

# Sequencer24 Developer's Reference Manual

## 0.9.3

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# 1 Sequencer24

**Author(s)** Chris Ahlstrom 2015-08-14

## 1.1 Introduction

Sequencer24 is a minor cleanup, refactoring, and documentation of the Seq24 live-play MIDI sequencer.

The current document describes the functions, classes, modules, and other entities used in this project.

For now, please read the ROADMAP and README files to understand the genesis of this project.

Also, I have pretty deeply documented Seq24 with a PDF file that can be generated by git-cloning the following project, installing a number of tools related to PDF and LaTeX, and running "make":

<https://github.com/ahlstromcj/seq24-doc.git>

In the present document, we've left out a fair amount a side-material to cut down on the size of the document. For example, the main module, redundant Windows support, utility headers like easy\_macros.h, simple stuff like the mutex module, the fruity variants (at least the ones already refactored into their own modules), etc., are all left out.

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## 3 Todo List

Global [Seq24SeqEventInput::on\\_button\\_press\\_event](#) (GdkEventButton \*a\_ev, seqevent &ths)

Needs update.

## 4 Hierarchical Index

### 4.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

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## 5 Data Structure Index

### 5.1 Data Structures

Here are the data structures with brief descriptions:

#### **AbstractPerfInput**

Provides an abstract base class to provide the minimal interface for the various "perf input" classes

??

#### **configfile**

This class is the abstract base class for optionsfile and userfile

??

#### **event**

Provides events for management of MIDI events

??

#### **font**

This class provides a wrapper for rendering fonts that are encoded as a 16 x 16 pixmap file in XPM format

??

#### **FruityPerfInput**

Implements the performance input of that certain fruity sequencer that people seem to like

??



<b>keybindentry</b>		
Class for management of application key-bindings		??
<b>lash</b>		
This class supports LASH operations, if compiled with LASH support (i.e LASH_SUPPORT is defined)		??
<b>maintime</b>		
This class provides the drawing of the progress bar at the top of the main window, along with the "pills" that move in time with the measures		??
<b>mainwid</b>		
This class implement the piano roll area of the application		??
<b>mainwnd</b>		
This class implements the functionality of the main window of the application, except for the Patterns Panel functionality, which is implemented in the mainwid class		??
<b>mastermidibus</b>		
The class that "supervises" all of the midibus objects?		??
<b>midibus</b>		
Provides a class for handling the MIDI buss on Linux		??
<b>midifile</b>		
This class handles the parsing and writing of MIDI files		??
<b>options</b>		
This class supports a full tabbed options dialog		??
<b>optionsfile</b>		
Provides a file for reading and writing the application' main configuration file		??
<b>perfedit</b>		
This class supports a Performance Editor that is used to arrange the patterns/sequences defined in the patterns panel, I think		??
<b>perfnames</b>		
This class implements the left-side keyboard in the patterns window		??
<b>perform</b>		
This class supports the performance mode		??
<b>perfroll</b>		
This class implements the performance roll user interface		??
<b>perftime</b>		
This class implements drawing the piano time at the top of the "performance window", also known as the "song editor"		??
<b>rect</b>		
A small helper class representing a rectangle		??
<b>Seq24Perflnput</b>		
Implements the default performance input characteristics of this application		??
<b>Seq24SeqEventlnput</b>		
This structure implement the normal interaction methods for Seq24		??
<b>Seq24SeqRolllnput</b>		
Implements the Seq24 mouse interaction paradigm for the seqroll		??

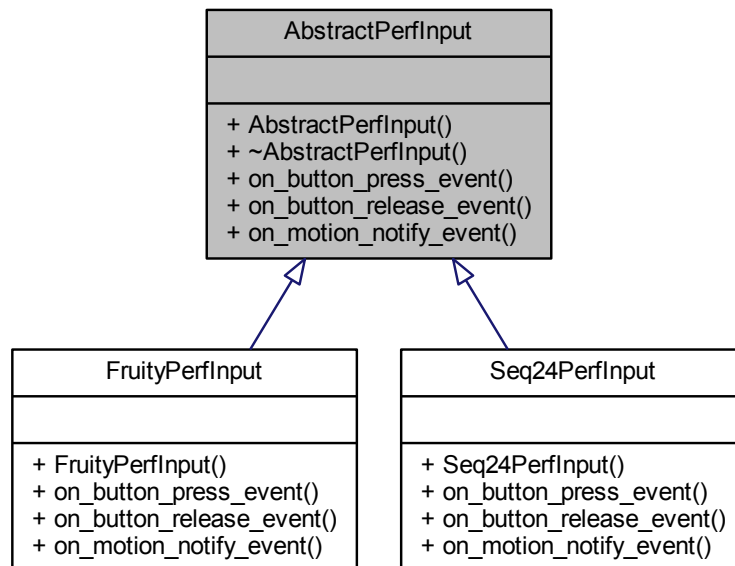
<b>seqdata</b>	This class supports drawing piano-roll events on a window	??
<b>seqedit</b>	Implements the Pattern Editor, which has references to:	??
<b>sequevent</b>	Implements the piano event drawing area	??
<b>seqkeys</b>	This class implements the left side piano of the pattern/sequence editor	??
<b>seqmenu</b>	This class handles the right-click menu of the sequence slots in the pattern window	??
<b>seqroll</b>	Implements the piano roll section of the pattern editor	??
<b>seqtime</b>	This class implements the piano time, whatever that is	??
<b>sequence</b>	Firstly a receptacle for a single track of MIDI data read from a MIDI file or edited into a pattern	??
<b>trigger</b>	This class is used in playback	??
<b>user_instrument_definition</b>	This structure corresponds to [user-instrument-0] definitions in the ~/.seq24usr file	??
<b>user_midi_bus_definition</b>	This structure corresponds to [user-midi-bus-0] definitions in the ~/.seq24usr file	??
<b>userfile</b>	Supports the user's ~/.seq24usr configuration file	??

## 6 Data Structure Documentation

### 6.1 AbstractPerfInput Class Reference

Provides an abstract base class to provide the minimal interface for the various "perf input" classes.

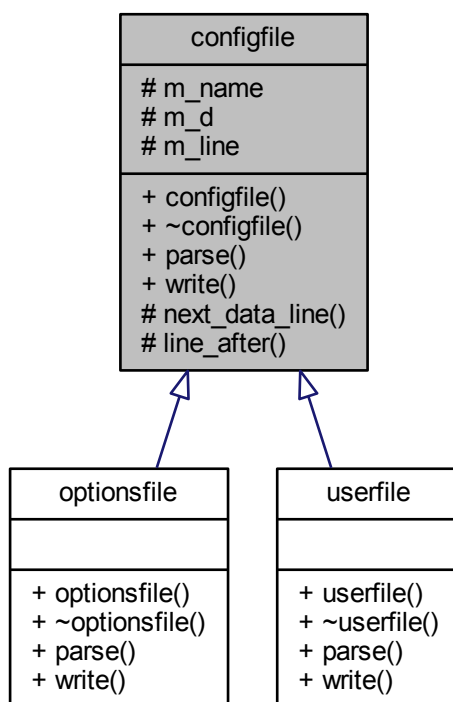
Inheritance diagram for AbstractPerInput:



## 6.2 configfile Class Reference

This class is the abstract base class for optionsfile and userfile.

Inheritance diagram for configfile:



### Public Member Functions

- [configfile](#) (const std::string &a\_name)  
*Provides the string constructor for a configuration file.*
- virtual [~configfile](#) ()  
*A rote constructor needed for a base class.*

### Protected Member Functions

- void [next\\_data\\_line](#) (std::ifstream &a\_file)  
*Gets the next line of data from an input stream.*
- void [line\\_after](#) (std::ifstream &a\_file, const std::string &a\_tag)  
*This function gets a specific line of text, specified as a tag.*

### Protected Attributes

- std::string [m\\_name](#)  
*Provides the name of the file.*
- unsigned char \* [m\\_d](#)  
*Points to an allocated buffer that holds the data for the configuration file.*
- char [m\\_line](#) [SEQ24\_LINE\_MAX]  
*The current line of text being processed.*

## 6.2.1 Constructor & Destructor Documentation

### 6.2.1.1 configfile::configfile ( const std::string & a\_name )

#### Parameters

<i>a_name</i>	The name of the configuration file.
---------------	-------------------------------------

## 6.2.2 Member Function Documentation

### 6.2.2.1 void configfile::next\_data\_line ( std::ifstream & a\_file ) [protected]

If the line starts with a number-sign, a space (!), or a null, it is skipped, to try the next line. This occurs until an EOF is encountered.

We may try to convert this item to a reference; pointers can be subject to problems. For example, what if someone passes a nullpointer? For speed, we don't check it.

Member m\_line is a "global" return value.

#### Parameters

<i>a_file</i>	Points to an input stream.
---------------	----------------------------

### 6.2.2.2 void configfile::line\_after ( std::ifstream & a\_file, const std::string & a\_tag ) [protected]

#### Parameters

<i>a_file</i>	Points to the input file stream.
<i>a_tag</i>	Provides a tag to be found. Lines are read until a match occurs with this tag.

## 6.2.3 Field Documentation

### 6.2.3.1 char configfile::m\_line[SEQ24\_LINE\_MAX] [protected]

This member receives an input line, and so needs to be a character buffer.

## 6.3 event Class Reference

Provides events for management of MIDI events.

#### Public Member Functions

- [event](#) ()  
*This constructor simply initializes all of the class members.*
- [~event](#) ()  
*This destructor explicitly deletes m\_sysex and sets it to null.*
- bool [operator<](#) (const [event](#) &rhsevent) const  
*If the current timestamp equal the event's timestamp, then this function returns true if the current rank is less than the event's rank.*
- void [set\\_timestamp](#) (unsigned long a\_time)  
*'Setter' function for member m\_timestamp*
- long [get\\_timestamp](#) () const  
*'Getter' function for member m\_timestamp*
- void [mod\\_timestamp](#) (unsigned long a\_mod)  
*Calculates the value of the current timestamp modulo the given parameter.*

- void [set\\_status](#) (char status)  
*Sets the m\_status member to the value of a\_status.*
- unsigned char [get\\_status](#) () const  
*'Getter' function for member m\_status*
- void [set\\_data](#) (char D1)  
*Clears the most-significant-bit of the a\_D1 parameter, and sets it into the first byte of m\_data.*
- void [set\\_data](#) (char D1, char D2)  
*Clears the most-significant-bit of both parameters, and sets them into the first and second bytes of m\_data.*
- void [get\\_data](#) (unsigned char \*D0, unsigned char \*D1)  
*Retrieves the two data bytes from m\_data[] and copies each into its respective parameter.*
- void [increment\\_data1](#) ()  
*Increments the first data byte (m\_data[1]) and clears the most significant bit.*
- void [decrement\\_data1](#) ()  
*Decrements the first data byte (m\_data[1]) and clears the most significant bit.*
- void [increment\\_data2](#) ()  
*Increments the second data byte (m\_data[1]) and clears the most significant bit.*
- void [decrement\\_data2](#) ()  
*Decrements the second data byte (m\_data[1]) and clears the most significant bit.*
- void [start\\_sysex](#) ()  
*Deletes and clears out the SYSEX buffer.*
- bool [append\\_sysex](#) (unsigned char \*a\_data, long size)  
*Appends SYSEX data to a new buffer.*
- unsigned char \* [get\\_sysex](#) () const  
*'Getter' function for member m\_sysex*
- void [set\\_size](#) (long a\_size)  
*'Setter' function for member m\_size*
- long [get\\_size](#) () const  
*'Getter' function for member m\_size*
- void [link](#) (event \*a\_event)  
*Sets m\_has\_link and sets m\_link to the provided event pointer.*
- event \* [get\\_linked](#) () const  
*'Getter' function for member m\_linked*
- bool [is\\_linked](#) () const  
*'Getter' function for member m\_has\_link*
- void [clear\\_link](#) ()  
*'Setter' function for member m\_has\_link*
- void [paint](#) ()  
*'Setter' function for member m\_painted*
- void [unpaint](#) ()  
*'Setter' function for member m\_painted*
- bool [is\\_painted](#) () const  
*'Getter' function for member m\_painted*
- void [mark](#) ()  
*'Setter' function for member m\_marked*
- void [unmark](#) ()  
*'Setter' function for member m\_marked*
- bool [is\\_marked](#) () const  
*'Getter' function for member m\_marked*
- void [select](#) ()  
*'Setter' function for member m\_selected*
- void [unselect](#) ()

- *'Setter' function for member m\_selected*
- bool `is_selected` () const
- *'Getter' function for member m\_selected*
- void `make_clock` ()
- *Sets m\_status to EVENT\_MIDI\_CLOCK;.*
- unsigned char `get_note` () const
- *Assuming m\_data[] holds a note, get the note number, which is in the first data byte, m\_data[0].*
- void `set_note` (char a\_note)
- *Sets the note number, clearing off the most-significant-bit and assigning it to the first data byte, m\_data[0].*
- unsigned char `get_note_velocity` () const
- *'Getter' function for member m\_data[1], the note velocity.*
- void `set_note_velocity` (int a\_vel)
- *Sets the note velocity, with is held in the second data byte, m\_data[1].*
- bool `is_note_on` () const
- *Returns true if m\_status is EVENT\_NOTE\_ON.*
- bool `is_note_off` () const
- *Returns true if m\_status is EVENT\_NOTE\_OFF.*
- void `print` ()
- *Prints out the timestamp, data size, the current status byte, any SYSEX data if present, or the two data bytes for the status byte.*

## Friends

- class **sequence**

### 6.3.1 Detailed Description

A MIDI event consists of 3 bytes:

```
-# Status byte, lsssnnn, where the sss bits specify the type of
   message, and the nnnn bits denote the channel number.
   The status byte always starts with 0.
-# The first data byte, 0xxxxxxx, where the data byte always
   start with 0, and the xxxxxxx values range from 0 to 127.
-# The second data byte, 0xxxxxxx.
```

This class may have too many member functions.

### 6.3.2 Member Function Documentation

#### 6.3.2.1 bool event::operator< ( const event & a\_rhsevent ) const

Otherwise, it returns true if the current timestamp is less than the event's timestamp.

#### Warning

The less-than operator is supposed to support a "strict weak ordering", and is supposed to leave equivalent values in the same order they were before the sort. However, every time we load and save our sample MIDI file, events get reversed. Here are program-changes that get reversed:

```
Save N:      0070: 6E 00 C4 48 00 C4 0C 00  C4 57 00 C4 19 00 C4 26
Save N+1:    0070: 6E 00 C4 26 00 C4 19 00  C4 57 00 C4 0C 00 C4 48
```

The 0070 is the offset within the versions of the  
b4uacuse-seq24.midi file.

#### 6.3.2.2 void event::mod\_timestamp ( unsigned long a\_mod ) [inline]

## Parameters

<code>a_mod</code>	The value to mod the timestamp against.
--------------------	---

## Returns

Returns a value ranging from 0 to `a_mod-1`.

## 6.3.2.3 void event::set\_status ( char a\_status )

If `a_status` is a non-channel event, then the channel portion of the status is cleared.

## 6.3.2.4 bool event::append\_sysex ( unsigned char \* a\_data, long a\_size )

First, a buffer of size `m_size+a_size` is created. The existing SYSEX data (stored in `m_sysex`) is copied to this buffer. Then the data represented by `a_data` and `a_size` is appended to that data buffer. Then the original SYSEX buffer, `m_sysex`, is deleted, and `m_sysex` is assigned to the new buffer..

## Warning

This function does not check any pointers.

## Parameters

<code>a_data</code>	Provides the additional SYSEX data.
<code>a_size</code>	Provides the size of the additional SYSEX data.

## Returns

Returns false if there was an `EVENT_SYSEX_END` byte in the appended data.

## 6.4 font Class Reference

This class provides a wrapper for rendering fonts that are encoded as a 16 x 16 pixmap file in XPM format.

## Public Types

- enum `Color` {  
    `BLACK`,  
    `WHITE` }

## Public Member Functions

- `font ()`  
*rote default constructor.*
- void `init` (Glib::RefPtr< Gdk::Window > `a_window`)  
*Initialization function for a window on which fonts will be drawn.*
- void `render_string_on_drawable` (Glib::RefPtr< Gdk::GC > `m_gc`, int `x`, int `y`, Glib::RefPtr< Gdk::Drawable > `a_draw`, const char \*`str`, `font::Color` `col`)  
*Draws a text string.*

## 6.4.1 Member Enumeration Documentation



### 6.4.1.1 enum font::Color

#### Enumerator

**BLACK** A simple enumeration to describe the basic colors used in writing text. Basically, these two values cause the selection of one or another pixmap (font\_b\_xpm and font\_w\_xpm).

The first supported color.

**WHITE** The second supported color.

## 6.4.2 Member Function Documentation

### 6.4.2.1 void font::init ( Glib::RefPtr< Gdk::Window > a\_window )

This function loads two pixmaps that contain the characters to be used to draw text strings. Both pixmaps provide a 16 x 16 grid of boxes, and each box contains one of the 256 characters in this font set.

One pixmap has white characters on a black background, and other other has black characters on a white background. See the descriptions of the c\_text\_x and c\_text\_y variables in the globals module.

### 6.4.2.2 void font::render\_string\_on\_drawable ( Glib::RefPtr< Gdk::GC > a\_gc, int x, int y, Glib::RefPtr< Gdk::Drawable > a\_draw, const char \* str, font::Color col )

This function grabs the proper font bitmap, extracts the current character pixmap from it, and slaps it down where it needs to be to render the character in the string.

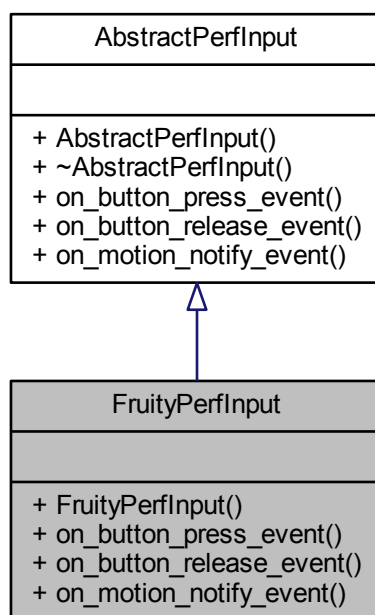
#### Parameters

<i>a_gc</i>	Provides the graphics context for drawing the text using GTK+.
<i>x</i>	The horizontal location of the text.
<i>y</i>	The vertical location of the text.
<i>a_draw</i>	The drawable object on which to draw the text.
<i>str</i>	The string to draw. Should use a constant string reference instead.
<i>col</i>	The font color to use to draw the string. The only support values are <a href="#">font::BLACK</a> and <a href="#">font::WHITE</a> , and the correct colors are provided by selecting one of two font pixmaps, as described in the <a href="#">init()</a> function.

## 6.5 FruityPerflnput Class Reference

Implements the performance input of that certain fruity sequencer that people seem to like.

Inheritance diagram for FruityPerfInput:



#### Public Member Functions

- bool `on_button_press_event` (GdkEventButton \*a\_ev, `perffroll` &roll)  
*Handles a button-press event in the Fruity manner.*
- bool `on_button_release_event` (GdkEventButton \*a\_ev, `perffroll` &roll)  
*Handles a button-release event.*
- bool `on_motion_notify_event` (GdkEventMotion \*a\_ev, `perffroll` &roll)  
*Handles a Fruity motion-notify event.*

## 6.6 keybindentry Class Reference

Class for management of application key-bindings.

Inherits Entry.

#### Public Member Functions

- `keybindentry` (type t, unsigned int \*location\_to\_write=nullptr, `perform` \*p=nullptr, long s=0)  
*This constructor initializes the member with values dependent on the value type provided in the first parameter.*
- void `set` (unsigned int val)  
*Gets the key name from the integer value; if there is one, then it is printed into a temporary buffer, otherwise the value is printed into that buffer as is.*
- virtual bool `on_key_press_event` (GdkEventKey \*event)  
*Handles a key press by calling `set()` with the event's key value.*

## Friends

- class **options**

### 6.6.1 Member Function Documentation

#### 6.6.1.1 void keybindentry::set ( unsigned int val )

Then we call set\_text(buf). The set\_width\_char() function is then called.

#### 6.6.1.2 bool keybindentry::on\_key\_press\_event ( GdkEventKey \* event ) [virtual]

This value is used to set the event or key depending on the value of m\_type.

## 6.7 lash Class Reference

This class supports LASH operations, if compiled with LASH support (i.e LASH\_SUPPORT is defined).

### Public Member Functions

- **lash** (int argc, char \*\*argv)  
*This constructor calls lash\_extract(), using the command-line arguments, if LASH\_SUPPORT is enabled.*
- void **init** (perform \*perform)  
*Initializes LASH support, if enabled.*
- void **set\_alsa\_client\_id** (int id)  
*Make ourselves a LASH ALSA client.*
- void **start** ()  
*Process any LASH events every 250 msec, which is an arbitrarily chosen interval.*

#### 6.7.1 Detailed Description

All of the #ifdef skeleton work is done in this class in such a way that any other part of the code can use this class whether or not lash support is actually built in; the functions will just do nothing.

#### 6.7.2 Constructor & Destructor Documentation

##### 6.7.2.1 lash::lash ( int argc, char \*\* argv )

We fixed the crazy usage of argc and argv here and in the client code in the seq24 module.

## 6.8 maintime Class Reference

This class provides the drawing of the progress bar at the top of the main window, along with the "pills" that move in time with the measures.

Inherits DrawingArea.

### Public Member Functions

- **maintime** ()  
*This constructor sets up the colors black, white, and grey, and then allocates them.*
- int **idle\_progress** (long a\_ticks)  
*This function clears the window, sets the foreground to black, draws the "time" window's rectangle, and more.*

## 6.8.1 Constructor &amp; Destructor Documentation

## 6.8.1.1 maintime::maintime ( )

In the constructor you can only allocate colors; get\_window() would return 0 because the windows has not yet been realized.

## 6.8.2 Member Function Documentation

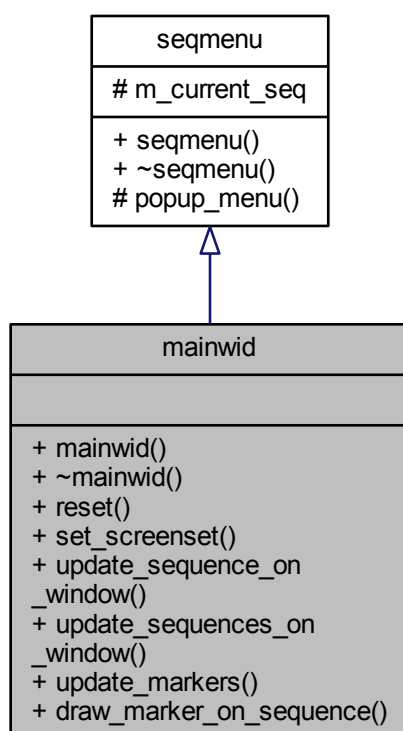
## 6.8.2.1 int maintime::idle\_progress ( long a\_ticks )

Idle hands do the devil's work. We need to figure at a high level what this routine draws, what a maintime is, and where it is located.

## 6.9 mainwid Class Reference

This class implement the piano roll area of the application.

Inheritance diagram for mainwid:



## Public Member Functions

- `mainwid (perform *a_p)`  
*Static array of characters for use in toggling patterns.*
- `~mainwid ()`

*A rote destructor.*

- void `reset ()`

*This function redraws everything and queues up a redraw operation.*

- void `set_screenset (int a_ss)`

*Set the current screen set.*

- void `update_sequence_on_window (int a_seq)`

*Updates the image of one sequencer.*

- void `update_sequences_on_window ()`

*Updates the image of multiple sequencers.*

- void `update_markers (int a_ticks)`

*Draw the cursors (long vertical bars) on each sequence, so that they follow the playing progress of each sequence in the mainwid (Patterns Panel.)*

- void `draw_marker_on_sequence (int a_seq, int a_tick)`

*Does the actual drawing of one pattern/sequence position marker (a vertical bar).*

## Additional Inherited Members

### 6.9.1 Constructor & Destructor Documentation

#### 6.9.1.1 `mainwid::mainwid ( perform * a_p )`

These look like the "Sequence toggle keys" in the Options / Keyboard dialog, except that they are upper-case here, and lower-case in that configuration dialog.

*Obsolete* It's only use was in this module, and is commented out below, replaced by another lookup method.

```
const char mainwid::m_seq_to_char[c_seqs_in_set] =
{
    '1', 'Q', 'A', 'Z',
    '2', 'W', 'S', 'X',
    '3', 'E', 'D', 'C',
    '4', 'R', 'F', 'V',
    '5', 'T', 'G', 'B',
    '6', 'Y', 'H', 'N',
    '7', 'U', 'J', 'M',
    '8', 'I', 'K', ', '
};
```

This constructor sets a lot of the members, but not all. And it asks for a size of `c_mainwid_x` by `c_mainwid_y`. It adds GDK masks for button presses, releases, and motion, and key presses and focus changes.

### 6.9.2 Member Function Documentation

#### 6.9.2.1 `void mainwid::draw_marker_on_sequence ( int a_seq, int a_tick )`

More Common code.

## 6.10 mainwnd Class Reference

This class implements the functionality of the main window of the application, except for the Patterns Panel functionality, which is implemented in the `mainwid` class.

Inherits `Window`, and `performcallback`.

## Public Member Functions

- [mainwnd](#) ([perform](#) \*a\_p)  
*The constructor the main window of the application.*
- [~mainwnd](#) ()  
*This destructor must explicitly delete some allocated resources.*
- void [open\\_file](#) (const std::string &)  
*Opens a MIDI file.*

## 6.10.1 Constructor &amp; Destructor Documentation

6.10.1.1 mainwnd::mainwnd ( [perform](#) \* a\_p )

This constructor is way too large; it would be nicer to provide a number of well-named initialization functions. File menu items, their accelerator keys, and their hot keys.

View menu items and their hot keys.

Help menu items

Top panel items, including the logo (updated for the new version of this application) and the "timeline" progress bar.

## 6.11 mastermidibus Class Reference

The class that "supervises" all of the midibus objects?

## Public Member Functions

- [mastermidibus](#) ()  
*The mastermidibus constructor fills the array with our busses.*
- [~mastermidibus](#) ()  
*The destructor deletes all of the output busses, clears out the ALSA events, stops and frees the queue, and closes ALSA for this application.*
- void [init](#) ()  
*Initialize the mastermidibus.*
- [snd\\_seq\\_t](#) \* [get\\_alsa\\_seq](#) () const  
*'Getter' function for member m\_alsa\_seq*
- int [get\\_num\\_out\\_buses](#) () const  
*'Getter' function for member m\_num\_out\_buses*
- int [get\\_num\\_in\\_buses](#) () const  
*'Getter' function for member m\_num\_in\_buses*
- void [set\\_bpm](#) (int a\_bpm)  
*Set the BPM value (beats per minute).*
- void [set\\_ppqn](#) (int a\_ppqn)  
*Set the PPQN value (parts per quarter note).*
- int [get\\_bpm](#) () const  
*'Getter' function for member m\_bpm*
- int [get\\_ppqn](#) () const  
*'Getter' function for member m\_ppqn*
- std::string [get\\_midi\\_out\\_bus\\_name](#) (int a\_bus)  
*Get the MIDI output buss name for the given (legal) buss number.*
- std::string [get\\_midi\\_in\\_bus\\_name](#) (int a\_bus)

- Get the MIDI input buss name for the given (legal) buss number.*
- void `print` ()
  - Print some information about the available MIDI output busses.*
- void `flush` ()
  - Flushes our local queue events out into ALSA.*
- void `start` ()
  - Starts all of the configured output busses up to `m_num_out_busses`.*
- void `stop` ()
  - Stops each of the output busses.*
- void `clock` (long `a_tick`)
  - Generates the MIDI clock for each of the output busses.*
- void `continue_from` (long `a_tick`)
  - Gets the output busses running again.*
- void `init_clock` (long `a_tick`)
  - Initializes the clock of each of the output busses.*
- int `poll_for_midi` ()
  - Initiate a poll() on the existing poll descriptors.*
- bool `is_more_input` ()
  - Test the ALSA sequencer to see if any more input is pending.*
- bool `get_midi_event` (event `*a_in`)
  - Grab a MIDI event.*
- void `set_sequence_input` (bool `a_state`, sequence `*a_seq`)
  - Set the input sequence object, and set the `m_dumping_input` value to the given state.*
- bool `is_dumping` () const
  - 'Getter' function for member `m_dumping_input`*
- sequence `* get_sequence` () const
  - 'Getter' function for member `m_seq`*
- void `sysex` (event `*a_event`)
  - Handle the sending of SYSEX events.*
- void `port_start` (int `a_client`, int `a_port`)
  - Start the given ALSA MIDI port.*
- void `port_exit` (int `a_client`, int `a_port`)
  - Turn off the given port for the given client.*
- void `play` (unsigned char `a_bus`, event `*a_e24`, unsigned char `a_channel`)
  - Handle the playing of MIDI events on the MIDI buss given by the parameter, as long as it is a legal buss number.*
- void `set_clock` (unsigned char `a_bus`, clock\_e `a_clock_type`)
  - Set the clock for the given (legal) buss number.*
- clock\_e `get_clock` (unsigned char `a_bus`)
  - Get the clock for the given (legal) buss number.*
- void `set_input` (unsigned char `a_bus`, bool `a_inputting`)
  - Set the status of the given input buss, if a legal buss number.*
- bool `get_input` (unsigned char `a_bus`)
  - Get the input for the given (legal) buss number.*

### 6.11.1 Member Function Documentation

#### 6.11.1.1 void mastermidibus::init ( )

It initializes 16 MIDI output busses, a hardwired constant, 16. Only one MIDI input buss is initialized.

#### 6.11.1.2 void mastermidibus::set\_bpm ( int *a\_bpm* )

This is done by creating an ALSA tempo structure, adding tempo information to it, and then setting the ALSA sequencer object with this information.

*Threadsafe*

#### 6.11.1.3 void mastermidibus::set\_ppqn ( int *a\_ppqn* )

This is done by creating an ALSA tempo structure, adding tempo information to it, and then setting the ALSA sequencer object with this information.

*Threadsafe*

#### 6.11.1.4 void mastermidibus::flush ( )

*Threadsafe*

#### 6.11.1.5 void mastermidibus::start ( )

*Threadsafe*

#### 6.11.1.6 void mastermidibus::stop ( )

*Threadsafe*

#### 6.11.1.7 void mastermidibus::clock ( long *a\_tick* )

*Threadsafe*

#### 6.11.1.8 void mastermidibus::continue\_from ( long *a\_tick* )

*Threadsafe*

#### 6.11.1.9 void mastermidibus::init\_clock ( long *a\_tick* )

*Threadsafe*

#### 6.11.1.10 bool mastermidibus::is\_more\_input ( )

*Threadsafe*

#### 6.11.1.11 bool mastermidibus::get\_midi\_event ( event \* *a\_in* )

*Threadsafe*

#### 6.11.1.12 void mastermidibus::set\_sequence\_input ( bool *a\_state*, sequence \* *a\_seq* )

*Threadsafe*

#### 6.11.1.13 void mastermidibus::sysex ( event \* *a\_ev* )

*Threadsafe*

#### 6.11.1.14 void mastermidibus::port\_start ( int *a\_client*, int *a\_port* )

*Threadsafe* Quite a lot is done during the lock!

#### 6.11.1.15 void mastermidibus::port\_exit ( int *a\_client*, int *a\_port* )

*Threadsafe*



6.11.1.16 void mastermidibus::play ( unsigned char *a\_bus*, event \* *a\_e24*, unsigned char *a\_channel* )

*Threadsafe*

6.11.1.17 void mastermidibus::set\_clock ( unsigned char *a\_bus*, clock\_e *a\_clock\_type* )

*Threadsafe*

6.11.1.18 void mastermidibus::set\_input ( unsigned char *a\_bus*, bool *a\_inputting* )

Why is another buss-count constant, and a global one at that, being used? And I thought there was only one input buss anyway!

*Threadsafe*

## 6.12 midibus Class Reference

Provides a class for handling the MIDI buss on Linux.

### Public Member Functions

- [midibus](#) (int *a\_localclient*, int *a\_destclient*, int *a\_destport*, snd\_seq\_t \**a\_seq*, const char \**a\_client\_name*, const char \**a\_port\_name*, int *a\_id*, int *a\_queue*)  
*Provides a constructor with client number, port number, ALSA sequencer support, name of client, name of port.*
- [midibus](#) (int *a\_localclient*, snd\_seq\_t \**a\_seq*, int *a\_id*, int *a\_queue*)  
*Secondary constructor.*
- [~midibus](#) ()  
*A rote empty destructor.*
- bool [init\\_out](#) ()  
*Initialize the MIDI output port.*
- bool [init\\_in](#) ()  
*Initialize the MIDI input port.*
- bool [deinit\\_in](#) ()  
*Deinitialize the MIDI input?*
- bool [init\\_out\\_sub](#) ()  
*Initialize the output in a different way?*
- bool [init\\_in\\_sub](#) ()  
*Initialize the output in a different way?*
- void [print](#) ()  
*Prints m\_name.*
- const std::string & [get\\_name](#) () const  
*'Getter' function for member n\_name*
- int [get\\_id](#) () const  
*'Getter' function for member m\_id*
- void [play](#) (event \**a\_e24*, unsigned char *a\_channel*)  
*This play() function takes a native event, encodes it to ALSA event, and puts it in the queue.*
- void [sysex](#) (event \**a\_e24*)  
*Takes a native SYSEX event, encodes it to an ALSA event, and then puts it in the queue.*
- void [start](#) ()  
*This function gets the MIDI clock a-runnin', if the clock type is not e\_clock\_off.*
- void [stop](#) ()  
*Stop the MIDI buss.*
- void [clock](#) (long *a\_tick*)

- *Generates the MIDI clock, starting at the given tick value.*
- void [continue\\_from](#) (long a\_tick)  
*Continueu from the given tick.*
- void [init\\_clock](#) (long a\_tick)  
*Initialize the clock, continuing from the given tick.*
- void [set\\_clock](#) (clock\_e a\_clock\_type)  
*'Setter' function for member m\_clock\_type*
- clock\_e [get\\_clock](#) () const  
*'Getter' function for member m\_clock\_type*
- void [set\\_input](#) (bool a\_inputing)  
*Input functions.*
- bool [get\\_input](#) () const  
*'Getter' function for member m\_inputing*
- void [flush](#) ()  
*Flushes our local queue events out into ALSA.*
- int [get\\_client](#) () const  
*'Getter' function for member m\_dest\_addr\_client The address of client.*
- int [get\\_port](#) () const  
*'Getter' function for member m\_dest\_addr\_port*

#### Static Public Member Functions

- static void [set\\_clock\\_mod](#) (int a\_clock\_mod)  
*Set the clock mod to the given value, if legal.*
- static int [get\\_clock\\_mod](#) ()  
*Get the clock mod.*

#### Friends

- class [mastermidibus](#)  
*The master MIDI bus sets up the buss.*

#### 6.12.1 Member Function Documentation

##### 6.12.1.1 void midibus::set\_input ( bool a\_inputing )

Set status to of "inputting" to the given value.

If the parameter is true, then [init\\_in\(\)](#) is called; otherwise, [deinit\\_in\(\)](#) is called.

## 6.13 midifile Class Reference

This class handles the parsing and writing of MIDI files.

#### Public Member Functions

- [midifile](#) (const std::string &name, bool propformat=true)  
*Principal constructor.*
- [~midifile](#) ()  
*A rote destructor.*
- bool [parse](#) ([perform](#) \*a\_perf, int a\_screen\_set)  
*This function opens a binary MIDI file and parses it into sequences and other application objects.*

### 6.13.1 Detailed Description

In addition to the standard MIDI tracks, it also handles some "private" or "proprietary" tracks specific to Seq24. It does not, however, handle SYSEX events.

### 6.13.2 Constructor & Destructor Documentation

#### 6.13.2.1 `midifile::midifile ( const std::string & a_name, bool propformat = true )`

##### Parameters

<i>a_name</i>	Provides the name of the MIDI file to be read or written.
<i>propformat</i>	If true, write out the MIDI file using the MIDI-compliant sequencer-specific prefix in from of the seq24-specific SeqSpec tags defined in the globals module. This option is true by default. Note that this option is only used in writing; reading can handle either format transparently.

## 6.14 options Class Reference

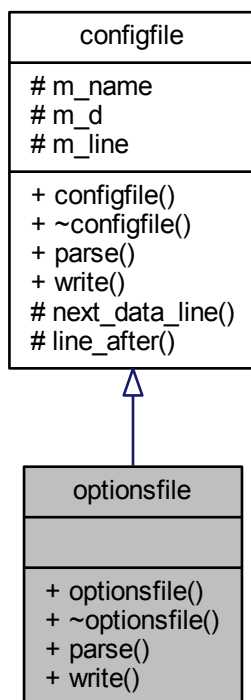
This class supports a full tabbed options dialog.

Inherits Dialog.

## 6.15 optionsfile Class Reference

Provides a file for reading and writing the application' main configuration file.

Inheritance diagram for optionsfile:



### Public Member Functions

- `optionsfile` (const std::string &a\_name)  
*Principal constructor.*
- `~optionsfile` ()  
*A rote destructor.*
- bool `parse` (perform \*a\_perf)  
*Parse the ~/.seq24rc file.*
- bool `write` (perform \*a\_perf)  
*This options-writing function is just about as complex as the options-reading function.*

### Additional Inherited Members

#### 6.15.1 Member Function Documentation

##### 6.15.1.1 bool optionsfile::parse ( perform \* a\_perf ) [virtual]

[midi-control]

Get the number of sequence definitions provided in the [midi-control] section. Ranges from 32 on up. Then read in all of the sequence lines. The first 32 apply to the first screen set. There can also be a comment line "# mute in group" followed by 32 more lines. Then there are additional comments and single lines for BPM up, BPM down, Screen Set Up, Screen Set Down, Mod Replace, Mod Snapshot, Mod Queue, Mod Gmute, Mod Glearn, and Screen Set Play. These are all forms of MIDI automation useful to control the playback while not sitting near the computer.

### [mute-group]

The mute-group starts with a line that indicates up to 32 mute-groups are defined. A common value is 1024, which means there are 32 groups times 32 keys. But this value is currently thrown away. This value is followed by 32 lines of data, each contained 4 sets of 8 settings. See the seq24-doc project on GitHub for a much more detailed description of this section.

### [midi-clock]

The MIDI-clock section defines the clocking value for up to 16 output busses. The first number, 16, indicates how many busses are specified. Generally, these busses are shown to the user with names such as "[1] seq24 1".

### [keyboard-control]

The keyboard control defines the keys that will toggle the stage of each of up to 32 patterns in a pattern/sequence box. These keys are displayed in each box as a reminder. The first number specifies the Key number, and the second number specifies the Sequence number.

### [keyboard-group]

The keyboard group specifies more automation for the application. The first number specifies the Key number, and the second number specifies the Group number. This section should be better described in the seq24-doc project on GitHub.

### [jack-transport]

This section covers various JACK settings, one setting per line. In order, the following numbers are specified:

- jack\_transport - Enable sync with JACK Transport.
- jack\_master - Seq24 will attempt to serve as JACK Master.
- jack\_master\_cond - Seq24 will fail to be Master if there is already a Master set.
- jack\_start\_mode:
  - 0 = Playback will be in Live mode. Use this to allow muting and unmuting of loops.
  - 1 = Playback will use the Song Editor's data.

### [midi-input]

This section covers the MIDI input busses, and has a format similar to "[midi-clock]". Generally, these busses are shown to the user with names such as "[1] seq24 1", and currently there is only one input buss. The first field is the port number, and the second number indicates whether it is disabled (0), or enabled (1).

### [midi-clock-mod-ticks]

This section covers.... One common value is 64.

### [manual-alsa-ports]

This section covers.... Set to 1 if you want seq24 to create its own ALSA ports and not connect to other clients.

### [last-used-dir]

This section simply holds the last path-name that was used to read or write a MIDI file. We still need to add a check for a valid path, and currently the path must start with a "/", so it is not suitable for Windows.

### [interaction-method]

This section specified the kind of mouse interaction.

- 0 = 'seq24' (original Seq24 method).
- 1 = 'fruity' (similar to a certain fruity sequencer we like).

Implements [configfile](#).

## 6.16 perfedit Class Reference

This class supports a Performance Editor that is used to arrange the patterns/sequences defined in the patterns panel, I think.

Inherits Window.

#### Public Member Functions

- [perfedit](#) ([perform](#) \*a\_perf)

*Principal constructor, has a pointer to a perform object.*

- [~perfedit](#) ()

*This rote constructor does nothing.*

- void [init\\_before\\_show](#) ()

*This function forwards its call to the perffroll function of the same name.*

#### 6.16.1 Detailed Description

It has a seqroll and piano roll? No, it has a perform, a perfnames, a perffroll, and a perftime.

#### 6.16.2 Constructor & Destructor Documentation

##### 6.16.2.1 `perfedit::perfedit ( perform * a_perf )`

We've reordered the pointer members and put them in the initializer list to make the constructor a bit cleaner.

##### 6.16.2.2 `perfedit::~~perfedit ( )`

We're going to have to run the application through valgrind to make sure that nothing is left behind.

#### 6.16.3 Member Function Documentation

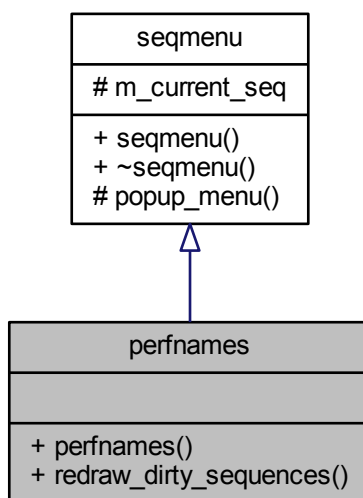
##### 6.16.3.1 `void perfedit::init_before_show ( )`

It does not seem to need to also forward to the perftime function of the same name.

## 6.17 perfnames Class Reference

This class implements the left-side keyboard in the patterns window.

Inheritance diagram for perfnames:



#### Public Member Functions

- `perfnames` (`perform` \*a\_perf, Gtk::Adjustment \*a\_vadjust)  
*Principal constructor for this user-interface object.*
- `void redraw_dirty_sequences` ()  
*Redraws sequences that have been modified.*

#### Additional Inherited Members

### 6.18 perform Class Reference

This class supports the performance mode.

#### Public Types

- `typedef std::map< unsigned int, long > SlotMap`  
*This typedef defines a map in which the key is the keycode, that is, the integer value of a keystroke, and the value is the pattern/sequence number or slot.*
- `typedef std::map< long, unsigned int > RevSlotMap`  
*This typedef is like SlotMap, but used for lookup in the other direction.*

#### Public Member Functions

- `perform` ()  
*This construction initializes a vast number of member variables, some of them public!*
- `~perform` ()  
*The destructor sets some running flags to false, signals this condition, then joins the input and output threads if the were launched.*

- [mastermidibus](#) & [master\\_bus](#) ()
  - 'Getter' function for member m\_master\_bus*
- bool [is\\_running](#) () const
  - 'Getter' function for member m\_running*
- bool [is\\_learn\\_mode](#) () const
  - 'Getter' function for member m\_mode\_group\_learn*
- void [init](#) ()
  - Initializes the master MIDI bus.*
- void [clear\\_all](#) ()
  - Clears all of the patterns/sequences.*
- void [launch\\_input\\_thread](#) ()
  - Creates the input thread using input\_thread\_func().*
- void [launch\\_output\\_thread](#) ()
  - Creates the output thread using output\_thread\_func().*
- void [init\\_jack](#) ()
  - Initializes JACK support, if JACK\_SUPPORT is defined.*
- void [deinit\\_jack](#) ()
  - Tears down the JACK infrastructure.*
- void [add\\_sequence](#) ([sequence](#) \*a\_seq, int a\_perf)
  - Adds a pattern/sequence pointer to the list of patterns.*
- void [delete\\_sequence](#) (int a\_num)
  - Deletes a pattern/sequence by number.*
- bool [is\\_sequence\\_in\\_edit](#) (int a\_num)
  - Check if the pattern/sequence, given by number, has an edit in progress.*
- void [clear\\_sequence\\_triggers](#) (int a\_seq)
  - Clears the patterns/sequence for the given sequence, if it is active.*
- bool [is\\_sequence\\_valid](#) (int a\_sequence) const
  - Provides common code to check for the bounds of a sequence number.*
- bool [is\\_sequence\\_invalid](#) (int a\_sequence) const
  - Provides common code to check for the bounds of a sequence number.*
- void [set\\_left\\_tick](#) (long a\_tick)
  - Set the left marker at the given tick.*
- long [get\\_left\\_tick](#) () const
  - 'Getter' function for member m\_left\_tick*
- void [set\\_starting\\_tick](#) (long a\_tick)
  - 'Setter' function for member m\_starting\_tick*
- long [get\\_starting\\_tick](#) () const
  - 'Getter' function for member m\_starting\_tick*
- void [set\\_right\\_tick](#) (long a\_tick)
  - Set the right marker at the given tick.*
- long [get\\_right\\_tick](#) () const
  - 'Getter' function for member m\_right\_tick*
- void [move\\_triggers](#) (bool a\_direction)
  - If the left tick is less than the right tick, then, for each sequence that is active, its triggers are moved by the difference between the right and left in the specified direction.*
- void [copy\\_triggers](#) ()
  - If the left tick is less than the right tick, then, for each sequence that is active, its triggers are copied, offset by the difference between the right and left.*
- void [push\\_trigger\\_undo](#) ()
  - For every active sequence, call that sequence's [push\\_trigger\\_undo\(\)](#) function.*
- void [pop\\_trigger\\_undo](#) ()



- For every active sequence, call that sequence's `pop_trigger_undo()` function.*

  - void `print ()`

*An information printing function with its body commented out.*
  - midi\_control \* `get_midi_control_toggle` (unsigned int a\_seq)

*Retrieves a value from `m_midi_cc_toggle[]`.*
  - midi\_control \* `get_midi_control_on` (unsigned int a\_seq)

*Retrieves a value from `m_midi_cc_on[]`.*
  - midi\_control \* `get_midi_control_off` (unsigned int a\_seq)

*Retrieves a value from `m_midi_cc_off[]`.*
  - void `handle_midi_control` (int a\_control, bool a\_state)

*Handle the MIDI Control values that provide some automation for the application.*
  - void `set_screen_set_notepad` (int a\_screen\_set, std::string \*a\_note)

*Copies the given string into `m_screen_set_notepad[]`.*
  - std::string \* `get_screen_set_notepad` (int a\_screen\_set)

*Retrieves the given string from `m_screen_set_notepad[]`.*
  - void `set_screenset` (int a\_ss)

*Sets the `m_screen_set` value (the index or ID of the current screen set).*
  - int `get_screenset ()` const

*'Getter' function for member `m_screen_set`*
  - void `set_playing_screenset ()`

*Sets the screen set that is active, based on the value of `m_playing_screen`.*
  - int `get_playing_screenset ()` const

*'Getter' function for member `m_playing_screen`*
  - void `mute_group_tracks ()`

*Will need to study this one more closely.*
  - void `select_and_mute_group` (int a\_g\_group)

*Select a mute group and then mutes the track in the group.*
  - void `set_mode_group_mute ()`

*'Setter' function for member `m_mode_group`*
  - void `unset_mode_group_mute ()`

*'Setter' function for member `m_mode_group` Unsets this member.*
  - void `select_group_mute` (int a\_g\_mute)

*Makes some checks and sets the group mute flag.*
  - void `set_mode_group_learn ()`

*Sets the group-mute mode, then the group-learn mode, then notifies all of the notification subscribers.*
  - void `unset_mode_group_learn ()`

*Notifies all of the notification subscribers that group-learn is being turned off.*
  - void `select_mute_group` (int a\_group)

*Will need to study this one more closely.*
  - void `start` (bool a\_state)

*If JACK is not running, call `inner_start()` with the given state.*
  - void `stop ()`

*If JACK is not running, call `inner_stop()`.*
  - bool `jack_session_event ()`

*Writes the MIDI file named "<jack session dir>-file.mid" using a mididfile object, quits if told to by JACK, and can free the JACK session event.*
  - void `start_jack ()`

*If JACK is supported, starts the JACK transport.*
  - void `stop_jack ()`

*If JACK is supported, stops the JACK transport.*
  - void `position_jack` (bool a\_state)

- If JACK is supported and running, sets the position of the transport.*

  - void `off_sequences` ()

*For all active patterns/sequences, set the playing state to false.*

- void `all_notes_off` ()

*For all active patterns/sequences, turn off its playing notes.*

- void `set_active` (int a\_sequence, bool a\_active)

*Sets or unsets the active state of the given pattern/sequence number.*

- void `set_was_active` (int a\_sequence)

*Sets was-active flags: main, edit, perf, and names.*

- bool `is_active` (int a\_sequence)

*Checks the pattern/sequence for activity.*

- bool `is_dirty_main` (int a\_sequence)

*Checks the pattern/sequence for main-dirtiness.*

- bool `is_dirty_edit` (int a\_sequence)

*Checks the pattern/sequence for edit-dirtiness.*

- bool `is_dirty_perf` (int a\_sequence)

*Checks the pattern/sequence for perf-dirtiness.*

- bool `is_dirty_names` (int a\_sequence)

*Checks the pattern/sequence for names-dirtiness.*

- void `new_sequence` (int a\_sequence)

*Creates a new pattern/sequence for the given slot, and sets the new pattern's master MIDI bus address.*

- `sequence * get_sequence` (int a\_sequence)

*Retrieves the actual sequence, based on the pattern/sequence number.*

- void `reset_sequences` ()

*For all active patterns/sequences, get its playing state, turn off the playing notes, set playing to false, zero the markers, and, if not in playback mode, restore the playing state.*

- void `play` (long a\_tick)

*Plays all notes to the current tick.*

- void `set_orig_ticks` (long a\_tick)

*For every pattern/sequence that is active, sets the "original ticks" value for the pattern.*

- void `set_bpm` (int a\_bpm)

*Sets the value of the BPM into the master MIDI buss, after making sure it is squelched to be between 20 and 500.*

- int `get_bpm` ()

*Retrieves the BPM setting of the master MIDI buss.*

- void `set_looping` (bool a\_looping)

*'Setter' function for member m\_looping*

- void `set_sequence_control_status` (int a\_status)

*If the given status is present in the c\_status\_snapshot, the playing state is saved.*

- void `unset_sequence_control_status` (int a\_status)

*If the given status is present in the c\_status\_snapshot, the playing state is restored.*

- void `set_group_mute_state` (int a\_g\_track, bool a\_mute\_state)

*'Setter' function for member m\_mute\_group*

- bool `get_group_mute_state` (int a\_g\_track)

*'Getter' function for member m\_mute\_group*

- void `mute_all_tracks` ()

*Mutes all tracks in the current set of active patterns/sequences.*

- void `output_func` ()

*Performance output function.*

- void `input_func` ()

*This function is called by input\_thread\_func().*

- long `get_max_trigger` ()

- Locates the largest trigger value among the active sequences.*

  - void `set_offset` (int a\_offset)

*Calculates the offset into the screen sets.*
- void `save_playing_state` ()

*For all active patterns/sequences, this function gets the playing status and saves it in `m_sequence_state[i]`.*
- void `restore_playing_state` ()

*For all active patterns/sequences, this function gets the playing status from `m_sequence_state[i]` and sets it for the sequence.*
- void `set_key_event` (unsigned int keycode, long sequence\_slot)

*At construction time, this function sets up one keycode and one event slot.*
- void `set_key_group` (unsigned int keycode, long group\_slot)

*At construction time, this function sets up one keycode and one group slot.*
- bool `show_ui_sequence_key` () const

**Accessor** `m_show_ui_sequency_key`

#### Data Fields

- unsigned int `m_key_bpm_up`
- Provides key assignments for some key sequencer features.*

#### Friends

- class **midifile**
  - class **optionsfile**
  - class **options**
  - int `jack_sync_callback` (jack\_transport\_state\_t state, jack\_position\_t \*pos, void \*arg)
- This JACK synchronization callback informs the specified perform object of the current state and parameters of JACK.*
- void `jack_shutdown` (void \*arg)
- Shutdown JACK by clearing the `perform::m_jack_running` flag.*
- void `jack_timebase_callback` (jack\_transport\_state\_t state, jack\_nframes\_t nframes, jack\_position\_t \*pos, int new\_pos, void \*arg)
- This function...*

#### 6.18.1 Detailed Description

It has way too many data members, many of the public. Might be ripe for refactoring.

#### 6.18.2 Constructor & Destructor Documentation

##### 6.18.2.1 `perform::~~perform` ( )

Finally, any active patterns/sequences are deleted.

#### 6.18.3 Member Function Documentation

##### 6.18.3.1 `void perform::launch_input_thread` ( )

This might be a good candidate for a small thread class derived from a small base class.

##### 6.18.3.2 `void perform::launch_output_thread` ( )

This might be a good candidate for a small thread class derived from a small base class.

### 6.18.3.3 void perform::add\_sequence ( sequence \* a\_seq, int a\_perf )

No check is made for a null pointer.

Check for preferred. This occurs if a\_perf is in the valid range (0 to c\_max\_sequence) and it is not active. If preferred, then add it and activate it.

Otherwise, iterate through all patterns from a\_perf to c\_max\_sequence and add and activate the first one that is not active.

Is there a usefulness in setting the sequence's tag?

#### Warning

The logic of the if-statement in this function was such that *a\_perf* could be out-of-bounds in the else-clause. We reworked the logic to be airtight. This bug was caught by gcc 4.8.3 on CentOS, but not on gcc 4.9.3 on Debian Sid! However, this decision-making seems goofy, and we ought to revisit it!

#### Parameters

<i>a_seq</i>	The number or index of the pattern/sequence to add. If this value is out-of-range, then it is ignored.
<i>a_perf</i>	The performance number of the pattern?

### 6.18.3.4 void perform::clear\_sequence\_triggers ( int a\_seq )

#### Parameters

<i>a_seq</i>	Provides the desired sequence. Hopefull, the <a href="#">is_active()</a> function validates this value.
--------------	---

### 6.18.3.5 bool perform::is\_sequence\_valid ( int a\_sequence ) const [inline]

#### Returns

Returns true if the sequence number is valid.

### 6.18.3.6 bool perform::is\_sequence\_invalid ( int a\_sequence ) const [inline]

#### Returns

Returns true if the sequence number is invalid.

### 6.18.3.7 void perform::move\_triggers ( bool a\_direction )

#### Parameters

<i>a_direction</i>	Specifies the desired direction; false = left, true = right.
--------------------	--

### 6.18.3.8 void perform::copy\_triggers ( )

This copies the triggers between the L marker and R marker to the R marker.

### 6.18.3.9 midi\_control \* perform::get\_midi\_control\_toggle ( unsigned int a\_seq )

#### Parameters

<i>a_seq</i>	Provides a control value (such as c_midi_control_bpm_up) to use to retrieve the desired midi_control object. Note that this value is unsigned simply to make the legality check of the parameter easier.
--------------	--

### 6.18.3.10 midi\_control \* perform::get\_midi\_control\_on ( unsigned int a\_seq )

## Parameters

<i>a_seq</i>	Provides a control value (such as <code>c_midi_control_bpm_up</code> ) to use to retrieve the desired <code>midi_control</code> object.
--------------	---

6.18.3.11 `midi_control * perform::get_midi_control_off ( unsigned int a_seq )`

## Parameters

<i>a_seq</i>	Provides a control value (such as <code>c_midi_control_bpm_up</code> ) to use to retrieve the desired <code>midi_control</code> object.
--------------	---

6.18.3.12 `void perform::set_screen_set_notepad ( int a_screen_set, std::string * a_notepad )`

## Parameters

<i>a_screen_set</i>	The ID number of the string set, an index into the <code>m_screen_set_xxx[]</code> arrays.
<i>a_notepad</i>	Provides the string data to copy into the notepad. Not sure why a pointer is used, instead of nice "const std::string &" parameter. And this pointer isn't checked.

6.18.3.13 `std::string * perform::get_screen_set_notepad ( int a_screen_set )`

## Parameters

<i>a_screen_set</i>	The ID number of the string set, an index into the <code>m_screen_set_xxx[]</code> arrays.
---------------------	--

6.18.3.14 `void perform::set_screenset ( int a_ss )`

## Parameters

<i>a_ss</i>	The index of the desired string set. It is forced to range from 0 to <code>c_max_sets - 1</code> .
-------------	--

6.18.3.15 `void perform::set_playing_screenset ( )`

For each value up to `c_seqs_in_set` (32), the index of the current sequence in the currently screen set (`m_playing_↔_screen`) is obtained. If it is active and the sequence actually exists

Modifies `m_playing_screen`, and mutes the group tracks.

6.18.3.16 `void perform::unset_mode_group_learn ( )`

Then unsets the group-learn mode flag..

6.18.3.17 `void perform::start ( bool a_state )`

## Parameters

<i>a_state</i>	What does this state mean?
----------------	----------------------------

6.18.3.18 `void perform::stop ( )`

The logic seems backward here, in that we call `inner_stop()` if JACK is not running. Or perhaps we misunderstand the meaning of `m_jack_running`?

6.18.3.19 `bool perform::jack_session_event ( )`

ca 2015-07-24 Just a note: The OMA (OpenMandrivaAssociation) patch was already applied to seq24 v.0.9.2. It put quotes around the `-file` argument.

Why are we using a `Glib::ustring` here? Convenience. But with C++11, we could use a `lexical_cast<>`. No more

uststring, baby!

It doesn't really matter; this function can call `Gtk::Main::quit()`.

**6.18.3.20** `void perform::position_jack ( bool a_state )`

#### Warning

A lot of this code is effectively disabled by an early return statement.

**6.18.3.21** `void perform::all_notes_off ( )`

Then flush the MIDI buss.

**6.18.3.22** `void perform::set_was_active ( int a_sequence )`

#### Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

**6.18.3.23** `bool perform::is_active ( int a_sequence )`

#### Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

#### Returns

Returns the value of the active-flag, or false if the pattern was invalid.

**6.18.3.24** `bool perform::is_dirty_main ( int a_sequence )`

#### Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

#### Returns

Returns the was-active-main flag value, before setting it to false. Returns false if the pattern was invalid.

**6.18.3.25** `bool perform::is_dirty_edit ( int a_sequence )`

#### Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

#### Returns

Returns the was-active-edit flag value, before setting it to false. Returns false if the pattern was invalid.

**6.18.3.26** `bool perform::is_dirty_perf ( int a_sequence )`

#### Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

#### Returns

Returns the was-active-perf flag value, before setting it to false. Returns false if the pattern/sequence number was invalid.

6.18.3.27 `bool perform::is_dirty_names ( int a_sequence )`

## Parameters

<i>a_sequence</i>	The pattern number. It is checked for invalidity.
-------------------	---

## Returns

Returns the was-active-names flag value, before setting it to false. Returns false if the pattern/sequence number was invalid.

6.18.3.28 void perform::new\_sequence ( int *a\_sequence* )

Then it activates the pattern.

It doesn't deal with thrown exceptions.

## 6.18.3.29 void perform::reset\_sequences ( )

Then flush the MIDI buss.

6.18.3.30 void perform::play ( long *a\_tick* )

Starts the playing of all the patterns/sequences.

This function just runs down the list of sequences and has them dump their events.

## Parameters

<i>a_tick</i>	Provides the tick at which to start playing.
---------------	--

6.18.3.31 void perform::set\_orig\_ticks ( long *a\_tick* )

## Parameters

<i>a_tick</i>	
---------------	--

6.18.3.32 void perform::set\_bpm ( int *a\_bpm* )

The value is set only if neither JACK nor this performance object are running.

6.18.3.33 void perform::set\_sequence\_control\_status ( int *a\_status* )

Then the given status is OR'd into the m\_control\_status.

6.18.3.34 void perform::unset\_sequence\_control\_status ( int *a\_status* )

Then the given status is reversed in m\_control\_status.

## 6.18.3.35 void perform::output\_func ( )

1. Get delta time (current - last).
2. Get delta ticks from time.
3. Add to current\_ticks.
4. Compute prebuffer ticks.
5. Play from current tick to prebuffer.

Figure out how much time we need to sleep, and do it.



#### 6.18.3.36 long perform::get\_max\_trigger ( )

##### Returns

Returns the highest trigger value, or zero. It is not clear why this function doesn't return a "no trigger found" value. Is there always at least one trigger, at 0?

#### 6.18.3.37 void perform::set\_offset ( int *a\_offset* ) [inline]

Sets `m_offset = a_offset * c_mainwnd_rows * c_mainwnd_cols`;

##### Parameters

<i>a_offset</i>	The desired offset.
-----------------	---------------------

#### 6.18.3.38 void perform::set\_key\_event ( unsigned int *keycode*, long *sequence\_slot* )

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window.

#### 6.18.3.39 void perform::set\_key\_group ( unsigned int *keycode*, long *group\_slot* )

It is called 32 times, corresponding the pattern/sequence slots in the Patterns window.

#### 6.18.3.40 bool perform::show\_ui\_sequence\_key ( ) const [inline]

Used in mainwid, options, optionsfile, userfile, and perform.

### 6.18.4 Friends And Related Function Documentation

#### 6.18.4.1 int jack\_sync\_callback ( jack\_transport\_state\_t *state*, jack\_position\_t \* *pos*, void \* *arg* ) [friend]

##### Parameters

<i>state</i>	The JACK Transport state.
<i>pos</i>	The JACK position value.
<i>arg</i>	The pointer to the perform object. Currently not checked for nullity.

### 6.18.5 Field Documentation

#### 6.18.5.1 unsigned int perform::m\_key\_bpm\_up

Used in mainwnd, options, optionsfile, perfedit, seqroll, userfile, and perform.

## 6.19 perfroll Class Reference

This class implements the performance roll user interface.

Inherits DrawingArea.

##### Public Member Functions

- [perfroll](#) ([perform](#) \**a\_perf*, Gtk::Adjustment \**a\_hadjust*, Gtk::Adjustment \**a\_vadjust*)  
*Principal constructor.*
- [~perfroll](#) ()  
*This destructor deletes the interaction object.*
- void [set\\_guides](#) (int *a\_snap*, int *a\_measure*, int *a\_beat*)  
*This function sets the snap, measure, and beats members, fills in the background, and queues up a draw operation.*

- void [update\\_sizes](#) ()  
*Updates the sizes of various items.*
- void [init\\_before\\_show](#) ()  
*Sets the roll-lengths ticks member.*
- void [fill\\_background\\_pixmap](#) ()  
*This function updates the background of the Performance roll.*
- void [increment\\_size](#) ()  
*Increments the value of `m_roll_length_ticks` by the `PPQN * 512`, then calls [update\\_sizes\(\)](#).*
- void [draw\\_progress](#) ()  
*Draws the progress line that shows where we are in the performance.*
- void [redraw\\_dirty\\_sequences](#) ()  
*Redraws patterns/sequences that have been modified.*

#### Friends

- class **FruityPerfInput**
- class **Seq24PerfInput**

## 6.20 perftime Class Reference

This class implements drawing the piano time at the top of the "performance window", also known as the "song editor".

Inherits DrawingArea.

#### Public Member Functions

- [perftime](#) ([perform](#) \*a\_perf, Gtk::Adjustment \*a\_hadjust)  
*Principal constructor.*
- void [set\\_guides](#) (int a\_snap, int a\_measure)  
*Sets the snap value and the measure-length members.*
- void [increment\\_size](#) ()  
*This function does nothing.*

### 6.20.1 Constructor & Destructor Documentation

#### 6.20.1.1 perftime::perftime ( [perform](#) \* *a\_perf*, Gtk::Adjustment \* *a\_hadjust* )

In the constructor you can only allocate colors; `get_window()` returns 0 because we have not been realized.

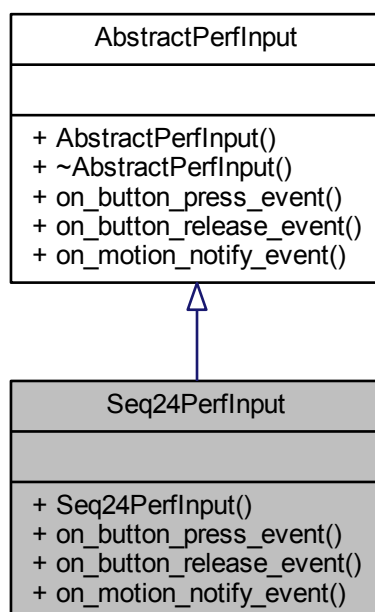
## 6.21 rect Class Reference

A small helper class representing a rectangle.

## 6.22 Seq24PerfInput Class Reference

Implements the default performance input characteristics of this application.

Inheritance diagram for Seq24PerfInput:



## Public Member Functions

- bool [on\\_button\\_press\\_event](#) (GdkEventButton \*a\_ev, [perfroll](#) &roll)  
*Handles the normal variety of button-press event.*
- bool [on\\_button\\_release\\_event](#) (GdkEventButton \*a\_ev, [perfroll](#) &roll)  
*Handles various button-release events.*
- bool [on\\_motion\\_notify\\_event](#) (GdkEventMotion \*a\_ev, [perfroll](#) &roll)  
*Handles the normal motion-notify event.*

### 6.22.1 Member Function Documentation

6.22.1.1 bool Seq24PerfInput::on\_button\_press\_event ( GdkEventButton \* a\_ev, [perfroll](#) & roll ) [virtual]

Is there any easy way to use ctrl-left-click as the middle button here?

Implements [AbstractPerfInput](#).

6.22.1.2 bool Seq24PerfInput::on\_button\_release\_event ( GdkEventButton \* a\_ev, [perfroll](#) & roll ) [virtual]

Any use for the middle-button or ctrl-left-click we can add?

Implements [AbstractPerfInput](#).

## 6.23 Seq24SeqEventInput Struct Reference

This structure implement the normal interaction methods for Seq24.

## Public Member Functions

- [Seq24SeqEventInput](#) ()  
*Default constructor.*
- void [set\\_adding](#) (bool a\_adding, [sequevent](#) &ths)  
*Changes the mouse cursor to a pencil or a left pointer in the given sequevent aobject, depending on the first parameter.*
- bool [on\\_button\\_press\\_event](#) (GdkEventButton \*a\_ev, [sequevent](#) &ths)  
*Implements the on-button-press event callback.*
- bool [on\\_button\\_release\\_event](#) (GdkEventButton \*a\_ev, [sequevent](#) &ths)  
*Implements the on-button-release callback.*
- bool [on\\_motion\\_notify\\_event](#) (GdkEventMotion \*a\_ev, [sequevent](#) &ths)  
*Implements the on-motion-notify event.*

## 6.23.1 Member Function Documentation

6.23.1.1 void Seq24SeqEventInput::set\_adding ( bool a\_adding, sequevent & sequev )

Modifies m\_adding as well.

6.23.1.2 bool Seq24SeqEventInput::on\_button\_press\_event ( GdkEventButton \* a\_ev, sequevent & ths )

**Todo** Needs update.

## 6.24 Seq24SeqRollInput Struct Reference

Implements the Seq24 mouse interaction paradigm for the seqroll.

## Public Member Functions

- [Seq24SeqRollInput](#) ()  
*Default constructor.*
- void [set\\_adding](#) (bool a\_adding, [seqroll](#) &ths)  
*Changes the mouse cursor pixmap according to whether a note is being added or not.*
- bool [on\\_button\\_press\\_event](#) (GdkEventButton \*a\_ev, [seqroll](#) &ths)  
*Implements the on-button-press event handling for the Seq24 style of mouse interaction.*
- bool [on\\_button\\_release\\_event](#) (GdkEventButton \*a\_ev, [seqroll](#) &ths)  
*Implements the on-button-release event handling for the Seq24 style of mouse interaction.*
- bool [on\\_motion\\_notify\\_event](#) (GdkEventMotion \*a\_ev, [seqroll](#) &ths)  
*Implements the on-motion-notify event handling for the Seq24 style of mouse interaction.*

## 6.24.1 Member Function Documentation

6.24.1.1 void Seq24SeqRollInput::set\_adding ( bool a\_adding, seqroll & sroll )

(Which?) popup menu calls this. It is actually a right click, I think.

## 6.25 seqdata Class Reference

This class supports drawing piano-roll events on a window.

Inherits DrawingArea.

## Public Member Functions

- `seqdata (sequence *a_seq, int a_zoom, Gtk::Adjustment *a_hadjust)`  
*Principal constructor.*
- `void reset ()`  
*This function calls `update_size()`.*
- `void redraw ()`  
*Updates the pixmap and queues up a redraw operation.*
- `void set_zoom (int a_zoom)`  
*Sets the zoom to the given value and resets the view via the reset function.*
- `void set_data_type (unsigned char a_status, unsigned char a_control)`  
*Sets the status to the given value, and the control to the optional given value, which defaults to 0, then calls `redraw()`.*
- `int idle_redraw ()`  
*Draws events on this object's built-in window and pixmap.*

## Friends

- class **seqroll**
- class **seqevent**

## 6.25.1 Constructor & Destructor Documentation

### 6.25.1.1 `seqdata::seqdata ( sequence * a_seq, int a_zoom, Gtk::Adjustment * a_hadjust )`

In the constructor you can only allocate colors, `get_window()` returns 0 because we have not been realized.

## 6.25.2 Member Function Documentation

### 6.25.2.1 `void seqdata::reset ( )`

Then, regardless of whether the view is realized, updates the pixmap and queues up a draw operation.

## Note

If it weren't for the `is_realized()` condition, we could just call `update_sizes()`, which does all this anyway.

### 6.25.2.2 `void seqdata::redraw ( ) [inline]`

We need to make this an inline function and use it as common code.

### 6.25.2.3 `void seqdata::set_zoom ( int a_zoom )`

This begs the question, do we have GUI access to the zoom setting?

### 6.25.2.4 `int seqdata::idle_redraw ( )`

This drawing is done only if there is no dragging in progress, to guarantee no flicker.

## 6.26 seqedit Class Reference

Implements the Pattern Editor, which has references to:

Inherits Window.

## Public Member Functions

- [seqedit](#) ([sequence](#) \*a\_seq, [perform](#) \*a\_perf, int a\_pos)  
*Connects to a menu item, tells the performance to launch the timer thread.*
- [~seqedit](#) ()  
*A rote destructor.*

## 6.26.1 Detailed Description

- [perform](#)
- [seqroll](#)
- [seqkeys](#)
- [seqdata](#)
- [seqtime](#)
- [seqevent](#)
- [sequence](#)

This class has a metric ton of user-interface objects and other members.

## 6.26.2 Constructor &amp; Destructor Documentation

6.26.2.1 [seqedit::seqedit](#) ( [sequence](#) \* a\_seq, [perform](#) \* a\_perf, int a\_pos )

But this is an unused, empty function.

`void seqedit::menu_action_quantise () { }` Principal constructor.

## 6.27 seqevent Class Reference

Implements the piano event drawing area.

Inherits [DrawingArea](#).

## Public Member Functions

- [seqevent](#) ([sequence](#) \*a\_seq, int a\_zoom, int a\_snap, [seqdata](#) \*a\_seqdata\_wid, [Gtk::Adjustment](#) \*a\_hadjust)  
*Principal constructor.*
- void [reset](#) ()  
*This function basically resets the whole widget as if it was realized again.*
- void [redraw](#) ()  
*Adjusts the scrolling offset for ticks, updates the pixmap, and draws it on the window.*
- void [set\\_zoom](#) (int a\_zoom)  
*Sets zoom to the given value, and resets if the value ended up being changed.*
- void [set\\_snap](#) (int a\_snap)  
*'Setter' function for member m\_snap*
- void [set\\_data\\_type](#) (unsigned char a\_status, unsigned char a\_control)  
*Sets the status to the given parameter, and the CC value to the given optional control parameter, which defaults to 0.*
- void [update\\_sizes](#) ()  
*If the window is realized, this function creates a pixmap with window dimensions, the updates the pixmap, and queues up a redraw.*

- void `draw_background()`  
*This function updates the background.*
- void `draw_events_on_pixmap()`  
*This function fills the main pixmap with events.*
- void `draw_pixmap_on_window()`  
*This function currently just queues up a draw operation for the pixmap.*
- void `draw_selection_on_window()`  
*Draw the selected events on the window.*
- void `update_pixmap()`  
*Redraws the background pixmap on the main pixmap, then puts the events on.*
- int `idle_redraw()`  
*Implements redraw while idling.*

## Friends

- struct **Seq24SeqEventInput**

### 6.27.1 Member Function Documentation

#### 6.27.1.1 void `sequevent::set_snap ( int a_snap )` `[inline]`

Simply sets the snap member.

#### 6.27.1.2 void `sequevent::set_data_type ( unsigned char a_status, unsigned char a_control = 0 )`

Then redraws.

#### 6.27.1.3 void `sequevent::update_sizes ( )`

This ends up filling the background with dotted lines, etc.

#### 6.27.1.4 void `sequevent::draw_background ( )`

It sets the foreground to white, draws the rectangle.

#### 6.27.1.5 void `sequevent::draw_pixmap_on_window ( )`

Old comments:

It then tells event to do the same.

We changed something on this window, and chances are we need to update the event widget as well and update our velocity window.

```
m_seqdata_wid->update_pixmap();
m_seqdata_wid->draw_pixmap_on_window();
RCB ??
```

#### 6.27.1.6 int `sequevent::idle_redraw ( )`

Who calls this routine?

## 6.28 seqkeys Class Reference

This class implements the left side piano of the pattern/sequence editor.

Inherits DrawingArea.

## Public Member Functions

- `seqkeys` (`sequence` \*a\_seq, Gtk::Adjustment \*a\_vadjust)  
*Principal constructor.*
- void `set_scale` (int a\_scale)  
*Sets the musical scale, then resets.*
- void `set_key` (int a\_key)  
*Sets the musical key, then resets.*
- void `set_hint_key` (int a\_key)  
*Sets a key to grey so that it can serve as a scale hint.*
- void `set_hint_state` (bool a\_state)  
*Sets the hint state to the given value.*

## 6.28.1 Member Function Documentation

## 6.28.1.1 void seqkeys::set\_hint\_state ( bool a\_state )

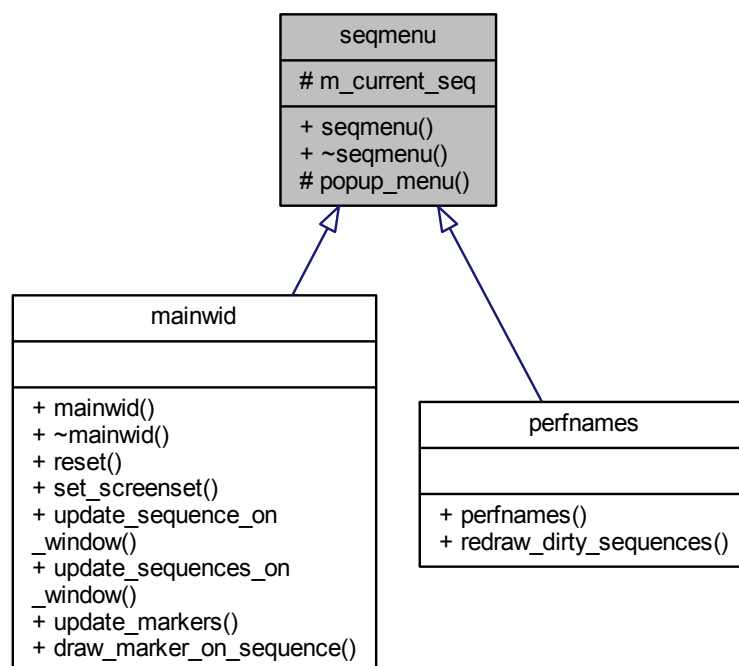
## Parameters

<code>a_state</code>	Provides the value for hinting, where true == on, false == off.
----------------------	---

## 6.29 seqmenu Class Reference

This class handles the right-click menu of the sequence slots in the pattern window.

Inheritance diagram for seqmenu:





## Public Member Functions

- `seqmenu` (`perform *a_p`)  
*Principal constructor.*
- `virtual ~seqmenu` ()  
*Provides a rote base-class destructor.*

## Protected Member Functions

- `void popup_menu` ()  
*This function sets up the File menu entries.*

### 6.29.1 Detailed Description

It is an abstract base class.

### 6.29.2 Constructor & Destructor Documentation

#### 6.29.2.1 `seqmenu::seqmenu ( perform * a_p )`

Apart from filling in some of the members, this function initializes the clipboard, so that we don't get a crash on a paste with no previous copy.

#### 6.29.2.2 `seqmenu::~~seqmenu ( )` [virtual]

A rote destructor.

This is necessary in an abstraction base class.

If we determine that we need to delete the `m_seqedit` pointer, we can do it here. But that is not likely, because we can have many new `seqedit` objects in play, because we can edit many at once.

## 6.30 seqroll Class Reference

Implements the piano roll section of the pattern editor.

Inherits `DrawingArea`.

## Public Member Functions

- `seqroll` (`perform *a_perf`, `sequence *a_seq`, `int a_zoom`, `int a_snap`, `seqdata *a_seqdata_wid`, `sequevent *a_sequevent_wid`, `seqkeys *a_seqkeys_wid`, `int a_pos`, `Gtk::Adjustment *a_hadjust`, `Gtk::Adjustment *a_vadjust`)  
*Principal constructor.*
- `~seqroll` ()  
*Provides a destructor to delete allocated objects.*
- `void reset` ()  
*This function basically resets the whole widget as if it was realized again.*
- `void redraw` ()  
*Redraws unless `m_ignore_redraw` is true.*
- `void redraw_events` ()  
*Redraws events unless `m_ignore_redraw` is true.*
- `void set_key` (`int a_key`)  
*Sets the music key to the given value, and then resets the view.*

- void [set\\_scale](#) (int a\_scale)  
*Sets the music scale to the given value, and then resets the view.*
- void [set\\_snap](#) (int a\_snap)  
*Sets the snap to the given value, and then resets the view.*
- void [set\\_zoom](#) (int a\_zoom)  
*Sets the zoom to the given value, and then resets the view.*
- void [set\\_note\\_length](#) (int a\_note\_length)  
*'Setter' function for member m\_note\_length*
- void [set\\_ignore\\_redraw](#) (bool a\_ignore)  
*'Setter' function for member m\_ignore\_redraw*
- void [set\\_data\\_type](#) (unsigned char a\_status, unsigned char a\_control)  
*Sets the status to the given parameter, and the CC value to the given optional control parameter, which defaults to 0.*
- void [set\\_background\\_sequence](#) (bool a\_state, int a\_seq)  
*This function sets the given sequence onto the piano roll of the pattern editor, so that the musician can have another pattern to play against.*
- void [update\\_pixmap](#) ()  
*This function draws the background pixmap on the main pixmap, and then draws the events on it.*
- void [update\\_sizes](#) ()  
*Update the sizes of items based on zoom, PPQN, BPM, BW (beat width) and more.*
- void [update\\_background](#) ()  
*Updates the background of this window.*
- void [draw\\_background\\_on\\_pixmap](#) ()  
*Draws the main pixmap.*
- void [draw\\_events\\_on\\_pixmap](#) ()  
*Fills the main pixmap with events.*
- void [draw\\_selection\\_on\\_window](#) ()  
*Draws the current selection on the main window.*
- void [draw\\_progress\\_on\\_window](#) ()  
*Draw a progress line on the window.*
- int [idle\\_redraw](#) ()  
*Draw the events on the main window and on the pixmap.*
- void [start\\_paste](#) ()  
*Starts a paste operation.*

#### Friends

- struct **Seq24SeqRollInput**

### 6.30.1 Member Function Documentation

#### 6.30.1.1 void seqroll::reset ( )

It's almost identical to the `change_horz()` function!

#### 6.30.1.2 void seqroll::set\_data\_type ( unsigned char a\_status, unsigned char a\_control = 0 )

Unlike the same function in `sequevent`, this version does not redraw.

#### 6.30.1.3 void seqroll::set\_background\_sequence ( bool a\_state, int a\_seq )

The `a_state` parameter sets the boolean `m_drawing_background_seq`.

#### 6.30.1.4 void seqroll::draw\_events\_on\_pixmap ( )

Just calls draw\_events\_on().

### 6.31 seqtime Class Reference

This class implements the piano time, whatever that is.

Inherits DrawingArea.

#### Public Member Functions

- [seqtime](#) ([sequence](#) \*a\_seq, int a\_zoom, Gtk::Adjustment \*a\_hadjust)  
*Principal constructor.*
- void [reset](#) ()  
*Sets the scroll offset tick and x values, updates the sizes and the pixmap, and resets the window.*
- void [redraw](#) ()  
*Very similar to the [reset\(\)](#) function, except it doesn't update the sizes.*
- void [set\\_zoom](#) (int a\_zoom)  
*Sets the zoom to the given value and resets the window.*

#### 6.31.1 Constructor & Destructor Documentation

##### 6.31.1.1 seqtime::seqtime ( [sequence](#) \* a\_seq, int a\_zoom, Gtk::Adjustment \* a\_hadjust )

In the constructor you can only allocate colors; get\_window() returns 0 because the window is not yet realized>

### 6.32 sequence Class Reference

The sequence class is firstly a receptable for a single track of MIDI data read from a MIDI file or edited into a pattern.

#### Public Types

- enum [select\\_action\\_e](#) {  
  [e\\_select](#) ,  
  [e\\_deselect](#),  
  [e\\_toggle\\_selection](#),  
  [e\\_remove\\_one](#) }

#### Public Member Functions

- [sequence](#) ()  
*Principal constructor.*
- [~sequence](#) ()  
*A rote destructor.*
- [sequence](#) & [operator=](#) (const [sequence](#) &a\_rhs)  
*Principal assignment operator.*
- int [event\\_count](#) () const  
*Returns the number of events stored in m\_list\_events.*
- void [push\\_undo](#) ()  
*Pushes the list-event into the undo-list.*
- void [pop\\_undo](#) ()

*If there are items on the undo list, this function pushes the list-event into the redo-list, puts the top of the undo-list into the list-event, pops from the undo-list, calls [verify\\_and\\_link\(\)](#), and then calls [unselect](#).*

- void [pop\\_redo](#) ()

*If there are items on the redo list, this function pushes the list-event into the undo-list, puts the top of the redo-list into the list-event, pops from the redo-list, calls [verify\\_and\\_link\(\)](#), and then calls [unselect](#).*

- void [push\\_trigger\\_undo](#) ()

*Pushes the list-trigger into the trigger undo-list, then flags each item in the undo-list as unselected.*

- void [pop\\_trigger\\_undo](#) ()

*If the trigger undo-list has any items, the list-trigger is pushed into the redo list, the top of the undo-list is copied into the list-trigger, and then pops from the undo-list.*

- void [set\\_bpm](#) (long a\_beats\_per\_measure)

*'Setter' function for member m\_time\_beats\_per\_measure*

- long [get\\_bpm](#) () const

*'Getter' function for member m\_time\_beats\_per\_measure*

- void [set\\_bw](#) (long a\_beat\_width)

*'Setter' function for member m\_time\_beat\_width*

- long [get\\_bw](#) () const

*'Getter' function for member m\_time\_beat\_width*

- void [set\\_rec\\_vol](#) (long a\_rec\_vol)

*'Setter' function for member m\_rec\_vol*

- void [set\\_song\\_mute](#) (bool a\_mute)

*'Setter' function for member m\_song\_mute*

- bool [get\\_song\\_mute](#) () const

*'Getter' function for member m\_song\_mute*

- void [set\\_editing](#) (bool a\_edit)

*'Setter' function for member m\_editing*

- bool [get\\_editing](#) (void)

*'Getter' function for member m\_editing*

- void [set\\_raise](#) (bool a\_edit)

*'Setter' function for member m\_raise*

- bool [get\\_raise](#) (void)

*'Getter' function for member m\_raise*

- void [toggle\\_queued](#) ()

*'Setter' function for member m\_queued and m\_queued\_tick*

- void [off\\_queued](#) ()

*'Setter' function for member m\_queued*

- bool [get\\_queued](#) () const

*'Getter' function for member m\_queued*

- long [get\\_queued\\_tick](#) () const

*'Getter' function for member m\_queued\_tick*

- bool [is\\_dirty\\_main](#) ()

*Returns the value of the dirty main flag, and sets that flag to false (i.e.*

- bool [is\\_dirty\\_edit](#) ()

*Returns the value of the dirty edit flag, and sets that flag to false.*

- bool [is\\_dirty\\_perf](#) ()

*Returns the value of the dirty performance flag, and sets that flag to false.*

- bool [is\\_dirty\\_names](#) ()

*Returns the value of the dirty names (heh heh) flag, and sets that flag to false.*

- void [set\\_dirty\\_mp](#) ()

*Sets the dirty flags for names, main, and performance.*

- void [set\\_dirty](#) ()

- Call `set_dirty_mp()` and then sets the dirty flag for editing.
- void `play` (long a\_tick, bool a\_playback\_mode)
  - The `play()` function dumps notes starting from the given tick, and it pre-buffers ahead.
- void `set_orig_tick` (long a\_tick)
  - 'Setter' function for member `m_last_tick`
- void `add_event` (const `event` \*a\_e)
  - Adds an event to the internal event list in a sorted manner.
- void `add_trigger` (long a\_tick, long a\_length, long a\_offset=0, bool a\_adjust\_offset=true)
  - Adds a trigger.
- void `split_trigger` (long a\_tick)
  - Splits a trigger.
- void `grow_trigger` (long a\_tick\_from, long a\_tick\_to, long a\_length)
  - Grows a trigger.
- void `del_trigger` (long a\_tick)
  - Deletes a trigger, that brackets the given tick, from the trigger-list.
- bool `unselect_triggers` ()
  - Always returns false!
- bool `intersectTriggers` (long position, long &start, long &end)
  - This function examines each trigger in the trigger list.
- bool `intersectNotes` (long position, long position\_note, long &start, long &end, long &note)
  - This function examines each note in the event list.
- bool `intersectEvents` (long posstart, long posend, long status, long &start)
  - This function examines each non-note event in the event list.
- void `move_selected_triggers_to` (long a\_tick, bool a\_adjust\_offset, int a\_which=2)
  - Moves selected triggers as per the given parameters.
- long `get_selected_trigger_start_tick` ()
  - Gets the selected trigger's start tick.
- long `get_selected_trigger_end_tick` ()
  - Gets the selected trigger's end tick.
- long `get_max_trigger` ()
  - Get the ending value of the last trigger in the trigger-list.
- void `move_triggers` (long a\_start\_tick, long a\_distance, bool a\_direction)
  - Moves triggers in the trigger-list.
- void `copy_triggers` (long a\_start\_tick, long a\_distance)
  - Not sure what these diagrams are for yet.
- void `clear_triggers` ()
  - Clears the whole list of triggers.
- long `get_trigger_offset` () const
  - 'Getter' function for member `m_trigger_offset`
- void `set_midi_bus` (char a\_mb)
  - Sets the midibus number to dump to.
- char `get_midi_bus` () const
  - 'Getter' function for member `m_bus`
- void `set_master_midi_bus` (mastermidibus \*a\_mmb)
  - 'Setter' function for member `m_masterbus`
- int `select_note_events` (long a\_tick\_s, int a\_note\_h, long a\_tick\_f, int a\_note\_l, `select_action_e` a\_action)
  - This function selects events in range of tick start, note high, tick end, and note low.
- int `select_events` (long a\_tick\_s, long a\_tick\_f, unsigned char a\_status, unsigned char a\_cc, `select_action_e` a\_action)
  - Select all events in the given range, and returns the number selected.
- int `select_events` (unsigned char a\_status, unsigned char a\_cc, bool a\_inverse=false)

- Select all events with the given status, and returns the number selected.*

  - int `get_num_selected_notes` ()

*Counts the selected notes in the event list.*
- int `get_num_selected_events` (unsigned char a\_status, unsigned char a\_cc)

*Counts the selected events, with the given status, in the event list.*
- void `select_all` ()

*Selects all events, unconditionally.*
- void `copy_selected` ()

*Copies the selected events.*
- void `paste_selected` (long a\_tick, int a\_note)

*Pastes the selected notes (and only note events) at the given tick and the given note value.*
- void `get_selected_box` (long \*a\_tick\_s, int \*a\_note\_h, long \*a\_tick\_f, int \*a\_note\_l)

*Returns the 'box' of the selected items.*
- void `get_clipboard_box` (long \*a\_tick\_s, int \*a\_note\_h, long \*a\_tick\_f, int \*a\_note\_l)

*Returns the 'box' of selected items.*
- void `move_selected_notes` (long a\_delta\_tick, int a\_delta\_note)

*Removes and adds reads selected in position.*
- void `add_note` (long a\_tick, long a\_length, int a\_note, bool a\_paint=false)

*Adds a note of a given length and note value, at a given tick location.*
- void `add_event` (long a\_tick, unsigned char a\_status, unsigned char a\_d0, unsigned char a\_d1, bool a\_paint=false)

*Adds a event of a given status value and data values, at a given tick location.*
- void `stream_event` (event \*a\_ev)

*Streams the given event.*
- void `change_event_data_range` (long a\_tick\_s, long a\_tick\_f, unsigned char a\_status, unsigned char a\_cc, int a\_d\_s, int a\_d\_f)

*Changes the event data range.*
- void `increment_selected` (unsigned char a\_status, unsigned char a\_control)

*Increments events the match the given status and control values.*
- void `decrement_selected` (unsigned char a\_status, unsigned char a\_control)

*Decrements events the match the given status and control values.*
- void `grow_selected` (long a\_delta\_tick)

*Moves note off event.*
- void `stretch_selected` (long a\_delta\_tick)

*Performs a stretch operation on the selected events.*
- void `remove_marked` ()

*Removes marked events.*
- void `mark_selected` ()

*Marks the selected events.*
- void `unpaint_all` ()

*Unpaints all list-events.*
- void `unselect` ()

*Deselects all events, unconditionally.*
- void `verify_and_link` ()

*This function verifies state: all note-ons have an off, and it links note-offs with their note-ons.*
- void `link_new` ()

*Links a new event.*
- void `zero_markers` ()

*Resets everything to zero.*
- void `play_note_on` (int a\_note)

*Plays a note from the piano roll on the main bus on the master MIDI buss.*

- void [play\\_note\\_off](#) (int a\_note)

*Turns off a note from the piano roll on the main bus on the master MIDI buss.*

- void [fill\\_list](#) (CharList \*a\_list, int a\_pos)

*This function fills the given character list with MIDI data from the current sequence, preparatory to writing it to a file.*

### 6.32.1 Detailed Description

More members than you can shake a stick at.

### 6.32.2 Member Enumeration Documentation

#### 6.32.2.1 enum `sequence::select_action_e`

Enumerator

**`e_select`** This enumeration is used in selecting events and note. Se the [select\\_note\\_events\(\)](#) and [select\\_events\(\)](#) functions.

**`e_deselect`** To deselect the event under the cursor.

**`e_toggle_selection`** To toggle the selection of the event under the cursor.

**`e_remove_one`** To remove one note under the cursor.

### 6.32.3 Member Function Documentation

#### 6.32.3.1 `sequence & sequence::operator= ( const sequence & a_rhs )`

Follows the stock rules for such an operator, but does a little more then just assign member values.

*Threadsafe*

#### 6.32.3.2 `int sequence::event_count ( ) const`

*Threadsafe*

#### 6.32.3.3 `void sequence::push_undo ( )`

*Threadsafe*

#### 6.32.3.4 `void sequence::pop_undo ( )`

*Threadsafe*

#### 6.32.3.5 `void sequence::pop_redo ( )`

*Threadsafe*

#### 6.32.3.6 `void sequence::push_trigger_undo ( )`

*Threadsafe*

#### 6.32.3.7 `void sequence::set_bpm ( long a_beats_per_measure )`

*Threadsafe*

#### 6.32.3.8 `void sequence::set_bw ( long a_beat_width )`

*Threadsafe*

6.32.3.9 `long sequence::get_bw ( ) const [inline]`

*Threadsafe*

6.32.3.10 `void sequence::set_rec_vol ( long a_rec_vol )`

*Threadsafe*

6.32.3.11 `void sequence::toggle_queued ( )`

Toggles the queued flag and sets the dirty-mp flag. Also calculated the queued tick based on m\_last\_tick.

*Threadsafe*

6.32.3.12 `void sequence::off_queued ( )`

Toggles the queued flag and sets the dirty-mp flag.

*Threadsafe*

6.32.3.13 `bool sequence::is_dirty_main ( )`

resets it). This flag signals that a redraw is needed from recording.

*Threadsafe*

6.32.3.14 `bool sequence::is_dirty_edit ( )`

*Threadsafe*

6.32.3.15 `bool sequence::is_dirty_perf ( )`

*Threadsafe*

6.32.3.16 `bool sequence::is_dirty_names ( )`

*Threadsafe*

6.32.3.17 `void sequence::set_dirty_mp ( )`

*Not threadsafe*

6.32.3.18 `void sequence::set_dirty ( )`

*Threadsafe*

6.32.3.19 `void sequence::play ( long a_tick, bool a_playback_mode )`

This function is called by the sequencer thread, performance. The tick comes in as global tick.

It turns the sequence off after we play in this frame.

*Threadsafe*

6.32.3.20 `void sequence::set_orig_tick ( long a_tick )`

*Threadsafe*

6.32.3.21 `void sequence::add_event ( const event * a_e )`

Then it reset the draw-marker and sets the dirty flag.

Currently, when reading a MIDI file (see the midifile module's parse function), only the main events (notes, after-touch, pitch, program changes, etc.) are added with this function. So, we can rely on reading only playable events into a sequence.



This module (sequencer) adds all of those events as well, but it can surely add other events. We should assume that any events added by sequencer are playable.

*Threadsafe*

#### Warning

This pushing (and, in writing the MIDI file, the popping, causes events with identical timestamps to be written in reverse order. Doesn't affect functionality, but it's puzzling until one understands what is happening.

**6.32.3.22** `void sequence::add_trigger ( long a_tick, long a_length, long a_offset = 0, bool a_adjust_offset = true )`

If `a_state = true`, the range is on. If `a_state = false`, the range is off.

What is this?

```

is      ie
<      ><      ><      >
es      ee
<      >
XX

es ee
<      >
<>

es      ee
<      >
<      >

es      ee
<      >
<      >

```

**6.32.3.23** `void sequence::split_trigger ( long a_tick )`

This is the public overload of `split_trigger`.

*Threadsafe*

**6.32.3.24** `void sequence::grow_trigger ( long a_tick_from, long a_tick_to, long a_length )`

*Threadsafe*

**6.32.3.25** `void sequence::del_trigger ( long a_tick )`

*Threadsafe*

**6.32.3.26** `bool sequence::intersectTriggers ( long position, long & start, long & end )`

If the given position is between the current trigger's tick-start and tick-end values, the these values are copied to the start and end parameters, respectively, and then we exit.

*Threadsafe*

#### Parameters

<i>position</i>	The position to examine.
<i>start</i>	The destination for the starting tick ( <code>m_tick_start</code> ) of the matching trigger.
<i>end</i>	The destination for the ending tick ( <code>m_tick_end</code> ) of the matching trigger.

#### Returns

Returns true if a trigger was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

**6.32.3.27** `bool sequence::intersectNotes ( long position, long position_note, long & start, long & end, long & note )`

If the given position is between the current notes on and off time values, values, the these values are copied to the start and end parameters, respectively, the note value is copied to the note parameter, and then we exit.

*Threadsafe*

Parameters

<i>position</i>	The position to examine.
<i>position_note</i>	I think this is the note value we might be looking for ???
<i>start</i>	The destination for the starting tick (m_tick_start) of the matching trigger.
<i>end</i>	The destination for the ending tick (m_tick_end) of the matching trigger.
<i>note</i>	The destination for the note of the matching event.

Returns

Returns true if a event was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

**6.32.3.28** `bool sequence::intersectEvents ( long posstart, long posend, long status, long & start )`

If the given position is between the current trigger's tick-start and tick-end values, the these values are copied to the start and end parameters, respectively, and then we exit.

*Threadsafe*

Parameters

<i>posstart</i>	The starting position to examine.
<i>posend</i>	The ending position to examine.
<i>status</i>	The desired status value.
<i>start</i>	The destination for the starting tick (m_tick_start) of the matching trigger.

Returns

Returns true if a event was found whose start/end ticks contained the position. Otherwise, false is returned, and the start and end return parameters should not be used.

**6.32.3.29** `void sequence::move_selected_triggers_to ( long a_tick, bool a_adjust_offset, int a_which = 2 )`

```
min_tick][0          1][max_tick
                2
```

- If we are moving the 0, use first as offset.
- If we are moving the 1, use the last as the offset.
- If we are moving both (2), use first as offset.

*Threadsafe*

**6.32.3.30** `long sequence::get_selected_trigger_start_tick ( )`

*Threadsafe*

**6.32.3.31** `long sequence::get_selected_trigger_end_tick ( )`

*Threadsafe*

**6.32.3.32** `long sequence::get_max_trigger ( )`

*Threadsafe*

6.32.3.33 void sequence::move\_triggers ( long a\_start\_tick, long a\_distance, bool a\_direction )

*Threadsafe*

6.32.3.34 void sequence::copy\_triggers ( long a\_start\_tick, long a\_distance )

```
... a
[      ][      ]
...
... a
...

5  7    play
3      offset
8  10   play

X...X...X...X...X...X...X...X...X...
L      R
[      ][      ][ ] orig
[      ][      ][ ]

    <<
    [      ][ ][ ] [ ] split on the R marker, shift first
    [      ][      ][ ]
    delete middle
    [      ][ ][ ] [ ] move ticks
    [      ][      ][ ]

    L      R
    [      ][ ][ ] [ ] split on L
    [      ][      ][ ]

    [      ][      ][ ] [ ] increase all after L
    [      ][      ][ ]
```

Copies triggers to...

*Threadsafe*

6.32.3.35 void sequence::clear\_triggers ( )

*Threadsafe*

6.32.3.36 void sequence::set\_midi\_bus ( char a\_mb )

*Threadsafe*

6.32.3.37 void sequence::set\_master\_midi\_bus ( mastermidibus \* a\_mmb )

*Threadsafe*

6.32.3.38 int sequence::select\_note\_events ( long a\_tick\_s, int a\_note\_h, long a\_tick\_f, int a\_note\_l, select\_action\_e a\_action )

Returns the number selected.

*Threadsafe*

6.32.3.39 int sequence::select\_events ( long a\_tick\_s, long a\_tick\_f, unsigned char a\_status, unsigned char a\_cc, select\_action\_e a\_action )

Note that there is also an overloaded version of this function.

*Threadsafe*

6.32.3.40 int sequence::select\_events ( unsigned char a\_status, unsigned char a\_cc, bool a\_inverse = false )

Note that there is also an overloaded version of this function.

*Threadsafe*

Warning

This used to be a void function, so it just returns 0 for now.

6.32.3.41 `int sequence::get_num_selected_notes ( )`

*Threadsafe*

6.32.3.42 `int sequence::get_num_selected_events ( unsigned char a_status, unsigned char a_cc )`

If the event is a control change (CC), then it must also match the given CC value.

*Threadsafe*

6.32.3.43 `void sequence::select_all ( )`

*Threadsafe*

6.32.3.44 `void sequence::copy_selected ( )`

*Threadsafe*

6.32.3.45 `void sequence::paste_selected ( long a_tick, int a_note )`

I wonder if we can get away with just getting a reference to `m_list_clipboard`, rather than copying the whole thing, for speed.

*Threadsafe*

6.32.3.46 `void sequence::add_note ( long a_tick, long a_length, int a_note, bool a_paint = false )`

It adds a single note-on / note-off pair.

The `a_paint` parameter indicates if we care about the painted event, so then the function runs though the events and deletes the painted ones that overlap the ones we want to add.

*Threadsafe*

6.32.3.47 `void sequence::add_event ( long a_tick, unsigned char a_status, unsigned char a_d0, unsigned char a_d1, bool a_paint = false )`

The `a_paint` parameter indicates if we care about the painted event, so then the function runs though the events and deletes the painted ones that overlap the ones we want to add.

*Threadsafe*

6.32.3.48 `void sequence::stream_event ( event * a_ev )`

*Threadsafe*

6.32.3.49 `void sequence::change_event_data_range ( long a_tick_s, long a_tick_f, unsigned char a_status, unsigned char a_cc, int a_data_s, int a_data_f )`

Changes only selected events, if any.

*Threadsafe*

Let `t` == the current tick value; `ts` == tick start value; `tf` == tick finish value; `ds` = data start value; `df` == data finish value; `d` = the new data value.

Then

$$df (t - ts) + ds (tf - t)$$

$$d = \frac{t - t_s}{t_f - t_s}$$

If this were an interpolation formula it would be:

$$d = d_s + (d_f - d_s) \frac{t - t_s}{t_f - t_s}$$

Something is not quite right; to be investigated.

```
\param a_tick_s
    Provides the starting tick value.

\param a_tick_f
    Provides the ending tick value.

\param a_status
    Provides the event status that is to be changed.

\param a_cc
    Provides the event control value.

\param a_data_s
    Provides the starting data value.

\param a_data_f
    Provides the finishing data value.
```

#### 6.32.3.50 void sequence::increment\_selected ( unsigned char *a\_stat*, unsigned char *a\_control* )

The supported statuses are:

- EVENT\_NOTE\_ON
- EVENT\_NOTE\_OFF
- EVENT\_AFTERTOUCH
- EVENT\_CONTROL\_CHANGE
- EVENT\_PITCH\_WHEEL
- EVENT\_PROGRAM\_CHANGE
- EVENT\_CHANNEL\_PRESSURE

*Threadsafe*

#### 6.32.3.51 void sequence::decrement\_selected ( unsigned char *a\_stat*, unsigned char *a\_control* )

The supported statuses are:

- EVENT\_NOTE\_ON
- EVENT\_NOTE\_OFF
- EVENT\_AFTERTOUCH
- EVENT\_CONTROL\_CHANGE
- EVENT\_PITCH\_WHEEL
- EVENT\_PROGRAM\_CHANGE
- EVENT\_CHANNEL\_PRESSURE

*Threadsafe*

#### 6.32.3.52 void sequence::grow\_selected ( long *a\_delta\_tick* )

*Threadsafe*

#### 6.32.3.53 void sequence::stretch\_selected ( long *a\_delta\_tick* )

This should move a note off event, according to old comments, but it doesn't seem to do that. See the [grow\\_selected\(\)](#) function.

*Threadsafe*

6.32.3.54 void sequence::remove\_marked ( )

*Threadsafe*

6.32.3.55 void sequence::mark\_selected ( )

*Threadsafe*

6.32.3.56 void sequence::unpaint\_all ( )

*Threadsafe*

6.32.3.57 void sequence::unselect ( )

*Threadsafe*

6.32.3.58 void sequence::verify\_and\_link ( )

*Threadsafe*

6.32.3.59 void sequence::link\_new ( )

*Threadsafe*

6.32.3.60 void sequence::zero\_markers ( )

This function is used when the sequencer stops.

*Threadsafe*

6.32.3.61 void sequence::play\_note\_on ( int a\_note )

It flushes a note to the midibus to preview its sound, used by the virtual piano.

*Threadsafe*

6.32.3.62 void sequence::play\_note\_off ( int a\_note )

*Threadsafe*

6.32.3.63 void sequence::fill\_list ( CharList \* a\_list, int a\_pos )

Note that some of the events might not come out in the same order they were stored in (we see that with program-change events).

## 6.33 trigger Class Reference

This class is used in playback.

### Public Member Functions

- [trigger](#) ()  
*Initializes the trigger structure.*
- bool [operator<](#) (const [trigger](#) &rhs)  
*This operator compares only the m\_tick\_start members.*

### 6.33.1 Detailed Description

Making its members public makes it really "just" a structure.

### 6.34 user\_instrument\_definition Struct Reference

This structure corresponds to `[user-instrument-0]` definitions in the `~/ .seq24usr` file.

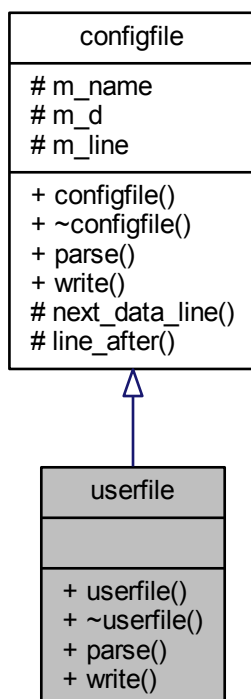
### 6.35 user\_midi\_bus\_definition Struct Reference

This structure corresponds to `[user-midi-bus-0]` definitions in the `~/ .seq24usr` file.

### 6.36 userfile Class Reference

Supports the user's `~/ .seq24usr` configuration file.

Inheritance diagram for userfile:



#### Public Member Functions

- `userfile` (`const std::string &a_name`)  
*Principal constructor.*
- `~userfile` ()  
*A rote destructor needed for a derived class.*
- `bool parse` (`perform *a_perf`)  
*Parses a "usr" file, filling in the given perform object.*
- `bool write` (`perform *a_perf`)  
*This function just returns false, as there is no "perfrom" information in the user-file.*

### Additional Inherited Members

#### 6.36.1 Member Function Documentation

##### 6.36.1.1 `bool userfile::parse ( perform * a_perf )` [virtual]

This function opens the file as a text file (line-oriented).

Implements [configfile](#).





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