_Window::show_next_window_iconic(c); }
102     void flx(Fl_X *x) { pWindow->flx_ = x; }
103     Fl_Cursor cursor_default() { return pWindow->cursor_default; }
104     void destroy_double_buffer();
105     Fl_Window *overlay() {
106         return pWindow->as_overlay_window() ? pWindow->as_overlay_window()->overlay_ : NULL;
107     }
108     void overlay(Fl_Window *o) {
109         if (pWindow->as_overlay_window()) pWindow->as_overlay_window()->overlay_ = o;
110     }
111
112     void resize_after_scale_change(int ns, float old_f, float new_f);
113     void set_popup_window() { pWindow->set_flag(Fl_Window::POPUP); }
114     bool popup_window()const { return pWindow->flags() & Fl_Window::POPUP; }
115
116     // --- window data
117     virtual int decorated_w() { return w(); } // default, should be overridden by driver
118     virtual int decorated_h() { return h(); }
119     virtual const Fl_Image* shape() { return NULL; }
120
121     // --- window management
122     virtual void take_focus();
123     virtual void flush(); // the default implementation may be enough
124     virtual void flush_double();
125     virtual void flush_overlay();
126     virtual void draw_begin();
127     virtual void draw_end();
128     void draw();
129     virtual void make_current();
130     virtual void label(const char *name, const char *mininame);
131
132     virtual void makeWindow() {}
133     virtual void wait_for_expose();
134     virtual void show();
135     virtual void resize(int /*X*/, int /*Y*/, int /*W*/, int /*H*/) {}
136     virtual void hide() {}
137     int hide_common();
138     virtual void map() {}

```

```

152 virtual void unmap() {}
153 virtual void fullscreen_on() {}
154 virtual void fullscreen_off(int /*X*/, int /*Y*/, int /*W*/, int /*H*/) {}
155 virtual void fullscreen_screens(bool /*on_off*/) {}
156 virtual void maximize();
157 virtual void un_maximize();
158 virtual bool maximize_needs_hide() { return false; }
159 void is_maximized(bool b) { pWindow->is_maximized_(b); }
160 virtual void use_border();
161 virtual void size_range();
162 virtual void iconize() {}
163 virtual void decoration_sizes(int *top, int *left, int *right, int *bottom) {
164     *top = *left = *right = *bottom = 0;
165 }
166 virtual void show_with_args_begin() {}
167 virtual void show_with_args_end(int /*argc*/, char ** /*argv*/) {}
168 virtual int can_do_overlay();
169 virtual void redraw_overlay();
170
171 // --- window cursor stuff
172 virtual int set_cursor(Fl_Cursor);
173 virtual int set_cursor(const Fl_RGB_Image*, int, int);
174
175 // --- window shape stuff
176 void shape_pixmap(Fl_Image* pixmap); // platform-independent, support function
177 virtual void shape(const Fl_Image*) {}
178 virtual void shape_alpha(Fl_Image*, int /*offset*/) {}
179
180 // --- window icon stuff
181 virtual void icons(const Fl_RGB_Image* /*icons*/[], int /*count*/) {}
182 virtual const void *icon() const { return NULL; }
183 virtual void icon(const void *) {}
184 virtual void free_icons() {}
185
186 // --- window printing/drawing helper
187 virtual void capture_titlebar_and_borders(Fl_RGB_Image*& top, Fl_RGB_Image*& left,
188                                         Fl_RGB_Image*& bottom, Fl_RGB_Image*& right);
189 virtual int scroll(int /*src_x*/, int /*src_y*/, int /*src_w*/, int /*src_h*/,
190                  int /*dest_x*/, int /*dest_y*/,
191                  void (*) (void*, int,int,int,int), void*) { return 0; }
192 static inline Fl_Window_Driver* driver(const Fl_Window *win) { return win->pWindowDriver; }
193
194 // --- support for menu windows
195 // The default implementation of next 2 virtual members is enough if the
196 // position of a window in a screen is known. Next static members may be useful
197 // when that's not the case, as with Wayland.
198 virtual void reposition_menu_window(int x, int y);
199 virtual void menu_window_area(int &X, int &Y, int &W, int &H, int nscreen = -1);
200 static Fl_Window *menu_parent(int *display_height = NULL);
201 static Fl_Window *menu_leftorigin(Fl_Window*);
202 static Fl_Window *menu_title(Fl_Window*);
203 static int menu_itemheight(Fl_Window*);
204 static int menu_bartitle(Fl_Window*);
205 static int menu_selected(Fl_Window*);
206 static int *menu_offset_y(Fl_Window*);
207 static bool is_floating_title(Fl_Window *);
208 static void scroll_to_selected_item(Fl_Window *);
209
210 virtual fl_uintptr_t os_id() { return 0; }
211 virtual void allow_expand_outside_parent() {}
212 };
213
214 #endif // FL_WINDOW_DRIVER_H
215

```

## 34.240 fl\_write\_png.cxx File Reference

PNG image support functions.

```

#include <config.h>
#include <FL/Fl_PNG_Image.H>
#include <FL/Fl_RGB_Image.H>
#include <FL/fl_string_functions.h>
#include <FL/fl_utf8.h>
#include <stdio.h>
#include <time.h>

```

## Functions

- `int fl_write_png (const char *filename, const char *pixels, int w, int h, int d, int ld)`  
Write raw image data to a PNG image file.
- `int fl_write_png (const char *filename, const unsigned char *pixels, int w, int h, int d, int ld)`  
Write raw image data to a PNG image file.
- `int fl_write_png (const char *filename, FL\_RGB\_Image *img)`  
Write an RGB(A) image to a PNG image file.

### 34.240.1 Detailed Description

PNG image support functions.

### 34.240.2 Function Documentation

#### 34.240.2.1 fl\_write\_png() [1/3]

```
int fl_write_png (
    const char * filename,
    const char * pixels,
    int w,
    int h,
    int d,
    int ld )
```

Write raw image data to a PNG image file.

This is a very basic and restricted function to create a PNG image file from raw image data, e.g. a screenshot.

The image data must be aligned w/o gaps after each row (`ld = 0` or `ld = w * d`) or `ld` must be the total length of each row, i.e. `w * d + gapsize`. If `ld == 0` then `ld = w * d` is assumed.

The total data size must be  $(w * d + \text{gapsize}) * h = ld' * h$  where  $ld' = w * d$  if `ld == 0`.

For further restrictions and return values please see `fl_write_png(const char *filename, FL\_RGB\_Image *img)`.

#### Parameters

in	<i>filename</i>	Output filename, extension should be '.png'
in	<i>pixels</i>	Image data
in	<i>w</i>	Image data width
in	<i>h</i>	Image data height
in	<i>d</i>	Image depth: 1 = GRAY, 2 = GRAY + alpha, 3 = RGB, 4 = RGBA
in	<i>ld</i>	Line delta: default (0) = $w * d$

#### Returns

success (0) or error code, see ...

#### See also

`fl\_write\_png\(const char \*filename, FL\\_RGB\\_Image \*img\)`

#### 34.240.2.2 fl\_write\_png() [2/3]

```
int fl_write_png (
    const char * filename,
    const unsigned char * pixels,
```

```

    int w,
    int h,
    int d,
    int ld )

```

Write raw image data to a PNG image file.

See also

[fl\\_write\\_png\(const char \\*filename, const char \\*pixels, int w, int h, int d, int ld\)](#)

### 34.240.2.3 fl\_write\_png() [3/3]

```

int fl_write_png (
    const char * filename,
    Fl_RGB_Image * img )

```

Write an RGB(A) image to a PNG image file.

This is a very basic and restricted function to create a PNG image file from an RGB image ([Fl\\_RGB\\_Image](#)).

The image data must be aligned w/o gaps, i.e. `ld()` **MUST** be zero or equal to `data_w() * data_h()`.

The image file is always written with the original image size `data_w()` and `data_h()`, even if the image has been scaled.

Image depth 1 (gray), 2 (gray + alpha channel), 3 (RGB) and 4 (RGBA) are supported.

Note

Currently there is no error handling except for errors when opening the file. This may be changed in the future.

#### Parameters

in	<i>filename</i>	Output filename, extension should be '.png'
in	<i>img</i>	RGB image to be written

#### Returns

success (0) or error code: negative values are errors

#### Return values

0	success, file has been written
-1	png or zlib library not available
-2	file open error

See also

[fl\\_write\\_png\(const char \\*, int, int, int, const unsigned char \\*\)](#)

## 34.241 Fl\_XColor.H

```

1 //
2 // X-specific color definitions for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //     https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:

```

```

13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef FL_DOXYGEN
18 #include <config.h>
19 #include <FL/Enumerations.H>
20
21 // one of these for each color in fltk's "colormap":
22 // if overlays are enabled, another one for the overlay
23 struct Fl_XColor {
24     unsigned char r,g,b; // actual color used by X
25     unsigned char mapped; // true when XAllocColor done
26     unsigned long pixel; // the X pixel to use
27 };
28 extern Fl_XColor fl_xmap[/overlay*][256];
29
30 // mask & shifts to produce xcolor for truecolor visuals:
31 extern unsigned char fl_redmask, fl_greenmask, fl_bluemask;
32 extern int fl_redshift, fl_greenshift, fl_blueshift, fl_extrashift;
33 #endif // FL_DOXYGEN

```

## 34.242 flstring.h

```

1 /*
2  * Common string header file for the Fast Light Tool Kit (FLTK).
3  * Internal use only (see "important note" below).
4  *
5  * Copyright 1998-2020 by Bill Spitzak and others.
6  *
7  * This library is free software. Distribution and use rights are outlined in
8  * the file "COPYING" which should have been included with this file. If this
9  * file is missing or damaged, see the license at:
10  *
11  *      https://www.fltk.org/COPYING.php
12  *
13  * Please see the following page on how to report bugs and issues:
14  *
15  *      https://www.fltk.org/bugs.php
16  */
17
18 /*
19  * Important note: this header file includes '<config.h>' !
20  *
21  * This header MUST NOT be included in public headers (i.e. in 'FL/') and
22  * SHOULD NOT be included in test and demo programs (i.e. in 'test/' or
23  * 'examples/') because it includes '<config.h>'.
24  */
25
26 #ifndef flstring_h
27 # define flstring_h
28
29 # include <FL/Fl_Export.H>
30 # include <config.h>
31 # include <stdio.h>
32 # include <stdarg.h>
33 # include <string.h>
34 # ifdef HAVE_STRINGS_H
35 # include <strings.h>
36 # endif /* HAVE_STRINGS_H */
37 # include <ctype.h>
38 # include <FL/fl_string_functions.h>
39
40 /*
41  * Apparently Unixware defines "index" to strchr (!) rather than
42  * providing a proper entry point or not providing the (obsolete)
43  * BSD function. Make sure index is not defined...
44  */
45
46 # ifdef index
47 # undef index
48 # endif /* index */
49
50 /*
51  * Visual C++ 2005 incorrectly displays a warning about the use of
52  * POSIX APIs on Windows, which is supposed to be POSIX compliant...
53  * Some of these functions are also defined in ISO C99...
54  */
55
56 # if defined(_WIN32) && !defined(__CYGWIN__) && !defined(__MINGW32__)
57 # define strcasecmp(s,t) _stricmp((s), (t))
58 # define strncasecmp(s,t,n) _strnicmp((s), (t), (n))
59 # endif /* _WIN32 && ... */
60
61 # ifdef __cplusplus

```

```

62 extern "C" {
63 #   endif /* __cplusplus */
64
65 FL_EXPORT extern int fl_snprintf(char *, size_t, const char *, ...);
66 #   ifndef HAVE_SNPRINTF
67 #       define snprintf fl_snprintf
68 #   endif /* !HAVE_SNPRINTF */
69
70 FL_EXPORT extern int fl_vsnprintf(char *, size_t, const char *, va_list ap);
71 #   ifndef HAVE_VSNPRINTF
72 #       define vsnprintf fl_vsnprintf
73 #   endif /* !HAVE_VSNPRINTF */
74
75 /*
76 * strcpy() and strcat() are some really useful BSD string functions
77 * that work the way strncpy() and strncat() *should* have worked.
78 */
79
80 FL_EXPORT extern size_t fl_strlcat(char *, const char *, size_t);
81 #   ifndef HAVE_STRLCAT
82 #       define strlcat fl_strlcat
83 #   endif /* !HAVE_STRLCAT */
84
85 /* promoted to <FL/fl_string_functions.h> */
86 /* FL_EXPORT extern size_t fl_strncpy(char *, const char *, size_t); */
87 #   ifndef HAVE_STRLCPY
88 #       define strncpy fl_strncpy
89 #   endif /* !HAVE_STRLCPY */
90
91 /*
92 * Locale independent ASCII string compare function,
93 * does not introduce locale issues as with strcasecmp()
94 */
95 FL_EXPORT extern int fl_ascii_strcasecmp(const char *s, const char *t);
96
97 #   ifdef __cplusplus
98 }
99 #   endif /* __cplusplus */
100
101 #endif /* !flstring_h */

```

## 34.243 freeglut\_teapot\_data.h

```

1 /*
2 * freeglut_teapot_data.h
3 *
4 * The freeglut library teapot data include file.
5 *
6 * Permission is hereby granted, free of charge, to any person obtaining a
7 * copy of this software and associated documentation files (the "Software"),
8 * to deal in the Software without restriction, including without limitation
9 * the rights to use, copy, modify, merge, publish, distribute, sublicense,
10 * and/or sell copies of the Software, and to permit persons to whom the
11 * Software is furnished to do so, subject to the following conditions:
12 *
13 * The above copyright notice and this permission notice shall be included
14 * in all copies or substantial portions of the Software.
15 *
16 * THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS
17 * OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,
18 * FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL
19 * PAWEŁ W. OLSZTA BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER
20 * IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN
21 * CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.
22 */
23
24 #ifndef FREEGLUT_TEAPOT_DATA_H
25 #define FREEGLUT_TEAPOT_DATA_H
26
27 /*
28 * Original teapot code copyright follows:
29 */
30
31 /*
32 * (c) Copyright 1993, Silicon Graphics, Inc.
33 *
34 * ALL RIGHTS RESERVED
35 *
36 * Permission to use, copy, modify, and distribute this software
37 * for any purpose and without fee is hereby granted, provided
38 * that the above copyright notice appear in all copies and that
39 * both the copyright notice and this permission notice appear in
40 * supporting documentation, and that the name of Silicon
41 * Graphics, Inc. not be used in advertising or publicity
42 * pertaining to distribution of the software without specific,

```

```

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64 * Software clause at DFARS 252.227-7013 and/or in similar or
65 * successor clauses in the FAR or the DOD or NASA FAR
66 * Supplement. Unpublished-- rights reserved under the copyright
67 * laws of the United States. Contractor/manufacturer is Silicon
68 * Graphics, Inc., 2011 N. Shoreline Blvd., Mountain View, CA
69 * 94039-7311.
70 *
71 * OpenGL(TM) is a trademark of Silicon Graphics, Inc.
72 */
73
74 /*
75 * Rim, body, lid, and bottom data must be reflected in x and y;
76 * handle and spout data across the y axis only.
77 */
78 static int patchdata[][16] =
79 {
80     { 102, 103, 104, 105, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 }, /* rim */
81     { 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 }, /* body */
82     { 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40 },
83     { 96, 96, 96, 96, 97, 98, 99, 100, 101, 101, 101, 101, 0, 1, 2, 3 }, /* lid */
84     { 0, 1, 2, 3, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117 },
85     { 118, 118, 118, 118, 124, 122, 119, 121, 123, 126, 125, 120, 40, 39, 38, 37 }, /* bottom */
86     { 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 }, /* handle */
87     { 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 28, 65, 66, 67 },
88     { 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83 }, /* spout */
89     { 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95 }
90 };
91
92 static double cpdata[][3] =
93 {
94     {0.2, 0, 2.7}, {0.2, -0.112, 2.7}, {0.112, -0.2, 2.7}, {0,
95     -0.2, 2.7}, {1.3375, 0, 2.53125}, {1.3375, -0.749, 2.53125},
96     {0.749, -1.3375, 2.53125}, {0, -1.3375, 2.53125}, {1.4375,
97     0, 2.53125}, {1.4375, -0.805, 2.53125}, {0.805, -1.4375,
98     2.53125}, {0, -1.4375, 2.53125}, {1.5, 0, 2.4}, {1.5, -0.84,
99     2.4}, {0.84, -1.5, 2.4}, {0, -1.5, 2.4}, {1.75, 0, 1.875},
100    {1.75, -0.98, 1.875}, {0.98, -1.75, 1.875}, {0, -1.75,
101    1.875}, {2, 0, 1.35}, {2, -1.12, 1.35}, {1.12, -2, 1.35},
102    {0, -2, 1.35}, {2, 0, 0.9}, {2, -1.12, 0.9}, {1.12, -2,
103    0.9}, {0, -2, 0.9}, {-2, 0, 0.9}, {2, 0, 0.45}, {2, -1.12,
104    0.45}, {1.12, -2, 0.45}, {0, -2, 0.45}, {1.5, 0, 0.225},
105    {1.5, -0.84, 0.225}, {0.84, -1.5, 0.225}, {0, -1.5, 0.225},
106    {1.5, 0, 0.15}, {1.5, -0.84, 0.15}, {0.84, -1.5, 0.15}, {0,
107    -1.5, 0.15}, {-1.6, 0, 2.025}, {-1.6, -0.3, 2.025}, {-1.5,
108    -0.3, 2.25}, {-1.5, 0, 2.25}, {-2.3, 0, 2.025}, {-2.3, -0.3,
109    2.025}, {-2.5, -0.3, 2.25}, {-2.5, 0, 2.25}, {-2.7, 0,
110    2.025}, {-2.7, -0.3, 2.025}, {-3, -0.3, 2.25}, {-3, 0,
111    2.25}, {-2.7, 0, 1.8}, {-2.7, -0.3, 1.8}, {-3, -0.3, 1.8},
112    {-3, 0, 1.8}, {-2.7, 0, 1.575}, {-2.7, -0.3, 1.575}, {-3,
113    -0.3, 1.35}, {-3, 0, 1.35}, {-2.5, 0, 1.125}, {-2.5, -0.3,
114    1.125}, {-2.65, -0.3, 0.9375}, {-2.65, 0, 0.9375}, {-2,
115    -0.3, 0.9}, {-1.9, -0.3, 0.6}, {-1.9, 0, 0.6}, {1.7, 0,
116    1.425}, {1.7, -0.66, 1.425}, {1.7, -0.66, 0.6}, {1.7, 0,
117    0.6}, {2.6, 0, 1.425}, {2.6, -0.66, 1.425}, {3.1, -0.66,
118    0.825}, {3.1, 0, 0.825}, {2.3, 0, 2.1}, {2.3, -0.25, 2.1},
119    {2.4, -0.25, 2.025}, {2.4, 0, 2.025}, {2.7, 0, 2.4}, {2.7,
120    -0.25, 2.4}, {3.3, -0.25, 2.4}, {3.3, 0, 2.4}, {2.8, 0,
121    2.475}, {2.8, -0.25, 2.475}, {3.525, -0.25, 2.49375},
122    {3.525, 0, 2.49375}, {2.9, 0, 2.475}, {2.9, -0.15, 2.475},
123    {3.45, -0.15, 2.5125}, {3.45, 0, 2.5125}, {2.8, 0, 2.4},
124    {2.8, -0.15, 2.4}, {3.2, -0.15, 2.4}, {3.2, 0, 2.4}, {0, 0,
125    3.15}, {0.8, 0, 3.15}, {0.8, -0.45, 3.15}, {0.45, -0.8,
126    3.15}, {0, -0.8, 3.15}, {0, 0, 2.85}, {1.4, 0, 2.4}, {1.4,
127    -0.784, 2.4}, {0.784, -1.4, 2.4}, {0, -1.4, 2.4}, {0.4, 0,
128    2.55}, {0.4, -0.224, 2.55}, {0.224, -0.4, 2.55}, {0, -0.4,
129    2.55}, {1.3, 0, 2.55}, {1.3, -0.728, 2.55}, {0.728, -1.3,

```

```

130     2.55}, {0, -1.3, 2.55}, {1.3, 0, 2.4}, {1.3, -0.728, 2.4},
131     {0.728, -1.3, 2.4}, {0, -1.3, 2.4}, {0, 0, 0}, {1.425,
132     -0.798, 0}, {1.5, 0, 0.075}, {1.425, 0, 0}, {0.798, -1.425,
133     0}, {0, -1.5, 0.075}, {0, -1.425, 0}, {1.5, -0.84, 0.075},
134     {0.84, -1.5, 0.075}
135 };
136
137 static double tex[2][2][2] =
138 {
139     { {0.0, 0.0}, {1.0, 0.0} },
140     { {0.0, 1.0}, {1.0, 1.0} }
141 };
142
143
144 #endif /* FREEGLUT_TEAPOT_DATA_H */
145

```

## 34.244 mediumarrow.h

```

1 #define mediumarrow_width 16
2 #define mediumarrow_height 16
3 static const unsigned char mediumarrow_bits[] = {
4     0x40, 0x00, 0x60, 0x00, 0x70, 0x00, 0x78, 0x00, 0xfc, 0x3f, 0x78, 0x00,
5     0x70, 0x00, 0x60, 0x02, 0x40, 0x06, 0x00, 0x0e, 0x00, 0x1e, 0xfc, 0x3f,
6     0x00, 0x1e, 0x00, 0x0e, 0x00, 0x06, 0x00, 0x02};

```

## 34.245 numeric sort.c File Reference

```

#include <ctype.h>
#include <stdlib.h>
#include <string.h>
#include <FL/platform_types.h>
#include <FL/filename.H>
#include <FL/fl_utf8.h>

```

### Functions

- [int fl\\_casenumERICsort](#) (struct dirent \*\*A, struct dirent \*\*B)  
*Compares directory entries alphanumerically (case-insensitive).*
- [int fl\\_numericSort](#) (struct dirent \*\*A, struct dirent \*\*B)  
*Compares directory entries alphanumerically (case-sensitive).*

### 34.245.1 Function Documentation

#### 34.245.1.1 fl\_casenumERICsort()

```

int fl_casenumERICsort (
    struct dirent ** A,
    struct dirent ** B )

```

Compares directory entries alphanumerically (case-insensitive).

#### Note

This comparison is UTF-8 aware.

#### See also

[fl\\_numericSort\(\)](#)

**34.245.1.2 fl\_numericsort()**

```
int fl_numericsort (
    struct dirent ** A,
    struct dirent ** B )
```

Compares directory entries alphanumerically (case-sensitive).

Numbers are compared without sign, i.e. "-" is not taken as a sign of following numerical values. The following list of files would be in ascending order (examples are ASCII and numbers only for simplicity):

1. 1zzz.txt
2. 2xxx.txt
3. 19uuu.txt
4. 100aaa.txt
5. file1z.txt
6. file5a.txt
7. file5z.txt
8. file30z.txt
9. file200a.txt
10. temp+5.txt ('+' is lexically lower than '-')
11. temp-5.txt ('-' is not a sign)
12. temp-100.txt (100 is bigger than 5, no sign)

**Parameters**

in	<i>A</i>	first directory entry
in	<i>B</i>	second directory entry

**Returns**

comparison result (-1, 0, or +1)

**Return values**

-1	$A < B$
0	$A == B$
+1	$A > B$

**Note**

This comparison is UTF-8 aware.

**See also**

[fl\\_casenumersort\(\)](#)

**34.246 print\_button.h**

```
1 //
2 // Header for "Print Window" functions for the Fast Light Tool Kit (FLTK).
3 //
```

```

4 // Copyright 1998-2022 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 #ifndef _SRC_FL_PRINT_BUTTON_H_
18 #define _SRC_FL_PRINT_BUTTON_H_
19
20 #include <FL/Fl_Window.H>
21
22 // These are all internal functions, do not FL_EXPORT these functions!
23 // These functions are mplemented in src/print_button.cxx
24
25 // Create and initialize the "Print/copy front window" dialog window
26
27 int fl_create_print_window();
28
29 // Print a window or copy its contents to the clipboard.
30
31 int fl_print_or_copy_window(Fl_Window *win, bool grab_decoration, int mode);
32
33 #endif // _SRC_FL_PRINT_BUTTON_H_

```

## 34.247 print\_panel.h

```

1 //
2 // Print panel for the Fast Light Tool Kit (FLTK).
3 //
4 // Copyright 1998-2010 by Bill Spitzak and others.
5 //
6 // This library is free software. Distribution and use rights are outlined in
7 // the file "COPYING" which should have been included with this file. If this
8 // file is missing or damaged, see the license at:
9 //
10 //      https://www.fltk.org/COPYING.php
11 //
12 // Please see the following page on how to report bugs and issues:
13 //
14 //      https://www.fltk.org/bugs.php
15 //
16
17 //
18 // This is a temporary file. It is only for development and will
19 // probably be removed later.
20 //
21
22 #ifndef print_panel_h
23 #define print_panel_h
24 #include <FL/Fl.H>
25 #include <FL/Fl_Double_Window.H>
26 #include <FL/Fl_Group.H>
27 #include <FL/Fl_Choice.H>
28 #include <FL/Fl_Button.H>
29 #include <FL/Fl_Box.H>
30 #include <FL/Fl_Round_Button.H>
31 #include <FL/Fl_Input.H>
32 #include <FL/Fl_Spinner.H>
33 #include <FL/Fl_Check_Button.H>
34 #include <FL/Fl_Return_Button.H>
35 #include <FL/Fl_Progress.H>
36 enum printing_style {SystemV, BSD};
37 static Fl_Double_Window* make_print_panel();
38 static void print_cb(Fl_Return_Button *, void *);
39 static printing_style print_load();
40 static void print_update_status();
41 #endif

```

## 34.248 slowarrow.h

```

1 #define slowarrow_width 16
2 #define slowarrow_height 16
3 static const unsigned char slowarrow_bits[] = {
4     0x40, 0x00, 0x40, 0x00, 0x60, 0x00, 0x60, 0x00, 0xf0, 0x0f, 0x60, 0x00,
5     0x60, 0x00, 0x40, 0x02, 0x40, 0x02, 0x00, 0x06, 0x00, 0x06, 0xf0, 0x0f,

```

```
6    0x00, 0x06, 0x00, 0x06, 0x00, 0x02, 0x00, 0x02};
```

## 34.249 utf8\_internal.h

```
1 /*
2  * Internal UTF-8 header file for the Fast Light Tool Kit (FLTK).
3  *
4  * Copyright 1998-2016 by Bill Spitzak and others.
5  *
6  * This library is free software. Distribution and use rights are outlined in
7  * the file "COPYING" which should have been included with this file. If this
8  * file is missing or damaged, see the license at:
9  *
10 *    https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *    https://www.fltk.org/bugs.php
15 */
16
17 /*
18 -----
19 Note to editors:
20 -----
21
22 This file may only contain common, platform-independent function
23 declarations used internally in FLTK. It may be #included everywhere
24 in source files in the library, but not in public header files.
25 */
26
27 #ifndef _SRC__FL_UTF8_H
28 #define _SRC__FL_UTF8_H
29
30 # ifdef __cplusplus
31 extern "C" {
32 # endif
33
34 unsigned short
35 XUtf8IsNonSpacing(
36     unsigned int ucs);
37
38 unsigned short
39 XUtf8IsRightToLeft(
40     unsigned int ucs);
41
42
43 int
44 XUtf8Tolower(
45     int ucs);
46
47 int
48 XUtf8Toupper(
49     int ucs);
50
51
52 # ifdef __cplusplus
53 }
54 # endif
55
56 #endif /* _SRC__FL_UTF8_H */
```

## 34.250 vsnprintf.c File Reference

Portable vsnprintf() implementation.

```
#include <stdio.h>
```

```
#include "flstring.h"
```

### Functions

- `int fl_snprintf` (char \*str, size\_t size, const char \*fmt,...)
- `int fl_vsnprintf` (char \*buffer, size\_t bufsz, const char \*format, va\_list ap)

*FLTK's platform independent wrapper for the vsnprintf() C library function.*

### 34.250.1 Detailed Description

Portable vsnprintf() implementation.

### 34.250.2 Function Documentation

#### 34.250.2.1 fl\_vsnprintf()

```
int fl_vsnprintf (
    char * buffer,
    size_t bufsize,
    const char * format,
    va_list ap )
```

FLTK's platform independent wrapper for the vsnprintf() C library function.

This function guarantees:

- access to vsnprintf(), even on systems that don't have it (FLTK's own built-in code is used)
- Guarantees NUL termination. Even if string expands larger than the buffer, a terminating NUL is included, unlike some implementations of vsnprintf(), notably Microsoft Visual Studio (pre-2015), which can leave the string unterminated when truncated.

If the build environment for FLTK has vsnprintf(), [fl\\_vsnprintf\(\)](#) is just a wrapper around the compiler's provided function. Otherwise, if the function is NOT available, FLTK's own built-in version is provided.

The FLTK built in provides these style options:

- %[ -+#]
- \* – padding width
- .\* – precision width
- Data types: h, l, ll, L
- Floating point formats: E, G, e, f, g
- Integer formats: B, X, b, d, i, o, u, x
- Pointer format: p
- String/char: c, s, n

## 34.251 Utf8.h

```
1 /*
2 * Author: Jean-Marc Lienher ( http://oksid.ch )
3 * Copyright 2000-2010 by O'ksi'D.
4 *
5 * This library is free software. Distribution and use rights are outlined in
6 * the file "COPYING" which should have been included with this file. If this
7 * file is missing or damaged, see the license at:
8 *
9 * https://www.fltk.org/COPYING.php
10 *
11 * Please see the following page on how to report bugs and issues:
12 *
13 * https://www.fltk.org/bugs.php
14 */
15
16 #if ! ( defined(_Utf8_h) || defined(FL_DOXYGEN) )
17 #define _Utf8_h
18
19 # ifdef __cplusplus
20 extern "C" {
21 # endif
22
23 #include <X11/X.h>
24 #include <X11/Xlib.h>
```

```

25 #include <X11/Xlocale.h>
26 #include <X11/Xutil.h>
27 #include <FL/Fl_Export.H>
28
29 typedef struct {
30     int nb_font;
31     char **font_name_list;
32     int *encodings;
33     XFontStruct **fonts;
34     Font fid;
35     int ascent;
36     int descent;
37     int *ranges;
38 } XUtf8FontStruct;
39
40 XUtf8FontStruct *
41 XCreateUtf8FontStruct (
42     Display          *dpy,
43     const char       *base_font_name_list);
44
45 void
46 XUtf8DrawString(
47     Display          *display,
48     Drawable         d,
49     XUtf8FontStruct *font_set,
50     GC               gc,
51     int              x,
52     int              y,
53     const char       *string,
54     int              num_bytes);
55
56 void
57 XUtf8_measure_extents(
58     Display          *display,
59     Drawable         d,
60     XUtf8FontStruct *font_set,
61     GC               gc,
62     int              *xx,
63     int              *yy,
64     int              *ww,
65     int              *hh,
66     const char       *string,
67     int              num_bytes);
68
69 void
70 XUtf8DrawRtlString(
71     Display          *display,
72     Drawable         d,
73     XUtf8FontStruct *font_set,
74     GC               gc,
75     int              x,
76     int              y,
77     const char       *string,
78     int              num_bytes);
79
80 void
81 XUtf8DrawImageString(
82     Display          *display,
83     Drawable         d,
84     XUtf8FontStruct *font_set,
85     GC               gc,
86     int              x,
87     int              y,
88     const char       *string,
89     int              num_bytes);
90
91 int
92 XUtf8TextWidth(
93     XUtf8FontStruct *font_set,
94     const char       *string,
95     int              num_bytes);
96
97 int
98 XUtf8UcsWidth(
99     XUtf8FontStruct *font_set,
100     unsigned int    ucs);
101
102 FL_EXPORT int
103 fl_XGetUtf8FontAndGlyph(
104     XUtf8FontStruct *font_set,
105     unsigned int    ucs,
106     XFontStruct     **fnt,
107     unsigned short  *id);
108
109 void
110 XFreeUtf8FontStruct (
111     Display          *dpy,
112     XUtf8FontStruct *font_set);

```

```

112
113
114 int
115 XConvertUtf8ToUcs (
116     const unsigned char    *buf,
117     int                    len,
118     unsigned int           *ucs);
119
120 int
121 XConvertUcsToUtf8 (
122     unsigned int           ucs,
123     char                  *buf);
124
125 int
126 XUtf8CharByteLen (
127     const unsigned char    *buf,
128     int                    len);
129
130 int
131 XCountUtf8Char (
132     const unsigned char *buf,
133     int len);
134
135 int
136 XFastConvertUtf8ToUcs (
137     const unsigned char    *buf,
138     int                    len,
139     unsigned int           *ucs);
140
141 long
142 XKeysymToUcs (
143     KeySym    keysym);
144
145 #ifdef X_HAVE_UTF8_STRING
146 #define XUtf8LookupString Xutf8LookupString
147 #else
148 int
149 XUtf8LookupString (
150     XIC                ic,
151     XKeyPressedEvent* event,
152     char*              buffer_return,
153     int               bytes_buffer,
154     KeySym*           keysym,
155     Status*           status_return);
156 #endif
157
158 # ifdef __cplusplus
159 }
160 # endif
161
162 #endif

```

## 34.252 case.h

```

1  /* spacing */
2
3  static const unsigned short ucs_table_0041[] = {
4  /* U+0041 */ 0x0061,
5  /* U+0042 */ 0x0062,
6  /* U+0043 */ 0x0063,
7  /* U+0044 */ 0x0064,
8  /* U+0045 */ 0x0065,
9  /* U+0046 */ 0x0066,
10 /* U+0047 */ 0x0067,
11 /* U+0048 */ 0x0068,
12 /* U+0049 */ 0x0069,
13 /* U+004A */ 0x006A,
14 /* U+004B */ 0x006B,
15 /* U+004C */ 0x006C,
16 /* U+004D */ 0x006D,
17 /* U+004E */ 0x006E,
18 /* U+004F */ 0x006F,
19 /* U+0050 */ 0x0070,
20 /* U+0051 */ 0x0071,
21 /* U+0052 */ 0x0072,
22 /* U+0053 */ 0x0073,
23 /* U+0054 */ 0x0074,
24 /* U+0055 */ 0x0075,
25 /* U+0056 */ 0x0076,
26 /* U+0057 */ 0x0077,
27 /* U+0058 */ 0x0078,
28 /* U+0059 */ 0x0079,
29 /* U+005A */ 0x007A,
30 0x00,
31 0x00,

```

```
32 0x00,  
33 0x00,  
34 0x00,  
35 0x00,  
36 0x00,  
37 0x00,  
38 0x00,  
39 0x00,  
40 0x00,  
41 0x00,  
42 0x00,  
43 0x00,  
44 0x00,  
45 0x00,  
46 0x00,  
47 0x00,  
48 0x00,  
49 0x00,  
50 0x00,  
51 0x00,  
52 0x00,  
53 0x00,  
54 0x00,  
55 0x00,  
56 0x00,  
57 0x00,  
58 0x00,  
59 0x00,  
60 0x00,  
61 0x00,  
62 0x00,  
63 0x00,  
64 0x00,  
65 0x00,  
66 0x00,  
67 0x00,  
68 0x00,  
69 0x00,  
70 0x00,  
71 0x00,  
72 0x00,  
73 0x00,  
74 0x00,  
75 0x00,  
76 0x00,  
77 0x00,  
78 0x00,  
79 0x00,  
80 0x00,  
81 0x00,  
82 0x00,  
83 0x00,  
84 0x00,  
85 0x00,  
86 0x00,  
87 0x00,  
88 0x00,  
89 0x00,  
90 0x00,  
91 0x00,  
92 0x00,  
93 0x00,  
94 0x00,  
95 0x00,  
96 0x00,  
97 0x00,  
98 0x00,  
99 0x00,  
100 0x00,  
101 0x00,  
102 0x00,  
103 0x00,  
104 0x00,  
105 0x00,  
106 0x00,  
107 0x00,  
108 0x00,  
109 0x00,  
110 0x00,  
111 0x00,  
112 0x00,  
113 0x00,  
114 0x00,  
115 0x00,  
116 0x00,  
117 0x00,  
118 0x00,
```

```
119 0x00,
120 0x00,
121 0x00,
122 0x00,
123 0x00,
124 0x00,
125 0x00,
126 0x00,
127 0x00,
128 0x00,
129 0x00,
130 0x00,
131 /* U+00C0 */ 0x00E0,
132 /* U+00C1 */ 0x00E1,
133 /* U+00C2 */ 0x00E2,
134 /* U+00C3 */ 0x00E3,
135 /* U+00C4 */ 0x00E4,
136 /* U+00C5 */ 0x00E5,
137 /* U+00C6 */ 0x00E6,
138 /* U+00C7 */ 0x00E7,
139 /* U+00C8 */ 0x00E8,
140 /* U+00C9 */ 0x00E9,
141 /* U+00CA */ 0x00EA,
142 /* U+00CB */ 0x00EB,
143 /* U+00CC */ 0x00EC,
144 /* U+00CD */ 0x00ED,
145 /* U+00CE */ 0x00EE,
146 /* U+00CF */ 0x00EF,
147 /* U+00D0 */ 0x00F0,
148 /* U+00D1 */ 0x00F1,
149 /* U+00D2 */ 0x00F2,
150 /* U+00D3 */ 0x00F3,
151 /* U+00D4 */ 0x00F4,
152 /* U+00D5 */ 0x00F5,
153 /* U+00D6 */ 0x00F6,
154 0x00,
155 /* U+00D8 */ 0x00F8,
156 /* U+00D9 */ 0x00F9,
157 /* U+00DA */ 0x00FA,
158 /* U+00DB */ 0x00FB,
159 /* U+00DC */ 0x00FC,
160 /* U+00DD */ 0x00FD,
161 /* U+00DE */ 0x00FE,
162 0x00,
163 0x00,
164 0x00,
165 0x00,
166 0x00,
167 0x00,
168 0x00,
169 0x00,
170 0x00,
171 0x00,
172 0x00,
173 0x00,
174 0x00,
175 0x00,
176 0x00,
177 0x00,
178 0x00,
179 0x00,
180 0x00,
181 0x00,
182 0x00,
183 0x00,
184 0x00,
185 0x00,
186 0x00,
187 0x00,
188 0x00,
189 0x00,
190 0x00,
191 0x00,
192 0x00,
193 0x00,
194 0x00,
195 /* U+0100 */ 0x0101,
196 0x00,
197 /* U+0102 */ 0x0103,
198 0x00,
199 /* U+0104 */ 0x0105,
200 0x00,
201 /* U+0106 */ 0x0107,
202 0x00,
203 /* U+0108 */ 0x0109,
204 0x00,
205 /* U+010A */ 0x010B,
```

```
206 0x00,
207 /* U+010C */ 0x010D,
208 0x00,
209 /* U+010E */ 0x010F,
210 0x00,
211 /* U+0110 */ 0x0111,
212 0x00,
213 /* U+0112 */ 0x0113,
214 0x00,
215 /* U+0114 */ 0x0115,
216 0x00,
217 /* U+0116 */ 0x0117,
218 0x00,
219 /* U+0118 */ 0x0119,
220 0x00,
221 /* U+011A */ 0x011B,
222 0x00,
223 /* U+011C */ 0x011D,
224 0x00,
225 /* U+011E */ 0x011F,
226 0x00,
227 /* U+0120 */ 0x0121,
228 0x00,
229 /* U+0122 */ 0x0123,
230 0x00,
231 /* U+0124 */ 0x0125,
232 0x00,
233 /* U+0126 */ 0x0127,
234 0x00,
235 /* U+0128 */ 0x0129,
236 0x00,
237 /* U+012A */ 0x012B,
238 0x00,
239 /* U+012C */ 0x012D,
240 0x00,
241 /* U+012E */ 0x012F,
242 0x00,
243 /* U+0130 */ 0x0,
244 0x00,
245 /* U+0132 */ 0x0133,
246 0x00,
247 /* U+0134 */ 0x0135,
248 0x00,
249 /* U+0136 */ 0x0137,
250 0x00,
251 0x00,
252 /* U+0139 */ 0x013A,
253 0x00,
254 /* U+013B */ 0x013C,
255 0x00,
256 /* U+013D */ 0x013E,
257 0x00,
258 /* U+013F */ 0x0140,
259 0x00,
260 /* U+0141 */ 0x0142,
261 0x00,
262 /* U+0143 */ 0x0144,
263 0x00,
264 /* U+0145 */ 0x0146,
265 0x00,
266 /* U+0147 */ 0x0148,
267 0x00,
268 0x00,
269 /* U+014A */ 0x014B,
270 0x00,
271 /* U+014C */ 0x014D,
272 0x00,
273 /* U+014E */ 0x014F,
274 0x00,
275 /* U+0150 */ 0x0151,
276 0x00,
277 /* U+0152 */ 0x0153,
278 0x00,
279 /* U+0154 */ 0x0155,
280 0x00,
281 /* U+0156 */ 0x0157,
282 0x00,
283 /* U+0158 */ 0x0159,
284 0x00,
285 /* U+015A */ 0x015B,
286 0x00,
287 /* U+015C */ 0x015D,
288 0x00,
289 /* U+015E */ 0x015F,
290 0x00,
291 /* U+0160 */ 0x0161,
292 0x00,
```

```
293 /* U+0162 */ 0x0163,
294 0x00,
295 /* U+0164 */ 0x0165,
296 0x00,
297 /* U+0166 */ 0x0167,
298 0x00,
299 /* U+0168 */ 0x0169,
300 0x00,
301 /* U+016A */ 0x016B,
302 0x00,
303 /* U+016C */ 0x016D,
304 0x00,
305 /* U+016E */ 0x016F,
306 0x00,
307 /* U+0170 */ 0x0171,
308 0x00,
309 /* U+0172 */ 0x0173,
310 0x00,
311 /* U+0174 */ 0x0175,
312 0x00,
313 /* U+0176 */ 0x0177,
314 0x00,
315 /* U+0178 */ 0x00FF,
316 /* U+0179 */ 0x017A,
317 0x00,
318 /* U+017B */ 0x017C,
319 0x00,
320 /* U+017D */ 0x017E,
321 0x00,
322 0x00,
323 0x00,
324 /* U+0181 */ 0x0253,
325 /* U+0182 */ 0x0183,
326 0x00,
327 /* U+0184 */ 0x0185,
328 0x00,
329 /* U+0186 */ 0x0254,
330 /* U+0187 */ 0x0188,
331 0x00,
332 /* U+0189 */ 0x0,
333 /* U+018A */ 0x0257,
334 /* U+018B */ 0x018C,
335 0x00,
336 0x00,
337 /* U+018E */ 0x0258,
338 /* U+018F */ 0x0259,
339 /* U+0190 */ 0x025B,
340 /* U+0191 */ 0x0192,
341 0x00,
342 /* U+0193 */ 0x0260,
343 /* U+0194 */ 0x0263,
344 0x00,
345 /* U+0196 */ 0x0269,
346 /* U+0197 */ 0x0268,
347 /* U+0198 */ 0x0199,
348 0x00,
349 0x00,
350 0x00,
351 /* U+019C */ 0x026F,
352 /* U+019D */ 0x0272,
353 0x00,
354 /* U+019F */ 0x0,
355 /* U+01A0 */ 0x01A1,
356 0x00,
357 /* U+01A2 */ 0x01A3,
358 0x00,
359 /* U+01A4 */ 0x01A5,
360 0x00,
361 0x00,
362 /* U+01A7 */ 0x01A8,
363 0x00,
364 /* U+01A9 */ 0x0283,
365 0x00,
366 0x00,
367 /* U+01AC */ 0x01AD,
368 0x00,
369 /* U+01AE */ 0x0288,
370 /* U+01AF */ 0x01B0,
371 0x00,
372 /* U+01B1 */ 0x028A,
373 /* U+01B2 */ 0x028B,
374 /* U+01B3 */ 0x01B4,
375 0x00,
376 /* U+01B5 */ 0x01B6,
377 0x00,
378 /* U+01B7 */ 0x0292,
379 /* U+01B8 */ 0x01B9,
```

```
380 0x00,
381 0x00,
382 0x00,
383 /* U+01BC */ 0x01BD,
384 0x00,
385 0x00,
386 0x00,
387 0x00,
388 0x00,
389 0x00,
390 0x00,
391 /* U+01C4 */ 0x01C6,
392 /* U+01C5 */ 0x0,
393 0x00,
394 /* U+01C7 */ 0x01C9,
395 /* U+01C8 */ 0x0,
396 0x00,
397 /* U+01CA */ 0x01CC,
398 /* U+01CB */ 0x0,
399 0x00,
400 /* U+01CD */ 0x01CE,
401 0x00,
402 /* U+01CF */ 0x01D0,
403 0x00,
404 /* U+01D1 */ 0x01D2,
405 0x00,
406 /* U+01D3 */ 0x01D4,
407 0x00,
408 /* U+01D5 */ 0x01D6,
409 0x00,
410 /* U+01D7 */ 0x01D8,
411 0x00,
412 /* U+01D9 */ 0x01DA,
413 0x00,
414 /* U+01DB */ 0x01DC,
415 0x00,
416 0x00,
417 /* U+01DE */ 0x01DF,
418 0x00,
419 /* U+01E0 */ 0x01E1,
420 0x00,
421 /* U+01E2 */ 0x01E3,
422 0x00,
423 /* U+01E4 */ 0x01E5,
424 0x00,
425 /* U+01E6 */ 0x01E7,
426 0x00,
427 /* U+01E8 */ 0x01E9,
428 0x00,
429 /* U+01EA */ 0x01EB,
430 0x00,
431 /* U+01EC */ 0x01ED,
432 0x00,
433 /* U+01EE */ 0x01EF,
434 0x00,
435 0x00,
436 /* U+01F1 */ 0x01F3,
437 /* U+01F2 */ 0x0,
438 0x00,
439 /* U+01F4 */ 0x01F5,
440 0x00,
441 0x00,
442 0x00,
443 0x00,
444 0x00,
445 /* U+01FA */ 0x01FB,
446 0x00,
447 /* U+01FC */ 0x01FD,
448 0x00,
449 /* U+01FE */ 0x01FF,
450 0x00,
451 /* U+0200 */ 0x0201,
452 0x00,
453 /* U+0202 */ 0x0203,
454 0x00,
455 /* U+0204 */ 0x0205,
456 0x00,
457 /* U+0206 */ 0x0207,
458 0x00,
459 /* U+0208 */ 0x0209,
460 0x00,
461 /* U+020A */ 0x020B,
462 0x00,
463 /* U+020C */ 0x020D,
464 0x00,
465 /* U+020E */ 0x020F,
466 0x00,
```

```
467 /* U+0210 */ 0x0211,
468 0x00,
469 /* U+0212 */ 0x0213,
470 0x00,
471 /* U+0214 */ 0x0215,
472 0x00,
473 /* U+0216 */ 0x0217,
474 0x00,
475 0x00,
476 0x00,
477 0x00,
478 0x00,
479 0x00,
480 0x00,
481 0x00,
482 0x00,
483 0x00,
484 0x00,
485 0x00,
486 0x00,
487 0x00,
488 0x00,
489 0x00,
490 0x00,
491 0x00,
492 0x00,
493 0x00,
494 0x00,
495 0x00,
496 0x00,
497 0x00,
498 0x00,
499 0x00,
500 0x00,
501 0x00,
502 0x00,
503 0x00,
504 0x00,
505 0x00,
506 0x00,
507 0x00,
508 0x00,
509 0x00,
510 0x00,
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512 0x00,
513 0x00,
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518 0x00,
519 0x00,
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521 0x00,
522 0x00,
523 0x00,
524 0x00,
525 0x00,
526 0x00,
527 0x00,
528 0x00,
529 0x00,
530 0x00,
531 0x00,
532 0x00,
533 0x00,
534 0x00,
535 0x00,
536 0x00,
537 0x00,
538 0x00,
539 0x00,
540 0x00,
541 0x00,
542 0x00,
543 0x00,
544 0x00,
545 0x00,
546 0x00,
547 0x00,
548 0x00,
549 /* U+0262 */ 0x0,
550 0x00,
551 0x00,
552 0x00,
553 0x00,
```

```
554 0x00,
555 0x00,
556 0x00,
557 /* U+026A */ 0x0,
558 0x00,
559 0x00,
560 0x00,
561 0x00,
562 0x00,
563 0x00,
564 0x00,
565 0x00,
566 0x00,
567 /* U+0274 */ 0x0,
568 0x00,
569 /* U+0276 */ 0x0,
570 0x00,
571 0x00,
572 0x00,
573 0x00,
574 0x00,
575 0x00,
576 0x00,
577 0x00,
578 0x00,
579 /* U+0280 */ 0x0,
580 /* U+0281 */ 0x0,
581 0x00,
582 0x00,
583 0x00,
584 0x00,
585 0x00,
586 0x00,
587 0x00,
588 0x00,
589 0x00,
590 0x00,
591 0x00,
592 0x00,
593 0x00,
594 /* U+028F */ 0x0,
595 0x00,
596 0x00,
597 0x00,
598 0x00,
599 0x00,
600 0x00,
601 0x00,
602 0x00,
603 0x00,
604 /* U+0299 */ 0x0,
605 0x00,
606 /* U+029B */ 0x0,
607 /* U+029C */ 0x0,
608 0x00,
609 0x00,
610 /* U+029F */ 0x0,
611 0x00,
612 0x00,
613 0x00,
614 0x00,
615 0x00,
616 0x00,
617 0x00,
618 0x00,
619 0x00,
620 0x00,
621 0x00,
622 0x00,
623 0x00,
624 0x00,
625 0x00,
626 0x00,
627 0x00,
628 0x00,
629 0x00,
630 0x00,
631 0x00,
632 0x00,
633 /* U+02B6 */ 0x0,
634 };
635
636 static const unsigned short ucs_table_0386[] = {
637 /* U+0386 */ 0x03AC,
638 0x00,
639 /* U+0388 */ 0x03AD,
640 /* U+0389 */ 0x03AE,
```

```
641 /* U+038A */ 0x03AF,
642 0x00,
643 /* U+038C */ 0x03CC,
644 0x00,
645 /* U+038E */ 0x03CD,
646 /* U+038F */ 0x03CE,
647 0x00,
648 /* U+0391 */ 0x03B1,
649 /* U+0392 */ 0x03B2,
650 /* U+0393 */ 0x03B3,
651 /* U+0394 */ 0x03B4,
652 /* U+0395 */ 0x03B5,
653 /* U+0396 */ 0x03B6,
654 /* U+0397 */ 0x03B7,
655 /* U+0398 */ 0x03B8,
656 /* U+0399 */ 0x03B9,
657 /* U+039A */ 0x03BA,
658 /* U+039B */ 0x03BB,
659 /* U+039C */ 0x03BC,
660 /* U+039D */ 0x03BD,
661 /* U+039E */ 0x03BE,
662 /* U+039F */ 0x03BF,
663 /* U+03A0 */ 0x03C0,
664 /* U+03A1 */ 0x03C1,
665 0x00,
666 /* U+03A3 */ 0x03C3,
667 /* U+03A4 */ 0x03C4,
668 /* U+03A5 */ 0x03C5,
669 /* U+03A6 */ 0x03C6,
670 /* U+03A7 */ 0x03C7,
671 /* U+03A8 */ 0x03C8,
672 /* U+03A9 */ 0x03C9,
673 /* U+03AA */ 0x03CA,
674 /* U+03AB */ 0x03CB,
675 0x00,
676 0x00,
677 0x00,
678 0x00,
679 0x00,
680 0x00,
681 0x00,
682 0x00,
683 0x00,
684 0x00,
685 0x00,
686 0x00,
687 0x00,
688 0x00,
689 0x00,
690 0x00,
691 0x00,
692 0x00,
693 0x00,
694 0x00,
695 0x00,
696 0x00,
697 0x00,
698 0x00,
699 0x00,
700 0x00,
701 0x00,
702 0x00,
703 0x00,
704 0x00,
705 0x00,
706 0x00,
707 0x00,
708 0x00,
709 0x00,
710 0x00,
711 0x00,
712 0x00,
713 /* U+03D2 */ 0x03D2,
714 /* U+03D3 */ 0x03D3,
715 /* U+03D4 */ 0x03D4,
716 0x00,
717 0x00,
718 0x00,
719 0x00,
720 0x00,
721 /* U+03DA */ 0x03DA,
722 0x00,
723 /* U+03DC */ 0x03DC,
724 0x00,
725 /* U+03DE */ 0x03DE,
726 0x00,
727 /* U+03E0 */ 0x03E0,
```

```
728 0x00,
729 /* U+03E2 */ 0x03E3,
730 0x00,
731 /* U+03E4 */ 0x03E5,
732 0x00,
733 /* U+03E6 */ 0x03E7,
734 0x00,
735 /* U+03E8 */ 0x03E9,
736 0x00,
737 /* U+03EA */ 0x03EB,
738 0x00,
739 /* U+03EC */ 0x03ED,
740 0x00,
741 /* U+03EE */ 0x03EF,
742 0x00,
743 0x00,
744 0x00,
745 0x00,
746 0x00,
747 0x00,
748 0x00,
749 0x00,
750 0x00,
751 0x00,
752 0x00,
753 0x00,
754 0x00,
755 0x00,
756 0x00,
757 0x00,
758 0x00,
759 0x00,
760 /* U+0401 */ 0x0451,
761 /* U+0402 */ 0x0452,
762 /* U+0403 */ 0x0453,
763 /* U+0404 */ 0x0454,
764 /* U+0405 */ 0x0455,
765 /* U+0406 */ 0x0456,
766 /* U+0407 */ 0x0457,
767 /* U+0408 */ 0x0458,
768 /* U+0409 */ 0x0459,
769 /* U+040A */ 0x045A,
770 /* U+040B */ 0x045B,
771 /* U+040C */ 0x045C,
772 0x00,
773 /* U+040E */ 0x045E,
774 /* U+040F */ 0x045F,
775 /* U+0410 */ 0x0430,
776 /* U+0411 */ 0x0431,
777 /* U+0412 */ 0x0432,
778 /* U+0413 */ 0x0433,
779 /* U+0414 */ 0x0434,
780 /* U+0415 */ 0x0435,
781 /* U+0416 */ 0x0436,
782 /* U+0417 */ 0x0437,
783 /* U+0418 */ 0x0438,
784 /* U+0419 */ 0x0439,
785 /* U+041A */ 0x043A,
786 /* U+041B */ 0x043B,
787 /* U+041C */ 0x043C,
788 /* U+041D */ 0x043D,
789 /* U+041E */ 0x043E,
790 /* U+041F */ 0x043F,
791 /* U+0420 */ 0x0440,
792 /* U+0421 */ 0x0441,
793 /* U+0422 */ 0x0442,
794 /* U+0423 */ 0x0443,
795 /* U+0424 */ 0x0444,
796 /* U+0425 */ 0x0445,
797 /* U+0426 */ 0x0446,
798 /* U+0427 */ 0x0447,
799 /* U+0428 */ 0x0448,
800 /* U+0429 */ 0x0449,
801 /* U+042A */ 0x044A,
802 /* U+042B */ 0x044B,
803 /* U+042C */ 0x044C,
804 /* U+042D */ 0x044D,
805 /* U+042E */ 0x044E,
806 /* U+042F */ 0x044F,
807 0x00,
808 0x00,
809 0x00,
810 0x00,
811 0x00,
812 0x00,
813 0x00,
814 0x00,
```

```
815 0x00,
816 0x00,
817 0x00,
818 0x00,
819 0x00,
820 0x00,
821 0x00,
822 0x00,
823 0x00,
824 0x00,
825 0x00,
826 0x00,
827 0x00,
828 0x00,
829 0x00,
830 0x00,
831 0x00,
832 0x00,
833 0x00,
834 0x00,
835 0x00,
836 0x00,
837 0x00,
838 0x00,
839 0x00,
840 0x00,
841 0x00,
842 0x00,
843 0x00,
844 0x00,
845 0x00,
846 0x00,
847 0x00,
848 0x00,
849 0x00,
850 0x00,
851 0x00,
852 0x00,
853 0x00,
854 0x00,
855 /* U+0460 */ 0x0461,
856 0x00,
857 /* U+0462 */ 0x0463,
858 0x00,
859 /* U+0464 */ 0x0465,
860 0x00,
861 /* U+0466 */ 0x0467,
862 0x00,
863 /* U+0468 */ 0x0469,
864 0x00,
865 /* U+046A */ 0x046B,
866 0x00,
867 /* U+046C */ 0x046D,
868 0x00,
869 /* U+046E */ 0x046F,
870 0x00,
871 /* U+0470 */ 0x0471,
872 0x00,
873 /* U+0472 */ 0x0473,
874 0x00,
875 /* U+0474 */ 0x0475,
876 0x00,
877 /* U+0476 */ 0x0477,
878 0x00,
879 /* U+0478 */ 0x0479,
880 0x00,
881 /* U+047A */ 0x047B,
882 0x00,
883 /* U+047C */ 0x047D,
884 0x00,
885 /* U+047E */ 0x047F,
886 0x00,
887 /* U+0480 */ 0x0481,
888 0x00,
889 0x00,
890 0x00,
891 0x00,
892 0x00,
893 0x00,
894 0x00,
895 0x00,
896 0x00,
897 0x00,
898 0x00,
899 0x00,
900 0x00,
901 0x00,
```

```
902 0x00,
903 /* U+0490 */ 0x0491,
904 0x00,
905 /* U+0492 */ 0x0493,
906 0x00,
907 /* U+0494 */ 0x0495,
908 0x00,
909 /* U+0496 */ 0x0497,
910 0x00,
911 /* U+0498 */ 0x0499,
912 0x00,
913 /* U+049A */ 0x049B,
914 0x00,
915 /* U+049C */ 0x049D,
916 0x00,
917 /* U+049E */ 0x049F,
918 0x00,
919 /* U+04A0 */ 0x04A1,
920 0x00,
921 /* U+04A2 */ 0x04A3,
922 0x00,
923 /* U+04A4 */ 0x04A5,
924 0x00,
925 /* U+04A6 */ 0x04A7,
926 0x00,
927 /* U+04A8 */ 0x04A9,
928 0x00,
929 /* U+04AA */ 0x04AB,
930 0x00,
931 /* U+04AC */ 0x04AD,
932 0x00,
933 /* U+04AE */ 0x04AF,
934 0x00,
935 /* U+04B0 */ 0x04B1,
936 0x00,
937 /* U+04B2 */ 0x04B3,
938 0x00,
939 /* U+04B4 */ 0x04B5,
940 0x00,
941 /* U+04B6 */ 0x04B7,
942 0x00,
943 /* U+04B8 */ 0x04B9,
944 0x00,
945 /* U+04BA */ 0x04BB,
946 0x00,
947 /* U+04BC */ 0x04BD,
948 0x00,
949 /* U+04BE */ 0x04BF,
950 0x00,
951 0x00,
952 /* U+04C1 */ 0x04C2,
953 0x00,
954 /* U+04C3 */ 0x04C4,
955 0x00,
956 0x00,
957 0x00,
958 /* U+04C7 */ 0x04C8,
959 0x00,
960 0x00,
961 0x00,
962 /* U+04CB */ 0x04CC,
963 0x00,
964 0x00,
965 0x00,
966 0x00,
967 /* U+04D0 */ 0x04D1,
968 0x00,
969 /* U+04D2 */ 0x04D3,
970 0x00,
971 /* U+04D4 */ 0x04D5,
972 0x00,
973 /* U+04D6 */ 0x04D7,
974 0x00,
975 /* U+04D8 */ 0x04D9,
976 0x00,
977 /* U+04DA */ 0x04DB,
978 0x00,
979 /* U+04DC */ 0x04DD,
980 0x00,
981 /* U+04DE */ 0x04DF,
982 0x00,
983 /* U+04E0 */ 0x04E1,
984 0x00,
985 /* U+04E2 */ 0x04E3,
986 0x00,
987 /* U+04E4 */ 0x04E5,
988 0x00,
```

```
989 /* U+04E6 */ 0x04E7,
990 0x00,
991 /* U+04E8 */ 0x04E9,
992 0x00,
993 /* U+04EA */ 0x04EB,
994 0x00,
995 0x00,
996 0x00,
997 /* U+04EE */ 0x04EF,
998 0x00,
999 /* U+04F0 */ 0x04F1,
1000 0x00,
1001 /* U+04F2 */ 0x04F3,
1002 0x00,
1003 /* U+04F4 */ 0x04F5,
1004 0x00,
1005 0x00,
1006 0x00,
1007 /* U+04F8 */ 0x04F9,
1008 0x00,
1009 0x00,
1010 0x00,
1011 0x00,
1012 0x00,
1013 0x00,
1014 0x00,
1015 0x00,
1016 0x00,
1017 0x00,
1018 0x00,
1019 0x00,
1020 0x00,
1021 0x00,
1022 0x00,
1023 0x00,
1024 0x00,
1025 0x00,
1026 0x00,
1027 0x00,
1028 0x00,
1029 0x00,
1030 0x00,
1031 0x00,
1032 0x00,
1033 0x00,
1034 0x00,
1035 0x00,
1036 0x00,
1037 0x00,
1038 0x00,
1039 0x00,
1040 0x00,
1041 0x00,
1042 0x00,
1043 0x00,
1044 0x00,
1045 0x00,
1046 0x00,
1047 0x00,
1048 0x00,
1049 0x00,
1050 0x00,
1051 0x00,
1052 0x00,
1053 0x00,
1054 0x00,
1055 0x00,
1056 0x00,
1057 0x00,
1058 0x00,
1059 0x00,
1060 0x00,
1061 0x00,
1062 0x00,
1063 0x00,
1064 /* U+0531 */ 0x0561,
1065 /* U+0532 */ 0x0562,
1066 /* U+0533 */ 0x0563,
1067 /* U+0534 */ 0x0564,
1068 /* U+0535 */ 0x0565,
1069 /* U+0536 */ 0x0566,
1070 /* U+0537 */ 0x0567,
1071 /* U+0538 */ 0x0568,
1072 /* U+0539 */ 0x0569,
1073 /* U+053A */ 0x056A,
1074 /* U+053B */ 0x056B,
1075 /* U+053C */ 0x056C,
```

```
1076 /* U+053D */ 0x056D,
1077 /* U+053E */ 0x056E,
1078 /* U+053F */ 0x056F,
1079 /* U+0540 */ 0x0570,
1080 /* U+0541 */ 0x0571,
1081 /* U+0542 */ 0x0572,
1082 /* U+0543 */ 0x0573,
1083 /* U+0544 */ 0x0574,
1084 /* U+0545 */ 0x0575,
1085 /* U+0546 */ 0x0576,
1086 /* U+0547 */ 0x0577,
1087 /* U+0548 */ 0x0578,
1088 /* U+0549 */ 0x0579,
1089 /* U+054A */ 0x057A,
1090 /* U+054B */ 0x057B,
1091 /* U+054C */ 0x057C,
1092 /* U+054D */ 0x057D,
1093 /* U+054E */ 0x057E,
1094 /* U+054F */ 0x057F,
1095 /* U+0550 */ 0x0580,
1096 /* U+0551 */ 0x0581,
1097 /* U+0552 */ 0x0582,
1098 /* U+0553 */ 0x0583,
1099 /* U+0554 */ 0x0584,
1100 /* U+0555 */ 0x0585,
1101 /* U+0556 */ 0x0586,
1102 };
1103
1104 static const unsigned short ucs_table_10A0[] = {
1105 /* U+10A0 */ 0x10D0,
1106 /* U+10A1 */ 0x10D1,
1107 /* U+10A2 */ 0x10D2,
1108 /* U+10A3 */ 0x10D3,
1109 /* U+10A4 */ 0x10D4,
1110 /* U+10A5 */ 0x10D5,
1111 /* U+10A6 */ 0x10D6,
1112 /* U+10A7 */ 0x10D7,
1113 /* U+10A8 */ 0x10D8,
1114 /* U+10A9 */ 0x10D9,
1115 /* U+10AA */ 0x10DA,
1116 /* U+10AB */ 0x10DB,
1117 /* U+10AC */ 0x10DC,
1118 /* U+10AD */ 0x10DD,
1119 /* U+10AE */ 0x10DE,
1120 /* U+10AF */ 0x10DF,
1121 /* U+10B0 */ 0x10E0,
1122 /* U+10B1 */ 0x10E1,
1123 /* U+10B2 */ 0x10E2,
1124 /* U+10B3 */ 0x10E3,
1125 /* U+10B4 */ 0x10E4,
1126 /* U+10B5 */ 0x10E5,
1127 /* U+10B6 */ 0x10E6,
1128 /* U+10B7 */ 0x10E7,
1129 /* U+10B8 */ 0x10E8,
1130 /* U+10B9 */ 0x10E9,
1131 /* U+10BA */ 0x10EA,
1132 /* U+10BB */ 0x10EB,
1133 /* U+10BC */ 0x10EC,
1134 /* U+10BD */ 0x10ED,
1135 /* U+10BE */ 0x10EE,
1136 /* U+10BF */ 0x10EF,
1137 /* U+10C0 */ 0x10F0,
1138 /* U+10C1 */ 0x10F1,
1139 /* U+10C2 */ 0x10F2,
1140 /* U+10C3 */ 0x10F3,
1141 /* U+10C4 */ 0x10F4,
1142 /* U+10C5 */ 0x10F5,
1143 };
1144
1145 static const unsigned short ucs_table_1E00[] = {
1146 /* U+1E00 */ 0x1E01,
1147 0x00,
1148 /* U+1E02 */ 0x1E03,
1149 0x00,
1150 /* U+1E04 */ 0x1E05,
1151 0x00,
1152 /* U+1E06 */ 0x1E07,
1153 0x00,
1154 /* U+1E08 */ 0x1E09,
1155 0x00,
1156 /* U+1E0A */ 0x1E0B,
1157 0x00,
1158 /* U+1E0C */ 0x1E0D,
1159 0x00,
1160 /* U+1E0E */ 0x1E0F,
1161 0x00,
1162 /* U+1E10 */ 0x1E11,
```

```
1163 0x00,
1164 /* U+1E12 */ 0x1E13,
1165 0x00,
1166 /* U+1E14 */ 0x1E15,
1167 0x00,
1168 /* U+1E16 */ 0x1E17,
1169 0x00,
1170 /* U+1E18 */ 0x1E19,
1171 0x00,
1172 /* U+1E1A */ 0x1E1B,
1173 0x00,
1174 /* U+1E1C */ 0x1E1D,
1175 0x00,
1176 /* U+1E1E */ 0x1E1F,
1177 0x00,
1178 /* U+1E20 */ 0x1E21,
1179 0x00,
1180 /* U+1E22 */ 0x1E23,
1181 0x00,
1182 /* U+1E24 */ 0x1E25,
1183 0x00,
1184 /* U+1E26 */ 0x1E27,
1185 0x00,
1186 /* U+1E28 */ 0x1E29,
1187 0x00,
1188 /* U+1E2A */ 0x1E2B,
1189 0x00,
1190 /* U+1E2C */ 0x1E2D,
1191 0x00,
1192 /* U+1E2E */ 0x1E2F,
1193 0x00,
1194 /* U+1E30 */ 0x1E31,
1195 0x00,
1196 /* U+1E32 */ 0x1E33,
1197 0x00,
1198 /* U+1E34 */ 0x1E35,
1199 0x00,
1200 /* U+1E36 */ 0x1E37,
1201 0x00,
1202 /* U+1E38 */ 0x1E39,
1203 0x00,
1204 /* U+1E3A */ 0x1E3B,
1205 0x00,
1206 /* U+1E3C */ 0x1E3D,
1207 0x00,
1208 /* U+1E3E */ 0x1E3F,
1209 0x00,
1210 /* U+1E40 */ 0x1E41,
1211 0x00,
1212 /* U+1E42 */ 0x1E43,
1213 0x00,
1214 /* U+1E44 */ 0x1E45,
1215 0x00,
1216 /* U+1E46 */ 0x1E47,
1217 0x00,
1218 /* U+1E48 */ 0x1E49,
1219 0x00,
1220 /* U+1E4A */ 0x1E4B,
1221 0x00,
1222 /* U+1E4C */ 0x1E4D,
1223 0x00,
1224 /* U+1E4E */ 0x1E4F,
1225 0x00,
1226 /* U+1E50 */ 0x1E51,
1227 0x00,
1228 /* U+1E52 */ 0x1E53,
1229 0x00,
1230 /* U+1E54 */ 0x1E55,
1231 0x00,
1232 /* U+1E56 */ 0x1E57,
1233 0x00,
1234 /* U+1E58 */ 0x1E59,
1235 0x00,
1236 /* U+1E5A */ 0x1E5B,
1237 0x00,
1238 /* U+1E5C */ 0x1E5D,
1239 0x00,
1240 /* U+1E5E */ 0x1E5F,
1241 0x00,
1242 /* U+1E60 */ 0x1E61,
1243 0x00,
1244 /* U+1E62 */ 0x1E63,
1245 0x00,
1246 /* U+1E64 */ 0x1E65,
1247 0x00,
1248 /* U+1E66 */ 0x1E67,
1249 0x00,
```

```
1250 /* U+1E68 */ 0x1E69,
1251 0x00,
1252 /* U+1E6A */ 0x1E6B,
1253 0x00,
1254 /* U+1E6C */ 0x1E6D,
1255 0x00,
1256 /* U+1E6E */ 0x1E6F,
1257 0x00,
1258 /* U+1E70 */ 0x1E71,
1259 0x00,
1260 /* U+1E72 */ 0x1E73,
1261 0x00,
1262 /* U+1E74 */ 0x1E75,
1263 0x00,
1264 /* U+1E76 */ 0x1E77,
1265 0x00,
1266 /* U+1E78 */ 0x1E79,
1267 0x00,
1268 /* U+1E7A */ 0x1E7B,
1269 0x00,
1270 /* U+1E7C */ 0x1E7D,
1271 0x00,
1272 /* U+1E7E */ 0x1E7F,
1273 0x00,
1274 /* U+1E80 */ 0x1E81,
1275 0x00,
1276 /* U+1E82 */ 0x1E83,
1277 0x00,
1278 /* U+1E84 */ 0x1E85,
1279 0x00,
1280 /* U+1E86 */ 0x1E87,
1281 0x00,
1282 /* U+1E88 */ 0x1E89,
1283 0x00,
1284 /* U+1E8A */ 0x1E8B,
1285 0x00,
1286 /* U+1E8C */ 0x1E8D,
1287 0x00,
1288 /* U+1E8E */ 0x1E8F,
1289 0x00,
1290 /* U+1E90 */ 0x1E91,
1291 0x00,
1292 /* U+1E92 */ 0x1E93,
1293 0x00,
1294 /* U+1E94 */ 0x1E95,
1295 0x00,
1296 0x00,
1297 0x00,
1298 0x00,
1299 0x00,
1300 0x00,
1301 0x00,
1302 0x00,
1303 0x00,
1304 0x00,
1305 0x00,
1306 /* U+1EA0 */ 0x1EA1,
1307 0x00,
1308 /* U+1EA2 */ 0x1EA3,
1309 0x00,
1310 /* U+1EA4 */ 0x1EA5,
1311 0x00,
1312 /* U+1EA6 */ 0x1EA7,
1313 0x00,
1314 /* U+1EA8 */ 0x1EA9,
1315 0x00,
1316 /* U+1EAA */ 0x1EAB,
1317 0x00,
1318 /* U+1EAC */ 0x1EAD,
1319 0x00,
1320 /* U+1EAE */ 0x1EAF,
1321 0x00,
1322 /* U+1EB0 */ 0x1EB1,
1323 0x00,
1324 /* U+1EB2 */ 0x1EB3,
1325 0x00,
1326 /* U+1EB4 */ 0x1EB5,
1327 0x00,
1328 /* U+1EB6 */ 0x1EB7,
1329 0x00,
1330 /* U+1EB8 */ 0x1EB9,
1331 0x00,
1332 /* U+1EBA */ 0x1EBB,
1333 0x00,
1334 /* U+1EBC */ 0x1EBD,
1335 0x00,
1336 /* U+1EBE */ 0x1EBF,
```

```
1337 0x00,
1338 /* U+1EC0 */ 0x1EC1,
1339 0x00,
1340 /* U+1EC2 */ 0x1EC3,
1341 0x00,
1342 /* U+1EC4 */ 0x1EC5,
1343 0x00,
1344 /* U+1EC6 */ 0x1EC7,
1345 0x00,
1346 /* U+1EC8 */ 0x1EC9,
1347 0x00,
1348 /* U+1ECA */ 0x1ECB,
1349 0x00,
1350 /* U+1ECC */ 0x1ECD,
1351 0x00,
1352 /* U+1ECE */ 0x1ECF,
1353 0x00,
1354 /* U+1ED0 */ 0x1ED1,
1355 0x00,
1356 /* U+1ED2 */ 0x1ED3,
1357 0x00,
1358 /* U+1ED4 */ 0x1ED5,
1359 0x00,
1360 /* U+1ED6 */ 0x1ED7,
1361 0x00,
1362 /* U+1ED8 */ 0x1ED9,
1363 0x00,
1364 /* U+1EDA */ 0x1EDB,
1365 0x00,
1366 /* U+1EDC */ 0x1EDD,
1367 0x00,
1368 /* U+1EDE */ 0x1EDF,
1369 0x00,
1370 /* U+1EE0 */ 0x1EE1,
1371 0x00,
1372 /* U+1EE2 */ 0x1EE3,
1373 0x00,
1374 /* U+1EE4 */ 0x1EE5,
1375 0x00,
1376 /* U+1EE6 */ 0x1EE7,
1377 0x00,
1378 /* U+1EE8 */ 0x1EE9,
1379 0x00,
1380 /* U+1EEA */ 0x1EEB,
1381 0x00,
1382 /* U+1EEC */ 0x1EED,
1383 0x00,
1384 /* U+1EEE */ 0x1EEF,
1385 0x00,
1386 /* U+1EF0 */ 0x1EF1,
1387 0x00,
1388 /* U+1EF2 */ 0x1EF3,
1389 0x00,
1390 /* U+1EF4 */ 0x1EF5,
1391 0x00,
1392 /* U+1EF6 */ 0x1EF7,
1393 0x00,
1394 /* U+1EF8 */ 0x1EF9,
1395 0x00,
1396 0x00,
1397 0x00,
1398 0x00,
1399 0x00,
1400 0x00,
1401 0x00,
1402 0x00,
1403 0x00,
1404 0x00,
1405 0x00,
1406 0x00,
1407 0x00,
1408 0x00,
1409 0x00,
1410 /* U+1F08 */ 0x1F00,
1411 /* U+1F09 */ 0x1F01,
1412 /* U+1F0A */ 0x1F02,
1413 /* U+1F0B */ 0x1F03,
1414 /* U+1F0C */ 0x1F04,
1415 /* U+1F0D */ 0x1F05,
1416 /* U+1F0E */ 0x1F06,
1417 /* U+1F0F */ 0x1F07,
1418 0x00,
1419 0x00,
1420 0x00,
1421 0x00,
1422 0x00,
1423 0x00,
```

```
1424 0x00,
1425 0x00,
1426 /* U+1F18 */ 0x1F10,
1427 /* U+1F19 */ 0x1F11,
1428 /* U+1F1A */ 0x1F12,
1429 /* U+1F1B */ 0x1F13,
1430 /* U+1F1C */ 0x1F14,
1431 /* U+1F1D */ 0x1F15,
1432 0x00,
1433 0x00,
1434 0x00,
1435 0x00,
1436 0x00,
1437 0x00,
1438 0x00,
1439 0x00,
1440 0x00,
1441 0x00,
1442 /* U+1F28 */ 0x1F20,
1443 /* U+1F29 */ 0x1F21,
1444 /* U+1F2A */ 0x1F22,
1445 /* U+1F2B */ 0x1F23,
1446 /* U+1F2C */ 0x1F24,
1447 /* U+1F2D */ 0x1F25,
1448 /* U+1F2E */ 0x1F26,
1449 /* U+1F2F */ 0x1F27,
1450 0x00,
1451 0x00,
1452 0x00,
1453 0x00,
1454 0x00,
1455 0x00,
1456 0x00,
1457 0x00,
1458 /* U+1F38 */ 0x1F30,
1459 /* U+1F39 */ 0x1F31,
1460 /* U+1F3A */ 0x1F32,
1461 /* U+1F3B */ 0x1F33,
1462 /* U+1F3C */ 0x1F34,
1463 /* U+1F3D */ 0x1F35,
1464 /* U+1F3E */ 0x1F36,
1465 /* U+1F3F */ 0x1F37,
1466 0x00,
1467 0x00,
1468 0x00,
1469 0x00,
1470 0x00,
1471 0x00,
1472 0x00,
1473 0x00,
1474 /* U+1F48 */ 0x1F40,
1475 /* U+1F49 */ 0x1F41,
1476 /* U+1F4A */ 0x1F42,
1477 /* U+1F4B */ 0x1F43,
1478 /* U+1F4C */ 0x1F44,
1479 /* U+1F4D */ 0x1F45,
1480 0x00,
1481 0x00,
1482 0x00,
1483 0x00,
1484 0x00,
1485 0x00,
1486 0x00,
1487 0x00,
1488 0x00,
1489 0x00,
1490 0x00,
1491 /* U+1F59 */ 0x1F51,
1492 0x00,
1493 /* U+1F5B */ 0x1F53,
1494 0x00,
1495 /* U+1F5D */ 0x1F55,
1496 0x00,
1497 /* U+1F5F */ 0x1F57,
1498 0x00,
1499 0x00,
1500 0x00,
1501 0x00,
1502 0x00,
1503 0x00,
1504 0x00,
1505 0x00,
1506 /* U+1F68 */ 0x1F60,
1507 /* U+1F69 */ 0x1F61,
1508 /* U+1F6A */ 0x1F62,
1509 /* U+1F6B */ 0x1F63,
1510 /* U+1F6C */ 0x1F64,
```

```
1511 /* U+1F6D */ 0x1F65,
1512 /* U+1F6E */ 0x1F66,
1513 /* U+1F6F */ 0x1F67,
1514 0x00,
1515 0x00,
1516 0x00,
1517 0x00,
1518 0x00,
1519 0x00,
1520 0x00,
1521 0x00,
1522 0x00,
1523 0x00,
1524 0x00,
1525 0x00,
1526 0x00,
1527 0x00,
1528 0x00,
1529 0x00,
1530 0x00,
1531 0x00,
1532 0x00,
1533 0x00,
1534 0x00,
1535 0x00,
1536 0x00,
1537 0x00,
1538 /* U+1F88 */ 0x0,
1539 /* U+1F89 */ 0x0,
1540 /* U+1F8A */ 0x0,
1541 /* U+1F8B */ 0x0,
1542 /* U+1F8C */ 0x0,
1543 /* U+1F8D */ 0x0,
1544 /* U+1F8E */ 0x0,
1545 /* U+1F8F */ 0x0,
1546 0x00,
1547 0x00,
1548 0x00,
1549 0x00,
1550 0x00,
1551 0x00,
1552 0x00,
1553 0x00,
1554 /* U+1F98 */ 0x0,
1555 /* U+1F99 */ 0x0,
1556 /* U+1F9A */ 0x0,
1557 /* U+1F9B */ 0x0,
1558 /* U+1F9C */ 0x0,
1559 /* U+1F9D */ 0x0,
1560 /* U+1F9E */ 0x0,
1561 /* U+1F9F */ 0x0,
1562 0x00,
1563 0x00,
1564 0x00,
1565 0x00,
1566 0x00,
1567 0x00,
1568 0x00,
1569 0x00,
1570 /* U+1FA8 */ 0x0,
1571 /* U+1FA9 */ 0x0,
1572 /* U+1FAA */ 0x0,
1573 /* U+1FAB */ 0x0,
1574 /* U+1FAC */ 0x0,
1575 /* U+1FAD */ 0x0,
1576 /* U+1FAE */ 0x0,
1577 /* U+1FAF */ 0x0,
1578 0x00,
1579 0x00,
1580 0x00,
1581 0x00,
1582 0x00,
1583 0x00,
1584 0x00,
1585 0x00,
1586 /* U+1FB8 */ 0x1FB0,
1587 /* U+1FB9 */ 0x1FB1,
1588 /* U+1FBA */ 0x1F70,
1589 /* U+1FBB */ 0x1F71,
1590 /* U+1FBC */ 0x0,
1591 0x00,
1592 0x00,
1593 0x00,
1594 0x00,
1595 0x00,
1596 0x00,
1597 0x00,
```

```
1598 0x00,
1599 0x00,
1600 0x00,
1601 0x00,
1602 /* U+1FC8 */ 0x1F72,
1603 /* U+1FC9 */ 0x1F73,
1604 /* U+1FCA */ 0x1F74,
1605 /* U+1FCB */ 0x1F75,
1606 /* U+1FCC */ 0x0,
1607 0x00,
1608 0x00,
1609 0x00,
1610 0x00,
1611 0x00,
1612 0x00,
1613 0x00,
1614 0x00,
1615 0x00,
1616 0x00,
1617 0x00,
1618 /* U+1FD8 */ 0x1FD0,
1619 /* U+1FD9 */ 0x1FD1,
1620 /* U+1FDA */ 0x1F76,
1621 /* U+1FDB */ 0x1F77,
1622 0x00,
1623 0x00,
1624 0x00,
1625 0x00,
1626 0x00,
1627 0x00,
1628 0x00,
1629 0x00,
1630 0x00,
1631 0x00,
1632 0x00,
1633 0x00,
1634 /* U+1FE8 */ 0x1FE0,
1635 /* U+1FE9 */ 0x1FE1,
1636 /* U+1FEA */ 0x1F7A,
1637 /* U+1FEB */ 0x1F7B,
1638 /* U+1FEC */ 0x1FE5,
1639 0x00,
1640 0x00,
1641 0x00,
1642 0x00,
1643 0x00,
1644 0x00,
1645 0x00,
1646 0x00,
1647 0x00,
1648 0x00,
1649 0x00,
1650 /* U+1FF8 */ 0x1F78,
1651 /* U+1FF9 */ 0x1F79,
1652 /* U+1FFA */ 0x1F7C,
1653 /* U+1FFB */ 0x1F7D,
1654 /* U+1FFC */ 0x0,
1655 };
1656
1657 static const unsigned short ucs_table_2102[] = {
1658 /* U+2102 */ 0x0,
1659 0x00,
1660 0x00,
1661 0x00,
1662 0x00,
1663 0x00,
1664 0x00,
1665 0x00,
1666 0x00,
1667 /* U+210B */ 0x0,
1668 /* U+210C */ 0x0,
1669 /* U+210D */ 0x0,
1670 0x00,
1671 0x00,
1672 /* U+2110 */ 0x0,
1673 /* U+2111 */ 0x0,
1674 /* U+2112 */ 0x2113,
1675 0x00,
1676 0x00,
1677 /* U+2115 */ 0x0,
1678 0x00,
1679 0x00,
1680 /* U+2118 */ 0x0,
1681 /* U+2119 */ 0x0,
1682 /* U+211A */ 0x0,
1683 /* U+211B */ 0x0,
1684 /* U+211C */ 0x0,
```

```
1685 /* U+211D */ 0x0,
1686 0x00,
1687 0x00,
1688 0x00,
1689 0x00,
1690 0x00,
1691 0x00,
1692 /* U+2124 */ 0x0,
1693 0x00,
1694 0x00,
1695 0x00,
1696 /* U+2128 */ 0x0,
1697 0x00,
1698 0x00,
1699 0x00,
1700 /* U+212C */ 0x0,
1701 /* U+212D */ 0x0,
1702 0x00,
1703 0x00,
1704 /* U+2130 */ 0x212F,
1705 /* U+2131 */ 0x0,
1706 /* U+2132 */ 0x0,
1707 /* U+2133 */ 0x0,
1708 };
1709
1710 static const unsigned short ucs_table_24B6[] = {
1711 /* U+24B6 */ 0x24D0,
1712 /* U+24B7 */ 0x24D1,
1713 /* U+24B8 */ 0x24D2,
1714 /* U+24B9 */ 0x24D3,
1715 /* U+24BA */ 0x24D4,
1716 /* U+24BB */ 0x24D5,
1717 /* U+24BC */ 0x24D6,
1718 /* U+24BD */ 0x24D7,
1719 /* U+24BE */ 0x24D8,
1720 /* U+24BF */ 0x24D9,
1721 /* U+24C0 */ 0x24DA,
1722 /* U+24C1 */ 0x24DB,
1723 /* U+24C2 */ 0x24DC,
1724 /* U+24C3 */ 0x24DD,
1725 /* U+24C4 */ 0x24DE,
1726 /* U+24C5 */ 0x24DF,
1727 /* U+24C6 */ 0x24E0,
1728 /* U+24C7 */ 0x24E1,
1729 /* U+24C8 */ 0x24E2,
1730 /* U+24C9 */ 0x24E3,
1731 /* U+24CA */ 0x24E4,
1732 /* U+24CB */ 0x24E5,
1733 /* U+24CC */ 0x24E6,
1734 /* U+24CD */ 0x24E7,
1735 /* U+24CE */ 0x24E8,
1736 /* U+24CF */ 0x24E9,
1737 };
1738
1739 static const unsigned short ucs_table_33CE[] = {
1740 /* U+33CE */ 0x0,
1741 };
1742
1743 static const unsigned short ucs_table_FF21[] = {
1744 /* U+FF21 */ 0xFF41,
1745 /* U+FF22 */ 0xFF42,
1746 /* U+FF23 */ 0xFF43,
1747 /* U+FF24 */ 0xFF44,
1748 /* U+FF25 */ 0xFF45,
1749 /* U+FF26 */ 0xFF46,
1750 /* U+FF27 */ 0xFF47,
1751 /* U+FF28 */ 0xFF48,
1752 /* U+FF29 */ 0xFF49,
1753 /* U+FF2A */ 0xFF4A,
1754 /* U+FF2B */ 0xFF4B,
1755 /* U+FF2C */ 0xFF4C,
1756 /* U+FF2D */ 0xFF4D,
1757 /* U+FF2E */ 0xFF4E,
1758 /* U+FF2F */ 0xFF4F,
1759 /* U+FF30 */ 0xFF50,
1760 /* U+FF31 */ 0xFF51,
1761 /* U+FF32 */ 0xFF52,
1762 /* U+FF33 */ 0xFF53,
1763 /* U+FF34 */ 0xFF54,
1764 /* U+FF35 */ 0xFF55,
1765 /* U+FF36 */ 0xFF56,
1766 /* U+FF37 */ 0xFF57,
1767 /* U+FF38 */ 0xFF58,
1768 /* U+FF39 */ 0xFF59,
1769 /* U+FF3A */ 0xFF5A,
1770 };
```

## 34.253 dingbats\_.h

```
1  /* dingbats */
2
3  static const char unicode_to_dingbats_1b_0020[] = {
4  /* U+0020 */ 0x20,
5  0x00,
6  0x00,
7  0x00,
8  0x00,
9  0x00,
10 0x00,
11 0x00,
12 0x00,
13 0x00,
14 0x00,
15 0x00,
16 0x00,
17 0x00,
18 0x00,
19 0x00,
20 0x00,
21 0x00,
22 0x00,
23 0x00,
24 0x00,
25 0x00,
26 0x00,
27 0x00,
28 0x00,
29 0x00,
30 0x00,
31 0x00,
32 0x00,
33 0x00,
34 0x00,
35 0x00,
36 0x00,
37 0x00,
38 0x00,
39 0x00,
40 0x00,
41 0x00,
42 0x00,
43 0x00,
44 0x00,
45 0x00,
46 0x00,
47 0x00,
48 0x00,
49 0x00,
50 0x00,
51 0x00,
52 0x00,
53 0x00,
54 0x00,
55 0x00,
56 0x00,
57 0x00,
58 0x00,
59 0x00,
60 0x00,
61 0x00,
62 0x00,
63 0x00,
64 0x00,
65 0x00,
66 0x00,
67 0x00,
68 0x00,
69 0x00,
70 0x00,
71 0x00,
72 0x00,
73 0x00,
74 0x00,
75 0x00,
76 0x00,
77 0x00,
78 0x00,
79 0x00,
80 0x00,
81 0x00,
82 0x00,
83 0x00,
84 0x00,
85 0x00,
```

```
86 0x00,
87 0x00,
88 0x00,
89 0x00,
90 0x00,
91 0x00,
92 0x00,
93 0x00,
94 0x00,
95 0x00,
96 0x00,
97 0x00,
98 0x00,
99 0x00,
100 0x00,
101 0x00,
102 0x00,
103 0x00,
104 0x00,
105 0x00,
106 0x00,
107 0x00,
108 0x00,
109 0x00,
110 0x00,
111 0x00,
112 0x00,
113 0x00,
114 0x00,
115 0x00,
116 0x00,
117 0x00,
118 0x00,
119 0x00,
120 0x00,
121 0x00,
122 0x00,
123 0x00,
124 0x00,
125 0x00,
126 0x00,
127 0x00,
128 0x00,
129 0x00,
130 0x00,
131 0x00,
132 /* U+00A0 */ 0x20,
133 };
134
135 static const char unicode_to_dingbats_lb_2192[] = {
136 /* U+2192 */ (char) 0xD5,
137 0x00,
138 /* U+2194 */ (char) 0xD6,
139 /* U+2195 */ (char) 0xD7,
140 };
141
142 static const char unicode_to_dingbats_lb_2460[] = {
143 /* U+2460 */ (char) 0xAC,
144 /* U+2461 */ (char) 0xAD,
145 /* U+2462 */ (char) 0xAE,
146 /* U+2463 */ (char) 0xAF,
147 /* U+2464 */ (char) 0xB0,
148 /* U+2465 */ (char) 0xB1,
149 /* U+2466 */ (char) 0xB2,
150 /* U+2467 */ (char) 0xB3,
151 /* U+2468 */ (char) 0xB4,
152 /* U+2469 */ (char) 0xB5,
153 };
154
155 static const char unicode_to_dingbats_lb_25A0[] = {
156 /* U+25A0 */ 0x6E,
157 0x00,
158 0x00,
159 0x00,
160 0x00,
161 0x00,
162 0x00,
163 0x00,
164 0x00,
165 0x00,
166 0x00,
167 0x00,
168 0x00,
169 0x00,
170 0x00,
171 0x00,
172 0x00,
```

```
173 0x00,  
174 /* U+25B2 */ 0x73,  
175 0x00,  
176 0x00,  
177 0x00,  
178 0x00,  
179 0x00,  
180 0x00,  
181 0x00,  
182 0x00,  
183 0x00,  
184 /* U+25BC */ 0x74,  
185 0x00,  
186 0x00,  
187 0x00,  
188 0x00,  
189 0x00,  
190 0x00,  
191 0x00,  
192 0x00,  
193 0x00,  
194 /* U+25C6 */ 0x75,  
195 0x00,  
196 0x00,  
197 0x00,  
198 0x00,  
199 0x00,  
200 0x00,  
201 0x00,  
202 0x00,  
203 /* U+25CF */ 0x6C,  
204 0x00,  
205 0x00,  
206 0x00,  
207 0x00,  
208 0x00,  
209 0x00,  
210 0x00,  
211 /* U+25D7 */ 0x77,  
212 0x00,  
213 0x00,  
214 0x00,  
215 0x00,  
216 0x00,  
217 0x00,  
218 0x00,  
219 0x00,  
220 0x00,  
221 0x00,  
222 0x00,  
223 0x00,  
224 0x00,  
225 0x00,  
226 0x00,  
227 0x00,  
228 0x00,  
229 0x00,  
230 0x00,  
231 0x00,  
232 0x00,  
233 0x00,  
234 0x00,  
235 0x00,  
236 0x00,  
237 0x00,  
238 0x00,  
239 0x00,  
240 0x00,  
241 0x00,  
242 0x00,  
243 0x00,  
244 0x00,  
245 0x00,  
246 0x00,  
247 0x00,  
248 0x00,  
249 0x00,  
250 0x00,  
251 0x00,  
252 0x00,  
253 0x00,  
254 0x00,  
255 0x00,  
256 0x00,  
257 /* U+2605 */ 0x48,  
258 0x00,  
259 0x00,
```

```
260 0x00,
261 0x00,
262 0x00,
263 0x00,
264 0x00,
265 0x00,
266 /* U+260E */ 0x25,
267 0x00,
268 0x00,
269 0x00,
270 0x00,
271 0x00,
272 0x00,
273 0x00,
274 0x00,
275 0x00,
276 0x00,
277 0x00,
278 0x00,
279 /* U+261B */ 0x2A,
280 0x00,
281 0x00,
282 /* U+261E */ 0x2B,
283 0x00,
284 0x00,
285 0x00,
286 0x00,
287 0x00,
288 0x00,
289 0x00,
290 0x00,
291 0x00,
292 0x00,
293 0x00,
294 0x00,
295 0x00,
296 0x00,
297 0x00,
298 0x00,
299 0x00,
300 0x00,
301 0x00,
302 0x00,
303 0x00,
304 0x00,
305 0x00,
306 0x00,
307 0x00,
308 0x00,
309 0x00,
310 0x00,
311 0x00,
312 0x00,
313 0x00,
314 0x00,
315 0x00,
316 0x00,
317 0x00,
318 0x00,
319 0x00,
320 0x00,
321 0x00,
322 0x00,
323 0x00,
324 0x00,
325 0x00,
326 0x00,
327 0x00,
328 0x00,
329 0x00,
330 0x00,
331 0x00,
332 0x00,
333 0x00,
334 0x00,
335 0x00,
336 0x00,
337 0x00,
338 0x00,
339 0x00,
340 0x00,
341 0x00,
342 0x00,
343 0x00,
344 0x00,
345 0x00,
346 0x00,
```

```
347 0x00,
348 /* U+2660 */ (char) 0xAB,
349 0x00,
350 0x00,
351 /* U+2663 */ (char) 0xA8,
352 0x00,
353 /* U+2665 */ (char) 0xAA,
354 /* U+2666 */ (char) 0xA9,
355 };
356
357 static const char unicode_to_dingbats_1b_2701[] = {
358 /* U+2701 */ 0x21,
359 /* U+2702 */ 0x22,
360 /* U+2703 */ 0x23,
361 /* U+2704 */ 0x24,
362 0x00,
363 /* U+2706 */ 0x26,
364 /* U+2707 */ 0x27,
365 /* U+2708 */ 0x28,
366 /* U+2709 */ 0x29,
367 0x00,
368 0x00,
369 /* U+270C */ 0x2C,
370 /* U+270D */ 0x2D,
371 /* U+270E */ 0x2E,
372 /* U+270F */ 0x2F,
373 /* U+2710 */ 0x30,
374 /* U+2711 */ 0x31,
375 /* U+2712 */ 0x32,
376 /* U+2713 */ 0x33,
377 /* U+2714 */ 0x34,
378 /* U+2715 */ 0x35,
379 /* U+2716 */ 0x36,
380 /* U+2717 */ 0x37,
381 /* U+2718 */ 0x38,
382 /* U+2719 */ 0x39,
383 /* U+271A */ 0x3A,
384 /* U+271B */ 0x3B,
385 /* U+271C */ 0x3C,
386 /* U+271D */ 0x3D,
387 /* U+271E */ 0x3E,
388 /* U+271F */ 0x3F,
389 /* U+2720 */ 0x40,
390 /* U+2721 */ 0x41,
391 /* U+2722 */ 0x42,
392 /* U+2723 */ 0x43,
393 /* U+2724 */ 0x44,
394 /* U+2725 */ 0x45,
395 /* U+2726 */ 0x46,
396 /* U+2727 */ 0x47,
397 0x00,
398 /* U+2729 */ 0x49,
399 /* U+272A */ 0x4A,
400 /* U+272B */ 0x4B,
401 /* U+272C */ 0x4C,
402 /* U+272D */ 0x4D,
403 /* U+272E */ 0x4E,
404 /* U+272F */ 0x4F,
405 /* U+2730 */ 0x50,
406 /* U+2731 */ 0x51,
407 /* U+2732 */ 0x52,
408 /* U+2733 */ 0x53,
409 /* U+2734 */ 0x54,
410 /* U+2735 */ 0x55,
411 /* U+2736 */ 0x56,
412 /* U+2737 */ 0x57,
413 /* U+2738 */ 0x58,
414 /* U+2739 */ 0x59,
415 /* U+273A */ 0x5A,
416 /* U+273B */ 0x5B,
417 /* U+273C */ 0x5C,
418 /* U+273D */ 0x5D,
419 /* U+273E */ 0x5E,
420 /* U+273F */ 0x5F,
421 /* U+2740 */ 0x60,
422 /* U+2741 */ 0x61,
423 /* U+2742 */ 0x62,
424 /* U+2743 */ 0x63,
425 /* U+2744 */ 0x64,
426 /* U+2745 */ 0x65,
427 /* U+2746 */ 0x66,
428 /* U+2747 */ 0x67,
429 /* U+2748 */ 0x68,
430 /* U+2749 */ 0x69,
431 /* U+274A */ 0x6A,
432 /* U+274B */ 0x6B,
433 0x00,
```

```
434 /* U+274D */ 0x6D,
435 0x00,
436 /* U+274F */ 0x6F,
437 /* U+2750 */ 0x70,
438 /* U+2751 */ 0x71,
439 /* U+2752 */ 0x72,
440 0x00,
441 0x00,
442 0x00,
443 /* U+2756 */ 0x76,
444 0x00,
445 /* U+2758 */ 0x78,
446 /* U+2759 */ 0x79,
447 /* U+275A */ 0x7A,
448 /* U+275B */ 0x7B,
449 /* U+275C */ 0x7C,
450 /* U+275D */ 0x7D,
451 /* U+275E */ 0x7E,
452 0x00,
453 0x00,
454 /* U+2761 */ (char) 0xA1,
455 /* U+2762 */ (char) 0xA2,
456 /* U+2763 */ (char) 0xA3,
457 /* U+2764 */ (char) 0xA4,
458 /* U+2765 */ (char) 0xA5,
459 /* U+2766 */ (char) 0xA6,
460 /* U+2767 */ (char) 0xA7,
461 0x00,
462 0x00,
463 0x00,
464 0x00,
465 0x00,
466 0x00,
467 0x00,
468 0x00,
469 0x00,
470 0x00,
471 0x00,
472 0x00,
473 0x00,
474 0x00,
475 /* U+2776 */ (char) 0xB6,
476 /* U+2777 */ (char) 0xB7,
477 /* U+2778 */ (char) 0xB8,
478 /* U+2779 */ (char) 0xB9,
479 /* U+277A */ (char) 0xBA,
480 /* U+277B */ (char) 0xBB,
481 /* U+277C */ (char) 0xBC,
482 /* U+277D */ (char) 0xBD,
483 /* U+277E */ (char) 0xBE,
484 /* U+277F */ (char) 0xBF,
485 /* U+2780 */ (char) 0xC0,
486 /* U+2781 */ (char) 0xC1,
487 /* U+2782 */ (char) 0xC2,
488 /* U+2783 */ (char) 0xC3,
489 /* U+2784 */ (char) 0xC4,
490 /* U+2785 */ (char) 0xC5,
491 /* U+2786 */ (char) 0xC6,
492 /* U+2787 */ (char) 0xC7,
493 /* U+2788 */ (char) 0xC8,
494 /* U+2789 */ (char) 0xC9,
495 /* U+278A */ (char) 0xCA,
496 /* U+278B */ (char) 0xCB,
497 /* U+278C */ (char) 0xCC,
498 /* U+278D */ (char) 0xCD,
499 /* U+278E */ (char) 0xCE,
500 /* U+278F */ (char) 0xCF,
501 /* U+2790 */ (char) 0xD0,
502 /* U+2791 */ (char) 0xD1,
503 /* U+2792 */ (char) 0xD2,
504 /* U+2793 */ (char) 0xD3,
505 /* U+2794 */ (char) 0xD4,
506 0x00,
507 0x00,
508 0x00,
509 /* U+2798 */ (char) 0xD8,
510 /* U+2799 */ (char) 0xD9,
511 /* U+279A */ (char) 0xDA,
512 /* U+279B */ (char) 0xDB,
513 /* U+279C */ (char) 0xDC,
514 /* U+279D */ (char) 0xDD,
515 /* U+279E */ (char) 0xDE,
516 /* U+279F */ (char) 0xDF,
517 /* U+27A0 */ (char) 0xE0,
518 /* U+27A1 */ (char) 0xE1,
519 /* U+27A2 */ (char) 0xE2,
520 /* U+27A3 */ (char) 0xE3,
```

```

521 /* U+27A4 */ (char) 0xE4,
522 /* U+27A5 */ (char) 0xE5,
523 /* U+27A6 */ (char) 0xE6,
524 /* U+27A7 */ (char) 0xE7,
525 /* U+27A8 */ (char) 0xE8,
526 /* U+27A9 */ (char) 0xE9,
527 /* U+27AA */ (char) 0xEA,
528 /* U+27AB */ (char) 0xEB,
529 /* U+27AC */ (char) 0xEC,
530 /* U+27AD */ (char) 0xED,
531 /* U+27AE */ (char) 0xEE,
532 /* U+27AF */ (char) 0xEF,
533 0x00,
534 /* U+27B1 */ (char) 0xF1,
535 /* U+27B2 */ (char) 0xF2,
536 /* U+27B3 */ (char) 0xF3,
537 /* U+27B4 */ (char) 0xF4,
538 /* U+27B5 */ (char) 0xF5,
539 /* U+27B6 */ (char) 0xF6,
540 /* U+27B7 */ (char) 0xF7,
541 /* U+27B8 */ (char) 0xF8,
542 /* U+27B9 */ (char) 0xF9,
543 /* U+27BA */ (char) 0xFA,
544 /* U+27BB */ (char) 0xFB,
545 /* U+27BC */ (char) 0xFC,
546 /* U+27BD */ (char) 0xFD,
547 /* U+27BE */ (char) 0xFE,
548 };
549
550 static const char unicode_to_dingbats_1b_F8D7[] = {
551 /* U+F8D7 */ (char) 0x80,
552 /* U+F8D8 */ (char) 0x81,
553 /* U+F8D9 */ (char) 0x82,
554 /* U+F8DA */ (char) 0x83,
555 /* U+F8DB */ (char) 0x84,
556 /* U+F8DC */ (char) 0x85,
557 /* U+F8DD */ (char) 0x86,
558 /* U+F8DE */ (char) 0x87,
559 /* U+F8DF */ (char) 0x88,
560 /* U+F8E0 */ (char) 0x89,
561 /* U+F8E1 */ (char) 0x8A,
562 /* U+F8E2 */ (char) 0x8B,
563 /* U+F8E3 */ (char) 0x8C,
564 /* U+F8E4 */ (char) 0x8D,
565 };

```

## 34.254 spacing.h

```

1 /* spacing */
2
3 static const unsigned short ucs_table_0300[] = {
4 /* U+0300 */ 0x0060,
5 /* U+0301 */ 0x00B4,
6 /* U+0302 */ 0x005E,
7 /* U+0303 */ 0x02DC,
8 /* U+0304 */ 0x00AF,
9 /* U+0305 */ 0x203E,
10 /* U+0306 */ 0x02D8,
11 /* U+0307 */ 0x02D9,
12 /* U+0308 */ 0x00A8,
13 /* U+0309 */ 0x0309,
14 /* U+030A */ 0x02DA,
15 /* U+030B */ 0x02DD,
16 /* U+030C */ 0x030C,
17 /* U+030D */ 0x030D,
18 /* U+030E */ 0x030E,
19 /* U+030F */ 0x030F,
20 /* U+0310 */ 0x0310,
21 /* U+0311 */ 0x0311,
22 /* U+0312 */ 0x0312,
23 /* U+0313 */ 0x1FBD,
24 /* U+0314 */ 0x1FFE,
25 /* U+0315 */ 0x0315,
26 /* U+0316 */ 0x0316,
27 /* U+0317 */ 0x0317,
28 /* U+0318 */ 0x0318,
29 /* U+0319 */ 0x0319,
30 /* U+031A */ 0x031A,
31 /* U+031B */ 0x031B,
32 /* U+031C */ 0x031C,
33 /* U+031D */ 0x031D,
34 /* U+031E */ 0x031E,
35 /* U+031F */ 0x031F,
36 /* U+0320 */ 0x0320,
37 /* U+0321 */ 0x0321,

```

```

38 /* U+0322 */ 0x0322,
39 /* U+0323 */ 0x0323,
40 /* U+0324 */ 0x0324,
41 /* U+0325 */ 0x0325,
42 /* U+0326 */ 0x0326,
43 /* U+0327 */ 0x00B8,
44 /* U+0328 */ 0x02DB,
45 /* U+0329 */ 0x0329,
46 /* U+032A */ 0x032A,
47 /* U+032B */ 0x032B,
48 /* U+032C */ 0x032C,
49 /* U+032D */ 0x032D,
50 /* U+032E */ 0x032E,
51 /* U+032F */ 0x032F,
52 /* U+0330 */ 0x0330,
53 /* U+0331 */ 0x0331,
54 /* U+0332 */ 0x005F,
55 /* U+0333 */ 0x2017,
56 /* U+0334 */ 0x0334,
57 /* U+0335 */ 0x0335,
58 /* U+0336 */ 0x0336,
59 /* U+0337 */ 0x0337,
60 /* U+0338 */ 0x0338,
61 /* U+0339 */ 0x0339,
62 /* U+033A */ 0x033A,
63 /* U+033B */ 0x033B,
64 /* U+033C */ 0x033C,
65 /* U+033D */ 0x033D,
66 /* U+033E */ 0x033E,
67 /* U+033F */ 0x033F,
68 /* U+0340 */ 0x0340,
69 /* U+0341 */ 0x0341,
70 /* U+0342 */ 0x1FC0,
71 /* U+0343 */ 0x0343,
72 /* U+0344 */ 0x0344,
73 /* U+0345 */ 0x037A,
74 0x00,
75 0x00,
76 0x00,
77 0x00,
78 0x00,
79 0x00,
80 0x00,
81 0x00,
82 0x00,
83 0x00,
84 0x00,
85 0x00,
86 0x00,
87 0x00,
88 0x00,
89 0x00,
90 0x00,
91 0x00,
92 0x00,
93 0x00,
94 0x00,
95 0x00,
96 0x00,
97 0x00,
98 0x00,
99 0x00,
100 /* U+0360 */ 0x0360,
101 /* U+0361 */ 0x0361,
102 };
103
104 static const unsigned short ucs_table_0483[] = {
105 /* U+0483 */ 0x0483,
106 /* U+0484 */ 0x0484,
107 /* U+0485 */ 0x0485,
108 /* U+0486 */ 0x0486,
109 };
110
111 static const unsigned short ucs_table_0591[] = {
112 /* U+0591 */ 0x0591,
113 /* U+0592 */ 0x0592,
114 /* U+0593 */ 0x0593,
115 /* U+0594 */ 0x0594,
116 /* U+0595 */ 0x0595,
117 /* U+0596 */ 0x0596,
118 /* U+0597 */ 0x0597,
119 /* U+0598 */ 0x0598,
120 /* U+0599 */ 0x0599,
121 /* U+059A */ 0x059A,
122 /* U+059B */ 0x059B,
123 /* U+059C */ 0x059C,
124 /* U+059D */ 0x059D,

```

```
125 /* U+059E */ 0x059E,
126 /* U+059F */ 0x059F,
127 /* U+05A0 */ 0x05A0,
128 /* U+05A1 */ 0x05A1,
129 0x00,
130 /* U+05A3 */ 0x05A3,
131 /* U+05A4 */ 0x05A4,
132 /* U+05A5 */ 0x05A5,
133 /* U+05A6 */ 0x05A6,
134 /* U+05A7 */ 0x05A7,
135 /* U+05A8 */ 0x05A8,
136 /* U+05A9 */ 0x05A9,
137 /* U+05AA */ 0x05AA,
138 /* U+05AB */ 0x05AB,
139 /* U+05AC */ 0x05AC,
140 /* U+05AD */ 0x05AD,
141 /* U+05AE */ 0x05AE,
142 /* U+05AF */ 0x05AF,
143 /* U+05B0 */ 0x05B0,
144 /* U+05B1 */ 0x05B1,
145 /* U+05B2 */ 0x05B2,
146 /* U+05B3 */ 0x05B3,
147 /* U+05B4 */ 0x05B4,
148 /* U+05B5 */ 0x05B5,
149 /* U+05B6 */ 0x05B6,
150 /* U+05B7 */ 0x05B7,
151 /* U+05B8 */ 0x05B8,
152 /* U+05B9 */ 0x05B9,
153 0x00,
154 /* U+05BB */ 0x05BB,
155 /* U+05BC */ 0x05BC,
156 /* U+05BD */ 0x05BD,
157 0x00,
158 /* U+05BF */ 0x05BF,
159 0x00,
160 /* U+05C1 */ 0x05C1,
161 /* U+05C2 */ 0x05C2,
162 0x00,
163 /* U+05C4 */ 0x05C4,
164 };
165
166 static const unsigned short ucs_table_064B[] = {
167 /* U+064B */ 0xFE70,
168 /* U+064C */ 0xFE72,
169 /* U+064D */ 0xFE74,
170 /* U+064E */ 0xFE76,
171 /* U+064F */ 0xFE78,
172 /* U+0650 */ 0xFE7A,
173 /* U+0651 */ 0xFE7C,
174 /* U+0652 */ 0xFE7E,
175 0x00,
176 0x00,
177 0x00,
178 0x00,
179 0x00,
180 0x00,
181 0x00,
182 0x00,
183 0x00,
184 0x00,
185 0x00,
186 0x00,
187 0x00,
188 0x00,
189 0x00,
190 0x00,
191 0x00,
192 0x00,
193 0x00,
194 0x00,
195 0x00,
196 0x00,
197 0x00,
198 0x00,
199 0x00,
200 0x00,
201 0x00,
202 0x00,
203 0x00,
204 /* U+0670 */ 0x0670,
205 0x00,
206 0x00,
207 0x00,
208 0x00,
209 0x00,
210 0x00,
211 0x00,
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212 0x00,  
213 0x00,  
214 0x00,  
215 0x00,  
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298 0x00,
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299 0x00,
300 0x00,
301 0x00,
302 0x00,
303 0x00,
304 0x00,
305 0x00,
306 /* U+06D6 */ 0x06D6,
307 /* U+06D7 */ 0x06D7,
308 /* U+06D8 */ 0x06D8,
309 /* U+06D9 */ 0x06D9,
310 /* U+06DA */ 0x06DA,
311 /* U+06DB */ 0x06DB,
312 /* U+06DC */ 0x06DC,
313 0x00,
314 0x00,
315 /* U+06DF */ 0x06DF,
316 /* U+06E0 */ 0x06E0,
317 /* U+06E1 */ 0x06E1,
318 /* U+06E2 */ 0x06E2,
319 /* U+06E3 */ 0x06E3,
320 /* U+06E4 */ 0x06E4,
321 0x00,
322 0x00,
323 /* U+06E7 */ 0x06E7,
324 /* U+06E8 */ 0x06E8,
325 0x00,
326 /* U+06EA */ 0x06EA,
327 /* U+06EB */ 0x06EB,
328 /* U+06EC */ 0x06EC,
329 /* U+06ED */ 0x06ED,
330 };
331
332 static const unsigned short ucs_table_0901[] = {
333 /* U+0901 */ 0x0901,
334 /* U+0902 */ 0x0902,
335 0x00,
336 0x00,
337 0x00,
338 0x00,
339 0x00,
340 0x00,
341 0x00,
342 0x00,
343 0x00,
344 0x00,
345 0x00,
346 0x00,
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349 0x00,
350 0x00,
351 0x00,
352 0x00,
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375 0x00,
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384 0x00,
385 0x00,
```

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386 0x00,
387 0x00,
388 0x00,
389 0x00,
390 0x00,
391 0x00,
392 /* U+093C */ 0x093C,
393 0x00,
394 0x00,
395 0x00,
396 0x00,
397 /* U+0941 */ 0x0941,
398 /* U+0942 */ 0x0942,
399 /* U+0943 */ 0x0943,
400 /* U+0944 */ 0x0944,
401 /* U+0945 */ 0x0945,
402 /* U+0946 */ 0x0946,
403 /* U+0947 */ 0x0947,
404 /* U+0948 */ 0x0948,
405 0x00,
406 0x00,
407 0x00,
408 0x00,
409 /* U+094D */ 0x094D,
410 0x00,
411 0x00,
412 0x00,
413 /* U+0951 */ 0x0951,
414 /* U+0952 */ 0x0952,
415 /* U+0953 */ 0x0953,
416 /* U+0954 */ 0x0954,
417 0x00,
418 0x00,
419 0x00,
420 0x00,
421 0x00,
422 0x00,
423 0x00,
424 0x00,
425 0x00,
426 0x00,
427 0x00,
428 0x00,
429 0x00,
430 /* U+0962 */ 0x0962,
431 /* U+0963 */ 0x0963,
432 0x00,
433 0x00,
434 0x00,
435 0x00,
436 0x00,
437 0x00,
438 0x00,
439 0x00,
440 0x00,
441 0x00,
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453 0x00,
454 0x00,
455 0x00,
456 0x00,
457 0x00,
458 0x00,
459 0x00,
460 0x00,
461 /* U+0981 */ 0x0981,
462 0x00,
463 0x00,
464 0x00,
465 0x00,
466 0x00,
467 0x00,
468 0x00,
469 0x00,
470 0x00,
471 0x00,
472 0x00,
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473 0x00,
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511 0x00,
512 0x00,
513 0x00,
514 0x00,
515 0x00,
516 0x00,
517 0x00,
518 0x00,
519 0x00,
520 /* U+09BC */ 0x09BC,
521 0x00,
522 0x00,
523 0x00,
524 0x00,
525 /* U+09C1 */ 0x09C1,
526 /* U+09C2 */ 0x09C2,
527 /* U+09C3 */ 0x09C3,
528 /* U+09C4 */ 0x09C4,
529 0x00,
530 0x00,
531 0x00,
532 0x00,
533 0x00,
534 0x00,
535 0x00,
536 0x00,
537 /* U+09CD */ 0x09CD,
538 0x00,
539 0x00,
540 0x00,
541 0x00,
542 0x00,
543 0x00,
544 0x00,
545 0x00,
546 0x00,
547 0x00,
548 0x00,
549 0x00,
550 0x00,
551 0x00,
552 0x00,
553 0x00,
554 0x00,
555 0x00,
556 0x00,
557 0x00,
558 /* U+09E2 */ 0x09E2,
559 /* U+09E3 */ 0x09E3,
```

```
560 0x00,
561 0x00,
562 0x00,
563 0x00,
564 0x00,
565 0x00,
566 0x00,
567 0x00,
568 0x00,
569 0x00,
570 0x00,
571 0x00,
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582 0x00,
583 0x00,
584 0x00,
585 0x00,
586 0x00,
587 0x00,
588 0x00,
589 0x00,
590 /* U+0A02 */ 0x0A02,
591 0x00,
592 0x00,
593 0x00,
594 0x00,
595 0x00,
596 0x00,
597 0x00,
598 0x00,
599 0x00,
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644 0x00,
645 0x00,
646 0x00,
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647 0x00,
648 /* U+0A3C */ 0x0A3C,
649 0x00,
650 0x00,
651 0x00,
652 0x00,
653 /* U+0A41 */ 0x0A41,
654 /* U+0A42 */ 0x0A42,
655 0x00,
656 0x00,
657 0x00,
658 0x00,
659 /* U+0A47 */ 0x0A47,
660 /* U+0A48 */ 0x0A48,
661 0x00,
662 0x00,
663 /* U+0A4B */ 0x0A4B,
664 /* U+0A4C */ 0x0A4C,
665 /* U+0A4D */ 0x0A4D,
666 0x00,
667 0x00,
668 0x00,
669 0x00,
670 0x00,
671 0x00,
672 0x00,
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696 0x00,
697 0x00,
698 0x00,
699 0x00,
700 /* U+0A70 */ 0x0A70,
701 /* U+0A71 */ 0x0A71,
702 0x00,
703 0x00,
704 0x00,
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706 0x00,
707 0x00,
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709 0x00,
710 0x00,
711 0x00,
712 0x00,
713 0x00,
714 0x00,
715 0x00,
716 0x00,
717 /* U+0A81 */ 0x0A81,
718 /* U+0A82 */ 0x0A82,
719 0x00,
720 0x00,
721 0x00,
722 0x00,
723 0x00,
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768 0x00,
769 0x00,
770 0x00,
771 0x00,
772 0x00,
773 0x00,
774 0x00,
775 0x00,
776 /* U+0ABC */ 0x0ABC,
777 0x00,
778 0x00,
779 0x00,
780 0x00,
781 /* U+0AC1 */ 0x0AC1,
782 /* U+0AC2 */ 0x0AC2,
783 /* U+0AC3 */ 0x0AC3,
784 /* U+0AC4 */ 0x0AC4,
785 /* U+0AC5 */ 0x0AC5,
786 0x00,
787 /* U+0AC7 */ 0x0AC7,
788 /* U+0AC8 */ 0x0AC8,
789 0x00,
790 0x00,
791 0x00,
792 0x00,
793 /* U+0ACD */ 0x0ACD,
794 0x00,
795 0x00,
796 0x00,
797 0x00,
798 0x00,
799 0x00,
800 0x00,
801 0x00,
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838 0x00,
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841 0x00,
842 0x00,
843 0x00,
844 0x00,
845 /* U+0B01 */ 0x0B01,
846 0x00,
847 0x00,
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896 0x00,
897 0x00,
898 0x00,
899 0x00,
900 0x00,
901 0x00,
902 0x00,
903 0x00,
904 /* U+0B3C */ 0x0B3C,
905 0x00,
906 0x00,
907 /* U+0B3F */ 0x0B3F,
```

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908 0x00,
909 /* U+0B41 */ 0x0B41,
910 /* U+0B42 */ 0x0B42,
911 /* U+0B43 */ 0x0B43,
912 0x00,
913 0x00,
914 0x00,
915 0x00,
916 0x00,
917 0x00,
918 0x00,
919 0x00,
920 0x00,
921 /* U+0B4D */ 0x0B4D,
922 0x00,
923 0x00,
924 0x00,
925 0x00,
926 0x00,
927 0x00,
928 0x00,
929 0x00,
930 /* U+0B56 */ 0x0B56,
931 0x00,
932 0x00,
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936 0x00,
937 0x00,
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969 0x00,
970 0x00,
971 0x00,
972 0x00,
973 0x00,
974 /* U+0B82 */ 0x0B82,
975 0x00,
976 0x00,
977 0x00,
978 0x00,
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1034 0x00,
1035 0x00,
1036 /* U+0BC0 */ 0x0BC0,
1037 0x00,
1038 0x00,
1039 0x00,
1040 0x00,
1041 0x00,
1042 0x00,
1043 0x00,
1044 0x00,
1045 0x00,
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1048 0x00,
1049 /* U+0BCD */ 0x0BCD,
1050 0x00,
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1123 0x00,
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1125 0x00,
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1128 0x00,
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1157 0x00,
1158 0x00,
1159 0x00,
1160 0x00,
1161 0x00,
1162 /* U+0C3E */ 0x0C3E,
1163 /* U+0C3F */ 0x0C3F,
1164 /* U+0C40 */ 0x0C40,
1165 0x00,
1166 0x00,
1167 0x00,
1168 0x00,
```

```
1169 0x00,
1170 /* U+0C46 */ 0x0C46,
1171 /* U+0C47 */ 0x0C47,
1172 /* U+0C48 */ 0x0C48,
1173 0x00,
1174 /* U+0C4A */ 0x0C4A,
1175 /* U+0C4B */ 0x0C4B,
1176 /* U+0C4C */ 0x0C4C,
1177 /* U+0C4D */ 0x0C4D,
1178 0x00,
1179 0x00,
1180 0x00,
1181 0x00,
1182 0x00,
1183 0x00,
1184 0x00,
1185 /* U+0C55 */ 0x0C55,
1186 /* U+0C56 */ 0x0C56,
1187 0x00,
1188 0x00,
1189 0x00,
1190 0x00,
1191 0x00,
1192 0x00,
1193 0x00,
1194 0x00,
1195 0x00,
1196 0x00,
1197 0x00,
1198 0x00,
1199 0x00,
1200 0x00,
1201 0x00,
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1286 0x00,
1287 0x00,
1288 0x00,
1289 0x00,
1290 0x00,
1291 /* U+0CBF */ 0x0CBF,
1292 0x00,
1293 0x00,
1294 0x00,
1295 0x00,
1296 0x00,
1297 0x00,
1298 /* U+0CC6 */ 0x0CC6,
1299 0x00,
1300 0x00,
1301 0x00,
1302 0x00,
1303 0x00,
1304 /* U+0CCC */ 0x0CCC,
1305 /* U+0CCD */ 0x0CCD,
1306 0x00,
1307 0x00,
1308 0x00,
1309 0x00,
1310 0x00,
1311 0x00,
1312 0x00,
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1414 0x00,
1415 0x00,
1416 0x00,
1417 0x00,
1418 0x00,
1419 0x00,
1420 0x00,
1421 /* U+0D41 */ 0x0D41,
1422 /* U+0D42 */ 0x0D42,
1423 /* U+0D43 */ 0x0D43,
1424 0x00,
1425 0x00,
1426 0x00,
1427 0x00,
1428 0x00,
1429 0x00,
```

```
1430 0x00,
1431 0x00,
1432 0x00,
1433 /* U+0D4D */ 0x0D4D,
1434 };
1435
1436 static const unsigned short ucs_table_0E31[] = {
1437 /* U+0E31 */ 0x0E31,
1438 0x00,
1439 0x00,
1440 /* U+0E34 */ 0x0E34,
1441 /* U+0E35 */ 0x0E35,
1442 /* U+0E36 */ 0x0E36,
1443 /* U+0E37 */ 0x0E37,
1444 /* U+0E38 */ 0x0E38,
1445 /* U+0E39 */ 0x0E39,
1446 /* U+0E3A */ 0x0E3A,
1447 0x00,
1448 0x00,
1449 0x00,
1450 0x00,
1451 0x00,
1452 0x00,
1453 0x00,
1454 0x00,
1455 0x00,
1456 0x00,
1457 0x00,
1458 0x00,
1459 /* U+0E47 */ 0x0E47,
1460 /* U+0E48 */ 0x0E48,
1461 /* U+0E49 */ 0x0E49,
1462 /* U+0E4A */ 0x0E4A,
1463 /* U+0E4B */ 0x0E4B,
1464 /* U+0E4C */ 0x0E4C,
1465 /* U+0E4D */ 0x0E4D,
1466 /* U+0E4E */ 0x0E4E,
1467 0x00,
1468 0x00,
1469 0x00,
1470 0x00,
1471 0x00,
1472 0x00,
1473 0x00,
1474 0x00,
1475 0x00,
1476 0x00,
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1558 0x00,
1559 0x00,
1560 0x00,
1561 0x00,
1562 0x00,
1563 0x00,
1564 0x00,
1565 /* U+0EB1 */ 0x0EB1,
1566 0x00,
1567 0x00,
1568 /* U+0EB4 */ 0x0EB4,
1569 /* U+0EB5 */ 0x0EB5,
1570 /* U+0EB6 */ 0x0EB6,
1571 /* U+0EB7 */ 0x0EB7,
1572 /* U+0EB8 */ 0x0EB8,
1573 /* U+0EB9 */ 0x0EB9,
1574 0x00,
1575 /* U+0EBB */ 0x0EBB,
1576 /* U+0EBC */ 0x0EBC,
1577 0x00,
1578 0x00,
1579 0x00,
1580 0x00,
1581 0x00,
1582 0x00,
1583 0x00,
1584 0x00,
1585 0x00,
1586 0x00,
1587 0x00,
1588 /* U+0EC8 */ 0x0EC8,
1589 /* U+0EC9 */ 0x0EC9,
1590 /* U+0ECA */ 0x0ECA,
1591 /* U+0ECB */ 0x0ECB,
1592 /* U+0ECC */ 0x0ECC,
1593 /* U+0ECD */ 0x0ECD,
1594 0x00,
1595 0x00,
1596 0x00,
1597 0x00,
1598 0x00,
1599 0x00,
1600 0x00,
1601 0x00,
1602 0x00,
1603 0x00,
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1604 0x00,
1605 0x00,
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1607 0x00,
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1610 0x00,
1611 0x00,
1612 0x00,
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1626 0x00,
1627 0x00,
1628 0x00,
1629 0x00,
1630 0x00,
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1632 0x00,
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1636 0x00,
1637 0x00,
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1658 0x00,
1659 0x00,
1660 0x00,
1661 0x00,
1662 0x00,
1663 0x00,
1664 0x00,
1665 0x00,
1666 0x00,
1667 0x00,
1668 /* U+0F18 */ 0x0F18,
1669 /* U+0F19 */ 0x0F19,
1670 0x00,
1671 0x00,
1672 0x00,
1673 0x00,
1674 0x00,
1675 0x00,
1676 0x00,
1677 0x00,
1678 0x00,
1679 0x00,
1680 0x00,
1681 0x00,
1682 0x00,
1683 0x00,
1684 0x00,
1685 0x00,
1686 0x00,
1687 0x00,
1688 0x00,
1689 0x00,
1690 0x00,
```

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1691 0x00,
1692 0x00,
1693 0x00,
1694 0x00,
1695 0x00,
1696 0x00,
1697 /* U+0F35 */ 0x0F35,
1698 0x00,
1699 /* U+0F37 */ 0x0F37,
1700 0x00,
1701 /* U+0F39 */ 0x0F39,
1702 0x00,
1703 0x00,
1704 0x00,
1705 0x00,
1706 0x00,
1707 0x00,
1708 0x00,
1709 0x00,
1710 0x00,
1711 0x00,
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1747 0x00,
1748 0x00,
1749 0x00,
1750 0x00,
1751 0x00,
1752 0x00,
1753 0x00,
1754 0x00,
1755 0x00,
1756 0x00,
1757 /* U+0F71 */ 0x0F71,
1758 /* U+0F72 */ 0x0F72,
1759 /* U+0F73 */ 0x0F73,
1760 /* U+0F74 */ 0x0F74,
1761 /* U+0F75 */ 0x0F75,
1762 /* U+0F76 */ 0x0F76,
1763 /* U+0F77 */ 0x0F77,
1764 /* U+0F78 */ 0x0F78,
1765 /* U+0F79 */ 0x0F79,
1766 /* U+0F7A */ 0x0F7A,
1767 /* U+0F7B */ 0x0F7B,
1768 /* U+0F7C */ 0x0F7C,
1769 /* U+0F7D */ 0x0F7D,
1770 /* U+0F7E */ 0x0F7E,
1771 0x00,
1772 /* U+0F80 */ 0x0F80,
1773 /* U+0F81 */ 0x0F81,
1774 /* U+0F82 */ 0x0F82,
1775 /* U+0F83 */ 0x0F83,
1776 /* U+0F84 */ 0x0F84,
1777 0x00,
```

```
1778 /* U+0F86 */ 0x0F86,
1779 /* U+0F87 */ 0x0F87,
1780 0x00,
1781 0x00,
1782 0x00,
1783 0x00,
1784 0x00,
1785 0x00,
1786 0x00,
1787 0x00,
1788 /* U+0F90 */ 0x0F90,
1789 /* U+0F91 */ 0x0F91,
1790 /* U+0F92 */ 0x0F92,
1791 /* U+0F93 */ 0x0F93,
1792 /* U+0F94 */ 0x0F94,
1793 /* U+0F95 */ 0x0F95,
1794 0x00,
1795 /* U+0F97 */ 0x0F97,
1796 0x00,
1797 /* U+0F99 */ 0x0F99,
1798 /* U+0F9A */ 0x0F9A,
1799 /* U+0F9B */ 0x0F9B,
1800 /* U+0F9C */ 0x0F9C,
1801 /* U+0F9D */ 0x0F9D,
1802 /* U+0F9E */ 0x0F9E,
1803 /* U+0F9F */ 0x0F9F,
1804 /* U+0FA0 */ 0x0FA0,
1805 /* U+0FA1 */ 0x0FA1,
1806 /* U+0FA2 */ 0x0FA2,
1807 /* U+0FA3 */ 0x0FA3,
1808 /* U+0FA4 */ 0x0FA4,
1809 /* U+0FA5 */ 0x0FA5,
1810 /* U+0FA6 */ 0x0FA6,
1811 /* U+0FA7 */ 0x0FA7,
1812 /* U+0FA8 */ 0x0FA8,
1813 /* U+0FA9 */ 0x0FA9,
1814 /* U+0FAA */ 0x0FAA,
1815 /* U+0FAB */ 0x0FAB,
1816 /* U+0FAC */ 0x0FAC,
1817 /* U+0FAD */ 0x0FAD,
1818 0x00,
1819 0x00,
1820 0x00,
1821 /* U+0FB1 */ 0x0FB1,
1822 /* U+0FB2 */ 0x0FB2,
1823 /* U+0FB3 */ 0x0FB3,
1824 /* U+0FB4 */ 0x0FB4,
1825 /* U+0FB5 */ 0x0FB5,
1826 /* U+0FB6 */ 0x0FB6,
1827 /* U+0FB7 */ 0x0FB7,
1828 0x00,
1829 /* U+0FB9 */ 0x0FB9,
1830 };
1831
1832 static const unsigned short ucs_table_20D0[] = {
1833 /* U+20D0 */ 0x20D0,
1834 /* U+20D1 */ 0x20D1,
1835 /* U+20D2 */ 0x20D2,
1836 /* U+20D3 */ 0x20D3,
1837 /* U+20D4 */ 0x20D4,
1838 /* U+20D5 */ 0x20D5,
1839 /* U+20D6 */ 0x20D6,
1840 /* U+20D7 */ 0x20D7,
1841 /* U+20D8 */ 0x20D8,
1842 /* U+20D9 */ 0x20D9,
1843 /* U+20DA */ 0x20DA,
1844 /* U+20DB */ 0x20DB,
1845 /* U+20DC */ 0x20DC,
1846 0x00,
1847 0x00,
1848 0x00,
1849 0x00,
1850 /* U+20E1 */ 0x20E1,
1851 };
1852
1853 static const unsigned short ucs_table_302A[] = {
1854 /* U+302A */ 0x302A,
1855 /* U+302B */ 0x302B,
1856 /* U+302C */ 0x302C,
1857 /* U+302D */ 0x302D,
1858 /* U+302E */ 0x302E,
1859 /* U+302F */ 0x302F,
1860 0x00,
1861 0x00,
1862 0x00,
1863 0x00,
1864 0x00,
```

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1865 0x00,  
1866 0x00,  
1867 0x00,  
1868 0x00,  
1869 0x00,  
1870 0x00,  
1871 0x00,  
1872 0x00,  
1873 0x00,  
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1876 0x00,  
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1943 0x00,  
1944 0x00,  
1945 0x00,  
1946 0x00,  
1947 0x00,  
1948 0x00,  
1949 0x00,  
1950 0x00,  
1951 0x00,
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1952 0x00,
1953 0x00,
1954 0x00,
1955 0x00,
1956 0x00,
1957 0x00,
1958 0x00,
1959 0x00,
1960 0x00,
1961 0x00,
1962 0x00,
1963 0x00,
1964 0x00,
1965 /* U+3099 */ 0x309B,
1966 /* U+309A */ 0x309C,
1967 };
1968
1969 static const unsigned short ucs_table_FB1E[] = {
1970 /* U+FB1E */ 0xFB1E,
1971 };
1972
1973 static const unsigned short ucs_table_FE20[] = {
1974 /* U+FE20 */ 0xFE20,
1975 /* U+FE21 */ 0xFE21,
1976 /* U+FE22 */ 0xFE22,
1977 /* U+FE23 */ 0xFE23,
1978 };
```

## 34.255 symbol\_.h

```
1 /* symbol */
2
3 static const char unicode_to_symbol_1b_0020[] = {
4 /* U+0020 */ 0x20,
5 /* U+0021 */ 0x21,
6 0x00,
7 /* U+0023 */ 0x23,
8 0x00,
9 /* U+0025 */ 0x25,
10 /* U+0026 */ 0x26,
11 0x00,
12 /* U+0028 */ 0x28,
13 /* U+0029 */ 0x29,
14 0x00,
15 /* U+002B */ 0x2B,
16 /* U+002C */ 0x2C,
17 0x00,
18 /* U+002E */ 0x2E,
19 /* U+002F */ 0x2F,
20 /* U+0030 */ 0x30,
21 /* U+0031 */ 0x31,
22 /* U+0032 */ 0x32,
23 /* U+0033 */ 0x33,
24 /* U+0034 */ 0x34,
25 /* U+0035 */ 0x35,
26 /* U+0036 */ 0x36,
27 /* U+0037 */ 0x37,
28 /* U+0038 */ 0x38,
29 /* U+0039 */ 0x39,
30 /* U+003A */ 0x3A,
31 /* U+003B */ 0x3B,
32 /* U+003C */ 0x3C,
33 /* U+003D */ 0x3D,
34 /* U+003E */ 0x3E,
35 /* U+003F */ 0x3F,
36 0x00,
37 0x00,
38 0x00,
39 0x00,
40 0x00,
41 0x00,
42 0x00,
43 0x00,
44 0x00,
45 0x00,
46 0x00,
47 0x00,
48 0x00,
49 0x00,
50 0x00,
51 0x00,
52 0x00,
53 0x00,
54 0x00,
55 0x00,
```

```
56 0x00,
57 0x00,
58 0x00,
59 0x00,
60 0x00,
61 0x00,
62 0x00,
63 /* U+005B */ 0x5B,
64 0x00,
65 /* U+005D */ 0x5D,
66 0x00,
67 /* U+005F */ 0x5F,
68 0x00,
69 0x00,
70 0x00,
71 0x00,
72 0x00,
73 0x00,
74 0x00,
75 0x00,
76 0x00,
77 0x00,
78 0x00,
79 0x00,
80 0x00,
81 0x00,
82 0x00,
83 0x00,
84 0x00,
85 0x00,
86 0x00,
87 0x00,
88 0x00,
89 0x00,
90 0x00,
91 0x00,
92 0x00,
93 0x00,
94 0x00,
95 /* U+007B */ 0x7B,
96 /* U+007C */ 0x7C,
97 /* U+007D */ 0x7D,
98 0x00,
99 0x00,
100 0x00,
101 0x00,
102 0x00,
103 0x00,
104 0x00,
105 0x00,
106 0x00,
107 0x00,
108 0x00,
109 0x00,
110 0x00,
111 0x00,
112 0x00,
113 0x00,
114 0x00,
115 0x00,
116 0x00,
117 0x00,
118 0x00,
119 0x00,
120 0x00,
121 0x00,
122 0x00,
123 0x00,
124 0x00,
125 0x00,
126 0x00,
127 0x00,
128 0x00,
129 0x00,
130 0x00,
131 0x00,
132 /* U+00A0 */ 0x20,
133 0x00,
134 0x00,
135 0x00,
136 0x00,
137 0x00,
138 0x00,
139 0x00,
140 0x00,
141 0x00,
142 0x00,
```

```
143 0x00,
144 /* U+00AC */ (char) 0xD8,
145 0x00,
146 0x00,
147 0x00,
148 /* U+00B0 */ (char) 0xB0,
149 /* U+00B1 */ (char) 0xB1,
150 0x00,
151 0x00,
152 0x00,
153 /* U+00B5 */ 0x6D,
154 0x00,
155 0x00,
156 0x00,
157 0x00,
158 0x00,
159 0x00,
160 0x00,
161 0x00,
162 0x00,
163 0x00,
164 0x00,
165 0x00,
166 0x00,
167 0x00,
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169 0x00,
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171 0x00,
172 0x00,
173 0x00,
174 0x00,
175 0x00,
176 0x00,
177 0x00,
178 0x00,
179 0x00,
180 0x00,
181 0x00,
182 0x00,
183 0x00,
184 0x00,
185 0x00,
186 0x00,
187 /* U+00D7 */ (char) 0xB4,
188 0x00,
189 0x00,
190 0x00,
191 0x00,
192 0x00,
193 0x00,
194 0x00,
195 0x00,
196 0x00,
197 0x00,
198 0x00,
199 0x00,
200 0x00,
201 0x00,
202 0x00,
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206 0x00,
207 0x00,
208 0x00,
209 0x00,
210 0x00,
211 0x00,
212 0x00,
213 0x00,
214 0x00,
215 0x00,
216 0x00,
217 0x00,
218 0x00,
219 /* U+00F7 */ (char) 0xB8,
220 };
221
222 static const char unicode_to_symbol_1b_0192[] = {
223 /* U+0192 */ (char) 0xA6,
224 };
225
226 static const char unicode_to_symbol_1b_0391[] = {
227 /* U+0391 */ 0x41,
228 /* U+0392 */ 0x42,
229 /* U+0393 */ 0x47,
```

```
230 /* U+0394 */ 0x44,
231 /* U+0395 */ 0x45,
232 /* U+0396 */ 0x5A,
233 /* U+0397 */ 0x48,
234 /* U+0398 */ 0x51,
235 /* U+0399 */ 0x49,
236 /* U+039A */ 0x4B,
237 /* U+039B */ 0x4C,
238 /* U+039C */ 0x4D,
239 /* U+039D */ 0x4E,
240 /* U+039E */ 0x58,
241 /* U+039F */ 0x4F,
242 /* U+03A0 */ 0x50,
243 /* U+03A1 */ 0x52,
244 0x00,
245 /* U+03A3 */ 0x53,
246 /* U+03A4 */ 0x54,
247 /* U+03A5 */ 0x55,
248 /* U+03A6 */ 0x46,
249 /* U+03A7 */ 0x43,
250 /* U+03A8 */ 0x59,
251 /* U+03A9 */ 0x57,
252 0x00,
253 0x00,
254 0x00,
255 0x00,
256 0x00,
257 0x00,
258 0x00,
259 /* U+03B1 */ 0x61,
260 /* U+03B2 */ 0x62,
261 /* U+03B3 */ 0x67,
262 /* U+03B4 */ 0x64,
263 /* U+03B5 */ 0x65,
264 /* U+03B6 */ 0x7A,
265 /* U+03B7 */ 0x68,
266 /* U+03B8 */ 0x71,
267 /* U+03B9 */ 0x69,
268 /* U+03BA */ 0x6B,
269 /* U+03BB */ 0x6C,
270 /* U+03BC */ 0x6D,
271 /* U+03BD */ 0x6E,
272 /* U+03BE */ 0x78,
273 /* U+03BF */ 0x6F,
274 /* U+03C0 */ 0x70,
275 /* U+03C1 */ 0x72,
276 /* U+03C2 */ 0x56,
277 /* U+03C3 */ 0x73,
278 /* U+03C4 */ 0x74,
279 /* U+03C5 */ 0x75,
280 /* U+03C6 */ 0x66,
281 /* U+03C7 */ 0x63,
282 /* U+03C8 */ 0x79,
283 /* U+03C9 */ 0x77,
284 0x00,
285 0x00,
286 0x00,
287 0x00,
288 0x00,
289 0x00,
290 0x00,
291 /* U+03D1 */ 0x4A,
292 /* U+03D2 */ (char) 0xA1,
293 0x00,
294 0x00,
295 /* U+03D5 */ 0x6A,
296 /* U+03D6 */ 0x76,
297 };
298
299 static const char unicode_to_symbol_lb_2022[] = {
300 /* U+2022 */ (char) 0xB7,
301 0x00,
302 0x00,
303 0x00,
304 /* U+2026 */ (char) 0xBC,
305 0x00,
306 0x00,
307 0x00,
308 0x00,
309 0x00,
310 0x00,
311 0x00,
312 0x00,
313 0x00,
314 0x00,
315 0x00,
316 /* U+2032 */ (char) 0xA2,
```

```
317 /* U+2033 */ (char) 0xB2,
318 0x00,
319 0x00,
320 0x00,
321 0x00,
322 0x00,
323 0x00,
324 0x00,
325 0x00,
326 0x00,
327 0x00,
328 0x00,
329 0x00,
330 0x00,
331 0x00,
332 0x00,
333 0x00,
334 /* U+2044 */ (char) 0xA4,
335 0x00,
336 0x00,
337 0x00,
338 0x00,
339 0x00,
340 0x00,
341 0x00,
342 0x00,
343 0x00,
344 0x00,
345 0x00,
346 0x00,
347 0x00,
348 0x00,
349 0x00,
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351 0x00,
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403 0x00,
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426 0x00,
427 0x00,
428 0x00,
429 0x00,
430 0x00,
431 0x00,
432 0x00,
433 0x00,
434 0x00,
435 0x00,
436 0x00,
437 0x00,
438 /* U+20AC */ (char) 0xA0,
439 0x00,
440 0x00,
441 0x00,
442 0x00,
443 0x00,
444 0x00,
445 0x00,
446 0x00,
447 0x00,
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531 0x00,
532 0x00,
533 0x00,
534 0x00,
535 0x00,
536 0x00,
537 0x00,
538 0x00,
539 /* U+2111 */ (char) 0xC1,
540 0x00,
541 0x00,
542 0x00,
543 0x00,
544 0x00,
545 0x00,
546 /* U+2118 */ (char) 0xC3,
547 0x00,
548 0x00,
549 0x00,
550 /* U+211C */ (char) 0xC2,
551 0x00,
552 0x00,
553 0x00,
554 0x00,
555 0x00,
556 0x00,
557 0x00,
558 0x00,
559 0x00,
560 /* U+2126 */ 0x57,
561 0x00,
562 0x00,
563 0x00,
564 0x00,
565 0x00,
566 0x00,
567 0x00,
568 0x00,
569 0x00,
570 0x00,
571 0x00,
572 0x00,
573 0x00,
574 0x00,
575 /* U+2135 */ (char) 0xC0,
576 0x00,
577 0x00,
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578 0x00,  
579 0x00,  
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581 0x00,  
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663 0x00,  
664 0x00,
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```
665 0x00,
666 /* U+2190 */ (char) 0xAC,
667 /* U+2191 */ (char) 0xAD,
668 /* U+2192 */ (char) 0xAE,
669 /* U+2193 */ (char) 0xAF,
670 /* U+2194 */ (char) 0xAB,
671 0x00,
672 0x00,
673 0x00,
674 0x00,
675 0x00,
676 0x00,
677 0x00,
678 0x00,
679 0x00,
680 0x00,
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695 0x00,
696 0x00,
697 0x00,
698 0x00,
699 0x00,
700 0x00,
701 0x00,
702 0x00,
703 /* U+21B5 */ (char) 0xBF,
704 0x00,
705 0x00,
706 0x00,
707 0x00,
708 0x00,
709 0x00,
710 0x00,
711 0x00,
712 0x00,
713 0x00,
714 0x00,
715 0x00,
716 0x00,
717 0x00,
718 0x00,
719 0x00,
720 0x00,
721 0x00,
722 0x00,
723 0x00,
724 0x00,
725 0x00,
726 0x00,
727 0x00,
728 0x00,
729 0x00,
730 /* U+21D0 */ (char) 0xDC,
731 /* U+21D1 */ (char) 0xDD,
732 /* U+21D2 */ (char) 0xDE,
733 /* U+21D3 */ (char) 0xDF,
734 /* U+21D4 */ (char) 0xDB,
735 0x00,
736 0x00,
737 0x00,
738 0x00,
739 0x00,
740 0x00,
741 0x00,
742 0x00,
743 0x00,
744 0x00,
745 0x00,
746 0x00,
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750 0x00,
751 0x00,
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752 0x00,
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763 0x00,
764 0x00,
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767 0x00,
768 0x00,
769 0x00,
770 0x00,
771 0x00,
772 0x00,
773 0x00,
774 0x00,
775 0x00,
776 0x00,
777 0x00,
778 /* U+2200 */ 0x22,
779 0x00,
780 /* U+2202 */ (char) 0xB6,
781 /* U+2203 */ 0x24,
782 0x00,
783 /* U+2205 */ (char) 0xC6,
784 /* U+2206 */ 0x44,
785 /* U+2207 */ (char) 0xD1,
786 /* U+2208 */ (char) 0xCE,
787 /* U+2209 */ (char) 0xCF,
788 0x00,
789 /* U+220B */ 0x27,
790 0x00,
791 0x00,
792 0x00,
793 /* U+220F */ (char) 0xD5,
794 0x00,
795 /* U+2211 */ (char) 0xE5,
796 /* U+2212 */ 0x2D,
797 0x00,
798 0x00,
799 /* U+2215 */ (char) 0xA4,
800 0x00,
801 /* U+2217 */ 0x2A,
802 0x00,
803 0x00,
804 /* U+221A */ (char) 0xD6,
805 0x00,
806 0x00,
807 /* U+221D */ (char) 0xB5,
808 /* U+221E */ (char) 0xA5,
809 0x00,
810 /* U+2220 */ (char) 0xD0,
811 0x00,
812 0x00,
813 0x00,
814 0x00,
815 0x00,
816 0x00,
817 /* U+2227 */ (char) 0xD9,
818 /* U+2228 */ (char) 0xDA,
819 /* U+2229 */ (char) 0xC7,
820 /* U+222A */ (char) 0xC8,
821 /* U+222B */ (char) 0xF2,
822 0x00,
823 0x00,
824 0x00,
825 0x00,
826 0x00,
827 0x00,
828 0x00,
829 0x00,
830 /* U+2234 */ 0x5C,
831 0x00,
832 0x00,
833 0x00,
834 0x00,
835 0x00,
836 0x00,
837 0x00,
838 /* U+223C */ 0x7E,
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839 0x00,
840 0x00,
841 0x00,
842 0x00,
843 0x00,
844 0x00,
845 0x00,
846 0x00,
847 /* U+2245 */ 0x40,
848 0x00,
849 0x00,
850 /* U+2248 */ (char) 0xBB,
851 0x00,
852 0x00,
853 0x00,
854 0x00,
855 0x00,
856 0x00,
857 0x00,
858 0x00,
859 0x00,
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864 0x00,
865 0x00,
866 0x00,
867 0x00,
868 0x00,
869 0x00,
870 0x00,
871 0x00,
872 0x00,
873 0x00,
874 /* U+2260 */ (char) 0xB9,
875 /* U+2261 */ (char) 0xBA,
876 0x00,
877 0x00,
878 /* U+2264 */ (char) 0xA3,
879 /* U+2265 */ (char) 0xB3,
880 0x00,
881 0x00,
882 0x00,
883 0x00,
884 0x00,
885 0x00,
886 0x00,
887 0x00,
888 0x00,
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895 0x00,
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897 0x00,
898 0x00,
899 0x00,
900 0x00,
901 0x00,
902 0x00,
903 0x00,
904 0x00,
905 0x00,
906 0x00,
907 0x00,
908 /* U+2282 */ (char) 0xCC,
909 /* U+2283 */ (char) 0xC9,
910 /* U+2284 */ (char) 0xCB,
911 0x00,
912 /* U+2286 */ (char) 0xCD,
913 /* U+2287 */ (char) 0xCA,
914 0x00,
915 0x00,
916 0x00,
917 0x00,
918 0x00,
919 0x00,
920 0x00,
921 0x00,
922 0x00,
923 0x00,
924 0x00,
925 0x00,
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```
926 0x00,  
927 /* U+2295 */ (char) 0xC5,  
928 0x00,  
929 /* U+2297 */ (char) 0xC4,  
930 0x00,  
931 0x00,  
932 0x00,  
933 0x00,  
934 0x00,  
935 0x00,  
936 0x00,  
937 0x00,  
938 0x00,  
939 0x00,  
940 0x00,  
941 0x00,  
942 0x00,  
943 /* U+22A5 */ 0x5E,  
944 0x00,  
945 0x00,  
946 0x00,  
947 0x00,  
948 0x00,  
949 0x00,  
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969 0x00,  
970 0x00,  
971 0x00,  
972 0x00,  
973 0x00,  
974 0x00,  
975 /* U+22C5 */ (char) 0xD7,  
976 0x00,  
977 0x00,  
978 0x00,  
979 0x00,  
980 0x00,  
981 0x00,  
982 0x00,  
983 0x00,  
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1013 0x00,
1014 0x00,
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1016 0x00,
1017 0x00,
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1019 0x00,
1020 0x00,
1021 0x00,
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1024 0x00,
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1056 0x00,
1057 0x00,
1058 0x00,
1059 0x00,
1060 0x00,
1061 0x00,
1062 0x00,
1063 0x00,
1064 0x00,
1065 0x00,
1066 /* U+2320 */ (char)0xF3,
1067 /* U+2321 */ (char)0xF5,
1068 0x00,
1069 0x00,
1070 0x00,
1071 0x00,
1072 0x00,
1073 0x00,
1074 0x00,
1075 /* U+2329 */ (char)0xE1,
1076 /* U+232A */ (char)0xF1,
1077 };
1078
1079 static const char unicode_to_symbol_1b_25CA[] = {
1080 /* U+25CA */ (char)0xE0,
1081 };
1082
1083 static const char unicode_to_symbol_1b_2660[] = {
1084 /* U+2660 */ (char)0xAA,
1085 0x00,
1086 0x00,
1087 /* U+2663 */ (char)0xA7,
1088 0x00,
1089 /* U+2665 */ (char)0xA9,
1090 /* U+2666 */ (char)0xA8,
1091 };
1092
1093 static const char unicode_to_symbol_1b_F6D9[] = {
1094 /* U+F6D9 */ (char)0xD3,
1095 /* U+F6DA */ (char)0xD2,
1096 /* U+F6DB */ (char)0xD4,
1097 };
1098
1099 static const char unicode_to_symbol_1b_F8E5[] = {
```

```

1100 /* U+F8E5 */ 0x60,
1101 /* U+F8E6 */ (char)0xBD,
1102 /* U+F8E7 */ (char)0xBE,
1103 /* U+F8E8 */ (char)0xE2,
1104 /* U+F8E9 */ (char)0xE3,
1105 /* U+F8EA */ (char)0xE4,
1106 /* U+F8EB */ (char)0xE6,
1107 /* U+F8EC */ (char)0xE7,
1108 /* U+F8ED */ (char)0xE8,
1109 /* U+F8EE */ (char)0xE9,
1110 /* U+F8EF */ (char)0xEA,
1111 /* U+F8F0 */ (char)0xEB,
1112 /* U+F8F1 */ (char)0xEC,
1113 /* U+F8F2 */ (char)0xED,
1114 /* U+F8F3 */ (char)0xEE,
1115 /* U+F8F4 */ (char)0xEF,
1116 /* U+F8F5 */ (char)0xF4,
1117 /* U+F8F6 */ (char)0xF6,
1118 /* U+F8F7 */ (char)0xF7,
1119 /* U+F8F8 */ (char)0xF8,
1120 /* U+F8F9 */ (char)0xF9,
1121 /* U+F8FA */ (char)0xFA,
1122 /* U+F8FB */ (char)0xFB,
1123 /* U+F8FC */ (char)0xFC,
1124 /* U+F8FD */ (char)0xFD,
1125 /* U+F8FE */ (char)0xFE,
1126 };

```

## 34.256 armSCII\_8.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/armSCII_8.h,v 1.4 2003/07/15 17:33:45 pascal Exp $ */
2
3 /*
4  * ARMSCII-8
5  */
6
7 static const unsigned short armSCII_8_2uni[96] = {
8     /* 0xa0 */
9     0x00a0, 0xffffd, 0x0587, 0x0589, 0x0029, 0x0028, 0x00bb, 0x00ab,
10     0x2014, 0x002e, 0x055d, 0x002c, 0x002d, 0x058a, 0x2026, 0x055c,
11     /* 0xb0 */
12     0x055b, 0x055e, 0x0531, 0x0561, 0x0532, 0x0562, 0x0533, 0x0563,
13     0x0534, 0x0564, 0x0535, 0x0565, 0x0536, 0x0566, 0x0537, 0x0567,
14     /* 0xc0 */
15     0x0538, 0x0568, 0x0539, 0x0569, 0x053a, 0x056a, 0x053b, 0x056b,
16     0x053c, 0x056c, 0x053d, 0x056d, 0x053e, 0x056e, 0x053f, 0x056f,
17     /* 0xd0 */
18     0x0540, 0x0570, 0x0541, 0x0571, 0x0542, 0x0572, 0x0543, 0x0573,
19     0x0544, 0x0574, 0x0545, 0x0575, 0x0546, 0x0576, 0x0547, 0x0577,
20     /* 0xe0 */
21     0x0548, 0x0578, 0x0549, 0x0579, 0x054a, 0x057a, 0x054b, 0x057b,
22     0x054c, 0x057c, 0x054d, 0x057d, 0x054e, 0x057e, 0x054f, 0x057f,
23     /* 0xf0 */
24     0x0550, 0x0580, 0x0551, 0x0581, 0x0552, 0x0582, 0x0553, 0x0583,
25     0x0554, 0x0584, 0x0555, 0x0585, 0x0556, 0x0586, 0x055a, 0xffffd,
26 };
27
28 static int
29 armSCII_8_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
30 {
31     unsigned char c = *s;
32     if (c < 0xa0) {
33         *pwc = (ucs4_t) c;
34         return 1;
35     }
36     else {
37         unsigned short wc = armSCII_8_2uni[c-0xa0];
38         if (wc != 0xffffd) {
39             *pwc = (ucs4_t) wc;
40             return 1;
41         }
42     }
43     return RET_ILSEQ;
44 }
45
46 static const unsigned char armSCII_8_page00[8] = {
47     0xa5, 0xa4, 0x2a, 0x2b, 0xab, 0xac, 0xa9, 0x2f, /* 0x28-0x2f */
48 };
49 static const unsigned char armSCII_8_page00_1[32] = {
50     0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
51     0x00, 0x00, 0x00, 0xa7, 0x00, 0x00, 0x00, 0x00, /* 0xa8-0xaf */
52     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
53     0x00, 0x00, 0x00, 0xa6, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
54 };
55 static const unsigned char armSCII_8_page05[96] = {

```

```

56 0x00, 0xb2, 0xb4, 0xb6, 0xb8, 0xba, 0xbc, 0xbe, /* 0x30-0x37 */
57 0xc0, 0xc2, 0xc4, 0xc6, 0xc8, 0xca, 0xcc, 0xce, /* 0x38-0x3f */
58 0xd0, 0xd2, 0xd4, 0xd6, 0xd8, 0xda, 0xdc, 0xde, /* 0x40-0x47 */
59 0xe0, 0xe2, 0xe4, 0xe6, 0xe8, 0xea, 0xec, 0xee, /* 0x48-0x4f */
60 0xf0, 0xf2, 0xf4, 0xf6, 0xf8, 0xfa, 0xfc, 0x00, /* 0x50-0x57 */
61 0x00, 0x00, 0xfe, 0xb0, 0xaf, 0xaa, 0xb1, 0x00, /* 0x58-0x5f */
62 0x00, 0xb3, 0xb5, 0xb7, 0xb9, 0xbb, 0xbd, 0xbf, /* 0x60-0x67 */
63 0xc1, 0xc3, 0xc5, 0xc7, 0xc9, 0xcb, 0xcd, 0xcf, /* 0x68-0x6f */
64 0xd1, 0xd3, 0xd5, 0xd7, 0xd9, 0xdb, 0xdd, 0xdf, /* 0x70-0x77 */
65 0xe1, 0xe3, 0xe5, 0xe7, 0xe9, 0xeb, 0xed, 0xef, /* 0x78-0x7f */
66 0xf1, 0xf3, 0xf5, 0xf7, 0xf9, 0xfb, 0xfd, 0xa2, /* 0x80-0x87 */
67 0x00, 0xa3, 0xad, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
68 };
69 static const unsigned char armSCII_8_page20[24] = {
70 0x00, 0x00, 0x00, 0x00, 0xa8, 0x00, 0x00, 0x00, /* 0x10-0x17 */
71 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
72 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xae, 0x00, /* 0x20-0x27 */
73 };
74
75 static int
76 armSCII_8_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
77 {
78     unsigned char c = 0;
79     if (wc < 0x0028) {
80         *r = wc;
81         return 1;
82     }
83     else if (wc >= 0x0028 && wc < 0x0030)
84         c = armSCII_8_page00[wc-0x0028];
85     else if (wc >= 0x0030 && wc < 0x00a0)
86         c = wc;
87     else if (wc >= 0x00a0 && wc < 0x00c0)
88         c = armSCII_8_page00_1[wc-0x00a0];
89     else if (wc >= 0x0530 && wc < 0x0590)
90         c = armSCII_8_page05[wc-0x0530];
91     else if (wc >= 0x2010 && wc < 0x2028)
92         c = armSCII_8_page20[wc-0x2010];
93     if (c != 0) {
94         *r = c;
95         return 1;
96     }
97     return RET_ILSEQ;
98 }

```

## 34.257 ascii.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/ascii.h,v 1.3 2000/11/29 17:40:28 dawes Exp $ */
2
3 /*
4  * ASCII
5  */
6
7 static int
8 ascii_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
9 {
10     unsigned char c = *s;
11     if (c < 0x80) {
12         *pwc = (ucs4_t) c;
13         return 1;
14     }
15     return RET_ILSEQ;
16 }
17
18 static int
19 ascii_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
20 {
21     if (wc < 0x0080) {
22         *r = wc;
23         return 1;
24     }
25     return RET_ILSEQ;
26 }

```

## 34.258 big5.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/big5.h,v 1.2 2003/05/27 22:26:28 tsi Exp $ */
2
3 /*
4  * BIG5
5  */
6 #ifdef NEED_TOWC
7 static const unsigned short big5_2uni_page1[6121] = {

```

```
8  /* 0xa1 */
9  0x3000, 0xff0c, 0x3001, 0x3002, 0xff0e, 0x2022, 0xff1b, 0xff1a,
10 0xff1f, 0xff01, 0xfe30, 0x2026, 0x2025, 0xfe50, 0xff64, 0xfe52,
11 0x00b7, 0xfe54, 0xfe55, 0xfe56, 0xfe57, 0xff5c, 0x2013, 0xfe31,
12 0x2014, 0xfe33, 0xfffd, 0xfe34, 0xfe4f, 0xff08, 0xff09, 0xfe35,
13 0xfe36, 0xff5b, 0xff5d, 0xfe37, 0xfe38, 0x3014, 0x3015, 0xfe39,
14 0xfe3a, 0x3010, 0x3011, 0xfe3b, 0xfe3c, 0x300a, 0x300b, 0xfe3d,
15 0xfe3e, 0x3008, 0x3009, 0xfe3f, 0xfe40, 0x300c, 0x300d, 0xfe41,
16 0xfe42, 0x300e, 0x300f, 0xfe43, 0xfe44, 0xfe59, 0xfe5a, 0xfe5b,
17 0xfe5c, 0xfe5d, 0xfe5e, 0x2018, 0x2019, 0x201c, 0x201d, 0x301d,
18 0x301e, 0x2035, 0x2032, 0xff03, 0xff06, 0xff0a, 0x203b, 0x00a7,
19 0x3003, 0x25cb, 0x25cf, 0x25b3, 0x25b2, 0x25ce, 0x2606, 0x2605,
20 0x25c7, 0x25c6, 0x25a1, 0x25a0, 0x25bd, 0x25bc, 0x32a3, 0x2105,
21 0x203e, 0xffffd, 0xff3f, 0xffffd, 0xfe49, 0xfe4a, 0xfe4d, 0xfe4e,
22 0xfe4b, 0xfe4c, 0xfe5f, 0xfe60, 0xfe61, 0xff0b, 0xff0d, 0x00d7,
23 0x00f7, 0x00b1, 0x221a, 0xff1c, 0xff1e, 0xff1d, 0x2266, 0x2267,
24 0x2260, 0x221e, 0x2252, 0x2261, 0xfe62, 0xfe63, 0xfe64, 0xfe65,
25 0xfe66, 0x223c, 0x2229, 0x222a, 0x22a5, 0x2220, 0x221f, 0x22bf,
26 0x33d2, 0x33d1, 0x222b, 0x222e, 0x2235, 0x2234, 0x2640, 0x2642,
27 0x2641, 0x2609, 0x2191, 0x2193, 0x2190, 0x2192, 0x2196, 0x2197,
28 0x2199, 0x2198, 0x2225, 0x2223, 0xffffd,
29 /* 0xa2 */
30 0xffffd, 0xff0f, 0xff3c, 0xff04, 0x00a5, 0x3012, 0x00a2, 0x00a3,
31 0xff05, 0xff20, 0x2103, 0x2109, 0xfe69, 0xfe6a, 0xfe6b, 0x33d5,
32 0x339c, 0x339d, 0x339e, 0x33ce, 0x33a1, 0x338e, 0x338f, 0x33c4,
33 0x00b0, 0x5159, 0x515b, 0x515e, 0x515d, 0x5161, 0x5163, 0x55e7,
34 0x74e9, 0x7cce, 0x2581, 0x2582, 0x2583, 0x2584, 0x2585, 0x2586,
35 0x2587, 0x2588, 0x258f, 0x258e, 0x258d, 0x258c, 0x258b, 0x258a,
36 0x2589, 0x253c, 0x2534, 0x252c, 0x2524, 0x251c, 0x2594, 0x2500,
37 0x2502, 0x2595, 0x250c, 0x2510, 0x2514, 0x2518, 0x256d, 0x256e,
38 0x2570, 0x256f, 0x2550, 0x255e, 0x256a, 0x2561, 0x25e2, 0x25e3,
39 0x25e5, 0x25e4, 0x2571, 0x2572, 0x2573, 0xff10, 0xff11, 0xff12,
40 0xff13, 0xff14, 0xff15, 0xff16, 0xff17, 0xff18, 0xff19, 0x2160,
41 0x2161, 0x2162, 0x2163, 0x2164, 0x2165, 0x2166, 0x2167, 0x2168,
42 0x2169, 0x3021, 0x3022, 0x3023, 0x3024, 0x3025, 0x3026, 0x3027,
43 0x3028, 0x3029, 0xffffd, 0x5344, 0xffffd, 0xff21, 0xff22, 0xff23,
44 0xff24, 0xff25, 0xff26, 0xff27, 0xff28, 0xff29, 0xff2a, 0xff2b,
45 0xff2c, 0xff2d, 0xff2e, 0xff2f, 0xff30, 0xff31, 0xff32, 0xff33,
46 0xff34, 0xff35, 0xff36, 0xff37, 0xff38, 0xff39, 0xff3a, 0xff41,
47 0xff42, 0xff43, 0xff44, 0xff45, 0xff46, 0xff47, 0xff48, 0xff49,
48 0xff4a, 0xff4b, 0xff4c, 0xff4d, 0xff4e, 0xff4f, 0xff50, 0xff51,
49 0xff52, 0xff53, 0xff54, 0xff55, 0xff56,
50 /* 0xa3 */
51 0xff57, 0xff58, 0xff59, 0xff5a, 0x0391, 0x0392, 0x0393, 0x0394,
52 0x0395, 0x0396, 0x0397, 0x0398, 0x0399, 0x039a, 0x039b, 0x039c,
53 0x039d, 0x039e, 0x039f, 0x03a0, 0x03a1, 0x03a3, 0x03a4, 0x03a5,
54 0x03a6, 0x03a7, 0x03a8, 0x03a9, 0x03b1, 0x03b2, 0x03b3, 0x03b4,
55 0x03b5, 0x03b6, 0x03b7, 0x03b8, 0x03b9, 0x03ba, 0x03bb, 0x03bc,
56 0x03bd, 0x03be, 0x03bf, 0x03c0, 0x03c1, 0x03c3, 0x03c4, 0x03c5,
57 0x03c6, 0x03c7, 0x03c8, 0x03c9, 0x3105, 0x3106, 0x3107, 0x3108,
58 0x3109, 0x310a, 0x310b, 0x310c, 0x310d, 0x310e, 0x310f, 0x3110,
59 0x3111, 0x3112, 0x3113, 0x3114, 0x3115, 0x3116, 0x3117, 0x3118,
60 0x3119, 0x311a, 0x311b, 0x311c, 0x311d, 0x311e, 0x311f, 0x3120,
61 0x3121, 0x3122, 0x3123, 0x3124, 0x3125, 0x3126, 0x3127, 0x3128,
62 0x3129, 0x02d9, 0x02c9, 0x02ca, 0x02c7, 0x02cb, 0xffffd, 0xffffd,
63 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
64 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
65 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
66 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
67 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
68 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
69 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
70 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
71 /* 0xa4 */
72 0x4e00, 0x4e59, 0x4e01, 0x4e03, 0x4e43, 0x4e5d, 0x4e86, 0x4e8c,
73 0x4eba, 0x513f, 0x5165, 0x516b, 0x51e0, 0x5200, 0x5201, 0x529b,
74 0x5315, 0x5341, 0x535c, 0x53c8, 0x4e09, 0x4e0b, 0x4e08, 0x4e0a,
75 0x4e2b, 0x4e38, 0x51e1, 0x4e45, 0x4e48, 0x4e5f, 0x4e5e, 0x4e8e,
76 0x4ea1, 0x5140, 0x5203, 0x52fa, 0x5343, 0x53c9, 0x53e3, 0x571f,
77 0x58eb, 0x5915, 0x5927, 0x5973, 0x5b50, 0x5b51, 0x5b53, 0x5bf8,
78 0x5c0f, 0x5c22, 0x5c38, 0x5c71, 0x5ddd, 0x5de5, 0x5df1, 0x5df2,
79 0x5df3, 0x5dfe, 0x5e72, 0x5efe, 0x5f0b, 0x5f13, 0x624d, 0x4e11,
80 0x4e10, 0x4e0d, 0x4e2d, 0x4e30, 0x4e39, 0x4e4b, 0x5c39, 0x4e88,
81 0x4e91, 0x4e95, 0x4e92, 0x4e94, 0x4ea2, 0x4ec1, 0x4ec0, 0x4ec3,
82 0x4ec6, 0x4ec7, 0x4ecd, 0x4eca, 0x4ecb, 0x4ec4, 0x5143, 0x5141,
83 0x5167, 0x516d, 0x516e, 0x516c, 0x5197, 0x51f6, 0x5206, 0x5207,
84 0x5208, 0x52fb, 0x52fe, 0x52ff, 0x5316, 0x5339, 0x5348, 0x5347,
85 0x5345, 0x535e, 0x5384, 0x53cb, 0x53ca, 0x53cd, 0x58ec, 0x5929,
86 0x592b, 0x592a, 0x592d, 0x5b54, 0x5c11, 0x5c24, 0x5c3a, 0x5c6f,
87 0x5df4, 0x5e7b, 0x5eff, 0x5ff14, 0x5ff15, 0x5fc3, 0x6208, 0x6236,
88 0x624b, 0x624e, 0x652f, 0x6587, 0x6597, 0x65a4, 0x65b9, 0x65e5,
89 0x66f0, 0x6708, 0x6728, 0x6b20, 0x6b62, 0x6b79, 0x6bcb, 0x6bd4,
90 0x6bdb, 0x6c0f, 0x6c34, 0x706b, 0x722a, 0x7236, 0x723b, 0x7247,
91 0x7259, 0x725b, 0x72ac, 0x738b, 0x4e19,
92 /* 0xa5 */
93 0x4e16, 0x4e15, 0x4e14, 0x4e18, 0x4e3b, 0x4e4d, 0x4e4f, 0x4e4e,
94 0x4ee5, 0x4ed8, 0x4ed4, 0x4ed5, 0x4ed6, 0x4ed7, 0x4ee3, 0x4ee4,
```

```
95 0x4ed9, 0x4ede, 0x5145, 0x5144, 0x5189, 0x518a, 0x51ac, 0x51f9,
96 0x51fa, 0x51f8, 0x520a, 0x52a0, 0x529f, 0x5305, 0x5306, 0x5317,
97 0x531d, 0x4edf, 0x534a, 0x5349, 0x5361, 0x5360, 0x536f, 0x536e,
98 0x53bb, 0x53ef, 0x53e4, 0x53f3, 0x53ec, 0x53ee, 0x53e9, 0x53e8,
99 0x53fc, 0x53f8, 0x53f5, 0x53eb, 0x53e6, 0x53ea, 0x53f2, 0x53f1,
100 0x53f0, 0x53e5, 0x53ed, 0x53fb, 0x56db, 0x56da, 0x5916, 0x592e,
101 0x5931, 0x5974, 0x5976, 0x5b55, 0x5b83, 0x5c3c, 0x5de8, 0x5de7,
102 0x5de6, 0x5e02, 0x5e03, 0x5e73, 0x5e7c, 0x5f01, 0x5f18, 0x5f17,
103 0x5fc5, 0x620a, 0x6253, 0x6254, 0x6252, 0x6251, 0x65a5, 0x65e6,
104 0x672e, 0x672c, 0x672a, 0x672b, 0x672d, 0x6b63, 0x6bcd, 0x6c11,
105 0x6c10, 0x6c38, 0x6c41, 0x6c40, 0x6c3e, 0x72af, 0x7384, 0x7389,
106 0x74dc, 0x74e6, 0x7518, 0x751f, 0x7528, 0x7529, 0x7530, 0x7531,
107 0x7532, 0x7533, 0x758b, 0x767d, 0x76ae, 0x76bf, 0x76ee, 0x77db,
108 0x77e2, 0x77f3, 0x793a, 0x79be, 0x7a74, 0x7acb, 0x4e1e, 0x4e1f,
109 0x4e52, 0x4e53, 0x4e59, 0x4e69, 0x4ea4, 0x4ea6, 0x4ea5, 0x4eff,
110 0x4f09, 0x4f19, 0x4f0a, 0x4f15, 0x4f0d, 0x4f10, 0x4f11, 0x4f0f,
111 0x4ef2, 0x4ef6, 0x4efb, 0x4ef0, 0x4ef3, 0x4efd, 0x4f01, 0x4f0b,
112 0x5149, 0x5147, 0x5146, 0x5148, 0x5168,
113 /* 0xa6 */
114 0x5171, 0x518d, 0x51b0, 0x5217, 0x5211, 0x5212, 0x520e, 0x5216,
115 0x52a3, 0x5308, 0x5321, 0x5320, 0x5370, 0x5371, 0x5409, 0x540f,
116 0x540c, 0x540a, 0x5410, 0x5401, 0x540b, 0x5404, 0x5411, 0x540d,
117 0x5408, 0x5403, 0x540e, 0x5406, 0x5412, 0x56e0, 0x56de, 0x56dd,
118 0x5733, 0x5730, 0x5728, 0x572d, 0x572c, 0x572f, 0x5729, 0x5919,
119 0x591a, 0x5937, 0x5938, 0x5984, 0x5978, 0x5983, 0x597d, 0x5979,
120 0x5982, 0x5981, 0x5b57, 0x5b58, 0x5b87, 0x5b88, 0x5b85, 0x5b89,
121 0x5bfa, 0x5c16, 0x5c79, 0x5dde, 0x5e06, 0x5e76, 0x5e74, 0x5f0f,
122 0x5f1b, 0x5fd9, 0x5fd6, 0x620e, 0x620c, 0x620d, 0x6210, 0x6263,
123 0x625b, 0x6258, 0x6536, 0x65e9, 0x65e8, 0x65ec, 0x65ed, 0x66f2,
124 0x66f3, 0x6709, 0x673d, 0x6734, 0x6731, 0x6735, 0x6b21, 0x6b64,
125 0x6b7b, 0x6c16, 0x6c5d, 0x6c57, 0x6c59, 0x6c5f, 0x6c60, 0x6c50,
126 0x6c55, 0x6c61, 0x6c5b, 0x6c4d, 0x6c4e, 0x7070, 0x725f, 0x725d,
127 0x767e, 0x7af9, 0x7cf3, 0x7cf8, 0x7f36, 0x7f8a, 0x7fbd, 0x8001,
128 0x8003, 0x800c, 0x8012, 0x8033, 0x807f, 0x8089, 0x808b, 0x808c,
129 0x81e3, 0x81ea, 0x81f3, 0x81fc, 0x820c, 0x821b, 0x821f, 0x826e,
130 0x8272, 0x827e, 0x866b, 0x8840, 0x884c, 0x8863, 0x897f, 0x9621,
131 0x4e32, 0x4ea8, 0x4f4d, 0x4f4f, 0x4f47, 0x4f57, 0x4f5e, 0x4f34,
132 0x4f5b, 0x4f55, 0x4f30, 0x4f50, 0x4f51, 0x4f3d, 0x4f3a, 0x4f38,
133 0x4f43, 0x4f54, 0x4f3c, 0x4f46, 0x4f63,
134 /* 0xa7 */
135 0x4f5c, 0x4f60, 0x4f2f, 0x4f4e, 0x4f36, 0x4f59, 0x4f5d, 0x4f48,
136 0x4f5a, 0x514c, 0x514b, 0x514d, 0x5175, 0x51b6, 0x51b7, 0x5225,
137 0x5224, 0x5229, 0x522a, 0x5228, 0x52ab, 0x52a9, 0x52aa, 0x52ac,
138 0x5323, 0x5373, 0x5375, 0x541d, 0x542d, 0x541e, 0x543e, 0x5426,
139 0x544e, 0x5427, 0x5446, 0x5443, 0x5433, 0x5448, 0x5442, 0x541b,
140 0x5429, 0x544a, 0x5439, 0x543b, 0x5438, 0x542e, 0x5435, 0x5436,
141 0x5420, 0x543c, 0x5440, 0x5431, 0x542b, 0x541f, 0x542c, 0x56ea,
142 0x56f0, 0x56e4, 0x56eb, 0x574a, 0x5751, 0x5740, 0x574d, 0x5747,
143 0x574e, 0x573e, 0x5750, 0x574f, 0x573b, 0x58ef, 0x593e, 0x599d,
144 0x5992, 0x59a8, 0x599e, 0x59a3, 0x5999, 0x5996, 0x598d, 0x59a4,
145 0x5993, 0x598a, 0x59a5, 0x5b5d, 0x5b5c, 0x5b5a, 0x5b5b, 0x5b8c,
146 0x5b8b, 0x5b8f, 0x5c2c, 0x5c40, 0x5c41, 0x5c3f, 0x5c3e, 0x5c90,
147 0x5c91, 0x5c94, 0x5c8c, 0x5deb, 0x5e0c, 0x5e8f, 0x5e87, 0x5e8a,
148 0x5ef7, 0x5f04, 0x5f1f, 0x5f64, 0x5f62, 0x5f77, 0x5f79, 0x5fd8,
149 0x5fcc, 0x5fd7, 0x5fcd, 0x5ff1, 0x5feb, 0x5ff8, 0x5fea, 0x6212,
150 0x6211, 0x6284, 0x6297, 0x6296, 0x6280, 0x6276, 0x6289, 0x626d,
151 0x628a, 0x627c, 0x627e, 0x6279, 0x6273, 0x6292, 0x626f, 0x6298,
152 0x626e, 0x6295, 0x6293, 0x6291, 0x6286, 0x6539, 0x653b, 0x6538,
153 0x65f1, 0x66f4, 0x675f, 0x674e, 0x674f, 0x6750, 0x6751, 0x675c,
154 0x6756, 0x675e, 0x6749, 0x6746, 0x6760,
155 /* 0xa8 */
156 0x6753, 0x6757, 0x6b65, 0x6bcf, 0x6c42, 0x6c5e, 0x6c99, 0x6c81,
157 0x6c88, 0x6c89, 0x6c85, 0x6c9b, 0x6c6a, 0x6c7a, 0x6c90, 0x6c70,
158 0x6c8c, 0x6c68, 0x6c96, 0x6c92, 0x6c7d, 0x6c83, 0x6c72, 0x6c7e,
159 0x6c74, 0x6c86, 0x6c76, 0x6c7c, 0x6c94, 0x6c98, 0x6c82, 0x7076,
160 0x707c, 0x707d, 0x7078, 0x7262, 0x7261, 0x7260, 0x72c4, 0x72c2,
161 0x7396, 0x752c, 0x752b, 0x7537, 0x7538, 0x7682, 0x76ef, 0x77e3,
162 0x79c1, 0x79c0, 0x79bf, 0x7a76, 0x7cfb, 0x7f55, 0x8096, 0x8093,
163 0x809d, 0x8098, 0x809b, 0x809a, 0x80b2, 0x826f, 0x8292, 0x828b,
164 0x828d, 0x898b, 0x89d2, 0x8a00, 0x8c37, 0x8c46, 0x8c55, 0x8c9d,
165 0x8d64, 0x8d70, 0x8db3, 0x8eab, 0x8eca, 0x8f9b, 0x8fb0, 0x8fc2,
166 0x8fc6, 0x8fc5, 0x8fc4, 0x5de1, 0x9091, 0x90a2, 0x90aa, 0x90a6,
167 0x90a3, 0x9149, 0x91c6, 0x91cc, 0x9632, 0x962e, 0x9631, 0x962a,
168 0x962c, 0x4e26, 0x4e56, 0x4e73, 0x4e8b, 0x4e9b, 0x4e9e, 0x4eab,
169 0x4eac, 0x4f6f, 0x4f9d, 0x4f8d, 0x4f73, 0x4f7f, 0x4f6c, 0x4f9b,
170 0x4f8b, 0x4f86, 0x4f83, 0x4f70, 0x4f75, 0x4f88, 0x4f69, 0x4f7b,
171 0x4f96, 0x4f7e, 0x4f8f, 0x4f91, 0x4f7a, 0x5154, 0x5152, 0x5155,
172 0x5169, 0x5177, 0x5176, 0x5178, 0x51bd, 0x51fd, 0x523b, 0x5238,
173 0x5237, 0x523a, 0x5230, 0x522e, 0x5236, 0x5241, 0x52be, 0x52bb,
174 0x5352, 0x5354, 0x5353, 0x5351, 0x5366, 0x5377, 0x5378, 0x5379,
175 0x53d6, 0x53d4, 0x53d7, 0x5473, 0x5475,
176 /* 0xa9 */
177 0x5496, 0x5478, 0x5495, 0x5480, 0x547b, 0x5477, 0x5484, 0x5492,
178 0x5486, 0x547c, 0x5490, 0x5471, 0x5476, 0x548c, 0x549a, 0x5462,
179 0x5468, 0x548b, 0x547d, 0x548e, 0x54fa, 0x5783, 0x5777, 0x576a,
180 0x5769, 0x5761, 0x5766, 0x5764, 0x577c, 0x591c, 0x5949, 0x5947,
181 0x5948, 0x5944, 0x5954, 0x59be, 0x59bb, 0x59d4, 0x59b9, 0x59ae,
```

```
182 0x59d1, 0x59c6, 0x59d0, 0x59cd, 0x59cb, 0x59d3, 0x59ca, 0x59af,
183 0x59b3, 0x59d2, 0x59c5, 0x5b5f, 0x5b64, 0x5b63, 0x5b97, 0x5b9a,
184 0x5b98, 0x5b9c, 0x5b99, 0x5b9b, 0x5c1a, 0x5c48, 0x5c45, 0x5c46,
185 0x5cb7, 0x5ca1, 0x5cb8, 0x5ca9, 0x5cab, 0x5cb1, 0x5cb3, 0x5e18,
186 0x5e1a, 0x5e16, 0x5e15, 0x5e1b, 0x5e11, 0x5e78, 0x5e9a, 0x5e97,
187 0x5e9c, 0x5e95, 0x5e96, 0x5ef6, 0x5f26, 0x5f27, 0x5f29, 0x5f80,
188 0x5f81, 0x5f7f, 0x5f7c, 0x5fdd, 0x5fe0, 0x5ffd, 0x5ff5, 0x5fff,
189 0x600f, 0x6014, 0x602f, 0x6035, 0x6016, 0x602a, 0x6015, 0x6021,
190 0x6027, 0x6029, 0x602b, 0x601b, 0x6216, 0x6215, 0x623f, 0x623e,
191 0x6240, 0x627f, 0x62c9, 0x62cc, 0x62c4, 0x62bf, 0x62c2, 0x62b9,
192 0x62d2, 0x62db, 0x62ab, 0x62d3, 0x62d4, 0x62cb, 0x62c8, 0x62a8,
193 0x62bd, 0x62bc, 0x62d0, 0x62d9, 0x62c7, 0x62cd, 0x62b5, 0x62da,
194 0x62b1, 0x62d8, 0x62d6, 0x62d7, 0x62c6, 0x62ac, 0x62ce, 0x653e,
195 0x65a7, 0x65bc, 0x65fa, 0x6614, 0x6613, 0x660c, 0x6606, 0x6602,
196 0x660e, 0x6600, 0x660f, 0x6615, 0x660a,
197 /* 0xaa */
198 0x6607, 0x670d, 0x670b, 0x676d, 0x678b, 0x6795, 0x6771, 0x679c,
199 0x6773, 0x6777, 0x6787, 0x6797, 0x676f, 0x6770, 0x677f,
200 0x6789, 0x677e, 0x6790, 0x6775, 0x679a, 0x6793, 0x677c, 0x676a,
201 0x6772, 0x6b23, 0x6b66, 0x6b67, 0x6b7f, 0x6c13, 0x6c1b, 0x6ce3,
202 0x6ce8, 0x6cf3, 0x6cb1, 0x6ccc, 0x6ce5, 0x6cb3, 0x6cbd, 0x6cbe,
203 0x6cbc, 0x6ce2, 0x6cab, 0x6cd5, 0x6cd3, 0x6cb8, 0x6cc4, 0x6cb9,
204 0x6cc1, 0x6cae, 0x6cd7, 0x6cc5, 0x6cf1, 0x6cbf, 0x6cbb, 0x6ce1,
205 0x6cdb, 0x6cca, 0x6cac, 0x6cef, 0x6cdc, 0x6cd6, 0x6ce0, 0x7095,
206 0x708e, 0x7092, 0x708a, 0x7099, 0x722c, 0x722d, 0x7238, 0x7248,
207 0x7267, 0x7269, 0x72c0, 0x72ce, 0x72d9, 0x72d7, 0x72d0, 0x73a9,
208 0x73a8, 0x739f, 0x73ab, 0x73a5, 0x753d, 0x759d, 0x7599, 0x759a,
209 0x7684, 0x76c2, 0x76f2, 0x76f4, 0x77e5, 0x77fd, 0x793e, 0x7940,
210 0x7941, 0x79c9, 0x79c8, 0x7a7a, 0x7a79, 0x7afa, 0x7cfe, 0x7f54,
211 0x7f8c, 0x7f8b, 0x8005, 0x80ba, 0x80a5, 0x80a2, 0x80b1, 0x80a1,
212 0x80ab, 0x80a9, 0x80b4, 0x80aa, 0x80af, 0x81e5, 0x81fe, 0x820d,
213 0x82b3, 0x829d, 0x8299, 0x82ad, 0x82bd, 0x829f, 0x82b9, 0x82b1,
214 0x82ac, 0x82a5, 0x82af, 0x82b8, 0x82a3, 0x82b0, 0x82be, 0x82b7,
215 0x864e, 0x8671, 0x521d, 0x8868, 0x8ecb, 0x8fce, 0x8fd4, 0x8fd1,
216 0x90b5, 0x90b8, 0x90b1, 0x90b6, 0x91c7, 0x91d1, 0x9577, 0x9580,
217 0x961c, 0x9640, 0x963f, 0x963b, 0x9644,
218 /* 0xab */
219 0x9642, 0x96b9, 0x96e8, 0x9752, 0x975e, 0x4e9f, 0x4ead, 0x4eae,
220 0x4fe1, 0x4fb5, 0x4faf, 0x4fbf, 0x4fe0, 0x4fd1, 0x4fcf, 0x4fdd,
221 0x4fc3, 0x4fb6, 0x4fd8, 0x4fdf, 0x4fca, 0x4fd7, 0x4fae, 0x4fd0,
222 0x4fc4, 0x4fc2, 0x4fda, 0x4fce, 0x4fde, 0x4fb7, 0x5157, 0x5192,
223 0x5191, 0x51a0, 0x524e, 0x5243, 0x524a, 0x524d, 0x524c, 0x524b,
224 0x5247, 0x52c7, 0x52c9, 0x52c3, 0x52c1, 0x530d, 0x5357, 0x537b,
225 0x539a, 0x53db, 0x54ac, 0x54c0, 0x54a8, 0x54ce, 0x54c9, 0x54b8,
226 0x54a6, 0x54b3, 0x54c7, 0x54c2, 0x54bd, 0x54aa, 0x54c1, 0x54c4,
227 0x54c8, 0x54af, 0x54ab, 0x54b1, 0x54bb, 0x54a9, 0x54a7, 0x54bf,
228 0x56ff, 0x5782, 0x578b, 0x57a0, 0x57a3, 0x57a2, 0x57ce, 0x57ae,
229 0x5793, 0x5955, 0x5951, 0x594f, 0x594e, 0x5950, 0x59dc, 0x59d8,
230 0x59ff, 0x59e3, 0x59e8, 0x5a03, 0x59e5, 0x59ea, 0x59da, 0x59e6,
231 0x5a01, 0x59fb, 0x5b69, 0x5ba3, 0x5ba6, 0x5ba4, 0x5ba2, 0x5ba5,
232 0x5c01, 0x5c4e, 0x5c4f, 0x5c4d, 0x5c4b, 0x5cd9, 0x5cd2, 0x5df7,
233 0x5e1d, 0x5e25, 0x5e1f, 0x5e7d, 0x5ea0, 0x5ea6, 0x5efa, 0x5f08,
234 0x5f2d, 0x5f65, 0x5f88, 0x5f85, 0x5f8a, 0x5f8b, 0x5f87, 0x5f8c,
235 0x5f89, 0x6012, 0x601d, 0x6020, 0x6025, 0x600e, 0x6028, 0x604d,
236 0x6070, 0x6068, 0x6062, 0x6046, 0x6043, 0x606c, 0x606b, 0x606a,
237 0x6064, 0x6241, 0x62dc, 0x6316, 0x6309, 0x62fc, 0x62ed, 0x6301,
238 0x62ee, 0x62fd, 0x6307, 0x62f1, 0x62f7,
239 /* 0xac */
240 0x62ef, 0x62ec, 0x62fe, 0x62f4, 0x6311, 0x6302, 0x653f, 0x6545,
241 0x65ab, 0x65bd, 0x65e2, 0x6625, 0x662d, 0x6620, 0x6627, 0x662f,
242 0x661f, 0x6628, 0x6631, 0x6624, 0x66f7, 0x67ff, 0x67d3, 0x67f1,
243 0x67d4, 0x67d0, 0x67ec, 0x67b6, 0x67af, 0x67f5, 0x67e9, 0x67ef,
244 0x67c4, 0x67d1, 0x67b4, 0x67da, 0x67e5, 0x67b8, 0x67cf, 0x67de,
245 0x67f3, 0x67b0, 0x67d9, 0x67e2, 0x67dd, 0x67d2, 0x6b6a, 0x6b83,
246 0x6b86, 0x6bb5, 0x6bd2, 0x6bd7, 0x6c1f, 0x6cc9, 0x6d0b, 0x6d32,
247 0x6d2a, 0x6d41, 0x6d25, 0x6d0c, 0x6d31, 0x6d1e, 0x6d17, 0x6d3b,
248 0x6d3d, 0x6d3e, 0x6d36, 0x6d1b, 0x6cf5, 0x6d39, 0x6d27, 0x6d38,
249 0x6d29, 0x6d2e, 0x6d35, 0x6d0e, 0x6d2b, 0x70ab, 0x70ba, 0x70b3,
250 0x70ac, 0x70af, 0x70ad, 0x70b8, 0x70ae, 0x70a4, 0x7230, 0x7272,
251 0x726f, 0x7274, 0x72e9, 0x72e0, 0x72e1, 0x73b7, 0x73ca, 0x73bb,
252 0x73b2, 0x73cd, 0x73c0, 0x73b3, 0x751a, 0x752d, 0x754f, 0x754c,
253 0x754e, 0x754b, 0x75ab, 0x75a4, 0x75a5, 0x75a2, 0x75a3, 0x7678,
254 0x7686, 0x7687, 0x7688, 0x76c8, 0x76c6, 0x76c3, 0x76c5, 0x7701,
255 0x76f9, 0x76f8, 0x7709, 0x770b, 0x76fe, 0x76fc, 0x7707, 0x77dc,
256 0x7802, 0x7814, 0x780c, 0x780d, 0x7946, 0x7949, 0x7948, 0x7947,
257 0x79b9, 0x79ba, 0x79d1, 0x79d2, 0x79cb, 0x7a7f, 0x7a81, 0x7aff,
258 0x7afd, 0x7c7d, 0x7d02, 0x7d05, 0x7d00, 0x7d09, 0x7d07, 0x7d04,
259 0x7d06, 0x7f38, 0x7f8e, 0x7fbf, 0x8004,
260 /* 0xad */
261 0x8010, 0x800d, 0x800d, 0x8011, 0x8036, 0x80d6, 0x80e5, 0x80da, 0x80c3,
262 0x80c4, 0x80cc, 0x80e1, 0x80db, 0x80ce, 0x80de, 0x80e4, 0x80dd,
263 0x81f4, 0x8222, 0x82e7, 0x8303, 0x8305, 0x82e3, 0x82db, 0x82e6,
264 0x8304, 0x82e5, 0x8302, 0x8309, 0x82d2, 0x82d7, 0x82f1, 0x8301,
265 0x82dc, 0x82d4, 0x82d1, 0x82de, 0x82d3, 0x82df, 0x82ef, 0x8306,
266 0x8650, 0x8679, 0x867b, 0x867a, 0x884d, 0x886b, 0x8981, 0x89d4,
267 0x8a08, 0x8a02, 0x8a03, 0x8c9e, 0x8ca0, 0x8d74, 0x8d73, 0x8db4,
268 0x8ecd, 0x8ecc, 0x8ff0, 0x8fe6, 0x8fe2, 0x8fea, 0x8fe5, 0x8fed,
```

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269 0x8feb, 0x8fe4, 0x8fe8, 0x90ca, 0x90ce, 0x90c1, 0x90c3, 0x914b,
270 0x914a, 0x91cd, 0x9582, 0x9650, 0x964b, 0x964c, 0x964d, 0x9762,
271 0x9769, 0x97cb, 0x97ed, 0x97f3, 0x9801, 0x98a8, 0x98db, 0x98df,
272 0x9996, 0x9999, 0x4e58, 0x4eb3, 0x500c, 0x500d, 0x5023, 0x4fef,
273 0x5026, 0x5025, 0x4ff8, 0x5029, 0x5016, 0x5006, 0x503c, 0x501f,
274 0x501a, 0x5012, 0x5011, 0x4ffa, 0x5000, 0x5014, 0x5028, 0x4ff1,
275 0x5021, 0x500b, 0x5019, 0x5018, 0x4ff3, 0x4fee, 0x502d, 0x502a,
276 0x4ffe, 0x502b, 0x5009, 0x517c, 0x51a4, 0x51a5, 0x51a2, 0x51cd,
277 0x51cc, 0x51c6, 0x51cb, 0x5256, 0x525c, 0x5254, 0x525b, 0x525d,
278 0x532a, 0x537f, 0x539f, 0x539d, 0x53df, 0x54e8, 0x5510, 0x5501,
279 0x5537, 0x54fc, 0x54e5, 0x54f2, 0x5506, 0x54fa, 0x5514, 0x54e9,
280 0x54ed, 0x54e1, 0x5509, 0x54ee, 0x54ea,
281 /* 0xae */
282 0x54e6, 0x5527, 0x5507, 0x54fd, 0x550f, 0x5703, 0x5704, 0x57c2,
283 0x57d4, 0x57cb, 0x57c3, 0x5809, 0x590f, 0x5957, 0x5958, 0x595a,
284 0x5a11, 0x5a18, 0x5a1c, 0x5a1f, 0x5a1b, 0x5a13, 0x59ec, 0x5a20,
285 0x5a23, 0x5a29, 0x5a25, 0x5a0c, 0x5a09, 0x5b6b, 0x5c58, 0x5bb0,
286 0x5bb3, 0x5bb6, 0x5bb4, 0x5bae, 0x5bb5, 0x5bb9, 0x5bb8, 0x5c04,
287 0x5c51, 0x5c55, 0x5c50, 0x5ced, 0x5cfd, 0x5cfb, 0x5cea, 0x5ce8,
288 0x5cf0, 0x5cf6, 0x5d01, 0x5cf4, 0x5dee, 0x5e2d, 0x5e2b, 0x5eab,
289 0x5ead, 0x5ea7, 0x5f31, 0x5f92, 0x5f91, 0x5f90, 0x6059, 0x6063,
290 0x6065, 0x6050, 0x6055, 0x606d, 0x6069, 0x606f, 0x6084, 0x609f,
291 0x609a, 0x608d, 0x6094, 0x608c, 0x6085, 0x6096, 0x6247, 0x62f3,
292 0x6308, 0x62ff, 0x634e, 0x633e, 0x632f, 0x6355, 0x6342, 0x6346,
293 0x634f, 0x6349, 0x633a, 0x6350, 0x633d, 0x632a, 0x632b, 0x6328,
294 0x634d, 0x634c, 0x6548, 0x6549, 0x6599, 0x65c1, 0x65c5, 0x6642,
295 0x6649, 0x664f, 0x6643, 0x6652, 0x664c, 0x6645, 0x6641, 0x66f8,
296 0x6714, 0x6715, 0x6717, 0x6821, 0x6838, 0x6848, 0x6846, 0x6853,
297 0x6839, 0x6842, 0x6854, 0x6829, 0x68b3, 0x6817, 0x684c, 0x6851,
298 0x683d, 0x67f4, 0x6850, 0x6840, 0x683c, 0x6843, 0x682a, 0x6845,
299 0x6813, 0x6818, 0x6841, 0x6b8a, 0x6b89, 0x6bb7, 0x6c23, 0x6c27,
300 0x6c28, 0x6c26, 0x6c24, 0x6cf0, 0x6d6a, 0x6d95, 0x6d88, 0x6d87,
301 0x6d66, 0x6d78, 0x6d77, 0x6d59, 0x6d93,
302 /* 0xaf */
303 0x6d6c, 0x6d89, 0x6d6e, 0x6d5a, 0x6d74, 0x6d69, 0x6d8c, 0x6d8a,
304 0x6d79, 0x6d85, 0x6d65, 0x6d94, 0x70ca, 0x70d8, 0x70e4, 0x70d9,
305 0x70c8, 0x70cf, 0x7239, 0x7279, 0x72fc, 0x72f9, 0x72fd, 0x72f8,
306 0x72f7, 0x7386, 0x73ed, 0x7409, 0x73ee, 0x73e0, 0x73ea, 0x73de,
307 0x7554, 0x755d, 0x755c, 0x755a, 0x7559, 0x75be, 0x75c5, 0x75c7,
308 0x75b2, 0x75b3, 0x75bd, 0x75bc, 0x75b9, 0x75c2, 0x75b8, 0x768b,
309 0x76b0, 0x76ca, 0x76cd, 0x76ce, 0x7729, 0x771f, 0x7720, 0x7728,
310 0x77e9, 0x7830, 0x783d, 0x7827, 0x7838, 0x781d, 0x7834, 0x7837, 0x7825,
311 0x782d, 0x7820, 0x781f, 0x7832, 0x7955, 0x7950, 0x7960, 0x795f,
312 0x7956, 0x795e, 0x795d, 0x7957, 0x795a, 0x79e4, 0x79e3, 0x79e7,
313 0x79df, 0x79e6, 0x79e9, 0x79d8, 0x7a84, 0x7a88, 0x7ad9, 0x7b06,
314 0x7b11, 0x7c89, 0x7d21, 0x7d17, 0x7d0b, 0x7d0a, 0x7d20, 0x7d22,
315 0x7d14, 0x7d10, 0x7d15, 0x7d1a, 0x7d1c, 0x7d0d, 0x7d19, 0x7d1b,
316 0x7f3a, 0x7f5f, 0x7f94, 0x7fc5, 0x7fc1, 0x8006, 0x8018, 0x8015,
317 0x8019, 0x8017, 0x803d, 0x803f, 0x80f1, 0x8102, 0x80f0, 0x8105,
318 0x80ed, 0x80f4, 0x8106, 0x80f8, 0x80f3, 0x8108, 0x80fd, 0x810a,
319 0x80fc, 0x80ef, 0x81ed, 0x81ec, 0x8200, 0x8210, 0x822a, 0x822b,
320 0x8228, 0x822c, 0x82bb, 0x832b, 0x8352, 0x8354, 0x834a, 0x8338,
321 0x8350, 0x8349, 0x8335, 0x8334, 0x834f, 0x8332, 0x8339, 0x8336,
322 0x8317, 0x8340, 0x8331, 0x8328, 0x8343,
323 /* 0xb0 */
324 0x8654, 0x868a, 0x86aa, 0x8693, 0x86a4, 0x86a9, 0x868c, 0x86a3,
325 0x869c, 0x8870, 0x8877, 0x8881, 0x8882, 0x887d, 0x8879, 0x8a18,
326 0x8a10, 0x8a0e, 0x8a0c, 0x8a15, 0x8a0a, 0x8a17, 0x8a13, 0x8a16,
327 0x8a0f, 0x8a11, 0x8c48, 0x8c7a, 0x8c79, 0x8ca1, 0x8ca2, 0x8d77,
328 0x8eac, 0x8ed2, 0x8ed4, 0x8ecf, 0x8fb1, 0x9001, 0x9006, 0x8ff7,
329 0x9000, 0x8ffa, 0x8ff4, 0x9003, 0x8ffd, 0x9005, 0x8ff8, 0x9095,
330 0x90e1, 0x90dd, 0x90e2, 0x9152, 0x914d, 0x914c, 0x91d8, 0x91dd,
331 0x91d7, 0x91dc, 0x91d9, 0x9583, 0x9662, 0x9663, 0x9661, 0x965b,
332 0x965d, 0x9664, 0x9658, 0x965e, 0x96bb, 0x98e2, 0x99ac, 0x9aa8,
333 0x9ad8, 0x9b23, 0x9b32, 0x9b3c, 0x4e7e, 0x507a, 0x507d, 0x505c,
334 0x5047, 0x5043, 0x504c, 0x505a, 0x5049, 0x5065, 0x5076, 0x504e,
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336 0x515c, 0x5195, 0x51f0, 0x526a, 0x526f, 0x52d2, 0x52d9, 0x52d8,
337 0x52d5, 0x5310, 0x530f, 0x5319, 0x533f, 0x5340, 0x533e, 0x53c3,
338 0x66fc, 0x5546, 0x556a, 0x5566, 0x5544, 0x555e, 0x5561, 0x5543,
339 0x554a, 0x5531, 0x5556, 0x554f, 0x5555, 0x552f, 0x5564, 0x5538,
340 0x552e, 0x555c, 0x552c, 0x5563, 0x5533, 0x5541, 0x5557, 0x5708,
341 0x570b, 0x5709, 0x57df, 0x5805, 0x580a, 0x5806, 0x57e0, 0x57e4,
342 0x57fa, 0x5802, 0x5835, 0x57f7, 0x57f9, 0x5920, 0x5962, 0x5a36,
343 0x5a41, 0x5a49, 0x5a66, 0x5a6a, 0x5a40,
344 /* 0xb1 */
345 0x5a3c, 0x5a62, 0x5a5a, 0x5a46, 0x5a4a, 0x5b70, 0x5bc7, 0x5bc5,
346 0x5bc4, 0x5bc2, 0x5bbf, 0x5bc6, 0x5c09, 0x5c08, 0x5c07, 0x5c60,
347 0x5c5c, 0x5c5d, 0x5d07, 0x5d06, 0x5d0e, 0x5d1b, 0x5d16, 0x5d22,
348 0x5d11, 0x5d29, 0x5d14, 0x5d19, 0x5d24, 0x5d27, 0x5d17, 0x5d2e,
349 0x5e38, 0x5e36, 0x5e33, 0x5e37, 0x5eb7, 0x5eb8, 0x5eb6, 0x5eb5,
350 0x5ebe, 0x5f35, 0x5f37, 0x5f57, 0x5f6c, 0x5f69, 0x5f6b, 0x5f97,
351 0x5f99, 0x5f9e, 0x5f98, 0x5fa1, 0x5fa0, 0x5f9c, 0x607f, 0x60a3,
352 0x6089, 0x60a0, 0x60a8, 0x60cb, 0x60b4, 0x60e6, 0x60bd, 0x60c5,
353 0x60bb, 0x60b5, 0x60dc, 0x60bc, 0x60d8, 0x60d5, 0x60c6, 0x60df,
354 0x60b8, 0x60da, 0x60c7, 0x621a, 0x621b, 0x6248, 0x63a0, 0x63a7,
355 0x6372, 0x6396, 0x63a2, 0x63a5, 0x6377, 0x6367, 0x6398, 0x63aa,
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358 0x6369, 0x6368, 0x637a, 0x655d, 0x6556, 0x6551, 0x6559, 0x6557,
359 0x555f, 0x654f, 0x6558, 0x6555, 0x6554, 0x659c, 0x659b, 0x65ac,
360 0x65cf, 0x65cb, 0x65cc, 0x65ce, 0x665d, 0x665a, 0x6664, 0x6668,
361 0x6666, 0x665e, 0x66f9, 0x52d7, 0x671b, 0x6881, 0x68af, 0x68a2,
362 0x6893, 0x68b5, 0x687f, 0x6876, 0x68b1, 0x68a7, 0x6897, 0x68b0,
363 0x6883, 0x68c4, 0x68ad, 0x6886, 0x6885, 0x6894, 0x689d, 0x68a8,
364 0x689f, 0x68a1, 0x6882, 0x6b32, 0x6bba,
365 /* 0xb2 */
366 0x6beb, 0x6bec, 0x6c2b, 0x6d8e, 0x6dbc, 0x6df3, 0x6dd9, 0x6db2,
367 0x6de1, 0x6dcc, 0x6de4, 0x6dfb, 0x6dfa, 0x6e05, 0x6dc7, 0x6dcb,
368 0x6daf, 0x6dd1, 0x6dae, 0x6dde, 0x6df9, 0x6db8, 0x6df7, 0x6df5,
369 0x6dc5, 0x6dd2, 0x6e1a, 0x6db5, 0x6dda, 0x6deb, 0x6dd8, 0x6dea,
370 0x6df1, 0x6dee, 0x6de8, 0x6dc6, 0x6dc4, 0x6daa, 0x6dec, 0x6dbf,
371 0x6de6, 0x70f9, 0x7109, 0x710a, 0x70fd, 0x70ef, 0x723d, 0x727d,
372 0x7281, 0x731c, 0x731b, 0x7316, 0x7313, 0x7319, 0x7387, 0x7405,
373 0x740a, 0x7403, 0x7406, 0x73fe, 0x740d, 0x74e0, 0x74f6, 0x74f7,
374 0x751c, 0x7522, 0x7565, 0x7566, 0x7562, 0x7570, 0x758f, 0x75d4,
375 0x75d5, 0x75b5, 0x75ca, 0x75cd, 0x768e, 0x76d4, 0x76d2, 0x76db,
376 0x7737, 0x773e, 0x773c, 0x7736, 0x7738, 0x773a, 0x786b, 0x7843,
377 0x784e, 0x7965, 0x7968, 0x796d, 0x79fb, 0x7a92, 0x7a95, 0x7b20,
378 0x7b28, 0x7b1b, 0x7b2c, 0x7b26, 0x7b19, 0x7b1e, 0x7b2e, 0x7c92,
379 0x7c97, 0x7c95, 0x7d46, 0x7d43, 0x7d71, 0x7d2e, 0x7d39, 0x7d3c,
380 0x7d40, 0x7d30, 0x7d33, 0x7d44, 0x7d2f, 0x7d42, 0x7d32, 0x7d31,
381 0x7f3d, 0x7f9e, 0x7f9a, 0x7fcc, 0x7fce, 0x7fd2, 0x801c, 0x804a,
382 0x8046, 0x812f, 0x8116, 0x8123, 0x812b, 0x8129, 0x8130, 0x8124,
383 0x8202, 0x8235, 0x8237, 0x8236, 0x8239, 0x838e, 0x839e, 0x8398,
384 0x8378, 0x83a2, 0x8396, 0x83bd, 0x83ab, 0x8392, 0x838a, 0x8393,
385 0x8389, 0x83a0, 0x8377, 0x837b, 0x837c,
386 /* 0xb3 */
387 0x8386, 0x83a7, 0x8655, 0x5f6a, 0x86c7, 0x86c0, 0x86b6, 0x86c4,
388 0x86b5, 0x86c6, 0x86cb, 0x86b1, 0x86af, 0x86c9, 0x8853, 0x889e,
389 0x8888, 0x88ab, 0x8892, 0x8896, 0x888d, 0x888b, 0x8993, 0x898f,
390 0x8a2a, 0x8a1d, 0x8a23, 0x8a25, 0x8a31, 0x8a2d, 0x8a1f, 0x8a1b,
391 0x8a22, 0x8c49, 0x8c5a, 0x8ca9, 0x8cac, 0x8cab, 0x8ca8, 0x8caa,
392 0x8ca7, 0x8d67, 0x8d66, 0x8dbe, 0x8dba, 0x8edb, 0x8edf, 0x9019,
393 0x900d, 0x901a, 0x9017, 0x9023, 0x901f, 0x901d, 0x9010, 0x9015,
394 0x901e, 0x9020, 0x900f, 0x9022, 0x9016, 0x901b, 0x9014, 0x90e8,
395 0x90ed, 0x90fd, 0x9157, 0x91ce, 0x91f5, 0x91e6, 0x91e3, 0x91e7,
396 0x91ed, 0x91e9, 0x9589, 0x966a, 0x9675, 0x9673, 0x9678, 0x9670,
397 0x9674, 0x9676, 0x9677, 0x966c, 0x96c0, 0x96ea, 0x96e9, 0x7ae0,
398 0x7adf, 0x9802, 0x9803, 0x9b5a, 0x9ce5, 0x9e75, 0x9e7f, 0x9ea5,
399 0x9ebb, 0x50a2, 0x508d, 0x5085, 0x5099, 0x5091, 0x5080, 0x5096,
400 0x5098, 0x509a, 0x509a, 0x6700, 0x51f1, 0x5272, 0x5274, 0x5275, 0x5269,
401 0x52de, 0x52dd, 0x52db, 0x535a, 0x53a5, 0x557b, 0x5580, 0x55a7,
402 0x557c, 0x558a, 0x559d, 0x5598, 0x5582, 0x559c, 0x55aa, 0x5594,
403 0x5587, 0x558b, 0x5583, 0x55b3, 0x55ae, 0x559f, 0x553e, 0x55b2,
404 0x559a, 0x55bb, 0x55ac, 0x55b1, 0x557e, 0x5589, 0x55ab, 0x5599,
405 0x570d, 0x582f, 0x582a, 0x5834, 0x5824, 0x5830, 0x5831, 0x5821,
406 0x581d, 0x5820, 0x58f9, 0x58fa, 0x5960,
407 /* 0xb4 */
408 0x5a77, 0x5a9a, 0x5a7f, 0x5a92, 0x5a9b, 0x5aa7, 0x5b73, 0x5b71,
409 0x5bd2, 0x5bcc, 0x5bd3, 0x5bd0, 0x5c0a, 0x5c0b, 0x5c31, 0x5d4c,
410 0x5d50, 0x5d34, 0x5d47, 0x5dfd, 0x5e45, 0x5e3d, 0x5e40, 0x5e43,
411 0x5e7e, 0x5eca, 0x5ec1, 0x5ec2, 0x5ec4, 0x5f3c, 0x5f6d, 0x5fa9,
412 0x5faa, 0x5fa8, 0x60d1, 0x60e1, 0x60b2, 0x60b6, 0x60e0, 0x611c,
413 0x6123, 0x60fa, 0x6115, 0x60f0, 0x60fb, 0x60f4, 0x6168, 0x60f1,
414 0x610e, 0x60f6, 0x6109, 0x6100, 0x6112, 0x621f, 0x6249, 0x63a3,
415 0x638c, 0x63cf, 0x63c0, 0x63e9, 0x63c9, 0x63c6, 0x63cd, 0x63d2,
416 0x63e3, 0x63d0, 0x63e1, 0x63d6, 0x63ed, 0x63ee, 0x6376, 0x63f4,
417 0x63ea, 0x63db, 0x6452, 0x63da, 0x63f9, 0x655e, 0x6566, 0x6562,
418 0x6563, 0x6591, 0x6590, 0x65af, 0x666e, 0x6670, 0x6674, 0x6676,
419 0x666f, 0x6691, 0x667a, 0x667e, 0x6677, 0x66fe, 0x66ff, 0x671f,
420 0x671d, 0x68fa, 0x68d5, 0x68e0, 0x68d8, 0x68d7, 0x6905, 0x68df,
421 0x68f5, 0x68ee, 0x68e7, 0x68f9, 0x68d2, 0x68f2, 0x68e3, 0x68cb,
422 0x68cd, 0x690d, 0x6912, 0x690e, 0x68c9, 0x68da, 0x696e, 0x68fb,
423 0x6b3e, 0x6b3a, 0x6b3d, 0x6b98, 0x6b96, 0x6bbc, 0x6bef, 0x6c2e,
424 0x6c2f, 0x6c2c, 0x6e2f, 0x6e38, 0x6e54, 0x6e21, 0x6e32, 0x6e67,
425 0x6e4a, 0x6e20, 0x6e25, 0x6e23, 0x6e1b, 0x6e5b, 0x6e58, 0x6e24,
426 0x6e56, 0x6e6e, 0x6e2d, 0x6e26, 0x6e6f, 0x6e34, 0x6e4d, 0x6e3a,
427 0x6e2c, 0x6e43, 0x6e1d, 0x6e3e, 0x6ecb,
428 /* 0xb5 */
429 0x6e89, 0x6e19, 0x6e4e, 0x6e63, 0x6e44, 0x6e72, 0x6e69, 0x6e5f,
430 0x7119, 0x711a, 0x7126, 0x7130, 0x7121, 0x7136, 0x716e, 0x711c,
431 0x724c, 0x7284, 0x7280, 0x7336, 0x7325, 0x7334, 0x7329, 0x743a,
432 0x742a, 0x7433, 0x7422, 0x7425, 0x7435, 0x7436, 0x7434, 0x742f,
433 0x741b, 0x7426, 0x7428, 0x7525, 0x7526, 0x756b, 0x756a, 0x75e2,
434 0x75db, 0x75e3, 0x75d9, 0x75d8, 0x75de, 0x75e0, 0x767b, 0x767c,
435 0x7696, 0x7693, 0x76b4, 0x76dc, 0x774f, 0x77ed, 0x785d, 0x786c,
436 0x786f, 0x7a0d, 0x7a08, 0x7a0b, 0x7a05, 0x7a00, 0x7a98, 0x7a97,
437 0x7a96, 0x7ae5, 0x7ae3, 0x7b49, 0x7b56, 0x7b46, 0x7b50, 0x7b52,
438 0x7b54, 0x7b4d, 0x7b4b, 0x7b44, 0x7b51, 0x7c9f, 0x7ca5, 0x7d5e,
439 0x7d50, 0x7d68, 0x7d55, 0x7d2b, 0x7d6e, 0x7d72, 0x7d61, 0x7d66,
440 0x7d62, 0x7d70, 0x7d73, 0x5584, 0x7fd4, 0x7fd5, 0x800b, 0x8052,
441 0x8085, 0x8155, 0x8154, 0x814b, 0x8151, 0x814e, 0x8139, 0x8146,
442 0x813e, 0x814c, 0x8153, 0x8174, 0x8212, 0x821c, 0x83e9, 0x8403,

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443 0x83f8, 0x840d, 0x83e0, 0x83c5, 0x840b, 0x83c1, 0x83ef, 0x83f1,
444 0x83f4, 0x8457, 0x840a, 0x83f0, 0x840c, 0x83cc, 0x83fd, 0x83f2,
445 0x83ca, 0x8438, 0x840e, 0x840a, 0x83dc, 0x8407, 0x83d4, 0x83df,
446 0x865b, 0x86df, 0x86d9, 0x86ed, 0x86d4, 0x86db, 0x86e4, 0x86d0,
447 0x86de, 0x8857, 0x88c1, 0x88c2, 0x88b1, 0x8983, 0x8996, 0x8a3b,
448 0x8a60, 0x8a55, 0x8a5e, 0x8a3c, 0x8a41,
449 /* 0xb6 */
450 0x8a54, 0x8a5b, 0x8a50, 0x8a46, 0x8a34, 0x8a3a, 0x8a36, 0x8a56,
451 0x8c61, 0x8c82, 0x8caf, 0x8cbc, 0x8cb3, 0x8cbd, 0x8cc1, 0x8cbb,
452 0x8cc0, 0x8cb4, 0x8cb7, 0x8cb6, 0x8cbf, 0x8cb8, 0x8d8a, 0x8d85,
453 0x8d81, 0x8dce, 0x8ddd, 0x8dc8, 0x8dda, 0x8dd1, 0x8dcc, 0x8ddb,
454 0x8dc6, 0x8efb, 0x8ef8, 0x8efc, 0x8f9c, 0x902e, 0x9035, 0x9031,
455 0x9038, 0x9032, 0x9036, 0x9102, 0x90f5, 0x9109, 0x90fe, 0x9163,
456 0x9165, 0x91cf, 0x9214, 0x9215, 0x9223, 0x9209, 0x921e, 0x920d,
457 0x9210, 0x9207, 0x9211, 0x9594, 0x958f, 0x958b, 0x9591, 0x9593,
458 0x9592, 0x958e, 0x968a, 0x968e, 0x968b, 0x967d, 0x9685, 0x9686,
459 0x968d, 0x9672, 0x9684, 0x96c1, 0x96c5, 0x96c4, 0x96c6, 0x96c7,
460 0x96ef, 0x96f2, 0x97cc, 0x9805, 0x9806, 0x9808, 0x98e7, 0x98ea,
461 0x98ef, 0x98e9, 0x98f2, 0x98ed, 0x99ae, 0x99ad, 0x9ec3, 0x9ecd,
462 0x9ed1, 0x4e82, 0x50ad, 0x50b5, 0x50b2, 0x50b3, 0x50c5, 0x50be,
463 0x50ac, 0x50b7, 0x50b8, 0x50af, 0x50c7, 0x527f, 0x5277, 0x527d,
464 0x52df, 0x52e6, 0x52e4, 0x52e2, 0x52e3, 0x532f, 0x55df, 0x55e8,
465 0x55d3, 0x55e6, 0x55ce, 0x55dc, 0x55c7, 0x55d1, 0x55e3, 0x55e4,
466 0x55ef, 0x55da, 0x55e1, 0x55c5, 0x55c6, 0x55e5, 0x55c9, 0x5712,
467 0x5713, 0x585e, 0x5851, 0x5858, 0x5857, 0x585a, 0x5854, 0x586b,
468 0x584c, 0x586d, 0x584a, 0x5862, 0x5852, 0x584b, 0x5967, 0x5ac1,
469 0x5ac9, 0x5acc, 0x5abe, 0x5abd, 0x5abc,
470 /* 0xb7 */
471 0x5ab3, 0x5ac2, 0x5ab2, 0x5d69, 0x5d6f, 0x5e4c, 0x5e79, 0x5ec9,
472 0x5ec8, 0x5f12, 0x5f59, 0x5fac, 0x5fae, 0x611a, 0x610f, 0x6148,
473 0x611f, 0x60f3, 0x611b, 0x60f9, 0x6101, 0x6108, 0x614e, 0x614c,
474 0x6144, 0x614d, 0x613e, 0x6134, 0x6127, 0x610d, 0x6106, 0x6137,
475 0x6221, 0x6222, 0x6413, 0x643e, 0x641e, 0x642a, 0x642d, 0x643d,
476 0x642c, 0x640f, 0x641c, 0x6414, 0x640d, 0x6436, 0x6416, 0x6417,
477 0x6406, 0x656c, 0x659f, 0x65b0, 0x6697, 0x6689, 0x6687, 0x6688,
478 0x6696, 0x6684, 0x6698, 0x668d, 0x6703, 0x6994, 0x696d, 0x695a,
479 0x6977, 0x6960, 0x6954, 0x6975, 0x6930, 0x6982, 0x694a, 0x6968,
480 0x696b, 0x695e, 0x6953, 0x6979, 0x6986, 0x695d, 0x6963, 0x695b,
481 0x6b47, 0x6b72, 0x6b6c, 0x6bbf, 0x6bd3, 0x6bfd, 0x6ea2, 0x6eaf,
482 0x6ed3, 0x6eb6, 0x6ec2, 0x6e90, 0x6e9d, 0x6ec7, 0x6ec5, 0x6ea5,
483 0x6e98, 0x6ebc, 0x6eba, 0x6eab, 0x6ed1, 0x6e96, 0x6e9c, 0x6ec4,
484 0x6ed4, 0x6eaa, 0x6ea7, 0x6eb4, 0x714e, 0x7159, 0x7169, 0x7164,
485 0x7149, 0x7167, 0x715c, 0x716c, 0x7166, 0x714c, 0x7165, 0x715e,
486 0x7146, 0x7168, 0x7156, 0x723a, 0x7252, 0x7337, 0x7345, 0x733f,
487 0x733e, 0x746f, 0x745a, 0x7455, 0x745f, 0x745e, 0x7441, 0x743f,
488 0x7459, 0x745b, 0x745c, 0x7576, 0x7578, 0x7600, 0x75f0, 0x7601,
489 0x75f2, 0x75f1, 0x75fa, 0x75ff, 0x75f4, 0x75f3, 0x76de, 0x76df,
490 0x775b, 0x776b, 0x7766, 0x775e, 0x7763,
491 /* 0xb8 */
492 0x7779, 0x776a, 0x776c, 0x775c, 0x7765, 0x7768, 0x7762, 0x77ee,
493 0x788e, 0x78b0, 0x7897, 0x7898, 0x788c, 0x7889, 0x787c, 0x7891,
494 0x7893, 0x787f, 0x797a, 0x797f, 0x7981, 0x842c, 0x79bd, 0x7a1c,
495 0x7a1a, 0x7a20, 0x7a14, 0x7a1f, 0x7a1e, 0x7a9f, 0x7aa0, 0x7b77,
496 0x7bc0, 0x7b60, 0x7b6e, 0x7b67, 0x7cb1, 0x7cb3, 0x7cb5, 0x7d93,
497 0x7d79, 0x7d91, 0x7d81, 0x7d8f, 0x7d5b, 0x7f6e, 0x7f69, 0x7f6a,
498 0x7f72, 0x7fa9, 0x7fa8, 0x7fa4, 0x8056, 0x8058, 0x8086, 0x8084,
499 0x8171, 0x8170, 0x8178, 0x8165, 0x816e, 0x8173, 0x816b, 0x8179,
500 0x817a, 0x8166, 0x8205, 0x8247, 0x8482, 0x8477, 0x843d, 0x8431,
501 0x8475, 0x8466, 0x846b, 0x8449, 0x846c, 0x845b, 0x843c, 0x8435,
502 0x8461, 0x8463, 0x8469, 0x846d, 0x8446, 0x865e, 0x865c, 0x865f,
503 0x86f9, 0x8713, 0x8708, 0x8707, 0x8700, 0x86fe, 0x86fb, 0x8702,
504 0x8703, 0x8706, 0x870a, 0x8859, 0x88df, 0x88d4, 0x88d9, 0x88dc,
505 0x88d8, 0x88dd, 0x88e1, 0x88ca, 0x88d5, 0x88d2, 0x899c, 0x89e3,
506 0x8a6b, 0x8a72, 0x8a73, 0x8a66, 0x8a69, 0x8a70, 0x8a87, 0x8a7c,
507 0x8a63, 0x8aa0, 0x8a71, 0x8a6d, 0x8a6d, 0x8a62, 0x8a6e, 0x8a6c,
508 0x8a79, 0x8a7b, 0x8a3e, 0x8a68, 0x8c62, 0x8c8a, 0x8c89, 0x8cca,
509 0x8cc7, 0x8cc8, 0x8cc4, 0x8cb2, 0x8cc3, 0x8cc2, 0x8cc5, 0x8de1,
510 0x8ddf, 0x8de8, 0x8def, 0x8df3, 0x8dfa, 0x8dea, 0x8de4, 0x8de6,
511 0x8eb2, 0x8f03, 0x8f09, 0x8efe, 0x8f0a,
512 /* 0xb9 */
513 0x8f9f, 0x8fb2, 0x904b, 0x904a, 0x9053, 0x9042, 0x9054, 0x903c,
514 0x9055, 0x9050, 0x9047, 0x904f, 0x904e, 0x904d, 0x9051, 0x903e,
515 0x9041, 0x9112, 0x9117, 0x916c, 0x916a, 0x9169, 0x91c9, 0x9237,
516 0x9257, 0x9238, 0x923d, 0x9240, 0x923e, 0x925b, 0x924b, 0x9264,
517 0x9251, 0x9234, 0x9249, 0x924d, 0x9245, 0x9239, 0x923f, 0x925a,
518 0x9598, 0x9698, 0x9694, 0x9695, 0x96cd, 0x96cb, 0x96c9, 0x96ca,
519 0x96f7, 0x96fb, 0x96f9, 0x96f6, 0x9756, 0x9774, 0x9776, 0x9810,
520 0x9811, 0x9813, 0x980a, 0x9812, 0x980c, 0x98fc, 0x98f4, 0x98fd,
521 0x98fe, 0x99b3, 0x99b1, 0x99b4, 0x9ae1, 0x9ce9, 0x9e82, 0x9f0e,
522 0x9f13, 0x9f20, 0x50e7, 0x50ee, 0x50e5, 0x50d6, 0x50ed, 0x50da,
523 0x50d5, 0x50cf, 0x50d1, 0x50f1, 0x50ce, 0x50e9, 0x5162, 0x51f3,
524 0x5283, 0x5282, 0x5331, 0x53ad, 0x55fe, 0x5600, 0x561b, 0x5617,
525 0x55fd, 0x5614, 0x5606, 0x5609, 0x560d, 0x560e, 0x55f7, 0x5616,
526 0x561f, 0x5608, 0x5610, 0x55f6, 0x5718, 0x5716, 0x5875, 0x587e,
527 0x5883, 0x5893, 0x588a, 0x5879, 0x5885, 0x587d, 0x58fd, 0x5925,
528 0x5922, 0x5924, 0x596a, 0x5969, 0x5ae1, 0x5ae6, 0x5ae9, 0x5ad7,
529 0x5ad6, 0x5ad8, 0x5ae3, 0x5b75, 0x5bde, 0x5be7, 0x5be1, 0x5be5,
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531 0x5d87, 0x5e5b, 0x5e63, 0x5e55, 0x5e57, 0x5e54, 0x5ed3, 0x5ed6,
532 0x5f0a, 0x5f46, 0x5f70, 0x5fb9, 0x6147,
533 /* 0xba */
534 0x613f, 0x614b, 0x6177, 0x6162, 0x6163, 0x615f, 0x615a, 0x6158,
535 0x6175, 0x622a, 0x6487, 0x6458, 0x6454, 0x64a4, 0x6478, 0x645f,
536 0x647a, 0x6451, 0x6467, 0x6434, 0x646d, 0x647b, 0x6572, 0x65a1,
537 0x65d7, 0x65d6, 0x66a2, 0x66a8, 0x669d, 0x699c, 0x69a8, 0x6995,
538 0x69c1, 0x69ae, 0x69d3, 0x69cb, 0x699b, 0x69b7, 0x69bb, 0x69ab,
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541 0x6f29, 0x6f3e, 0x6f20, 0x6f2c, 0x6f0f, 0x6f02, 0x6f22, 0x6eff,
542 0x6eef, 0x6f06, 0x6f31, 0x6f38, 0x6f32, 0x6f23, 0x6f15, 0x6f2b,
543 0x6f2f, 0x6f88, 0x6f2a, 0x6eec, 0x6f01, 0x6ef2, 0x6ecc, 0x6ef7,
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545 0x7296, 0x7344, 0x7350, 0x7464, 0x7463, 0x746a, 0x7470, 0x746d,
546 0x7504, 0x7591, 0x7627, 0x760d, 0x760b, 0x7609, 0x7613, 0x76e1,
547 0x76e3, 0x7784, 0x777d, 0x777f, 0x7761, 0x78c1, 0x789f, 0x78a7,
548 0x78b3, 0x78a9, 0x78a3, 0x798e, 0x798f, 0x798d, 0x7a2e, 0x7a31,
549 0x7aaa, 0x7aa9, 0x7aed, 0x7aef, 0x7ba1, 0x7b95, 0x7b8b, 0x7b75,
550 0x7b97, 0x7b9d, 0x7b94, 0x7b8f, 0x7bb8, 0x7b87, 0x7b84, 0x7cb9,
551 0x7cbd, 0x7cbe, 0x7dbb, 0x7db0, 0x7d9c, 0x7dbd, 0x7dbe, 0x7da0,
552 0x7dca, 0x7db4, 0x7db2, 0x7db1, 0x7dba, 0x7da2, 0x7dbf, 0x7db5,
553 0x7db8, 0x7dad, 0x7dd2, 0x7dc7, 0x7dac,
554 /* 0xbb */
555 0x7f70, 0x7fe0, 0x7fe1, 0x7fdf, 0x805e, 0x805a, 0x8087, 0x8150,
556 0x8180, 0x818f, 0x8188, 0x818a, 0x817f, 0x8182, 0x81e7, 0x81fa,
557 0x8207, 0x8214, 0x821e, 0x824b, 0x84c9, 0x84bf, 0x84c6, 0x84c4,
558 0x8499, 0x849e, 0x84b2, 0x849c, 0x84cb, 0x84b8, 0x84c0, 0x84d3,
559 0x8490, 0x84bc, 0x84d1, 0x84ca, 0x873f, 0x871c, 0x873b, 0x8722,
560 0x8725, 0x8734, 0x8718, 0x8755, 0x8737, 0x8729, 0x88f3, 0x8902,
561 0x88f4, 0x88f9, 0x88f8, 0x88fd, 0x88e8, 0x891a, 0x88ef, 0x8aa6,
562 0x8a8c, 0x8a9e, 0x8aa3, 0x8a8d, 0x8aa1, 0x8a93, 0x8aa4, 0x8aaa,
563 0x8aa5, 0x8aa8, 0x8a98, 0x8a91, 0x8a9a, 0x8aa7, 0x8c6a, 0x8c8d,
564 0x8c8c, 0x8cd3, 0x8cd1, 0x8cd2, 0x8d6b, 0x8d99, 0x8d95, 0x8dfc,
565 0x8f14, 0x8f12, 0x8f15, 0x8f13, 0x8fa3, 0x9060, 0x9058, 0x905c,
566 0x9063, 0x9059, 0x905e, 0x9062, 0x905d, 0x905b, 0x9119, 0x9118,
567 0x911e, 0x9175, 0x9178, 0x9177, 0x9174, 0x9278, 0x9280, 0x9285,
568 0x9298, 0x9296, 0x927b, 0x9293, 0x929c, 0x92a8, 0x927c, 0x9291,
569 0x95a1, 0x95a8, 0x95a9, 0x95a3, 0x95a5, 0x95a4, 0x9699, 0x969c,
570 0x969b, 0x96cc, 0x96d2, 0x9700, 0x977c, 0x9785, 0x97f6, 0x9817,
571 0x9818, 0x98af, 0x98b1, 0x9903, 0x9905, 0x990c, 0x9909, 0x99c1,
572 0x9aaf, 0x9ab0, 0x9ae6, 0x9b41, 0x9b42, 0x9cf4, 0x9cf6, 0x9cf3,
573 0x9ebc, 0x9f3b, 0x9f4a, 0x5104, 0x5100, 0x50fb, 0x50f5, 0x50f9,
574 0x5102, 0x5108, 0x5109, 0x5105,
575 /* 0xbc */
576 0x5287, 0x5288, 0x5289, 0x528d, 0x528a, 0x52f0, 0x53b2, 0x562e,
577 0x563b, 0x5639, 0x5632, 0x563f, 0x5634, 0x5629, 0x5653, 0x564e,
578 0x5657, 0x5674, 0x5636, 0x562f, 0x5630, 0x5880, 0x589f, 0x589e,
579 0x58b3, 0x589c, 0x58ae, 0x58a9, 0x58a6, 0x596d, 0x5b09, 0x5afb,
580 0x5b0b, 0x5af5, 0x5b0c, 0x5b08, 0x5bee, 0x5bec, 0x5be9, 0x5beb,
581 0x5c64, 0x5c65, 0x5d9d, 0x5d94, 0x5e62, 0x5e5f, 0x5e61, 0x5ee2,
582 0x5eda, 0x5edf, 0x5edd, 0x5ee3, 0x5ee0, 0x5f48, 0x5f71, 0x5fb7,
583 0x5fb5, 0x6176, 0x6167, 0x616e, 0x615d, 0x6155, 0x6182, 0x617c,
584 0x6170, 0x616b, 0x617e, 0x61a7, 0x6190, 0x61ab, 0x618e, 0x61ac,
585 0x619a, 0x61a4, 0x6194, 0x61ae, 0x622e, 0x6469, 0x646f, 0x6479,
586 0x649e, 0x64b2, 0x6488, 0x6490, 0x64b0, 0x64a5, 0x6493, 0x6495,
587 0x64a9, 0x6492, 0x64ae, 0x64ad, 0x64ab, 0x649a, 0x64ac, 0x6499,
588 0x64a2, 0x64b3, 0x6575, 0x6577, 0x6578, 0x66ae, 0x66ab, 0x66b4,
589 0x66b1, 0x6a23, 0x6a1f, 0x69e8, 0x6a01, 0x6a1e, 0x6a19, 0x69fd,
590 0x6a21, 0x6a13, 0x6a0a, 0x69f3, 0x6a02, 0x6a05, 0x69ed, 0x6a11,
591 0x6b50, 0x6b46, 0x6ba4, 0x6bc5, 0x6bc6, 0x6f3f, 0x6f7c, 0x6f84,
592 0x6f51, 0x6f66, 0x6f54, 0x6f86, 0x6f6d, 0x6f5b, 0x6f78, 0x6f6e,
593 0x6f8e, 0x6f7a, 0x6f70, 0x6f64, 0x6f97, 0x6f58, 0x6ed5, 0x6f6f,
594 0x6f60, 0x6f5f, 0x719f, 0x71ac, 0x71b1, 0x71a8, 0x7256, 0x729b,
595 0x734e, 0x7357, 0x7469, 0x748b, 0x7483,
596 /* 0xbd */
597 0x747e, 0x7480, 0x757f, 0x7620, 0x7629, 0x761f, 0x7624, 0x7626,
598 0x7621, 0x7622, 0x769a, 0x76ba, 0x76e4, 0x778e, 0x7787, 0x778c,
599 0x7791, 0x778b, 0x78cb, 0x78c5, 0x78ba, 0x78ca, 0x78be, 0x78d5,
600 0x78bc, 0x78d0, 0x7a3f, 0x7a3c, 0x7a40, 0x7a3d, 0x7a37, 0x7a3b,
601 0x7aaf, 0x7aae, 0x7bad, 0x7bb1, 0x7bc4, 0x7bb4, 0x7bc6, 0x7bc7,
602 0x7bc1, 0x7ba0, 0x7bcc, 0x7cca, 0x7de0, 0x7df4, 0x7def, 0x7dfb,
603 0x7dd8, 0x7dec, 0x7ddd, 0x7de8, 0x7de3, 0x7dda, 0x7dde, 0x7de9,
604 0x7d9e, 0x7dd9, 0x7df2, 0x7df9, 0x7f75, 0x7f77, 0x7faf, 0x7fe9,
605 0x8026, 0x819b, 0x819c, 0x819d, 0x81a0, 0x819a, 0x8198, 0x8517,
606 0x853d, 0x851a, 0x84ee, 0x852c, 0x852d, 0x8513, 0x8511, 0x8523,
607 0x8521, 0x8514, 0x84ec, 0x8525, 0x84ff, 0x8506, 0x8782, 0x8774,
608 0x8776, 0x8760, 0x8766, 0x8778, 0x8768, 0x8759, 0x8757, 0x874c,
609 0x8753, 0x885b, 0x885d, 0x8910, 0x8907, 0x8912, 0x8913, 0x8915,
610 0x890a, 0x8abc, 0x8ad2, 0x8ac7, 0x8ac4, 0x8a95, 0x8acb, 0x8af8,
611 0x8ab2, 0x8ac9, 0x8ac2, 0x8abf, 0x8ab0, 0x8ad6, 0x8acd, 0x8ab6,
612 0x8ab9, 0x8adb, 0x8ac4, 0x8c4c, 0x8c6c, 0x8ce0, 0x8cde, 0x8ce6,
613 0x8ce4, 0x8cec, 0x8ced, 0x8ce2, 0x8ce3, 0x8cdc, 0x8cea, 0x8ce1,
614 0x8d6d, 0x8d9f, 0x8da3, 0x8e2b, 0x8e10, 0x8e1d, 0x8e22, 0x8e0f,
615 0x8e29, 0x8e1f, 0x8e21, 0x8e1e, 0x8eba, 0x8f1d, 0x8f1b, 0x8f1f,
616 0x8f29, 0x8f26, 0x8f2a, 0x8f1c, 0x8f1e,

```

```
617 /* 0xbe */
618 0x8f25, 0x9069, 0x906e, 0x9068, 0x906d, 0x9077, 0x9130, 0x912d,
619 0x9127, 0x9131, 0x9187, 0x9189, 0x918b, 0x9183, 0x92c5, 0x92bb,
620 0x92b7, 0x92ea, 0x92ac, 0x92e4, 0x92c1, 0x92b3, 0x92bc, 0x92d2,
621 0x92c7, 0x92f0, 0x92b2, 0x95ad, 0x95b1, 0x9704, 0x9706, 0x9707,
622 0x9709, 0x9760, 0x978d, 0x978b, 0x978f, 0x9821, 0x982b, 0x981c,
623 0x98b3, 0x990a, 0x9913, 0x9912, 0x9918, 0x99dd, 0x99d0, 0x99df,
624 0x99db, 0x99d1, 0x99d5, 0x99d2, 0x99d9, 0x9ab7, 0x9aee, 0x9aef,
625 0x9b27, 0x9b45, 0x9b44, 0x9b77, 0x9b6f, 0x9d06, 0x9d09, 0x9d03,
626 0x9ea9, 0x9ebe, 0x9ece, 0x58a8, 0x9f52, 0x5112, 0x5118, 0x5114,
627 0x5110, 0x5115, 0x5180, 0x51aa, 0x51dd, 0x5291, 0x5293, 0x52f3,
628 0x5659, 0x566b, 0x5679, 0x5669, 0x5664, 0x5678, 0x566a, 0x5668,
629 0x5665, 0x5671, 0x566f, 0x566c, 0x5662, 0x5676, 0x58c1, 0x58be,
630 0x58c7, 0x58c5, 0x596e, 0x5b1d, 0x5b34, 0x5b78, 0x5bf0, 0x5c0e,
631 0x5f4a, 0x61b2, 0x61b6, 0x6191, 0x61a9, 0x618a, 0x61cd, 0x61b6, 0x61be,
632 0x61ca, 0x61c8, 0x6230, 0x64c5, 0x64c1, 0x64cb, 0x64bb, 0x64bc,
633 0x64da, 0x64c4, 0x64c7, 0x64c2, 0x64cd, 0x64bf, 0x64d2, 0x64d4,
634 0x64be, 0x6574, 0x66c6, 0x66c9, 0x66b9, 0x66c4, 0x66c7, 0x66b8,
635 0x6a3d, 0x6a38, 0x6a3a, 0x6a59, 0x6a6b, 0x6a58, 0x6a39, 0x6a44,
636 0x6a62, 0x6a61, 0x6a4b, 0x6a47, 0x6a35, 0x6a5f, 0x6a48, 0x6b59,
637 0x6b77, 0x6c05, 0x6fc2, 0x6fb1, 0x6fa1,
638 /* 0xbf */
639 0x6fc3, 0x6fa4, 0x6fc1, 0x6fa7, 0x6fb3, 0x6fc0, 0x6fb9, 0x6fb6,
640 0x6fa6, 0x6fa0, 0x6fb4, 0x71be, 0x71c9, 0x71d0, 0x71d2, 0x71c8,
641 0x71d5, 0x71b9, 0x71ce, 0x71d9, 0x71dc, 0x71c3, 0x71c4, 0x7368,
642 0x749c, 0x74a3, 0x7498, 0x749f, 0x749e, 0x74e2, 0x750c, 0x750d,
643 0x7634, 0x7638, 0x763a, 0x76e7, 0x76e5, 0x77a0, 0x779e, 0x779f,
644 0x77a5, 0x78e8, 0x78da, 0x78ec, 0x78e7, 0x79a6, 0x7a4d, 0x7a4e,
645 0x7a46, 0x7a4c, 0x7a4b, 0x7aba, 0x7bd9, 0x7c11, 0x7bc9, 0x7be4,
646 0x7bdb, 0x7be1, 0x7be9, 0x7be6, 0x7cd5, 0x7cd6, 0x7e0a, 0x7e11,
647 0x7e08, 0x7e1b, 0x7e23, 0x7e1e, 0x7e1d, 0x7e09, 0x7e10, 0x7f79,
648 0x7fb2, 0x7ff0, 0x7ff1, 0x7fee, 0x8028, 0x81b3, 0x81a9, 0x81a8,
649 0x81fb, 0x8208, 0x8258, 0x8259, 0x854a, 0x8559, 0x8548, 0x8568,
650 0x8569, 0x8543, 0x8549, 0x856d, 0x856a, 0x855e, 0x8783, 0x879f,
651 0x879e, 0x87a2, 0x878d, 0x8861, 0x892a, 0x8932, 0x8925, 0x892b,
652 0x8921, 0x89aa, 0x89a6, 0x8aee, 0x8aef, 0x8aeb, 0x8af1, 0x8b00,
653 0x8adc, 0x8ae7, 0x8aee, 0x8afe, 0x8b01, 0x8b02, 0x8af7, 0x8aed,
654 0x8af3, 0x8af6, 0x8afc, 0x8c6b, 0x8c6d, 0x8c93, 0x8cf4, 0x8e44,
655 0x8e31, 0x8e34, 0x8e42, 0x8e39, 0x8e35, 0x8f3b, 0x8f2f, 0x8f38,
656 0x8f33, 0x8fa8, 0x8fa6, 0x9075, 0x9074, 0x9078, 0x9072, 0x907c,
657 0x907a, 0x9134, 0x9192, 0x9320, 0x9336, 0x92f8, 0x9333, 0x932f,
658 0x9322, 0x92fc, 0x932b, 0x9304, 0x931a,
659 /* 0xc0 */
660 0x9310, 0x9326, 0x9321, 0x9315, 0x932e, 0x9319, 0x95bb, 0x96a7,
661 0x96a8, 0x96aa, 0x96d5, 0x970e, 0x9711, 0x9716, 0x970d, 0x9713,
662 0x970f, 0x975b, 0x975c, 0x9766, 0x9798, 0x9830, 0x9838, 0x983b,
663 0x9837, 0x982d, 0x9839, 0x9824, 0x9910, 0x9928, 0x991e, 0x991b,
664 0x9921, 0x991a, 0x99ed, 0x99e2, 0x99f1, 0x9ab8, 0x9abc, 0x9afb,
665 0x9aed, 0x9b28, 0x9b91, 0x9d15, 0x9d23, 0x9d26, 0x9d28, 0x9d12,
666 0x9d1b, 0x9ed8, 0x9ed4, 0x9f8d, 0x9f9c, 0x512a, 0x511f, 0x5121,
667 0x5132, 0x52f5, 0x568e, 0x5680, 0x5690, 0x5685, 0x5687, 0x568f,
668 0x58d5, 0x58d3, 0x58d1, 0x58ce, 0x5b30, 0x5b2a, 0x5b24, 0x5b7a,
669 0x5c37, 0x5c68, 0x5dbc, 0x5dba, 0x5dbd, 0x5db8, 0x5e6b, 0x5f4c,
670 0x5fbd, 0x61c9, 0x61c2, 0x61c7, 0x61e6, 0x61cb, 0x6232, 0x6234,
671 0x64ce, 0x64ca, 0x64d8, 0x64e0, 0x64f0, 0x64e6, 0x64ec, 0x64f1,
672 0x64e2, 0x64ed, 0x6582, 0x6583, 0x66d9, 0x66d6, 0x6a80, 0x6a94,
673 0x6a84, 0x6aa2, 0x6aa9, 0x6adb, 0x6aa3, 0x6a7e, 0x6a97, 0x6a90,
674 0x6aa0, 0x6b5c, 0x6bae, 0x6bda, 0x6c08, 0x6fd8, 0x6ff1, 0x6fdf,
675 0x6fe0, 0x6fdb, 0x6fe4, 0x6feb, 0x6fef, 0x6f80, 0x6fec, 0x6fe1,
676 0x6fe9, 0x6fd5, 0x6fee, 0x6ff0, 0x71e7, 0x71d7, 0x71ee, 0x71e6,
677 0x71e5, 0x71ed, 0x71ec, 0x71f4, 0x71e0, 0x7235, 0x7246, 0x7370,
678 0x7372, 0x74a9, 0x74b0, 0x74a6, 0x74a8, 0x7646, 0x7642, 0x764c,
679 0x76ea, 0x77b3, 0x77aa, 0x77b0, 0x77ac,
680 /* 0xc1 */
681 0x77a7, 0x77ad, 0x77ef, 0x78f7, 0x78fa, 0x78f4, 0x78ef, 0x7901,
682 0x79a7, 0x79aa, 0x7a57, 0x7abf, 0x7c07, 0x7c0d, 0x7bfe, 0x7bf7,
683 0x7c0c, 0x7be0, 0x7ce0, 0x7cdc, 0x7cde, 0x7ce2, 0x7cdf, 0x7cd9,
684 0x7cdd, 0x7e2e, 0x7e3e, 0x7e46, 0x7e37, 0x7e32, 0x7e43, 0x7e2b,
685 0x7e3d, 0x7e31, 0x7e45, 0x7e41, 0x7e34, 0x7e39, 0x7e48, 0x7e35,
686 0x7e3f, 0x7e2f, 0x7f44, 0x7ff3, 0x7ffc, 0x8071, 0x8072, 0x8070,
687 0x806f, 0x8073, 0x81c6, 0x81c3, 0x81ba, 0x81c2, 0x81c0, 0x81bf,
688 0x81bd, 0x81c9, 0x81be, 0x81e8, 0x8209, 0x8271, 0x85aa, 0x8584,
689 0x857e, 0x859c, 0x8591, 0x8594, 0x85af, 0x859b, 0x8587, 0x85a8,
690 0x858a, 0x8667, 0x87c0, 0x87d1, 0x87b3, 0x87d2, 0x87c6, 0x87ab,
691 0x87bb, 0x87ba, 0x87c8, 0x87cb, 0x893b, 0x8936, 0x8944, 0x8938,
692 0x893d, 0x89ac, 0x8b0e, 0x8b17, 0x8b19, 0x8b1b, 0x8b0a, 0x8b20,
693 0x8b1d, 0x8b04, 0x8b10, 0x8c41, 0x8c3f, 0x8c73, 0x8cfa, 0x8cfd,
694 0x8cfc, 0x8cf8, 0x8cfb, 0x8da8, 0x8e49, 0x8e4b, 0x8e48, 0x8e4a,
695 0x8f44, 0x8f3e, 0x8f42, 0x8f45, 0x8f3f, 0x907f, 0x907d, 0x9084,
696 0x9081, 0x9082, 0x9080, 0x9139, 0x91a3, 0x919e, 0x919c, 0x934d,
697 0x9382, 0x9328, 0x9375, 0x934a, 0x9365, 0x934b, 0x9318, 0x937e,
698 0x936c, 0x935b, 0x9370, 0x935a, 0x9354, 0x95ca, 0x95cb, 0x95cc,
699 0x95c8, 0x95c6, 0x96b1, 0x96b8, 0x96d6, 0x971c, 0x971e, 0x97a0,
700 0x97d3, 0x9846, 0x98b6, 0x9935, 0x9a01,
701 /* 0xc2 */
702 0x99ff, 0x9bae, 0x9bab, 0x9baa, 0x9bad, 0x9d3b, 0x9d3f, 0x9e8b,
703 0x9ecf, 0x9ede, 0x9edc, 0x9edd, 0x9edb, 0x9f3e, 0x9f4b, 0x53e2,
```

```
704 0x5695, 0x56ae, 0x58d9, 0x58d8, 0x5b38, 0x5f5d, 0x61e3, 0x6233,
705 0x64f4, 0x64f2, 0x64fe, 0x6506, 0x64fa, 0x64fb, 0x64f7, 0x65b7,
706 0x66dc, 0x6726, 0x6ab3, 0x6aac, 0x6ac3, 0x6abb, 0x6ab8, 0x6ac2,
707 0x6aae, 0x6aaf, 0x6b5f, 0x6b78, 0x6baf, 0x7009, 0x700b, 0x6ffe,
708 0x7006, 0x6ffa, 0x7011, 0x700f, 0x71fb, 0x71fc, 0x71fe, 0x71f8,
709 0x7377, 0x7375, 0x74a7, 0x74bf, 0x7515, 0x7656, 0x7658, 0x7652,
710 0x77bd, 0x77bf, 0x77bb, 0x77bc, 0x790e, 0x79ae, 0x7a61, 0x7a62,
711 0x7a60, 0x7ac4, 0x7ac5, 0x7c2b, 0x7c27, 0x7c2a, 0x7c1e, 0x7c23,
712 0x7c21, 0x7ce7, 0x7e54, 0x7e55, 0x7e5e, 0x7e5a, 0x7e61, 0x7e52,
713 0x7e59, 0x7f48, 0x7ff9, 0x7ffb, 0x8077, 0x8076, 0x81cd, 0x81cf,
714 0x820a, 0x85cf, 0x85a9, 0x85cd, 0x85d0, 0x85c9, 0x85b0, 0x85ba,
715 0x85b9, 0x85a6, 0x87ef, 0x87ec, 0x87f2, 0x87e0, 0x8986, 0x89b2,
716 0x89f4, 0x8b28, 0x8b39, 0x8b2c, 0x8b2b, 0x8c50, 0x8d05, 0x8e59,
717 0x8e63, 0x8e66, 0x8e64, 0x8e5f, 0x8e55, 0x8ec0, 0x8f49, 0x8f4d,
718 0x9087, 0x9083, 0x9088, 0x91ab, 0x91ac, 0x91d0, 0x9394, 0x938a,
719 0x9396, 0x93a2, 0x93b3, 0x93ae, 0x93ac, 0x93b0, 0x9398, 0x939a,
720 0x9397, 0x95d4, 0x95d6, 0x95d0, 0x95d5, 0x96e2, 0x96dc, 0x96d9,
721 0x96db, 0x96de, 0x9724, 0x97a3, 0x97a6,
722 /* 0xc3 */
723 0x97ad, 0x97f9, 0x984d, 0x984f, 0x984c, 0x984e, 0x9853, 0x98ba,
724 0x993e, 0x993f, 0x993d, 0x992e, 0x99a5, 0x9a0e, 0x9ac1, 0x9b03,
725 0x9b06, 0x9b4f, 0x9b4e, 0x9b4d, 0x9bca, 0x9bc9, 0x9bfd, 0x9bc8,
726 0x9bc0, 0x9d51, 0x9d5d, 0x9d60, 0x9ee0, 0x9f15, 0x9f2c, 0x5133,
727 0x56a5, 0x58de, 0x58df, 0x58e2, 0x5bf5, 0x9f90, 0x5eec, 0x61f2,
728 0x61f7, 0x61f6, 0x61f5, 0x6500, 0x650f, 0x66e0, 0x66dd, 0x6ae5,
729 0x6add, 0x6ada, 0x6ad3, 0x701b, 0x701f, 0x7028, 0x701a, 0x701d,
730 0x7015, 0x7018, 0x7018, 0x7206, 0x720d, 0x7258, 0x72a2, 0x7378, 0x737a,
731 0x74bd, 0x74ca, 0x74e3, 0x7587, 0x7586, 0x765f, 0x7661, 0x77c7,
732 0x7919, 0x79b1, 0x7a6b, 0x7a69, 0x7c3e, 0x7c3f, 0x7c38, 0x7c3d,
733 0x7c37, 0x7c40, 0x7e6b, 0x7e6d, 0x7e79, 0x7e69, 0x7e6a, 0x7f85,
734 0x7e73, 0x7fb6, 0x7fb9, 0x7fb8, 0x81d8, 0x85e9, 0x85dd, 0x85ea,
735 0x85d5, 0x85e4, 0x85e5, 0x85f7, 0x87fb, 0x8805, 0x880d, 0x87f9,
736 0x87fe, 0x8960, 0x895f, 0x895e, 0x895e, 0x8b41, 0x8b5c, 0x8b58,
737 0x8b49, 0x8b5a, 0x8b4e, 0x8b4f, 0x8b46, 0x8b59, 0x8d08, 0x8d0a,
738 0x8e7c, 0x8e72, 0x8e87, 0x8e76, 0x8e6c, 0x8e7a, 0x8e74, 0x8f54,
739 0x8f4e, 0x8fad, 0x908a, 0x908b, 0x91b1, 0x91ae, 0x93e1, 0x93d1,
740 0x93df, 0x93c3, 0x93c8, 0x93dc, 0x93dd, 0x93d6, 0x93e2, 0x93cd,
741 0x93d8, 0x93e4, 0x93d7, 0x93e8, 0x95dc, 0x96b4, 0x96e3, 0x972a,
742 0x9727, 0x9761, 0x97dc, 0x97fb, 0x985e,
743 /* 0xc4 */
744 0x9858, 0x985b, 0x98bc, 0x9945, 0x9949, 0x9a16, 0x9a19, 0x9b0d,
745 0x9be8, 0x9be7, 0x9bdb, 0x9db8, 0x9d89, 0x9d61, 0x9d72, 0x9d6a,
746 0x9d6c, 0x9e92, 0x9e97, 0x9e93, 0x9eb4, 0x52f8, 0x56a8, 0x56b7,
747 0x56b6, 0x56b4, 0x56bc, 0x58e4, 0x5b40, 0x5b43, 0x5b7d, 0x5bfb,
748 0x5dc9, 0x61f8, 0x61fa, 0x6518, 0x6514, 0x6519, 0x66e6, 0x6727,
749 0x6aec, 0x703e, 0x7030, 0x7032, 0x7210, 0x737b, 0x74cf, 0x7662,
750 0x7665, 0x7926, 0x792a, 0x792c, 0x792b, 0x7ac7, 0x7af6, 0x7c4c,
751 0x7c43, 0x7c4d, 0x7cef, 0x7cf0, 0x8fae, 0x7e7d, 0x7e7c, 0x7e82,
752 0x7f4c, 0x8000, 0x81da, 0x8266, 0x85fb, 0x85f9, 0x8611, 0x85fa,
753 0x8606, 0x860b, 0x8607, 0x860a, 0x8814, 0x8815, 0x8964, 0x89ba,
754 0x89f8, 0x8b70, 0x8b6c, 0x8b6f, 0x8b5f, 0x8b6b, 0x8d0f,
755 0x8d0d, 0x8e89, 0x8e81, 0x8e85, 0x8e82, 0x91b4, 0x91cb, 0x9418,
756 0x9403, 0x93fd, 0x95e1, 0x9730, 0x98c4, 0x9952, 0x9951, 0x99a8,
757 0x9a2b, 0x9a30, 0x9a37, 0x9a35, 0x9c13, 0x9c0d, 0x9e79, 0x9eb5,
758 0x9ee8, 0x9f2f, 0x9f5f, 0x9f63, 0x9f61, 0x5137, 0x5138, 0x56c1,
759 0x56c0, 0x56c2, 0x5914, 0x5c6c, 0x5dcd, 0x61fc, 0x61fe, 0x651d,
760 0x651c, 0x6595, 0x66e9, 0x66fa, 0x6b04, 0x6afa, 0x6bb2, 0x704c,
761 0x721b, 0x72a7, 0x74d6, 0x74d4, 0x7669, 0x77d3, 0x7c50, 0x7e8f,
762 0x7e8c, 0x7fbc, 0x8617, 0x862d, 0x861a, 0x8823, 0x8822, 0x8821,
763 0x881f, 0x896a, 0x896c, 0x89bd, 0x8b74,
764 /* 0xc5 */
765 0x8b77, 0x8b7d, 0x8d13, 0x8e8a, 0x8e8d, 0x8e8b, 0x8f5f, 0x8faf,
766 0x91ba, 0x942e, 0x9433, 0x9435, 0x943a, 0x9438, 0x9432, 0x942b,
767 0x95e2, 0x9738, 0x9739, 0x9732, 0x97ff, 0x9867, 0x9865, 0x9957,
768 0x9a45, 0x9a43, 0x9a40, 0x9a3e, 0x9acf, 0x9b54, 0x9b51, 0x9c2d,
769 0x9c25, 0x9daf, 0x9db4, 0x9dc2, 0x9db8, 0x9e9d, 0x9eef, 0x9f19,
770 0x9f5c, 0x9f66, 0x9f67, 0x513c, 0x513b, 0x56c8, 0x56ca, 0x56c9,
771 0x5b7f, 0x5dd4, 0x5dd2, 0x5f4e, 0x61ff, 0x6524, 0x6b0a, 0x6b61,
772 0x7051, 0x7058, 0x7380, 0x74e4, 0x758a, 0x766e, 0x766c, 0x79b3,
773 0x7c60, 0x7c5f, 0x807e, 0x807d, 0x81df, 0x8972, 0x896f, 0x89fc,
774 0x8b80, 0x8d16, 0x8d17, 0x8e91, 0x8e93, 0x8f61, 0x9148, 0x9444,
775 0x9451, 0x9452, 0x973d, 0x973e, 0x97c3, 0x97c1, 0x986b, 0x9955,
776 0x9a55, 0x9a4d, 0x9ad2, 0x9b1a, 0x9c49, 0x9c31, 0x9c3e, 0x9c3b,
777 0x9dd3, 0x9dd7, 0x9f34, 0x9f6c, 0x9f6a, 0x9f94, 0x56cc, 0x5dd6,
778 0x6200, 0x6523, 0x652b, 0x652a, 0x66ec, 0x6b10, 0x74da, 0x7aca,
779 0x7c64, 0x7c63, 0x7c65, 0x7e93, 0x7e96, 0x7e94, 0x81e2, 0x8638,
780 0x863f, 0x8831, 0x8b8a, 0x9090, 0x908f, 0x9463, 0x9460, 0x9464,
781 0x9768, 0x986f, 0x995c, 0x9a5a, 0x9a5b, 0x9a57, 0x9ad3, 0x9ad4,
782 0x9ad1, 0x9c54, 0x9c57, 0x9c56, 0x9de5, 0x9e9f, 0x9ef4, 0x56d1,
783 0x58e9, 0x652c, 0x705e, 0x7671, 0x7672, 0x77d7, 0x7f50, 0x7f88,
784 0x8836, 0x8839, 0x8862, 0x8b93, 0x8b92,
785 /* 0xc6 */
786 0x8b96, 0x8277, 0x8d1b, 0x91c0, 0x946a, 0x9742, 0x9748, 0x9744,
787 0x97c6, 0x9870, 0x9a5f, 0x9b22, 0x9b58, 0x9c5f, 0x9df9, 0x9dfa,
788 0x9e7c, 0x9e7d, 0x9f07, 0x9f77, 0x9f72, 0x5ef3, 0x6b16, 0x7063,
789 0x7c6c, 0x7c6e, 0x883b, 0x89c0, 0x8ea1, 0x91c1, 0x9472, 0x9470,
790 0x9871, 0x995e, 0x9ad6, 0x9b23, 0x9ecc, 0x7064, 0x77da, 0x8b9a,
```

```
791 0x9477, 0x97c9, 0x9a62, 0x9a65, 0x7e9c, 0x8b9c, 0x8eaa, 0x91c5,
792 0x947d, 0x947e, 0x947c, 0x9c77, 0x9c78, 0x9ef7, 0x8c54, 0x947f,
793 0x9e1a, 0x7228, 0x9a6a, 0x9b31, 0x9e1b, 0x9e1e, 0x7c72, 0x30fe,
794 0x309d, 0x309e, 0x3005, 0x3041, 0x3042, 0x3043, 0x3044, 0x3045,
795 0x3046, 0x3047, 0x3048, 0x3049, 0x304a, 0x304b, 0x304c, 0x304d,
796 0x304e, 0x304f, 0x3050, 0x3051, 0x3052, 0x3053, 0x3054, 0x3055,
797 0x3056, 0x3057, 0x3058, 0x3059, 0x305a, 0x305b, 0x305c, 0x305d,
798 0x305e, 0x305f, 0x3060, 0x3061, 0x3062, 0x3063, 0x3064, 0x3065,
799 0x3066, 0x3067, 0x3068, 0x3069, 0x306a, 0x306b, 0x306c, 0x306d,
800 0x306e, 0x306f, 0x3070, 0x3071, 0x3072, 0x3073, 0x3074, 0x3075,
801 0x3076, 0x3077, 0x3078, 0x3079, 0x307a, 0x307b, 0x307c, 0x307d,
802 0x307e, 0x307f, 0x3080, 0x3081, 0x3082, 0x3083, 0x3084, 0x3085,
803 0x3086, 0x3087, 0x3088, 0x3089, 0x308a, 0x308b, 0x308c, 0x308d,
804 0x308e, 0x308f, 0x3090, 0x3091, 0x3092, 0x3093, 0x30a1, 0x30a2,
805 0x30a3, 0x30a4, 0x30a5, 0x30a6, 0x30a7,
806 /* 0xc7 */
807 0x30a8, 0x30a9, 0x30aa, 0x30ab, 0x30ac, 0x30ad, 0x30ae, 0x30af,
808 0x30b0, 0x30b1, 0x30b2, 0x30b3, 0x30b4, 0x30b5, 0x30b6, 0x30b7,
809 0x30b8, 0x30b9, 0x30ba, 0x30bb, 0x30bc, 0x30bd, 0x30be, 0x30bf,
810 0x30c0, 0x30c1, 0x30c2, 0x30c3, 0x30c4, 0x30c5, 0x30c6, 0x30c7,
811 0x30c8, 0x30c9, 0x30ca, 0x30cb, 0x30cc, 0x30cd, 0x30ce, 0x30cf,
812 0x30d0, 0x30d1, 0x30d2, 0x30d3, 0x30d4, 0x30d5, 0x30d6, 0x30d7,
813 0x30d8, 0x30d9, 0x30da, 0x30db, 0x30dc, 0x30dd, 0x30de, 0x30df,
814 0x30e0, 0x30e1, 0x30e2, 0x30e3, 0x30e4, 0x30e5, 0x30e6, 0x30e7,
815 0x30e8, 0x30e9, 0x30ea, 0x30eb, 0x30ec, 0x30ed, 0x30ee, 0x30ef,
816 0x30f0, 0x30f1, 0x30f2, 0x30f3, 0x30f4, 0x30f5, 0x30f6, 0x0414,
817 0x0415, 0x0401, 0x0416, 0x0417, 0x0418, 0x0419, 0x041a, 0x041b,
818 0x041c, 0x0423, 0x0424, 0x0425, 0x0426, 0x0427, 0x0428, 0x0429,
819 0x042a, 0x042b, 0x042c, 0x042d, 0x042e, 0x042f, 0x0430, 0x0431,
820 0x0432, 0x0433, 0x0434, 0x0435, 0x0436, 0x0437, 0x0438,
821 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e, 0x043f, 0x0440,
822 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446, 0x0447, 0x0448,
823 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e, 0x044f, 0x2460,
824 0x2461, 0x2462, 0x2463, 0x2464, 0x2465, 0x2466, 0x2467, 0x2468,
825 0x2469, 0x2474, 0x2475, 0x2476, 0x2477, 0x2478, 0x2479, 0x247a,
826 0x247b, 0x247c, 0x247d,
827 };
828 static const unsigned short big5_2uni_pagec9[7652] = {
829 /* 0xc9 */
830 0x4e42, 0x4e5c, 0x51f5, 0x531a, 0x5382, 0x4e07, 0x4e0c, 0x4e47,
831 0x4e8d, 0x56d7, 0xfa0c, 0x5c6e, 0x5f73, 0x4e0f, 0x5187, 0x4e0e,
832 0x4e2e, 0x4e93, 0x4ec2, 0x4ec9, 0x4ec8, 0x5198, 0x52fc, 0x536c,
833 0x53b9, 0x5720, 0x5903, 0x592c, 0x5c10, 0x5dff, 0x65e1, 0x6bb3,
834 0x6bcc, 0x6c14, 0x723f, 0x4e31, 0x4e3c, 0x4ee8, 0x4edc, 0x4ee9,
835 0x4ee1, 0x4edd, 0x4eda, 0x520c, 0x531c, 0x534c, 0x5722, 0x5723,
836 0x5917, 0x592f, 0x5b81, 0x5b84, 0x5c12, 0x5c3b, 0x5c74, 0x5c73,
837 0x5e04, 0x5e80, 0x5e82, 0x5fc9, 0x6209, 0x6250, 0x6c15, 0x6c36,
838 0x6c43, 0x6c3f, 0x6c3b, 0x72ae, 0x72b0, 0x738a, 0x79b8, 0x808a,
839 0x961e, 0x4f0e, 0x4f18, 0x4f2c, 0x4ef5, 0x4f14, 0x4ef1, 0x4f00,
840 0x4ef7, 0x4f08, 0x4f1d, 0x4f02, 0x4f05, 0x4f22, 0x4f13, 0x4f04,
841 0x4ef4, 0x4f12, 0x51b1, 0x5213, 0x5209, 0x5210, 0x52a6, 0x5322,
842 0x531f, 0x534d, 0x538a, 0x5407, 0x56e1, 0x56df, 0x572e, 0x572a,
843 0x5734, 0x593c, 0x5980, 0x597c, 0x5985, 0x597b, 0x597e, 0x5977,
844 0x597f, 0x5b56, 0x5c15, 0x5c25, 0x5c7c, 0x5c7a, 0x5c7b, 0x5c7e,
845 0x5ddf, 0x5e75, 0x5e84, 0x5f02, 0x5f1a, 0x5f74, 0x5fd5, 0x5fd4,
846 0x5fcf, 0x625c, 0x625e, 0x6264, 0x6261, 0x6266, 0x6262, 0x6259,
847 0x6260, 0x625a, 0x6265, 0x65ef, 0x65ee, 0x673e, 0x6739, 0x6738,
848 0x673b, 0x673a, 0x673f, 0x673c, 0x6733, 0x6c18, 0x6c46, 0x6c52,
849 0x6c5c, 0x6c4f, 0x6c4a, 0x6c54, 0x6c4b,
850 /* 0xca */
851 0x6c4c, 0x7071, 0x725e, 0x72b4, 0x72b5, 0x738e, 0x752a, 0x767f,
852 0x7a75, 0x7f51, 0x8278, 0x827c, 0x8280, 0x827d, 0x827f, 0x864d,
853 0x897e, 0x9099, 0x9097, 0x9098, 0x909b, 0x9094, 0x9622, 0x9624,
854 0x9620, 0x9623, 0x4f56, 0x4f3b, 0x4f62, 0x4f49, 0x4f53, 0x4f64,
855 0x4f3e, 0x4f67, 0x4f52, 0x4f5f, 0x4f41, 0x4f58, 0x4f2d, 0x4f33,
856 0x4f3f, 0x4f61, 0x518f, 0x51b9, 0x521c, 0x521e, 0x5221, 0x52ad,
857 0x52ae, 0x5309, 0x5363, 0x5372, 0x538e, 0x538f, 0x5430, 0x5437,
858 0x542a, 0x5454, 0x5445, 0x5419, 0x541c, 0x5425, 0x5418, 0x543d,
859 0x544f, 0x5441, 0x5428, 0x5424, 0x5447, 0x56ee, 0x56e7, 0x56e5,
860 0x5741, 0x5745, 0x574c, 0x5749, 0x574b, 0x5752, 0x5906, 0x5940,
861 0x59a6, 0x5998, 0x59a0, 0x5997, 0x598e, 0x59a2, 0x5990, 0x598f,
862 0x59a7, 0x59a1, 0x5b8e, 0x5b92, 0x5c28, 0x5c2a, 0x5c8d, 0x5c8f,
863 0x5c88, 0x5c8b, 0x5c89, 0x5c92, 0x5c8a, 0x5c86, 0x5c93, 0x5c95,
864 0x5de0, 0x5e0a, 0x5e0e, 0x5e8b, 0x5e89, 0x5e8c, 0x5e88, 0x5e8d,
865 0x5f05, 0x5f1d, 0x5f78, 0x5f76, 0x5fd2, 0x5fd1, 0x5fd0, 0x5fed,
866 0x5fe8, 0x5fee, 0x5ff3, 0x5fe1, 0x5fe4, 0x5fe3, 0x5ffa, 0x5fef,
867 0x5ff7, 0x5ff6, 0x6000, 0x5ff4, 0x623a, 0x6283, 0x628c, 0x628e,
868 0x628f, 0x6294, 0x6287, 0x6271, 0x627b, 0x627a, 0x6270, 0x6281,
869 0x6288, 0x6277, 0x627d, 0x6272, 0x6274, 0x6537, 0x65f0, 0x65f4,
870 0x65f3, 0x65f2, 0x65f5, 0x6745, 0x6747,
871 /* 0xcb */
872 0x6759, 0x6755, 0x674c, 0x6748, 0x675d, 0x674d, 0x675a, 0x674b,
873 0x6bd0, 0x6c19, 0x6c1a, 0x6c78, 0x6c67, 0x6c6b, 0x6c84, 0x6c8b,
874 0x6c8f, 0x6c71, 0x6c6f, 0x6c69, 0x6c9a, 0x6c6d, 0x6c87, 0x6c95,
875 0x6c9c, 0x6c66, 0x6c73, 0x6c65, 0x6c7b, 0x6c8e, 0x7074, 0x707a,
876 0x7263, 0x72b6, 0x72bf, 0x72bd, 0x72c3, 0x72c6, 0x72c1, 0x72ba, 0x72c5,
877 0x7395, 0x7397, 0x7393, 0x7394, 0x7392, 0x753a, 0x7539, 0x7594,
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878 0x7595, 0x7681, 0x793d, 0x8034, 0x8095, 0x8099, 0x8090, 0x8092,
879 0x809c, 0x8290, 0x828f, 0x8285, 0x828e, 0x8291, 0x8293, 0x828a,
880 0x8283, 0x8284, 0x828a, 0x8c78, 0x8fc9, 0x8fbf, 0x909f, 0x90a1, 0x90a5,
881 0x909e, 0x90a7, 0x90a0, 0x9630, 0x9628, 0x962f, 0x962d, 0x4e33,
882 0x4f98, 0x4f7c, 0x4f85, 0x4f7d, 0x4f80, 0x4f87, 0x4f76, 0x4f74,
883 0x4f89, 0x4f84, 0x4f77, 0x4f4c, 0x4f97, 0x4f6a, 0x4f9a, 0x4f79,
884 0x4f81, 0x4f78, 0x4f90, 0x4f9c, 0x4f94, 0x4f9e, 0x4f92, 0x4f82,
885 0x4f95, 0x4f6b, 0x4f6e, 0x519e, 0x51bc, 0x51be, 0x5235, 0x5232,
886 0x5233, 0x5246, 0x5231, 0x52bc, 0x530a, 0x530b, 0x533c, 0x5392,
887 0x5394, 0x5487, 0x547f, 0x5481, 0x5491, 0x5482, 0x5488, 0x546b,
888 0x547a, 0x547e, 0x5465, 0x546c, 0x5474, 0x5466, 0x548d, 0x546f,
889 0x5461, 0x5460, 0x5498, 0x5463, 0x5467, 0x5464, 0x56f7, 0x56f9,
890 0x576f, 0x5772, 0x576d, 0x576b, 0x5771, 0x5770, 0x5776, 0x5780,
891 0x5775, 0x577b, 0x5773, 0x5774, 0x5762,
892 /* 0xcc */
893 0x5768, 0x577d, 0x590c, 0x5945, 0x59b5, 0x59ba, 0x59cf, 0x59ce,
894 0x59b2, 0x59cc, 0x59c1, 0x59b6, 0x59bc, 0x59c3, 0x59d6, 0x59b1,
895 0x59bd, 0x59c0, 0x59c8, 0x59b4, 0x59c7, 0x5b62, 0x5b65, 0x5b93,
896 0x5b95, 0x5c44, 0x5c47, 0x5cae, 0x5ca4, 0x5ca0, 0x5cb5, 0x5caf,
897 0x5ca8, 0x5cac, 0x5c9f, 0x5ca3, 0x5cad, 0x5ca2, 0x5caa, 0x5ca7,
898 0x5c9d, 0x5ca5, 0x5cb6, 0x5cb0, 0x5ca6, 0x5e17, 0x5e14, 0x5e19,
899 0x5f28, 0x5f22, 0x5f23, 0x5f24, 0x5f54, 0x5f82, 0x5f7e, 0x5f7d,
900 0x5fde, 0x5fe5, 0x602d, 0x6026, 0x6019, 0x6032, 0x600b, 0x6034,
901 0x600a, 0x6017, 0x6033, 0x601a, 0x601e, 0x602c, 0x6022, 0x600d,
902 0x6010, 0x602e, 0x6013, 0x6011, 0x600c, 0x6009, 0x601c, 0x6214,
903 0x623d, 0x62ad, 0x62b4, 0x62d1, 0x62be, 0x62aa, 0x62b6, 0x62ca,
904 0x62ae, 0x62b3, 0x62af, 0x62bb, 0x62a9, 0x62b0, 0x62b8, 0x63d,
905 0x65a8, 0x65bb, 0x6609, 0x65fc, 0x6604, 0x6612, 0x6608, 0x65fb,
906 0x6603, 0x660b, 0x660d, 0x6605, 0x65fd, 0x6611, 0x6610, 0x66f6,
907 0x670a, 0x6785, 0x676c, 0x678e, 0x6792, 0x677e, 0x677b, 0x6798,
908 0x6786, 0x6784, 0x6774, 0x678d, 0x678c, 0x677a, 0x679f, 0x6791,
909 0x6799, 0x6783, 0x677d, 0x6781, 0x6778, 0x6779, 0x6794, 0x6b25,
910 0x6b80, 0x6b7e, 0x6bde, 0x6c1d, 0x6c93, 0x6cec, 0x6ceb, 0x6cee,
911 0x6cd9, 0x6cb6, 0x6cd4, 0x6cad, 0x6ce7, 0x6cb7, 0x6cd0, 0x6cc2,
912 0x6cba, 0x6cc3, 0x6cc6, 0x6ced, 0x6cf2,
913 /* 0xcd */
914 0x6cd2, 0x6cdd, 0x6cb4, 0x6c8a, 0x6c9d, 0x6c80, 0x6cde, 0x6cc0,
915 0x6d30, 0x6ccd, 0x6cc7, 0x6cb0, 0x6cf9, 0x6ccf, 0x6ce9, 0x6cd1,
916 0x7094, 0x7098, 0x7085, 0x7093, 0x7086, 0x7084, 0x7091, 0x7096,
917 0x7082, 0x709a, 0x7083, 0x726a, 0x72d6, 0x72cb, 0x72d8, 0x72c9,
918 0x72dc, 0x72d2, 0x72d4, 0x72da, 0x72cc, 0x72d1, 0x73a4, 0x73a1,
919 0x73ad, 0x73a6, 0x73a2, 0x73a0, 0x73ac, 0x739d, 0x74dd, 0x74e8,
920 0x753f, 0x7540, 0x753e, 0x758c, 0x7598, 0x76af, 0x76f3, 0x76f1,
921 0x76f0, 0x76f5, 0x77f8, 0x77fc, 0x77f9, 0x77fb, 0x77fa, 0x77f7,
922 0x7942, 0x793f, 0x79c5, 0x7a78, 0x7a7b, 0x7afb, 0x7c75, 0x7cfd,
923 0x8035, 0x808f, 0x80ae, 0x80a3, 0x80b8, 0x80b5, 0x80ad, 0x8220,
924 0x82a0, 0x82c0, 0x82ab, 0x829a, 0x8298, 0x829b, 0x82b5, 0x82a7,
925 0x82ae, 0x82bc, 0x829e, 0x82ba, 0x82b4, 0x82a8, 0x82a1, 0x82a9,
926 0x82c2, 0x82a4, 0x82c3, 0x82b6, 0x82a2, 0x8670, 0x866f, 0x866d,
927 0x866e, 0x8c56, 0x8fd2, 0x8fcb, 0x8fd3, 0x8fcd, 0x8fd6, 0x8fd5,
928 0x8fd7, 0x90b2, 0x90b4, 0x90af, 0x90b3, 0x90b0, 0x9639, 0x963d,
929 0x963c, 0x963a, 0x9643, 0x4fcd, 0x4fc5, 0x4fd3, 0x4fb2, 0x4fc9,
930 0x4fcb, 0x4fc1, 0x4fd4, 0x4fdc, 0x4fd9, 0x4fbb, 0x4fb3, 0x4fdb,
931 0x4fc7, 0x4fd6, 0x4fba, 0x4fc0, 0x4fb9, 0x4fec, 0x5244, 0x5249,
932 0x52c0, 0x52c2, 0x533d, 0x537c, 0x5397, 0x5396, 0x5399, 0x5398,
933 0x54ba, 0x54a1, 0x54ad, 0x54a5, 0x54cf,
934 /* 0xce */
935 0x54c3, 0x830d, 0x54b7, 0x54ae, 0x54d6, 0x54b6, 0x54c5, 0x54c6,
936 0x54a0, 0x5470, 0x54bc, 0x54a2, 0x54be, 0x5472, 0x54de, 0x54b0,
937 0x57b5, 0x579e, 0x579f, 0x57a4, 0x578c, 0x5797, 0x579d, 0x579b,
938 0x5794, 0x5798, 0x578f, 0x5799, 0x57a5, 0x579a, 0x5795, 0x58f4,
939 0x590d, 0x5953, 0x59e1, 0x59de, 0x59ee, 0x5a00, 0x59f1, 0x59dd,
940 0x59fa, 0x59fd, 0x59fc, 0x59f6, 0x59e4, 0x59f2, 0x59f7, 0x59db,
941 0x59e9, 0x59f3, 0x59f5, 0x59e0, 0x59fe, 0x59f4, 0x59ed, 0x5ba8,
942 0x5c4c, 0x5cd0, 0x5cd8, 0x5ccc, 0x5cd7, 0x5ccb, 0x5cdb, 0x5cde,
943 0x5cda, 0x5cc9, 0x5cc7, 0x5cca, 0x5cd6, 0x5cd3, 0x5cd4, 0x5ccf,
944 0x5cc8, 0x5cc6, 0x5cce, 0x5cdf, 0x5cf8, 0x5df9, 0x5e21, 0x5e22,
945 0x5e23, 0x5e20, 0x5e24, 0x5eb0, 0x5ea4, 0x5ea2, 0x5e9b, 0x5ea3,
946 0x5ea5, 0x5f07, 0x5f2e, 0x5f56, 0x5f86, 0x6037, 0x6039, 0x6054,
947 0x6072, 0x605e, 0x6045, 0x6053, 0x6047, 0x6049, 0x605b, 0x604c,
948 0x6040, 0x6042, 0x605f, 0x6024, 0x6044, 0x6058, 0x6066, 0x606e,
949 0x6242, 0x6243, 0x62cf, 0x630d, 0x630b, 0x62f5, 0x630e, 0x6303,
950 0x62eb, 0x62f9, 0x630f, 0x630c, 0x62f8, 0x62f6, 0x6300, 0x6313,
951 0x6314, 0x62fa, 0x6315, 0x62fb, 0x62f0, 0x6541, 0x6543, 0x65aa,
952 0x65bf, 0x6636, 0x6621, 0x6632, 0x6635, 0x661c, 0x6626, 0x6622,
953 0x6633, 0x662b, 0x663a, 0x661d, 0x6634, 0x6639, 0x662e, 0x670f,
954 0x6710, 0x67c1, 0x67f2, 0x67c8, 0x67ba,
955 /* 0xcf */
956 0x67dc, 0x67bb, 0x67f8, 0x67d8, 0x67c0, 0x67b7, 0x67c5, 0x67eb,
957 0x67e4, 0x67df, 0x67b5, 0x67cd, 0x67b3, 0x67f7, 0x67f6, 0x67ee,
958 0x67e3, 0x67c2, 0x67b9, 0x67ce, 0x67e7, 0x67f0, 0x67b2, 0x67fc,
959 0x67c6, 0x67ed, 0x67cc, 0x67ae, 0x67e6, 0x67db, 0x67fa, 0x67c9,
960 0x67ca, 0x67c3, 0x67ea, 0x67cb, 0x6b28, 0x6b82, 0x6b84, 0x6bb6,
961 0x6bd6, 0x6bd8, 0x6be0, 0x6c20, 0x6c21, 0x6d28, 0x6d34, 0x6d2d,
962 0x6d1f, 0x6d3c, 0x6d3f, 0x6d12, 0x6d0a, 0x6cda, 0x6d33, 0x6d04,
963 0x6d19, 0x6d3a, 0x6d1a, 0x6d11, 0x6d00, 0x6d1d, 0x6d42, 0x6d01,
964 0x6d18, 0x6d37, 0x6d03, 0x6d0f, 0x6d40, 0x6d07, 0x6d20, 0x6d2c,

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966 0x70b0, 0x70a1, 0x70b4, 0x70b5, 0x70a9, 0x7241, 0x7249, 0x724a,
967 0x726c, 0x7270, 0x7273, 0x726e, 0x72ca, 0x72e4, 0x72e8, 0x72eb,
968 0x72df, 0x72ea, 0x72e6, 0x72e3, 0x7385, 0x73cc, 0x73c2, 0x73c8,
969 0x73c5, 0x73b9, 0x73b6, 0x73b5, 0x73b4, 0x73eb, 0x73bf, 0x73c7,
970 0x73be, 0x73c3, 0x73c6, 0x73b8, 0x73cb, 0x74ec, 0x74ee, 0x752e,
971 0x7547, 0x7548, 0x75a7, 0x75aa, 0x7679, 0x76c4, 0x7708, 0x7703,
972 0x7704, 0x7705, 0x770a, 0x76f7, 0x76fb, 0x76fa, 0x77e7, 0x77e8,
973 0x7806, 0x7811, 0x7812, 0x7805, 0x7810, 0x780f, 0x780e, 0x7809,
974 0x7803, 0x7813, 0x794a, 0x794c, 0x794b, 0x7945, 0x7944, 0x79d5,
975 0x79cd, 0x79cf, 0x79d6, 0x79ce, 0x7a80,
976 /* 0xd0 */
977 0x7a7e, 0x7ad1, 0x7b00, 0x7b01, 0x7c7a, 0x7c78, 0x7c79, 0x7c7f,
978 0x7c80, 0x7c81, 0x7d03, 0x7d08, 0x7d01, 0x7f58, 0x7f91, 0x7f8d,
979 0x7fbe, 0x8007, 0x800e, 0x800f, 0x8014, 0x8037, 0x80d8, 0x80c7,
980 0x80e0, 0x80d1, 0x80c8, 0x80c2, 0x80d0, 0x80c5, 0x80e3, 0x80d9,
981 0x80dc, 0x80ca, 0x80d5, 0x80c9, 0x80cf, 0x80d7, 0x80e6, 0x80cd,
982 0x81ff, 0x8221, 0x8294, 0x82d9, 0x82fe, 0x82f9, 0x8307, 0x82e8,
983 0x8300, 0x82d5, 0x833a, 0x82eb, 0x82d6, 0x82f4, 0x82ec, 0x82e1,
984 0x82f2, 0x82f5, 0x830c, 0x82fb, 0x82f6, 0x82f0, 0x82ea, 0x82e4,
985 0x82e0, 0x82fa, 0x82f3, 0x82ed, 0x8677, 0x8674, 0x867c, 0x8673,
986 0x8841, 0x884e, 0x8867, 0x886a, 0x8869, 0x89d3, 0x8a04, 0x8a07,
987 0x8d72, 0x8fe3, 0x8fe1, 0x8fee, 0x8fe0, 0x90f1, 0x90bd, 0x90bf,
988 0x90d5, 0x90c5, 0x90be, 0x90c7, 0x90cb, 0x90c8, 0x91d4, 0x91d3,
989 0x9654, 0x964f, 0x9651, 0x9653, 0x964a, 0x964e, 0x501e, 0x5005,
990 0x5007, 0x5013, 0x5022, 0x5030, 0x501b, 0x4ff5, 0x4ff4, 0x5033,
991 0x5037, 0x502c, 0x4ff6, 0x4ff7, 0x5017, 0x501c, 0x5020, 0x5027,
992 0x5035, 0x502f, 0x5031, 0x500e, 0x515a, 0x5194, 0x5193, 0x51ca,
993 0x51c4, 0x51c5, 0x51c8, 0x51ce, 0x5261, 0x525a, 0x5252, 0x525e,
994 0x525f, 0x5255, 0x5262, 0x52cd, 0x530e, 0x539e, 0x5526, 0x54e2,
995 0x5517, 0x5512, 0x54e7, 0x54f3, 0x54e4, 0x551a, 0x54ff, 0x5504,
996 0x5508, 0x54eb, 0x5511, 0x5505, 0x54f1,
997 /* 0xd1 */
998 0x550a, 0x54fb, 0x54f7, 0x54f8, 0x54e0, 0x550e, 0x5503, 0x550b,
999 0x5701, 0x5702, 0x57cc, 0x5832, 0x57d5, 0x57d2, 0x57ba, 0x57c6,
1000 0x57bd, 0x57bc, 0x57b8, 0x57b6, 0x57bf, 0x57c7, 0x57d0, 0x57b9,
1001 0x57c1, 0x590e, 0x594a, 0x5a19, 0x5a16, 0x5a2d, 0x5a2e, 0x5a15,
1002 0x5a0f, 0x5a17, 0x5a0a, 0x5a1e, 0x5a33, 0x5b6c, 0x5ba7, 0x5bad,
1003 0x5bac, 0x5c03, 0x5c56, 0x5c54, 0x5cec, 0x5cff, 0x5cee, 0x5cfl,
1004 0x5cf7, 0x5d00, 0x5cf9, 0x5e29, 0x5e28, 0x5ea8, 0x5eae, 0x5eaa,
1005 0x5eac, 0x5f33, 0x5f30, 0x5f67, 0x605d, 0x605a, 0x6067, 0x6041,
1006 0x60a2, 0x6088, 0x6080, 0x6092, 0x6081, 0x609d, 0x6083, 0x6095,
1007 0x609b, 0x6097, 0x6087, 0x609c, 0x608e, 0x6219, 0x6246, 0x62f2,
1008 0x6310, 0x6356, 0x632c, 0x6344, 0x6345, 0x6336, 0x6343, 0x63e4,
1009 0x6339, 0x634b, 0x634a, 0x633c, 0x6329, 0x6341, 0x6334, 0x6358,
1010 0x6354, 0x6359, 0x632d, 0x6347, 0x6333, 0x635a, 0x6351, 0x6338,
1011 0x6357, 0x6340, 0x6348, 0x654a, 0x6546, 0x65c6, 0x65c3, 0x65c4,
1012 0x65c2, 0x664a, 0x665f, 0x6647, 0x6651, 0x6712, 0x6713, 0x681f,
1013 0x681a, 0x6849, 0x6832, 0x6833, 0x683b, 0x684b, 0x684f, 0x6816,
1014 0x6831, 0x681c, 0x6835, 0x682b, 0x682d, 0x682f, 0x684e, 0x6844,
1015 0x6834, 0x681d, 0x6812, 0x6814, 0x6826, 0x6828, 0x682e, 0x684d,
1016 0x683a, 0x6825, 0x6820, 0x6b2c, 0x6b2f, 0x6b2d, 0x6b31, 0x6b34,
1017 0x6b6d, 0x8082, 0x6b88, 0x6be6, 0x6be4,
1018 /* 0xd2 */
1019 0x6be8, 0x6be3, 0x6be2, 0x6be7, 0x6c25, 0x6d7a, 0x6d63, 0x6d64,
1020 0x6d76, 0x6d0d, 0x6d61, 0x6d92, 0x6d58, 0x6d62, 0x6d6d, 0x6d6f,
1021 0x6d91, 0x6d8d, 0x6def, 0x6d7f, 0x6d86, 0x6d5e, 0x6d67, 0x6d60,
1022 0x6d97, 0x6d70, 0x6d7c, 0x6d5f, 0x6d82, 0x6d98, 0x6d2f, 0x6d68,
1023 0x6d8b, 0x6d7e, 0x6d80, 0x6d84, 0x6d16, 0x6d83, 0x6d7b, 0x6d7d,
1024 0x6d75, 0x6d90, 0x70dc, 0x70d3, 0x70d1, 0x70dd, 0x70cb, 0x7f39,
1025 0x70e2, 0x70d7, 0x70d2, 0x70de, 0x70e0, 0x70d4, 0x70cd, 0x70c5,
1026 0x70c6, 0x70c7, 0x70da, 0x70ce, 0x70e1, 0x7242, 0x7278, 0x7277,
1027 0x7276, 0x7300, 0x72fa, 0x72f4, 0x72fe, 0x72f6, 0x72f3, 0x72fb,
1028 0x7301, 0x73d3, 0x73d9, 0x73e5, 0x73d6, 0x73bc, 0x73e7, 0x73e3,
1029 0x73e9, 0x73de, 0x73d2, 0x73db, 0x73d4, 0x73dd, 0x73da, 0x73d7,
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1031 0x755f, 0x75b0, 0x75c1, 0x75bb, 0x75c4, 0x75c0, 0x75bf, 0x75b6,
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1033 0x7723, 0x7711, 0x7715, 0x7719, 0x771a, 0x7722, 0x7727, 0x7823,
1034 0x782c, 0x7822, 0x7835, 0x782f, 0x7828, 0x782e, 0x782b, 0x7821,
1035 0x7829, 0x7833, 0x782a, 0x7831, 0x7954, 0x795b, 0x794f, 0x795c,
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1037 0x79ea, 0x79dc, 0x79de, 0x79dd, 0x7a86, 0x7a89, 0x7a85, 0x7a8b,
1038 0x7a8c, 0x7a8a, 0x7a87, 0x7ad8, 0x7b10,
1039 /* 0xd3 */
1040 0x7b04, 0x7b13, 0x7b05, 0x7b0f, 0x7b08, 0x7b0a, 0x7b0e, 0x7b09,
1041 0x7b12, 0x7c84, 0x7c91, 0x7c8a, 0x7c8c, 0x7c88, 0x7c8d, 0x7c85,
1042 0x7d1e, 0x7d1d, 0x7d11, 0x7d0e, 0x7d18, 0x7d16, 0x7d13, 0x7d1f,
1043 0x7d12, 0x7d0f, 0x7d0c, 0x7f5c, 0x7f61, 0x7f5e, 0x7f60, 0x7f5d,
1044 0x7f5b, 0x7f96, 0x7f92, 0x7fc3, 0x7fc2, 0x7fc0, 0x8016, 0x803e,
1045 0x8039, 0x80fa, 0x80f2, 0x80f9, 0x80f5, 0x8101, 0x80fb, 0x8100,
1046 0x8201, 0x822f, 0x8225, 0x8333, 0x832d, 0x8344, 0x8319, 0x8351,
1047 0x8325, 0x8356, 0x833f, 0x8341, 0x8326, 0x831c, 0x8322, 0x8342,
1048 0x834e, 0x831b, 0x832a, 0x8308, 0x833c, 0x834d, 0x8316, 0x8324,
1049 0x8320, 0x8337, 0x832f, 0x8329, 0x8347, 0x8345, 0x834c, 0x8353,
1050 0x831e, 0x832c, 0x834b, 0x8327, 0x8348, 0x8653, 0x8652, 0x86a2,
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1055 0x887e, 0x8874, 0x887c, 0x8a12, 0x8c47, 0x8c57, 0x8c7b, 0x8ca4,
1056 0x8ca3, 0x8d76, 0x8d78, 0x8db5, 0x8db7, 0x8db6, 0x8ed1, 0x8ed3,
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1058 0x90d6, 0x90e0, 0x90d9, 0x90da, 0x90e3, 0x90df, 0x90e5, 0x90d8,
1059 0x90db, 0x90d7, 0x90dc, 0x90e4, 0x9150,
1060 /* 0xd4 */
1061 0x914e, 0x914f, 0x91d5, 0x91e2, 0x91da, 0x965c, 0x965f, 0x96bc,
1062 0x98e3, 0x9adf, 0x9b2f, 0x4e7f, 0x5070, 0x506a, 0x5061, 0x505e,
1063 0x5060, 0x5053, 0x504b, 0x505d, 0x5072, 0x5048, 0x504d, 0x5041,
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1066 0x51d0, 0x52f6, 0x526d, 0x526c, 0x526e, 0x52d6, 0x52d3, 0x532d,
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1068 0x5551, 0x5562, 0x5536, 0x5535, 0x5530, 0x5552, 0x5545, 0x550c,
1069 0x5532, 0x5565, 0x554e, 0x5539, 0x5548, 0x552d, 0x553b, 0x5540,
1070 0x554b, 0x570a, 0x5707, 0x57fb, 0x5814, 0x57e2, 0x57f6, 0x57dc,
1071 0x57f4, 0x5800, 0x57ed, 0x57fd, 0x5808, 0x57f8, 0x580b, 0x57f3,
1072 0x57cf, 0x5807, 0x57ee, 0x57e3, 0x57f2, 0x57e5, 0x57ec, 0x57e1,
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1074 0x57f0, 0x580d, 0x5804, 0x595c, 0x5a60, 0x5a58, 0x5a55, 0x5a67,
1075 0x5a5e, 0x5a38, 0x5a35, 0x5a6d, 0x5a50, 0x5a5f, 0x5a65, 0x5a6c,
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1077 0x5a48, 0x5a8e, 0x5a3e, 0x5a4d, 0x5a39, 0x5a4c, 0x5a70, 0x5a69,
1078 0x5a47, 0x5a51, 0x5a56, 0x5a42, 0x5a5c, 0x5b72, 0x5b6e, 0x5bcl,
1079 0x5bc0, 0x5c59, 0x5d1e, 0x5d0b, 0x5d1d, 0x5d1a, 0x5d20, 0x5d0c,
1080 0x5d28, 0x5d0d, 0x5d26, 0x5d25, 0x5d0f,
1081 /* 0xd5 */
1082 0x5d30, 0x5d12, 0x5d23, 0x5d1f, 0x5d2e, 0x5e3e, 0x5e34, 0x5eb1,
1083 0x5eb4, 0x5eb9, 0x5eb2, 0x5eb3, 0x5f36, 0x5f38, 0x5f9b, 0x5f96,
1084 0x5f9f, 0x608a, 0x6090, 0x6086, 0x60be, 0x60b0, 0x60ba, 0x60d3,
1085 0x60d4, 0x60cf, 0x60e4, 0x60d9, 0x60dd, 0x60c8, 0x60b1, 0x60db,
1086 0x60b7, 0x60ca, 0x60bf, 0x60c3, 0x60cd, 0x60c0, 0x6332, 0x6365,
1087 0x638a, 0x6382, 0x637d, 0x63bd, 0x639e, 0x63ad, 0x639d, 0x6397,
1088 0x63ab, 0x638e, 0x636f, 0x6387, 0x6390, 0x636e, 0x63af, 0x6375,
1089 0x639c, 0x636d, 0x63ae, 0x637c, 0x63a4, 0x633b, 0x639f, 0x6378,
1090 0x6385, 0x6381, 0x6391, 0x638d, 0x6370, 0x6553, 0x65cd, 0x6665,
1091 0x6661, 0x665b, 0x6659, 0x665c, 0x6662, 0x6718, 0x6879, 0x6887,
1092 0x6890, 0x689c, 0x686d, 0x686e, 0x68ae, 0x68ab, 0x6956, 0x686f,
1093 0x68a3, 0x68ac, 0x68a9, 0x6875, 0x6874, 0x68b2, 0x688f, 0x6877,
1094 0x6892, 0x687c, 0x686b, 0x6872, 0x68aa, 0x6880, 0x6871, 0x687e,
1095 0x689b, 0x6896, 0x688b, 0x68a0, 0x6889, 0x68a4, 0x6878, 0x687b,
1096 0x6891, 0x688c, 0x688a, 0x687d, 0x6b36, 0x6b33, 0x6b37, 0x6b38,
1097 0x6b91, 0x6b8f, 0x6b8d, 0x6b8e, 0x6b8c, 0x6c2a, 0x6dc0, 0x6dab,
1098 0x6db4, 0x6db3, 0x6e74, 0x6dac, 0x6de9, 0x6de2, 0x6db7, 0x6ddf6,
1099 0x6dd4, 0x6e00, 0x6dc8, 0x6de0, 0x6ddf, 0x6dd6, 0x6dbe, 0x6de5,
1100 0x6ddc, 0x6ddd, 0x6ddb, 0x6df4, 0x6dca, 0x6dbd, 0x6ded, 0x6df0,
1101 0x6dba, 0x6dd5, 0x6dc2, 0x6dcf, 0x6dc9,
1102 /* 0xd6 */
1103 0x6dd0, 0x6df2, 0x6dd3, 0x6dfd, 0x6dd7, 0x6dcd, 0x6de3, 0x6dbb,
1104 0x70fa, 0x710d, 0x70f7, 0x7117, 0x70f4, 0x710c, 0x70f0, 0x7104,
1105 0x70f3, 0x7110, 0x70fc, 0x70ff, 0x7106, 0x7113, 0x7100, 0x70f8,
1106 0x70f6, 0x710b, 0x7102, 0x710e, 0x727e, 0x727b, 0x727c, 0x727f,
1107 0x731d, 0x7317, 0x7307, 0x7311, 0x7318, 0x730a, 0x7308, 0x72ff,
1108 0x730f, 0x731e, 0x7388, 0x73f6, 0x73f8, 0x73f5, 0x7404, 0x7401,
1109 0x73fd, 0x7407, 0x7400, 0x73fa, 0x73fc, 0x73ff, 0x740c, 0x740b,
1110 0x73f4, 0x7408, 0x7564, 0x7563, 0x75ce, 0x75d2, 0x75cf, 0x75cb,
1111 0x75cc, 0x75d1, 0x75d0, 0x768f, 0x7689, 0x76d3, 0x7739, 0x772e,
1112 0x772d, 0x7731, 0x7732, 0x7734, 0x7733, 0x773d, 0x7725, 0x773b,
1113 0x7735, 0x7848, 0x7852, 0x7849, 0x784d, 0x784a, 0x784c, 0x7826,
1114 0x7845, 0x7850, 0x7964, 0x7967, 0x7969, 0x796a, 0x7963, 0x796b,
1115 0x7961, 0x79bb, 0x79fa, 0x79f8, 0x79f6, 0x79f7, 0x7a8f, 0x7a94,
1116 0x7a90, 0x7b35, 0x7b47, 0x7b34, 0x7b25, 0x7b30, 0x7b22, 0x7b24,
1117 0x7b33, 0x7b18, 0x7b2a, 0x7b1d, 0x7b31, 0x7b2b, 0x7b2d, 0x7b2f,
1118 0x7b32, 0x7b38, 0x7b1a, 0x7b23, 0x7c94, 0x7c98, 0x7c96, 0x7ca3,
1119 0x7d35, 0x7d3d, 0x7d38, 0x7d36, 0x7d3a, 0x7d45, 0x7d2c, 0x7d29,
1120 0x7d41, 0x7d47, 0x7d3e, 0x7d3f, 0x7d4a, 0x7d3b, 0x7d28, 0x7f63,
1121 0x7f95, 0x7f9c, 0x7f9d, 0x7f9b, 0x7fca, 0x7fcb, 0x7fcd, 0x7fd0,
1122 0x7fd1, 0x7fc7, 0x7fcf, 0x7fc9, 0x801f,
1123 /* 0xd7 */
1124 0x801e, 0x801b, 0x8047, 0x8043, 0x8048, 0x8118, 0x8125, 0x8119,
1125 0x811b, 0x812d, 0x811f, 0x812c, 0x811e, 0x8121, 0x8115, 0x8127,
1126 0x811d, 0x8122, 0x8211, 0x8238, 0x8233, 0x823a, 0x8234, 0x8232,
1127 0x8274, 0x8390, 0x83a3, 0x83a8, 0x838d, 0x837a, 0x8373, 0x83a4,
1128 0x8374, 0x838f, 0x8381, 0x8395, 0x8399, 0x8375, 0x8394, 0x83a9,
1129 0x837d, 0x8383, 0x838c, 0x839d, 0x839b, 0x83aa, 0x838b, 0x837e,
1130 0x83a5, 0x83af, 0x8388, 0x8397, 0x83b0, 0x837f, 0x83a6, 0x8387,
1131 0x83ae, 0x8376, 0x839a, 0x8659, 0x8656, 0x86bf, 0x86b7, 0x86c2,
1132 0x86c1, 0x86c5, 0x86ba, 0x86b0, 0x86c8, 0x86b9, 0x86b3, 0x86b8,
1133 0x86cc, 0x86b4, 0x86bb, 0x86bc, 0x86c3, 0x86bd, 0x86be, 0x8852,
1134 0x8889, 0x8895, 0x88a8, 0x88a2, 0x88aa, 0x889a, 0x8891, 0x88a1,
1135 0x889f, 0x8898, 0x88a7, 0x8899, 0x889b, 0x8897, 0x88a4, 0x88ac,
1136 0x888c, 0x8893, 0x888e, 0x8882, 0x89d6, 0x89d9, 0x89d5, 0x8a30,
1137 0x8a27, 0x8a2c, 0x8a1e, 0x8c39, 0x8c3b, 0x8c5c, 0x8c5d, 0x8c7d,
1138 0x8ca5, 0x8d7d, 0x8d7b, 0x8d79, 0x8dbc, 0x8dc2, 0x8db9, 0x8dbf,

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1139 0x8dc1, 0x8ed8, 0x8ede, 0x8edd, 0x8edc, 0x8ed7, 0x8ee0, 0x8ee1,
1140 0x9024, 0x900b, 0x9011, 0x901c, 0x900c, 0x9021, 0x90ef, 0x90ea,
1141 0x90f0, 0x90f4, 0x90f2, 0x90f3, 0x90d4, 0x90eb, 0x90ec, 0x90e9,
1142 0x9156, 0x9158, 0x915a, 0x9153, 0x9155, 0x91ec, 0x91f4, 0x91f1,
1143 0x91f3, 0x91f8, 0x91e4, 0x91f9, 0x91ea,
1144 /* 0xd8 */
1145 0x91eb, 0x91f7, 0x91e8, 0x91ee, 0x957a, 0x9586, 0x9588, 0x967c,
1146 0x966d, 0x966b, 0x9671, 0x966f, 0x96bf, 0x976a, 0x9804, 0x98e5,
1147 0x9997, 0x509b, 0x5095, 0x5094, 0x509e, 0x508b, 0x50a3, 0x5083,
1148 0x508c, 0x508e, 0x509d, 0x5068, 0x509c, 0x5092, 0x5082, 0x5087,
1149 0x515f, 0x51d4, 0x5312, 0x5311, 0x53a4, 0x53a7, 0x5591, 0x55a8,
1150 0x55a5, 0x55ad, 0x5577, 0x5645, 0x55a2, 0x5593, 0x5588, 0x558f,
1151 0x55b5, 0x5581, 0x55a3, 0x5592, 0x55a4, 0x557d, 0x558c, 0x55a6,
1152 0x557f, 0x5595, 0x55a1, 0x558e, 0x570c, 0x5829, 0x5837, 0x5819,
1153 0x581e, 0x5827, 0x5823, 0x5823, 0x5828, 0x57f5, 0x5848, 0x5825, 0x581c,
1154 0x581b, 0x5833, 0x583f, 0x5836, 0x582e, 0x5839, 0x5838, 0x582d,
1155 0x582c, 0x583b, 0x5961, 0x5aaf, 0x5a94, 0x5a9f, 0x5a7a, 0x5aa2,
1156 0x5a9e, 0x5a78, 0x5aa6, 0x5a7c, 0x5aa5, 0x5aac, 0x5a95, 0x5aae,
1157 0x5a37, 0x5a84, 0x5a8a, 0x5a97, 0x5a83, 0x5a8b, 0x5aa9, 0x5a7b,
1158 0x5a7d, 0x5a8c, 0x5a9c, 0x5a8f, 0x5a93, 0x5a9d, 0x5bea, 0x5bcd,
1159 0x5bcb, 0x5bd4, 0x5bd1, 0x5bca, 0x5bce, 0x5c0c, 0x5c30, 0x5d37,
1160 0x5d43, 0x5d6b, 0x5d41, 0x5d4b, 0x5d3f, 0x5d35, 0x5d51, 0x5d4e,
1161 0x5d55, 0x5d33, 0x5d3a, 0x5d52, 0x5d3d, 0x5d31, 0x5d59, 0x5d42,
1162 0x5d39, 0x5d49, 0x5d38, 0x5d3c, 0x5d32, 0x5d36, 0x5d40, 0x5d45,
1163 0x5e44, 0x5e41, 0x5f58, 0x5fa6, 0x5fa5, 0x5fab, 0x60c9, 0x60b9,
1164 0x60cc, 0x60e2, 0x60ce, 0x60c4, 0x6114,
1165 /* 0xd9 */
1166 0x60f2, 0x610a, 0x6116, 0x6105, 0x60f5, 0x6113, 0x60f8, 0x60fc,
1167 0x60fe, 0x60c1, 0x6103, 0x6118, 0x611d, 0x6110, 0x60ff, 0x6104,
1168 0x610b, 0x624a, 0x6394, 0x63b1, 0x63b0, 0x63ce, 0x63e5, 0x63e8,
1169 0x63ef, 0x63c3, 0x649d, 0x63f3, 0x63ca, 0x63e0, 0x63f6, 0x63d5,
1170 0x63f2, 0x63f5, 0x6461, 0x63df, 0x63be, 0x63dd, 0x63dc, 0x63c4,
1171 0x63d8, 0x63d3, 0x63c2, 0x63c7, 0x63cc, 0x63cb, 0x63c8, 0x63f0,
1172 0x63d7, 0x63d9, 0x6532, 0x6567, 0x656a, 0x6564, 0x655c, 0x6568,
1173 0x6565, 0x658c, 0x659d, 0x659e, 0x65ae, 0x65d0, 0x65d2, 0x667c,
1174 0x666c, 0x667b, 0x6680, 0x6671, 0x6679, 0x666a, 0x6672, 0x6701,
1175 0x690c, 0x68d3, 0x6904, 0x68dc, 0x692a, 0x68ec, 0x68ea, 0x68f1,
1176 0x690f, 0x68d6, 0x68f7, 0x68eb, 0x68e4, 0x68f6, 0x6913, 0x6910,
1177 0x68f3, 0x68e1, 0x6907, 0x68cc, 0x6908, 0x6970, 0x68b4, 0x6911,
1178 0x68ef, 0x68c6, 0x6914, 0x68f8, 0x68d0, 0x68fd, 0x68fc, 0x68e8,
1179 0x690b, 0x690a, 0x6917, 0x68ce, 0x68c8, 0x68dd, 0x68de, 0x68e6,
1180 0x68f4, 0x68d1, 0x6906, 0x68d4, 0x68e9, 0x6915, 0x6925, 0x68c7,
1181 0x6b39, 0x6b3b, 0x6b3f, 0x6b3c, 0x6b94, 0x6b97, 0x6b99, 0x6b95,
1182 0x6bbd, 0x6bf0, 0x6bf2, 0x6bf3, 0x6c30, 0x6dfc, 0x6e46, 0x6e47,
1183 0x6e1f, 0x6e49, 0x6e88, 0x6e3c, 0x6e3d, 0x6e45, 0x6e62, 0x6e2b,
1184 0x6e3f, 0x6e41, 0x6e5d, 0x6e73, 0x6e1c, 0x6e33, 0x6e4b, 0x6e40,
1185 0x6e51, 0x6e3b, 0x6e03, 0x6e2e, 0x6e5e,
1186 /* 0xda */
1187 0x6e68, 0x6e5c, 0x6e61, 0x6e31, 0x6e28, 0x6e60, 0x6e71, 0x6e6b,
1188 0x6e39, 0x6e22, 0x6e30, 0x6e53, 0x6e65, 0x6e27, 0x6e78, 0x6e64,
1189 0x6e77, 0x6e55, 0x6e79, 0x6e52, 0x6e66, 0x6e35, 0x6e36, 0x6e5a,
1190 0x7120, 0x711e, 0x712f, 0x70fb, 0x712e, 0x7131, 0x7123, 0x7125,
1191 0x7122, 0x7132, 0x711f, 0x7128, 0x713a, 0x711b, 0x724b, 0x725a,
1192 0x7288, 0x7289, 0x7286, 0x7285, 0x728b, 0x7312, 0x730b, 0x7330,
1193 0x7322, 0x7331, 0x7333, 0x7327, 0x7332, 0x732d, 0x7326, 0x7323,
1194 0x7335, 0x730c, 0x742e, 0x742c, 0x7430, 0x742b, 0x7416, 0x741a,
1195 0x7421, 0x742d, 0x7431, 0x7424, 0x7423, 0x741d, 0x7429, 0x7420,
1196 0x7432, 0x74fb, 0x752f, 0x756f, 0x756c, 0x75e7, 0x75da, 0x75e1,
1197 0x75e6, 0x75dd, 0x75df, 0x75e4, 0x75d7, 0x7695, 0x7692, 0x76da,
1198 0x7746, 0x7747, 0x7744, 0x774d, 0x7745, 0x774a, 0x774e, 0x774b,
1199 0x774c, 0x77de, 0x77ec, 0x7860, 0x7864, 0x7865, 0x785c, 0x786d,
1200 0x7871, 0x786a, 0x786e, 0x7870, 0x7869, 0x7868, 0x785e, 0x7862,
1201 0x7974, 0x7973, 0x7972, 0x7970, 0x7a02, 0x7a0a, 0x7a03, 0x7a0c,
1202 0x7a04, 0x7a99, 0x7ae6, 0x7ae4, 0x7b4a, 0x7b3b, 0x7b44, 0x7b48,
1203 0x7b4c, 0x7b4e, 0x7b40, 0x7b58, 0x7b45, 0x7ca2, 0x7c9e, 0x7ca8,
1204 0x7ca1, 0x7d58, 0x7d6f, 0x7d63, 0x7d53, 0x7d56, 0x7d67, 0x7d6a,
1205 0x7d4f, 0x7d6d, 0x7d5c, 0x7d6b, 0x7d52, 0x7d54, 0x7d69, 0x7d51,
1206 0x7d5f, 0x7d4e, 0x7f3e, 0x7f3f, 0x7f65,
1207 /* 0xdb */
1208 0x7f66, 0x7fa2, 0x7fa0, 0x7fa1, 0x7fd7, 0x8051, 0x804f, 0x8050,
1209 0x80fe, 0x80d4, 0x8143, 0x814a, 0x8152, 0x814f, 0x8147, 0x813d,
1210 0x814d, 0x813a, 0x81e6, 0x81ee, 0x81f7, 0x81f8, 0x81f9, 0x8204,
1211 0x823c, 0x823d, 0x823f, 0x8275, 0x833b, 0x83cf, 0x83f9, 0x8423,
1212 0x83c0, 0x83e8, 0x8412, 0x83e7, 0x83e4, 0x83cf, 0x83f6, 0x8410,
1213 0x83c6, 0x83c8, 0x83eb, 0x83e3, 0x83bf, 0x8401, 0x83dd, 0x83e5,
1214 0x83d8, 0x83ff, 0x83e1, 0x83cb, 0x83ce, 0x83d6, 0x83f5, 0x83c9,
1215 0x8409, 0x840f, 0x83de, 0x8411, 0x8406, 0x83c2, 0x83f3, 0x83d5,
1216 0x83fa, 0x83c7, 0x83d1, 0x83ea, 0x8413, 0x83c3, 0x83ec, 0x83ee,
1217 0x83c4, 0x83fb, 0x83d7, 0x83e2, 0x841b, 0x83db, 0x83fe, 0x86d8,
1218 0x86e2, 0x86e6, 0x86d3, 0x86e3, 0x86da, 0x86ea, 0x86dd, 0x86eb,
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1220 0x8855, 0x88ba, 0x88d7, 0x88b9, 0x88b8, 0x88c0, 0x88be, 0x88b6,
1221 0x88bc, 0x88b7, 0x88bd, 0x88b2, 0x8901, 0x88c9, 0x8955, 0x8998,
1222 0x8997, 0x89dd, 0x89da, 0x89db, 0x8a4e, 0x8a4d, 0x8a39, 0x8a59,
1223 0x8a40, 0x8a57, 0x8a58, 0x8a44, 0x8a45, 0x8a52, 0x8a48, 0x8a51,
1224 0x8a4a, 0x8a4c, 0x8a4f, 0x8c5f, 0x8c81, 0x8c80, 0x8cba, 0x8cbe,
1225 0x8cb0, 0x8cb9, 0x8cb5, 0x8d84, 0x8d80, 0x8d89, 0x8dd8, 0x8dd3,
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1226 0x8dcd, 0x8dc7, 0x8dd6, 0x8ddc, 0x8dcf, 0x8dd5, 0x8dd9, 0x8dc8,
1227 0x8dd7, 0x8dc5, 0x8eef, 0x8ef7, 0x8efa,
1228 /* 0xdc */
1229 0x8ef9, 0x8ee6, 0x8eee, 0x8ee5, 0x8ef5, 0x8ee7, 0x8ee8, 0x8ef6,
1230 0x8eeb, 0x8ef1, 0x8eec, 0x8ef4, 0x8ee9, 0x902d, 0x9034, 0x902f,
1231 0x9106, 0x912c, 0x9104, 0x90ff, 0x90fc, 0x9108, 0x90f9, 0x90fb,
1232 0x9101, 0x9100, 0x9107, 0x9105, 0x9103, 0x9161, 0x9164, 0x915f,
1233 0x9162, 0x9160, 0x9201, 0x920a, 0x9225, 0x9203, 0x921a, 0x9226,
1234 0x920f, 0x920c, 0x9200, 0x9212, 0x91ff, 0x91fd, 0x9206, 0x9204,
1235 0x9227, 0x9202, 0x921c, 0x9224, 0x9219, 0x9217, 0x9205, 0x9216,
1236 0x957b, 0x958d, 0x958c, 0x9590, 0x9687, 0x967e, 0x9688, 0x9689,
1237 0x9683, 0x9680, 0x96c2, 0x96c8, 0x96c3, 0x96f1, 0x96f0, 0x976c,
1238 0x9770, 0x976e, 0x9807, 0x98a9, 0x98eb, 0x9ce6, 0x9ef9, 0x4e83,
1239 0x4e84, 0x4eb6, 0x50bd, 0x50bf, 0x50c6, 0x50ae, 0x50c4, 0x50ca,
1240 0x50b4, 0x50c8, 0x50c2, 0x50b0, 0x50c1, 0x50ba, 0x50b1, 0x50cb,
1241 0x50c9, 0x50b6, 0x50b8, 0x51d7, 0x527a, 0x5278, 0x527b, 0x527c,
1242 0x55c3, 0x55db, 0x55cc, 0x55d0, 0x55cb, 0x55ca, 0x55dd, 0x55c0,
1243 0x55d4, 0x55c4, 0x55e9, 0x55bf, 0x55d2, 0x558d, 0x55cf, 0x55d5,
1244 0x55e2, 0x55d6, 0x55c8, 0x55f2, 0x55cd, 0x55d9, 0x55c2, 0x5714,
1245 0x5853, 0x5868, 0x5864, 0x584f, 0x584d, 0x5849, 0x586f, 0x5855,
1246 0x584e, 0x585d, 0x5859, 0x5865, 0x585b, 0x583d, 0x5863, 0x5871,
1247 0x58fc, 0x5ac7, 0x5ac4, 0x5acb, 0x5aba, 0x5ab8, 0x5ab1, 0x5ab5,
1248 0x5ab0, 0x5abf, 0x5ac8, 0x5abb, 0x5ac6,
1249 /* 0xdd */
1250 0x5ab7, 0x5ac0, 0x5aca, 0x5ab4, 0x5ab6, 0x5acd, 0x5ab9, 0x5a90,
1251 0x5bd6, 0x5bd8, 0x5bd9, 0x5c1f, 0x5c33, 0x5d71, 0x5d63, 0x5d4a,
1252 0x5d65, 0x5d72, 0x5d6c, 0x5d5e, 0x5d68, 0x5d67, 0x5d62, 0x5df0,
1253 0x5e4f, 0x5e4e, 0x5e4a, 0x5e4d, 0x5e4b, 0x5ec5, 0x5ecc, 0x5ec6,
1254 0x5ecb, 0x5ec7, 0x5f40, 0x5faf, 0x5fad, 0x60f7, 0x6149, 0x614a,
1255 0x612b, 0x6145, 0x6136, 0x6132, 0x612e, 0x6146, 0x612f, 0x614f,
1256 0x6129, 0x6140, 0x6220, 0x9168, 0x6223, 0x6225, 0x6224, 0x63c5,
1257 0x63f1, 0x63eb, 0x6410, 0x6412, 0x6409, 0x6420, 0x6424, 0x6433,
1258 0x6443, 0x641f, 0x6415, 0x6418, 0x6439, 0x6437, 0x6422, 0x6423,
1259 0x640c, 0x6426, 0x6430, 0x6428, 0x6441, 0x6435, 0x642f, 0x640a,
1260 0x641a, 0x6440, 0x6425, 0x6427, 0x640b, 0x63e7, 0x641b, 0x642e,
1261 0x6421, 0x640e, 0x656f, 0x6592, 0x65d3, 0x6686, 0x668c, 0x6695,
1262 0x6690, 0x668b, 0x668a, 0x6699, 0x6694, 0x6678, 0x6720, 0x6966,
1263 0x695f, 0x6938, 0x694e, 0x6962, 0x6971, 0x693f, 0x6945, 0x696a,
1264 0x6939, 0x6942, 0x6957, 0x6959, 0x697a, 0x6948, 0x6949, 0x6935,
1265 0x696c, 0x6933, 0x693d, 0x6965, 0x68f0, 0x6978, 0x6934, 0x6969,
1266 0x6940, 0x696f, 0x6944, 0x6976, 0x6958, 0x6941, 0x6974, 0x694c,
1267 0x693b, 0x694b, 0x6937, 0x695c, 0x694f, 0x6951, 0x6932, 0x6952,
1268 0x692f, 0x697b, 0x693c, 0x6b46, 0x6b45, 0x6b43, 0x6b42, 0x6b48,
1269 0x6b41, 0x6b9b, 0xfa0d, 0x6bfb, 0x6bfc,
1270 /* 0xde */
1271 0x6bf9, 0x6bf7, 0x6bf8, 0x6e9b, 0x6ed6, 0x6ec8, 0x6e8f, 0x6ec0,
1272 0x6e9f, 0x6e93, 0x6e94, 0x6ea0, 0x6eb1, 0x6eb9, 0x6ec6, 0x6ed2,
1273 0x6ebd, 0x6ec1, 0x6e9e, 0x6ec9, 0x6eb7, 0x6eb0, 0x6ecd, 0x6ea6,
1274 0x6ecf, 0x6eb2, 0x6ebe, 0x6ec3, 0x6edc, 0x6ed8, 0x6e99, 0x6e92,
1275 0x6e8e, 0x6e8d, 0x6ea4, 0x6ea1, 0x6ebf, 0x6eb3, 0x6ed0, 0x6eca,
1276 0x6e97, 0x6eae, 0x6ea3, 0x7147, 0x7154, 0x7152, 0x7163, 0x7160,
1277 0x7141, 0x715d, 0x7162, 0x7172, 0x7178, 0x716a, 0x7161, 0x7142,
1278 0x7158, 0x7143, 0x714b, 0x7170, 0x715f, 0x7150, 0x7153, 0x7144,
1279 0x714d, 0x715a, 0x724f, 0x728d, 0x728c, 0x7291, 0x7290, 0x728e,
1280 0x733c, 0x7342, 0x733b, 0x733a, 0x7340, 0x734a, 0x7349, 0x7444,
1281 0x744a, 0x744b, 0x7452, 0x7451, 0x7457, 0x7440, 0x744f, 0x7450,
1282 0x744e, 0x7442, 0x7446, 0x744d, 0x7454, 0x74e1, 0x74ff, 0x74fe,
1283 0x74fd, 0x751d, 0x7579, 0x7577, 0x6983, 0x75ef, 0x760f, 0x7603,
1284 0x75f7, 0x75fe, 0x75fc, 0x75f9, 0x75f8, 0x7610, 0x75fb, 0x75f6,
1285 0x75ed, 0x75f5, 0x75fd, 0x7699, 0x76b5, 0x76dd, 0x7755, 0x775e,
1286 0x7760, 0x7752, 0x7756, 0x775a, 0x7769, 0x7767, 0x7754, 0x7759,
1287 0x776d, 0x77e0, 0x7887, 0x789a, 0x7894, 0x788f, 0x7884, 0x7895,
1288 0x7885, 0x7886, 0x78a1, 0x7883, 0x7879, 0x7899, 0x7880, 0x7896,
1289 0x787b, 0x797c, 0x7982, 0x797d, 0x7979, 0x7a11, 0x7a18, 0x7a19,
1290 0x7a12, 0x7a17, 0x7a15, 0x7a22, 0x7a13,
1291 /* 0xdf */
1292 0x7a1b, 0x7a10, 0x7aa3, 0x7aa2, 0x7a9e, 0x7aeb, 0x7b66, 0x7b64,
1293 0x7b6d, 0x7b74, 0x7b69, 0x7b72, 0x7b65, 0x7b73, 0x7b71, 0x7b70,
1294 0x7b61, 0x7b78, 0x7b76, 0x7b63, 0x7cb2, 0x7cb4, 0x7caf, 0x7d88,
1295 0x7d86, 0x7d80, 0x7d8d, 0x7d7f, 0x7d85, 0x7d7a, 0x7d8e, 0x7d7b,
1296 0x7d83, 0x7d7c, 0x7d8c, 0x7d94, 0x7d84, 0x7d92, 0x7f6d,
1297 0x7f6b, 0x7f67, 0x7f68, 0x7f6c, 0x7fa6, 0x7fa5, 0x7fa7, 0x7fdb,
1298 0x7fdc, 0x8021, 0x8164, 0x8160, 0x8177, 0x815c, 0x8169, 0x815b,
1299 0x8162, 0x8172, 0x6721, 0x815e, 0x8176, 0x8167, 0x816f, 0x8144,
1300 0x8161, 0x821d, 0x8249, 0x8244, 0x8240, 0x8242, 0x8245, 0x84f1,
1301 0x843f, 0x8456, 0x8476, 0x8479, 0x848f, 0x848d, 0x8465, 0x8451,
1302 0x8440, 0x8486, 0x8467, 0x8430, 0x844d, 0x847d, 0x845a, 0x8459,
1303 0x8474, 0x8473, 0x845d, 0x8507, 0x845e, 0x8437, 0x843a, 0x8434,
1304 0x847a, 0x8443, 0x8478, 0x8432, 0x8445, 0x8429, 0x83d9, 0x844b,
1305 0x842f, 0x8442, 0x842d, 0x845f, 0x8470, 0x8439, 0x844e, 0x844c,
1306 0x8452, 0x846f, 0x84c5, 0x848e, 0x843b, 0x8447, 0x8436, 0x8433,
1307 0x8468, 0x847e, 0x8444, 0x842b, 0x8460, 0x8454, 0x846e, 0x8450,
1308 0x870b, 0x8704, 0x86f7, 0x870c, 0x86fa, 0x86d6, 0x86f5, 0x874d,
1309 0x86f8, 0x870e, 0x8709, 0x8701, 0x86f6, 0x870d, 0x8705, 0x88d6,
1310 0x88cb, 0x88cd, 0x88ce, 0x88de, 0x88da, 0x88cc, 0x88dd,
1311 0x8985, 0x899b, 0x89df, 0x89e5, 0x89e4,
1312 /* 0xe0 */

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1313 0x89e1, 0x89e0, 0x89e2, 0x89dc, 0x89e6, 0x8a76, 0x8a86, 0x8a7f,
1314 0x8a61, 0x8a3f, 0x8a77, 0x8a82, 0x8a84, 0x8a75, 0x8a83, 0x8a81,
1315 0x8a74, 0x8a7a, 0x8c3c, 0x8c4b, 0x8c4a, 0x8c65, 0x8c64, 0x8c66,
1316 0x8c86, 0x8c84, 0x8c85, 0x8ccc, 0x8d68, 0x8d69, 0x8d91, 0x8d8c,
1317 0x8d8e, 0x8d8f, 0x8d8d, 0x8d93, 0x8d94, 0x8d90, 0x8d92, 0x8df0,
1318 0x8de0, 0x8dec, 0x8df1, 0x8dee, 0x8dd0, 0x8de9, 0x8de3, 0x8de2,
1319 0x8de7, 0x8df2, 0x8deb, 0x8df4, 0x8f06, 0x8eff, 0x8f01, 0x8f00,
1320 0x8f05, 0x8f07, 0x8f08, 0x8f02, 0x8f0b, 0x9052, 0x903f, 0x9044,
1321 0x9049, 0x903d, 0x9110, 0x910d, 0x910f, 0x9111, 0x9116, 0x9114,
1322 0x910b, 0x910e, 0x916e, 0x916f, 0x9248, 0x9252, 0x9230, 0x923a,
1323 0x9266, 0x9233, 0x9265, 0x925e, 0x9283, 0x922e, 0x924a, 0x9246,
1324 0x926d, 0x926c, 0x924f, 0x9260, 0x9267, 0x926f, 0x9236, 0x9261,
1325 0x9270, 0x9231, 0x9254, 0x9263, 0x9250, 0x9272, 0x924e, 0x9253,
1326 0x924c, 0x9256, 0x9232, 0x959f, 0x959c, 0x959e, 0x959b, 0x9692,
1327 0x9693, 0x9691, 0x9697, 0x96ce, 0x96fa, 0x96fd, 0x96f8, 0x96f5,
1328 0x9773, 0x9777, 0x9778, 0x9772, 0x980f, 0x980d, 0x980e, 0x98ac,
1329 0x98f6, 0x98f9, 0x99af, 0x99b2, 0x99b0, 0x99b5, 0x9aad, 0x9aab,
1330 0x9b5b, 0x9cea, 0x9ced, 0x9ce7, 0x9e80, 0x9efd, 0x50e6, 0x50d4,
1331 0x50d7, 0x50e8, 0x50f3, 0x50db, 0x50ea, 0x50dd, 0x50e4, 0x50d3,
1332 0x50ec, 0x50f0, 0x50ef, 0x50e3, 0x50e0,
1333 /* 0xe1 */
1334 0x51d8, 0x5280, 0x5281, 0x52e9, 0x52eb, 0x5330, 0x53ac, 0x5627,
1335 0x5615, 0x560c, 0x5612, 0x55fc, 0x560f, 0x561c, 0x5601, 0x5613,
1336 0x5602, 0x55fa, 0x561d, 0x5604, 0x55ff, 0x55f9, 0x5589, 0x587c,
1337 0x5890, 0x5898, 0x5886, 0x5881, 0x587f, 0x5874, 0x588b, 0x587a,
1338 0x5887, 0x5891, 0x588e, 0x5876, 0x5882, 0x5888, 0x587b, 0x5894,
1339 0x588f, 0x587e, 0x596b, 0x5adc, 0x5aee, 0x5ae5, 0x5ad5, 0x5aea,
1340 0x5ada, 0x5aed, 0x5aeb, 0x5af3, 0x5ae2, 0x5ae0, 0x5adb, 0x5aec,
1341 0x5ade, 0x5add, 0x5ad9, 0x5ae8, 0x5adf, 0x5b77, 0x5be0, 0x5be3,
1342 0x5c63, 0x5d82, 0x5d80, 0x5d7d, 0x5d86, 0x5d7a, 0x5d81, 0x5d77,
1343 0x5d8a, 0x5d89, 0x5d88, 0x5d7e, 0x5d7c, 0x5d8d, 0x5d79, 0x5d7f,
1344 0x5e58, 0x5e59, 0x5e53, 0x5ed8, 0x5ed1, 0x5ed7, 0x5ece, 0x5edc,
1345 0x5ed5, 0x5ed9, 0x5ed2, 0x5ed4, 0x5f44, 0x5f43, 0x5f6f, 0x5fb6,
1346 0x612c, 0x6128, 0x6141, 0x615e, 0x6171, 0x6173, 0x6152, 0x6153,
1347 0x6172, 0x616c, 0x6180, 0x6174, 0x6154, 0x617a, 0x615b, 0x6165,
1348 0x613b, 0x616a, 0x6161, 0x6156, 0x6229, 0x6227, 0x622b, 0x642b,
1349 0x644d, 0x645b, 0x645d, 0x6474, 0x6476, 0x6472, 0x6473, 0x647d,
1350 0x6475, 0x6466, 0x64a6, 0x644e, 0x6482, 0x645e, 0x645c, 0x644b,
1351 0x6453, 0x6460, 0x6450, 0x647f, 0x643f, 0x646c, 0x646b, 0x6459,
1352 0x6465, 0x6477, 0x6573, 0x65a0, 0x66a1, 0x66a0, 0x669f, 0x6705,
1353 0x6704, 0x6722, 0x69b1, 0x69b6, 0x69c9,
1354 /* 0xe2 */
1355 0x69a0, 0x69ce, 0x6996, 0x69b0, 0x69ac, 0x69bc, 0x6991, 0x6999,
1356 0x698e, 0x69a7, 0x698d, 0x69a9, 0x69be, 0x69af, 0x69bf, 0x69c4,
1357 0x69bd, 0x69a4, 0x69d4, 0x69b9, 0x69ca, 0x699a, 0x69cf, 0x69b3,
1358 0x6993, 0x69aa, 0x69a1, 0x699e, 0x69d9, 0x6997, 0x6990, 0x69c2,
1359 0x69b5, 0x69a5, 0x69c6, 0x6b4a, 0x6b4d, 0x6b4b, 0x6b9e, 0x6b9f,
1360 0x6ba0, 0x6bc3, 0x6bc4, 0x6bfe, 0x6ece, 0x6ef5, 0x6ef1, 0x6f03,
1361 0x6f25, 0x6ef8, 0x6f37, 0x6efb, 0x6f2e, 0x6f09, 0x6f4e, 0x6f19,
1362 0x6f1a, 0x6f27, 0x6f18, 0x6f3b, 0x6f12, 0x6eed, 0x6f0a, 0x6f36,
1363 0x6f73, 0x6ef9, 0x6eee, 0x6f2d, 0x6f40, 0x6f30, 0x6f3c, 0x6f35,
1364 0x6eeb, 0x6f07, 0x6f0e, 0x6f43, 0x6f05, 0x6efd, 0x6ef6, 0x6f39,
1365 0x6f1c, 0x6efc, 0x6f3a, 0x6f1f, 0x6f0d, 0x6f1e, 0x6f08, 0x6f21,
1366 0x7187, 0x7190, 0x7189, 0x718d, 0x7185, 0x7182, 0x718f, 0x717b,
1367 0x7186, 0x7181, 0x7197, 0x7244, 0x7253, 0x7297, 0x7295, 0x7293,
1368 0x7343, 0x734d, 0x7351, 0x734c, 0x7462, 0x7473, 0x7471, 0x7475,
1369 0x7472, 0x7467, 0x746e, 0x7500, 0x7502, 0x7503, 0x757d, 0x7590,
1370 0x7616, 0x7608, 0x760c, 0x7615, 0x7611, 0x760a, 0x7614, 0x76b8,
1371 0x7781, 0x777c, 0x7785, 0x7782, 0x776e, 0x7780, 0x776f, 0x777e,
1372 0x7783, 0x78b2, 0x78aa, 0x78b4, 0x78ad, 0x78a8, 0x787e, 0x78ab,
1373 0x789e, 0x78a5, 0x78a0, 0x78ac, 0x78a2, 0x78a4, 0x7998, 0x798a,
1374 0x798b, 0x7996, 0x7995, 0x7994, 0x7993,
1375 /* 0xe3 */
1376 0x7997, 0x7988, 0x7992, 0x7990, 0x7a2b, 0x7a4a, 0x7a30, 0x7a2f,
1377 0x7a28, 0x7a26, 0x7a8, 0x7aab, 0x7aac, 0x7aee, 0x7b88, 0x7b9c,
1378 0x7b8a, 0x7b91, 0x7b90, 0x7b96, 0x7b8d, 0x7b8c, 0x7b9b, 0x7b8e,
1379 0x7b85, 0x7b98, 0x5284, 0x7b99, 0x7ba4, 0x7b82, 0x7cbb, 0x7cbf,
1380 0x7cbc, 0x7cba, 0x7da7, 0x7db7, 0x7dc2, 0x7da3, 0x7daa, 0x7dc1,
1381 0x7dc0, 0x7dc5, 0x7d9d, 0x7dce, 0x7dc4, 0x7dc6, 0x7dcb, 0x7dcc,
1382 0x7daf, 0x7db9, 0x7d96, 0x7dbc, 0x7dbf, 0x7da6, 0x7dae, 0x7da9,
1383 0x7da1, 0x7dc9, 0x7f73, 0x7fe2, 0x7fe3, 0x7fe5, 0x7fde, 0x8024,
1384 0x805d, 0x805c, 0x8189, 0x8186, 0x8183, 0x8187, 0x818d, 0x818c,
1385 0x818b, 0x8215, 0x8497, 0x84a4, 0x84a1, 0x849f, 0x84ba, 0x84ce,
1386 0x84c2, 0x84ac, 0x84ae, 0x84ab, 0x84b9, 0x84b4, 0x84c1, 0x84cd,
1387 0x84aa, 0x849a, 0x84b1, 0x84d0, 0x849d, 0x84a7, 0x84bb, 0x84a2,
1388 0x8494, 0x84c7, 0x84cc, 0x849b, 0x84a9, 0x84af, 0x84a8, 0x84d6,
1389 0x8498, 0x84b6, 0x84cf, 0x84a0, 0x84d7, 0x84d4, 0x84d2, 0x84db,
1390 0x84b0, 0x8491, 0x8661, 0x8733, 0x8723, 0x8728, 0x876b, 0x8740,
1391 0x872e, 0x871e, 0x8721, 0x8719, 0x871b, 0x8743, 0x872c, 0x8741,
1392 0x873e, 0x8746, 0x8720, 0x8732, 0x872a, 0x872d, 0x873c, 0x8712,
1393 0x873a, 0x8731, 0x8735, 0x8742, 0x8726, 0x8727, 0x8738, 0x8724,
1394 0x871a, 0x8730, 0x8711, 0x88f7, 0x88e7, 0x88f1, 0x88f2, 0x88fa,
1395 0x88fe, 0x88ee, 0x88fc, 0x88f6, 0x88fb,
1396 /* 0xe4 */
1397 0x88f0, 0x88ec, 0x88eb, 0x899d, 0x89a1, 0x899f, 0x899e, 0x89e9,
1398 0x89eb, 0x89e8, 0x8aab, 0x8a99, 0x8a8b, 0x8a92, 0x8a8f, 0x8a96,
1399 0x8c3d, 0x8c68, 0x8c69, 0x8cd5, 0x8ccf, 0x8cd7, 0x8d96, 0x8e09,
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1401 0x8e05, 0x8dfe, 0x8e00, 0x8e04, 0x8f10, 0x8f11, 0x8f0e, 0x8f0d,
1402 0x9123, 0x911c, 0x9120, 0x9122, 0x911f, 0x911d, 0x911a, 0x9124,
1403 0x9121, 0x911b, 0x917a, 0x9172, 0x9179, 0x9173, 0x92a5, 0x92a4,
1404 0x9276, 0x929b, 0x927a, 0x92a0, 0x9294, 0x92aa, 0x928d, 0x92a6,
1405 0x929a, 0x92ab, 0x9279, 0x9297, 0x927f, 0x92a3, 0x92ee, 0x928e,
1406 0x9282, 0x9295, 0x92a2, 0x927d, 0x9288, 0x92a1, 0x928a, 0x9286,
1407 0x928c, 0x9299, 0x92a7, 0x927e, 0x9287, 0x92a9, 0x929d, 0x928b,
1408 0x922d, 0x969e, 0x96a1, 0x96ff, 0x9758, 0x977d, 0x977a, 0x977e,
1409 0x9783, 0x9780, 0x9782, 0x977b, 0x9784, 0x9781, 0x977f, 0x97ce,
1410 0x97cd, 0x9816, 0x98ad, 0x98ae, 0x9902, 0x9900, 0x9907, 0x999d,
1411 0x999c, 0x99c3, 0x99b9, 0x99bb, 0x99ba, 0x99c2, 0x99bd, 0x99c7,
1412 0x9ab1, 0x9ae3, 0x9ae7, 0x9b3e, 0x9b3f, 0x9b60, 0x9b61, 0x9b5f,
1413 0x9cf1, 0x9cf2, 0x9cf5, 0x9ea7, 0x50ff, 0x5103, 0x5130, 0x50f8,
1414 0x5106, 0x5107, 0x50f6, 0x50fe, 0x510b, 0x510c, 0x50fd, 0x510a,
1415 0x528b, 0x528c, 0x52f1, 0x52ef, 0x5648, 0x5642, 0x564c, 0x5635,
1416 0x5641, 0x564a, 0x5649, 0x5646, 0x5658,
1417 /* 0xe5 */
1418 0x565a, 0x5640, 0x5633, 0x563d, 0x562c, 0x563e, 0x5638, 0x562a,
1419 0x563a, 0x571a, 0x58ab, 0x589d, 0x58b1, 0x58a0, 0x58a3, 0x58af,
1420 0x58ac, 0x58a5, 0x58a1, 0x58ff, 0x5aff, 0x5af4, 0x5afd, 0x5af7,
1421 0x5af6, 0x5b03, 0x5af8, 0x5b02, 0x5af9, 0x5b01, 0x5b07, 0x5b05,
1422 0x5b0f, 0x5c67, 0x5d99, 0x5d97, 0x5d9f, 0x5d92, 0x5da2, 0x5d93,
1423 0x5d95, 0x5da0, 0x5d9c, 0x5da1, 0x5d9a, 0x5d9e, 0x5e69, 0x5e5d,
1424 0x5e60, 0x5e5c, 0x7df3, 0x5edb, 0x5ede, 0x5ee1, 0x5f49, 0x5fb2,
1425 0x618b, 0x6183, 0x6179, 0x61b1, 0x61b0, 0x61a2, 0x6189, 0x619b,
1426 0x6193, 0x61af, 0x61ad, 0x619f, 0x6192, 0x61aa, 0x61a1, 0x618d,
1427 0x6166, 0x61b3, 0x622d, 0x646e, 0x6470, 0x6496, 0x64a0, 0x6485,
1428 0x6497, 0x649c, 0x648f, 0x648b, 0x648a, 0x648c, 0x64a3, 0x649f,
1429 0x6468, 0x64b1, 0x6498, 0x6576, 0x657a, 0x6579, 0x657b, 0x65b2,
1430 0x65b3, 0x66b5, 0x66b0, 0x66a9, 0x66b2, 0x66b7, 0x66aa, 0x66af,
1431 0x6a00, 0x6a06, 0x6a17, 0x69e5, 0x69f8, 0x6a15, 0x69f1, 0x69e4,
1432 0x6a20, 0x69ff, 0x69ec, 0x69e2, 0x6a1b, 0x6a1d, 0x69fe, 0x6a27,
1433 0x69f2, 0x69ee, 0x6a14, 0x69f7, 0x69e7, 0x6a40, 0x6a08, 0x69e6,
1434 0x69fb, 0x6a0d, 0x69fc, 0x69eb, 0x6a09, 0x6a04, 0x6a18, 0x6a25,
1435 0x6a0f, 0x69f6, 0x6a26, 0x6a07, 0x69f4, 0x6a16, 0x6b51, 0x6ba5,
1436 0x6ba3, 0x6ba2, 0x6ba6, 0x6c01, 0x6c00, 0x6bff, 0x6c02, 0x6f41,
1437 0x6f26, 0x6f7e, 0x6f87, 0x6fc6, 0x6f92,
1438 /* 0xe6 */
1439 0x6f8d, 0x6f89, 0x6f8c, 0x6f62, 0x6f4f, 0x6f85, 0x6f5a, 0x6f96,
1440 0x6f76, 0x6f6c, 0x6f82, 0x6f55, 0x6f72, 0x6f52, 0x6f50, 0x6f57,
1441 0x6f94, 0x6f93, 0x6f5d, 0x6f00, 0x6f61, 0x6f6b, 0x6f7d, 0x6f67,
1442 0x6f90, 0x6f53, 0x6f8b, 0x6f69, 0x6f7f, 0x6f95, 0x6f63, 0x6f77,
1443 0x6f6a, 0x6f7b, 0x71b2, 0x71af, 0x719b, 0x71b0, 0x71a0, 0x719a,
1444 0x71a9, 0x71b5, 0x719d, 0x71a5, 0x719e, 0x71a4, 0x71a1, 0x71aa,
1445 0x719c, 0x71a7, 0x71b3, 0x7298, 0x729a, 0x7358, 0x7352, 0x735e,
1446 0x735f, 0x7360, 0x735d, 0x735b, 0x7361, 0x735a, 0x7359, 0x7362,
1447 0x7487, 0x7489, 0x748a, 0x7486, 0x7481, 0x747d, 0x7485, 0x7488,
1448 0x747c, 0x7479, 0x7508, 0x7507, 0x757e, 0x7625, 0x761e, 0x7619,
1449 0x761d, 0x761c, 0x7623, 0x761a, 0x7628, 0x761b, 0x769c, 0x769d,
1450 0x769e, 0x769b, 0x778d, 0x778f, 0x7789, 0x7788, 0x78cd, 0x78bb,
1451 0x78cf, 0x78cc, 0x78d1, 0x78ce, 0x78d4, 0x78c8, 0x78c3, 0x78c4,
1452 0x78c9, 0x799a, 0x79a1, 0x79a0, 0x799c, 0x79a2, 0x799b, 0x6b76,
1453 0x7a39, 0x7ab2, 0x7ab4, 0x7ab3, 0x7bb7, 0x7bcb, 0x7bbe, 0x7bac,
1454 0x7bce, 0x7baf, 0x7bb9, 0x7bca, 0x7bb5, 0x7cc5, 0x7cc8, 0x7ccc,
1455 0x7ccb, 0x7df7, 0x7ddb, 0x7dea, 0x7de7, 0x7dd7, 0x7de1, 0x7e03,
1456 0x7dfa, 0x7de6, 0x7df6, 0x7df1, 0x7df0, 0x7dee, 0x7ddf, 0x7f76,
1457 0x7fac, 0x7fb0, 0x7fad, 0x7fed, 0x7feb, 0x7fea, 0x7fec, 0x7fe6,
1458 0x7fe8, 0x8064, 0x8067, 0x81a3, 0x819f,
1459 /* 0xe7 */
1460 0x819e, 0x8195, 0x81a2, 0x8199, 0x8197, 0x8216, 0x824f, 0x8253,
1461 0x8252, 0x8250, 0x824e, 0x8251, 0x8524, 0x853b, 0x850f, 0x8500,
1462 0x8529, 0x850e, 0x8509, 0x850d, 0x851f, 0x850a, 0x8527, 0x851c,
1463 0x84fb, 0x852b, 0x84fa, 0x8508, 0x850c, 0x84f4, 0x852a, 0x84f2,
1464 0x8515, 0x84f7, 0x84eb, 0x84f3, 0x84fc, 0x8512, 0x84ea, 0x84e9,
1465 0x8516, 0x84fe, 0x8528, 0x851d, 0x852e, 0x8502, 0x84fd, 0x851e,
1466 0x84f6, 0x8531, 0x8526, 0x84e7, 0x84e8, 0x84f0, 0x84ef, 0x84f9,
1467 0x8518, 0x8520, 0x8530, 0x850b, 0x8519, 0x852f, 0x8662, 0x8756,
1468 0x8763, 0x8764, 0x8777, 0x87e1, 0x8773, 0x8758, 0x8754, 0x875b,
1469 0x8752, 0x8761, 0x875a, 0x8751, 0x875e, 0x876d, 0x876a, 0x8750,
1470 0x874e, 0x875f, 0x875d, 0x876f, 0x876c, 0x877a, 0x876e, 0x875c,
1471 0x8765, 0x874f, 0x877b, 0x8775, 0x8762, 0x8767, 0x8769, 0x885a,
1472 0x8905, 0x890c, 0x8914, 0x890b, 0x8917, 0x8918, 0x8919, 0x8906,
1473 0x8916, 0x8911, 0x890e, 0x8909, 0x89a2, 0x89a4, 0x89a3, 0x89ed,
1474 0x89f0, 0x89ec, 0x8acf, 0x8ac6, 0x8ab8, 0x8ad3, 0x8ad1, 0x8ad4,
1475 0x8ad5, 0x8abb, 0x8ad7, 0x8abe, 0x8ac0, 0x8ac5, 0x8ad8, 0x8ac3,
1476 0x8aba, 0x8abd, 0x8ad9, 0x8c3e, 0x8c4d, 0x8c8f, 0x8ce5, 0x8cdf,
1477 0x8cd9, 0x8ce8, 0x8cda, 0x8cdd, 0x8ce7, 0x8da0, 0x8d9c, 0x8da1,
1478 0x8d9b, 0x8e20, 0x8e23, 0x8e25, 0x8e24, 0x8e2e, 0x8e15, 0x8e1b,
1479 0x8e16, 0x8e11, 0x8e19, 0x8e26, 0x8e27,
1480 /* 0xe8 */
1481 0x8e14, 0x8e12, 0x8e18, 0x8e13, 0x8e1c, 0x8e17, 0x8e1a, 0x8f2c,
1482 0x8f24, 0x8f18, 0x8f1a, 0x8f20, 0x8f23, 0x8f16, 0x8f17, 0x9073,
1483 0x9070, 0x906f, 0x9067, 0x906b, 0x912f, 0x912b, 0x9129, 0x912a,
1484 0x9132, 0x9126, 0x912e, 0x9185, 0x9186, 0x918a, 0x9181, 0x9182,
1485 0x9184, 0x9180, 0x92d0, 0x92c3, 0x92c4, 0x92c0, 0x92d9, 0x92b6,
1486 0x92cf, 0x92f1, 0x92df, 0x92d8, 0x92e9, 0x92d7, 0x92dd, 0x92cc,

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1488 0x92d5, 0x92c9, 0x92e0, 0x92de, 0x92e7, 0x92d1, 0x92d3, 0x92b5,
1489 0x92e1, 0x92c6, 0x92b4, 0x957c, 0x95ac, 0x95ab, 0x95ae, 0x95b0,
1490 0x96a4, 0x96a2, 0x96d3, 0x9705, 0x9708, 0x9702, 0x975a, 0x978a,
1491 0x978e, 0x9788, 0x97d0, 0x97cf, 0x981e, 0x981d, 0x9826, 0x9829,
1492 0x9828, 0x9820, 0x981b, 0x9827, 0x98b2, 0x9908, 0x98fa, 0x9911,
1493 0x9914, 0x9916, 0x9917, 0x9915, 0x99dc, 0x99cd, 0x99cf, 0x99d3,
1494 0x99d4, 0x99ce, 0x99c9, 0x99d6, 0x99d8, 0x99cb, 0x99d7, 0x99cc,
1495 0x9ab3, 0x9aec, 0x9aeb, 0x9af3, 0x9af2, 0x9af1, 0x9b46, 0x9b43,
1496 0x9b67, 0x9b74, 0x9b71, 0x9b66, 0x9b76, 0x9b75, 0x9b70, 0x9b68,
1497 0x9b64, 0x9b6c, 0x9cfc, 0x9cfa, 0x9cfd, 0x9cff, 0x9cf7, 0x9d07,
1498 0x9d00, 0x9cf9, 0x9cfb, 0x9d08, 0x9d05, 0x9d04, 0x9e83, 0x9ed3,
1499 0x9f0f, 0x9f10, 0x511c, 0x5113, 0x5117, 0x511a, 0x5111, 0x51de,
1500 0x5334, 0x53e1, 0x5670, 0x5660, 0x566e,
1501 /* 0xe9 */
1502 0x5673, 0x5666, 0x5663, 0x566d, 0x5672, 0x565e, 0x5677, 0x571c,
1503 0x571b, 0x58c8, 0x58bd, 0x58c9, 0x58bf, 0x58ba, 0x58c2, 0x58bc,
1504 0x58c6, 0x5b17, 0x5b19, 0x5b1b, 0x5b21, 0x5b14, 0x5b13, 0x5b10,
1505 0x5b16, 0x5b28, 0x5b1a, 0x5b20, 0x5b1e, 0x5bef, 0x5dac, 0x5db1,
1506 0x5da9, 0x5da7, 0x5db5, 0x5db0, 0x5dae, 0x5daa, 0x5da8, 0x5db2,
1507 0x5dad, 0x5daf, 0x5db4, 0x5e67, 0x5e68, 0x5e66, 0x5e6f, 0x5ee9,
1508 0x5ee7, 0x5ee6, 0x5ee8, 0x5ee5, 0x5f4b, 0x5fbc, 0x619d, 0x61a8,
1509 0x6196, 0x61c5, 0x61b4, 0x61c6, 0x61c1, 0x61cc, 0x61ba, 0x61bf,
1510 0x61b8, 0x618c, 0x64d7, 0x64d6, 0x64d0, 0x64cf, 0x64c9, 0x64bd,
1511 0x6489, 0x64c3, 0x64db, 0x64f3, 0x64d9, 0x6533, 0x657f, 0x657c,
1512 0x65a2, 0x66c8, 0x66be, 0x66c0, 0x66ca, 0x66cb, 0x66cf, 0x66bd,
1513 0x66bb, 0x66ba, 0x66cc, 0x6723, 0x6a34, 0x6a66, 0x6a49, 0x6a67,
1514 0x6a32, 0x6a68, 0x6a3e, 0x6a5d, 0x6a6d, 0x6a76, 0x6a5b, 0x6a51,
1515 0x6a28, 0x6a5a, 0x6a3b, 0x6a3f, 0x6a41, 0x6a6a, 0x6a64, 0x6a50,
1516 0x6a4f, 0x6a54, 0x6a6f, 0x6a69, 0x6a60, 0x6a3c, 0x6a5e, 0x6a56,
1517 0x6a55, 0x6a4d, 0x6a4e, 0x6a46, 0x6b55, 0x6b54, 0x6b56, 0x6ba7,
1518 0x6baa, 0x6bab, 0x6bc8, 0x6bc7, 0x6c04, 0x6c03, 0x6c06, 0x6fad,
1519 0x6fcb, 0x6fa3, 0x6fc7, 0x6fbc, 0x6fce, 0x6fc8, 0x6f5e, 0x6fc4,
1520 0x6fbd, 0x6f9e, 0x6fca, 0x6fa8, 0x7004, 0x6fa5, 0x6fae, 0x6fba,
1521 0x6fac, 0x6faa, 0x6fcf, 0x6fbf, 0x6fb8,
1522 /* 0xea */
1523 0x6fa2, 0x6fc9, 0x6fab, 0x6fcd, 0x6faf, 0x6fb2, 0x6fb0, 0x71c5,
1524 0x71c2, 0x71bf, 0x71b8, 0x71d6, 0x71c0, 0x71c1, 0x71cb, 0x71d4,
1525 0x71ca, 0x71c7, 0x71cf, 0x71bd, 0x71d8, 0x71bc, 0x71c6, 0x71da,
1526 0x71db, 0x729d, 0x729e, 0x7369, 0x7366, 0x7367, 0x736c, 0x7365,
1527 0x736b, 0x736a, 0x747f, 0x749a, 0x74a0, 0x7494, 0x7492, 0x7495,
1528 0x74a1, 0x750b, 0x7580, 0x762f, 0x762d, 0x7631, 0x763d, 0x7633,
1529 0x763c, 0x7635, 0x7632, 0x7630, 0x76bb, 0x76e6, 0x779a, 0x779d,
1530 0x77a1, 0x779c, 0x779b, 0x77a2, 0x77a3, 0x7795, 0x7799, 0x7797,
1531 0x78dd, 0x78e9, 0x78e5, 0x78ea, 0x78de, 0x783c, 0x78db, 0x78e1,
1532 0x78e2, 0x78ed, 0x78df, 0x78e0, 0x79a4, 0x7a44, 0x7a48, 0x7a47,
1533 0x7ab6, 0x7ab8, 0x7ab5, 0x7ab1, 0x7ab7, 0x7bde, 0x7be3, 0x7be7,
1534 0x7bdd, 0x7bd5, 0x7be5, 0x7bda, 0x7be8, 0x7bf9, 0x7bd4, 0x7bea,
1535 0x7be2, 0x7bdc, 0x7beb, 0x7bd8, 0x7bdf, 0x7cd2, 0x7cd4, 0x7cd7,
1536 0x7cd0, 0x7cd1, 0x7e12, 0x7e21, 0x7e17, 0x7e0c, 0x7e1f, 0x7e20,
1537 0x7e13, 0x7e0e, 0x7e1c, 0x7e15, 0x7e1a, 0x7e22, 0x7e0b, 0x7e0f,
1538 0x7e16, 0x7e0d, 0x7e14, 0x7e25, 0x7e24, 0x7f43, 0x7f7b, 0x7f7c,
1539 0x7f7a, 0x7fb1, 0x7fef, 0x802a, 0x8029, 0x806c, 0x81b1, 0x81a6,
1540 0x81ae, 0x81b9, 0x81b5, 0x81ab, 0x81b0, 0x81ac, 0x81b4, 0x81b2,
1541 0x81b7, 0x81a7, 0x81f2, 0x8255, 0x8256, 0x8257, 0x8556, 0x8545,
1542 0x856b, 0x854d, 0x8553, 0x8561, 0x8558,
1543 /* 0xeb */
1544 0x8540, 0x8546, 0x8564, 0x8541, 0x8562, 0x8544, 0x8551, 0x8547,
1545 0x8563, 0x853e, 0x855b, 0x8571, 0x854e, 0x856e, 0x8575, 0x8555,
1546 0x8567, 0x8560, 0x858c, 0x8566, 0x855d, 0x8554, 0x8565, 0x856c,
1547 0x8663, 0x8665, 0x8664, 0x879b, 0x878f, 0x8797, 0x8793, 0x8792,
1548 0x8788, 0x8781, 0x8796, 0x8798, 0x8779, 0x8787, 0x87a3, 0x8785,
1549 0x8790, 0x8791, 0x879d, 0x8784, 0x8794, 0x879c, 0x879a, 0x8789,
1550 0x891e, 0x8926, 0x8930, 0x892d, 0x892e, 0x8927, 0x8931, 0x8922,
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1553 0x8ac8, 0x8ade, 0x8ae1, 0x8ae8, 0x8aff, 0x8aef, 0x8afb, 0x8c91,
1554 0x8c92, 0x8c90, 0x8cf5, 0x8cee, 0x8cf1, 0x8cf0, 0x8cf3, 0x8d6c,
1555 0x8d6e, 0x8da5, 0x8da7, 0x8e33, 0x8e3c, 0x8e38, 0x8e40, 0x8e45,
1556 0x8e36, 0x8e3c, 0x8e3d, 0x8e41, 0x8e30, 0x8e3f, 0x8ebd, 0x8f36,
1557 0x8f2e, 0x8f35, 0x8f32, 0x8f39, 0x8f37, 0x8f34, 0x9076, 0x9079,
1558 0x907b, 0x9086, 0x90fa, 0x9133, 0x9135, 0x9136, 0x9193, 0x9190,
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1561 0x9346, 0x932d, 0x930e, 0x930d, 0x92cb, 0x931d, 0x92fa, 0x9325,
1562 0x9313, 0x92f9, 0x92f7, 0x9334, 0x9302, 0x9324, 0x92ff, 0x9329,
1563 0x9339, 0x9335, 0x932a, 0x9314, 0x930c,
1564 /* 0xec */
1565 0x930b, 0x92fe, 0x9309, 0x9300, 0x92fb, 0x9316, 0x95bc, 0x95cd,
1566 0x95be, 0x95b9, 0x95ba, 0x95b6, 0x95bf, 0x95b5, 0x95bd, 0x96a9,
1567 0x96d4, 0x970b, 0x9712, 0x9710, 0x9799, 0x9797, 0x9794, 0x97f0,
1568 0x97f8, 0x9835, 0x982f, 0x9832, 0x9924, 0x991f, 0x9927, 0x9929,
1569 0x999e, 0x99ee, 0x99ec, 0x99e5, 0x99e4, 0x99f0, 0x99e3, 0x99ea,
1570 0x99e9, 0x99e7, 0x9ab9, 0x9abf, 0x9ab4, 0x9abb, 0x9af6, 0x9afa,
1571 0x9af9, 0x9af7, 0x9b33, 0x9b80, 0x9b85, 0x9b87, 0x9b7c, 0x9b7e,
1572 0x9b7b, 0x9b82, 0x9b93, 0x9b92, 0x9b90, 0x9b7a, 0x9b95, 0x9b7d,
1573 0x9b88, 0x9d25, 0x9d17, 0x9d20, 0x9d1e, 0x9d14, 0x9d29, 0x9d1d,
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1575 0x9eae, 0x9ead, 0x9ed5, 0x9ed6, 0x9efa, 0x9f12, 0x9f3d, 0x5126,
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1577 0x568d, 0x5686, 0x5684, 0x5683, 0x567e, 0x5682, 0x567f, 0x5681,
1578 0x58d6, 0x58d4, 0x58cf, 0x58d2, 0x5b2d, 0x5b25, 0x5b32, 0x5b23,
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1582 0x64e3, 0x64eb, 0x64e4, 0x64e8, 0x6581, 0x6580, 0x65b6, 0x65da,
1583 0x66d2, 0x6a8d, 0x6a96, 0x6a81, 0x6aa5, 0x6a89, 0x6a9f, 0x6a9b,
1584 0x6aa1, 0x6a9e, 0x6a87, 0x6a93, 0x6a8e,
1585 /* 0xed */
1586 0x6a95, 0x6a83, 0x6aa8, 0x6aa4, 0x6a91, 0x6a7f, 0x6aa6, 0x6a9a,
1587 0x6a85, 0x6a8c, 0x6a92, 0x6b5b, 0x6bad, 0x6c09, 0x6fcc, 0x6fa9,
1588 0x6ff4, 0x6fd4, 0x6fe3, 0x6fdc, 0x6fed, 0x6fe7, 0x6fe6, 0x6fde,
1589 0x6ff2, 0x6fdd, 0x6fe2, 0x6fe8, 0x71e1, 0x71f1, 0x71e8, 0x71f2,
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1591 0x74ab, 0x7490, 0x74aa, 0x74ad, 0x74b1, 0x74a5, 0x74af, 0x7510,
1592 0x7511, 0x7512, 0x750f, 0x7584, 0x7643, 0x7648, 0x7649, 0x7647,
1593 0x76a4, 0x76e9, 0x77b5, 0x77ab, 0x77b2, 0x77b7, 0x77b6, 0x77b4,
1594 0x77b1, 0x77a8, 0x77f0, 0x78f3, 0x78fd, 0x7902, 0x78fb, 0x78fc,
1595 0x78f2, 0x7905, 0x78f9, 0x78fe, 0x7904, 0x79ab, 0x79a8, 0x7a5c,
1596 0x7a5b, 0x7a56, 0x7a58, 0x7a54, 0x7a5a, 0x7abe, 0x7ac0, 0x7ac1,
1597 0x7c05, 0x7c0f, 0x7bf2, 0x7c00, 0x7bff, 0x7bfb, 0x7c0e, 0x7bf4,
1598 0x7c0b, 0x7bf3, 0x7c02, 0x7c09, 0x7c03, 0x7c01, 0x7bf8, 0x7bfd,
1599 0x7c06, 0x7bf0, 0x7bf1, 0x7c10, 0x7c0a, 0x7ce8, 0x7e2d, 0x7e3c,
1600 0x7e42, 0x7e33, 0x9848, 0x7e38, 0x7e2a, 0x7e49, 0x7e40, 0x7e47,
1601 0x7e29, 0x7e4c, 0x7e30, 0x7e3b, 0x7e36, 0x7e44, 0x7e3a, 0x7f45,
1602 0x7f7f, 0x7f7e, 0x7f7d, 0x7ff4, 0x7ff2, 0x802c, 0x81bb, 0x81c4,
1603 0x81cc, 0x81c9, 0x81c5, 0x81c7, 0x81bc, 0x81e9, 0x825b, 0x825a,
1604 0x825c, 0x8583, 0x8580, 0x858f, 0x85a7, 0x8595, 0x85a0, 0x858b,
1605 0x85a3, 0x857b, 0x85a4, 0x859a, 0x859e,
1606 /* 0xee */
1607 0x8577, 0x857c, 0x8589, 0x85a1, 0x857a, 0x8578, 0x8557, 0x858e,
1608 0x8596, 0x8586, 0x858d, 0x8599, 0x859d, 0x8581, 0x85a2, 0x8582,
1609 0x8588, 0x8585, 0x8579, 0x8576, 0x8598, 0x8590, 0x859f, 0x8668,
1610 0x87be, 0x87aa, 0x87ad, 0x87c5, 0x87b0, 0x87ac, 0x87b9, 0x87b5,
1611 0x87bc, 0x87ae, 0x87c9, 0x87c3, 0x87c2, 0x87cc, 0x87b7, 0x87af,
1612 0x87c4, 0x87ca, 0x87b4, 0x87b6, 0x87bf, 0x87b8, 0x87bd, 0x87de,
1613 0x87b2, 0x8935, 0x8933, 0x893c, 0x893e, 0x8941, 0x8952, 0x8937,
1614 0x8942, 0x89ad, 0x89af, 0x89ae, 0x89f2, 0x89f3, 0x8b1e, 0x8b18,
1615 0x8b16, 0x8b11, 0x8b05, 0x8b0b, 0x8b22, 0x8b0f, 0x8b12, 0x8b15,
1616 0x8b07, 0x8b0d, 0x8b08, 0x8b06, 0x8b1c, 0x8b13, 0x8b1a, 0x8c4f,
1617 0x8c70, 0x8c72, 0x8c71, 0x8c6f, 0x8c95, 0x8c94, 0x8cf9, 0x8d6f,
1618 0x8e4e, 0x8e4d, 0x8e53, 0x8e50, 0x8e4c, 0x8e47, 0x8f43, 0x8f40,
1619 0x9085, 0x907e, 0x9138, 0x919a, 0x91a2, 0x919b, 0x9199, 0x919f,
1620 0x91a1, 0x919d, 0x91a0, 0x93a1, 0x9383, 0x93af, 0x9364, 0x9356,
1621 0x9347, 0x937c, 0x9358, 0x935c, 0x9376, 0x9349, 0x9350, 0x9351,
1622 0x9360, 0x936d, 0x938f, 0x934c, 0x936a, 0x9379, 0x9357, 0x9355,
1623 0x9352, 0x934f, 0x9371, 0x9377, 0x937b, 0x9361, 0x935e, 0x9363,
1624 0x9367, 0x9380, 0x934e, 0x9359, 0x95c7, 0x95c0, 0x95c9, 0x95c3,
1625 0x95c5, 0x95b7, 0x96ae, 0x96b0, 0x96ac, 0x9720, 0x971f, 0x9718,
1626 0x971d, 0x9719, 0x979a, 0x97a1, 0x979c,
1627 /* 0xef */
1628 0x979e, 0x979d, 0x97d5, 0x97d4, 0x97f1, 0x9841, 0x9844, 0x984a,
1629 0x9849, 0x9845, 0x9843, 0x9925, 0x992b, 0x992c, 0x992a, 0x9933,
1630 0x9932, 0x992f, 0x992d, 0x9931, 0x9930, 0x9998, 0x99a3, 0x99a1,
1631 0x9a02, 0x99fa, 0x99f4, 0x99f7, 0x99f9, 0x99f8, 0x99f6, 0x99fb,
1632 0x99fd, 0x99fe, 0x99fc, 0x9a03, 0x9abe, 0x9afe, 0x9afd, 0x9b01,
1633 0x9afc, 0x9b48, 0x9b9a, 0x9ba8, 0x9b9e, 0x9b9b, 0x9ba6, 0x9ba1,
1634 0x9ba5, 0x9ba4, 0x9b86, 0x9ba2, 0x9ba0, 0x9baf, 0x9d33, 0x9d41,
1635 0x9d67, 0x9d36, 0x9d2e, 0x9d2f, 0x9d31, 0x9d38, 0x9d30, 0x9d45,
1636 0x9d42, 0x9d43, 0x9d3e, 0x9d37, 0x9d40, 0x9d3d, 0x7ff5, 0x9d2d,
1637 0x9e8a, 0x9e89, 0x9e8d, 0x9eb0, 0x9ec8, 0x9eda, 0x9efb, 0x9eff,
1638 0x9f24, 0x9f23, 0x9f22, 0x9f54, 0x9fa0, 0x5131, 0x512d, 0x512e,
1639 0x5698, 0x569c, 0x5697, 0x569d, 0x5699, 0x5697, 0x5970, 0x5b3c,
1640 0x5c69, 0x5c6a, 0x5dc0, 0x5e6d, 0x5e6e, 0x61d8, 0x61df, 0x61ed,
1641 0x61ee, 0x61f1, 0x61ea, 0x61f0, 0x61eb, 0x61d6, 0x61e9, 0x64ff,
1642 0x6504, 0x64fd, 0x64f8, 0x6501, 0x6503, 0x64fc, 0x6594, 0x65db,
1643 0x66da, 0x66db, 0x66d8, 0x6ac5, 0x6ab9, 0x6abd, 0x6ae1, 0x6ac6,
1644 0x6aba, 0x6ab6, 0x6ab7, 0x6ac7, 0x6ab4, 0x6aad, 0x6b5e, 0x6bc9,
1645 0x6c0b, 0x7007, 0x700c, 0x700d, 0x7001, 0x7005, 0x7014, 0x700e,
1646 0x6fff, 0x7000, 0x6ffb, 0x7026, 0x6ffc, 0x6ff7, 0x700a, 0x7201,
1647 0x71ff, 0x71f9, 0x7203, 0x71fd, 0x7376,
1648 /* 0xf0 */
1649 0x74b8, 0x74c0, 0x74b5, 0x74c1, 0x74be, 0x74b6, 0x74bb, 0x74c2,
1650 0x7514, 0x7513, 0x765c, 0x765d, 0x7659, 0x7650, 0x7653, 0x7657,
1651 0x765a, 0x76a6, 0x76bd, 0x76ec, 0x77c2, 0x77ba, 0x78ff, 0x790c,
1652 0x7913, 0x7914, 0x7909, 0x7910, 0x7912, 0x7911, 0x79ad, 0x79ac,
1653 0x7a5f, 0x7c1c, 0x7c29, 0x7c19, 0x7c20, 0x7c1f, 0x7c2d, 0x7c1d,
1654 0x7c26, 0x7c28, 0x7c22, 0x7c25, 0x7c30, 0x7e5c, 0x7e50, 0x7e56,
1655 0x7e63, 0x7e58, 0x7e62, 0x7e5f, 0x7e51, 0x7e60, 0x7e57, 0x7e53,
1656 0x7fb5, 0x7fb3, 0x7ff7, 0x7ff8, 0x8075, 0x81d1, 0x81d2, 0x81d0,
1657 0x825f, 0x825e, 0x85b4, 0x85c6, 0x85c0, 0x85c3, 0x85c2, 0x85b3,
1658 0x85b5, 0x85bd, 0x85c7, 0x85c4, 0x85bf, 0x85cb, 0x85ce, 0x85c8,
1659 0x85c5, 0x85b1, 0x85b6, 0x85d2, 0x8624, 0x85b7, 0x85be,
1660 0x8669, 0x87e7, 0x87e6, 0x87e2, 0x87db, 0x87eb, 0x87ea, 0x87e5,

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1661 0x87df, 0x87f3, 0x87e4, 0x87d4, 0x87dc, 0x87d3, 0x87ed, 0x87d8,
1662 0x87e3, 0x87a4, 0x87d7, 0x87d9, 0x8801, 0x87f4, 0x87e8, 0x87dd,
1663 0x8953, 0x894b, 0x894f, 0x894c, 0x8946, 0x8950, 0x8951, 0x8949,
1664 0x8b2a, 0x8b27, 0x8b23, 0x8b33, 0x8b30, 0x8b35, 0x8b47, 0x8b2f,
1665 0x8b3c, 0x8b3e, 0x8b31, 0x8b25, 0x8b37, 0x8b26, 0x8b36, 0x8b2e,
1666 0x8b24, 0x8b3b, 0x8b3d, 0x8b3a, 0x8c42, 0x8c75, 0x8c99, 0x8c98,
1667 0x8c97, 0x8cfe, 0x8d04, 0x8d02, 0x8d00, 0x8e5c, 0x8e62, 0x8e60,
1668 0x8e57, 0x8e56, 0x8e5e, 0x8e65, 0x8e67,
1669 /* 0xf1 */
1670 0x8e5b, 0x8e5a, 0x8e61, 0x8e5d, 0x8e69, 0x8e54, 0x8f46, 0x8f47,
1671 0x8f48, 0x8f4b, 0x9128, 0x913a, 0x913b, 0x913e, 0x91a8, 0x91a5,
1672 0x91a7, 0x91af, 0x91aa, 0x93b5, 0x938c, 0x9392, 0x93b7, 0x939b,
1673 0x939d, 0x9389, 0x93a7, 0x938e, 0x93aa, 0x939e, 0x93a6, 0x9395,
1674 0x9388, 0x9399, 0x939f, 0x938d, 0x93b1, 0x9391, 0x93b2, 0x93a4,
1675 0x93a8, 0x93b4, 0x93a3, 0x93a5, 0x95d2, 0x95d3, 0x95d1, 0x96b3,
1676 0x96d7, 0x96da, 0x5dc2, 0x96df, 0x96d8, 0x96dd, 0x9723, 0x9722,
1677 0x9725, 0x97ac, 0x97ae, 0x97a8, 0x97ab, 0x97a4, 0x97aa, 0x97a2,
1678 0x97a5, 0x97d7, 0x97d9, 0x97d6, 0x97d8, 0x97fa, 0x9850, 0x9851,
1679 0x9852, 0x98b8, 0x9941, 0x993c, 0x993a, 0x9a0f, 0x9a0b, 0x9a09,
1680 0x9a0d, 0x9a04, 0x9a11, 0x9a0a, 0x9a05, 0x9a07, 0x9a06, 0x9ac0,
1681 0x9adc, 0x9b08, 0x9b04, 0x9b05, 0x9b29, 0x9b35, 0x9b4a, 0x9b4c,
1682 0x9b4b, 0x9b37, 0x9b36, 0x9b33, 0x9bbf, 0x9bc1, 0x9bb5, 0x9bb8,
1683 0x9bd3, 0x9bb6, 0x9bc4, 0x9bb9, 0x9bbd, 0x9d5c, 0x9d53, 0x9d4f,
1684 0x9d4a, 0x9d5b, 0x9d4b, 0x9d59, 0x9d56, 0x9d4c, 0x9d57, 0x9d52,
1685 0x9d54, 0x9d5f, 0x9d58, 0x9d5a, 0x9e8e, 0x9e8c, 0x9edf, 0x9f01,
1686 0x9f00, 0x9f16, 0x9f25, 0x9f2b, 0x9f2a, 0x9f29, 0x9f28, 0x9f4c,
1687 0x9f55, 0x5134, 0x5135, 0x5296, 0x52f7, 0x53b4, 0x56ab, 0x56ad,
1688 0x56a6, 0x56a7, 0x56aa, 0x56ac, 0x58da, 0x58dd, 0x58db, 0x5912,
1689 0x5b3d, 0x5b3e, 0x5b3f, 0x5dc3, 0x5e70,
1690 /* 0xf2 */
1691 0x5fbf, 0x61fb, 0x6507, 0x6510, 0x650d, 0x6509, 0x650c, 0x650e,
1692 0x6584, 0x65de, 0x65dd, 0x66de, 0x6ae7, 0x6ae0, 0x6acc, 0x6ad1,
1693 0x6ad9, 0x6acb, 0x6adf, 0x6adc, 0x6ad0, 0x6aeb, 0x6acf, 0x6acd,
1694 0x6ade, 0x6b60, 0x6bb0, 0x6c0c, 0x7019, 0x7027, 0x7020, 0x7016,
1695 0x702b, 0x7021, 0x7022, 0x7023, 0x7029, 0x7017, 0x7024, 0x701c,
1696 0x702a, 0x702c, 0x720a, 0x720b, 0x7207, 0x7202, 0x7205, 0x72a5, 0x72a6,
1697 0x72a4, 0x72a3, 0x72a1, 0x74cb, 0x74c5, 0x74b7, 0x74c3, 0x7516,
1698 0x7660, 0x77c9, 0x77ca, 0x77c4, 0x77f1, 0x791d, 0x791b, 0x7921,
1699 0x791c, 0x7917, 0x791e, 0x79b0, 0x7a67, 0x7a68, 0x7c33, 0x7c3c,
1700 0x7c39, 0x7c2c, 0x7c3b, 0x7cec, 0x7cea, 0x7e76, 0x7e75, 0x7e78,
1701 0x7e70, 0x7e77, 0x7e6f, 0x7e7a, 0x7e72, 0x7e74, 0x7e68, 0x7f4b,
1702 0x7f4a, 0x7f83, 0x7f86, 0x7fb7, 0x7ffd, 0x7ffe, 0x8078, 0x81d7,
1703 0x81d5, 0x8264, 0x8261, 0x8263, 0x85eb, 0x85f1, 0x85ed, 0x85d9,
1704 0x85e1, 0x85e8, 0x85da, 0x85d7, 0x85ec, 0x85f2, 0x85f8, 0x85d8,
1705 0x85df, 0x85e3, 0x85dc, 0x85d1, 0x85f0, 0x85e6, 0x85ef, 0x85de,
1706 0x85e2, 0x8800, 0x87fa, 0x8803, 0x87f6, 0x87f7, 0x8809, 0x880c,
1707 0x880b, 0x8806, 0x87fc, 0x8808, 0x87ff, 0x880a, 0x8802, 0x8962,
1708 0x895a, 0x895b, 0x8957, 0x8961, 0x895c, 0x8958, 0x895d, 0x8959,
1709 0x8988, 0x89b7, 0x89b6, 0x89f6, 0x8b50, 0x8b48, 0x8b4a, 0x8b40,
1710 0x8b53, 0x8b56, 0x8b54, 0x8b4b, 0x8b55,
1711 /* 0xf3 */
1712 0x8b51, 0x8b42, 0x8b52, 0x8b57, 0x8c43, 0x8c77, 0x8c76, 0x8c9a,
1713 0x8d06, 0x8d07, 0x8d09, 0x8dac, 0x8daa, 0x8dad, 0x8dab, 0x8e6d,
1714 0x8e78, 0x8e73, 0x8e6a, 0x8e6f, 0x8e7b, 0x8ec2, 0x8f52, 0x8f51,
1715 0x8f4f, 0x8f50, 0x8f53, 0x8fb4, 0x9140, 0x913f, 0x91b0, 0x91ad,
1716 0x93de, 0x93c7, 0x93cf, 0x93c2, 0x93da, 0x93d0, 0x93f9, 0x93ec,
1717 0x93cc, 0x93d9, 0x93a9, 0x93e6, 0x93ca, 0x93d4, 0x93ee, 0x93e3,
1718 0x93d5, 0x93c4, 0x93ce, 0x93c0, 0x93d2, 0x93e7, 0x957d, 0x95da,
1719 0x95db, 0x96e1, 0x9729, 0x972b, 0x972c, 0x9728, 0x9726, 0x97b3,
1720 0x97b7, 0x97b6, 0x97dd, 0x97de, 0x97df, 0x985c, 0x9859, 0x985d,
1721 0x9857, 0x98bf, 0x98bd, 0x98bb, 0x98be, 0x9948, 0x9947, 0x9943,
1722 0x99a6, 0x99a7, 0x9a1a, 0x9a15, 0x9a25, 0x9a1d, 0x9a24, 0x9a1b,
1723 0x9a22, 0x9a20, 0x9a27, 0x9a23, 0x9a1e, 0x9a1c, 0x9a14, 0x9ac2,
1724 0x9b0b, 0x9b0a, 0x9b0e, 0x9b0c, 0x9b37, 0x9bea, 0x9beb, 0x9be0,
1725 0x9bde, 0x9be4, 0x9be6, 0x9be5, 0x9bf0, 0x9bd4, 0x9bd7, 0x9bec,
1726 0x9bdc, 0x9bd9, 0x9be5, 0x9be2, 0x9be1, 0x9bda, 0x9d77, 0x9d81,
1727 0x9d8a, 0x9d84, 0x9d88, 0x9d71, 0x9d80, 0x9d78, 0x9d86, 0x9d8b,
1728 0x9d8c, 0x9d7d, 0x9d6b, 0x9d74, 0x9d75, 0x9d70, 0x9d69, 0x9d85,
1729 0x9d73, 0x9d7b, 0x9d82, 0x9d6f, 0x9d79, 0x9d7f, 0x9d87, 0x9d68,
1730 0x9e94, 0x9e91, 0x9ec0, 0x9efc, 0x9f2d, 0x9f40, 0x9f41, 0x9f4d,
1731 0x9f56, 0x9f57, 0x9f58, 0x5337, 0x56b2,
1732 /* 0xf4 */
1733 0x56b5, 0x56b3, 0x58e3, 0x5b45, 0x5dc6, 0x5dc7, 0x5eee, 0x5eef,
1734 0x5fc0, 0x5fc1, 0x61f9, 0x6517, 0x6516, 0x6515, 0x6513, 0x65df,
1735 0x66e8, 0x66e3, 0x66e4, 0x6af3, 0x6af0, 0x6aea, 0x6ae8, 0x6af9,
1736 0x6af1, 0x6aee, 0x6aef, 0x703c, 0x7035, 0x702f, 0x7037, 0x7034,
1737 0x7031, 0x7042, 0x7038, 0x703f, 0x703a, 0x7039, 0x7040, 0x703b,
1738 0x7033, 0x7041, 0x7213, 0x7214, 0x72a8, 0x737d, 0x737c, 0x74ba,
1739 0x76ab, 0x76aa, 0x76be, 0x76ed, 0x77ce, 0x77cf, 0x77cd,
1740 0x77f2, 0x7925, 0x7923, 0x7927, 0x7928, 0x7924, 0x7929, 0x79b2,
1741 0x7a6e, 0x7a6c, 0x7a6d, 0x7af7, 0x7c49, 0x7c48, 0x7c4a, 0x7c47,
1742 0x7c45, 0x7cee, 0x7e7b, 0x7e7e, 0x7e81, 0x7e80, 0x7eba, 0x7fff,
1743 0x8079, 0x81db, 0x81d9, 0x820b, 0x8268, 0x8269, 0x8622, 0x85ff,
1744 0x8601, 0x85fe, 0x861b, 0x8600, 0x85f6, 0x8604, 0x8609, 0x8605,
1745 0x860c, 0x85fd, 0x8819, 0x8810, 0x8811, 0x8817, 0x8813, 0x8816,
1746 0x8963, 0x8966, 0x89b9, 0x89f7, 0x8b60, 0x8b6a, 0x8b5d, 0x8b68,
1747 0x8b63, 0x8b65, 0x8b67, 0x8b6d, 0x8dae, 0x8e86, 0x8e88, 0x8e84,
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1748 0x8f59, 0x8f56, 0x8f57, 0x8f55, 0x8f58, 0x8f5a, 0x908d, 0x9143,
1749 0x9141, 0x91b7, 0x91b5, 0x91b2, 0x91b3, 0x940b, 0x9413, 0x93fb,
1750 0x9420, 0x940f, 0x9414, 0x93fe, 0x9415, 0x9410, 0x9428, 0x9419,
1751 0x940d, 0x93f5, 0x9400, 0x93f7, 0x9407, 0x940e, 0x9416, 0x9412,
1752 0x93fa, 0x9409, 0x93f8, 0x940a, 0x93ff,
1753 /* 0xf5 */
1754 0x93fc, 0x940c, 0x93f6, 0x9411, 0x9406, 0x95de, 0x95e0, 0x95df,
1755 0x972e, 0x972f, 0x97b9, 0x97bb, 0x97fd, 0x97fe, 0x9860, 0x9862,
1756 0x9863, 0x985f, 0x98c1, 0x98c2, 0x9950, 0x994e, 0x9959, 0x994c,
1757 0x994b, 0x9953, 0x9a32, 0x9a34, 0x9a31, 0x9a2c, 0x9a2a, 0x9a36,
1758 0x9a29, 0x9a2e, 0x9a38, 0x9a2d, 0x9ac7, 0x9aca, 0x9ac6, 0x9b10,
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1760 0x9c40, 0x9c07, 0x9c0e, 0x9c06, 0x9c17, 0x9c14, 0x9c09, 0x9d9f,
1761 0x9d99, 0x9da4, 0x9d9d, 0x9d92, 0x9d98, 0x9d90, 0x9d9b, 0x9da0,
1762 0x9d94, 0x9d9c, 0x9daa, 0x9d97, 0x9da1, 0x9da9, 0x9da2, 0x9da8,
1763 0x9d9e, 0x9da3, 0x9dbf, 0x9da9, 0x9d96, 0x9da6, 0x9da7, 0x9e99,
1764 0x9e9b, 0x9e9a, 0x9ee5, 0x9ee4, 0x9ee7, 0x9ee6, 0x9f30, 0x9f2e,
1765 0x9f5b, 0x9f60, 0x9f5e, 0x9f5d, 0x9f59, 0x9f91, 0x513a, 0x5139,
1766 0x5298, 0x5297, 0x56c3, 0x56bd, 0x56be, 0x5b48, 0x5b47, 0x5dcb,
1767 0x5dcf, 0x5ef1, 0x61fd, 0x651b, 0x6b02, 0x6afc, 0x6b03, 0x6af8,
1768 0x6b00, 0x7043, 0x7044, 0x704a, 0x7048, 0x7049, 0x7045, 0x7046,
1769 0x721d, 0x721a, 0x7219, 0x737e, 0x7517, 0x766a, 0x77d0, 0x792d,
1770 0x7931, 0x792f, 0x7c54, 0x7c53, 0x7cf2, 0x7e8a, 0x7e87, 0x7e88,
1771 0x7e8b, 0x7e86, 0x7e8d, 0x7f4d, 0x7fbb, 0x8030, 0x81dd, 0x8618,
1772 0x862a, 0x8626, 0x861f, 0x8623, 0x861c, 0x8619, 0x8627, 0x862e,
1773 0x8621, 0x8620, 0x8629, 0x861e, 0x8625,
1774 /* 0xf6 */
1775 0x8829, 0x881d, 0x881b, 0x8820, 0x8824, 0x881c, 0x882b, 0x884a,
1776 0x896d, 0x8969, 0x896e, 0x896b, 0x89fa, 0x8b79, 0x8b78, 0x8b45,
1777 0x8b7a, 0x8b7b, 0x8d10, 0x8d14, 0x8daf, 0x8e8e, 0x8e8c, 0x8f5e,
1778 0x8f5b, 0x8f5d, 0x9146, 0x9144, 0x9145, 0x91b9, 0x943f, 0x943b,
1779 0x9436, 0x9429, 0x943d, 0x943c, 0x9430, 0x9439, 0x942a, 0x9437,
1780 0x942c, 0x9440, 0x9431, 0x95e5, 0x95e4, 0x95e3, 0x9735, 0x973a,
1781 0x97bf, 0x97e1, 0x9864, 0x98c9, 0x98c6, 0x98c0, 0x9958, 0x9956,
1782 0x9a39, 0x9a3d, 0x9a46, 0x9a44, 0x9a42, 0x9a41, 0x9a3a, 0x9a3f,
1783 0x9acd, 0x9b15, 0x9b17, 0x9b18, 0x9b16, 0x9b3a, 0x9b52, 0x9c2b,
1784 0x9c1d, 0x9c1c, 0x9c2c, 0x9c23, 0x9c28, 0x9c29, 0x9c24, 0x9c21,
1785 0x9db7, 0x9db6, 0x9dbc, 0x9dc1, 0x9dc7, 0x9dca, 0x9dcf, 0x9dbe,
1786 0x9dc5, 0x9dc3, 0x9ddb, 0x9db5, 0x9dce, 0x9db9, 0x9dba, 0x9dac,
1787 0x9dc8, 0x9db1, 0x9dad, 0x9dcc, 0x9db3, 0x9dcd, 0x9db2, 0x9e7a,
1788 0x9e9c, 0x9eeb, 0x9eee, 0x9eed, 0x9f1b, 0x9f18, 0x9f1a, 0x9f31,
1789 0x9f4e, 0x9f65, 0x9f64, 0x9f92, 0x4eb9, 0x56c6, 0x56c5, 0x56cb,
1790 0x5971, 0x5b4b, 0x5b4c, 0x5dd5, 0x5dd1, 0x5ef2, 0x6521, 0x6520,
1791 0x6526, 0x6522, 0x6b0b, 0x6b08, 0x6b09, 0x6c0d, 0x7055, 0x7056,
1792 0x7057, 0x7052, 0x721e, 0x721f, 0x72a9, 0x737f, 0x74d8, 0x74d5,
1793 0x74d9, 0x74d7, 0x766d, 0x76ad, 0x7935, 0x79b4, 0x7a70, 0x7a71,
1794 0x7c57, 0x7c5c, 0x7c59, 0x7c5b, 0x7c5a,
1795 /* 0xf7 */
1796 0x7cf4, 0x7cf1, 0x7e91, 0x7f4f, 0x7f87, 0x81de, 0x826b, 0x8634,
1797 0x8635, 0x8633, 0x862c, 0x8632, 0x8636, 0x882c, 0x8828, 0x8826,
1798 0x882a, 0x8825, 0x8971, 0x89bf, 0x89be, 0x89fb, 0x8b7e, 0x8b84,
1799 0x8b82, 0x8b86, 0x8b85, 0x8b7f, 0x8d15, 0x8e95, 0x8e94, 0x8e9a,
1800 0x8e92, 0x8e90, 0x8e96, 0x8e97, 0x8f60, 0x8f62, 0x9147, 0x944c,
1801 0x9450, 0x944a, 0x944b, 0x944f, 0x9447, 0x9445, 0x9448, 0x9449,
1802 0x9446, 0x973f, 0x97e3, 0x986a, 0x9869, 0x98cb, 0x9954, 0x995b,
1803 0x9a4e, 0x9a53, 0x9a54, 0x9a4c, 0x9a4f, 0x9a48, 0x9a4a, 0x9a49,
1804 0x9a52, 0x9a50, 0x9ad0, 0x9b19, 0x9b2b, 0x9b3b, 0x9b56, 0x9b55,
1805 0x9c46, 0x9c48, 0x9c3f, 0x9c44, 0x9c39, 0x9c33, 0x9c41, 0x9c3c,
1806 0x9c37, 0x9c34, 0x9c32, 0x9c3d, 0x9c36, 0x9ddb, 0x9dd2, 0x9dde,
1807 0x9dda, 0x9dcf, 0x9dd0, 0x9ddc, 0x9dd1, 0x9ddf, 0x9de9, 0x9dd9,
1808 0x9dd8, 0x9dd6, 0x9df5, 0x9dd5, 0x9ddd, 0x9eb6, 0x9ef0, 0x9f35,
1809 0x9f33, 0x9f32, 0x9f42, 0x9f6b, 0x9f95, 0x9fa2, 0x513d, 0x5299,
1810 0x58e8, 0x58e7, 0x5972, 0x5b4d, 0x5dd8, 0x882f, 0x5f4f, 0x6201,
1811 0x6203, 0x6204, 0x6529, 0x6525, 0x6596, 0x66eb, 0x6b11, 0x6b12,
1812 0x6b0f, 0x6bca, 0x705b, 0x705a, 0x7222, 0x7382, 0x7381, 0x7383,
1813 0x7670, 0x77d4, 0x7c67, 0x7c66, 0x7e95, 0x826c, 0x863a, 0x8640,
1814 0x8639, 0x863c, 0x8631, 0x863b, 0x863e, 0x8830, 0x8832, 0x882e,
1815 0x8833, 0x8976, 0x8974, 0x8973, 0x89fe,
1816 /* 0xf8 */
1817 0x8b8c, 0x8b8e, 0x8b8b, 0x8b88, 0x8c45, 0x8d19, 0x8e98, 0x8f64,
1818 0x8f63, 0x91bc, 0x9462, 0x9455, 0x945d, 0x9457, 0x945e, 0x97c4,
1819 0x97c5, 0x9800, 0x9a56, 0x9a59, 0x9b1e, 0x9b1f, 0x9b20, 0x9c52,
1820 0x9c58, 0x9c50, 0x9c4a, 0x9c4d, 0x9c4b, 0x9c55, 0x9c59, 0x9c4c,
1821 0x9c4e, 0x9dfb, 0x9df7, 0x9def, 0x9de3, 0x9deb, 0x9df8, 0x9de4,
1822 0x9df6, 0x9del, 0x9dee, 0x9de6, 0x9df2, 0x9df0, 0x9de2, 0x9dec,
1823 0x9df4, 0x9df3, 0x9de8, 0x9ded, 0x9ec2, 0x9ed0, 0x9ef2, 0x9ef3,
1824 0x9f06, 0x9f1c, 0x9f38, 0x9f37, 0x9f36, 0x9f43, 0x9f4f, 0x9f71,
1825 0x9f70, 0x9f6e, 0x9f6f, 0x56d3, 0x56cd, 0x5b4e, 0x5c6d, 0x652d,
1826 0x66ed, 0x66ee, 0x6b13, 0x705f, 0x7061, 0x705d, 0x7060, 0x7223,
1827 0x74db, 0x74e5, 0x77d5, 0x7938, 0x79b7, 0x79b6, 0x7c6a, 0x7e97,
1828 0x7f89, 0x826d, 0x8643, 0x8838, 0x8837, 0x8835, 0x884b, 0x8b94,
1829 0x8b95, 0x8e9e, 0x8e9f, 0x8ea0, 0x8e9d, 0x91be, 0x91bd, 0x91c2,
1830 0x946b, 0x9468, 0x9469, 0x96e5, 0x9746, 0x9743, 0x9747, 0x97c7,
1831 0x97e5, 0x9a5e, 0x9ad5, 0x9b59, 0x9c63, 0x9c67, 0x9c66, 0x9c62,
1832 0x9c5e, 0x9c60, 0x9e02, 0x9dfe, 0x9e07, 0x9e03, 0x9e06, 0x9e05,
1833 0x9e00, 0x9e01, 0x9e09, 0x9dff, 0x9dfd, 0x9e04, 0x9ea0, 0x9f1e,
1834 0x9f46, 0x9f74, 0x9f75, 0x9f76, 0x56d4, 0x652e, 0x65b8, 0x6b18,
```

```
1835 0x6b19, 0x6b17, 0x6b1a, 0x7062, 0x7226, 0x72aa, 0x77d8, 0x77d9,
1836 0x7939, 0x7c69, 0x7c6b, 0x7cf6, 0x7e9a,
1837 /* 0xf9 */
1838 0x7e98, 0x7e9b, 0x7e99, 0x81e0, 0x81e1, 0x8646, 0x8647, 0x8648,
1839 0x8979, 0x897a, 0x897c, 0x897b, 0x89ff, 0x8b98, 0x8b99, 0x8ea5,
1840 0x8ea4, 0x8ea3, 0x946e, 0x946e, 0x946d, 0x946f, 0x9471, 0x9473, 0x9749,
1841 0x9872, 0x995f, 0x9c68, 0x9c6e, 0x9c6d, 0x9e0b, 0x9e0d, 0x9e10,
1842 0x9e0f, 0x9e12, 0x9e11, 0x9ea1, 0x9ef5, 0x9f09, 0x9f47, 0x9f78,
1843 0x9f7b, 0x9f7a, 0x9f79, 0x571e, 0x7066, 0x7c6f, 0x883c, 0x8db2,
1844 0x8ea6, 0x91c3, 0x9474, 0x9478, 0x9476, 0x9475, 0x9a60, 0x9c74,
1845 0x9c73, 0x9c71, 0x9c75, 0x9e14, 0x9e13, 0x9ef6, 0x9f0a, 0x9fa4,
1846 0x7068, 0x7065, 0x7cf7, 0x866a, 0x883e, 0x883d, 0x883f, 0x8b9e,
1847 0x8c9c, 0x8ea9, 0x8ec9, 0x974b, 0x9873, 0x9874, 0x98cc, 0x9961,
1848 0x99ab, 0x9a64, 0x9a66, 0x9a67, 0x9b24, 0x9e15, 0x9e17, 0x9f48,
1849 0x6207, 0x6b1e, 0x7227, 0x864c, 0x8ea8, 0x9482, 0x9480, 0x9481,
1850 0x9a69, 0x9a68, 0x9b2e, 0x9e19, 0x7229, 0x864b, 0x8b9f, 0x9483,
1851 0x9c79, 0x9eb7, 0x7675, 0x9a6b, 0x9c7a, 0x9eid, 0x7069, 0x706a,
1852 0x9ea4, 0x9f7e, 0x9f49, 0x9f98,
1853 };
1854
1855 static int
1856 big5_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
1857 {
1858     unsigned char c1 = s[0];
1859     if ((c1 >= 0xa1 && c1 <= 0xc7) || (c1 >= 0xc9 && c1 <= 0xf9)) {
1860         if (n >= 2) {
1861             unsigned char c2 = s[1];
1862             if ((c2 >= 0x40 && c2 < 0x7f) || (c2 >= 0xa1 && c2 < 0xff)) {
1863                 unsigned int i = 157 * (c1 - 0xa1) + (c2 - (c2 >= 0xa1 ? 0x62 : 0x40));
1864                 unsigned short wc = 0xffff;
1865                 if (i < 6280) {
1866                     if (i < 6121)
1867                         wc = big5_2uni_pageal[i];
1868                     } else {
1869                         if (i < 13932)
1870                             wc = big5_2uni_pagec9[i-6280];
1871                     }
1872                     if (wc != 0xffff) {
1873                         *pwc = (ucs4_t) wc;
1874                         return 2;
1875                     }
1876                 }
1877                 return RET_ILSEQ;
1878             }
1879             return RET_TOOFEW(0);
1880         }
1881         return RET_ILSEQ;
1882     }
1883 #endif /* NEED_TOWC */
1884
1885 #ifdef NEED_TOMB
1886 static const unsigned short big5_2charset[13703] = {
1887     0xa246, 0xa247, 0xa244, 0xa1b1, 0xa258, 0xa1d3, 0xa150, 0xa1d1,
1888     0xa1d2, 0xa3be, 0xa3bc, 0xa3bd, 0xa3bf, 0xa3bb, 0xa344, 0xa345,
1889     0xa346, 0xa347, 0xa348, 0xa349, 0xa34a, 0xa34b, 0xa34c, 0xa34d,
1890     0xa34e, 0xa34f, 0xa350, 0xa351, 0xa352, 0xa353, 0xa354, 0xa355,
1891     0xa356, 0xa357, 0xa358, 0xa359, 0xa35a, 0xa35b, 0xa35c, 0xa35d,
1892     0xa35e, 0xa35f, 0xa360, 0xa361, 0xa362, 0xa363, 0xa364, 0xa365,
1893     0xa366, 0xa367, 0xa368, 0xa369, 0xa36a, 0xa36b, 0xa36c, 0xa36d,
1894     0xa36e, 0xa36f, 0xa370, 0xa371, 0xa372, 0xa373, 0xc7b3, 0xc7b1,
1895     0xc7b2, 0xc7b4, 0xc7b5, 0xc7b6, 0xc7b7, 0xc7b8, 0xc7b9, 0xc7ba,
1896     0xc7bb, 0xc7bc, 0xc7bd, 0xc7be, 0xc7bf, 0xc7c0, 0xc7c1, 0xc7c2,
1897     0xc7c3, 0xc7c4, 0xc7c5, 0xc7c6, 0xc7c7, 0xc7c8, 0xc7c9, 0xc7ca,
1898     0xc7cb, 0xc7cc, 0xc7cd, 0xc7cf, 0xc7d0, 0xc7d1, 0xc7d2, 0xc7d3,
1899     0xc7d4, 0xc7d5, 0xc7d6, 0xc7d7, 0xc7d8, 0xc7d9, 0xc7da, 0xc7db,
1900     0xc7dc, 0xc7dd, 0xc7de, 0xc7df, 0xc7e0, 0xc7e1, 0xc7e2, 0xc7e3,
1901     0xc7e4, 0xc7e5, 0xc7e6, 0xc7e7, 0xc7e8, 0xc7e9, 0xa156, 0xa158,
1902     0xa1a5, 0xa1a6, 0xa1a7, 0xa1a8, 0xa1a9, 0xa145, 0xa14c, 0xa14b, 0xa1ac,
1903     0xa1ab, 0xa1b0, 0xa1c2, 0xa24a, 0xa1c1, 0xa24b, 0xa2b9, 0xa2ba,
1904     0xa2bb, 0xa2bc, 0xa2bd, 0xa2be, 0xa2bf, 0xa2c0, 0xa2c1, 0xa2c2,
1905     0xa1f6, 0xa1f4, 0xa1f7, 0xa1f5, 0xa1f8, 0xa1f9, 0xa1fb, 0xa1fa,
1906     0xa1d4, 0xa1db, 0xa1e8, 0xa1e7, 0xa1fd, 0xa1fc, 0xa1e4, 0xa1e5,
1907     0xa1ec, 0xa1ed, 0xa1ef, 0xa1ee, 0xa1e3, 0xa1dc, 0xa1da, 0xa1dd,
1908     0xa1d8, 0xa1d9, 0xa1e6, 0xa1e9, 0xc7e9, 0xc7ea, 0xc7eb, 0xc7ec,
1909     0xc7ed, 0xc7ee, 0xc7ef, 0xc7f0, 0xc7f1, 0xc7f2, 0xc7f3, 0xc7f4,
1910     0xc7f5, 0xc7f6, 0xc7f7, 0xc7f8, 0xc7f9, 0xc7fa, 0xc7fb, 0xc7fc,
1911     0xa277, 0xa278, 0xa27a, 0xa27b, 0xa27c, 0xa27d, 0xa275, 0xa274,
1912     0xa273, 0xa272, 0xa271, 0xa2a4, 0xa2a5, 0xa2a7, 0xa2a6, 0xa27e,
1913     0xa2a1, 0xa2a3, 0xa2a2, 0xa2ac, 0xa2ad, 0xa2ae, 0xa262, 0xa263,
1914     0xa264, 0xa265, 0xa266, 0xa267, 0xa268, 0xa269, 0xa270, 0xa26f,
1915     0xa26e, 0xa26d, 0xa26c, 0xa26b, 0xa26a, 0xa276, 0xa279, 0xa1bd,
1916     0xa1bc, 0xa1b6, 0xa1b5, 0xa1bf, 0xa1be, 0xa1bb, 0xa1ba, 0xa1b3,
1917     0xa1b7, 0xa1b4, 0xa2a8, 0xa2a9, 0xa2ab, 0xa2aa, 0xa1b9, 0xa1b8,
1918     0xa1f3, 0xa1f0, 0xa1f2, 0xa1f1, 0xa140, 0xa142, 0xa143, 0xa1b2,
1919     0xc6a4, 0xa171, 0xa172, 0xa16d, 0xa16e, 0xa175, 0xa176, 0xa179,
1920     0xa17a, 0xa169, 0xa16a, 0xa245, 0xa165, 0xa166, 0xa1a9, 0xa1aa,
1921     0xa2c3, 0xa2c4, 0xa2c5, 0xa2c6, 0xa2c7, 0xa2c8, 0xa2c9, 0xa2ca,
```

1922 0xa2cb, 0xc6a5, 0xc6a6, 0xc6a7, 0xc6a8, 0xc6a9, 0xc6aa, 0xc6ab,  
1923 0xc6ac, 0xc6ad, 0xc6ae, 0xc6af, 0xc6b0, 0xc6b1, 0xc6b2, 0xc6b3,  
1924 0xc6b4, 0xc6b5, 0xc6b6, 0xc6b7, 0xc6b8, 0xc6b9, 0xc6ba, 0xc6bb,  
1925 0xc6bc, 0xc6bd, 0xc6be, 0xc6bf, 0xc6c0, 0xc6c1, 0xc6c2, 0xc6c3,  
1926 0xc6c4, 0xc6c5, 0xc6c6, 0xc6c7, 0xc6c8, 0xc6c9, 0xc6ca, 0xc6cb,  
1927 0xc6cc, 0xc6cd, 0xc6ce, 0xc6cf, 0xc6d0, 0xc6d1, 0xc6d2, 0xc6d3,  
1928 0xc6d4, 0xc6d5, 0xc6d6, 0xc6d7, 0xc6d8, 0xc6d9, 0xc6da, 0xc6db,  
1929 0xc6dc, 0xc6dd, 0xc6de, 0xc6df, 0xc6e0, 0xc6e1, 0xc6e2, 0xc6e3,  
1930 0xc6e4, 0xc6e5, 0xc6e6, 0xc6e7, 0xc6e8, 0xc6e9, 0xc6ea, 0xc6eb,  
1931 0xc6ec, 0xc6ed, 0xc6ee, 0xc6ef, 0xc6f0, 0xc6f1, 0xc6f2, 0xc6f3,  
1932 0xc6f4, 0xc6f5, 0xc6f6, 0xc6f7, 0xc6fa, 0xc6fb, 0xc6fc, 0xc6fd,  
1933 0xc6fa, 0xc6fb, 0xc6fc, 0xc6fd, 0xc6fe, 0xc740, 0xc741, 0xc742,  
1934 0xc743, 0xc744, 0xc745, 0xc746, 0xc747, 0xc748, 0xc749, 0xc74a,  
1935 0xc74b, 0xc74c, 0xc74d, 0xc74e, 0xc74f, 0xc750, 0xc751, 0xc752,  
1936 0xc753, 0xc754, 0xc755, 0xc756, 0xc757, 0xc758, 0xc759, 0xc75a,  
1937 0xc75b, 0xc75c, 0xc75d, 0xc75e, 0xc75f, 0xc760, 0xc761, 0xc762,  
1938 0xc763, 0xc764, 0xc765, 0xc766, 0xc767, 0xc768, 0xc769, 0xc76a,  
1939 0xc76b, 0xc76c, 0xc76d, 0xc76e, 0xc76f, 0xc770, 0xc771, 0xc772,  
1940 0xc773, 0xc774, 0xc775, 0xc776, 0xc777, 0xc778, 0xc779, 0xc77a,  
1941 0xc77b, 0xc77c, 0xc77d, 0xc77e, 0xc7a1, 0xc7a2, 0xc7a3, 0xc7a4,  
1942 0xc7a5, 0xc7a6, 0xc7a7, 0xc7a8, 0xc7a9, 0xc7aa, 0xc7ab, 0xc7ac,  
1943 0xc7ad, 0xc7ae, 0xc7af, 0xc7b0, 0xc6a1, 0xa374, 0xa375, 0xa376,  
1944 0xa377, 0xa378, 0xa379, 0xa37a, 0xa37b, 0xa37c, 0xa37d, 0xa37e,  
1945 0xa3a1, 0xa3a2, 0xa3a3, 0xa3a4, 0xa3a5, 0xa3a6, 0xa3a7, 0xa3a8,  
1946 0xa3a9, 0xa3aa, 0xa3ab, 0xa3ac, 0xa3ad, 0xa3ae, 0xa3af, 0xa3b0,  
1947 0xa3b1, 0xa3b2, 0xa3b3, 0xa3b4, 0xa3b5, 0xa3b6, 0xa3b7, 0xa3b8,  
1948 0xa3b9, 0xa3ba, 0xa1c0, 0xa255, 0xa256, 0xa250, 0xa251, 0xa252,  
1949 0xa254, 0xa257, 0xa253, 0xa1eb, 0xa1ea, 0xa24f, 0xa440, 0xa442,  
1950 0xa443, 0xc945, 0xa456, 0xa454, 0xa457, 0xa455, 0xc946, 0xa4a3,  
1951 0xc94f, 0xc94d, 0xa4a2, 0xa4a1, 0xa542, 0xa541, 0xa540, 0xa543,  
1952 0xa4fe, 0xa5e0, 0xa5e1, 0xa8c3, 0xa458, 0xa4a4, 0xc950, 0xa4a5,  
1953 0xc963, 0xa6ea, 0xcbb1, 0xa459, 0xa4a6, 0xa544, 0xc964, 0xc940,  
1954 0xa444, 0xa45b, 0xc947, 0xa45c, 0xa4a7, 0xa545, 0xa547, 0xa546,  
1955 0xa5e2, 0xa5e3, 0xa8c4, 0xadbc, 0xa441, 0xc941, 0xa445, 0xa45e,  
1956 0xa45d, 0xa5e4, 0xa8c5, 0xb0ae, 0xd44b, 0xb6c3, 0xdcbb1, 0xdcbb2,  
1957 0xa446, 0xa4a9, 0xa8c6, 0xa447, 0xc948, 0xa45f, 0xa4aa, 0xa4ac,  
1958 0xc951, 0xa4ad, 0xa4ab, 0xa5e5, 0xa8c7, 0xa8c8, 0xab45, 0xa460,  
1959 0xa4ae, 0xa5e6, 0xa5e8, 0xa5e7, 0xa6eb, 0xa8c9, 0xa8ca, 0xab46,  
1960 0xab47, 0xadbb, 0xdcbb3, 0xf6d6, 0xa448, 0xa4b0, 0xa4af, 0xc952,  
1961 0xa4b1, 0xa4b7, 0xa4b2, 0xa4b3, 0xc954, 0xc953, 0xa4b5, 0xa4b6,  
1962 0xa4b4, 0xa54a, 0xa54b, 0xa54c, 0xa54d, 0xa549, 0xa550, 0xc96a,  
1963 0xc966, 0xc969, 0xa551, 0xa561, 0xc968, 0xa54e, 0xa54f, 0xa548,  
1964 0xc965, 0xc967, 0xa5f5, 0xc9b0, 0xa5f2, 0xa5f6, 0xc9ba, 0xc9ae,  
1965 0xa5f3, 0xc9b2, 0xa5f4, 0xa5f7, 0xa5e9, 0xc9b1, 0xa5f8, 0xc9b5,  
1966 0xc9b9, 0xc9b6, 0xc9b3, 0xa5ea, 0xa5ec, 0xa5f9, 0xa5ee, 0xc9ab,  
1967 0xa5f1, 0xa5ef, 0xa5f0, 0xc9bb, 0xc9b8, 0xc9af, 0xa5ed, 0xc9ac,  
1968 0xa5eb, 0xc9b4, 0xc9b7, 0xc9ad, 0xca66, 0xa742, 0xa6f4, 0xca67,  
1969 0xa6f1, 0xa744, 0xa6f9, 0xa6f8, 0xca5b, 0xa6fc, 0xa6f7, 0xca60,  
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3555 0xf8e5, 0xf8e2, 0xf8e3, 0xf8dc, 0xf8df, 0xf8e7, 0xf8e1, 0xf8e0,  
3556 0xf8de, 0xf8e4, 0xf95d, 0xf95e, 0xf960, 0xf95f, 0xf962, 0xf961,  
3557 0xf97c, 0xf97b, 0xf9b7, 0xf9b8, 0xf9c5, 0xc678, 0xc67c, 0xf9cf,  
3558 0xc67d, 0xb3bf, 0xc4d0, 0xf6c9, 0xc650, 0xc651, 0xb3c0, 0xe0ee,  
3559 0xb9a8, 0xe8f0, 0xecb0, 0xecb1, 0xecaf, 0xefab, 0xefaa, 0xc247,  
3560 0xf1df, 0xefac, 0xf1de, 0xf3f3, 0xc451, 0xc453, 0xf3f2, 0xc452,  
3561 0xf5b1, 0xf5b3, 0xf5b2, 0xf6ca, 0xc565, 0xc5ef, 0xf8e8, 0xf963,  
3562 0xf9d2, 0xb3c1, 0xe4e5, 0xbea2, 0xecb3, 0xecb2, 0xefad, 0xc454,  
3563 0xc4d1, 0xf7c7, 0xf9cb, 0xb3c2, 0xbbf2, 0xbea3, 0xf3f4, 0xf874,  
3564 0xb6c0, 0xefae, 0xc664, 0xb6c1, 0xbea4, 0xc248, 0xf875, 0xb6c2,  
3565 0xe8f1, 0xc072, 0xecb4, 0xecb5, 0xc071, 0xefaf, 0xc24c, 0xc24a,  
3566 0xc24b, 0xc249, 0xf1e0, 0xc35c, 0xf5b5, 0xf5b4, 0xf5b7, 0xf5b6,  
3567 0xc4d2, 0xf6cb, 0xf6cd, 0xf6cc, 0xc566, 0xf7c8, 0xf876, 0xf877,  
3568 0xc5f0, 0xf964, 0xf97d, 0xc675, 0xdcdb, 0xecb6, 0xefb0, 0xf3f5,  
3569 0xe0ef, 0xefb1, 0xf1e2, 0xf1e1, 0xf878, 0xc652, 0xf965, 0xf97e,  
3570 0xb9a9, 0xe8f2, 0xe8f3, 0xecb7, 0xb9aa, 0xc35d, 0xf1e3, 0xf6cf,  
3571 0xc567, 0xf6d0, 0xf6ce, 0xf879, 0xf8e9, 0xb9ab, 0xefb4, 0xefb3,  
3572 0xefb2, 0xf1e4, 0xf1e8, 0xf1e7, 0xf1e6, 0xf1e5, 0xc35e, 0xf3f6,  
3573 0xf5b9, 0xc4d3, 0xf5b8, 0xf6d1, 0xf7cb, 0xf7ca, 0xc5c4, 0xf7c9,  
3574 0xf87c, 0xf87b, 0xf87a, 0xbbf3, 0xecb8, 0xc24d, 0xf3f7, 0xf3f8,

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3577 0xf3fb, 0xf3fc, 0xf5be, 0xf5ba, 0xc568, 0xf5bd, 0xf5bc, 0xc4d4,
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3579 0xf7cd, 0xc5c5, 0xf8a3, 0xf8a4, 0xf8a2, 0xf8a1, 0xc654, 0xf8eb,
3580 0xf8ec, 0xf8ed, 0xc653, 0xf967, 0xf96a, 0xf969, 0xf968, 0xf9d3,
3581 0xc073, 0xc365, 0xf5bf, 0xf6d5, 0xc5c7, 0xf7ce, 0xf9d5, 0xc074,
3582 0xefb6, 0xf7cf, 0xf9a1, 0xc94a, 0xddfc, 0xa14a, 0xa157, 0xa159,
3583 0xa15b, 0xa15f, 0xa160, 0xa163, 0xa164, 0xa167, 0xa168, 0xa16b,
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3588 0xa1df, 0xa1e0, 0xa1e1, 0xa1e2, 0xa24c, 0xa24d, 0xa24e, 0xa149,
3589 0xa1ad, 0xa243, 0xa248, 0xa1ae, 0xa15d, 0xa15e, 0xa1af, 0xa1cf,
3590 0xa141, 0xa1d0, 0xa144, 0xa241, 0xa2af, 0xa2b0, 0xa2b1, 0xa2b2,
3591 0xa2b3, 0xa2b4, 0xa2b5, 0xa2b6, 0xa2b7, 0xa2b8, 0xa147, 0xa146,
3592 0xa1d5, 0xa1d7, 0xa1d6, 0xa148, 0xa249, 0xa2cf, 0xa2d0, 0xa2d1,
3593 0xa2d2, 0xa2d3, 0xa2d4, 0xa2d5, 0xa2d6, 0xa2d7, 0xa2d8, 0xa2d9,
3594 0xa2da, 0xa2db, 0xa2dc, 0xa2dd, 0xa2de, 0xa2df, 0xa2e0, 0xa2e1,
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3596 0xa1c4, 0xa2e9, 0xa2ea, 0xa2eb, 0xa2ec, 0xa2ed, 0xa2ee, 0xa2ef,
3597 0xa2f0, 0xa2f1, 0xa2f2, 0xa2f3, 0xa2f4, 0xa2f5, 0xa2f6, 0xa2f7,
3598 0xa2f8, 0xa2f9, 0xa2fa, 0xa2fb, 0xa2fc, 0xa2fd, 0xa2fe, 0xa340,
3599 0xa341, 0xa342, 0xa343, 0xa161, 0xa155, 0xa162, 0xa14e,
3600 };
3601
3602 static const Summary16 big5_uni2indx_page00[16] = {
3603     /* 0x0000 */
3604     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 },
3605     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 },
3606     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x00ac }, { 4, 0x0083 },
3607     { 7, 0x0000 }, { 7, 0x0080 }, { 8, 0x0000 }, { 8, 0x0080 },
3608 };
3609 static const Summary16 big5_uni2indx_page02[38] = {
3610     /* 0x0200 */
3611     { 9, 0x0000 }, { 9, 0x0000 }, { 9, 0x0000 }, { 9, 0x0000 },
3612     { 9, 0x0000 }, { 9, 0x0000 }, { 9, 0x0000 }, { 9, 0x0000 },
3613     { 9, 0x0000 }, { 9, 0x0000 }, { 9, 0x0000 }, { 9, 0x0000 },
3614     { 9, 0x0e80 }, { 13, 0x0200 }, { 14, 0x0000 }, { 14, 0x0000 },
3615     /* 0x0300 */
3616     { 14, 0x0000 }, { 14, 0x0000 }, { 14, 0x0000 }, { 14, 0x0000 },
3617     { 14, 0x0000 }, { 14, 0x0000 }, { 14, 0x0000 }, { 14, 0x0000 },
3618     { 14, 0x0000 }, { 14, 0xffff }, { 29, 0x03fb }, { 38, 0xffff },
3619     { 53, 0x03fb }, { 62, 0x0000 }, { 62, 0x0000 }, { 62, 0x0000 },
3620     /* 0x0400 */
3621     { 62, 0x0002 }, { 63, 0x1ff0 }, { 72, 0xffff }, { 85, 0xffff },
3622     { 101, 0xffff }, { 117, 0x0002 },
3623 };
3624 static const Summary16 big5_uni2indx_page20[44] = {
3625     /* 0x2000 */
3626     { 118, 0x0000 }, { 118, 0x3318 }, { 124, 0x0064 }, { 127, 0x4824 },
3627     { 131, 0x0000 }, { 131, 0x0000 }, { 131, 0x0000 }, { 131, 0x0000 },
3628     { 131, 0x0000 }, { 131, 0x0000 }, { 131, 0x0000 }, { 131, 0x0000 },
3629     { 131, 0x0000 }, { 131, 0x0000 }, { 131, 0x0000 }, { 131, 0x0000 },
3630     /* 0x2100 */
3631     { 131, 0x0228 }, { 134, 0x0000 }, { 134, 0x0000 }, { 134, 0x0000 },
3632     { 134, 0x0000 }, { 134, 0x0000 }, { 134, 0x03ff }, { 144, 0x0000 },
3633     { 144, 0x0000 }, { 144, 0x03cf }, { 152, 0x0000 }, { 152, 0x0000 },
3634     { 152, 0x0000 }, { 152, 0x0000 }, { 152, 0x0000 }, { 152, 0x0000 },
3635     /* 0x2200 */
3636     { 152, 0x0000 }, { 152, 0xc400 }, { 155, 0x4e29 }, { 162, 0x1030 },
3637     { 165, 0x0000 }, { 165, 0x0004 }, { 166, 0x00c3 }, { 170, 0x0000 },
3638     { 170, 0x0000 }, { 170, 0x0000 }, { 170, 0x0020 }, { 171, 0x8000 },
3639 };
3640 static const Summary16 big5_uni2indx_page24[37] = {
3641     /* 0x2400 */
3642     { 172, 0x0000 }, { 172, 0x0000 }, { 172, 0x0000 }, { 172, 0x0000 },
3643     { 172, 0x0000 }, { 172, 0x0000 }, { 172, 0x03ff }, { 182, 0x3ff0 },
3644     { 192, 0x0000 }, { 192, 0x0000 }, { 192, 0x0000 }, { 192, 0x0000 },
3645     { 192, 0x0000 }, { 192, 0x0000 }, { 192, 0x0000 }, { 192, 0x0000 },
3646     /* 0x2500 */
3647     { 192, 0x1005 }, { 195, 0x1111 }, { 199, 0x1010 }, { 201, 0x1010 },
3648     { 203, 0x0000 }, { 203, 0x4001 }, { 205, 0xe402 }, { 210, 0x000f },
3649     { 214, 0xffff }, { 229, 0x0030 }, { 231, 0x0003 }, { 233, 0x300c },
3650     { 237, 0xc8c0 }, { 242, 0x0000 }, { 242, 0x003c }, { 246, 0x0000 },
3651     /* 0x2600 */
3652     { 246, 0x0260 }, { 249, 0x0000 }, { 249, 0x0000 }, { 249, 0x0000 },
3653     { 249, 0x0007 },
3654 };
3655 static const Summary16 big5_uni2indx_page30[62] = {
3656     /* 0x3000 */
3657     { 252, 0xff2f }, { 265, 0x6037 }, { 272, 0x03fe }, { 281, 0x0000 },
3658     { 281, 0xffff }, { 296, 0xffff }, { 312, 0xffff }, { 328, 0xffff },
3659     { 344, 0xffff }, { 360, 0x600f }, { 366, 0xffff }, { 381, 0xffff },
3660     { 397, 0xffff }, { 413, 0xffff }, { 429, 0xffff }, { 445, 0x407f },
3661     /* 0x3100 */

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3662 { 453, 0xffe0 }, { 464, 0xffff }, { 480, 0x03ff }, { 490, 0x0000 },
3663 { 490, 0x0000 }, { 490, 0x0000 }, { 490, 0x0000 }, { 490, 0x0000 },
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3668 { 490, 0x0000 }, { 490, 0x0000 }, { 490, 0x0000 }, { 490, 0x0000 },
3669 { 490, 0x0000 }, { 490, 0x0000 }, { 490, 0x0008 }, { 491, 0x0000 },
3670 { 491, 0x0000 }, { 491, 0x0000 }, { 491, 0x0000 }, { 491, 0x0000 },
3671 /* 0x3300 */
3672 { 491, 0x0000 }, { 491, 0x0000 }, { 491, 0x0000 }, { 491, 0x0000 },
3673 { 491, 0x0000 }, { 491, 0x0000 }, { 491, 0x0000 }, { 491, 0x0000 },
3674 { 491, 0xc000 }, { 493, 0x7000 }, { 496, 0x0002 }, { 497, 0x0000 },
3675 { 497, 0x4010 }, { 499, 0x0026 },
3676 };
3677 static const Summary16 big5_uni2indx_page4e[1307] = {
3678 /* 0x4e00 */
3679 { 502, 0xff8b }, { 514, 0xc373 }, { 523, 0x6840 }, { 527, 0x1b0f },
3680 { 535, 0xe9ac }, { 544, 0xf34c }, { 553, 0x0200 }, { 554, 0xc008 },
3681 { 557, 0x795c }, { 566, 0xca3e }, { 575, 0x7976 }, { 585, 0x0648 },
3682 { 589, 0x2fdf }, { 601, 0xf7f0 }, { 612, 0x033a }, { 618, 0xa8ff },
3683 /* 0x4f00 */
3684 { 629, 0xef37 }, { 641, 0x233f }, { 650, 0xb004 }, { 654, 0xfd59 },
3685 { 665, 0xf3ca }, { 675, 0xffff }, { 691, 0xde9f }, { 703, 0xffff9 },
3686 { 717, 0xabff }, { 730, 0x7df7 }, { 743, 0xc000 }, { 745, 0x8eec },
3687 { 754, 0xeebf }, { 767, 0xffdb }, { 781, 0xd003 }, { 786, 0x45fa },
3688 /* 0x5000 */
3689 { 795, 0xfae1 }, { 805, 0xdffe }, { 819, 0xbfef }, { 833, 0x10ab },
3690 { 839, 0xffeb }, { 853, 0xfcaa }, { 863, 0xef3f }, { 876, 0x24fd },
3691 { 885, 0x78ad }, { 894, 0x7f76 }, { 906, 0xf00c }, { 912, 0xedff },
3692 { 926, 0xcff6 }, { 938, 0x2cfa }, { 947, 0xf7f9 }, { 960, 0xeb6b },
3693 /* 0x5100 */
3694 { 971, 0x1ffd }, { 983, 0x95bf }, { 994, 0x6677 }, { 1004, 0xbfbf },
3695 { 1018, 0x3bfb }, { 1030, 0xfeb4 }, { 1041, 0x7bae }, { 1052, 0x11e2 },
3696 { 1058, 0xa681 }, { 1064, 0x41be }, { 1072, 0x1435 }, { 1078, 0x72c3 },
3697 { 1086, 0x7d70 }, { 1095, 0x7191 }, { 1102, 0x0003 }, { 1104, 0x276b },
3698 /* 0x5200 */
3699 { 1113, 0x57cb }, { 1123, 0x70cf }, { 1132, 0x4732 }, { 1139, 0x0def },
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3702 { 1221, 0x228f }, { 1228, 0xebec }, { 1239, 0x8a5c }, { 1246, 0xddbb },
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3707 { 1356, 0x2f08 }, { 1362, 0x88d0 }, { 1367, 0xff7e }, { 1381, 0x192f },
3708 /* 0x5400 */
3709 { 1389, 0xffda }, { 1402, 0xfb07 }, { 1412, 0x7ff1 }, { 1424, 0x7beb },
3710 { 1436, 0xc5ef }, { 1447, 0x0010 }, { 1448, 0x99ff }, { 1460, 0xfdf9 },
3711 { 1475, 0x79d7 }, { 1486, 0x0567 }, { 1493, 0xffe7 }, { 1507, 0xfdc9 },
3712 { 1519, 0xc3ff }, { 1531, 0x4040 }, { 1533, 0x6ff7 }, { 1546, 0xbd8e },
3713 /* 0x5500 */
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3715 { 1595, 0xed7b }, { 1607, 0xd0e7 }, { 1616, 0x047e }, { 1623, 0xf8e0 },
3716 { 1631, 0xff9f }, { 1645, 0xb73e }, { 1656, 0x7dfe }, { 1669, 0x882e },
3717 { 1675, 0xffffd }, { 1690, 0xbe7f }, { 1703, 0x83fe }, { 1713, 0xf6c4 },
3718 /* 0x5600 */
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3720 { 1763, 0x5767 }, { 1773, 0x4788 }, { 1779, 0xff7d }, { 1793, 0xc3df },
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3722 { 1843, 0x3f6f }, { 1855, 0xec9a }, { 1864, 0x4cb3 }, { 1872, 0x8681 },
3723 /* 0x5700 */
3724 { 1877, 0x3f9e }, { 1888, 0xdd5c }, { 1898, 0xf70d }, { 1908, 0x4819 },
3725 { 1913, 0xfea3 }, { 1924, 0x0007 }, { 1927, 0xaf56 }, { 1937, 0x38ff },
3726 { 1948, 0x980d }, { 1954, 0xefb8 }, { 1965, 0x403d }, { 1971, 0xb760 },
3727 { 1979, 0xd8ce }, { 1988, 0x9035 }, { 1994, 0x72bf }, { 2005, 0x3fff },
3728 /* 0x5800 */
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3730 { 2066, 0xff00 }, { 2074, 0x6fbe }, { 2086, 0xa93c }, { 2094, 0xfe72 },
3731 { 2105, 0xcfe9 }, { 2118, 0xf11b }, { 2127, 0xdb6b }, { 2138, 0xf40a },
3732 { 2145, 0xc3e6 }, { 2154, 0xef7e }, { 2167, 0x9b9c }, { 2176, 0xf610 },
3733 /* 0x5900 */
3734 { 2183, 0xf048 }, { 2189, 0x16f4 }, { 2197, 0xfeb5 }, { 2209, 0x5182 },
3735 { 2214, 0xc7b1 }, { 2223, 0x15bb }, { 2232, 0x6e87 }, { 2241, 0xfdbf },
3736 { 2255, 0xe43f }, { 2265, 0x63cd }, { 2274, 0xc1ff }, { 2285, 0x7e7e },
3737 { 2297, 0xfdeb }, { 2310, 0x7d5f }, { 2322, 0x777b }, { 2334, 0xfcfe },
3738 /* 0x5a00 */
3739 { 2347, 0x960b }, { 2354, 0xdbea }, { 2365, 0x6229 }, { 2371, 0x53e8 },
3740 { 2379, 0x37df }, { 2391, 0xfdef }, { 2405, 0x36f5 }, { 2415, 0xbd81 },
3741 { 2423, 0xdc18 }, { 2430, 0xfc9d }, { 2442, 0xd2e4 }, { 2450, 0xffff },
3742 { 2466, 0x3fd7 }, { 2478, 0xffe0 }, { 2489, 0x7f6f }, { 2502, 0xabf8 },
3743 /* 0x5b00 */
3744 { 2512, 0x9bae }, { 2522, 0x6ed9 }, { 2532, 0xf5fb }, { 2545, 0xf115 },
3745 { 2553, 0x79a9 }, { 2562, 0xbdfb }, { 2575, 0x5a3c }, { 2583, 0xadaf },
3746 { 2594, 0xdbba }, { 2605, 0x1fac }, { 2614, 0x71fc }, { 2624, 0x8379 },
3747 { 2632, 0x7cf7 }, { 2644, 0xc35f }, { 2654, 0xdfff }, { 2669, 0x0567 },
3748 /* 0x5c00 */

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3749 { 2676, 0xff9a }, { 2688, 0x8467 }, { 2695, 0x1534 }, { 2701, 0xdf8b },
3750 { 2712, 0xf9f3 }, { 2724, 0x3373 }, { 2733, 0xf7bd }, { 2746, 0x5e1a },
3751 { 2754, 0xbf40 }, { 2762, 0xa03f }, { 2770, 0xffff }, { 2786, 0x01eb },
3752 { 2793, 0xdfc0 }, { 2802, 0xcfd9 }, { 2814, 0x7500 }, { 2819, 0xabd3 },
3753 /* 0x5d00 */
3754 { 2829, 0xf8c3 }, { 2838, 0xeed6 }, { 2849, 0x43fd }, { 2859, 0xb7ff },
3755 { 2873, 0x5eaf }, { 2884, 0x4227 }, { 2890, 0x9bac }, { 2899, 0xf686 },
3756 { 2908, 0x27d7 }, { 2918, 0xf6bc }, { 2929, 0xf787 }, { 2940, 0x35b7 },
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3758 /* 0x5e00 */
3759 { 2987, 0x545c }, { 2994, 0xaff2 }, { 3005, 0x2b3f }, { 3015, 0x61d8 },
3760 { 3022, 0xfc3b }, { 3033, 0xbbb8 }, { 3043, 0xffcf }, { 3057, 0x7b7d },
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3762 { 3110, 0x5fff }, { 3122, 0xffff }, { 3137, 0xd3ef }, { 3149, 0xc4ce },
3763 /* 0x5f00 */
3764 { 3157, 0x8db6 }, { 3166, 0xadbc }, { 3176, 0x63dc }, { 3185, 0x11eb },
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3768 /* 0x6000 */
3769 { 3316, 0xfe01 }, { 3324, 0x7eff }, { 3338, 0xffff }, { 3353, 0x02bc },
3770 { 3359, 0x32ff }, { 3370, 0xef39 }, { 3381, 0xfffc }, { 3395, 0x8005 },
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3773 /* 0x6100 */
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3776 { 3575, 0x7e0d }, { 3584, 0xac5f }, { 3594, 0xff96 }, { 3606, 0xd57f },
3777 { 3618, 0x3fee }, { 3630, 0xc140 }, { 3634, 0x6ff9 }, { 3646, 0xffe7 },
3778 /* 0x6200 */
3779 { 3660, 0x779b }, { 3671, 0x8e77 }, { 3681, 0x6ebf }, { 3693, 0xe45d },
3780 { 3702, 0x6fcf }, { 3714, 0x5f1f }, { 3725, 0xe07f }, { 3735, 0xfedf },
3781 { 3749, 0xd7db }, { 3761, 0x01fe }, { 3769, 0xff00 }, { 3777, 0xfb7b },
3782 { 3790, 0xffd4 }, { 3802, 0x1fdf }, { 3814, 0xf800 }, { 3819, 0xffff },
3783 /* 0x6300 */
3784 { 3835, 0xfb8f }, { 3847, 0x007b }, { 3853, 0xbf00 }, { 3860, 0x7f5c },
3785 { 3871, 0xffff }, { 3887, 0x07f3 }, { 3896, 0xeba0 }, { 3904, 0x3de7 },
3786 { 3915, 0xf7bf }, { 3929, 0xfbd7 }, { 3942, 0xffbf }, { 3957, 0x6003 },
3787 { 3961, 0xffff }, { 3976, 0xbfed }, { 3989, 0xfbb }, { 4002, 0x027f },
3788 /* 0x6400 */
3789 { 4010, 0xfe40 }, { 4018, 0xddfd }, { 4031, 0xfdff }, { 4046, 0xe2f9 },
3790 { 4056, 0x680b }, { 4062, 0xfb1f }, { 4074, 0xfbe3 }, { 4086, 0xaaffd },
3791 { 4099, 0x9fa4 }, { 4108, 0xf7ed }, { 4121, 0x7a7d }, { 4132, 0xf80f },
3792 { 4141, 0xeebe }, { 4153, 0x0fd5 }, { 4162, 0xbb5d }, { 4173, 0xfd9f },
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4027 { 11987, 0xf59d }, { 11998, 0xf7f7 }, { 12012, 0x51de }, { 12021, 0xffe0 },
4028 /* 0x9400 */
4029 { 12032, 0xfec9 }, { 12043, 0x037f }, { 12052, 0x5f01 }, { 12059, 0xbfef },
4030 { 12073, 0x9ff1 }, { 12084, 0x60a7 }, { 12091, 0xef1d }, { 12102, 0xf1ff },
4031 { 12115, 0x000f }, { 12119, 0x0000 }, { 12119, 0x0000 }, { 12119, 0x0000 },
4032 { 12119, 0x0000 }, { 12119, 0x0000 }, { 12119, 0x0000 }, { 12119, 0x0000 },
4033 /* 0x9500 */
4034 { 12119, 0x0000 }, { 12119, 0x0000 }, { 12119, 0x0000 }, { 12119, 0x0000 },
4035 { 12119, 0x0000 }, { 12119, 0x0000 }, { 12119, 0x0000 }, { 12119, 0x3c80 },
4036 { 12124, 0xfb4d }, { 12135, 0xd91f }, { 12145, 0x7b3a }, { 12155, 0xffe3 },
4037 { 12167, 0x3fe9 }, { 12178, 0xdc7f }, { 12190, 0x003f }, { 12196, 0x0000 },
4038 /* 0x9600 */
4039 { 12196, 0x0000 }, { 12196, 0x5000 }, { 12198, 0xf51f }, { 12209, 0xbe07 },
4040 { 12218, 0xfc1d }, { 12228, 0xf91b }, { 12238, 0xbc1e }, { 12247, 0x71ff },
4041 { 12259, 0x6ff9 }, { 12271, 0x5bbe }, { 12282, 0x5796 }, { 12291, 0x9b1b },
4042 { 12300, 0x7fff }, { 12315, 0xfffc }, { 12329, 0x872e }, { 12337, 0xafe7 },
4043 /* 0x9700 */
4044 { 12349, 0xebf5 }, { 12361, 0xf34f }, { 12372, 0xdffd }, { 12386, 0xe725 },
4045 { 12395, 0x0bdc }, { 12403, 0x5d44 }, { 12410, 0x5747 }, { 12419, 0xfddd },
4046 { 12432, 0xed3f }, { 12444, 0x7790 }, { 12452, 0x7d7f }, { 12465, 0x8ac8 },
4047 { 12471, 0xfafa }, { 12483, 0xf3f9 }, { 12495, 0x202a }, { 12499, 0xef4b },
4048 /* 0x9800 */
4049 { 12510, 0xf5ff }, { 12524, 0x79cf }, { 12535, 0xabd3 }, { 12545, 0x0ba5 },
4050 { 12552, 0xf77a }, { 12564, 0xfb8f }, { 12576, 0x8ebd }, { 12586, 0x001f },
4051 { 12591, 0x0000 }, { 12591, 0x0000 }, { 12591, 0xf300 }, { 12597, 0xfd4e },
4052 { 12608, 0x1a57 }, { 12616, 0x8800 }, { 12618, 0xaeac }, { 12627, 0x7654 },
4053 /* 0x9900 */
4054 { 12635, 0x17ad }, { 12644, 0xcdff }, { 12657, 0xffb2 }, { 12669, 0xf42f },
4055 { 12679, 0x5baa }, { 12688, 0xdbff }, { 12702, 0x0002 }, { 12703, 0x0000 },
4056 { 12703, 0x0000 }, { 12703, 0x73c0 }, { 12710, 0xf9ea }, { 12721, 0x2e3f },
4057 { 12731, 0xfa8e }, { 12741, 0xbfff }, { 12755, 0x76bc }, { 12765, 0xffd3 },
4058 /* 0x9a00 */
4059 { 12778, 0xeefe }, { 12791, 0x7e72 }, { 12801, 0x7ebd }, { 12813, 0xe7f7 },
4060 { 12826, 0xf77f }, { 12840, 0xcefd }, { 12852, 0x0ff5 }, { 12862, 0x0000 },
4061 { 12862, 0x0000 }, { 12862, 0x0000 }, { 12862, 0xa900 }, { 12866, 0xdb9b },
4062 { 12877, 0xa4c7 }, { 12885, 0x917f }, { 12895, 0xf8ca }, { 12904, 0x7ece },
4063 /* 0x9b00 */
4064 { 12915, 0x7d7a }, { 12926, 0xc7e7 }, { 12937, 0xcbbd }, { 12948, 0xdcae },
4065 { 12958, 0xfd7e }, { 12971, 0x8f76 }, { 12981, 0x91d3 }, { 12989, 0x7cf3 },
4066 { 13000, 0x01e5 }, { 13006, 0x4c2f }, { 13014, 0xed77 }, { 13026, 0xa360 },
4067 { 13032, 0x07db }, { 13041, 0x5ef8 }, { 13051, 0x1df7 }, { 13062, 0x2181 },
4068 /* 0x9c00 */
4069 { 13066, 0x6be0 }, { 13074, 0x309c }, { 13080, 0x3b3a }, { 13089, 0xfade },
4070 { 13101, 0x7f53 }, { 13112, 0xc3f5 }, { 13122, 0x61cd }, { 13130, 0x07ba },
4071 { 13138, 0x0000 }, { 13138, 0x0000 }, { 13138, 0x0000 }, { 13138, 0x0000 },
4072 { 13138, 0x0000 }, { 13138, 0x0000 }, { 13138, 0x26e0 }, { 13144, 0xbefe },
4073 /* 0x9d00 */
4074 { 13157, 0x03f9 }, { 13165, 0xebb5 }, { 13176, 0xe36d }, { 13186, 0xe9cb },
4075 { 13196, 0x9c2f }, { 13205, 0xbfde }, { 13218, 0x9f83 }, { 13227, 0xabbf },
4076 { 13239, 0x1fff }, { 13251, 0xffd5 }, { 13264, 0xb7df }, { 13277, 0xdffe },
4077 { 13291, 0xfdae }, { 13303, 0xffef }, { 13318, 0xfb7e }, { 13331, 0xeffd },
4078 /* 0x9e00 */
4079 { 13345, 0xaaff }, { 13357, 0x6ebf }, { 13369, 0x0000 }, { 13369, 0x0000 },
4080 { 13369, 0x0000 }, { 13369, 0x0000 }, { 13369, 0x0000 }, { 13369, 0xb620 },
4081 { 13375, 0x7fcd }, { 13387, 0xbe9e }, { 13398, 0x62b3 }, { 13406, 0x58f1 },
4082 { 13414, 0xf10d }, { 13422, 0xfd7b }, { 13435, 0xe9f1 }, { 13445, 0xbefd },
4083 /* 0x9f00 */
4084 { 13458, 0xc6c3 }, { 13466, 0x5f6d }, { 13477, 0xff3d }, { 13490, 0x69ff },
4085 { 13502, 0xffcf }, { 13516, 0xfb74 }, { 13528, 0xdcfb }, { 13540, 0x4ff7 },
4086 { 13552, 0x2000 }, { 13553, 0x1137 }, { 13560, 0x0015 },
4087 };
4088 static const Summary16 big5_uni2indx_pagefa[1] = {
4089 /* 0xfa00 */
4090 { 13563, 0x3000 },
4091 };
4092 static const Summary16 big5_uni2indx_pagefe[23] = {
4093 /* 0xfe00 */
4094 { 13565, 0x0000 }, { 13565, 0x0000 }, { 13565, 0x0000 }, { 13565, 0xffffb },
4095 { 13580, 0xfe1f }, { 13592, 0xfef5 }, { 13605, 0x0e7f }, { 13615, 0x0000 },
4096 { 13615, 0x0000 }, { 13615, 0x0000 }, { 13615, 0x0000 }, { 13615, 0x0000 },

```

```

4097 { 13615, 0x0000 }, { 13615, 0x0000 }, { 13615, 0x0000 }, { 13615, 0x0000 },
4098 /* 0xff00 */
4099 { 13615, 0xff7a }, { 13628, 0xffff }, { 13644, 0xffff }, { 13660, 0x97ff },
4100 { 13673, 0xfffe }, { 13688, 0x3fff }, { 13702, 0x0010 },
4101 };
4102
4103 static int
4104 big5_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
4105 {
4106     (void)conv;
4107     if (n >= 2) {
4108         const Summary16 *summary = NULL;
4109         if (wc < 0x0100)
4110             summary = &big5_uni2indx_page00[(wc>>4)];
4111         else if (wc >= 0x0200 && wc < 0x0460)
4112             summary = &big5_uni2indx_page02[(wc>>4)-0x020];
4113         else if (wc >= 0x2000 && wc < 0x22c0)
4114             summary = &big5_uni2indx_page20[(wc>>4)-0x200];
4115         else if (wc >= 0x2400 && wc < 0x2650)
4116             summary = &big5_uni2indx_page24[(wc>>4)-0x240];
4117         else if (wc >= 0x3000 && wc < 0x33e0)
4118             summary = &big5_uni2indx_page30[(wc>>4)-0x300];
4119         else if (wc >= 0x4e00 && wc < 0x9fb0)
4120             summary = &big5_uni2indx_page4e[(wc>>4)-0x4e0];
4121         else if (wc >= 0xfa00 && wc < 0xfa10)
4122             summary = &big5_uni2indx_pagefa[(wc>>4)-0xfa0];
4123         else if (wc >= 0xfe00 && wc < 0xff70)
4124             summary = &big5_uni2indx_pagefe[(wc>>4)-0xfe0];
4125         if (summary) {
4126             unsigned short used = summary->used;
4127             unsigned int i = wc & 0x0f;
4128             if (used & ((unsigned short) 1 << i)) {
4129                 unsigned short c;
4130                 /* Keep in 'used' only the bits 0..i-1. */
4131                 used &= ((unsigned short) 1 << i) - 1;
4132                 /* Add 'summary->indx' and the number of bits set in 'used'. */
4133                 used = (used & 0x5555) + ((used & 0xaaaa) >> 1);
4134                 used = (used & 0x3333) + ((used & 0xcccc) >> 2);
4135                 used = (used & 0x0f0f) + ((used & 0xf0f0) >> 4);
4136                 used = (used & 0x00ff) + (used >> 8);
4137                 c = big5_2charset[summary->indx + used];
4138                 r[0] = (c >> 8); r[1] = (c & 0xff);
4139                 return 2;
4140             }
4141         }
4142         return RET_ILSEQ;
4143     }
4144     return RET_TOOSMALL;
4145 }
4146 #endif /* NEED_TOMB */

```

## 34.259 big5\_emacs.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/big5_emacs.h,v 1.1 2000/11/28 18:50:06 dawes Exp $ */
2
3 /*
4  * BIG5-0 and BIG5-1
5  */
6
7 /*
8  BIG5 with its 13494 characters doesn't fit in a single 94x94 or 96x96
9  block. Therefore Emacs/Mule developers, in a typically Japanese way of
10 thinking, have developed an alternative encoding of BIG5 in two 94x94
11 planes, very similar to the SHIFT_JIS encoding for JISX0208.
12
13 Conversion between BIG5 codes (s1,s2) and BIG5-0 codes (c1,c2):
14 Example. (s1,s2) = 0xA140, (c1,c2) = 0x2121.
15 0xA1 <= s1 <= 0xC7, 0x40 <= s2 <= 0x7E || 0xA1 <= s2 <= 0xFE,
16 0x21 <= c1 <= 0x62, 0x21 <= c2 <= 0x7E.
17 Invariant:
18 157*(s1-0xA1) + (s2 < 0x80 ? s2-0x40 : s2-0x62)
19 = 94*(c1-0x21)+(c2-0x21)
20 Conversion (s1,s2) -> (c1,c2):
21 t := 157*(s1-0xA1) + (s2 < 0x80 ? s2-0x40 : s2-0x62)
22 c1 := (t div 94) + 0x21
23 c2 := (t mod 94) + 0x21
24 Conversion (c1,c2) -> (s1,s2):
25 t := 94*(c1-0x21)+(c2-0x21)
26 t2 := t mod 157
27 s1 := (t div 157) + 0xA1
28 s2 := (t2 < 0x3F ? t2+0x40 : t2+0x62)
29
30 Conversion between BIG5 codes (s1,s2) and BIG5-1 codes (c1,c2):
31 Example. (s1,s2) = 0xC940, (c1,c2) = 0x2121.
32 0xC9 <= s1 <= 0xF9, 0x40 <= s2 <= 0x7E || 0xA1 <= s2 <= 0xFE,

```

```

33 0x21 <= c1 <= 0x72, 0x21 <= c2 <= 0x7E.
34 Invariant:
35 157*(s1-0xC9) + (s2 < 0x80 ? s2-0x40 : s2-0x62)
36 = 94*(c1-0x21)+(c2-0x21)
37 Conversion (s1,s2) -> (c1,c2):
38 t := 157*(s1-0xC9) + (s2 < 0x80 ? s2-0x40 : s2-0x62)
39 c1 := (t div 94) + 0x21
40 c2 := (t mod 94) + 0x21
41 Conversion (c1,c2) -> (s1,s2):
42 t := 94*(c1-0x21)+(c2-0x21)
43 t2 := t mod 157
44 s1 := (t div 157) + 0xC9
45 s2 := (t2 < 0x3F ? t2+0x40 : t2+0x62)
46 */
47
48 static int
49 big5_0_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
50 {
51     unsigned char c1 = s[0];
52     if (c1 >= 0x21 && c1 <= 0x62) {
53         if (n >= 2) {
54             unsigned char c2 = s[1];
55             if (c2 >= 0x21 && c2 <= 0x7e) {
56                 unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
57                 if (0) {
58                     /* Unoptimized. */
59                     unsigned char buf[2];
60                     buf[0] = (i / 157) + 0xa1;
61                     i = i % 157;
62                     buf[1] = i + (i < 0x3f ? 0x40 : 0x62);
63                     return big5_mbtowc(conv,pwc,buf,2);
64                 } else {
65                     /* Inline the implementation of big5_mbtowc. */
66                     if (i < 6121) {
67                         unsigned short wc = big5_2uni_pagea1[i];
68                         if (wc != 0xffffd) {
69                             *pwc = (ucs4_t) wc;
70                             return 2;
71                         }
72                     }
73                 }
74             }
75             return RET_ILSEQ;
76         }
77         return RET_TOOFEW(0);
78     }
79     return RET_ILSEQ;
80 }
81
82 static int
83 big5_1_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
84 {
85     unsigned char c1 = s[0];
86     if (c1 >= 0x21 && c1 <= 0x72) {
87         if (n >= 2) {
88             unsigned char c2 = s[1];
89             if (c2 >= 0x21 && c2 <= 0x7e) {
90                 unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
91                 if (0) {
92                     /* Unoptimized. */
93                     unsigned char buf[2];
94                     buf[0] = (i / 157) + 0xc9;
95                     i = i % 157;
96                     buf[1] = i + (i < 0x3f ? 0x40 : 0x62);
97                     return big5_mbtowc(conv,pwc,buf,2);
98                 } else {
99                     /* Inline the implementation of big5_mbtowc. */
100                     if (i < 7652) {
101                         unsigned short wc = big5_2uni_pagec9[i];
102                         if (wc != 0xffffd) {
103                             *pwc = (ucs4_t) wc;
104                             return 2;
105                         }
106                     }
107                 }
108             }
109             return RET_ILSEQ;
110         }
111         return RET_TOOFEW(0);
112     }
113     return RET_ILSEQ;
114 }
115
116 static int
117 big5_0_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
118 {
119     if (n >= 2) {

```

```

120     unsigned char buf[2];
121     int ret = big5_wctomb(conv,buf,wc,2);
122     if (ret != RET_ILSEQ) {
123         unsigned char s1, s2;
124         if (ret != 2) abort();
125         s1 = buf[0];
126         s2 = buf[1];
127         if (!(s1 >= 0xa1)) abort();
128         if (!(s2 >= 0x40 && s2 <= 0x7e) || (s2 >= 0xa1 && s2 <= 0xfe)) abort();
129         if (s1 < 0xc9) {
130             unsigned int t = 157 * (s1 - 0xa1) + s2 - (s2 < 0x80 ? 0x40 : 0x62);
131             r[0] = (t / 94) + 0x21;
132             r[1] = (t % 94) + 0x21;
133             return 2;
134         }
135     }
136     return RET_ILSEQ;
137 }
138 return RET_TOOSMALL;
139 }
140
141 static int
142 big5_l_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
143 {
144     if (n >= 2) {
145         unsigned char buf[2];
146         int ret = big5_wctomb(conv,buf,wc,2);
147         if (ret != RET_ILSEQ) {
148             unsigned char s1, s2;
149             if (ret != 2) abort();
150             s1 = buf[0];
151             s2 = buf[1];
152             if (!(s1 <= 0xf9)) abort();
153             if (!(s2 >= 0x40 && s2 <= 0x7e) || (s2 >= 0xa1 && s2 <= 0xfe)) abort();
154             if (s1 >= 0xc9) {
155                 unsigned int t = 157 * (s1 - 0xc9) + s2 - (s2 < 0x80 ? 0x40 : 0x62);
156                 r[0] = (t / 94) + 0x21;
157                 r[1] = (t % 94) + 0x21;
158                 return 2;
159             }
160         }
161         return RET_ILSEQ;
162     }
163     return RET_TOOSMALL;
164 }

```

## 34.260 cp1133.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/cp1133.h,v 1.3 2000/11/29 17:40:28 dawes Exp $ */
2
3 /*
4  * IBM-CP1133
5  */
6
7 static const unsigned short cp1133_2uni_1[64] = {
8     /* 0xa0 */
9     0x00a0, 0x0e81, 0x0e82, 0x0e84, 0x0e87, 0x0e88, 0x0eaa, 0x0e8a,
10     0x0e8d, 0x0e94, 0x0e95, 0x0e96, 0x0e97, 0x0e99, 0x0e9a, 0x0e9b,
11     /* 0xb0 */
12     0x0e9c, 0x0e9d, 0x0e9e, 0x0e9f, 0x0ea1, 0x0ea2, 0x0ea3, 0x0ea5,
13     0x0ea7, 0x0eab, 0x0ead, 0x0eae, 0xfffd, 0xfffd, 0xfffd, 0x0eaf,
14     /* 0xc0 */
15     0x0eb0, 0x0eb2, 0x0eb3, 0x0eb4, 0x0eb5, 0x0eb6, 0x0eb7, 0x0eb8,
16     0x0eb9, 0x0ebc, 0x0eb1, 0x0ebb, 0x0ebd, 0xfffd, 0xfffd, 0xfffd,
17     /* 0xd0 */
18     0x0ec0, 0x0ec1, 0x0ec2, 0x0ec3, 0x0ec4, 0x0ec8, 0x0ec9, 0x0eca,
19     0x0ecb, 0x0ecc, 0x0ecd, 0x0ec6, 0xfffd, 0x0edc, 0x0edd, 0x20ad,
20 };
21 static const unsigned short cp1133_2uni_2[16] = {
22     /* 0xf0 */
23     0x0ed0, 0x0ed1, 0x0ed2, 0x0ed3, 0x0ed4, 0x0ed5, 0x0ed6, 0x0ed7,
24     0x0ed8, 0x0ed9, 0xfffd, 0xfffd, 0x00a2, 0x00ac, 0x00a6, 0xfffd,
25 };
26
27 static int
28 cp1133_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
29 {
30     unsigned char c = *s;
31     if (c < 0xa0) {
32         *pwc = (ucs4_t) c;
33         return 1;
34     }
35     else if (c < 0xe0) {
36         unsigned short wc = cp1133_2uni_1[c-0xa0];
37         if (wc != 0xfffd) {

```

```

38     *pwc = (ucs4_t) wc;
39     return 1;
40 }
41 }
42 else if (c < 0xf0) {
43 }
44 else {
45     unsigned short wc = cp1133_uni_2[c-0xf0];
46     if (wc != 0xffffd) {
47         *pwc = (ucs4_t) wc;
48         return 1;
49     }
50 }
51 return RET_ILSEQ;
52 }
53
54 static const unsigned char cp1133_page00[16] = {
55     0xa0, 0x00, 0xfc, 0x00, 0x00, 0x00, 0xfe, 0x00, /* 0xa0-0xa7 */
56     0x00, 0x00, 0x00, 0x00, 0xfd, 0x00, 0x00, 0x00, /* 0xa8-0xaf */
57 };
58 static const unsigned char cp1133_page0e[96] = {
59     0x00, 0xa1, 0xa2, 0x00, 0xa3, 0x00, 0x00, 0xa4, /* 0x80-0x87 */
60     0xa5, 0x00, 0xa7, 0x00, 0x00, 0xa8, 0x00, 0x00, /* 0x88-0x8f */
61     0x00, 0x00, 0x00, 0x00, 0xa9, 0xaa, 0xab, 0xac, /* 0x90-0x97 */
62     0x00, 0xad, 0xae, 0xaf, 0xb0, 0xb1, 0xb2, 0xb3, /* 0x98-0x9f */
63     0x00, 0xb4, 0xb5, 0xb6, 0x00, 0xb7, 0x00, 0xb8, /* 0xa0-0xa7 */
64     0x00, 0x00, 0xa6, 0xb9, 0x00, 0xba, 0xbb, 0xbf, /* 0xa8-0xaf */
65     0xc0, 0xca, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, /* 0xb0-0xb7 */
66     0xc7, 0xc8, 0x00, 0xcb, 0xc9, 0xcc, 0x00, 0x00, /* 0xb8-0xbf */
67     0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0x00, 0xdb, 0x00, /* 0xc0-0xc7 */
68     0xd5, 0xd6, 0xd7, 0xd8, 0xd9, 0xda, 0x00, 0x00, /* 0xc8-0xcf */
69     0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xd0-0xd7 */
70     0xf8, 0xf9, 0x00, 0x00, 0xdd, 0xde, 0x00, 0x00, /* 0xd8-0xdf */
71 };
72
73 static int
74 cp1133_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
75 {
76     unsigned char c = 0;
77     if (wc < 0x00a0) {
78         *r = wc;
79         return 1;
80     }
81     else if (wc >= 0x00a0 && wc < 0x00b0)
82         c = cp1133_page00[wc-0x00a0];
83     else if (wc >= 0x0e80 && wc < 0x0ee0)
84         c = cp1133_page0e[wc-0x0e80];
85     else if (wc == 0x20ad)
86         c = 0xdf;
87     if (c != 0) {
88         *r = c;
89         return 1;
90     }
91     return RET_ILSEQ;
92 }

```

## 34.261 cp1251.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/cp1251.h,v 1.1 2000/12/04 18:49:32 dawes Exp $ */
2
3 /*
4  * CP1251
5  */
6 #ifndef NEED_TOWC
7
8 static const unsigned short cp1251_uni[128] = {
9     /* 0x80 */
10     0x0402, 0x0403, 0x201a, 0x0453, 0x201e, 0x2026, 0x2020, 0x2021,
11     0x20ac, 0x2030, 0x0409, 0x2039, 0x040a, 0x040c, 0x040b, 0x040f,
12     /* 0x90 */
13     0x0452, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
14     0xffffd, 0x2122, 0x0459, 0x203a, 0x045a, 0x045c, 0x045b, 0x045f,
15     /* 0xa0 */
16     0x00a0, 0x040e, 0x045e, 0x0408, 0x00a4, 0x0490, 0x00a6, 0x00a7,
17     0x0401, 0x00a9, 0x0404, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x0407,
18     /* 0xb0 */
19     0x00b0, 0x00b1, 0x0406, 0x0456, 0x0491, 0x00b5, 0x00b6, 0x00b7,
20     0x0451, 0x2116, 0x0454, 0x00bb, 0x0458, 0x0405, 0x0455, 0x0457,
21     /* 0xc0 */
22     0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0416, 0x0417,
23     0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e, 0x041f,
24     /* 0xd0 */
25     0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426, 0x0427,
26     0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e, 0x042f,
27     /* 0xe0 */

```

```

28 0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0436, 0x0437,
29 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e, 0x043f,
30 /* 0xf0 */
31 0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446, 0x0447,
32 0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e, 0x044f,
33 };
34
35 static int
36 cp1251_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
37 {
38     unsigned char c = *s;
39     if (c < 0x80) {
40         *pwc = (ucs4_t) c;
41         return 1;
42     }
43     else {
44         unsigned short wc = cp1251_2uni[c-0x80];
45         if (wc != 0xffffd) {
46             *pwc = (ucs4_t) wc;
47             return 1;
48         }
49     }
50     return RET_ILSEQ;
51 }
52 #endif /* NEED_TOWC */
53
54 #ifdef NEED_TOMB
55 static const unsigned char cp1251_page00[32] = {
56     0xa0, 0x00, 0x00, 0x00, 0xa4, 0x00, 0xa6, 0xa7, /* 0xa0-0xa7 */
57     0x00, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0x00, /* 0xa8-0xaf */
58     0xb0, 0xb1, 0x00, 0x00, 0x00, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
59     0x00, 0x00, 0x00, 0xbb, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
60 };
61 static const unsigned char cp1251_page04[152] = {
62     0x00, 0xa8, 0x80, 0x81, 0xaa, 0xbd, 0xb2, 0xaf, /* 0x00-0x07 */
63     0xa3, 0x8a, 0x8c, 0x8e, 0x8d, 0x00, 0xa1, 0x8f, /* 0x08-0x0f */
64     0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x10-0x17 */
65     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x18-0x1f */
66     0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0x20-0x27 */
67     0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, /* 0x28-0x2f */
68     0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0x30-0x37 */
69     0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0x38-0x3f */
70     0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0x40-0x47 */
71     0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0xfd, 0xfe, 0xff, /* 0x48-0x4f */
72     0x00, 0xb8, 0x90, 0x83, 0xba, 0xbe, 0xb3, 0xbf, /* 0x50-0x57 */
73     0xbc, 0x9a, 0x9c, 0x9e, 0x9d, 0x00, 0xa2, 0x9f, /* 0x58-0x5f */
74     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
75     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
76     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
77     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
78     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
79     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
80     0xa5, 0xb4, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
81 };
82 static const unsigned char cp1251_page20[48] = {
83     0x00, 0x00, 0x00, 0x96, 0x97, 0x00, 0x00, 0x00, /* 0x10-0x17 */
84     0x91, 0x92, 0x82, 0x00, 0x93, 0x94, 0x84, 0x00, /* 0x18-0x1f */
85     0x86, 0x87, 0x95, 0x00, 0x00, 0x00, 0x85, 0x00, /* 0x20-0x27 */
86     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
87     0x89, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
88     0x00, 0x8b, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
89 };
90
91 static int
92 cp1251_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
93 {
94     (void)conv; (void)n;
95     unsigned char c = 0;
96     if (wc < 0x0080) {
97         *r = wc;
98         return 1;
99     }
100     else if (wc >= 0x00a0 && wc < 0x00c0)
101         c = cp1251_page00[wc-0x00a0];
102     else if (wc >= 0x0400 && wc < 0x0498)
103         c = cp1251_page04[wc-0x0400];
104     else if (wc >= 0x2010 && wc < 0x2040)
105         c = cp1251_page20[wc-0x2010];
106     else if (wc == 0x20ac)
107         c = 0x88;
108     else if (wc == 0x2116)
109         c = 0xb9;
110     else if (wc == 0x2122)
111         c = 0x99;
112     if (c != 0) {
113         *r = c;
114         return 1;

```

```

115     }
116     return RET_ILSEQ;
117 }
118 #endif /* NEED_TOMB */

```

## 34.262 cp1255.h

```

1  /* $XFree86: xc/lib/X11/lcUniConv/cp1255.h,v 1.1 2000/12/04 18:49:33 dawes Exp $ */
2
3  /*
4   * CP1255
5   */
6
7  static const unsigned short cp1255_2uni[128] = {
8      /* 0x80 */
9      0x20ac, 0xffffd, 0x201a, 0x0192, 0x201e, 0x2026, 0x2020, 0x2021,
10     0x02c6, 0x2030, 0xffffd, 0x2039, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
11     /* 0x90 */
12     0xffffd, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
13     0x02dc, 0x2122, 0xffffd, 0x203a, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
14     /* 0xa0 */
15     0x00a0, 0x00a1, 0x00a2, 0x00a3, 0x20aa, 0x00a5, 0x00a6, 0x00a7,
16     0x00a8, 0x00a9, 0x00d7, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x00af,
17     /* 0xb0 */
18     0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x00b6, 0x00b7,
19     0x00b8, 0x00b9, 0x00f7, 0x00bb, 0x00bc, 0x00bd, 0x00be, 0x00bf,
20     /* 0xc0 */
21     0x05b0, 0x05b1, 0x05b2, 0x05b3, 0x05b4, 0x05b5, 0x05b6, 0x05b7,
22     0x05b8, 0x05b9, 0xffffd, 0x05bb, 0x05bc, 0x05bd, 0x05be, 0x05bf,
23     /* 0xd0 */
24     0x05c0, 0x05c1, 0x05c2, 0x05c3, 0x05f0, 0x05f1, 0x05f2, 0x05f3,
25     0x05f4, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
26     /* 0xe0 */
27     0x05d0, 0x05d1, 0x05d2, 0x05d3, 0x05d4, 0x05d5, 0x05d6, 0x05d7,
28     0x05d8, 0x05d9, 0x05da, 0x05db, 0x05dc, 0x05dd, 0x05de, 0x05df,
29     /* 0xf0 */
30     0x05e0, 0x05e1, 0x05e2, 0x05e3, 0x05e4, 0x05e5, 0x05e6, 0x05e7,
31     0x05e8, 0x05e9, 0x05ea, 0xffffd, 0xffffd, 0x200e, 0x200f, 0xffffd,
32 };
33
34 static int
35 cp1255_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
36 {
37     unsigned char c = *s;
38     if (c < 0x80) {
39         *pwc = (ucs4_t) c;
40         return 1;
41     }
42     else {
43         unsigned short wc = cp1255_2uni[c-0x80];
44         if (wc != 0xffffd) {
45             *pwc = (ucs4_t) wc;
46             return 1;
47         }
48     }
49     return RET_ILSEQ;
50 }
51
52 static const unsigned char cp1255_page00[88] = {
53     0xa0, 0xa1, 0xa2, 0xa3, 0x00, 0xa5, 0xa6, 0xa7, /* 0xa0-0xa7 */
54     0xa8, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0xa8-0xaf */
55     0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
56     0xb8, 0xb9, 0x00, 0xbb, 0xbc, 0xbd, 0xbe, 0xbf, /* 0xb8-0xbf */
57     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
58     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
59     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xaa, /* 0xd0-0xd7 */
60     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
61     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
63     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xba, /* 0xf0-0xf7 */
64 };
65 static const unsigned char cp1255_page02[32] = {
66     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x88, 0x00, /* 0xc0-0xc7 */
67     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
68     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
69     0x00, 0x00, 0x00, 0x00, 0x98, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
70 };
71 static const unsigned char cp1255_page05[72] = {
72     0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0xb0-0xb7 */
73     0xc8, 0xc9, 0x00, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0xb8-0xbf */
74     0xd0, 0xd1, 0xd2, 0xd3, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
75     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
76     0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0xd0-0xd7 */
77     0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xd8-0xdf */
78     0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xe0-0xe7 */

```

```

79 0xf8, 0xf9, 0xfa, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
80 0xd4, 0xd5, 0xd6, 0xd7, 0xd8, 0x00, 0x00, 0x00, /* 0xf0-0xf7 */
81 };
82 static const unsigned char cp1255_page20[56] = {
83 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xfd, 0xfe, /* 0x08-0x0f */
84 0x00, 0x00, 0x00, 0x96, 0x97, 0x00, 0x00, 0x00, /* 0x10-0x17 */
85 0x91, 0x92, 0x82, 0x00, 0x93, 0x94, 0x84, 0x00, /* 0x18-0x1f */
86 0x86, 0x87, 0x95, 0x00, 0x00, 0x00, 0x85, 0x00, /* 0x20-0x27 */
87 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
88 0x89, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
89 0x00, 0x8b, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
90 };
91
92 static int
93 cp1255_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
94 {
95     unsigned char c = 0;
96     if (wc < 0x0080) {
97         *r = wc;
98         return 1;
99     }
100     else if (wc >= 0x00a0 && wc < 0x00f8)
101         c = cp1255_page00[wc-0x00a0];
102     else if (wc == 0x0192)
103         c = 0x83;
104     else if (wc >= 0x02c0 && wc < 0x02e0)
105         c = cp1255_page02[wc-0x02c0];
106     else if (wc >= 0x05b0 && wc < 0x05f8)
107         c = cp1255_page05[wc-0x05b0];
108     else if (wc >= 0x2008 && wc < 0x2040)
109         c = cp1255_page20[wc-0x2008];
110     else if (wc == 0x20aa)
111         c = 0xa4;
112     else if (wc == 0x20ac)
113         c = 0x80;
114     else if (wc == 0x2122)
115         c = 0x99;
116     if (c != 0) {
117         *r = c;
118         return 1;
119     }
120     return RET_ILSEQ;
121 }

```

## 34.263 cp1256.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/cp1256.h,v 1.1 2000/12/04 18:49:34 dawes Exp $ */
2
3 /*
4  * CP1256
5  */
6
7 static const unsigned short cp1256_2uni[128] = {
8     /* 0x80 */
9     0x20ac, 0x067e, 0x201a, 0x0192, 0x201e, 0x2026, 0x2020, 0x2021,
10    0x02c6, 0x2030, 0x0679, 0x2039, 0x0152, 0x0686, 0x0698, 0x0688,
11    /* 0x90 */
12    0x06af, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
13    0x06a9, 0x2122, 0x0691, 0x203a, 0x0153, 0x200c, 0x200d, 0x06ba,
14    /* 0xa0 */
15    0x00a0, 0x060c, 0x00a2, 0x00a3, 0x00a4, 0x00a5, 0x00a6, 0x00a7,
16    0x00a8, 0x00a9, 0x06be, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x00af,
17    /* 0xb0 */
18    0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x00b6, 0x00b7,
19    0x00b8, 0x00b9, 0x061b, 0x00bb, 0x00bc, 0x00bd, 0x00be, 0x061f,
20    /* 0xc0 */
21    0x06c1, 0x0621, 0x0622, 0x0623, 0x0624, 0x0625, 0x0626, 0x0627,
22    0x0628, 0x0629, 0x062a, 0x062b, 0x062c, 0x062d, 0x062e, 0x062f,
23    /* 0xd0 */
24    0x0630, 0x0631, 0x0632, 0x0633, 0x0634, 0x0635, 0x0636, 0x00d7,
25    0x0637, 0x0638, 0x0639, 0x063a, 0x0640, 0x0641, 0x0642, 0x0643,
26    /* 0xe0 */
27    0x00e0, 0x0644, 0x00e2, 0x0645, 0x0646, 0x0647, 0x0648, 0x00e7,
28    0x00e8, 0x00e9, 0x00ea, 0x00eb, 0x0649, 0x064a, 0x00ee, 0x00ef,
29    /* 0xf0 */
30    0x064b, 0x064c, 0x064d, 0x064e, 0x00f4, 0x064f, 0x0650, 0x00f7,
31    0x0651, 0x00f9, 0x0652, 0x00fb, 0x00fc, 0x200e, 0x200f, 0x06d2,
32 };
33
34 static int
35 cp1256_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
36 {
37     unsigned char c = *s;
38     if (c < 0x80)
39         *pwc = (ucs4_t) c;

```

```

40     else
41         *pwc = (ucs4_t) cp1256_2uni[c-0x80];
42     return 1;
43 }
44
45 static const unsigned char cp1256_page00[96] = {
46     0xa0, 0x00, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0xa0-0xa7 */
47     0xa8, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0xa8-0xaf */
48     0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
49     0xb8, 0xb9, 0x00, 0xbb, 0xbc, 0xbd, 0xbe, 0x00, /* 0xb8-0xbf */
50     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
51     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
52     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd7, /* 0xd0-0xd7 */
53     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
54     0xe0, 0x00, 0xe2, 0x00, 0x00, 0x00, 0x00, 0xe7, /* 0xe0-0xe7 */
55     0xe8, 0xe9, 0xea, 0xeb, 0x00, 0x00, 0xee, 0xef, /* 0xe8-0xef */
56     0x00, 0x00, 0x00, 0x00, 0xf4, 0x00, 0x00, 0xf7, /* 0xf0-0xf7 */
57     0x00, 0xf9, 0x00, 0xfb, 0xfc, 0x00, 0x00, 0x00, /* 0xf8-0xff */
58 };
59 static const unsigned char cp1256_page01[72] = {
60     0x00, 0x00, 0x8c, 0x9c, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
61     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
63     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
64     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
65     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
66     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
67     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
68     0x00, 0x00, 0x83, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
69 };
70 static const unsigned char cp1256_page06[208] = {
71     0x00, 0x00, 0x00, 0x00, 0xa1, 0x00, 0x00, 0x00, /* 0x08-0x0f */
72     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
73     0x00, 0x00, 0x00, 0xba, 0x00, 0x00, 0x00, 0xbf, /* 0x18-0x1f */
74     0x00, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x20-0x27 */
75     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x28-0x2f */
76     0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd8, /* 0x30-0x37 */
77     0xd9, 0xda, 0xdb, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
78     0xdc, 0xdd, 0xde, 0xdf, 0xe1, 0xe3, 0xe4, 0xe5, /* 0x40-0x47 */
79     0xe6, 0xec, 0xed, 0xf0, 0xf1, 0xf2, 0xf3, 0xf5, /* 0x48-0x4f */
80     0xf6, 0xf8, 0xfa, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
81     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
82     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
83     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
84     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
85     0x00, 0x8a, 0x00, 0x00, 0x00, 0x00, 0x81, 0x00, /* 0x78-0x7f */
86     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x8d, 0x00, /* 0x80-0x87 */
87     0x8f, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
88     0x00, 0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
89     0x8e, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
90     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
91     0x00, 0x98, 0x00, 0x00, 0x00, 0x00, 0x00, 0x90, /* 0xa8-0xaf */
92     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
93     0x00, 0x00, 0x9f, 0x00, 0x00, 0x00, 0xaa, 0x00, /* 0xb8-0xbf */
94     0x00, 0xc0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
95     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
96     0x00, 0x00, 0xff, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
97 };
98 static const unsigned char cp1256_page20[56] = {
99     0x00, 0x00, 0x00, 0x00, 0x9d, 0x9e, 0xfd, 0xfe, /* 0x08-0x0f */
100    0x00, 0x00, 0x00, 0x96, 0x97, 0x00, 0x00, 0x00, /* 0x10-0x17 */
101    0x91, 0x92, 0x82, 0x00, 0x93, 0x94, 0x84, 0x00, /* 0x18-0x1f */
102    0x86, 0x87, 0x95, 0x00, 0x00, 0x00, 0x85, 0x00, /* 0x20-0x27 */
103    0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
104    0x89, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
105    0x00, 0x8b, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
106 };
107
108 static int
109 cp1256_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
110 {
111     unsigned char c = 0;
112     if (wc < 0x0080) {
113         *r = wc;
114         return 1;
115     }
116     else if (wc >= 0x00a0 && wc < 0x0100)
117         c = cp1256_page00[wc-0x00a0];
118     else if (wc >= 0x0150 && wc < 0x0198)
119         c = cp1256_page01[wc-0x0150];
120     else if (wc == 0x02c6)
121         c = 0x88;
122     else if (wc >= 0x0608 && wc < 0x06d8)
123         c = cp1256_page06[wc-0x0608];
124     else if (wc >= 0x2008 && wc < 0x2040)
125         c = cp1256_page20[wc-0x2008];
126     else if (wc == 0x20ac)

```

```

127     c = 0x80;
128     else if (wc == 0x2122)
129         c = 0x99;
130     if (c != 0) {
131         *r = c;
132         return 1;
133     }
134     return RET_ILSEQ;
135 }

```

## 34.264 cp936ext.h

```

1 /*
2  * Character encoding support for the Fast Light Tool Kit (FLTK).
3  *
4  * Copyright 1998-2025 by Bill Spitzak and others.
5  *
6  * This library is free software. Distribution and use rights are outlined in
7  * the file "COPYING" which should have been included with this file. If this
8  * file is missing or damaged, see the license at:
9  *
10 *     https://www.fltk.org/COPYING.php
11 *
12 * Please see the following page on how to report bugs and issues:
13 *
14 *     https://www.fltk.org/bugs.php
15 */
16
17 #ifndef CP936
18 #ifdef NEED_TOWC
19 static int
20 cp936ext_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
21 {
22     return 0;
23 }
24 #endif /* NEED_TOWC */
25
26 #ifdef NEED_TOMB
27 static int
28 cp936ext_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
29 {
30     (void)conv; (void)r; (void)wc; (void)n;
31     return 0;
32 }
33 #endif /* NEED_TOMB */
34
35 #else /* CP936 */
36 /*
37  * CP936EXT
38  */
39 #ifdef NEED_TOWC
40
41 static const unsigned short cp936ext_2uni_page81[23766] = {
42     /* 0x81 */
43     0x4e02, 0x4e04, 0x4e05, 0x4e06, 0x4e0f, 0x4e12, 0x4e17, 0x4e1f,
44     0x4e20, 0x4e21, 0x4e23, 0x4e26, 0x4e29, 0x4e2e, 0x4e2f, 0x4e31,
45     0x4e33, 0x4e35, 0x4e37, 0x4e3c, 0x4e40, 0x4e41, 0x4e42, 0x4e44,
46     0x4e46, 0x4e4a, 0x4e51, 0x4e55, 0x4e57, 0x4e5a, 0x4e5b, 0x4e62,
47     0x4e63, 0x4e64, 0x4e65, 0x4e67, 0x4e68, 0x4e6a, 0x4e6b, 0x4e6c,
48     0x4e6d, 0x4e6e, 0x4e6f, 0x4e72, 0x4e74, 0x4e75, 0x4e76, 0x4e77,
49     0x4e78, 0x4e79, 0x4e7a, 0x4e7b, 0x4e7c, 0x4e7d, 0x4e7f, 0x4e80,
50     0x4e81, 0x4e82, 0x4e83, 0x4e84, 0x4e85, 0x4e87, 0x4e8a, 0x4e90,
51     0x4e96, 0x4e97, 0x4e99, 0x4e9c, 0x4e9d, 0x4e9e, 0x4ea3, 0x4eaa,
52     0x4eaf, 0x4eb0, 0x4eb1, 0x4eb4, 0x4eb6, 0x4eb7, 0x4eb8, 0x4eb9,
53     0x4ebc, 0x4ebd, 0x4ebe, 0x4ec8, 0x4ecc, 0x4ecf, 0x4ed0, 0x4ed2,
54     0x4eda, 0x4edb, 0x4edc, 0x4ee0, 0x4ee2, 0x4ee6, 0x4ee7, 0x4ee9,
55     0x4eed, 0x4eee, 0x4eef, 0x4ef1, 0x4ef4, 0x4ef8, 0x4ef9, 0x4efa,
56     0x4efc, 0x4efe, 0x4f00, 0x4f02, 0x4f03, 0x4f04, 0x4f05, 0x4f06,
57     0x4f07, 0x4f08, 0x4f0b, 0x4f0c, 0x4f12, 0x4f13, 0x4f14, 0x4f15,
58     0x4f16, 0x4f1c, 0x4f1d, 0x4f21, 0x4f23, 0x4f28, 0x4f29, 0x4f2c,
59     0x4f2d, 0x4f2e, 0x4f31, 0x4f33, 0x4f35, 0x4f37, 0x4f39, 0x4f3b,
60     0x4f3e, 0x4f3f, 0x4f40, 0x4f41, 0x4f42, 0x4f44, 0x4f45, 0x4f47,
61     0x4f48, 0x4f49, 0x4f4a, 0x4f4b, 0x4f4c, 0x4f52, 0x4f54, 0x4f56,
62     0x4f61, 0x4f62, 0x4f66, 0x4f68, 0x4f6a, 0x4f6b, 0x4f6d, 0x4f6e,
63     0x4f71, 0x4f72, 0x4f75, 0x4f77, 0x4f78, 0x4f79, 0x4f7a, 0x4f7d,
64     0x4f80, 0x4f81, 0x4f82, 0x4f85, 0x4f86, 0x4f87, 0x4f8a, 0x4f8c,
65     0x4f8e, 0x4f90, 0x4f92, 0x4f93, 0x4f95, 0x4f96, 0x4f98, 0x4f99,
66     0x4f9a, 0x4f9c, 0x4f9e, 0x4f9f, 0x4fa1, 0x4fa2,
67     /* 0x82 */
68     0x4fa4, 0x4fab, 0x4fad, 0x4fb0, 0x4fb1, 0x4fb2, 0x4fb3, 0x4fb4,
69     0x4fb6, 0x4fb7, 0x4fb8, 0x4fb9, 0x4fba, 0x4fbb, 0x4fbc, 0x4fbd,
70     0x4fbe, 0x4fc0, 0x4fc1, 0x4fc2, 0x4fc6, 0x4fc7, 0x4fc8, 0x4fc9,
71     0x4fcb, 0x4fcc, 0x4fcd, 0x4fd2, 0x4fd3, 0x4fd4, 0x4fd5, 0x4fd6,
72     0x4fd9, 0x4fdb, 0x4fe0, 0x4fe2, 0x4fe4, 0x4fe5, 0x4fe7, 0x4feb,
73     0x4fec, 0x4ff0, 0x4ff2, 0x4ff4, 0x4ff5, 0x4ff6, 0x4ff7, 0x4ff9,

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```
74 0x4ffb, 0x4ffc, 0x4ffd, 0x4fff, 0x5000, 0x5001, 0x5002, 0x5003,
75 0x5004, 0x5005, 0x5006, 0x5007, 0x5008, 0x5009, 0x500a, 0x500b,
76 0x500e, 0x5010, 0x5011, 0x5013, 0x5015, 0x5016, 0x5017, 0x501b,
77 0x501d, 0x501e, 0x5020, 0x5022, 0x5023, 0x5024, 0x5027, 0x502b,
78 0x502f, 0x5030, 0x5031, 0x5032, 0x5033, 0x5034, 0x5035, 0x5036,
79 0x5037, 0x5038, 0x5039, 0x503b, 0x503d, 0x503f, 0x5040, 0x5041,
80 0x5042, 0x5044, 0x5045, 0x5046, 0x5049, 0x504a, 0x504b, 0x504d,
81 0x5050, 0x5051, 0x5052, 0x5053, 0x5054, 0x5056, 0x5057, 0x5058,
82 0x5059, 0x505b, 0x505d, 0x505e, 0x505f, 0x5060, 0x5061, 0x5062,
83 0x5063, 0x5064, 0x5066, 0x5067, 0x5068, 0x5069, 0x506a, 0x506b,
84 0x506d, 0x506e, 0x506f, 0x5070, 0x5071, 0x5072, 0x5073, 0x5074,
85 0x5075, 0x5078, 0x5079, 0x507a, 0x507c, 0x507d, 0x5081, 0x5082,
86 0x5083, 0x5084, 0x5086, 0x5087, 0x5089, 0x508a, 0x508b, 0x508c,
87 0x508e, 0x508f, 0x5090, 0x5091, 0x5092, 0x5093, 0x5094, 0x5095,
88 0x5096, 0x5097, 0x5098, 0x5098, 0x5099, 0x509a, 0x509b, 0x509c, 0x509d,
89 0x509e, 0x509f, 0x50a0, 0x50a1, 0x50a2, 0x50a4, 0x50a6, 0x50aa,
90 0x50ab, 0x50ad, 0x50ae, 0x50af, 0x50b0, 0x50b1, 0x50b3, 0x50b4,
91 0x50b5, 0x50b6, 0x50b7, 0x50b8, 0x50b9, 0x50bc,
92 /* 0x83 */
93 0x50bd, 0x50be, 0x50bf, 0x50c0, 0x50c1, 0x50c2, 0x50c3, 0x50c4,
94 0x50c5, 0x50c6, 0x50c7, 0x50c8, 0x50c9, 0x50ca, 0x50cb, 0x50cc,
95 0x50cd, 0x50ce, 0x50d0, 0x50d1, 0x50d2, 0x50d3, 0x50d4, 0x50d5,
96 0x50d7, 0x50d8, 0x50d9, 0x50db, 0x50dc, 0x50dd, 0x50de, 0x50df,
97 0x50e0, 0x50e1, 0x50e2, 0x50e3, 0x50e4, 0x50e5, 0x50e8, 0x50e9,
98 0x50ea, 0x50eb, 0x50ef, 0x50f0, 0x50f1, 0x50f2, 0x50f4, 0x50f6,
99 0x50f7, 0x50f8, 0x50f9, 0x50fa, 0x50fc, 0x50fd, 0x50fe, 0x50ff,
100 0x5100, 0x5101, 0x5102, 0x5103, 0x5104, 0x5105, 0x5108, 0x5109,
101 0x510a, 0x510c, 0x510d, 0x510e, 0x510f, 0x5110, 0x5111, 0x5113,
102 0x5114, 0x5115, 0x5116, 0x5117, 0x5118, 0x5119, 0x511a, 0x511b,
103 0x511c, 0x511d, 0x511e, 0x511f, 0x5120, 0x5122, 0x5123, 0x5124,
104 0x5125, 0x5126, 0x5127, 0x5128, 0x5129, 0x512a, 0x512b, 0x512c,
105 0x512d, 0x512e, 0x512f, 0x5130, 0x5131, 0x5132, 0x5133, 0x5134,
106 0x5135, 0x5136, 0x5137, 0x5138, 0x5139, 0x513a, 0x513b, 0x513c,
107 0x513d, 0x513e, 0x5142, 0x5147, 0x514a, 0x514c, 0x514e, 0x514f,
108 0x5150, 0x5152, 0x5153, 0x5157, 0x5158, 0x5159, 0x515b, 0x515d,
109 0x515e, 0x515f, 0x5160, 0x5161, 0x5163, 0x5164, 0x5166, 0x5167,
110 0x5169, 0x516a, 0x516f, 0x5172, 0x517a, 0x517e, 0x517f, 0x5183,
111 0x5184, 0x5186, 0x5187, 0x518a, 0x518b, 0x518e, 0x518f, 0x5190,
112 0x5191, 0x5193, 0x5194, 0x5198, 0x519a, 0x519d, 0x519e, 0x519f,
113 0x51a1, 0x51a3, 0x51a6, 0x51a7, 0x51a8, 0x51a9, 0x51aa, 0x51ad,
114 0x51ae, 0x51b4, 0x51b8, 0x51b9, 0x51ba, 0x51be, 0x51bf, 0x51c1,
115 0x51c2, 0x51c3, 0x51c5, 0x51c8, 0x51ca, 0x51cd, 0x51ce, 0x51d0,
116 0x51d2, 0x51d3, 0x51d4, 0x51d5, 0x51d6, 0x51d7,
117 /* 0x84 */
118 0x51d8, 0x51d9, 0x51da, 0x51dc, 0x51de, 0x51df, 0x51e2, 0x51e3,
119 0x51e5, 0x51e6, 0x51e7, 0x51e8, 0x51e9, 0x51ea, 0x51ec, 0x51ee,
120 0x51f1, 0x51f2, 0x51f4, 0x51f7, 0x51fe, 0x5204, 0x5205, 0x5209,
121 0x520b, 0x520c, 0x520f, 0x5210, 0x5213, 0x5214, 0x5215, 0x521c,
122 0x521e, 0x521f, 0x5221, 0x5222, 0x5223, 0x5225, 0x5226, 0x5227,
123 0x522a, 0x522c, 0x522f, 0x5231, 0x5232, 0x5234, 0x5235, 0x523c,
124 0x523e, 0x5244, 0x5245, 0x5246, 0x5247, 0x5248, 0x5249, 0x524b,
125 0x524e, 0x524f, 0x5252, 0x5253, 0x5255, 0x5257, 0x5258, 0x5259,
126 0x525a, 0x525b, 0x525d, 0x525f, 0x5260, 0x5262, 0x5263, 0x5264,
127 0x5266, 0x5268, 0x526b, 0x526c, 0x526d, 0x526e, 0x5270, 0x5271,
128 0x5273, 0x5274, 0x5275, 0x5276, 0x5277, 0x5278, 0x5279, 0x527a,
129 0x527b, 0x527c, 0x527e, 0x5280, 0x5283, 0x5284, 0x5285, 0x5286,
130 0x5287, 0x5289, 0x528a, 0x528b, 0x528c, 0x528d, 0x528e, 0x528f,
131 0x5291, 0x5292, 0x5294, 0x5295, 0x5296, 0x5297, 0x5298, 0x5299,
132 0x529a, 0x529c, 0x52a4, 0x52a5, 0x52a6, 0x52a7, 0x52ae, 0x52af,
133 0x52b0, 0x52b4, 0x52b5, 0x52b6, 0x52b7, 0x52b8, 0x52b9, 0x52ba,
134 0x52bb, 0x52bc, 0x52bd, 0x52c0, 0x52c1, 0x52c2, 0x52c4, 0x52c5,
135 0x52c6, 0x52c8, 0x52ca, 0x52cc, 0x52cd, 0x52ce, 0x52cf, 0x52d1,
136 0x52d3, 0x52d4, 0x52d5, 0x52d7, 0x52d9, 0x52da, 0x52db, 0x52dc,
137 0x52dd, 0x52de, 0x52e0, 0x52e1, 0x52e2, 0x52e3, 0x52e5, 0x52e6,
138 0x52e7, 0x52e8, 0x52e9, 0x52ea, 0x52eb, 0x52ec, 0x52ed, 0x52ee,
139 0x52ef, 0x52f1, 0x52f2, 0x52f3, 0x52f4, 0x52f5, 0x52f6, 0x52f7,
140 0x52f8, 0x52fb, 0x52fc, 0x52fd, 0x5301, 0x5302, 0x5303, 0x5304,
141 0x5307, 0x5309, 0x530a, 0x530b, 0x530c, 0x530e,
142 /* 0x85 */
143 0x5311, 0x5312, 0x5313, 0x5314, 0x5318, 0x531b, 0x531c, 0x531e,
144 0x531f, 0x5322, 0x5324, 0x5325, 0x5327, 0x5328, 0x5329, 0x532b,
145 0x532c, 0x532d, 0x532f, 0x5330, 0x5331, 0x5332, 0x5333, 0x5334,
146 0x5335, 0x5336, 0x5337, 0x5338, 0x533c, 0x533d, 0x5340, 0x5342,
147 0x5344, 0x5346, 0x534b, 0x534c, 0x534d, 0x5350, 0x5354, 0x5358,
148 0x5359, 0x535b, 0x535d, 0x5365, 0x5368, 0x536a, 0x536c, 0x536d,
149 0x5372, 0x5376, 0x5379, 0x537b, 0x537c, 0x537d, 0x537e, 0x5380,
150 0x5381, 0x5383, 0x5387, 0x5388, 0x538a, 0x538e, 0x538f, 0x5390,
151 0x5391, 0x5392, 0x5393, 0x5394, 0x5396, 0x5397, 0x5399, 0x539b,
152 0x539c, 0x539e, 0x53a0, 0x53a1, 0x53a4, 0x53a7, 0x53aa, 0x53ab,
153 0x53ac, 0x53ad, 0x53af, 0x53b0, 0x53b1, 0x53b2, 0x53b3, 0x53b4,
154 0x53b5, 0x53b7, 0x53b8, 0x53b9, 0x53ba, 0x53bc, 0x53bd, 0x53be,
155 0x53c0, 0x53c3, 0x53c4, 0x53c5, 0x53c6, 0x53c7, 0x53ce, 0x53cf,
156 0x53d0, 0x53d2, 0x53d3, 0x53d5, 0x53da, 0x53dc, 0x53dd, 0x53de,
157 0x53e1, 0x53e2, 0x53e7, 0x53f4, 0x53fa, 0x53fe, 0x53ff, 0x5400,
158 0x5402, 0x5405, 0x5407, 0x540b, 0x5414, 0x5418, 0x5419, 0x541a,
159 0x541c, 0x5422, 0x5424, 0x5425, 0x542a, 0x5430, 0x5433, 0x5436,
160 0x5437, 0x543a, 0x543d, 0x543f, 0x5441, 0x5442, 0x5444, 0x5445,
```

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161 0x5447, 0x5449, 0x544c, 0x544d, 0x544e, 0x544f, 0x5451, 0x545a,
162 0x545d, 0x545e, 0x545f, 0x5460, 0x5461, 0x5463, 0x5465, 0x5467,
163 0x5469, 0x546a, 0x546b, 0x546c, 0x546d, 0x546e, 0x546f, 0x5470,
164 0x5474, 0x5479, 0x547a, 0x547e, 0x547f, 0x5481, 0x5483, 0x5485,
165 0x5487, 0x5488, 0x5489, 0x548a, 0x548d, 0x5491, 0x5493, 0x5497,
166 0x5498, 0x549c, 0x549e, 0x549f, 0x54a0, 0x54a1,
167 /* 0x86 */
168 0x54a2, 0x54a5, 0x54ae, 0x54b0, 0x54b2, 0x54b5, 0x54b6, 0x54b7,
169 0x54b9, 0x54ba, 0x54bc, 0x54be, 0x54c3, 0x54c5, 0x54ca, 0x54cb,
170 0x54d6, 0x54d8, 0x54db, 0x54e0, 0x54e1, 0x54e2, 0x54e3, 0x54e4,
171 0x54eb, 0x54ec, 0x54ef, 0x54f0, 0x54f1, 0x54f4, 0x54f5, 0x54f6,
172 0x54f7, 0x54f8, 0x54f9, 0x54fb, 0x54fe, 0x5500, 0x5502, 0x5503,
173 0x5504, 0x5505, 0x5508, 0x550a, 0x550b, 0x550c, 0x550d, 0x550e,
174 0x5512, 0x5513, 0x5515, 0x5516, 0x5517, 0x5518, 0x5519, 0x551a,
175 0x551c, 0x551d, 0x551e, 0x551f, 0x5521, 0x5525, 0x5526, 0x5528,
176 0x5529, 0x552b, 0x552d, 0x5532, 0x5534, 0x5535, 0x5536, 0x5538,
177 0x5539, 0x553a, 0x553b, 0x553d, 0x5540, 0x5542, 0x5545, 0x5547,
178 0x5548, 0x554b, 0x554c, 0x554d, 0x554e, 0x554f, 0x5551, 0x5552,
179 0x5553, 0x5554, 0x5557, 0x5558, 0x5559, 0x555a, 0x555b, 0x555d,
180 0x555e, 0x555f, 0x5560, 0x5562, 0x5563, 0x5568, 0x5569, 0x556b,
181 0x556f, 0x5570, 0x5571, 0x5572, 0x5573, 0x5574, 0x5579, 0x557a,
182 0x557d, 0x557f, 0x5585, 0x5586, 0x558c, 0x558d, 0x558e, 0x5590,
183 0x5592, 0x5593, 0x5595, 0x5596, 0x5597, 0x559a, 0x559b, 0x559e,
184 0x55a0, 0x55a1, 0x55a2, 0x55a3, 0x55a4, 0x55a5, 0x55a6, 0x55a8,
185 0x55a9, 0x55aa, 0x55ab, 0x55ac, 0x55ad, 0x55ae, 0x55af, 0x55b0,
186 0x55b2, 0x55b4, 0x55b6, 0x55b8, 0x55ba, 0x55bc, 0x55bf, 0x55c0,
187 0x55c1, 0x55c2, 0x55c3, 0x55c6, 0x55c7, 0x55c8, 0x55ca, 0x55cb,
188 0x55ce, 0x55cf, 0x55d0, 0x55d5, 0x55d7, 0x55d8, 0x55d9, 0x55da,
189 0x55db, 0x55de, 0x55e0, 0x55e2, 0x55e7, 0x55e9, 0x55ed, 0x55ee,
190 0x55f0, 0x55f1, 0x55f4, 0x55f6, 0x55f8, 0x55f9, 0x55fa, 0x55fb,
191 0x55fc, 0x55ff, 0x5602, 0x5603, 0x5604, 0x5605,
192 /* 0x87 */
193 0x5606, 0x5607, 0x560a, 0x560b, 0x560d, 0x5610, 0x5611, 0x5612,
194 0x5613, 0x5614, 0x5615, 0x5616, 0x5617, 0x5619, 0x561a, 0x561c,
195 0x561d, 0x5620, 0x5621, 0x5622, 0x5625, 0x5626, 0x5628, 0x5629,
196 0x562a, 0x562b, 0x562e, 0x562f, 0x5630, 0x5633, 0x5635, 0x5637,
197 0x5638, 0x563a, 0x563c, 0x563d, 0x563e, 0x5640, 0x5641, 0x5642,
198 0x5643, 0x5644, 0x5645, 0x5646, 0x5647, 0x5648, 0x5649, 0x564a,
199 0x564b, 0x564f, 0x5650, 0x5651, 0x5652, 0x5653, 0x5655, 0x5656,
200 0x565a, 0x565b, 0x565d, 0x565e, 0x565f, 0x5660, 0x5661, 0x5663,
201 0x5665, 0x5666, 0x5667, 0x566d, 0x566e, 0x566f, 0x5670, 0x5672,
202 0x5673, 0x5674, 0x5675, 0x5677, 0x5678, 0x5679, 0x567a, 0x567d,
203 0x567e, 0x567f, 0x5680, 0x5681, 0x5682, 0x5683, 0x5684, 0x5687,
204 0x5688, 0x5689, 0x568a, 0x568b, 0x568c, 0x568d, 0x5690, 0x5691,
205 0x5692, 0x5694, 0x5695, 0x5696, 0x5697, 0x5698, 0x5699, 0x569a,
206 0x569b, 0x569c, 0x569d, 0x569e, 0x569f, 0x56a0, 0x56a1, 0x56a2,
207 0x56a4, 0x56a5, 0x56a6, 0x56a7, 0x56a8, 0x56a9, 0x56aa, 0x56ab,
208 0x56ac, 0x56ad, 0x56ae, 0x56b0, 0x56b1, 0x56b2, 0x56b3, 0x56b4,
209 0x56b5, 0x56b6, 0x56b8, 0x56b9, 0x56ba, 0x56bb, 0x56bd, 0x56be,
210 0x56bf, 0x56c0, 0x56c1, 0x56c2, 0x56c3, 0x56c4, 0x56c5, 0x56c6,
211 0x56c7, 0x56c8, 0x56c9, 0x56cb, 0x56cc, 0x56cd, 0x56ce, 0x56cf,
212 0x56d0, 0x56d1, 0x56d2, 0x56d3, 0x56d5, 0x56d6, 0x56d8, 0x56d9,
213 0x56dc, 0x56e3, 0x56e5, 0x56e6, 0x56e7, 0x56e8, 0x56e9, 0x56ea,
214 0x56ec, 0x56ee, 0x56ef, 0x56f2, 0x56f3, 0x56f6, 0x56f7, 0x56f8,
215 0x56fb, 0x56fc, 0x5700, 0x5701, 0x5702, 0x5705, 0x5707, 0x570b,
216 0x570c, 0x570d, 0x570e, 0x570f, 0x5710, 0x5711,
217 /* 0x88 */
218 0x5712, 0x5713, 0x5714, 0x5715, 0x5716, 0x5717, 0x5718, 0x5719,
219 0x571a, 0x571b, 0x571d, 0x571e, 0x5720, 0x5721, 0x5722, 0x5724,
220 0x5725, 0x5726, 0x5727, 0x572b, 0x5731, 0x5732, 0x5734, 0x5735,
221 0x5736, 0x5737, 0x5738, 0x573c, 0x573d, 0x573f, 0x5741, 0x5743,
222 0x5744, 0x5745, 0x5746, 0x5748, 0x5749, 0x574b, 0x5752, 0x5753,
223 0x5754, 0x5755, 0x5756, 0x5758, 0x5759, 0x5762, 0x5763, 0x5765,
224 0x5767, 0x576c, 0x576e, 0x5770, 0x5771, 0x5772, 0x5774, 0x5775,
225 0x5778, 0x5779, 0x577a, 0x577d, 0x577e, 0x577f, 0x5780, 0x5781,
226 0x5787, 0x5788, 0x5789, 0x578a, 0x578d, 0x578e, 0x578f, 0x5790,
227 0x5791, 0x5794, 0x5795, 0x5796, 0x5797, 0x5798, 0x5799, 0x579a,
228 0x579c, 0x579d, 0x579e, 0x579f, 0x57a5, 0x57a8, 0x57aa, 0x57ac,
229 0x57af, 0x57b0, 0x57b1, 0x57b3, 0x57b5, 0x57b6, 0x57b7, 0x57b9,
230 0x57ba, 0x57bb, 0x57bc, 0x57bd, 0x57be, 0x57bf, 0x57c0, 0x57c1,
231 0x57c4, 0x57c5, 0x57c6, 0x57c7, 0x57c8, 0x57c9, 0x57ca, 0x57cc,
232 0x57cd, 0x57d0, 0x57d1, 0x57d3, 0x57d6, 0x57d7, 0x57db, 0x57dc,
233 0x57de, 0x57e1, 0x57e2, 0x57e3, 0x57e5, 0x57e6, 0x57e7, 0x57e8,
234 0x57e9, 0x57ea, 0x57eb, 0x57ec, 0x57ee, 0x57f0, 0x57f1, 0x57f2,
235 0x57f3, 0x57f5, 0x57f6, 0x57f7, 0x57fb, 0x57fc, 0x57fe, 0x57ff,
236 0x5801, 0x5803, 0x5804, 0x5805, 0x5808, 0x5809, 0x580a, 0x580c,
237 0x580e, 0x580f, 0x5810, 0x5812, 0x5813, 0x5814, 0x5816, 0x5817,
238 0x5818, 0x581a, 0x581b, 0x581c, 0x581d, 0x581f, 0x5822, 0x5823,
239 0x5825, 0x5826, 0x5827, 0x5828, 0x5829, 0x582b, 0x582c, 0x582d,
240 0x582e, 0x582f, 0x5831, 0x5832, 0x5833, 0x5834, 0x5836, 0x5837,
241 0x5838, 0x5839, 0x583a, 0x583b, 0x583c, 0x583d,
242 /* 0x89 */
243 0x583e, 0x583f, 0x5840, 0x5841, 0x5842, 0x5843, 0x5845, 0x5846,
244 0x5847, 0x5848, 0x5849, 0x584a, 0x584b, 0x584e, 0x584f, 0x5850,
245 0x5852, 0x5853, 0x5855, 0x5856, 0x5857, 0x5859, 0x585a, 0x585b,
246 0x585c, 0x585d, 0x585f, 0x5860, 0x5861, 0x5862, 0x5863, 0x5864,
247 0x5866, 0x5867, 0x5868, 0x5869, 0x586a, 0x586d, 0x586e, 0x586f,
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248 0x5870, 0x5871, 0x5872, 0x5873, 0x5874, 0x5875, 0x5876, 0x5877,
249 0x5878, 0x5879, 0x587a, 0x587b, 0x587c, 0x587d, 0x587f, 0x5882,
250 0x5884, 0x5886, 0x5887, 0x5888, 0x588a, 0x588b, 0x588c, 0x588d,
251 0x588e, 0x588f, 0x5890, 0x5891, 0x5894, 0x5895, 0x5896, 0x5897,
252 0x5898, 0x589b, 0x589c, 0x589d, 0x58a0, 0x58a1, 0x58a2, 0x58a3,
253 0x58a4, 0x58a5, 0x58a6, 0x58a7, 0x58aa, 0x58ab, 0x58ac, 0x58ad,
254 0x58ae, 0x58af, 0x58b0, 0x58b1, 0x58b2, 0x58b3, 0x58b4, 0x58b5,
255 0x58b6, 0x58b7, 0x58b8, 0x58b9, 0x58ba, 0x58bb, 0x58bd, 0x58be,
256 0x58bf, 0x58c0, 0x58c2, 0x58c3, 0x58c4, 0x58c6, 0x58c7, 0x58c8,
257 0x58c9, 0x58ca, 0x58cb, 0x58cc, 0x58cd, 0x58ce, 0x58cf, 0x58d0,
258 0x58d2, 0x58d3, 0x58d4, 0x58d6, 0x58d7, 0x58d8, 0x58d9, 0x58da,
259 0x58db, 0x58dc, 0x58dd, 0x58de, 0x58df, 0x58e0, 0x58e1, 0x58e2,
260 0x58e3, 0x58e5, 0x58e6, 0x58e7, 0x58e8, 0x58e9, 0x58ea, 0x58ed,
261 0x58ef, 0x58f1, 0x58f2, 0x58f4, 0x58f5, 0x58f7, 0x58f8, 0x58fa,
262 0x58fb, 0x58fc, 0x58fd, 0x58fe, 0x58ff, 0x5900, 0x5901, 0x5903,
263 0x5905, 0x5906, 0x5908, 0x5909, 0x590a, 0x590b, 0x590c, 0x590e,
264 0x5910, 0x5911, 0x5912, 0x5913, 0x5917, 0x5918, 0x591b, 0x591d,
265 0x591e, 0x5920, 0x5921, 0x5922, 0x5923, 0x5926, 0x5928, 0x592c,
266 0x5930, 0x5932, 0x5933, 0x5935, 0x5936, 0x593b,
267 /* 0x8a */
268 0x593d, 0x593e, 0x593f, 0x5940, 0x5943, 0x5945, 0x5946, 0x594a,
269 0x594c, 0x594d, 0x5950, 0x5952, 0x5953, 0x5959, 0x595b, 0x595c,
270 0x595d, 0x595e, 0x595f, 0x5961, 0x5963, 0x5964, 0x5966, 0x5967,
271 0x5968, 0x5969, 0x596a, 0x596b, 0x596c, 0x596d, 0x596e, 0x596f,
272 0x5970, 0x5971, 0x5972, 0x5975, 0x5977, 0x597a, 0x597b, 0x597c,
273 0x597e, 0x597f, 0x5980, 0x5985, 0x5989, 0x598b, 0x598c, 0x598e,
274 0x598f, 0x5990, 0x5991, 0x5994, 0x5995, 0x5998, 0x599a, 0x599b,
275 0x599c, 0x599d, 0x599f, 0x59a0, 0x59a1, 0x59a2, 0x59a6, 0x59a7,
276 0x59ac, 0x59ad, 0x59b0, 0x59b1, 0x59b3, 0x59b4, 0x59b5, 0x59b6,
277 0x59b7, 0x59b8, 0x59ba, 0x59bc, 0x59bd, 0x59bf, 0x59c0, 0x59c1,
278 0x59c2, 0x59c3, 0x59c4, 0x59c5, 0x59c7, 0x59c8, 0x59c9, 0x59cc,
279 0x59cd, 0x59ce, 0x59cf, 0x59d5, 0x59d6, 0x59d9, 0x59db, 0x59de,
280 0x59df, 0x59e0, 0x59e1, 0x59e2, 0x59e4, 0x59e6, 0x59e7, 0x59e9,
281 0x59ea, 0x59eb, 0x59ed, 0x59ee, 0x59ef, 0x59f0, 0x59f1, 0x59f2,
282 0x59f3, 0x59f4, 0x59f5, 0x59f6, 0x59f7, 0x59f8, 0x59fa, 0x59fc,
283 0x59fd, 0x59fe, 0x5a00, 0x5a02, 0x5a0a, 0x5a0b, 0x5a0d, 0x5a0e,
284 0x5a0f, 0x5a10, 0x5a12, 0x5a14, 0x5a15, 0x5a16, 0x5a17, 0x5a19,
285 0x5a1a, 0x5a1b, 0x5a1d, 0x5a1e, 0x5a21, 0x5a22, 0x5a24, 0x5a26,
286 0x5a27, 0x5a28, 0x5a2a, 0x5a2b, 0x5a2c, 0x5a2d, 0x5a2e, 0x5a2f,
287 0x5a30, 0x5a33, 0x5a35, 0x5a37, 0x5a38, 0x5a39, 0x5a3a, 0x5a3b,
288 0x5a3d, 0x5a3e, 0x5a3f, 0x5a41, 0x5a42, 0x5a43, 0x5a44, 0x5a45,
289 0x5a47, 0x5a48, 0x5a4b, 0x5a4c, 0x5a4d, 0x5a4e, 0x5a4f, 0x5a50,
290 0x5a51, 0x5a52, 0x5a53, 0x5a54, 0x5a56, 0x5a57, 0x5a58, 0x5a59,
291 0x5a5b, 0x5a5c, 0x5a5d, 0x5a5e, 0x5a5f, 0x5a60,
292 /* 0x8b */
293 0x5a61, 0x5a63, 0x5a64, 0x5a65, 0x5a66, 0x5a68, 0x5a69, 0x5a6b,
294 0x5a6c, 0x5a6d, 0x5a6e, 0x5a6f, 0x5a70, 0x5a71, 0x5a72, 0x5a73,
295 0x5a78, 0x5a79, 0x5a7b, 0x5a7c, 0x5a7d, 0x5a7e, 0x5a80, 0x5a81,
296 0x5a82, 0x5a83, 0x5a84, 0x5a85, 0x5a86, 0x5a87, 0x5a88, 0x5a89,
297 0x5a8a, 0x5a8b, 0x5a8c, 0x5a8d, 0x5a8e, 0x5a8f, 0x5a90, 0x5a91,
298 0x5a93, 0x5a94, 0x5a95, 0x5a96, 0x5a97, 0x5a98, 0x5a99, 0x5a9c,
299 0x5a9d, 0x5a9e, 0x5a9f, 0x5aa0, 0x5aa1, 0x5aa2, 0x5aa3, 0x5aa4,
300 0x5aa5, 0x5aa6, 0x5aa7, 0x5aa8, 0x5aa9, 0x5aab, 0x5aac, 0x5aad,
301 0x5aae, 0x5aaf, 0x5ab0, 0x5ab1, 0x5ab4, 0x5ab6, 0x5ab7, 0x5ab9,
302 0x5aba, 0x5abb, 0x5abc, 0x5abd, 0x5abf, 0x5ac0, 0x5ac3, 0x5ac4,
303 0x5ac5, 0x5ac6, 0x5ac7, 0x5ac8, 0x5aca, 0x5acb, 0x5acd, 0x5ace,
304 0x5acf, 0x5ad0, 0x5ad1, 0x5ad3, 0x5ad5, 0x5ad7, 0x5ad9, 0x5ada,
305 0x5adb, 0x5add, 0x5ade, 0x5adf, 0x5ae2, 0x5ae4, 0x5ae5, 0x5ae7,
306 0x5ae8, 0x5aea, 0x5aee, 0x5aed, 0x5aef, 0x5af0, 0x5af2,
307 0x5af3, 0x5af4, 0x5af5, 0x5af6, 0x5af7, 0x5af8, 0x5af9, 0x5afa,
308 0x5afb, 0x5afc, 0x5afd, 0x5afe, 0x5aff, 0x5b00, 0x5b01, 0x5b02,
309 0x5b03, 0x5b04, 0x5b05, 0x5b06, 0x5b07, 0x5b08, 0x5b0a, 0x5b0b,
310 0x5b0c, 0x5b0d, 0x5b0e, 0x5b0f, 0x5b10, 0x5b11, 0x5b12, 0x5b13,
311 0x5b14, 0x5b15, 0x5b18, 0x5b19, 0x5b1a, 0x5b1b, 0x5b1c, 0x5b1d,
312 0x5b1e, 0x5b1f, 0x5b20, 0x5b21, 0x5b22, 0x5b23, 0x5b24, 0x5b25,
313 0x5b26, 0x5b27, 0x5b28, 0x5b29, 0x5b2a, 0x5b2b, 0x5b2c, 0x5b2d,
314 0x5b2e, 0x5b2f, 0x5b30, 0x5b31, 0x5b33, 0x5b35, 0x5b36, 0x5b38,
315 0x5b39, 0x5b3a, 0x5b3b, 0x5b3c, 0x5b3d, 0x5b3e, 0x5b3f, 0x5b41,
316 0x5b42, 0x5b43, 0x5b44, 0x5b45, 0x5b46, 0x5b47,
317 /* 0x8c */
318 0x5b48, 0x5b49, 0x5b4a, 0x5b4b, 0x5b4c, 0x5b4d, 0x5b4e, 0x5b4f,
319 0x5b52, 0x5b56, 0x5b5e, 0x5b60, 0x5b61, 0x5b67, 0x5b68, 0x5b6b,
320 0x5b6d, 0x5b6e, 0x5b6f, 0x5b72, 0x5b74, 0x5b76, 0x5b77, 0x5b78,
321 0x5b79, 0x5b7b, 0x5b7c, 0x5b7e, 0x5b7f, 0x5b82, 0x5b86, 0x5b8a,
322 0x5b8d, 0x5b8e, 0x5b90, 0x5b91, 0x5b92, 0x5b94, 0x5b96, 0x5b9f,
323 0x5ba7, 0x5ba8, 0x5ba9, 0x5bac, 0x5bad, 0x5bae, 0x5baf, 0x5bb1,
324 0x5bb2, 0x5bb7, 0x5bba, 0x5bbb, 0x5bbc, 0x5bc0, 0x5bc1, 0x5bc3,
325 0x5bc8, 0x5bc9, 0x5bcb, 0x5bcd, 0x5bce, 0x5bcf, 0x5bd1,
326 0x5bd4, 0x5bd5, 0x5bd6, 0x5bd7, 0x5bd8, 0x5bd9, 0x5bda, 0x5bdb,
327 0x5bdc, 0x5be0, 0x5be2, 0x5be3, 0x5be6, 0x5be7, 0x5be9, 0x5bea,
328 0x5beb, 0x5bec, 0x5bed, 0x5bef, 0x5bf1, 0x5bf2, 0x5bf3, 0x5bf4,
329 0x5bf5, 0x5bf6, 0x5bf7, 0x5bfd, 0x5bfe, 0x5c00, 0x5c02, 0x5c03,
330 0x5c05, 0x5c07, 0x5c08, 0x5c0b, 0x5c0c, 0x5c0d, 0x5c0e, 0x5c10,
331 0x5c12, 0x5c13, 0x5c17, 0x5c19, 0x5c1b, 0x5c1e, 0x5c1f, 0x5c20,
332 0x5c21, 0x5c23, 0x5c26, 0x5c28, 0x5c29, 0x5c2a, 0x5c2b, 0x5c2d,
333 0x5c2e, 0x5c2f, 0x5c30, 0x5c32, 0x5c33, 0x5c35, 0x5c36, 0x5c37,
334 0x5c43, 0x5c44, 0x5c46, 0x5c47, 0x5c4c, 0x5c4d, 0x5c52, 0x5c53,

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336 0x5c5f, 0x5c62, 0x5c64, 0x5c67, 0x5c68, 0x5c69, 0x5c6a, 0x5c6b,
337 0x5c6c, 0x5c6d, 0x5c6d, 0x5c70, 0x5c72, 0x5c73, 0x5c74, 0x5c75, 0x5c76,
338 0x5c77, 0x5c78, 0x5c7b, 0x5c7c, 0x5c7d, 0x5c7e, 0x5c80, 0x5c83,
339 0x5c84, 0x5c85, 0x5c86, 0x5c87, 0x5c89, 0x5c8a, 0x5c8b, 0x5c8e,
340 0x5c8f, 0x5c92, 0x5c93, 0x5c95, 0x5c9d, 0x5c9e, 0x5c9f, 0x5ca0,
341 0x5ca1, 0x5ca4, 0x5ca5, 0x5ca6, 0x5ca7, 0x5ca8,
342 /* 0x8d */
343 0x5caa, 0x5cae, 0x5caf, 0x5cb0, 0x5cb2, 0x5cb4, 0x5cb6, 0x5cb9,
344 0x5cba, 0x5cbb, 0x5cbc, 0x5cbe, 0x5cc0, 0x5cc2, 0x5cc3, 0x5cc5,
345 0x5cc6, 0x5cc7, 0x5cc8, 0x5cc9, 0x5cca, 0x5ccc, 0x5ccd, 0x5cce,
346 0x5ccf, 0x5cd0, 0x5cd1, 0x5cd3, 0x5cd4, 0x5cd5, 0x5cd6, 0x5cd7,
347 0x5cd8, 0x5cda, 0x5cdb, 0x5cdc, 0x5cdd, 0x5cde, 0x5cdf, 0x5ce0,
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349 0x5cf1, 0x5cf2, 0x5cf3, 0x5cf4, 0x5cf5, 0x5cf6, 0x5cf7, 0x5cf8,
350 0x5cf9, 0x5cfa, 0x5cfc, 0x5cfd, 0x5cfe, 0x5cff, 0x5d00, 0x5d01,
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352 0x5d0f, 0x5d10, 0x5d11, 0x5d12, 0x5d13, 0x5d15, 0x5d17, 0x5d18,
353 0x5d19, 0x5d1a, 0x5d1c, 0x5d1d, 0x5d1f, 0x5d20, 0x5d21, 0x5d22,
354 0x5d23, 0x5d25, 0x5d28, 0x5d2a, 0x5d2b, 0x5d2c, 0x5d2f, 0x5d30,
355 0x5d31, 0x5d32, 0x5d33, 0x5d35, 0x5d36, 0x5d37, 0x5d38, 0x5d39,
356 0x5d3a, 0x5d3b, 0x5d3c, 0x5d3f, 0x5d40, 0x5d41, 0x5d42, 0x5d43,
357 0x5d44, 0x5d45, 0x5d46, 0x5d48, 0x5d49, 0x5d4d, 0x5d4e, 0x5d4f,
358 0x5d50, 0x5d51, 0x5d52, 0x5d53, 0x5d54, 0x5d55, 0x5d56, 0x5d57,
359 0x5d59, 0x5d5a, 0x5d5c, 0x5d5e, 0x5d5f, 0x5d60, 0x5d61, 0x5d62,
360 0x5d63, 0x5d64, 0x5d65, 0x5d66, 0x5d67, 0x5d68, 0x5d6a, 0x5d6d,
361 0x5d6e, 0x5d70, 0x5d71, 0x5d72, 0x5d73, 0x5d75, 0x5d76, 0x5d77,
362 0x5d78, 0x5d79, 0x5d7a, 0x5d7b, 0x5d7c, 0x5d7d, 0x5d7e, 0x5d7f,
363 0x5d80, 0x5d81, 0x5d83, 0x5d84, 0x5d85, 0x5d86, 0x5d87, 0x5d88,
364 0x5d89, 0x5d8a, 0x5d8b, 0x5d8c, 0x5d8d, 0x5d8e, 0x5d8f, 0x5d90,
365 0x5d91, 0x5d92, 0x5d93, 0x5d94, 0x5d95, 0x5d96, 0x5d97, 0x5d98,
366 0x5d9a, 0x5d9b, 0x5d9c, 0x5d9e, 0x5d9f, 0x5da0,
367 /* 0x8e */
368 0x5da1, 0x5da2, 0x5da3, 0x5da4, 0x5da5, 0x5da6, 0x5da7, 0x5da8,
369 0x5da9, 0x5daa, 0x5dab, 0x5dac, 0x5dad, 0x5dae, 0x5daf, 0x5db0,
370 0x5db1, 0x5db2, 0x5db3, 0x5db4, 0x5db5, 0x5db6, 0x5db8, 0x5db9,
371 0x5dba, 0x5dbb, 0x5dbc, 0x5dbd, 0x5dbe, 0x5dbf, 0x5dc0, 0x5dc1,
372 0x5dc2, 0x5dc3, 0x5dc4, 0x5dc6, 0x5dc7, 0x5dc8, 0x5dc9, 0x5dca,
373 0x5dcb, 0x5dcc, 0x5dce, 0x5dcf, 0x5dd0, 0x5dd1, 0x5dd2, 0x5dd3,
374 0x5dd4, 0x5dd5, 0x5dd6, 0x5dd7, 0x5dd8, 0x5dd9, 0x5dda, 0x5ddc,
375 0x5ddf, 0x5de0, 0x5de3, 0x5de4, 0x5dea, 0x5dec, 0x5ded, 0x5df0,
376 0x5df5, 0x5df6, 0x5df8, 0x5df9, 0x5dfa, 0x5dfb, 0x5dfc, 0x5dff,
377 0x5e00, 0x5e04, 0x5e07, 0x5e09, 0x5e0a, 0x5e0b, 0x5e0d, 0x5e0e,
378 0x5e12, 0x5e13, 0x5e17, 0x5e1e, 0x5e1f, 0x5e20, 0x5e21, 0x5e22,
379 0x5e23, 0x5e24, 0x5e25, 0x5e28, 0x5e29, 0x5e2a, 0x5e2b, 0x5e2c,
380 0x5e2f, 0x5e30, 0x5e32, 0x5e33, 0x5e34, 0x5e35, 0x5e36, 0x5e39,
381 0x5e3a, 0x5e3e, 0x5e3f, 0x5e40, 0x5e41, 0x5e43, 0x5e46, 0x5e47,
382 0x5e48, 0x5e49, 0x5e4a, 0x5e4b, 0x5e4d, 0x5e4e, 0x5e4f, 0x5e50,
383 0x5e51, 0x5e52, 0x5e53, 0x5e56, 0x5e57, 0x5e58, 0x5e59, 0x5e5a,
384 0x5e5c, 0x5e5d, 0x5e5f, 0x5e60, 0x5e63, 0x5e64, 0x5e65, 0x5e66,
385 0x5e67, 0x5e68, 0x5e69, 0x5e6a, 0x5e6b, 0x5e6c, 0x5e6d, 0x5e6e,
386 0x5e6f, 0x5e70, 0x5e71, 0x5e75, 0x5e77, 0x5e79, 0x5e7e, 0x5e81,
387 0x5e82, 0x5e83, 0x5e85, 0x5e88, 0x5e89, 0x5e8c, 0x5e8d, 0x5e8e,
388 0x5e92, 0x5e98, 0x5e9b, 0x5e9d, 0x5ea1, 0x5ea2, 0x5ea3, 0x5ea4,
389 0x5ea8, 0x5ea9, 0x5eaa, 0x5eab, 0x5eac, 0x5eae, 0x5eaf, 0x5eb0,
390 0x5eb1, 0x5eb2, 0x5eb4, 0x5eba, 0x5ebb, 0x5ebc, 0x5ebd, 0x5ebf,
391 0x5ec0, 0x5ec1, 0x5ec2, 0x5ec3, 0x5ec4, 0x5ec5,
392 /* 0x8f */
393 0x5ec6, 0x5ec7, 0x5ec8, 0x5ecb, 0x5ecc, 0x5ecd, 0x5ece, 0x5ecf,
394 0x5ed0, 0x5ed4, 0x5ed5, 0x5ed7, 0x5ed8, 0x5ed9, 0x5eda, 0x5edc,
395 0x5edd, 0x5ede, 0x5edf, 0x5ee0, 0x5ee1, 0x5ee2, 0x5ee3, 0x5ee4,
396 0x5ee5, 0x5ee6, 0x5ee7, 0x5ee9, 0x5eeb, 0x5eec, 0x5eed, 0x5eee,
397 0x5eef, 0x5ef0, 0x5ef1, 0x5ef2, 0x5ef3, 0x5ef5, 0x5ef8, 0x5ef9,
398 0x5efb, 0x5efc, 0x5efd, 0x5f05, 0x5f06, 0x5f07, 0x5f09, 0x5f0c,
399 0x5f0d, 0x5f0e, 0x5f10, 0x5f12, 0x5f14, 0x5f16, 0x5f19, 0x5f1a,
400 0x5f1c, 0x5f1d, 0x5f1e, 0x5f21, 0x5f22, 0x5f23, 0x5f24, 0x5f28,
401 0x5f2b, 0x5f2c, 0x5f2e, 0x5f30, 0x5f32, 0x5f33, 0x5f34, 0x5f35,
402 0x5f36, 0x5f37, 0x5f38, 0x5f3b, 0x5f3d, 0x5f3e, 0x5f3f, 0x5f41,
403 0x5f42, 0x5f43, 0x5f44, 0x5f45, 0x5f46, 0x5f47, 0x5f48, 0x5f49,
404 0x5f4a, 0x5f4b, 0x5f4c, 0x5f4d, 0x5f4e, 0x5f4f, 0x5f51, 0x5f54,
405 0x5f59, 0x5f5a, 0x5f5b, 0x5f5c, 0x5f5e, 0x5f5f, 0x5f60, 0x5f63,
406 0x5f65, 0x5f67, 0x5f68, 0x5f6b, 0x5f6e, 0x5f6f, 0x5f72, 0x5f74,
407 0x5f75, 0x5f76, 0x5f78, 0x5f7a, 0x5f7d, 0x5f7e, 0x5f7f, 0x5f83,
408 0x5f86, 0x5f8d, 0x5f8e, 0x5f8f, 0x5f91, 0x5f93, 0x5f94, 0x5f96,
409 0x5f9a, 0x5f9b, 0x5f9d, 0x5f9e, 0x5f9f, 0x5fa0, 0x5fa2, 0x5fa3,
410 0x5fa4, 0x5fa5, 0x5fa6, 0x5fa7, 0x5fa9, 0x5fab, 0x5fac, 0x5faf,
411 0x5fb0, 0x5fb1, 0x5fb2, 0x5fb3, 0x5fb4, 0x5fb6, 0x5fb8, 0x5fb9,
412 0x5fba, 0x5fbb, 0x5fbe, 0x5fbf, 0x5fc0, 0x5fc1, 0x5fc2, 0x5fc7,
413 0x5fc8, 0x5fca, 0x5fcb, 0x5fce, 0x5fd3, 0x5fd4, 0x5fd5, 0x5fda,
414 0x5fdb, 0x5fdc, 0x5fde, 0x5fde, 0x5fe2, 0x5fe3, 0x5fe5, 0x5fe6,
415 0x5fe8, 0x5fe9, 0x5fec, 0x5fef, 0x5ff0, 0x5ff2, 0x5ff3, 0x5ff4,
416 0x5ff6, 0x5ff7, 0x5ff9, 0x5ffa, 0x5ffc, 0x6007,
417 /* 0x90 */
418 0x6008, 0x6009, 0x600b, 0x600c, 0x6010, 0x6011, 0x6013, 0x6017,
419 0x6018, 0x601a, 0x601e, 0x601f, 0x6022, 0x6023, 0x6024, 0x602c,
420 0x602d, 0x602e, 0x6030, 0x6032, 0x6033, 0x6034, 0x6036,
421 0x6037, 0x6038, 0x6039, 0x603a, 0x603d, 0x603e, 0x6040, 0x6044,
```

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422 0x6045, 0x6046, 0x6047, 0x6048, 0x6049, 0x604a, 0x604c, 0x604e,
423 0x604f, 0x6051, 0x6053, 0x6054, 0x6056, 0x6057, 0x6058, 0x605b,
424 0x605c, 0x605e, 0x605f, 0x6060, 0x6061, 0x6065, 0x6066, 0x606e,
425 0x6071, 0x6072, 0x6074, 0x6075, 0x6077, 0x607e, 0x6080, 0x6081,
426 0x6082, 0x6085, 0x6086, 0x6087, 0x6088, 0x608a, 0x608b, 0x608e,
427 0x608f, 0x6090, 0x6091, 0x6093, 0x6095, 0x6097, 0x6098, 0x6099,
428 0x609c, 0x609e, 0x60a1, 0x60a2, 0x60a4, 0x60a5, 0x60a7, 0x60a9,
429 0x60aa, 0x60ae, 0x60b0, 0x60b3, 0x60b5, 0x60b6, 0x60b7, 0x60b9,
430 0x60ba, 0x60bd, 0x60be, 0x60bf, 0x60c0, 0x60c1, 0x60c2, 0x60c3,
431 0x60c4, 0x60c7, 0x60c8, 0x60c9, 0x60cc, 0x60cd, 0x60ce, 0x60cf,
432 0x60d0, 0x60d2, 0x60d3, 0x60d4, 0x60d6, 0x60d7, 0x60d9, 0x60db,
433 0x60de, 0x60e1, 0x60e2, 0x60e3, 0x60e4, 0x60e5, 0x60ea, 0x60f1,
434 0x60f2, 0x60f5, 0x60f7, 0x60f8, 0x60fb, 0x60fc, 0x60fd, 0x60fe,
435 0x60ff, 0x6102, 0x6103, 0x6104, 0x6105, 0x6107, 0x610a, 0x610b,
436 0x610c, 0x6110, 0x6111, 0x6112, 0x6113, 0x6114, 0x6116, 0x6117,
437 0x6118, 0x6119, 0x611b, 0x611c, 0x611d, 0x611e, 0x6121, 0x6122,
438 0x6125, 0x6128, 0x6129, 0x612a, 0x612c, 0x612d, 0x612e, 0x612f,
439 0x6130, 0x6131, 0x6132, 0x6133, 0x6134, 0x6135, 0x6136, 0x6137,
440 0x6138, 0x6139, 0x613a, 0x613b, 0x613c, 0x613d, 0x613e, 0x6140,
441 0x6141, 0x6142, 0x6143, 0x6144, 0x6145, 0x6146,
442 /* 0x91 */
443 0x6147, 0x6149, 0x614b, 0x614d, 0x614f, 0x6150, 0x6152, 0x6153,
444 0x6154, 0x6156, 0x6157, 0x6158, 0x6159, 0x615a, 0x615b, 0x615c,
445 0x615e, 0x615f, 0x6160, 0x6161, 0x6163, 0x6164, 0x6165, 0x6166,
446 0x6169, 0x616a, 0x616b, 0x616c, 0x616d, 0x616e, 0x616f, 0x6171,
447 0x6172, 0x6173, 0x6174, 0x6176, 0x6178, 0x6179, 0x617a, 0x617b,
448 0x617c, 0x617d, 0x617e, 0x617f, 0x6180, 0x6181, 0x6182, 0x6183,
449 0x6184, 0x6185, 0x6186, 0x6187, 0x6188, 0x6189, 0x618a, 0x618c,
450 0x618d, 0x618f, 0x6190, 0x6191, 0x6192, 0x6193, 0x6195, 0x6196,
451 0x6197, 0x6198, 0x6199, 0x619a, 0x619b, 0x619c, 0x619e, 0x619f,
452 0x61a0, 0x61a1, 0x61a2, 0x61a3, 0x61a4, 0x61a5, 0x61a6, 0x61aa,
453 0x61ab, 0x61ad, 0x61ae, 0x61af, 0x61b0, 0x61b1, 0x61b2, 0x61b3,
454 0x61b4, 0x61b5, 0x61b6, 0x61b8, 0x61b9, 0x61ba, 0x61bb, 0x61bc,
455 0x61bd, 0x61bf, 0x61c0, 0x61c1, 0x61c3, 0x61c4, 0x61c5, 0x61c6,
456 0x61c7, 0x61c9, 0x61cc, 0x61cd, 0x61ce, 0x61cf, 0x61d0, 0x61d3,
457 0x61d5, 0x61d6, 0x61d7, 0x61d8, 0x61d9, 0x61da, 0x61db, 0x61dc,
458 0x61dd, 0x61de, 0x61df, 0x61e0, 0x61e1, 0x61e2, 0x61e3, 0x61e4,
459 0x61e5, 0x61e7, 0x61e8, 0x61e9, 0x61ea, 0x61eb, 0x61ec, 0x61ed,
460 0x61ee, 0x61ef, 0x61f0, 0x61f1, 0x61f2, 0x61f3, 0x61f4, 0x61f6,
461 0x61f7, 0x61f8, 0x61f9, 0x61fa, 0x61fb, 0x61fc, 0x61fd, 0x61fe,
462 0x6200, 0x6201, 0x6202, 0x6203, 0x6204, 0x6205, 0x6207, 0x6209,
463 0x6213, 0x6214, 0x6219, 0x621c, 0x621d, 0x621e, 0x6220, 0x6223,
464 0x6226, 0x6227, 0x6228, 0x6229, 0x622b, 0x622d, 0x622f, 0x6230,
465 0x6231, 0x6232, 0x6235, 0x6236, 0x6238, 0x6239, 0x623a, 0x623b,
466 0x623c, 0x6242, 0x6243, 0x6244, 0x6245, 0x6246, 0x624a,
467 /* 0x92 */
468 0x624f, 0x6250, 0x6255, 0x6256, 0x6257, 0x6259, 0x625a, 0x625c,
469 0x625d, 0x625e, 0x625f, 0x6260, 0x6261, 0x6262, 0x6264, 0x6265,
470 0x6268, 0x6271, 0x6272, 0x6274, 0x6275, 0x6277, 0x6278, 0x627a,
471 0x627b, 0x627d, 0x6281, 0x6282, 0x6283, 0x6285, 0x6286, 0x6287,
472 0x6288, 0x628b, 0x628c, 0x628d, 0x628e, 0x628f, 0x6290, 0x6294,
473 0x6299, 0x629c, 0x629d, 0x629e, 0x62a3, 0x62a6, 0x62a7, 0x62a9,
474 0x62aa, 0x62ad, 0x62ae, 0x62af, 0x62b0, 0x62b2, 0x62b3, 0x62b4,
475 0x62b6, 0x62b7, 0x62b8, 0x62ba, 0x62be, 0x62c0, 0x62c1, 0x62c3,
476 0x62cb, 0x62cf, 0x62d1, 0x62d5, 0x62dd, 0x62de, 0x62e0, 0x62e1,
477 0x62e4, 0x62ea, 0x62eb, 0x62f0, 0x62f2, 0x62f5, 0x62f8, 0x62f9,
478 0x62fa, 0x62fb, 0x6300, 0x6303, 0x6304, 0x6305, 0x6306, 0x630a,
479 0x630b, 0x630c, 0x630d, 0x630f, 0x6310, 0x6312, 0x6313, 0x6314,
480 0x6315, 0x6317, 0x6318, 0x6319, 0x631c, 0x6326, 0x6327, 0x6329,
481 0x632c, 0x632d, 0x632e, 0x6330, 0x6331, 0x6333, 0x6334, 0x6335,
482 0x6336, 0x6337, 0x6338, 0x633b, 0x633c, 0x633e, 0x633f, 0x6340,
483 0x6341, 0x6344, 0x6347, 0x6348, 0x634a, 0x6351, 0x6352, 0x6353,
484 0x6354, 0x6356, 0x6357, 0x6358, 0x6359, 0x635a, 0x635b, 0x635c,
485 0x635d, 0x6360, 0x6364, 0x6365, 0x6366, 0x6368, 0x636a, 0x636b,
486 0x636c, 0x636f, 0x6370, 0x6372, 0x6373, 0x6374, 0x6375, 0x6378,
487 0x6379, 0x637c, 0x637d, 0x637e, 0x637f, 0x6381, 0x6383, 0x6384,
488 0x6385, 0x6386, 0x638b, 0x638d, 0x6391, 0x6393, 0x6394, 0x6395,
489 0x6397, 0x6399, 0x639a, 0x639b, 0x639c, 0x639d, 0x639e, 0x639f,
490 0x63a1, 0x63a4, 0x63a6, 0x63ab, 0x63af, 0x63b1, 0x63b2, 0x63b5,
491 0x63b6, 0x63b9, 0x63bb, 0x63bd, 0x63bf, 0x63c0,
492 /* 0x93 */
493 0x63c1, 0x63c2, 0x63c3, 0x63c5, 0x63c7, 0x63c8, 0x63ca, 0x63cb,
494 0x63cc, 0x63d1, 0x63d3, 0x63d4, 0x63d5, 0x63d7, 0x63d8, 0x63d9,
495 0x63da, 0x63db, 0x63dc, 0x63dd, 0x63df, 0x63e2, 0x63e4, 0x63e5,
496 0x63e6, 0x63e7, 0x63e8, 0x63eb, 0x63ec, 0x63ee, 0x63ef, 0x63f0,
497 0x63f1, 0x63f3, 0x63f5, 0x63f7, 0x63f9, 0x63fa, 0x63fb, 0x63fc,
498 0x63fe, 0x6403, 0x6404, 0x6406, 0x6407, 0x6408, 0x6409, 0x640a,
499 0x640d, 0x640e, 0x6411, 0x6412, 0x6415, 0x6416, 0x6417, 0x6418,
500 0x6419, 0x641a, 0x641d, 0x641f, 0x6422, 0x6423, 0x6424, 0x6425,
501 0x6427, 0x6428, 0x6429, 0x642b, 0x642e, 0x642f, 0x6430, 0x6431,
502 0x6432, 0x6433, 0x6435, 0x6436, 0x6437, 0x6438, 0x6439, 0x643b,
503 0x643c, 0x643e, 0x6440, 0x6442, 0x6443, 0x6449, 0x644b, 0x644c,
504 0x644d, 0x644e, 0x644f, 0x6450, 0x6451, 0x6453, 0x6455, 0x6456,
505 0x6457, 0x6459, 0x645a, 0x645b, 0x645c, 0x645d, 0x645f, 0x6460,
506 0x6461, 0x6462, 0x6463, 0x6464, 0x6465, 0x6466, 0x6468, 0x646a,
507 0x646b, 0x646c, 0x646e, 0x646f, 0x6470, 0x6471, 0x6472, 0x6473,
508 0x6474, 0x6475, 0x6476, 0x6477, 0x647b, 0x647c, 0x647d, 0x647e,
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509 0x647f, 0x6480, 0x6481, 0x6483, 0x6486, 0x6488, 0x6489, 0x648a,
510 0x648b, 0x648c, 0x648d, 0x648e, 0x648f, 0x6490, 0x6493, 0x6494,
511 0x6497, 0x6498, 0x649a, 0x649b, 0x649c, 0x649d, 0x649f, 0x64a0,
512 0x64a1, 0x64a2, 0x64a3, 0x64a5, 0x64a6, 0x64a7, 0x64a8, 0x64aa,
513 0x64ab, 0x64af, 0x64b1, 0x64b2, 0x64b3, 0x64b4, 0x64b6, 0x64b9,
514 0x64bb, 0x64bd, 0x64be, 0x64bf, 0x64c1, 0x64c3, 0x64c4, 0x64c6,
515 0x64c7, 0x64c8, 0x64c9, 0x64ca, 0x64cb, 0x64cc, 0x64cf, 0x64d1,
516 0x64d3, 0x64d4, 0x64d5, 0x64d6, 0x64d9, 0x64da,
517 /* 0x94 */
518 0x64db, 0x64dc, 0x64dd, 0x64df, 0x64e0, 0x64e1, 0x64e3, 0x64e5,
519 0x64e7, 0x64e8, 0x64e9, 0x64ea, 0x64eb, 0x64ec, 0x64ed, 0x64ee,
520 0x64ef, 0x64f0, 0x64f1, 0x64f2, 0x64f3, 0x64f4, 0x64f5, 0x64f6,
521 0x64f7, 0x64f8, 0x64f9, 0x64fa, 0x64fb, 0x64fc, 0x64fd, 0x64fe,
522 0x64ff, 0x6501, 0x6502, 0x6503, 0x6504, 0x6505, 0x6506, 0x6507,
523 0x6508, 0x650a, 0x650b, 0x650c, 0x650d, 0x650e, 0x650f, 0x6510,
524 0x6511, 0x6513, 0x6514, 0x6515, 0x6516, 0x6517, 0x6519, 0x651a,
525 0x651b, 0x651c, 0x651d, 0x651e, 0x651f, 0x6520, 0x6521, 0x6522,
526 0x6523, 0x6524, 0x6526, 0x6527, 0x6528, 0x6529, 0x652a, 0x652c,
527 0x652d, 0x6530, 0x6531, 0x6532, 0x6533, 0x6537, 0x653a, 0x653c,
528 0x653d, 0x6540, 0x6541, 0x6542, 0x6543, 0x6544, 0x6546, 0x6547,
529 0x654a, 0x654b, 0x654d, 0x654e, 0x6550, 0x6552, 0x6553, 0x6554,
530 0x6557, 0x6558, 0x655a, 0x655c, 0x655f, 0x6560, 0x6561, 0x6564,
531 0x6565, 0x6567, 0x6568, 0x6569, 0x656a, 0x656d, 0x656e, 0x656f,
532 0x6571, 0x6573, 0x6575, 0x6576, 0x6578, 0x6579, 0x657a, 0x657b,
533 0x657c, 0x657d, 0x657e, 0x657f, 0x6580, 0x6581, 0x6582, 0x6583,
534 0x6584, 0x6585, 0x6586, 0x6588, 0x6589, 0x658a, 0x658d, 0x658e,
535 0x658f, 0x6592, 0x6594, 0x6595, 0x6596, 0x6598, 0x659a, 0x659d,
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541 0x65df, 0x65e1, 0x65e3, 0x65e4, 0x65ea, 0x65eb,
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553 0x6673, 0x6675, 0x6678, 0x6679, 0x667b, 0x667c, 0x667d, 0x667f,
554 0x6680, 0x6681, 0x6683, 0x6685, 0x6686, 0x6688, 0x6689, 0x668a,
555 0x668b, 0x668d, 0x668e, 0x668f, 0x6690, 0x6692, 0x6693, 0x6694,
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586 0x6804, 0x6806, 0x680d, 0x6810, 0x6812, 0x6814, 0x6815, 0x6818,
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588 0x6823, 0x6824, 0x6825, 0x6826, 0x6827, 0x6828, 0x682b, 0x682c,
589 0x682d, 0x682e, 0x682f, 0x6830, 0x6831, 0x6834, 0x6835, 0x6836,
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591 0x6856, 0x6857, 0x6858, 0x6859, 0x685a, 0x685b,
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605 0x68e5, 0x68e6, 0x68e7, 0x68e8, 0x68e9, 0x68ea, 0x68eb, 0x68ec,
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615 0x694d, 0x694e, 0x694f, 0x6950, 0x6951, 0x6952, 0x6953, 0x6955,
616 0x6956, 0x6958, 0x6959, 0x695b, 0x695c, 0x695f,
617 /* 0x98 */
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703 0x6d03, 0x6d05, 0x6d06, 0x6d08, 0x6d09, 0x6d0a, 0x6d0d, 0x6d0f,
704 0x6d10, 0x6d11, 0x6d13, 0x6d14, 0x6d15, 0x6d16, 0x6d18, 0x6d1c,
705 0x6d1d, 0x6d1f, 0x6d20, 0x6d21, 0x6d22, 0x6d23, 0x6d24, 0x6d26,
706 0x6d28, 0x6d29, 0x6d2c, 0x6d2d, 0x6d2f, 0x6d30, 0x6d34, 0x6d36,
707 0x6d37, 0x6d38, 0x6d3a, 0x6d3f, 0x6d40, 0x6d42, 0x6d44, 0x6d49,
708 0x6d4c, 0x6d50, 0x6d55, 0x6d56, 0x6d57, 0x6d58, 0x6d5b, 0x6d5d,
709 0x6d5f, 0x6d61, 0x6d62, 0x6d64, 0x6d65, 0x6d67, 0x6d68, 0x6d6b,
710 0x6d6c, 0x6d6d, 0x6d70, 0x6d71, 0x6d72, 0x6d73, 0x6d75, 0x6d76,
711 0x6d79, 0x6d7a, 0x6d7b, 0x6d7d, 0x6d7e, 0x6d7f, 0x6d80, 0x6d81,
712 0x6d83, 0x6d84, 0x6d86, 0x6d87, 0x6d8a, 0x6d8b, 0x6d8d, 0x6d8f,
713 0x6d90, 0x6d92, 0x6d96, 0x6d97, 0x6d98, 0x6d99, 0x6d9a, 0x6d9c,
714 0x6da2, 0x6da5, 0x6dac, 0x6dad, 0x6db0, 0x6db1, 0x6db3, 0x6db4,
715 0x6db6, 0x6db7, 0x6db9, 0x6dba, 0x6dbb, 0x6dbc, 0x6dbd, 0x6dbe,
716 0x6dc1, 0x6dc2, 0x6dc3, 0x6dc8, 0x6dc9, 0x6dca,
717 /* 0x9c */
718 0x6dcd, 0x6dce, 0x6dcf, 0x6dd0, 0x6dd2, 0x6dd3, 0x6dd4, 0x6dd5,
719 0x6dd7, 0x6dda, 0x6ddb, 0x6ddc, 0x6ddf, 0x6de2, 0x6de3, 0x6de5,
720 0x6de7, 0x6de8, 0x6de9, 0x6dea, 0x6ded, 0x6def, 0x6df0, 0x6df2,
721 0x6df4, 0x6df5, 0x6df6, 0x6df8, 0x6dfa, 0x6dfd, 0x6dfe, 0x6dff,
722 0x6e00, 0x6e01, 0x6e02, 0x6e03, 0x6e04, 0x6e06, 0x6e07, 0x6e08,
723 0x6e09, 0x6e0b, 0x6e0f, 0x6e12, 0x6e13, 0x6e15, 0x6e18, 0x6e19,
724 0x6e1b, 0x6e1c, 0x6e1e, 0x6e1f, 0x6e22, 0x6e26, 0x6e27, 0x6e28,
725 0x6e2a, 0x6e2c, 0x6e2e, 0x6e30, 0x6e31, 0x6e33, 0x6e35, 0x6e36,
726 0x6e37, 0x6e39, 0x6e3b, 0x6e3c, 0x6e3d, 0x6e3e, 0x6e3f, 0x6e40,
727 0x6e41, 0x6e42, 0x6e45, 0x6e46, 0x6e47, 0x6e48, 0x6e49, 0x6e4a,
728 0x6e4b, 0x6e4c, 0x6e4f, 0x6e50, 0x6e51, 0x6e52, 0x6e55, 0x6e57,
729 0x6e59, 0x6e5a, 0x6e5c, 0x6e5d, 0x6e5e, 0x6e60, 0x6e61, 0x6e62,
730 0x6e63, 0x6e64, 0x6e65, 0x6e66, 0x6e67, 0x6e68, 0x6e69, 0x6e6a,
731 0x6e6c, 0x6e6d, 0x6e6f, 0x6e70, 0x6e71, 0x6e72, 0x6e73, 0x6e74,
732 0x6e75, 0x6e76, 0x6e77, 0x6e78, 0x6e79, 0x6e7a, 0x6e7b, 0x6e7c,
733 0x6e7d, 0x6e80, 0x6e81, 0x6e82, 0x6e84, 0x6e87, 0x6e88, 0x6e8a,
734 0x6e8b, 0x6e8c, 0x6e8d, 0x6e8e, 0x6e91, 0x6e92, 0x6e93, 0x6e94,
735 0x6e95, 0x6e96, 0x6e97, 0x6e99, 0x6e9a, 0x6e9b, 0x6e9d, 0x6e9e,
736 0x6eaa, 0x6eaa3, 0x6eaa6, 0x6eaa8, 0x6eaa9, 0x6eaaab,
737 0x6eac, 0x6ead, 0x6eae, 0x6eb0, 0x6eb3, 0x6eb5, 0x6eb8, 0x6eb9,
738 0x6ebc, 0x6ebe, 0x6ebf, 0x6ec0, 0x6ec3, 0x6ec4, 0x6ec5, 0x6ec6,
739 0x6ec8, 0x6ec9, 0x6eca, 0x6ecc, 0x6ecd, 0x6ece, 0x6ed0, 0x6ed2,
740 0x6ed6, 0x6ed8, 0x6ed9, 0x6edb, 0x6edc, 0x6edd, 0x6ee3, 0x6ee7,
741 0x6eea, 0x6eeb, 0x6eec, 0x6eed, 0x6eee, 0x6eef,
742 /* 0x9d */
743 0x6ef0, 0x6ef1, 0x6ef2, 0x6ef3, 0x6ef5, 0x6ef6, 0x6ef7, 0x6ef8,
744 0x6efa, 0x6efb, 0x6efc, 0x6efd, 0x6efe, 0x6eff, 0x6f00, 0x6f01,
745 0x6f03, 0x6f04, 0x6f05, 0x6f07, 0x6f08, 0x6f0a, 0x6f0b, 0x6f0c,
746 0x6f0d, 0x6f0e, 0x6f10, 0x6f11, 0x6f12, 0x6f16, 0x6f17, 0x6f18,
747 0x6f19, 0x6f1a, 0x6f1b, 0x6f1c, 0x6f1d, 0x6f1e, 0x6f1f, 0x6f21,
748 0x6f22, 0x6f23, 0x6f25, 0x6f26, 0x6f27, 0x6f28, 0x6f2c, 0x6f2e,
749 0x6f30, 0x6f32, 0x6f34, 0x6f35, 0x6f37, 0x6f38, 0x6f39, 0x6f3a,
750 0x6f3b, 0x6f3c, 0x6f3d, 0x6f3f, 0x6f40, 0x6f41, 0x6f42, 0x6f43,
751 0x6f44, 0x6f45, 0x6f48, 0x6f49, 0x6f4a, 0x6f4c, 0x6f4e, 0x6f4f,
752 0x6f50, 0x6f51, 0x6f52, 0x6f53, 0x6f54, 0x6f55, 0x6f56, 0x6f57,
753 0x6f59, 0x6f5a, 0x6f5b, 0x6f5d, 0x6f5f, 0x6f60, 0x6f61, 0x6f63,
754 0x6f64, 0x6f65, 0x6f67, 0x6f68, 0x6f69, 0x6f6a, 0x6f6b, 0x6f6c,
755 0x6f6f, 0x6f70, 0x6f71, 0x6f73, 0x6f75, 0x6f76, 0x6f77, 0x6f79,
756 0x6f7b, 0x6f7d, 0x6f7e, 0x6f7f, 0x6f80, 0x6f81, 0x6f82, 0x6f83,
757 0x6f85, 0x6f86, 0x6f87, 0x6f8a, 0x6f8b, 0x6f8f, 0x6f90, 0x6f91,
758 0x6f92, 0x6f93, 0x6f94, 0x6f95, 0x6f96, 0x6f97, 0x6f98, 0x6f99,
759 0x6f9a, 0x6f9b, 0x6f9d, 0x6f9e, 0x6f9f, 0x6fa0, 0x6fa2, 0x6fa3,
760 0x6fa4, 0x6fa5, 0x6fa6, 0x6fa8, 0x6fa9, 0x6faa, 0x6fab, 0x6fac,
761 0x6fad, 0x6fae, 0xfaf, 0x6fb0, 0x6fb1, 0x6fb2, 0x6fb4, 0x6fb5,
762 0x6fb7, 0x6fb8, 0x6fba, 0x6fbb, 0x6fbc, 0x6fbd, 0x6fbe, 0x6fbf,
763 0x6fc1, 0x6fc3, 0x6fc4, 0x6fc5, 0x6fc6, 0x6fc7, 0x6fc8, 0x6fca,
764 0x6fcb, 0x6fcc, 0x6fcd, 0x6fce, 0x6fcf, 0x6fd0, 0x6fd3, 0x6fd4,
765 0x6fd5, 0x6fd6, 0x6fd7, 0x6fd8, 0x6fd9, 0x6fda, 0x6fdb, 0x6fdc,
766 0x6fdd, 0x6fdf, 0x6fe2, 0x6fe3, 0x6fe4, 0x6fe5,
767 /* 0x9e */
768 0x6fe6, 0x6fe7, 0x6fe8, 0x6fe9, 0x6fea, 0x6feb, 0x6fec, 0x6fed,
769 0x6fef0, 0x6fef1, 0x6fef2, 0x6fef3, 0x6fef4, 0x6fef5, 0x6fef6, 0x6fef7,
```

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770 0x6ff8, 0x6ff9, 0x6ffa, 0x6ffb, 0x6ffc, 0x6ffd, 0x6ffe, 0x6fff,
771 0x7000, 0x7001, 0x7002, 0x7003, 0x7004, 0x7005, 0x7006, 0x7007,
772 0x7008, 0x7009, 0x700a, 0x700b, 0x700c, 0x700d, 0x700e, 0x700f,
773 0x7010, 0x7012, 0x7013, 0x7014, 0x7015, 0x7016, 0x7017, 0x7018,
774 0x7019, 0x701c, 0x701d, 0x701e, 0x701f, 0x7020, 0x7021, 0x7022,
775 0x7024, 0x7025, 0x7026, 0x7027, 0x7028, 0x7029, 0x702a, 0x702b,
776 0x702c, 0x702d, 0x702e, 0x702f, 0x7030, 0x7031, 0x7032, 0x7033,
777 0x7034, 0x7036, 0x7037, 0x7038, 0x703a, 0x703b, 0x703c, 0x703d,
778 0x703e, 0x703f, 0x7040, 0x7041, 0x7042, 0x7043, 0x7044, 0x7045,
779 0x7046, 0x7047, 0x7048, 0x7049, 0x704a, 0x704b, 0x704d, 0x704e,
780 0x7050, 0x7051, 0x7052, 0x7053, 0x7054, 0x7055, 0x7056, 0x7057,
781 0x7058, 0x7059, 0x705a, 0x705b, 0x705c, 0x705d, 0x705f, 0x7060,
782 0x7061, 0x7062, 0x7063, 0x7064, 0x7065, 0x7066, 0x7067, 0x7068,
783 0x7069, 0x706a, 0x706e, 0x7071, 0x7072, 0x7073, 0x7074, 0x7077,
784 0x7079, 0x707a, 0x707b, 0x707d, 0x7081, 0x7082, 0x7083, 0x7084,
785 0x7086, 0x7087, 0x7088, 0x708b, 0x708c, 0x708d, 0x708f, 0x7090,
786 0x7091, 0x7093, 0x7097, 0x7098, 0x709a, 0x709b, 0x709e, 0x709f,
787 0x70a0, 0x70a1, 0x70a2, 0x70a3, 0x70a4, 0x70a5, 0x70a6, 0x70a7,
788 0x70a8, 0x70a9, 0x70aa, 0x70b0, 0x70b2, 0x70b4, 0x70b5, 0x70b6,
789 0x70ba, 0x70be, 0x70bf, 0x70c4, 0x70c5, 0x70c6, 0x70c7, 0x70c9,
790 0x70cb, 0x70cc, 0x70cd, 0x70ce, 0x70cf, 0x70d0, 0x70d1, 0x70d2,
791 0x70d3, 0x70d4, 0x70d5, 0x70d6, 0x70d7, 0x70da,
792 /* 0x9f */
793 0x70dc, 0x70dd, 0x70de, 0x70e0, 0x70e1, 0x70e2, 0x70e3, 0x70e5,
794 0x70ea, 0x70ee, 0x70f0, 0x70f1, 0x70f2, 0x70f3, 0x70f4, 0x70f5,
795 0x70fe, 0x70ff, 0x70fa, 0x70fb, 0x70fc, 0x70fd, 0x70ff, 0x7100,
796 0x7101, 0x7102, 0x7103, 0x7104, 0x7105, 0x7106, 0x7107, 0x7108,
797 0x710b, 0x710c, 0x710d, 0x710e, 0x710f, 0x7111, 0x7112, 0x7114,
798 0x7117, 0x711b, 0x711c, 0x711d, 0x711e, 0x711f, 0x7120, 0x7121,
799 0x7122, 0x7123, 0x7124, 0x7125, 0x7127, 0x7128, 0x7129, 0x712a,
800 0x712b, 0x712c, 0x712d, 0x712e, 0x7132, 0x7133, 0x7134, 0x7135,
801 0x7137, 0x7138, 0x7139, 0x713a, 0x713b, 0x713c, 0x713d, 0x713e,
802 0x713f, 0x7140, 0x7141, 0x7142, 0x7143, 0x7144, 0x7146, 0x7147,
803 0x7148, 0x7149, 0x714b, 0x714d, 0x714f, 0x7150, 0x7151, 0x7152,
804 0x7153, 0x7154, 0x7155, 0x7156, 0x7157, 0x7158, 0x7159, 0x715a,
805 0x715b, 0x715d, 0x715f, 0x7160, 0x7161, 0x7162, 0x7163, 0x7165,
806 0x7169, 0x716a, 0x716b, 0x716c, 0x716d, 0x716f, 0x7170, 0x7171,
807 0x7174, 0x7175, 0x7176, 0x7177, 0x7179, 0x717b, 0x717c, 0x717e,
808 0x717f, 0x7180, 0x7181, 0x7182, 0x7183, 0x7185, 0x7186, 0x7187,
809 0x7188, 0x7189, 0x718b, 0x718c, 0x718d, 0x718e, 0x7190, 0x7191,
810 0x7192, 0x7193, 0x7195, 0x7196, 0x7197, 0x719a, 0x719b, 0x719c,
811 0x719d, 0x719e, 0x71a1, 0x71a2, 0x71a3, 0x71a4, 0x71a5, 0x71a6,
812 0x71a7, 0x71a9, 0x71aa, 0x71ab, 0x71ad, 0x71ae, 0x71af, 0x71b0,
813 0x71b1, 0x71b2, 0x71b4, 0x71b6, 0x71b7, 0x71b8, 0x71ba, 0x71bb,
814 0x71bc, 0x71bd, 0x71be, 0x71bf, 0x71c0, 0x71c1, 0x71c2, 0x71c4,
815 0x71c5, 0x71c6, 0x71c7, 0x71c8, 0x71c9, 0x71ca, 0x71cb, 0x71cc,
816 0x71cd, 0x71cf, 0x71d0, 0x71d1, 0x71d2, 0x71d3,
817 /* 0xa0 */
818 0x71d6, 0x71d7, 0x71d8, 0x71d9, 0x71da, 0x71db, 0x71dc, 0x71dd,
819 0x71de, 0x71df, 0x71e1, 0x71e2, 0x71e3, 0x71e4, 0x71e6, 0x71e8,
820 0x71e9, 0x71ea, 0x71eb, 0x71ec, 0x71ed, 0x71ef, 0x71f0, 0x71f1,
821 0x71f2, 0x71f3, 0x71f4, 0x71f5, 0x71f6, 0x71f7, 0x71f8, 0x71fa,
822 0x71fb, 0x71fc, 0x71fd, 0x71fe, 0x71ff, 0x7200, 0x7201, 0x7202,
823 0x7203, 0x7204, 0x7205, 0x7207, 0x7208, 0x7209, 0x720a, 0x720b,
824 0x720c, 0x720d, 0x720e, 0x720f, 0x7210, 0x7211, 0x7212, 0x7213,
825 0x7214, 0x7215, 0x7216, 0x7217, 0x7218, 0x7219, 0x721a, 0x721b,
826 0x721c, 0x721e, 0x721f, 0x7220, 0x7221, 0x7222, 0x7223, 0x7224,
827 0x7225, 0x7226, 0x7227, 0x7229, 0x722b, 0x722d, 0x722e, 0x722f,
828 0x7232, 0x7233, 0x7234, 0x723a, 0x723c, 0x723e, 0x7240, 0x7241,
829 0x7242, 0x7243, 0x7244, 0x7245, 0x7246, 0x7249, 0x724a, 0x724b,
830 0x724e, 0x724f, 0x7250, 0x7251, 0x7253, 0x7254, 0x7255, 0x7257,
831 0x7258, 0x725a, 0x725c, 0x725e, 0x7260, 0x7263, 0x7264, 0x7265,
832 0x7268, 0x726a, 0x726b, 0x726c, 0x726d, 0x7270, 0x7271, 0x7273,
833 0x7274, 0x7276, 0x7277, 0x7278, 0x727b, 0x727c, 0x727d, 0x7282,
834 0x7283, 0x7285, 0x7286, 0x7287, 0x7288, 0x7289, 0x728c, 0x728e,
835 0x7290, 0x7291, 0x7293, 0x7294, 0x7295, 0x7296, 0x7297, 0x7298,
836 0x7299, 0x729a, 0x729b, 0x729c, 0x729d, 0x729e, 0x72a0, 0x72a1,
837 0x72a2, 0x72a3, 0x72a4, 0x72a5, 0x72a6, 0x72a7, 0x72a8, 0x72a9,
838 0x72aa, 0x72ab, 0x72ae, 0x72b1, 0x72b2, 0x72b3, 0x72b5, 0x72ba,
839 0x72bb, 0x72bc, 0x72bd, 0x72be, 0x72bf, 0x72c0, 0x72c5, 0x72c6,
840 0x72c7, 0x72c9, 0x72ca, 0x72cb, 0x72cc, 0x72cf, 0x72d1, 0x72d3,
841 0x72d4, 0x72d5, 0x72d6, 0x72d8, 0x72da, 0x72db,
842 /* 0xa1 */
843 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
844 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
845 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
846 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
847 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
848 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
849 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
850 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
851 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
852 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
853 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
854 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
855 0x3000, 0x3001, 0x3002, 0x00b7, 0x02c9, 0x02c7, 0x00a8, 0x3003,
856 0x3005, 0x2014, 0xff5e, 0x2016, 0x2026, 0x2018, 0x2019, 0x201c,
```

```
857 0x201d, 0x3014, 0x3015, 0x3008, 0x3009, 0x300a, 0x300b, 0x300c,
858 0x300d, 0x300e, 0x300f, 0x3016, 0x3017, 0x3010, 0x3011, 0x00b1,
859 0x00d7, 0x00f7, 0x2236, 0x2227, 0x2228, 0x2211, 0x220f, 0x222a,
860 0x2229, 0x2208, 0x2237, 0x221a, 0x22a5, 0x2225, 0x2220, 0x2312,
861 0x2299, 0x222b, 0x222e, 0x2261, 0x224c, 0x2248, 0x223d, 0x221d,
862 0x2260, 0x226e, 0x226f, 0x2264, 0x2265, 0x221e, 0x2235, 0x2234,
863 0x2642, 0x2640, 0x00b0, 0x2032, 0x2033, 0x2103, 0xff04, 0x00a4,
864 0xffe0, 0xffe1, 0x2030, 0x00a7, 0x2116, 0x2606, 0x2605, 0x25cb,
865 0x25cf, 0x25ce, 0x25c7, 0x25c6, 0x25a1, 0x25a0, 0x25b3, 0x25b2,
866 0x203b, 0x2192, 0x2190, 0x2191, 0x2193, 0x3013,
867 /* 0xa2 */
868 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
869 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
870 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
871 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
872 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
873 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
874 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
875 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
876 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
877 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
878 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
879 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
880 0x2170, 0x2171, 0x2172, 0x2173, 0x2174, 0x2175, 0x2176, 0x2177,
881 0x2178, 0x2179, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
882 0x2488, 0x2489, 0x248a, 0x248b, 0x248c, 0x248d, 0x248e, 0x248f,
883 0x2490, 0x2491, 0x2492, 0x2493, 0x2494, 0x2495, 0x2496, 0x2497,
884 0x2498, 0x2499, 0x249a, 0x249b, 0x2474, 0x2475, 0x2476, 0x2477,
885 0x2478, 0x2479, 0x247a, 0x247b, 0x247c, 0x247d, 0x247e, 0x247f,
886 0x2480, 0x2481, 0x2482, 0x2483, 0x2484, 0x2485, 0x2486, 0x2487,
887 0x2460, 0x2461, 0x2462, 0x2463, 0x2464, 0x2465, 0x2466, 0x2467,
888 0x2468, 0x2469, 0xffff, 0xffff, 0x3220, 0x3221, 0x3222, 0x3223,
889 0x3224, 0x3225, 0x3226, 0x3227, 0x3228, 0x3229, 0xffff, 0xffff,
890 0x2160, 0x2161, 0x2162, 0x2163, 0x2164, 0x2165, 0x2166, 0x2167,
891 0x2168, 0x2169, 0x216a, 0x216b, 0xffff, 0xffff,
892 /* 0xa3 */
893 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
894 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
895 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
896 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
897 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
898 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
899 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
900 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
901 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
902 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
903 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
904 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
905 0xff01, 0xff02, 0xff03, 0xffe5, 0xff05, 0xff06, 0xff07, 0xff08,
906 0xff09, 0xff0a, 0xff0b, 0xff0c, 0xff0d, 0xff0e, 0xff0f, 0xff10,
907 0xff11, 0xff12, 0xff13, 0xff14, 0xff15, 0xff16, 0xff17, 0xff18,
908 0xff19, 0xff1a, 0xff1b, 0xff1c, 0xff1d, 0xff1e, 0xff1f, 0xff20,
909 0xff21, 0xff22, 0xff23, 0xff24, 0xff25, 0xff26, 0xff27, 0xff28,
910 0xff29, 0xff2a, 0xff2b, 0xff2c, 0xff2d, 0xff2e, 0xff2f, 0xff30,
911 0xff31, 0xff32, 0xff33, 0xff34, 0xff35, 0xff36, 0xff37, 0xff38,
912 0xff39, 0xff3a, 0xff3b, 0xff3c, 0xff3d, 0xff3e, 0xff3f, 0xff40,
913 0xff41, 0xff42, 0xff43, 0xff44, 0xff45, 0xff46, 0xff47, 0xff48,
914 0xff49, 0xff4a, 0xff4b, 0xff4c, 0xff4d, 0xff4e, 0xff4f, 0xff50,
915 0xff51, 0xff52, 0xff53, 0xff54, 0xff55, 0xff56, 0xff57, 0xff58,
916 0xff59, 0xff5a, 0xff5b, 0xff5c, 0xff5d, 0xff5e,
917 /* 0xa4 */
918 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
919 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
920 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
921 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
922 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
923 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
924 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
925 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
926 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
927 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
928 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
929 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
930 0x3041, 0x3042, 0x3043, 0x3044, 0x3045, 0x3046, 0x3047, 0x3048,
931 0x3049, 0x304a, 0x304b, 0x304c, 0x304d, 0x304e, 0x304f, 0x3050,
932 0x3051, 0x3052, 0x3053, 0x3054, 0x3055, 0x3056, 0x3057, 0x3058,
933 0x3059, 0x305a, 0x305b, 0x305c, 0x305d, 0x305e, 0x305f, 0x3060,
934 0x3061, 0x3062, 0x3063, 0x3064, 0x3065, 0x3066, 0x3067, 0x3068,
935 0x3069, 0x306a, 0x306b, 0x306c, 0x306d, 0x306e, 0x306f, 0x3070,
936 0x3071, 0x3072, 0x3073, 0x3074, 0x3075, 0x3076, 0x3077, 0x3078,
937 0x3079, 0x307a, 0x307b, 0x307c, 0x307d, 0x307e, 0x307f, 0x3080,
938 0x3081, 0x3082, 0x3083, 0x3084, 0x3085, 0x3086, 0x3087, 0x3088,
939 0x3089, 0x308a, 0x308b, 0x308c, 0x308d, 0x308e, 0x308f, 0x3090,
940 0x3091, 0x3092, 0x3093, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
941 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
942 /* 0xa5 */
943 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
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944 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
945 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
946 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
947 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
948 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
949 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
950 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
951 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
952 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
953 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
954 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
955 0x30a1, 0x30a2, 0x30a3, 0x30a4, 0x30a5, 0x30a6, 0x30a7, 0x30a8,
956 0x30a9, 0x30aa, 0x30ab, 0x30ac, 0x30ad, 0x30ae, 0x30af, 0x30b0,
957 0x30b1, 0x30b2, 0x30b3, 0x30b4, 0x30b5, 0x30b6, 0x30b7, 0x30b8,
958 0x30b9, 0x30ba, 0x30bb, 0x30bc, 0x30bd, 0x30be, 0x30bf, 0x30c0,
959 0x30c1, 0x30c2, 0x30c3, 0x30c4, 0x30c5, 0x30c6, 0x30c7, 0x30c8,
960 0x30c9, 0x30ca, 0x30cb, 0x30cc, 0x30cd, 0x30ce, 0x30cf, 0x30d0,
961 0x30d1, 0x30d2, 0x30d3, 0x30d4, 0x30d5, 0x30d6, 0x30d7, 0x30d8,
962 0x30d9, 0x30da, 0x30db, 0x30dc, 0x30dd, 0x30de, 0x30df, 0x30e0,
963 0x30e1, 0x30e2, 0x30e3, 0x30e4, 0x30e5, 0x30e6, 0x30e7, 0x30e8,
964 0x30e9, 0x30ea, 0x30eb, 0x30ec, 0x30ed, 0x30ee, 0x30ef, 0x30f0,
965 0x30f1, 0x30f2, 0x30f3, 0x30f4, 0x30f5, 0x30f6, 0xffffd, 0xffffd,
966 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
967 /* 0xa6 */
968 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
969 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
970 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
971 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
972 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
973 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
974 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
975 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
976 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
977 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
978 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
979 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
980 0x0391, 0x0392, 0x0393, 0x0394, 0x0395, 0x0396, 0x0397, 0x0398,
981 0x0399, 0x039a, 0x039b, 0x039c, 0x039d, 0x039e, 0x039f, 0x03a0,
982 0x03a1, 0x03a3, 0x03a4, 0x03a5, 0x03a6, 0x03a7, 0x03a8, 0x03a9,
983 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
984 0x03b1, 0x03b2, 0x03b3, 0x03b4, 0x03b5, 0x03b6, 0x03b7, 0x03b8,
985 0x03b9, 0x03ba, 0x03bb, 0x03bc, 0x03bd, 0x03be, 0x03bf, 0x03c0,
986 0x03c1, 0x03c3, 0x03c4, 0x03c5, 0x03c6, 0x03c7, 0x03c8, 0x03c9,
987 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xfe35,
988 0xfe36, 0xfe39, 0xfe3a, 0xfe3f, 0xfe40, 0xfe3d, 0xfe3e, 0xfe41,
989 0xfe42, 0xfe43, 0xfe44, 0xffffd, 0xffffd, 0xfe3b, 0xfe3c, 0xfe37,
990 0xfe38, 0xfe31, 0xffffd, 0xfe33, 0xfe34, 0xffffd, 0xffffd, 0xffffd,
991 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
992 /* 0xa7 */
993 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
994 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
995 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
996 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
997 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
998 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
999 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1000 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1001 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1002 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1003 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1004 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1005 0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0401, 0x0416,
1006 0x0417, 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e,
1007 0x041f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426,
1008 0x0427, 0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e,
1009 0x042f, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1010 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1011 0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0451, 0x0436,
1012 0x0437, 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e,
1013 0x043f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446,
1014 0x0447, 0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e,
1015 0x044f, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1016 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1017 /* 0xa8 */
1018 0x02ca, 0x02cb, 0x02d9, 0x2013, 0x2015, 0x2025, 0x2035, 0x2105,
1019 0x2109, 0x2196, 0x2197, 0x2198, 0x2199, 0x2215, 0x221f, 0x2223,
1020 0x2252, 0x2266, 0x2267, 0x22bf, 0x2550, 0x2551, 0x2552, 0x2553,
1021 0x2554, 0x2555, 0x2556, 0x2557, 0x2558, 0x2559, 0x255a, 0x255b,
1022 0x255c, 0x255d, 0x255e, 0x255f, 0x2560, 0x2561, 0x2562, 0x2563,
1023 0x2564, 0x2565, 0x2566, 0x2567, 0x2568, 0x2569, 0x256a, 0x256b,
1024 0x256c, 0x256d, 0x256e, 0x256f, 0x2570, 0x2571, 0x2572, 0x2573,
1025 0x2581, 0x2582, 0x2583, 0x2584, 0x2585, 0x2586, 0x2587, 0x2588,
1026 0x2589, 0x258a, 0x258b, 0x258c, 0x258d, 0x258e, 0x258f, 0x2593,
1027 0x2594, 0x2595, 0x25bc, 0x25bd, 0x25e2, 0x25e3, 0x25e4, 0x25e5,
1028 0x2609, 0x2295, 0x3012, 0x301d, 0x301e, 0xffffd, 0xffffd, 0xffffd,
1029 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1030 0x0101, 0x00e1, 0x01ce, 0x00e0, 0x0113, 0x00e9, 0x011b, 0x00e8,

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1031 0x012b, 0x00ed, 0x01d0, 0x00ec, 0x014d, 0x00f3, 0x01d2, 0x00f2,
1032 0x016b, 0x00fa, 0x01d4, 0x00f9, 0x01d6, 0x01d8, 0x01da, 0x01dc,
1033 0x00fc, 0x00ea, 0x0251, 0xffff, 0x0144, 0x0148, 0xffff, 0x0261,
1034 0xffff, 0xffff, 0xffff, 0xffff, 0x3105, 0x3106, 0x3107, 0x3108,
1035 0x3109, 0x310a, 0x310b, 0x310c, 0x310d, 0x310e, 0x310f, 0x3110,
1036 0x3111, 0x3112, 0x3113, 0x3114, 0x3115, 0x3116, 0x3117, 0x3118,
1037 0x3119, 0x311a, 0x311b, 0x311c, 0x311d, 0x311e, 0x311f, 0x3120,
1038 0x3121, 0x3122, 0x3123, 0x3124, 0x3125, 0x3126, 0x3127, 0x3128,
1039 0x3129, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1040 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1041 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1042 /* 0xa9 */
1043 0x3021, 0x3022, 0x3023, 0x3024, 0x3025, 0x3026, 0x3027, 0x3028,
1044 0x3029, 0x32a3, 0x338e, 0x338f, 0x339c, 0x339d, 0x339e, 0x33a1,
1045 0x33c4, 0x33ce, 0x33d1, 0x33d2, 0x33d5, 0xfe30, 0xfe2, 0xfe4,
1046 0xffff, 0x2121, 0x3231, 0xffff, 0x2010, 0xffff, 0xffff, 0xffff,
1047 0x30fc, 0x309b, 0x309c, 0x30fd, 0x30fe, 0x3006, 0x309d, 0x309e,
1048 0xfe49, 0xfe4a, 0xfe4b, 0xfe4c, 0xfe4d, 0xfe4e, 0xfe4f, 0xfe50,
1049 0xfe51, 0xfe52, 0xfe54, 0xfe55, 0xfe56, 0xfe57, 0xfe59, 0xfe5a,
1050 0xfe5b, 0xfe5c, 0xfe5d, 0xfe5e, 0xfe5f, 0xfe60, 0xfe61, 0xfe62,
1051 0xfe63, 0xfe64, 0xfe65, 0xfe66, 0xfe68, 0xfe69, 0xfe6a, 0xfe6b,
1052 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1053 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0x3007, 0xffff, 0xffff,
1054 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1055 0xffff, 0xffff, 0xffff, 0x2500, 0x2501, 0x2502, 0x2503, 0x2504,
1056 0x2505, 0x2506, 0x2507, 0x2508, 0x2509, 0x250a, 0x250b, 0x250c,
1057 0x250d, 0x250e, 0x250f, 0x2510, 0x2511, 0x2512, 0x2513, 0x2514,
1058 0x2515, 0x2516, 0x2517, 0x2518, 0x2519, 0x251a, 0x251b, 0x251c,
1059 0x251d, 0x251e, 0x251f, 0x2520, 0x2521, 0x2522, 0x2523, 0x2524,
1060 0x2525, 0x2526, 0x2527, 0x2528, 0x2529, 0x252a, 0x252b, 0x252c,
1061 0x252d, 0x252e, 0x252f, 0x2530, 0x2531, 0x2532, 0x2533, 0x2534,
1062 0x2535, 0x2536, 0x2537, 0x2538, 0x2539, 0x253a, 0x253b, 0x253c,
1063 0x253d, 0x253e, 0x253f, 0x2540, 0x2541, 0x2542, 0x2543, 0x2544,
1064 0x2545, 0x2546, 0x2547, 0x2548, 0x2549, 0x254a, 0x254b, 0xffff,
1065 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1066 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1067 /* 0xaa */
1068 0x72dc, 0x72dd, 0x72df, 0x72e2, 0x72e3, 0x72e4, 0x72e5, 0x72e6,
1069 0x72e7, 0x72ea, 0x72eb, 0x72f5, 0x72f6, 0x72f9, 0x72fd, 0x72fe,
1070 0x72ff, 0x7300, 0x7302, 0x7304, 0x7305, 0x7306, 0x7307, 0x7308,
1071 0x7309, 0x730b, 0x730c, 0x730d, 0x730f, 0x7310, 0x7311, 0x7312,
1072 0x7314, 0x7318, 0x7319, 0x731a, 0x731f, 0x7320, 0x7323, 0x7324,
1073 0x7326, 0x7327, 0x7328, 0x732d, 0x732f, 0x7330, 0x7332, 0x7333,
1074 0x7335, 0x7336, 0x733a, 0x733b, 0x733c, 0x733d, 0x7340, 0x7341,
1075 0x7342, 0x7343, 0x7344, 0x7345, 0x7346, 0x7347, 0x7348, 0x7349,
1076 0x734a, 0x734b, 0x734c, 0x734e, 0x734f, 0x7351, 0x7353, 0x7354,
1077 0x7355, 0x7356, 0x7358, 0x7359, 0x735a, 0x735b, 0x735c, 0x735d,
1078 0x735e, 0x735f, 0x7361, 0x7362, 0x7363, 0x7364, 0x7365, 0x7366,
1079 0x7367, 0x7368, 0x7369, 0x736a, 0x736b, 0x736e, 0x7370, 0x7371,
1080 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1081 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1082 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1083 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1084 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1085 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1086 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1087 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1088 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1089 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1090 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1091 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1092 /* 0xab */
1093 0x7372, 0x7373, 0x7374, 0x7375, 0x7376, 0x7377, 0x7378, 0x7379,
1094 0x737a, 0x737b, 0x737c, 0x737d, 0x737f, 0x7380, 0x7381, 0x7382,
1095 0x7383, 0x7385, 0x7386, 0x7388, 0x738a, 0x738c, 0x738d, 0x738f,
1096 0x7390, 0x7392, 0x7393, 0x7394, 0x7395, 0x7397, 0x7398, 0x7399,
1097 0x739a, 0x739c, 0x739d, 0x739e, 0x73a0, 0x73a1, 0x73a3, 0x73a4,
1098 0x73a5, 0x73a6, 0x73a7, 0x73a8, 0x73aa, 0x73ac, 0x73ad, 0x73b1,
1099 0x73b4, 0x73b5, 0x73b6, 0x73b8, 0x73b9, 0x73bc, 0x73bd, 0x73be,
1100 0x73bf, 0x73c1, 0x73c3, 0x73c4, 0x73c5, 0x73c6, 0x73c7, 0x73cb,
1101 0x73cc, 0x73ce, 0x73d2, 0x73d3, 0x73d4, 0x73d5, 0x73d6, 0x73d7,
1102 0x73d8, 0x73da, 0x73db, 0x73dc, 0x73dd, 0x73df, 0x73e1, 0x73e2,
1103 0x73e3, 0x73e4, 0x73e6, 0x73e8, 0x73ea, 0x73eb, 0x73ec, 0x73ee,
1104 0x73ef, 0x73f0, 0x73f1, 0x73f3, 0x73f4, 0x73f5, 0x73f6, 0x73f7,
1105 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1106 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1107 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1108 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1109 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1110 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1111 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1112 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1113 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1114 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1115 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1116 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1117 /* 0xac */
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1118 0x73f8, 0x73f9, 0x73fa, 0x73fb, 0x73fc, 0x73fd, 0x73fe, 0x73ff,
1119 0x7400, 0x7401, 0x7402, 0x7404, 0x7407, 0x7408, 0x740b, 0x740c,
1120 0x740d, 0x740e, 0x7411, 0x7412, 0x7413, 0x7414, 0x7415, 0x7416,
1121 0x7417, 0x7418, 0x7419, 0x741c, 0x741d, 0x741e, 0x741f, 0x7420,
1122 0x7421, 0x7423, 0x7424, 0x7427, 0x7429, 0x742b, 0x742d, 0x742f,
1123 0x7431, 0x7432, 0x7437, 0x7438, 0x7439, 0x743a, 0x743b, 0x743d,
1124 0x743e, 0x743f, 0x7440, 0x7442, 0x7443, 0x7444, 0x7445, 0x7446,
1125 0x7447, 0x7448, 0x7449, 0x744a, 0x744b, 0x744c, 0x744d, 0x744e,
1126 0x744f, 0x7450, 0x7451, 0x7452, 0x7453, 0x7454, 0x7456, 0x7458,
1127 0x745d, 0x7460, 0x7461, 0x7462, 0x7463, 0x7464, 0x7465, 0x7466,
1128 0x7467, 0x7468, 0x7469, 0x746a, 0x746b, 0x746c, 0x746e, 0x746f,
1129 0x7471, 0x7472, 0x7473, 0x7474, 0x7475, 0x7478, 0x7479, 0x747a,
1130 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1131 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1132 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1133 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1134 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1135 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1136 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1137 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1138 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1139 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1140 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1141 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1142 /* 0xad */
1143 0x747b, 0x747c, 0x747d, 0x747f, 0x7482, 0x7484, 0x7485, 0x7486,
1144 0x7488, 0x7489, 0x748a, 0x748c, 0x748d, 0x748f, 0x7491, 0x7492,
1145 0x7493, 0x7494, 0x7495, 0x7496, 0x7497, 0x7498, 0x7499, 0x749a,
1146 0x749b, 0x749d, 0x749f, 0x74a0, 0x74a1, 0x74a2, 0x74a3, 0x74a4,
1147 0x74a5, 0x74a6, 0x74aa, 0x74ab, 0x74ac, 0x74ad, 0x74ae, 0x74af,
1148 0x74b0, 0x74b1, 0x74b2, 0x74b3, 0x74b4, 0x74b5, 0x74b6, 0x74b7,
1149 0x74b8, 0x74b9, 0x74bb, 0x74bc, 0x74bd, 0x74be, 0x74bf, 0x74c0,
1150 0x74c1, 0x74c2, 0x74c3, 0x74c4, 0x74c5, 0x74c6, 0x74c7, 0x74c8,
1151 0x74c9, 0x74ca, 0x74cb, 0x74cc, 0x74cd, 0x74ce, 0x74cf, 0x74d0,
1152 0x74d1, 0x74d3, 0x74d4, 0x74d5, 0x74d6, 0x74d7, 0x74d8, 0x74d9,
1153 0x74da, 0x74db, 0x74dd, 0x74df, 0x74e1, 0x74e5, 0x74e7, 0x74e8,
1154 0x74e9, 0x74ea, 0x74eb, 0x74ec, 0x74ed, 0x74f0, 0x74f1, 0x74f2,
1155 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1156 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1157 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1158 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1159 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1160 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1161 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1162 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1163 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1164 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1165 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1166 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1167 /* 0xae */
1168 0x74f3, 0x74f5, 0x74f8, 0x74f9, 0x74fa, 0x74fb, 0x74fc, 0x74fd,
1169 0x74fe, 0x7500, 0x7501, 0x7502, 0x7503, 0x7505, 0x7506, 0x7507,
1170 0x7508, 0x7509, 0x750a, 0x750b, 0x750c, 0x750e, 0x7510, 0x7512,
1171 0x7514, 0x7515, 0x7516, 0x7517, 0x751b, 0x751d, 0x751e, 0x7520,
1172 0x7521, 0x7522, 0x7523, 0x7524, 0x7526, 0x7527, 0x752a, 0x752e,
1173 0x7534, 0x7536, 0x7539, 0x753c, 0x753d, 0x753f, 0x7541, 0x7542,
1174 0x7543, 0x7544, 0x7546, 0x7547, 0x7549, 0x754a, 0x754d, 0x7550,
1175 0x7551, 0x7552, 0x7553, 0x7555, 0x7556, 0x7557, 0x7558, 0x755d,
1176 0x755e, 0x755f, 0x7560, 0x7561, 0x7562, 0x7563, 0x7564, 0x7567,
1177 0x7568, 0x7569, 0x756b, 0x756c, 0x756d, 0x756e, 0x756f, 0x7570,
1178 0x7571, 0x7573, 0x7575, 0x7576, 0x7577, 0x757a, 0x757b, 0x757c,
1179 0x757d, 0x757e, 0x7580, 0x7581, 0x7582, 0x7584, 0x7585, 0x7587,
1180 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1181 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1182 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1183 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1184 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1185 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1186 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1187 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1188 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1189 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1190 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1191 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
1192 /* 0xaf */
1193 0x7588, 0x7589, 0x758a, 0x758c, 0x758d, 0x758e, 0x7590, 0x7593,
1194 0x7595, 0x7598, 0x759b, 0x759c, 0x759e, 0x75a2, 0x75a6, 0x75a7,
1195 0x75a8, 0x75a9, 0x75aa, 0x75ad, 0x75b6, 0x75b7, 0x75ba, 0x75bb,
1196 0x75bf, 0x75c0, 0x75c1, 0x75c6, 0x75cb, 0x75cc, 0x75ce, 0x75cf,
1197 0x75d0, 0x75d1, 0x75d3, 0x75d7, 0x75d9, 0x75da, 0x75dc, 0x75dd,
1198 0x75df, 0x75e0, 0x75e1, 0x75e5, 0x75e9, 0x75ec, 0x75ed, 0x75ee,
1199 0x75ef, 0x75f2, 0x75f3, 0x75f5, 0x75f6, 0x75f7, 0x75f8, 0x75fa,
1200 0x75fb, 0x75fd, 0x75fe, 0x7602, 0x7604, 0x7606, 0x7607, 0x7608,
1201 0x7609, 0x760b, 0x760d, 0x760e, 0x760f, 0x7611, 0x7612, 0x7613,
1202 0x7614, 0x7616, 0x761a, 0x761c, 0x761d, 0x761e, 0x7621, 0x7623,
1203 0x7627, 0x7628, 0x762c, 0x762e, 0x762f, 0x7631, 0x7632, 0x7636,
1204 0x7637, 0x7639, 0x763a, 0x763b, 0x763d, 0x7641, 0x7642, 0x7644,
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1205 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1206 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1207 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1208 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1209 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1210 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1211 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1212 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1213 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1214 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1215 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1216 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
1217 /* 0xb0 */
1218 0x7645, 0x7646, 0x7647, 0x7648, 0x7649, 0x764a, 0x764b, 0x764e,
1219 0x764f, 0x7650, 0x7651, 0x7652, 0x7653, 0x7655, 0x7657, 0x7658,
1220 0x7659, 0x765a, 0x765b, 0x765d, 0x765f, 0x7660, 0x7661, 0x7662,
1221 0x7664, 0x7665, 0x7666, 0x7667, 0x7668, 0x7669, 0x766a, 0x766c,
1222 0x766d, 0x766e, 0x766f, 0x7670, 0x7671, 0x7672, 0x7673, 0x7674,
1223 0x7676, 0x7677, 0x7679, 0x767a, 0x767c, 0x767f, 0x7680, 0x7681,
1224 0x7683, 0x7685, 0x7689, 0x768a, 0x768c, 0x768d, 0x768f, 0x7690,
1225 0x7692, 0x7694, 0x7695, 0x7697, 0x7698, 0x769a, 0x769b, 0x769c,
1226 0x769d, 0x769e, 0x769f, 0x76a0, 0x76a1, 0x76a2, 0x76a3, 0x76a5,
1227 0x76a6, 0x76a7, 0x76a8, 0x76a9, 0x76aa, 0x76ab, 0x76ac, 0x76ad,
1228 0x76af, 0x76b0, 0x76b3, 0x76b5, 0x76b6, 0x76b7, 0x76b8, 0x76b9,
1229 0x76ba, 0x76bb, 0x76bc, 0x76bd, 0x76be, 0x76c0, 0x76c1, 0x76c3,
1230 0x554a, 0x963f, 0x57c3, 0x6328, 0x54ce, 0x5509, 0x54c0, 0x7691,
1231 0x764c, 0x853c, 0x77ee, 0x827e, 0x788d, 0x7231, 0x9698, 0x978d,
1232 0x6c28, 0x5b89, 0x4ffa, 0x6309, 0x6697, 0x5cb8, 0x80fa, 0x6848,
1233 0x80ae, 0x6602, 0x76ce, 0x51f9, 0x6556, 0x71ac, 0x7ff1, 0x8884,
1234 0x50b2, 0x5965, 0x61ca, 0x6fb3, 0x82ad, 0x634c, 0x6252, 0x53ed,
1235 0x5427, 0x7b06, 0x516b, 0x75a4, 0x5df4, 0x62d4, 0x8dc3, 0x9776,
1236 0x628a, 0x8019, 0x575d, 0x9738, 0x7f62, 0x7238, 0x767d, 0x67cf,
1237 0x767e, 0x6446, 0x4f70, 0x8d25, 0x62dc, 0x7a17, 0x6591, 0x73ed,
1238 0x642c, 0x6273, 0x822c, 0x9881, 0x677f, 0x7248, 0x626e, 0x62cc,
1239 0x4f34, 0x74e3, 0x534a, 0x529e, 0x7eca, 0x90a6, 0x5e2e, 0x6886,
1240 0x699c, 0x8180, 0x7ed1, 0x68d2, 0x78c5, 0x868c, 0x9551, 0x508d,
1241 0x8c24, 0x82de, 0x80de, 0x5305, 0x8912, 0x5265,
1242 /* 0xb1 */
1243 0x76c4, 0x76c7, 0x76c9, 0x76cb, 0x76cc, 0x76d3, 0x76d5, 0x76d9,
1244 0x76da, 0x76dc, 0x76dd, 0x76de, 0x76e0, 0x76e1, 0x76e2, 0x76e3,
1245 0x76e4, 0x76e6, 0x76e7, 0x76e8, 0x76e9, 0x76ea, 0x76eb, 0x76ec,
1246 0x76ed, 0x76f0, 0x76f3, 0x76f5, 0x76f6, 0x76f7, 0x76fa, 0x76fb,
1247 0x76fd, 0x76ff, 0x7700, 0x7702, 0x7703, 0x7705, 0x7706, 0x770a,
1248 0x770c, 0x770e, 0x770f, 0x7710, 0x7711, 0x7712, 0x7713, 0x7714,
1249 0x7715, 0x7716, 0x7717, 0x7718, 0x771b, 0x771c, 0x771d, 0x771e,
1250 0x7721, 0x7723, 0x7724, 0x7725, 0x7727, 0x772a, 0x772b, 0x772c,
1251 0x772e, 0x7730, 0x7731, 0x7732, 0x7733, 0x7734, 0x7739, 0x773b,
1252 0x773d, 0x773e, 0x773f, 0x7742, 0x7744, 0x7745, 0x7746, 0x7748,
1253 0x7749, 0x774a, 0x774b, 0x774c, 0x774d, 0x774e, 0x774f, 0x7752,
1254 0x7753, 0x7754, 0x7755, 0x7756, 0x7757, 0x7758, 0x7759, 0x775c,
1255 0x8584, 0x96f9, 0x4fdd, 0x5821, 0x9971, 0x5b9d, 0x62b1, 0x62a5,
1256 0x66b4, 0x8c79, 0x9c8d, 0x7206, 0x676f, 0x7891, 0x60b2, 0x5351,
1257 0x5317, 0x8f88, 0x80cc, 0x8d1d, 0x94a1, 0x500d, 0x72c8, 0x5907,
1258 0x60eb, 0x7119, 0x88ab, 0x5954, 0x82ef, 0x672c, 0x7b28, 0x5d29,
1259 0x7ef7, 0x752d, 0x6cf5, 0x8e66, 0x8ff8, 0x903c, 0x9f3b, 0x6bd4,
1260 0x9119, 0x7b14, 0x5f7c, 0x78a7, 0x84d6, 0x853d, 0x6bd5, 0x6bd9,
1261 0x6bd6, 0x5e01, 0x5e87, 0x75f9, 0x95ed, 0x655d, 0x5f0a, 0x5fcs,
1262 0x8f9f, 0x58c1, 0x81c2, 0x907f, 0x965b, 0x97ad, 0x8fb9, 0x7f16,
1263 0x8d2c, 0x6241, 0x4fbf, 0x53d8, 0x535e, 0x8fa8, 0x8fa9, 0x8fab,
1264 0x904d, 0x6807, 0x5f6a, 0x8198, 0x8868, 0x9cd6, 0x618b, 0x522b,
1265 0x762a, 0x5f6c, 0x658c, 0x6fd2, 0x6ee8, 0x5bbe, 0x6448, 0x5175,
1266 0x51b0, 0x67c4, 0x4e19, 0x79c9, 0x997c, 0x70b3,
1267 /* 0xb2 */
1268 0x775d, 0x775e, 0x775f, 0x7760, 0x7764, 0x7767, 0x7769, 0x776a,
1269 0x776d, 0x776e, 0x776f, 0x7770, 0x7771, 0x7772, 0x7773, 0x7774,
1270 0x7775, 0x7776, 0x7777, 0x7778, 0x777a, 0x777b, 0x777c, 0x7781,
1271 0x7782, 0x7783, 0x7786, 0x7787, 0x7788, 0x7789, 0x778a, 0x778b,
1272 0x778f, 0x7790, 0x7793, 0x7794, 0x7795, 0x7796, 0x7797, 0x7798,
1273 0x7799, 0x779a, 0x779b, 0x779c, 0x779d, 0x779e, 0x77a1, 0x77a3,
1274 0x77a4, 0x77a6, 0x77a8, 0x77ab, 0x77ad, 0x77ae, 0x77af, 0x77b1,
1275 0x77b2, 0x77b4, 0x77b6, 0x77b7, 0x77b8, 0x77b9, 0x77ba, 0x77bc,
1276 0x77be, 0x77c0, 0x77c1, 0x77c2, 0x77c3, 0x77c4, 0x77c5, 0x77c6,
1277 0x77c7, 0x77c8, 0x77c9, 0x77ca, 0x77cb, 0x77cc, 0x77ce, 0x77cf,
1278 0x77d0, 0x77d1, 0x77d2, 0x77d3, 0x77d4, 0x77d5, 0x77d6, 0x77d8,
1279 0x77d9, 0x77da, 0x77dd, 0x77de, 0x77df, 0x77e0, 0x77e1, 0x77e4,
1280 0x75c5, 0x5e76, 0x73bb, 0x83e0, 0x64ad, 0x62e8, 0x94b5, 0x6ce2,
1281 0x535a, 0x52c3, 0x640f, 0x94c2, 0x7b94, 0x4f2f, 0x5e1b, 0x8236,
1282 0x8116, 0x818a, 0x6e24, 0x6cca, 0x9a73, 0x6355, 0x535c, 0x54fa,
1283 0x8865, 0x57e0, 0x4e0d, 0x5e03, 0x6b65, 0x7c3f, 0x90e8, 0x6016,
1284 0x64e6, 0x731c, 0x88c1, 0x6750, 0x624d, 0x8d22, 0x776c, 0x8e29,
1285 0x91c7, 0x5f69, 0x83dc, 0x8521, 0x9910, 0x53c2, 0x8695, 0x6b8b,
1286 0x60ed, 0x60e8, 0x707f, 0x82cd, 0x8231, 0x4ed3, 0x6ca7, 0x85cf,
1287 0x64cd, 0x7cd9, 0x69fd, 0x66f9, 0x8349, 0x5395, 0x7b56, 0x4fa7,
1288 0x518c, 0x6d4b, 0x5c42, 0x8e6d, 0x63d2, 0x53c9, 0x832c, 0x8336,
1289 0x67e5, 0x78b4, 0x643d, 0x5bdf, 0x5c94, 0x5dee, 0x8be7, 0x62c6,
1290 0x67f4, 0x8c7a, 0x6400, 0x63ba, 0x8749, 0x998b, 0x8c17, 0x7f20,
1291 0x94f2, 0x4ea7, 0x9610, 0x98a4, 0x660c, 0x7316,
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1292  /* 0xb3 */
1293  0x77e6, 0x77e8, 0x77ea, 0x77ef, 0x77f0, 0x77f1, 0x77f2, 0x77f4,
1294  0x77f5, 0x77f7, 0x77f9, 0x77fa, 0x77fb, 0x77fc, 0x7803, 0x7804,
1295  0x7805, 0x7806, 0x7807, 0x7808, 0x780a, 0x780b, 0x780e, 0x780f,
1296  0x7810, 0x7813, 0x7815, 0x7819, 0x781b, 0x781e, 0x7820, 0x7821,
1297  0x7822, 0x7824, 0x7828, 0x782a, 0x782b, 0x782e, 0x782f, 0x7831,
1298  0x7832, 0x7833, 0x7835, 0x7836, 0x783d, 0x783f, 0x7841, 0x7842,
1299  0x7843, 0x7844, 0x7846, 0x7848, 0x7849, 0x784a, 0x784b, 0x784d,
1300  0x784f, 0x7851, 0x7853, 0x7854, 0x7858, 0x7859, 0x785a, 0x785b,
1301  0x785c, 0x785e, 0x785f, 0x7860, 0x7861, 0x7862, 0x7863, 0x7864,
1302  0x7865, 0x7866, 0x7867, 0x7868, 0x7869, 0x786f, 0x7870, 0x7871,
1303  0x7872, 0x7873, 0x7874, 0x7875, 0x7876, 0x7878, 0x7879, 0x787a,
1304  0x787b, 0x787d, 0x787e, 0x787f, 0x7880, 0x7881, 0x7882, 0x7883,
1305  0x573a, 0x5c1d, 0x5e38, 0x957f, 0x507f, 0x80a0, 0x5382, 0x655e,
1306  0x7545, 0x5531, 0x5021, 0x8d85, 0x6284, 0x949e, 0x671d, 0x5632,
1307  0x6f6e, 0x5de2, 0x5435, 0x7092, 0x8f66, 0x626f, 0x64a4, 0x63a3,
1308  0x5f7b, 0x6f88, 0x90f4, 0x81e3, 0x8fb0, 0x5c18, 0x6668, 0x5ff1,
1309  0x6c89, 0x9648, 0x8d81, 0x886c, 0x6491, 0x79f0, 0x57ce, 0x6a59,
1310  0x6210, 0x5448, 0x4e58, 0x7a0b, 0x60e9, 0x6f84, 0x8bda, 0x627f,
1311  0x901e, 0x9a8b, 0x79e4, 0x5403, 0x75f4, 0x6301, 0x5319, 0x6c60,
1312  0x8fdf, 0x5f1b, 0x9a70, 0x803b, 0x9f7f, 0x4f88, 0x5c3a, 0x8d64,
1313  0x7fc5, 0x65a5, 0x70bd, 0x5145, 0x51b2, 0x866b, 0x5d07, 0x5ba0,
1314  0x62bd, 0x916c, 0x7574, 0x8e0c, 0x7a20, 0x6101, 0x7b79, 0x4ec7,
1315  0x7ef8, 0x7785, 0x4e11, 0x81ed, 0x521d, 0x51fa, 0x6a71, 0x53a8,
1316  0x8e87, 0x9504, 0x96cf, 0x6ec1, 0x9664, 0x695a,
1317  /* 0xb4 */
1318  0x7884, 0x7885, 0x7886, 0x7888, 0x788a, 0x788b, 0x788f, 0x7890,
1319  0x7892, 0x7894, 0x7895, 0x7896, 0x7899, 0x789d, 0x789e, 0x78a0,
1320  0x78a2, 0x78a4, 0x78a6, 0x78a8, 0x78a9, 0x78aa, 0x78ab, 0x78ac,
1321  0x78ad, 0x78ae, 0x78af, 0x78b5, 0x78b6, 0x78b7, 0x78b8, 0x78ba,
1322  0x78bb, 0x78bc, 0x78bd, 0x78bf, 0x78c0, 0x78c2, 0x78c3, 0x78c4,
1323  0x78c6, 0x78c7, 0x78c8, 0x78cc, 0x78cd, 0x78ce, 0x78cf, 0x78d1,
1324  0x78d2, 0x78d3, 0x78d6, 0x78d7, 0x78d8, 0x78da, 0x78db, 0x78dc,
1325  0x78dd, 0x78de, 0x78df, 0x78e0, 0x78e1, 0x78e2, 0x78e3, 0x78e4,
1326  0x78e5, 0x78e6, 0x78e7, 0x78e9, 0x78ea, 0x78eb, 0x78ed, 0x78ee,
1327  0x78ef, 0x78f0, 0x78f1, 0x78f3, 0x78f5, 0x78f6, 0x78f8, 0x78f9,
1328  0x78fb, 0x78fc, 0x78fd, 0x78fe, 0x78ff, 0x7900, 0x7902, 0x7903,
1329  0x7904, 0x7906, 0x7907, 0x7908, 0x7909, 0x790a, 0x790b, 0x790c,
1330  0x7840, 0x50a8, 0x77d7, 0x6410, 0x89e6, 0x5904, 0x63e3, 0x5ddd,
1331  0x7a7f, 0x693d, 0x4f20, 0x8239, 0x5598, 0x4e32, 0x75ae, 0x7a97,
1332  0x5e62, 0x5e8a, 0x95ef, 0x521b, 0x5439, 0x708a, 0x6376, 0x9524,
1333  0x5782, 0x6625, 0x693f, 0x9187, 0x5507, 0x6df3, 0x7eaf, 0x8822,
1334  0x6233, 0x7ef0, 0x75b5, 0x8328, 0x78c1, 0x96cc, 0x8f9e, 0x6148,
1335  0x74f7, 0x8bcd, 0x6b64, 0x523a, 0x8d50, 0x6b21, 0x806a, 0x8471,
1336  0x56f1, 0x5306, 0x4ece, 0x4e1b, 0x51d1, 0x7c97, 0x918b, 0x7c07,
1337  0x4fc3, 0x8e7f, 0x7be1, 0x7a9c, 0x6467, 0x5d14, 0x50ac, 0x8106,
1338  0x7601, 0x7cb9, 0x6dec, 0x7fe0, 0x6751, 0x5b58, 0x5bf8, 0x78cb,
1339  0x64ae, 0x6413, 0x63aa, 0x632b, 0x9519, 0x642d, 0x8f8e, 0x7b54,
1340  0x7629, 0x6253, 0x5927, 0x5446, 0x6b79, 0x50a3, 0x6234, 0x5e26,
1341  0x6b86, 0x4ee3, 0x8d37, 0x888b, 0x5f85, 0x902e,
1342  /* 0xb5 */
1343  0x790d, 0x790e, 0x790f, 0x7910, 0x7911, 0x7912, 0x7914, 0x7915,
1344  0x7916, 0x7917, 0x7918, 0x7919, 0x791a, 0x791b, 0x791c, 0x791d,
1345  0x791f, 0x7920, 0x7921, 0x7922, 0x7923, 0x7925, 0x7926, 0x7927,
1346  0x7928, 0x7929, 0x792a, 0x792b, 0x792c, 0x792d, 0x792e, 0x792f,
1347  0x7930, 0x7931, 0x7932, 0x7933, 0x7935, 0x7936, 0x7937, 0x7938,
1348  0x7939, 0x793d, 0x793f, 0x7942, 0x7943, 0x7944, 0x7945, 0x7947,
1349  0x794a, 0x794b, 0x794c, 0x794d, 0x794e, 0x794f, 0x7950, 0x7951,
1350  0x7952, 0x7954, 0x7955, 0x7958, 0x7959, 0x7961, 0x7963, 0x7964,
1351  0x7966, 0x7969, 0x796a, 0x796b, 0x796c, 0x796e, 0x7970, 0x7971,
1352  0x7972, 0x7973, 0x7974, 0x7975, 0x7976, 0x7979, 0x797b, 0x797c,
1353  0x797d, 0x797e, 0x797f, 0x7982, 0x7983, 0x7986, 0x7987, 0x7988,
1354  0x7989, 0x798b, 0x798c, 0x798d, 0x798e, 0x7990, 0x7991, 0x7992,
1355  0x6020, 0x803d, 0x62c5, 0x4e39, 0x5355, 0x90f8, 0x63b8, 0x80c6,
1356  0x65e6, 0x6c2e, 0x4f46, 0x60ee, 0x6de1, 0x8bde, 0x5f39, 0x86cb,
1357  0x5f53, 0x6321, 0x515a, 0x8361, 0x6863, 0x5200, 0x6363, 0x8e48,
1358  0x5012, 0x5c9b, 0x7977, 0x5bfc, 0x5230, 0x7a3b, 0x60bc, 0x9053,
1359  0x76d7, 0x5fb7, 0x5f97, 0x7684, 0x8e6c, 0x706f, 0x767b, 0x7b49,
1360  0x77aa, 0x51f3, 0x9093, 0x5824, 0x4f4e, 0x6ef4, 0x8fea, 0x654c,
1361  0x7b1b, 0x72c4, 0x6da4, 0x7fdf, 0x5ae1, 0x62b5, 0x5e95, 0x5730,
1362  0x8482, 0x7b2c, 0x5e1d, 0x5f1f, 0x9012, 0x7f14, 0x98a0, 0x6382,
1363  0x6ec7, 0x7898, 0x70b9, 0x5178, 0x975b, 0x57ab, 0x7535, 0x4f43,
1364  0x7538, 0x5e97, 0x60e6, 0x5960, 0x6dc0, 0x6bbf, 0x7889, 0x53fc,
1365  0x96d5, 0x51cb, 0x5201, 0x6389, 0x540a, 0x9493, 0x8c03, 0x8dcc,
1366  0x7239, 0x789f, 0x8776, 0x8fed, 0x8c0d, 0x53e0,
1367  /* 0xb6 */
1368  0x7993, 0x7994, 0x7995, 0x7996, 0x7997, 0x7998, 0x7999, 0x799b,
1369  0x799c, 0x799d, 0x799e, 0x799f, 0x79a0, 0x79a1, 0x79a2, 0x79a3,
1370  0x79a4, 0x79a5, 0x79a6, 0x79a8, 0x79a9, 0x79aa, 0x79ab, 0x79ac,
1371  0x79ad, 0x79ae, 0x79af, 0x79b0, 0x79b1, 0x79b2, 0x79b4, 0x79b5,
1372  0x79b6, 0x79b7, 0x79b8, 0x79bc, 0x79bf, 0x79c2, 0x79c4, 0x79c5,
1373  0x79c7, 0x79c8, 0x79ca, 0x79cc, 0x79ce, 0x79cf, 0x79d0, 0x79d3,
1374  0x79d4, 0x79d6, 0x79d7, 0x79d9, 0x79da, 0x79db, 0x79dc, 0x79dd,
1375  0x79de, 0x79e0, 0x79e1, 0x79e2, 0x79e5, 0x79e8, 0x79ea, 0x79ec,
1376  0x79ee, 0x79f1, 0x79f2, 0x79f3, 0x79f4, 0x79f5, 0x79f6, 0x79f7,
1377  0x79f9, 0x79fa, 0x79fc, 0x79fd, 0x79fe, 0x79ff, 0x7a01, 0x7a04, 0x7a05,
1378  0x7a07, 0x7a08, 0x7a09, 0x7a0a, 0x7a0c, 0x7a0f, 0x7a10, 0x7a11,

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```
1379 0x7a12, 0x7a13, 0x7a15, 0x7a16, 0x7a18, 0x7a19, 0x7a1b, 0x7a1c,
1380 0x4e01, 0x76ef, 0x53ee, 0x9489, 0x9876, 0x9f0e, 0x952d, 0x5b9a,
1381 0x8ba2, 0x4e22, 0x4e1c, 0x51ac, 0x8463, 0x61c2, 0x52a8, 0x680b,
1382 0x4f97, 0x606b, 0x51bb, 0x6d1e, 0x515c, 0x6296, 0x6597, 0x9661,
1383 0x8c46, 0x9017, 0x75d8, 0x90fd, 0x7763, 0x6bd2, 0x728a, 0x72ec,
1384 0x8bfb, 0x5835, 0x7779, 0x8d4c, 0x675c, 0x9540, 0x809a, 0x5ea6,
1385 0x6e21, 0x5992, 0x7aef, 0x77ed, 0x953b, 0x6bb5, 0x65ad, 0x7f0e,
1386 0x5806, 0x5151, 0x961f, 0x5bf9, 0x58a9, 0x5428, 0x8e72, 0x6566,
1387 0x987f, 0x56e4, 0x949d, 0x76fe, 0x9041, 0x6387, 0x54c6, 0x591a,
1388 0x593a, 0x579b, 0x8eb2, 0x6735, 0x8dfa, 0x8235, 0x5241, 0x60f0,
1389 0x5815, 0x86fe, 0x5ce8, 0x9e45, 0x4fc4, 0x989d, 0x8bb9, 0x5a25,
1390 0x6076, 0x5384, 0x627c, 0x904f, 0x9102, 0x997f, 0x6069, 0x800c,
1391 0x513f, 0x8033, 0x5c14, 0x9975, 0x6d31, 0x4e8c,
1392 /* 0xb7 */
1393 0x7a1d, 0x7a1f, 0x7a21, 0x7a22, 0x7a24, 0x7a25, 0x7a26, 0x7a27,
1394 0x7a28, 0x7a29, 0x7a2a, 0x7a2b, 0x7a2c, 0x7a2d, 0x7a2e, 0x7a2f,
1395 0x7a30, 0x7a31, 0x7a32, 0x7a34, 0x7a35, 0x7a36, 0x7a38, 0x7a3a,
1396 0x7a3e, 0x7a40, 0x7a41, 0x7a42, 0x7a43, 0x7a44, 0x7a45, 0x7a47,
1397 0x7a48, 0x7a49, 0x7a4a, 0x7a4b, 0x7a4c, 0x7a4d, 0x7a4e, 0x7a4f,
1398 0x7a50, 0x7a52, 0x7a53, 0x7a54, 0x7a55, 0x7a56, 0x7a58, 0x7a59,
1399 0x7a5a, 0x7a5b, 0x7a5c, 0x7a5d, 0x7a5e, 0x7a5f, 0x7a60, 0x7a61,
1400 0x7a62, 0x7a63, 0x7a64, 0x7a65, 0x7a66, 0x7a67, 0x7a68, 0x7a69,
1401 0x7a6a, 0x7a6b, 0x7a6c, 0x7a6d, 0x7a6e, 0x7a6f, 0x7a71, 0x7a72,
1402 0x7a73, 0x7a75, 0x7a7b, 0x7a7c, 0x7a7d, 0x7a7e, 0x7a82, 0x7a85,
1403 0x7a87, 0x7a89, 0x7a8a, 0x7a8b, 0x7a8c, 0x7a8e, 0x7a8f, 0x7a90,
1404 0x7a93, 0x7a94, 0x7a99, 0x7a9a, 0x7a9b, 0x7a9e, 0x7aa1, 0x7aa2,
1405 0x8d30, 0x53d1, 0x7f5a, 0x7b4f, 0x4f10, 0x4e4f, 0x9600, 0x6cd5,
1406 0x73d0, 0x85e9, 0x5e06, 0x756a, 0x7ffb, 0x6a0a, 0x77fe, 0x9492,
1407 0x7e41, 0x51e1, 0x70e6, 0x53cd, 0x8fd4, 0x8303, 0x8d29, 0x72af,
1408 0x996d, 0x6cdb, 0x574a, 0x82b3, 0x65b9, 0x80aa, 0x623f, 0x9632,
1409 0x59a8, 0x4eff, 0x8bbf, 0x7eba, 0x653e, 0x83f2, 0x975e, 0x5561,
1410 0x98de, 0x80a5, 0x532a, 0x8bfd, 0x5420, 0x80ba, 0x5e9f, 0x6cb8,
1411 0x8d39, 0x82ac, 0x915a, 0x5429, 0x6c1b, 0x5206, 0x7eb7, 0x575f,
1412 0x711a, 0x6c7e, 0x7c89, 0x594b, 0x4efd, 0x5fff, 0x6124, 0x7caa,
1413 0x4e30, 0x5c01, 0x67ab, 0x8702, 0x5cf0, 0x950b, 0x98ce, 0x75af,
1414 0x70fd, 0x9022, 0x51af, 0x7f1d, 0x8bbd, 0x5949, 0x51e4, 0x4f5b,
1415 0x5426, 0x592b, 0x6577, 0x80a4, 0x5b75, 0x6276, 0x62c2, 0x8f90,
1416 0x5e45, 0x6c1f, 0x7b26, 0x4f0f, 0x4fd8, 0x670d,
1417 /* 0xb8 */
1418 0x7aa3, 0x7aa4, 0x7aa7, 0x7aa9, 0x7aaa, 0x7aab, 0x7aae, 0x7aaf,
1419 0x7ab0, 0x7ab1, 0x7ab2, 0x7ab4, 0x7ab5, 0x7ab6, 0x7ab7, 0x7ab8,
1420 0x7ab9, 0x7aba, 0x7abb, 0x7abc, 0x7abd, 0x7abe, 0x7ac0, 0x7ac1,
1421 0x7ac2, 0x7ac3, 0x7ac4, 0x7ac5, 0x7ac6, 0x7ac7, 0x7ac8, 0x7ac9,
1422 0x7aca, 0x7acc, 0x7acd, 0x7ace, 0x7acf, 0x7ad0, 0x7ad1, 0x7ad2,
1423 0x7ad3, 0x7ad4, 0x7ad5, 0x7ad7, 0x7ad8, 0x7ada, 0x7adb, 0x7adc,
1424 0x7add, 0x7ae1, 0x7ae2, 0x7ae4, 0x7ae7, 0x7ae8, 0x7ae9, 0x7aea,
1425 0x7aeb, 0x7aec, 0x7aee, 0x7af0, 0x7af1, 0x7af2, 0x7af3, 0x7af4,
1426 0x7af5, 0x7af6, 0x7af7, 0x7af8, 0x7afb, 0x7afc, 0x7afe, 0x7b00,
1427 0x7b01, 0x7b02, 0x7b05, 0x7b07, 0x7b09, 0x7b0c, 0x7b0d, 0x7b0e,
1428 0x7b10, 0x7b12, 0x7b13, 0x7b16, 0x7b17, 0x7b18, 0x7b1a, 0x7b1c,
1429 0x7b1d, 0x7b1f, 0x7b21, 0x7b22, 0x7b23, 0x7b27, 0x7b29, 0x7b2d,
1430 0x6d6e, 0x6daa, 0x798f, 0x88b1, 0x5f17, 0x752b, 0x629a, 0x8f85,
1431 0x4fef, 0x91dc, 0x65a7, 0x812f, 0x8151, 0x5e9c, 0x8150, 0x8d74,
1432 0x526f, 0x8986, 0x8d4b, 0x590d, 0x5085, 0x4ed8, 0x961c, 0x7236,
1433 0x8179, 0x8d1f, 0x5bcc, 0x8ba3, 0x9644, 0x5987, 0x7f1a, 0x5490,
1434 0x5676, 0x560e, 0x8be5, 0x6539, 0x6982, 0x9499, 0x76d6, 0x6e89,
1435 0x5e72, 0x7518, 0x6746, 0x67d1, 0x7aff, 0x80d9, 0x8d76, 0x611f,
1436 0x79c6, 0x6562, 0x8d63, 0x5188, 0x521a, 0x94a2, 0x7f38, 0x809b,
1437 0x7eb2, 0x5c97, 0x6e2f, 0x6760, 0x7bd9, 0x768b, 0x9ad8, 0x818f,
1438 0x7f94, 0x7cd5, 0x641e, 0x9550, 0x7a3f, 0x544a, 0x54e5, 0x6b4c,
1439 0x6401, 0x6208, 0x9e3d, 0x80f3, 0x7599, 0x5272, 0x9769, 0x845b,
1440 0x683c, 0x86e4, 0x9601, 0x9694, 0x94ec, 0x4e2a, 0x5404, 0x7ed9,
1441 0x6839, 0x8ddf, 0x8015, 0x66f4, 0x5e9a, 0x7fb9,
1442 /* 0xb9 */
1443 0x7b2f, 0x7b30, 0x7b32, 0x7b34, 0x7b35, 0x7b36, 0x7b37, 0x7b39,
1444 0x7b3b, 0x7b3d, 0x7b3f, 0x7b40, 0x7b41, 0x7b42, 0x7b43, 0x7b44,
1445 0x7b46, 0x7b48, 0x7b4a, 0x7b4d, 0x7b4e, 0x7b53, 0x7b55, 0x7b57,
1446 0x7b59, 0x7b5c, 0x7b5e, 0x7b5f, 0x7b61, 0x7b63, 0x7b64, 0x7b65,
1447 0x7b66, 0x7b67, 0x7b68, 0x7b69, 0x7b6a, 0x7b6b, 0x7b6c, 0x7b6d,
1448 0x7b6f, 0x7b70, 0x7b73, 0x7b74, 0x7b76, 0x7b78, 0x7b7a, 0x7b7c,
1449 0x7b7d, 0x7b7f, 0x7b81, 0x7b82, 0x7b83, 0x7b84, 0x7b86, 0x7b87,
1450 0x7b88, 0x7b89, 0x7b8a, 0x7b8b, 0x7b8c, 0x7b8e, 0x7b8f, 0x7b91,
1451 0x7b92, 0x7b93, 0x7b96, 0x7b98, 0x7b99, 0x7b9a, 0x7b9b, 0x7b9e,
1452 0x7b9f, 0x7ba0, 0x7ba3, 0x7ba4, 0x7ba5, 0x7bae, 0x7baf, 0x7bb0,
1453 0x7bb2, 0x7bb3, 0x7bb5, 0x7bb6, 0x7bb7, 0x7bb9, 0x7bba, 0x7bbb,
1454 0x7bbc, 0x7bbd, 0x7bbe, 0x7bbf, 0x7bc0, 0x7bc2, 0x7bc3, 0x7bc4,
1455 0x57c2, 0x803f, 0x6897, 0x5de5, 0x653b, 0x529f, 0x606d, 0x9f9a,
1456 0x4f9b, 0x8eac, 0x516c, 0x5bab, 0x5f13, 0x5de9, 0x6c5e, 0x62f1,
1457 0x8d21, 0x5171, 0x94a9, 0x52fe, 0x6c9f, 0x82df, 0x72d7, 0x57a2,
1458 0x6784, 0x8d2d, 0x591f, 0x8f9c, 0x83c7, 0x5495, 0x7b8d, 0x4f30,
1459 0x6cbd, 0x5b64, 0x59d1, 0x9f13, 0x53e4, 0x86ca, 0x9aa8, 0x8c37,
1460 0x80a1, 0x6545, 0x987e, 0x56fa, 0x96c7, 0x522e, 0x74dc, 0x5250,
1461 0x5be1, 0x6302, 0x8902, 0x4e56, 0x62d0, 0x602a, 0x68fa, 0x5173,
1462 0x5b98, 0x51a0, 0x89c2, 0x7ba1, 0x9986, 0x7f50, 0x60ef, 0x704c,
1463 0x8d2f, 0x5149, 0x5e7f, 0x901b, 0x7470, 0x89c4, 0x572d, 0x7845,
1464 0x5f52, 0x9f9f, 0x95fa, 0x8f68, 0x9b3c, 0x8be1, 0x7678, 0x6842,
1465 0x67dc, 0x8dea, 0x8d35, 0x523d, 0x8f8a, 0x6eda, 0x68cd, 0x9505,
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1466 0x90ed, 0x56fd, 0x679c, 0x88f9, 0x8fc7, 0x54c8,
1467 /* 0xba */
1468 0x7bc5, 0x7bc8, 0x7bc9, 0x7bca, 0x7bcb, 0x7bcd, 0x7bce, 0x7bcf,
1469 0x7bd0, 0x7bd2, 0x7bd4, 0x7bd5, 0x7bd6, 0x7bd7, 0x7bd8, 0x7bdb,
1470 0x7bdc, 0x7bde, 0x7bdf, 0x7be0, 0x7be2, 0x7be3, 0x7be4, 0x7be7,
1471 0x7be8, 0x7be9, 0x7beb, 0x7bec, 0x7bed, 0x7bef, 0x7bf0, 0x7bf2,
1472 0x7bf3, 0x7bf4, 0x7bf5, 0x7bf6, 0x7bf8, 0x7bf9, 0x7bfa, 0x7bfb,
1473 0x7bfd, 0x7bff, 0x7c00, 0x7c01, 0x7c02, 0x7c03, 0x7c04, 0x7c05,
1474 0x7c06, 0x7c08, 0x7c09, 0x7c0a, 0x7c0d, 0x7c0e, 0x7c10, 0x7c11,
1475 0x7c12, 0x7c13, 0x7c14, 0x7c15, 0x7c17, 0x7c18, 0x7c19, 0x7c1a,
1476 0x7c1b, 0x7c1c, 0x7c1d, 0x7c1e, 0x7c20, 0x7c21, 0x7c22, 0x7c23,
1477 0x7c24, 0x7c25, 0x7c28, 0x7c29, 0x7c2b, 0x7c2c, 0x7c2d, 0x7c2e,
1478 0x7c2f, 0x7c30, 0x7c31, 0x7c32, 0x7c33, 0x7c34, 0x7c35, 0x7c36,
1479 0x7c37, 0x7c39, 0x7c3a, 0x7c3b, 0x7c3c, 0x7c3d, 0x7c3e, 0x7c42,
1480 0x9ab8, 0x5b69, 0x6d77, 0x6c26, 0x4ea5, 0x5bb3, 0x9a87, 0x9163,
1481 0x61a8, 0x90af, 0x97e9, 0x542b, 0x6db5, 0x5bd2, 0x51fd, 0x558a,
1482 0x7f55, 0x7ff0, 0x64bc, 0x634d, 0x65f1, 0x61be, 0x608d, 0x710a,
1483 0x6c57, 0x6c49, 0x592f, 0x676d, 0x822a, 0x58d5, 0x568e, 0x8c6a,
1484 0x6beb, 0x90dd, 0x597d, 0x8017, 0x53f7, 0x6d69, 0x5475, 0x559d,
1485 0x8377, 0x83cf, 0x6838, 0x79be, 0x548c, 0x4f55, 0x5408, 0x76d2,
1486 0x8c89, 0x9602, 0x6cb3, 0x6db8, 0x8d6b, 0x8910, 0x9e64, 0x8d3a,
1487 0x563f, 0x9ed1, 0x75d5, 0x5f88, 0x72e0, 0x6068, 0x54fc, 0x4ea8,
1488 0x6a2a, 0x8861, 0x6052, 0x8f70, 0x54c4, 0x70d8, 0x8679, 0x9e3f,
1489 0x6d2a, 0x5b8f, 0x5f18, 0x7ea2, 0x5589, 0x4faf, 0x7334, 0x543c,
1490 0x539a, 0x5019, 0x540e, 0x547c, 0x4e4e, 0x5ffd, 0x745a, 0x58f6,
1491 0x846b, 0x80e1, 0x8774, 0x72d0, 0x7cca, 0x6e56,
1492 /* 0xbb */
1493 0x7c43, 0x7c44, 0x7c45, 0x7c46, 0x7c47, 0x7c48, 0x7c49, 0x7c4a,
1494 0x7c4b, 0x7c4c, 0x7c4e, 0x7c4f, 0x7c50, 0x7c51, 0x7c52, 0x7c53,
1495 0x7c54, 0x7c55, 0x7c56, 0x7c57, 0x7c58, 0x7c59, 0x7c5a, 0x7c5b,
1496 0x7c5c, 0x7c5d, 0x7c5e, 0x7c5f, 0x7c60, 0x7c61, 0x7c62, 0x7c63,
1497 0x7c64, 0x7c65, 0x7c66, 0x7c67, 0x7c68, 0x7c69, 0x7c6a, 0x7c6b,
1498 0x7c6c, 0x7c6d, 0x7c6e, 0x7c6f, 0x7c70, 0x7c71, 0x7c72, 0x7c75,
1499 0x7c76, 0x7c77, 0x7c78, 0x7c79, 0x7c7a, 0x7c7e, 0x7c7f, 0x7c80,
1500 0x7c81, 0x7c82, 0x7c83, 0x7c84, 0x7c85, 0x7c86, 0x7c87, 0x7c88,
1501 0x7c8a, 0x7c8b, 0x7c8c, 0x7c8d, 0x7c8e, 0x7c8f, 0x7c90, 0x7c93,
1502 0x7c94, 0x7c96, 0x7c99, 0x7c9a, 0x7c9b, 0x7ca0, 0x7ca1, 0x7ca3,
1503 0x7ca6, 0x7ca7, 0x7ca8, 0x7ca9, 0x7cab, 0x7cac, 0x7cad, 0x7caf,
1504 0x7cb0, 0x7cb4, 0x7cb5, 0x7cb6, 0x7cb7, 0x7cb8, 0x7cba, 0x7cbb,
1505 0x5f27, 0x864e, 0x552c, 0x62a4, 0x4e92, 0x6caa, 0x6237, 0x82b1,
1506 0x54d7, 0x534e, 0x733e, 0x6ed1, 0x753b, 0x5212, 0x5316, 0x8bdd,
1507 0x69d0, 0x5f8a, 0x6000, 0x6dee, 0x574f, 0x6b22, 0x73af, 0x6853,
1508 0x8fd8, 0x7f13, 0x6362, 0x60a3, 0x5524, 0x75ea, 0x8c62, 0x7115,
1509 0x6da3, 0x5ba6, 0x5e7b, 0x8352, 0x614c, 0x9ec4, 0x78fa, 0x8757,
1510 0x7c27, 0x7687, 0x51f0, 0x60f6, 0x714c, 0x6643, 0x5e4c, 0x604d,
1511 0x8c0e, 0x7070, 0x6325, 0x8f89, 0x5fbd, 0x6062, 0x86d4, 0x56de,
1512 0x6bc1, 0x6094, 0x6167, 0x5349, 0x60e0, 0x6666, 0x8d3f, 0x79fd,
1513 0x4f1a, 0x70e9, 0x6c47, 0x8bb3, 0x8bf2, 0x7ed8, 0x8364, 0x660f,
1514 0x5a5a, 0x9b42, 0x6d51, 0x6df7, 0x8c41, 0x6d3b, 0x4f19, 0x706b,
1515 0x83b7, 0x6216, 0x60d1, 0x970d, 0x8d27, 0x7978, 0x51fb, 0x573e,
1516 0x57fa, 0x673a, 0x7578, 0x7a3d, 0x79ef, 0x7b95,
1517 /* 0xbc */
1518 0x7cbf, 0x7cc0, 0x7cc2, 0x7cc3, 0x7cc4, 0x7cc6, 0x7cc9, 0x7ccb,
1519 0x7cce, 0x7ccf, 0x7cd0, 0x7cd1, 0x7cd2, 0x7cd3, 0x7cd4, 0x7cd8,
1520 0x7cda, 0x7cdb, 0x7cdd, 0x7cde, 0x7ce1, 0x7ce2, 0x7ce3, 0x7ce4,
1521 0x7ce5, 0x7ce6, 0x7ce7, 0x7ce9, 0x7cea, 0x7ceb, 0x7cec, 0x7ced,
1522 0x7cee, 0x7cf0, 0x7cf1, 0x7cf2, 0x7cf3, 0x7cf4, 0x7cf5, 0x7cf6,
1523 0x7cf7, 0x7cf9, 0x7cfa, 0x7cfc, 0x7cfd, 0x7cfe, 0x7cff, 0x7d00,
1524 0x7d01, 0x7d02, 0x7d03, 0x7d04, 0x7d05, 0x7d06, 0x7d07, 0x7d08,
1525 0x7d09, 0x7d0b, 0x7d0c, 0x7d0d, 0x7d0f, 0x7d10, 0x7d11,
1526 0x7d12, 0x7d13, 0x7d14, 0x7d15, 0x7d16, 0x7d17, 0x7d18, 0x7d19,
1527 0x7d1a, 0x7d1b, 0x7d1c, 0x7d1d, 0x7d1e, 0x7d1f, 0x7d21, 0x7d23,
1528 0x7d24, 0x7d25, 0x7d26, 0x7d28, 0x7d29, 0x7d2a, 0x7d2c, 0x7d2d,
1529 0x7d2e, 0x7d30, 0x7d31, 0x7d32, 0x7d33, 0x7d34, 0x7d35, 0x7d36,
1530 0x808c, 0x9965, 0x8ff9, 0x6fc0, 0x8ba5, 0x9e21, 0x59ec, 0x7ee9,
1531 0x7f09, 0x5409, 0x6781, 0x68d8, 0x8f91, 0x7c4d, 0x96c6, 0x53ca,
1532 0x6025, 0x75be, 0x6c72, 0x5373, 0x5ac9, 0x7ea7, 0x6324, 0x51e0,
1533 0x810a, 0x5df1, 0x84df, 0x6280, 0x5180, 0x5b63, 0x4f0e, 0x796d,
1534 0x5242, 0x60b8, 0x6d4e, 0x5bc4, 0x5bc2, 0x8ba1, 0x8bb0, 0x65e2,
1535 0x5fcc, 0x9645, 0x5993, 0x7ee7, 0x7eaa, 0x5609, 0x67b7, 0x5939,
1536 0x4f73, 0x5bb6, 0x52a0, 0x835a, 0x988a, 0x8d3e, 0x7532, 0x94be,
1537 0x5047, 0x7a3c, 0x4ef7, 0x67b6, 0x9a7e, 0x5ac1, 0x6b7c, 0x76d1,
1538 0x575a, 0x5c16, 0x7b3a, 0x95f4, 0x714e, 0x517c, 0x80a9, 0x8270,
1539 0x5978, 0x7f04, 0x8327, 0x68c0, 0x67ec, 0x78b1, 0x7877, 0x62e3,
1540 0x6361, 0x7b80, 0x4fed, 0x526a, 0x51cf, 0x8350, 0x69db, 0x9274,
1541 0x8df5, 0x8d31, 0x89c1, 0x952e, 0x7bad, 0x4ef6,
1542 /* 0xbd */
1543 0x7d37, 0x7d38, 0x7d39, 0x7d3a, 0x7d3b, 0x7d3c, 0x7d3d, 0x7d3e,
1544 0x7d3f, 0x7d40, 0x7d41, 0x7d42, 0x7d43, 0x7d44, 0x7d45, 0x7d46,
1545 0x7d47, 0x7d48, 0x7d49, 0x7d4a, 0x7d4b, 0x7d4c, 0x7d4d, 0x7d4e,
1546 0x7d4f, 0x7d50, 0x7d51, 0x7d52, 0x7d53, 0x7d54, 0x7d55, 0x7d56,
1547 0x7d57, 0x7d58, 0x7d59, 0x7d5a, 0x7d5b, 0x7d5c, 0x7d5d, 0x7d5e,
1548 0x7d5f, 0x7d60, 0x7d61, 0x7d62, 0x7d63, 0x7d64, 0x7d65, 0x7d66,
1549 0x7d67, 0x7d68, 0x7d69, 0x7d6a, 0x7d6b, 0x7d6c, 0x7d6d, 0x7d6f,
1550 0x7d70, 0x7d71, 0x7d72, 0x7d73, 0x7d74, 0x7d75, 0x7d76, 0x7d78,
1551 0x7d79, 0x7d7a, 0x7d7b, 0x7d7c, 0x7d7d, 0x7d7e, 0x7d7f, 0x7d80,
1552 0x7d81, 0x7d82, 0x7d83, 0x7d84, 0x7d85, 0x7d86, 0x7d87, 0x7d88,

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1553 0x7d89, 0x7d8a, 0x7d8b, 0x7d8c, 0x7d8d, 0x7d8e, 0x7d8f, 0x7d90,
1554 0x7d91, 0x7d92, 0x7d93, 0x7d94, 0x7d95, 0x7d96, 0x7d97, 0x7d98,
1555 0x5065, 0x8230, 0x5251, 0x996f, 0x6e10, 0x6e85, 0x6da7, 0x5efa,
1556 0x50f5, 0x59dc, 0x5c06, 0x6d46, 0x6c5f, 0x7586, 0x848b, 0x6868,
1557 0x5956, 0x8bb2, 0x5320, 0x9171, 0x964d, 0x8549, 0x6912, 0x7901,
1558 0x7126, 0x80f6, 0x4ea4, 0x90ca, 0x6d47, 0x9a84, 0x5a07, 0x56bc,
1559 0x6405, 0x94f0, 0x77eb, 0x4fa5, 0x811a, 0x72e1, 0x89d2, 0x997a,
1560 0x7f34, 0x7ede, 0x527f, 0x6559, 0x9175, 0x8f7f, 0x8f83, 0x53eb,
1561 0x7a96, 0x63ed, 0x63a5, 0x7686, 0x79f8, 0x8857, 0x9636, 0x622a,
1562 0x52ab, 0x8282, 0x6854, 0x6770, 0x6377, 0x776b, 0x7aed, 0x6d01,
1563 0x7ed3, 0x89e3, 0x59d0, 0x6212, 0x85c9, 0x82a5, 0x754c, 0x501f,
1564 0x4ecb, 0x75a5, 0x8beeb, 0x5c4a, 0x5dfe, 0x7b4b, 0x65a4, 0x91d1,
1565 0x4eca, 0x6d25, 0x895f, 0x7d27, 0x9526, 0x4ec5, 0x8c28, 0x8fdb,
1566 0x9773, 0x664b, 0x7981, 0x8fd1, 0x70ec, 0x6d78,
1567 /* 0xbe */
1568 0x7d99, 0x7d9a, 0x7d9b, 0x7d9c, 0x7d9d, 0x7d9e, 0x7d9f, 0x7da0,
1569 0x7da1, 0x7da2, 0x7da3, 0x7da4, 0x7da5, 0x7da7, 0x7da8, 0x7da9,
1570 0x7daa, 0x7dab, 0x7dac, 0x7dad, 0x7daf, 0x7db0, 0x7db1, 0x7db2,
1571 0x7db3, 0x7db4, 0x7db5, 0x7db6, 0x7db7, 0x7db8, 0x7db9, 0x7dba,
1572 0x7dbb, 0x7dbc, 0x7dbd, 0x7dbe, 0x7dbf, 0x7dc0, 0x7dc1, 0x7dc2,
1573 0x7dc3, 0x7dc4, 0x7dc5, 0x7dc6, 0x7dc7, 0x7dc8, 0x7dc9, 0x7dca,
1574 0x7dcb, 0x7dcc, 0x7dcd, 0x7dce, 0x7dcf, 0x7dd0, 0x7dd1, 0x7dd2,
1575 0x7dd3, 0x7dd4, 0x7dd5, 0x7dd6, 0x7dd7, 0x7dd8, 0x7dd9, 0x7dda,
1576 0x7ddb, 0x7ddc, 0x7ddd, 0x7dde, 0x7ddf, 0x7de0, 0x7de1, 0x7de2,
1577 0x7de3, 0x7de4, 0x7de5, 0x7de6, 0x7de7, 0x7de8, 0x7de9, 0x7dea,
1578 0x7deb, 0x7dec, 0x7ded, 0x7dee, 0x7def, 0x7df0, 0x7df1, 0x7df2,
1579 0x7df3, 0x7df4, 0x7df5, 0x7df6, 0x7df7, 0x7df8, 0x7df9, 0x7dfa,
1580 0x5c3d, 0x52b2, 0x8346, 0x5162, 0x830e, 0x775b, 0x6676, 0x9cb8,
1581 0x4eac, 0x60ca, 0x7cbe, 0x7cb3, 0x7ecf, 0x4e95, 0x8b66, 0x666f,
1582 0x9888, 0x9759, 0x5883, 0x656c, 0x955c, 0x5f84, 0x75c9, 0x9756,
1583 0x7adf, 0x7ade, 0x51c0, 0x70af, 0x7a98, 0x63ea, 0x7a76, 0x7ea0,
1584 0x7396, 0x97ed, 0x4e45, 0x7078, 0x4e5d, 0x9152, 0x53a9, 0x6551,
1585 0x65e7, 0x81fc, 0x8205, 0x548e, 0x5c31, 0x759a, 0x97a0, 0x62d8,
1586 0x72d9, 0x75bd, 0x5c45, 0x9a79, 0x83ca, 0x5c40, 0x5480, 0x77e9,
1587 0x4e3e, 0x6cae, 0x805a, 0x62d2, 0x636e, 0x5de8, 0x5177, 0x8ddd,
1588 0x8e1e, 0x952f, 0x4ff1, 0x53e5, 0x60e7, 0x70ac, 0x5267, 0x6350,
1589 0x9e43, 0x5a1f, 0x5026, 0x7737, 0x5377, 0x7ee2, 0x6485, 0x652b,
1590 0x6289, 0x6398, 0x5014, 0x7235, 0x89c9, 0x51b3, 0x8bc0, 0x7edd,
1591 0x5747, 0x83cc, 0x94a7, 0x519b, 0x541b, 0x5c5b,
1592 /* 0xbf */
1593 0x7dfb, 0x7dfc, 0x7dfd, 0x7dfe, 0x7dff, 0x7e00, 0x7e01, 0x7e02,
1594 0x7e03, 0x7e04, 0x7e05, 0x7e06, 0x7e07, 0x7e08, 0x7e09, 0x7e0a,
1595 0x7e0b, 0x7e0c, 0x7e0d, 0x7e0e, 0x7e0f, 0x7e10, 0x7e11, 0x7e12,
1596 0x7e13, 0x7e14, 0x7e15, 0x7e16, 0x7e17, 0x7e18, 0x7e19, 0x7e1a,
1597 0x7e1b, 0x7e1c, 0x7e1d, 0x7e1e, 0x7e1f, 0x7e20, 0x7e21, 0x7e22,
1598 0x7e23, 0x7e24, 0x7e25, 0x7e26, 0x7e27, 0x7e28, 0x7e29, 0x7e2a,
1599 0x7e2b, 0x7e2c, 0x7e2d, 0x7e2e, 0x7e2f, 0x7e30, 0x7e31, 0x7e32,
1600 0x7e33, 0x7e34, 0x7e35, 0x7e36, 0x7e37, 0x7e38, 0x7e39, 0x7e3a,
1601 0x7e3c, 0x7e3d, 0x7e3e, 0x7e3f, 0x7e40, 0x7e42, 0x7e43, 0x7e44,
1602 0x7e45, 0x7e46, 0x7e48, 0x7e49, 0x7e4a, 0x7e4b, 0x7e4c, 0x7e4d,
1603 0x7e4e, 0x7e4f, 0x7e50, 0x7e51, 0x7e52, 0x7e53, 0x7e54, 0x7e55,
1604 0x7e56, 0x7e57, 0x7e58, 0x7e59, 0x7e5a, 0x7e5b, 0x7e5c, 0x7e5d,
1605 0x4fca, 0x7ae3, 0x6d5a, 0x90e1, 0x9a8f, 0x5580, 0x5496, 0x5361,
1606 0x54af, 0x5f00, 0x63e9, 0x6977, 0x51ef, 0x6168, 0x520a, 0x582a,
1607 0x52d8, 0x574e, 0x780d, 0x770b, 0x5eb7, 0x6177, 0x7ce0, 0x625b,
1608 0x6297, 0x4ea2, 0x7095, 0x8003, 0x62f7, 0x70e4, 0x9760, 0x5777,
1609 0x82db, 0x67ef, 0x68f5, 0x78d5, 0x9897, 0x79d1, 0x58f3, 0x54b3,
1610 0x53ef, 0x6e34, 0x514b, 0x523b, 0x5ba2, 0x8bfe, 0x80af, 0x5543,
1611 0x57a6, 0x6073, 0x5751, 0x542d, 0x7a7a, 0x6050, 0x5b54, 0x63a7,
1612 0x62a0, 0x53e3, 0x6263, 0x5bc7, 0x67af, 0x54ed, 0x7a9f, 0x82e6,
1613 0x9177, 0x5e93, 0x88e4, 0x5938, 0x57ae, 0x630e, 0x8de8, 0x80ef,
1614 0x5757, 0x7b77, 0x4fa9, 0x5feb, 0x5bbd, 0x6b3e, 0x5321, 0x7b50,
1615 0x72c2, 0x6846, 0x77ff, 0x7736, 0x65f7, 0x51b5, 0x4e8f, 0x76d4,
1616 0x5cbf, 0x7aa5, 0x8475, 0x594e, 0x9b41, 0x5080,
1617 /* 0xc0 */
1618 0x7e5e, 0x7e5f, 0x7e60, 0x7e61, 0x7e62, 0x7e63, 0x7e64, 0x7e65,
1619 0x7e66, 0x7e67, 0x7e68, 0x7e69, 0x7e6a, 0x7e6b, 0x7e6c, 0x7e6d,
1620 0x7e6e, 0x7e6f, 0x7e70, 0x7e71, 0x7e72, 0x7e73, 0x7e74, 0x7e75,
1621 0x7e76, 0x7e77, 0x7e78, 0x7e79, 0x7e7a, 0x7e7b, 0x7e7c, 0x7e7d,
1622 0x7e7e, 0x7e7f, 0x7e80, 0x7e81, 0x7e83, 0x7e84, 0x7e85, 0x7e86,
1623 0x7e87, 0x7e88, 0x7e89, 0x7e8a, 0x7e8b, 0x7e8c, 0x7e8d, 0x7e8e,
1624 0x7e8f, 0x7e90, 0x7e91, 0x7e92, 0x7e93, 0x7e94, 0x7e95, 0x7e96,
1625 0x7e97, 0x7e98, 0x7e99, 0x7e9a, 0x7e9c, 0x7e9d, 0x7e9e, 0x7e9f,
1626 0x7eb4, 0x7eb5, 0x7ebc, 0x7ed6, 0x7ee4, 0x7eec, 0x7ef9, 0x7f0a,
1627 0x7f10, 0x7f1e, 0x7f37, 0x7f39, 0x7f3b, 0x7f3c, 0x7f3d, 0x7f3e,
1628 0x7f3f, 0x7f40, 0x7f41, 0x7f43, 0x7f46, 0x7f47, 0x7f48, 0x7f49,
1629 0x7f4a, 0x7f4b, 0x7f4c, 0x7f4d, 0x7f4e, 0x7f4f, 0x7f52, 0x7f53,
1630 0x9988, 0x6127, 0x6e83, 0x5764, 0x6606, 0x6346, 0x56f0, 0x62ec,
1631 0x6269, 0x5ed3, 0x9614, 0x5783, 0x62c9, 0x5587, 0x8721, 0x814a,
1632 0x8fa3, 0x5566, 0x83b1, 0x6765, 0x8d56, 0x84dd, 0x5a6a, 0x680f,
1633 0x62e6, 0x7bee, 0x9611, 0x5170, 0x6f9c, 0x8c30, 0x63fd, 0x89c8,
1634 0x61d2, 0x7f06, 0x70c2, 0x6ee5, 0x7405, 0x6994, 0x72fc, 0x5eca,
1635 0x90ce, 0x6717, 0x6d6a, 0x635e, 0x52b3, 0x7262, 0x8001, 0x4f6c,
1636 0x59e5, 0x916a, 0x70d9, 0x6d9d, 0x52d2, 0x4e50, 0x96f7, 0x956d,
1637 0x857e, 0x78ca, 0x7d2f, 0x5121, 0x5792, 0x64c2, 0x808b, 0x7c7b,
1638 0x6cea, 0x68f1, 0x695e, 0x51b7, 0x5398, 0x68a8, 0x7281, 0x9ece,
1639 0x7bf1, 0x72f8, 0x79bb, 0x6f13, 0x7406, 0x674e, 0x91cc, 0x9ca4,
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1640 0x793c, 0x8389, 0x8354, 0x540f, 0x6817, 0x4e3d, 0x5389, 0x52b1,
1641 0x783e, 0x5386, 0x5229, 0x5088, 0x4f8b, 0x4fd0,
1642 /* 0xc1 */
1643 0x7f56, 0x7f59, 0x7f5b, 0x7f5c, 0x7f5d, 0x7f5e, 0x7f60, 0x7f63,
1644 0x7f64, 0x7f65, 0x7f66, 0x7f67, 0x7f6b, 0x7f6c, 0x7f6d, 0x7f6f,
1645 0x7f70, 0x7f73, 0x7f75, 0x7f76, 0x7f77, 0x7f78, 0x7f7a, 0x7f7b,
1646 0x7f7c, 0x7f7d, 0x7f7f, 0x7f80, 0x7f82, 0x7f83, 0x7f84, 0x7f85,
1647 0x7f86, 0x7f87, 0x7f88, 0x7f89, 0x7f8b, 0x7f8d, 0x7f8f, 0x7f90,
1648 0x7f91, 0x7f92, 0x7f93, 0x7f95, 0x7f96, 0x7f97, 0x7f98, 0x7f99,
1649 0x7f9b, 0x7f9c, 0x7fa0, 0x7fa2, 0x7fa3, 0x7fa5, 0x7fa6, 0x7fa8,
1650 0x7fa9, 0x7faa, 0x7fab, 0x7fac, 0x7fad, 0x7fae, 0x7fb1, 0x7fb3,
1651 0x7fb4, 0x7fb5, 0x7fb6, 0x7fb7, 0x7fba, 0x7fbb, 0x7fbe, 0x7fc0,
1652 0x7fc2, 0x7fc3, 0x7fc4, 0x7fc6, 0x7fc7, 0x7fc8, 0x7fc9, 0x7fcb,
1653 0x7fcd, 0x7fcf, 0x7fd0, 0x7fd1, 0x7fd2, 0x7fd3, 0x7fd6, 0x7fd7,
1654 0x7fd9, 0x7fda, 0x7fdb, 0x7fdc, 0x7fdd, 0x7fde, 0x7fe2, 0x7fe3,
1655 0x75e2, 0x7acb, 0x7c92, 0x6ca5, 0x96b6, 0x529b, 0x7483, 0x54e9,
1656 0x4fe9, 0x8054, 0x83b2, 0x8fde, 0x9570, 0x5ec9, 0x601c, 0x6d9f,
1657 0x5e18, 0x655b, 0x8138, 0x94fe, 0x604b, 0x70bc, 0x7ec3, 0x7cae,
1658 0x51c9, 0x6881, 0x7cb1, 0x826f, 0x4e24, 0x8f86, 0x91cf, 0x667e,
1659 0x4eae, 0x8c05, 0x64a9, 0x804a, 0x50da, 0x7597, 0x71ce, 0x5be5,
1660 0x8fbd, 0x6f66, 0x4e86, 0x6482, 0x9563, 0x5ed6, 0x6599, 0x5217,
1661 0x88c2, 0x70c8, 0x52a3, 0x730e, 0x7433, 0x6797, 0x78f7, 0x9716,
1662 0x4e34, 0x90bb, 0x9cde, 0x6dcf, 0x51db, 0x8d41, 0x541d, 0x62ce,
1663 0x73b2, 0x8021, 0x83f1, 0x96f6, 0x9f84, 0x94c3, 0x4f36, 0x7f9a, 0x51cc,
1664 0x7075, 0x9675, 0x5cad, 0x9886, 0x53e6, 0x4ee4, 0x6e9c, 0x7409,
1665 0x69b4, 0x786b, 0x998f, 0x7559, 0x5218, 0x7624, 0x6d41, 0x67f3,
1666 0x516d, 0x9f99, 0x804b, 0x5499, 0x7b3c, 0x7abf,
1667 /* 0xc2 */
1668 0x7fe4, 0x7fe7, 0x7fe8, 0x7fea, 0x7feb, 0x7fec, 0x7fed, 0x7fef,
1669 0x7ff2, 0x7ff4, 0x7ff5, 0x7ff6, 0x7ff7, 0x7ff8, 0x7ff9, 0x7ffa,
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1672 0x801f, 0x8021, 0x8023, 0x8024, 0x802b, 0x802c, 0x802d, 0x802e,
1673 0x802f, 0x8030, 0x8032, 0x8034, 0x8039, 0x803a, 0x803c, 0x803e,
1674 0x8040, 0x8041, 0x8044, 0x8045, 0x8047, 0x8048, 0x8049, 0x804e,
1675 0x804f, 0x8050, 0x8051, 0x8053, 0x8055, 0x8056, 0x8057, 0x8059,
1676 0x805b, 0x805c, 0x805d, 0x805e, 0x805f, 0x8060, 0x8061, 0x8062,
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1678 0x806d, 0x806e, 0x806f, 0x8070, 0x8072, 0x8073, 0x8074, 0x8075,
1679 0x8076, 0x8077, 0x8078, 0x8079, 0x807a, 0x807b, 0x807c, 0x807d,
1680 0x9686, 0x5784, 0x62e2, 0x9647, 0x697c, 0x5a04, 0x6402, 0x7bd3,
1681 0x6f0f, 0x964b, 0x82a6, 0x5362, 0x9885, 0x5e90, 0x7089, 0x63b3,
1682 0x5364, 0x864f, 0x9c81, 0x9e93, 0x788c, 0x9732, 0x8def, 0x8d42,
1683 0x9e7f, 0x6f5e, 0x7984, 0x5f55, 0x9646, 0x622e, 0x9a74, 0x5415,
1684 0x94dd, 0x4fa3, 0x65c5, 0x5c65, 0x5c61, 0x7f15, 0x8651, 0x6c2f,
1685 0x5f8b, 0x7387, 0x6ee4, 0x7eff, 0x5ce6, 0x631b, 0x5b6a, 0x6ee6,
1686 0x5375, 0x4e71, 0x63a0, 0x7565, 0x62a1, 0x8f6e, 0x4f26, 0x4ed1,
1687 0x6ca6, 0x7eb6, 0x8bba, 0x841d, 0x87ba, 0x7f57, 0x903b, 0x9523,
1688 0x7ba9, 0x9aa1, 0x88f8, 0x843d, 0x6d1b, 0x9a86, 0x7edc, 0x5988,
1689 0x9ebb, 0x739b, 0x7801, 0x8682, 0x9a6c, 0x9a82, 0x561b, 0x5417,
1690 0x57cb, 0x4e70, 0x9ea6, 0x5356, 0x8fc8, 0x8109, 0x7792, 0x9992,
1691 0x86ee, 0x6ee1, 0x8513, 0x66fc, 0x6162, 0x6f2b,
1692 /* 0xc3 */
1693 0x807e, 0x8081, 0x8082, 0x8085, 0x8088, 0x808a, 0x808d, 0x808e,
1694 0x808f, 0x8090, 0x8091, 0x8092, 0x8094, 0x8095, 0x8097, 0x8099,
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1696 0x80b5, 0x80b6, 0x80b8, 0x80b9, 0x80bb, 0x80c5, 0x80c7, 0x80c8,
1697 0x80c9, 0x80ca, 0x80cb, 0x80cf, 0x80d0, 0x80d1, 0x80d2, 0x80d3,
1698 0x80d4, 0x80d5, 0x80d8, 0x80df, 0x80e0, 0x80e2, 0x80e3, 0x80e6,
1699 0x80ee, 0x80f5, 0x80f7, 0x80f9, 0x80fb, 0x80fe, 0x80ff, 0x8100,
1700 0x8101, 0x8103, 0x8104, 0x8105, 0x8107, 0x8108, 0x810b, 0x810c,
1701 0x8115, 0x8117, 0x8119, 0x811b, 0x811c, 0x811d, 0x811f, 0x8120,
1702 0x8121, 0x8122, 0x8123, 0x8124, 0x8125, 0x8126, 0x8127, 0x8128,
1703 0x8129, 0x812a, 0x812b, 0x812d, 0x812e, 0x8130, 0x8133, 0x8134,
1704 0x8135, 0x8137, 0x8139, 0x813a, 0x813b, 0x813c, 0x813d, 0x813f,
1705 0x8c29, 0x8292, 0x832b, 0x76f2, 0x6c13, 0x5fd9, 0x83bd, 0x732b,
1706 0x8305, 0x951a, 0x6bdb, 0x77db, 0x94c6, 0x536f, 0x8302, 0x5192,
1707 0x5e3d, 0x8c8c, 0x8d38, 0x4e48, 0x73ab, 0x679a, 0x6885, 0x9176,
1708 0x9709, 0x7164, 0x6ca1, 0x7709, 0x5a92, 0x9541, 0x6bcf, 0x7f8e,
1709 0x6627, 0x5bd0, 0x59b9, 0x5a9a, 0x95e8, 0x95f7, 0x4eec, 0x840c,
1710 0x8499, 0x6aac, 0x76df, 0x9530, 0x731b, 0x68a6, 0x5b5f, 0x772f,
1711 0x919a, 0x9761, 0x7cdc, 0x8ff7, 0x8c1c, 0x5f25, 0x7c73, 0x79d8,
1712 0x89c5, 0x6ccc, 0x871c, 0x5bc6, 0x5e42, 0x68c9, 0x7720, 0x7ef5,
1713 0x5195, 0x514d, 0x52c9, 0x5a29, 0x7f05, 0x9762, 0x82d7, 0x63cf,
1714 0x7784, 0x85d0, 0x79d2, 0x6e3a, 0x5e99, 0x5999, 0x8511, 0x706d,
1715 0x6c11, 0x62bf, 0x76bf, 0x654f, 0x60af, 0x95fd, 0x660e, 0x879f,
1716 0x9e23, 0x94ed, 0x540d, 0x547d, 0x8c2c, 0x6478,
1717 /* 0xc4 */
1718 0x8140, 0x8141, 0x8142, 0x8143, 0x8144, 0x8145, 0x8147, 0x8149,
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1720 0x815c, 0x815d, 0x815e, 0x815f, 0x8161, 0x8162, 0x8163, 0x8164,
1721 0x8166, 0x8168, 0x816a, 0x816b, 0x816c, 0x816f, 0x8172, 0x8173,
1722 0x8175, 0x8176, 0x8177, 0x8178, 0x8181, 0x8183, 0x8184, 0x8185,
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1724 0x8192, 0x8193, 0x8194, 0x8195, 0x8196, 0x8197, 0x8199, 0x819a,
1725 0x819e, 0x819f, 0x81a0, 0x81a1, 0x81a2, 0x81a4, 0x81a5, 0x81a7,
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1729 0x81cb, 0x81cd, 0x81ce, 0x81cf, 0x81d0, 0x81d1, 0x81d2, 0x81d3,
1730 0x6479, 0x8611, 0x6a21, 0x819c, 0x78e8, 0x6469, 0x9b54, 0x62b9,
1731 0x672b, 0x83ab, 0x58a8, 0x9ed8, 0x6cab, 0x6f20, 0x5bde, 0x964c,
1732 0x8c0b, 0x725f, 0x67d0, 0x62c7, 0x7261, 0x4ea9, 0x59c6, 0x6bcd,
1733 0x5893, 0x66ae, 0x5e55, 0x52df, 0x6155, 0x6728, 0x76ee, 0x7766,
1734 0x7267, 0x7a46, 0x62ff, 0x54ea, 0x5450, 0x94a0, 0x90a3, 0x5a1c,
1735 0x7eb3, 0x6c16, 0x4e43, 0x5976, 0x8010, 0x5948, 0x5357, 0x7537,
1736 0x96be, 0x56ca, 0x6320, 0x8111, 0x607c, 0x95f9, 0x6dd6, 0x5462,
1737 0x9981, 0x5185, 0x5ae9, 0x80fd, 0x59ae, 0x9713, 0x502a, 0x6ce5,
1738 0x5c3c, 0x62df, 0x4f60, 0x533f, 0x817b, 0x9006, 0x6eba, 0x852b,
1739 0x62c8, 0x5e74, 0x78be, 0x64b5, 0x637b, 0x5ff5, 0x5a18, 0x917f,
1740 0x9e1f, 0x5c3f, 0x634f, 0x8042, 0x5b7d, 0x556e, 0x954a, 0x954d,
1741 0x6d85, 0x60a8, 0x67e0, 0x72de, 0x51dd, 0x5b81,
1742 /* 0xc5 */
1743 0x81d4, 0x81d5, 0x81d6, 0x81d7, 0x81d8, 0x81d9, 0x81da, 0x81db,
1744 0x81dc, 0x81dd, 0x81de, 0x81df, 0x81e0, 0x81e1, 0x81e2, 0x81e4,
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1746 0x81f1, 0x81f2, 0x81f5, 0x81f6, 0x81f7, 0x81f8, 0x81f9, 0x81fa,
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1748 0x820e, 0x820f, 0x8211, 0x8213, 0x8215, 0x8216, 0x8217, 0x8218,
1749 0x8219, 0x821a, 0x821d, 0x8220, 0x8224, 0x8225, 0x8226, 0x8227,
1750 0x8229, 0x822e, 0x8232, 0x823a, 0x823c, 0x823d, 0x823f, 0x8240,
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1755 0x62e7, 0x6cde, 0x725b, 0x626d, 0x94ae, 0x7ebd, 0x8113, 0x6d53,
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1757 0x759f, 0x632a, 0x61e6, 0x7cef, 0x8bfa, 0x54e6, 0x6b27, 0x9e25,
1758 0x6bb4, 0x85d5, 0x5455, 0x5076, 0x6ca4, 0x556a, 0x8db4, 0x722c,
1759 0x5e15, 0x6015, 0x7436, 0x62cd, 0x6392, 0x724c, 0x5f98, 0x6e43,
1760 0x6d3e, 0x6500, 0x6f58, 0x76d8, 0x78d0, 0x76fc, 0x7554, 0x5224,
1761 0x53db, 0x4e53, 0x5e9e, 0x65c1, 0x802a, 0x80d6, 0x629b, 0x5486,
1762 0x5228, 0x70ae, 0x888d, 0x8dd1, 0x6ce1, 0x5478, 0x80da, 0x57f9,
1763 0x88f4, 0x8d54, 0x966a, 0x914d, 0x4f69, 0x6c9b, 0x55b7, 0x76c6,
1764 0x7830, 0x62a8, 0x70f9, 0x6f8e, 0x5f6d, 0x84ec, 0x68da, 0x787c,
1765 0x7bf7, 0x81a8, 0x670b, 0x9e4f, 0x6367, 0x78b0, 0x576f, 0x7812,
1766 0x9739, 0x6279, 0x62ab, 0x5288, 0x7435, 0x6bd7,
1767 /* 0xc6 */
1768 0x826a, 0x826b, 0x826c, 0x826d, 0x8271, 0x8275, 0x8276, 0x8277,
1769 0x8278, 0x827b, 0x827c, 0x8280, 0x8281, 0x8283, 0x8285, 0x8286,
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1773 0x82c3, 0x82c5, 0x82c6, 0x82c9, 0x82d0, 0x82d6, 0x82d9, 0x82da,
1774 0x82dd, 0x82e2, 0x82e7, 0x82e8, 0x82e9, 0x82ea, 0x82ec, 0x82ed,
1775 0x82ee, 0x82f0, 0x82f2, 0x82f3, 0x82f5, 0x82f6, 0x82f8, 0x82fa,
1776 0x82fc, 0x82fd, 0x82fe, 0x82ff, 0x8300, 0x830a, 0x830b, 0x830d,
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1783 0x4e52, 0x676a, 0x82f9, 0x840d, 0x5e73, 0x51ed, 0x74f6, 0x8bc4,
1784 0x5c4f, 0x5761, 0x6cfc, 0x9887, 0x5a46, 0x7834, 0x9b44, 0x8feb,
1785 0x7c95, 0x5256, 0x6251, 0x94fa, 0x4ec6, 0x8386, 0x8461, 0x83e9,
1786 0x84b2, 0x57d4, 0x6734, 0x5703, 0x666e, 0x6d66, 0x8c31, 0x66dd,
1787 0x7011, 0x671f, 0x6b3a, 0x6816, 0x621a, 0x59bb, 0x4e03, 0x51c4,
1788 0x6f06, 0x67d2, 0x6c8f, 0x5176, 0x68cb, 0x5947, 0x6b67, 0x7566,
1789 0x5d0e, 0x8110, 0x9f50, 0x65d7, 0x7948, 0x7941, 0x9a91, 0x8d77,
1790 0x5c82, 0x4e5e, 0x4f01, 0x542f, 0x5951, 0x780c, 0x5668, 0x6c14,
1791 0x8fc4, 0x5f03, 0x6c7d, 0x6ce3, 0x8bab, 0x6390,
1792 /* 0xc7 */
1793 0x833e, 0x833f, 0x8341, 0x8342, 0x8344, 0x8345, 0x8348, 0x834a,
1794 0x834b, 0x834c, 0x834d, 0x834e, 0x8353, 0x8355, 0x8356, 0x8357,
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1802 0x83c8, 0x83c9, 0x83cb, 0x83cd, 0x83ce, 0x83d0, 0x83d1, 0x83d2,
1803 0x83d3, 0x83d5, 0x83d7, 0x83d9, 0x83da, 0x83db, 0x83de, 0x83e2,
1804 0x83e3, 0x83e4, 0x83e6, 0x83e7, 0x83e8, 0x83eb, 0x83ec, 0x83ed,
1805 0x6070, 0x6d3d, 0x7275, 0x6266, 0x948e, 0x94c5, 0x5343, 0x8fcl,
1806 0x7b7e, 0x4edf, 0x8c26, 0x4e7e, 0x9ed4, 0x94b1, 0x94b3, 0x524d,
1807 0x6f5c, 0x9063, 0x6d45, 0x8c34, 0x5811, 0x5d4c, 0x6b20, 0x6b49,
1808 0x67aa, 0x545b, 0x8154, 0x7f8c, 0x5899, 0x8537, 0x5f3a, 0x62a2,
1809 0x6a47, 0x9539, 0x6572, 0x6084, 0x6865, 0x77a7, 0x4e54, 0x4fa8,
1810 0x5de7, 0x9798, 0x64ac, 0x7fd8, 0x5ced, 0x4fcf, 0x7a8d, 0x5207,
1811 0x8304, 0x4e14, 0x602f, 0x7a83, 0x94a6, 0x4fb5, 0x4eb2, 0x79e6,
1812 0x7434, 0x52e4, 0x82b9, 0x64d2, 0x79bd, 0x5bdd, 0x6c81, 0x9752,
1813 0x8f7b, 0x6c22, 0x503e, 0x537f, 0x6e05, 0x64ce, 0x6674, 0x6c30,
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1814 0x60c5, 0x9877, 0x8bf7, 0x5e86, 0x743c, 0x7a77, 0x79cb, 0x4e18,
1815 0x90b1, 0x7403, 0x6c42, 0x56da, 0x914b, 0x6cc5, 0x8d8b, 0x533a,
1816 0x86c6, 0x66f2, 0x8eaf, 0x5c48, 0x9a71, 0x6e20,
1817 /* 0xc8 */
1818 0x83ee, 0x83ef, 0x83f3, 0x83f4, 0x83f5, 0x83f6, 0x83f7, 0x83fa,
1819 0x83fb, 0x83fc, 0x83fe, 0x83ff, 0x8400, 0x8402, 0x8405, 0x8407,
1820 0x8408, 0x8409, 0x840a, 0x8410, 0x8412, 0x8413, 0x8414, 0x8415,
1821 0x8416, 0x8417, 0x8419, 0x841a, 0x841b, 0x841e, 0x841f, 0x8420,
1822 0x8421, 0x8422, 0x8423, 0x8429, 0x842a, 0x842b, 0x842c, 0x842d,
1823 0x842e, 0x842f, 0x8430, 0x8432, 0x8433, 0x8434, 0x8435, 0x8436,
1824 0x8437, 0x8439, 0x843a, 0x843b, 0x843e, 0x843f, 0x8440, 0x8441,
1825 0x8442, 0x8443, 0x8444, 0x8445, 0x8447, 0x8448, 0x8449, 0x844a,
1826 0x844b, 0x844c, 0x844d, 0x844e, 0x844f, 0x8450, 0x8452, 0x8453,
1827 0x8454, 0x8455, 0x8456, 0x8458, 0x845d, 0x845e, 0x845f, 0x8460,
1828 0x8462, 0x8464, 0x8465, 0x8466, 0x8467, 0x8468, 0x846a, 0x846e,
1829 0x846f, 0x8470, 0x8472, 0x8474, 0x8477, 0x8479, 0x847b, 0x847c,
1830 0x53d6, 0x5a36, 0x9f8b, 0x8da3, 0x53bb, 0x5708, 0x98a7, 0x6743,
1831 0x919b, 0x6cc9, 0x5168, 0x75ca, 0x62f3, 0x72ac, 0x5238, 0x529d,
1832 0x7f3a, 0x7094, 0x7638, 0x5374, 0x9e4a, 0x69b7, 0x786e, 0x96c0,
1833 0x88d9, 0x7fa4, 0x7136, 0x71c3, 0x5189, 0x67d3, 0x74e4, 0x58e4,
1834 0x6518, 0x56b7, 0x8ba9, 0x9976, 0x6270, 0x7ed5, 0x60f9, 0x70ed,
1835 0x58ec, 0x4ec1, 0x4eba, 0x5fcd, 0x97e7, 0x4efb, 0x8ba4, 0x5203,
1836 0x598a, 0x7eab, 0x6254, 0x4ecd, 0x65e5, 0x620e, 0x8338, 0x84c9,
1837 0x8363, 0x878d, 0x7194, 0x6eb6, 0x5bb9, 0x7ed2, 0x5197, 0x63c9,
1838 0x67d4, 0x8089, 0x8339, 0x8815, 0x5112, 0x5b7a, 0x5982, 0x8fb1,
1839 0x4e73, 0x6c5d, 0x5165, 0x8925, 0x8f6f, 0x962e, 0x854a, 0x745e,
1840 0x9510, 0x95f0, 0x6da6, 0x82e5, 0x5f31, 0x6492, 0x6d12, 0x8428,
1841 0x816e, 0x9cc3, 0x585e, 0x8d5b, 0x4e09, 0x53c1,
1842 /* 0xc9 */
1843 0x847d, 0x847e, 0x847f, 0x8480, 0x8481, 0x8483, 0x8484, 0x8485,
1844 0x8486, 0x848a, 0x848d, 0x848f, 0x8490, 0x8491, 0x8492, 0x8493,
1845 0x8494, 0x8495, 0x8496, 0x8498, 0x849a, 0x849b, 0x849d, 0x849e,
1846 0x849f, 0x84a0, 0x84a2, 0x84a3, 0x84a4, 0x84a5, 0x84a6, 0x84a7,
1847 0x84a8, 0x84a9, 0x84aa, 0x84ab, 0x84ac, 0x84ad, 0x84ae, 0x84b0,
1848 0x84b1, 0x84b3, 0x84b5, 0x84b6, 0x84b7, 0x84bb, 0x84bc, 0x84be,
1849 0x84c0, 0x84c2, 0x84c3, 0x84c4, 0x84c6, 0x84c7, 0x84c8, 0x84cb,
1850 0x84cc, 0x84ce, 0x84cf, 0x84d2, 0x84d4, 0x84d5, 0x84d7, 0x84d8,
1851 0x84d9, 0x84da, 0x84db, 0x84dc, 0x84de, 0x84e1, 0x84e2, 0x84e4,
1852 0x84e7, 0x84e8, 0x84e9, 0x84ea, 0x84eb, 0x84ed, 0x84ee, 0x84ef,
1853 0x84f1, 0x84f2, 0x84f3, 0x84f4, 0x84f5, 0x84f6, 0x84f7, 0x84f8,
1854 0x84f9, 0x84fa, 0x84fb, 0x84fd, 0x84fe, 0x8500, 0x8501, 0x8502,
1855 0x4f1e, 0x6563, 0x6851, 0x55d3, 0x4e27, 0x6414, 0x9a9a, 0x626b,
1856 0x5ac2, 0x745f, 0x8272, 0x6da9, 0x68ee, 0x50e7, 0x838e, 0x7802,
1857 0x6740, 0x5239, 0x6c99, 0x7eb1, 0x50bb, 0x5565, 0x715e, 0x7b5b,
1858 0x6652, 0x73ca, 0x82eb, 0x6749, 0x5c71, 0x5220, 0x717d, 0x886b,
1859 0x95ea, 0x9655, 0x64c5, 0x8d61, 0x81b3, 0x5584, 0x6c55, 0x6247,
1860 0x7f2e, 0x5892, 0x4f24, 0x5546, 0x8d4f, 0x664c, 0x4e0a, 0x5c1a,
1861 0x88f3, 0x68a2, 0x634e, 0x7a0d, 0x70e7, 0x828d, 0x52fa, 0x97f6,
1862 0x5c11, 0x54e8, 0x90b5, 0x7ecd, 0x5962, 0x8d4a, 0x86c7, 0x820c,
1863 0x820d, 0x8d66, 0x6444, 0x5c04, 0x6151, 0x6d89, 0x793e, 0x8bbe,
1864 0x7837, 0x7533, 0x547b, 0x4f38, 0x8eab, 0x6df1, 0x5a20, 0x7ec5,
1865 0x795e, 0x6c88, 0x5ba1, 0x5a76, 0x751a, 0x80be, 0x614e, 0x6e17,
1866 0x58f0, 0x751f, 0x7525, 0x7272, 0x5347, 0x7ef3,
1867 /* 0xca */
1868 0x8503, 0x8504, 0x8505, 0x8506, 0x8507, 0x8508, 0x8509, 0x850a,
1869 0x850b, 0x850d, 0x850e, 0x850f, 0x8510, 0x8512, 0x8514, 0x8515,
1870 0x8516, 0x8518, 0x8519, 0x851b, 0x851c, 0x851d, 0x851e, 0x8520,
1871 0x8522, 0x8523, 0x8524, 0x8525, 0x8526, 0x8527, 0x8528, 0x8529,
1872 0x852a, 0x852d, 0x852e, 0x852f, 0x8530, 0x8531, 0x8532, 0x8533,
1873 0x8534, 0x8535, 0x8536, 0x853e, 0x853f, 0x8540, 0x8541, 0x8542,
1874 0x8544, 0x8545, 0x8546, 0x8547, 0x854b, 0x854c, 0x854d, 0x854e,
1875 0x854f, 0x8550, 0x8551, 0x8552, 0x8553, 0x8554, 0x8555, 0x8557,
1876 0x8558, 0x855a, 0x855b, 0x855c, 0x855d, 0x855f, 0x8560, 0x8561,
1877 0x8562, 0x8563, 0x8565, 0x8566, 0x8567, 0x8569, 0x856a, 0x856b,
1878 0x856c, 0x856d, 0x856e, 0x856f, 0x8570, 0x8571, 0x8573, 0x8575,
1879 0x8576, 0x8577, 0x8578, 0x857c, 0x857d, 0x857f, 0x8580, 0x8581,
1880 0x7701, 0x76db, 0x5269, 0x80dc, 0x5723, 0x5e08, 0x5931, 0x72ee,
1881 0x65bd, 0x6e7f, 0x8bd7, 0x5c38, 0x8671, 0x5341, 0x77f3, 0x62fe,
1882 0x65f6, 0x4ec0, 0x98df, 0x8680, 0x5b9e, 0x8bc6, 0x53f2, 0x77e2,
1883 0x4f7f, 0x5c4e, 0x9a76, 0x59cb, 0x5f0f, 0x793a, 0x58eb, 0x4e16,
1884 0x67ff, 0x4e8b, 0x62ed, 0x8a93, 0x901d, 0x52bf, 0x662f, 0x55dc,
1885 0x566c, 0x9002, 0x4ed5, 0x4f8d, 0x91ca, 0x9970, 0x6c0f, 0x5e02,
1886 0x6043, 0x5ba4, 0x89c6, 0x8bd5, 0x6536, 0x624b, 0x9996, 0x5b88,
1887 0x5bff, 0x6388, 0x552e, 0x53d7, 0x7626, 0x517d, 0x852c, 0x67a2,
1888 0x68b3, 0x6b8a, 0x6292, 0x8f93, 0x53d4, 0x8212, 0x6dd1, 0x758f,
1889 0x4e66, 0x8d4e, 0x5b70, 0x719f, 0x85af, 0x6691, 0x66d9, 0x7f72,
1890 0x8700, 0x9ecd, 0x9f20, 0x5c5e, 0x72f2, 0x8ff0, 0x6811, 0x675f,
1891 0x620d, 0x7ad6, 0x5885, 0x5eb6, 0x6570, 0x6f31,
1892 /* 0xcb */
1893 0x8582, 0x8583, 0x8586, 0x8588, 0x8589, 0x858a, 0x858b, 0x858c,
1894 0x858d, 0x858e, 0x8590, 0x8591, 0x8592, 0x8593, 0x8594, 0x8595,
1895 0x8596, 0x8597, 0x8598, 0x8599, 0x859a, 0x859d, 0x859e, 0x859f,
1896 0x85a0, 0x85a1, 0x85a2, 0x85a3, 0x85a5, 0x85a6, 0x85a7, 0x85a9,
1897 0x85ab, 0x85ac, 0x85ad, 0x85b1, 0x85b2, 0x85b3, 0x85b4, 0x85b5,
1898 0x85b6, 0x85b8, 0x85ba, 0x85bb, 0x85bc, 0x85bd, 0x85be, 0x85bf,
1899 0x85c0, 0x85c2, 0x85c3, 0x85c4, 0x85c5, 0x85c6, 0x85c7, 0x85c8,
1900 0x85ca, 0x85cb, 0x85cc, 0x85cd, 0x85ce, 0x85d1, 0x85d2, 0x85d4,
```

```
1901 0x85d6, 0x85d7, 0x85d8, 0x85d9, 0x85da, 0x85db, 0x85dd, 0x85de,
1902 0x85df, 0x85e0, 0x85e1, 0x85e2, 0x85e3, 0x85e5, 0x85e6, 0x85e7,
1903 0x85e8, 0x85ea, 0x85eb, 0x85ec, 0x85ed, 0x85ee, 0x85ef, 0x85f0,
1904 0x85f1, 0x85f2, 0x85f3, 0x85f4, 0x85f5, 0x85f6, 0x85f7, 0x85f8,
1905 0x6055, 0x5237, 0x800d, 0x6454, 0x8870, 0x7529, 0x5e05, 0x6813,
1906 0x62f4, 0x971c, 0x53cc, 0x723d, 0x8c01, 0x6c34, 0x7761, 0x7a0e,
1907 0x542e, 0x77ac, 0x987a, 0x821c, 0x8bf4, 0x7855, 0x6714, 0x70c1,
1908 0x65af, 0x6495, 0x5636, 0x601d, 0x79c1, 0x53f8, 0x4e1d, 0x6b7b,
1909 0x8086, 0x5bfa, 0x55e3, 0x56db, 0x4f3a, 0x4f3c, 0x9972, 0x5df3,
1910 0x677e, 0x8038, 0x6002, 0x9882, 0x9001, 0x5b8b, 0x8bbc, 0x8bf5,
1911 0x641c, 0x8258, 0x64de, 0x55fd, 0x82cf, 0x9165, 0x4fd7, 0x7d20,
1912 0x901f, 0x7c9f, 0x50f3, 0x5851, 0x6eaf, 0x5bbf, 0x8bc9, 0x8083,
1913 0x9178, 0x849c, 0x7b97, 0x867d, 0x968b, 0x968f, 0x7ee5, 0x9ad3,
1914 0x788e, 0x5c81, 0x7a57, 0x9042, 0x96a7, 0x795f, 0x5b59, 0x635f,
1915 0x7b0b, 0x84d1, 0x68ad, 0x5506, 0x7f29, 0x7410, 0x7d22, 0x9501,
1916 0x6240, 0x584c, 0x4ed6, 0x5b83, 0x5979, 0x5854,
1917 /* 0xcc */
1918 0x85f9, 0x85fa, 0x85fc, 0x85fd, 0x85fe, 0x8600, 0x8601, 0x8602,
1919 0x8603, 0x8604, 0x8606, 0x8607, 0x8608, 0x8609, 0x860a, 0x860b,
1920 0x860c, 0x860d, 0x860e, 0x860f, 0x8610, 0x8612, 0x8613, 0x8614,
1921 0x8615, 0x8617, 0x8618, 0x8619, 0x861a, 0x861b, 0x861c, 0x861d,
1922 0x861e, 0x861f, 0x8620, 0x8621, 0x8622, 0x8623, 0x8624, 0x8625,
1923 0x8626, 0x8628, 0x862a, 0x862b, 0x862c, 0x862d, 0x862e, 0x862f,
1924 0x8630, 0x8631, 0x8632, 0x8633, 0x8634, 0x8635, 0x8636, 0x8637,
1925 0x8639, 0x863a, 0x863b, 0x863d, 0x863e, 0x863f, 0x8640, 0x8641,
1926 0x8642, 0x8643, 0x8644, 0x8645, 0x8646, 0x8647, 0x8648, 0x8649,
1927 0x864a, 0x864b, 0x864c, 0x864d, 0x8652, 0x8653, 0x8655, 0x8656,
1928 0x8658, 0x8659, 0x865b, 0x865c, 0x865d, 0x865f, 0x8660, 0x8661,
1929 0x8663, 0x8664, 0x8665, 0x8666, 0x8667, 0x8668, 0x8669, 0x866a,
1930 0x736d, 0x631e, 0x8e4b, 0x8e0f, 0x80ce, 0x82d4, 0x62ac, 0x53f0,
1931 0x6cf0, 0x915e, 0x592a, 0x6001, 0x6c70, 0x574d, 0x644a, 0x8d2a,
1932 0x762b, 0x6ee9, 0x575b, 0x6a80, 0x75f0, 0x6f6d, 0x8c2d, 0x8c08,
1933 0x5766, 0x6bef, 0x8892, 0x78b3, 0x63a2, 0x53f9, 0x70ad, 0x6c64,
1934 0x5858, 0x642a, 0x5802, 0x68e0, 0x819b, 0x5510, 0x7cd6, 0x5018,
1935 0x8eba, 0x6dcc, 0x8d9f, 0x70eb, 0x638f, 0x6d9b, 0x6ed4, 0x7ee6,
1936 0x8404, 0x6843, 0x9003, 0x6dd8, 0x9676, 0x8ba8, 0x5957, 0x7279,
1937 0x85e4, 0x817e, 0x75bc, 0x8a8a, 0x68af, 0x5254, 0x8e22, 0x9511,
1938 0x63d0, 0x9898, 0x8e44, 0x557c, 0x4f53, 0x66ff, 0x568f, 0x60d5,
1939 0x6d95, 0x5243, 0x5c49, 0x5929, 0x6dfb, 0x586b, 0x7530, 0x751c,
1940 0x606c, 0x8214, 0x8146, 0x6311, 0x6761, 0x8fe2, 0x773a, 0x8df3,
1941 0x8d34, 0x94c1, 0x5e16, 0x5385, 0x542c, 0x70c3,
1942 /* 0xcd */
1943 0x866d, 0x866f, 0x8670, 0x8672, 0x8673, 0x8674, 0x8675, 0x8676,
1944 0x8677, 0x8678, 0x8683, 0x8684, 0x8685, 0x8686, 0x8687, 0x8688,
1945 0x8689, 0x868e, 0x868f, 0x8690, 0x8691, 0x8692, 0x8694, 0x8696,
1946 0x8697, 0x8698, 0x8699, 0x869a, 0x869b, 0x869e, 0x869f, 0x86a0,
1947 0x86a1, 0x86a2, 0x86a5, 0x86a6, 0x86ab, 0x86ad, 0x86ae, 0x86b2,
1948 0x86b3, 0x86b7, 0x86b8, 0x86b9, 0x86bb, 0x86bc, 0x86bd, 0x86be,
1949 0x86bf, 0x86c1, 0x86c2, 0x86c3, 0x86c5, 0x86c8, 0x86cc, 0x86cd,
1950 0x86d2, 0x86d3, 0x86d5, 0x86d6, 0x86d7, 0x86da, 0x86dc, 0x86dd,
1951 0x86e0, 0x86e1, 0x86e2, 0x86e3, 0x86e5, 0x86e6, 0x86e7, 0x86e8,
1952 0x86ea, 0x86eb, 0x86ec, 0x86ef, 0x86f5, 0x86f6, 0x86f7, 0x86fa,
1953 0x86fb, 0x86fc, 0x86fd, 0x86ff, 0x8701, 0x8704, 0x8705, 0x8706,
1954 0x870b, 0x870c, 0x870e, 0x870f, 0x8710, 0x8711, 0x8714, 0x8716,
1955 0x6c40, 0x5ef7, 0x505c, 0x4ead, 0x5ead, 0x633a, 0x8247, 0x901a,
1956 0x6850, 0x916e, 0x77b3, 0x540c, 0x94dc, 0x5f64, 0x7ae5, 0x6876,
1957 0x6345, 0x7b52, 0x7edf, 0x75db, 0x5077, 0x6295, 0x5934, 0x900f,
1958 0x51f8, 0x79c3, 0x7a81, 0x56fe, 0x5f92, 0x9014, 0x6d82, 0x5c60,
1959 0x571f, 0x5410, 0x5154, 0x6e4d, 0x56e2, 0x63a8, 0x9893, 0x817f,
1960 0x8715, 0x892a, 0x9000, 0x541e, 0x5c6f, 0x81c0, 0x62d6, 0x6258,
1961 0x8131, 0x9e35, 0x9640, 0x9a6e, 0x9a7c, 0x692d, 0x59a5, 0x62d3,
1962 0x553e, 0x6316, 0x54c7, 0x86d9, 0x6d3c, 0x5a03, 0x74e6, 0x889c,
1963 0x6b6a, 0x5916, 0x8c4c, 0x5f2f, 0x6e7e, 0x73a9, 0x987d, 0x4e38,
1964 0x70f7, 0x5b8c, 0x7897, 0x633d, 0x665a, 0x7696, 0x60cb, 0x5b9b,
1965 0x5a49, 0x4e07, 0x8155, 0x6c6a, 0x738b, 0x4ea1, 0x6789, 0x7f51,
1966 0x5f80, 0x65fa, 0x671b, 0x5fd8, 0x5984, 0x5a01,
1967 /* 0xce */
1968 0x8719, 0x871b, 0x871d, 0x871f, 0x8720, 0x8724, 0x8726, 0x8727,
1969 0x8728, 0x872a, 0x872b, 0x872c, 0x872d, 0x872f, 0x8730, 0x8732,
1970 0x8733, 0x8735, 0x8736, 0x8738, 0x8739, 0x873a, 0x873c, 0x873d,
1971 0x8740, 0x8741, 0x8742, 0x8743, 0x8744, 0x8745, 0x8746, 0x874a,
1972 0x874b, 0x874d, 0x874f, 0x8750, 0x8751, 0x8752, 0x8754, 0x8755,
1973 0x8756, 0x8758, 0x875a, 0x875b, 0x875c, 0x875d, 0x875e, 0x875f,
1974 0x8761, 0x8762, 0x8766, 0x8767, 0x8768, 0x8769, 0x876a, 0x876b,
1975 0x876c, 0x876d, 0x876f, 0x8771, 0x8772, 0x8773, 0x8775, 0x8777,
1976 0x8778, 0x8779, 0x877a, 0x877f, 0x8780, 0x8781, 0x8784, 0x8786,
1977 0x8787, 0x8789, 0x878a, 0x878c, 0x878e, 0x878f, 0x8790, 0x8791,
1978 0x8792, 0x8794, 0x8795, 0x8796, 0x8798, 0x8799, 0x879a, 0x879b,
1979 0x879c, 0x879d, 0x879e, 0x87a0, 0x87a1, 0x87a2, 0x87a3, 0x87a4,
1980 0x5dcd, 0x5fae, 0x5371, 0x97e6, 0x8fdd, 0x6845, 0x56f4, 0x552f,
1981 0x60df, 0x4e3a, 0x6f4d, 0x7ef4, 0x82c7, 0x840e, 0x59d4, 0x4f1f,
1982 0x4f2a, 0x5c3e, 0x7eac, 0x672a, 0x851a, 0x5473, 0x754f, 0x80c3,
1983 0x5582, 0x9b4f, 0x4f4d, 0x6e2d, 0x8c13, 0x5c09, 0x6170, 0x536b,
1984 0x761f, 0x6e29, 0x868a, 0x6587, 0x95fb, 0x7eb9, 0x543b, 0x7a33,
1985 0x7d0a, 0x95ee, 0x55e1, 0x7fc1, 0x74ee, 0x631d, 0x8717, 0x6da1,
1986 0x7a9d, 0x6211, 0x65a1, 0x5367, 0x63e1, 0x6c83, 0x5deb, 0x545c,
1987 0x94a8, 0x4e4c, 0x6c61, 0x8bec, 0x5c4b, 0x65e0, 0x829c, 0x68a7,
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1988 0x543e, 0x5434, 0x6bcb, 0x6b66, 0x4e94, 0x6342, 0x5348, 0x821e,
1989 0x4f0d, 0x4fae, 0x575e, 0x620a, 0x96fe, 0x6664, 0x7269, 0x52ff,
1990 0x52a1, 0x609f, 0x8bef, 0x6614, 0x7199, 0x6790, 0x897f, 0x7852,
1991 0x77fd, 0x6670, 0x563b, 0x5438, 0x9521, 0x727a,
1992 /* 0xcf */
1993 0x87a5, 0x87a6, 0x87a7, 0x87a9, 0x87aa, 0x87ae, 0x87b0, 0x87b1,
1994 0x87b2, 0x87b4, 0x87b6, 0x87b7, 0x87b8, 0x87b9, 0x87bb, 0x87bc,
1995 0x87be, 0x87bf, 0x87c1, 0x87c2, 0x87c3, 0x87c4, 0x87c5, 0x87c7,
1996 0x87c8, 0x87c9, 0x87cc, 0x87cd, 0x87ce, 0x87cf, 0x87d0, 0x87d4,
1997 0x87d5, 0x87d6, 0x87d7, 0x87d8, 0x87d9, 0x87da, 0x87dc, 0x87dd,
1998 0x87de, 0x87df, 0x87e1, 0x87e2, 0x87e3, 0x87e4, 0x87e6, 0x87e7,
1999 0x87e8, 0x87e9, 0x87eb, 0x87ec, 0x87ed, 0x87ef, 0x87f0, 0x87f1,
2000 0x87f2, 0x87f3, 0x87f4, 0x87f5, 0x87f6, 0x87f7, 0x87f8, 0x87fa,
2001 0x87fb, 0x87fc, 0x87fd, 0x87ff, 0x8800, 0x8801, 0x8802, 0x8804,
2002 0x8805, 0x8806, 0x8807, 0x8808, 0x8809, 0x880b, 0x880c, 0x880d,
2003 0x880e, 0x880f, 0x8810, 0x8811, 0x8812, 0x8814, 0x8817, 0x8818,
2004 0x8819, 0x881a, 0x881c, 0x881d, 0x881e, 0x881f, 0x8820, 0x8823,
2005 0x7a00, 0x606f, 0x5e0c, 0x6089, 0x819d, 0x5915, 0x60dc, 0x7184,
2006 0x70ef, 0x6eaa, 0x6c50, 0x7280, 0x6a84, 0x88ad, 0x5e2d, 0x4e60,
2007 0x5ab3, 0x559c, 0x94e3, 0x6d17, 0x7cfe, 0x9699, 0x620f, 0x7ec6,
2008 0x778e, 0x867e, 0x5323, 0x971e, 0x8f96, 0x6687, 0x5ce1, 0x4fa0,
2009 0x72ed, 0x4e0b, 0x53a6, 0x590f, 0x5413, 0x6380, 0x9528, 0x5148,
2010 0x4ed9, 0x9c9c, 0x7ea4, 0x54b8, 0x8d24, 0x8854, 0x8237, 0x95f2,
2011 0x6d8e, 0x5f26, 0x5acc, 0x663e, 0x9669, 0x73b0, 0x732e, 0x53bf,
2012 0x817a, 0x9985, 0x7fa1, 0x5baa, 0x9677, 0x9650, 0x7ebf, 0x76f8,
2013 0x53a2, 0x9576, 0x9999, 0x7bb1, 0x8944, 0x6e58, 0x4e61, 0x7fd4,
2014 0x7965, 0x8be6, 0x60f3, 0x54cd, 0x4eab, 0x9879, 0x5df7, 0x6a61,
2015 0x50cf, 0x5411, 0x8c61, 0x8427, 0x785d, 0x9704, 0x524a, 0x54ee,
2016 0x56a3, 0x9500, 0x6d88, 0x5bb5, 0x6dc6, 0x6653,
2017 /* 0xd0 */
2018 0x8824, 0x8825, 0x8826, 0x8827, 0x8828, 0x8829, 0x882a, 0x882b,
2019 0x882c, 0x882d, 0x882e, 0x882f, 0x8830, 0x8831, 0x8833, 0x8834,
2020 0x8835, 0x8836, 0x8837, 0x8838, 0x883a, 0x883b, 0x883d, 0x883e,
2021 0x883f, 0x8841, 0x8842, 0x8843, 0x8846, 0x8847, 0x8848, 0x8849,
2022 0x884a, 0x884b, 0x884e, 0x884f, 0x8850, 0x8851, 0x8852, 0x8853,
2023 0x8855, 0x8856, 0x8858, 0x885a, 0x885b, 0x885c, 0x885d, 0x885e,
2024 0x885f, 0x8860, 0x8866, 0x8867, 0x886a, 0x886d, 0x886f, 0x8871,
2025 0x8873, 0x8874, 0x8875, 0x8876, 0x8878, 0x8879, 0x887a, 0x887b,
2026 0x887c, 0x8880, 0x8883, 0x8886, 0x8887, 0x8889, 0x888a, 0x888c,
2027 0x888e, 0x888f, 0x8890, 0x8891, 0x8893, 0x8894, 0x8895, 0x8897,
2028 0x8898, 0x8899, 0x889a, 0x889b, 0x889d, 0x889e, 0x889f, 0x88a0,
2029 0x88a1, 0x88a3, 0x88a5, 0x88a6, 0x88a7, 0x88a8, 0x88a9, 0x88aa,
2030 0x5c0f, 0x5b5d, 0x6821, 0x8096, 0x5578, 0x7b11, 0x6548, 0x6954,
2031 0x4e9b, 0x6b47, 0x874e, 0x978b, 0x534f, 0x631f, 0x643a, 0x90aa,
2032 0x659c, 0x80c1, 0x8c10, 0x5199, 0x68b0, 0x5378, 0x87f9, 0x61c8,
2033 0x6cc4, 0x6cfb, 0x8c22, 0x5c51, 0x85aa, 0x82af, 0x950c, 0x6b23,
2034 0x8f9b, 0x65b0, 0x5ffb, 0x5fc3, 0x4fe1, 0x8845, 0x661f, 0x8165,
2035 0x7329, 0x60fa, 0x5174, 0x5211, 0x578b, 0x5f62, 0x90a2, 0x884c,
2036 0x9192, 0x5e78, 0x674f, 0x6027, 0x59d3, 0x5144, 0x51f6, 0x80f8,
2037 0x5308, 0x6c79, 0x96c4, 0x718a, 0x4f11, 0x4fee, 0x7f9e, 0x673d,
2038 0x55c5, 0x9508, 0x79c0, 0x8896, 0x7ee3, 0x589f, 0x620c, 0x9700,
2039 0x865a, 0x5618, 0x987b, 0x5f90, 0x8bb8, 0x84c4, 0x9157, 0x53d9,
2040 0x65ed, 0x5e8f, 0x755c, 0x6064, 0x7d6e, 0x5a7f, 0x7eea, 0x7eed,
2041 0x8f69, 0x55a7, 0x5ba3, 0x60ac, 0x65cb, 0x7384,
2042 /* 0xd1 */
2043 0x88ac, 0x88ae, 0x88af, 0x88b0, 0x88b2, 0x88b3, 0x88b4, 0x88b5,
2044 0x88b6, 0x88b8, 0x88b9, 0x88ba, 0x88bb, 0x88bd, 0x88be, 0x88bf,
2045 0x88c0, 0x88c3, 0x88c4, 0x88c7, 0x88c8, 0x88ca, 0x88cb, 0x88cc,
2046 0x88cd, 0x88cf, 0x88d0, 0x88d1, 0x88d3, 0x88d6, 0x88d7, 0x88da,
2047 0x88db, 0x88dc, 0x88dd, 0x88de, 0x88e0, 0x88e1, 0x88e6, 0x88e7,
2048 0x88e9, 0x88ea, 0x88eb, 0x88ec, 0x88ed, 0x88ee, 0x88ef, 0x88f2,
2049 0x88f5, 0x88f6, 0x88f7, 0x88fa, 0x88fb, 0x88fd, 0x88ff, 0x8900,
2050 0x8901, 0x8903, 0x8904, 0x8905, 0x8906, 0x8907, 0x8908, 0x8909,
2051 0x890b, 0x890c, 0x890d, 0x890e, 0x890f, 0x8911, 0x8914, 0x8915,
2052 0x8916, 0x8917, 0x8918, 0x891c, 0x891d, 0x891e, 0x891f, 0x8920,
2053 0x8922, 0x8923, 0x8924, 0x8926, 0x8927, 0x8928, 0x8929, 0x892c,
2054 0x892d, 0x892e, 0x892f, 0x8931, 0x8932, 0x8933, 0x8935, 0x8937,
2055 0x9009, 0x7663, 0x7729, 0x7eda, 0x9774, 0x859b, 0x5b66, 0x7a74,
2056 0x96ea, 0x8840, 0x52cb, 0x718f, 0x5faa, 0x65ec, 0x8be2, 0x5bfb,
2057 0x9a6f, 0x5de1, 0x6b89, 0x6c5b, 0x8bad, 0x8baf, 0x900a, 0x8fc5,
2058 0x538b, 0x62bc, 0x9e26, 0x9e2d, 0x5440, 0x4e2b, 0x82bd, 0x7259,
2059 0x869c, 0x5d16, 0x8859, 0x6daf, 0x96c5, 0x54d1, 0x4e9a, 0x8bb6,
2060 0x7109, 0x54bd, 0x9609, 0x70df, 0x6df9, 0x76d0, 0x4e25, 0x7814,
2061 0x8712, 0x5ca9, 0x5ef6, 0x8a00, 0x989c, 0x960e, 0x708e, 0x6cbf,
2062 0x5944, 0x63a9, 0x773c, 0x884d, 0x6f14, 0x8273, 0x5830, 0x71d5,
2063 0x538c, 0x781a, 0x96c1, 0x5501, 0x5f66, 0x7130, 0x5bb4, 0x8c1a,
2064 0x9a8c, 0x6b83, 0x592e, 0x9e2f, 0x79e7, 0x6768, 0x626c, 0x4f6f,
2065 0x75a1, 0x7f8a, 0x6d0b, 0x9633, 0x6c27, 0x4ef0, 0x75d2, 0x517b,
2066 0x6837, 0x6f3e, 0x9080, 0x8170, 0x5996, 0x7476,
2067 /* 0xd2 */
2068 0x8938, 0x8939, 0x893a, 0x893b, 0x893c, 0x893d, 0x893e, 0x893f,
2069 0x8940, 0x8942, 0x8943, 0x8945, 0x8946, 0x8947, 0x8948, 0x8949,
2070 0x894a, 0x894b, 0x894c, 0x894d, 0x894e, 0x894f, 0x8950, 0x8951,
2071 0x8952, 0x8953, 0x8954, 0x8955, 0x8956, 0x8957, 0x8958, 0x8959,
2072 0x895a, 0x895b, 0x895c, 0x895d, 0x895e, 0x895f, 0x8960, 0x8961,
2073 0x8962, 0x8963, 0x8964, 0x8965, 0x8967, 0x8968, 0x8969, 0x896a,
2074 0x896b, 0x896c, 0x896d, 0x896e, 0x896f, 0x8970, 0x8971, 0x8972, 0x8973, 0x8974,

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2076 0x897e, 0x8980, 0x8982, 0x8984, 0x8985, 0x8987, 0x8988, 0x8989,
2077 0x898a, 0x898b, 0x898c, 0x898d, 0x898e, 0x898f, 0x8990, 0x8991,
2078 0x8992, 0x8993, 0x8994, 0x8995, 0x8996, 0x8997, 0x8998, 0x8999,
2079 0x899a, 0x899b, 0x899c, 0x899d, 0x899e, 0x899f, 0x89a0, 0x89a1,
2080 0x6447, 0x5c27, 0x9065, 0x7a91, 0x8c23, 0x59da, 0x54ac, 0x8200,
2081 0x836f, 0x8981, 0x8000, 0x6930, 0x564e, 0x8036, 0x7237, 0x91ce,
2082 0x51b6, 0x4e5f, 0x9875, 0x6396, 0x4e1a, 0x53f6, 0x66f3, 0x814b,
2083 0x591c, 0x6db2, 0x4e00, 0x58f9, 0x533b, 0x63d6, 0x94f1, 0x4f9d,
2084 0x4f0a, 0x8863, 0x9890, 0x5937, 0x9057, 0x79fb, 0x4eea, 0x80f0,
2085 0x7591, 0x6c82, 0x5b9c, 0x59e8, 0x5f5d, 0x6905, 0x8681, 0x501a,
2086 0x5df2, 0x4e59, 0x77e3, 0x4ee5, 0x827a, 0x6291, 0x6613, 0x9091,
2087 0x5c79, 0x4ebf, 0x5f79, 0x81c6, 0x9038, 0x8084, 0x75ab, 0x4ea6,
2088 0x88d4, 0x610f, 0x6bc5, 0x5fc6, 0x4e49, 0x76ca, 0x6ea2, 0x8be3,
2089 0x8bae, 0x8c0a, 0x8bd1, 0x5f02, 0x7ffc, 0x7fcc, 0x7ece, 0x8335,
2090 0x836b, 0x56e0, 0x6bb7, 0x97f3, 0x9634, 0x59fb, 0x541f, 0x94f6,
2091 0x6deb, 0x5bc5, 0x996e, 0x5c39, 0x5f15, 0x9690,
2092 /* 0xd3 */
2093 0x89a2, 0x89a3, 0x89a4, 0x89a5, 0x89a6, 0x89a7, 0x89a8, 0x89a9,
2094 0x89aa, 0x89ab, 0x89ac, 0x89ad, 0x89ae, 0x89af, 0x89b0, 0x89b1,
2095 0x89b2, 0x89b3, 0x89b4, 0x89b5, 0x89b6, 0x89b7, 0x89b8, 0x89b9,
2096 0x89ba, 0x89bb, 0x89bc, 0x89bd, 0x89be, 0x89bf, 0x89c0, 0x89c3,
2097 0x89cd, 0x89d3, 0x89d4, 0x89d5, 0x89d7, 0x89d8, 0x89d9, 0x89db,
2098 0x89dd, 0x89df, 0x89e0, 0x89e1, 0x89e2, 0x89e4, 0x89e7, 0x89e8,
2099 0x89e9, 0x89ea, 0x89ec, 0x89ed, 0x89ee, 0x89f0, 0x89f1, 0x89f2,
2100 0x89f4, 0x89f5, 0x89f6, 0x89f7, 0x89f8, 0x89f9, 0x89fa, 0x89fb,
2101 0x89fc, 0x89fd, 0x89fe, 0x89ff, 0x8a01, 0x8a02, 0x8a03, 0x8a04,
2102 0x8a05, 0x8a06, 0x8a08, 0x8a09, 0x8a0a, 0x8a0b, 0x8a0c, 0x8a0d,
2103 0x8a0e, 0x8a0f, 0x8a10, 0x8a11, 0x8a12, 0x8a13, 0x8a14, 0x8a15,
2104 0x8a16, 0x8a17, 0x8a18, 0x8a19, 0x8a1a, 0x8a1b, 0x8a1c, 0x8a1d,
2105 0x5370, 0x82f1, 0x6a31, 0x5a74, 0x9e70, 0x5e94, 0x7f28, 0x83b9,
2106 0x8424, 0x8425, 0x8367, 0x8747, 0x8fce, 0x8d62, 0x76c8, 0x5f71,
2107 0x9896, 0x786c, 0x6620, 0x54df, 0x62e5, 0x4f63, 0x81c3, 0x75c8,
2108 0x5eb8, 0x96cd, 0x8e0a, 0x86f9, 0x548f, 0x6cf3, 0x6d8c, 0x6c38,
2109 0x607f, 0x52c7, 0x7528, 0x5e7d, 0x4f18, 0x60a0, 0x5fe7, 0x5c24,
2110 0x7531, 0x90ae, 0x94c0, 0x72b9, 0x6cb9, 0x6e38, 0x9149, 0x6709,
2111 0x53cb, 0x53f3, 0x4f51, 0x91c9, 0x8bf1, 0x53c8, 0x5e7c, 0x8fc2,
2112 0x6de4, 0x4e8e, 0x76c2, 0x6986, 0x865e, 0x611a, 0x8206, 0x4f59,
2113 0x4fde, 0x903e, 0x9c7c, 0x6109, 0x6e1d, 0x6e14, 0x9685, 0x4e88,
2114 0x5a31, 0x96e8, 0x4e0e, 0x5c7f, 0x79b9, 0x5b87, 0x8bed, 0x7fbd,
2115 0x7389, 0x57df, 0x828b, 0x90c1, 0x5401, 0x9047, 0x55bb, 0x5cea,
2116 0x5fa1, 0x6108, 0x6b32, 0x72f1, 0x80b2, 0x8a89,
2117 /* 0xd4 */
2118 0x8a1e, 0x8a1f, 0x8a20, 0x8a21, 0x8a22, 0x8a23, 0x8a24, 0x8a25,
2119 0x8a26, 0x8a27, 0x8a28, 0x8a29, 0x8a2a, 0x8a2b, 0x8a2c, 0x8a2d,
2120 0x8a2e, 0x8a2f, 0x8a30, 0x8a31, 0x8a32, 0x8a33, 0x8a34, 0x8a35,
2121 0x8a36, 0x8a37, 0x8a38, 0x8a39, 0x8a3a, 0x8a3b, 0x8a3c, 0x8a3d,
2122 0x8a3f, 0x8a40, 0x8a41, 0x8a42, 0x8a43, 0x8a44, 0x8a45, 0x8a46,
2123 0x8a47, 0x8a49, 0x8a4a, 0x8a4b, 0x8a4c, 0x8a4d, 0x8a4e, 0x8a4f,
2124 0x8a50, 0x8a51, 0x8a52, 0x8a53, 0x8a54, 0x8a55, 0x8a56, 0x8a57,
2125 0x8a58, 0x8a59, 0x8a5a, 0x8a5b, 0x8a5c, 0x8a5d, 0x8a5e, 0x8a5f,
2126 0x8a60, 0x8a61, 0x8a62, 0x8a63, 0x8a64, 0x8a65, 0x8a66, 0x8a67,
2127 0x8a68, 0x8a69, 0x8a6a, 0x8a6b, 0x8a6c, 0x8a6d, 0x8a6e, 0x8a6f,
2128 0x8a70, 0x8a71, 0x8a72, 0x8a73, 0x8a74, 0x8a75, 0x8a76, 0x8a77,
2129 0x8a78, 0x8a7a, 0x8a7b, 0x8a7c, 0x8a7d, 0x8a7e, 0x8a7f, 0x8a80,
2130 0x6d74, 0x5bd3, 0x88d5, 0x9884, 0x8c6b, 0x9a6d, 0x9e33, 0x6e0a,
2131 0x51a4, 0x5143, 0x57a3, 0x8881, 0x539f, 0x63f4, 0x8f95, 0x56ed,
2132 0x5458, 0x5706, 0x733f, 0x6e90, 0x7f18, 0x8fdc, 0x82d1, 0x613f,
2133 0x6028, 0x9662, 0x66f0, 0x7ea6, 0x8d8a, 0x8dc3, 0x94a5, 0x5cb3,
2134 0x7ca4, 0x6708, 0x60a6, 0x9605, 0x8018, 0x4e91, 0x90e7, 0x5300,
2135 0x9668, 0x5141, 0x8fd0, 0x8574, 0x915d, 0x6655, 0x97f5, 0x5b55,
2136 0x531d, 0x7838, 0x6742, 0x683d, 0x54c9, 0x707e, 0x5bb0, 0x8f7d,
2137 0x518d, 0x5728, 0x54b1, 0x6512, 0x6682, 0x8d5e, 0x8d43, 0x810f,
2138 0x846c, 0x906d, 0x7cdf, 0x51ff, 0x85fb, 0x67a3, 0x65e9, 0x6fa1,
2139 0x86a4, 0x8e81, 0x566a, 0x9020, 0x7682, 0x7076, 0x71e5, 0x8d23,
2140 0x62e9, 0x5219, 0x6cfd, 0x8d3c, 0x600e, 0x589e, 0x618e, 0x66fe,
2141 0x8d60, 0x624e, 0x55b3, 0x6e23, 0x672d, 0x8f67,
2142 /* 0xd5 */
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2144 0x8a8b, 0x8a8c, 0x8a8d, 0x8a8e, 0x8a8f, 0x8a90, 0x8a91, 0x8a92,
2145 0x8a94, 0x8a95, 0x8a96, 0x8a97, 0x8a98, 0x8a99, 0x8a9a, 0x8a9b,
2146 0x8a9c, 0x8a9d, 0x8a9e, 0x8a9f, 0x8aa0, 0x8aa1, 0x8aa2, 0x8aa3,
2147 0x8aa4, 0x8aa5, 0x8aa6, 0x8aa7, 0x8aa8, 0x8aa9, 0x8aaa, 0x8aab,
2148 0x8aac, 0x8aad, 0x8aae, 0x8aaf, 0x8ab0, 0x8ab1, 0x8ab2, 0x8ab3,
2149 0x8ab4, 0x8ab5, 0x8ab6, 0x8ab7, 0x8ab8, 0x8ab9, 0x8aba, 0x8abb,
2150 0x8abc, 0x8abd, 0x8abe, 0x8abf, 0x8ac0, 0x8ac1, 0x8ac2, 0x8ac3,
2151 0x8ac4, 0x8ac5, 0x8ac6, 0x8ac7, 0x8ac8, 0x8ac9, 0x8aca, 0x8acb,
2152 0x8acc, 0x8acd, 0x8ace, 0x8acf, 0x8ad0, 0x8ad1, 0x8ad2, 0x8ad3,
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2154 0x8adc, 0x8add, 0x8ade, 0x8adf, 0x8ae0, 0x8ae1, 0x8ae2, 0x8ae3,
2155 0x94e1, 0x95f8, 0x7728, 0x6805, 0x69a8, 0x548b, 0x4e4d, 0x70b8,
2156 0x8bc8, 0x6458, 0x658b, 0x5b85, 0x7a84, 0x503a, 0x5be8, 0x77bb,
2157 0x6be1, 0x8a79, 0x7c98, 0x6cbe, 0x76cf, 0x65a9, 0x8f97, 0x5d2d,
2158 0x5c55, 0x8638, 0x6808, 0x5360, 0x6218, 0x7ad9, 0x6e5b, 0x7efd,
2159 0x6a1f, 0x7ae0, 0x5f70, 0x6f33, 0x5f20, 0x638c, 0x6da8, 0x6756,
2160 0x4e08, 0x5e10, 0x8d26, 0x4ed7, 0x80c0, 0x7634, 0x969c, 0x62db,
2161 0x662d, 0x627e, 0x6cbc, 0x8d75, 0x7167, 0x7f69, 0x5146, 0x8087,
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2162 0x53ec, 0x906e, 0x6298, 0x54f2, 0x86f0, 0x8f99, 0x8005, 0x9517,
2163 0x8517, 0x8fd9, 0x6d59, 0x73cd, 0x659f, 0x771f, 0x7504, 0x7827,
2164 0x81fb, 0x8d1e, 0x9488, 0x4fa6, 0x6795, 0x75b9, 0x8bca, 0x9707,
2165 0x632f, 0x9547, 0x9635, 0x84b8, 0x6323, 0x7741, 0x5f81, 0x72f0,
2166 0x4e89, 0x6014, 0x6574, 0x62ef, 0x6b63, 0x653f,
2167 /* 0xd6 */
2168 0x8ae4, 0x8ae5, 0x8ae6, 0x8ae7, 0x8ae8, 0x8ae9, 0x8aea, 0x8aeb,
2169 0x8aec, 0x8aed, 0x8aee, 0x8aef, 0x8af0, 0x8af1, 0x8af2, 0x8af3,
2170 0x8af4, 0x8af5, 0x8af6, 0x8af7, 0x8af8, 0x8af9, 0x8afa, 0x8afb,
2171 0x8afc, 0x8afd, 0x8afe, 0x8aff, 0x8b00, 0x8b01, 0x8b02, 0x8b03,
2172 0x8b04, 0x8b05, 0x8b06, 0x8b08, 0x8b09, 0x8b0a, 0x8b0b, 0x8b0c,
2173 0x8b0d, 0x8b0e, 0x8b0f, 0x8b10, 0x8b11, 0x8b12, 0x8b13, 0x8b14,
2174 0x8b15, 0x8b16, 0x8b17, 0x8b18, 0x8b19, 0x8b1a, 0x8b1b, 0x8b1c,
2175 0x8b1d, 0x8b1e, 0x8b1f, 0x8b20, 0x8b21, 0x8b22, 0x8b23, 0x8b24,
2176 0x8b25, 0x8b27, 0x8b28, 0x8b29, 0x8b2a, 0x8b2b, 0x8b2c, 0x8b2d,
2177 0x8b2e, 0x8b2f, 0x8b30, 0x8b31, 0x8b32, 0x8b33, 0x8b34, 0x8b35,
2178 0x8b36, 0x8b37, 0x8b38, 0x8b39, 0x8b3a, 0x8b3b, 0x8b3c, 0x8b3d,
2179 0x8b3e, 0x8b3f, 0x8b40, 0x8b41, 0x8b42, 0x8b43, 0x8b44, 0x8b45,
2180 0x5e27, 0x75c7, 0x90d1, 0x8bc1, 0x829d, 0x679d, 0x652f, 0x5431,
2181 0x8718, 0x77e5, 0x80a2, 0x8102, 0x6c41, 0x4e4b, 0x7ec7, 0x804c,
2182 0x76f4, 0x690d, 0x6b96, 0x6267, 0x503c, 0x4f84, 0x5740, 0x6307,
2183 0x6b62, 0x8dbe, 0x53ea, 0x65e8, 0x7eb8, 0x5fd7, 0x631a, 0x63b7,
2184 0x81f3, 0x81f4, 0x7f6e, 0x5e1c, 0x5cd9, 0x5236, 0x667a, 0x79e9,
2185 0x7a1a, 0x8d28, 0x7099, 0x75d4, 0x6ede, 0x6cbb, 0x7a92, 0x4e2d,
2186 0x76c5, 0x5fe0, 0x949f, 0x8877, 0x7ec8, 0x79cd, 0x80bf, 0x91cd,
2187 0x4ef2, 0x4f17, 0x821f, 0x5468, 0x5dde, 0x6d32, 0x8bcc, 0x7ca5,
2188 0x8f74, 0x8098, 0x5e1a, 0x5492, 0x76b1, 0x5b99, 0x663c, 0x9aa4,
2189 0x73e0, 0x682a, 0x86db, 0x6731, 0x732a, 0x8bf8, 0x8bdb, 0x9010,
2190 0x7af9, 0x70db, 0x716e, 0x62c4, 0x77a9, 0x5631, 0x4e3b, 0x8457,
2191 0x67f1, 0x52a9, 0x86c0, 0x8d2e, 0x94f8, 0x7b51,
2192 /* 0xd7 */
2193 0x8b46, 0x8b47, 0x8b48, 0x8b49, 0x8b4a, 0x8b4b, 0x8b4c, 0x8b4d,
2194 0x8b4e, 0x8b4f, 0x8b50, 0x8b51, 0x8b52, 0x8b53, 0x8b54, 0x8b55,
2195 0x8b56, 0x8b57, 0x8b58, 0x8b59, 0x8b5a, 0x8b5b, 0x8b5c, 0x8b5d,
2196 0x8b5e, 0x8b5f, 0x8b60, 0x8b61, 0x8b62, 0x8b63, 0x8b64, 0x8b65,
2197 0x8b66, 0x8b67, 0x8b68, 0x8b69, 0x8b6a, 0x8b6b, 0x8b6c, 0x8b6d,
2198 0x8b6e, 0x8b6f, 0x8b70, 0x8b71, 0x8b72, 0x8b73, 0x8b74, 0x8b75, 0x8b76, 0x8b77,
2199 0x8b78, 0x8b79, 0x8b7a, 0x8b7b, 0x8b7c, 0x8b7d, 0x8b7e, 0x8b7f,
2200 0x8b80, 0x8b81, 0x8b82, 0x8b83, 0x8b84, 0x8b85, 0x8b86, 0x8b87,
2201 0x8b88, 0x8b89, 0x8b8a, 0x8b8b, 0x8b8c, 0x8b8d, 0x8b8e, 0x8b8f,
2202 0x8b90, 0x8b91, 0x8b92, 0x8b93, 0x8b94, 0x8b95, 0x8b96, 0x8b97,
2203 0x8b98, 0x8b99, 0x8b9a, 0x8b9b, 0x8b9c, 0x8b9d, 0x8b9e, 0x8b9f,
2204 0x8bac, 0x8bb1, 0x8bb2, 0x8bb3, 0x8bb4, 0x8bb5, 0x8bb6, 0x8bb7,
2205 0x4f4f, 0x6ce8, 0x795d, 0x9a7b, 0x6293, 0x722a, 0x62fd, 0x4e13,
2206 0x7816, 0x8f6c, 0x64b0, 0x8d5a, 0x7bc6, 0x6869, 0x5e84, 0x88c5,
2207 0x5986, 0x649e, 0x58ee, 0x72b6, 0x690e, 0x9525, 0x8ffd, 0x8d58,
2208 0x5760, 0x7f00, 0x8c06, 0x51c6, 0x6349, 0x62d9, 0x5353, 0x684c,
2209 0x7422, 0x8301, 0x914c, 0x5544, 0x7740, 0x707c, 0x6d4a, 0x5179,
2210 0x54a8, 0x8d44, 0x59ff, 0x6ecb, 0x6dc4, 0x5b5c, 0x7d2b, 0x4ed4,
2211 0x7c7d, 0x6ed3, 0x5b50, 0x81ea, 0x6e0d, 0x5b57, 0x9b03, 0x68d5,
2212 0x8e2a, 0x5b97, 0x7efc, 0x603b, 0x7eb5, 0x90b9, 0x8d70, 0x594f,
2213 0x63cd, 0x79df, 0x8db3, 0x5352, 0x65cf, 0x7956, 0x8bc5, 0x963b,
2214 0x7ec4, 0x94bb, 0x7e82, 0x5634, 0x9189, 0x6700, 0x7f6a, 0x5c0a,
2215 0x9075, 0x6628, 0x5de6, 0x4f50, 0x67de, 0x505a, 0x4f5c, 0x5750,
2216 0x5ea7, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
2217 /* 0xd8 */
2218 0x8c38, 0x8c39, 0x8c3a, 0x8c3b, 0x8c3c, 0x8c3d, 0x8c3e, 0x8c3f,
2219 0x8c40, 0x8c42, 0x8c43, 0x8c44, 0x8c45, 0x8c48, 0x8c4a, 0x8c4b,
2220 0x8c4d, 0x8c4e, 0x8c4f, 0x8c50, 0x8c51, 0x8c52, 0x8c53, 0x8c54,
2221 0x8c56, 0x8c57, 0x8c58, 0x8c59, 0x8c5b, 0x8c5c, 0x8c5d, 0x8c5e,
2222 0x8c5f, 0x8c60, 0x8c63, 0x8c64, 0x8c65, 0x8c66, 0x8c67, 0x8c68,
2223 0x8c69, 0x8c6c, 0x8c6d, 0x8c6e, 0x8c6f, 0x8c70, 0x8c71, 0x8c72,
2224 0x8c74, 0x8c75, 0x8c76, 0x8c77, 0x8c7b, 0x8c7c, 0x8c7d, 0x8c7e,
2225 0x8c7f, 0x8c80, 0x8c81, 0x8c83, 0x8c84, 0x8c86, 0x8c87, 0x8c88,
2226 0x8c8b, 0x8c8d, 0x8c8e, 0x8c8f, 0x8c90, 0x8c91, 0x8c92, 0x8c93,
2227 0x8c95, 0x8c96, 0x8c97, 0x8c99, 0x8c9a, 0x8c9b, 0x8c9c, 0x8c9d,
2228 0x8c9e, 0x8c9f, 0x8ca0, 0x8ca1, 0x8ca2, 0x8ca3, 0x8ca4, 0x8ca5,
2229 0x8ca6, 0x8ca7, 0x8ca8, 0x8ca9, 0x8caa, 0x8cab, 0x8cac, 0x8cad,
2230 0x4e8d, 0x4e0c, 0x5140, 0x4e10, 0x5eff, 0x5345, 0x4e15, 0x4e98,
2231 0x4e1e, 0x9b32, 0x5b6c, 0x5669, 0x4e28, 0x79ba, 0x4e3f, 0x5315,
2232 0x4e47, 0x592d, 0x723b, 0x536e, 0x6c10, 0x56df, 0x80e4, 0x9997,
2233 0x6bd3, 0x777e, 0x9f17, 0x4e36, 0x4e9f, 0x9f10, 0x4e5c, 0x4e69,
2234 0x4e93, 0x8288, 0x5b5b, 0x556c, 0x560f, 0x4ec4, 0x538d, 0x539d,
2235 0x53a3, 0x53a5, 0x53ae, 0x9765, 0x8d5d, 0x531a, 0x53f5, 0x5326,
2236 0x532e, 0x533e, 0x8d5c, 0x5366, 0x5363, 0x5202, 0x5208, 0x520e,
2237 0x522d, 0x5233, 0x523f, 0x5240, 0x524c, 0x525e, 0x5261, 0x525c,
2238 0x84af, 0x527d, 0x5282, 0x5281, 0x5290, 0x5293, 0x5182, 0x7f54,
2239 0x4ebb, 0x4ec3, 0x4ec9, 0x4ec2, 0x4ee8, 0x4ee1, 0x4eeb, 0x4ede,
2240 0x4f1b, 0x4ef3, 0x4f22, 0x4f64, 0x4ef5, 0x4f25, 0x4f27, 0x4f09,
2241 0x4f2b, 0x4f5e, 0x4f67, 0x6538, 0x4f5a, 0x4f5d,
2242 /* 0xd9 */
2243 0x8cae, 0x8caf, 0x8cb0, 0x8cb1, 0x8cb2, 0x8cb3, 0x8cb4, 0x8cb5,
2244 0x8cb6, 0x8cb7, 0x8cb8, 0x8cb9, 0x8cba, 0x8cbb, 0x8cbc, 0x8cbd,
2245 0x8cbe, 0x8cbf, 0x8cc0, 0x8cc1, 0x8cc2, 0x8cc3, 0x8cc4, 0x8cc5,
2246 0x8cc6, 0x8cc7, 0x8cc8, 0x8cc9, 0x8cca, 0x8ccb, 0x8ccc, 0x8ccd,
2247 0x8cce, 0x8ccf, 0x8cd0, 0x8cd1, 0x8cd2, 0x8cd3, 0x8cd4, 0x8cd5,
2248 0x8cd6, 0x8cd7, 0x8cd8, 0x8cd9, 0x8cda, 0x8cdb, 0x8cdc, 0x8cdd,

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2249 0x8cde, 0x8cdf, 0x8ce0, 0x8ce1, 0x8ce2, 0x8ce3, 0x8ce4, 0x8ce5,
2250 0x8ce6, 0x8ce7, 0x8ce8, 0x8ce9, 0x8cea, 0x8ceb, 0x8cec, 0x8ced,
2251 0x8cee, 0x8cef, 0x8cf0, 0x8cf1, 0x8cf2, 0x8cf3, 0x8cf4, 0x8cf5,
2252 0x8cf6, 0x8cf7, 0x8cf8, 0x8cf9, 0x8cfa, 0x8cfb, 0x8cfc, 0x8cfd,
2253 0x8cfe, 0x8cff, 0x8d00, 0x8d01, 0x8d02, 0x8d03, 0x8d04, 0x8d05,
2254 0x8d06, 0x8d07, 0x8d08, 0x8d09, 0x8d0a, 0x8d0b, 0x8d0c, 0x8d0d,
2255 0x4f5f, 0x4f57, 0x4f32, 0x4f3d, 0x4f76, 0x4f74, 0x4f91, 0x4f89,
2256 0x4f83, 0x4f8f, 0x4f7e, 0x4f7b, 0x4faa, 0x4f7c, 0x4fac, 0x4f94,
2257 0x4fe6, 0x4fe8, 0x4fea, 0x4fc5, 0x4fda, 0x4fe3, 0x4fdc, 0x4fd1,
2258 0x4fdf, 0x4ff8, 0x5029, 0x504c, 0x4ff3, 0x502c, 0x500f, 0x502e,
2259 0x502d, 0x4ffe, 0x501c, 0x500c, 0x5025, 0x5028, 0x507e, 0x5043,
2260 0x5055, 0x5048, 0x504e, 0x506c, 0x507b, 0x50a5, 0x50a7, 0x50a9,
2261 0x50ba, 0x50d6, 0x5106, 0x50ed, 0x50ec, 0x50e6, 0x50ee, 0x5107,
2262 0x510b, 0x4edd, 0x6c3d, 0x4f58, 0x4f65, 0x4fce, 0x9fa0, 0x6c46,
2263 0x7c74, 0x516e, 0x5dfd, 0x9ec9, 0x9998, 0x5181, 0x5914, 0x52f9,
2264 0x530d, 0x8a07, 0x5310, 0x51eb, 0x5919, 0x5155, 0x4ea0, 0x5156,
2265 0x4eb3, 0x886e, 0x88a4, 0x4eb5, 0x8114, 0x88d2, 0x7980, 0x5b34,
2266 0x8803, 0x7fb8, 0x51ab, 0x51b1, 0x51bd, 0x51bc,
2267 /* 0xda */
2268 0x8d0e, 0x8d0f, 0x8d10, 0x8d11, 0x8d12, 0x8d13, 0x8d14, 0x8d15,
2269 0x8d16, 0x8d17, 0x8d18, 0x8d19, 0x8d1a, 0x8d1b, 0x8d1c, 0x8d20,
2270 0x8d51, 0x8d52, 0x8d57, 0x8d5f, 0x8d65, 0x8d68, 0x8d69, 0x8d6a,
2271 0x8d6c, 0x8d6e, 0x8d6f, 0x8d71, 0x8d72, 0x8d78, 0x8d79, 0x8d7a,
2272 0x8d7b, 0x8d7c, 0x8d7d, 0x8d7e, 0x8d7f, 0x8d80, 0x8d82, 0x8d83,
2273 0x8d86, 0x8d87, 0x8d88, 0x8d89, 0x8d8c, 0x8d8d, 0x8d8e, 0x8d8f,
2274 0x8d90, 0x8d92, 0x8d93, 0x8d95, 0x8d96, 0x8d97, 0x8d98, 0x8d99,
2275 0x8d9a, 0x8d9b, 0x8d9c, 0x8d9d, 0x8d9e, 0x8da0, 0x8da1, 0x8da2,
2276 0x8da4, 0x8da5, 0x8da6, 0x8da7, 0x8da8, 0x8da9, 0x8daa, 0x8dab,
2277 0x8dac, 0x8dad, 0x8dae, 0x8daf, 0x8db0, 0x8db2, 0x8db6, 0x8db7,
2278 0x8db9, 0x8dbb, 0x8dbd, 0x8dc0, 0x8dc1, 0x8dc2, 0x8dc5, 0x8dc7,
2279 0x8dc8, 0x8dc9, 0x8dca, 0x8dcd, 0x8dd0, 0x8dd2, 0x8dd3, 0x8dd4,
2280 0x51c7, 0x5196, 0x51a2, 0x51a5, 0x8baa, 0x8ba6, 0x8ba7, 0x8baa,
2281 0x8bb4, 0x8bb5, 0x8bb7, 0x8bc2, 0x8bc3, 0x8bcb, 0x8bcf, 0x8bce,
2282 0x8bd2, 0x8bd3, 0x8bd4, 0x8bd6, 0x8bd8, 0x8bd9, 0x8bdc, 0x8bdf,
2283 0x8be0, 0x8be4, 0x8be8, 0x8be9, 0x8bee, 0x8bf0, 0x8bf3, 0x8bf6,
2284 0x8bf9, 0x8bfc, 0x8bff, 0x8c00, 0x8c02, 0x8c04, 0x8c07, 0x8c0c,
2285 0x8c0f, 0x8c11, 0x8c12, 0x8c14, 0x8c15, 0x8c16, 0x8c19, 0x8c1b,
2286 0x8c18, 0x8c1d, 0x8c1f, 0x8c20, 0x8c21, 0x8c25, 0x8c27, 0x8c2a,
2287 0x8c2b, 0x8c2e, 0x8c2f, 0x8c32, 0x8c33, 0x8c35, 0x8c36, 0x5369,
2288 0x537a, 0x961d, 0x9622, 0x9621, 0x9631, 0x962a, 0x963d, 0x963c,
2289 0x9642, 0x9649, 0x9654, 0x965f, 0x9667, 0x966c, 0x9672, 0x9674,
2290 0x9688, 0x968d, 0x9697, 0x96b0, 0x9097, 0x909b, 0x909d, 0x9099,
2291 0x90ac, 0x90a1, 0x90b4, 0x90b3, 0x90b6, 0x90ba,
2292 /* 0xdb */
2293 0x8dd5, 0x8dd8, 0x8dd9, 0x8ddc, 0x8de0, 0x8de1, 0x8de2, 0x8de5,
2294 0x8de6, 0x8de7, 0x8de9, 0x8ded, 0x8dee, 0x8df0, 0x8df1, 0x8df2,
2295 0x8df4, 0x8df6, 0x8dfc, 0x8dfe, 0x8dff, 0x8e00, 0x8e01, 0x8e02,
2296 0x8e03, 0x8e04, 0x8e06, 0x8e07, 0x8e08, 0x8e0b, 0x8e0d, 0x8e0e,
2297 0x8e10, 0x8e11, 0x8e12, 0x8e13, 0x8e15, 0x8e16, 0x8e17, 0x8e18,
2298 0x8e19, 0x8e1a, 0x8e1b, 0x8e1c, 0x8e20, 0x8e21, 0x8e24, 0x8e25,
2299 0x8e26, 0x8e27, 0x8e28, 0x8e2b, 0x8e2d, 0x8e30, 0x8e32, 0x8e33,
2300 0x8e34, 0x8e36, 0x8e37, 0x8e38, 0x8e3b, 0x8e3c, 0x8e3e, 0x8e3f,
2301 0x8e43, 0x8e45, 0x8e46, 0x8e4c, 0x8e4d, 0x8e4e, 0x8e4f, 0x8e50,
2302 0x8e53, 0x8e54, 0x8e55, 0x8e56, 0x8e57, 0x8e58, 0x8e5a, 0x8e5b,
2303 0x8e5c, 0x8e5d, 0x8e5e, 0x8e5f, 0x8e60, 0x8e61, 0x8e62, 0x8e63,
2304 0x8e64, 0x8e65, 0x8e67, 0x8e68, 0x8e6a, 0x8e6b, 0x8e6e, 0x8e71,
2305 0x90b8, 0x90b0, 0x90cf, 0x90c5, 0x90be, 0x90d0, 0x90c4, 0x90c7,
2306 0x90d3, 0x90e6, 0x90e2, 0x90dc, 0x90d7, 0x90db, 0x90eb, 0x90ef,
2307 0x90fe, 0x9104, 0x9122, 0x911e, 0x9123, 0x9131, 0x912f, 0x9139,
2308 0x9143, 0x9146, 0x520d, 0x5942, 0x52a2, 0x52ac, 0x52ad, 0x52be,
2309 0x54ff, 0x52d0, 0x52d6, 0x52f0, 0x53df, 0x71ee, 0x77cd, 0x5ef4,
2310 0x51f5, 0x51fc, 0x9b2f, 0x53b6, 0x5f01, 0x755a, 0x5def, 0x574c,
2311 0x57a9, 0x57a1, 0x587e, 0x58bc, 0x58c5, 0x58d1, 0x5729, 0x572c,
2312 0x572a, 0x5733, 0x5739, 0x572e, 0x572f, 0x575c, 0x573b, 0x5742,
2313 0x5769, 0x5785, 0x576b, 0x5786, 0x577c, 0x577b, 0x5768, 0x576d,
2314 0x5776, 0x5773, 0x57ad, 0x57a4, 0x578c, 0x57b2, 0x57cf, 0x57a7,
2315 0x57b4, 0x5793, 0x57a0, 0x57d5, 0x57d8, 0x57da, 0x57d9, 0x57d2,
2316 0x57b8, 0x57f4, 0x57ef, 0x57f8, 0x57e4, 0x57dd,
2317 /* 0xdc */
2318 0x8e73, 0x8e75, 0x8e77, 0x8e78, 0x8e79, 0x8e7a, 0x8e7b, 0x8e7d,
2319 0x8e7e, 0x8e80, 0x8e82, 0x8e83, 0x8e84, 0x8e86, 0x8e88, 0x8e89,
2320 0x8e8a, 0x8e8b, 0x8e8c, 0x8e8d, 0x8e8e, 0x8e91, 0x8e92, 0x8e93,
2321 0x8e95, 0x8e96, 0x8e97, 0x8e98, 0x8e99, 0x8e9a, 0x8e9b, 0x8e9d,
2322 0x8e9f, 0x8ea0, 0x8ea1, 0x8ea2, 0x8ea3, 0x8ea4, 0x8ea5, 0x8ea6,
2323 0x8ea7, 0x8ea8, 0x8ea9, 0x8eaa, 0x8ead, 0x8eae, 0x8eb0, 0x8eb1,
2324 0x8eb3, 0x8eb4, 0x8eb5, 0x8eb6, 0x8eb7, 0x8eb8, 0x8eb9, 0x8ebb,
2325 0x8ebc, 0x8ebd, 0x8ebe, 0x8ebf, 0x8ec0, 0x8ec1, 0x8ec2, 0x8ec3,
2326 0x8ec4, 0x8ec5, 0x8ec6, 0x8ec7, 0x8ec8, 0x8ec9, 0x8eca, 0x8ecb,
2327 0x8ecc, 0x8ecd, 0x8ecf, 0x8ed0, 0x8ed1, 0x8ed2, 0x8ed3, 0x8ed4,
2328 0x8ed5, 0x8ed6, 0x8ed7, 0x8ed8, 0x8ed9, 0x8eda, 0x8edb, 0x8edc,
2329 0x8edd, 0x8ede, 0x8edf, 0x8ee0, 0x8ee1, 0x8ee2, 0x8ee3, 0x8ee4,
2330 0x580b, 0x580d, 0x57fd, 0x57ed, 0x5800, 0x581e, 0x5819, 0x5844,
2331 0x5820, 0x5865, 0x586c, 0x5881, 0x5889, 0x589a, 0x5880, 0x99a8,
2332 0x9f19, 0x61ff, 0x8279, 0x827d, 0x827f, 0x828f, 0x828a, 0x82a8,
2333 0x8284, 0x828e, 0x8291, 0x8297, 0x8299, 0x82ab, 0x82b8, 0x82be,
2334 0x82b0, 0x82c8, 0x82ca, 0x82e3, 0x8298, 0x82b7, 0x82ae, 0x82cb,
2335 0x82cc, 0x82c1, 0x82a9, 0x82b4, 0x82a1, 0x82aa, 0x829f, 0x82c4,
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2336 0x82ce, 0x82a4, 0x82e1, 0x8309, 0x82f7, 0x82e4, 0x830f, 0x8307,
2337 0x82dc, 0x82f4, 0x82d2, 0x82d8, 0x830c, 0x82fb, 0x82d3, 0x8311,
2338 0x831a, 0x8306, 0x8314, 0x8314, 0x8315, 0x82e0, 0x82d5, 0x831c, 0x8351,
2339 0x835b, 0x835c, 0x8308, 0x8392, 0x833c, 0x8334, 0x8331, 0x839b,
2340 0x835e, 0x832f, 0x834f, 0x8347, 0x8343, 0x835f, 0x8340, 0x8317,
2341 0x8360, 0x832d, 0x833a, 0x8333, 0x8366, 0x8365,
2342 /* 0xdd */
2343 0x8ee5, 0x8ee6, 0x8ee7, 0x8ee8, 0x8ee9, 0x8eea, 0x8eeb, 0x8eec,
2344 0x8eed, 0x8eee, 0x8eeef, 0x8ef0, 0x8ef1, 0x8ef2, 0x8ef3, 0x8ef4,
2345 0x8ef5, 0x8ef6, 0x8ef7, 0x8ef8, 0x8ef9, 0x8efa, 0x8efb, 0x8efc,
2346 0x8efd, 0x8efe, 0x8eff, 0x8f00, 0x8f01, 0x8f02, 0x8f03, 0x8f04,
2347 0x8f05, 0x8f06, 0x8f07, 0x8f08, 0x8f09, 0x8f0a, 0x8f0b, 0x8f0c,
2348 0x8f0d, 0x8f0e, 0x8f0f, 0x8f10, 0x8f11, 0x8f12, 0x8f13, 0x8f14,
2349 0x8f15, 0x8f16, 0x8f17, 0x8f18, 0x8f19, 0x8f1a, 0x8f1b, 0x8f1c,
2350 0x8f1d, 0x8f1e, 0x8f1f, 0x8f20, 0x8f21, 0x8f22, 0x8f23, 0x8f24,
2351 0x8f25, 0x8f26, 0x8f27, 0x8f28, 0x8f29, 0x8f2a, 0x8f2b, 0x8f2c,
2352 0x8f2d, 0x8f2e, 0x8f2f, 0x8f30, 0x8f31, 0x8f32, 0x8f33, 0x8f34,
2353 0x8f35, 0x8f36, 0x8f37, 0x8f38, 0x8f39, 0x8f3a, 0x8f3b, 0x8f3c,
2354 0x8f3d, 0x8f3e, 0x8f3f, 0x8f40, 0x8f41, 0x8f42, 0x8f43, 0x8f44,
2355 0x8368, 0x831b, 0x8369, 0x836c, 0x836a, 0x836d, 0x836e, 0x83b0,
2356 0x8378, 0x83b3, 0x83b4, 0x83a0, 0x83aa, 0x8393, 0x839c, 0x8385,
2357 0x837c, 0x83b6, 0x83a9, 0x837d, 0x83b8, 0x837b, 0x8398, 0x839e,
2358 0x83a8, 0x83ba, 0x83bc, 0x83c1, 0x8401, 0x83e5, 0x83d8, 0x5807,
2359 0x8418, 0x840b, 0x83dd, 0x83fd, 0x83d6, 0x841c, 0x8438, 0x8411,
2360 0x8406, 0x83d4, 0x83df, 0x840f, 0x8403, 0x83f8, 0x83f9, 0x83ea,
2361 0x83c5, 0x83c0, 0x8426, 0x83f0, 0x83e1, 0x845c, 0x8451, 0x845a,
2362 0x8459, 0x8473, 0x8487, 0x8488, 0x847a, 0x8489, 0x8478, 0x843c,
2363 0x8446, 0x8469, 0x8476, 0x848c, 0x848e, 0x8431, 0x846d, 0x84c1,
2364 0x84cd, 0x84d0, 0x84e6, 0x84bd, 0x84d3, 0x84ca, 0x84bf, 0x84ba,
2365 0x84e0, 0x84a1, 0x84b9, 0x84b4, 0x8497, 0x84e5, 0x84e3, 0x850c,
2366 0x750d, 0x8538, 0x84f0, 0x8539, 0x851f, 0x853a,
2367 /* 0xde */
2368 0x8f45, 0x8f46, 0x8f47, 0x8f48, 0x8f49, 0x8f4a, 0x8f4b, 0x8f4c,
2369 0x8f4d, 0x8f4e, 0x8f4f, 0x8f50, 0x8f51, 0x8f52, 0x8f53, 0x8f54,
2370 0x8f55, 0x8f56, 0x8f57, 0x8f58, 0x8f59, 0x8f5a, 0x8f5b, 0x8f5c,
2371 0x8f5d, 0x8f5e, 0x8f5f, 0x8f60, 0x8f61, 0x8f62, 0x8f63, 0x8f64,
2372 0x8f65, 0x8f6a, 0x8f80, 0x8f8c, 0x8f92, 0x8f9d, 0x8fa0, 0x8fal,
2373 0x8fa2, 0x8fa4, 0x8fa5, 0x8fa6, 0x8fa7, 0x8faa, 0x8fac, 0x8fad,
2374 0x8fae, 0x8faf, 0x8fb2, 0x8fb3, 0x8fb4, 0x8fb5, 0x8fb7, 0x8fb8,
2375 0x8fba, 0x8fbb, 0x8fbc, 0x8fbf, 0x8fc0, 0x8fc3, 0x8fc6, 0x8fc9,
2376 0x8fca, 0x8fcb, 0x8fcc, 0x8fcd, 0x8fcf, 0x8fd2, 0x8fd6, 0x8fd7,
2377 0x8fda, 0x8fe0, 0x8fe1, 0x8fe3, 0x8fe7, 0x8fec, 0x8fef, 0x8ff1,
2378 0x8ff2, 0x8ff4, 0x8ff5, 0x8ff6, 0x8ffa, 0x8ffb, 0x8ffc, 0x8ffe,
2379 0x8fff, 0x9007, 0x9008, 0x900c, 0x900e, 0x9013, 0x9015, 0x9018,
2380 0x8556, 0x853b, 0x84ff, 0x84fc, 0x8559, 0x8548, 0x8568, 0x8564,
2381 0x855e, 0x857a, 0x77a2, 0x8543, 0x8572, 0x857b, 0x85a4, 0x85a8,
2382 0x8587, 0x858f, 0x8579, 0x85ae, 0x859c, 0x8585, 0x85b9, 0x85b7,
2383 0x85b0, 0x85d3, 0x85c1, 0x85dc, 0x85ff, 0x8627, 0x8605, 0x8629,
2384 0x8616, 0x863c, 0x5efe, 0x5f08, 0x593c, 0x5941, 0x8037, 0x5955,
2385 0x595a, 0x5958, 0x530f, 0x5c22, 0x5c25, 0x5c2c, 0x5c34, 0x624c,
2386 0x626a, 0x629f, 0x62bb, 0x62ca, 0x62da, 0x62d7, 0x62ee, 0x6322,
2387 0x62f6, 0x6339, 0x634b, 0x6343, 0x63ad, 0x63f6, 0x6371, 0x637a,
2388 0x638e, 0x63b4, 0x636d, 0x63ac, 0x638a, 0x6369, 0x63ae, 0x63bc,
2389 0x63f2, 0x63f8, 0x63e0, 0x63ff, 0x63c4, 0x63de, 0x63ce, 0x6452,
2390 0x63c6, 0x63be, 0x6445, 0x6441, 0x640b, 0x641b, 0x6420, 0x640c,
2391 0x6426, 0x6421, 0x645e, 0x6484, 0x646d, 0x6496,
2392 /* 0xdf */
2393 0x9019, 0x901c, 0x9023, 0x9024, 0x9025, 0x9027, 0x9028, 0x9029,
2394 0x902a, 0x902b, 0x902c, 0x9030, 0x9031, 0x9032, 0x9033, 0x9034,
2395 0x9037, 0x9039, 0x903a, 0x903d, 0x903f, 0x9040, 0x9043, 0x9045,
2396 0x9046, 0x9048, 0x9049, 0x904a, 0x904b, 0x904c, 0x904e, 0x9054,
2397 0x9055, 0x9056, 0x9059, 0x905a, 0x905c, 0x905d, 0x905e, 0x905f,
2398 0x9060, 0x9061, 0x9064, 0x9066, 0x9067, 0x9069, 0x906a, 0x906b,
2399 0x906c, 0x906f, 0x9070, 0x9071, 0x9072, 0x9073, 0x9076, 0x9077,
2400 0x9078, 0x9079, 0x907a, 0x907b, 0x907c, 0x907e, 0x9081, 0x9084,
2401 0x9085, 0x9086, 0x9087, 0x9089, 0x908a, 0x908c, 0x908d, 0x908e,
2402 0x908f, 0x9090, 0x9092, 0x9094, 0x9096, 0x9098, 0x909a, 0x909c,
2403 0x909e, 0x909f, 0x90a0, 0x90a4, 0x90a5, 0x90a7, 0x90a8, 0x90a9,
2404 0x90ab, 0x90ad, 0x90b2, 0x90b7, 0x90bc, 0x90bd, 0x90bf, 0x90c0,
2405 0x647a, 0x64b7, 0x64b8, 0x6499, 0x64ba, 0x64c0, 0x64d0, 0x64d7,
2406 0x64e4, 0x64e2, 0x6509, 0x6525, 0x652e, 0x5f0b, 0x5fd2, 0x7519,
2407 0x5f11, 0x535f, 0x53f1, 0x53fd, 0x53e9, 0x53e8, 0x53fb, 0x5412,
2408 0x5416, 0x5406, 0x544b, 0x5452, 0x5453, 0x5454, 0x5456, 0x5443,
2409 0x5421, 0x5457, 0x5459, 0x5459, 0x5423, 0x5432, 0x5482, 0x5494, 0x5477,
2410 0x5471, 0x5464, 0x549a, 0x549b, 0x5484, 0x5476, 0x5466, 0x549d,
2411 0x54d0, 0x54ad, 0x54c2, 0x54b4, 0x54d2, 0x54a7, 0x54a6, 0x54d3,
2412 0x54d4, 0x5472, 0x54a3, 0x54d5, 0x54bb, 0x54bf, 0x54cc, 0x54d9,
2413 0x54da, 0x54dc, 0x54a9, 0x54aa, 0x54a4, 0x54dd, 0x54cf, 0x54de,
2414 0x551b, 0x54e7, 0x5520, 0x54fd, 0x5514, 0x54f3, 0x5522, 0x5523,
2415 0x550f, 0x5511, 0x5527, 0x552a, 0x5567, 0x558f, 0x55b5, 0x5549,
2416 0x556d, 0x5541, 0x5555, 0x553f, 0x5550, 0x553c,
2417 /* 0xe0 */
2418 0x90c2, 0x90c3, 0x90c6, 0x90c8, 0x90c9, 0x90cb, 0x90cc, 0x90cd,
2419 0x90d2, 0x90d4, 0x90d5, 0x90d6, 0x90d8, 0x90d9, 0x90da, 0x90de,
2420 0x90df, 0x90e0, 0x90e3, 0x90e4, 0x90e5, 0x90e9, 0x90ea, 0x90ec,
2421 0x90ee, 0x90f0, 0x90f1, 0x90f2, 0x90f3, 0x90f5, 0x90f6, 0x90f7,
2422 0x90f9, 0x90fa, 0x90fb, 0x90fc, 0x90ff, 0x9100, 0x9101, 0x9103,

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2424 0x910d, 0x910e, 0x910f, 0x9110, 0x9111, 0x9112, 0x9113, 0x9114,
2425 0x9115, 0x9116, 0x9117, 0x9118, 0x911a, 0x911b, 0x911c, 0x911d,
2426 0x911f, 0x9120, 0x9121, 0x9124, 0x9125, 0x9126, 0x9127, 0x9128,
2427 0x9129, 0x912a, 0x912b, 0x912c, 0x912d, 0x912e, 0x9130, 0x9132,
2428 0x9133, 0x9134, 0x9135, 0x9136, 0x9137, 0x9138, 0x913a, 0x913b,
2429 0x913c, 0x913d, 0x913e, 0x913f, 0x9140, 0x9141, 0x9142, 0x9144,
2430 0x5537, 0x5556, 0x5575, 0x5576, 0x5577, 0x5533, 0x5530, 0x555c,
2431 0x558b, 0x55d2, 0x5583, 0x55b1, 0x55b9, 0x5588, 0x5581, 0x559f,
2432 0x557e, 0x55d6, 0x5591, 0x557b, 0x55df, 0x55bd, 0x55be, 0x5594,
2433 0x5599, 0x55ea, 0x55f7, 0x55c9, 0x561f, 0x55d1, 0x55eb, 0x55ec,
2434 0x55d4, 0x55e6, 0x55dd, 0x55c4, 0x55ef, 0x55e5, 0x55f2, 0x55f3,
2435 0x55cc, 0x55cd, 0x55e8, 0x55f5, 0x55e4, 0x8f94, 0x561e, 0x5608,
2436 0x560c, 0x5601, 0x5624, 0x5623, 0x55fe, 0x5600, 0x5627, 0x562d,
2437 0x5658, 0x5639, 0x5657, 0x562c, 0x564d, 0x5662, 0x5659, 0x565c,
2438 0x564c, 0x5654, 0x5686, 0x5664, 0x5671, 0x566b, 0x567b, 0x567c,
2439 0x5685, 0x5693, 0x56af, 0x56d4, 0x56d7, 0x56dd, 0x56e1, 0x56f5,
2440 0x56eb, 0x56f9, 0x56ff, 0x5704, 0x570a, 0x5709, 0x571c, 0x5e0f,
2441 0x5e19, 0x5e14, 0x5e11, 0x5e31, 0x5e3b, 0x5e3c,
2442 /* 0xe1 */
2443 0x9145, 0x9147, 0x9148, 0x9151, 0x9153, 0x9154, 0x9155, 0x9156,
2444 0x9158, 0x9159, 0x915b, 0x915c, 0x915f, 0x9160, 0x9166, 0x9167,
2445 0x9168, 0x916b, 0x916d, 0x9173, 0x917a, 0x917b, 0x917c, 0x9180,
2446 0x9181, 0x9182, 0x9183, 0x9184, 0x9186, 0x9188, 0x918a, 0x918e,
2447 0x918f, 0x9193, 0x9194, 0x9195, 0x9196, 0x9197, 0x9198, 0x9199,
2448 0x919c, 0x919d, 0x919e, 0x919f, 0x91a0, 0x91a1, 0x91a4, 0x91a5,
2449 0x91a6, 0x91a7, 0x91a8, 0x91a9, 0x91ab, 0x91ac, 0x91b0, 0x91b1,
2450 0x91b2, 0x91b3, 0x91b6, 0x91b7, 0x91b8, 0x91b9, 0x91bb, 0x91bc,
2451 0x91bd, 0x91be, 0x91bf, 0x91c0, 0x91c1, 0x91c2, 0x91c3, 0x91c4,
2452 0x91c5, 0x91c6, 0x91c8, 0x91cb, 0x91d0, 0x91d2, 0x91d3, 0x91d4,
2453 0x91d5, 0x91d6, 0x91d7, 0x91d8, 0x91d9, 0x91da, 0x91db, 0x91dd,
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2455 0x5e37, 0x5e44, 0x5e54, 0x5e5b, 0x5e5e, 0x5e61, 0x5c8c, 0x5c7a,
2456 0x5c8d, 0x5c90, 0x5c96, 0x5c88, 0x5c98, 0x5c99, 0x5c91, 0x5c9a,
2457 0x5c9c, 0x5cb5, 0x5ca2, 0x5cbd, 0x5cac, 0x5cab, 0x5cb1, 0x5ca3,
2458 0x5cc1, 0x5cb7, 0x5cc4, 0x5cd2, 0x5ce4, 0x5ccb, 0x5ce5, 0x5d02,
2459 0x5d03, 0x5d27, 0x5d26, 0x5d2e, 0x5d24, 0x5d1e, 0x5d06, 0x5d1b,
2460 0x5d58, 0x5d3e, 0x5d34, 0x5d3d, 0x5d6c, 0x5d5b, 0x5d6f, 0x5d5d,
2461 0x5d6b, 0x5d4b, 0x5d4a, 0x5d69, 0x5d74, 0x5d82, 0x5d99, 0x5d9d,
2462 0x8c73, 0x5db7, 0x5dc5, 0x5f73, 0x5f77, 0x5f82, 0x5f87, 0x5f89,
2463 0x5f8c, 0x5f95, 0x5f99, 0x5f9c, 0x5fa8, 0x5fad, 0x5fb5, 0x5fbc,
2464 0x8862, 0x5f61, 0x72ad, 0x72b0, 0x72b4, 0x72b7, 0x72b8, 0x72c3,
2465 0x72c1, 0x72ce, 0x72cd, 0x72d2, 0x72e8, 0x72ef, 0x72e9, 0x72f2,
2466 0x72f4, 0x72f7, 0x7301, 0x72f3, 0x7303, 0x72fa,
2467 /* 0xe2 */
2468 0x91e6, 0x91e7, 0x91e8, 0x91e9, 0x91ea, 0x91eb, 0x91ec, 0x91ed,
2469 0x91ee, 0x91ef, 0x91f0, 0x91f1, 0x91f2, 0x91f3, 0x91f4, 0x91f5,
2470 0x91f6, 0x91f7, 0x91f8, 0x91f9, 0x91fa, 0x91fb, 0x91fc, 0x91fd,
2471 0x91fe, 0x91ff, 0x9200, 0x9201, 0x9202, 0x9203, 0x9204, 0x9205,
2472 0x9206, 0x9207, 0x9208, 0x9209, 0x920a, 0x920b, 0x920c, 0x920d,
2473 0x920e, 0x920f, 0x9210, 0x9211, 0x9212, 0x9213, 0x9214, 0x9215,
2474 0x9216, 0x9217, 0x9218, 0x9219, 0x921a, 0x921b, 0x921c, 0x921d,
2475 0x921e, 0x921f, 0x9220, 0x9221, 0x9222, 0x9223, 0x9224, 0x9225,
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2479 0x923e, 0x923f, 0x9240, 0x9241, 0x9242, 0x9243, 0x9244, 0x9245,
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2481 0x7322, 0x7339, 0x7325, 0x732c, 0x7338, 0x7331, 0x7350, 0x734d,
2482 0x7357, 0x7360, 0x736c, 0x736f, 0x737e, 0x821b, 0x5925, 0x98e7,
2483 0x5924, 0x5902, 0x9963, 0x9967, 0x9968, 0x9969, 0x996a, 0x996b,
2484 0x996c, 0x9974, 0x9977, 0x997d, 0x9980, 0x9984, 0x9987, 0x998a,
2485 0x998d, 0x9990, 0x9991, 0x9993, 0x9994, 0x9995, 0x5e80, 0x5e91,
2486 0x5e8b, 0x5e96, 0x5ea5, 0x5ea0, 0x5eb9, 0x5eb5, 0x5ebe, 0x5eb3,
2487 0x8d53, 0x5ed2, 0x5ed1, 0x5edb, 0x5ee8, 0x5eea, 0x81ba, 0x5fc4,
2488 0x5fc9, 0x5fd6, 0x5fcf, 0x6003, 0x5fee, 0x6004, 0x5fe1, 0x5fe4,
2489 0x5ffe, 0x6005, 0x6006, 0x5fea, 0x5fed, 0x5ffb, 0x6019, 0x6035,
2490 0x6026, 0x601b, 0x600f, 0x600d, 0x6029, 0x602b, 0x600a, 0x603f,
2491 0x6021, 0x6078, 0x6079, 0x607b, 0x607a,
2492 /* 0xe3 */
2493 0x9246, 0x9247, 0x9248, 0x9249, 0x924a, 0x924b, 0x924c, 0x924d,
2494 0x924e, 0x924f, 0x9250, 0x9251, 0x9252, 0x9253, 0x9254, 0x9255,
2495 0x9256, 0x9257, 0x9258, 0x9259, 0x925a, 0x925b, 0x925c, 0x925d,
2496 0x925e, 0x925f, 0x9260, 0x9261, 0x9262, 0x9263, 0x9264, 0x9265,
2497 0x9266, 0x9267, 0x9268, 0x9269, 0x926a, 0x926b, 0x926c, 0x926d,
2498 0x926e, 0x926f, 0x9270, 0x9271, 0x9272, 0x9273, 0x9275, 0x9276,
2499 0x9277, 0x9278, 0x9279, 0x927a, 0x927b, 0x927c, 0x927d, 0x927e,
2500 0x927f, 0x9280, 0x9281, 0x9282, 0x9283, 0x9284, 0x9285, 0x9286,
2501 0x9287, 0x9288, 0x9289, 0x928a, 0x928b, 0x928c, 0x928d, 0x928f,
2502 0x9290, 0x9291, 0x9292, 0x9293, 0x9294, 0x9295, 0x9296, 0x9297,
2503 0x9298, 0x9299, 0x929a, 0x929b, 0x929c, 0x929d, 0x929e, 0x929f,
2504 0x92a0, 0x92a1, 0x92a2, 0x92a3, 0x92a4, 0x92a5, 0x92a6, 0x92a7,
2505 0x606a, 0x607d, 0x6096, 0x609a, 0x60ad, 0x609d, 0x6083, 0x6092,
2506 0x608c, 0x609b, 0x60ec, 0x60bb, 0x60b1, 0x60dd, 0x60d8, 0x60c6,
2507 0x60da, 0x60b4, 0x6120, 0x6126, 0x6115, 0x6123, 0x60f4, 0x6100,
2508 0x610e, 0x612b, 0x614a, 0x6175, 0x61ac, 0x6194, 0x61a7, 0x61b7,
2509 0x61d4, 0x61f5, 0x5fdd, 0x96b3, 0x95e9, 0x95eb, 0x95f1, 0x95f3,
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2510 0x95f5, 0x95f6, 0x95fc, 0x95fe, 0x9603, 0x9604, 0x9606, 0x9608,
2511 0x960a, 0x960b, 0x960c, 0x960d, 0x960f, 0x9612, 0x9615, 0x9616,
2512 0x9617, 0x9619, 0x961a, 0x4e2c, 0x723f, 0x6215, 0x6c35, 0x6c54,
2513 0x6c5c, 0x6c4a, 0x6ca3, 0x6c85, 0x6c90, 0x6c94, 0x6c8c, 0x6c68,
2514 0x6c69, 0x6c74, 0x6c76, 0x6c86, 0x6ca9, 0x6cd0, 0x6cd4, 0x6cad,
2515 0x6cf7, 0x6cf8, 0x6cf1, 0x6cd7, 0x6cb2, 0x6ce0, 0x6cd6, 0x6cfa,
2516 0x6ceb, 0x6cee, 0x6cb1, 0x6cd3, 0x6cef, 0x6cfe,
2517 /* 0xe4 */
2518 0x92a8, 0x92a9, 0x92aa, 0x92ab, 0x92ac, 0x92ad, 0x92af, 0x92b0,
2519 0x92b1, 0x92b2, 0x92b3, 0x92b4, 0x92b5, 0x92b6, 0x92b7, 0x92b8,
2520 0x92b9, 0x92ba, 0x92bb, 0x92bc, 0x92bd, 0x92be, 0x92bf, 0x92c0,
2521 0x92c1, 0x92c2, 0x92c3, 0x92c4, 0x92c5, 0x92c6, 0x92c7, 0x92c9,
2522 0x92ca, 0x92cb, 0x92cc, 0x92cd, 0x92ce, 0x92cf, 0x92d0, 0x92d1,
2523 0x92d2, 0x92d3, 0x92d4, 0x92d5, 0x92d6, 0x92d7, 0x92d8, 0x92d9,
2524 0x92da, 0x92db, 0x92dc, 0x92dd, 0x92de, 0x92df, 0x92e0, 0x92e1,
2525 0x92e2, 0x92e3, 0x92e4, 0x92e5, 0x92e6, 0x92e7, 0x92e8, 0x92e9,
2526 0x92ea, 0x92eb, 0x92ec, 0x92ed, 0x92ee, 0x92ef, 0x92f0, 0x92f1,
2527 0x92f2, 0x92f3, 0x92f4, 0x92f5, 0x92f6, 0x92f7, 0x92f8, 0x92f9,
2528 0x92fa, 0x92fb, 0x92fc, 0x92fd, 0x92fe, 0x92ff, 0x9300, 0x9301,
2529 0x9302, 0x9303, 0x9304, 0x9305, 0x9306, 0x9307, 0x9308, 0x9309,
2530 0x6d39, 0x6d27, 0x6d0c, 0x6d43, 0x6d48, 0x6d07, 0x6d04, 0x6d19,
2531 0x6d0e, 0x6d2b, 0x6d4d, 0x6d2e, 0x6d35, 0x6d1a, 0x6d4f, 0x6d52,
2532 0x6d54, 0x6d33, 0x6d91, 0x6d6f, 0x6d9e, 0x6da0, 0x6d5e, 0x6d93,
2533 0x6d94, 0x6d5c, 0x6d60, 0x6d7c, 0x6d63, 0x6e1a, 0x6dc7, 0x6dc5,
2534 0x6dde, 0x6e0e, 0x6dbf, 0x6de0, 0x6e11, 0x6de6, 0x6ddd, 0x6dd9,
2535 0x6e16, 0x6dab, 0x6e0c, 0x6dae, 0x6e2b, 0x6e6e, 0x6e4e, 0x6e6b,
2536 0x6eb2, 0x6e5f, 0x6e86, 0x6e53, 0x6e54, 0x6e32, 0x6e25, 0x6e44,
2537 0x6edf, 0x6eb1, 0x6e98, 0x6ee0, 0x6f2d, 0x6ee2, 0x6ea5, 0x6ea7,
2538 0x6ebd, 0x6ebb, 0x6eb7, 0x6ed7, 0x6eb4, 0x6ecf, 0x6e8f, 0x6ec2,
2539 0x6e9f, 0x6f62, 0x6f46, 0x6f47, 0x6f24, 0x6f15, 0x6ef9, 0x6f2f,
2540 0x6f36, 0x6f4b, 0x6f74, 0x6f2a, 0x6f09, 0x6f29, 0x6f89, 0x6f8d,
2541 0x6f8c, 0x6f78, 0x6f72, 0x6f7c, 0x6f7a, 0x6fd1,
2542 /* 0xe5 */
2543 0x930a, 0x930b, 0x930c, 0x930d, 0x930e, 0x930f, 0x9310, 0x9311,
2544 0x9312, 0x9313, 0x9314, 0x9315, 0x9316, 0x9317, 0x9318, 0x9319,
2545 0x931a, 0x931b, 0x931c, 0x931d, 0x931e, 0x931f, 0x9320, 0x9321,
2546 0x9322, 0x9323, 0x9324, 0x9325, 0x9326, 0x9327, 0x9328, 0x9329,
2547 0x932a, 0x932b, 0x932c, 0x932d, 0x932e, 0x932f, 0x9330, 0x9331,
2548 0x9332, 0x9333, 0x9334, 0x9335, 0x9336, 0x9337, 0x9338, 0x9339,
2549 0x933a, 0x933b, 0x933c, 0x933d, 0x933f, 0x9340, 0x9341, 0x9342,
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2551 0x934b, 0x934c, 0x934d, 0x934e, 0x934f, 0x9350, 0x9351, 0x9352,
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2553 0x935b, 0x935c, 0x935d, 0x935e, 0x935f, 0x9360, 0x9361, 0x9362,
2554 0x9363, 0x9364, 0x9365, 0x9366, 0x9367, 0x9368, 0x9369, 0x936b,
2555 0x6fc9, 0x6fa7, 0x6fb9, 0x6fb6, 0x6fc2, 0x6fe1, 0x6fee, 0x6fde,
2556 0x6fe0, 0x6fef, 0x701a, 0x7023, 0x701b, 0x7039, 0x7035, 0x704f,
2557 0x705e, 0x5b80, 0x5b84, 0x5b95, 0x5b93, 0x5ba5, 0x5bb8, 0x752f,
2558 0x9a9e, 0x6434, 0x5be4, 0x5bee, 0x8930, 0x5bf0, 0x8e47, 0x8b07,
2559 0x8fb6, 0x8fd3, 0x8fd5, 0x8fe5, 0x8fee, 0x8fe4, 0x8fe9, 0x8fe6,
2560 0x8ff3, 0x8fe8, 0x9005, 0x900f, 0x900b, 0x9026, 0x9011, 0x900d,
2561 0x9016, 0x9021, 0x9035, 0x9036, 0x902d, 0x902f, 0x9044, 0x9051,
2562 0x9052, 0x9050, 0x9068, 0x9058, 0x9062, 0x905b, 0x66b9, 0x9074,
2563 0x907d, 0x9082, 0x9088, 0x9083, 0x908b, 0x5f50, 0x5f57, 0x5f56,
2564 0x5f58, 0x5c3b, 0x54ab, 0x5c50, 0x5c59, 0x5b71, 0x5c63, 0x5c66,
2565 0x7fbc, 0x5f2a, 0x5f29, 0x5f2d, 0x8274, 0x5f3c, 0x9b3b, 0x5c6e,
2566 0x5981, 0x5983, 0x598d, 0x59a9, 0x59aa, 0x59a3,
2567 /* 0xe6 */
2568 0x936c, 0x936d, 0x936e, 0x936f, 0x9370, 0x9371, 0x9372, 0x9373,
2569 0x9374, 0x9375, 0x9376, 0x9377, 0x9378, 0x9379, 0x937a, 0x937b,
2570 0x937c, 0x937d, 0x937e, 0x937f, 0x9380, 0x9381, 0x9382, 0x9383,
2571 0x9384, 0x9385, 0x9386, 0x9387, 0x9388, 0x9389, 0x938a, 0x938b,
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2576 0x93ad, 0x93ae, 0x93af, 0x93b0, 0x93b1, 0x93b2, 0x93b3, 0x93b4,
2577 0x93b5, 0x93b6, 0x93b7, 0x93b8, 0x93b9, 0x93ba, 0x93bb, 0x93bc,
2578 0x93bd, 0x93be, 0x93bf, 0x93c0, 0x93c1, 0x93c2, 0x93c3, 0x93c4,
2579 0x93c5, 0x93c6, 0x93c7, 0x93c8, 0x93c9, 0x93cb, 0x93cc, 0x93cd,
2580 0x5997, 0x599a, 0x599b, 0x599e, 0x59a4, 0x59d2, 0x59b2, 0x59af,
2581 0x59d7, 0x59be, 0x5a05, 0x5a06, 0x59dd, 0x5a08, 0x59e3, 0x59d8,
2582 0x59f9, 0x5a0c, 0x5a09, 0x5a32, 0x5a34, 0x5a11, 0x5a23, 0x5a13,
2583 0x5a40, 0x5a67, 0x5a4a, 0x5a55, 0x5a3c, 0x5a62, 0x5a75, 0x80ec,
2584 0x5aaaa, 0x5a9b, 0x5a77, 0x5a7a, 0x5abe, 0x5aeb, 0x5ab2, 0x5ad2,
2585 0x5ad4, 0x5ab8, 0x5ae0, 0x5ae3, 0x5af1, 0x5ad6, 0x5ae6, 0x5ad8,
2586 0x5adc, 0x5b09, 0x5b17, 0x5b16, 0x5b32, 0x5b37, 0x5b40, 0x5c15,
2587 0x5c1c, 0x5b5a, 0x5b65, 0x5b73, 0x5b51, 0x5b53, 0x5b62, 0x9a75,
2588 0x9a77, 0x9a78, 0x9a7a, 0x9a7f, 0x9a7d, 0x9a80, 0x9a81, 0x9a85,
2589 0x9a88, 0x9a8a, 0x9a90, 0x9a92, 0x9a93, 0x9a96, 0x9a98, 0x9a9b,
2590 0x9a9c, 0x9a9d, 0x9a9f, 0x9aa0, 0x9aa2, 0x9aa3, 0x9aa5, 0x9aa7,
2591 0x7e9f, 0x7ea1, 0x7ea3, 0x7ea5, 0x7ea8, 0x7ea9,
2592 /* 0xe7 */
2593 0x93ce, 0x93cf, 0x93d0, 0x93d1, 0x93d2, 0x93d3, 0x93d4, 0x93d5,
2594 0x93d7, 0x93d8, 0x93d9, 0x93da, 0x93db, 0x93dc, 0x93dd, 0x93de,
2595 0x93df, 0x93e0, 0x93e1, 0x93e2, 0x93e3, 0x93e4, 0x93e5, 0x93e6,
2596 0x93e7, 0x93e8, 0x93e9, 0x93ea, 0x93eb, 0x93ec, 0x93ed, 0x93ee,

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2598 0x93f7, 0x93f8, 0x93f9, 0x93fa, 0x93fb, 0x93fc, 0x93fd, 0x93fe,
2599 0x93ff, 0x9400, 0x9401, 0x9402, 0x9403, 0x9404, 0x9405, 0x9406,
2600 0x9407, 0x9408, 0x9409, 0x940a, 0x940b, 0x940c, 0x940d, 0x940e,
2601 0x940f, 0x9410, 0x9411, 0x9412, 0x9413, 0x9414, 0x9415, 0x9416,
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2603 0x941f, 0x9420, 0x9421, 0x9422, 0x9423, 0x9424, 0x9425, 0x9426,
2604 0x9427, 0x9428, 0x9429, 0x942a, 0x942b, 0x942c, 0x942d, 0x942e,
2605 0x7ead, 0x7eb0, 0x7ebe, 0x7ec0, 0x7ec1, 0x7ec2, 0x7ec9, 0x7ecb,
2606 0x7ecc, 0x7ed0, 0x7ed4, 0x7ed7, 0x7edb, 0x7ee0, 0x7ee1, 0x7ee8,
2607 0x7eeb, 0x7eee, 0x7eeF, 0x7ef1, 0x7ef2, 0x7f0d, 0x7ef6, 0x7efa,
2608 0x7efb, 0x7efe, 0x7f01, 0x7f02, 0x7f03, 0x7f07, 0x7f08, 0x7f0b,
2609 0x7f0c, 0x7f0f, 0x7f11, 0x7f12, 0x7f17, 0x7f19, 0x7f1c, 0x7f1b,
2610 0x7f1f, 0x7f21, 0x7f22, 0x7f23, 0x7f24, 0x7f25, 0x7f26, 0x7f27,
2611 0x7f2a, 0x7f2b, 0x7f2c, 0x7f2d, 0x7f2f, 0x7f30, 0x7f31, 0x7f32,
2612 0x7f33, 0x7f35, 0x5e7a, 0x757f, 0x5ddb, 0x753e, 0x9095, 0x738e,
2613 0x7391, 0x73ae, 0x73a2, 0x739f, 0x73cf, 0x73c2, 0x73d1, 0x73b7,
2614 0x73b3, 0x73c0, 0x73c9, 0x73c8, 0x73e5, 0x73d9, 0x987c, 0x740a,
2615 0x73e9, 0x73e7, 0x73de, 0x73ba, 0x73f2, 0x740f, 0x742a, 0x745b,
2616 0x7426, 0x7425, 0x7428, 0x7430, 0x742e, 0x742c,
2617 /* 0xe8 */
2618 0x942f, 0x9430, 0x9431, 0x9432, 0x9433, 0x9434, 0x9435, 0x9436,
2619 0x9437, 0x9438, 0x9439, 0x943a, 0x943b, 0x943c, 0x943d, 0x943e,
2620 0x9440, 0x9441, 0x9442, 0x9443, 0x9444, 0x9445, 0x9446, 0x9447,
2621 0x9448, 0x9449, 0x944a, 0x944b, 0x944c, 0x944d, 0x944e, 0x944f,
2622 0x9450, 0x9451, 0x9452, 0x9453, 0x9454, 0x9455, 0x9456, 0x9457,
2623 0x9458, 0x9459, 0x945a, 0x945b, 0x945c, 0x945d, 0x945e, 0x945f,
2624 0x9460, 0x9461, 0x9462, 0x9463, 0x9464, 0x9465, 0x9466, 0x9467,
2625 0x9468, 0x9469, 0x946a, 0x946c, 0x946d, 0x946e, 0x946f, 0x9470,
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2627 0x9479, 0x947a, 0x947b, 0x947c, 0x947d, 0x947e, 0x947f, 0x9480,
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2629 0x94cf, 0x94d3, 0x94d4, 0x94da, 0x94e6, 0x94fb, 0x951c, 0x9520,
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2631 0x746d, 0x747e, 0x749c, 0x748e, 0x7480, 0x7481, 0x7487, 0x748b,
2632 0x749e, 0x74a8, 0x74a9, 0x7490, 0x74a7, 0x74d2, 0x74ba, 0x97ea,
2633 0x97eb, 0x97ec, 0x674c, 0x6753, 0x675e, 0x6748, 0x6769, 0x67a5,
2634 0x6787, 0x676a, 0x6773, 0x6798, 0x67a7, 0x6775, 0x67a8, 0x679e,
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2636 0x67e9, 0x67b0, 0x680c, 0x67d9, 0x67b5, 0x67da, 0x67b3, 0x67dd,
2637 0x6800, 0x67c3, 0x67b8, 0x67e2, 0x680e, 0x67c1, 0x67fd, 0x6832,
2638 0x6833, 0x6860, 0x6861, 0x684e, 0x6862, 0x6844, 0x6864, 0x6883,
2639 0x681d, 0x6855, 0x6866, 0x6841, 0x6867, 0x6840, 0x683e, 0x684a,
2640 0x6849, 0x6829, 0x68b5, 0x688f, 0x6874, 0x6877, 0x6893, 0x686b,
2641 0x68c2, 0x696e, 0x68fc, 0x691f, 0x6920, 0x68f9,
2642 /* 0xe9 */
2643 0x9527, 0x9533, 0x953d, 0x9543, 0x9548, 0x954b, 0x9555, 0x955a,
2644 0x9560, 0x956e, 0x9574, 0x9575, 0x9577, 0x9578, 0x9579, 0x957a,
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2651 0x95ac, 0x95ad, 0x95ae, 0x95af, 0x95b0, 0x95b1, 0x95b2, 0x95b3,
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2653 0x95bc, 0x95bd, 0x95be, 0x95bf, 0x95c0, 0x95c1, 0x95c2, 0x95c3,
2654 0x95c4, 0x95c5, 0x95c6, 0x95c7, 0x95c8, 0x95c9, 0x95ca, 0x95cb,
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2656 0x6939, 0x6960, 0x6942, 0x695d, 0x6984, 0x696b, 0x6980, 0x6998,
2657 0x6978, 0x6934, 0x69cc, 0x6987, 0x6988, 0x69ce, 0x6989, 0x6966,
2658 0x6963, 0x6979, 0x699b, 0x69a7, 0x69bb, 0x69ab, 0x69ad, 0x69d4,
2659 0x69b1, 0x69c1, 0x69ca, 0x69df, 0x6995, 0x69e0, 0x698d, 0x69ff,
2660 0x6a2f, 0x69ed, 0x6a17, 0x6a18, 0x6a65, 0x69f2, 0x6a44, 0x6a3e,
2661 0x6aa0, 0x6a50, 0x6a5b, 0x6a35, 0x6a8e, 0x6a79, 0x6a3d, 0x6a28,
2662 0x6a58, 0x6a7c, 0x6a91, 0x6a90, 0x6aa9, 0x6a97, 0x6aab, 0x7337,
2663 0x7352, 0x6b81, 0x6b82, 0x6b87, 0x6b84, 0x6b92, 0x6b93, 0x6b8d,
2664 0x6b9a, 0x6b9b, 0x6ba1, 0x6baa, 0x8f6b, 0x8f6d, 0x8f71, 0x8f72,
2665 0x8f73, 0x8f75, 0x8f76, 0x8f78, 0x8f77, 0x8f79, 0x8f7c,
2666 0x8f7e, 0x8f81, 0x8f82, 0x8f84, 0x8f87, 0x8f8b,
2667 /* 0xea */
2668 0x95cc, 0x95cd, 0x95ce, 0x95cf, 0x95d0, 0x95d1, 0x95d2, 0x95d3,
2669 0x95d4, 0x95d5, 0x95d6, 0x95d7, 0x95d8, 0x95d9, 0x95da, 0x95db,
2670 0x95dc, 0x95dd, 0x95de, 0x95df, 0x95e0, 0x95e1, 0x95e2, 0x95e3,
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2677 0x9666, 0x966b, 0x966d, 0x966e, 0x966f, 0x9670, 0x9671, 0x9673,
2678 0x9678, 0x9679, 0x967a, 0x967b, 0x967c, 0x967d, 0x967e, 0x967f,
2679 0x9680, 0x9681, 0x9682, 0x9683, 0x9684, 0x9687, 0x9689, 0x968a,
2680 0x8f8d, 0x8f8e, 0x8f8f, 0x8f98, 0x8f9a, 0x8ece, 0x620b, 0x6217,
2681 0x621b, 0x621f, 0x6222, 0x6221, 0x6225, 0x6224, 0x622c, 0x81e7,
2682 0x74ef, 0x74f4, 0x74ff, 0x750f, 0x7511, 0x7513, 0x6534, 0x65ee,
2683 0x65ef, 0x65f0, 0x660a, 0x6619, 0x6772, 0x6603, 0x6615, 0x6600,
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2686 0x6684, 0x668c, 0x668c, 0x66a7, 0x669d, 0x66be, 0x66db, 0x66dc, 0x66e6,
2687 0x66e9, 0x8d32, 0x8d33, 0x8d36, 0x8d3b, 0x8d3d, 0x8d40, 0x8d45,
2688 0x8d46, 0x8d48, 0x8d49, 0x8d47, 0x8d4d, 0x8d55, 0x8d59, 0x89c7,
2689 0x89ca, 0x89cb, 0x89cc, 0x89ce, 0x89cf, 0x89d0, 0x89d1, 0x726e,
2690 0x729f, 0x725d, 0x7266, 0x726f, 0x727e, 0x727f, 0x7284, 0x728b,
2691 0x728d, 0x728f, 0x7292, 0x6308, 0x6332, 0x63b0,
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2693 0x968c, 0x968e, 0x9691, 0x9692, 0x9693, 0x9695, 0x9696, 0x969a,
2694 0x969b, 0x969d, 0x969e, 0x969f, 0x96a0, 0x96a1, 0x96a2, 0x96a3,
2695 0x96a4, 0x96a5, 0x96a6, 0x96a8, 0x96a9, 0x96aa, 0x96ab, 0x96ac,
2696 0x96ad, 0x96ae, 0x96af, 0x96b1, 0x96b2, 0x96b4, 0x96b5, 0x96b7,
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2699 0x96d9, 0x96da, 0x96db, 0x96dc, 0x96dd, 0x96de, 0x96df, 0x96e1,
2700 0x96e2, 0x96e3, 0x96e4, 0x96e5, 0x96e6, 0x96e7, 0x96eb, 0x96ec,
2701 0x96ed, 0x96ee, 0x96ef, 0x96f1, 0x96f2, 0x96f4, 0x96f5, 0x96f8,
2702 0x96fa, 0x96fb, 0x96fc, 0x96fd, 0x96ff, 0x9702, 0x9703, 0x9705,
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2708 0x724d, 0x7252, 0x7256, 0x7230, 0x8662, 0x5216, 0x809f, 0x809c,
2709 0x8093, 0x80bc, 0x670a, 0x80bd, 0x80b1, 0x80ab, 0x80ad, 0x80b4,
2710 0x80b7, 0x80e7, 0x80e8, 0x80e9, 0x80ea, 0x80db, 0x80c2, 0x80c4,
2711 0x80d9, 0x80cd, 0x80d7, 0x6710, 0x80dd, 0x80eb, 0x80f1, 0x80f4,
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2713 0x8136, 0x811e, 0x812c, 0x8118, 0x8132, 0x8148, 0x814c, 0x8153,
2714 0x8174, 0x8159, 0x815a, 0x8171, 0x8160, 0x8169, 0x817c, 0x817d,
2715 0x816d, 0x8167, 0x584d, 0x5ab5, 0x8188, 0x8182, 0x8191, 0x6ed5,
2716 0x81a3, 0x81aa, 0x81cc, 0x6726, 0x81ca, 0x81bb,
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2728 0x9788, 0x9789, 0x978a, 0x978c, 0x978e, 0x978f, 0x9790, 0x9793,
2729 0x9795, 0x9796, 0x9797, 0x9799, 0x979a, 0x979b, 0x979c, 0x979d,
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2736 0x7145, 0x7172, 0x714a, 0x7178, 0x717a, 0x7198, 0x71b3, 0x71b5,
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2789 0x94cb, 0x94cc, 0x94cd, 0x94ce, 0x94d0, 0x94d1, 0x94d2, 0x94d5,
2790 0x94d6, 0x94d7, 0x94d9, 0x94d8, 0x94db, 0x94de, 0x94df, 0x94e0,
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2817 /* 0xf0 */
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2841 0x7617, 0x760a, 0x7625, 0x7618, 0x7615, 0x7619,
2842 /* 0xf1 */
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2861 0x88f1, 0x891a, 0x88fc, 0x88e8, 0x88fe, 0x88f0, 0x8921, 0x8919,
2862 0x8913, 0x891b, 0x890a, 0x8934, 0x892b, 0x8936, 0x8941, 0x8966,
2863 0x897b, 0x758b, 0x80e5, 0x76b2, 0x76b4, 0x77dc, 0x8012, 0x8014,
2864 0x8016, 0x801c, 0x8020, 0x8022, 0x8025, 0x8026, 0x8027, 0x8029,
2865 0x8028, 0x8031, 0x800b, 0x8035, 0x8043, 0x8046, 0x804d, 0x8052,
2866 0x8069, 0x8071, 0x8983, 0x9878, 0x9880, 0x9883,
2867 /* 0xf2 */
2868 0x99fa, 0x99fb, 0x99fc, 0x99fd, 0x99fe, 0x99ff, 0x9a00, 0x9a01,
2869 0x9a02, 0x9a03, 0x9a04, 0x9a05, 0x9a06, 0x9a07, 0x9a08, 0x9a09,
2870 0x9a0a, 0x9a0b, 0x9a0c, 0x9a0d, 0x9a0e, 0x9a0f, 0x9a10, 0x9a11,
2871 0x9a12, 0x9a13, 0x9a14, 0x9a15, 0x9a16, 0x9a17, 0x9a18, 0x9a19,
2872 0x9a1a, 0x9a1b, 0x9a1c, 0x9a1d, 0x9a1e, 0x9a1f, 0x9a20, 0x9a21,
2873 0x9a22, 0x9a23, 0x9a24, 0x9a25, 0x9a26, 0x9a27, 0x9a28, 0x9a29,
2874 0x9a2a, 0x9a2b, 0x9a2c, 0x9a2d, 0x9a2e, 0x9a2f, 0x9a30, 0x9a31,
2875 0x9a32, 0x9a33, 0x9a34, 0x9a35, 0x9a36, 0x9a37, 0x9a38, 0x9a39,
2876 0x9a3a, 0x9a3b, 0x9a3c, 0x9a3d, 0x9a3e, 0x9a3f, 0x9a40, 0x9a41,
2877 0x9a42, 0x9a43, 0x9a44, 0x9a45, 0x9a46, 0x9a47, 0x9a48, 0x9a49,
2878 0x9a4a, 0x9a4b, 0x9a4c, 0x9a4d, 0x9a4e, 0x9a4f, 0x9a50, 0x9a51,
2879 0x9a52, 0x9a53, 0x9a54, 0x9a55, 0x9a56, 0x9a57, 0x9a58, 0x9a59,
2880 0x9889, 0x988c, 0x988d, 0x988f, 0x9894, 0x989a, 0x989b, 0x989e,
2881 0x989f, 0x98a1, 0x98a2, 0x98a5, 0x98a6, 0x864d, 0x8654, 0x866c,
2882 0x866e, 0x867f, 0x867a, 0x867c, 0x867b, 0x86a8, 0x868d, 0x868b,
2883 0x86ac, 0x869d, 0x86a7, 0x86a3, 0x86aa, 0x8693, 0x86a9, 0x86b6,
2884 0x86c4, 0x86b5, 0x86ce, 0x86b0, 0x86ba, 0x86b1, 0x86af, 0x86c9,
2885 0x86cf, 0x86b4, 0x86e9, 0x86f1, 0x86f2, 0x86ed, 0x86f3, 0x86d0,
2886 0x8713, 0x86de, 0x86f4, 0x86df, 0x86d8, 0x86d1, 0x8703, 0x8707,
2887 0x86f8, 0x8708, 0x870a, 0x870d, 0x8709, 0x8723, 0x873b, 0x871e,
2888 0x8725, 0x872e, 0x871a, 0x873e, 0x8748, 0x8734, 0x8731, 0x8729,
2889 0x8737, 0x873f, 0x8782, 0x8722, 0x877d, 0x877e, 0x877b, 0x8760,
2890 0x8770, 0x874c, 0x876e, 0x878b, 0x8753, 0x8763, 0x877c, 0x8764,
2891 0x8759, 0x8765, 0x8793, 0x87af, 0x87a8, 0x87d2,
2892 /* 0xf3 */
2893 0x9a5a, 0x9a5b, 0x9a5c, 0x9a5d, 0x9a5e, 0x9a5f, 0x9a60, 0x9a61,
2894 0x9a62, 0x9a63, 0x9a64, 0x9a65, 0x9a66, 0x9a67, 0x9a68, 0x9a69,
2895 0x9a6a, 0x9a6b, 0x9a72, 0x9a83, 0x9a89, 0x9a8d, 0x9a8e, 0x9a94,
2896 0x9a95, 0x9a99, 0x9aa6, 0x9aa9, 0x9aaa, 0x9aab, 0x9aac, 0x9aad,
2897 0x9aae, 0x9aaf, 0x9ab2, 0x9ab3, 0x9ab4, 0x9ab5, 0x9ab9, 0x9abb,
2898 0x9abd, 0x9abe, 0x9abf, 0x9ac3, 0x9ac4, 0x9ac6, 0x9ac7, 0x9ac8,
2899 0x9acd, 0x9aca, 0x9acd, 0x9ace, 0x9acf, 0x9ad0, 0x9ad2, 0x9ad4,
2900 0x9ad5, 0x9ad6, 0x9ad7, 0x9ad9, 0x9ada, 0x9adb, 0x9adc, 0x9add,
2901 0x9ade, 0x9ae0, 0x9ae2, 0x9ae3, 0x9ae4, 0x9ae5, 0x9ae7, 0x9ae8,
2902 0x9ae9, 0x9aea, 0x9aeb, 0x9aee, 0x9af0, 0x9af1, 0x9af2, 0x9af3,
2903 0x9af4, 0x9af5, 0x9af6, 0x9af7, 0x9af8, 0x9afa, 0x9afc, 0x9afd,
2904 0x9afe, 0x9aff, 0x9b00, 0x9b01, 0x9b02, 0x9b04, 0x9b05, 0x9b06,
2905 0x87c6, 0x8788, 0x8785, 0x87ad, 0x8797, 0x8783, 0x87ab, 0x87e5,
2906 0x87ac, 0x87b5, 0x87b3, 0x87cb, 0x87d3, 0x87bd, 0x87d1, 0x87c0,
2907 0x87ca, 0x87db, 0x87ea, 0x87e0, 0x87ee, 0x8816, 0x8813, 0x87fe,
2908 0x880a, 0x881b, 0x8821, 0x8839, 0x883c, 0x7f36, 0x7f42, 0x7f44,
2909 0x7f45, 0x8210, 0x7afa, 0x7afd, 0x7b08, 0x7b03, 0x7b04, 0x7b15,
2910 0x7b0a, 0x7b2b, 0x7b0f, 0x7b47, 0x7b38, 0x7b2a, 0x7b19, 0x7b2e,
2911 0x7b31, 0x7b20, 0x7b25, 0x7b24, 0x7b33, 0x7b3e, 0x7b1e, 0x7b58,
2912 0x7b5a, 0x7b45, 0x7b75, 0x7b4c, 0x7b5d, 0x7b60, 0x7b6e, 0x7b7b,
2913 0x7b62, 0x7b72, 0x7b71, 0x7b90, 0x7ba6, 0x7ba7, 0x7bb8, 0x7bac,
2914 0x7b9d, 0x7ba8, 0x7b85, 0x7baa, 0x7b9c, 0x7ba2, 0x7bab, 0x7bb4,
2915 0x7bd1, 0x7bc1, 0x7bcc, 0x7bdd, 0x7bda, 0x7be5, 0x7be6, 0x7bea,
2916 0x7c0c, 0x7bfe, 0x7bfc, 0x7c0f, 0x7c16, 0x7c0b,
2917 /* 0xf4 */
2918 0x9b07, 0x9b09, 0x9b0a, 0x9b0b, 0x9b0c, 0x9b0d, 0x9b0e, 0x9b10,
2919 0x9b11, 0x9b12, 0x9b14, 0x9b15, 0x9b16, 0x9b17, 0x9b18, 0x9b19,
2920 0x9b1a, 0x9b1b, 0x9b1c, 0x9b1d, 0x9b1e, 0x9b20, 0x9b21, 0x9b22,
2921 0x9b24, 0x9b25, 0x9b26, 0x9b27, 0x9b28, 0x9b29, 0x9b2a, 0x9b2b,
2922 0x9b2c, 0x9b2d, 0x9b2e, 0x9b30, 0x9b31, 0x9b33, 0x9b34, 0x9b35,
2923 0x9b36, 0x9b37, 0x9b38, 0x9b39, 0x9b3a, 0x9b3d, 0x9b3e, 0x9b3f,
2924 0x9b40, 0x9b46, 0x9b4a, 0x9b4b, 0x9b4c, 0x9b4e, 0x9b50, 0x9b52,
2925 0x9b53, 0x9b55, 0x9b56, 0x9b57, 0x9b58, 0x9b59, 0x9b5a, 0x9b5b,
2926 0x9b5c, 0x9b5d, 0x9b5e, 0x9b5f, 0x9b60, 0x9b61, 0x9b62, 0x9b63,
2927 0x9b64, 0x9b65, 0x9b66, 0x9b67, 0x9b68, 0x9b69, 0x9b6a, 0x9b6b,
2928 0x9b6c, 0x9b6d, 0x9b6e, 0x9b6f, 0x9b70, 0x9b71, 0x9b72, 0x9b73,
2929 0x9b74, 0x9b75, 0x9b76, 0x9b77, 0x9b78, 0x9b79, 0x9b7a, 0x9b7b,
2930 0x7c1f, 0x7c2a, 0x7c26, 0x7c38, 0x7c41, 0x7c40, 0x81fe, 0x8201,
2931 0x8202, 0x8204, 0x81ec, 0x8844, 0x8221, 0x8222, 0x8223, 0x822d,
2932 0x822f, 0x8228, 0x822b, 0x8238, 0x823b, 0x8233, 0x8234, 0x823e,
2933 0x8244, 0x8249, 0x824b, 0x824f, 0x825a, 0x825f, 0x8268, 0x887e,
2934 0x8885, 0x8888, 0x888d, 0x88df, 0x895e, 0x7f9d, 0x7f9f, 0x7fa7,
2935 0x7faf, 0x7fb0, 0x7fb2, 0x7fc7, 0x6549, 0x7c91, 0x7c9d, 0x7c9c,
2936 0x7c9e, 0x7ca2, 0x7cb2, 0x7cbc, 0x7cbd, 0x7cc1, 0x7cc7, 0x7ccc,
2937 0x7ccd, 0x7cc8, 0x7cc5, 0x7cd7, 0x7ce8, 0x826e, 0x66a8, 0x7fbf,
2938 0x7fce, 0x7fd5, 0x7fe5, 0x7fe1, 0x7fe6, 0x7fe9, 0x7fee, 0x7ff3,
2939 0x7cf8, 0x7d77, 0x7da6, 0x7dae, 0x7e47, 0x7e9b, 0x9eb8, 0x9eb4,
2940 0x8d73, 0x8d84, 0x8d94, 0x8d91, 0x8db1, 0x8d67, 0x8d6d, 0x8c47,
2941 0x8c49, 0x914a, 0x9150, 0x914e, 0x914f, 0x9164,
2942 /* 0xf5 */
2943 0x9b7c, 0x9b7d, 0x9b7e, 0x9b7f, 0x9b80, 0x9b81, 0x9b82, 0x9b83,
2944 0x9b84, 0x9b85, 0x9b86, 0x9b87, 0x9b88, 0x9b89, 0x9b8a, 0x9b8b,

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2945 0x9b8c, 0x9b8d, 0x9b8e, 0x9b8f, 0x9b90, 0x9b91, 0x9b92, 0x9b93,
2946 0x9b94, 0x9b95, 0x9b96, 0x9b97, 0x9b98, 0x9b99, 0x9b9a, 0x9b9b,
2947 0x9b9c, 0x9b9d, 0x9b9e, 0x9b9f, 0x9ba0, 0x9ba1, 0x9ba2, 0x9ba3,
2948 0x9ba4, 0x9ba5, 0x9ba6, 0x9ba7, 0x9ba8, 0x9ba9, 0xbaa, 0x9bab,
2949 0x9bac, 0x9bad, 0x9bae, 0x9baf, 0x9bb0, 0x9bb1, 0x9bb2, 0x9bb3,
2950 0x9bb4, 0x9bb5, 0x9bb6, 0x9bb7, 0x9bb8, 0x9bb9, 0x9bba, 0x9bbb,
2951 0x9bbc, 0x9bbd, 0x9bbe, 0x9bbf, 0x9bc0, 0x9bc1, 0x9bc2, 0x9bc3,
2952 0x9bc4, 0x9bc5, 0x9bc6, 0x9bc7, 0x9bc8, 0x9bc9, 0x9bca, 0x9bcb,
2953 0x9bcc, 0x9bcd, 0x9bce, 0x9bcf, 0x9bd0, 0x9bd1, 0x9bd2, 0x9bd3,
2954 0x9bd4, 0x9bd5, 0x9bd6, 0x9bd7, 0x9bd8, 0x9bd9, 0x9bda, 0x9bdb,
2955 0x9162, 0x9161, 0x9170, 0x9169, 0x916f, 0x917d, 0x917e, 0x9172,
2956 0x9174, 0x9179, 0x918c, 0x9185, 0x9190, 0x918d, 0x9191, 0x91a2,
2957 0x91a3, 0x91aa, 0x91ad, 0x91ae, 0x91af, 0x91b5, 0x91b4, 0x91ba,
2958 0x8c55, 0x9e7e, 0x8db8, 0x8deb, 0x8e05, 0x8e59, 0x8e69, 0x8db5,
2959 0x8dbf, 0x8dbc, 0x8dba, 0x8dc4, 0x8dd6, 0x8dd7, 0x8dda, 0x8dde,
2960 0x8dce, 0x8dcf, 0x8ddb, 0x8dc6, 0x8dec, 0x8df7, 0x8df8, 0x8de3,
2961 0x8df9, 0x8dfb, 0x8de4, 0x8e09, 0x8dfd, 0x8e14, 0x8e1d, 0x8e1f,
2962 0x8e2c, 0x8e2e, 0x8e23, 0x8e2f, 0x8e3a, 0x8e40, 0x8e39, 0x8e35,
2963 0x8e3d, 0x8e31, 0x8e49, 0x8e41, 0x8e42, 0x8e51, 0x8e52, 0x8e4a,
2964 0x8e70, 0x8e76, 0x8e7c, 0x8e6f, 0x8e74, 0x8e85, 0x8e8f, 0x8e94,
2965 0x8e90, 0x8e9c, 0x8e9e, 0x8c78, 0x8c82, 0x8c8a, 0x8c85, 0x8c98,
2966 0x8c94, 0x659b, 0x89d6, 0x89de, 0x89da, 0x89dc,
2967 /* 0xf6 */
2968 0x9bdc, 0x9bdd, 0x9bde, 0x9bdf, 0x9be0, 0x9be1, 0x9be2, 0x9be3,
2969 0x9be4, 0x9be5, 0x9be6, 0x9be7, 0x9be8, 0x9be9, 0x9bea, 0x9beb,
2970 0x9bec, 0x9bed, 0x9bee, 0x9bef, 0x9bf0, 0x9bf1, 0x9bf2, 0x9bf3,
2971 0x9bf4, 0x9bf5, 0x9bf6, 0x9bf7, 0x9bf8, 0x9bf9, 0x9bfa, 0x9bfb,
2972 0x9bfc, 0x9bfd, 0x9bfe, 0x9bff, 0x9c00, 0x9c01, 0x9c02, 0x9c03,
2973 0x9c04, 0x9c05, 0x9c06, 0x9c07, 0x9c08, 0x9c09, 0x9c0a, 0x9c0b,
2974 0x9c0c, 0x9c0d, 0x9c0e, 0x9c0f, 0x9c10, 0x9c11, 0x9c12, 0x9c13,
2975 0x9c14, 0x9c15, 0x9c16, 0x9c17, 0x9c18, 0x9c19, 0x9c1a, 0x9c1b,
2976 0x9c1c, 0x9c1d, 0x9c1e, 0x9c1f, 0x9c20, 0x9c21, 0x9c22, 0x9c23,
2977 0x9c24, 0x9c25, 0x9c26, 0x9c27, 0x9c28, 0x9c29, 0x9c2a, 0x9c2b,
2978 0x9c2c, 0x9c2d, 0x9c2e, 0x9c2f, 0x9c30, 0x9c31, 0x9c32, 0x9c33,
2979 0x9c34, 0x9c35, 0x9c36, 0x9c37, 0x9c38, 0x9c39, 0x9c3a, 0x9c3b,
2980 0x89e5, 0x89eb, 0x89ef, 0x8a3e, 0x8b26, 0x9753, 0x96e9, 0x96f3,
2981 0x96ef, 0x9706, 0x9701, 0x9708, 0x970f, 0x970e, 0x972a, 0x972d,
2982 0x9730, 0x973e, 0x9f80, 0x9f83, 0x9f85, 0x9f86, 0x9f87, 0x9f88,
2983 0x9f89, 0x9f8a, 0x9f8c, 0x9efe, 0x9f0b, 0x9f0d, 0x96b9, 0x96bc,
2984 0x96bd, 0x96ce, 0x96d2, 0x77bf, 0x96e0, 0x928e, 0x92ae, 0x92c8,
2985 0x933e, 0x936a, 0x93ca, 0x938f, 0x943e, 0x946b, 0x9c7f, 0x9c82,
2986 0x9c85, 0x9c86, 0x9c87, 0x9c88, 0x7a23, 0x9c8b, 0x9c8e, 0x9c90,
2987 0x9c91, 0x9c92, 0x9c94, 0x9c95, 0x9c9a, 0x9c9b, 0x9c9e, 0x9c9f,
2988 0x9ca0, 0x9ca1, 0x9ca2, 0x9ca3, 0x9ca5, 0x9ca6, 0x9ca7, 0x9ca8,
2989 0x9ca9, 0x9cab, 0x9cad, 0x9cae, 0x9cb0, 0x9cb1, 0x9cb2, 0x9cb3,
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2991 0x9cc4, 0x9cc5, 0x9cc6, 0x9cc7, 0x9cca, 0x9ccb,
2992 /* 0xf7 */
2993 0x9c3c, 0x9c3d, 0x9c3e, 0x9c3f, 0x9c40, 0x9c41, 0x9c42, 0x9c43,
2994 0x9c44, 0x9c45, 0x9c46, 0x9c47, 0x9c48, 0x9c49, 0x9c4a, 0x9c4b,
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3002 0x9c8f, 0x9c93, 0x9c96, 0x9c97, 0x9c98, 0x9c99, 0x9c9d, 0x9caa,
3003 0x9cac, 0x9caf, 0x9cb9, 0x9cbe, 0x9cbf, 0x9cc0, 0x9cc1, 0x9cc2,
3004 0x9cc8, 0x9cc9, 0x9cd1, 0x9cd2, 0x9cda, 0x9cdb, 0x9ce0, 0x9ce1,
3005 0x9ccc, 0x9ccd, 0x9cce, 0x9ccf, 0x9cd0, 0x9cd3, 0x9cd4, 0x9cd5,
3006 0x9cd7, 0x9cd8, 0x9cd9, 0x9cdc, 0x9cdd, 0x9cdf, 0x9ce2, 0x977c,
3007 0x9785, 0x9791, 0x9792, 0x9794, 0x979a, 0x97ab, 0x97a3, 0x97b2,
3008 0x97b4, 0x9ab1, 0x9ab0, 0x9ab7, 0x9e58, 0x9ab6, 0x9aba, 0x9abc,
3009 0x9ac1, 0x9ac0, 0x9ac5, 0x9ac2, 0x9acb, 0x9acc, 0x9ad1, 0x9b45,
3010 0x9b43, 0x9b47, 0x9b49, 0x9b48, 0x9b4d, 0x9b51, 0x98e8, 0x990d,
3011 0x992e, 0x9955, 0x9954, 0x9adf, 0x9ae1, 0x9ae6, 0x9aef, 0x9aeb,
3012 0x9afb, 0x9aed, 0x9af9, 0x9b08, 0x9b0f, 0x9b13, 0x9b1f, 0x9b23,
3013 0x9ebd, 0x9ebe, 0x7e3b, 0x9e82, 0x9e87, 0x9e88, 0x9e8b, 0x9e92,
3014 0x93d6, 0x9e9d, 0x9e9f, 0x9edb, 0x9edc, 0x9edd, 0x9ee0, 0x9edf,
3015 0x9ee2, 0x9ee9, 0x9ee7, 0x9ee5, 0x9eea, 0x9ee6, 0x9f22, 0x9f2c,
3016 0x9f2f, 0x9f39, 0x9f37, 0x9f3d, 0x9f3e, 0x9f44,
3017 /* 0xf8 */
3018 0x9ce3, 0x9ce4, 0x9ce5, 0x9ce6, 0x9ce7, 0x9ce8, 0x9ce9, 0x9cea,
3019 0x9ceb, 0x9cec, 0x9ced, 0x9cee, 0x9cef, 0x9cf0, 0x9cf1, 0x9cf2,
3020 0x9cf3, 0x9cf4, 0x9cf5, 0x9cf6, 0x9cf7, 0x9cf8, 0x9cf9, 0x9cfa,
3021 0x9cfb, 0x9cfc, 0x9cfd, 0x9cfe, 0x9cff, 0x9d00, 0x9d01, 0x9d02,
3022 0x9d03, 0x9d04, 0x9d05, 0x9d06, 0x9d07, 0x9d08, 0x9d09, 0x9d0a,
3023 0x9d0b, 0x9d0c, 0x9d0d, 0x9d0e, 0x9d0f, 0x9d10, 0x9d11, 0x9d12,
3024 0x9d13, 0x9d14, 0x9d15, 0x9d16, 0x9d17, 0x9d18, 0x9d19, 0x9d1a,
3025 0x9d1b, 0x9d1c, 0x9d1d, 0x9d1e, 0x9d1f, 0x9d20, 0x9d21, 0x9d22,
3026 0x9d23, 0x9d24, 0x9d25, 0x9d26, 0x9d27, 0x9d28, 0x9d29, 0x9d2a,
3027 0x9d2b, 0x9d2c, 0x9d2d, 0x9d2e, 0x9d2f, 0x9d30, 0x9d31, 0x9d32,
3028 0x9d33, 0x9d34, 0x9d35, 0x9d36, 0x9d37, 0x9d38, 0x9d39, 0x9d3a,
3029 0x9d3b, 0x9d3c, 0x9d3d, 0x9d3e, 0x9d3f, 0x9d40, 0x9d41, 0x9d42,
3030 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3031 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
```

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3032 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3033 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3034 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3035 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3036 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3037 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3038 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3039 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3040 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3041 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3042 /* 0xf9 */
3043 0x9d43, 0x9d44, 0x9d45, 0x9d46, 0x9d47, 0x9d48, 0x9d49, 0x9d4a,
3044 0x9d4b, 0x9d4c, 0x9d4d, 0x9d4e, 0x9d4f, 0x9d50, 0x9d51, 0x9d52,
3045 0x9d53, 0x9d54, 0x9d55, 0x9d56, 0x9d57, 0x9d58, 0x9d59, 0x9d5a,
3046 0x9d5b, 0x9d5c, 0x9d5d, 0x9d5e, 0x9d5f, 0x9d60, 0x9d61, 0x9d62,
3047 0x9d63, 0x9d64, 0x9d65, 0x9d66, 0x9d67, 0x9d68, 0x9d69, 0x9d6a,
3048 0x9d6b, 0x9d6c, 0x9d6d, 0x9d6e, 0x9d6f, 0x9d70, 0x9d71, 0x9d72,
3049 0x9d73, 0x9d74, 0x9d75, 0x9d76, 0x9d77, 0x9d78, 0x9d79, 0x9d7a,
3050 0x9d7b, 0x9d7c, 0x9d7d, 0x9d7e, 0x9d7f, 0x9d80, 0x9d81, 0x9d82,
3051 0x9d83, 0x9d84, 0x9d85, 0x9d86, 0x9d87, 0x9d88, 0x9d89, 0x9d8a,
3052 0x9d8b, 0x9d8c, 0x9d8d, 0x9d8e, 0x9d8f, 0x9d90, 0x9d91, 0x9d92,
3053 0x9d93, 0x9d94, 0x9d95, 0x9d96, 0x9d97, 0x9d98, 0x9d99, 0x9da0,
3054 0x9da1, 0x9da2, 0x9da3, 0x9da4, 0x9da5, 0x9da6, 0x9da7, 0x9da8, 0x9da9,
3055 0x9daa, 0x9dab, 0x9dac, 0x9dad, 0x9dae, 0x9daf, 0x9db0, 0x9db1, 0x9db2,
3056 0x9db3, 0x9db4, 0x9db5, 0x9db6, 0x9db7, 0x9db8, 0x9db9, 0x9dba,
3057 0x9dbb, 0x9dbc, 0x9dbd, 0x9dbe, 0x9dbf, 0x9dc0, 0x9dc1, 0x9dc2,
3058 0x9dc3, 0x9dc4, 0x9dc5, 0x9dc6, 0x9dc7, 0x9dc8, 0x9dc9, 0x9dca,
3059 0x9dcb, 0x9dcc, 0x9dcd, 0x9dce, 0x9dcf, 0x9dd0, 0x9dd1, 0x9dd2,
3060 0x9dd3, 0x9dd4, 0x9dd5, 0x9dd6, 0x9dd7, 0x9dd8, 0x9dd9, 0x9dda,
3061 0x9ddb, 0x9ddb, 0x9ddd, 0x9dde, 0x9ddf, 0x9de0, 0x9de1, 0x9de2,
3062 0x9de3, 0x9de4, 0x9de5, 0x9de6, 0x9de7, 0x9de8, 0x9de9, 0x9dea,
3063 0x9deb, 0x9dec, 0x9ded, 0x9dee, 0x9def, 0x9df0, 0x9df1, 0x9df2,
3064 0x9df3, 0x9df4, 0x9df5, 0x9df6, 0x9df7, 0x9df8, 0x9df9, 0x9dfa,
3065 0x9dfb, 0x9dfc, 0x9dfd, 0x9dfe, 0x9dff, 0x9e00, 0x9e01, 0x9e02,
3066 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3067 /* 0xfa */
3068 0x9da3, 0x9da4, 0x9da5, 0x9da6, 0x9da7, 0x9da8, 0x9da9, 0x9daa,
3069 0x9dab, 0x9dac, 0x9dad, 0x9dae, 0x9daf, 0x9db0, 0x9db1, 0x9db2,
3070 0x9db3, 0x9db4, 0x9db5, 0x9db6, 0x9db7, 0x9db8, 0x9db9, 0x9dba,
3071 0x9dbb, 0x9dbc, 0x9dbd, 0x9dbe, 0x9dbf, 0x9dc0, 0x9dc1, 0x9dc2,
3072 0x9dc3, 0x9dc4, 0x9dc5, 0x9dc6, 0x9dc7, 0x9dc8, 0x9dc9, 0x9dca,
3073 0x9dcb, 0x9dcc, 0x9dcd, 0x9dce, 0x9dcf, 0x9dd0, 0x9dd1, 0x9dd2,
3074 0x9dd3, 0x9dd4, 0x9dd5, 0x9dd6, 0x9dd7, 0x9dd8, 0x9dd9, 0x9dda,
3075 0x9ddb, 0x9ddb, 0x9ddd, 0x9dde, 0x9ddf, 0x9de0, 0x9de1, 0x9de2,
3076 0x9de3, 0x9de4, 0x9de5, 0x9de6, 0x9de7, 0x9de8, 0x9de9, 0x9dea,
3077 0x9deb, 0x9dec, 0x9ded, 0x9dee, 0x9def, 0x9df0, 0x9df1, 0x9df2,
3078 0x9df3, 0x9df4, 0x9df5, 0x9df6, 0x9df7, 0x9df8, 0x9df9, 0x9dfa,
3079 0x9dfb, 0x9dfc, 0x9dfd, 0x9dfe, 0x9dff, 0x9e00, 0x9e01, 0x9e02,
3080 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3081 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3082 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3083 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3084 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3085 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3086 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3087 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3088 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3089 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3090 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3091 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
3092 /* 0xfb */
3093 0x9e03, 0x9e04, 0x9e05, 0x9e06, 0x9e07, 0x9e08, 0x9e09, 0x9e0a,
3094 0x9e0b, 0x9e0c, 0x9e0d, 0x9e0e, 0x9e0f, 0x9e10, 0x9e11, 0x9e12,
3095 0x9e13, 0x9e14, 0x9e15, 0x9e16, 0x9e17, 0x9e18, 0x9e19, 0x9e1a,
3096 0x9e1b, 0x9e1c, 0x9e1d, 0x9e1e, 0x9e1f, 0x9e20, 0x9e21, 0x9e22,
3097 0x9e23, 0x9e24, 0x9e25, 0x9e26, 0x9e27, 0x9e28, 0x9e29, 0x9e2a,
3098 0x9e2b, 0x9e2c, 0x9e2d, 0x9e2e, 0x9e2f, 0x9e30, 0x9e31, 0x9e32,
3099 0x9e33, 0x9e34, 0x9e35, 0x9e36, 0x9e37, 0x9e38, 0x9e39, 0x9e3a,
3100 0x9e3b, 0x9e3c, 0x9e3d, 0x9e3e, 0x9e3f, 0x9e40, 0x9e41, 0x9e42,
3101 0x9e43, 0x9e44, 0x9e45, 0x9e46, 0x9e47, 0x9e48, 0x9e49, 0x9e4a,
3102 0x9e4b, 0x9e4c, 0x9e4d, 0x9e4e, 0x9e4f, 0x9e50, 0x9e51, 0x9e52,
3103 0x9e53, 0x9e54, 0x9e55, 0x9e56, 0x9e57, 0x9e58, 0x9e59, 0x9e5a,
3104 0x9e5b, 0x9e5c, 0x9e5d, 0x9e5e, 0x9e5f, 0x9e60, 0x9e61, 0x9e62,
3105 0x9e63, 0x9e64, 0x9e65, 0x9e66, 0x9e67, 0x9e68, 0x9e69, 0x9e6a,
3106 0x9e6b, 0x9e6c, 0x9e6d, 0x9e6e, 0x9e6f, 0x9e70, 0x9e71, 0x9e72,
3107 0x9e73, 0x9e74, 0x9e75, 0x9e76, 0x9e77, 0x9e78, 0x9e79, 0x9e7a,
3108 0x9e7b, 0x9e7c, 0x9e7d, 0x9e7e, 0x9e7f, 0x9e80, 0x9e81, 0x9e82,
3109 0x9e83, 0x9e84, 0x9e85, 0x9e86, 0x9e87, 0x9e88, 0x9e89, 0x9e8a,
3110 0x9e8b, 0x9e8c, 0x9e8d, 0x9e8e, 0x9e8f, 0x9e90, 0x9e91, 0x9e92,
3111 0x9e93, 0x9e94, 0x9e95, 0x9e96, 0x9e97, 0x9e98, 0x9e99, 0x9e9a,
3112 0x9e9b, 0x9e9c, 0x9e9d, 0x9e9e, 0x9e9f, 0x9ea0, 0x9ea1, 0x9ea2,
3113 0x9ea3, 0x9ea4, 0x9ea5, 0x9ea6, 0x9ea7, 0x9ea8, 0x9ea9, 0x9eaa,
3114 0x9eab, 0x9eac, 0x9ead, 0x9eae, 0x9eaf, 0x9eb0, 0x9eb1, 0x9eb2,
3115 0x9eb3, 0x9eb4, 0x9eb5, 0x9eb6, 0x9eb7, 0x9eb8, 0x9eb9, 0x9eba,
3116 0x9ebb, 0x9ebc, 0x9ebd, 0x9ebe, 0x9ebf, 0x9ec0, 0x9ec1, 0x9ec2,
3117 /* 0xfc */
3118 0x9eab, 0x9eac, 0x9ead, 0x9eae, 0x9eaf, 0x9eb0, 0x9eb1, 0x9eb2,

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3119 0x9eb3, 0x9eb5, 0x9eb6, 0x9eb7, 0x9eb9, 0x9eba, 0x9ebc, 0x9ebf,
3120 0x9ec0, 0x9ec1, 0x9ec2, 0x9ec3, 0x9ec5, 0x9ec6, 0x9ec7, 0x9ec8,
3121 0x9eca, 0x9ecb, 0x9ecc, 0x9ed0, 0x9ed2, 0x9ed3, 0x9ed5, 0x9ed6,
3122 0x9ed7, 0x9ed9, 0x9eda, 0x9ede, 0x9eel, 0x9ee3, 0x9ee4, 0x9ee6,
3123 0x9ee8, 0x9eeb, 0x9eec, 0x9eed, 0x9eee, 0x9ef0, 0x9ef1, 0x9ef2,
3124 0x9ef3, 0x9ef4, 0x9ef5, 0x9ef6, 0x9ef7, 0x9ef8, 0x9efa, 0x9efd,
3125 0x9eff, 0x9f00, 0x9f01, 0x9f02, 0x9f03, 0x9f04, 0x9f05, 0x9f06,
3126 0x9f07, 0x9f08, 0x9f09, 0x9f0a, 0x9f0c, 0x9f0f, 0x9f11, 0x9f12,
3127 0x9f14, 0x9f15, 0x9f16, 0x9f18, 0x9f1a, 0x9f1b, 0x9f1c, 0x9f1d,
3128 0x9f1e, 0x9f1f, 0x9f21, 0x9f23, 0x9f24, 0x9f25, 0x9f26, 0x9f27,
3129 0x9f28, 0x9f29, 0x9f2a, 0x9f2b, 0x9f2d, 0x9f2e, 0x9f30, 0x9f31,
3130 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3131 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3132 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3133 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3134 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3135 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3136 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3137 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3138 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3139 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3140 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3141 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3142 /* 0xfd */
3143 0x9f32, 0x9f33, 0x9f34, 0x9f35, 0x9f36, 0x9f38, 0x9f3a, 0x9f3c,
3144 0x9f3f, 0x9f40, 0x9f41, 0x9f42, 0x9f43, 0x9f45, 0x9f46, 0x9f47,
3145 0x9f48, 0x9f49, 0x9f4a, 0x9f4b, 0x9f4c, 0x9f4d, 0x9f4e, 0x9f4f,
3146 0x9f52, 0x9f53, 0x9f54, 0x9f55, 0x9f56, 0x9f57, 0x9f58, 0x9f59,
3147 0x9f5a, 0x9f5b, 0x9f5c, 0x9f5d, 0x9f5e, 0x9f5f, 0x9f60, 0x9f61,
3148 0x9f62, 0x9f63, 0x9f64, 0x9f65, 0x9f66, 0x9f67, 0x9f68, 0x9f69,
3149 0x9f6a, 0x9f6b, 0x9f6c, 0x9f6d, 0x9f6e, 0x9f6f, 0x9f70, 0x9f71,
3150 0x9f72, 0x9f73, 0x9f74, 0x9f75, 0x9f76, 0x9f77, 0x9f78, 0x9f79,
3151 0x9f7a, 0x9f7b, 0x9f7c, 0x9f7d, 0x9f7e, 0x9f81, 0x9f82, 0x9f8d,
3152 0x9f8e, 0x9f8f, 0x9f90, 0x9f91, 0x9f92, 0x9f93, 0x9f94, 0x9f95,
3153 0x9f96, 0x9f97, 0x9f98, 0x9f9c, 0x9f9d, 0x9f9e, 0x9fa1, 0x9fa2,
3154 0x9fa3, 0x9fa4, 0x9fa5, 0xf92c, 0xf979, 0xf995, 0xf9e7, 0xf9f1,
3155 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3156 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3157 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3158 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3159 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3160 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3161 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3162 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3163 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3164 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3165 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3166 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
3167 /* 0xfe */
3168 0xfa0c, 0xfa0d, 0xfa0e, 0xfa0f, 0xfa11, 0xfa13, 0xfa14, 0xfa18,
3169 0xfa1f, 0xfa20, 0xfa21, 0xfa23, 0xfa24, 0xfa27, 0xfa28, 0xfa29,
3170 };
3171
3172 static int
3173 cp936ext_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
3174 {
3175     unsigned char c1 = s[0];
3176     if ((c1 >= 0x81 && c1 <= 0xfe)) {
3177         if (n >= 2) {
3178             unsigned char c2 = s[1];
3179             if ((c2 >= 0x40 && c2 < 0x7f) || (c2 >= 0x80 && c2 < 0xff)) {
3180                 unsigned int i = 190 * (c1 - 0x81) + (c2 - (c2 >= 0x80 ? 0x41 : 0x40));
3181                 unsigned short wc = 0xffff;
3182                 {
3183                     if (i < 23766)
3184                         wc = cp936ext_2uni_page81[i];
3185                 }
3186                 if (wc != 0xffff) {
3187                     *pwc = (ucs4_t) wc;
3188                     return 2;
3189                 }
3190             }
3191             return RET_ILSEQ;
3192         }
3193         return RET_TOOFEW(0);
3194     }
3195     return RET_ILSEQ;
3196 }
3197 #endif /* NEED_TOWC */
3198
3199 #ifdef NEED_TOMB
3200
3201 static const unsigned short cp936ext_page0014[208] = {
3202     0x0000, 0x0000, 0x0000, 0x0000, 0xale8, 0x0000, 0x0000, 0xalec, /*0xa0-0xa7*/
3203     0xala7, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xa8-0xaf*/
3204     0xale3, 0xalc0, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xala4, /*0xb0-0xb7*/
3205     0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xb8-0xbf*/

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```

3206 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xc0-0xc7*/
3207 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xc8-0xcf*/
3208 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1c1, /*0xd0-0xd7*/
3209 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xd8-0xdf*/
3210 0xa8a4, 0xa8a2, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xe0-0xe7*/
3211 0xa8a8, 0xa8a6, 0xa8ba, 0x0000, 0xa8ac, 0xa8aa, 0x0000, 0x0000, /*0xe8-0xef*/
3212 0x0000, 0x0000, 0xa8b0, 0xa8ae, 0x0000, 0x0000, 0x0000, 0xa1c2, /*0xf0-0xf7*/
3213 0x0000, 0xa8b4, 0xa8b2, 0x0000, 0xa8b9, 0x0000, 0x0000, 0x0000, /*0xf8-0xff*/
3214 /* 0x0100 */
3215 0x0000, 0xa8a1, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x00-0x07*/
3216 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x08-0x0f*/
3217 0x0000, 0x0000, 0x0000, 0xa8a5, 0x0000, 0x0000, 0x0000, 0x0000, /*0x10-0x17*/
3218 0x0000, 0x0000, 0x0000, 0xa8a7, 0x0000, 0x0000, 0x0000, 0x0000, /*0x18-0x1f*/
3219 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x20-0x27*/
3220 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x28-0x2f*/
3221 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x30-0x37*/
3222 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x38-0x3f*/
3223 0x0000, 0x0000, 0x0000, 0x0000, 0xa8bd, 0x0000, 0x0000, 0x0000, /*0x40-0x47*/
3224 0xa8be, 0x0000, 0x0000, 0x0000, 0x0000, 0xa8ad, 0x0000, 0x0000, /*0x48-0x4f*/
3225 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x50-0x57*/
3226 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x58-0x5f*/
3227 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x60-0x67*/
3228 0x0000, 0x0000, 0x0000, 0xa8b1, 0x0000, 0x0000, 0x0000, 0x0000, /*0x68-0x6f*/
3229 };
3230 static const unsigned short cp936ext_page0039[24] = {
3231 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa8a3, 0x0000, /*0xc8-0xcf*/
3232 0xa8ab, 0x0000, 0xa8af, 0x0000, 0xa8b3, 0x0000, 0xa8b5, 0x0000, /*0xd0-0xd7*/
3233 0xa8b6, 0x0000, 0xa8b7, 0x0000, 0xa8b8, 0x0000, 0x0000, 0x0000, /*0xd8-0xdf*/
3234 };
3235 static const unsigned short cp936ext_page004a[24] = {
3236 0x0000, 0xa8bb, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x50-0x57*/
3237 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x58-0x5f*/
3238 0x0000, 0xa8c0, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x60-0x67*/
3239 };
3240 static const unsigned short cp936ext_page0058[32] = {
3241 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1a6, /*0xc0-0xc7*/
3242 0x0000, 0xa1a5, 0xa840, 0xa841, 0x0000, 0x0000, 0x0000, 0x0000, /*0xc8-0xcf*/
3243 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xd0-0xd7*/
3244 0x0000, 0xa842, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xd8-0xdf*/
3245 };
3246 static const unsigned short cp936ext_page0072[64] = {
3247 0x0000, 0xa6a1, 0xa6a2, 0xa6a3, 0xa6a4, 0xa6a5, 0xa6a6, 0xa6a7, /*0x90-0x97*/
3248 0xa6a8, 0xa6a9, 0xa6aa, 0xa6ab, 0xa6ac, 0xa6ad, 0xa6ae, 0xa6af, /*0x98-0x9f*/
3249 0xa6b0, 0xa6b1, 0x0000, 0xa6b2, 0xa6b3, 0xa6b4, 0xa6b5, 0xa6b6, /*0xa0-0xa7*/
3250 0xa6b7, 0xa6b8, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xa8-0xaf*/
3251 0x0000, 0xa6c1, 0xa6c2, 0xa6c3, 0xa6c4, 0xa6c5, 0xa6c6, 0xa6c7, /*0xb0-0xb7*/
3252 0xa6c8, 0xa6c9, 0xa6ca, 0xa6cb, 0xa6cc, 0xa6cd, 0xa6ce, 0xa6cf, /*0xb8-0xbf*/
3253 0xa6d0, 0xa6d1, 0x0000, 0xa6d2, 0xa6d3, 0xa6d4, 0xa6d5, 0xa6d6, /*0xc0-0xcf*/
3254 0xa6d7, 0xa6d8, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xc8-0xcf*/
3255 };
3256 static const unsigned short cp936ext_page0080[88] = {
3257 0x0000, 0xa7a7, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x00-0x07*/
3258 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x08-0x0f*/
3259 0xa7a1, 0xa7a2, 0xa7a3, 0xa7a4, 0xa7a5, 0xa7a6, 0xa7a8, 0xa7a9, /*0x10-0x17*/
3260 0xa7aa, 0xa7ab, 0xa7ac, 0xa7ad, 0xa7ae, 0xa7af, 0xa7b0, 0xa7b1, /*0x18-0x1f*/
3261 0xa7b2, 0xa7b3, 0xa7b4, 0xa7b5, 0xa7b6, 0xa7b7, 0xa7b8, 0xa7b9, /*0x20-0x27*/
3262 0xa7ba, 0xa7bb, 0xa7bc, 0xa7bd, 0xa7be, 0xa7bf, 0xa7c0, 0xa7c1, /*0x28-0x2f*/
3263 0xa7d1, 0xa7d2, 0xa7d3, 0xa7d4, 0xa7d5, 0xa7d6, 0xa7d8, 0xa7d9, /*0x30-0x37*/
3264 0xa7da, 0xa7db, 0xa7dc, 0xa7dd, 0xa7de, 0xa7df, 0xa7e0, 0xa7e1, /*0x38-0x3f*/
3265 0xa7e2, 0xa7e3, 0xa7e4, 0xa7e5, 0xa7e6, 0xa7e7, 0xa7e8, 0xa7e9, /*0x40-0x47*/
3266 0xa7ea, 0xa7eb, 0xa7ec, 0xa7ed, 0xa7ee, 0xa7ef, 0xa7f0, 0xa7f1, /*0x48-0x4f*/
3267 0x0000, 0xa7d7, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x50-0x57*/
3268 };
3269 static const unsigned short cp936ext_page0402[48] = {
3270 0xa95c, 0x0000, 0x0000, 0xa843, 0xa1aa, 0xa844, 0xa1ac, 0x0000, /*0x10-0x17*/
3271 0xa1ae, 0xa1af, 0x0000, 0x0000, 0xa1b0, 0xa1b1, 0x0000, 0x0000, /*0x18-0x1f*/
3272 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa845, 0xa1ad, 0x0000, /*0x20-0x27*/
3273 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x28-0x2f*/
3274 0xa1eb, 0x0000, 0xa1e4, 0xa1e5, 0x0000, 0xa846, 0x0000, 0x0000, /*0x30-0x37*/
3275 0x0000, 0x0000, 0x0000, 0xa1f9, 0x0000, 0x0000, 0x0000, 0x0000, /*0x38-0x3f*/
3276 };
3277 static const unsigned short cp936ext_page0420[160] = {
3278 0x0000, 0x0000, 0x0000, 0xa1e6, 0x0000, 0xa847, 0x0000, 0x0000, /*0x00-0x07*/
3279 0x0000, 0xa848, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x08-0x0f*/
3280 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1ed, 0x0000, /*0x10-0x17*/
3281 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x18-0x1f*/
3282 0x0000, 0xa959, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x20-0x27*/
3283 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x28-0x2f*/
3284 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x30-0x37*/
3285 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x38-0x3f*/
3286 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x40-0x47*/
3287 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x48-0x4f*/
3288 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x50-0x57*/
3289 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x58-0x5f*/
3290 0xa2f1, 0xa2f2, 0xa2f3, 0xa2f4, 0xa2f5, 0xa2f6, 0xa2f7, 0xa2f8, /*0x60-0x67*/
3291 0xa2f9, 0xa2fa, 0xa2fb, 0xa2fc, 0x0000, 0x0000, 0x0000, 0x0000, /*0x68-0x6f*/
3292 0xa2a1, 0xa2a2, 0xa2a3, 0xa2a4, 0xa2a5, 0xa2a6, 0xa2a7, 0xa2a8, /*0x70-0x77*/

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3293 0xa2a9, 0xa2aa, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x78-0x7f*/
3294 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x80-0x87*/
3295 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x88-0x8f*/
3296 0xa1fb, 0xa1fc, 0xa1fa, 0xa1fd, 0x0000, 0x0000, 0xa849, 0xa84a, /*0x90-0x97*/
3297 0xa84b, 0xa84c, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x98-0x9f*/
3298 };
3299 static const unsigned short cp936ext_page0441[184] = {
3300 0xa1ca, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1c7, /*0x08-0x0f*/
3301 0x0000, 0xa1c6, 0x0000, 0x0000, 0x0000, 0xa84d, 0x0000, 0x0000, /*0x10-0x17*/
3302 0x0000, 0x0000, 0xa1cc, 0x0000, 0x0000, 0xa1d8, 0xa1de, 0xa84e, /*0x18-0x1f*/
3303 0xa1cf, 0x0000, 0x0000, 0xa84f, 0x0000, 0xa1ce, 0x0000, 0xa1c4, /*0x20-0x27*/
3304 0xa1c5, 0xa1c9, 0xa1c8, 0xa1d2, 0x0000, 0x0000, 0xa1d3, 0x0000, /*0x28-0x2f*/
3305 0x0000, 0x0000, 0x0000, 0x0000, 0xa1e0, 0xa1df, 0xa1c3, 0xa1cb, /*0x30-0x37*/
3306 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1d7, 0x0000, 0x0000, /*0x38-0x3f*/
3307 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x40-0x47*/
3308 0xa1d6, 0x0000, 0x0000, 0x0000, 0xa1d5, 0x0000, 0x0000, 0x0000, /*0x48-0x4f*/
3309 0x0000, 0x0000, 0xa850, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x50-0x57*/
3310 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x58-0x5f*/
3311 0xa1d9, 0xa1d4, 0x0000, 0x0000, 0xa1dc, 0xa1dd, 0xa851, 0xa852, /*0x60-0x67*/
3312 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1da, 0xa1db, /*0x68-0x6f*/
3313 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x70-0x77*/
3314 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x78-0x7f*/
3315 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x80-0x87*/
3316 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x88-0x8f*/
3317 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa892, 0x0000, 0x0000, /*0x90-0x97*/
3318 0x0000, 0xa1d1, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x98-0x9f*/
3319 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1cd, 0x0000, 0x0000, /*0xa0-0xa7*/
3320 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xa8-0xaf*/
3321 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xb0-0xbf*/
3322 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa853, /*0xb8-0xbf*/
3323 };
3324 static const unsigned short cp936ext_page048c[64] = {
3325 0xa2d9, 0xa2da, 0xa2db, 0xa2dc, 0xa2dd, 0xa2de, 0xa2df, 0xa2e0, /*0x60-0x67*/
3326 0xa2e1, 0xa2e2, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x68-0x6f*/
3327 0x0000, 0x0000, 0x0000, 0x0000, 0xa2c5, 0xa2c6, 0xa2c7, 0xa2c8, /*0x70-0x77*/
3328 0xa2c9, 0xa2ca, 0xa2cb, 0xa2cc, 0xa2cd, 0xa2ce, 0xa2cf, 0xa2d0, /*0x78-0x7f*/
3329 0xa2d1, 0xa2d2, 0xa2d3, 0xa2d4, 0xa2d5, 0xa2d6, 0xa2d7, 0xa2d8, /*0x80-0x87*/
3330 0xa2b1, 0xa2b2, 0xa2b3, 0xa2b4, 0xa2b5, 0xa2b6, 0xa2b7, 0xa2b8, /*0x88-0x8f*/
3331 0xa2b9, 0xa2ba, 0xa2bb, 0xa2bc, 0xa2bd, 0xa2be, 0xa2bf, 0xa2c0, /*0x90-0x97*/
3332 0xa2c1, 0xa2c2, 0xa2c3, 0xa2c4, 0x0000, 0x0000, 0x0000, 0x0000, /*0x98-0x9f*/
3333 };
3334 static const unsigned short cp936ext_page04a0[232] = {
3335 0xa9a4, 0xa9a5, 0xa9a6, 0xa9a7, 0xa9a8, 0xa9a9, 0xa9aa, 0xa9ab, /*0x00-0x07*/
3336 0xa9ac, 0xa9ad, 0xa9ae, 0xa9af, 0xa9b0, 0xa9b1, 0xa9b2, 0xa9b3, /*0x08-0x0f*/
3337 0xa9b4, 0xa9b5, 0xa9b6, 0xa9b7, 0xa9b8, 0xa9b9, 0xa9ba, 0xa9bb, /*0x10-0x17*/
3338 0xa9bc, 0xa9bd, 0xa9be, 0xa9bf, 0xa9c0, 0xa9c1, 0xa9c2, 0xa9c3, /*0x18-0x1f*/
3339 0xa9c4, 0xa9c5, 0xa9c6, 0xa9c7, 0xa9c8, 0xa9c9, 0xa9ca, 0xa9cb, /*0x20-0x27*/
3340 0xa9cc, 0xa9cd, 0xa9ce, 0xa9cf, 0xa9d0, 0xa9d1, 0xa9d2, 0xa9d3, /*0x28-0x2f*/
3341 0xa9d4, 0xa9d5, 0xa9d6, 0xa9d7, 0xa9d8, 0xa9d9, 0xa9da, 0xa9db, /*0x30-0x37*/
3342 0xa9dc, 0xa9dd, 0xa9de, 0xa9df, 0xa9e0, 0xa9e1, 0xa9e2, 0xa9e3, /*0x38-0x3f*/
3343 0xa9e4, 0xa9e5, 0xa9e6, 0xa9e7, 0xa9e8, 0xa9e9, 0xa9ea, 0xa9eb, /*0x40-0x47*/
3344 0xa9ec, 0xa9ed, 0xa9ee, 0xa9ef, 0x0000, 0x0000, 0x0000, 0x0000, /*0x48-0x4f*/
3345 0xa854, 0xa855, 0xa856, 0xa857, 0xa858, 0xa859, 0xa85a, 0xa85b, /*0x50-0x57*/
3346 0xa85c, 0xa85d, 0xa85e, 0xa85f, 0xa860, 0xa861, 0xa862, 0xa863, /*0x58-0x5f*/
3347 0xa864, 0xa865, 0xa866, 0xa867, 0xa868, 0xa869, 0xa86a, 0xa86b, /*0x60-0x67*/
3348 0xa86c, 0xa86d, 0xa86e, 0xa86f, 0xa870, 0xa871, 0xa872, 0xa873, /*0x68-0x6f*/
3349 0xa874, 0xa875, 0xa876, 0xa877, 0x0000, 0x0000, 0x0000, 0x0000, /*0x70-0x77*/
3350 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x78-0x7f*/
3351 0x0000, 0xa878, 0xa879, 0xa87a, 0xa87b, 0xa87c, 0xa87d, 0xa87e, /*0x80-0x87*/
3352 0xa880, 0xa881, 0xa882, 0xa883, 0xa884, 0xa885, 0xa886, 0xa887, /*0x88-0x8f*/
3353 0x0000, 0x0000, 0x0000, 0xa888, 0xa889, 0xa88a, 0x0000, 0x0000, /*0x90-0x97*/
3354 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x98-0x9f*/
3355 0xa1f6, 0xa1f5, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xa0-0xa7*/
3356 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xa8-0xaf*/
3357 0x0000, 0x0000, 0xa1f8, 0xa1f7, 0x0000, 0x0000, 0x0000, 0x0000, /*0xb0-0xbf*/
3358 0x0000, 0x0000, 0x0000, 0x0000, 0xa88b, 0xa88c, 0x0000, 0x0000, /*0xb8-0xbf*/
3359 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1f4, 0xa1f3, /*0xc0-0xc7*/
3360 0x0000, 0x0000, 0x0000, 0xa1f0, 0x0000, 0x0000, 0xa1f2, 0xa1f1, /*0xc8-0xcf*/
3361 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xd0-0xdf*/
3362 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xe0-0xef*/
3363 0x0000, 0x0000, 0xa88d, 0xa88e, 0xa88f, 0xa890, 0x0000, 0x0000, /*0xf0-0xff*/
3364 };
3365 static const unsigned short cp936ext_page04c0[72] = {
3366 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa1ef, 0xa1ee, /*0x00-0x07*/
3367 0x0000, 0xa891, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x08-0x0f*/
3368 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x10-0x17*/
3369 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x18-0x1f*/
3370 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x20-0x27*/
3371 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x28-0x2f*/
3372 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x30-0x37*/
3373 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x38-0x3f*/
3374 0xa1e2, 0x0000, 0xa1e1, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x40-0x47*/
3375 };
3376 static const unsigned short cp936ext_page0600[304] = {
3377 0xa1a1, 0xa1a2, 0xa1a3, 0xa1a8, 0x0000, 0xa1a9, 0xa965, 0xa996, /*0x00-0x07*/
3378 0xa1b4, 0xa1b5, 0xa1b6, 0xa1b7, 0xa1b8, 0xa1b9, 0xa1ba, 0xa1bb, /*0x08-0x0f*/
3379 0xa1be, 0xa1bf, 0xa893, 0xa1fe, 0xa1b2, 0xa1b3, 0xa1bc, 0xa1bd, /*0x10-0x17*/
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3380 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa894, 0xa895, 0x0000, /*0x18-0x1f*/
3381 0x0000, 0xa940, 0xa941, 0xa942, 0xa943, 0xa944, 0xa945, 0xa946, /*0x20-0x27*/
3382 0xa947, 0xa948, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x28-0x2f*/
3383 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x30-0x37*/
3384 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x38-0x3f*/
3385 0x0000, 0xa4a1, 0xa4a2, 0xa4a3, 0xa4a4, 0xa4a5, 0xa4a6, 0xa4a7, /*0x40-0x47*/
3386 0xa4a8, 0xa4a9, 0xa4aa, 0xa4ab, 0xa4ac, 0xa4ad, 0xa4ae, 0xa4af, /*0x48-0x4f*/
3387 0xa4b0, 0xa4b1, 0xa4b2, 0xa4b3, 0xa4b4, 0xa4b5, 0xa4b6, 0xa4b7, /*0x50-0x57*/
3388 0xa4b8, 0xa4b9, 0xa4ba, 0xa4bb, 0xa4bc, 0xa4bd, 0xa4be, 0xa4bf, /*0x58-0x5f*/
3389 0xa4c0, 0xa4c1, 0xa4c2, 0xa4c3, 0xa4c4, 0xa4c5, 0xa4c6, 0xa4c7, /*0x60-0x67*/
3390 0xa4c8, 0xa4c9, 0xa4ca, 0xa4cb, 0xa4cc, 0xa4cd, 0xa4ce, 0xa4cf, /*0x68-0x6f*/
3391 0xa4d0, 0xa4d1, 0xa4d2, 0xa4d3, 0xa4d4, 0xa4d5, 0xa4d6, 0xa4d7, /*0x70-0x77*/
3392 0xa4d8, 0xa4d9, 0xa4da, 0xa4db, 0xa4dc, 0xa4dd, 0xa4de, 0xa4df, /*0x78-0x7f*/
3393 0xa4e0, 0xa4e1, 0xa4e2, 0xa4e3, 0xa4e4, 0xa4e5, 0xa4e6, 0xa4e7, /*0x80-0x87*/
3394 0xa4e8, 0xa4e9, 0xa4ea, 0xa4eb, 0xa4ec, 0xa4ed, 0xa4ee, 0xa4ef, /*0x88-0x8f*/
3395 0xa4f0, 0xa4f1, 0xa4f2, 0xa4f3, 0x0000, 0x0000, 0x0000, 0x0000, /*0x90-0x97*/
3396 0x0000, 0x0000, 0x0000, 0xa961, 0xa962, 0xa966, 0xa967, 0x0000, /*0x98-0x9f*/
3397 0x0000, 0xa5a1, 0xa5a2, 0xa5a3, 0xa5a4, 0xa5a5, 0xa5a6, 0xa5a7, /*0xa0-0xa7*/
3398 0xa5a8, 0xa5a9, 0xa5aa, 0xa5ab, 0xa5ac, 0xa5ad, 0xa5ae, 0xa5af, /*0xa8-0xaf*/
3399 0xa5b0, 0xa5b1, 0xa5b2, 0xa5b3, 0xa5b4, 0xa5b5, 0xa5b6, 0xa5b7, /*0xb0-0xb7*/
3400 0xa5b8, 0xa5b9, 0xa5ba, 0xa5bb, 0xa5bc, 0xa5bd, 0xa5be, 0xa5bf, /*0xb8-0xbf*/
3401 0xa5c0, 0xa5c1, 0xa5c2, 0xa5c3, 0xa5c4, 0xa5c5, 0xa5c6, 0xa5c7, /*0xc0-0xc7*/
3402 0xa5c8, 0xa5c9, 0xa5ca, 0xa5cb, 0xa5cc, 0xa5cd, 0xa5ce, 0xa5cf, /*0xc8-0xcf*/
3403 0xa5d0, 0xa5d1, 0xa5d2, 0xa5d3, 0xa5d4, 0xa5d5, 0xa5d6, 0xa5d7, /*0xd0-0xd7*/
3404 0xa5d8, 0xa5d9, 0xa5da, 0xa5db, 0xa5dc, 0xa5dd, 0xa5de, 0xa5df, /*0xd8-0xdf*/
3405 0xa5e0, 0xa5e1, 0xa5e2, 0xa5e3, 0xa5e4, 0xa5e5, 0xa5e6, 0xa5e7, /*0xe0-0xef*/
3406 0xa5e8, 0xa5e9, 0xa5ea, 0xa5eb, 0xa5ec, 0xa5ed, 0xa5ee, 0xa5ef, /*0xf0-0xff*/
3407 0xa5f0, 0xa5f1, 0xa5f2, 0xa5f3, 0xa5f4, 0xa5f5, 0xa5f6, 0x0000, /*0xf0-0xff*/
3408 0x0000, 0x0000, 0x0000, 0x0000, 0xa960, 0xa963, 0xa964, 0x0000, /*0xf8-0xff*/
3409 /* 0x3100 */
3410 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa8c5, 0xa8c6, 0xa8c7, /*0x00-0x07*/
3411 0xa8c8, 0xa8c9, 0xa8ca, 0xa8cb, 0xa8cc, 0xa8cd, 0xa8ce, 0xa8cf, /*0x08-0x0f*/
3412 0xa8d0, 0xa8d1, 0xa8d2, 0xa8d3, 0xa8d4, 0xa8d5, 0xa8d6, 0xa8d7, /*0x10-0x17*/
3413 0xa8d8, 0xa8d9, 0xa8da, 0xa8db, 0xa8dc, 0xa8dd, 0xa8de, 0xa8df, /*0x18-0x1f*/
3414 0xa8e0, 0xa8e1, 0xa8e2, 0xa8e3, 0xa8e4, 0xa8e5, 0xa8e6, 0xa8e7, /*0x20-0x27*/
3415 0xa8e8, 0xa8e9, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x28-0x2f*/
3416 };
3417 static const unsigned short cp936ext_page0644[24] = {
3418 0xa2e5, 0xa2e6, 0xa2e7, 0xa2e8, 0xa2e9, 0xa2ea, 0xa2eb, 0xa2ec, /*0x20-0x27*/
3419 0xa2ed, 0xa2ee, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x28-0x2f*/
3420 0x0000, 0xa95a, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x30-0x37*/
3421 };
3422 static const unsigned short cp936ext_page0671[80] = {
3423 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa94a, 0xa94b, /*0x88-0x8f*/
3424 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x90-0x97*/
3425 0x0000, 0x0000, 0x0000, 0x0000, 0xa94c, 0xa94d, 0xa94e, 0x0000, /*0x98-0x9f*/
3426 0x0000, 0xa94f, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xa0-0xaf*/
3427 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xa8-0xaf*/
3428 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xb0-0xbf*/
3429 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xb8-0xbf*/
3430 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa950, 0x0000, 0x0000, /*0xc0-0xcf*/
3431 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xa951, 0x0000, /*0xc8-0xcf*/
3432 0x0000, 0xa952, 0xa953, 0x0000, 0x0000, 0xa954, 0x0000, 0x0000, /*0xd0-0xd7*/
3433 };
3434 static const unsigned short cp936ext_page09c0[20904] = {
3435 0xd2bb, 0xb6a1, 0x8140, 0xc6df, 0x8141, 0x8142, 0x8143, 0xcdf2, /*0x00-0x07*/
3436 0xd5c9, 0xc8fd, 0xc9cf, 0xcfc2, 0xd8a2, 0xb2bb, 0xd3eb, 0x8144, /*0x08-0x0f*/
3437 0xd8a4, 0xb3f3, 0x8145, 0xd7a8, 0xc7d2, 0xd8a7, 0xcac0, 0x8146, /*0x10-0x17*/
3438 0xc7f0, 0xb1fb, 0xd2b5, 0xb4d4, 0xb6aa, 0xcbbf, 0xd8a9, 0x8147, /*0x18-0x1f*/
3439 0x8148, 0x8149, 0xb6aa, 0x814a, 0xc1bd, 0xd1cf, 0x814b, 0xc9a5, /*0x20-0x27*/
3440 0xd8ad, 0x814c, 0xb8f6, 0xd1be, 0xe3dc, 0xd6d0, 0x814d, 0x814e, /*0x28-0x2f*/
3441 0xb7e1, 0x814f, 0xb4ae, 0x8150, 0xc1d9, 0x8151, 0xd8bc, 0x8152, /*0x30-0x37*/
3442 0xcde8, 0xb5a4, 0xceaa, 0xd6f7, 0x8153, 0xc0f6, 0xbdd9, 0xd8af, /*0x38-0x3f*/
3443 0x8154, 0x8155, 0x8156, 0xc4cb, 0x8157, 0xbec3, 0x8158, 0xd8b1, /*0x40-0x47*/
3444 0xc3b4, 0xd2e5, 0x8159, 0xd6ae, 0xcda, 0xd5a7, 0xbaf5, 0xb7a6, /*0x48-0x4f*/
3445 0xc0d6, 0x815a, 0xc6b9, 0xc5d2, 0xc7c7, 0x815b, 0xb9d4, 0x815c, /*0x50-0x57*/
3446 0xb3cb, 0xd2d2, 0x815d, 0x815e, 0xd8bf, 0xbec5, 0xc6f2, 0xd2b2, /*0x58-0x5f*/
3447 0xcfb0, 0xcfe7, 0x815f, 0x8160, 0x8161, 0x8162, 0xcae9, 0x8163, /*0x60-0x67*/
3448 0x8164, 0xd8c0, 0x8165, 0x8166, 0x8167, 0x8168, 0x8169, 0x816a, /*0x68-0x6f*/
3449 0xc2f2, 0xc2d2, 0x816b, 0xc8e9, 0x816c, 0x816d, 0x816e, 0x816f, /*0x70-0x77*/
3450 0x8170, 0x8171, 0x8172, 0x8173, 0x8174, 0x8175, 0xc7ac, 0x8176, /*0x78-0x7f*/
3451 0x8177, 0x8178, 0x8179, 0x817a, 0x817b, 0x817c, 0xc1cb, 0x817d, /*0x80-0x87*/
3452 0xd3e8, 0xd5f9, 0x817e, 0xcac2, 0xb6fe, 0xd8a1, 0xd3da, 0xbff7, /*0x88-0x8f*/
3453 0x8180, 0xd4c6, 0xbba5, 0xd8c1, 0xccee, 0xbbae, 0x8181, 0x8182, /*0x90-0x97*/
3454 0xd8a8, 0x8183, 0xd1c7, 0xd0a9, 0x8184, 0x8185, 0x8186, 0xd8bd, /*0x98-0x9f*/
3455 0xd9ef, 0xcdcf, 0xbfbba, 0x8187, 0xbdbb, 0xbba5, 0xd2e0, 0xb2fa, /*0xa0-0xaf*/
3456 0xbbae, 0xc4b6, 0x8188, 0xcfed, 0xbbae, 0xcda4, 0xc1c1, 0x8189, /*0xa8-0xaf*/
3457 0x818a, 0x818b, 0xc7d7, 0xd9f1, 0x818c, 0xd9f4, 0x818d, 0x818e, /*0xb0-0xbf*/
3458 0x818f, 0x8190, 0xc8cb, 0xd8e9, 0x8191, 0x8192, 0x8193, 0xd2da, /*0xb8-0xbf*/
3459 0xcab2, 0xc8ca, 0xd8ec, 0xd8ea, 0xd8c6, 0xbdf6, 0xc6cd, 0xb3f0, /*0xc0-0xcf*/
3460 0x8194, 0xd8eb, 0xbdf1, 0xbde9, 0x8195, 0xc8d4, 0xb4d3, 0x8196, /*0xc8-0xcf*/
3461 0x8197, 0xc2d8, 0x8198, 0xb2d6, 0xd7d0, 0xcacb, 0xcfbf, 0xd5cc, /*0xd0-0xd7*/
3462 0xb8b6, 0xcfc9, 0x8199, 0x819a, 0x819b, 0xd9da, 0xd8f0, 0xc7aa, /*0xd8-0xdf*/
3463 0x819c, 0xd8ee, 0x819d, 0xb4fa, 0xc1ee, 0xd2d4, 0x819e, 0x819f, /*0xe0-0xef*/
3464 0xd8ed, 0x81a0, 0xd2c7, 0xd8ef, 0xc3c7, 0x81a1, 0x81a2, 0x81a3, /*0xe8-0xef*/
3465 0xd1f6, 0x81a4, 0xd6d9, 0xd8f2, 0x81a5, 0xbcf6, 0xbcdh, /*0xf0-0xff*/
3466 0x81a6, 0x81a7, 0x81a8, 0xc8ce, 0x81a9, 0xb7dd, 0x81aa, 0xb7c2, /*0xf8-0xff*/

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3467 /* 0x4f00 */
3468 0x81ab, 0xc6f3, 0x81ac, 0x81ad, 0x81ae, 0x81af, 0x81b0, 0x81b1, /*0x00-0x07*/
3469 0x81b2, 0xd8f8, 0xd2c1, 0x81b3, 0x81b4, 0xcee9, 0xbcbf, 0xb7fc, /*0x08-0x0f*/
3470 0xb7a5, 0xd0dd, 0x81b5, 0x81b6, 0x81b7, 0x81b8, 0x81b9, 0xd6da, /*0x10-0x17*/
3471 0xd3c5, 0xbbeef, 0xbbe1, 0xd8f1, 0x81ba, 0x81bb, 0xc9a1, 0xceb0, /*0x18-0x1f*/
3472 0xb4ab, 0x81bc, 0xd8f3, 0x81bd, 0xc9cb, 0xd8f6, 0xc2d7, 0xd8f7, /*0x20-0x27*/
3473 0x81be, 0x81bf, 0xceb1, 0xd8f9, 0x81c0, 0x81c1, 0x81c2, 0xb2ae, /*0x28-0x2f*/
3474 0xb9c0, 0x81c3, 0xd9a3, 0x81c4, 0xb0e9, 0x81c5, 0xc1e6, 0x81c6, /*0x30-0x37*/
3475 0xc9ec, 0x81c7, 0xcbc5, 0x81c8, 0xcbc6, 0xd9a4, 0x81c9, 0x81ca, /*0x38-0x3f*/
3476 0x81cb, 0x81cc, 0x81cd, 0xb5e8, 0x81ce, 0x81cf, 0xb5ab, 0x81d0, /*0x40-0x47*/
3477 0x81d1, 0x81d2, 0x81d3, 0x81d4, 0x81d5, 0xcebb, 0xb5cd, 0xd7a1, /*0x48-0x4f*/
3478 0xd7f4, 0xd3d3, 0x81d6, 0xcce5, 0x81d7, 0xbace, 0x81d8, 0xd9a2, /*0x50-0x57*/
3479 0xd9dc, 0xd3e0, 0xd8fd, 0xb7f0, 0xd7f7, 0xd8fe, 0xd8fa, 0xd9a1, /*0x58-0x5f*/
3480 0xc4e3, 0x81d9, 0x81da, 0xd3b6, 0xd8f4, 0xd9dd, 0x81db, 0xd8fb, /*0x60-0x67*/
3481 0x81dc, 0xc5e5, 0x81dd, 0xc0d0, 0x81de, 0xc0df, 0x81e0, 0xd1f0, /*0x68-0x6f*/
3482 0xb0db, 0x81e1, 0x81e2, 0xbcd1, 0xd9a6, 0x81e3, 0xd9a5, 0x81e4, /*0x70-0x77*/
3483 0x81e5, 0x81e6, 0x81e7, 0xd9ac, 0xd9ae, 0x81e8, 0xd9ab, 0xcab9, /*0x78-0x7f*/
3484 0x81e9, 0x81ea, 0x81eb, 0xd9a9, 0xd6b6, 0x81ec, 0x81ed, 0x81ee, /*0x80-0x87*/
3485 0xb3de, 0xd9a8, 0x81ef, 0xc0fd, 0x81f0, 0xcacc, 0x81f1, 0xd9aa, /*0x88-0x8f*/
3486 0x81f2, 0xd9a7, 0x81f3, 0x81f4, 0xd9b0, 0x81f5, 0x81f6, 0xb6b1, /*0x90-0x97*/
3487 0x81f7, 0xd1f8, 0x81f9, 0xb9a9, 0x81fa, 0xd2c0, 0x81fb, 0x81fc, /*0x98-0x9f*/
3488 0xcfc0, 0x81fd, 0x81fe, 0xc2c2, 0x8240, 0xbdc4, 0xd5ec, 0xb2e0, /*0xa0-0xaf*/
3489 0xc7c8, 0xbfbef, 0xd9ad, 0x8241, 0xd9af, 0x8242, 0xccea, 0xbae, /*0xa8-0xaf*/
3490 0x8243, 0x8244, 0x8245, 0x8246, 0x8247, 0xc7d6, 0x8248, 0x8249, /*0xb0-0xbf*/
3491 0x824a, 0x824b, 0x824c, 0x824d, 0x824e, 0x824f, 0x8250, 0xb1e3, /*0xb8-0xbf*/
3492 0x8251, 0x8252, 0x8253, 0xb4d9, 0xb6ed, 0xd9b4, 0x8254, 0x8255, /*0xc0-0xcf*/
3493 0x8256, 0x8257, 0xbfa1, 0x8258, 0x8259, 0x825a, 0xd9de, 0xc7ce, /*0xc8-0xcf*/
3494 0xc0fe, 0xd9b8, 0x825b, 0x825c, 0x825d, 0x825e, 0x825f, 0xcdb7, /*0xd0-0xdf*/
3495 0xb7fd, 0x8260, 0xd9b5, 0x8261, 0xd9b7, 0xb1a3, 0xd3e1, 0xd9b9, /*0xd8-0xdf*/
3496 0x8262, 0xd0c5, 0x8263, 0xd9b6, 0x8264, 0x8265, 0xd9b1, 0x8266, /*0xe0-0xef*/
3497 0xd9b2, 0xc1a9, 0xd9b3, 0x8267, 0x8268, 0xbcf3, 0xd0de, 0xb8a9, /*0xe8-0xef*/
3498 0x8269, 0xbef, 0x826a, 0xd9bd, 0x826b, 0x826c, 0x826d, 0x826e, /*0xf0-0xff*/
3499 0xd9ba, 0x826f, 0xb0b3, 0x8270, 0x8271, 0x8272, 0xd9c2, 0x8273, /*0xf8-0xff*/
3500 /* 0x5000 */
3501 0x8274, 0x8275, 0x8276, 0x8277, 0x8278, 0x8279, 0x827a, 0x827b, /*0x00-0x07*/
3502 0x827c, 0x827d, 0x827e, 0x8280, 0xd9c4, 0xb1b6, 0x8281, 0xd9bf, /*0x08-0x0f*/
3503 0x8282, 0x8283, 0xb5b9, 0x8284, 0xbef3, 0x8285, 0x8286, 0x8287, /*0x10-0x17*/
3504 0xccc8, 0xbaf2, 0xd2d0, 0x8288, 0xd9c3, 0x8289, 0x828a, 0xbde8, /*0x18-0x1f*/
3505 0x828b, 0xb3ab, 0x828c, 0x828d, 0x828e, 0xd9c5, 0xbbeb, 0x828f, /*0x20-0x27*/
3506 0xd9c6, 0xd9bb, 0xc4df, 0x8290, 0xd9be, 0xd9c1, 0xd9c0, 0x8291, /*0x28-0x2f*/
3507 0x8292, 0x8293, 0x8294, 0x8295, 0x8296, 0x8297, 0x8298, 0x8299, /*0x30-0x37*/
3508 0x829a, 0x829b, 0xd5ae, 0x829c, 0xd6b5, 0x829d, 0xc7e3, 0x829e, /*0x38-0x3f*/
3509 0x829f, 0x82a0, 0x82a1, 0xd9c8, 0x82a2, 0x82a3, 0x82a4, 0xbcd9, /*0x40-0x47*/
3510 0xd9ca, 0x82a5, 0x82a6, 0x82a7, 0xd9bc, 0x82a8, 0xd9cb, 0xc6ab, /*0x48-0x4f*/
3511 0x82a9, 0x82aa, 0x82ab, 0x82ac, 0x82ad, 0xd9c9, 0x82ae, 0x82af, /*0x50-0x57*/
3512 0x82b0, 0x82b1, 0xd7f6, 0x82b2, 0xcda3, 0x82b3, 0x82b4, 0x82b5, /*0x58-0x5f*/
3513 0x82b6, 0x82b7, 0x82b8, 0x82b9, 0x82ba, 0xbda1, 0x82bb, 0x82bc, /*0x60-0x67*/
3514 0x82bd, 0x82be, 0x82bf, 0x82c0, 0xd9cc, 0x82c1, 0x82c2, 0x82c3, /*0x68-0x6f*/
3515 0x82c4, 0x82c5, 0x82c6, 0x82c7, 0x82c8, 0x82c9, 0xc5bc, 0xcdb5, /*0x70-0x77*/
3516 0x82ca, 0x82cb, 0x82cc, 0xd9cd, 0x82cd, 0x82ce, 0xd9c7, 0xb3a5, /*0x78-0x7f*/
3517 0xbffe, 0x82cf, 0x82d0, 0x82d1, 0x82d2, 0xb8b5, 0x82d3, 0x82d4, /*0x80-0x87*/
3518 0xc0fc, 0x82d5, 0x82d6, 0x82d7, 0x82d8, 0xb0f8, 0x82d9, 0x82da, /*0x88-0x8f*/
3519 0x82db, 0x82dc, 0x82dd, 0x82de, 0x82df, 0x82e0, 0x82e1, 0x82e2, /*0x90-0x97*/
3520 0x82e3, 0x82e4, 0x82e5, 0x82e6, 0x82e7, 0x82e8, 0x82e9, 0x82ea, /*0x98-0x9f*/
3521 0x82eb, 0x82ec, 0x82ed, 0xb4f6, 0x82ee, 0xd9ce, 0x82ef, 0xd9cf, /*0xa0-0xaf*/
3522 0xb4a2, 0xd9d0, 0x82f0, 0x82f1, 0xb4df, 0x82f2, 0x82f3, 0x82f4, /*0xa8-0xaf*/
3523 0x82f5, 0x82f6, 0xb0c1, 0x82f7, 0x82f8, 0x82f9, 0x82fa, 0x82fb, /*0xb0-0xbf*/
3524 0x82fc, 0x82fd, 0xd9d1, 0xc9b5, 0x82fe, 0x8340, 0x8341, 0x8342, /*0xb8-0xbf*/
3525 0x8343, 0x8344, 0x8345, 0x8346, 0x8347, 0x8348, 0x8349, 0x834a, /*0xc0-0xcf*/
3526 0x834b, 0x834c, 0x834d, 0x834e, 0x834f, 0x8350, 0x8351, 0xcff1, /*0xc8-0xcf*/
3527 0x8352, 0x8353, 0x8354, 0x8355, 0x8356, 0x8357, 0xd9d2, 0x8358, /*0xd0-0xdf*/
3528 0x8359, 0x835a, 0xc1c5, 0x835b, 0x835c, 0x835d, 0x835e, 0x835f, /*0xd8-0xdf*/
3529 0x8360, 0x8361, 0x8362, 0x8363, 0x8364, 0x8365, 0xd9d6, 0xc9ae, /*0xe0-0xef*/
3530 0x8366, 0x8367, 0x8368, 0x8369, 0xd9d5, 0xd9d6, 0xd9d7, 0x836a, /*0xe8-0xef*/
3531 0x836b, 0x836c, 0x836d, 0xcdbd, 0x836e, 0xbda9, 0x836f, 0x8370, /*0xf0-0xff*/
3532 0x8371, 0x8372, 0x8373, 0xc6a7, 0x8374, 0x8375, 0x8376, 0x8377, /*0xf8-0xff*/
3533 /* 0x5100 */
3534 0x8378, 0x8379, 0x837a, 0x837b, 0x837c, 0x837d, 0xd9d3, 0xd9d8, /*0x00-0x07*/
3535 0x837e, 0x8380, 0x8381, 0xd9d9, 0x8382, 0x8383, 0x8384, 0x8385, /*0x08-0x0f*/
3536 0x8386, 0x8387, 0xc8e5, 0x8388, 0x8389, 0x838a, 0x838b, 0x838c, /*0x10-0x17*/
3537 0x838d, 0x838e, 0x838f, 0x8390, 0x8391, 0x8392, 0x8393, 0x8394, /*0x18-0x1f*/
3538 0x8395, 0xc0dc, 0x8396, 0x8397, 0x8398, 0x8399, 0x839a, 0x839b, /*0x20-0x27*/
3539 0x839c, 0x839d, 0x839e, 0x839f, 0x83a0, 0x83a1, 0x83a2, 0x83a3, /*0x28-0x2f*/
3540 0x83a4, 0x83a5, 0x83a6, 0x83a7, 0x83a8, 0x83a9, 0x83aa, 0x83ab, /*0x30-0x37*/
3541 0x83ac, 0x83ad, 0x83ae, 0x83af, 0x83b0, 0x83b1, 0x83b2, 0xb6f9, /*0x38-0x3f*/
3542 0xd8a3, 0xd4ca, 0x83b3, 0xd4aa, 0xd0d6, 0xb3e4, 0xd5d7, 0x83b4, /*0x40-0x47*/
3543 0xcfc8, 0xb9e2, 0x83b5, 0xbfcf, 0x83b6, 0xc3e2, 0x83b7, 0x83b8, /*0x48-0x4f*/
3544 0x83b9, 0xb6d2, 0x83ba, 0x83bb, 0xcdc3, 0xd9ee, 0xd9f0, 0x83bc, /*0x50-0x57*/
3545 0x83bd, 0x83be, 0xb5b3, 0x83bf, 0xb6b5, 0x83c0, 0x83c1, 0x83c2, /*0x58-0x5f*/
3546 0x83c3, 0x83c4, 0x83c5, 0x83c6, 0x83c7, 0x83c8, 0x83c9, 0x83ca, /*0x60-0x6f*/
3547 0xc8ab, 0x83c9, 0x83ca, 0xb0cb, 0xb9ab, 0xc1f9, 0xd9e2, 0x83cb, /*0x68-0x6f*/
3548 0xc0bc, 0xb9b2, 0x83cc, 0xb9d8, 0xd0cb, 0xb1f8, 0xc6e4, 0xbef, /*0x70-0x77*/
3549 0xb5e4, 0xd7c8, 0x83cd, 0xd1f8, 0xbce6, 0xcade, 0x83ce, 0x83cf, /*0x78-0x7f*/
3550 0xbcbd, 0xd9e6, 0xd8e7, 0x83d0, 0x83d1, 0xc4da, 0x83d2, 0x83d3, /*0x80-0x87*/
3551 0xb8d4, 0xc8bd, 0x83d4, 0x83d5, 0xb2e1, 0xd4d9, 0x83d6, 0x83d7, /*0x88-0x8f*/
3552 0x83d8, 0x83d9, 0xc3b0, 0x83da, 0xc3e1, 0xdaa2, 0xc8df, /*0x90-0x97*/
3553 0x83dc, 0xd0b4, 0x83dd, 0xbefc, 0xc5a9, 0x83de, 0x83df, 0x83e0, /*0x98-0x9f*/
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3554 0xb9da, 0x83e1, 0xdaa3, 0x83e2, 0xd4a9, 0xdaa4, 0x83e3, 0x83e4, /*0xa0-0xa7*/
3555 0x83e5, 0x83e6, 0x83e7, 0xd9fb, 0xb6ac, 0x83e8, 0x83e9, 0xb7eb, /*0xa8-0xaf*/
3556 0xb1f9, 0xd9fc, 0xb3e5, 0xbef6, 0x83ea, 0xbff6, 0xd2b1, 0xc0e4, /*0xb0-0xbf*/
3557 0x83eb, 0x83ec, 0x83ed, 0xb6b3, 0xd9fe, 0xd9fd, 0x83ee, 0x83ef, /*0xb8-0xbf*/
3558 0xebbb, 0x83f0, 0x83f1, 0x83f2, 0xc6e0, 0x83f3, 0xd7bc, 0xdaa1, /*0xc0-0xcf*/
3559 0x83f4, 0xc1b9, 0x83f5, 0xb5f2, 0xc1e8, 0x83f6, 0x83f7, 0xbcf5, /*0xc8-0xcf*/
3560 0x83f8, 0xb4d5, 0x83f9, 0x83fa, 0x83fb, 0x83fc, 0x83fd, 0x83fe, /*0xd0-0xd7*/
3561 0x8440, 0x8441, 0x8442, 0xc1dd, 0x8443, 0xc4fd, 0x8444, 0x8445, /*0xd8-0xdf*/
3562 0xbcb8, 0xb7b2, 0x8446, 0x8447, 0xb7ef, 0x8448, 0x8449, 0x844a, /*0xe0-0xef*/
3563 0x844b, 0x844c, 0x844d, 0xd9ec, 0x844e, 0xc6be, 0x844f, 0xbfad, /*0xe8-0xef*/
3564 0xbcbcb, 0x8450, 0x8451, 0xb5ca, 0x8452, 0xdbc9, 0xd0d7, 0x8453, /*0xf0-0xff*/
3565 0xcdb9, 0xb0bc, 0xb3f6, 0xbbf7, 0xdbc9, 0xbaf, 0x8454, 0xd4e4, /*0xf8-0xff*/
3566 /* 0x5200 */
3567 0xb5b6, 0xb5f3, 0xd8d6, 0xc8d0, 0x8455, 0x8456, 0xb7d6, 0xc7d0, /*0x00-0x07*/
3568 0xd8d7, 0x8457, 0xbfaf, 0x8458, 0x8459, 0xdbbb, 0xd8d8, 0x845a, /*0x08-0x0f*/
3569 0x845b, 0xd0cc, 0xbbae, 0x845c, 0x845d, 0x845e, 0xebbe, 0xc1d0, /*0x10-0x17*/
3570 0xc1f5, 0xd4f2, 0xb8d5, 0xb4b4, 0x845f, 0xb3f5, 0x8460, 0x8461, /*0x18-0x1f*/
3571 0xc9be, 0x8462, 0x8463, 0x8464, 0xc5d0, 0x8465, 0x8466, 0x8467, /*0x20-0x27*/
3572 0xc5d9, 0xc0fb, 0x8468, 0xb1f0, 0x8469, 0xd8d9, 0xb9ce, 0x846a, /*0x28-0x2f*/
3573 0xb5bd, 0x846b, 0x846c, 0xd8da, 0x846d, 0x846e, 0xd6c6, 0xcba2, /*0x30-0x37*/
3574 0xc8af, 0xc9b2, 0xb4cc, 0xbfcc, 0x846f, 0xb9f4, 0x8470, 0xd8db, /*0x38-0x3f*/
3575 0xd8dc, 0xb6e7, 0xbcc1, 0xccea, 0x8471, 0x8472, 0x8473, 0x8474, /*0x40-0x47*/
3576 0x8475, 0x8476, 0xcff7, 0x8477, 0xd8dd, 0xc7b0, 0x8478, 0x8479, /*0x48-0x4f*/
3577 0xb9d0, 0xbda3, 0x847a, 0x847b, 0xcdda, 0x847c, 0xc6ca, 0x847d, /*0x50-0x57*/
3578 0x847e, 0x8480, 0x8481, 0x8482, 0xd8e0, 0x8483, 0xd8de, 0x8484, /*0x58-0x5f*/
3579 0x8485, 0xd8df, 0x8486, 0x8487, 0x8488, 0xb0fe, 0x8489, 0xbee7, /*0x60-0x67*/
3580 0x848a, 0xc8aa, 0xc8af, 0x848b, 0x848c, 0x848d, 0x848e, 0xb8b1, /*0x68-0x6f*/
3581 0x848f, 0x8490, 0xb8ee, 0x8491, 0x8492, 0x8493, 0x8494, 0x8495, /*0x70-0x77*/
3582 0x8496, 0x8497, 0x8498, 0x8499, 0x849a, 0xd8e2, 0x849b, 0xbdc, /*0x78-0x7f*/
3583 0x849c, 0xd8e4, 0xd8e3, 0x849d, 0x849e, 0x849f, 0x84a0, 0x84a1, /*0x80-0x87*/
3584 0xc5fc, 0x84a2, 0x84a3, 0x84a4, 0x84a5, 0x84a6, 0x84a7, 0x84a8, /*0x88-0x8f*/
3585 0xd8e5, 0x84a9, 0x84aa, 0xd8e6, 0x84ab, 0x84ac, 0x84ad, 0x84ae, /*0x90-0x97*/
3586 0x84af, 0x84b0, 0x84b1, 0xc1a6, 0x84b2, 0xc8b0, 0xb0ec, 0xb9a6, /*0x98-0x9f*/
3587 0xbcd3, 0xcef1, 0xdbbd, 0xc1d3, 0x84b3, 0x84b4, 0x84b5, 0x84b6, /*0xa0-0xaf*/
3588 0xb6af, 0xd6fa, 0xc5ac, 0xbdd9, 0xdbbe, 0xdbbf, 0x84b7, 0x84b8, /*0xa8-0xaf*/
3589 0x84b9, 0xc0f8, 0x84ba, 0xc0cd, 0x84bb, 0x84bb, 0x84bc, 0x84bd, /*0xb0-0xbf*/
3590 0x84be, 0x84bf, 0x84c0, 0x84c1, 0x84c2, 0x84c3, 0xdbc0, 0xcac6, /*0xb8-0xbf*/
3591 0x84c4, 0x84c5, 0x84c6, 0xb2aa, 0x84c7, 0x84c8, 0x84c9, 0xd3c2, /*0xc0-0xcf*/
3592 0x84ca, 0xc3e3, 0x84cb, 0xd1ab, 0x84cc, 0x84cd, 0x84ce, 0x84cf, /*0xc8-0xcf*/
3593 0xdbc2, 0x84d0, 0xc0d5, 0x84d1, 0x84d2, 0x84d3, 0xdbc3, 0x84d4, /*0xd0-0xdf*/
3594 0xbfb1, 0x84d5, 0x84d6, 0x84d7, 0x84d8, 0x84d9, 0x84da, 0xc4bc, /*0xd8-0xdf*/
3595 0x84db, 0x84dc, 0x84dd, 0x84de, 0xc7da, 0x84df, 0x84e0, 0x84e1, /*0xe0-0xef*/
3596 0x84e2, 0x84e3, 0x84e4, 0x84e5, 0x84e6, 0x84e7, 0x84e8, 0x84e9, /*0xe8-0xef*/
3597 0xdbc4, 0x84ea, 0x84eb, 0x84ec, 0x84ed, 0x84ee, 0x84ef, 0x84f0, /*0xf0-0xff*/
3598 0x84f1, 0xd9e8, 0xc9d7, 0x84f2, 0x84f3, 0x84f4, 0xb9b4, 0xccef0, /*0xf8-0xff*/
3599 /* 0x5300 */
3600 0xd4c8, 0x84f5, 0x84f6, 0x84f7, 0x84f8, 0xb0fc, 0xb4d2, 0x84f9, /*0x00-0x07*/
3601 0xd0d9, 0x84fa, 0x84fb, 0x84fc, 0x84fd, 0xd9e9, 0x84fe, 0xdec, /*0x08-0x0f*/
3602 0xd9eb, 0x8540, 0x8541, 0x8542, 0x8543, 0xd8b0, 0xbba, 0xb1b1, /*0x10-0x17*/
3603 0x8544, 0xb3d7, 0xd8ce, 0x8545, 0x8546, 0xd4d1, 0x8547, 0x8548, /*0x18-0x1f*/
3604 0xbdb3, 0xbfef, 0x8549, 0xcfb, 0x854a, 0x854b, 0xd8d0, 0x854c, /*0x20-0x27*/
3605 0x854d, 0x854e, 0xb7cb, 0x854f, 0x8550, 0x8551, 0xd8d1, 0x8552, /*0x28-0x2f*/
3606 0x8553, 0x8554, 0x8555, 0x8556, 0x8557, 0x8558, 0x8559, 0x855a, /*0x30-0x37*/
3607 0x855b, 0xc6a5, 0xc7f8, 0xd2bd, 0x855c, 0x855d, 0xd8d2, 0xc4e4, /*0x38-0x3f*/
3608 0x855e, 0xc8aa, 0x855f, 0xc7a7, 0x8560, 0xd8a6, 0x8561, 0xc9fd, /*0x40-0x47*/
3609 0xcce7, 0xbddc, 0xb0eb, 0x8562, 0x8563, 0x8564, 0xbba, 0xd0ad, /*0x48-0x4f*/
3610 0x8565, 0xb1b0, 0xd7e4, 0xd7bf, 0x8566, 0xb5a5, 0xc2f4, 0xc4cf, /*0x50-0x57*/
3611 0x8567, 0x8568, 0xb2a9, 0x8569, 0xb2b7, 0x856a, 0xb1e5, 0xdfb2, /*0x58-0x5f*/
3612 0xd5bc, 0xbfa8, 0xc2ac, 0xd8d5, 0xc2b1, 0x856b, 0xd8d4, 0xcd4, /*0x60-0x67*/
3613 0x856c, 0xdae0, 0x856d, 0xcce0, 0x856e, 0x856f, 0xd8b4, 0xc3ae, /*0x68-0x6f*/
3614 0xd3a1, 0xc8aa, 0x8570, 0xbcb4, 0xc8b4, 0xc2d1, 0x8571, 0xbee, /*0x70-0x77*/
3615 0xd0b6, 0x8572, 0xdae1, 0x8573, 0x8574, 0x8575, 0x8576, 0xc7e4, /*0x78-0x7f*/
3616 0x8577, 0x8578, 0xb3a7, 0x8579, 0xb6f2, 0xcce, 0xc0fa, 0x857a, /*0x80-0x87*/
3617 0x857b, 0xc0f7, 0x857c, 0xd1b9, 0xd1e1, 0xd8c7, 0x857d, 0x857e, /*0x88-0x8f*/
3618 0x8580, 0x8581, 0x8582, 0x8583, 0x8584, 0xb2de, 0x8585, 0x8586, /*0x90-0x97*/
3619 0xc0e5, 0x8587, 0xbaf1, 0x8588, 0x8589, 0xd8c8, 0x858a, 0xd4ad, /*0x98-0x9f*/
3620 0x858b, 0x858c, 0xcfe1, 0xd8c9, 0x858d, 0xd8ca, 0xcfc3, 0x858e, /*0xa0-0xaf*/
3621 0xb3f8, 0xbec7, 0x858f, 0x8590, 0x8591, 0x8592, 0xd8cb, 0x8593, /*0xa8-0xaf*/
3622 0x8594, 0x8595, 0x8596, 0x8597, 0x8598, 0x8599, 0xdbcc, 0x859a, /*0xb0-0xbf*/
3623 0x859b, 0x859c, 0x859d, 0xc8a5, 0x859e, 0x859f, 0x85a0, 0xcfd, /*0xb8-0xbf*/
3624 0x85a1, 0xc8fe, 0xb2ce, 0x85a2, 0x85a3, 0x85a4, 0x85a5, 0x85a6, /*0xc0-0xcf*/
3625 0xd3d6, 0xb2e6, 0xbcb0, 0xd3d1, 0xcbab, 0xb7b4, 0x85a7, 0x85a8, /*0xc8-0xcf*/
3626 0x85a9, 0xb7a2, 0x85aa, 0x85ab, 0xc8a5, 0x85ac, 0xc8a1, 0xcad, /*0xd0-0xdf*/
3627 0xb1e4, 0xd0f0, 0x85ad, 0xc5d1, 0x85ae, 0x85af, 0x85b0, 0xdbc5, /*0xd8-0xdf*/
3628 0xb5fe, 0x85b1, 0x85b2, 0xbfd, 0xb9c5, 0xbee4, 0xc1ed, 0x85b3, /*0xe0-0xef*/
3629 0xdfb6, 0xdfb5, 0xd6bb, 0xbdd0, 0xd5d9, 0xb0c8, 0xb6a3, 0xbfc, /*0xe8-0xef*/
3630 0xc8a8, 0xdfb3, 0xcab7, 0xd3d2, 0x85b4, 0xd8cf, 0x85b5, 0xbac5, /*0xf0-0xff*/
3631 0xcbb, 0xcbe, 0x85b5, 0xdfb7, 0xb5f0, 0xdfb4, 0x85b6, 0x85b7, /*0xf8-0xff*/
3632 /* 0x5400 */
3633 0x85b8, 0xd3f5, 0x85b9, 0xb3d4, 0xb8f7, 0x85ba, 0xdfba, 0x85bb, /*0x00-0x07*/
3634 0xbacf, 0xbcaa, 0xb5f5, 0x85bc, 0xcdac, 0xc3fb, 0xbaf3, 0xc0f4, /*0x08-0x0f*/
3635 0xcdc2, 0xcff2, 0xdfb8, 0xcfc5, 0x85bd, 0xc2c0, 0xdfb9, 0xc2f0, /*0x10-0x17*/
3636 0x85be, 0x85bf, 0x85c0, 0xbefd, 0x85c1, 0xc1df, 0xcdcc, 0xd2f7, /*0x18-0x1f*/
3637 0xb7cd, 0xdfc1, 0x85c2, 0xdfc4, 0x85c3, 0x85c4, 0xb7f1, 0xb0c9, /*0x20-0x27*/
3638 0xb6d6, 0xb7d4, 0x85c5, 0xbaac, 0xcdf, 0xbfd4, 0xcbb1, 0xc6f4, /*0x28-0x2f*/
3639 0x85c6, 0xd6a8, 0xdfc5, 0x85c7, 0xcce2, 0xb3b3, 0x85c8, 0x85c9, /*0x30-0x37*/
3640 0xcfec, 0xb4b5, 0x85ca, 0xcce7, 0xbaf0, 0x85cb, 0xcce1, 0x85cc, /*0x38-0x3f*/

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3641 0xd1bd, 0x85cd, 0x85ce, 0xdfc0, 0x85cf, 0x85d0, 0xb4f4, 0x85d1, /*0x40-0x47*/
3642 0xb3ca, 0x85d2, 0xb8e6, 0xdfbb, 0x85d3, 0x85d4, 0x85d5, 0x85d6, /*0x48-0x4f*/
3643 0xc4c5, 0x85d7, 0xdfbc, 0xdfbd, 0xdfbe, 0xc5bb, 0xdfbf, 0xdfc2, /*0x50-0x5f*/
3644 0xd4b1, 0xdfc3, 0x85d8, 0xc7ba, 0xcded8, 0x85d9, 0x85da, 0x85db, /*0x58-0x5f*/
3645 0x85dc, 0x85dd, 0xc4d8, 0x85de, 0xdfca, 0x85df, 0xdfcf, 0x85e0, /*0x60-0x67*/
3646 0xd6dc, 0x85e1, 0x85e2, 0x85e3, 0x85e4, 0x85e5, 0x85e6, 0x85e7, /*0x68-0x6f*/
3647 0x85e8, 0xdfc9, 0xdfda, 0xceb6, 0x85e9, 0xbac7, 0xdfce, 0xdfc8, /*0x70-0x77*/
3648 0xc5de, 0x85ea, 0x85eb, 0xc9eb, 0xbaf4, 0xc3fc, 0x85ec, 0x85ed, /*0x78-0x7f*/
3649 0xbed7, 0x85ee, 0xdfc6, 0x85ef, 0xdfcd, 0x85f0, 0xc5d8, 0x85f1, /*0x80-0x87*/
3650 0x85f2, 0x85f3, 0x85f4, 0xd5a6, 0xbacd, 0x85f5, 0xbecc, 0xd3bd, /*0x88-0x8f*/
3651 0xb8c0, 0x85f6, 0xd6e4, 0x85f7, 0xdfc7, 0xb9be, 0xbfa7, 0x85f8, /*0x90-0x97*/
3652 0x85f9, 0xc1fc, 0xdfcb, 0xdfcc, 0x85fa, 0xdfd0, 0x85fb, 0x85fc, /*0x98-0x9f*/
3653 0x85fd, 0x85fe, 0x8640, 0xdfdb, 0xdfd5, 0x8641, 0xdfd7, 0xdfd6, /*0xa0-0xa7*/
3654 0xd7c9, 0xdfef, 0xdfef, 0xe5eb, 0xd2a7, 0xdfd2, 0x8642, 0xbfa9, /*0xa8-0xaf*/
3655 0x8643, 0xd4db, 0x8644, 0xbfc8, 0xdfd4, 0x8645, 0x8646, 0x8647, /*0xb0-0xbf*/
3656 0xcfcc, 0x8648, 0x8649, 0xdfdd, 0x864a, 0xd1ca, 0x864b, 0xdfde, /*0xb8-0xbf*/
3657 0xb0a7, 0xc6b7, 0xdfd3, 0x864c, 0xbae5, 0x864d, 0xb6df, 0xcddb, /*0xc0-0xcf*/
3658 0xb9fe, 0xd4d5, 0x864e, 0x864f, 0xdfdf, 0xcfec, 0xb0a5, 0xdfef, /*0xc8-0xcf*/
3659 0xdfd1, 0xd1c6, 0xdfd5, 0xdfd8, 0xdfd9, 0xdfdc, 0x8650, 0xbba9, /*0xd0-0xd7*/
3660 0x8651, 0xdfef, 0xdfef, 0x8652, 0xdfef, 0xdfef, 0xdfef, 0xd3b4, /*0xd8-0xdf*/
3661 0x8653, 0x8654, 0x8655, 0x8656, 0x8657, 0xb8e7, 0xc5b6, 0xdfef, /*0xe0-0xef*/
3662 0xc9da, 0xc1a8, 0xc4c4, 0x8658, 0x8659, 0xbfde, 0xcff8, 0x865a, /*0xe8-0xef*/
3663 0x865b, 0x865c, 0xd5dc, 0xdfef, 0x865d, 0x865e, 0x865f, 0x8660, /*0xf0-0xff*/
3664 0x8661, 0x8662, 0xb2b8, 0x8663, 0xbadf, 0xdfec, 0x8664, 0xdbcl, /*0xf8-0xff*/
3665 /* 0x5500 */
3666 0x8665, 0xd1e4, 0x8666, 0x8667, 0x8668, 0x8669, 0xcbf4, 0xb4bd, /*0x00-0x07*/
3667 0x866a, 0xb0a6, 0x866b, 0x866c, 0x866d, 0x866e, 0xdfd1, /*0x08-0x0f*/
3668 0xccc6, 0xdfd2, 0x8670, 0x8671, 0xdfed, 0x8672, 0x8673, 0x8674, /*0x10-0x17*/
3669 0x8675, 0x8676, 0x8677, 0xdfef, 0x8678, 0x8679, 0x867a, 0x867b, /*0x18-0x1f*/
3670 0xdfef, 0x867c, 0xdfef, 0xdfef, 0x867d, 0x867e, 0x867f, 0xdfd3, /*0x20-0x27*/
3671 0x8680, 0x8681, 0xdfd4, 0x8682, 0xbba3, 0x8683, 0xcadb, 0xcea8, /*0x28-0x2f*/
3672 0xe0a7, 0xb3aa, 0x8684, 0xe0a6, 0x8685, 0x8686, 0x8687, 0xe0a1, /*0x30-0x37*/
3673 0x8688, 0x8689, 0x868a, 0x868b, 0xdfef, 0x868c, 0xcdd9, 0xdfd4, /*0x38-0x3f*/
3674 0x868d, 0xdfd5, 0x868e, 0xbfd0, 0xd7c4, 0x868f, 0xc9cc, 0x8690, /*0x40-0x47*/
3675 0x8691, 0xdfd8, 0xb0a1, 0x8692, 0x8693, 0x8694, 0x8695, 0x8696, /*0x48-0x4f*/
3676 0xdfd9, 0x8697, 0x8698, 0x8699, 0xdfd9, 0xe0a2, 0x869b, /*0x50-0x57*/
3677 0x869c, 0x869d, 0x869e, 0x869f, 0xe0a8, 0x86a0, 0x86a1, 0x86a2, /*0x58-0x5f*/
3678 0x86a3, 0xb7c8, 0x86a4, 0x86a5, 0xc6a1, 0xc9b6, 0xc0b2, 0xdfd5, /*0x60-0x67*/
3679 0x86a6, 0x86a7, 0xc5be, 0x86a8, 0xd8c4, 0xdfd9, 0xc4f6, 0x86a9, /*0x68-0x6f*/
3680 0x86aa, 0x86ab, 0x86ac, 0x86ad, 0x86ae, 0xe0a3, 0xe0a4, 0xe0a5, /*0x70-0x77*/
3681 0xd0a5, 0x86af, 0x86b0, 0xe0b4, 0xcce4, 0x86b1, 0xe0b1, 0x86b2, /*0x78-0x7f*/
3682 0xbfa6, 0xe0af, 0xcce9, 0xe0ab, 0xc9c6, 0x86b3, 0x86b4, 0xc0ae, /*0x80-0x87*/
3683 0xe0ae, 0xbaed, 0xbab0, 0xe0a9, 0x86b5, 0x86b6, 0x86b7, 0xdfd6, /*0x88-0x8f*/
3684 0x86b8, 0xe0b3, 0x86b9, 0x86ba, 0xe0b8, 0x86bb, 0x86bc, 0x86bd, /*0x90-0x97*/
3685 0xb4ad, 0xe0b9, 0x86be, 0x86bf, 0xcfb2, 0xbac8, 0x86c0, 0xe0b0, /*0x98-0x9f*/
3686 0x86c1, 0x86c2, 0x86c3, 0x86c4, 0x86c5, 0x86c6, 0x86c7, 0xd0fa, /*0xa0-0xaf*/
3687 0x86c8, 0x86c9, 0x86ca, 0x86cb, 0x86cc, 0x86cd, 0x86ce, 0x86cf, /*0xa8-0xaf*/
3688 0x86d0, 0xe0ac, 0x86d1, 0xd4fb, 0x86d2, 0xdfd7, 0x86d3, 0xc5e7, /*0xb0-0xbf*/
3689 0x86d4, 0xe0ad, 0x86d5, 0xd3f7, 0x86d6, 0xe0b6, 0xe0b7, 0x86d7, /*0xb8-0xbf*/
3690 0x86d8, 0x86d9, 0x86da, 0x86db, 0xe0c4, 0xd0e1, 0x86dc, 0x86dd, /*0xc0-0xcf*/
3691 0x86de, 0xe0bc, 0x86df, 0x86e0, 0xe0c9, 0xe0ca, 0x86e1, 0x86e2, /*0xc8-0xcf*/
3692 0x86e3, 0xe0be, 0xe0aa, 0xc9a4, 0xe0c1, 0x86e4, 0xe0b2, 0x86e5, /*0xd0-0xdf*/
3693 0x86e6, 0x86e7, 0x86e8, 0x86e9, 0xcac8, 0xe0c3, 0x86ea, 0xe0b5, /*0xd8-0xdf*/
3694 0x86eb, 0xcceb, 0x86ec, 0xcbc3, 0xe0cd, 0xe0c6, 0xe0c2, 0x86ed, /*0xe0-0xef*/
3695 0xe0cb, 0x86ee, 0xe0ba, 0xe0bf, 0xe0c0, 0x86ef, 0x86f0, 0xe0c5, /*0xe8-0xef*/
3696 0x86f1, 0x86f2, 0xe0c7, 0xe0c8, 0x86f3, 0xe0cc, 0x86f4, 0xe0bb, /*0xf0-0xff*/
3697 0x86f5, 0x86f6, 0x86f7, 0x86f8, 0x86f9, 0xcdb4, 0xe0d5, 0x86fa, /*0xf8-0xff*/
3698 /* 0x5600 */
3699 0xe0d6, 0xe0d2, 0x86fb, 0x86fc, 0x86fd, 0x86fe, 0x8740, 0x8741, /*0x00-0x07*/
3700 0xe0d0, 0xbccce, 0x8742, 0x8743, 0xe0d1, 0x8744, 0xb8c2, 0xd8c5, /*0x08-0x0f*/
3701 0x8745, 0x8746, 0x8747, 0x8748, 0x8749, 0x874a, 0x874b, 0x874c, /*0x10-0x17*/
3702 0xd0ea, 0x874d, 0x874e, 0xc2ef, 0x874f, 0x8750, 0xe0cf, 0xe0bd, /*0x18-0x1f*/
3703 0x8751, 0x8752, 0x8753, 0xe0d4, 0xe0d3, 0x8754, 0x8755, 0xe0d7, /*0x20-0x27*/
3704 0x8756, 0x8757, 0x8758, 0x8759, 0xe0dc, 0xe0d8, 0x875a, 0x875b, /*0x28-0x2f*/
3705 0x875c, 0xd6f6, 0xb3b0, 0x875d, 0xd7ec, 0x875e, 0xcbbb, 0x875f, /*0x30-0x37*/
3706 0x8760, 0xe0da, 0x8761, 0xcfeb, 0x8762, 0x8763, 0x8764, 0xbad9, /*0x38-0x3f*/
3707 0x8765, 0x8766, 0x8767, 0x8768, 0x8769, 0x876a, 0x876b, 0x876c, /*0x40-0x47*/
3708 0x876d, 0x876e, 0x876f, 0x8770, 0xe0e1, 0xe0dd, 0xd2ad, 0x8771, /*0x48-0x4f*/
3709 0x8772, 0x8773, 0x8774, 0x8775, 0xe0e2, 0x8776, 0x8777, 0xe0db, /*0x50-0x57*/
3710 0xe0d9, 0xe0df, 0x8778, 0x8779, 0xe0e0, 0x877a, 0x877b, 0x877c, /*0x58-0x5f*/
3711 0x877d, 0x877e, 0xe0de, 0xe0e4, 0xe0e4, 0x8781, 0x8782, 0x8783, /*0x60-0x6f*/
3712 0xc6f7, 0xd8ac, 0xd4eb, 0xe0e6, 0xcac9, 0x8784, 0x8785, 0x8786, /*0x68-0x6f*/
3713 0x8787, 0xe0e5, 0x8788, 0x8789, 0x878a, 0x878b, 0xb8c1, 0x878c, /*0x70-0x77*/
3714 0x878d, 0x878e, 0x878f, 0xe0e7, 0xe0e8, 0x8790, 0x8791, 0x8792, /*0x78-0x7f*/
3715 0x8793, 0x8794, 0x8795, 0x8796, 0x8797, 0xe0e9, 0xe0e3, 0x8798, /*0x80-0x87*/
3716 0x8799, 0x879a, 0x879b, 0x879c, 0x879d, 0x879e, 0xbabf, 0xcce7, /*0x88-0x8f*/
3717 0x879f, 0x87a0, 0x87a1, 0xe0ea, 0x87a2, 0x87a3, 0x87a4, 0x87a5, /*0x90-0x97*/
3718 0x87a6, 0x87a7, 0x87a8, 0x87a9, 0x87aa, 0x87ab, 0x87ac, 0x87ad, /*0x98-0x9f*/
3719 0x87ae, 0x87af, 0x87b0, 0xcff9, 0x87b1, 0x87b2, 0x87b3, 0x87b4, /*0xa0-0xaf*/
3720 0x87b5, 0x87b6, 0x87b7, 0x87b8, 0x87b9, 0x87ba, 0x87bb, 0xe0eb, /*0xa8-0xaf*/
3721 0x87bc, 0x87bd, 0x87be, 0x87bf, 0x87c0, 0x87c1, 0x87c2, 0xc8c2, /*0xb0-0xbf*/
3722 0x87c3, 0x87c4, 0x87c5, 0x87c6, 0xbdc0, 0x87c7, 0x87c8, 0x87c9, /*0xb8-0xbf*/
3723 0x87ca, 0x87cb, 0x87cc, 0x87cd, 0x87ce, 0x87cf, 0x87d0, 0x87d1, /*0xc0-0xcf*/
3724 0x87d2, 0x87d3, 0xc4d2, 0x87d4, 0x87d5, 0x87d6, 0x87d7, 0x87d8, /*0xc8-0xcf*/
3725 0x87d9, 0x87da, 0x87db, 0x87dc, 0xe0ec, 0x87dd, 0x87de, 0xe0ed, /*0xd0-0xdf*/
3726 0x87df, 0x87e0, 0xc7f4, 0xcbc4, 0x87e1, 0xe0ee, 0xbdb8, 0xd8b6, /*0xd8-0xdf*/
3727 0xd2f2, 0xe0ef, 0xcdc5, 0x87e2, 0xb6da, 0x87e3, 0x87e4, 0x87e5, /*0xe0-0xef*/
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3728 0x87e6, 0x87e7, 0x87e8, 0xe0f1, 0x87e9, 0xd4b0, 0x87ea, 0x87eb, /*0xe8-0xef*/
3729 0xc0a7, 0xb4d1, 0x87ec, 0x87ed, 0xcea7, 0xe0f0, 0x87ee, 0x87ef, /*0xf0-0xf7*/
3730 0x87f0, 0xe0f2, 0xb9cc, 0x87f1, 0x87f2, 0xb9fa, 0xcdbc, 0xe0f3, /*0xf8-0xff*/
3731 /* 0x5700 */
3732 0x87f3, 0x87f4, 0x87f5, 0xc6d4, 0xe0f4, 0x87f6, 0xd4b2, 0x87f7, /*0x00-0x07*/
3733 0xc8a6, 0xe0f6, 0xe0f5, 0x87f8, 0x87f9, 0x87fa, 0x87fb, 0x87fc, /*0x08-0x0f*/
3734 0x87fd, 0x87fe, 0x8840, 0x8841, 0x8842, 0x8843, 0x8844, 0x8845, /*0x10-0x17*/
3735 0x8846, 0x8847, 0x8848, 0x8849, 0xe0f7, 0x884a, 0x884b, 0xcdc1, /*0x18-0x1f*/
3736 0x884c, 0x884d, 0xc84e, 0xcaa5, 0x884f, 0x8850, 0x8851, 0x8852, /*0x20-0x27*/
3737 0xd4da, 0xdbd7, 0xdbd9, 0x8853, 0xdbd8, 0xb9e7, 0xdbdc, 0xdbdd, /*0x28-0x2f*/
3738 0xb5d8, 0x8854, 0x8855, 0xdbda, 0x8856, 0x8857, 0x8858, 0x8859, /*0x30-0x37*/
3739 0x885a, 0xdbdb, 0xb3a1, 0xdbdf, 0x885b, 0x885c, 0xbbf8, 0x885d, /*0x38-0x3f*/
3740 0xd6b7, 0x885e, 0x885f, 0x8860, 0x8861, 0x8862, 0xbef9, /*0x40-0x47*/
3741 0x8863, 0x8864, 0xb7bb, 0x8865, 0xdbd0, 0xccae, 0xbfb2, 0xbbb5, /*0x48-0x4f*/
3742 0xd7f8, 0xbfd3, 0x8866, 0x8867, 0x8868, 0x8869, 0x886a, 0xbfe9, /*0x50-0x57*/
3743 0x886b, 0x886c, 0xbce1, 0xccb3, 0xdbde, 0xb0d3, 0xceeb, 0xb7d8, /*0x58-0x5f*/
3744 0xd7b9, 0xc6c2, 0x886d, 0x886e, 0xc0a4, 0x886f, 0xccb9, 0x8870, /*0x60-0x67*/
3745 0x886e, 0x886f, 0xc6ba, 0x8867, 0x8871, 0xdbde, 0x8872, 0xc5f7, /*0x68-0x6f*/
3746 0x8873, 0x8874, 0x8875, 0x8876, 0x8877, 0x8878, 0x8879, 0xbfc0, /*0x70-0x77*/
3747 0x8878, 0x8879, 0x887a, 0x887b, 0x887c, 0x887d, 0x887e, 0x887f, /*0x78-0x7f*/
3748 0x887e, 0x8880, 0xb4b9, 0xc0ac, 0xc2a2, 0xdbde, 0x8881, 0x8882, /*0x80-0x87*/
3749 0x8882, 0x8883, 0x8884, 0xd0cd, 0x8885, 0x8886, 0x8887, 0x8888, /*0x88-0x8f*/
3750 0x8888, 0x8889, 0xc0dd, 0x888a, 0x888b, 0x888c, 0x888d, 0x888e, /*0x90-0x97*/
3751 0x888e, 0x888f, 0x8890, 0x8891, 0x8892, 0x8893, 0x8894, 0x8895, /*0x98-0x9f*/
3752 0x8896, 0x8897, 0x8898, 0x8899, 0x889a, 0x889b, 0x889c, 0x889d, /*0xa0-0xaf*/
3753 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0xb0-0xbf*/
3754 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0xc0-0xcf*/
3755 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0xd0-0xdf*/
3756 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0xe0-0xef*/
3757 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0xf0-0xff*/
3758 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x00-0x07*/
3759 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x08-0x0f*/
3760 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x10-0x17*/
3761 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x18-0x1f*/
3762 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x20-0x27*/
3763 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x28-0x2f*/
3764 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x30-0x37*/
3765 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x38-0x3f*/
3766 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x40-0x47*/
3767 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x48-0x4f*/
3768 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x50-0x57*/
3769 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x58-0x5f*/
3770 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x60-0x67*/
3771 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x68-0x6f*/
3772 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x70-0x77*/
3773 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x78-0x7f*/
3774 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x80-0x87*/
3775 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x88-0x8f*/
3776 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x90-0x97*/
3777 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x98-0x9f*/
3778 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0xa0-0xaf*/
3779 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0xb0-0xbf*/
3780 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0xc0-0xcf*/
3781 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0xd0-0xdf*/
3782 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0xe0-0xef*/
3783 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0xf0-0xff*/
3784 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x00-0x07*/
3785 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x08-0x0f*/
3786 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x10-0x17*/
3787 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x18-0x1f*/
3788 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x20-0x27*/
3789 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x28-0x2f*/
3790 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x30-0x37*/
3791 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x38-0x3f*/
3792 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x40-0x47*/
3793 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x48-0x4f*/
3794 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x50-0x57*/
3795 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x58-0x5f*/
3796 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x60-0x67*/
3797 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x68-0x6f*/
3798 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x70-0x77*/
3799 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x78-0x7f*/
3800 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x80-0x87*/
3801 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x88-0x8f*/
3802 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x90-0x97*/
3803 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x98-0x9f*/
3804 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0xa0-0xaf*/
3805 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0xb0-0xbf*/
3806 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0xc0-0xcf*/
3807 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0xd0-0xdf*/
3808 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0xe0-0xef*/
3809 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0xf0-0xff*/
3810 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x00-0x07*/
3811 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x08-0x0f*/
3812 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, /*0x10-0x17*/
3813 0x889a, 0x889b, 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, /*0x18-0x1f*/
3814 0x889c, 0x889d, 0x889e, 0x889f, 0x889a, 0x889b, 0x889c, 0x889d, /*0x20-0x27*/
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3815 0xc2e8, 0x8a6c, 0xc8d1, 0x8a6d, 0x8a6e, 0xe5fb, 0x8a6f, 0x8a70, /*0x88-0x8f*/
3816 0x8a71, 0x8a72, 0xb6ca, 0xbccb, 0x8a73, 0x8a74, 0xd1fd, 0xe6a1, /*0x90-0x97*/
3817 0x8a75, 0xc3ee, 0x8a76, 0x8a77, 0x8a78, 0x8a79, 0xe6a4, 0x8a7a, /*0x98-0x9f*/
3818 0x8a7b, 0x8a7c, 0x8a7d, 0xe5fe, 0xe6a5, 0xcdd7, 0x8a7e, 0x8a80, /*0xa0-0xa7*/
3819 0xb7c1, 0xe5fc, 0xe5fd, 0xe6a3, 0x8a81, 0x8a82, 0xc4dd, 0xe6a8, /*0xa8-0xaf*/
3820 0x8a83, 0x8a84, 0xe6a7, 0x8a85, 0x8a86, 0x8a87, 0x8a88, 0x8a89, /*0xb0-0xb7*/
3821 0x8a8a, 0xc3c3, 0x8a8b, 0xc6de, 0x8a8c, 0x8a8d, 0xe6aa, 0x8a8e, /*0xb8-0xbf*/
3822 0x8a8f, 0x8a90, 0x8a91, 0x8a92, 0x8a93, 0x8a94, 0xc4b7, 0x8a95, /*0xc0-0xc7*/
3823 0x8a96, 0x8a97, 0xe6a2, 0xcabc, 0x8a98, 0x8a99, 0x8a9a, 0x8a9b, /*0xc8-0xcf*/
3824 0xbde3, 0xb9c3, 0xe6a6, 0xd0d5, 0xceaf, 0x8a9c, 0x8a9d, 0xe6a9, /*0xd0-0xd7*/
3825 0xe6b0, 0x8a9e, 0xd2a6, 0x8a9f, 0xbdaa, 0xe6ad, 0x8aa0, 0x8aa1, /*0xd8-0xdf*/
3826 0x8aa2, 0x8aa3, 0x8aa4, 0xe6af, 0x8aa5, 0xc0d1, 0x8aa6, 0x8aa7, /*0xe0-0xe7*/
3827 0xd2cc, 0x8aa8, 0x8aa9, 0x8aaa, 0xbca7, 0x8aab, 0x8aac, 0x8aad, /*0xe8-0xef*/
3828 0x8aae, 0x8aaf, 0x8ab0, 0x8ab1, 0x8ab2, 0x8ab3, 0x8ab4, 0x8ab5, /*0xf0-0xf7*/
3829 0x8ab6, 0xe6b1, 0x8ab7, 0xd2f6, 0x8ab8, 0x8ab9, 0x8aba, 0xd7cb, /*0xf8-0xff*/
3830 /* 0x5a00 */
3831 0x8abb, 0xcdfe, 0x8abc, 0xcdde, 0xc2a6, 0xe6ab, 0xe6ac, 0xbdbf, /*0x00-0x07*/
3832 0xe6ae, 0xe6b3, 0x8abd, 0x8abe, 0xe6b2, 0x8abf, 0x8ac0, 0x8ac1, /*0x08-0x0f*/
3833 0x8ac2, 0xe6b6, 0x8ac3, 0xe6b8, 0x8ac4, 0x8ac5, 0x8ac6, 0x8ac7, /*0x10-0x17*/
3834 0xc4ef, 0x8ac8, 0x8ac9, 0x8aca, 0xc4c8, 0x8acb, 0x8acc, 0xbbee, /*0x18-0x1f*/
3835 0xc9ef, 0x8acd, 0x8ace, 0xe6b7, 0x8acf, 0xb6f0, 0x8ad0, 0x8ad1, /*0x20-0x27*/
3836 0x8ad2, 0xc3e4, 0x8ad3, 0x8ad4, 0x8ad5, 0x8ad6, 0x8ad7, 0x8ad8, /*0x28-0x2f*/
3837 0x8ad9, 0xd3e9, 0xe6b4, 0x8ada, 0xe6b5, 0x8adb, 0xc8a2, 0x8adc, /*0x30-0x37*/
3838 0x8add, 0x8ade, 0x8adf, 0x8ae0, 0xe6bd, 0x8ae1, 0x8ae2, 0x8ae3, /*0x38-0x3f*/
3839 0xe6b9, 0x8ae4, 0x8ae5, 0x8ae6, 0x8ae7, 0x8ae8, 0xc6c5, 0x8ae9, /*0x40-0x47*/
3840 0x8aea, 0xcdf1, 0xe6bb, 0x8aeb, 0x8aec, 0x8aed, 0x8aee, 0x8aef, /*0x48-0x4f*/
3841 0x8af0, 0x8af1, 0x8af2, 0x8af3, 0x8af4, 0xe6bc, 0x8af5, 0x8af6, /*0x50-0x57*/
3842 0x8af7, 0x8af8, 0xbbe9, 0x8af9, 0x8afa, 0x8afb, 0x8afc, 0x8afd, /*0x58-0x5f*/
3843 0x8afe, 0xb40, 0xe6be, 0x8b41, 0x8b42, 0x8b43, 0x8b44, 0xe6ba, /*0x60-0x67*/
3844 0x8b45, 0x8b46, 0xc0b7, 0x8b47, 0x8b48, 0x8b49, 0x8b4a, 0x8b4b, /*0x68-0x6f*/
3845 0x8b4c, 0x8b4d, 0x8b4e, 0x8b4f, 0xd3a4, 0xe6bf, 0xc9f4, 0xe6c3, /*0x70-0x77*/
3846 0x8b50, 0x8b51, 0xe6c4, 0x8b52, 0x8b53, 0x8b54, 0x8b55, 0xd0f6, /*0x78-0x7f*/
3847 0x8b56, 0x8b57, 0x8b58, 0x8b59, 0x8b5a, 0x8b5b, 0x8b5c, 0x8b5d, /*0x80-0x87*/
3848 0x8b5e, 0x8b5f, 0x8b60, 0x8b61, 0x8b62, 0x8b63, 0x8b64, 0x8b65, /*0x88-0x8f*/
3849 0x8b66, 0x8b67, 0xc3bd, 0x8b68, 0x8b69, 0x8b6a, 0x8b6b, 0x8b6c, /*0x90-0x97*/
3850 0x8b6d, 0x8b6e, 0xc3c4, 0xe6c2, 0x8b6f, 0x8b70, 0x8b71, 0x8b72, /*0x98-0x9f*/
3851 0x8b73, 0x8b74, 0x8b75, 0x8b76, 0x8b77, 0x8b78, 0x8b79, 0x8b7a, /*0xa0-0xaf*/
3852 0x8b7b, 0x8b7c, 0xe6c1, 0x8b7d, 0x8b7e, 0x8b80, 0x8b81, 0x8b82, /*0xaa-0xaf*/
3853 0x8b83, 0x8b84, 0xe6c7, 0xcfb1, 0x8b85, 0xebf4, 0x8b86, 0x8b87, /*0xb0-0xb7*/
3854 0xe6ca, 0x8b88, 0x8b89, 0x8b8a, 0x8b8b, 0x8b8c, 0xe6c5, 0x8b8d, /*0xb8-0xbf*/
3855 0x8b8e, 0xbcd, 0xc9a9, 0x8b8f, 0x8b90, 0x8b91, 0x8b92, 0x8b93, /*0xc0-0xc7*/
3856 0x8b94, 0xbcb5, 0x8b95, 0x8b96, 0xcfd3, 0x8b97, 0x8b98, 0x8b99, /*0xc8-0xcf*/
3857 0x8b9a, 0x8b9b, 0xe6c8, 0x8b9c, 0xe6c9, 0x8b9d, 0xe6ce, 0x8b9e, /*0xd0-0xdf*/
3858 0xe6d0, 0x8b9f, 0x8ba0, 0x8ba1, 0xe6d1, 0x8ba2, 0x8ba3, 0x8ba4, /*0xd8-0xdf*/
3859 0xe6cb, 0xb5d5, 0x8ba5, 0xe6cc, 0x8ba6, 0x8ba7, 0xe6cf, 0x8ba8, /*0xe0-0xef*/
3860 0x8ba9, 0xc4db, 0x8baa, 0xe6c6, 0x8bab, 0x8bac, 0x8bad, 0x8bae, /*0xf0-0xf7*/
3861 0x8baf, 0xe6cd, 0x8bb0, 0x8bb1, 0x8bb2, 0x8bb3, 0x8bb4, 0x8bb5, /*0xf8-0xff*/
3862 0x8bb6, 0x8bb7, 0x8bb8, 0x8bb9, 0x8bba, 0x8bbb, 0x8bbc, 0x8bbd, /*0xf8-0xff*/
3863 /* 0x5b00 */
3864 0x8bbe, 0x8bbf, 0x8bc0, 0x8bc1, 0x8bc2, 0x8bc3, 0x8bc4, 0x8bc5, /*0x00-0x07*/
3865 0x8bc6, 0xe6d2, 0x8bc7, 0x8bc8, 0x8bc9, 0x8bca, 0x8bcb, 0x8bcc, /*0x08-0x0f*/
3866 0x8bcd, 0x8bce, 0x8bcf, 0x8bd0, 0x8bd1, 0x8bd2, 0xe6d4, 0xe6d3, /*0x10-0x17*/
3867 0x8bd3, 0x8bd4, 0x8bd5, 0x8bd6, 0x8bd7, 0x8bd8, 0x8bd9, 0x8bda, /*0x18-0x1f*/
3868 0x8bdb, 0xb5dc, 0x8bdd, 0x8bde, 0x8bdf, 0x8be0, 0x8be1, 0x8be2, /*0x20-0x27*/
3869 0x8be3, 0x8be4, 0x8be5, 0x8be6, 0x8be7, 0x8be8, 0x8be9, 0x8bea, /*0x28-0x2f*/
3870 0x8beb, 0x8bec, 0xe6d5, 0x8bed, 0xd9f8, 0x8bee, 0x8bef, 0xe6d6, /*0x30-0x37*/
3871 0x8bf0, 0x8bf1, 0x8bf2, 0x8bf3, 0x8bf4, 0x8bf5, 0x8bf6, 0x8bf7, /*0x38-0x3f*/
3872 0xe6d7, 0x8bf8, 0x8bf9, 0x8bfa, 0x8bfb, 0x8bfc, 0x8bfd, 0x8bfe, /*0x40-0x47*/
3873 0x8c40, 0x8c41, 0x8c42, 0x8c43, 0x8c44, 0x8c45, 0x8c46, 0x8c47, /*0x48-0x4f*/
3874 0xd7d3, 0xe6dd, 0x8c48, 0xe6de, 0xbfd7, 0xd4d0, 0x8c49, 0xd7d6, /*0x50-0x57*/
3875 0xb4e6, 0xcbe, 0xe6da, 0xd8c3, 0xd7ce, 0xd0a2, 0x8c4a, 0xc3cf, /*0x58-0x5f*/
3876 0x8c4b, 0x8c4c, 0xe6df, 0xbcb, 0xb9c2, 0xe6db, 0xd1a7, 0x8c4d, /*0x60-0x67*/
3877 0x8c4e, 0xbaa2, 0xc2cf, 0x8c4f, 0xd8ab, 0x8c50, 0x8c51, 0x8c52, /*0x68-0x6f*/
3878 0xcaeb, 0xe5ee, 0x8c53, 0xe6dc, 0x8c54, 0xb7f5, 0x8c55, 0x8c56, /*0x70-0x77*/
3879 0x8c57, 0x8c58, 0x8c59, 0x8c5a, 0xc4f5, 0x8c5b, 0x8c5c, 0x8c5d, /*0x78-0x7f*/
3880 0xe5b2, 0xc4fe, 0x8c5d, 0xcbf, 0xe5b3, 0xd5ac, 0x8c5e, 0xd3ee, /*0x80-0x87*/
3881 0xcad8, 0xb0b2, 0x8c5f, 0xcbe, 0xcdea, 0x8c60, 0x8c61, 0xbae, /*0x88-0x8f*/
3882 0x8c62, 0x8c63, 0x8c64, 0xe5b5, 0x8c65, 0xe5b4, 0x8c66, 0xd7da, /*0x90-0x97*/
3883 0xb9d9, 0xd6e6, 0xb6a8, 0xcdf0, 0xd2cb, 0xb1a6, 0xcab5, 0x8c67, /*0x98-0x9f*/
3884 0xb3e8, 0xc9f3, 0xbfd, 0xd0fb, 0xcad2, 0xe5b6, 0xbbc2, 0x8c68, /*0xa0-0xaf*/
3885 0x8c69, 0x8c6a, 0xcfd, 0xb9ac, 0x8c6c, 0x8c6d, 0x8c6e, 0x8c6f, /*0xaa-0xaf*/
3886 0xd4d7, 0x8c6f, 0x8c70, 0xbaa6, 0xd1e7, 0xcffc, 0xbcd2, 0x8c71, /*0xb0-0xb7*/
3887 0xe5b7, 0x8c8d, 0x8c72, 0x8c73, 0x8c74, 0xbfed, 0xb1f6, 0xcbe, /*0xb8-0xbf*/
3888 0x8c75, 0x8c76, 0xbcc5, 0x8c77, 0xbcc4, 0xd2fa, 0xc3dc, 0xbfd, /*0xc0-0xcf*/
3889 0x8c78, 0x8c79, 0x8c7a, 0x8c7b, 0xb8bb, 0x8c7c, 0x8c7d, 0x8c7e, /*0xc8-0xcf*/
3890 0xc3c2, 0x8c80, 0xbaae, 0xd4a2, 0x8c81, 0x8c82, 0x8c83, 0x8c84, /*0xd0-0xdf*/
3891 0x8c85, 0x8c86, 0x8c87, 0x8c88, 0x8c89, 0xc7de, 0xc4af, 0xb2ec, /*0xd8-0xdf*/
3892 0x8c8a, 0xb9d1, 0x8c8b, 0x8c8c, 0xe5bb, 0xc1c8, 0x8c8d, 0x8c8e, /*0xe0-0xef*/
3893 0xd5af, 0x8c8f, 0x8c90, 0x8c91, 0x8c92, 0x8c93, 0xe5bc, 0x8c94, /*0xf0-0xf7*/
3894 0xe5be, 0x8c95, 0x8c96, 0x8c97, 0x8c98, 0x8c99, 0x8c9a, 0x8c9b, /*0xf8-0xff*/
3895 0xb4e7, 0xb6d4, 0xcbe, 0xd1b0, 0xb5bc, 0x8c9c, 0x8c9d, 0xcad9, /*0xf8-0xff*/
3896 /* 0x5c00 */
3897 0x8c9e, 0xb7e2, 0x8c9f, 0x8ca0, 0xc9e4, 0x8ca1, 0xbdab, 0x8ca2, /*0x00-0x07*/
3898 0x8ca3, 0xcebe, 0xd7f0, 0x8ca4, 0x8ca5, 0x8ca6, 0x8ca7, 0xd0a1, /*0x08-0x0f*/
3899 0x8ca8, 0xc9d9, 0x8ca9, 0x8caa, 0xb6fb, 0xe6d8, 0xbce2, 0x8cab, /*0x10-0x17*/
3900 0xb3be, 0x8cac, 0xc9d0, 0x8cad, 0xe6d9, 0xb3a2, 0x8cae, 0x8caf, /*0x18-0x1f*/
3901 0x8cb0, 0x8cb1, 0xdecc, 0x8cb2, 0xd3c8, 0xdec, 0x8cb3, 0xd2a2, /*0x20-0x27*/
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3902 0x8cb4, 0x8cb5, 0x8cb6, 0x8cb7, 0xdece, 0x8cb8, 0x8cb9, 0x8cba, /*0x28-0x2f*/
3903 0x8cbb, 0xbecd, 0x8cbc, 0x8cbd, 0xdecf, 0x8cbe, 0x8cbf, 0x8cc0, /*0x30-0x37*/
3904 0xcaac, 0xd2fc, 0xb3df, 0xe5ea, 0xc4e1, 0xbea1, 0xcbe2, 0xc4f2, /*0x38-0x3f*/
3905 0xbcd6, 0xc6a8, 0xb2e3, 0x8cc1, 0x8cc2, 0xbcd3, 0x8cc3, 0x8cc4, /*0x40-0x47*/
3906 0xc7fc, 0xcceb, 0xbdec, 0xcedd, 0x8cc5, 0x8cc6, 0xcaba, 0xc6c1, /*0x48-0x4f*/
3907 0xe5ec, 0xd0bc, 0x8cc7, 0x8cc8, 0x8cc9, 0xd5b9, 0x8cca, 0x8ccb, /*0x50-0x57*/
3908 0x8ccc, 0xe5ed, 0x8ccd, 0x8cce, 0x8ccf, 0x8cd0, 0xcaf4, 0x8cd1, /*0x58-0x5f*/
3909 0xcdc0, 0xc2c5, 0x8cd2, 0xe5ef, 0x8cd3, 0xc2c4, 0xe5f0, 0x8cd4, /*0x60-0x67*/
3910 0x8cd5, 0x8cd6, 0x8cd7, 0x8cd8, 0x8cd9, 0x8cda, 0xe5f8, 0xcdcd, /*0x68-0x6f*/
3911 0x8cdb, 0xc9bd, 0x8cdc, 0x8cdd, 0x8cde, 0x8cdf, 0x8ce0, 0x8ce1, /*0x70-0x77*/
3912 0x8ce2, 0xd2d9, 0xe1a8, 0x8ce3, 0x8ce4, 0x8ce5, 0x8ce6, 0xd3ec, /*0x78-0x7f*/
3913 0x8ce7, 0xcbea, 0xc6f1, 0x8ce8, 0x8ce9, 0x8cea, 0x8ceb, 0x8cec, /*0x80-0x87*/
3914 0xe1ac, 0x8ced, 0x8cee, 0x8cef, 0xe1a7, 0xe1a9, 0x8cf0, 0x8cf1, /*0x88-0x8f*/
3915 0xe1aa, 0xe1af, 0x8cf2, 0x8cf3, 0xb2ed, 0x8cf4, 0xe1ab, 0xb8da, /*0x90-0x97*/
3916 0xe1ad, 0xe1ae, 0xe1b0, 0xb5ba, 0xe1b1, 0x8cf5, 0x8cf6, 0x8cf7, /*0x98-0x9f*/
3917 0x8cf8, 0x8cf9, 0xe1b3, 0xe1b8, 0x8cfa, 0x8cfb, 0x8cfc, 0x8cfd, /*0xa0-0xaf*/
3918 0x8cfe, 0xd1d2, 0x8d40, 0xe1b6, 0xe1b5, 0xc1eb, 0x8d41, 0x8d42, /*0xa8-0xaf*/
3919 0x8d43, 0xe1b7, 0x8d44, 0xd4c0, 0x8d45, 0xe1b2, 0x8d46, 0xe1ba, /*0xb0-0xbf*/
3920 0xb0b6, 0x8d47, 0x8d48, 0x8d49, 0x8d4a, 0xe1b4, 0x8d4b, 0xbff9, /*0xb8-0xbf*/
3921 0x8d4c, 0xe1b9, 0x8d4d, 0x8d4e, 0xe1bb, 0x8d4f, 0x8d50, 0x8d51, /*0xc0-0xcf*/
3922 0x8d52, 0x8d53, 0x8d54, 0xe1be, 0x8d55, 0x8d56, 0x8d57, 0x8d58, /*0xc8-0xcf*/
3923 0x8d59, 0x8d5a, 0xe1bc, 0x8d5b, 0x8d5c, 0x8d5d, 0x8d5e, 0x8d5f, /*0xd0-0xdf*/
3924 0x8d60, 0xd6c5, 0x8d61, 0x8d62, 0x8d63, 0x8d64, 0x8d65, 0x8d66, /*0xd8-0xdf*/
3925 0x8d67, 0xcfbf, 0x8d68, 0x8d69, 0xe1bd, 0xe1bf, 0xc2cd, 0x8d6a, /*0xe0-0xef*/
3926 0xb6eb, 0x8d6b, 0xd3f8, 0x8d6c, 0x8d6d, 0xc7cd, 0x8d6e, 0x8d6f, /*0xe8-0xef*/
3927 0xb7e5, 0x8d70, 0x8d71, 0x8d72, 0x8d73, 0x8d74, 0x8d75, 0x8d76, /*0xf0-0xf7*/
3928 0x8d77, 0x8d78, 0x8d79, 0xbefe, 0x8d7a, 0x8d7b, 0x8d7c, 0x8d7d, /*0xf8-0xff*/
3929 /* 0x5d00 */
3930 0x8d7e, 0x8d80, 0xe1c0, 0xe1c1, 0x8d81, 0x8d82, 0xe1c7, 0xb3e7, /*0x00-0x07*/
3931 0x8d83, 0x8d84, 0x8d85, 0x8d86, 0x8d87, 0x8d88, 0xc6e9, 0x8d89, /*0x08-0x0f*/
3932 0x8d8a, 0x8d8b, 0x8d8c, 0x8d8d, 0xb4de, 0x8d8e, 0xd1c2, 0x8d8f, /*0x10-0x17*/
3933 0x8d90, 0x8d91, 0x8d92, 0xe1c8, 0x8d93, 0x8d94, 0xe1c6, 0x8d95, /*0x18-0x1f*/
3934 0x8d96, 0x8d97, 0x8d98, 0x8d99, 0xe1c5, 0x8d9a, 0xe1c3, 0xe1c2, /*0x20-0x27*/
3935 0x8d9b, 0xb1c0, 0x8d9c, 0x8d9d, 0x8d9e, 0xd5b8, 0xe1c4, 0x8d9f, /*0x28-0x2f*/
3936 0x8da0, 0x8da1, 0x8da2, 0x8da3, 0xe1cb, 0x8da4, 0x8da5, 0x8da6, /*0x30-0x37*/
3937 0x8da7, 0x8da8, 0x8da9, 0x8daa, 0x8dab, 0xe1cc, 0xe1ca, 0x8dac, /*0x38-0x3f*/
3938 0x8dad, 0x8dae, 0x8daf, 0x8db0, 0x8db1, 0x8db2, 0x8db3, 0xeffa, /*0x40-0x47*/
3939 0x8db4, 0x8db5, 0xe1d3, 0xe1d2, 0xc7b6, 0x8db6, 0x8db7, 0x8db8, /*0x48-0x4f*/
3940 0x8db9, 0x8dba, 0x8dbb, 0x8dbc, 0x8dbd, 0x8dbe, 0x8dbf, 0x8dc0, /*0x50-0x57*/
3941 0xe1c9, 0x8dc1, 0x8dc2, 0xe1ce, 0x8dc3, 0xe1d0, 0x8dc4, 0x8dc5, /*0x58-0x5f*/
3942 0x8dc6, 0x8dc7, 0x8dc8, 0x8dc9, 0x8dca, 0x8dcb, 0x8dcc, 0x8dcd, /*0x60-0x67*/
3943 0x8dce, 0xe1d4, 0x8dcf, 0xe1d1, 0xe1cd, 0x8dd0, 0xe1cf, 0x8dd1, /*0x68-0x6f*/
3944 0x8dd2, 0x8dd3, 0x8dd4, 0x8dd5, 0xe1d5, 0x8dd6, 0x8dd7, 0x8dd8, /*0x70-0x77*/
3945 0x8dd9, 0x8dda, 0x8ddb, 0x8ddc, 0x8ddd, 0x8dde, 0x8ddf, 0x8de0, /*0x78-0x7f*/
3946 0x8de1, 0x8de2, 0xe1d6, 0x8de3, 0x8de4, 0x8de5, 0x8de6, 0x8de7, /*0x80-0x87*/
3947 0x8de8, 0x8de9, 0x8dea, 0x8deb, 0x8dec, 0x8ded, 0x8dee, 0x8def, /*0x88-0x8f*/
3948 0x8df0, 0x8df1, 0x8df2, 0x8df3, 0x8df4, 0x8df5, 0x8df6, 0x8df7, /*0x90-0x97*/
3949 0x8df8, 0xe1d7, 0x8df9, 0x8dfa, 0x8dfb, 0xe1d8, 0x8dfc, 0x8dfd, /*0x98-0x9f*/
3950 0x8dfe, 0x8e40, 0x8e41, 0x8e42, 0x8e43, 0x8e44, 0x8e45, 0x8e46, /*0xa0-0xaf*/
3951 0x8e47, 0x8e48, 0x8e49, 0x8e4a, 0x8e4b, 0x8e4c, 0x8e4d, 0x8e4e, /*0xa8-0xaf*/
3952 0x8e4f, 0x8e50, 0x8e51, 0x8e52, 0x8e53, 0x8e54, 0x8e55, 0xe1da, /*0xb0-0xbf*/
3953 0x8e56, 0x8e57, 0x8e58, 0x8e59, 0x8e5a, 0x8e5b, 0x8e5c, 0x8e5d, /*0xb8-0xbf*/
3954 0x8e5e, 0x8e5f, 0x8e60, 0x8e61, 0x8e62, 0xe1db, 0x8e63, 0x8e64, /*0xc0-0xcf*/
3955 0x8e65, 0x8e66, 0x8e67, 0x8e68, 0x8e69, 0xc6ea, 0x8e6a, 0x8e6b, /*0xc8-0xcf*/
3956 0x8e6c, 0x8e6d, 0x8e6e, 0x8e6f, 0x8e70, 0x8e71, 0x8e72, 0x8e73, /*0xd0-0xdf*/
3957 0x8e74, 0x8e75, 0x8e76, 0xe7dd, 0x8e77, 0xb4a8, 0xd6dd, 0x8e78, /*0xd8-0xdf*/
3958 0x8e79, 0xd1b2, 0xb3b2, 0x8e7a, 0x8e7b, 0xb9a4, 0xd7f3, 0xc7c9, /*0xe0-0xef*/
3959 0xbede, 0xb9ae, 0x8e7c, 0xcdd7, 0x8e7d, 0x8e7e, 0xb2ee, 0xdbcf, /*0xe8-0xef*/
3960 0x8e80, 0xbcbca, 0xd2d1, 0xcbbc8, 0xb0cd, 0x8e81, 0x8e82, 0xcfef, /*0xf0-0xf7*/
3961 0x8e83, 0x8e84, 0x8e85, 0x8e86, 0x8e87, 0xd9e3, 0xbded, 0x8e88, /*0xf8-0xff*/
3962 /* 0x5e00 */
3963 0x8e89, 0xb1d2, 0xcad0, 0xb2bc, 0x8e8a, 0xcba7, 0xb7ab, 0x8e8b, /*0x00-0x07*/
3964 0xcaa6, 0x8e8c, 0x8e8d, 0x8e8e, 0xcfa3, 0x8e8f, 0x8e90, 0xe0f8, /*0x08-0x0f*/
3965 0xd5ca, 0xe0fb, 0x8e91, 0x8e92, 0xe0fa, 0xc5c1, 0xccfb, 0x8e93, /*0x10-0x17*/
3966 0xc1b1, 0xe0f9, 0xd6e3, 0xb2af, 0xd6c4, 0xb5db, 0x8e94, 0x8e95, /*0x18-0x1f*/
3967 0x8e96, 0x8e97, 0x8e98, 0x8e99, 0x8e9a, 0x8e9b, 0xb4f8, 0x8e9a, /*0x20-0x27*/
3968 0x8e9c, 0x8e9d, 0x8e9e, 0x8e9f, 0x8ea0, 0xcfaf, 0xb0ef, 0x8ea1, /*0x28-0x2f*/
3969 0x8ea2, 0xe0fc, 0x8ea3, 0x8ea4, 0x8ea5, 0x8ea6, 0x8ea7, 0xe1a1, /*0x30-0x37*/
3970 0xb3a3, 0x8ea8, 0x8ea9, 0xe0fd, 0xe0fe, 0xc3b1, 0x8eaa, 0x8eab, /*0x38-0x3f*/
3971 0x8eac, 0x8ead, 0xc3dd, 0x8eae, 0xe1a2, 0xb7f9, 0x8eaf, 0x8eb0, /*0x40-0x47*/
3972 0x8eb1, 0x8eb2, 0x8eb3, 0x8eb4, 0xbbcf, 0x8eb5, 0x8eb6, 0x8eb7, /*0x48-0x4f*/
3973 0x8eb8, 0x8eb9, 0x8eba, 0x8ebb, 0xe1a3, 0xc4bb, 0x8ebc, 0x8ebd, /*0x50-0x57*/
3974 0x8ebe, 0x8ebf, 0x8ec0, 0xe1a4, 0x8ec1, 0x8ec2, 0xe1a5, 0x8ec3, /*0x58-0x5f*/
3975 0x8ec4, 0xe1a6, 0xb4b1, 0x8ec5, 0x8ec6, 0x8ec7, 0x8ec8, 0x8ec9, /*0x60-0x67*/
3976 0x8eca, 0x8ecb, 0x8ecc, 0x8ecd, 0x8ece, 0x8ecf, 0x8ed0, 0x8ed1, /*0x68-0x6f*/
3977 0x8ed2, 0x8ed3, 0xb8c9, 0xc6bd, 0xc4ea, 0x8ed4, 0xb2a2, 0x8ed5, /*0x70-0x77*/
3978 0xd0d2, 0x8ed6, 0xe7db, 0xbbc3, 0xd3d7, 0xd3c4, 0x8ed7, 0xb9e3, /*0x78-0x7f*/
3979 0xe2cf, 0x8ed8, 0x8ed9, 0x8eda, 0xd7af, 0x8edb, 0xc7ec, 0xb1d3, /*0x80-0x87*/
3980 0x8edc, 0x8edd, 0xb4b2, 0xe2d1, 0x8ede, 0x8edf, 0x8ee0, 0xd0f2, /*0x88-0x8f*/
3981 0xc2ae, 0xe2d0, 0x8ee1, 0xbfe2, 0xd3a6, 0xb5d7, 0xe2d2, 0xb5ea, /*0x90-0x97*/
3982 0x8ee2, 0xc3ed, 0xb8fd, 0x8ee3, 0xb8ae, 0x8ee4, 0xc5d3, 0xb7cf, /*0x98-0x9f*/
3983 0xe2d4, 0x8ee5, 0x8ee6, 0x8ee7, 0x8ee8, 0xe2d3, 0xb6c8, 0xd7f9, /*0xa0-0xaf*/
3984 0x8ee9, 0x8eea, 0x8eeb, 0x8eec, 0x8eed, 0xcda5, 0x8eee, 0x8eef, /*0xa8-0xaf*/
3985 0x8ef0, 0x8ef1, 0x8ef2, 0xe2d8, 0x8ef3, 0xe2d6, 0xcafc, 0xbfb5, /*0xb0-0xbf*/
3986 0xd3b9, 0xe2d5, 0x8ef4, 0x8ef5, 0x8ef6, 0x8ef7, 0xe2d7, 0x8ef8, /*0xb8-0xbf*/
3987 0x8ef9, 0x8efa, 0x8efb, 0x8efc, 0x8efd, 0x8efe, 0x8ef0, 0x8ef1, /*0xc0-0xcf*/
3988 0x8ef2, 0xc1ae, 0xc0c8, 0x8ef3, 0x8ef4, 0x8ef5, 0x8ef6, 0x8ef7, /*0xc8-0xcf*/
```

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3989 0x8f48, 0xe2db, 0xe2da, 0xc0aa, 0x8f49, 0x8f4a, 0xc1ce, 0x8f4b, /*0xd0-0xd7*/
3990 0x8f4c, 0x8f4d, 0x8f4e, 0xe2dc, 0x8f4f, 0x8f50, 0x8f51, 0x8f52, /*0xd8-0xdf*/
3991 0x8f53, 0x8f54, 0x8f55, 0x8f56, 0x8f57, 0x8f58, 0x8f59, 0x8f5a, /*0xe0-0xe7*/
3992 0xe2dd, 0x8f5b, 0xe2de, 0x8f5c, 0x8f5d, 0x8f5e, 0x8f5f, 0x8f60, /*0xe8-0xef*/
3993 0x8f61, 0x8f62, 0x8f63, 0x8f64, 0xdbc8, 0x8f65, 0xd1d3, 0xcda2, /*0xf0-0xf7*/
3994 0x8f66, 0x8f67, 0xbda8, 0x8f68, 0x8f69, 0x8f6a, 0xdec3, 0xda5a, /*0xf8-0xff*/
3995 /* 0x5f00 */
3996 0xbfaa, 0xdbcd, 0xd2ec, 0xc6fa, 0xc5aa, 0x8f6b, 0x8f6c, 0x8f6d, /*0x00-0x07*/
3997 0xdec4, 0x8f6e, 0xb1d7, 0xdfae, 0x8f6f, 0x8f70, 0x8f71, 0xcabd, /*0x08-0x0f*/
3998 0x8f72, 0xdfb1, 0x8f73, 0xb9ad, 0x8f74, 0xd2fd, 0x8f75, 0xb8a5, /*0x10-0x17*/
3999 0xbaeb, 0x8f76, 0x8f77, 0xb3da, 0x8f78, 0x8f79, 0x8f7a, 0xb5dc, /*0x18-0x1f*/
4000 0xd5c5, 0x8f7b, 0x8f7c, 0x8f7d, 0x8f7e, 0xc3d6, 0xcfd2, 0xbba1, /*0x20-0x27*/
4001 0x8f80, 0xe5f3, 0xe5f2, 0x8f81, 0x8f82, 0xe5f4, 0x8f83, 0xcde4, /*0x28-0x2f*/
4002 0x8f84, 0xc8f5, 0x8f85, 0x8f86, 0x8f87, 0x8f88, 0x8f89, 0x8f8a, /*0x30-0x37*/
4003 0x8f8b, 0xb5af, 0xc7bf, 0x8f8c, 0xe5f6, 0x8f8d, 0x8f8e, 0x8f8f, /*0x38-0x3f*/
4004 0xecb0, 0x8f90, 0x8f91, 0x8f92, 0x8f93, 0x8f94, 0x8f95, 0x8f96, /*0x40-0x47*/
4005 0x8f97, 0x8f98, 0x8f99, 0x8f9a, 0x8f9b, 0x8f9c, 0x8f9d, 0x8f9e, /*0x48-0x4f*/
4006 0xe5e6, 0x8f9f, 0x8f9f, 0xb9e9, 0xb5b1, 0x8fa0, 0xc2bc, 0xe5e8, 0xe5e7, /*0x50-0x57*/
4007 0xe5e9, 0x8fa1, 0x8fa2, 0x8fa3, 0x8fa4, 0xd2cd, 0x8fa5, 0x8fa6, /*0x58-0x5f*/
4008 0x8fa7, 0xe1ea, 0xd0ce, 0x8fa8, 0xcdae, 0x8fa9, 0xd1e5, 0x8faa, /*0x60-0x67*/
4009 0x8fab, 0xb2ca, 0xb1eb, 0x8fac, 0xb1f2, 0xc5ed, 0x8fad, 0x8fae, /*0x68-0x6f*/
4010 0xd5c3, 0xd3b0, 0x8faf, 0xeldc, 0x8fb0, 0x8fb1, 0x8fb2, 0xeldd, /*0x70-0x77*/
4011 0x8fb3, 0xd2db, 0x8fb4, 0xb3b9, 0xb1cb, 0x8fb5, 0x8fb6, 0x8fb7, /*0x78-0x7f*/
4012 0xcdf9, 0xd5f7, 0xe1de, 0x8fb8, 0xeb66, 0xb4fd, 0x8fb9, 0xeldf, /*0x80-0x87*/
4013 0xbadc, 0xe1e0, 0xbbb2, 0xc2c9, 0xe1e1, 0x8fba, 0x8fbb, 0x8fbc, /*0x88-0x8f*/
4014 0xd0ec, 0x8fbd, 0xcdbd, 0x8fbe, 0x8fbf, 0xe1e2, 0x8fc0, 0xb5c3, /*0x90-0x97*/
4015 0x8fd1, 0xe1e3, 0x8fc1, 0x8fc2, 0xe1e4, 0x8fc3, 0x8fc4, 0x8fc5, /*0x98-0x9f*/
4016 0x8fc6, 0xd3f9, 0x8fc7, 0x8fc8, 0x8fc9, 0x8fca, 0x8fcb, 0x8fcc, /*0xa0-0xa7*/
4017 0xe1e5, 0x8fcd, 0xd1ad, 0x8fce, 0x8fcf, 0xe1e6, 0xcea2, 0x8fd0, /*0xa8-0xaf*/
4018 0x8fd1, 0x8fd2, 0x8fd3, 0x8fd4, 0x8fd5, 0xe1e7, 0x8fd6, 0xb5c2, /*0xb0-0xbf*/
4019 0x8fd7, 0x8fd8, 0x8fd9, 0x8fda, 0xe1e8, 0xbbd5, 0x8fdb, 0x8fdc, /*0xb8-0xbf*/
4020 0x8fdd, 0x8fde, 0x8fdf, 0xd0c4, 0xe2e0, 0xb1d8, 0xd2e4, 0x8fe0, /*0xc0-0xc7*/
4021 0x8fe1, 0xe2e1, 0x8fe2, 0x8fe3, 0xbcc9, 0xc8cc, 0x8fe4, 0xe2e3, /*0xc8-0xcf*/
4022 0xecfe, 0xecfd, 0xdfaf, 0x8fe5, 0x8fe6, 0x8fe7, 0xe2e2, 0xd6be, /*0xd0-0xd7*/
4023 0xcdfc, 0xc3a6, 0x8fe8, 0x8fe9, 0x8fea, 0xe3c3, 0x8feb, 0x8fec, /*0xd8-0xdf*/
4024 0xd6d2, 0xe2e7, 0x8fed, 0x8fee, 0xe2e8, 0x8fef, 0x8ff0, 0xd3c7, /*0xe0-0xe7*/
4025 0x8ff1, 0x8ff2, 0xe2ec, 0xbfec, 0x8ff3, 0xe2ed, 0xe2e5, 0x8ff4, /*0xe8-0xef*/
4026 0x8ff5, 0xb3c0, 0x8ff6, 0x8ff7, 0x8ff8, 0xc4ee, 0x8ff9, 0x8ffa, /*0xf0-0xf7*/
4027 0xe2ee, 0x8ffb, 0x8ffc, 0xd0c3, 0x8ffd, 0xbaf6, 0xe2e9, 0xb7de, /*0xf8-0xff*/
4028 /* 0x6000 */
4029 0xbbbb, 0xccac, 0xcbbcb, 0xe2e4, 0xe2e6, 0xe2ea, 0xe2eb, 0x8ffe, /*0x00-0x07*/
4030 0x0040, 0x0041, 0xe2f7, 0x0042, 0x0043, 0xe2f3, 0xd4f5, 0xe2f3, /*0x08-0x0f*/
4031 0x0044, 0x0045, 0xc5ad, 0x0046, 0xd5fa, 0xc5c2, 0xb2c0, 0x0047, /*0x10-0x17*/
4032 0x0048, 0xe2ef, 0x0049, 0xe2f2, 0xc1af, 0xcbbcb, 0x004a, 0x004b, /*0x18-0x1f*/
4033 0xb5a1, 0xe2f9, 0x004c, 0x004d, 0x004e, 0xe2f1, 0xd0d4, 0x004f, /*0x20-0x27*/
4034 0xd4b9, 0xe2f5, 0xb9d6, 0xe2f6, 0x004f, 0x0050, 0x0051, 0xc7d3, /*0x28-0x2f*/
4035 0x0052, 0x0053, 0x0054, 0x0055, 0x0056, 0xe2f0, 0x0057, 0x0058, /*0x30-0x37*/
4036 0x0059, 0x005a, 0x005b, 0xd7dc, 0xeda1, 0x005c, 0x005d, 0xe2f8, /*0x38-0x3f*/
4037 0x005e, 0xeda5, 0xe2fe, 0xcad1, 0x005f, 0x0060, 0x0061, 0x0062, /*0x40-0x47*/
4038 0x0063, 0x0064, 0x0065, 0xc1b5, 0x0066, 0xbdb0, 0x0067, 0x0068, /*0x48-0x4f*/
4039 0xbfd6, 0x0069, 0xbbae3, 0x006a, 0x006b, 0xcba1, 0x006c, 0x006d, /*0x50-0x57*/
4040 0x006e, 0xeda6, 0xeda3, 0x006f, 0x0070, 0xeda2, 0x0071, 0x0072, /*0x58-0x5f*/
4041 0x0073, 0x0074, 0xbdb6, 0xeda7, 0xd0f4, 0x0075, 0x0076, 0xeda4, /*0x60-0x67*/
4042 0xbade, 0xb6f7, 0xe3a1, 0xb6b2, 0xccf1, 0xb9a7, 0x0077, 0xcfa2, /*0x68-0x6f*/
4043 0xc7a1, 0x0078, 0x0079, 0xbfd2, 0x007a, 0x007b, 0xb6f1, 0x007c, /*0x70-0x77*/
4044 0xe2fa, 0xe2fb, 0xe2fd, 0xe2fc, 0xc4d5, 0xe3a2, 0x007d, 0xd3c1, /*0x78-0x7f*/
4045 0x007e, 0x0080, 0x0081, 0xe3a7, 0xc7c4, 0x0082, 0x0083, 0x0084, /*0x80-0x87*/
4046 0x0085, 0xcfa4, 0x0086, 0x0087, 0xe3a9, 0xbab7, 0x0088, 0x0089, /*0x88-0x8f*/
4047 0x008a, 0x008b, 0xe3a8, 0x008c, 0xbdbd, 0x008d, 0xe3a3, 0x008e, /*0x90-0x97*/
4048 0x008f, 0x0090, 0xe3a4, 0xe3aa, 0x0091, 0xe3a6, 0x0092, 0xcfe2, /*0x98-0x9f*/
4049 0xd3c6, 0x0093, 0x0094, 0xbbbc, 0x0095, 0x0096, 0xd4c3, 0x0097, /*0xa0-0xaf*/
4050 0xc4fa, 0x0098, 0x0099, 0xeda8, 0xd0fc, 0xe3a5, 0x009a, 0xc3f5, /*0xa8-0xaf*/
4051 0x009b, 0xe3ad, 0xb1af, 0x009c, 0xe3b2, 0x009d, 0x009e, 0x009f, /*0xb0-0xbf*/
4052 0xbcc2, 0x009a, 0x009a1, 0xe3ac, 0xb5bf, 0x009a2, 0x009a3, 0x009a4, /*0xb8-0xbf*/
4053 0x009a5, 0x009a6, 0x009a7, 0x009a8, 0xc7e9, 0xe3b0, 0x009aa, /*0xc0-0xc7*/
4054 0x009ab, 0x009ac, 0xbbae, 0xcdef, 0x009ad, 0x009ae, 0x009af, 0x009b0, /*0xc8-0xcf*/
4055 0x009b1, 0xbbf3, 0x009b2, 0x009b3, 0x009b4, 0xcce8, 0x009b5, 0x009b6, /*0xd0-0xd7*/
4056 0xe3af, 0x009b7, 0xe3b1, 0x009b8, 0xcfa7, 0xe3ae, 0x009b9, 0xcfa9, /*0xd8-0xdf*/
4057 0xbdbd, 0x009ba, 0x009bb, 0x009bc, 0x009bd, 0x009be, 0xb5eb, 0xb5ee, /*0xe0-0xe7*/
4058 0xb2d2, 0xb3cd, 0x009bf, 0xb1b9, 0xe3ab, 0xb2d1, 0xb5ac, 0xb9df, /*0xe8-0xef*/
4059 0xb6e8, 0x009c0, 0x009c1, 0xcfeb, 0xe3b7, 0x009c2, 0xbbcc, 0x009c3, /*0xf0-0xf7*/
4060 0x009c4, 0xc8c7, 0xd0ca, 0x009c5, 0x009c6, 0x009c7, 0x009c8, 0x009c9, /*0xf8-0xff*/
4061 /* 0x6100 */
4062 0xe3b8, 0xb3ee, 0x009ca, 0x009cb, 0x009cc, 0x009cd, 0xeda9, 0x009ce, /*0x00-0x07*/
4063 0xd3fa, 0xd3e4, 0x009cf, 0x009d0, 0x009d1, 0xeda9, 0xe3b9, 0xd2e2, /*0x08-0x0f*/
4064 0x009d2, 0x009d3, 0x009d4, 0x009d5, 0x009d6, 0xe3b5, 0x009d7, 0x009d8, /*0x10-0x17*/
4065 0x009d9, 0x009da, 0xd3de, 0x009db, 0x009dc, 0x009de, 0xb8d0, 0x009df, /*0x18-0x1f*/
4066 0xe3b3, 0x009df, 0x009e0, 0xe3b6, 0xb7df, 0x009e1, 0xe3b4, 0xc0a2, /*0x20-0x27*/
4067 0x009e2, 0x009e3, 0x009e4, 0xe3ba, 0x009e5, 0x009e6, 0x009e7, 0x009e8, /*0x28-0x2f*/
4068 0x009e9, 0x009ea, 0x009eb, 0x009ec, 0x009ed, 0x009ee, 0x009ef, 0x009f0, /*0x30-0x37*/
4069 0x009f1, 0x009f2, 0x009f3, 0x009f4, 0x009f5, 0x009f6, 0x009f7, 0xd4b8, /*0x38-0x3f*/
4070 0x009f8, 0x009f9, 0x009fa, 0x009fb, 0x009fc, 0x009fd, 0x009fe, 0x009ff, /*0x40-0x47*/
4071 0xb4c8, 0x9141, 0xe3bb, 0x9142, 0xbbc5, 0x9143, 0xc9f7, 0x9144, /*0x48-0x4f*/
4072 0x9145, 0xc9e5, 0x9146, 0x9147, 0x9148, 0xc4bd, 0x9149, 0x914a, /*0x50-0x57*/
4073 0x914b, 0x914c, 0x914d, 0x914e, 0x914f, 0xedab, 0x9150, 0x9151, /*0x58-0x5f*/
4074 0x9152, 0x9153, 0xc2fd, 0x9154, 0x9155, 0x9156, 0x9157, 0xbdbd, /*0x60-0x6f*/
4075 0xbfae, 0x9158, 0x9159, 0x915a, 0x915b, 0x915c, 0x915d, 0x915e, /*0x68-0x6f*/
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4076 0xcebf, 0x915f, 0x9160, 0x9161, 0x9162, 0xe3bc, 0x9163, 0xbfb6, /*0x70-0x77*/
4077 0x9164, 0x9165, 0x9166, 0x9167, 0x9168, 0x9169, 0x916a, 0x916b, /*0x78-0x7f*/
4078 0x916c, 0x916d, 0x916e, 0x916f, 0x9170, 0x9171, 0x9172, 0x9173, /*0x80-0x87*/
4079 0x9174, 0x9175, 0x9176, 0xb1ef, 0x9177, 0x9178, 0xd4f7, 0x9179, /*0x88-0x8f*/
4080 0x917a, 0x917b, 0x917c, 0x917d, 0xe3be, 0x917e, 0x9180, 0x9181, /*0x90-0x97*/
4081 0x9182, 0x9183, 0x9184, 0x9185, 0x9186, 0xedad, 0x9187, 0x9188, /*0x98-0x9f*/
4082 0x9189, 0x918a, 0x918b, 0x918c, 0x918d, 0x918e, 0x918f, 0xe3bf, /*0xa0-0xa7*/
4083 0xbaa9, 0xedac, 0x9190, 0x9191, 0xe3bd, 0x9192, 0x9193, 0x9194, /*0xa8-0xaf*/
4084 0x9195, 0x9196, 0x9197, 0x9198, 0x9199, 0x919a, 0x919b, 0xe3c0, /*0xb0-0xb7*/
4085 0x919c, 0x919d, 0x919e, 0x919f, 0x91a0, 0x91a1, 0xbab6, 0x91a2, /*0xb8-0xbf*/
4086 0x91a3, 0x91a4, 0xb6ae, 0x91a5, 0x91a6, 0x91a7, 0x91a8, 0x91a9, /*0xc0-0xc7*/
4087 0xd0b8, 0x91aa, 0xb0c3, 0xedae, 0x91ab, 0x91ac, 0x91ad, 0x91ae, /*0xc8-0xcf*/
4088 0x91af, 0xedaf, 0xc0c1, 0x91b0, 0xe3c1, 0x91b1, 0x91b2, 0x91b3, /*0xd0-0xd7*/
4089 0x91b4, 0x91b5, 0x91b6, 0x91b7, 0x91b8, 0x91b9, 0x91ba, 0x91bb, /*0xd8-0xdf*/
4090 0x91bc, 0x91bd, 0x91be, 0x91bf, 0x91c0, 0x91c1, 0xc5b3, 0x91c2, /*0xe0-0xef*/
4091 0x91c3, 0x91c4, 0x91c5, 0x91c6, 0x91c7, 0x91c8, 0x91c9, 0x91ca, /*0xe8-0xef*/
4092 0x91cb, 0x91cc, 0x91cd, 0x91ce, 0x91cf, 0xe3c2, 0x91d0, 0x91d1, /*0xf0-0xf7*/
4093 0x91d2, 0x91d3, 0x91d4, 0x91d5, 0x91d6, 0x91d7, 0x91d8, 0xdcb2, /*0xf8-0xff*/
4094 /* 0x6200 */
4095 0x91d9, 0x91da, 0x91db, 0x91dc, 0x91dd, 0x91de, 0xedb0, 0x91df, /*0x00-0x07*/
4096 0xb8ea, 0x91e0, 0xceec, 0xea7, 0xd0e7, 0xc9f9, 0xc8d6, 0xcfb7, /*0x08-0x0f*/
4097 0xb3c9, 0xcded2, 0xbde4, 0x91e1, 0x91e2, 0xe3de, 0xbbf2, 0xea8, /*0x10-0x17*/
4098 0xd5bd, 0x91e3, 0xc6dd, 0xea9, 0x91e4, 0x91e5, 0x91e6, 0x91e7, /*0x18-0x1f*/
4099 0x91e7, 0xeaac, 0xeaab, 0x91e8, 0xeaad, 0x91e9, 0x91ea, 0x91eb, /*0x20-0x27*/
4100 0x91eb, 0x91ec, 0xbdd8, 0x91ed, 0xeaaf, 0x91ee, 0xc2be, 0x91ef, /*0x28-0x2f*/
4101 0x91f0, 0x91f1, 0x91f2, 0xb4c1, 0xb4f7, 0x91f3, 0x91f4, 0xbba7, /*0x30-0x37*/
4102 0x91f5, 0x91f6, 0x91f7, 0x91f8, 0x91f9, 0xece6, 0xece5, 0xb7bf, /*0x38-0x3f*/
4103 0xcbf9, 0xb1e2, 0x91fa, 0xece7, 0x91fb, 0x91fc, 0x91fd, 0xc9c8, /*0x40-0x47*/
4104 0xece8, 0xece9, 0x91fe, 0xcad6, 0xded0, 0xb2c5, 0xd4fa, 0x9240, /*0x48-0x4f*/
4105 0x9241, 0xc6cb, 0xb0c7, 0xb4f2, 0xc8d3, 0x9242, 0x9243, 0x9244, /*0x50-0x57*/
4106 0xcd0, 0x9245, 0x9246, 0xbfb8, 0x9247, 0x9248, 0x9249, 0x924a, /*0x58-0x5f*/
4107 0x924b, 0x924c, 0x924d, 0xbfdb, 0x924e, 0x924f, 0xc7a4, 0xd6b4, /*0x60-0x67*/
4108 0x9250, 0xc0a9, 0xded1, 0xc9a8, 0xd1ef, 0xc5a4, 0xb0e7, 0xb3b6, /*0x68-0x6f*/
4109 0xc8c5, 0x9251, 0x9252, 0xb0e2, 0x9253, 0x9254, 0xb7f6, 0x9255, /*0x70-0x77*/
4110 0x9256, 0xc5fa, 0x9257, 0x9258, 0xb6f3, 0x9259, 0xd5d2, 0xb3d0, /*0x78-0x7f*/
4111 0xbcbc, 0x925a, 0x925b, 0x925c, 0xb3ad, 0x925d, 0x925e, 0x925f, /*0x80-0x87*/
4112 0x9260, 0xbef1, 0xb0d1, 0x9261, 0x9262, 0x9263, 0x9264, 0x9265, /*0x88-0x8f*/
4113 0x9266, 0xd2d6, 0xcae3, 0xd7a5, 0x9267, 0xcdb6, 0xb6b6, 0xbfb9, /*0x90-0x97*/
4114 0xd5db, 0x9268, 0xb8a7, 0xc5d7, 0x9269, 0x926a, 0x926b, 0xded2, /*0x98-0x9f*/
4115 0xbfd9, 0xc2d5, 0xc7c0, 0x926c, 0xbba4, 0xb1a8, 0x926d, 0x926e, /*0xa0-0xaf*/
4116 0xc5ea, 0x926f, 0x9270, 0xc5fb, 0xc9a7, 0x9271, 0x9272, 0x9273, /*0xa8-0xaf*/
4117 0x9274, 0xb1a7, 0x9275, 0x9276, 0x9277, 0xb5d6, 0x9278, 0x9279, /*0xb0-0xbf*/
4118 0x927a, 0xc4a8, 0x927b, 0xded3, 0xd1ba, 0xb3e9, 0x927c, 0xc3f2, /*0xb8-0xbf*/
4119 0x927d, 0x927e, 0xb7f7, 0x9280, 0xd6f4, 0xb5a3, 0xb2f0, 0xc4b4, /*0xc0-0xc7*/
4120 0xc4e9, 0xc0ad, 0xded4, 0x9281, 0xb0e8, 0xc5c4, 0xc1e0, 0x9282, /*0xc8-0xcf*/
4121 0xb9d5, 0x9283, 0xbdc, 0xcdd8, 0xb0ce, 0x9284, 0xcdcf, 0xded6, /*0xd0-0xdf*/
4122 0xbdc, 0xd7be, 0xded5, 0xd5d0, 0xb0dd, 0x9285, 0x9286, 0xc4e2, /*0xd8-0xdf*/
4123 0x9287, 0x9288, 0xc2a3, 0xbcf0, 0x9289, 0xd3b5, 0xc0b9, 0xc5a1, /*0xe0-0xef*/
4124 0xb2a6, 0xd4f1, 0x928a, 0x928b, 0xc0a8, 0xcac3, 0xded7, 0xd5fc, /*0xe8-0xef*/
4125 0x928c, 0xb9b0, 0x928d, 0xc8ad, 0xcba9, 0x928e, 0xded9, 0xbfbdb, /*0xf0-0xf7*/
4126 0x928f, 0x9290, 0x9291, 0x9292, 0xc6b4, 0xd7a7, 0xcab0, 0xc4c3, /*0xf8-0xff*/
4127 /* 0x6300 */
4128 0x9293, 0xb3d6, 0xb9d2, 0x9294, 0x9295, 0x9296, 0x9297, 0xd6b8, /*0x00-0x07*/
4129 0xeafc, 0xb0b4, 0x9298, 0x9299, 0x929a, 0x929b, 0xbfe6, 0x929c, /*0x08-0x0f*/
4130 0x929d, 0xccf4, 0x929e, 0x929f, 0x92a0, 0x92a1, 0xcdda, 0x92a2, /*0x10-0x17*/
4131 0x92a3, 0x92a4, 0xd6bf, 0xc2ce, 0x92a5, 0x92a6, 0xcce, 0xc9a7, 0xd0ae, /*0x18-0x1f*/
4132 0xc4d3, 0xb5b2, 0xded8, 0xd5f5, 0xbcb7, 0xbbd3, 0x92a6, 0x92a7, /*0x20-0x27*/
4133 0xb0a4, 0x92a8, 0xc5b2, 0xb4ec, 0x92a9, 0x92aa, 0x92ab, 0xd5f1, /*0x28-0x2f*/
4134 0x92ac, 0x92ad, 0xeafd, 0x92ae, 0x92af, 0x92b0, 0x92b1, 0x92b2, /*0x30-0x37*/
4135 0x92b3, 0xdeda, 0xcda6, 0x92ba, 0x92b5, 0xcdec, 0x92b6, 0x92b7, /*0x38-0x3f*/
4136 0x92b8, 0x92b9, 0xcee6, 0xdedc, 0x92ba, 0xcdb1, 0xc0a6, 0x92bb, /*0x40-0x47*/
4137 0x92bc, 0xd7bd, 0x92bd, 0xdedb, 0xb0c6, 0xbab4, 0xc9d3, 0xc4f3, /*0x48-0x4f*/
4138 0xbec8, 0x92be, 0x92bf, 0x92c0, 0x92c1, 0xb2b6, 0x92c2, 0x92c3, /*0x50-0x57*/
4139 0x92c4, 0x92c5, 0x92c6, 0x92c7, 0x92c8, 0x92c9, 0xc0cc, 0xcbf0, /*0x58-0x5f*/
4140 0x92ca, 0xbcf1, 0xbbbb, 0xb5b7, 0x92cb, 0x92cc, 0x92cd, 0xc5f5, /*0x60-0x67*/
4141 0x92ce, 0x92cf, 0x92d0, 0x92d1, 0x92d2, 0x92d3, 0xbdd, 0x92d4, /*0x68-0x6f*/
4142 0x92d3, 0xdedf, 0x92d4, 0x92d5, 0x92d6, 0x92d7, 0xb4b7, 0xbddd, /*0x70-0x77*/
4143 0x92d8, 0x92d9, 0x92de, 0xc4ed, 0x92da, 0x92db, 0x92dc, 0x92dd, /*0x78-0x7f*/
4144 0xcfc6, 0x92de, 0xb5e0, 0x92df, 0x92e0, 0x92e1, 0x92e2, 0xb6de, /*0x80-0x87*/
4145 0xcada, 0xb5f4, 0x92e3, 0x92e4, 0xd5c6, 0x92e5, 0x92e6, 0xc9cc, /*0x88-0x8f*/
4146 0xc6fe, 0x92e5, 0xc5c5, 0x92e6, 0x92e7, 0x92e8, 0xd2b4, 0x92e9, /*0x90-0x97*/
4147 0xbef2, 0x92ea, 0x92eb, 0x92ec, 0x92ed, 0x92ee, 0x92ef, 0x92f0, /*0x98-0x9f*/
4148 0xc2d3, 0x92f1, 0xccbd, 0xb3b8, 0x92f2, 0xbdd3, 0x92f3, 0xbfd8, /*0xa0-0xaf*/
4149 0xcdc6, 0xd1da, 0xb4eb, 0x92f4, 0x92f5, 0x92f6, 0x92f7, 0x92f8, /*0xa8-0xaf*/
4150 0xeafe, 0x92f6, 0x92f7, 0xc2b0, 0x92f8, 0x92f9, 0xd6c0, 0x92fa, /*0xb0-0xbf*/
4151 0xb5a7, 0x92fa, 0xb2f4, 0x92fb, 0x92fc, 0x92fd, 0x92fe, 0x92ff, /*0xb8-0xbf*/
4152 0x92fe, 0x9300, 0x9301, 0x9302, 0x9303, 0x9304, 0x9305, 0x9306, /*0xc0-0xc7*/
4153 0x9307, 0xc8e0, 0x9308, 0x9309, 0x9310, 0x9311, 0x9312, 0x9313, /*0xc8-0xcf*/
4154 0xcce1, 0x9314, 0xb2e5, 0x9315, 0x9316, 0x9317, 0x9318, 0x9319, /*0xd0-0xdf*/
4155 0x931a, 0x931b, 0x931c, 0x931d, 0x931e, 0x931f, 0x9320, 0x9321, /*0xd8-0xdf*/
4156 0x9322, 0xcdd5, 0x9323, 0xb4a7, 0x9324, 0x9325, 0x9326, 0x9327, /*0xe0-0xef*/
4157 0x9328, 0xbfbf, 0x9329, 0x9330, 0x9331, 0x9332, 0xbdd2, 0x9333, /*0xe8-0xef*/
4158 0x9334, 0x9335, 0x9336, 0x9337, 0x9338, 0x9339, 0x9340, 0x9341, /*0xf0-0xf7*/
4159 0x9342, 0x9343, 0x9344, 0x9345, 0x9346, 0x9347, 0x9348, 0x9349, /*0xf8-0xff*/
4160 /* 0x6400 */
4161 0xb2f3, 0xb8e9, 0xc2a7, 0x9349, 0x9350, 0x9351, 0xbdc1, 0x9352, /*0x00-0x07*/
4162 0x9353, 0x9354, 0x9355, 0xdedf, 0x9356, 0x9357, 0x9358, 0x9359, /*0x08-0x0f*/

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4163 0xb4a4, 0x9372, 0x9373, 0xb4ea, 0xc9a6, 0x9374, 0x9375, 0x9376, /*0x10-0x17*/
4164 0x9377, 0x9378, 0x9379, 0xdf6, 0xcdb1, 0x937a, 0xb8e3, 0x937b, /*0x18-0x1f*/
4165 0xdf7, 0xdfa, 0x37c, 0x937d, 0x937e, 0x9380, 0xdf9, 0x9381, /*0x20-0x27*/
4166 0x9382, 0x9383, 0xcc2, 0x9384, 0xb0e1, 0xb4ee, 0x9385, 0x9386, /*0x28-0x2f*/
4167 0x9387, 0x9388, 0x9389, 0x938a, 0xe5ba, 0x938b, 0x938c, 0x938d, /*0x30-0x37*/
4168 0x938e, 0x938f, 0xd0af, 0x9390, 0x9391, 0xb2eb, 0x9392, 0xeba1, /*0x38-0x3f*/
4169 0x9393, 0xdf4, 0x9394, 0x9395, 0xc9e3, 0xdf3, 0xb0da, 0xd2a1, /*0x40-0x47*/
4170 0xb1f7, 0x9396, 0xccaf, 0x9397, 0x9398, 0x9399, 0x939a, 0x939b, /*0x48-0x4f*/
4171 0x939c, 0x939d, 0xdf0, 0x939e, 0xcba4, 0x939f, 0x93a0, 0x93a1, /*0x50-0x57*/
4172 0xd5aa, 0x93a2, 0x93a3, 0x93a4, 0x93a5, 0x93a6, 0xdfb, 0x93a7, /*0x58-0x5f*/
4173 0x93a8, 0x93a9, 0x93aa, 0x93ab, 0x93ac, 0x93ad, 0x93ae, 0xb4dd, /*0x60-0x67*/
4174 0x93af, 0xc4a6, 0xc4a6, 0x93b0, 0x93b1, 0x93b2, 0xdfd, 0x93b3, 0x93b4, /*0x68-0x6f*/
4175 0x93b5, 0x93b6, 0x93b7, 0x93b8, 0x93b9, 0x93ba, 0x93bb, 0x93bc, /*0x70-0x77*/
4176 0xc3fe, 0xc4a1, 0xdfa1, 0x93bd, 0x93be, 0x93bf, 0x93c0, 0x93c1, /*0x78-0x7f*/
4177 0x93c2, 0x93c3, 0xc1cc, 0x93c4, 0xdfc, 0xbef, 0x93c5, 0xc6b2, /*0x80-0x8f*/
4178 0x93c6, 0x93c7, 0x93c8, 0x93c9, 0x93ca, 0x93cb, 0x93cc, 0x93cd, /*0x88-0x8f*/
4179 0x93ce, 0xb3c5, 0xc8f6, 0x93cf, 0x93d0, 0xcbb, 0xdfef, 0x93d1, /*0x90-0x97*/
4180 0x93d2, 0xdfa4, 0x93d3, 0x93d4, 0x93d5, 0x93d6, 0xd7b2, 0x93d7, /*0x98-0x9f*/
4181 0x93d8, 0x93d9, 0x93da, 0x93db, 0xb3b7, 0x93dc, 0x93dd, 0x93de, /*0xa0-0xa7*/
4182 0x93df, 0xc1c3, 0x93e0, 0x93e1, 0xc7cb, 0xb2a5, 0xb4e9, 0x93e2, /*0xa8-0xaf*/
4183 0xd7ab, 0x93e3, 0x93e4, 0x93e5, 0x93e6, 0xc4ec, 0x93e7, 0xdfa2, /*0xb0-0xb7*/
4184 0xdfa3, 0x93e8, 0xdfa5, 0x93e9, 0xbab3, 0x93ea, 0x93eb, 0x93ec, /*0xb8-0xbf*/
4185 0xdfa6, 0x93ed, 0xc0de, 0x93ee, 0x93ef, 0xc9c3, 0x93f0, 0x93f1, /*0xc0-0xc7*/
4186 0x93f2, 0x93f3, 0x93f4, 0x93f5, 0x93f6, 0xb2d9, 0xc7e6, 0x93f7, /*0xc8-0xcf*/
4187 0xdfa7, 0x93f8, 0xc7dc, 0x93f9, 0x93fa, 0x93fb, 0x93fc, 0xdfa8, /*0xd0-0xd7*/
4188 0xeba2, 0x93fd, 0x93fe, 0x9400, 0x9441, 0x9442, 0xcdb3, 0x9443, /*0xd8-0xdf*/
4189 0x9444, 0x9445, 0xdfaa, 0x9446, 0xdfa9, 0x9447, 0xb2c1, 0x9448, /*0xe0-0xef*/
4190 0x9449, 0x944a, 0x944b, 0x944c, 0x944d, 0x944e, 0x944f, 0x9450, /*0xe8-0xef*/
4191 0x9451, 0x9452, 0x9453, 0x9454, 0x9455, 0x9456, 0x9457, 0x9458, /*0xf0-0xf7*/
4192 0x9459, 0x945a, 0x945b, 0x945c, 0x945d, 0x945e, 0x945f, 0x9460, /*0xf8-0xff*/
4193 /* 0x6500 */
4194 0xc5ca, 0x9461, 0x9462, 0x9463, 0x9464, 0x9465, 0x9466, 0x9467, /*0x00-0x07*/
4195 0x9468, 0xdfab, 0x9469, 0x946a, 0x946b, 0x946c, 0x946d, 0x946e, /*0x08-0x0f*/
4196 0x946f, 0x9470, 0xd4dc, 0x9471, 0x9472, 0x9473, 0x9474, 0x9475, /*0x10-0x17*/
4197 0xc8c1, 0x9476, 0x9477, 0x9478, 0x9479, 0x947a, 0x947b, 0x947c, /*0x18-0x1f*/
4198 0x947d, 0x947e, 0x9480, 0x9481, 0x9482, 0xdfac, 0x9483, 0x9484, /*0x20-0x27*/
4199 0x9485, 0x9486, 0x9487, 0xbf0, 0x9488, 0x9489, 0xdfad, 0xd6a7, /*0x28-0x2f*/
4200 0x948a, 0x948b, 0x948c, 0x948d, 0xebb6, 0xcad5, 0x948e, 0x948f, /*0x30-0x37*/
4201 0xd8fc, 0xb8c4, 0x948f, 0xb9a5, 0x9490, 0x9491, 0xb7c5, 0xd5fe, /*0x38-0x3f*/
4202 0x9492, 0x9493, 0x9494, 0x9495, 0x9496, 0xb9ca, 0x9497, 0x9498, /*0x40-0x47*/
4203 0xd0a7, 0xf4cd, 0x9499, 0x949a, 0xb5d0, 0x949b, 0x949c, 0xc3f4, /*0x48-0x4f*/
4204 0x949d, 0xbec8, 0x949e, 0x949f, 0x94a0, 0xebb7, 0xb0bd, 0x94a1, /*0x50-0x57*/
4205 0x94a2, 0xbdcc, 0x94a3, 0xc1b2, 0x94a4, 0xb1d6, 0xb3a8, 0x94a5, /*0x58-0x5f*/
4206 0x94a6, 0x94a7, 0xb8d2, 0xc9a2, 0x94a8, 0x94a9, 0xb6d8, 0x94aa, /*0x60-0x67*/
4207 0x94ab, 0x94ac, 0x94ad, 0xebb8, 0xebb4, 0x94ae, 0x94af, 0x94b0, /*0x68-0x6f*/
4208 0xcafd, 0x94b1, 0xc7c3, 0x94b2, 0xd5fb, 0x94b3, 0x94b4, 0xb7f3, /*0x70-0x77*/
4209 0x94b5, 0x94b6, 0x94b7, 0x94b8, 0x94b9, 0x94ba, 0x94bb, 0x94bc, /*0x78-0x7f*/
4210 0x94bd, 0x94be, 0x94bf, 0x94c0, 0x94c1, 0x94c2, 0x94c3, 0xccec4, /*0x80-0x87*/
4211 0x94c4, 0x94c5, 0x94c6, 0xd5ab, 0xb1f3, 0x94c7, 0x94c8, 0x94c9, /*0x88-0x8f*/
4212 0xecb3, 0xb0df, 0x94ca, 0xecb5, 0x94cb, 0x94cc, 0x94cd, 0xb6b7, /*0x90-0x97*/
4213 0x94ce, 0xc1cf, 0x94cf, 0xf5fa, 0xd0b1, 0x94d0, 0x94d1, 0xd5e5, /*0x98-0x9f*/
4214 0x94d2, 0xc3d3, 0x94d3, 0x94d4, 0xbdef, 0xb3e2, 0x94d5, 0xb8ab, /*0xa0-0xaf*/
4215 0x94d6, 0xd5b6, 0x94d7, 0xedbd, 0x94d8, 0xb6cf, 0x94d9, 0xcbb9, /*0xa8-0xaf*/
4216 0xd0c2, 0x94da, 0x94db, 0x94dc, 0x94dd, 0x94de, 0x94df, 0x94e0, /*0xb0-0xbf*/
4217 0x94e1, 0xb7bd, 0x94e2, 0x94e3, 0xecb6, 0xcaa9, 0x94e4, 0x94e5, /*0xb8-0xbf*/
4218 0x94e6, 0xc5d4, 0x94e7, 0xecb9, 0xecb8, 0xc2c3, 0xecb7, 0x94e8, /*0xc0-0xc7*/
4219 0x94e9, 0x94ea, 0x94eb, 0xd0fd, 0xecba, 0x94ec, 0xecbb, 0xd7e5, /*0xc8-0xcf*/
4220 0x94ed, 0x94ee, 0xecbc, 0x94ef, 0x94f0, 0x94f1, 0xecbd, 0xc6ec, /*0xd0-0xd7*/
4221 0x94f2, 0x94f3, 0x94f4, 0x94f5, 0x94f6, 0x94f7, 0x94f8, 0x94f9, /*0xd8-0xdf*/
4222 0xc3de, 0x94fa, 0xbcc8, 0x94fb, 0x94fc, 0xc8d5, 0xb5a9, 0xbec9, /*0xe0-0xef*/
4223 0xd6bc, 0xd4e7, 0x94fd, 0x94fe, 0xd1ae, 0xd0f1, 0xeab8, 0xeab9, /*0xe8-0xef*/
4224 0xeaba, 0xbab5, 0x9540, 0x9541, 0x9542, 0x9543, 0xcab1, 0xbff5, /*0xf0-0xf7*/
4225 0x9544, 0x9545, 0xcdfa, 0x9546, 0x9547, 0x9548, 0x9549, 0x954a, /*0xf8-0xff*/
4226 /* 0x6600 */
4227 0xeac0, 0x954b, 0xb0ba, 0xeabe, 0x954c, 0x954d, 0xc0a5, 0x954e, /*0x00-0x07*/
4228 0x954f, 0x9550, 0xeabb, 0x9551, 0xb2fd, 0x9552, 0xc3f7, 0xbbe8, /*0x08-0x0f*/
4229 0x9553, 0x9554, 0x9555, 0xd2d7, 0xc3f4, 0xeabf, 0x9556, 0x9557, /*0x10-0x17*/
4230 0x9558, 0xeabc, 0x9559, 0x955a, 0x955b, 0xeac3, 0x955c, 0xd0c7, /*0x18-0x1f*/
4231 0xd3b3, 0x955d, 0x955e, 0x955f, 0x9560, 0xb4ba, 0x9561, 0xc3c1, /*0x20-0x27*/
4232 0xd7f2, 0x9562, 0x9563, 0x9564, 0x9565, 0xd5d1, 0x9566, 0xcac7, /*0x28-0x2f*/
4233 0x9567, 0xeac5, 0x9568, 0x9569, 0xeac6, 0xeac7, 0xeac6, 0x956a, /*0x30-0x37*/
4234 0x956b, 0x956c, 0x956d, 0x956e, 0xd6e7, 0x956f, 0xcfd4, 0x9570, /*0x38-0x3f*/
4235 0x9571, 0xeac6, 0x9572, 0xbce, 0x9573, 0x9574, 0x9575, 0x9576, /*0x40-0x47*/
4236 0x9577, 0x9578, 0x9579, 0xbdfa, 0xc9ce, 0x957a, 0x957b, 0xeacc, /*0x48-0x4f*/
4237 0x957c, 0x957d, 0xc9b9, 0xcffe, 0xeaca, 0xd4ce, 0xeacd, 0xeacf, /*0x50-0x57*/
4238 0x957e, 0x9580, 0xc3de, 0x9581, 0x9582, 0x9583, 0x9584, 0xeac9, /*0x58-0x5f*/
4239 0x9585, 0xeace, 0x9586, 0x9587, 0xccee, 0x9588, 0xbdbd, 0x9589, /*0x60-0x67*/
4240 0xb3bf, 0x958a, 0x958b, 0x958c, 0x958d, 0x958e, 0xc6d5, 0xbbe0, /*0x68-0x6f*/
4241 0xc3fa, 0x958f, 0x9590, 0x9591, 0xc7e7, 0x9592, 0xbea7, 0xeado, /*0x70-0x77*/
4242 0x9593, 0x9594, 0xd6c7, 0x9595, 0x9596, 0x9597, 0xc1c0, 0x9598, /*0x78-0x7f*/
4243 0x9599, 0x959a, 0xd4dd, 0x959b, 0xeado, 0x959c, 0x959d, 0xc3be, /*0x80-0x87*/
4244 0x959e, 0x959f, 0x95a0, 0x95a1, 0xeado, 0x95a2, 0x95a3, 0x95a4, /*0x88-0x8f*/
4245 0x95a5, 0xc3ae, 0x95a6, 0x95a7, 0x95a8, 0xc3af, 0xb0b5, 0x95a9, /*0x90-0x97*/
4246 0x95aa, 0x95ab, 0x95ac, 0x95ad, 0x95ae, 0xeado, 0x95af, 0x95b0, /*0x98-0x9f*/
4247 0x95b1, 0x95b2, 0x95b3, 0x95b4, 0x95b5, 0x95b6, 0x95b7, 0xeado, /*0xa0-0xaf*/
4248 0xf4df, 0x95b8, 0x95b9, 0x95ba, 0x95bb, 0x95bc, 0xc4ba, 0x95bd, /*0xa8-0xaf*/
4249 0x95be, 0x95bf, 0x95c0, 0x95c1, 0xb1a9, 0x95c2, 0x95c3, 0x95c4, /*0xb0-0xbf*/
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4250 0x95c5, 0xe5df, 0x95c6, 0x95c7, 0x95c8, 0x95c9, 0xead5, 0x95ca, /*0xb8-0xbf*/
4251 0x95cb, 0x95cc, 0x95cd, 0x95ce, 0x95cf, 0x95d0, 0x95d1, 0x95d2, /*0xc0-0xc7*/
4252 0x95d3, 0x95d4, 0x95d5, 0x95de, 0x95df, 0x95e0, 0x95e1, 0x95e2, /*0xc8-0xcf*/
4253 0x95db, 0x95dc, 0x95dd, 0x95de, 0x95df, 0x95e0, 0x95e1, 0x95e2, /*0xd0-0xd7*/
4254 0x95e3, 0xcaef, 0x95e4, 0xead6, 0xead7, 0xc6d8, 0x95e5, 0x95e6, /*0xd8-0xdf*/
4255 0x95e7, 0x95e8, 0x95e9, 0x95ea, 0x95eb, 0x95ec, 0x95ed, 0x95ee, /*0xe0-0xef*/
4256 0x95ee, 0xead9, 0x95ef, 0x95f0, 0x95f1, 0x95f2, 0x95f3, 0x95f4, /*0xe8-0xef*/
4257 0xd4bb, 0x95f5, 0xc7fa, 0xd2b7, 0xb8fc, 0x95f6, 0x95f7, 0xeac2, /*0xf0-0xff*/
4258 0x95f8, 0xb2dc, 0x95f9, 0x95fa, 0xc2fc, 0x95fb, 0xd4f8, 0xcce6, /*0xf8-0xff*/
4259 /* 0x6700 */
4260 0xd7ee, 0x95fc, 0x95fd, 0x95fe, 0x9640, 0x9641, 0x9642, 0x9643, /*0x00-0x07*/
4261 0xd4c2, 0xd3d0, 0xebc3, 0xc5f3, 0x9644, 0xb7fe, 0x9645, 0x9646, /*0x08-0x0f*/
4262 0xebd4, 0x9647, 0x9648, 0x9649, 0xcbb7, 0xebde, 0x964a, 0xc0ca, /*0x10-0x17*/
4263 0x964b, 0x964c, 0x964d, 0xcdfb, 0x964e, 0xb3af, 0x964f, 0xc6da, /*0x18-0x1f*/
4264 0x9650, 0x9651, 0x9652, 0x9653, 0x9654, 0x9655, 0xebfc, 0x9656, /*0x20-0x27*/
4265 0xc4be, 0x9657, 0xceb4, 0xc4a9, 0xb1be, 0xd4fd, 0x9658, 0xcaf5, /*0x28-0x2f*/
4266 0x9659, 0xd6ec, 0x965a, 0x965b, 0xc6d3, 0xb6e4, 0x965c, 0x965d, /*0x30-0x37*/
4267 0x965e, 0x965f, 0xcbbfa, 0x9660, 0x9661, 0xd0e0, 0x9662, 0x9663, /*0x38-0x3f*/
4268 0xc9b1, 0x9664, 0xd4d3, 0xc8a8, 0x9665, 0x9666, 0xb8cb, 0x9667, /*0x40-0x47*/
4269 0xe8be, 0xc9bc, 0x9668, 0x9669, 0xe8bb, 0x966a, 0xc0ee, 0xd0d3, /*0x48-0x4f*/
4270 0xb2c4, 0xb4e5, 0x966b, 0xe8bc, 0x966c, 0x966d, 0xd5c8, 0x966e, /*0x50-0x57*/
4271 0x966f, 0x9670, 0x9671, 0x9672, 0xb6c5, 0x9673, 0xe8bd, 0xcaf8, /*0x58-0x5f*/
4272 0xb8dc, 0xccf5, 0x9674, 0x9675, 0x9676, 0xc0b4, 0x9677, 0x9678, /*0x60-0x67*/
4273 0x1ee, 0xe8bf, 0xe8c2, 0x9679, 0x967a, 0xbabc, 0x967b, 0xb1ad, /*0x68-0x6f*/
4274 0xbddc, 0x967c, 0xeabd, 0xe8c3, 0x967d, 0xe8c6, 0x967e, 0xe8cb, /*0x70-0x77*/
4275 0x9680, 0x9681, 0x9682, 0x9683, 0xe8cc, 0x9684, 0xcbc9, 0xb0e5, /*0x78-0x7f*/
4276 0x9685, 0xbcab, 0x9686, 0x9687, 0x9688, 0x9689, 0x968a, 0xe8c1, /*0x80-0x87*/
4277 0x968a, 0xcdf7, 0x968b, 0xe8ca, 0x968c, 0x968d, 0x968e, 0x968f, /*0x88-0x8f*/
4278 0xcef6, 0x9690, 0x9691, 0x9692, 0x9693, 0xd5ed, 0x9694, 0xc1de, /*0x90-0x97*/
4279 0xe8c4, 0x9695, 0xc3b6, 0x9696, 0xb9fb, 0xd6a6, 0xe8c8, 0x9697, /*0x98-0x9f*/
4280 0x9698, 0x9699, 0xcae0, 0xd4e6, 0x969a, 0xe8c0, 0x969b, 0xe8c5, /*0xa0-0xa7*/
4281 0xe8c7, 0x969c, 0xc7b9, 0xb7e3, 0x969d, 0xe8c9, 0x969e, 0xbfd, /*0xa8-0xaf*/
4282 0xe8d2, 0x969f, 0x96a0, 0xe8d7, 0x96a1, 0xe8d5, 0xbcdc, 0xbccf, /*0xb0-0xbf*/
4283 0xe8db, 0x96a2, 0x96a3, 0x96a4, 0x96a5, 0x96a6, 0x96a7, 0x96a8, /*0xb8-0xbf*/
4284 0x96a9, 0xe8de, 0x96aa, 0xe8da, 0xb1fa, 0x96ab, 0x96ac, 0x96ad, /*0xc0-0xc7*/
4285 0x96ae, 0x96af, 0x96b0, 0x96b1, 0x96b2, 0x96b3, 0x96b4, 0xb0d8, /*0xc8-0xcf*/
4286 0xc4b3, 0xb8cc, 0xc6e2, 0xc8be, 0xc8e1, 0x96b5, 0x96b6, 0x96b7, /*0xd0-0xd7*/
4287 0xe8cf, 0xe8d4, 0xe8d6, 0x96b8, 0xb9f1, 0xe8d8, 0xd7f5, 0x96b9, /*0xd8-0xdf*/
4288 0xc4fb, 0x96ba, 0xe8dc, 0x96bb, 0xb2e9, 0x96bd, 0x96be, /*0xe0-0xef*/
4289 0x96bf, 0xe8d1, 0x96c0, 0x96c1, 0xbced, 0x96c2, 0x96c3, 0xbfc2, /*0xe8-0xef*/
4290 0xe8cd, 0xd6f9, 0x96c4, 0xc1f8, 0xb2f1, 0x96c5, 0x96c6, 0x96c7, /*0xf0-0xff*/
4291 0x96c8, 0x96c9, 0x96ca, 0x96cb, 0x96cc, 0xe8df, 0x96cd, 0xcac1, /*0xf8-0xff*/
4292 /* 0x6800 */
4293 0xe8d9, 0x96ce, 0x96cf, 0x96d0, 0x96d1, 0xd5a4, 0x96d2, 0xb1ea, /*0x00-0x07*/
4294 0xd5bb, 0xe8ce, 0xe8d0, 0xb6b0, 0xe8d3, 0x96d3, 0xe8dd, 0xc0b8, /*0x08-0x0f*/
4295 0x96d4, 0xcaf7, 0x96d5, 0xcba8, 0x96d6, 0x96d7, 0xc6dc, 0xc0f5, /*0x10-0x17*/
4296 0x96d8, 0x96d9, 0x96da, 0x96db, 0x96dc, 0xe8e9, 0x96dd, 0x96de, /*0x18-0x1f*/
4297 0x96df, 0xd0a3, 0x96e0, 0x96e1, 0x96e2, 0x96e3, 0x96e4, 0x96e5, /*0x20-0x27*/
4298 0x96e6, 0xe8f2, 0xd6ea, 0x96e7, 0x96e8, 0x96e9, 0x96ea, 0x96eb, /*0x28-0x2f*/
4299 0x96ec, 0x96ed, 0xe8e0, 0xe8e1, 0x96ee, 0x96ef, 0x96f0, 0xd1f9, /*0x30-0x37*/
4300 0xbacb, 0xb8f9, 0x96f1, 0x96f2, 0xb8f1, 0xd4d4, 0xe8ef, 0x96f3, /*0x38-0x3f*/
4301 0xe8ee, 0xe8ec, 0xb9f0, 0xcd2, 0xe8e6, 0xcea6, 0xbff2, 0x96f4, /*0x40-0x47*/
4302 0xb0b8, 0xe8f1, 0xe8f0, 0x96f5, 0xd7c0, 0x96f6, 0xe8e4, 0x96f7, /*0x48-0x4f*/
4303 0xcda9, 0xc9a3, 0x96f8, 0xbdbb, 0xbdbb, 0xe8ea, 0x96f9, 0x96fa, /*0x50-0x57*/
4304 0x96fb, 0x96fc, 0x96fd, 0x96fe, 0x9740, 0x9741, 0x9742, 0x9743, /*0x58-0x5f*/
4305 0xe8e2, 0xe8e3, 0xe8e5, 0xb5b5, 0xe8e7, 0xc7c5, 0xe8eb, 0xe8ed, /*0x60-0x67*/
4306 0xbdb0, 0xd7ae, 0x9744, 0xe8f8, 0x9745, 0x9746, 0x9747, 0x9748, /*0x68-0x6f*/
4307 0x9749, 0x974a, 0x974b, 0x974c, 0xe8f5, 0x974d, 0xcdb0, 0xe8f6, /*0x70-0x77*/
4308 0x974e, 0x974f, 0x9750, 0x9751, 0x9752, 0x9753, 0x9754, 0x9755, /*0x78-0x7f*/
4309 0x9756, 0xc1ba, 0x9757, 0xe8e8, 0x9758, 0xc3b7, 0xb0f0, 0x9759, /*0x80-0x87*/
4310 0x975a, 0x975b, 0x975c, 0x975d, 0x975e, 0x975f, 0x9760, 0xe8f4, /*0x88-0x8f*/
4311 0x9761, 0x9762, 0x9763, 0xe8f7, 0x9764, 0x9765, 0x9766, 0xb9a3, /*0x90-0x97*/
4312 0x9767, 0x9768, 0x9769, 0x976a, 0x976b, 0x976c, 0x976d, 0x976e, /*0x98-0x9f*/
4313 0x976f, 0x9770, 0xc9d2, 0x9771, 0x9772, 0x9773, 0xc3ce, 0xcce0, /*0xa0-0xaf*/
4314 0xc0e6, 0x9774, 0x9775, 0x9776, 0x9777, 0xcbf3, 0x9778, 0xcdd, /*0xa8-0xaf*/
4315 0xd0b5, 0x9779, 0x977a, 0xcae1, 0x977b, 0xe8f3, 0x977c, 0x977d, /*0xb0-0xbf*/
4316 0x977e, 0x9780, 0x9781, 0x9782, 0x9783, 0x9784, 0x9785, 0x9786, /*0xb8-0xbf*/
4317 0xbcec, 0x9787, 0xe8f9, 0x9788, 0x9789, 0x978a, 0x978b, 0x978c, /*0xc0-0xc7*/
4318 0x978d, 0xc3de, 0x978e, 0xc6e5, 0x978f, 0xb9f7, 0x9790, 0x9791, /*0xc8-0xcf*/
4319 0x9792, 0x9793, 0xb0f4, 0x9794, 0x9795, 0xd7d8, 0x9796, 0x9797, /*0xd0-0xd7*/
4320 0xbcac, 0x9798, 0xc5ef, 0x9799, 0x979a, 0x979b, 0x979c, 0x979d, /*0xd8-0xdf*/
4321 0xccc4, 0x979e, 0x979f, 0xe9a6, 0x97a0, 0x97a1, 0x97a2, 0x97a3, /*0xe0-0xef*/
4322 0x97a4, 0x97a5, 0x97a6, 0x97a7, 0x97a8, 0x97a9, 0xc9ad, 0x97aa, /*0xe8-0xef*/
4323 0xe9a2, 0xc0e2, 0x97ab, 0x97ac, 0x97ad, 0xbfc3, 0x97ae, 0x97af, /*0xf0-0xff*/
4324 0x97b0, 0xe8fe, 0xb9d7, 0x97b1, 0xe8fb, 0x97b2, 0x97b3, 0x97b4, /*0xf8-0xff*/
4325 /* 0x6900 */
4326 0x97b5, 0xe9a4, 0x97b6, 0x97b7, 0x97b8, 0xd2ce, 0x97b9, 0x97ba, /*0x00-0x07*/
4327 0x97bb, 0x97bc, 0x97bd, 0xe9a3, 0x97be, 0xd6b2, 0xd7b5, 0x97bf, /*0x08-0x0f*/
4328 0xe9a7, 0x97c0, 0xbdb7, 0x97c1, 0x97c2, 0x97c3, 0x97c4, 0x97c5, /*0x10-0x17*/
4329 0x97c6, 0x97c7, 0x97c8, 0x97c9, 0x97ca, 0x97cb, 0x97cc, 0xe8fc, /*0x18-0x1f*/
4330 0xe8fd, 0x97cd, 0x97ce, 0x97cf, 0xe9a1, 0x97d0, 0x97d1, 0x97d2, /*0x20-0x27*/
4331 0x97d3, 0x97d4, 0x97d5, 0x97d6, 0x97d7, 0xcdd6, 0x97d8, 0x97d9, /*0x28-0x2f*/
4332 0xd2ac, 0x97da, 0x97db, 0x97dc, 0xe9b2, 0x97dd, 0x97de, 0x97df, /*0x30-0x37*/
4333 0x97e0, 0xe9a9, 0x97e1, 0x97e2, 0x97e3, 0xb4aa, 0x97e4, 0xb4bb, /*0x38-0x3f*/
4334 0x97e5, 0x97e6, 0xe9ab, 0x97e7, 0x97e8, 0x97e9, 0x97ea, 0x97eb, /*0x40-0x4f*/
4335 0x97ec, 0x97ed, 0x97ee, 0x97ef, 0x97f0, 0x97f1, 0x97f2, 0x97f3, /*0x48-0x4f*/
4336 0x97f4, 0x97f5, 0x97f6, 0x97f7, 0xd0a8, 0x97f8, 0x97f9, 0xe9a5, /*0x50-0x57*/
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4337 0x97fa, 0x97fb, 0xb3fe, 0x97fc, 0x97fd, 0xe9ac, 0xc0e3, 0x97fe, /*0x58-0x5f*/
4338 0xe9aa, 0x9840, 0x9841, 0xe9b9, 0x9842, 0x9843, 0xe9b8, 0x9844, /*0x60-0x67*/
4339 0x9845, 0x9846, 0x9847, 0xe9ae, 0x9848, 0x9849, 0xe9fa, 0x984a, /*0x68-0x6f*/
4340 0x984b, 0xe9a8, 0x984c, 0x984d, 0x984e, 0x984f, 0x9850, 0xbfac, /*0x70-0x77*/
4341 0xe9b1, 0xe9ba, 0x9851, 0x9852, 0xc2a5, 0x9853, 0x9854, 0x9855, /*0x78-0x7f*/
4342 0xe9af, 0x9856, 0xb8c5, 0x9857, 0xe9ad, 0x9858, 0xd3dc, 0xe9b4, /*0x80-0x87*/
4343 0xe9b5, 0xe9b7, 0x9859, 0x985a, 0x985b, 0xe9c7, 0x985c, 0x985d, /*0x88-0x8f*/
4344 0x985e, 0x985f, 0x9860, 0x9861, 0xc0c6, 0xe9c5, 0x9862, 0x9863, /*0x90-0x97*/
4345 0xe9b0, 0x9864, 0x9865, 0xe9bb, 0xb0f1, 0x9866, 0x9867, 0x9868, /*0x98-0x9f*/
4346 0x9869, 0x986a, 0x986b, 0x986c, 0x986d, 0x986e, 0x986f, 0xe9bc, /*0xa0-0xa7*/
4347 0xd5a5, 0x9870, 0x9871, 0xe9be, 0x9872, 0xe9bf, 0x9873, 0x9874, /*0xa8-0xaf*/
4348 0x9875, 0xe9c1, 0x9876, 0x9877, 0xc1f1, 0x9878, 0x9879, 0xc8b6, /*0xb0-0xb7*/
4349 0x987a, 0x987b, 0x987c, 0xe9bd, 0x987d, 0x987e, 0x9880, 0x9881, /*0xb8-0xbf*/
4350 0x9882, 0xe9c2, 0x9883, 0x9884, 0x9885, 0x9886, 0x9887, 0x9888, /*0xc0-0xc7*/
4351 0x9889, 0x988a, 0xe9c3, 0x988b, 0xe9b3, 0x988c, 0xe9b6, 0x988d, /*0xc8-0xcf*/
4352 0xbbb1, 0x988e, 0x988f, 0x9890, 0xe9c0, 0x9891, 0x9892, 0x9893, /*0xd0-0xd7*/
4353 0x9894, 0x9895, 0x9896, 0xbcf7, 0x9897, 0x9898, 0x9899, 0xe9c4, /*0xd8-0xdf*/
4354 0xe9c6, 0x989a, 0x989b, 0x989c, 0x989d, 0x989e, 0x989f, 0x98a0, /*0xe0-0xef*/
4355 0x98a1, 0x98a2, 0x98a3, 0x98a4, 0x98a5, 0xe9ca, 0x98a6, 0x98a7, /*0xe8-0xef*/
4356 0x98a8, 0x98a9, 0xe9ce, 0x98aa, 0x98ab, 0x98ac, 0x98ad, 0x98ae, /*0xf0-0xf7*/
4357 0x98af, 0x98b0, 0x98b1, 0x98b2, 0x98b3, 0xb2db, 0x98b4, 0xe9c8, /*0xf8-0xff*/
4358 /* 0x6a00 */
4359 0x98b5, 0x98b6, 0x98b7, 0x98b8, 0x98b9, 0x98ba, 0x98bb, 0x98bc, /*0x00-0x07*/
4360 0x98bd, 0x98be, 0xb7ae, 0x98bf, 0x98c0, 0x98c1, 0x98c2, 0x98c3, /*0x08-0x0f*/
4361 0x98c4, 0x98c5, 0x98c6, 0x98c7, 0x98c8, 0x98c9, 0x98ca, 0xe9cb, /*0x10-0x17*/
4362 0xe9cc, 0x98cb, 0x98cc, 0x98cd, 0x98ce, 0x98cf, 0x98d0, 0xd5c1, /*0x18-0x1f*/
4363 0x98d1, 0xc4a3, 0x98d2, 0x98d3, 0x98d4, 0x98d5, 0x98d6, 0x98d7, /*0x20-0x27*/
4364 0xe9d8, 0x98d8, 0xbae1, 0x98d9, 0x98da, 0x98db, 0x98dc, 0xe9c9, /*0x28-0x2f*/
4365 0x98dd, 0xd3a3, 0x98de, 0x98df, 0x98e0, 0xe9d4, 0x98e1, 0x98e2, /*0x30-0x37*/
4366 0x98e3, 0x98e4, 0x98e5, 0x98e6, 0x98e7, 0xe9d7, 0xe9d0, 0x98e8, /*0x38-0x3f*/
4367 0x98e9, 0x98ea, 0x98eb, 0x98ec, 0xe9cf, 0x98ed, 0x98ee, 0xc7c1, /*0x40-0x47*/
4368 0x98ef, 0x98f0, 0x98f1, 0x98f2, 0x98f3, 0x98f4, 0x98f5, 0x98f6, /*0x48-0x4f*/
4369 0xe9d2, 0x98f7, 0x98f8, 0x98f9, 0x98fa, 0x98fb, 0x98fc, 0x98fd, /*0x50-0x57*/
4370 0xe9d9, 0xb3c8, 0x98fe, 0xe9d3, 0x9940, 0x9941, 0x9942, 0x9943, /*0x58-0x5f*/
4371 0x9944, 0xcff0, 0x9945, 0x9946, 0x9947, 0xe9cd, 0x9948, 0x9949, /*0x60-0x67*/
4372 0x994a, 0x994b, 0x994c, 0x994d, 0x994e, 0x994f, 0x9950, 0x9951, /*0x68-0x6f*/
4373 0x9952, 0xb3f7, 0x9953, 0x9954, 0x9955, 0x9956, 0x9957, 0x9958, /*0x70-0x77*/
4374 0x9959, 0xe9d6, 0x995a, 0x995b, 0xe9da, 0x995c, 0x995d, 0x995e, /*0x78-0x7f*/
4375 0xc9b4, 0x995f, 0x9960, 0x9961, 0xcfad, 0x9962, 0x9963, 0x9964, /*0x80-0x87*/
4376 0x9965, 0x9966, 0x9967, 0x9968, 0x9969, 0x996a, 0xe9d5, 0x996b, /*0x88-0x8f*/
4377 0xe9dc, 0xe9db, 0x996c, 0x996d, 0x996e, 0x996f, 0x9970, 0xe9de, /*0x90-0x97*/
4378 0x9971, 0x9972, 0x9973, 0x9974, 0x9975, 0x9976, 0x9977, 0x9978, /*0x98-0x9f*/
4379 0xe9d1, 0x9979, 0x997a, 0x997b, 0x997c, 0x997d, 0x997e, 0x9980, /*0xa0-0xaf*/
4380 0x9981, 0xe9dd, 0x9982, 0xe9df, 0xc3ca, 0x9983, 0x9984, 0x9985, /*0xa8-0xaf*/
4381 0x9986, 0x9987, 0x9988, 0x9989, 0x998a, 0x998b, 0x998c, 0x998d, /*0xb0-0xbf*/
4382 0x998e, 0x998f, 0x9990, 0x9991, 0x9992, 0x9993, 0x9994, 0x9995, /*0xb8-0xbf*/
4383 0x9996, 0x9997, 0x9998, 0x9999, 0x999a, 0x999b, 0x999c, 0x999d, /*0xc0-0xc7*/
4384 0x999e, 0x999f, 0x99a0, 0x99a1, 0x99a2, 0x99a3, 0x99a4, 0x99a5, /*0xc8-0xcf*/
4385 0x99a6, 0x99a7, 0x99a8, 0x99a9, 0x99aa, 0x99ab, 0x99ac, 0x99ad, /*0xd0-0xdf*/
4386 0x99ae, 0x99af, 0x99b0, 0x99b1, 0x99b2, 0x99b3, 0x99b4, 0x99b5, /*0xe0-0xef*/
4387 0x99b6, 0x99b7, 0x99b8, 0x99b9, 0x99ba, 0x99bb, 0x99bc, 0x99bd, /*0xf0-0xf7*/
4388 0x99be, 0x99bf, 0x99c0, 0x99c1, 0x99c2, 0x99c3, 0x99c4, 0x99c5, /*0xe8-0xef*/
4389 0x99c6, 0x99c7, 0x99c8, 0x99c9, 0x99ca, 0x99cb, 0x99cc, 0x99cd, /*0xf0-0xf7*/
4390 0x99ce, 0x99cf, 0x99d0, 0x99d1, 0x99d2, 0x99d3, 0x99d4, 0x99d5, /*0xf8-0xff*/
4391 /* 0x6b00 */
4392 0x99d6, 0x99d7, 0x99d8, 0x99d9, 0x99da, 0x99db, 0x99dc, 0x99dd, /*0x00-0x07*/
4393 0x99de, 0x99df, 0x99e0, 0x99e1, 0x99e2, 0x99e3, 0x99e4, 0x99e5, /*0x08-0x0f*/
4394 0x99e6, 0x99e7, 0x99e8, 0x99e9, 0x99ea, 0x99eb, 0x99ec, 0x99ed, /*0x10-0x17*/
4395 0x99ee, 0x99ef, 0x99f0, 0x99f1, 0x99f2, 0x99f3, 0x99f4, 0x99f5, /*0x18-0x1f*/
4396 0xc7b7, 0xb4ce, 0xbbb6, 0xd0c0, 0xeca3, 0x99f6, 0x99f7, 0xc5b7, /*0x20-0x27*/
4397 0x99f8, 0x99f9, 0x99fa, 0x99fb, 0x99fc, 0x99fd, 0x99fe, 0x99a0, /*0x28-0x2f*/
4398 0x99a1, 0x99a2, 0xd3fb, 0x99a3, 0x99a4, 0x99a5, 0x99a6, 0xeca4, /*0x30-0x37*/
4399 0x99a7, 0xeca5, 0xc6db, 0x99a8, 0x99a9, 0x99aa, 0xbfee, 0x99ab, /*0x38-0x3f*/
4400 0x99ac, 0x99ad, 0x99ae, 0xeca6, 0x99af, 0x99b0, 0xeca7, 0xd0aa, /*0x40-0x47*/
4401 0x99a5, 0xc7b8, 0x99a2, 0x99a3, 0x99a4, 0x99a5, 0x99a6, 0x99a7, /*0x48-0x4f*/
4402 0x99a8, 0x99a9, 0x99aa, 0x99ab, 0x99ac, 0x99ad, 0x99ae, 0x99af, /*0x50-0x57*/
4403 0x99b0, 0xeca8, 0x99a6, 0x99a7, 0x99a8, 0x99a9, 0x99aa, 0x99ab, /*0x58-0x5f*/
4404 0x99ac, 0x99ad, 0xd6b9, 0xd5fd, 0xb4cb, 0xb2bd, 0xcee4, 0xc6e7, /*0x60-0x67*/
4405 0x99b6, 0x99b7, 0xcde1, 0x99b8, 0x99b9, 0x99ba, 0x99bb, 0x99bc, 0x99bd, /*0x68-0x6f*/
4406 0x99be, 0x99bf, 0x99c0, 0x99c1, 0x99c2, 0x99c3, 0x99c4, 0x99c5, /*0x70-0x77*/
4407 0x99c6, 0xb4f5, 0x99c7, 0xbcd0, 0x99c8, 0x99c9, 0x99ca, 0x99cb, /*0x78-0x7f*/
4408 0x99cc, 0xe9e2, 0xe9e3, 0xd1ea, 0xe9e4, 0x99c7, 0xb4f9, 0xe9e4, /*0x80-0x87*/
4409 0x99c8, 0xd1b3, 0xcae2, 0xb2d0, 0x99c9, 0xe9e8, 0x99c8, 0x99c9, /*0x88-0x8f*/
4410 0x99ca, 0x99cb, 0x99ca, 0xe9e6, 0xe9e7, 0x99ca, 0x99cb, 0x99cb, /*0x90-0x97*/
4411 0x99ca, 0x99cb, 0xe9e9, 0xe9ea, 0x99ca, 0x99cb, 0x99cb, 0x99cb, /*0x98-0x9f*/
4412 0x99cb, 0xe9eb, 0x99ca, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, /*0xa0-0xaf*/
4413 0x99cb, 0x99cb, 0x99cb, 0xe9ec, 0x99cb, 0x99cb, 0x99cb, 0x99cb, /*0xa8-0xaf*/
4414 0x99cb, 0x99cb, 0x99cb, 0xeca9, 0xc5b9, 0xb6ce, 0x99cb, 0xd2f3, /*0xb0-0xbf*/
4415 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0xb5ee, 0xb5ee, /*0xb8-0xbf*/
4416 0x99cb, 0xb5bd, 0xecb1, 0x99cb, 0x99cb, 0x99cb, 0xd2e3, 0x99cb, /*0xc0-0xcf*/
4417 0x99cb, 0x99cb, 0x99cb, 0xcee3, 0x99cb, 0xc4b8, 0x99cb, 0xc3bf, /*0xc8-0xcf*/
4418 0x99cb, 0x99cb, 0xb6be, 0xd8b9, 0xb1c8, 0xb1cf, 0xb1d1, 0xc5fe, /*0xd0-0xdf*/
4419 0x99cb, 0xb1d0, 0x99cb, 0xc3ab, 0x99cb, 0x99cb, 0x99cb, 0x99cb, /*0xd8-0xdf*/
4420 0x99cb, 0xd5b1, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, /*0xe0-0xef*/
4421 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0xc9cb, 0xc9cb, /*0xe8-0xef*/
4422 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, /*0xf0-0xf7*/
4423 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, 0x99cb, /*0xf8-0xff*/
```

```
4424 /* 0x6c00 */
4425 0x9ad1, 0x9ad2, 0x9ad3, 0x9ad4, 0x9ad5, 0xeba9, 0xebab, 0xebaa, /*0x00-0x07*/
4426 0x9ad6, 0x9ad7, 0x9ad8, 0x9ad9, 0xada, 0xebac, 0x9adb, 0xcacf, /*0x08-0x0f*/
4427 0xd8b5, 0xc3f1, 0x9adc, 0xc3a5, 0xc6f8, 0xebad, 0xc4ca, 0x9add, /*0x10-0x17*/
4428 0xebae, 0xebaf, 0xebb0, 0xb7d5, 0x9ade, 0x9adf, 0x9ae0, 0xb7fa, /*0x18-0x1f*/
4429 0x9ae1, 0xebb1, 0xc7e2, 0x9ae2, 0xebb3, 0x9ae3, 0xbaa4, 0xd1f5, /*0x20-0x27*/
4430 0xb0b1, 0xebb2, 0xebb4, 0x9ae4, 0x9ae5, 0x9ae6, 0xb5aa, 0xc2c8, /*0x28-0x2f*/
4431 0xc7e8, 0x9ae7, 0xebb5, 0x9ae8, 0xcbae, 0xe3df, 0x9ae9, 0x9aea, /*0x30-0x37*/
4432 0xd3c0, 0x9aeb, 0x9aec, 0x9aed, 0x9aee, 0xd9db, 0x9aef, 0x9af0, /*0x38-0x3f*/
4433 0xcdal, 0xd6ad, 0xc7f3, 0x9af1, 0x9af2, 0x9af3, 0xd9e0, 0xbbe3, /*0x40-0x47*/
4434 0x9af4, 0xbaba, 0xe3e2, 0x9af5, 0x9af6, 0x9af7, 0x9af8, 0x9af9, /*0x48-0x4f*/
4435 0xcfab, 0x9afa, 0x9afb, 0x9afc, 0xe3e0, 0xc9c7, 0x9afd, 0xbab9, /*0x50-0x57*/
4436 0x9afe, 0x9b40, 0x9b41, 0xd1b4, 0xe3e1, 0xc8ea, 0xb9af, 0xbdad, /*0x58-0x5f*/
4437 0xb3d8, 0xcedb, 0x9b42, 0x9b43, 0xccc0, 0x9b44, 0x9b45, 0x9b46, /*0x60-0x67*/
4438 0xe3e8, 0xe3e9, 0xcdf4, 0x9b47, 0x9b48, 0x9b49, 0x9b4a, 0x9b4b, /*0x68-0x6f*/
4439 0xccad, 0x9b4c, 0xbcb3, 0x9b4d, 0xe3ea, 0x9b4e, 0xe3eb, 0x9b4f, /*0x70-0x77*/
4440 0x9b50, 0xd0da, 0x9b51, 0x9b52, 0x9b53, 0xc6fb, 0xb7da, 0x9b54, /*0x78-0x7f*/
4441 0x9b55, 0xc7df, 0xd2ca, 0xc6e6, 0x9b56, 0xe3e4, 0xe3ec, 0x9b57, /*0x80-0x87*/
4442 0xc9f2, 0xb3c1, 0x9b58, 0x9b59, 0xe3e7, 0x9b5a, 0x9b5b, 0xc6e3, /*0x88-0x8f*/
4443 0xe3e5, 0x9b5c, 0x9b5d, 0xedb3, 0xe3e6, 0x9b5e, 0x9b5f, 0x9b60, /*0x90-0x97*/
4444 0x9b61, 0xc9b3, 0x9b62, 0xc5e6, 0x9b63, 0x9b64, 0x9b65, 0xb9b5, /*0x98-0x9f*/
4445 0x9b66, 0xc3bb, 0x9b67, 0xe3e3, 0xc5bd, 0xc1a4, 0xc2d9, 0xb2d7, /*0xa0-0xaf*/
4446 0x9b68, 0xe3ed, 0xbba6, 0xc4ad, 0x9b69, 0xe3f0, 0xbeda, 0x9b6a, /*0xab-0xaf*/
4447 0x9b6b, 0xe3fb, 0xe3f5, 0xbad3, 0x9b6c, 0x9b6d, 0x9b6e, 0x9b6f, /*0xb0-0xbf*/
4448 0xb7d0, 0xd3cd, 0x9b70, 0xd6ce, 0xd5d3, 0xb9c1, 0xd5b4, 0xd1d8, /*0xb8-0xbf*/
4449 0x9b71, 0x9b72, 0x9b73, 0x9b74, 0xd0b9, 0xc7f6, 0x9b75, 0x9b76, /*0xc0-0xcf*/
4450 0x9b77, 0xc8aa, 0xb2b4, 0x9b78, 0xc3da, 0x9b79, 0x9b7a, 0x9b7b, /*0xc8-0xcf*/
4451 0xe3ee, 0x9b7c, 0x9b7d, 0xe3fc, 0xe3ef, 0xb7a8, 0xe3f7, 0xe3f4, /*0xd0-0xdf*/
4452 0x9b7e, 0x9b80, 0x9b81, 0xb7ba, 0x9b82, 0x9b83, 0xc5a2, 0x9b84, /*0xd8-0xdf*/
4453 0xe3f6, 0xc5dd, 0xb2a8, 0xc6fc, 0x9b85, 0xc4e0, 0x9b86, 0x9b87, /*0xe0-0xef*/
4454 0xd7a2, 0x9b88, 0xc0e1, 0xe3f9, 0x9b89, 0x9b8a, 0xe3fa, 0xe3fd, /*0xe8-0xef*/
4455 0xc9a9, 0xe3f3, 0x9b8b, 0xd3be, 0x9b8c, 0xb1c3, 0xedb4, 0xe3f1, /*0xf0-0xff*/
4456 0xe3f2, 0x9b8d, 0xe3f8, 0xd0ba, 0xc6c3, 0xd4f3, 0xe3fe, 0x9b8e, /*0xf8-0xff*/
4457 /* 0x6d00 */
4458 0x9b8f, 0xbde0, 0x9b90, 0x9b91, 0xe4a7, 0x9b92, 0x9b93, 0xe4a6, /*0x00-0x07*/
4459 0x9b94, 0x9b95, 0x9b96, 0xd1f3, 0xe4a3, 0x9b97, 0xe4a9, 0x9b98, /*0x08-0x0f*/
4460 0x9b99, 0x9b9a, 0xc8f7, 0x9b9b, 0x9b9c, 0x9b9d, 0x9b9e, 0xcfb4, /*0x10-0x17*/
4461 0x9b9f, 0xe4a8, 0xe4ae, 0xc2e5, 0x9ba0, 0x9ba1, 0xb6b4, 0x9ba2, /*0x18-0x1f*/
4462 0x9ba3, 0x9ba4, 0x9ba5, 0x9ba6, 0x9ba7, 0xbdf2, 0x9ba8, 0xe4a2, /*0x20-0x27*/
4463 0x9ba9, 0x9baa, 0xbae9, 0xe4aa, 0x9bab, 0x9bac, 0xe4ac, 0x9bad, /*0x28-0x2f*/
4464 0x9bae, 0xb6fd, 0xd6de, 0xe4b2, 0x9baf, 0xe4ad, 0x9bb0, 0x9bb1, /*0x30-0x37*/
4465 0x9bb2, 0xe4a1, 0x9bb3, 0xbbee, 0xcddd, 0xc7a2, 0xc5c9, 0x9bb4, /*0x38-0x3f*/
4466 0x9bb5, 0xc1f7, 0x9bb6, 0xe4a4, 0x9bb7, 0xc7b3, 0xbdac, 0xbdbd, /*0x40-0x47*/
4467 0xe4a5, 0x9bb8, 0xd7c7, 0xb2e2, 0x9bb9, 0xe4ab, 0xbcc3, 0xe4af, /*0x48-0x4f*/
4468 0x9bba, 0xbbeb, 0xe4b0, 0xc5a8, 0xe4b1, 0x9bbb, 0x9bbc, 0x9bbd, /*0x50-0x57*/
4469 0x9bbe, 0xd5e3, 0xbfa3, 0x9bbf, 0xe4ba, 0x9bc0, 0xe4b7, 0x9bcl, /*0x58-0x5f*/
4470 0xe4bb, 0x9bc2, 0x9bc3, 0xe4bd, 0x9bc4, 0x9bc5, 0xc6d6, 0x9bc6, /*0x60-0x67*/
4471 0x9bc7, 0xbac6, 0xc0cb, 0x9bc8, 0x9bc9, 0x9bca, 0xb8a1, 0xe4b4, /*0x68-0x6f*/
4472 0x9bcb, 0x9bcc, 0x9bcd, 0x9bce, 0xd4a1, 0x9bcf, 0x9bd0, 0xbaa3, /*0x70-0x77*/
4473 0xbdfc, 0x9bd1, 0x9bd2, 0x9bd3, 0xe4bc, 0x9bd4, 0x9bd5, 0x9bd6, /*0x78-0x7f*/
4474 0x9bd7, 0x9bd8, 0xcdbf, 0x9bd9, 0x9bda, 0xc4f9, 0x9bdb, 0x9bdc, /*0x80-0x87*/
4475 0xcffb, 0xc9e6, 0x9bdd, 0x9bde, 0xd3bf, 0x9bdf, 0xcfd1, 0x9be0, /*0x88-0x8f*/
4476 0x9be1, 0xe4b3, 0x9be2, 0xe4b8, 0xe4b9, 0xcce9, 0x9be3, 0x9be4, /*0x90-0x97*/
4477 0x9be5, 0x9be6, 0x9be7, 0xcce, 0x9be8, 0xc0d4, 0xe4b5, 0xc1b0, /*0x98-0x9f*/
4478 0xe4b6, 0xc9e0, 0x9be9, 0xbbc1, 0xb5d3, 0x9bea, 0xc8f3, 0xbda7, /*0xa0-0xaf*/
4479 0xd5c7, 0xc9ac, 0xb8a2, 0xe4ca, 0x9beb, 0x9bec, 0xe4cc, 0xd1c4, /*0xab-0xaf*/
4480 0x9bed, 0x9bee, 0xd2ba, 0x9bef, 0x9bf0, 0xbaad, 0x9bf1, 0x9bf2, /*0xb0-0xbf*/
4481 0xbad4, 0x9bf3, 0x9bf4, 0x9bf5, 0x9bf6, 0x9bf7, 0x9bf8, 0xe4c3, /*0xb8-0xbf*/
4482 0xb5ed, 0x9bf9, 0x9bfa, 0x9bfb, 0xd7cd, 0xe4c0, 0xcffd, 0xe4bf, /*0xc0-0xcf*/
4483 0x9bfc, 0x9bfd, 0x9bfe, 0xc1cd, 0xc9c4, 0x9c41, 0x9c42, 0xc8d4, /*0xc8-0xcf*/
4484 0x9c43, 0xcae7, 0x9c44, 0x9c45, 0x9c46, 0x9c47, 0xc4d7, 0x9c48, /*0xd0-0xdf*/
4485 0xc9cd, 0xe4c8, 0x9c49, 0x9c4a, 0x9c4b, 0xe4c7, 0xe4c1, 0x9c4c, /*0xd8-0xdf*/
4486 0xe4c4, 0xb5ad, 0x9c4d, 0x9c4e, 0xd3d9, 0x9c4f, 0xe4c6, 0x9c50, /*0xe0-0xef*/
4487 0x9c51, 0x9c52, 0x9c53, 0xd2f9, 0xb4e3, 0x9c54, 0xbbb4, 0x9c55, /*0xe8-0xef*/
4488 0x9c56, 0xc9e8, 0x9c57, 0xb4be, 0x9c58, 0x9c59, 0x9c5a, 0xbbec, /*0xf0-0xff*/
4489 0x9c5b, 0xd1cd, 0x9c5c, 0xc9cd, 0xedb5, 0x9c5d, 0x9c5e, 0x9c5f, /*0xf8-0xff*/
4490 /* 0x6e00 */
4491 0x9c60, 0x9c61, 0x9c62, 0x9c63, 0x9c64, 0xc7e5, 0x9c65, 0x9c66, /*0x00-0x07*/
4492 0x9c67, 0x9c68, 0xd4a8, 0x9c69, 0xe4cb, 0xd7d5, 0xe4c2, 0x9c6a, /*0x08-0x0f*/
4493 0xbda5, 0xe4c5, 0x9c6b, 0x9c6c, 0xd3e6, 0x9c6d, 0xe4c9, 0xc9f8, /*0x10-0x17*/
4494 0x9c6e, 0x9c6f, 0xe4be, 0x9c70, 0x9c71, 0xd3e5, 0x9c72, 0x9c73, /*0x18-0x1f*/
4495 0xc7fe, 0xb6c9, 0x9c74, 0xd4fc, 0xb2b3, 0xe4d7, 0x9c75, 0x9c76, /*0x20-0x27*/
4496 0x9c77, 0xc9e2, 0x9c78, 0xe4cd, 0x9c79, 0xc9eb, 0x9c7a, 0xb8db, /*0x28-0x2f*/
4497 0x9c7b, 0xc9c7, 0xe4d6, 0x9c7d, 0xbfca, 0x9c7e, 0x9c80, 0x9c81, /*0x30-0x37*/
4498 0xd3ce, 0x9c82, 0xc3ec, 0x9c83, 0x9c84, 0x9c85, 0x9c86, 0x9c87, /*0x38-0x3f*/
4499 0x9c88, 0x9c89, 0x9c8a, 0xc5c8, 0xe4d8, 0x9c8b, 0x9c8c, 0x9c8d, /*0x40-0x47*/
4500 0x9c8e, 0x9c8f, 0x9c90, 0x9c91, 0x9c92, 0xc9cd, 0xe4cf, 0x9c93, /*0x48-0x4f*/
4501 0x9c94, 0x9c95, 0x9c96, 0xe4d4, 0xe4d5, 0x9c97, 0xbafe, 0x9c98, /*0x50-0x57*/
4502 0xcfe6, 0x9c99, 0x9c9a, 0xd5bf, 0x9c9b, 0x9c9c, 0x9c9d, 0xe4d2, /*0x58-0x5f*/
4503 0x9c9e, 0x9c9f, 0x9ca0, 0x9ca1, 0x9ca2, 0x9ca3, 0x9ca4, 0x9ca5, /*0x60-0x6f*/
4504 0x9ca6, 0x9ca7, 0x9ca8, 0xe4d0, 0x9ca9, 0x9caa, 0xe4ce, 0x9cab, /*0x68-0x6f*/
4505 0x9cac, 0x9cad, 0x9cae, 0x9caf, 0x9cb0, 0x9cb1, 0x9cb2, 0x9cb3, /*0x70-0x77*/
4506 0x9cb4, 0x9cb5, 0x9cb6, 0x9cb7, 0x9cb8, 0x9cb9, 0xcde5, 0xc9aa, /*0x78-0x7f*/
4507 0x9cba, 0x9cbb, 0x9cbc, 0xc0a3, 0x9cbd, 0xbda6, 0xe4d3, 0x9cbe, /*0x80-0x87*/
4508 0x9cbf, 0xb8c8, 0x9cc0, 0x9cc1, 0x9cc2, 0x9cc3, 0x9cc4, 0xe4e7, /*0x88-0x8f*/
4509 0xd4b4, 0x9cc5, 0x9cc6, 0x9cc7, 0x9cc8, 0x9cc9, 0x9cca, 0x9ccb, /*0x90-0x97*/
4510 0xe4db, 0x9ccc, 0x9ccd, 0x9cce, 0xc1ef, 0x9ccf, 0x9cd0, 0xe4e9, /*0x98-0x9f*/
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4511 0x9cd1, 0x9cd2, 0xd2e7, 0x9cd3, 0x9cd4, 0xe4df, 0x9cd5, 0xe4e0, /*0xa0-0xa7*/
4512 0x9cd6, 0x9cd7, 0xcfaa, 0x9cd8, 0x9cd9, 0x9cda, 0x9cdb, 0xcbdd, /*0xa8-0xaf*/
4513 0x9cdc, 0xe4da, 0xe4d1, 0x9cdd, 0xe4e5, 0x9cde, 0xc8dc, 0xe4e3, /*0xb0-0xbf*/
4514 0x9cdf, 0x9ce0, 0xc4e7, 0xe4e2, 0x9ce1, 0xe4e1, 0x9ce2, 0x9ce3, /*0xb8-0xbf*/
4515 0x9ce4, 0xb3fc, 0xe4e8, 0x9ce5, 0x9ce6, 0x9ce7, 0x9ce8, 0xb5e1, /*0xc0-0xcf*/
4516 0x9ce9, 0x9cea, 0x9ceb, 0xd7cc, 0x9cec, 0x9ced, 0x9cee, 0xe4e6, /*0xc8-0xcf*/
4517 0x9cef, 0xbbac, 0x9cf0, 0xd7d2, 0xcccf, 0xebf8, 0x9cf1, 0xe4e4, /*0xd0-0xd7*/
4518 0x9cf2, 0x9cf3, 0xb9f6, 0x9cf4, 0x9cf5, 0x9cf6, 0xd6cd, 0xe4d9, /*0xd8-0xdf*/
4519 0xe4dc, 0xc2fa, 0xe4de, 0x9cf7, 0xc2cb, 0xc0c4, 0xc2d0, 0x9cf8, /*0xe0-0xef*/
4520 0xb1f5, 0xccb2, 0x9cf9, 0x9cfa, 0x9cfb, 0x9cfc, 0x9cfd, 0x9cfe, /*0xe8-0xef*/
4521 0x9d40, 0x9d41, 0x9d42, 0x9d43, 0xb5ce, 0x9d44, 0x9d45, 0x9d46, /*0xf0-0xff*/
4522 0x9d47, 0xe4ef, 0x9d48, 0x9d49, 0x9d4a, 0x9d4b, 0x9d4c, 0x9d4d, /*0xf8-0xff*/
4523 /* 0x6f00 */
4524 0x9d4e, 0x9d4f, 0xc6af, 0x9d50, 0x9d51, 0x9d52, 0xc6e1, 0x9d53, /*0x00-0x07*/
4525 0x9d54, 0xe4f5, 0x9d55, 0x9d56, 0x9d57, 0x9d58, 0x9d59, 0xc2a9, /*0x08-0x0f*/
4526 0x9d5a, 0x9d5b, 0x9d5c, 0xc0ec, 0xd1dd, 0xe4ee, 0x9d5d, 0x9d5e, /*0x10-0x17*/
4527 0x9d5f, 0x9d60, 0x9d61, 0x9d62, 0x9d63, 0x9d64, 0x9d65, 0x9d66, /*0x18-0x1f*/
4528 0xc4ae, 0x9d67, 0x9d68, 0x9d69, 0xe4ed, 0x9d6a, 0x9d6b, 0x9d6c, /*0x20-0x27*/
4529 0x9d6d, 0xe4f6, 0xe4f4, 0xc2fe, 0x9d6e, 0xe4dd, 0x9d6f, 0xe4f0, /*0x28-0x2f*/
4530 0x9d70, 0xcafe, 0x9d71, 0xd5c4, 0x9d72, 0x9d73, 0xe4f1, 0x9d74, /*0x30-0x37*/
4531 0x9d75, 0x9d76, 0x9d77, 0x9d78, 0x9d79, 0x9d7a, 0xd1fa, 0x9d7b, /*0x38-0x3f*/
4532 0x9d7c, 0x9d7d, 0x9d7e, 0x9d80, 0x9d81, 0x9d82, 0xe4eb, 0xe4ec, /*0x40-0x47*/
4533 0x9d83, 0x9d84, 0x9d85, 0xe4f2, 0x9d86, 0xceab, 0x9d87, 0x9d88, /*0x48-0x4f*/
4534 0x9d89, 0x9d8a, 0x9d8b, 0x9d8c, 0x9d8d, 0x9d8e, 0x9d8f, 0x9d90, /*0x50-0x57*/
4535 0xc5cb, 0x9d91, 0x9d92, 0x9d93, 0xc7b1, 0x9d94, 0xc2ba, 0x9d95, /*0x58-0x5f*/
4536 0x9d96, 0x9d97, 0xe4ea, 0x9d98, 0x9d99, 0x9da0, 0xc1ca, 0x9d9b, /*0x60-0x67*/
4537 0x9d9c, 0x9d9d, 0x9d9e, 0x9d9f, 0x9da0, 0xc0cb, 0xb3b1, 0x9da1, /*0x68-0x6f*/
4538 0x9da2, 0x9da3, 0xe4fb, 0x9da4, 0xe4f3, 0x9da5, 0x9da6, 0x9da7, /*0x70-0x77*/
4539 0xe4fa, 0x9da8, 0xe4fd, 0x9da9, 0xe4fc, 0x9daa, 0x9dab, 0x9dac, /*0x78-0x7f*/
4540 0x9dad, 0x9dae, 0x9daf, 0x9db0, 0xb3ce, 0x9db1, 0x9db2, 0x9db3, /*0x80-0x87*/
4541 0xb3ba, 0xe4f7, 0x9db4, 0x9db5, 0xe4f9, 0xe4f8, 0xc5ec, 0x9db6, /*0x88-0x8f*/
4542 0x9db7, 0x9db8, 0x9db9, 0x9dba, 0x9dbb, 0x9dbc, 0x9dbd, 0x9dbe, /*0x90-0x97*/
4543 0x9dbf, 0x9dc0, 0x9dc1, 0x9dc2, 0xc0bd, 0x9dc3, 0x9dc4, 0x9dc5, /*0x98-0x9f*/
4544 0x9dc6, 0xd4e8, 0x9dc7, 0x9dc8, 0x9dc9, 0x9dca, 0x9dcb, 0xe5a2, /*0xa0-0xaf*/
4545 0x9dcc, 0x9dcd, 0x9dce, 0x9dcf, 0x9dd0, 0x9dd1, 0x9dd2, 0x9dd3, /*0xa8-0xaf*/
4546 0x9dd4, 0x9dd5, 0x9dd6, 0xb0c4, 0x9dd7, 0x9dd8, 0xe5a4, 0x9dd9, /*0xb0-0xbf*/
4547 0x9dda, 0xe5a3, 0x9ddb, 0x9ddc, 0x9ddd, 0x9dde, 0x9ddf, 0x9de0, /*0xb8-0xbf*/
4548 0xbca4, 0x9de1, 0xe5a5, 0x9de2, 0x9de3, 0x9de4, 0x9de5, 0x9de6, /*0xc0-0xcf*/
4549 0x9de7, 0xe5a1, 0x9de8, 0x9de9, 0x9dea, 0x9deb, 0x9dec, 0x9ded, /*0xc8-0xcf*/
4550 0x9dee, 0xe4fe, 0xb1f4, 0x9def, 0x9df0, 0x9df1, 0x9df2, 0x9df3, /*0xd0-0xdf*/
4551 0x9df4, 0x9df5, 0x9df6, 0x9df7, 0x9df8, 0x9df9, 0xe5a8, 0x9dfa, /*0xd8-0xdf*/
4552 0xe5a9, 0xe5a6, 0x9dfb, 0x9dfc, 0x9dfd, 0x9dfe, 0x9e40, 0x9e41, /*0xe0-0xef*/
4553 0x9e42, 0x9e43, 0x9e44, 0x9e45, 0x9e46, 0x9e47, 0xe5a7, 0xe5aa, /*0xe8-0xef*/
4554 0x9e48, 0x9e49, 0x9e4a, 0x9e4b, 0x9e4c, 0x9e4d, 0x9e4e, 0x9e4f, /*0xf0-0xff*/
4555 0x9e50, 0x9e51, 0x9e52, 0x9e53, 0x9e54, 0x9e55, 0x9e56, 0x9e57, /*0xf8-0xff*/
4556 /* 0x7000 */
4557 0x9e58, 0x9e59, 0x9e5a, 0x9e5b, 0x9e5c, 0x9e5d, 0x9e5e, 0x9e5f, /*0x00-0x07*/
4558 0x9e60, 0x9e61, 0x9e62, 0x9e63, 0x9e64, 0x9e65, 0x9e66, 0x9e67, /*0x08-0x0f*/
4559 0x9e68, 0xc6d9, 0x9e69, 0x9e6a, 0x9e6b, 0x9e6c, 0x9e6d, 0x9e6e, /*0x10-0x17*/
4560 0x9e6f, 0x9e70, 0xe5ab, 0xe5ad, 0x9e71, 0x9e72, 0x9e73, 0x9e74, /*0x18-0x1f*/
4561 0x9e75, 0x9e76, 0x9e77, 0xe5ac, 0x9e78, 0x9e79, 0x9e7a, 0x9e7b, /*0x20-0x27*/
4562 0x9e7c, 0x9e7d, 0x9e7e, 0x9e80, 0x9e81, 0x9e82, 0x9e83, 0x9e84, /*0x28-0x2f*/
4563 0x9e85, 0x9e86, 0x9e87, 0x9e88, 0x9e89, 0xe5af, 0x9e8a, 0x9e8b, /*0x30-0x37*/
4564 0x9e8c, 0xe5ae, 0x9e8d, 0x9e8e, 0x9e8f, 0x9e90, 0x9e91, 0x9e92, /*0x38-0x3f*/
4565 0x9e93, 0x9e94, 0x9e95, 0x9e96, 0x9e97, 0x9e98, 0x9e99, 0x9e9a, /*0x40-0x47*/
4566 0x9e9b, 0x9e9c, 0x9e9d, 0x9e9e, 0xb9e0, 0x9e9f, 0x9ea0, 0xe5b0, /*0x48-0x4f*/
4567 0x9ea1, 0x9ea2, 0x9ea3, 0x9ea4, 0x9ea5, 0x9ea6, 0x9ea7, 0x9ea8, /*0x50-0x57*/
4568 0x9ea9, 0x9eaa, 0x9eab, 0x9eac, 0x9ead, 0x9eae, 0xe5b1, 0x9eaf, /*0x58-0x5f*/
4569 0x9eb0, 0x9eb1, 0x9eb2, 0x9eb3, 0x9eb4, 0x9eb5, 0x9eb6, 0x9eb7, /*0x60-0x67*/
4570 0x9eb8, 0x9eb9, 0x9eba, 0xbbf0, 0xece1, 0xc3f0, 0x9ebb, 0xb5c6, /*0x68-0x6f*/
4571 0xbbd2, 0x9ebc, 0x9ebd, 0x9ebe, 0x9ebf, 0xc1e9, 0xd4ee, 0x9ec0, /*0x70-0x77*/
4572 0xbec4, 0x9ec1, 0x9ec2, 0x9ec3, 0xd7c6, 0x9ec4, 0xd4d6, 0xb2d3, /*0x78-0x7f*/
4573 0xecbe, 0x9ec5, 0x9ec6, 0x9ec7, 0x9ec8, 0xeac1, 0x9ec9, 0x9eca, /*0x80-0x87*/
4574 0x9ecb, 0xc2af, 0xb4b6, 0x9ecc, 0x9ecd, 0x9ece, 0xd1d7, 0x9ecf, /*0x88-0x8f*/
4575 0x9ed0, 0x9ed1, 0xb3b4, 0x9ed2, 0xc8b2, 0xbfbf, 0xecc0, 0x9ed3, /*0x90-0x97*/
4576 0x9ed4, 0xd6cb, 0x9ed5, 0x9ed6, 0xecbf, 0xecc1, 0x9ed7, 0x9ed8, /*0x98-0x9f*/
4577 0x9ed9, 0x9eda, 0x9edb, 0x9edc, 0x9edd, 0x9ede, 0x9edf, 0x9ee0, /*0xa0-0xaf*/
4578 0x9ee1, 0x9ee2, 0x9ee3, 0xecc5, 0xbbee, 0xc0cb, 0xc5da, 0xbecb, /*0xa8-0xaf*/
4579 0x9ee4, 0xecc6, 0x9ee5, 0xb1fe, 0x9ee6, 0x9ee7, 0x9ee8, 0xeccc, /*0xb0-0xbf*/
4580 0xd5a8, 0xb5e3, 0x9ee9, 0xecc2, 0xc1b6, 0xb3e3, 0x9eea, 0x9eeb, /*0xb8-0xbf*/
4581 0xecc3, 0xcbb8, 0xc0c3, 0xc0cc, 0x9eec, 0x9eed, 0x9eee, 0x9eef, /*0xc0-0xcf*/
4582 0xc1d2, 0x9ef0, 0xecc8, 0x9ef1, 0x9ef2, 0x9ef3, 0x9ef4, 0x9ef5, /*0xc8-0xcf*/
4583 0x9ef6, 0x9ef7, 0x9ef8, 0x9ef9, 0x9efa, 0x9efb, 0x9efc, 0x9efd, /*0xd0-0xdf*/
4584 0xbae6, 0xc0d3, 0x9efe, 0xd6f2, 0x9ff4, 0x9ff1, 0x9ff2, 0xd1cc, /*0xd8-0xdf*/
4585 0x9ff3, 0x9ff4, 0x9ff5, 0x9ff6, 0xbfbf, 0x9ff7, 0xb7b3, 0xc9d5, /*0xe0-0xef*/
4586 0xecc7, 0xbbe2, 0x9ff8, 0xc0cc, 0xbdfd, 0xc8c8, 0x9ff9, 0xcfa9, /*0xe8-0xef*/
4587 0x9ff4a, 0x9ff4b, 0x9ff4c, 0x9ff4d, 0x9ff4e, 0x9ff4f, 0x9ff50, 0xcde9, /*0xf0-0xff*/
4588 0x9ff51, 0xc5eb, 0x9ff52, 0x9ff53, 0x9ff54, 0xb7e9, 0x9ff55, 0x9ff56, /*0xf8-0xff*/
4589 /* 0x7100 */
4590 0x9ff57, 0x9ff58, 0x9ff59, 0x9ff5a, 0x9ff5b, 0x9ff5c, 0x9ff5d, 0x9ff5e, /*0x00-0x07*/
4591 0x9ff5f, 0xd1c9, 0xbab8, 0x9ff60, 0x9ff61, 0x9ff62, 0x9ff63, 0x9ff64, /*0x08-0x0f*/
4592 0xecc9, 0x9ff65, 0x9ff66, 0xecca, 0x9ff67, 0xbbc0, 0xeccb, 0x9ff68, /*0x10-0x17*/
4593 0xece2, 0xb1ba, 0xb7d9, 0x9ff69, 0x9ff6a, 0x9ff6b, 0x9ff6c, 0x9ff6d, /*0x18-0x1f*/
4594 0x9ff6e, 0x9ff6f, 0x9ff70, 0x9ff71, 0x9ff72, 0x9ff73, 0xbdb9, 0x9ff74, /*0x20-0x27*/
4595 0x9ff75, 0x9ff76, 0x9ff77, 0x9ff78, 0x9ff79, 0x9ff7a, 0x9ff7b, 0xeccc, /*0x28-0x2f*/
4596 0xd1e6, 0xeccc, 0x9ff7c, 0x9ff7d, 0x9ff7e, 0x9ff7f, 0x9ff80, 0xc8bb, /*0x30-0x3f*/
4597 0x9ff82, 0x9ff83, 0x9ff84, 0x9ff85, 0x9ff86, 0x9ff87, 0x9ff88, 0x9ff89, /*0x38-0x3f*/
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4598 0x9f8a, 0x9f8b, 0x9f8c, 0x9f8d, 0x9f8e, 0xecd1, 0x9f8f, 0x9f90, /*0x40-0x47*/
4599 0x9f91, 0x9f92, 0xecd3, 0x9f93, 0xbbcd, 0x9f94, 0xbce5, 0x9f95, /*0x48-0x4f*/
4600 0x9f96, 0x9f97, 0x9f98, 0x9f99, 0x9f9a, 0x9f9b, 0x9f9c, 0x9f9d, /*0x50-0x57*/
4601 0x9f9e, 0x9f9f, 0x9fa0, 0x9fa1, 0xeccf, 0x9fa2, 0xc9b7, 0x9fa3, /*0x58-0x5f*/
4602 0x9fa4, 0x9fa5, 0x9fa6, 0x9fa7, 0xc3ba, 0x9fa8, 0xece3, 0xd5d5, /*0x60-0x67*/
4603 0xecd0, 0x9fab, 0x9faa, 0x9fac, 0x9fad, 0xd6f3, 0x9fae, /*0x68-0x6f*/
4604 0x9faf, 0x9fb0, 0xecd2, 0xecce, 0x9fb1, 0x9fb2, 0x9fb3, 0x9fb4, /*0x70-0x77*/
4605 0xecd4, 0x9fb5, 0xecd5, 0x9fb6, 0x9fb7, 0xc9bf, 0x9fb8, 0x9fb9, /*0x78-0x7f*/
4606 0x9fba, 0x9fbb, 0x9fbc, 0x9fbd, 0xcfa8, 0x9fbe, 0x9fbf, 0x9fc0, /*0x80-0x87*/
4607 0x9fc1, 0x9fc2, 0xd0dc, 0x9fc3, 0x9fc4, 0x9fc5, 0x9fc6, 0xd1ac, /*0x88-0x8f*/
4608 0x9fc7, 0x9fc8, 0x9fc9, 0x9fca, 0xc8db, 0x9fcb, 0x9fcc, 0x9fcd, /*0x90-0x97*/
4609 0xecd6, 0xcef5, 0x9fce, 0x9fcf, 0x9fd0, 0x9fd1, 0x9fd2, 0xcaec, /*0x98-0x9f*/
4610 0xecda, 0x9fd3, 0x9fd4, 0x9fd5, 0x9fd6, 0x9fd7, 0x9fd8, 0x9fd9, /*0xa0-0xa7*/
4611 0xecd9, 0x9fda, 0x9fdb, 0x9fdc, 0xb0be, 0x9fdd, 0x9fde, 0x9fdf, /*0xa8-0xaf*/
4612 0x9fe0, 0x9fe1, 0x9fe2, 0xecd7, 0x9fe3, 0xecd8, 0x9fe4, 0x9fe5, /*0xb0-0xbf*/
4613 0x9fe6, 0xece4, 0x9fe7, 0x9fe8, 0x9fe9, 0x9fea, 0x9feb, 0x9fec, /*0xb8-0xbf*/
4614 0x9fed, 0x9fee, 0x9fef, 0xc8bc, 0x9ff0, 0x9ff1, 0x9ff2, 0x9ff3, /*0xc0-0xcf*/
4615 0x9ff4, 0x9ff5, 0x9ff6, 0x9ff7, 0x9ff8, 0x9ff9, 0xc1c7, 0x9ffa, /*0xc8-0xcf*/
4616 0x9ffb, 0x9ffc, 0x9ffd, 0x9ffe, 0xecdc, 0xd1e0, 0xa040, 0xa041, /*0xd0-0xd7*/
4617 0xa042, 0xa043, 0xa044, 0xa045, 0xa046, 0xa047, 0xa048, 0xa049, /*0xd8-0xdf*/
4618 0xecdb, 0xa04a, 0xa04b, 0xa04c, 0xa04d, 0xd4ef, 0xa04e, 0xecdd, /*0xe0-0xef*/
4619 0xa04f, 0xa050, 0xa051, 0xa052, 0xa053, 0xa054, 0xdb6c, 0xa055, /*0xe8-0xef*/
4620 0xa056, 0xa057, 0xa058, 0xa059, 0xa05a, 0xa05b, 0xa05c, 0xa05d, /*0xf0-0xff*/
4621 0xa05e, 0xecde, 0xa05f, 0xa060, 0xa061, 0xa062, 0xa063, 0xa064, /*0xf8-0xff*/
4622 /* 0x7200 */
4623 0xa065, 0xa066, 0xa067, 0xa068, 0xa069, 0xa06a, 0xb1ac, 0xa06b, /*0x00-0x07*/
4624 0xa06c, 0xa06d, 0xa06e, 0xa06f, 0xa070, 0xa071, 0xa072, 0xa073, /*0x08-0x0f*/
4625 0xa074, 0xa075, 0xa076, 0xa077, 0xa078, 0xa079, 0xa07a, 0xa07b, /*0x10-0x17*/
4626 0xa07c, 0xa07d, 0xa07e, 0xa080, 0xa081, 0xecdf, 0xa082, 0xa083, /*0x18-0x1f*/
4627 0xa084, 0xa085, 0xa086, 0xa087, 0xa088, 0xa089, 0xa08a, 0xa08b, /*0x20-0x27*/
4628 0xece0, 0xa08c, 0xd7a6, 0xa08d, 0xc5c0, 0xa08e, 0xa08f, 0xa090, /*0x28-0x2f*/
4629 0xebbc, 0xb0ae, 0xa091, 0xa092, 0xa093, 0xbef4, 0xb8b8, 0xd2af, /*0x30-0x37*/
4630 0xb0d6, 0xb5f9, 0xa094, 0xd8b3, 0xa095, 0xcbac, 0xa096, 0xe3dd, /*0x38-0x3f*/
4631 0xa097, 0xa098, 0xa099, 0xa09a, 0xa09b, 0xa09c, 0xa09d, 0xc6ac, /*0x40-0x47*/
4632 0xb0e6, 0xa09e, 0xa09f, 0xa0a0, 0xc5c6, 0xebb9, 0xa0a1, 0xa0a2, /*0x48-0x4f*/
4633 0xa0a3, 0xa0a4, 0xebba, 0xa0a5, 0xa0a6, 0xa0a7, 0xebbb, 0xa0a8, /*0x50-0x57*/
4634 0xa0a9, 0xd1c0, 0xa0aa, 0xc5a3, 0xa0ab, 0xeaf2, 0xa0ac, 0xc4b2, /*0x58-0x5f*/
4635 0xa0ad, 0xc4b5, 0xc0ce, 0xa0ae, 0xa0af, 0xa0b0, 0xeaf3, 0xc4c1, /*0x60-0x67*/
4636 0xa0b1, 0xcceef, 0xa0b2, 0xa0b3, 0xa0b4, 0xa0b5, 0xeaf0, 0xeaf4, /*0x68-0x6f*/
4637 0xa0b6, 0xa0b7, 0xc9fc, 0xa0b8, 0xa0b9, 0xc7a3, 0xa0ba, 0xa0bb, /*0x70-0x77*/
4638 0xa0bc, 0xccd8, 0xccefe, 0xa0bd, 0xa0be, 0xa0bf, 0xeaf5, 0xeaf6, /*0x78-0x7f*/
4639 0xcfac, 0xc0e7, 0xa0c0, 0xeaf7, 0xa0c2, 0xa0c3, 0xa0c4, 0xa0c5, /*0x80-0x87*/
4640 0xa0c6, 0xa0c7, 0xb6bf, 0xeaf8, 0xa0c8, 0xeaf9, 0xa0c9, 0xeafa, /*0x88-0x8f*/
4641 0xa0ca, 0xa0cb, 0xeafb, 0xa0cc, 0xa0cd, 0xa0ce, 0xa0cf, /*0x90-0x97*/
4642 0xa0d0, 0xa0d1, 0xa0d2, 0xa0d3, 0xa0d4, 0xa0d5, 0xa0d6, 0xeaf1, /*0x98-0x9f*/
4643 0xa0d7, 0xa0d8, 0xa0d9, 0xa0da, 0xa0db, 0xa0dc, 0xa0dd, 0xa0de, /*0xa0-0xaf*/
4644 0xa0df, 0xa0e0, 0xa0e1, 0xa0e2, 0xc8ae, 0xe1eb, 0xa0e3, 0xb7b8, /*0xa8-0xaf*/
4645 0xe1ec, 0xa0e4, 0xa0e5, 0xa0e6, 0xe1ed, 0xa0e7, 0xd7b4, 0xe1ee, /*0xb0-0xbf*/
4646 0xe1ef, 0xd3cc, 0xa0e8, 0xa0e9, 0xa0ea, 0xa0eb, 0xa0ec, 0xa0ed, /*0xb8-0xbf*/
4647 0xa0ee, 0xe1f1, 0xbff1, 0xe1f2, 0xb5d2, 0xa0ef, 0xa0f0, 0xa0f1, /*0xc0-0xcf*/
4648 0xb1b7, 0xa0f2, 0xa0f3, 0xa0f4, 0xa0f5, 0xe1f3, 0xe1f2, 0xa0f6, /*0xc8-0xcf*/
4649 0xbafc, 0xa0f7, 0xe1f4, 0xa0f8, 0xa0f9, 0xa0fa, 0xa0fb, 0xb9b7, /*0xd0-0xdf*/
4650 0xa0fc, 0xbed1, 0xa0fd, 0xa0fe, 0xaa40, 0xaa41, 0xc4fc, 0xaa42, /*0xd8-0xdf*/
4651 0xbadd, 0xbdc6, 0xaa43, 0xaa44, 0xaa45, 0xaa46, 0xaa47, 0xaa48, /*0xe0-0xef*/
4652 0xe1f5, 0xe1f7, 0xaa49, 0xaa4a, 0xb6c0, 0xcfc1, 0xcaa8, 0xe1f6, /*0xe8-0xef*/
4653 0xd5f8, 0xd3fc, 0xe1f8, 0xe1f9, 0xaa4b, 0xaa4c, 0xe1fa, /*0xf0-0xff*/
4654 0xc0ea, 0xaa4d, 0xe1fe, 0xe2a1, 0xc0c7, 0xaa4e, 0xaa4f, 0xaa50, /*0xf8-0xff*/
4655 /* 0x7300 */
4656 0xaa51, 0xe1fb, 0xaa52, 0xe1fd, 0xaa53, 0xaa54, 0xaa55, 0xaa56, /*0x00-0x07*/
4657 0xaa57, 0xaa58, 0xaa59, 0xaa5a, 0xaa5b, 0xc1d4, 0xaa5c, /*0x08-0x0f*/
4658 0xaa5d, 0xaa5e, 0xaa5f, 0xe2a3, 0xaa60, 0xe2a8, 0xb2fe, 0xe2a2, /*0x10-0x17*/
4659 0xaa61, 0xaa62, 0xaa63, 0xc3cd, 0xb2c2, 0xe2a7, 0xe2a6, 0xaa64, /*0x18-0x1f*/
4660 0xaa65, 0xe2a4, 0xaa66, 0xaa67, 0xe2ab, 0xaa68, 0xaa69, /*0x20-0x27*/
4661 0xaa6a, 0xd0c9, 0xd6ed, 0xc3a8, 0xe2ac, 0xaa6b, 0xcfd7, 0xaa6c, /*0x28-0x2f*/
4662 0xaa6d, 0xe2ae, 0xaa6e, 0xaa6f, 0xbaef, 0xaa70, 0xaa71, 0xe9e0, /*0x30-0x37*/
4663 0xe2ad, 0xe2aa, 0xaa72, 0xaa73, 0xaa74, 0xaa75, 0xbbab, 0xd4b3, /*0x38-0x3f*/
4664 0xaa76, 0xaa77, 0xaa78, 0xaa79, 0xaa7a, 0xaa7b, 0xaa7c, 0xaa7d, /*0x40-0x47*/
4665 0xaa7e, 0xaa80, 0xaa81, 0xaa82, 0xaa83, 0xe2b0, 0xaa84, 0xaa85, /*0x48-0x4f*/
4666 0xe2af, 0xaa86, 0xe9e1, 0xaa87, 0xaa88, 0xaa89, 0xaa8a, 0xe2b1, /*0x50-0x57*/
4667 0xaa8b, 0xaa8c, 0xaa8d, 0xaa8e, 0xaa8f, 0xaa90, 0xaa91, 0xaa92, /*0x58-0x5f*/
4668 0xe2b2, 0xaa93, 0xaa94, 0xaa95, 0xaa96, 0xaa97, 0xaa98, 0xaa99, /*0x60-0x67*/
4669 0xaa9a, 0xaa9b, 0xaa9c, 0xaa9d, 0xe2b3, 0xccal, 0xaa9e, 0xe2b4, /*0x68-0x6f*/
4670 0xaa9f, 0xaaa0, 0xab40, 0xab41, 0xab42, 0xab43, 0xab44, 0xab45, /*0x70-0x77*/
4671 0xab46, 0xab47, 0xab48, 0xab49, 0xab4a, 0xab4b, 0xe2b5, 0xab4c, /*0x78-0x7f*/
4672 0xab4d, 0xab4e, 0xab4f, 0xab50, 0xd0fe, 0xab51, 0xab52, 0xc2ca, /*0x80-0x87*/
4673 0xab53, 0xd3f1, 0xab54, 0xcdf5, 0xab55, 0xab56, 0xe7e0, 0xab57, /*0x88-0x8f*/
4674 0xab58, 0xe7e1, 0xab59, 0xab5a, 0xab5b, 0xab5c, 0xbec1, 0xab5d, /*0x90-0x97*/
4675 0xab5e, 0xab5f, 0xab60, 0xc2ea, 0xab61, 0xab62, 0xab63, 0xe7e4, /*0x98-0x9f*/
4676 0xab64, 0xab65, 0xe7e3, 0xab66, 0xab67, 0xab68, 0xab69, 0xab6a, /*0xa0-0xaf*/
4677 0xab6b, 0xcde6, 0xab6c, 0xc3b5, 0xab6d, 0xab6e, 0xe7e2, 0xbbb7, /*0xa8-0xaf*/
4678 0xcfd6, 0xab6f, 0xc1e1, 0xe7e9, 0xab70, 0xab71, 0xab72, 0xe7e8, /*0xb0-0xbf*/
4679 0xab73, 0xab74, 0xe7f4, 0xb2a3, 0xab75, 0xab76, 0xab77, 0xab78, /*0xb8-0xbf*/
4680 0xe7ea, 0xab79, 0xe7e6, 0xab7a, 0xab7b, 0xab7c, 0xab7d, 0xab7e, /*0xc0-0xcf*/
4681 0xe7ec, 0xe7eb, 0xc9ba, 0xab80, 0xab81, 0xd5e4, 0xab82, 0xe7e5, /*0xc8-0xcf*/
4682 0xb7a9, 0xe7e7, 0xab83, 0xab84, 0xab85, 0xab86, 0xab87, 0xab88, /*0xd0-0xdf*/
4683 0xab89, 0xe7ee, 0xab8a, 0xab8b, 0xab8c, 0xab8d, 0xe7f3, 0xab8e, /*0xd8-0xdf*/
4684 0xd6e9, 0xab8f, 0xab90, 0xab91, 0xab92, 0xe7ed, 0xab93, 0xe7f2, /*0xe0-0xef*/

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4685 0xab94, 0xe7f1, 0xab95, 0xab96, 0xab97, 0xb0e0, 0xab98, 0xab99, /*0xe8-0xef*/
4686 0xab9a, 0xab9b, 0xe7f5, 0xab9c, 0xab9d, 0xab9e, 0xab9f, 0xaba0, /*0xf0-0xf7*/
4687 0xac40, 0xac41, 0xac42, 0xac43, 0xac44, 0xac45, 0xac46, 0xac47, /*0xf8-0xff*/
4688 /* 0x7400 */
4689 0xac48, 0xac49, 0xac4a, 0xc7f2, 0xac4b, 0xc0c5, 0xc0ed, 0xac4c, /*0x00-0x07*/
4690 0xac4d, 0xc1f0, 0xe7f0, 0xac4e, 0xac4f, 0xac50, 0xac51, 0xe7f6, /*0x08-0x0f*/
4691 0xcbf6, 0xac52, 0xac53, 0xac54, 0xac55, 0xac56, 0xac57, 0xac58, /*0x10-0x17*/
4692 0xac59, 0xac5a, 0xe8a2, 0xe8a1, 0xac5b, 0xac5c, 0xac5d, 0xac5e, /*0x18-0x1f*/
4693 0xac5f, 0xac60, 0xd7c1, 0xac61, 0xac62, 0xe7fa, 0xe7f9, 0xac63, /*0x20-0x27*/
4694 0xe7fb, 0xac64, 0xe7f7, 0xac65, 0xe7fe, 0xac66, 0xe7fd, 0xac67, /*0x28-0x2f*/
4695 0xe7fc, 0xac68, 0xac69, 0xc1d5, 0xc7d9, 0xc5fd, 0xc5c3, 0xac6a, /*0x30-0x37*/
4696 0xac6b, 0xac6c, 0xac6d, 0xac6e, 0xc7ed, 0xac6f, 0xac70, 0xac71, /*0x38-0x3f*/
4697 0xac72, 0xe8a3, 0xac73, 0xac74, 0xac75, 0xac76, 0xac77, 0xac78, /*0x40-0x47*/
4698 0xac79, 0xac7a, 0xac7b, 0xac7c, 0xac7d, 0xac7e, 0xac80, 0xac81, /*0x48-0x4f*/
4699 0xac82, 0xac83, 0xac84, 0xac85, 0xac86, 0xe8a6, 0xac87, 0xe8a5, /*0x50-0x57*/
4700 0xac88, 0xe8a7, 0xbaf7, 0xe7f8, 0xe8a4, 0xac89, 0xc8f0, 0xc9aa, /*0x58-0x5f*/
4701 0xac8a, 0xac8b, 0xac8c, 0xac8d, 0xac8e, 0xac8f, 0xac90, 0xac91, /*0x60-0x67*/
4702 0xac92, 0xac93, 0xac94, 0xac95, 0xac96, 0xe8a9, 0xac97, 0xac98, /*0x68-0x6f*/
4703 0xb9e5, 0xac99, 0xac9a, 0xac9b, 0xac9c, 0xac9d, 0xd1fe, 0xe8a8, /*0x70-0x77*/
4704 0xac9e, 0xac9f, 0xaca0, 0xad40, 0xad41, 0xad42, 0xe8aa, 0xad43, /*0x78-0x7f*/
4705 0xe8ad, 0xe8ae, 0xad44, 0xc1a7, 0xad45, 0xad46, 0xad47, 0xe8af, /*0x80-0x87*/
4706 0xad48, 0xad49, 0xad4a, 0xe8b0, 0xad4b, 0xad4c, 0xe8ac, 0xad4d, /*0x88-0x8f*/
4707 0xe8b4, 0xad4e, 0xad4f, 0xad50, 0xad51, 0xad52, 0xad53, 0xad54, /*0x90-0x97*/
4708 0xad55, 0xad56, 0xad57, 0xad58, 0xe8ab, 0xad59, 0xe8b1, 0xad5a, /*0x98-0x9f*/
4709 0xad5b, 0xad5c, 0xad5d, 0xad5e, 0xad5f, 0xad60, 0xad61, 0xe8b5, /*0xa0-0xa7*/
4710 0xe8b2, 0xe8b3, 0xad62, 0xad63, 0xad64, 0xad65, 0xad66, 0xad67, /*0xa8-0xaf*/
4711 0xad68, 0xad69, 0xad6a, 0xad6b, 0xad6c, 0xad6e, 0xad6f, /*0xb0-0xbf*/
4712 0xad70, 0xad71, 0xe8b7, 0xad72, 0xad73, 0xad74, 0xad75, 0xad76, /*0xb8-0xbf*/
4713 0xad77, 0xad78, 0xad79, 0xad7a, 0xad7b, 0xad7c, 0xad7d, 0xad7e, /*0xc0-0xcf*/
4714 0xad80, 0xad81, 0xad82, 0xad83, 0xad84, 0xad85, 0xad86, 0xad87, /*0xc8-0xcf*/
4715 0xad88, 0xad89, 0xe8b6, 0xad8a, 0xad8b, 0xad8c, 0xad8d, 0xad8e, /*0xd0-0xdf*/
4716 0xad8f, 0xad90, 0xad91, 0xad92, 0xb9cf, 0xad93, 0xf0ac, 0xad94, /*0xd8-0xdf*/
4717 0xf0ad, 0xad95, 0xc6b0, 0xb0ea, 0xc8bf, 0xad96, 0xcddf, 0xad97, /*0xe0-0xef*/
4718 0xad98, 0xad99, 0xad9a, 0xad9b, 0xad9c, 0xad9d, 0xccecd, 0xeab1, /*0xe8-0xef*/
4719 0xad9e, 0xad9f, 0xada0, 0xae40, 0xeab2, 0xae41, 0xc6bf, 0xb4c9, /*0xf0-0xf7*/
4720 0xae42, 0xae43, 0xae44, 0xae45, 0xae46, 0xae47, 0xae48, 0xeab3, /*0xf8-0xff*/
4721 /* 0x7500 */
4722 0xae49, 0xae4a, 0xae4b, 0xae4c, 0xd5e7, 0xae4d, 0xae4e, 0xae4f, /*0x00-0x07*/
4723 0xae50, 0xae51, 0xae52, 0xae53, 0xae54, 0xae55, 0xeab4, /*0x08-0x0f*/
4724 0xae56, 0xeab5, 0xae57, 0xeab6, 0xae58, 0xae59, 0xae5a, 0xae5b, /*0x10-0x17*/
4725 0xb8ca, 0xdfb0, 0xc9f5, 0xae5c, 0xccf0, 0xae5d, 0xae5e, 0xc9fa, /*0x18-0x1f*/
4726 0xae5f, 0xae60, 0xae61, 0xae62, 0xae63, 0xc9fb, 0xae64, 0xae65, /*0x20-0x27*/
4727 0xd3c3, 0xcba6, 0xae66, 0xb8a6, 0xf0ae, 0xb1c2, 0xae67, 0xe5b8, /*0x28-0x2f*/
4728 0xccef, 0xd3c9, 0xbcd7, 0xc9ea, 0xae68, 0xb5e7, 0xae69, 0xc4d0, /*0x30-0x37*/
4729 0xb5e9, 0xae6a, 0xeeae, 0xbbad, 0xae6b, 0xae6c, 0xe7de, 0xae6d, /*0x38-0x3f*/
4730 0xeeaf, 0xae6e, 0xae6f, 0xae70, 0xae71, 0xb3a9, 0xae72, 0xae73, /*0x40-0x47*/
4731 0xeeb2, 0xae74, 0xae75, 0xeeb1, 0xbde7, 0xae76, 0xeeb0, 0xceb7, /*0x48-0x4f*/
4732 0xae77, 0xae78, 0xae79, 0xae7a, 0xc5cf, 0xae7b, 0xae7c, 0xae7d, /*0x50-0x57*/
4733 0xae7e, 0xc1f4, 0xdbee, 0xeeb3, 0xd0f3, 0xae80, 0xae81, 0xae82, /*0x58-0x5f*/
4734 0xae83, 0xae84, 0xae85, 0xae86, 0xae87, 0xc2d4, 0xc6e8, 0xae88, /*0x60-0x67*/
4735 0xae89, 0xae8a, 0xb7ac, 0xae8b, 0xae8c, 0xae8d, 0xae8e, 0xae8f, /*0x68-0x6f*/
4736 0xae90, 0xae91, 0xeeb4, 0xae92, 0xb3eb, 0xae93, 0xae94, 0xae95, /*0x70-0x77*/
4737 0xbbbf, 0xeeb5, 0xae96, 0xae97, 0xae98, 0xae99, 0xae9a, 0xe7dc, /*0x78-0x7f*/
4738 0xae9b, 0xae9c, 0xae9d, 0xeeb6, 0xae9e, 0xae9f, 0xbdae, 0xaea0, /*0x80-0x87*/
4739 0xaf40, 0xaf41, 0xaf42, 0xf1e2, 0xaf43, 0xaf44, 0xaf45, 0xcae8, /*0x88-0x8f*/
4740 0xaf46, 0xd2c9, 0xf0da, 0xaf47, 0xf0db, 0xaf48, 0xf0dc, 0xc1c6, /*0x90-0x97*/
4741 0xaf49, 0xb8ed, 0xbece, 0xaf4a, 0xaf4b, 0xf0de, 0xaf4c, 0xc5b1, /*0x98-0x9f*/
4742 0xf0dd, 0xd1f1, 0xaf4d, 0xf0e0, 0xb0cc, 0xbdea, 0xaf4e, 0xaf4f, /*0xa0-0xaf*/
4743 0xaf50, 0xaf51, 0xaf52, 0xd2df, 0xf0df, 0xaf53, 0xb4af, 0xb7e8, /*0xa8-0xaf*/
4744 0xf0e6, 0xf0e5, 0xc6a3, 0xf0e1, 0xf0e2, 0xb4c3, 0xaf54, 0xaf55, /*0xb0-0xbf*/
4745 0xf0e3, 0xd5ee, 0xaf56, 0xaf57, 0xcceb, 0xbed2, 0xbcb2, 0xaf58, /*0xb8-0xbf*/
4746 0xaf59, 0xaf5a, 0xf0e8, 0xf0e7, 0xf0e4, 0xb2a1, 0xaf5b, 0xd6a2, /*0xc0-0xcf*/
4747 0xd3b8, 0xbbe7, 0xc8ac, 0xaf5c, 0xaf5d, 0xf0ea, 0xaf5e, 0xaf5f, /*0xc8-0xcf*/
4748 0xaf60, 0xaf61, 0xd1f7, 0xaf62, 0xd6cc, 0xbadb, 0xf0e9, 0xaf63, /*0xd0-0xdf*/
4749 0xb6bb, 0xaf64, 0xaf65, 0xcdb4, 0xaf66, 0xaf67, 0xc6a6, 0xaf68, /*0xd8-0xdf*/
4750 0xaf69, 0xaf6a, 0xc1a1, 0xf0eb, 0xf0ee, 0xaf6b, 0xf0ed, 0xf0f0, /*0xe0-0xef*/
4751 0xf0ec, 0xaf6c, 0xbbbe, 0xf0ef, 0xaf6d, 0xaf6e, 0xaf6f, 0xaf70, /*0xe8-0xef*/
4752 0xccb5, 0xf0f2, 0xaf71, 0xaf72, 0xb3d5, 0xaf73, 0xaf74, 0xaf75, /*0xf0-0xf7*/
4753 0xaf76, 0xb1d4, 0xaf77, 0xaf78, 0xf0f3, 0xaf79, 0xaf7a, 0xf0f4, /*0xf8-0xff*/
4754 /* 0x7600 */
4755 0xf0f6, 0xb4e1, 0xaf7b, 0xf0f1, 0xaf7c, 0xf0f7, 0xaf7d, 0xaf7e, /*0x00-0x07*/
4756 0xaf80, 0xaf81, 0xf0fa, 0xaf82, 0xf0f8, 0xaf83, 0xaf84, 0xaf85, /*0x08-0x0f*/
4757 0xf0f5, 0xaf86, 0xaf87, 0xaf88, 0xaf89, 0xf0fd, 0xaf8a, 0xf0f9, /*0x10-0x17*/
4758 0xf0fc, 0xf0fe, 0xaf8b, 0xf1a1, 0xaf8c, 0xaf8d, 0xaf8e, 0xcce1, /*0x18-0x1f*/
4759 0xf1a4, 0xaf8f, 0xf1a3, 0xaf90, 0xc1f6, 0xf0fb, 0xcadd, 0xaf91, /*0x20-0x27*/
4760 0xaf92, 0xb4f1, 0xb1f1, 0xcdb1, 0xaf93, 0xf1a6, 0xaf94, 0xaf95, /*0x28-0x2f*/
4761 0xf1a7, 0xaf96, 0xaf97, 0xf1ac, 0xd5ce, 0xf1a9, 0xaf98, 0xaf99, /*0x30-0x37*/
4762 0xc8b3, 0xaf9a, 0xaf9b, 0xaf9c, 0xf1a2, 0xaf9d, 0xf1ab, 0xf1a8, /*0x38-0x3f*/
4763 0xf1a5, 0xaf9e, 0xaf9f, 0xf1aa, 0xafa0, 0xb040, 0xb041, 0xb042, /*0x40-0x47*/
4764 0xb043, 0xb044, 0xb045, 0xb046, 0xb0a9, 0xf1ad, 0xb047, 0xb048, /*0x48-0x4f*/
4765 0xb049, 0xb04a, 0xb04b, 0xb04c, 0xf1af, 0xb04d, 0xf1b1, 0xb04e, /*0x50-0x57*/
4766 0xb04f, 0xb050, 0xb051, 0xb052, 0xf1b0, 0xb053, 0xf1ae, 0xb054, /*0x58-0x5f*/
4767 0xb055, 0xb056, 0xb057, 0xd1a2, 0xb058, 0xb059, 0xb05a, 0xb05b, /*0x60-0x6f*/
4768 0xb05c, 0xb05d, 0xb05e, 0xf1b2, 0xb05f, 0xb060, 0xb061, 0xf1b3, /*0x68-0x6f*/
4769 0xb062, 0xb063, 0xb064, 0xb065, 0xb066, 0xb067, 0xb068, 0xb069, /*0x70-0x77*/
4770 0xb06e, 0xb06a, 0xb06b, 0xb06c, 0xb0d7, 0xb0d9, 0xb06d, /*0x78-0x7f*/
4771 0xb06e, 0xb06f, 0xd4ed, 0xb070, 0xb5c4, 0xb071, 0xbdd4, 0xbbc4, /*0x80-0x87*/
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4772 0xf0a7, 0xb072, 0xb073, 0xb8de, 0xb074, 0xb075, 0xf0a8, 0xb076, /*0x88-0x8f*/
4773 0xb077, 0xb0a8, 0xb078, 0xf0a9, 0xb079, 0xb07a, 0xcdee, 0xb07b, /*0x90-0x97*/
4774 0xb07c, 0xf0aa, 0xb07d, 0xb07e, 0xb080, 0xb081, 0xb082, 0xb083, /*0x98-0x9f*/
4775 0xb084, 0xb085, 0xb086, 0xb087, 0xf0ab, 0xb088, 0xb089, 0xb08a, /*0xa0-0xa7*/
4776 0xb08b, 0xb08c, 0xb08d, 0xb08e, 0xb08f, 0xb090, 0xc6a4, 0xb091, /*0xa8-0xaf*/
4777 0xb092, 0xd6e5, 0xf1e4, 0xb093, 0xf1e5, 0xb094, 0xb095, 0xb096, /*0xb0-0xbf*/
4778 0xb097, 0xb098, 0xb099, 0xb09a, 0xb09b, 0xb09c, 0xb09d, 0xc3f3, /*0xb8-0xbf*/
4779 0xb09e, 0xb09f, 0xd3db, 0xb0a0, 0xb140, 0xd6d1, 0xc5e8, 0xb141, /*0xc0-0xc7*/
4780 0xd3af, 0xb142, 0xd2e6, 0xb143, 0xb144, 0xeeec, 0xb0bb, 0xd5b5, /*0xc8-0xcf*/
4781 0xd1ce, 0xbce0, 0xbad0, 0xb145, 0xbff8, 0xb146, 0xb8c7, 0xb5c1, /*0xd0-0xd7*/
4782 0xc5cc, 0xb147, 0xb148, 0xcaa2, 0xb149, 0xb14a, 0xb14b, 0xc3cb, /*0xd8-0xdf*/
4783 0xb14c, 0xb14d, 0xb14e, 0xb14f, 0xb150, 0xeeec, 0xb151, 0xb152, /*0xe0-0xef*/
4784 0xb153, 0xb154, 0xb155, 0xb156, 0xb157, 0xb158, 0xc4bf, 0xb6a2, /*0xe8-0xef*/
4785 0xb159, 0xedec, 0xc3a4, 0xb15a, 0xd6b1, 0xb15b, 0xb15c, 0xb15d, /*0xf0-0xf7*/
4786 0xcfe0, 0xedef, 0xb15e, 0xb15f, 0xc5ce, 0xb160, 0xb6dc, 0xb161, /*0xf8-0xff*/
4787 /* 0x7700 */
4788 0xb162, 0xcaa1, 0xb163, 0xb164, 0xeded, 0xb165, 0xb166, 0xedf0, /*0x00-0x07*/
4789 0xedf1, 0xc3bc, 0xb167, 0xbfb4, 0xb168, 0xede, 0xb169, 0xb16a, /*0x08-0x0f*/
4790 0xb16b, 0xb16c, 0xb16d, 0xb16e, 0xb16f, 0xb170, 0xb171, 0xb172, /*0x10-0x17*/
4791 0xb173, 0xedf4, 0xedf2, 0xb174, 0xb175, 0xb176, 0xb177, 0xd5e6, /*0x18-0x1f*/
4792 0xc3df, 0xb178, 0xedf3, 0xb179, 0xb17a, 0xb17b, 0xedf6, 0xb17c, /*0x20-0x27*/
4793 0xd5a3, 0xd1a3, 0xb17d, 0xb17e, 0xb180, 0xedf5, 0xb181, 0xc3d0, /*0x28-0x2f*/
4794 0xb182, 0xb183, 0xb184, 0xb185, 0xb186, 0xedf7, 0xbff4, 0xbeec, /*0x30-0x37*/
4795 0xedf8, 0xb187, 0xccf7, 0xb188, 0xd1db, 0xb189, 0xb18a, 0xb18b, /*0x38-0x3f*/
4796 0xd7c5, 0xd5f6, 0xb18c, 0xedfc, 0xb18d, 0xb18e, 0xb18f, 0xedfb, /*0x40-0x47*/
4797 0xb190, 0xb191, 0xb192, 0xb193, 0xb194, 0xb195, 0xb196, 0xb197, /*0x48-0x4f*/
4798 0xedf9, 0xedfa, 0xb198, 0xb199, 0xb19a, 0xb19b, 0xb19c, 0xb19d, /*0x50-0x57*/
4799 0xb19e, 0xb19f, 0xedfd, 0xbea6, 0xb1a0, 0xb240, 0xb241, 0xb242, /*0x58-0x5f*/
4800 0xb243, 0xcba, 0xeea1, 0xb6bd, 0xb244, 0xeea2, 0xc4c0, 0xb245, /*0x60-0x67*/
4801 0xedfe, 0xb246, 0xb247, 0xbdde, 0xb2c7, 0xb248, 0xb249, 0xb24a, /*0x68-0x6f*/
4802 0xb24b, 0xb24c, 0xb24d, 0xb24e, 0xb24f, 0xb250, 0xb251, 0xb252, /*0x70-0x77*/
4803 0xb253, 0xb6c3, 0xb254, 0xb255, 0xb256, 0xeea5, 0xd8ba, 0xeea3, /*0x78-0x7f*/
4804 0xeea6, 0xb257, 0xb258, 0xb259, 0xc3e9, 0xb3f2, 0xb25a, 0xb25b, /*0x80-0x87*/
4805 0xb25c, 0xb25d, 0xb25e, 0xb25f, 0xeea7, 0xeea4, 0xcfb9, 0xb260, /*0x88-0x8f*/
4806 0xb261, 0xeea8, 0xc2f7, 0xb262, 0xb263, 0xb264, 0xb265, 0xb266, /*0x90-0x97*/
4807 0xb267, 0xb268, 0xb269, 0xb26a, 0xb26b, 0xb26c, 0xb26d, 0xeea9, /*0x98-0x9f*/
4808 0xeeaa, 0xb26e, 0xdeab, 0xb26f, 0xb270, 0xc6b3, 0xb271, 0xc7c6, /*0xa0-0xaf*/
4809 0xb272, 0xd6f5, 0xb5c9, 0xb273, 0xcbb2, 0xb274, 0xb275, 0xb276, /*0xa8-0xaf*/
4810 0xeeab, 0xb277, 0xb278, 0xcdab, 0xb279, 0xeeac, 0xb27a, 0xb27b, /*0xb0-0xbf*/
4811 0xb27c, 0xb27d, 0xb27e, 0xd5b0, 0xb280, 0xeead, 0xb281, 0xf6c4, /*0xb8-0xbf*/
4812 0xb282, 0xb283, 0xb284, 0xb285, 0xb286, 0xb287, 0xb288, 0xb289, /*0xc0-0xc7*/
4813 0xb28a, 0xb28b, 0xb28c, 0xb28d, 0xb28e, 0xb28f, 0xb290, 0xb291, /*0xc8-0xcf*/
4814 0xb291, 0xb292, 0xb293, 0xb294, 0xb295, 0xb296, 0xb297, 0xb4a3, /*0xd0-0xdf*/
4815 0xb298, 0xb299, 0xb29a, 0xc3ac, 0xf1e6, 0xb29b, 0xb29c, 0xb29d, /*0xd8-0xdf*/
4816 0xb29e, 0xb29f, 0xcab8, 0xd2d3, 0xb2a0, 0xd6aa, 0xb340, 0xefff, /*0xe0-0xef*/
4817 0xb341, 0xbed8, 0xb342, 0xbdc3, 0xefff, 0xb6cc, 0xb0ab, 0xb343, /*0xe8-0xef*/
4818 0xb344, 0xb345, 0xb346, 0xcaaf, 0xb347, 0xb348, 0xedb6, 0xb349, /*0xf0-0xf7*/
4819 0xedb7, 0xb34a, 0xb34b, 0xb34c, 0xb34d, 0xcef9, 0xb7af, 0xbfff, /*0xf8-0xff*/
4820 /* 0x7800 */
4821 0xedb8, 0xc2eb, 0xc9b0, 0xb34e, 0xb34f, 0xb350, 0xb351, 0xb352, /*0x00-0x07*/
4822 0xb353, 0xedb9, 0xb354, 0xb355, 0xc6f6, 0xbfb3, 0xb356, 0xb357, /*0x08-0x0f*/
4823 0xb358, 0xedbc, 0xc5f8, 0xb359, 0xd1d0, 0xb35a, 0xd7a9, 0xedba, /*0x10-0x17*/
4824 0xedbb, 0xb35b, 0xd1e2, 0xb35c, 0xedbf, 0xedc0, 0xb35d, 0xedc4, /*0x18-0x1f*/
4825 0xb35e, 0xb35f, 0xb360, 0xedc8, 0xb361, 0xedc6, 0xedce, 0xd5e8, /*0x20-0x27*/
4826 0xb362, 0xedc9, 0xb363, 0xb364, 0xedc7, 0xedbe, 0xb365, 0xb366, /*0x28-0x2f*/
4827 0xc5e9, 0xb367, 0xb368, 0xb369, 0xc6c6, 0xb36a, 0xb36b, 0xc9e9, /*0x30-0x37*/
4828 0xd4d2, 0xedc1, 0xedc2, 0xedc3, 0xedc5, 0xb36c, 0xc0f9, 0xb36d, /*0x38-0x3f*/
4829 0xb4a1, 0xb36e, 0xb36f, 0xb370, 0xb371, 0xb9e8, 0xb372, 0xedd0, /*0x40-0x47*/
4830 0xb373, 0xb374, 0xb375, 0xb376, 0xedd1, 0xb377, 0xedca, 0xb378, /*0x48-0x4f*/
4831 0xedcf, 0xb379, 0xcfe8, 0xb37a, 0xb37b, 0xcbb6, 0xedcc, 0xedcd, /*0x50-0x57*/
4832 0xb37c, 0xb37d, 0xb37e, 0xb380, 0xb381, 0xcff5, 0xb382, 0xb383, /*0x58-0x5f*/
4833 0xb384, 0xb385, 0xb386, 0xb387, 0xb388, 0xb389, 0xb38a, 0xb38b, /*0x60-0x67*/
4834 0xb38c, 0xb38d, 0xedd2, 0xc1f2, 0xedcb, 0xc8b7, 0xb38e, 0xb38f, /*0x68-0x6f*/
4835 0xb38f, 0xb390, 0xb391, 0xb392, 0xb393, 0xb394, 0xb395, 0xbcef, /*0x70-0x77*/
4836 0xb396, 0xb397, 0xb398, 0xb399, 0xc5f0, 0xb39a, 0xb39b, 0xb39c, /*0x78-0x7f*/
4837 0xb39d, 0xb39e, 0xb39f, 0xb3a0, 0xb440, 0xb441, 0xb442, 0xedd6, /*0x80-0x87*/
4838 0xb443, 0xb5ef, 0xb444, 0xb445, 0xc2b5, 0xb0ad, 0xcbe9, 0xb446, /*0x88-0x8f*/
4839 0xb447, 0xb1ae, 0xb448, 0xedd4, 0xb449, 0xb44a, 0xb44b, 0xcdeb, /*0x90-0x97*/
4840 0xb5e2, 0xb44c, 0xedd5, 0xedd3, 0xedd7, 0xb44d, 0xb44e, 0xb5fa, /*0x98-0x9f*/
4841 0xb44f, 0xedd8, 0xb450, 0xedd9, 0xb451, 0xeddc, 0xb452, 0xb1cc, /*0xa0-0xaf*/
4842 0xb453, 0xb454, 0xb455, 0xb456, 0xb457, 0xb458, 0xb459, 0xb45a, /*0xa8-0xaf*/
4843 0xc5f6, 0xbcee, 0xedda, 0xcbbc, 0xb2ea, 0xb45b, 0xb45c, 0xb45d, /*0xb0-0xbf*/
4844 0xb45e, 0xeddb, 0xb45f, 0xb460, 0xb461, 0xb462, 0xc4eb, 0xb463, /*0xb8-0xbf*/
4845 0xb464, 0xb4c5, 0xb465, 0xb466, 0xb467, 0xb0f5, 0xb468, 0xb469, /*0xc0-0xc7*/
4846 0xb46a, 0xeddf, 0xc0da, 0xb4e8, 0xb46b, 0xb46c, 0xb46d, 0xb46e, /*0xc8-0xcf*/
4847 0xc5cd, 0xb46f, 0xb470, 0xb471, 0xeddd, 0xbfc4, 0xb472, 0xb473, /*0xd0-0xdf*/
4848 0xb474, 0xedde, 0xb475, 0xb476, 0xb477, 0xb478, 0xb479, 0xb47a, /*0xd8-0xdf*/
4849 0xb47b, 0xb47c, 0xb47d, 0xb47e, 0xb480, 0xb481, 0xb482, 0xb483, /*0xe0-0xef*/
4850 0xc4a5, 0xb484, 0xb485, 0xb486, 0xede0, 0xb487, 0xb488, 0xb489, /*0xe8-0xef*/
4851 0xb48a, 0xb48b, 0xede1, 0xb48c, 0xede3, 0xb48d, 0xb48e, 0xc1d7, /*0xf0-0xf7*/
4852 0xb48f, 0xb490, 0xbbc7, 0xb491, 0xb492, 0xb493, 0xb494, 0xb495, /*0xf8-0xff*/
4853 /* 0x7900 */
4854 0xb496, 0xbdb8, 0xb497, 0xb498, 0xb499, 0xede2, 0xb49a, 0xb49b, /*0x00-0x07*/
4855 0xb49c, 0xb49d, 0xb49e, 0xb49f, 0xb4a0, 0xb540, 0xb541, 0xb542, /*0x08-0x0f*/
4856 0xb543, 0xb544, 0xb545, 0xede4, 0xb546, 0xb547, 0xb548, 0xb549, /*0x10-0x17*/
4857 0xb54a, 0xb54b, 0xb54c, 0xb54d, 0xb54e, 0xb54f, 0xede6, 0xb550, /*0x18-0x1f*/
4858 0xb551, 0xb552, 0xb553, 0xb554, 0xede5, 0xb555, 0xb556, 0xb557, /*0x20-0x27*/
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4859 0xb558, 0xb559, 0xb55a, 0xb55b, 0xb55c, 0xb55d, 0xb55e, 0xb55f, /*0x28-0x2f*/
4860 0xb560, 0xb561, 0xb562, 0xb563, 0xede7, 0xb564, 0xb565, 0xb566, /*0x30-0x37*/
4861 0xb567, 0xb568, 0xcabe, 0xcea, 0xc0f1, 0xb569, 0xc9e7, 0xb56a, /*0x38-0x3f*/
4862 0xeceb, 0xc6ee, 0xb56b, 0xb56c, 0xb56d, 0xb56e, 0xecec, 0xb56f, /*0x40-0x47*/
4863 0xc6ed, 0xeced, 0xb570, 0xb571, 0xb572, 0xb573, 0xb574, 0xb575, /*0x48-0x4f*/
4864 0xb576, 0xb577, 0xb578, 0xecf0, 0xb579, 0xb57a, 0xd7e6, 0xecf3, /*0x50-0x57*/
4865 0xb57b, 0xb57c, 0xecf1, 0xecee, 0xecef, 0xd7a3, 0xc9f1, 0xcbee, /*0x58-0x5f*/
4866 0xecf4, 0xb57d, 0xecf2, 0xb57e, 0xb580, 0xcfe9, 0xb581, 0xecf6, /*0x60-0x67*/
4867 0xc6b1, 0xb582, 0xb583, 0xb584, 0xb585, 0xbcc0, 0xb586, 0xecf5, /*0x68-0x6f*/
4868 0xb587, 0xb588, 0xb589, 0xb58a, 0xb58b, 0xb58c, 0xb58d, 0xb5bb, /*0x70-0x77*/
4869 0xbbf6, 0xb58e, 0xecf7, 0xb58f, 0xb590, 0xb591, 0xb592, 0xb593, /*0x78-0x7f*/
4870 0xd9f7, 0xbdfb, 0xb594, 0xb595, 0xc2bb, 0xecf8, 0xb596, 0xb597, /*0x80-0x87*/
4871 0xb598, 0xb599, 0xecf9, 0xb59a, 0xb59b, 0xb59c, 0xb59d, 0xb8a3, /*0x88-0x8f*/
4872 0xb59e, 0xb59f, 0xb5a0, 0xb640, 0xb641, 0xb642, 0xb643, 0xb644, /*0x90-0x97*/
4873 0xb645, 0xb646, 0xecfa, 0xb647, 0xb648, 0xb649, 0xb64a, 0xb64b, /*0x98-0x9f*/
4874 0xb64c, 0xb64d, 0xb64e, 0xb64f, 0xb650, 0xb651, 0xb652, 0xecfb, /*0xa0-0xa7*/
4875 0xb653, 0xb654, 0xb655, 0xb656, 0xb657, 0xb658, 0xb659, 0xb65a, /*0xa8-0xaf*/
4876 0xb65b, 0xb65c, 0xb65d, 0xecfc, 0xb65e, 0xb65f, 0xb660, 0xb661, /*0xb0-0xbf*/
4877 0xb662, 0xd3ed, 0xd8ae, 0xc0eb, 0xb663, 0xc7dd, 0xbacc, 0xb664, /*0xb8-0xbf*/
4878 0xd0e3, 0xcbbd, 0xb665, 0xcdba, 0xb666, 0xb667, 0xb8d1, 0xb668, /*0xc0-0xcf*/
4879 0xb669, 0xb1fc, 0xb66a, 0xc7ef, 0xb66b, 0xd6d6, 0xb66c, 0xb66d, /*0xc8-0xcf*/
4880 0xb66e, 0xbfc6, 0xc3eb, 0xb66f, 0xb670, 0xeff5, 0xb671, 0xb672, /*0xd0-0xdf*/
4881 0xc3d8, 0xb673, 0xb674, 0xb675, 0xb676, 0xb677, 0xb678, 0xd7e2, /*0xd8-0xdf*/
4882 0xb679, 0xb67a, 0xb67b, 0xeff7, 0xb3d3, 0xb67c, 0xc7d8, 0xd1ed, /*0xe0-0xef*/
4883 0xb67d, 0xd6c8, 0xb67e, 0xeff8, 0xb680, 0xeff6, 0xb681, 0xbbfd, /*0xe8-0xef*/
4884 0xb3c6, 0xb682, 0xb683, 0xb684, 0xb685, 0xb686, 0xb687, 0xb688, /*0xf0-0xff*/
4885 0xbdd5, 0xb689, 0xb68a, 0xd2c6, 0xb68b, 0xbbe0, 0xb68c, 0xb68d, /*0xf8-0xff*/
4886 /* 0x7a00 */
4887 0xcfa1, 0xb68e, 0xeffc, 0xeffb, 0xb68f, 0xb690, 0xeff9, 0xb691, /*0x00-0x07*/
4888 0xb692, 0xb693, 0xb694, 0xb3cc, 0xb695, 0xc9d4, 0xcbb0, 0xb696, /*0x08-0x0f*/
4889 0xb697, 0xb698, 0xb699, 0xb69a, 0xeffe, 0xb69b, 0xb69c, 0xb0de, /*0x10-0x17*/
4890 0xb69d, 0xb69e, 0xd6c9, 0xb69f, 0xb6a0, 0xb740, 0xeffd, 0xb741, /*0x18-0x1f*/
4891 0xb3ed, 0xb742, 0xb743, 0xf6d5, 0xb744, 0xb745, 0xb746, 0xb747, /*0x20-0x27*/
4892 0xb748, 0xb749, 0xb74a, 0xb74b, 0xb74c, 0xb74d, 0xb74e, 0xb74f, /*0x28-0x2f*/
4893 0xb750, 0xb751, 0xb752, 0xcce8, 0xb753, 0xb754, 0xb755, 0xf0a2, /*0x30-0x37*/
4894 0xb756, 0xf0a1, 0xb757, 0xb5be, 0xcdda, 0xbbf6, 0xb758, 0xb8e5, /*0x38-0x3f*/
4895 0xb759, 0xb75a, 0xb75b, 0xb75c, 0xb75d, 0xb75e, 0xc4c2, 0xb75f, /*0x40-0x47*/
4896 0xb760, 0xb761, 0xb762, 0xb763, 0xb764, 0xb765, 0xb766, 0xb767, /*0x48-0x4f*/
4897 0xb768, 0xf0a3, 0xb769, 0xb76a, 0xb76b, 0xb76c, 0xb76d, 0xcbeb, /*0x50-0x57*/
4898 0xb76e, 0xb76f, 0xb770, 0xb771, 0xb772, 0xb773, 0xb774, 0xb775, /*0x58-0x5f*/
4899 0xb776, 0xb777, 0xb778, 0xb779, 0xb77a, 0xb77b, 0xb77c, 0xb77d, /*0x60-0x67*/
4900 0xb77e, 0xb780, 0xb781, 0xb782, 0xb783, 0xb784, 0xb785, 0xb786, /*0x68-0x6f*/
4901 0xf0a6, 0xb787, 0xb788, 0xb789, 0xd1a8, 0xb78a, 0xbefb, 0xc7ee, /*0x70-0x77*/
4902 0xf1b6, 0xf1b7, 0xbfd5, 0xb78b, 0xb78c, 0xb78d, 0xb78e, 0xb4a9, /*0x78-0x7f*/
4903 0xf1b8, 0xcdbb, 0xb78f, 0xc7d4, 0xd5ad, 0xb790, 0xf1b9, 0xb791, /*0x80-0x87*/
4904 0xf1ba, 0xb792, 0xb793, 0xb794, 0xb795, 0xc7cf, 0xb796, 0xb797, /*0x88-0x8f*/
4905 0xb798, 0xd2a4, 0xd6cf, 0xb799, 0xb79a, 0xf1bb, 0xbdd1, 0xb4b0, /*0x90-0x97*/
4906 0xbbed, 0xb79b, 0xb79c, 0xb79d, 0xb4dc, 0xcdd1, 0xb79e, 0xbfd6, /*0x98-0x9f*/
4907 0xf1bd, 0xb79f, 0xb7a0, 0xb840, 0xb841, 0xbffa, 0xf1bc, 0xb842, /*0xa0-0xaf*/
4908 0xf1bf, 0xb843, 0xb844, 0xb845, 0xf1be, 0xf1c0, 0xb846, 0xb847, /*0xa8-0xaf*/
4909 0xb848, 0xb849, 0xb84a, 0xf1c1, 0xb84b, 0xb84c, 0xb84d, 0xb84e, /*0xb0-0xbf*/
4910 0xb84f, 0xb850, 0xb851, 0xb852, 0xb853, 0xb854, 0xb855, 0xc1fe, /*0xb8-0xbf*/
4911 0xb856, 0xb857, 0xb858, 0xb859, 0xb85a, 0xb85b, 0xb85c, 0xb85d, /*0xc0-0xcf*/
4912 0xb85e, 0xb85f, 0xb860, 0xc1a2, 0xb861, 0xb862, 0xb863, 0xb864, /*0xc8-0xcf*/
4913 0xb865, 0xb866, 0xb867, 0xb868, 0xb869, 0xb86a, 0xcafa, 0xb86b, /*0xd0-0xdf*/
4914 0xb86c, 0xd5be, 0xb86d, 0xb86e, 0xb86f, 0xb870, 0xb86a, 0xb86b, /*0xd8-0xdf*/
4915 0xd5c2, 0xb871, 0xb872, 0xb873, 0xcda, 0xf1b5, 0xb874, 0xb875, /*0xe0-0xef*/
4916 0xb876, 0xb877, 0xb878, 0xb879, 0xbddf, 0xb87a, 0xb87b, 0xb87c, /*0xe8-0xef*/
4917 0xb87d, 0xb87e, 0xb87f, 0xb880, 0xb881, 0xb882, 0xb883, 0xb884, /*0xf0-0xff*/
4918 0xb885, 0xd6f1, 0xf3c3, 0xb886, 0xb887, 0xf3c4, 0xb888, 0xb889, /*0xf8-0xff*/
4919 /* 0x7b00 */
4920 0xb88a, 0xb88b, 0xb88c, 0xf3c6, 0xf3c7, 0xb88d, 0xb0ca, 0xb88e, /*0x00-0x07*/
4921 0xf3c5, 0xb88d, 0xf3c9, 0xcbf1, 0xb88e, 0xb88f, 0xb890, 0xf3cb, /*0x08-0x0f*/
4922 0xb891, 0xd0a6, 0xb892, 0xb893, 0xb1ca, 0xf3c8, 0xb894, 0xb895, /*0x10-0x17*/
4923 0xb896, 0xf3cf, 0xb897, 0xb5d1, 0xb898, 0xb899, 0xf3d7, 0xb89a, /*0x18-0x1f*/
4924 0xf3d2, 0xb89b, 0xb89c, 0xb89d, 0xf3d4, 0xf3d3, 0xb7fb, 0xb89e, /*0x20-0x27*/
4925 0xb1bf, 0xb89f, 0xf3ce, 0xf3ca, 0xb5da, 0xb8a0, 0xf3d0, 0xb940, /*0x28-0x2f*/
4926 0xb941, 0xf3d1, 0xb942, 0xf3d3, 0xb943, 0xb944, 0xb945, 0xb946, /*0x30-0x37*/
4927 0xf3cd, 0xb947, 0xbce3, 0xb948, 0xc1fd, 0xb949, 0xf3d6, 0xb94a, /*0x38-0x3f*/
4928 0xb94b, 0xb94c, 0xb94d, 0xb94e, 0xb94f, 0xf3da, 0xb950, 0xf3cc, /*0x40-0x47*/
4929 0xb951, 0xb5c8, 0xb952, 0xbdee, 0xf3dc, 0xb953, 0xb954, 0xb7a4, /*0x48-0x4f*/
4930 0xbbf0, 0xd6fe, 0xcdb2, 0xb955, 0xb4f0, 0xb956, 0xb2df, 0xb957, /*0x50-0x57*/
4931 0xf3d8, 0xb958, 0xf3d9, 0xc9b8, 0xb959, 0xf3dd, 0xb95a, 0xb95b, /*0x58-0x5f*/
4932 0xf3de, 0xb95c, 0xf3e1, 0xb95d, 0xb95e, 0xb95f, 0xb960, 0xb961, /*0x60-0x67*/
4933 0xb962, 0xb963, 0xb964, 0xb965, 0xb966, 0xb967, 0xf3df, 0xb968, /*0x68-0x6f*/
4934 0xb969, 0xf3e3, 0xf3e2, 0xb96a, 0xb96b, 0xf3db, 0xb96c, 0xb96d, /*0x70-0x77*/
4935 0xb96e, 0xb3ef, 0xb96e, 0xf3e0, 0xb96f, 0xb970, 0xc7a9, 0xb971, /*0x78-0x7f*/
4936 0xbcf2, 0xb972, 0xb973, 0xb974, 0xb975, 0xf3eb, 0xb976, 0xb977, /*0x80-0x87*/
4937 0xb978, 0xb979, 0xb97a, 0xb97b, 0xb97c, 0xb97d, 0xb97e, 0xb97f, /*0x88-0x8f*/
4938 0xf3e4, 0xb980, 0xb981, 0xb982, 0xb2ad, 0xbbf6, 0xb983, 0xcbe3, /*0x90-0x97*/
4939 0xb984, 0xb985, 0xb986, 0xb987, 0xf3ed, 0xf3e9, 0xb988, 0xb989, /*0x98-0x9f*/
4940 0xb98a, 0xb98c, 0xf3ee, 0xb98b, 0xb98c, 0xb98d, 0xf3e5, 0xf3e6, /*0xa0-0xaf*/
4941 0xf3ea, 0xc2e1, 0xf3ec, 0xf3ef, 0xf3e8, 0xbcf6, 0xb98e, 0xb98f, /*0xa8-0xaf*/
4942 0xb990, 0xcfe4, 0xb991, 0xb992, 0xf3f0, 0xb993, 0xb994, 0xb995, /*0xb0-0xbf*/
4943 0xf3e7, 0xb996, 0xb997, 0xb998, 0xb999, 0xb99a, 0xb99b, 0xb99c, /*0xb8-0xbf*/
4944 0xb99d, 0xf3f2, 0xb99e, 0xb99f, 0xb9a0, 0xd7ad, 0xc6aa, 0xc0c7, /*0xc0-0xcf*/
4945 0xba41, 0xba42, 0xba43, 0xba44, 0xf3f3, 0xba45, 0xba46, 0xba47, /*0xc8-0xcf*/
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4946 0xba48, 0xf3f1, 0xba49, 0xc2a8, 0xba4a, 0xba4b, 0xba4c, 0xba4d, /*0xd0-0xd7*/
4947 0xba4e, 0xb8dd, 0xf3f5, 0xba4f, 0xba50, 0xf3f4, 0xba51, 0xba52, /*0xd8-0xdf*/
4948 0xba53, 0xb4db, 0xba54, 0xba55, 0xba56, 0xf3f6, 0xf3f7, 0xba57, /*0xe0-0xef*/
4949 0xba58, 0xba59, 0xf3f8, 0xba5a, 0xba5b, 0xba5c, 0xc0ba, 0xba5d, /*0xe8-0xef*/
4950 0xba5e, 0xc0e9, 0xba5f, 0xba60, 0xba61, 0xba62, 0xba63, 0xc5f1, /*0xf0-0xf7*/
4951 0xba64, 0xba65, 0xba66, 0xba67, 0xf3fb, 0xba68, 0xf3fa, 0xba69, /*0xf8-0xff*/
4952 /* 0x7c00 */
4953 0xba6a, 0xba6b, 0xba6c, 0xba6d, 0xba6e, 0xba6f, 0xba70, 0xb4d8, /*0x00-0x07*/
4954 0xba71, 0xba72, 0xba73, 0xf3fe, 0xf3f9, 0xba74, 0xba75, 0xf3fc, /*0x08-0x0f*/
4955 0xba76, 0xba77, 0xba78, 0xba79, 0xba7a, 0xba7b, 0xf3fd, 0xba7c, /*0x10-0x17*/
4956 0xba7d, 0xba7e, 0xba80, 0xba81, 0xba82, 0xba83, 0xba84, 0xf4a1, /*0x18-0x1f*/
4957 0xba85, 0xba86, 0xba87, 0xba88, 0xba89, 0xba8a, 0xf4a3, 0xbbc9, /*0x20-0x27*/
4958 0xba8b, 0xba8c, 0xf4a2, 0xba8d, 0xba8e, 0xba8f, 0xba90, 0xba91, /*0x28-0x2f*/
4959 0xba92, 0xba93, 0xba94, 0xba95, 0xba96, 0xba97, 0xba98, 0xba99, /*0x30-0x37*/
4960 0xf4a4, 0xba9a, 0xba9b, 0xba9c, 0xba9d, 0xba9e, 0xba9f, 0xb2be, /*0x38-0x3f*/
4961 0xf4a6, 0xf4a5, 0xbaa0, 0xbb40, 0xbb41, 0xbb42, 0xbb43, 0xbb44, /*0x40-0x47*/
4962 0xbb45, 0xbb46, 0xbb47, 0xbb48, 0xbb49, 0xbcae, 0xbb4a, 0xbb4b, /*0x48-0x4f*/
4963 0xbb4c, 0xbb4d, 0xbb4e, 0xbb4f, 0xbb50, 0xbb51, 0xbb52, 0xbb53, /*0x50-0x57*/
4964 0xbb54, 0xbb55, 0xbb56, 0xbb57, 0xbb58, 0xbb59, 0xbb5a, 0xbb5b, /*0x58-0x5f*/
4965 0xbb5c, 0xbb5d, 0xbb5e, 0xbb5f, 0xbb60, 0xbb61, 0xbb62, 0xbb63, /*0x60-0x67*/
4966 0xbb64, 0xbb65, 0xbb66, 0xbb67, 0xbb68, 0xbb69, 0xbb6a, 0xbb6b, /*0x68-0x6f*/
4967 0xbb6c, 0xbb6d, 0xbb6e, 0xc3d7, 0xd9e1, 0xbb6f, 0xbb70, 0xbb71, /*0x70-0x77*/
4968 0xbb72, 0xbb73, 0xbb74, 0xc0e0, 0xf4cc, 0xd7d1, 0xbb75, 0xbb76, /*0x78-0x7f*/
4969 0xbb77, 0xbb78, 0xbb79, 0xbb7a, 0xbb7b, 0xbb7c, 0xbb7d, 0xbb7e, /*0x80-0x87*/
4970 0xbb80, 0xb7db, 0xbb81, 0xbb82, 0xbb83, 0xbb84, 0xbb85, 0xbb86, /*0x88-0x8f*/
4971 0xbb87, 0xf4ce, 0xc1a3, 0xbb88, 0xbb89, 0xc6c9, 0xbb8a, 0xb4d6, /*0x90-0x97*/
4972 0xd5b3, 0xbb8b, 0xbb8c, 0xbb8d, 0xf4d0, 0xf4cf, 0xf4d1, 0xcdbd, /*0x98-0x9f*/
4973 0xbb8e, 0xbb8f, 0xf4d2, 0xbb90, 0xd4c1, 0xd6e0, 0xbb91, 0xbb92, /*0xa0-0xa7*/
4974 0xbb93, 0xbb94, 0xb7e0, 0xbb95, 0xbb96, 0xbb97, 0xc1b8, 0xbb98, /*0xa8-0xaf*/
4975 0xbb99, 0xc1bb, 0xf4d3, 0xbeac, 0xbb9a, 0xbb9b, 0xbb9c, 0xbb9d, /*0xb0-0xbf*/
4976 0xbb9e, 0xb4e2, 0xbb9f, 0xbba0, 0xf4d4, 0xf4d5, 0xbeab, 0xb4c0, /*0xb8-0xbf*/
4977 0xb4c1, 0xf4d6, 0xb4c2, 0xb4c3, 0xb4c4, 0xf4db, 0xb4c5, 0xf4d7, /*0xc0-0xc7*/
4978 0xf4da, 0xb4c6, 0xb4fd, 0xb4c7, 0xf4d8, 0xf4d9, 0xb4c8, 0xb4c9, /*0xc8-0xcf*/
4979 0xb4ca, 0xb4cb, 0xb4cc, 0xb4cd, 0xb4ce, 0xb8e2, 0xcc7, 0xf4dc, /*0xd0-0xd7*/
4980 0xb4cf, 0xb2da, 0xb4c0, 0xb4c1, 0xc3d3, 0xb4c2, 0xb4c3, 0xd4e3, /*0xd8-0xdf*/
4981 0xbfb7, 0xb4c4, 0xb4c5, 0xb4c6, 0xb4c7, 0xb4c8, 0xb4c9, 0xb4ca, /*0xe0-0xef*/
4982 0xf4dd, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xe8-0xef*/
4983 0xb4c7, 0xb4c8, 0xb4c9, 0xb4ca, 0xb4cb, 0xb4cc, 0xb4cd, 0xb4ce, /*0xf0-0xf7*/
4984 0xf4e9, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xf8-0xff*/
4985 /* 0x7d00 */
4986 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x00-0x07*/
4987 0xb4c7, 0xb4c8, 0xb4c9, 0xb4ca, 0xb4cb, 0xb4cc, 0xb4cd, 0xb4ce, /*0x08-0x0f*/
4988 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x10-0x17*/
4989 0xb4c7, 0xb4c8, 0xb4c9, 0xb4ca, 0xb4cb, 0xb4cc, 0xb4cd, 0xb4ce, /*0x18-0x1f*/
4990 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x20-0x27*/
4991 0xb4c7, 0xb4c8, 0xb4c9, 0xb4ca, 0xb4cb, 0xb4cc, 0xb4cd, 0xb4ce, /*0x28-0x2f*/
4992 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x30-0x37*/
4993 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x38-0x3f*/
4994 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x40-0x47*/
4995 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x48-0x4f*/
4996 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x50-0x57*/
4997 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x58-0x5f*/
4998 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x60-0x67*/
4999 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x68-0x6f*/
5000 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x70-0x77*/
5001 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x78-0x7f*/
5002 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x80-0x87*/
5003 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x88-0x8f*/
5004 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x90-0x97*/
5005 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x98-0x9f*/
5006 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xa0-0xaf*/
5007 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xb0-0xbf*/
5008 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xc0-0xc7*/
5009 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xc8-0xcf*/
5010 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xd0-0xdf*/
5011 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xe0-0xef*/
5012 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xf0-0xf7*/
5013 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0xf8-0xff*/
5014 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x00-0x07*/
5015 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x08-0x0f*/
5016 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x10-0x17*/
5017 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x18-0x1f*/
5018 /* 0x7e00 */
5019 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x20-0x27*/
5020 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x28-0x2f*/
5021 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x30-0x37*/
5022 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x38-0x3f*/
5023 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x40-0x47*/
5024 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x48-0x4f*/
5025 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x50-0x57*/
5026 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x58-0x5f*/
5027 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x60-0x67*/
5028 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x68-0x6f*/
5029 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x70-0x77*/
5030 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x78-0x7f*/
5031 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x80-0x87*/
5032 0xb4cf, 0xb4c0, 0xb4c1, 0xb4c2, 0xb4c3, 0xb4c4, 0xb4c5, 0xb4c6, /*0x88-0x8f*/
```

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5033 0xc052, 0xc053, 0xc054, 0xc055, 0xc056, 0xc057, 0xc058, 0xc059, /*0x70-0x77*/
5034 0xc05a, 0xc05b, 0xc05c, 0xc05d, 0xc05e, 0xc05f, 0xc060, 0xc061, /*0x78-0x7f*/
5035 0xc062, 0xc063, 0xd7eb, 0xc064, 0xc065, 0xc066, 0xc067, 0xc068, /*0x80-0x87*/
5036 0xc069, 0xc06a, 0xc06b, 0xc06c, 0xc06d, 0xc06e, 0xc06f, 0xc070, /*0x88-0x8f*/
5037 0xc071, 0xc072, 0xc073, 0xc074, 0xc075, 0xc076, 0xc077, 0xc078, /*0x90-0x97*/
5038 0xc079, 0xc07a, 0xc07b, 0xc07c, 0xc07d, 0xc07e, 0xc07f, /*0x98-0x9f*/
5039 0xbec0, 0xe6fa, 0xbaec, 0xe6fb, 0xcfcf, 0xe6fc, 0xd4bc, 0xbcb6, /*0xa0-0xa7*/
5040 0xe6fd, 0xe6fe, 0xbccd, 0xc8d2, 0xcceb3, 0xe7a1, 0xc080, 0xb4bf, /*0xa8-0xaf*/
5041 0xe7a2, 0xc9b4, 0xb8d9, 0xc4c9, 0xc081, 0xd7dd, 0xc2da, 0xb7d7, /*0xb0-0xb7*/
5042 0xd6bd, 0xccec6, 0xb7c4, 0xc082, 0xc083, 0xc5a6, 0xe7a3, 0xcfdcf, /*0xb8-0xbf*/
5043 0xe7a4, 0xe7a5, 0xe7a6, 0xc1b7, 0xd7e9, 0xc9f0, 0xcfb8, 0xd6af, /*0xc0-0xc7*/
5044 0xd6d5, 0xe7a7, 0xb0ed, 0xe7a8, 0xe7a9, 0xc9dc, 0xd2ef, 0xbead, /*0xc8-0xcf*/
5045 0xe7aa, 0xb0f3, 0xc8de, 0xbde1, 0xe7ab, 0xc8c6, 0xc084, 0xe7ac, /*0xd0-0xd7*/
5046 0xbbe6, 0xb8f8, 0xd1a4, 0xe7ad, 0xc2e7, 0xbef8, 0xbdc4, 0xcdb3, /*0xd8-0xdf*/
5047 0xe7ae, 0xe7af, 0xb0ee, 0xd0e5, 0xc085, 0xcbe7, 0xcdd0, 0xbccc, /*0xe0-0xef*/
5048 0xe7b0, 0xbca8, 0xd0f7, 0xe7b1, 0xc086, 0xd0f8, 0xe7b2, 0xe7b3, /*0xf0-0xff*/
5049 0xb4c2, 0xe7b4, 0xe7b5, 0xc9fe, 0xceac, 0xc3e0, 0xe7b7, 0xb1c1, /*0xf0-0xff*/
5050 0xb3f1, 0xc087, 0xe7b8, 0xe7b9, 0xd7db, 0xd5c0, 0xe7ba, 0xc2cc, /*0xf8-0xff*/
5051 /* 0x7f00 */
5052 0xd7ba, 0xe7bb, 0xe7bc, 0xe7bd, 0xbcea, 0xc3e5, 0xc0c2, 0xe7be, /*0x00-0x07*/
5053 0xe7bf, 0xbca9, 0xc088, 0xe7c0, 0xe7c1, 0xe7b6, 0xb6d0, 0xe7c2, /*0x08-0x0f*/
5054 0xc089, 0xe7c3, 0xe7c4, 0xbbaa, 0xb5de, 0xc2c6, 0xb1e0, 0xe7c5, /*0x10-0x17*/
5055 0xd4b5, 0xe7c6, 0xb8bf, 0xe7c8, 0xe7c7, 0xb7ec, 0xc08a, 0xe7c9, /*0x18-0x1f*/
5056 0xb2f8, 0xe7ca, 0xe7cb, 0xe7cc, 0xe7cd, 0xe7ce, 0xe7cf, 0xe7d0, /*0x20-0x27*/
5057 0xd3a7, 0xcbf5, 0xe7d1, 0xe7d2, 0xe7d3, 0xe7d4, 0xc9c9, 0xe7d5, /*0x28-0x2f*/
5058 0xe7d6, 0xe7d7, 0xe7d8, 0xe7d9, 0xbdc9, 0xe7da, 0xf3be, 0xc08b, /*0x30-0x37*/
5059 0xb8d7, 0xc08c, 0xc8b1, 0xc08d, 0xc08e, 0xc08f, 0xc090, 0xc091, /*0x38-0x3f*/
5060 0xc092, 0xc093, 0xf3bf, 0xc094, 0xf3c0, 0xf3c1, 0xc095, 0xc096, /*0x40-0x47*/
5061 0xc097, 0xc098, 0xc099, 0xc09a, 0xc09b, 0xc09c, 0xc09d, 0xc09e, /*0x48-0x4f*/
5062 0xb9de, 0xcdf8, 0xc09f, 0xc0a0, 0xd8e8, 0xbab1, 0xc140, 0xc2de, /*0x50-0x57*/
5063 0xeeb7, 0xc141, 0xb7a3, 0xc142, 0xc143, 0xc144, 0xc145, 0xeeb9, /*0x58-0x5f*/
5064 0xc146, 0xeeb8, 0xb0d5, 0xc147, 0xc148, 0xc149, 0xc14a, 0xc14b, /*0x60-0x67*/
5065 0xeebb, 0xd5d6, 0xd7ef, 0xc14c, 0xc14d, 0xc14e, 0xd6c3, 0xc14f, /*0x68-0x6f*/
5066 0xc150, 0xeebd, 0xcaf0, 0xc151, 0xeebc, 0xc152, 0xc153, 0xc154, /*0x70-0x77*/
5067 0xc155, 0xeebe, 0xc156, 0xc157, 0xc158, 0xc159, 0xeec0, 0xc15a, /*0x78-0x7f*/
5068 0xc15b, 0xeebf, 0xc15c, 0xc15d, 0xc15e, 0xc15f, 0xc160, 0xc161, /*0x80-0x87*/
5069 0xc162, 0xc163, 0xd1f2, 0xc164, 0xc7bc, 0xc165, 0xc3c0, 0xc166, /*0x88-0x8f*/
5070 0xc167, 0xc168, 0xc169, 0xc16a, 0xb8e1, 0xc16b, 0xc16c, 0xc16d, /*0x90-0x97*/
5071 0xc16e, 0xc16f, 0xc170, 0xc171, 0xc172, 0xf4c6, 0xd0df, 0xf4c7, /*0x98-0x9f*/
5072 0xc172, 0xcfdb, 0xc173, 0xc174, 0xc8ba, 0xc175, 0xc176, 0xf4c8, /*0xa0-0xaf*/
5073 0xc177, 0xc178, 0xc179, 0xc17a, 0xc17b, 0xc17c, 0xc17d, 0xf4c9, /*0xa8-0xaf*/
5074 0xf4ca, 0xc17e, 0xf4cb, 0xc180, 0xc181, 0xc182, 0xc183, 0xc184, /*0xb0-0xbf*/
5075 0xd9fa, 0xb8fe, 0xc185, 0xc186, 0xe5f1, 0xd3f0, 0xc187, 0xf4e0, /*0xb8-0xbf*/
5076 0xc188, 0xccec, 0xc189, 0xc18a, 0xc18b, 0xb3e1, 0xc18c, 0xc18d, /*0xc0-0xc7*/
5077 0xc18e, 0xc18f, 0xf1b4, 0xc190, 0xd2ee, 0xc191, 0xf4e1, 0xc192, /*0xc8-0xcf*/
5078 0xc193, 0xc194, 0xc195, 0xc196, 0xcfe8, 0xf4e2, 0xc197, 0xc198, /*0xd0-0xd7*/
5079 0xc7cc, 0xc199, 0xc19a, 0xc19b, 0xc19c, 0xc19d, 0xc19e, 0xb5d4, /*0xd8-0xdf*/
5080 0xb4e4, 0xf4e4, 0xc19f, 0xc1a0, 0xc240, 0xf4e3, 0xf4e5, 0xc241, /*0xe0-0xef*/
5081 0xc242, 0xf4e6, 0xc243, 0xc244, 0xc245, 0xc246, 0xf4e7, 0xc247, /*0xf0-0xff*/
5082 0xbab2, 0xb0bf, 0xc248, 0xf4e8, 0xc249, 0xc24a, 0xc24b, 0xc24c, /*0xf0-0xff*/
5083 0xc24d, 0xc24e, 0xc24f, 0xb7ad, 0xd2ed, 0xc250, 0xc251, 0xc252, /*0xf8-0xff*/
5084 /* 0x8000 */
5085 0xd2ab, 0xc0cf, 0xc253, 0xbfbf, 0xeba3, 0xd5df, 0xeac8, 0xc254, /*0x00-0x07*/
5086 0xc255, 0xc256, 0xc257, 0xf1f3, 0xb6f8, 0xcba3, 0xc258, 0xc259, /*0x08-0x0f*/
5087 0xc4cd, 0xc25a, 0xf1e7, 0xc25b, 0xf1e8, 0xb8fb, 0xf1e9, 0xbac4, /*0x10-0x17*/
5088 0xd4c5, 0xb0d2, 0xc25c, 0xc25d, 0xf1ea, 0xc25e, 0xc25f, 0xc260, /*0x18-0x1f*/
5089 0xf1eb, 0xc261, 0xf1ec, 0xc262, 0xc263, 0xf1ed, 0xf1ee, 0xf1ef, /*0x20-0x27*/
5090 0xf1f1, 0xf1f0, 0xc5d5, 0xc264, 0xc265, 0xc266, 0xc267, 0xc268, /*0x28-0x2f*/
5091 0xc269, 0xf1f2, 0xc26a, 0xb6fa, 0xc26b, 0xf1f4, 0xd2ae, 0xd2ec, /*0x30-0x37*/
5092 0xcbaa, 0xc26c, 0xc26d, 0xb3dc, 0xc26e, 0xb5a2, 0xc26f, 0xb9a2, /*0x38-0x3f*/
5093 0xc270, 0xc271, 0xc4f4, 0xf1f5, 0xc272, 0xc273, 0xf1f6, 0xc274, /*0x40-0x47*/
5094 0xc275, 0xc276, 0xc1c4, 0xc1fb, 0xd6b0, 0xf1f7, 0xc277, 0xc278, /*0x48-0x4f*/
5095 0xc279, 0xc27a, 0xf1f8, 0xc27b, 0xc1aa, 0xc27c, 0xc27d, 0xc27e, /*0x50-0x57*/
5096 0xc6b8, 0xc280, 0xbdbd, 0xc281, 0xc282, 0xc283, 0xc284, 0xc285, /*0x58-0x5f*/
5097 0xc286, 0xc287, 0xc288, 0xc289, 0xc28a, 0xc28b, 0xc28c, 0xc28d, /*0x60-0x6f*/
5098 0xc28e, 0xf1f9, 0xb4cf, 0xc28f, 0xc290, 0xc291, 0xc292, 0xc293, /*0x68-0x6f*/
5099 0xc294, 0xf1fa, 0xc295, 0xc296, 0xc297, 0xc298, 0xc299, 0xc29a, /*0x70-0x77*/
5100 0xc29b, 0xc29c, 0xc29d, 0xc29e, 0xc29f, 0xc2a0, 0xc340, 0xedb2, /*0x78-0x7f*/
5101 0xedb1, 0xc341, 0xc342, 0xcbe0, 0xd2de, 0xc343, 0xc344, 0xd5d8, /*0x80-0x87*/
5102 0xc344, 0xc8e2, 0xc345, 0xc0df, 0xbca1, 0xc346, 0xc347, 0xc348, /*0x88-0x8f*/
5103 0xc349, 0xc34a, 0xc34b, 0xc34c, 0xc34d, 0xd0a4, 0xc34e, 0xc34f, /*0x90-0x97*/
5104 0xd6e2, 0xc34f, 0xb6c7, 0xb8d8, 0xebc0, 0xb8ce, 0xc350, 0xebbf, /*0x98-0x9f*/
5105 0xb3a6, 0xb9c9, 0xd6ab, 0xc351, 0xb7f4, 0xb7ca, 0xc352, 0xc353, /*0xa0-0xaf*/
5106 0xc354, 0xbce7, 0xb7be, 0xebc6, 0xc355, 0xebc7, 0xb0b9, 0xbfcf, /*0xa8-0xaf*/
5107 0xc356, 0xebc5, 0xd3fd, 0xebc8, 0xc357, 0xebc9, 0xc358, 0xc359, /*0xb0-0xbf*/
5108 0xc35a, 0xc35b, 0xb7ce, 0xc35c, 0xebc2, 0xebc4, 0xc9f6, 0xd6d7, /*0xb8-0xbf*/
5109 0xd5cd, 0xd0b2, 0xebcf, 0xebd0, 0xc35d, 0xb5a8, 0xc35e, 0xc35f, /*0xc0-0xc7*/
5110 0xc35f, 0xc360, 0xc361, 0xc362, 0xb1b3, 0xebd2, 0xc363, 0xc364, /*0xc8-0xcf*/
5111 0xc364, 0xc365, 0xc366, 0xc367, 0xc368, 0xc369, 0xc5d6, 0xebd3, /*0xd0-0xdf*/
5112 0xc36a, 0xebd1, 0xc5df, 0xebce, 0xc36a, 0xebd5, 0xb0fb, 0xc36b, /*0xd8-0xdf*/
5113 0xc36c, 0xbafa, 0xc36d, 0xc36e, 0xd8b7, 0xf1e3, 0xc36f, 0xebca, /*0xe0-0xef*/
5114 0xebcb, 0xebcc, 0xebcd, 0xebde, 0xe6c0, 0xebd9, 0xc370, 0xbfe8, /*0xf0-0xff*/
5115 0xd2c8, 0xebd7, 0xebdc, 0xb8ec, 0xebdd, 0xc371, 0xbdba, 0xc372, /*0xf0-0xff*/
5116 0xd0d8, 0xc373, 0xb0b7, 0xc374, 0xebdd, 0xc4dc, 0xc375, 0xc376, /*0xf8-0xff*/
5117 /* 0x8100 */
5118 0xc377, 0xc378, 0xd6ac, 0xc379, 0xc37a, 0xc37b, 0xb4e0, 0xc37c, /*0x00-0x07*/
5119 0xc37d, 0xc2f6, 0xbcb9, 0xc37e, 0xc380, 0xebda, 0xebdb, 0xd4e0, /*0x08-0x0f*/
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5120 0xc6ea, 0xc4d4, 0xebdf, 0xc5a7, 0xd9f5, 0xc381, 0xb2b1, 0xc382, /*0x10-0x17*/
5121 0xeb4e, 0xc383, 0xbdc5, 0xc384, 0xc385, 0xc386, 0xeb2e, 0xc387, /*0x18-0x1f*/
5122 0xc388, 0xc389, 0xc38a, 0xc38b, 0xc38c, 0xc38d, 0xc38e, 0xc38f, /*0x20-0x27*/
5123 0xc390, 0xc391, 0xc392, 0xc393, 0xeb3e, 0xc394, 0xc395, 0xb8ac, /*0x28-0x2f*/
5124 0xc396, 0xcdd1, 0xeb5e, 0xc397, 0xc398, 0xc399, 0xeb1e, 0xc39a, /*0x30-0x37*/
5125 0xc1b3, 0xc39b, 0xc39c, 0xc39d, 0xc39e, 0xc39f, 0xc6a2, 0xc3a0, /*0x38-0x3f*/
5126 0xc440, 0xc441, 0xc442, 0xc443, 0xc444, 0xc445, 0xccf3, 0xc446, /*0x40-0x47*/
5127 0xeb6e, 0xc447, 0xc0b0, 0xd2b8, 0xeb7e, 0xc448, 0xc449, 0xc44a, /*0x48-0x4f*/
5128 0xb8af, 0xb8ad, 0xc44b, 0xeb8e, 0xc7bb, 0xcdf3, 0xc44c, 0xc44d, /*0x50-0x57*/
5129 0xc44e, 0xeb3a, 0xeb3b, 0xc44f, 0xc450, 0xc451, 0xc452, 0xc453, /*0x58-0x5f*/
5130 0xeb3d, 0xc454, 0xc455, 0xc456, 0xc457, 0xd0c8, 0xc458, 0xebf2, /*0x60-0x67*/
5131 0xc459, 0xeb3e, 0xc45a, 0xc45b, 0xc45c, 0xc45d, 0xebf1, 0xc8f9, 0xc45d, /*0x68-0x6f*/
5132 0xd1fc, 0xeb3c, 0xc45e, 0xc45f, 0xeb3e, 0xc460, 0xc461, 0xc462, /*0x70-0x77*/
5133 0xc463, 0xb8b9, 0xcfd9, 0xc4e5, 0xebef, 0xebf0, 0xcdda, 0xcddc, /*0x78-0x7f*/
5134 0xb0f2, 0xc464, 0xebf6, 0xc465, 0xc466, 0xc467, 0xc468, 0xc469, /*0x80-0x8f*/
5135 0xebf5, 0xc46a, 0xb2b2, 0xc46b, 0xc46c, 0xc46d, 0xc46e, 0xb8e0, /*0x88-0x8f*/
5136 0xc46f, 0xebf7, 0xc470, 0xc471, 0xc472, 0xc473, 0xc474, 0xc475, /*0x90-0x97*/
5137 0xb1ec, 0xc476, 0xc477, 0xc478, 0xc479, 0xc47a, 0xc47b, 0xc47c, /*0x98-0x9f*/
5138 0xc47d, 0xc47e, 0xc47f, 0xc480, 0xc481, 0xc482, 0xc483, 0xc484, 0xc485, /*0xa0-0xaf*/
5139 0xc486, 0xc487, 0xc488, 0xc489, 0xc48a, 0xc48b, 0xc48c, 0xc48d, /*0xb0-0xbf*/
5140 0xc48e, 0xc48f, 0xe2df, 0xebfe, 0xc490, 0xc491, 0xc492, 0xc493, /*0xc0-0xcf*/
5141 0xc494, 0xc495, 0xc496, 0xc497, 0xc498, 0xc499, 0xc49a, 0xc49b, /*0xd0-0xdf*/
5142 0xc49c, 0xc49d, 0xc49e, 0xc49f, 0xc500, 0xc501, 0xc502, 0xc503, /*0xe0-0xef*/
5143 0xc504, 0xc505, 0xc506, 0xc507, 0xc508, 0xc509, 0xc50a, 0xc50b, /*0xf0-0xff*/
5144 0xc50c, 0xc50d, 0xc50e, 0xc50f, 0xc510, 0xc511, 0xc512, 0xc513, /*0x00-0x07*/
5145 0xc514, 0xc515, 0xc516, 0xc517, 0xc518, 0xc519, 0xc51a, 0xc51b, /*0x08-0x0f*/
5146 0xc51c, 0xc51d, 0xc51e, 0xc51f, 0xc520, 0xc521, 0xc522, 0xc523, /*0x10-0x17*/
5147 0xc524, 0xc525, 0xc526, 0xc527, 0xc528, 0xc529, 0xc52a, 0xc52b, /*0x18-0x1f*/
5148 0xc52c, 0xc52d, 0xc52e, 0xc52f, 0xc530, 0xc531, 0xc532, 0xc533, /*0x20-0x27*/
5149 0xc534, 0xc535, 0xc536, 0xc537, 0xc538, 0xc539, 0xc53a, 0xc53b, /*0x28-0x2f*/
5150 0xc53c, 0xc53d, 0xc53e, 0xc53f, 0xc540, 0xc541, 0xc542, 0xc543, /*0x30-0x37*/
5151 0xc544, 0xc545, 0xc546, 0xc547, 0xc548, 0xc549, 0xc54a, 0xc54b, /*0x38-0x3f*/
5152 0xc54c, 0xc54d, 0xc54e, 0xc54f, 0xc550, 0xc551, 0xc552, 0xc553, /*0x40-0x47*/
5153 0xc554, 0xc555, 0xc556, 0xc557, 0xc558, 0xc559, 0xc55a, 0xc55b, /*0x48-0x4f*/
5154 0xc55c, 0xc55d, 0xc55e, 0xc55f, 0xc560, 0xc561, 0xc562, 0xc563, /*0x50-0x57*/
5155 0xc564, 0xc565, 0xc566, 0xc567, 0xc568, 0xc569, 0xc56a, 0xc56b, /*0x58-0x5f*/
5156 0xc56c, 0xc56d, 0xc56e, 0xc56f, 0xc570, 0xc571, 0xc572, 0xc573, /*0x60-0x67*/
5157 0xc574, 0xc575, 0xc576, 0xc577, 0xc578, 0xc579, 0xc57a, 0xc57b, /*0x68-0x6f*/
5158 0xc57c, 0xc57d, 0xc57e, 0xc57f, 0xc580, 0xc581, 0xc582, 0xc583, /*0x70-0x77*/
5159 0xc584, 0xc585, 0xc586, 0xc587, 0xc588, 0xc589, 0xc58a, 0xc58b, /*0x78-0x7f*/
5160 0xc58c, 0xc58d, 0xc58e, 0xc58f, 0xc590, 0xc591, 0xc592, 0xc593, /*0x80-0x8f*/
5161 0xc594, 0xc595, 0xc596, 0xc597, 0xc598, 0xc599, 0xc59a, 0xc59b, /*0x88-0x8f*/
5162 0xc59c, 0xc59d, 0xc59e, 0xc59f, 0xc600, 0xc601, 0xc602, 0xc603, /*0x90-0x97*/
5163 0xc604, 0xc605, 0xc606, 0xc607, 0xc608, 0xc609, 0xc60a, 0xc60b, /*0x98-0x9f*/
5164 0xc60c, 0xc60d, 0xc60e, 0xc60f, 0xc610, 0xc611, 0xc612, 0xc613, /*0xa0-0xaf*/
5165 0xc614, 0xc615, 0xc616, 0xc617, 0xc618, 0xc619, 0xc61a, 0xc61b, /*0xb0-0xbf*/
5166 0xc61c, 0xc61d, 0xc61e, 0xc61f, 0xc620, 0xc621, 0xc622, 0xc623, /*0xc0-0xcf*/
5167 0xc624, 0xc625, 0xc626, 0xc627, 0xc628, 0xc629, 0xc62a, 0xc62b, /*0xd0-0xdf*/
5168 0xc62c, 0xc62d, 0xc62e, 0xc62f, 0xc630, 0xc631, 0xc632, 0xc633, /*0xe0-0xef*/
5169 0xc634, 0xc635, 0xc636, 0xc637, 0xc638, 0xc639, 0xc63a, 0xc63b, /*0xf0-0xff*/
5170 0xc63c, 0xc63d, 0xc63e, 0xc63f, 0xc640, 0xc641, 0xc642, 0xc643, /*0x00-0x07*/
5171 0xc644, 0xc645, 0xc646, 0xc647, 0xc648, 0xc649, 0xc64a, 0xc64b, /*0x08-0x0f*/
5172 0xc64c, 0xc64d, 0xc64e, 0xc64f, 0xc650, 0xc651, 0xc652, 0xc653, /*0x10-0x17*/
5173 0xc654, 0xc655, 0xc656, 0xc657, 0xc658, 0xc659, 0xc65a, 0xc65b, /*0x18-0x1f*/
5174 0xc65c, 0xc65d, 0xc65e, 0xc65f, 0xc660, 0xc661, 0xc662, 0xc663, /*0x20-0x27*/
5175 0xc664, 0xc665, 0xc666, 0xc667, 0xc668, 0xc669, 0xc66a, 0xc66b, /*0x28-0x2f*/
5176 0xc66c, 0xc66d, 0xc66e, 0xc66f, 0xc670, 0xc671, 0xc672, 0xc673, /*0x30-0x37*/
5177 0xc674, 0xc675, 0xc676, 0xc677, 0xc678, 0xc679, 0xc67a, 0xc67b, /*0x38-0x3f*/
5178 0xc67c, 0xc67d, 0xc67e, 0xc67f, 0xc680, 0xc681, 0xc682, 0xc683, /*0x40-0x47*/
5179 0xc684, 0xc685, 0xc686, 0xc687, 0xc688, 0xc689, 0xc68a, 0xc68b, /*0x48-0x4f*/
5180 0xc68c, 0xc68d, 0xc68e, 0xc68f, 0xc690, 0xc691, 0xc692, 0xc693, /*0x50-0x57*/
5181 0xc694, 0xc695, 0xc696, 0xc697, 0xc698, 0xc699, 0xc69a, 0xc69b, /*0x58-0x5f*/
5182 0xc69c, 0xc69d, 0xc69e, 0xc69f, 0xc700, 0xc701, 0xc702, 0xc703, /*0x60-0x67*/
5183 0xc704, 0xc705, 0xc706, 0xc707, 0xc708, 0xc709, 0xc70a, 0xc70b, /*0x68-0x6f*/
5184 0xc70c, 0xc70d, 0xc70e, 0xc70f, 0xc710, 0xc711, 0xc712, 0xc713, /*0x70-0x77*/
5185 0xc714, 0xc715, 0xc716, 0xc717, 0xc718, 0xc719, 0xc71a, 0xc71b, /*0x78-0x7f*/
5186 0xc71c, 0xc71d, 0xc71e, 0xc71f, 0xc720, 0xc721, 0xc722, 0xc723, /*0x80-0x8f*/
5187 0xc724, 0xc725, 0xc726, 0xc727, 0xc728, 0xc729, 0xc72a, 0xc72b, /*0x88-0x8f*/
5188 0xc72c, 0xc72d, 0xc72e, 0xc72f, 0xc730, 0xc731, 0xc732, 0xc733, /*0x90-0x97*/
5189 0xc734, 0xc735, 0xc736, 0xc737, 0xc738, 0xc739, 0xc73a, 0xc73b, /*0x98-0x9f*/
5190 0xc73c, 0xc73d, 0xc73e, 0xc73f, 0xc740, 0xc741, 0xc742, 0xc743, /*0xa0-0xaf*/
5191 0xc744, 0xc745, 0xc746, 0xc747, 0xc748, 0xc749, 0xc74a, 0xc74b, /*0xb0-0xbf*/
5192 0xc74c, 0xc74d, 0xc74e, 0xc74f, 0xc750, 0xc751, 0xc752, 0xc753, /*0xc0-0xcf*/
5193 0xc754, 0xc755, 0xc756, 0xc757, 0xc758, 0xc759, 0xc75a, 0xc75b, /*0xd0-0xdf*/
5194 0xc75c, 0xc75d, 0xc75e, 0xc75f, 0xc760, 0xc761, 0xc762, 0xc763, /*0xe0-0xef*/
5195 0xc764, 0xc765, 0xc766, 0xc767, 0xc768, 0xc769, 0xc76a, 0xc76b, /*0xf0-0xff*/
5196 0xc76c, 0xc76d, 0xc76e, 0xc76f, 0xc770, 0xc771, 0xc772, 0xc773, /*0x00-0x07*/
5197 0xc774, 0xc775, 0xc776, 0xc777, 0xc778, 0xc779, 0xc77a, 0xc77b, /*0x08-0x0f*/
5198 0xc77c, 0xc77d, 0xc77e, 0xc77f, 0xc780, 0xc781, 0xc782, 0xc783, /*0x10-0x17*/
5199 0xc784, 0xc785, 0xc786, 0xc787, 0xc788, 0xc789, 0xc78a, 0xc78b, /*0x18-0x1f*/
5200 0xc78c, 0xc78d, 0xc78e, 0xc78f, 0xc790, 0xc791, 0xc792, 0xc793, /*0x20-0x27*/
5201 0xc794, 0xc795, 0xc796, 0xc797, 0xc798, 0xc799, 0xc79a, 0xc79b, /*0x28-0x2f*/
5202 0xc79c, 0xc79d, 0xc79e, 0xc79f, 0xc800, 0xc801, 0xc802, 0xc803, /*0x30-0x37*/
5203 0xc804, 0xc805, 0xc806, 0xc807, 0xc808, 0xc809, 0xc80a, 0xc80b, /*0x38-0x3f*/
5204 0xc80c, 0xc80d, 0xc80e, 0xc80f, 0xc810, 0xc811, 0xc812, 0xc813, /*0x40-0x47*/
5205 0xc814, 0xc815, 0xc816, 0xc817, 0xc818, 0xc819, 0xc81a, 0xc81b, /*0x48-0x4f*/
5206 0xc81c, 0xc81d, 0xc81e, 0xc81f, 0xc820, 0xc821, 0xc822, 0xc823, /*0x50-0x57*/

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5207 0xddb5, 0xd3a8, 0xddba, 0xc782, 0xddbb, 0xc3a7, 0xc783, 0xc784, /*0xb8-0xbf*/
5208 0xddd2, 0xddbc, 0xc785, 0xc786, 0xc787, 0xddd1, 0xc788, 0xb9bd, /*0xc0-0xc7*/
5209 0xc789, 0xc78a, 0xbcd5, 0xc78b, 0xbefa, 0xc78c, 0xc78d, 0xbaca, /*0xc8-0xcf*/
5210 0xc78e, 0xc78f, 0xc790, 0xc791, 0xddca, 0xc792, 0xddc5, 0xc793, /*0xd0-0xd7*/
5211 0xddbf, 0xc794, 0xc795, 0xc796, 0xb2cb, 0xddc3, 0xc797, 0xddcb, /*0xd8-0xdf*/
5212 0xb2a4, 0xddd5, 0xc798, 0xc799, 0xc79a, 0xddbe, 0xc79b, 0xc79c, /*0xe0-0xef*/
5213 0xc79d, 0xc6d0, 0xddd0, 0xc79e, 0xc79f, 0xc7a0, 0xc840, 0xc841, /*0xe8-0xef*/
5214 0xddd4, 0xc1e2, 0xb7c6, 0xc842, 0xc843, 0xc844, 0xc845, 0xc846, /*0xf0-0xff*/
5215 0xddce, 0xddcf, 0xc847, 0xc848, 0xc849, 0xddc4, 0xc84a, 0xc84b, /*0xf8-0xff*/
5216 /* 0x8400 */
5217 0xc84c, 0xddbd, 0xc84d, 0xddcd, 0xccd1, 0xc84e, 0xddc9, 0xc84f, /*0x00-0x07*/
5218 0xc850, 0xc851, 0xc852, 0xddc2, 0xc3c8, 0xc6bc, 0xceae, 0xddcc, /*0x08-0x0f*/
5219 0xc853, 0xddc8, 0xc854, 0xc855, 0xc856, 0xc857, 0xc858, 0xc859, /*0x10-0x17*/
5220 0xddc1, 0xc85a, 0xc85b, 0xc85c, 0xddc6, 0xc2dc, 0xc85d, 0xc85e, /*0x18-0x1f*/
5221 0xc85f, 0xc860, 0xc861, 0xc862, 0xd3a9, 0xd3aa, 0xddd3, 0xcff4, /*0x20-0x2f*/
5222 0xc8f8, 0xc863, 0xc864, 0xc865, 0xc866, 0xc867, 0xc868, 0xc869, /*0x28-0x2f*/
5223 0xc86a, 0xddde, 0xc86b, 0xc86c, 0xc86d, 0xc86e, 0xc86f, 0xc870, /*0x30-0x37*/
5224 0xddc3, 0xc871, 0xc872, 0xc873, 0xddde, 0xc2e4, 0xc874, 0xc875, /*0x38-0x3f*/
5225 0xc876, 0xc877, 0xc878, 0xc879, 0xc87a, 0xc87b, 0xddde, 0xc87c, /*0x40-0x47*/
5226 0xc87d, 0xc87e, 0xc880, 0xc881, 0xc882, 0xc883, 0xc884, 0xc885, /*0x48-0x4f*/
5227 0xc886, 0xdddd, 0xc887, 0xc888, 0xc889, 0xc88a, 0xc88b, 0xd6f8, /*0x50-0x57*/
5228 0xc88c, 0xdddd, 0xdddd, 0xb8f0, 0xdddd, 0xc88d, 0xc88e, 0xc88f, /*0x58-0x5f*/
5229 0xc890, 0xc6cf, 0xc891, 0xb6ad, 0xc892, 0xc893, 0xc894, 0xc895, /*0x60-0x6f*/
5230 0xc896, 0xddde, 0xc897, 0xbaf9, 0xd4e1, 0xddde, 0xc898, 0xc899, /*0x68-0x6f*/
5231 0xc89a, 0xb4d0, 0xc89b, 0xddda, 0xc89c, 0xbfffb, 0xddde, 0xc89d, /*0x70-0x77*/
5232 0xdddf, 0xc89e, 0xdddd, 0xc89f, 0xc8a0, 0xc940, 0xc941, 0xc942, /*0x78-0x7f*/
5233 0xc943, 0xc944, 0xb5d9, 0xc945, 0xc946, 0xc947, 0xc948, 0xdddb, /*0x80-0x8f*/
5234 0xdddc, 0xddde, 0xc949, 0xbdaf, 0xddde, 0xc94a, 0xddde, 0xc94b, /*0x88-0x8f*/
5235 0xc94c, 0xc94d, 0xc94e, 0xc94f, 0xc950, 0xc951, 0xc952, 0xdddf, /*0x90-0x97*/
5236 0xc953, 0xc954, 0xc955, 0xc956, 0xc957, 0xc958, 0xc959, /*0x98-0x9f*/
5237 0xc95a, 0xc95b, 0xc95c, 0xc95d, 0xc95e, 0xc95f, /*0xa0-0xaf*/
5238 0xc960, 0xc961, 0xc962, 0xc963, 0xc964, 0xc965, 0xc966, 0xd8e1, /*0xa8-0xaf*/
5239 0xc967, 0xc968, 0xc969, 0xc96a, 0xc96b, 0xc96c, 0xc96d, /*0xb0-0xbf*/
5240 0xd5f4, 0xddf3, 0xddf0, 0xc96d, 0xc96e, 0xddde, 0xc96f, 0xddde, /*0xb8-0xbf*/
5241 0xc970, 0xddde, 0xc971, 0xc972, 0xd0ee, 0xc973, 0xc974, 0xc975, /*0xc0-0xc7*/
5242 0xc976, 0xc8d8, 0xddde, 0xc977, 0xc978, 0xddde, 0xc979, 0xc97a, /*0xc8-0xcf*/
5243 0xddde, 0xc97b, 0xddde, 0xc97c, 0xc97d, 0xb1cd, 0xc97e, /*0xd0-0xd7*/
5244 0xc980, 0xc981, 0xc982, 0xc983, 0xc984, 0xc0b6, 0xc985, 0xbcb, /*0xd8-0xdf*/
5245 0xddf1, 0xc986, 0xc987, 0xddf7, 0xc988, 0xdddf, 0xc989, /*0xe0-0xef*/
5246 0xc98a, 0xc98b, 0xc98c, 0xc98d, 0xc5ee, 0xc98e, 0xc98f, 0xc990, /*0xe8-0xef*/
5247 0xddfb, 0xc991, 0xc992, 0xc993, 0xc994, 0xc995, 0xc996, 0xc997, /*0xf0-0xff*/
5248 0xc998, 0xc999, 0xc99a, 0xc99b, 0xdea4, 0xc99c, 0xc99d, 0xdea3, /*0xf8-0xff*/
5249 /* 0x8500 */
5250 0xc99e, 0xc99f, 0xc9a0, 0xca40, 0xca41, 0xca42, 0xca43, 0xca44, /*0x00-0x07*/
5251 0xca45, 0xca46, 0xca47, 0xca48, 0xdddf, 0xca49, 0xca4a, 0xca4b, /*0x08-0x0f*/
5252 0xca4c, 0xc3ef, 0xca4d, 0xc2fb, 0xca4e, 0xca4f, 0xca50, 0xd5e1, /*0x10-0x17*/
5253 0xca51, 0xca52, 0xc9eb, 0xca53, 0xca54, 0xca55, 0xca56, 0xdddf, /*0x18-0x1f*/
5254 0xca57, 0xb2cc, 0xca58, 0xca59, 0xca5a, 0xca5b, 0xca5c, 0xca5d, /*0x20-0x2f*/
5255 0xca5e, 0xca5f, 0xca60, 0xc4e8, 0xcadf, 0xca61, 0xca62, 0xca63, /*0x28-0x2f*/
5256 0xca64, 0xca65, 0xca66, 0xca67, 0xca68, 0xca69, 0xca6a, 0xc7be, /*0x30-0x37*/
5257 0xddfa, 0xddfc, 0xdea2, 0xb0aa, 0xb1ce, 0xca6b, 0xca6c, /*0x38-0x3f*/
5258 0xca6d, 0xca6e, 0xca6f, 0xdea3, 0xca70, 0xca71, 0xca72, 0xca73, /*0x40-0x47*/
5259 0xdea6, 0xbdb6, 0xc8ef, 0xca74, 0xca75, 0xca76, 0xca77, 0xca78, /*0x48-0x4f*/
5260 0xca79, 0xca7a, 0xca7b, 0xca7c, 0xca7d, 0xca7e, 0xdea1, 0xca80, /*0x50-0x57*/
5261 0xca81, 0xdea5, 0xca82, 0xca83, 0xca84, 0xca85, 0xdea9, 0xca86, /*0x58-0x5f*/
5262 0xca87, 0xca88, 0xca89, 0xca8a, 0xdea8, 0xca8b, 0xca8c, 0xca8d, /*0x60-0x6f*/
5263 0xdea7, 0xca8e, 0xca8f, 0xca90, 0xca91, 0xca92, 0xca93, 0xca94, /*0x68-0x6f*/
5264 0xca95, 0xca96, 0xdead, 0xca97, 0xd4cc, 0xca98, 0xca99, 0xca9a, /*0x70-0x77*/
5265 0xca9b, 0xdeb3, 0xdea, 0xdea, 0xca9c, 0xca9d, 0xc0d9, 0xca9e, /*0x78-0x7f*/
5266 0xca9f, 0xc9a0, 0xc9a1, 0xc9a2, 0xc9a3, 0xc9a4, 0xc9a5, 0xc9a6, /*0x80-0x8f*/
5267 0xc9a7, 0xc9a8, 0xc9a9, 0xc9aa, 0xc9ab, 0xc9ac, 0xc9ad, 0xc9ae, /*0x88-0x8f*/
5268 0xc9af, 0xc9b0, 0xc9b1, 0xc9b2, 0xc9b3, 0xc9b4, 0xc9b5, 0xc9b6, /*0x90-0x97*/
5269 0xc9b7, 0xc9b8, 0xc9b9, 0xc9ba, 0xc9bb, 0xc9bc, 0xc9bd, 0xc9be, /*0x98-0x9f*/
5270 0xc9bf, 0xc9c0, 0xc9c1, 0xc9c2, 0xc9c3, 0xc9c4, 0xc9c5, 0xc9c6, /*0xa0-0xaf*/
5271 0xc9c7, 0xc9c8, 0xc9c9, 0xc9ca, 0xc9cb, 0xc9cc, 0xc9cd, 0xc9ce, /*0xa8-0xaf*/
5272 0xc9cf, 0xc9d0, 0xc9d1, 0xc9d2, 0xc9d3, 0xc9d4, 0xc9d5, 0xc9d6, /*0xb0-0xbf*/
5273 0xc9d7, 0xc9d8, 0xc9d9, 0xc9da, 0xc9db, 0xc9dc, 0xc9dd, 0xc9de, /*0xb8-0xbf*/
5274 0xc9df, 0xc9e0, 0xc9e1, 0xc9e2, 0xc9e3, 0xc9e4, 0xc9e5, 0xc9e6, /*0xc0-0xc7*/
5275 0xc9e7, 0xc9e8, 0xc9e9, 0xc9ea, 0xc9eb, 0xc9ec, 0xc9ed, 0xc9ee, /*0xc8-0xcf*/
5276 0xc9ef, 0xc9f0, 0xc9f1, 0xc9f2, 0xc9f3, 0xc9f4, 0xc9f5, 0xc9f6, /*0xd0-0xd7*/
5277 0xc9f7, 0xc9f8, 0xc9f9, 0xc9fa, 0xc9fb, 0xc9fc, 0xc9fd, 0xc9fe, /*0xd8-0xdf*/
5278 0xc9ff, 0xc9a0, 0xc9a1, 0xc9a2, 0xc9a3, 0xc9a4, 0xc9a5, 0xc9a6, /*0xe0-0xef*/
5279 0xc9a7, 0xc9a8, 0xc9a9, 0xc9aa, 0xc9ab, 0xc9ac, 0xc9ad, 0xc9ae, /*0xe8-0xef*/
5280 0xc9af, 0xc9b0, 0xc9b1, 0xc9b2, 0xc9b3, 0xc9b4, 0xc9b5, 0xc9b6, /*0xf0-0xff*/
5281 0xc9b7, 0xc9b8, 0xc9b9, 0xc9ba, 0xc9bb, 0xc9bc, 0xc9bd, 0xc9be, /*0xf8-0xff*/
5282 /* 0x8600 */
5283 0xc9bf, 0xc9c0, 0xc9c1, 0xc9c2, 0xc9c3, 0xc9c4, 0xc9c5, 0xc9c6, /*0x00-0x07*/
5284 0xc9c7, 0xc9c8, 0xc9c9, 0xc9ca, 0xc9cb, 0xc9cc, 0xc9cd, 0xc9ce, /*0x08-0x0f*/
5285 0xc9cf, 0xc9d0, 0xc9d1, 0xc9d2, 0xc9d3, 0xc9d4, 0xc9d5, 0xc9d6, /*0x10-0x17*/
5286 0xc9d7, 0xc9d8, 0xc9d9, 0xc9da, 0xc9db, 0xc9dc, 0xc9dd, 0xc9de, /*0x18-0x1f*/
5287 0xc9df, 0xc9e0, 0xc9e1, 0xc9e2, 0xc9e3, 0xc9e4, 0xc9e5, 0xc9e6, /*0x20-0x2f*/
5288 0xc9e7, 0xc9e8, 0xc9e9, 0xc9ea, 0xc9eb, 0xc9ec, 0xc9ed, 0xc9ee, /*0x28-0x2f*/
5289 0xc9ef, 0xc9f0, 0xc9f1, 0xc9f2, 0xc9f3, 0xc9f4, 0xc9f5, 0xc9f6, /*0x30-0x37*/
5290 0xc9f7, 0xc9f8, 0xc9f9, 0xc9fa, 0xc9fb, 0xc9fc, 0xc9fd, 0xc9fe, /*0x38-0x3f*/
5291 0xc9ff, 0xc9a0, 0xc9a1, 0xc9a2, 0xc9a3, 0xc9a4, 0xc9a5, 0xc9a6, /*0x40-0x4f*/
5292 0xc9a7, 0xc9a8, 0xc9a9, 0xc9aa, 0xc9ab, 0xc9ac, 0xc9ad, 0xc9ae, /*0x48-0x4f*/
5293 0xc9af, 0xc9b0, 0xc9b1, 0xc9b2, 0xc9b3, 0xc9b4, 0xc9b5, 0xc9b6, /*0x50-0x57*/
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5294 0xcc91, 0xcc92, 0xd0e9, 0xcc93, 0xcc94, 0xcc95, 0xd3dd, 0xcc96, /*0x58-0x5f*/
5295 0xcc97, 0xcc98, 0xebbd, 0xcc99, 0xcc9a, 0xcc9b, 0xcc9c, 0xcc9d, /*0x60-0x67*/
5296 0xcc9e, 0xcc9f, 0xcca0, 0xb3e6, 0xf2b0, 0xcd40, 0xf2b1, 0xcd41, /*0x68-0x6f*/
5297 0xcd42, 0xcaad, 0xcd43, 0xcd44, 0xcd45, 0xcd46, 0xcd47, 0xcd48, /*0x70-0x77*/
5298 0xcd49, 0xbae7, 0xf2b3, 0xf2b5, 0xf2b4, 0xcbe4, 0xcfa, 0xf2b2, /*0x78-0x7f*/
5299 0xcab4, 0xd2cf, 0xc2ec, 0xcd4a, 0xcd4b, 0xcd4c, 0xcd4d, 0xcd4e, /*0x80-0x87*/
5300 0xcd4f, 0xcd50, 0xccc3, 0xf2b8, 0xb0f6, 0xf2b7, 0xcd51, 0xcd52, /*0x88-0x8f*/
5301 0xcd53, 0xcd54, 0xcd55, 0xf2be, 0xcd56, 0xb2cf, 0xcd57, 0xcd58, /*0x90-0x97*/
5302 0xcd59, 0xcd5a, 0xcd5b, 0xcd5c, 0xd1c1, 0xf2ba, 0xcd5d, 0xcd5e, /*0x98-0x9f*/
5303 0xcd5f, 0xcd60, 0xcd61, 0xf2bc, 0xd4e9, 0xcd62, 0xcd63, 0xf2bb, /*0xa0-0xa7*/
5304 0xf2b6, 0xf2bf, 0xf2bd, 0xcd64, 0xf2b9, 0xcd65, 0xcd66, 0xf2c7, /*0xa8-0xaf*/
5305 0xf2c4, 0xf2c6, 0xcd67, 0xcd68, 0xf2ca, 0xf2c2, 0xf2c0, 0xcd69, /*0xb0-0xb7*/
5306 0xcd6a, 0xcd6b, 0xf2c5, 0xcd6c, 0xcd6d, 0xcd6e, 0xcd6f, 0xcd70, /*0xb8-0xbf*/
5307 0xd6fb, 0xcd71, 0xcd72, 0xcd73, 0xf2c1, 0xcd74, 0xc7f9, 0xc9df, /*0xc0-0xcf*/
5308 0xcd75, 0xf2c8, 0xb9c6, 0xb5b0, 0xcd76, 0xcd77, 0xf2c3, 0xf2c9, /*0xc8-0xcf*/
5309 0xf2d0, 0xf2d6, 0xcd78, 0xcd79, 0xbbd7, 0xcd7a, 0xcd7b, 0xcd7c, /*0xd0-0xd7*/
5310 0xf2d5, 0xcdde, 0xcd7d, 0xd6eb, 0xcd7e, 0xcd80, 0xf2d2, 0xf2d4, /*0xd8-0xdf*/
5311 0xcd81, 0xc0af, 0xf2ec, 0xcd83, 0xcd84, 0xb8f2, 0xcd85, 0xcd86, 0xcd87, /*0xe0-0xef*/
5312 0xcd88, 0xf2cb, 0xcd89, 0xcd8a, 0xcd8b, 0xf2ce, 0xc2f9, 0xcd8c, /*0xe8-0xef*/
5313 0xd5dd, 0xf2cc, 0xf2cd, 0xf2cf, 0xf2d3, 0xcd8d, 0xcd8e, 0xcd8f, /*0xf0-0xf7*/
5314 0xf2d9, 0xd3bc, 0xcd90, 0xcd91, 0xcd92, 0xcd93, 0xb6ea, 0xcd94, /*0xf8-0xff*/
5315 /* 0x8700 */
5316 0xcaf1, 0xcd95, 0xb7e4, 0xf2d7, 0xcd96, 0xcd97, 0xcd98, 0xf2d8, /*0x00-0x07*/
5317 0xf2da, 0xf2dd, 0xf2db, 0xcd99, 0xcd9a, 0xf2dc, 0xcd9b, 0xcd9c, /*0x08-0x0f*/
5318 0xcd9d, 0xcd9e, 0xd1d1, 0xf2d1, 0xcd9f, 0xcdc9, 0xcda0, 0xccc, /*0x10-0x17*/
5319 0xd6a9, 0xce40, 0xf2e3, 0xce41, 0xc3db, 0xce42, 0xf2e0, 0xce43, /*0x18-0x1f*/
5320 0xce44, 0xc0af, 0xf2ec, 0xf2de, 0xce45, 0xf2e1, 0xce46, 0xce47, /*0x20-0x27*/
5321 0xce48, 0xf2e8, 0xce49, 0xce4a, 0xce4b, 0xce4c, 0xf2e2, 0xce4d, /*0x28-0x2f*/
5322 0xce4e, 0xf2e7, 0xce4f, 0xce50, 0xf2e6, 0xce51, 0xce52, 0xf2e9, /*0x30-0x37*/
5323 0xce53, 0xce54, 0xce55, 0xf2df, 0xce56, 0xce57, 0xf2e4, 0xf2ea, /*0x38-0x3f*/
5324 0xce58, 0xce59, 0xce5a, 0xce5b, 0xce5c, 0xce5d, 0xce5e, 0xd3ac, /*0x40-0x47*/
5325 0xf2e5, 0xb2f5, 0xce5f, 0xce60, 0xf2f2, 0xce61, 0xd0ab, 0xce62, /*0x48-0x4f*/
5326 0xce63, 0xce64, 0xce65, 0xf2f5, 0xce66, 0xce67, 0xce68, 0xbbc8, /*0x50-0x57*/
5327 0xce69, 0xf2f9, 0xce6a, 0xce6b, 0xce6c, 0xce6d, 0xce6e, 0xce6f, /*0x58-0x5f*/
5328 0xf2f0, 0xce70, 0xce71, 0xf2f6, 0xf2f8, 0xf2fa, 0xce72, 0xce73, /*0x60-0x67*/
5329 0xce74, 0xce75, 0xce76, 0xce77, 0xce78, 0xce79, 0xf2f3, 0xce7a, /*0x68-0x6f*/
5330 0xf2f1, 0xce7b, 0xce7c, 0xce7d, 0xbafb, 0xce7e, 0xb5fb, 0xce80, /*0x70-0x77*/
5331 0xce81, 0xce82, 0xce83, 0xf2ef, 0xf2f7, 0xf2ed, 0xf2ee, 0xce84, /*0x78-0x7f*/
5332 0xce85, 0xce86, 0xf2eb, 0xf3a6, 0xce87, 0xf3a3, 0xce88, 0xce89, /*0x80-0x87*/
5333 0xf3a2, 0xce8a, 0xce8b, 0xf2f4, 0xce8c, 0xc8da, 0xce8d, 0xce8e, /*0x88-0x8f*/
5334 0xce8f, 0xce90, 0xce91, 0xf2fb, 0xce92, 0xce93, 0xce94, 0xf3a5, /*0x90-0x97*/
5335 0xce95, 0xce96, 0xce97, 0xce98, 0xce99, 0xce9a, 0xc3f8, 0xc3f9, /*0x98-0x9f*/
5336 0xce9c, 0xce9d, 0xce9e, 0xce9f, 0xc0a0, 0xcf40, 0xcf41, 0xcf42, /*0xa0-0xaf*/
5337 0xf2fd, 0xcf43, 0xcf44, 0xf3a7, 0xf3a9, 0xf3a4, 0xcf45, 0xf2fc, /*0xa8-0xaf*/
5338 0xcf46, 0xcf47, 0xcf48, 0xf3ab, 0xcf49, 0xf3aa, 0xcf4a, 0xcf4b, /*0xb0-0xbf*/
5339 0xcf4c, 0xcf4d, 0xc2dd, 0xcf4e, 0xcf4f, 0xf3ae, 0xcf50, 0xcf51, /*0xb8-0xbf*/
5340 0xf3b0, 0xcf52, 0xcf53, 0xcf54, 0xcf55, 0xcf56, 0xf3a1, 0xcf57, /*0xc0-0xcf*/
5341 0xcf58, 0xcf59, 0xf3b1, 0xf3ac, 0xcf5a, 0xcf5b, 0xcf5c, 0xcf5d, /*0xc8-0xcf*/
5342 0xcf5e, 0xf3af, 0xf2fe, 0xf3ad, 0xcf5f, 0xcf60, 0xcf61, 0xcf62, /*0xd0-0xdf*/
5343 0xcf63, 0xcf64, 0xcf65, 0xf3b2, 0xcf66, 0xcf67, 0xcf68, 0xcf69, /*0xd8-0xdf*/
5344 0xf3b4, 0xcf6a, 0xcf6b, 0xcf6c, 0xcf6d, 0xf3a8, 0xcf6e, 0xcf6f, /*0xe0-0xef*/
5345 0xcf70, 0xcf71, 0xf3b3, 0xcf72, 0xcf73, 0xcf74, 0xf3b5, 0xcf75, /*0xe8-0xef*/
5346 0xcf76, 0xcf77, 0xcf78, 0xcf79, 0xcf7a, 0xcf7b, 0xcf7c, 0xcf7d, /*0xf0-0xf7*/
5347 0xcf7e, 0xd0b7, 0xcf80, 0xcf81, 0xcf82, 0xcf83, 0xf3b8, 0xcf84, /*0xf8-0xff*/
5348 /* 0x8800 */
5349 0xcf85, 0xcf86, 0xcf87, 0xd9f9, 0xcf88, 0xcf89, 0xcf8a, 0xcf8b, /*0x00-0x07*/
5350 0xcf8c, 0xcf8d, 0xf3b9, 0xcf8e, 0xcf8f, 0xcf90, 0xcf91, 0xcf92, /*0x08-0x0f*/
5351 0xcf93, 0xcf94, 0xcf95, 0xf3b7, 0xcf96, 0xc8e4, 0xf3b6, 0xcf97, /*0x10-0x17*/
5352 0xcf98, 0xcf99, 0xcf9a, 0xf3ba, 0xcf9b, 0xcf9c, 0xcf9d, 0xcf9e, /*0x18-0x1f*/
5353 0xcf9f, 0xf3bb, 0xb4c0, 0xcfa0, 0xd041, 0xd042, 0xd043, 0xd044, /*0x20-0x27*/
5354 0xd044, 0xd045, 0xd046, 0xd047, 0xd048, 0xd049, 0xd04a, 0xd04b, /*0x28-0x2f*/
5355 0xd04c, 0xd04d, 0xccc3, 0xd04e, 0xd04f, 0xd050, 0xd051, 0xd052, /*0x30-0x37*/
5356 0xd053, 0xf3bc, 0xd054, 0xd055, 0xf3bd, 0xd056, 0xd057, 0xd058, /*0x38-0x3f*/
5357 0xd1aa, 0xd059, 0xd05a, 0xd05b, 0xf4ac, 0xd0c6, 0xd05c, 0xd05d, /*0x40-0x47*/
5358 0xd05e, 0xd05f, 0xd060, 0xd061, 0xd0d0, 0xd062, 0xd063, 0xd064, /*0x48-0x4f*/
5359 0xd06a, 0xd065, 0xd066, 0xd067, 0xcfc, 0xd068, 0xd069, 0xbdd6, /*0x50-0x57*/
5360 0xd06a, 0xd1c3, 0xd06b, 0xd06c, 0xd06d, 0xd06e, 0xd06f, 0xd070, /*0x58-0x5f*/
5361 0xd071, 0xbae2, 0xe1e9, 0xd2c2, 0xf1c2, 0xb2b9, 0xd072, 0xd073, /*0x60-0x67*/
5362 0xb1ed, 0xf1c3, 0xd074, 0xc9c0, 0xb3c4, 0xd075, 0xd9f2, 0xd076, /*0x68-0x6f*/
5363 0xcba5, 0xd077, 0xf1c4, 0xd078, 0xd079, 0xd07a, 0xd07b, 0xd6d4, /*0x70-0x77*/
5364 0xd07c, 0xd07d, 0xd07e, 0xd080, 0xd081, 0xf1c5, 0xf4c0, 0xf1c6, /*0x78-0x7f*/
5365 0xd082, 0xd4ac, 0xf1c7, 0xd083, 0xb0c0, 0xf4c1, 0xd084, 0xd085, /*0x80-0x87*/
5366 0xf4c2, 0xd086, 0xd087, 0xb4fc, 0xd088, 0xc5db, 0xd089, 0xd08a, /*0x88-0x8f*/
5367 0xd08b, 0xd08c, 0xc0bb, 0xd08d, 0xd08e, 0xd08f, 0xd0e4, 0xd090, /*0x90-0x97*/
5368 0xd091, 0xd092, 0xd093, 0xd094, 0xcde0, 0xd095, 0xd096, 0xd097, /*0x98-0x9f*/
5369 0xd098, 0xd099, 0xf1c8, 0xd09a, 0xd9f3, 0xd09b, 0xd09c, 0xd09d, /*0xa0-0xaf*/
5370 0xd09e, 0xd09f, 0xd0a0, 0xb1bb, 0xd140, 0xcfae, 0xd141, 0xd142, /*0xa8-0xaf*/
5371 0xd143, 0xb8a4, 0xd144, 0xd145, 0xd146, 0xd147, 0xd148, 0xf1ca, /*0xb0-0xbf*/
5372 0xd149, 0xd14a, 0xd14b, 0xd14c, 0xf1cb, 0xd14d, 0xd14e, 0xd14f, /*0xb8-0xbf*/
5373 0xd150, 0xb2c3, 0xc1d1, 0xd151, 0xd152, 0xd7b0, 0xf1c9, 0xd153, /*0xc0-0xcf*/
5374 0xd154, 0xf1cc, 0xd155, 0xd156, 0xd157, 0xd158, 0xf1ce, 0xd159, /*0xc8-0xcf*/
5375 0xd15a, 0xd15b, 0xd9f6, 0xd15c, 0xd2e1, 0xd4a3, 0xd15d, 0xd15e, /*0xd0-0xdf*/
5376 0xf4c3, 0xc8b9, 0xd15f, 0xd160, 0xd161, 0xd162, 0xd163, 0xf4c4, /*0xd8-0xdf*/
5377 0xd164, 0xd165, 0xf1cd, 0xf1cf, 0xbfe3, 0xf1d0, 0xd166, 0xd167, /*0xe0-0xef*/
5378 0xf1d4, 0xd168, 0xd169, 0xd16a, 0xd16b, 0xd16c, 0xd16d, 0xd16e, /*0xe8-0xef*/
5379 0xf1d6, 0xf1d1, 0xd16f, 0xc9d1, 0xc5e1, 0xd170, 0xd171, 0xd172, /*0xf0-0xf7*/
5380 0xc2e3, 0xb9fc, 0xd173, 0xd174, 0xf1d3, 0xd175, 0xf1d5, 0xd176, /*0xf8-0xff*/

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5381 /* 0x8900 */
5382 0xd177, 0xd178, 0xb9d3, 0xd179, 0xd17a, 0xd17b, 0xd17c, 0xd17d, /*0x00-0x07*/
5383 0xd17e, 0xd180, 0xf1db, 0xd181, 0xd182, 0xd183, 0xd184, 0xd185, /*0x08-0x0f*/
5384 0xbad6, 0xd186, 0xb0fd, 0xf1d9, 0xd187, 0xd188, 0xd189, 0xd18a, /*0x10-0x17*/
5385 0xd18b, 0xf1d8, 0xf1d2, 0xf1da, 0xd18c, 0xd18d, 0xd18e, 0xd18f, /*0x18-0x1f*/
5386 0xd190, 0xf1d7, 0xd191, 0xd192, 0xd193, 0xc8ec, 0xd194, 0xd195, /*0x20-0x27*/
5387 0xd196, 0xd197, 0xcdca, 0xf1dd, 0xd198, 0xd199, 0xd19a, 0xd19b, /*0x28-0x2f*/
5388 0xe5bd, 0xd19c, 0xd19d, 0xd19e, 0xf1dc, 0xd19f, 0xf1de, 0xd1a0, /*0x30-0x37*/
5389 0xd240, 0xd241, 0xd242, 0xd243, 0xd244, 0xd245, 0xd246, 0xd247, /*0x38-0x3f*/
5390 0xd248, 0xf1df, 0xd249, 0xd24a, 0xcfe5, 0xd24b, 0xd24c, 0xd24d, /*0x40-0x47*/
5391 0xd24e, 0xd24f, 0xd250, 0xd251, 0xd252, 0xd253, 0xd254, 0xd255, /*0x48-0x4f*/
5392 0xd256, 0xd257, 0xd258, 0xd259, 0xd25a, 0xd25b, 0xd25c, 0xd25d, /*0x50-0x57*/
5393 0xd25e, 0xd25f, 0xd260, 0xd261, 0xd262, 0xd263, 0xf4c5, 0xbdf3, /*0x58-0x5f*/
5394 0xd264, 0xd265, 0xd266, 0xd267, 0xd268, 0xd269, 0xf1e0, 0xd26a, /*0x60-0x67*/
5395 0xd26b, 0xd26c, 0xd26d, 0xd26e, 0xd26f, 0xd270, 0xd271, 0xd272, /*0x68-0x6f*/
5396 0xd273, 0xd274, 0xd275, 0xd276, 0xd277, 0xd278, 0xd279, 0xd27a, /*0x70-0x77*/
5397 0xd27b, 0xd27c, 0xd27d, 0xf1e1, 0xd27e, 0xd280, 0xd281, 0xcef7, /*0x78-0x7f*/
5398 0xd282, 0xd2aa, 0xd283, 0xf1fb, 0xd284, 0xd285, 0xb8b2, 0xd286, /*0x80-0x87*/
5399 0xd287, 0xd288, 0xd289, 0xd28a, 0xd28b, 0xd28c, 0xd28d, 0xd28e, /*0x88-0x8f*/
5400 0xd28f, 0xd290, 0xd291, 0xd292, 0xd293, 0xd294, 0xd295, 0xd296, /*0x90-0x97*/
5401 0xd297, 0xd298, 0xd299, 0xd29a, 0xd29b, 0xd29c, 0xd29d, 0xd29e, /*0x98-0x9f*/
5402 0xd29f, 0xd2a0, 0xd340, 0xd341, 0xd342, 0xd343, 0xd344, 0xd345, /*0xa0-0xa7*/
5403 0xd346, 0xd347, 0xd348, 0xd349, 0xd34a, 0xd34b, 0xd34c, 0xd34d, /*0xa8-0xaf*/
5404 0xd34e, 0xd34f, 0xd350, 0xd351, 0xd352, 0xd353, 0xd354, 0xd355, /*0xb0-0xbf*/
5405 0xd356, 0xd357, 0xd358, 0xd359, 0xd35a, 0xd35b, 0xd35c, 0xd35d, /*0xb8-0xbf*/
5406 0xd35e, 0xbcbf, 0xb9db, 0xd35f, 0xb9e6, 0xc3d9, 0xcad3, 0xaeae, /*0xc0-0xc7*/
5407 0xc0c0, 0xbef5, 0xaeae, 0xaeae, 0xaeae, 0xaeae, 0xaeae, 0xaeae, /*0xc8-0xcf*/
5408 0xaeae, 0xaeaf, 0xbdc7, 0xd361, 0xd362, 0xd363, 0xf5fb, 0xd364, /*0xd0-0xd7*/
5409 0xd365, 0xd366, 0xf5fd, 0xd367, 0xf5fe, 0xd368, 0xf5fc, 0xd369, /*0xd8-0xdf*/
5410 0xd36a, 0xd36b, 0xd36c, 0xbde2, 0xd36d, 0xf6a1, 0xd36a5, 0xd36e, /*0xe0-0xef*/
5411 0xd36f, 0xd370, 0xd371, 0xf6a2, 0xd372, 0xd373, 0xd374, 0xf6a3, /*0xe8-0xef*/
5412 0xd375, 0xd376, 0xd377, 0xecb2, 0xd378, 0xd379, 0xd37a, 0xd37b, /*0xf0-0xff*/
5413 0xd37c, 0xd37d, 0xd37e, 0xd380, 0xd381, 0xd382, 0xd383, 0xd384, /*0xf8-0xff*/
5414 /* 0x8a00 */
5415 0xd1d4, 0xd385, 0xd386, 0xd387, 0xd388, 0xd389, 0xd38a, 0xd9ea, /*0x00-0x07*/
5416 0xd38b, 0xd38c, 0xd38d, 0xd38e, 0xd38f, 0xd390, 0xd391, 0xd392, /*0x08-0x0f*/
5417 0xd393, 0xd394, 0xd395, 0xd396, 0xd397, 0xd398, 0xd399, 0xd39a, /*0x10-0x17*/
5418 0xd39b, 0xd39c, 0xd39d, 0xd39e, 0xd39f, 0xd3a0, 0xd440, 0xd441, /*0x18-0x1f*/
5419 0xd442, 0xd443, 0xd444, 0xd445, 0xd446, 0xd447, 0xd448, 0xd449, /*0x20-0x27*/
5420 0xd44a, 0xd44b, 0xd44c, 0xd44d, 0xd44e, 0xd44f, 0xd450, 0xd451, /*0x28-0x2f*/
5421 0xd452, 0xd453, 0xd454, 0xd455, 0xd456, 0xd457, 0xd458, 0xd459, /*0x30-0x37*/
5422 0xd45a, 0xd45b, 0xd45c, 0xd45d, 0xd45e, 0xd45f, 0xf6a4, 0xd460, /*0x38-0x3f*/
5423 0xd461, 0xd462, 0xd463, 0xd464, 0xd465, 0xd466, 0xd467, 0xd468, /*0x40-0x47*/
5424 0xeeba, 0xd469, 0xd46a, 0xd46b, 0xd46c, 0xd46d, 0xd46e, 0xd46f, /*0x48-0x4f*/
5425 0xd470, 0xd471, 0xd472, 0xd473, 0xd474, 0xd475, 0xd476, 0xd477, /*0x50-0x57*/
5426 0xd478, 0xd479, 0xd47a, 0xd47b, 0xd47c, 0xd47d, 0xd47e, 0xd480, /*0x58-0x5f*/
5427 0xd481, 0xd482, 0xd483, 0xd484, 0xd485, 0xd486, 0xd487, 0xd488, /*0x60-0x67*/
5428 0xd489, 0xd48a, 0xd48b, 0xd48c, 0xd48d, 0xd48e, 0xd48f, 0xd490, /*0x68-0x6f*/
5429 0xd491, 0xd492, 0xd493, 0xd494, 0xd495, 0xd496, 0xd497, 0xd498, /*0x70-0x77*/
5430 0xd499, 0xd5b2, 0xd49a, 0xd49b, 0xd49c, 0xd49d, 0xd49e, 0xd49f, /*0x78-0x7f*/
5431 0xd4a0, 0xd540, 0xd541, 0xd542, 0xd543, 0xd544, 0xd545, 0xd546, /*0x80-0x87*/
5432 0xd547, 0xd3fe, 0xccdc, 0xd548, 0xd549, 0xd54a, 0xd54b, 0xd54c, /*0x88-0x8f*/
5433 0xd54d, 0xd54e, 0xd54f, 0xcac4, 0xd550, 0xd551, 0xd552, 0xd553, /*0x90-0x97*/
5434 0xd554, 0xd555, 0xd556, 0xd557, 0xd558, 0xd559, 0xd55a, 0xd55b, /*0x98-0x9f*/
5435 0xd55c, 0xd55d, 0xd55e, 0xd55f, 0xd560, 0xd561, 0xd562, 0xd563, /*0xa0-0xaf*/
5436 0xd564, 0xd565, 0xd566, 0xd567, 0xd568, 0xd569, 0xd56a, 0xd56b, /*0xab-0xaf*/
5437 0xd56c, 0xd56d, 0xd56e, 0xd56f, 0xd570, 0xd571, 0xd572, 0xd573, /*0xb0-0xbf*/
5438 0xd574, 0xd575, 0xd576, 0xd577, 0xd578, 0xd579, 0xd57a, 0xd57b, /*0xb8-0xbf*/
5439 0xd57c, 0xd57d, 0xd57e, 0xd580, 0xd581, 0xd582, 0xd583, 0xd584, /*0xc0-0xc7*/
5440 0xd585, 0xd586, 0xd587, 0xd588, 0xd589, 0xd58a, 0xd58b, 0xd58c, /*0xc8-0xcf*/
5441 0xd58d, 0xd58e, 0xd58f, 0xd590, 0xd591, 0xd592, 0xd593, 0xd594, /*0xd0-0xdf*/
5442 0xd595, 0xd596, 0xd597, 0xd598, 0xd599, 0xd59a, 0xd59b, 0xd59c, /*0xe0-0xef*/
5443 0xd59d, 0xd59e, 0xd59f, 0xd5a0, 0xd640, 0xd641, 0xd642, 0xd643, /*0xe8-0xef*/
5444 0xd644, 0xd645, 0xd646, 0xd647, 0xd648, 0xd649, 0xd64a, 0xd64b, /*0xf0-0xff*/
5445 0xd64c, 0xd64d, 0xd64e, 0xd64f, 0xd650, 0xd651, 0xd652, 0xd653, /*0xf8-0xff*/
5446 0xd654, 0xd655, 0xd656, 0xd657, 0xd658, 0xd659, 0xd65a, 0xd65b, /*0xf8-0xff*/
5447 /* 0x8b00 */
5448 0xd65c, 0xd65d, 0xd65e, 0xd65f, 0xd660, 0xd661, 0xd662, 0xe5c0, /*0x00-0x07*/
5449 0xd663, 0xd664, 0xd665, 0xd666, 0xd667, 0xd668, 0xd669, 0xd66a, /*0x08-0x0f*/
5450 0xd66b, 0xd66c, 0xd66d, 0xd66e, 0xd66f, 0xd670, 0xd671, 0xd672, /*0x10-0x17*/
5451 0xd673, 0xd674, 0xd675, 0xd676, 0xd677, 0xd678, 0xd679, 0xd67a, /*0x18-0x1f*/
5452 0xd67b, 0xd67c, 0xd67d, 0xd67e, 0xd680, 0xd681, 0xf6a5, 0xd682, /*0x20-0x27*/
5453 0xd683, 0xd684, 0xd685, 0xd686, 0xd687, 0xd688, 0xd689, 0xd68a, /*0x28-0x2f*/
5454 0xd68b, 0xd68c, 0xd68d, 0xd68e, 0xd68f, 0xd690, 0xd691, 0xd692, /*0x30-0x37*/
5455 0xd693, 0xd694, 0xd695, 0xd696, 0xd697, 0xd698, 0xd699, 0xd69a, /*0x38-0x3f*/
5456 0xd69b, 0xd69c, 0xd69d, 0xd69e, 0xd69f, 0xd6a0, 0xd740, 0xd741, /*0x40-0x47*/
5457 0xd742, 0xd743, 0xd744, 0xd745, 0xd746, 0xd747, 0xd748, 0xd749, /*0x48-0x4f*/
5458 0xd74a, 0xd74b, 0xd74c, 0xd74d, 0xd74e, 0xd74f, 0xd750, 0xd751, /*0x50-0x57*/
5459 0xd752, 0xd753, 0xd754, 0xd755, 0xd756, 0xd757, 0xd758, 0xd759, /*0x58-0x5f*/
5460 0xd75a, 0xd75b, 0xd75c, 0xd75d, 0xd75e, 0xd75f, 0xbcaf, 0xd760, /*0x60-0x6f*/
5461 0xd761, 0xd762, 0xd763, 0xd764, 0xc6a9, 0xd765, 0xd766, 0xd767, /*0x68-0x6f*/
5462 0xd768, 0xd769, 0xd76a, 0xd76b, 0xd76c, 0xd76d, 0xd76e, 0xd76f, /*0x70-0x77*/
5463 0xd770, 0xd771, 0xd772, 0xd773, 0xd774, 0xd775, 0xd776, 0xd777, /*0x78-0x7f*/
5464 0xd778, 0xd779, 0xd77a, 0xd77b, 0xd77c, 0xd77d, 0xd77e, 0xd780, /*0x80-0x87*/
5465 0xd781, 0xd782, 0xd783, 0xd784, 0xd785, 0xd786, 0xd787, 0xd788, /*0x88-0x8f*/
5466 0xd789, 0xd78a, 0xd78b, 0xd78c, 0xd78d, 0xd78e, 0xd78f, 0xd790, /*0x90-0x97*/
5467 0xd791, 0xd792, 0xd793, 0xd794, 0xd795, 0xd796, 0xd797, 0xd798, /*0x98-0x9f*/
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5468 0xdaa5, 0xbcc6, 0xb6a9, 0xb8bc, 0xc8cf, 0xbca5, 0xdaa6, 0xdaa7, /*0xa0-0xa7*/
5469 0xccd6, 0xc8c3, 0xdaa8, 0xc6fd, 0xd799, 0xd1b5, 0xd2e9, 0xd1b6, /*0xa8-0xaf*/
5470 0xbcc7, 0xd79a, 0xbdb2, 0xbbe4, 0xdaa9, 0xdaaa, 0xd1c8, 0xdaab, /*0xb0-0xbf*/
5471 0xd0ed, 0xb6ef, 0xc2db, 0xd79b, 0xcbcf, 0xb7ed, 0xc9e8, 0xb7c3, /*0xb8-0xbf*/
5472 0xbef7, 0xd6a4, 0xdaac, 0xdaad, 0xc6c0, 0xd7e7, 0xcab6, 0xd79c, /*0xc0-0xcf*/
5473 0xd5a9, 0xcdbf, 0xd5ef, 0xdaae, 0xd6df, 0xb4ca, 0xdab0, 0xdaaf, /*0xc8-0xcf*/
5474 0xd79d, 0xd2eb, 0xdab1, 0xdab2, 0xdab3, 0xcad4, 0xdab4, 0xcaab, /*0xd0-0xd7*/
5475 0xdab5, 0xdab6, 0xb3cf, 0xd6ef, 0xdab7, 0xbbb0, 0xb5ae, 0xdab8, /*0xd8-0xdf*/
5476 0xdab9, 0xb9ee, 0xd1af, 0xd2e8, 0xdaba, 0xb8c3, 0xcfea, 0xb2ef, /*0xe0-0xef*/
5477 0xdabb, 0xdabc, 0xd79e, 0xbdeb, 0xcdec, 0xd3ef, 0xdabd, 0xcef3, /*0xe8-0xef*/
5478 0xdabe, 0xd3d5, 0xbbe5, 0xdabf, 0xcbb5, 0xcbd0, 0xdac0, 0xc7eb, /*0xf0-0xff*/
5479 0xd6ee, 0xdac1, 0xc5b5, 0xb6c1, 0xdac2, 0xb7cc, 0xbfce, 0xdac3, /*0xf8-0xff*/
5480 /* 0x8c00 */
5481 0xdac4, 0xcbad, 0xdac5, 0xb5f7, 0xdac6, 0xc1c2, 0xd7bb, 0xdac7, /*0x00-0x07*/
5482 0xccb8, 0xd79f, 0xd2ea, 0xc4b1, 0xdac8, 0xb5fd, 0xbbd1, 0xdac9, /*0x08-0x0f*/
5483 0xd0b3, 0xdaca, 0xdacb, 0xcebd, 0xdacc, 0xdacd, 0xdace, 0xb2f7, /*0x10-0x17*/
5484 0xdad1, 0xdacf, 0xd1e8, 0xdad0, 0xc3d5, 0xdad2, 0xd7a0, 0xdad3, /*0x18-0x1f*/
5485 0xdad4, 0xdad5, 0xd0bb, 0xd2a5, 0xb0f9, 0xdad6, 0xc7ab, 0xdad7, /*0x20-0x27*/
5486 0xbdf7, 0xc3a1, 0xdad8, 0xdad9, 0xc3fd, 0xccb7, 0xdada, 0xdadb, /*0x28-0x2f*/
5487 0xc0be, 0xc6d7, 0xdadc, 0xdadd, 0xc7b4, 0xdade, 0xdadf, 0xb9c8, /*0x30-0x37*/
5488 0xd840, 0xd841, 0xd842, 0xd843, 0xd844, 0xd845, 0xd846, 0xd847, /*0x38-0x3f*/
5489 0xd848, 0xbbed, 0xd849, 0xd84a, 0xd84b, 0xd84c, 0xb6b9, 0xf4f8, /*0x40-0x47*/
5490 0xd84d, 0xf4f9, 0xd84e, 0xd84f, 0xcde3, 0xd850, 0xd851, 0xd852, /*0x48-0x4f*/
5491 0xd853, 0xd854, 0xd855, 0xd856, 0xd857, 0xf5b9, 0xd858, 0xd859, /*0x50-0x57*/
5492 0xd85a, 0xd85b, 0xebe0, 0xd85c, 0xd85d, 0xd85e, 0xd85f, 0xd860, /*0x58-0x5f*/
5493 0xd861, 0xcff3, 0xbbbf, 0xd862, 0xd863, 0xd864, 0xd865, 0xd866, /*0x60-0x67*/
5494 0xd867, 0xd868, 0xbac0, 0xd4a5, 0xd869, 0xd86a, 0xd86b, 0xd86c, /*0x68-0x6f*/
5495 0xd86d, 0xd86e, 0xd86f, 0xe1d9, 0xd870, 0xd871, 0xd872, 0xd873, /*0x70-0x77*/
5496 0xf5f4, 0xb1aa, 0xb2f2, 0xd874, 0xd875, 0xd876, 0xd877, 0xd878, /*0x78-0x7f*/
5497 0xd879, 0xd87a, 0xf5f5, 0xd87b, 0xd87c, 0xf5f7, 0xd87d, 0xd87e, /*0x80-0x87*/
5498 0xd880, 0xbad1, 0xf5f6, 0xd881, 0xc3b2, 0xd882, 0xd883, 0xd884, /*0x88-0x8f*/
5499 0xd885, 0xd886, 0xd887, 0xd888, 0xf5f9, 0xd889, 0xd88a, 0xd88b, /*0x90-0x97*/
5500 0xf5f8, 0xd88c, 0xd88d, 0xd88e, 0xd88f, 0xd890, 0xd891, 0xd892, /*0x98-0x9f*/
5501 0xd893, 0xd894, 0xd895, 0xd896, 0xd897, 0xd898, 0xd899, 0xd89a, /*0xa0-0xa7*/
5502 0xd89b, 0xd89c, 0xd89d, 0xd89e, 0xd89f, 0xd8a0, 0xd940, 0xd941, /*0xa8-0xaf*/
5503 0xd942, 0xd943, 0xd944, 0xd945, 0xd946, 0xd947, 0xd948, 0xd949, /*0xb0-0xbf*/
5504 0xd94a, 0xd94b, 0xd94c, 0xd94d, 0xd94e, 0xd94f, 0xd950, 0xd951, /*0xb8-0xbf*/
5505 0xd952, 0xd953, 0xd954, 0xd955, 0xd956, 0xd957, 0xd958, 0xd959, /*0xc0-0xcf*/
5506 0xd95a, 0xd95b, 0xd95c, 0xd95d, 0xd95e, 0xd95f, 0xd960, 0xd961, /*0xc8-0xcf*/
5507 0xd962, 0xd963, 0xd964, 0xd965, 0xd966, 0xd967, 0xd968, 0xd969, /*0xd0-0xdf*/
5508 0xd96a, 0xd96b, 0xd96c, 0xd96d, 0xd96e, 0xd96f, 0xd970, 0xd971, /*0xd8-0xdf*/
5509 0xd972, 0xd973, 0xd974, 0xd975, 0xd976, 0xd977, 0xd978, 0xd979, /*0xe0-0xef*/
5510 0xd97a, 0xd97b, 0xd97c, 0xd97d, 0xd97e, 0xd980, 0xd981, 0xd982, /*0xe8-0xef*/
5511 0xd983, 0xd984, 0xd985, 0xd986, 0xd987, 0xd988, 0xd989, 0xd98a, /*0xf0-0xff*/
5512 0xd98b, 0xd98c, 0xd98d, 0xd98e, 0xd98f, 0xd990, 0xd991, 0xd992, /*0xf8-0xff*/
5513 /* 0x8d00 */
5514 0xd993, 0xd994, 0xd995, 0xd996, 0xd997, 0xd998, 0xd999, 0xd99a, /*0x00-0x07*/
5515 0xd99b, 0xd99c, 0xd99d, 0xd99e, 0xd99f, 0xda00, 0xda40, 0xda41, /*0x08-0x0f*/
5516 0xda42, 0xda43, 0xda44, 0xda45, 0xda46, 0xda47, 0xda48, 0xda49, /*0x10-0x17*/
5517 0xda4a, 0xda4b, 0xda4c, 0xda4d, 0xda4e, 0xb1b4, 0xd5ea, 0xb8ba, /*0x18-0x1f*/
5518 0xda4f, 0xb9b1, 0xb2c6, 0xd4f0, 0xcfcf, 0xb0dc, 0xd5cb, 0xbbf5, /*0x20-0x27*/
5519 0xd6ca, 0xb7b7, 0xccb0, 0xc6b6, 0xb1e1, 0xb9ba, 0xd6fc, 0xb9e1, /*0x28-0x2f*/
5520 0xb7a1, 0xbcf, 0xeada, 0xeadd, 0xcff9, 0xb9f3, 0xeadc, 0xb4fb, /*0x30-0x37*/
5521 0xc3b3, 0xb7d1, 0xbad8, 0xeadd, 0xd4f4, 0xeade, 0xbcd6, 0xbddf, /*0x38-0x3f*/
5522 0xeadf, 0xc1de, 0xc2b8, 0xd4df, 0xd7ca, 0xae0, 0xae1, 0xae4, /*0x40-0x47*/
5523 0xae5, 0xae6, 0xc9de, 0xb8b3, 0xb6c4, 0xae5, 0xcaea, 0xc9cd, /*0x48-0x4f*/
5524 0xb4cd, 0xda50, 0xda51, 0xe2d9, 0xc5e2, 0xae6, 0xc0b5, 0xda52, /*0x50-0x57*/
5525 0xd7b8, 0xae7, 0xd7ac, 0xc8fc, 0xd8d3, 0xd8cd, 0xd4de, 0xda53, /*0x58-0x5f*/
5526 0xd4f9, 0xc9c4, 0xd3ae, 0xb8d3, 0xb3e0, 0xda54, 0xc9e2, 0xf4f6, /*0x60-0x67*/
5527 0xda55, 0xda56, 0xda57, 0xbad5, 0xda58, 0xf4f7, 0xda59, 0xda5a, /*0x68-0x6f*/
5528 0xd7df, 0xda5b, 0xda5c, 0xf4f1, 0xb8b0, 0xd5d4, 0xb8cf, 0xc6f0, /*0x70-0x77*/
5529 0xda5d, 0xda5e, 0xda5f, 0xda60, 0xda61, 0xda62, 0xda63, 0xda64, /*0x78-0x7f*/
5530 0xda65, 0xb3c3, 0xda66, 0xda67, 0xf4f2, 0xb3ac, 0xda68, 0xda69, /*0x80-0x87*/
5531 0xda6a, 0xda6b, 0xd4bd, 0xc7f7, 0xda6c, 0xda6d, 0xda6e, 0xda6f, /*0x88-0x8f*/
5532 0xda70, 0xf4f4, 0xda71, 0xda72, 0xf4f3, 0xda73, 0xda74, 0xda75, /*0x90-0x97*/
5533 0xda76, 0xda77, 0xda78, 0xda79, 0xda7a, 0xda7b, 0xda7c, 0xcccb, /*0x98-0x9f*/
5534 0xda7d, 0xda7e, 0xda80, 0xc8a4, 0xda81, 0xda82, 0xda83, 0xda84, /*0xa0-0xaf*/
5535 0xda85, 0xda86, 0xda87, 0xda88, 0xda89, 0xda8a, 0xda8b, 0xda8c, /*0xa8-0xaf*/
5536 0xda8d, 0xf4f5, 0xda8e, 0xd7e3, 0xc5bf, 0xf5c0, 0xda8f, 0xda90, /*0xb0-0xbf*/
5537 0xf5bb, 0xda91, 0xf5c3, 0xda92, 0xf5c2, 0xda93, 0xd6ba, 0xf5c1, /*0xb8-0xbf*/
5538 0xda94, 0xda95, 0xda96, 0xd4be, 0xf5c4, 0xda97, 0xf5cc, 0xda98, /*0xc0-0xcf*/
5539 0xda99, 0xda9a, 0xda9b, 0xb0cf, 0xb5f8, 0xda9c, 0xf5c9, 0xf5ca, /*0xc8-0xcf*/
5540 0xda9d, 0xc5dc, 0xda9e, 0xda9f, 0xdaa0, 0xdb40, 0xf5c5, 0xf5c6, /*0xd0-0xdf*/
5541 0xdb41, 0xdb42, 0xf5c7, 0xf5cb, 0xdb43, 0xbbee, 0xf5c8, 0xb8fa, /*0xd8-0xdf*/
5542 0xdb44, 0xdb45, 0xdb46, 0xf5d0, 0xf5d3, 0xdb47, 0xdb48, 0xdb49, /*0xe0-0xef*/
5543 0xbfe7, 0xdb4a, 0xb9f2, 0xf5bc, 0xf5cd, 0xdb4b, 0xdb4c, 0xc2b7, /*0xe8-0xef*/
5544 0xdb4d, 0xdb4e, 0xdb4f, 0xcff8, 0xdb50, 0xbcf9, 0xdb51, 0xf5ce, /*0xf0-0xff*/
5545 0xf5cf, 0xf5d1, 0xb6e5, 0xf5d2, 0xdb52, 0xf5d5, 0xdb53, 0xdb54, /*0xf8-0xff*/
5546 /* 0xe000 */
5547 0xdb55, 0xdb56, 0xdb57, 0xdb58, 0xdb59, 0xf5bd, 0xdb5a, 0xdb5b, /*0x00-0x07*/
5548 0xdb5c, 0xf5d4, 0xdb5d, 0xdb5e, 0xb3ec, 0xdb5e, 0xdb5f, 0xcaca, /*0x08-0x0f*/
5549 0xdb60, 0xdb61, 0xdb62, 0xdb63, 0xf5d6, 0xdb64, 0xdb65, 0xdb66, /*0x10-0x17*/
5550 0xdb67, 0xdb68, 0xdb69, 0xdb6a, 0xdb6b, 0xf5d7, 0xbbee, 0xf5d8, /*0x18-0x1f*/
5551 0xdb6c, 0xdb6d, 0xcddf, 0xf5db, 0xdb6e, 0xdb6f, 0xdb70, 0xdb71, /*0x20-0x27*/
5552 0xdb72, 0xb2c8, 0xd7d9, 0xdb73, 0xf5d9, 0xdb74, 0xf5da, 0xf5dc, /*0x28-0x2f*/
5553 0xdb75, 0xf5e2, 0xdb76, 0xdb77, 0xdb78, 0xf5e0, 0xdb79, 0xdb7a, /*0x30-0x37*/
5554 0xdb7b, 0xf5df, 0xf5dd, 0xdb7c, 0xdb7d, 0xf5e1, 0xdb7e, 0xdb80, /*0x38-0x3f*/

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5555 0xf5de, 0xf5e4, 0xf5e5, 0xdb81, 0xcc3, 0xdb82, 0xdb83, 0xe5bf, /*0x40-0x47*/
5556 0xb5b8, 0xf5e3, 0xf5e8, 0xca3, 0xdb84, 0xdb85, 0xdb86, 0xdb87, /*0x48-0x4f*/
5557 0xdb88, 0xf5e6, 0xf5e7, 0xdb89, 0xdb8a, 0xdb8b, 0xdb8c, 0xdb8d, /*0x50-0x57*/
5558 0xdb8e, 0xf5be, 0xdb8f, 0xdb90, 0xdb91, 0xdb92, 0xdb93, 0xdb94, /*0x58-0x5f*/
5559 0xdb95, 0xdb96, 0xdb97, 0xdb98, 0xdb99, 0xdb9a, 0xb1c4, 0xdb9b, /*0x60-0x67*/
5560 0xdb9c, 0xf5bf, 0xdb9d, 0xdb9e, 0xb5c5, 0xb2e4, 0xdb9f, 0xf5ec, /*0x68-0x6f*/
5561 0xf5e9, 0xdba0, 0xb6d7, 0xdc40, 0xf5ed, 0xdc41, 0xf5ea, 0xdc42, /*0x70-0x77*/
5562 0xdc43, 0xdc44, 0xdc45, 0xdc46, 0xf5eb, 0xdc47, 0xdc48, 0xb4da, /*0x78-0x7f*/
5563 0xdc49, 0xd4ea, 0xdc4a, 0xdc4b, 0xdc4c, 0xf5ee, 0xdc4d, 0xb3f9, /*0x80-0x87*/
5564 0xdc4e, 0xdc4f, 0xdc50, 0xdc51, 0xdc52, 0xdc53, 0xdc54, 0xf5ef, /*0x88-0x8f*/
5565 0xf5f1, 0xdc55, 0xdc56, 0xdc57, 0xf5f0, 0xdc58, 0xdc59, 0xdc5a, /*0x90-0x97*/
5566 0xdc5b, 0xdc5c, 0xdc5d, 0xdc5e, 0xf5f2, 0xdc5f, 0xf5f3, 0xdc60, /*0x98-0x9f*/
5567 0xdc61, 0xdc62, 0xdc63, 0xdc64, 0xdc65, 0xdc66, 0xdc67, 0xdc68, /*0xa0-0xa7*/
5568 0xdc69, 0xdc6a, 0xdc6b, 0xc9ed, 0xb9aa, 0xdc6c, 0xdc6d, 0xc7fb, /*0xa8-0xaf*/
5569 0xdc6e, 0xdc6f, 0xb6e3, 0xdc70, 0xdc71, 0xdc72, 0xdc73, 0xdc74, /*0xb0-0xbf*/
5570 0xdc75, 0xdc76, 0xcc9, 0xdc77, 0xdc78, 0xdc79, 0xdc7a, 0xdc7b, /*0xb8-0xbf*/
5571 0xdc7c, 0xdc7d, 0xdc7e, 0xdc80, 0xdc81, 0xdc82, 0xdc83, 0xdc84, /*0xc0-0xc7*/
5572 0xdc85, 0xdc86, 0xdc87, 0xdc88, 0xdc89, 0xdc8a, 0xea6, 0xdc8b, /*0xc8-0xcf*/
5573 0xdc8c, 0xdc8d, 0xdc8e, 0xdc8f, 0xdc90, 0xdc91, 0xdc92, 0xdc93, /*0xd0-0xd7*/
5574 0xdc94, 0xdc95, 0xdc96, 0xdc97, 0xdc98, 0xdc99, 0xdc9a, 0xdc9b, /*0xd8-0xdf*/
5575 0xdc9c, 0xdc9d, 0xdc9e, 0xdc9f, 0xdca0, 0xdd41, 0xdd42, /*0xe0-0xe7*/
5576 0xdd43, 0xdd44, 0xdd45, 0xdd46, 0xdd47, 0xdd48, 0xdd49, 0xdd4a, /*0xe8-0xef*/
5577 0xdd4b, 0xdd4c, 0xdd4d, 0xdd4e, 0xdd4f, 0xdd50, 0xdd51, 0xdd52, /*0xf0-0xf7*/
5578 0xdd53, 0xdd54, 0xdd55, 0xdd56, 0xdd57, 0xdd58, 0xdd59, 0xdd5a, /*0xf8-0xff*/
5579 /* 0x8f00 */
5580 0xdd5b, 0xdd5c, 0xdd5d, 0xdd5e, 0xdd5f, 0xdd60, 0xdd61, 0xdd62, /*0x00-0x07*/
5581 0xdd63, 0xdd64, 0xdd65, 0xdd66, 0xdd67, 0xdd68, 0xdd69, 0xdd6a, /*0x08-0x0f*/
5582 0xdd6b, 0xdd6c, 0xdd6d, 0xdd6e, 0xdd6f, 0xdd70, 0xdd71, 0xdd72, /*0x10-0x17*/
5583 0xdd73, 0xdd74, 0xdd75, 0xdd76, 0xdd77, 0xdd78, 0xdd79, 0xdd7a, /*0x18-0x1f*/
5584 0xdd7b, 0xdd7c, 0xdd7d, 0xdd7e, 0xdd80, 0xdd81, 0xdd82, 0xdd83, /*0x20-0x27*/
5585 0xdd84, 0xdd85, 0xdd86, 0xdd87, 0xdd88, 0xdd89, 0xdd8a, 0xdd8b, /*0x28-0x2f*/
5586 0xdd8c, 0xdd8d, 0xdd8e, 0xdd8f, 0xdd90, 0xdd91, 0xdd92, 0xdd93, /*0x30-0x37*/
5587 0xdd94, 0xdd95, 0xdd96, 0xdd97, 0xdd98, 0xdd99, 0xdd9a, 0xdd9b, /*0x38-0x3f*/
5588 0xdd9c, 0xdd9d, 0xdd9e, 0xdd9f, 0xdda0, 0xde40, 0xde41, 0xde42, /*0x40-0x47*/
5589 0xde43, 0xde44, 0xde45, 0xde46, 0xde47, 0xde48, 0xde49, 0xde4a, /*0x48-0x4f*/
5590 0xde4b, 0xde4c, 0xde4d, 0xde4e, 0xde4f, 0xde50, 0xde51, 0xde52, /*0x50-0x57*/
5591 0xde53, 0xde54, 0xde55, 0xde56, 0xde57, 0xde58, 0xde59, 0xde5a, /*0x58-0x5f*/
5592 0xde5b, 0xde5c, 0xde5d, 0xde5e, 0xde5f, 0xde60, 0xb3b5, 0xd4fe, /*0x60-0x67*/
5593 0xb9ec, 0xd0f9, 0xde61, 0xe9ed, 0xd7aa, 0xe9ee, 0xc2d6, 0xc8ed, /*0x68-0x6f*/
5594 0xbae4, 0xe9ef, 0xe9f0, 0xe9f1, 0xd6e1, 0xe9f2, 0xe9f3, 0xe9f5, /*0x70-0x77*/
5595 0xe9f4, 0xe9f6, 0xe9f7, 0xc7e1, 0xe9f8, 0xd4d8, 0xe9f9, 0xbdc, /*0x78-0x7f*/
5596 0xde62, 0xe9fa, 0xe9fb, 0xbdcf, 0xe9fc, 0xb8a8, 0xc1be, 0xe9fd, /*0x80-0x87*/
5597 0xb1b2, 0xbbd4, 0xb9f5, 0xe9fe, 0xde63, 0xea1, 0xea2, 0xea3, /*0x88-0x8f*/
5598 0xb7f8, 0xbcad, 0xde64, 0xcae4, 0xe0ce, 0xd4af, 0xcfb, 0xd5b7, /*0x90-0x97*/
5599 0xea4, 0xd5de, 0xea5, 0xd0c1, 0xb9bc, 0xde65, 0xb4c7, 0xb1d9, /*0x98-0x9f*/
5600 0xde66, 0xde67, 0xde68, 0xc0b1, 0xde69, 0xde6a, 0xde6b, 0xde6c, /*0xa0-0xaf*/
5601 0xb1e6, 0xb1e7, 0xde6d, 0xb1e8, 0xde6e, 0xde6f, 0xde70, 0xde71, /*0xa8-0xaf*/
5602 0xb3bd, 0xc8e8, 0xde72, 0xde73, 0xde74, 0xde75, 0xe5c1, 0xde76, /*0xb0-0xbf*/
5603 0xde77, 0xb1df, 0xde78, 0xde79, 0xde7a, 0xc1c9, 0xb4ef, 0xde7b, /*0xb8-0xbf*/
5604 0xde7c, 0xc7a8, 0xd3d8, 0xde7d, 0xc6f9, 0xd1b8, 0xde7e, 0xb9fd, /*0xc0-0xc7*/
5605 0xc2f5, 0xde80, 0xde81, 0xde82, 0xde83, 0xde84, 0xd3ad, 0xde85, /*0xc8-0xcf*/
5606 0xd4cb, 0xbdfc, 0xde86, 0xe5c2, 0xb7b5, 0xe5c3, 0xde87, 0xde88, /*0xd0-0xd7*/
5607 0xbbb9, 0xd5e2, 0xde89, 0xbdf8, 0xd4b6, 0xcea5, 0xc1ac, 0xb3d9, /*0xd8-0xdf*/
5608 0xde8a, 0xde8b, 0xcfc6, 0xde8c, 0xe5c6, 0xe5c4, 0xe5c8, 0xde8d, /*0xe0-0xe7*/
5609 0xe5ca, 0xe5c7, 0xb5cf, 0xc6c8, 0xde8e, 0xb5fc, 0xe5c5, 0xde8f, /*0xe8-0xef*/
5610 0xcaf6, 0xde90, 0xde91, 0xe5c9, 0xde92, 0xde93, 0xde94, 0xc3d4, /*0xf0-0xf7*/
5611 0xb1c5, 0xbca3, 0xde95, 0xde96, 0xde97, 0xd7b7, 0xde98, 0xde99, /*0xf8-0xff*/
5612 /* 0x9000 */
5613 0xcdcb, 0xcbcd, 0xcaca, 0xcd3, 0xe5cc, 0xe5cb, 0xc4e6, 0xde9a, /*0x00-0x07*/
5614 0xde9b, 0xd1a1, 0xd1b7, 0xe5cd, 0xde9c, 0xe5d0, 0xde9d, 0xcdb8, /*0x08-0x0f*/
5615 0xd6f0, 0xe5cf, 0xb5dd, 0xde9e, 0xcdb, 0xde9f, 0xe5d1, 0xb6ba, /*0x10-0x17*/
5616 0xdea0, 0xdf40, 0xcda8, 0xb9e4, 0xdf41, 0xcac5, 0xb3d1, 0xcdbd9, /*0x18-0x1f*/
5617 0xd4ec, 0xe5d2, 0xb7ea, 0xdf42, 0xdf43, 0xdf44, 0xe5ce, 0xdf45, /*0x20-0x27*/
5618 0xdf46, 0xdf47, 0xdf48, 0xdf49, 0xdf4a, 0xe5d5, 0xb4fe, 0xe5d6, /*0x28-0x2f*/
5619 0xdf4b, 0xdf4c, 0xdf4d, 0xdf4e, 0xdf4f, 0xe5d3, 0xe5d4, 0xdf50, /*0x30-0x37*/
5620 0xd2dd, 0xdf51, 0xdf52, 0xc2df, 0xb1c6, 0xdf53, 0xd3e2, 0xdf54, /*0x38-0x3f*/
5621 0xdf55, 0xb6dd, 0xcbec, 0xdf56, 0xe5d7, 0xdf57, 0xdf58, 0xd3f6, /*0x40-0x47*/
5622 0xdf59, 0xdf5a, 0xdf5b, 0xdf5c, 0xdf5d, 0xb1e9, 0xdf5e, 0xb6f4, /*0x48-0x4f*/
5623 0xe5da, 0xe5d8, 0xe5d9, 0xb5c0, 0xdf5f, 0xdf60, 0xdf61, 0xd2c5, /*0x50-0x57*/
5624 0xe5dc, 0xdf62, 0xdf63, 0xe5de, 0xdf64, 0xdf65, 0xdf66, 0xdf67, /*0x58-0x5f*/
5625 0xdf68, 0xdf69, 0xe5dd, 0xc7b2, 0xdf6a, 0xd2a3, 0xdf6b, 0xdf6c, /*0x60-0x67*/
5626 0xe5db, 0xdf6d, 0xdf6e, 0xdf6f, 0xdf70, 0xd4e2, 0xd5da, 0xdf71, /*0x68-0x6f*/
5627 0xdf72, 0xdf73, 0xdf74, 0xdf75, 0xe5e0, 0xd7f1, 0xdf76, 0xdf77, /*0x70-0x77*/
5628 0xdf78, 0xdf79, 0xdf7a, 0xdf7b, 0xdf7c, 0xe5e1, 0xdf7d, 0xb1dc, /*0x78-0x7f*/
5629 0xd1fb, 0xdf7e, 0xe5e2, 0xe5e4, 0xdf80, 0xdf81, 0xdf82, 0xdf83, /*0x80-0x87*/
5630 0xe5e3, 0xdf84, 0xdf85, 0xe5e5, 0xdf86, 0xdf87, 0xdf88, 0xdf89, /*0x88-0x8f*/
5631 0xdf8a, 0xd2d8, 0xdf8b, 0xb5cb, 0xdf8c, 0xe7df, 0xdf8d, 0xdf8f, /*0x90-0x97*/
5632 0xdf8e, 0xdaf8, 0xdf8f, 0xdaf6, 0xdf90, 0xdaf7, 0xdf91, 0xdf92, /*0x98-0x9f*/
5633 0xdf93, 0xdafa, 0xd0cf, 0xc4c7, 0xdf94, 0xdf95, 0xb0ee, 0xdf96, /*0xa0-0xaf*/
5634 0xdf97, 0xdf98, 0xd0b0, 0xdf99, 0xdaf9, 0xdf9a, 0xdf9c, 0xbaaa, /*0xa8-0xaf*/
5635 0xdba2, 0xc7f1, 0xdf9b, 0xdafc, 0xdafb, 0xc9db, 0xdafd, 0xdf9c, /*0xb0-0xbf*/
5636 0xdba1, 0xd7de, 0xdafe, 0xc1da, 0xdf9d, 0xdf9e, 0xdba5, 0xdf9f, /*0xb8-0xbf*/
5637 0xdfa0, 0xd3f4, 0xe040, 0xe041, 0xdba7, 0xdba4, 0xe042, 0xdba8, /*0xc0-0xc7*/
5638 0xe043, 0xe044, 0xbdbc, 0xe045, 0xe046, 0xe047, 0xc0c9, 0xdba3, /*0xc8-0xcf*/
5639 0xdba6, 0xd6a3, 0xe048, 0xdba9, 0xe049, 0xe04a, 0xe04b, 0xdbad, /*0xd0-0xdf*/
5640 0xe04c, 0xe04d, 0xe04e, 0xdbae, 0xbac2, 0xe04f, 0xe050, /*0xd8-0xdf*/
5641 0xe051, 0xbfa4, 0xdbab, 0xe052, 0xe053, 0xe054, 0xdbaa, 0xd4c7, /*0xe0-0xe7*/
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5642 0xb2bf, 0xe055, 0xe056, 0xdbaf, 0xe057, 0xb9f9, 0xe058, 0xdbb0, /*0xe8-0xef*/
5643 0xe059, 0xe05a, 0xe05b, 0xe05c, 0xb3bb, 0xe05d, 0xe05e, 0xe05f, /*0xf0-0xf7*/
5644 0xb5a6, 0xe060, 0xe061, 0xe062, 0xe063, 0xb6bc, 0xdbb1, 0xe064, /*0xf8-0xff*/
5645 /* 0x9100 */
5646 0xe065, 0xe066, 0xb6f5, 0xe067, 0xdbb2, 0xe068, 0xe069, 0xe06a, /*0x00-0x07*/
5647 0xe06b, 0xe06c, 0xe06d, 0xe06e, 0xe06f, 0xe070, 0xe071, 0xe072, /*0x08-0x0f*/
5648 0xe073, 0xe074, 0xe075, 0xe076, 0xe077, 0xe078, 0xe079, 0xe07a, /*0x10-0x17*/
5649 0xe07b, 0xb1c9, 0xe07c, 0xe07d, 0xe07e, 0xe080, 0xdbb4, 0xe081, /*0x18-0x1f*/
5650 0xe082, 0xe083, 0xdbb3, 0xdbb5, 0xe084, 0xe085, 0xe086, 0xe087, /*0x20-0x27*/
5651 0xe088, 0xe089, 0xe08a, 0xe08b, 0xe08c, 0xe08d, 0xe08e, 0xdbb7, /*0x28-0x2f*/
5652 0xe08f, 0xdbb6, 0xe090, 0xe091, 0xe092, 0xe093, 0xe094, 0xe095, /*0x30-0x37*/
5653 0xe096, 0xdbb8, 0xe097, 0xe098, 0xe099, 0xe09a, 0xe09b, 0xe09c, /*0x38-0x3f*/
5654 0xe09d, 0xe09e, 0xe09f, 0xdbb9, 0xe0a0, 0xe140, 0xdbba, 0xe141, /*0x40-0x47*/
5655 0xe142, 0xd3cf, 0xf4fa, 0xc7f5, 0xd7c3, 0xc5e4, 0xf4fc, 0xf4fd, /*0x48-0x4f*/
5656 0xf4fb, 0xe143, 0xbec6, 0xe144, 0xe145, 0xe146, 0xe147, 0xd0ef, /*0x50-0x57*/
5657 0xe148, 0xe149, 0xb7d3, 0xe14a, 0xe14b, 0xd4cd, 0xccaa, 0xe14c, /*0x58-0x5f*/
5658 0xe14d, 0xf5a2, 0xf5a1, 0xbaa8, 0xf4fe, 0xcbd6, 0xe14e, 0xe14f, /*0x60-0x67*/
5659 0xe150, 0xf5a4, 0xc0d2, 0xe151, 0xb3ea, 0xe152, 0xcdaa, 0xf5a5, /*0x68-0x6f*/
5660 0xf5a3, 0xbdb4, 0xf5a8, 0xe153, 0xf5a9, 0xbdc4, 0xc3b8, 0xbfe1, /*0x70-0x77*/
5661 0xcbel, 0xf5aa, 0xe154, 0xe155, 0xe156, 0xf5a6, 0xf5a7, 0xc4f0, /*0x78-0x7f*/
5662 0xe157, 0xe158, 0xcad3, 0xe159, 0xe15a, 0xe15b, 0xf5ac, 0xe15c, 0xb4bc, /*0x80-0x87*/
5663 0xe15d, 0xd7ed, 0xe15e, 0xb4d7, 0xf5ab, 0xf5ae, 0xe15f, 0xe160, /*0x88-0x8f*/
5664 0xf5ad, 0xf5af, 0xd0d1, 0xe161, 0xe162, 0xe163, 0xe164, 0xe165, /*0x90-0x97*/
5665 0xe166, 0xe167, 0xc3d1, 0xc8a9, 0xe168, 0xe169, 0xe16a, 0xe16b, /*0x98-0x9f*/
5666 0xe16c, 0xe16d, 0xf5b0, 0xf5b1, 0xe16e, 0xe16f, 0xe170, 0xe171, /*0xa0-0xa7*/
5667 0xe172, 0xe173, 0xf5b2, 0xe174, 0xe175, 0xf5b3, 0xf5b4, 0xf5b5, /*0xa8-0xaf*/
5668 0xe176, 0xe177, 0xe178, 0xe179, 0xf5b6, 0xe17a, 0xe17b, 0xb0, /*0xb0-0xb7*/
5669 0xe17c, 0xe17d, 0xf5b8, 0xe17e, 0xe180, 0xe181, 0xe182, 0xe183, /*0xb8-0xbf*/
5670 0xe184, 0xe185, 0xe186, 0xe187, 0xe188, 0xe189, 0xe18a, 0xb2c9, /*0xc0-0xc7*/
5671 0xe18b, 0xd3d4, 0xcacd, 0xe18c, 0xc0ef, 0xd6d8, 0xd2b0, 0xc1bf, /*0xc8-0xcf*/
5672 0xe18d, 0xbdf0, 0xe18e, 0xe18f, 0xe190, 0xe191, 0xe192, 0xe193, /*0xd0-0xd7*/
5673 0xe194, 0xe195, 0xe196, 0xe197, 0xb8aa, 0xe198, 0xe199, 0xe19a, /*0xd8-0xdf*/
5674 0xe19b, 0xe19c, 0xe19d, 0xe19e, 0xe19f, 0xe1a0, 0xe240, 0xe241, /*0xe0-0xe7*/
5675 0xe242, 0xe243, 0xe244, 0xe245, 0xe246, 0xe247, 0xe248, 0xe249, /*0xe8-0xef*/
5676 0xe24a, 0xe24b, 0xe24c, 0xe24d, 0xe24e, 0xe24f, 0xe250, 0xe251, /*0xf0-0xf7*/
5677 0xe252, 0xe253, 0xe254, 0xe255, 0xe256, 0xe257, 0xe258, 0xe259, /*0xf8-0xff*/
5678 /* 0x9200 */
5679 0xe25a, 0xe25b, 0xe25c, 0xe25d, 0xe25e, 0xe25f, 0xe260, 0xe261, /*0x00-0x07*/
5680 0xe262, 0xe263, 0xe264, 0xe265, 0xe266, 0xe267, 0xe268, 0xe269, /*0x08-0x0f*/
5681 0xe26a, 0xe26b, 0xe26c, 0xe26d, 0xe26e, 0xe26f, 0xe270, 0xe271, /*0x10-0x17*/
5682 0xe272, 0xe273, 0xe274, 0xe275, 0xe276, 0xe277, 0xe278, 0xe279, /*0x18-0x1f*/
5683 0xe27a, 0xe27b, 0xe27c, 0xe27d, 0xe27e, 0xe27f, 0xe280, 0xe281, /*0x20-0x27*/
5684 0xe282, 0xe283, 0xe284, 0xe285, 0xe286, 0xe287, 0xe288, 0xe289, /*0x28-0x2f*/
5685 0xe28a, 0xe28b, 0xe28c, 0xe28d, 0xe28e, 0xe28f, 0xe290, 0xe291, /*0x30-0x37*/
5686 0xe292, 0xe293, 0xe294, 0xe295, 0xe296, 0xe297, 0xe298, 0xe299, /*0x38-0x3f*/
5687 0xe29a, 0xe29b, 0xe29c, 0xe29d, 0xe29e, 0xe29f, 0xe2a0, 0xe2a1, /*0x40-0x47*/
5688 0xe2a2, 0xe2a3, 0xe2a4, 0xe2a5, 0xe2a6, 0xe2a7, 0xe2a8, 0xe2a9, /*0x48-0x4f*/
5689 0xe2aa, 0xe2ab, 0xe2ac, 0xe2ad, 0xe2ae, 0xe2af, 0xe2b0, 0xe2b1, /*0x50-0x57*/
5690 0xe2b2, 0xe2b3, 0xe2b4, 0xe2b5, 0xe2b6, 0xe2b7, 0xe2b8, 0xe2b9, /*0x58-0x5f*/
5691 0xe2ba, 0xe2bb, 0xe2bc, 0xe2bd, 0xe2be, 0xe2bf, 0xe2c0, 0xe2c1, /*0x60-0x67*/
5692 0xe2c2, 0xe2c3, 0xe2c4, 0xe2c5, 0xe2c6, 0xe2c7, 0xe2c8, 0xe2c9, /*0x68-0x6f*/
5693 0xe2ca, 0xe2cb, 0xe2cc, 0xe2cd, 0xe2ce, 0xe2cf, 0xe2d0, 0xe2d1, /*0x70-0x77*/
5694 0xe2d2, 0xe2d3, 0xe2d4, 0xe2d5, 0xe2d6, 0xe2d7, 0xe2d8, 0xe2d9, /*0x78-0x7f*/
5695 0xe2da, 0xe2db, 0xe2dc, 0xe2dd, 0xe2de, 0xe2df, 0xe2e0, 0xe2e1, /*0x80-0x87*/
5696 0xe2e2, 0xe2e3, 0xe2e4, 0xe2e5, 0xe2e6, 0xe2e7, 0xe2e8, 0xe2e9, /*0x88-0x8f*/
5697 0xe2ea, 0xe2eb, 0xe2ec, 0xe2ed, 0xe2ee, 0xe2ef, 0xe2f0, 0xe2f1, /*0x90-0x97*/
5698 0xe2f2, 0xe2f3, 0xe2f4, 0xe2f5, 0xe2f6, 0xe2f7, 0xe2f8, 0xe2f9, /*0x98-0x9f*/
5699 0xe2fa, 0xe2fb, 0xe2fc, 0xe2fd, 0xe2fe, 0xe2ff, 0xe300, 0xe301, /*0xa0-0xaf*/
5700 0xe302, 0xe303, 0xe304, 0xe305, 0xe306, 0xe307, 0xe308, 0xe309, /*0xb0-0xbf*/
5701 0xe30a, 0xe30b, 0xe30c, 0xe30d, 0xe30e, 0xe30f, 0xe310, 0xe311, /*0xc0-0xc7*/
5702 0xe312, 0xe313, 0xe314, 0xe315, 0xe316, 0xe317, 0xe318, 0xe319, /*0xc8-0xcf*/
5703 0xe31a, 0xe31b, 0xe31c, 0xe31d, 0xe31e, 0xe31f, 0xe320, 0xe321, /*0xd0-0xd7*/
5704 0xe322, 0xe323, 0xe324, 0xe325, 0xe326, 0xe327, 0xe328, 0xe329, /*0xd8-0xdf*/
5705 0xe32a, 0xe32b, 0xe32c, 0xe32d, 0xe32e, 0xe32f, 0xe330, 0xe331, /*0xe0-0xe7*/
5706 0xe332, 0xe333, 0xe334, 0xe335, 0xe336, 0xe337, 0xe338, 0xe339, /*0xe8-0xef*/
5707 0xe33a, 0xe33b, 0xe33c, 0xe33d, 0xe33e, 0xe33f, 0xe340, 0xe341, /*0xf0-0xf7*/
5708 0xe342, 0xe343, 0xe344, 0xe345, 0xe346, 0xe347, 0xe348, 0xe349, /*0xf8-0xff*/
5709 0xe34a, 0xe34b, 0xe34c, 0xe34d, 0xe34e, 0xe34f, 0xe350, 0xe351,
5710 0xe352, 0xe353, 0xe354, 0xe355, 0xe356, 0xe357, 0xe358, 0xe359,
5711 /* 0x9300 */
5712 0xe35a, 0xe35b, 0xe35c, 0xe35d, 0xe35e, 0xe35f, 0xe360, 0xe361, /*0x00-0x07*/
5713 0xe362, 0xe363, 0xe364, 0xe365, 0xe366, 0xe367, 0xe368, 0xe369, /*0x08-0x0f*/
5714 0xe36a, 0xe36b, 0xe36c, 0xe36d, 0xe36e, 0xe36f, 0xe370, 0xe371, /*0x10-0x17*/
5715 0xe372, 0xe373, 0xe374, 0xe375, 0xe376, 0xe377, 0xe378, 0xe379, /*0x18-0x1f*/
5716 0xe37a, 0xe37b, 0xe37c, 0xe37d, 0xe37e, 0xe37f, 0xe380, 0xe381, /*0x20-0x27*/
5717 0xe382, 0xe383, 0xe384, 0xe385, 0xe386, 0xe387, 0xf6c6, 0xe388, /*0x28-0x2f*/
5718 0xe389, 0xe38a, 0xe38b, 0xe38c, 0xe38d, 0xe38e, 0xe38f, 0xe390, /*0x30-0x37*/
5719 0xe391, 0xe392, 0xe393, 0xe394, 0xe395, 0xe396, 0xe397, 0xe398, /*0x38-0x3f*/
5720 0xe399, 0xe39a, 0xe39b, 0xe39c, 0xe39d, 0xe39e, 0xe39f, 0xe3a0, /*0x40-0x47*/
5721 0xe3a1, 0xe3a2, 0xe3a3, 0xe3a4, 0xe3a5, 0xe3a6, 0xe3a7, 0xe3a8, /*0x48-0x4f*/
5722 0xe3a9, 0xe3aa, 0xe3ab, 0xe3ac, 0xe3ad, 0xe3ae, 0xe3af, 0xe3b0, /*0x50-0x57*/
5723 0xe3b1, 0xe3b2, 0xe3b3, 0xe3b4, 0xe3b5, 0xe3b6, 0xe3b7, 0xe3b8, /*0x58-0x5f*/
5724 0xe3b9, 0xe3ba, 0xe3bb, 0xe3bc, 0xe3bd, 0xe3be, 0xe3bf, 0xe3c0, /*0x60-0x67*/
5725 0xe3c1, 0xe3c2, 0xe3c3, 0xe3c4, 0xe3c5, 0xe3c6, 0xe3c7, 0xe3c8, /*0x68-0x6f*/
5726 0xe3c9, 0xe3ca, 0xe3cb, 0xe3cc, 0xe3cd, 0xe3ce, 0xe3cf, 0xe3d0, /*0x70-0x77*/
5727 0xe3d1, 0xe3d2, 0xe3d3, 0xe3d4, 0xe3d5, 0xe3d6, 0xe3d7, 0xe3d8, /*0x78-0x7f*/
5728 0xe3d9, 0xe3da, 0xe3db, 0xe3dc, 0xe3dd, 0xe3de, 0xe3df, 0xe3e0, /*0x80-0x87*/
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5729 0xe65c, 0xe65d, 0xe65e, 0xe65f, 0xe660, 0xe661, 0xe662, 0xf6cc, /*0x88-0x8f*/
5730 0xe663, 0xe664, 0xe665, 0xe666, 0xe667, 0xe668, 0xe669, 0xe66a, /*0x90-0x97*/
5731 0xe66b, 0xe66c, 0xe66d, 0xe66e, 0xe66f, 0xe670, 0xe671, 0xe672, /*0x98-0x9f*/
5732 0xe673, 0xe674, 0xe675, 0xe676, 0xe677, 0xe678, 0xe679, 0xe67a, /*0xa0-0xa7*/
5733 0xe67b, 0xe67c, 0xe67d, 0xe67e, 0xe680, 0xe681, 0xe682, 0xe683, /*0xa8-0xaf*/
5734 0xe684, 0xe685, 0xe686, 0xe687, 0xe688, 0xe689, 0xe68a, 0xe68b, /*0xb0-0xbf*/
5735 0xe68c, 0xe68d, 0xe68e, 0xe68f, 0xe690, 0xe691, 0xe692, 0xe693, /*0xb8-0xbf*/
5736 0xe694, 0xe695, 0xe696, 0xe697, 0xe698, 0xe699, 0xe69a, 0xe69b, /*0xc0-0xcf*/
5737 0xe69c, 0xe69d, 0xf6cb, 0xe69e, 0xe69f, 0xe6a0, 0xe740, 0xe741, /*0xc8-0xcf*/
5738 0xe742, 0xe743, 0xe744, 0xe745, 0xe746, 0xe747, 0xf7e9, 0xe748, /*0xd0-0xdf*/
5739 0xe749, 0xe74a, 0xe74b, 0xe74c, 0xe74d, 0xe74e, 0xe74f, 0xe750, /*0xd8-0xdf*/
5740 0xe751, 0xe752, 0xe753, 0xe754, 0xe755, 0xe756, 0xe757, 0xe758, /*0xe0-0xef*/
5741 0xe759, 0xe75a, 0xe75b, 0xe75c, 0xe75d, 0xe75e, 0xe75f, 0xe760, /*0xe8-0xef*/
5742 0xe761, 0xe762, 0xe763, 0xe764, 0xe765, 0xe766, 0xe767, 0xe768, /*0xf0-0xff*/
5743 0xe769, 0xe76a, 0xe76b, 0xe76c, 0xe76d, 0xe76e, 0xe76f, 0xe770, /*0xf8-0xff*/
5744 /* 0x9400 */
5745 0xe771, 0xe772, 0xe773, 0xe774, 0xe775, 0xe776, 0xe777, 0xe778, /*0x00-0x07*/
5746 0xe779, 0xe77a, 0xe77b, 0xe77c, 0xe77d, 0xe77e, 0xe780, 0xe781, /*0x08-0x0f*/
5747 0xe782, 0xe783, 0xe784, 0xe785, 0xe786, 0xe787, 0xe788, 0xe789, /*0x10-0x17*/
5748 0xe78a, 0xe78b, 0xe78c, 0xe78d, 0xe78e, 0xe78f, 0xe790, 0xe791, /*0x18-0x1f*/
5749 0xe792, 0xe793, 0xe794, 0xe795, 0xe796, 0xe797, 0xe798, 0xe799, /*0x20-0x27*/
5750 0xe79a, 0xe79b, 0xe79c, 0xe79d, 0xe79e, 0xe79f, 0xe7a0, 0xe840, /*0x28-0x2f*/
5751 0xe841, 0xe842, 0xe843, 0xe844, 0xe845, 0xe846, 0xe847, 0xe848, /*0x30-0x37*/
5752 0xe849, 0xe84a, 0xe84b, 0xe84c, 0xe84d, 0xe84e, 0xf6cd, 0xe84f, /*0x38-0x3f*/
5753 0xe850, 0xe851, 0xe852, 0xe853, 0xe854, 0xe855, 0xe856, 0xe857, /*0x40-0x47*/
5754 0xe858, 0xe859, 0xe85a, 0xe85b, 0xe85c, 0xe85d, 0xe85e, 0xe85f, /*0x48-0x4f*/
5755 0xe860, 0xe861, 0xe862, 0xe863, 0xe864, 0xe865, 0xe866, 0xe867, /*0x50-0x57*/
5756 0xe868, 0xe869, 0xe86a, 0xe86b, 0xe86c, 0xe86d, 0xe86e, 0xe86f, /*0x58-0x5f*/
5757 0xe870, 0xe871, 0xe872, 0xe873, 0xe874, 0xe875, 0xe876, 0xe877, /*0x60-0x67*/
5758 0xe878, 0xe879, 0xe87a, 0xf6ce, 0xe87b, 0xe87c, 0xe87d, 0xe87e, /*0x68-0x6f*/
5759 0xe880, 0xe881, 0xe882, 0xe883, 0xe884, 0xe885, 0xe886, 0xe887, /*0x70-0x77*/
5760 0xe888, 0xe889, 0xe88a, 0xe88b, 0xe88c, 0xe88d, 0xe88e, 0xe88f, /*0x78-0x7f*/
5761 0xe890, 0xe891, 0xe892, 0xe893, 0xe894, 0xe895, 0xe896, 0xe897, /*0x80-0x87*/
5762 0xd5eb, 0xb6a4, 0xeec8, 0xeec7, 0xeec9, 0xeeca, 0xc7a5, 0xeecb, /*0x88-0x8f*/
5763 0xeec4, 0xe895, 0xb7b0, 0xb5f6, 0xeecd, 0xeecf, 0xe896, 0xeec5, /*0x90-0x97*/
5764 0xe897, 0xb8c6, 0xeed0, 0xeed1, 0xeed2, 0xb6d3, 0xb3ae, 0xd6d3, /*0x98-0x9f*/
5765 0xc4c6, 0xb1b5, 0xb8d6, 0xeed3, 0xeed4, 0xd4bf, 0xc7d5, 0xbefb, /*0xa0-0xaf*/
5766 0xc4d9, 0xb9b3, 0xeed6, 0xeed5, 0xeed6, 0xeed7, 0xc5a5, 0xeed9, /*0xa8-0xaf*/
5767 0xeeda, 0xc7ae, 0xeedb, 0xc7af, 0xeedd, 0xb2a7, 0xeedd, 0xeede, /*0xb0-0xbf*/
5768 0xeedf, 0xee0, 0xee1, 0xd7ea, 0xee2, 0xee3, 0xbcd8, 0xee4, /*0xb8-0xbf*/
5769 0xd3cb, 0xccfa, 0xb2ac, 0xc1e5, 0xee5, 0xc7a6, 0xc3ad, 0xe898, /*0xc0-0xcf*/
5770 0xee6, 0xee7, 0xee8, 0xee9, 0xeea, 0xeeb, 0xeec, 0xe899, /*0xc8-0xcf*/
5771 0xeecd, 0xeee, 0xeee, 0xe89a, 0xe89b, 0xeef0, 0xeef1, 0xeef2, /*0xd0-0xdf*/
5772 0xeef4, 0xeef3, 0xe89c, 0xeef5, 0xc4ad, 0xc2c1, 0xeef6, 0xeef7, /*0xd8-0xdf*/
5773 0xeef8, 0xd5a1, 0xeef9, 0xcfb3, 0xeefa, 0xeefb, 0xe89d, 0xeefc, /*0xe0-0xef*/
5774 0xeefd, 0xefa1, 0xeefe, 0xefa2, 0xb8f5, 0xc3fa, 0xefa3, 0xefa4, /*0xe8-0xef*/
5775 0xbdc2, 0xd2bf, 0xb2f9, 0xefa5, 0xefa6, 0xefa7, 0xd2f8, 0xefa8, /*0xf0-0xff*/
5776 0xd6fd, 0xefa9, 0xc6cc, 0xefaa, 0xefab, 0xc1b4, 0xefac, /*0xf8-0xff*/
5777 /* 0x9500 */
5778 0xcffa, 0xcbf8, 0xefae, 0xefad, 0xb3fa, 0xb9f8, 0xefaf, 0xefb0, /*0x00-0x07*/
5779 0xd0e2, 0xefb1, 0xefb2, 0xb7e6, 0xd0bf, 0xefb3, 0xefb4, 0xefb5, /*0x08-0x0f*/
5780 0xc8f1, 0xcc0, 0xefb6, 0xefb7, 0xefb8, 0xefb9, 0xefba, 0xd5e0, /*0x10-0x17*/
5781 0xefbb, 0xb4ed, 0xc3aa, 0xefbc, 0xe89f, 0xefbd, 0xefbe, 0xefbf, /*0x18-0x1f*/
5782 0xe8a0, 0xc4fd, 0xefc0, 0xc2e0, 0xb4b8, 0xd7b6, 0xbdf5, 0xe940, /*0x20-0x27*/
5783 0xcfc7, 0xefc3, 0xefc1, 0xefc2, 0xefc4, 0xb6a7, 0xbcf, 0xb2ee, /*0x28-0x2f*/
5784 0xc3cc, 0xefc5, 0xefc6, 0xe941, 0xefc7, 0xefcf, 0xefc8, 0xefc9, /*0x30-0x37*/
5785 0xefca, 0xc7c2, 0xefc1, 0xb6cd, 0xefcb, 0xe942, 0xf6cc, 0xefcd, /*0x38-0x3f*/
5786 0xb6c6, 0xc3be, 0xefce, 0xe943, 0xefd0, 0xefd1, 0xefd2, 0xd5f2, /*0x40-0x47*/
5787 0xe944, 0xefd3, 0xc4f7, 0xe945, 0xefd4, 0xc4f8, 0xefd5, 0xefd6, /*0x48-0x4f*/
5788 0xb8e4, 0xb0f7, 0xefd7, 0xefd8, 0xefd9, 0xe946, 0xefda, 0xefdb, /*0x50-0x57*/
5789 0xefdc, 0xefdd, 0xe947, 0xefde, 0xb2b5, 0xefef, 0xefdf, 0xefef, /*0x58-0x5f*/
5790 0xe948, 0xefef, 0xefef, 0xc1cd, 0xefef, 0xefef, 0xefef, 0xefef, /*0x60-0x67*/
5791 0xefef, 0xefef, 0xefef, 0xefef, 0xefef, 0xc0d8, 0xe949, 0xefef, /*0x68-0x6f*/
5792 0xc1ad, 0xefef, 0xefef, 0xefef, 0xe94a, 0xe94b, 0xcfe2, 0xe94c, /*0x70-0x77*/
5793 0xe94d, 0xe94e, 0xe94f, 0xe950, 0xe951, 0xe952, 0xe953, 0xb3a4, /*0x78-0x7f*/
5794 0xe954, 0xe955, 0xe956, 0xe957, 0xe958, 0xe959, 0xe95a, 0xe95b, /*0x80-0x87*/
5795 0xe95c, 0xe95d, 0xe95e, 0xe95f, 0xe960, 0xe961, 0xe962, 0xe963, /*0x88-0x8f*/
5796 0xe964, 0xe965, 0xe966, 0xe967, 0xe968, 0xe969, 0xe96a, 0xe96b, /*0x90-0x97*/
5797 0xe96c, 0xe96d, 0xe96e, 0xe96f, 0xe970, 0xe971, 0xe972, 0xe973, /*0x98-0x9f*/
5798 0xe974, 0xe975, 0xe976, 0xe977, 0xe978, 0xe979, 0xe97a, 0xe97b, /*0xa0-0xaf*/
5799 0xe97c, 0xe97d, 0xe97e, 0xe97f, 0xe980, 0xe981, 0xe982, 0xe983, /*0xa8-0xaf*/
5800 0xe984, 0xe985, 0xe986, 0xe987, 0xe988, 0xe989, 0xe98a, 0xe98b, /*0xb0-0xbf*/
5801 0xe98c, 0xe98d, 0xe98e, 0xe98f, 0xe990, 0xe991, 0xe992, 0xe993, /*0xb8-0xbf*/
5802 0xe994, 0xe995, 0xe996, 0xe997, 0xe998, 0xe999, 0xe99a, 0xe99b, /*0xc0-0xcf*/
5803 0xe99c, 0xe99d, 0xe99e, 0xe99f, 0xe9a0, 0xe9a1, 0xe9a2, 0xe9a3, /*0xc8-0xcf*/
5804 0xe9a4, 0xe9a5, 0xe9a6, 0xe9a7, 0xe9a8, 0xe9a9, 0xe9aa, 0xe9ab, /*0xd0-0xdf*/
5805 0xe9ac, 0xe9ad, 0xe9ae, 0xe9af, 0xe9b0, 0xe9b1, 0xe9b2, 0xe9b3, /*0xd8-0xdf*/
5806 0xe9b4, 0xe9b5, 0xe9b6, 0xe9b7, 0xe9b8, 0xe9b9, 0xe9ba, 0xe9bb, /*0xe0-0xef*/
5807 0xc3c5, 0xe9bc, 0xc9c1, 0xe9bd, 0xe9be, 0xb1d5, 0xc3ca, 0xb4b3, /*0xe8-0xef*/
5808 0xc8f2, 0xe9bf, 0xc3cd, 0xc3ce, 0xc3cf, 0xc3d0, 0xc3d1, 0xc3d2, /*0xf0-0xff*/
5809 0xd5a2, 0xc4d6, 0xb9eb, 0xc3ce, 0xc3cf, 0xc3d0, 0xc3d1, 0xc3d2, /*0xf8-0xff*/
5810 /* 0x9600 */
5811 0xb7a7, 0xb8f3, 0xbad2, 0xe9cd, 0xe9ce, 0xd4c4, 0xe9cf, 0xe9d0, /*0x00-0x07*/
5812 0xe9d1, 0xd1cb, 0xe9d2, 0xe9d3, 0xe9d4, 0xd1d6, 0xe9d5, 0xe9d6, /*0x08-0x0f*/
5813 0xb2fb, 0xc0bb, 0xe9d7, 0xe9d8, 0xc0ab, 0xe9d9, 0xe9da, 0xe9db, /*0x10-0x17*/
5814 0xe9dc, 0xe9dd, 0xe9de, 0xe9df, 0xe9e0, 0xb8b7, 0xdae2, 0xe9e1, /*0x18-0x1f*/
5815 0xe9e2, 0xdae3, 0xdae4, 0xe9e5, 0xe9e6, 0xe9e7, 0xe9e8, 0xe9e9, /*0x20-0x27*/
```

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5816 0xea69, 0xea6a, 0xdae6, 0xea6b, 0xea6c, 0xea6d, 0xc8ee, 0xea6e, /*0x28-0x2f*/
5817 0xea6f, 0xdae5, 0xb7c0, 0xd1f4, 0xd2f5, 0xd5f3, 0xbdd7, 0xea70, /*0x30-0x37*/
5818 0xea71, 0xea72, 0xea73, 0xd7e8, 0xdae8, 0xdae7, 0xea74, 0xb0a2, /*0x38-0x3f*/
5819 0xcdd3, 0xea75, 0xdae9, 0xea76, 0xb8bd, 0xbcca, 0xc2bd, 0xc2a4, /*0x40-0x47*/
5820 0xb3c2, 0xdaea, 0xea77, 0xc2aa, 0xc4b0, 0xbdb5, 0xea78, 0xea79, /*0x48-0x4f*/
5821 0xcfd6, 0xea7a, 0xea7b, 0xea7c, 0xdaeb, 0xc9c2, 0xea7d, 0xea7e, /*0x50-0x5f*/
5822 0xea80, 0xea81, 0xea82, 0xb1dd, 0xea83, 0xea84, 0xea85, 0xdaec, /*0x58-0x5f*/
5823 0xea86, 0xb6b8, 0xd4ba, 0xea87, 0xb3fd, 0xea88, 0xea89, 0xdaed, /*0x60-0x67*/
5824 0xd4c9, 0xcfd5, 0xc5e3, 0xea8a, 0xdaee, 0xea8b, 0xea8c, 0xea8d, /*0x68-0x6f*/
5825 0xea8e, 0xea8f, 0xdaef, 0xea90, 0xdaf0, 0xc1ea, 0xccd5, 0xcfd5, /*0x70-0x77*/
5826 0xea91, 0xea92, 0xea93, 0xea94, 0xea95, 0xea96, 0xea97, 0xea98, /*0x78-0x7f*/
5827 0xea99, 0xea9a, 0xea9b, 0xea9c, 0xea9d, 0xd3e7, 0xc2a1, 0xea9e, /*0x80-0x87*/
5828 0xdaf1, 0xea9f, 0xeaa0, 0xcbe5, 0xeb40, 0xdaf2, 0xeb41, 0xcbe6, /*0x88-0x8f*/
5829 0xd2fe, 0xeb42, 0xeb43, 0xeb44, 0xb8f4, 0xeb45, 0xeb46, 0xdaf3, /*0x90-0x97*/
5830 0xb0af, 0xcfb6, 0xeb47, 0xeb48, 0xd5cf, 0xeb49, 0xeb4a, 0xeb4b, /*0x98-0x9f*/
5831 0xeb4c, 0xeb4d, 0xeb4e, 0xeb4f, 0xeb50, 0xeb51, 0xeb52, 0xcbed, /*0xa0-0xa7*/
5832 0xeb53, 0xeb54, 0xeb55, 0xeb56, 0xeb57, 0xeb58, 0xeb59, 0xeb5a, /*0xa8-0xaf*/
5833 0xdaf4, 0xeb5b, 0xeb5c, 0xeb5d, 0xeb5e, 0xc1a5, 0xeb5f, /*0xb0-0xbf*/
5834 0xeb60, 0xf6bf, 0xeb61, 0xeb62, 0xf6c0, 0xf6c1, 0xc4d1, 0xeb63, /*0xb8-0xbf*/
5835 0xc8b8, 0xd1e3, 0xeb64, 0xeb65, 0xd0db, 0xd1c5, 0xbcaf, 0xb9cd, /*0xc0-0xcf*/
5836 0xeb66, 0xeef4, 0xeb67, 0xeb68, 0xb4c6, 0xd3ba, 0xf6c2, 0xb3fb, /*0xc8-0xcf*/
5837 0xeb69, 0xeb6a, 0xf6c3, 0xeb6b, 0xeb6c, 0xb5f1, 0xeb6d, 0xeb6e, /*0xd0-0xd7*/
5838 0xeb6f, 0xeb70, 0xeb71, 0xeb72, 0xeb73, 0xeb74, 0xeb75, 0xeb76, /*0xd8-0xdf*/
5839 0xf6c5, 0xeb77, 0xeb78, 0xeb79, 0xeb7a, 0xeb7b, 0xeb7c, 0xeb7d, /*0xe0-0xef*/
5840 0xd3ea, 0xf6a7, 0xd1a9, 0xeb7e, 0xeb80, 0xeb81, 0xeb82, 0xf6a9, /*0xe8-0xef*/
5841 0xeb83, 0xeb84, 0xeb85, 0xf6a8, 0xeb86, 0xeb87, 0xc1e3, 0xc0d7, /*0xf0-0xf7*/
5842 0xeb88, 0xb1a2, 0xeb89, 0xeb8a, 0xeb8b, 0xeb8c, 0xceed, 0xeb8d, /*0xf8-0xff*/
5843 /* 0x9700 */
5844 0xd0e8, 0xf6ab, 0xeb8e, 0xeb8f, 0xcff6, 0xeb90, 0xf6aa, 0xd5f0, /*0x00-0x07*/
5845 0xf6ac, 0xc3b9, 0xeb91, 0xeb92, 0xeb93, 0xbbf4, 0xf6ae, 0xf6ad, /*0x08-0x0f*/
5846 0xeb94, 0xeb95, 0xeb96, 0xc4de, 0xeb97, 0xeb98, 0xc1d8, 0xeb99, /*0x10-0x17*/
5847 0xeb9a, 0xeb9b, 0xeb9c, 0xeb9d, 0xcbaa, 0xeb9e, 0xcfb3, 0xeb9f, /*0x18-0x1f*/
5848 0xeba0, 0xec40, 0xec41, 0xec42, 0xec43, 0xec44, 0xec45, 0xec46, /*0x20-0x27*/
5849 0xec47, 0xec48, 0xf6af, 0xec49, 0xec4a, 0xf6b0, 0xec4b, 0xec4c, /*0x28-0x2f*/
5850 0xf6b1, 0xec4d, 0xc2b6, 0xec4e, 0xec4f, 0xec50, 0xec51, 0xec52, /*0x30-0x37*/
5851 0xb0d4, 0xc5f9, 0xec53, 0xec54, 0xec55, 0xec56, 0xf6b2, 0xec57, /*0x38-0x3f*/
5852 0xec58, 0xec59, 0xec5a, 0xec5b, 0xec5c, 0xec5d, 0xec5e, 0xec5f, /*0x40-0x47*/
5853 0xec60, 0xec61, 0xec62, 0xec63, 0xec64, 0xec65, 0xec66, 0xec67, /*0x48-0x4f*/
5854 0xec68, 0xec69, 0xc7e0, 0xf6ab, 0xec6a, 0xec6b, 0xb5b8, 0xec6c, /*0x50-0x5f*/
5855 0xec6d, 0xb5b2, 0xec6e, 0xb5e5, 0xec6f, 0xec70, 0xb7c7, 0xec71, /*0x58-0x5f*/
5856 0xbfbf, 0xc3d2, 0xc3e6, 0xec72, 0xec73, 0xd8cc, 0xec74, 0xec75, /*0x60-0x67*/
5857 0xec76, 0xb8ef, 0xec77, 0xec78, 0xec79, 0xec7a, 0xec7b, 0xec7c, /*0x68-0x6f*/
5858 0xec7d, 0xec7e, 0xec80, 0xbdf9, 0xd1a5, 0xec81, 0xb0d0, 0xec82, /*0x70-0x77*/
5859 0xec83, 0xec84, 0xec85, 0xec86, 0xf7b0, 0xec87, 0xec88, 0xec89, /*0x78-0x7f*/
5860 0xec8a, 0xec8b, 0xec8c, 0xec8d, 0xec8e, 0xf7b1, 0xec8f, 0xec90, /*0x80-0x87*/
5861 0xec91, 0xec92, 0xec93, 0xd0ac, 0xec94, 0xb0b0, 0xec95, 0xec96, /*0x88-0x8f*/
5862 0xec97, 0xf7b2, 0xf7b3, 0xec98, 0xf7b4, 0xec99, 0xec9a, 0xec9b, /*0x90-0x97*/
5863 0xc7ca, 0xec9c, 0xec9d, 0xec9e, 0xec9f, 0xeca0, 0xed40, 0xed41, /*0x98-0x9f*/
5864 0xbecf, 0xed42, 0xed43, 0xf7b7, 0xed44, 0xed45, 0xed46, 0xed47, /*0xa0-0xaf*/
5865 0xed48, 0xed49, 0xed4a, 0xf7b6, 0xed4b, 0xb1de, 0xed4c, 0xf7b5, /*0xa8-0xaf*/
5866 0xed4d, 0xed4e, 0xf7b8, 0xed4f, 0xf7b9, 0xed50, 0xed51, 0xed52, /*0xb0-0xbf*/
5867 0xed53, 0xed54, 0xed55, 0xed56, 0xed57, 0xed58, 0xed59, 0xed5a, /*0xb8-0xbf*/
5868 0xed5b, 0xed5c, 0xed5d, 0xed5e, 0xed5f, 0xed60, 0xed61, 0xed62, /*0xc0-0xcf*/
5869 0xed63, 0xed64, 0xed65, 0xed66, 0xed67, 0xed68, 0xed69, 0xed6a, /*0xc8-0xcf*/
5870 0xed6b, 0xed6c, 0xed6d, 0xed6e, 0xed6f, 0xed70, 0xed71, 0xed72, /*0xd0-0xdf*/
5871 0xed73, 0xed74, 0xed75, 0xed76, 0xed77, 0xed78, 0xed79, 0xed7a, /*0xd8-0xdf*/
5872 0xed7b, 0xed7c, 0xed7d, 0xed7e, 0xed80, 0xed81, 0xcea4, 0xc8cd, /*0xe0-0xef*/
5873 0xed82, 0xbaab, 0xe8b8, 0xe8b9, 0xe8ba, 0xbec2, 0xed83, 0xed84, /*0xe8-0xef*/
5874 0xed85, 0xed86, 0xed87, 0xd2f4, 0xed88, 0xd4cf, 0xc9d8, 0xed89, /*0xf0-0xf7*/
5875 0xed8a, 0xed8b, 0xed8c, 0xed8d, 0xed8e, 0xed8f, 0xed90, 0xed91, /*0xf8-0xff*/
5876 /* 0x9800 */
5877 0xed92, 0xed93, 0xed94, 0xed95, 0xed96, 0xed97, 0xed98, 0xed99, /*0x00-0x07*/
5878 0xed9a, 0xed9b, 0xed9c, 0xed9d, 0xed9e, 0xed9f, 0xeda0, 0xee40, /*0x08-0x0f*/
5879 0xee41, 0xee42, 0xee43, 0xee44, 0xee45, 0xee46, 0xee47, 0xee48, /*0x10-0x17*/
5880 0xee49, 0xee4a, 0xee4b, 0xee4c, 0xee4d, 0xee4e, 0xee4f, 0xee50, /*0x18-0x1f*/
5881 0xee51, 0xee52, 0xee53, 0xee54, 0xee55, 0xee56, 0xee57, 0xee58, /*0x20-0x27*/
5882 0xee59, 0xee5a, 0xee5b, 0xee5c, 0xee5d, 0xee5e, 0xee5f, 0xee60, /*0x28-0x2f*/
5883 0xee61, 0xee62, 0xee63, 0xee64, 0xee65, 0xee66, 0xee67, 0xee68, /*0x30-0x37*/
5884 0xee69, 0xee6a, 0xee6b, 0xee6c, 0xee6d, 0xee6e, 0xee6f, 0xee70, /*0x38-0x3f*/
5885 0xee71, 0xee72, 0xee73, 0xee74, 0xee75, 0xee76, 0xee77, 0xee78, /*0x40-0x47*/
5886 0xee79, 0xee7a, 0xee7b, 0xee7c, 0xee7d, 0xee7e, 0xee80, 0xee81, /*0x48-0x4f*/
5887 0xee82, 0xee83, 0xee84, 0xee85, 0xee86, 0xee87, 0xee88, 0xee89, /*0x50-0x57*/
5888 0xee8a, 0xee8b, 0xee8c, 0xee8d, 0xee8e, 0xee8f, 0xee90, 0xee91, /*0x58-0x5f*/
5889 0xee92, 0xee93, 0xee94, 0xee95, 0xee96, 0xee97, 0xee98, 0xee99, /*0x60-0x67*/
5890 0xee9a, 0xee9b, 0xee9c, 0xee9d, 0xee9e, 0xee9f, 0xeea0, 0xef40, /*0x68-0x6f*/
5891 0xef41, 0xef42, 0xef43, 0xef44, 0xef45, 0xd2b3, 0xb6a5, 0xc7ea, /*0x70-0x77*/
5892 0xf1fc, 0xcfee, 0xcbb3, 0xd0eb, 0xe7ef, 0xcde7, 0xb9cb, 0xb6d9, /*0x78-0x7f*/
5893 0xf1fd, 0xb0e4, 0xcbbc, 0xf1fe, 0xd4a4, 0xc2ad, 0xc1ec, 0xc6c4, /*0x80-0x87*/
5894 0xb5b1, 0xf2a1, 0xbcd5, 0xf46, 0xf2a2, 0xf2a3, 0xf47, 0xf2a4, /*0x88-0x8f*/
5895 0xd2c3, 0xc6b5, 0xf48, 0xcdc7, 0xf2a5, 0xf49, 0xd3b1, 0xbfc5, /*0x90-0x97*/
5896 0xcce2, 0xf4a, 0xf2a6, 0xf2a7, 0xd1d5, 0xb6ee, 0xf2a8, 0xf2a9, /*0x98-0x9f*/
5897 0xb5df, 0xf2aa, 0xf2ab, 0xf4b, 0xb2fc, 0xf2ac, 0xf2ad, 0xc8a7, /*0xa0-0xaf*/
5898 0xef4c, 0xf4d, 0xf4e, 0xf4f, 0xf50, 0xf51, 0xf52, 0xf53, /*0xa8-0xaf*/
5899 0xf54, 0xf55, 0xf56, 0xf57, 0xf58, 0xf59, 0xf5a, 0xf5b, /*0xb0-0xbf*/
5900 0xf5c, 0xf5d, 0xf5e, 0xf5f, 0xf60, 0xf61, 0xf62, 0xf63, /*0xb8-0xbf*/
5901 0xf64, 0xf65, 0xf66, 0xf67, 0xf68, 0xf69, 0xf6a, 0xf6b, /*0xc0-0xcf*/
5902 0xf6c, 0xf6d, 0xf6e, 0xf6f, 0xf70, 0xf71, 0xb7e7, 0xf72, /*0xc8-0xcf*/

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5903 0xef73, 0xeca9, 0xecaa, 0xecab, 0xef74, 0xecac, 0xef75, 0xef76, /*0xd0-0xd7*/
5904 0xc6ae, 0xecad, 0xecae, 0xef77, 0xef78, 0xef79, 0xb7c9, 0xcab3, /*0xd8-0xdf*/
5905 0xef7a, 0xef7b, 0xef7c, 0xef7d, 0xef7e, 0xef80, 0xef81, 0xe2b8, /*0xe0-0xe7*/
5906 0xf7cf, 0xef82, 0xef83, 0xef84, 0xef85, 0xef86, 0xef87, 0xef88, /*0xe8-0xef*/
5907 0xef89, 0xef8a, 0xef8b, 0xef8c, 0xef8d, 0xef8e, 0xef8f, 0xef90, /*0xf0-0xf7*/
5908 0xef91, 0xef92, 0xef93, 0xef94, 0xef95, 0xef96, 0xef97, 0xef98, /*0xf8-0xff*/
5909 /* 0x9900 */
5910 0xef99, 0xef9a, 0xef9b, 0xef9c, 0xef9d, 0xef9e, 0xef9f, 0xefa0, /*0x00-0x07*/
5911 0xf040, 0xf041, 0xf042, 0xf043, 0xf044, 0xf7d0, 0xf045, 0xf046, /*0x08-0x0f*/
5912 0xb2cd, 0xf047, 0xf048, 0xf049, 0xf04a, 0xf04b, 0xf04c, 0xf04d, /*0x10-0x17*/
5913 0xf04e, 0xf04f, 0xf050, 0xf051, 0xf052, 0xf053, 0xf054, 0xf055, /*0x18-0x1f*/
5914 0xf056, 0xf057, 0xf058, 0xf059, 0xf05a, 0xf05b, 0xf05c, 0xf05d, /*0x20-0x27*/
5915 0xf05e, 0xf05f, 0xf060, 0xf061, 0xf062, 0xf063, 0xf7d1, 0xf064, /*0x28-0x2f*/
5916 0xf065, 0xf066, 0xf067, 0xf068, 0xf069, 0xf06a, 0xf06b, 0xf06c, /*0x30-0x37*/
5917 0xf06d, 0xf06e, 0xf06f, 0xf070, 0xf071, 0xf072, 0xf073, 0xf074, /*0x38-0x3f*/
5918 0xf075, 0xf076, 0xf077, 0xf078, 0xf079, 0xf07a, 0xf07b, 0xf07c, /*0x40-0x47*/
5919 0xf07d, 0xf07e, 0xf080, 0xf081, 0xf082, 0xf083, 0xf084, 0xf085, /*0x48-0x4f*/
5920 0xf086, 0xf087, 0xf088, 0xf089, 0xf08a, 0xf08b, 0xf08c, 0xf08d, /*0x50-0x57*/
5921 0xf08e, 0xf08f, 0xf090, 0xf091, 0xf092, 0xf093, 0xf094, 0xf095, /*0x58-0x5f*/
5922 0xf096, 0xf097, 0xf098, 0xf099, 0xf09a, 0xf09b, 0xf09c, 0xf09d, /*0x60-0x6f*/
5923 0xf09e, 0xf09f, 0xf100, 0xf101, 0xf102, 0xf103, 0xf104, 0xf105, /*0x70-0x7f*/
5924 0xf106, 0xf107, 0xf108, 0xf109, 0xf10a, 0xf10b, 0xf10c, 0xf10d, /*0x80-0x8f*/
5925 0xf10e, 0xf10f, 0xf110, 0xf111, 0xf112, 0xf113, 0xf114, 0xf115, /*0x90-0x9f*/
5926 0xf116, 0xf117, 0xf118, 0xf119, 0xf11a, 0xf11b, 0xf11c, 0xf11d, /*0xa0-0xaf*/
5927 0xf11e, 0xf11f, 0xf120, 0xf121, 0xf122, 0xf123, 0xf124, 0xf125, /*0xb0-0xbf*/
5928 0xf126, 0xf127, 0xf128, 0xf129, 0xf12a, 0xf12b, 0xf12c, 0xf12d, /*0xc0-0xcf*/
5929 0xf12e, 0xf12f, 0xf130, 0xf131, 0xf132, 0xf133, 0xf134, 0xf135, /*0xd0-0xdf*/
5930 0xf136, 0xf137, 0xf138, 0xf139, 0xf13a, 0xf13b, 0xf13c, 0xf13d, /*0xe0-0xef*/
5931 0xf13e, 0xf13f, 0xf140, 0xf141, 0xf142, 0xf143, 0xf144, 0xf145, /*0xf0-0xff*/
5932 0xf146, 0xf147, 0xf148, 0xf149, 0xf14a, 0xf14b, 0xf14c, 0xf14d, /*0x00-0x07*/
5933 0xf14e, 0xf14f, 0xf150, 0xf151, 0xf152, 0xf153, 0xf154, 0xf155, /*0x08-0x0f*/
5934 0xf156, 0xf157, 0xf158, 0xf159, 0xf15a, 0xf15b, 0xf15c, 0xf15d, /*0x10-0x17*/
5935 0xf15e, 0xf15f, 0xf160, 0xf161, 0xf162, 0xf163, 0xf164, 0xf165, /*0x18-0x1f*/
5936 0xf166, 0xf167, 0xf168, 0xf169, 0xf16a, 0xf16b, 0xf16c, 0xf16d, /*0x20-0x27*/
5937 0xf16e, 0xf16f, 0xf170, 0xf171, 0xf172, 0xf173, 0xf174, 0xf175, /*0x28-0x2f*/
5938 0xf176, 0xf177, 0xf178, 0xf179, 0xf17a, 0xf17b, 0xf17c, 0xf17d, /*0x30-0x37*/
5939 0xf17e, 0xf17f, 0xf180, 0xf181, 0xf182, 0xf183, 0xf184, 0xf185, /*0x38-0x3f*/
5940 0xf186, 0xf187, 0xf188, 0xf189, 0xf18a, 0xf18b, 0xf18c, 0xf18d, /*0x40-0x47*/
5941 0xf18e, 0xf18f, 0xf190, 0xf191, 0xf192, 0xf193, 0xf194, 0xf195, /*0x48-0x4f*/
5942 0xf196, 0xf197, 0xf198, 0xf199, 0xf19a, 0xf19b, 0xf19c, 0xf19d, /*0x50-0x57*/
5943 0xf19e, 0xf19f, 0xf200, 0xf201, 0xf202, 0xf203, 0xf204, 0xf205, /*0x58-0x5f*/
5944 0xf206, 0xf207, 0xf208, 0xf209, 0xf20a, 0xf20b, 0xf20c, 0xf20d, /*0x60-0x6f*/
5945 0xf20e, 0xf20f, 0xf210, 0xf211, 0xf212, 0xf213, 0xf214, 0xf215, /*0x70-0x7f*/
5946 0xf216, 0xf217, 0xf218, 0xf219, 0xf21a, 0xf21b, 0xf21c, 0xf21d, /*0x80-0x8f*/
5947 0xf21e, 0xf21f, 0xf220, 0xf221, 0xf222, 0xf223, 0xf224, 0xf225, /*0x90-0x9f*/
5948 0xf226, 0xf227, 0xf228, 0xf229, 0xf22a, 0xf22b, 0xf22c, 0xf22d, /*0xa0-0xaf*/
5949 0xf22e, 0xf22f, 0xf230, 0xf231, 0xf232, 0xf233, 0xf234, 0xf235, /*0xb0-0xbf*/
5950 0xf236, 0xf237, 0xf238, 0xf239, 0xf23a, 0xf23b, 0xf23c, 0xf23d, /*0xc0-0xcf*/
5951 0xf23e, 0xf23f, 0xf240, 0xf241, 0xf242, 0xf243, 0xf244, 0xf245, /*0xd0-0xdf*/
5952 0xf246, 0xf247, 0xf248, 0xf249, 0xf24a, 0xf24b, 0xf24c, 0xf24d, /*0xe0-0xef*/
5953 0xf24e, 0xf24f, 0xf250, 0xf251, 0xf252, 0xf253, 0xf254, 0xf255, /*0xf0-0xff*/
5954 0xf256, 0xf257, 0xf258, 0xf259, 0xf25a, 0xf25b, 0xf25c, 0xf25d, /*0x00-0x07*/
5955 0xf25e, 0xf25f, 0xf260, 0xf261, 0xf262, 0xf263, 0xf264, 0xf265, /*0x08-0x0f*/
5956 0xf266, 0xf267, 0xf268, 0xf269, 0xf26a, 0xf26b, 0xf26c, 0xf26d, /*0x10-0x17*/
5957 0xf26e, 0xf26f, 0xf270, 0xf271, 0xf272, 0xf273, 0xf274, 0xf275, /*0x18-0x1f*/
5958 0xf276, 0xf277, 0xf278, 0xf279, 0xf27a, 0xf27b, 0xf27c, 0xf27d, /*0x20-0x27*/
5959 0xf27e, 0xf27f, 0xf280, 0xf281, 0xf282, 0xf283, 0xf284, 0xf285, /*0x28-0x2f*/
5960 0xf286, 0xf287, 0xf288, 0xf289, 0xf28a, 0xf28b, 0xf28c, 0xf28d, /*0x30-0x37*/
5961 0xf28e, 0xf28f, 0xf290, 0xf291, 0xf292, 0xf293, 0xf294, 0xf295, /*0x38-0x3f*/
5962 0xf296, 0xf297, 0xf298, 0xf299, 0xf29a, 0xf29b, 0xf29c, 0xf29d, /*0x40-0x47*/
5963 0xf29e, 0xf29f, 0xf300, 0xf301, 0xf302, 0xf303, 0xf304, 0xf305, /*0x48-0x4f*/
5964 0xf306, 0xf307, 0xf308, 0xf309, 0xf30a, 0xf30b, 0xf30c, 0xf30d, /*0x50-0x57*/
5965 0xf30e, 0xf30f, 0xf310, 0xf311, 0xf312, 0xf313, 0xf314, 0xf315, /*0x58-0x5f*/
5966 0xf316, 0xf317, 0xf318, 0xf319, 0xf31a, 0xf31b, 0xf31c, 0xf31d, /*0x60-0x6f*/
5967 0xf31e, 0xf31f, 0xf320, 0xf321, 0xf322, 0xf323, 0xf324, 0xf325, /*0x70-0x7f*/
5968 0xf326, 0xf327, 0xf328, 0xf329, 0xf32a, 0xf32b, 0xf32c, 0xf32d, /*0x80-0x8f*/
5969 0xf32e, 0xf32f, 0xf330, 0xf331, 0xf332, 0xf333, 0xf334, 0xf335, /*0x90-0x9f*/
5970 0xf336, 0xf337, 0xf338, 0xf339, 0xf33a, 0xf33b, 0xf33c, 0xf33d, /*0xa0-0xaf*/
5971 0xf33e, 0xf33f, 0xf340, 0xf341, 0xf342, 0xf343, 0xf344, 0xf345, /*0xb0-0xbf*/
5972 0xf346, 0xf347, 0xf348, 0xf349, 0xf34a, 0xf34b, 0xf34c, 0xf34d, /*0xc0-0xcf*/
5973 0xf34e, 0xf34f, 0xf350, 0xf351, 0xf352, 0xf353, 0xf354, 0xf355, /*0xd0-0xdf*/
5974 0xf356, 0xf357, 0xf358, 0xf359, 0xf35a, 0xf35b, 0xf35c, 0xf35d, /*0xe0-0xef*/
5975 0xf35e, 0xf35f, 0xf360, 0xf361, 0xf362, 0xf363, 0xf364, 0xf365, /*0xf0-0xff*/
5976 0xf366, 0xf367, 0xf368, 0xf369, 0xf36a, 0xf36b, 0xf36c, 0xf36d, /*0x00-0x07*/
5977 0xf36e, 0xf36f, 0xf370, 0xf371, 0xf372, 0xf373, 0xf374, 0xf375, /*0x08-0x0f*/
5978 0xf376, 0xf377, 0xf378, 0xf379, 0xf37a, 0xf37b, 0xf37c, 0xf37d, /*0x10-0x17*/
5979 0xf37e, 0xf37f, 0xf380, 0xf381, 0xf382, 0xf383, 0xf384, 0xf385, /*0x18-0x1f*/
5980 0xf386, 0xf387, 0xf388, 0xf389, 0xf38a, 0xf38b, 0xf38c, 0xf38d, /*0x20-0x27*/
5981 0xf38e, 0xf38f, 0xf390, 0xf391, 0xf392, 0xf393, 0xf394, 0xf395, /*0x28-0x2f*/
5982 0xf396, 0xf397, 0xf398, 0xf399, 0xf39a, 0xf39b, 0xf39c, 0xf39d, /*0x30-0x37*/
5983 0xf39e, 0xf39f, 0xf400, 0xf401, 0xf402, 0xf403, 0xf404, 0xf405, /*0x38-0x3f*/
5984 0xf406, 0xf407, 0xf408, 0xf409, 0xf40a, 0xf40b, 0xf40c, 0xf40d, /*0x40-0x47*/
5985 0xf40e, 0xf40f, 0xf410, 0xf411, 0xf412, 0xf413, 0xf414, 0xf415, /*0x48-0x4f*/
5986 0xf416, 0xf417, 0xf418, 0xf419, 0xf41a, 0xf41b, 0xf41c, 0xf41d, /*0x50-0x57*/
5987 0xf41e, 0xf41f, 0xf420, 0xf421, 0xf422, 0xf423, 0xf424, 0xf425, /*0x58-0x5f*/
5988 0xf426, 0xf427, 0xf428, 0xf429, 0xf42a, 0xf42b, 0xf42c, 0xf42d, /*0x60-0x6f*/
5989 0xf42e, 0xf42f, 0xf430, 0xf431, 0xf432, 0xf433, 0xf434, 0xf435, /*0x68-0x6f*/
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5990 0xf495, 0xf496, 0xf497, 0xf498, 0xf499, 0xf49a, 0xf49b, 0xf49c, /*0x70-0x77*/
5991 0xf49d, 0xf49e, 0xf49f, 0xf4a0, 0xf540, 0xf541, 0xf542, 0xf543, /*0x78-0x7f*/
5992 0xf544, 0xf545, 0xf546, 0xf547, 0xf548, 0xf549, 0xf54a, 0xf54b, /*0x80-0x87*/
5993 0xf54c, 0xf54d, 0xf54e, 0xf54f, 0xf550, 0xf551, 0xf552, 0xf553, /*0x88-0x8f*/
5994 0xf554, 0xf555, 0xf556, 0xf557, 0xf558, 0xf559, 0xf55a, 0xf55b, /*0x90-0x97*/
5995 0xf55c, 0xf55d, 0xf55e, 0xf55f, 0xf560, 0xf561, 0xf562, 0xf563, /*0x98-0x9f*/
5996 0xf564, 0xf565, 0xf566, 0xf567, 0xf568, 0xf569, 0xf56a, 0xf56b, /*0xa0-0xa7*/
5997 0xf56c, 0xf56d, 0xf56e, 0xf56f, 0xf570, 0xf571, 0xf572, 0xf573, /*0xa8-0xaf*/
5998 0xf574, 0xf575, 0xf576, 0xf577, 0xf578, 0xf579, 0xf57a, 0xf57b, /*0xb0-0xbf*/
5999 0xf57c, 0xf57d, 0xf57e, 0xf580, 0xf581, 0xf582, 0xf583, 0xf584, /*0xb8-0xbf*/
6000 0xf585, 0xf586, 0xf587, 0xf588, 0xf589, 0xf58a, 0xf58b, 0xf58c, /*0xc0-0xcf*/
6001 0xf58d, 0xf58e, 0xf58f, 0xf590, 0xf591, 0xf592, 0xf593, 0xf594, /*0xc8-0xcf*/
6002 0xf595, 0xf596, 0xf597, 0xf598, 0xf599, 0xf59a, 0xf59b, 0xf59c, /*0xd0-0xdf*/
6003 0xf59d, 0xf59e, 0xf59f, 0xf5a0, 0xf640, 0xf641, 0xf642, 0xf643, /*0xd8-0xdf*/
6004 0xf644, 0xf645, 0xf646, 0xf647, 0xf648, 0xf649, 0xf64a, 0xf64b, /*0xe0-0xef*/
6005 0xf64c, 0xf64d, 0xf64e, 0xf64f, 0xf650, 0xf651, 0xf652, 0xf653, /*0xe8-0xef*/
6006 0xf654, 0xf655, 0xf656, 0xf657, 0xf658, 0xf659, 0xf65a, 0xf65b, /*0xf0-0xff*/
6007 0xf65c, 0xf65d, 0xf65e, 0xf65f, 0xf660, 0xf661, 0xf662, 0xf663, /*0xf8-0xff*/
6008 /* 0x9c00 */
6009 0xf664, 0xf665, 0xf666, 0xf667, 0xf668, 0xf669, 0xf66a, 0xf66b, /*0x00-0x07*/
6010 0xf66c, 0xf66d, 0xf66e, 0xf66f, 0xf670, 0xf671, 0xf672, 0xf673, /*0x08-0x0f*/
6011 0xf674, 0xf675, 0xf676, 0xf677, 0xf678, 0xf679, 0xf67a, 0xf67b, /*0x10-0x17*/
6012 0xf67c, 0xf67d, 0xf67e, 0xf680, 0xf681, 0xf682, 0xf683, 0xf684, /*0x18-0x1f*/
6013 0xf685, 0xf686, 0xf687, 0xf688, 0xf689, 0xf68a, 0xf68b, 0xf68c, /*0x20-0x27*/
6014 0xf68d, 0xf68e, 0xf68f, 0xf690, 0xf691, 0xf692, 0xf693, 0xf694, /*0x28-0x2f*/
6015 0xf695, 0xf696, 0xf697, 0xf698, 0xf699, 0xf69a, 0xf69b, 0xf69c, /*0x30-0x37*/
6016 0xf69d, 0xf69e, 0xf69f, 0xf6a0, 0xf740, 0xf741, 0xf742, 0xf743, /*0x38-0x3f*/
6017 0xf744, 0xf745, 0xf746, 0xf747, 0xf748, 0xf749, 0xf74a, 0xf74b, /*0x40-0x47*/
6018 0xf74c, 0xf74d, 0xf74e, 0xf74f, 0xf750, 0xf751, 0xf752, 0xf753, /*0x48-0x4f*/
6019 0xf754, 0xf755, 0xf756, 0xf757, 0xf758, 0xf759, 0xf75a, 0xf75b, /*0x50-0x57*/
6020 0xf75c, 0xf75d, 0xf75e, 0xf75f, 0xf760, 0xf761, 0xf762, 0xf763, /*0x58-0x5f*/
6021 0xf764, 0xf765, 0xf766, 0xf767, 0xf768, 0xf769, 0xf76a, 0xf76b, /*0x60-0x67*/
6022 0xf76c, 0xf76d, 0xf76e, 0xf76f, 0xf770, 0xf771, 0xf772, 0xf773, /*0x68-0x6f*/
6023 0xf774, 0xf775, 0xf776, 0xf777, 0xf778, 0xf779, 0xf77a, 0xf77b, /*0x70-0x77*/
6024 0xf77c, 0xf77d, 0xf77e, 0xf780, 0xd3e3, 0xf781, 0xf782, 0xf6cf, /*0x78-0x7f*/
6025 0xf783, 0xc2b3, 0xf6d0, 0xf784, 0xf785, 0xf6d1, 0xf6d2, 0xf6d3, /*0x80-0x87*/
6026 0xf6d4, 0xf786, 0xf787, 0xf6d6, 0xf788, 0xb1ab, 0xf6d7, 0xf789, /*0x88-0x8f*/
6027 0xf6d8, 0xf6d9, 0xf6da, 0xf78a, 0xf6db, 0xf6dc, 0xf78b, 0xf78c, /*0x90-0x97*/
6028 0xf78d, 0xf78e, 0xf6dd, 0xf6de, 0xcfcf, 0xf78f, 0xf6df, 0xf6e0, /*0x98-0x9f*/
6029 0xf6e1, 0xf6e2, 0xf6e3, 0xf6e4, 0xc0f0, 0xf6e5, 0xf6e6, 0xf6e7, /*0xa0-0xaf*/
6030 0xf6e8, 0xf6e9, 0xf790, 0xf6ea, 0xf791, 0xf6eb, 0xf6ec, 0xf792, /*0xa8-0xaf*/
6031 0xf6ed, 0xf6ee, 0xf6ef, 0xf6f0, 0xf6f1, 0xf6f2, 0xf6f3, 0xf6f4, /*0xb0-0xbf*/
6032 0xbea8, 0xf793, 0xf6f5, 0xf6f6, 0xf6f7, 0xf6f8, 0xf794, 0xf795, /*0xb8-0xbf*/
6033 0xf796, 0xf797, 0xf798, 0xc8fa, 0xf6f9, 0xf6fa, 0xf6fb, 0xf6fc, /*0xc0-0xcf*/
6034 0xf799, 0xf79a, 0xf6fd, 0xf6fe, 0xf7a1, 0xf7a2, 0xf7a3, 0xf7a4, /*0xc8-0xcf*/
6035 0xf7a5, 0xf79b, 0xf79c, 0xf7a6, 0xf7a7, 0xf7a8, 0xb1ee, 0xf7a9, /*0xd0-0xdf*/
6036 0xf7aa, 0xf7ab, 0xf79d, 0xf79e, 0xf7ac, 0xf7ad, 0xc1db, 0xf7ae, /*0xd8-0xdf*/
6037 0xf79f, 0xf7a0, 0xf7af, 0xf840, 0xf841, 0xf842, 0xf843, 0xf844, /*0xe0-0xef*/
6038 0xf845, 0xf846, 0xf847, 0xf848, 0xf849, 0xf84a, 0xf84b, 0xf84c, /*0xe8-0xef*/
6039 0xf84d, 0xf84e, 0xf84f, 0xf850, 0xf851, 0xf852, 0xf853, 0xf854, /*0xf0-0xff*/
6040 0xf855, 0xf856, 0xf857, 0xf858, 0xf859, 0xf85a, 0xf85b, 0xf85c, /*0xf8-0xff*/
6041 /* 0x9d00 */
6042 0xf85d, 0xf85e, 0xf85f, 0xf860, 0xf861, 0xf862, 0xf863, 0xf864, /*0x00-0x07*/
6043 0xf865, 0xf866, 0xf867, 0xf868, 0xf869, 0xf86a, 0xf86b, 0xf86c, /*0x08-0x0f*/
6044 0xf86d, 0xf86e, 0xf86f, 0xf870, 0xf871, 0xf872, 0xf873, 0xf874, /*0x10-0x17*/
6045 0xf875, 0xf876, 0xf877, 0xf878, 0xf879, 0xf87a, 0xf87b, 0xf87c, /*0x18-0x1f*/
6046 0xf87d, 0xf87e, 0xf880, 0xf881, 0xf882, 0xf883, 0xf884, 0xf885, /*0x20-0x27*/
6047 0xf886, 0xf887, 0xf888, 0xf889, 0xf88a, 0xf88b, 0xf88c, 0xf88d, /*0x28-0x2f*/
6048 0xf88e, 0xf88f, 0xf890, 0xf891, 0xf892, 0xf893, 0xf894, 0xf895, /*0x30-0x37*/
6049 0xf896, 0xf897, 0xf898, 0xf899, 0xf89a, 0xf89b, 0xf89c, 0xf89d, /*0x38-0x3f*/
6050 0xf89e, 0xf89f, 0xf8a0, 0xf940, 0xf941, 0xf942, 0xf943, 0xf944, /*0x40-0x47*/
6051 0xf945, 0xf946, 0xf947, 0xf948, 0xf949, 0xf94a, 0xf94b, 0xf94c, /*0x48-0x4f*/
6052 0xf94d, 0xf94e, 0xf94f, 0xf950, 0xf951, 0xf952, 0xf953, 0xf954, /*0x50-0x57*/
6053 0xf955, 0xf956, 0xf957, 0xf958, 0xf959, 0xf95a, 0xf95b, 0xf95c, /*0x58-0x5f*/
6054 0xf95d, 0xf95e, 0xf95f, 0xf960, 0xf961, 0xf962, 0xf963, 0xf964, /*0x60-0x67*/
6055 0xf965, 0xf966, 0xf967, 0xf968, 0xf969, 0xf96a, 0xf96b, 0xf96c, /*0x68-0x6f*/
6056 0xf96d, 0xf96e, 0xf96f, 0xf970, 0xf971, 0xf972, 0xf973, 0xf974, /*0x70-0x77*/
6057 0xf975, 0xf976, 0xf977, 0xf978, 0xf979, 0xf97a, 0xf97b, 0xf97c, /*0x78-0x7f*/
6058 0xf97d, 0xf97e, 0xf980, 0xf981, 0xf982, 0xf983, 0xf984, 0xf985, /*0x80-0x87*/
6059 0xf986, 0xf987, 0xf988, 0xf989, 0xf98a, 0xf98b, 0xf98c, 0xf98d, /*0x88-0x8f*/
6060 0xf98e, 0xf98f, 0xf990, 0xf991, 0xf992, 0xf993, 0xf994, 0xf995, /*0x90-0x97*/
6061 0xf996, 0xf997, 0xf998, 0xf999, 0xf99a, 0xf99b, 0xf99c, 0xf99d, /*0x98-0x9f*/
6062 0xf99e, 0xf99f, 0xf9a0, 0xf9a1, 0xf9a2, 0xf9a3, 0xf9a4, 0xf9a5, /*0xa0-0xaf*/
6063 0xf9a6, 0xf9a7, 0xf9a8, 0xf9a9, 0xf9aa, 0xf9ab, 0xf9ac, 0xf9ad, /*0xa8-0xaf*/
6064 0xf9ae, 0xf9af, 0xf9b0, 0xf9b1, 0xf9b2, 0xf9b3, 0xf9b4, 0xf9b5, /*0xb0-0xbf*/
6065 0xf9b6, 0xf9b7, 0xf9b8, 0xf9b9, 0xf9ba, 0xf9bb, 0xf9bc, 0xf9bd, /*0xb8-0xbf*/
6066 0xf9be, 0xf9bf, 0xf9c0, 0xf9c1, 0xf9c2, 0xf9c3, 0xf9c4, 0xf9c5, /*0xc0-0xcf*/
6067 0xf9c6, 0xf9c7, 0xf9c8, 0xf9c9, 0xf9ca, 0xf9cb, 0xf9cc, 0xf9cd, /*0xc8-0xcf*/
6068 0xf9ce, 0xf9cf, 0xf9d0, 0xf9d1, 0xf9d2, 0xf9d3, 0xf9d4, 0xf9d5, /*0xd0-0xdf*/
6069 0xf9d6, 0xf9d7, 0xf9d8, 0xf9d9, 0xf9da, 0xf9db, 0xf9dc, 0xf9dd, /*0xd8-0xdf*/
6070 0xf9de, 0xf9df, 0xf9e0, 0xf9e1, 0xf9e2, 0xf9e3, 0xf9e4, 0xf9e5, /*0xe0-0xef*/
6071 0xf9e6, 0xf9e7, 0xf9e8, 0xf9e9, 0xf9ea, 0xf9eb, 0xf9ec, 0xf9ed, /*0xe8-0xef*/
6072 0xf9ee, 0xf9ef, 0xf9f0, 0xf9f1, 0xf9f2, 0xf9f3, 0xf9f4, 0xf9f5, /*0xf0-0xff*/
6073 0xf9f6, 0xf9f7, 0xf9f8, 0xf9f9, 0xf9fa, 0xf9fb, 0xf9fc, 0xf9fd, /*0xf8-0xff*/
6074 /* 0x9e00 */
6075 0xf9fe, 0xf9ff, 0xf9fa, 0xf9fb, 0xf9fc, 0xf9fd, 0xf9fe, 0xf9ff, /*0x00-0x07*/
6076 0xf9fa, 0xf9fb, 0xf9fc, 0xf9fd, 0xf9fe, 0xf9ff, 0xf9fa, 0xf9fb, /*0x08-0x0f*/
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6077 0xfb4d, 0xfb4e, 0xfb4f, 0xfb50, 0xfb51, 0xfb52, 0xfb53, 0xfb54, /*0x10-0x17*/
6078 0xfb55, 0xfb56, 0xfb57, 0xfb58, 0xfb59, 0xfb5a, 0xfb5b, 0xc4f1, /*0x18-0x1f*/
6079 0xf0af, 0xbca6, 0xf0b0, 0xc3f9, 0xfb5c, 0xc5b8, 0xd1bb, 0xfb5d, /*0x20-0x27*/
6080 0xf0b1, 0xf0b2, 0xf0b3, 0xf0b4, 0xf0b5, 0xd1bc, 0xfb5e, 0xd1ec, /*0x28-0x2f*/
6081 0xfb5f, 0xf0b7, 0xf0b6, 0xd4a7, 0xfb60, 0xcd2, 0xf0b8, 0xf0ba, /*0x30-0x37*/
6082 0xf0b9, 0xf0bb, 0xf0bc, 0xfb61, 0xfb62, 0xb8eb, 0xf0bd, 0xbae8, /*0x38-0x3f*/
6083 0xfb63, 0xf0be, 0xf0bf, 0xb6e9, 0xf0c0, 0xb6ec, 0xf0c1, 0xf0c2, /*0x40-0x47*/
6084 0xf0c3, 0xf0c4, 0xc8b5, 0xf0c5, 0xf0c6, 0xfb64, 0xf0c7, 0xc5f4, /*0x48-0x4f*/
6085 0xfb65, 0xf0c8, 0xfb66, 0xfb67, 0xfb68, 0xf0c9, 0xfb69, 0xf0ca, /*0x50-0x57*/
6086 0xf7bd, 0xfb6a, 0xf0cb, 0xf0cc, 0xf0cd, 0xfb6b, 0xf0ce, 0xfb6c, /*0x58-0x5f*/
6087 0xfb6d, 0xfb6e, 0xfb6f, 0xf0cf, 0xbad7, 0xfb70, 0xf0d0, 0xf0d1, /*0x60-0x67*/
6088 0xf0d2, 0xf0d3, 0xf0d4, 0xf0d5, 0xf0d6, 0xf0d8, 0xfb71, 0xfb72, /*0x68-0x6f*/
6089 0xd3a5, 0xf0d7, 0xfb73, 0xf0d9, 0xfb74, 0xfb75, 0xfb76, 0xfb77, /*0x70-0x77*/
6090 0xfb78, 0xfb79, 0xfb7a, 0xfb7b, 0xfb7c, 0xfb7d, 0xf5ba, 0xc2b9, /*0x78-0x7f*/
6091 0xfb7e, 0xfb80, 0xf7e4, 0xfb81, 0xfb82, 0xfb83, 0xfb84, 0xf7e5, /*0x80-0x87*/
6092 0xf7e6, 0xfb85, 0xfb86, 0xf7e7, 0xfb87, 0xfb88, 0xfb89, 0xfb8a, /*0x88-0x8f*/
6093 0xfb8b, 0xfb8c, 0xf7e8, 0xc2b4, 0xfb8d, 0xfb8e, 0xfb8f, 0xfb90, /*0x90-0x97*/
6094 0xfb91, 0xfb92, 0xfb93, 0xfb94, 0xfb95, 0xf7ea, 0xfb96, 0xf7eb, /*0x98-0x9f*/
6095 0xfb97, 0xfb98, 0xfb99, 0xfb9a, 0xfb9b, 0xfb9c, 0xc2f3, 0xfb9d, /*0xa0-0xa7*/
6096 0xfb9e, 0xfb9f, 0xfba0, 0xfc40, 0xfc41, 0xfc42, 0xfc43, 0xfc44, /*0xa8-0xaf*/
6097 0xfc45, 0xfc46, 0xfc47, 0xfc48, 0xfc49, 0xfc4a, 0xfc4b, 0xb0, 0xb7, /*0xb0-0xb7*/
6098 0xf4ef, 0xfc4c, 0xfc4d, 0xc2e9, 0xfc4e, 0xf7e1, 0xf7e2, 0xfc4f, /*0xb8-0xbf*/
6099 0xfc50, 0xfc51, 0xfc52, 0xfc53, 0xbbc6, 0xfc54, 0xfc55, 0xfc56, /*0xc0-0xcf*/
6100 0xfc57, 0xd9e4, 0xfc58, 0xfc59, 0xfc5a, 0xc2f4, 0xc0e8, 0xf0a4, /*0xc8-0xcf*/
6101 0xfc5b, 0xbada, 0xfc5c, 0xfc5d, 0xc7ad, 0xfc5e, 0xfc5f, 0xfc60, /*0xd0-0xdf*/
6102 0xc4ac, 0xfc61, 0xfc62, 0xf7ec, 0xf7ed, 0xf7ee, 0xfc63, 0xf7f0, /*0xd8-0xdf*/
6103 0xf7ef, 0xfc64, 0xf7f1, 0xfc65, 0xfc66, 0xf7f4, 0xfc67, 0xf7f3, /*0xe0-0xef*/
6104 0xfc68, 0xf7f2, 0xf7f5, 0xfc69, 0xfc6a, 0xfc6b, 0xfc6c, 0xf7f6, /*0xe8-0xef*/
6105 0xfc6d, 0xfc6e, 0xfc6f, 0xfc70, 0xfc71, 0xfc72, 0xfc73, 0xfc74, /*0xf0-0xf7*/
6106 0xfc75, 0xede9, 0xfc76, 0xede8, 0xede9, 0xede7, 0xfc77, 0xf6bc, 0xfc78, /*0xf8-0xff*/
6107 /* 0x9f00 */
6108 0xfc79, 0xfc7a, 0xfc7b, 0xfc7c, 0xfc7d, 0xfc7e, 0xfc80, 0xfc81, /*0x00-0x07*/
6109 0xfc82, 0xfc83, 0xfc84, 0xf6bd, 0xfc85, 0xf6be, 0xb6a6, 0xfc86, /*0x08-0x0f*/
6110 0xd8be, 0xfc87, 0xfc88, 0xb9c4, 0xfc89, 0xfc8a, 0xfc8b, 0xd8bb, /*0x10-0x17*/
6111 0xfc8c, 0xdcbl, 0xfc8d, 0xfc8e, 0xfc8f, 0xfc90, 0xfc91, 0xfc92, /*0x18-0x1f*/
6112 0xc2f3, 0xfc93, 0xf7f7, 0xfc94, 0xfc95, 0xfc96, 0xfc97, 0xfc98, /*0x20-0x27*/
6113 0xfc99, 0xfc9a, 0xfc9b, 0xfc9c, 0xf7f8, 0xfc9d, 0xfc9e, 0xf7f9, /*0x28-0x2f*/
6114 0xfc9f, 0xfca0, 0xfd40, 0xfd41, 0xfd42, 0xfd43, 0xfd44, 0xf7fb, /*0x30-0x37*/
6115 0xfd45, 0xf7fa, 0xfd46, 0xb1c7, 0xfd47, 0xf7fc, 0xf7fd, 0xfd48, /*0x38-0x3f*/
6116 0xfd49, 0xfd4a, 0xfd4b, 0xfd4c, 0xf7fe, 0xfd4d, 0xfd4e, 0xfd4f, /*0x40-0x47*/
6117 0xfd50, 0xfd51, 0xfd52, 0xfd53, 0xfd54, 0xfd55, 0xfd56, 0xfd57, /*0x48-0x4f*/
6118 0xc6eb, 0xecb4, 0xfd58, 0xfd59, 0xfd5a, 0xfd5b, 0xfd5c, 0xfd5d, /*0x50-0x57*/
6119 0xfd5e, 0xfd5f, 0xfd60, 0xfd61, 0xfd62, 0xfd63, 0xfd64, 0xfd65, /*0x58-0x5f*/
6120 0xfd66, 0xfd67, 0xfd68, 0xfd69, 0xfd6a, 0xfd6b, 0xfd6c, 0xfd6d, /*0x60-0x67*/
6121 0xfd6e, 0xfd6f, 0xfd70, 0xfd71, 0xfd72, 0xfd73, 0xfd74, 0xfd75, /*0x68-0x6f*/
6122 0xfd76, 0xfd77, 0xfd78, 0xfd79, 0xfd7a, 0xfd7b, 0xfd7c, 0xfd7d, /*0x70-0x77*/
6123 0xfd7e, 0xfd80, 0xfd81, 0xfd82, 0xfd83, 0xfd84, 0xfd85, 0xb3dd, /*0x78-0x7f*/
6124 0xfd86, 0xfd87, 0xf6b4, 0xc1e4, 0xf6b5, 0xf6b6, 0xf6b7, /*0x80-0x87*/
6125 0xf6b8, 0xf6b9, 0xf6ba, 0xc8a3, 0xf6bb, 0xfd88, 0xfd89, 0xfd8a, /*0x88-0x8f*/
6126 0xfd8b, 0xfd8c, 0xfd8d, 0xfd8e, 0xfd8f, 0xfd90, 0xfd91, 0xfd92, /*0x90-0x97*/
6127 0xfd93, 0xc1fa, 0xb9a8, 0xede8, 0xfd94, 0xfd95, 0xf6bc, 0xb9ea, /*0x98-0x9f*/
6128 0xd9df, 0xfd97, 0xfd98, 0xfd99, 0xfd9a, 0xfd9b, 0x0000, 0x0000, /*0xa0-0xaf*/
6129 };
6130 static const unsigned short cp936ext_pagelf2f[32] = {
6131 0x0000, 0xfd9d, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x78-0x7f*/
6132 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x80-0x87*/
6133 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x88-0x8f*/
6134 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xfd9e, 0x0000, 0x0000, /*0x90-0x97*/
6135 };
6136 static const unsigned short cp936ext_pagelf3c[24] = {
6137 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xfd9f, /*0xe0-0xef*/
6138 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xe8-0xef*/
6139 0x0000, 0xfda0, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0xf0-0xf7*/
6140 };
6141 static const unsigned short cp936ext_pagelf41[40] = {
6142 0x0000, 0x0000, 0x0000, 0x0000, 0xfe40, 0xfe41, 0xfe42, 0xfe43, /*0x08-0x0f*/
6143 0x0000, 0xfe44, 0x0000, 0xfe45, 0xfe46, 0x0000, 0x0000, 0x0000, /*0x10-0x17*/
6144 0xfe47, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0xfe48, /*0x18-0x1f*/
6145 0xfe49, 0xfe4a, 0x0000, 0xfe4b, 0xfe4c, 0x0000, 0x0000, 0xfe4d, /*0x20-0x27*/
6146 0xfe4e, 0xfe4f, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000, /*0x28-0x2f*/
6147 };
6148 static const unsigned short cp936ext_pagelfc6[64] = {
6149 0xa955, 0xa6f2, 0x0000, 0xa6f4, 0xa6f5, 0xa6e0, 0xa6e1, 0xa6f0, /*0x30-0x37*/
6150 0xa6f1, 0xa6e2, 0xa6e3, 0xa6ee, 0xa6ef, 0xa6e6, 0xa6e7, 0xa6e4, /*0x38-0x3f*/
6151 0xa6e5, 0xa6e8, 0xa6e9, 0xa6ea, 0xa6eb, 0x0000, 0x0000, 0x0000, /*0x40-0x47*/
6152 0x0000, 0xa968, 0xa969, 0xa96a, 0xa96b, 0xa96c, 0xa96d, 0xa96e, /*0x48-0x4f*/
6153 0xa96f, 0xa970, 0xa971, 0x0000, 0xa972, 0xa973, 0xa974, 0xa975, /*0x50-0x57*/
6154 0x0000, 0xa976, 0xa977, 0xa978, 0xa979, 0xa97a, 0xa97b, 0xa97c, /*0x58-0x5f*/
6155 0xa97d, 0xa97e, 0xa980, 0xa981, 0xa982, 0xa983, 0xa984, 0x0000, /*0x60-0x67*/
6156 0xa985, 0xa986, 0xa987, 0xa988, 0x0000, 0x0000, 0x0000, 0x0000, /*0x68-0x6f*/
6157 };
6158 static const unsigned short cp936ext_pagelfe0[96] = {
6159 0x0000, 0xa3a1, 0xa3a2, 0xa3a3, 0xa3a4, 0xa3a5, 0xa3a6, 0xa3a7, /*0x00-0x07*/
6160 0xa3a8, 0xa3a9, 0xa3aa, 0xa3ab, 0xa3ac, 0xa3ad, 0xa3ae, 0xa3af, /*0x08-0x0f*/
6161 0xa3b0, 0xa3b1, 0xa3b2, 0xa3b3, 0xa3b4, 0xa3b5, 0xa3b6, 0xa3b7, /*0x10-0x17*/
6162 0xa3b8, 0xa3b9, 0xa3ba, 0xa3bb, 0xa3bc, 0xa3bd, 0xa3be, 0xa3bf, /*0x18-0x1f*/
6163 0xa3c0, 0xa3c1, 0xa3c2, 0xa3c3, 0xa3c4, 0xa3c5, 0xa3c6, 0xa3c7, /*0x20-0x27*/
```

```

6164 0xa3c8, 0xa3c9, 0xa3ca, 0xa3cb, 0xa3cc, 0xa3cd, 0xa3ce, 0xa3cf, /*0x28-0x2f*/
6165 0xa3d0, 0xa3d1, 0xa3d2, 0xa3d3, 0xa3d4, 0xa3d5, 0xa3d6, 0xa3d7, /*0x30-0x37*/
6166 0xa3d8, 0xa3d9, 0xa3da, 0xa3db, 0xa3dc, 0xa3dd, 0xa3de, 0xa3df, /*0x38-0x3f*/
6167 0xa3e0, 0xa3e1, 0xa3e2, 0xa3e3, 0xa3e4, 0xa3e5, 0xa3e6, 0xa3e7, /*0x40-0x47*/
6168 0xa3e8, 0xa3e9, 0xa3ea, 0xa3eb, 0xa3ec, 0xa3ed, 0xa3ee, 0xa3ef, /*0x48-0x4f*/
6169 0xa3f0, 0xa3f1, 0xa3f2, 0xa3f3, 0xa3f4, 0xa3f5, 0xa3f6, 0xa3f7, /*0x50-0x57*/
6170 0xa3f8, 0xa3f9, 0xa3fa, 0xa3fb, 0xa3fc, 0xa3fd, 0xalab, 0x0000, /*0x58-0x5f*/
6171 };
6172 static const unsigned short cp936ext_page1ffc[8] = {
6173 0xa1e9, 0xa1ea, 0xa956, 0xa3fe, 0xa957, 0xa3a4, 0x0000, 0x0000, /*0xe0-0xe7*/
6174 };
6175
6176 static int
6177 cp936ext_wctomb (conv_t conv, unsigned char *, ucs4_t wc, int n)
6178 {
6179     if (n >= 2) {
6180         unsigned short c = 0;
6181         if (wc >= 0x00a0 && wc < 0x0170)
6182             c = cp936ext_page0014[wc-0x00a0];
6183         else if (wc >= 0x01c8 && wc < 0x01e0)
6184             c = cp936ext_page0039[wc-0x01c8];
6185         else if (wc >= 0x0250 && wc < 0x0268)
6186             c = cp936ext_page004a[wc-0x0250];
6187         else if (wc >= 0x02c0 && wc < 0x02e0)
6188             c = cp936ext_page0058[wc-0x02c0];
6189         else if (wc >= 0x0390 && wc < 0x03d0)
6190             c = cp936ext_page0072[wc-0x0390];
6191         else if (wc >= 0x0400 && wc < 0x0458)
6192             c = cp936ext_page0080[wc-0x0400];
6193         else if (wc >= 0x2010 && wc < 0x2040)
6194             c = cp936ext_page0402[wc-0x2010];
6195         else if (wc >= 0x2100 && wc < 0x21a0)
6196             c = cp936ext_page0420[wc-0x2100];
6197         else if (wc >= 0x2208 && wc < 0x22c0)
6198             c = cp936ext_page0441[wc-0x2208];
6199         else if (wc == 0x2312)
6200             c = 0xal0;
6201         else if (wc >= 0x2460 && wc < 0x24a0)
6202             c = cp936ext_page048c[wc-0x2460];
6203         else if (wc >= 0x2500 && wc < 0x25e8)
6204             c = cp936ext_page04a0[wc-0x2500];
6205         else if (wc >= 0x2600 && wc < 0x2648)
6206             c = cp936ext_page04c0[wc-0x2600];
6207         else if (wc >= 0x3000 && wc < 0x3130)
6208             c = cp936ext_page0600[wc-0x3000];
6209         else if (wc >= 0x3220 && wc < 0x3238)
6210             c = cp936ext_page0644[wc-0x3220];
6211         else if (wc == 0x32a3)
6212             c = 0xa949;
6213         else if (wc >= 0x3388 && wc < 0x33d8)
6214             c = cp936ext_page0671[wc-0x3388];
6215         else if (wc >= 0x4e00 && wc < 0x9fa8)
6216             c = cp936ext_page09c0[wc-0x4e00];
6217         else if (wc == 0xf92c)
6218             c = 0xfd9c;
6219         else if (wc >= 0xf978 && wc < 0xf998)
6220             c = cp936ext_page1f2f[wc-0xf978];
6221         else if (wc >= 0xf9e0 && wc < 0xf9f8)
6222             c = cp936ext_page1f3c[wc-0xf9e0];
6223         else if (wc >= 0xfa08 && wc < 0xfa30)
6224             c = cp936ext_page1f41[wc-0xfa08];
6225         else if (wc >= 0xfe30 && wc < 0xfe70)
6226             c = cp936ext_page1fc6[wc-0xfe30];
6227         else if (wc >= 0xff00 && wc < 0xff60)
6228             c = cp936ext_page1fe0[wc-0xff00];
6229         else if (wc >= 0xffe0 && wc < 0xffe8)
6230             c = cp936ext_page1ffc[wc-0xffe0];
6231         if (c != 0) {
6232             r[0] = (c >> 8); r[1] = (c & 0xff);
6233             return 2;
6234         }
6235         return RET_ILSEQ;
6236     }
6237     return RET_TOOSMALL;
6238 }
6239 #endif /* NEED_TOMB */
6240
6241 #endif /* CP936 */

```

## 34.265 gb2312.h

```

1 /* $XFree86: xc/lib/X11/locUniConv/gb2312.h,v 1.5 2003/05/27 22:26:29 tsi Exp $ */
2
3 /*
4 * GB2312.1980-0

```

```
5 */
6 #ifdef NEED_TOWC
7 static const unsigned short gb2312_2uni_page21[831] = {
8     /* 0x21 */
9     0x3000, 0x3001, 0x3002, 0x30fb, 0x02c9, 0x02c7, 0x00a8, 0x3003,
10     0x3005, 0x2015, 0xff5e, 0x2016, 0x2026, 0x2018, 0x2019, 0x201c,
11     0x201d, 0x3014, 0x3015, 0x3008, 0x3009, 0x300a, 0x300b, 0x300c,
12     0x300d, 0x300e, 0x300f, 0x3016, 0x3017, 0x3010, 0x3011, 0x00b1,
13     0x00d7, 0x00f7, 0x2236, 0x2227, 0x2228, 0x2211, 0x220f, 0x222a,
14     0x2229, 0x2208, 0x2237, 0x221a, 0x22a5, 0x2225, 0x2220, 0x2312,
15     0x2299, 0x222b, 0x222e, 0x2261, 0x224c, 0x2248, 0x223d, 0x221d,
16     0x2260, 0x226e, 0x226f, 0x2264, 0x2265, 0x221e, 0x2235, 0x2234,
17     0x2642, 0x2640, 0x00b0, 0x2032, 0x2033, 0x2103, 0xff04, 0x00a4,
18     0xffe0, 0xffe1, 0x2030, 0x00a7, 0x2116, 0x2606, 0x2605, 0x25cb,
19     0x25cf, 0x25ce, 0x25c7, 0x25c6, 0x25a1, 0x25a0, 0x25b3, 0x25b2,
20     0x203b, 0x2192, 0x2190, 0x2191, 0x2193, 0x3013,
21     /* 0x22 */
22     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
23     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
24     0x2488, 0x2489, 0x248a, 0x248b, 0x248c, 0x248d, 0x248e, 0x248f,
25     0x2490, 0x2491, 0x2492, 0x2493, 0x2494, 0x2495, 0x2496, 0x2497,
26     0x2498, 0x2499, 0x249a, 0x249b, 0x2474, 0x2475, 0x2476, 0x2477,
27     0x2478, 0x2479, 0x247a, 0x247b, 0x247c, 0x247d, 0x247e, 0x247f,
28     0x2480, 0x2481, 0x2482, 0x2483, 0x2484, 0x2485, 0x2486, 0x2487,
29     0x2460, 0x2461, 0x2462, 0x2463, 0x2464, 0x2465, 0x2466, 0x2467,
30     0x2468, 0x2469, 0xffffd, 0xffffd, 0x3220, 0x3221, 0x3222, 0x3223,
31     0x3224, 0x3225, 0x3226, 0x3227, 0x3228, 0x3229, 0xffffd, 0xffffd,
32     0x2160, 0x2161, 0x2162, 0x2163, 0x2164, 0x2165, 0x2166, 0x2167,
33     0x2168, 0x2169, 0x216a, 0x216b, 0xffffd, 0xffffd,
34     /* 0x23 */
35     0xff01, 0xff02, 0xff03, 0xffe5, 0xff05, 0xff06, 0xff07, 0xff08,
36     0xff09, 0xff0a, 0xff0b, 0xff0c, 0xff0d, 0xff0e, 0xff0f, 0xff10,
37     0xff11, 0xff12, 0xff13, 0xff14, 0xff15, 0xff16, 0xff17, 0xff18,
38     0xff19, 0xff1a, 0xff1b, 0xff1c, 0xff1d, 0xff1e, 0xff1f, 0xff20,
39     0xff21, 0xff22, 0xff23, 0xff24, 0xff25, 0xff26, 0xff27, 0xff28,
40     0xff29, 0xff2a, 0xff2b, 0xff2c, 0xff2d, 0xff2e, 0xff2f, 0xff30,
41     0xff31, 0xff32, 0xff33, 0xff34, 0xff35, 0xff36, 0xff37, 0xff38,
42     0xff39, 0xff3a, 0xff3b, 0xff3c, 0xff3d, 0xff3e, 0xff3f, 0xff40,
43     0xff41, 0xff42, 0xff43, 0xff44, 0xff45, 0xff46, 0xff47, 0xff48,
44     0xff49, 0xff4a, 0xff4b, 0xff4c, 0xff4d, 0xff4e, 0xff4f, 0xff50,
45     0xff51, 0xff52, 0xff53, 0xff54, 0xff55, 0xff56, 0xff57, 0xff58,
46     0xff59, 0xff5a, 0xff5b, 0xff5c, 0xff5d, 0xffe3,
47     /* 0x24 */
48     0x3041, 0x3042, 0x3043, 0x3044, 0x3045, 0x3046, 0x3047, 0x3048,
49     0x3049, 0x304a, 0x304b, 0x304c, 0x304d, 0x304e, 0x304f, 0x3050,
50     0x3051, 0x3052, 0x3053, 0x3054, 0x3055, 0x3056, 0x3057, 0x3058,
51     0x3059, 0x305a, 0x305b, 0x305c, 0x305d, 0x305e, 0x305f, 0x3060,
52     0x3061, 0x3062, 0x3063, 0x3064, 0x3065, 0x3066, 0x3067, 0x3068,
53     0x3069, 0x306a, 0x306b, 0x306c, 0x306d, 0x306e, 0x306f, 0x3070,
54     0x3071, 0x3072, 0x3073, 0x3074, 0x3075, 0x3076, 0x3077, 0x3078,
55     0x3079, 0x307a, 0x307b, 0x307c, 0x307d, 0x307e, 0x307f, 0x3080,
56     0x3081, 0x3082, 0x3083, 0x3084, 0x3085, 0x3086, 0x3087, 0x3088,
57     0x3089, 0x308a, 0x308b, 0x308c, 0x308d, 0x308e, 0x308f, 0x3090,
58     0x3091, 0x3092, 0x3093, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
59     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
60     /* 0x25 */
61     0x30a1, 0x30a2, 0x30a3, 0x30a4, 0x30a5, 0x30a6, 0x30a7, 0x30a8,
62     0x30a9, 0x30aa, 0x30ab, 0x30ac, 0x30ad, 0x30ae, 0x30af, 0x30b0,
63     0x30b1, 0x30b2, 0x30b3, 0x30b4, 0x30b5, 0x30b6, 0x30b7, 0x30b8,
64     0x30b9, 0x30ba, 0x30bb, 0x30bc, 0x30bd, 0x30be, 0x30bf, 0x30c0,
65     0x30c1, 0x30c2, 0x30c3, 0x30c4, 0x30c5, 0x30c6, 0x30c7, 0x30c8,
66     0x30c9, 0x30ca, 0x30cb, 0x30cc, 0x30cd, 0x30ce, 0x30cf, 0x30d0,
67     0x30d1, 0x30d2, 0x30d3, 0x30d4, 0x30d5, 0x30d6, 0x30d7, 0x30d8,
68     0x30d9, 0x30da, 0x30db, 0x30dc, 0x30dd, 0x30de, 0x30df, 0x30e0,
69     0x30e1, 0x30e2, 0x30e3, 0x30e4, 0x30e5, 0x30e6, 0x30e7, 0x30e8,
70     0x30e9, 0x30ea, 0x30eb, 0x30ec, 0x30ed, 0x30ee, 0x30ef, 0x30f0,
71     0x30f1, 0x30f2, 0x30f3, 0x30f4, 0x30f5, 0x30f6, 0xffffd, 0xffffd,
72     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
73     /* 0x26 */
74     0x0391, 0x0392, 0x0393, 0x0394, 0x0395, 0x0396, 0x0397, 0x0398,
75     0x0399, 0x039a, 0x039b, 0x039c, 0x039d, 0x039e, 0x039f, 0x03a0,
76     0x03a1, 0x03a3, 0x03a4, 0x03a5, 0x03a6, 0x03a7, 0x03a8, 0x03a9,
77     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
78     0x03b1, 0x03b2, 0x03b3, 0x03b4, 0x03b5, 0x03b6, 0x03b7, 0x03b8,
79     0x03b9, 0x03ba, 0x03bb, 0x03bc, 0x03bd, 0x03be, 0x03bf, 0x03c0,
80     0x03c1, 0x03c3, 0x03c4, 0x03c5, 0x03c6, 0x03c7, 0x03c8, 0x03c9,
81     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
82     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
83     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
84     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
85     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
86     /* 0x27 */
87     0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0401, 0x0416,
88     0x0417, 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e,
89     0x041f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426,
90     0x0427, 0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e,
91     0x042f, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
```

```

92 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
93 0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0451, 0x0436,
94 0x0437, 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e,
95 0x043f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446,
96 0x0447, 0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e,
97 0x044f, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
98 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
99 /* 0x28 */
100 0x0101, 0x00e1, 0x01ce, 0x00e0, 0x0113, 0x00e9, 0x011b, 0x00e8,
101 0x012b, 0x00ed, 0x01d0, 0x00ec, 0x014d, 0x00f3, 0x01d2, 0x00f2,
102 0x016b, 0x00fa, 0x01d4, 0x00f9, 0x01d6, 0x01d8, 0x01da, 0x01dc,
103 0x00fc, 0x00ea, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
104 0xffff, 0xffff, 0xffff, 0xffff, 0x3105, 0x3106, 0x3107, 0x3108,
105 0x3109, 0x310a, 0x310b, 0x310c, 0x310d, 0x310e, 0x310f, 0x3110,
106 0x3111, 0x3112, 0x3113, 0x3114, 0x3115, 0x3116, 0x3117, 0x3118,
107 0x3119, 0x311a, 0x311b, 0x311c, 0x311d, 0x311e, 0x311f, 0x3120,
108 0x3121, 0x3122, 0x3123, 0x3124, 0x3125, 0x3126, 0x3127, 0x3128,
109 0x3129, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
110 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
111 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
112 /* 0x29 */
113 0xffff, 0xffff, 0xffff, 0x2500, 0x2501, 0x2502, 0x2503, 0x2504,
114 0x2505, 0x2506, 0x2507, 0x2508, 0x2509, 0x250a, 0x250b, 0x250c,
115 0x250d, 0x250e, 0x250f, 0x2510, 0x2511, 0x2512, 0x2513, 0x2514,
116 0x2515, 0x2516, 0x2517, 0x2518, 0x2519, 0x251a, 0x251b, 0x251c,
117 0x251d, 0x251e, 0x251f, 0x2520, 0x2521, 0x2522, 0x2523, 0x2524,
118 0x2525, 0x2526, 0x2527, 0x2528, 0x2529, 0x252a, 0x252b, 0x252c,
119 0x252d, 0x252e, 0x252f, 0x2530, 0x2531, 0x2532, 0x2533, 0x2534,
120 0x2535, 0x2536, 0x2537, 0x2538, 0x2539, 0x253a, 0x253b, 0x253c,
121 0x253d, 0x253e, 0x253f, 0x2540, 0x2541, 0x2542, 0x2543, 0x2544,
122 0x2545, 0x2546, 0x2547, 0x2548, 0x2549, 0x254a, 0x254b,
123 };
124 static const unsigned short gb2312_2uni_page30[6768] = {
125 /* 0x30 */
126 0x554a, 0x963f, 0x57c3, 0x6328, 0x54ce, 0x5509, 0x54c0, 0x7691,
127 0x764c, 0x853c, 0x77ee, 0x827e, 0x788d, 0x7231, 0x9698, 0x978d,
128 0x6c28, 0x5b89, 0x4ffa, 0x6309, 0x6697, 0x5cb8, 0x80fa, 0x6848,
129 0x80ae, 0x6602, 0x76ce, 0x51f9, 0x6556, 0x71ac, 0x7ff1, 0x8884,
130 0x50b2, 0x5965, 0x61ca, 0x6fb3, 0x82ad, 0x634c, 0x6252, 0x53ed,
131 0x5427, 0x7b06, 0x516b, 0x75a4, 0x5df4, 0x62d4, 0x8dcb, 0x9776,
132 0x628a, 0x8019, 0x575d, 0x9738, 0x7f62, 0x7238, 0x767d, 0x67cf,
133 0x767e, 0x6446, 0x4ff7, 0x8d25, 0x62dc, 0x7a17, 0x6591, 0x73ed,
134 0x642c, 0x6273, 0x822c, 0x9881, 0x677f, 0x7248, 0x626e, 0x62cc,
135 0x4f34, 0x74e3, 0x534a, 0x529e, 0x7eca, 0x90a6, 0x5e2e, 0x6886,
136 0x699c, 0x8180, 0x7ed1, 0x68d2, 0x78c5, 0x868c, 0x9551, 0x508d,
137 0x8c24, 0x82de, 0x80de, 0x5305, 0x8912, 0x5265,
138 /* 0x31 */
139 0x8584, 0x96f9, 0x4fdd, 0x5821, 0x9971, 0x5b9d, 0x62b1, 0x62a5,
140 0x66b4, 0x8c79, 0x9c8d, 0x7206, 0x676f, 0x7891, 0x60b2, 0x5351,
141 0x5317, 0x8f88, 0x80cc, 0x8d1d, 0x94a1, 0x500d, 0x72c8, 0x5907,
142 0x60eb, 0x7119, 0x88ab, 0x5954, 0x82ef, 0x672c, 0x7b28, 0x5d29,
143 0x7ef7, 0x752d, 0x6cf5, 0x8e66, 0x8ff8, 0x903c, 0x9f3b, 0x6bd4,
144 0x9119, 0x7b14, 0x5f7c, 0x78a7, 0x84d6, 0x853d, 0x6bd5, 0x6bd9,
145 0x6bd6, 0x5e01, 0x5e87, 0x75f9, 0x95ed, 0x655d, 0x5f0a, 0x5fc5,
146 0x8f9f, 0x58c1, 0x81c2, 0x907f, 0x965b, 0x97ad, 0x8fb9, 0x7f16,
147 0x8d2c, 0x6241, 0x4fbf, 0x53d8, 0x535e, 0x8fa8, 0x8fa9, 0x8fab,
148 0x904d, 0x6807, 0x5f6a, 0x8198, 0x8868, 0x9cd6, 0x618b, 0x522b,
149 0x762a, 0x5f6c, 0x658c, 0x6fd2, 0x6ee8, 0x5bbe, 0x6448, 0x5175,
150 0x51b0, 0x67c4, 0x4e19, 0x79c9, 0x997c, 0x70b3,
151 /* 0x32 */
152 0x75c5, 0x5e76, 0x73bb, 0x83e0, 0x64ad, 0x62e8, 0x94b5, 0x6ce2,
153 0x535a, 0x52c3, 0x640f, 0x94c2, 0x7b94, 0x4f2f, 0x5e1b, 0x8236,
154 0x8116, 0x818a, 0x6e24, 0x6cca, 0x9a73, 0x6355, 0x535c, 0x54fa,
155 0x8865, 0x57e0, 0x4e0d, 0x5e03, 0x6b65, 0x7c3f, 0x90e8, 0x6016,
156 0x64e6, 0x731c, 0x88c1, 0x6750, 0x624d, 0x8d22, 0x776c, 0x8e29,
157 0x91c7, 0x5f69, 0x83dc, 0x8521, 0x9910, 0x53c2, 0x8695, 0x6b8b,
158 0x60ed, 0x60e8, 0x707f, 0x82cd, 0x8231, 0x4ed3, 0x6ca7, 0x85cf,
159 0x64cd, 0x7cd9, 0x69fd, 0x66f9, 0x8349, 0x5395, 0x7b56, 0x4fa7,
160 0x518c, 0x6d4b, 0x5c42, 0x8e6d, 0x63d2, 0x53c9, 0x832c, 0x8336,
161 0x67e5, 0x78b4, 0x643d, 0x5bdf, 0x5c94, 0x5dee, 0x8be7, 0x62c6,
162 0x67f4, 0x8c7a, 0x6400, 0x63ba, 0x8749, 0x998b, 0x8c17, 0x7f20,
163 0x94f2, 0x4ea7, 0x9610, 0x98a4, 0x660c, 0x7316,
164 /* 0x33 */
165 0x573a, 0x5c1d, 0x5e38, 0x957f, 0x507f, 0x80a0, 0x5382, 0x655e,
166 0x7545, 0x5531, 0x5021, 0x8d85, 0x6284, 0x949e, 0x671d, 0x5632,
167 0x6f6e, 0x5de2, 0x5435, 0x7092, 0x8f66, 0x626f, 0x64a4, 0x63a3,
168 0x5f7b, 0x6f88, 0x90f4, 0x81e3, 0x8fb0, 0x5c18, 0x6668, 0x5ff1,
169 0x6c89, 0x9648, 0x8d81, 0x886c, 0x6491, 0x79f0, 0x57ce, 0x6a59,
170 0x6210, 0x5448, 0x4e58, 0x7a0b, 0x60e9, 0x6f84, 0x8bda, 0x627f,
171 0x901e, 0x9a8b, 0x79e4, 0x5403, 0x75f4, 0x6301, 0x5319, 0x6c60,
172 0x8fd1, 0x5f1b, 0x9a70, 0x803b, 0x9f7f, 0x4f88, 0x5c3a, 0x8d64,
173 0x7fc5, 0x65a5, 0x70bd, 0x5145, 0x51b2, 0x866b, 0x5d07, 0x5ba0,
174 0x62bd, 0x916c, 0x7574, 0x8e0c, 0x7a20, 0x6101, 0x7b79, 0x4ec7,
175 0x7ef8, 0x7785, 0x4e11, 0x81ed, 0x521d, 0x51fa, 0x6a71, 0x53a8,
176 0x8e87, 0x9504, 0x96cf, 0x6ec1, 0x9664, 0x695a,
177 /* 0x34 */
178 0x7840, 0x50a8, 0x77d7, 0x6410, 0x89e6, 0x5904, 0x63e3, 0x5ddd,

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179 0x7a7f, 0x693d, 0x4f20, 0x8239, 0x5598, 0x4e32, 0x75ae, 0x7a97,
180 0x5e62, 0x5e8a, 0x95ef, 0x521b, 0x5439, 0x708a, 0x6376, 0x9524,
181 0x5782, 0x6625, 0x693f, 0x9187, 0x5507, 0x6df3, 0x7eaf, 0x8822,
182 0x6233, 0x7ef0, 0x75b5, 0x8328, 0x78c1, 0x96cc, 0x8f9e, 0x6148,
183 0x74f7, 0x8bcd, 0x6b64, 0x523a, 0x8d50, 0x6b21, 0x806a, 0x8471,
184 0x56f1, 0x5306, 0x4ece, 0x4e1b, 0x51d1, 0x7c97, 0x918b, 0x7c07,
185 0x4fc3, 0x8e7f, 0x7be1, 0x7a9c, 0x6467, 0x5d14, 0x50ac, 0x8106,
186 0x7601, 0x7cb9, 0x6dec, 0x7fe0, 0x6751, 0x5b58, 0x5bf8, 0x78cb,
187 0x64ae, 0x6413, 0x63aa, 0x632b, 0x9519, 0x642d, 0x8fbe, 0x7b54,
188 0x7629, 0x6253, 0x5927, 0x5446, 0x6b79, 0x50a3, 0x6234, 0x5e26,
189 0x6b86, 0x4ee3, 0x8d37, 0x888b, 0x5f85, 0x902e,
190 /* 0x35 */
191 0x6020, 0x803d, 0x62c5, 0x4e39, 0x5355, 0x90f8, 0x63b8, 0x80c6,
192 0x65e6, 0x6c2e, 0x4f46, 0x60ee, 0x6de1, 0x8bde, 0x5f39, 0x86cb,
193 0x5f53, 0x6321, 0x515a, 0x8361, 0x6863, 0x5200, 0x6363, 0x8e48,
194 0x5012, 0x5c9b, 0x7977, 0x5bfc, 0x5230, 0x7a3b, 0x60bc, 0x9053,
195 0x76d7, 0x5fb7, 0x5f97, 0x7684, 0x8e6c, 0x706f, 0x767b, 0x7b49,
196 0x77aa, 0x51f3, 0x9093, 0x5824, 0x4f4e, 0x6ef4, 0x8fea, 0x654c,
197 0x7b1b, 0x72c4, 0x6da4, 0x7fdf, 0x5ae1, 0x62b5, 0x5e95, 0x5730,
198 0x8482, 0x7b2c, 0x5e1d, 0x5f1f, 0x9012, 0x7f14, 0x98a0, 0x6382,
199 0x6ec7, 0x7898, 0x70b9, 0x5178, 0x975b, 0x57ab, 0x7535, 0x4f43,
200 0x7538, 0x5e97, 0x60e6, 0x5960, 0x6dc0, 0x6bbf, 0x7889, 0x53fc,
201 0x96d5, 0x51cb, 0x5201, 0x6389, 0x540a, 0x9493, 0x8c03, 0x8dcc,
202 0x7239, 0x789f, 0x8776, 0x8fed, 0x8c0d, 0x53e0,
203 /* 0x36 */
204 0x4e01, 0x76ef, 0x53ee, 0x9489, 0x9876, 0x9f0e, 0x952d, 0x5b9a,
205 0x8ba2, 0x4e22, 0x4e1c, 0x51ac, 0x8463, 0x61c2, 0x52a8, 0x680b,
206 0x4f97, 0x606b, 0x51bb, 0x6d1e, 0x515c, 0x6296, 0x6597, 0x9661,
207 0x8c46, 0x9017, 0x75d8, 0x90fd, 0x7763, 0x6bd2, 0x728a, 0x72ec,
208 0x8bfb, 0x5835, 0x7779, 0x8d4c, 0x675c, 0x9540, 0x809a, 0x5ea6,
209 0x6e21, 0x5992, 0x7aef, 0x77ed, 0x953b, 0x6bb5, 0x65ad, 0x7f0e,
210 0x5806, 0x5151, 0x961f, 0x5bf9, 0x58a9, 0x5428, 0x8e72, 0x6566,
211 0x987f, 0x56e4, 0x949d, 0x76fe, 0x9041, 0x6387, 0x54c6, 0x591a,
212 0x593a, 0x579b, 0x8eb2, 0x6735, 0x8dfa, 0x8235, 0x5241, 0x60f0,
213 0x5815, 0x86fe, 0x5ce8, 0x9e45, 0x4fc4, 0x989d, 0x8bb9, 0x5a25,
214 0x6076, 0x5384, 0x627c, 0x904f, 0x9102, 0x997f, 0x6069, 0x800c,
215 0x513f, 0x8033, 0x5c14, 0x9975, 0x6d31, 0x4e8c,
216 /* 0x37 */
217 0x8d30, 0x53d1, 0x7f5a, 0x7b4f, 0x4f10, 0x4e4f, 0x9600, 0x6cd5,
218 0x73d0, 0x85e9, 0x5e06, 0x756a, 0x7ffb, 0x6a0a, 0x77fe, 0x9492,
219 0x7e41, 0x51e1, 0x70e6, 0x53cd, 0x8fd4, 0x8303, 0x8d29, 0x72af,
220 0x996d, 0x6cdb, 0x574a, 0x82b3, 0x65b9, 0x80aa, 0x623f, 0x9632,
221 0x59a8, 0x4eff, 0x8bbf, 0x7eba, 0x653e, 0x83f2, 0x975e, 0x5561,
222 0x98de, 0x80a5, 0x532a, 0x8bfd, 0x5420, 0x80ba, 0x5e9f, 0x6cb8,
223 0x8d39, 0x82ac, 0x915a, 0x5429, 0x6c1b, 0x5206, 0x7eb7, 0x575f,
224 0x711a, 0x6c7e, 0x7c89, 0x594b, 0x4efd, 0x5fff, 0x6124, 0x7caa,
225 0x4e30, 0x5c01, 0x67ab, 0x8702, 0x5cf0, 0x950b, 0x98ce, 0x75af,
226 0x70fd, 0x9022, 0x51af, 0x7f1d, 0x8bbd, 0x5949, 0x51e4, 0x4f5b,
227 0x5426, 0x592b, 0x6577, 0x80a4, 0x5b75, 0x6276, 0x62c2, 0x8f90,
228 0x5e45, 0x6c1f, 0x7b26, 0x4f0f, 0x4fd8, 0x670d,
229 /* 0x38 */
230 0x6d6e, 0x6daa, 0x798f, 0x88b1, 0x5f17, 0x752b, 0x629a, 0x8f85,
231 0x4fef, 0x91dc, 0x65a7, 0x812f, 0x8151, 0x5e9c, 0x8150, 0x8d74,
232 0x526f, 0x8986, 0x8d4b, 0x590d, 0x5085, 0x4ed8, 0x961c, 0x7236,
233 0x8179, 0x8d1f, 0x5bcc, 0x8ba3, 0x9644, 0x5987, 0x7f1a, 0x5490,
234 0x5676, 0x560e, 0x8be5, 0x6539, 0x6982, 0x9499, 0x76d6, 0x6e89,
235 0x5e72, 0x7518, 0x6746, 0x67d1, 0x7aff, 0x809d, 0x8d76, 0x611f,
236 0x79c6, 0x6562, 0x8d63, 0x5188, 0x521a, 0x94a2, 0x7f38, 0x809b,
237 0x7eb2, 0x5c97, 0x6e2f, 0x6760, 0x7bd9, 0x768b, 0x9ad8, 0x818f,
238 0x7f94, 0x7cd5, 0x641e, 0x9550, 0x7a3f, 0x544a, 0x54e5, 0x6b4c,
239 0x6401, 0x6208, 0x9e3d, 0x80f3, 0x7599, 0x5272, 0x9769, 0x845b,
240 0x683c, 0x86e4, 0x9601, 0x9694, 0x94ec, 0x4e2a, 0x5404, 0x7ed9,
241 0x6839, 0x8ddf, 0x8015, 0x66f4, 0x5e9a, 0x7fb9,
242 /* 0x39 */
243 0x57c2, 0x803f, 0x6897, 0x5de5, 0x653b, 0x529f, 0x606d, 0x9f9a,
244 0x4f9b, 0x8eac, 0x516c, 0x5bab, 0x5f13, 0x5de9, 0x6c5e, 0x62f1,
245 0x8d21, 0x5171, 0x94a9, 0x52fe, 0x6c9f, 0x82df, 0x72d7, 0x57a2,
246 0x6784, 0x8d2d, 0x591f, 0x8f9c, 0x83c7, 0x5495, 0x7b8d, 0x4f30,
247 0x6cbd, 0x5b64, 0x59d1, 0x9f13, 0x53e4, 0x86ca, 0x9aa8, 0x8c37,
248 0x80a1, 0x6545, 0x987e, 0x56fa, 0x96c7, 0x522e, 0x74dc, 0x5250,
249 0x5be1, 0x6302, 0x8902, 0x4e56, 0x62d0, 0x602a, 0x68fa, 0x5173,
250 0x5b98, 0x51a0, 0x89c2, 0x7ba1, 0x9986, 0x7f50, 0x60ef, 0x704c,
251 0x8d2f, 0x5149, 0x5e7f, 0x901b, 0x7470, 0x89c4, 0x572d, 0x7845,
252 0x5f52, 0x9f9f, 0x95fa, 0x8f68, 0x9b3c, 0x8be1, 0x7678, 0x6842,
253 0x67dc, 0x8dea, 0x8d35, 0x523d, 0x8f8a, 0x6eda, 0x68cd, 0x9505,
254 0x90ed, 0x56fd, 0x679c, 0x88f9, 0x8fc7, 0x54c8,
255 /* 0x3a */
256 0x9ab8, 0x5b69, 0x6d77, 0x6c26, 0x4ea5, 0x5bb3, 0x9a87, 0x9163,
257 0x61a8, 0x90af, 0x97e9, 0x542b, 0x6db5, 0x5bd2, 0x51fd, 0x558a,
258 0x7f55, 0x7ff0, 0x64bc, 0x634d, 0x65f1, 0x61be, 0x608d, 0x710a,
259 0x6c57, 0x6c49, 0x592f, 0x676d, 0x822a, 0x58d5, 0x568e, 0x8c6a,
260 0x6beb, 0x90dd, 0x597d, 0x8017, 0x53f7, 0x6d69, 0x5475, 0x559d,
261 0x8377, 0x83cf, 0x6838, 0x79be, 0x548c, 0x4f55, 0x5408, 0x76d2,
262 0x8c89, 0x9602, 0x6cb3, 0x6db8, 0x8d6b, 0x8910, 0x9e64, 0x8d3a,
263 0x563f, 0x9ed1, 0x75d5, 0x5f88, 0x72e0, 0x6068, 0x54fc, 0x4ea8,
264 0x6a2a, 0x8861, 0x6052, 0x8f70, 0x54c4, 0x70d8, 0x8679, 0x9e3f,
265 0x6d2a, 0x5b8f, 0x5f18, 0x7ea2, 0x5589, 0x4faf, 0x7334, 0x543c,
```

```
266 0x539a, 0x5019, 0x540e, 0x547c, 0x4e4e, 0x5ffd, 0x745a, 0x58f6,
267 0x846b, 0x80e1, 0x8774, 0x72d0, 0x7cca, 0x6e56,
268 /* 0x3b */
269 0x5f27, 0x864e, 0x552c, 0x62a4, 0x4e92, 0x6caa, 0x6237, 0x82b1,
270 0x54d7, 0x534e, 0x733e, 0x6ed1, 0x753b, 0x5212, 0x5316, 0x8bdd,
271 0x69d0, 0x5f8a, 0x6000, 0x6dee, 0x574f, 0x6b22, 0x73af, 0x6853,
272 0x8fd8, 0x7f13, 0x6362, 0x60a3, 0x5524, 0x75ea, 0x8c62, 0x7115,
273 0x6da3, 0x5ba6, 0x5e7b, 0x8352, 0x614c, 0x9ec4, 0x78fa, 0x8757,
274 0x7c27, 0x7687, 0x51f0, 0x60f6, 0x714c, 0x6643, 0x5e4c, 0x604d,
275 0x8c0e, 0x7070, 0x6325, 0x8f89, 0x5fbd, 0x6062, 0x86d4, 0x56de,
276 0x6bc1, 0x6094, 0x6167, 0x5349, 0x60e0, 0x6666, 0x8d3f, 0x79fd,
277 0x4f1a, 0x70e9, 0x6c47, 0x8bb3, 0x8bf2, 0x7ed8, 0x8364, 0x660f,
278 0x5a5a, 0x9b42, 0x6d51, 0x6df7, 0x8c41, 0x6d3b, 0x4f19, 0x706b,
279 0x83b7, 0x6216, 0x60d1, 0x970d, 0x8d27, 0x7978, 0x51fb, 0x573e,
280 0x57fa, 0x673a, 0x7578, 0x7a3d, 0x79ef, 0x7b95,
281 /* 0x3c */
282 0x808c, 0x9965, 0x8ff9, 0x6fc0, 0x8ba5, 0x9e21, 0x59ec, 0x7ee9,
283 0x7f09, 0x5409, 0x6781, 0x68d8, 0x8f91, 0x7c4d, 0x96c6, 0x53ca,
284 0x6025, 0x75be, 0x6c72, 0x5373, 0x5ac9, 0x7ea7, 0x6324, 0x51e0,
285 0x810a, 0x5df1, 0x84df, 0x6280, 0x5180, 0x5b63, 0x4f0e, 0x796d,
286 0x5242, 0x60b8, 0x6d4e, 0x5bc4, 0x5bc2, 0x8ba1, 0x8bb0, 0x65e2,
287 0x5fcc, 0x9645, 0x5993, 0x7ee7, 0x7eaa, 0x5609, 0x67b7, 0x5939,
288 0x4f73, 0x5bb6, 0x52a0, 0x835a, 0x988a, 0x8d3e, 0x7532, 0x94be,
289 0x5047, 0x7a3c, 0x4ef7, 0x67b6, 0x9a7e, 0x5ac1, 0x6b7c, 0x76d1,
290 0x575a, 0x5c16, 0x7b3a, 0x95f4, 0x714e, 0x517c, 0x80a9, 0x8270,
291 0x5978, 0x7f04, 0x8327, 0x68c0, 0x67ec, 0x78b1, 0x7877, 0x62e3,
292 0x6361, 0x7b80, 0x4fed, 0x526a, 0x51cf, 0x8350, 0x69db, 0x9274,
293 0x8df5, 0x8d31, 0x89c1, 0x952e, 0x7bad, 0x4ef6,
294 /* 0x3d */
295 0x5065, 0x8230, 0x5251, 0x996f, 0x6e10, 0x6e85, 0x6da7, 0x5efa,
296 0x50f5, 0x59dc, 0x5c06, 0x6d46, 0x6c5f, 0x7586, 0x848b, 0x6868,
297 0x5956, 0x8bb2, 0x5320, 0x9171, 0x964d, 0x8549, 0x6912, 0x7901,
298 0x7126, 0x80f6, 0x4ea4, 0x90ca, 0x6d47, 0x9a84, 0x5a07, 0x56bc,
299 0x6405, 0x94f0, 0x77eb, 0x4fa5, 0x811a, 0x72e1, 0x89d2, 0x997a,
300 0x7f34, 0x7ede, 0x527f, 0x6559, 0x9175, 0x8f7f, 0x8f83, 0x53eb,
301 0x7a96, 0x63ed, 0x63a5, 0x7686, 0x79f8, 0x8857, 0x9636, 0x622a,
302 0x52ab, 0x8282, 0x6854, 0x6770, 0x6377, 0x776b, 0x7aed, 0x6d01,
303 0x7ed3, 0x89e3, 0x59d0, 0x6212, 0x85c9, 0x82a5, 0x754c, 0x501f,
304 0x4ecb, 0x75a5, 0x8beb, 0x5c4a, 0x5dfe, 0x7b4b, 0x65a4, 0x91d1,
305 0x4eca, 0x6d25, 0x895f, 0x7d27, 0x9526, 0x4ec5, 0x8c28, 0x8fdb,
306 0x9773, 0x664b, 0x7981, 0x8fd1, 0x70ec, 0x6d78,
307 /* 0x3e */
308 0x5c3d, 0x52b2, 0x8346, 0x5162, 0x830e, 0x775b, 0x6676, 0x9cb8,
309 0x4eac, 0x60ca, 0x7cbe, 0x7cb3, 0x7ecf, 0x4e95, 0x8b66, 0x666f,
310 0x9888, 0x9759, 0x5883, 0x656c, 0x955c, 0x5f84, 0x75c9, 0x9756,
311 0x7adf, 0x7ade, 0x51c0, 0x70af, 0x7a98, 0x63ea, 0x7a76, 0x7ea0,
312 0x7396, 0x97ed, 0x4e45, 0x7078, 0x4e5d, 0x9152, 0x53a9, 0x6551,
313 0x65e7, 0x81fc, 0x8205, 0x548e, 0x5c31, 0x759a, 0x97a0, 0x62d8,
314 0x72d9, 0x75bd, 0x5c45, 0x9a79, 0x83ca, 0x5c40, 0x5480, 0x77e9,
315 0x4e3e, 0x6cae, 0x805a, 0x62d2, 0x636e, 0x5de8, 0x5177, 0x8ddd,
316 0x8e1e, 0x952f, 0x4ff1, 0x53e5, 0x60e7, 0x70ac, 0x5267, 0x6350,
317 0x9e43, 0x5a1f, 0x5026, 0x7737, 0x5377, 0x7ee2, 0x6485, 0x652b,
318 0x6289, 0x6398, 0x5014, 0x7235, 0x89c9, 0x51b3, 0x8bc0, 0x7edd,
319 0x5747, 0x83cc, 0x94a7, 0x519b, 0x541b, 0x5cfb,
320 /* 0x3f */
321 0x4fca, 0x7ae3, 0x6d5a, 0x90e1, 0x9a8f, 0x5580, 0x5496, 0x5361,
322 0x54af, 0x5f00, 0x63e9, 0x6977, 0x51ef, 0x6168, 0x520a, 0x582a,
323 0x52d8, 0x574e, 0x780d, 0x770b, 0x5eb7, 0x6177, 0x7ce0, 0x625b,
324 0x6297, 0x4ea2, 0x7095, 0x8003, 0x62f7, 0x70e4, 0x9760, 0x5777,
325 0x82db, 0x67ef, 0x68f5, 0x78d5, 0x9897, 0x79d1, 0x58f3, 0x54b3,
326 0x53ef, 0x6e34, 0x514b, 0x523b, 0x5ba2, 0x8bfe, 0x80af, 0x5543,
327 0x57a6, 0x6073, 0x5751, 0x542d, 0x7a7a, 0x6050, 0x5b54, 0x63a7,
328 0x62a0, 0x53e3, 0x6263, 0x5bc7, 0x67af, 0x54ed, 0x7a9f, 0x82e6,
329 0x9177, 0x5e93, 0x88e4, 0x5938, 0x57ae, 0x630e, 0x8de8, 0x80ef,
330 0x5757, 0x7b77, 0x4fa9, 0x5feb, 0x5bbd, 0x6b3e, 0x5321, 0x7b50,
331 0x72c2, 0x6846, 0x77ff, 0x7736, 0x65f7, 0x51b5, 0x4e8f, 0x76d4,
332 0x5cbf, 0x7aa5, 0x8475, 0x594e, 0x9b41, 0x5080,
333 /* 0x40 */
334 0x9988, 0x6127, 0x6e83, 0x5764, 0x6606, 0x6346, 0x56f0, 0x62ec,
335 0x6269, 0x5ed3, 0x9614, 0x5783, 0x62c9, 0x5587, 0x8721, 0x814a,
336 0x8fa3, 0x5566, 0x83b1, 0x6765, 0x8d56, 0x84dd, 0x5a6a, 0x680f,
337 0x62e6, 0x7bee, 0x9611, 0x5170, 0x6f9c, 0x8c30, 0x63fd, 0x89c8,
338 0x61d2, 0x7f06, 0x70c2, 0x6ee5, 0x7405, 0x6994, 0x72fc, 0x5eca,
339 0x90ce, 0x6717, 0x6d6a, 0x635e, 0x52b3, 0x7262, 0x8001, 0x4f6c,
340 0x59e5, 0x916a, 0x70d9, 0x6d9d, 0x52d2, 0x4e50, 0x96f7, 0x956d,
341 0x857e, 0x78ca, 0x7d2f, 0x5121, 0x5792, 0x64c2, 0x808b, 0x7c7b,
342 0x6cea, 0x68f1, 0x695e, 0x51b7, 0x5398, 0x68a8, 0x7281, 0x9ece,
343 0x7bf1, 0x72f8, 0x79bb, 0x6f13, 0x7406, 0x674e, 0x91cc, 0x9ca4,
344 0x793c, 0x8389, 0x8354, 0x540f, 0x6817, 0x4e3d, 0x5389, 0x52b1,
345 0x783e, 0x5386, 0x5229, 0x5088, 0x4f8b, 0x4fd0,
346 /* 0x41 */
347 0x75e2, 0x7acb, 0x7c92, 0x6ca5, 0x96b6, 0x529b, 0x7483, 0x54e9,
348 0x4fe9, 0x8054, 0x83b2, 0x8fde, 0x9570, 0x5ec9, 0x601c, 0x6d9f,
349 0x5e18, 0x655b, 0x8138, 0x94fe, 0x604b, 0x70bc, 0x7ec3, 0x7cae,
350 0x51c9, 0x6881, 0x7cb1, 0x826f, 0x4e24, 0x8f86, 0x91cf, 0x667e,
351 0x4eae, 0x8c05, 0x64a9, 0x804a, 0x50da, 0x7597, 0x71ce, 0x5be5,
352 0x8fbd, 0x6f66, 0x4e86, 0x6482, 0x9563, 0x5ed6, 0x6599, 0x5217,
```

```
353 0x88c2, 0x70c8, 0x52a3, 0x730e, 0x7433, 0x6797, 0x78f7, 0x9716,
354 0x4e34, 0x90bb, 0x9cde, 0x6dcb, 0x51db, 0x8d41, 0x541d, 0x62ce,
355 0x73b2, 0x83f1, 0x96f6, 0x9f84, 0x94c3, 0x4f36, 0x7f9a, 0x51cc,
356 0x7075, 0x9675, 0x5cad, 0x9886, 0x53e6, 0x4ee4, 0x6e9c, 0x7409,
357 0x69b4, 0x786b, 0x998f, 0x7559, 0x5218, 0x7624, 0x6d41, 0x67f3,
358 0x516d, 0x9f99, 0x804b, 0x5499, 0x7b3c, 0x7abf,
359 /* 0x42 */
360 0x9686, 0x5784, 0x62e2, 0x9647, 0x697c, 0x5a04, 0x6402, 0x7bd3,
361 0x6f0f, 0x964b, 0x82a6, 0x5362, 0x9885, 0x5e90, 0x7089, 0x63b3,
362 0x5364, 0x864f, 0x9c81, 0x9e93, 0x788c, 0x9732, 0x8def, 0x8d42,
363 0x9e7f, 0x6f5e, 0x7984, 0x5f55, 0x9646, 0x622e, 0x9a74, 0x5415,
364 0x94dd, 0x4fa3, 0x65c5, 0x5c65, 0x5c61, 0x7f15, 0x8651, 0x6c2f,
365 0x5f8b, 0x7387, 0x6ee4, 0x7eff, 0x5ce6, 0x631b, 0x5b6a, 0x6ee6,
366 0x5375, 0x4e71, 0x63a0, 0x7565, 0x62a1, 0x8f6e, 0x4f26, 0x4ed1,
367 0x6ca6, 0x7eb6, 0x8bba, 0x841d, 0x87ba, 0x7f57, 0x903b, 0x9523,
368 0x7ba9, 0x9aa1, 0x88f8, 0x843d, 0x6d1b, 0x9a86, 0x7edc, 0x5988,
369 0x9ebb, 0x739b, 0x7801, 0x8682, 0x9a6c, 0x9a82, 0x561b, 0x5417,
370 0x57cb, 0x4e70, 0x9ea6, 0x5356, 0x8fc8, 0x8109, 0x7792, 0x9992,
371 0x86ee, 0x6ee1, 0x8513, 0x66fc, 0x6162, 0x6f2b,
372 /* 0x43 */
373 0x8c29, 0x8292, 0x832b, 0x76f2, 0x6c13, 0x5fd9, 0x83bd, 0x732b,
374 0x8305, 0x951a, 0x6bdb, 0x77db, 0x94c6, 0x536f, 0x8302, 0x5192,
375 0x5e3d, 0x8c8c, 0x8d38, 0x4e48, 0x73ab, 0x679a, 0x6885, 0x9176,
376 0x9709, 0x7164, 0x6ca1, 0x7709, 0x5a92, 0x9541, 0x6bcf, 0x7f8e,
377 0x6627, 0x5bd0, 0x59b9, 0x5a9a, 0x95e8, 0x95f7, 0x4eec, 0x840c,
378 0x8499, 0x6aac, 0x76df, 0x9530, 0x731b, 0x68a6, 0x5b5f, 0x772f,
379 0x919a, 0x9761, 0x7cdc, 0x8ff7, 0x8c1c, 0x5f25, 0x7c73, 0x79d8,
380 0x89c5, 0x6ccc, 0x871c, 0x5bc6, 0x5e42, 0x68c9, 0x7720, 0x7ef5,
381 0x5195, 0x514d, 0x52c9, 0x5a29, 0x7f05, 0x9762, 0x82d7, 0x63cf,
382 0x7784, 0x85d0, 0x79d2, 0x6e3a, 0x5e99, 0x5999, 0x8511, 0x706d,
383 0x6c11, 0x62bf, 0x76bf, 0x654f, 0x60af, 0x95fd, 0x660e, 0x879f,
384 0x9e23, 0x94ed, 0x540d, 0x547d, 0x8c2c, 0x6478,
385 /* 0x44 */
386 0x6479, 0x8611, 0x6a21, 0x819c, 0x78e8, 0x6469, 0x9b54, 0x62b9,
387 0x672b, 0x83ab, 0x58a8, 0x9ed8, 0x6cab, 0x6f20, 0x5bde, 0x964c,
388 0x8c0b, 0x725f, 0x67d0, 0x62c7, 0x7261, 0x4ea9, 0x59c6, 0x6bcd,
389 0x5893, 0x66ae, 0x5e55, 0x52df, 0x6155, 0x6728, 0x76ee, 0x7766,
390 0x7267, 0x7a46, 0x62ff, 0x54ea, 0x5450, 0x94a0, 0x90a3, 0x5a1c,
391 0x7eb3, 0x6c16, 0x4e43, 0x5976, 0x8010, 0x5948, 0x5357, 0x7537,
392 0x96be, 0x56ca, 0x6320, 0x8111, 0x607c, 0x95f9, 0x6dd6, 0x5462,
393 0x9981, 0x5185, 0x5ae9, 0x80fd, 0x59ae, 0x9713, 0x502a, 0x6ce5,
394 0x5c3c, 0x62df, 0x4f60, 0x533f, 0x817b, 0x9006, 0x6eba, 0x852b,
395 0x62c8, 0x5e74, 0x78be, 0x64b5, 0x637b, 0x5ff5, 0x5a18, 0x917f,
396 0x9e1f, 0x5c3f, 0x634f, 0x8042, 0x5b7d, 0x556e, 0x954a, 0x954d,
397 0x6d85, 0x60a8, 0x67e0, 0x72de, 0x51dd, 0x5b81,
398 /* 0x45 */
399 0x62e7, 0x6cde, 0x725b, 0x626d, 0x94ae, 0x7ebd, 0x8113, 0x6d53,
400 0x519c, 0x5f04, 0x5974, 0x52aa, 0x6012, 0x5973, 0x6696, 0x8650,
401 0x759f, 0x632a, 0x61e6, 0x7cef, 0x8bfa, 0x54e6, 0x6b27, 0x9e25,
402 0x6bb4, 0x85d5, 0x5455, 0x5076, 0x6ca4, 0x556a, 0x8db4, 0x722c,
403 0x5e15, 0x6015, 0x7436, 0x62cd, 0x6392, 0x724c, 0x5f98, 0x6e43,
404 0x6d3e, 0x6500, 0x6f58, 0x76d8, 0x78d0, 0x76fc, 0x7554, 0x5224,
405 0x53db, 0x4e53, 0x5e9e, 0x65c1, 0x802a, 0x80d6, 0x629b, 0x5486,
406 0x5228, 0x70ae, 0x888d, 0x8dd1, 0x6ce1, 0x5478, 0x80da, 0x57f9,
407 0x88f4, 0x8d54, 0x966a, 0x914d, 0x4f69, 0x6c9b, 0x55b7, 0x76c6,
408 0x7830, 0x62a8, 0x70f9, 0x6f8e, 0x5f6d, 0x84ec, 0x68da, 0x787c,
409 0x7bf7, 0x81a8, 0x670b, 0x9e4f, 0x6367, 0x78b0, 0x576f, 0x7812,
410 0x9739, 0x6279, 0x62ab, 0x5288, 0x7435, 0x6bd7,
411 /* 0x46 */
412 0x5564, 0x813e, 0x75b2, 0x76ae, 0x5339, 0x75de, 0x50fb, 0x5c41,
413 0x8b6c, 0x7bc7, 0x504f, 0x7247, 0x9a97, 0x98d8, 0x6f02, 0x74e2,
414 0x7968, 0x6487, 0x77a5, 0x62fc, 0x9891, 0x8d2b, 0x54c1, 0x8058,
415 0x4e52, 0x576a, 0x82f9, 0x840d, 0x5e73, 0x51ed, 0x74f6, 0x8bc4,
416 0x5c4f, 0x5761, 0x6cfc, 0x9887, 0x5a46, 0x7834, 0x9b44, 0x8feb,
417 0x7c95, 0x5256, 0x6251, 0x94fa, 0x4ec6, 0x8386, 0x8461, 0x83e9,
418 0x84b2, 0x57d4, 0x6734, 0x5703, 0x666e, 0x6d66, 0x8c31, 0x66dd,
419 0x7011, 0x671f, 0x6b3a, 0x6816, 0x621a, 0x59bb, 0x4e03, 0x51c4,
420 0x6f06, 0x67d2, 0x6c8f, 0x5176, 0x68cb, 0x5947, 0x6b67, 0x7566,
421 0x5d0e, 0x8110, 0x9f50, 0x65d7, 0x7948, 0x7941, 0x9a91, 0x8d77,
422 0x5c82, 0x4e5e, 0x4f01, 0x542f, 0x5951, 0x780c, 0x5668, 0x6c14,
423 0x8fc4, 0x5f03, 0x6c7d, 0x6ce3, 0x8bab, 0x6390,
424 /* 0x47 */
425 0x6070, 0x6d3d, 0x7275, 0x6266, 0x948e, 0x94c5, 0x5343, 0x8fc1,
426 0x7b7e, 0x4edf, 0x8c26, 0x4e7e, 0x9ed4, 0x94b1, 0x94b3, 0x524d,
427 0x6f5c, 0x9063, 0x6d45, 0x8c34, 0x5811, 0x5d4c, 0x6b20, 0x6b49,
428 0x67aa, 0x545b, 0x8154, 0x7f8c, 0x5899, 0x8537, 0x5f3a, 0x62a2,
429 0x6a47, 0x9539, 0x6572, 0x6084, 0x6865, 0x77a7, 0x4e54, 0x4fa8,
430 0x5de7, 0x9798, 0x64ac, 0x7fd8, 0x5ced, 0x4fcf, 0x7a8d, 0x5207,
431 0x8304, 0x4e14, 0x602f, 0x7a83, 0x94a6, 0x4fb5, 0x4eb2, 0x79e6,
432 0x7434, 0x52e4, 0x82b9, 0x64d2, 0x79bd, 0x5bdd, 0x6c81, 0x9752,
433 0x8f7b, 0x6c22, 0x503e, 0x537f, 0x6e05, 0x64ce, 0x6674, 0x6c30,
434 0x60c5, 0x9877, 0x8bf7, 0x5e86, 0x743c, 0x7a77, 0x79cb, 0x4e18,
435 0x90b1, 0x7403, 0x6c42, 0x56da, 0x914b, 0x6cc5, 0x8d8b, 0x533a,
436 0x86c6, 0x66f2, 0x8eaf, 0x5c48, 0x9a71, 0x6e20,
437 /* 0x48 */
438 0x53d6, 0x5a36, 0x9f8b, 0x8da3, 0x53bb, 0x5708, 0x98a7, 0x6743,
439 0x919b, 0x6cc9, 0x5168, 0x75ca, 0x62f3, 0x72ac, 0x5238, 0x529d,
```

```
440 0x7f3a, 0x7094, 0x7638, 0x5374, 0x9e4a, 0x69b7, 0x786e, 0x96c0,
441 0x88d9, 0x7fa4, 0x7136, 0x71c3, 0x5189, 0x67d3, 0x74e4, 0x58e4,
442 0x6518, 0x56b7, 0x8ba9, 0x9976, 0x6270, 0x7ed5, 0x60f9, 0x70ed,
443 0x58ec, 0x4ec1, 0x4eba, 0x5fcd, 0x97e7, 0x4efb, 0x8ba4, 0x5203,
444 0x598a, 0x7eab, 0x6254, 0x4ecd, 0x65e5, 0x620e, 0x8338, 0x84c9,
445 0x8363, 0x878d, 0x7194, 0x6eb6, 0x5bb9, 0x7ed2, 0x5197, 0x63c9,
446 0x67d4, 0x8089, 0x8339, 0x8815, 0x5112, 0x5b7a, 0x5982, 0x8fb1,
447 0x4e73, 0x6c5d, 0x5165, 0x8925, 0x8f6f, 0x962e, 0x854a, 0x745e,
448 0x9510, 0x95f0, 0x6da6, 0x82e5, 0x5f31, 0x6492, 0x6d12, 0x8428,
449 0x816e, 0x9cc3, 0x585e, 0x8d5b, 0x4e09, 0x53c1,
450 /* 0x49 */
451 0x4f1e, 0x6563, 0x6851, 0x55d3, 0x4e27, 0x6414, 0x9a9a, 0x626b,
452 0x5ac2, 0x745f, 0x8272, 0x6da9, 0x68ee, 0x50e7, 0x838e, 0x7802,
453 0x6740, 0x5239, 0x6c99, 0x7eb1, 0x50bb, 0x5565, 0x715e, 0x7b5b,
454 0x6652, 0x73ca, 0x82eb, 0x6749, 0x5c71, 0x5220, 0x717d, 0x886b,
455 0x95ea, 0x9655, 0x64c5, 0x8d61, 0x81b3, 0x5584, 0x6c55, 0x6247,
456 0x7f2e, 0x5892, 0x4f24, 0x5546, 0x8d4f, 0x664c, 0x4e0a, 0x5c1a,
457 0x88f3, 0x68a2, 0x634e, 0x7a0d, 0x70e7, 0x828d, 0x52fa, 0x97f6,
458 0x5c11, 0x54e8, 0x90b5, 0x7ecd, 0x5962, 0x8d4a, 0x86c7, 0x820c,
459 0x820d, 0x8d66, 0x6444, 0x5c04, 0x6151, 0x6d89, 0x793e, 0x8bbe,
460 0x7837, 0x7533, 0x547b, 0x4f38, 0x8eab, 0x6df1, 0x5a20, 0x7ec5,
461 0x795e, 0x6c88, 0x5ba1, 0x5a76, 0x751a, 0x80be, 0x614e, 0x6e17,
462 0x58f0, 0x751f, 0x7525, 0x7272, 0x5347, 0x7ef3,
463 /* 0x4a */
464 0x7701, 0x76db, 0x5269, 0x80dc, 0x5723, 0x5e08, 0x5931, 0x72ee,
465 0x65bd, 0x6e7f, 0x8bd7, 0x5c38, 0x8671, 0x5341, 0x77f3, 0x62fe,
466 0x65f6, 0x4ec0, 0x98df, 0x8680, 0x5b9e, 0x8bbc, 0x53f2, 0x77e2,
467 0x4f7f, 0x5c4e, 0x9a76, 0x59cb, 0x5f0f, 0x793a, 0x58eb, 0x4e16,
468 0x67ff, 0x4e8b, 0x62ed, 0x8a93, 0x901d, 0x52bf, 0x662f, 0x55dc,
469 0x566c, 0x9002, 0x4ed5, 0x4f8d, 0x91ca, 0x9970, 0x6c0f, 0x5e02,
470 0x6043, 0x5ba4, 0x89c6, 0x8bd5, 0x6536, 0x624b, 0x9996, 0x5b88,
471 0x5bff, 0x6388, 0x552e, 0x53d7, 0x7626, 0x517d, 0x852c, 0x67a2,
472 0x68b3, 0x6b8a, 0x6292, 0x8f93, 0x53d4, 0x8212, 0x6dd1, 0x758f,
473 0x4e66, 0x8d4e, 0x5b70, 0x719f, 0x85af, 0x6691, 0x66d9, 0x7f72,
474 0x8700, 0x9ecd, 0x9f20, 0x5c5e, 0x672f, 0x8ff0, 0x6811, 0x675f,
475 0x620d, 0x7ad6, 0x5885, 0x5eb6, 0x6570, 0x6f31,
476 /* 0x4b */
477 0x6055, 0x5237, 0x800d, 0x6454, 0x8870, 0x7529, 0x5e05, 0x6813,
478 0x62f4, 0x971c, 0x53cc, 0x723d, 0x8c01, 0x6c34, 0x7761, 0x7a0e,
479 0x542e, 0x77ac, 0x987a, 0x821c, 0x8bf4, 0x7855, 0x6714, 0x70c1,
480 0x65af, 0x6495, 0x5636, 0x601d, 0x79c1, 0x53f8, 0x4e1d, 0x6b7b,
481 0x8086, 0x5bfa, 0x55e3, 0x56db, 0x4f3a, 0x4f3c, 0x9972, 0x5df3,
482 0x677e, 0x8038, 0x6002, 0x9882, 0x9001, 0x5b8b, 0x8bbc, 0x8bf5,
483 0x641c, 0x8258, 0x64de, 0x55fd, 0x82cf, 0x9165, 0x4fd7, 0x7d20,
484 0x901f, 0x7c9f, 0x50f3, 0x5851, 0x6eaf, 0x5bbf, 0x8bc9, 0x8083,
485 0x9178, 0x849c, 0x7b97, 0x867d, 0x968b, 0x968f, 0x7ee5, 0x9ad3,
486 0x788e, 0x5c81, 0x7a57, 0x9042, 0x96a7, 0x795f, 0x5b59, 0x635f,
487 0x7b0b, 0x84d1, 0x68ad, 0x5506, 0x7f29, 0x7410, 0x7d22, 0x9501,
488 0x6240, 0x584c, 0x4ed6, 0x5b83, 0x5979, 0x5854,
489 /* 0x4c */
490 0x736d, 0x631e, 0x8e4b, 0x8e0f, 0x80ce, 0x82d4, 0x62ac, 0x53f0,
491 0x6cf0, 0x915e, 0x592a, 0x6001, 0x6c70, 0x574d, 0x644a, 0x8d2a,
492 0x762b, 0x6ee9, 0x575b, 0x6a80, 0x75f0, 0x6f6d, 0x8c2d, 0x8c08,
493 0x5766, 0x6bef, 0x8892, 0x78b3, 0x63a2, 0x53f9, 0x70ad, 0x6c64,
494 0x5858, 0x642a, 0x5802, 0x68e0, 0x819b, 0x5510, 0x7cd6, 0x5018,
495 0x8eba, 0x6dcc, 0x8d9f, 0x70eb, 0x638f, 0x6d9b, 0x6ed4, 0x7ee6,
496 0x8404, 0x6843, 0x9003, 0x6dd8, 0x9676, 0x8ba8, 0x5957, 0x7279,
497 0x85e4, 0x817e, 0x75bc, 0x8a8a, 0x68af, 0x5254, 0x8e22, 0x9511,
498 0x63d0, 0x9898, 0x8e44, 0x557c, 0x4f53, 0x66ff, 0x568f, 0x60d5,
499 0x6d95, 0x5243, 0x5c49, 0x5929, 0x6dfb, 0x586b, 0x7530, 0x751c,
500 0x606c, 0x8214, 0x8146, 0x6311, 0x6761, 0x8fe2, 0x773a, 0x8df3,
501 0x8d34, 0x94c1, 0x5e16, 0x5385, 0x542c, 0x70c3,
502 /* 0x4d */
503 0x6c40, 0x5ef7, 0x505c, 0x4ead, 0x5ead, 0x633a, 0x8247, 0x901a,
504 0x6850, 0x916e, 0x77b3, 0x540c, 0x94dc, 0x5f64, 0x7ae5, 0x6876,
505 0x6345, 0x7b52, 0x7edf, 0x75db, 0x5077, 0x6295, 0x5934, 0x900f,
506 0x51f8, 0x79c3, 0x7a81, 0x56fe, 0x5f92, 0x9014, 0x6d82, 0x5c60,
507 0x571f, 0x5410, 0x5154, 0x6e4d, 0x56e2, 0x63a8, 0x9893, 0x817f,
508 0x8715, 0x892a, 0x9000, 0x541e, 0x5c6f, 0x81c0, 0x62d6, 0x6258,
509 0x8131, 0x9e35, 0x9640, 0x9a6e, 0x9a7c, 0x692d, 0x59a5, 0x62d3,
510 0x553e, 0x6316, 0x54c7, 0x86d9, 0x6d3c, 0x5a03, 0x74e6, 0x889c,
511 0x6b6a, 0x5916, 0x8c4c, 0x5f2f, 0x6e7e, 0x73a9, 0x987d, 0x4e38,
512 0x70f7, 0x5b8c, 0x7897, 0x633d, 0x665a, 0x769e, 0x60cb, 0x5b9b,
513 0x5a49, 0x4e07, 0x8155, 0x6c6a, 0x738b, 0x4ea1, 0x6789, 0x7f51,
514 0x5f80, 0x65fa, 0x671b, 0x5fd8, 0x5984, 0x5a01,
515 /* 0x4e */
516 0x5dcd, 0x5fae, 0x5371, 0x97e6, 0x8fdd, 0x6845, 0x56f4, 0x552f,
517 0x60df, 0x4e3a, 0x6f4d, 0x7ef4, 0x82c7, 0x840e, 0x59d4, 0x4f1f,
518 0x4f2a, 0x5c3e, 0x7eac, 0x672a, 0x851a, 0x5473, 0x754f, 0x80c3,
519 0x5582, 0x9b4f, 0x4f4d, 0x6e2d, 0x8c13, 0x5c09, 0x6170, 0x536b,
520 0x761f, 0x6e29, 0x868a, 0x6587, 0x95fb, 0x7eb9, 0x543b, 0x7a33,
521 0x7d0a, 0x95ee, 0x55e1, 0x7fc1, 0x74ee, 0x631d, 0x8717, 0x6da1,
522 0x7a9d, 0x6211, 0x65a1, 0x5367, 0x63e1, 0x6c83, 0x5deb, 0x545c,
523 0x94a8, 0x4e4c, 0x6c61, 0x8bec, 0x5c4b, 0x65e0, 0x829c, 0x68a7,
524 0x543e, 0x5434, 0x6bcb, 0x6b66, 0x4e94, 0x6342, 0x5348, 0x821e,
525 0x4f0d, 0x4fae, 0x575e, 0x620a, 0x96fe, 0x6664, 0x7269, 0x52ff,
526 0x52a1, 0x609f, 0x8bef, 0x6614, 0x7199, 0x6790, 0x897f, 0x7852,
```

```
527 0x77fd, 0x6670, 0x563b, 0x5438, 0x9521, 0x727a,
528 /* 0x4f */
529 0x7a00, 0x606f, 0x5e0c, 0x6089, 0x819d, 0x5915, 0x60dc, 0x7184,
530 0x70ef, 0x6eaa, 0x6c50, 0x7280, 0x6a84, 0x88ad, 0x5e2d, 0x4e60,
531 0x5ab3, 0x559c, 0x94e3, 0x6d17, 0x7cfb, 0x9699, 0x620f, 0x7ec6,
532 0x778e, 0x867e, 0x5323, 0x971e, 0x8f96, 0x6687, 0x5ce1, 0x4fa0,
533 0x72ed, 0x4e0b, 0x53a6, 0x590f, 0x5413, 0x6380, 0x9528, 0x5148,
534 0x4ed9, 0x9c9c, 0x7ea4, 0x54b8, 0x8d24, 0x8854, 0x8237, 0x95f2,
535 0x6d8e, 0x5f26, 0x5acc, 0x663e, 0x9669, 0x73b0, 0x732e, 0x53bf,
536 0x817a, 0x9985, 0x7fa1, 0x5baa, 0x9677, 0x9650, 0x7ebf, 0x76f8,
537 0x53a2, 0x9576, 0x9999, 0x7bb1, 0x8944, 0x6e58, 0x4e61, 0x7fd4,
538 0x7965, 0x8be6, 0x60f3, 0x54cd, 0x4eab, 0x9879, 0x5df7, 0x6a61,
539 0x50cf, 0x5411, 0x8c61, 0x8427, 0x785d, 0x9704, 0x524a, 0x54ee,
540 0x56a3, 0x9500, 0x6d88, 0x5bb5, 0x6dc6, 0x6653,
541 /* 0x50 */
542 0x5c0f, 0x5b5d, 0x6821, 0x8096, 0x5578, 0x7b11, 0x6548, 0x6954,
543 0x4e9b, 0x6b47, 0x874e, 0x978b, 0x534f, 0x631f, 0x643a, 0x90aa,
544 0x659c, 0x80c1, 0x8c10, 0x5199, 0x68b0, 0x5378, 0x87f9, 0x61c8,
545 0x6cc4, 0x6cfb, 0x8c22, 0x5c51, 0x85aa, 0x82af, 0x950c, 0x6b23,
546 0x8f9b, 0x65b0, 0x5ffb, 0x5fc3, 0x4fe1, 0x8845, 0x661f, 0x8165,
547 0x7329, 0x60fa, 0x5174, 0x5211, 0x578b, 0x5f62, 0x90a2, 0x884c,
548 0x9192, 0x5e78, 0x674f, 0x6027, 0x59d3, 0x5144, 0x51f6, 0x80f8,
549 0x5308, 0x6c79, 0x96c4, 0x718a, 0x4f11, 0x4fee, 0x7f9e, 0x673d,
550 0x55c5, 0x9508, 0x79c0, 0x8896, 0x7ee3, 0x589f, 0x620c, 0x9700,
551 0x865a, 0x5618, 0x987b, 0x5f90, 0x8bb8, 0x84c4, 0x9157, 0x53d9,
552 0x65ed, 0x5e8f, 0x755c, 0x6064, 0x7d6e, 0x5a7e, 0x7eea, 0x7eed,
553 0x8f69, 0x55a7, 0x5ba3, 0x60ac, 0x65cb, 0x7384,
554 /* 0x51 */
555 0x9009, 0x7663, 0x7729, 0x7eda, 0x9774, 0x859b, 0x5b66, 0x7a74,
556 0x96ea, 0x8840, 0x52cb, 0x718f, 0x5faa, 0x65ec, 0x8be2, 0x5bfb,
557 0x9a6f, 0x5de1, 0x6b89, 0x6c5b, 0x8bad, 0x8baf, 0x900a, 0x8fc5,
558 0x538b, 0x62bc, 0x9e26, 0x9e2d, 0x5440, 0x4e2b, 0x82bd, 0x7259,
559 0x869c, 0x5d16, 0x8859, 0x6daf, 0x96c5, 0x54d1, 0x4e9a, 0x8bb6,
560 0x7109, 0x54bd, 0x9609, 0x70df, 0x6df9, 0x76d0, 0x4e25, 0x7814,
561 0x8712, 0x5ca9, 0x5ef6, 0x8a00, 0x989c, 0x960e, 0x708e, 0x6cbf,
562 0x5944, 0x63a9, 0x773c, 0x884d, 0x6f14, 0x8273, 0x5830, 0x71d5,
563 0x538c, 0x781a, 0x96c1, 0x5501, 0x5f66, 0x7130, 0x5bb4, 0x8c1a,
564 0x9a8c, 0x6b83, 0x592e, 0x9e2f, 0x79e7, 0x6768, 0x626c, 0x4f6f,
565 0x75a1, 0x7f8a, 0x6d0b, 0x9633, 0x6c27, 0x4ef0, 0x75d2, 0x517b,
566 0x6837, 0x6f3e, 0x9080, 0x8170, 0x5996, 0x7476,
567 /* 0x52 */
568 0x6447, 0x5c27, 0x9065, 0x7a91, 0x8c23, 0x59da, 0x54ac, 0x8200,
569 0x836f, 0x8981, 0x8000, 0x6930, 0x564e, 0x8036, 0x7237, 0x91ce,
570 0x51b6, 0x4e5f, 0x9875, 0x6396, 0x4e1a, 0x53f6, 0x66f3, 0x814b,
571 0x591c, 0x6db2, 0x4e00, 0x58f9, 0x533b, 0x63d6, 0x94f1, 0x4f9d,
572 0x4f0a, 0x8863, 0x9890, 0x5937, 0x9057, 0x79fb, 0x4eea, 0x80f0,
573 0x7591, 0x6c82, 0x5b9c, 0x59e8, 0x5f5d, 0x6905, 0x8681, 0x501a,
574 0x5df2, 0x4e59, 0x77e3, 0x4ee5, 0x827a, 0x6291, 0x6613, 0x9091,
575 0x5c79, 0x4ebf, 0x5f79, 0x81c6, 0x9038, 0x8084, 0x75ab, 0x4ea6,
576 0x88d4, 0x610f, 0x6bc5, 0x5fc6, 0x4e49, 0x76ca, 0x6ea2, 0x8be3,
577 0x8bae, 0x8c0a, 0x8bd1, 0x5f02, 0x7ffc, 0x7fcc, 0x7ece, 0x8335,
578 0x836b, 0x56e0, 0x6bb7, 0x97f3, 0x9634, 0x59fb, 0x541f, 0x94f6,
579 0x6deb, 0x5bc5, 0x996e, 0x5c39, 0x5f15, 0x9690,
580 /* 0x53 */
581 0x5370, 0x82f1, 0x6a31, 0x5a74, 0x9e70, 0x5e94, 0x7f28, 0x83b9,
582 0x8424, 0x8425, 0x8367, 0x8747, 0x8fce, 0x8d62, 0x76c8, 0x5f71,
583 0x9896, 0x786c, 0x6620, 0x54df, 0x62e5, 0x4f63, 0x81c3, 0x75c8,
584 0x5eb8, 0x96cd, 0x8e0a, 0x86f9, 0x548f, 0x6cf3, 0x6d8c, 0x6c38,
585 0x607f, 0x52c7, 0x7528, 0x5e7d, 0x4f18, 0x60a0, 0x5fe7, 0x5c24,
586 0x7531, 0x90ae, 0x94c0, 0x72b9, 0x6cb9, 0x6e38, 0x9149, 0x6709,
587 0x53cb, 0x53f3, 0x4f51, 0x91c9, 0x8bf1, 0x53c8, 0x5e7c, 0x8fc2,
588 0x6de4, 0x4e8e, 0x76c2, 0x6986, 0x865e, 0x611a, 0x8206, 0x4f59,
589 0x4fde, 0x903e, 0x9c7c, 0x6109, 0x6e1d, 0x6e14, 0x9685, 0x4e88,
590 0x5a31, 0x96e8, 0x4e0e, 0x5c7f, 0x79b9, 0x5b87, 0x8bed, 0x7fbd,
591 0x7389, 0x57df, 0x828b, 0x90c1, 0x5401, 0x9047, 0x55bb, 0x5cea,
592 0x5fa1, 0x6108, 0x6b32, 0x72f1, 0x80b2, 0x8a89,
593 /* 0x54 */
594 0x6d74, 0x5bd3, 0x88d5, 0x9884, 0x8c6b, 0x9a6d, 0x9e33, 0x6e0a,
595 0x51a4, 0x5143, 0x57a3, 0x8881, 0x539f, 0x63f4, 0x8f95, 0x56ed,
596 0x5458, 0x5706, 0x733f, 0x6e90, 0x7f18, 0x8fdc, 0x82d1, 0x613f,
597 0x6028, 0x9662, 0x66f0, 0x7ea6, 0x8d8a, 0x8dc3, 0x94a5, 0x5cb3,
598 0x7ca4, 0x6708, 0x60a6, 0x9605, 0x8018, 0x4e91, 0x90e7, 0x5300,
599 0x9668, 0x5141, 0x8fd0, 0x8574, 0x915d, 0x6655, 0x97f5, 0x5b55,
600 0x531d, 0x7838, 0x6742, 0x683d, 0x54c9, 0x707e, 0x5bb0, 0x8f7d,
601 0x518d, 0x5728, 0x54b1, 0x6512, 0x6682, 0x8d5e, 0x8d43, 0x810f,
602 0x846c, 0x906d, 0x7cdf, 0x51ff, 0x85fb, 0x67a3, 0x65e9, 0x6fa1,
603 0x86a4, 0x8e81, 0x566a, 0x9020, 0x7682, 0x7076, 0x71e5, 0x8d23,
604 0x62e9, 0x5219, 0x6cfd, 0x8d3c, 0x600e, 0x589e, 0x618e, 0x66fe,
605 0x8d60, 0x624e, 0x55b3, 0x6e23, 0x672d, 0x8f67,
606 /* 0x55 */
607 0x94e1, 0x95f8, 0x7728, 0x6805, 0x69a8, 0x548b, 0x4e4d, 0x70b8,
608 0x8bc8, 0x6458, 0x658b, 0x5b85, 0x7a84, 0x503a, 0x5be8, 0x77bb,
609 0x6be1, 0x8a79, 0x7c98, 0x6cbe, 0x76cf, 0x65a9, 0x8f97, 0x5d2d,
610 0x5c55, 0x8638, 0x6808, 0x5360, 0x6218, 0x7ad9, 0x6e5b, 0x7efd,
611 0x6a1f, 0x7ae0, 0x5f70, 0x6f33, 0x5f20, 0x638c, 0x6da8, 0x6756,
612 0x4e08, 0x5e10, 0x8d26, 0x4ed7, 0x80c0, 0x7634, 0x969c, 0x62db,
613 0x662d, 0x627e, 0x6cbc, 0x8d75, 0x7167, 0x7f69, 0x5146, 0x8087,
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614 0x53ec, 0x906e, 0x6298, 0x54f2, 0x86f0, 0x8f99, 0x8005, 0x9517,
615 0x8517, 0x8fd9, 0x6d59, 0x73cd, 0x659f, 0x771f, 0x7504, 0x7827,
616 0x81fb, 0x8d1e, 0x9488, 0x4fa6, 0x6795, 0x75b9, 0x8bca, 0x9707,
617 0x632f, 0x9547, 0x9635, 0x84b8, 0x6323, 0x7741, 0x5f81, 0x72f0,
618 0x4e89, 0x6014, 0x6574, 0x62ef, 0x6b63, 0x653f,
619 /* 0x56 */
620 0x5e27, 0x75c7, 0x90d1, 0x8bc1, 0x829d, 0x679d, 0x652f, 0x5431,
621 0x8718, 0x77e5, 0x80a2, 0x8102, 0x6c41, 0x4e4b, 0x7ec7, 0x804c,
622 0x76f4, 0x690d, 0x6b96, 0x6267, 0x503c, 0x4f84, 0x5740, 0x6307,
623 0x6b62, 0x8dbe, 0x53ea, 0x65e8, 0x7eb8, 0x5fd7, 0x631a, 0x63b7,
624 0x81f3, 0x81f4, 0x7f6e, 0x5e1c, 0x5cd9, 0x5236, 0x667a, 0x79e9,
625 0x7a1a, 0x8d28, 0x7099, 0x75d4, 0x6ede, 0x6cbb, 0x7a92, 0x4e2d,
626 0x76c5, 0x5fe0, 0x949f, 0x8877, 0x7ec8, 0x79cd, 0x80bf, 0x91cd,
627 0x4ef2, 0x4f17, 0x821f, 0x5468, 0x5dde, 0x6d32, 0x8bcc, 0x7ca5,
628 0x8f74, 0x8098, 0x5e1a, 0x5492, 0x76b1, 0x5b99, 0x663c, 0x9aa4,
629 0x73e0, 0x682a, 0x86db, 0x6731, 0x732a, 0x8bf8, 0x8bdb, 0x9010,
630 0x7af9, 0x70db, 0x716e, 0x62c4, 0x77a9, 0x5631, 0x4e3b, 0x8457,
631 0x67f1, 0x52a9, 0x86c0, 0x8d2e, 0x94f8, 0x7b51,
632 /* 0x57 */
633 0x4f4f, 0x6ce8, 0x795d, 0x9a7b, 0x6293, 0x722a, 0x62fd, 0x4e13,
634 0x7816, 0x8f6c, 0x64b0, 0x8d5a, 0x7bc6, 0x6869, 0x5e84, 0x88c5,
635 0x5986, 0x649e, 0x58ee, 0x72b6, 0x690e, 0x9525, 0x8ffd, 0x8d58,
636 0x5760, 0x7f00, 0x8c06, 0x51c6, 0x6349, 0x62d9, 0x5353, 0x684c,
637 0x7422, 0x8301, 0x914c, 0x5544, 0x7740, 0x707c, 0x6d4a, 0x5179,
638 0x54a8, 0x8d44, 0x59ff, 0x6ecb, 0x6dc4, 0x5b5c, 0x7d2b, 0x4ed4,
639 0x7c7d, 0x6ed3, 0x5b50, 0x81ea, 0x6e0d, 0x5b57, 0x9b03, 0x68d5,
640 0x8e2a, 0x5b97, 0x7efc, 0x603b, 0x7eb5, 0x90b9, 0x8d70, 0x594f,
641 0x63cd, 0x79df, 0x8db3, 0x5352, 0x65cf, 0x7956, 0x8bc5, 0x963b,
642 0x7ec4, 0x94bb, 0x7e82, 0x5634, 0x9189, 0x6700, 0x7f6a, 0x5c0a,
643 0x9075, 0x6628, 0x5de6, 0x4f50, 0x67de, 0x505a, 0x4f5c, 0x5750,
644 0x5ea7, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
645 /* 0x58 */
646 0x4e8d, 0x4e0c, 0x5140, 0x4e10, 0x5eff, 0x5345, 0x4e15, 0x4e98,
647 0x4e1e, 0x9b32, 0x5b6c, 0x5669, 0x4e28, 0x79ba, 0x4e3f, 0x5315,
648 0x4e47, 0x592d, 0x723b, 0x536e, 0x6c10, 0x56df, 0x80e4, 0x9997,
649 0x6bd3, 0x777e, 0x9f17, 0x4e36, 0x4e9f, 0x9f10, 0x4e5c, 0x4e69,
650 0x4e93, 0x8288, 0x5b5b, 0x556c, 0x560f, 0x4ec4, 0x538d, 0x539d,
651 0x53a3, 0x53a5, 0x53ae, 0x9765, 0x8d5d, 0x531a, 0x53f5, 0x5326,
652 0x532e, 0x533e, 0x533e, 0x8d5c, 0x5366, 0x5363, 0x5202, 0x5208, 0x520e,
653 0x522d, 0x5233, 0x523f, 0x5240, 0x524c, 0x525e, 0x5261, 0x525c,
654 0x84af, 0x527d, 0x5282, 0x5281, 0x5290, 0x5293, 0x5182, 0x7f54,
655 0x4ebb, 0x4ec3, 0x4ec9, 0x4ec2, 0x4ee8, 0x4ee1, 0x4eeb, 0x4ede,
656 0x4f1b, 0x4ef3, 0x4f22, 0x4f64, 0x4ef5, 0x4f25, 0x4f27, 0x4f09,
657 0x4f2b, 0x4f5e, 0x4f67, 0x6538, 0x4f5a, 0x4f5d,
658 /* 0x59 */
659 0x4f5f, 0x4f57, 0x4f32, 0x4f3d, 0x4f76, 0x4f74, 0x4f91, 0x4f89,
660 0x4f83, 0x4f8f, 0x4f7e, 0x4f7b, 0x4faa, 0x4f7c, 0x4fac, 0x4f94,
661 0x4fe6, 0x4fe8, 0x4fea, 0x4fc5, 0x4fda, 0x4fe3, 0x4fdc, 0x4fd1,
662 0x4fdf, 0x4ff8, 0x5029, 0x504c, 0x4ff3, 0x502c, 0x500f, 0x502e,
663 0x502d, 0x4ffe, 0x501c, 0x500c, 0x5025, 0x5028, 0x507e, 0x5043,
664 0x5055, 0x5048, 0x504e, 0x506c, 0x507b, 0x50a5, 0x50a7, 0x50a9,
665 0x50ba, 0x50d6, 0x5106, 0x50ed, 0x50ec, 0x50e6, 0x50ee, 0x5107,
666 0x510b, 0x4edd, 0x6c3d, 0x4f58, 0x4f65, 0x4fce, 0x9fa0, 0x6c46,
667 0x7c74, 0x516e, 0x5dfd, 0x9ec9, 0x9998, 0x5181, 0x5914, 0x52f9,
668 0x530d, 0x8a07, 0x5310, 0x51eb, 0x5919, 0x5155, 0x4ea0, 0x5156,
669 0x4eb3, 0x886e, 0x88a4, 0x4eb5, 0x8114, 0x88d2, 0x7980, 0x5b34,
670 0x8803, 0x7fb8, 0x51ab, 0x51b1, 0x51bd, 0x51bc,
671 /* 0x5a */
672 0x51c7, 0x5196, 0x51a2, 0x51a5, 0x8ba0, 0x8ba6, 0x8ba7, 0x8baa,
673 0x8bb4, 0x8bb5, 0x8bb7, 0x8bc2, 0x8bc3, 0x8bcb, 0x8bcf, 0x8bce,
674 0x8bd2, 0x8bd3, 0x8bd4, 0x8bd6, 0x8bd8, 0x8bd9, 0x8bdc, 0x8bdf,
675 0x8be0, 0x8be4, 0x8be8, 0x8be9, 0x8bee, 0x8bf0, 0x8bf3, 0x8bf6,
676 0x8bf9, 0x8bfc, 0x8bff, 0x8c00, 0x8c02, 0x8c04, 0x8c07, 0x8c0c,
677 0x8c0f, 0x8c11, 0x8c12, 0x8c14, 0x8c15, 0x8c16, 0x8c19, 0x8c1b,
678 0x8c18, 0x8c1d, 0x8c1f, 0x8c20, 0x8c21, 0x8c25, 0x8c27, 0x8c2a,
679 0x8c2b, 0x8c2e, 0x8c2f, 0x8c32, 0x8c33, 0x8c35, 0x8c36, 0x5369,
680 0x537a, 0x961d, 0x9622, 0x9621, 0x9631, 0x962a, 0x963d, 0x963c,
681 0x9642, 0x9649, 0x9654, 0x965f, 0x9667, 0x966c, 0x9672, 0x9674,
682 0x9688, 0x968d, 0x9697, 0x96b0, 0x9097, 0x909b, 0x909d, 0x9099,
683 0x90ac, 0x90a1, 0x90b4, 0x90b3, 0x90b6, 0x90ba,
684 /* 0x5b */
685 0x90b8, 0x90b0, 0x90cf, 0x90c5, 0x90be, 0x90d0, 0x90c4, 0x90c7,
686 0x90d3, 0x90e6, 0x90e2, 0x90dc, 0x90d7, 0x90db, 0x90eb, 0x90ef,
687 0x90fe, 0x9104, 0x9122, 0x911e, 0x9123, 0x9131, 0x912f, 0x9139,
688 0x9143, 0x9146, 0x520d, 0x5942, 0x52a2, 0x52ac, 0x52ad, 0x52be,
689 0x54ff, 0x52d0, 0x52d6, 0x52f0, 0x53df, 0x71ee, 0x77cd, 0x5ef4,
690 0x51f5, 0x51fc, 0x9b2f, 0x53b6, 0x5f01, 0x755a, 0x5def, 0x574c,
691 0x57a9, 0x57a1, 0x587e, 0x58bc, 0x58c5, 0x58d1, 0x5729, 0x572c,
692 0x572a, 0x5733, 0x5739, 0x572e, 0x572f, 0x575c, 0x573b, 0x5742,
693 0x5769, 0x5785, 0x576b, 0x5786, 0x577c, 0x577b, 0x5768, 0x576d,
694 0x5776, 0x5773, 0x57ad, 0x57a4, 0x578c, 0x57b2, 0x57cf, 0x57a7,
695 0x57b4, 0x5793, 0x57a0, 0x57d5, 0x57d8, 0x57da, 0x57d9, 0x57d2,
696 0x57b8, 0x57f4, 0x57ef, 0x57f8, 0x57e4, 0x57dd,
697 /* 0x5c */
698 0x580b, 0x580d, 0x57fd, 0x57ed, 0x5800, 0x581e, 0x5819, 0x5844,
699 0x5820, 0x5865, 0x586c, 0x5881, 0x5889, 0x589a, 0x5880, 0x99a8,
700 0x9f19, 0x61ff, 0x8279, 0x827d, 0x827f, 0x828f, 0x828a, 0x82a8,

```

```
701 0x8284, 0x828e, 0x8291, 0x8297, 0x8299, 0x82ab, 0x82b8, 0x82be,
702 0x82b0, 0x82c8, 0x82ca, 0x82e3, 0x8298, 0x82b7, 0x82ae, 0x82cb,
703 0x82cc, 0x82c1, 0x82a9, 0x82b4, 0x82a1, 0x82aa, 0x829f, 0x82c4,
704 0x82ce, 0x82a4, 0x82e1, 0x8309, 0x82f7, 0x82e4, 0x830f, 0x8307,
705 0x82dc, 0x82f4, 0x82d2, 0x82d8, 0x830c, 0x82fb, 0x82d3, 0x8311,
706 0x831a, 0x8306, 0x8314, 0x8315, 0x82e0, 0x82d5, 0x831c, 0x8351,
707 0x835b, 0x835c, 0x8308, 0x8392, 0x833c, 0x8334, 0x8331, 0x839b,
708 0x835e, 0x832f, 0x834f, 0x8347, 0x8343, 0x835f, 0x8340, 0x8317,
709 0x8360, 0x832d, 0x833a, 0x8333, 0x8366, 0x8365,
710 /* 0x5d */
711 0x8368, 0x831b, 0x8369, 0x836c, 0x836a, 0x836d, 0x836e, 0x83b0,
712 0x8378, 0x83b3, 0x83b4, 0x83a0, 0x83aa, 0x8393, 0x839c, 0x8385,
713 0x837c, 0x83b6, 0x83a9, 0x837d, 0x83b8, 0x837b, 0x8398, 0x839e,
714 0x83a8, 0x83ba, 0x83bc, 0x83c1, 0x8401, 0x83e5, 0x83d8, 0x5807,
715 0x8418, 0x840b, 0x83dd, 0x83fd, 0x83d6, 0x841c, 0x8438, 0x8411,
716 0x8406, 0x83d4, 0x83df, 0x840f, 0x8403, 0x83f8, 0x83f9, 0x83ea,
717 0x83c5, 0x83c0, 0x8426, 0x83f0, 0x83e1, 0x845c, 0x8451, 0x845a,
718 0x8459, 0x8473, 0x8487, 0x8488, 0x847a, 0x8489, 0x8478, 0x843c,
719 0x8446, 0x8469, 0x8476, 0x848c, 0x848e, 0x8431, 0x846d, 0x84c1,
720 0x84cd, 0x84d0, 0x84e6, 0x84bd, 0x84d3, 0x84ca, 0x84bf, 0x84ba,
721 0x84e0, 0x84a1, 0x84b9, 0x84b4, 0x8497, 0x84e5, 0x84e3, 0x850c,
722 0x750d, 0x8538, 0x84f0, 0x8539, 0x851f, 0x853a,
723 /* 0x5e */
724 0x8556, 0x853b, 0x84ff, 0x84fc, 0x8559, 0x8548, 0x8568, 0x8564,
725 0x855e, 0x857a, 0x77a2, 0x8543, 0x8572, 0x857b, 0x85a4, 0x85a8,
726 0x8587, 0x858f, 0x8579, 0x85ae, 0x859c, 0x8585, 0x85b9, 0x85b7,
727 0x85b0, 0x85d3, 0x85c1, 0x85dc, 0x85ff, 0x8627, 0x8605, 0x8629,
728 0x8616, 0x863c, 0x5efe, 0x5f08, 0x593c, 0x5941, 0x8037, 0x5955,
729 0x595a, 0x5958, 0x530f, 0x5c22, 0x5c25, 0x5c2c, 0x5c34, 0x624c,
730 0x626a, 0x629f, 0x62b1, 0x62bb, 0x62ca, 0x62da, 0x62d7, 0x62ee, 0x6322,
731 0x62f6, 0x6339, 0x634b, 0x6343, 0x63ad, 0x63f6, 0x6371, 0x637a,
732 0x638e, 0x63b4, 0x636d, 0x63ac, 0x638a, 0x6369, 0x63ae, 0x63bc,
733 0x63f2, 0x63f8, 0x63e0, 0x63ff, 0x63c4, 0x63de, 0x63ce, 0x6452,
734 0x63c6, 0x63be, 0x6445, 0x6441, 0x640b, 0x641b, 0x6420, 0x640c,
735 0x6426, 0x6421, 0x645e, 0x6484, 0x646d, 0x6496,
736 /* 0x5f */
737 0x647a, 0x64b7, 0x64b8, 0x6499, 0x64ba, 0x64c0, 0x64d0, 0x64d7,
738 0x64e4, 0x64e2, 0x6509, 0x6525, 0x652e, 0x5f0b, 0x5fd2, 0x7519,
739 0x5f11, 0x535f, 0x53f1, 0x53fd, 0x53e9, 0x53e8, 0x53fb, 0x5412,
740 0x5416, 0x5406, 0x544b, 0x5452, 0x5453, 0x5454, 0x5456, 0x5443,
741 0x5421, 0x5457, 0x5459, 0x5423, 0x5432, 0x5482, 0x5494, 0x5477,
742 0x5471, 0x5464, 0x549a, 0x549b, 0x5484, 0x5476, 0x5466, 0x549d,
743 0x54d0, 0x54ad, 0x54c2, 0x54b4, 0x54d2, 0x54a7, 0x54a6, 0x54d3,
744 0x54d4, 0x5472, 0x54a3, 0x54d5, 0x54bb, 0x54bf, 0x54cc, 0x54d9,
745 0x54da, 0x54dc, 0x54a9, 0x54aa, 0x54a4, 0x54dd, 0x54cf, 0x54de,
746 0x551b, 0x54e7, 0x5520, 0x54fd, 0x5514, 0x54f3, 0x5522, 0x5523,
747 0x550f, 0x5511, 0x5527, 0x552a, 0x5567, 0x558f, 0x55b5, 0x5549,
748 0x556d, 0x5541, 0x5555, 0x553f, 0x5550, 0x553c,
749 /* 0x60 */
750 0x5537, 0x5556, 0x5575, 0x5576, 0x5577, 0x5533, 0x5530, 0x555c,
751 0x558b, 0x55d2, 0x5583, 0x55b1, 0x55b9, 0x5588, 0x5581, 0x559f,
752 0x557e, 0x55d6, 0x5591, 0x557b, 0x55df, 0x55bd, 0x55be, 0x5594,
753 0x5599, 0x55ea, 0x55f7, 0x55c9, 0x561f, 0x55d1, 0x55eb, 0x55ec,
754 0x55d4, 0x55e6, 0x55dd, 0x55c4, 0x55ef, 0x55e5, 0x55f2, 0x55f3,
755 0x55cc, 0x55cd, 0x55e8, 0x55f5, 0x55e4, 0x8f94, 0x561e, 0x5608,
756 0x560c, 0x5601, 0x5624, 0x5623, 0x55fe, 0x5600, 0x5627, 0x562d,
757 0x5658, 0x5639, 0x5657, 0x562c, 0x564d, 0x5662, 0x5659, 0x565c,
758 0x564c, 0x5654, 0x5686, 0x5664, 0x5671, 0x566b, 0x567b, 0x567c,
759 0x5685, 0x5693, 0x56af, 0x56d4, 0x56d7, 0x56dd, 0x56e1, 0x56f5,
760 0x56eb, 0x56f9, 0x56ff, 0x5704, 0x570a, 0x5709, 0x571c, 0x5e0f,
761 0x5e19, 0x5e14, 0x5e11, 0x5e31, 0x5e3b, 0x5e3c,
762 /* 0x61 */
763 0x5e37, 0x5e44, 0x5e54, 0x5e5b, 0x5e5e, 0x5e61, 0x5c8c, 0x5c7a,
764 0x5c8d, 0x5c90, 0x5c96, 0x5c88, 0x5c98, 0x5c99, 0x5c91, 0x5c9a,
765 0x5c9c, 0x5cb5, 0x5ca2, 0x5cbd, 0x5cac, 0x5cab, 0x5cb1, 0x5ca3,
766 0x5cc1, 0x5cb7, 0x5cc4, 0x5cd2, 0x5ce4, 0x5ccb, 0x5ce5, 0x5d02,
767 0x5d03, 0x5d27, 0x5d26, 0x5d2e, 0x5d24, 0x5d1e, 0x5d06, 0x5d1b,
768 0x5d58, 0x5d3e, 0x5d34, 0x5d3d, 0x5d6c, 0x5d5b, 0x5d6f, 0x5d5d,
769 0x5d6b, 0x5d4b, 0x5d4a, 0x5d69, 0x5d74, 0x5d82, 0x5d99, 0x5d9d,
770 0x8c73, 0x5db7, 0x5dc5, 0x5f73, 0x5f77, 0x5f82, 0x5f87, 0x5f89,
771 0x5f8c, 0x5f95, 0x5f99, 0x5f9c, 0x5fa8, 0x5fad, 0x5fb5, 0x5fbc,
772 0x8862, 0x5f61, 0x72ad, 0x72b0, 0x72b4, 0x72b7, 0x72b8, 0x72c3,
773 0x72c1, 0x72ce, 0x72cd, 0x72d2, 0x72e8, 0x72ef, 0x72e9, 0x72f2,
774 0x72f4, 0x72f7, 0x7301, 0x72f3, 0x7303, 0x72fa,
775 /* 0x62 */
776 0x72fb, 0x7317, 0x7313, 0x7321, 0x730a, 0x731e, 0x731d, 0x7315,
777 0x7322, 0x7339, 0x7325, 0x732c, 0x7338, 0x7331, 0x7350, 0x734d,
778 0x7357, 0x7360, 0x736c, 0x736f, 0x737e, 0x821b, 0x5925, 0x98e7,
779 0x5924, 0x5902, 0x9963, 0x9967, 0x9968, 0x9969, 0x996a, 0x996b,
780 0x996c, 0x9974, 0x9977, 0x997d, 0x9980, 0x9984, 0x9987, 0x998a,
781 0x998d, 0x9990, 0x9991, 0x9993, 0x9994, 0x9995, 0x5e80, 0x5e91,
782 0x5e8b, 0x5e96, 0x5ea5, 0x5ea0, 0x5eb9, 0x5eb5, 0x5ebe, 0x5eb3,
783 0x8d53, 0x5ed2, 0x5ed1, 0x5edb, 0x5ee8, 0x5eea, 0x81ba, 0x5fc4,
784 0x5fc9, 0x5fd6, 0x5fcf, 0x6003, 0x5fee, 0x6004, 0x5fe1, 0x5fe4,
785 0x5ffe, 0x6005, 0x6006, 0x5fea, 0x5fed, 0x5ff8, 0x6019, 0x6035,
786 0x6026, 0x601b, 0x600f, 0x600d, 0x6029, 0x602b, 0x600a, 0x603f,
787 0x6021, 0x6078, 0x6079, 0x607b, 0x607a, 0x6042,
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```

788 /* 0x63 */
789 0x606a, 0x607d, 0x6096, 0x609a, 0x60ad, 0x609d, 0x6083, 0x6092,
790 0x608c, 0x609b, 0x609c, 0x60bb, 0x60b1, 0x60dd, 0x60d8, 0x60c6,
791 0x60da, 0x60b4, 0x6120, 0x6126, 0x6115, 0x6123, 0x60f4, 0x6100,
792 0x610e, 0x612b, 0x614a, 0x6175, 0x61ac, 0x6194, 0x61a7, 0x61b7,
793 0x61d4, 0x61f5, 0x5fdd, 0x96b3, 0x95e9, 0x95eb, 0x95f1, 0x95f3,
794 0x95f5, 0x95f6, 0x95fc, 0x95fe, 0x9603, 0x9604, 0x9606, 0x9608,
795 0x960a, 0x960b, 0x960c, 0x960d, 0x960f, 0x9612, 0x9615, 0x9616,
796 0x9617, 0x9619, 0x961a, 0x4e2c, 0x723f, 0x6215, 0x6c35, 0x6c54,
797 0x6c5c, 0x6c4a, 0x6ca3, 0x6c85, 0x6c90, 0x6c94, 0x6c8c, 0x6c68,
798 0x6c69, 0x6c74, 0x6c76, 0x6c86, 0x6ca9, 0x6cd0, 0x6cd4, 0x6cad,
799 0x6cf7, 0x6cf8, 0x6cf1, 0x6cd7, 0x6cb2, 0x6ce0, 0x6cd6, 0x6cfa,
800 0x6ceb, 0x6cee, 0x6cb1, 0x6cd3, 0x6cef, 0x6cfe,
801 /* 0x64 */
802 0x6d39, 0x6d27, 0x6d0c, 0x6d43, 0x6d48, 0x6d07, 0x6d04, 0x6d19,
803 0x6d0e, 0x6d2b, 0x6d4d, 0x6d2e, 0x6d35, 0x6d1a, 0x6d4f, 0x6d52,
804 0x6d54, 0x6d33, 0x6d91, 0x6d6f, 0x6d9e, 0x6da0, 0x6d5e, 0x6d93,
805 0x6d94, 0x6d5c, 0x6d60, 0x6d7c, 0x6d63, 0x6e1a, 0x6dc7, 0x6dc5,
806 0x6dde, 0x6e0e, 0x6dbf, 0x6de0, 0x6e11, 0x6de6, 0x6ddd, 0x6dd9,
807 0x6e16, 0x6dab, 0x6e0c, 0x6dae, 0x6e2b, 0x6e6e, 0x6e4e, 0x6e6b,
808 0x6eb2, 0x6e5f, 0x6e86, 0x6e53, 0x6e54, 0x6e32, 0x6e25, 0x6e44,
809 0x6edf, 0x6eb1, 0x6e98, 0x6ee0, 0x6f2d, 0x6ee2, 0x6ea5, 0x6ea7,
810 0x6ebd, 0x6ebb, 0x6eb7, 0x6ed7, 0x6eb4, 0x6ecf, 0x6e8f, 0x6ec2,
811 0x6e9f, 0x6f62, 0x6f46, 0x6f47, 0x6f24, 0x6f15, 0x6ef9, 0x6f2f,
812 0x6f36, 0x6f4b, 0x6f74, 0x6f2a, 0x6f09, 0x6f29, 0x6f89, 0x6f8d,
813 0x6f8c, 0x6f78, 0x6f72, 0x6f7c, 0x6f7a, 0x6fd1,
814 /* 0x65 */
815 0x6fc9, 0x6fa7, 0x6fb9, 0x6fb6, 0x6fc2, 0x6fel, 0x6fee, 0x6fde,
816 0x6fe0, 0x6fef, 0x701a, 0x7023, 0x701b, 0x7039, 0x7035, 0x704f,
817 0x705e, 0x5b80, 0x5b84, 0x5b95, 0x5b93, 0x5ba5, 0x5bb8, 0x752f,
818 0x9a9e, 0x6434, 0x5be4, 0x5bee, 0x8930, 0x5bf0, 0x8e47, 0x8b07,
819 0x8fb6, 0x8fd3, 0x8fd5, 0x8fe5, 0x8fee, 0x8fe4, 0x8fe9, 0x8fe6,
820 0x8ff3, 0x8fe8, 0x9005, 0x9004, 0x900b, 0x9026, 0x9011, 0x900d,
821 0x9016, 0x9021, 0x9035, 0x9036, 0x902d, 0x902f, 0x9044, 0x9051,
822 0x9052, 0x9050, 0x9068, 0x9058, 0x9062, 0x905b, 0x66b9, 0x9074,
823 0x907d, 0x9082, 0x9088, 0x9083, 0x908b, 0x5f50, 0x5f57, 0x5f56,
824 0x5f58, 0x5c3b, 0x54ab, 0x5c50, 0x5c59, 0x5b71, 0x5c63, 0x5c66,
825 0x7fbc, 0x5f2a, 0x5f29, 0x5f2d, 0x8274, 0x5f3c, 0x9b3b, 0x5c6e,
826 0x5981, 0x5983, 0x598d, 0x59a9, 0x59aa, 0x59a3,
827 /* 0x66 */
828 0x5997, 0x59ca, 0x59ab, 0x599e, 0x59a4, 0x59d2, 0x59b2, 0x59af,
829 0x59d7, 0x59be, 0x5a05, 0x5a06, 0x59dd, 0x5a08, 0x59e3, 0x59d8,
830 0x59f9, 0x5a0c, 0x5a09, 0x5a32, 0x5a34, 0x5a11, 0x5a23, 0x5a13,
831 0x5a40, 0x5a67, 0x5a4a, 0x5a55, 0x5a3c, 0x5a62, 0x5a75, 0x80ec,
832 0x5aaa, 0x5a9b, 0x5a77, 0x5a7a, 0x5abe, 0x5aeb, 0x5ab2, 0x5ad2,
833 0x5ad4, 0x5ab8, 0x5ae0, 0x5ae3, 0x5af1, 0x5ad6, 0x5ae6, 0x5ad8,
834 0x5adc, 0x5b09, 0x5b17, 0x5b16, 0x5b32, 0x5b37, 0x5b40, 0x5c15,
835 0x5c1c, 0x5b5a, 0x5b65, 0x5b73, 0x5b51, 0x5b53, 0x5b62, 0x9a75,
836 0x9a77, 0x9a78, 0x9a7a, 0x9a7f, 0x9a7d, 0x9a80, 0x9a81, 0x9a85,
837 0x9a88, 0x9a8a, 0x9a90, 0x9a92, 0x9a93, 0x9a96, 0x9a98, 0x9a9b,
838 0x9a9c, 0x9a9d, 0x9a9f, 0x9aa0, 0x9aa2, 0x9aa3, 0x9aa5, 0x9aa7,
839 0x7e9f, 0x7ea1, 0x7ea3, 0x7ea5, 0x7ea8, 0x7ea9,
840 /* 0x67 */
841 0x7ead, 0x7eb0, 0x7ebe, 0x7ec0, 0x7ec1, 0x7ec2, 0x7ec9, 0x7ecb,
842 0x7ecc, 0x7ed0, 0x7ed4, 0x7ed7, 0x7edb, 0x7ee0, 0x7ee1, 0x7ee8,
843 0x7eeb, 0x7eee, 0x7eef, 0x7ef1, 0x7ef2, 0x7f0d, 0x7fef, 0x7efa,
844 0x7efb, 0x7efe, 0x7f01, 0x7f02, 0x7f03, 0x7f07, 0x7f08, 0x7f0b,
845 0x7f0c, 0x7f0f, 0x7f11, 0x7f12, 0x7f17, 0x7f19, 0x7f1c, 0x7f1b,
846 0x7f1f, 0x7f21, 0x7f22, 0x7f23, 0x7f24, 0x7f25, 0x7f26, 0x7f27,
847 0x7f2a, 0x7f2b, 0x7f2c, 0x7f2d, 0x7f2f, 0x7f30, 0x7f31, 0x7f32,
848 0x7f33, 0x7f35, 0x5e7a, 0x757f, 0x5ddb, 0x753e, 0x9095, 0x738e,
849 0x7391, 0x73ae, 0x73a2, 0x739f, 0x73cf, 0x73c2, 0x73d1, 0x73b7,
850 0x73b3, 0x73c0, 0x73c9, 0x73c8, 0x73e5, 0x73d9, 0x987c, 0x740a,
851 0x73e9, 0x73e7, 0x73de, 0x73ba, 0x73f2, 0x740f, 0x742a, 0x745b,
852 0x7426, 0x7425, 0x7428, 0x7430, 0x742e, 0x742c,
853 /* 0x68 */
854 0x741b, 0x741a, 0x7441, 0x745c, 0x7457, 0x7455, 0x7459, 0x7477,
855 0x746d, 0x747e, 0x749c, 0x748e, 0x7480, 0x7481, 0x7487, 0x748b,
856 0x749e, 0x74a8, 0x74a9, 0x7490, 0x74a7, 0x74d2, 0x74ba, 0x97ea,
857 0x97eb, 0x97ec, 0x674c, 0x6753, 0x675e, 0x6748, 0x6769, 0x67a5,
858 0x6787, 0x676a, 0x6773, 0x6798, 0x67a7, 0x6775, 0x67a8, 0x679e,
859 0x67ad, 0x678b, 0x6777, 0x677c, 0x67f0, 0x6809, 0x67d8, 0x680a,
860 0x67e9, 0x67b0, 0x680c, 0x67d9, 0x67b5, 0x67da, 0x67b3, 0x67dd,
861 0x6800, 0x67c3, 0x67b8, 0x67e2, 0x680e, 0x67c1, 0x67fd, 0x6832,
862 0x6833, 0x6860, 0x6861, 0x684e, 0x6862, 0x6844, 0x6864, 0x6883,
863 0x681d, 0x6855, 0x6866, 0x6841, 0x6867, 0x6840, 0x683e, 0x684a,
864 0x6849, 0x6829, 0x68b5, 0x688f, 0x6874, 0x6877, 0x6893, 0x686b,
865 0x68c2, 0x696e, 0x68fc, 0x691f, 0x6920, 0x68f9,
866 /* 0x69 */
867 0x6924, 0x68f0, 0x690b, 0x6901, 0x6957, 0x68e3, 0x6910, 0x6971,
868 0x6939, 0x6960, 0x6942, 0x695d, 0x6984, 0x696b, 0x6980, 0x6998,
869 0x6978, 0x6934, 0x69cc, 0x6987, 0x6988, 0x69ce, 0x6989, 0x6966,
870 0x6963, 0x6979, 0x699b, 0x69a7, 0x69bb, 0x69ab, 0x69ad, 0x69d4,
871 0x69b1, 0x69c1, 0x69ca, 0x69df, 0x6995, 0x69e0, 0x698d, 0x69ff,
872 0x6a2f, 0x69ed, 0x6a17, 0x6a18, 0x6a65, 0x69f2, 0x6a44, 0x6a3e,
873 0x6aa0, 0x6a50, 0x6a5b, 0x6a35, 0x6a8e, 0x6a79, 0x6a3d, 0x6a28,
874 0x6a58, 0x6a7c, 0x6a91, 0x6a90, 0x6aa9, 0x6a97, 0x6aab, 0x7337,

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875 0x7352, 0x6b81, 0x6b82, 0x6b87, 0x6b84, 0x6b92, 0x6b93, 0x6b8d,
876 0x6b9a, 0x6b9b, 0x6ba1, 0x6baa, 0x8f6b, 0x8f6d, 0x8f71, 0x8f72,
877 0x8f73, 0x8f75, 0x8f76, 0x8f78, 0x8f77, 0x8f79, 0x8f7a, 0x8f7c,
878 0x8f7e, 0x8f81, 0x8f82, 0x8f84, 0x8f87, 0x8f8b,
879 /* 0x6a */
880 0x8f8d, 0x8f8e, 0x8f8f, 0x8f98, 0x8f9a, 0x8ece, 0x620b, 0x6217,
881 0x621b, 0x621f, 0x6222, 0x6221, 0x6225, 0x6224, 0x622c, 0x81e7,
882 0x74ef, 0x74f4, 0x74ff, 0x750f, 0x7511, 0x7513, 0x6534, 0x65ee,
883 0x65ef, 0x65f0, 0x660a, 0x6619, 0x6772, 0x6603, 0x6615, 0x6600,
884 0x7085, 0x66f7, 0x661d, 0x6634, 0x6631, 0x6636, 0x6635, 0x8006,
885 0x665f, 0x6654, 0x6641, 0x664f, 0x6656, 0x6661, 0x6657, 0x6677,
886 0x6684, 0x668c, 0x66a7, 0x669d, 0x66be, 0x66db, 0x66dc, 0x66e6,
887 0x66e9, 0x8d32, 0x8d33, 0x8d36, 0x8d3b, 0x8d3d, 0x8d40, 0x8d45,
888 0x8d46, 0x8d48, 0x8d49, 0x8d47, 0x8d4d, 0x8d55, 0x8d59, 0x89c7,
889 0x89ca, 0x89cb, 0x89cc, 0x89ce, 0x89cf, 0x89d0, 0x89d1, 0x726e,
890 0x729f, 0x725d, 0x7266, 0x726f, 0x727e, 0x727f, 0x7284, 0x728b,
891 0x728d, 0x728f, 0x7292, 0x6308, 0x6332, 0x63b0,
892 /* 0x6b */
893 0x643f, 0x64d8, 0x8004, 0x6bea, 0x6bf3, 0x6bfd, 0x6bf5, 0x6bf9,
894 0x6c05, 0x6c07, 0x6c06, 0x6c0d, 0x6c15, 0x6c18, 0x6c19, 0x6c1a,
895 0x6c21, 0x6c29, 0x6c29, 0x6c24, 0x6c2a, 0x6c32, 0x6535, 0x6555, 0x656b,
896 0x724d, 0x7252, 0x7256, 0x7230, 0x8662, 0x5216, 0x809f, 0x809c,
897 0x8093, 0x80bc, 0x670a, 0x80bd, 0x80b1, 0x80ab, 0x80ad, 0x80b4,
898 0x80b7, 0x80e7, 0x80e8, 0x80e9, 0x80ea, 0x80db, 0x80c2, 0x80c4,
899 0x80d9, 0x80cd, 0x80d7, 0x6710, 0x80dd, 0x80eb, 0x80f1, 0x80f4,
900 0x80ed, 0x810d, 0x810e, 0x80f2, 0x80fc, 0x6715, 0x8112, 0x8c5a,
901 0x8136, 0x811e, 0x812c, 0x8118, 0x8132, 0x8148, 0x814c, 0x8153,
902 0x8174, 0x8159, 0x815a, 0x8171, 0x8160, 0x8169, 0x817c, 0x817d,
903 0x816d, 0x8167, 0x584d, 0x5ab5, 0x8188, 0x8182, 0x8191, 0x6ed5,
904 0x81a3, 0x81aa, 0x81cc, 0x6726, 0x81ca, 0x81bb,
905 /* 0x6c */
906 0x81c1, 0x81a6, 0x6b24, 0x6b37, 0x6b39, 0x6b43, 0x6b46, 0x6b59,
907 0x98d1, 0x98d2, 0x98d3, 0x98d5, 0x98da, 0x6bb3, 0x5f40,
908 0x6bc2, 0x89f3, 0x6590, 0x9f51, 0x6593, 0x65bc, 0x65c6, 0x65c4,
909 0x65c3, 0x65cc, 0x65ce, 0x65d2, 0x65d6, 0x7080, 0x709c, 0x7096,
910 0x709d, 0x70bb, 0x70c0, 0x70b7, 0x70ab, 0x70b1, 0x70e8, 0x70ca,
911 0x7110, 0x7113, 0x7116, 0x712f, 0x7131, 0x7173, 0x715c, 0x7168,
912 0x7145, 0x7172, 0x714a, 0x7178, 0x717a, 0x7198, 0x71b3, 0x71b5,
913 0x71a8, 0x71a0, 0x71e0, 0x71d4, 0x71e7, 0x71f9, 0x721d, 0x7228,
914 0x706c, 0x7118, 0x7166, 0x71b9, 0x623e, 0x623d, 0x6243, 0x6248,
915 0x6249, 0x793b, 0x7940, 0x7946, 0x7949, 0x795b, 0x795c, 0x7953,
916 0x795a, 0x7962, 0x7957, 0x7960, 0x796f, 0x7967, 0x797a, 0x7985,
917 0x798a, 0x799a, 0x79a7, 0x79b3, 0x5fd1, 0x5fd0,
918 /* 0x6d */
919 0x603c, 0x605d, 0x605a, 0x6067, 0x6041, 0x6059, 0x6063, 0x60ab,
920 0x6106, 0x610d, 0x615d, 0x61a9, 0x619d, 0x61cb, 0x61d1, 0x6206,
921 0x8080, 0x807f, 0x6c93, 0x6cf6, 0x6dfc, 0x77f6, 0x77f8, 0x7800,
922 0x7809, 0x7817, 0x7818, 0x7811, 0x65ab, 0x782d, 0x781c, 0x781d,
923 0x7839, 0x783a, 0x783b, 0x781f, 0x783c, 0x7825, 0x782c, 0x7823,
924 0x7829, 0x784e, 0x786d, 0x7856, 0x7857, 0x7826, 0x7850, 0x7847,
925 0x784c, 0x786a, 0x789b, 0x7893, 0x789a, 0x7887, 0x789c, 0x78a1,
926 0x78a3, 0x78b2, 0x78b9, 0x78a5, 0x78d4, 0x78d9, 0x78c9, 0x78ec,
927 0x78f2, 0x7905, 0x78f4, 0x7913, 0x7924, 0x791e, 0x7934, 0x9f9b,
928 0x9ef9, 0x9efb, 0x9efc, 0x76f1, 0x7704, 0x770d, 0x76f9, 0x7707,
929 0x7708, 0x771a, 0x7722, 0x7719, 0x772d, 0x7726, 0x7735, 0x7738,
930 0x7750, 0x7751, 0x7747, 0x7743, 0x775a, 0x7768,
931 /* 0x6e */
932 0x7762, 0x7765, 0x777f, 0x778d, 0x777d, 0x7780, 0x778c, 0x7791,
933 0x779f, 0x77a0, 0x77b0, 0x77b5, 0x77bd, 0x753a, 0x7540, 0x754e,
934 0x754b, 0x7548, 0x755b, 0x7572, 0x7579, 0x7583, 0x7f58, 0x7f61,
935 0x7f5f, 0x8a48, 0x7f68, 0x7f74, 0x7f71, 0x7f79, 0x7f81, 0x7f7e,
936 0x76cd, 0x76e5, 0x8832, 0x9485, 0x9486, 0x9487, 0x948b, 0x948a,
937 0x948c, 0x948d, 0x948f, 0x9490, 0x9494, 0x9497, 0x9495, 0x949a,
938 0x949b, 0x949c, 0x94a3, 0x94a4, 0x94ab, 0x94aa, 0x94ad, 0x94ac,
939 0x94af, 0x94b0, 0x94b2, 0x94b4, 0x94b6, 0x94b7, 0x94b8, 0x94b9,
940 0x94ba, 0x94bc, 0x94bd, 0x94bf, 0x94c4, 0x94c8, 0x94c9, 0x94ca,
941 0x94cb, 0x94cc, 0x94cd, 0x94ce, 0x94d0, 0x94d1, 0x94d2, 0x94d5,
942 0x94d6, 0x94d7, 0x94d9, 0x94d8, 0x94db, 0x94de, 0x94df, 0x94e0,
943 0x94e2, 0x94e4, 0x94e5, 0x94e7, 0x94e8, 0x94ea,
944 /* 0x6f */
945 0x94e9, 0x94eb, 0x94ee, 0x94ef, 0x94f3, 0x94f4, 0x94f5, 0x94f7,
946 0x94f9, 0x94fc, 0x94fd, 0x94ff, 0x9503, 0x9502, 0x9506, 0x9507,
947 0x9509, 0x950a, 0x950d, 0x950e, 0x950f, 0x9512, 0x9513, 0x9514,
948 0x9515, 0x9516, 0x9518, 0x951b, 0x951d, 0x951e, 0x951f, 0x9522,
949 0x952a, 0x952b, 0x9529, 0x952c, 0x9531, 0x9532, 0x9534, 0x9536,
950 0x9537, 0x9538, 0x953c, 0x953e, 0x953f, 0x9542, 0x9535, 0x9544,
951 0x9545, 0x9546, 0x9549, 0x954c, 0x954e, 0x954f, 0x9552, 0x9553,
952 0x9554, 0x9556, 0x9557, 0x9558, 0x9559, 0x955b, 0x955e, 0x955f,
953 0x955d, 0x9561, 0x9562, 0x9564, 0x9565, 0x9566, 0x9567, 0x9568,
954 0x9569, 0x956a, 0x956b, 0x956c, 0x956f, 0x9571, 0x9572, 0x9573,
955 0x953a, 0x77e7, 0x77ec, 0x96c9, 0x79d5, 0x79ed, 0x79e3, 0x79eb,
956 0x7a06, 0x5d47, 0x7a03, 0x7a02, 0x7a1e, 0x7a14,
957 /* 0x70 */
958 0x7a39, 0x7a37, 0x7a51, 0x9ecf, 0x99a5, 0x7a70, 0x7688, 0x768e,
959 0x7693, 0x7699, 0x76a4, 0x74de, 0x74e0, 0x752c, 0x9e20, 0x9e22,
960 0x9e28, 0x9e29, 0x9e2a, 0x9e2b, 0x9e2c, 0x9e32, 0x9e31, 0x9e36,
961 0x9e38, 0x9e37, 0x9e39, 0x9e3a, 0x9e3e, 0x9e41, 0x9e42, 0x9e44,
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962 0x9e46, 0x9e47, 0x9e48, 0x9e49, 0x9e4b, 0x9e4c, 0x9e4e, 0x9e51,
963 0x9e55, 0x9e57, 0x9e5a, 0x9e5b, 0x9e5c, 0x9e5e, 0x9e63, 0x9e66,
964 0x9e67, 0x9e68, 0x9e69, 0x9e6a, 0x9e6b, 0x9e6c, 0x9e71, 0x9e6d,
965 0x9e73, 0x7592, 0x7594, 0x7596, 0x75a0, 0x759d, 0x75ac, 0x75a3,
966 0x75b3, 0x75b4, 0x75b8, 0x75c4, 0x75b1, 0x75b0, 0x75c3, 0x75c2,
967 0x75d6, 0x75cd, 0x75e3, 0x75e8, 0x75e6, 0x75e4, 0x75eb, 0x75e7,
968 0x7603, 0x75f1, 0x75fc, 0x75ff, 0x7610, 0x7600, 0x7605, 0x760c,
969 0x7617, 0x760a, 0x7625, 0x7618, 0x7615, 0x7619,
970 /* 0x71 */
971 0x761b, 0x763c, 0x7622, 0x7620, 0x7640, 0x762d, 0x7630, 0x763f,
972 0x7635, 0x7643, 0x763e, 0x7633, 0x764d, 0x765e, 0x7654, 0x765c,
973 0x7656, 0x766b, 0x766f, 0x7fca, 0x7ae6, 0x7a78, 0x7a79, 0x7a80,
974 0x7a86, 0x7a88, 0x7a95, 0x7aa6, 0x7aa0, 0x7aac, 0x7aa8, 0x7aad,
975 0x7ab3, 0x8864, 0x8869, 0x8872, 0x887d, 0x887f, 0x8882, 0x88a2,
976 0x88c6, 0x88b7, 0x88bc, 0x88c9, 0x88e2, 0x88ce, 0x88e3, 0x88e5,
977 0x88f1, 0x891a, 0x88fc, 0x88e8, 0x88fe, 0x88f0, 0x8921, 0x8919,
978 0x8913, 0x891b, 0x890a, 0x8934, 0x892b, 0x8936, 0x8941, 0x8966,
979 0x897b, 0x758b, 0x80e5, 0x76b2, 0x76b4, 0x77dc, 0x8012, 0x8014,
980 0x8016, 0x801c, 0x8020, 0x8022, 0x8025, 0x8026, 0x8027, 0x8029,
981 0x8028, 0x8031, 0x800b, 0x8035, 0x8043, 0x8046, 0x804d, 0x8052,
982 0x8069, 0x8071, 0x8983, 0x9878, 0x9880, 0x9883,
983 /* 0x72 */
984 0x9889, 0x988c, 0x988d, 0x988f, 0x9894, 0x989a, 0x989b, 0x989e,
985 0x989f, 0x98a1, 0x98a2, 0x98a5, 0x98a6, 0x864d, 0x8654, 0x866c,
986 0x866e, 0x867f, 0x867a, 0x867c, 0x867b, 0x86a8, 0x868d, 0x868b,
987 0x86ac, 0x869d, 0x86a7, 0x86a3, 0x86aa, 0x8693, 0x86a9, 0x86b6,
988 0x86c4, 0x86b5, 0x86ce, 0x86b0, 0x86ba, 0x86b1, 0x86af, 0x86c9,
989 0x86cf, 0x86b4, 0x86e9, 0x86f1, 0x86f2, 0x86ed, 0x86f3, 0x86d0,
990 0x8713, 0x86de, 0x86f4, 0x86df, 0x86d8, 0x86d1, 0x8703, 0x8707,
991 0x86f8, 0x8708, 0x870a, 0x870d, 0x8709, 0x8723, 0x873b, 0x871e,
992 0x8725, 0x872e, 0x871a, 0x873e, 0x8748, 0x8734, 0x8731, 0x8729,
993 0x8737, 0x873f, 0x8782, 0x8722, 0x877d, 0x877e, 0x877b, 0x8760,
994 0x8770, 0x874c, 0x876e, 0x878b, 0x8753, 0x8763, 0x877c, 0x8764,
995 0x8759, 0x8765, 0x8793, 0x87af, 0x87a8, 0x87d2,
996 /* 0x73 */
997 0x87c6, 0x8788, 0x8785, 0x87ad, 0x8797, 0x8783, 0x87ab, 0x87e5,
998 0x87ac, 0x87b5, 0x87b3, 0x87cb, 0x87d3, 0x87bd, 0x87d1, 0x87c0,
999 0x87ca, 0x87db, 0x87ea, 0x87e0, 0x87ee, 0x8816, 0x8813, 0x87fe,
1000 0x880a, 0x881b, 0x8821, 0x8839, 0x883c, 0x7f36, 0x7f42, 0x7f44,
1001 0x7f45, 0x8210, 0x7afa, 0x7afd, 0x7b08, 0x7b03, 0x7b04, 0x7b15,
1002 0x7b0a, 0x7b2b, 0x7b0f, 0x7b47, 0x7b38, 0x7b2a, 0x7b19, 0x7b2e,
1003 0x7b31, 0x7b20, 0x7b25, 0x7b24, 0x7b33, 0x7b3e, 0x7b1e, 0x7b58,
1004 0x7b5a, 0x7b45, 0x7b75, 0x7b4c, 0x7b5d, 0x7b60, 0x7b6e, 0x7b7b,
1005 0x7b62, 0x7b72, 0x7b71, 0x7b90, 0x7ba6, 0x7ba7, 0x7bb8, 0x7bac,
1006 0x7b9d, 0x7ba8, 0x7b85, 0x7baa, 0x7b9c, 0x7ba2, 0x7bab, 0x7bb4,
1007 0x7bd1, 0x7bc1, 0x7bcc, 0x7bdd, 0x7bda, 0x7be5, 0x7be6, 0x7bea,
1008 0x7c0c, 0x7bfe, 0x7bfc, 0x7c0f, 0x7c16, 0x7c0b,
1009 /* 0x74 */
1010 0x7c1f, 0x7c2a, 0x7c26, 0x7c38, 0x7c41, 0x7c40, 0x81fe, 0x8201,
1011 0x8202, 0x8204, 0x81ec, 0x8844, 0x8221, 0x8222, 0x8223, 0x822d,
1012 0x822f, 0x8228, 0x822b, 0x8238, 0x823b, 0x8233, 0x8234, 0x823e,
1013 0x8244, 0x8249, 0x824b, 0x824f, 0x825a, 0x825f, 0x8268, 0x887e,
1014 0x8885, 0x8888, 0x88d8, 0x88df, 0x895e, 0x7f9d, 0x7f9f, 0x7fa7,
1015 0x7faf, 0x7fb0, 0x7fb2, 0x7c7c, 0x6549, 0x7c91, 0x7c9d, 0x7c9c,
1016 0x7c9e, 0x7ca2, 0x7cb2, 0x7cbc, 0x7cbd, 0x7cc1, 0x7cc7, 0x7ccc,
1017 0x7ccd, 0x7cc8, 0x7cc5, 0x7cd7, 0x7ce8, 0x826e, 0x66a8, 0x7fbf,
1018 0x7fce, 0x7fd5, 0x7fe5, 0x7fe1, 0x7fe6, 0x7fe9, 0x7fee, 0x7ff3,
1019 0x7cf8, 0x7d77, 0x7da6, 0x7dae, 0x7e47, 0x7e9b, 0x9eb8, 0x9eb4,
1020 0x8d73, 0x8d84, 0x8d94, 0x8d91, 0x8db1, 0x8d67, 0x8d6d, 0x8c47,
1021 0x8c49, 0x914a, 0x9150, 0x914e, 0x914f, 0x9164,
1022 /* 0x75 */
1023 0x9162, 0x9161, 0x9170, 0x9169, 0x916f, 0x917d, 0x917e, 0x9172,
1024 0x9174, 0x9179, 0x918c, 0x9185, 0x9190, 0x918d, 0x9191, 0x91a2,
1025 0x91a3, 0x91aa, 0x91ad, 0x91ae, 0x91af, 0x91b5, 0x91b4, 0x91ba,
1026 0x8c55, 0x9e7e, 0x8db8, 0x8deb, 0x8e05, 0x8e59, 0x8e69, 0x8db5,
1027 0x8dbf, 0x8dbc, 0x8dba, 0x8dc4, 0x8dd0, 0x8dd4, 0x8dde,
1028 0x8dce, 0x8dcf, 0x8ddb, 0x8dc6, 0x8dec, 0x8df7, 0x8df8, 0x8de3,
1029 0x8df9, 0x8dfd, 0x8de4, 0x8e09, 0x8dfd, 0x8e14, 0x8e1d, 0x8e1f,
1030 0x8e2c, 0x8e2e, 0x8e23, 0x8e2f, 0x8e3a, 0x8e40, 0x8e39, 0x8e35,
1031 0x8e3d, 0x8e31, 0x8e49, 0x8e41, 0x8e42, 0x8e51, 0x8e52, 0x8e4a,
1032 0x8e70, 0x8e76, 0x8e7c, 0x8e6f, 0x8e74, 0x8e85, 0x8e8f, 0x8e94,
1033 0x8e90, 0x8e9c, 0x8e9e, 0x8c78, 0x8c82, 0x8c8a, 0x8c85, 0x8c98,
1034 0x8c94, 0x659b, 0x89d6, 0x89de, 0x89da, 0x89dc,
1035 /* 0x76 */
1036 0x89e5, 0x89eb, 0x89ef, 0x8a3e, 0x8b26, 0x9753, 0x96e9, 0x96f3,
1037 0x96ef, 0x9706, 0x9701, 0x9708, 0x970f, 0x970e, 0x972a, 0x972d,
1038 0x9730, 0x973e, 0x9f80, 0x9f83, 0x9f85, 0x9f86, 0x9f87, 0x9f88,
1039 0x9f89, 0x9f8a, 0x9f8c, 0x9efe, 0x9f0b, 0x9f0d, 0x96b9, 0x96bc,
1040 0x96bd, 0x96ce, 0x96d2, 0x77bf, 0x96e0, 0x928e, 0x92ae, 0x92c8,
1041 0x933e, 0x936a, 0x93ca, 0x938f, 0x943e, 0x946b, 0x9c7f, 0x9c82,
1042 0x9c85, 0x9c86, 0x9c87, 0x9c88, 0x7a23, 0x9c8b, 0x9c8e, 0x9c90,
1043 0x9c91, 0x9c92, 0x9c94, 0x9c95, 0x9c9a, 0x9c9b, 0x9c9e, 0x9c9f,
1044 0x9ca0, 0x9ca1, 0x9ca2, 0x9ca3, 0x9ca5, 0x9ca6, 0x9ca7, 0x9ca8,
1045 0x9ca9, 0x9cab, 0x9cad, 0x9cae, 0x9cb0, 0x9cb1, 0x9cb2, 0x9cb3,
1046 0x9cb4, 0x9cb5, 0x9cb6, 0x9cb7, 0x9cba, 0x9cbb, 0x9cbc, 0x9cbd,
1047 0x9cc4, 0x9cc5, 0x9cc6, 0x9cc7, 0x9cca, 0x9ccb,
1048 /* 0x77 */
```

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1049 0x9ccc, 0x9ccd, 0x9cce, 0x9ccf, 0x9cd0, 0x9cd3, 0x9cd4, 0x9cd5,
1050 0x9cd7, 0x9cd8, 0x9cd9, 0x9cdc, 0x9cdd, 0x9cdf, 0x9ce2, 0x977c,
1051 0x9785, 0x9791, 0x9792, 0x9794, 0x97af, 0x97ab, 0x97a3, 0x97b2,
1052 0x97b4, 0x9ab1, 0x9ab0, 0x9ab7, 0x9e58, 0x9ab6, 0x9aba, 0x9abc,
1053 0x9ac1, 0x9ac0, 0x9ac5, 0x9ac2, 0x9acb, 0x9acc, 0x9ad1, 0x9b45,
1054 0x9b43, 0x9b47, 0x9b49, 0x9b48, 0x9b4d, 0x9b51, 0x98e8, 0x990d,
1055 0x992e, 0x9955, 0x9954, 0x9adf, 0x9ae1, 0x9ae6, 0x9aef, 0x9aeb,
1056 0x9afb, 0x9aed, 0x9af9, 0x9b08, 0x9b0f, 0x9b13, 0x9b1f, 0x9b23,
1057 0x9ebd, 0x9ebe, 0x7e3b, 0x9e82, 0x9e87, 0x9e88, 0x9e8b, 0x9e92,
1058 0x93d6, 0x9e9d, 0x9e9f, 0x9edb, 0x9edc, 0x9edd, 0x9ee0, 0x9edf,
1059 0x9ee2, 0x9ee9, 0x9ee7, 0x9ee5, 0x9eea, 0x9eef, 0x9f22, 0x9f2c,
1060 0x9f2f, 0x9f39, 0x9f37, 0x9f3d, 0x9f3e, 0x9f44,
1061 };
1062
1063 static int
1064 gb2312_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
1065 {
1066     unsigned char c1 = (s[0] & 0x7F);
1067     if ((c1 >= 0x21 && c1 <= 0x29) || (c1 >= 0x30 && c1 <= 0x77)) {
1068         if (n >= 2) {
1069             unsigned char c2 = (s[1] & 0x7F);
1070             if (c2 >= 0x21 && c2 < 0x7f) {
1071                 unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
1072                 unsigned short wc = 0xffff;
1073                 if (i < 1410) {
1074                     if (i < 831)
1075                         wc = gb2312_2uni_page21[i];
1076                 } else {
1077                     if (i < 8178)
1078                         wc = gb2312_2uni_page30[i-1410];
1079                 }
1080                 if (wc != 0xffff) {
1081                     *pwc = (ucs4_t) wc;
1082                     return 2;
1083                 }
1084             }
1085             return RET_ILSEQ;
1086         }
1087         return RET_TOOFEW(0);
1088     }
1089     return RET_ILSEQ;
1090 }
1091 #endif /* NEED_TOWC */
1092
1093 #ifdef NEED_TOMB
1094 static const unsigned short gb2312_2charset[7445] = {
1095 0x2168, 0x216c, 0x2127, 0x2163, 0x2140, 0x2141, 0x2824, 0x2822,
1096 0x2828, 0x2826, 0x283a, 0x282c, 0x282a, 0x2830, 0x282e, 0x2142,
1097 0x2834, 0x2832, 0x2839, 0x2821, 0x2825, 0x2827, 0x2829, 0x282d,
1098 0x2831, 0x2823, 0x282b, 0x282f, 0x2833, 0x2835, 0x2836, 0x2837,
1099 0x2838, 0x2126, 0x2125, 0x2621, 0x2622, 0x2623, 0x2624, 0x2625,
1100 0x2626, 0x2627, 0x2628, 0x2629, 0x262a, 0x262b, 0x262c, 0x262d,
1101 0x262e, 0x262f, 0x2630, 0x2631, 0x2632, 0x2633, 0x2634, 0x2635,
1102 0x2636, 0x2637, 0x2638, 0x2641, 0x2642, 0x2643, 0x2644, 0x2645,
1103 0x2646, 0x2647, 0x2648, 0x2649, 0x264a, 0x264b, 0x264c, 0x264d,
1104 0x264e, 0x264f, 0x2650, 0x2651, 0x2652, 0x2653, 0x2654, 0x2655,
1105 0x2656, 0x2657, 0x2658, 0x2727, 0x2721, 0x2722, 0x2723, 0x2724,
1106 0x2725, 0x2726, 0x2728, 0x2729, 0x272a, 0x272b, 0x272c, 0x272d,
1107 0x272e, 0x272f, 0x2730, 0x2731, 0x2732, 0x2733, 0x2734, 0x2735,
1108 0x2736, 0x2737, 0x2738, 0x2739, 0x273a, 0x273b, 0x273c, 0x273d,
1109 0x273e, 0x273f, 0x2740, 0x2741, 0x2751, 0x2752, 0x2753, 0x2754,
1110 0x2755, 0x2756, 0x2758, 0x2759, 0x275a, 0x275b, 0x275c, 0x275d,
1111 0x275e, 0x275f, 0x2760, 0x2761, 0x2762, 0x2763, 0x2764, 0x2765,
1112 0x2766, 0x2767, 0x2768, 0x2769, 0x276a, 0x276b, 0x276c, 0x276d,
1113 0x276e, 0x276f, 0x2770, 0x2771, 0x2757, 0x212a, 0x212c, 0x212e,
1114 0x212f, 0x2130, 0x2131, 0x212d, 0x216b, 0x2164, 0x2165, 0x2179,
1115 0x2166, 0x216d, 0x2271, 0x2272, 0x2273, 0x2274, 0x2275, 0x2276,
1116 0x2277, 0x2278, 0x2279, 0x227a, 0x227b, 0x227c, 0x217b, 0x217c,
1117 0x217a, 0x217d, 0x214a, 0x2147, 0x2146, 0x214c, 0x2158, 0x215e,
1118 0x214f, 0x214e, 0x2144, 0x2145, 0x2149, 0x2148, 0x2152, 0x2153,
1119 0x2160, 0x215f, 0x2143, 0x214b, 0x2157, 0x2156, 0x2155, 0x2159,
1120 0x2154, 0x215c, 0x215d, 0x215a, 0x215b, 0x2151, 0x214d, 0x2150,
1121 0x2259, 0x225a, 0x225b, 0x225c, 0x225d, 0x225e, 0x225f, 0x2260,
1122 0x2261, 0x2262, 0x2245, 0x2246, 0x2247, 0x2248, 0x2249, 0x224a,
1123 0x224b, 0x224c, 0x224d, 0x224e, 0x224f, 0x2250, 0x2251, 0x2252,
1124 0x2253, 0x2254, 0x2255, 0x2256, 0x2257, 0x2258, 0x2231, 0x2232,
1125 0x2233, 0x2234, 0x2235, 0x2236, 0x2237, 0x2238, 0x2239, 0x223a,
1126 0x223b, 0x223c, 0x223d, 0x223e, 0x223f, 0x2240, 0x2241, 0x2242,
1127 0x2243, 0x2244, 0x2924, 0x2925, 0x2926, 0x2927, 0x2928, 0x2929,
1128 0x292a, 0x292b, 0x292c, 0x292d, 0x292e, 0x292f, 0x2930, 0x2931,
1129 0x2932, 0x2933, 0x2934, 0x2935, 0x2936, 0x2937, 0x2938, 0x2939,
1130 0x293a, 0x293b, 0x293c, 0x293d, 0x293e, 0x293f, 0x2940, 0x2941,
1131 0x2942, 0x2943, 0x2944, 0x2945, 0x2946, 0x2947, 0x2948, 0x2949,
1132 0x294a, 0x294b, 0x294c, 0x294d, 0x294e, 0x294f, 0x2950, 0x2951,
1133 0x2952, 0x2953, 0x2954, 0x2955, 0x2956, 0x2957, 0x2958, 0x2959,
1134 0x295a, 0x295b, 0x295c, 0x295d, 0x295e, 0x295f, 0x2960, 0x2961,
1135 0x2962, 0x2963, 0x2964, 0x2965, 0x2966, 0x2967, 0x2968, 0x2969,
```

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1136 0x296a, 0x296b, 0x296c, 0x296d, 0x296e, 0x296f, 0x2176, 0x2175,
1137 0x2178, 0x2177, 0x2174, 0x2173, 0x2170, 0x2172, 0x2171, 0x216f,
1138 0x216e, 0x2162, 0x2161, 0x2121, 0x2122, 0x2123, 0x2128, 0x2129,
1139 0x2134, 0x2135, 0x2136, 0x2137, 0x2138, 0x2139, 0x213a, 0x213b,
1140 0x213e, 0x213f, 0x217e, 0x2132, 0x2133, 0x213c, 0x213d, 0x2421,
1141 0x2422, 0x2423, 0x2424, 0x2425, 0x2426, 0x2427, 0x2428, 0x2429,
1142 0x242a, 0x242b, 0x242c, 0x242d, 0x242e, 0x242f, 0x2430, 0x2431,
1143 0x2432, 0x2433, 0x2434, 0x2435, 0x2436, 0x2437, 0x2438, 0x2439,
1144 0x243a, 0x243b, 0x243c, 0x243d, 0x243e, 0x243f, 0x2440, 0x2441,
1145 0x2442, 0x2443, 0x2444, 0x2445, 0x2446, 0x2447, 0x2448, 0x2449,
1146 0x244a, 0x244b, 0x244c, 0x244d, 0x244e, 0x244f, 0x2450, 0x2451,
1147 0x2452, 0x2453, 0x2454, 0x2455, 0x2456, 0x2457, 0x2458, 0x2459,
1148 0x245a, 0x245b, 0x245c, 0x245d, 0x245e, 0x245f, 0x2460, 0x2461,
1149 0x2462, 0x2463, 0x2464, 0x2465, 0x2466, 0x2467, 0x2468, 0x2469,
1150 0x246a, 0x246b, 0x246c, 0x246d, 0x246e, 0x246f, 0x2470, 0x2471,
1151 0x2472, 0x2473, 0x2521, 0x2522, 0x2523, 0x2524, 0x2525, 0x2526,
1152 0x2527, 0x2528, 0x2529, 0x252a, 0x252b, 0x252c, 0x252d, 0x252e,
1153 0x252f, 0x2530, 0x2531, 0x2532, 0x2533, 0x2534, 0x2535, 0x2536,
1154 0x2537, 0x2538, 0x2539, 0x253a, 0x253b, 0x253c, 0x253d, 0x253e,
1155 0x253f, 0x2540, 0x2541, 0x2542, 0x2543, 0x2544, 0x2545, 0x2546,
1156 0x2547, 0x2548, 0x2549, 0x254a, 0x254b, 0x254c, 0x254d, 0x254e,
1157 0x254f, 0x2550, 0x2551, 0x2552, 0x2553, 0x2554, 0x2555, 0x2556,
1158 0x2557, 0x2558, 0x2559, 0x255a, 0x255b, 0x255c, 0x255d, 0x255e,
1159 0x255f, 0x2560, 0x2561, 0x2562, 0x2563, 0x2564, 0x2565, 0x2566,
1160 0x2567, 0x2568, 0x2569, 0x256a, 0x256b, 0x256c, 0x256d, 0x256e,
1161 0x256f, 0x2570, 0x2571, 0x2572, 0x2573, 0x2574, 0x2575, 0x2576,
1162 0x2124, 0x2845, 0x2846, 0x2847, 0x2848, 0x2849, 0x284a, 0x284b,
1163 0x284c, 0x284d, 0x284e, 0x284f, 0x2850, 0x2851, 0x2852, 0x2853,
1164 0x2854, 0x2855, 0x2856, 0x2857, 0x2858, 0x2859, 0x285a, 0x285b,
1165 0x285c, 0x285d, 0x285e, 0x285f, 0x2860, 0x2861, 0x2862, 0x2863,
1166 0x2864, 0x2865, 0x2866, 0x2867, 0x2868, 0x2869, 0x2265, 0x2266,
1167 0x2267, 0x2268, 0x2269, 0x226a, 0x226b, 0x226c, 0x226d, 0x226e,
1168 0x523b, 0x3621, 0x465f, 0x4d72, 0x5549, 0x487d, 0x494f, 0x4f42,
1169 0x5822, 0x323b, 0x536b, 0x5824, 0x3373, 0x5728, 0x4752, 0x5827,
1170 0x4a40, 0x4770, 0x317b, 0x5235, 0x3454, 0x362b, 0x4b3f, 0x5829,
1171 0x362a, 0x413d, 0x514f, 0x4925, 0x582d, 0x3876, 0x513e, 0x635c,
1172 0x5650, 0x3761, 0x342e, 0x4159, 0x583c, 0x4d68, 0x3524, 0x4e2a,
1173 0x5677, 0x4076, 0x3e59, 0x582f, 0x444b, 0x3e43, 0x5831, 0x4334,
1174 0x5265, 0x562e, 0x4e5a, 0x5527, 0x3a75, 0x3726, 0x4056, 0x4639,
1175 0x4552, 0x4747, 0x3954, 0x334b, 0x5252, 0x583f, 0x3e45, 0x4672,
1176 0x5232, 0x4f30, 0x4f67, 0x4a69, 0x5840, 0x4272, 0x4252, 0x4869,
1177 0x472c, 0x414b, 0x5368, 0x5579, 0x4a42, 0x367e, 0x5821, 0x535a,
1178 0x3f77, 0x5446, 0x3b25, 0x5841, 0x4e65, 0x3e2e, 0x5828, 0x5147,
1179 0x5029, 0x583d, 0x596f, 0x4d76, 0x3f3a, 0x3d3b, 0x3a25, 0x5260,
1180 0x327a, 0x3a60, 0x4436, 0x4f6d, 0x3e29, 0x4d24, 0x4141, 0x4757,
1181 0x5971, 0x5974, 0x484b, 0x5869, 0x525a, 0x4a32, 0x484a, 0x586c,
1182 0x586a, 0x5846, 0x3d76, 0x464d, 0x3370, 0x586b, 0x3d71, 0x3d69,
1183 0x4854, 0x3453, 0x4258, 0x3256, 0x5750, 0x4a4b, 0x4b7b, 0x554c,
1184 0x3836, 0x4f49, 0x595a, 0x5870, 0x472a, 0x586e, 0x347a, 0x416e,
1185 0x5254, 0x586d, 0x5247, 0x586f, 0x4347, 0x5176, 0x5659, 0x5872,
1186 0x5875, 0x3c7e, 0x3c5b, 0x484e, 0x375d, 0x3742, 0x4673, 0x5878,
1187 0x5241, 0x4e69, 0x3c3f, 0x377c, 0x3725, 0x505d, 0x565a, 0x5345,
1188 0x3b6f, 0x3b61, 0x5871, 0x4921, 0x4e30, 0x342b, 0x5873, 0x494b,
1189 0x5876, 0x4257, 0x5877, 0x4e31, 0x5879, 0x322e, 0x3940, 0x5923,
1190 0x3069, 0x4166, 0x496c, 0x4b45, 0x4b46, 0x5924, 0x3568, 0x352b,
1191 0x4e3b, 0x354d, 0x5721, 0x5774, 0x5353, 0x4c65, 0x3a4e, 0x5922,
1192 0x595c, 0x5360, 0x587d, 0x3770, 0x5777, 0x587e, 0x587a, 0x5921,
1193 0x4463, 0x5336, 0x5874, 0x595d, 0x587b, 0x4565, 0x4050, 0x5170,
1194 0x305b, 0x3c51, 0x5926, 0x5925, 0x592c, 0x592e, 0x592b, 0x4a39,
1195 0x5929, 0x5636, 0x335e, 0x5928, 0x407d, 0x4a4c, 0x592a, 0x5927,
1196 0x5930, 0x3631, 0x3929, 0x5240, 0x4f40, 0x4242, 0x3d44, 0x556c,
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1870 0x756c, 0x7569, 0x3657, 0x756d, 0x756a, 0x756b, 0x345a, 0x546a,
1871 0x756e, 0x3379, 0x756f, 0x7571, 0x7570, 0x7572, 0x7573, 0x496d,
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1873 0x5079, 0x696d, 0x572a, 0x696e, 0x4256, 0x486d, 0x3a64, 0x696f,
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1875 0x6977, 0x4761, 0x6978, 0x5458, 0x6979, 0x3d4e, 0x697a, 0x697b,
1876 0x3d4f, 0x697c, 0x3828, 0x413e, 0x697d, 0x3132, 0x3b54, 0x3975,
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1879 0x3447, 0x3159, 0x4031, 0x3166, 0x3167, 0x3168, 0x333d, 0x4868,
1880 0x6541, 0x315f, 0x4149, 0x346f, 0x4728, 0x5358, 0x4679, 0x5138,
1881 0x397d, 0x4275, 0x532d, 0x544b, 0x3d7c, 0x6542, 0x3735, 0x6543,
1882 0x3b39, 0x5562, 0x3d78, 0x5436, 0x4e25, 0x412c, 0x3359, 0x4c76,
1883 0x6546, 0x6544, 0x6548, 0x654a, 0x6547, 0x354f, 0x4648, 0x357c,
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1888 0x376a, 0x654e, 0x6555, 0x347e, 0x6556, 0x6553, 0x6554, 0x525d,
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1916 0x6e5e, 0x6e5f, 0x6e60, 0x6e61, 0x576a, 0x6e62, 0x6e63, 0x3c58,
1917 0x6e64, 0x534b, 0x4c7a, 0x322c, 0x4165, 0x6e65, 0x4726, 0x432d,
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1924 0x4134, 0x6f2c, 0x4f7a, 0x4b78, 0x6f2e, 0x6f2d, 0x337a, 0x3978,
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2024 0x2376, 0x2377, 0x2378, 0x2379, 0x237a, 0x237b, 0x237c, 0x237d,
2025 0x212b, 0x2169, 0x216a, 0x237e, 0x2324,
2026 };
2027
2028 static const Summary16 gb2312_uni2indx_page00[70] = {
2029     /* 0x0000 */
2030     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 },
2031     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 },
2032     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0190 }, { 3, 0x0003 },
2033     { 5, 0x0000 }, { 5, 0x0080 }, { 6, 0x3703 }, { 13, 0x168c },
2034     /* 0x0100 */
2035     { 19, 0x0002 }, { 20, 0x0808 }, { 22, 0x0800 }, { 23, 0x0000 },
2036     { 23, 0x2000 }, { 24, 0x0000 }, { 24, 0x0800 }, { 25, 0x0000 },
2037     { 25, 0x0000 }, { 25, 0x0000 }, { 25, 0x0000 }, { 25, 0x0000 },
2038     { 25, 0x4000 }, { 26, 0x1555 }, { 33, 0x0000 }, { 33, 0x0000 },
2039     /* 0x0200 */
2040     { 33, 0x0000 }, { 33, 0x0000 }, { 33, 0x0000 }, { 33, 0x0000 },
2041     { 33, 0x0000 }, { 33, 0x0000 }, { 33, 0x0000 }, { 33, 0x0000 },
2042     { 33, 0x0000 }, { 33, 0x0000 }, { 33, 0x0000 }, { 33, 0x0000 },
2043     { 33, 0x0280 }, { 35, 0x0000 }, { 35, 0x0000 }, { 35, 0x0000 },
2044     /* 0x0300 */
2045     { 35, 0x0000 }, { 35, 0x0000 }, { 35, 0x0000 }, { 35, 0x0000 },
2046     { 35, 0x0000 }, { 35, 0x0000 }, { 35, 0x0000 }, { 35, 0x0000 },
2047     { 35, 0x0000 }, { 35, 0xffff }, { 50, 0x03fb }, { 59, 0xffff },
2048     { 74, 0x03fb }, { 83, 0x0000 }, { 83, 0x0000 }, { 83, 0x0000 },
2049     /* 0x0400 */
2050     { 83, 0x0002 }, { 84, 0xffff }, { 100, 0xffff }, { 116, 0xffff },
2051     { 132, 0xffff }, { 148, 0x0002 },
2052 };
2053 static const Summary16 gb2312_uni2indx_page20[101] = {
2054     /* 0x2000 */
2055     { 149, 0x0000 }, { 149, 0x3360 }, { 155, 0x0040 }, { 156, 0x080d },
2056     { 160, 0x0000 }, { 160, 0x0000 }, { 160, 0x0000 }, { 160, 0x0000 },
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2063     { 178, 0x0000 }, { 178, 0x0000 }, { 178, 0x0000 }, { 178, 0x0000 },
2064     /* 0x2200 */
2065     { 178, 0x8100 }, { 180, 0x6402 }, { 184, 0x4fa1 }, { 192, 0x20f0 },
2066     { 197, 0x1100 }, { 199, 0x0000 }, { 199, 0xc033 }, { 205, 0x0000 },
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2076     { 208, 0x0000 }, { 208, 0x0000 }, { 208, 0x03ff }, { 218, 0xffff },
2077     { 230, 0xffff }, { 246, 0xffff }, { 258, 0x0000 }, { 258, 0x0000 },
2078     { 258, 0x0000 }, { 258, 0x0000 }, { 258, 0x0000 }, { 258, 0x0000 },
2079     /* 0x2500 */
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2083     { 338, 0xc8c0 }, { 343, 0x0000 }, { 343, 0x0000 }, { 343, 0x0000 },
2084     /* 0x2600 */
2085     { 343, 0x0060 }, { 345, 0x0000 }, { 345, 0x0000 }, { 345, 0x0000 },
2086     { 345, 0x0005 },
2087 };
2088 static const Summary16 gb2312_uni2indx_page30[35] = {
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2090     { 347, 0xff2f }, { 360, 0x00fb }, { 367, 0x0000 }, { 367, 0x0000 },
2091     { 367, 0xffff }, { 382, 0xffff }, { 398, 0xffff }, { 414, 0xffff },
2092     { 430, 0xffff }, { 446, 0x000f }, { 450, 0xffff }, { 465, 0xffff },

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2094 /* 0x3100 */
2095 { 537, 0xffe0 }, { 548, 0xffff }, { 564, 0x03ff }, { 574, 0x0000 },
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2099 /* 0x3200 */
2100 { 574, 0x0000 }, { 574, 0x0000 }, { 574, 0x03ff },
2101 };
2102 static const Summary16 gb2312_uni2indx_page4e[1263] = {
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2105 { 628, 0xfba8 }, { 638, 0xf35d }, { 649, 0x0243 }, { 653, 0x400b },
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2107 { 693, 0x6eff }, { 706, 0xe3fa }, { 717, 0x1d3a }, { 725, 0xa8ed },
2108 /* 0x4f00 */
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2113 /* 0x5000 */
2114 { 854, 0xb000 }, { 857, 0x9714 }, { 864, 0x7762 }, { 873, 0x5400 },
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2117 { 905, 0x8000 }, { 906, 0x0440 }, { 908, 0x70c0 }, { 913, 0x0828 },
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2133 /* 0x5400 */
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2138 /* 0x5500 */
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2303 /* 0x7600 */
2304 { 4205, 0x142b }, { 4211, 0x8ba1 }, { 4218, 0x2e75 }, { 4227, 0xd139 },
2305 { 4235, 0x3009 }, { 4239, 0x5050 }, { 4243, 0x8808 }, { 4246, 0x6900 },
2306 { 4250, 0x49d4 }, { 4257, 0x024a }, { 4261, 0x4010 }, { 4263, 0x8016 },
2307 { 4267, 0xe564 }, { 4275, 0x89d7 }, { 4284, 0xc020 }, { 4287, 0x5316 },
2308 /* 0x7700 */
2309 { 4294, 0x2b92 }, { 4301, 0x8600 }, { 4304, 0xa345 }, { 4311, 0x15e0 },
2310 { 4317, 0x008b }, { 4321, 0x0c03 }, { 4325, 0x196e }, { 4333, 0xe200 },
2311 { 4337, 0x7031 }, { 4343, 0x8006 }, { 4346, 0x16a5 }, { 4353, 0xa829 },
2312 { 4359, 0x2000 }, { 4360, 0x1880 }, { 4363, 0x7aac }, { 4372, 0xe148 },
2313 /* 0x7800 */
2314 { 4378, 0x3207 }, { 4384, 0xb5d6 }, { 4394, 0x32e8 }, { 4401, 0x5f91 },
2315 { 4410, 0x50a1 }, { 4415, 0x20e5 }, { 4421, 0x7c00 }, { 4426, 0x1080 },
2316 { 4428, 0x7280 }, { 4433, 0x9d8a }, { 4441, 0x00aa }, { 4445, 0x421f },
2317 { 4452, 0x0e22 }, { 4457, 0x0231 }, { 4461, 0x1100 }, { 4463, 0x0494 },
2318 /* 0x7900 */
2319 { 4467, 0x0022 }, { 4469, 0x4008 }, { 4471, 0x0010 }, { 4472, 0x5c10 },
2320 { 4477, 0x0343 }, { 4482, 0xfcc8 }, { 4491, 0xa1a5 }, { 4498, 0x0580 },
2321 { 4501, 0x8433 }, { 4507, 0x0400 }, { 4508, 0x0080 }, { 4509, 0x6e08 },
2322 { 4515, 0x2a4b }, { 4522, 0x8126 }, { 4527, 0xaaad }, { 4535, 0x2901 },
2323 /* 0x7a00 */
2324 { 4539, 0x684d }, { 4546, 0x4490 }, { 4550, 0x0009 }, { 4552, 0xba88 },
2325 { 4559, 0x0040 }, { 4560, 0x0082 }, { 4562, 0x0000 }, { 4562, 0x87d1 },
2326 { 4570, 0x215b }, { 4577, 0xb1e6 }, { 4586, 0x3161 }, { 4592, 0x8008 },
2327 { 4594, 0x0800 }, { 4595, 0xc240 }, { 4599, 0xa069 }, { 4605, 0xa600 },
2328 /* 0x7b00 */
2329 { 4609, 0x8d58 }, { 4616, 0x4a32 }, { 4622, 0x5d71 }, { 4631, 0x550a },
2330 { 4637, 0x9aa0 }, { 4643, 0x2d57 }, { 4652, 0x4005 }, { 4655, 0x4aa6 },
2331 { 4662, 0x2021 }, { 4665, 0x30b1 }, { 4671, 0x3fc6 }, { 4681, 0x0112 },
2332 { 4684, 0x10c2 }, { 4688, 0x260a }, { 4693, 0x4462 }, { 4698, 0x5082 },
2333 /* 0x7c00 */
2334 { 4702, 0x9880 }, { 4706, 0x8040 }, { 4708, 0x04c0 }, { 4711, 0x8100 },
2335 { 4713, 0x2003 }, { 4716, 0x0000 }, { 4716, 0x0000 }, { 4716, 0x3818 },
2336 { 4721, 0x0200 }, { 4722, 0xf1a6 }, { 4731, 0x4434 }, { 4736, 0x720e },
2337 { 4743, 0x35a2 }, { 4750, 0x92e0 }, { 4756, 0x8101 }, { 4759, 0x0900 },
2338 /* 0x7d00 */
2339 { 4761, 0x0400 }, { 4762, 0x0000 }, { 4762, 0x8885 }, { 4767, 0x0000 },
2340 { 4767, 0x0000 }, { 4767, 0x0000 }, { 4767, 0x4000 }, { 4768, 0x0080 },
2341 { 4769, 0x0000 }, { 4769, 0x0000 }, { 4769, 0x4040 }, { 4771, 0x0000 },
2342 { 4771, 0x0000 }, { 4771, 0x0000 }, { 4771, 0x0000 }, { 4771, 0x0000 },
2343 /* 0x7e00 */
2344 { 4771, 0x0000 }, { 4771, 0x0000 }, { 4771, 0x0000 }, { 4771, 0x0800 },
2345 { 4772, 0x0082 }, { 4774, 0x0000 }, { 4774, 0x0000 }, { 4774, 0x0000 },
2346 { 4774, 0x0004 }, { 4775, 0x8800 }, { 4777, 0xbfff }, { 4792, 0xe7ef },
2347 { 4805, 0xffff }, { 4821, 0xffbf }, { 4836, 0xefef }, { 4850, 0xfdff },
2348 /* 0x7f00 */
2349 { 4865, 0xbfff }, { 4880, 0xbffe }, { 4894, 0xffff }, { 4910, 0x057f },
2350 { 4919, 0x0034 }, { 4922, 0x85b3 }, { 4930, 0x4706 }, { 4936, 0x4216 },
2351 { 4941, 0x5402 }, { 4945, 0xe410 }, { 4950, 0x8092 }, { 4954, 0xb305 },
2352 { 4961, 0x5422 }, { 4966, 0x8130 }, { 4970, 0x4263 }, { 4976, 0x180b },
2353 /* 0x8000 */
```

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2354 { 4981, 0x387b }, { 4990, 0x13f5 }, { 4999, 0x07e5 }, { 5007, 0xa9ea },
2355 { 5016, 0x3c4c }, { 5023, 0x0514 }, { 5027, 0x0600 }, { 5029, 0x8002 },
2356 { 5031, 0x1ad9 }, { 5039, 0xbd48 }, { 5047, 0xee37 }, { 5058, 0xf496 },
2357 { 5067, 0x705f }, { 5076, 0x7ec0 }, { 5084, 0xbfb2 }, { 5095, 0x355f },
2358 /* 0x8100 */
2359 { 5105, 0xe644 }, { 5112, 0x455f }, { 5121, 0x9000 }, { 5123, 0x4146 },
2360 { 5128, 0x1d40 }, { 5133, 0x063b }, { 5140, 0x62a1 }, { 5146, 0xfe13 },
2361 { 5156, 0x8505 }, { 5161, 0x3902 }, { 5166, 0x0548 }, { 5170, 0x0c08 },
2362 { 5173, 0x144f }, { 5180, 0x0000 }, { 5180, 0x3488 }, { 5185, 0x5818 },
2363 /* 0x8200 */
2364 { 5190, 0x3077 }, { 5198, 0xd815 }, { 5205, 0xbd0e }, { 5214, 0x4bfb },
2365 { 5225, 0x8a90 }, { 5230, 0x8500 }, { 5233, 0xc100 }, { 5236, 0xe61d },
2366 { 5245, 0xed14 }, { 5253, 0xb386 }, { 5261, 0xff72 }, { 5273, 0x639b },
2367 { 5282, 0xfd92 }, { 5292, 0xd9be }, { 5303, 0x887b }, { 5311, 0x0a92 },
2368 /* 0x8300 */
2369 { 5316, 0xd3fe }, { 5328, 0x1cb2 }, { 5335, 0xb980 }, { 5341, 0x177a },
2370 { 5350, 0x82c9 }, { 5356, 0xdc17 }, { 5365, 0xffffb }, { 5380, 0x3980 },
2371 { 5385, 0x4260 }, { 5389, 0x590c }, { 5395, 0x0f01 }, { 5400, 0x37df },
2372 { 5412, 0x94a3 }, { 5419, 0xb150 }, { 5425, 0x0623 }, { 5430, 0x2307 },
2373 /* 0x8400 */
2374 { 5436, 0xf85a }, { 5445, 0x3102 }, { 5449, 0x01f0 }, { 5454, 0x3102 },
2375 { 5458, 0x0040 }, { 5459, 0x1e82 }, { 5465, 0x3a0a }, { 5471, 0x056a },
2376 { 5477, 0x5b84 }, { 5484, 0x1280 }, { 5487, 0x8002 }, { 5489, 0xa714 },
2377 { 5496, 0x2612 }, { 5501, 0xa04b }, { 5507, 0x1069 }, { 5512, 0x9001 },
2378 /* 0x8500 */
2379 { 5515, 0x1000 }, { 5516, 0x848a }, { 5521, 0x1802 }, { 5524, 0x3f80 },
2380 { 5531, 0x0708 }, { 5535, 0x4240 }, { 5538, 0x0110 }, { 5540, 0x4e14 },
2381 { 5546, 0x80b0 }, { 5550, 0x1800 }, { 5552, 0xc510 }, { 5557, 0x0281 },
2382 { 5560, 0x8202 }, { 5563, 0x1029 }, { 5567, 0x0210 }, { 5569, 0x8800 },
2383 /* 0x8600 */
2384 { 5571, 0x0020 }, { 5572, 0x0042 }, { 5574, 0x0280 }, { 5576, 0x1100 },
2385 { 5578, 0xe000 }, { 5581, 0x4413 }, { 5586, 0x5804 }, { 5590, 0xfe02 },
2386 { 5598, 0x3c07 }, { 5605, 0x3028 }, { 5609, 0x9798 }, { 5617, 0x0473 },
2387 { 5623, 0xcd1 }, { 5632, 0xcb13 }, { 5640, 0x6210 }, { 5644, 0x431f },
2388 /* 0x8700 */
2389 { 5652, 0x278d }, { 5660, 0x55ac }, { 5668, 0x422e }, { 5674, 0xc892 },
2390 { 5680, 0x5380 }, { 5685, 0x0288 }, { 5688, 0x4039 }, { 5693, 0x7851 },
2391 { 5700, 0x292c }, { 5706, 0x8088 }, { 5709, 0xb900 }, { 5714, 0x2428 },
2392 { 5718, 0x0c41 }, { 5722, 0x080e }, { 5726, 0x4421 }, { 5730, 0x4200 },
2393 /* 0x8800 */
2394 { 5732, 0x0408 }, { 5734, 0x0868 }, { 5738, 0x0006 }, { 5740, 0x1204 },
2395 { 5743, 0x3031 }, { 5748, 0x0290 }, { 5751, 0x5b3e }, { 5761, 0xe085 },
2396 { 5767, 0x2936 }, { 5774, 0x1044 }, { 5777, 0x2814 }, { 5781, 0x1082 },
2397 { 5784, 0x4266 }, { 5790, 0x8334 }, { 5796, 0x013c }, { 5801, 0x531b },
2398 /* 0x8900 */
2399 { 5809, 0x0404 }, { 5811, 0x0e0d }, { 5817, 0x0c22 }, { 5821, 0x0051 },
2400 { 5824, 0x0012 }, { 5826, 0xc000 }, { 5828, 0x0040 }, { 5829, 0x8800 },
2401 { 5831, 0x004a }, { 5834, 0x0000 }, { 5834, 0x0000 }, { 5834, 0x0000 },
2402 { 5834, 0xdff6 }, { 5847, 0x5447 }, { 5854, 0x8868 }, { 5859, 0x0008 },
2403 /* 0x8a00 */
2404 { 5860, 0x0081 }, { 5862, 0x0000 }, { 5862, 0x0000 }, { 5862, 0x4000 },
2405 { 5863, 0x0100 }, { 5864, 0x0000 }, { 5864, 0x0000 }, { 5864, 0x0200 },
2406 { 5865, 0x0600 }, { 5867, 0x0008 }, { 5868, 0x0000 }, { 5868, 0x0000 },
2407 { 5868, 0x0000 }, { 5868, 0x0000 }, { 5868, 0x0000 }, { 5868, 0x0000 },
2408 /* 0x8b00 */
2409 { 5868, 0x0080 }, { 5869, 0x0000 }, { 5869, 0x0040 }, { 5870, 0x0000 },
2410 { 5870, 0x0000 }, { 5870, 0x0000 }, { 5870, 0x1040 }, { 5872, 0x0000 },
2411 { 5872, 0x0000 }, { 5872, 0x0000 }, { 5872, 0xffff }, { 5887, 0xf7fd },
2412 { 5901, 0xff7f }, { 5916, 0xffff }, { 5931, 0xfbf }, { 5946, 0xffff },
2413 /* 0x8c00 */
2414 { 5962, 0xfdf }, { 5977, 0xbfff }, { 5992, 0xffff }, { 6008, 0x00ff },
2415 { 6016, 0x12c2 }, { 6021, 0x0420 }, { 6023, 0x0c06 }, { 6027, 0x0708 },
2416 { 6031, 0x1624 }, { 6036, 0x0110 }, { 6038, 0x0000 }, { 6038, 0x0000 },
2417 { 6038, 0x0000 }, { 6038, 0x0000 }, { 6038, 0x0000 }, { 6038, 0x0000 },
2418 /* 0x8d00 */
2419 { 6038, 0x0000 }, { 6038, 0xe000 }, { 6041, 0xffff }, { 6056, 0xffff },
2420 { 6072, 0xffff }, { 6088, 0x7f79 }, { 6100, 0x28df }, { 6109, 0x00f9 },
2421 { 6115, 0x0c32 }, { 6120, 0x8012 }, { 6123, 0x0008 }, { 6124, 0xd53a },
2422 { 6133, 0xd858 }, { 6140, 0xecc2 }, { 6148, 0x9d18 }, { 6155, 0x2fa8 },
2423 /* 0x8e00 */
2424 { 6163, 0x9620 }, { 6168, 0xe010 }, { 6172, 0xd60c }, { 6179, 0x2622 },
2425 { 6184, 0x0f97 }, { 6193, 0x0206 }, { 6196, 0xb240 }, { 6201, 0x9055 },
2426 { 6207, 0x80a2 }, { 6211, 0x5011 }, { 6215, 0x9800 }, { 6218, 0x0404 },
2427 { 6220, 0x4000 }, { 6221, 0x0000 }, { 6221, 0x0000 }, { 6221, 0x0000 },
2428 /* 0x8f00 */
2429 { 6221, 0x0000 }, { 6221, 0x0000 }, { 6221, 0x0000 }, { 6221, 0x0000 },
2430 { 6221, 0x0000 }, { 6221, 0x0000 }, { 6221, 0xfbc0 }, { 6230, 0xffff },
2431 { 6246, 0xeffe }, { 6260, 0xdffb }, { 6274, 0x0b08 }, { 6278, 0x6243 },
2432 { 6284, 0x41b6 }, { 6291, 0xfb3b }, { 6303, 0x6f74 }, { 6313, 0x2389 },
2433 /* 0x9000 */
2434 { 6319, 0xae7f }, { 6331, 0xecd7 }, { 6342, 0xe047 }, { 6349, 0x5960 },
2435 { 6355, 0xa096 }, { 6361, 0x098f }, { 6368, 0x612c }, { 6374, 0xa030 },
2436 { 6378, 0x090d }, { 6383, 0x2aaa }, { 6390, 0xd44e }, { 6398, 0x4f7b },
2437 { 6409, 0xc4b2 }, { 6416, 0x388b }, { 6423, 0xa9c6 }, { 6431, 0x6110 },
2438 /* 0x9100 */
2439 { 6435, 0x0014 }, { 6437, 0x4200 }, { 6439, 0x800c }, { 6442, 0x0202 },
2440 { 6444, 0xfe48 }, { 6453, 0x6485 }, { 6459, 0xd63e }, { 6469, 0xe3f7 },

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2441 { 6481, 0x3aa0 }, { 6487, 0x0c07 }, { 6492, 0xe40c }, { 6498, 0x0430 },
2442 { 6501, 0xf680 }, { 6508, 0x1002 }, { 6510, 0x0000 }, { 6510, 0x0000 },
2443 /* 0x9200 */
2444 { 6510, 0x0000 }, { 6510, 0x0000 }, { 6510, 0x0000 }, { 6510, 0x0000 },
2445 { 6510, 0x0000 }, { 6510, 0x0000 }, { 6510, 0x0000 }, { 6510, 0x0010 },
2446 { 6511, 0x4000 }, { 6512, 0x0000 }, { 6512, 0x4000 }, { 6513, 0x0000 },
2447 { 6513, 0x0100 }, { 6514, 0x0000 }, { 6514, 0x0000 }, { 6514, 0x0000 },
2448 /* 0x9300 */
2449 { 6514, 0x0000 }, { 6514, 0x0000 }, { 6514, 0x0000 }, { 6514, 0x4000 },
2450 { 6515, 0x0000 }, { 6515, 0x0000 }, { 6515, 0x0400 }, { 6516, 0x0000 },
2451 { 6516, 0x8000 }, { 6517, 0x0000 }, { 6517, 0x0000 }, { 6517, 0x0000 },
2452 { 6517, 0x0400 }, { 6518, 0x0040 }, { 6519, 0x0000 }, { 6519, 0x0000 },
2453 /* 0x9400 */
2454 { 6519, 0x0000 }, { 6519, 0x0000 }, { 6519, 0x0000 }, { 6519, 0x4000 },
2455 { 6520, 0x0000 }, { 6520, 0x0000 }, { 6520, 0x0800 }, { 6521, 0x0000 },
2456 { 6521, 0xffe0 }, { 6532, 0xfebd }, { 6545, 0xffff }, { 6561, 0xffff },
2457 { 6577, 0x7f7f }, { 6591, 0xfbe7 }, { 6604, 0xfbf7 }, { 6619, 0xf7ff },
2458 /* 0x9500 */
2459 { 6634, 0xffff }, { 6650, 0xffff }, { 6665, 0xff7e }, { 6679, 0xdff7 },
2460 { 6693, 0xf6f7 }, { 6706, 0xfdbf }, { 6720, 0xbffe }, { 6734, 0x804f },
2461 { 6740, 0x0000 }, { 6740, 0x0000 }, { 6740, 0x0000 }, { 6740, 0x0000 },
2462 { 6740, 0x0000 }, { 6740, 0x0000 }, { 6740, 0xef00 }, { 6747, 0x7fff },
2463 /* 0x9600 */
2464 { 6762, 0xff7f }, { 6777, 0xb6f7 }, { 6789, 0x4406 }, { 6793, 0xb87e },
2465 { 6803, 0x3bf5 }, { 6814, 0x8831 }, { 6819, 0x1796 }, { 6827, 0x00f4 },
2466 { 6832, 0xa960 }, { 6838, 0x1391 }, { 6844, 0x0080 }, { 6845, 0x7249 },
2467 { 6852, 0xf2f3 }, { 6863, 0x0024 }, { 6865, 0x8701 }, { 6870, 0x42c8 },
2468 /* 0x9700 */
2469 { 6875, 0xe3d3 }, { 6885, 0x5048 }, { 6889, 0x2400 }, { 6891, 0x4305 },
2470 { 6896, 0x0000 }, { 6896, 0x4a4c }, { 6902, 0x0227 }, { 6907, 0x1058 },
2471 { 6911, 0x2820 }, { 6914, 0x0116 }, { 6918, 0xa809 }, { 6923, 0x0014 },
2472 { 6925, 0x0000 }, { 6925, 0x0000 }, { 6925, 0x3ec0 }, { 6932, 0x0068 },
2473 /* 0x9800 */
2474 { 6935, 0x0000 }, { 6935, 0x0000 }, { 6935, 0x0000 }, { 6935, 0x0000 },
2475 { 6935, 0x0000 }, { 6935, 0x0000 }, { 6935, 0x0000 }, { 6935, 0xffe0 },
2476 { 6946, 0xb7ff }, { 6960, 0xfddb }, { 6973, 0x00f7 }, { 6980, 0x0000 },
2477 { 6980, 0x4000 }, { 6981, 0xc72e }, { 6990, 0x0180 }, { 6992, 0x0000 },
2478 /* 0x9900 */
2479 { 6992, 0x2000 }, { 6993, 0x0001 }, { 6994, 0x4000 }, { 6995, 0x0000 },
2480 { 6995, 0x0000 }, { 6995, 0x0030 }, { 6997, 0xffa8 }, { 7008, 0xb4f7 },
2481 { 7019, 0xadf3 }, { 7030, 0x03ff }, { 7040, 0x0120 }, { 7042, 0x0000 },
2482 { 7042, 0x0000 }, { 7042, 0x0000 }, { 7042, 0x0000 }, { 7042, 0x0000 },
2483 /* 0x9a00 */
2484 { 7042, 0x0000 }, { 7042, 0x0000 }, { 7042, 0x0000 }, { 7042, 0x0000 },
2485 { 7042, 0x0000 }, { 7042, 0x0000 }, { 7042, 0xf000 }, { 7046, 0xffffb },
2486 { 7061, 0x9df7 }, { 7073, 0xfdcf }, { 7086, 0x01bf }, { 7094, 0x15c3 },
2487 { 7101, 0x1827 }, { 7107, 0x810a }, { 7111, 0xa842 }, { 7116, 0x0a00 },
2488 /* 0x9b00 */
2489 { 7118, 0x8108 }, { 7121, 0x8008 }, { 7123, 0x8008 }, { 7125, 0x1804 },
2490 { 7128, 0xa3be }, { 7138, 0x0012 }, { 7140, 0x0000 }, { 7140, 0x0000 },
2491 { 7140, 0x0000 }, { 7140, 0x0000 }, { 7140, 0x0000 }, { 7140, 0x0000 },
2492 { 7140, 0x0000 }, { 7140, 0x0000 }, { 7140, 0x0000 }, { 7140, 0x0000 },
2493 /* 0x9c00 */
2494 { 7140, 0x0000 }, { 7140, 0x0000 }, { 7140, 0x0000 }, { 7140, 0x0000 },
2495 { 7140, 0x0000 }, { 7140, 0x0000 }, { 7140, 0x0000 }, { 7140, 0x9000 },
2496 { 7142, 0x69e6 }, { 7151, 0xdc37 }, { 7161, 0x6bff }, { 7174, 0x3dff },
2497 { 7187, 0xfcf8 }, { 7198, 0xf3f9 }, { 7210, 0x0004 },
2498 };
2499 static const Summary16 gb2312_uni2indx_page9e[27] = {
2500 /* 0x9e00 */
2501 { 7211, 0x0000 }, { 7211, 0x8000 }, { 7212, 0xbf6f }, { 7225, 0xe7ee },
2502 { 7237, 0xdffe }, { 7251, 0x5da2 }, { 7259, 0x3fd8 }, { 7269, 0xc00b },
2503 { 7274, 0x0984 }, { 7278, 0xa00c }, { 7282, 0x0040 }, { 7283, 0x6910 },
2504 { 7288, 0xe210 }, { 7293, 0xb912 }, { 7300, 0x86a5 }, { 7307, 0x5a00 },
2505 /* 0x9f00 */
2506 { 7311, 0x6800 }, { 7314, 0x0289 }, { 7318, 0x9005 }, { 7322, 0x6a80 },
2507 { 7327, 0x0010 }, { 7328, 0x0003 }, { 7330, 0x0000 }, { 7330, 0x8000 },
2508 { 7331, 0x1ff9 }, { 7342, 0x8e00 }, { 7346, 0x0001 },
2509 };
2510 static const Summary16 gb2312_uni2indx_pageff[15] = {
2511 /* 0xff00 */
2512 { 7347, 0xffff }, { 7362, 0xffff }, { 7378, 0xffff }, { 7394, 0xffff },
2513 { 7410, 0xffff }, { 7426, 0x7fff }, { 7441, 0x0000 }, { 7441, 0x0000 },
2514 { 7441, 0x0000 }, { 7441, 0x0000 }, { 7441, 0x0000 }, { 7441, 0x0000 },
2515 { 7441, 0x0000 }, { 7441, 0x0000 }, { 7441, 0x002b },
2516 };
2517
2518 static int
2519 gb2312_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
2520 {
2521     (void)conv;
2522     if (n >= 2) {
2523         const Summary16 *summary = NULL;
2524         if (wc < 0x0460)
2525             summary = &gb2312_uni2indx_page00[(wc>4)];
2526         else if (wc >= 0x2000 && wc < 0x2650)
2527             summary = &gb2312_uni2indx_page20[(wc>4)-0x200];

```

```

2528     else if (wc >= 0x3000 && wc < 0x3230)
2529         summary = &gb2312_uni2indx_page30[(wc>4)-0x300];
2530     else if (wc >= 0x4e00 && wc < 0x9cf0)
2531         summary = &gb2312_uni2indx_page4e[(wc>4)-0x4e0];
2532     else if (wc >= 0x9e00 && wc < 0x9fb0)
2533         summary = &gb2312_uni2indx_page9e[(wc>4)-0x9e0];
2534     else if (wc >= 0xff00 && wc < 0xffff0)
2535         summary = &gb2312_uni2indx_pageff[(wc>4)-0xff0];
2536     if (summary) {
2537         unsigned short used = summary->used;
2538         unsigned int i = wc & 0x0f;
2539         if (used & ((unsigned short) 1 << i)) {
2540             unsigned short c;
2541             /* Keep in 'used' only the bits 0..i-1. */
2542             used &= ((unsigned short) 1 << i) - 1;
2543             /* Add 'summary->indx' and the number of bits set in 'used'. */
2544             used = (used & 0x5555) + ((used & 0xaaaa) >> 1);
2545             used = (used & 0x3333) + ((used & 0xcccc) >> 2);
2546             used = (used & 0x0f0f) + ((used & 0xf0f0) >> 4);
2547             used = (used & 0x00ff) + (used >> 8);
2548             c = gb2312_2charset[summary->indx + used];
2549             r[0] = (c >> 8); r[1] = (c & 0xff);
2550             return 2;
2551         }
2552     }
2553     return RET_ILSEQ;
2554 }
2555 return RET_TOOSMALL;
2556 }
2557 #endif /* NEED_TOMB */

```

## 34.266 georgian\_academy.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/georgian_academy.h,v 1.3 2000/11/29 17:40:29 dawes Exp $ */
2
3 /*
4  * GEORGIAN-ACADEMY
5  */
6
7 static const unsigned short georgian_academy_2uni[32] = {
8     /* 0x80 */
9     0x0080, 0x0081, 0x201a, 0x0192, 0x201e, 0x2026, 0x2020, 0x2021,
10    0x02c6, 0x2030, 0x0160, 0x2039, 0x0152, 0x008d, 0x008e, 0x008f,
11    /* 0x90 */
12    0x0090, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
13    0x02dc, 0x2122, 0x0161, 0x203a, 0x0153, 0x009d, 0x009e, 0x0178,
14 };
15
16 static int
17 georgian_academy_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
18 {
19     unsigned char c = *s;
20     if (c >= 0x80 && c < 0xa0)
21         *pwc = (ucs4_t) georgian_academy_2uni[c-0x80];
22     else if (c >= 0xc0 && c < 0xe7)
23         *pwc = (ucs4_t) c + 0x1010;
24     else
25         *pwc = (ucs4_t) c;
26     return 1;
27 }
28
29 static const unsigned char georgian_academy_page00[32] = {
30     0x80, 0x81, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
31     0x00, 0x00, 0x00, 0x00, 0x00, 0x8d, 0x8e, 0x8f, /* 0x88-0x8f */
32     0x90, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
33     0x00, 0x00, 0x00, 0x00, 0x00, 0x9d, 0x9e, 0x00, /* 0x98-0x9f */
34 };
35 static const unsigned char georgian_academy_page01[72] = {
36     0x00, 0x00, 0x8c, 0x9c, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
37     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
38     0x8a, 0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
39     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
40     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
41     0x9f, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
42     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
43     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
44     0x00, 0x00, 0x83, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
45 };
46 static const unsigned char georgian_academy_page02[32] = {
47     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x88, 0x00, /* 0xc0-0xc7 */
48     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
49     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
50     0x00, 0x00, 0x00, 0x00, 0x98, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
51 };
52 static const unsigned char georgian_academy_page20[48] = {

```

```

53 0x00, 0x00, 0x00, 0x96, 0x97, 0x00, 0x00, 0x00, /* 0x10-0x17 */
54 0x91, 0x92, 0x82, 0x00, 0x93, 0x94, 0x84, 0x00, /* 0x18-0x1f */
55 0x86, 0x87, 0x95, 0x00, 0x00, 0x00, 0x85, 0x00, /* 0x20-0x27 */
56 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
57 0x89, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
58 0x00, 0x8b, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
59 };
60
61 static int
62 georgian_academy_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
63 {
64     unsigned char c = 0;
65     if (wc < 0x0080) {
66         *r = wc;
67         return 1;
68     }
69     else if (wc >= 0x0080 && wc < 0x00a0)
70         c = georgian_academy_page00[wc-0x0080];
71     else if ((wc >= 0x00a0 && wc < 0x00c0) || (wc >= 0x00e7 && wc < 0x0100))
72         c = wc;
73     else if (wc >= 0x0150 && wc < 0x0198)
74         c = georgian_academy_page01[wc-0x0150];
75     else if (wc >= 0x02c0 && wc < 0x02e0)
76         c = georgian_academy_page02[wc-0x02c0];
77     else if (wc >= 0x10d0 && wc < 0x10f7)
78         c = wc-0x1010;
79     else if (wc >= 0x2010 && wc < 0x2040)
80         c = georgian_academy_page20[wc-0x2010];
81     else if (wc == 0x2122)
82         c = 0x99;
83     if (c != 0) {
84         *r = c;
85         return 1;
86     }
87     return RET_ILSEQ;
88 }

```

## 34.267 georgian\_ps.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/georgian_ps.h,v 1.3 2000/11/29 17:40:29 dawes Exp $ */
2
3 /*
4  * GEORGIAN-PS
5  */
6
7 static const unsigned short georgian_ps_2uni_1[32] = {
8     /* 0x80 */
9     0x0080, 0x0081, 0x201a, 0x0192, 0x201e, 0x2026, 0x2020, 0x2021,
10     0x02c6, 0x2030, 0x0160, 0x2039, 0x0152, 0x008d, 0x008e, 0x008f,
11     /* 0x90 */
12     0x0090, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
13     0x02dc, 0x2122, 0x0161, 0x203a, 0x0153, 0x009d, 0x009e, 0x0178,
14 };
15 static const unsigned short georgian_ps_2uni_2[39] = {
16     /* 0xc0 */
17     0x10d0, 0x10d1, 0x10d2, 0x10d3, 0x10d4, 0x10d5, 0x10d6, 0x10f1,
18     0x10d7, 0x10d8, 0x10d9, 0x10da, 0x10db, 0x10dc, 0x10f2, 0x10dd,
19     /* 0xd0 */
20     0x10de, 0x10df, 0x10e0, 0x10e1, 0x10e2, 0x10f3, 0x10e3, 0x10e4,
21     0x10e5, 0x10e6, 0x10e7, 0x10e8, 0x10e9, 0x10ea, 0x10eb, 0x10ec,
22     /* 0xe0 */
23     0x10ed, 0x10ee, 0x10f4, 0x10ef, 0x10f0, 0x10f5,
24 };
25
26 static int
27 georgian_ps_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
28 {
29     unsigned char c = *s;
30     if (c >= 0x80 && c < 0xa0)
31         *pwc = (ucs4_t) georgian_ps_2uni_1[c-0x80];
32     else if (c >= 0xc0 && c < 0xe6)
33         *pwc = (ucs4_t) georgian_ps_2uni_2[c-0xc0];
34     else
35         *pwc = (ucs4_t) c;
36     return 1;
37 }
38
39 static const unsigned char georgian_ps_page00[32] = {
40     0x80, 0x81, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
41     0x00, 0x00, 0x00, 0x00, 0x00, 0x8d, 0x8e, 0x8f, /* 0x88-0x8f */
42     0x90, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
43     0x00, 0x00, 0x00, 0x00, 0x00, 0x9d, 0x9e, 0x00, /* 0x98-0x9f */
44 };
45 static const unsigned char georgian_ps_page01[72] = {
46     0x00, 0x00, 0x8c, 0x9c, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */

```

```

47 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
48 0x8a, 0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
49 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
50 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
51 0x9f, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
52 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
53 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
54 0x00, 0x00, 0x83, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
55 };
56 static const unsigned char georgian_ps_page02[32] = {
57 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x88, 0x00, /* 0xc0-0xc7 */
58 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
59 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
60 0x00, 0x00, 0x00, 0x00, 0x98, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
61 };
62 static const unsigned char georgian_ps_page10[40] = {
63 0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc8, /* 0xd0-0xd7 */
64 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xcf, 0xd0, 0xd1, /* 0xd8-0xdf */
65 0xd2, 0xd3, 0xd4, 0xd6, 0xd7, 0xd8, 0xd9, 0xda, /* 0xe0-0xe7 */
66 0xdb, 0xdc, 0xdd, 0xde, 0xdf, 0xe0, 0xe1, 0xe3, /* 0xe8-0xef */
67 0xe4, 0xc7, 0xce, 0xd5, 0xe2, 0xe5, 0x00, 0x00, /* 0xf0-0xf7 */
68 };
69 static const unsigned char georgian_ps_page20[48] = {
70 0x00, 0x00, 0x00, 0x00, 0x96, 0x97, 0x00, 0x00, 0x00, /* 0x10-0x17 */
71 0x91, 0x92, 0x82, 0x00, 0x93, 0x94, 0x84, 0x00, /* 0x18-0x1f */
72 0x86, 0x87, 0x95, 0x00, 0x00, 0x00, 0x85, 0x00, /* 0x20-0x27 */
73 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
74 0x89, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
75 0x00, 0x8b, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
76 };
77
78 static int
79 georgian_ps_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
80 {
81     unsigned char c = 0;
82     if (wc < 0x0080) {
83         *r = wc;
84         return 1;
85     }
86     else if (wc >= 0x0080 && wc < 0x00a0)
87         c = georgian_ps_page00[wc-0x0080];
88     else if ((wc >= 0x00a0 && wc < 0x00c0) || (wc >= 0x00e6 && wc < 0x0100))
89         c = wc;
90     else if (wc >= 0x0150 && wc < 0x0198)
91         c = georgian_ps_page01[wc-0x0150];
92     else if (wc >= 0x02c0 && wc < 0x02e0)
93         c = georgian_ps_page02[wc-0x02c0];
94     else if (wc >= 0x10d0 && wc < 0x10f8)
95         c = georgian_ps_page10[wc-0x10d0];
96     else if (wc >= 0x2010 && wc < 0x2040)
97         c = georgian_ps_page20[wc-0x2010];
98     else if (wc == 0x2122)
99         c = 0x99;
100     if (c != 0) {
101         *r = c;
102         return 1;
103     }
104     return RET_ILSEQ;
105 }

```

## 34.268 iso8859\_1.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_1.h,v 1.3 2000/11/29 17:40:30 dawes Exp $ */
2
3 /*
4  * ISO-8859-1
5  */
6
7 static int
8 iso8859_1_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
9 {
10     unsigned char c = *s;
11     *pwc = (ucs4_t) c;
12     return 1;
13 }
14
15 static int
16 iso8859_1_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
17 {
18     if (wc < 0x0100) {
19         *r = wc;
20         return 1;
21     }
22     return RET_ILSEQ;
23 }

```

## 34.269 iso8859\_10.h

```
1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_10.h,v 1.3 2000/11/29 17:40:30 dawes Exp $ */
2
3 /*
4  * ISO-8859-10
5  */
6
7 #ifdef NEED_TOWC
8 static const unsigned short iso8859_10_2uni[96] = {
9     /* 0xa0 */
10     0x00a0, 0x0104, 0x0112, 0x0122, 0x012a, 0x0128, 0x0136, 0x00a7,
11     0x013b, 0x0110, 0x0160, 0x0166, 0x017d, 0x00ad, 0x016a, 0x014a,
12     /* 0xb0 */
13     0x00b0, 0x0105, 0x0113, 0x0123, 0x012b, 0x0129, 0x0137, 0x00b7,
14     0x013c, 0x0111, 0x0161, 0x0167, 0x017e, 0x2015, 0x016b, 0x014b,
15     /* 0xc0 */
16     0x0100, 0x00c1, 0x00c2, 0x00c3, 0x00c4, 0x00c5, 0x00c6, 0x012e,
17     0x010c, 0x00c9, 0x0118, 0x00cb, 0x0116, 0x00cd, 0x00ce, 0x00cf,
18     /* 0xd0 */
19     0x00d0, 0x0145, 0x014c, 0x00d3, 0x00d4, 0x00d5, 0x00d6, 0x0168,
20     0x00d8, 0x0172, 0x00da, 0x00db, 0x00dc, 0x00dd, 0x00de, 0x00df,
21     /* 0xe0 */
22     0x0101, 0x00e1, 0x00e2, 0x00e3, 0x00e4, 0x00e5, 0x00e6, 0x012f,
23     0x010d, 0x00e9, 0x0119, 0x00eb, 0x0117, 0x00ed, 0x00ee, 0x00ef,
24     /* 0xf0 */
25     0x00f0, 0x0146, 0x014d, 0x00f3, 0x00f4, 0x00f5, 0x00f6, 0x0169,
26     0x00f8, 0x0173, 0x00fa, 0x00fb, 0x00fc, 0x00fd, 0x00fe, 0x0138,
27 };
28
29 static int
30 iso8859_10_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0xa0)
34         *pwc = (ucs4_t) c;
35     else
36         *pwc = (ucs4_t) iso8859_10_2uni[c-0xa0];
37     return 1;
38 }
39 #endif /* NEED_TOWC */
40
41 #ifdef NEED_TOMB
42 static const unsigned char iso8859_10_page00[224] = {
43     0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
44     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xad, 0x00, /* 0xa8-0xaf */
45     0xb0, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb7, /* 0xb0-0xb7 */
46     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
47     0x00, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0x00, /* 0xc0-0xc7 */
48     0x00, 0xc9, 0x00, 0xcb, 0x00, 0xcd, 0xce, 0xcf, /* 0xc8-0xcf */
49     0xd0, 0x00, 0x00, 0xd3, 0xd4, 0xd5, 0xd6, 0x00, /* 0xd0-0xd7 */
50     0xd8, 0x00, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, /* 0xd8-0xdf */
51     0x00, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0x00, /* 0xe0-0xe7 */
52     0x00, 0xe9, 0x00, 0xeb, 0x00, 0xed, 0xee, 0xef, /* 0xe8-0xef */
53     0xf0, 0x00, 0x00, 0xf3, 0xf4, 0xf5, 0xf6, 0x00, /* 0xf0-0xf7 */
54     0xf8, 0x00, 0xfa, 0xfb, 0xfc, 0xfd, 0xfe, 0x00, /* 0xf8-0xff */
55     /* 0x0100 */
56     0xc0, 0xe0, 0x00, 0x00, 0xa1, 0xb1, 0x00, 0x00, /* 0x00-0x07 */
57     0x00, 0x00, 0x00, 0x00, 0xc8, 0xe8, 0x00, 0x00, /* 0x08-0x0f */
58     0xa9, 0xb9, 0xa2, 0xb2, 0x00, 0x00, 0xcc, 0xec, /* 0x10-0x17 */
59     0xca, 0xea, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
60     0x00, 0x00, 0xa3, 0xb3, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
61     0xa5, 0xb5, 0xa4, 0xb4, 0x00, 0x00, 0xc7, 0xe7, /* 0x28-0x2f */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa6, 0xb6, /* 0x30-0x37 */
63     0xff, 0x00, 0x00, 0xa8, 0xb8, 0x00, 0x00, 0x00, /* 0x38-0x3f */
64     0x00, 0x00, 0x00, 0xa0, 0x00, 0xd1, 0xf1, 0x00, /* 0x40-0x47 */
65     0x00, 0x00, 0xaf, 0xbf, 0xd2, 0xf2, 0x00, 0x00, /* 0x48-0x4f */
66     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
67     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
68     0xaa, 0xba, 0x00, 0x00, 0x00, 0x00, 0xab, 0xbb, /* 0x60-0x67 */
69     0xd7, 0xf7, 0xae, 0xbe, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
70     0x00, 0x00, 0xd9, 0xf9, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
71     0x00, 0x00, 0x00, 0x00, 0x00, 0xac, 0xbc, 0x00, /* 0x78-0x7f */
72 };
73
74 static int
75 iso8859_10_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
76 {
77     (void)conv; (void)n;
78     unsigned char c = 0;
79     if (wc < 0x00a0) {
80         *r = wc;
81         return 1;
82     }
83     else if (wc >= 0x00a0 && wc < 0x0180)
84         c = iso8859_10_page00[wc-0x00a0];
85     else if (wc == 0x2015)
```

```

86     c = 0xbd;
87     if (c != 0) {
88         *r = c;
89         return 1;
90     }
91     return RET_ILSEQ;
92 }
93 #endif /* NEED_TOMB */

```

## 34.270 iso8859\_11.h

```

1  /* $XFree86: xc/lib/X11/lcUniConv/iso8859_11.h,v 1.2 2002/10/09 16:38:19 tsi Exp $ */
2
3  /*
4  * ISO8859-11
5  */
6
7  #ifdef NEED_TOWC
8  static const unsigned short iso8859_11_2uni[96] = {
9      /* 0xa0 */
10     0x00a0, 0x0e01, 0x0e02, 0x0e03, 0x0e04, 0x0e05, 0x0e06, 0x0e07,
11     0x0e08, 0x0e09, 0x0e0a, 0x0e0b, 0x0e0c, 0x0e0d, 0x0e0e, 0x0e0f,
12     /* 0xb0 */
13     0x0e10, 0x0e11, 0x0e12, 0x0e13, 0x0e14, 0x0e15, 0x0e16, 0x0e17,
14     0x0e18, 0x0e19, 0x0e1a, 0x0e1b, 0x0e1c, 0x0e1d, 0x0e1e, 0x0e1f,
15     /* 0xc0 */
16     0x0e20, 0x0e21, 0x0e22, 0x0e23, 0x0e24, 0x0e25, 0x0e26, 0x0e27,
17     0x0e28, 0x0e29, 0x0e2a, 0x0e2b, 0x0e2c, 0x0e2d, 0x0e2e, 0x0e2f,
18     /* 0xd0 */
19     0x0e30, 0x0e31, 0x0e32, 0x0e33, 0x0e34, 0x0e35, 0x0e36, 0x0e37,
20     0x0e38, 0x0e39, 0x0e3a, 0xffff, 0xffff, 0xffff, 0xffff, 0x0e3f,
21     /* 0xe0 */
22     0x0e40, 0x0e41, 0x0e42, 0x0e43, 0x0e44, 0x0e45, 0x0e46, 0x0e47,
23     0x0e48, 0x0e49, 0x0e4a, 0x0e4b, 0x0e4c, 0x0e4d, 0x0e4e, 0x0e4f,
24     /* 0xf0 */
25     0x0e50, 0x0e51, 0x0e52, 0x0e53, 0x0e54, 0x0e55, 0x0e56, 0x0e57,
26     0x0e58, 0x0e59, 0x0e5a, 0x0e5b, 0xffff, 0xffff, 0xffff, 0xffff,
27 };
28
29 static int
30 iso8859_11_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0x80) {
34         *pwc = (ucs4_t) c;
35         return 1;
36     }
37     else if (c < 0xa0) {
38     }
39     else {
40         unsigned short wc = iso8859_11_2uni[c-0xa0];
41         if (wc != 0xffff) {
42             *pwc = (ucs4_t) wc;
43             return 1;
44         }
45     }
46     return RET_ILSEQ;
47 }
48 #endif /* NEED_TOWC */
49
50 #ifdef NEED_TOMB
51 static const unsigned char iso8859_11_page0e[96] = {
52     0x00, 0xa1, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0x00-0x07 */
53     0xa8, 0xa9, 0xaa, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0x08-0x0f */
54     0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0x10-0x17 */
55     0xb8, 0xb9, 0xba, 0xbb, 0xbc, 0xbd, 0xbe, 0xbf, /* 0x18-0x1f */
56     0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x20-0x27 */
57     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x28-0x2f */
58     0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0x30-0x37 */
59     0xd8, 0xd9, 0xda, 0x00, 0x00, 0x00, 0x00, 0xdf, /* 0x38-0x3f */
60     0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0x40-0x47 */
61     0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0x48-0x4f */
62     0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0x50-0x57 */
63     0xf8, 0xf9, 0xfa, 0xfb, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
64 };
65
66 static int
67 iso8859_11_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
68 {
69     (void)conv; (void)n;
70     unsigned char c = 0;
71     if (wc < 0x0080 || wc == 0x00a0) {
72         *r = wc;
73         return 1;
74     }

```

```

75     else if (wc >= 0x0e00 && wc < 0x0e60)
76         c = iso8859_11_page0e[wc-0x0e00];
77     if (c != 0) {
78         *r = c;
79         return 1;
80     }
81     return RET_ILSEQ;
82 }
83 #endif /* NEED_TOMB */

```

## 34.271 iso8859\_13.h

```

1  /* $XFree86: xc/lib/X11/lcUniConv/iso8859_13.h,v 1.2 2000/11/28 16:10:26 dawes Exp $ */
2
3  /*
4   * ISO-8859-13
5   */
6
7  #ifndef NEED_TOWC
8  static const unsigned short iso8859_13_2uni[96] = {
9      /* 0xa0 */
10     0x00a0, 0x201d, 0x00a2, 0x00a3, 0x00a4, 0x201e, 0x00a6, 0x00a7,
11     0x00d8, 0x00a9, 0x0156, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x00c6,
12     /* 0xb0 */
13     0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x201c, 0x00b5, 0x00b6, 0x00b7,
14     0x00f8, 0x00b9, 0x0157, 0x00bb, 0x00bc, 0x00bd, 0x00be, 0x00e6,
15     /* 0xc0 */
16     0x0104, 0x012e, 0x0100, 0x0106, 0x00c4, 0x00c5, 0x0118, 0x0112,
17     0x010c, 0x00c9, 0x0179, 0x0116, 0x0122, 0x0136, 0x012a, 0x013b,
18     /* 0xd0 */
19     0x0160, 0x0143, 0x0145, 0x00d3, 0x014c, 0x00d5, 0x00d6, 0x00d7,
20     0x0172, 0x0141, 0x015a, 0x016a, 0x00dc, 0x017b, 0x017d, 0x00df,
21     /* 0xe0 */
22     0x0105, 0x012f, 0x0101, 0x0107, 0x00e4, 0x00e5, 0x0119, 0x0113,
23     0x010d, 0x00e9, 0x017a, 0x0117, 0x0123, 0x0137, 0x012b, 0x013c,
24     /* 0xf0 */
25     0x0161, 0x0144, 0x0146, 0x00f3, 0x014d, 0x00f5, 0x00f6, 0x00f7,
26     0x0173, 0x0142, 0x015b, 0x016b, 0x00fc, 0x017c, 0x017e, 0x2019,
27 };
28
29 static int
30 iso8859_13_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0xa0)
34         *pwc = (ucs4_t) c;
35     else
36         *pwc = (ucs4_t) iso8859_13_2uni[c-0xa0];
37     return 1;
38 }
39 #endif /* NEED_TOWC */
40
41 #ifndef NEED_TOMB
42 static const unsigned char iso8859_13_page00[224] = {
43     0xa0, 0x00, 0xa2, 0xa3, 0xa4, 0x00, 0xa6, 0xa7, /* 0xa0-0xa7 */
44     0x00, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0x00, /* 0xa8-0xaf */
45     0xb0, 0xb1, 0xb2, 0xb3, 0x00, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
46     0x00, 0xb9, 0x00, 0xbb, 0xbc, 0xbd, 0xbe, 0x00, /* 0xb8-0xbf */
47     0x00, 0xc0, 0x00, 0xc4, 0xc5, 0xaf, 0x00, /* 0xc0-0xc7 */
48     0x00, 0xc9, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
49     0x00, 0x00, 0x00, 0xd3, 0x00, 0xd5, 0xd6, 0xd7, /* 0xd0-0xd7 */
50     0xa8, 0x00, 0x00, 0xdc, 0x00, 0x00, 0x00, 0xdf, /* 0xd8-0xdf */
51     0x00, 0x00, 0x00, 0x00, 0xe4, 0xe5, 0xbf, 0x00, /* 0xe0-0xe7 */
52     0x00, 0xe9, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
53     0x00, 0x00, 0x00, 0xf3, 0x00, 0xf5, 0xf6, 0xf7, /* 0xf0-0xf7 */
54     0xb8, 0x00, 0x00, 0x00, 0xfc, 0x00, 0x00, 0x00, /* 0xf8-0xff */
55     /* 0x0100 */
56     0xc2, 0xe2, 0x00, 0x00, 0xc0, 0xe0, 0xc3, 0xe3, /* 0x00-0x07 */
57     0x00, 0x00, 0x00, 0x00, 0xc8, 0xe8, 0x00, 0x00, /* 0x08-0x0f */
58     0x00, 0x00, 0xc7, 0xe7, 0x00, 0x00, 0xcb, 0xeb, /* 0x10-0x17 */
59     0xc6, 0xe6, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
60     0x00, 0x00, 0xcc, 0xec, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
61     0x00, 0x00, 0xce, 0xee, 0x00, 0x00, 0xc1, 0xe1, /* 0x28-0x2f */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xcd, 0xed, /* 0x30-0x37 */
63     0x00, 0x00, 0x00, 0xcf, 0xef, 0x00, 0x00, 0x00, /* 0x38-0x3f */
64     0x00, 0xd9, 0xf9, 0xd1, 0xf1, 0xd2, 0xf2, 0x00, /* 0x40-0x47 */
65     0x00, 0x00, 0x00, 0xd4, 0xf4, 0x00, 0x00, /* 0x48-0x4f */
66     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xaa, 0xba, /* 0x50-0x57 */
67     0x00, 0x00, 0xda, 0xfa, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
68     0xd0, 0xf0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
69     0x00, 0x00, 0xdb, 0xfb, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
70     0x00, 0x00, 0xd8, 0xf8, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
71     0x00, 0xca, 0xea, 0xdd, 0xfd, 0xde, 0xfe, 0x00, /* 0x78-0x7f */
72 };
73 static const unsigned char iso8859_13_page20[8] = {

```

```

74 0x00, 0xff, 0x00, 0x00, 0xb4, 0xa1, 0xa5, 0x00, /* 0x18-0x1f */
75 };
76
77 static int
78 iso8859_13_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
79 {
80     (void)conv; (void)n;
81     unsigned char c = 0;
82     if (wc < 0x00a0) {
83         *r = wc;
84         return 1;
85     }
86     else if (wc >= 0x00a0 && wc < 0x0180)
87         c = iso8859_13_page00[wc-0x00a0];
88     else if (wc >= 0x2018 && wc < 0x2020)
89         c = iso8859_13_page20[wc-0x2018];
90     if (c != 0) {
91         *r = c;
92         return 1;
93     }
94     return RET_ILSEQ;
95 }
96 #endif /* NEED_TOWC */

```

## 34.272 iso8859\_14.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_14.h,v 1.3 2000/11/29 17:40:30 dawes Exp $ */
2
3 /*
4  * ISO-8859-14
5  */
6
7 #ifdef NEED_TOWC
8 static const unsigned short iso8859_14_2uni[96] = {
9     /* 0xa0 */
10     0x00a0, 0x1e02, 0x1e03, 0x00a3, 0x010a, 0x010b, 0x1e0a, 0x00a7,
11     0x1e80, 0x00a9, 0x1e82, 0x1e0b, 0x1ef2, 0x00ad, 0x00ae, 0x0178,
12     /* 0xb0 */
13     0x1e1e, 0x1e1f, 0x0120, 0x0121, 0x1e40, 0x1e41, 0x00b6, 0x1e56,
14     0x1e81, 0x1e57, 0x1e83, 0x1e60, 0x1ef3, 0x1e84, 0x1e85, 0x1e61,
15     /* 0xc0 */
16     0x00c0, 0x00c1, 0x00c2, 0x00c3, 0x00c4, 0x00c5, 0x00c6, 0x00c7,
17     0x00c8, 0x00c9, 0x00ca, 0x00cb, 0x00cc, 0x00cd, 0x00ce, 0x00cf,
18     /* 0xd0 */
19     0x0174, 0x00d1, 0x00d2, 0x00d3, 0x00d4, 0x00d5, 0x00d6, 0x1e6a,
20     0x00d8, 0x00d9, 0x00da, 0x00db, 0x00dc, 0x00dd, 0x0176, 0x00df,
21     /* 0xe0 */
22     0x00e0, 0x00e1, 0x00e2, 0x00e3, 0x00e4, 0x00e5, 0x00e6, 0x00e7,
23     0x00e8, 0x00e9, 0x00ea, 0x00eb, 0x00ec, 0x00ed, 0x00ee, 0x00ef,
24     /* 0xf0 */
25     0x0175, 0x00f1, 0x00f2, 0x00f3, 0x00f4, 0x00f5, 0x00f6, 0x1e6b,
26     0x00f8, 0x00f9, 0x00fa, 0x00fb, 0x00fc, 0x00fd, 0x0177, 0x00ff,
27 };
28
29 static int
30 iso8859_14_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c >= 0xa0)
34         *pwc = (ucs4_t) iso8859_14_2uni[c-0xa0];
35     else
36         *pwc = (ucs4_t) c;
37     return 1;
38 }
39 #endif /* NEED_TOWC */
40
41 #ifdef NEED_TOMB
42 static const unsigned char iso8859_14_page00[96] = {
43     0xa0, 0x00, 0x00, 0xa3, 0x00, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
44     0x00, 0xa9, 0x00, 0x00, 0x00, 0xad, 0xae, 0x00, /* 0xa8-0xaf */
45     0x00, 0x00, 0x00, 0x00, 0x00, 0xb6, 0x00, /* 0xb0-0xb7 */
46     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
47     0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0xc0-0xc7 */
48     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0xc8-0xcf */
49     0x00, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0x00, /* 0xd0-0xd7 */
50     0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0xdd, 0x00, 0xdf, /* 0xd8-0xdf */
51     0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0xe0-0xe7 */
52     0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xe8-0xef */
53     0x00, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0x00, /* 0xf0-0xf7 */
54     0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0xfd, 0x00, 0xff, /* 0xf8-0xff */
55 };
56 static const unsigned char iso8859_14_page01_0[32] = {
57     0x00, 0x00, 0xa4, 0xa5, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
58     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
59     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */

```

```

60 0xb2, 0xb3, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
61 };
62 static const unsigned char iso8859_14_page01_1[16] = {
63 0x00, 0x00, 0x00, 0x00, 0xd0, 0xf0, 0xde, 0xfe, /* 0x70-0x77 */
64 0xaf, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
65 };
66 static const unsigned char iso8859_14_pagele_0[136] = {
67 0x00, 0x00, 0xa1, 0xa2, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
68 0x00, 0x00, 0xa6, 0xab, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
69 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
70 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb0, 0xb1, /* 0x18-0x1f */
71 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
72 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
73 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
74 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
75 0xb4, 0xb5, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
76 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
77 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb7, 0xb9, /* 0x50-0x57 */
78 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
79 0xbb, 0xbf, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
80 0x00, 0x00, 0xd7, 0xf7, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
81 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
82 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
83 0xa8, 0xb8, 0xaa, 0xba, 0xbd, 0xbe, 0x00, 0x00, /* 0x80-0x87 */
84 };
85 static const unsigned char iso8859_14_pagele_1[8] = {
86 0x00, 0x00, 0xac, 0xbc, 0x00, 0x00, 0x00, 0x00, /* 0xf0-0xf7 */
87 };
88
89 static int
90 iso8859_14_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
91 {
92     (void)conv; (void)n;
93     unsigned char c = 0;
94     if (wc < 0x00a0) {
95         *r = wc;
96         return 1;
97     }
98     else if (wc >= 0x00a0 && wc < 0x0100)
99         c = iso8859_14_page00[wc-0x00a0];
100     else if (wc >= 0x0108 && wc < 0x0128)
101         c = iso8859_14_page01_0[wc-0x0108];
102     else if (wc >= 0x0170 && wc < 0x0180)
103         c = iso8859_14_page01_1[wc-0x0170];
104     else if (wc >= 0x1e00 && wc < 0x1e88)
105         c = iso8859_14_pagele_0[wc-0x1e00];
106     else if (wc >= 0x1ef0 && wc < 0x1ef8)
107         c = iso8859_14_pagele_1[wc-0x1ef0];
108     if (c != 0) {
109         *r = c;
110         return 1;
111     }
112     return RET_ILSEQ;
113 }
114 #endif /* NEED_TOMB */

```

## 34.273 iso8859\_15.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_15.h,v 1.3 2000/11/29 17:40:31 dawes Exp $ */
2
3 /*
4  * ISO-8859-15
5  */
6
7 #ifdef NEED_TOWC
8 static const unsigned short iso8859_15_2uni[32] = {
9     /* 0xa0 */
10     0x00a0, 0x00a1, 0x00a2, 0x00a3, 0x20ac, 0x00a5, 0x0160, 0x00a7,
11     0x0161, 0x00a9, 0x00aa, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x00af,
12     /* 0xb0 */
13     0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x017d, 0x00b5, 0x00b6, 0x00b7,
14     0x017e, 0x00b9, 0x00ba, 0x00bb, 0x0152, 0x0153, 0x0178, 0x00bf,
15 };
16
17 static int
18 iso8859_15_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
19 {
20     unsigned char c = *s;
21     if (c >= 0xa0 && c < 0xc0)
22         *pwc = (ucs4_t) iso8859_15_2uni[c-0xa0];
23     else
24         *pwc = (ucs4_t) c;
25     return 1;
26 }
27 #endif /* NEED_TOWC */

```

```

28
29 #ifdef NEED_TOMB
30 static const unsigned char iso8859_15_page00[32] = {
31     0xa0, 0xa1, 0xa2, 0xa3, 0x00, 0xa5, 0x00, 0xa7, /* 0xa0-0xa7 */
32     0x00, 0xa9, 0xaa, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0xa8-0xaf */
33     0xb0, 0xb1, 0xb2, 0xb3, 0x00, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
34     0x00, 0xb9, 0xba, 0xbb, 0x00, 0x00, 0x00, 0xbf, /* 0xb8-0xbf */
35 };
36 static const unsigned char iso8859_15_page01[48] = {
37     0x00, 0x00, 0xbc, 0xbd, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
38     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
39     0xa6, 0xa8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
40     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
41     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
42     0xbe, 0x00, 0x00, 0x00, 0x00, 0xb4, 0xb8, 0x00, /* 0x78-0x7f */
43 };
44
45 static int
46 iso8859_15_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
47 {
48     (void)conv; (void)n;
49     unsigned char c = 0;
50     if (wc < 0x00a0) {
51         *r = wc;
52         return 1;
53     }
54     else if (wc >= 0x00a0 && wc < 0x00c0)
55         c = iso8859_15_page00[wc-0x00a0];
56     else if (wc >= 0x00c0 && wc < 0x0100)
57         c = wc;
58     else if (wc >= 0x0150 && wc < 0x0180)
59         c = iso8859_15_page01[wc-0x0150];
60     else if (wc == 0x20ac)
61         c = 0xa4;
62     if (c != 0) {
63         *r = c;
64         return 1;
65     }
66     return RET_ILSEQ;
67 }
68 #endif /* NEED_TOMB */

```

## 34.274 iso8859\_16.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_16.h,v 1.4 2003/07/15 17:33:45 pascal Exp $ */
2
3 /*
4  * ISO-8859-16
5  */
6
7 static const unsigned short iso8859_16_2uni[96] = {
8     /* 0xa0 */
9     0x00a0, 0x0104, 0x0105, 0x0141, 0x20ac, 0x201e, 0x0160, 0x00a7,
10    0x0161, 0x00a9, 0x0218, 0x00ab, 0x0179, 0x00ad, 0x017a, 0x017b,
11    /* 0xb0 */
12    0x00b0, 0x00b1, 0x010c, 0x0142, 0x017d, 0x201d, 0x00b6, 0x00b7,
13    0x017e, 0x010d, 0x0219, 0x00bb, 0x0152, 0x0153, 0x0178, 0x017c,
14    /* 0xc0 */
15    0x00c0, 0x00c1, 0x00c2, 0x0102, 0x00c4, 0x0106, 0x00c6, 0x00c7,
16    0x00c8, 0x00c9, 0x00ca, 0x00cb, 0x00cc, 0x00cd, 0x00ce, 0x00cf,
17    /* 0xd0 */
18    0x0110, 0x0143, 0x00d2, 0x00d3, 0x00d4, 0x0150, 0x00d6, 0x015a,
19    0x0170, 0x00d9, 0x00da, 0x00db, 0x00dc, 0x0118, 0x021a, 0x00df,
20    /* 0xe0 */
21    0x00e0, 0x00e1, 0x00e2, 0x0103, 0x00e4, 0x0107, 0x00e6, 0x00e7,
22    0x00e8, 0x00e9, 0x00ea, 0x00eb, 0x00ec, 0x00ed, 0x00ee, 0x00ef,
23    /* 0xf0 */
24    0x0111, 0x0144, 0x00f2, 0x00f3, 0x00f4, 0x0151, 0x00f6, 0x015b,
25    0x0171, 0x00f9, 0x00fa, 0x00fb, 0x00fc, 0x0119, 0x021b, 0x00ff,
26 };
27
28 static int
29 iso8859_16_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
30 {
31     unsigned char c = *s;
32     if (c < 0xa0)
33         *pwc = (ucs4_t) c;
34     else
35         *pwc = (ucs4_t) iso8859_16_2uni[c-0xa0];
36     return 1;
37 }
38
39 static const unsigned char iso8859_16_page00[224] = {
40     0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
41     0x00, 0xa9, 0x00, 0xab, 0x00, 0xad, 0x00, 0x00, /* 0xa8-0xaf */

```

```

42  0xb0, 0xb1, 0x00, 0x00, 0x00, 0x00, 0xb6, 0xb7, /* 0xb0-0xb7 */
43  0x00, 0x00, 0x00, 0xbb, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
44  0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0xc0-0xc7 */
45  0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0xc8-0xcf */
46  0x00, 0x00, 0xd2, 0xd3, 0xd4, 0x00, 0xd6, 0x00, /* 0xd0-0xd7 */
47  0x00, 0xd9, 0xda, 0xdb, 0xdc, 0x00, 0x00, 0xdf, /* 0xd8-0xdf */
48  0xe0, 0xe1, 0xe2, 0x00, 0xe4, 0x00, 0xe6, 0xe7, /* 0xe0-0xe7 */
49  0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xe8-0xef */
50  0x00, 0x00, 0xf2, 0xf3, 0xf4, 0x00, 0xf6, 0x00, /* 0xf0-0xf7 */
51  0x00, 0xf9, 0xfa, 0xfb, 0xfc, 0x00, 0x00, 0xff, /* 0xf8-0xff */
52  /* 0x0100 */
53  0x00, 0x00, 0xc3, 0xe3, 0xa1, 0xa2, 0xc5, 0xe5, /* 0x00-0x07 */
54  0x00, 0x00, 0x00, 0x00, 0xb2, 0xb9, 0x00, 0x00, /* 0x08-0x0f */
55  0xd0, 0xf0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
56  0xdd, 0xfd, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
57  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
58  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
59  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
60  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
61  0x00, 0xa3, 0xb3, 0xd1, 0xf1, 0x00, 0x00, 0x00, /* 0x40-0x47 */
62  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
63  0xd5, 0xf5, 0xbc, 0xbd, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
64  0x00, 0x00, 0xd7, 0xf7, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
65  0xa6, 0xa8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
66  0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
67  0xd8, 0xf8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
68  0xbe, 0xac, 0xae, 0xaf, 0xbf, 0xb4, 0xb8, 0x00, /* 0x78-0x7f */
69 };
70 static const unsigned char iso8859_16_page02[8] = {
71  0xaa, 0xba, 0xde, 0xfe, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
72 };
73 static const unsigned char iso8859_16_page20[8] = {
74  0x00, 0x00, 0x00, 0x00, 0x00, 0xb5, 0xa5, 0x00, /* 0x18-0x1f */
75 };
76
77 static int
78 iso8859_16_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
79 {
80     unsigned char c = 0;
81     if (wc < 0x00a0) {
82         *r = wc;
83         return 1;
84     }
85     else if (wc >= 0x00a0 && wc < 0x0180)
86         c = iso8859_16_page00[wc-0x00a0];
87     else if (wc >= 0x0218 && wc < 0x0220)
88         c = iso8859_16_page02[wc-0x0218];
89     else if (wc >= 0x2018 && wc < 0x2020)
90         c = iso8859_16_page20[wc-0x2018];
91     else if (wc == 0x20ac)
92         c = 0xa4;
93     if (c != 0) {
94         *r = c;
95         return 1;
96     }
97     return RET_ILSEQ;
98 }

```

## 34.275 iso8859\_2.h

```

1  /* $XFree86: xc/lib/X11/lcUniConv/iso8859_2.h,v 1.3 2000/11/29 17:40:31 dawes Exp $ */
2
3  /*
4  * ISO-8859-2
5  */
6
7  #ifndef NEED_TOWC
8  static const unsigned short iso8859_2_uni[96] = {
9      /* 0xa0 */
10     0x00a0, 0x0104, 0x02d8, 0x0141, 0x00a4, 0x013d, 0x015a, 0x00a7,
11     0x00a8, 0x0160, 0x015e, 0x0164, 0x0179, 0x00ad, 0x017d, 0x017b,
12     /* 0xb0 */
13     0x00b0, 0x0105, 0x02db, 0x0142, 0x00b4, 0x013e, 0x015b, 0x02c7,
14     0x00b8, 0x0161, 0x015f, 0x0165, 0x017a, 0x02dd, 0x017e, 0x017c,
15     /* 0xc0 */
16     0x0154, 0x00c1, 0x00c2, 0x0102, 0x00c4, 0x0139, 0x0106, 0x00c7,
17     0x010c, 0x00c9, 0x0118, 0x00cb, 0x011a, 0x00cd, 0x00ce, 0x010e,
18     /* 0xd0 */
19     0x0110, 0x0143, 0x0147, 0x00d3, 0x00d4, 0x0150, 0x00d6, 0x00d7,
20     0x0158, 0x016e, 0x00da, 0x0170, 0x00dc, 0x00dd, 0x0162, 0x00df,
21     /* 0xe0 */
22     0x0155, 0x00e1, 0x00e2, 0x0103, 0x00e4, 0x013a, 0x0107, 0x00e7,
23     0x010d, 0x00e9, 0x0119, 0x00eb, 0x011b, 0x00ed, 0x00ee, 0x010f,
24     /* 0xf0 */
25     0x0111, 0x0144, 0x0148, 0x00f3, 0x00f4, 0x0151, 0x00f6, 0x00f7,

```

```

26 0x0159, 0x016f, 0x00fa, 0x0171, 0x00fc, 0x00fd, 0x0163, 0x02d9,
27 };
28
29 static int
30 iso8859_2_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0xa0)
34         *pwc = (ucs4_t) c;
35     else
36         *pwc = (ucs4_t) iso8859_2_2uni[c-0xa0];
37     return 1;
38 }
39 #endif /* NEED_TOWC */
40
41 #ifdef NEED_TOMB
42 static const unsigned char iso8859_2_page00[224] = {
43     0xa0, 0x00, 0x00, 0x00, 0x00, 0xa4, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
44     0xa8, 0x00, 0x00, 0x00, 0x00, 0xad, 0x00, 0x00, /* 0xa8-0xaf */
45     0xb0, 0x00, 0x00, 0x00, 0xb4, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
46     0xb8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
47     0x00, 0xc1, 0xc2, 0x00, 0xc4, 0x00, 0x00, 0xc7, /* 0xc0-0xc7 */
48     0x00, 0xc9, 0x00, 0xcb, 0x00, 0xcd, 0xce, 0x00, /* 0xc8-0xcf */
49     0x00, 0x00, 0x00, 0xd3, 0xd4, 0x00, 0xd6, 0xd7, /* 0xd0-0xd7 */
50     0x00, 0x00, 0xda, 0x00, 0xdc, 0xdd, 0x00, 0xdf, /* 0xd8-0xdf */
51     0x00, 0xe1, 0xe2, 0x00, 0xe4, 0x00, 0x00, 0xe7, /* 0xe0-0xe7 */
52     0x00, 0xe9, 0x00, 0xeb, 0x00, 0xed, 0xee, 0x00, /* 0xe8-0xef */
53     0x00, 0x00, 0x00, 0xf3, 0xf4, 0x00, 0xf6, 0xf7, /* 0xf0-0xf7 */
54     0x00, 0x00, 0xfa, 0x00, 0xfc, 0xfd, 0x00, 0x00, /* 0xf8-0xff */
55     /* 0x0100 */
56     0x00, 0x00, 0xc3, 0xe3, 0xa1, 0xb1, 0xc6, 0xe6, /* 0x00-0x07 */
57     0x00, 0x00, 0x00, 0x00, 0xc8, 0xe8, 0xcf, 0xef, /* 0x08-0x0f */
58     0xd0, 0xf0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
59     0xca, 0xea, 0xcc, 0xec, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
60     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
61     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
63     0x00, 0xc5, 0xe5, 0x00, 0x00, 0xa5, 0xb5, 0x00, /* 0x38-0x3f */
64     0x00, 0xa3, 0xb3, 0xd1, 0xf1, 0x00, 0x00, 0xd2, /* 0x40-0x47 */
65     0xf2, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
66     0xd5, 0xf5, 0x00, 0x00, 0xc0, 0xe0, 0x00, 0x00, /* 0x50-0x57 */
67     0xd8, 0xf8, 0xa6, 0xb6, 0x00, 0x00, 0xaa, 0xba, /* 0x58-0x5f */
68     0xa9, 0xb9, 0xde, 0xfe, 0xab, 0xbb, 0x00, 0x00, /* 0x60-0x67 */
69     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd9, 0xf9, /* 0x68-0x6f */
70     0xdb, 0xfb, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
71     0x00, 0xac, 0xbc, 0xaf, 0xbf, 0xae, 0xbe, 0x00, /* 0x78-0x7f */
72 };
73 static const unsigned char iso8859_2_page02[32] = {
74     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb7, /* 0xc0-0xc7 */
75     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
76     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
77     0xa2, 0xff, 0x00, 0xb2, 0x00, 0xbd, 0x00, 0x00, /* 0xd8-0xdf */
78 };
79
80 /*
81 static int
82 iso8859_2_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
83 {
84     unsigned char c = 0;
85     if (wc < 0x00a0) {
86         *r = wc;
87         return 1;
88     }
89     else if (wc >= 0x00a0 && wc < 0x0180)
90         c = iso8859_2_page00[wc-0x00a0];
91     else if (wc >= 0x02c0 && wc < 0x02e0)
92         c = iso8859_2_page02[wc-0x02c0];
93     if (c != 0) {
94         *r = c;
95         return 1;
96     }
97     return RET_ILSEQ;
98 }
99 */
100 #endif /* NEED_TOMB */

```

## 34.276 iso8859\_3.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_3.h,v 1.3 2000/11/29 17:40:31 dawes Exp $ */
2
3 /*
4  * ISO-8859-3
5  */
6
7 #ifdef NEED_TOWC

```

```

8 static const unsigned short iso8859_3_2uni[96] = {
9     /* 0xa0 */
10    0x00a0, 0x0126, 0x02d8, 0x00a3, 0x00a4, 0xfffd, 0x0124, 0x00a7,
11    0x00a8, 0x0130, 0x015e, 0x011e, 0x0134, 0x00ad, 0xfffd, 0x017b,
12    /* 0xb0 */
13    0x00b0, 0x0127, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x0125, 0x00b7,
14    0x00b8, 0x0131, 0x015f, 0x011f, 0x0135, 0x00bd, 0xfffd, 0x017c,
15    /* 0xc0 */
16    0x00c0, 0x00c1, 0x00c2, 0xfffd, 0x00c4, 0x010a, 0x0108, 0x00c7,
17    0x00c8, 0x00c9, 0x00ca, 0x00cb, 0x00cc, 0x00cd, 0x00ce, 0x00cf,
18    /* 0xd0 */
19    0xfffd, 0x00d1, 0x00d2, 0x00d3, 0x00d4, 0x0120, 0x00d6, 0x00d7,
20    0x011c, 0x00d9, 0x00da, 0x00db, 0x00dc, 0x016c, 0x015c, 0x00df,
21    /* 0xe0 */
22    0x00e0, 0x00e1, 0x00e2, 0xfffd, 0x00e4, 0x010b, 0x0109, 0x00e7,
23    0x00e8, 0x00e9, 0x00ea, 0x00eb, 0x00ec, 0x00ed, 0x00ee, 0x00ef,
24    /* 0xf0 */
25    0xfffd, 0x00f1, 0x00f2, 0x00f3, 0x00f4, 0x0121, 0x00f6, 0x00f7,
26    0x011d, 0x00f9, 0x00fa, 0x00fb, 0x00fc, 0x016d, 0x015d, 0x02d9,
27 };
28
29 static int
30 iso8859_3_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0xa0) {
34         *pwc = (ucs4_t) c;
35         return 1;
36     }
37     else {
38         unsigned short wc = iso8859_3_2uni[c-0xa0];
39         if (wc != 0xffff) {
40             *pwc = (ucs4_t) wc;
41             return 1;
42         }
43     }
44     return RET_ILSEQ;
45 }
46 #endif /* NEED_TOWC */
47
48 #ifdef NEED_TOMB
49 static const unsigned char iso8859_3_page00[96] = {
50     0xa0, 0x00, 0x00, 0xa3, 0xa4, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
51     0xa8, 0x00, 0x00, 0x00, 0x00, 0xad, 0x00, 0x00, /* 0xa8-0xaf */
52     0xb0, 0x00, 0xb2, 0xb3, 0xb4, 0xb5, 0x00, 0xb7, /* 0xb0-0xb7 */
53     0xb8, 0x00, 0x00, 0x00, 0x00, 0xbd, 0x00, 0x00, /* 0xb8-0xbf */
54     0xc0, 0xc1, 0xc2, 0x00, 0xc4, 0x00, 0x00, 0xc7, /* 0xc0-0xc7 */
55     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0xc8-0xcf */
56     0x00, 0xd1, 0xd2, 0xd3, 0xd4, 0x00, 0xd6, 0xd7, /* 0xd0-0xd7 */
57     0x00, 0xd9, 0xda, 0xdb, 0xdc, 0x00, 0x00, 0xdf, /* 0xd8-0xdf */
58     0xe0, 0xe1, 0xe2, 0x00, 0xe4, 0x00, 0x00, 0xe7, /* 0xe0-0xe7 */
59     0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xe8-0xef */
60     0x00, 0xf1, 0xf2, 0xf3, 0xf4, 0x00, 0xf6, 0xf7, /* 0xf0-0xf7 */
61     0x00, 0xf9, 0xfa, 0xfb, 0xfc, 0x00, 0x00, 0x00, /* 0xf8-0xff */
62 };
63 static const unsigned char iso8859_3_page01[120] = {
64     0xc6, 0xe6, 0xc5, 0xe5, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
65     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
66     0x00, 0x00, 0x00, 0x00, 0xd8, 0xf8, 0xab, 0xbb, /* 0x18-0x1f */
67     0xd5, 0xf5, 0x00, 0x00, 0xa6, 0xb6, 0xa1, 0xb1, /* 0x20-0x27 */
68     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
69     0xa9, 0xb9, 0x00, 0x00, 0xac, 0xbc, 0x00, 0x00, /* 0x30-0x37 */
70     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
71     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
72     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
73     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
74     0x00, 0x00, 0x00, 0x00, 0xde, 0xfe, 0xaa, 0xba, /* 0x58-0x5f */
75     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
76     0x00, 0x00, 0x00, 0x00, 0xdd, 0xfd, 0x00, 0x00, /* 0x68-0x6f */
77     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
78     0x00, 0x00, 0x00, 0xaf, 0xbf, 0x00, 0x00, 0x00, /* 0x78-0x7f */
79 };
80 static const unsigned char iso8859_3_page02[8] = {
81     0xa2, 0xff, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
82 };
83
84 static int
85 iso8859_3_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
86 {
87     (void)conv; (void)n;
88     unsigned char c = 0;
89     if (wc < 0x00a0) {
90         *r = wc;
91         return 1;
92     }
93     else if (wc >= 0x00a0 && wc < 0x0100)
94         c = iso8859_3_page00[wc-0x00a0];

```

```

95     else if (wc >= 0x0108 && wc < 0x0180)
96         c = iso8859_3_page01[wc-0x0108];
97     else if (wc >= 0x02d8 && wc < 0x02e0)
98         c = iso8859_3_page02[wc-0x02d8];
99     if (c != 0) {
100         *r = c;
101         return 1;
102     }
103     return RET_ILSEQ;
104 }
105 #endif /* NEED_TOMB */

```

## 34.277 iso8859\_4.h

```

1  /* $XFree86: xc/lib/X11/lcUniConv/iso8859_4.h,v 1.3 2000/11/29 17:40:31 dawes Exp $ */
2
3  /*
4   * ISO-8859-4
5   */
6
7  #ifdef NEED_TOWC
8  static const unsigned short iso8859_4_2uni[96] = {
9      /* 0xa0 */
10     0x00a0, 0x0104, 0x0138, 0x0156, 0x00a4, 0x0128, 0x013b, 0x00a7,
11     0x00a8, 0x0160, 0x0112, 0x0122, 0x0166, 0x00ad, 0x017d, 0x00af,
12     /* 0xb0 */
13     0x00b0, 0x0105, 0x02db, 0x0157, 0x00b4, 0x0129, 0x013c, 0x02c7,
14     0x00b8, 0x0161, 0x0113, 0x0123, 0x0167, 0x014a, 0x017e, 0x014b,
15     /* 0xc0 */
16     0x0100, 0x00c1, 0x00c2, 0x00c3, 0x00c4, 0x00c5, 0x00c6, 0x012e,
17     0x010c, 0x00c9, 0x0118, 0x00cb, 0x0116, 0x00cd, 0x00ce, 0x012a,
18     /* 0xd0 */
19     0x0110, 0x0145, 0x014c, 0x0136, 0x00d4, 0x00d5, 0x00d6, 0x00d7,
20     0x00d8, 0x0172, 0x00da, 0x00db, 0x00dc, 0x0168, 0x016a, 0x00df,
21     /* 0xe0 */
22     0x0101, 0x00e1, 0x00e2, 0x00e3, 0x00e4, 0x00e5, 0x00e6, 0x012f,
23     0x010d, 0x00e9, 0x0119, 0x00eb, 0x0117, 0x00ed, 0x00ee, 0x012b,
24     /* 0xf0 */
25     0x0111, 0x0146, 0x014d, 0x0137, 0x00f4, 0x00f5, 0x00f6, 0x00f7,
26     0x00f8, 0x0173, 0x00fa, 0x00fb, 0x00fc, 0x0169, 0x016b, 0x02d9,
27 };
28
29 static int
30 iso8859_4_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0xa0)
34         *pwc = (ucs4_t) c;
35     else
36         *pwc = (ucs4_t) iso8859_4_2uni[c-0xa0];
37     return 1;
38 }
39 #endif /* NEED_TOWC */
40
41 #ifdef NEED_TOMB
42 static const unsigned char iso8859_4_page00[224] = {
43     0xa0, 0x00, 0x00, 0x00, 0xa4, 0x00, 0x00, 0xa7, /* 0xa0-0xa7 */
44     0xa8, 0x00, 0x00, 0x00, 0x00, 0xad, 0x00, 0xaf, /* 0xa8-0xaf */
45     0xb0, 0x00, 0x00, 0x00, 0xb4, 0x00, 0x00, 0xb7, /* 0xb0-0xb7 */
46     0xb8, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xbf, /* 0xb8-0xbf */
47     0x00, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0x00, /* 0xc0-0xc7 */
48     0x00, 0xc9, 0x00, 0xcb, 0x00, 0xcd, 0xce, 0x00, /* 0xc8-0xcf */
49     0x00, 0x00, 0x00, 0x00, 0xd4, 0xd5, 0xd6, 0xd7, /* 0xd0-0xd7 */
50     0xd8, 0x00, 0xda, 0xdb, 0xdc, 0x00, 0x00, 0xdf, /* 0xd8-0xdf */
51     0x00, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0x00, /* 0xe0-0xe7 */
52     0x00, 0xe9, 0x00, 0xeb, 0x00, 0xed, 0xee, 0x00, /* 0xe8-0xef */
53     0x00, 0x00, 0x00, 0x00, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xf0-0xf7 */
54     0xf8, 0x00, 0xfa, 0xfb, 0xfc, 0x00, 0x00, 0xff, /* 0xf8-0xff */
55     /* 0x0100 */
56     0xc0, 0xe0, 0x00, 0x00, 0xa1, 0xb1, 0x00, 0x00, /* 0x00-0x07 */
57     0x00, 0x00, 0x00, 0x00, 0xc8, 0xe8, 0x00, 0x00, /* 0x08-0x0f */
58     0xd0, 0xf0, 0xaa, 0xba, 0x00, 0x00, 0xcc, 0xec, /* 0x10-0x17 */
59     0xca, 0xea, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
60     0x00, 0x00, 0xab, 0xbb, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
61     0xa5, 0xb5, 0xcf, 0xef, 0x00, 0x00, 0xc7, 0xe7, /* 0x28-0x2f */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd3, 0xf3, /* 0x30-0x37 */
63     0xa2, 0x00, 0x00, 0xa6, 0xb6, 0x00, 0x00, 0x00, /* 0x38-0x3f */
64     0x00, 0x00, 0x00, 0x00, 0x00, 0xd1, 0xf1, 0x00, /* 0x40-0x47 */
65     0x00, 0x00, 0xbd, 0xbf, 0xd2, 0xf2, 0x00, 0x00, /* 0x48-0x4f */
66     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa3, 0xb3, /* 0x50-0x57 */
67     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
68     0xa9, 0xb9, 0x00, 0x00, 0x00, 0x00, 0xac, 0xbc, /* 0x60-0x67 */
69     0xdd, 0xfd, 0xde, 0xfe, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
70     0x00, 0x00, 0xd9, 0xf9, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
71     0x00, 0x00, 0x00, 0x00, 0x00, 0xae, 0xbe, 0x00, /* 0x78-0x7f */

```

```

72 };
73 static const unsigned char iso8859_4_page02[32] = {
74     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb7, /* 0xc0-0xc7 */
75     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
76     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
77     0x00, 0xff, 0x00, 0xb2, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
78 };
79
80 static int
81 iso8859_4_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
82 {
83     (void)conv; (void)n;
84     unsigned char c = 0;
85     if (wc < 0x00a0) {
86         *r = wc;
87         return 1;
88     }
89     else if (wc >= 0x00a0 && wc < 0x0180)
90         c = iso8859_4_page00[wc-0x00a0];
91     else if (wc >= 0x02c0 && wc < 0x02e0)
92         c = iso8859_4_page02[wc-0x02c0];
93     if (c != 0) {
94         *r = c;
95         return 1;
96     }
97     return RET_ILSEQ;
98 }
99 #endif /* NEED_TOMB */

```

## 34.278 iso8859\_5.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_5.h,v 1.3 2000/11/29 17:40:32 dawes Exp $ */
2
3 /*
4  * ISO-8859-5
5  */
6
7 #ifndef NEED_TOWC
8 static const unsigned short iso8859_5_2uni[96] = {
9     /* 0xa0 */
10     0x00a0, 0x0401, 0x0402, 0x0403, 0x0404, 0x0405, 0x0406, 0x0407,
11     0x0408, 0x0409, 0x040a, 0x040b, 0x040c, 0x00ad, 0x040e, 0x040f,
12     /* 0xb0 */
13     0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0416, 0x0417,
14     0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e, 0x041f,
15     /* 0xc0 */
16     0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426, 0x0427,
17     0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e, 0x042f,
18     /* 0xd0 */
19     0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0436, 0x0437,
20     0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e, 0x043f,
21     /* 0xe0 */
22     0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446, 0x0447,
23     0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e, 0x044f,
24     /* 0xf0 */
25     0x2116, 0x0451, 0x0452, 0x0453, 0x0454, 0x0455, 0x0456, 0x0457,
26     0x0458, 0x0459, 0x045a, 0x045b, 0x045c, 0x00a7, 0x045e, 0x045f,
27 };
28
29 static int
30 iso8859_5_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0xa0)
34         *pwc = (ucs4_t) c;
35     else
36         *pwc = (ucs4_t) iso8859_5_2uni[c-0xa0];
37     return 1;
38 }
39 #endif /* NEED_TOWC */
40
41 #ifndef NEED_TOMB
42 static const unsigned char iso8859_5_page00[16] = {
43     0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xfd, /* 0xa0-0xa7 */
44     0x00, 0x00, 0x00, 0x00, 0x00, 0xad, 0x00, 0x00, /* 0xa8-0xaf */
45 };
46 static const unsigned char iso8859_5_page04[96] = {
47     0x00, 0xa1, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0x00-0x07 */
48     0xa8, 0xa9, 0xaa, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0x08-0x0f */
49     0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0x10-0x17 */
50     0xb8, 0xb9, 0xba, 0xbb, 0xbc, 0xbd, 0xbe, 0xbf, /* 0x18-0x1f */
51     0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x20-0x27 */
52     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x28-0x2f */
53     0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0x30-0x37 */
54     0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, /* 0x38-0x3f */

```

```

55 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0x40-0x47 */
56 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0x48-0x4f */
57 0x00, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0x50-0x57 */
58 0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0x00, 0xfe, 0xff, /* 0x58-0x5f */
59 };
60
61 static int
62 iso8859_5_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
63 {
64     (void)conv; (void)n;
65     unsigned char c = 0;
66     if (wc < 0x00a0) {
67         *r = wc;
68         return 1;
69     }
70     else if (wc >= 0x00a0 && wc < 0x00b0)
71         c = iso8859_5_page00[wc-0x00a0];
72     else if (wc >= 0x0400 && wc < 0x0460)
73         c = iso8859_5_page04[wc-0x0400];
74     else if (wc == 0x2116)
75         c = 0xf0;
76     if (c != 0) {
77         *r = c;
78         return 1;
79     }
80     return RET_ILSEQ;
81 }
82 #endif /* NEED_TOMB */

```

## 34.279 iso8859\_6.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_6.h,v 1.3 2000/11/29 17:40:32 dawes Exp $ */
2
3 /*
4  * ISO-8859-6
5  */
6
7 #ifndef NEED_TOWC
8 static const unsigned short iso8859_6_2uni[96] = {
9     /* 0xa0 */
10     0x00a0, 0xffffd, 0xffffd, 0xffffd, 0x00a4, 0xffffd, 0xffffd, 0xffffd,
11     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0x0060c, 0x00ad, 0xffffd, 0xffffd,
12     /* 0xb0 */
13     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
14     0xffffd, 0xffffd, 0xffffd, 0x061b, 0xffffd, 0xffffd, 0xffffd, 0x061f,
15     /* 0xc0 */
16     0xffffd, 0x0621, 0x0622, 0x0623, 0x0624, 0x0625, 0x0626, 0x0627,
17     0x0628, 0x0629, 0x062a, 0x062b, 0x062c, 0x062d, 0x062e, 0x062f,
18     /* 0xd0 */
19     0x0630, 0x0631, 0x0632, 0x0633, 0x0634, 0x0635, 0x0636, 0x0637,
20     0x0638, 0x0639, 0x063a, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
21     /* 0xe0 */
22     0x0640, 0x0641, 0x0642, 0x0643, 0x0644, 0x0645, 0x0646, 0x0647,
23     0x0648, 0x0649, 0x064a, 0x064b, 0x064c, 0x064d, 0x064e, 0x064f,
24     /* 0xf0 */
25     0x0650, 0x0651, 0x0652, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
26     0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd, 0xffffd,
27 };
28
29 static int
30 iso8859_6_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0xa0) {
34         *pwc = (ucs4_t) c;
35         return 1;
36     }
37     else {
38         unsigned short wc = iso8859_6_2uni[c-0xa0];
39         if (wc != 0xffffd) {
40             *pwc = (ucs4_t) wc;
41             return 1;
42         }
43     }
44     return RET_ILSEQ;
45 }
46 #endif /* NEED_TOWC */
47
48 #ifndef NEED_TOMB
49 static const unsigned char iso8859_6_page00[16] = {
50     0xa0, 0x00, 0x00, 0x00, 0xa4, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
51     0x00, 0x00, 0x00, 0x00, 0x00, 0xad, 0x00, 0x00, /* 0xa8-0xaf */
52 };
53 static const unsigned char iso8859_6_page06[80] = {
54     0x00, 0x00, 0x00, 0x00, 0xac, 0x00, 0x00, 0x00, /* 0x08-0x0f */

```

```

55 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
56 0x00, 0x00, 0x00, 0xbb, 0x00, 0x00, 0x00, 0xbf, /* 0x18-0x1f */
57 0x00, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x20-0x27 */
58 0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x28-0x2f */
59 0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0x30-0x37 */
60 0xd8, 0xd9, 0xda, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
61 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0x40-0x47 */
62 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0x48-0x4f */
63 0xf0, 0xf1, 0xf2, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
64 };
65
66 static int
67 iso8859_6_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
68 {
69     (void)conv; (void)n;
70     unsigned char c = 0;
71     if (wc < 0x00a0) {
72         *r = wc;
73         return 1;
74     }
75     else if (wc >= 0x00a0 && wc < 0x00b0)
76         c = iso8859_6_page00[wc-0x00a0];
77     else if (wc >= 0x0608 && wc < 0x0658)
78         c = iso8859_6_page06[wc-0x0608];
79     if (c != 0) {
80         *r = c;
81         return 1;
82     }
83     return RET_ILSEQ;
84 }
85 #endif /* NEED_TOMB */

```

## 34.280 iso8859\_7.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_7.h,v 1.3 2000/11/29 17:40:32 dawes Exp $ */
2
3 /*
4  * ISO-8859-7
5  */
6
7 #ifndef NEED_TOWC
8 static const unsigned short iso8859_7_2uni[96] = {
9     /* 0xa0 */
10    0x00a0, 0x2018, 0x2019, 0x00a3, 0xffff, 0xffff, 0x00a6, 0x00a7,
11    0x00a8, 0x00a9, 0xffff, 0x00ab, 0x00ac, 0x00ad, 0xffff, 0x2015,
12    /* 0xb0 */
13    0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x0384, 0x0385, 0x0386, 0x00b7,
14    0x0388, 0x0389, 0x038a, 0x00bb, 0x038c, 0x00bd, 0x038e, 0x038f,
15    /* 0xc0 */
16    0x0390, 0x0391, 0x0392, 0x0393, 0x0394, 0x0395, 0x0396, 0x0397,
17    0x0398, 0x0399, 0x039a, 0x039b, 0x039c, 0x039d, 0x039e, 0x039f,
18    /* 0xd0 */
19    0x03a0, 0x03a1, 0xffff, 0x03a3, 0x03a4, 0x03a5, 0x03a6, 0x03a7,
20    0x03a8, 0x03a9, 0x03aa, 0x03ab, 0x03ac, 0x03ad, 0x03ae, 0x03af,
21    /* 0xe0 */
22    0x03b0, 0x03b1, 0x03b2, 0x03b3, 0x03b4, 0x03b5, 0x03b6, 0x03b7,
23    0x03b8, 0x03b9, 0x03ba, 0x03bb, 0x03bc, 0x03bd, 0x03be, 0x03bf,
24    /* 0xf0 */
25    0x03c0, 0x03c1, 0x03c2, 0x03c3, 0x03c4, 0x03c5, 0x03c6, 0x03c7,
26    0x03c8, 0x03c9, 0x03ca, 0x03cb, 0x03cc, 0x03cd, 0x03ce, 0xffff,
27 };
28
29 static int
30 iso8859_7_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c < 0xa0) {
34         *pwc = (ucs4_t) c;
35         return 1;
36     }
37     else {
38         unsigned short wc = iso8859_7_2uni[c-0xa0];
39         if (wc != 0xffff) {
40             *pwc = (ucs4_t) wc;
41             return 1;
42         }
43     }
44     return RET_ILSEQ;
45 }
46 #endif /* NEED_TOWC */
47
48 #ifndef NEED_TOMB
49 static const unsigned char iso8859_7_page00[32] = {
50    0xa0, 0x00, 0x00, 0xa3, 0x00, 0x00, 0xa6, 0xa7, /* 0xa0-0xa7 */
51    0xa8, 0xa9, 0x00, 0xab, 0xac, 0xad, 0x00, 0x00, /* 0xa8-0xaf */

```

```

52 0xb0, 0xb1, 0xb2, 0xb3, 0x00, 0x00, 0x00, 0xb7, /* 0xb0-0xb7 */
53 0x00, 0x00, 0x00, 0xbb, 0x00, 0xbd, 0x00, 0x00, /* 0xb8-0xbf */
54 };
55 static const unsigned char iso8859_7_page03[80] = {
56 0x00, 0x00, 0x00, 0x00, 0xb4, 0xb5, 0xb6, 0x00, /* 0x80-0x87 */
57 0xb8, 0xb9, 0xba, 0x00, 0xbc, 0x00, 0xbe, 0xbf, /* 0x88-0x8f */
58 0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x90-0x97 */
59 0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x98-0x9f */
60 0xd0, 0xd1, 0x00, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0xa0-0xa7 */
61 0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, /* 0xa8-0xaf */
62 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0xb0-0xb7 */
63 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xb8-0xbf */
64 0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xc0-0xc7 */
65 0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0xfd, 0xfe, 0x00, /* 0xc8-0xcf */
66 };
67 static const unsigned char iso8859_7_page20[16] = {
68 0x00, 0x00, 0x00, 0x00, 0x00, 0xaf, 0x00, 0x00, /* 0x10-0x17 */
69 0xa1, 0xa2, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
70 };
71
72 static int
73 iso8859_7_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
74 {
75     (void)conv; (void)n;
76     unsigned char c = 0;
77     if (wc < 0x00a0) {
78         *r = wc;
79         return 1;
80     }
81     else if (wc >= 0x00a0 && wc < 0x00c0)
82         c = iso8859_7_page00[wc-0x00a0];
83     else if (wc >= 0x0380 && wc < 0x03d0)
84         c = iso8859_7_page03[wc-0x0380];
85     else if (wc >= 0x2010 && wc < 0x2020)
86         c = iso8859_7_page20[wc-0x2010];
87     if (c != 0) {
88         *r = c;
89         return 1;
90     }
91     return RET_ILSEQ;
92 }
93 #endif /* NEED_TOMB */

```

## 34.281 iso8859\_8.h

```

1 /* $XFree86: xc/lib/X11/locUniConv/iso8859_8.h,v 1.3 2000/11/29 17:40:32 dawes Exp $ */
2
3 /*
4  * ISO-8859-8
5  */
6
7 #ifdef NEED_TOWC
8 static const unsigned short iso8859_8_2uni[96] = {
9     /* 0xa0 */
10     0x00a0, 0xffff, 0x00a2, 0x00a3, 0x00a4, 0x00a5, 0x00a6, 0x00a7,
11     0x00a8, 0x00a9, 0x00d7, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x00af,
12     /* 0xb0 */
13     0x00b0, 0x00b1, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x00b6, 0x00b7,
14     0x00b8, 0x00b9, 0x00f7, 0x00bb, 0x00bc, 0x00bd, 0x00be, 0xffff,
15     /* 0xc0 */
16     0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
17     0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
18     /* 0xd0 */
19     0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
20     0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0x2017,
21     /* 0xe0 */
22     0x05d0, 0x05d1, 0x05d2, 0x05d3, 0x05d4, 0x05d5, 0x05d6, 0x05d7,
23     0x05d8, 0x05d9, 0x05da, 0x05db, 0x05dc, 0x05dd, 0x05de, 0x05df,
24     /* 0xf0 */
25     0x05e0, 0x05e1, 0x05e2, 0x05e3, 0x05e4, 0x05e5, 0x05e6, 0x05e7,
26     0x05e8, 0x05e9, 0x05ea, 0xffff, 0xffff, 0x200e, 0x200f, 0xffff,
27 };
28
29 static int
30 iso8859_8_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
31 {
32     unsigned char c = *s;
33     if (c >= 0xa0) {
34         unsigned short wc = iso8859_8_2uni[c-0xa0];
35         if (wc != 0xffff) {
36             *pwc = (ucs4_t) wc;
37             return 1;
38         }
39     }
40     else {

```

```

41     *pwc = (ucs4_t) c;
42     return 1;
43 }
44 return RET_ILSEQ;
45 }
46 #endif /* NEED_TOWC */
47
48 #ifdef NEED_TOMB
49 static const unsigned char iso8859_8_page00[88] = {
50     0xa0, 0x00, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0xa0-0xa7 */
51     0xa8, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0xa8-0xaf */
52     0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
53     0xb8, 0xb9, 0x00, 0xbb, 0xbc, 0xbd, 0xbe, 0x00, /* 0xb8-0xbf */
54     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
55     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
56     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xaa, /* 0xd0-0xd7 */
57     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
58     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
59     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
60     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xba, /* 0xf0-0xf7 */
61 };
62 static const unsigned char iso8859_8_page05[32] = {
63     0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0xd0-0xd7 */
64     0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xd8-0xdf */
65     0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xe0-0xe7 */
66     0xf8, 0xf9, 0xfa, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
67 };
68 static const unsigned char iso8859_8_page20[16] = {
69     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xfd, 0xfe, /* 0x08-0x0f */
70     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xdf, /* 0x10-0x17 */
71 };
72
73 static int
74 iso8859_8_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
75 {
76     (void)conv; (void)n;
77     unsigned char c = 0;
78     if (wc < 0x00a0) {
79         *r = wc;
80         return 1;
81     }
82     else if (wc >= 0x00a0 && wc < 0x00f8)
83         c = iso8859_8_page00[wc-0x00a0];
84     else if (wc >= 0x00f8 && wc < 0x05d0)
85         c = iso8859_8_page05[wc-0x00f8];
86     else if (wc >= 0x05d0 && wc < 0x2018)
87         c = iso8859_8_page20[wc-0x05d0];
88     if (c != 0) {
89         *r = c;
90         return 1;
91     }
92     return RET_ILSEQ;
93 }
94 #endif /* NEED_TOMB */

```

## 34.282 iso8859\_9.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_9.h,v 1.3 2000/11/29 17:40:32 dawes Exp $ */
2
3 /*
4  * ISO-8859-9
5  */
6
7 #ifdef NEED_TOWC
8 static const unsigned short iso8859_9_2uni[48] = {
9     /* 0xd0 */
10     0x011e, 0x00d1, 0x00d2, 0x00d3, 0x00d4, 0x00d5, 0x00d6, 0x00d7,
11     0x00d8, 0x00d9, 0x00da, 0x00db, 0x00dc, 0x0130, 0x015e, 0x00df,
12     /* 0xe0 */
13     0x00e0, 0x00e1, 0x00e2, 0x00e3, 0x00e4, 0x00e5, 0x00e6, 0x00e7,
14     0x00e8, 0x00e9, 0x00ea, 0x00eb, 0x00ec, 0x00ed, 0x00ee, 0x00ef,
15     /* 0xf0 */
16     0x011f, 0x00f1, 0x00f2, 0x00f3, 0x00f4, 0x00f5, 0x00f6, 0x00f7,
17     0x00f8, 0x00f9, 0x00fa, 0x00fb, 0x00fc, 0x0131, 0x015f, 0x00ff,
18 };
19
20 static int
21 iso8859_9_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
22 {
23     unsigned char c = *s;
24     if (c >= 0xd0)
25         *pwc = (ucs4_t) iso8859_9_2uni[c-0xd0];
26     else
27         *pwc = (ucs4_t) c;
28     return 1;

```

```

29 }
30 #endif /* NEED_TOWC */
31
32 #ifdef NEED_TOMB
33 static const unsigned char iso8859_9_page00[48] = {
34     0x00, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0xd0-0xd7 */
35     0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0x00, 0x00, 0xdf, /* 0xd8-0xdf */
36     0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0xe0-0xe7 */
37     0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xe8-0xef */
38     0x00, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xf0-0xf7 */
39     0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0x00, 0x00, 0xff, /* 0xf8-0xff */
40 };
41 static const unsigned char iso8859_9_page01[72] = {
42     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd0, 0xf0, /* 0x18-0x1f */
43     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
44     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
45     0xdd, 0xfd, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
46     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
47     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
48     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
49     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
50     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xde, 0xfe, /* 0x58-0x5f */
51 };
52
53 static int
54 iso8859_9_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
55 {
56     (void)conv; (void)n;
57     unsigned char c = 0;
58     if (wc < 0x00d0) {
59         *r = wc;
60         return 1;
61     }
62     else if (wc >= 0x00d0 && wc < 0x0100)
63         c = iso8859_9_page00[wc-0x00d0];
64     else if (wc >= 0x0118 && wc < 0x0160)
65         c = iso8859_9_page01[wc-0x0118];
66     if (c != 0) {
67         *r = c;
68         return 1;
69     }
70     return RET_ILSEQ;
71 }
72 #endif /* NEED_TOMB */

```

## 34.283 iso8859\_9e.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/iso8859_9e.h,v 1.3 2000/11/28 16:10:28 dawes Exp $ */
2
3 /*
4  * ISO-8859-9E
5  */
6
7 static const unsigned short iso8859_9e_2uni[96] = {
8     /* 0xa0 */
9     0x00a0, 0x017d, 0x00a2, 0x00a3, 0x20ac, 0x00a5, 0x012c, 0x00a7,
10     0x016c, 0x00a9, 0x01e6, 0x00ab, 0x014a, 0x00ad, 0x00ae, 0x01d1,
11     /* 0xb0 */
12     0x00b0, 0x017e, 0x00b2, 0x00b3, 0x00b4, 0x00b5, 0x012d, 0x00b7,
13     0x016d, 0x00b9, 0x01e7, 0x00bb, 0x014b, 0x00bd, 0x0178, 0x01d2,
14     /* 0xc0 */
15     0x00c0, 0x00c1, 0x00c2, 0x00c3, 0x00c4, 0x00c5, 0x018f, 0x00c7,
16     0x00c8, 0x00c9, 0x00ca, 0x00cb, 0x00cc, 0x00cd, 0x00ce, 0x00cf,
17     /* 0xd0 */
18     0x011e, 0x00d1, 0x00d2, 0x00d3, 0x00d4, 0x00d5, 0x00d6, 0x00dd,
19     0x019f, 0x00d9, 0x00da, 0x00db, 0x00dc, 0x0130, 0x015e, 0x00df,
20     /* 0xe0 */
21     0x00e0, 0x00e1, 0x00e2, 0x00e3, 0x00e4, 0x00e5, 0x0259, 0x00e7,
22     0x00e8, 0x00e9, 0x00ea, 0x00eb, 0x00ec, 0x00ed, 0x00ee, 0x00ef,
23     /* 0xf0 */
24     0x011f, 0x00f1, 0x00f2, 0x00f3, 0x00f4, 0x00f5, 0x00f6, 0x00fd,
25     0x0275, 0x00f9, 0x00fa, 0x00fb, 0x00fc, 0x0131, 0x015f, 0x00ff,
26 };
27
28 static int
29 iso8859_9e_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
30 {
31     unsigned char c = *s;
32     if (c >= 0xa0)
33         *pwc = (ucs4_t) iso8859_9e_2uni[c-0xa0];
34     else
35         *pwc = (ucs4_t) c;
36     return 1;
37 }
38

```

```

39 static const unsigned char iso8859_9e_page00[96] = {
40     0xa0, 0x00, 0xa2, 0xa3, 0x00, 0xa5, 0x00, 0xa7, /* 0xa0-0xa7 */
41     0x00, 0xa9, 0x00, 0xab, 0x00, 0xad, 0xae, 0x00, /* 0xa8-0xaf */
42     0xb0, 0x00, 0xb2, 0xb3, 0xb4, 0xb5, 0x00, 0xb7, /* 0xb0-0xb7 */
43     0x00, 0xb9, 0x00, 0xbb, 0x00, 0xbd, 0x00, 0x00, /* 0xb8-0xbf */
44     0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0x00, 0xc7, /* 0xc0-0xc7 */
45     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0xc8-0xcf */
46     0x00, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0x00, /* 0xd0-0xd7 */
47     0x00, 0xd9, 0xda, 0xdb, 0xdc, 0xd7, 0x00, 0xdf, /* 0xd8-0xdf */
48     0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0x00, 0xe7, /* 0xe0-0xe7 */
49     0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0xe8-0xef */
50     0x00, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0x00, /* 0xf0-0xf7 */
51     0x00, 0xf9, 0xfa, 0xfb, 0xfc, 0xf7, 0x00, 0xff, /* 0xf8-0xff */
52 };
53 static const unsigned char iso8859_9e_page01[136] = {
54     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd0, 0xf0, /* 0x18-0x1f */
55     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
56     0x00, 0x00, 0x00, 0x00, 0x00, 0xa6, 0xb6, 0x00, /* 0x28-0x2f */
57     0xdd, 0xfd, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
58     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
59     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
60     0x00, 0x00, 0xac, 0xbc, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
61     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xde, /* 0x58-0x5f */
63     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
64     0x00, 0x00, 0x00, 0x00, 0xa8, 0xb8, 0x00, 0x00, /* 0x68-0x6f */
65     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
66     0xbe, 0x00, 0x00, 0x00, 0x00, 0xa1, 0xb1, 0x00, /* 0x78-0x7f */
67     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
68     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xc6, /* 0x88-0x8f */
69     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
70     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xd8, /* 0x98-0x9f */
71 };
72 static const unsigned char iso8859_9e_page01_d[24] = {
73     0x00, 0xaf, 0xbf, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
74     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
75     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xaa, 0xba, /* 0xe0-0xe7 */
76 };
77
78 static int
79 iso8859_9e_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
80 {
81     unsigned char c = 0;
82     if (wc < 0x00a0) {
83         *r = wc;
84         return 1;
85     }
86     else if (wc >= 0x00a0 && wc < 0x0100)
87         c = iso8859_9e_page00[wc-0x00a0];
88     else if (wc >= 0x0118 && wc < 0x01a0)
89         c = iso8859_9e_page01[wc-0x0118];
90     else if (wc >= 0x01d0 && wc < 0x01e8)
91         c = iso8859_9e_page01_d[wc-0x01d0];
92     else if (wc == 0x0259)
93         c = 0xe6;
94     else if (wc == 0x0275)
95         c = 0xf8;
96     else if (wc == 0x20ac)
97         c = 0xa4;
98     if (c != 0) {
99         *r = c;
100         return 1;
101     }
102     return RET_ILSEQ;
103 }

```

## 34.284 jisx0201.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/jisx0201.h,v 1.3 2000/11/29 17:40:33 dawes Exp $ */
2
3 /*
4  * JISX0201.1976-0
5  */
6 #ifdef NEED_TOWC
7
8 static int
9 jisx0201_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
10 {
11     unsigned char c = *s;
12     if (c < 0x80) {
13         if (c == 0x5c)
14             *pwc = (ucs4_t) 0x00a5;
15         else if (c == 0x7e)
16             *pwc = (ucs4_t) 0x203e;
17         else

```

```

18     *pwc = (ucs4_t) c;
19     return 1;
20 } else {
21     if (c >= 0xa1 && c < 0xe0) {
22         *pwc = (ucs4_t) c + 0xfec0;
23         return 1;
24     }
25 }
26 return RET_ILSEQ;
27 }
28 #endif /* NEED_TOWC */
29
30 #ifdef NEED_TOMB
31
32 static int
33 jisx0201_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
34 {
35     (void)conv; (void)n;
36     if (wc < 0x0080 && !(wc == 0x005c || wc == 0x007e)) {
37         *r = wc;
38         return 1;
39     }
40     if (wc == 0x00a5) {
41         *r = 0x5c;
42         return 1;
43     }
44     if (wc == 0x203e) {
45         *r = 0x7e;
46         return 1;
47     }
48     if (wc >= 0xff61 && wc < 0xffa0) {
49         *r = wc - 0xfec0;
50         return 1;
51     }
52     return RET_ILSEQ;
53 }
54 #endif /* NEED_TOMB */

```

## 34.285 jisx0208.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/jisx0208.h,v 1.6 2003/05/27 22:26:31 tsi Exp $ */
2
3 /*
4  * JISX0208.1990-0
5  */
6 #ifdef NEED_TOWC
7
8 static const unsigned short jisx0208_2uni_page21[690] = {
9     /* 0x21 */
10     0x3000, 0x3001, 0x3002, 0xff0c, 0xff0e, 0x30fb, 0xff1a, 0xff1b,
11     0xff1f, 0xff01, 0x309b, 0x309c, 0x00b4, 0xff40, 0x00a8, 0xff3e,
12     0xffe3, 0xff3f, 0x30fd, 0x30fe, 0x309d, 0x309e, 0x3003, 0x4edd,
13     0x3005, 0x3006, 0x3007, 0x30fc, 0x2015, 0x2010, 0xff0f, 0xff3c,
14     0x301c, 0x2016, 0xff5c, 0x2026, 0x2025, 0x2018, 0x2019, 0x201c,
15     0x201d, 0xff08, 0xff09, 0x3014, 0x3015, 0xff3b, 0xff3d, 0xff5b,
16     0xff5d, 0x3008, 0x3009, 0x300a, 0x300b, 0x300c, 0x300d, 0x300e,
17     0x300f, 0x3010, 0x3011, 0xff0b, 0x2212, 0x00b1, 0x00d7, 0x00f7,
18     0xff1d, 0x2260, 0xff1c, 0xff1e, 0x2266, 0x2267, 0x221e, 0x2234,
19     0x2642, 0x2640, 0x00b0, 0x2032, 0x2033, 0x2103, 0xffe5, 0xff04,
20     0x00a2, 0x00a3, 0xff05, 0xff03, 0xff06, 0xff0a, 0xff20, 0x00a7,
21     0x2606, 0x2605, 0x25cb, 0x25cf, 0x25ce, 0x25c7,
22     /* 0x22 */
23     0x25c6, 0x25a1, 0x25a0, 0x25b3, 0x25b2, 0x25bd, 0x25bc, 0x203b,
24     0x3012, 0x2192, 0x2190, 0x2191, 0x2193, 0x3013, 0xfffd, 0xfffd,
25     0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
26     0xfffd, 0x2208, 0x220b, 0x2286, 0x2287, 0x2282, 0x2283, 0x222a,
27     0x2229, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
28     0xfffd, 0x2227, 0x2228, 0x00ac, 0x21d2, 0x21d4, 0x2200, 0x2203,
29     0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
30     0xfffd, 0xfffd, 0xfffd, 0x2220, 0x22a5, 0x2312, 0x2202, 0x2207,
31     0x2261, 0x2252, 0x226a, 0x226b, 0x221a, 0x223d, 0x221d, 0x2235,
32     0x222b, 0x222c, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
33     0xfffd, 0x212b, 0x2030, 0x266f, 0x266d, 0x266a, 0x2020, 0x2021,
34     0x00b6, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0x25ef,
35     /* 0x23 */
36     0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
37     0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xff10,
38     0xff11, 0xff12, 0xff13, 0xff14, 0xff15, 0xff16, 0xff17, 0xff18,
39     0xff19, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
40     0xff21, 0xff22, 0xff23, 0xff24, 0xff25, 0xff26, 0xff27, 0xff28,
41     0xff29, 0xff2a, 0xff2b, 0xff2c, 0xff2d, 0xff2e, 0xff2f, 0xff30,
42     0xff31, 0xff32, 0xff33, 0xff34, 0xff35, 0xff36, 0xff37, 0xff38,
43     0xff39, 0xff3a, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd, 0xfffd,
44     0xff41, 0xff42, 0xff43, 0xff44, 0xff45, 0xff46, 0xff47, 0xff48,
45     0xff49, 0xff4a, 0xff4b, 0xff4c, 0xff4d, 0xff4e, 0xff4f, 0xff50,

```

```
46 0xff51, 0xff52, 0xff53, 0xff54, 0xff55, 0xff56, 0xff57, 0xff58,
47 0xff59, 0xff5a, 0xff5d, 0xff5e, 0xff5f, 0xff60, 0xff61, 0xff62,
48 /* 0x24 */
49 0x3041, 0x3042, 0x3043, 0x3044, 0x3045, 0x3046, 0x3047, 0x3048,
50 0x3049, 0x304a, 0x304b, 0x304c, 0x304d, 0x304e, 0x304f, 0x3050,
51 0x3051, 0x3052, 0x3053, 0x3054, 0x3055, 0x3056, 0x3057, 0x3058,
52 0x3059, 0x305a, 0x305b, 0x305c, 0x305d, 0x305e, 0x305f, 0x3060,
53 0x3061, 0x3062, 0x3063, 0x3064, 0x3065, 0x3066, 0x3067, 0x3068,
54 0x3069, 0x306a, 0x306b, 0x306c, 0x306d, 0x306e, 0x306f, 0x3070,
55 0x3071, 0x3072, 0x3073, 0x3074, 0x3075, 0x3076, 0x3077, 0x3078,
56 0x3079, 0x307a, 0x307b, 0x307c, 0x307d, 0x307e, 0x307f, 0x3080,
57 0x3081, 0x3082, 0x3083, 0x3084, 0x3085, 0x3086, 0x3087, 0x3088,
58 0x3089, 0x308a, 0x308b, 0x308c, 0x308d, 0x308e, 0x308f, 0x3090,
59 0x3091, 0x3092, 0x3093, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
60 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
61 /* 0x25 */
62 0x30a1, 0x30a2, 0x30a3, 0x30a4, 0x30a5, 0x30a6, 0x30a7, 0x30a8,
63 0x30a9, 0x30aa, 0x30ab, 0x30ac, 0x30ad, 0x30ae, 0x30af, 0x30b0,
64 0x30b1, 0x30b2, 0x30b3, 0x30b4, 0x30b5, 0x30b6, 0x30b7, 0x30b8,
65 0x30b9, 0x30ba, 0x30bb, 0x30bc, 0x30bd, 0x30be, 0x30bf, 0x30c0,
66 0x30c1, 0x30c2, 0x30c3, 0x30c4, 0x30c5, 0x30c6, 0x30c7, 0x30c8,
67 0x30c9, 0x30ca, 0x30cb, 0x30cc, 0x30cd, 0x30ce, 0x30cf, 0x30d0,
68 0x30d1, 0x30d2, 0x30d3, 0x30d4, 0x30d5, 0x30d6, 0x30d7, 0x30d8,
69 0x30d9, 0x30da, 0x30db, 0x30dc, 0x30dd, 0x30de, 0x30df, 0x30e0,
70 0x30e1, 0x30e2, 0x30e3, 0x30e4, 0x30e5, 0x30e6, 0x30e7, 0x30e8,
71 0x30e9, 0x30ea, 0x30eb, 0x30ec, 0x30ed, 0x30ee, 0x30ef, 0x30f0,
72 0x30f1, 0x30f2, 0x30f3, 0x30f4, 0x30f5, 0x30f6, 0xffff, 0xffff,
73 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
74 /* 0x26 */
75 0x0391, 0x0392, 0x0393, 0x0394, 0x0395, 0x0396, 0x0397, 0x0398,
76 0x0399, 0x039a, 0x039b, 0x039c, 0x039d, 0x039e, 0x039f, 0x03a0,
77 0x03a1, 0x03a3, 0x03a4, 0x03a5, 0x03a6, 0x03a7, 0x03a8, 0x03a9,
78 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
79 0x03b1, 0x03b2, 0x03b3, 0x03b4, 0x03b5, 0x03b6, 0x03b7, 0x03b8,
80 0x03b9, 0x03ba, 0x03bb, 0x03bc, 0x03bd, 0x03be, 0x03bf, 0x03c0,
81 0x03c1, 0x03c3, 0x03c4, 0x03c5, 0x03c6, 0x03c7, 0x03c8, 0x03c9,
82 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
83 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
84 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
85 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
86 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
87 /* 0x27 */
88 0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0401, 0x0416,
89 0x0417, 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e,
90 0x041f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426,
91 0x0427, 0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e,
92 0x042f, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
93 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
94 0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0451, 0x0436,
95 0x0437, 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e,
96 0x043f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446,
97 0x0447, 0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e,
98 0x044f, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
99 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
100 /* 0x28 */
101 0x2500, 0x2502, 0x250c, 0x2510, 0x2518, 0x2514, 0x251c, 0x252c,
102 0x2524, 0x2534, 0x253c, 0x2501, 0x2503, 0x250f, 0x2513, 0x251b,
103 0x2517, 0x2523, 0x2533, 0x252b, 0x253b, 0x254b, 0x2520, 0x252f,
104 0x2528, 0x2537, 0x253f, 0x251d, 0x2530, 0x2525, 0x2538, 0x2542,
105 };
106 static const unsigned short jisx0208_2uni_page30[6398] = {
107 /* 0x30 */
108 0x4e9c, 0x5516, 0x5a03, 0x963f, 0x54c0, 0x611b, 0x6328, 0x59f6,
109 0x9022, 0x8475, 0x831c, 0x7a50, 0x60aa, 0x63e1, 0x6e25, 0x65ed,
110 0x8466, 0x82a6, 0x9bf5, 0x6893, 0x5727, 0x65a1, 0x6271, 0x5b9b,
111 0x59d0, 0x867b, 0x98f4, 0x7d62, 0x7dbe, 0x9b8e, 0x6216, 0x7c9f,
112 0x88b7, 0x5b89, 0x5eb5, 0x6309, 0x6697, 0x6848, 0x95c7, 0x978d,
113 0x674f, 0x4ee5, 0x4f0a, 0x4f4d, 0x4f9d, 0x5049, 0x56f2, 0x5937,
114 0x59d4, 0x5a01, 0x5c09, 0x60df, 0x610f, 0x6170, 0x6613, 0x6905,
115 0x70ba, 0x754f, 0x7570, 0x79fb, 0x7dad, 0x7def, 0x80c3, 0x840e,
116 0x8863, 0x8b02, 0x9055, 0x907a, 0x533b, 0x4e95, 0x4ea5, 0x57df,
117 0x80b2, 0x90c1, 0x78ef, 0x4e00, 0x58f1, 0x6ea2, 0x9038, 0x7a32,
118 0x8328, 0x828b, 0x9c2f, 0x5141, 0x5370, 0x54bd, 0x54e1, 0x56e0,
119 0x59fb, 0x5f15, 0x98f2, 0x6deb, 0x80e4, 0x852d,
120 /* 0x31 */
121 0x9662, 0x9670, 0x96a0, 0x97fb, 0x540b, 0x53f3, 0x5b87, 0x70cf,
122 0x7fbd, 0x8fc2, 0x96e8, 0x536f, 0x9d5c, 0x7aba, 0x4e11, 0x7893,
123 0x81fc, 0x6e26, 0x5618, 0x5504, 0x6b1d, 0x851a, 0x9c3b, 0x59e5,
124 0x53a9, 0x6d66, 0x74dc, 0x958f, 0x5642, 0x4e91, 0x904b, 0x96f2,
125 0x834f, 0x990c, 0x53e1, 0x55b6, 0x5b30, 0x5f71, 0x6620, 0x66f3,
126 0x6804, 0x6c38, 0x6cf3, 0x6d29, 0x745b, 0x76c8, 0x7a4e, 0x9834,
127 0x82f1, 0x885b, 0x8a60, 0x92ed, 0x6db2, 0x75ab, 0x76ca, 0x99c5,
128 0x60a6, 0x8b01, 0x8d8a, 0x95b2, 0x698e, 0x53ad, 0x5186, 0x5712,
129 0x5830, 0x5944, 0x5bb4, 0x5ef6, 0x6028, 0x63a9, 0x63f4, 0x6cbf,
130 0x6f14, 0x708e, 0x7114, 0x7159, 0x71d5, 0x733f, 0x7e01, 0x8276,
131 0x82d1, 0x8597, 0x9060, 0x925b, 0x9d1b, 0x5869, 0x65bc, 0x6c5a,
132 0x7525, 0x51f9, 0x592e, 0x5965, 0x5f80, 0x5fdd,
```

```

133  /* 0x32 */
134  0x62bc, 0x65fa, 0x6a2a, 0x6b27, 0x6bb4, 0x738b, 0x7fc1, 0x8956,
135  0x9d2c, 0x9d0e, 0x9ec4, 0x5ca1, 0x6c96, 0x837b, 0x5104, 0x5c4b,
136  0x61b6, 0x81c6, 0x6876, 0x7261, 0x4e59, 0x4ffa, 0x5378, 0x6069,
137  0x6e29, 0x7a4f, 0x97f3, 0x4e0b, 0x5316, 0x4eee, 0x4f55, 0x4f3d,
138  0x4fa1, 0x4f73, 0x52a0, 0x53ef, 0x5609, 0x590f, 0x5ac1, 0x5bb6,
139  0x5be1, 0x79d1, 0x6687, 0x679c, 0x67b6, 0x6b4c, 0x6cb3, 0x706b,
140  0x73c2, 0x798d, 0x79be, 0x7a3c, 0x7b87, 0x82b1, 0x82db, 0x8304,
141  0x8377, 0x83ef, 0x83d3, 0x8766, 0x8ab2, 0x5629, 0x8ca8, 0x8fe6,
142  0x904e, 0x971e, 0x868a, 0x4fc4, 0x5ce8, 0x6211, 0x7259, 0x753b,
143  0x81e5, 0x82bd, 0x86fe, 0x8cc0, 0x96c5, 0x9913, 0x99d5, 0x4ecb,
144  0x4f1a, 0x89e3, 0x56de, 0x584a, 0x58ca, 0x5efb, 0x5feb, 0x602a,
145  0x6094, 0x6062, 0x61d0, 0x6212, 0x62d0, 0x6539,
146  /* 0x33 */
147  0x9b41, 0x6666, 0x68b0, 0x6d77, 0x7070, 0x754c, 0x7686, 0x7d75,
148  0x82a5, 0x87f9, 0x958b, 0x968e, 0x8c9d, 0x51f1, 0x52be, 0x5916,
149  0x54b3, 0x5bb3, 0x5d16, 0x6168, 0x6982, 0x6daa, 0x788d, 0x84cb,
150  0x8857, 0x8a72, 0x93a7, 0x9ab8, 0x6d6c, 0x99a8, 0x86d9, 0x57a3,
151  0x67ff, 0x86ce, 0x920e, 0x5283, 0x5687, 0x5404, 0x5ed3, 0x62e1,
152  0x64b9, 0x683c, 0x6838, 0x6bbb, 0x7372, 0x78ba, 0x7a6b, 0x899a,
153  0x89d2, 0x8d6b, 0x8f03, 0x90ed, 0x95a3, 0x9694, 0x9769, 0x5b66,
154  0x5cb3, 0x697d, 0x984d, 0x984e, 0x639b, 0x7b20, 0x6a2b, 0x6a7f,
155  0x68b6, 0x9c0d, 0x6f5f, 0x5272, 0x559d, 0x6070, 0x62ec, 0x6d3b,
156  0x6e07, 0x6ed1, 0x845b, 0x8910, 0x8f44, 0x4e14, 0x9c39, 0x53f6,
157  0x691b, 0x6a3a, 0x9784, 0x682a, 0x515c, 0x7ac3, 0x84b2, 0x91dc,
158  0x938c, 0x565b, 0x9d28, 0x6822, 0x8305, 0x8431,
159  /* 0x34 */
160  0x7ca5, 0x5208, 0x82c5, 0x74e6, 0x4e7e, 0x4f83, 0x51a0, 0x5bd2,
161  0x520a, 0x52d8, 0x52e7, 0x5dfb, 0x559a, 0x582a, 0x59e6, 0x5b8c,
162  0x5b98, 0x5bdb, 0x5e72, 0x5e79, 0x60a3, 0x611f, 0x6163, 0x61be,
163  0x63db, 0x6562, 0x67d1, 0x6853, 0x68fa, 0x6b3e, 0x6b53, 0x6c57,
164  0x6f22, 0x6f97, 0x6f45, 0x74b0, 0x7518, 0x76e3, 0x770b, 0x7aff,
165  0x7ba1, 0x7c21, 0x7de9, 0x7f36, 0x7ff0, 0x809d, 0x8266, 0x839e,
166  0x89b3, 0x8acc, 0x8cab, 0x9084, 0x9451, 0x9593, 0x9591, 0x95a2,
167  0x9665, 0x97d3, 0x9928, 0x8218, 0x4e38, 0x542b, 0x5cb8, 0x5dcc,
168  0x73a9, 0x764c, 0x773c, 0x5ca9, 0x7feb, 0x8d0b, 0x96c1, 0x9811,
169  0x9854, 0x9858, 0x4f01, 0x4f0e, 0x5371, 0x559c, 0x5668, 0x57fa,
170  0x5947, 0x5b09, 0x5bc4, 0x5c90, 0x5e0c, 0x5e7e, 0x5fcc, 0x63ee,
171  0x673a, 0x65d7, 0x65e2, 0x671f, 0x68cb, 0x68c4,
172  /* 0x35 */
173  0x6a5f, 0x5e30, 0x6bc5, 0x6c17, 0x6c7d, 0x757f, 0x7948, 0x5b63,
174  0x7a00, 0x7d00, 0x5fbd, 0x898f, 0x8a18, 0x8cb4, 0x8d77, 0x8ecc,
175  0x8f1d, 0x98e2, 0x9a0e, 0x9b3c, 0x4e80, 0x507d, 0x5100, 0x5993,
176  0x5b9c, 0x622f, 0x6280, 0x64ec, 0x6b3a, 0x72a0, 0x7591, 0x7947,
177  0x7fa9, 0x87fb, 0x8abc, 0x8b70, 0x63ac, 0x83ca, 0x97a0, 0x5409,
178  0x5403, 0x55ab, 0x6854, 0x6a58, 0x8a70, 0x7827, 0x6775, 0x9ecd,
179  0x5374, 0x5ba2, 0x811a, 0x8650, 0x9006, 0x4e18, 0x4e45, 0x4ec7,
180  0x4f11, 0x53ca, 0x5438, 0x5bae, 0x5f13, 0x6025, 0x6551, 0x673d,
181  0x6c42, 0x6c72, 0x6ce3, 0x7078, 0x7403, 0x7a76, 0x7aae, 0x7b08,
182  0x7d1a, 0x7cfe, 0x7d66, 0x65e7, 0x725b, 0x53bb, 0x5c45, 0x5de8,
183  0x62d2, 0x62e0, 0x6319, 0x6e20, 0x865a, 0x8a31, 0x8ddd, 0x92f8,
184  0x6f01, 0x79a6, 0x9b5a, 0x4ea8, 0x4eab, 0x4eac,
185  /* 0x36 */
186  0x4f9b, 0x4fa0, 0x50d1, 0x5147, 0x7af6, 0x5171, 0x51f6, 0x5354,
187  0x5321, 0x537f, 0x53eb, 0x55ac, 0x5883, 0x5ce1, 0x5f37, 0x5f4a,
188  0x602f, 0x6050, 0x606d, 0x631f, 0x6559, 0x6a4b, 0x6cc1, 0x72c2,
189  0x72ed, 0x77ef, 0x80f8, 0x8105, 0x8208, 0x854e, 0x90f7, 0x93e1,
190  0x97ff, 0x9957, 0x9a5a, 0x4ef0, 0x51dd, 0x5c2d, 0x6681, 0x696d,
191  0x5c40, 0x66f2, 0x6975, 0x7389, 0x6850, 0x7c81, 0x50c5, 0x52e4,
192  0x5747, 0x5dfe, 0x9326, 0x65a4, 0x6b23, 0x6b3d, 0x7434, 0x7981,
193  0x79bd, 0x7b4b, 0x7dca, 0x82b9, 0x83cc, 0x887f, 0x895f, 0x8b39,
194  0x8fd1, 0x91d1, 0x541f, 0x9280, 0x4e5d, 0x5036, 0x53e5, 0x533a,
195  0x72d7, 0x7396, 0x77e9, 0x82e6, 0x8eaf, 0x99c6, 0x99c8, 0x99d2,
196  0x5177, 0x611a, 0x865e, 0x55b0, 0x7a7a, 0x5076, 0x5bd3, 0x9047,
197  0x9685, 0x4e32, 0x6adb, 0x91e7, 0x5c51, 0x5c48,
198  /* 0x37 */
199  0x6398, 0x7a9f, 0x6c93, 0x9774, 0x8f61, 0x7aaa, 0x718a, 0x9688,
200  0x7c82, 0x6817, 0x7e70, 0x6851, 0x936c, 0x52f2, 0x541b, 0x85ab,
201  0x8a13, 0x7fa4, 0x8ecd, 0x90e1, 0x5366, 0x8888, 0x7941, 0x4fc2,
202  0x50be, 0x5211, 0x5144, 0x5553, 0x572d, 0x73ea, 0x578b, 0x5951,
203  0x5f62, 0x5f84, 0x6075, 0x6176, 0x6167, 0x61a9, 0x63b2, 0x643a,
204  0x656c, 0x666f, 0x6842, 0x6e13, 0x7566, 0x7a3d, 0x7cfb, 0x7d4c,
205  0x7d99, 0x7e4b, 0x7f6b, 0x830e, 0x834a, 0x86cd, 0x8a08, 0x8a63,
206  0x8b66, 0x8efd, 0x981a, 0x9d8f, 0x82b8, 0x8fce, 0x9be8, 0x5287,
207  0x621f, 0x6483, 0x6fc0, 0x9699, 0x6841, 0x5091, 0x6b20, 0x6c7a,
208  0x6f54, 0x7a74, 0x7d50, 0x8840, 0x8a23, 0x6708, 0x4ef6, 0x5039,
209  0x5026, 0x5065, 0x517c, 0x5238, 0x5263, 0x55a7, 0x570f, 0x5805,
210  0x5acc, 0x5efa, 0x61b2, 0x61f8, 0x62f3, 0x6372,
211  /* 0x38 */
212  0x691c, 0x6a29, 0x727d, 0x72ac, 0x732e, 0x7814, 0x786f, 0x7d79,
213  0x770c, 0x80a9, 0x898b, 0x8b19, 0x8ce2, 0x8ed2, 0x9063, 0x9375,
214  0x967a, 0x9855, 0x9a13, 0x9e78, 0x5143, 0x539f, 0x53b3, 0x5e7b,
215  0x5f26, 0x6e1b, 0x6e90, 0x7384, 0x73fe, 0x7d43, 0x8237, 0x8a00,
216  0x8afa, 0x9650, 0x4e4e, 0x500b, 0x53e4, 0x547c, 0x56fa, 0x59d1,
217  0x5b64, 0x5df1, 0x5eab, 0x5f27, 0x6238, 0x6545, 0x67af, 0x6e56,
218  0x72d0, 0x7cca, 0x88b4, 0x80a1, 0x80e1, 0x83f0, 0x864e, 0x8a87,
219  0x8de8, 0x9237, 0x96c7, 0x9867, 0x9f13, 0x4e94, 0x4e92, 0x4f0d,

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220 0x5348, 0x5449, 0x543e, 0x5a2f, 0x5f8c, 0x5fa1, 0x609f, 0x68a7,
221 0x6a8e, 0x745a, 0x7881, 0x8a9e, 0x8aa4, 0x8b77, 0x9190, 0x4e5e,
222 0x9bc9, 0x4ea4, 0x4f7c, 0x4faf, 0x5019, 0x5016, 0x5149, 0x516c,
223 0x529f, 0x52b9, 0x52fe, 0x539a, 0x53e3, 0x5411,
224 /* 0x39 */
225 0x540e, 0x5589, 0x5751, 0x57a2, 0x597d, 0x5b54, 0x5b5d, 0x5b8f,
226 0x5de5, 0x5de7, 0x5df7, 0x5e78, 0x5e83, 0x5e9a, 0x5eb7, 0x5f18,
227 0x6052, 0x614c, 0x6297, 0x62d8, 0x63a7, 0x653b, 0x6602, 0x6643,
228 0x66f4, 0x676d, 0x6821, 0x6897, 0x69cb, 0x6c5f, 0x6d2a, 0x6d69,
229 0x6e2f, 0x6e9d, 0x7532, 0x7687, 0x786c, 0x7a3f, 0x7ce0, 0x7d05,
230 0x7d18, 0x7d5e, 0x7db1, 0x8015, 0x8003, 0x80af, 0x80b1, 0x8154,
231 0x818f, 0x822a, 0x8352, 0x884c, 0x8861, 0x8b1b, 0x8ca2, 0x8cfc,
232 0x90ca, 0x9175, 0x9271, 0x783f, 0x92fc, 0x95a4, 0x964d, 0x9805,
233 0x9999, 0x9ad8, 0x9d3b, 0x525b, 0x52ab, 0x53f7, 0x5408, 0x58d5,
234 0x62f7, 0x6fe0, 0x8c6a, 0x8f5f, 0x9eb9, 0x514b, 0x523b, 0x544a,
235 0x56fd, 0x7a40, 0x9177, 0x9d60, 0x9ed2, 0x7344, 0x6f09, 0x8170,
236 0x7511, 0x5ffd, 0x60da, 0x9aa8, 0x72db, 0x8fbc,
237 /* 0x3a */
238 0x6b64, 0x9803, 0x4eca, 0x56f0, 0x5764, 0x58be, 0x5a5a, 0x6068,
239 0x61c7, 0x660f, 0x6606, 0x6839, 0x68b1, 0x6df7, 0x75d5, 0x7d3a,
240 0x826e, 0x9b42, 0x8e9b, 0x4f50, 0x53c9, 0x5506, 0x5d6f, 0x5de6,
241 0x5dee, 0x67fb, 0x6c99, 0x7473, 0x7802, 0x8a50, 0x9396, 0x88df,
242 0x5750, 0x5ea7, 0x632b, 0x50b5, 0x50ac, 0x518d, 0x6700, 0x54c9,
243 0x585e, 0x59bb, 0x59bb0, 0x5f69, 0x624d, 0x63a1, 0x683d, 0x6b73,
244 0x6e08, 0x707d, 0x91c7, 0x7280, 0x7815, 0x7826, 0x796d, 0x658e,
245 0x7d30, 0x83dc, 0x88c1, 0x8f09, 0x969b, 0x5264, 0x5728, 0x6750,
246 0x7f6a, 0x8ca1, 0x51b4, 0x5742, 0x962a, 0x583a, 0x698a, 0x80b4,
247 0x54b2, 0x5d0e, 0x57fc, 0x7895, 0x9dfa, 0x4f5c, 0x524a, 0x548b,
248 0x643e, 0x6628, 0x6714, 0x67f5, 0x7a84, 0x7b56, 0x7d22, 0x932f,
249 0x685c, 0x9bad, 0x7b39, 0x5319, 0x518a, 0x5237,
250 /* 0x3b */
251 0x5bdf, 0x62f6, 0x64ae, 0x64e6, 0x672d, 0x6bba, 0x85a9, 0x96d1,
252 0x7690, 0x9bd6, 0x634c, 0x9306, 0x9bab, 0x76bf, 0x6652, 0x4e09,
253 0x5098, 0x53c2, 0x5c71, 0x60e8, 0x6492, 0x6563, 0x685f, 0x71e6,
254 0x73ca, 0x7523, 0x7b97, 0x7e82, 0x8695, 0x8b83, 0x8cdb, 0x9178,
255 0x9910, 0x65ac, 0x66ab, 0x6b8b, 0x4ed5, 0x4ed4, 0x4f3a, 0x4f7f,
256 0x523a, 0x53f8, 0x53f2, 0x55e3, 0x56db, 0x58eb, 0x59cb, 0x59c9,
257 0x59ff, 0x5b50, 0x5c4d, 0x5e02, 0x5e2b, 0x5fd7, 0x601d, 0x6307,
258 0x652f, 0x5b5c, 0x65af, 0x65bd, 0x65e8, 0x679d, 0x6b62, 0x6b7b,
259 0x6c0f, 0x7345, 0x7949, 0x79c1, 0x7cf8, 0x7d19, 0x7d2b, 0x80a2,
260 0x8102, 0x81f3, 0x8996, 0x8a5e, 0x8a69, 0x8a66, 0x8a8c, 0x8aee,
261 0x8cc7, 0x8cdc, 0x96cc, 0x98fc, 0x6b6f, 0x4e8b, 0x4f3c, 0x4f8d,
262 0x5150, 0x5b57, 0x5bfa, 0x6148, 0x6301, 0x6642,
263 /* 0x3c */
264 0x6b21, 0x6ecb, 0x6cbb, 0x723e, 0x74bd, 0x75d4, 0x78c1, 0x793a,
265 0x800c, 0x8033, 0x81ea, 0x8494, 0x8f9e, 0x6c50, 0x9e7f, 0x5f0f,
266 0x8b58, 0x9d2b, 0x7afa, 0x8ef8, 0x5b8d, 0x96eb, 0x4e03, 0x53f1,
267 0x57f7, 0x5931, 0x5ac9, 0x5ba4, 0x6089, 0x6e7f, 0x6f06, 0x75be,
268 0x8cea, 0x5b9f, 0x8500, 0x7be0, 0x5072, 0x67f4, 0x829d, 0x5c61,
269 0x854a, 0x7e1e, 0x820e, 0x5199, 0x5c04, 0x6368, 0x8d66, 0x659c,
270 0x716e, 0x793e, 0x7d17, 0x8005, 0x8b1d, 0x8eca, 0x906e, 0x86c7,
271 0x90aa, 0x501f, 0x52fa, 0x5c3a, 0x6753, 0x707c, 0x7235, 0x914c,
272 0x91c8, 0x932b, 0x82e5, 0x5bc2, 0x5f31, 0x60f9, 0x4e3b, 0x53d6,
273 0x5b88, 0x624b, 0x6731, 0x6b8a, 0x72e9, 0x73e0, 0x7a2e, 0x816b,
274 0x8da3, 0x9152, 0x9996, 0x5112, 0x53d7, 0x546a, 0x5bff, 0x6388,
275 0x6a39, 0x7dac, 0x9700, 0x56da, 0x53ce, 0x5468,
276 /* 0x3d */
277 0x5b97, 0x5c31, 0x5dde, 0x4fee, 0x6101, 0x62fe, 0x6d32, 0x79c0,
278 0x79cb, 0x7d42, 0x7e4d, 0x7fd2, 0x81ed, 0x821f, 0x8490, 0x8846,
279 0x8972, 0x8b90, 0x8be7, 0x8f74, 0x9031, 0x914b, 0x916c, 0x96c6,
280 0x919c, 0x4ec0, 0x4f4f, 0x5145, 0x5341, 0x5f93, 0x620e, 0x67d4,
281 0x6c41, 0x6e0b, 0x7363, 0x7e26, 0x91cd, 0x9283, 0x53d4, 0x5919,
282 0x5bbf, 0x6dd1, 0x795d, 0x7e2e, 0x7c9b, 0x587e, 0x719f, 0x51fa,
283 0x8853, 0x8ff0, 0x4fca, 0x5cfb, 0x6625, 0x77ac, 0x7ae3, 0x821c,
284 0x99ff, 0x51c6, 0x5faa, 0x65ec, 0x696f, 0x6b89, 0x6df3, 0x6e96,
285 0x6f64, 0x76fe, 0x7d14, 0x5de1, 0x9075, 0x9187, 0x9806, 0x51e6,
286 0x521d, 0x6240, 0x6691, 0x66d9, 0x6e1a, 0x5eb6, 0x7dd2, 0x7f72,
287 0x66f8, 0x85af, 0x85f7, 0x8af8, 0x52a9, 0x53d9, 0x5973, 0x5e8f,
288 0x5f90, 0x6055, 0x92e4, 0x9664, 0x50b7, 0x511f,
289 /* 0x3e */
290 0x52dd, 0x5320, 0x5347, 0x53ec, 0x54e8, 0x5546, 0x5531, 0x5617,
291 0x5968, 0x59be, 0x5a3c, 0x5bb5, 0x5c06, 0x5c0f, 0x5c11, 0x5c1a,
292 0x5e84, 0x5e8a, 0x5ee0, 0x5f70, 0x627f, 0x6284, 0x62db, 0x638c,
293 0x6377, 0x6607, 0x660c, 0x662d, 0x6676, 0x677e, 0x68a2, 0x6a1f,
294 0x6a35, 0x6cbc, 0x6d88, 0x6e09, 0x6e58, 0x713c, 0x7126, 0x7167,
295 0x75c7, 0x7701, 0x785d, 0x7901, 0x7965, 0x79f0, 0x7ae0, 0x7b11,
296 0x7ca7, 0x7d39, 0x8096, 0x83d6, 0x848b, 0x8549, 0x885d, 0x88f3,
297 0x8a1f, 0x8a3c, 0x8a54, 0x8a73, 0x8c61, 0x8cde, 0x91a4, 0x9266,
298 0x937e, 0x9418, 0x969c, 0x9798, 0x4e0a, 0x4e08, 0x4e1e, 0x4e57,
299 0x5197, 0x5270, 0x57ce, 0x5834, 0x58cc, 0x5b22, 0x5e38, 0x60c5,
300 0x64fe, 0x6761, 0x6756, 0x6d44, 0x72b6, 0x7573, 0x7a63, 0x84b8,
301 0x8b72, 0x91b8, 0x9320, 0x5631, 0x57f4, 0x98fe,
302 /* 0x3f */
303 0x62ed, 0x690d, 0x6b96, 0x71ed, 0x7e54, 0x8077, 0x8272, 0x89e6,
304 0x98df, 0x8755, 0x8fb1, 0x5c3b, 0x4f38, 0x4fe1, 0x4fb5, 0x5507,
305 0x5a20, 0x5bdd, 0x5be9, 0x5fc3, 0x614e, 0x632f, 0x65b0, 0x664b,
306 0x68ee, 0x699b, 0x6d78, 0x6df1, 0x7533, 0x75b9, 0x771f, 0x795e,
```

```
307 0x79e6, 0x7d33, 0x81e3, 0x82af, 0x85aa, 0x89aa, 0x8a3a, 0x8eab,
308 0x8f9b, 0x9032, 0x91dd, 0x9707, 0x4eba, 0x4ec1, 0x5203, 0x5875,
309 0x58ec, 0x5c0b, 0x751a, 0x5c3d, 0x814e, 0x8a0a, 0x8fc5, 0x9663,
310 0x976d, 0x7b25, 0x8acf, 0x9808, 0x9162, 0x56f3, 0x53a8, 0x9017,
311 0x5439, 0x5782, 0x5e25, 0x63a8, 0x6c34, 0x708a, 0x7761, 0x7c8b,
312 0x7fe0, 0x8870, 0x9042, 0x9154, 0x9310, 0x9318, 0x968f, 0x745e,
313 0x9ac4, 0x5d07, 0x5d69, 0x6570, 0x67a2, 0x8da8, 0x96db, 0x636e,
314 0x6749, 0x6919, 0x83c5, 0x9817, 0x96c0, 0x88fe,
315 /* 0x40 */
316 0x6f84, 0x647a, 0x5bf8, 0x4e16, 0x702c, 0x755d, 0x662f, 0x51c4,
317 0x5236, 0x52e2, 0x59d3, 0x5f81, 0x6027, 0x6210, 0x653f, 0x6574,
318 0x661f, 0x6674, 0x68f2, 0x6816, 0x6b63, 0x6e05, 0x7272, 0x751f,
319 0x76db, 0x7cbe, 0x8056, 0x58f0, 0x88fd, 0x897f, 0x8aa0, 0x8a93,
320 0x8acb, 0x901d, 0x9192, 0x9752, 0x9759, 0x6589, 0x7a0e, 0x8106,
321 0x96bb, 0x5e2d, 0x60dc, 0x621a, 0x65a5, 0x6614, 0x6790, 0x77f3,
322 0x7a4d, 0x7c4d, 0x7e3e, 0x810a, 0x8cac, 0x8d64, 0x8de1, 0x8e5f,
323 0x78a9, 0x5207, 0x62d9, 0x63a5, 0x6442, 0x6298, 0x8a2d, 0x7a83,
324 0x7bc0, 0x8aac, 0x96ea, 0x7d76, 0x820c, 0x8749, 0x4ed9, 0x5148,
325 0x5343, 0x5360, 0x5ba3, 0x5c02, 0x5c16, 0x5ddd, 0x6226, 0x6247,
326 0x64b0, 0x6813, 0x6834, 0x6cc9, 0x6d45, 0x6d17, 0x67d3, 0x6f5c,
327 0x714e, 0x717d, 0x65cb, 0x7a7f, 0x7bad, 0x7dda,
328 /* 0x41 */
329 0x7e4a, 0x7fa8, 0x817a, 0x821b, 0x8239, 0x85a6, 0x8a6e, 0x8cce,
330 0x8df5, 0x9078, 0x9077, 0x92ad, 0x9291, 0x9583, 0x9bae, 0x524d,
331 0x5584, 0x6f38, 0x7136, 0x5168, 0x7985, 0x7e55, 0x81b3, 0x7cce,
332 0x564c, 0x5851, 0x5ca8, 0x63aa, 0x66fe, 0x66fd, 0x695a, 0x72d9,
333 0x758f, 0x758e, 0x790e, 0x7956, 0x79df, 0x7c97, 0x7d20, 0x7d44,
334 0x8607, 0x8a34, 0x963b, 0x9061, 0x9f20, 0x50e7, 0x5275, 0x53cc,
335 0x53e2, 0x5009, 0x55aa, 0x58ee, 0x594f, 0x723d, 0x5b8b, 0x5c64,
336 0x531d, 0x60e3, 0x60f3, 0x635c, 0x6383, 0x633f, 0x63bb, 0x64cd,
337 0x65e9, 0x66f9, 0x5de3, 0x69cd, 0x69fd, 0x6f15, 0x71e5, 0x4e89,
338 0x75e9, 0x76f8, 0x7a93, 0x7cdf, 0x7dcf, 0x7d9c, 0x8061, 0x8349,
339 0x8358, 0x846c, 0x84bc, 0x85fb, 0x88c5, 0x8d70, 0x9001, 0x906d,
340 0x9397, 0x971c, 0x9a12, 0x50cf, 0x5897, 0x618e,
341 /* 0x42 */
342 0x81d3, 0x8535, 0x8d08, 0x9020, 0x4fc3, 0x5074, 0x5247, 0x5373,
343 0x606f, 0x6349, 0x675f, 0x6e2c, 0x8db3, 0x901f, 0x4fd7, 0x5c5e,
344 0x8cca, 0x65cf, 0x7d9a, 0x5352, 0x8896, 0x5176, 0x63c3, 0x5b58,
345 0x5b6b, 0x5c0a, 0x640d, 0x6751, 0x905c, 0x4ed6, 0x591a, 0x592a,
346 0x6c70, 0x8a51, 0x553e, 0x5815, 0x59a5, 0x60f0, 0x6253, 0x67c1,
347 0x8235, 0x6955, 0x9640, 0x99c4, 0x9a28, 0x4f53, 0x5806, 0x5bfe,
348 0x8010, 0x5cb1, 0x5e2f, 0x5f85, 0x6020, 0x614b, 0x6234, 0x66ff,
349 0x6cf0, 0x6ede, 0x80ce, 0x817f, 0x82d4, 0x888b, 0x8cb8, 0x9000,
350 0x902e, 0x968a, 0x9edb, 0x9bdb, 0x4ee3, 0x53f0, 0x5927, 0x7b2c,
351 0x918d, 0x984c, 0x9df9, 0x6edd, 0x7027, 0x5353, 0x5544, 0x5b85,
352 0x6258, 0x629e, 0x62d3, 0x6ca2, 0x6fef, 0x7422, 0x8a17, 0x9438,
353 0x6fc1, 0x8afe, 0x8338, 0x51e7, 0x86f8, 0x53ea,
354 /* 0x43 */
355 0x53e9, 0x4f46, 0x9054, 0x8fb0, 0x596a, 0x8131, 0x5dfd, 0x7aea,
356 0x8fbf, 0x68da, 0x8c37, 0x72f8, 0x9c48, 0x6a3d, 0x8ab0, 0x4e39,
357 0x5358, 0x5606, 0x5766, 0x62c5, 0x63a2, 0x65e6, 0x6b4e, 0x6de1,
358 0x6e5b, 0x70ad, 0x77ed, 0x7aef, 0x7baa, 0x7dbb, 0x803d, 0x80c6,
359 0x86cb, 0x8a95, 0x935b, 0x56e3, 0x58c7, 0x5f3e, 0x65ad, 0x6696,
360 0x6a80, 0x6bb5, 0x7537, 0x8ac7, 0x5024, 0x77e5, 0x5730, 0x5f1b,
361 0x6065, 0x667a, 0x6c60, 0x75f4, 0x7a1a, 0x7f6e, 0x81f4, 0x8718,
362 0x9045, 0x99b3, 0x7bc9, 0x755c, 0x7af9, 0x7b51, 0x84c4, 0x9010,
363 0x79e9, 0x7a92, 0x8336, 0x5ae1, 0x7740, 0x4e2d, 0x4ef2, 0x5b99,
364 0x5fe0, 0x62bd, 0x663c, 0x67f1, 0x6ce8, 0x866b, 0x8877, 0x8a3b,
365 0x914e, 0x92f3, 0x99d0, 0x6a17, 0x7026, 0x732a, 0x82e7, 0x8457,
366 0x8ca1, 0x4e01, 0x5146, 0x51cb, 0x558b, 0x5bf5,
367 /* 0x44 */
368 0x5e16, 0x5e33, 0x5e81, 0x5f14, 0x5f35, 0x5f6b, 0x5fb4, 0x61f2,
369 0x6311, 0x66a2, 0x671d, 0x6f6e, 0x7252, 0x753a, 0x773a, 0x8074,
370 0x8139, 0x8178, 0x8776, 0x8abf, 0x8adc, 0x8d85, 0x8df3, 0x929a,
371 0x9577, 0x9802, 0x9ce5, 0x52c5, 0x6357, 0x76f4, 0x6715, 0x6c88,
372 0x73cd, 0x8cc3, 0x93ae, 0x9673, 0x6d25, 0x589c, 0x690e, 0x69cc,
373 0x8ffd, 0x939a, 0x75db, 0x901a, 0x585a, 0x6802, 0x63b4, 0x69fb,
374 0x4f43, 0x6f2c, 0x67d8, 0x8fbb, 0x8526, 0x7db4, 0x9354, 0x693f,
375 0x6f70, 0x576a, 0x58f7, 0x5b2c, 0x7d2c, 0x722a, 0x540a, 0x91e3,
376 0x9db4, 0x4ead, 0x4f4e, 0x505c, 0x5075, 0x5243, 0x8c9e, 0x5448,
377 0x5824, 0x5b9a, 0x5e1d, 0x5e95, 0x5ead, 0x5ef7, 0x5f1f, 0x608c,
378 0x62b5, 0x633a, 0x63d0, 0x68af, 0x6c40, 0x7887, 0x798e, 0x7a0b,
379 0x7de0, 0x8247, 0x8a02, 0x8ae6, 0x8e44, 0x9013,
380 /* 0x45 */
381 0x90b8, 0x912d, 0x91d8, 0x9f0e, 0x6ce5, 0x6458, 0x64e2, 0x6575,
382 0x6ef4, 0x7684, 0x7b1b, 0x9069, 0x93d1, 0x6eba, 0x54f2, 0x5fb9,
383 0x64a4, 0x8fd4, 0x8fed, 0x9244, 0x5178, 0x586b, 0x5929, 0x5c55,
384 0x5e97, 0x6dfb, 0x7e8f, 0x751c, 0x8cbc, 0x8ee2, 0x985b, 0x70b9,
385 0x4f1d, 0x6bbf, 0x6fb1, 0x7530, 0x96fb, 0x514e, 0x5410, 0x5835,
386 0x5857, 0x59ac, 0x5c60, 0x5f92, 0x6597, 0x675c, 0x6e21, 0x767b,
387 0x83df, 0x8ced, 0x9014, 0x90fd, 0x934d, 0x7825, 0x783a, 0x52aa,
388 0x5ea6, 0x571f, 0x5974, 0x6012, 0x5012, 0x515a, 0x51ac, 0x51cd,
389 0x5200, 0x5510, 0x5854, 0x5858, 0x5957, 0x5b95, 0x5cf6, 0x5d8b,
390 0x60bc, 0x6295, 0x642d, 0x6771, 0x6843, 0x68bc, 0x68df, 0x76d7,
391 0x6dd8, 0x6e6f, 0x6d9b, 0x706f, 0x71c8, 0x5f53, 0x75d8, 0x7977,
392 0x7b49, 0x7b54, 0x7b52, 0x7cd6, 0x7d71, 0x5230,
393 /* 0x46 */
```

```
394 0x8463, 0x8569, 0x85e4, 0x8a0e, 0x8b04, 0x8c46, 0x8e0f, 0x9003,
395 0x900f, 0x9419, 0x9676, 0x982d, 0x9a30, 0x95d8, 0x50cd, 0x52d5,
396 0x540c, 0x5802, 0x5c0e, 0x61a7, 0x649e, 0x6d1e, 0x77b3, 0x7ae5,
397 0x80f4, 0x8404, 0x9053, 0x9285, 0x5ce0, 0x9d07, 0x533f, 0x5f97,
398 0x5fb3, 0x6d9c, 0x7279, 0x7763, 0x79bf, 0x7be4, 0x6bd2, 0x72ec,
399 0x8aad, 0x6803, 0x6a61, 0x51f8, 0x7a81, 0x6934, 0x5c4a, 0x9cf6,
400 0x82eb, 0x5bc5, 0x9149, 0x701e, 0x5678, 0x5c6f, 0x60c7, 0x6566,
401 0x6c8c, 0x8c5a, 0x9041, 0x9813, 0x5451, 0x66c7, 0x920d, 0x5948,
402 0x90a3, 0x5185, 0x4e4d, 0x51ea, 0x8599, 0x8b0e, 0x7058, 0x637a,
403 0x934b, 0x6962, 0x99b4, 0x7e04, 0x7577, 0x5357, 0x6960, 0x8edf,
404 0x96e3, 0x6c5d, 0x4e8c, 0x5c3c, 0x5f10, 0x8fe9, 0x5302, 0x8cd1,
405 0x8089, 0x8679, 0x5eff, 0x65e5, 0x4e73, 0x5165,
406 /* 0x47 */
407 0x5982, 0x5c3f, 0x97ee, 0x4efb, 0x598a, 0x5fcd, 0x8a8d, 0x6fe1,
408 0x79b0, 0x7962, 0x7962, 0x5be7, 0x8471, 0x732b, 0x71b1, 0x5e74, 0x5ff5,
409 0x637b, 0x649a, 0x71c3, 0x7c98, 0x4e43, 0x5efc, 0x4e4b, 0x57dc,
410 0x56a2, 0x60a9, 0x6fc3, 0x7d0d, 0x80fd, 0x8133, 0x81bf, 0x8fb2,
411 0x8997, 0x86a4, 0x5df4, 0x628a, 0x64ad, 0x8987, 0x6777, 0x6ce2,
412 0x6d3e, 0x7436, 0x7834, 0x5a46, 0x7f75, 0x82ad, 0x99ac, 0x4ff3,
413 0x5ec3, 0x62dd, 0x6392, 0x6557, 0x676f, 0x76c3, 0x724c, 0x80cc,
414 0x80ba, 0x8f29, 0x914d, 0x500d, 0x57f9, 0x5a92, 0x6885, 0x6973,
415 0x7164, 0x72fd, 0x8cb7, 0x58f2, 0x8ce0, 0x966a, 0x9019, 0x877f,
416 0x79e4, 0x77e7, 0x8429, 0x4f2f, 0x5265, 0x535a, 0x62cd, 0x67cf,
417 0x6cca, 0x767d, 0x7b94, 0x7c95, 0x8236, 0x8584, 0x8feb, 0x66dd,
418 0x6f20, 0x7206, 0x7e1b, 0x83ab, 0x99c1, 0x9ea6,
419 /* 0x48 */
420 0x51fd, 0x7bb1, 0x7872, 0x7bb8, 0x8087, 0x7b48, 0x6ae8, 0x5e61,
421 0x808c, 0x7551, 0x7560, 0x516b, 0x9262, 0x6e8c, 0x767a, 0x9197,
422 0x9aea, 0x4f10, 0x7f70, 0x629c, 0x7b4f, 0x95a5, 0x9ce9, 0x567a,
423 0x5859, 0x86e4, 0x96bc, 0x4f34, 0x5224, 0x534a, 0x53cd, 0x53db,
424 0x5e06, 0x642c, 0x6591, 0x677f, 0x6c3e, 0x6c4e, 0x7248, 0x72af,
425 0x73ed, 0x7554, 0x7e41, 0x822c, 0x85e9, 0x8ca9, 0x7bc4, 0x91c6,
426 0x7169, 0x9812, 0x98ef, 0x633d, 0x6669, 0x756a, 0x76e4, 0x78d0,
427 0x8543, 0x86ee, 0x532a, 0x5351, 0x5426, 0x5983, 0x5e87, 0x5f7c,
428 0x60b2, 0x6249, 0x6279, 0x62ab, 0x6590, 0x6bd4, 0x6ccc, 0x75b2,
429 0x76ae, 0x7891, 0x79d8, 0x7dc8, 0x7f77, 0x80a5, 0x88ab, 0x8ab9,
430 0x8cbb, 0x907f, 0x975e, 0x98db, 0x6a0b, 0x7c38, 0x5099, 0x5c3e,
431 0x5fae, 0x6787, 0x6bd8, 0x7435, 0x7709, 0x7f8e,
432 /* 0x49 */
433 0x9f3b, 0x67ca, 0x7a17, 0x5339, 0x758b, 0x9aed, 0x5f66, 0x819d,
434 0x83f1, 0x8098, 0x5f3c, 0x5fc5, 0x7562, 0x7b46, 0x903c, 0x6867,
435 0x59eb, 0x5a9b, 0x7d10, 0x767e, 0x8b2c, 0x4ff5, 0x5f6a, 0x6a19,
436 0x6c37, 0x6f02, 0x74e2, 0x7968, 0x8868, 0x8a55, 0x8c79, 0x5edf,
437 0x63cf, 0x75c5, 0x79d2, 0x82d7, 0x9328, 0x92f2, 0x849c, 0x86ed,
438 0x9c2d, 0x54c1, 0x5f6c, 0x658c, 0x6d5c, 0x7015, 0x8ca7, 0x8cd3,
439 0x983b, 0x654f, 0x74f6, 0x4e0d, 0x4ed8, 0x57e0, 0x592b, 0x5a66,
440 0x5bcc, 0x51a8, 0x5e03, 0x5e9c, 0x6016, 0x6276, 0x6577, 0x65a7,
441 0x666e, 0x6d6e, 0x7236, 0x7b26, 0x8150, 0x819a, 0x8299, 0x8b5c,
442 0x8ca0, 0x8ce6, 0x8d74, 0x961c, 0x9644, 0x4fae, 0x64ab, 0x6b66,
443 0x821e, 0x8461, 0x856a, 0x90e8, 0x5c01, 0x6953, 0x98a8, 0x847a,
444 0x8557, 0x4f0f, 0x526f, 0x5fa9, 0x5e45, 0x670d,
445 /* 0x4a */
446 0x798f, 0x8179, 0x8907, 0x8986, 0x6df5, 0x5f17, 0x6255, 0x6cb8,
447 0x4ecf, 0x7269, 0x9b92, 0x5206, 0x543b, 0x5674, 0x58b3, 0x61a4,
448 0x626e, 0x711a, 0x596e, 0x7c89, 0x7cde, 0x7d1b, 0x96f0, 0x6587,
449 0x805e, 0x4e19, 0x4f75, 0x5175, 0x5840, 0x5e63, 0x5e73, 0x5f0a,
450 0x67c4, 0x4e26, 0x853d, 0x9589, 0x965b, 0x7c73, 0x9801, 0x50fb,
451 0x58c1, 0x7656, 0x78a7, 0x5225, 0x77a5, 0x8511, 0x7b86, 0x504f,
452 0x5909, 0x7247, 0x7bc7, 0x7de8, 0x8fba, 0x8fd4, 0x904d, 0x4fbf,
453 0x52c9, 0x5a29, 0x5f01, 0x97ad, 0x4fdd, 0x8217, 0x92ea, 0x5703,
454 0x6355, 0x6b69, 0x752b, 0x88dc, 0x8f14, 0x7a42, 0x52df, 0x5893,
455 0x6155, 0x620a, 0x66ae, 0x6bcd, 0x7c3f, 0x83e9, 0x5023, 0x4ff8,
456 0x5305, 0x5446, 0x5831, 0x5949, 0x5b9d, 0x5cf0, 0x5cef, 0x5d29,
457 0x5e96, 0x62b1, 0x6367, 0x653e, 0x65b9, 0x670b,
458 /* 0x4b */
459 0x6cd5, 0x6ce1, 0x70f9, 0x7832, 0x7e2b, 0x80de, 0x82b3, 0x840c,
460 0x84ec, 0x8702, 0x8912, 0x8a2a, 0x8c4a, 0x90a6, 0x92d2, 0x98fd,
461 0x9cf3, 0x9d6c, 0x4e4f, 0x4ea1, 0x508d, 0x5256, 0x574a, 0x59a8,
462 0x5e3d, 0x5fd8, 0x5fd9, 0x623f, 0x66b4, 0x671b, 0x67d0, 0x68d2,
463 0x5192, 0x7d21, 0x80aa, 0x81a8, 0x8b00, 0x8c8c, 0x8cbf, 0x927e,
464 0x9632, 0x5420, 0x982c, 0x5317, 0x50d5, 0x535c, 0x58a8, 0x64b2,
465 0x6734, 0x7267, 0x7766, 0x7a46, 0x91e6, 0x52c3, 0x6ca1, 0x6b86,
466 0x5800, 0x5e4c, 0x5954, 0x672c, 0x7ffb, 0x51e1, 0x76c6, 0x6469,
467 0x78e8, 0x9b54, 0x9ebb, 0x57cb, 0x59b9, 0x6627, 0x679a, 0x6bce,
468 0x54e9, 0x69d9, 0x5e55, 0x819c, 0x6795, 0x9baa, 0x67fe, 0x9c52,
469 0x685d, 0x4ea6, 0x4fe3, 0x53c8, 0x62b9, 0x672b, 0x6cab, 0x8fc4,
470 0x4fad, 0x7e6d, 0x9ebf, 0x4e07, 0x6162, 0x6e80,
471 /* 0x4c */
472 0x6f2b, 0x8513, 0x5473, 0x672a, 0x9b45, 0x5df3, 0x7b95, 0x5cac,
473 0x5bc6, 0x871c, 0x6e4a, 0x84d1, 0x7a14, 0x8108, 0x5999, 0x7c8d,
474 0x6c11, 0x7720, 0x52d9, 0x5922, 0x7121, 0x725f, 0x77db, 0x9727,
475 0x9d61, 0x690b, 0x5a7f, 0x5a18, 0x51a5, 0x540d, 0x547d, 0x660e,
476 0x76df, 0x8ff7, 0x9298, 0x9cf4, 0x59ea, 0x725d, 0x6ec5, 0x514d,
477 0x68c9, 0x7dbf, 0x7dec, 0x9762, 0x9eba, 0x6478, 0x6a21, 0x8302,
478 0x5984, 0x5b5f, 0x6bdb, 0x731b, 0x76f2, 0x7db2, 0x8017, 0x8499,
479 0x5132, 0x6728, 0x9ed9, 0x76ee, 0x6762, 0x52ff, 0x9905, 0x5c24,
480 0x623b, 0x7c7e, 0x8cb0, 0x554f, 0x60b6, 0x7d0b, 0x9580, 0x5301,
```

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481 0x4e5f, 0x51b6, 0x591c, 0x723a, 0x8036, 0x91ce, 0x5f25, 0x77e2,
482 0x5384, 0x5f79, 0x7d04, 0x85ac, 0x8a33, 0x8e8d, 0x9756, 0x67f3,
483 0x85ae, 0x9453, 0x6109, 0x6108, 0x6cb9, 0x7652,
484 /* 0x4d */
485 0x8aed, 0x8f38, 0x552f, 0x4f51, 0x512a, 0x52c7, 0x53cb, 0x5ba5,
486 0x5e7d, 0x60a0, 0x6182, 0x63d6, 0x6709, 0x67da, 0x6e67, 0x6d8c,
487 0x7336, 0x7337, 0x7531, 0x7950, 0x88d5, 0x8a98, 0x904a, 0x9091,
488 0x90f5, 0x96c4, 0x878d, 0x5915, 0x4e88, 0x4f59, 0x4e0e, 0x8a89,
489 0x8f3f, 0x9810, 0x50ad, 0x5e7c, 0x5996, 0x5bb9, 0x5eb8, 0x63da,
490 0x63fa, 0x64c1, 0x66dc, 0x694a, 0x69d8, 0x6d0b, 0x6eb6, 0x7194,
491 0x7528, 0x7aaf, 0x7f8a, 0x8000, 0x8449, 0x84c9, 0x8981, 0x8b21,
492 0x8e0a, 0x9065, 0x967d, 0x990a, 0x617e, 0x6291, 0x6b32, 0x6c83,
493 0x6d74, 0x7fcc, 0x7ffc, 0x6dc0, 0x7f85, 0x87ba, 0x88f8, 0x6765,
494 0x83b1, 0x983c, 0x96f7, 0x6d1b, 0x7d61, 0x843d, 0x916a, 0x4e71,
495 0x5375, 0x5d50, 0x6b04, 0x6feb, 0x85cd, 0x862d, 0x89a7, 0x5229,
496 0x540f, 0x5c65, 0x674e, 0x68a8, 0x7406, 0x7483,
497 /* 0x4e */
498 0x75e2, 0x88cf, 0x88e1, 0x91cc, 0x96e2, 0x9678, 0x5f8b, 0x7387,
499 0x7acb, 0x844e, 0x63a0, 0x7565, 0x5289, 0x6d41, 0x6e9c, 0x7409,
500 0x7559, 0x786b, 0x7c92, 0x9686, 0x7adc, 0x9f8d, 0x4fb6, 0x616e,
501 0x65c5, 0x865c, 0x4e86, 0x4eae, 0x50da, 0x4e21, 0x51cc, 0x5bee,
502 0x6599, 0x6881, 0x6dbc, 0x731f, 0x7642, 0x77ad, 0x7a1c, 0x7ce7,
503 0x826f, 0x8ad2, 0x907c, 0x91cf, 0x9675, 0x9818, 0x529b, 0x7dd1,
504 0x502b, 0x5398, 0x6797, 0x6dc9, 0x71d0, 0x7433, 0x81e8, 0x8f2a,
505 0x96a3, 0x9c57, 0x9e9f, 0x7460, 0x5841, 0x6d99, 0x7d2f, 0x985e,
506 0x4ee4, 0x4f36, 0x4f8b, 0x51b7, 0x52b1, 0x5dba, 0x601c, 0x73b2,
507 0x793c, 0x82d3, 0x9234, 0x96b7, 0x96f6, 0x970a, 0x9e97, 0x9f62,
508 0x66a6, 0x6b74, 0x5217, 0x52a3, 0x70c8, 0x88c2, 0x5ec9, 0x604b,
509 0x6190, 0x6f23, 0x7149, 0x7c3e, 0x7df4, 0x806f,
510 /* 0x4f */
511 0x84ee, 0x9023, 0x932c, 0x5442, 0x9b6f, 0x6ad3, 0x7089, 0x8cc2,
512 0x8def, 0x9732, 0x52b4, 0x5a41, 0x5eca, 0x5f04, 0x6717, 0x697c,
513 0x6994, 0x6d6a, 0x6f0f, 0x7262, 0x72fc, 0x7bed, 0x8001, 0x807e,
514 0x874b, 0x90ce, 0x516d, 0x9e93, 0x7984, 0x808b, 0x9332, 0x8ad6,
515 0x502d, 0x548c, 0x8a71, 0x6b6a, 0x8cc4, 0x8107, 0x60d1, 0x67a0,
516 0x9df2, 0x4e99, 0x4e98, 0x9c10, 0x8a6b, 0x85c1, 0x8568, 0x6900,
517 0x6e7e, 0x7897, 0x8155, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
518 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
519 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
520 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
521 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
522 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
523 /* 0x50 */
524 0x5f0c, 0x4e10, 0x4e15, 0x4e2a, 0x4e31, 0x4e36, 0x4e3c, 0x4e3f,
525 0x4e42, 0x4e56, 0x4e58, 0x4e82, 0x4e85, 0x8c6b, 0x4e8a, 0x8212,
526 0x5f0d, 0x4e8e, 0x4e9e, 0x4e9f, 0x4ea0, 0x4ea2, 0x4eb0, 0x4eb3,
527 0x4eb6, 0x4ece, 0x4ecd, 0x4ec4, 0x4ec6, 0x4ec2, 0x4ed7, 0x4ede,
528 0x4eed, 0x4edf, 0x4ef7, 0x4f09, 0x4f5a, 0x4f30, 0x4f5b, 0x4f5d,
529 0x4f57, 0x4f47, 0x4f76, 0x4f88, 0x4f8f, 0x4f98, 0x4f7b, 0x4f69,
530 0x4f70, 0x4f91, 0x4f6f, 0x4f86, 0x4f96, 0x5118, 0x4fd4, 0x4fdf,
531 0x4fce, 0x4fdb, 0x4fdb, 0x4fd1, 0x4fda, 0x4fd0, 0x4fe4, 0x4fe5,
532 0x501a, 0x5028, 0x5014, 0x502a, 0x5025, 0x5005, 0x4f1c, 0x4ff6,
533 0x5021, 0x5029, 0x502c, 0x4ffe, 0x4fef, 0x5011, 0x5006, 0x5043,
534 0x5047, 0x6703, 0x5055, 0x5050, 0x5048, 0x505a, 0x5056, 0x506c,
535 0x5078, 0x5080, 0x509a, 0x5085, 0x50b4, 0x50b2,
536 /* 0x51 */
537 0x50c9, 0x50ca, 0x50b3, 0x50c2, 0x50d6, 0x50de, 0x50e5, 0x50ed,
538 0x50e3, 0x50ee, 0x50f9, 0x50f5, 0x5109, 0x5101, 0x5102, 0x5116,
539 0x5115, 0x5114, 0x511a, 0x5121, 0x513a, 0x5137, 0x513c, 0x513b,
540 0x513f, 0x5140, 0x5152, 0x514c, 0x5154, 0x5162, 0x7af8, 0x5169,
541 0x516a, 0x516e, 0x5180, 0x5182, 0x56d8, 0x518c, 0x5189, 0x518f,
542 0x5191, 0x5193, 0x5195, 0x5196, 0x51a4, 0x51a6, 0x51a2, 0x51a9,
543 0x51aa, 0x51ab, 0x51b3, 0x51b1, 0x51b2, 0x51b0, 0x51b5, 0x51bd,
544 0x51c5, 0x51c9, 0x51db, 0x51e0, 0x8655, 0x51e9, 0x51ed, 0x51f0,
545 0x51f5, 0x51fe, 0x5204, 0x520b, 0x5214, 0x520e, 0x5227, 0x522a,
546 0x522e, 0x5233, 0x5239, 0x524f, 0x5244, 0x524b, 0x524c, 0x525e,
547 0x5254, 0x526a, 0x5274, 0x5269, 0x5273, 0x527f, 0x527d, 0x528d,
548 0x5294, 0x5292, 0x5271, 0x5288, 0x5291, 0x8fa8,
549 /* 0x52 */
550 0x8fa7, 0x52ac, 0x52ad, 0x52bc, 0x52b5, 0x52c1, 0x52cd, 0x52d7,
551 0x52de, 0x52e3, 0x52e6, 0x98ed, 0x52e0, 0x52f3, 0x52f5, 0x52f8,
552 0x52f9, 0x5306, 0x5308, 0x7538, 0x530d, 0x5310, 0x530f, 0x5315,
553 0x531a, 0x5323, 0x532f, 0x5331, 0x5333, 0x5338, 0x5340, 0x5346,
554 0x5345, 0x4e17, 0x5349, 0x534d, 0x51d6, 0x535e, 0x5369, 0x536e,
555 0x5918, 0x537b, 0x5377, 0x5382, 0x5396, 0x53a0, 0x53a6, 0x53a5,
556 0x53ae, 0x53b0, 0x53b6, 0x53c3, 0x7c12, 0x96d9, 0x53df, 0x66fc,
557 0x71ee, 0x53ee, 0x53e8, 0x53ed, 0x53fa, 0x5401, 0x543d, 0x5440,
558 0x542c, 0x542d, 0x543c, 0x542e, 0x5436, 0x5429, 0x541d, 0x544e,
559 0x548f, 0x5475, 0x548e, 0x545f, 0x5471, 0x5477, 0x5470, 0x5492,
560 0x547b, 0x5480, 0x5476, 0x5484, 0x5490, 0x5486, 0x54c7, 0x54a2,
561 0x54b8, 0x54a5, 0x54ac, 0x54c4, 0x54c8, 0x54a8,
562 /* 0x53 */
563 0x54ab, 0x54c2, 0x54a4, 0x54be, 0x54bc, 0x54d8, 0x54e5, 0x54e6,
564 0x550f, 0x5514, 0x54fd, 0x54ee, 0x54ed, 0x54fa, 0x54e2, 0x5539,
565 0x5540, 0x5563, 0x554c, 0x552e, 0x555c, 0x5545, 0x5556, 0x5557,
566 0x5538, 0x5533, 0x555d, 0x5599, 0x5580, 0x54af, 0x558a, 0x559f,
567 0x557b, 0x557e, 0x5598, 0x559e, 0x55ae, 0x557c, 0x5583, 0x55a9,
```

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568 0x5587, 0x55a8, 0x55da, 0x55c5, 0x55df, 0x55c4, 0x55dc, 0x55e4,
569 0x55d4, 0x5614, 0x55f7, 0x5616, 0x55fe, 0x55fd, 0x561b, 0x55f9,
570 0x564e, 0x5650, 0x71df, 0x5634, 0x5636, 0x5632, 0x5638, 0x566b,
571 0x5664, 0x562f, 0x566c, 0x566a, 0x5686, 0x5680, 0x568a, 0x56a0,
572 0x5694, 0x568f, 0x56a5, 0x56ae, 0x56b6, 0x56b4, 0x56c2, 0x56bc,
573 0x56c1, 0x56c3, 0x56c0, 0x56c8, 0x56ce, 0x56d1, 0x56d3, 0x56d7,
574 0x56ee, 0x56f9, 0x5700, 0x56ff, 0x5704, 0x5709,
575 /* 0x54 */
576 0x5708, 0x570b, 0x570d, 0x5713, 0x5718, 0x5716, 0x55c7, 0x571c,
577 0x5726, 0x5737, 0x5738, 0x574e, 0x573b, 0x5740, 0x574f, 0x5769,
578 0x57c0, 0x5788, 0x5761, 0x577f, 0x5789, 0x5793, 0x57a0, 0x57b3,
579 0x57a4, 0x57aa, 0x57b0, 0x57c3, 0x57c6, 0x57d4, 0x57d2, 0x57d3,
580 0x580a, 0x57d6, 0x57e3, 0x580b, 0x5819, 0x581d, 0x5872, 0x5821,
581 0x5862, 0x584b, 0x5870, 0x6bc0, 0x5852, 0x583d, 0x5879, 0x5885,
582 0x58b9, 0x589f, 0x58ab, 0x58ba, 0x58de, 0x58bb, 0x58b8, 0x58ae,
583 0x58c5, 0x58d3, 0x58d1, 0x58d7, 0x58d9, 0x58d8, 0x58e5, 0x58dc,
584 0x58e4, 0x58df, 0x58ef, 0x58fa, 0x58f9, 0x58fb, 0x58fc, 0x58fd,
585 0x5902, 0x590a, 0x5910, 0x591b, 0x68a6, 0x5925, 0x592c, 0x592d,
586 0x5932, 0x5938, 0x593e, 0x7ad2, 0x5955, 0x5950, 0x594e, 0x595a,
587 0x5958, 0x5962, 0x5960, 0x5967, 0x596c, 0x5969,
588 /* 0x55 */
589 0x5978, 0x5981, 0x599d, 0x4f5e, 0x4fab, 0x59a3, 0x59b2, 0x59c6,
590 0x59e8, 0x59dc, 0x598d, 0x59d9, 0x59da, 0x5a25, 0x5a1f, 0x5a11,
591 0x5a1c, 0x5a09, 0x5a1a, 0x5a40, 0x5a6c, 0x5a49, 0x5a35, 0x5a36,
592 0x5a62, 0x5a6a, 0x5a9a, 0x5abc, 0x5abe, 0x5acb, 0x5ac2, 0x5abd,
593 0x5ae3, 0x5ad7, 0x5ae6, 0x5ae9, 0x5ad6, 0x5afa, 0x5afb, 0x5b0c,
594 0x5b0b, 0x5b16, 0x5b32, 0x5ad0, 0x5b2a, 0x5b36, 0x5b3e, 0x5b43,
595 0x5b45, 0x5b40, 0x5b51, 0x5b55, 0x5b5a, 0x5b5b, 0x5b65, 0x5b69,
596 0x5b70, 0x5b73, 0x5b75, 0x5b78, 0x6588, 0x5b7a, 0x5b80, 0x5b83,
597 0x5ba6, 0x5bb8, 0x5bcb, 0x5bc3, 0x5bc7, 0x5bc9, 0x5bd4, 0x5bd0, 0x5be4,
598 0x5be6, 0x5be2, 0x5bde, 0x5be5, 0x5beb, 0x5bf0, 0x5bf6, 0x5bf3,
599 0x5c05, 0x5c07, 0x5c08, 0x5c0d, 0x5c13, 0x5c20, 0x5c22, 0x5c28,
600 0x5c38, 0x5c39, 0x5c41, 0x5c46, 0x5c4e, 0x5c53,
601 /* 0x56 */
602 0x5c50, 0x5c4f, 0x5b71, 0x5c6c, 0x5c6e, 0x4e62, 0x5c76, 0x5c79,
603 0x5c8c, 0x5c91, 0x5c94, 0x599b, 0x5cab, 0x5cbb, 0x5cb6, 0x5cbc,
604 0x5cb7, 0x5cc5, 0x5cbe, 0x5cc7, 0x5cd9, 0x5ce9, 0x5cfd, 0x5cfa,
605 0x5ced, 0x5d8c, 0x5cea, 0x5d0b, 0x5d15, 0x5d17, 0x5d5c, 0x5d1f,
606 0x5d1b, 0x5d11, 0x5d14, 0x5d22, 0x5d1a, 0x5d19, 0x5d18, 0x5d4c,
607 0x5d52, 0x5d4e, 0x5d4b, 0x5d6c, 0x5d73, 0x5d76, 0x5d87, 0x5d84,
608 0x5d82, 0x5da2, 0x5d9d, 0x5dac, 0x5dae, 0x5dbd, 0x5d90, 0x5db7,
609 0x5dbc, 0x5dc9, 0x5dcd, 0x5dd3, 0x5dd2, 0x5dd6, 0x5ddb, 0x5deb,
610 0x5df2, 0x5df5, 0x5e0b, 0x5e1a, 0x5e19, 0x5e11, 0x5e1b, 0x5e36,
611 0x5e37, 0x5e44, 0x5e43, 0x5e40, 0x5e4e, 0x5e57, 0x5e54, 0x5e5f,
612 0x5e62, 0x5e64, 0x5e47, 0x5e75, 0x5e76, 0x5e7a, 0x9ebc, 0x5e7f,
613 0x5ea0, 0x5ec1, 0x5ec2, 0x5ec8, 0x5ed0, 0x5ecf,
614 /* 0x57 */
615 0x5ed6, 0x5ee3, 0x5edd, 0x5eda, 0x5edb, 0x5ee2, 0x5ee1, 0x5ee8,
616 0x5ee9, 0x5eec, 0x5ef1, 0x5ef3, 0x5ef0, 0x5ef4, 0x5ef8, 0x5efe,
617 0x5f03, 0x5f09, 0x5f5d, 0x5f5c, 0x5f0b, 0x5f11, 0x5f16, 0x5f29,
618 0x5f2d, 0x5f38, 0x5f41, 0x5f48, 0x5f4c, 0x5f4e, 0x5f2f, 0x5f51,
619 0x5f56, 0x5f57, 0x5f59, 0x5f61, 0x5f6d, 0x5f73, 0x5f77, 0x5f83,
620 0x5f82, 0x5f7f, 0x5f8a, 0x5f88, 0x5f91, 0x5f87, 0x5f9e, 0x5f99,
621 0x5f98, 0x5fa0, 0x5fa8, 0x5fad, 0x5fbc, 0x5fd6, 0x5ffb, 0x5fe4,
622 0x5ff8, 0x5ff1, 0x5fdd, 0x60b3, 0x5fff, 0x6021, 0x6060, 0x6019,
623 0x6010, 0x6029, 0x600e, 0x6031, 0x601b, 0x6015, 0x602b, 0x6026,
624 0x600f, 0x603a, 0x605a, 0x6041, 0x606a, 0x6077, 0x605f, 0x604a,
625 0x6046, 0x604d, 0x6063, 0x6043, 0x6064, 0x6042, 0x606c, 0x606b,
626 0x6059, 0x6081, 0x608d, 0x60e7, 0x6083, 0x609a,
627 /* 0x58 */
628 0x6084, 0x609b, 0x6096, 0x6097, 0x6092, 0x60a7, 0x608b, 0x60e1,
629 0x60b8, 0x60e0, 0x60d3, 0x60b4, 0x5ff0, 0x60bd, 0x60c6, 0x60b5,
630 0x60d8, 0x614d, 0x6115, 0x6106, 0x60f6, 0x60f7, 0x6100, 0x60f4,
631 0x60fa, 0x6103, 0x6121, 0x60fb, 0x60f1, 0x610d, 0x610e, 0x6147,
632 0x613e, 0x6128, 0x6127, 0x614a, 0x613f, 0x613c, 0x612c, 0x6134,
633 0x613d, 0x6142, 0x6144, 0x6173, 0x6177, 0x6158, 0x6159, 0x615a,
634 0x616b, 0x6174, 0x616f, 0x6165, 0x6171, 0x615f, 0x615d, 0x6153,
635 0x6175, 0x6199, 0x6196, 0x6187, 0x61ac, 0x6194, 0x619a, 0x618a,
636 0x6191, 0x61ab, 0x61ae, 0x61cc, 0x61ca, 0x61c9, 0x61f7, 0x61c8,
637 0x61c3, 0x61c6, 0x61ba, 0x61cb, 0x7f79, 0x61cd, 0x61e6, 0x61e3,
638 0x61f6, 0x61fa, 0x61f4, 0x61ff, 0x61fd, 0x61fc, 0x61fe, 0x6200,
639 0x6208, 0x6209, 0x620d, 0x620c, 0x6214, 0x621b,
640 /* 0x59 */
641 0x621e, 0x6221, 0x622a, 0x622e, 0x6230, 0x6232, 0x6233, 0x6241,
642 0x624e, 0x625e, 0x6263, 0x625b, 0x6260, 0x6268, 0x627c, 0x6282,
643 0x6289, 0x627e, 0x6292, 0x6293, 0x6296, 0x62d4, 0x6283, 0x6294,
644 0x62d7, 0x62d1, 0x62bb, 0x62cf, 0x62ff, 0x62c6, 0x64d4, 0x62c8,
645 0x62dc, 0x62cc, 0x62ca, 0x62c2, 0x62c7, 0x629b, 0x62c9, 0x630c,
646 0x62ee, 0x62f1, 0x6327, 0x6302, 0x6308, 0x62ef, 0x62f5, 0x6350,
647 0x633e, 0x634d, 0x641c, 0x634f, 0x6396, 0x638e, 0x6380, 0x63ab,
648 0x6376, 0x63a3, 0x638f, 0x6389, 0x639f, 0x63b5, 0x636b, 0x6369,
649 0x63be, 0x63e9, 0x63c0, 0x63c6, 0x63e3, 0x63c9, 0x63d2, 0x63f6,
650 0x63c4, 0x6416, 0x6434, 0x6406, 0x6413, 0x6426, 0x6436, 0x651d,
651 0x6417, 0x6428, 0x640f, 0x6467, 0x646f, 0x6476, 0x644e, 0x652a,
652 0x6495, 0x6493, 0x64a5, 0x64a9, 0x6488, 0x64bc,
653 /* 0x5a */
654 0x64da, 0x64d2, 0x64c5, 0x64c7, 0x64bb, 0x64d8, 0x64c2, 0x64f1,
```

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655 0x64e7, 0x8209, 0x64e0, 0x64e1, 0x62ac, 0x64e3, 0x64ef, 0x652c,
656 0x64f6, 0x64f4, 0x64f2, 0x64fa, 0x6500, 0x64fd, 0x6518, 0x651c,
657 0x6505, 0x6524, 0x6523, 0x652b, 0x6534, 0x6535, 0x6537, 0x6536,
658 0x6538, 0x754b, 0x6548, 0x6556, 0x6555, 0x654d, 0x6558, 0x655e,
659 0x655d, 0x6572, 0x6578, 0x6582, 0x6583, 0x8b8a, 0x659b, 0x659f,
660 0x65ab, 0x65b7, 0x65c3, 0x65c6, 0x65c1, 0x65c4, 0x65cc, 0x65d2,
661 0x65db, 0x65d9, 0x65e0, 0x65e1, 0x65f1, 0x6772, 0x660a, 0x6603,
662 0x65fb, 0x6773, 0x6635, 0x6636, 0x6634, 0x661c, 0x664f, 0x6644,
663 0x6649, 0x6641, 0x665e, 0x665d, 0x6664, 0x6667, 0x6668, 0x665f,
664 0x6662, 0x6670, 0x6683, 0x6688, 0x668e, 0x6689, 0x6684, 0x6698,
665 0x669d, 0x66c1, 0x66b9, 0x66c9, 0x66be, 0x66bc,
666 /* 0x5b */
667 0x66c4, 0x66b8, 0x66d6, 0x66da, 0x66e0, 0x663f, 0x66e6, 0x66e9,
668 0x66f0, 0x66f5, 0x66f7, 0x670f, 0x6716, 0x671e, 0x6726, 0x6727,
669 0x9738, 0x672e, 0x673f, 0x6736, 0x6741, 0x6738, 0x6737, 0x6746,
670 0x675e, 0x6760, 0x6759, 0x6763, 0x6764, 0x6789, 0x6770, 0x67a9,
671 0x677c, 0x676a, 0x678c, 0x678b, 0x67a6, 0x67a1, 0x6785, 0x67b7,
672 0x67ef, 0x67b4, 0x67ec, 0x67b3, 0x67e9, 0x67b8, 0x67e4, 0x67de,
673 0x67dd, 0x67e2, 0x67ee, 0x67b9, 0x67ce, 0x67c6, 0x67e7, 0x6a9c,
674 0x681e, 0x6846, 0x6829, 0x6840, 0x684d, 0x6832, 0x684e, 0x68b3,
675 0x682b, 0x6859, 0x6863, 0x6877, 0x687f, 0x689f, 0x688f, 0x68ad,
676 0x6894, 0x689d, 0x689b, 0x6883, 0x6aae, 0x68b9, 0x6874, 0x68b5,
677 0x68a0, 0x68ba, 0x690f, 0x688d, 0x687e, 0x6901, 0x68ca, 0x6908,
678 0x68d8, 0x6922, 0x6926, 0x68e1, 0x690c, 0x68cd,
679 /* 0x5c */
680 0x68d4, 0x68e7, 0x68d5, 0x6936, 0x6912, 0x6904, 0x68d7, 0x68e3,
681 0x6925, 0x68f9, 0x68e0, 0x68ef, 0x6928, 0x692a, 0x691a, 0x6923,
682 0x6921, 0x68c6, 0x6979, 0x6977, 0x695c, 0x6978, 0x696b, 0x6954,
683 0x697e, 0x696e, 0x6939, 0x6974, 0x693d, 0x6959, 0x6930, 0x6961,
684 0x695e, 0x695d, 0x6981, 0x696a, 0x69b2, 0x69ae, 0x69d0, 0x69bf,
685 0x69c1, 0x69d3, 0x69be, 0x69ce, 0x5be8, 0x69ca, 0x69dd, 0x69bb,
686 0x69c3, 0x69a7, 0x6a2e, 0x6991, 0x69a0, 0x699c, 0x6995, 0x69b4,
687 0x69de, 0x69e8, 0x6a02, 0x6a1b, 0x69ff, 0x6b0a, 0x69f9, 0x69f2,
688 0x69e7, 0x6a05, 0x69b1, 0x6a1e, 0x69ed, 0x6a14, 0x69eb, 0x6a0a,
689 0x6a12, 0x6ac1, 0x6a23, 0x6a13, 0x6a44, 0x6a0c, 0x6a72, 0x6a36,
690 0x6a78, 0x6a47, 0x6a62, 0x6a59, 0x6a66, 0x6a48, 0x6a38, 0x6a22,
691 0x6a90, 0x6a8d, 0x6aa0, 0x6a84, 0x6aa2, 0x6aa3,
692 /* 0x5d */
693 0x6a97, 0x8617, 0x6abb, 0x6ac3, 0x6ac2, 0x6ab8, 0x6ab3, 0x6aac,
694 0x6ade, 0x6ad1, 0x6adf, 0x6aaa, 0x6ada, 0x6aea, 0x6afb, 0x6b05,
695 0x8616, 0x6afa, 0x6b12, 0x6b16, 0x9b31, 0x6b1f, 0x6b38, 0x6b37,
696 0x76dc, 0x6b39, 0x98ee, 0x6b47, 0x6b43, 0x6b49, 0x6b50, 0x6b59,
697 0x6b54, 0x6b5b, 0x6b5f, 0x6b61, 0x6b78, 0x6b79, 0x6b7f, 0x6b80,
698 0x6b84, 0x6b83, 0x6b8d, 0x6b98, 0x6b95, 0x6b9e, 0x6ba4, 0x6baa,
699 0x6bab, 0x6baf, 0x6bb2, 0x6bb1, 0x6bb3, 0x6bb7, 0x6bbc, 0x6bc6,
700 0x6bcb, 0x6bd3, 0x6bdf, 0x6bec, 0x6beb, 0x6bf3, 0x6bef, 0x9ebe,
701 0x6c08, 0x6c13, 0x6c14, 0x6c1b, 0x6c24, 0x6c23, 0x6c5e, 0x6c55,
702 0x6c62, 0x6c6a, 0x6c82, 0x6c8d, 0x6c9a, 0x6c81, 0x6c9b, 0x6c7e,
703 0x6c68, 0x6c73, 0x6c92, 0x6c90, 0x6cc4, 0x6cf1, 0x6cd3, 0x6cbd,
704 0x6cd7, 0x6cc5, 0x6cdd, 0x6cae, 0x6cb1, 0x6cbe,
705 /* 0x5e */
706 0x6cba, 0x6cdb, 0x6cef, 0x6cd9, 0x6cea, 0x6d1f, 0x884d, 0x6d36,
707 0x6d2b, 0x6d3d, 0x6d38, 0x6d19, 0x6d35, 0x6d33, 0x6d12, 0x6d0c,
708 0x6d63, 0x6d93, 0x6d64, 0x6d5a, 0x6d79, 0x6d59, 0x6d8e, 0x6d95,
709 0x6fe4, 0x6d85, 0x6df9, 0x6e15, 0x6e0a, 0x6db5, 0x6dc7, 0x6de6,
710 0x6db8, 0x6dc6, 0x6dec, 0x6dde, 0x6dcc, 0x6de8, 0x6dd2, 0x6dc5,
711 0x6dfa, 0x6dd9, 0x6dea, 0x6dd5, 0x6dea, 0x6dee, 0x6e2d, 0x6e6e,
712 0x6e2e, 0x6e19, 0x6e72, 0x6e5f, 0x6e3e, 0x6e23, 0x6e6b, 0x6e2b,
713 0x6e76, 0x6e4d, 0x6e1f, 0x6e43, 0x6e3a, 0x6e4e, 0x6e24, 0x6eff,
714 0x6e1d, 0x6e38, 0x6e82, 0x6eaa, 0x6e98, 0x6ec9, 0x6eb7, 0x6ed3,
715 0x6ebd, 0x6eaf, 0x6ec4, 0x6eb2, 0x6ed4, 0x6ed5, 0x6e8f, 0x6ea5,
716 0x6ec2, 0x6e9f, 0x6ef4, 0x6f11, 0x704c, 0x6eec, 0x6ef8, 0x6efe,
717 0x6f3f, 0x6ef2, 0x6f31, 0x6eef, 0x6f32, 0x6ecc,
718 /* 0x5f */
719 0x6f3e, 0x6f13, 0x6ef7, 0x6f86, 0x6f7a, 0x6f78, 0x6f81, 0x6f80,
720 0x6f6f, 0x6f5b, 0x6ff3, 0x6f6d, 0x6f82, 0x6f7c, 0x6f58, 0x6f8e,
721 0x6f91, 0x6fc2, 0x6f66, 0x6fb3, 0x6fa3, 0x6fa1, 0x6fa4, 0x6fb9,
722 0x6fc6, 0x6faa, 0x6fdf, 0x6fd5, 0x6fec, 0x6fd4, 0x6fd8, 0x6ff1,
723 0x6fee, 0x6fdb, 0x7009, 0x700b, 0x6ffa, 0x7011, 0x7001, 0x700f,
724 0x6ffe, 0x701b, 0x701a, 0x6f74, 0x701d, 0x7018, 0x701f, 0x7030,
725 0x703e, 0x7032, 0x7051, 0x7063, 0x7099, 0x7092, 0x70af, 0x70f1,
726 0x70ac, 0x70b8, 0x70b3, 0x70ae, 0x70df, 0x70cb, 0x70dd, 0x70d9,
727 0x7109, 0x70fd, 0x711c, 0x7119, 0x7165, 0x7155, 0x7188, 0x7166,
728 0x7162, 0x714c, 0x7156, 0x716c, 0x718f, 0x71fb, 0x7184, 0x7195,
729 0x71a8, 0x71ac, 0x71d7, 0x71b9, 0x71be, 0x71d2, 0x71c9, 0x71d4,
730 0x71ce, 0x71e0, 0x71ec, 0x71e7, 0x71f5, 0x71fc,
731 /* 0x60 */
732 0x71f9, 0x71ff, 0x720d, 0x7210, 0x721b, 0x7228, 0x722d, 0x722c,
733 0x7230, 0x7232, 0x723b, 0x723c, 0x723f, 0x7240, 0x7246, 0x724b,
734 0x7258, 0x7274, 0x727e, 0x7282, 0x7281, 0x7287, 0x7292, 0x7296,
735 0x72a2, 0x72a7, 0x72b9, 0x72b2, 0x72c3, 0x72c6, 0x72c4, 0x72ce,
736 0x72d2, 0x72e2, 0x72e0, 0x72e1, 0x72f9, 0x72f7, 0x500f, 0x7317,
737 0x730a, 0x731c, 0x7316, 0x731d, 0x7334, 0x732f, 0x7329, 0x7325,
738 0x733e, 0x734e, 0x734f, 0x9ed8, 0x7357, 0x736a, 0x7368, 0x7370,
739 0x7378, 0x7375, 0x737b, 0x737a, 0x73c8, 0x73b3, 0x73ce, 0x73bb,
740 0x73c0, 0x73e5, 0x73ee, 0x73de, 0x74a2, 0x7405, 0x746f, 0x7425,
741 0x73f8, 0x7432, 0x743a, 0x7455, 0x743f, 0x745f, 0x7459, 0x7441,

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742 0x745c, 0x7469, 0x7470, 0x7463, 0x746a, 0x7476, 0x747e, 0x748b,
743 0x749e, 0x74a7, 0x74ca, 0x74cf, 0x74d4, 0x73f1,
744 /* 0x61 */
745 0x74e0, 0x74e3, 0x74e7, 0x74e9, 0x74ee, 0x74f2, 0x74f0, 0x74f1,
746 0x74f8, 0x74f7, 0x7504, 0x7503, 0x7505, 0x750c, 0x750e, 0x750d,
747 0x7515, 0x7513, 0x751e, 0x7526, 0x752c, 0x753c, 0x7544, 0x754d,
748 0x754a, 0x7549, 0x755b, 0x7546, 0x755a, 0x7569, 0x7564, 0x7567,
749 0x756b, 0x756d, 0x7578, 0x7576, 0x7586, 0x7587, 0x7574, 0x758a,
750 0x7589, 0x7582, 0x7594, 0x759a, 0x759d, 0x75a5, 0x75a3, 0x75c2,
751 0x75b3, 0x75c3, 0x75b5, 0x75bd, 0x75b8, 0x75bc, 0x75b1, 0x75cd,
752 0x75ca, 0x75d2, 0x75d9, 0x75e3, 0x75de, 0x75fe, 0x75ff, 0x75fc,
753 0x7601, 0x75f0, 0x75fa, 0x75f2, 0x75f3, 0x760b, 0x760d, 0x7609,
754 0x761f, 0x7627, 0x7620, 0x7621, 0x7622, 0x7624, 0x7634, 0x7630,
755 0x763b, 0x7647, 0x7648, 0x7646, 0x765c, 0x7658, 0x7661, 0x7662,
756 0x7668, 0x7669, 0x766a, 0x7667, 0x766c, 0x7670,
757 /* 0x62 */
758 0x7672, 0x7676, 0x7678, 0x767c, 0x7680, 0x7683, 0x7688, 0x768b,
759 0x768e, 0x7696, 0x7693, 0x7699, 0x769a, 0x76b0, 0x76b4, 0x76b8,
760 0x76b9, 0x76ba, 0x76c2, 0x76cd, 0x76d6, 0x76d2, 0x76de, 0x76e1,
761 0x76e5, 0x76e7, 0x76ea, 0x862f, 0x76fb, 0x7708, 0x7707, 0x7704,
762 0x7729, 0x7724, 0x771e, 0x7725, 0x7726, 0x771b, 0x7737, 0x7738,
763 0x7747, 0x775a, 0x7768, 0x776b, 0x775b, 0x7765, 0x777f, 0x777e,
764 0x7779, 0x778e, 0x778b, 0x7791, 0x77a0, 0x779e, 0x77b0, 0x77b6,
765 0x77b9, 0x77bf, 0x77bc, 0x77bd, 0x77bb, 0x77c7, 0x77cd, 0x77d7,
766 0x77da, 0x77dc, 0x77e3, 0x77ee, 0x77fc, 0x780c, 0x7812, 0x7926,
767 0x7820, 0x792a, 0x7845, 0x788e, 0x7874, 0x7886, 0x787c, 0x789a,
768 0x788c, 0x78a3, 0x78b5, 0x78aa, 0x78af, 0x78d1, 0x78c6, 0x78cb,
769 0x78d4, 0x78be, 0x78bc, 0x78c5, 0x78ca, 0x78ec,
770 /* 0x63 */
771 0x78e7, 0x78da, 0x78fd, 0x78f4, 0x7907, 0x7912, 0x7911, 0x7919,
772 0x792c, 0x792b, 0x7940, 0x7960, 0x7957, 0x795f, 0x795a, 0x7955,
773 0x7953, 0x797a, 0x797f, 0x798a, 0x799d, 0x79a7, 0x9f4b, 0x79aa,
774 0x79ae, 0x79b3, 0x79b9, 0x79ba, 0x79c9, 0x79d5, 0x79e7, 0x79ec,
775 0x79e1, 0x79e3, 0x7a08, 0x7a0d, 0x7a18, 0x7a19, 0x7a20, 0x7a1f,
776 0x7980, 0x7a31, 0x7a3b, 0x7a3e, 0x7a37, 0x7a43, 0x7a57, 0x7a49,
777 0x7a61, 0x7a62, 0x7a69, 0x9f9d, 0x7a70, 0x7a79, 0x7a7d, 0x7a88,
778 0x7a97, 0x7a95, 0x7a98, 0x7a96, 0x7aa9, 0x7ac8, 0x7ab0, 0x7ab6,
779 0x7ac5, 0x7ac4, 0x7abf, 0x9083, 0x7ac7, 0x7aca, 0x7acd, 0x7acf,
780 0x7ad5, 0x7ad3, 0x7ad9, 0x7ada, 0x7add, 0x7ae1, 0x7ae2, 0x7ae6,
781 0x7aed, 0x7af0, 0x7b02, 0x7b0f, 0x7b0a, 0x7b06, 0x7b33, 0x7b18,
782 0x7b19, 0x7b1e, 0x7b35, 0x7b28, 0x7b36, 0x7b50,
783 /* 0x64 */
784 0x7b7a, 0x7b04, 0x7b4d, 0x7b0b, 0x7b4c, 0x7b45, 0x7b75, 0x7b65,
785 0x7b74, 0x7b67, 0x7b70, 0x7b71, 0x7b6c, 0x7b6e, 0x7b9d, 0x7b98,
786 0x7b9f, 0x7b8d, 0x7b9c, 0x7b9a, 0x7b8b, 0x7b92, 0x7b8f, 0x7b5d,
787 0x7b99, 0x7bcb, 0x7bc1, 0x7bcc, 0x7bcf, 0x7bb4, 0x7bc6, 0x7bdd,
788 0x7be9, 0x7c11, 0x7c14, 0x7be6, 0x7be5, 0x7c60, 0x7c00, 0x7c07,
789 0x7c13, 0x7bf3, 0x7bf7, 0x7c17, 0x7c0d, 0x7bf6, 0x7c23, 0x7c27,
790 0x7c2a, 0x7c1f, 0x7c37, 0x7c2b, 0x7c3d, 0x7c4c, 0x7c43, 0x7c54,
791 0x7c4f, 0x7c40, 0x7c50, 0x7c58, 0x7c5f, 0x7c64, 0x7c56, 0x7c65,
792 0x7c6c, 0x7c75, 0x7c83, 0x7c90, 0x7ca4, 0x7cad, 0x7ca2, 0x7cab,
793 0x7ca1, 0x7ca8, 0x7cb3, 0x7cb2, 0x7cb1, 0x7cae, 0x7cb9, 0x7cbd,
794 0x7cc0, 0x7cc5, 0x7cc2, 0x7cd8, 0x7cd2, 0x7cdc, 0x7ce2, 0x9b3b,
795 0x7cef, 0x7cf2, 0x7cf4, 0x7cf6, 0x7cfa, 0x7d06,
796 /* 0x65 */
797 0x7d02, 0x7d1c, 0x7d15, 0x7d0a, 0x7d45, 0x7d4b, 0x7d2e, 0x7d32,
798 0x7d3f, 0x7d35, 0x7d46, 0x7d73, 0x7d56, 0x7d4e, 0x7d72, 0x7d68,
799 0x7d6e, 0x7d4f, 0x7d63, 0x7d93, 0x7d89, 0x7d5b, 0x7d8f, 0x7d7d,
800 0x7d9b, 0x7dba, 0x7dae, 0x7da3, 0x7db5, 0x7dc7, 0x7dbd, 0x7dab,
801 0x7e3d, 0x7da2, 0x7daf, 0x7ddc, 0x7db8, 0x7d9f, 0x7db0, 0x7dd8,
802 0x7ddd, 0x7de4, 0x7dde, 0x7dfb, 0x7df2, 0x7de1, 0x7e05, 0x7e0a,
803 0x7e23, 0x7e21, 0x7e12, 0x7e31, 0x7e1f, 0x7e09, 0x7e0b, 0x7e22,
804 0x7e46, 0x7e66, 0x7e3b, 0x7e35, 0x7e39, 0x7e43, 0x7e37, 0x7e32,
805 0x7e3a, 0x7e67, 0x7e5d, 0x7e56, 0x7e5e, 0x7e59, 0x7e5a, 0x7e79,
806 0x7e6a, 0x7e69, 0x7e7c, 0x7e7b, 0x7e83, 0x7dd5, 0x7e7d, 0x8fae,
807 0x7e7f, 0x7e88, 0x7e89, 0x7e8c, 0x7e92, 0x7e90, 0x7e93, 0x7e94,
808 0x7e96, 0x7e8e, 0x7e9b, 0x7e9c, 0x7f38, 0x7f3a,
809 /* 0x66 */
810 0x7f45, 0x7f4c, 0x7f4d, 0x7f4e, 0x7f50, 0x7f51, 0x7f55, 0x7f54,
811 0x7f58, 0x7f5f, 0x7f60, 0x7f68, 0x7f69, 0x7f67, 0x7f78, 0x7f82,
812 0x7f86, 0x7f83, 0x7f88, 0x7f87, 0x7f8c, 0x7f94, 0x7f9e, 0x7f9d,
813 0x7f9a, 0x7fa3, 0x7faf, 0x7fb2, 0x7fb9, 0x7fae, 0x7fb6, 0x7fb8,
814 0x8b71, 0x7fc5, 0x7fc6, 0x7fca, 0x7fd5, 0x7fd4, 0x7fe1, 0x7fe6,
815 0x7fe9, 0x7ff3, 0x7ff9, 0x98dc, 0x8006, 0x8004, 0x800b, 0x8012,
816 0x8018, 0x8019, 0x801c, 0x8021, 0x8028, 0x803f, 0x803b, 0x804a,
817 0x8046, 0x8052, 0x8058, 0x805a, 0x805f, 0x8062, 0x8068, 0x8073,
818 0x8072, 0x8070, 0x8076, 0x8079, 0x807d, 0x807f, 0x8084, 0x8086,
819 0x8085, 0x809b, 0x8093, 0x809a, 0x80ad, 0x5190, 0x80ac, 0x80db,
820 0x80e5, 0x80d9, 0x80dd, 0x80c4, 0x80da, 0x80d6, 0x8109, 0x80ef,
821 0x80f1, 0x811b, 0x8129, 0x8123, 0x812f, 0x814b,
822 /* 0x67 */
823 0x968b, 0x8146, 0x813e, 0x8153, 0x8151, 0x80fc, 0x8171, 0x816e,
824 0x8165, 0x8166, 0x8174, 0x8183, 0x8188, 0x818a, 0x8180, 0x8182,
825 0x81a0, 0x8195, 0x81a4, 0x81a3, 0x815f, 0x8193, 0x81a9, 0x81b0,
826 0x81b5, 0x81be, 0x81b8, 0x81bd, 0x81c0, 0x81c2, 0x81ba, 0x81c9,
827 0x81cd, 0x81d1, 0x81d9, 0x81d8, 0x81c8, 0x81da, 0x81df, 0x81e0,
828 0x81e7, 0x81fa, 0x81fb, 0x81fe, 0x8201, 0x8202, 0x8205, 0x8207,
```

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829 0x820a, 0x820d, 0x8210, 0x8216, 0x8229, 0x822b, 0x8238, 0x8233,
830 0x8240, 0x8259, 0x8258, 0x825d, 0x825a, 0x825f, 0x8264, 0x8262,
831 0x8268, 0x826a, 0x826b, 0x822e, 0x8271, 0x8277, 0x8278, 0x827e,
832 0x828d, 0x8292, 0x82ab, 0x829f, 0x82bb, 0x82ac, 0x82e1, 0x82e3,
833 0x82df, 0x82d2, 0x82f4, 0x82f3, 0x82fa, 0x8393, 0x8303, 0x82fb,
834 0x82f9, 0x82de, 0x8306, 0x82dc, 0x8309, 0x82d9,
835 /* 0x68 */
836 0x8335, 0x8334, 0x8316, 0x8332, 0x8331, 0x8340, 0x8339, 0x8350,
837 0x8345, 0x832f, 0x832b, 0x8317, 0x8318, 0x8385, 0x839a, 0x83aa,
838 0x839f, 0x83a2, 0x8396, 0x8323, 0x838e, 0x8387, 0x838a, 0x837c,
839 0x83b5, 0x8373, 0x8375, 0x83a0, 0x8389, 0x83a8, 0x83f4, 0x8413,
840 0x83eb, 0x83ce, 0x83fd, 0x8403, 0x83d8, 0x840b, 0x83c1, 0x83f7,
841 0x8407, 0x83e0, 0x83f2, 0x840d, 0x8422, 0x8420, 0x83bd, 0x8438,
842 0x8506, 0x83fb, 0x846d, 0x842a, 0x843c, 0x855a, 0x8484, 0x8477,
843 0x846b, 0x84ad, 0x846e, 0x8482, 0x8469, 0x8446, 0x842c, 0x846f,
844 0x8479, 0x8435, 0x84ca, 0x8462, 0x84b9, 0x84bf, 0x849f, 0x84d9,
845 0x84cd, 0x84bb, 0x84da, 0x84d0, 0x84c1, 0x84c6, 0x84d6, 0x84a1,
846 0x8521, 0x84ff, 0x84f4, 0x8517, 0x8518, 0x852c, 0x851f, 0x8515,
847 0x8514, 0x84fc, 0x8540, 0x8563, 0x8558, 0x8548,
848 /* 0x69 */
849 0x8541, 0x8602, 0x854b, 0x8555, 0x8580, 0x85a4, 0x8588, 0x8591,
850 0x858a, 0x85a8, 0x856d, 0x8594, 0x859b, 0x85ea, 0x8587, 0x859c,
851 0x8577, 0x857e, 0x8590, 0x85c9, 0x85ba, 0x85c1, 0x85b9, 0x85d0,
852 0x85d5, 0x85dd, 0x85e5, 0x85dc, 0x85f9, 0x860a, 0x8613, 0x860b,
853 0x85fe, 0x85fa, 0x8606, 0x8622, 0x861a, 0x8630, 0x863f, 0x864d,
854 0x4e55, 0x8654, 0x865f, 0x8667, 0x8671, 0x8693, 0x86a3, 0x86a9,
855 0x86aa, 0x868b, 0x868c, 0x86b6, 0x86af, 0x86c4, 0x86c6, 0x86b0,
856 0x86c9, 0x8823, 0x86ab, 0x86d4, 0x86de, 0x86e9, 0x86ec, 0x86df,
857 0x86db, 0x86ef, 0x8712, 0x8706, 0x8708, 0x8700, 0x8703, 0x86fb,
858 0x8711, 0x8709, 0x870d, 0x86f9, 0x870a, 0x8734, 0x873f, 0x8737,
859 0x873b, 0x8725, 0x8729, 0x871a, 0x8760, 0x875f, 0x8778, 0x874c,
860 0x874e, 0x8774, 0x8757, 0x8768, 0x876e, 0x8759,
861 /* 0x6a */
862 0x8753, 0x8763, 0x876a, 0x8805, 0x87a2, 0x879f, 0x8782, 0x87af,
863 0x87cb, 0x87bd, 0x87c0, 0x87d0, 0x96d6, 0x87ab, 0x87c4, 0x87b3,
864 0x87c7, 0x87c6, 0x87bb, 0x87ef, 0x87f2, 0x87e0, 0x880f, 0x880d,
865 0x87fe, 0x87f6, 0x87f7, 0x880e, 0x87d2, 0x8811, 0x8816, 0x8815,
866 0x8822, 0x8821, 0x8831, 0x8836, 0x8839, 0x8827, 0x883b, 0x8844,
867 0x8842, 0x8852, 0x8859, 0x885e, 0x8862, 0x886b, 0x8881, 0x887e,
868 0x889e, 0x8875, 0x887d, 0x88b5, 0x8872, 0x8882, 0x8897, 0x8892,
869 0x88ae, 0x8899, 0x88a2, 0x888d, 0x88a4, 0x88b0, 0x88bf, 0x88b1,
870 0x88c3, 0x88c4, 0x88d4, 0x88d8, 0x88d9, 0x88dd, 0x88f9, 0x8902,
871 0x88fc, 0x88f4, 0x88e8, 0x88f2, 0x8904, 0x890c, 0x890a, 0x8913,
872 0x8943, 0x891e, 0x8925, 0x892a, 0x892b, 0x8941, 0x8944, 0x893b,
873 0x8936, 0x8938, 0x894c, 0x891d, 0x8960, 0x895e,
874 /* 0x6b */
875 0x8966, 0x8964, 0x896d, 0x896a, 0x896f, 0x8974, 0x8977, 0x897e,
876 0x8983, 0x8988, 0x898a, 0x8993, 0x8998, 0x89a1, 0x89a9, 0x89a6,
877 0x89ac, 0x89af, 0x89b2, 0x89ba, 0x89bd, 0x89bf, 0x89c0, 0x89da,
878 0x89dc, 0x89dd, 0x89e7, 0x89f4, 0x89f8, 0x8a03, 0x8a16, 0x8a10,
879 0x8a0c, 0x8a1b, 0x8a1d, 0x8a25, 0x8a36, 0x8a41, 0x8a5b, 0x8a52,
880 0x8a46, 0x8a48, 0x8a7c, 0x8a6d, 0x8a6c, 0x8a62, 0x8a85, 0x8a82,
881 0x8a84, 0x8aa8, 0x8aa1, 0x8a91, 0x8aa5, 0x8aa6, 0x8a9a, 0x8aa3,
882 0x8ac4, 0x8acd, 0x8ac2, 0x8ada, 0x8aeb, 0x8af3, 0x8ae7, 0x8ae4,
883 0x8af1, 0x8b14, 0x8ae0, 0x8ae2, 0x8af7, 0x8ade, 0x8adb, 0x8b0c,
884 0x8b07, 0x8b1a, 0x8ae1, 0x8b16, 0x8b10, 0x8b17, 0x8b20, 0x8b33,
885 0x97ab, 0x8b26, 0x8b2b, 0x8b3e, 0x8b28, 0x8b41, 0x8b4c, 0x8b4f,
886 0x8b4e, 0x8b49, 0x8b56, 0x8b5b, 0x8b5a, 0x8b6b,
887 /* 0x6c */
888 0x8b5f, 0x8b6c, 0x8b6f, 0x8b74, 0x8b7d, 0x8b80, 0x8b8c, 0x8b8e,
889 0x8b92, 0x8b93, 0x8b96, 0x8b99, 0x8b9a, 0x8c3a, 0x8c41, 0x8c3f,
890 0x8c48, 0x8c4c, 0x8c4e, 0x8c50, 0x8c55, 0x8c62, 0x8c6c, 0x8c78,
891 0x8c7a, 0x8c82, 0x8c89, 0x8c85, 0x8c8a, 0x8c8d, 0x8c8e, 0x8c94,
892 0x8c7c, 0x8c98, 0x621d, 0x8cad, 0x8caa, 0x8cbd, 0x8cb2, 0x8cb3,
893 0x8cae, 0x8cb6, 0x8cc8, 0x8cc1, 0x8ce4, 0x8ce3, 0x8cda, 0x8cdf,
894 0x8cfa, 0x8cfb, 0x8d04, 0x8d05, 0x8d0a, 0x8d07, 0x8d0f, 0x8d0d,
895 0x8d10, 0x9f4e, 0x8d13, 0x8ccd, 0x8d14, 0x8d16, 0x8d67, 0x8d6d,
896 0x8d71, 0x8d73, 0x8d81, 0x8d99, 0x8dc2, 0x8dbe, 0x8dba, 0x8dcf,
897 0x8dda, 0x8dd6, 0x8ddc, 0x8ddb, 0x8dc8, 0x8dea, 0x8deb, 0x8ddf,
898 0x8de3, 0x8dfc, 0x8e08, 0x8e09, 0x8dff, 0x8e1d, 0x8e1e, 0x8e10,
899 0x8e1f, 0x8e42, 0x8e35, 0x8e30, 0x8e34, 0x8e4a,
900 /* 0x6d */
901 0x8e47, 0x8e49, 0x8e4c, 0x8e50, 0x8e48, 0x8e59, 0x8e64, 0x8e60,
902 0x8e2a, 0x8e63, 0x8e55, 0x8e76, 0x8e72, 0x8e7c, 0x8e81, 0x8e87,
903 0x8e85, 0x8e84, 0x8e8b, 0x8e8a, 0x8e93, 0x8e91, 0x8e94, 0x8e99,
904 0x8eaa, 0x8ea1, 0x8eac, 0x8eb0, 0x8ec6, 0x8eb1, 0x8ebe, 0x8ec5,
905 0x8ec8, 0x8ecb, 0x8edb, 0x8ee3, 0x8efc, 0x8efb, 0x8eeb, 0x8efe,
906 0x8f0a, 0x8f05, 0x8f15, 0x8f12, 0x8f19, 0x8f13, 0x8f1c, 0x8f1f,
907 0x8f1b, 0x8f0c, 0x8f26, 0x8f33, 0x8f3b, 0x8f39, 0x8f45, 0x8f42,
908 0x8f3e, 0x8f4c, 0x8f49, 0x8f46, 0x8f4e, 0x8f57, 0x8f5c, 0x8f62,
909 0x8f63, 0x8f64, 0x8f9c, 0x8f9f, 0x8fa3, 0x8fad, 0x8faf, 0x8fb7,
910 0x8fda, 0x8fe5, 0x8fe2, 0x8fea, 0x8fef, 0x9087, 0x8ff4, 0x9005,
911 0x8fff9, 0x8ffa, 0x9011, 0x9015, 0x9021, 0x900d, 0x901e, 0x9016,
912 0x900b, 0x9027, 0x9036, 0x9035, 0x9039, 0x8fff8,
913 /* 0x6e */
914 0x904f, 0x9050, 0x9051, 0x9052, 0x900e, 0x9049, 0x903e, 0x9056,
915 0x9058, 0x905e, 0x9068, 0x906f, 0x9076, 0x96a8, 0x9072, 0x9082,

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```
916 0x907d, 0x9081, 0x9080, 0x908a, 0x9089, 0x908f, 0x90a8, 0x90af,
917 0x90b1, 0x90b5, 0x90e2, 0x90e4, 0x6248, 0x90db, 0x9102, 0x9112,
918 0x9119, 0x9132, 0x9130, 0x914a, 0x9156, 0x9158, 0x9163, 0x9165,
919 0x9169, 0x9173, 0x9172, 0x918b, 0x9189, 0x9182, 0x91a2, 0x91ab,
920 0x91af, 0x91aa, 0x91b5, 0x91b4, 0x91ba, 0x91c0, 0x91c1, 0x91c9,
921 0x91cb, 0x91d0, 0x91d6, 0x91df, 0x91e1, 0x91db, 0x91fc, 0x91f5,
922 0x91f6, 0x921e, 0x91ff, 0x9214, 0x922c, 0x9215, 0x9211, 0x925e,
923 0x9257, 0x9245, 0x9249, 0x9264, 0x9248, 0x9295, 0x923f, 0x924b,
924 0x9250, 0x929c, 0x9296, 0x9293, 0x929b, 0x925a, 0x92cf, 0x92b9,
925 0x92b7, 0x92e9, 0x930f, 0x92fa, 0x9344, 0x932e,
926 /* 0x6f */
927 0x9319, 0x9322, 0x931a, 0x9323, 0x933a, 0x9335, 0x933b, 0x935c,
928 0x9360, 0x937c, 0x936e, 0x9356, 0x93b0, 0x93ac, 0x93ad, 0x9394,
929 0x93b9, 0x93d6, 0x93d7, 0x93e8, 0x93e5, 0x93d8, 0x93c3, 0x93dd,
930 0x93d0, 0x93c8, 0x93e4, 0x941a, 0x9414, 0x9413, 0x9403, 0x9407,
931 0x9410, 0x9436, 0x942b, 0x9435, 0x9421, 0x943a, 0x9441, 0x9452,
932 0x9444, 0x945b, 0x9460, 0x9462, 0x945e, 0x946a, 0x9229, 0x9470,
933 0x9475, 0x9477, 0x947d, 0x945a, 0x947c, 0x947e, 0x9481, 0x947f,
934 0x9582, 0x9587, 0x958a, 0x9594, 0x9596, 0x9598, 0x9599, 0x95a0,
935 0x95a8, 0x95a7, 0x95ad, 0x95bc, 0x95bb, 0x95b9, 0x95be, 0x95ca,
936 0x6fff, 0x95c3, 0x95cd, 0x95cc, 0x95d5, 0x95d4, 0x95d6, 0x95dc,
937 0x95e1, 0x95e5, 0x95e2, 0x9621, 0x9628, 0x962e, 0x962f, 0x9642,
938 0x964c, 0x964f, 0x964b, 0x9677, 0x965c, 0x965e,
939 /* 0x70 */
940 0x965d, 0x965f, 0x9666, 0x9672, 0x966c, 0x968d, 0x9698, 0x9695,
941 0x9697, 0x96aa, 0x96a7, 0x96b1, 0x96b2, 0x96b0, 0x96b4, 0x96b6,
942 0x96b8, 0x96b9, 0x96b9, 0x96ce, 0x96cb, 0x96c9, 0x96cd, 0x894d, 0x96dc,
943 0x970d, 0x96d5, 0x96f9, 0x9704, 0x9706, 0x9708, 0x9713, 0x970e,
944 0x9711, 0x970f, 0x9716, 0x9719, 0x9724, 0x972a, 0x9730, 0x9739,
945 0x973d, 0x973e, 0x973c, 0x9744, 0x9746, 0x9748, 0x9742, 0x9749, 0x975c,
946 0x9760, 0x9764, 0x9766, 0x9768, 0x52d2, 0x976b, 0x9771, 0x9779,
947 0x9785, 0x977c, 0x9781, 0x977a, 0x9786, 0x978b, 0x978f, 0x9790,
948 0x979c, 0x97a8, 0x97a6, 0x97a3, 0x97b3, 0x97b4, 0x97c3, 0x97c6,
949 0x97c8, 0x97cb, 0x97dc, 0x97ed, 0x9f4f, 0x97f2, 0x7adf, 0x97f6,
950 0x97f5, 0x980f, 0x980c, 0x9838, 0x9824, 0x9821, 0x9837, 0x983d,
951 0x9846, 0x984f, 0x984b, 0x986b, 0x986f, 0x9870,
952 /* 0x71 */
953 0x9871, 0x9874, 0x9873, 0x98aa, 0x98af, 0x98b1, 0x98b6, 0x98c4,
954 0x98c3, 0x98c6, 0x98e9, 0x98eb, 0x9903, 0x9909, 0x9912, 0x9914,
955 0x9918, 0x9921, 0x991d, 0x991e, 0x9924, 0x9920, 0x992c, 0x992e,
956 0x993d, 0x993e, 0x9942, 0x9949, 0x9945, 0x9950, 0x994b, 0x9951,
957 0x9952, 0x994c, 0x9955, 0x9997, 0x9998, 0x99a5, 0x99ad, 0x99ae,
958 0x99bc, 0x99df, 0x99db, 0x99dd, 0x99d8, 0x99d1, 0x99ed, 0x99ee,
959 0x99f1, 0x99f2, 0x99fb, 0x99f8, 0x9a01, 0x9a0f, 0x9a05, 0x99e2,
960 0x9a19, 0x9a2b, 0x9a37, 0x9a45, 0x9a42, 0x9a40, 0x9a43, 0x9a3e,
961 0x9a55, 0x9a4d, 0x9a5b, 0x9a57, 0x9a5f, 0x9a62, 0x9a65, 0x9a64,
962 0x9a69, 0x9a6b, 0x9a6a, 0x9aad, 0x9ab0, 0x9abc, 0x9ac0, 0x9acf,
963 0x9ad1, 0x9ad3, 0x9ad4, 0x9ade, 0x9adf, 0x9ae2, 0x9ae3, 0x9ae6,
964 0x9aef, 0x9aeb, 0x9aee, 0x9af4, 0x9af1, 0x9af7,
965 /* 0x72 */
966 0x9afb, 0x9b06, 0x9b18, 0x9b1a, 0x9b1f, 0x9b22, 0x9b23, 0x9b25,
967 0x9b27, 0x9b28, 0x9b29, 0x9b2a, 0x9b2e, 0x9b2f, 0x9b32, 0x9b44,
968 0x9b43, 0x9b4f, 0x9b4d, 0x9b4e, 0x9b51, 0x9b58, 0x9b74, 0x9b93,
969 0x9b83, 0x9b91, 0x9b96, 0x9b97, 0x9b9f, 0x9ba0, 0x9ba8, 0x9bb4,
970 0x9bc0, 0x9bca, 0x9bb9, 0x9bc6, 0x9bcf, 0x9bd1, 0x9bd2, 0x9be3,
971 0x9be2, 0x9be4, 0x9bd4, 0x9be1, 0x9c3a, 0x9bf2, 0x9bf1, 0x9bf0,
972 0x9c15, 0x9c14, 0x9c09, 0x9c13, 0x9c0c, 0x9c06, 0x9c08, 0x9c12,
973 0x9c0a, 0x9c04, 0x9c2e, 0x9c1b, 0x9c25, 0x9c24, 0x9c21, 0x9c30,
974 0x9c47, 0x9c32, 0x9c46, 0x9c3e, 0x9c5a, 0x9c60, 0x9c67, 0x9c76,
975 0x9c78, 0x9ce7, 0x9cec, 0x9cf0, 0x9d09, 0x9d08, 0x9ceb, 0x9d03,
976 0x9d06, 0x9d2a, 0x9d26, 0x9daf, 0x9d23, 0x9d1f, 0x9d44, 0x9d15,
977 0x9d12, 0x9d41, 0x9d3f, 0x9d3e, 0x9d46, 0x9d48,
978 /* 0x73 */
979 0x9d5d, 0x9d5e, 0x9d64, 0x9d51, 0x9d50, 0x9d59, 0x9d72, 0x9d89,
980 0x9d87, 0x9dab, 0x9d6f, 0x9d7a, 0x9d9a, 0x9da4, 0x9da9, 0x9db2,
981 0x9dc4, 0x9dc1, 0x9dbb, 0x9db8, 0x9dba, 0x9dc6, 0x9dcf, 0x9dc2,
982 0x9dd9, 0x9dd3, 0x9df8, 0x9de6, 0x9ded, 0x9def, 0x9dfd, 0x9e1a,
983 0x9e1b, 0x9e1e, 0x9e75, 0x9e79, 0x9e7d, 0x9e81, 0x9e88, 0x9e8b,
984 0x9e8c, 0x9e92, 0x9e95, 0x9e91, 0x9e9d, 0x9ea5, 0x9ea9, 0x9eb8,
985 0x9eaa, 0x9ead, 0x9761, 0x9ecc, 0x9ece, 0x9ecf, 0x9ed0, 0x9ed4,
986 0x9edc, 0x9ede, 0x9edd, 0x9ee0, 0x9ee5, 0x9ee8, 0x9eef, 0x9ef4,
987 0x9ef6, 0x9ef7, 0x9ef9, 0x9efb, 0x9efc, 0x9efd, 0x9f07, 0x9f08,
988 0x76b7, 0x9f15, 0x9f21, 0x9f2c, 0x9f3e, 0x9f4a, 0x9f52, 0x9f54,
989 0x9f63, 0x9f5f, 0x9f60, 0x9f61, 0x9f66, 0x9f67, 0x9f6c, 0x9f6a,
990 0x9f77, 0x9f72, 0x9f76, 0x9f95, 0x9f9c, 0x9fa0,
991 /* 0x74 */
992 0x582f, 0x69c7, 0x9059, 0x7464, 0x51dc, 0x7199,
993 };
994
995 static int
996 jisx0208_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
997 {
998     unsigned char c1 = (s[0] & 0x7F);
999     if ((c1 >= 0x21 && c1 <= 0x28) || (c1 >= 0x30 && c1 <= 0x74)) {
1000         if (n >= 2) {
1001             unsigned char c2 = (s[1] & 0x7F);
1002             if (c2 >= 0x21 && c2 < 0x7f) {
```

```
1003     unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
1004     unsigned short wc = 0xffffd;
1005     if (i < 1410) {
1006         if (i < 690)
1007             wc = jisx0208_2uni_page21[i];
1008         else {
1009             if (i < 7808)
1010                 wc = jisx0208_2uni_page30[i-1410];
1011         }
1012         if (wc != 0xffffd) {
1013             *pwc = (ucs4_t) wc;
1014             return 2;
1015         }
1016     }
1017     return RET_ILSEQ;
1018 }
1019 return RET_TOOFEW(0);
1020 }
1021 return RET_ILSEQ;
1022 }
1023 #endif /* NEED_TOWC */
1024
1025 #ifdef NEED_TOMB
1026 static const unsigned short jisx0208_2charset[6879] = {
1027     0x2140, 0x2171, 0x2172, 0x2178, 0x212f, 0x224c, 0x216b, 0x215e,
1028     0x212d, 0x2279, 0x215f, 0x2160, 0x2621, 0x2622, 0x2623, 0x2624,
1029     0x2625, 0x2626, 0x2627, 0x2628, 0x2629, 0x262a, 0x262b, 0x262c,
1030     0x262d, 0x262e, 0x262f, 0x2630, 0x2631, 0x2632, 0x2633, 0x2634,
1031     0x2635, 0x2636, 0x2637, 0x2638, 0x2641, 0x2642, 0x2643, 0x2644,
1032     0x2645, 0x2646, 0x2647, 0x2648, 0x2649, 0x264a, 0x264b, 0x264c,
1033     0x264d, 0x264e, 0x264f, 0x2650, 0x2651, 0x2652, 0x2653, 0x2654,
1034     0x2655, 0x2656, 0x2657, 0x2658, 0x2727, 0x2721, 0x2722, 0x2723,
1035     0x2724, 0x2725, 0x2726, 0x2728, 0x2729, 0x272a, 0x272b, 0x272c,
1036     0x272d, 0x272e, 0x272f, 0x2730, 0x2731, 0x2732, 0x2733, 0x2734,
1037     0x2735, 0x2736, 0x2737, 0x2738, 0x2739, 0x273a, 0x273b, 0x273c,
1038     0x273d, 0x273e, 0x273f, 0x2740, 0x2741, 0x2751, 0x2752, 0x2753,
1039     0x2754, 0x2755, 0x2756, 0x2758, 0x2759, 0x275a, 0x275b, 0x275c,
1040     0x275d, 0x275e, 0x275f, 0x2760, 0x2761, 0x2762, 0x2763, 0x2764,
1041     0x2765, 0x2766, 0x2767, 0x2768, 0x2769, 0x276a, 0x276b, 0x276c,
1042     0x276d, 0x276e, 0x276f, 0x2770, 0x2771, 0x2757, 0x213e, 0x213d,
1043     0x2142, 0x2146, 0x2147, 0x2148, 0x2149, 0x2277, 0x2278, 0x2145,
1044     0x2144, 0x2273, 0x216c, 0x216d, 0x2228, 0x216e, 0x2272, 0x222b,
1045     0x222c, 0x222a, 0x222d, 0x224d, 0x224e, 0x224f, 0x225f, 0x2250,
1046     0x2260, 0x223a, 0x223b, 0x215d, 0x2265, 0x2267, 0x2167, 0x225c,
1047     0x224a, 0x224b, 0x2241, 0x2240, 0x2269, 0x226a, 0x2168, 0x2268,
1048     0x2266, 0x2262, 0x2162, 0x2261, 0x2165, 0x2166, 0x2263, 0x2264,
1049     0x223e, 0x223f, 0x223c, 0x223d, 0x225d, 0x225e, 0x2821, 0x282c,
1050     0x2822, 0x282d, 0x2823, 0x282e, 0x2824, 0x282f, 0x2826, 0x2831,
1051     0x2825, 0x2830, 0x2827, 0x283c, 0x2837, 0x2832, 0x2829, 0x283e,
1052     0x2839, 0x2834, 0x2828, 0x2838, 0x283d, 0x2833, 0x282a, 0x283a,
1053     0x283f, 0x2835, 0x282b, 0x283b, 0x2840, 0x2836, 0x2223, 0x2222,
1054     0x2225, 0x2224, 0x2227, 0x2226, 0x2221, 0x217e, 0x217b, 0x217d,
1055     0x217c, 0x227e, 0x217a, 0x2179, 0x216a, 0x2169, 0x2276, 0x2275,
1056     0x2274, 0x2121, 0x2122, 0x2123, 0x2137, 0x2139, 0x213a, 0x213b,
1057     0x2152, 0x2153, 0x2154, 0x2155, 0x2156, 0x2157, 0x2158, 0x2159,
1058     0x215a, 0x215b, 0x2229, 0x222e, 0x214c, 0x214d, 0x2141, 0x2421,
1059     0x2422, 0x2423, 0x2424, 0x2425, 0x2426, 0x2427, 0x2428, 0x2429,
1060     0x242a, 0x242b, 0x242c, 0x242d, 0x242e, 0x242f, 0x2430, 0x2431,
1061     0x2432, 0x2433, 0x2434, 0x2435, 0x2436, 0x2437, 0x2438, 0x2439,
1062     0x243a, 0x243b, 0x243c, 0x243d, 0x243e, 0x243f, 0x2440, 0x2441,
1063     0x2442, 0x2443, 0x2444, 0x2445, 0x2446, 0x2447, 0x2448, 0x2449,
1064     0x244a, 0x244b, 0x244c, 0x244d, 0x244e, 0x244f, 0x2450, 0x2451,
1065     0x2452, 0x2453, 0x2454, 0x2455, 0x2456, 0x2457, 0x2458, 0x2459,
1066     0x245a, 0x245b, 0x245c, 0x245d, 0x245e, 0x245f, 0x2460, 0x2461,
1067     0x2462, 0x2463, 0x2464, 0x2465, 0x2466, 0x2467, 0x2468, 0x2469,
1068     0x246a, 0x246b, 0x246c, 0x246d, 0x246e, 0x246f, 0x2470, 0x2471,
1069     0x2472, 0x2473, 0x212b, 0x212c, 0x2135, 0x2136, 0x2521, 0x2522,
1070     0x2523, 0x2524, 0x2525, 0x2526, 0x2527, 0x2528, 0x2529, 0x252a,
1071     0x252b, 0x252c, 0x252d, 0x252e, 0x252f, 0x2530, 0x2531, 0x2532,
1072     0x2533, 0x2534, 0x2535, 0x2536, 0x2537, 0x2538, 0x2539, 0x253a,
1073     0x253b, 0x253c, 0x253d, 0x253e, 0x253f, 0x2540, 0x2541, 0x2542,
1074     0x2543, 0x2544, 0x2545, 0x2546, 0x2547, 0x2548, 0x2549, 0x254a,
1075     0x254b, 0x254c, 0x254d, 0x254e, 0x254f, 0x2550, 0x2551, 0x2552,
1076     0x2553, 0x2554, 0x2555, 0x2556, 0x2557, 0x2558, 0x2559, 0x255a,
1077     0x255b, 0x255c, 0x255d, 0x255e, 0x255f, 0x2560, 0x2561, 0x2562,
1078     0x2563, 0x2564, 0x2565, 0x2566, 0x2567, 0x2568, 0x2569, 0x256a,
1079     0x256b, 0x256c, 0x256d, 0x256e, 0x256f, 0x2570, 0x2571, 0x2572,
1080     0x2573, 0x2574, 0x2575, 0x2576, 0x2126, 0x213c, 0x2133, 0x2134,
1081     0x306c, 0x437a, 0x3c37, 0x4b7c, 0x3e66, 0x3b30, 0x3e65, 0x323c,
1082     0x4954, 0x4d3f, 0x5022, 0x312f, 0x336e, 0x5023, 0x4024, 0x5242,
1083     0x3556, 0x4a3a, 0x3e67, 0x4e3e, 0x4a42, 0x5024, 0x4366, 0x5025,
1084     0x367a, 0x5026, 0x345d, 0x4330, 0x3c67, 0x5027, 0x5028, 0x5029,
1085     0x4735, 0x3557, 0x4737, 0x4663, 0x3843, 0x4b33, 0x6949, 0x502a,
1086     0x3e68, 0x502b, 0x3235, 0x3665, 0x3870, 0x4c69, 0x5626, 0x4d70,
1087     0x467d, 0x3425, 0x3535, 0x502c, 0x502d, 0x4e3b, 0x4d3d, 0x4168,
1088     0x502f, 0x3b76, 0x4673, 0x5032, 0x313e, 0x385f, 0x385e, 0x3066,
1089     0x4f4b, 0x4f4a, 0x3a33, 0x3021, 0x5033, 0x5034, 0x5035, 0x4b34,
```

```
1090 0x5036, 0x3872, 0x3067, 0x4b72, 0x357c, 0x357d, 0x357e, 0x4462,
1091 0x4e3c, 0x5037, 0x5038, 0x5039, 0x3f4d, 0x3d3a, 0x3f4e, 0x503e,
1092 0x503c, 0x503d, 0x3558, 0x3a23, 0x3270, 0x503b, 0x503a, 0x4a29,
1093 0x3b46, 0x3b45, 0x423e, 0x503f, 0x4955, 0x4067, 0x2138, 0x5040,
1094 0x5042, 0x4265, 0x4e61, 0x304a, 0x5041, 0x323e, 0x3644, 0x4367,
1095 0x376f, 0x5043, 0x4724, 0x346b, 0x5044, 0x304b, 0x3860, 0x346c,
1096 0x497a, 0x4832, 0x3559, 0x3271, 0x5067, 0x4541, 0x476c, 0x5046,
1097 0x483c, 0x4e62, 0x3f2d, 0x3b47, 0x3b77, 0x3240, 0x4451, 0x4322,
1098 0x504a, 0x304c, 0x4463, 0x3d3b, 0x3a34, 0x4d24, 0x424e, 0x323f,
1099 0x5049, 0x4d3e, 0x5045, 0x5047, 0x3a6e, 0x5048, 0x5524, 0x5050,
1100 0x5053, 0x5051, 0x3242, 0x4a3b, 0x504b, 0x504f, 0x3873, 0x3b48,
1101 0x3426, 0x5054, 0x504c, 0x4e63, 0x3b78, 0x504d, 0x5052, 0x5055,
1102 0x504e, 0x3621, 0x304d, 0x3622, 0x3241, 0x5525, 0x4b79, 0x496e,
1103 0x3874, 0x3f2f, 0x4e37, 0x4a58, 0x3738, 0x4225, 0x3264, 0x3d53,
1104 0x5059, 0x5059, 0x505c, 0x505e, 0x5057, 0x422f, 0x505a, 0x505d, 0x505b,
1105 0x4a5d, 0x5058, 0x3f2e, 0x4b73, 0x505f, 0x5060, 0x3d24, 0x506d,
1106 0x4750, 0x4936, 0x5068, 0x4a70, 0x3236, 0x506c, 0x5066, 0x506f,
1107 0x4152, 0x3844, 0x475c, 0x6047, 0x506e, 0x455d, 0x5063, 0x3876,
1108 0x3875, 0x5061, 0x3c5a, 0x5069, 0x4a6f, 0x434d, 0x5065, 0x3771,
1109 0x5062, 0x506a, 0x5064, 0x4e51, 0x506b, 0x4f41, 0x3666, 0x3770,
1110 0x5070, 0x5071, 0x5075, 0x304e, 0x4a50, 0x5074, 0x5073, 0x5077,
1111 0x5076, 0x4464, 0x3772, 0x5078, 0x3c45, 0x4226, 0x4465, 0x3676,
1112 0x5079, 0x3536, 0x507a, 0x507c, 0x4b35, 0x3766, 0x3b31, 0x4877,
1113 0x507b, 0x3a45, 0x4d43, 0x507e, 0x5123, 0x507d, 0x3a44, 0x3d7d,
1114 0x3739, 0x5124, 0x364f, 0x5121, 0x5122, 0x462f, 0x417c, 0x3623,
1115 0x4b4d, 0x5125, 0x4e3d, 0x5126, 0x5129, 0x5127, 0x414e, 0x5128,
1116 0x512a, 0x512c, 0x512b, 0x4a48, 0x3537, 0x512e, 0x512f, 0x322f,
1117 0x512d, 0x3c74, 0x5132, 0x5131, 0x5130, 0x5056, 0x5133, 0x3d7e,
1118 0x5134, 0x4d25, 0x4c59, 0x5136, 0x5135, 0x5138, 0x5137, 0x5139,
1119 0x513a, 0x3074, 0x3835, 0x373b, 0x3d3c, 0x437b, 0x3624, 0x4068,
1120 0x3877, 0x396e, 0x513c, 0x4c48, 0x4546, 0x3b79, 0x513b, 0x513d,
1121 0x455e, 0x3375, 0x513e, 0x467e, 0x4134, 0x5140, 0x5141, 0x482c,
1122 0x3878, 0x4f3b, 0x5142, 0x3626, 0x4a3c, 0x4236, 0x3671, 0x4535,
1123 0x3773, 0x5143, 0x5144, 0x4662, 0x315f, 0x5147, 0x3a7d, 0x5146,
1124 0x3a46, 0x5148, 0x666e, 0x5149, 0x4b41, 0x514a, 0x514b, 0x514c,
1125 0x3e69, 0x3c4c, 0x3427, 0x514f, 0x514d, 0x4c3d, 0x514e, 0x495a,
1126 0x5150, 0x5151, 0x5152, 0x455f, 0x5156, 0x5154, 0x5155, 0x5153,
1127 0x3a63, 0x5157, 0x4c6a, 0x4e64, 0x5158, 0x4028, 0x5159, 0x3d5a,
1128 0x515a, 0x437c, 0x4e3f, 0x4560, 0x5245, 0x515b, 0x7425, 0x3645,
1129 0x515c, 0x4b5e, 0x3d68, 0x427c, 0x515e, 0x4664, 0x515f, 0x5160,
1130 0x332e, 0x5161, 0x3627, 0x464c, 0x317a, 0x3d50, 0x4821, 0x5162,
1131 0x4561, 0x3f4f, 0x5163, 0x4a2c, 0x405a, 0x3422, 0x3429, 0x5164,
1132 0x5166, 0x373a, 0x5165, 0x4e73, 0x3d69, 0x483d, 0x4a4c, 0x5167,
1133 0x4d78, 0x5168, 0x5169, 0x457e, 0x516a, 0x4029, 0x3a7e, 0x3774,
1134 0x516b, 0x3b49, 0x396f, 0x4466, 0x516d, 0x4227, 0x3a6f, 0x516e,
1135 0x516f, 0x4130, 0x516c, 0x5171, 0x4b36, 0x3964, 0x5170, 0x3775,
1136 0x3a5e, 0x476d, 0x5174, 0x5172, 0x497b, 0x3e6a, 0x517b, 0x3364,
1137 0x5175, 0x5173, 0x414f, 0x5177, 0x5176, 0x3344, 0x3760, 0x517c,
1138 0x4e2d, 0x5178, 0x517d, 0x517a, 0x5179, 0x4e4f, 0x3879, 0x3243,
1139 0x4e74, 0x3d75, 0x4558, 0x3965, 0x5222, 0x5223, 0x4e65, 0x4f2b,
1140 0x5225, 0x387a, 0x5224, 0x332f, 0x5226, 0x4b56, 0x443c, 0x4d26,
1141 0x4a59, 0x5227, 0x7055, 0x4630, 0x5228, 0x342a, 0x4c33, 0x3e21,
1142 0x5229, 0x4a67, 0x522d, 0x402a, 0x522a, 0x3650, 0x522b, 0x342b,
1143 0x372e, 0x522e, 0x522f, 0x5230, 0x5231, 0x3c5b, 0x387b, 0x4c5e,
1144 0x4c68, 0x4677, 0x4a71, 0x5232, 0x5233, 0x5235, 0x5237, 0x5236,
1145 0x5238, 0x323d, 0x4b4c, 0x3a7c, 0x5239, 0x4159, 0x3e22, 0x3629,
1146 0x523a, 0x485b, 0x523b, 0x523c, 0x523d, 0x523e, 0x4924, 0x3668,
1147 0x3065, 0x463f, 0x523f, 0x3d3d, 0x4069, 0x5241, 0x5240, 0x3e23,
1148 0x3861, 0x5243, 0x483e, 0x5244, 0x485c, 0x4234, 0x426e, 0x3628,
1149 0x466e, 0x4331, 0x476e, 0x4b4e, 0x5246, 0x406a, 0x3735, 0x5247,
1150 0x5248, 0x312c, 0x3075, 0x346d, 0x4228, 0x3551, 0x4d71, 0x524b,
1151 0x3237, 0x524a, 0x362a, 0x524c, 0x4c71, 0x524d, 0x4e52, 0x387c,
1152 0x3836, 0x524e, 0x5250, 0x524f, 0x3f5f, 0x3139, 0x315e, 0x5251,
1153 0x5252, 0x3837, 0x5253, 0x356e, 0x3b32, 0x5254, 0x4b74, 0x3a35,
1154 0x355a, 0x4d27, 0x4150, 0x483f, 0x3c7d, 0x3d47, 0x3c68, 0x3c75,
1155 0x3d76, 0x4840, 0x5257, 0x3143, 0x4151, 0x387d, 0x3845, 0x3667,
1156 0x525b, 0x4321, 0x427e, 0x362b, 0x3e24, 0x525c, 0x525a, 0x3244,
1157 0x4266, 0x3c38, 0x3b4b, 0x3126, 0x3370, 0x3966, 0x3b4a, 0x525d,
1158 0x525e, 0x3549, 0x3346, 0x3967, 0x3548, 0x445f, 0x3125, 0x4631,
1159 0x4c3e, 0x3921, 0x4d79, 0x4547, 0x387e, 0x372f, 0x5267, 0x3663,
1160 0x4b4a, 0x485d, 0x5266, 0x345e, 0x5261, 0x5262, 0x5264, 0x5265,
1161 0x355b, 0x3f61, 0x4a2d, 0x5263, 0x525f, 0x3863, 0x5260, 0x4f24,
1162 0x4a72, 0x4468, 0x3862, 0x3970, 0x5268, 0x465d, 0x526c, 0x3c7e,
1163 0x3c76, 0x526f, 0x526d, 0x4c23, 0x526a, 0x5273, 0x526e, 0x5271,
1164 0x3846, 0x4c3f, 0x5272, 0x5274, 0x5276, 0x3a70, 0x4f42, 0x526b,
1165 0x5269, 0x5275, 0x5270, 0x5278, 0x5323, 0x527a, 0x527e, 0x5321,
1166 0x527b, 0x533e, 0x3a69, 0x3331, 0x5279, 0x5325, 0x3076, 0x5324,
1167 0x3025, 0x494a, 0x5322, 0x527c, 0x5277, 0x527d, 0x3a48, 0x5326,
1168 0x3077, 0x532f, 0x5327, 0x5328, 0x3e25, 0x4b69, 0x532d, 0x532c,
1169 0x452f, 0x532e, 0x532b, 0x3134, 0x3a36, 0x3f30, 0x5329, 0x4562,
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1344 0x4347, 0x3b5b, 0x3f37, 0x5a52, 0x4a7d, 0x3177, 0x3b5c, 0x5a55,  
1345 0x5a53, 0x5a56, 0x4e39, 0x5a54, 0x407b, 0x5a57, 0x4232, 0x5a58,  
1346 0x347a, 0x5a5a, 0x5a59, 0x5a5b, 0x5a5c, 0x347b, 0x467c, 0x4336,  
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1353 0x4961, 0x374a, 0x5a72, 0x4032, 0x3e3d, 0x4352, 0x3647, 0x5a73,  
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1355 0x5a78, 0x5a79, 0x442a, 0x4e71, 0x3b43, 0x4a6b, 0x4b3d, 0x5b22,  
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1882 0x2358, 0x2359, 0x235a, 0x214e, 0x214f, 0x2130, 0x2132, 0x212e,
1883 0x2361, 0x2362, 0x2363, 0x2364, 0x2365, 0x2366, 0x2367, 0x2368,
1884 0x2369, 0x236a, 0x236b, 0x236c, 0x236d, 0x236e, 0x236f, 0x2370,
1885 0x2371, 0x2372, 0x2373, 0x2374, 0x2375, 0x2376, 0x2377, 0x2378,
1886 0x2379, 0x237a, 0x2150, 0x2143, 0x2151, 0x2131, 0x216f,
1887 };
1888
1889 static const Summary16 jisx0208_uni2indx_page00[16] = {
1890     /* 0x0000 */
1891     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 },
1892     { 0, 0x0000 }, { 0, 0x1000 }, { 1, 0x0000 }, { 1, 0x0000 },
1893     { 1, 0x0000 }, { 1, 0x0000 }, { 1, 0x118c }, { 6, 0x0053 },
1894     { 10, 0x0000 }, { 10, 0x0080 }, { 11, 0x0000 }, { 11, 0x0080 },
1895 };
1896 static const Summary16 jisx0208_uni2indx_page03[22] = {
1897     /* 0x0300 */
1898     { 12, 0x0000 }, { 12, 0x0000 }, { 12, 0x0000 }, { 12, 0x0000 },
1899     { 12, 0x0000 }, { 12, 0x0000 }, { 12, 0x0000 }, { 12, 0x0000 },
1900     { 12, 0x0000 }, { 12, 0xffff }, { 27, 0x03fb }, { 36, 0xffff },
1901     { 51, 0x03fb }, { 60, 0x0000 }, { 60, 0x0000 }, { 60, 0x0000 },
1902     /* 0x0400 */
1903     { 60, 0x0002 }, { 61, 0xffff }, { 77, 0xffff }, { 93, 0xffff },
1904     { 109, 0xffff }, { 125, 0x0002 },
1905 };
1906 static const Summary16 jisx0208_uni2indx_page20[50] = {
1907     /* 0x2000 */
1908     { 126, 0x0000 }, { 126, 0x3361 }, { 133, 0x0063 }, { 137, 0x080d },
1909     { 141, 0x0000 }, { 141, 0x0000 }, { 141, 0x0000 }, { 141, 0x0000 },
1910     { 141, 0x0000 }, { 141, 0x0000 }, { 141, 0x0000 }, { 141, 0x0000 },
1911     { 141, 0x0000 }, { 141, 0x0000 }, { 141, 0x0000 }, { 141, 0x0000 },
1912     /* 0x2100 */
1913     { 141, 0x0008 }, { 142, 0x0000 }, { 142, 0x0800 }, { 143, 0x0000 },
1914     { 143, 0x0000 }, { 143, 0x0000 }, { 143, 0x0000 }, { 143, 0x0000 },
1915     { 143, 0x0000 }, { 143, 0x000f }, { 147, 0x0000 }, { 147, 0x0000 },
1916     { 147, 0x0000 }, { 147, 0x0014 }, { 149, 0x0000 }, { 149, 0x0000 },
1917     /* 0x2200 */
1918     { 149, 0x098d }, { 155, 0x6404 }, { 159, 0x1f81 }, { 166, 0x2030 },
1919     { 169, 0x0000 }, { 169, 0x0004 }, { 170, 0x0cc3 }, { 176, 0x0000 },
1920     { 176, 0x00cc }, { 180, 0x0000 }, { 180, 0x0020 }, { 181, 0x0000 },
1921     { 181, 0x0000 }, { 181, 0x0000 }, { 181, 0x0000 }, { 181, 0x0000 },
1922     /* 0x2300 */
1923     { 181, 0x0000 }, { 181, 0x0004 },
1924 };
1925 static const Summary16 jisx0208_uni2indx_page25[23] = {
1926     /* 0x2500 */
1927     { 182, 0x900f }, { 188, 0x3999 }, { 196, 0x9939 }, { 204, 0x9999 },
1928     { 212, 0x0804 }, { 214, 0x0000 }, { 214, 0x0000 }, { 214, 0x0000 },
1929     { 214, 0x0000 }, { 214, 0x0000 }, { 214, 0x0003 }, { 216, 0x300c },
1930     { 220, 0xc8c0 }, { 225, 0x0000 }, { 225, 0x8000 }, { 226, 0x0000 },
1931     /* 0x2600 */
1932     { 226, 0x0060 }, { 228, 0x0000 }, { 228, 0x0000 }, { 228, 0x0000 },
1933     { 228, 0x0005 }, { 230, 0x0000 }, { 230, 0xa400 },
1934 };
1935 static const Summary16 jisx0208_uni2indx_page30[16] = {
1936     /* 0x3000 */
1937     { 233, 0xffef }, { 248, 0x103f }, { 255, 0x0000 }, { 255, 0x0000 },
1938     { 255, 0xffff }, { 270, 0xffff }, { 286, 0xffff }, { 302, 0xffff },
1939     { 318, 0xffff }, { 334, 0x780f }, { 342, 0xffff }, { 357, 0xffff },
1940     { 373, 0xffff }, { 389, 0xffff }, { 405, 0xffff }, { 421, 0x787f },
1941 };
1942 static const Summary16 jisx0208_uni2indx_page4e[1307] = {
1943     /* 0x4e00 */
1944     { 432, 0x6f8b }, { 442, 0x43f3 }, { 451, 0x2442 }, { 455, 0x9b46 },
1945     { 463, 0xe82c }, { 470, 0xe3e0 }, { 478, 0x0004 }, { 479, 0x400a },
1946     { 482, 0x5f65 }, { 492, 0xdb36 }, { 502, 0x7977 }, { 513, 0x0449 },
1947     { 517, 0xecd7 }, { 528, 0xe3f0 }, { 537, 0x6038 }, { 542, 0x08c5 },
1948     /* 0x4f00 */
1949     { 547, 0xe602 }, { 553, 0x3403 }, { 558, 0x8000 }, { 559, 0x3551 },
1950     { 566, 0xe0c8 }, { 572, 0x7eab }, { 583, 0x8200 }, { 585, 0x9869 },
1951     { 592, 0xa948 }, { 598, 0x2942 }, { 603, 0xe803 }, { 609, 0x8060 },
1952     { 612, 0x441c }, { 617, 0xad93 }, { 626, 0xc03a }, { 632, 0x4568 },
1953     /* 0x5000 */
1954     { 638, 0xaa60 }, { 644, 0x8656 }, { 651, 0x3f7a }, { 662, 0x0240 },
1955     { 664, 0x8388 }, { 669, 0x1461 }, { 674, 0x1020 }, { 676, 0x2174 },
1956     { 682, 0x2021 }, { 685, 0x0702 }, { 689, 0x3000 }, { 691, 0x40bc },
1957     { 697, 0xa624 }, { 703, 0x4462 }, { 708, 0x60a8 }, { 713, 0x0a20 },
1958     /* 0x5100 */
1959     { 716, 0x0217 }, { 721, 0x8574 }, { 728, 0x0402 }, { 730, 0x9c84 },

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1961 { 769, 0xb665 }, { 778, 0x02ef }, { 786, 0x1f75 }, { 796, 0x20ff },
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1963 /* 0x5200 */
1964 { 832, 0x4dd9 }, { 841, 0x2092 }, { 845, 0x46b0 }, { 851, 0x0fc9 },
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1967 { 908, 0x22aa }, { 914, 0xe3a4 }, { 922, 0x00dd }, { 928, 0xc72c },
1968 /* 0x5300 */
1969 { 936, 0xa166 }, { 943, 0x26e1 }, { 950, 0x840b }, { 955, 0x8f0a },
1970 { 962, 0x27eb }, { 972, 0x559e }, { 981, 0xc241 }, { 986, 0x89bb },
1971 { 995, 0x0014 }, { 997, 0x8540 }, { 1001, 0x6361 }, { 1008, 0x0849 },
1972 { 1012, 0x7f0c }, { 1021, 0x8ad0 }, { 1027, 0xff3e }, { 1040, 0x05cf },
1973 /* 0x5400 */
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1977 { 1120, 0x0397 }, { 1127, 0x0100 }, { 1128, 0x6366 }, { 1136, 0x2404 },
1978 /* 0x5500 */
1979 { 1139, 0x80d0 }, { 1143, 0x0051 }, { 1146, 0xc000 }, { 1148, 0x430a },
1980 { 1153, 0x9071 }, { 1159, 0x30c8 }, { 1164, 0x0008 }, { 1165, 0x5800 },
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1982 { 1191, 0x00b0 }, { 1194, 0x9410 }, { 1198, 0x0018 }, { 1200, 0x6280 },
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1984 { 1204, 0x0240 }, { 1206, 0x09d0 }, { 1211, 0x8200 }, { 1213, 0x0156 },
1985 { 1218, 0x5004 }, { 1221, 0x0801 }, { 1223, 0x1d10 }, { 1228, 0x0510 },
1986 { 1231, 0x84c1 }, { 1236, 0x0010 }, { 1237, 0x4025 }, { 1241, 0x1050 },
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1990 { 1289, 0xc485 }, { 1295, 0x0003 }, { 1297, 0x0652 }, { 1302, 0x8000 },
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1992 { 1315, 0x4849 }, { 1320, 0x905c }, { 1326, 0x0009 }, { 1328, 0x1690 },
1993 /* 0x5800 */
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1995 { 1352, 0x0c03 }, { 1356, 0x4796 }, { 1364, 0x0a04 }, { 1367, 0x4225 },
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1997 { 1387, 0x14a2 }, { 1392, 0xd3aa }, { 1401, 0xd830 }, { 1407, 0x3e87 },
1998 /* 0x5900 */
1999 { 1416, 0x8604 }, { 1420, 0x1f61 }, { 1428, 0x7ea4 }, { 1437, 0x4186 },
2000 { 1442, 0xc390 }, { 1448, 0x05b3 }, { 1455, 0x57a5 }, { 1464, 0x2118 },
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2013 /* 0x5c00 */
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2023 /* 0x5e00 */
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2025 { 1829, 0x50b9 }, { 1836, 0x80b0 }, { 1840, 0x001e }, { 1844, 0xff7c },
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2027 { 1877, 0x870e }, { 1884, 0xac49 }, { 1891, 0x130f }, { 1898, 0xdddb },
2028 /* 0x5f00 */
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2030 { 1941, 0x5502 }, { 1946, 0x32ca }, { 1953, 0x3e46 }, { 1961, 0x928b },
2031 { 1968, 0x1dbf }, { 1979, 0x438f }, { 1987, 0x6703 }, { 1994, 0x3218 },
2032 { 1999, 0x3028 }, { 2003, 0x33c0 }, { 2009, 0x0811 }, { 2012, 0xa923 },
2033 /* 0x6000 */
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2035 { 2041, 0x2c4e }, { 2048, 0x8625 }, { 2054, 0xbf3d }, { 2066, 0x00a1 },
2036 { 2069, 0x3a1a }, { 2076, 0x8cd4 }, { 2083, 0x06c9 }, { 2089, 0x317c },
2037 { 2097, 0x00e0 }, { 2100, 0x950a }, { 2106, 0x018b }, { 2111, 0x0edb },
2038 /* 0x6100 */
2039 { 2120, 0xe34b }, { 2129, 0x8c20 }, { 2133, 0x1182 }, { 2137, 0xf010 },
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2041 { 2174, 0x4484 }, { 2178, 0x0653 }, { 2184, 0x5a90 }, { 2190, 0x4444 },
2042 { 2194, 0x3fc8 }, { 2203, 0x0001 }, { 2204, 0x0048 }, { 2206, 0xf5d4 },
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2046 { 2268, 0x061d }, { 2274, 0x59fe }, { 2285, 0x1800 }, { 2287, 0x3a22 },
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2048 /* 0x6300 */
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2050 { 2344, 0xb200 }, { 2348, 0x10a1 }, { 2352, 0x4b80 }, { 2357, 0x0cc4 },
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2058 /* 0x6500 */
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2062 { 2543, 0x987a }, { 2551, 0x0a84 }, { 2555, 0x33e7 }, { 2565, 0x0c02 },
2063 /* 0x6600 */
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2067 { 2635, 0x0292 }, { 2639, 0x3640 }, { 2644, 0x0241 }, { 2647, 0xf3bd },
2068 /* 0x6700 */
2069 { 2659, 0xab09 }, { 2666, 0xe8f0 }, { 2674, 0x7dc0 }, { 2682, 0xa5d2 },
2070 { 2690, 0xc242 }, { 2695, 0xd24b }, { 2703, 0xa43f }, { 2712, 0xd0af },
2071 { 2721, 0x1aa0 }, { 2726, 0x34a1 }, { 2732, 0x8247 }, { 2738, 0x03d8 },
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2308  /* 0x9700 */
2309  { 6263, 0xe5d1 }, { 6272, 0x524a }, { 6278, 0x0490 }, { 6281, 0x6305 },
2310  { 6287, 0x0354 }, { 6292, 0x5244 }, { 6297, 0x2b57 }, { 6306, 0x1612 },
2311  { 6311, 0xa872 }, { 6318, 0x1101 }, { 6321, 0x2949 }, { 6327, 0x0018 },
2312  { 6329, 0x0948 }, { 6333, 0x1008 }, { 6335, 0x6000 }, { 6337, 0x886c },
2313  /* 0x9800 */
2314  { 6343, 0x916e }, { 6351, 0x058f }, { 6358, 0x3012 }, { 6362, 0x3990 },
2315  { 6368, 0xf840 }, { 6374, 0x4930 }, { 6379, 0x8880 }, { 6382, 0x001b },
2316  { 6386, 0x0000 }, { 6386, 0x0000 }, { 6386, 0x8500 }, { 6389, 0x0042 },
2317  { 6391, 0x0058 }, { 6394, 0x9800 }, { 6397, 0xea04 }, { 6403, 0x7014 },
2318  /* 0x9900 */
2319  { 6408, 0x1628 }, { 6413, 0x611d }, { 6420, 0x5113 }, { 6426, 0x6000 },
2320  { 6428, 0x1a24 }, { 6433, 0x00a7 }, { 6438, 0x0000 }, { 6438, 0x0000 },
2321  { 6438, 0x0000 }, { 6438, 0x03c0 }, { 6442, 0x7120 }, { 6447, 0x1018 },
2322  { 6450, 0x0172 }, { 6455, 0xa927 }, { 6463, 0x6004 }, { 6466, 0x8906 },
2323  /* 0x9a00 */
2324  { 6471, 0xc022 }, { 6475, 0x020c }, { 6478, 0x0900 }, { 6480, 0x4081 },
2325  { 6483, 0x202d }, { 6488, 0x8ca0 }, { 6493, 0x0e34 }, { 6499, 0x0000 },
2326  { 6499, 0x0000 }, { 6499, 0x0000 }, { 6499, 0x2100 }, { 6501, 0x1101 },
2327  { 6504, 0x8011 }, { 6507, 0xc11a }, { 6513, 0xec4c }, { 6521, 0x0892 },
2328  /* 0x9b00 */
2329  { 6525, 0x0040 }, { 6526, 0x8500 }, { 6529, 0xc7ac }, { 6538, 0x1806 },
2330  { 6542, 0xe03e }, { 6550, 0x0512 }, { 6554, 0x8000 }, { 6555, 0x0010 },
2331  { 6556, 0x4008 }, { 6558, 0x80ce }, { 6564, 0x6d01 }, { 6570, 0x0210 },
2332  { 6572, 0x8641 }, { 6577, 0x0856 }, { 6582, 0x011e }, { 6587, 0x0027 },
2333  /* 0x9c00 */
2334  { 6591, 0x3750 }, { 6598, 0x083d }, { 6604, 0xe032 }, { 6610, 0x4e05 },
2335  { 6616, 0x01c0 }, { 6619, 0x0484 }, { 6622, 0x0081 }, { 6624, 0x0140 },
2336  { 6626, 0x0000 }, { 6626, 0x0000 }, { 6626, 0x0000 }, { 6626, 0x0000 },
2337  { 6626, 0x0000 }, { 6626, 0x0000 }, { 6626, 0x1aa0 }, { 6631, 0x0059 },
2338  /* 0x9d00 */
2339  { 6635, 0x43c8 }, { 6641, 0x8824 }, { 6645, 0x1d48 }, { 6651, 0xc800 },
2340  { 6654, 0x0152 }, { 6658, 0x7203 }, { 6664, 0x9013 }, { 6669, 0x0404 },
2341  { 6671, 0x8280 }, { 6674, 0x0400 }, { 6675, 0x8a10 }, { 6679, 0x0d14 },
2342  { 6684, 0x8056 }, { 6689, 0x0208 }, { 6691, 0xa040 }, { 6694, 0x2704 },
2343  /* 0x9e00 */
2344  { 6699, 0x0000 }, { 6699, 0x4c00 }, { 6702, 0x0000 }, { 6702, 0x0000 },
2345  { 6702, 0x0000 }, { 6702, 0x0000 }, { 6702, 0x0000 }, { 6702, 0xa320 },
2346  { 6707, 0x1902 }, { 6711, 0xa0ae }, { 6718, 0x2660 }, { 6723, 0xdf00 },
2347  { 6730, 0xf010 }, { 6735, 0x7b15 }, { 6744, 0x8121 }, { 6748, 0x3ad0 },
2348  /* 0x9f00 */
2349  { 6755, 0x4180 }, { 6758, 0x0028 }, { 6760, 0x1003 }, { 6763, 0x4800 },
2350  { 6765, 0xcc00 }, { 6769, 0x8014 }, { 6772, 0x14cf }, { 6780, 0x00c4 },
2351  { 6783, 0x2000 }, { 6784, 0x3020 }, { 6787, 0x0001 },
2352 };
2353 static const Summary16 jisx0208_uni2indx_pageff[15] = {
2354  /* 0xff00 */
2355  { 6788, 0xdf7a }, { 6800, 0xffff }, { 6816, 0xffff }, { 6832, 0xefff },
2356  { 6847, 0xffff }, { 6863, 0x3fff }, { 6877, 0x0000 }, { 6877, 0x0000 },
2357  { 6877, 0x0000 }, { 6877, 0x0000 }, { 6877, 0x0000 }, { 6877, 0x0000 },
2358  { 6877, 0x0000 }, { 6877, 0x0000 }, { 6877, 0x0028 },
2359 };
2360
2361 static int
2362 jisx0208_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
2363 {
2364     (void) conv;
2365     if (n >= 2) {
2366         const Summary16 *summary = NULL;
2367         if (wc < 0x0100)
2368             summary = &jisx0208_uni2indx_page00[(wc>>4)];
2369         else if (wc >= 0x0300 && wc < 0x0460)
2370             summary = &jisx0208_uni2indx_page03[(wc>>4)-0x030];
2371         else if (wc >= 0x2000 && wc < 0x2320)
2372             summary = &jisx0208_uni2indx_page20[(wc>>4)-0x200];
2373         else if (wc >= 0x2500 && wc < 0x2670)
2374             summary = &jisx0208_uni2indx_page25[(wc>>4)-0x250];
2375         else if (wc >= 0x3000 && wc < 0x3100)
2376             summary = &jisx0208_uni2indx_page30[(wc>>4)-0x300];
2377         else if (wc >= 0x4e00 && wc < 0x9fb0)
2378             summary = &jisx0208_uni2indx_page4e[(wc>>4)-0x4e0];
2379         else if (wc >= 0xff00 && wc < 0xffff)
2380             summary = &jisx0208_uni2indx_pageff[(wc>>4)-0xff0];
2381         if (summary) {
2382             unsigned short used = summary->used;
2383             unsigned int i = wc & 0x0f;
2384             if (used & ((unsigned short) 1 << i)) {
2385                 unsigned short c;
2386                 /* Keep in 'used' only the bits 0..i-1. */
2387                 used &= ((unsigned short) 1 << i) - 1;
2388                 /* Add 'summary->indx' and the number of bits set in 'used'. */
2389                 used = (used & 0x5555) + ((used & 0xaaaa) >> 1);
2390                 used = (used & 0x3333) + ((used & 0xcccc) >> 2);
2391                 used = (used & 0x0f0f) + ((used & 0xf0f0) >> 4);
2392                 used = (used & 0x00ff) + ((used >> 8);
2393                 c = jisx0208_2charset[summary->indx + used];
2394                 r[0] = (c >> 8); r[1] = (c & 0xff);

```

```

2395         return 2;
2396     }
2397 }
2398 return RET_ILSEQ;
2399 }
2400 return RET_TOOSMALL;
2401 }
2402 #endif /* NEED_TOMB */

```

## 34.286 jisx0212.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/jisx0212.h,v 1.5 2003/05/27 22:26:31 tsi Exp $ */
2
3 /*
4  * JISX0212.1990-0
5  */
6 #ifndef NEED_TOWC
7
8 static const unsigned short jisx0212_2uni_page22[81] = {
9     /* 0x22 */
10    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
11    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0x02d8, 0x02c7,
12    0x00b8, 0x02d9, 0x02dd, 0x00af, 0x02db, 0x02da, 0x007e, 0x0384,
13    0x0385, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
14    0xffff, 0x00a1, 0x00a6, 0x00bf, 0xffff, 0xffff, 0xffff, 0xffff,
15    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
16    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
17    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
18    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
19    0xffff, 0xffff, 0x00ba, 0x00aa, 0x00a9, 0x00ae, 0x2122, 0x00a4,
20    0x2116,
21 };
22 static const unsigned short jisx0212_2uni_page26[188] = {
23     /* 0x26 */
24    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
25    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
26    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
27    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
28    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
29    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
30    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
31    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
32    0x0386, 0x0388, 0x0389, 0x038a, 0x03aa, 0xffff, 0x038c, 0xffff,
33    0x038e, 0x03ab, 0xffff, 0x038f, 0xffff, 0xffff, 0xffff, 0xffff,
34    0x03ac, 0x03ad, 0x03ae, 0x03af, 0x03ca, 0x0390, 0x03cc, 0x03c2,
35    0x03cd, 0x03cb, 0x03b0, 0x03ce, 0xffff, 0xffff,
36     /* 0x27 */
37    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
38    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
39    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
40    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
41    0xffff, 0x0402, 0x0403, 0x0404, 0x0405, 0x0406, 0x0407, 0x0408,
42    0x0409, 0x040a, 0x040b, 0x040c, 0x040e, 0x040f, 0xffff, 0xffff,
43    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
44    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
45    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
46    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
47    0xffff, 0x0452, 0x0453, 0x0454, 0x0455, 0x0456, 0x0457, 0x0458,
48    0x0459, 0x045a, 0x045b, 0x045c, 0x045e, 0x045f,
49 };
50 static const unsigned short jisx0212_2uni_page29[275] = {
51     /* 0x29 */
52    0x00c6, 0x0110, 0xffff, 0x0126, 0xffff, 0x0132, 0xffff, 0x0141,
53    0x013f, 0xffff, 0x014a, 0x00d8, 0x0152, 0xffff, 0x0166, 0x00de,
54    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
55    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
56    0x00e6, 0x0111, 0x00f0, 0x0127, 0x0131, 0x0133, 0x0138, 0x0142,
57    0x0140, 0x0149, 0x014b, 0x00f8, 0x0153, 0x00df, 0x0167, 0x00fe,
58    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
59    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
60    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
61    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
62    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
63    0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
64     /* 0x2a */
65    0x00c1, 0x00c0, 0x00c4, 0x00c2, 0x0102, 0x01cd, 0x0100, 0x0104,
66    0x00c5, 0x00c3, 0x0106, 0x0108, 0x010c, 0x00c7, 0x010a, 0x010e,
67    0x00c9, 0x00c8, 0x00cb, 0x00ca, 0x011a, 0x0116, 0x0112, 0x0118,
68    0xffff, 0x011c, 0x011e, 0x0122, 0x0120, 0x0124, 0x00cd, 0x00cc,
69    0x00cf, 0x00ce, 0x01cf, 0x0130, 0x012a, 0x012e, 0x0128, 0x0134,
70    0x0136, 0x0139, 0x013d, 0x013b, 0x0143, 0x0147, 0x0145, 0x00d1,
71    0x00d3, 0x00d2, 0x00d6, 0x00d4, 0x01d1, 0x0150, 0x014c, 0x00d5,
72    0x0154, 0x0158, 0x0156, 0x015a, 0x015c, 0x0160, 0x015e, 0x0164,
73    0x0162, 0x00da, 0x00d9, 0x00dc, 0x00db, 0x016c, 0x01d3, 0x0170,
74    0x016a, 0x0172, 0x016e, 0x0168, 0x01d7, 0x01db, 0x01d9, 0x01d5,

```

```
75 0x0174, 0x00dd, 0x0178, 0x0176, 0x0179, 0x017d, 0x017b, 0xffff,
76 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
77 /* 0x2b */
78 0x00e1, 0x00e0, 0x00e4, 0x00e2, 0x0103, 0x01ce, 0x0101, 0x0105,
79 0x00e5, 0x00e3, 0x0107, 0x0109, 0x010d, 0x00e7, 0x010b, 0x010f,
80 0x00e9, 0x00e8, 0x00eb, 0x00ea, 0x011b, 0x0117, 0x0113, 0x0119,
81 0x01f5, 0x011d, 0x011f, 0xffff, 0x0121, 0x0125, 0x00ed, 0x00ec,
82 0x00ef, 0x00ee, 0x01d0, 0xffff, 0x012b, 0x012f, 0x0129, 0x0135,
83 0x0137, 0x013a, 0x013e, 0x013c, 0x0144, 0x0148, 0x0146, 0x00f1,
84 0x00f3, 0x00f2, 0x00f6, 0x00f4, 0x01d2, 0x0151, 0x014d, 0x00f5,
85 0x0155, 0x0159, 0x0157, 0x015b, 0x015d, 0x0161, 0x015f, 0x0165,
86 0x0163, 0x00fa, 0x00f9, 0x00fc, 0x00fb, 0x016d, 0x01d4, 0x0171,
87 0x016b, 0x0173, 0x016f, 0x0169, 0x01d8, 0x01dc, 0x01da, 0x01d6,
88 0x0175, 0x00fd, 0x00ff, 0x0177, 0x017a, 0x017e, 0x017c,
89 };
90 static const unsigned short jisx0212_2uni_page30[5801] = {
91 /* 0x30 */
92 0x4e02, 0x4e04, 0x4e05, 0x4e0c, 0x4e12, 0x4e1f, 0x4e23, 0x4e24,
93 0x4e28, 0x4e2b, 0x4e2e, 0x4e2f, 0x4e30, 0x4e35, 0x4e40, 0x4e41,
94 0x4e44, 0x4e47, 0x4e51, 0x4e5a, 0x4e5c, 0x4e63, 0x4e68, 0x4e69,
95 0x4e74, 0x4e75, 0x4e79, 0x4e7f, 0x4e8d, 0x4e96, 0x4e97, 0x4e9d,
96 0x4eaf, 0x4eb9, 0x4ec3, 0x4ed0, 0x4eda, 0x4edb, 0x4ee0, 0x4ee1,
97 0x4ee2, 0x4ee8, 0x4eef, 0x4ef1, 0x4ef3, 0x4ef5, 0x4efd, 0x4efe,
98 0x4eff, 0x4f00, 0x4f02, 0x4f03, 0x4f08, 0x4f0b, 0x4f0c, 0x4f12,
99 0x4f15, 0x4f16, 0x4f17, 0x4f19, 0x4f2e, 0x4f31, 0x4f60, 0x4f33,
100 0x4f35, 0x4f37, 0x4f39, 0x4f3b, 0x4f3e, 0x4f40, 0x4f42, 0x4f48,
101 0x4f49, 0x4f4b, 0x4f4c, 0x4f52, 0x4f54, 0x4f56, 0x4f58, 0x4f5f,
102 0x4f63, 0x4f6a, 0x4f6c, 0x4f6e, 0x4f71, 0x4f77, 0x4f78, 0x4f79,
103 0x4f7a, 0x4f7d, 0x4f7e, 0x4f81, 0x4f82, 0x4f84,
104 /* 0x31 */
105 0x4f85, 0x4f89, 0x4f8a, 0x4f8c, 0x4f8e, 0x4f90, 0x4f92, 0x4f93,
106 0x4f94, 0x4f97, 0x4f99, 0x4f9a, 0x4f9e, 0x4f9f, 0x4fb2, 0x4fb7,
107 0x4fb9, 0x4fbb, 0x4fbc, 0x4fbd, 0x4fbe, 0x4fc0, 0x4fc1, 0x4fc5,
108 0x4fc6, 0x4fc8, 0x4fc9, 0x4fcb, 0x4fcc, 0x4fcd, 0x4fcf, 0x4fd2,
109 0x4fdc, 0x4fe0, 0x4fe2, 0x4ff0, 0x4ff2, 0x4ffc, 0x4ffd, 0x4fff,
110 0x5000, 0x5001, 0x5004, 0x5007, 0x500a, 0x500c, 0x500e, 0x5010,
111 0x5013, 0x5017, 0x5018, 0x501b, 0x501c, 0x501d, 0x501e, 0x5022,
112 0x5027, 0x502e, 0x5030, 0x5032, 0x5033, 0x5035, 0x5040, 0x5041,
113 0x5042, 0x5045, 0x5046, 0x504a, 0x504c, 0x504e, 0x5051, 0x5052,
114 0x5053, 0x5057, 0x5059, 0x505f, 0x5060, 0x5062, 0x5063, 0x5066,
115 0x5067, 0x506a, 0x506d, 0x5070, 0x5071, 0x503b, 0x5081, 0x5083,
116 0x5084, 0x5086, 0x508a, 0x508e, 0x508f, 0x5090,
117 /* 0x32 */
118 0x5092, 0x5093, 0x5094, 0x5096, 0x509b, 0x509c, 0x509e, 0x509f,
119 0x50a0, 0x50a1, 0x50a2, 0x50aa, 0x50af, 0x50b0, 0x50b9, 0x50ba,
120 0x50bd, 0x50c0, 0x50c3, 0x50c4, 0x50c7, 0x50cc, 0x50ce, 0x50d0,
121 0x50d3, 0x50d4, 0x50d8, 0x50dc, 0x50dd, 0x50df, 0x50e2, 0x50e4,
122 0x50e6, 0x50e8, 0x50e9, 0x50ef, 0x50f1, 0x50f6, 0x50fa, 0x50fe,
123 0x5103, 0x5106, 0x5107, 0x5108, 0x510b, 0x510c, 0x510d, 0x510e,
124 0x50f2, 0x5110, 0x5117, 0x5119, 0x511b, 0x511c, 0x511d, 0x511e,
125 0x5123, 0x5127, 0x5128, 0x512c, 0x512d, 0x512f, 0x5131, 0x5133,
126 0x5134, 0x5135, 0x5138, 0x5139, 0x5142, 0x514a, 0x514f, 0x5153,
127 0x5155, 0x5157, 0x5158, 0x515f, 0x5164, 0x5166, 0x517e, 0x5183,
128 0x5184, 0x518b, 0x518e, 0x5198, 0x519d, 0x51a1, 0x51a3, 0x51ad,
129 0x51b8, 0x51ba, 0x51bc, 0x51be, 0x51bf, 0x51c2,
130 /* 0x33 */
131 0x51c8, 0x51cf, 0x51d1, 0x51d2, 0x51d3, 0x51d5, 0x51d8, 0x51de,
132 0x51e2, 0x51e5, 0x51ee, 0x51f2, 0x51f3, 0x51f4, 0x51f7, 0x5201,
133 0x5202, 0x5205, 0x5212, 0x5213, 0x5215, 0x5216, 0x5218, 0x5222,
134 0x5228, 0x5231, 0x5232, 0x5235, 0x523c, 0x5245, 0x5249, 0x5255,
135 0x5257, 0x5258, 0x525a, 0x525c, 0x525f, 0x5260, 0x5261, 0x5266,
136 0x526e, 0x5277, 0x5278, 0x5279, 0x5280, 0x5282, 0x5285, 0x528a,
137 0x528c, 0x5293, 0x5295, 0x5296, 0x5297, 0x5298, 0x529a, 0x529c,
138 0x52a4, 0x52a5, 0x52a6, 0x52a7, 0x52af, 0x52b0, 0x52b6, 0x52b7,
139 0x52b8, 0x52ba, 0x52bb, 0x52bd, 0x52c0, 0x52c4, 0x52c6, 0x52c8,
140 0x52cc, 0x52cf, 0x52d1, 0x52d4, 0x52d6, 0x52db, 0x52dc, 0x52e1,
141 0x52e5, 0x52e8, 0x52e9, 0x52ea, 0x52ec, 0x52f0, 0x52f1, 0x52f4,
142 0x52f6, 0x52f7, 0x5300, 0x5303, 0x530a, 0x530b,
143 /* 0x34 */
144 0x530c, 0x5311, 0x5313, 0x5318, 0x531b, 0x531c, 0x531e, 0x531f,
145 0x5325, 0x5327, 0x5328, 0x5329, 0x532b, 0x532c, 0x532d, 0x5330,
146 0x5332, 0x5335, 0x533c, 0x533d, 0x533e, 0x5342, 0x534c, 0x534b,
147 0x5359, 0x535b, 0x5361, 0x5363, 0x5365, 0x536c, 0x536d, 0x5372,
148 0x5379, 0x537e, 0x5383, 0x5387, 0x5388, 0x538e, 0x5393, 0x5394,
149 0x5399, 0x539d, 0x53a1, 0x53a4, 0x53aa, 0x53ab, 0x53af, 0x53b2,
150 0x53b4, 0x53b5, 0x53b7, 0x53b8, 0x53ba, 0x53bd, 0x53c0, 0x53c5,
151 0x53cf, 0x53d2, 0x53d3, 0x53d5, 0x53da, 0x53dd, 0x53de, 0x53e0,
152 0x53e6, 0x53e7, 0x53f5, 0x5402, 0x5413, 0x541a, 0x5421, 0x5427,
153 0x5428, 0x542a, 0x542f, 0x5431, 0x5434, 0x5435, 0x5443, 0x5444,
154 0x5447, 0x544d, 0x544f, 0x545e, 0x5462, 0x5464, 0x5466, 0x5467,
155 0x5469, 0x546b, 0x546d, 0x546e, 0x5474, 0x547f,
156 /* 0x35 */
157 0x5481, 0x5483, 0x5485, 0x5488, 0x5489, 0x548d, 0x5491, 0x5495,
158 0x5496, 0x549c, 0x549f, 0x54a1, 0x54a6, 0x54a7, 0x54a9, 0x54aa,
159 0x54ad, 0x54ae, 0x54b1, 0x54b7, 0x54b9, 0x54ba, 0x54bb, 0x54bf,
160 0x54c6, 0x54ca, 0x54cd, 0x54ce, 0x54e0, 0x54ea, 0x54ec, 0x54ef,
161 0x54f6, 0x54fc, 0x54fe, 0x54ff, 0x5500, 0x5501, 0x5505, 0x5508,
```

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162 0x5509, 0x550c, 0x550d, 0x550e, 0x5515, 0x552a, 0x552b, 0x5532,
163 0x5535, 0x5536, 0x553b, 0x553c, 0x553d, 0x5541, 0x5547, 0x5549,
164 0x554a, 0x554d, 0x5550, 0x5551, 0x5558, 0x555a, 0x555b, 0x555e,
165 0x5560, 0x5561, 0x5564, 0x5566, 0x557f, 0x5581, 0x5582, 0x5586,
166 0x5588, 0x558e, 0x558f, 0x5591, 0x5592, 0x5593, 0x5594, 0x5597,
167 0x55a3, 0x55a4, 0x55ad, 0x55b2, 0x55bf, 0x55c1, 0x55c3, 0x55c6,
168 0x55c9, 0x55cb, 0x55cc, 0x55ce, 0x55d1, 0x55d2,
169 /* 0x36 */
170 0x55d3, 0x55d7, 0x55d8, 0x55db, 0x55de, 0x55e2, 0x55e9, 0x55f6,
171 0x55ff, 0x5605, 0x5608, 0x560a, 0x560d, 0x560e, 0x560f, 0x5610,
172 0x5611, 0x5612, 0x5619, 0x562c, 0x5630, 0x5633, 0x5635, 0x5637,
173 0x5639, 0x563b, 0x563c, 0x563d, 0x563f, 0x5640, 0x5641, 0x5643,
174 0x5644, 0x5646, 0x5649, 0x564b, 0x564d, 0x564f, 0x5654, 0x565e,
175 0x5660, 0x5661, 0x5662, 0x5663, 0x5666, 0x5669, 0x566d, 0x566f,
176 0x5671, 0x5672, 0x5675, 0x5684, 0x5685, 0x5688, 0x568b, 0x568c,
177 0x5695, 0x5699, 0x569a, 0x569d, 0x569e, 0x569f, 0x56a6, 0x56a7,
178 0x56a8, 0x56a9, 0x56ab, 0x56ac, 0x56ad, 0x56b1, 0x56b3, 0x56b7,
179 0x56be, 0x56c5, 0x56c9, 0x56ca, 0x56cb, 0x56cf, 0x56d0, 0x56cc,
180 0x56cd, 0x56d9, 0x56dc, 0x56dd, 0x56df, 0x56e1, 0x56e4, 0x56e5,
181 0x56e6, 0x56e7, 0x56e8, 0x56f1, 0x56eb, 0x56ed,
182 /* 0x37 */
183 0x56f6, 0x56f7, 0x5701, 0x5702, 0x5707, 0x570a, 0x570c, 0x5711,
184 0x5715, 0x571a, 0x571b, 0x571d, 0x5720, 0x5722, 0x5723, 0x5724,
185 0x5725, 0x5729, 0x572a, 0x572c, 0x572e, 0x572f, 0x5733, 0x5734,
186 0x573d, 0x573e, 0x573f, 0x5745, 0x5746, 0x574c, 0x574d, 0x5752,
187 0x5762, 0x5765, 0x5767, 0x5768, 0x576b, 0x576d, 0x576e, 0x576f,
188 0x5770, 0x5771, 0x5773, 0x5774, 0x5775, 0x5777, 0x5779, 0x577a,
189 0x577b, 0x577c, 0x577e, 0x5781, 0x5783, 0x578c, 0x5794, 0x5797,
190 0x5799, 0x579a, 0x579c, 0x579d, 0x579e, 0x579f, 0x57a1, 0x5795,
191 0x57a7, 0x57a8, 0x57a9, 0x57ac, 0x57b8, 0x57bd, 0x57c7, 0x57c8,
192 0x57cc, 0x57cf, 0x57d5, 0x57dd, 0x57de, 0x57e4, 0x57e6, 0x57e7,
193 0x57e9, 0x57ed, 0x57f0, 0x57f5, 0x57f6, 0x57f8, 0x57fd, 0x57fe,
194 0x57ff, 0x5803, 0x5804, 0x5808, 0x5809, 0x57e1,
195 /* 0x38 */
196 0x580c, 0x580d, 0x581b, 0x581e, 0x581f, 0x5820, 0x5826, 0x5827,
197 0x582d, 0x5832, 0x583d, 0x5839, 0x583f, 0x5849, 0x584c, 0x584d, 0x584f,
198 0x5850, 0x5855, 0x585f, 0x5861, 0x5864, 0x5867, 0x5868, 0x5878,
199 0x587c, 0x587f, 0x5880, 0x5881, 0x5887, 0x5888, 0x5889, 0x588a,
200 0x588c, 0x588d, 0x588f, 0x5890, 0x5894, 0x5896, 0x589d, 0x58a0,
201 0x58a1, 0x58a2, 0x58a6, 0x58a9, 0x58b1, 0x58b2, 0x58c4, 0x58bc,
202 0x58c2, 0x58c8, 0x58cd, 0x58ce, 0x58d0, 0x58d2, 0x58d4, 0x58d6,
203 0x58da, 0x58dd, 0x58e1, 0x58e2, 0x58e9, 0x58f3, 0x5905, 0x5906,
204 0x590b, 0x590c, 0x5912, 0x5913, 0x5914, 0x8641, 0x591d, 0x5921,
205 0x5923, 0x5924, 0x5928, 0x592f, 0x5930, 0x5933, 0x5935, 0x5936,
206 0x593f, 0x5943, 0x5946, 0x5952, 0x5953, 0x5959, 0x595b, 0x595d,
207 0x595e, 0x595f, 0x5961, 0x5963, 0x596b, 0x596d,
208 /* 0x39 */
209 0x596f, 0x5972, 0x5975, 0x5976, 0x5979, 0x597b, 0x597c, 0x598b,
210 0x598c, 0x598e, 0x5992, 0x5995, 0x5997, 0x599f, 0x59a4, 0x59a7,
211 0x59ad, 0x59ae, 0x59af, 0x59b0, 0x59b3, 0x59b7, 0x59ba, 0x59bc,
212 0x59c1, 0x59c3, 0x59c4, 0x59c8, 0x59ca, 0x59cd, 0x59d2, 0x59dd,
213 0x59de, 0x59df, 0x59e3, 0x59e4, 0x59e7, 0x59ee, 0x59ef, 0x59f1,
214 0x59f2, 0x59f4, 0x59f7, 0x5a00, 0x5a04, 0x5a0c, 0x5a0d, 0x5a0e,
215 0x5a12, 0x5a13, 0x5a1e, 0x5a23, 0x5a24, 0x5a27, 0x5a28, 0x5a2a,
216 0x5a2d, 0x5a30, 0x5a44, 0x5a45, 0x5a47, 0x5a48, 0x5a4c, 0x5a50,
217 0x5a55, 0x5a5e, 0x5a63, 0x5a65, 0x5a67, 0x5a6d, 0x5a77, 0x5a7a,
218 0x5a7b, 0x5a7e, 0x5a8b, 0x5a90, 0x5a93, 0x5a96, 0x5a99, 0x5a9c,
219 0x5a9e, 0x5a9f, 0x5aa0, 0x5aa2, 0x5aa7, 0x5aac, 0x5ab1, 0x5ab2,
220 0x5ab3, 0x5ab5, 0x5ab8, 0x5aba, 0x5abb, 0x5abf,
221 /* 0x3a */
222 0x5ac4, 0x5ac6, 0x5ac8, 0x5acf, 0x5ada, 0x5adc, 0x5ae0, 0x5ae5,
223 0x5aea, 0x5aee, 0x5af5, 0x5af6, 0x5afd, 0x5b00, 0x5b01, 0x5b08,
224 0x5b17, 0x5b34, 0x5b3b, 0x5b19, 0x5b1b, 0x5b1d, 0x5b21, 0x5b25, 0x5b2d,
225 0x5b38, 0x5b41, 0x5b4b, 0x5b4c, 0x5b52, 0x5b56, 0x5b5e, 0x5b68,
226 0x5b6e, 0x5b6f, 0x5b7c, 0x5b7d, 0x5b7e, 0x5b7f, 0x5b81, 0x5b84,
227 0x5b86, 0x5b8a, 0x5b8e, 0x5b90, 0x5b91, 0x5b93, 0x5b94, 0x5b96,
228 0x5ba8, 0x5ba9, 0x5bac, 0x5bad, 0x5baf, 0x5bb1, 0x5bb2, 0x5bb7,
229 0x5bba, 0x5bbc, 0x5bc0, 0x5bc1, 0x5bcd, 0x5bcf, 0x5bd6, 0x5bd7,
230 0x5bd8, 0x5bd9, 0x5bda, 0x5be0, 0x5bef, 0x5bf1, 0x5bf4, 0x5bfd,
231 0x5c0c, 0x5c17, 0x5c1e, 0x5c1f, 0x5c23, 0x5c26, 0x5c29, 0x5c2b,
232 0x5c2c, 0x5c2e, 0x5c30, 0x5c32, 0x5c35, 0x5c36, 0x5c59, 0x5c5a,
233 0x5c5c, 0x5c62, 0x5c63, 0x5c67, 0x5c68, 0x5c69,
234 /* 0x3b */
235 0x5c6d, 0x5c70, 0x5c74, 0x5c75, 0x5c7a, 0x5c7b, 0x5c7c, 0x5c7d,
236 0x5c87, 0x5c88, 0x5c8a, 0x5c8f, 0x5c92, 0x5c9d, 0x5c9f, 0x5ca0,
237 0x5ca2, 0x5ca3, 0x5ca6, 0x5caa, 0x5cb2, 0x5cb3, 0x5cb5, 0x5cba,
238 0x5cc9, 0x5ccb, 0x5cd2, 0x5cdd, 0x5cd7, 0x5cee, 0x5cf1, 0x5cf2,
239 0x5cf4, 0x5d01, 0x5d06, 0x5d0d, 0x5d12, 0x5d2b, 0x5d23, 0x5d24,
240 0x5d26, 0x5d27, 0x5d31, 0x5d34, 0x5d39, 0x5d3d, 0x5d3f, 0x5d42,
241 0x5d43, 0x5d46, 0x5d48, 0x5d55, 0x5d51, 0x5d59, 0x5d4a, 0x5d5f,
242 0x5d60, 0x5d61, 0x5d62, 0x5d64, 0x5d6a, 0x5d6d, 0x5d70, 0x5d79,
243 0x5d7a, 0x5d7e, 0x5d7f, 0x5d81, 0x5d83, 0x5d88, 0x5d8a, 0x5d92,
244 0x5d93, 0x5d94, 0x5d95, 0x5d99, 0x5d9b, 0x5d9f, 0x5da0, 0x5da7,
245 0x5dab, 0x5db0, 0x5db4, 0x5db8, 0x5db9, 0x5dc3, 0x5dc7, 0x5dcb,
246 0x5dd0, 0x5dce, 0x5dd8, 0x5dd9, 0x5de0, 0x5de4,
247 /* 0x3c */
248 0x5de9, 0x5df8, 0x5df9, 0x5e00, 0x5e07, 0x5e0d, 0x5e12, 0x5e14,

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```
249 0x5e15, 0x5e18, 0x5e1f, 0x5e20, 0x5e2e, 0x5e28, 0x5e32, 0x5e35,
250 0x5e3e, 0x5e4b, 0x5e50, 0x5e49, 0x5e51, 0x5e56, 0x5e58, 0x5e5b,
251 0x5e5c, 0x5e5e, 0x5e68, 0x5e6a, 0x5e6b, 0x5e6c, 0x5e6d, 0x5e6e,
252 0x5e70, 0x5e80, 0x5e8b, 0x5e8e, 0x5ea2, 0x5ea4, 0x5ea5, 0x5ea8,
253 0x5eaa, 0x5eac, 0x5eb1, 0x5eb3, 0x5ebd, 0x5ebe, 0x5ebf, 0x5ec6,
254 0x5ecc, 0x5ecb, 0x5f02, 0x5f06, 0x5f07, 0x5f08, 0x5f0e,
255 0x5ede, 0x5ee5, 0x5eeb, 0x5f02, 0x5f06, 0x5f07, 0x5f08, 0x5f0e,
256 0x5f19, 0x5f1c, 0x5f1d, 0x5f21, 0x5f22, 0x5f23, 0x5f24, 0x5f28,
257 0x5f2b, 0x5f2c, 0x5f2e, 0x5f30, 0x5f34, 0x5f36, 0x5f3b, 0x5f3d,
258 0x5f3f, 0x5f40, 0x5f44, 0x5f45, 0x5f47, 0x5f4d, 0x5f50, 0x5f54,
259 0x5f58, 0x5f5b, 0x5f60, 0x5f63, 0x5f64, 0x5f67,
260 /* 0x3d */
261 0x5f6f, 0x5f72, 0x5f74, 0x5f75, 0x5f78, 0x5f7a, 0x5f7d, 0x5f7e,
262 0x5f89, 0x5f8d, 0x5f8f, 0x5f96, 0x5f9c, 0x5f9d, 0x5fa2, 0x5fa7,
263 0x5fab, 0x5fa4, 0x5fac, 0x5faf, 0x5fb0, 0x5fb1, 0x5fb8, 0x5fc4,
264 0x5fc7, 0x5fc8, 0x5fc9, 0x5fcb, 0x5fd0, 0x5fd1, 0x5fd2, 0x5fd3,
265 0x5fd4, 0x5fde, 0x5fe1, 0x5fe2, 0x5fe8, 0x5fe9, 0x5fea, 0x5fec,
266 0x5fed, 0x5fee, 0x5fef, 0x5ff2, 0x5ff3, 0x5ff6, 0x5ffa, 0x5ffc,
267 0x6007, 0x600a, 0x600d, 0x6013, 0x6014, 0x6017, 0x6018, 0x601a,
268 0x601f, 0x6024, 0x602d, 0x6033, 0x6035, 0x6040, 0x6047, 0x6048,
269 0x6049, 0x604c, 0x6051, 0x6054, 0x6056, 0x6057, 0x605d, 0x6061,
270 0x6067, 0x6071, 0x607e, 0x607f, 0x6082, 0x6086, 0x6088, 0x608a,
271 0x608e, 0x6091, 0x6093, 0x6095, 0x6098, 0x609d, 0x609e, 0x60a2,
272 0x60a4, 0x60a5, 0x60a8, 0x60b0, 0x60b1, 0x60b7,
273 /* 0x3e */
274 0x60bb, 0x60be, 0x60c2, 0x60c4, 0x60c8, 0x60c9, 0x60ca, 0x60cb,
275 0x60ce, 0x60cf, 0x60d4, 0x60d5, 0x60d9, 0x60db, 0x60dd, 0x60de,
276 0x60e2, 0x60e5, 0x60f2, 0x60f5, 0x60f8, 0x60fc, 0x60fd, 0x6102,
277 0x6107, 0x610a, 0x610c, 0x6110, 0x6111, 0x6112, 0x6113, 0x6114,
278 0x6116, 0x6117, 0x6119, 0x611c, 0x611e, 0x6122, 0x612a, 0x612b,
279 0x6130, 0x6131, 0x6135, 0x6136, 0x6137, 0x6139, 0x6141, 0x6145,
280 0x6146, 0x6149, 0x615e, 0x6160, 0x616c, 0x6172, 0x6178, 0x617b,
281 0x617c, 0x617f, 0x6180, 0x6181, 0x6183, 0x6184, 0x618b, 0x618d,
282 0x6192, 0x6193, 0x6197, 0x6198, 0x619c, 0x619d, 0x619f, 0x61a0,
283 0x61a5, 0x61a8, 0x61aa, 0x61ad, 0x61b8, 0x61b9, 0x61bc, 0x61c0,
284 0x61c1, 0x61c2, 0x61ce, 0x61cf, 0x61d5, 0x61dc, 0x61dd, 0x61de,
285 0x61df, 0x61e1, 0x61e2, 0x61e7, 0x61e9, 0x61e5,
286 /* 0x3f */
287 0x61ec, 0x61ed, 0x61ef, 0x6201, 0x6203, 0x6204, 0x6207, 0x6213,
288 0x6215, 0x621c, 0x6220, 0x6222, 0x6223, 0x6227, 0x6229, 0x622b,
289 0x6239, 0x623d, 0x6242, 0x6243, 0x6244, 0x6246, 0x624c, 0x6250,
290 0x6251, 0x6252, 0x6254, 0x6256, 0x625a, 0x625c, 0x6264, 0x626d,
291 0x626f, 0x6273, 0x627a, 0x627d, 0x628d, 0x628e, 0x628f, 0x6290,
292 0x62a6, 0x62a8, 0x62b3, 0x62b6, 0x62b7, 0x62ba, 0x62be, 0x62bf,
293 0x62c4, 0x62ce, 0x62d5, 0x62d6, 0x62da, 0x62ea, 0x62f2, 0x62f4,
294 0x62fc, 0x62fd, 0x6303, 0x6304, 0x630a, 0x630b, 0x630d, 0x6310,
295 0x6313, 0x6316, 0x6318, 0x6329, 0x632a, 0x632d, 0x6335, 0x6336,
296 0x6339, 0x633c, 0x6341, 0x6342, 0x6343, 0x6344, 0x6346, 0x634a,
297 0x634b, 0x634e, 0x6352, 0x6353, 0x6354, 0x6358, 0x635b, 0x6365,
298 0x6366, 0x636c, 0x636d, 0x6371, 0x6374, 0x6375,
299 /* 0x40 */
300 0x6378, 0x637c, 0x637d, 0x637f, 0x6382, 0x6384, 0x6387, 0x638a,
301 0x6390, 0x6394, 0x6395, 0x6399, 0x639a, 0x639e, 0x63a4, 0x63a6,
302 0x63ad, 0x63ae, 0x63af, 0x63bd, 0x63c1, 0x63c5, 0x63c8, 0x63ce,
303 0x63dl, 0x63d3, 0x63d4, 0x63d5, 0x63dc, 0x63e0, 0x63e5, 0x63ea,
304 0x63ec, 0x63f2, 0x63f3, 0x63f5, 0x63f8, 0x63f9, 0x6409, 0x640a,
305 0x6410, 0x6412, 0x6414, 0x6418, 0x641e, 0x6420, 0x6422, 0x6424,
306 0x6425, 0x6429, 0x642a, 0x642f, 0x6430, 0x6435, 0x643d, 0x643f,
307 0x644b, 0x644f, 0x6451, 0x6452, 0x6453, 0x6454, 0x645a, 0x645b,
308 0x645c, 0x645d, 0x645f, 0x6460, 0x6461, 0x6463, 0x646d, 0x6473,
309 0x6474, 0x647b, 0x647d, 0x6485, 0x6487, 0x648f, 0x6490, 0x6491,
310 0x6498, 0x6499, 0x649b, 0x649d, 0x649f, 0x64a1, 0x64a3, 0x64a6,
311 0x64a8, 0x64ac, 0x64ab3, 0x64bd, 0x64be, 0x64bf,
312 /* 0x41 */
313 0x64c4, 0x64c9, 0x64ca, 0x64cb, 0x64cc, 0x64ce, 0x64d0, 0x64d1,
314 0x64d5, 0x64d7, 0x64e4, 0x64e5, 0x64e9, 0x64ea, 0x64ed, 0x64f0,
315 0x64f5, 0x64f7, 0x64fb, 0x64ff, 0x6501, 0x6504, 0x6508, 0x6509,
316 0x650a, 0x650f, 0x6513, 0x6514, 0x6516, 0x6519, 0x651b, 0x651e,
317 0x651f, 0x6522, 0x6526, 0x6529, 0x652e, 0x6531, 0x653a, 0x653c,
318 0x653d, 0x6543, 0x6547, 0x6549, 0x6550, 0x6552, 0x6554, 0x655f,
319 0x6560, 0x6567, 0x656b, 0x657a, 0x657d, 0x6581, 0x6585, 0x658a,
320 0x6592, 0x6595, 0x6598, 0x659d, 0x65a0, 0x65a3, 0x65a6, 0x65ae,
321 0x65b2, 0x65b3, 0x65b4, 0x65bf, 0x65c2, 0x65c8, 0x65c9, 0x65ce,
322 0x65d0, 0x65d4, 0x65d6, 0x65df, 0x65f0, 0x65f2, 0x65f4,
323 0x65f5, 0x65f9, 0x65fe, 0x65ff, 0x6600, 0x6604, 0x6608, 0x6609,
324 0x660d, 0x6611, 0x6612, 0x6615, 0x6616, 0x661d,
325 /* 0x42 */
326 0x661e, 0x6621, 0x6622, 0x6623, 0x6624, 0x6626, 0x6629, 0x662a,
327 0x662b, 0x662c, 0x662e, 0x6630, 0x6631, 0x6633, 0x6639, 0x6637,
328 0x6640, 0x6645, 0x6646, 0x664a, 0x664c, 0x6651, 0x664e, 0x6657,
329 0x6658, 0x6659, 0x665b, 0x665c, 0x6660, 0x6661, 0x66fb, 0x666a,
330 0x666b, 0x666c, 0x667e, 0x6673, 0x6675, 0x667f, 0x6677, 0x6678,
331 0x6679, 0x667b, 0x6680, 0x667c, 0x668b, 0x668c, 0x668d, 0x6690,
332 0x6692, 0x6699, 0x669a, 0x669b, 0x669c, 0x669f, 0x66a0, 0x66a4,
333 0x66ad, 0x66b1, 0x66b2, 0x66b5, 0x66bb, 0x66bf, 0x66c0, 0x66c2,
334 0x66c3, 0x66c8, 0x66cc, 0x66ce, 0x66cf, 0x66d4, 0x66db, 0x66df,
335 0x66e8, 0x66eb, 0x66ec, 0x66ee, 0x66fa, 0x6705, 0x6707, 0x670e,
```

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336 0x6713, 0x6719, 0x671c, 0x6720, 0x6722, 0x6733, 0x673e, 0x6745,
337 0x6747, 0x6748, 0x674c, 0x6754, 0x6755, 0x675d,
338 /* 0x43 */
339 0x6766, 0x676c, 0x676e, 0x6774, 0x6776, 0x677b, 0x6781, 0x6784,
340 0x678e, 0x678f, 0x6791, 0x6793, 0x6796, 0x6798, 0x6799, 0x679b,
341 0x67b0, 0x67b1, 0x67b2, 0x67b5, 0x67bb, 0x67bc, 0x67bd, 0x67f9,
342 0x67c0, 0x67c2, 0x67c3, 0x67c5, 0x67c8, 0x67c9, 0x67d2, 0x67d7,
343 0x67d9, 0x67dc, 0x67e1, 0x67e6, 0x67f0, 0x67f2, 0x67f6, 0x67f7,
344 0x6852, 0x6814, 0x6819, 0x681d, 0x681f, 0x6828, 0x6827, 0x682c,
345 0x682d, 0x682f, 0x6830, 0x6831, 0x6833, 0x683b, 0x683f, 0x6844,
346 0x6845, 0x684a, 0x684c, 0x6855, 0x6857, 0x6858, 0x685b, 0x686b,
347 0x686e, 0x686f, 0x6870, 0x6871, 0x6872, 0x6875, 0x6879, 0x687a,
348 0x687b, 0x687c, 0x6882, 0x6884, 0x6886, 0x6888, 0x6896, 0x6898,
349 0x689a, 0x689c, 0x68a1, 0x68a3, 0x68a5, 0x68a9, 0x68aa, 0x68ae,
350 0x68b2, 0x68bb, 0x68c5, 0x68c8, 0x68cc, 0x68cf,
351 /* 0x44 */
352 0x68d0, 0x68d1, 0x68d3, 0x68d6, 0x68d9, 0x68dc, 0x68dd, 0x68e5,
353 0x68e8, 0x68ea, 0x68eb, 0x68ec, 0x68ed, 0x68f0, 0x68f1, 0x68f5,
354 0x68f6, 0x68fb, 0x68fc, 0x68fd, 0x6906, 0x6909, 0x690a, 0x6910,
355 0x6911, 0x6913, 0x6916, 0x6917, 0x6931, 0x6933, 0x6935, 0x6938,
356 0x693b, 0x6942, 0x6945, 0x6949, 0x694e, 0x6957, 0x695b, 0x6963,
357 0x6964, 0x6965, 0x6966, 0x6968, 0x6969, 0x696c, 0x6970, 0x6971,
358 0x6972, 0x697a, 0x697b, 0x697f, 0x6980, 0x698d, 0x6992, 0x6996,
359 0x6998, 0x69a1, 0x69a5, 0x69a6, 0x69a8, 0x69ab, 0x69ad, 0x69af,
360 0x69b7, 0x69b8, 0x69ba, 0x69bc, 0x69c5, 0x69c8, 0x69d1, 0x69d6,
361 0x69d7, 0x69e2, 0x69e5, 0x69ee, 0x69ef, 0x69f1, 0x69f3, 0x69f5,
362 0x69fe, 0x6a00, 0x6a01, 0x6a03, 0x6a0f, 0x6a11, 0x6a15, 0x6a1a,
363 0x6a1d, 0x6a20, 0x6a24, 0x6a28, 0x6a30, 0x6a32,
364 /* 0x45 */
365 0x6a34, 0x6a37, 0x6a3b, 0x6a3e, 0x6a3f, 0x6a45, 0x6a46, 0x6a49,
366 0x6a4a, 0x6a4e, 0x6a50, 0x6a51, 0x6a52, 0x6a55, 0x6a56, 0x6a5b,
367 0x6a64, 0x6a67, 0x6a6a, 0x6a71, 0x6a73, 0x6a7e, 0x6a81, 0x6a83,
368 0x6a86, 0x6a87, 0x6a89, 0x6a8b, 0x6a91, 0x6a9b, 0x6a9d, 0x6a9e,
369 0x6a9f, 0x6aa5, 0x6aab, 0x6aaf, 0x6ab0, 0x6ab1, 0x6ab4, 0x6abd,
370 0x6abe, 0x6abf, 0x6ac6, 0x6ac9, 0x6ac8, 0x6acc, 0x6ad0, 0x6ad4,
371 0x6ad5, 0x6ad6, 0x6adc, 0x6add, 0x6ae4, 0x6ae7, 0x6aeb, 0x6aef,
372 0x6af1, 0x6af2, 0x6afc, 0x6afd, 0x6b02, 0x6b03, 0x6b06, 0x6b07,
373 0x6b09, 0x6b0f, 0x6b10, 0x6b11, 0x6b17, 0x6b1b, 0x6b1e, 0x6b24,
374 0x6b28, 0x6b2b, 0x6b2c, 0x6b2f, 0x6b35, 0x6b36, 0x6b3b, 0x6b3f,
375 0x6b46, 0x6b4a, 0x6b4d, 0x6b52, 0x6b56, 0x6b58, 0x6b5d, 0x6b60,
376 0x6b67, 0x6b6b, 0x6b6e, 0x6b70, 0x6b75, 0x6b7d,
377 /* 0x46 */
378 0x6b7e, 0x6b82, 0x6b85, 0x6b97, 0x6b9b, 0x6b9f, 0x6ba0, 0x6ba2,
379 0x6ba3, 0x6ba8, 0x6ba9, 0x6bac, 0x6bad, 0x6bae, 0x6bb0, 0x6bb8,
380 0x6bb9, 0x6bbd, 0x6bbe, 0x6bc3, 0x6bc4, 0x6bc9, 0x6bcc, 0x6bd6,
381 0x6bda, 0x6be1, 0x6be3, 0x6be6, 0x6be7, 0x6bee, 0x6bf1, 0x6bf7,
382 0x6bf9, 0x6bff, 0x6c02, 0x6c04, 0x6c05, 0x6c09, 0x6c0d, 0x6c0e,
383 0x6c10, 0x6c12, 0x6c19, 0x6c1f, 0x6c26, 0x6c27, 0x6c28, 0x6c2c,
384 0x6c2e, 0x6c33, 0x6c35, 0x6c36, 0x6c3a, 0x6c3b, 0x6c3f, 0x6c4a,
385 0x6c4b, 0x6c4d, 0x6c4f, 0x6c52, 0x6c54, 0x6c59, 0x6c5b, 0x6c5c,
386 0x6c6b, 0x6c6d, 0x6c6f, 0x6c74, 0x6c76, 0x6c78, 0x6c79, 0x6c7b,
387 0x6c85, 0x6c86, 0x6c87, 0x6c89, 0x6c94, 0x6c95, 0x6c97, 0x6c98,
388 0x6c9c, 0x6c9f, 0x6cb0, 0x6cb2, 0x6cb4, 0x6cc2, 0x6cc6, 0x6ccd,
389 0x6ccf, 0x6cd0, 0x6cd1, 0x6cd4, 0x6cd6,
390 /* 0x47 */
391 0x6cda, 0x6cdc, 0x6ce0, 0x6ce7, 0x6ce9, 0x6ceb, 0x6cec, 0x6cee,
392 0x6cf2, 0x6cf4, 0x6d04, 0x6d07, 0x6d0a, 0x6d0e, 0x6d0f, 0x6d11,
393 0x6d13, 0x6d1a, 0x6d26, 0x6d27, 0x6d28, 0x6d67, 0x6d2e, 0x6d2f,
394 0x6d31, 0x6d39, 0x6d3c, 0x6d3f, 0x6d57, 0x6d5e, 0x6d5f, 0x6d61,
395 0x6d65, 0x6d67, 0x6d6f, 0x6d70, 0x6d7c, 0x6d82, 0x6d87, 0x6d91,
396 0x6d92, 0x6d94, 0x6d96, 0x6d97, 0x6d98, 0x6daa, 0x6dac, 0x6ddb,
397 0x6db7, 0x6db9, 0x6dbd, 0x6dbf, 0x6dc4, 0x6dc8, 0x6dca, 0x6dce,
398 0x6dcf, 0x6dd6, 0x6ddb, 0x6ddf, 0x6de0, 0x6de2, 0x6de5,
399 0x6de9, 0x6def, 0x6df0, 0x6df4, 0x6df6, 0x6dfc, 0x6e00, 0x6e04,
400 0x6e1e, 0x6e22, 0x6e27, 0x6e39, 0x6e36, 0x6e39, 0x6e3b, 0x6e3c,
401 0x6e44, 0x6e45, 0x6e48, 0x6e49, 0x6e4b, 0x6e4f, 0x6e51, 0x6e52,
402 0x6e53, 0x6e54, 0x6e57, 0x6e5c, 0x6e5d, 0x6e5e,
403 /* 0x48 */
404 0x6e62, 0x6e63, 0x6e68, 0x6e73, 0x6e7b, 0x6e7d, 0x6e8d, 0x6e93,
405 0x6e99, 0x6ea0, 0x6ea7, 0x6ead, 0x6eae, 0x6eb1, 0x6eb3, 0x6ebb,
406 0x6ebf, 0x6ec0, 0x6ec1, 0x6ec3, 0x6ec7, 0x6ec8, 0x6eca, 0x6ecd,
407 0x6ece, 0x6ecf, 0x6eeb, 0x6eed, 0x6eee, 0x6ef9, 0x6efb, 0x6efd,
408 0x6f04, 0x6f08, 0x6f0a, 0x6f0c, 0x6f0d, 0x6f16, 0x6f18, 0x6f1a,
409 0x6f1b, 0x6f26, 0x6f29, 0x6f2a, 0x6f2f, 0x6f30, 0x6f33, 0x6f36,
410 0x6f3b, 0x6f3c, 0x6f2d, 0x6f4f, 0x6f51, 0x6f52, 0x6f53, 0x6f57,
411 0x6f59, 0x6f5a, 0x6f5d, 0x6f5e, 0x6f61, 0x6f62, 0x6f68, 0x6f6c,
412 0x6f7d, 0x6f7e, 0x6f83, 0x6f87, 0x6f88, 0x6f8b, 0x6f8c, 0x6f8d,
413 0x6f90, 0x6f92, 0x6f93, 0x6f94, 0x6f96, 0x6f9a, 0x6f9f, 0x6fa0,
414 0x6fa5, 0x6fa6, 0x6fa7, 0x6fa8, 0x6fae, 0x6faf, 0x6fb0, 0x6fb5,
415 0x6fb6, 0x6fbc, 0x6fc5, 0x6fc7, 0x6fc8, 0x6fca,
416 /* 0x49 */
417 0x6fda, 0x6fde, 0x6fe8, 0x6fe9, 0x6ff0, 0x6ff5, 0x6ff9, 0x6ffc,
418 0x6ffd, 0x7000, 0x7005, 0x7006, 0x7007, 0x700d, 0x7017, 0x7020,
419 0x7023, 0x702f, 0x7034, 0x7037, 0x7039, 0x703c, 0x7043, 0x7044,
420 0x7048, 0x7049, 0x704a, 0x704b, 0x7054, 0x7055, 0x705d, 0x705e,
421 0x704e, 0x7064, 0x7065, 0x706c, 0x706e, 0x7075, 0x7076, 0x707e,
422 0x7081, 0x7085, 0x7086, 0x7094, 0x7095, 0x7096, 0x7097, 0x7098,

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423 0x709b, 0x70a4, 0x70ab, 0x70b0, 0x70b1, 0x70b4, 0x70b7, 0x70ca,
424 0x70d1, 0x70d3, 0x70d4, 0x70d5, 0x70d6, 0x70d8, 0x70dc, 0x70e4,
425 0x70fa, 0x7103, 0x7104, 0x7105, 0x7106, 0x7107, 0x710b, 0x710c,
426 0x710f, 0x711e, 0x7120, 0x712b, 0x712d, 0x712f, 0x7130, 0x7131,
427 0x7138, 0x7141, 0x7145, 0x7146, 0x7147, 0x714a, 0x714b, 0x7150,
428 0x7152, 0x7157, 0x715a, 0x715c, 0x715e, 0x7160,
429 /* 0x4a */
430 0x7168, 0x7179, 0x7180, 0x7185, 0x7187, 0x718c, 0x7192, 0x719a,
431 0x719b, 0x71a0, 0x71a2, 0x71af, 0x71b0, 0x71b2, 0x71b3, 0x71ba,
432 0x71bf, 0x71c0, 0x71c1, 0x71c4, 0x71cb, 0x71cc, 0x71d3, 0x71d6,
433 0x71d9, 0x71da, 0x71dc, 0x71f8, 0x71fe, 0x7200, 0x7207, 0x7208,
434 0x7209, 0x7213, 0x7217, 0x721a, 0x721d, 0x721f, 0x7224, 0x722b,
435 0x722f, 0x7234, 0x7238, 0x7239, 0x7241, 0x7242, 0x7243, 0x7245,
436 0x724e, 0x724f, 0x7250, 0x7253, 0x7255, 0x7256, 0x725a, 0x725c,
437 0x725e, 0x7260, 0x7263, 0x7268, 0x726b, 0x726e, 0x726f, 0x7271,
438 0x7277, 0x7278, 0x727b, 0x727c, 0x727f, 0x7284, 0x7289, 0x728d,
439 0x728e, 0x7293, 0x729b, 0x72a8, 0x72ad, 0x72ae, 0x72b1, 0x72b4,
440 0x72be, 0x72c1, 0x72c7, 0x72c9, 0x72cc, 0x72d5, 0x72d6, 0x72d8,
441 0x72df, 0x72e5, 0x72f3, 0x72f4, 0x72fa, 0x72fb,
442 /* 0x4b */
443 0x72fe, 0x7302, 0x7304, 0x7305, 0x7307, 0x730b, 0x730d, 0x7312,
444 0x7313, 0x7318, 0x7319, 0x731e, 0x7322, 0x7324, 0x7327, 0x7328,
445 0x732c, 0x7331, 0x7332, 0x7335, 0x733a, 0x733b, 0x733d, 0x7343,
446 0x734d, 0x7350, 0x7352, 0x7356, 0x7358, 0x735d, 0x735e, 0x735f,
447 0x7360, 0x7366, 0x7367, 0x7369, 0x736b, 0x736c, 0x736e, 0x736f,
448 0x7371, 0x7377, 0x7379, 0x737c, 0x7380, 0x7381, 0x7383, 0x7385,
449 0x7386, 0x738e, 0x7390, 0x7390, 0x7393, 0x7395, 0x7397, 0x7398, 0x739c,
450 0x739e, 0x739f, 0x73a0, 0x73a2, 0x73a5, 0x73a6, 0x73aa, 0x73ab,
451 0x73ad, 0x73b5, 0x73b7, 0x73b9, 0x73bc, 0x73bd, 0x73bf, 0x73c5,
452 0x73c6, 0x73c9, 0x73cb, 0x73cc, 0x73cf, 0x73d2, 0x73d3, 0x73d6,
453 0x73d9, 0x73dd, 0x73e1, 0x73e3, 0x73e6, 0x73e7, 0x73e9, 0x73f4,
454 0x73f5, 0x73f7, 0x73f9, 0x73fa, 0x73fb, 0x73fd,
455 /* 0x4c */
456 0x73ff, 0x7400, 0x7401, 0x7404, 0x7407, 0x740a, 0x7411, 0x741a,
457 0x741b, 0x7424, 0x7426, 0x7428, 0x7429, 0x742a, 0x742b, 0x742c,
458 0x742d, 0x742e, 0x742f, 0x7430, 0x7431, 0x7439, 0x7440, 0x7443,
459 0x7444, 0x7446, 0x7447, 0x744b, 0x744d, 0x7451, 0x7452, 0x7457,
460 0x745d, 0x7462, 0x7466, 0x7467, 0x7468, 0x746b, 0x746d, 0x746e,
461 0x7471, 0x7472, 0x7478, 0x7480, 0x7481, 0x7485, 0x7486, 0x7487, 0x7489,
462 0x748f, 0x7490, 0x7491, 0x7492, 0x7498, 0x7499, 0x749a, 0x749c,
463 0x749f, 0x74a0, 0x74a1, 0x74a3, 0x74a6, 0x74a8, 0x74a9, 0x74aa,
464 0x74ab, 0x74ae, 0x74af, 0x74b1, 0x74b2, 0x74b5, 0x74b9, 0x74bb,
465 0x74bf, 0x74c8, 0x74c9, 0x74cc, 0x74d0, 0x74d3, 0x74d8, 0x74da,
466 0x74db, 0x74de, 0x74df, 0x74e4, 0x74e8, 0x74ea, 0x74eb, 0x74ef,
467 0x74f4, 0x74fa, 0x74fb, 0x74fc, 0x74ff, 0x7506,
468 /* 0x4d */
469 0x7512, 0x7516, 0x7517, 0x7520, 0x7521, 0x7524, 0x7527, 0x7529,
470 0x752a, 0x752f, 0x7536, 0x7539, 0x753d, 0x753e, 0x753f, 0x7540,
471 0x7543, 0x7547, 0x7548, 0x754e, 0x7550, 0x7552, 0x7557, 0x755e,
472 0x755f, 0x7561, 0x756f, 0x7571, 0x7579, 0x757a, 0x757b, 0x757c,
473 0x757d, 0x757e, 0x7581, 0x7585, 0x7590, 0x7592, 0x7593, 0x7595,
474 0x7599, 0x759c, 0x75a2, 0x75a4, 0x75b4, 0x75ba, 0x75bf, 0x75c0,
475 0x75c1, 0x75c4, 0x75c6, 0x75cc, 0x75ce, 0x75cf, 0x75d7, 0x75dc,
476 0x75df, 0x75e0, 0x75e1, 0x75e4, 0x75e7, 0x75ec, 0x75ee, 0x75ef,
477 0x75f1, 0x75f9, 0x7600, 0x7602, 0x7603, 0x7604, 0x7607, 0x7608,
478 0x760a, 0x760c, 0x760f, 0x7612, 0x7613, 0x7615, 0x7616, 0x7619,
479 0x761b, 0x761c, 0x761d, 0x761e, 0x7623, 0x7625, 0x7626, 0x7629,
480 0x762d, 0x7632, 0x7633, 0x7635, 0x7638, 0x7639,
481 /* 0x4e */
482 0x763a, 0x763c, 0x764a, 0x7640, 0x7641, 0x7643, 0x7644, 0x7645,
483 0x7649, 0x764b, 0x7655, 0x7659, 0x765f, 0x7664, 0x7665, 0x766d,
484 0x766e, 0x766f, 0x7671, 0x7674, 0x7681, 0x7685, 0x768c, 0x768d,
485 0x7695, 0x769b, 0x769c, 0x769d, 0x769f, 0x76a0, 0x76a2, 0x76a3,
486 0x76a4, 0x76a5, 0x76a6, 0x76a7, 0x76a8, 0x76aa, 0x76ad, 0x76bd,
487 0x76c1, 0x76c1, 0x76c9, 0x76cb, 0x76cc, 0x76ce, 0x76d4, 0x76d9,
488 0x76e0, 0x76e6, 0x76e8, 0x76ec, 0x76f0, 0x76f1, 0x76f6, 0x76f9,
489 0x76fc, 0x7700, 0x7706, 0x770a, 0x770e, 0x7712, 0x7714, 0x7715,
490 0x7717, 0x7719, 0x771a, 0x771c, 0x7722, 0x7728, 0x772d, 0x772e,
491 0x772f, 0x7734, 0x7735, 0x7736, 0x7739, 0x773d, 0x773e, 0x7742,
492 0x7745, 0x7746, 0x774a, 0x774d, 0x774e, 0x774f, 0x7752, 0x7756,
493 0x7757, 0x775c, 0x775e, 0x775f, 0x7760, 0x7762,
494 /* 0x4f */
495 0x7764, 0x7767, 0x776a, 0x776c, 0x7770, 0x7772, 0x7773, 0x7774,
496 0x777a, 0x777d, 0x7780, 0x7784, 0x778c, 0x778d, 0x7794, 0x7795,
497 0x7796, 0x779a, 0x779f, 0x77a2, 0x77a7, 0x77aa, 0x77ae, 0x77af,
498 0x77b1, 0x77b5, 0x77be, 0x77c0, 0x77c9, 0x77d1, 0x77d2, 0x77d5,
499 0x77d9, 0x77de, 0x77df, 0x77e0, 0x77e4, 0x77e6, 0x77ea, 0x77ec,
500 0x77f0, 0x77f1, 0x77f4, 0x77f8, 0x77fb, 0x7805, 0x7806, 0x7809,
501 0x780d, 0x780e, 0x7811, 0x781d, 0x7821, 0x7822, 0x7823, 0x782d,
502 0x782e, 0x7830, 0x7835, 0x7837, 0x7843, 0x7844, 0x7847, 0x7848,
503 0x784c, 0x784e, 0x7852, 0x785c, 0x785e, 0x7860, 0x7861, 0x7863,
504 0x7864, 0x7868, 0x786a, 0x786e, 0x787a, 0x787e, 0x788a, 0x788f,
505 0x7894, 0x7898, 0x78a1, 0x789d, 0x789e, 0x789f, 0x78a4, 0x78a8,
506 0x78ac, 0x78ad, 0x78b0, 0x78b1, 0x78b2, 0x78b3,
507 /* 0x50 */
508 0x78bb, 0x78bd, 0x78bf, 0x78c7, 0x78c8, 0x78c9, 0x78cc, 0x78ce,
509 0x78d2, 0x78d3, 0x78d5, 0x78d6, 0x78e4, 0x78db, 0x78df, 0x78e0,
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510 0x78e1, 0x78e6, 0x78ea, 0x78f2, 0x78f3, 0x7900, 0x78f6, 0x78f7,
511 0x78fa, 0x78fb, 0x78ff, 0x7906, 0x790c, 0x7910, 0x791a, 0x791c,
512 0x791e, 0x791f, 0x7920, 0x7925, 0x7927, 0x7929, 0x792d, 0x7931,
513 0x7934, 0x7935, 0x793b, 0x793d, 0x793f, 0x7944, 0x7945, 0x7946,
514 0x794a, 0x794b, 0x794f, 0x7951, 0x7954, 0x7958, 0x795b, 0x795c,
515 0x7967, 0x7969, 0x796b, 0x7972, 0x7979, 0x797b, 0x797c, 0x797e,
516 0x798b, 0x798c, 0x7991, 0x7993, 0x7994, 0x7995, 0x7996, 0x7998,
517 0x799b, 0x799c, 0x79a1, 0x79a8, 0x79a9, 0x79ab, 0x79af, 0x79b1,
518 0x79b4, 0x79b8, 0x79bb, 0x79c2, 0x79c4, 0x79c7, 0x79c8, 0x79ca,
519 0x79cf, 0x79d4, 0x79d6, 0x79da, 0x79dd, 0x79de,
520 /* 0x51 */
521 0x79e0, 0x79e2, 0x79e5, 0x79ea, 0x79eb, 0x79ed, 0x79f1, 0x79f8,
522 0x79fc, 0x7a02, 0x7a03, 0x7a07, 0x7a09, 0x7a0a, 0x7a0c, 0x7a11,
523 0x7a15, 0x7a1b, 0x7a1e, 0x7a21, 0x7a27, 0x7a2b, 0x7a2d, 0x7a2f,
524 0x7a30, 0x7a34, 0x7a35, 0x7a38, 0x7a39, 0x7a3a, 0x7a44, 0x7a45,
525 0x7a47, 0x7a48, 0x7a4c, 0x7a55, 0x7a56, 0x7a59, 0x7a5c, 0x7a5d,
526 0x7a5f, 0x7a60, 0x7a65, 0x7a67, 0x7a6a, 0x7a6d, 0x7a75, 0x7a78,
527 0x7a7e, 0x7a80, 0x7a82, 0x7a85, 0x7a86, 0x7a8a, 0x7a8b, 0x7a90,
528 0x7a91, 0x7a94, 0x7a9e, 0x7aa0, 0x7aa3, 0x7aac, 0x7ab3, 0x7ab5,
529 0x7ab9, 0x7abb, 0x7abc, 0x7ac6, 0x7ac9, 0x7acc, 0x7ace, 0x7ad1,
530 0x7adb, 0x7aeb, 0x7ae8, 0x7ae9, 0x7aeb, 0x7aec, 0x7af1, 0x7af4, 0x7afb,
531 0x7afd, 0x7afe, 0x7b07, 0x7b14, 0x7b1f, 0x7b23, 0x7b27, 0x7b29,
532 0x7b2a, 0x7b2b, 0x7b2d, 0x7b2e, 0x7b2f, 0x7b30,
533 /* 0x52 */
534 0x7b31, 0x7b34, 0x7b3d, 0x7b3f, 0x7b40, 0x7b41, 0x7b47, 0x7b4e,
535 0x7b55, 0x7b60, 0x7b64, 0x7b66, 0x7b69, 0x7b6a, 0x7b6d, 0x7b6f,
536 0x7b72, 0x7b73, 0x7b77, 0x7b84, 0x7b89, 0x7b8e, 0x7b90, 0x7b91,
537 0x7b96, 0x7b9b, 0x7b9e, 0x7ba0, 0x7ba5, 0x7bac, 0x7baf, 0x7bb0,
538 0x7bb2, 0x7bb5, 0x7bb6, 0x7bba, 0x7bbb, 0x7bbc, 0x7bbd, 0x7bc2,
539 0x7bc5, 0x7bc8, 0x7bca, 0x7bd4, 0x7bd6, 0x7bd7, 0x7bd9, 0x7bda,
540 0x7bdb, 0x7be8, 0x7bea, 0x7bf2, 0x7bf4, 0x7bf5, 0x7bf8, 0x7bf9,
541 0x7bfa, 0x7bfc, 0x7bfe, 0x7c01, 0x7c02, 0x7c03, 0x7c04, 0x7c06,
542 0x7c09, 0x7c0b, 0x7c0c, 0x7c0e, 0x7c0f, 0x7c19, 0x7c1b, 0x7c20,
543 0x7c25, 0x7c26, 0x7c28, 0x7c2c, 0x7c31, 0x7c33, 0x7c34, 0x7c36,
544 0x7c39, 0x7c3a, 0x7c46, 0x7c4a, 0x7c55, 0x7c51, 0x7c52, 0x7c53,
545 0x7c59, 0x7c5a, 0x7c5b, 0x7c5c, 0x7c5d, 0x7c5e,
546 /* 0x53 */
547 0x7c61, 0x7c63, 0x7c67, 0x7c69, 0x7c6d, 0x7c6e, 0x7c70, 0x7c72,
548 0x7c79, 0x7c7c, 0x7c7d, 0x7c86, 0x7c87, 0x7c8f, 0x7c94, 0x7c9e,
549 0x7ca0, 0x7ca6, 0x7cb0, 0x7cb6, 0x7cb7, 0x7cba, 0x7cbb, 0x7cbc,
550 0x7cbf, 0x7cc4, 0x7cc7, 0x7cc8, 0x7cc9, 0x7ccd, 0x7ccf, 0x7cd3,
551 0x7cd4, 0x7cd5, 0x7cd7, 0x7cd9, 0x7cda, 0x7cdd, 0x7ce6, 0x7ce9,
552 0x7ceb, 0x7cf5, 0x7d03, 0x7d07, 0x7d08, 0x7d09, 0x7d0f, 0x7d11,
553 0x7d12, 0x7d13, 0x7d16, 0x7d1d, 0x7d1e, 0x7d23, 0x7d26, 0x7d2a,
554 0x7d2d, 0x7d31, 0x7d31, 0x7d3c, 0x7d3d, 0x7d3e, 0x7d40, 0x7d41, 0x7d47,
555 0x7d48, 0x7d4d, 0x7d51, 0x7d53, 0x7d57, 0x7d59, 0x7d5a, 0x7d5c,
556 0x7d5d, 0x7d65, 0x7d67, 0x7d6a, 0x7d70, 0x7d78, 0x7d7a, 0x7d7b,
557 0x7d7f, 0x7d81, 0x7d82, 0x7d83, 0x7d85, 0x7d86, 0x7d88, 0x7d8b,
558 0x7d8c, 0x7d8d, 0x7d91, 0x7d96, 0x7d97, 0x7d9d,
559 /* 0x54 */
560 0x7d9e, 0x7da6, 0x7da7, 0x7daa, 0x7db3, 0x7db6, 0x7db7, 0x7db9,
561 0x7dc2, 0x7dc3, 0x7dc4, 0x7dc5, 0x7dc6, 0x7dcc, 0x7dcd, 0x7dce,
562 0x7dd7, 0x7dd9, 0x7de0, 0x7de2, 0x7de5, 0x7de6, 0x7dea, 0x7deb,
563 0x7ded, 0x7df1, 0x7df5, 0x7df6, 0x7df9, 0x7dfa, 0x7e08, 0x7e10,
564 0x7e11, 0x7e15, 0x7e17, 0x7e1c, 0x7e1d, 0x7e20, 0x7e27, 0x7e28,
565 0x7e2c, 0x7e2d, 0x7e2f, 0x7e33, 0x7e36, 0x7e3f, 0x7e44, 0x7e45,
566 0x7e47, 0x7e4e, 0x7e50, 0x7e52, 0x7e58, 0x7e5f, 0x7e61, 0x7e62,
567 0x7e65, 0x7e6b, 0x7e6e, 0x7e6f, 0x7e73, 0x7e78, 0x7e7e, 0x7e81,
568 0x7e86, 0x7e87, 0x7e8a, 0x7e8d, 0x7e91, 0x7e95, 0x7e98, 0x7e9a,
569 0x7e9d, 0x7e9e, 0x7f3c, 0x7f3b, 0x7f3d, 0x7f3e, 0x7f3f, 0x7f43,
570 0x7f44, 0x7f47, 0x7f4f, 0x7f52, 0x7f53, 0x7f5b, 0x7f5c, 0x7f5d,
571 0x7f61, 0x7f63, 0x7f64, 0x7f65, 0x7f66, 0x7f6d,
572 /* 0x55 */
573 0x7f71, 0x7f7d, 0x7f7e, 0x7f7f, 0x7f80, 0x7f8b, 0x7f8d, 0x7f8f,
574 0x7f90, 0x7f91, 0x7f96, 0x7f97, 0x7f9c, 0x7fa1, 0x7fa2, 0x7fa6,
575 0x7faa, 0x7fad, 0x7fb4, 0x7fbc, 0x7fbf, 0x7fc0, 0x7fc3, 0x7fc8,
576 0x7fce, 0x7fcf, 0x7fdb, 0x7fdf, 0x7fe3, 0x7fe5, 0x7fe8, 0x7fec,
577 0x7fee, 0x7fef, 0x7ff2, 0x7ffa, 0x7ffd, 0x7ffe, 0x7fff, 0x8007,
578 0x8008, 0x800a, 0x800d, 0x800e, 0x800f, 0x8011, 0x8013, 0x8014,
579 0x8016, 0x801d, 0x801e, 0x801f, 0x8020, 0x8024, 0x8026, 0x802c,
580 0x802e, 0x8030, 0x8034, 0x8035, 0x8037, 0x8039, 0x803a, 0x803c,
581 0x803e, 0x8040, 0x8044, 0x8060, 0x8064, 0x8066, 0x806d, 0x8071,
582 0x8075, 0x8081, 0x8088, 0x808e, 0x809c, 0x809e, 0x80a6, 0x80a7,
583 0x80ab, 0x80b8, 0x80b9, 0x80c8, 0x80cd, 0x80cf, 0x80d2, 0x80d4,
584 0x80d5, 0x80d7, 0x80d8, 0x80e0, 0x80ed, 0x80ee,
585 /* 0x56 */
586 0x80f0, 0x80f2, 0x80f3, 0x80f6, 0x80f9, 0x80fa, 0x80fe, 0x8103,
587 0x810b, 0x8116, 0x8117, 0x8118, 0x811c, 0x811e, 0x8120, 0x8124,
588 0x8127, 0x812c, 0x8130, 0x8135, 0x813a, 0x813c, 0x8145, 0x8147,
589 0x814a, 0x814c, 0x8152, 0x8157, 0x8160, 0x8161, 0x8167, 0x8168,
590 0x8169, 0x816d, 0x816f, 0x8177, 0x8181, 0x8190, 0x8184, 0x8185,
591 0x8186, 0x818b, 0x818e, 0x8196, 0x8198, 0x819b, 0x819e, 0x81a2,
592 0x81ae, 0x81b2, 0x81b4, 0x81bb, 0x81cb, 0x81c3, 0x81c5, 0x81ca,
593 0x81ce, 0x81cf, 0x81d5, 0x81d7, 0x81db, 0x81dd, 0x81de, 0x81e1,
594 0x81e4, 0x81eb, 0x81ec, 0x81f0, 0x81f1, 0x81f2, 0x81f5, 0x81f6,
595 0x81f8, 0x81f9, 0x81fd, 0x81ff, 0x8200, 0x8203, 0x820f, 0x8213,
596 0x8214, 0x8219, 0x821a, 0x821d, 0x8221, 0x8222, 0x8228, 0x8232,
```

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597 0x8234, 0x823a, 0x8243, 0x8244, 0x8245, 0x8246,
598 /* 0x57 */
599 0x824b, 0x824e, 0x824f, 0x8251, 0x8256, 0x825c, 0x8260, 0x8263,
600 0x8267, 0x826d, 0x8274, 0x827b, 0x827d, 0x827f, 0x8280, 0x8281,
601 0x8283, 0x8284, 0x8287, 0x8289, 0x828a, 0x828e, 0x8291, 0x8294,
602 0x8296, 0x8298, 0x829a, 0x829b, 0x82a0, 0x82a1, 0x82a3, 0x82a4,
603 0x82a7, 0x82a8, 0x82a9, 0x82aa, 0x82ae, 0x82b0, 0x82b2, 0x82b4,
604 0x82b7, 0x82ba, 0x82bc, 0x82be, 0x82bf, 0x82c6, 0x82d0, 0x82d5,
605 0x82da, 0x82e0, 0x82e2, 0x82e4, 0x82e8, 0x82ea, 0x82ed, 0x82ef,
606 0x82f6, 0x82f7, 0x82fd, 0x82fe, 0x8300, 0x8301, 0x8307, 0x8308,
607 0x830a, 0x830b, 0x8354, 0x831b, 0x831d, 0x831e, 0x831f, 0x8321,
608 0x8322, 0x832c, 0x832d, 0x832e, 0x8330, 0x8333, 0x8337, 0x833a,
609 0x833c, 0x833d, 0x8342, 0x8343, 0x8344, 0x8347, 0x834d, 0x834e,
610 0x8351, 0x8355, 0x8356, 0x8357, 0x8370, 0x8378,
611 /* 0x58 */
612 0x837d, 0x837f, 0x8380, 0x8382, 0x8384, 0x8386, 0x838d, 0x8392,
613 0x8394, 0x8395, 0x8398, 0x8399, 0x839b, 0x839c, 0x839d, 0x83a6,
614 0x83a7, 0x83a9, 0x83ac, 0x83be, 0x83bf, 0x83c0, 0x83c7, 0x83c9,
615 0x83cf, 0x83d0, 0x83d1, 0x83d4, 0x83dd, 0x8353, 0x83e8, 0x83ea,
616 0x83f6, 0x83f8, 0x83f9, 0x83fc, 0x8401, 0x8406, 0x840a, 0x840f,
617 0x8411, 0x8415, 0x8419, 0x83ad, 0x842f, 0x8439, 0x8445, 0x8447,
618 0x8448, 0x844a, 0x844d, 0x844f, 0x8451, 0x8452, 0x8456, 0x8458,
619 0x8459, 0x845a, 0x845c, 0x8460, 0x8464, 0x8465, 0x8467, 0x846a,
620 0x8470, 0x8473, 0x8474, 0x8476, 0x8478, 0x847c, 0x847d, 0x8481,
621 0x8485, 0x8492, 0x8493, 0x8495, 0x849e, 0x84a6, 0x84a8, 0x84a9,
622 0x84aa, 0x84af, 0x84b1, 0x84b4, 0x84ba, 0x84bd, 0x84be, 0x84c0,
623 0x84c2, 0x84c7, 0x84c8, 0x84cc, 0x84cf, 0x84d3,
624 /* 0x59 */
625 0x84dc, 0x84e7, 0x84ea, 0x84ef, 0x84f0, 0x84f1, 0x84f2, 0x84f7,
626 0x8532, 0x84fa, 0x84fb, 0x84fd, 0x8502, 0x8503, 0x8507, 0x850c,
627 0x850e, 0x8510, 0x851c, 0x851e, 0x8522, 0x8523, 0x8524, 0x8525,
628 0x8527, 0x852a, 0x852b, 0x852f, 0x8533, 0x8534, 0x8536, 0x853f,
629 0x8546, 0x854f, 0x8550, 0x8551, 0x8552, 0x8553, 0x8556, 0x8559,
630 0x855c, 0x855d, 0x855e, 0x855f, 0x8560, 0x8561, 0x8562, 0x8564,
631 0x856b, 0x856f, 0x8579, 0x857a, 0x857b, 0x857d, 0x857f, 0x8581,
632 0x8585, 0x8586, 0x8589, 0x858b, 0x858c, 0x858f, 0x8593, 0x8598,
633 0x859d, 0x859f, 0x85a0, 0x85a2, 0x85a5, 0x85a7, 0x85b4, 0x85b6,
634 0x85b7, 0x85b8, 0x85bc, 0x85bd, 0x85be, 0x85bf, 0x85c2, 0x85c7,
635 0x85ca, 0x85cb, 0x85ce, 0x85ad, 0x85d8, 0x85da, 0x85df, 0x85e0,
636 0x85e6, 0x85e8, 0x85ed, 0x85f3, 0x85f6, 0x85fc,
637 /* 0x5a */
638 0x85ff, 0x8600, 0x8604, 0x8605, 0x860d, 0x860e, 0x8610, 0x8611,
639 0x8612, 0x8618, 0x8619, 0x861b, 0x861e, 0x8621, 0x8627, 0x8629,
640 0x8636, 0x8638, 0x863a, 0x863c, 0x863d, 0x8640, 0x8642, 0x8646,
641 0x8652, 0x8653, 0x8656, 0x8657, 0x8658, 0x8659, 0x865d, 0x8660,
642 0x8661, 0x8662, 0x8663, 0x8664, 0x8669, 0x866c, 0x866f, 0x8675,
643 0x8676, 0x8677, 0x867a, 0x868d, 0x8691, 0x8696, 0x8698, 0x869a,
644 0x869c, 0x86a1, 0x86a6, 0x86a7, 0x86a8, 0x86ad, 0x86b1, 0x86b3,
645 0x86b4, 0x86b5, 0x86b7, 0x86b8, 0x86b9, 0x86bf, 0x86c0, 0x86c1,
646 0x86c3, 0x86c5, 0x86d1, 0x86d2, 0x86d5, 0x86d7, 0x86da, 0x86dc,
647 0x86e0, 0x86e3, 0x86e5, 0x86e7, 0x8688, 0x86fa, 0x86fc, 0x86fd,
648 0x8704, 0x8705, 0x8707, 0x870b, 0x870e, 0x870f, 0x8710, 0x8713,
649 0x8714, 0x8719, 0x871e, 0x871f, 0x8721, 0x8723,
650 /* 0x5b */
651 0x8728, 0x872e, 0x872f, 0x8731, 0x8732, 0x8739, 0x873a, 0x873c,
652 0x873d, 0x873e, 0x8740, 0x8743, 0x8745, 0x874d, 0x8758, 0x875d,
653 0x8761, 0x8764, 0x8765, 0x876f, 0x8771, 0x8772, 0x877b, 0x8783,
654 0x8784, 0x8785, 0x8786, 0x8787, 0x8788, 0x8789, 0x878b, 0x878c,
655 0x8790, 0x8793, 0x8795, 0x8797, 0x8798, 0x8799, 0x879e, 0x87a0,
656 0x87a3, 0x87a7, 0x87ac, 0x87ad, 0x87ae, 0x87b1, 0x87b5, 0x87be,
657 0x87bf, 0x87c1, 0x87c8, 0x87c9, 0x87ca, 0x87ce, 0x87d5, 0x87d6,
658 0x87d9, 0x87da, 0x87dc, 0x87df, 0x87e2, 0x87e3, 0x87e4, 0x87ea,
659 0x87eb, 0x87ed, 0x87f1, 0x87f3, 0x87f8, 0x87fa, 0x87ff, 0x8801,
660 0x8803, 0x8806, 0x8809, 0x880a, 0x880b, 0x8810, 0x8819, 0x8812,
661 0x8813, 0x8814, 0x8818, 0x881a, 0x881b, 0x881c, 0x881e, 0x881f,
662 0x8828, 0x882d, 0x882e, 0x8830, 0x8832, 0x8835,
663 /* 0x5c */
664 0x883a, 0x883c, 0x8841, 0x8843, 0x8845, 0x8848, 0x8849, 0x884a,
665 0x884b, 0x884e, 0x8851, 0x8855, 0x8856, 0x8858, 0x885a, 0x885c,
666 0x885f, 0x8860, 0x8864, 0x8869, 0x8871, 0x8879, 0x887b, 0x8880,
667 0x8898, 0x889a, 0x889b, 0x889c, 0x889f, 0x88a0, 0x88a8, 0x88aa,
668 0x88ba, 0x88bd, 0x88be, 0x88c0, 0x88ca, 0x88cb, 0x88cc, 0x88cd,
669 0x88ce, 0x88d1, 0x88d2, 0x88d3, 0x88db, 0x88de, 0x88e7, 0x88ef,
670 0x88f0, 0x88f1, 0x88f5, 0x88f7, 0x8901, 0x8906, 0x890d, 0x890e,
671 0x890f, 0x8915, 0x8916, 0x8918, 0x8919, 0x891a, 0x891c, 0x8920,
672 0x8926, 0x8927, 0x8928, 0x8930, 0x8931, 0x8932, 0x8935, 0x8939,
673 0x893a, 0x893e, 0x8940, 0x8942, 0x8945, 0x8946, 0x8949, 0x894f,
674 0x8952, 0x8957, 0x895a, 0x895b, 0x895c, 0x8961, 0x8962, 0x8963,
675 0x896b, 0x896e, 0x8970, 0x8973, 0x8975, 0x897a,
676 /* 0x5d */
677 0x897b, 0x897c, 0x897d, 0x8989, 0x898d, 0x8990, 0x8994, 0x8995,
678 0x899b, 0x899c, 0x899f, 0x89a0, 0x89a5, 0x89b0, 0x89b4, 0x89b5,
679 0x89b6, 0x89b7, 0x89bc, 0x89d4, 0x89d5, 0x89d6, 0x89d7, 0x89d8,
680 0x89e5, 0x89e9, 0x89eb, 0x89ed, 0x89f1, 0x89f3, 0x89f6, 0x89f9,
681 0x89fd, 0x89ff, 0x8a04, 0x8a05, 0x8a07, 0x8a0f, 0x8a11, 0x8a12,
682 0x8a14, 0x8a15, 0x8a1e, 0x8a20, 0x8a22, 0x8a24, 0x8a26, 0x8a2b,
683 0x8a2c, 0x8a2f, 0x8a35, 0x8a37, 0x8a3d, 0x8a3e, 0x8a40, 0x8a43,
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684 0x8a45, 0x8a47, 0x8a49, 0x8a4d, 0x8a4e, 0x8a53, 0x8a56, 0x8a57,
685 0x8a58, 0x8a5c, 0x8a5d, 0x8a61, 0x8a65, 0x8a67, 0x8a75, 0x8a76,
686 0x8a77, 0x8a79, 0x8a7a, 0x8a7b, 0x8a7e, 0x8a7f, 0x8a80, 0x8a83,
687 0x8a86, 0x8a8b, 0x8a8f, 0x8a90, 0x8a92, 0x8a96, 0x8a97, 0x8a99,
688 0x8a9f, 0x8aa7, 0x8aa9, 0x8aae, 0x8aaf, 0x8ab3,
689 /* 0x5e */
690 0x8ab6, 0x8ab7, 0x8abb, 0x8abe, 0x8ac3, 0x8ac6, 0x8ac8, 0x8ac9,
691 0x8aca, 0x8ad1, 0x8ad3, 0x8ad4, 0x8ad5, 0x8ad7, 0x8add, 0x8adf,
692 0x8aec, 0x8af0, 0x8af4, 0x8af5, 0x8af6, 0x8afc, 0x8aff, 0x8b05,
693 0x8b06, 0x8b0b, 0x8b11, 0x8b1c, 0x8b1e, 0x8b1f, 0x8b0a, 0x8b2d,
694 0x8b30, 0x8b37, 0x8b3c, 0x8b42, 0x8b43, 0x8b44, 0x8b45, 0x8b46,
695 0x8b48, 0x8b52, 0x8b53, 0x8b54, 0x8b59, 0x8b4d, 0x8b5e, 0x8b63,
696 0x8b6d, 0x8b76, 0x8b78, 0x8b79, 0x8b7c, 0x8b7e, 0x8b81, 0x8b84,
697 0x8b85, 0x8b8b, 0x8b8d, 0x8b8f, 0x8b94, 0x8b95, 0x8b9c, 0x8b9e,
698 0x8b9f, 0x8c38, 0x8c39, 0x8c3d, 0x8c3e, 0x8c45, 0x8c47, 0x8c49,
699 0x8c4b, 0x8c4f, 0x8c51, 0x8c53, 0x8c54, 0x8c57, 0x8c58, 0x8c5b,
700 0x8c5d, 0x8c59, 0x8c63, 0x8c64, 0x8c66, 0x8c68, 0x8c69, 0x8c6d,
701 0x8c73, 0x8c75, 0x8c76, 0x8c7b, 0x8c7e, 0x8c86,
702 /* 0x5f */
703 0x8c87, 0x8c8b, 0x8c90, 0x8c92, 0x8c93, 0x8c99, 0x8c9b, 0x8c9c,
704 0x8ca4, 0x8cb9, 0x8cba, 0x8cc5, 0x8cc6, 0x8ccb, 0x8ccf,
705 0x8cd6, 0x8cd5, 0x8cd9, 0x8cdd, 0x8ce1, 0x8ce8, 0x8cec, 0x8cef,
706 0x8cf0, 0x8cf2, 0x8cf5, 0x8cf7, 0x8cf8, 0x8cfe, 0x8cff, 0x8d01,
707 0x8d03, 0x8d09, 0x8d12, 0x8d17, 0x8d1b, 0x8d65, 0x8d69, 0x8d6c,
708 0x8d6e, 0x8d7f, 0x8d82, 0x8d84, 0x8d88, 0x8d8d, 0x8d90, 0x8d91,
709 0x8d95, 0x8d9e, 0x8d9f, 0x8da0, 0x8da6, 0x8dab, 0x8dac, 0x8daf,
710 0x8db2, 0x8db5, 0x8db7, 0x8db9, 0x8dbb, 0x8dc0, 0x8dc5, 0x8dc6,
711 0x8dc7, 0x8dc8, 0x8dca, 0x8dce, 0x8dd1, 0x8dd4, 0x8dd5, 0x8dd7,
712 0x8dd9, 0x8de4, 0x8de5, 0x8de7, 0x8dec, 0x8df0, 0x8dbc, 0x8df1,
713 0x8df2, 0x8df4, 0x8dfd, 0x8e01, 0x8e04, 0x8e05, 0x8e06, 0x8e0b,
714 0x8e11, 0x8e14, 0x8e16, 0x8e20, 0x8e21, 0x8e22,
715 /* 0x60 */
716 0x8e23, 0x8e26, 0x8e27, 0x8e31, 0x8e33, 0x8e36, 0x8e37, 0x8e38,
717 0x8e39, 0x8e3d, 0x8e40, 0x8e41, 0x8e4b, 0x8e4d, 0x8e4e, 0x8e4f,
718 0x8e54, 0x8e5b, 0x8e5c, 0x8e5d, 0x8e5e, 0x8e61, 0x8e62, 0x8e69,
719 0x8e6c, 0x8e6d, 0x8e6f, 0x8e70, 0x8e71, 0x8e79, 0x8e7a, 0x8e7b,
720 0x8e82, 0x8e83, 0x8e89, 0x8e90, 0x8e92, 0x8e95, 0x8e9a, 0x8e9b,
721 0x8e9d, 0x8e9e, 0x8ea2, 0x8ea7, 0x8ea9, 0x8ead, 0x8eae, 0x8eb3,
722 0x8eb5, 0x8eba, 0x8ebb, 0x8ec0, 0x8ec1, 0x8ec3, 0x8ec4, 0x8ec7,
723 0x8ecf, 0x8ed1, 0x8ed4, 0x8edc, 0x8ee8, 0x8eee, 0x8ef0, 0x8ef1,
724 0x8ef7, 0x8ef9, 0x8efa, 0x8eed, 0x8f00, 0x8f02, 0x8f07, 0x8f08,
725 0x8f0f, 0x8f10, 0x8f16, 0x8f17, 0x8f18, 0x8f1e, 0x8f20, 0x8f21,
726 0x8f23, 0x8f25, 0x8f27, 0x8f28, 0x8f2c, 0x8f2d, 0x8f2e, 0x8f34,
727 0x8f35, 0x8f36, 0x8f37, 0x8f3a, 0x8f40, 0x8f41,
728 /* 0x61 */
729 0x8f43, 0x8f47, 0x8f4f, 0x8f51, 0x8f52, 0x8f53, 0x8f54, 0x8f55,
730 0x8f58, 0x8f5d, 0x8f5e, 0x8f65, 0x8f9d, 0x8fa0, 0x8fa1, 0x8fa4,
731 0x8fa5, 0x8fa6, 0x8fb5, 0x8fb6, 0x8fb8, 0x8fbe, 0x8fc0, 0x8fc1,
732 0x8fc6, 0x8fca, 0x8fcb, 0x8fcd, 0x8fd0, 0x8fd2, 0x8fd3, 0x8fd5,
733 0x8fe0, 0x8fe3, 0x8fe4, 0x8fe8, 0xfee, 0x8ff1, 0x8ff5, 0x8ff6,
734 0x8ffb, 0x8ffe, 0x9002, 0x9004, 0x9008, 0x900c, 0x9018, 0x901b,
735 0x9028, 0x9029, 0x902f, 0x902a, 0x902c, 0x902d, 0x9033, 0x9034,
736 0x9037, 0x903f, 0x9043, 0x9044, 0x904c, 0x905b, 0x905d, 0x9062,
737 0x9066, 0x906f, 0x906c, 0x9070, 0x9074, 0x9079, 0x9085, 0x9088,
738 0x908b, 0x908c, 0x908e, 0x9090, 0x9095, 0x9097, 0x9098, 0x9099,
739 0x909b, 0x90a0, 0x90a1, 0x90a2, 0x90a5, 0x90b0, 0x90b2, 0x90b3,
740 0x90b4, 0x90b6, 0x90bd, 0x90cc, 0x90be, 0x90c3,
741 /* 0x62 */
742 0x90c4, 0x90c5, 0x90c7, 0x90c8, 0x90d5, 0x90d7, 0x90d8, 0x90d9,
743 0x90dc, 0x90dd, 0x90df, 0x90e5, 0x90d2, 0x90f6, 0x90eb, 0x90ef,
744 0x90f0, 0x90f4, 0x90fe, 0x90ff, 0x9100, 0x9104, 0x9105, 0x9106,
745 0x9108, 0x910d, 0x9110, 0x9114, 0x9116, 0x9117, 0x9118, 0x911a,
746 0x911c, 0x911e, 0x9120, 0x9125, 0x9122, 0x9123, 0x9127, 0x9129,
747 0x912e, 0x912f, 0x9131, 0x9134, 0x9136, 0x9137, 0x9139, 0x913a,
748 0x913c, 0x913d, 0x9143, 0x9147, 0x9148, 0x914f, 0x9153, 0x9157,
749 0x9159, 0x915a, 0x915b, 0x9161, 0x9164, 0x9167, 0x916d, 0x9174,
750 0x9179, 0x917a, 0x917b, 0x9181, 0x9183, 0x9185, 0x9186, 0x918a,
751 0x918e, 0x9191, 0x9193, 0x9194, 0x9195, 0x9198, 0x919e, 0x91a1,
752 0x91a6, 0x91a8, 0x91ac, 0x91ad, 0x91ae, 0x91b0, 0x91b1, 0x91b2,
753 0x91b3, 0x91b6, 0x91bb, 0x91bc, 0x91bd, 0x91bf,
754 /* 0x63 */
755 0x91c2, 0x91c3, 0x91c5, 0x91d3, 0x91d4, 0x91d7, 0x91d9, 0x91da,
756 0x91de, 0x91e4, 0x91e5, 0x91e9, 0x91ea, 0x91ec, 0x91ed, 0x91ee,
757 0x91ef, 0x91f0, 0x91f1, 0x91f7, 0x91f9, 0x91fb, 0x91fd, 0x9200,
758 0x9201, 0x9204, 0x9205, 0x9206, 0x9207, 0x9209, 0x920a, 0x920c,
759 0x9210, 0x9212, 0x9213, 0x9216, 0x9218, 0x921c, 0x921d, 0x9223,
760 0x9224, 0x9225, 0x9226, 0x9228, 0x922e, 0x922f, 0x9230, 0x9233,
761 0x9235, 0x9236, 0x9238, 0x9239, 0x923a, 0x923c, 0x923e, 0x9240,
762 0x9242, 0x9243, 0x9246, 0x9247, 0x924a, 0x924d, 0x924e, 0x924f,
763 0x9251, 0x9258, 0x9259, 0x925c, 0x925d, 0x9260, 0x9261, 0x9265,
764 0x9267, 0x9268, 0x9269, 0x926e, 0x926f, 0x9270, 0x9275, 0x9276,
765 0x9277, 0x9278, 0x9279, 0x927b, 0x927c, 0x927d, 0x927f, 0x9288,
766 0x9289, 0x928a, 0x928d, 0x928e, 0x9292, 0x9297,
767 /* 0x64 */
768 0x9299, 0x929f, 0x92a0, 0x92a4, 0x92a5, 0x92a7, 0x92a8, 0x92ab,
769 0x92af, 0x92b2, 0x92b6, 0x92ba, 0x92bb, 0x92bc, 0x92bd,
770 0x92bf, 0x92c0, 0x92c1, 0x92c2, 0x92c3, 0x92c5, 0x92c6, 0x92c7,
```

```
771 0x92c8, 0x92cb, 0x92cc, 0x92cd, 0x92ce, 0x92d0, 0x92d3, 0x92d5,
772 0x92d7, 0x92d8, 0x92d9, 0x92dc, 0x92dd, 0x92de, 0x92e0, 0x92e1,
773 0x92e3, 0x92e5, 0x92e7, 0x92e8, 0x92ec, 0x92ee, 0x92f0, 0x92f9,
774 0x92fb, 0x92ff, 0x9300, 0x9302, 0x9308, 0x930d, 0x9311, 0x9314,
775 0x9315, 0x931c, 0x931d, 0x931e, 0x931f, 0x9321, 0x9324, 0x9325,
776 0x9327, 0x9329, 0x932a, 0x9332, 0x9333, 0x9334, 0x9336, 0x9337, 0x9347,
777 0x9348, 0x9349, 0x9350, 0x9351, 0x9352, 0x9355, 0x9357, 0x9358,
778 0x935a, 0x935e, 0x9364, 0x9365, 0x9367, 0x9369, 0x936a, 0x936d,
779 0x936f, 0x9370, 0x9371, 0x9373, 0x9374, 0x9376,
780 /* 0x65 */
781 0x937a, 0x937d, 0x937f, 0x9380, 0x9381, 0x9382, 0x9388, 0x938a,
782 0x938b, 0x938d, 0x938f, 0x9392, 0x9395, 0x9398, 0x939b, 0x939e,
783 0x93a1, 0x93a3, 0x93a4, 0x93a6, 0x93a8, 0x93ab, 0x93b4, 0x93b5,
784 0x93b6, 0x93ba, 0x93a9, 0x93c1, 0x93c4, 0x93c5, 0x93c6, 0x93c7,
785 0x93c9, 0x93ca, 0x93cb, 0x93cc, 0x93cd, 0x93d3, 0x93d9, 0x93dc,
786 0x93de, 0x93df, 0x93e2, 0x93e6, 0x93e7, 0x93f9, 0x93f7, 0x93f8,
787 0x93fa, 0x93fb, 0x93fd, 0x9401, 0x9402, 0x9404, 0x9408, 0x9409,
788 0x940d, 0x940e, 0x940f, 0x9415, 0x9416, 0x9417, 0x941f, 0x942e,
789 0x942f, 0x9431, 0x9432, 0x9433, 0x9434, 0x943b, 0x943f, 0x943d,
790 0x9443, 0x9445, 0x9448, 0x944a, 0x944c, 0x9455, 0x9459, 0x945c,
791 0x945f, 0x9461, 0x9463, 0x9468, 0x946b, 0x946d, 0x946e, 0x946f,
792 0x9471, 0x9472, 0x9484, 0x9483, 0x9578, 0x9579,
793 /* 0x66 */
794 0x957e, 0x9584, 0x9588, 0x958c, 0x958d, 0x958e, 0x959d, 0x959e,
795 0x959f, 0x95a1, 0x95a6, 0x95a9, 0x95ab, 0x95ac, 0x95b4, 0x95b6,
796 0x95ba, 0x95bd, 0x95bf, 0x95c6, 0x95c8, 0x95c9, 0x95cb, 0x95d0,
797 0x95d1, 0x95d2, 0x95d3, 0x95d9, 0x95da, 0x95dd, 0x95de, 0x95df,
798 0x95e0, 0x95e4, 0x95e6, 0x961d, 0x961e, 0x9622, 0x9624, 0x9625,
799 0x9626, 0x962c, 0x9631, 0x9633, 0x9637, 0x9638, 0x9639, 0x963a,
800 0x963c, 0x963d, 0x9641, 0x9652, 0x9654, 0x9656, 0x9657, 0x9658,
801 0x9661, 0x966e, 0x9674, 0x967b, 0x967c, 0x967e, 0x967f, 0x9681,
802 0x9682, 0x9683, 0x9684, 0x9689, 0x9691, 0x9696, 0x969a, 0x969d,
803 0x969f, 0x96a4, 0x96a5, 0x96a9, 0x96ae, 0x96af, 0x96b3,
804 0x96ba, 0x96ca, 0x96d2, 0x5db2, 0x96d8, 0x96da, 0x96dd, 0x96de,
805 0x96df, 0x96e9, 0x96ef, 0x96f1, 0x96fa, 0x9702,
806 /* 0x67 */
807 0x9703, 0x9705, 0x9709, 0x971a, 0x971b, 0x971d, 0x9721, 0x9722,
808 0x9723, 0x9728, 0x9731, 0x9733, 0x9741, 0x9743, 0x974a, 0x974e,
809 0x974f, 0x9755, 0x9757, 0x9758, 0x975a, 0x975b, 0x9763, 0x9767,
810 0x976a, 0x976e, 0x9773, 0x9776, 0x9777, 0x9778, 0x977b, 0x977d,
811 0x977f, 0x9780, 0x9789, 0x9795, 0x9796, 0x9797, 0x9799, 0x979a,
812 0x979e, 0x979f, 0x97a2, 0x97ac, 0x97ae, 0x97b1, 0x97b2, 0x97b5,
813 0x97b6, 0x97b8, 0x97b9, 0x97ba, 0x97bc, 0x97be, 0x97bf, 0x97c1,
814 0x97c4, 0x97c5, 0x97c7, 0x97c9, 0x97ca, 0x97cc, 0x97cd, 0x97ce,
815 0x97d0, 0x97d1, 0x97d4, 0x97d7, 0x97d8, 0x97d9, 0x97dd, 0x97de,
816 0x97e0, 0x97db, 0x97e1, 0x97e4, 0x97ef, 0x97f1, 0x97f4, 0x97f7,
817 0x97f8, 0x97fa, 0x9807, 0x980a, 0x9819, 0x980d, 0x980e, 0x9814,
818 0x9816, 0x981c, 0x981e, 0x9820, 0x9823, 0x9826,
819 /* 0x68 */
820 0x982b, 0x982e, 0x982f, 0x9830, 0x9832, 0x9833, 0x9835, 0x9825,
821 0x983e, 0x9844, 0x9847, 0x984a, 0x9851, 0x9852, 0x9853, 0x9856,
822 0x9857, 0x9859, 0x985a, 0x9862, 0x9863, 0x9865, 0x9866, 0x986a,
823 0x986c, 0x98ab, 0x98ad, 0x98ae, 0x98b0, 0x98b4, 0x98b7, 0x98b8,
824 0x98ba, 0x98bb, 0x98bf, 0x98c2, 0x98c5, 0x98c8, 0x98cc, 0x98e1,
825 0x98e3, 0x98e5, 0x98e6, 0x98e7, 0x98ea, 0x98f3, 0x98f6, 0x9902,
826 0x9907, 0x9908, 0x9911, 0x9915, 0x9916, 0x9917, 0x991a, 0x991b,
827 0x991c, 0x991f, 0x9922, 0x9926, 0x9927, 0x992b, 0x9931, 0x9932,
828 0x9933, 0x9934, 0x9935, 0x9939, 0x993a, 0x993b, 0x993c, 0x9940,
829 0x9941, 0x9946, 0x9947, 0x9948, 0x994d, 0x994e, 0x9954, 0x9958,
830 0x9959, 0x995b, 0x995c, 0x995e, 0x995f, 0x9960, 0x999b, 0x999d,
831 0x999f, 0x99a6, 0x99b0, 0x99b1, 0x99b2, 0x99b5,
832 /* 0x69 */
833 0x99b9, 0x99ba, 0x99bd, 0x99bf, 0x99c3, 0x99c9, 0x99d3, 0x99d4,
834 0x99d9, 0x99da, 0x99dc, 0x99de, 0x99e7, 0x99ea, 0x99eb, 0x99ec,
835 0x99f0, 0x99f4, 0x99f5, 0x99f9, 0x99fd, 0x99fe, 0x9a02, 0x9a03,
836 0x9a04, 0x9a0b, 0x9a0c, 0x9a10, 0x9a11, 0x9a16, 0x9a1e, 0x9a20,
837 0x9a22, 0x9a23, 0x9a24, 0x9a27, 0x9a2d, 0x9a2e, 0x9a33, 0x9a35,
838 0x9a36, 0x9a38, 0x9a47, 0x9a41, 0x9a44, 0x9a4a, 0x9a4b, 0x9a4c,
839 0x9a4e, 0x9a51, 0x9a54, 0x9a56, 0x9a5d, 0x9aaa, 0x9aac, 0x9aae,
840 0x9aaf, 0x9ab2, 0x9ab4, 0x9ab5, 0x9ab6, 0x9ab9, 0x9abb, 0x9abe,
841 0x9abf, 0x9ac1, 0x9ac3, 0x9ac6, 0x9ac8, 0x9ace, 0x9ad0, 0x9ad2,
842 0x9ad5, 0x9ad6, 0x9ad7, 0x9adb, 0x9adc, 0x9ae0, 0x9ae4, 0x9ae5,
843 0x9ae7, 0x9ae9, 0x9aec, 0x9af2, 0x9af3, 0x9af5, 0x9af9, 0x9afa,
844 0x9afd, 0x9aff, 0x9b00, 0x9b01, 0x9b02, 0x9b03,
845 /* 0x6a */
846 0x9b04, 0x9b05, 0x9b08, 0x9b09, 0x9b0b, 0x9b0c, 0x9b0d, 0x9b0e,
847 0x9b10, 0x9b12, 0x9b16, 0x9b19, 0x9b1b, 0x9b1c, 0x9b20, 0x9b26,
848 0x9b2b, 0x9b2d, 0x9b33, 0x9b34, 0x9b35, 0x9b37, 0x9b39, 0x9b3a,
849 0x9b3d, 0x9b48, 0x9b4b, 0x9b4c, 0x9b55, 0x9b56, 0x9b57, 0x9b5b,
850 0x9b5e, 0x9b61, 0x9b63, 0x9b65, 0x9b66, 0x9b68, 0x9b6a, 0x9b6b,
851 0x9b6c, 0x9b6d, 0x9b6e, 0x9b73, 0x9b75, 0x9b77, 0x9b78, 0x9b79,
852 0x9b7f, 0x9b80, 0x9b84, 0x9b85, 0x9b86, 0x9b87, 0x9b89, 0x9b8a,
853 0x9b8b, 0x9b8d, 0x9b8f, 0x9b90, 0x9b94, 0x9b9a, 0x9b9d, 0x9b9e,
854 0x9ba6, 0x9ba7, 0x9ba9, 0x9bac, 0x9bb0, 0x9bb1, 0x9bb2, 0x9bb7,
855 0x9bb8, 0x9bbb, 0x9bbc, 0x9bbe, 0x9bbf, 0x9bc1, 0x9bc7, 0x9bc8,
856 0x9bce, 0x9bd0, 0x9bd7, 0x9bdd, 0x9bdf, 0x9be5, 0x9be7,
857 0x9bea, 0x9beb, 0x9bef, 0x9bf3, 0x9bf7, 0x9bf8,
```

```

858  /* 0x6b */
859  0x9bf9, 0x9bfa, 0x9bfd, 0x9bff, 0x9c00, 0x9c02, 0x9c0b, 0x9c0f,
860  0x9c11, 0x9c16, 0x9c18, 0x9c19, 0x9c1a, 0x9c1c, 0x9c1e, 0x9c22,
861  0x9c23, 0x9c26, 0x9c27, 0x9c28, 0x9c29, 0x9c2a, 0x9c31, 0x9c35,
862  0x9c36, 0x9c37, 0x9c3d, 0x9c41, 0x9c43, 0x9c44, 0x9c45, 0x9c49,
863  0x9c4a, 0x9c4e, 0x9c4f, 0x9c50, 0x9c53, 0x9c54, 0x9c56, 0x9c58,
864  0x9c5b, 0x9c5d, 0x9c5e, 0x9c5f, 0x9c63, 0x9c69, 0x9c6a, 0x9c5c,
865  0x9c6b, 0x9c68, 0x9c6e, 0x9c70, 0x9c72, 0x9c75, 0x9c77, 0x9c7b,
866  0x9ce6, 0x9cf2, 0x9cf7, 0x9cf9, 0x9d0b, 0x9d02, 0x9d11, 0x9d17,
867  0x9d18, 0x9d1c, 0x9d1d, 0x9d1e, 0x9d2f, 0x9d30, 0x9d32, 0x9d33,
868  0x9d34, 0x9d3a, 0x9d3c, 0x9d45, 0x9d3d, 0x9d42, 0x9d43, 0x9d47,
869  0x9d4a, 0x9d53, 0x9d54, 0x9d5f, 0x9d63, 0x9d62, 0x9d65, 0x9d69,
870  0x9d6a, 0x9d6b, 0x9d70, 0x9d76, 0x9d77, 0x9d7b,
871  /* 0x6c */
872  0x9d7c, 0x9d7e, 0x9d83, 0x9d84, 0x9d86, 0x9d8a, 0x9d8d, 0x9d8e,
873  0x9d92, 0x9d93, 0x9d95, 0x9d96, 0x9d97, 0x9d98, 0x9da1, 0x9daa,
874  0x9dac, 0x9dae, 0x9db1, 0x9db5, 0x9db9, 0x9dbc, 0x9dbf, 0x9dc3,
875  0x9dc7, 0x9dc9, 0x9dca, 0x9dda, 0x9dd5, 0x9dd6, 0x9dd7, 0x9dda,
876  0x9dde, 0x9ddf, 0x9de0, 0x9de5, 0x9de7, 0x9de9, 0x9deb, 0x9dee,
877  0x9df0, 0x9df3, 0x9df4, 0x9dfe, 0x9e0a, 0x9e02, 0x9e07, 0x9e0e,
878  0x9e10, 0x9e11, 0x9e12, 0x9e15, 0x9e16, 0x9e19, 0x9e1c, 0x9e1d,
879  0x9e7a, 0x9e7b, 0x9e7c, 0x9e80, 0x9e82, 0x9e83, 0x9e84, 0x9e85,
880  0x9e87, 0x9e8e, 0x9e8f, 0x9e96, 0x9e98, 0x9e9b, 0x9e9e, 0x9ea4,
881  0x9ea8, 0x9eac, 0x9eae, 0x9eaf, 0x9eb0, 0x9eb3, 0x9eb4, 0x9eb5,
882  0x9ec6, 0x9ec8, 0x9ecb, 0x9ed5, 0x9edf, 0x9ee4, 0x9ee7, 0x9eec,
883  0x9eed, 0x9eee, 0x9ef0, 0x9ef1, 0x9ef2, 0x9ef5,
884  /* 0x6d */
885  0x9ef8, 0x9eff, 0x9f02, 0x9f03, 0x9f09, 0x9f0f, 0x9f10, 0x9f11,
886  0x9f12, 0x9f14, 0x9f16, 0x9f17, 0x9f19, 0x9f1a, 0x9f1b, 0x9f1f,
887  0x9f22, 0x9f26, 0x9f2a, 0x9f2b, 0x9f2f, 0x9f31, 0x9f32, 0x9f34,
888  0x9f37, 0x9f39, 0x9f3a, 0x9f3c, 0x9f3d, 0x9f3f, 0x9f41, 0x9f43,
889  0x9f44, 0x9f45, 0x9f46, 0x9f47, 0x9f53, 0x9f55, 0x9f56, 0x9f57,
890  0x9f58, 0x9f5a, 0x9f5d, 0x9f5e, 0x9f68, 0x9f69, 0x9f6d, 0x9f6e,
891  0x9f6f, 0x9f70, 0x9f71, 0x9f73, 0x9f75, 0x9f7a, 0x9f7d, 0x9f8f,
892  0x9f90, 0x9f91, 0x9f92, 0x9f94, 0x9f96, 0x9f97, 0x9f9e, 0x9fa1,
893  0x9fa2, 0x9fa3, 0x9fa5,
894  };
895
896  static int
897  jisx0212_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
898  {
899      unsigned char c1 = (s[0] & 0x7f);
900      if ((c1 == 0x22) || (c1 >= 0x26 && c1 <= 0x27) || (c1 >= 0x29 && c1 <= 0x2b) || (c1 >= 0x30 && c1 <=
901          0x6d)) {
902          if (n >= 2) {
903              unsigned char c2 = (s[1] & 0x7f);
904              if (c2 >= 0x21 && c2 < 0x7f) {
905                  unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
906                  unsigned short wc = 0xffffd;
907                  if (i < 470) {
908                      if (i < 175)
909                          wc = jisx0212_2uni_page22[i-94];
910                      else if (i < 752) {
911                          if (i < 658)
912                              wc = jisx0212_2uni_page26[i-470];
913                      } else if (i < 1410) {
914                          if (i < 1027)
915                              wc = jisx0212_2uni_page29[i-752];
916                      } else {
917                          if (i < 7211)
918                              wc = jisx0212_2uni_page30[i-1410];
919                      }
920                  }
921                  if (wc != 0xffffd) {
922                      *pwc = (ucs4_t) wc;
923                      return 2;
924                  }
925              }
926              return RET_ILSEQ;
927          }
928          return RET_ILSEQ;
929      }
930      #endif /* NEED_TOWC */
931
932      #ifdef NEED_TOMB
933      static const unsigned short jisx0212_2charset[6067] = {
934          0x2237, 0x2242, 0x2270, 0x2243, 0x226d, 0x226c, 0x226e, 0x2234,
935          0x2231, 0x226b, 0x2244, 0x2a22, 0x2a21, 0x2a2a, 0x2a2a, 0x2a23,
936          0x2a29, 0x2921, 0x2a2e, 0x2a32, 0x2a31, 0x2a34, 0x2a33, 0x2a40,
937          0x2a3f, 0x2a42, 0x2a41, 0x2a50, 0x2a52, 0x2a51, 0x2a54, 0x2a58,
938          0x2a53, 0x292c, 0x2a63, 0x2a62, 0x2a65, 0x2a64, 0x2a72, 0x2930,
939          0x294e, 0x2b22, 0x2b21, 0x2b24, 0x2b2a, 0x2b23, 0x2b29, 0x2941,
940          0x2b2e, 0x2b32, 0x2b31, 0x2b34, 0x2b33, 0x2b40, 0x2b3f, 0x2b42,
941          0x2b41, 0x2943, 0x2b50, 0x2b52, 0x2b51, 0x2b54, 0x2b58, 0x2b53,
942          0x294c, 0x2b63, 0x2b62, 0x2b65, 0x2b64, 0x2b72, 0x2950, 0x2b73,
943          0x2a27, 0x2b27, 0x2a25, 0x2b25, 0x2a28, 0x2b28, 0x2a2b, 0x2b2b,

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```
944 0x2a2c, 0x2b2c, 0x2a2f, 0x2b2f, 0x2a2d, 0x2b2d, 0x2a30, 0x2b30,
945 0x2922, 0x2942, 0x2a37, 0x2b37, 0x2a36, 0x2b36, 0x2a38, 0x2b38,
946 0x2a35, 0x2b35, 0x2a3a, 0x2b3a, 0x2a3b, 0x2b3b, 0x2a3d, 0x2b3d,
947 0x2a3c, 0x2a3e, 0x2b3e, 0x2924, 0x2944, 0x2a47, 0x2b47, 0x2a45,
948 0x2b45, 0x2a46, 0x2b46, 0x2a44, 0x2945, 0x2926, 0x2946, 0x2a48,
949 0x2b48, 0x2a49, 0x2b49, 0x2947, 0x2a4a, 0x2b4a, 0x2a4c, 0x2b4c,
950 0x2a4b, 0x2b4b, 0x2929, 0x2949, 0x2928, 0x2948, 0x2a4d, 0x2b4d,
951 0x2a4f, 0x2b4f, 0x2a4e, 0x2b4e, 0x294a, 0x292b, 0x294b, 0x2a57,
952 0x2b57, 0x2a56, 0x2b56, 0x292d, 0x294d, 0x2a59, 0x2b59, 0x2a5b,
953 0x2b5b, 0x2a5a, 0x2b5a, 0x2a5c, 0x2b5c, 0x2a5d, 0x2b5d, 0x2a5f,
954 0x2b5f, 0x2a5e, 0x2b5e, 0x2a61, 0x2b61, 0x2a60, 0x2b60, 0x292f,
955 0x294f, 0x2a6c, 0x2b6c, 0x2a69, 0x2b69, 0x2a66, 0x2b66, 0x2a6b,
956 0x2b6b, 0x2a68, 0x2b68, 0x2a6a, 0x2b6a, 0x2a71, 0x2b71, 0x2a74,
957 0x2b74, 0x2a73, 0x2a75, 0x2b75, 0x2a77, 0x2b77, 0x2a76, 0x2b76,
958 0x2a26, 0x2b26, 0x2a43, 0x2b43, 0x2a55, 0x2b55, 0x2a67, 0x2b67,
959 0x2a70, 0x2b70, 0x2a6d, 0x2b6d, 0x2a6f, 0x2b6f, 0x2a6e, 0x2b6e,
960 0x2b39, 0x2230, 0x222f, 0x2232, 0x2236, 0x2235, 0x2233, 0x2238,
961 0x2239, 0x2661, 0x2662, 0x2663, 0x2664, 0x2667, 0x2669, 0x266c,
962 0x2676, 0x2665, 0x266a, 0x2671, 0x2672, 0x2673, 0x2674, 0x267b,
963 0x2678, 0x2675, 0x267a, 0x2677, 0x2679, 0x267c, 0x2742, 0x2743,
964 0x2744, 0x2745, 0x2746, 0x2747, 0x2748, 0x2749, 0x274a, 0x274b,
965 0x274c, 0x274d, 0x274e, 0x2772, 0x2773, 0x2774, 0x2775, 0x2776,
966 0x2777, 0x2778, 0x2779, 0x277a, 0x277b, 0x277c, 0x277d, 0x277e,
967 0x2271, 0x226f, 0x3021, 0x3022, 0x3023, 0x3024, 0x3025, 0x3026,
968 0x3027, 0x3028, 0x3029, 0x302a, 0x302b, 0x302c, 0x302d, 0x302e,
969 0x302f, 0x3030, 0x3031, 0x3032, 0x3033, 0x3034, 0x3035, 0x3036,
970 0x3037, 0x3038, 0x3039, 0x303a, 0x303b, 0x303c, 0x303d, 0x303e,
971 0x303f, 0x3040, 0x3041, 0x3042, 0x3043, 0x3044, 0x3045, 0x3046,
972 0x3047, 0x3048, 0x3049, 0x304a, 0x304b, 0x304c, 0x304d, 0x304e,
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975 0x3060, 0x3061, 0x3062, 0x3063, 0x3064, 0x3065, 0x3066, 0x3067,
976 0x3068, 0x3069, 0x306a, 0x306b, 0x306c, 0x306d, 0x306e, 0x306f,
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979 0x3121, 0x3122, 0x3123, 0x3124, 0x3125, 0x3126, 0x3127, 0x3128,
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987 0x3160, 0x3161, 0x3162, 0x3163, 0x3164, 0x3165, 0x3166, 0x3167,
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997 0x3253, 0x3254, 0x3255, 0x3256, 0x3257, 0x3258, 0x3259, 0x325a,
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1008 0x334d, 0x334e, 0x334f, 0x3350, 0x3351, 0x3352, 0x3353, 0x3354,
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1012 0x336d, 0x336e, 0x336f, 0x3370, 0x3371, 0x3372, 0x3373, 0x3374,
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1692 0x6d61, 0x6d62, 0x6d63,
1693 };
1694
1695 static const Summary16 jisx0212_uni2indx_page00[70] = {
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1697     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 },
1698     { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x4000 },
1699     { 1, 0x0000 }, { 1, 0x0000 }, { 1, 0xc652 }, { 8, 0x8500 },
1700     { 11, 0xffff }, { 27, 0xff7e }, { 41, 0xffff }, { 57, 0xff7f },
1701     /* 0x0100 */
1702     { 72, 0xffff }, { 88, 0xffcf }, { 102, 0xcff7 }, { 115, 0xffff },
1703     { 131, 0x3fff }, { 145, 0xffff }, { 161, 0xffff }, { 177, 0x7fff },
1704     { 192, 0x0000 }, { 192, 0x0000 }, { 192, 0x0000 }, { 192, 0x0000 },
1705     { 192, 0xe000 }, { 195, 0x1fff }, { 208, 0x0000 }, { 208, 0x0020 },
1706     /* 0x0200 */
1707     { 209, 0x0000 }, { 209, 0x0000 }, { 209, 0x0000 }, { 209, 0x0000 },
1708     { 209, 0x0000 }, { 209, 0x0000 }, { 209, 0x0000 }, { 209, 0x0000 },
1709     { 209, 0x0000 }, { 209, 0x0000 }, { 209, 0x0000 }, { 209, 0x0000 },
1710     { 209, 0x0080 }, { 210, 0x2f00 }, { 215, 0x0000 }, { 215, 0x0000 },
1711     /* 0x0300 */
1712     { 215, 0x0000 }, { 215, 0x0000 }, { 215, 0x0000 }, { 215, 0x0000 },
1713     { 215, 0x0000 }, { 215, 0x0000 }, { 215, 0x0000 }, { 215, 0x0000 },
1714     { 215, 0xd770 }, { 224, 0x0001 }, { 225, 0xfc00 }, { 231, 0x0001 },
1715     { 232, 0x7c04 }, { 238, 0x0000 }, { 238, 0x0000 }, { 238, 0x0000 },
1716     /* 0x0400 */
1717     { 238, 0xdffc }, { 251, 0x0000 }, { 251, 0x0000 }, { 251, 0x0000 },
1718     { 251, 0x0000 }, { 251, 0xdffc },
1719 };
1720 static const Summary16 jisx0212_uni2indx_page21[3] = {
1721     /* 0x2100 */
1722     { 264, 0x0000 }, { 264, 0x0040 }, { 265, 0x0004 },
1723 };
1724 static const Summary16 jisx0212_uni2indx_page4e[1307] = {
1725     /* 0x4e00 */
1726     { 266, 0x1034 }, { 270, 0x8004 }, { 272, 0xc918 }, { 278, 0x0021 },
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1728 { 294, 0x2000 }, { 295, 0x20c0 }, { 298, 0x8000 }, { 299, 0x0200 },
1729 { 300, 0x0008 }, { 301, 0x0c01 }, { 304, 0x8107 }, { 309, 0xe02a },
1730 /* 0x4f00 */
1731 { 315, 0x190d }, { 321, 0x02e4 }, { 326, 0x4000 }, { 327, 0x4aaa },
1732 { 334, 0x1b05 }, { 340, 0x8154 }, { 345, 0x5409 }, { 350, 0x6782 },
1733 { 357, 0x5636 }, { 365, 0xc69d }, { 374, 0x0000 }, { 374, 0x7a84 },
1734 { 381, 0xbb63 }, { 391, 0x1004 }, { 393, 0x0005 }, { 395, 0xb005 },
1735 /* 0x5000 */
1736 { 400, 0x5493 }, { 407, 0x7989 }, { 415, 0x4084 }, { 418, 0x082d },
1737 { 423, 0x5467 }, { 431, 0x828e }, { 437, 0x24cd }, { 444, 0x0003 },
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1739 { 471, 0x5099 }, { 477, 0xb119 }, { 484, 0x8354 }, { 490, 0x4446 },
1740 /* 0x5100 */
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1742 { 522, 0x8404 }, { 525, 0x81a8 }, { 530, 0x0050 }, { 532, 0x4000 },
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1745 /* 0x5200 */
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1747 { 577, 0x0220 }, { 579, 0x95a0 }, { 585, 0x4043 }, { 589, 0x0380 },
1748 { 592, 0x1425 }, { 597, 0x15e8 }, { 604, 0x80f0 }, { 609, 0x2dc1 },
1749 { 616, 0x9151 }, { 622, 0x1852 }, { 627, 0x1722 }, { 633, 0x00d3 },
1750 /* 0x5300 */
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1752 { 663, 0x1804 }, { 666, 0x0a00 }, { 668, 0x302a }, { 673, 0x4204 },
1753 { 676, 0x4188 }, { 680, 0x2218 }, { 684, 0x8c12 }, { 689, 0x25b4 },
1754 { 696, 0x8021 }, { 699, 0x642c }, { 705, 0x00c1 }, { 708, 0x0020 },
1755 /* 0x5400 */
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1757 { 720, 0xa098 }, { 725, 0x4000 }, { 726, 0x6ad4 }, { 734, 0x8010 },
1758 { 736, 0x232a }, { 742, 0x9062 }, { 747, 0x66c2 }, { 754, 0x8e82 },
1759 { 760, 0x6440 }, { 764, 0x0000 }, { 764, 0x9401 }, { 768, 0xd040 },
1760 /* 0x5500 */
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1764 { 821, 0x5a4a }, { 828, 0x498e }, { 835, 0x0204 }, { 837, 0x8040 },
1765 /* 0x5600 */
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1769 { 903, 0xbe20 }, { 910, 0xb201 }, { 915, 0x29f2 }, { 923, 0x00c2 },
1770 /* 0x5700 */
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1772 { 951, 0x3060 }, { 955, 0x0004 }, { 956, 0xe9a4 }, { 964, 0x5ebb },
1773 { 975, 0x100a }, { 978, 0xf6b0 }, { 987, 0x1382 }, { 992, 0x2100 },
1774 { 994, 0x9180 }, { 998, 0x6020 }, { 1001, 0x22d2 }, { 1007, 0xe161 },
1775 /* 0x5800 */
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1779 { 1065, 0x6114 }, { 1070, 0x2455 }, { 1076, 0x0206 }, { 1079, 0x0008 },
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2021 { 4455, 0xe042 }, { 4460, 0x1760 }, { 4466, 0x01c1 }, { 4470, 0x4627 },
2022 { 4477, 0x8265 }, { 4483, 0x1c84 }, { 4488, 0x480e }, { 4493, 0x3c29 },
2023 { 4500, 0x2200 }, { 4502, 0x9831 }, { 4508, 0x0021 }, { 4510, 0x10f1 },
2024 { 4516, 0x0000 }, { 4516, 0x01f0 }, { 4521, 0x2a20 }, { 4525, 0xa24a },
2025 /* 0x8a00 */
2026 { 4531, 0x80b0 }, { 4535, 0x4036 }, { 4540, 0x9855 }, { 4547, 0x60a0 },
2027 { 4551, 0x62a9 }, { 4558, 0x31c8 }, { 4564, 0x00a2 }, { 4567, 0xcee0 },
2028 { 4575, 0x8849 }, { 4580, 0x82c5 }, { 4586, 0xc280 }, { 4590, 0x48c8 },
2029 { 4595, 0x0748 }, { 4600, 0xa0ba }, { 4607, 0x1000 }, { 4608, 0x9071 },
2030 /* 0x8b00 */
2031 { 4614, 0x0c60 }, { 4618, 0xd002 }, { 4622, 0x2000 }, { 4623, 0x1081 },
2032 { 4626, 0x217c }, { 4633, 0x421c }, { 4638, 0x2008 }, { 4640, 0x5340 },
2033 { 4645, 0xa832 }, { 4651, 0xd030 }, { 4656, 0x0000 }, { 4656, 0x0000 },
2034 { 4656, 0x0000 }, { 4656, 0x0000 }, { 4656, 0x0000 }, { 4656, 0x0000 },
2035 /* 0x8c00 */
2036 { 4656, 0x0000 }, { 4656, 0x0000 }, { 4656, 0x0000 }, { 4656, 0x6300 },
2037 { 4660, 0x8aa0 }, { 4665, 0x2b9a }, { 4673, 0x2358 }, { 4679, 0x4868 },
2038 { 4684, 0x08c0 }, { 4687, 0x1a0d }, { 4693, 0x0010 }, { 4694, 0x0600 },
2039 { 4696, 0x8a60 }, { 4701, 0x2260 }, { 4705, 0x9102 }, { 4709, 0xc1a5 },
2040 /* 0x8d00 */
2041 { 4716, 0x020a }, { 4719, 0x0884 }, { 4722, 0x0000 }, { 4722, 0x0000 },
2042 { 4722, 0x0000 }, { 4722, 0x0000 }, { 4722, 0x5220 }, { 4726, 0x8000 },
2043 { 4727, 0x2114 }, { 4731, 0xc023 }, { 4736, 0x9841 }, { 4741, 0x1aa4 },
2044 { 4747, 0x45e1 }, { 4754, 0x02b2 }, { 4759, 0x10b0 }, { 4763, 0x2017 },
2045 /* 0x8e00 */
2046 { 4768, 0x0872 }, { 4773, 0x0052 }, { 4776, 0x00cf }, { 4782, 0x23ca },
2047 { 4789, 0xe803 }, { 4795, 0x7810 }, { 4800, 0xb206 }, { 4806, 0x0e03 },
2048 { 4811, 0x020c }, { 4814, 0x6c25 }, { 4821, 0x6284 }, { 4826, 0x0c28 },
2049 { 4830, 0x809b }, { 4836, 0x1012 }, { 4839, 0x6100 }, { 4842, 0x0683 },
2050 /* 0x8f00 */
2051 { 4847, 0x8185 }, { 4852, 0x41c1 }, { 4857, 0x71ab }, { 4866, 0x04f0 },
2052 { 4871, 0x808b }, { 4876, 0x613e }, { 4884, 0x0020 }, { 4885, 0x0000 },
2053 { 4885, 0x0000 }, { 4885, 0x2000 }, { 4886, 0x0073 }, { 4891, 0x4160 },
2054 { 4895, 0x2c43 }, { 4901, 0x002d }, { 4905, 0x4119 }, { 4910, 0x4862 },
2055 /* 0x9000 */
2056 { 4915, 0x1114 }, { 4919, 0x0900 }, { 4921, 0xb700 }, { 4927, 0x8098 },
2057 { 4931, 0x1018 }, { 4934, 0x2800 }, { 4936, 0x10c4 }, { 4940, 0x0211 },
2058 { 4943, 0x5920 }, { 4948, 0x0ba1 }, { 4954, 0x0027 }, { 4958, 0x605d },
2059 { 4965, 0x11b8 }, { 4971, 0xb3a4 }, { 4979, 0x8820 }, { 4982, 0xc051 },
2060 /* 0x9100 */
2061 { 4987, 0x2171 }, { 4993, 0x55d1 }, { 5001, 0xc2ad }, { 5009, 0x36d2 },
2062 { 5017, 0x8188 }, { 5021, 0x0e88 }, { 5026, 0x2092 }, { 5030, 0x0e10 },
2063 { 5034, 0x446a }, { 5040, 0x413a }, { 5046, 0x7142 }, { 5052, 0xb84f },
2064 { 5061, 0x002c }, { 5064, 0x4698 }, { 5070, 0xf630 }, { 5078, 0x2a83 },
2065 /* 0x9200 */
2066 { 5084, 0x16f3 }, { 5093, 0x314d }, { 5100, 0xc178 }, { 5107, 0x5769 },
2067 { 5116, 0xe4cd }, { 5125, 0x3302 }, { 5130, 0xc3a3 }, { 5138, 0xbbe1 },
2068 { 5148, 0x6700 }, { 5153, 0x8284 }, { 5157, 0x89b1 }, { 5164, 0xbd44 },
2069 { 5172, 0x79ef }, { 5184, 0xb3a9 }, { 5193, 0x51ab }, { 5201, 0x8a01 },
2070 /* 0x9300 */
2071 { 5205, 0x2105 }, { 5209, 0xf032 }, { 5216, 0x06b2 }, { 5222, 0x00d8 },
2072 { 5226, 0x0380 }, { 5229, 0x45a7 }, { 5237, 0xa6b0 }, { 5244, 0xa45b },
2073 { 5252, 0xad07 }, { 5260, 0x4924 }, { 5265, 0x0b5a }, { 5272, 0x0470 },
2074 { 5276, 0x3ef2 }, { 5286, 0xd208 }, { 5291, 0x00c4 }, { 5294, 0x2f80 },
```

```

2075  /* 0x9400 */
2076  { 5300, 0xe316 }, { 5308, 0x80e0 }, { 5312, 0xc000 }, { 5314, 0xa81e },
2077  { 5321, 0x1528 }, { 5326, 0x9220 }, { 5330, 0xe90a }, { 5337, 0x0006 },
2078  { 5339, 0x0018 }, { 5341, 0x0000 }, { 5341, 0x0000 }, { 5341, 0x0000 },
2079  { 5341, 0x0000 }, { 5341, 0x0000 }, { 5341, 0x0000 }, { 5341, 0x0000 },
2080  /* 0x9500 */
2081  { 5341, 0x0000 }, { 5341, 0x0000 }, { 5341, 0x0000 }, { 5341, 0x0000 },
2082  { 5341, 0x0000 }, { 5341, 0x0000 }, { 5341, 0x0000 }, { 5341, 0x4300 },
2083  { 5344, 0x7110 }, { 5349, 0xe000 }, { 5352, 0x1a42 }, { 5357, 0xa450 },
2084  { 5362, 0x0b40 }, { 5366, 0xe60f }, { 5375, 0x0051 }, { 5378, 0x0000 },
2085  /* 0x9600 */
2086  { 5378, 0x0000 }, { 5378, 0x6000 }, { 5380, 0x1074 }, { 5385, 0x378a },
2087  { 5393, 0x0002 }, { 5394, 0x01d4 }, { 5399, 0x4002 }, { 5401, 0xd810 },
2088  { 5406, 0x021e }, { 5411, 0xa442 }, { 5416, 0xc270 }, { 5422, 0x0408 },
2089  { 5424, 0x0400 }, { 5425, 0xe504 }, { 5431, 0x8200 }, { 5433, 0x0402 },
2090  /* 0x9700 */
2091  { 5435, 0x022c }, { 5439, 0x2c00 }, { 5442, 0x010e }, { 5446, 0x000a },
2092  { 5448, 0xc40a }, { 5453, 0x0da0 }, { 5458, 0x4488 }, { 5462, 0xa9c8 },
2093  { 5469, 0x0201 }, { 5471, 0xc6e0 }, { 5478, 0x5004 }, { 5481, 0xd766 },
2094  { 5491, 0x76b2 }, { 5500, 0x6b93 }, { 5509, 0x8013 }, { 5513, 0x0592 },
2095  /* 0x9800 */
2096  { 5518, 0x6480 }, { 5522, 0x5250 }, { 5527, 0xc869 }, { 5534, 0x402d },
2097  { 5539, 0x0490 }, { 5542, 0x06ce }, { 5549, 0x146c }, { 5555, 0x0000 },
2098  { 5555, 0x0000 }, { 5555, 0x0000 }, { 5555, 0x6800 }, { 5558, 0x8d91 },
2099  { 5565, 0x1124 }, { 5569, 0x0000 }, { 5569, 0x04ea }, { 5575, 0x0048 },
2100  /* 0x9900 */
2101  { 5577, 0x0184 }, { 5580, 0x9ce2 }, { 5588, 0x08c4 }, { 5592, 0x1e3e },
2102  { 5601, 0x61c3 }, { 5608, 0xdb10 }, { 5615, 0x0001 }, { 5616, 0x0000 },
2103  { 5616, 0x0000 }, { 5616, 0xa800 }, { 5619, 0x0040 }, { 5620, 0xa627 },
2104  { 5628, 0x0208 }, { 5630, 0x5618 }, { 5636, 0x1c80 }, { 5640, 0x6231 },
2105  /* 0x9a00 */
2106  { 5646, 0x181c }, { 5651, 0x4043 }, { 5655, 0x609d }, { 5662, 0x0168 },
2107  { 5666, 0x5c92 }, { 5673, 0x2052 }, { 5677, 0x0000 }, { 5677, 0x0000 },
2108  { 5677, 0x0000 }, { 5677, 0x0000 }, { 5677, 0xd400 }, { 5681, 0xca74 },
2109  { 5689, 0x414a }, { 5694, 0x18e5 }, { 5701, 0x12b1 }, { 5707, 0xa62c },
2110  /* 0x9b00 */
2111  { 5714, 0x7b3f }, { 5726, 0x1a45 }, { 5732, 0x2841 }, { 5736, 0x26b8 },
2112  { 5743, 0x1900 }, { 5746, 0x48e0 }, { 5751, 0x7d6a }, { 5761, 0x83a8 },
2113  { 5767, 0xaeef }, { 5777, 0x6411 }, { 5782, 0x12c0 }, { 5786, 0xd987 },
2114  { 5795, 0x4182 }, { 5799, 0xa181 }, { 5804, 0x8ca0 }, { 5809, 0xa788 },
2115  /* 0x9c00 */
2116  { 5816, 0x8805 }, { 5820, 0x5742 }, { 5827, 0x07cc }, { 5834, 0x20e2 },
2117  { 5839, 0xc63a }, { 5847, 0xf959 }, { 5857, 0x4f08 }, { 5863, 0x08a5 },
2118  { 5868, 0x0000 }, { 5868, 0x0000 }, { 5868, 0x0000 }, { 5868, 0x0000 },
2119  { 5868, 0x0000 }, { 5868, 0x0000 }, { 5868, 0x0040 }, { 5869, 0x0284 },
2120  /* 0x9d00 */
2121  { 5872, 0x0804 }, { 5874, 0x7182 }, { 5880, 0x8000 }, { 5881, 0x341d },
2122  { 5888, 0x04ac }, { 5893, 0x8018 }, { 5896, 0x0e2c }, { 5902, 0x58c1 },
2123  { 5908, 0x6458 }, { 5914, 0x01ec }, { 5920, 0x5402 }, { 5924, 0x9222 },
2124  { 5929, 0x0688 }, { 5933, 0xc4f0 }, { 5940, 0x4aa1 }, { 5946, 0x4019 },
2125  /* 0x9e00 */
2126  { 5950, 0x4484 }, { 5954, 0x3267 }, { 5962, 0x0000 }, { 5962, 0x0000 },
2127  { 5962, 0x0000 }, { 5962, 0x0000 }, { 5962, 0x1c00 },
2128  { 5965, 0xc0bd }, { 5973, 0x4940 }, { 5977, 0xd110 }, { 5982, 0x0039 },
2129  { 5986, 0x0940 }, { 5989, 0x8020 }, { 5991, 0x7090 }, { 5996, 0x8127 },
2130  /* 0x9f00 */
2131  { 6002, 0x820c }, { 6006, 0x8ed7 }, { 6016, 0x8c44 }, { 6021, 0xb696 },
2132  { 6030, 0x00fa }, { 6036, 0x65e8 }, { 6044, 0xe300 }, { 6049, 0x242b },
2133  { 6055, 0x8000 }, { 6056, 0x40d7 }, { 6063, 0x002e },
2134 };
2135
2136 static int
2137 jisx0212_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
2138 {
2139     (void)conv;
2140     if (n >= 2) {
2141         const Summary16 *summary = NULL;
2142         if (wc < 0x0460)
2143             summary = &jisx0212_uni2indx_page00[(wc>>4)];
2144         else if (wc >= 0x2100 && wc < 0x2130)
2145             summary = &jisx0212_uni2indx_page21[(wc>>4)-0x210];
2146         else if (wc >= 0x4e00 && wc < 0x9fb0)
2147             summary = &jisx0212_uni2indx_page4e[(wc>>4)-0x4e0];
2148         if (summary) {
2149             unsigned short used = summary->used;
2150             unsigned int i = wc & 0x0f;
2151             if (used & ((unsigned short) 1 << i)) {
2152                 unsigned short c;
2153                 /* Keep in 'used' only the bits 0..i-1. */
2154                 used &= ((unsigned short) 1 << i) - 1;
2155                 /* Add 'summary->indx' and the number of bits set in 'used'. */
2156                 used = (used & 0x5555) + ((used & 0xaaaa) >> 1);
2157                 used = (used & 0x3333) + ((used & 0xcccc) >> 2);
2158                 used = (used & 0x0f0f) + ((used & 0xf0f0) >> 4);
2159                 used = (used & 0x00ff) + (used >> 8);
2160                 c = jisx0212_2charset[summary->indx + used];
2161                 r[0] = (c >> 8); r[1] = (c & 0xff);

```

```

2162         return 2;
2163     }
2164 }
2165 return RET_ILSEQ;
2166 }
2167 return RET_TOOSMALL;
2168 }
2169 #endif /* NEED_TOMB */

```

## 34.287 koi8\_c.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/koi8_c.h,v 1.2 2000/11/28 16:10:29 dawes Exp $ */
2
3 /*
4  * KOI8-C
5  */
6
7 static const unsigned short koi8_c_2uni[128] = {
8     /* 0x80 */
9     0x0493, 0x0497, 0x049b, 0x049d, 0x04a3, 0x04af, 0x04b1, 0x04b3,
10    0x04b7, 0x04b9, 0x04bb, 0x2580, 0x04d9, 0x04e3, 0x04e9, 0x04ef,
11    /* 0x90 */
12    0x0492, 0x0496, 0x049a, 0x049c, 0x04a2, 0x04ae, 0x04b0, 0x04b2,
13    0x04b6, 0x04b8, 0x04ba, 0x2321, 0x04d8, 0x04e2, 0x04e8, 0x04ee,
14    /* 0xa0 */
15    0x00a0, 0x0452, 0x0453, 0x0451, 0x0454, 0x0455, 0x0456, 0x0457,
16    0x0458, 0x0459, 0x045a, 0x045b, 0x045c, 0x0491, 0x045e, 0x045f,
17    /* 0xb0 */
18    0x2116, 0x0402, 0x0403, 0x0401, 0x0404, 0x0405, 0x0406, 0x0407,
19    0x0486, 0x0409, 0x040a, 0x040b, 0x040c, 0x0490, 0x040e, 0x040f,
20    /* 0xc0 */
21    0x044e, 0x0430, 0x0431, 0x0446, 0x0434, 0x0435, 0x0444, 0x0433,
22    0x0445, 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e,
23    /* 0xd0 */
24    0x043f, 0x044f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0436, 0x0432,
25    0x044c, 0x044b, 0x0437, 0x0448, 0x044d, 0x0449, 0x0447, 0x044a,
26    /* 0xe0 */
27    0x042e, 0x0410, 0x0411, 0x0426, 0x0414, 0x0415, 0x0424, 0x0413,
28    0x0425, 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e,
29    /* 0xf0 */
30    0x041f, 0x042f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0416, 0x0412,
31    0x042c, 0x042b, 0x0417, 0x0428, 0x042d, 0x0429, 0x0427, 0x042a,
32 };
33
34 static int
35 koi8_c_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
36 {
37     unsigned char c = *s;
38     if (c < 0x80)
39         *pwc = (ucs4_t) c;
40     else
41         *pwc = (ucs4_t) koi8_c_2uni[c-0x80];
42     return 1;
43 }
44
45 static const unsigned char koi8_c_page00[1] = {
46     0xa0, /* 0xa0-0xa7 */
47 };
48 static const unsigned char koi8_c_page04[240] = {
49     0x00, 0xb3, 0xb1, 0xb2, 0xb4, 0xb5, 0xb6, 0xb7, /* 0x00-0x07 */
50     0xb8, 0xb9, 0xba, 0xbb, 0xbc, 0x00, 0xbe, 0xbf, /* 0x08-0x0f */
51     0xe1, 0xe2, 0xf7, 0xe7, 0xe4, 0xe5, 0xf6, 0xfa, /* 0x10-0x17 */
52     0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, 0xf0, /* 0x18-0x1f */
53     0xf2, 0xf3, 0xf4, 0xf5, 0xe6, 0xe8, 0xe3, 0xfe, /* 0x20-0x27 */
54     0xfb, 0xfd, 0xff, 0xf9, 0xf8, 0xfc, 0xe0, 0xf1, /* 0x28-0x2f */
55     0xc1, 0xc2, 0xd7, 0xc7, 0xc4, 0xc5, 0xd6, 0xda, /* 0x30-0x37 */
56     0xc9, 0xca, 0xcc, 0xcd, 0xce, 0xcf, 0xd0, /* 0x38-0x3f */
57     0xd2, 0xd3, 0xd4, 0xd5, 0xc6, 0xc8, 0xc3, 0xde, /* 0x40-0x47 */
58     0xdb, 0xdd, 0xdf, 0xd9, 0xd8, 0xdc, 0xc0, 0xd1, /* 0x48-0x4f */
59     0x00, 0xa3, 0xa1, 0xa2, 0xa4, 0xa5, 0xa6, 0xa7, /* 0x50-0x57 */
60     0xa8, 0xa9, 0xaa, 0xab, 0xac, 0x00, 0xae, 0xaf, /* 0x58-0x5f */
61     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
62     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
63     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
64     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
65     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
66     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
67     0xbd, 0xad, 0x90, 0x80, 0x00, 0x00, 0x91, 0x81, /* 0x90-0x97 */
68     0x00, 0x00, 0x92, 0x82, 0x93, 0x83, 0x00, 0x00, /* 0x98-0x9f */
69     0x00, 0x00, 0x94, 0x84, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
70     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x95, 0x85, /* 0xa8-0xaf */
71     0x96, 0x86, 0x97, 0x87, 0x00, 0x00, 0x98, 0x88, /* 0xb0-0xb7 */
72     0x99, 0x89, 0x9a, 0x8a, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
73     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
74     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */

```

```

75 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
76 0x9c, 0x8c, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
77 0x00, 0x00, 0x9d, 0x8d, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
78 0x9e, 0x8e, 0x00, 0x00, 0x00, 0x00, 0x9f, 0x8f, /* 0xe8-0xef */
79 };
80 static const unsigned char koi8_c_page22[1] = {
81     0xb0, /* 0x16-0x16 */
82 };
83
84 static int
85 koi8_c_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
86 {
87     unsigned char c = 0;
88     if (wc < 0x0080) {
89         *r = wc;
90         return 1;
91     }
92     else if (wc >= 0x00a0 && wc < 0x00a1)
93         c = koi8_c_page00[wc-0x00a0];
94     else if (wc >= 0x0400 && wc < 0x04ef)
95         c = koi8_c_page04[wc-0x0400];
96     else if (wc >= 0x2216 && wc < 0x2217)
97         c = koi8_c_page22[wc-0x2216];
98     if (c != 0) {
99         *r = c;
100        return 1;
101    }
102    return RET_ILSEQ;
103 }

```

## 34.288 koi8\_r.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/koi8_r.h,v 1.3 2000/11/29 17:40:34 dawes Exp $ */
2
3 /*
4  * KOI8-R
5  */
6
7 /* Specification: RFC 1489 */
8
9 #ifdef NEED_TOWC
10 static const unsigned short koi8_r_2uni[128] = {
11     /* 0x80 */
12     0x2500, 0x2502, 0x250c, 0x2510, 0x2514, 0x2518, 0x251c, 0x2524,
13     0x252c, 0x2534, 0x253c, 0x2580, 0x2584, 0x2588, 0x258c, 0x2590,
14     /* 0x90 */
15     0x2591, 0x2592, 0x2593, 0x2320, 0x25a0, 0x2219, 0x221a, 0x2248,
16     0x2264, 0x2265, 0x00a0, 0x2321, 0x00b0, 0x00b2, 0x00b7, 0x00f7,
17     /* 0xa0 */
18     0x2550, 0x2551, 0x2552, 0x0451, 0x2553, 0x2554, 0x2555, 0x2556,
19     0x2557, 0x2558, 0x2559, 0x255a, 0x255b, 0x255c, 0x255d, 0x255e,
20     /* 0xb0 */
21     0x255f, 0x2560, 0x2561, 0x0401, 0x2562, 0x2563, 0x2564, 0x2565,
22     0x2566, 0x2567, 0x2568, 0x2569, 0x256a, 0x256b, 0x256c, 0x00a9,
23     /* 0xc0 */
24     0x044e, 0x0430, 0x0431, 0x0446, 0x0434, 0x0435, 0x0444, 0x0433,
25     0x0445, 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e,
26     /* 0xd0 */
27     0x043f, 0x044f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0436, 0x0432,
28     0x044c, 0x044b, 0x0437, 0x0448, 0x044d, 0x0449, 0x0447, 0x044a,
29     /* 0xe0 */
30     0x042e, 0x0410, 0x0411, 0x0426, 0x0414, 0x0415, 0x0424, 0x0413,
31     0x0425, 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e,
32     /* 0xf0 */
33     0x041f, 0x042f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0416, 0x0412,
34     0x042c, 0x042b, 0x0417, 0x0428, 0x042d, 0x0429, 0x0427, 0x042a,
35 };
36
37 static int
38 koi8_r_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
39 {
40     unsigned char c = *s;
41     if (c < 0x80)
42         *pwc = (ucs4_t) c;
43     else
44         *pwc = (ucs4_t) koi8_r_2uni[c-0x80];
45     return 1;
46 }
47 #endif /* NEED_TOWC */
48
49 #ifdef NEED_TOMB
50 static const unsigned char koi8_r_page00[88] = {
51     0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
52     0x00, 0xbf, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa8-0xaf */
53     0x9c, 0x00, 0x9d, 0x00, 0x00, 0x00, 0x00, 0x9e, /* 0xb0-0xb7 */

```

```

54 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
55 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
56 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
57 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
58 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
59 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
60 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
61 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x9f, /* 0xf0-0xf7 */
62 };
63 static const unsigned char koi8_r_page04[88] = {
64 0x00, 0xb3, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
65 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
66 0xe1, 0xe2, 0xf7, 0xe7, 0xe4, 0xe5, 0xf6, 0xfa, /* 0x10-0x17 */
67 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, 0xf0, /* 0x18-0x1f */
68 0xf2, 0xf3, 0xf4, 0xf5, 0xe6, 0xe8, 0xe3, 0xfe, /* 0x20-0x27 */
69 0xfb, 0xfd, 0xff, 0xf9, 0xf8, 0xfc, 0xe0, 0xf1, /* 0x28-0x2f */
70 0xc1, 0xc2, 0xd7, 0xc7, 0xc4, 0xc5, 0xd6, 0xda, /* 0x30-0x37 */
71 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, 0xd0, /* 0x38-0x3f */
72 0xd2, 0xd3, 0xd4, 0xd5, 0xc6, 0xc8, 0xc3, 0xde, /* 0x40-0x47 */
73 0xdb, 0xdd, 0xdf, 0xd9, 0xd8, 0xdc, 0xc0, 0xd1, /* 0x48-0x4f */
74 0x00, 0xa3, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
75 };
76 static const unsigned char koi8_r_page22[80] = {
77 0x00, 0x95, 0x96, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
78 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
79 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
80 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
81 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
82 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
83 0x97, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
84 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
85 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
86 0x00, 0x00, 0x00, 0x00, 0x98, 0x99, 0x00, 0x00, /* 0x60-0x67 */
87 };
88 static const unsigned char koi8_r_page23[8] = {
89 0x93, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
90 };
91 static const unsigned char koi8_r_page25[168] = {
92 0x80, 0x00, 0x81, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
93 0x00, 0x00, 0x00, 0x00, 0x82, 0x00, 0x00, 0x00, /* 0x08-0x0f */
94 0x83, 0x00, 0x00, 0x00, 0x84, 0x00, 0x00, 0x00, /* 0x10-0x17 */
95 0x85, 0x00, 0x00, 0x00, 0x86, 0x00, 0x00, 0x00, /* 0x18-0x1f */
96 0x00, 0x00, 0x00, 0x00, 0x87, 0x00, 0x00, 0x00, /* 0x20-0x27 */
97 0x00, 0x00, 0x00, 0x00, 0x88, 0x00, 0x00, 0x00, /* 0x28-0x2f */
98 0x00, 0x00, 0x00, 0x00, 0x89, 0x00, 0x00, 0x00, /* 0x30-0x37 */
99 0x00, 0x00, 0x00, 0x00, 0x8a, 0x00, 0x00, 0x00, /* 0x38-0x3f */
100 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
101 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
102 0xa0, 0xa1, 0xa2, 0xa4, 0xa5, 0xa6, 0xa7, 0xa8, /* 0x50-0x57 */
103 0xa9, 0xaa, 0xab, 0xac, 0xad, 0xae, 0xaf, 0xb0, /* 0x58-0x5f */
104 0xb1, 0xb2, 0xb4, 0xb5, 0xb6, 0xb7, 0xb8, 0xb9, /* 0x60-0x67 */
105 0xba, 0xbb, 0xbc, 0xbd, 0xbe, 0x00, 0x00, 0x00, /* 0x68-0x6f */
106 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
107 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
108 0x8b, 0x00, 0x00, 0x00, 0x8c, 0x00, 0x00, 0x00, /* 0x80-0x87 */
109 0x8d, 0x00, 0x00, 0x00, 0x8e, 0x00, 0x00, 0x00, /* 0x88-0x8f */
110 0x8f, 0x90, 0x91, 0x92, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
111 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
112 0x94, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
113 };
114
115 static int
116 koi8_r_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
117 {
118     (void)conv; (void)n;
119     unsigned char c = 0;
120     if (wc < 0x0080) {
121         *r = wc;
122         return 1;
123     }
124     else if (wc >= 0x00a0 && wc < 0x00f8)
125         c = koi8_r_page00[wc-0x00a0];
126     else if (wc >= 0x0400 && wc < 0x0458)
127         c = koi8_r_page04[wc-0x0400];
128     else if (wc >= 0x2218 && wc < 0x2268)
129         c = koi8_r_page22[wc-0x2218];
130     else if (wc >= 0x2320 && wc < 0x2328)
131         c = koi8_r_page23[wc-0x2320];
132     else if (wc >= 0x2500 && wc < 0x25a8)
133         c = koi8_r_page25[wc-0x2500];
134     if (c != 0) {
135         *r = c;
136         return 1;
137     }
138     return RET_ILSEQ;
139 }
140 #endif /* NEED_TOMB */

```

## 34.289 koi8\_u.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/koi8_u.h,v 1.3 2000/11/29 17:40:34 dawes Exp $ */
2
3 /*
4  * KOI8-U
5  */
6
7 /* Specification: RFC 2319 */
8 #ifdef NEED_TOWC
9 static const unsigned short koi8_u_2uni[128] = {
10     /* 0x80 */
11     0x2500, 0x2502, 0x250c, 0x2510, 0x2514, 0x2518, 0x251c, 0x2524,
12     0x252c, 0x2534, 0x253c, 0x2580, 0x2584, 0x2588, 0x258c, 0x2590,
13     /* 0x90 */
14     0x2591, 0x2592, 0x2593, 0x2320, 0x25a0, 0x2219, 0x221a, 0x2248,
15     0x2264, 0x2265, 0x00a0, 0x2321, 0x00b0, 0x00b2, 0x00b7, 0x00f7,
16     /* 0xa0 */
17     0x2550, 0x2551, 0x2552, 0x0451, 0x0454, 0x2554, 0x0456, 0x0457,
18     0x2557, 0x2558, 0x2559, 0x255a, 0x255b, 0x0491, 0x255d, 0x255e,
19     /* 0xb0 */
20     0x255f, 0x2560, 0x2561, 0x0401, 0x0404, 0x2563, 0x0406, 0x0407,
21     0x2566, 0x2567, 0x2568, 0x2569, 0x256a, 0x0490, 0x256c, 0x00a9,
22     /* 0xc0 */
23     0x044e, 0x0430, 0x0431, 0x0446, 0x0434, 0x0435, 0x0444, 0x0433,
24     0x0445, 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e,
25     /* 0xd0 */
26     0x043f, 0x044f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0436, 0x0432,
27     0x044c, 0x044b, 0x0437, 0x0448, 0x044d, 0x0449, 0x0447, 0x044a,
28     /* 0xe0 */
29     0x042e, 0x0410, 0x0411, 0x0426, 0x0414, 0x0415, 0x0424, 0x0413,
30     0x0425, 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e,
31     /* 0xf0 */
32     0x041f, 0x042f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0416, 0x0412,
33     0x042c, 0x042b, 0x0417, 0x0428, 0x042d, 0x0429, 0x0427, 0x042a,
34 };
35
36 static int
37 koi8_u_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
38 {
39     unsigned char c = *s;
40     if (c < 0x80)
41         *pwc = (ucs4_t) c;
42     else
43         *pwc = (ucs4_t) koi8_u_2uni[c-0x80];
44     return 1;
45 }
46 #endif /* NEED_TOWC */
47
48 #ifdef NEED_TOMB
49 static const unsigned char koi8_u_page00[88] = {
50     0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
51     0x00, 0xbf, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa8-0xaf */
52     0x9c, 0x00, 0x9d, 0x00, 0x00, 0x00, 0x00, 0x9e, /* 0xb0-0xb7 */
53     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
54     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
55     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
56     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
57     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
58     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
59     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
60     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x9f, /* 0xf0-0xf7 */
61 };
62
63 static const unsigned char koi8_u_page04[152] = {
64     0x00, 0xb3, 0x00, 0x00, 0xb0, 0x00, 0xb6, 0xb7, /* 0x00-0x07 */
65     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
66     0xe1, 0xe2, 0xf7, 0xe7, 0xe4, 0xe5, 0xf6, 0xfa, /* 0x10-0x17 */
67     0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, 0xf0, /* 0x18-0x1f */
68     0xf2, 0xf3, 0xf4, 0xf5, 0xe6, 0xe8, 0xe3, 0xfe, /* 0x20-0x27 */
69     0xfb, 0xfd, 0xff, 0xf9, 0xf8, 0xfc, 0xe0, 0xf1, /* 0x28-0x2f */
70     0xc1, 0xc2, 0xd7, 0xc7, 0xc4, 0xc5, 0xd6, 0xda, /* 0x30-0x37 */
71     0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, 0xd0, /* 0x38-0x3f */
72     0xd2, 0xd3, 0xd4, 0xd5, 0xc6, 0xc8, 0xc3, 0xde, /* 0x40-0x47 */
73     0xdb, 0xdd, 0xdf, 0xd9, 0xd8, 0xdc, 0xc0, 0xd1, /* 0x48-0x4f */
74     0x00, 0xa3, 0x00, 0x00, 0x00, 0xa4, 0x00, 0xa6, 0xa7, /* 0x50-0x57 */
75     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
76     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
77     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
78     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
79     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
80     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
81     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
82     0xbd, 0xad, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
83 };
84
85 static const unsigned char koi8_u_page22[80] = {
86     0x00, 0x95, 0x96, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
87     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */

```

```

86 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
87 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
88 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
89 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
90 0x97, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
91 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
92 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
93 0x00, 0x00, 0x00, 0x00, 0x98, 0x99, 0x00, 0x00, /* 0x60-0x67 */
94 };
95 static const unsigned char koi8_u_page23[8] = {
96 0x93, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
97 };
98 static const unsigned char koi8_u_page25[168] = {
99 0x80, 0x00, 0x81, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
100 0x00, 0x00, 0x00, 0x00, 0x00, 0x82, 0x00, 0x00, /* 0x08-0x0f */
101 0x83, 0x00, 0x00, 0x00, 0x84, 0x00, 0x00, 0x00, /* 0x10-0x17 */
102 0x85, 0x00, 0x00, 0x00, 0x86, 0x00, 0x00, 0x00, /* 0x18-0x1f */
103 0x00, 0x00, 0x00, 0x00, 0x87, 0x00, 0x00, 0x00, /* 0x20-0x27 */
104 0x00, 0x00, 0x00, 0x00, 0x88, 0x00, 0x00, 0x00, /* 0x28-0x2f */
105 0x00, 0x00, 0x00, 0x00, 0x89, 0x00, 0x00, 0x00, /* 0x30-0x37 */
106 0x00, 0x00, 0x00, 0x00, 0x8a, 0x00, 0x00, 0x00, /* 0x38-0x3f */
107 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
108 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
109 0xa0, 0xa1, 0xa2, 0x00, 0xa5, 0x00, 0xa8, /* 0x50-0x57 */
110 0xa9, 0xaa, 0xab, 0xac, 0x00, 0xae, 0xaf, 0xb0, /* 0x58-0x5f */
111 0xb1, 0xb2, 0x00, 0xb5, 0x00, 0x00, 0xb8, 0xb9, /* 0x60-0x67 */
112 0xba, 0xbb, 0xbc, 0x00, 0xbe, 0x00, 0x00, 0x00, /* 0x68-0x6f */
113 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
114 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
115 0x8b, 0x00, 0x00, 0x00, 0x8c, 0x00, 0x00, 0x00, /* 0x80-0x87 */
116 0x8d, 0x00, 0x00, 0x00, 0x8e, 0x00, 0x00, 0x00, /* 0x88-0x8f */
117 0x8f, 0x90, 0x91, 0x92, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
118 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
119 0x94, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
120 };
121
122 static int
123 koi8_u_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
124 {
125     (void)conv; (void)n;
126     unsigned char c = 0;
127     if (wc < 0x0080) {
128         *r = wc;
129         return 1;
130     }
131     else if (wc >= 0x00a0 && wc < 0x00f8)
132         c = koi8_u_page00[wc-0x00a0];
133     else if (wc >= 0x0400 && wc < 0x0498)
134         c = koi8_u_page04[wc-0x0400];
135     else if (wc >= 0x2218 && wc < 0x2268)
136         c = koi8_u_page22[wc-0x2218];
137     else if (wc >= 0x2320 && wc < 0x2328)
138         c = koi8_u_page23[wc-0x2320];
139     else if (wc >= 0x2500 && wc < 0x25a8)
140         c = koi8_u_page25[wc-0x2500];
141     if (c != 0) {
142         *r = c;
143         return 1;
144     }
145     return RET_ILSEQ;
146 }
147 #endif /* NEED_TOMB */

```

## 34.290 ksc5601.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/ksc5601.h,v 1.5 2003/05/27 22:26:34 tsi Exp $ */
2
3 /*
4  * KSC5601.1987-0
5  */
6 #ifdef NEED_TOWC
7 static const unsigned short ksc5601_2uni_page21[1115] = {
8     /* 0x21 */
9     0x3000, 0x3001, 0x3002, 0x00b7, 0x2025, 0x2026, 0x00a8, 0x3003,
10     0x00ad, 0x2015, 0x2225, 0xff3c, 0x223c, 0x2018, 0x2019, 0x201c,
11     0x201d, 0x3014, 0x3015, 0x3008, 0x3009, 0x300a, 0x300b, 0x300c,
12     0x300d, 0x300e, 0x300f, 0x3010, 0x3011, 0x00b1, 0x00d7, 0x00f7,
13     0x2260, 0x2264, 0x2265, 0x221e, 0x2234, 0x00b0, 0x2032, 0x2033,
14     0x2103, 0x212b, 0xffe0, 0xffe1, 0xffe5, 0x2642, 0x2640, 0x2220,
15     0x22a5, 0x2312, 0x2202, 0x2207, 0x2261, 0x2252, 0x00a7, 0x203b,
16     0x2606, 0x2605, 0x25cb, 0x25cf, 0x25ce, 0x25c7, 0x25c6, 0x25a1,
17     0x25a0, 0x25b3, 0x25b2, 0x25bd, 0x25bc, 0x2192, 0x2190, 0x2191,
18     0x2193, 0x2194, 0x3013, 0x226a, 0x226b, 0x221a, 0x223d, 0x221d,
19     0x2235, 0x222b, 0x222c, 0x2208, 0x220b, 0x2286, 0x2287, 0x2282,
20     0x2283, 0x222a, 0x2229, 0x2227, 0x2228, 0xffe2,

```

```
21  /* 0x22 */
22 0x21d2, 0x21d4, 0x2200, 0x2203, 0x00b4, 0xff5e, 0x02c7, 0x02d8,
23 0x02dd, 0x02da, 0x02d9, 0x00b8, 0x02db, 0x00a1, 0x00bf, 0x02d0,
24 0x222e, 0x2211, 0x220f, 0x00a4, 0x2109, 0x2030, 0x25c1, 0x25c0,
25 0x25b7, 0x25b6, 0x2664, 0x2660, 0x2661, 0x2665, 0x2667, 0x2663,
26 0x2299, 0x25c8, 0x25a3, 0x25d0, 0x25d1, 0x2592, 0x25a4, 0x25a5,
27 0x25a8, 0x25a7, 0x25a6, 0x25a9, 0x2668, 0x260f, 0x260e, 0x261c,
28 0x261e, 0x00b6, 0x2020, 0x2021, 0x2195, 0x2197, 0x2199, 0x2196,
29 0x2198, 0x266d, 0x2669, 0x266a, 0x266c, 0x327f, 0x321c, 0x2116,
30 0x33c7, 0x2122, 0x33c2, 0x33d8, 0x2121, 0xffff, 0xffff, 0xffff,
31 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
32 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
33 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
34 /* 0x23 */
35 0xff01, 0xff02, 0xff03, 0xff04, 0xff05, 0xff06, 0xff07, 0xff08,
36 0xff09, 0xff0a, 0xff0b, 0xff0c, 0xff0d, 0xff0e, 0xff0f, 0xff10,
37 0xff11, 0xff12, 0xff13, 0xff14, 0xff15, 0xff16, 0xff17, 0xff18,
38 0xff19, 0xff1a, 0xff1b, 0xff1c, 0xff1d, 0xff1e, 0xff1f, 0xff20,
39 0xff21, 0xff22, 0xff23, 0xff24, 0xff25, 0xff26, 0xff27, 0xff28,
40 0xff29, 0xff2a, 0xff2b, 0xff2c, 0xff2d, 0xff2e, 0xff2f, 0xff30,
41 0xff31, 0xff32, 0xff33, 0xff34, 0xff35, 0xff36, 0xff37, 0xff38,
42 0xff39, 0xff3a, 0xff3b, 0xffe6, 0xff3d, 0xff3e, 0xff3f, 0xff40,
43 0xff41, 0xff42, 0xff43, 0xff44, 0xff45, 0xff46, 0xff47, 0xff48,
44 0xff49, 0xff4a, 0xff4b, 0xff4c, 0xff4d, 0xff4e, 0xff4f, 0xff50,
45 0xff51, 0xff52, 0xff53, 0xff54, 0xff55, 0xff56, 0xff57, 0xff58,
46 0xff59, 0xff5a, 0xff5b, 0xff5c, 0xff5d, 0xffe3,
47 /* 0x24 */
48 0x3131, 0x3132, 0x3133, 0x3134, 0x3135, 0x3136, 0x3137, 0x3138,
49 0x3139, 0x313a, 0x313b, 0x313c, 0x313d, 0x313e, 0x313f, 0x3140,
50 0x3141, 0x3142, 0x3143, 0x3144, 0x3145, 0x3146, 0x3147, 0x3148,
51 0x3149, 0x314a, 0x314b, 0x314c, 0x314d, 0x314e, 0x314f, 0x3150,
52 0x3151, 0x3152, 0x3153, 0x3154, 0x3155, 0x3156, 0x3157, 0x3158,
53 0x3159, 0x315a, 0x315b, 0x315c, 0x315d, 0x315e, 0x315f, 0x3160,
54 0x3161, 0x3162, 0x3163, 0x3164, 0x3165, 0x3166, 0x3167, 0x3168,
55 0x3169, 0x316a, 0x316b, 0x316c, 0x316d, 0x316e, 0x316f, 0x3170,
56 0x3171, 0x3172, 0x3173, 0x3174, 0x3175, 0x3176, 0x3177, 0x3178,
57 0x3179, 0x317a, 0x317b, 0x317c, 0x317d, 0x317e, 0x317f, 0x3180,
58 0x3181, 0x3182, 0x3183, 0x3184, 0x3185, 0x3186, 0x3187, 0x3188,
59 0x3189, 0x318a, 0x318b, 0x318c, 0x318d, 0x318e,
60 /* 0x25 */
61 0x2170, 0x2171, 0x2172, 0x2173, 0x2174, 0x2175, 0x2176, 0x2177,
62 0x2178, 0x2179, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0x2160,
63 0x2161, 0x2162, 0x2163, 0x2164, 0x2165, 0x2166, 0x2167, 0x2168,
64 0x2169, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
65 0x0391, 0x0392, 0x0393, 0x0394, 0x0395, 0x0396, 0x0397, 0x0398,
66 0x0399, 0x039a, 0x039b, 0x039c, 0x039d, 0x039e, 0x039f, 0x03a0,
67 0x03a1, 0x03a3, 0x03a4, 0x03a5, 0x03a6, 0x03a7, 0x03a8, 0x03a9,
68 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
69 0x03b1, 0x03b2, 0x03b3, 0x03b4, 0x03b5, 0x03b6, 0x03b7, 0x03b8,
70 0x03b9, 0x03ba, 0x03bb, 0x03bc, 0x03bd, 0x03be, 0x03bf, 0x03c0,
71 0x03c1, 0x03c3, 0x03c4, 0x03c5, 0x03c6, 0x03c7, 0x03c8, 0x03c9,
72 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
73 /* 0x26 */
74 0x2500, 0x2502, 0x250c, 0x2510, 0x2518, 0x2514, 0x251c, 0x252c,
75 0x2524, 0x2534, 0x253c, 0x2501, 0x2503, 0x250f, 0x2513, 0x251b,
76 0x2517, 0x2523, 0x2533, 0x252b, 0x253b, 0x254b, 0x2520, 0x252f,
77 0x2528, 0x2537, 0x253f, 0x251d, 0x2530, 0x2525, 0x2538, 0x2542,
78 0x2512, 0x2511, 0x251a, 0x2519, 0x2516, 0x2515, 0x250e, 0x250d,
79 0x251e, 0x251f, 0x2521, 0x2522, 0x2526, 0x2527, 0x2529, 0x252a,
80 0x252d, 0x252e, 0x2531, 0x2532, 0x2535, 0x2536, 0x2539, 0x253a,
81 0x253d, 0x253e, 0x2540, 0x2541, 0x2543, 0x2544, 0x2545, 0x2546,
82 0x2547, 0x2548, 0x2549, 0x254a, 0xffff, 0xffff, 0xffff, 0xffff,
83 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
84 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
85 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
86 /* 0x27 */
87 0x3395, 0x3396, 0x3397, 0x2113, 0x3398, 0x33c4, 0x33a3, 0x33a4,
88 0x33a5, 0x33a6, 0x3399, 0x339a, 0x339b, 0x339c, 0x339d, 0x339e,
89 0x339f, 0x33a0, 0x33a1, 0x33a2, 0x33ca, 0x338d, 0x338e, 0x338f,
90 0x33cf, 0x3388, 0x3389, 0x33c8, 0x33a7, 0x33a8, 0x33b0, 0x33b1,
91 0x33b2, 0x33b3, 0x33b4, 0x33b5, 0x33b6, 0x33b7, 0x33b8, 0x33b9,
92 0x3380, 0x3381, 0x3382, 0x3383, 0x3384, 0x33ba, 0x33bb, 0x33bc,
93 0x33bd, 0x33be, 0x33bf, 0x3390, 0x3391, 0x3392, 0x3393, 0x3394,
94 0x2126, 0x33c0, 0x33c1, 0x338a, 0x338b, 0x338c, 0x33d6, 0x33c5,
95 0x33ad, 0x33ae, 0x33af, 0x33db, 0x33a9, 0x33aa, 0x33ab, 0x33ac,
96 0x33dd, 0x33d0, 0x33d3, 0x33c3, 0x33c9, 0x33dc, 0x33ce, 0xffff,
97 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
98 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
99 /* 0x28 */
100 0x00c6, 0x00d0, 0x00da, 0x00aa, 0x0126, 0xffff, 0x0132, 0xffff, 0x013f,
101 0x0141, 0x00d8, 0x0152, 0x00ba, 0x00de, 0x0166, 0x014a, 0xffff,
102 0x3260, 0x3261, 0x3262, 0x3263, 0x3264, 0x3265, 0x3266, 0x3267,
103 0x3268, 0x3269, 0x326a, 0x326b, 0x326c, 0x326d, 0x326e, 0x326f,
104 0x3270, 0x3271, 0x3272, 0x3273, 0x3274, 0x3275, 0x3276, 0x3277,
105 0x3278, 0x3279, 0x327a, 0x327b, 0x24d0, 0x24d1, 0x24d2, 0x24d3,
106 0x24d4, 0x24d5, 0x24d6, 0x24d7, 0x24d8, 0x24d9, 0x24da, 0x24db,
107 0x24dc, 0x24dd, 0x24de, 0x24df, 0x24e0, 0x24e1, 0x24e2, 0x24e3,
```

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108 0x24e4, 0x24e5, 0x24e6, 0x24e7, 0x24e8, 0x24e9, 0x2460, 0x2461,
109 0x2462, 0x2463, 0x2464, 0x2465, 0x2466, 0x2467, 0x2468, 0x2469,
110 0x246a, 0x246b, 0x246c, 0x246d, 0x246e, 0x00bd, 0x2153, 0x2154,
111 0x00bc, 0x00be, 0x215b, 0x215c, 0x215d, 0x215e,
112 /* 0x29 */
113 0x00e6, 0x0111, 0x00f0, 0x0127, 0x0131, 0x0133, 0x0138, 0x0140,
114 0x0142, 0x00f8, 0x0153, 0x00df, 0x00fe, 0x0167, 0x014b, 0x0149,
115 0x3200, 0x3201, 0x3202, 0x3203, 0x3204, 0x3205, 0x3206, 0x3207,
116 0x3208, 0x3209, 0x320a, 0x320b, 0x320c, 0x320d, 0x320e, 0x320f,
117 0x3210, 0x3211, 0x3212, 0x3213, 0x3214, 0x3215, 0x3216, 0x3217,
118 0x3218, 0x3219, 0x321a, 0x321b, 0x249c, 0x249d, 0x249e, 0x249f,
119 0x24a0, 0x24a1, 0x24a2, 0x24a3, 0x24a4, 0x24a5, 0x24a6, 0x24a7,
120 0x24a8, 0x24a9, 0x24aa, 0x24ab, 0x24ac, 0x24ad, 0x24ae, 0x24af,
121 0x24b0, 0x24b1, 0x24b2, 0x24b3, 0x24b4, 0x24b5, 0x2474, 0x2475,
122 0x2476, 0x2477, 0x2478, 0x2479, 0x247a, 0x247b, 0x247c, 0x247d,
123 0x247e, 0x247f, 0x2480, 0x2481, 0x2482, 0x00b9, 0x00b2, 0x00b3,
124 0x2074, 0x207f, 0x2081, 0x2082, 0x2083, 0x2084,
125 /* 0x2a */
126 0x3041, 0x3042, 0x3043, 0x3044, 0x3045, 0x3046, 0x3047, 0x3048,
127 0x3049, 0x304a, 0x304b, 0x304c, 0x304d, 0x304e, 0x304f, 0x3050,
128 0x3051, 0x3052, 0x3053, 0x3054, 0x3055, 0x3056, 0x3057, 0x3058,
129 0x3059, 0x305a, 0x305b, 0x305c, 0x305d, 0x305e, 0x305f, 0x3060,
130 0x3061, 0x3062, 0x3063, 0x3064, 0x3065, 0x3066, 0x3067, 0x3068,
131 0x3069, 0x306a, 0x306b, 0x306c, 0x306d, 0x306e, 0x306f, 0x3070,
132 0x3071, 0x3072, 0x3073, 0x3074, 0x3075, 0x3076, 0x3077, 0x3078,
133 0x3079, 0x307a, 0x307b, 0x307c, 0x307d, 0x307e, 0x307f, 0x3080,
134 0x3081, 0x3082, 0x3083, 0x3084, 0x3085, 0x3086, 0x3087, 0x3088,
135 0x3089, 0x308a, 0x308b, 0x308c, 0x308d, 0x308e, 0x308f, 0x3090,
136 0x3091, 0x3092, 0x3093, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
137 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
138 /* 0x2b */
139 0x30a1, 0x30a2, 0x30a3, 0x30a4, 0x30a5, 0x30a6, 0x30a7, 0x30a8,
140 0x30a9, 0x30aa, 0x30ab, 0x30ac, 0x30ad, 0x30ae, 0x30af, 0x30b0,
141 0x30b1, 0x30b2, 0x30b3, 0x30b4, 0x30b5, 0x30b6, 0x30b7, 0x30b8,
142 0x30b9, 0x30ba, 0x30bb, 0x30bc, 0x30bd, 0x30be, 0x30bf, 0x30c0,
143 0x30c1, 0x30c2, 0x30c3, 0x30c4, 0x30c5, 0x30c6, 0x30c7, 0x30c8,
144 0x30c9, 0x30ca, 0x30cb, 0x30cc, 0x30cd, 0x30ce, 0x30cf, 0x30d0,
145 0x30d1, 0x30d2, 0x30d3, 0x30d4, 0x30d5, 0x30d6, 0x30d7, 0x30d8,
146 0x30d9, 0x30da, 0x30db, 0x30dc, 0x30dd, 0x30de, 0x30df, 0x30e0,
147 0x30e1, 0x30e2, 0x30e3, 0x30e4, 0x30e5, 0x30e6, 0x30e7, 0x30e8,
148 0x30e9, 0x30ea, 0x30eb, 0x30ec, 0x30ed, 0x30ee, 0x30ef, 0x30f0,
149 0x30f1, 0x30f2, 0x30f3, 0x30f4, 0x30f5, 0x30f6, 0xffff, 0xffff,
150 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
151 /* 0x2c */
152 0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0401, 0x0416,
153 0x0417, 0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e,
154 0x041f, 0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426,
155 0x0427, 0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e,
156 0x042f, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
157 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff, 0xffff,
158 0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0451, 0x0436,
159 0x0437, 0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e,
160 0x043f, 0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446,
161 0x0447, 0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e,
162 0x044f,
163 };
164 static const unsigned short ksc5601_uni_page30[2350] = {
165 /* 0x30 */
166 0xac00, 0xac01, 0xac04, 0xac07, 0xac08, 0xac09, 0xac0a, 0xac10,
167 0xac11, 0xac12, 0xac13, 0xac14, 0xac15, 0xac16, 0xac17, 0xac19,
168 0xac1a, 0xac1b, 0xac1c, 0xac1d, 0xac20, 0xac24, 0xac2c, 0xac2d,
169 0xac2f, 0xac30, 0xac31, 0xac38, 0xac39, 0xac3c, 0xac40, 0xac4b,
170 0xac4d, 0xac54, 0xac58, 0xac5c, 0xac70, 0xac71, 0xac74, 0xac77,
171 0xac78, 0xac7a, 0xac80, 0xac81, 0xac83, 0xac84, 0xac85, 0xac86,
172 0xac89, 0xac8a, 0xac8b, 0xac8c, 0xac90, 0xac94, 0xac9c, 0xac9d,
173 0xac9f, 0xaca0, 0xaca1, 0xaca8, 0xaca9, 0xacaa, 0xacac, 0xacaf,
174 0xacb0, 0xacb8, 0xacb9, 0xacbb, 0xacbc, 0xacbd, 0xacc1, 0xacc4,
175 0xacc8, 0xacc, 0xacd5, 0xacd7, 0xace0, 0xace1, 0xace4, 0xace7,
176 0xace8, 0xace, 0xacec, 0xacef, 0xacf0, 0xacf1, 0xacf3, 0xacf5,
177 0xacf6, 0xacfc, 0xacfd, 0xad00, 0xad04, 0xad06,
178 /* 0x31 */
179 0xad0c, 0xad0d, 0xad0f, 0xad11, 0xad18, 0xad1c, 0xad20, 0xad29,
180 0xad2c, 0xad2d, 0xad34, 0xad35, 0xad38, 0xad3c, 0xad44, 0xad45,
181 0xad47, 0xad49, 0xad50, 0xad54, 0xad58, 0xad61, 0xad63, 0xad6c,
182 0xad6d, 0xad70, 0xad73, 0xad74, 0xad75, 0xad76, 0xad7b, 0xad7c,
183 0xad7d, 0xad7f, 0xad81, 0xad82, 0xad88, 0xad89, 0xad8c, 0xad90,
184 0xad9c, 0xad9d, 0xada4, 0xadb7, 0xadc0, 0xadc1, 0xadc4, 0xadc8,
185 0xadd0, 0xadd1, 0xadd3, 0xaddc, 0xade0, 0xade4, 0xadf8, 0xadf9,
186 0xadfc, 0xadff, 0xae00, 0xae01, 0xae08, 0xae09, 0xae0b, 0xae0d,
187 0xae14, 0xae30, 0xae31, 0xae34, 0xae37, 0xae38, 0xae3a, 0xae40,
188 0xae41, 0xae43, 0xae45, 0xae46, 0xae4a, 0xae4c, 0xae4d, 0xae4e,
189 0xae50, 0xae54, 0xae56, 0xae5c, 0xae5d, 0xae5f, 0xae60, 0xae61,
190 0xae65, 0xae68, 0xae69, 0xae6c, 0xae70, 0xae78,
191 /* 0x32 */
192 0xae79, 0xae7b, 0xae7c, 0xae7d, 0xae84, 0xae85, 0xae8c, 0xaebc,
193 0xaebd, 0xaebe, 0xaec0, 0xaec4, 0xaecc, 0xaecd, 0xaecf, 0xaed0,
194 0xaed1, 0xaed8, 0xaed9, 0xaedc, 0xae, 0xae, 0xaee, 0xaef4,
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195 0xaeef8, 0xaeefc, 0xaf07, 0xaf08, 0xaf0d, 0xaf10, 0xaf2c, 0xaf2d,
196 0xaf30, 0xaf32, 0xaf34, 0xaf3c, 0xaf3d, 0xaf3f, 0xaf41, 0xaf42,
197 0xaf43, 0xaf48, 0xaf49, 0xaf50, 0xaf5c, 0xaf5d, 0xaf64, 0xaf65,
198 0xaf79, 0xaf80, 0xaf84, 0xaf88, 0xaf90, 0xaf91, 0xaf95, 0xaf9c,
199 0xafb8, 0xafb9, 0xafbc, 0xafc0, 0xafc7, 0xafc8, 0xafc9, 0xafcb,
200 0xafcd, 0xafce, 0xafd4, 0xafdc, 0xafe8, 0xafef, 0xafff, 0xafff1,
201 0xaff4, 0xaff8, 0xb000, 0xb001, 0xb004, 0xb00c, 0xb010, 0xb014,
202 0xb01c, 0xb01d, 0xb028, 0xb044, 0xb045, 0xb048, 0xb04a, 0xb04c,
203 0xb04e, 0xb053, 0xb054, 0xb055, 0xb057, 0xb059,
204 /* 0x33 */
205 0xb05d, 0xb07c, 0xb07d, 0xb080, 0xb084, 0xb08c, 0xb08d, 0xb08f,
206 0xb091, 0xb098, 0xb099, 0xb09a, 0xb09c, 0xb09f, 0xb0a0, 0xb0a1,
207 0xb0a2, 0xb0a8, 0xb0a9, 0xb0ab, 0xb0ac, 0xb0ad, 0xb0ae, 0xb0af,
208 0xb0b1, 0xb0b3, 0xb0b4, 0xb0b5, 0xb0b8, 0xb0bc, 0xb0c4, 0xb0c5,
209 0xb0c7, 0xb0c8, 0xb0c9, 0xb0d0, 0xb0d1, 0xb0d4, 0xb0d8, 0xb0e0,
210 0xb0e5, 0xb108, 0xb109, 0xb10b, 0xb10c, 0xb110, 0xb112, 0xb113,
211 0xb118, 0xb119, 0xb11b, 0xb11c, 0xb11d, 0xb123, 0xb124, 0xb125,
212 0xb128, 0xb12c, 0xb134, 0xb135, 0xb137, 0xb138, 0xb139, 0xb140,
213 0xb141, 0xb144, 0xb148, 0xb150, 0xb151, 0xb154, 0xb155, 0xb158,
214 0xb15c, 0xb160, 0xb178, 0xb179, 0xb17c, 0xb180, 0xb182, 0xb188,
215 0xb189, 0xb18b, 0xb18d, 0xb192, 0xb193, 0xb194, 0xb198, 0xb19c,
216 0xb1a8, 0xb1cc, 0xb1d0, 0xb1d4, 0xb1dc, 0xb1dd,
217 /* 0x34 */
218 0xb1df, 0xb1e8, 0xb1e9, 0xb1ec, 0xb1f0, 0xb1f9, 0xb1fb, 0xb1fd,
219 0xb204, 0xb205, 0xb208, 0xb20b, 0xb20c, 0xb214, 0xb215, 0xb217,
220 0xb219, 0xb220, 0xb234, 0xb23c, 0xb258, 0xb25c, 0xb260, 0xb268,
221 0xb269, 0xb274, 0xb275, 0xb27c, 0xb284, 0xb285, 0xb289, 0xb290,
222 0xb291, 0xb294, 0xb298, 0xb299, 0xb29a, 0xb2a0, 0xb2a1, 0xb2a3,
223 0xb2a5, 0xb2a6, 0xb2aa, 0xb2ac, 0xb2b0, 0xb2b4, 0xb2c8, 0xb2c9,
224 0xb2cc, 0xb2d0, 0xb2d2, 0xb2d8, 0xb2d9, 0xb2db, 0xb2dd, 0xb2e2,
225 0xb2e4, 0xb2e5, 0xb2e6, 0xb2e8, 0xb2eb, 0xb2ec, 0xb2ed, 0xb2ee,
226 0xb2ef, 0xb2f3, 0xb2f4, 0xb2f5, 0xb2f7, 0xb2f8, 0xb2f9, 0xb2fa,
227 0xb2fb, 0xb2ff, 0xb300, 0xb301, 0xb304, 0xb308, 0xb310, 0xb311,
228 0xb313, 0xb314, 0xb315, 0xb31c, 0xb354, 0xb355, 0xb356, 0xb358,
229 0xb35b, 0xb35c, 0xb35e, 0xb35f, 0xb364, 0xb365,
230 /* 0x35 */
231 0xb367, 0xb369, 0xb36b, 0xb36e, 0xb370, 0xb371, 0xb374, 0xb378,
232 0xb380, 0xb381, 0xb383, 0xb384, 0xb385, 0xb38c, 0xb390, 0xb394,
233 0xb3a0, 0xb3a1, 0xb3a8, 0xb3ac, 0xb3c4, 0xb3c5, 0xb3c8, 0xb3cb,
234 0xb3cc, 0xb3ce, 0xb3d0, 0xb3d4, 0xb3d5, 0xb3d7, 0xb3d9, 0xb3db,
235 0xb3dd, 0xb3e0, 0xb3e4, 0xb3e8, 0xb3fc, 0xb410, 0xb418, 0xb41c,
236 0xb420, 0xb428, 0xb429, 0xb42b, 0xb434, 0xb450, 0xb451, 0xb454,
237 0xb458, 0xb460, 0xb461, 0xb463, 0xb465, 0xb46c, 0xb480, 0xb488,
238 0xb49d, 0xb4a4, 0xb4a8, 0xb4ac, 0xb4b5, 0xb4b7, 0xb4b9, 0xb4c0,
239 0xb4c4, 0xb4c8, 0xb4d0, 0xb4d5, 0xb4dc, 0xb4dd, 0xb4e0, 0xb4e3,
240 0xb4e4, 0xb4e6, 0xb4ec, 0xb4ed, 0xb4ef, 0xb4f1, 0xb4f8, 0xb514,
241 0xb515, 0xb518, 0xb51b, 0xb51c, 0xb524, 0xb525, 0xb527, 0xb528,
242 0xb529, 0xb52a, 0xb530, 0xb531, 0xb534, 0xb538,
243 /* 0x36 */
244 0xb540, 0xb541, 0xb543, 0xb544, 0xb545, 0xb54b, 0xb54c, 0xb54d,
245 0xb550, 0xb554, 0xb55c, 0xb55d, 0xb55f, 0xb560, 0xb561, 0xb5a0,
246 0xb5a1, 0xb5a4, 0xb5a8, 0xb5aa, 0xb5ab, 0xb5b0, 0xb5b1, 0xb5b3,
247 0xb5b4, 0xb5b5, 0xb5bb, 0xb5bc, 0xb5bd, 0xb5c0, 0xb5c4, 0xb5cc,
248 0xb5cd, 0xb5cf, 0xb5d0, 0xb5d1, 0xb5d8, 0xb5ec, 0xb610, 0xb611,
249 0xb614, 0xb618, 0xb625, 0xb62c, 0xb634, 0xb648, 0xb664, 0xb668,
250 0xb69c, 0xb69d, 0xb6a0, 0xb6a4, 0xb6ab, 0xb6ac, 0xb6b1, 0xb6d4,
251 0xb6f0, 0xb6f4, 0xb6f8, 0xb700, 0xb701, 0xb705, 0xb728, 0xb729,
252 0xb72c, 0xb72f, 0xb730, 0xb738, 0xb739, 0xb73b, 0xb744, 0xb748,
253 0xb74c, 0xb754, 0xb755, 0xb760, 0xb764, 0xb768, 0xb770, 0xb771,
254 0xb773, 0xb775, 0xb77c, 0xb77d, 0xb780, 0xb784, 0xb78c, 0xb78d,
255 0xb78f, 0xb790, 0xb791, 0xb792, 0xb796, 0xb797,
256 /* 0x37 */
257 0xb798, 0xb799, 0xb79c, 0xb7a0, 0xb7a8, 0xb7a9, 0xb7ab, 0xb7ac,
258 0xb7ad, 0xb7b4, 0xb7b5, 0xb7b8, 0xb7c7, 0xb7c9, 0xb7ec, 0xb7ed,
259 0xb7f0, 0xb7f4, 0xb7fc, 0xb7fd, 0xb7ff, 0xb800, 0xb801, 0xb807,
260 0xb808, 0xb809, 0xb80c, 0xb810, 0xb818, 0xb819, 0xb81b, 0xb81d,
261 0xb824, 0xb825, 0xb828, 0xb82c, 0xb834, 0xb835, 0xb837, 0xb838,
262 0xb839, 0xb840, 0xb844, 0xb851, 0xb853, 0xb85c, 0xb85d, 0xb860,
263 0xb864, 0xb86c, 0xb86d, 0xb86f, 0xb871, 0xb878, 0xb87c, 0xb88d,
264 0xb8a8, 0xb8b0, 0xb8b4, 0xb8b8, 0xb8c0, 0xb8c1, 0xb8c3, 0xb8c5,
265 0xb8cc, 0xb8d0, 0xb8d4, 0xb8dd, 0xb8df, 0xb8e1, 0xb8e8, 0xb8e9,
266 0xb8ec, 0xb8f0, 0xb8f8, 0xb8f9, 0xb8fb, 0xb8fd, 0xb904, 0xb918,
267 0xb920, 0xb93c, 0xb93d, 0xb940, 0xb944, 0xb94c, 0xb94f, 0xb951,
268 0xb958, 0xb959, 0xb95c, 0xb960, 0xb968, 0xb969,
269 /* 0x38 */
270 0xb96b, 0xb96d, 0xb974, 0xb975, 0xb978, 0xb97c, 0xb984, 0xb985,
271 0xb987, 0xb989, 0xb98a, 0xb98d, 0xb98e, 0xb9ac, 0xb9ad, 0xb9b0,
272 0xb9b4, 0xb9bc, 0xb9bd, 0xb9bf, 0xb9c1, 0xb9c8, 0xb9c9, 0xb9cc,
273 0xb9ce, 0xb9cf, 0xb9d0, 0xb9d1, 0xb9d2, 0xb9d8, 0xb9d9, 0xb9db,
274 0xb9dd, 0xb9de, 0xb9e1, 0xb9e3, 0xb9e4, 0xb9e5, 0xb9e8, 0xb9ec,
275 0xb9f4, 0xb9f5, 0xb9f7, 0xb9f8, 0xb9f9, 0xb9fa, 0xba00, 0xba01,
276 0xba08, 0xba15, 0xba38, 0xba39, 0xba3c, 0xba40, 0xba42, 0xba48,
277 0xba49, 0xba4b, 0xba4d, 0xba4e, 0xba53, 0xba54, 0xba55, 0xba58,
278 0xba5c, 0xba64, 0xba65, 0xba67, 0xba68, 0xba69, 0xba70, 0xba71,
279 0xba74, 0xba78, 0xba83, 0xba84, 0xba85, 0xba87, 0xba8c, 0xbaa8,
280 0xbaa9, 0xbaaab, 0baaac, 0bab0, 0bab2, 0bab8, 0bab9, 0babbb,
281 0xbabd, 0xbac4, 0xbac8, 0xbad8, 0xbad9, 0xbafc,

```

```
282 /* 0x39 */
283 0xbb00, 0xbb04, 0xbb0d, 0xbb0f, 0xbb11, 0xbb18, 0xbb1c, 0xbb20,
284 0xbb29, 0xbb2b, 0xbb34, 0xbb35, 0xbb36, 0xbb38, 0xbb3b, 0xbb3c,
285 0xbb3d, 0xbb3e, 0xbb44, 0xbb45, 0xbb47, 0xbb49, 0xbb4d, 0xbb4f,
286 0xbb50, 0xbb54, 0xbb58, 0xbb61, 0xbb63, 0xbb6c, 0xbb88, 0xbb8c,
287 0xbb90, 0xbba4, 0xbba8, 0xbbac, 0xbbb4, 0xbbb7, 0xbbc0, 0xbbc4,
288 0xbbc8, 0xbbd0, 0xbbd3, 0xbbf8, 0xbbf9, 0xbbf c, 0xbbff, 0xbc00,
289 0xbc02, 0xbc08, 0xbc09, 0xbc0b, 0xbc0c, 0xbc0d, 0xbc0f, 0xbc11,
290 0xbc14, 0xbc15, 0xbc16, 0xbc17, 0xbc18, 0xbc1b, 0xbc1c, 0xbc1d,
291 0xbc1e, 0xbc1f, 0xbc24, 0xbc25, 0xbc27, 0xbc29, 0xbc2d, 0xbc30,
292 0xbc31, 0xbc34, 0xbc38, 0xbc40, 0xbc41, 0xbc43, 0xbc44, 0xbc45,
293 0xbc49, 0xbc4c, 0xbc4d, 0xbc50, 0xbc5d, 0xbc84, 0xbc85, 0xbc88,
294 0xbc8b, 0xbc8c, 0xbc8e, 0xbc94, 0xbc95, 0xbc97,
295 /* 0x3a */
296 0xbc99, 0xbc9a, 0xbca0, 0xbca1, 0xbca4, 0xbca7, 0xbca8, 0xbcb0,
297 0xbcb1, 0xbcb3, 0xbcb4, 0xbcb5, 0xbcbc, 0xbcbd, 0xbcc0, 0xbcc4,
298 0xbccd, 0xbccf, 0xbcd0, 0xbcd1, 0xbcd5, 0xbcd8, 0xbcdc, 0xbcf4,
299 0xbcf5, 0xbcf6, 0xbcf8, 0xbcf c, 0xbd04, 0xbd05, 0xbd07, 0xbd09,
300 0xbd10, 0xbd14, 0xbd24, 0xbd2c, 0xbd40, 0xbd48, 0xbd49, 0xbd4c,
301 0xbd50, 0xbd58, 0xbd59, 0xbd64, 0xbd68, 0xbd80, 0xbd81, 0xbd84,
302 0xbd87, 0xbd88, 0xbd89, 0xbd8a, 0xbd90, 0xbd91, 0xbd93, 0xbd95,
303 0xbd99, 0xbd9a, 0xbd9c, 0xbda4, 0xbdb0, 0xbdb8, 0xbdd4, 0xbdd5,
304 0xbdd8, 0xbddc, 0xbde9, 0xbdf0, 0xbdf4, 0xbdf c, 0xbe00, 0xbe03,
305 0xbe05, 0xbe0c, 0xbe0d, 0xbe10, 0xbe14, 0xbe1c, 0xbe1d, 0xbe1f,
306 0xbe44, 0xbe45, 0xbe48, 0xbe4c, 0xbe4e, 0xbe54, 0xbe55, 0xbe57,
307 0xbe59, 0xbe5a, 0xbe5b, 0xbe60, 0xbe61, 0xbe64,
308 /* 0x3b */
309 0xbe68, 0xbe6a, 0xbe70, 0xbe71, 0xbe73, 0xbe74, 0xbe75, 0xbe7b,
310 0xbe7c, 0xbe7d, 0xbe80, 0xbe84, 0xbe8c, 0xbe8d, 0xbe8f, 0xbe90,
311 0xbe91, 0xbe98, 0xbe99, 0xbea8, 0xbed0, 0xbed1, 0xbed4, 0xbed7,
312 0xbed8, 0xee0, 0xee3, 0xee4, 0xee5, 0xee c, 0xbf01, 0xbf08,
313 0xbf09, 0xbf18, 0xbf19, 0xbf1b, 0xbf1c, 0xbf1d, 0xbf40, 0xbf41,
314 0xbf44, 0xbf48, 0xbf50, 0xbf51, 0xbf55, 0xbf59, 0xbf5d, 0xbf5f,
315 0xbfcc, 0xbfcd, 0xbfd0, 0xbfd4, 0xbfdc, 0xbfdf, 0xbfe1, 0xc03c,
316 0xc051, 0xc058, 0xc05c, 0xc060, 0xc068, 0xc069, 0xc090, 0xc091,
317 0xc094, 0xc098, 0xc0a0, 0xc0a1, 0xc0a3, 0xc0a5, 0xc0ac, 0xc0ad,
318 0xc0af, 0xc0b0, 0xc0b3, 0xc0b4, 0xc0b5, 0xc0b6, 0xc0bc, 0xc0bd,
319 0xc0bf, 0xc0c0, 0xc0c1, 0xc0c5, 0xc0c8, 0xc0c9, 0xc0cc, 0xc0d0,
320 0xc0d8, 0xc0d9, 0xc0db, 0xc0dc, 0xc0dd, 0xc0e4,
321 /* 0x3c */
322 0xc0e5, 0xc0e8, 0xc0ec, 0xc0f4, 0xc0f5, 0xc0f7, 0xc0f9, 0xc100,
323 0xc104, 0xc108, 0xc110, 0xc115, 0xc11c, 0xc11d, 0xc11e, 0xc11f,
324 0xc120, 0xc123, 0xc124, 0xc126, 0xc127, 0xc12c, 0xc12d, 0xc12f,
325 0xc130, 0xc131, 0xc136, 0xc138, 0xc139, 0xc13c, 0xc140, 0xc148,
326 0xc149, 0xc14b, 0xc14c, 0xc14d, 0xc154, 0xc155, 0xc158, 0xc15c,
327 0xc164, 0xc165, 0xc167, 0xc168, 0xc169, 0xc170, 0xc174, 0xc178,
328 0xc185, 0xc18c, 0xc18d, 0xc18e, 0xc190, 0xc194, 0xc196, 0xc19c,
329 0xc19d, 0xc19f, 0xc1a1, 0xc1a5, 0xc1a8, 0xc1a9, 0xc1ac, 0xc1b0,
330 0xc1bd, 0xc1c4, 0xc1c8, 0xc1cc, 0xc1d4, 0xc1d7, 0xc1d8, 0xc1e0,
331 0xc1e4, 0xc1e8, 0xc1f0, 0xc1f1, 0xc1f3, 0xc1fc, 0xc1fd, 0xc200,
332 0xc204, 0xc20c, 0xc20d, 0xc20f, 0xc211, 0xc218, 0xc219, 0xc21c,
333 0xc21f, 0xc220, 0xc228, 0xc229, 0xc22b, 0xc22d,
334 /* 0x3d */
335 0xc22f, 0xc231, 0xc232, 0xc234, 0xc248, 0xc250, 0xc251, 0xc254,
336 0xc258, 0xc260, 0xc265, 0xc26c, 0xc26d, 0xc270, 0xc274, 0xc27c,
337 0xc27d, 0xc27f, 0xc281, 0xc288, 0xc289, 0xc290, 0xc298, 0xc29b,
338 0xc29d, 0xc2a4, 0xc2a5, 0xc2a8, 0xc2ac, 0xc2ad, 0xc2b4, 0xc2b5,
339 0xc2b7, 0xc2b9, 0xc2dc, 0xc2dd, 0xc2e0, 0xc2e3, 0xc2e4, 0xc2eb,
340 0xc2ec, 0xc2ed, 0xc2ef, 0xc2f1, 0xc2f6, 0xc2f8, 0xc2f9, 0xc2fb,
341 0xc2fc, 0xc300, 0xc308, 0xc309, 0xc30c, 0xc30d, 0xc313, 0xc314,
342 0xc315, 0xc318, 0xc31c, 0xc324, 0xc325, 0xc328, 0xc329, 0xc345,
343 0xc368, 0xc369, 0xc36c, 0xc370, 0xc372, 0xc378, 0xc379, 0xc37c,
344 0xc37d, 0xc384, 0xc388, 0xc38c, 0xc3c0, 0xc3d8, 0xc3d9, 0xc3dc,
345 0xc3df, 0xc3e0, 0xc3e2, 0xc3e8, 0xc3e9, 0xc3ed, 0xc3f4, 0xc3f5,
346 0xc3f8, 0xc408, 0xc410, 0xc424, 0xc42c, 0xc430,
347 /* 0x3e */
348 0xc434, 0xc43c, 0xc43d, 0xc448, 0xc464, 0xc465, 0xc468, 0xc46c,
349 0xc474, 0xc475, 0xc479, 0xc480, 0xc494, 0xc49c, 0xc4b8, 0xc4bc,
350 0xc4e9, 0xc4f0, 0xc4f1, 0xc4f4, 0xc4f8, 0xc4fa, 0xc4ff, 0xc500,
351 0xc501, 0xc50c, 0xc510, 0xc514, 0xc51c, 0xc528, 0xc529, 0xc52c,
352 0xc530, 0xc538, 0xc539, 0xc53b, 0xc53d, 0xc544, 0xc545, 0xc548,
353 0xc549, 0xc54a, 0xc54c, 0xc54d, 0xc54e, 0xc553, 0xc554, 0xc555,
354 0xc557, 0xc558, 0xc559, 0xc55d, 0xc55e, 0xc560, 0xc561, 0xc564,
355 0xc568, 0xc570, 0xc571, 0xc573, 0xc574, 0xc575, 0xc57c, 0xc57d,
356 0xc580, 0xc584, 0xc587, 0xc58c, 0xc58d, 0xc58f, 0xc591, 0xc595,
357 0xc597, 0xc598, 0xc59c, 0xc5a0, 0xc5a9, 0xc5b4, 0xc5b5, 0xc5b8,
358 0xc5b9, 0xc5bb, 0xc5bc, 0xc5bd, 0xc5be, 0xc5c4, 0xc5c5, 0xc5c6,
359 0xc5c7, 0xc5c8, 0xc5c9, 0xc5ca, 0xc5cc, 0xc5ce,
360 /* 0x3f */
361 0xc5d0, 0xc5d1, 0xc5d4, 0xc5d8, 0xc5e0, 0xc5e1, 0xc5e3, 0xc5e5,
362 0xc5ec, 0xc5ed, 0xc5ee, 0xc5f0, 0xc5f4, 0xc5f6, 0xc5f7, 0xc5fc,
363 0xc5fd, 0xc5fe, 0xc5ff, 0xc600, 0xc601, 0xc605, 0xc606, 0xc607,
364 0xc608, 0xc60c, 0xc610, 0xc618, 0xc619, 0xc61b, 0xc61c, 0xc624,
365 0xc625, 0xc628, 0xc62c, 0xc62d, 0xc62e, 0xc630, 0xc633, 0xc634,
366 0xc635, 0xc637, 0xc639, 0xc63b, 0xc640, 0xc641, 0xc644, 0xc648,
367 0xc650, 0xc651, 0xc653, 0xc654, 0xc655, 0xc65c, 0xc65d, 0xc660,
368 0xc66c, 0xc66f, 0xc671, 0xc678, 0xc679, 0xc67c, 0xc680, 0xc688,
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369 0xc689, 0xc68b, 0xc68d, 0xc694, 0xc695, 0xc698, 0xc69c, 0xc6a4,
370 0xc6a5, 0xc6a7, 0xc6a9, 0xc6b0, 0xc6b1, 0xc6b4, 0xc6b8, 0xc6b9,
371 0xc6ba, 0xc6c0, 0xc6c1, 0xc6c3, 0xc6c5, 0xc6cc, 0xc6cd, 0xc6d0,
372 0xc6d4, 0xc6dc, 0xc6dd, 0xc6e0, 0xc6e1, 0xc6e8,
373 /* 0x40 */
374 0xc6e9, 0xc6ec, 0xc6f0, 0xc6f8, 0xc6f9, 0xc6fd, 0xc704, 0xc705,
375 0xc708, 0xc70c, 0xc714, 0xc715, 0xc717, 0xc719, 0xc720, 0xc721,
376 0xc724, 0xc728, 0xc730, 0xc731, 0xc733, 0xc735, 0xc737, 0xc73c,
377 0xc73d, 0xc740, 0xc744, 0xc74a, 0xc74c, 0xc74d, 0xc74f, 0xc751,
378 0xc752, 0xc753, 0xc754, 0xc755, 0xc756, 0xc757, 0xc758, 0xc75c,
379 0xc760, 0xc768, 0xc76b, 0xc774, 0xc775, 0xc778, 0xc77c, 0xc77d,
380 0xc77e, 0xc783, 0xc784, 0xc785, 0xc787, 0xc788, 0xc789, 0xc78a,
381 0xc78e, 0xc790, 0xc791, 0xc794, 0xc796, 0xc797, 0xc798, 0xc79a,
382 0xc7a0, 0xc7a1, 0xc7a3, 0xc7a4, 0xc7a5, 0xc7a6, 0xc7ac, 0xc7ad,
383 0xc7b0, 0xc7b4, 0xc7b6, 0xc7bc, 0xc7bd, 0xc7bf, 0xc7c0, 0xc7c1, 0xc7c8,
384 0xc7c9, 0xc7cc, 0xc7ce, 0xc7d0, 0xc7d8, 0xc7dd, 0xc7e4, 0xc7e8,
385 0xc7ec, 0xc800, 0xc801, 0xc804, 0xc808, 0xc80a,
386 /* 0x41 */
387 0xc810, 0xc811, 0xc813, 0xc815, 0xc816, 0xc81c, 0xc81d, 0xc820,
388 0xc824, 0xc82c, 0xc82d, 0xc82f, 0xc831, 0xc838, 0xc83c, 0xc840,
389 0xc848, 0xc849, 0xc84c, 0xc84d, 0xc854, 0xc870, 0xc871, 0xc874,
390 0xc878, 0xc87a, 0xc880, 0xc881, 0xc883, 0xc885, 0xc886, 0xc887,
391 0xc88b, 0xc88c, 0xc88d, 0xc894, 0xc89d, 0xc89f, 0xc8a1, 0xc8a8,
392 0xc8bc, 0xc8bd, 0xc8bd, 0xc8c4, 0xc8cc, 0xc8cd, 0xc8d5, 0xc8d7,
393 0xc8d9, 0xc8e0, 0xc8e1, 0xc8e4, 0xc8f5, 0xc8fc, 0xc8fd, 0xc900,
394 0xc904, 0xc905, 0xc906, 0xc90c, 0xc90d, 0xc90f, 0xc911, 0xc918,
395 0xc92c, 0xc934, 0xc93a, 0xc950, 0xc951, 0xc954, 0xc958, 0xc960, 0xc961,
396 0xc963, 0xc96c, 0xc970, 0xc974, 0xc97c, 0xc988, 0xc989, 0xc98c,
397 0xc990, 0xc998, 0xc999, 0xc99b, 0xc99d, 0xc9c0, 0xc9c1, 0xc9c4,
398 0xc9c7, 0xc9c8, 0xc9ca, 0xc9d0, 0xc9d1, 0xc9d3,
399 /* 0x42 */
400 0xc9d5, 0xc9d6, 0xc9d9, 0xc9da, 0xc9dc, 0xc9dd, 0xc9e0, 0xc9e2,
401 0xc9e4, 0xc9e7, 0xc9ec, 0xc9ed, 0xc9ef, 0xc9f0, 0xc9f1, 0xc9f8,
402 0xc9f9, 0xc9fc, 0xca00, 0xca08, 0xca09, 0xca0b, 0xca0c, 0xca0d,
403 0xca14, 0xca18, 0xca29, 0xca4c, 0xca4d, 0xca50, 0xca54, 0xca5c,
404 0xca5d, 0xca5f, 0xca60, 0xca61, 0xca68, 0xca7d, 0xca84, 0xca98,
405 0xcabc, 0xcabd, 0xcac0, 0xcac4, 0xcacc, 0xcacd, 0xcacf, 0xcad1,
406 0xcad3, 0xcad8, 0xcad9, 0xcae0, 0xcaec, 0xcaf4, 0xcb08, 0xcb10,
407 0xcb14, 0xcb18, 0xcb20, 0xcb21, 0xcb41, 0xcb48, 0xcb49, 0xcb4c,
408 0xcb50, 0xcb58, 0xcb59, 0xcb5d, 0xcb64, 0xcb78, 0xcb79, 0xcb9c,
409 0xcbb8, 0xcbbd, 0xcbe4, 0xcbe7, 0xcbe9, 0xcc0c, 0xcc0d, 0xcc10,
410 0xcc14, 0xcc1c, 0xcc1d, 0xcc21, 0xcc22, 0xcc27, 0xcc28, 0xcc29,
411 0xcc2c, 0xcc2e, 0xcc30, 0xcc38, 0xcc39, 0xcc3b,
412 /* 0x43 */
413 0xcc3c, 0xcc3d, 0xcc3e, 0xcc44, 0xcc45, 0xcc48, 0xcc4c, 0xcc54,
414 0xcc55, 0xcc57, 0xcc58, 0xcc59, 0xcc60, 0xcc64, 0xcc66, 0xcc68,
415 0xcc70, 0xcc75, 0xcc98, 0xcc99, 0xcc9c, 0xcca0, 0xcca8, 0xcca9,
416 0xccab, 0xccac, 0xccad, 0xccb4, 0xccb5, 0xccb8, 0xccbc, 0xccc4,
417 0xccc5, 0xccc7, 0xccc9, 0xccd0, 0xccd4, 0xcce4, 0xccec, 0xccf0,
418 0xcd01, 0xcd08, 0xcd09, 0xcd0c, 0xcd10, 0xcd18, 0xcd19, 0xcd1b,
419 0xcd1d, 0xcd24, 0xcd28, 0xcd2c, 0xcd39, 0xcd5c, 0xcd60, 0xcd64,
420 0xcd6c, 0xcd6d, 0xcd6f, 0xcd71, 0xcd78, 0xcd88, 0xcd94, 0xcd95,
421 0xcd98, 0xcd9c, 0xcda4, 0xcda5, 0xcda7, 0xcda9, 0xcdb0, 0xcdc4,
422 0xcdcc, 0xcdcd, 0xcde8, 0xcdec, 0xcdf0, 0xcdf8, 0xcdf9, 0xcdfb,
423 0xcdfd, 0xce04, 0xce08, 0xce0c, 0xce14, 0xce19, 0xce20, 0xce21,
424 0xce24, 0xce28, 0xce30, 0xce31, 0xce33, 0xce35,
425 /* 0x44 */
426 0xce58, 0xce59, 0xce5c, 0xce5f, 0xce60, 0xce61, 0xce68, 0xce69,
427 0xce6b, 0xce6d, 0xce74, 0xce75, 0xce78, 0xce7c, 0xce84, 0xce85,
428 0xce87, 0xce89, 0xce90, 0xce91, 0xce94, 0xce98, 0xcea0, 0xcea1,
429 0xcea3, 0xcea4, 0xcea5, 0xceac, 0xcead, 0xcec1, 0xcee4, 0xcee5,
430 0xcee8, 0xceeb, 0xceec, 0xcef4, 0xcef5, 0xcef7, 0xcef8, 0xcef9,
431 0xcf00, 0xcf01, 0xcf04, 0xcf08, 0xcf10, 0xcf11, 0xcf13, 0xcf15,
432 0xcf1c, 0xcf20, 0xcf24, 0xcf2c, 0xcf2d, 0xcf2f, 0xcf30, 0xcf31,
433 0xcf38, 0xcf39, 0xcf55, 0xcf58, 0xcf5c, 0xcf64, 0xcf65, 0xcf67,
434 0xcf69, 0xcf70, 0xcf71, 0xcf74, 0xcf78, 0xcf80, 0xcf85, 0xcf8c,
435 0xcfa1, 0xcfa8, 0xcfb0, 0xcfc4, 0xcfe0, 0xcfe1, 0xcfe4, 0xcfe8,
436 0xcff0, 0xcff1, 0xcff3, 0xcff5, 0xcffc, 0xd000, 0xd004, 0xd011,
437 0xd018, 0xd02d, 0xd034, 0xd035, 0xd038, 0xd03c,
438 /* 0x45 */
439 0xd044, 0xd045, 0xd047, 0xd049, 0xd050, 0xd054, 0xd058, 0xd060,
440 0xd06c, 0xd06d, 0xd070, 0xd074, 0xd07c, 0xd07d, 0xd081, 0xd0a4,
441 0xd0a5, 0xd0a8, 0xd0ac, 0xd0b4, 0xd0b5, 0xd0b7, 0xd0b9, 0xd0c0,
442 0xd0c1, 0xd0c4, 0xd0c8, 0xd0c9, 0xd0d0, 0xd0d1, 0xd0d3, 0xd0d4,
443 0xd0d5, 0xd0dc, 0xd0dd, 0xd0e0, 0xd0e4, 0xd0ec, 0xd0ed, 0xd0ef,
444 0xd0f0, 0xd0f1, 0xd0f8, 0xd10d, 0xd130, 0xd131, 0xd134, 0xd138,
445 0xd13a, 0xd140, 0xd141, 0xd143, 0xd144, 0xd145, 0xd14c, 0xd14d,
446 0xd150, 0xd154, 0xd15c, 0xd15d, 0xd15f, 0xd161, 0xd168, 0xd16c,
447 0xd17c, 0xd184, 0xd188, 0xd1a0, 0xd1a1, 0xd1a4, 0xd1a8, 0xd1b0,
448 0xd1b1, 0xd1b3, 0xd1b5, 0xd1ba, 0xd1bc, 0xd1c0, 0xd1d8, 0xd1f4,
449 0xd1f8, 0xd207, 0xd209, 0xd210, 0xd22c, 0xd22d, 0xd230, 0xd234,
450 0xd23c, 0xd23d, 0xd23f, 0xd241, 0xd248, 0xd25c,
451 /* 0x46 */
452 0xd264, 0xd280, 0xd281, 0xd284, 0xd288, 0xd290, 0xd291, 0xd295,
453 0xd29c, 0xd2a0, 0xd2a4, 0xd2ac, 0xd2b1, 0xd2b8, 0xd2b9, 0xd2bc,
454 0xd2bf, 0xd2c0, 0xd2c2, 0xd2c8, 0xd2c9, 0xd2cb, 0xd2d4, 0xd2d8,
455 0xd2dc, 0xd2e4, 0xd2e5, 0xd2f0, 0xd2f1, 0xd2f4, 0xd2f8, 0xd300,

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```
456 0xd301, 0xd303, 0xd305, 0xd30c, 0xd30d, 0xd30e, 0xd310, 0xd314,
457 0xd316, 0xd31c, 0xd31d, 0xd31f, 0xd320, 0xd321, 0xd325, 0xd328,
458 0xd329, 0xd32c, 0xd330, 0xd338, 0xd339, 0xd33b, 0xd33c, 0xd33d,
459 0xd344, 0xd345, 0xd37c, 0xd37d, 0xd380, 0xd384, 0xd38c, 0xd38d,
460 0xd38f, 0xd390, 0xd391, 0xd398, 0xd399, 0xd39c, 0xd3a0, 0xd3a8,
461 0xd3a9, 0xd3ab, 0xd3ad, 0xd3b4, 0xd3b8, 0xd3bc, 0xd3c4, 0xd3c5,
462 0xd3c8, 0xd3c9, 0xd3d0, 0xd3d8, 0xd3e1, 0xd3e3, 0xd3ec, 0xd3ed,
463 0xd3f0, 0xd3f4, 0xd3fc, 0xd3fd, 0xd3ff, 0xd401,
464 /* 0x47 */
465 0xd408, 0xd41d, 0xd440, 0xd444, 0xd45c, 0xd460, 0xd464, 0xd46d,
466 0xd46f, 0xd478, 0xd479, 0xd47c, 0xd47f, 0xd480, 0xd482, 0xd488,
467 0xd489, 0xd48b, 0xd48d, 0xd494, 0xd4a9, 0xd4cc, 0xd4d0, 0xd4d4,
468 0xd4dc, 0xd4df, 0xd4e8, 0xd4ec, 0xd4f0, 0xd4f8, 0xd4fb, 0xd4fd,
469 0xd504, 0xd508, 0xd50c, 0xd514, 0xd515, 0xd517, 0xd53c, 0xd53d,
470 0xd540, 0xd544, 0xd54c, 0xd54d, 0xd54f, 0xd551, 0xd558, 0xd559,
471 0xd55c, 0xd560, 0xd565, 0xd568, 0xd569, 0xd56b, 0xd56d, 0xd574,
472 0xd575, 0xd578, 0xd57c, 0xd584, 0xd585, 0xd587, 0xd588, 0xd589,
473 0xd590, 0xd5a5, 0xd5c8, 0xd5c9, 0xd5cc, 0xd5d0, 0xd5d2, 0xd5d8,
474 0xd5d9, 0xd5db, 0xd5dd, 0xd5e4, 0xd5e5, 0xd5e8, 0xd5ec, 0xd5f4,
475 0xd5f5, 0xd5f7, 0xd5f9, 0xd600, 0xd601, 0xd604, 0xd608, 0xd610,
476 0xd611, 0xd613, 0xd614, 0xd615, 0xd61c, 0xd620,
477 /* 0x48 */
478 0xd624, 0xd62d, 0xd638, 0xd639, 0xd63c, 0xd640, 0xd645, 0xd648,
479 0xd649, 0xd64b, 0xd64d, 0xd651, 0xd654, 0xd655, 0xd658, 0xd65c,
480 0xd667, 0xd669, 0xd670, 0xd671, 0xd674, 0xd683, 0xd685, 0xd68c,
481 0xd68d, 0xd690, 0xd694, 0xd69d, 0xd69f, 0xd6a1, 0xd6a8, 0xd6ac,
482 0xd6b0, 0xd6b9, 0xd6bb, 0xd6c4, 0xd6c5, 0xd6c8, 0xd6cc, 0xd6d1,
483 0xd6d4, 0xd6d7, 0xd6d9, 0xd6e0, 0xd6e4, 0xd6e8, 0xd6f0, 0xd6f5,
484 0xd6fc, 0xd6fd, 0xd700, 0xd704, 0xd711, 0xd718, 0xd719, 0xd71c,
485 0xd720, 0xd728, 0xd729, 0xd72b, 0xd72d, 0xd734, 0xd735, 0xd738,
486 0xd73c, 0xd744, 0xd747, 0xd749, 0xd750, 0xd751, 0xd754, 0xd756,
487 0xd757, 0xd758, 0xd759, 0xd760, 0xd761, 0xd763, 0xd765, 0xd769,
488 0xd76c, 0xd770, 0xd774, 0xd77c, 0xd77d, 0xd781, 0xd788, 0xd789,
489 0xd78c, 0xd790, 0xd798, 0xd799, 0xd79b, 0xd79d,
490 };
491 static const unsigned short ksc5601_2uni_page4a[4888] = {
492 /* 0x4a */
493 0x4f3d, 0x4f73, 0x5047, 0x50f9, 0x52a0, 0x53ef, 0x5475, 0x54e5,
494 0x5609, 0x5ac1, 0x5bbb6, 0x6687, 0x67b6, 0x67b7, 0x67ef, 0x6b4c,
495 0x73c2, 0x75c2, 0x7a3c, 0x82db, 0x8304, 0x8857, 0x8888, 0x8a36,
496 0x8cc8, 0x8dcf, 0x8efb, 0x8fe6, 0x99d5, 0x523b, 0x5374, 0x5404,
497 0x606a, 0x6164, 0x6bbbc, 0x73cf, 0x811a, 0x89ba, 0x89d2, 0x95a3,
498 0x4f83, 0x520a, 0x58be, 0x5978, 0x59e6, 0x5e72, 0x5e79, 0x61c7,
499 0x63c0, 0x6746, 0x67ec, 0x687f, 0x6f97, 0x764e, 0x770b, 0x78f5,
500 0x7a08, 0x7aff, 0x7c21, 0x809d, 0x826e, 0x8271, 0x8aeb, 0x9593,
501 0x4e6b, 0x559d, 0x66f7, 0x6e34, 0x78a3, 0x7aed, 0x845b, 0x8910,
502 0x874e, 0x97a8, 0x52d8, 0x574e, 0x582a, 0x5d4c, 0x611f, 0x61be,
503 0x6221, 0x6562, 0x67d1, 0x6a44, 0x6e1b, 0x7518, 0x75b3, 0x76e3,
504 0x77b0, 0x7d3a, 0x90af, 0x9451, 0x9452, 0x9f95,
505 /* 0x4b */
506 0x5323, 0x5cac, 0x7532, 0x80db, 0x9240, 0x9598, 0x525b, 0x5808,
507 0x59dc, 0x5ca1, 0x5d17, 0x5eb7, 0x5f3a, 0x5f4a, 0x6177, 0x6c5f,
508 0x757a, 0x7586, 0x7ce0, 0x7d73, 0x7db1, 0x7f8c, 0x8154, 0x8221,
509 0x8591, 0x8941, 0x8b1b, 0x92fc, 0x964d, 0x9c47, 0x4ecb, 0x4ef7,
510 0x500b, 0x51f1, 0x584f, 0x6137, 0x613e, 0x6168, 0x6539, 0x69ea,
511 0x6f11, 0x75a5, 0x7686, 0x76d6, 0x7b87, 0x82a5, 0x84cb, 0xf900,
512 0x93a7, 0x958b, 0x5580, 0x5ba2, 0x5751, 0xf901, 0x7cb3, 0x7fb9,
513 0x91b5, 0x5028, 0x53bb, 0x5c45, 0x5de8, 0x62d2, 0x636e, 0x64da,
514 0x64e7, 0x6e20, 0x70ac, 0x795b, 0x8ddd, 0x8e1e, 0xf902, 0x907d,
515 0x9245, 0x92f8, 0x947e, 0x4ef6, 0x5065, 0x5dfe, 0x5efa, 0x6106,
516 0x6957, 0x8171, 0x8654, 0x8e47, 0x9375, 0x9a2b, 0x4e5e, 0x5091,
517 0x6770, 0x6840, 0x5109, 0x528d, 0x5292, 0x6aa2,
518 /* 0x4c */
519 0x77bc, 0x9210, 0x9ed4, 0x52ab, 0x602f, 0x8ff2, 0x5048, 0x61a9,
520 0x63ed, 0x64ca, 0x683c, 0x6a84, 0x6fc0, 0x8188, 0x89a1, 0x9694,
521 0x5805, 0x727d, 0x72ac, 0x7504, 0x7d79, 0x7e6d, 0x809a, 0x898b,
522 0x8b74, 0x9063, 0x9d51, 0x6289, 0x6c7a, 0x6f54, 0x7d50, 0x7f3a,
523 0x8a23, 0x517c, 0x614a, 0x7b9d, 0x8b19, 0x9257, 0x938c, 0x4eac,
524 0x4fd3, 0x501e, 0x50be, 0x5106, 0x52c1, 0x52cd, 0x537f, 0x5770,
525 0x5883, 0x5e9a, 0x5f91, 0x6176, 0x61ac, 0x64ce, 0x656c, 0x666f,
526 0x66bb, 0x66f4, 0x6897, 0x6d87, 0x7085, 0x70f1, 0x749f, 0x74a5,
527 0x74ca, 0x75d9, 0x786c, 0x78ec, 0x7adf, 0x7af6, 0x7d45, 0x7d93,
528 0x8015, 0x803f, 0x811b, 0x8396, 0x8b66, 0x8f15, 0x9015, 0x93e1,
529 0x9803, 0x9838, 0x9a5a, 0x9be8, 0x4fc2, 0x5553, 0x583a, 0x5951,
530 0x5b63, 0x5c46, 0x60b8, 0x6212, 0x6842, 0x68b0,
531 /* 0x4d */
532 0x68e8, 0x6eaa, 0x754c, 0x7678, 0x78ce, 0x7a3d, 0x7cfb, 0x7e6b,
533 0x7e7c, 0x8a08, 0x8aa1, 0x8c3f, 0x968e, 0x9dc4, 0x53e4, 0x53e9,
534 0x544a, 0x5471, 0x56fa, 0x59d1, 0x5b64, 0x5c3b, 0x5eab, 0x62f7,
535 0x6537, 0x6545, 0x6572, 0x66a0, 0x67af, 0x69c1, 0x6cbd, 0x75fc,
536 0x7690, 0x777e, 0x7a3f, 0x7f94, 0x8003, 0x80a1, 0x818f, 0x82e6,
537 0x82fd, 0x83f0, 0x85c1, 0x8831, 0x88b4, 0x8aa5, 0xf903, 0x8f9c,
538 0x932e, 0x96c7, 0x9867, 0x9ad8, 0x9f13, 0x54ed, 0x659b, 0x66f2,
539 0x688f, 0x7a40, 0x8c37, 0x9d60, 0x56f0, 0x5764, 0x5d11, 0x6606,
540 0x68b1, 0x68cd, 0x6efe, 0x7428, 0x889e, 0x9be4, 0x6c68, 0xf904,
541 0x9aa8, 0x4f9b, 0x516c, 0x5171, 0x529f, 0x5b54, 0x5de5, 0x6050,
542 0x606d, 0x62f1, 0x63a7, 0x653b, 0x73d9, 0x7a7a, 0x86a3, 0x8ca2,
```

```
543 0x978f, 0x4e32, 0x5be1, 0x6208, 0x679c, 0x74dc,
544 /* 0x4e */
545 0x79d1, 0x83d3, 0x8a87, 0x8ab2, 0x8de8, 0x904e, 0x934b, 0x9846,
546 0x5ed3, 0x69e8, 0x85ff, 0x90ed, 0xf905, 0x51a0, 0x5b98, 0x5bec,
547 0x6163, 0x68fa, 0x6b3e, 0x704c, 0x742f, 0x74d8, 0x7ba1, 0x7f50,
548 0x83c5, 0x89c0, 0x8cab, 0x95dc, 0x9928, 0x522e, 0x605d, 0x62ec,
549 0x9002, 0x4f8a, 0x5149, 0x5321, 0x58d9, 0x5ee3, 0x66e0, 0x6d38,
550 0x709a, 0x72c2, 0x73d6, 0x7b50, 0x80f1, 0x945b, 0x5366, 0x639b,
551 0x7f6b, 0x4e56, 0x5080, 0x584a, 0x58de, 0x602a, 0x6127, 0x62d0,
552 0x69d0, 0x9b41, 0x5b8f, 0x7d18, 0x80b1, 0x8f5f, 0x4ea4, 0x50d1,
553 0x54ac, 0x55ac, 0x5b0c, 0x5da0, 0x5de7, 0x652a, 0x654e, 0x6821,
554 0x6a4b, 0x72e1, 0x768e, 0x77ef, 0x7d5e, 0x7ff9, 0x81a0, 0x854e,
555 0x86df, 0x8f03, 0x8f4e, 0x90ca, 0x9903, 0x9a55, 0x9bab, 0x4e18,
556 0x4e45, 0x4e5d, 0x4ec7, 0x4ff1, 0x5177, 0x52fe,
557 /* 0x4f */
558 0x5340, 0x53e3, 0x53e5, 0x548e, 0x5614, 0x5775, 0x57a2, 0x5bc7,
559 0x5d87, 0x5ed0, 0x61fc, 0x62d8, 0x6551, 0x67b8, 0x67e9, 0x69cb,
560 0x6b50, 0x6bc6, 0x6bec, 0x6c42, 0x6e9d, 0x7078, 0x72d7, 0x7396,
561 0x7403, 0x77bf, 0x77e9, 0x7a76, 0x7d7f, 0x8009, 0x81fc, 0x8205,
562 0x820a, 0x82df, 0x8862, 0x8b33, 0x8cfc, 0x8ec0, 0x9011, 0x90b1,
563 0x9264, 0x92b6, 0x99d2, 0x9a45, 0x9ce9, 0x9dd7, 0x9f9c, 0x570b,
564 0x5c40, 0x83ca, 0x97a0, 0x97ab, 0x9eb4, 0x541b, 0x7a98, 0x7fa4,
565 0x88d9, 0x8ecd, 0x90e1, 0x5800, 0x5c48, 0x6398, 0x7a9f, 0x5bae,
566 0x5f13, 0x7a79, 0x7aae, 0x828e, 0x8eac, 0x5026, 0x5238, 0x52f8,
567 0x5377, 0x5708, 0x62f3, 0x6372, 0x6b0a, 0x6dc3, 0x7737, 0x53a5,
568 0x7357, 0x8568, 0x8e76, 0x95d5, 0x673a, 0x6ac3, 0x6f70, 0x8a6d,
569 0x8ecc, 0x994b, 0xf906, 0x6677, 0x6b78, 0x8cb4,
570 /* 0x50 */
571 0x9b3c, 0xf907, 0x53eb, 0x572d, 0x594e, 0x63c6, 0x69fb, 0x73ea,
572 0x7845, 0x7aba, 0x7ac5, 0x7cfe, 0x8475, 0x898f, 0x8d73, 0x9035,
573 0x95a8, 0x52fb, 0x5747, 0x7547, 0x7b60, 0x83cc, 0x921e, 0xf908,
574 0x6a58, 0x514b, 0x524b, 0x5287, 0x621f, 0x68d8, 0x6975, 0x9699,
575 0x50c5, 0x52a4, 0x52e4, 0x61c3, 0x65a4, 0x6839, 0x69ff, 0x747e,
576 0x7b4b, 0x82b9, 0x83eb, 0x89b2, 0x8b39, 0x8fd1, 0x9949, 0xf909,
577 0x4eca, 0x5997, 0x64d2, 0x6611, 0x6a8e, 0x7434, 0x7981, 0x79bd,
578 0x82a9, 0x887e, 0x887f, 0x895f, 0xf90a, 0x9326, 0x4f0b, 0x53ca,
579 0x6025, 0x6271, 0x6c72, 0x7d1a, 0x7d66, 0x4e98, 0x5162, 0x77dc,
580 0x80af, 0x4f01, 0x4f0e, 0x5176, 0x5180, 0x55dc, 0x5668, 0x573b,
581 0x57fa, 0x57fc, 0x5914, 0x5947, 0x5993, 0x5bc4, 0x5c90, 0x5d0e,
582 0x5df1, 0x5e7e, 0x5fcc, 0x6280, 0x65d7, 0x65e3,
583 /* 0x51 */
584 0x671e, 0x671f, 0x675e, 0x68cb, 0x68c4, 0x6a5f, 0x6b3a, 0x6c23,
585 0x6c7d, 0x6c82, 0x6dc7, 0x7398, 0x7426, 0x742a, 0x7482, 0x74a3,
586 0x7578, 0x757f, 0x7881, 0x78ef, 0x7941, 0x7947, 0x7948, 0x797a,
587 0x7b95, 0x7d00, 0x7dba, 0x7f88, 0x8006, 0x802d, 0x808c, 0x8a18,
588 0x8b4f, 0x8c48, 0x8d77, 0x9321, 0x9324, 0x98e2, 0x9951, 0x9a0e,
589 0x9a0f, 0x9a65, 0x9e92, 0x7dca, 0x4f76, 0x5409, 0x62ee, 0x6854,
590 0x91d1, 0x55ab, 0x513a, 0xf90b, 0xf90c, 0x5a1c, 0x61e6, 0xf90d,
591 0x62cf, 0x62ff, 0xf90e, 0xf90f, 0xf910, 0xf911, 0xf912, 0xf913,
592 0x90a3, 0xf914, 0xf915, 0xf916, 0xf917, 0xf918, 0x8afe, 0xf919,
593 0xf91a, 0xf91b, 0xf91c, 0x6696, 0xf91d, 0x7156, 0xf91e, 0xf91f,
594 0x96e3, 0xf920, 0x634f, 0x637a, 0x5357, 0xf921, 0x678f, 0x6960,
595 0x6e73, 0xf922, 0x7537, 0xf923, 0xf924, 0xf925,
596 /* 0x52 */
597 0x7d0d, 0xf926, 0xf927, 0x8872, 0x56ca, 0x5a18, 0xf928, 0xf929,
598 0xf92a, 0xf92b, 0xf92c, 0x4e43, 0xf92d, 0x5167, 0x5948, 0x67f0,
599 0x8010, 0xf92e, 0x5973, 0x5e74, 0x649a, 0x79ca, 0x5ff5, 0x606c,
600 0x62c8, 0x637b, 0x5be7, 0x5bd7, 0x52aa, 0xf92f, 0x5974, 0x5f29,
601 0x6012, 0xf930, 0xf931, 0xf932, 0x7459, 0xf933, 0xf934, 0xf935,
602 0xf936, 0xf937, 0xf938, 0x99d1, 0xf939, 0xf93a, 0xf93b, 0xf93c,
603 0xf93d, 0xf93e, 0xf93f, 0xf940, 0xf941, 0xf942, 0xf943, 0x6fc3,
604 0xf944, 0xf945, 0x81bf, 0x8fb2, 0x60f1, 0xf946, 0xf947, 0x8166,
605 0xf948, 0xf949, 0x5c3f, 0xf94a, 0xf94b, 0xf94c, 0xf94d, 0xf94e,
606 0xf94f, 0xf950, 0xf951, 0x5ae9, 0x8a25, 0x677b, 0x7d10, 0xf952,
607 0xf953, 0xf954, 0xf955, 0xf956, 0xf957, 0x80fd, 0xf958, 0xf959,
608 0x5c3c, 0x6ce5, 0x533f, 0x6eba, 0x591a, 0x8336,
609 /* 0x53 */
610 0x4e39, 0x4eb6, 0x4f46, 0x55ae, 0x5718, 0x58c7, 0x5f56, 0x65b7,
611 0x65e6, 0x6a80, 0x6bb5, 0x6e4d, 0x77ed, 0x7aef, 0x7c1e, 0x7dde,
612 0x86cb, 0x8892, 0x9132, 0x935b, 0x64bb, 0x6fbe, 0x737a, 0x75b8,
613 0x9054, 0x5556, 0x574d, 0x61ba, 0x64d4, 0x66c7, 0x6de1, 0x6e5b,
614 0x6f6d, 0x6fb9, 0x75f0, 0x8043, 0x81bd, 0x8541, 0x8983, 0x8ac7,
615 0x8b5a, 0x931f, 0x6c93, 0x7553, 0x7b54, 0x8e0f, 0x905d, 0x5510,
616 0x5802, 0x5858, 0x5e62, 0x6207, 0x649e, 0x68e0, 0x7576, 0x7cd6,
617 0x87b3, 0x9ee8, 0x4ee3, 0x5788, 0x576e, 0x5927, 0x5c0d, 0x5cb1,
618 0x5e36, 0x5f85, 0x6234, 0x64e1, 0x73b3, 0x81fa, 0x888b, 0x8cb8,
619 0x968a, 0x9edb, 0x5b85, 0x5fb7, 0x60b3, 0x5012, 0x5200, 0x5230,
620 0x5716, 0x5835, 0x5857, 0x5c0e, 0x5c60, 0x5cf6, 0x5d8b, 0x5ea6,
621 0x5f92, 0x60bc, 0x6311, 0x6389, 0x6417, 0x6843,
622 /* 0x54 */
623 0x68f9, 0x6ac2, 0x6dd8, 0x6e21, 0x6ed4, 0x6fe4, 0x71fe, 0x76dc,
624 0x7779, 0x79b1, 0x7a3b, 0x8404, 0x89a9, 0x8ced, 0x8df3, 0x8e48,
625 0x9003, 0x9014, 0x9053, 0x90fd, 0x934d, 0x9676, 0x97dc, 0x6bd2,
626 0x7006, 0x7258, 0x72a2, 0x7368, 0x7763, 0x79bf, 0x7be4, 0x7e9b,
627 0x8b80, 0x58a9, 0x60c7, 0x6566, 0x65fd, 0x66be, 0x6c8c, 0x711e,
628 0x71c9, 0x8c5a, 0x9813, 0x4e6d, 0x7a81, 0x4edd, 0x51ac, 0x51cd,
629 0x52d5, 0x540c, 0x61a7, 0x6771, 0x6850, 0x68df, 0x6dle, 0x6f7c,
```

```
630 0x75bc, 0x77b3, 0x7ae5, 0x80f4, 0x8463, 0x9285, 0x515c, 0x6597,
631 0x675c, 0x6793, 0x75d8, 0x7ac7, 0x8373, 0xf95a, 0x8c46, 0x9017,
632 0x982d, 0x5c6f, 0x81c0, 0x829a, 0x9041, 0x906f, 0x920d, 0x5f97,
633 0x5d9d, 0x6a59, 0x71c8, 0x767b, 0x7b49, 0x85e4, 0x8b04, 0x9127,
634 0x9a30, 0x5587, 0x61f6, 0xf95b, 0x7669, 0x7f85,
635 /* 0x55 */
636 0x863f, 0x87ba, 0x88f8, 0x908f, 0xf95c, 0x6d1b, 0x70d9, 0x73de,
637 0x7d61, 0x843d, 0xf95d, 0x916a, 0x99f1, 0xf95e, 0x4e82, 0x5375,
638 0x6b04, 0x6b12, 0x703e, 0x721b, 0x862d, 0x9e1e, 0x524c, 0x8fa3,
639 0x5d50, 0x64e5, 0x652c, 0x6b16, 0x6feb, 0x7c43, 0x7e9c, 0x85cd,
640 0x8964, 0x89bd, 0x62c9, 0x81d8, 0x881f, 0x5eca, 0x6717, 0x6d6a,
641 0x72fc, 0x7405, 0x746f, 0x8782, 0x90de, 0x4f86, 0x5d0d, 0x5fa0,
642 0x840a, 0x51b7, 0x63a0, 0x7565, 0x4eae, 0x5006, 0x5169, 0x51c9,
643 0x6881, 0x6a11, 0x7cae, 0x7cb1, 0x7ce7, 0x826f, 0x8ad2, 0x8f1b,
644 0x91cf, 0x4fb6, 0x9234, 0x5137, 0x52f5, 0x5442, 0x5eec, 0x616e, 0x623e,
645 0x65c5, 0x6ada, 0x6ffe, 0x792a, 0x85dc, 0x8823, 0x95ad, 0x9a62,
646 0x9a6a, 0x9e97, 0x9ece, 0x529b, 0x66c6, 0x6b77, 0x701d, 0x792b,
647 0x8f62, 0x9742, 0x6190, 0x6200, 0x6523, 0x6f23,
648 /* 0x56 */
649 0x7149, 0x7489, 0x7df4, 0x806f, 0x84ee, 0x8f26, 0x9023, 0x934a,
650 0x51bd, 0x5217, 0x52a3, 0x6d0c, 0x70c8, 0x88c2, 0x5ec9, 0x6582,
651 0x6bae, 0x6fc2, 0x7c3e, 0x7375, 0x4ee4, 0x4f36, 0x56f9, 0xf95f,
652 0x5cba, 0x5dba, 0x601c, 0x73b2, 0x7b2d, 0x7f9a, 0x7fce, 0x8046,
653 0x901e, 0x9234, 0x96f6, 0x9748, 0x9818, 0x9f61, 0x4fb8, 0x6fa7,
654 0x79ae, 0x91b4, 0x96b7, 0x52de, 0xf960, 0x6488, 0x64c4, 0x6ad3,
655 0x6f5e, 0x7018, 0x7210, 0x76e7, 0x8001, 0x8606, 0x865c, 0x8def,
656 0x8f05, 0x9732, 0x9b6f, 0x9dfa, 0x9e75, 0x788c, 0x797f, 0x7da0,
657 0x83c9, 0x9304, 0x9e7f, 0x9e93, 0x8ad6, 0x58df, 0x5f04, 0x6727,
658 0x7027, 0x74cf, 0x7c60, 0x807e, 0x5121, 0x7028, 0x7262, 0x78ca,
659 0x8cc2, 0x8cda, 0x8cf4, 0x96f7, 0x4e86, 0x50da, 0x5bee, 0x5ed6,
660 0x6599, 0x71ce, 0x7642, 0x77ad, 0x804a, 0x84fc,
661 /* 0x57 */
662 0x907c, 0x9b27, 0x9f8d, 0x58d8, 0x5a41, 0x5c62, 0x6a13, 0x6dda,
663 0x6f0f, 0x763b, 0x7d2f, 0x7e37, 0x851e, 0x8938, 0x93e4, 0x964b,
664 0x5289, 0x65d2, 0x67f3, 0x69b4, 0x6d41, 0x6e9c, 0x700f, 0x7409,
665 0x7460, 0x7559, 0x7624, 0x786b, 0x8b2c, 0x985e, 0x516d, 0x622e,
666 0x9678, 0x4f96, 0x502b, 0x5d19, 0x6dea, 0x7db8, 0x8f2a, 0x5f8b,
667 0x6144, 0x6817, 0xf961, 0x9686, 0x52d2, 0x808b, 0x51dc, 0x51cc,
668 0x695e, 0x7a1c, 0x7dbe, 0x83f1, 0x9675, 0x4fda, 0x5229, 0x5398,
669 0x540f, 0x550e, 0x5c65, 0x60a7, 0x674e, 0x68a8, 0x6d6c, 0x7281,
670 0x72f8, 0x7406, 0x7483, 0xf962, 0x75e2, 0x7c6c, 0x7f79, 0x7fb8,
671 0x8389, 0x88cf, 0x88e1, 0x91cc, 0x91d0, 0x96e2, 0x9bc9, 0x541d,
672 0x6f7e, 0x71d0, 0x7498, 0x85fa, 0x8eaa, 0x96a3, 0x9c57, 0x9e9f,
673 0x6797, 0x6dc8, 0x7433, 0x81e8, 0x9716, 0x782c,
674 /* 0x58 */
675 0x7acb, 0x7b20, 0x7c92, 0x6469, 0x746a, 0x75f2, 0x78bc, 0x78e8,
676 0x99ac, 0x9b54, 0x9ebb, 0x5bde, 0x5e55, 0x6f20, 0x819c, 0x83ab,
677 0x9088, 0x4e07, 0x534d, 0x5a29, 0x5dd2, 0x5f4e, 0x6162, 0x633d,
678 0x6669, 0x66fc, 0x6eff, 0x6f2b, 0x7063, 0x779e, 0x842c, 0x8513,
679 0x883b, 0x8f13, 0x9945, 0x9c3b, 0x551c, 0x62b9, 0x672b, 0x6cab,
680 0x8309, 0x896a, 0x977a, 0x4ea1, 0x5984, 0x5fd8, 0x5fd9, 0x671b,
681 0x7db2, 0x7f54, 0x8292, 0x832b, 0x83bd, 0x8f1e, 0x9099, 0x57cb,
682 0x59b9, 0x5a92, 0x5bd0, 0x6627, 0x679a, 0x6885, 0x6bcf, 0x7164,
683 0x7f75, 0x8cb7, 0x8ce3, 0x9081, 0x9b45, 0x8108, 0x8c8a, 0x964c,
684 0x9a40, 0x9ea5, 0x5b5f, 0x6c13, 0x731b, 0x76f2, 0x76df, 0x840c,
685 0x51aa, 0x8993, 0x514d, 0x5195, 0x52c9, 0x68c9, 0x6c94, 0x7704,
686 0x7720, 0x7dbf, 0x7dec, 0x9762, 0x9eb5, 0x6ec5,
687 /* 0x59 */
688 0x8511, 0x51a5, 0x540d, 0x547d, 0x660e, 0x669d, 0x6927, 0x6e9f,
689 0x76bf, 0x7791, 0x8317, 0x84c2, 0x879f, 0x9169, 0x9298, 0x9cf4,
690 0x8882, 0x4fae, 0x5192, 0x52df, 0x59c6, 0x5e3d, 0x6155, 0x6478,
691 0x6479, 0x66ae, 0x67d0, 0x6a21, 0x6bcd, 0x6bdb, 0x725f, 0x7261,
692 0x7441, 0x7738, 0x77db, 0x8017, 0x82bc, 0x8305, 0x8b00, 0x8b28,
693 0x8c8c, 0x6728, 0x6c90, 0x7267, 0x76ee, 0x7766, 0x7a46, 0x9da9,
694 0x6b7f, 0x6c92, 0x5922, 0x6726, 0x8499, 0x536f, 0x5893, 0x5999,
695 0x5edf, 0x63cf, 0x6634, 0x6773, 0x6e3a, 0x732b, 0x7ad7, 0x82d7,
696 0x9328, 0x52d9, 0x5deb, 0x61ae, 0x61cb, 0x620a, 0x62c7, 0x64ab,
697 0x65e0, 0x6959, 0x6b66, 0x6bcb, 0x7121, 0x73f7, 0x755d, 0x7e46,
698 0x821e, 0x8302, 0x856a, 0x8aa3, 0x8cbf, 0x9727, 0x9d61, 0x58a8,
699 0x9ed8, 0x5011, 0x520e, 0x543b, 0x554f, 0x6587,
700 /* 0x5a */
701 0x6c76, 0x7d0a, 0x7d0b, 0x805e, 0x868a, 0x9580, 0x96ef, 0x52ff,
702 0x6c95, 0x7269, 0x5473, 0x5a9a, 0x5c3e, 0x5d4b, 0x5f4c, 0x5fae,
703 0x672a, 0x68b6, 0x6963, 0x6e3c, 0x6e44, 0x7709, 0x7c73, 0x7f8e,
704 0x8587, 0x8b0e, 0x8ff7, 0x9761, 0x9ef4, 0x5cb7, 0x60b6, 0x610d,
705 0x61ab, 0x654f, 0x65fb, 0x65fc, 0x6c11, 0x6cef, 0x739f, 0x73c9,
706 0x7de1, 0x9594, 0x5bcb, 0x871c, 0x8b10, 0x525d, 0x535a, 0x62cd,
707 0x640f, 0x64b2, 0x6734, 0x6a38, 0x6cca, 0x73c0, 0x749e, 0x7b94,
708 0x7c95, 0x7e1b, 0x818a, 0x8236, 0x8584, 0x8feb, 0x96f9, 0x99c1,
709 0x4f34, 0x534a, 0x53cd, 0x53db, 0x62cc, 0x642c, 0x6500, 0x6591,
710 0x69c3, 0x6cee, 0x6f58, 0x73ed, 0x7554, 0x7622, 0x76e4, 0x76fc,
711 0x78d0, 0x78fb, 0x792c, 0x7d46, 0x822c, 0x87e0, 0x8fd4, 0x9812,
712 0x98ef, 0x52c3, 0x62d4, 0x64a5, 0x6e24, 0x6f51,
713 /* 0x5b */
714 0x767c, 0x8dc8, 0x91b1, 0x9262, 0x9aee, 0x9b43, 0x5023, 0x508d,
715 0x574a, 0x59a8, 0x5c28, 0x5e47, 0x5f77, 0x623f, 0x653e, 0x65b9,
716 0x65c1, 0x6609, 0x678b, 0x699c, 0x6ec2, 0x78c5, 0x7d21, 0x80aa,
```

```

717 0x8180, 0x822b, 0x82b3, 0x84a1, 0x868c, 0x8a2a, 0x8b17, 0x90a6,
718 0x9632, 0x9f90, 0x500d, 0x4ff3, 0xf963, 0x57f9, 0x5f98, 0x62dc,
719 0x6392, 0x676f, 0x6e43, 0x7119, 0x76c3, 0x80cc, 0x80da, 0x88f4,
720 0x88f5, 0x8919, 0x8ce0, 0x8f29, 0x914d, 0x966a, 0x4f2f, 0x4f70,
721 0x5e1b, 0x67cf, 0x6822, 0x767d, 0x767e, 0x9b44, 0x5e61, 0x6a0a,
722 0x7169, 0x71d4, 0x756a, 0xf964, 0x7e41, 0x8543, 0x85e9, 0x98dc,
723 0x4f10, 0x7b4f, 0x7f70, 0x95a5, 0x51e1, 0x5e06, 0x68b5, 0x6c3e,
724 0x6c4e, 0x6cdb, 0x72af, 0x7bc4, 0x8303, 0x6cd5, 0x743a, 0x50fb,
725 0x5288, 0x58c1, 0x64d8, 0x6a97, 0x74a7, 0x7656,
726 /* 0x5c */
727 0x78a7, 0x8617, 0x95e2, 0x9739, 0xf965, 0x535e, 0x5f01, 0x8b8a,
728 0x8fa8, 0x8faf, 0x908a, 0x5225, 0x77a5, 0x9c49, 0x9f08, 0x4e19,
729 0x5002, 0x5175, 0x5c5b, 0x5e77, 0x661e, 0x663a, 0x67c4, 0x68c5,
730 0x70b3, 0x7501, 0x75c5, 0x79c9, 0x7add, 0x8f27, 0x9920, 0x9a08,
731 0x4fdd, 0x5821, 0x5831, 0x5bf6, 0x666e, 0x6b65, 0x6d11, 0x6e7a,
732 0x6f7d, 0x73e4, 0x752b, 0x83e9, 0x88dc, 0x8913, 0x8b5c, 0x8f14,
733 0x4f0f, 0x50d5, 0x5310, 0x535c, 0x5b93, 0x5fa9, 0x670d, 0x798f,
734 0x8179, 0x832f, 0x8514, 0x8907, 0x8986, 0x8f39, 0x8f3b, 0x99a5,
735 0x9c12, 0x672c, 0x4e76, 0x4ff8, 0x5949, 0x5c01, 0x5cef, 0x5cf0,
736 0x6367, 0x68d2, 0x70fd, 0x71a2, 0x742b, 0x7e2b, 0x84ec, 0x8702,
737 0x9022, 0x92d2, 0x9cf3, 0x4e0d, 0x4ed8, 0x4fef, 0x5085, 0x5256,
738 0x526f, 0x5426, 0x5490, 0x57e0, 0x592b, 0x5a66,
739 /* 0x5d */
740 0x5b5a, 0x5b75, 0x5bcc, 0x5e9c, 0xf966, 0x6276, 0x6577, 0x65a7,
741 0x6d6e, 0x6ea5, 0x7236, 0x7b26, 0x7c3f, 0x7f36, 0x8150, 0x8151,
742 0x819a, 0x8240, 0x8299, 0x83a9, 0x8a03, 0x8ca0, 0x8ce6, 0x8cfb,
743 0x8d74, 0x8dba, 0x90e8, 0x91dc, 0x961c, 0x9644, 0x99d9, 0x9ce7,
744 0x5317, 0x5206, 0x5429, 0x5674, 0x58b3, 0x5954, 0x596e, 0x5fff,
745 0x61a4, 0x626e, 0x6610, 0x6c7e, 0x711a, 0x76c6, 0x7c89, 0x7cde,
746 0x7dlb, 0x82ac, 0x8cc1, 0x96f0, 0xf967, 0x4f5b, 0x5f17, 0x5f7f,
747 0x62c2, 0x5d29, 0x670b, 0x68da, 0x787c, 0x7e43, 0x9d6c, 0x4e15,
748 0x5099, 0x5315, 0x532a, 0x5351, 0x5983, 0x5a62, 0x5e87, 0x60b2,
749 0x618a, 0x6249, 0x6279, 0x6590, 0x6787, 0x69a7, 0x6bd4, 0x6bd6,
750 0x6bd7, 0x6bd8, 0x6cb8, 0xf968, 0x7435, 0x75fa, 0x7812, 0x7891,
751 0x79d5, 0x79d8, 0x7c83, 0x7dcb, 0x7fe1, 0x80a5,
752 /* 0x5e */
753 0x813e, 0x81c2, 0x83f2, 0x871a, 0x88e8, 0x8ab9, 0x8b6c, 0x8cbb,
754 0x9119, 0x975e, 0x98db, 0x9f3b, 0x56ac, 0x5b2a, 0x5f6c, 0x658c,
755 0x6ab3, 0x6baf, 0x6d5c, 0x6ff1, 0x7015, 0x725d, 0x73ad, 0x8ca7,
756 0x8cd3, 0x983b, 0x6191, 0x6c37, 0x8058, 0x9a01, 0x4e4d, 0x4e8b,
757 0x4e9b, 0x4ed5, 0x4f3a, 0x4f3c, 0x4f7f, 0x4fd9, 0x50ff, 0x53f2,
758 0x53f8, 0x5506, 0x55e3, 0x56db, 0x58eb, 0x5962, 0x5a11, 0x5beb,
759 0x5bf9, 0x5c04, 0x5df3, 0x5e2b, 0x5f99, 0x601d, 0x6368, 0x659c,
760 0x65af, 0x67f6, 0x67fb, 0x68ad, 0x6b7b, 0x6c99, 0x6cd7, 0x6e23,
761 0x7009, 0x7345, 0x7802, 0x793e, 0x7940, 0x7960, 0x79c1, 0x7be9,
762 0x7d17, 0x7d72, 0x8086, 0x820d, 0x838e, 0x84d1, 0x86c7, 0x88df,
763 0x8a50, 0x8a5e, 0x8b1d, 0x8cdc, 0x8d66, 0x8fad, 0x90aa, 0x98fc,
764 0x99df, 0x9e9d, 0x524a, 0xf969, 0x6714, 0xf96a,
765 /* 0x5f */
766 0x5098, 0x522a, 0x5c71, 0x6563, 0x6c55, 0x73ca, 0x7523, 0x759d,
767 0x7b97, 0x849c, 0x9178, 0x9730, 0x4e77, 0x6492, 0x6bba, 0x715e,
768 0x85a9, 0x4e09, 0xf96b, 0x6749, 0x68ee, 0x6e17, 0x829f, 0x8518,
769 0x886b, 0x63f7, 0x6f81, 0x9212, 0x98af, 0x4e0a, 0x50b7, 0x50cf,
770 0x511f, 0x5546, 0x55aa, 0x5617, 0x5b40, 0x5c19, 0x5ce0, 0x5e38,
771 0x5e8a, 0x5ea0, 0x5ec2, 0x60f3, 0x6851, 0x6a61, 0x6e58, 0x723d,
772 0x7240, 0x72c0, 0x76f8, 0x7965, 0x7bb1, 0x7fd4, 0x88f3, 0x89f4,
773 0x8a73, 0x8c61, 0x8cde, 0x971c, 0x585e, 0x74bd, 0x8cfd, 0x55c7,
774 0xf96c, 0x7a61, 0x7d22, 0x8272, 0x7272, 0x751f, 0x7525, 0xf96d,
775 0x7b19, 0x5885, 0x58fb, 0x5dbc, 0x5e8f, 0x5eb6, 0x5f90, 0x6055,
776 0x6292, 0x637f, 0x654d, 0x6691, 0x66d9, 0x66f8, 0x6816, 0x68f2,
777 0x7280, 0x745e, 0x7b6e, 0x7d6e, 0x7dd6, 0x7f72,
778 /* 0x60 */
779 0x80e5, 0x8212, 0x85af, 0x897f, 0x8a93, 0x901d, 0x92e4, 0x9ecd,
780 0x9f20, 0x5915, 0x596d, 0x5e2d, 0x60dc, 0x6614, 0x6673, 0x6790,
781 0x6c50, 0x6dc5, 0x6f5f, 0x77f3, 0x78a9, 0x84c6, 0x91cb, 0x932b,
782 0x4ed9, 0x50ca, 0x5148, 0x5584, 0x5b0b, 0x5ba3, 0x6247, 0x657e,
783 0x65cb, 0x6e32, 0x717d, 0x7401, 0x7444, 0x7487, 0x74bf, 0x766c,
784 0x79aa, 0x7dda, 0x7e55, 0x7fa8, 0x817a, 0x81b3, 0x8239, 0x861a,
785 0x87ec, 0x8a75, 0x8de3, 0x9078, 0x9291, 0x9425, 0x994d, 0x9bae,
786 0x5368, 0x5c51, 0x6954, 0x6cc4, 0x6d29, 0x6e2b, 0x820c, 0x859b,
787 0x893b, 0x8a2d, 0x8aaa, 0x96ea, 0x9f67, 0x5261, 0x66b9, 0x6bb2,
788 0x7e96, 0x87fe, 0x8d0d, 0x9583, 0x965d, 0x651d, 0x6d89, 0x71ee,
789 0xf96e, 0x57ce, 0x59d3, 0x5bac, 0x6027, 0x60fa, 0x6210, 0x661f,
790 0x665f, 0x7329, 0x73f9, 0x76db, 0x7701, 0x7b6c,
791 /* 0x61 */
792 0x8056, 0x8072, 0x8165, 0x8aa0, 0x9192, 0x4e16, 0x52e2, 0x6b72,
793 0x6d17, 0x7a05, 0x7b39, 0x7d30, 0xf96f, 0x8cb0, 0x53ec, 0x562f,
794 0x5851, 0x5bb5, 0x5c0f, 0x5c11, 0x5de2, 0x6240, 0x6383, 0x6414,
795 0x662d, 0x68b3, 0x6cbc, 0x6d88, 0x6eaf, 0x701f, 0x70a4, 0x71d2,
796 0x7526, 0x758f, 0x758e, 0x7619, 0x7b11, 0x7be0, 0x7c2b, 0x7d20,
797 0x7d39, 0x852c, 0x856d, 0x8607, 0x8a34, 0x900d, 0x9061, 0x90b5,
798 0x92b7, 0x97f6, 0x9a37, 0x4fd7, 0x5c6c, 0x675f, 0x6d91, 0x7c9f,
799 0x7e8c, 0x8b16, 0x8d16, 0x901f, 0x5b6b, 0x5dfd, 0x640d, 0x84c0,
800 0x905c, 0x98e1, 0x7387, 0x5b8b, 0x609a, 0x677e, 0x6dde, 0x8a1f,
801 0x8aa6, 0x9001, 0x980c, 0x5237, 0xf970, 0x7051, 0x788e, 0x9396,
802 0x8870, 0x91d7, 0x4fee, 0x53d7, 0x55fd, 0x56da, 0x5782, 0x58fd,
803 0x5ac2, 0x5b88, 0x5cab, 0x5cc0, 0x5e25, 0x6101,

```

```
804 /* 0x62 */
805 0x620d, 0x624b, 0x6388, 0x641c, 0x6536, 0x6578, 0x6a39, 0x6b8a,
806 0x6c34, 0x6d19, 0x6f31, 0x71e7, 0x72e9, 0x7378, 0x7407, 0x74b2,
807 0x7626, 0x7761, 0x79c0, 0x7a57, 0x7aea, 0x7cb9, 0x7d8f, 0x7dac,
808 0x7e61, 0x7f9e, 0x8129, 0x8331, 0x8490, 0x84da, 0x85ea, 0x8896,
809 0x8ab0, 0x8b90, 0x8f38, 0x9042, 0x9083, 0x916c, 0x9296, 0x92b9,
810 0x968b, 0x96a7, 0x96a8, 0x96d6, 0x9700, 0x9808, 0x9996, 0x9ad3,
811 0x9b1a, 0x93d4, 0x587e, 0x5919, 0x5b70, 0x5bbf, 0x6dd1, 0x6f5a,
812 0x719f, 0x7421, 0x74b9, 0x8085, 0x83fd, 0x5de1, 0x5f87, 0x5faa,
813 0x6042, 0x65ec, 0x6812, 0x696f, 0x6a53, 0x6b89, 0x6d35, 0x6df3,
814 0x73e3, 0x76fe, 0x77ac, 0x7b4d, 0x7d14, 0x8123, 0x821c, 0x8340,
815 0x84f4, 0x8563, 0x8a62, 0x8ac4, 0x9187, 0x931e, 0x9806, 0x99b4,
816 0x620c, 0x8853, 0x8ff0, 0x9265, 0x5d07, 0x5d27,
817 /* 0x63 */
818 0x5d69, 0x745f, 0x819d, 0x8768, 0x6fd5, 0x62fe, 0x7fd2, 0x8936,
819 0x8972, 0x4e1e, 0x4e58, 0x50e7, 0x52dd, 0x5347, 0x627f, 0x6607,
820 0x7e69, 0x8805, 0x965e, 0x4f8d, 0x5319, 0x5636, 0x59cb, 0x5aa4,
821 0x5c38, 0x5c4e, 0x5c4d, 0x5e02, 0x5f11, 0x6043, 0x65bd, 0x662f,
822 0x6642, 0x67be, 0x67f4, 0x731c, 0x77e2, 0x793a, 0x7fc5, 0x8494,
823 0x84cd, 0x8996, 0x8a66, 0x8a69, 0x8ae1, 0x8c55, 0x8c7a, 0x57f4,
824 0x5bd4, 0x5f0f, 0x606f, 0x62ed, 0x69d0, 0x6b96, 0x6e5c, 0x7184,
825 0x7bd2, 0x8755, 0x8b58, 0x8efe, 0x98df, 0x98fe, 0x4f38, 0x4f81,
826 0x4fe1, 0x547b, 0x5a20, 0x5bb8, 0x613c, 0x65b0, 0x6668, 0x71fc,
827 0x7533, 0x795e, 0x9f77, 0x5b89, 0x5cb8, 0x6309, 0x664f, 0x6848,
828 0x8703, 0x8a0a, 0x8eab, 0x8f9b, 0xf971, 0x8fc5, 0x5931, 0x5ba4,
829 0x5be6, 0x6089, 0x5be9, 0x5c0b, 0x5fc3, 0x6c81,
830 /* 0x64 */
831 0xf972, 0x6df1, 0x700b, 0x751a, 0x82af, 0x8af6, 0x4ec0, 0x5341,
832 0xf973, 0x96d9, 0x6c0f, 0x4e9e, 0x4fc4, 0x5152, 0x555e, 0x5a25,
833 0x5ce8, 0x6211, 0x7259, 0x82bd, 0x83aa, 0x86fe, 0x8859, 0x8a1d,
834 0x963f, 0x96c5, 0x9913, 0x9d09, 0x9d5d, 0x580a, 0x5cb3, 0x5dbd,
835 0x5e44, 0x60e1, 0x6115, 0x63e1, 0x6a02, 0x6e25, 0x9102, 0x9354,
836 0x984e, 0x9c10, 0x9f77, 0x5b89, 0x5cb8, 0x6309, 0x664f, 0x6848,
837 0x773c, 0x96c1, 0x978d, 0x9854, 0x9b9f, 0x65a1, 0x8b01, 0x8ecb,
838 0x95bc, 0x5535, 0x5ca9, 0x5dd6, 0x5eb5, 0x6697, 0x764c, 0x83f4,
839 0x95c7, 0x58d3, 0x62bc, 0x72ce, 0x9d28, 0x4ef0, 0x592e, 0x600f,
840 0x663b, 0x6b83, 0x79e7, 0x9d26, 0x5393, 0x54c0, 0x57c3, 0x5d16,
841 0x611b, 0x66d6, 0x6daf, 0x788d, 0x827e, 0x9698, 0x9744, 0x5384,
842 0x627c, 0x6396, 0x6db2, 0x7e0a, 0x814b, 0x984d,
843 /* 0x65 */
844 0x6afb, 0x7f4c, 0x9daf, 0x9ela, 0x4e5f, 0x503b, 0x51b6, 0x591c,
845 0x60f9, 0x63f6, 0x6930, 0x723a, 0x8036, 0xf974, 0x91ce, 0x5f31,
846 0xf975, 0xf976, 0x7d04, 0x82e5, 0x846f, 0x84bb, 0x85e5, 0x8e8d,
847 0xf977, 0x4f6f, 0xf978, 0xf979, 0x58e4, 0x5b43, 0x6059, 0x63da,
848 0x6518, 0x656d, 0x6698, 0xf97a, 0x694a, 0x6a23, 0x6d0b, 0x7001,
849 0x716c, 0x75d2, 0x760d, 0x79b3, 0x7a70, 0xf97b, 0x7f8a, 0xf97c,
850 0x8944, 0xf97d, 0x8b93, 0x91c0, 0x967d, 0xf97e, 0x990a, 0x5704,
851 0x5fa1, 0x65bc, 0x6bf0, 0x7600, 0x79a6, 0x8a9e, 0x99ad, 0x9b5a,
852 0x9f6c, 0x5104, 0x61b6, 0x6291, 0x6a8d, 0x81c6, 0x5043, 0x5830,
853 0x5f66, 0x7109, 0x8a00, 0x8afa, 0x5b7c, 0x8616, 0x4ffa, 0x513c,
854 0x56b4, 0x5944, 0x63a9, 0x6df9, 0x5daa, 0x696d, 0x5186, 0x4e88,
855 0x4f59, 0xf97f, 0xf980, 0xf981, 0x5982, 0xf982,
856 /* 0x66 */
857 0xf983, 0x6b5f, 0x6c5d, 0xf984, 0x74b5, 0x7916, 0xf985, 0x8207,
858 0x8245, 0x8339, 0x8f3f, 0x8f5d, 0xf986, 0x9918, 0xf987, 0xf988,
859 0xf989, 0x4ea6, 0xf98a, 0x57df, 0x5f79, 0x6613, 0xf98b, 0xf98c,
860 0x75ab, 0x7e79, 0x8bb6, 0xf98d, 0x9006, 0x9a5b, 0x56a5, 0x5827,
861 0x59f8, 0x5a1f, 0x5bb4, 0xf98e, 0x5ef6, 0xf98f, 0xf990, 0x6350,
862 0x633b, 0xf991, 0x693d, 0x6c87, 0x6cbf, 0x6d8e, 0x6d93, 0x6df5,
863 0x6f14, 0xf992, 0x70df, 0x7136, 0x7159, 0xf993, 0x71c3, 0x71d5,
864 0xf994, 0x784f, 0x786f, 0xf995, 0x7b75, 0x7de3, 0xf996, 0x7e2f,
865 0xf997, 0x884d, 0x8edf, 0xf998, 0xf999, 0xf99a, 0x925b, 0xf99b,
866 0x9cf6, 0xf99c, 0xf99d, 0xf99e, 0x6085, 0x6d85, 0xf99f, 0x71b1,
867 0xf9a0, 0xf9a1, 0x95b1, 0x53ad, 0xf9a2, 0xf9a3, 0xf9a4, 0x67d3,
868 0xf9a5, 0x708e, 0x7130, 0x7430, 0x8276, 0x82d2,
869 /* 0x67 */
870 0xf9a6, 0x95bb, 0x9ae5, 0x9e7d, 0x66c4, 0xf9a7, 0x71c1, 0x8449,
871 0xf9a8, 0xf9a9, 0x584b, 0xf9aa, 0xf9ab, 0x5db8, 0x5f71, 0xf9ac,
872 0x6620, 0x668e, 0x6979, 0x69ae, 0x6c38, 0x6cf3, 0x6e36, 0x6f41,
873 0x6fda, 0x701b, 0x702f, 0x7150, 0x71df, 0x7370, 0xf9ad, 0x745b,
874 0xf9ae, 0x74d4, 0x76c8, 0x7a4e, 0x7e93, 0xf9af, 0xf9b0, 0x82f1,
875 0x8a60, 0x8fce, 0xf9b1, 0x9348, 0xf9b2, 0x9719, 0xf9b3, 0xf9b4,
876 0x4e42, 0x502a, 0xf9b5, 0x5208, 0x53e1, 0x66f3, 0x6c6d, 0x6fca,
877 0x730a, 0x777f, 0x7a62, 0x82ae, 0x85dd, 0x8602, 0xf9b6, 0x88d4,
878 0x8a63, 0x8b7d, 0x8c6b, 0xf9b7, 0x92b3, 0xf9b8, 0x9713, 0x9810,
879 0x4e94, 0x4f0d, 0x4fc9, 0x50b2, 0x5348, 0x543e, 0x5433, 0x55da,
880 0x5862, 0x58ba, 0x5967, 0x5a1b, 0x5be4, 0x609f, 0xf9b9, 0x61ca,
881 0x6556, 0x65ff, 0x6664, 0x68a7, 0x6c5a, 0x6fb3,
882 /* 0x68 */
883 0x70cf, 0x71ac, 0x7352, 0x7b7d, 0x8708, 0x8aa4, 0x9c32, 0x9f07,
884 0x5c4b, 0x6c83, 0x7344, 0x7389, 0x923a, 0x6eab, 0x7465, 0x761f,
885 0x7a69, 0x7e15, 0x860a, 0x5140, 0x58c5, 0x64c1, 0x74ee, 0x7515,
886 0x7670, 0x7fc1, 0x9095, 0x96cd, 0x9954, 0x6e26, 0x7466, 0x7aa9,
887 0x7aaa, 0x81e5, 0x86d9, 0x8778, 0x8a1b, 0x5a49, 0x5b8c, 0x5b9b,
888 0x68a1, 0x6900, 0x6d63, 0x73a9, 0x7413, 0x742c, 0x7897, 0x7de9,
889 0x7feb, 0x8118, 0x8155, 0x839e, 0x8c4c, 0x962e, 0x9811, 0x66f0,
890 0x5f80, 0x65fa, 0x6789, 0x6c6a, 0x738b, 0x502d, 0x5a03, 0x6b6a,
```

```
891 0x77ee, 0x5916, 0x5d6c, 0x5dcd, 0x7325, 0x754f, 0xf9ba, 0xf9bb,
892 0x50e5, 0x51f9, 0x582f, 0x592d, 0x5996, 0x59da, 0x5be5, 0xf9bc,
893 0xf9bd, 0x5da2, 0x62d7, 0x6416, 0x6493, 0x64fe, 0xf9be, 0x66dc,
894 0xf9bf, 0x6a48, 0xf9c0, 0x71ff, 0x7464, 0xf9c1,
895 /* 0x69 */
896 0x7a88, 0x7aaf, 0x7e47, 0x7e5e, 0x8000, 0x8170, 0xf9c2, 0x87ef,
897 0x8981, 0x8b20, 0x9059, 0xf9c3, 0x9080, 0x9952, 0x617e, 0x6b32,
898 0x6d74, 0x7e1f, 0x8925, 0x8fb1, 0x4fd1, 0x50ad, 0x5197, 0x52c7,
899 0x57c7, 0x5889, 0x5bb9, 0x5eb8, 0x6142, 0x6995, 0x6d8c, 0x6e67,
900 0x6eb6, 0x7194, 0x7462, 0x7528, 0x752c, 0x8073, 0x8338, 0x84c9,
901 0x8e0a, 0x9394, 0x93de, 0xf9c4, 0x4e8e, 0x4f51, 0x5076, 0x512a,
902 0x53c8, 0x53cb, 0x53f3, 0x5b87, 0x5bd3, 0x5c24, 0x611a, 0x6182,
903 0x65f4, 0x725b, 0x7397, 0x7440, 0x76c2, 0x7950, 0x7991, 0x79b9,
904 0x7d06, 0x7fbd, 0x828b, 0x85d5, 0x865e, 0x8fc2, 0x9047, 0x90f5,
905 0x91ea, 0x9685, 0x96e8, 0x96e9, 0x52d6, 0x5f67, 0x65ed, 0x6631,
906 0x682f, 0x715c, 0x7a36, 0x90c1, 0x980a, 0x4e91, 0xf9c5, 0x6a52,
907 0x6b9e, 0xf690, 0x7189, 0x8018, 0x82b8, 0x8553,
908 /* 0x6a */
909 0x904b, 0x9695, 0x96f2, 0x97fb, 0x851a, 0x9b31, 0x4e90, 0x718a,
910 0x96c4, 0x5143, 0x539f, 0x54e1, 0x5713, 0x5712, 0x57a3, 0x5a9b,
911 0x5ac4, 0x5bc3, 0x6028, 0x613f, 0x63f4, 0x6c85, 0x6d39, 0x6e72,
912 0x6e90, 0x7230, 0x733f, 0x7457, 0x82d1, 0x8881, 0x8f45, 0x9060,
913 0xf9c6, 0x9662, 0x9858, 0x9dlb, 0x6708, 0x8d8a, 0x925e, 0x4f4d,
914 0x5049, 0x50de, 0x5371, 0x570d, 0x59d4, 0x5a01, 0x5c09, 0x6170,
915 0x6690, 0x6e2d, 0x7232, 0x744b, 0x7def, 0x80c3, 0x840e, 0x8466,
916 0x853f, 0x875f, 0x885b, 0x8918, 0x8b02, 0x9055, 0x97cb, 0x9b4f,
917 0x4e73, 0x4f91, 0x5112, 0x516a, 0xf9c7, 0x552f, 0x55a9, 0x5b7a,
918 0x5ba5, 0x5e7c, 0x5e7d, 0x5ebe, 0x60a0, 0x60df, 0x6108, 0x6109,
919 0x63c4, 0x6538, 0x6709, 0xf9c8, 0x67d4, 0x67da, 0xf9c9, 0x6961,
920 0x6962, 0x6cb9, 0x6d27, 0xf9ca, 0x6e38, 0xf9cb,
921 /* 0x6b */
922 0x6fe1, 0x7336, 0x7337, 0xf9cc, 0x745c, 0x7531, 0xf9cd, 0x7652,
923 0xf9ce, 0xf9cf, 0x7dad, 0x81fe, 0x8438, 0x88d5, 0x8a98, 0x8adb,
924 0x8aed, 0x8e30, 0x8e42, 0x904a, 0x903e, 0x907a, 0x9149, 0x91c9,
925 0x936e, 0xf9d0, 0xf9d1, 0x5809, 0xf9d2, 0x6bd3, 0x8089, 0x80b2,
926 0xf9d3, 0xf9d4, 0x5141, 0x596b, 0x5c39, 0xf9d5, 0xf9d6, 0x6f64,
927 0x73a7, 0x80e4, 0x8d07, 0xf9d7, 0x9217, 0x958f, 0xf9d8, 0xf9d9,
928 0xf9da, 0xf9db, 0x807f, 0x620e, 0x701c, 0x7d68, 0x878d, 0xf9dc,
929 0x57a0, 0x6069, 0x6147, 0x6bb7, 0x8abe, 0x9280, 0x96b1, 0x4e59,
930 0x541f, 0x6deb, 0x852d, 0x9670, 0x97f3, 0x98ee, 0x63d6, 0x6ce3,
931 0x9091, 0x51dd, 0x61c9, 0x81ba, 0x9df9, 0x4f9d, 0x501a, 0x5100,
932 0x5b9c, 0x610f, 0x61ff, 0x64ec, 0x6905, 0x6bc5, 0x7591, 0x77e3,
933 0x7fa9, 0x8264, 0x858f, 0x87fb, 0x8863, 0x8abc,
934 /* 0x6c */
935 0x8b70, 0x91ab, 0x4e8c, 0x4ee5, 0x4f0a, 0xf9dd, 0xf9de, 0x5937,
936 0x59e8, 0xf9df, 0x5df2, 0x5f1b, 0x5f5b, 0x6021, 0xf9e0, 0xf9e1,
937 0xf9e2, 0xf9e3, 0x723e, 0x73e5, 0xf9e4, 0x7570, 0x75cd, 0xf9e5,
938 0x79fb, 0xf9e6, 0x800c, 0x8033, 0x8084, 0x82e1, 0x8351, 0xf9e7,
939 0xf9e8, 0x8cbd, 0x8cb3, 0x9087, 0xf9e9, 0xf9ea, 0x98f4, 0x990c,
940 0xf9eb, 0xf9ec, 0x7037, 0x76ca, 0x7fca, 0x7fcc, 0x7ffc, 0x8b1a,
941 0x4eba, 0x4ec1, 0x5203, 0x5370, 0xf9ed, 0x54bd, 0x56e0, 0x59fb,
942 0x5bc5, 0x5f15, 0x5fcd, 0x6e6e, 0xf9ee, 0xf9ef, 0x7d6a, 0x8335,
943 0xf9f0, 0x8693, 0x8a8d, 0xf9f1, 0x976d, 0x9777, 0xf9f2, 0xf9f3,
944 0x4e00, 0x4f5a, 0x4f7e, 0x58f9, 0x65e5, 0x6ea2, 0x9038, 0x93b0,
945 0x99b9, 0x4efb, 0x58ec, 0x598a, 0x59d9, 0x6041, 0xf9f4, 0xf9f5,
946 0x7a14, 0xf9f6, 0x834f, 0x8cc3, 0x5165, 0x5344,
947 /* 0x6d */
948 0xf9f7, 0xf9f8, 0xf9f9, 0x4ecd, 0x5269, 0x5b55, 0x82bf, 0x4ed4,
949 0x523a, 0x54a8, 0x59c9, 0x59ff, 0x5b50, 0x5b57, 0x5b5c, 0x6063,
950 0x6148, 0x6ecb, 0x7099, 0x716e, 0x7386, 0x74f7, 0x75b5, 0x78c1,
951 0x7d2b, 0x8005, 0x81ea, 0x8328, 0x8517, 0x85c9, 0x8aee, 0x8cc7,
952 0x96cc, 0x4f5c, 0x52fa, 0x56bc, 0x65ab, 0x6628, 0x707c, 0x70b8,
953 0x7235, 0x7dbd, 0x828d, 0x914c, 0x96c0, 0x9d72, 0x5b71, 0x68e7,
954 0x6b98, 0x6f7a, 0x76de, 0x5c91, 0x66ab, 0x6f5b, 0x7bb4, 0x7c2a,
955 0x8836, 0x96dc, 0x4e08, 0x4ed7, 0x5320, 0x5834, 0x58bb, 0x58ef,
956 0x596c, 0x5c07, 0x5e33, 0x5e84, 0x5f35, 0x638c, 0x66b2, 0x6756,
957 0x6a1f, 0x6aa3, 0x6b0c, 0x6f3f, 0x7246, 0xf9fa, 0x7350, 0x748b,
958 0x7ae0, 0x7ca7, 0x8178, 0x81df, 0x81e7, 0x838a, 0x846c, 0x8523,
959 0x8594, 0x85cf, 0x88dd, 0x8d13, 0x91ac, 0x9577,
960 /* 0x6e */
961 0x969c, 0x518d, 0x54c9, 0x5728, 0x5bb0, 0x624d, 0x6750, 0x683d,
962 0x6893, 0x6e3d, 0x6ed3, 0x707d, 0x7e21, 0x88c1, 0x8ca1, 0x8f09,
963 0x9f4b, 0x9f4e, 0x722d, 0x7b8f, 0x8acd, 0x931a, 0x4f47, 0x4f4e,
964 0x5132, 0x5480, 0x59d0, 0x5e95, 0x62b5, 0x6775, 0x696e, 0x6a17,
965 0x6cae, 0x6e1a, 0x72d9, 0x732a, 0x75bd, 0x7bb8, 0x7d35, 0x82e7,
966 0x83f9, 0x8457, 0x85f7, 0x8a5b, 0x8caf, 0x8e87, 0x9019, 0x90b8,
967 0x96ce, 0x9f5f, 0x52e3, 0x540a, 0x5ae1, 0x5bc2, 0x6458, 0x6575,
968 0x6ef4, 0x72c4, 0xf9fb, 0x7684, 0x7a4d, 0x7b1b, 0x7c4d, 0x7e3e,
969 0x7fd8, 0x837b, 0x8b2b, 0x8cca, 0x8d64, 0x8de1, 0x8e5f, 0x8fea,
970 0x8ff9, 0x9069, 0x93d1, 0x4f43, 0x4f7a, 0x50b3, 0x5168, 0x5178,
971 0x524d, 0x526a, 0x5861, 0x587c, 0x5960, 0x5c08, 0x5c55, 0x5edb,
972 0x609b, 0x6230, 0x6813, 0x6bbf, 0x6c08, 0x6fb1,
973 /* 0x6f */
974 0x714e, 0x7420, 0x7530, 0x7538, 0x7551, 0x7672, 0x7b4c, 0x7b8b,
975 0x7bad, 0x7bc6, 0x7e8f, 0x8a6e, 0x8f3e, 0x8f49, 0x923f, 0x9293,
976 0x9322, 0x942b, 0x96fb, 0x985a, 0x986b, 0x991e, 0x5207, 0x622a,
977 0x6298, 0x6d59, 0x7664, 0x7aca, 0x7bc0, 0x7d76, 0x5360, 0x5cbe,
```

```
978 0x5e97, 0x6f38, 0x70b9, 0x7c98, 0x9711, 0x9b8e, 0x9ede, 0x63a5,
979 0x647a, 0x8776, 0x4e01, 0x4e95, 0x4ead, 0x505c, 0x5075, 0x5448,
980 0x59c3, 0x5b9a, 0x5e40, 0x5ead, 0x5ef7, 0x5f81, 0x60c5, 0x633a,
981 0x653f, 0x6574, 0x65cc, 0x6676, 0x6678, 0x67fe, 0x6968, 0x6a89,
982 0x6b63, 0x6c40, 0x6dc0, 0x6de8, 0x6e1f, 0x6e5e, 0x701e, 0x70a1,
983 0x738e, 0x73fd, 0x753a, 0x775b, 0x7887, 0x798e, 0x7a0b, 0x7a7d,
984 0x7cbe, 0x7d8e, 0x8247, 0x8a02, 0x8aea, 0x8c9e, 0x912d, 0x914a,
985 0x91d8, 0x9266, 0x92cc, 0x9320, 0x9706, 0x9756,
986 /* 0x70 */
987 0x975c, 0x9802, 0x9f0e, 0x5236, 0x5291, 0x557c, 0x5824, 0x5e1d,
988 0x5f1f, 0x608c, 0x63d0, 0x68af, 0x6fdf, 0x796d, 0x7b2c, 0x81cd,
989 0x85ba, 0x88fd, 0x8af8, 0x8e44, 0x918d, 0x9664, 0x969b, 0x973d,
990 0x984c, 0x9f4a, 0x4fce, 0x5146, 0x51cb, 0x52a9, 0x5632, 0x5f14,
991 0x5f6b, 0x63aa, 0x64cd, 0x65e9, 0x6641, 0x66fa, 0x66f9, 0x671d,
992 0x689d, 0x68d7, 0x69fd, 0x6f15, 0x6f6e, 0x7167, 0x71e5, 0x722a,
993 0x74aa, 0x773a, 0x7956, 0x795a, 0x79df, 0x7a20, 0x7a95, 0x7c97,
994 0x7cdf, 0x7d44, 0x7e70, 0x8087, 0x85fb, 0x86a4, 0x8a54, 0x8abf,
995 0x8d99, 0x8e81, 0x9020, 0x906d, 0x91e3, 0x963b, 0x96d5, 0x9ce5,
996 0x65cf, 0x7c07, 0x8db3, 0x93c3, 0x5b58, 0x5c0a, 0x5352, 0x62d9,
997 0x731d, 0x5027, 0x5b97, 0x5f9e, 0x60b0, 0x616b, 0x68d5, 0x6dd9,
998 0x742e, 0x7a2e, 0x7d42, 0x7d9c, 0x7e31, 0x816b,
999 /* 0x71 */
1000 0x8e2a, 0x8e35, 0x937e, 0x9418, 0x4f50, 0x5750, 0x5de6, 0x5ea7,
1001 0x632b, 0x7f6a, 0x4e3b, 0x4f4f, 0x4f8f, 0x505a, 0x59dd, 0x80c4,
1002 0x546a, 0x5468, 0x55fe, 0x594f, 0x5b99, 0x5dde, 0x5eda, 0x665d,
1003 0x6731, 0x67f1, 0x682a, 0x6ce8, 0x6d32, 0x6e4a, 0x6f8d, 0x70b7,
1004 0x73e0, 0x7587, 0x7c4c, 0x7d02, 0x7d2c, 0x7da2, 0x821f, 0x86db,
1005 0x8a3b, 0x8a85, 0x8d70, 0x8e8a, 0x8f33, 0x9031, 0x914e, 0x9152,
1006 0x9444, 0x99d0, 0x7af9, 0x7ca5, 0x4fca, 0x5101, 0x51c6, 0x57c8,
1007 0x5bef, 0x5cfb, 0x6659, 0x6a3d, 0x6d5a, 0x6e96, 0x6fec, 0x710c,
1008 0x756f, 0x7ae3, 0x8822, 0x9021, 0x9075, 0x96cb, 0x99ff, 0x8301,
1009 0x4e2d, 0x4ef2, 0x8846, 0x91cd, 0x537d, 0x6adb, 0x696b, 0x6c41,
1010 0x847a, 0x589e, 0x618e, 0x66fe, 0x62ef, 0x70dd, 0x7511, 0x75c7,
1011 0x7e52, 0x84b8, 0x8b49, 0x8d08, 0x4e4b, 0x53ea,
1012 /* 0x72 */
1013 0x54ab, 0x5730, 0x5740, 0x5fd7, 0x6301, 0x6307, 0x646f, 0x652f,
1014 0x65e8, 0x667a, 0x679d, 0x67b3, 0x6b62, 0x6c60, 0x6c9a, 0x6f2c,
1015 0x77e5, 0x7825, 0x7949, 0x7957, 0x7d19, 0x80a2, 0x8102, 0x81f3,
1016 0x829d, 0x82b7, 0x8718, 0x8a8c, 0xf9fc, 0x8d04, 0x8dbe, 0x9072,
1017 0x76f4, 0x7a19, 0x7a37, 0x7e54, 0x8077, 0x5507, 0x55d4, 0x5875,
1018 0x632f, 0x6422, 0x6649, 0x664b, 0x686d, 0x699b, 0x6b84, 0x6d25,
1019 0x6eb1, 0x73cd, 0x7468, 0x74a1, 0x755b, 0x75b9, 0x76e1, 0x771e,
1020 0x778b, 0x79e6, 0x7e09, 0x7e1d, 0x81fb, 0x852f, 0x8897, 0x8a3a,
1021 0x8cd1, 0x8eeb, 0x8fb0, 0x9032, 0x93ad, 0x9663, 0x9673, 0x9707,
1022 0x4f84, 0x53f1, 0x59ea, 0x5ac9, 0x5e19, 0x684e, 0x74c6, 0x75be,
1023 0x79e9, 0x7a92, 0x81a3, 0x86ed, 0x8cea, 0x8dcc, 0x8fed, 0x659f,
1024 0x6715, 0xf9fd, 0x57f7, 0x6f57, 0x7ddd, 0x8f2f,
1025 /* 0x73 */
1026 0x93f6, 0x96c6, 0x5fb5, 0x61f2, 0x6f84, 0x4e14, 0x4f98, 0x501f,
1027 0x53c9, 0x55df, 0x5d6f, 0x5dee, 0x6b21, 0x6b64, 0x78cb, 0x7b9a,
1028 0xf9fe, 0x8e49, 0x8eca, 0x906e, 0x6349, 0x643e, 0x7740, 0x7a84,
1029 0x932f, 0x947f, 0x9f6a, 0x64b0, 0x6faf, 0x71e6, 0x74a8, 0x74da,
1030 0x7ac4, 0x7c12, 0x7e82, 0x7cb2, 0x7e98, 0x8b9a, 0x8d0a, 0x947d,
1031 0x9910, 0x994c, 0x5239, 0x5bdf, 0x64e6, 0x672d, 0x7d2e, 0x50ed,
1032 0x53c3, 0x5879, 0x6158, 0x6159, 0x61fa, 0x65ac, 0x7ad9, 0x8b92,
1033 0x8b96, 0x5009, 0x5021, 0x5275, 0x5531, 0x5a3c, 0x5ee0, 0x5f70,
1034 0x6134, 0x655e, 0x660c, 0x6636, 0x66a2, 0x69cd, 0x6ec4, 0x6f32,
1035 0x7316, 0x7621, 0x7a93, 0x8139, 0x8259, 0x83d6, 0x84bc, 0x50b5,
1036 0x57f0, 0x5bc0, 0x5be8, 0x5f69, 0x63a1, 0x7826, 0x7db5, 0x83dc,
1037 0x8521, 0x91c7, 0x91f5, 0x518a, 0x67f5, 0x7b56,
1038 /* 0x74 */
1039 0x8cac, 0x51c4, 0x59bb, 0x60bd, 0x8655, 0x501c, 0xf9ff, 0x5254,
1040 0x5c3a, 0x617d, 0x621a, 0x62d3, 0x64f2, 0x65a5, 0x6ecc, 0x7620,
1041 0x810a, 0x8e60, 0x965f, 0x96bb, 0x4edf, 0x5343, 0x5598, 0x5929,
1042 0x5ddd, 0x64c5, 0x6cc9, 0x6dfa, 0x7394, 0x7a7f, 0x821b, 0x85a6,
1043 0x8ce4, 0x8e10, 0x9077, 0x91e7, 0x95e1, 0x9621, 0x97c6, 0x51f8,
1044 0x54f2, 0x5586, 0x5fb9, 0x64a4, 0x6f88, 0x7db4, 0x8f1f, 0x8fd4,
1045 0x9435, 0x50c9, 0x5c16, 0x6cbe, 0x6dfb, 0x751b, 0x77bb, 0x7c3d,
1046 0x7c64, 0x8a79, 0x8ac2, 0x581e, 0x59be, 0x5e16, 0x6377, 0x7252,
1047 0x758a, 0x776b, 0x8adc, 0x8cbc, 0x8f12, 0x5ef3, 0x6674, 0x6dff,
1048 0x807d, 0x83c1, 0x8acb, 0x9751, 0x9bd6, 0xfa00, 0x5243, 0x66ff,
1049 0x6d95, 0x6eef, 0x7de0, 0x8ae6, 0x902e, 0x905e, 0x9ad4, 0x521d,
1050 0x527f, 0x54e8, 0x6194, 0x6284, 0x62db, 0x68a2,
1051 /* 0x75 */
1052 0x6912, 0x695a, 0x6a35, 0x7092, 0x7126, 0x785d, 0x7901, 0x790e,
1053 0x79d2, 0x7a0d, 0x8096, 0x8278, 0x82d5, 0x8349, 0x8549, 0x8c82,
1054 0x8d85, 0x9162, 0x918b, 0x91ae, 0x4fc3, 0x56d1, 0x71ed, 0x77d7,
1055 0x8700, 0x89f8, 0x5bf8, 0x5fd6, 0x6751, 0x90a8, 0x53e2, 0x585a,
1056 0x5bf5, 0x60a4, 0x6181, 0x6460, 0x7e3d, 0x8070, 0x8525, 0x9283,
1057 0x64ae, 0x50ac, 0x5d14, 0x6700, 0x589c, 0x62bd, 0x63a8, 0x690e,
1058 0x6978, 0x6a1e, 0x6e6b, 0x76ba, 0x79cb, 0x82bb, 0x8429, 0x8acf,
1059 0x8da8, 0x8ffd, 0x9112, 0x914b, 0x919c, 0x9310, 0x9318, 0x939a,
1060 0x96db, 0x9a36, 0x9c0d, 0x4e11, 0x755c, 0x795d, 0x7afa, 0x7b51,
1061 0x7bc9, 0x7e2e, 0x84c4, 0x8e59, 0x8e74, 0x8ef8, 0x9010, 0x6625,
1062 0x693f, 0x7443, 0x51fa, 0x672e, 0x9edc, 0x5145, 0x5fe0, 0x6c96,
1063 0x87f2, 0x885d, 0x8877, 0x60b4, 0x81b5, 0x8403,
1064 /* 0x76 */
```

```
1065 0x8d05, 0x53d6, 0x5439, 0x5634, 0x5a36, 0x5c31, 0x708a, 0x7fe0,
1066 0x805a, 0x8106, 0x81ed, 0x8da3, 0x9189, 0x9a5f, 0x9df2, 0x5074,
1067 0x4ec4, 0x53a0, 0x60fb, 0x6e2c, 0x5c64, 0x4f88, 0x5024, 0x55e4,
1068 0x5cd9, 0x5e5f, 0x6065, 0x6894, 0x6cbb, 0x6dc4, 0x71be, 0x75d4,
1069 0x75f4, 0x7661, 0x7a1a, 0x7a49, 0x7dc7, 0x7dfb, 0x7f6e, 0x81f4,
1070 0x86a9, 0x8f1c, 0x96c9, 0x99b3, 0x9f52, 0x5247, 0x52c5, 0x98ed,
1071 0x89aa, 0x4e03, 0x67d2, 0x6f06, 0x4fb5, 0x5be2, 0x6795, 0x6c88,
1072 0x6d78, 0x741b, 0x7827, 0x91dd, 0x937c, 0x87c4, 0x79e4, 0x7a31,
1073 0x5feb, 0x4ed6, 0x54a4, 0x553e, 0x58ae, 0x59a5, 0x60f0, 0x6253,
1074 0x62d6, 0x6736, 0x6955, 0x8235, 0x9640, 0x99b1, 0x99dd, 0x502c,
1075 0x5353, 0x5544, 0x577c, 0xfa01, 0x6258, 0xfa02, 0x64e2, 0x666b,
1076 0x67dd, 0x6fc1, 0x6fef, 0x7422, 0x7438, 0x8a17,
1077 /* 0x77 */
1078 0x9438, 0x5451, 0x5606, 0x5766, 0x5f48, 0x619a, 0x6b4e, 0x7058,
1079 0x70ad, 0x7dbb, 0x8a95, 0x596a, 0x812b, 0x63a2, 0x7708, 0x803d,
1080 0x8caa, 0x5854, 0x642d, 0x69bb, 0x5b95, 0x5e11, 0x6e6f, 0xfa03,
1081 0x8569, 0x514c, 0x53f0, 0x592a, 0x6020, 0x614b, 0x6b86, 0x6c70,
1082 0x6cf0, 0x7b1e, 0x80ce, 0x82d4, 0x8dc6, 0x90b0, 0x98b1, 0xfa04,
1083 0x64c7, 0x6fa4, 0x6491, 0x6504, 0x514e, 0x5410, 0x571f, 0x8a0e,
1084 0x615f, 0x6876, 0xfa05, 0x75db, 0x7b52, 0x7d71, 0x901a, 0x5806,
1085 0x69cc, 0x817f, 0x892a, 0x9000, 0x9839, 0x5078, 0x5957, 0x59ac,
1086 0x6295, 0x900f, 0x9b2a, 0x615d, 0x7279, 0x95d6, 0x5761, 0x5a46,
1087 0x5df4, 0x628a, 0x64ad, 0x64fa, 0x6777, 0x6ce2, 0x6d3e, 0x722c,
1088 0x7436, 0x7834, 0x7f77, 0x82ad, 0x8ddb, 0x9817, 0x5224, 0x5742,
1089 0x677f, 0x7248, 0x74e3, 0x8ca9, 0x8fa6, 0x9211,
1090 /* 0x78 */
1091 0x962a, 0x516b, 0x53ed, 0x634c, 0x4f69, 0x5504, 0x6096, 0x6557,
1092 0x6c9b, 0x6d7f, 0x724c, 0x72fd, 0x7a17, 0x8987, 0x8c9d, 0x5f6d,
1093 0x6f8e, 0x70f9, 0x81a8, 0x610e, 0x4fbf, 0x504f, 0x6241, 0x7247,
1094 0x7bc7, 0x7de8, 0x7fe9, 0x904d, 0x97ad, 0x9a19, 0x8cb6, 0x576a,
1095 0x5e73, 0x67b0, 0x840d, 0x8a55, 0x5420, 0x5b16, 0x5e63, 0x5ee2,
1096 0x5f0a, 0x6583, 0x80ba, 0x853d, 0x9589, 0x965b, 0x4f48, 0x5305,
1097 0x530d, 0x530f, 0x5486, 0x54fa, 0x5703, 0x5e03, 0x6016, 0x629b,
1098 0x62b1, 0x6355, 0xfa06, 0x6ce1, 0x6d66, 0x75b1, 0x7832, 0x80de,
1099 0x812f, 0x82de, 0x8461, 0x84b2, 0x888d, 0x8912, 0x900b, 0x92ea,
1100 0x98fd, 0x9b91, 0x5e45, 0x66b4, 0x66dd, 0x7011, 0x7206, 0xfa07,
1101 0x4ff5, 0x527d, 0x5f6a, 0x6153, 0x6753, 0x6a19, 0x6f02, 0x74e2,
1102 0x7968, 0x8868, 0x8c79, 0x98c7, 0x98c4, 0x9a43,
1103 /* 0x79 */
1104 0x54c1, 0x7a1f, 0x6953, 0x8af7, 0x8c4a, 0x98a8, 0x99ae, 0x5f7c,
1105 0x62ab, 0x75b2, 0x76ae, 0x88ab, 0x907f, 0x9642, 0x5339, 0x5f3c,
1106 0x5fc5, 0x6ccc, 0x73cc, 0x7562, 0x758b, 0x7b46, 0x82fe, 0x999d,
1107 0x4e4f, 0x903c, 0x4e0b, 0x4f55, 0x53a6, 0x590f, 0x5ec8, 0x6630,
1108 0x6cb3, 0x7455, 0x8377, 0x8766, 0x8cc0, 0x9050, 0x971e, 0x9c15,
1109 0x58d1, 0x5b78, 0x8650, 0x8b14, 0x9db4, 0x5bd2, 0x6068, 0x608d,
1110 0x65f1, 0x6c57, 0x6f22, 0x6fa3, 0x701a, 0x7f55, 0x7ff0, 0x9591,
1111 0x9592, 0x9650, 0x97d3, 0x5272, 0x8f44, 0x51fd, 0x542b, 0x54b8,
1112 0x5563, 0x558a, 0x6abb, 0x6db5, 0x7dd8, 0x8266, 0x929c, 0x9677,
1113 0x9e79, 0x5408, 0x54c8, 0x76d2, 0x86e4, 0x95a4, 0x95d4, 0x965c,
1114 0x4ea2, 0x4f09, 0x59ee, 0x5ae6, 0x5df7, 0x6052, 0x6297, 0x676d,
1115 0x6841, 0x6c86, 0x6e2f, 0x7f38, 0x809b, 0x822a,
1116 /* 0x7a */
1117 0xfa08, 0xfa09, 0x9805, 0x4ea5, 0x5055, 0x54b3, 0x5793, 0x595a,
1118 0x5b69, 0x5bb3, 0x61c8, 0x6977, 0x6d77, 0x7023, 0x87f9, 0x89e3,
1119 0x8a72, 0x8ae7, 0x9082, 0x99ed, 0x9ab8, 0x52be, 0x6838, 0x5016,
1120 0x5e78, 0x674f, 0x8347, 0x884c, 0x4eab, 0x5411, 0x56ae, 0x73e6,
1121 0x9115, 0x97ff, 0x9909, 0x9957, 0x9999, 0x5653, 0x589f, 0x865b,
1122 0x8a31, 0x61b2, 0x6af6, 0x737b, 0x8ed2, 0x6b47, 0x96aa, 0x9a57,
1123 0x5955, 0x7200, 0x8d6b, 0x9769, 0x4fd4, 0x5cf4, 0x5f26, 0x61f8,
1124 0x665b, 0x6ceb, 0x70ab, 0x7384, 0x73b9, 0x73fe, 0x7729, 0x774d,
1125 0x7d43, 0x7d62, 0x7e23, 0x8237, 0x8852, 0xfa0a, 0x8ce2, 0x9249,
1126 0x986f, 0x5b51, 0x7a74, 0x8840, 0x9801, 0x5acc, 0x4fe0, 0x5354,
1127 0x593e, 0x5cfd, 0x633e, 0x6d79, 0x72f9, 0x8105, 0x8107, 0x83a2,
1128 0x92cf, 0x9830, 0x4ea8, 0x5144, 0x5211, 0x578b,
1129 /* 0x7b */
1130 0x5f62, 0x6cc2, 0x6ece, 0x7005, 0x7050, 0x70af, 0x7192, 0x73e9,
1131 0x7469, 0x834a, 0x87a2, 0x8861, 0x9008, 0x90a2, 0x93a3, 0x99a8,
1132 0x516e, 0x5f57, 0x60e0, 0x6167, 0x66b3, 0x8559, 0x8e4a, 0x91af,
1133 0x978b, 0x4e4e, 0x4e92, 0x547c, 0x58d5, 0x58fa, 0x597d, 0x5cb5,
1134 0x5f27, 0x6236, 0x6248, 0x660a, 0x6667, 0x6beb, 0x6d69, 0x6dcf,
1135 0x6e56, 0x6ef8, 0x6f94, 0x6fe0, 0x6fe9, 0x705d, 0x72d0, 0x7425,
1136 0x745a, 0x74e0, 0x7693, 0x795c, 0x7cca, 0x7e1e, 0x80e1, 0x82a6,
1137 0x846b, 0x84bf, 0x864e, 0x865f, 0x8774, 0x8b77, 0x8c6a, 0x93ac,
1138 0x9800, 0x9865, 0x60d1, 0x6216, 0x9177, 0x5a5a, 0x660f, 0x6df7,
1139 0x6e3e, 0x743f, 0x9b42, 0x5ffd, 0x60da, 0x7b0f, 0x54c4, 0x5f18,
1140 0x6c5e, 0x6cd3, 0x6d2a, 0x70d8, 0x7d05, 0x8679, 0x8a0c, 0x9d3b,
1141 0x5316, 0x548c, 0x5b05, 0x6a3a, 0x706b, 0x7575,
1142 /* 0x7c */
1143 0x798d, 0x79be, 0x82b1, 0x83ef, 0x8a71, 0x8b41, 0x8ca8, 0x9774,
1144 0xfa0b, 0x64f4, 0x652b, 0x78ba, 0x78bb, 0x7a6b, 0x4e38, 0x559a,
1145 0x5950, 0x5ba6, 0x5e7b, 0x60a3, 0x63db, 0x6b61, 0x6665, 0x6853,
1146 0x6e19, 0x7165, 0x74b0, 0x7d08, 0x9084, 0x9a69, 0x9c25, 0x6d3b,
1147 0x6ed1, 0x733e, 0x8c41, 0x95ca, 0x51f0, 0x5e4c, 0x5fa8, 0x604d,
1148 0x60f6, 0x6130, 0x614c, 0x6643, 0x6644, 0x69a5, 0x6cc1, 0x6e5f,
1149 0x6ec9, 0x6f62, 0x714c, 0x749c, 0x7687, 0x7bc1, 0x7c27, 0x8352,
1150 0x8757, 0x9051, 0x968d, 0x9ec3, 0x532f, 0x56de, 0x5efb, 0x5f8a,
1151 0x6062, 0x6094, 0x61f7, 0x6666, 0x6703, 0x6a9c, 0x6dee, 0x6fae,
```

```
1152 0x7070, 0x736a, 0x7e6a, 0x81be, 0x8334, 0x86d4, 0x8aa8, 0x8cc4,
1153 0x5283, 0x7372, 0x5b96, 0x6a6b, 0x9404, 0x54ee, 0x5686, 0x5b5d,
1154 0x6548, 0x6585, 0x66c9, 0x689f, 0x6d8d, 0x6dc6,
1155 /* 0x7d */
1156 0x723b, 0x80b4, 0x9175, 0x9a4d, 0x4faf, 0x5019, 0x539a, 0x540e,
1157 0x543c, 0x5589, 0x55c5, 0x5e3f, 0x5f8c, 0x673d, 0x7166, 0x73dd,
1158 0x9005, 0x52db, 0x52f3, 0x5864, 0x58ce, 0x7104, 0x718f, 0x71fb,
1159 0x85b0, 0x8a13, 0x6688, 0x85a8, 0x55a7, 0x6684, 0x714a, 0x8431,
1160 0x5349, 0x5599, 0x6bc1, 0x5f59, 0x5fbd, 0x63ee, 0x6689, 0x7147,
1161 0x8af1, 0x8f1d, 0x9ebe, 0x4f11, 0x643a, 0x70cb, 0x7566, 0x8667,
1162 0x6064, 0x8b4e, 0x9df8, 0x5147, 0x51f6, 0x5308, 0x6d36, 0x80f8,
1163 0x9ed1, 0x6615, 0x6b23, 0x7098, 0x75d5, 0x5403, 0x5c79, 0x7d07,
1164 0x8a16, 0x6b20, 0x6b3d, 0x6b46, 0x5438, 0x6070, 0x6d3d, 0x7fd5,
1165 0x8208, 0x50d6, 0x51de, 0x559c, 0x566b, 0x56cd, 0x59ec, 0x5b09,
1166 0x5e0c, 0x6199, 0x6198, 0x6231, 0x665e, 0x66e6, 0x7199, 0x71b9,
1167 0x71ba, 0x72a7, 0x79a7, 0x7a00, 0x7fb2, 0x8a70,
1168 };
1169
1170 static int
1171 ksc5601_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
1172 {
1173     unsigned char c1 = (s[0] & 0x7f);
1174     if ((c1 >= 0x21 && c1 <= 0x2c) || (c1 >= 0x30 && c1 <= 0x48) || (c1 >= 0x4a && c1 <= 0x7d)) {
1175         if (n >= 2) {
1176             unsigned char c2 = (s[1] & 0x7f);
1177             if (c2 >= 0x21 && c2 < 0x7f) {
1178                 unsigned int i = 94 * (c1 - 0x21) + (c2 - 0x21);
1179                 unsigned short wc = 0xffff;
1180                 if (i < 1410) {
1181                     if (i < 1115)
1182                         wc = ksc5601_2uni_page21[i];
1183                     } else if (i < 3854) {
1184                         if (i < 3760)
1185                             wc = ksc5601_2uni_page30[i-1410];
1186                     } else {
1187                         if (i < 8742)
1188                             wc = ksc5601_2uni_page4a[i-3854];
1189                     }
1190                     if (wc != 0xffff) {
1191                         *pwc = (ucs4_t) wc;
1192                         return 2;
1193                     }
1194                 }
1195                 return RET_ILSEQ;
1196             }
1197             return RET_TOOFEW(0);
1198         }
1199         return RET_ILSEQ;
1200     }
1201 #endif /* NEED_TOWC */
1202
1203 #ifdef NEED_TOMB
1204 static const unsigned short ksc5601_2charset[8224] = {
1205     0x222e, 0x2234, 0x2157, 0x2127, 0x2823, 0x2129, 0x2146, 0x213e,
1206     0x2977, 0x2978, 0x2225, 0x2252, 0x2124, 0x222c, 0x2976, 0x282c,
1207     0x2879, 0x2876, 0x287a, 0x222f, 0x2821, 0x2822, 0x213f, 0x282a,
1208     0x282d, 0x292c, 0x2921, 0x2923, 0x2140, 0x292a, 0x292d, 0x2922,
1209     0x2824, 0x2924, 0x2925, 0x2826, 0x2926, 0x2927, 0x2828, 0x2928,
1210     0x2829, 0x2929, 0x2930, 0x282f, 0x292f, 0x282b, 0x292b, 0x282e,
1211     0x292e, 0x2227, 0x2230, 0x2228, 0x222b, 0x222a, 0x222d, 0x2229,
1212     0x2541, 0x2542, 0x2543, 0x2544, 0x2545, 0x2546, 0x2547, 0x2548,
1213     0x2549, 0x254a, 0x254b, 0x254c, 0x254d, 0x254e, 0x254f, 0x2550,
1214     0x2551, 0x2552, 0x2553, 0x2554, 0x2555, 0x2556, 0x2557, 0x2558,
1215     0x2561, 0x2562, 0x2563, 0x2564, 0x2565, 0x2566, 0x2567, 0x2568,
1216     0x2569, 0x256a, 0x256b, 0x256c, 0x256d, 0x256e, 0x256f, 0x2570,
1217     0x2571, 0x2572, 0x2573, 0x2574, 0x2575, 0x2576, 0x2577, 0x2578,
1218     0x2c27, 0x2c21, 0x2c22, 0x2c23, 0x2c24, 0x2c25, 0x2c26, 0x2c28,
1219     0x2c29, 0x2c2a, 0x2c2b, 0x2c2c, 0x2c2d, 0x2c2e, 0x2c2f, 0x2c30,
1220     0x2c31, 0x2c32, 0x2c33, 0x2c34, 0x2c35, 0x2c36, 0x2c37, 0x2c38,
1221     0x2c39, 0x2c3a, 0x2c3b, 0x2c3c, 0x2c3d, 0x2c3e, 0x2c3f, 0x2c40,
1222     0x2c41, 0x2c51, 0x2c52, 0x2c53, 0x2c54, 0x2c55, 0x2c56, 0x2c58,
1223     0x2c59, 0x2c5a, 0x2c5b, 0x2c5c, 0x2c5d, 0x2c5e, 0x2c5f, 0x2c60,
1224     0x2c61, 0x2c62, 0x2c63, 0x2c64, 0x2c65, 0x2c66, 0x2c67, 0x2c68,
1225     0x2c69, 0x2c6a, 0x2c6b, 0x2c6c, 0x2c6d, 0x2c6e, 0x2c6f, 0x2c70,
1226     0x2c71, 0x2c57, 0x212a, 0x212e, 0x212f, 0x2130, 0x2131, 0x2253,
1227     0x2254, 0x2125, 0x2126, 0x2236, 0x2147, 0x2148, 0x2158, 0x2979,
1228     0x297a, 0x297b, 0x297c, 0x297d, 0x297e, 0x2149, 0x2235, 0x2724,
1229     0x2260, 0x2265, 0x2262, 0x2759, 0x214a, 0x2877, 0x2878, 0x287b,
1230     0x287c, 0x287d, 0x287e, 0x2530, 0x2531, 0x2532, 0x2533, 0x2534,
1231     0x2535, 0x2536, 0x2537, 0x2538, 0x2539, 0x2521, 0x2522, 0x2523,
1232     0x2524, 0x2525, 0x2526, 0x2527, 0x2528, 0x2529, 0x252a, 0x2167,
1233     0x2168, 0x2166, 0x2169, 0x216a, 0x2255, 0x2258, 0x2256, 0x2259,
1234     0x2257, 0x2221, 0x2222, 0x2223, 0x2153, 0x2224, 0x2154, 0x2174,
1235     0x2175, 0x2233, 0x2232, 0x216e, 0x2170, 0x2144, 0x2150, 0x212b,
1236     0x217c, 0x217d, 0x217b, 0x217a, 0x2172, 0x2173, 0x2231, 0x2145,
1237     0x2171, 0x212d, 0x216f, 0x216f, 0x2156, 0x2141, 0x2155, 0x2142, 0x2143,
1238     0x216c, 0x216d, 0x2178, 0x2179, 0x2176, 0x2177, 0x2241, 0x2151,
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1242 0x296f, 0x2970, 0x2971, 0x2972, 0x2973, 0x2974, 0x2975, 0x294d,  
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1325 0x5e42, 0x7662, 0x6d5c, 0x5c75, 0x6039, 0x544e, 0x7435, 0x535b,

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2198 0x5277, 0x5278, 0x5466, 0x547c, 0x5525, 0x552b, 0x552e, 0x5638,
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2203 0x657b, 0x657c, 0x657e, 0x6621, 0x6624, 0x6627, 0x662d, 0x662f,
2204 0x6630, 0x6631, 0x6633, 0x6637, 0x6638, 0x663c, 0x6644, 0x6646,
2205 0x6647, 0x664a, 0x6652, 0x6656, 0x6659, 0x665c, 0x665f, 0x6661,
2206 0x6664, 0x6665, 0x6666, 0x6668, 0x666a, 0x666b, 0x666c, 0x666f,
2207 0x6671, 0x6672, 0x6675, 0x6676, 0x6677, 0x6679, 0x6721, 0x6726,
2208 0x6729, 0x672a, 0x672c, 0x672d, 0x6730, 0x673f, 0x6741, 0x6746,
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2212 0x6a74, 0x6a77, 0x6a7c, 0x6a7e, 0x6b24, 0x6b27, 0x6b29, 0x6b2a,
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2215 0x6c2f, 0x6c30, 0x6c31, 0x6c32, 0x6c35, 0x6c38, 0x6c3a, 0x6c40,
2216 0x6c41, 0x6c45, 0x6c46, 0x6c49, 0x6c4a, 0x6c55, 0x6c5d, 0x6c5e,
2217 0x6c61, 0x6c64, 0x6c67, 0x6c68, 0x6c77, 0x6c78, 0x6c7a, 0x6d21,
2218 0x6d22, 0x6d23, 0x6d6e, 0x6e5b, 0x723d, 0x727a, 0x7331, 0x7427,
2219 0x746e, 0x7674, 0x7676, 0x7738, 0x7748, 0x7753, 0x785b, 0x7870,
2220 0x7a21, 0x7a22, 0x7a66, 0x7c29, 0x2321, 0x2322, 0x2323, 0x2324,
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2226 0x234d, 0x234e, 0x234f, 0x2350, 0x2351, 0x2352, 0x2353, 0x2354,
2227 0x2355, 0x2356, 0x2357, 0x2358, 0x2359, 0x235a, 0x235b, 0x212c,
2228 0x235d, 0x235e, 0x235f, 0x2360, 0x2361, 0x2362, 0x2363, 0x2364,
2229 0x2365, 0x2366, 0x2367, 0x2368, 0x2369, 0x236a, 0x236b, 0x236c,
2230 0x236d, 0x236e, 0x236f, 0x2370, 0x2371, 0x2372, 0x2373, 0x2374,
2231 0x2375, 0x2376, 0x2377, 0x2378, 0x2379, 0x237a, 0x237b, 0x237c,
2232 0x237d, 0x2226, 0x214b, 0x214c, 0x217e, 0x237e, 0x214d, 0x235c,
2233 };
2234
2235 static const Summary16 ksc5601_uni2indx_page00[70] = {
2236 /* 0x0000 */
2237 { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 },
2238 { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x0000 },
2239 { 0, 0x0000 }, { 0, 0x0000 }, { 0, 0x2592 }, { 6, 0xf7df },
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2241 /* 0x0100 */
2242 { 31, 0x0000 }, { 31, 0x0002 }, { 32, 0x00c0 }, { 34, 0x810e },
2243 { 39, 0x0e07 }, { 45, 0x000c }, { 47, 0x00c0 }, { 49, 0x0000 },
2244 { 49, 0x0000 }, { 49, 0x0000 }, { 49, 0x0000 }, { 49, 0x0000 },
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2246 /* 0x0200 */
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2255 { 95, 0x03fb }, { 104, 0x0000 }, { 104, 0x0000 }, { 104, 0x0000 },
2256 /* 0x0400 */
2257 { 104, 0x0002 }, { 105, 0xffff }, { 121, 0xffff }, { 137, 0xffff },
2258 { 153, 0xffff }, { 169, 0x0002 },
2259 };
2260 static const Summary16 ksc5601_uni2indx_page20[103] = {
2261 /* 0x2000 */
2262 { 170, 0x0000 }, { 170, 0x3320 }, { 175, 0x0063 }, { 179, 0x080d },
2263 { 183, 0x0000 }, { 183, 0x0000 }, { 183, 0x0000 }, { 183, 0x8010 },
2264 { 185, 0x001e }, { 189, 0x0000 }, { 189, 0x0000 }, { 189, 0x0000 },
2265 { 189, 0x0000 }, { 189, 0x0000 }, { 189, 0x0000 }, { 189, 0x0000 },
2266 /* 0x2100 */
2267 { 189, 0x0208 }, { 191, 0x0048 }, { 193, 0x0846 }, { 197, 0x0000 },
2268 { 197, 0x0000 }, { 197, 0x7818 }, { 203, 0x03ff }, { 213, 0x03ff },
2269 { 223, 0x0000 }, { 223, 0x03ff }, { 233, 0x0000 }, { 233, 0x0000 },
2270 { 233, 0x0000 }, { 233, 0x0014 }, { 235, 0x0000 }, { 235, 0x0000 },
2271 /* 0x2200 */
2272 { 235, 0x898d }, { 242, 0x6402 }, { 246, 0x5fa1 }, { 255, 0x3030 },
2273 { 259, 0x0000 }, { 259, 0x0004 }, { 260, 0x0c33 }, { 266, 0x0000 },
2274 { 266, 0x00cc }, { 270, 0x0200 }, { 271, 0x0020 }, { 272, 0x0000 },
2275 { 272, 0x0000 }, { 272, 0x0000 }, { 272, 0x0000 }, { 272, 0x0000 },
2276 /* 0x2300 */
2277 { 272, 0x0000 }, { 272, 0x0004 }, { 273, 0x0000 }, { 273, 0x0000 },
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2279 { 273, 0x0000 }, { 273, 0x0000 }, { 273, 0x0000 }, { 273, 0x0000 },
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2283 { 273, 0x0000 }, { 273, 0x0000 }, { 273, 0x7fff }, { 288, 0xffff0 },
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2285 { 329, 0x0000 }, { 329, 0xffff }, { 345, 0x03ff }, { 355, 0x0000 },
2286 /* 0x2500 */
2287 { 355, 0xf00f }, { 363, 0xffff }, { 379, 0xffff }, { 395, 0xffff },
2288 { 411, 0x0fff }, { 423, 0x0000 }, { 423, 0x0000 }, { 423, 0x0000 },
2289 { 423, 0x0000 }, { 423, 0x0004 }, { 424, 0x03fb }, { 433, 0x30cc },
2290 { 439, 0xc9c3 }, { 447, 0x0003 }, { 449, 0x0000 }, { 449, 0x0000 },
2291 /* 0x2600 */
2292 { 449, 0xc060 }, { 453, 0x5000 }, { 455, 0x0000 }, { 455, 0x0000 },
2293 { 455, 0x0005 }, { 457, 0x0000 }, { 457, 0x37bb },
2294 };
2295 static const Summary16 ksc5601_uni2indx_page30[62] = {
2296 /* 0x3000 */
2297 { 468, 0xff0f }, { 480, 0x003b }, { 485, 0x0000 }, { 485, 0x0000 },
2298 { 485, 0xffffe }, { 500, 0xffff }, { 516, 0xffff }, { 532, 0xffff },
2299 { 548, 0xffff }, { 564, 0x000f }, { 568, 0xffffe }, { 583, 0xffff },
2300 { 599, 0xffff }, { 615, 0xffff }, { 631, 0xffff }, { 647, 0x007f },
2301 /* 0x3100 */
2302 { 654, 0x0000 }, { 654, 0x0000 }, { 654, 0x0000 }, { 654, 0xffffe },
2303 { 669, 0xffff }, { 685, 0xffff }, { 701, 0xffff }, { 717, 0xffff },
2304 { 733, 0x7fff }, { 748, 0x0000 }, { 748, 0x0000 }, { 748, 0x0000 },
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2306 /* 0x3200 */
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2308 { 777, 0x0000 }, { 777, 0x0000 }, { 777, 0xffff }, { 793, 0x8fff },
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2310 { 806, 0x0000 }, { 806, 0x0000 }, { 806, 0x0000 }, { 806, 0x0000 },
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2313 { 806, 0x0000 }, { 806, 0x0000 }, { 806, 0x0000 }, { 806, 0x0000 },
2314 { 806, 0xff1f }, { 819, 0xffff }, { 835, 0xffff }, { 851, 0xffff },
2315 { 867, 0x87ff }, { 879, 0x3949 },
2316 };
2317 static const Summary16 ksc5601_uni2indx_page4e[1306] = {
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2319 { 886, 0x2f8b }, { 895, 0x4372 }, { 902, 0x2000 }, { 903, 0x0b04 },
2320 { 907, 0xe82c }, { 914, 0xe340 }, { 920, 0x2800 }, { 922, 0x40c8 },
2321 { 926, 0x5944 }, { 932, 0x4937 }, { 940, 0x7976 }, { 950, 0x0440 },
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2323 /* 0x4f00 */
2324 { 975, 0xee02 }, { 982, 0x0003 }, { 984, 0x8000 }, { 985, 0x3550 },
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2330 { 1078, 0x8388 }, { 1083, 0x1420 }, { 1086, 0x0020 }, { 1087, 0x0170 },
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2332 { 1104, 0x8620 }, { 1108, 0x4462 }, { 1113, 0x20a0 }, { 1116, 0x8a00 },
2333 /* 0x5100 */
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2335 { 1132, 0x7bfb }, { 1145, 0x1004 }, { 1147, 0x7fa4 }, { 1157, 0x11e2 },
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2337 { 1177, 0x3a50 }, { 1183, 0x7000 }, { 1186, 0x0002 }, { 1187, 0x2743 },
2338 /* 0x5200 */
2339 { 1194, 0x45c9 }, { 1201, 0x2082 }, { 1204, 0x4630 }, { 1209, 0x0fc1 },
2340 { 1216, 0x3c88 }, { 1222, 0x2850 }, { 1226, 0x8602 }, { 1230, 0xa024 },
2341 { 1234, 0x2388 }, { 1239, 0x8806 }, { 1243, 0x0e19 }, { 1249, 0x4000 },
2342 { 1250, 0x22aa }, { 1256, 0xeb64 }, { 1265, 0x001c }, { 1268, 0xcd28 },
2343 /* 0x5300 */
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2345 { 1291, 0x279b }, { 1300, 0x549e }, { 1308, 0x8141 }, { 1312, 0xa0b3 },
2346 { 1319, 0x0010 }, { 1320, 0x8508 }, { 1324, 0x2061 }, { 1328, 0x0800 },
2347 { 1329, 0x2f08 }, { 1335, 0x08d0 }, { 1339, 0xbe3e }, { 1350, 0x010f },
2348 /* 0x5400 */
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2350 { 1379, 0x0504 }, { 1382, 0x0002 }, { 1383, 0x0500 }, { 1385, 0x382a },
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2352 { 1403, 0x0313 }, { 1408, 0x0000 }, { 1408, 0x6122 }, { 1413, 0x0404 },
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2355 { 1425, 0x8050 }, { 1428, 0x4048 }, { 1431, 0x0008 }, { 1432, 0x1000 },
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2362 { 1478, 0x2400 }, { 1480, 0x4c02 }, { 1484, 0x0001 }, { 1485, 0x0601 },
2363 /* 0x5700 */
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2366 { 1518, 0x0904 }, { 1521, 0x0008 }, { 1522, 0x000d }, { 1525, 0x0000 },
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2375 { 1622, 0xc390 }, { 1628, 0x04b3 }, { 1634, 0x7c85 }, { 1642, 0x2118 },
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2378 /* 0x5a00 */
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2383 /* 0x5b00 */
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2392 { 1854, 0x0001 }, { 1855, 0x0200 }, { 1856, 0x8101 }, { 1859, 0x2851 },
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2394 { 1864, 0x6080 }, { 1867, 0x02d2 }, { 1872, 0x0280 }, { 1874, 0x0000 },
2395 { 1874, 0x1800 }, { 1876, 0x0001 }, { 1877, 0x9200 }, { 1880, 0x0000 },
2396 { 1880, 0x0880 }, { 1882, 0x2000 }, { 1883, 0x0405 }, { 1886, 0x3500 },
2397 { 1890, 0x2000 }, { 1891, 0x6044 }, { 1895, 0x49e6 }, { 1903, 0x609e },
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2930 { 7667, 0x0102 }, { 7669, 0x2000 }, { 7670, 0x0000 }, { 7670, 0x0000 },
2931 { 7670, 0x0011 }, { 7672, 0x1000 }, { 7673, 0xa011 }, { 7677, 0x9300 },
2932 { 7681, 0x2b05 }, { 7687, 0x0010 }, { 7688, 0x0200 }, { 7689, 0x0000 },
2933 { 7689, 0x1000 }, { 7690, 0x9011 }, { 7694, 0x1100 }, { 7696, 0x2901 },
2934 /* 0xd500 */
2935 { 7700, 0x1110 }, { 7703, 0x00b0 }, { 7706, 0x0000 }, { 7706, 0x3000 },
2936 { 7708, 0xb011 }, { 7713, 0x1302 }, { 7717, 0x2b21 }, { 7723, 0x1130 },
2937 { 7727, 0x03b0 }, { 7732, 0x0001 }, { 7733, 0x0020 }, { 7734, 0x0000 },
2938 { 7734, 0x1300 }, { 7737, 0x2b05 }, { 7743, 0x1130 }, { 7747, 0x02b0 },
2939 /* 0xd600 */
2940 { 7751, 0x0113 }, { 7755, 0x103b }, { 7761, 0x2011 }, { 7764, 0x1300 },
2941 { 7767, 0x2b21 }, { 7773, 0x1132 }, { 7778, 0x0280 }, { 7780, 0x0013 },
2942 { 7783, 0x3028 }, { 7787, 0xa011 }, { 7791, 0x1102 }, { 7794, 0x0a01 },
2943 { 7797, 0x1130 }, { 7801, 0x0292 }, { 7805, 0x0111 }, { 7808, 0x3021 },
2944 /* 0xd700 */
2945 { 7812, 0x0011 }, { 7814, 0x1302 }, { 7818, 0x2b01 }, { 7823, 0x1130 },
2946 { 7827, 0x0290 }, { 7830, 0x03d3 }, { 7837, 0x122b }, { 7843, 0x3011 },
2947 { 7847, 0x1302 }, { 7851, 0x2b01 },
2948 };
2949 static const Summary16 ksc5601_uni2indx_pagef9[17] = {
2950 /* 0xf900 */
2951 { 7856, 0xffff }, { 7872, 0xffff }, { 7888, 0xffff }, { 7904, 0xffff },
2952 { 7920, 0xffff }, { 7936, 0xffff }, { 7952, 0xffff }, { 7968, 0xffff },
2953 { 7984, 0xffff }, { 8000, 0xffff }, { 8016, 0xffff }, { 8032, 0xffff },
2954 { 8048, 0xffff }, { 8064, 0xffff }, { 8080, 0xffff }, { 8096, 0xffff },
2955 /* 0xfa00 */
2956 { 8112, 0xffff },
2957 };
2958 static const Summary16 ksc5601_uni2indx_pageff[15] = {
2959 /* 0xff00 */
2960 { 8124, 0xfffe }, { 8139, 0xffff }, { 8155, 0xffff }, { 8171, 0xffff },
2961 { 8187, 0xffff }, { 8203, 0x7fff }, { 8218, 0x0000 }, { 8218, 0x0000 },
2962 { 8218, 0x0000 }, { 8218, 0x0000 }, { 8218, 0x0000 }, { 8218, 0x0000 },
2963 { 8218, 0x0000 }, { 8218, 0x0000 }, { 8218, 0x006f },
2964 };
2965
2966 static int
2967 ksc5601_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
2968 {
2969     (void)conv;
2970     if (n >= 2) {
2971         const Summary16 *summary = NULL;
2972         if (wc < 0x0460)
2973             summary = &ksc5601_uni2indx_page00[(wc>4)];
2974         else if (wc >= 0x2000 && wc < 0x2670)
2975             summary = &ksc5601_uni2indx_page20[(wc>4)-0x200];
2976         else if (wc >= 0x3000 && wc < 0x33e0)
2977             summary = &ksc5601_uni2indx_page30[(wc>4)-0x300];
2978         else if (wc >= 0x4e00 && wc < 0x9fa0)

```

```

2979     summary = &ksc5601_uni2indx_page4e[(wc>>4)-0x4e0];
2980     else if (wc >= 0xac00 && wc < 0xd7a0)
2981         summary = &ksc5601_uni2indx_pageac[(wc>>4)-0xac0];
2982     else if (wc >= 0xf900 && wc < 0xfa10)
2983         summary = &ksc5601_uni2indx_pagef9[(wc>>4)-0xf90];
2984     else if (wc >= 0xff00 && wc < 0xffff0)
2985         summary = &ksc5601_uni2indx_pageff[(wc>>4)-0xff0];
2986     if (summary) {
2987         unsigned short used = summary->used;
2988         unsigned int i = wc & 0x0f;
2989         if (used & ((unsigned short) 1 << i)) {
2990             unsigned short c;
2991             /* Keep in 'used' only the bits 0..i-1. */
2992             used &= ((unsigned short) 1 << i) - 1;
2993             /* Add 'summary->indx' and the number of bits set in 'used'. */
2994             used = (used & 0x5555) + ((used & 0xaaaa) >> 1);
2995             used = (used & 0x3333) + ((used & 0xcccc) >> 2);
2996             used = (used & 0x0f0f) + ((used & 0xf0f0) >> 4);
2997             used = (used & 0x00ff) + (used >> 8);
2998             c = ksc5601_2charset[summary->indx + used];
2999             r[0] = (c >> 8); r[1] = (c & 0xff);
3000             return 2;
3001         }
3002     }
3003     return RET_ILSEQ;
3004 }
3005 return RET_TOOSMALL;
3006 }
3007 #endif /* NEED_TOMB */

```

## 34.291 mulelao.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/mulelao.h,v 1.3 2000/11/29 17:40:35 dawes Exp $ */
2
3 /*
4  * MULELAO-1
5  */
6
7 static const unsigned short mulelao_2uni[96] = {
8     /* 0xa0 */
9     0x00a0, 0x0e81, 0x0e82, 0xffffd, 0x0e84, 0xffffd, 0xffffd, 0x0e87,
10    0x0e88, 0xffffd, 0x0e8a, 0xffffd, 0xffffd, 0x0e8d, 0xffffd, 0xffffd,
11    /* 0xb0 */
12    0xffffd, 0xffffd, 0xffffd, 0xffffd, 0x0e94, 0x0e95, 0x0e96, 0x0e97,
13    0xffffd, 0x0e99, 0x0e9a, 0x0e9b, 0x0e9c, 0x0e9d, 0x0e9e, 0x0e9f,
14    /* 0xc0 */
15    0xffffd, 0x0ea1, 0x0ea2, 0x0ea3, 0xffffd, 0x0ea5, 0xffffd, 0x0ea7,
16    0xffffd, 0xffffd, 0x0eaa, 0x0eab, 0xffffd, 0x0ead, 0x0eae, 0x0eaf,
17    /* 0xd0 */
18    0x0eb0, 0x0eb1, 0x0eb2, 0x0eb3, 0x0eb4, 0x0eb5, 0x0eb6, 0x0eb7,
19    0x0eb8, 0x0eb9, 0xffffd, 0x0ebb, 0x0ebc, 0x0ebd, 0xffffd, 0xffffd,
20    /* 0xe0 */
21    0x0ec0, 0x0ec1, 0x0ec2, 0x0ec3, 0x0ec4, 0xffffd, 0x0ec6, 0xffffd,
22    0x0ec8, 0x0ec9, 0x0eca, 0x0ecb, 0x0ecc, 0x0ecd, 0xffffd, 0xffffd,
23    /* 0xf0 */
24    0x0ed0, 0x0ed1, 0x0ed2, 0x0ed3, 0x0ed4, 0x0ed5, 0x0ed6, 0x0ed7,
25    0x0ed8, 0x0ed9, 0xffffd, 0xffffd, 0x0edc, 0x0edd, 0xffffd, 0xffffd,
26 };
27
28 static int
29 mulelao_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
30 {
31     unsigned char c = *s;
32     if (c < 0xa0) {
33         *pwc = (ucs4_t) c;
34         return 1;
35     }
36     else {
37         unsigned short wc = mulelao_2uni[c-0xa0];
38         if (wc != 0xffffd) {
39             *pwc = (ucs4_t) wc;
40             return 1;
41         }
42     }
43     return RET_ILSEQ;
44 }
45
46 static const unsigned char mulelao_page0e[96] = {
47     0x00, 0xa1, 0xa2, 0x00, 0xa4, 0x00, 0x00, 0xa7, /* 0x80-0x87 */
48     0xa8, 0x00, 0xaa, 0x00, 0x00, 0xad, 0x00, 0x00, /* 0x88-0x8f */
49     0x00, 0x00, 0x00, 0x00, 0xb4, 0xb5, 0xb6, 0xb7, /* 0x90-0x97 */
50     0x00, 0xb9, 0xba, 0xbb, 0xbc, 0xbd, 0xbe, 0xbf, /* 0x98-0x9f */
51     0x00, 0xc1, 0xc2, 0xc3, 0x00, 0xc5, 0x00, 0xc7, /* 0xa0-0xa7 */
52     0x00, 0x00, 0xca, 0xcb, 0x00, 0xcd, 0xce, 0xcf, /* 0xa8-0xaf */
53     0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0xb0-0xb7 */

```

```

54 0xd8, 0xd9, 0x00, 0xdb, 0xdc, 0xdd, 0x00, 0x00, /* 0xb8-0xbf */
55 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0x00, 0xe6, 0x00, /* 0xc0-0xc7 */
56 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0x00, 0x00, /* 0xc8-0xcf */
57 0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0xd0-0xd7 */
58 0xf8, 0xf9, 0x00, 0x00, 0xfc, 0xfd, 0x00, 0x00, /* 0xd8-0xdf */
59 };
60
61 static int
62 mulelao_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
63 {
64     unsigned char c = 0;
65     if (wc < 0x00a0) {
66         *r = wc;
67         return 1;
68     }
69     else if (wc == 0x00a0)
70         c = 0xa0;
71     else if (wc >= 0x0e80 && wc < 0x0ee0)
72         c = mulelao_page0e[wc-0x0e80];
73     if (c != 0) {
74         *r = c;
75         return 1;
76     }
77     return RET_ILSEQ;
78 }

```

## 34.292 tatar\_cyr.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/tatar_cyr.h,v 1.3 2000/12/04 18:49:42 dawes Exp $ */
2
3 /*
4  * TATAR-CYR
5  */
6
7 static const unsigned short tatar_cyr_2uni[128] = {
8     /* 0x80 */
9     0x04d8, 0x0403, 0x201a, 0x0453, 0x201e, 0x2026, 0x2020, 0x2021,
10    0x20ac, 0x2030, 0x04e8, 0x2039, 0x04ae, 0x0496, 0x04a2, 0x04ba,
11    /* 0x90 */
12    0x04d9, 0x2018, 0x2019, 0x201c, 0x201d, 0x2022, 0x2013, 0x2014,
13    0x98, 0x2122, 0x04e9, 0x203a, 0x04af, 0x0497, 0x04a3, 0x04bb,
14    /* 0xa0 */
15    0x00a0, 0x040e, 0x045e, 0x0408, 0x00a4, 0x0490, 0x00a6, 0x00a7,
16    0x0401, 0x00a9, 0x0404, 0x00ab, 0x00ac, 0x00ad, 0x00ae, 0x0407,
17    /* 0xb0 */
18    0x00b0, 0x00b1, 0x0406, 0x0456, 0x0491, 0x00b5, 0x00b6, 0x00b7,
19    0x0451, 0x2116, 0x0454, 0x00bb, 0x0458, 0x0405, 0x0455, 0x0457,
20    /* 0xc0 */
21    0x0410, 0x0411, 0x0412, 0x0413, 0x0414, 0x0415, 0x0416, 0x0417,
22    0x0418, 0x0419, 0x041a, 0x041b, 0x041c, 0x041d, 0x041e, 0x041f,
23    /* 0xd0 */
24    0x0420, 0x0421, 0x0422, 0x0423, 0x0424, 0x0425, 0x0426, 0x0427,
25    0x0428, 0x0429, 0x042a, 0x042b, 0x042c, 0x042d, 0x042e, 0x042f,
26    /* 0xe0 */
27    0x0430, 0x0431, 0x0432, 0x0433, 0x0434, 0x0435, 0x0436, 0x0437,
28    0x0438, 0x0439, 0x043a, 0x043b, 0x043c, 0x043d, 0x043e, 0x043f,
29    /* 0xf0 */
30    0x0440, 0x0441, 0x0442, 0x0443, 0x0444, 0x0445, 0x0446, 0x0447,
31    0x0448, 0x0449, 0x044a, 0x044b, 0x044c, 0x044d, 0x044e, 0x044f,
32 };
33
34 static int
35 tatar_cyr_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
36 {
37     unsigned char c = *s;
38     if (c < 0x80)
39         *pwc = (ucs4_t) c;
40     else
41         *pwc = (ucs4_t) tatar_cyr_2uni[c-0x80];
42     return 1;
43 }
44
45 static const unsigned char tatar_cyr_page00[32] = {
46     0xa0, 0x00, 0x00, 0x00, 0xa4, 0x00, 0xa6, 0xa7, /* 0xa0-0xa7 */
47     0x00, 0xa9, 0x00, 0xab, 0xac, 0xad, 0xae, 0x00, /* 0xa8-0xaf */
48     0xb0, 0xb1, 0x00, 0x00, 0xb5, 0xb6, 0xb7, /* 0xb0-0xb7 */
49     0x00, 0x00, 0x00, 0xb8, 0xb9, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
50 };
51 static const unsigned char tatar_cyr_page04[240] = {
52     0x00, 0xa8, 0x00, 0x81, 0xaa, 0xbd, 0xb2, 0xaf, /* 0x00-0x07 */
53     0xa3, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa1, 0x00, /* 0x08-0x0f */
54     0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x10-0x17 */
55     0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x18-0x1f */
56     0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0x20-0x27 */
57     0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, /* 0x28-0x2f */

```

```

58 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0x30-0x37 */
59 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0x38-0x3f */
60 0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0x40-0x47 */
61 0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0xfd, 0xfe, 0xff, /* 0x48-0x4f */
62 0x00, 0xb8, 0x00, 0x83, 0xba, 0xbe, 0xb3, 0xbf, /* 0x50-0x57 */
63 0xbc, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa2, 0x00, /* 0x58-0x5f */
64 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
65 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
66 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
67 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
68 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
69 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
70 0xa5, 0xb4, 0x00, 0x00, 0x00, 0x00, 0x8d, 0x9d, /* 0x90-0x97 */
71 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
72 0x00, 0x00, 0x8e, 0x9e, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
73 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x8c, 0x9c, /* 0xa8-0xaf */
74 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
75 0x00, 0x00, 0x8f, 0x9f, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
76 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
77 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xc8-0xcf */
78 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd0-0xd7 */
79 0x80, 0x90, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xd8-0xdf */
80 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xef */
81 0x8a, 0x9a, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xe8-0xef */
82 };
83 static const unsigned char tatar_cyr_page20[48] = {
84 0x00, 0x00, 0x00, 0x00, 0x96, 0x97, 0x00, 0x00, 0x00, /* 0x10-0x17 */
85 0x91, 0x92, 0x82, 0x00, 0x93, 0x94, 0x84, 0x00, /* 0x18-0x1f */
86 0x86, 0x87, 0x95, 0x00, 0x00, 0x00, 0x85, 0x00, /* 0x20-0x27 */
87 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
88 0x89, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
89 0x00, 0x8b, 0x9b, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
90 };
91 static const unsigned char tatar_cyr_page21[24] = {
92 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xb9, 0x00, /* 0x10-0x17 */
93 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
94 0x00, 0x00, 0x99, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
95 };
96 static const unsigned char tatar_cyr_page22[1] = {
97 0xb0, /* 0x16-0x16 */
98 };
99
100 static int
101 tatar_cyr_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
102 {
103     unsigned char c = 0;
104     if (wc < 0x0080) {
105         *r = wc;
106         return 1;
107     }
108     else if (wc >= 0x00a0 && wc < 0x00bc)
109         c = tatar_cyr_page00[wc-0x00a0];
110     else if (wc >= 0x0400 && wc < 0x04ef)
111         c = tatar_cyr_page04[wc-0x0400];
112     else if (wc >= 0x2010 && wc < 0x203b)
113         c = tatar_cyr_page20[wc-0x2010];
114     else if (wc == 0x20ac)
115         c = 0x88;
116     else if (wc >= 0x2110 && wc < 0x2123)
117         c = tatar_cyr_page21[wc-0x2110];
118     if (c != 0) {
119         *r = c;
120         return 1;
121     }
122     return RET_ILSEQ;
123 }

```

## 34.293 tcvn.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/tcvn.h,v 1.3 2000/11/29 17:40:35 dawes Exp $ */
2
3 /*
4  * TCVN-5712
5  */
6
7 static const unsigned short tcvn_2uni_1[32] = {
8     /* 0x00 */
9     0x0000, 0x00da, 0x1ee4, 0x0003, 0x1eea, 0x1eec, 0x1eee, 0x0007,
10     0x0008, 0x0009, 0x000a, 0x000b, 0x000c, 0x000d, 0x000e, 0x000f,
11     /* 0x10 */
12     0x0010, 0x1ee8, 0x1ef0, 0x1ef2, 0x1ef6, 0x1ef8, 0x00dd, 0x1ef4,
13     0x0018, 0x0019, 0x001a, 0x001b, 0x001c, 0x001d, 0x001e, 0x001f,
14 };
15 static const unsigned short tcvn_2uni_2[128] = {
16     /* 0x80 */

```

```

17 0x00c0, 0x1ea2, 0x00c3, 0x00c1, 0x1ea0, 0x1eb6, 0x1eac, 0x00c8,
18 0x1eba, 0x1ebc, 0x00c9, 0x1eb8, 0x1ec6, 0x00cc, 0x1ec8, 0x0128,
19 /* 0x90 */
20 0x00cd, 0x1eca, 0x00d2, 0x1ece, 0x00d5, 0x00d3, 0x1ecc, 0x1ed8,
21 0x1edc, 0x1ede, 0x1ee0, 0x1eda, 0x1ee2, 0x00d9, 0x1ee6, 0x0168,
22 /* 0xa0 */
23 0x00a0, 0x0102, 0x00c2, 0x00ca, 0x00d4, 0x01a0, 0x01af, 0x0110,
24 0x0103, 0x00e2, 0x00ea, 0x00f4, 0x01a1, 0x01b0, 0x0111, 0x1eb0,
25 /* 0xb0 */
26 0x0300, 0x0309, 0x0303, 0x0301, 0x0323, 0x00e0, 0x1ea3, 0x00e3,
27 0x00e1, 0x1ea1, 0x1eb2, 0x1eb1, 0x1eb3, 0x1eb5, 0x1eaf, 0x1eb4,
28 /* 0xc0 */
29 0x1eae, 0x1ea6, 0x1ea8, 0x1eaa, 0x1ea4, 0x1ec0, 0x1eb7, 0x1ea7,
30 0x1ea9, 0x1eab, 0x1ea5, 0x1ead, 0x00e8, 0x1ec2, 0x1ebb, 0x1ebd,
31 /* 0xd0 */
32 0x00e9, 0x1eb9, 0x1ec1, 0x1ec3, 0x1ec5, 0x1ebf, 0x1ec7, 0x00ec,
33 0x1ec9, 0x1ec4, 0x1ebe, 0x1ed2, 0x0129, 0x00ed, 0x1ecb, 0x00f2,
34 /* 0xe0 */
35 0x1ed4, 0x1ecf, 0x00f5, 0x00f3, 0x1ecd, 0x1ed3, 0x1ed5, 0x1ed7,
36 0x1ed1, 0x1ed9, 0x1edd, 0x1edf, 0x1ee1, 0x1edb, 0x1ee3, 0x00f9,
37 /* 0xf0 */
38 0x1ed6, 0x1ee7, 0x0169, 0x00fa, 0x1ee5, 0x1eeb, 0x1eed, 0x1eef,
39 0x1ee9, 0x1ef1, 0x1ef3, 0x1ef7, 0x1ef9, 0x00fd, 0x1ef5, 0x1ed0,
40 };
41
42 static int
43 tcvn_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
44 {
45     unsigned char c = *s;
46     if (c < 0x20)
47         *pwc = (ucs4_t) tcvn_2uni_1[c];
48     else if (c < 0x80)
49         *pwc = (ucs4_t) c;
50     else
51         *pwc = (ucs4_t) tcvn_2uni_2[c-0x80];
52     return 1;
53 }
54
55 static const unsigned char tcvn_page00[96+184] = {
56 0xa0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
57 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa8-0xaf */
58 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
59 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb8-0xbf */
60 0x80, 0x83, 0xa2, 0x82, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
61 0x87, 0x8a, 0xa3, 0x00, 0x8d, 0x90, 0x00, 0x00, /* 0xc8-0xcf */
62 0x00, 0x00, 0x92, 0x95, 0xa4, 0x94, 0x00, 0x00, /* 0xd0-0xd7 */
63 0x00, 0x9d, 0x01, 0x00, 0x00, 0x16, 0x00, 0x00, /* 0xd8-0xdf */
64 0xb5, 0xb8, 0xa9, 0xb7, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
65 0xcc, 0xd0, 0xaa, 0x00, 0xd7, 0xdd, 0x00, 0x00, /* 0xe8-0xef */
66 0x00, 0x00, 0xdf, 0xe3, 0xab, 0xe2, 0x00, 0x00, /* 0xf0-0xf7 */
67 0x00, 0xef, 0xf3, 0x00, 0x00, 0xfd, 0x00, 0x00, /* 0xf8-0xff */
68 /* 0x0100 */
69 0x00, 0x00, 0xa1, 0xa8, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
70 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
71 0xa7, 0xae, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
72 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
73 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
74 0x8f, 0xdc, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
75 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
76 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
77 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
78 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */
79 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
80 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
81 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
82 0x9f, 0xf2, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
83 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
84 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
85 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
86 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
87 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
88 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
89 0xa5, 0xac, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
90 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xa6, /* 0xa8-0xaf */
91 0xad, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
92 };
93 static const unsigned char tcvn_page03[40] = {
94 0xb0, 0xb3, 0x00, 0xb2, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
95 0x00, 0xb1, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
96 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
97 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
98 0x00, 0x00, 0x00, 0xb4, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
99 };
100 static const unsigned char tcvn_page1e[96] = {
101 0x84, 0xb9, 0x81, 0xb6, 0xc4, 0xca, 0xc1, 0xc7, /* 0xa0-0xa7 */
102 0xc2, 0xc8, 0xc3, 0xc9, 0x86, 0xcb, 0xc0, 0xbe, /* 0xa8-0xaf */
103 0xaf, 0xbb, 0xba, 0xbc, 0xbf, 0xbd, 0x85, 0xc6, /* 0xb0-0xb7 */

```

```

104 0x8b, 0xd1, 0x88, 0xce, 0x89, 0xcf, 0xda, 0xd5, /* 0xb8-0xbf */
105 0xc5, 0xd2, 0xcd, 0xd3, 0xd9, 0xd4, 0x8c, 0xd6, /* 0xc0-0xc7 */
106 0x8e, 0xd8, 0x91, 0xde, 0x96, 0xe4, 0x93, 0xe1, /* 0xc8-0xcf */
107 0xff, 0xe8, 0xdb, 0xe5, 0xe0, 0xe6, 0xf0, 0xe7, /* 0xd0-0xd7 */
108 0x97, 0xe9, 0x9b, 0xed, 0x98, 0xea, 0x99, 0xeb, /* 0xd8-0xdf */
109 0x9a, 0xec, 0x9c, 0xee, 0x02, 0xf4, 0x9e, 0xf1, /* 0xe0-0xe7 */
110 0x11, 0xf8, 0x04, 0xf5, 0x05, 0xf6, 0x06, 0xf7, /* 0xe8-0xef */
111 0x12, 0xf9, 0x13, 0xfa, 0x17, 0xfe, 0x14, 0xfb, /* 0xf0-0xf7 */
112 0x15, 0xfc, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xf8-0xff */
113 };
114
115 static int
116 tcvn_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
117 {
118     unsigned char c = 0;
119     if (wc < 0x0080 && (wc >= 0x0020 || (0x00fe0076 & (1 << wc)) == 0)) {
120         *r = wc;
121         return 1;
122     }
123     else if (wc >= 0x00a0 && wc < 0x01b8)
124         c = tcvn_page00[wc-0x00a0];
125     else if (wc >= 0x0300 && wc < 0x0328)
126         c = tcvn_page03[wc-0x0300];
127     else if (wc >= 0x1ea0 && wc < 0x1f00)
128         c = tcvn_page1e[wc-0x1ea0];
129     if (c != 0) {
130         *r = c;
131         return 1;
132     }
133     return RET_ILSEQ;
134 }

```

## 34.294 tis620.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/tis620.h,v 1.4 2001/02/09 00:02:54 dawes Exp $ */
2
3 /*
4  * TIS620-0
5  */
6
7 static const unsigned short tis620_2uni[96] = {
8     /* 0xa0 */
9     0xffff, 0x0e01, 0x0e02, 0x0e03, 0x0e04, 0x0e05, 0x0e06, 0x0e07,
10    0x0e08, 0x0e09, 0x0e0a, 0x0e0b, 0x0e0c, 0x0e0d, 0x0e0e, 0x0e0f,
11    /* 0xb0 */
12    0x0e10, 0x0e11, 0x0e12, 0x0e13, 0x0e14, 0x0e15, 0x0e16, 0x0e17,
13    0x0e18, 0x0e19, 0x0e1a, 0x0e1b, 0x0e1c, 0x0e1d, 0x0e1e, 0x0e1f,
14    /* 0xc0 */
15    0x0e20, 0x0e21, 0x0e22, 0x0e23, 0x0e24, 0x0e25, 0x0e26, 0x0e27,
16    0x0e28, 0x0e29, 0x0e2a, 0x0e2b, 0x0e2c, 0x0e2d, 0x0e2e, 0x0e2f,
17    /* 0xd0 */
18    0x0e30, 0x0e31, 0x0e32, 0x0e33, 0x0e34, 0x0e35, 0x0e36, 0x0e37,
19    0x0e38, 0x0e39, 0x0e3a, 0xffff, 0xffff, 0xffff, 0xffff, 0x0e3f,
20    /* 0xe0 */
21    0x0e40, 0x0e41, 0x0e42, 0x0e43, 0x0e44, 0x0e45, 0x0e46, 0x0e47,
22    0x0e48, 0x0e49, 0x0e4a, 0x0e4b, 0x0e4c, 0x0e4d, 0x0e4e, 0x0e4f,
23    /* 0xf0 */
24    0x0e50, 0x0e51, 0x0e52, 0x0e53, 0x0e54, 0x0e55, 0x0e56, 0x0e57,
25    0x0e58, 0x0e59, 0x0e5a, 0x0e5b, 0xffff, 0xffff, 0xffff, 0xffff,
26 };
27
28 static int
29 tis620_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
30 {
31     unsigned char c = *s;
32     if (c < 0x80) {
33         *pwc = (ucs4_t) c;
34         return 1;
35     }
36     else if (c < 0xa0) {
37     }
38     else {
39         unsigned short wc = tis620_2uni[c-0xa0];
40         if (wc != 0xffff) {
41             *pwc = (ucs4_t) wc;
42             return 1;
43         }
44     }
45     return RET_ILSEQ;
46 }
47
48 static const unsigned char tis620_page0e[96] = {
49     0x00, 0xa1, 0xa2, 0xa3, 0xa4, 0xa5, 0xa6, 0xa7, /* 0x00-0x07 */
50     0xa8, 0xa9, 0xaa, 0xab, 0xac, 0xad, 0xae, 0xaf, /* 0x08-0x0f */
51     0xb0, 0xb1, 0xb2, 0xb3, 0xb4, 0xb5, 0xb6, 0xb7, /* 0x10-0x17 */

```

```

52 0xb8, 0xb9, 0xba, 0xbb, 0xbc, 0xbd, 0xbe, 0xbf, /* 0x18-0x1f */
53 0xc0, 0xc1, 0xc2, 0xc3, 0xc4, 0xc5, 0xc6, 0xc7, /* 0x20-0x27 */
54 0xc8, 0xc9, 0xca, 0xcb, 0xcc, 0xcd, 0xce, 0xcf, /* 0x28-0x2f */
55 0xd0, 0xd1, 0xd2, 0xd3, 0xd4, 0xd5, 0xd6, 0xd7, /* 0x30-0x37 */
56 0xd8, 0xd9, 0xda, 0xdb, 0xdc, 0xdd, 0xde, 0xdf, /* 0x38-0x3f */
57 0xe0, 0xe1, 0xe2, 0xe3, 0xe4, 0xe5, 0xe6, 0xe7, /* 0x40-0x47 */
58 0xe8, 0xe9, 0xea, 0xeb, 0xec, 0xed, 0xee, 0xef, /* 0x48-0x4f */
59 0xf0, 0xf1, 0xf2, 0xf3, 0xf4, 0xf5, 0xf6, 0xf7, /* 0x50-0x57 */
60 0xf8, 0xf9, 0xfa, 0xfb, 0xfc, 0xfd, 0xfe, 0xff, /* 0x58-0x5f */
61 };
62
63 static int
64 tis620_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
65 {
66     unsigned char c = 0;
67     if (wc < 0x0080) {
68         *r = wc;
69         return 1;
70     }
71     else if (wc >= 0x0e00 && wc < 0x0e60)
72         c = tis620_page0e[wc-0x0e00];
73     if (c != 0) {
74         *r = c;
75         return 1;
76     }
77     return RET_ILSEQ;
78 }

```

## 34.295 ucs2be.h

```

1 /*
2  * UCS-2BE = UCS-2 big endian
3  */
4 /* $XFree86: xc/lib/X11/lcUniConv/ucs2be.h,v 1.1 2000/11/28 17:25:09 dawes Exp $ */
5
6 static int
7 ucs2be_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
8 {
9     if (n >= 2) {
10         if (s[0] >= 0xd8 && s[0] < 0xe0) {
11             return RET_ILSEQ;
12         } else {
13             *pwc = (s[0] << 8) + s[1];
14             return 2;
15         }
16     }
17     return RET_TOOFEW(0);
18 }
19
20 static int
21 ucs2be_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
22 {
23     if (wc < 0x10000 && !(wc >= 0xd800 && wc < 0xe000)) {
24         if (n >= 2) {
25             r[0] = (unsigned char) (wc >> 8);
26             r[1] = (unsigned char) wc;
27             return 2;
28         } else
29             return RET_TOOSMALL;
30     }
31     return RET_ILSEQ;
32 }

```

## 34.296 utf8.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/utf8.h,v 1.3 2000/11/28 18:50:07 dawes Exp $ */
2
3 /*
4  * UTF-8
5  */
6
7 /* Specification: RFC 2279 */
8
9 static int
10 utf8_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
11 {
12     unsigned char c = s[0];
13
14     if (c < 0x80) {
15         *pwc = c;
16         return 1;
17     } else if (c < 0xc2) {

```

```

18     return RET_ILSEQ;
19 } else if (c < 0xe0) {
20     if (n < 2)
21         return RET_TOOFEW(0);
22     if (!(s[1] ^ 0x80) < 0x40))
23         return RET_ILSEQ;
24     *pwc = ((ucs4_t) (c & 0x1f) << 6)
25           | (ucs4_t) (s[1] ^ 0x80);
26     return 2;
27 } else if (c < 0xf0) {
28     if (n < 3)
29         return RET_TOOFEW(0);
30     if (!(s[1] ^ 0x80) < 0x40 && (s[2] ^ 0x80) < 0x40
31         && (c >= 0xe1 || s[1] >= 0xa0)))
32         return RET_ILSEQ;
33     *pwc = ((ucs4_t) (c & 0x0f) << 12)
34           | ((ucs4_t) (s[1] ^ 0x80) << 6)
35           | (ucs4_t) (s[2] ^ 0x80);
36     return 3;
37 } else if (c < 0xf8) {
38     if (n < 4)
39         return RET_TOOFEW(0);
40     if (!(s[1] ^ 0x80) < 0x40 && (s[2] ^ 0x80) < 0x40
41         && (s[3] ^ 0x80) < 0x40
42         && (c >= 0xf1 || s[1] >= 0x90)))
43         return RET_ILSEQ;
44     *pwc = ((ucs4_t) (c & 0x07) << 18)
45           | ((ucs4_t) (s[1] ^ 0x80) << 12)
46           | ((ucs4_t) (s[2] ^ 0x80) << 6)
47           | (ucs4_t) (s[3] ^ 0x80);
48     return 4;
49 } else if (c < 0xfc) {
50     if (n < 5)
51         return RET_TOOFEW(0);
52     if (!(s[1] ^ 0x80) < 0x40 && (s[2] ^ 0x80) < 0x40
53         && (s[3] ^ 0x80) < 0x40 && (s[4] ^ 0x80) < 0x40
54         && (c >= 0xf9 || s[1] >= 0x88)))
55         return RET_ILSEQ;
56     *pwc = ((ucs4_t) (c & 0x03) << 24)
57           | ((ucs4_t) (s[1] ^ 0x80) << 18)
58           | ((ucs4_t) (s[2] ^ 0x80) << 12)
59           | ((ucs4_t) (s[3] ^ 0x80) << 6)
60           | (ucs4_t) (s[4] ^ 0x80);
61     return 5;
62 } else if (c < 0xfe) {
63     if (n < 6)
64         return RET_TOOFEW(0);
65     if (!(s[1] ^ 0x80) < 0x40 && (s[2] ^ 0x80) < 0x40
66         && (s[3] ^ 0x80) < 0x40 && (s[4] ^ 0x80) < 0x40
67         && (s[5] ^ 0x80) < 0x40
68         && (c >= 0xfd || s[1] >= 0x84)))
69         return RET_ILSEQ;
70     *pwc = ((ucs4_t) (c & 0x01) << 30)
71           | ((ucs4_t) (s[1] ^ 0x80) << 24)
72           | ((ucs4_t) (s[2] ^ 0x80) << 18)
73           | ((ucs4_t) (s[3] ^ 0x80) << 12)
74           | ((ucs4_t) (s[4] ^ 0x80) << 6)
75           | (ucs4_t) (s[5] ^ 0x80);
76     return 6;
77 } else
78     return RET_ILSEQ;
79 }
80
81 static int
82 utf8_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n) /* n == 0 is acceptable */
83 {
84     int count;
85     if (wc < 0x80)
86         count = 1;
87     else if (wc < 0x800)
88         count = 2;
89     else if (wc < 0x10000)
90         count = 3;
91     else if (wc < 0x200000)
92         count = 4;
93     else if (wc < 0x4000000)
94         count = 5;
95     else if (wc <= 0x7fffffff)
96         count = 6;
97     else
98         return RET_ILSEQ;
99     if (n < count)
100         return RET_TOOSMALL;
101     switch (count) { /* note: code falls through cases! */
102     case 6: r[5] = 0x80 | (wc & 0x3f); wc = wc >> 6; wc |= 0x4000000;
103     case 5: r[4] = 0x80 | (wc & 0x3f); wc = wc >> 6; wc |= 0x200000;
104     case 4: r[3] = 0x80 | (wc & 0x3f); wc = wc >> 6; wc |= 0x10000;

```

```

105     case 3: r[2] = 0x80 | (wc & 0x3f); wc = wc >> 6; wc |= 0x800;
106     case 2: r[1] = 0x80 | (wc & 0x3f); wc = wc >> 6; wc |= 0xc0;
107     case 1: r[0] = wc;
108 }
109 return count;
110 }

```

## 34.297 viscii.h

```

1 /* $XFree86: xc/lib/X11/lcUniConv/viscii.h,v 1.3 2000/11/29 17:40:35 dawes Exp $ */
2
3 /*
4  * VISCI1.1-1
5  */
6
7 /* Specification: RFC 1456 */
8
9 static const unsigned short viscii_2uni_1[32] = {
10     /* 0x00 */
11     0x0000, 0x0001, 0x1eb2, 0x0003, 0x0004, 0x1eb4, 0x1eaa, 0x0007,
12     0x0008, 0x0009, 0x000a, 0x000b, 0x000c, 0x000d, 0x000e, 0x000f,
13     /* 0x10 */
14     0x0010, 0x0011, 0x0012, 0x0013, 0x1ef6, 0x0015, 0x0016, 0x0017,
15     0x0018, 0x1ef8, 0x001a, 0x001b, 0x001c, 0x001d, 0x1ef4, 0x001f,
16 };
17 static const unsigned short viscii_2uni_2[128] = {
18     /* 0x80 */
19     0x1ea0, 0x1eae, 0x1eb0, 0x1eb6, 0x1ea4, 0x1ea6, 0x1ea8, 0x1eac,
20     0x1ebc, 0x1eb8, 0x1ebe, 0x1ec0, 0x1ec2, 0x1ec4, 0x1ec6, 0x1ed0,
21     /* 0x90 */
22     0x1ed2, 0x1ed4, 0x1ed6, 0x1ed8, 0x1ee2, 0x1eda, 0x1edc, 0x1ede,
23     0x1eca, 0x1ece, 0x1ecc, 0x1ec8, 0x1ee6, 0x0168, 0x1ee4, 0x1ef2,
24     /* 0xa0 */
25     0x00d5, 0x1eaf, 0x1eb1, 0x1eb7, 0x1ea5, 0x1ea7, 0x1ea9, 0x1ead,
26     0x1ebd, 0x1eb9, 0x1ebf, 0x1ec1, 0x1ec3, 0x1ec5, 0x1ec7, 0x1ed1,
27     /* 0xb0 */
28     0x1ed3, 0x1ed5, 0x1ed7, 0x1ee0, 0x01a0, 0x1ed9, 0x1edd, 0x1edf,
29     0x1ecb, 0x1ef0, 0x1ee8, 0x1eea, 0x1eec, 0x01a1, 0x1edb, 0x01af,
30     /* 0xc0 */
31     0x00c0, 0x00c1, 0x00c2, 0x00c3, 0x1ea2, 0x0102, 0x1eb3, 0x1eb5,
32     0x00c8, 0x00c9, 0x00ca, 0x1eba, 0x00cc, 0x00cd, 0x0128, 0x1ef3,
33     /* 0xd0 */
34     0x0110, 0x1ee9, 0x00d2, 0x00d3, 0x00d4, 0x1ea1, 0x1ef7, 0x1eeb,
35     0x1eed, 0x00d9, 0x00da, 0x1ef9, 0x1ef5, 0x00dd, 0x1eel, 0x01b0,
36     /* 0xe0 */
37     0x00e0, 0x00e1, 0x00e2, 0x00e3, 0x1ea3, 0x0103, 0x1eef, 0x1eab,
38     0x00e8, 0x00e9, 0x00ea, 0x1ebb, 0x00ec, 0x00ed, 0x0129, 0x1ec9,
39     /* 0xf0 */
40     0x0111, 0x1ef1, 0x00f2, 0x00f3, 0x00f4, 0x00f5, 0x1ecf, 0x1ecd,
41     0x1ee5, 0x00f9, 0x00fa, 0x0169, 0x1ee7, 0x00fd, 0x1ee3, 0x1eee,
42 };
43
44 static int
45 viscii_mbtowc (conv_t conv, ucs4_t *pwc, const unsigned char *s, int n)
46 {
47     unsigned char c = *s;
48     if (c < 0x20)
49         *pwc = (ucs4_t) viscii_2uni_1[c];
50     else if (c < 0x80)
51         *pwc = (ucs4_t) c;
52     else
53         *pwc = (ucs4_t) viscii_2uni_2[c-0x80];
54     return 1;
55 }
56
57 static const unsigned char viscii_page00[64+184] = {
58     0xc0, 0xc1, 0xc2, 0xc3, 0x00, 0x00, 0x00, 0x00, /* 0xc0-0xc7 */
59     0xc8, 0xc9, 0xca, 0x00, 0xcc, 0xcd, 0x00, 0x00, /* 0xc8-0xcf */
60     0x00, 0x00, 0xd2, 0xd3, 0xd4, 0xa0, 0x00, 0x00, /* 0xd0-0xd7 */
61     0x00, 0xd9, 0xda, 0x00, 0x00, 0xdd, 0x00, 0x00, /* 0xd8-0xdf */
62     0xe0, 0xe1, 0xe2, 0xe3, 0x00, 0x00, 0x00, 0x00, /* 0xe0-0xe7 */
63     0xe8, 0xe9, 0xea, 0x00, 0xec, 0xed, 0x00, 0x00, /* 0xe8-0xef */
64     0x00, 0x00, 0xf2, 0xf3, 0xf4, 0xf5, 0x00, 0x00, /* 0xf0-0xf7 */
65     0x00, 0xf9, 0xfa, 0x00, 0x00, 0xfd, 0x00, 0x00, /* 0xf8-0xff */
66     /* 0x0100 */
67     0x00, 0x00, 0xc5, 0xe5, 0x00, 0x00, 0x00, 0x00, /* 0x00-0x07 */
68     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x08-0x0f */
69     0xd0, 0xf0, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x10-0x17 */
70     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x18-0x1f */
71     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x20-0x27 */
72     0xce, 0xee, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x28-0x2f */
73     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x30-0x37 */
74     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x38-0x3f */
75     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x40-0x47 */
76     0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x48-0x4f */

```

```

77 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x50-0x57 */
78 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x58-0x5f */
79 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x60-0x67 */
80 0x9d, 0xfb, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x68-0x6f */
81 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x70-0x77 */
82 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x78-0x7f */
83 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x80-0x87 */
84 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x88-0x8f */
85 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x90-0x97 */
86 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0x98-0x9f */
87 0xb4, 0xbd, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xa0-0xa7 */
88 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xbf, /* 0xa8-0xaf */
89 0xdf, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xb0-0xb7 */
90 };
91 static const unsigned char viscii_pagele[96] = {
92 0x80, 0xd5, 0xc4, 0xe4, 0x84, 0xa4, 0x85, 0xa5, /* 0xa0-0xa7 */
93 0x86, 0xa6, 0x06, 0xe7, 0x87, 0xa7, 0x81, 0xa1, /* 0xa8-0xaf */
94 0x82, 0xa2, 0x02, 0xc6, 0x05, 0xc7, 0x83, 0xa3, /* 0xb0-0xb7 */
95 0x89, 0xa9, 0xcb, 0xeb, 0x88, 0xa8, 0x8a, 0xaa, /* 0xb8-0xbf */
96 0x8b, 0xab, 0x8c, 0xac, 0x8d, 0xad, 0x8e, 0xae, /* 0xc0-0xc7 */
97 0x9b, 0xef, 0x98, 0xb8, 0x9a, 0xf7, 0x99, 0xf6, /* 0xc8-0xcf */
98 0x8f, 0xaf, 0x90, 0xb0, 0x91, 0xb1, 0x92, 0xb2, /* 0xd0-0xd7 */
99 0x93, 0xb5, 0x95, 0xbe, 0x96, 0xb6, 0x97, 0xb7, /* 0xd8-0xdf */
100 0xb3, 0xde, 0x94, 0xfe, 0x9e, 0xf8, 0x9c, 0xfc, /* 0xe0-0xe7 */
101 0xba, 0xd1, 0xbb, 0xd7, 0xbc, 0xd8, 0xff, 0xe6, /* 0xe8-0xef */
102 0xb9, 0xf1, 0x9f, 0xcf, 0x1e, 0xdc, 0x14, 0xd6, /* 0xf0-0xf7 */
103 0x19, 0xdb, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, /* 0xf8-0xff */
104 };
105
106 static int
107 viscii_wctomb (conv_t conv, unsigned char *r, ucs4_t wc, int n)
108 {
109     unsigned char c = 0;
110     if (wc < 0x0080 && (wc >= 0x0020 || (0x42100064 & (1 « wc)) == 0)) {
111         *r = wc;
112         return 1;
113     }
114     else if (wc >= 0x00c0 && wc < 0x01b8)
115         c = viscii_page00[wc-0x00c0];
116     else if (wc >= 0x1ea0 && wc < 0x1f00)
117         c = viscii_pagele[wc-0x1ea0];
118     if (c != 0) {
119         *r = c;
120         return 1;
121     }
122     return RET_ILSEQ;
123 }

```

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