# Yoshimi Advanced Reference Manual, v 2.3.3

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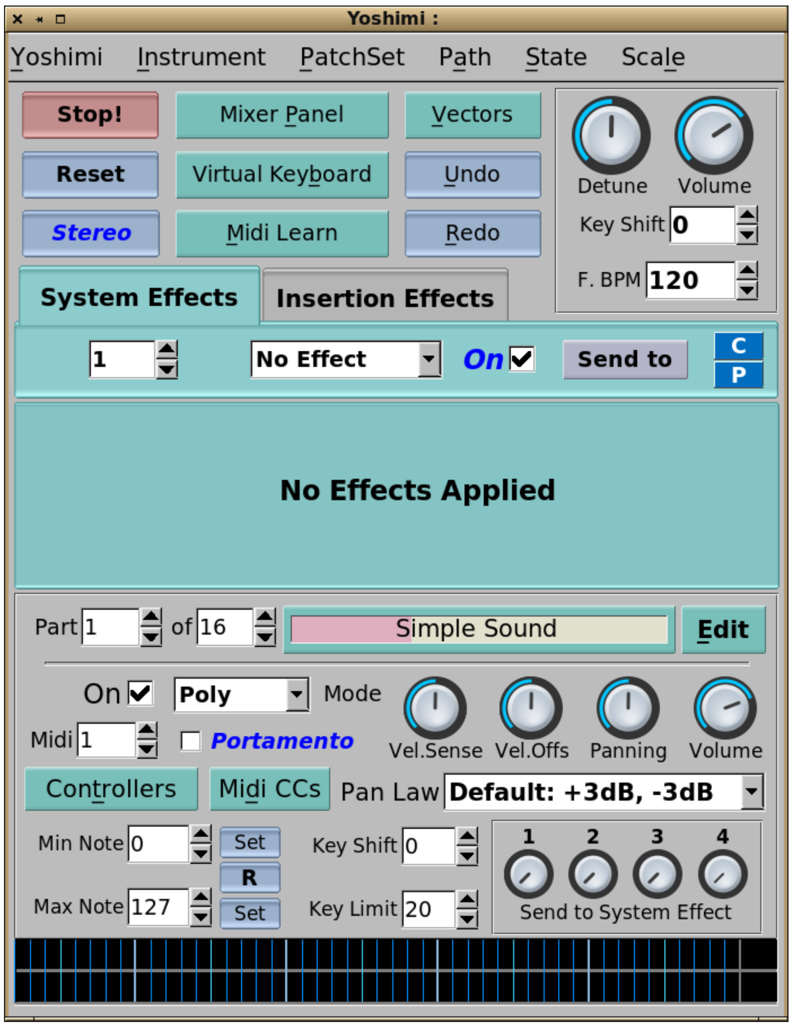
December 5, 2024




Proof reading: Art Horan (and others)

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# 1 Introduction

This manual was inspired by a wiki version of a *ZynAddSubFX* manual (see reference [31]). That wiki shows screen shots and a detailed survey of the settings and parameters of *ZynAddSubFX*. It inspired us to thoroughly document *Yoshimi*, with the help of Will Godfrey, who, with the 'little band of helpers' continues to improve *Yoshimi* at great pace. This manual owes much to the descriptions and diagrams provided by the original *ZynAddSubFX* author, Paul Nasca, as well as some others whose names we don't know.

## 1.1 Yoshimi And ZynAddSubFX

*Yoshimi* is an algorithmic MIDI software synthesizer for Linux. It synthesizes in real time, can run polyphonic or monophonic, with multiple simultaneous patches on one or more MIDI channels, and has broad microtonal capability. It includes extensive addititive, subtractive, and pad synth capabilities which can be run simultaneously within the same patch. It also has eight audio effects modules.

This manual describes how to use *Yoshimi* [19], the software synthesizer derived from the great *ZynAddSubFx* (version 2.4.0) [23] software synthesizer (Copyright 2002-2009 Nasca Octavian Paul). This manual uses some earlier *ZynAddSubFX* documentation and diagrams. Please note that any reference to *ZynAddSubFx* in this manual applies specifically to versions of *ZynAddSubFx* prior to version 3.0.

## 1.2 New Features

This section provides an *ad hoc*, catch-as-catch-can survey of the new features of *Yoshimi*, in no particular order. There are new features for the command-line interface, and many internal fixes to reduce the likelihood of "xruns", static, clicks, or other performance issues.

### 1.2.1 New for Version 2.3.1

There has been some revision of microtonal scales. The most noticable is that you can now export both tunings and keymaps. A little less obvious is the Map Size in now editable.

### 1.2.2 New for Version 2.3.0

The most obvious development with this release is the ability to create and select different colour themes covering the whole of the graphic interface. These can be applied immediately on a running *Yoshimi* instance. At the same time *action* and *link* buttons have been changed to make them more obviously different. On advice received, identification uses both colour and button shape.

It was noticed that some users were not aware that many buttons were MIDI-learnable, so the way these are represented has also been changed. All sliders are learnable as are all rotary 'knobs' (as before). Now, all check boxes, buttons, menus, spin boxes and number rollers that have blue bold italic labels are learnable. This is much more obvious than previously.

Additionally, sliders and knobs now identify when they are at their default setting. With knobs, the pointer is black, and red when at any other position. With sliders the 'peg' has a green centre which again becomes red when changed.

Under the hood is a less obvious but highly significant improvement. A range of controls that were saved as stepped 0 to 127 values are now saved as high resolution values. However this is done in a way that is completely both forward and backward compatible. Old files can be accurately read, and new files can be read by older *Yoshimi* verisons at their native resolution.

### 1.2.3 New for Version 2.2.0

A major development here concerns the PadSynth engine. It is now possible to make changes deep within this structure without interruption while notes are sounding. There is a setting to enable the sound to smoothly fade from one setting to the next over a few milliseconds. Alternatively one can set a new control in the PadSynth engine itself to spread the change over several seconds for a unique musical effect.

Another much requested feature is a comprehensive Undo/Redo capability. This is most useful when wanting to try changing something but with the safety net of being able to revert if the result is unsatisfactory.

When we first implemented BPM sync for LFOs etc. we had to provide a fallback in case there was no incoming MIDI clock to sync to. We set this to the standard 120 BPM. Now, however there is a control so that it can be set over a wide range to get exactly the wanted effect.

### 1.2.4 New for Version 2.1.1, 2.1.2

The most noticeable feature is a new button in the main window for access to the MIDI CCs window. This was always accessible, but required a right-click on the Controllers button; many people never knew it was available! These controls can be used with no MIDI source connected, and they can be learned and combined with others for greater expression.

Improved instrument bank management gives a faster startup (particularly with very large banks and roots) and greater protection against outside influences. A setup with 7500 instruments in 200 banks used to take nearly 5 seconds to get to the main window, and now takes much less than a second.

There is a new ability to separate properly instruments in banks with the same numeric prefix, but different names. Also, two that have different file-names but the same prefix (and are in fact the same) are treated as just the one. This situation typically occurs when banks were merged in the past with a mixture of spaces and underscores in the filenames.

We've removed the switch for disabling 'Enable part on program change'. It was only relevant to MIDI and nobody could think of a circumstance where one would want to select a program via MIDI but not have it active. If one wants to silence a channel, CC7 (volume) would do so, and if it was just a specific part, there is an NRPN that can do it.

A double-click on a path in the filer favourites view will now select it and return you to the main filer window.

### 1.2.5 Resizeable Windows

A major development with version 2.0 of *Yoshimi* is the ability to resize every window right up to the size of the monitor - even on 4K screens. Full details can be found in Section 2 "Revised Graphical Interface" on page 25

### 1.2.6 Instant Control

As of version 1.7.0, *Yoshimi* is able to give immediate response to almost all rotary controls and sliders. This is also true of many of the switches as well. Previously only a very small number responded straight away, while most only responded on the next note played.

### 1.2.7 MIDI Learn

*Yoshimi*, as of version 1.5.0, supports MIDI Learn. It is available by right-clicking on the desired parameter widget. See Section 24.5.1 "Concepts / MIDI / Learn" on page 289, and Section 19 "MIDI Learn" on page 228, for more information.

### 1.2.8 LV2 Plugin

*Yoshimi* can run as an LV2 plugin. Supported features:

1. Sample-accurate MIDI timing.
2. State save/restore support via *LV2_State_Interface*.
3. Working UI support via *LV2_External_UI_Widget*.
4. Programs interface support via *LV2_Programs_Interface*.

5. Multi-channel audio output. 'outl' and 'outr' have lv2 index 2 and 3. All individual ports numbers start at 4.

See Section 22 "LV2 Plug-in Support" on page 278, for more information, but keep in mind there is still much more to document concerning the LV2 plugin.

#### 1.2.9 Control Automation

Controls automation support is a part of a common controls interface. There are significant extensions to the NRPNs that *Yoshimi* handles. Sensitivity to MIDI volume change (CC #7) is variable in **Controllers** in the same way as pan width, etc. The numeric range is 64 to 127; the default at 96 gives the same sensitivity as before at -12dB relative to the GUI controls. 127 gives 0dB and 64 gives -26dB.

In parallel with this there are more NRPNs supported so that one can perform some of these controls via automation. The arrangement looks positively steam-punk, but is actually very easy to use, requiring only a utility that can send MIDI CCs. NRPNs aren't special. They are simply a specific pattern of CCs. *Yoshimi*'s implementation is very forgiving, doesn't mind if one stops halfway through (will just get on with other things while it waits) and will report exactly what it is doing. See Section 17 "Non-Registered Parameter Numbers" on page 210, for more information, as well as the sections noted below.

#### 1.2.10 MIDI CC

To help when things don't seem to go right, one can show raw incoming CCs. This is enabled from the **Settings / MIDI** tab. These are the values before *Yoshimi* does any processing.

MIDI program changes have always been pretty clean from the time Cal first introduced them, but now GUI changes are just as clean. While it is generally best to change a program when the part is silent, even if a part is sounding there is barely a click. There is no interference at all with any other sounding parts.

Sometimes MIDI CCs don't seem to give the results one expects. There is a setting that reports all incoming CCs so that one can discover what *Yoshimi* actually sees (which may not be what was expected).

At the request of one user, *Yoshimi* has an implementation of CC 2, Breath Control. This feature combines volume with filter cutoff. See Section 24.5.2 "Concepts / MIDI / Messages" on page 289, for more information.

*Yoshimi* implements the "legato footswitch" control, MIDI CC 68. Send this command with a value of 64 and above, and it will switch to Legato mode. Send less than 64, and it will revert to whatever it was before. So, if the mode had been Poly, it goes back to that, and it it already was Legato, it just stays at Legato.

#### 1.2.11 Vectors

It's probably best to more clearly separate the concept of *parts* versus *channels* these days. *Yoshimi* can provide up to 64 parts, in blocks of 16. One can decide how many one wants to have available using the spin-box alongside the channel number. One can have 16, 32 or 64 parts. By default, all the upper parts are mapped to the same MIDI channel numbers as the lowest ones, but have independent voice and patch set values. They cannot normally receive independent note or control messages. However, vector control will intelligently work with however many are set, as will all the NRPN direct part controls. See Section 18 "Vector Control" on page 219, for more information.

### 1.2.12 Bank Support

Bank root directories are better identified, with IDs that can be changed by the user in the GUI. This is also made available for selecting over MIDI. MIDI only sees banks in the *current* **root** directory, but all banks are accessible to the GUI. One can set up a new bank root path when starting from the command line. This takes the form:

```
$ yoshimi -D /home/(username)/(directory)/(subdirectory)/bank
```

*Yoshimi* will scan this path for new banks, but won't make the root (or any of its banks) current. The final directory doesn't have to be `banks`, but that is tradition. When running from the command line there is access to many of the system and root, bank, and other settings.

*Yoshimi* splits out roots and banks from the main configuration file, and creates a new "history" file. The separation means that the different functions can be implemented, saved, and loaded at the most appropriate time. These files have "yoshimi" as the doc-type. See the new Banks sections, Section 5 "Banks and Roots" on page 37and Section 16.1 "Yoshimi Banks" on page 208, for more information.

### 1.2.13 Accessibility

An important feature of recent releases of *Yoshimi* is improved accessibility. The effectiveness and usefulness of accessibility will shape future complementary interfaces. A number of first-time defaults have been changed to make accessibility easier.

It has always been possible to run *Yoshimi* headless. Since V 1.5.11 it has been possible to *compile* a headless version with no need for any graphical components to be installed. Real accessible control is available.

Once running, all setup can be done within the terminal window. Some settings will require a restart. There is also extensive control of roots, banks, parts and instruments including the ability to list and set all of these. One can do things like:

```
add root /home/music/yoshimi/banks
set part 4 program 130
```

Additional controls that are taken for granted in the GUI but otherwise forgotten are master key shift and master volume. The most important parts of vector control are exposed to the command line. For all of this there is extensive error checking and feedback, which can be rendered in voice using text-to-speech software.

There is a partially-sighted person we hear from, and a totally blind person (working with a Braille reader/writer) who has offered a lot of suggestions, and very much likes vector control. So accessibility is an important feature of *Yoshimi*. See the section that follows.

### 1.2.14 Command Line

*Yoshimi* offers great control of one's working environment. One can have the graphical user interface, a command-line interface, or both, and these settings can be saved. And both interfaces can be disabled, so *Yoshimi* runs in a headless mode, responding in the background to MIDI events.

The command-line interface can access all top level controls, as well as the part editing controls, and can select any effect and effect preset. It can be used to set up Vector Control much more quickly and easily than using NRPNs. It allows settings to be made to the various synthesis engines. The command-line is also context-sensitive, which, with careful choice of command names and abbreviations, allows fast access with minimal typing.

Since version 1.5.8 it has been possible to start, stop and select different instances for further control.

*Yoshimi*'s parser is case-insensitive for commands (but not for filenames), and accepts the shortest unambiguous abbreviation. It is quite pedantic, and expects spelling to be correct regardless of length. Apart from the `back` commands, it is word-based, so spaces are significant. Some examples:

"`s p 4 pr 6`" ("set part 4 program 6"): This command sets part 4 to the instrument with ID 6 from the current bank. It also leaves one at the part context level and pointed to part 4. Additionally, the fact that it loaded an instrument means it will activate that part if it was off (and the configuration setting is checked). In most cases the words **program** and **instrument** are interchangeable.

"`s ef 1 rev`" ("set effect 1 reverb"): This command moves one to the effects context level and sets that part's effect number 1 to effect type **reverb**.

"`s pre 2`" ("set preset 2"): This command sets preset number 2 (we use numbers here as most preset names repeat the effect type).

"`..s 6 v 80`" ("up one level, set part 6 volume 80"): This command drops one back to part level, switches one to part 6 (but doesn't enable it), and sets its volume to 80.

"`/s ve cc 93`" ("to top level, set vector control cc 93"): This command drops up to the top level, and sets vector control for channel 1, X axis to respond to CC 93 leaving one in the vector context.

Whenever intermediate values are omitted, the default or last-used value will be assumed. All *standard* CLI inputs, and the return message numbers, should start from 1 with the following exceptions:

- Bank roots
- Banks
- CCs

These follow standard MIDI practice in the CLI and in the GUI.

The CLI prompt always shows what level one is on, and the help-lists are also context-sensitive, so one doesn't see a lot of irrelevant clutter. See Section 21 "The Yoshimi Command-Line Interface" on page 237, for more information.

### 1.2.15 Audio Support

The preferred JACK/ALSA MIDI and audio interfaces are no longer fixed at compile time. There are checkboxes on **Settings** to change them. One can also set preferred startup ALSA/JACK MIDI and audio devices. These selections will be remembered on the next run.

*Yoshimi* will always start even if the audio/MIDI backend called for doesn't exist. In this situation, it will try all combinations in this order: JACK, ALSA, and null. This enables one to then change the settings and try again.

A significant improvement is the handling of ALSA audio, which is very important for some people. *Yoshimi* can handle 2-channel 16-bit format. Tests have shown that virtually all motherboard sound chipsets will handle this setting, but many external ones don't. So *Yoshimi* initially requests 32-bit 2-channel, then works towards a compromise with the hardware. See Section 6.1.3.5 "Menu / Yoshimi / Settings / Alsa" on page 52, for details.

### 1.2.16 User Feedback

With any complex software it is important that the user is kept informed as to exactly what the current status is, and over time *Yoshimi* has had extensive development of tooltips, warnings and action reports.

For example, since V 1.5.11 one is now warned if an effect is a modified version of a preset and not it's default. This is in the form of changing the background colour of the preset button to a bright blue.

When editing an AddSynth voice that is taking its waveform from another one there is a new warning when actually entering the waveform window.

### 1.2.17 Miscellany

*Yoshimi* stamps its XML files with its own major and minor version numbers underneath the existing ones, so it is possible to tell which version created the files. If the files (such as config) are not compatible with *ZynAddSubFX*, the doctype and all other details are identified as purely for *Yoshimi*.

One can direct messages to either `stderr` (the error output of a terminal console) or the **Reports** window on the fly. If one chose `stderr`, the **Reports** window is inactive.

One can use the mouse scroll wheel to adjust rotary controls. Holding down the Ctrl key gives access to finer adjustment. Also, horizontal as well as vertical mouse movement will adjust the knob.

All rotary controls and sliders will return to their home positions if right-clicked anywhere in the control.

As of version 1.5.8 switches, buttons and selectors will also home with a right-click.

Part-editing windows carry the part number and voice name in the title bar. For the AddSynth oscillator window this also includes the voice number.

When opening an instrument bank, one can tell exactly which synth engines are used by each instrument. This is represented by three pale background colours: Red = AddSynth; Blue = SubSynth; and Green = PadSynth.

If the instruments are kits they are scanned to find out if any member of the kit contains each engine, so that the colours above can be applied. This feature is duplicated in the current part, the mixer panel for the currently loaded instruments, and in the Instrument Edit window. The same colours highlight the engine names when they are enabled with the check boxes.

*Yoshimi* remembers where windows were last placed (per instance), and they will be reopened at the same location on the next run.

Thanks to the *ZynAddSubFX* developers, *Yoshimi* has pink as well as white noise available on AddSynth voices. Pink noise sounds softer. In *Yoshimi* version 1.6.0 we added spot noise, which has a sort of 'gritty' sound.

The **Humanise** feature has had more interest so it's been upgraded. It's now a pair of sliders, and its settings can be saved in patch sets. It provides a tiny per-note random detune and/or velocity attenuation to an *entire* part (all engines in all kits), but only for that part.

Audio and MIDI preferences have been improved. If one sets ALSA MIDI and JACK audio from the GUI or the command line, the setting can be saved and will be reinstated on the next run. These settings are per-instance, so if one has multiple sound cards, one can make full use of them. Barring major system failures, there are no circumstances where *Yoshimi* will fail to start.

We've tested *Yoshimi* in recovery mode, logged in as root, with no X server.

The command `/usr/share/bin/yoshimi -A -i` worked perfectly and auto-connected the keyboard. Since version 1.5.11 one can provide a compile-time option to build a purely headless version.

Load and Save dialogues recognise the history lists and offer the appropriate first choice. External instrument loads and saves are also remembered. For saves, on a restart, one is offered the home directory regardless of where *Yoshimi* was launched, but in the case of saving external instruments, one is always offered the name of the instrument in the currently selected part, prefixed with the home directory.

There is a specific *State* menu item ("Save as Default") to save the current complete setup as the default. This particular state file is always saved to *Yoshimi*'s configuration directory, and will not show in history lists.

If **Start With Default State** has been set, and a default state has been saved, a complete restart will load this state, and a master reset will load this file, instead of doing a first-time default reset. There is a "gotcha" with this, in that when saving the default state, one must *already* have set the **Start With Default State** switch, otherwise reloading the default state works *once*, but upon re-opening *Yoshimi*, the switch will be unchecked —that is, quite correctly in its previously saved state!

A final detail with the history lists is that in each list type, the last used item will be placed at the top of the list. This is especially useful when wanting to continually save/load an item currently being worked on. However, since version 1.6.0 it has been possible to freeze these lists, so benefiting the (also new) MIDI NRPN control to load settings from these lists.

## 1.3 File Compatibility

It is always a challenge with developing software to make improvements to features and add new ones without breaking older versions that users might not be in a position to upgrade. *Yoshimi* handles this by retaining original file parameters with the closest match possible, and at the same time a separately-named new or extended parameter. This ensures both older *Yoshimi* versions will run correctly, and will do so on *ZynAddSubFX*. Obviously, completely new features will be lost to older versions but otherwise files will behave as before. This is especially relevant where existing files are loaded and then re-saved.

Where there are great changes or where an entirely new concept is developed we create a completely new file type, but again store what is relevant in the older type. This has worked very well for several years. However we have come up against a problem. The *ZynAddSubFX* developers have taken a different approach, and some parameters have different types in their versions from 3.0 onward. Therefore we now make a test for this and give a warning as shown below.

This is known to be a problem with instrument files (.xiz) and presets (.xpz). We don't know if there are others. Ironically, even the latest *Yoshimi* versions of these files will behave correctly on *ZynAddSubFX*.

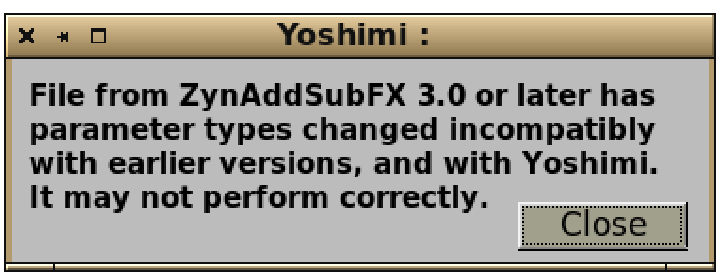



Figure 1: Compatibility Warning

## 1.4 Document Structure

The structure of any manual is a struggle. There's no way to avoid jumping all over the place to cover a topic. The sections are covered roughly in the order of the user interface of *Yoshimi*. To help the reader jump around this manual, multiple links and an index are supplied.

Usage tips for each of the functions provided in *Yoshimi* are sprinkled throughout this manual. Each tip occurs in a section beginning with "Tip:". Each tip is provided with an entry in the Index, under the main topic "tips". Bug notes may also be found. Each bug occurs in a sentence beginning with "Bug:". Each bug is provided with an entry in the Index, under the main topic "bugs". New features since the last version are flagged with "New:" We cannot pretend to have marked all new developments, as *Yoshimi* is advancing fast. To-do items are also present, in the same vein.

## 1.5 Yoshimi Mailing List

The *Yoshimi* project used to have an email listserv at SourceForge, but the unreliability of the site has prompted a move to a new mailing list. See reference [21]. The team have managed to port across all the old yoshimi-user archives to this new site. See reference [22].

Subscribe to the *Yoshimi* mailing list with an e-mail to: `yoshimi-request@freelists.org` or by visiting `http://www.freelists.org/list/yoshimi`.

To post to the list, send an email to: `yoshimi@freelists.org`. The news archive is at: `https://www.freelists.org/archive/yoshimi`.

## 1.6 Yoshimi Licensing

Software licenses are are something I *really* don't want to get involved in - I have much better things to do with my time - but I found I was obliged to do so.

It is possible I'm the only person who knows all the following events, as I was the one that instigated them!

The first time I saw ZynAddSubFX source files they were licensed as GPL V2. At that time Zyn had a number of very serious problems, and not much was being done about them. Somewhat naively I asked Lars Luthman if he would help, as he had offered a couple of small patches previously. His response was that he would not do any significant work, as he did not agree with the GPL V2 only license.

I then contacted Paul, explaining the situation and asking if he would consider a change in the license to V2 or later. I was actually a bit surprised that he immediately agreed. When I next looked at the sources, the licenses on the files had indeed been updated, so I passed this information on.

Unfortunately Paul forgot to update the website, but I wasn't especially concerned as it was only the files themselves that really mattered.

While developing Yoshimi after the initial fork, Cal queried the license situation. I told him of the conversations I'd had, and passed him a copy of the email I'd got from Paul. Later on, Cal - in good faith - wrote new sources and placed them under GPL V3. This would be quite compatible with V2 or later, but not with V2 strict.

What I didn't notice until very much later was that Paul had only updated half of the text in the sources, leaving the actual licence in an ambiguous state.

To the best of my knowledge, V3 is not compatible with V2 strict, but V2 or later is. However the *complete* project then becomes downgraded to V2 strict - although the V2 or later sources (such as all the new root/bank code) can independently be freely merged into V3 code.

I doubt anyone would actually make an issue of this. However, to safeguard Yoshimi as a whole, I took it upon myself to change Cal's code to V2 or later. I believe it retains the spirit of his wishes, and the only person with standing to object – his daughter - has been totally supportive of the work currently being done on Yoshimi.

Any source code I add will be GPL V2 or later.

**Update:** The original change discussion has been located and the license for both Zyn and Yoshi is confirmed as GPL V2 or later. Anyone wanting to confirm this should look at the Zyn user list archives August 2007 and September 2007.

### 1.7 Let's Get Started with Yoshimi!

Let us run *Yoshimi*. The first thing to do is make sure one has no other sound application running (unless one wants to risk blocking *Yoshimi* or hearing two sounds simultaneously, depending on one's sound card and ALSA setup). Then start *Yoshimi*:

```
$ yoshimi
```

If JACK is available, it will be used. Otherwise ALSA will be used.


Figure 2: Yoshimi Splash Screen!

One sees a brief message, or if enabled, the splash screen. We show the new splash screen, Figure 2 "Yoshimi Splash Screen!" on page 23, here because it only appears for four or five seconds when one runs *Yoshimi*! What fun is that?

Next shown is the *Yoshimi* main window, as shown in Figure 3 "Yoshimi Main Screen" on page 24, and it persists, of course:

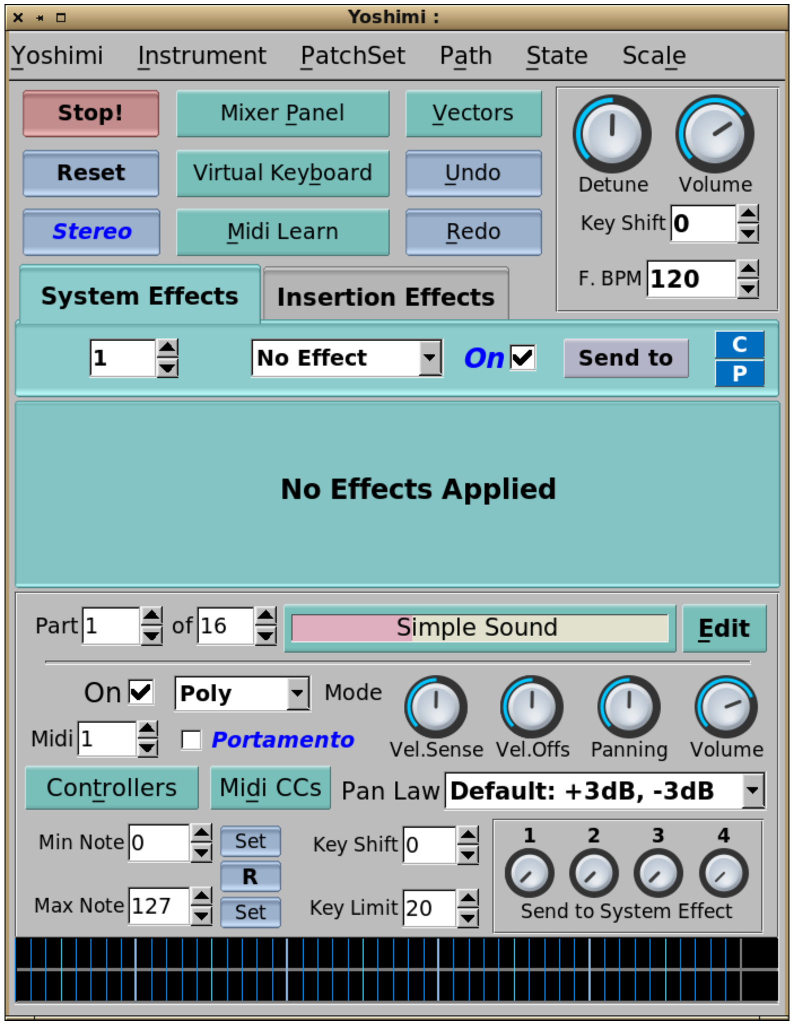



Figure 3: Yoshimi Main Screen

From *Yoshimi* version 1.5.11, the very first time Yoshimi is started, the main window will be overlaid with the following prompt. This is for the benefit of very new users who might not know where to start.

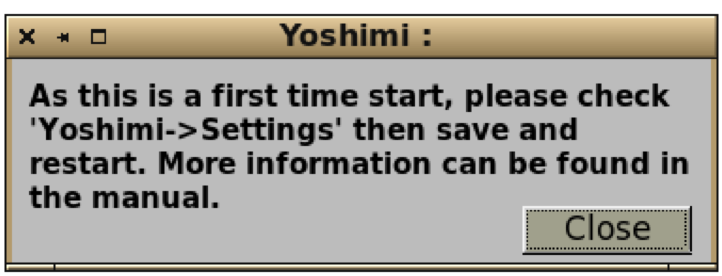



Figure 4: First Time Prompt

Note that, if one presses the `Space` bar while the main window has keyboard focus The AddSynth engine of Part 1 is toggled on or off. With other windows various checkboxes are likely to be toggled. This is under investigation!

For this manual, the main window is composed of the following sections:

1. **Menu**.
2. **Top Panel**.
3. **Effects Panel**.
4. **Bottom Panel**. Includes the VU-meter at the bottom.

Starting with version 1.4.0, a right-click on any control in *Yoshimi* will reset the control's value to its default position. In version 1.4.1, the **Vectors** control appears, with some minor rearrangement of the top panel.

There's a lot going on with *Yoshimi*, with no way to describe it in linear order. This manual describes how to do useful things in each of the sections noted above, while leaving some of the details to be described in later sections, to which reference can be made for the details. This document depends heavily on index entries and references. There is also a "cookbook" at [3]; it is a long way from being comprehensive, but still has some useful tips.

If one downloads the source code for *Yoshimi*, in the `examples` directory one finds a complete song set, `OutThere.mid` and `OutThere.xmz`. Together these produce a fairly complex 12 part tune that makes *Yoshimi* work quite hard. Also, after installing *Yoshimi*, one can find a nice, short introduction to *Yoshimi* in Will's document, `/usr/share/doc/yoshimi/The Short Yoshimi Guide.odt`, along with a number of texts files with information that might not yet be present in the long manual.

One last thing to note is that there is a list of important concepts in Section 24 "Concepts" on page 280, which one should consult if a term is puzzling.

## 2 Revised Graphical Interface

When *Yoshimi* started being produced, all windows were a fixed size, which suited the resolution of monitors of that time. As resolution increased over the years, *Yoshimi's* windows became progressively smaller. Eventually we received complaints about this. It came to a head with the introduction of 4K screens. On such a display a magnifying glass was needed to read the text!

FLTK 1.3.x has some resize capability and will keep the graphics mostly in scale, but not the text, nor things like tabs and menu bars. Therefore we had to develop work-arounds and emulations for these. Eventually the following decisions were made:

- All windows will be independently re-sizeable up to the full screen size.
- Windows and their contents will stay in scale.
- Inserts (such as Formant windows) from different sections will have their own set of positions/sizes.
- Last seen positions and sizes will be saved.
- Different *Yoshimi* instances will have their own set of positions/sizes.

The first example shows Yoshimi with all visible windows at their default sizes on a 1920x1080 monitor. Notice the Sys Sends window (the smallest one) alongside the Main window.

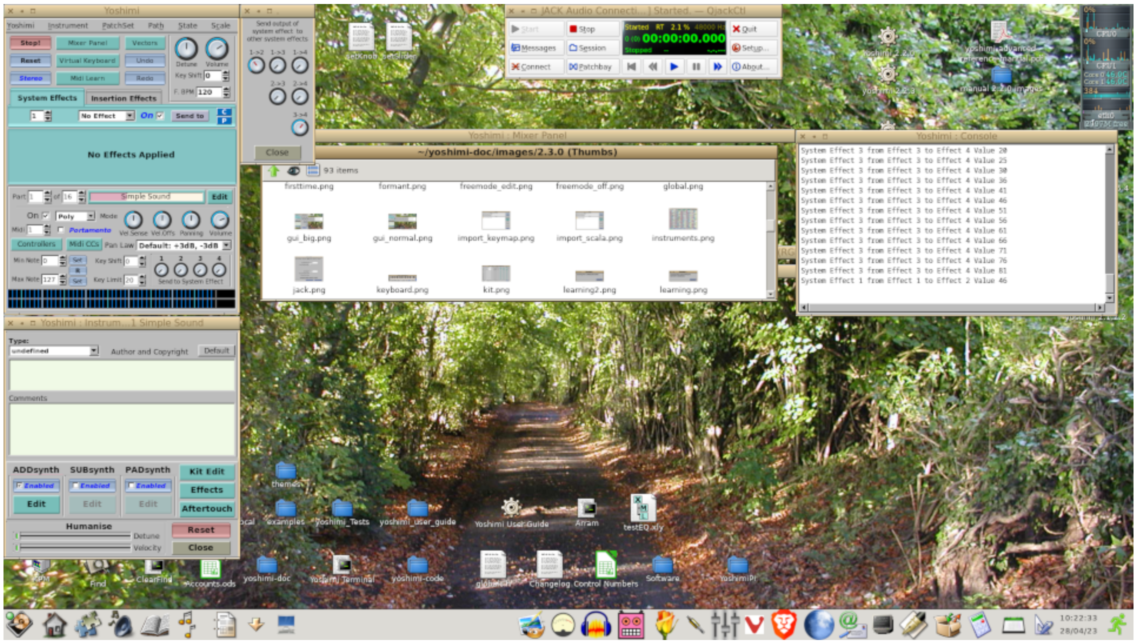


Figure 5: Windows at default size

Next see the same view, but with the Sys Sends window resized to the full height of the display. All items, including knobs and labels, remain perfectly in scale.

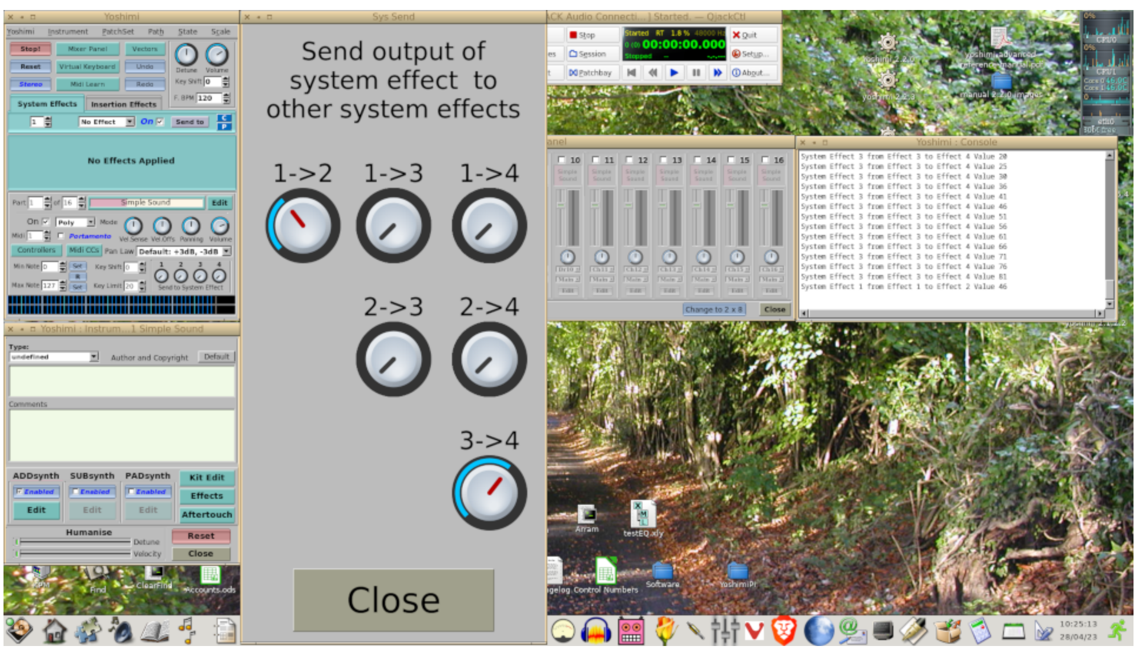



Figure 6: System Sends window resized

## 2.1 Revised Graphical Interface / The Filer

One feature that proved impossible to work around was the default FLTK file chooser. The only recourse was to replace it with a *Yoshimi* chooser. This provided the opportunity to discard all generic features and controls, and provide exactly what *Yoshimi* needed, fitting neatly with *Yoshimi's* uncluttered ethos of only showing what one needs to see.

Below is a typical entry for loading a patchset.

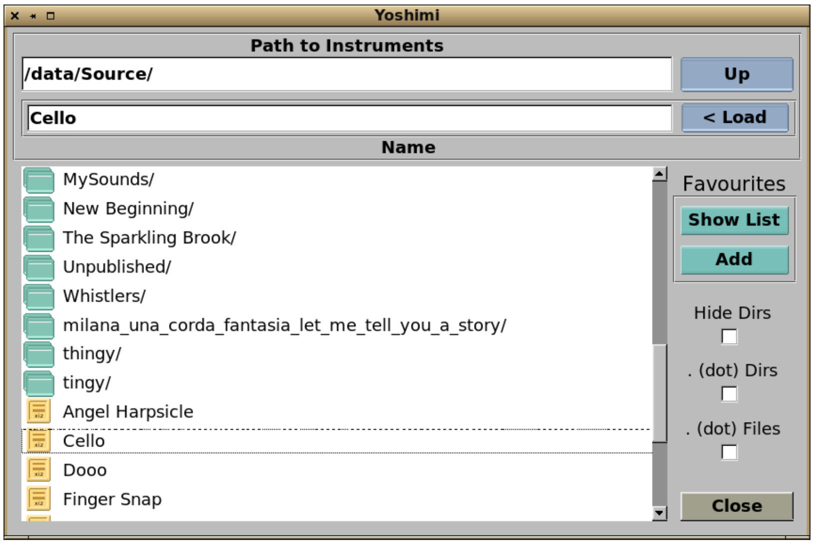



Figure 7: A Filer 'Load' Window

At the top is the *path* field. One can manually edit this field to go to a known route, and on hitting 'Return' the list below it will be updated. If saving or exporting files, new directories can added here. A request for confirmation will pop up. However it wouldn't make sense to try to load or import something from a directory that doesn't yet exist, so this will generate an error message.

The *Up* button moves back along the directory tree, or one can simply edit out one or more directory names and hit 'Return'.

The *Load* button simply performs that action on the entry in the *name* field if it is valid. For saving, one can create a new name here.

**Note:** The Path and Name fields, and the Up and Load buttons, change depending on what type of file is being managed. See the examples below.

The main list area shows first the sub-directories found; a double-click on these will add them to the path field and re-scan for contents. Below these are the files that *Yoshimi* recognises. A single-click on one of these will will place it in the name field where it can be edited, whereas a double-click performs the appropriate load/save operation.

To the side are a number of extra buttons and switches:

*Show List* is described below.

*Add* places the current path in the favourites list and switches to this view for further management.

*Hide Dirs* is useful when one knows they have the right path, but the directory contains a long list of sub-directories.

*.(dot) Dirs* makes these directories visible, although it would be most unusual to have these containing valid *Yoshimi* files.

*.(dot) Files* makes these *Yoshimi* files visible.

Here are just the headings for several other file types.

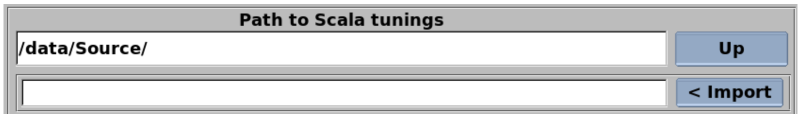



Figure 8: A Scala 'import' Window


Figure 9: A Bank 'root' Window


Figure 10: A Bank 'import' Window

Neither the bank root nor bank import views have a 'name' field. This is because one is directly importing or registering a path containing these elements, not the elements themselves. Therefore the path 'leaf' **is** the name. However, when exporting these you will want to give them a name, so the field is then present.

When selecting 'Show Favourites', the existing filer window is overlaid with the following view. Notice, it retains the path as a reminder.

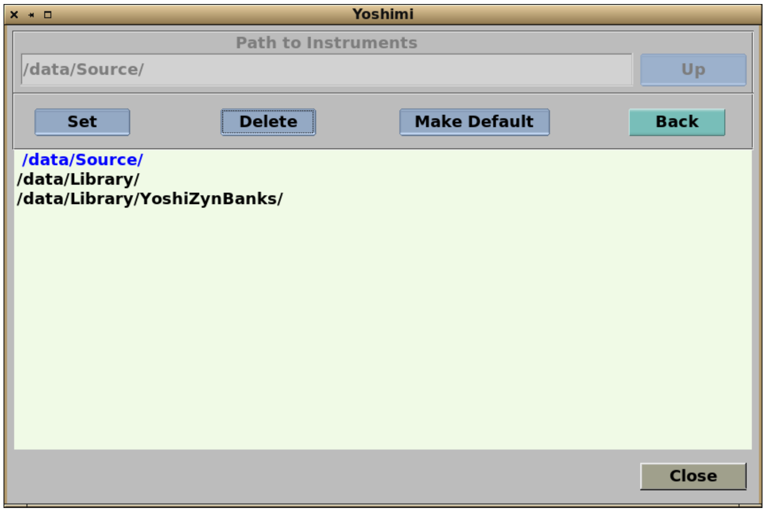



Figure 11: The Filer 'Favourites' Window

A double-click on a path in the filer favourites view will now select it and return you to the main filer window.

# 3 Configuration Files

Let's cover the configuration files, which have expanded in utility in recent versions of *Yoshimi*. Understanding these configuration file makes it easier to use *Yoshimi*. Also note that all configuration settings are exposed to the command line interface as well.

As with most applications, *Yoshimi* allows for one to save one's work and reload it. In recent versions of *Yoshimi*, it is possible to autoload a default state on startup, so that *Yoshimi* is already configured exactly as desired, with patches loaded and part destinations set. In addition, *Yoshimi* now saves settings that have been disabled. In this way, they can be re-enabled without having to reconstruct them from scratch.

However, the configuration has changed quite a bit, and configurations from *Yoshimi* 1.4 and earlier will need to be reconstructed. With *Yoshimi* V 1.5.0 the following warning was devised, and will be updated with all major version number increments:

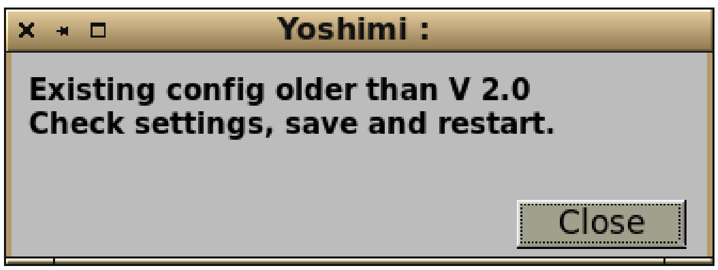



Figure 12: Configuration Warning Dialog

*Yoshimi* has a number of different files that make up the current configuration. Together, they make up the concept of a *patch set* (also called a *patchset*). Sometimes one will see reference to a "session", but that term is too easy to confuse with the "session" in "JACK session manager".

The last-used file in any configuration section is always at the top of its history list. The main benefit of this new setup is that now all patch sets, vectors, scales, MIDI Learn, and state - offer the most recent entry when asked to load or save. On first-time use, when there is no history, one is offered one's home directory as a location, regardless of where *Yoshimi* was called from. Since *Yoshimi* V 2.3.1 Presets have also been included in this process.

When saving these "managed" files, one won't be offered the previous last-used configuration unless it was seen during that session, either by being loaded, or saved by name. This protects against accidental overwrites....

For example, you've been working on 'foo' for a whole day, saving as you go, then the following day you start up *Yoshimi*, and immediately have a completely new idea 'bar', and start working on it. Without thinking you save and hit Enter. Oops, you just wiped out 'foo'. Only you haven't! At startup *Yoshimi* would not see the older file, so the save command just offers the home directory to put a new name in.

Here is a summary of the files. Please note that the names all start with `yoshimi`. For example, `.banks` is really `yoshimi.banks`.

- `.banks` Contains information on the accessible instrument banks, and information to translate between bank directory names and bank ID values. Current root and current bank settings have now been moved from `banks` to the `config` and `instance` files, so the banks file now consists only of the bank structure. On first time start up, *Yoshimi* will look for *ZynAddSubFX* banks as well as *Yoshimi* banks in the usual locations. It *will not* look for a *ZynAddSubFX* configuration file, as these are no longer relevant.
- `.config` Contains the setup information configured in the **Yoshimi / Settings** dialog. This is just the basic configuration file. Configuration instances are now in place, so the main configuration file is common to all, but each instance has its own file for things like current bank, JACK/ALSA settings, etc. Common overall settings are only visible in the main instance and completely hidden in all the later ones. In *Yoshimi* V 1.6.1 there has been further revision of this.
- `.instance(n)` Contains the current root/bank, MIDI settings, and preferred engines. *Yoshimi* now has instance data separated from the main configuration file, with the name `yoshimi-(n).instance`.
- `.state` Contains the information needed to duplicate a complete *Yoshimi* session that was saved.
- `windows` Contains the current layout of windows for re-instation at the next startup of *Yoshimi*. If there is no such directory (`~/.config/yoshimi/windows`) then the keyboard is also opened, alongside the main window, as a help to those new to *Yoshimi*. And of course that state will be saved, if present, when *Yoshimi* exits. This directory is specific to the GUI, so doesn't really figure in this scheme, but it is created or saved when one exits *Yoshimi*.

The entire config set should then be (ignoring the prepended `yoshimi`):

- `.config`
- `.instance[n]`
- `windows`
- `.banks`

Before *Yoshimi* V 1.7.1 there was a single `.windows` file but now the directory called `windows` contains individual files with the status of each window recognised. This is more reliable and less prone to errors under fault conditions. Also, the main config directory is more rational.

Other *Yoshimi* specific files are:

- `.xiz` An Instrument file. This format is the **Legacy** or **Zyn** file format. This format will be supported forever, although some backward-compatible refinements might be made as time goes on.
- `.xiy` An Instrument file in the new *Yoshimi* file format. This format includes all the controllers, the part mode status (Poly, Mono, Legato) and the Humanise settings. When loading files, *Yoshimi* will always look for the `.xiy` version first, and, if it can't find it, will then look for the `.xiz` version.
- `.xly` A MIDI-Learn file for saving the MIDI-Learn settings in force at the moment this file is saved. It is also included in the state file (`.state`).
- `.xmz` All *Yoshimi* active data; everything except MIDI-Learn. This file is called a *patch set*.
- `.xpz` Presets. A preset is a *Yoshimi* section of data stored by of the copy (C) controls. This may be an effect, part of an instrument etc.
- `.xsz` Scale Settings.
- `.xvy` Vector settings. The extension stands for "Xml Vector Yoshimi". Vector settings are now included in both the patch sets (`.xmz`) and state files (`.state`. For a good example, see Section 18.4 "Vector / Command Line" on page 226.

In the file-save dialogs, the file extension is determined by the type of file being saved, and it doesn't matter if one enters the extension explicitly, or not. If it's missing, or it is the wrong one, it will be replaced. This is actually true of almost all file saves, and has been for quite some time now.

For vectors (in common with external instruments and patch sets), the configuration is saved to the user's home directory. Once saved, **Vectors / Options / Recent** is your friend.

## 3.1 Configuration Files / Patch Set

A patch set is basically a group of instruments related simply by the user wanting to have them all loaded at once into *Yoshimi*. A patch set is stored in a `.xmz` file. A patch set is akin to a preset, in that it stores a combination of items, that took awhile to set up, for easy retrieval later.

Patch sets are not the full configuration. They carry *most* of it, including almost all of the dynamic settings, but they don't contain the configuration settings that `.state` does. The patch set format is either XML or compressed XML, as explained elsewhere. The **Patch Sets / Save External...** menu entry saves files with the `.xmz` extension.

One of the simplest ways to save one's work is to save the bulk of the *Yoshimi* dynamic settings. This saving can be done through the **Patch Sets** menu, and will result in the creation of a `.xmz` file. Once created, this file will hold the settings for all settings within that setup, such as microtonal tunings, all patches, system effects, insertion effects, etc. See Section 6.1.3.1 "Menu / Yoshimi / Settings / Main Settings" on page 43. Patch sets will save all other instruments regardless of whether they are activated or not.

In many cases saving everything in a part is not what is desired. Saving a patch later on in an editing session is one such example. In order to save a patch, one can either save it from the **Instruments** menu, or through the **Bank** window.

## 3.2 Configuration Files / Config

Often, one will see the extension `.config` used in the `$HOME/.config/yoshimi` directory. This file once contained information to translate between bank directory names and bank ID values. In recent versions of *Yoshimi*, this file is much reduced in size, and its "doctype" is "Yoshimi".

The `.config` file is always going to be specific to one machine and working modes, so no one will ever want to copy it across even to another *Yoshimi* environment. Recent patch sets are now no longer stored in the main `.config` file, but in a new `recent` file.

The `.config` file is now a much reduced common startup settings file. It is a single file that every instance can read, but only the first one can write.

The `.config` file has been separated from `.instance(n)`. It is saved only when the user explicitly calls for it to be saved. If it is missing for some reason when restarting, *Yoshimi* will report the fact and take corrective action.

```
$ yoshimi -a -A
Yoshimi is starting
ConfigFile /home/ahlstrom/.config/yoshimi/yoshimi.config not found, will
   use default settings ...
```

The `.config` file will be readable by all instances of *Yoshimi*, but writable only by the main instance. The relevant controls will be hidden from the other instances. Also, those controls not relevant to LV2 are disabled in that mode. The `.config` and `.banks` data now reside in separate configuration files. The banks file is saved every time there is a normal exit, so the last-used root and bank IDs will always match what that instance thinks is there. Conversely, the main `.config` file *doesn't* get saved when one starts a new (unknown) instance of *Yoshimi*, but the config-changed flag is set, so one has control over whether any settings are saved. So now, if anything goes wrong with the config files they won't corrupt one's carefully organised bank files, and vice-versa.

## 3.3 Configuration Files / State

Sometimes one will see the extension `.state` used in the `$HOME/.config/yoshimi` directory. These files contain a lot more information that is needed to duplicate a *Yoshimi* session that was saved. This file is a superset of an `.xmz` file, saving everything. The state file is accessed from the **State** menu item in the main window. Its default name is `~/.config/yoshimi/yoshimi.state`. This file can be auto-loaded when *Yoshimi* starts, if it is present and the feature enabled. Otherwise the normal settings are in place.

The advantage of this is that one can set up a complete patch set of instruments one commonly uses, with all their settings, including audio destination. Save it to the default state and it will be loaded, along with the system settings, every time one starts *Yoshimi*, if the **Yoshimi / Settings / Switches / Start With Default State** setting is checked. To revert the state, simply uncheck the **Yoshimi / Settings / Switches / Start With Default State** setting (and change any other needed).

Since *Yoshimi* V 1.6.1 one specifically must **not** save the settings when changing this. It is part of the reorganisation. State, defaults, and jack session files have all been considerably improved, and behave in a more transparent fashion. Also, the instances have more controls available that can be actively restored.

The *Yoshimi* 'state' file consists of the entire setup, (apart from basic configuration settings), instance to currently-loaded instrument sets. However, upon investigating some session managers, it looks like they don't want (or can't use) some of the configuration information because they are expecting to be able to change the entire state in *running* instances.

*Yoshimi* now splits the 'instance' data from the main configuration. This solves this session issue by saving only the true configuration locally, and to the state save. However, the 'instance' data includes things like ALSA/JACK settings. Since *Yoshimi* V1.6.1 one can change these *at the time the instance starts*, but there is a potential 'gotcha'. If using the JACK session manager (and possibly others) it is possible to save a session to switch to ALSA audio when run, and this will be done. However, at that point the session manager loses contact with *Yoshimi* and it is no longer possible to save anything back to that session for that instance (assuming the session manager can handle multiple instances).

## 3.4 Configuration Files / Instrument

An Instrument. These files can have two formats, compressed and uncompressed. Uncompressed is set by **Yoshimi / Settings / Main Settings / XML Compression Level** set to 0, and compressed is set by a value greater than 0.

With the **Instrument** menu, one can save the file to any given location with the `.xiz` and/or `.xiy` extension.

Default instruments are never saved, not even in patch sets and states, but if the parts are activated, that fact *is* saved; it's a part feature, not an instrument feature.

## 3.5 Configuration Files / Scale

Scale Settings. These files store microtonal settings that *Yoshimi* can use to produce non-standard musical scales. Recent scales settings are saved and recorded.

## 3.6 Configuration Files / Instance

A new feature of the *Yoshimi* configuration. It contains the current root/bank, MIDI settings, and preferred engines. These instance files are totally independent files, distinguished by a number in the file-name.

## 3.7 Configuration Files / Banks

A new feature of the *Yoshimi* configuration. Currently each *Yoshimi* instance takes its own copy of the actual files as it starts up. Previously, they could all save, delete, or rename the actual files without talking to the other instances, so one could move a file in one instance, and then try (and fail) to access it from another.

For V 1.5.10 this issue was partially resolved by only allowing the main instance to make actual file changes (the related icons no longer existing in the other instances). However from V 1.7.2 this has been reverted as it was causing confusion, especially when *Yoshimi* was used as a plugin. The issue of all instances not being informed of a change made by the one currently in use will eventually be resolved.

With the **Banks** menu, one can assign a patch to a given slot with a bank. This instrument will remain in that slot for future use until it is deleted. To see the physical location of the `.xiz` file, one should check the **Yoshimi / Settings / Banks / Root Dirs** (*File / Settings / Bank_Root_Dirs*) window to see the paths for banks.

At startup, after all the configuration is complete, the banks are loaded and installed. On a per instance basis, the first thing this process does is look for a `yoshimi(-n).banks` file. If it can't find that it then hunts for a `yoshimi(-n).config` file. Finally, if that fails it does a re-scan for banks. In this way it should be completely backward compatible with any previous config files.

The `.banks` file is *saved* every time roots, banks, or instruments are changed, and again on a normal exit to catch the current root and bank (which don't otherwise trigger a save). This allows the last-used root and bank IDs to always match what that instance thinks is there. Note that one needs to have write permissions to add instruments to the bank. When one saves an instrument to a bank slot, it is given a filename with the internal name as the leaf-name. When one saves an instrument to an external file, one is first offered the internal name and the current directory, but one can change it if desired.

By default, *Yoshimi* does not assign a bank ID 0 (zero) in any root. This feature has an interesting benefit. Several sequencers insist on setting a bank with every program change, and if one doesn't give a bank, they will try to set 0. However, *Yoshimi* is smart enough to ignore any invalid bank ID and remain with the existing bank number.

As a further protection against rogue sequencers making assumptions, any attempt to set an invalid bank root will also be ignored. On a first-time startup, discovered roots will be given ID numbers starting from 5, continuing in steps of 5. This makes it easier to re-arrange them to preference. We recommend not using 0.

On first-time start up, *Yoshimi* looks for *ZynAddSubFX* banks as well, in the usual locations. It will not look for a *ZynAddSubFX* configuration file, as these are no longer relevant to *Yoshimi*.

Banks are more thoroughly described in Section 24.3 "Concepts / Banks and Roots" on page 283.

### 3.8 Configuration Files / .bankdir

A bit of ancient history has bubbled to the surface. When one creates a new bank in *Yoshimi*, it inserts an empty file in the new bank, called `.bankdir`. For example:

```
... /banks/Zen Collection/.bankdir
```

The reason for this is that when scanning for banks (especially at startup) it looks for this file first. If it can't find it, then it has to go though the slower process of looking for at least one completely valid instrument file. Running from SSDs, it probably won't make a lot of speed difference but it will on a conventional hard drive, especially if one has lots of banks. So, if one wants to get that little startup edge, plonk a copy of this file into all your banks. It's an empty file.

In modern times, one of the main distros creates a warning for the packagers if it sees embedded dot files, and gets very unhappy if these are empty ones. The obvious answer is to put something there; *Yoshimi* now adds a `.bankdir` file that is useful – when one creates a new bank, this file contains a string with the *Yoshimi* version number it was created with, and to add icing to the cake, every time one saves an instrument file in a bank, this file is updated and will have the current *Yoshimi* version number. Also, it will be created if it wasn't already there.

So now it is be possible to tell how recently a bank was changed, which may have implications if running modern instruments on older *Yoshimi*'s. Also, the complaining distro will be happier because the `.bankdir` file won't be empty.

For the "Collection" bank, the version number is now 2.0; although its instruments were created with *Yoshimi* sometime before version 1.3.0, some of the instrument files contain more information. "Drums" is set to 2.2.1; "Companion" is currently set to 2.2.0.

### 3.9 Configuration Files / Windows

No, this term isn't a reference to "that other operating system"; it is a new feature of the *Yoshimi* configuration. It saves the current layout of application windows for re-instation at the next startup of *Yoshimi*.

### 3.10 Configuration Files / Format

The Unix `file` command indicates that the XML files are one of two types:

- *exported SGML document, ASCII text*. These files are unindented XML data with an encoding of UTF-8 and a DOCTYPE of "ZynAddSubFX-data".
- *gzip compressed data, from Unix*. These files can be renamed to end in ".gz", and then run through the `gunzip` program to yield the XML file (but without an `.xml` extension).

The format depends on the "XML compression level" option discussed in Section 6.1.3.1 "Menu / Yoshimi / Settings / Main Settings" on page 43.

Saving settings or not: If one changes settings, and closes without saving, that means the settings remain in place only for the current session. If one has changed anything, when one closes *Yoshimi*, one will be given a second chance to save them. If one responds 'No', the next time *Yoshimi* starts, the old settings will be restored. An 'undo' feature would get pretty crazy very quickly.

In the **Settings** window, **Save Settings** refers to the entire window, not just individual tabs. The close buttons are actually outside the frame of the tabs.

**Close without saving** doesn't mean revert to previous settings; it means to use the changes, but don't immediately store them to the filesystem.

In general, the contents are structured a lot like the user-interface elements that are used to set them.

### 3.11 Configuration Files / MIDI Learn

The MIDI-Learn data crosses the border between static configuration and dynamic settings. It is stored in files with an extension of `.xly` ("XML Learn Yoshimi"). If compression is turned off (**Yoshimi / Settings / Main Settings / XML Compression Level** set to 0), this file is an XML/SGML file with a MIDILEARN section in it.

When saving states, if there are any configured MIDI learned lines, these lines will also be saved. When one reloads the state they will also be restored. However, if the state file *doesn't* have any MIDI learn data, it *will not* clear any settings that are already there.

Therefore, be aware that if one now re-saves that state, it *will* include such MIDI learned data, and the next time it is loaded, it *will* overwrite any lines that are already there.

Also note that, during a master reset, the MIDI learn data is the only thing that *is not* cleared (unless the CTRL key is held down at the same time).

These features are designed to give the best protection to a setup that could have taken quite a long time to arrange exactly as desired. In our experiments, we have discovered that we seem to use pretty much the same controls and actions, and the list of our 'preferred' settings is slowly increasing.

## 4 Local Data Files

During the development of *Yoshimi* V 1.7.1/2, a number of files and directories have been moved from the configuration directory to the standards preferred hidden directory in one's `home` directory. However, one's existing files in the old locations will be copied across, so there should be no disruption. For *Yoshimi* this is `.local/share/yoshimi`

Here is a summary of the files.

- `presets` User defined presets (or snapshots) are stored as individual files in the `presets subdirectory`.
- `clipboard` Unnamed presets are stored in the `clipboard subdirectory` for immediate copying to a different location.
- `recent` Recent instruments, patch sets, etc. are stored in the `recent` file. The last-used file in any section is always at the top of its recent history list.
- `found` Editable copies of all the banks found in the `\usr` installed locations are stored here.
- `theme` Imported Yoshimi GUI colour themes are stored in this subdirectory, along with the 'Classic' example file.
- `~/.yoshimi_history` Specific to command line use, this holds the command-line history.

## 4.1 Local Data Files / Presets

Have a favourite setting for an envelope, or a difficult-to-reproduce oscillator? Then presets are for you! Presets allow for one to save the settings for any of the components which support copy/paste operations. This is done with preset files (`.xpz`), which get stored in the folders indicated by *Paths / Preset Dirs....* The key thing about using presets is that one must first specify a presets directory! Otherwise, who knows where they go? A good choice for a preset directory is `~/.local/share/yoshimi/presets`. In addition, copy-and-paste of synth settings can be done across *Yoshimi* instances.

In *Yoshimi*, a *preset* is any collection of settings that can be saved to the clipboard or to a file, for later loading elsewhere.

A preset is a canned version of a *Yoshimi* sub-setting. Presets can be copied and pasted using the blue **C** and **P** user-interface buttons associated with many of the *Yoshimi* dialog windows. They make it easy to save portions of the current settings for later use. For example, resonance settings can be saved.

The naming convention for a preset file is `presetname.presettype.xpz`, where *presetname* is the name one types into the **Copy to Preset** name field, *presettype* is the name that appears in the **Type** field, and *xpz* is the file-extension for compressed XML preset files.

Since *Yoshimi* V 1.6.0 Preset 'root' directories are arranged in a similar way as bank roots, so one can zero in on just those of interest, with a 'current' directory instead of the previous 'default' one. *Yoshimi* instances can, of course, have their own current root, but the list of directories is common to all.

## 4.2 Local Data Files / Clipboard

Since *Yoshimi* V 2.3.2 a clipboard copy is held as a file is rather than holding it in memory. This means all presets are handled exactly the same way. Also, the last used copy of any section will be retained over *Yoshimi* restarts. Over time one ends up with a collection of these representing the last used entry of that type.

The clipboard has two benefits. One can quickly copy an entry then paste that copy to any number of same-type sub-setting. Also if one has to respond to an interruption, on the next time *Yoshimi* is started one can carry on where they left off.

## 4.3 Local Data Files / Recent

Recently seen instruments, patch sets, etc. are stored in the `recent` file. For example, if the **XML Compression** option is set to 0, and one exits *Yoshimi*, then the following file might contain the following items (ignoring the XML markup):

```
~/.local/share/yoshimi/recent

  /home/me/yoshimi-cookbook/sequencer64/b4uacuse/yoshimi-b4uacuse-gm.state
  /home/me/sequencer64/contrib/yoshimi/horse.state
```

`recent` is a single history file that every instance can read and write.

This is actually quite interesting as there can never be a conflict. It is impossible to have two browser lists open at the same time, and the lists are always rebuilt from memory every time they are opened. Similarly, the entries are added to every time a new recognised file is loaded or saved and one can't physically do two at the same time – even if one could it would simply mean that one very briefly waited for the other, which is not an issue as they are not in the realtime thread.

The `recent` file is saved only upon a normal exit, as it is comparatively unimportant.

### 4.4 Local Data Files / Found

Banks supplied when *Yoshimi* is installed are placed in read-only locations. This is inconvenient when one wishes to add to, or re-arrange them. From V 1.7.1, the first time these banks are seen they are copied into the local directory which **is** writable. For further details see Section 5.2.1 "Bank Directories" on page 39

### 4.5 Local Data Files / Themes

*Yoshimi's* themes allow dramatic changes to be easily made to personalise the GUI appearance without in any way interfering with its functionality. This includes in-line editing of the current displayed user theme. Full details can be found in Section 20 "Themes" on page 234.

### 4.6 Local Data Files / CLI history

The CLI history is an outlier and not part of the *Yoshimi* file management. It is a hidden file in one's `home` directory, maintained by the standard `readline` program. It conveniently allows you to easily repeat previous commands, both in the current session, and when restarting later ones.

## 5 Banks and Roots

In recent versions of *Yoshimi*, the concepts of banks and roots have undergone a fair amount of change, including new features to make them easier to manage and easier to automate. There are a lot of details to understand, too many to include along with the descriptions of the user-interface elements that control them. Therefore, this new section is devoted to banks and roots. It is an elaboration of material originally presented in Section 24.3 "Concepts / Banks and Roots" on page 283.

At one time, one could in theory have 1000 roots, 1000 banks and 1000 presets. However, now roots and banks have been trimmed to what can be addressed from MIDI. One can supposedly still have 1000 presets, though. Anyway, 128x128x160 = 2621440 instruments should be enough for anyone.

All root, bank, and instrument IDs are used by MIDI controls, and as of version 1.3.6 will also be accessible to the command line.

The file `Banks.txt` in the *Yoshimi* source-code bundle makes an important point about a transition (in newer versions) to tagging roots (directories) and banks with an ID code:

> One no longer has the concept of a default root directory, but a current one. This can by changed at any time without requiring a restart, so there is no longer a need to display the (confusing) contents of all roots. Also, roots now have ID numbers associated with them, but no changes have been made to the actual directories to achieve this. Instead the IDs are stored in the config file. The same ID system is used for banks, again without making any file system changes.
>
> At first run (and whenever new root directories are set) unknown roots and banks are given these IDs. Once set they will not change no matter how many more roots and banks are later added. One can however, manually change root directory IDs in the 'Bank Root Paths window' accessible from the 'Paths' item in the main window. Also, there is a new Banks window so that these can be set up, moved and renamed in exactly

the same way as instruments can. With these IDs, roots and banks can be grouped/ordered by function instead of alphabetically. When using the GUI, one will always know exactly which root and bank one fetches an instrument from.

One can quickly step between roots, banks and instruments with the so marked buttons in each of these, and if one right-clicks on them one will close one window as one opens the other.

The significance of all this is that one's MIDI sequencer can now reliably use these ID numbers to select roots, banks and (already available) instruments. That Rosegarden or Muse file one saves today will be just as valid in the future, unless one makes the deliberate choice to change some IDs. Indeed, one can now start with an 'empty' *Yoshimi*, and via MIDI, set roots, banks and load instruments into parts (enabling the parts as one does so) swapping banks and roots as necessary. While the MIDI file runs it can silently pull instruments from any root/bank into any non-sounding part without disturbing the playing ones.

In Yoshimi / Settings / MIDI one can enable or disable all these features, and can define which CCs one wants to use. Bank can be Off, MSB or LSB (as before). Since V1.5.11 Root can also be Off, MSB or LSB. Also, Extended Program Change now has the restriction of not being any reserved CC. These three are all cross-checked against each other. As an example, one might set Bank to LSB and Root to MSB, effectively giving one extended bank control compatible with all sequencers.

Also, different instances have their own config files so that one can have (say) the main instance with current root(9), bank(23) while instance 4 has current root(2), bank(6). One can call up instances by number and thus access saved settings for that instance. As each instance has its own MIDI and audio ports, they can behave more-or-less independently.

In doing all of this we have completely changed the way we manage the structure internally, resulting in much greater efficiency, at the cost of only a slightly slower startup. Swapping roots performs *no* file operations. Swapping banks only fetches the directory list of the newly selected bank. Changing an instrument doesn't have to search for a file, only load from its already known location.

If one changes a bank root path, either through the gui or via MIDI, it will always reset the current bank to the lowest numbered one it can find. This is because there may not be a bank in the new root with the same ID, and even if there is, there is no guarantee that it will have the same name or contents.

Also if an attempt is made to reload the same root, nothing will actually happen. The same is true of banks. Both of these are kept fully up-to-date so there would be no point.

However, reloading the same *instrument* will be performed every time, as one may have changed what is currently loaded without saving it. This provides an effective 'restore' operation.

Finally, it is generally advisable to make root and bank changes on channel 1 so that one can more easily keep track of them. However they are not channel sensitive as they don't directly affect the sound, so one can set them in any convenient channel then perform individual program changes on the desired channels.

It has always been possible to swap and move instruments within a bank, and since V 1.3.5 it was possible to swap banks within a bank root, but now one can swap/move instruments across any banks and any bank roots. One can also move whole banks across bank roots. These extensions use exactly the same controls as before. However, it isn't just a case of changing IDs. Files are actually moved, so additional protections and warnings are in place.

There are also bank importing and exporting controls and since version 1.5.8 these have been made available to the CLI with specific `IMport` and `EXPort` controls.

A "CC" is a MIDI "continuous controller". A MIDI bank change is usually a CC#0 value of 0, followed by a CC#32 value of X, where X is the desired bank number from 0 to whatever. (However, in some cases it may simply be a CC#0 on its own with a value of X). Many synths also require that one send a program change after the bank change, to select the program within the bank.

## 5.1 Roots

In *Yoshimi*, a *root* is a location in which banks can be stored. It is basically a directory, though it ultimately is assigned a number by *Yoshimi*, so that it can be accessed in an automated way. By choosing a root and making it the current root, one can hone in on a smaller collection of banks.

One can reach root paths from the Banks window or the Instruments window, and both of the latter also have multiple entry routes. Roots can also be reached through the **Yoshimi / Paths** menu.

## 5.2 Banks

Banks of instruments are loaded and saved automatically by the program. On program start, the last used bank is loaded. A single bank can store up to 128 instruments normally, and 160 using extended programs. There is a MIDI CC one can use to access the voices from 129 to 160 (numbered re 1).

All the Bank controls are contained in a tab in the main **Settings** window, and take immediate effect.

Bank root directories are identified with ID numbers that can be changed by the user in the user-interface. This feature is also made available for selection over MIDI. MIDI only sees banks in the *current* root directory, but all banks are accessible to the user-interface.

### 5.2.1 Bank Directories

Banks are arranged in directories, with each directory containing a number of instrument files.

Each instrument's file-name should begin with a 4-digit number (left-padded with 0's to make it 4 digits long). This number can serve as a MIDI patch number for automated selection of the instrument via a MIDI program-change message.

Unnumbered instruments in a bank will be given a temporary ID starting from number 160 and working down. If those numbers already exist then they will be skipped over. This can get very confusing. However, if one simply loads it and re-saves it to the same instrument slot, it will gain that ID and be properly fixed. One can then move-swap it with others.

See also Section 6.3 "Menu / PatchSet" on page 67, and Section 16 "Banks Collection" on page 208, for further information.

During development of *Yoshimi* V 1.7.1 there has been further restructuring of banks to make them not only more efficient, but also provide additional protections and capability.

The first of these restructuring actions copies all banks found in the non-editable locations `/usr` and `/usr/local` into the users hidden home directory `.local/share`. It only does this copying if the banks are not already there, and, for first-time users, silently adds these to priority locations in the recognised bank roots. One now has the best of both worlds – fully editable banks and roots, but also the protected non-writable ones.

For long-time users, the copying process takes place, but the banks are not automatically installed. Instead, one is presented with the following dialog.

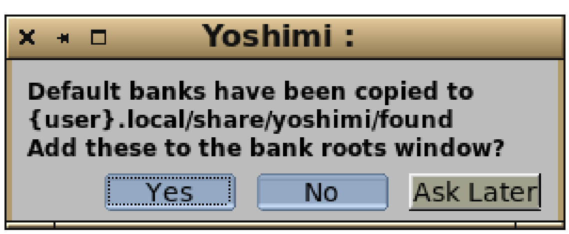



Figure 13: Bank Install Dialog

With either 'Yes' or 'No' one will not be asked again, so if in doubt it is advisable to select 'Ask Later'

Another upgrade resolves a problem where it is possible to start with no banks at all. This could be due to an accidental deletion, or, for a new user, an installer may not have included them. In this situation *Yoshimi* generates a new bank root, bank, and instrument, and makes these available.

A similar problem happens when one tries to add a new bank root that doesn't actually exist. Previously, *Yoshimi* would just report this and close the operation. Now one will see the following dialog.

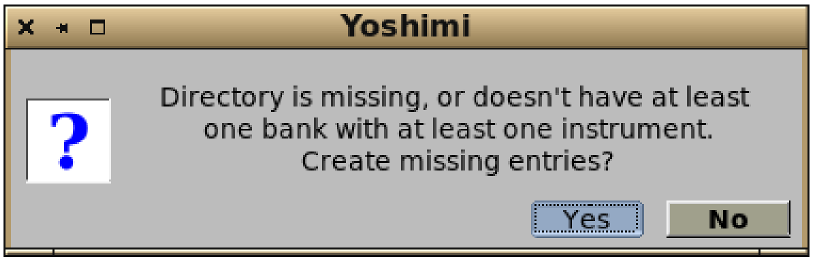



Figure 14: Root Not Found Dialog

If one selects 'Yes', *Yoshimi* creates and installs the bank root asked for, and will create the `newBank` directory in it, and inside that a '0005-First Instrument' file which will be a quite nice SubSynth patch. It will also load that instrument to part 1. These names can, of course, be changed later.

The last improvement provided by *Yoshimi* V 1.7.1 concerns banks having additional entries installed by external means, such as from the OS filing system. This is always advised against, partly because one doesn't necessarily know exactly what is there, but also because, previously, it would cause *Yoshimi* to regenerate the entire bank root, which would result in different IDs for existing ones, thus breaking one's older projects.

The new behaviour is to first install banks *Yoshimi* already knows about, and then test validity and install any new ones in spaces between the others. We still advise against doing this. It is much better to use the **Install** routine provided in the **Banks** window.

# 6 Menu

We're now ready to describe the user-interface of *Yoshimi*! The *Yoshimi* menu, as seen at the top of Figure 3 "Yoshimi Main Screen" on page 24, is fairly simple, but it is important to understand the structure of the menu entries.

## 6.1 Menu / Yoshimi

The *Yoshimi* menu entry contains the sub-items shown in Figure 15 "Yoshimi Menu, Exit" on page 40.


Figure 15: Yoshimi Menu

The next few sub-sections discuss the sub-items in the *Yoshimi* sub-menu.

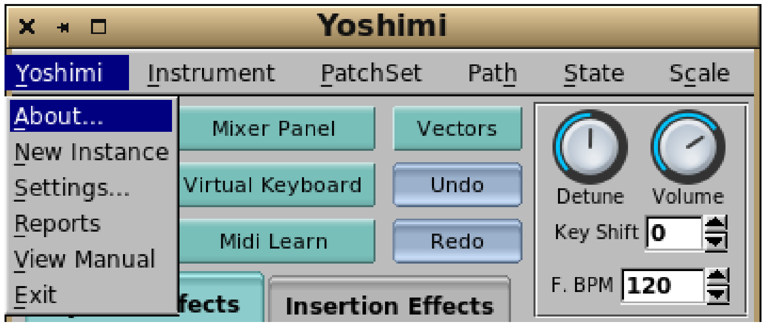



Figure 16: Yoshimi Menu

The items it contains are:

1. **About...**
2. **New instance**
3. **Settings...**
4. **Reports...**
5. **View Manual...**
6. **Exit**

The **Vectors** menu entry of version 1.4.0 has been moved to its own button in version 1.4.1, as can be seen in the figure. See Section 18.2 "Vector Dialogs" on page 220, which presents this dialog and describes it.

**Reports** This opens the *Yoshimi* console window. It has been swapped with MIDI-learn, which now has the button on the main window. Note that this will only show any messages if reports are not going to `stdout`. This can be changed by setting **Yoshimi / Settings / Main Settings / Send reports to:** to *Console Window* (for this item see Section 6.1.3.1 "Menu / Yoshimi / Settings / Main Settings" on page 43.)

**View Manual** This currently requires that a PDF viewer be installed. Note that some viewers might not work properly (e.g. `apvlv` ([1]).

### 6.1.1 Menu / Yoshimi / About...

There is no **Help** menu in *Yoshimi*. Therefore, the **About** dialog appears in the **Yoshimi** menu, as shown in Figure 17 "Yoshimi Menu, About Dialog" on page 42. These guys need some acknowledgement for their hard work! And they acknowledge the massive groundwork laid by the *ZynAddSubFX* project.

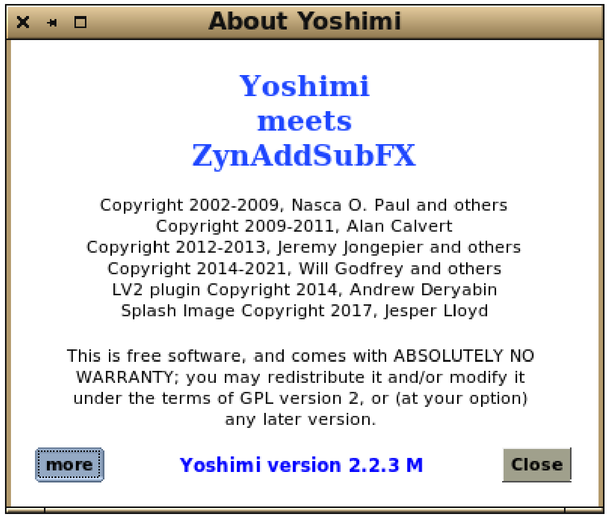



Figure 17: Yoshimi Menu, About Dialog

This has a new 'more' button that changes the window to an alphabetic list of all those who have helped Yoshimi. Sometimes just a hint from these friends has been enough to pave the way for extensive improvements.


Figure 18: Yoshimi Menu, Contributors

### 6.1.2 Menu / Yoshimi / New instance

The **New instance** menu entry creates a new instance of *Yoshimi*. If JACK is running, start a normal (JACK-using) instance of *Yoshimi*. Then use this menu entry. *Yoshimi* will start another instance of itself, with a prompt to accept the next available instance ID or to change it. The presence of this instance can be verified by running a JACK session manager such as *QJackCtl*. In a non-JACK setup it won't fail, but in the absence of any specific setting, it will have null audio, but (probably) will still connect to ALSA MIDI.

It is important to note that each instance of *Yoshimi* has its own configuration file. Each also has its own MIDI and audio ports. Thus, these instances are partly independent of each other. (They can share some information, such as copy/paste.) The new instance tries to open a *Yoshimi* instance based on the configuration found in the file `~/.config/yoshimi/yoshimi-XX.instance`, where *XX* is the ID one supplied.

Opening a new instance creates a copy that has it's own dynamic memory for running storage. Some data (such as recent history and copy/paste buffers) is shared between instances. The bank structure is partially synchronised, but needs more work.

Instances no longer fight for access to JACK/ALSA audio; they simply try to find another route to a soundcard. Failing to find one, they revert to null audio, but nonetheless start cleanly.

The list of hidden "base parameters" that are set only by the main instance is now:

- XML Compression Level
- Show Splash Screen
- Enable GUI
- Enable CLI
- Enable Auto Instance
- Enable Single Master

In the other instances these are now hidden instead of deactivated. This behaviour makes sense, as they are *never* enabled in the other instances of *Yoshimi*. This is more consistent, making *Yoshimi*'s configuration directory more tidy. These entries are also hidden when *Yoshimi* is being used as an LV2 plugin as they are not relevant at all in that environment.

#### 6.1.3 Menu / Yoshimi / Settings...

The *Yoshimi Settings* dialog contains six tabs that control the major and overall settings of *Yoshimi*.

**Settings** window.

At the bottom of this dialog is a **Close** button which closes the *Yoshimi* settings dialog. There used to be a **Save and Close** button as well, but since *Yoshimi* version 2.3.3 that is no longer needed, as all configuration changes are saved immediately. This simplifies a number of technical issues, as well as being more convenient for users.

Here are the tabs included in the main settings of *Yoshimi* as of version 2.3.3; each is described in its own section.

- **Main settings**
- **Switches**
- **Jack**
- **Alsa**
- **MIDI**
- **Theme**

##### 6.1.3.1 Menu / Yoshimi / Settings / Main Settings

The Main Settings tab controls the main configuration items that follow, which apply to all patches/instruments. The main settings are shown in Figure 19 "Yoshimi Main Settings Tab" on page 44. Some settings only take effect after restarting the synthesizer. In **Main settings**, only the items marked with an asterisk ('*') need a restart. The settings dialogs have changed gradually as *Yoshimi* has progressed.

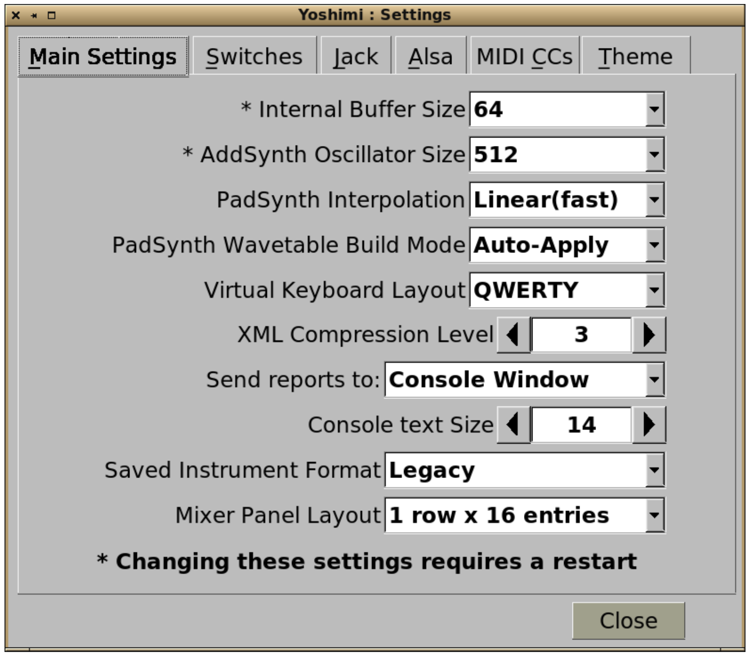



Figure 19: Yoshimi Main Settings Tab

The following settings exist in the *Main settings* tab:

1. **Internal Buffer Size**
2. **AddSynth Oscillator Size**
3. **PadSynth Interpolation**
4. **PadSynth Wavetable Build Mode**
5. **Virtual Keyboard Layout**
6. **XML compression level**
7. **Send reports to**
8. **Console Text Size**
9. **Saved instrument Format**
10. **Mixer Panel Layout**

**1. Internal Buffer Size.** This item was updated with version 1.3.6. It is actually the old **Period Size** field from the **Alsa** tab. It sets the granularity of the sound generation. To find out the internal delay in milliseconds, divide the buffer-size value by the sample-rate, then multiply the result by 1000: For example, $256/44100 * 1000 = 5.8ms$.

The default internal buffer size has been reduced from 1024 to 256. One gets better latency that way. Almost all modern computers can run *Yoshimi* with the current default (smaller) buffer-size value, and many will do so at 64 frames (and even 16 frames!) without any special precautions.

Note that, for ALSA, if the audio destination is "default", then ALSA decides on the buffer size (among other settings), and *Yoshimi* will set it's internal buffer size to match, which always seems to be 1024.

Values: `64, 128, 256*, 512, 1024, 2048, 4096, 8192`

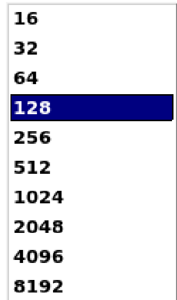



Figure 20: AddSynth Internal Buffer Size)

**2. AddSynth Oscillator Size.** ADDsynth Oscillator Size (in samples). This item used to be called "OscilSize". Sets the number of the points of the ADDsynth oscillator. Bigger is better, as it results in a more mathematically-correct waveform, but it takes more CPU, though it has no effect on latency. In an all-JACK environment, JACK determines the latency. There are very few occasions where one might want the internal buffer smaller than the JACK size, and none where it should be bigger. If it is bigger, the extra space will (to a small degree) represent wasted memory and processor use.

The default value for *Yoshimi* is shown marked with an asterisk. This asterisk/plus-sign convention is used throughout this manual. See Figure 21 "OscilSize Values" on page 45, shown below for the AddSynth Oscillator Size drop-down element.

Values: `256, 512*, 1024, 2048, 4096, 8192, 16384`

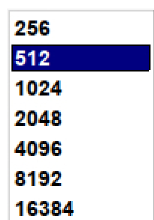



Figure 21: AddSynth Oscillator Size (samples)

**3. PADsynth Interpolation.** See Figure 22 "PADSynth Interpolation" on page 45, shown below, for the interpolation values. From an email conversation with Paul Nasca, Will notes that the sound improvement with cubic interpolation is quite subtle, and requires a well designed audio setup, a PADsynth instrument with a fair amount of high-frequency content... and good hearing!

Values: `Linear(fast)*, Cubic(slow)`

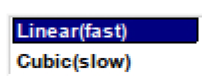



Figure 22: PADSynth Interpolation Values

**4. PadSynth Wavetable Build Mode.**

PadSynth wavetables have to be generated before they can be played, and this can take some time. Previously this always involved silencing the whole part, building the wave table, then restarting the part. While this *Muted* mode is still available for older computers, there are now two other build modes.

*Background*, as the name implies will let one continue using an existing wavetable while it builds a new one, then notifies that it is ready to be applied. Finally, *Auto-Apply* also builds the new wavetable without disrupting one's playing, then applies it as soon as it is ready.

Values: `Muted, Background*, Auto-Apply`

**5. Virtual Keyboard Layout.** The virtual keyboard is useful, but it is difficult to move the mouse rapidly to the next key on the virtual keyboard. Therefore, *Yoshimi* supports using the computer keyboard to produce notes.

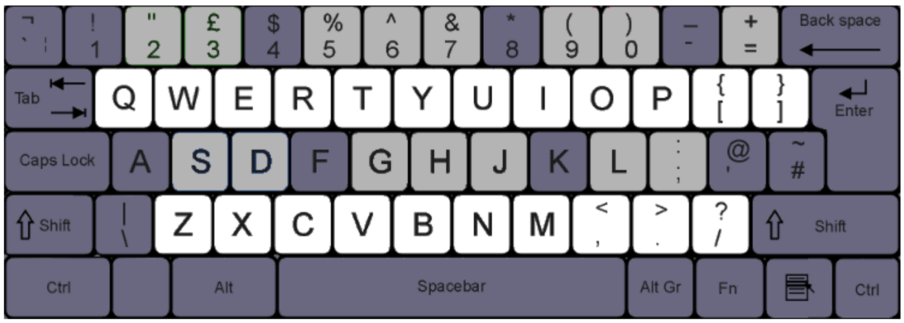



Figure 23: QWERTY Virtual Keyboard Layout

See Figure 23 "QWERTY Virtual Keyboard Layout", for the mapping of the computer keyboard to the virtual keyboard. Three octaves are available, with the dark keys of each colour representing the "black" keys. Note that this is a QWERTY layout. *Yoshimi* also supports other keyboard layouts. See Figure 24 "Virtual Keyboard Layout" on page 46, for the virtual keyboard layout settings drop-down.

Values: `QWERTY*, Dvorak, QWERTZ, AZERTY`

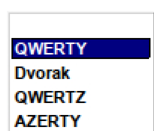



Figure 24: Virtual Keyboard Layout Values

**6. XML compression level.** Gzip Compression level of *Yoshimi* XML files. The settings and instruments of *Yoshimi* are preserved in XML files. The value of 0 indicates that the XML file is uncompressed.

In general, 0 is a setting for debugging only. Setting this option makes the XML files a bit larger, perhaps larger by a factor of more than 10, making a 10K file into a 180K file. For a little "wasted" space and time, one can view the XML file in a text editor. If one's system is tight on disk space, higher levels of compression can be specified. Using XML compression can also save file access time which may be beneficial if one's computer is borderline on latency. This setting should stay at 3 if one is going to make instruments publicly available, as some older versions of Yoshimi don't recognise uncompressed files. This also applies if one is going to save large patchsets that will be loaded while running. Uncompressing is *much* faster than file loading.

Values: `0 to 9, 3*`

**7. Send reports to.** Notices and error messages can be sent to the standard error log of the terminal in which *Yoshimi* can be run, or, more usefully, to an output console window. In some versions of Yoshimi these messages were pushed in reverse order, to avoid manually scrolling and to make the most recent statuses easily visible. However, a method has now been found to auto-scroll and keep the most recent entry visible, so new entries are in normal reading order.

See Figure 25 "Send Reports" on page 47. It provides a depiction of the selection drop-down.

Values: `stderr*, Console Window`

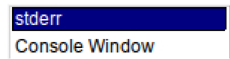



Figure 25: Send Reports To

If the **Console Window** option is chosen, then a small console dialog will be opened, as shown in Figure 26 "Yoshimi Console Window" on page 47. If this is closed, it can be re-opened from the *Yoshimi* menu.

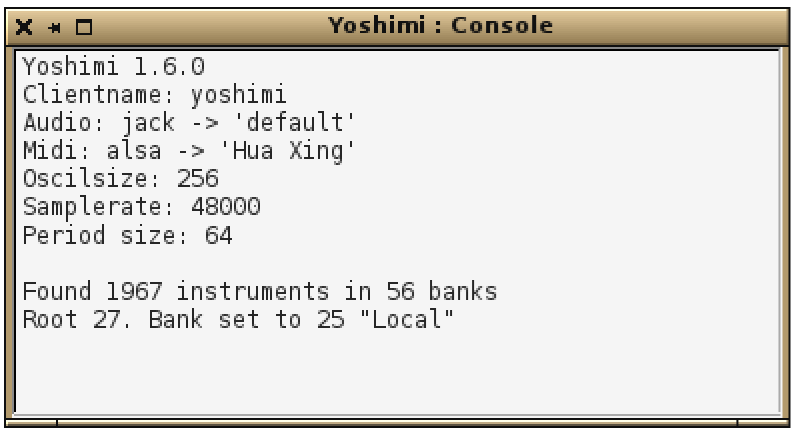



Figure 26: Console Window

Note that numbers that are shown (such as part numbers) all start from 1, not 0.

```
Loaded 65 "Hyper Arpeggio" to Part 1
Loaded 10 "Arpeggio11" to Part 2
Loaded 41 "Soft Arpeggio4" to Part 3
Loaded 67 "Glass Arpeggio1" to Part 4
```

**8. Console Text Size.** New in V2.1.0.

The Console window was always resizeable so that one could change the length of lines, or number of lines visible. This meant we couldn't realistically make the contents (i.e. the text) resize automatically. The new control allows one to set a suitable text font size.

Values: `11 to 100, 12*`

**9. Saved instrument Format.** This new (1.5.5) feature provides a choice between the old instrument format and a new format. The **Legacy** format has a file extension `.xiz`. The **Yoshimi** format has a file extension `.xiy`.

Values: `Legacy (.xiz), Yoshimi (.xiy), Both (.xiz + .xiy)`

Some users wanted a way to store the **Controllers** settings with an instrument, as they can make a dramatic difference to the sound. There is now a superset of instruments that can be saved instead of, or as well as, the standard ones. On loading, *Yoshimi* will look for the extended version (`.xiy`) first. This applies to instruments in banks, as well as externally saved instrument. If one has an extended type loaded, the instrument name will be in a blue font, instead of black. This also applies to the stored instruments in bank slots.


Figure 27: Extended File Format Font

This is part of the rationale of the new instrument format: We will *never* make any changes to the standard instruments, and one will always be able to load and save them. However, we will incrementally add improvements and refinements to the new format, with compatible adjustments for the standard-format instruments, where appropriate.

There is a caveat when handling instruments in banks. If one sets for only **Legacy** or only **Yoshimi**, but have previously set for both, saving to such a dual entry will erase the one that wasn't selected. Currently, it is not known why that happens (banks are 'interesting').

**10. Mixer Panel Layout.** This enables one to set either a single row of 16 parts, or a 'box' style of two rows of eight. It performs the same function as the one in the mixer window itself. This has been placed here as it has been found that with very low resolution screens and some window managers it is possible for the mixer panel's own selector to disappear off the screen in an unrecoverable manner.

#### 6.1.3.2 Menu / Yoshimi / Settings / Switches

Many of the check-box items have been moved into this new tab, to reduce clutter.

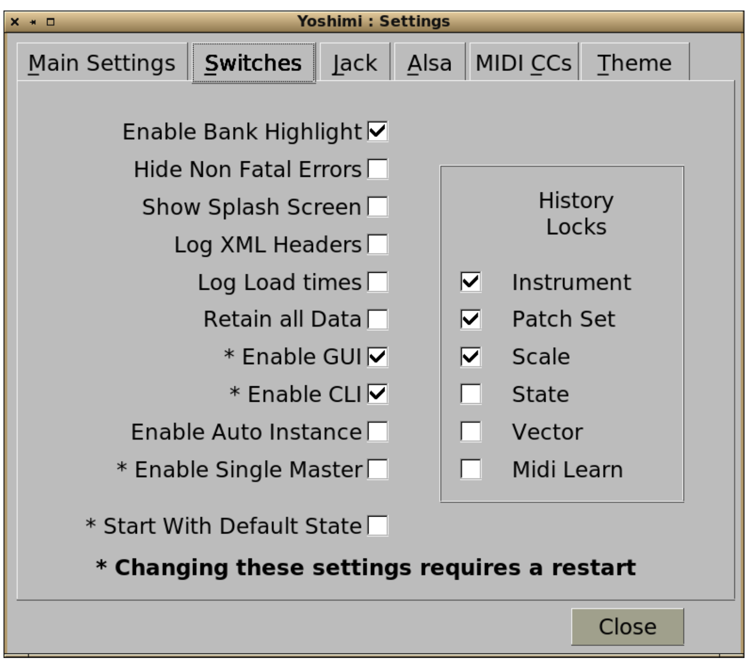



Figure 28: Yoshimi Switches Tab

The following settings exist in the *Switches* tab:

1. **Enable Bank Highlight**
2. **Hide Non Fatal Errors**
3. **Show Splash Screen**
4. **Log XML Headers**
5. **Log Load times**
6. **Retain all data**
7. **Enable GUI**
8. **Enable CLI**
9. **Enable Auto Instance**
10. **Enable Single Master**
11. **Start With Default State**

**1. Enable Bank Highlight.** Setting this will highlight the most recent instrument either loaded from, or saved to a bank. It will be printed in bold text so will really stand out. This is especially useful where instruments have a different internal name to their filename.

**2. Hide Non Fatal Errors.** Especially when running from the command line (with reports going there too), under some circumstances one can get a swamp of low-level error messages (such as XRUNs) that is so large that one cannot work out what is going on. This feature disables these error messages; it is a work in progress to catch the bulk of them, while still reporting top-level messages and ones that cause a forced exit (surely not!)

**3. Show Splash Screen.** This item will speed up the start-up of *Yoshimi* slightly if unchecked, by not showing the splash screen while files are being loaded.

**4. Log XML Headers.** This item sends the information to the console window (or `stderr`) so that one can then see what *Yoshimi* version created the file.

**5. Log Load times.** Provides a way of noting problematic patch sets, which may take a long enough time to load so as to affect the smoothness of playback.

**6. Retain all Data.** Allows disabled data to be stored in the XML file. This makes it a lot easier to re-enable a setting later. However, the file size will be significantly greater.

**7. Enable GUI.** If checked, the user-interface is enabled. This setting is normally what one wants. If one unchecks it, it warns that disabling the GUI can only be reversed from the command line.

**8. Enable CLI.** If checked, the command-line interface is enabled. Note as of V 1.5.6 it has been possible to disable both the user-interface and the command line at the same time. This means that Yoshimi can only be closed by sending a special MIDI message (CC 99, 68, CC 98, 68). Alternatively one could send a system shutdown message.

**9. Enable Auto Instance.** If checked, then, if any other instances were open at the time one closes the main instance, then these other instances will be re-opened next time one runs *Yoshimi*.

If these instances each have their own **Start with Default State** switch checked, and if there is a valid default state for them, then these instances will also have their default state loaded. Therefore, just by starting the main instance, one can have a highly-detailed multi-instance setup installed. This setup will include such things as JACK/ALSA audio and MIDI, and a complete patch set, etc.

**10. Enable Single Master.** If checked, then once running, trying to start a new instance from the desktop ( or command line) will instead get the next available instance in the currently running one. This is both more efficient use of resources, and ensures consistency because top-level instances cannot communicate independently changed configuration settings. (new from V 1.6.0)

**11. Start With Default State.** Requires *Yoshimi* to be restarted, to take effect. This setting allows *Yoshimi* to be initialised with one's own initial state file that matches one's usual work setup. The default state file is named `~/.config/yoshimi/yoshimi.state`.

If the **Reset** button on the main screen is clicked, then this file is loaded, instead of reverting to the first-run default state of *Yoshimi*.

#### 6.1.3.3 Menu / Yoshimi / Settings / Switches / History Locks

New in *Yoshimi* V 1.6.0 there is a sub-panel *History Locks*

This is a set of config switches so that one can independently lock each of the history lists against change. In the locked state loading or saving new files will not update the associated history list at all. At any time, these lists can of course be unlocked again. This is especially useful when changing these settings via MIDI NRPNs (also new).

1. **Instrument**
2. **Patch Set**
3. **Scale**
4. **State**
5. **Vector**
6. **Midi Learn**

The default state is 'unlocked' as shown in the image above, retaining compatibility with older versions of *Yoshimi*.

Finally, the history file is unique in that it is entirely internally generated, and the file is common across all instances. Although treated as a config setting, the new switch settings are actually embedded in the history file itself, which ensures consistency.

#### 6.1.3.4 Menu / Yoshimi / Settings / Jack

JACK is the "Jack Audio Connection Kit", very useful for increasing audio performance and configurability. When using the JACK audio backend, instruments can be individually routed and sent to the main L/R outputs. This is controlled from the panel window, Section 9.1 "Mixer Panel Window" on page 118, and the settings are saved with all the other parameters.

Direct part outputs are only available to Jack, and include the Part and Insertion effects, but not the System ones.

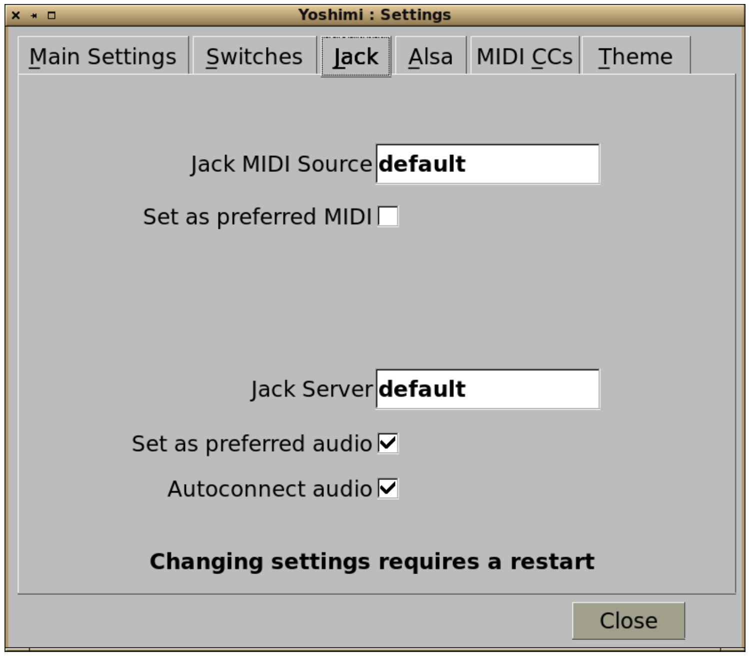



Figure 29: JACK Settings Tab

The following items are provided by the Jack settings:

1. **Jack Midi Source**
2. **Set as preferred MIDI**
3. **Jack Server**
4. **Set as preferred audio**
5. **Autoconnect audio** (new, 1.3.9)

**1. Jack Midi Source.** Jack MIDI Source. It is possible to have more than one JACK MIDI source. This option tells this instance of *Yoshimi* which JACK client to try to auto-connect to for MIDI input. This option corresponds to the *Yoshimi* command line option `--jack-midi(=device)`.

Values: `default*, name` name; see "man jackd" for details.

**2. Set as preferred MIDI.** Set as preferred MIDI for JACK. This setting determines which MIDI connections a particular instance will first attempt. The switches are mutually exclusive across JACK and ALSA, so if one checks ALSA for MIDI, it automatically unchecks JACK for MIDI. As well as from the GUI, this setting can be set (for instance 0) from the command line, both at start-up and once running.

**3. Jack Server.** Jack Server Name. It is possible to have more than one JACK server running. This option tells this instance of *Yoshimi* which JACK server to use. This option corresponds to the *Yoshimi* command line option `--jack-audio(=server)`.

Values: `default*, name` name, as set by `jackd --name`; see "man jackd" for details.

**4. Set as preferred audio.** Set as preferred audio for JACK. This setting determines which audio connections a particular instance will first attempt. The switches are mutually exclusive across JACK and ALSA, so if one checks ALSA for audio, it automatically unchecks JACK for audio. As well as from the GUI, this setting can be set (for instance 0) from the command line, both at start-up and once running. Note that any of these setting changes require a restart of *Yoshimi* to take effect.

**5. Autoconnect audio.** Sets *Yoshimi* to connect automatically to the JACK server, just like the `-K` command-line option does. (However, note that the command-line has no way to disable this feature if the configuration has been saved.)

#### 6.1.3.5 Menu / Yoshimi / Settings / Alsa

A significant improvement is to the handling of ALSA audio, which is still very important for some people. Until now, *Yoshimi* has insisted on a 2-channel, 16-bit format. Tests have shown that virtually all motherboard sound chipsets will handle this, but many external ones don't.

From *Yoshimi* 1.3.6 onward, when using ALSA audio, *Yoshimi* first tries to connect 2 channels at 32 bit depth. If that connection does not succeed, then *Yoshimi* negotiates whatever the soundcard will support. For example, a card might support only 24 bits, and 6 channels. So *Yoshimi* will fall back to 24 bit, and, due to its own limits, will use only channels 1 and 2. With external sound modules in mind, endian swaps are also implemented.

To be able to reliably use ALSA audio, one needs to set a card name, not just "Default". In a terminal window enter the following command:

```
$ cat /proc/asound/card*/id
```

The result of this command should be something like:

```
PCH
K6
```

Go to the ALSA settings tab illustrated below, and in *Alsa Audio Device* enter, for example, "hw:PCH". This ensures one will always connect to this card at startup regardless of the order this and of other cards. Another benefit of using this hardware name is that ALSA will now use *Yoshimi*'s internal buffer size (default 256), otherwise ALSA will force *Yoshimi* to accept its default size (usually 1024).

One can also set the sample rate, but bear in mind that not all cards can use all of these. The sample rates 44100 and 48000 are almost always available. If one sets a Midi Device as well (such as a keyboard) Yoshimi will try to find and connect to this device at startup.

To find the MIDI devices available, try:

```
$ grep Client /proc/asound/seq/clients
```

The result of this command should be something like:

```
Client info
Client   0 : "System" [Kernel]
Client  14 : "Midi Through" [Kernel]
Client 128 : "TiMidity" [User]
```

It is not obvious how ALSA audio is controlled and who takes command. If one sets a specific audio destination, then *Yoshimi* makes a request. It's often a negotiation on bit depth and channel count, but *Yoshimi* nearly always gets to decide the buffer size, which is the internal buffer size. However, if the destination is 'default' then ALSA decides on the sound card, bit depth, number of channels and the buffer size, and *Yoshimi* will set it's internal buffer size to match. On most machines this seems to be 1024.

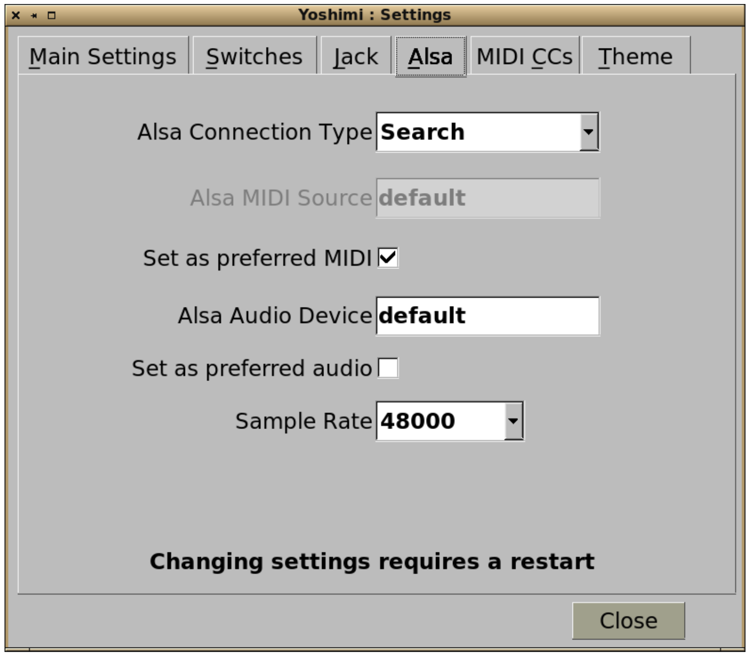



Figure 30: ALSA Settings Tab

**1. Alsa Connection Type.** ALSA MIDI Connection Type. This feature was added in *Yoshimi* V 1.6.1 and is a dropdown list with the following three options.

Values: `Fixed, Search*, External`

**Fixed** is the original arrangement, and activates the Alsa Midi Source control below.

**Search** will search for and connect to any MIDI sources that are available and is aimed particularly at new users.

**External** doesn't make any attempt to connect at all, so one would then do so by some other means.

Notice that the default is now the second option. However this will not affect existing users, who will see it as 'Fixed' until such time as they change it themselves.

**2. Alsa Midi Source.** ALSA MIDI Source. The purpose of this setting is the same as the command line option `--alsa-midi="name"`. It is used so that *Yoshimi* can auto connect to a MIDI source such as a keyboard. For example, the one that Will has identifies itself as name = "Hua Xing". A port name, such as "128:0" (for one of the ports provided by *TiMidity*) should work as well, but beware of USB MIDI devices that might not have the same port numbers each time.

An extension was also added here during the development of *Yoshimi* V 1.6 so that one can have a comma separated list of sources. These will be searched for and connected if found. This is especially useful if wanting a known variety of keyboards and/or controllers connected, but only those in a comparatively congested MIDI setup.

Values: `default*`

**3. Set as preferred MIDI.** Set as preferred MIDI for ALSA. This setting determines which MIDI connections a particular instance will first attempt. The switches are mutually exclusive across JACK and

ALSA, so if one checks ALSA for MIDI, it automatically unchecks JACK for MIDI. As well as from the GUI, this setting can be set (for instance 0) from the command line, both at start-up and once running.

**4. Alsa Audio Device.** ALSA Audio Device. This specifies the sound card to which *Yoshimi* can connect. Normally, this will be an ALSA hardware specification such as "hw:0". ALSA audio also lets one connect to a sound card by name. For example, with a Komplete Audio KA 6 sound card, the device specification is "hw:K6". This feature is particularly useful for USB modules, as one can never be sure where they appear numerically.

Values: `default*`

Note, that if it is left as "default" then all aspects will be at their default settings. This includes sample rate and buffer size.

**5. Set as preferred audio.** Set as preferred audio for ALSA. This setting determines which audio connections a particular instance will first attempt. The switches are mutually exclusive across JACK and ALSA, so if one checks ALSA for audio, it automatically unchecks JACK for audio. As well as from the GUI, this setting can be set (for instance 0) from the command line, both at start-up and once running.

**6. Sample Rate.** Sample Rate. Sets the quality of the sound, higher is better, but it uses more CPU. One can select from a list. Note that both ALSA and JACK will support the 192000 rate, if the sound-card supports it. To find out the internal delay in milliseconds, divide the buffer-size value by the Sample Rate and multiply the result by 1000 (256 / 44100 * 1000 = 5.8 ms).

Note that, as of version 1.3.6, the **Period Size** field has been removed from the **Alsa** tab, and is replaced by the **Internal Buffer Size** field in the **Main Settings** tab. Note that any of these setting changes require a restart of *Yoshimi* to take effect.

Values: `192000, 96000, 48000*, 44100`

#### 6.1.3.6 Menu / Yoshimi / Settings / MIDI CCs

The CC settings tab has been renamed to "MIDI CCs" tab. This tab, shown in Figure 31 "MIDI Preferences" on page 55, presents MIDI bank-root, bank, program change, and extended program change settings, plus some new values.

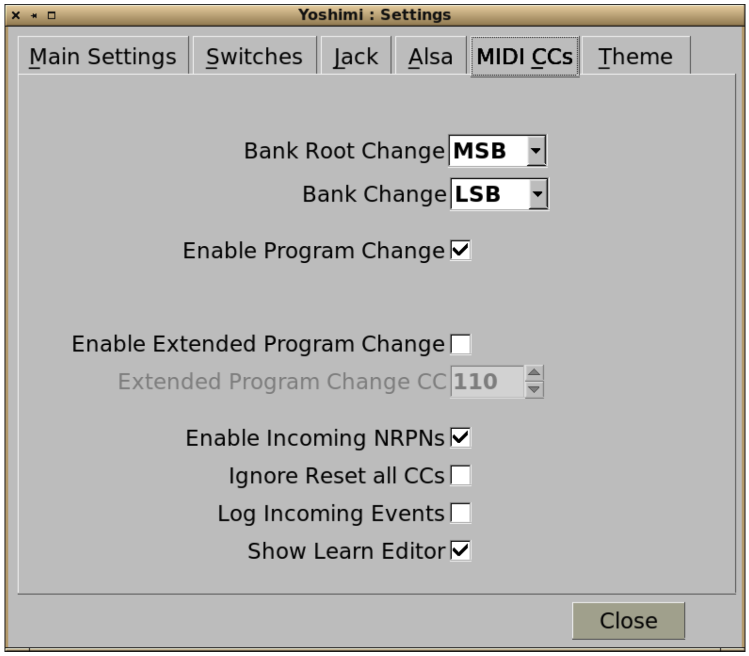



Figure 31: MIDI Preferences Tab

A recent feature is that some changes to the items in this tab cause a red **Pending** button to appear. Pressing this button saves that particular change.

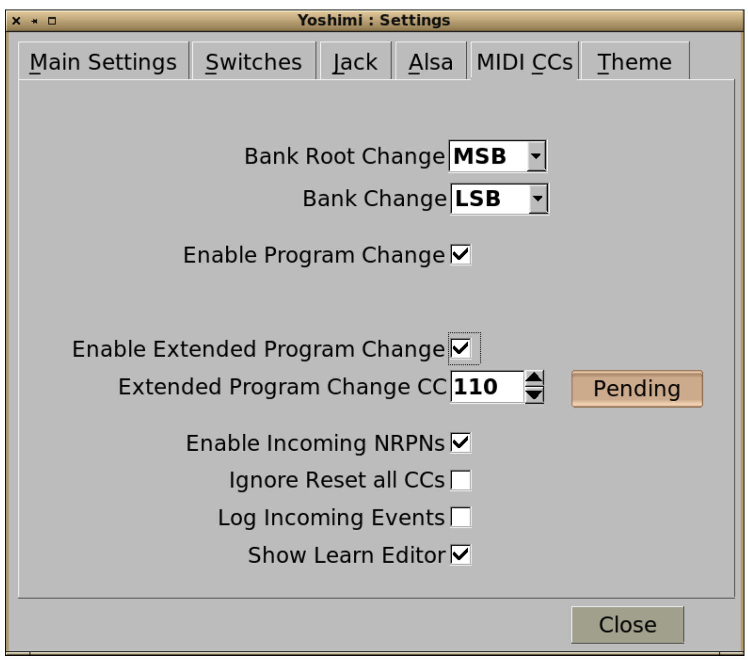



Figure 32: MIDI Settings Pending

The following items are provided by the MIDI CCs settings tab:

1. **Bank Root Change**
2. **Bank Change**

3. **Enable Program Change**
4. **Enable Extended Program Change**
5. **Extended Program Change**
6. **Enable Incoming NRPNs**
7. **Ignore Reset all CCs**
8. **Log Incoming CCs**
9. **Show Learn Editor**

The concepts of banks and roots is very useful. See Section 24.3 "Concepts / Banks and Roots" on page 283. The settings in this tab affect the usage of banks and root changes controlled by MIDI messages, thereby making *Yoshimi* able to implement MIDI automation.

For many of the controls in this section, if the control number is already in use for another purpose, one might get a warning like the following:

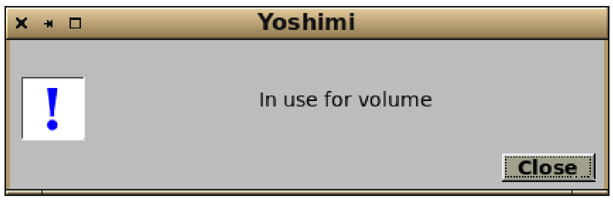



Figure 33: MIDI Setting In Use

**1. Bank Root Change.** Bank Root Change. Defines which MIDI controller one wants to use. This has been changed in V 1.5.11 so that it is consistent with Bank Change.

Values: `LSB, MSB*, Off`

**2. Bank Change.** Bank Change. Defines which MIDI controller one wants to use.

Values: `LSB, MSB*, Off`

When combined, these Bank Select messages provide `128*128` = 16384 banks.

Note that normally MIDI Controller 0 = CC0 = Bank Select MSB, and MIDI Controller 32 = CC32 = Bank Select LSB. Also a Bank (and Bank Root) selection simply makes these available for the next Program Change event. The program doesn't change after changing a bank, until an actual Program Change is sent. Bank/Root changes can be completely disabled, as some hardware synthesizers don't play nice with banks when used to send MIDI.

**3. Enable Program Change.**

Values: `Off*, On`

Enables/disables MIDI program change. Program changes can be completely disabled, as some hardware synths don't play nice when used to send MIDI.

The part is automatically enabled if the MIDI program was changed on this part. There is no longer an option to disable this enabling.

**4. Enable Extended Program Change.**

Values: `Off*, On`

**5. Extended Program Change CC.** If enabled, a new reddish button, **Pending**, appears. Once the change has been made in the scroll list, click this button to set the change. **Warning:** The **Save and Close** button will not result in the removal of the **Pending** button. This result seems counter-intuitive, but the pending button is not removed here because, at that point, it still hasn't actually been either set or abandoned. It remains available for when the user actually makes up their mind.

Values: `0-127, 110*`

**6. Enable Incoming NRPNs.** Set by default, so one might not notice it at first. Disabling incoming NPRNs stops rogue MIDI sources from screwing things up. Disabling it also lets one use the NRPN CCs for other functions, if wanting to use a programmable hardware controller.

Values: `Off, On*`

**7. Ignore Reset all CCs.** Causes *Yoshimi* to ignore this message. For example, using *Yoshimi*'s CC monitor (see the next item), Will found that one software sequencer was sending CC 121 (reset all controllers) at the start of some song segments. Checking this option prevents unwanted resets.

Values: `Off*, On`

**8. Log Incoming Events.** This setting is now saved (in the `config` file). It is there as an aid for when *Yoshimi* appears to ignore MIDI commands, as it tells one exactly what *Yoshimi* thinks it received.

Values: `Off*, On`

**9. Show Learn Editor.** Sets whether the MIDI Learn editor window is to be opened when learning a new control. One might find that when learning a new control one wants to change the **Min** and **Max** settings.

Values: `Off, On*`

#### 6.1.3.7 Menu / Yoshimi / Settings / Themes

From *Yoshimi* Version 2.3.0 one can change the colours of almost all parts of all windows. A slight variation of the original colours is now called 'classic', and this will always be available. There is also quite an extreme demonstration of what is possible.

There is enough new information to justify a separate discussion of this, so full details can be found in Section 20 "Themes" on page 234 .

### 6.1.4 Menu / Yoshimi / View Manual...

This menu entry brings up the most recent version of this manual, which is now included as part of a *Yoshimi* installation. Note that some viewers might not work properly (e.g. `apvlv` ([1]).

### 6.1.5 Menu / Yoshimi / Exit

Simply exits from *Yoshimi*. The user is prompted if unsaved changes exist, as shown in Figure 34 "Yoshimi Menu, Exit" on page 58.

One can sometimes get a false parameters-changed warning if one scrolls through one of the menu type entries without actually changing it. Better safe than sorry!

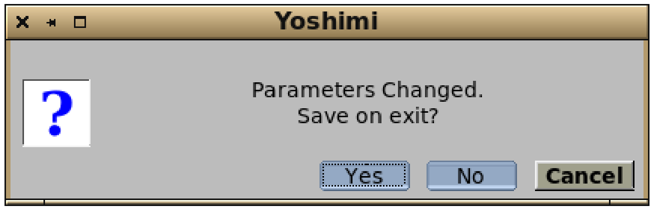



Figure 34: Yoshimi Menu, Exit

## 6.2 Menu / Instruments

The *Yoshimi* Instruments menu lets one select instruments and work with banks of instruments.

While the **Instrument Menu** allows for the management of parts, the **Part Edit** dialog, described in Section 11.3 "Bottom Panel Instrument Edit" on page 158, is where one would start for the the creation of a new part/instrument.

When opening an instrument bank one can now tell exactly which synth engines are used by each instrument. This is represented by three pale background colours:

- **Red**: ADDsynth
- **Blue**: SUBsynth
- **Green**: PADsynth

These new coloured engine backgrounds aren't just pretty. They give real information about expected processor load, and time taken to be ready when loaded:

- Processor Load, low to high: **PAD**, **SUB**, then **ADD**.
- Time to initialise, low to high: **SUB**, **ADD**, **PAD**.

If the instruments are kits they are scanned to find out if *any* member of the kit contains each engine. This scanning is duplicated in the current part, the mixer panel for the currently loaded instruments, and in the Instrument Edit window the same colours highlight the engine names when they are enabled with the check boxes.

The following sub-menus are provided, as shown in Figure 35 "Yoshimi Menu, Instruments" on page 58.

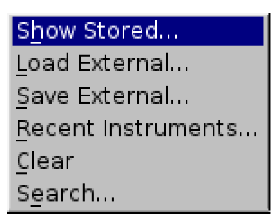



Figure 35: Yoshimi Menu, Instruments

This new version of the **Instruments** menu is somewhat different than the old version. It is actually simpler and easier to use, while still offering all of the power of the setting up of instruments in *Yoshimi*.

1. **Show Stored...**

2. **Load External...**
3. **Save External...**
4. **Recent Instruments...**
5. **Clear**
6. **Search**

### 6.2.1 Menu / Instrument / Show Stored...

Instruments are stored in banks (see Section 24.3 "Concepts / Banks and Roots" on page 283). The banks (and current bank setting) are loaded/saved automatically by the program, so one doesn't have to worry about saving the banks before the program exits. On program start, the last used bank is loaded. A single bank can store up to 128 instruments. However, there is space for a number of additional instruments in the bank, the extended-program section, to allow up to 160 instruments in a bank.

When the **Show Stored...** button is selected, a dialog comes up that shows all of the instruments present in the currently-selected bank.

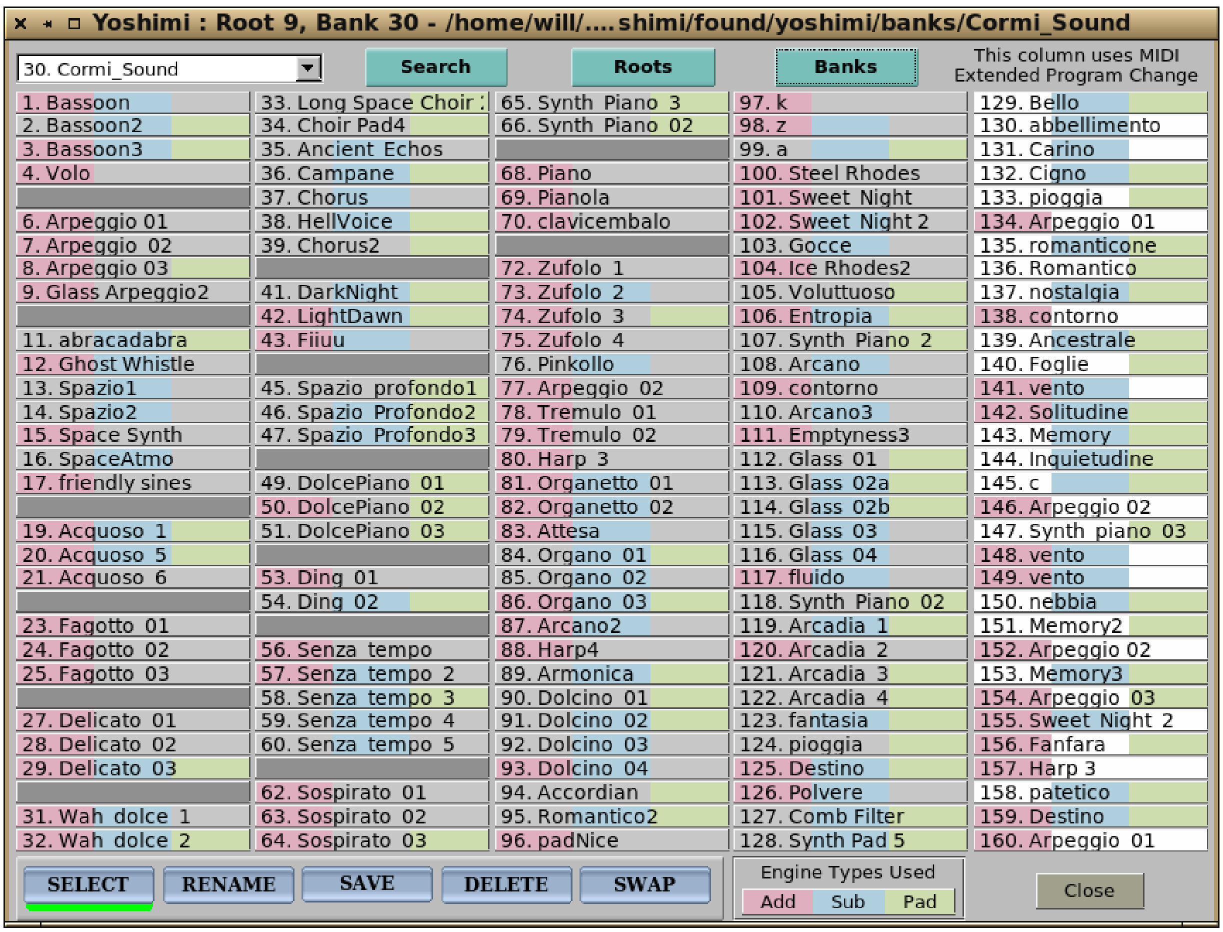



Figure 36: Instruments Stored in Current Banks

As Figure 36 "Show Stored Instruments" on page 59, shows, this is a very complex dialog with a lot of options. The figure shows a default setup, with the bank of instruments at location 30, **30. Cormi Sound**, listed. If one drops this list down (shown later), one also observes that the banks are numbered in increments of 5, to make it easier for a user to insert his or her own bank(s) of instruments. The default set of banks are spaced 5 apart for this reason. If we add more than 25 banks in future versions of *Yoshimi*, then a *clean* install will wrap round starting with location 2 and again spaced 5 apart, and so-on until all spaces are filled. For an existing setup, new entries will just be slotted in where they will fit.

Also, if one deletes banks or instruments by some external means, the next time *Yoshimi* starts, it will notice their absence and quietly remove their entries.

Note how *Yoshimi* shows the colour coding for the synth-sections used in each instrument: red for ADDsynth, blue for SUBsynth, and green for PADsynth. This used to be switchable as not fetching the colour information from the banks meant startup was sometimes slightly faster. However this then interfered with later developments that use this information for other purposes so it has now been removed.

Also note how the numbers at the beginning of the filenames are used as an "instrument" or "program" number. These numbers can be used in MIDI Program Change commands.

A new feature since *Yoshimi* V 1.7.2 is highlighting the last instrument seen. In this case, the third one in the list. This is particularly useful for banks where the internal name is different from the filename.

All of the instrument files (such as `0001-Arpeggio1.xiz`) with filenames starting with numbers (no matter how many digits) will be shown in the corresponding slot number. Variations in filename after the number are ignored; the files are treated as the same instrument.

Those instrument files without numbers (or larger numbers?) will start with numbers at 129 or above ("Extended Program Change") up to 160. One could give them numbers by renaming them outside of *Yoshimi*, then reloading the bank. One can also fix unnumbered ones simply by loading them, then re-saving them to the same slot. It's then probably best to swap them into the main set, if there is space.

Note that MIDI CC (see Section 6.1.3.6 "Menu / Yoshimi / Settings / MIDI CCs" on page 54) can be set to access voices from 129 to 160. All the Bank controls in the **MIDI** settings tab take immediate effect when set. Bank and program changes can be completely disabled in the settings tab; some hardware synths don't play nice with it.

Learning how to use the Instruments dialog is an important way to make instruments easier to manage, and so this will be a long discussion.

Here is a list of the user-interface items in the instruments/banks dialog:

1. **Bank Names**
2. **Search**
3. **Roots**
4. **Banks**
5. **Instrument and Bank Matrix**
6. **SELECT**
7. **RENAME**
8. **SAVE**
9. **DELETE**
10. **SWAP**
11. **Close**

**1. Bank Names.** Instruments Bank Name. This item is a drop-down list of the available instrument banks in the currently-selected **root** directory. Basically, each bank is a directory name, with a number prepended. The banks are found under the current root, which is a also a directory name, and is the name of the parent directory of a set of banks. Here is the Bank Names drop-down list for the default setup, which has the default banks provided by the basic *Yoshimi* installation.

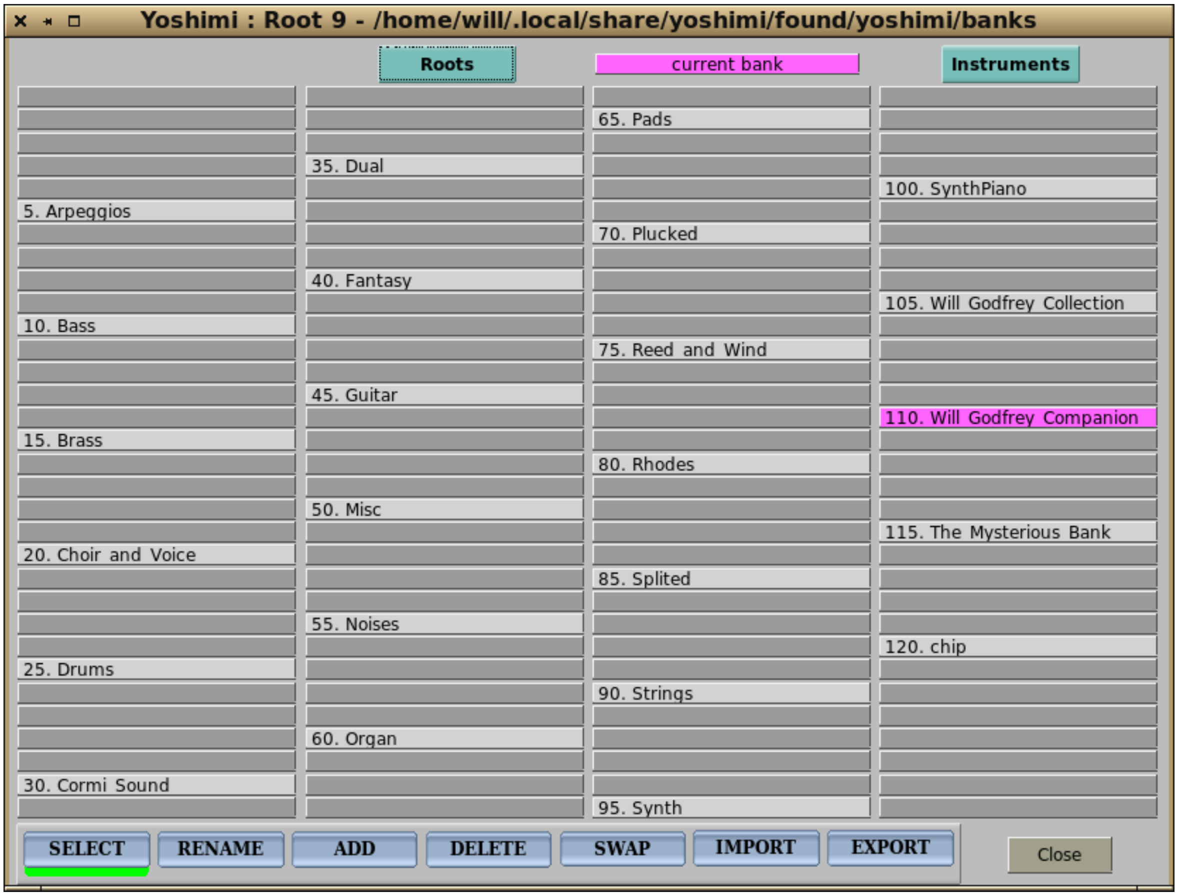



Figure 37: A Sample Bank List

And here is the directory listing associated with it, in the order produced by the UNIX/Linux `ls -1` (list single-column) command (shown in two columns to save space):

```
Arpeggios          Plucked
Bass               Reed_and_Wind
Brass              Rhodes
Choir_and_Voice    Splited
Drums              Strings
Dual               Synth
Fantasy            SynthPiano
Guitar             The_Mysterious_Bank
Misc               Will_Godfrey_Collection
Noises             Will_Godfrey_Companion
Organ              chip
Pads               Cormi_Sound
```

The directories (banks) shown above come from the default **root** when *Yoshimi* and its data files are installed:

```
/usr/share/yoshimi/banks
```

If one installed *Yoshimi* by building the source code, then this directory is:

`/usr/local/share/yoshimi/banks`

Note that the directory that holds the banks is shown in the title bar. Another good source of banks, if one installs *ZynAddSubFX*, is:

`/usr/share/zynaddsubfx/banks`

Note that there are only 128 *Yoshimi* banks supported in a *Yoshimi* root. If the list of banks takes up about half of the available slots, it might be time to move some of those banks to a new root directory.

The numbers in the drop-down list are generated by *Yoshimi* the first time it sees a new root path or a new bank within the root path. Once set, these numbers will never change unless one actually moves them around (using the **SWAP** button).

The bank number is also the MIDI ID for the bank; one can be sure that it will always be there for bank changes, no matter how many banks are added later. *Yoshimi* always lists the banks in ID order, not alphabetical order, so one can group them sensibly and permanently. However, at first-time creation *Yoshimi* sets the IDs in alphabetical order and tries to space them evenly over the range to provide some wiggle room. Selecting one of the items in this drop-down list selects the bank and loads it into the Banks dialog.

Right-clicking or left-clicking on a bank in the drop-down list causes the instrument list of the previous bank to be replaced by the instrument list of the newly-selected bank.

**2. Search.** Instruments Search Button. This feature arrived with *Yoshimi* V 1.6.0 and provides a way of finding instruments of a given type right across all known banks and bank roots.

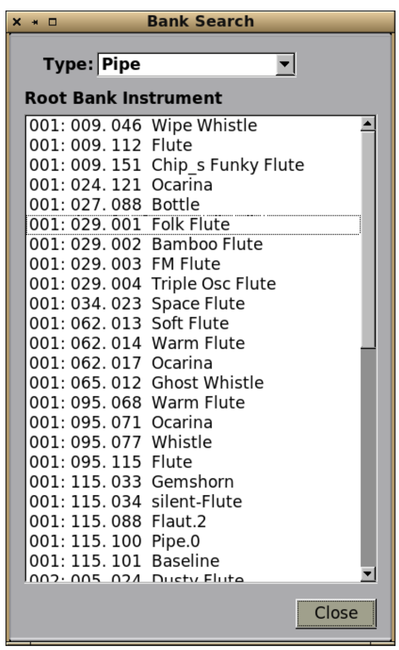



Figure 38: A search list

The top field is a drop-down menu that gives all the types *Yoshimi* recognises, and below this is the list of those most recently found. As well as the names of the instruments one sees the bank root ID, bank

ID and instrument number. All of these are the values that will be recognised by MIDI.

Clicking on any entry will immediately load the instrument into the current part **without** changing the settings for current bank or root.

**3. Roots.** Instruments Roots Button. Shows a list of directories that can serve as "root" directories. The "Bank Root Paths" dialog discussed in Section 6.3.5 "Menu / PatchSets / Patch Bank Roots" on page 71 in Figure 43 "Show Patch Banks" on page 68 shows the system root (e.g. `/usr/share/yoshimi/banks`) and a user's home location for his/her banks and roots.

**4. Banks.** Banks Button. This item brings up a Banks dialog showing all of the banks present in the current root. It is an alternative to using the **Bank Names** drop-down list to select a bank. It is also a way to reorganise and renumber the banks without using the Linux console or a file-explorer application to do so.

**5. Instrument and Bank Matrix.** Instruments Bank Matrix. Shows the instruments that are in the currently selected bank.

The next few items are selector buttons that determine what happens when one clicks on an instrument name.

**6. SELECT.** Instruments SELECT. When this button is selected, then clicking on an instrument selects that instrument as the instrument for the current Part active in the main window. In the main window of *Yoshimi*, that instrument name will appear in the currently-selected **Part**. If *Yoshimi* is writing to a console window then each part, when clicked, will be shown:

```
yoshimi> Loaded 64 "Hyper Organ1" to Part 1
Loaded 65 "Hyper Arpeggio" to Part 1
Loaded 10 "Arpeggio11" to Part 1
Loaded 41 "Soft Arpeggio4" to Part 1
Loaded 67 "Glass Arpeggio1" to Part 1
```

**7. RENAME.** Instruments RENAME. When this button is selected, then clicking on a bank brings up a small dialog to rename the clicked-on bank. However, one will see the following warning message if trying to rename a file that is in a directory not modifiable by normal users:

```
! Could not rename instrument 39 to Soft Arpeggio5 [Close]
```

Note that, as soon as this operation is done, the auto-selector (green check-box) moves back to the **SELECT** button.

**8. SAVE.** Instruments SAVE. When this button is selected, then clicking on a bank saves the instruments as currently configured. A prompt like the following will appear:

```
? Overwrite the slot no. 43 ?  [No/Yes]
```

However, if one answers yes, and the instrument is in a non-modifiable directory, then one will see the following error message:

```
! Could not save to this location [Close]
```

**9. DELETE.** Instruments DELETE. Selecting this button and clicking an empty bank entry does nothing. Selecting this button and clicking an existing bank entry brings up a small dialog asking one if this instrument is really to be deleted from the bank.

```
? Clear the slot no. 68?  [No/Yes]
```

However, if one answers yes, and the instrument is in a non-modifiable directory, then one will see the following error message:

```
! Could not clear this location  [Close]
```

**10. SWAP.** Instruments SWAP. Selecting this button, then selecting one instrument, and then another, swaps the numbering and position of the selected instruments. However, one might also experience the following warning message:

```
! Could not swap these locations  [Close]
```

Note that all of the above error messages are also shown in the console, if it is where *Yoshimi* is running. For example:

```
40 Failed to remove /usr/local/share/yoshimi/banks/Arpeggios/0041-Soft
Arpeggio3.xiz Permission denied
```

**11. Close.** Closes the window.

### 6.2.2 Menu / Instrument / Load External...

This menu entry simply brings up a file dialog, allowing the user to navigate to an arbitrary directory, and then to a solitary instrument file (`*.xiz`), and load it into the current Part.

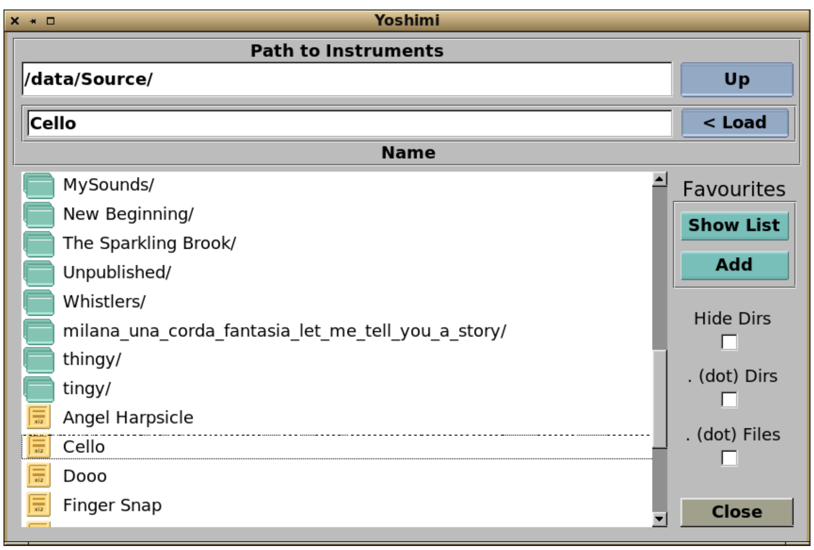



Figure 39: Instruments, Load External

These "xiz" files are normally found in a `banks` directory, but this operation allows access to instruments that are not located in a bank.

- If loading an external instrument file with no internal name, the file leafname will be shown.

- If loading an external instrument file with the name *Simple Sound*, the name *No Title* will be given.
- If loading a patch set that has unnamed instruments, or ones with the name *Simple Sound*, those will be given the name *No Title*.

This dialog has a number of user-interface elements to discuss:

For further details see Section 2.1 "Revised Graphical Interface / The Filer" on page 27.

### 6.2.3 Menu / Instrument / Save External...

This menu entry simply brings up a file dialog, allowing the user to navigate to an arbitrary directory, and then save the current Part to a solitary instrument file (`*.xiz`).

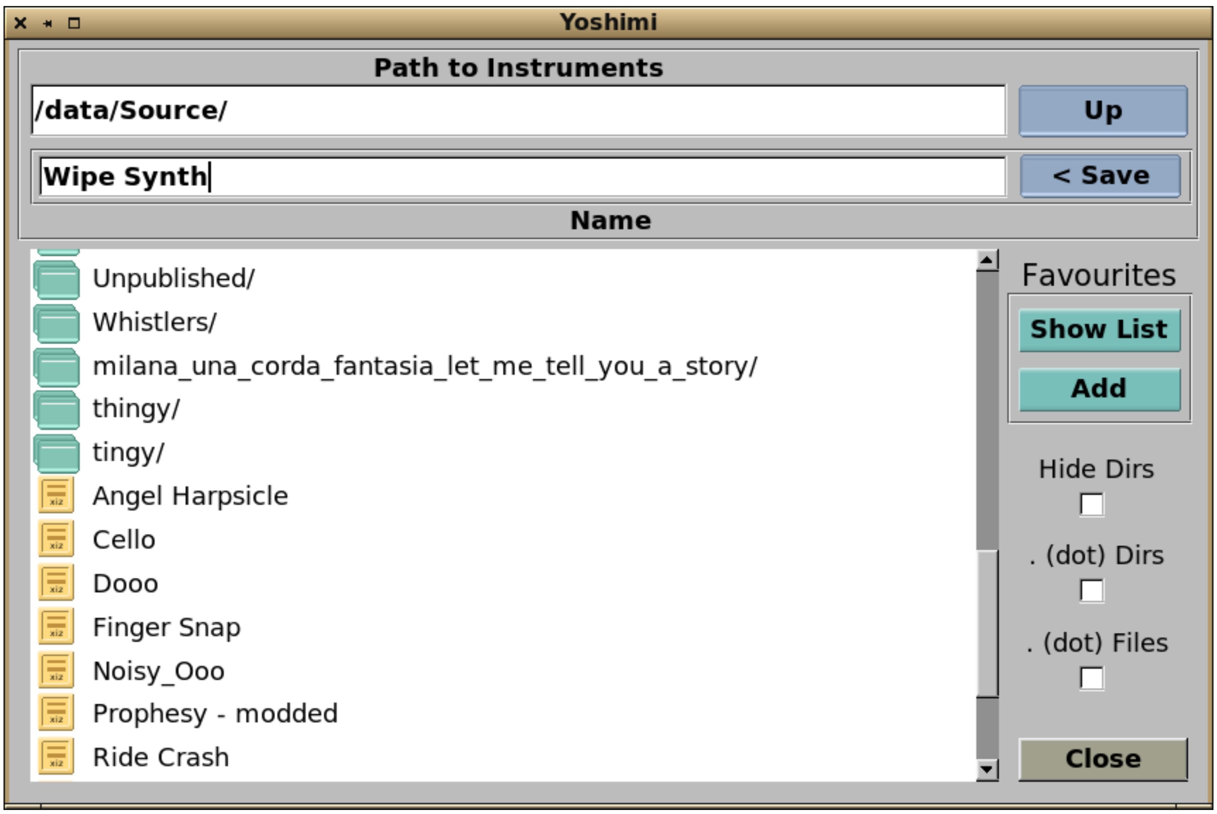



Figure 40: Instruments, Save External

This dialog is very similar to the **Load External** dialog.

The instrument save action saves only what is essential to the instrument, and not the part it may be sitting in. If there have been no changes in the instrument, then a **Nothing to save!** dialog appears.

From *Yoshimi* V1.7.4 there is a warning if the 'type' filed has not been filled in. One can ignore this and save regardless, but it is hoped the gentle reminder will encourage more people to fill it in.

### 6.2.4 Menu / Instrument / Recent Instruments...

This menu brings up a simple window with a list of the most recent instruments that have been selected. A single-click on the desired instrument will load it.

### 6.2.5 Menu / Instrument / Clear

Normally this menu entry simply clears the instrument that is loaded into the current Part. This converts the instrument to a *Simple Sound* patch. However, if the Ctrl key is held down when clicking on the entry, the entire part will be returned to default values, including Controllers etc.

In either case, the menu entry brings up a prompt with details of exactly what will be cleared.

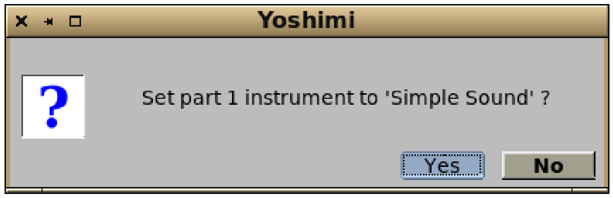



Figure 41: Clear Instrument Dialog


Figure 42: Clear Part Dialog

**No** is the default action.

### 6.2.6 Menu / Instrument / Search

This entry provides a quicker route to the instrument search feature described in Section 6.2.1 "Menu / Instrument / Show Stored.." on page 59

### 6.2.7 Menu / Instrument / Misc Notes

There are still many instruments out there with no internal title. This fact applies to both external files and instruments in banks, and means that, once loaded, one does not know what instruments one has. So now, if the internal name is missing, *Yoshimi* will use the leaf-name of the file. When one saves an instrument to a bank slot, it will get a filename with the internal name as the leaf-name. When saving an instrument to an external file, the first offered will be the internal name and in the current directory, but this can be changed if desired.

The part and mixer name fields will always show the (possibly adjusted) internal name regardless of the external filename, which could easily have been changed at some time. The instrument banks will always show the file's leaf-name, so it more-or-less matches external files (what one sees from a file display). As soon as one edits an instrument, if it was *Simple Sound*, the name will be changed to *No Title*. *Yoshimi* generally won't let one rename an instrument to *Simple Sound*.

Default instruments are never saved, not even in patch sets and states, but if the parts are activated, that fact *is* saved; it's a part feature, not an instrument one.

Patch sets will save all other instruments regardless of whether they are activated or not.

While testing all these features, Will created a new multi-part instrument kit. It's now in the *Companion* set and is called *Pad Kit*.

## 6.3 Menu / PatchSet

This new menu entry is part of the very nice reorganisation and simplification of the handling of roots and banks in the new *Yoshimi*. The **PatchSet** menu replaces the old **Parameters** menu. Do you like the new name? The patch set saves all of the settings, including effects and instruments. Patch sets will save all other instruments regardless of whether they are activated or not. Default instruments are never saved, not even in patch sets, but if the parts are activated that fact *is* saved. It is a part feature, not an instrument feature.

*Yoshimi* stamps its configuration XML files with its own major and minor version numbers so it is possible to tell which version created the files.

The main dialog is somewhat similar in layout and function to the dialog shown in Figure 36 "Show Stored Instruments" on page 59, for managing instruments in a selected bank.

### 6.3.1 Menu / PatchSets / Show Patch Banks...

The **Banks** window has had some button shuffling, and one can import and export banks as well.

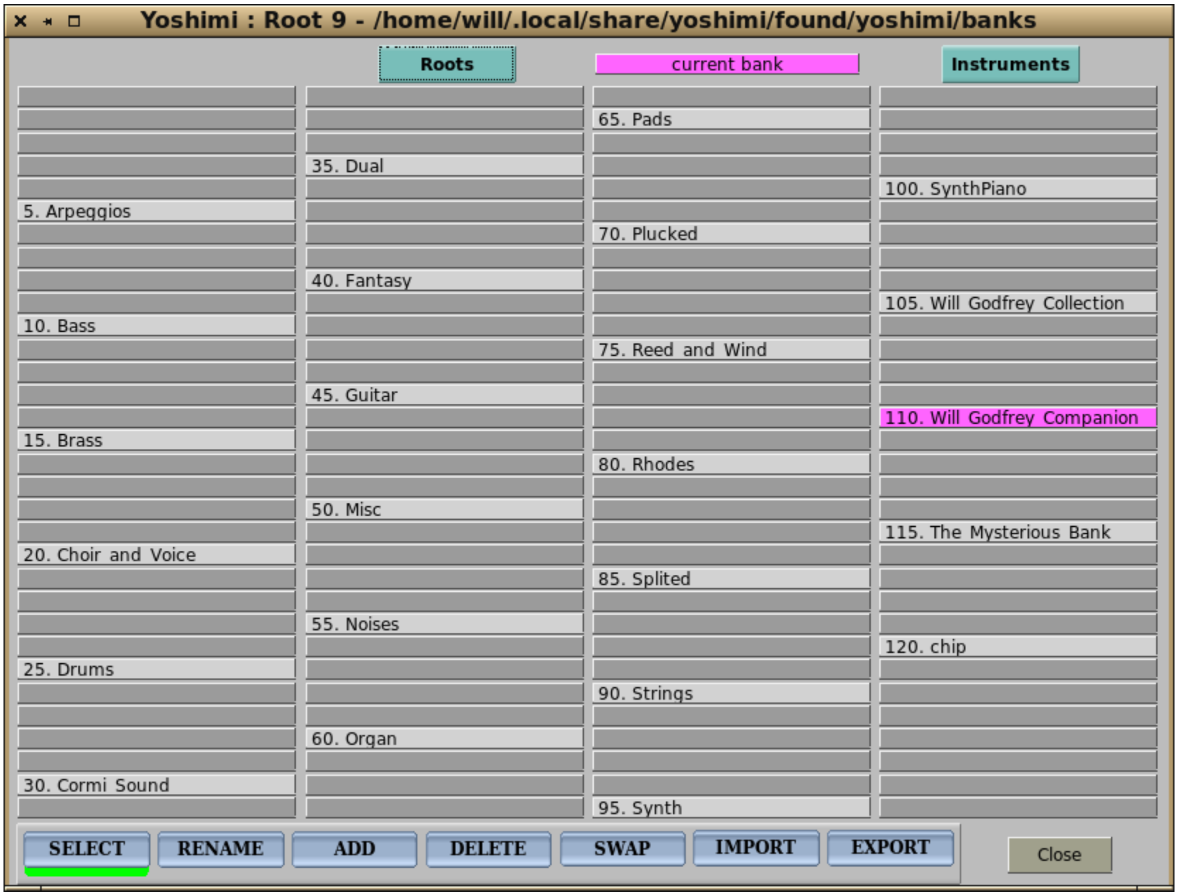



Figure 43: Show Patch Banks

Here is a list of the user-interface items in the patch-banks dialog:

1. **Roots**
2. **current bank**
3. **Instruments**
4. **Bank Matrix**
5. **SELECT**
6. **RENAME**
7. **SAVE**
8. **DELETE**
9. **SWAP**
10. **IMPORT**
11. **EXPORT**
12. **Close**

**1. Roots.** Show Patch Banks, Root Directories. To add a bank root path, delete a bank root path, or manage bank root path, press this button. The result is somewhat similar to a file dialog, and is described in detail in Section 6.3.5 "Menu / PatchSets / Patch Bank Roots" on page 71, later in this sub-chapter.

**2. current bank.** This item is highlighted in pink, and the bank that is actually the current bank is also highlighted in pink. There is no action associated with this user-interface element; it merely indicates the currently-selected bank.

**3. Instrument.** This button brings up an instruments window similar to the one shown in Figure 36 "Show Stored Instruments" on page 59, which shows the instruments collected in the currently-selected bank. Clicking on a bank in the dialog also brings up the instruments window.

**4. Bank Matrix.** This view shows all of the banks available in the current root. Left-clicking on a bank in the dialog brings up the Instruments window for that bank. Right-clicking on a bank in the dialog brings up the Instruments window for that bank, but also closes the banks window, to reduce clutter.

**5. IMPORT.** There are a number of benefits to using the IMPORT/EXPORT buttons rather than dealing with the directories externally. One has far greater control where things go when importing, and it's much easier to identify the bank to export.

When importing or exporting, *Yoshimi* refuses to overwrite existing banks or directories. That is a flat refusal for exporting, but for importing it will add a numeric suffix to the name.

Importing will copy in *only* files that *Yoshimi* understands, but will notify if there were other unrecognised types in there. Exporting just dumps out the entire bank contents.

There are a number of banks in the wild that contain all sorts of extraneous stuff, usually copyright notices; one should use only the instrument text fields, provided for exactly that purpose. Oh, and one bank Will found had sub-directories with pictures, and they weren't small!

In the main part **Instrument Edit** window there is a new **Default** button top right. See Section 11.3 "Bottom Panel Instrument Edit" on page 158.

We hope this encourages people to fill in the Author and Copyright information. To set it up, fill in the text field as normal, then, while holding down the Ctrl key, click on the button (left or middle mouse click) . This text will now be stored in one's *Yoshimi* configuration directory, and whenever one creates a new instrument, just click on the **Default** button, and the saved text will be filled in.

**6. EXPORT.** Export of banks is described in the previous section.

The buttons **SELECT**, **RENAME**, **SAVE**, **DELETE**, and **SWAP** behave similarly to the same buttons in the Instruments window, as described in the discussion at Section 6.2.1 "Menu / Instrument / Show Stored.." on page 59.

### 6.3.2 Menu / PatchSet / Load External...

This menu entry simply brings up a file dialog, allowing the user to navigate to an arbitrary directory, and then to a solitary instrument file (`*.xmz`), and load it into the current set of parts.

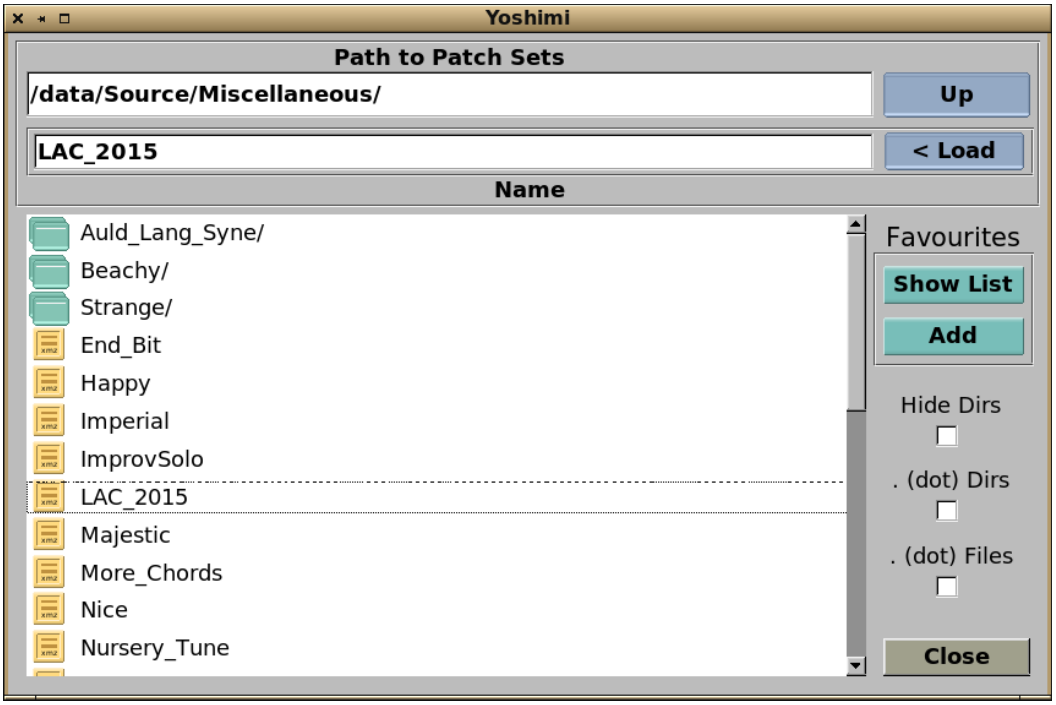



Figure 44: Load Patch Set

These "xmz" files are normally found in a `banks` directory, but this operation allows access to banks that are not located in a particular root.

When an "xmz" file is loaded, all of the instruments it contains are loaded sequentially into the Parts. Thus, a number of instruments are loaded at once. So, a patch set is a list of instruments that are related by being necessary for a given tune, rather than by being located in a particular bank.

#### 6.3.3 Menu / PatchSet / Save External...

This menu entry simply brings up a file dialog, allowing the user to navigate to an arbitrary directory, and then save the current Part to a solitary instrument file (`*.xiz`).

In patch sets, *Yoshimi* will save named-but-disabled patches.

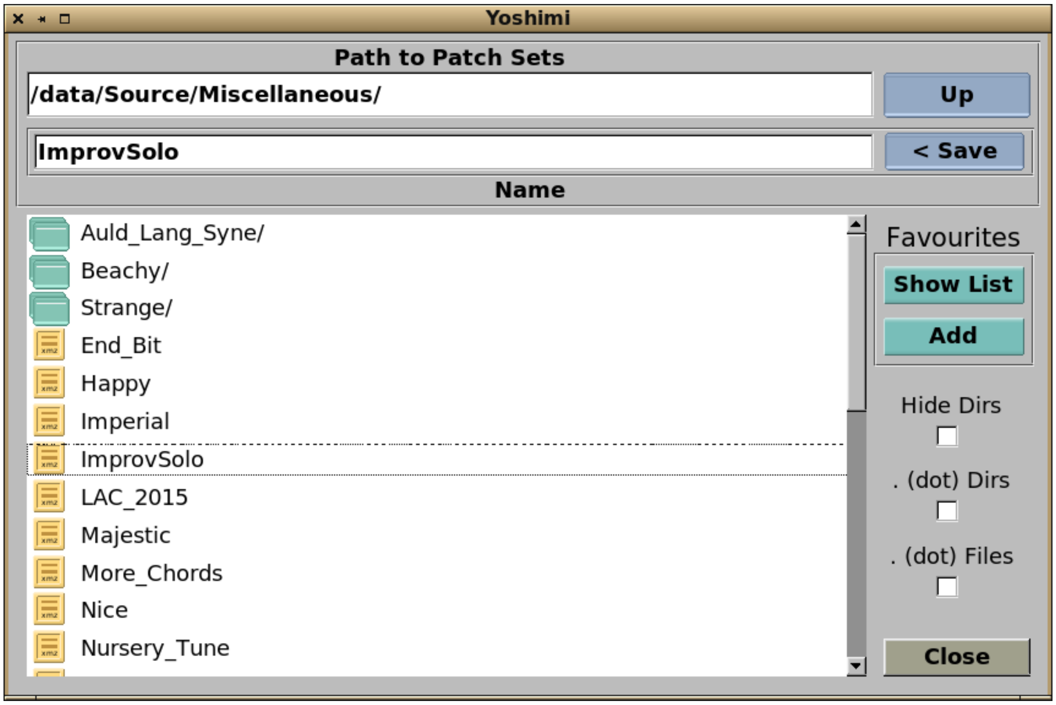



Figure 45: Save Patch Set

Patch set saves include everything that is not part of the main configuration, and so saved patch sets includes **Master Volume** and **Detune Part** destinations, **Humanise**, and more. If nothing has changed, then the following dialog is shown.

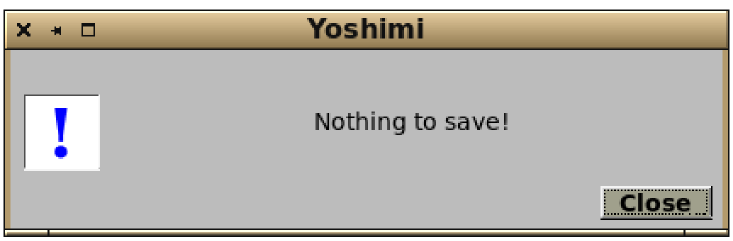



Figure 46: Patch Set, Nothing to Save

### 6.3.4 Menu / PatchSet / Recent Sets

This menu entry brings up a dialog box with a list of the recent patch sets that have been loaded. This item makes it easy to move around one's frequently-used banks.

### 6.3.5 Menu / PatchSets / Patch Bank Roots

This entry no longer exists. Bank Roots are now accessed via Section 6.4 "Menu / Paths" on page 72.

## 6.4 Menu / Paths

*Yoshimi* (as installed by Debian Linux) provides a default bank at `/usr/share/yoshimi/banks`. To add one's own directory, click on the **Bank Root Dirs...** entry. It brings up the following dialog.

1. **Bank Root Dirs...**.

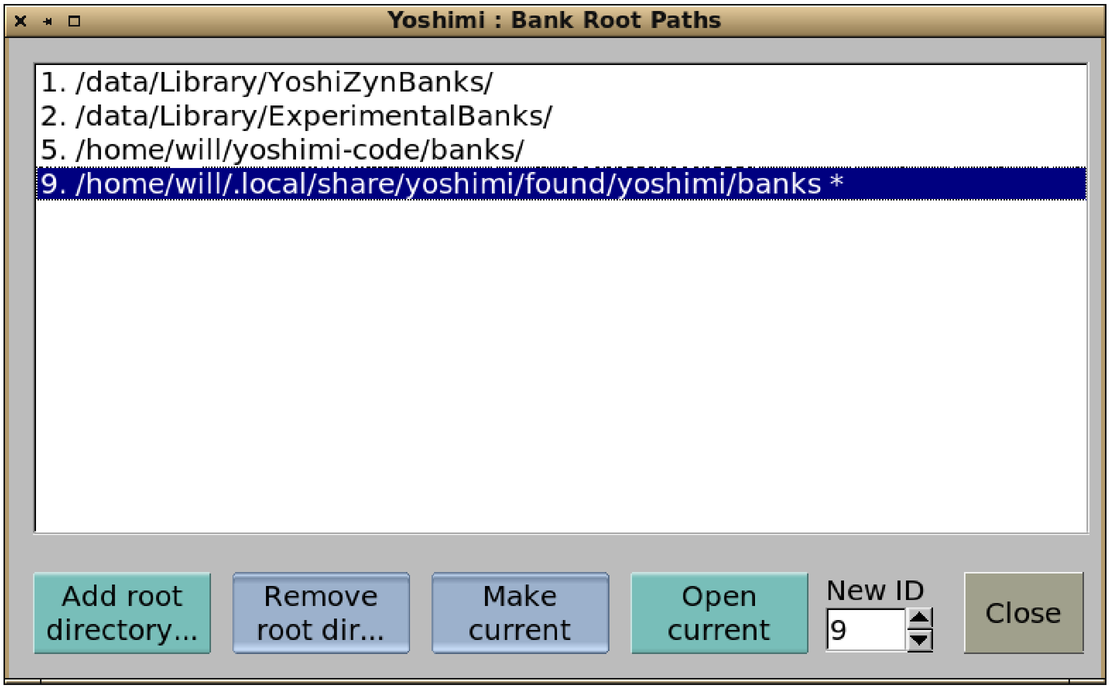



Figure 47: Bank Root Paths

This dialog has a number of buttons, some of which will be disabled if no directory in the list is selected.

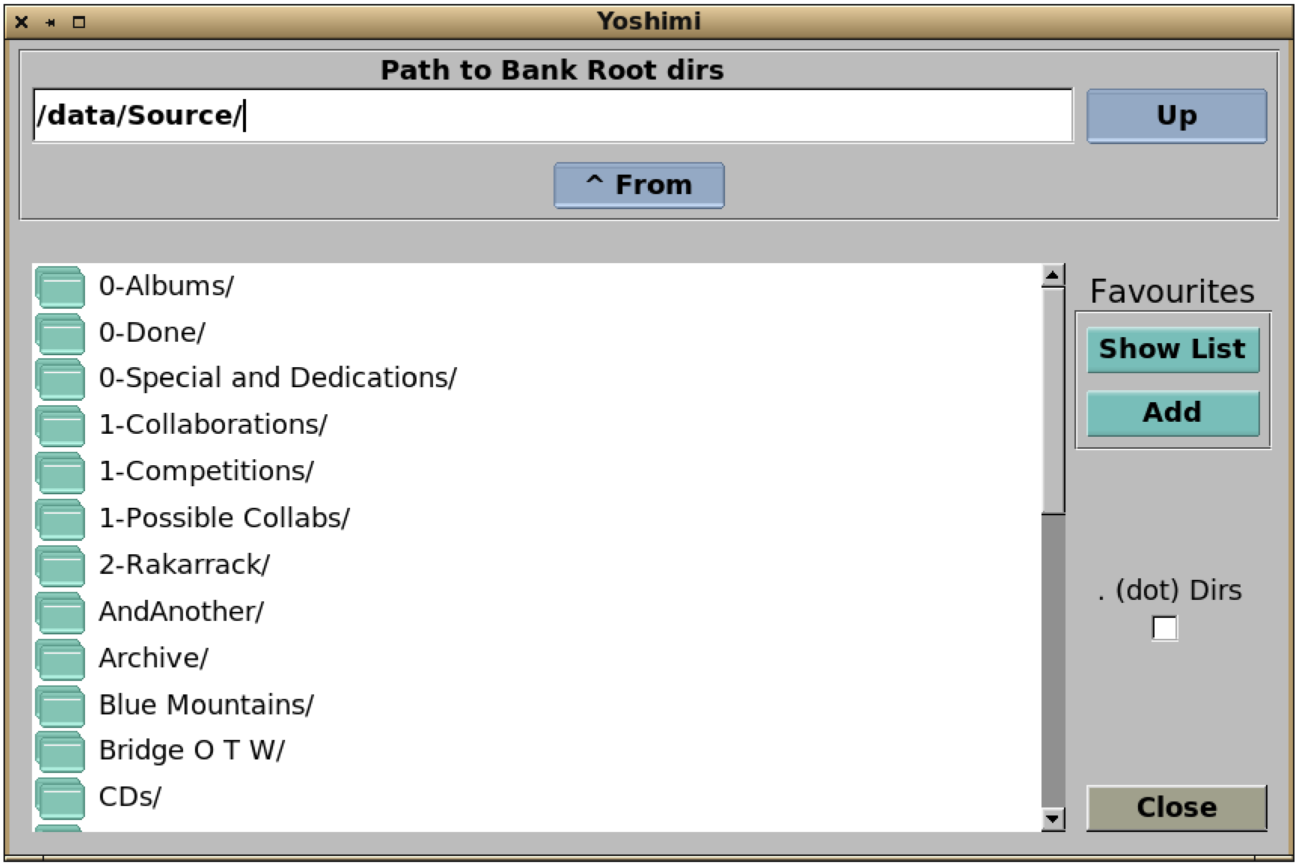



Figure 48: New Root Directory

**1. Add root directory....** Bank Root Paths, Add Root Directory.
Once selected, one will see that `/usr/share/yoshimi/banks` or `/usr/local/share/yoshimi/banks` is marked with an asterisk. One can select the new root directory via the file dialog that appears, and then make it the current root by clicking the **Make current** button. Then the Banks dialog will show all the banks in that directory, one bank per subdirectory (each subdirectory "is" a bank).
**2. Remove root directory....** Bank Root Paths, Remove Root Directory. If a path is selected, then this button is active, and can be used to delete the selected path from the "root paths" list. Note that this does **not** delete actual files, just removes the entry from the list.
**3. Make current.** Bank Root Paths, Make Current. This button marks the currently-selected path as the "current root" path.
**4. Open current.** Bank Root Paths, Open Current. This button opens the current root path.
**5. Change ID.** Bank Root Paths, Change ID. This ID can be used to make the bank selectable via an extended MIDI control.
Values: `0* to 127`

2. **Preset Dirs....** The *Yoshimi* preset directories are the locations where presets can be found. See below for details.

The *Yoshimi* preset directories are the locations where presets can be found. When first installed, the system preset directory is one of the following, depending on whether *Yoshimi* was installed via a package manager or via source code:

```
/usr/share/yoshimi/presets
/usr/local/share/yoshimi/presets
```

The user can provide additional directories for the presets, up to a limit of 128 directories (like roots and banks). These directories are useful for containing copies of the system presets that one can modify safely, and for providing custom presets designed by the user.

The following items are provided by the preset directory settings:

1. **Preset list**
2. **Add preset directory...**
3. **Remove preset directory...**
4. **Make Current**
5. **Close**

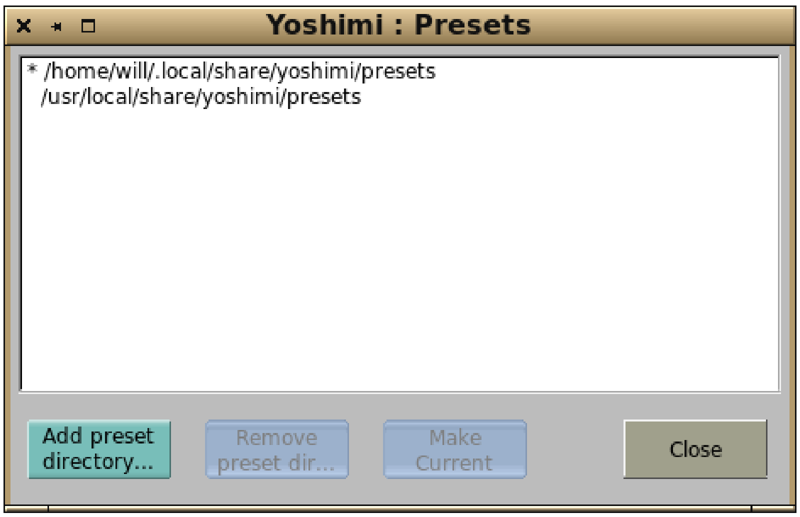



Figure 49: Yoshimi Preset Dirs Dialog

**1. Preset list.** This interface element contains a list of preset directories. By default, the only directory present is the installed preset directory. For example, `/usr/share/yoshimi/presets`.

**Tip:** If there is no directory in this dialog, then one must add one, otherwise there is no place to store the presets. So make this one of the first items specified when first running *Yoshimi*!

Another example would be this project; let YOSHIMI-DOC be the directory where this project is stored. Then one can add `YOSHIMI-DOC/config/yoshimi/presets` to this list, using the button described next.

**2. Add preset directory....** Use this button and dialog to add a preset directory to the list, for easy access.

Press the **Add preset directory...** button, revealing the following dialog.

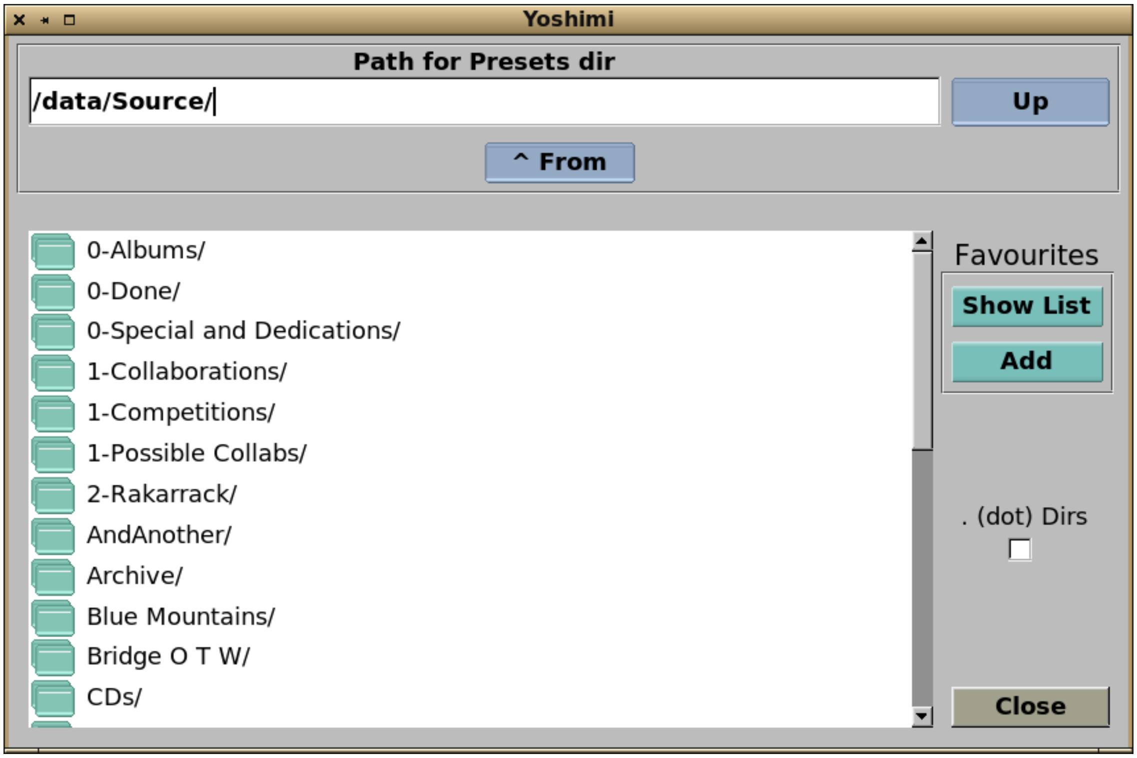



Figure 50: Add a Preset Directory

Navigate to the desired directory, select it, and press the **Ok** button. (There is no need to press the **Save and Close** button; the directory is added as soon as *OK* is clicked. However, one tends to want to click it anyway, to be sure.) *Important*: Restart *Yoshimi* to use the preset directory.

**3. Remove preset directory....** Select one of the preset directories in the preset list, then press this button to remove the preset directory from the list of preset directories. It is removed immediately, with no need to confirm the deletion, click an OK button, or click a Save button.

**4. Make current preset.** Make Current. Select one of the preset directories in the preset list, then press this button to make the preset directory the currently visible preset directory. It should be a directory for which one has write permissions. By default, it is `~/.config/yoshimi/presets`.

## 6.5 Menu / State

*Yoshimi* state is saved in files with the extension `.state`. These files are also XML files.

*Yoshimi* "state" will include the system settings, as well as all patches. Some of these settings (such as Oscillator Size) can only be realised on a reload if loading via the command line at startup.

1. **Load**
2. **Save**
3. **Save as Default**
4. **Recent States...**

State files were originally stored in the user's `.config/yoshimi/yoshimi.state` file, but now *Yoshimi* offers the user's home directory instead.

**1. State Load.** Provides a way to load a previously-saved *Yoshimi* state file.

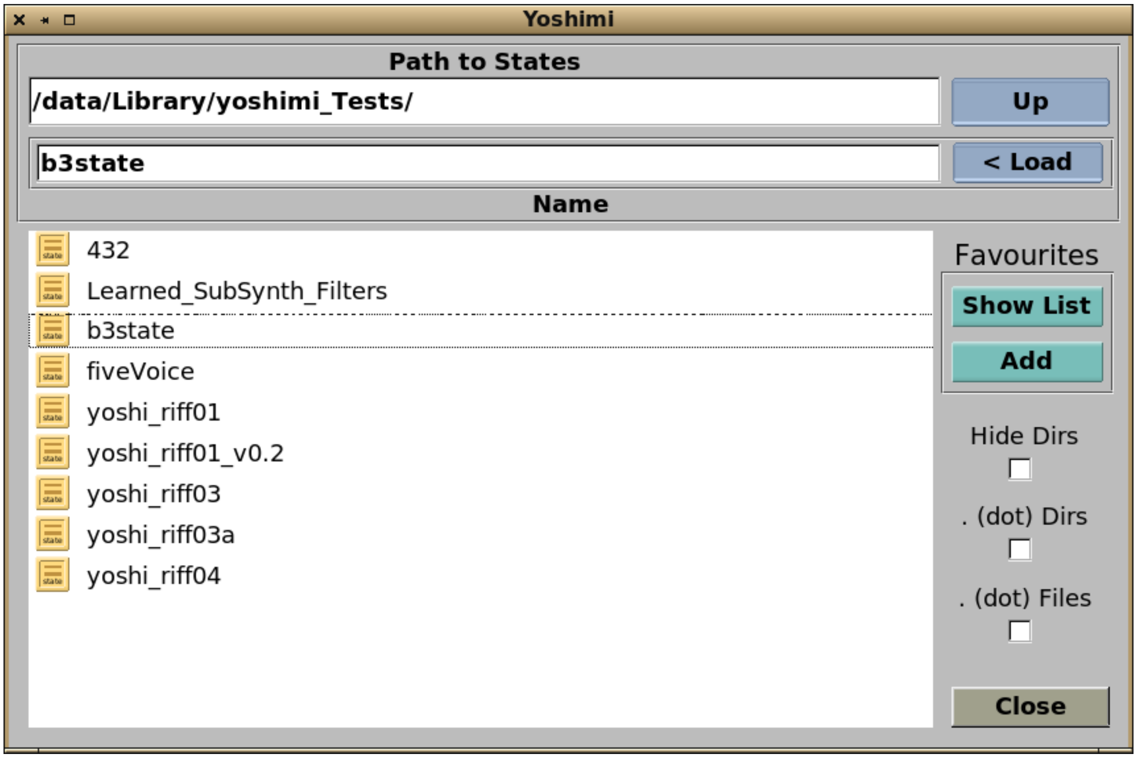



Figure 51: Yoshimi Menu, State Load

This item is a standard *Yoshimi* file dialog.

**2. State Save.** Provides a way to save a new or modified *Yoshimi* state file.

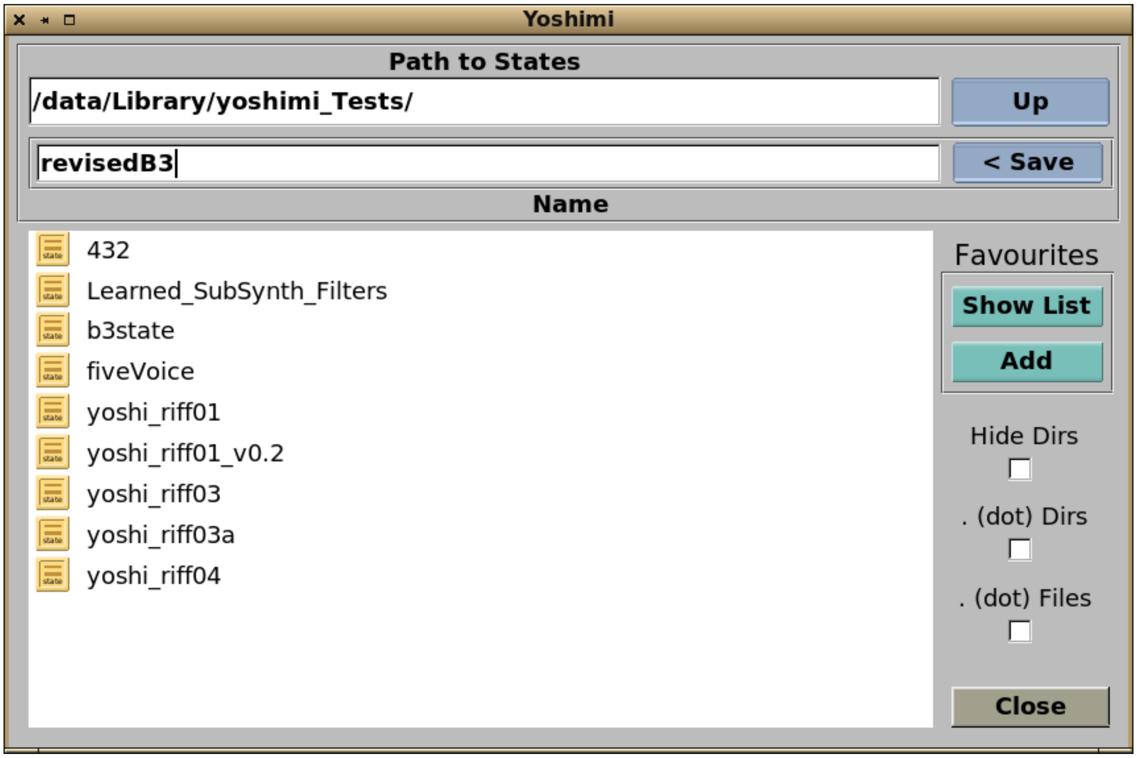



Figure 52: Yoshimi Menu, State Save

This item is a standard *Yoshimi* file dialog.

**3. Save as Default.** This item simply makes the current state the new default state when starting *Yoshimi*. This item is effective only if the **Start With Default State** option is checked in **Yoshimi / Settings**. This item is also exceptional as it will *not* appear in the history list, and so will not be offered as a normal load or save. This provides some protection against inadvertently overwriting it.

**4. Recent States.** This item brings up a list of states to select. The Recent States dialog will not come up if there are no states that have yet been managed.

# 7 Scales

*Yoshimi* is a microtonal synthesizer, and is capable of a wide range of microtonal scales. Many improvements have been made to the scales, including the user-interface, performance, accuracy of calculations, and adherence to the Scala ([15]) specification in version 1.5.2 and above. At the request of users, since version 1.5.8 some controls have been made accessible to MIDI-learn, and these have the familiar pale blue border. For users of the LV2 plugin, any changes in scale settings are reported back so that the plugin host can be aware of the change.

## 7.1 Scales / Command Line

One can now fully control scales from the CLI. For tunings, either ratios or floating point numbers can be entered. Ratios are in the form `n1/n2` to a maximum of normal integer range. If just a numerator is set, it will be regarded as `n/1`. Floating point numbers *must* include the decimal point and at least one digit (or zero) on either side. The numbers are padded out with leading and trailing zeros in the form `nnnn.nnnnnn`.

In keyboard maps, non-sounding notes should be entered as an 'x' instead of the key number.

CLI tunings and keymaps are entered in CSV format. Tuning:

```
0076.049000, 0193.156860, 0310.264710, 5/4, 0503.421570,
0579.470570, 0696.578430, 25/16, 0889.735290, 1006.843140,
1082.892140, 2/1
```

Keymap:

```
0, 1, 2, 3, x, 5, 6, 7, x, 9, 10, 11
```

The tuning/keymap sizes are generated internally by counting the number of entries in the strings.

When saving scales, for floating point numbers, *Yoshimi* includes the text it was derived from. This has accuracy benefits, but also reassures less experienced users, because the values they enter won't seem to change on re-loading. The stored value is still saved for backward compatibility with older versions of *Yoshimi*.

Scale shift provides an offset to the scale start position, and only makes a difference in uneven interval sizes.

Normally (for the even tempered scale) the scale starts on 'A', and, as the intervals are all identical, changing the octave start will make no difference. However, if one has (say) a 5-note pentatonic scale, the intervals will be very different and the scale shift will effectively determine the key of the scale.

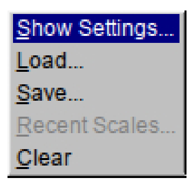



Figure 53: Yoshimi Menu, Scales

1. **Show Settings...**
2. **Load...**
3. **Save...**
4. **Recent Scales...**
5. **Clear**

## 7.2 Scales / Show Settings

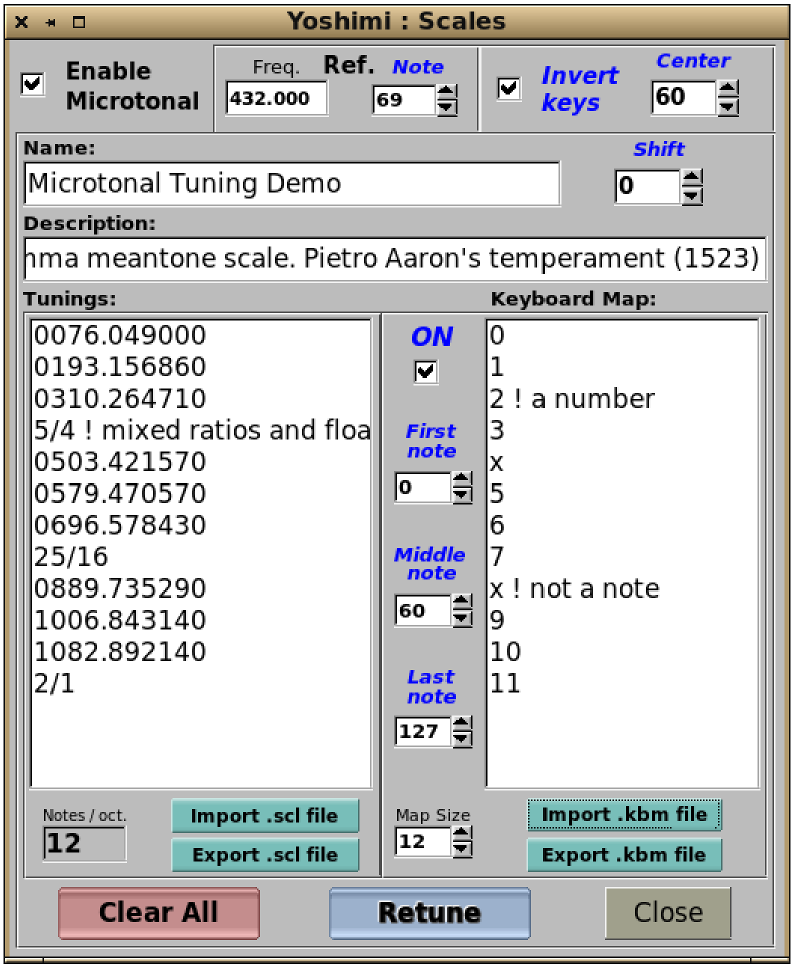



Figure 54: Yoshimi Menu, Scales Settings

### 7.2.1 Scales Basic Settings

This item controls the microtonal capabilities of *Yoshimi* and some other settings related to tuning. The last entry in the tunings list represents one octave. All other notes are deduced from these settings.

**Note** The above is not quite correct. One can have scales covering multiple octaves. We don't yet know the full implications of that!

1. **Enable Microtonal**
2. **(Ref.) Freq.**
3. **(Ref.) Note**
4. **Invert Keys**
5. **Center**
6. **Name**
7. **Shift**
8. **Comment**
9. **Tunings**

10. **Keyboard Mapping**
11. **ON**
12. **First note**
13. **Middle note**
14. **Last note**
15. **nts./oct.**
16. **Import .scl file**
17. **Export .scl file**
18. **Map Size**
19. **Import .kbm file**
20. **Export .kbm file**

**1. Enable Microtonal.** Enable Microtonal Scales. When disabled, the synthesizer will use equal-temperament, 12 notes per octave. Otherwise, one can input any scale one desires. In *Yoshimi* V 1.6.1 this was revised to more correctly identify the frequency and note settings. The ranges have also been reduced to reduce the risk of possible damage to audio equipment. They are still well outside any reasonable requirement.

Values: `Off*, On`

**2. (Ref.) Freq.** Frequency of the reference note. Sets the frequency of the reference key. The standard is "A", 440.0 Hz.

Values: `30 to 1100, 440*`

**3. (Ref.) Note.** Sets the MIDI value of the reference note. This is usually number 69, which is A4

Values: `24 to 84, 69*`

**4. Invert Keys.** Allows the keys to be inverted, so that higher-valued keys play lower notes.

Values: `Off*, On`

**5. Center.** Center for Inverted Keys. This is the center where the notes frequencies are turned upside-down if **Invert keys** is enabled. If the center is 60, the note 59 will become 61, 58 will become 62, 61 will become 59, and so on.

Values: `0 to 127, 60*`

**6. Name.** Name of the Scale. For example, the default scale is called "12tET".

**7. Shift.** Key Shift. Shift the scale. If the scale is tuned to A, one can easily tune it to another key.

Values: `-63 to 64, 0*`

**8. Comment.** Comment for Scale. Provides a comment or a description of the scale. By default, this is "Equal Temperament 12 notes per octave".

**9. Tunings.** Tunings. Here one can input a scale by entering all the tunings for one octave. One can enter the tunings in two ways:

1. As the number of cents (1200 cents=1 octave) as a float number like "100.0", "123.234"
2. As a proportion like "2/1" which represents one octave, "3/2" a perfect fifth, "5734/6561". "2/1" is equal to "1200.0" cents.

The default is a series of values: `0100.0, 0200.0, ..., 1100.0, 2/1`.

**10. Keyboard Mapping.** The items related to the **Keyboard Mapping** are discussed separately in the next section.

**11. Notes/oct.** Notes Per Octave. This value is affected by changes to the **Tunings**.

Values: `12*`

**12. Import .SCL file.** Import Scala files. Scala is a powerful application for experimentation with musical tunings (intonation scales, micro-tonal,...etc.). From its home page [15], one can download more than 2800 scales which one can import directly into *Yoshimi*. Note that the zip file *must* be unzipped with the `-aa` ("autoconvert") option. However, we have converted it to a much smaller tar file (it crams 18 Mb of files into an sub-500 Kb file), which can be untarred directly into one's configuration directory to create a `~/.config/yoshimi/scales` directory chock full of scales.

```
$ cd ~/.config/yoshimi/
$ tar xf yoshimi-scales.tar.xz
```

Note that a Scala file cannot be loaded directly. It must be imported.

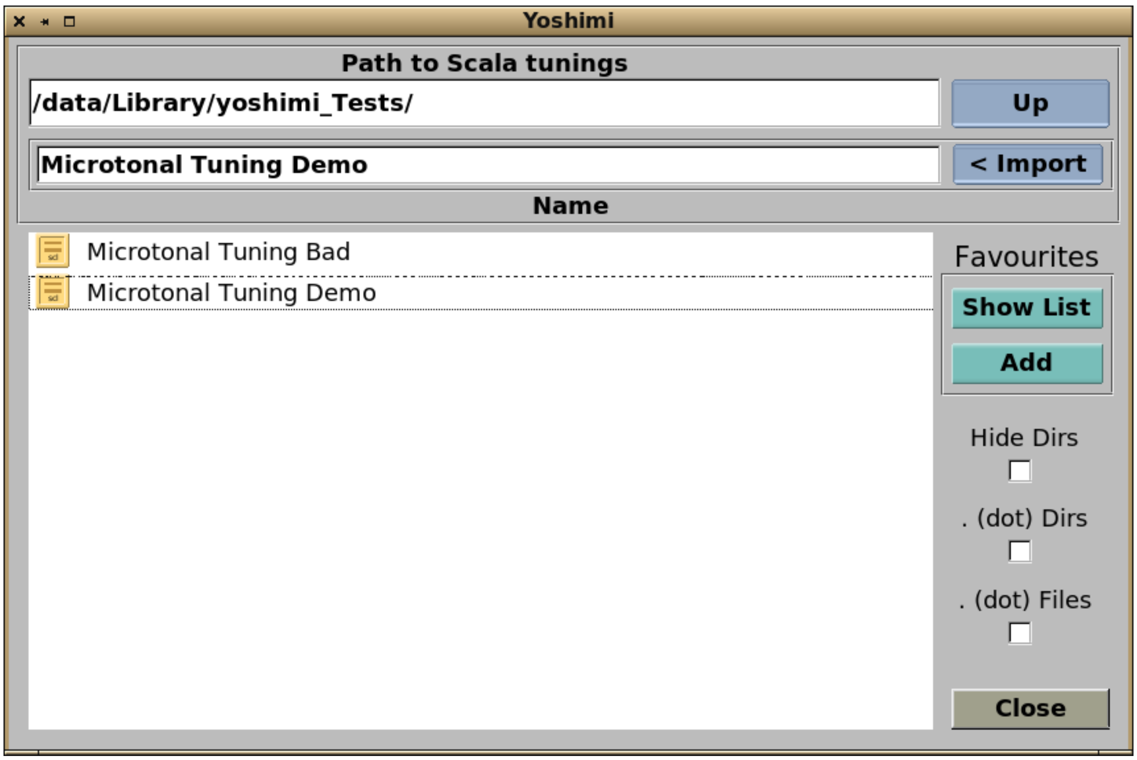



Figure 55: Yoshimi Menu, Scales, Import File

This item is a standard file dialog for reading a `*.scl` file.

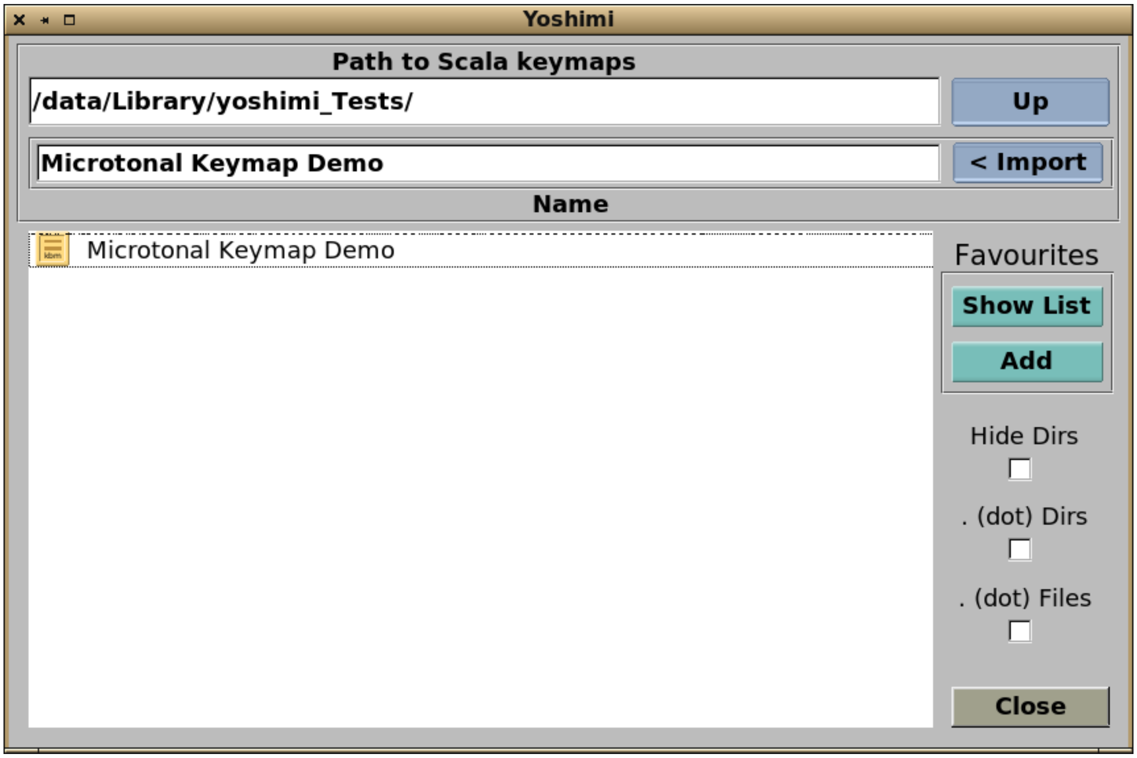



Figure 56: Yoshimi Menu, Scales, Import Keyboard Map

**13. Export .SCL file.** As of *Yoshimi* V2.3.1 one can export Scala compatible scales using the same dialogs as for importing.

**14. Map Size.** Map Size. As of *Yoshimi* V2.3.1 this value independent of the actual **Keyboard Mapping**.

Values: `12*`

**15. Import .kbm file.** This item is a standard file dialog for reading a `*.kbm` file.

**16. Export .kbm file.** As of *Yoshimi* V2.3.1 it is now possible to export a Scala compatible keymap.

### 7.2.2 Keyboard Mapping

One can set the MIDI keyboard mapping to scale-degree mapping. This is used if the scale has more or less than 12 notes/octave. One can enable the mapping by pressing the **ON** check-box.

1. **ON**
2. **First Note**
3. **Last Note**
4. **Middle Note**
5. **Map**
6. **Map Size**

**1. ON.** This item enables the **Keyboard Mapping** list.

Values: `Off*, On`

**2. First Note.** First MIDI Note Number. Sets the MIDI note value to use for the first note of the scale. MIDI notes below this value are ignored.

Values: `0* to 127`

**3. Middle Note.** Sets the MIDI note value to use for the middle note of the scale. This is the note where the scale-degree 0 setting is mapped; the middle note represents the note where the formal octave starts.

Values: `0 to 127, 60*`

**4. Last Note.** Last MIDI Note Number. Sets the MIDI note value to use for the last note of the scale. Keys above this value are ignored.

Values: `0 to 127*`

**5. Map.** Scales map. This is the input field where the mappings are entered. The numbers represent the order (degree) entered on **Tunings Input** field, with the first value being 0. This number must be less than the number of notes per octave (since the values start at 0). If one doesn't want a key to be mapped, one enters an "x" instead of a number.

Values: `0 to 127, 11*`

**6. Map Size.** Provides the size of the scale-map.

Values: `0 to 128, 12*` The map size can be different to the number of entries. If the size is greater, the 'missing' entries are regarded as not mapped, in the same way as being set to "x". However, if it is smaller than the list entries, those beyond will simply be ignored (and not saved either).

A zero size map is a special case. It is regarded as no mapping but *First Note, Middle Note, Last Note* are still active. Additionally the *Reference Note* and *Reference Frequency* are still considered as part of the keymap and will be exported along with the rest.

As of *Yoshimi* V2.3.1 one can add comments to any of the tuning or mapping lines for extra information.

e.g.
5/4 ! mixed ratios and floats

## 7.3 Scales / Bottom Line

1. **Clear All**
2. **Retune**
3. **Close**

**1. Clear All.** Clear Button. This will clear all scale settings and disable microtonal control, returning one to the default scale.

**2. Retune.** Retune button. This button retunes the synthesizer according to the settings of the **Tunings** and **Keyboard Mapping** lists.

The **Retune** button is needed if one changes any of the actual scale settings or key mapping. However, it is not needed for any other controls, all of which operate immediately.

**3. Close, Scales Dialog.**

## 7.4 Scales / Load

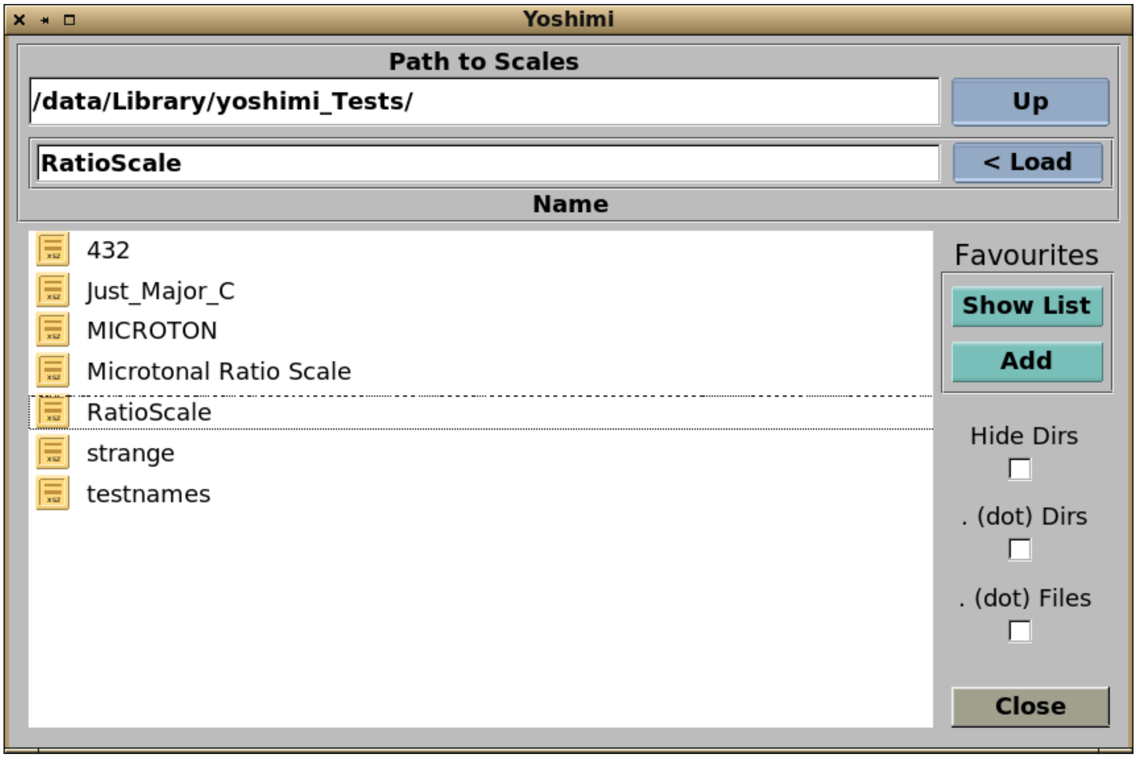



Figure 57: Yoshimi Menu, Open Scales

If the format of the scales file is not correct, then the following prompt will appear.

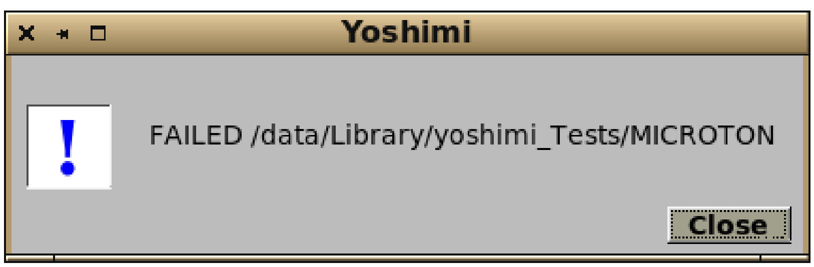



Figure 58: Yoshimi Menu, Failed to Load Scales

Note that the loading and saving of scales is fully available in the command-line as well.

## 7.5 Scales / Save

This dialog opens a stock file-dialog to allow the saving of `*.xsz` files. If one has imported a scale from an `*.scl` file, and one wants direct access to it from the **Scales / Recent Scales** menu, one must first save the imported file as an `*.xsz` files.

Note that the loading and saving of scales is fully available in the command-line as well.

In the past, every time one saved and reloaded a scale, there was a degradation in the accuracy of the scales. This issue has been fixed, since people are very sensitive to pitch intervals.

## 7.6 Scales / Recent Scales...

Once a scale file has been loaded (or imported and saved), then it becomes available in this list, for more convenient access to it.

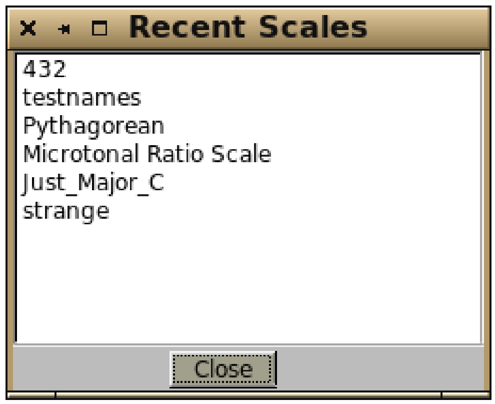



Figure 59: Yoshimi Menu, Recent Scales

## 7.7 Scales / Clear

This menu entry simply resets the *Yoshimi* scale back to its default, the twelve-tone equally-tempered scale.

## 7.8 Scales / Reference Pitch...

A note about relationships between the reference note frequency, note number and key shifts.

The reference note frequency should be regarded as an absolute value, with the note number being specifically a MIDI representation. Master keyshift, and Part keyshifts are relative values that modify this for convenience.

As an example, some very old wood-framed pianos were tuned with C4=256 cycles per second (Hz). This can't be changed as the frame couldn't withstand the extra stress, so to play alongside such a piano one would have to set the absolute value 'A' frequency at 430.581Hz. Better still would be to set note number 60 to a frequency of 256! If you have the reports window open you will see the following responses, making it quite clear what has changed.

```
Scales Ref note 60 (C4)
Scales (C4) Frequency Value 256.000000
```

A singer might then say they couldn't sing at that pitch, so one would then use the Master Keyshift to change to a key they were more comfortable with.

When playing *Yoshimi* in a band where there is a minor pitch discrepancy it would be best to use the Master Detune to match, rather than altering the reference frequency.

Since V 1.5.11 reference frequency range has been limited, and revised further since V 1.6. The range is 30Hz to 1100Hz which covers the range B0 to C6. Previously it could be set anywhere between 1Hz and 2000Hz. Not only did this put most notes right out of the audio spectrum, but it was potentially damaging for some audio equipment.

With the various key shift and octave controls it is still possible to cover every part of the audio spectrum.

# 8 Stock Settings Elements

This section collects all of the settings values and small user-interface items that one will find for audio parameters in the *Yoshimi* GUI. Sometimes the labels and tool-tips in the application are a bit too brief to understand. One will find their full meanings, their tricks, and usage notes in this section. This section also covers the sub-panels that provide the settings. Many of these sub-panels are used in many places in *Yoshimi*, not only as user-interface elements, but as presets that can be saved and loaded. By describing the deep details of these sub-panels here, we can refer to them when describing how to set up specific sounds in *Yoshimi*. Much of this material comes from http://sourceforge.net/zynaddsubfx/Doc and has been reorganised and expanded.

## 8.1 Settings Features

This section notes some minor interface and synthesizer features that may be seen throughout *Yoshimi*.

### 8.1.1 Mouse Features

The right mouse click is used for setting the default value of a control, where it acts like a "reset" button, and (combined with CTRL) is also used to bring up the **MIDI Learn** dialog for controls that can be MIDI-learned.

When traversing window stacks, a right click will close one window as it opens the next. Closing such a window with the right button will re-open its parent.

### 8.1.2 Tooltips

Like many applications, *Yoshimi* provides tooltips to help the user navigate the many controls and data fields in the user-interface. Many of the controls now have active tooltips that show the current value of the control when one hovers over it, so one no longer must click the control to see its value (and accidentally change it at the same time). Many have real-world data units, such as **dB**, **Hz**, **mS** etc.

### 8.1.3 Title Bars

The title bars of all editing windows display both the part number and the current name of the instrument one is working on. In the **ADDsynth Oscillator Editor**, one also sees the voice number of the oscillator one is editing. Title bars also include the kit entry number if that part has a kit enabled.

### 8.1.4 Colour Coding

A GUI enhancement for *Yoshimi 1.3.5* is colour-coded identification of an instrument's use of ADD-, SUB-, and PAD-synth engines, no matter where in the instrument's kit they may be. This can be enabled/disabled in the mixer panel. It does slow down *Yoshimi*'s startup, but due to the banks reorganisation (done some time ago) it causes no delay in changing banks/instruments once *Yoshimi* is up and running. Some saved instruments seem to have had their "Info" section corrupted. *Yoshimi* can detect this issue, and step over it to find the true status. Also, if one resaves the instrument, not only will the PADsynth status be restored, but ADDsynth and SUBsynth will be included, allowing a faster scan next time.

### 8.1.5 Rotary Knobs

Visual rotary knobs are used for modifying numerical parameters in the user-interface. Horizontal, as well as vertical, mouse movements will adjust the knob. Mouse clicks also can adjust the knob.

- **Coarse Control**. When rotated using the left mouse button, the rotary knobs give a coarse control of the numerical settings of the knob.
- **Fine Control**. When a knob is rotated using the middle mouse button, the rotary knobs give a finer control of the numerical settings of the knob.
- **Scroll Wheel**. One can also use the mouse scroll wheel to adjust rotary controls, which gives better control than using the mouse pointer.
- **Super Fine Control**. If the Ctrl key is held at the same time as the wheel is scrolled, the control is *extremely* fine.
  Note that the right mouse button can be used for setting the default value of a control or for the initiation of MIDI learn.
- **Home Position**. A right-click sends the knob to the home position (and sets its value to the home value). For setting like **Pan** and **Detune** it is the middle position; for other settings, it is whatever the default value is for that setting.

The fact that *every* control can now be homed with a right mouse click means there is no longer a need for the few "Zero" and "Reset" buttons dotted around, so they are all gone as of version 1.4.0.

### 8.1.6 Sliders

For both horizontal and vertical sliders, if one holds down the right mouse button, the thumb will go to it's default position. The same thing will happen if one clicks on the track with the right button.

*Yoshimi* has changed some rotary controls or rollers to sliders. These controls pack better without looking crowded, are easier to manage, with clearer indication.

Since version 2.3.0 one will see colour changes of knob pointers and slider 'peg' centres if the controls are not at their default positions. The defaults are with black knob pointers and green slider pegs.

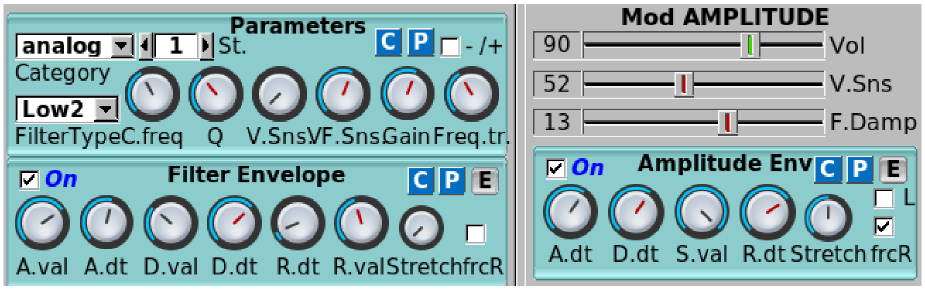



Figure 60: Controls Changed

### 8.1.7 Presets

The *Yoshimi* concept of presets is very powerful.

Absolutely every user-interface section that has dark blue **C** and **P** buttons can be stored in the `presets` directory. That includes entire Addsynth engines! When one looks at the copy/paste buffer, one sees only items that are relevant to the group that the C/P buttons are in.

As one wants to save, as well as load, these presets, it makes sense to copy all the default ones to preferred location `~/.local/share/yoshimi/presets`. That makes them fully accessible, but tucked away out of sight. *Yoshimi* creates this directory at first time start up. Preset files allow one to save the settings for any of the components which support copy/paste operations. This is done with preset files (`.xpz`), which get stored in the folders indicated by **Paths / Preset Dirs...**. Note that the number of preset directories that can be set is limited to 128 (like roots and banks).

### 8.1.8 Automation

In *Yoshimi 1.3.5*, a number of existing, as well as new features have come together to give much greater flexibility (especially for automation) using standard MIDI messages. These are:

1. **NRPNs**
2. **ZynAddSubFX controls**
3. **Independent part control**
4. **16, 32 or 64 parts**
5. **Vector Control**
6. **Direct part stereo audio output**

**1. NRPNs.** NRPNs can handle individual bytes appearing in either order, and usually the same with the data bytes. Increment and decrement is also supported as graduated values for both data LSB and MSB. Additionally, the ALSA sequencer's 14-bit NRPN blocks are supported.

**2. controls.** System and Insertion Effect controls are fully supported, with extensions to allow one to set the effect type and (for insertion effects) the destination part number.

**3. Part control.** Independent part control enables one to change instrument, volume, pan, or indeed any other available control of just that part, without affecting any others that are receiving the same MIDI channel. This can be particularly interesting with multiply layered sounds. There are more extensions planned.

**4. 16/32/64 Parts.** With 32 and 64 parts, it helps to think of 2 or 4 rows of 16. When one saves a parameter block, the number of parts is also saved, and will be restored when one reloads. By default each *column* has the same MIDI channel number, but these can be independently switched around, and by setting (say) number 17 taken right out of normal access.

In tests, *compiling* for 64 parts compared with 16 parts increased processor load by a very small amount when *Yoshimi* was idling, but this becomes virtually undetectable once one has 8 or more instruments actually generating output. In normal use, selecting the different formats makes no detectable difference, but using the default 16 reduces clutter when one doesn't need the extras.

**5. Vector control.** Vector control is based on these parts columns, giving one either 2 (X only) or 4 (X + Y) instruments in this channel. Currently the vector CCs one set up can (as inverse pairs) vary any combination of volume, pan, and filter cut-off. More will be added. To keep the processor load reasonable it pays to use fairly simple instruments, but if one has sufficient processing power, it would be theoretically possible to set up all 16 channels with quite independent vector behaviour! Also see Section 18.2 "Vector Dialogs" on page 220, for a discussion of the vector configuration dialog, and Section 18 "Vector Control" on page 219, for an in-depth discussion of how vectors work.

**6. Direct part audio.** Direct part audio is JACK-specific, and allows one to apply further processing to just the defined part's audio output (which can still output to the main L+R if one wants). This setting is saved with patch sets. Currently it is only set in the mixer panel window, but it will also eventually come under MIDI direct part control. Again, to reduce unnecessary clutter, part ports are only registered with JACK if they are both enabled, and set for direct output. However, once set they will remain in place for the session to avoid disrupting other applications that may have seen them.

## 8.2 Volume Velocity Panning

In *Yoshimi* V 1.7.2 this panel of controls within the amplitude groups of AddSynth, Voice, SubSynth and PadSynth has undergone considerable change. This can be seen in Figure 62 "Volume/Velocity/Panning" on page 90. All of these have the same actual controls although the settings vary slightly. Therefore, rather than repeat the description in all four sections of the manual they are detailed here. Both 'Volume' and 'Vel Sens' are now defined in actual dB terms.

**1. Volume.** Volume. Sets the overall/relative volume of the instrument.

**2. Vel Sens.** Velocity Sensing function. Velocity sensing is simply an exponential transformation from the note's velocity to some parameter change. Observe Figure 61 "Velocity Sensing Function" on page 90. It shows how the velocity sensing controls affects the translation of a parameter over the whole range of possible note velocities. Turn the knob rightmost/maximum to disable this function.

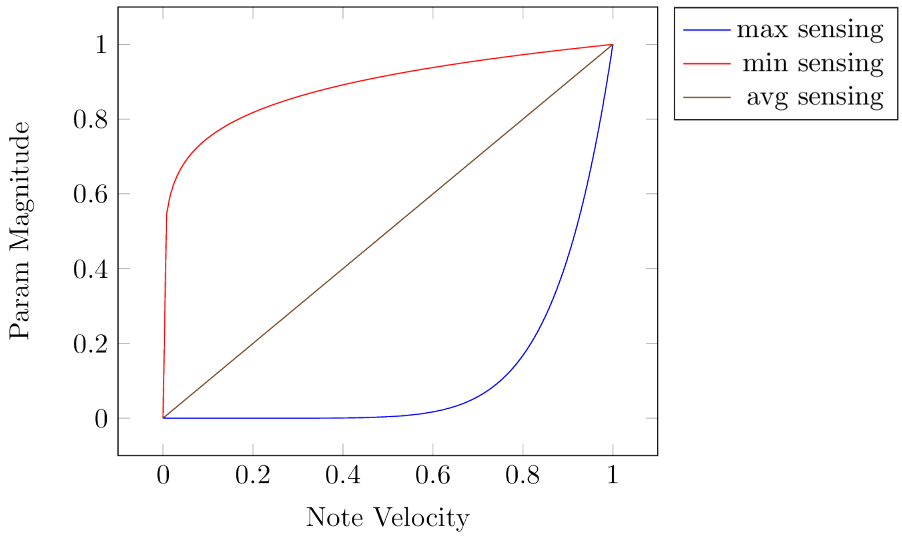



Figure 61: Velocity Sensing Function

**3. Pan.** Panning. This control no longer doubles up as a random panning switch, and is defined in terms of plus/minus percentage.

**4. Rand.** Random Panning Switch. Switches the random function on or off.

**5. Width.** 'Width. This is a new control also defined in terms of percentage.

The way this works is that with the default random setting of 100% the apparent position can be anywhere between extreme left and extreme right, as before. Set this to 50% and the range will be between 50% left of the centre position and 50% right of the centre. However, unlike the previous implementation, the panning position is still active, and if one was to set that to 25% left, then the actual range will be between 75% left and 25% right.

Obviously it is not possible to go to more than 100% so if the controls were set with Pan at 100% right, and width was 100% the actual range would be centre to 100% right. The range is set before the actual randomisation so this will still produce an even distribution over the range, resulting in an apparent centre of 50% right. That is, the same as if of both controls were set at 50%

As far as possible we maintain backwards compatibility, and in this case the fact of random panning being set will be correctly interpreted by older versions of *Yoshimi* but random position and width will be lost.

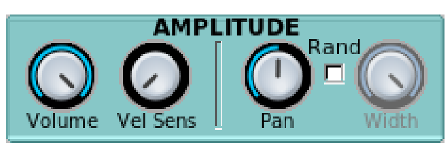



Figure 62: Volume/Velocity/Panning

## 8.3 Filter Settings

This section describes filtering at a high level, in terms of frequency responses and other concepts of filtering. The end of this section covers a user interface used in filter settings. It is a stock-panel re-used in other user-interface elements. See Section 8.3.5 "Filter Parameters User Interface" on page 93, if one is in a hurry.

*Yoshimi* offers several different types of filters, which can be used to shape the spectrum of a signal. The primary parameters that affect the characteristics of the filter are the cutoff, resonance, filter stages, and the filter type.

Filter stages are the number of times that this filter is applied in series. So, if this number is 1, one simply has this one filter. If it is two, the sound first passes the filter, and the results then pass the same filter again. In *Yoshimi*, the wetness is applied after all stages were passed.

### 8.3.1 Filter Type

A filter removes or attenuates frequency elements or tones from a signal. Filtering changes the character of a signal.

The basic analog filters that *Yoshimi* offers are shown in Figure 63 "Basic Filter Types" on page 91, with the center frequency being marked by the red line. The state variable filters should look quite similar.

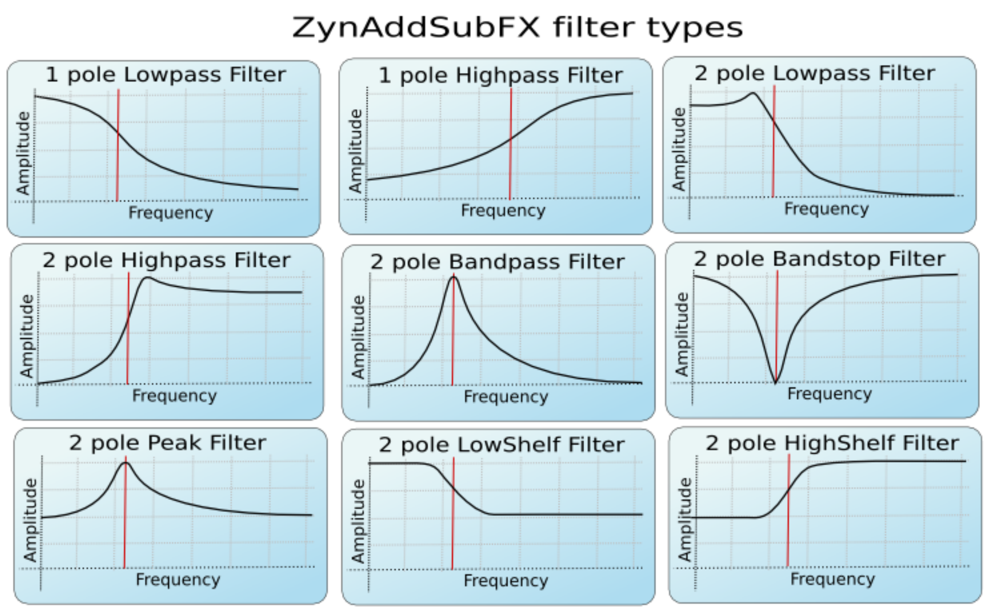



Figure 63: Filter Types, Yoshimi

1. A **low-pass** filter makes the sound more muffled.
2. A **band-pass** filter makes the sound more tone-like, and sometimes more penetrating, if the total energy in the passband is preserved as the bandwidth decreases.
3. A **high-pass** filter makes the sound seem sharper or more strident.

### 8.3.2 Filter Cutoff

The filter cutoff value determines which frequency marks the changing point for the filter. In a low pass filter, this value marks the point where higher frequencies begin to be attenuated.

### 8.3.3 Filter Resonance

The resonance of a filter determines how much excess energy is present at the cutoff frequency. In *Yoshimi*, this is represented by the Q-factor, which is defined to be the cutoff frequency divided by the bandwidth. In other words higher Q values result in a much more narrow resonant spike.

The Q value of a filter affects how concentrated the signal's energy is at the cutoff frequency. The result of differing Q values are shown in Figure 64 "Low Q vs. High Q" on page 92. For many classical analog sounds, high Q values were used on sweeping filters. A simple high Q low pass filter modulated by a strong envelope is usually sufficient to get a good sound.

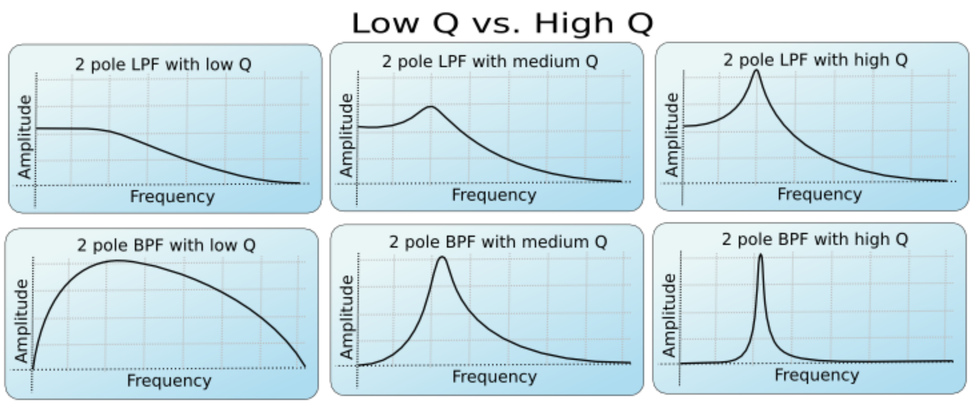



Figure 64: The Effect of the Q Value

### 8.3.4 Filter Stages

The number of stages in a given filter describes how sharply it is able to make changes in the frequency response. The more stages, the sharper the filter. However, each added stage increases the processor time needed to make the filter calculation.

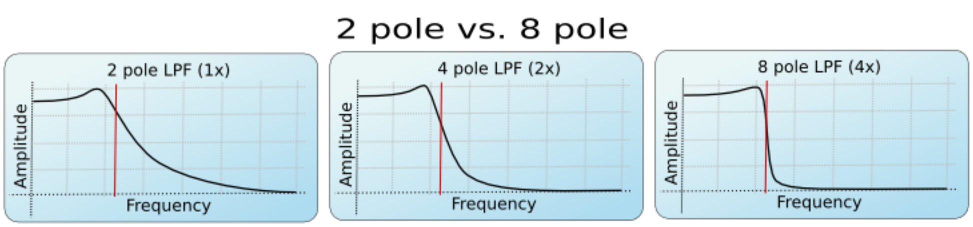



Figure 65: The Effect of the Order of a Filter

The affect of the order of the filter can be seen in the figure above. This is roughly synonymous with the number of stages of the filter. For more complex patches, it is important to realise that the extra sharpness in the filter does not come for free, as it requires many more calculations to be performed. This phenomena is the most visible in SUBsynth, where it is easy to need several *hundred* filter stages to produce a given note.

There are different types of filters. The number of poles define what will happen at a given frequency. Mathematically, the filters are functions which have poles that correspond to that frequency. Usually, two poles mean that the function has more ”steepness”, and that one can set the exact value of the function at the poles by defining the ”resonance value”. Filters with two poles are also often referred to as *Butterworth Filters*.

For the interested, functions having poles means that we are given a quotient of polynomials. The denominator has degree 1 or 2, depending on the filter having one or two poles. In the file `DSP/AnalogFilter.cpp`, `computefiltercoefs()` sets the coefficients (depending on the filter type), and `singlefilterout()` shows the whole polynomial (in a formula where no quotient is needed).

### 8.3.5 Filter Parameters User Interface

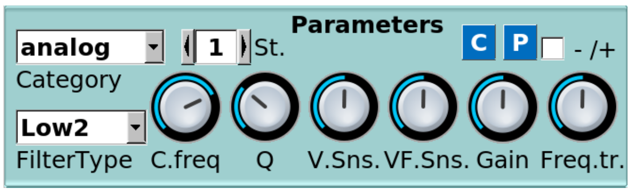



Figure 66: Stock Filter Parameters Sub-Panel

The user interface for filter parameters is a small stock sub-panel that is re-used in a number of larger dialog boxes, as shown in the figure above. This panel has changed slightly with version 1.5.0. Let's describe each item of this sub-panel.

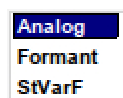



Figure 67: Filter Categories, Dropdown Box

1. **Category**
2. **Filter Type**
3. **C.freq**
4. **St**
5. **Q**
6. **V.SnsA**
7. **V.Sns**
8. **Gain**
9. **Freq.tr**
10. **0/+**

**1. Category.** Determines the category of filter to be used. There are three categories of filters (as shown in the dropdown element shown in Figure 67 ”Filter Categories Dropdown” on page 93).

1. **Analog** (the default)
2. **Formant**
3. **StVarF**

An **analog** filter is one that approximates a filter that is based on a network of resistors, capacitors, and inductors.

A **formant** filter is a more complex kind of filter that acts a lot like the human vocal tract, allowing for sounds that are a bit like human voices. For a description of how formants work, see Section 24.4.9 "Concepts / Basic Synthesis / Formants" on page 288.

Using formant filters can be rather like pulling teeth. Although Paul gave a pretty good description of how the vowels and formants interact and are laid out, there is an extremely important bit of information missing! The filter lays out the sequence (or sequences if there are multiple vowels) but it is the filter *envelope* that sets the rate and degree to which these are traversed. Also, the richer the original harmonic content the more pronounced the effect will be (quite useless on sine wave).

See Section 8.6.6.1 "Formant Parameters" on page 112 for the formant parameters, which may have slightly different names from what Paul used.

A **state variable** ("StVarF") filter is a type of active filter. The frequency of operation and the Q factor can be varied independently. This and the ability to switch between different filter responses make the state-variable filter widely used in analogue synthesizers.

Values: `Analog*, Formant, StVarF`

**2. Filter Type.** Selects the type of filter to be used, such as high-pass, low-pass, and band-pass. See the dropdown element in Figure 68 "Filter Type Dropdown" on page 94.

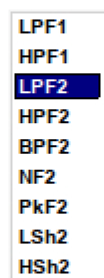



Figure 68: Type of Filter Passband, Dropdown Box

Values: `LPF1, HPF1, LPF2*, HPF2, BPF2, NF2, PkF2, LSh2, HSh2`

**3. C.freq.** Cutoff frequency or center frequency. This item has various definitions in the literature. Usually it refers to the frequency at which the level drops to 3dB below the maximum level. In various dialogs, this value is the center frequency of the filter or the base position in a vowel's sequence.

Values: `0 to 127, 90*`

**4. St.** Filter stages. The more filter stages applied to a signal, the stronger (in general) the filtering. It is the number of additional times the filter will be applied (in order to create a very steep roll-off, such as 48 dB/octave). This dropdown element is shown in Figure 69 "Filter Stage Dropdown" on page 94. Obviously, the more stages used, the more calculation-intensive the filter will be. This should also increase the latency (lag) of the filter.


Figure 69: Filter Stage Dropdown

**5. Q.** The level of resonance for the filter. It indicates a measure of the sharpness of a filter. The higher the Q, the sharper the filter. Generally, a higher Q value leads to a louder, more tonal affect for the filter. Note that some filter types might ignore this parameter.

**6. V.SnsA.** Velocity sensing amount for filter cutoff. Velocity sensing amount of the filter.

Values: `0 to 127, 64*`

**7. V.Sns.** Velocity sensing function of the filter. Set the amplitude of the velocity sensing.

Values: `0 to 127, 64*`

**8. Gain.** Filter gain. Additional gain/attenuation for a filter. Also described as the filter output gain/damping factor.

Values: `0 to 127, 64*`

**9. Freq.tr.** Filter Frequency Tracking Amount. When this parameter is positive, higher note frequencies shift the filter's cutoff frequency higher. For the filter frequency tracking knob, left is negative, middle is zero, and right is positive.

Values: `0 to 127, 64*`

**10. 0/+.** Filter tracking upgrade. Filter tracking could never quite reach 100%, so if using it to get "notes" from noise it would go slightly out-of-tune. *Yoshimi* now has this new check box that changes its range so that instead of -100% : 98.4% it will track 0% : 198.4%.

This new feature is one of the first that actually change instrument files. However, the format is backwards compatible; older versions of *Yoshimi* simply ignore them.

Also present in this sub-panel are the usual **C**opy and **P**aste buttons that call up a copy-parameters or a paste-parameters dialog.

## 8.4 Stock Resonance Settings

*Yoshimi* provides for setting very arbitrary "resonance" settings for some sounds. In fact, "resonance" is too limiting a word. A lot of control over the *spectrum* is possible. The following dialog is used by the ADDsynth editor, and the PADsynth editor.

The resonance editor is brought on-screen via the **Resonance** button of the ADDsynth or PADsynth global part editors.

The resonance effect acts as a "resonance box" or a filter with arbitrary frequency response. This produces very realistic sounds. The cursor location is shown below the graph (the frequency, kHz, and the amplitude, dB).

Paul Nasca has a video on YouTube that includes a demonstration of how the resonance dialog works and affects the sound, if one cares to look for it.

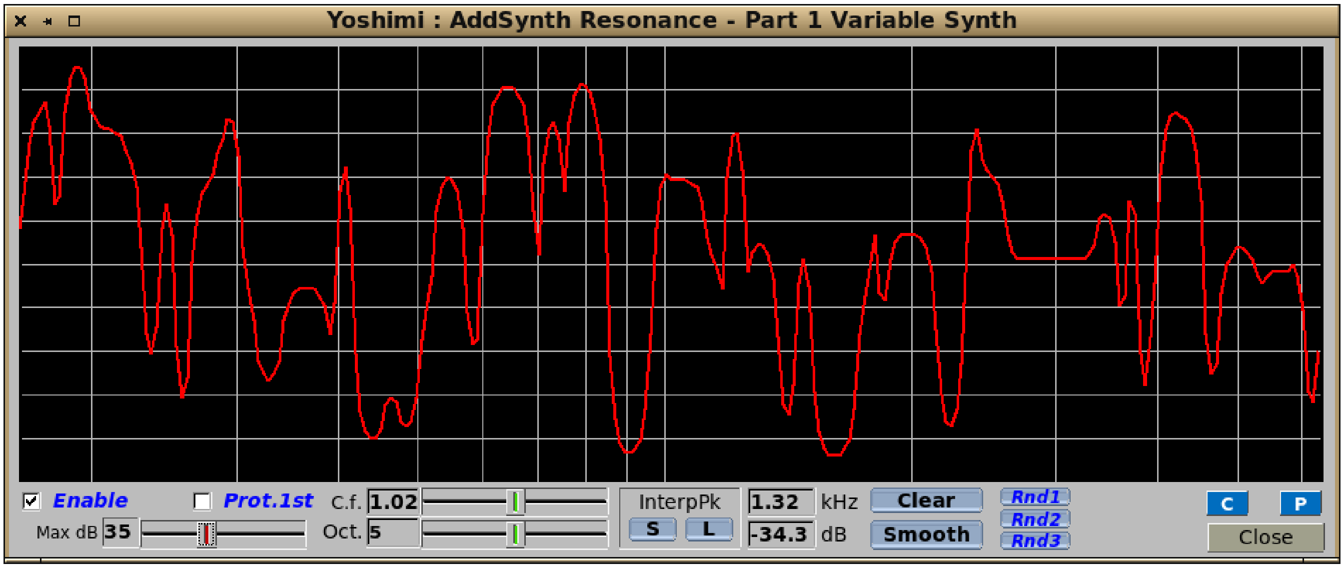



Figure 70: ADDsynth/PADsynth Resonance

1. **Graph Window**
2. **Enable**
3. **Max dB**
4. **C.f.**
5. **Oct.**
6. **Prot.1st**
7. **InterpPk**
8. **KHz**
9. **dB**
10. **Zero**
11. **Smooth**
12. **RND1**
13. **RND2**
14. **RND3**
15. **C**
16. **P**
17. **Close**

**1. Graph Window.** Resonance Graph Window. Lets one draw the resonance frequency response in "freehand" mode.

**2. Enable.** Resonance Enable. Turn the Resonance effect on.

Values: `Off*, On`

**3. Max dB (wheel).** The Maximum Amplitude (dB) wheel. Sets the amount of resonance: lower values have little effect. Use the roller below to set it.

Values: `1 to 90, 20*`

**4. C.f. (knob).** Center Frequency (kHz). Sets the center frequency of the graph. The value is shown in the read-only text-box to the left.

Values: `0 to 127, 64*` for `0.10 to 10.0, 1.0*`

**5. Oct.** Number of Octaves. Sets the number of octaves the graph represents. The value is shown in the read-only text-box to the left.

Values: `0 to 127, 64*` for `0 to 10, 5*`

**6. Prot.1st.** Protect the fundamental Frequency. That is, do not damp the first harmonic.

Values: `Off, On`

**7. InterpPk.** Interpolate the resonance peaks. This setting used to be a weird one where the mouse button (left versus right) affected the kind of interpolation used, but also affects the next field as well, but in *Yoshimi* 1.3.9 the mechanism for interpolation has been made more clear. In addition, some of the controls have been changed to sliders for easier usage.

This setting allows one to make resonance functions very easily. To use it effectively, first, clear the graph using the **Clear** button. Click the left button on a position on the graph to create a peak (or do it more than once to create more peaks).

First we show the manual edit that both the modified types were taken from, as shown here.

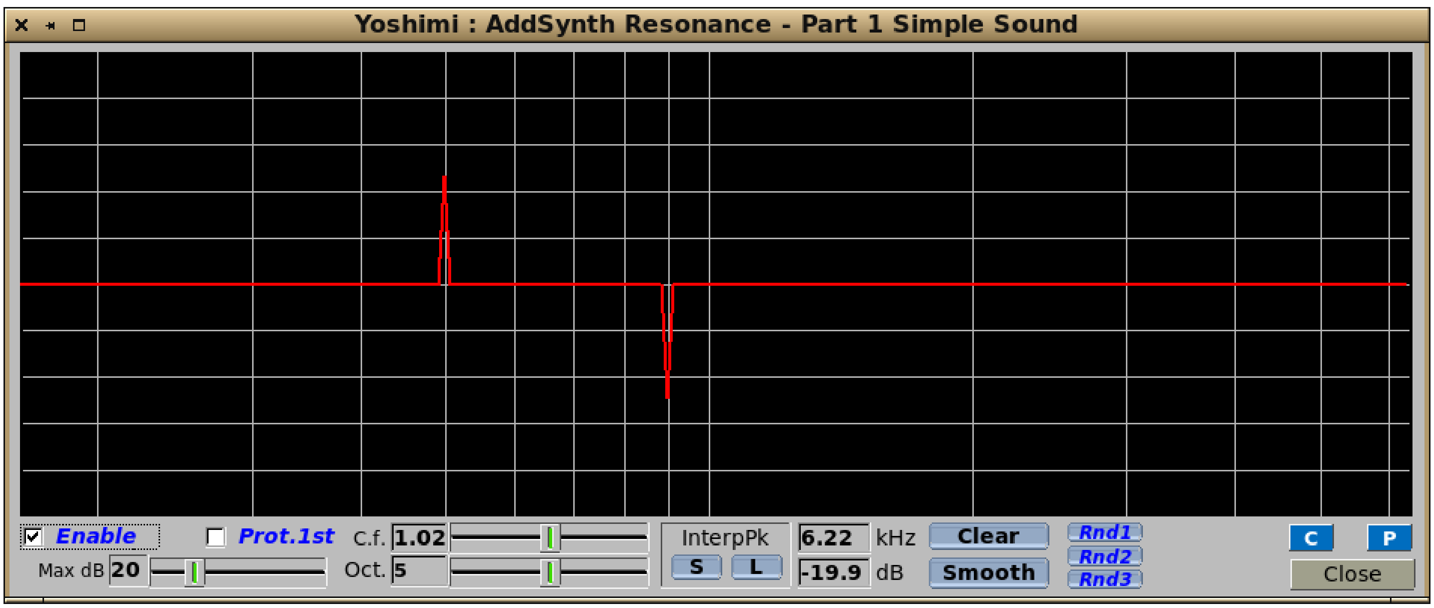



Figure 71: ADDsynth/PADsynth Resonance Edit

Click either the **InterpPk S** button (smooth interpolation) or the **InterpPk L** button (linear interpolation). *Yoshimi* will interpolate automatically between the peaks drawn, as shown in Figure 72 "ADDsynth/PADsynth Resonance Interpolated" on page 98, which shows *smooth interpolation*.

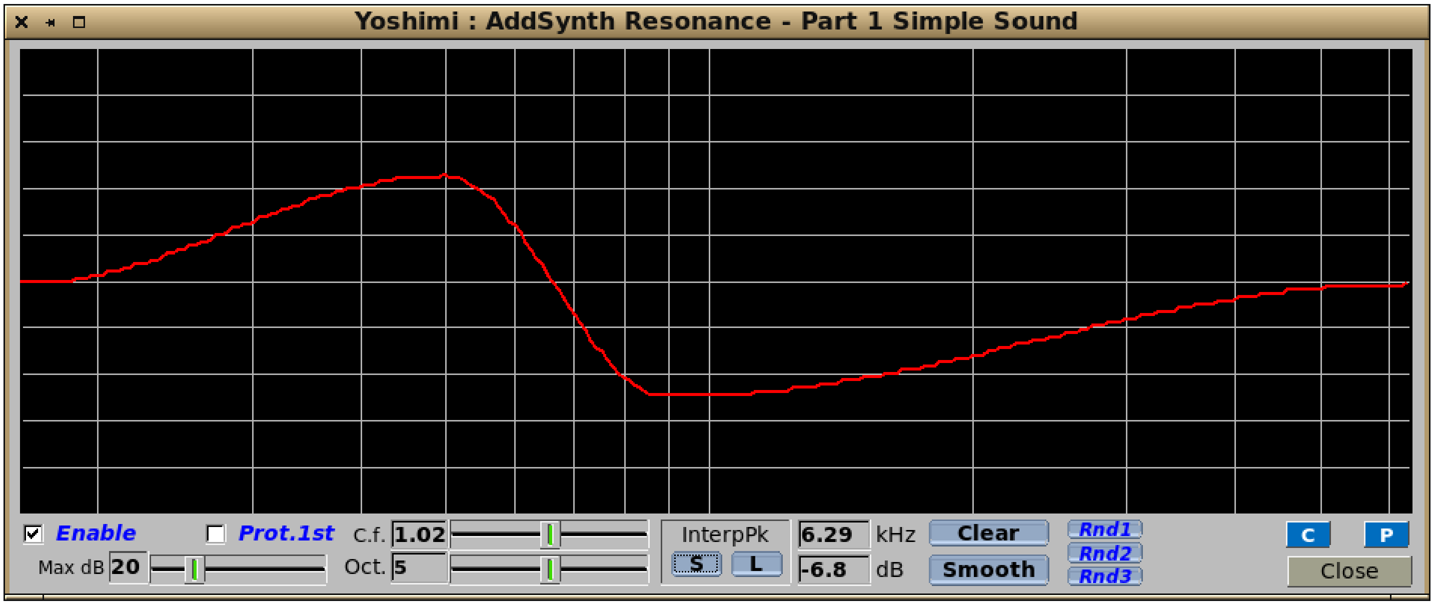



Figure 72: ADDsynth/PADsynth Resonance Interpolated

Please do not confuse this "smoothing" with the processing done using the **Smooth** button discussed below.

Also note that one can clear a part of the graph by dragging with the right mouse button. In fact, the **interpPk** functionality interpolates between non-zero values. Oh, and note that the **kHz** and **dB** fields update to match it.

**8. KHz.** The current frequency on graph.

**9. dB.** The current level on graph window.

Values: `-90 to +90`

**10. Clear.** Clear the resonance function. (Used to be called "Zero".) Clear the graph.

**11. Smooth.** Smooth the resonance function. Smooth the graph. This button causes each jagged portion of the graph to be smoothed. This smooth does not interpolate between the peaks, unlike the **InterpPk** functionality described earlier. Compare the interpolation shown in Figure 72 "ADDsynth/PADsynth Resonance Interpolated" on page 98, and the smoothing shown in Figure 73 "ADDsynth/PADsynth Resonance Smoothed" on page 99.

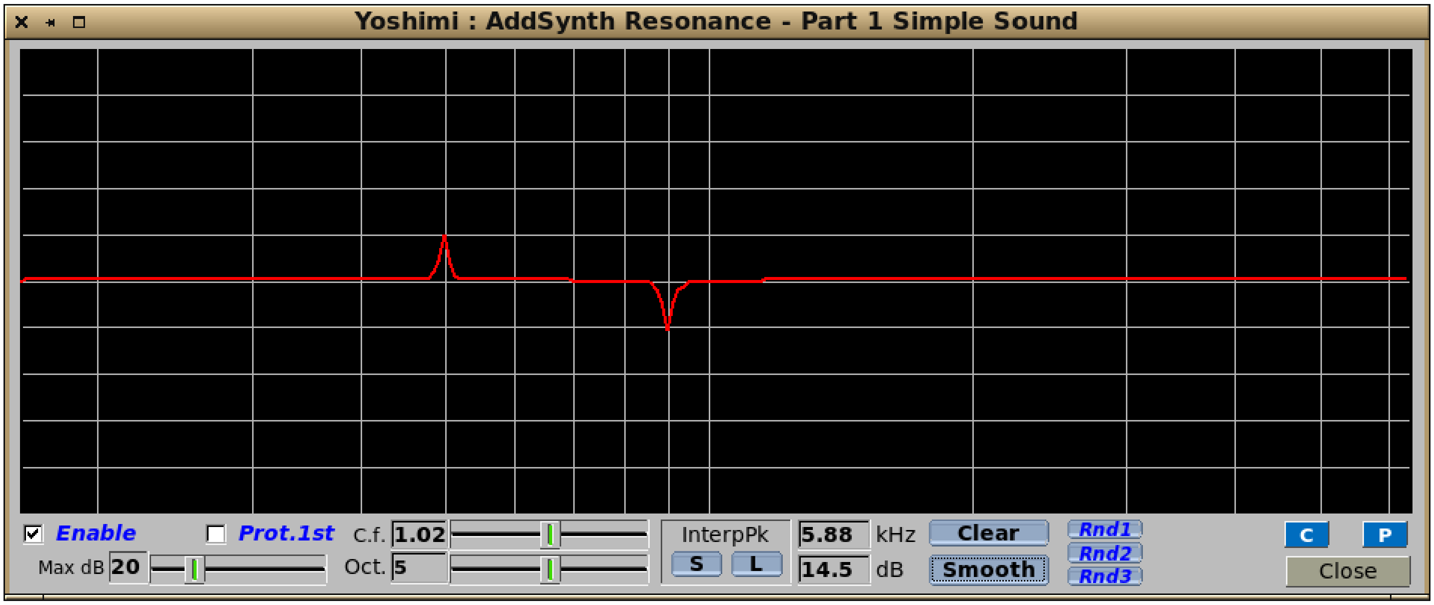



Figure 73: ADDsynth/PADsynth Resonance Smoothed

Note how the amplitude of the peaks is also reduced by the smoothing. Presumably, a frequency-smoothing window is applied to the peaks, thus making each new data-point a weighted average of the data-points around it.

**12. RND1.** Randomise the resonance function, 1. RND1, RND2, RND3 are used to create random resonance functions.

**13. RND2.** Randomise the resonance function, 2.

**14. RND3.** Randomise the resonance function, 3.

**15. C.** Copy Dialog.

**16. P.** Paste Dialog.

**17. Close.** Close.

## 8.5 LFO Settings

*Yoshimi* provides LFOs for it amplitude, frequency, and filtering functions. "LFO" means Low Frequency Oscillator. These oscillators are not used to make sounds by themselves, but they change parameters cyclically as a sound plays.

LFOs are, as the name says, oscillators with, compared to the frequency of the sound, low frequency. They often appear in order to control the effect.

### 8.5.1 LFO Basic Parameters

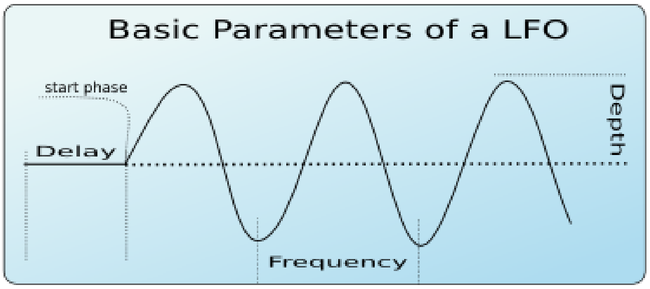



Figure 74: Basic LFO Parameters

1. **Delay**.
2. **Start Phase**.
3. **Frequency**.
4. **Depth**.

The LFOs have some basic parameters (see Figure 74 "Basic LFO Parameters" on page 100.

**1. Delay.** LFO Delay. This parameter sets how much time takes since the start of the note to start the cycling of the LFO. When the LFO starts, it has a certain position called "start phase".

**2. Start Phase.** LFO Start Phase. The angular position at which a LFO waveform will start.

**3. Frequency.** LFO Frequency. How fast the LFO is (i.e. how fast the parameter controlled by the LFO changes.)

**4. Depth.** LFO Depth. The amplitude of the LFO (i.e. how much the parameter is controlled by the LFO changes.)

### 8.5.2 LFO Function

Another important additional LFO parameter is the shape or type of the LFO. There are many LFO Types that vary according to the function used to generate the LFO. *Yoshimi* supports the LFO shapes shown in Figure 75 "LFO Functions" on page 100.

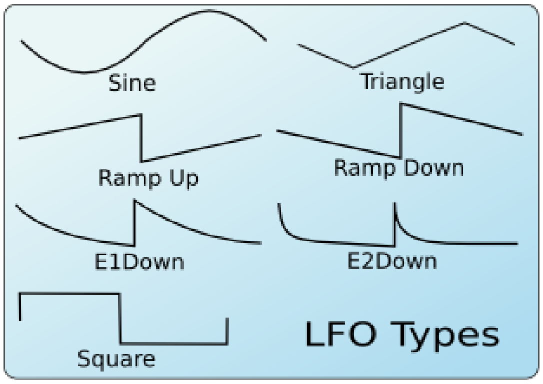



Figure 75: LFO Types, Shapes, or Functions

### 8.5.3 LFO Randomness

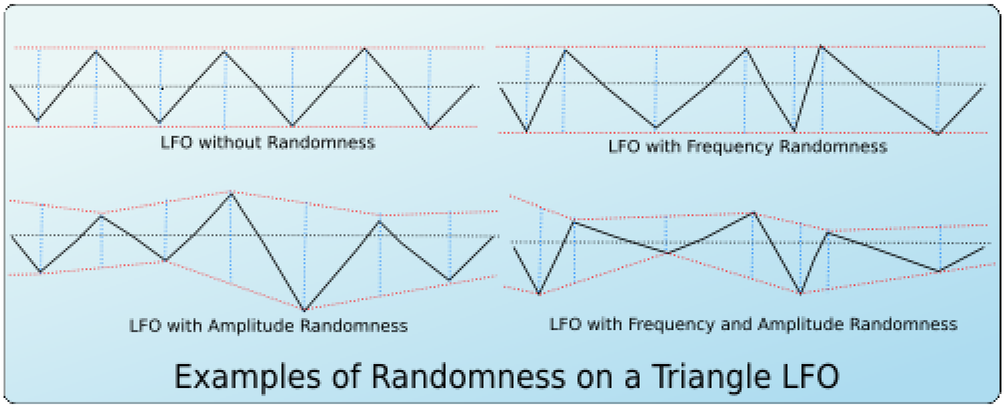



Figure 76: LFO Randomisation

Another parameter is the LFO Randomness. It modifies the LFO amplitude or the LFO frequency at random. In *Yoshimi* one can choose how much the LFO frequency or LFO amplitude changes by this parameter. Observe Figure 76 "LFO Randomisation" on page 101. It shows some examples of randomness and how it changes the shape of a triangle LFO.

### 8.5.4 LFO, More Settings

Other settings are available as well.

Continuous mode: If this mode is used, the LFO will not start from "zero" on each new note, but it will be continuous. This is very useful if one applies on filters to make interesting sweeps.

Stretch: It controls how much the LFO frequency changes according to the note's frequency. It can vary from negative stretch (the LFO frequency is decreased on higher notes) to zero (the LFO frequency will be the same on all notes) to positive stretch (the LFO frequency will be increased on higher notes).

### 8.5.5 LFO User Interface Panels

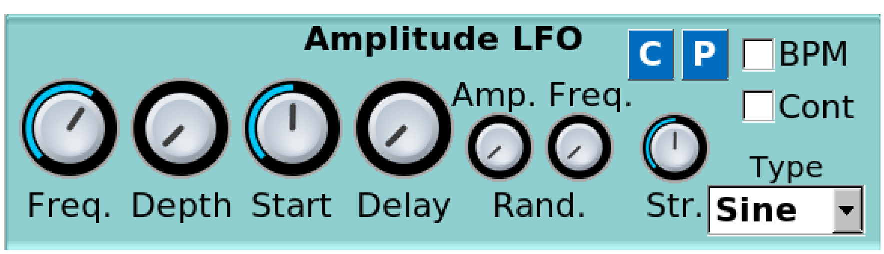



Figure 77: Amplitude LFO Sub-Panel

In *Yoshimi*, LFO parameters are available for amplitude, filters, and frequency. They all have essentially the same interface elements. Note Figure 77 "Amplitude LFO Sub-Panel" on page 101, which shows an example of an LFO stock sub-panel.

These parameters are:

1. **On** (Only on AddSynth Voices)
2. **Freq**
3. **Depth**
4. **Start**
5. **Delay**
6. **Amp. (Rand.)**
7. **Freq (Rand.)**
8. **Str**
9. **BPM**
10. **Cont.**
11. **Type**
12. **C** (copy)
13. **P** (paste)

**1. On.** (Only on AddSynth Voices)

Values: `Off*, On`

**2. Freq.** LFO Frequency. This parameter varies from 0 to 85.25Hz.

Values: `0 to 85.25, 6.259*`

**3. Depth.** LFO Depth. Also called "LFO Amount". Uniquely, this control can be set greater than full depth, and the LFO envelope becomes re-entrant. A sine shape becomes two humps, as if rectified, triangle becomes two, etc.

Values: `0* to 200%`

**4. Start.** LFO Start Phase in degrees. If this knob is at the lowest value, the LFO Start Phase will be random.

Values: `random/-167, to 179, 0*`

**5. Delay.** LFO Delay.

Values: `0* to 4.00 sec`

**6. Amp. (Rand.).** LFO Amplitude Randomness.

Values: `0.1* to 100%`

**7. Freq.(Rand.).** LFO Frequency Randomness.

Values: `0.1* to 100%`

**8. Str.** LFO Stretch. See the image in Figure 77 "Amplitude LFO Sub-Panel" on page 101. It shows that the LFO stretch is set to zero.

Values: `-100% to 100%, 0*`

**9. BPM.** Turns the LFO frequency control into a ratio control related to the incoming MIDI timecode. New in *Yoshimi* V2.0 See Section 8.5.8 "BPM and Frequency" on page 104 for further details.

Values: `Off*, On`

**10. Cont..** LFO Continous Mode.

Values: `Off*, On`

**11. Type.** LFO Function.

Also present in this sub-panel are the usual **C**opy and **P**aste buttons that call up a copy-parameters or paste-parameters dialog.

Values: `SINE*, TRI, SQR, R.up, R.dn, E1dn, E2dn, S&H, RSQu, RSQd`

Meaning: `Sine, Triangle, Square, Ramp Up, Ramp Down, Exponent 1 Down, Exponent 2 Down, Sample and Hold, Random Square Up, Random Square Down`


Figure 78: LFO Function Type Drop-down

The various shapes of LFO functions are shown in Figure 75 "LFO Functions" on page 100. The values that can be selected are shown in Figure 78 "LFO Type Drop-down" on page 103.

The last three types are new from *Yoshimi* V 1.7.2. They are all based on the square wave type but with the following variations:

`S&H` alternates between the maximum depth and a random level from the 'depth' setting to the maximum. It also randomly skips some changes.

`RSQu` maintains the frequency (doesn't skip any changes) but alternates between the depth control setting and a random level from that to the maximum depth.

`RSQd` also maintains the frequency but alternates between the maximum depth and a random amount from the depth control setting and maximum.

These extensions sound more like some special effect than normal LFOs, so it is likely they would be of most interest to those involved in experimental sounds and music.

**12. C / P.** Also present in this sub-panel are the usual **C**opy and **P**aste buttons that call up a copy-parameters or paste-parameters dialog.

### 8.5.6 Filter LFO Sub-panel

The controls and layout for this are identical to the Amplitude LFO. Section 8.5.5 "LFO User Interface Panels" on page 101

### 8.5.7 Frequency LFO Sub-panel

The controls and layout for this are identical to the Amplitude LFO. Section 8.5.5 "LFO User Interface Panels" on page 101

#### 8.5.8 BPM and Frequency

The BPM setting for LFOs and Effects changes the behaviour so that the frequency control produces stepped ratios against the incoming MIDI timecode.
These are:
. 1/16, 1/15, 1/14, 1/13, 1/12, 1/11, 1/10, 1/9, 1/8, 1/7, 1/6, 1/5, 1/4, 1/3, 1/2
. 2/3, 1/1, 3/2
. 2/1, 3/1, 4/1, 5/1, 6/1, 7/1, 8/1, 9/1, 10/1, 11/1, 12/1, 13/1, 14/1, 15/1, 16/1
This will track timecode changes in real time, but rapid or extreme changes may introduce unwanted artefacts. Also, if there is no incoming timecode the BPM will be the figure set at the top of the main window (F.BPM).

### 8.6 Envelope Settings

Envelopes control how the amplitude, the frequency, or the filter changes over time. The general envelope generator has four sections:

1. **Attack**. The attack is the initial envelope response. It begins when the key for the note is first held down (at Note On). The volume starts at 0, and rises fast or slowly until a peak value. In *Yoshimi*, the attack is always linear.
2. **Decay** When the attack is at its highest value, it immediately begins to decay to the sustain value. The decay can be fast or slow. The attack and decay together can be used to produce something like horn blips, for example.
3. **Sustain** This is the level at which the parameter stays while the key is held down, i.e. until a Note Off occurs.
4. **Release** When the key is released, the sound decays, either fast or slowly, until it is off (the volume is 0).

Together, these values are called "ADSR". The ADSR envelope generally controls the amplitude of the sound. In *Yoshimi*, amplitude envelopes can be *linear* or *logarithmic*.

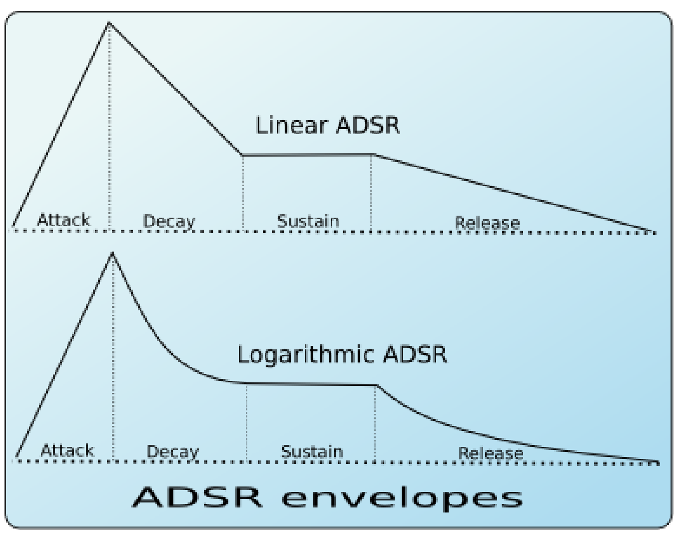



Figure 79: ADSR Envelope (Amplitude)

See Figure 79 "ADSR Envelope (Amplitude)" on page 104, it shows a depiction of an ADSR envelope. The ADSR is mostly applied to amplitude envelopes.

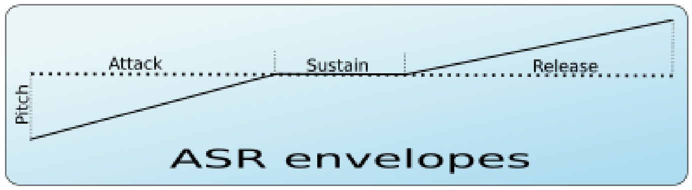



Figure 80: ASR Envelope, Frequency

Frequency envelopes control the frequency (more exactly, the pitch) of the oscillators. The following image depicts the stages of these envelopes.

For frequency envelopes, a simpler form of envelope is used. This envelope is an ASR envelope, shown in Figure 80 "ASR Envelope, Frequency" on page 105. The dotted line represents the real pitch of the sound without the envelope. The frequency envelopes are divided into 3 stages:

1. **Attack**. It begins at the Note On. The frequency starts from a certain value and glides to the real frequency of the note.
2. **Sustain**. The frequency stays the same during the sustain period.
3. **Release**. This stage begins on Note Off and glides the frequency of the note to a certain value.

### 8.6.1 Amplitude Envelope Sub-Panel


Figure 81: Amplitude Envelope Sub-Panel

1. **A.dt**
2. **D.dt**
3. **S.val**
4. **R.dt**
5. **Str**
6. **L**
7. **frcR**
8. **C**
9. **P**
10. **E**

**1. A.dt.** Attack duration, attack time. (mS)

Values: `0* to 41S`

**2. D.dt.** Decay duration, decay time.

Values: `0 to 41S, 127mS*`

**3. S.val.** Sustain value. This is the level at which the envelope will settle while the note is held down. The only stage that always remains defined is the Sustain, where the envelopes freezes until a Note Off event.

Values: `-60dB to 0*`

**4. R.dt.** Release time.

Values: `0 to 41S, 41.4mS*`

**5. Str.** Stretch. How the envelope is stretched according the note. Envelope Stretch means that, on lower notes, the envelope will be longer. On the higher notes the envelopes are shorter than lower notes. In the leftmost value, the stretch is zero. The rightmost use a stretch of 200%; this means that the envelope is stretched about 4 times per octave.

Values: `0.0% to 100.1%, 50.4%*`

**6. L.** Linear envelope. If this option is set, the envelope is linear, otherwise, it will be logarithmic.

Values: `Off*, On`

**7. frcR.** Forced release. If this option is turned on, the release will go to the final value, even if the sustain stage is not reached. Usually, this must be set. Also present in this sub-panel are the usual **C**opy and **P**aste buttons that call up a copy-parameters or paste-parameters dialog.

Values: `Off, On*`

**8. C.** Copy to Clipboard/Preset.

**9. P.** Paste from Clipboard/Preset.

**10. E.** Amplitude Envelope Editing Window. Described in the next section.

### 8.6.2 Envelope Settings

This section describes the **Amplitude Envelope Editing** window. The behaviour of the Filter and Frequency envelopes is identical.

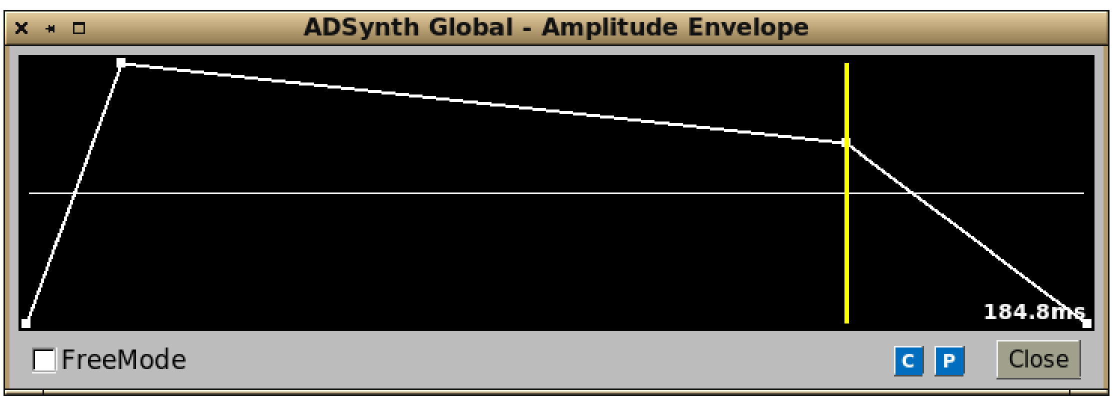



Figure 82: Amplitude Envelope Editor

1. **Graph Window**
2. **FreeMode**
3. **C**
4. **P**
5. **Close**

**1. FreeMode.** Freemode Enable. Enables the envelope editor's Free Mode. See the next section for details.

Values: `Off*, On`

### 8.6.3 Freemode Envelope Settings

The envelope panels are parts that control a parameter (such as the frequencies) of a sound. For all envelopes, there is a mode that allows the user to set an arbitrary number of stages and control points. This mode is called *Freemode*. The only stage that always remains defined is the Sustain, where the envelopes freezes until a Note Off event. The Freemode envelope editor has a separate window to set the parameters and controls.

The main concept of the freemode editor window is the *control point*. One can move the points using the mouse. In the right on the window, it shows the total duration of the envelope. If the mouse button is pressed on a control point, it will be shown the duration of the stage where the point is.

For an example of the stock Freemode envelope editor, with Freemode enabled, see Figure 83 "Amplitude Envelope Freemode Editor" on page 107.

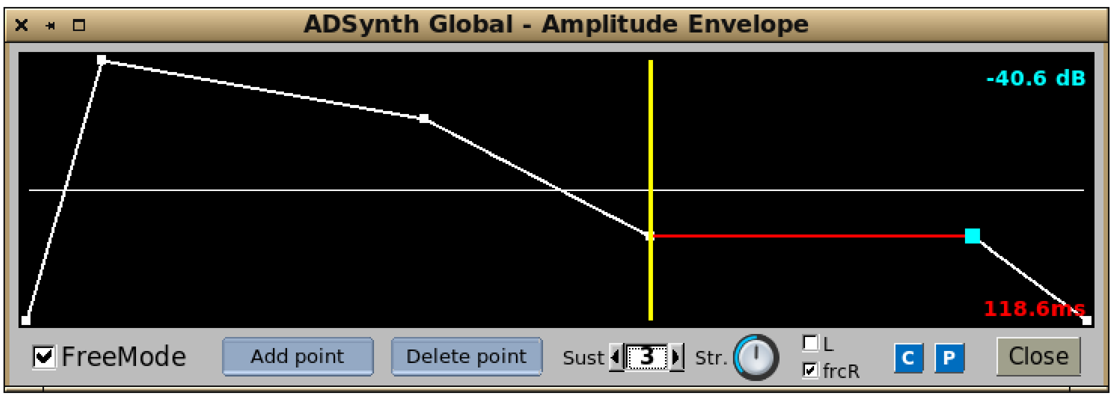



Figure 83: Amplitude Envelope Freemode Editor

All of the envelope editors have some common controls.

1. **Graph Window**
2. **Add point**
3. **E**
4. **FreeMode**
5. **Add point**
6. **Delete point**
7. **Sust**
8. **Stretch**
9. **L**
10. **frcR**
11. **Close**
12. **C**
13. **P**

**1. E.** Editor. Graph Window. Shows a window with the real envelope shape and the option to convert to Freemode to edit it. The envelope editor shows a window in which one can view and modify the detailed envelope shape, or convert it to Freemode to edit it almost without restriction. By default, only the *Freemode* button/checkbox is visible.

If an envelope has FreeMode enabled, it allows one to edit the graph of the envelope directly. Select a point from the graph and move it. Notice that *only the line **before** the currently edited point of the envelope* changes its duration. As the point is dragged, the text on the right shows the duration of the line before it. Otherwise, the text shows the total duration of the envelope.

If the envelope doesn't have the FreeMode mode enabled, it doesn't allow one to move the points; the envelope window is then useful only to see what happens if one changes the ADSR settings.

**2. FreeMode.** FreeMode. Provides a mode where completely arbitrary envelopes may be drawn. Actually, the envelopes aren't completely arbitrary, as the sustain section is always flat, and its duration corresponds with the duration the note is held down. When this mode is enabled, the rest of the controls shown in Figure 83 "Amplitude Envelope Freemode Editor" on page 107 appear, and are described in the following paragraphs.

Values: `Off*, On`

**3. Add point.** Add point. Provides a way to add a data point to the Freemode envelope. It adds the point after the currently-selected point. One can select a point by clicking on it.

**4. Delete point.** Delete point. Provides a way to delete the current data point from the Freemode envelope.

**5. Sust.** Sustain point. Sets the sustain point. The sustain point is shown using the yellow line. If the point is at 0, then sustain is disabled. It is difficult to determine the difference between 1 and 2.

1. 0 means that sustain is disabled, and the envelope immediately starts dying, even if the note is held.
2. 1 seems to mean the sustain curve follows its course while the note is held.
3. 2 seems to mean that extra sustain kicks in after the note is released.

Values: `0, 1, 2*`

**6. Stretch.** Envelope Stretch. How the envelope is stretched according the note. On the higher notes the envelopes are shorter than lower notes. At the leftmost value, the stretch is zero. The rightmost sets a stretch of 200%; this means that the envelope is stretched about four times/octave.

**7. L.** Envelope Linear. This setting is only available in the amplitude envelope. If enabled, the envelope is linear. If not enabled, the envelope is logarithmic (dB).

Values: `Off*, On`

**8. frcR.** Forced Release. This means that if this option is turned on, the release will go immediately to the final value, even if the sustain stage is not reached. Usually, this must be set. When the key is released, the position of the envelope jumps directly to the point after the release point. If the release is disabled, the envelope position jumps to the last point on release.

Values: `Off*, On`

**9. Close.** Close Dialog.

Also present in this sub-panel are the usual **C**opy and **P**aste buttons that call up a copy-parameters or paste-parameters dialog, as well as a button to bring up the editor window.

### 8.6.4 Envelope Settings, Frequency

These envelopes controls the frequency (more exactly, the pitch) of the oscillators. Observe Figure 80 "ASR Envelope, Frequency" on page 105. It depicts the stages of these envelopes. The dotted line represents the real pitch of the sound without the envelope.

The frequency envelopes are divided into 3 stages: attack (see 1.); sustain (see 3.); and release (see 4.).

One question to answer is: can the attack and release go in the opposite directions, or do the knob ranges prohibit this?

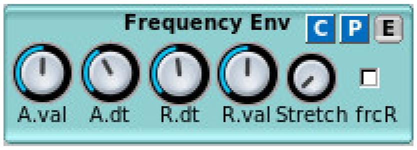



Figure 84: Frequency Envelope Sub-Panel

1. **Enable** (present on some versions of this sub-panel).
2. **A.value** or **A.val**
3. **A.dt**
4. **R.dt**
5. **R.val** (present on some versions of this sub-panel).
6. **Stretch**
7. **frcR**
8. **C**
9. **P**
10. **E**

For Frequency Envelopes the interface has the following parameters:

**1. Enable.** Enable the panel. (Present on some versions of this sub-panel).

**2. A.val.** Attack value. We need to figure out what this means.

Values: `0 to 127, 64*`

**3. A.dt.** Attack duration. Attack time.

Values: `0 to 127, 40*`

**4. R.dt.** Release time.

Values: `0 to 127, 60*`

**5. R.val.** Release Value. Actually present only on the Frequency Env sub-panel.

Values: `0 to 127, 64*`

**6. Stretch.** Envelope Stretch. Envelope Stretch (on lower notes make the envelope longer).

Values: `0 to 127, 64*`

**7. frcR.** Forced release. If this option is turned on, the release will go to the final value, even if the sustain level is not reached.

Values: `Off, On*`

Also present in this sub-panel are the usual **C**opy and **P**aste buttons that call up a copy-parameters or paste-parameters dialog, as well as a button to bring up the editor window.

### 8.6.5 Envelope Settings for Filter

This envelope controls the cutoff frequency of the filters. The filter envelopes are divided into 4 stages:

1. **Attack**. It begins at the Note On. The cutoff frequency starts from a certain value and glides to another value.
2. **Decay**. The cutoff frequency continues to glide to the real cutoff frequency value of the filter (dotted line).
3. **Sustain**. The cutoff frequency stays the same during the sustain period (dotted line).
4. **Release**. This stage begins on Note Off and glides the filter cutoff frequency of the note to a certain value.

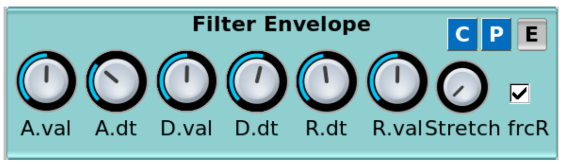



Figure 85: Filter Envelope Sub-Panel

The items in this panel are:

1. **A.value**
2. **A.dt**
3. **D.val**
4. **D.dt**
5. **R.dt**
6. **Stretch**
7. **frcR**
8. **L**

Filter Envelopes has the following parameters:

**1. A.value.** Attack Value. Starting Value. We need to figure out what this means.

Values: `0 to 127, 64*`

**2. A.dt.** Attack Duration. Attack Time.

Values: `0 to 127, 40*`

**3. D.val.** Decay Value.

Values: `0 to 127, 64*`

**4. D.dt.** Decay Duration. Decay Time.

Values: `0 to 127, 70*`

**5. R.dt.** Release time.

Values: `0 to 127, 60*`

**6. Stretch.** Stretch. Envelope Stretch (on lower notes make the envelope longer).

Values: `0 to 127, 64*`

**7. frcR.** Forced Release. If this option is turned on, the release will go to the final value, even if the sustain level is not reached.

Values: `Off, On*`

Also present in this sub-panel are the usual **C**opy and **P**aste buttons that call up a copy-parameters or paste-parameters dialog, as well as a button that bring up the editor window.

**8. L.** If this option is set, the envelope is linear, otherwise, it will be logarithmic.

Values: `Off*, On`

### 8.6.6 Formant Filter Settings

This window allows one to change most of the parameters of the formant filter. It is reached by enabling a **FILTER** panel in an AddSynth part, changing the **Category** (top right in the **Filter Params** sub-panel) value to *Formant*, and then clicking the **Edit** button that sits below the category drop-down list.

One should keep in mind that these controls are an *addition* to the parent filter ones.

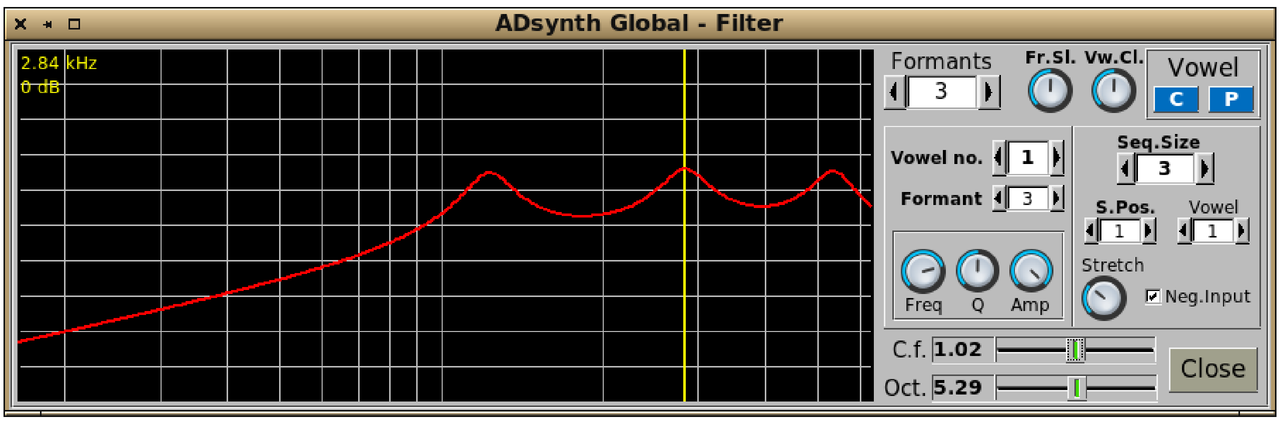



Figure 86: Formant Filter Editor Dialog

This editor dialog provides a lot of functionality:

1. **Graph Window**
2. **Formants**
3. **Fr.Sl.**
4. **Vw.Cl.**
5. **C.f.**
6. **Oct.**
7. **Vowel no.**
8. **Formant**
9. **freq**
10. **Q**
11. **amp**
12. **Seq.Size**
13. **S.Pos.**
14. **Vowel**
15. **Stretch**
16. **Neg Input**

#### 8.6.6.1 Formant Parameters

**9. Formants Graph Window.** The graph window shows the formant frequency envelope in red, and one or more vertical yellow lines at each formant's center frequency. As the mouse pointer is moved over the graph, other formant center frequencies may appear, highlighted in yellow. Various mouse actions will modify the formant graph in a manner that might be more intuitive than frobbing the spin and knob controls.

One can control some of the parameters by placing the mouse pointer over the yellow lines representing each formant. Hold down the left or right mouse button and move the mouse sideways: this action will change the formant's center frequency. The Left button down: moving vertically will change the amplitude. The Right button down: moving vertically changes the formant's Q factor. Anywhere on the graph: the scroll-wheel changes the octave range, and holding `Shift` at the same time changes the center frequency.

Thus, one can control most of the formant features one-handed, quickly, while also playing on a keyboard. If one's mouse has extra buttons on the sides (many haven't) these can be used to switch between the formants instead of moving the mouse across to the next one. While making changes, one sees the respective knobs/sliders moving too; these are still fully functional.

Even though there may only be three or four formants per vowel enabled and active, *Yoshimi* will store (and recover) all twelve possible formants per vowel. All six vowels are always available, and from the **main** filter window a preset stores all of them, their formants and the sequence information.

One should be aware though, that when actually in the formant editing window itself **only** the formants of the currently selected vowel will be stored as a preset. No other data at all.

Another trap for the unwary is that one can still edit vowels that are not currently in use... and wonder why nothing seems to change. From *Yoshimi* V 2.2.3 there is now a warning of this in the form of a redish patch that appears behind the vowel number if it's not in use, i.e. not seen in any sequence position.

An important detail is that, uniquely, there is no 'default' value for formant frequency. This value will be set randomly when the filter is created, and a pseudo-default value is set. When saved, it is the **current** postion that becomes the default value just for the saved copy.

**10. Formants.** Number of Formants Used.

Values: `1 to 12, 3*`

**11. Fr.Sl.** Formant Slowness. Technically, this parameter prevents too-fast morphing between individual formants of adjacent vowels, but the user perception is that the vowels morph as a whole.

Values: `0 to 127, 64*`

**12. Vw.Cl.** Vowel "Clearness". Sets how much the vowels are kept "clear", that is, how much "mixed" vowels are avoided.

Values: `0 to 127, 64*`

**13. C.f.** Center Frequency. This slider changes the center frequency of the entire filter, in relative units.

Values: `0.09 to 10.00, 1.0*`

**14. Oct.** Number of Octaves. This slider controls the frequency range of the entire filter shifting and expanding / compressing each formant by a scaled amount.

Values: `0 to 10`

#### 8.6.6.2 Formant Vowel Parameters

**15. Vowel no.** Vowel Number. The number of the current vowel. Each number represents a different vowel, and leads to a gross change in the shape of the formant spectrum. The display only shows the formants of the currently seleved vowel, and the yellow line identifies which one is being managed. There is no overal view.

Values: `1 to 6`

**16. Formant.** Formant Number. The current formant to be emphasised or modified. The vertical marker in the graph moves as this value is changed.

Values: `1 to 12`

**17. freq.** Formant Frequency. The frequency of the current formant. This knob changes the frequency of the formant peak selected by the Formant Number control.

Values: `0 to 127`

**18. Q.** Formant Resonance, Formant Q. The Q (resonance depth or bandwidth) of the current formant. Used to sharpen or make the current formant sound dull.

Values: `0 to 127`

**19. amp.** Formant Amplitude. Controls the amplitude of the current formant. Initially, one will want to set this to the maximum value.

Values: `0 to 127`

#### 8.6.6.3 Formant Sequence Parameters

The sequence represents the order in which each vowel will sound when traversing the input from the filter envelopes and LFO's.

**20. Seq Size.** Sequence Size. The number of vowels in the sequence.

Values: `1 to 6`

**21. S.Pos.** Sequence Position. The current position of the sequence.

Values: `1 to 8`

**22. Vowel.** Vowel Position. The vowel used at the current position. One should keep in mind the same vowel can be used at several sequence postions!

Values: `1 to 6`

**23. Stretch.** How the sequence is stretched. This number gives the duration of the sequence relative to the pitch of the notes playing.

Values: `0 to 127`

**24. Neg Input.** Negative Input. If enabled, the input from the envelope or LFO control is reversed. The effect of this can be quite subtle.

Values: `off, on`

## 8.7 Clipboard Presets

In many of the settings panels, there are buttons labelled **C**, **P**.

**C** and **P** are the clipboard/preset copy and paste dialogs, respectively. These buttons allow cut-and-paste for shorter sections of the XML configuration.

The first thing to be aware of is that one will only ever see items of a type relevant to the section one is copy/pasting. Also, in the *clipboard* there can only be one of each type (so making a fresh copy will overwrite any previous one). However, the clipboard can hold many *different* types at once. Once held here an entry can be pasted multiple times in any section that has a matching type.

For example: one can copy an effect from system effects, then go to (say) part 4 effects and paste it there. Alternatively it is possible to copy the whole of AddSynth from part 1 then paste it to AddSynth in part 6 kit item 4.

However, one can't copy an amplitude envelope then paste it to a filter one as they are different types of envelopes.

The preset dialog also provides a way to save a preset to a preset file. The naming convention for a preset file is `presetname.presettype.xpz`, where *presetname* is the name one types into the **Copy to Preset** name field, *presettype* is the name that appears in the **Type** field, and *xpz* is the file-extension for compressed XML preset files.

The presets are stored in the current default preset directory, which is normally `~/.local/share/yoshimi/presets`.

Preset directories can be added to the list, and the default preset directory can be changed. See Section 6.4 "Menu / Paths" on page 72.

### 8.7.1 Clipboard/Preset Copy

Note that Figure 87 "Copy to Clipboard/Presets" on page 115 shows an example of the copying dialog for the clipboard and presets.

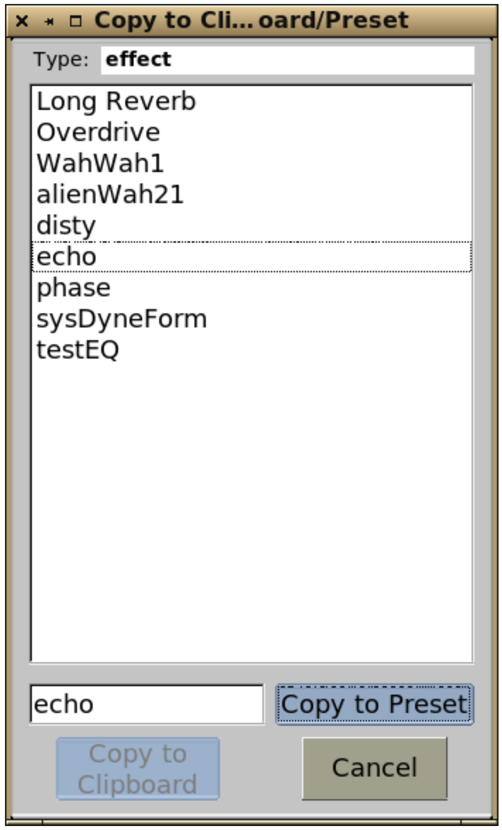



Figure 87: Copy to Clipboard/Presets

**1. Type.** Section type for copying. This field indicates the context (e.g "effect" - an effect envelope), also the name of the section from which the data will be copied. If the preset is saved/copied to a file, this field becomes the second part of the preset's file-name.

**2. Preset list.** Preset list. This item is actually a list of preset files available to be selected for this block of *Yoshimi* settings. Since *Yoshimi* V 1.6.0 the different preset root locations have been made selectable in a similar style as bank roots.

**3. Copy to Preset.** Copy to preset. Provides a way to specify the preset (and, indirectly, the preset file) to which this data should be copied.

To save to a preset, type the desired name of the setting. This entry will enable this button. When the button is pressed, the preset will be saved to the current preset directory. Be sure to set up a current preset directory where ordinary users have write permissions! A good choice for a preset directory is `~/.local/share/yoshimi/presets`. The file-name of the preset will be a non-hidden file such as

```
my_preset.Paddsyth.xpz
```

The middle part of this name is shown near the top of the preset dialog, as a cue. There is no way in *Yoshimi* to change this part of the file-name. And don't do it using file system commands! Modify the first part of the file-name to distinguish it from other versions of the preset. Only the type-name will ever be visible in the *Yoshimi* presets **Type** field.

There is also a legacy type for some engine presets, an example would be.

```
Crash.ADnoteparameters.xpz
```

But from *Yoshimi*V 1.6.0 while one can still load this, it would be saved as

`Crash.Paddsyth.xpz`

Note that *Yoshimi* ships with a number of non-hidden `.xpz` files.

**4. Copy to Clipboard.** Copies the section to the clipboard.

### 8.7.2 Clipboard/Preset Paste

Observe Figure 88 "Paste from Preset" on page 116. It shows an example of the pasting dialog for presets immediately prior to making the actual selection.

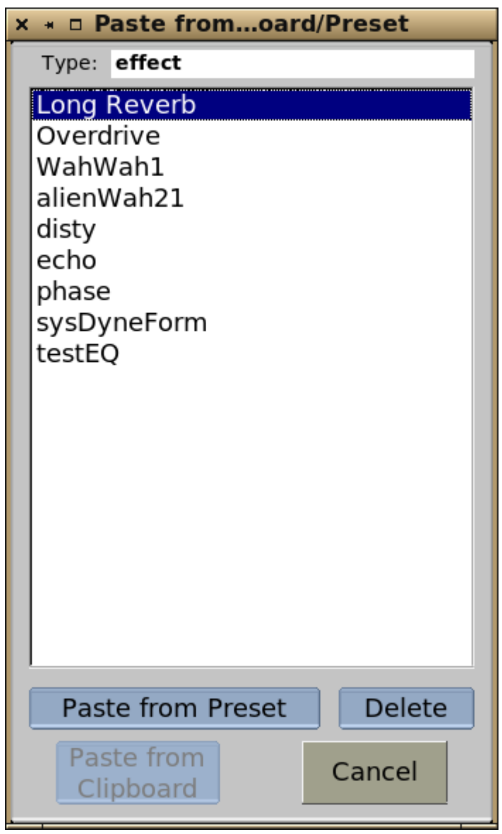



Figure 88: Paste from Preset

1. **Type**
2. **Preset list**
3. **Paste from Preset**
4. **Paste from Clipboard**

**1. Type.** Clipboard/Preset type for pasting. This field indicates the context (e.g "effect") or name of the section to which the data will be copied.

**2. Preset list.** Preset list.

**3. Paste from Preset.** Paste from preset. Provides a way to specify the preset from which this data should be copied. This remains deactivated until a selection has been made from the list.

**4. Paste from Clipboard.** Clipboard to section. Note, this is also shown deactivated but this is due to there being no data in the clipboard for this type.

This seems to reset the base function to a sine wave, converting the original waveform to sine waves of apropriate amplitude and phase angle at each harmonic position.

# 9 Top Panel

The *Yoshimi* top panel provides quick access to some major features of the application. The top panel is shown in Figure 3 "Yoshimi Main Screen" on page 24.

Here are the major elements of the top panel. There have been several new additions and a reorganisation of this section starting from *Yoshimi* V 2.2.0.

1. **Stop!**
2. **Reset**
3. **Stereo**
4. **Mixer Panel**
5. **Virtual Keyboard**
6. **Midi Learn**
7. **Vectors**
8. **Undo**
9. **Redo**
10. **Detune**
11. **Volume**
12. **Key Shift**
13. **F. BPM**

**1. Stop!.** Stop! This button causes *Yoshimi* to "Cease all sound immediately!" Useful when MIDI input suddenly stops resulting in 'stuck' notes, most likely due to a bug in the MIDI source .

**2. Reset.** Master Reset. Resets *Yoshimi* to its default state, when no default configuration files exist. If there is a saved default state and the **start with default** option is set, then a reset will reload that file. For any other situation it will set the first-time defaults.

If the Ctrl key is held down while doing a master reset, then MIDI Learn will also be cleared.

**3. Stereo.** Stereo Button. This toggles the main audio output between stereo and mono, but doesn't affect individual part ones. It is useful for checking balance between the two on the fly while playing. This is new from V 1.5.11.

**4. Mixer Panel.** This button brings up a panel that shows a "mixer" view of all of the parts that have been created in the current state of *Yoshimi*.

For the details of this panel, see Section 9.1 "Mixer Panel Window" on page 118.

**5. Virtual Keyboard.** This button brings up the virtual keyboard, which is a way to enter MIDI information without a real MIDI keyboard. It also provides a way to use the computer keyboard for faster playing. See Section 9.2 "Virtual Keyboard" on page 121.

**6. Midi Learn.** When pressed, the *Yoshimi* Midi Learn editing window is opened. This button used to be for opening the *Yoshimi* Reports window, but that is seldom changed so they've been swapped.

**7. Vectors.** Provides two or four part vector control. This was originally in the **Yoshimi** menu. See Section 18.2 "Vector Dialogs" on page 220.

**8. Undo.** Undo Button. This reverts the last control change made. More details are... This is new from V 2.2.0.

**9. Undo.** Redo Button. This re-applies control change that was most recently 'undone'. More details are... This is new from V 2.2.0.

**10. Detune.** Detune. Provides a global fine detune functionality. The fine detune mapping to the knob values shown below is -64 to 63 cents.

Values: `0 to 127, 64*` (float)

**11. Volume.** Volume, Master Volume. Controls the overall volume of all sounds generated by *Yoshimi*.

Values: `0 to 127, 90*`

**12. Key Shift.** Master Key Shift. This is the key-shift (transpose) that applies to all parts, in units of semitones. In recent versions of *Yoshimi*, this range has been extended. Also note that the master key shift can be set via the user-interface, the command-line, or by MIDI NRPN commands.

Values: `-36 to 36, 0*`

Also see the **Key Shift** item in Section 11 "Bottom Panel" on page 149 for more information.

**13. F. BPM.** Fallback BPM. Provides a synchronising MIDI clock for BPM controls if *Yoshimi* is not seeing an incoming one. This is new from V 2.2.0.

Values: `32 to 480, 120*`

## 9.1 Mixer Panel Window

The *Mixer Panel* button opens the "Mixer" window. The mixer provides a global view of the most important adjustable parameters of all of the defined parts. There are two views, a 2x8 view and a 1x16 view. See Figure 89 "Yoshimi Mixer Panel" on page 119, which shows the 1x16 view.

The Mixer Panel Window acts like a mixer and allows one to edit some important part parameters, such as Instrument choice, Volume, Panning, etc.
Also, since V 1.5.11 this window shows VU-meters for each part. To make a part the current part, left-click on its **Edit** button. To edit an instrument, right-click on the **Edit** button for that instrument.

When using the JACK audio backend, parts can be individually routed or sent to the main L/R outputs, either by themselves, or working with the main Left and Right outputs at the same time. This is controlled from the panel window, and the settings are saved with all the other parameters.

The individual *Direct Part* outputs will have the part effects, and any **Insertion** effects that are linked to them, but not the **System** effects.

*Yoshimi* used to register all parts with JACK by default, but that is a bit much now that 64 parts are available, so now *Yoshimi* uses an "on demand" model.

In the mixer panel window one will see a field just above the **Edit** button. This field determines the audio destination on a part-by-part basis, defaulting to just the main L+R pair. The direct part outputs are only exposed on parts that are active, and have the destination set to either **part** or **both**. Once activated, they will remain in place for the entire session, even if the part is later disabled or routed to main only. This is so that other programs won't see links suddenly disappear, although they will become silent. This setting is preserved in Yoshimi's patch sets and will be re-instated when next loaded.

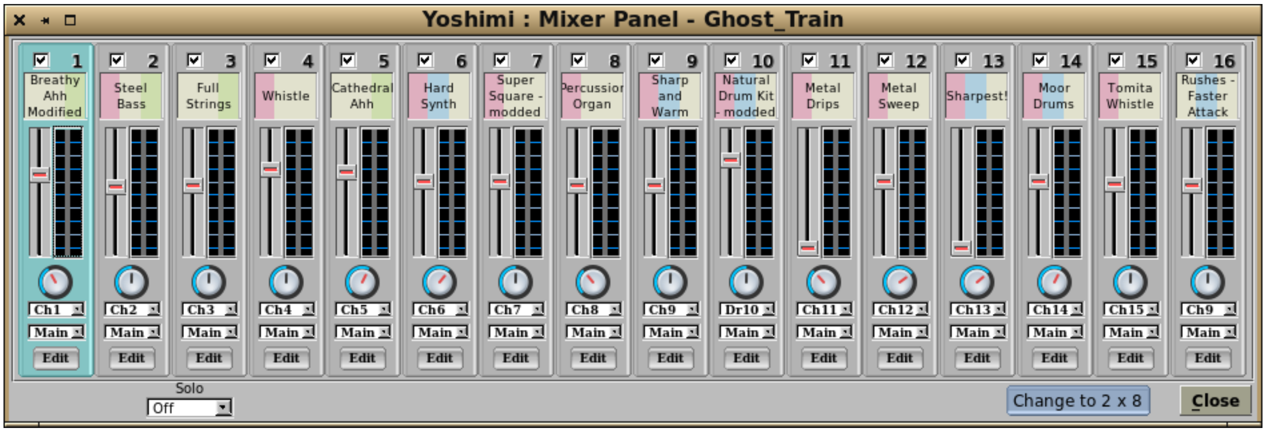



Figure 89: Yoshimi Mixer Panel, 1x16 View

Note that there is also a 2x8 version of this dialog (not shown). This dialog has been further updated; as well as the **Solo** control, (described below) it now presents separate left and right VU meter bars.

**1. Part Summary.** Parts View or Summary.

**2. Enable part.** Enable/Disable the part. The check-box enables/disables the part. When the part is disabled, its controls are greyed out.

Values: `Off*, On`

**3. Part name.** Instrument name. Click on this box to change the instrument (it will open up the current **Bank** window if it wasn't already open.

**4. Volume Slider.** Volume Bar. Changes the volume of the part.

**5. VU-meter display.** Shows the level of the part when playing.

**6. Panning Knob.** Panning Dial-Button. Changes the panning of the part.

Values: `0 (left) to 64* (center) to 127 (right)`

**7. Channel.** Receive from MIDI channel. Changes the MIDI channel assigned to the part.

Values: `Ch1*, Ch2, ..., Ch16`

**8. Main.** Set Audio Destination. Sets the audio for this part to be routed to the main audio output, to the audio specified by the part setup, or to both outputs. This option requires that *Yoshimi* use JACK audio. If running ALSA, this option is disabled (greyed out). The part's audio destination (JACK) is saved with the patch sets, and so is the number of available parts.

Values: `Main, Part, or Both`

**9. Edit.** The Edit button provides two functions.

- Left mouse button: Makes this the currently selected part.
- Right mouse button: As above, but also opens the part edit window.

This setup is a bit unintuitive, but the tooltips make it clear which click one might want to use.

**10. Solo.** There are several basic commands that change the way *Yoshimi* responds to incoming MIDI, so that only one of a group of instruments will see note-on events, but all of the group will see note-off ones. These commands are in the **Mixer Panel**, as shown below.


Figure 90: Yoshimi Mixer Panel, Solo

They are referred as a *Solo* feature. The **Solo** settings are saved in patch sets, which saves a little frustration when loading one's current favourite patch set.

Since *Yoshimi* V 1.7.1 a new mode of operation has been available, so the complete list is:

Values: `Off*, Row, Column, Loop, TwoWay, Channel`

For these modes, if one has a programmable MIDI controller, one can set it up to activate a specific part, or to increment/decrement which part in the set is active. The **Solo** drop-down list enables the feature for one of these mode, and also makes the CC spin-box visible. One uses this spin-box to set which incoming CC changes the part that gets new notes. The *value* this CC sends performs the actual change, instantly and silently. Most importantly it leaves any existing notes sounding, though a note off will release them and set the effects tail.

**Row** means that all of the first 16 channels will be set to channel 1, but with only one active, and one's CC will dial up any of the parts, disabling the others. In **Row** mode the whole of the first 16 parts are ostensibly receiving on channel 1. This mode is most useful if one wants to play live through a piece with multiple instrument changes while playing. It works best with a foot switch that internally stores a channel number and increments/decrements it with every press, then sends it.

Although this uses all of the first 16 parts, one can set the number of parts to 32, so that one can use the 17+ row for normal 1 through 16 channels. Also, if one has **vector control** set up, **Solo** intelligently recognises this fact, and, for each vector it finds, it will switch in/out the whole vector column appropriately.

For running **Solo** in **Column** mode, one needs to have 32 or (preferably) 64 parts set; with this setup, one can have up to 4 parts switched per channel, and independently of each other. However, this works more like vector control in that switching has to be in groups of 16. For example, to control the channel 4 column one would send 4, 20, 36, 52 to select the wanted part. This usage is more appropriate for post recording MIDI automation.

For both of these modes, if one has a programmable MIDI controller, one can set it up to activate a specific part, or the increment/decrement which part in the set is active.

Note that **Row and Column** are recommended only for automation.

**Loop**. Loop mode is a variation on the Row mode. With this mode, if one sends *any* value (except zero) via the designated CC, it will increment the active part by one, rolling round to 1 after 16. This should make even the dumbest foot controller usable.

To keep it all lightweight, one needs to load and activate all the patches and parts wanted, but that could be obtained from a saved patch set, and the channels are only changed from the very first time one sends the CC. To look really clever, the whole lot can be embedded in a MIDI file.

One can play a piece that needs to live-switch between 10 instruments, using a footswitch to do the channel changes. The device holds a channel number (starting with zero) and increments/decrements it depending on which switch is pressed, then sends the resulting CC.

At the *2017 Linux Audio Conference*, it became obvious there was a possible problem with the **Loop** feature. This issue arose from the 'bounce' of a cheap footswitch that would then send two changes instead of one. It is now resolved by adding a debounce timer of about 60ms so that a second pulse inside that time will be ignored.

**TwoWay**. A further development suggested at that time has now also been implemented. This is the addition of a **TwoWay** option. This option works in a similar way to **Loop**, but a value between 1 and 63 will step down instead of up, so that if one does make a mistake it can quickly be rectified.

With a reasonable MIDI controller one can usually set a couple of foot switches to report the same CC but with different values. Alternatively stick to their native values and pass them through something like *QmidiRoute* to do the translation.

**Channel**. This new mode of operation will block new notes sent to all parts that are not on the same MIDI channel as the one sending the CC if the value sent on the designated CC is greater than 63. Note Off messages will still be seen. If the CC value is less than 64, these other parts will be re-enabled again.

If the same CC is sent on a different channel, then the new one will cancel the old one and become the soloed one. It follows on that any channel can cancel the feature.

**11. Parts Layout.** Changes the layout of the panel to the other layout, either **Change to 2 x 8** or **Change to 1 x 16**.

**12. Close.** Close the window.

## 9.2 Virtual Keyboard

This section describes the detailed usage of the *Yoshimi* virtual keyboard. The virtual keyboard lets one play notes using the keyboard/mouse. There is no MIDI requirement.

Using the computer keyboard: The keyboard is split into three octaves. It may happen that the keys will not trigger a note-on; this happens when another widget has the keyboard focus. To play using the computer keyboard, click on the virtual keyboard.

Using the mouse: One can use the mouse to play. If one presses the Shift key while pressing the mouse button, the keys will not be released when the mouse button is released. If one presses the **Stop!** or "panic" button from the *Yoshimi* main window, all keys are released.

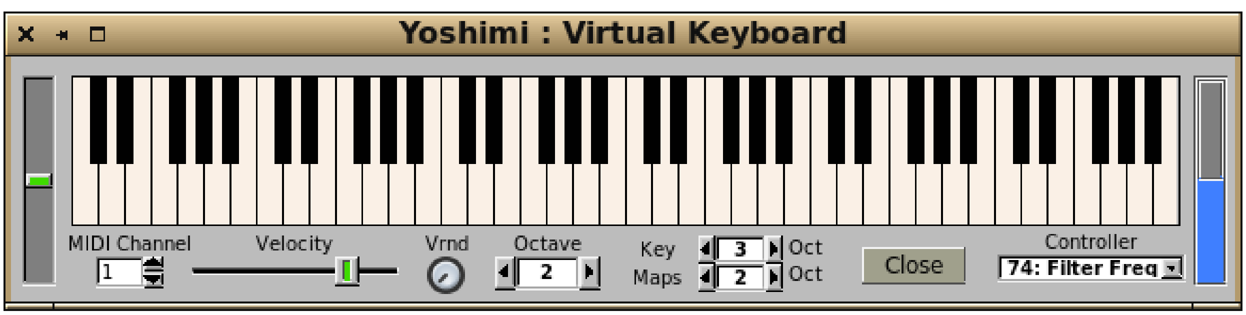



Figure 91: Yoshimi Virtual Keyboard

### 9.2.1 Virtual Keyboard, Basics

1. **Pwh**
2. **Midi Channel**
3. **Velocity**
4. **Velocity**
5. **Octave**
6. **Key Oct**

7. **Maps Oct**
8. **Controller**
9. **Cval**
10. **Close**

**1. Pwh.** Pitch bend knob. Pitch wheel. This item is now a slider control. To reset it to the middle position, right-click within the slider. **2. Midi Channel.** MIDI Channel. Sets the MIDI channel for the virtual keyboard.

Values: `1* to 16`

**3. Velocity.** Velocity of Notes. Sets the note-on velocity for the virtual keyboard.

Values: `1 to 127, 100*`

**4. Velocity.** Velocity Randomness.

Values: `0* to 127`

**5. Octave.** Transposes all of the virtual keyboard notes by the given number of octaves.

Values: `1, 2*, 3, 4, 5`

**6. Key Oct.** Transposes the upper keys (the numbers and the "qwert" keys); the range of these keys is from C-4 to A-5 (replace the '5' with the octave). Look at the tooltips as a reminder.

Values: `1, 2*, 3, 4, 5`

**7. Maps Oct.** Transposes the lower keys ("sdghj" and "zxcvb"); the range of these keys is from C-3 to E-4 (replace the '4' with the octave). Look at the tooltips as a reminder.

Values: `1, 2*, 3, 4, 5`

**8. Controller.** Keyboard Controller.

Values:
`01:Mod.Wheel, 07:Volume, 10:Panning, 11:Expression, 64:Sustain, 65:Portamento, 71:Filter Q, 74:Filter Freq*, 75:Bandwidth, 76:FM Gain, 77:Res.c.freq, 78:Res.bw.`

Sets the controller to be changed according to the **Cval** controller. See Section 9.2.3 "Virtual Keyboard, Controllers" on page 123.

**9. Cval.** Controller value. Changes the controller value. This item is a combination value-bar and slider that one can move up and down with the mouse, to change the controller value. The numeric value is indicated with a dynamic tooltip. Note that the value might not reflect the internal value of the controller when one changes the controller.

Values: `1 to 127, 96*`

**10. Close.** Close button.

### 9.2.2 Virtual Keyboard, ASCII Mapping

In addition to this virtual keyboard, the QWERTY (or Dvorak, or AZERTY) keyboards can be used to produce notes. The computer keyboard layout is shown in Figure 23 "QWERTY Virtual Keyboard Layout" on page 46, The "white" keys are the light shade, and the "black" keys are the darker shade. The range of the keys on the "zxcvb..." row is C3 to E4. The range of the keys on the "qwert..." row is C4 to A5. These octave ranges can be adjusted. The computer keyboard will produce notes only when the virtual keyboard has focus.

### 9.2.3 Virtual Keyboard, Controllers

This section gives a brief overview of the controller's that this window supports.

1. **01: Mod. Wheel**
2. **07: Volume**
3. **10: Panning**
4. **11: Expression**
5. **64: Sustain**
6. **65: Portamento**
7. **71: Filter Q**
8. **74: Filter Freq.**
9. **75: Bandwidth**
10. **76: FM Gain**
11. **77: Res. c. freq**
12. **78: Res. bw.**

The following figure shows the corresponding drop-down list of controller values, each preceded by its MIDI control number, re 1.

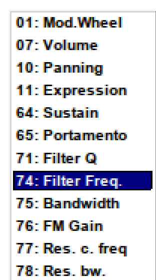



Figure 92: Virtual Keyboard Controllers

**1. Mod. Wheel.** Sets the MIDI modulation value. This control will only have an effect on certain instruments. (It has no effect on the "Simple Sound", for example).

**2. Volume.** Controls the overall volume of the instrument being played by the virtual keyboard.

**3. Panning.** Controls the left-right location of the sounds played by the virtual keyboard.

**4. Expression.** Controls the expression. This probably can have different effects depending on the instrument. For example, with the "Simple Sound", this control is a lot like volume.

**5. Sustain.** Controls the sustain duration. This works even with the "Simple Sound". Using it makes even this virtual keyboard capable of some "virtuoso" expression.

**6. Portamento.** Controls the time of transition from one pitch to another. Using it makes even this virtual keyboard capable of some "virtuoso" expression.

**7. Filter Q.** Controls the sharpness of the filters used in an instrument. Generally requires a complex instrument to take effect. For example, try this control with the "Weird Pad" instrument in the "Fantasy" bank.

**8. Filter Freq.** Controls the center frequency of the filters used in an instrument. Generally requires a complex instrument to take effect. For example, try this control with the "Weird Pad" instrument in the "Fantasy" bank.

**9. Bandwidth.** Controls the frequency bandwidth of the filters used in an instrument.

**10. FM Gain.** TODO. Haven't found a sound that exercises this control. Haven't looked all that hard yet.

**11. Res. c. freq.** Resonance Center Frequency. Applies only if the part has resonance set up.

**12. Res. bw.** Resonance Bandwidth. Applies only if the part has resonance set up.

# 10 Effects

The *Yoshimi* **Effects** panel provides a number of special effects that can be applied to parts. Effects are, generally, black boxes that transform audio signals in a specified way. More exactly, the only input data for an effect in *Yoshimi* is an array of samples. The output is the transformed array of samples.

As described, effects have no information about anything else. For example, key presses are not recognised. Therefore, pressing a key does not initiate the LFO. Phase knobs will always be relative to a global LFO, dependent only on the system time.

*Wetness* determines the mix of the results of the effect and its input. This mix is made at the effects output. If an effect is wet, it means that nothing of the input signal is bypassing the effect. If it is dry, then the effect has no effect.

*Interpolation* means that, if one MIDI-learns the controls, one can now automate them smoothly instead of the somewhat gritty previous behaviour. This does not change processor demand when running at 64 frames, a short number of frames. This interpolation is especially effective on "saw" sounds with the frequency control on the EQ low pass filter.

The **Effects** panel is shown in Figure 3 "Yoshimi Main Screen" on page 24. Note that these effects have been incorporated into a separate guitar-effects project called *Rakkarrak* [13].

There are two types of effects: System effects and Insertion effects. Insertion effects have a sub-type for part effects. The effects themselves behave in the same way but with slightly different 'outer' controls.

The System effects apply to all parts and allows one to set the amount of effect that applies to each part. Also, it is possible to send the output of one system effect to another system effect. In the user interface this is shown as "source -<destination". For example: The **0 -<1** knob controls how much of the system effect 0 is sent to system effect 1.

Insertion effects are described in Section 10.1.2 "Effects / Panel Types / Insertion" on page 129.

## 10.1 Effects / Panel Types

There are three variations of Effects sub-panels:

- **System Effects**.
- **Insertion Effects**.
- **Part/Instrument Effects**.

Here are the major elements of the main effects panel, which shows the System and Insertion effects tabs.

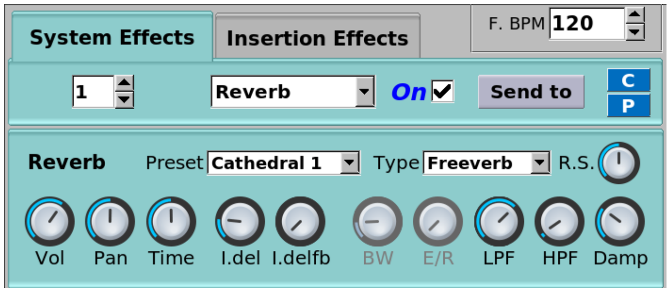



Figure 93: System Effects Dialog

1. **System Effects Tab**
2. **Effect Number**
3. **Effect Name**
4. **On**
5. **Send to**
6. **C**
7. **P**
8. **Effects Panel**
9. **Insertion Effects Tab**

**1. System Effects Tab.** System Effects Tab. The items in this tab are described in the next few paragraphs.

**2. Effect Number.** Effect Number. Up to 8 effects can be supported at one time by one part.

**3. Effect Name.** Effect Name.

Values: `No Effect*, Reverb, Echo, Chorus, Phaser, AlienWah, Distortion, EQ, DynFilter`


Figure 94: Effects Names

**4. Effect On.** Effect enable checkbox. Used to temporarily disable a particular system effect without altering the settings. New in *Yoshimi* V1.6.0

Values: `On*, Off`

**5. Send to.** Effects Send To. Each knob controls how much of the system effect indicated by the left number is sent to the system effect indicated by the right number.

Values: `Next Effect, Part Out, Dry Out`

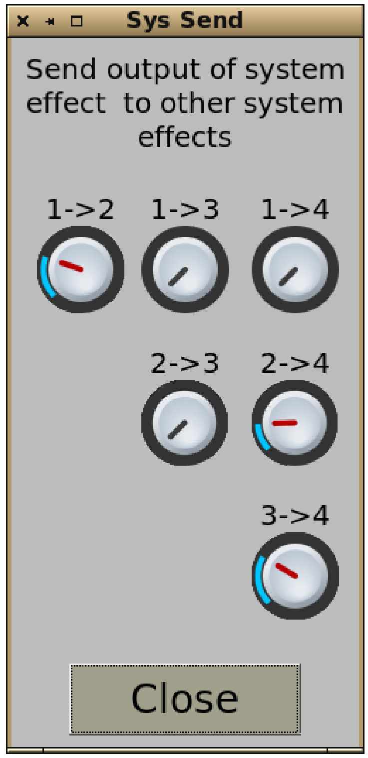



Figure 95: Effects, Send To

**6. C.** Copy-to-clipboard Dialog.

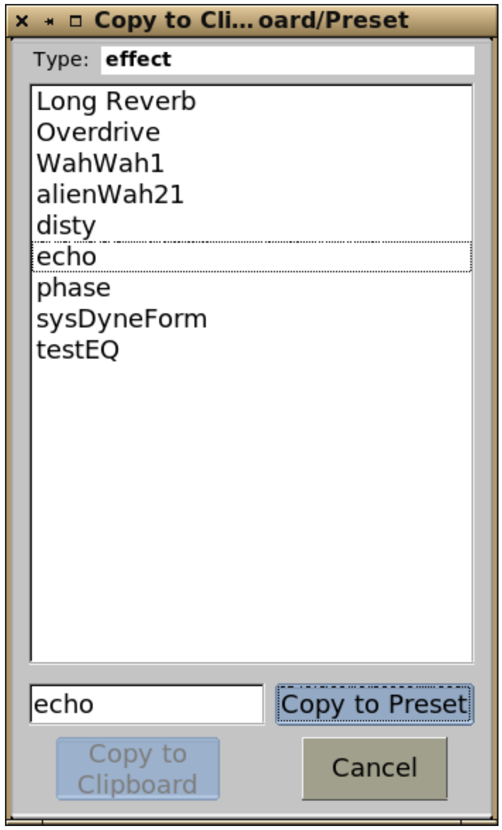



Figure 96: Effects / Copy To Clipboard

**7. P.** Paste-from-clipboard Dialog.

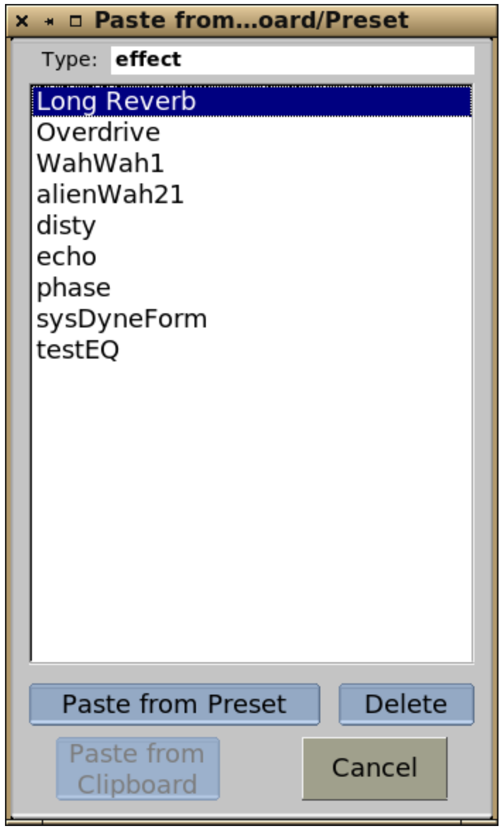



Figure 97: Effects / Paste From Clipboard

**8. Effects Panel.** Effects Panel. This area is filled by the controls for the selected effect.

**9. Insertion Effects Tab.** Insertion Effects Tab. The items in this tab are described below, in the 10.1.2 sub-section.

The next sub-sections show the variations on the effects panels.

### 10.1.1 Effects / Panel Types / System

The first variation appears when one enables an effect in the **System Effects** panel of the main *Yoshimi* dialog. It contains the standard controls for the given effect, plus the following interface items (as previously described).

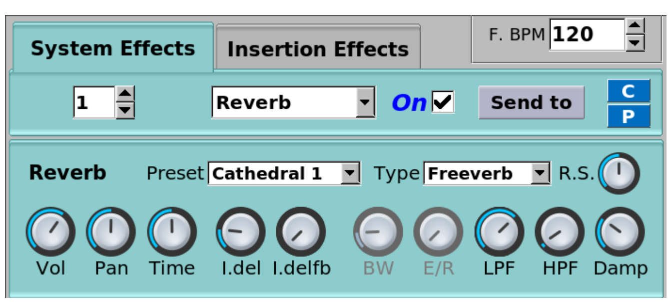



Figure 98: Sample System Effects Dialog

1. **Effect number**
2. **Effect name**
3. **On**
4. **Send To**
5. **C**
6. **P**

### 10.1.2 Effects / Panel Types / Insertion

The second effects variation appears when one enables an effect in the **Insertion Effects** panel of the main *Yoshimi* dialog. It contains the same standard controls for the given effect, but with a different header containing the following interface items.

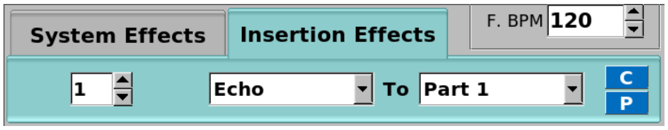



Figure 99: Insertion Effects Dialog

1. **Effect number**
2. **Effect selection**
3. **To**
4. **C**
5. **P**

The insertion effects apply to one part or to the master output. One may use more than one insertion effect for one part or the master output. If using more than one effect, the effects with smaller indexes will be applied first (first, insertion effect 1 occurs, then effect 2, and so on).

**1. To.** Send the Effect To.

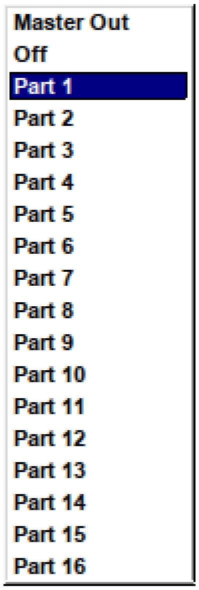



Figure 100: Part Selection Dropdown

The first option sends the effect to the main L/R outputs rather than just one part. Note that if *Yoshimi* is set for 32 or 64 parts, the dropdown list will be extended to include them.

### 10.1.3 Effects / Panel Types / Instrument

There is also a "part" or "instrument" effects window which is accessed by going to the main window, clicking the **Edit** button in the bottom panel to open the edit dialog, and then clicking the **Effects** button there. The part effects window has the same layout as System and Insertion effects; it is now almost identical to Insertion effects.

It contains the standard controls for the given effect, plus the following interface items.

1. **Effect number**
2. **Effect selection**
3. **To** (part-selection-dropdown.png)
4. **C**
5. **P**
6. **Bypass**
7. **Close**

"To" Values: `Next Effect*` , `Part Out`, `Dry Out`

The default is to pass each effect (combined with the incoming signal) on to the next, forming a daisy chain of effects.
If it is set to Part Out, it breaks the chain and blocks any higher numbered effects.
If it is set to Dry Out, it sends the incoming signal component directly where part effects are added together, so it won't be passed on to later effects. However, the output of the effect itself *is* passed on to later ones. Consequently, if this effect is bypassed it also effectively bypasses all later ones.


Figure 101: Sample Instrument Effects Dialog

Note the extra **Bypass** check-box. If the **Bypass** item is checked, then the effect is not used; it is taken out of the circuit. This user-interface item only appears if one clicks the **Edit** button for a Part, and then clicks the **Effects** button in the **Edit** window.

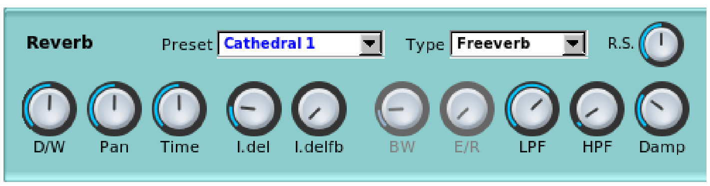
Also be aware that the layout of some of the effects dialogs have been modified in the latest revisions of *Yoshimi*. This dialog form is reversed (top and bottom) compared with very old *Yoshimi* versions, and slightly simplified in appearance. This was done to more closely match the layout of the System and Insertion Effects. Also, in the actual effects, some control positions and sizes have been changed to improve readability.

From here on we only show the effects inserts themselves, as they are identical across Part, Insertion, and System. The only difference being **D/W** becoming **Vol** in System effects. Also, note that EQ has a **Gain** control instead of **Vol**

All effects (apart from EQ) also have a panning control, which behaves in the same way as everywhere else, permitting the effect to appear to have an off-center position.

## 10.2 Effects / Upgrade

Since V 1.5.11 there is an indication that effect controls have been altered. As can be seen, the normal black text of the preset selector becomes a strong blue. This colour change will also apply to any effects that have been saved.




This change will take place if one alters any of the controls after a preset has been selected. The rationale here is that one can make such changes, then save the Instrument/Patchset that this effect is in. When re-loading, one would be quite likely to forget that changes have been made and experimentally switch to different presets or even different effects. Previously, at this point those changes have been lost and one might be puzzled that the sound has changed (possibly quite subtly) when returning to the same preset.

With the new upgrade one is warned about this. It even applies when loading very old Instruments and Patchsets as the effects are checked against the known defaults as they are installed.

## 10.3 Effects / None


Figure 102: Effects Edit, No Effect

## 10.4 Effects / DynFilter

A dynamic filter is, as the name says, a filter which changes its parameters dynamically, dependent on the input and current time. In *Yoshimi*, frequency is the only variable parameter. It can be used as an "envelope following filter" (sometimes referenced "Auto Wah" or simply "envelope filter").

#### 10.4.1 Effects / DynFilter / Circuit

Though this filter might look a bit complicated, it is actually easy. We divide the parameters into two classes:

- Filter Parameters are the ones obtained when one clicks on Filter. They give the filter its basic settings.
- Effect Parameters are the other ones that control how the filter changes.

The filter basically works like this: The input signal is passed through a filter which dynamically changes its frequency. The frequency is an additive of:

- The filter's base frequency.
- An LFO from the effect parameters.
- The "amplitude" of the input wave.

The amplitude of the input wave is not the current amplitude, but the so called "Root Mean Square (RMS)" value. This means that we build a mean on the current amplitude and the past values. How much the new amplitude takes influence is determined by the Amplitude Smoothness (see below).

RMS value plays an important role in the term *loudness*. A fully distorted signal can sound 20dB louder due to its higher RMS value. This filter takes this into account, depending on the smoothness.

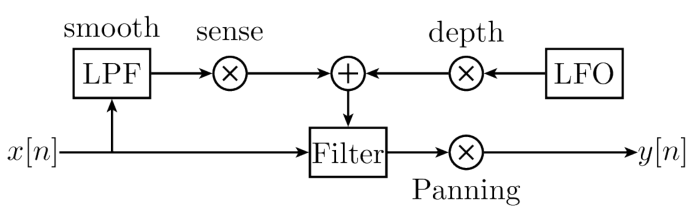



Figure 103: Dynamic Filter Circuit Diagram

#### 10.4.2 Effects / DynFilter / User Interface


Figure 104: Effects Edit, DynFilter

This figure shows the Part/Instrument variation of the DynFilter sub-panel. The System/Insertion variation has the following elements.

1. **Preset**
2. **Filter**
3. **Vol** (system/insertion) or **D/W** (part/instrument)
4. **Pan**

5. **Freq**
6. **Rnd**
7. **BPM**
8. **LFO Type**
9. **St.df**
10. **LfoD**
11. **A.S.**
12. **A.M.**
13. **Inv.**

The five controls in the middle of the middle panel (**Freq**, **Rnd**, **BPM**, **LFO Type**, and **St.df**) control the LFO.

BPM is new from *Yoshimi* V 2.1.0 and locks the frequency control to the incoming MIDI clock. See Section 8.5.8 "BPM and Frequency" on page 104 for further details.

**NOTE:**
One should be aware that DynFilter sets its own (quite different) default values for almost all the actual filter controls. For VocalMorph1 and VocalMorph2 this includes the formant elements themselves:
Per vowel, Per formant! This became more obvious with the default indication provided since V 2.3.0

Let's start with the user-interface elements present in the System/Insertion variation of this effect.

**1. Preset.** DynFilter Preset.


Figure 105: DynFilter Presets

Values: `WahWah, AutoWah, Sweep, VocalMorph1, VocalMorph2`

**2. Filter.** DynFilter Filter.

This small button brings up Filter Params stock sub-panel item. This stock user-interface item is shown and described in Section 8.3.5 "Filter Parameters User Interface" on page 93.

**3. Vol.** DynFilter Volume.

Values: *0 to 127*

If the effect is used as a System effect, then this control appears.

**4. D/W.** DynFilter Dry/Wet Mix Setting.

Values: *0 to 127*

If the effect is used as an Insertion effect, then this control appears. "Dry" means the unprocessed signal and "wet" means the processed signal.

**5. Pan.** DynFilter Panning.

Values: *0 to 127*

After the input signal has passed through the filter, Pan can apply panning.

**6. Freq.** DynFilter LFO Frequency.

Values: *0 to 127*

**7. Rnd.** DynFilter LFO Randomness.

Values: *0 to 127*

**8. LFO Type.** DynFilter LFO Type.

**9. St.df.** DynFilter LFO. Left/right channel phase shift.

**10. LfoD.** DynFilter LFO Depth. This control is one that helps define the mix of the LFO and the amplitude.

**11. A.S.** DynFilter A.S. This control is one that helps define the mix of the LFO and the amplitude. A.S sets the Amplitude Sensing (i.e. how much influence the amplitude shall have).

**12. A.M.** DynFilter A.M. Changes the rate at which the amplitude changes the filter. The higher one sets this value, the more slowly will the filter react.

**13. Inv..** DynFilter A.Inv. If set, negates the (absolute) RMS value. This will lower the filter frequency instead of increasing it. Note that this will not have much effect if the effects input is not very loud.

### 10.4.3 Effects / DynFilter / NRPN Values

Effects can be controlled via "non-registered parameter numbers", or NRPNs. This section will eventually (we hope) detail the NRPN values supported by the DynFilter effect.

For more information on the concept of NRPNs, see Section 24.5.3 "Concepts / MIDI / NRPN" on page 290.

## 10.5 Effects / AlienWah

AlienWah is a nice effect done by Paul Nasca. It resembles a vocal morpher or wahwah a bit, but it is more strange. That's why he called it "AlienWah" The effect is a feedback delay with complex numbers.

The AlienWah effect is a special, dynamic formant filter. Paul Nasca named it AlienWah because it sounded "a bit like wahwah, but more strange". The result of the filter is a sound varying between the vocals "Ahhhhh" (or "Uhhhhh") and "Eeeeee".

### 10.5.1 Effects / AlienWah / Circuit

No diagram, just a description of AlienWah.

Hint: Keep in mind that Effects that can be controlled by LFO can also be controlled arbitrarily: Set the LFO depth to zero and manipulate the phase knob (e.g. with NRPNs or maybe via OSC in the future).

The way that the filter moves between the two vocals is mainly described by an LFO. Paul Nasca has stated the - slightly simplified - formula (for i2 = -1 and R <1) as:

$$fb = R * (cos(a) + i * sin(a))$$

$$yn = yn - delay * R * (cos(a) + i * sin(a)) + xn * (1 - R).$$

The input xn has the real part of the samples from the wavefile and the imaginary part is zero. The output of this effect is the real part of `yn`. `a` is the phase.

### 10.5.2 Effects / AlienWah / User Interface

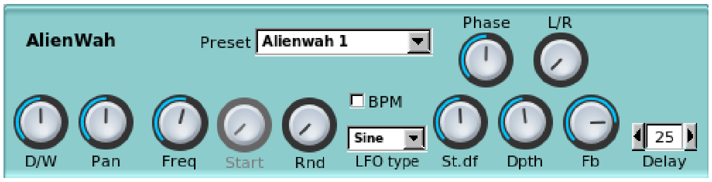



Figure 106: Effects Edit, AlienWah

1. **Preset**
2. **Phase**
3. **Vol** or **D/W**
4. **Pan**
5. **Freq**
6. **Rnd**
7. **BPM**
8. **LFO type**
9. **St.df.**
10. **Dpth**
11. **Fb.**
12. **Delay**
13. **L/R**

**1. Preset.** AlienWah Preset.

Values: `AlienWah 1, AlienWah 2, AlienWah 3, AlienWah 4`

**2. Phase.** The phase of the AlienWah. See `a` in the above formula. This lets one set where the vocal is between "Ahhhhh" and "Eeeeee".

**3. Vol.** AlienWah Volume.

Values: `0 to 127`

The volume control is present in this effect when used as a System effect.

**4. D/W.** AlienWah Dry/Wet.

Values: `0 to 127`

The **Vol** control is replaced by this control if the effect is used as an Insertion effect.

**5. Freq.** LFO Frequency.

Values: `0 to 127`

Determines the LFO's frequency in relative units.

**6. Rnd.** LFO Amplitude Randomness.

Values: `0 to 127`

Part of the LFO definition.

**7. BPM.** Locks the frequency control to the incoming MIDI clock. New from *Yoshimi* V 2.1.0 See Section 8.5.8 "BPM and Frequency" on page 104 for further details.

**8. LFO type.** Set the LFO shape.

Values: `SINE, TRI`

Part of the LFO definition. Note that the LFO in other contexts has ramps and exponential shapes that are not present here.

**9. St.df.** AlienWah Left/Right Channel Phase Difference.

Values: `0 to 127`

Part of the LFO definition. Sets the phase difference between LFO for left/right channels. **St.df** lets one determine how much left and right LFO are phase shifted. 64.0 means stereo, higher values increase the right LFO relatively to the left one.

**10. Dpth.** LFO depth.

Values: `0 to 127`

**Dpth** is a multiplier to the LFO. Thus, it determines the LFO's amplitude and its influence.

**11. Delay.** Amount of delay before the feedback.

Values: `1 to 100`

If this value is low, the sound becomes more of a "wah-wah" effect.

**12. Fb.** AlienWah Feedback.

Values: `0 to 127`

TODO: What is the effect of the AlienWah feedback setting?

**13. L/R.** Determines how the left/right channels are routed to output:

- *Leftmost/0*. Left to left and right to right.
- *Middle/64*. Left+right to mono.
- *Rightmost/127*. Left to right, and right to left.

L/R applies crossover at the end of every stage. This is currently not implemented for the Analog Phaser.

**14. Subtract.** The output is inverted

### 10.5.3 Effects / AlienWah / NRPN Values

Effects can be controlled via "non-registered parameter numbers", or NRPNs. This section details the value supported by the AlienWah effect.

## 10.6 Effects / Chorus

In a chorus, many people sing together. Even if each of them sings at exactly the same frequency, all their voices usually sound different. We say they have a different timbre. Timbre is the way we perceive sound and enables us to tell the difference between various music instruments. This is, physically, achieved by varying both the amplitude envelope and the frequency spectrum. Multiple sounds with slightly different timbres make a sound more shimmering, or powerful. This is called the chorus effect.

The chorus effect can be achieved by multiple people singing together. In a concert, there are many instruments, resulting in the same effect. When making electronic music, we only have an input wave and need to generate these different timbres ourselves. *Yoshimi* therefore simply plays the sound, pitch modulated by an LFO, and adds this to the original sound. This explains the diagram below: The multiple pitches are generated by a delayed version of the input. This version is being pitched by an LFO. More detailed, this pitch is generated by varying the reading speed of the delayed sound; the variation amount is controlled by an LFO.

Related effects to Chorus are Flangers. Flangers can be described as Chorus with very short LFO delay and little LFO depth. One can imagine a flanger as two copies of a sound playing at almost the same time. This leads to interference, which can be clearly heard. It is popular to apply flangers to guitars, giving them more "character".

### 10.6.1 Effects / Chorus / Circuit

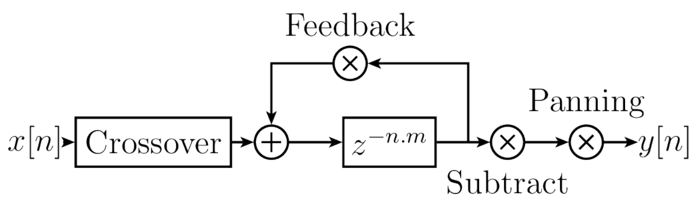



Figure 107: Chorus Circuit Diagram

First, crossover is applied. The **Freq**, **Rnd**, **LFO Type**, **St.df**, **Depth** knobs control the LFO for the pitch. If the depth is set to zero, the pitch will not be changed at all.

Delay is the time that the delayed sound is delayed "on average". Note that the delay also depends on the current pitch.

After the correct element of the sound buffer is found using the LFO, the Fb knob lets one set how loud it shall be played. This is mostly redundant to the D/W knob, but we have not applied panning and subtraction yet.

Next, the signal can be negated. If the **Subtract** checkbox is activated, the amplitude is multiplied by -1.

Finally, **Pan** lets one apply panning.

### 10.6.2 Effects / Chorus / User Interface

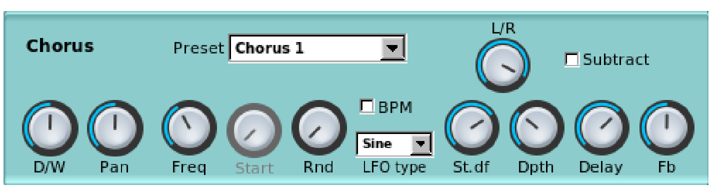



Figure 108: Effects Edit, Chorus

1. **Vol** or **D/W**
2. **Pan**
3. **Freq**
4. **Rnd**

5. **BPM**
6. **LFO type**
7. **St.df.**
8. **Dpth**
9. **Delay**
10. **Fb.**
11. **L/R**
12. **Subtract**

**1. Freq.** Chorus LFO Frequency.

**2. Rnd.** Chorus LFO randomness.

**3. LFO type.** Set the LFO shape.

**4. BPM.** Locks the frequency control to the incoming MIDI clock. New from *Yoshimi* V 2.1.0 See Section 8.5.8 "BPM and Frequency" on page 104 for further details.

**5. St.df.** The phase difference between LFO for left/right channels .

**6. Dpth.** Chorus LFO depth.

**7. Delay.** Delay of the chorus. If one uses low delays and LFO depths, this will result in a flanger effect.

**8. Fb.** Chorus Feedback.

**9. L/R.** How the left/right channels are routed to output:

1. leftmost. Left to left and right to right.
2. middle. Left+right to mono.
3. rightmost. Left to right, and right to left.

**10. Subtract.** The Chorus output is inverted

### 10.6.3 Effects / Chorus / NRPN Values

Effects can be controlled via "non-registered parameter numbers", or NRPNs. This section details the value supported by the Chorus effect.

## 10.7 Effects / Distortion

Distortion means, in general, altering a signal. Natural instruments usually produce sine-like waves. A wave is transformed in an unnatural way when distortion is used. The most distorted waves are usually pulse waves. It is typical for distortion to add overtones to a sound. Distortion often increases the power and the loudness of a signal, while the dB level is not increased. This is an important topic in the Loudness War.

As distortion increases loudness, distorted music can cause ear damage at lower volume levels. Thus, one might want to use it carefully. Distortion can happen in many situations when working with audio. Often, this is not wanted. In classical music, for example, distortion does not occur naturally. However, distortion can also be a wanted effect. It is typical for Rock guitars, but also present in electronic music, mostly in Dubstep and DrumNBass.

The basic components of distortion are mainly

- A preamplifier.

- The waveshaping function.
- Filters.

Preamplification changes the volume before the wave is shaped, and is indeed the amount of distortion. For example, if one clips a signal, the louder the input gets, the more distortion one will get. This can have different meanings for different types of distortions, as described below.

The filters are practical. A reason for using them afterwards is that distortion can lead to waves with undesired high frequency parts. Those can be filtered out using the LPF. A reason for using filters before applying is to achieve multiband distortion.

The topic of types of distortion is discussed in the Oscillator Section.

Note that one can use the Oscillator editor in order to find out what the distortion effect does. Also note that while the Oscillator editor's distortion is limited to some oscillators one can produce in the Oscillator editor, the distortion effect can be used on every wave that one can generate with *Yoshimi*.

### 10.7.1 Effects / Distortion / Circuit

We explain the functionality in a diagram and list the components below.

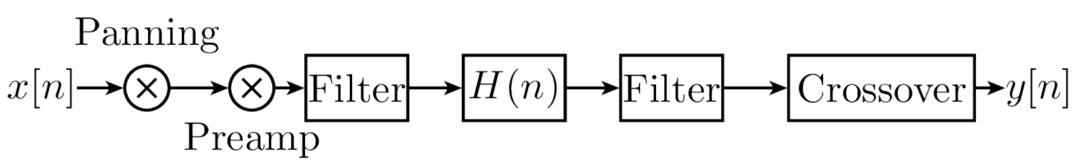



Figure 109: Distortion Circuit Diagram

Negation is the first thing to happen. If the **Neg Checkbox** is activated, the amplitude is multiplied by -1.

Panning is applied. Note, however, that one must activate the Stereo Checkbox, labelled **St**, before it will work.

Pre-amplification is done next. The amount can be changed using the Drive nob. Indeed, this is the amount of distortion. For example, if one clips a signal, the louder the input gets, the more distortion one will get. This can have different meanings for different types of distortion, as described above.

HPF and LPF are filters with 2 poles. Whether they are used before or after the waveshape, depends on the checkbox labeled PF.

The next step is the wave shape. This defines how the wave is actually modified. The Type ComboBox lets one define how. We will discuss some types below.

After the wave shape, we scale the level again. This is called output amplification. One can change the value using the Level knob.

Crossover is the last step. This is controlled by the knob LR Mix and means that afterwards, a percentage of the left side is applied to the right side, and, synchronously, the other way round. It is a kind of interpolation between left and right. If one sets the LR Mix to 0.0, one will always have a stereo output.

### 10.7.2 Effects / Distortion / User Interface


Figure 110: Effects Edit, Distortion

1. **Vol** or **D/W**
2. **Pan**
3. **Drive**
4. **Level**
5. **Type**
6. **Neg.**
7. **LPF**
8. **HPF**
9. **St.**

**1. Drive.** Set the amount of distortion.

**2. Level.** Amplify or reduce the signal after distortion.

**3. Type.** Set the function of the distortion (like arctangent, sine).

**4. Neg.** Negates the amplitude (invert the signal).

**5. LPF.** Low Pass Filter.

**6. HPF.** High Pass Filter.

**7. St.** Set the distortion mode (stereo or mono, checked is stereo).

### 10.7.3 Effects / Distortion / NRPN Values

Effects can be controlled via "non-registered parameter numbers", or NRPNs. This section details the value supported by the Distortion effect.

## 10.8 Effects / Echo

The echo effect, also known as delay effect, simulates the natural reflection of a sound. The listener can hear the sound multiple times, usually decreasing in volume. Echos can be useful to fill empty parts of songs with.

### 10.8.1 Effects / Echo / Circuit

The good circuit diagram is shown in an old printout we have, but the current version of the Echo description at http://zynaddsubfx.sourceforge.net/Doc/ shows a junk file. So Paul Nasca's description will have to suffice.

The echo is basically implemented as the addition of the current sound and a delayed version of it. The delay is implemented as in the picture below. First, we add the delayed signal to the effect input. Then, they pass an LP1. This shall simulate the effect of dampening, which means that low and especially high frequencies get lost earlier over distance than middle frequencies do. Next, the sound is delayed, and then it will be output and added to the input.

The exact formula in the source code for the dampening effect is as follows:

$$Y(t) = (1 - d) * X(t) + d * Y(t - 1)$$

where t be the time index for the input buffer, d be the dampening amount and X,Y be the input, respective the output of the dampening. This solves to

$$Y(z) = Z(Y(t)) = (1 - d) * X(z) + d * Y(z) * z - 1 <==> H(z) = Y(z)X(z) = 1 - d1 - d * z - 1$$

which is used in $Y(z) = H(z) * X(z)$. So H(z) is indeed a filter, and by looking at it, we see that it is an LP1. Note that infinite looping for d=1 is impossible.

### 10.8.2 Effects / Echo / User Interface

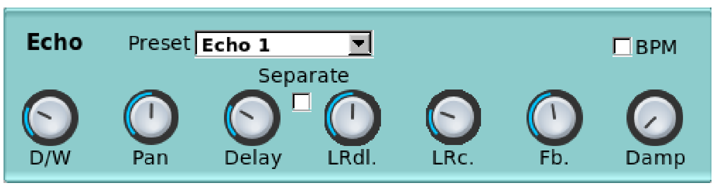



Figure 111: Effects Edit, Echo

1. **Vol** or **D/W**
2. **Pan**
3. **Delay**
4. **Separate**
5. **LRdl.**
6. **LRc.**
7. **Fb.**
8. **Damp**
9. **BPM**

**1. Delay.** The delay time of one echo.

**2. Separate.** Changes the **Delay** and and **Left-Right-Delay** to independent **Left delay** and **Right Delay**

**3. LRdl.** Left-Right-Delay. The delay between left/right channels. If it is set to the middle, then both sides are delayed equally. If not, then the left echo comes earlier and the right echo comes (the same amount) later than the average echo; or the other way round. Set the knob to 0 to hear on the right first.

**4. LRc.** Echo Crossover. The "crossing" between left/right channels.

**5. Fb.** Echo feedback. Feedback describes how much of the delay is added back to the input. Set Fb. to the maximum to hear an infinite echo, or to the minimum to just hear a single repeat.

**6. Damp.** Echo damping. How high frequencies are damped in the Echo effect. The Damp value lets the LP1 reject higher frequencies earlier if increased.

**7. BPM.** Locks the delay time to the incoming MIDI clock. New from *Yoshimi* V 2.1.0 See Section 8.5.8 "BPM and Frequency" on page 104 for further details.

#### 10.8.3 Effects / Echo / NRPN Values

Effects can be controlled via "non-registered parameter numbers", or NRPNs. This section details the value supported by the Echo effect. TODO.

### 10.9 Effects / EQ

EQ is a parametric equaliser. An equaliser is a filter effect that applies different volume to different frequencies of the input signal. This can, for example, be used to "filter out" unwanted frequencies. *Yoshimi*'s implementations follow the "Cookbook formulae for audio EQ" ([5]) by Robert Bristow-Johnson.

On the equaliser graph there are 3 white vertical bars for 100Hz, 1kHz, 10kHz.

#### 10.9.1 Effects / EQ / Circuit

#### 10.9.2 Effects / EQ / User Interface

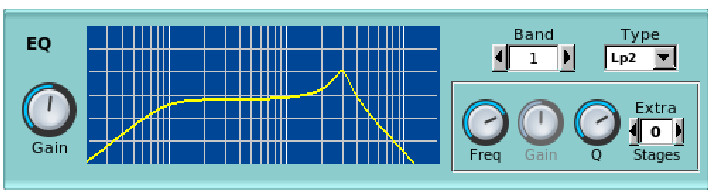



Figure 112: Effects Edit, EQ

We describe all parts of the GUI here. The term passband (or often just "band") refers to the amount of frequencies which are not significantly attenuated by the filter.

1. **Gain**
2. **Graph**
3. **Band**
4. **Type**
5. **Freq**
6. **Gain**
7. **Q**
8. **Stages**

Global:

**1. Gain Master.** Amplifies or reduces the overall signal that passes through EQ.

**2. Graph.** Shows the complete frequency response of all the active EQ bands and the master **Gain** setting.

**3. Band.** Set the current frequency band number (or filter). Band lets one choose the passband number. Multiple passbands define one filter. This is important if one wants multiple filters to be called after each other. Note that filters are commutative.

Values: `0*, 1, ... 7`

Bands:

**4. Type.** Set the type of the filter.

Values: `Off*, Lp1, Hp1, Lp2, Hp2, Bp2, N2, Pk, Lsh, Hsh`

Note that, for certain values of the **Type** parameter, the **Gain** and/or **Q** controls will not be available.

**5. Freq.** The frequency of the filter. Freq describes the frequencies where the filter has its poles. For some filters, this is called the "cutoff" frequency. Note, however, that a bandpass filter has two cutoff frequencies.

**6. Gain (Filter).** The gain of an individual filter. Gain is only active for some filters (**Pk**, **Lsh**, and **Hsh**, and it sets the amount of a special peak these filters have. Note that for those filters, using the predefined gain makes them ineffective.

**7. Q.** The Q (resonance, or bandwidth) of the filter. Resonance lets one describe a peak at the given frequency for filters with 2 poles. This can be compared to real physical objects that have more gain at their resonant frequency.

**8. Stages.** Number of additional times the filter will be applied (in order to do very steep roll-off - eg. 48 dB/octave). Stages lets one define multiple filter stages. This is equivalent to having multiple copies of the same filter in sequence.

Values: `0*, 1, ... 4`

### 10.9.3 Effects / EQ / NRPN Values

Effects can be controlled via "non-registered parameter numbers", or NRPNs. This section details the value supported by the EQ effect.

TODO.

## 10.10 Effects / Phaser

The Phaser is a special dynamic filter. The result is a sweeping sound, which is often used on instruments with a large frequency band, like guitars or strings. This makes it typical for genres like rock or funk, where it is often modulated with a pedal, but also for giving strings a warm, relaxing character.

### 10.10.1 Effects / Phaser / Circuit

We explain the functionality in a diagram and list the components below.

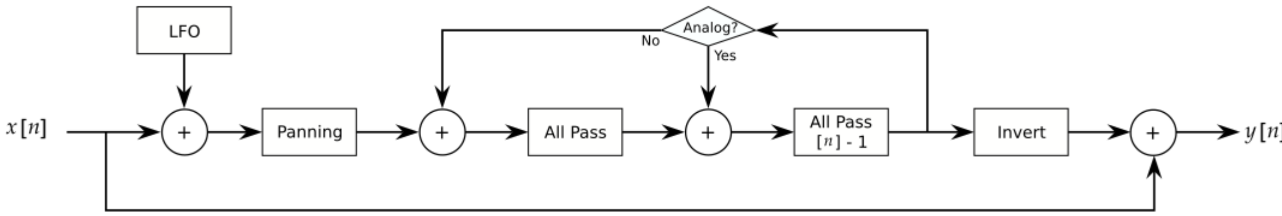



Figure 113: Phaser Circuit

The audio signal is split into two paths. One path remains unchanged. The other one is sent to a delay line. The delay time (the so-called phase) is made dependent on the frequency. Therefore, an all-pass filter is applied to the signal, which preserves the amplitude, but determines the delay time. At the end, both paths are added.

Yoshimi offers different types of phasers:

- **Analog and "normal" phasers**. Analog phasers are more complicated. They sound punchier, while normal phasers sound more fluent. However, analog filters usually need more filter stages to reach a characteristic sound.
- **Sine and triangle filters**. Note that an analog triangle filter with many poles is a barber pole filter and can be used to generate Shepard Tones, i.e. tones that seem to increase or decrease with time, but do not really.
- **The LFO function can be squared**. This is only available for the Analog phaser and converts the triangle wave into a hyper sine wave. This approximates a triangle for the top half, and more rounded sine-like bottom half. The sine squared is simply a faster sine wave.

For the normal phaser, Figure 114 "Effects Edit, Phaser" on page 145, below, shows the controls referred to in this list of steps.

1. First, the LFO is generated. There are 4 controls (**Freq**, **Rnd**, **LFO** type, **St.df**) that define the LFO.
2. **Phase** and **Depth** are added in the usual way.
3. If **hyper** is set, then the LFO function is squared.
4. Next, this modulates the input signal amplitude.
5. The **Analog** setting decides whether the phaser is analog or "normal". For the analog phaser (see the **Analog** check-box), **L/R** is not implemented. Conversely, for the normal phaser, **hyper** and **dist** are not available.
6. **Pan** applies panning to the original input in every loop.
7. Next, phasing is applied - barber-pole type for **Analog** only.
8. Then, based on the setting of **Stages**, further phasing stages are applied. For **Analog** only the **dist** control sets the amount of distortion when applying the phasing stages.
9. **Fb** applies feedback next. The last sound buffer element is (after phasing) multiplied by this value and then added back in. For the normal filter, the value is added before, and, for analog, after the first phasing stage.
10. Finally, the **Sub.** option inverts the signal, multiplying it by -1.

### 10.10.2 Effects / Phaser / User Interface

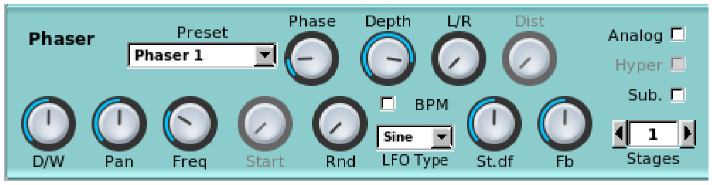



Figure 114: Effects Edit, Phaser

1. **Preset.**
2. **Vol** or **D/W**
3. **Pan**
4. **Phase**
5. **Depth**
6. **L/R**
7. **Dist**
8. **D/W**
9. **Pan**
10. **Freq**
11. **Start**
12. **Rnd**
13. **BPM**
14. **LFO type**
15. **St.df**
16. **Fb**
17. **Analog**
18. **Hyper**
19. **Sub.**
20. **Stages**

**1. Preset.** Phaser Presets.

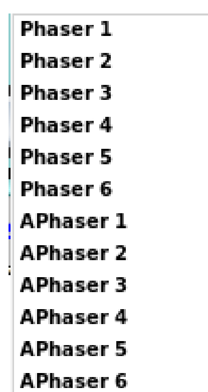



Figure 115: Phaser presets

Values: `Phaser 1 - 6, APhaser 1 - 6`

**2. Phase.** Phaser Phase.

Values: `0% to 100%`

**3. Depth.** Phaser Depth. Phaser LFO Depth?

Values: `0% to 100%`

**4. L/R.** L/R. How the left/right channels are routed to output:

1. leftmost. Left to left and right to right.
2. middle. Left+right to mono.
3. rightmost. Left to right, and right to left.

**5. Dist.** Phaser Distortion. Ranges from 0% to 100%.

**6. D/W.** Phaser Dry/Wet. This knob sets the effect volume. The dry value ranges from 0 dB down to "inf" (infinity) dB, while the wet value is the complementary range, from "inf" dB to 0 dB. Confusing? The tooltip tells the user exactly what the settings are.

**7. Pan.** Phaser Panning. Ranges from 100% left to centered to 100% right.

**8. Freq.** Phaser Freq. Set the Phaser LFO frequency. Ranges from 0.0 Hz to 30.68 Hz.

**9. Start.** Phaser Start. Set the start of the Phaser phase relative to MIDI sync. Ranges from 0 to 178.6%

**10. Rnd.** Phaser Randomness. Set the Phaser LFO randomness. Ranges from 0.0% to 100% percent.

**11. BPM.** Locks the frequency control to the incoming MIDI clock. New from *Yoshimi* V 2.1.0 See Section 8.5.8 "BPM and Frequency" on page 104 for further details.

**12. LFO.** Phaser LFO Type.

Values: `SINE, TRI`

**13. St.df.** Left/Right Channel Phase Shift. The phase difference between LFO for left/right channels. Ranges from -180 degrees (left 180) to equal to +180 degrees (right 180). The actual end values can differ a little from 180.

**14. Fb.** Phaser Feedback. Ranges from -99% to 99%.

**15. Analog.** Phaser Analog. Checking this box emulates an "FET" (Field-effect transistor).

Values: `Off*, On`

**16. Hyper.** Phaser Hyper. Checking this box sets the "hyper-sine" mode.

Values: `Off*, On`

**17. Sub..** Phaser Subtract. Checking this box inverts the output so it tends to subtract from the incoming rather than adding.

Values: `Off*, On`

**18. Stages.** Phaser Stages.

Values: `1*, 2, ... 12`

#### 10.10.3 Effects / Phaser / NRPN Values

Effects can be controlled via "non-registered parameter numbers", or NRPNs. This section details the value supported by the Phaser effect.

## 10.11 Effects / Reverb

A Reverberation actually expresses the effect of many echoes being played at the same time. This can happen in an enclosed room, where the sound can be reflected in different angles. Also, in nature, thunder approximates reverb, because the sound is reflected in many different ways, arriving at the listener at different times.

In music, reverb is popular in many ways. Reverb with large room size can be used to emulate sounds like in live concerts. This is useful for voices, pads, and hand claps. A small room size can simulate the sound board of string instruments, like guitars or pianos.

### 10.11.1 Effects / Reverb / Circuit

As mentioned, a reverb consists of permanent echo. The reverb in *Yoshimi* is more complex than the echo. After the delaying, comb filters and then allpass filters are being applied. These make the resulting sound more realistic. The parameters for these filters depend on the roomsize. For details, consider the information about Freeverb.

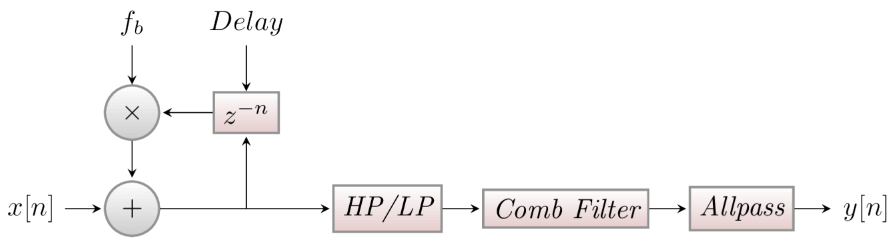



Figure 116: Reverb Circuit Diagram

### 10.11.2 Effects / Reverb / User Interface

The user-interface for the Reverb effect depends on whether it is used as a System effect or an Insertion effect. When used as a System effect **D/W** becomes **Vol**.


Figure 117: Effects Edit, Reverb

1. **Preset**
2. **Type**
3. **R.S.**
4. **D/W**
5. **Pan**
6. **Time**
7. **I.del**
8. **I.delfb**
9. **BW**

10. **E/R**
11. **LPF**
12. **HPF**
13. **Damp**

**1. Preset.** Reverb Preset.

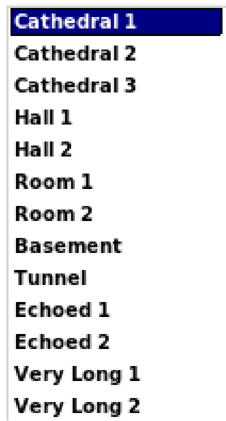



Figure 118: Reverb Preset Dropdown

Values: `Cathedral 1, Cathedral 2, Cathedral 3, Hall 1, Hall 2, Room 1, Room 2, Basement, Tunnel, Echoed 1, Echoed 2, Very Long 1, Very Long 2`

**2. Type.** Reverb Type. The combobox lets one select a reverb type.


Figure 119: Reverb Type Dropdown

- Freeverb is a preset. It was proposed by Jezar at Dreampoint.
- Bandwidth has the same parameters for the comb and allpass filters, but it applies a unison before the LPF/HPF. The unison's bandwidth can be set using BW.
- Random chooses a random layout for comb and allpass each time the type or the roomsize is being changed.

Values: `Random, Freeverb, Bandwidth`

**3. R.S.** Reverb Room Size. The room size defines parameters only for the comb and allpass filters.

**4. D/W.** Reverb Dry/Wet Setting. This setting controls much of the original signal is mixed with the reverb effect.

**5. Pan.** Reverb Panning. Pan lets one apply panning. This is the last process to happen.

**6. Time.** Reverb Time. Set the duration of late reverb. Time controls how long the whole reverb takes, including how slowly the volume is decreased.

**7. I.del.** Reverb Initial Delay. The initial delay (I.del) is the time which the sounds need at least to return to the user.

**8. I.delfb.** Reverb Initial Delay Feedback. Sets the initial delay feedback. The initial delay feedback (I.delfb) says how much of the delayed sound is added to the input. It is not recommended to use this setting together with low initial delays).

**9. BW.** Reverb Bandwidth.

**10. E/R.** Reverb E/R. Early Reflection (not currently implemented).

**11. LPF.** Reverb Lowpass Filter. This filter is applied before the comb filters.

**12. HPF.** Reverb Highpass Filter. This filter is applied before the comb filters.

**13. Damp.** Reverb Damp. Damp determines how high frequencies are damped during the reverberation. The dampening control (Damp) currently only allows to damp low frequencies. Its parameters are used by the comb and allpass filters.

### 10.11.3 Effects / Reverb / NRPN Values

Effects can be controlled via "non-registered parameter numbers", or NRPNs. This section details the values supported by the Reverb effect.

TODO: detail the values supported by the Reverb effect.

# 11 Bottom Panel

## 11.1 Bottom Panel Controls

The *Yoshimi* bottom panel provides quick access to some major features of the application. The bottom panel is shown in Figure 3 "Yoshimi Main Screen" on page 24.

Here are the major elements of the bottom panel.

1. **Part**
2. **of**
3. **Instrument Name**
4. **Edit** (Instrument Edit Button)
5. **On**
6. **Mode**
7. **Midi**
8. **Portamento**
9. **Velocity Sens**
10. **Velocity Offset**
11. **Pan**
12. **Volume**
13. **Controllers**
14. **MIDI CCs**
15. **Pan Law**
16. **Minimum Note**
17. **Maximum Note**
18. **m**
19. **R**
20. **M**

21. **Key Shift**
22. **Key Limit**
23. **System Effect Sends 1**
24. **System Effect Sends 2**
25. **System Effect Sends 3**
26. **System Effect Sends 4**
27. **Sound Meter**

**1. Part.** Part Number.

Values: `1 to 16; 1 to 32; 1 to 64`

Show and set current part. The maximum number of values depends on the **Part of** selection.

**2. of.** Maximum Number of Parts.

Values: `16*, 32, 64`

*Yoshimi* now has up to 64 parts in blocks of 16. One can now decide how many one wants to have available using this user-interface item. By default these are wrapped around the normal MIDI channels, so that parts 1, 17, 33, and 49 all respond to channel 1 messages. This was originally implemented for Vector Control, working with up to four sounds on a channel (similar to the Yamaha SY hardware series).

However, these additional parts have other less obvious uses. One of these is getting far more than 16 completely independent tracks addressed by just the 16 channels. Most tunes run with instruments having a relatively narrow pitch range, and this is what we can make use of.

As an example, in *Yoshimi*'s main window select 64 parts, then on part 1 set (say) 'Steel Bass' and maximum note as 52 (E). Next select part 17 and enable it (easiest to use the mixer panel for this) set 'Tunnel Piano', the *minimum* note as 53 and maximum as 71 (B). Finally, enable part 33, set 'Rushes', and set its minimum note as 72, but key shift down an octave. With a 61 note keyboard that gives one quite a useful working range, on just one channel.

However, the idea really comes into its own with a sequencer like Rosegarden where one can record multiple parts over the full MIDI range and track them to the same channel. Also, in Rosegarden the parts can be separately named, and identified as 'Bass' and 'Treble' in the notation editor. This setup makes it very convenient for those wanting a more formal musical layout.

So, with very little effort, one can now have 48 tracks playing at once! Ummm, one does need a decent processor though :) Yes, one could run more instances of Yoshimi on different MIDI ports, but where's the fun in that?

Another possibility is obtaining very smooth transitions between different sounds on the same channel. If one uses program change to do this, that part has to be muted, and there is a variable time lag (while the new part is loaded) before one can play any more notes on that channel. However, with 32 and 64 parts one can actually overlap notes with different instruments on a playing channel.

This setup is accomplished by pre-loading the wanted instruments, then switching channel numbers. If (via the direct part NRPN) one adds 16 to a sounding part's channel number, it will then only respond to Note Off events. To bring it back into operation simply restore the original channel number. An example:

1. Enable 32 parts.
2. Load 'Simple Chimes' into part 0 (part 1 in the GUI).
3. Load 'Silver Bell' into part 16 (part 17 in the GUI).
4. In your sequencer, via direct part NRPN set part 16 to channel 16. This will now be 'whited out' in the GUI.

5. Record some notes to channel 0 (1 in human-readable terms).
6. In the sequencer, just before the first note that one wants to sound as 'Silver Bell', insert two direct part NRPNs, with one to set part 0 to channel 16, and the other to set part 16 to channel 0.

Now, when played through, the last 'Simple Chimes' note will have its full release and reverb tail, blending into the first 'Silver Bell' note. To go back to using 'Simple Chimes' just reverse the NRPNs. The only time this gets complicated is if the new note is exactly the same pitch as the old one, in which case the NRPNs need to be between the old note-off and the new note-on.

By default, all the upper parts (numbers greater than 16) are mapped to the same MIDI channel numbers as the lowest ones, but have independent voice and parameter settings. They cannot normally receive independent note or control messages. However, vector control will intelligently work with however many one has set, as will all the NRPN direct part controls. See Section 18.3 "Vector / Vector Control" on page 225.

This item is a fairly new feature of *Yoshimi* (as of version 1.3.5).

**3. Instrument Name.** Instrument Name. Left-click to open the Bank window. Right-click to change the name of the current instrument. One needs to change only one character to make the instrument name savable. If one goes into the instrument editor and changes engine controls, then 'Simple Sound' gets changed to 'No Title', and this change can be saved. Blocking the saving of 'Simple Sound' was done for two reasons. Initially there was no name at all by default, and people were saving them like that. The problem then was once re-loaded one had no idea what was there, or even if there was anything at all except the basic sound. Also, to save time and space, when saving patch set or state files, no 'empty' instruments are included, and that name is a quick way to identify such an instrument; the alternative would be to compare every single element of the instrument against it's default setting.

If one changes the name of the instrument, be sure to select **Menu / Instrument / Save Instrument** to preserve that change.

The name now has colour-coding to indicate the instrument's use of ADDsynth, SUBsynth, or PADsynth. One can see the "red" colour for ADDsynth in the figure for the bottom panel. "Blue" would indicate SUBsynth, and "green" would indicate PADsynth.

**4. Edit.** Instrument Edit button. This button brings up the instrument-edit dialog shown in Figure 123 "Part Edit (Instrument) Dialog" on page 158.

This dialog provides a very broad overview of the instrument, and provides access to far more detailed dialogs to edit the instrument. This dialog is explained in detail in Section 11.3 "Bottom Panel Instrument Edit" on page 158.

There are some additional tricks to this button. From the main window there are shortcuts to go directly to the Add, Sub, and Pad editors (in kit mode this only applies to item 1). Holding down `A`, `S`, `P`, for AddSynth, SubSynth, and PadSynth, respectively, while left-clicking the **Edit** button, will open their respective editors, but only if the desired engine is *enabled*; otherwise, the keystroke will be ignored, but the normal part-edit window will come up.

Using the right mouse button to click will enable the engine and then open the editor. The same is true with `S` for SUBSynth and `P` for PADSynth.

`D` can be used as an alternative to `P`, which is nice for QWERTY keyboards. This is not perfect, and if one's timing is a bit quick it might miss, and just open the normal part selection window.

Holding down the `K` key then clicking will open the Kit editor. The `E` key opens the part's Effects window.

**5. On.** Enable the part. If the Part is disabled it doesn't use CPU time.

Values: `Off*, On`

Note. At startup, and after a main reset part 1 will be set 'On', but all others will be 'Off'.

**6. Mode.** Note-generation mode. Sets the mode (polyphonic/monophonic/legato). In Polyphonic mode, multiple simultaneous notes are supported. In Monophonic mode, only one note is supported. In Legato mode, the sound flows smoothly from note to note without any breaks. This mode is particularly effective with Portamento. If one uses the foot-pedal CC to enable it, the text in the **Mode** icon will show this status, and then will drop back to whatever it was previously when the pedal is released.

However, one cannot have legato mode and drum mode (see Section 15 "Kit Edit" on page 205) at the same time. If drum mode is set when trying to enable legato, drum mode takes priority, and the "Legato" label will be shown in red. Cancelling drum mode makes legato valid, and the "Legato" label will turn black again. If using a legato MIDI pedal, *Yoshimi*'s part mode will show the legato change, and will set the label red if an instrument in drum mode is on in that part.

Values: `Poly, Mono, Legato`

**7. Midi.** MIDI Channel this part responds to.

Values: `1 to 16`

**8. Portamento.** Enable/disable the portamento. One can set the duration and other parameters by opening the Controllers window.

Values: `Off*, On`

**9. Velocity Sens.** Velocity Sensing Function.

Values: `0 to 127, 64*`

**10. Velocity Offset.** Velocity Offset.

Values: `0 to 127, 64*`

**11. Pan.** Pan.

Values: `0 to 127, 64*`

**12. Volume.** Instrument Volume.

Values: `0 to 127, 96*`

The default volume for ADD parts (overall) and SUB parts is 96; the default volume for SUB parts is 90; the ADD voice volume is 100; and effects volumes vary heavily with the effect.

**13. Pan Law.** Session panning behaviour.

Values: `Cut, Default*, Boost`

This dropdown menu is new in *Yoshimi* V 1.7.1 and determines the way stereo sounds are tracked across, and their effect in mono.

**Default** is what we've been using up to now, and gives a fairly even response.

**Cut** tends to make the sound move away as it reaches the extreme left or right, and, as it's name suggests, seems to make it quieter in Mono.

**Boost** makes the sound move closer to the extremes, and, uniquely, leaves the volume unchanged in Mono.

Note that, when listening on speakers, the greater the distance from the speakers, the closer one is to hearing a monaural sound, so the setting of this control can have quite a profound effect. It is stored in patch sets.

**14. Minimum Note.** Minimum note the part receives.

Values: `0* to 127`

**15. Maximum Note.** Maximum note the part receives.

Values: `0 to 127*`

**16. m.** Minimum Note Capture Button.

Set minimum note to last note played.

**17. R.** Minimum and Maximum Note Reset Button.

Reset the minimum key to 0 and the maximum key to 127.

**18. M.** Maximum Note Capture Button. Sets the maximum note to the last pressed key.

**19. Key Shift.** Key Shift. This value is like the master **Key Shift** in the top panel, but it applies only to the current part active in the bottom panel. In recent versions of *Yoshimi*, it has been extended to a larger semitone range. Also note that the key shift can be set via the user-interface, the command-line, or by MIDI NRPN commands. With NRPN, this part shift can be set by direct part control or by channel number.

Values: `-36 to 36, 0*`

Also see the **Key Shift** item in Section 9 "Top Panel" on page 117 for more information.

**20. Key Limit.** Maximum keys to be allocated for this part.

Values: `0 to 60, 20*`

**21. System Effect Sends 1, 2, 3, and 4.**

Values: `0 to 127*`

These controls determine the amount of signal that is sent from this part to each of the identically numbered **System Effects** (in the panel in the middle of the window). Obviously, if there is no system effect set then the control will do nothing.

**22. Sound Meter.** VU Meter. Sound Meter.

This discussion of "Audio Output and Levels" comes from `Output Levels.txt`.

At the bottom of the main window there is a pair of horizontal grids representing a bargraph type display. The upper one is for the left hand channel and the lower one for the right hand one. The grid divisions each represent 1 dB, and the brighter divisions are therefore 5 dB. The thicker bright divisions therefore being 10 dB. The overall scale range is -48 dB to 0 dB.

As the output level rises pale blue strips will light up in these grids. These fast responding bars are the peak levels and should never be allowed to go above 0 dB, otherwise the output is likely to be clipped and distorted. There is also a pair of boxes on the end of these grids which will show the highest peak level seen. If clipping has happened the box background will change from black to red. To clear the clip and peak level indication, click on this area.

As well as the peak level, the display shows a much slower responding RMS level, as a yellow line on top of the blue bar. This gives and indication of the apparent acoustic power.

If one opens the mixer panel window one will see vertical bargraphs for each individual part. On these, the faint bars are 5dB steps and the bright ones 10dB. The peak level isn't shown numerically, but if one exceeds 0dB a thick red line will appear at the top of the bargraph. This is also cleared from the box in the main window.

#### 11.1.0.1 Tip: Using the VU Meter

The VU meter topic is very interesting, because one of the problems is a tendency to overdrive it by way of sustain pedal. At the last test, it showed up in the output before it showed up in the VU meter, so the VU meter will help a lot in analysis.

One way to avoid overdrive is to keep polyphony to 20 on each patch (two or three patches per *Yoshimi* instance, with two or three *Yoshimi* simultaneous instances depending on the patch). Another item which helps a lot is compression (for example, the Calf multiband compressor is amazingly good.

## 11.2 Bottom Panel / Controllers and MIDI CCs

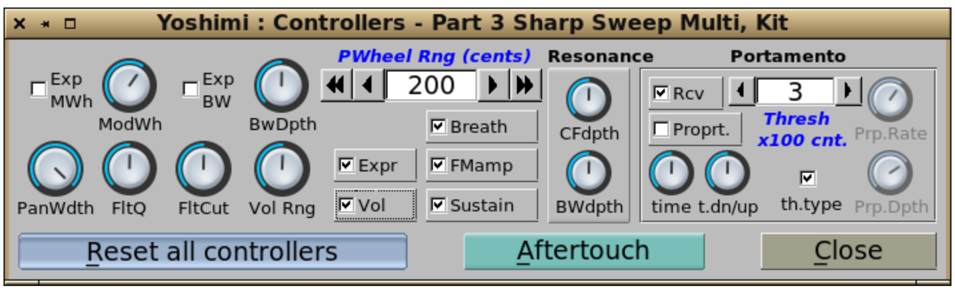



Figure 120: Controllers Dialog

1. **Exp MWh**
2. **ModWh**
3. **Exp BW**
4. **BwDepth**
5. **PanWdth**
6. **FltQ**
7. **FitCut**
8. **Vol Rng**
9. **PWheelB.Rng**
10. **Expr**
11. **Breath** (1.5.6)
12. **FMamp**
13. **Vol**
14. **Sustain**
15. **Resonance** (section)
16. **Portamento** (section)
17. **Reset all controllers**
18. **Aftertouch**
19. **Close**

1. **Exp MWh.** Exponential Modulation Wheel. Changes the modulation scale to exponential.

   Values: `Off*, On`

2. **ModWh.** Modulation Wheel Depth.

   Values: `0 to 127, 80*`

3. **Exp BW.** Exponential Bandwidth Controller. Changes the bandwidth scale to exponential.

   Values: `Off*, On`

4. **BwDepth.** Bandwidth Depth.

   Values: `0 to 127, 64*`

5. **Exp BW.** Exponential Bandwidth. Changes the bandwidth scale to exponential.

   Values: `0 to 127, 64*`

6. **PanDpth.** Panning Depth.

   Values: `0 to 64*`

7. **FltQ.** Filter Q (resonance) Depth.

   Values: `0 to 127, 64*`

8. **FltCut.** Filter Cutoff Frequency Depth.

   Values: `0 to 127, 64*`

9. **Vol Rng.** Volume Range.

   Values: `64 to 127, 64*`

10. **PWheelB.Rng.** Pitch Wheel Bend Range (cents). 100 cents = 1 halftone.

    Values: `-6400 to 6400, 200*`

11. **Expr.** Expression Enable. Enable/disable expression.

    Values: `Off, On*`

12. **Breath.** Breath.

Breath control was once a "per part" setting, but now it is a "per instrument" setting. By default, this setting is enabled. This new switch is visible from version 1.5.6 on, and it is saved only in new `.xiy` format. See Section 3 "Configuration Files" on page 29 for details on the new format.

Values: `Off, On*`

13. **FMamp.** FM Amplitude Enable. Enable/disable receiving Modulation Amplitude controller (76).

    Values: `Off, On*`

14. **Vol.** Volume Enable.

    Values: `Off, On*`

Enable/disable receiving volume controller. Sensitivity to MIDI volume change (CC7) is now variable in 'Controllers' in the same way as pan width etc. The numeric range is 64 to 127; the default at 96 gives the same sensitivity as before at -12dB relative to the GUI controls. 127 gives 0dB and 64 gives -26dB

15. **Sustain.** Sustain Pedal Enable. Enable/disable sustain pedal.

    Values: `Off, On*`

16. **Reset all controllers.** Reset All Controllers.

**17. Aftertouch.** Open Aftertouch window.

**18. Close.** Close Window.

### 11.2.1 Bottom Panel / Controllers / Aftertouch

Completely new to *Yoshimi V 1.7.1*. Clicking on the button in **Controllers** opens the window below.

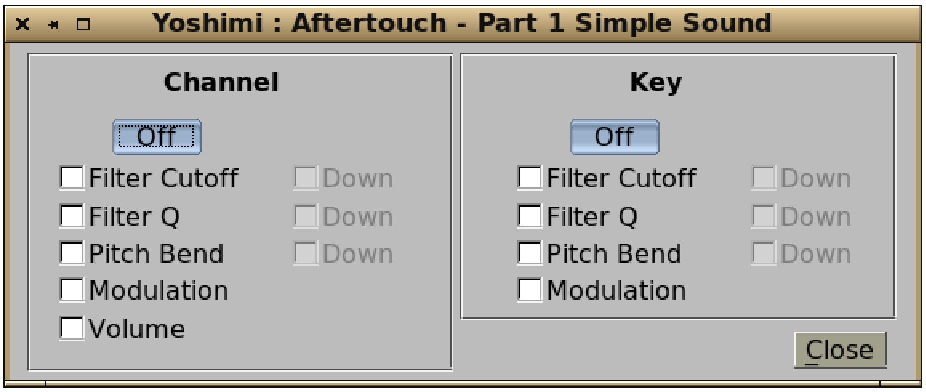



Figure 121: The MIDI Aftertouch Window

This feature is so new that it may well change dependent on user feedback.

Both types of aftertouch are supported, *Channel* and *Key*. Many keyboards only have *Channel* aftertouch, but *Key* is becoming more common. *Key* is where the aftertouch behaviour only affects the note produced by the key being pressed harder.

Currently, both forms support **Filter Cutoff** point, **Filter Q**, and **Pitch Bend**. Also note the extra checkboxes where these can be set to move the controls down instead of up.

Also there is **Modulation**, and finally, **Volume** is only available to **Channel** pressure.

One can have multiple actions such as **Filter Q** and **Pitch Bend**, but one cannot have the same control on both **Channel** and **Key**.

### 11.2.2 Bottom Panel / Controllers / MIDI Controls

There is a new button in the main window for access to the small MIDI CCs window. Access to this window used to require a right click on the Controllers button, but many people never knew it was available! These controls can be used when one doesn't have a MIDI source connected, and they can also be learned and combined with others for greater expression. This window has five controls that are MIDI-learnable.


Figure 122: MIDI Controls from MIDI CCs Button

1. **Modulation**
2. **Expression**
3. **Filter Q**
4. **Filter Cutoff**
5. **Bandwidth**

Will has one keyboard that sends aftertouch messages, and all of these work correctly with it. An interesting effect was to have a sawtooth wave set up in **AddSynth** and the frequency LFO level turned up. Then, he learned **Modulation**, **Expression**, and **Filter Cutoff**, all on aftertouch. He then reduced their ranges in the MIDI learn window and the effect was very interesting. Try it!

Because of the way this is implemented, these controls are also accessible via command line (CLI) direct access for both for read and write, and the knobs will respond to this, as well as to learned controls.

**1. Modulation.** Affects the (amplitude) modulation of all engines in the part.

**2. Expression.** Affects the "expression" of all engines in the part.

**3. Filter Q.** Affects the sharpness of the filtering of all engines in the part.

**4. Filter Cutoff.** Affects the brightness of all engines in the part by increasing or reducing the corner frequency.

**5. Bandwidth.** The master bandwidth control affects all engines in a part, and is real-time. It is also highly dependent on the harmonic structure, so is most effective on SubSynth sounds. Like all of these MIDI controls, it is a part control, not an instrument setting, and is never saved. It is available in the window shown above, the command-line, and it is learnable. It considerably "expands" some instruments.

### 11.2.3 Bottom Panel / Controllers / Resonance

**1. CFdepth.** Resonance Center Frequency Depth, Center Frequency Controller Depth.

Values: `0 to 127, 64*`

**2. BWdepth.** Resonance Bandwidth Depth, Resonance Bandwidth Controller Depth.

Values: `0 to 127, 64*`

### 11.2.4 Bottom Panel / Controllers / Portamento

**1. Rcv.** Portamento Receive, Receive Portamento Controllers. Determines if the part receives Portamento On/Off (65) controller.

Values: `Off, On*`

**2. Proprt.** Portamento Proportional, Enable Proportional Portamento (over fixed portamento).

Values: `Off*, On`

**3. time.** Portamento time. The duration of the portamento.

Values: `0 to 127, 64*`

**4. t.dn/up.** Portamento Time Stretch (up/down).

Values: `0 to 127, 64*`

**5. threshx100 cnt.** Threshold of the Portamento. The minimum or maximum difference of notes in order to do the portamento (x 100 cents). It represents the minimum or the maximum number of halftones (or hundred cents) required to start the portamento. The difference is computed between the last note and current note. The threshold refers to the frequencies and *not* to MIDI notes (one should consider this if one uses microtonal scales).

Values: `0 to 127, 3*`

**6. th.type.** Threshold Type (min/max). Checked means that the portamento activates when the difference of frequencies is above the threshold (”thresh”); not checked is for below the threshold.

Values: `Off, On*`

**7. Propt.** Proportional Portamento. If set, the portamento is proportional to ratio of frequencies.

Values: `Off, On*`

**8. Prp.Rate.** Distance required to double change from nonproportional portamento time. The ratio needed to double the time of portamento.

Values: `0 to 127, 80*`, requires **Proprt.** = `On`

**9. Prp.Depth.** The difference from nonproportional portamento.

Values: `0 to 127, 90*`, requires **Proprt.** = `On`

## 11.3 Bottom Panel Instrument Edit

The main instrument-editing (”part edit”) dialog is relatively simple, and provides for editing information that identifies the instrument, and buttons to access the more complex dialogs of the **ADDsynth**, **SUBsynth**, **PADsynth**, **Kit Edit**, and **Effects** components.

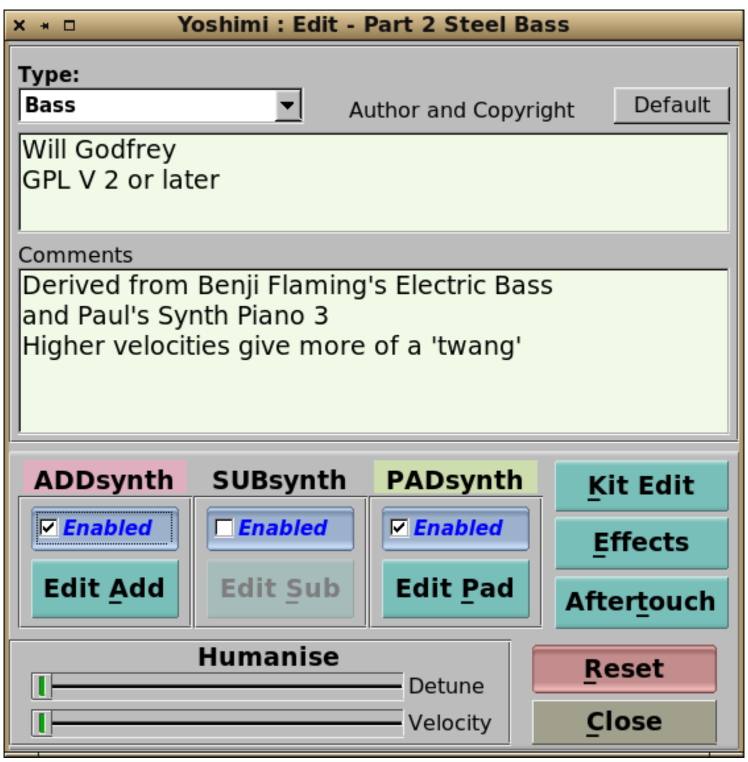



Figure 123: Part Edit (Instrument) Dialog

This dialog provides a very broad overview of the instrument, and provides access to far more detailed dialogs to edit the instrument. This dialog is called up by the **Edit** button on the bottom panel of the main *Yoshimi* main screen.

1. **Type**
2. **Author and Copyright**
3. **Default**
4. **Comments**
5. **ADDsynth**
   1. **Enabled**
   2. **Edit**
6. **SUBsynth**
   1. **Enabled**
   2. **Edit**
7. **PADsynth**
   1. **Enabled**
   2. **Edit**
8. **Kit Edit**
9. **Effects**
10. **Aftertouch**
11. **Detune**, slider, part of the extended **Humanise**.
12. **Velocity**, slider, part of the extended **Humanise**.
13. **Reset**, set the instrument/part to default settings.
14. **Close**

The **ADDsynth**, **SUBsynth**, **PADsynth**, **Kit Edit**, and **Effects** dialogs are detailed in separated sections, as they are all very complex dialogs with many sub-dialogs.

**1. Type.** Instrument Type. Instrument Category.

This dropdown dialog allows one to tag the type of instrument, to indicate what category of instruments it fits into. The following figure shows the types.

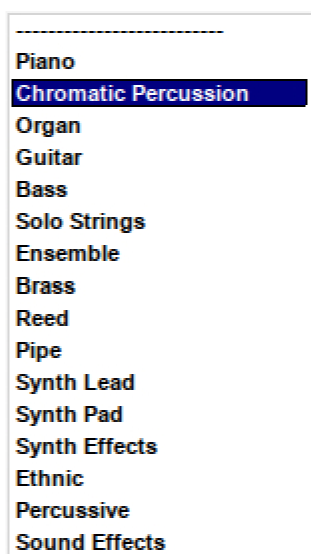



Figure 124: Instrument Type Drop-down List

Values: `Piano, Chromatic Percussion, Organ, Guitar, Bass, Solo Strings, Ensemble, Brass, Reed, Pipe, Synth Lead, Synth Pad, Synth Effects, Ethnic, Percussive, Sound Effects`

**2. Author and Copyright.** This field provides space for identifying the author, copyright, and license for the part. Starting text can be saved by using the **Default** button, described in the next section.

**3. Default.** In the main part **Instrument Edit** window there is a new **Default** button at top right. We hope this encourages people to fill in the Author and Copyright information. To set it up, fill in the text field as normal, then, while holding down the Ctrl key, click on the button (left or middle mouse click) . This text will now be stored in one's *Yoshimi* configuration directory, and whenever one creates a new instrument, just click on the **Default** button, and the saved text will be filled in.

This button was added to discourage users from adding supplementary information directly into the bank directories.

**4. Comments.** Allows free-form comments and notes to be entered.

**5. ADDsynth.**

1. **Enabled**. Enables this synth type to be used in the part/instrument. When enabled, its marker colour, red, is shown.
2. **Edit**. Brings up the editing dialog presented in Figure 125 "ADDsynth Edit/Global Dialog" on page 162. There one will find a full discussion of that dialog.

**6. SUBsynth.**

1. **Enabled**. Enables this synth type to be used in the part/instrument. When enabled, its marker colour, blue, is shown.
2. **Edit**. Brings up the editing dialog presented in Figure 165 "SUBsynth Edit Dialog" on page 200. There one will find a full discussion of that dialog.

**7. PADsynth.**

1. **Enabled**. Enables this synth type to be used in the part/instrument. When enabled, its marker colour, green, is shown.
2. **Edit**. Brings up the editing dialog presented in Figure 141 "PADsynth Edit Dialog" on page 182. There one will find a full discussion of that dialog.

**8. Kit Edit.** Brings up the editing dialog presented in Figure 169 "Kit Edit Dialog" on page 205. There one will find a full discussion of that dialog.

**9. Effects.** Brings up the editing dialog presented in Figure 102 "Effects Edit, No Effect" on page 131. There one will find a full discussion of that dialog.

When the effects panels are brought up from this button, there are two extra user-interface elements: **Bypass** and **Close**. If the **Bypass** item is checked, then the effect is not used; it is taken out of the circuit.

**10. Aftertouch.** Open Aftertouch window.

**11. Detune (Humanise).** Small Random Detune.

**12. Velocity (Humanise).** Small Random Velocity Attenuation.

There used to be a single Humanise control which set a random detune in cents. Since *Yoshimi* V 1.6.0 this has become the detune component of Humanise.

The velocity slider gives an independent random attenuation as a percentage of the full output. This, as well as changing the perceived volume, will change any velocity sensing features, such as filters.

Combined, they lend considerable complexity or piquancy to the part. Both have the same numeric range.

Values: `0* to 50`

**13. Reset.** Restores the part's instrument to the default 'Simple Sound' or if the Ctrl key is held down, the entire part (including Controllers etc.) will be set to default values.

In either case, this brings up a prompt with details of exactly what will be cleared, and behaves identically to making the call from the top level Instrument menu.

**14. Close.** Closes the Edit window.

# 12 ADDsynth

The *Yoshimi* ADDsynth (also spelled "ADsynth" or "AddSynth") dialog is a complex dialog for creating an instrument. This is the most complex, most advanced and most sophisticated part of the synthesizer and allows one to edit the parameters that apply to all the voices of ADDsynth. AddSynth is the most complex and feature filled engine, and so is split up into various context levels. Although based on well-known additive synthesis, *Yoshimi* extends that considerably.

ADDsynth, a primarily additive synthesis engine, is one of the three major synthesis engines available in *Yoshimi*. The basic concept of this engine is the summation of a collection of voices, each of which consists of oscillators.

"ADDsynth" (sometimes spelled "ADsynth") or "ADnote" is a complex engine which makes sounds by adding a number of voices. Each one has filters, envelopes, LFOs, morphing, modulation, resonance, etc. Each voice includes a very powerful waveform generator with up to 128 sine/non-sine harmonics. One can use Fourier synthesis, or if one doesn't like it, one can use wave-shaping/filtering of functions. This engine includes anti-aliasing. Modulation includes ring modulation, phase modulation, and more. The modulators can have any shape. [27]

There are two oscillators per voice: the voice oscillator and the modulation oscillator. For each of these two oscillators, there are three alternatives: one can have a locally defined oscillator (internal), an oscillator defined in a lower-numbered voice or use a lower-numbered voice itself as an oscillator (that voice must be enabled).

In the voice window, each of the two oscillators has a **Source** and a **Local Oscillator**. The **Source** gives the choice of previous voices as oscillators and the **Local Oscillator** gives the choice of previously defined oscillators and the current (internal) oscillator.

The sum of the voices are passed through filters and amplification to produce the final sound. This could lead one to think that ADDsynth is just a bunch of minor post-processing, and at this level much of the sound generation is hidden.

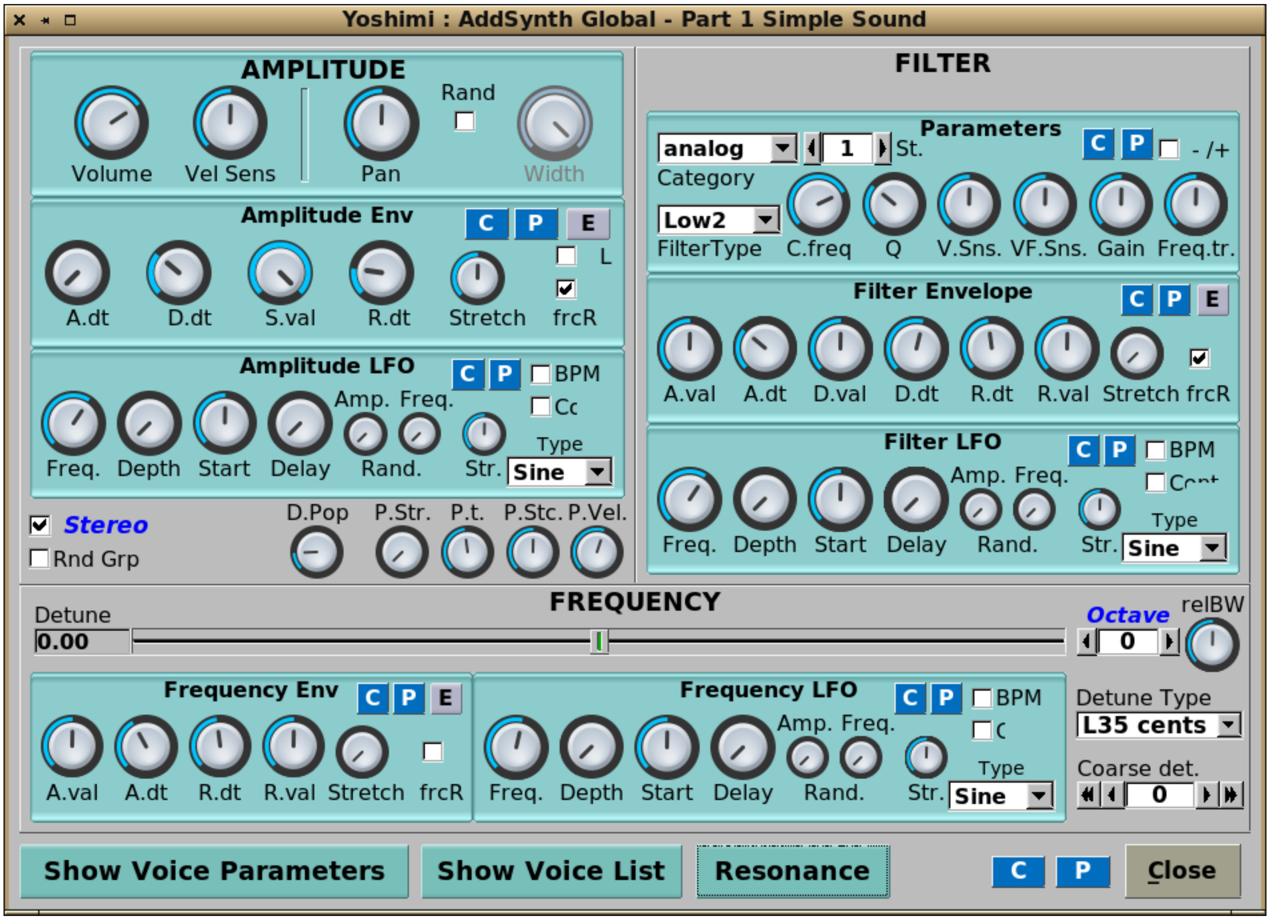



Figure 125: ADDsynth Edit/Global Dialog

The major sections of this dialog are listed:

1. **AMPLITUDE** (stock section)
2. **FILTER** (stock section)
3. **FREQUENCY** (stock section)
4. **Show Voice Parameters** (section)
5. **Show Voice List** (section)
6. **Resonance** (stock section)
7. **C**
8. **P**
9. **Close**

This complex dialog is best described section by section. Many of the sub-sections are stock sub-panels described elsewhere in this document. References to those sections are included.

## 12.1 ADDsynth / AMPLITUDE

1. **Volume**
2. **Vel Sens**
3. **Pan**
4. **Rand**

5. **Width**
   The controls above are discussed in detail in Section 8.2 "Volume Velocity Panning" on page 89. However their values for ADDsynth are as below.
6. **Amplitude Env** The Amplitude Env panel is described in detail in Section 8.6.1 "Amplitude Envelope Sub-Panel" on page 105.
7. **Amplitude LFO** The Amplitude LFO panel is described in detail in Section 8.5.5 "LFO User Interface Panels" on page 101.
8. **Stereo**
9. **Rnd Grp**
10. **D.Pop**
11. **P.Str.**
12. **P.t**
13. **P.Stc.**
14. **P.Vel.**
15. **Detune**

Note the two sub-panels, mentioned above, that are described elsewhere. They will not be discussed in detail below.

**1. Volume.**

Values: `-60dB to 19.4dB, -3.8dB*`

**2. Vel Sens.**

Values: `-48dB to -0.8dB, disabled, -6.02dB*`

**3. Pan.**

Values: `100% left to 100% right, centered*`

**4. Rand.**

Values: `off*, on`

**5. Width.**

Values: `0 to 100%*`

Next, we skip the **Amplitude Env** and **Amplitude LFO** panels, which are described elsewhere, as noted above.

**6. Stereo.** ADDsynth Stereo. Stereo can be enabled. When disabled, all the voices will also have panning disabled. **Stereo** determines whether the whole of this engine is to be Stereo or Mono. If the box is not checked (i.e. Mono), there will be no *spread* to the sound, but the Panning controls will not be affected, and neither will the stereo spread of any part effects.

Values: `Off, On*`

**7. Rnd Grp.** ADDsynth Random Group. **Rnd Grp** Normally each voice has it's own harmonic amplitude random element. If this is checked, then all voices that use the same waveform oscillator will be grouped so they have the same harmonic randomness, assuming this has been set in the Waveform window. It disables harmonic amplitude randomness of voices with a common oscillator. There are many per-voice random elements that can give the sound more 'depth'. When this control is checked, the voices all sound together instead.

Values: `Off*, On`

**8. D. Pop.** ADDsynth De-Pop. This sets the time of a very short attack ramp up, to suppress the click some sounds might produce.

**9. P.Str.** ADDsynth Punch Strength. The punch strength of a note in ADDsynth is a constant amplification to the output at the start of the note, with its length determined by the punch time and stretch and the amplitude being determined by the punch strength and velocity sensing.

Values: `0* to 127`

**10. P.t.** ADDsynth Punch Time (duration). Sets the punch effect duration (from 0.1 ms to 100 ms on an A note, 440Hz).

Values: `0 to 127, 64*`

**11. P.Stc.** ADDsynth Punch Stretch. Sets the punch effect stretch according to frequency. On lower-frequency notes, punch stretch makes the punch effect last longer.

Values: `0 to 127, 64*`

**12. P.Vel.** ADDsynth Punch Velocity Sensing. The higher this value, the higher the effect of velocity on the punch of the note.

Values: `0 to 127, 72*`

## 12.2 ADDsynth / FILTER

The ADDsynth FILTER block consists solely of sub-panels described in detail in the sections noted below. The sub-panels of the FILTER section are:

1. **Filter Params**
2. **Filter Env**
3. **Filter LFO**

**1. Filter Params.** ADDsynth Filter Parameters. The Filter Params panel is described in detail in Section 8.3.5 "Filter Parameters User Interface" on page 93.

**2. Filter Env.** ADDsynth Filter Envelope. The Filter Env panel is described in detail in Section 8.6.5 "Envelope Settings for Filter" on page 110.

**3. Filter LFO.** The Filter LFO panel is described in detail in Section 8.5.5 "LFO User Interface Panels" on page 101.

## 12.3 ADDsynth / FREQUENCY

1. **Detune** [value]
2. **FREQUENCY slider**
3. **Octave**
4. **RelBW**
5. **Frequency Env**. A stock sub-panel described in Section 8.6.4 "Envelope Settings, Frequency" on page 109.
6. **Frequency LFO** A stock sub-panel described in Section 8.5.7 "Frequency LFO Sub-panel" on page 103.
7. **Detune Type**
8. **Coarse det.**

**1. Detune.** ADDsynth Detune Value. This display box shows the value of the detune as selected by the frequency slider described below.

**2. FREQUENCY slider.** ADDsynth Fine Detune (cents), a slider control. While the detune type dropdown and the octave selection provide a coarse selection of detune, the slider allows for a finer selection of detune, up to roughly one-third of a semitone at the default detune type of 35 cents. It will be proportionally less at 10 cents and greater at the other settings.

Values: `-35.00 to 35.00`, `-10.00 to 10.00`, `-100.00 to 100.00`, `-1200.00 to 1200.00`

**3. Octave.** ADDSynth Octave. The octave setting changes the frequency by octaves.

Values: `-8 to 7, 0*`

**4. RelBW.** ADDSynth Relative Bandwidth. Bandwidth: how the relative fine detune of the voice is changed.

Values: `0 to 127, 64*`

**5. Frequency Env.** ADDsynth Frequency Envelope. The Frequency Env panel is described in detail in Section 8.6.4 "Envelope Settings, Frequency" on page 109.

**6. Frequency LFO.** The Frequency LFO panel is described in detail in Section 8.5.5 "LFO User Interface Panels" on page 101

**7. Detune Type.** Frequency Detune Type. This dropdown sets the number of cents that define the range of the **FREQUENCY** slider below and above the main frequency. The values are 35 cents, 10 cents, 100 cents (one semitone), or 1200 cents (1 octave), The default is 35 cents. The 1200-cents setting provides a whole octave of detuning in either direction.

The "L" stands for "linear", and the "E" for "exponential", describing how the detune slider acts.

Values: `L35cents, L10cents, E100cents, E1200cents`

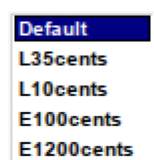



Figure 126: ADDsynth Frequency Detune Type

**8. Coarse det.** Coarse Detune, "C.detune". The single-arrow buttons change the value by one. "One" depends on the detune type. If the detune type is 100 cents it is one semitone, At 1200 cents it's seven semitones. The double-arrow buttons change the value by ten.

Values: `-64 to 63, 0*`

## 12.4 ADDsynth / Links

**1. Show Voice Parameters.** ADDsynth Show Voice Parameters. This button brings up the "voice parameters" dialog discussed in Section 12.5 "ADDsynth / Voice Parameters" on page 166.

**2. Show Voice List.** ADDsynth Show Voice List. This button brings up the "voice list" dialog which gives one a list of all voices with some abridged editing. See Section 12.6 "ADDsynth / Voice List" on page 176.

**3. Resonance.** This button brings up the stock "resonance" dialog which is shared in common with the PADsynth editor. Details of this can be found in Section 8.4 "Stock Resonance Settings" on page 95.

## 12.5 ADDsynth / Voice Parameters

Again, this dialog is built from some stock sections and stock sub-panels, plus additional elements.

Each *Yoshimi* ADDsynth instrument consists of up to 8 voices that can all interact with each other to some degree. Each of those voices has a waveform oscillator, and, optionally a modulation one with five different modulation types. It also has "Unison" capability (effectively sub-voices).

The oscillators themselves have a wide range of waveform shaping controls, almost all of which can be changed in real time.

The image shows your entry point with all the global controls. Much of this actually consists of standardised inserts that are used across all engines. Detailed descriptions of these are provided in the following sections. This dialog provides a way to define each of the 8 voices in great detail. By default, an ADDsynth instrument consists of one voice, voice 1.

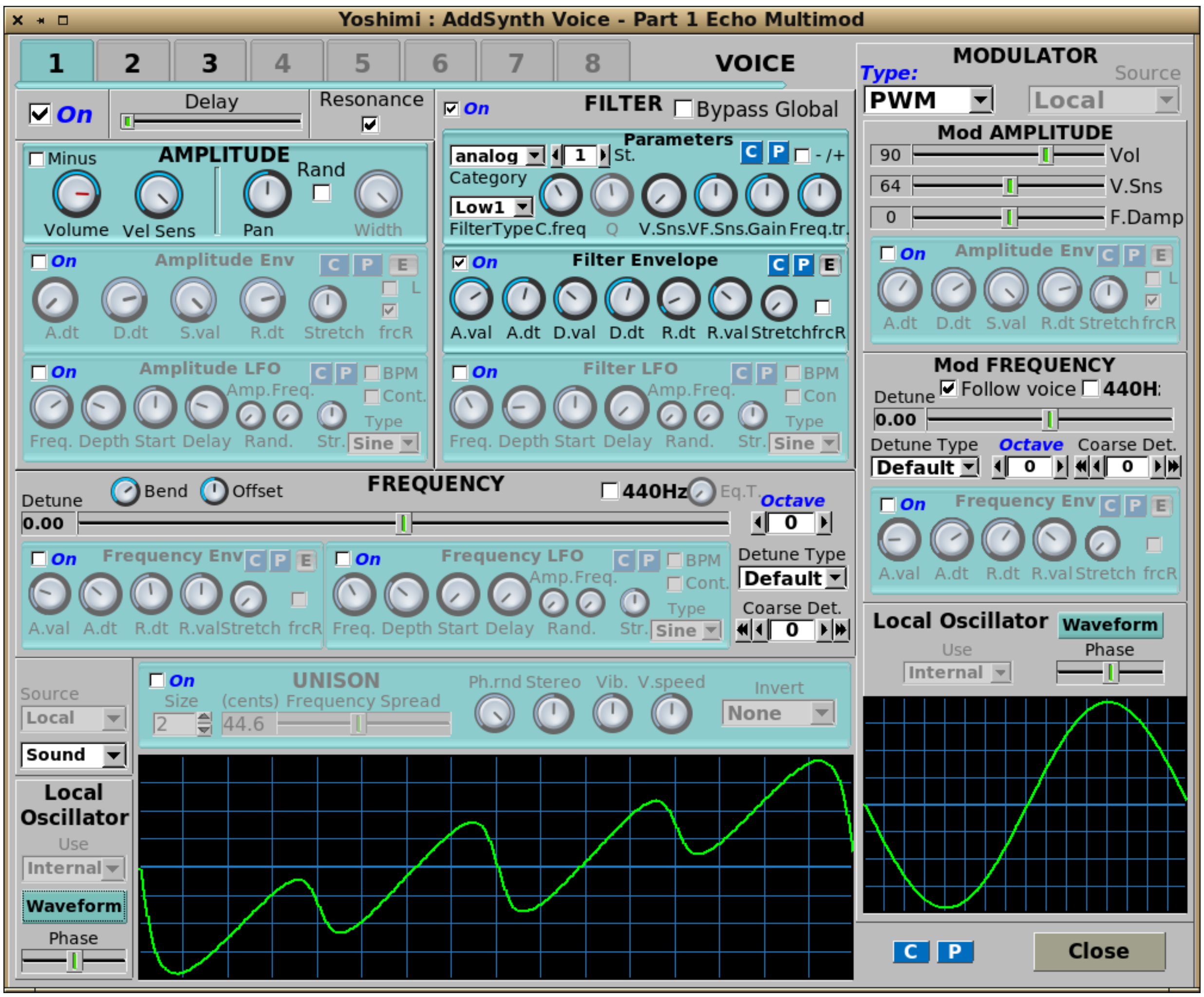



Figure 127: ADDsynth Voice Parameters Dialog

Note the 8 **VOICE** tabs at the top of the window. These make it easy to switch to another voice without opening up yet another editing window. Non-active voices are shown with an inactive tab/number appearance. This is all in synchrony with the **Voice List** window. The tabs select the particular voice to manage, and its modulator section. The tab colour changes to cyan to indicate it is the selected one. Active voices show their tab *number* in black to show at a glance which ones have been enabled.

This dialog consists of a few extra settings, plus a number of stock dialog sections. Take some time to compare Figure 125 "ADDsynth Edit/Global Dialog" on page 162, which covers the overall instrument, with Figure 127 "ADDsynth Voice Parameters Dialog" on page 166, which covers each of the voices. The stock sections in the former cover the whole instrument as one, while the very similar stock sections in the latter cover only the voice they configure. Obviously, the combinations of settings are essentially endless.

Each voice can be amplitude-controlled, filter-controlled, and frequency-controlled. Each voice can also be modulated by a modulator.

Another property of the voice is that one can tell *Yoshimi* to import a given lower-numbered voice, either as an oscillator, or as a modulator.

1. **Voice Number Tab**
2. **On**
3. **Delay**
4. **Resonance**
5. **AMPLITUDE** (see the stock-panel section below)
6. **FILTER** (see the stock-panel section below)
7. **MODULATOR** (see the stock-panel section below)
8. **FREQUENCY** (see the stock-panel section below)

**1. Voice Number Tab.** ADDsynth Voice Number. When highlighted this indicates the voice currently being viewed. Each *Yoshimi* part/instrument can consist of up to eight voices. The voice being worked on can be selected using the **Current Voice** tab.

Values: `1* to 8`

**2. On.** ADDsynth Voice On/Off. Enables this voice in the part/instrument. It enables or disables the entire voice, including it's modulator. Also, with the exception of **Volume/Panning**, all inserts can be switched on or off.

Values: `Off, On`

**3. Delay.** ADDsynth Voice Delay. Individual voices can be delayed against the overall note on point. However, if one is delayed beyond the note release point, it will never sound.

Values: `0* to 4.90 s`

**4. Resonance.** ADDsynth Voice Resonance On/Off. This determines whether overall resonance is applied to a particular voice.

The rest of the GUI elements (AMPLITUDE, FILTER, MODULATOR, FREQUENCY, and Voice Oscillator) are more detailed, and discussed in the sections that follow.

Values: `Off, On*`

### 12.5.1 ADDsynth / Voice Parameters / AMPLITUDE

This section of the voice parameters dialog also includes a couple of stock sub-panels that have an additional "Enable" control.

1. **Minus**
2. **Volume**
3. **Vel Sens**

4. **Pan**
5. **Rand**
6. **Width**
   The controls above are discussed in detail in Section 8.2 "Volume Velocity Panning" on page 89. However their values for ADDsynth Voice are as below.
7. **Amplitude Env, Stock + Enable**
8. **Amplitude LFO, Stock + Enable**

**1. Minus.** ADDsynth Amplitude Minus. This control inverts the phase of the waveform relative to all the other voices. With only one voice enabled, this control will seem to do nothing. With two voices enabled with *identical* waveforms, the **Minus** control will indeed seem to reverse the effect of the volume control. But if the waveforms are different, then it can provide some interesting harmonic change effects.

Values: `Off*, On`

**2. Volume.**

Values: `off, -57.6dB to 0dB, -12.8dB*`

**3. Vel Sens.**

Values: `-48dB to -0.8dB, disabled*`

**4. Pan.**

Values: `100% left to 100% right, centered*`

**5. Rand.**

Values: `off*, on`

**6. Width.**

Values: `0 to 100%*`

**7. Amplitude Env, Stock + Enable.** ADDsynth Amplitude Envelope Sub-panel. See Section 8.6.1 "Amplitude Envelope Sub-Panel" on page 105. Additionally, the **Enable** checkbox allows the enabling of this component.

**8. Amplitude LFO, Stock + Enable.** ADDsynth Amplitude LFO Sub-panel. See Section 8.5.5 "LFO User Interface Panels" on page 101. Additionally, the **Enable** checkbox allows the enabling of this component.

### 12.5.2 ADDsynth / Voice Parameters / FILTER

This section of the voice parameters dialog also includes a couple of stock sub-panels that have an additional "Enable" control.

1. **Enable**
2. **Bypass Global F.**
3. **Filter Params, Stock**
4. **Filter Env, Stock + Enable**
5. **Filter LFO, Stock + Enable**

**1. Enable.** ADDsynth Voice Enable Filter. This value enables the whole FILTER dialog section.

Values: `Off*, On`

**2. Bypass Global F.** ADDsynth Voice Bypass Global Filter. The voice signal bypasses the global filter, and only uses the filter block for the voice; otherwise it is applied, but before the global one.

Values: `Off*, On`

**3. Filter Params, Stock.** See Section 8.3.5 "Filter Parameters User Interface" on page 93.

**4. Filter Env, Stock + Enable.** See Section 8.6.5 "Envelope Settings for Filter" on page 110.

**5. Filter LFO, Stock + Enable.** See Section 8.5.6 "Filter LFO Sub-panel" on page 103.

### 12.5.3 ADDsynth / Voice Parameters / FREQUENCY

This frequency section is almost a stock part. It is similar to the ADDsynth Edit's **FREQUENCY** section.

1. **Detune**
2. **FREQUENCY slider**
3. **Bend**
4. **Offset**
5. **440Hz**
6. **Eq.T**
7. **Octave**
8. **Detune Type**
9. **Coarse det**
10. **Frequency Env, Stock + Enable**
11. **Frequency LFO, Stock + Enable**
12. **Voice Oscillator**

**1. Detune.** Voice Parameters Detune. Shows the value selected by the frequency slider.

**2. FREQUENCY slider.** Frequency Slider. Provides fine detune, in cents. Note that 35 cents is roughly one-third of a semitone.

Values: `-35.00 to 35.00, 0*`

**3. Bend.** Bend. It modifies the pitch bend control. It is possible to make the pitch bend control work in the opposite direction.

**4. Offset.** Offset. It shifts the overall pitch of the engine (up or down) relative to the rest of the engines.

**5. 440Hz.** 440 Hz Selection. Fixes the voice base frequency to 440 Hz. One can adjust this with the detune settings. No matter what key is played on the keyboard, this voice will emit only 440 Hz. This is useful for defining a constant frequency to use as a modulator for the other voices in the part. For example, one can define voice 1 to be a tone, then define voice 2 to be 440 Hz. The two voices will mix, but only voice 1 will change frequencies as different keys are played.

Values: `Off*, On`

**6. Eq.T.** Equal Temperament This item is enabled only if the **440Hz** check-box is enabled. If this is greater than zero it modifies the effect of the 440Hz checkbox. The A4 key remains at 440Hz, but the frequency of the other keys vary according to the key pressed. When set to the middle of the value range (64), the step size is exactly like the classical equal temperament, i.e. one note step for one semitone and 12 steps will double the frequency.

Values: `0 to 127`

**7. Octave.** Voice Parameters Octave.

Values: `-8 to 7, 0*`

**8. Detune Type.** Detune Type.

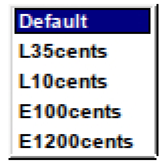



Figure 128: Frequency Detune Type

Values: `Default*, L35cents, L10cents, E100cents, E1200cents`

**9. Coarse det.** Coarse Detune.

Values: `-64 to 63, 0*`

**10. Frequency Env, Stock + Enable.** Frequency Envelope. See Section 8.6.4 "Envelope Settings, Frequency" on page 109.

**11. Frequency LFO, Stock + Enable.** Frequency LFO. See Section 8.5.7 "Frequency LFO Sub-panel" on page 103.

**12. Voice Oscillator.** Voice Parameters Oscillator. See the next section.

### 12.5.4 ADDsynth / Voice Parameters / UNISON

Enabling this item causes the Unison-related items to become activated.

1. **On**
2. **Size**
3. **Frequency Spread**
4. **Ph.rnd**
5. **Stereo**
6. **Vib.**
7. **V.speed**
8. **Invert**

**1. On.** Enables or disables unison. When disabled the size is always set at 2.

Values: `Off*, On`

**2. Unison Size.** Sets the number of unison sub-voices.

Values: `2* to 50`

**3. Unison Frequency Spread.** Frequency spread of the unison (cents).

Values: `0 to 200, 44.6*`

**4. Phase Randomness.** Unison Phase Randomness.

Values: `0 to 127*`

**5. Stereo Spread.** Unison Stereo Spread.

Values: `0 to 127, 64*`

**6. Unison Vibrato.** Unison Vibrato.

Values: `0 to 127, 64*`

**7. Vibrato Speed.** Unison Vibrato Average Speed.

Values: `0 to 127, 64*`

**8. Phase Invert.** Unison Phase Invert. Values: `None*, Random, 50%, 33%, 25%, 20%`

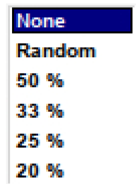



Figure 129: Unison Phase Invert Dropdown

### 12.5.5 ADDsynth / Voice Parameters / Voice Oscillator

The ADDsynth Voice Oscillator panel is tucked in the lower left side of the ADDSynth Voice Parameters editor.

1. **Voice**
2. **Sound**
3. **Waveform graph**
4. **Use**
5. **Waveform** (was Change)
6. **Phase**
7. **C**
8. **P**
9. **Close**

**1. Source.** ADDSynth Voice Import. Selects whether to import a lower-numbered voice as oscillator for this voice, or to generate a local voice. All parameters from the imported voice remain in effect, except for volume, panning, base frequency and pitch bend scaling factor. The voice is also converted to mono. Parameters in the current voice will then tweak the signal further.

**2. Sound.** ADDSynth Oscillator Type (sound/noise). Sound/Noise choice. Select the mode of the oscillator (sound versus white noise).

Values: `Sound* (green), Noise (black), Noise (pink), Noise (cyan)`

The noise types are, respectively, white noise, pink noise, and spot noise, as explained below.


Figure 130: Voice Oscillator Choices

**3. Waveform graph.** Waveform Graph. Shows a period of the currently configured oscillator.

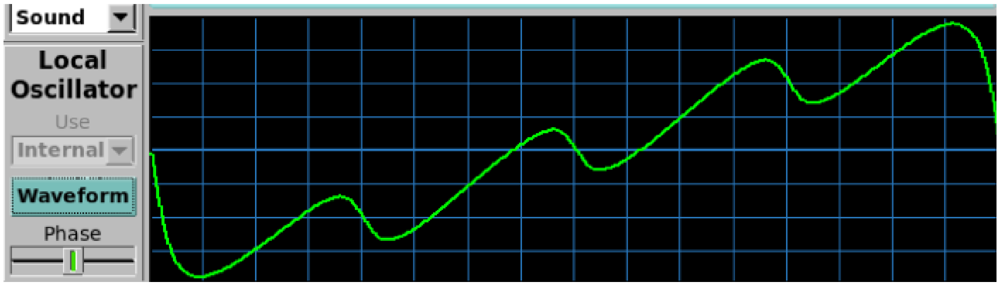



Figure 131: Oscillator in ADDSynth Voice

If white **Noise** is selected, then the waveform graph simply announces "White Noise". Also, the **Unison, Frequency, Modulator** controls are all disabled.


Figure 132: White Noise in ADDSynth Voice

If the pink **Noise** entry is selected, then the waveform graph simply announces "Pink Noise". Also, the **Unison, Frequency, Modulator** controls are all disabled.


Figure 133: Pink Noise in ADDSynth Voice

If the cyan (spot) **Noise** entry is selected, then the waveform graph simply announces "Spot Noise". Also, the **Unison, Frequency, Modulator** controls are all disabled. Spot noise is based on white noise but has a very broken sound. Combined with envelope shaping this is useful for adding 'grit' or sizzle, particularly for percussion.


Figure 134: Spot Noise in ADDSynth Voice

**4. Use (oscillator).** Use Oscillator. If the **Current Voice** is set to a value greater than 1, meaning that one is editing additional voices, then this dropdown item also includes the values of all oscillators less than this one, marked as "Voice n", where "n" is the voice number. For example, if one is currently editing current voice 3, then the dropdown list includes **Internal**, **Voice 1**, and **Voice 2**.

Unlike Source, using an oscillator from a different voice only imports the waveform, not any other parameters.

Values: `Internal*, Other oscillators ("Voice n")`

**5. Waveform.** ADDSynth Voice Oscillator Waveform. This button brings up the ADDsynth Oscillator Editor dialog. This dialog is described elsewhere; it used to be called **Change**.

**6. Phase.** Voice Oscillator Phase.

Values: `-90, 0*, 88.6 (degrees)`

#### 12.5.6 ADDsynth / Voice Parameters / MODULATOR

1. **Type:**
2. **Modulator Source**
3. **Mod AMPLITUDE**
4. **Mod FREQUENCY**
5. **Local Oscillator**

**1. Type:.** ADDsynth Modulator Type.


Figure 135: Voice Modulator Type

1. **OFF**. This setting turns off the modulator.
2. **MORPH** The morph modulator works by combining the output of the voice oscillator and the modulator oscillator into one sound, with the amplitude envelope translating between one waveform and the other. It is important that the amplitude envelope is enabled, otherwise no movement between the voice and modulation oscillators will happen. Instead there will be a static mix of them dependent on the Volume and Velocity controls.

3. **RING** The ring modulator is useful for making bell-like sounds and some weird effects. The ring modulator works by multiplying two waveforms together, producing a signal that possesses the sum and difference of the frequencies present in the waveforms. The ins-and-outs of the ring modulator are explained in detail in paragraph 12.5.6.1 "Tip: Using the Ring Modulator" on page 175.
4. **PM** The PM (phase modulation) modulator works by using a modulator envelope to change the phase of the voice oscillator. It produces a similar effect to frequency modulation. Generally, set **F.Damp** to zero, so that the modulation amount doesn't depend on the note number.
5. **FM** The (frequency modulation) morph modulator works by modulating the frequency. Examples can be heard in the "Ethereal" and "Steel Wire" instruments.
6. **PWM** The pulse width modulator works by pulse-width modulation.

Values: `OFF, MORPH, RING, PM, FM, PWM`

**2. Modulator Source.** AddSynth Modulator Source. Use another voice as a modulator instead of the modulator of the internal voice. One can make a "modulation stack". All parameters from the imported voice remain in effect, except for volume, panning, base frequency and pitch bend scaling factor. The voice is also converted to mono. Parameters in the current voice will then tweak the modulator further. One can only select Local (i.e. Internal), or one from a lower numbered voice.

This feature allows one of the voices (of the up to 8 allowed in a single ADDsynth instrument) to be used as a modulator or external oscillator for another voice in the instrument. Note that the voice must be one with a number *below* the current voice. It's important to understand that oscillators always exist even if not used. This option specifies to use the oscillator of another voice or the *local* oscillator.

Values: `Local*, "Mod n"`

The parameters must be lower than the voice index; one cannot use the oscillator from a voice with a bigger index (e.g. one can't use the oscillator of voice 8 for voice 4). This is very useful because, if one uses many voices with the same oscillator settings, one can use only one oscillator and select other voices to use this, and if one changes a parameter of this oscillator, all voices using this oscillator will be affected.

If one sets up voice 2 as a square wave, and voice 1 as a triangle wave, then sets voice 3 to voice 2, voice 3 will get a square wave.

If one then sets voice 2 to voice 1, voice 2 will get a triangle wave but voice 3 will still get a square wave.

Voice 3 can use the oscillator from voice 1, *even if voice 1 is switched off*.

Modulator 3 can use the oscillator from modulator 1, even if modulator 1 is switched off, but modulator 3 can't use voice 1 if voice 1 is switched off.

However, if voice 2 is using the oscillator from voice 1, and modulator 3 is using voice 2, it will still get voice 2 oscillator.

When a voice or modulator is pointed to another voice/modulator, the oscillator window will show the waveform of the actual source, and all the controls will change this, not the internal oscillator.

**Local**. Uses the local (internal) oscillator as the modulator of another voice.

Values: `Local*, Other voice numbers`

**3. Mod AMPLITUDE.** Modulator Amplitude.

1. **Vol** Volume. Values: `0 to 127, 90*`
2. **V.Sns** Velocity Sensing Function; set to rightmost/max to disable. Values: `0 to 127, 64*`
3. **F.Damp** Modulator Damp at higher frequency. How the modulator intensity is lowered according to lower/higher note frequencies. Values: `0 to 127, 90*`

4. **Amplitude Env, Stock + Enable** See Section 8.6.1 "Amplitude Envelope Sub-Panel" on page 105.

**4. Mod FREQUENCY.** Modulator Frequency.

1. **Follow voice** Applies all detuning in the main voice oscillator to the modulator as well. If turned off, the modulator will be completely unaffected by all detuning in the main voice oscillator, including detuned unison voices.
2. **440Hz** Use 440Hz as base frequency for the modulator.
3. **Detune slider** Fine Detune (cents). Values: `-35.00 to 35.00, 0*`
4. **Detune Type** Fine Detune (cents). Values: `L35cents, L10cents, E100cents, E1200cents` See Figure 126 "ADDsynth Frequency Detune Type" on page 165.
5. **Octave** Octave. Values: `-8 to 7, 0*`
6. **Coarse Det.** Coarse Detune. Values: `-64 to 63, 0*`
7. **Frequency Env, Stock + Enable** See Section 8.6.4 "Envelope Settings, Frequency" on page 109.

**5. Local Oscillator.** Local Oscillator. Provides the modulator for the oscillator. This value must indicate a modulator from a voice with a number less than the current voice. Entries are greyed out for Voice 1, as there is no lower-numbered voice available for modulation.

Values: `Internal*, "Mod n"`

1. **Waveform** ADDsynth Oscillator Editor.
2. **Use** Oscillator to Use. See the paragraph below. Values: `Internal*, (Available Others)`
3. **Phase** Oscillator Phase.
   Values: `-90, 0*, 88.6 (degrees)`
4. **Waveform graph** Waveform graph.

One has the choice between **Internal**, which in this case means a completely independent modulator oscillator per voice (extra waveform button), or **Mod. (n)**, which refers to the modulation oscillators one has already defined for the voices with a lower index. The voice of lower index doesn't need to be enabled in order to be used as a modulator. This means one can make one modulation oscillator for voice 1, and reuse it in voices 2 and 3. This is the same system used for the normal (voice) oscillators.

#### 12.5.6.1 Tip: Using the Ring Modulator

This section is derived from one of the short text files in the *Yoshimi* source-code bundle ([19] or [20]). It notes that "Some people have been confused about how to use an 'external' Mod Oscillator", and provides usage notes that we will elaborate on here. Here is the way to use the ring modulator:

1. Open the ADDsynth editing window. Then open **Show Voice Parameters**.
2. For **Type**, select the **RING** value. This selection will activate the **Mod Oscillator**.
3. In the **Local Oscillator**, click on **Waveform** to open the **ADDsynth Oscillator Editor**.
4. Set the wave-shape to **Triangle**.
5. Switch to voice number 2 and enable it.
6. Again, for **Type**, select the **RING** value. However, feel free to select one of the other modulators, if one wishes.
7. One can now use **Internal** for voice 2, or select **Voice** 1, to use the first voice as in internal modulator.
8. Change the internal voice to, for example, **Square**.
9. Do the same setup for voice 3. One will find that one can use its **Internal** or either of the two previous ones.

Now the joker in the pack is that one can disable both the previous voices but *still* use their Mod Oscillators.

In a newsgroup ([14], the following note is found.

> Say I want the A tone ring-modulated by 880Hz. A is 440 Hz, the ring modulation setting lets me choose the modulation frequency relative to the frequency of the tone. So I choose octave 1 and let the detune at zero. If I move the detune, it'll shift the modulation frequency a bit, which will make a disharmonic effect.
>
> Wet/dry setting is controlled by volume in "modulation amplitude". The modulation frequency can further be multiplied or several modulations can be simulated by changing the oscillator waveform.
>
> One huge letdown is that it is only available for Adsynth. PadSynth does not seem to have ring modulation option, so the coolest sounds stay out of question for massive lead tones. :-(

We have provided a more useful "tutorial" on using the ring modulator in the *Yoshimi Cookbook* [4] document.

Finally, at the bottom of the ADDsynth Voice Part dialog, (under the Modulator section, we find the last few controls.

1. **C.** Opens the Copy window with "AddSynth Voice" as the type.
2. **P.** Opens the Paste window with "AddSynth Voice" as the type.
3. **Close.** Close.

## 12.6 ADDsynth / Voice List

The ADDsynth Voices List shows a summary of voices 1 to 8, and allows some overall control of them, almost like a simple mixer. It is brought on-screen via the **Show Voice List** button of the ADDsynth global part editor. It is fully in sync with the voice windows.


Figure 136: ADDsynth Voices List

1. **No. (1 to 8)**
2. **Edit**
3. **Wave**
4. **Mod**
5. **Vol**
6. **Pan**
7. **Res**

8. **Detune Value**
9. **Detune**
10. **Vibrato Depth**
11. **Close**

**1. No. (1 to 8).** Voice List Number. This check-box enables or disables a given voice in the current part.

Values: `Off, On`

**2. Edit.** ADDSynth Voice List Edit Button. This button brings up the appropriate ADDSynth Voice dialog so that the waveform can be easily brought up for modification.

**3. Wave Icon.** Waveform Icon. The waveform icon shows a rough rendering of the actual shape of the voice waveform, or the letter **N** if the voice is constructed from white noise, or the letters **O** or **V** followed by a number if the voice is using an external oscillator or voice input, respectively. Note that this picture isn't updated if the voice is edited, until the voice list is closed and reopened.

**4. Modulation Icon.** Modulation Icon. The modulation icon shows a rough rendering of the actual shape of the voice modulation, or the letters **M** or **V** followed by a number if the voice is using an external modulator oscillator or voice input, respectively. Note that this picture isn't updated if the voice is edited, until the voice list is closed and reopened.

**5. Vol.** Voice Volume. This slider controls the relative volume of a given voice in the current part.

Values: `0 to 127, 100*`

**6. Pan.** Voice Panning (0/leftmost is Random). This slider controls the panning of a given voice in the current part.

Values: `0 to 127, 64*`

**7. Res.** Resonance On/Off. Enable/disable the resonance effect of a voice. Note that the resonance is configured by the Resonance dialog brought up by the **Resonance** button at the bottom of the ADDsynth main dialog. The resonance dialog has its own global Enable button, but this one is provided so individual voices can bypass the resonance filter.

Values: `Off, On*`

**8. Detune Value.** This read-only text-box shows the current value of detune as selected by its slider.

**9. Detune.** Fine Detune (cents).

Values: `-35 to 35, 0*`

**10. Vibrato Depth.** Frequency LFO Amount/Depth. This setting can be very useful because, with the detune settings, one can create very good sounding instruments.

Values: `0 to 127, 40*`

**11. Close.** A Close button.

## 12.7 ADDsynth / Oscillator

Pressing the **Waveform** button in the ADDsynth voice-editor dialog brings up a very complex dialog for modifying the harmonics of the voice.

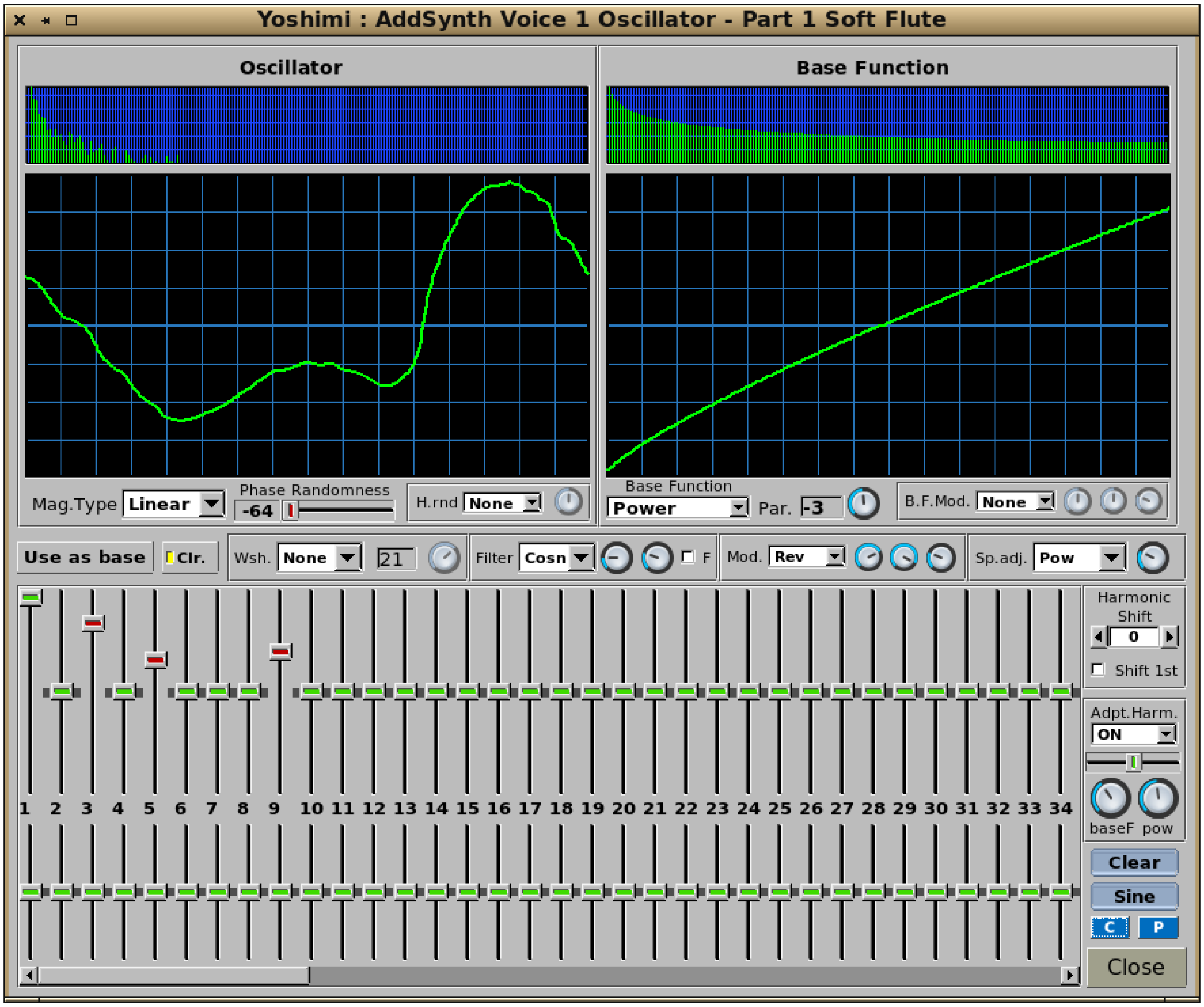



Figure 137: ADDsynth Oscillator Editor

This item is nearly identical to the PADsynth harmonic editor depicted in Figure 155 "Harmonic Content Editor" on page 192, except for the items noted below. Obviously, it is a topic unto itself!

1. **Oscillator Spectrum Graph**
2. **Oscillator Waveform Graph**
3. **Mag.Type**
4. **Phase Randomness** (ADDsynth Oscillator Editor only)
5. **H.rnd** (ADDsynth Oscillator Editor only)
6. **H.rnd knob** (ADDsynth Oscillator Editor only)

**1. Oscillator Spectrum Graph.** Oscillator Spectrum Graph. This graph shows the spectrum of the oscillator as a series of vertical lines, a kind of frequency histogram.

**2. Oscillator Waveform Graph.** Oscillator Waveform Graph. This graph shows the temporal waveform of the oscillator.

**3. Mag.Type.** Oscillator Magnitude Type. Sets how the magnitudes from the user interface behave. See the values below.

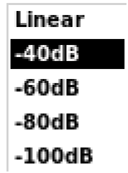



Figure 138: ADDsynth Oscillator Magnitude Type

**4. Phase Randomness.** Phase Randomness. Sets the randomness of the oscillator phase which is settable from -64 (-90 deg) to 63 (+90 deg).

**5. H.rnd.** Harmonic Amplitude Randomness. Enables the feature and sets the 'law' for the way randomness is applied.

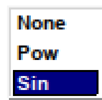



Figure 139: ADDsynth Oscillator Harmonic Randomness Selections

Values: `None, Pow, and Sin`

**6. H.rnd knob.** Harmonic Amplitude Randomness Knob. Adjusts the amount of randomness applied to the amplitudes of individual harmonics.

Values: `0 to 127, 64*`

## 12.8 ADDsynth / Voice Warning

As of V 1.5.11 there is a warning about editing waveforms.

When editing an AddSynth voice that is taking its waveform from another one the 'Waveform' text turns blue as a warning. However when actually entering the waveform window itself, until now there was no indication that one was likely to change a shared oscillator. This is put right since V 1.5.11 and it also applies to modulator waveforms.

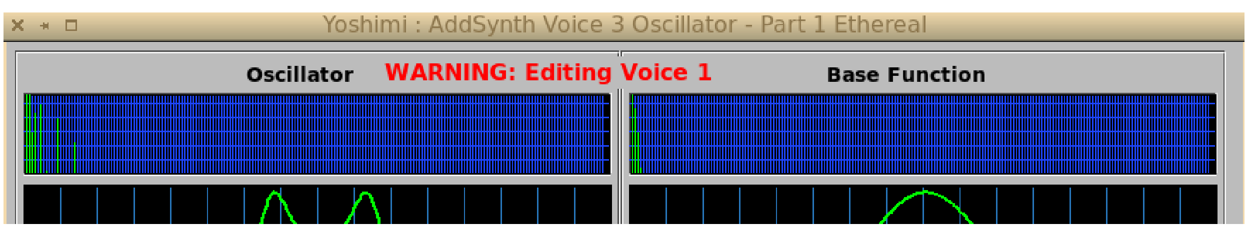



Figure 140: Warning in ADDSynth Oscillator

As can be seen, not only does one see the warning, but also exactly which voice (or modulator) is being edited.

# 13 PADsynth

The *Yoshimi* PADsynth dialog is a complex dialog for creating a pad instrument, "PADsynth" or "PADnote" is an engine that makes very beautiful pads and other instruments. (These instruments can be exported for use with other programs too).

The PadSynth engine was designed by Paul Nasca and to the best of our knowledge there is no comparable type generally available. It starts with a waveform that is virtually identical to the one used by AddSynth. However, each harmonic of this waveform is then widened and shifted and blurred, by rendering it with a harmonic profile (frequency distribution). The resulting sound is similar to granular synthesis, but can be generated very efficiently from a set of perfectly looping wavetables. These wavetables need to be precomputed after a change, so none of the harmonic profile controls are real-time. Also, it is the wavetables that are called for actual sound generation after passing through the usual envelope controls (and this part of sound generation does work real-time).

The PADsynth dialog consists of two major tabs, **Harmonic Structure** and **EnvelopesLFOs**. Each of these tabs is complex, so the discussion will break the tabs down by sub-sections.

There is extra protection for a really huge PadSynth engine (that can potentially take tens of seconds to complete). For that time, any attempt to alter the part that contains the one that's updating will not accept any other changes, and will give the warning: `Part n busy`.

## 13.1 PADsynth / Algorithm

The complexity of the PADsynth dialog reflects the complexity of the PADsynth algorithms themselves.

### 13.1.1 PADsynth / Algorithm / General

The PADsynth algorithm generates very beautiful sounds, even if its idea is much simpler than other algorithms. It generates a perfectly looped wave-table sample which can be used in instruments. It easily generates sounds of ensembles, choirs, metallic sounds (bells) and many other types of sound. Paul Nasca wanted to make this algorithm known, and everyone is welcome to learn and use this algorithm in one's projects or products (non-commercial or commercial).

Quote [27]:

> You will not be disappointed by this algorithm.
>
> I hope that this algorithm will be implemented in many software/hardware synthesizers. Use it, spread it, write about it, create beautiful instruments with it. If your synthesizer uses plenty of samples, you can use this algorithm to generate many ready-to-use samples.
>
> This algorithm, this page, the images, the implementations from this page, the audio examples, the parameter files from this page are released under Public Domain by Nasca Octavian Paul. e-mail: zynaddsubfx AT yahoo DOT com

In order to understand how this algorithm works, one needs to be familiar with how to think about musical instruments. Please read an introduction for the description of the meaning and the importance of bandwidth of each harmonic and randomness.

This algorithm generates some large wave-tables that can be played at different speeds to get the desired sound. This algorithm describes only how these wave-tables are generated. The result is a perfectly looped wave-table. Unlike other synthesis methods, which use the Inverse Fast Fourier Transform, this one does not use overlap/add methods and there is only one IFFT for the whole sample.

The basic steps are:

1. Make a very large array that represents the amplitude spectrum of the sound (all default values are zero).
2. Generate the distribution of each harmonic in the frequency spectrum and add it to the array.
3. Put random phases to each frequency of the spectrum.
4. Do a single Inverse Fourier Transform of the whole spectrum. There is no need of any overlapping windows, because there is only one single IFFT for the whole sample.

The output is a sample which can be used as a wave-table.

#### 13.1.2 PADsynth / Algorithm / Harmonic Bandwidth

We consider one harmonic (overtone) as being composed of many frequencies. These sine components of one harmonic are spread over a certain band of frequencies. Higher harmonics have a wider bandwidth. In natural choirs/ensembles the bandwidth is proportional to the frequency of the harmonic.

The harmonics become wider and wider, until a certain frequency, where they may merge into a noise band. This is quite normal and we recommend not suppressing this by limiting the bandwidth of the harmonics.

This describes the function of the spread of the harmonic. Here are some examples of how they can be spread:

1. A special case is where there is only a single sine component inside the harmonic In this case, the harmonic and the "sine component" are the same thing.
2. Detuned. In this case there are two sine components which are detuned.
3. Evenly spread inside the harmonic (all components have the same amplitude)
4. Normal (Gaussian) distribution. The sine components amplitude are bell-shaped. The largest amplitude is in the center of the band. This distribution gives the most natural sounds (it simulates a very, very large ensemble).

Of course, one can use many other profiles of the harmonic. *Yoshimi*'s PADsynth module offers many ways to generate the harmonic profile. Also, it's very important that the harmonic must have the same amplitude, regardless of the profile functions/parameters and the bandwidth. For many more details of this algorithm, see Paul Nasca's document [27].

##### 13.1.2.1 Tip: Using the PADsynth

Keep in mind that the resulting wave-tables are perfectly looped. There are some sound-generation ideas to keep in mind:

1. When using the wave-tables for instruments, on each Note On, start from a random position and not from the start. This avoids hearing the same sound on each keystroke.
2. One can use the same wave-table for generating stereo sounds, by playing the same wave-table at different positions for left and right. The best method is to create a difference between left and right of N/2.
3. Generate different wave-tables for different pitches and use the one that is closest to the desired pitch.
4. Upsample or downsample the amplitude array of the harmonic before running the algorithm, according to the fundamental frequency. In this case we need to set a parameter "base_frequency" which represents the frequency where the array is left unchanged.

Example: We have A_orig[]=1,2,1,3,0,0,1,0 and base_frequency is equal to 440 Hz Here are some cases:

A[] for 440 Hz: is the same as A_orig[]

A[] for 220 Hz: is the A_orig[] upsampled by factor of 2

so: A[]=1, 1, 1.5, 2, 1.5, 1, 2, 3, 1.5, 0, 0, 0, 0.5, 1, 0.5, 0

(the original A_orig amplitudes are shown as bold)

A[] for 880 Hz: the A_orig[] is downsampled by a factor of 2

so: A[]=1.5, 2, 0, 0.5

A[] for F Hz: the A_orig[] is scaled by a factor of 440/F.

Even if this idea is very simple, the resulting sounds are very natural, because it keeps the spectrum constant according to the frequency of the harmonic and not to the number of the harmonics. This follows from the document where Paul Nasca describes some principles regarding synthesis.

## 13.2 PADsynth / Harmonic Structure

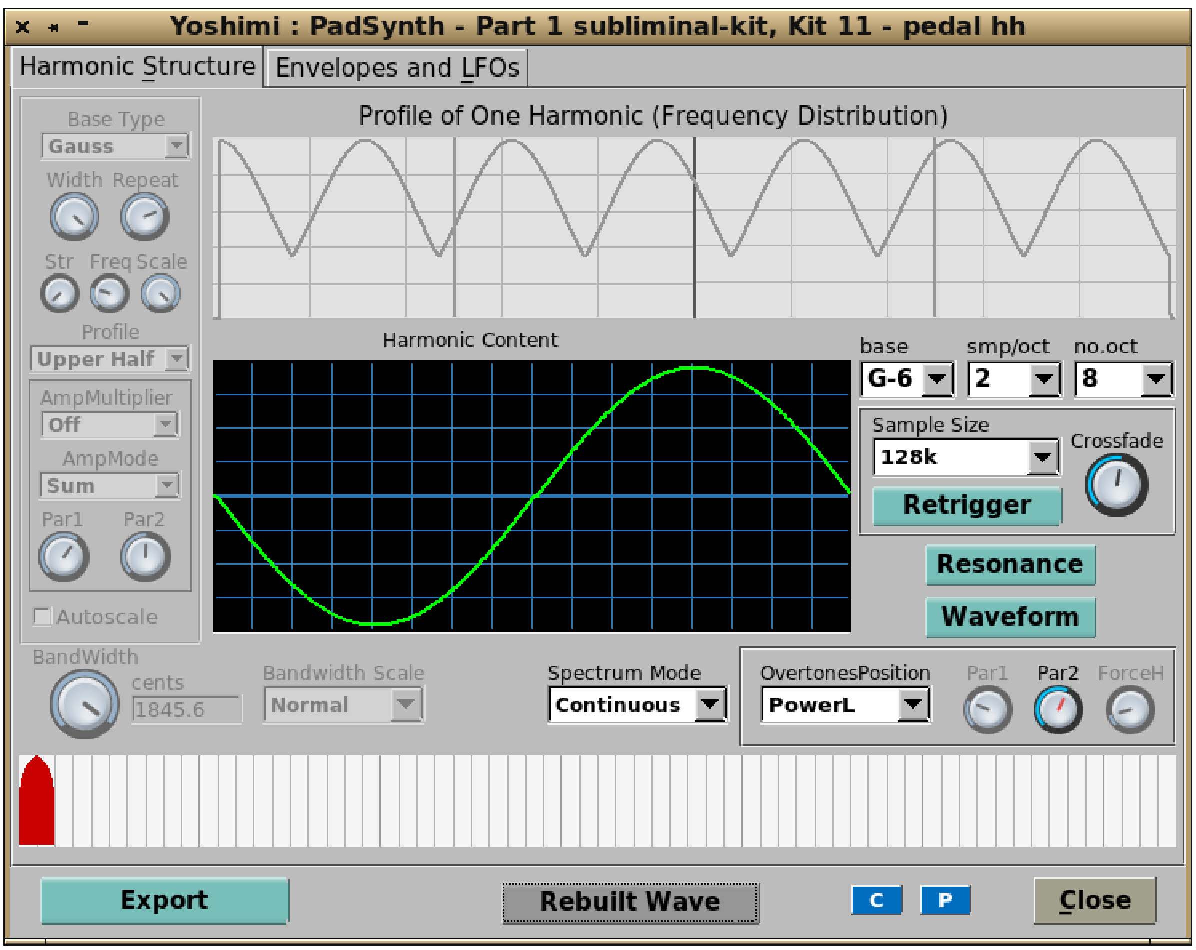



Figure 141: PADsynth Edit Dialog

Note how, in the newer versions of *Yoshimi*, the part number and part name are part of the window caption. There are a lot of parameter sections to keep track of, and to describe.

1. **Basics** (section)
2. **Harmonic** (section)
3. **Resonance** (section)
4. **Waveform** (section)
5. **Bandwidth and Position** (section)
6. **Export** (section)
7. **C**
8. **P**
9. **Apply Changes**
10. **Close**

Some of these elements have their own sections devoted to them, below.

### 13.2.1 PADsynth / Harmonic Structure / Basics

1. **Base Type**
2. **Width**
3. **Repeat**
4. **Str**
5. **Freq**
6. **Scale**
7. **Profile**
8. **AmpMultiplier**
9. **AmpMode**
10. **Par1**
11. **Par2**

**1. Base Type.** Base Type of the Harmonic. This is the base shape used to widen and spread each harmonic: gauss, square, or double explonential.

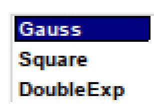



Figure 142: Base Type of Harmonic

Values: `Gauss*, Square, DoubleExp`

**2. Width.** Width of harmonic, the spread of a single peak within the profile. The lowest value yields a very thin **Profile of One Harmonic (Frequency Distribution)** waveform, pretty close to a Dirac delta function (in this case, pretty close to a sine wave). The highest value yields a broadband spectrum, almost a flat spectrum, but it has a hump around the center frequency.

Values: `0 to 127`

**3. Repeat.** Spectrum Multiplier. Increasing this value causes more and more repetitions of the harmonic spectrum frequency distribution to appear. A value of 127 yields 32 repetitions of the spectrum.

Values: `0 to 127`

**4. Str.** Stretch. Modulate and spread the base shape, thereby creating several side bands with frequency shifted slightly above/below the center; side bands create a chorus like quality. Increasing it adds harmonics to the spectrum and alters the distribution of their levels.

Values: `0 to 127`

**5. Freq.** Frequency Multiplier. Increasing this value causes more and more repetitions of the harmonic spectrum frequency distribution to appear. This increases the energy of the sidebands. A value of 127 yields 32 repetitions of the spectrum.

Values: `0 to 127`

**6. Scale.** Harmonic Scale. The profile as a whole can be stretched or squeezed by this parameter. Note: when AutoScale is on, the effect of this parameter is almost completely compensated. Increasing it tightens up the spread of harmonics.

Values: `0 to 127`

**7. Profile.** Harmonic Sidebands. These menu entries select the full spectrum, or filter in only the upper sidebands of the spectrum, or the lower sidebands.

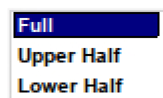



Figure 143: PADsynth Full/Upper/Lower Harmonics

Values: `Full*, Upper Half, Lower Half`

**8. AmpMultiplier.** Amplitude Multiplier. Apply a secondary modulation on top of the profile built thus far; the modulating shape can be a bell function (gauss), a sine wave, or just a plateau in the center (flat). These values spread out the frequency components in various ways.

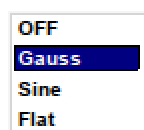



Figure 144: PADsynth Amplitude Multiplier

Values: `OFF*, Gauss, Sine, Flat`

**9. AmpMode.** Amplitude Mode. The way this secondary modulation is worked into the profile.

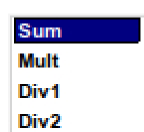



Figure 145: PADsynth Amplitude Mode

Values: `Sum*, Mult, Div1, Div2`

- **Sum**. A linear blend between the secondary modulator, and the original profile; the fade is controlled by par2
- **Multiply**. The profile is filtered by (multiplied with) the modulator; the strength of filtering is controlled by par2
- **Div1**. The profile is divided by the modulator — where the latter is strong, the profile is damped

- **Div2**. The modulator is divided by the profile, i.e. the profile is carved out of the modulator shape

**10. Par1.** Harmonic Parameter 1. Squeeze or spread the secondary modulating shape. Increasing this parameter narrows the width of the central spectral component.

Values: `0 to 127`

**11. Par2.** Harmonic Parameter 2. Controls how the secondary modulation is faded or combined with the harmonic profile. Varying this parameter changes the relative amplitude of the central spectral component and the sidebands.

Values: `0 to 127`

### 13.2.2 PADsynth / Harmonic Structure / Harmonic

1. **Profile of One Harmonic**
2. **Harmonic Content Window**
3. **base**
4. **smp/oct**
5. **no.oct**
6. **Sample Size**
7. **Crossfade**
8. **Retrigger** (section)
9. **Resonance** (section)
10. **Waveform** (section)

**1. Profile.** Profile of One Harmonic (Frequency Distribution). Indicates which part of the profile to use: Full (the default), or only the upper half, or only the lower half.

**2. Harmonic Content Window.** Harmonic Content Window.

**3. base.** The note value for the lowest wavetable generated.

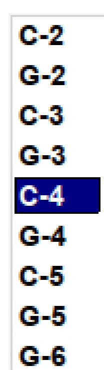



Figure 146: Harmonic Base Dropdown

Values: `C-2, G-2, C-3, G-3, C-4*, G-4, C-5, G-5, G-6`

**4. smp/oct.** Harmonic Samples Per Octave. The number of wavetables generated within each octave.

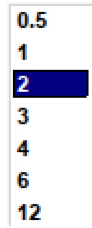



Figure 147: Harmonic Samples Per Octave

**5. no.oct.** Number of Octaves of Harmonic. The number of octaves to cover with dedicated wavetables.


Figure 148: Harmonic Number of Octaves

Values: `1, 2, 3, 4*, 5, 6, 7, 8`

**6. Sample Size.** Harmonic Sample Size. Size of the generated wavetable(s). A large wavetable captures more fine details of the harmonic profile and gives more time until the patterns repeat, but it costs more time to build and it takes up more memory.

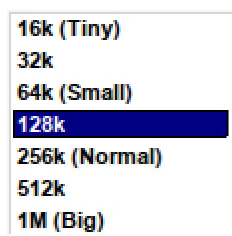



Figure 149: Harmonic Sample Size Dropdown

- **128k** The default value provides 2.6sec of sound at 48kHz sampling rate and requires 1/2 MiB.
- **1M (big)** The largest possible wavetable holds 21sec of sound until repetition, and requires 4 MiB of RAM per table.

Values: `16k (Tiny), 32k, 64k (Small), 128k*, 256k (Normal), 512k, 1M (Big)`

**7. Crossfade.** Wavetable Fade Time. The time it takes to fade from the old wavetable to the new one (for Background and Auto-Apply modes).

Values: `off, 1mS,200mS*, 20S`

### 13.2.3 PADsynth / Harmonic Structure / Bandwidth and Position

1. **BandWidth**
2. **cents**
3. **Bandwidth Scale**
4. **Spectrum Mode**
5. **OvertonesPosition**
6. **Par1**
7. **Par2**
8. **ForceH**
9. **Harmonics Plot**

**1. AutoScale.** AutoScale. Automatically stretches or squeezes the resulting profile, so that all the various profile shapes generate a similar blurring effect. What is taken as *nominal bandwith* is indicated in the profile display by the vertical bars and the dark background. If AutoScale is disabled, this nominal bandwidth is fixed and thus reshaping the profile also increases or decreases the actual spread.

**2. BandWidth.** Harmonics Bandwidth. This is the most important control, and defines the effective Bandwidth of the harmonic profile in cents. By increasing this value, the sound transitions gradually from the precise waveform to a sonic cloud.

Values: `0 to 127`

**3. cents.** Bandwidth Reading (cents).

**4. Bandwidth Scale.** Bandwidth Scale. How the Bandwidth is adjusted with the increasing frequency of each harmonic.

- **Normal**. Bandwith grows with frequency, and thus perceptually the spread is the same on each harmonic.
- **EqualHz**. Bandwidth is constant, independent of frequency. Perceptually this means that the bandwidth on higher harmonics seems to diminish.
- **Quarter, Half, 75%, 150%, Double**. All these setting increase the Bandwith for higher harmonics to various degrees.
- **Inv.Half**. Here the bandwidth is even reduced for higher harmonics by half an octave per octave.

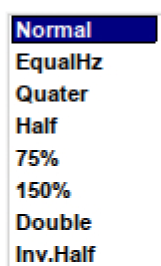



Figure 150: Harmonics Bandwidth Scale.

Values: `Normal, EqualHz, Quarter, Half, 75%, 150%, Double, Inv. Half`

**5. Spectrum Mode.** Harmonics Spectrum Mode.

Spectrum Mode defines the way PadSynth generates the spectrum, which is then rendered into wavetables.


Figure 151: PADsynth Harmonics Spectrum Mode

- **Bandwidth(default)**. Widen each harmonic of the base waveform spectrum with the harmonic profile, by an amount controlled through the bandwidth setting and bandwidth scale.
- **Discrete**. Similar to AddSynth, each harmonic is retained as a sharp line, not using bandwidth and profile, yet the overtones position can still be shifted and unharmonic.
- **Continuous**. Likewise ignoring bandwidth and profile, but this time taken to the other extreme; the outline of all harmonics is connected into a common distribution and thus rendered into a form of coloured noise.

Values: `Bandwidth*, Discrete, Continuous`

**6. OvertonesPosition.** Overtones Position. Since PadSynth re-renders the partials with high resolution, it is possible to shift overtones to non-harmonic positions, to create a wide array of metallic and noisy flavours. For Harmonic there is no control, so the other parameters are inactive. Similarly Par 2 does nothing for Shift so is disabled for that variation.

- **Harmonic (default)**. Overtones are located at exact multiples of the base frequency.
- **Shift**. All overtones are spread towards higher pitches.
- **Power**. Here the spread is guided by a power function and thus increases excessively for higher harmonics; Par2 defines the exponent (i.e. the acceleration).
- **ShiftU / ShiftL**. Par2 defines a threshold, harmonics above are spread or condensed.
- **PowerU**. Par1 defines a turning point, par2 the strength of the effect; harmonics are condensed around the turning point by a power function.
- **PowerL**. Par1 controls a linear blend between the harmonic positions and positions shifed by a power function; harmonics are here spread away from a fixed turning point at the 10-th overtone.
- **Sine**. Harmonics are alternatingly shifted up or down, causing them to cluster; par2 defines the frequency and thus the density of these overtones.

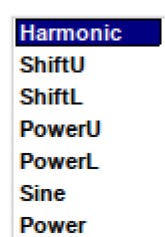



Figure 152: PADsynth Overtones Position

Values: `Harmonic*, ShiftU, ShiftL, PowerU, PowerL, Sine, Power`

**7. Par1.** PADSynth Bandwidth Parameters 1. If the **Overtones Position** drop-down is set to something other than `Harmonic`, then this knob changes the harmonic lines shown in the spectrum view just below this item. It is best to play with this setting and observe and hear the changes it makes.

**8. Par2.** PADSynth Bandwidth Parameters 2. If the **Overtones Position** drop-down is set to something other than `Harmonic`, then this knob changes the harmonic lines shown in the spectrum view (**Harmonics Plot**) just below this item. It is best to play with this setting and observe and hear the changes it makes.

**9. ForceH.** PADSynth Bandwidth ForceH. If the **Overtones Position** drop-down is set to something other than `Harmonic`, then this knob changes the harmonic lines shown in the spectrum view just below this item. It moves the shifted harmonics by a variable amount back towards the nearest actual multiple of the fundamental. This allows one to reduce and fine-tune the actual amount of *noisiness*. It is best to play with this setting and observe and hear the changes it makes.

**10. Harmonics Plot.** PADSynth Harmonics Plot. Shows the position and amplitude of each of the harmonic lines that the settings will generate.

**Apply Changes**. If any of the above controls for the harmonic profile are altered it will be necessary to rebuild the wavetables to hear the effect. Also, be aware that with a very big sample size and/or octave range and samples/octave this could take many seconds to complete. *Yoshimi* provides several modes to handle these PadSynth wavetable builds, which can be configured in the **Global Settings**:

- **Mute**. Build is triggered manually with the Apply button — disable part while wavetable is assembled. This is the legacy mode and should be used if the other modes cause audible clicks.
- **Background(default)**. Build triggered manually — continue using old wavetables while building the new ones in the background; smooth transition with crossfade when ready.
- **Auto-Apply**. Automatically launch a wavetable build whenever a parameter is changed, then crossfade when ready.

### 13.2.4 PADsynth / Harmonic Structure / Export

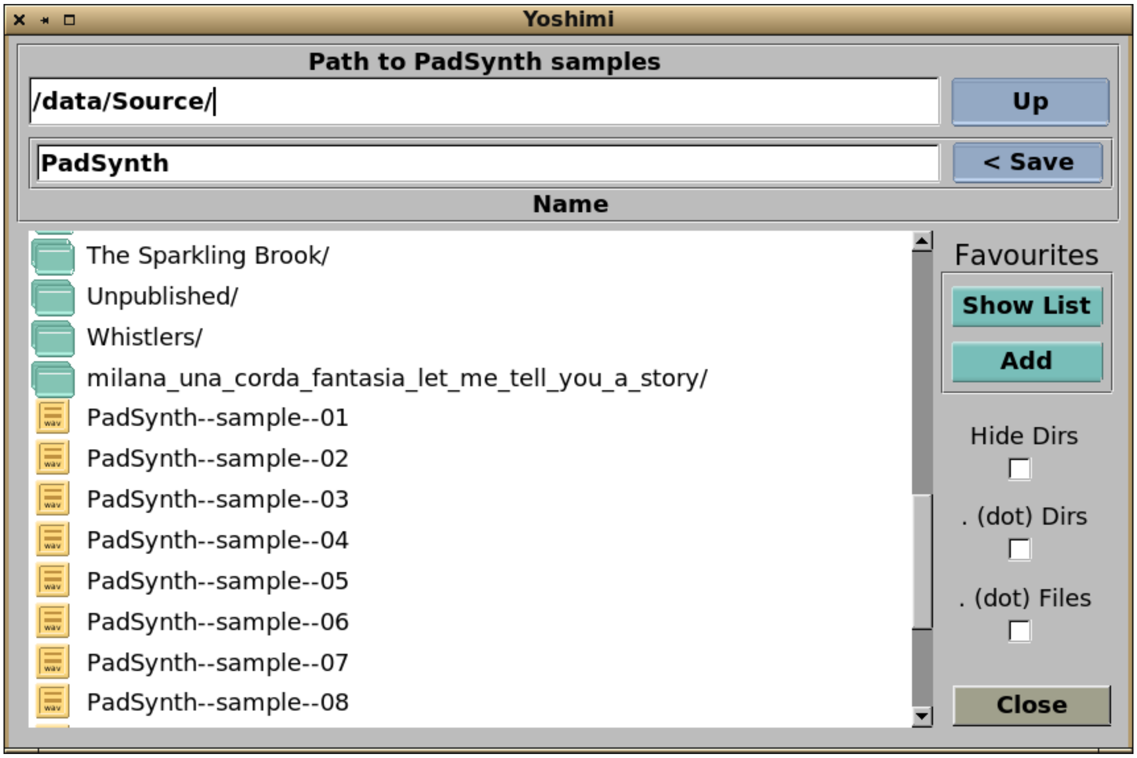



Figure 153: Harmonics Structure Export Dialog

This export dialog is a file dialog similar to other file dialogs in *Yoshimi*. It is a filer window for exporting a complete wavetable with the total number of samples one has currently set. These don't include any changes in the sound produced by controls in the envelopes window.

This view shows the directory after the samples have been exported.

### 13.2.5 PADsynth / Harmonic Structure / Retrigger

This button opens a window for Random regeneration of the wavetable.

The sound from PadSynth can be soft and scintillating, yet after playing some time, one will notice recurring patterns. This is due to the fixed wavetables, which are built once and then looped for performance reasons. However, each new set of wavetables will re-shuffle the phase information randomly, and so we'll get a completely new patterning, whenever building all wavetables from scratch. This is an expensive operation, but fortunately it suffices to do it occasionally.


Figure 154: Random Walk Editor

1. **Retrigger**
2. **Detune**
3. **Filter Freq**
4. **Bandwidth**
5. **Line Width**
6. **Profile Stretch**

**1. Retrigger.** The sample time before recomputing, from 200ms to 60sec. Zero (left) disables retriggering completely.

At the above times the settings of the following controls will be read. They each randomly change one characteristic of the wavetable by a varable amount between 0 (off) and 599%

**2. Detune.** Slightly change the note pitch

**3. Filter freq.** Nominal frequency of the filter, rsp. vowel position of the formant filter

**4. Bandwidth.** Spread of the harmonic profile

**5. Line Width.** Width of a single peak within the profile

**6. Profile Stretch.** Stretch out and modulate

**Note** This extension to PadSynth is still experimental, and the precise control behaviour and ranges may change following experience and feedback from users.

### 13.2.6 PADsynth / Harmonic Structure / Resonance

This button gives access to an overall Resonance that can be applied to the engine. This dialog, shared in common with the ADDsynth editor, is a stock user-interface element described in Section 8.4 "Stock Resonance Settings" on page 95.

### 13.2.7 PADsynth / Harmonic Structure / Waveform

The **Waveform** button brings up the Harmonic Content editor, which is another complex dialog. Like Figure 137 "ADDsynth Oscillator Editor" on page 178, it allows one to create an essentially unlimited number of oscillators. It is a highly detailed waveshape editor, which is identical to the one available in AddSynth — with the exception of the phase control on individual partials; PadSynth ignores these and always picks completely random phases, whenever building a new wavetable. Note also that one can copy and paste the entire settings of this waveform editor between AddSynth and PadSynth; one may create a clear and pronounced sound with AddSynth and then take it into PadSynth to soften, spread and blur it, while retaining its character.

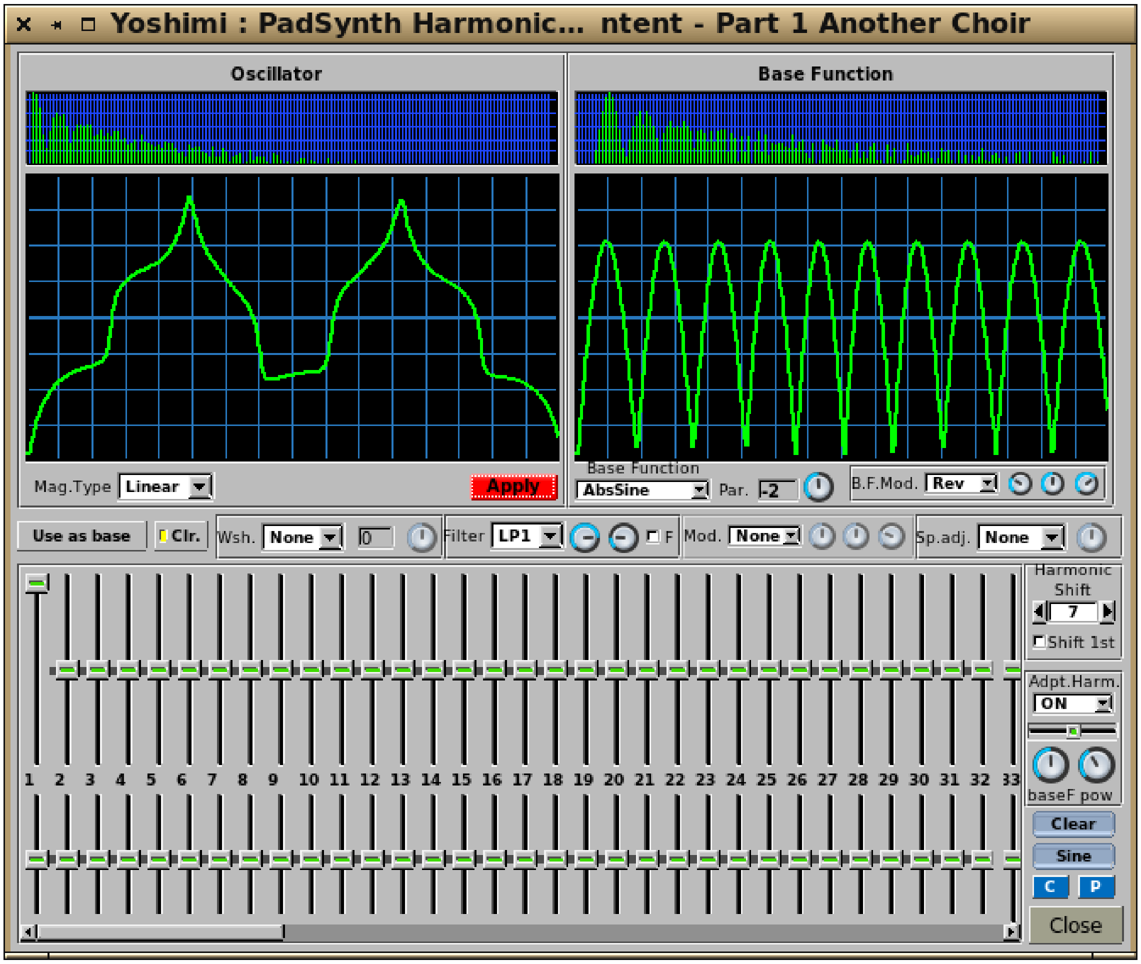



Figure 155: Harmonic Content Editor

This dialog is complex enough that it makes sense to break it down into sub-sections.

1. **Oscillator** (section)
2. **Base Function** (section)
3. **Middle** (section)
4. **Harmonic** (section)

#### 13.2.7.1 PADsynth / Harmonic Structure / Waveform / Oscillator

1. **Oscillator Spectrum Graph**
2. **Oscillator Waveform Graph**
3. **Mag.Type**
4. **Apply**

**1. Oscillator Spectrum Graph.** Oscillator Spectrum Graph. This graph shows the spectrum of the oscillator as a series of vertical lines, a kind of frequency histogram.

**2. Oscillator Waveform Graph.** Oscillator Waveform Graph. This graph shows the temporal waveform of the oscillator.

**3. Mag.Type.** Oscillator Magnitude Type. Sets how the magnitudes from the user interface behave. See the values below.

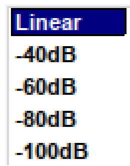



Figure 156: PADsynth Harmonic Content Mag Type

Values: `Linear*, -40dB, -60db, -80dB, -100dB`

**4. Apply.** PADsynth Harmonic Content Editor Apply Button.

**Note:** This is not present in the ADDsynth oscillator. Instead there are two additional controls, as seen with Figure 157 "ADDsynth Oscillator Extras".


Figure 157: ADDsynth Oscillator Extras

**Phase Randomness** changes the relative phase of the overall oscillator and is only really noticeable when there is more than one voice.

**H. rnd** - Harmonic Randomness is very noticeable and (we think) changes the *amplitude* of the harmonics.

#### 13.2.7.2 PADsynth / Harmonic Structure / Waveform / Base Function

1. **Base Func. Spectrum Graph**
2. **Base Func. Waveform Graph**
3. **Base F..**
4. **Par. Value**
5. **Par. Wheel**
6. **B.F.Mod.**
7. **Wheel 1**
8. **Wheel 2**
9. **Wheel 3**

**1. Base Func. Spectrum Graph.** Harmonic Base Function Spectrum Graph.

**2. Base Func. Waveform Graph.** Harmonic Base Function Waveform Graph.

**3. Base F.** Harmonic Base Function. Sets what function to use as the harmonics base function. One can use any base function as harmonics.

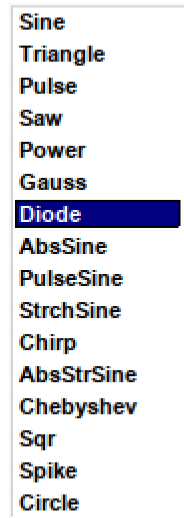



Figure 158: PADsynth Harmonic Content Base Function

Values: `Sine*, Triangle, Pulse, Saw, Power, Gauss, Diode, AbsSine, PulseSine, StrchSine, Chirp, AbsStrSine, Chebyshev, Sqr, Spike, Circle`

**4. Par. Value.** PADsynth Parameter Value.

**5. Par. Wheel.** PADsynth Parameter Wheel. Change the parameter of the base function.

**6. B.F.Mod.** PADSynth Base Frequency Mod. This item is very similar to the Harmonic Editor Modulation (**Mod.**) setting.

Values: `None*, Rev, Sine, Pow`

**7. Wheel 1.** PADsynth Wheel 1. With the **B.F.Mod.** selection set to something other than `None`, this modifies one (unknown at this time) parameter of the modulation selection.

**8. Wheel 2.** PADsynth Wheel 2. With the **B.F.Mod.** selection set to something other than `None`, this modifies one (unknown at this time) parameter of the modulation selection.

**9. Wheel 3.** PADsynth Wheel 3. With the **B.F.Mod.** selection set to something other than `None`, this modifies one (unknown at this time) parameter of the modulation selection.

#### 13.2.7.3 PADsynth / Harmonic Structure / Waveform / Middle

1. **Use as base**
2. **Clr.**
3. **Wsh.**
4. **Wsh Value**
5. **Wsh Wheel**
6. **Filter**
7. **Filter Wheel 1**
8. **Filter Wheel 2**
9. **Filter p**
10. **Mod.**
11. **Mod. Wheel 1**
12. **Mod. Wheel 2**

13. **Mod. Wheel 3**
14. **Sp.adj.**
15. **Sp.adj. Wheel**

**1. Use as base.** Use as Base. Convert the oscillator output to a base function. Changing the Base function or its parameter will erase the converted base function.

**2. Clr.** Clear. Clear the settings and make the oscillator equal to a base function. If this is cleared, one can click the **Use as base** button to make multiple conversions to base functions.

**3. Wsh.** Harmonic Editor Wave-shaping, "W.sh".

Wave shaping function that applies to the oscillator. It has one parameter that fine-tunes the wave-shaping function.

**4. Wsh Value.** Harmonic Editor Wave-shaping Value.

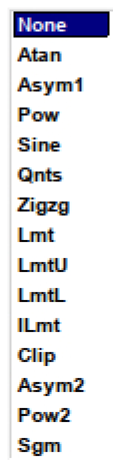



Figure 159: PADsynth Harmonic Content Editor Wave-Shaping Function

Values: `None*, Atan, Asym1, Pow, Sine, Qnts, Zigzg, Lmt, LmtU, LmtL, ILmt, Clip, Asym2, Pow2, Sgm`

The type of wave-shaping distortion has much influence on how the overtones are being placed. Sometimes, one gets a "fat" bass, and sometimes, high frequencies are added, making the sound "crystal clear".

**Atan & Sigmoid**. This is the default setting. It is an easy way to apply loudness to a wave without getting undesired high overtones. Thus, it can be used both for making instruments that sound like "real" ones, but also for electronic music. The transformation turns, roughly said, every amplitude into a square amplitude. Thus, sine, power, pulse and triangle turn into a usual square wave, while a saw turns into a phased square wave. A chirp wave turns into a kind of phase modulated square wave.

**Quants** ("Qnts") Quantisation adds high overtones early. It can be seen as an unnatural effect, which is often used for electronic music. The transformation is a bit similar to building the lower sum of a wave, mathematically said. This means that the transformation effect turns an "endless high" sampled wave into only a few samples. The more distortion one applies, the fewer samples will be used. Indeed, this is equivalent to say that more input amplification is used.

If one turns on quantisation very high, one might be confused that, especially high notes, make no sound. The reason: High frequencies are "forgotten" if one samples with only few samples. Also, the sign of an amplitude can be forgotten. This behaviour might make some quantisations a bit unexpected.

**Limiting** (”Lmt*” and ”Clip”) Limiting usually means that for a signal, the amplitude is modified because it exceeds its maximum value. Overdrive, as often used for guitars, is often achieved by limiting: It happens because an amplifier ”overdrives” the maximum amplitude it can deliver.

*Yoshimi* has two types of limiting. Soft limiting, here as Lmt, means that the sound may not exceed a certain value. If the amplitude does so, it will simply be reduced to the limiting value. The overtones are generated in the lower frequencies first.

Hard limiting, is also called clipping and abbreviated Clip. This means that if the maximum is exceeded, instead of being constant at the limiting value, the original signal still has some influence on the output signal. Still, it does not exceed the limiting value. For *Yoshimi*, a signal exceeding the limiting value will continue to grow ”in the negative”. This leads to overtones being generated on the full frequency band.

**5. Wsh Wheel.** Harmonic Editor Wave-shaping Wheel.

**6. Filter.** Harmonic Editor Filter. Sets the type of the harmonic filter.

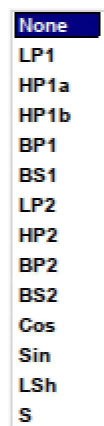



Figure 160: PADsynth Harmonic Content Filter

Values: `None*, LP1, HP1a, HP1b, BP1, BS1, LP2, HP2, BP2, BS2, Cos, Sin, LSh, S`

**7. Filter Wheel 1.** Harmonic Editor Filter, Wheel 1. The knob on the left sets one filter parameter, which is either the cutoff frequency, or, if the filter is a bandpass filter, the lower corner frequency. It is best to play with this knob with various kinds of filters selected from the filter drop-down list.

**8. Filter Wheel 2.** Harmonic Editor Filter, Wheel 2. The knob on the right sets, if the filter is a bandpass filter, the upper corner frequency. It is best to play with this knob with various kinds of filters selected from the filter drop-down list.

**9. Filter p.** Harmonic Editor Filter, p. If set, the filter is applied before waveshaping.

**10. Mod.** Harmonic Editor Modulation.

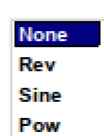



Figure 161: PADsynth Harmonic Content Editor Modulation

Values: `None*, Rev, Sine, Pow`

**11. Mod. Wheel 1.** Harmonic Editor Modulation Wheel 1. With the **Mod.** selection set to something other than `None`, this modifies one (unknown at this time) parameter of the modulation selection.

**12. Mod. Wheel 2.** Harmonic Editor Modulation Wheel 2. With the **Mod.** selection set to something other than `None`, this modifies one (unknown at this time) parameter of the modulation selection.

**13. Mod. Wheel 3.** Harmonic Editor Modulation Wheel 3. With the **Mod.** selection set to something other than `None`, this modifies one (unknown at this time) parameter of the modulation selection.

**14. Sp.adj.** Harmonic Editor Spectrum Adjust. Adjust the spectrum of the waveform.

RMS normalize. Enables the RMS normalization method (recommended); this keeps the same loudness regardless of the harmonic content.

Below are the harmonics and their phases. One can use them to add to oscillator harmonics that has the waveform of the base function. Increasing the number of harmonics has virtually no effect on CPU usage. Right click to set a harmonic/phase to the default value.

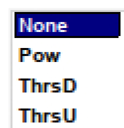



Figure 162: PADsynth Harmonic Content Editor Spectrum Adjust

Values: `None*, Pow, ThrsD, ThrsU`

**15. Sp.adj. Wheel.** Harmonic Editor Spectrum Adjust Wheel.

#### 13.2.7.4 PADsynth / Harmonic Structure / Waveform / Harmonic

1. **Harmonics Amplitude**
2. **Harmonics Bandwidth**
3. **Harmonics Scrollbar**
4. **Harmonic Shift**
5. **Harmonic Shift preH**
6. **Adpt.Harm.**
7. **Adpt.Harm. Slider**
8. **Adpt.Harm. baseF**
9. **Adpt.Harm. pow**
10. **Clear**
11. **Sine**
12. **C**
13. **P**
14. **Close**

**16. Harmonics Amplitude.** Harmonics Amplitude. Provides 128 sliders for the amplitude of harmonics.

Values: `-100%, 0*, 100%`

**17. Harmonics Phase.** Harmonics Phase. Provides 128 sliders for the phase of harmonics relative to the base function.

Values: `-88.6, 0*, 90` (degrees)

**18. Harmonics Scrollbar.** Harmonics Scrollbar.

**19. Harmonic Shift.** Harmonics Shift.

**20. Harmonic Shift preH.** Harmonics Shift preH. If set, applies the harmonic shift before the filtering and waveshaping.

**21. Adpt.Harm.** Adaptive Harmonics. Changes the type of the adaptive harmonics.

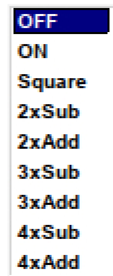



Figure 163: PADsynth Adaptive Harmonic Type

Values: `OFF*, ON, Square, 2xSub, 2xAdd, 3xSub, 3xAdd, 4xSub, 4xAdd`

**22. Adpt.Harm. Slider.** Adaptive Harmonics Slider. If something other than `OFF` or `ON` is selected, then this slider changes the waveform appearance. Even more informative is the change in the spectrum that is shown. This setting is something to play with while listening to the waveform.

**23. Adpt.Harm. baseF.** Adaptive Harmonics Base Frequency. If something other than `OFF` is selected, then this knob changes the waveform appearance. Even more informative is the change in the spectrum that is shown. This setting is also something to play with while listening to the waveform.

**24. Adpt.Harm. pow.** Adaptive Harmonics Power. If something other than `OFF` is selected, then this knob changes the waveform appearance. Even more informative is the change in the spectrum that is shown. Again, this setting is something to play with while listening to the waveform.

**25. Clear.** Harmonics Clear. Clears the harmonics settings.

**26. Sine.** Harmonics Sine. The user is prompted to "Convert to sine" This resets the base function to a sine wave, converting the original waveform to sine waves of apropriate amplitude and phase angle at each harmonic position.

**27. C.** Harmonics Copy.

**28. P.** Harmonics Paste.

**29. Close.** Harmonics Close.

## 13.3 PADsynth / Envelopes and LFOs

This dialog is reached by click on the **Envelopes LFOs** tab of the PADsynth parameters dialog. This tab is next to the **Harmonic Structure** tab.

This view consists of nothing but stock user-interface elements that are described elsewhere in this manual. The Volume and Panning values and ranges are identical to the ADDsynth global ones. None of these affect the wavetable itself, so there is no need for the apply button here.

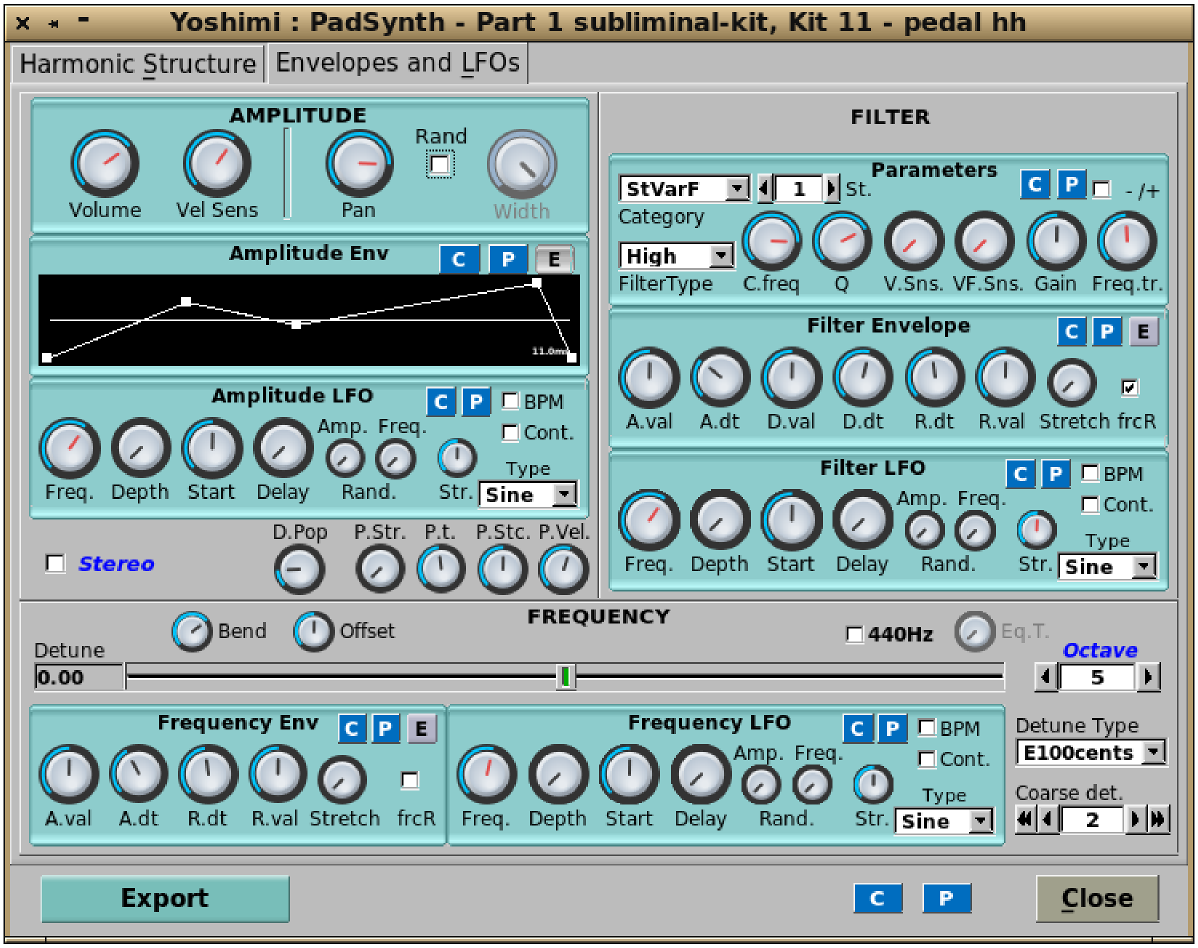



Figure 164: PADSynth Parameters, Envelopes and LFOs

1. **AMPLITUDE**
2. **FILTER** (section)
3. **FREQUENCY** (section)
4. **Export**
5. **C**
6. **P**
7. **Close**

Note the "Amplitude Envelope" section in the figure. This is a free-edit version of the envelope. A non-free-edit view can be seen in Figure 81 "Amplitude Envelope Sub-Panel" on page 105, which describes this user-interface item in more detail.

**30. AMPLITUDE.** See Section 12.1 "ADDsynth / AMPLITUDE" on page 162. This stock dialog section provides volume, velocity sensing, panning, an amplitude envelope sub-panel, and an amplitude LFO sub-panel.

**31. FILTER.** See Section 12.2 "ADDsynth / FILTER" on page 164.

**32. FREQUENCY.** See Section 12.3 "ADDsynth / FREQUENCY" on page 164.

**33. Export.** Very similar to Figure 153 "Harmonics Structure Export Dialog" on page 190.

**34. C.** The stock copy dialog.

**35. P.** The stock paste dialog.

**36. Close.** Close.

## 14 SUBsynth

The *Yoshimi* SUBsynth dialog is yet another complex dialog, this time for creating a subtractive-synthesis instrument, "SUBsynth" or "SUBnote" is a simple engine which makes sounds through subtraction of harmonics from white noise. [27]

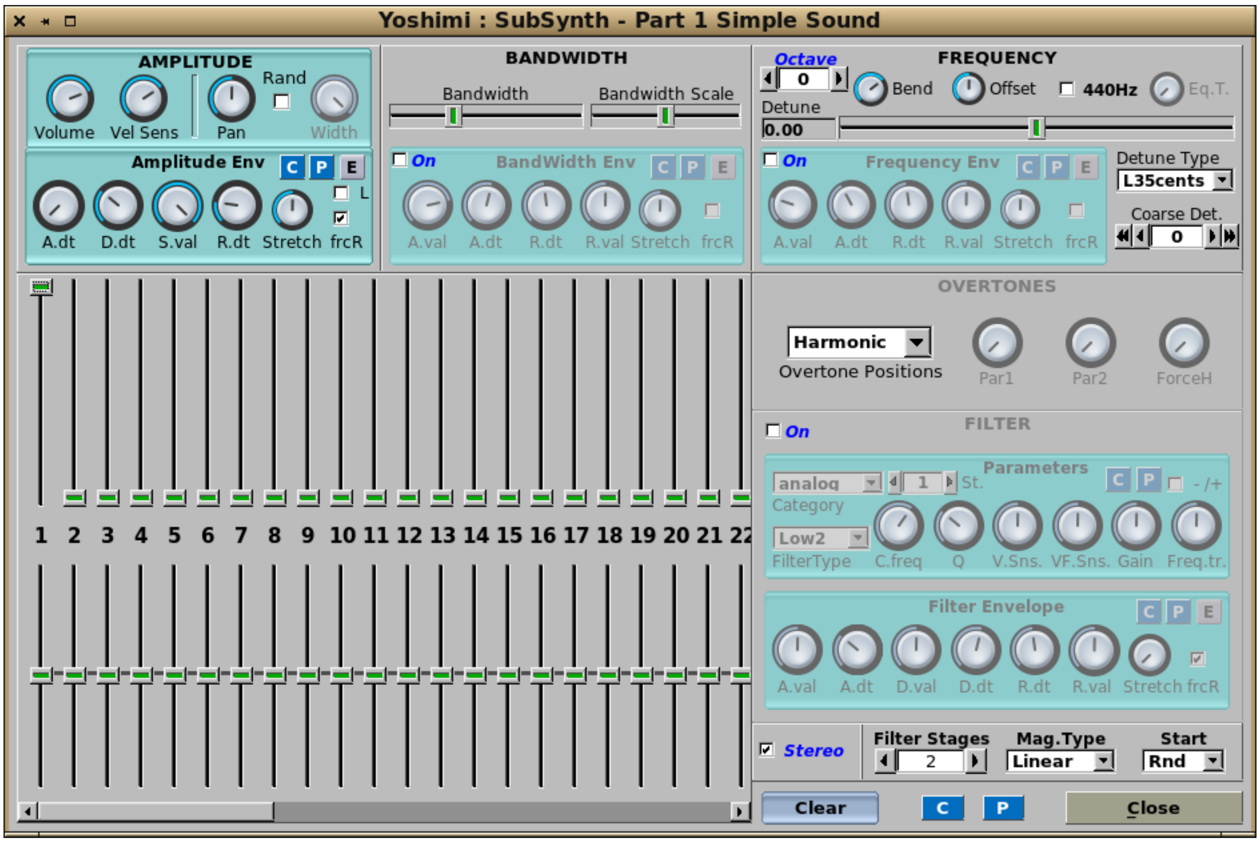



Figure 165: SUBsynth Edit Dialog

This dialog, though very complex, consists of a number of stock sections that are described elsewhere in this manual. Some descriptions are repeated here, though.

1. **AMPLITUDE** (section)
2. **BANDWIDTH** (section)
3. **FREQUENCY** (section)
4. **OVERTONES** (section)
5. **FILTER** (section)
6. **Harmonics** (section)
7. **Clear**
8. **C**
9. **P**
10. **Close**

### 14.1 SUBsynth / AMPLITUDE

1. **Volume**
2. **Vel Sens**
3. **Pan**
4. **Rand**
5. **Width**
   The controls above are discussed in detail in Section 8.2 "Volume Velocity Panning" on page 89. However their values for SUBsynth are as below.
6. **Amplitude Env** (stock sub-panel)

**1. Volume.**

Values: `-60dB to 19.4dB, 0dB*`

**2. Vel Sens.**

Values: `-48dB to -0.8dB, disabled, -2.59dB*`

**3. Pan.**

Values: `100% left to 100% right, centered*`

**4. Rand.**

Values: `off*, on`

**5. Width.**

Values: `0 to 100%*`

**6. Amplitude Env.** Amplitude Envelope. See Section 8.6.1 "Amplitude Envelope Sub-Panel" on page 105, for information on this stock sub-panel.

### 14.2 SUBsynth / BANDWIDTH

1. **BandWidth**
2. **B.Width Scale**
3. **Bandwidth Env**

**1. BandWidth.** SUBsynth Bandwidth. Sets the bandwidth of each harmonic. At the default setting the *equivalent* multiplier is 8.731 (as indicated by the tooltip) although the control value is zero. Left of center reduces the bandwidth and right of center increases it.

Values: `1 to 127, 40*`

**2. B.Width Scale.** SUBsynth Bandwidth Scale. This provides a factor to alter the ratio of the bandwidth related to the frequency of the harmonic. When the dial is centered the ratio is 1:1 as indicated by the tooltip, so effectively unchanged. Left of center reduces the LF bandwidth and increases the HF bandwith (relative to 1kHz) and right of center has the reverse action.

Values: `-64 to 63, 0*`

**3. Bandwidth Env.** SUBsynth Bandwidth.

1. **Enabled**
2. **A.val**
3. **A.dt**
4. **R.dt**

5. **R.val**
6. **Stretch**
7. **frcR**
8. **C**
9. **P**
10. **E**

**1. Enabled.** Enable the panel.

**2. A.val.** Attack value. The value of the multiplier is shown in the tooltip in the GUI interface. The default of 100 provides an equivalent multiplier of 49.351 for the initial bandwidth (as shown by the tooltip). The bandwidth will gradually resolve to its original setting at a rate set by A dt.

Values: `0 to 127, 100*`

**3. A.dt.** Attack duration. Attack time.

Values: `0 to 127, 70*`

**4. R.dt.** Release time.

Values: `0 to 127, 60*`

**5. R.val.** Release Value. Actually present only on the Frequency Env sub-panel.

Values: `0 to 127, 64*`

**6. Stretch.** Bandwidth Stretch. On lower notes make the bandwidth wider.

Values: `0 to 127, 64*`

**7. frcR.** Forced release. If this option is turned on, the release will go to the final value, even if the sustain level is not reached.

Also present in this sub-panel are the usual **C**opy and **P**aste buttons that call up a copy-parameters or paste-parameters dialog, as well as a button to bring up the editor window.

Values: `Off, On*`

## 14.3 SUBsynth / FREQUENCY

1. **Detune**
2. **FREQUENCY Slider**
3. **Bend**
4. **Offset**
5. **440Hz**
6. **Eq.T**
7. **Octave**
8. **Detune Type**
9. **Coarse Det.**
10. **Frequency Env**

**1. Detune.** Frequency Detune Indicator

**2. FREQUENCY Slider.** Frequency Slider.

Values: `-35 to 34.99`

**3. Bend.** Bend. It modifies the pitch bend control. It is possible to make the pitch bend control work in the opposite direction.

**4. Offset.** Offset. It shifts the overall pitch of the engine (up or down) relative to the rest of the engines.

**5. 440Hz.** Frequency 440Hz. Fixes the base frequency to 440Hz. One can adjust it with detune settings.

**6. Eq.T.** Frequency Equalise Time. Sets how the frequency varies according to the keyboard. Set to the leftmost setting for a fixed frequency.

**7. Octave.** Frequency Octave. Octave Shift.

**8. Detune Type.** Frequency Detune Type. Sets the "Detune" and "Coarse Detune" behaviour

**9. Coarse Det.** Frequency Coarse Detune, "C.Detune".

**10. Frequency Env.** Frequency Envelope Stock Sub-Panel.

1. **Enable**
2. **A.value** or **A.val**
3. **A.dt**
4. **R.dt**
5. **R.val**
6. **Stretch**
7. **frcR**
8. **C**
9. **P**
10. **E**

See Section 82 "Amplitude Envelope Editor" on page 106, for more details.

## 14.4 SUBsynth / OVERTONES

By default harmonic overtones are exact multiples of the base frequency, but this section allows one to shift them in various unharmonic ways to produce metalic or noisy variations.

1. **Overtones Position**
2. **Par1**
3. **Par2**
4. **ForceH**

**1. Overtones Position.** Subsynth Overtones Position. Sets the type of overtone variation. For *Harmonic* there is no control, so the other parameters are inactive. Similarly *par2* does nothing for *Shift* so is disabled for that variation.

Values: `Harmonic*, ShiftU, ShiftL, PowerU, PowerL, Sine, Power, Shift`

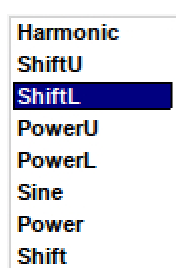



Figure 166: Harmonic Type Dropdown

**2. Par1.** Subsynth Overtones Par1. Spreads the harmonics according to the 'position' type.

Values: `0* to 127`

**3. Par2.** Subsynth Overtones Par2. Provides a further variation on the harmonics spread.

Values: `0* to 127`

**4. ForceH.** Subsynth Overtones ForceH. Moves the shifted harmonics by a variable amount towards the nearest actual multiple of the fundamental.

Values: `0* to 127`

## 14.5 SUBsynth / FILTER

1. **Enabled**
2. **Filter Params** (stock sub-panel)
3. **Filter Env** (stock sub-panel)
4. **Stereo**
5. **Filter Stages**
6. **Mag. Type**
7. **Start**

**1. Enabled.** SUBsynth Filter Enabled.

**2. Filter Params.** Filter Params. See Section 8.3.5 "Filter Parameters User Interface" on page 93, which describes this stock sub-panel.

**3. Filter Env.** Filter Params. See Section 8.6.5 "Envelope Settings for Filter" on page 110, which describes this stock sub-panel.

**4. Stereo.** SUBsynth Stereo. Make the instrument stereo. The CPU usage goes up about 2 times. This item isn't really a **FILTER** item, it is just located in that same area.

**5. Filter Stages.** Filter Stages. Filter Order. Sets the number of filter stages applied to white noise. This parameter affects the CPU usage.

Values: `0, 1, 2*, 3, 4, 5`

**6. Mag. Type.** Magnitude Type. Sets the type of magnitude settings (linear versus dB values)

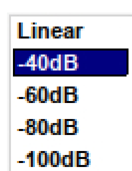



Figure 167: SUBSynth Magnitude Type Dropdown

Values: `Linear, -40dB, -60dB, -80dB, -100dB`

**7. Start.** Start Type. How to start the filters.

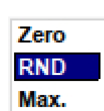



Figure 168: SUBsynth Start Type

Values: `Zero, RND, Max.`

### 14.6 SUBsynth / Harmonics

The harmonics settings controls the harmonic intensities/relative bandwidth. Moving the sliders upwards increases the relative bandwidth. Please note that, if one increases the number of harmonics, the CPU usage increases. Right click to set the parameters to default values.

This section consists of 64 sliders to control the amplitude of the narrow noise band at a given harmonic, and 64 sliders to control the bandwidth of each band.

The top row of SUBsynth sliders sets the *relative* amplitude. This use of the word ”relative” is an important distinction, as the overall level of the output is normalised; all actual levels will be dependent on whichever is the highest.

The bottom row sets the bandwidth of each harmonic. If one has just the fundamental, and drops the bandwidth to the minimum, one gets very nearly a sinewave. Set it to maximum and it is very obviously filtered noise.

## 15 Kit Edit

The *Yoshimi* Kit dialog is a dialog for creating a set of drums or layered instruments. It provides a way to use individual voices and synth blocks to create drum-like sounds, or complex layered sounds. Within this window one can create drum kits, layered instruments, or one can combine more instruments into one instrument.

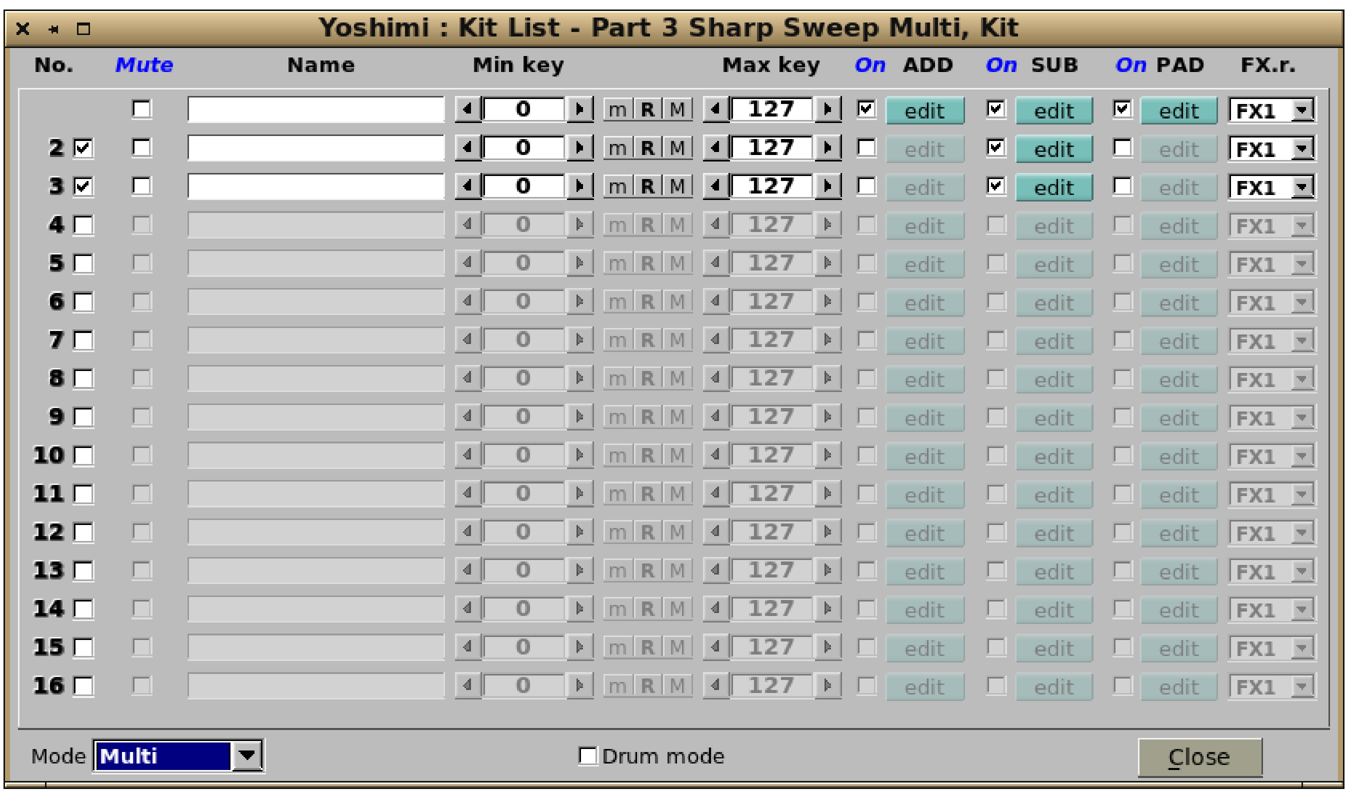



Figure 169: Kit Edit Dialog

During development of *Yoshimi* there have been some minor changes to this figure.

1. **Rows 1 to 16.** This dialog contains 16 identical rows containing the following elements, in the order given:
    1. **No.**
    2. **Enable** (unlabelled checkbox)
    3. **Mute** (was called "M")
    4. **Name** (Instrument Name)
    5. **Min key**
    6. **m** (set minimum note)
    7. **R** (reset default note range)
    8. **M** (set maximum note)
    9. **Max key**
    10. **ADsynth**
        1. **Enable**
        2. **edit**
    11. **SUBsynth**
        1. **Enable**
        2. **edit**
    12. **PADsynth**
        1. **Enable**
        2. **edit**
    13. **FX.r.**
2. **Mode**
3. **Drum mode**
4. **Close**

**1. No.** Kit Row Number, Kit Item Number. A simple label to indicate the instrument number in the kit.

**2. Enable.** Kit Row Enable. This unlabelled checkbox enables or disables an instrument in the kit.

Item 1 is a special type: it cannot be disabled (but it can be muted), to edit it one must use "ADDsynth edit" or "SUBsynth edit" from the part window.

Value: `Off*, On`

**3. Mute.** Kit Row "M", now labelled as "Mute". Mute an item of the kit.

**4. Instrument Name.** Kit Instrument Name.

**5. Min key.** Kit Instrument Minimum Key, was formerly labelled "Min.k". Sets the minimum key of the item of the kit.

**6. m.** Sets the minimum note of this instrument to value of the last note pressed.

**7. R.** Resets the minimum and maximum notes to their default values.

**8. M.** Sets the maximum note of this instrument to value of the last note pressed.

**9. Max key.** Kit Instrument Maximum Key, was formerly labelled "Max.k". Sets the maximum key of the item of the kit.

**10. ADsynth.** Kit ADDsynth. A checkbox is provided to enable/disable this synth component, and an edit button is provided to edit the component.

**11. SUBsynth.** Kit SUBsynth. A checkbox is provided to enable/disable this synth component, and an edit button is provided to edit the component.

**12. PADsynth.** Kit PADsynth. A checkbox is provided to enable/disable this synth component, and an edit button is provided to edit the component.

**13. FX.r.** Kit Effect. Chooses the Part Effect (PartFX) this item will pass through (OFF means no effect its used).

Values: `OFF, FX1, FX2, FX3`

**14. Mode.** Kit Mode.

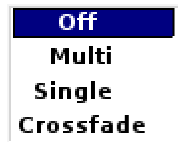



Figure 170: Kit Mode

- **Off** means no kit is enabled, so one only has the Add, Sub, and Pad sounds in the Instrument Edit window.
- **Multi** means all the kit items will sound together where their note ranges overlap.
- **Single** means only the lowest numbered item will sound in a given note range. There will be no overlap.
- **Crossfade** is described in detail below.

For example: Item 1 has **Min key** set to 0 and **Max key** set to 60, and Item 2 has **Min key** set to 40 and **Max key** set to 127.

In **Single mode**, only Item 1 will sound in the note range 0 to 60, and Item 2 will sound in the range 61 to 127.

In **Multi** mode, only Item 1 will sound in the range 0 to 40, both items will sound from 41 to 60, and only Item 2 will sound from 61 to 127.

Values: `Off*, Multi, Single, Crossfade`.

The part's kit edit **Mode** menu has an additional entry called **Crossfade**. When crossfade is set, one gets **Multi** behaviour with overlapping key ranges, but with a very smooth crossfade between sequential *pairs* of kit items. This follows the pattern 1+2, 3+4, etc. Each pair will not affect any other kit items.

It doesn't matter which of the pair has the lower range, as long as there is a range overlap. The code is semi-intelligent, and any that are not paired will exhibit normal **Multi** behaviour. If one item in a pair is not enabled then the other one will exhibit normal **Multi** behaviour and will not fade at all.

An interesting effect is that if one of the pair is enabled, but muted or has no engines enabled, then the other one still fades through the overlap range, so one can get sounds fading out (or fading in) with increasing pitch!

If one wants a fade to come in then go out again, one needs two sets of pairs, with a hard non-overlapped point in the middle.

```
item 1 - min 0 max 60
item 2 - min 40 max 80 (fades up)
```

```
item 3 - min 81 max 100 (fades down)
item 4 - min 90 max 127
```

This feature is backward-compatible, in that older versions of *Yoshimi* will see it as an ordinary **Multi** – it uses a new variable stored in the instrument file that is simply ignored by earlier versions.

**15. Drum mode.** Kit Drum Mode. If drum-mode is set, then microtonal tuning is ignored for this kit, otherwise it could make drum sounds very unpredictable!

**16. Close Window.** Close.

# 16 Banks Collection

In this section, we attempt to collect and summarise all of the existing banks for *Yoshimi* that we can find. Many of them are supplied by the project.

Between all of the collections, there is a large amount of duplication. There is also semi-duplication, with slight variations on the same basic instrument. Various Linux distributions which package *ZynAddSubFX* and *Yoshimi* might add some banks to their versions of these packages. Thus, there are far more sound settings than we can discuss and categorise.

One thing we're looking for is a good General MIDI (GM) bank for *Yoshimi*. As part of our *Yoshimi Cookbook* [4], we include a basic General MIDI bank for. However, there are number of patches with no good implementation in it.

## 16.1 Yoshimi Banks

*Yoshimi* comes with the following banks, which may be found in `/usr/share/yoshimi/banks` as installed by the installer. In this case, it is the Debian installer.

1. **Arpeggios**.
2. **Bass**.
3. **Brass**.
4. **Choir_and_Voice**
5. **Cormi_Sound** Also in ZynAddSubFX, slightly different bank name.
6. **Drums**. Also in ZynAddSubFX, but with only one drum kit included.
7. **Dual**.
8. **Fantasy**.
9. **Guitar**.
10. **Misc**.
11. **Noises**.
12. **Organ**.
13. **Pads**.
14. **Plucked**.
15. **Reed_and_Wind**. Also in ZynAddSubFX, slightly different bank name.
16. **Rhodes**.
17. **Splited**. Also in ZynAddSubFX, slightly different bank name.
18. **Strings**.
19. **Synth**.

20. **SynthPiano**.
21. **The_Mysterious_Bank**. Also in ZynAddSubFX, slightly different bank name.
22. **Will_Godfrey_Collection**.
23. **Will_Godfrey_Companion**.
24. **chip**.

## 16.2 Additional Banks

*ZynAddSubFX* has some of the same banks (as far as we can tell) as *Yoshimi*, but with the following additions:

1. **Cormi_Noise** [6].
2. **Laba170bank**.
3. **olivers-100**. Some very good instruments, including sitar and steel drums.
4. **the_mysterious_bank**.
5. **the_mysterious_bank_2**.
6. **the_mysterious_bank_3**.
7. **the_mysterious_bank_4**.

Here are some additional banks we have found, or have built ourselves. It often happens that, later on, a site is no longer available. Or we forget from whence we got the banks. In these cases, the banks are stored in the `contrib/banks` directory of this project.

1. **Alex_J**. The site seems to be gone/expired. So one will find these in the "contrib/banks" directory for safekeeping.
2. **Bells**.
3. **Chromatic Percussion**.
4. **Drums_DS**.
5. **Electric Piano**.
6. **Flute**.
7. **folderol collection**. [8], also found at [26].
8. **Internet Collection**.
9. **Leads**.
10. **Louigi_Verona_Workshop**. The site seems to be gone/expired. So one will find these in the "contrib/banks" directory for safekeeping.
11. **Misc Keys**.
12. **mmxgn Collection** [12].
13. **Piano**.
14. **RB Zyn Presets**.
15. **Vanilla**. See [26] for this bank, and for some demonstration files of *ZynAddSubFX* sounds, and some other nice links.
16. **VDX**.
17. **x31eq.com** [18].
18. **XAdriano Petrosillo**.
19. **Zen Collection**.

The source of some of these banks is currently unknown.

To find out how to integrate these into one's installation, see Section 5.1 "Roots" on page 38, and Section 6.3.1 "Menu / PatchSets / Show Patch Banks.." on page 67

# 17 Non-Registered Parameter Numbers

*Yoshimi* implements System and Insertion effects control in a manner compatible with *ZynAddSubFX*. As with all *Yoshimi*'s NRPNs, the controls can be sent on any MIDI channel.

## 17.1 NRPN / Basics

NRPN stands for "Non Registered Parameters Number". NRPNs can control all System and Insertion effect parameters. Using NRPNs, *Yoshimi* can directly set some part values regardless of what channel that part is connected to. For example, one may change the reverb time when playing on a keyboard, or change the flanger's LFO frequency. The controls can be sent on any MIDI channel (the MIDI channels numbers are ignored).

The parameters are:

- **NRPN MSB** (coarse) (99 or 0x63) sets the system/insertion effects (4 for system effects or 8 for insertion effects). We abbreviate this value as `Nhigh`.
- **NRPN LSB** (fine) (98 or 0x62) sets the number of the effect (first effect is 0). We abbreviate this value as `Nlow`.
- **Data entry MSB** (coarse) (6) sets the parameter number of effect to change (see below). We abbreviate this value as `Dhigh`.
- **Data entry LSB** (fine) (26) sets the parameter of the effect. We abbreviate this value as `Dlow`.

One must send NRPN coarse/fine before sending Data entry coarse/fine. If the effect/parameter doesn't exist or is set to none, then the NRPN is ignored.

Also note that when a parameter, such as channel or program is to be modified by an NRPN, the value is specified as *raw* data, meaning the values start at **0**, not **1**.

It's advisable to set NRPN MSB before LSB. However, once MSB has been set one can set a chain of LSBs if they share the same MSB. The data CCs associated with these are 6 for MSB and 38 for LSB. Only when an NRPN has been established can the data values be entered (they will be ignored otherwise). If a supported control is identified, these data values will be stored locally (if needed) so that other NRPNs can be set. Whenever either byte of the NRPN is changed, the data values will be cleared (but stored settings will not be affected). If either NRPN byte is set to 127, all data values are ignored again.

In *Yoshimi*, NRPNs are not themselves channel-sensitive, but the final results will often be sent to whichever is the current channel. *Yoshimi* also supports the curious 14-bit NRPNs, but this shouldn't be noticeable to the user. (In these notes, where practical we also list the 14 bit values in square brackets.)

In order to deal with some variations in the way sequencers present NRPNs generally, if a complete NRPN is set (i.e. `Nhigh`, `Nlow`, `Dhigh`, `Dlow`), then the data bytes can be in either order, but must follow `Nhigh` and `Nlow`.

After this, for running values, once `Dhigh` and `Dlow` have been set, if one changes either of these values, the other value will be assumed. For example, starting with `Dhigh` = 6 and `Dlow` = 20:

Change `Dlow` to 15, and *Yoshimi* will regard this as a command `Dhigh` 6 + `Dlow` 15. Alternatively, change `Dhigh` to 2, and *Yoshimi* will regard this as a command `Dhigh` 2 + `Dlow` 20. This can be useful but may have unintended consequences! If in doubt; change either of the NRPN bytes and both data bytes will be cleared.

Additionally there is CC 96 for data increment, and CC 97 for data decrement.

Data increment and decrement operation enables one to directly change the data LSB by deltas between 0 and 63. To change the MSB, add 64 to cover the same range. Setting 0 might seem pointless, but it gives an alternative way to make an initial setting if one's sequencer doesn't play nice.

Although data increment and decrement are only active if a valid NRPN has been set, they are otherwise quite independent single CCs. For example:

```
Start   Value      Command value   Result
-----   -----      --------------  ------
LSB      5           inc 20         25
MSB      7           inc 68         11
LSB      128(off)    inc 1          1
MSB      126         dec 74         116
MSB      128(off)    dec 65         127
```

A small example (all values in this example are hex):

```
B0 63 08 // Select the insertion effects
B0 62 01 // Select the second effect (remember: the first is 00 and not 01)
B0 06 00 // Select the effect parameter 00
B0 26 7F // Change the parameter of effect to the value 7F (127)
```

## 17.2 CC and NRPN Quick Reference

The table Table 1 "CC and NRPN Quick Reference" on page 212, is a simple list of all the Continuous Controllers (CCs) and Non Registered Parameter Numbers (NRPNs) recognised by Yoshimi. For more CC details see Section 24.5.2 "Concepts / MIDI / Messages" on page 289, and for NRPN details Section 17 "Non-Registered Parameter Numbers" on page 210.

Table 1: CC and NRPN Quick Reference

| CC | | Function |
|---|---|---|
| Hex (Dec) | | |
| 00 (0) | | Bank MSB |
| 01 (1) | | Modulation Wheel |
| 02 (2) | | Breath |
| 06 (6) | | NRPN Data MSB |
| 07 (7) | | Volume |
| 0A (10) | | Panning |
| 0B (11) | | Expression |
| 20 (32) | | Bank LSB |
| 26 (38) | | NRPN Data LSB |
| 40 (64) | | Sustain Pedal |
| 41 (65) | | Portamento |
| 44 (68) | | Legato Pedal |
| 47 (71) | | Filter Q |
| 4A (74) | | Filter Cutoff |
| 4B (75) | | Bandwidth |
| 4C (76) | | FM Amplitude |
| 4D (77) | | Resonance Centre Frequency |
| 4E (78) | | Resonance Bandwidth |
| 60 (96) | | NRPN Data Increment |
| 61 (97) | | NRPN Data Decrement |
| 62 (98) | | NRPN LSB |
| 63 (99) | | NRPN MSB |
| 78 (120) | | All Sound Off |
| 79 (121) | | Reset All Controllers |
| 7B (123) | | All Notes Off |
| | | |
| **NRPN MSB** | **NRPN LSB** | **Function** |
| Hex (Dec) | Hex (Dec) | |
| 04 (4) | 00-04 (0-4) | System Effect number |
| 08 (8) | 00-08 (0-8) | Insertion Effect number |
| 40 (64) | 00 (0) | Direct part control |
| 40 (64) | 01 (1) | Vector Control |
| 40 (64) | 02 (2) | System Settings |
| 60 (96) | 00-05 (0-5) | Load Numbered File from List |
| | | |
| **ShortForm** | LSB is value | No data bytes needed |
| 41 (65) | 00-05 (0-5) | Set Solo Switch Type |
| 42 (66) | 00-77 (0-119) | Set Solo Switch Incomming Controller |
| 44 (68) | 44 (68) | Perform Normal Shutdown, exit value 0 |
| 44 (68) | 45 (69) | Perform shutdown without messages, exit value 16 |

## 17.3 Effects NRPN values

**WARNING**: Changing some of the effect parameters produces clicks when sounds pass through them. We advise one to only change them when the sound volume that passes through the effect is very low (or silence). Some other parameters produce clicks when they are changed rapidly.

Here are the effects parameter numbers (for Data entry, coarse). The parameters that produce clicks are written in red and have (AC) after their entry (always clicks). The parameter that produces clicks only when they are changed fast are written in blue and have a (FC) after the entry (Fast Clicks). Most parameters have the range from 0 to 127. All numbers are specified with respect to 0, not 1. For example, channel numbers range from 0 to 15, not 1 to 16, when used in an NRPN setting. When parameters have a different range, it is written as "(low..high)".

Here are the basic formats:

1. Send NRPN:
   - MSB = 64 (same as for vectors)
   - LSB = 0
2. Send Data MSB (6); all value ranges start from zero, not 1.
   - 0 : data LSB = part number
   - 1 : data LSB = program number
   - 2 : data LSB = controller number
   - 3 : data LSB = controller value
   - 4 : data LSB = part's channel number (16 to 31 allows only Note Off for this part, while numbers 32 or above disconnects the part from all channel message)
   - 5 : data LSB = part's audio destination, one of 1 = main L&R; 2 = direct L&R; 3 = both; all other values are ignored
   - 7 : data LSB = main volume
   - 35 (0x23) : data LSB = controller LSB value (not yet implemented)
   - 39 (0x27) : data LSB = main volume LSB (not yet implemented)
   - 64 (0x40) : data LSB = key shift value (64 = no shift)
   - Other values are currently ignored.

Other values are currently ignored by *Yoshimi*.

## 17.4 NRPN / Effects Control

#### 17.4.0.1 Reverb

- 00 - Volume or Dry/Wet (FC)
- 01 - Pan (FC)
- 02 - Reverb Time
- 03 - Initial Delay (FC)
- 04 - Initial Delay Feedback
- 05 - reserved
- 06 - reserved
- 07 - Low Pass
- 08 - High Pass

- 09 - High Frequency Damping (64..127) 64=no damping
- 10 - Reverb Type (0..1) 0-Random, 1-Freeverb (AC)
- 11 - Room Size (AC)

#### 17.4.0.2 Echo

- 00 - Volume or Dry/Wet (FC)
- 01 - Pan (FC)
- 02 - Delay (AC)
- 03 - Delay between left and right (AC)
- 04 - Left/Right Crossing (FC)
- 05 - Feedback
- 06 - High Frequency Damp

#### 17.4.0.3 Chorus

- 00 - Volume or Dry/Wet (FC)
- 01 - Pan (FC)
- 02 - LFO Frequency
- 03 - LFO Randomness
- 04 - LFO Type (0..1)
- 05 - LFO Stereo Difference
- 06 - LFO Depth
- 07 - Delay
- 08 - Feedback
- 09 - Left/Right Crossing (FC)
- 10 - reserved
- 11 - Mode (0..1) (0=add, 1=subtract) (AC)

#### 17.4.0.4 Phaser

- 00 - Volume or Dry/Wet (FC)
- 01 - Pan (FC)
- 02 - LFO Frequency
- 03 - LFO Randomness
- 04 - LFO Type (0..1)
- 05 - LFO Stereo Difference
- 06 - LFO Depth
- 07 - Feedback
- 08 - Number of stages (0..11) (AC)
- 09 - Let/Right Crossing (FC)
- 10 - Mode (0..1) (0=add, 1=subtract) (AC)
- 11 - Phase

#### 17.4.0.5 AlienWah

- 00 - Volume or Dry/Wet (FC)
- 01 - Pan (FC)
- 02 - LFO Frequency
- 03 - LFO Randomness

- 04 - LFO Type (0..1)
- 05 - LFO Stereo Difference
- 06 - LFO Depth
- 07 - Feedback
- 08 - Delay (0..100)
- 09 - Left/Right Crossing (FC)
- 10 - Phase

#### 17.4.0.6 Distortion

- 00 - Volume or Dry/Wet (FC)
- 01 - Pan (FC)
- 02 - Left/Right Crossing
- 03 - Drive (FC)
- 04 - Level (FC)
- 05 - Type (0..11)
- 06 - Invert the signal (negate) (0..1)
- 07 - Low Pass
- 08 - High Pass
- 09 - Mode (0..1) (0=mono,1=stereo)

#### 17.4.0.7 EQ

- 00 - Gain (FC)

All other settings of the EQ are shown in a different way. The N represent the band ("B." setting in the UI) and the first band is 0 (and not 1), like it is shown in the UI. Change the "N" with the band one likes. If one wants to change a band that doesn't exist, the NRPN will be ignored.

- 10+N*5 - Change the mode of the filter (0..9) (AC)
- 11+N*5 - Band's filter frequency
- 12+N*5 - Band's filter gain
- 13+N*5 - Band's filter Q (bandwidth or resonance)
- 14+N*5 - reserved

Example of setting the gain on the second band in the EQ module:

- The bands start counting from 0, so the second band is 1 =<N=1.
- The formula is 12+N*5 =<12+1*5=17, so the number of effect parameter (for Data entry coarse) is 17.

#### 17.4.0.8 DynFilter

- 0 - Volume
- 1 - Pan
- 2 - LFO Frequency
- 3 - LFO Randomness
- 4 - LFO Type

- 5 - LFO Stereo Difference
- 6 - LFO Depth
- 7 - Filter Amplitude
- 8 - Filter Amplitude Rate Change
- 9 - Invert the signal (negate) (0..1)

Click behaviour of DynFilter has not yet been tested.

#### 17.4.0.9 Yoshimi Extensions

If the Data MSB bit 6 is set (64) then Data LSB sets the effect type instead of a parameter number. This must be set before making a parameter change.

- 0 - Reverb
- 1 - Echo
- 2 - Chorus
- 3 - Phaser
- 4 - AlienWah
- 5 - Distortion
- 6 - EQ
- 7 - DynFilter

For System effects, if the Data MSB bit 5 (32) is set *and* Data MSB bit 6 (64) is set (i.e. a combined value of 96), then the command sets how much of one system effect is sent to another. The range of values depend on which is the sending effect. It can't be sent to itself, or a lower numbered one.

The MSB would be from 96 to 98, representing effect 2 to 4.

The Data LSB is the amount to actually send.

For Insert effects, if the Data MSB bit 5 (32) is set *and* Data MSB bit 6 (64) is set (i.e. a combined value of 96), then Data LSB sets the destination part number. 127 is off and 126 is the Master Output. A complete example:

- 99 - 8 ˜insert effects
- 98 - 3 ˜number 4 (as displayed)
- 6 - 32 ˜set destination
- 38 - 126 ˜Master Out
- 99 - 8 *
- 98 - 3 *
- 6 - 64 ˜change effect
- 38 - 4 ˜Alienwah
- 99 - 8 *
- 98 - 3 *
- 6 - 0 ˜Dry/Wet
- 38 - 30 ˜value

Notes (*): these repeats are not needed for *Yoshimi*, but some sequencers are unhappy without them. Changing just a parameter on an existing system effect:

- 99 - 4 ˜system effects
- 98 - 0 ˜the first effect
- 6 - 1 ˜Pan
- 38 - 75 ˜value

## 17.5 NRPN / Direct Part Controls

All of these controls are assigned to a specific part, regardless of what channel number it is on and in most cases doesn't even require the part to be enabled. They do however need to be in the current range available. i.e if the range is 32 parts, one can only set numbers 0 to 31.

Data MSB is the control to be managed, and Data LSB is the value to set.

- 0 Part number (this must be set first)
- 1 Program Change
- 2 Controller to change (0 - 119)
- 3 Controller value
- 4 Channel number
    a) 0 - 15 select for all messages
    b) 6 - 31 select for note off only
    c) 32 - 47 mute
- 5 * Audio destination (0 - 2) main/part/both
- 8 Send part output the System effect 1
- 9 Send part output the System effect 2
- 10 Send part output the System effect 3
- 11 Send part output the System effect 4
- 64 * Key shift (28 - 100) gives -36 to +36

Note (*): requires the part to be enabled.

## 17.6 NRPN / Dynamic System Settings

Almost all dynamic setup (i.e. that doesn't require a restart) can now be done via NRPNs, so a MIDI file can manage *Yoshimi* starting from a pretty random state, and set up important features like Bank and Program Change behaviour and the number of available parts.

In parallel with this setup, there is a command to list all of these settings. One can also list the available bank roots, the banks in any root, and instruments in any bank, along with their numeric IDs. These IDs can then be used with normal MIDI CCs to get exactly the instrument you want at any time.

This arrangement looks positively steam-punk, but is actually very easy to use, requiring only a command line interface and any utility that can send MIDI CCs. NRPNs aren't special. They are simply a specific pattern of CCs. *Yoshimi*'s implementation is very forgiving, doesn't mind if you stop halfway through (will just get on with other things while it waits), and will report exactly what it is doing. So ...

... If *Yoshimi* has been started from the command line (but not necessarily in the no-GUI mode), all of the system settings that don't require a restart can now be viewed by sending the appropriate NRPN. Most of them can also be changed in this way. To access this functionality, set NRPN MSB (CC 99) to 64 and NRPN LSB (CC 98) to 2 (8130).

After that send the following DATA values. Commands with LSB x don't actually use DATA LSB, but one still needs to send it (unless it has already been set by a previous command in this control group).

Table 2: Dynamic System Commands

| DATA MSB | DATA LSB | Setting |
|---|---|---|
| 2 | LSB key | Set master key shift, 52<=key<=76 (-36 to +36) |
| 7 | LSB volume | Set master Volume 'volume' |
| 64-79 | LSB key | Set channel-based (MSB-64) key shift, key-64 (-36 to +36) |
| 80 | root | Set which CC will control Root path change (>119 disables) |
| 81 | bank | Set wich CC will control Bank change (>119 disables) |
| 82 | >63 | Enable Program change otherwise disable |
| 84 | extended | Set CC control Extended program change (>119 disables) |
| 85 | parts | Set number of available parts (16, 32 or 64) |
| 86 | x | Save all dynamic settings |

## 17.7 NRPN / Load From History Index

Since *Yoshimi* V 1.6.0 there is a method of loading external instruments, patch sets, etc. from their history lists. This is only practical if the relative history has been locked in settings.

For all of these the NRPN MSB is 96 (0x60), and the LSB determines which list type is to be handled.

Table 3: History Load Commands

| NRPN LSB | Type | DATA MSB | Range | DATA LSB | Range |
|---|---|---|---|---|---|
| 0 | Instrument | Part | 0 to 63 | index | 0 to 24 |
| 1 | Patch Set | (none) | 0 | index | 0 to 24 |
| 2 | Scale | (none) | 0 | index | 0 to 24 |
| 3 | State | (none) | 0 | index | 0 to 24 |
| 4 | Vector | Channel | 0 to 15 | index | 0 to 24 |
| 5 | Midi Learn | (none) | 0 | index | 0 to 24 |

The absolute maximum size of these lists is 24, but if an index is given that is greater than the current list size an error will be reported.

If an instrument part number is greater than 63 then it will be loaded to any part previously seen by the NRPN system, but if none was seen then the entire command will be ignored, on the basis that no action is better than wrong action.

If a vector channel value is greater than 15 then *Yoshimi* will load this to the channel that the vector was originally saved from.

*Yoshimi* can run with neither GUI nor CLI input access. Working purely as a hidden MIDI device.

To enable a tidy close, there is a new short-form NRPN. Just send 68 to both MSB and LSB (CC 99 and CC 98). If you make the LSB 69, it will return an exit value of 16. This is the 'forced exit' and can be used by the system for other cleanups and a shut down.

# 18 Vector Control

This section comes from the source-code documentation file `doc/Vector_Control.txt`. Also see Section 8.1.8 "Automation" on page 88, for a discussion of vector automation, and Section 18.2 "Vector Dialogs" on page 220, for a discussion of the vector configuration dialog.

Vector load and save also work from the command-line, for a complete vector set, with all mappings, instruments, etc. One can independently decide which channel to load and save from, so one can actually build up a vector set in (say) channel 3, then later decide to use it in channel 7. The vector settings file has the extension `.xvy` standing for *Xml / Vector / Yoshimi*.

Vector controls can be set on any and all channels, stored in both patch sets and saved state.

## 18.1 Vector / Basics

Vector control is a way to control more than one part with the controllers. It is a little bit reminiscent of the "vector" control knob on the Yamaha PSS-790 consumer MIDI synthesizer. Vector control is only possible if one has 32 or 64 parts active. Setup is per MIDI channel, so one can have totally different vector behaviour on, say, channel 1 and channel 5. The term *base channel* refers to the incoming MIDI channel that a particular vector setup will respond to, and the base channel directly relates to the 1 to 16 range of parts in the mixer panel.

Vector control has been extended so that there are four independent 'features' that each axis can control. One is fixed as *Volume* (if enabled) but the other three can be any valid CC, and can also be reversed. The vector 'sweep' CCs are split out very early in the MIDI chain, and the new CCs created are fed back in before any other processing. The result of this is that (in combination with MIDI-learn) the control possibilities expand dramatically.

In vector mode, parts will still play together but the vector controls can change their volume, pan, filter cutoff in pairs, controlled by user-defined CCs set up with NRPNs.

One must set the X axis CC before the Y axis, but if one doesn't set the Y axis at all, one can run just a single axis. If one has only 32 parts active, Y settings are ignored. One cannot make any Y axis settings until, at the very least, the X CC has be set, and if one sets that back to zero, the Y axis is again disabled. Setting an X axis control CC will immediately enable the base channel part and the part number + 16, as well as setting *Yoshimi* for 32 parts, if it was less than that. If it was the same, or was set to 64 parts, then nothing changes. Setting the CC will also ensure that both parts are actually responding to that MIDI channel (they might have been set to something else, or even disabled).

Setting a Y axis control CC will immediately enable the part (base channel + 32) and the part number + 48, as well as setting for 64 parts, if it was less than that. If it was the same, again nothing changes, and again the parts are set to the correct MIDI channel.

The instruments that are loaded into the respective parts are always shown, regardless of whether there is a configured vector or not. They are a direct analogue of the main part instrument selector and behave in the same way (i.e. click on them to open the instrument selection window). There are tooltips for these items, along with the base channel and controller.

The features are pretty self descriptive as soon as clicking on them. They apply inversely to the *pair* of instruments on each axis. One could have all four, but it would probably sound messy.

Options are pretty obvious, and follow a familiar pattern for load, save, etc. Loading or saving a vector will put the leafname in the bottom text field.

Disabling or clearing vectors will *not* change the number of parts because they may have already been set to increased numbers for some other purpose. Similarly, disabling or clearing vectors will *not* clear any instrument patches that have been loaded. Of course making any changes to the parts outside vector control will likely mess them up. It won't do any harm, just be puzzling.

For example: parts 1 and 17 can be set as x1 & x2 (volume only) while parts 33 and 49 can be y1 & y2 (pan only).

Independently of this, Parts 2 & 18 could use filter and pan from another CC.

## 18.2 Vector Dialogs

Vectors provide a way of mixing up to four parts in a manner that can be automatically, saved, and loaded. The features of vector control are presented in Section 18 "Vector Control" on page 219. Vector setup and control from the *Yoshimi* command-line are discussed in Section 21.2 "Command Level" on page 241. Here, we discuss the vector configuration dialog. (As an exercise, one can compare the various functions of the vector dialog to the command-line commands one can use to set up the vector functionality.) The new **Vectors** button brings up the following dialog:

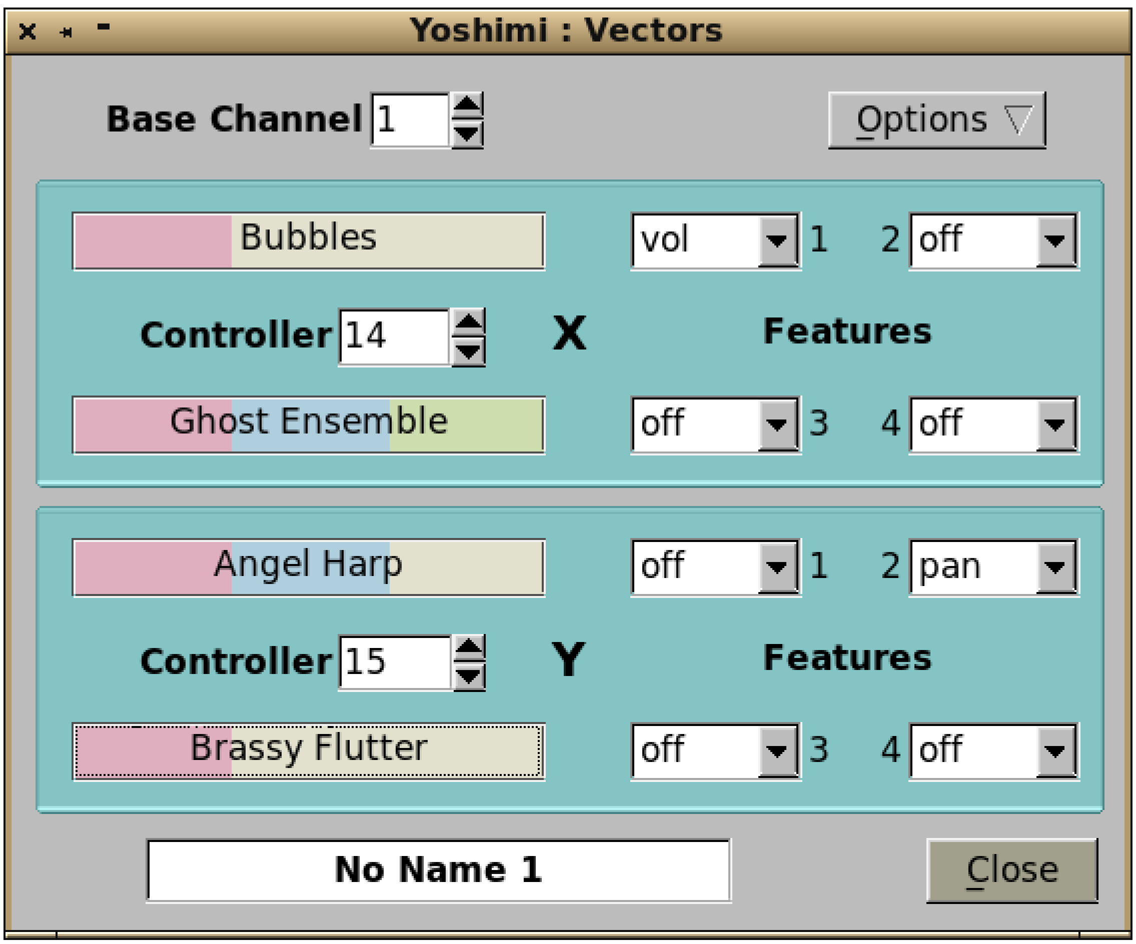



Figure 171: Yoshimi Vectors Dialog

The user-interface items in the vector dialog are:

1. **Top Line**
    1. **Base Channel**
    2. **Options**
2. **X Vector**
    1. **Controller** (CC Event)
    2. **Part 1**
    3. **Part 2**
    4. **Features**
        1. **Feature 1** (Volume)
        2. **Feature 2** (Pan)
        3. **Feature 3** (Brightness)
        4. **Feature 4** (Modulation)
3. **Y Vector**
    1. **Controller** (CC Event)
    2. **Part 1**
    3. **Part 2**
    4. **Features**
        1. **Feature 1** (Volume)
        2. **Feature 2** (Pan)
        3. **Feature 3** (Brightness)
        4. **Feature 4** (Modulation)
4. **Bottom Line**
    1. **Vector Name**
    2. **Close**

Although they are nested, for simplicity we will discuss the unique items serially.

**1. Base Channel.** Vector Base Channel. This item specifies the MIDI channel on which the vector (of parts) will be based. This channel is the incoming MIDI channel to which the vector setup will respond, on all parts.

Values: `1 to 16, 1*`

**2. Options.** Vector Options.

Values: `1 to 127, 64*`

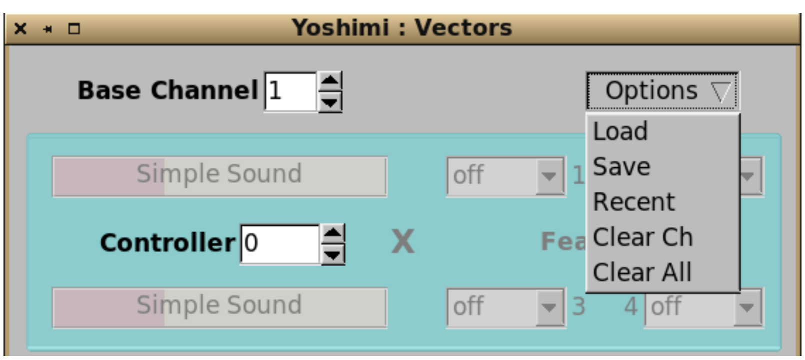



Figure 172: Yoshimi Vectors Options

The menu entries provide the actions described in this list:

1. **Load**. Brings up a file dialog that lets one pick an arbitrary vector file (extension `.xvy`) in an arbitrary directory, or select a "Favourites" directory in which to look for vector files. The base name of the file is then shown in the **Vector Name** field. This field is also user-editable, and is stored when the settings are saved.
2. **Save**. Brings up a file dialog that lets one save an arbitrary vector file (extension `.xvy`) in an arbitrary directory, or select a "Favourites" directory in which to save a vector file. The base name of the file is then shown in the **Vector Name** field.
3. **Recent**. Brings up a short list of the previous vector files dealt with.
4. **Clear Chan**. Clears the contents of the currently selected base channel.
5. **Clear All**. Clears out the full vector setup, rendering it an "empty" vector setup that cannot be saved.

Note that loading vectors is a 'soft' load. It first runs down the overall volume (over about 100 ms), then mutes the whole synth before performing the load operation. Only when that is complete does it unmute the synth. (Note that soft loading also applies to patch sets, but not to instrument patches.)

**3. X Vector.** The X Vector. This vector provides the minimal setup for a vector. This setup requires *Yoshimi* to be configured for 32 parts, to be able to fully support a two-part vector for every MIDI channel. This section is disabled until a **Controller** event value has been selected for it.

**4. Controller.** Vector Controller CC Event. If 0, the section (**X** or **Y**) that this value is in, is disabled. Otherwise, the number is the MIDI continuous controller (CC) event value that is to be used to control the mix of the two parts involved in this vector. If the number of parts was 16, this will be changed to 32.

Values: `0, 14 to 119, 0*`

**5. Y Vector.** The Y Vector. This vector provides the maximal setup for a vector. This setup requires *Yoshimi* to be configured for 64 parts, to be able to support an additional two-part vector for every MIDI channel. This section is disabled until a **Controller** event value has been selected for it. At this point, if number of parts was 32 or 16 it will be set to 64.

Other than that, the **Y** vector acts like the **X** vector, and all of the sub-items have the same functionality as in the **X** vector.

**6. Part 1.** Part 1. The top button in the section (**X** or **Y**) selects the first part to use in the two-part vector. Clicking this button brings up the default bank dialog. This dialog allows one to select a part (instrument), or to select an different bank from which to choose a part (instrument).

**7. Part 2.** Part 2. The bottom button in the section (**X** or **Y**) selects the second part to use in the two-part vector. Clicking this button brings up the default bank dialog, just as for the **Part 1** button.

**8. Feature 1.** Vector Feature 1, Volume. This feature can be disabled, or enabled. Feature 1 is always fixed as MIDI event 7 (volume), and is not reversible. When enabled, the volume is traded off between the first part and second part as the selected MIDI CC controller event data value changes. While the first part increases in volume, the second part decreases in volume, and vice versa.

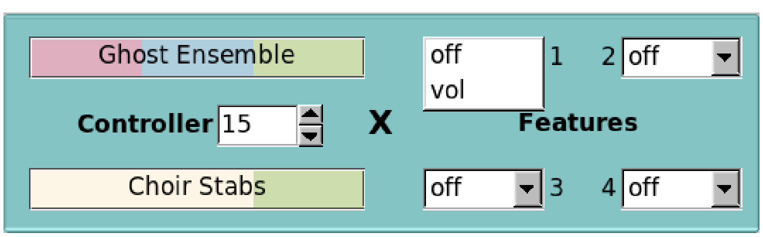



Figure 173: Yoshimi Vectors, Feature 1

Values: `Off*, Vol`

Note that the common theme between all features is that they apply inversely to the two parts/instruments that are paired in an **X** or **Y** vector.

**9. Feature 2.** Vector Feature 2, Pan. This feature can be disabled, enabled, or reversed. When enabled, it acts similarly to volume, panning from left to right as the data value increases. When reversed, it pans from right to left as the data value increases.

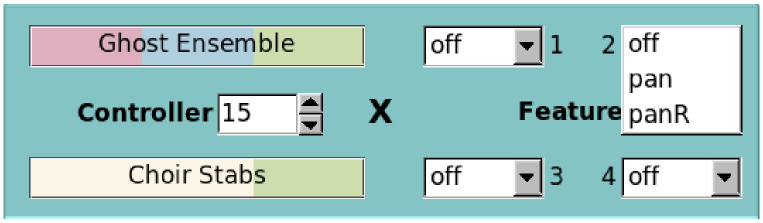



Figure 174: Yoshimi Vectors, Feature 2

Values: `Off*, Pan, Pan R`

**10. Feature 3.** Vector Feature 3, Brightness. Brightness here refers to the application of a low-pass filter with a varying cutoff frequency. This feature can be disabled, enabled, or reversed. When enabled, it acts similarly to volume, changing the brightness but as this is shown for the Y axis movement will be down to up as the data value increases. When reversed, it changes the brightness from up to down as the data value increases.

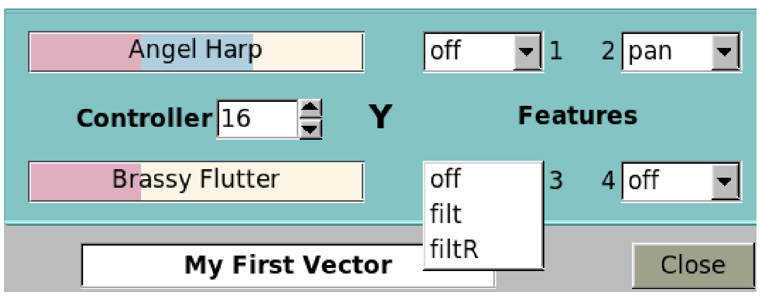



Figure 175: Yoshimi Vectors, Feature 3

Values: `Off*, Filt, Filt R`

**11. Feature 4.** Vector Feature 4, Modulation. Modulation here refers to the application of an LFO (for amplitude or frequency) with a varying modulation depth. This feature can be disabled, enabled, or reversed. When enabled, it acts similarly to volume, changing the modulation but as this is shown for the Y axis movement will be down to up as the data value increases. When reversed, it changes the modulation from up to down as the data value increases.

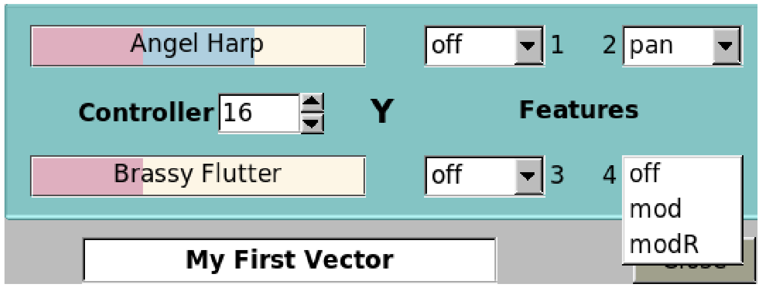



Figure 176: Yoshimi Vectors, Feature 4

Values: `Off*, Mod, Mod R`

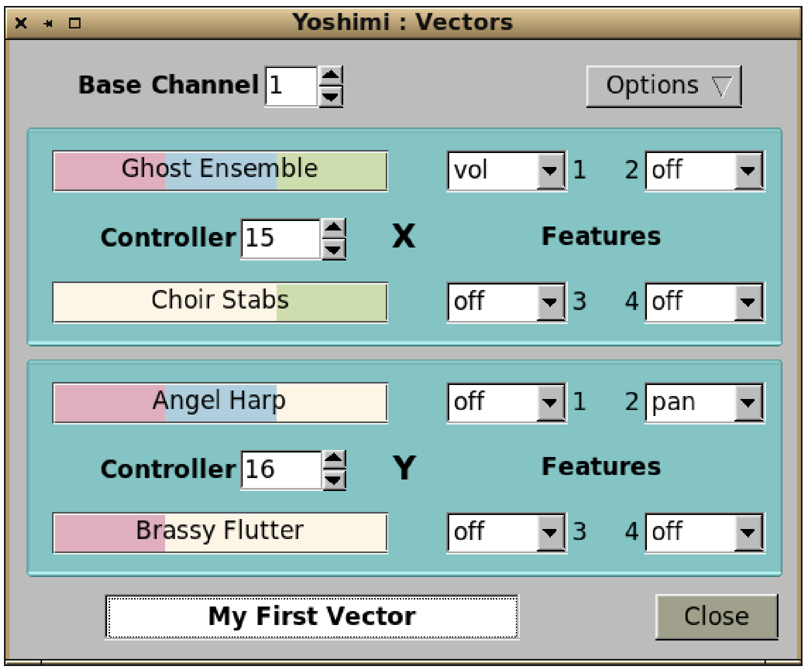



Figure 177: Yoshimi Vectors Saved as "My First Vector"

If starting a new vector setup, first select the base channel (1 to 16) to set the vector on. Next, use the **X** and **Y Controller** spin-boxes to select the incoming CC. If setting an invalid one strange things may happen, though it won't actually do any harm.

The instrument buttons bring up the instrument list window in exactly the same way as the main part one does, but do not currently have the right-click windows return feature.

When setting up a completely new vector, if the mixer or the main part are visible, they may be slightly out of sync, but will correct themselves as soon as one changes an instrument or part.

When one **clears** a vector, it doesn't delete loaded voices, nor does it change the active status of the part, nor the number of parts available. This is because these settings may have been made independent of vector control. In short, vector setup will add things but not remove them.

**12. Vector Name.** From version 1.5.3 on, the vector name is now editable in the same way as an instrument name is, and it is stored along with all the other data. This is particularly relevant when it is saved in a patch set. When reloading, one will know what the vector is called; previously, the name was lost.

### 18.3 Vector / Vector Control

Setting up vector control via MIDI is currently done as follows. In the required channel send:

- NRPN MSB (99) set to 64
- NRPN LSB (98) set to 1 [8192]
- Data MSB (6) set mode:
  - 0 = X sweep CC
  - 1 = Y sweep CC
  - 2 = enable X features
  - 3 = enable Y features
  - 4 = x1 instrument (optional)
  - 5 = x2 instrument (optional)
  - 6 = y1 instrument (optional)
  - 7 = y2 instrument (optional)

Setting CC for X enables vector control; any value outside the above list disables it.

Data LSB (38) value to set features:

- 1 = Volume (fixed)
- 2 = Pan (the default)
- 4 = Filter Cutoff (Brightness, it is the default)
- 8 = Mod Wheel (the default)
- 0x12 = 18 = Reversed Pan
- 0x24 = 36 = Reversed Filter Cutoff
- 0x48 = 72 = Reversed Mod Wheel

The feature numbers are chosen so they can be combined. So, 5 would be Volume + Brightness and 19 would be Volume + Reversed Pan.

Setting the sweep CC for the X axis enables vector control. It also sets, but doesn't enable the default X axis features. Setting the sweep CC for the Y axis sets, but doesn't enable the default Y axis features. If one doesn't enable any features, not a lot will happen.

The feature numbers are chosen so they can be combined. So, 5 would be Volume + Brightness and 19 would be Volume + Reversed Pan.

Optional settings. The first part, the number, is the MSB value. The second part is the LSB, the parameter value to set. Note that the instrument IDs are for instruments in the current bank.

- 4 = x1 instrument ID
- 5 = x2 instrument ID
- 6 = y1 instrument ID
- 7 = y2 instrument ID
- 8 = set CC for X feature 2

- 9 = set CC for X feature 4
- 10 = set CC for X feature 8
- 11 = set CC for Y feature 2
- 12 = set CC for Y feature 4
- 13 = set CC for Y feature 8

The IDs are for instruments in the current bank. Any data MSB value outside the above list disables vector control. Sweep CCs and feature CCs are sanity-checked.

An Example. From channel 1, send the following CCs:

```
CC      Value
99       64
98        1
 6        0
38       14
98        1 *
 6        1
38       15
98        1 *
 6        2
38        1
98        1 *
 6        3
38        2
```

This sequence will set up CC 14 as the X axis incoming controller, and CC 15 as the Y axis incoming controller, with X set to volume control and Y set to pan control.

One can either go on with the NRPNs to set the instruments (this will load and enable instruments from the current bank), or enable and load them by hand. For channel 1 this would be part 1 and 17 for X and part 33 and 49 for Y.

The (*) CCs ensure that the data bytes are reset each time. This is not really necessary for the earlier commands, but should be done if one sets the instruments with NRPNs as well, otherwise one will try to set them twice.

### 18.4 Vector / Command Line

This section covers material that could be in the command-line section (see Section 21 "The Yoshimi Command-Line Interface" on page 237), but is really too detailed to cover there. The examples here, to set up vectors from the command line, are provided by Will.

Assuming we want just a single axis on channel 1 (which is channel 2 in the GUI), first we need to make sure we have enough parts available:

```
yoshimi> set available 32
Available parts set to 32
```

The next command must always be the first command, as everything else depends on it. It's the command that *enables* vector control. The `x` token denotes the "x axis", and the `cc` token, followed by 14, is the incoming sweep CC (control change) that will vary the features one sets.

```
yoshimi > set vector 1 x cc 14
Vector channel set to 1
```

Note that, according to the list of MIDI CC's at http://nickfever.com/music/midi-cc-list, CC 14 is undefined, normally. It is thus available for *Yoshimi* to assign for its own purpose.

There are four vector features currently available:

- **1** is fixed as *volume*.
- **2** is *pan* by default.
- **3** is *brightness* by default.
- **4** is *modulation* by default.

We will select *volume* for this example. Let's enable this feature:

```
yoshimi Vect Ch 1 X > set features 1 enable
Set X features 1 en
```

Next, one needs to set the instruments that will be used. The instruments can only be selected from the instruments in the current bank. Therefore, assuming the current bank is the "*Will Godfrey Companion*", let's set up two instruments:

```
yoshimi Vect Ch 1 X > set program left 20
Loaded 20 "Bubbles" to Part 1

yoshimi Vect Ch 1 X > set program right 120
Loaded 120 "Ghost Ensemble" to Part 17
```

The `left` token merely assigns instrument 20 to a "virtual" left side of the X axis, and the `right` token assigns instrument 120 to a "virtual" right side of the X axis.

If one now sweeps the controller assigned to CC 14, the sound will morph between these two instruments.

To continue on to using the other axis as well, one needs to have 64 parts available:

```
yoshimi Vect Ch 1 X > /set available 64
Available parts set to 64
```

Note the slash, which lets the user immediately access the topmost command level, where the "available parts" setting can be performed. Then:

```
yoshimi > set vector y cc 15
Vector 1 Y CC set to 15
```

This command sets up the Y axis to be controlled by MIDI CC 15, which is, again, a CC that is normally undefined. We will use *panning* (feature 2) for this vector, which is defined on the Y axis:

```
yoshimi Vect Ch 1 Y > set features 2 enable
Set Y features 2 en
```

Analogous to the "left" and "right" virtual directions used above for the X axis, the Y axis used the "up" and "down" virtual directions:

```
yoshimi Vect Ch 1 Y > set program down 107
Loaded 107 "Angel Harp" to Part 32

yoshimi Vect Ch 1 Y > set program up 78
Loaded 78 "Brassy Flutter" to Part 48
```

Notice that the directions left, right, up, and down match the directions provided by a traditional joystick.

So we have now set up a vector sound where MIDI CC 14 morphs the sound through a continuous linear combination of two different instruments, and MIDI CC 15 morphs the sound between two other instruments. One can then save one's cool vector sound to a file from the top level:

```
yoshimi Vect Ch 1 Y > /save vector CoolSound
Saved channel 1 Vector to CoolSound
```

The file extension for the save vector sound file is `.xvy`, and this extension is added automatically. The final name of the file is `CoolSound.xvy`.

At any time one can reload this vector sound file from the command-line:

```
yoshimi> load vector channel 0 CoolSound
Loaded Vector CoolSound to channel 0
```

If there is no channel number provided, then the vector sound will be loaded to the same channel as it was saved from:

```
yoshimi> load vector CoolSound
Loaded Vector CoolSound to source channel
```

# 19 MIDI Learn

In this section, we show how to use the new (with 1.5.0) **MIDI Learn** feature of *Yoshimi*. MIDI Learn is a method to remotely control many parameters in an audio/MIDI application via a MIDI controller. Each parameter that is "learned" can be controlled, and the setting changes recorded.

## 19.1 MIDI Learn / Basics

One can have multiple controls on the same CC. But, although they all work, only the last one updates the user interface. They are channel specific. So if one is rich enough to have two MIDI keyboards, one can set them up to do quite different jobs. Some of the controls, like volume and pan, are immediate, but most are "next note".

In order to unset a learned value, simply delete the line.

Some external controllers use the pitch wheel control per-channel for up to 16 high-resolution faders. Some synthesizers send a number of high resolution controllers as NRPNs. *Yoshimi* MIDI Learn can handle these. The controls that can actually benefit from better resolution are most of the volume and detune ones. They are learned in exactly the same way as ordinary CCs, but instead of presenting a line that includes an editable CC field, they show a non-editable hexadecimal number with a space between the bytes and followed by an "h", such as `0a 2c h`. Also, these lines default to having **Block** set. See that item's discussion below.

Now *Yoshimi* can respond to aftertouch. One might wonder why one would want to MIDI-learn modulation when there is already a dedicated CC for it; and the same for "brightness". The answer is that there is currently no way to link these to aftertouch, and this is especially relevant for people using wind controllers. MIDI Learn sees aftertouch as CC 129 (via a sneaky conversion). This has another nice result. If one does not have an aftertouch device currently in hand, use any other controller; then, in the editing window, just change the controller number to 129. Save the learned set, and next time one *does* have such a device, just load the file and off you go! MIDI Learn can emulate the MOD wheel, as it is an accessible control in the little panel brought up when one right-clicks the **Controllers** button in the bottom panel of the *Yoshimi* main window: One can use it for any volume or pan, and can have a lot of fun with things like the **Phaser** effect as these are all "instant". The **Mod** wheel is seen as CC 130.

Finally, there is a hidden control that can be learned, **Breath** (CC 2). This will show in the learned list, but there is no GUI knob to represent it.


Figure 178: MIDI Controls Panel

The emulated MIDI controls are: **Modulation**, **Expression**, **Filter Q**, **Filter Cutoff**, and **Master Bandwidth**.

## 19.2 MIDI Learn / User Interface

To activate MIDI Learn, `Ctrl-right-click` on any user interface control. A pop-up window will detail the control selected, or indicate that the control is not learnable. A message will also appear in the console window or command-line interface (if active).

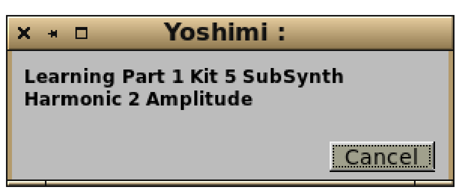



Figure 179: MIDI Learn Prompt Example 1

Here is another example:

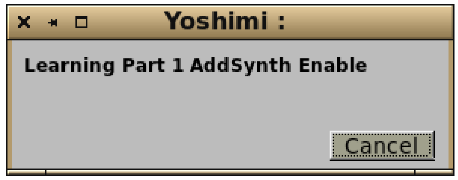



Figure 180: MIDI Learn Prompt Example 2

If a `Yoshimi` control is not MIDI-learnable, a message pop-up will indicate that it is not learnable:

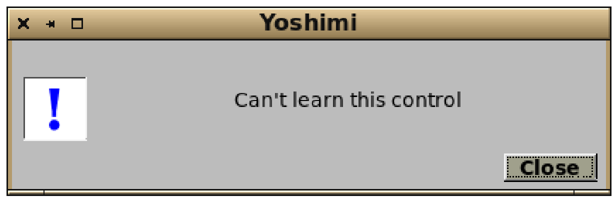



Figure 181: MIDI Learn Prompt Unsupported Example

Note that the majority of controls, including the sliders, are MIDI learnable. Since *Yoshimi* V 1.7.0 sliders will respond to a click on the *thumb* as well as the *track*.

If the *Yoshimi / Midi Learn* button is pressed, and there are no MIDI-learn entries available yet, then the following empty dialog appears:


Figure 182: Empty Midi Learn Dialog

A message will also appear in the console window/CLI.

After turning on learn, the first physical controller moved, or CC message sent, will be locked in, and one will see the user-interface knob or slider move in synchrony with the physical control. The pop-up window will disappear, and the console message `Learned` appears, with a line underneath with exactly what control was caught.

There is also an activity "LED" between **Chan** and **Min** indicators that flickers when the associated CC or channel is received, provided the line is not muted, or blocked by an earlier one.

One can stack up message lines that have the same CC and channel, so that a single incoming can change a part volume and at the same time change the filter cutoff and with a third line change the panning of a *different* part.

Multiple lines will always be displayed (and actioned) in ascending order of CC, then channel number.

For a quick example, on our system we're running only ALSA. So we plug a *Korg NanoKEY2* mini-USB keyboard in. We determine the existing ports using

```
$ aconnect -i -o
```

We see that we have (among other ports) client 24:0 is the nanoKEY2 MIDI keyboard, and *Yoshimi* at client 129:0. We connect it to *Yoshimi* using

```
$ aconnect 24:0 129:0
```

We ctrl-right-click on *Yoshimi*'s **Velocity Sense** knob in the main window, then we click on the **MOD** button on the *nanoKEY2*, and we see an entry CC=1, Chan=1, Min=0, Max=127, and control function name of "Part 1 Vel Sens". Every time we press the **MOD** button on the *nanoKEY2*, we see the "LED" appear, and movement in *Yoshimi*'s **Velocity Sense** knob.

Once entries have been added, a fully-fleshed list of learned items is presented, provided "Show Learn Editor" is checked in *Settings, MIDI CCs* . Otherwise, if one uses the *Midi Learn* button; one will see a new window displaying the recently-learned controller. Along with a number of settings, one sees text with precise details of this complete action.

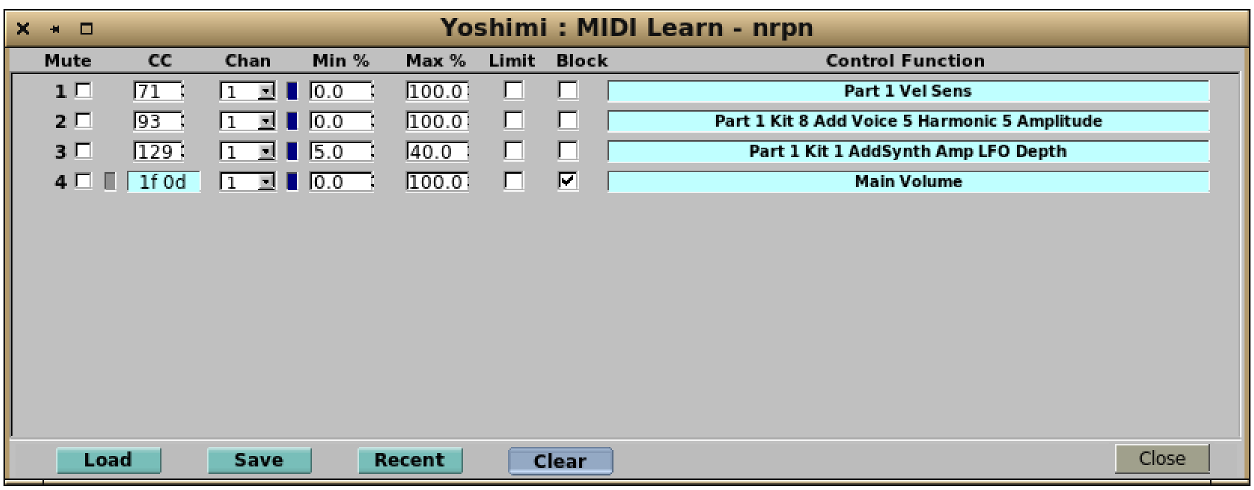



Figure 183: MIDI Learn Dialog

If the controller learned was an NRPN, this dialog will show a hexadecimal number in the CC field, and this item will not be editable. Notice that a small indented button will appear between the mute status and the NRPN value. If this it clicked on, it will turn red; indicating that it is now a 7 bit value. This control range is sent by some hardware synths and controllers.

Adding or deleting rows in this dialog, or changing the CC or channel number, will cause the rows to be sorted again. Since *Yoshimi* V 2.0 the maximum number of MIDI-Learned lines per session has been raised to 400. Previously it was 200.

The major items of this dialog are the editor settings available:

1. **Mute**
2. **CC**
3. **Chan**
4. **Min**
5. **Max**
6. **Limit**
7. **Block**
8. **Control Function**
9. **Load**
10. **Save**
11. **Recent**
12. **Clear**

Now click on the `Midi Learn` button, to see a new window displaying the recently-learned controller. Along with a number of settings, it shows text with precise details of this complete action.

Also shown is an `activity` LED that flickers when the associated CC/channel is received.

**1. Mute.** Mute. Disables the MIDI Learn control specified by the corresponding line of settings. The control is still available, but will not be in effect.

Values: `Checked, Unchecked`

**2. CC.** CC. Incoming CC. Provides the value of the controller that is learned. For example, a value of 7 indicates the control value that would normally affect the main volume of `Yoshimi`. Note that NRPNs are *not included.* Also note that CC has no default values; the values are whatever the incoming learned values are. However, they are then editable.

Values: `1 to 127`

**3. Chan.** Chan. Incoming channel number. Note that, in the **MIDI Learn** window, the channel numbers start from 1, as do all the other numbers in that window except controllers, which start from 0, following MIDI convention. Also note that the channel has no default values; the values are whatever the incoming learned values are. However, they are then editable.

Values: `1 to 16, and All`

**4. Min/Max.** Min and Max. Provides the minimum and maximum incoming values for the controller value. Since V 1.5.2 this is shown as a percentage with a resolution of 0.5. However, the resulting output value will be a floating point number that will be further modified to suit the control that was learned. If **Min** is greater than **Max**, this reverses the control direction. If **Min** is equal to **Max**, it becomes a threshold setting. Any value lower than this threshold will be passed on as 0, and any value higher will be passed on as 127. These values will then be translated to the **Min** and **Max** of whatever controller has been linked. Thus, for a simple switch those values will be 0 (off) and 1 (on). For most controls it will be 0 and 127. For an Addsynth modulator it will be OFF and PWM.

Bear in mind that **Min** and **Max** are percentage values, not 0-to-127 MIDI values. Divide the incoming MIDI value by 1.27 to get the percentage value. To summarise:

1. In MIDI Learn, set both **Min** and **Max** to the same percentage value. Call it "M%".
2. Multiply `M%` by 1.27, and increase the result up to the next integer value.

For example, if `M% = 90.0`, any MIDI value $\leq$ 115 will turn a switch off, and any value $>$ 115 will turn it on.

Values: `0 * (min) to 100 * (max)`

**5. Limit.** Limit/Compression switch. Limiter versus compression. The Min/Max range can either be in the style of a limiter or a compression. Set to **limit**, the **Min** and **Max** will be hard cutoffs. For example, if **Min** is 30% and the incoming MIDI value is 5, the result is 30%.

Set to **compress**, the incoming value will be converted to fit the range. For example, if **Min** is 30%, **Max** is 95%, an incoming MIDI value of 0 will be 30%, an incoming MIDI value of 2 will be 30.8%, etc.

Values: `Checked (Limit), Unchecked (Compress)`

**6. Block.** Block. Specifies blocking of all later actions on the same CC/channel pair (including system ones). If a loaded set refers to *Yoshimi* controls that are disabled, or don't exist, such controls will be ignored. However, the *block* feature will be active unless the line is muted.

Values: `Checked, Unchecked`

Also, for devices that send high resolution controllers as NRPNs, the lines default to having **Block** set. This is so that the NRPN is not passed on to *Yoshimi*, which would result in "go away" messages or obscure actions. However, like ordinary CCs, they will stack and one can set several lines with the same NRPN performing multiple actions, and then unblock all but the last one.

The way this fits in with the rest is that the incoming data values are combined as a 14 bit number, then (as a floating point number) divided by 128 so the overall range is exactly the same as normal CCs. However, when decoded for various controls *all* CCs are converted by a second (hidden) set of limits to get the maximum possible resolution:

- **Part**: 1 to 16
- **Engine fine detunes**: -8192 to 8191
- **Engine coarse detunes**: -64 to 63
- **LFO frequency**: 0.0 to 1.0 (float)

The actual resolution is determined by the physical control source. Most controls seem to be 10 bit, but if generated within an automation source, one will get the full 14 bits.

**7. Control Function.** Control function. Provides text describing what control is affected, or if the part is disabled or not.

One can delete any existing MIDI Learn via `Ctrl-right-click` on the `Control Function` text for that line. One is then presented with a confirmation message giving the line number and the text as a reminder. Adding lines, or changing either CC or channel numbers, will re-order the lines. Deleting lines will cause a redraw, but not a re-sort. Changing the CC or channel will only do a re-sort when necessary, as when the new number is now higher or lower than the adjacent ones.

The same CC/controller can be used to change several different internal `Yoshimi` controls. For example, one can have a part's volume being changed while another part is having an effect level changed. This is done by selecting one part, and making a setting with the desired controller, and then selecting another part, and making a setting with the same controller. This single controller will then affect both parts at once.

**8. Load.** Load. Loads a set of MIDI Learn values from a file. The extension of the file is `.xly`. If a loaded set refers to `Yoshimi` controls that are disabled, or don't exist, those controls will be ignored. However the Block feature will still be active, unless the line is muted.

**9. Save.** Save. A complete list of MIDI Learn values will be saved by clicking on the Save button; one then sees the usual file-chooser window. The file is saved where desired, with the extension `.xly`,

**10. Recent.** Recent. This button is used for loading a set of MIDI Learn values from the recent history.

**11. Clear.** Clear. This button clears the entire learned list from the **MIDI Learn** dialog.

### 19.3 MIDI Learn / Tutorial

*This mini-tutorial is courtesy of Will.*

Say one has a foot pedal that outputs CC values on the standard volume, CC 7. Now this is per channel, so only instruments on the first channel will pick it up. This presents a problem if one has automation/backing tracks on other channels and one wants to keep everything together. So here is what to do:

While holding down `Ctrl`, right-click on the **Volume** knob at the top of the main window. A window will open with the message "Learning Main Volume". If one now operates the foot pedal, the window will disappear and one will see that the main volume control is now responding to the foot pedal.

*However*, this means one is changing both the main volume *and* the part 1 volume at the same time. So now open the **MIDI learn** window via the **Yoshimi** button. One will see that it now has a line detailing the incoming CC and channel, along with other controls and the control function named **Main Volume**. Click on the **Block** check box, and one will see that the part 1 volume control no longer responds.

Now the foot pedal will control *only* the master volume, not the individual part volumes. This setup will survive loading new patch sets, and also a main reset (while still running).

It's quite likely that the foot pedal will go from 0 to 127, when one actually wants a much smaller control range. In that case, one can change the **Min** and **Max** values to (for example) 40 and 90. In this way, the entire range of the pedal control will be reduced linearly to 40-90.

If one sets the **Limit** checkbox, then these values will instead be cutoff points so anything from the pedal between 0 and 40 will be 40, and anything between 90 and 127 will be 90

To temporarily disable this controller line, use the **Mute** checkbox. The entire line will be greyed, and as the **Block** is no longer active normal part volume control will be restored.

A point that is not obvious is that although incoming CCs are per-channel, the actions are per-*part*, so if one sets controller 94 for part 1 volume and then set it again for part 2 volume, one gets *two* lines, each controlling a different part but *acting together*. Change the **Min** and **Max** of one of them to 127 and 0 respectively and one will increase in volume while the other reduces.

Volume, pan, and most of the effects are *immediate*, while some of the other controls start on the *next note*.

## 20 Themes

This section details the new (with *Yoshimi* V2.3.0) **Themes** feature. This gives access to virtually all colour elements.

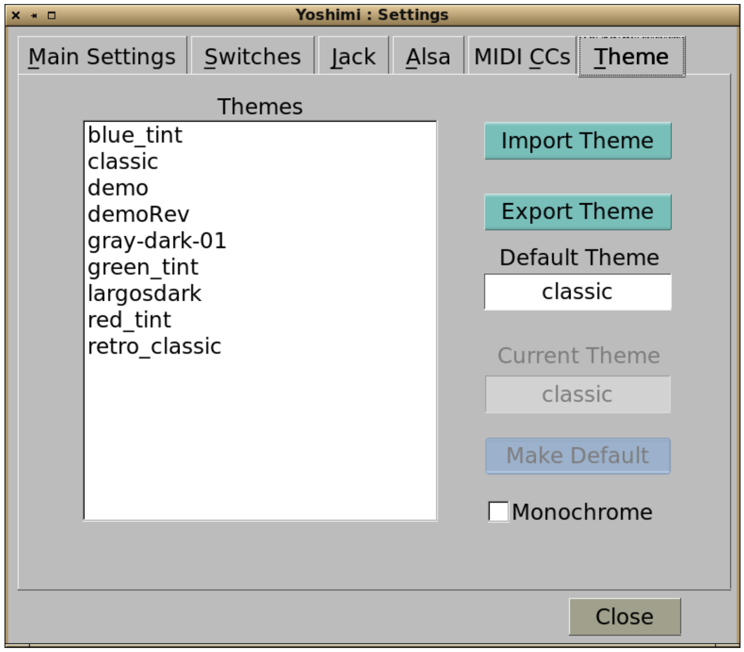



Figure 184: The New Theme Tab

The following items are provided by the Theme settings tab:

1. **Installed Themes Menu**
2. **Import Theme**
3. **Export Theme**
4. **Default Theme Display**
5. **Current Theme Display**
6. **Make Default**
7. **Monochrome**

**1. Installed Themes Menu.** A click on an entry will immediately switch to that theme.

**2. Import Theme.** Themes can be found via the file manager and installed with this button. Any new themes one installs will show in the menu next time the window is refreshed.

**3. Export Theme.** This lets one copy the currently selected theme back out for editing in (say) a text editor. This can then be re-imported on top of the original, or with a different name to create personalised variations.

**4. Default Theme Display.** Shows the name of the theme currently set as the default one.

**5. Current Theme Display.** Shows the currently selected theme (which may be different to the default).

**6. Make Default.** Sets the currently displayed theme as the new default one.

**7. Monochrome.** Converts the current theme to it's grey equivalent. This setting is not saved.

#### 20.0.0.1 Menu / Yoshimi / Themes / Editing

Manually editing themes to suit ones own purposes is quite practical, and it is for this reason they have been laid out as simple text files.

Below is part of the 'classic' theme that is provided as a reference file. *Yoshimi* doesn't use this. It is copied out from the internally generated values.

```
Do not edit this. It may be overwritten.
Instead, copy as template for other named themes.
Don't add or remove lines between and including dashes.
This would corrupt the colour map.
------------------ data start marker
0,255, Grey scale min-max (can be reversed) optional + R,G,B, (tint)
0,255,255, Panels (R,G,B or #rrggbb)
0,0,0, RESERVED
186,198,211, Knob shadow (#bac6d3)
231,235,239, Knob highlight (#e7ebef)
51,51,51, Knob ring
0,197,255, Knob ring lit
61,61,61, Knob pointer default
225,75,75, Knob pointer changed
0,0,0, Slider track
0,170,0, Slider peg default
..
..
..
255,255,0, Envelope sustain line
255,255,255, Envelope line
255,0,0, Envelope line selected
================== data end marker
Add your own notes here:
Copyright © 2020 A. N. Other
The default theme
```

As can be seen there is a lot of built-in 'help' text. With all colour lines it is important that there are no spaces between the number entries themselves, but after the last comma the descriptive text can have any characters (or be ommitted).

The first entry (Grey scale) is placed here as it will significantly affect most of the others, so one should decide on this first. Notice it can be reversed such that light and dark shades are swapped.

One can add on three R,G,B values to the greyscale line which will then provide a colour tint to elements that have a grey content.

As an example:

```
0,255,240,160,80, Grey scale min-max (can be reversed) optional + R,G,B, (tint)
```

This gives a sort of brick-orange tint to everything.

For all the following entries, and as hinted in the 'Panels', Knob shadow and Knob highlight lines, one can use either R, G, B, numbers in the range 0 to 255, or as hexadacimal entries preceeded with the 'hash' character such as '#090a0b,' which corresponds to '9,10,11,'.

There is quite extensive error checking, with errors reporting the actual line number in the source text. The faulty line and all following ones are then ignored.

In addition to 'classic', there is a 'demo' theme. This uses quite extreme settings to give an idea of the range of possibilities. Both of these will be kept updated if there are any future additions.

To allow for updates, a number of 'RESERVED' entries have been included. These currently do nothing, but must be kept in place.

#### 20.0.0.2 Menu / Yoshimi / Themes / Location

The files are plain text. There is a reference one called 'classic.clr' and a rather extreme example called 'demo.clr'. 'classic' is auto-generated on the first run of the latest yoshimi from github or sourceforge. and 'demo' will be transferred from:

`/home/user/yoshimi-code/doc/examples/themes`.

A number of other themes may be added to 'examples' from time to time/

Their normal location is `/home/user/.local/share/yoshimi/themes`.

Since *Yoshimi* V2.3.3 it has been possible to edit the selected theme (with the exception of 'classic') in situ with an external text editor, and for as long as the themes window is visible, the changes to the file will be immediately activated. Also, the theme list will be immediately updated if one adds or removes files from:
`/home/user/.local/share/yoshimi/themes`

## 21 The Yoshimi Command-Line Interface

*Yoshimi* provides a command-line mode of operation where almost all aspects of the application can be controlled via text commands. This mode is useful for blind people, those with motor control problems and for programmers, for example. These text commands can also be put into a script file, and that script can then be run with full error checking.

To access the command-line mode, add the `-i` or `--no-gui` command-line option when starting *Yoshimi* on the command-line. But note that, when starting *Yoshimi* on the command-line without the "no gui" option, the "command-line" mode of operation is available at the same time as the GUI, as well.

One of the main features of recent *Yoshimi* releases is improved non-GUI accessibility. In fact, *Yoshimi* can run with neither GUI nor CLI input access. Working purely as a hidden MIDI device, a daemon of sorts. To enable a tidy close, there is a new short-form NRPN. Just send 68 to both MSB and LSB (CC99 and CC98). If you make the LSB 69, it will return an exit value of 16. This is the 'forced exit' and can be used by the system for other cleanups and a shut down.

For full details of NRPNs see Section 17.1 "NRPN / Basics" on page 210

In a command line environment, all the 'running' commands are available, and now all of the instrument editing ones are too. Also, the whole of vector control, and MIDI-learn, is exposed to the command line.

One can decide what MIDI/audio setup is wanted, list and set roots and banks, load instruments into any part, change a part's channel, set main volume and key shift, and set up vector control. A number of first-time defaults have been changed to make this feature easier.

When starting from the command line, an argument can be included for a new root path to be defined to point to a set of banks fetched from elsewhere. This will be given the next free ID. A future upgrade will allow the ID to be set to any valid one when it is created, mirroring the GUI behaviour.

Once running, all configuration can be done within the terminal window. There is also extensive control of roots, banks, parts and instruments including the ability to list and set all of these. Additional controls that are frequently taken for granted in the GUI, but otherwise get forgotten, are *master key shift* and *master volume*.

The command-line mode provides extensive error checking and feedback. The prompt will always show what *command level* one is on, along with relevant information.

## 21.1 Command Depth

Recent developments in *Yoshimi* have made it possible to greatly (one could say dramatically) extend command-line access deep into the synth structures. This creates a problem where the command line itself could become unmanageably long. Thus, now only the current context level is printed in full. The levels higher up the tree are minimised:

```
yoshimi Part 1+>
yoshimi P1+, Sub>
yoshimi P1+, Sub+>
yoshimi P1+, S+, Filter analog>
```

Rather than stating that a switch is on or off, there is now just a `+` sign for "on", and nothing for "off". This is clearer than using a -, and the slight shift in the line gives the user another visual clue.

There is a new command in the "config" context that controls where this is displayed, or whether it is shown at all. This command is:

```
EXPose {OFF, ON, PRompt}
```

**Off** will give the bare prompt with no other information. **On** shows it as a separate line above the prompt:

```
@ P1+, S+, Filter analog
yoshimi>
```

**Prompt** shows it as a part of the prompt:

```
yoshimi P1+, S+, Filter analog>
```

The default setting is **ON**.

At the CLI prompt, when effects are being managed, the preset number is also shown on the prompt, so one typically sees something like:

```
yoshimi p2+ eff 1 reverb-1 >
```

One will also get a confirmation message. Here is an example session:

Starting from the `yoshimi` prompt:

```
yoshimi> s p 2 on
Main Part Number 2
Part 2 Enable Value 1
```

```
yoshimi part 2+ > s pr 107
Loaded Smooth Guitar to Part 2
yoshimi part 2+ >
```

This command **s**ets **p**art number 2 to **pr**ogram number 107 from the *current* instrument bank. *Yoshimi* is now on part 2 as the current part (indicated by the prompt), and all subsequent commands will relate to this "level". At this level, one can change the current part simply with:

```
yoshimi part 2+ > s 4 on
yoshimi part 4+ >
```

For clarity we omit the confirmation messages from here on.

*Yoshimi* is now on part number 4. Now set an effect:

```
yoshimi part 4+ > s ef re
yoshimi p4+ eff 1 reverb-1 >
```

This command **s**ets the part's **ef**fect 1 (implicit) to the **re**verb type.

Note that many settings parameters are optional, and if omitted, either a default or last-used value will be assumed. Also, names are truncated to 6 characters so the prompt line doesn't get unmanageably long. From here one can set a preset for this effect:

```
yoshimi 4+ eff 1 reverb-1 > s pre 3
```

Since V 1.5.0 the **pre**sets have been shown in the prompt, and one will still get a confirmation message. Also, it used to be necessary to enter **ty**pe for an effect but since V 1.5.10 the name is entered directly. Note that when entering effects, there will always be a preset. It will be number 1 unless it is changed.

Many settings that follow in a direct command "path" through several levels can be made all at once, and one will be left at the appropriate level. Thus, summarising some of the above commands:

```
yoshimi part 4+ > s ef 2 re
yoshimi p4+ eff 2 reverb-1>
```

A new feature in *Yoshimi* V 1.6.0 is a warning when an effect isn't at the default settings for the given preset. This is in the form of a question mark on the end of the line.

```
yoshimi p4+ eff 2 reverb-1? >
```

This warning will be there as soon as one changes any of the effect controls until either another preset or effect is selected. It will also show if a patchset or instrument is loaded that was previously saved with altered effects controls.

One cannot combine `type` and `preset` as they are both at the same level.

To go back one level, use the ".." command (reminiscent of the `cd ..` operation in an OS command shell):

```
yoshimi p4+ eff 2 reverb-5 > ..
yoshimi part 4+ >
```

To go back to the top command level, use the "/" command:

```
yoshimi part 4 > /
yoshimi >
```

These two special level-movement commands can also be put on the front of any other command. Starting where we were before:

```
yoshimi p4+ eff 2 reverb-1 > .. s vol 70
yoshimi part 4+ >
```

Part 4 volume is now at 70, and *Yoshimi* is once again at the "part level", not the "part FX level".

The help menus and lists are also partially context sensitive. This feature should help avoid clutter and confusion.

As well as an immediate history, *Yoshimi* maintains a single command history file for all instances of *Yoshimi* that records any non-duplicated loads or save. Thus, provided one makes a normal command-line exit, the last commands will be available on the next run of *Yoshimi*.

The command-line now has formal methods of opening, selecting and closing additional instances.

When loading external files from the command line, there is an alternative to entering the full name if *Yoshimi* has already seen this file and it is in the history list. In this situation one enters '@' followed by the list number.

```
yoshimi> l h v

Recent Vectors:
1  /home/will/another.xvy
2  /home/will/Subtle.xvy
3  /home/will/excellent.xvy
4  /home/will/yoshimi-code/examples/CoolSound.xvy

yoshimi> lo ve @4
Main Vector Loaded /home/will/yoshimi-code/examples/CoolSound.xvy to chan 1
```

The loading of externally-saved instruments is also done, by default, relative to one's *Yoshimi* home directory. However, saving an external instrument from the command-line still requires a full pathname.

The 'recent history' lists can load MIDI-learned files, patchsets, or vector files numerically from the associated list, instead of having to type the names out. This uses the '@' (list number) operator.

Commands with "*" in the description need the setup to be saved, and *Yoshimi* restarted to be activated.

Note that *Yoshimi*'s command-line can also load and save states, patchsets, and scales, and can list recent histories. Vector load and save is also supported from the command-line. That's a complete vector set, with all mappings, instruments, etc. One can independently decide which channel to load and save from, so that one can actually build up a vector set in (say) channel 3, then later decide to use it in channel 7. It has the extension `.xvy`, standing for "Xml/Vector/Yoshimi". Since V 1.5.9 this has also been integrated with the saved states.

Another small detail is that all of the minimum command-line abbreviations are now **C**apitalised in the help lists.

The organisation of these features may be adjusted slightly, based on comments from users.

## 21.2 Command Level

A command level (also known as a "context level") is simply a position in the hierarchy of commands that cover some aspect of *Yoshimi* functionality. The major levels are:

- **Top Level**
- **System Effects**
- **Insertion Effects**
- **Part**
- **Part Effects**
- **Bank**
- **Scales (microtonal)**
- **Vector**
- **Config**
- **Synth Engines**
  - **Addsynth**
  - **Addsynth Voice**
  - **Subsynth**
  - **Padsynth Harmonics**
  - **Padsynth Envelopes**

Any level that has direct numerical content can be changed with "set (n)" once at that level. The level is indicated by the text in the *Yoshimi* prompt. For example, one can set 1 to 16 vector channels, so, from the *Top* level, the following command will set the default (1, or the last-used number). The second command will, given this level (the *Vector* level), switch to vector channel 5. However, at the start, one could have gone straight to 5 with the third command.

```
set vector                          # or "s ve"; sets the context
set 5                               # or "s 5"
set vector 5                        # or "s ve 5"; quicker!
```

A detailed discussion of command-line vector control is presented in Section 18.4 "Vector / Command Line" on page 226.

## 21.3 Command Scripts

*Yoshimi* command-line users can run plain-text scripts that behave in exactly the same way as if the commands had been entered from the command-line directly. The actual script command can be initiated from any context/level and is simply:

```
RUN {filepath-of-script}
```

To avoid confusion, the script routine first sets the context to the top level, then performs all the commands, following context level changes. If there is a fault in the script, it will be reported along with the number of the line where the error occurred. Due to the buffering used, the script will return before many of the actions have actually taken place. Therefore an error report is likely to be some way up the responses. Typically it will be something like:

```
*** Error: Which Operation? @ line 13 ***
```

Here is a simple example:

```
# A script test
set part on
    # These two lines are spaced in a bit
    set add on
set voice on
set volume 45
```

This script makes sure the part is on, that the relative addsynth and voice are on, and finally sets its volume to 45.

Although this process starts from the top level, it will use the parameters that were last set. Thus, if one had been working on part 7, addsynth voice 2, then that is the one that will have its volume adjusted. This means one can set up generic preferences, then apply them to any part, engine, etc.

The script routine honours any normal abbreviations. Blank lines are ignored. A '#' at the start of a line marks it as a comment so will also be ignored. However, both of these kinds of lines will be in the line count if an error is reported.

Buffering can also cause commands to go out of sequence if a buffered one is immediately followed by a related direct one. For this reason there is an extra command specific to scripts:

```
WAIT [n]
```

The command must be entered in full, and the range is 1 to 30,000 milliseconds. In the example below, switching the kit mode is buffered but setting a kit item isn't, so without a delay the setting would be attempted before it was available. A 20ms wait seems to be enough of a delay in this case.

```
# Using delays
s p 1 on
s add off
..
s mul
wait 20
s 5
s on
s sub on
```

Since *Yoshimi* V 2.0.2 there has been an alternative command:

```
RUNLocal {filepath-of-script}
```

As it's name suggests, this will run from the current context level.

## 21.4 Other Command Tables

When running from the command line, commands can be entered after the 'up and running' message. Commands are *not* case-sensitive. Commands can be abbreviated to the first three letters of each command, or, in some cases, just one letter. This is indicated by uppercase letters in command descriptions. The commands available depend on the current "context" of the command line. However, there is a group of commands always available:

- `?` or `help`
- `List`
- `RESet`
- `EXit`

Apart from these commands, the command line works on a system of context levels, and normally only the commands relevant to that "level" will be available.

We describe the command lists here. These lists are relative to a particular context, and what one sees if one enters **?** while at that level, to get help. However the command lists can all be called *specifically* from any level and the normal abbreviations are accepted. For example:

```
yoshimi> ? p
```

This will list just the part commands regardless of what context it is called from.

Also, from any level, **? ?** will show the top level one.

### 21.4.1 Top Commands

These commands are part of the Top context/command level. First, one gets the default options, always available. Then there are several options that have ellipsis (...); these are the context submenus. After that come all the actual top level controls; there are still a lot!

```
yoshimi> ?
```

Note that there are a number of commands common to all command levels. We describe them here.

Table 4: Yoshimi Top-Level Commands

| | |
|---|---|
| `'...'` | Indicates a context switch as well as a **Help** sub-menu. |
| `Part [n] ...` | Enter context level. |
| `VEctor [n] ...` | Enter context level. |
| `SCale ...` | Enter context level. |
| `MLearn ...` | Edit learned lines. |
| `COnfig ...` | Enter context level. |
| `BAnk ...` | Enter context level. |
| `LIst ...` | Show various settings and available parameters. |
| `LOad ...` | Load various files. |
| `SAve ...` | Save various files. |
| `ADD` | Add paths and files. |

| | |
|---|---|
| `- Root [s]` | Add a root path [s] to the root list. |
| `- Bank [s]` | Add a bank [s] to the current root. |
| `- YOshimi [n]` | Start a new instance. |
| `IMport [s [n1]] [n2] [s]` | Imports a bank. |
| `EXport [s [n1]] [n2] [s]` | Exports a bank. |
| `REMove` | Remove paths, files, and entries. |
| `- Root [n]` | De-list root path ID [n]. |
| `- Bank [n]` | Delete bank ID [n] (and all contents) from the current root. |
| `- Instrument [n]` | Restore instrument [n] to the default state. |
| `- YOshimi [n]` | Close an instance. |
| `- MLearn [s] [n]` | Delete MIDI learned values: |
| | 'ALL' removes whole list, or select line [n]. |
| | |
| `Set/Read/MLearn` | Set, read or learn all the following main parameters. |
| `MINimum/MAXimum/DEFault` | Or find ranges (mostly in the part context). |
| `Part [n] ...` | Enter context level. |
| `VEctor [n] ...` | Enter context level. |
| `SCale ...` | Enter context level. |
| `MLearn ...` | Edit learned lines. |
| `COnfig ...` | Enter context level. |
| `BAnk ...` | Enter context level. |
| `YOshimi [n]` | Read the current instance or change to [n]. |
| `MONo [s]` | Switches the main audio output to mono (ON / other). |
| `SYStem effects [n]` | Enter system effect [n] context. |
| `- SEnd [n1] [n2]` | Send this effect to effect [n1] at volume [n2]. |
| `...` | Effect dependent controls. |
| `INSert effects [n]` | Enter insertion effect [n] context. |
| `- SEnd [s]/[n]` | Send effect destination to (Master, Off or part number). |
| `...` | Effect dependent controls. |
| `AVailable [n]` | The available number of parts, [n] = 16, 32, 64. |
| `Volume [n]` | Read Master volume or set to [n]. |
| `SHift [n]` | Master key shift in semitones [n] (0 no shift). |
| `DEtune [n]` | Master fine detune to [n] to match other sound sources. |
| `SOlo [s]` | Set the 'solo' switcher (OFF, Row, Column, Loop) |
| `SOlo CC [n]` | Set incoming 'solo' channel number to [n]. |

Some of the commands in the table above have more extensive descriptions in the sections that follow.

##### 21.4.1.1 List

With no suffix this displays all the lists that are available. We show this here as the entries are extremely useful.

Table 5: Yoshimi Lists

| | |
|---|---|
| `Roots` | all available root paths |
| `Banks [n]` | banks in root ID or current |
| `Instruments [n]` | instruments in bank ID or current |
| `Group <s1> [s2]` | instruments by s1 type grouping (s2 'Location' for extra details) |
| `Parts [s]` | parts with instruments installed ('More' for extra details) |
| `Vectors` | settings for all enabled vectors |
| `Tuning` | microtonal scale tunings |
| `Keymap` | microtonal scale keyboard map |
| `Config` | current configuration |
| `MLearn [s <n>]` | midi learned controls ('@' n for full details on one line) |
| `SECtion ...` | Copy/Paste section presets available for the current context. |
| `History [s]` | recent files (Patchsets, SCales, STates, Vectors, MLearn) |
| `Effects [s]` | effect types ('all' include preset numbers and names) |
| `PREsets` | all the presets for the currently selected effect |

#### 21.4.1.2 MONo

The **MONo** [s] command is provided for switching between mono and stereo on the fly while *Yoshimi* is actually playing. This helps one make sure there is a good balance between these two.

#### 21.4.1.3 SOlo

The **SOlo** [s] and **SOlo CC** [n] commands enable and set *Yoshimi*'s 'Solo' feature, whereby one can silently switch MIDI input to different parts. The 'Row' and 'Loop' types use the first 16 parts, while 'Column' type can use all possible 64 parts.

The type setting has to be decided before setting 'CC', which then determines which MIDI controller to listen to for performing the actual switch. See Section 9.1 "Mixer Panel Window" on page 118; it goes into more details about this setting, at a graphical user interface level.

#### 21.4.1.4 Set / Read / MLearn Context Levels

The Set / Read commands set or read all main parameters and the MLearn one initiates a MIDI learn with exactly the same parameters. In fact there are three more commands that follow this pattern:

- `MINimum`. Show the minimum value a command may set.
- `MAXimum`. Show the maximum value a command may set.
- `DEFault`. Show the default value of a command.

There are a few commands that set the context or command level, where additional commands peculiar to the "context" are provided. Here are the command/context levels (also see Section 21.2 "Command Level" on page 241.) Note that we also list commands for the effects levels.

- `Part`. Enter context level for part operations.
- `VEctor`. Enter context level for vector operations.

- `SCale`. Enter context level for scale (microtonal) operations.
- `MLearn`. Enter context level for MIDI Learn line editing.
- `COnfig`. Enter context level for configuration settings.
- `SYStem effects [n]`. Enter the effects context level.
  - `[s]`. Set the effect type directly by name.
  - `PREset [n]`. Set the numbered effect preset to n.
  - `SEnd [n1] [n2]`. Send the current system effect to effect n1 at volume n2.
- `INSert effects [n]`. Enter effects context level.
  - `[s]`. Set the effect type directly by name.
  - `PREset [n]`. Set numbered effect preset to n.
  - `SEnd [s]/[n]`. Set where to send the effect ('Master', 'Off', or a part number).

#### 21.4.1.5 Part Command Level

This command switches to the part context level and makes all its commands accessible. If no number '[n]' is entered it will be on the default part (1) or whatever was the previous part in use.

*Yoshimi* has a number of commands for controlling and configuring the synth engines from the command-line. First of all there is the part kit structure. There are three modes (i.e. settings) that the kits of the engines can take:

1. MUlti
2. SIngle
3. CRossfade

These forms are exactly the same as the graphical controls, and can be set once in the part context. Starting at the part level prompt, this command will return the setting on the line after the command, and show a new context level prompt:

```
yoshimi Part 1+> set multi
Part 1 Kit Mode multi
yoshimi p1+, Multi 1+>
```

This setting is at the kit item 1 (which is always enabled). Let's change to kit item 4, and, since it hasn't yet been enabled, let's enable it and turn on the SubSynth engine so that it will sound:

```
yoshimi p1+, Multi 1+> set 4
yoshimi p1+, Multi 4> set on
yoshimi p1+, Multi 4+> set sub on
yoshimi p1+, M4+ Sub+>
```

Note how the prompt line is more compact, and indicates via the plus-signs that the part, kit, and subsynth are all on.

These new controls are shown in the part context help list. The synth engines, AddSynth, Voice, SubSynth and PadSynth also have their own contexts with appropriate help lists. Also, LFO, Filter, Envelope and Resonance have their own contexts above whichever engine they are sitting on, so again have their own help lists. A fairly deep context is:

```
yoshimi P1+, M4+, A+, Voice 5+> set lfo frequency on
```

From the voice context, this command would set the context shown below.

```
yoshimi P1+, M4+, A+, V5+, LFO freq+>
```

The need for compression is obvious, and once at this level, the `?` command will list the LFO controls.

### 21.4.2 Part Common Commands

The idea of having a list of common commands is now deprecated. This is because although originally intended to keep the individual command lists to manageable proportions, it actually made it more confusing when trying to see what controls were available in each context.

### 21.4.3 Part Commands

Note that the table below assumes one is already at part level.

Table 6: Part Commands

| | |
|---|---|
| `(part) [n]` | Change part number. |
| `[ON/OFF]` | Enables / Disables the part. |
| `Volume [n]` | Volume. |
| `Pan [n]` | Panning. |
| `VElocity [n]` | Velocity sensing sensitivity. |
| `LEvel [n]` | Velocity sense offset level. |
| `MIn [[s][n]]` | Minimum MIDI last seen, or note value. |
| `MAx [[s][n]]` | Maximum MIDI last seen, or note value. |
| `FUll` | Restore full key range. |
| `POrtamento [s]` | (ON / other). |
| `Mode [s]` | Mode (Poly, Mono, Legato). |
| `Note [n]` | Polyphony. |
| `SHift [n]` | Shift semitones (0 no shift). |
| `BYpass [n] [s]` | bypass part effect number n, (ON / other). |
| `EFfects [n]` | Enter effects context level and optionally change number. |
| `(effect) [s]` | Effect type. |
| `(effect) PREset [n]` | Numbered effect preset to n. |
| `(effect) Send [n1] [n2]` | Current part to system effect n1 at volume n2. |
| `PRogram [s]/[[s] [n]]` | Instrument ID / Group (n) loads from search list. |
| `LAtest` | The most recent bank instrument loaded or saved. |
| `TYPe [s]` | The instrument type, i.e. Piano, Guitar etc. |
| `NAme [s]` | The display name the part can be saved with. |
| `COPyright [s]` | The copyright message. |
| `INFo [s]` | Additional information, use suggestions. |
| `Humanise Pitch [n]` | A small random detune. |
| `Humanise Velocity [n]` | A small random velocity reduction. |
| `CLear` | Resets the part to the default 'Simple Sound'. |
| `Channel [n]` | CHannel (32 disables, 16 note off only). |
| `AFtertouch Chan <s1> [s2]` | Off, Filter (Down) + Peak (Down) + Bend (Down) + Modulation + Volume. |
| `AFtertouch Key <s1> [s2]` | Off, Filter (Down) + Peak (Down) + Bend (Down) + Modulation. |
| `Destination [s]` | JACK audio destination (Main, Part, Both). |
| `MUlti` | Set kit mode and allow kit item overlaps. |
| `SIngle` | Set kit mode and only lowest numbered item in key range. |
| `CRoss` | Set kit mode and cross fade item pairs. |
| `KIT` | Re-enter kit mode editing if it is enabled. |
| `NORmal` | Return to normal (not kit) mode. |
| `(kit mode) [n]` | Kit item number (1-16). |
| `(kit mode) [ON/OFF]` | Enables / Disables and removes the kit item. |
| `(kit mode) QUiet [s]` | Mute this kit item without changing it's features (ON, other). |
| `(kit item) MIn [[s][n]]` | Minimum MIDI last seen, or note value |
| `(kit item) MAx [[s][n]]` | Maximum MIDI last seen, or note value. |

| | |
|---|---|
| `(kit item) FUll` | Restore full key range. |
| `(kit item) EFfect [n]` | Effect for this item (0-none, 1-3). |
| `(kit item) NAme [s]` | The name of this item. |
| `DRum [s]` | Kit to drum mode (ON, other). |
| `ADDsynth ...` | Enter AddSynth context. |
| `SUBsynth ...` | Enter SubSynth context. |
| `PADsynth ...` | Enter PadSynth context. |
| `MCOntrol ...` | Enter MIDI controllers context. |

Kit mode is an unusual form of context level as it either modifies some part level controls or adds new ones. At the same time it still allows all the other part controls. The examples below show how kit mode interacts with part, and how one is informed of the exact status.

```
yoshimi Part 1+> set multi
yoshimi Part 1+, Multi 1+> set 2
yoshimi Part 1+, Multi 2+> ..
yoshimi Part 1+, (Multi)> set 3
yoshimi Part 3> set 1
yoshimi Part 1+, (Multi) set kit
yoshimi Part 1+, Multi 1+>
```

Note how the kit mode is shown in parenthesis when not actually in the kit editing context. Also, to disable kit mode the specific **NOR**mal command must be used, as the **ON/OFF** commands refer to individual kit items.

#### 21.4.3.1 Part MIDI Controllers

Table 7: Part MIDI Controllers

| | |
|---|---|
| `VOlume [s]` | enables/disables volume control (OFF / other). |
| `VRange [n]` | relative degree of volume control. |
| `PAn [n]` | relative range (width) of panning control. |
| `MOdwheel [s]` | enables/disables exponential modulation (ON / other). |
| `MRange [n]` | relative modulation control range. |
| `EXpression [s]` | enables/disables expression control (OFF / other). |
| `SUstain [s]` | enables/disables sustain control (OFF / other). |
| `PWheel [n]` | relative pitch wheel control range. |
| `BReath [s]` | enables/disables breath control (OFF / other). |
| `CUtoff [n]` | relative filter cutoff control range. |
| `Q [n]` | relative filter Q control range. |
| `BANdwidth [s]` | enables/disables exponential bandwidth (ON / other). |
| `BARange [n]` | relative bandwidth control range. |
| `FMamplitude [s]` | enables/disables FM amplitude control (OFF / other). |
| `RCenter [n]` | resonance center frequency. |
| `RBand [n]` | resonance bandwidth. |
| `POrtamento [s]` | enables/disables portamento control (OFF / other). |
| `PGate [n]` | point where portamento starts or ends. |
| `PForm [s]` | whether portamento is from or to (Start, End). |
| `PTime [n]` | portamento sweep speed. |
| `PDownup [n]` | portamento up/down speed ratio. |
| `PProportional [s]` | enables/disables proportional portamento (ON / other). |
| `PExtent [n]` | distance to double change. |
| `PRange [n]` | difference from non proportional. |
| `CLear` | set all controllers to defaults. |

It is also possible to emulate the action of some incoming MIDI CCs. This was initially needed so that they can be MIDI-learned, but also provides a means of checking and modifying these settings directly.

Table 8: MIDI Emulators

| | |
|---|---|
| `E Modulation [n]` | emulate modulation controller. |
| `E Expression [n]` | emulate expression controller. |
| `E BReath [n]` | emulate breath controller (MIDI and CLI only). |
| `E Cutoff [n]` | emulate filter cutoff controller. |
| `E Q [n]` | emulate filter Q controller. |
| `E BAndwidth [n]` | emulate bandwidth controller. |

The following commands are available once in the context for the various types of synth engines:

#### 21.4.3.2 Part AddSynth Commands

Table 9: Part AddSynth Commands

| | |
|---|---|
| `[ON/OFF]` | Enables / Disables the AddSynth engine. |
| `Volume [n]` | AddSynth Volume. |
| `Pan [n]` | Panning position. |
| `PRandom [s]` | Enable random panning (ON / other). |
| `PWidth [n]` | Random panning range. |
| `VElocity [n]` | Velocity sensing sensitivity. |
| `STEreo [s]` | Sets this engine as stereo or mono (ON / other). |
| `DEPop [n]` | Initial attack slope. |
| `PUnch Power [n]` | Attack boost amplitude. |
| `PUnch Duration [n]` | Attack boost time. |
| `PUnch Stretch [n]` | Attack boost extend. |
| `PUnch Velocity [n]` | Attack boost velocity sensitivity. |
| `DETune Fine [n]` | Fine frequency. |
| `DETune Coarse [n]` | Coarse stepped frequency. |
| `DETune Type [s]` | Type of coarse stepping. (DEFault, L35, L10, E100, E1200) |
| `OCTave [n]` | Shift octaves up or down. |
| `GRoup [s]` | Disables harmonic amplitude randomness of voices with a common oscillator (ON / other). |
| `Bandwidth [n]` | Modifies the relative fine detune of voices. |
| `VOice ...` | Enter the Addsynth voice context. |
| `LFO ...` | Enter LFO insert context. |
| `FILter ...` | Enter Filter insert context. |
| `ENVelope ...` | Enter Envelope insert context. |
| `REsonance ...` | Enter the AddSynth resonance context. |

Table 10: AddSynth Voice Commands

| | |
|---|---|
| `(voice) [n]` | Change voice number. |
| `[ON/OFF]` | Enables / Disables the Voice. |
| `Volume [n]` | Voice Volume. |
| `Pan [n]` | Panning position. |
| `PRandom [s]` | Enable random panning (ON / other). |
| `PWidth [n]` | Random panning range. |
| `VElocity [n]` | Velocity sensing sensitivity. |
| `BENd Adjust [n]` | Pitch bend range. |
| `BENd Offset [n]` | Pitch bend shift. |
| `DETune Fine [n]` | Fine frequency. |
| `DETune Coarse [n]` | Coarse stepped frequency. |
| `DETune Type [n]` | Type of coarse stepping. |
| `OCTave [n]` | Shift octaves up or down. |
| `FIXed [s]` | Set base frequency to 440Hz (ON / other). |
| `EQUal [n]` | Equal temper variation. |
| `Type [s]` | Sound type (Oscillator, White noise, Pink noise, Spot noise). |
| `SOurce [n]` | Voice source number (Local for self). |
| `OSCillator [n]` | Oscillator source number (Internal for self). |
| `Phase [n]` | Relative voice phase. |
| `Minus [s]` | Invert entire voice (ON / other). |
| `DELay [n]` | Delay before this voice starts. |
| `Resonance [s]` | Enable resonance for this voice (ON / other). |
| `Bypass [s]` | Bypass global filter for this voice (ON / other). |
| `Unison [s]` | (ON, OFF). |
| `Unison Size[n]` | Number of unison elements. |
| `Unison Frequency[n]` | Frequency spread of elements. |
| `Unison Phase[n]` | Phase randomness of elements. |
| `Unison Width[n]` | Stereo width. |
| `Unison Vibrato[n]` | Vibrato depth. |
| `Unison Rate[n]` | Vibrato speed. |
| `Unison Invert [s]` | Phase inversion type (None, Random, Half, Third, Quarter, Fifth). |
| `MOdulator ...` | Enter the modulator context. |
| `WAveform ...` | Enter the oscillator waveform context. |
| `LFO ...` | Enter LFO insert context. |
| `FILter ...` | Enter Filter insert context. |
| `ENVelope ...` | Enter Envelope insert context. |

Table 11: Voice Modulator Commands

| | |
|---|---|
| `[s]` | Directly set the type (OFF, Morph, Ring, Phase, Frequency, Pulse width). |
| `SOurce [[s]/[n]]` | Oscillator source (Local, voice number). |
| `Volume [n]` | Modulator depth. |
| `VElocity [n]` | Velocity sensing sensitivity. |
| `Damping [n]` | Higher frequency relative damping. |
| `OSCillator [[s]/[n]]` | Modulation oscillator (Internal, modulator number). |
| `FOLlow [s]` | Use source oscillator detune (ON / other). |
| `SHift [n]` | Oscillator relative phase. |
| `WAveform ...` | Enter the modulator waveform context. |

#### 21.4.3.3 Part PadSynth Commands

Table 12: Part PadSynth Commands

| | |
|---|---|
| `[ON/OFF]` | Enables / Disables the PadSynth engine. |
| `Volume [n]` | PadSynth Volume. |
| `Pan [n]` | Panning position. |
| `PRandom [s]` | Enable random panning (ON / other). |
| `PWidth [n]` | Random panning range. |
| `VElocity [n]` | Velocity sensing sensitivity. |
| `STEreo [s]` | Sets this engine as stereo or mono (ON / other). |
| `DEPop [n]` | Initial attack slope. |
| `PUnch Power [n]` | Attack boost amplitude. |
| `PUnch Duration [n]` | Attack boost time. |
| `PUnch Stretch [n]` | Attack boost extend. |
| `PUnch Velocity [n]` | Attack boost velocity sensitivity. |
| `BENd Adjust [n]` | Pitch bend range. |
| `BENd Offset [n]` | Pitch bend shift. |
| `DETune Fine [n]` | Fine frequency. |
| `DETune Coarse [n]` | Coarse stepped frequency. |
| `DETune Type [n]` | Type of coarse stepping. |
| `OCTave [n]` | Shift octaves up or down. |
| `FIXed [s]` | Set base frequency to 440Hz (ON / other). |
| `EQUal [n]` | Equal temper variation. |
| `PRofile [s]` | The shape of harmonic profile (Gauss, Square Double exponent). |
| `WIdth [n]` | Width of the harmonic profile. |
| `COunt [n]` | Number of profile repetitions. |
| `EXpand [n]` | Adds harmonics and changes the distribution. |
| `FRequency [n]` | Further modifies distribution (dependent on stretch). |
| `SIze [n]` | Changes harmonic width while retaining shape. |
| `CRoss [s]` | Cross section of profile (Full, Upper, Lower). |
| `MUltiplier [s]` | amplitude multiplier (Off, Gauss, Sine, Flat). |
| `MOde [s]` | Amplitude mode (Sum, Mult, D1, D2). |
| `CEnter [n]` | Changes the central harmonic component width. |
| `RELative [n]` | Changes central component relative amplitude. |
| `AUto [s]` | Autoscaling (ON / other). |
| `BASe [s]` | Base profile distribution (C2, G2, C3, G3, C4, G4, C5, G5, G6). |
| `SAmples [n]` | Samples per octave (0.5, 1, 2, 3, 4, 6, 12). |
| `RAnge [n]` | Number of octaves (1 to 8). |
| `LEngth [n]` | Length of one sample in k (16, 32, 64, 128, 256, 512, 1024). |
| `BAndwidth [n]` | Overall bandwidth. |
| `SCale [s]` | Bandwidth scale. (Normal, Equalhz, Quarter, Half, Three Quarter, One and a half, Double, Inverse Half). |
| `SPectrum [s]` | Spectrum mode (Bandwidth, Discrete, Continuous). |
| `OVertone Position [s]` | Relationship to fundamental (HArmonic, SIne, POwer, SHift, UShift, LShift, UPower, LPower). |
| `OVertone First [n]` | Degree of first parameter. |
| `OVertone Second [n]` | Degree of second parameter. |
| `OVertone Harmonic [n]` | Amount harmonics are forced. |

| | |
|---|---|
| `XFadeupdate [n]` | Cross fade (millisec) after building new wavetable. |
| `BUildtrigger [n]` | Re-trigger wavetable build after n millisec. |
| `RWDetune [n]` | Random walk spread of voice detune on re-triggered build (0 off 96 factor 2). |
| `RWBandwidth [n]` | Random walk spread of line bandwidth. |
| `RWFilterFreq [n]` | Random walk spread of filter cutoff frequency. |
| `RWWidthProfile [n]` | Random walk spread of profile line width. |
| `RWStretchProfile [n]` | Random walk spread of profile modulation stretch. |
| `APply` | Puts the latest changes into the wavetable. |
| `XPort` | Export the current sample set to named file. |
| `WAveform ...` | Enter the oscillator waveform context. |
| `LFO ...` | Enter LFO insert context. |
| `FILter ...` | Enter Filter insert context. |
| `ENVelope ...` | Enter Envelope insert context. |
| `REsonance ...` | Enter the PadSynth resonance context. |

#### 21.4.3.4 Part SubSynth Commands

Table 13: Part SubSynth Commands

| | |
|---|---|
| `[ON/OFF]` | Enables / Disables the SubSynth engine. |
| `Volume [n]` | SubSynth Volume. |
| `Pan [n]` | Panning position. |
| `PRandom [s]` | Enable random panning (ON / other). |
| `PWidth [n]` | Random panning range. |
| `VElocity [n]` | Velocity sensing sensitivity. |
| `STEreo [s]` | Sets this engine as stereo or mono (ON / other). |
| `BENd Adjust [n]` | Pitch bend range. |
| `BENd Offset [n]` | Pitch bend shift. |
| `DETune Fine [n]` | Fine frequency. |
| `DETune Coarse [n]` | Coarse stepped frequency. |
| `DETune Type [n]` | Type of coarse stepping. (DEFault, L35, L10, E100, E1200) |
| `OCTave [n]` | Shift octaves up or down. |
| `FIXed [s]` | Set base frequency to 440Hz (ON / other). |
| `EQUal [n]` | Equal temper variation. |
| `HArmonic [n1] Amp [n2]` | Set harmonic n1 to n2 intensity. |
| `HArmonic [n1] Band [n2]` | Set harmonic n1 to n2 width. |
| `HArmonic Stages [n]` | Number of stages. |
| `HArmonic Mag [s]` | Harmonics filtering type. (Linear, 40dB, 60dB, 80dB, 100dB) |
| `HArmonic Position [s]` | Start position. (Zero, Random, Maximum) |
| `BAnd Width [n]` | Common bandwidth. |
| `BAnd Scale [n]` | Bandwidth slope versus frequency. |
| `OVertone Position [s]` | Relationship to fundamental (HArmonic, SIne, POwer, SHift, UShift, LShift, UPower, LPower). |
| `OVertone First [n]` | Degree of first parameter. |
| `OVertone Second [n]` | Degree of second parameter. |
| `OVertone Harmonic [n]` | Amount harmonics are forced. |
| `FILter ...` | Enter Filter insert context. |
| `ENVelope ...` | Enter Envelope insert context. |

#### 21.4.3.5 Part Resonance Commands

Table 14: Resonance Commands

| | |
|---|---|
| `(enable) [s]` | Activate resonance (ON / other). |
| `PRotect [s]` | Leave fundamental unchanged (ON / other). |
| `Maxdb [n]` | Set the maximum attenuation of points. |
| `Random [s]` | Set a random distribution (Coarse, Medium, Fine). |
| `CEnter [n]` | Set the center frequency of the resonance range. |
| `Octaves [n]` | The number of octaves covered. |
| `Interpolate [s]` | Turn isolated peaks into lines or curves (Linear, Smooth). |
| `Smooth` | Reduce range and sharpness of peaks. |
| `CLear` | Set all points to the mid level. |
| `POints [[n1] [n2]]` | Show all or read n1 or set n1 to n2 |

#### 21.4.3.6 Part Waveform Commands

Table 15: Part Waveform Commands

| | |
|---|---|
| `[s]` | Directly set the basic waveform type by name. |
| `HArmonic [n1] Amp [n2]` | Set harmonic n1 to n2 intensity. |
| `HArmonic [n1] Phase [n2]` | Set harmonic n1 to n2 phase. |
| `Harmonic Shift [n]` | Amount harmonics are moved. |
| `Harmonic Before [s]` | Shift before waveshaping and filtering (ON other). |
| `COnvert` | Change resultant wave to groups of sine waves. |
| `CLear` | Clear harmonic settings. |
| `Base Par [n]` | Basic wave parameter. |
| `Base Mod Type [s]` | Basic modulation type (OFF, Rev, Sine Power). |
| `Base Mod Par [n1] [n2]` | Parameter number n1 (1 - 3) set to n2 value. |
| `Base Convert [s]` | Use resultant wave as basic waveform type.<br>Also clear modifiers and harmonics (OFF other). |
| `SHape Type [s]` | Wave shape modifier type. (OFF, ATAn, ASYm1, POWer, SINe, QNTs, ZIGzag, LMT, ULMt, LLMt, ILMt, CLIp, AS2, PO2, SGM) |
| `SHape Par [n]` | Wave shape modifier amount. |
| `Filter Type [s]` | (OFF, LP1, HPA1, HPB1, BP1, BS1, LP2, HP2, BP2, BS2, COS, SIN, LSH, SGM) |
| `Filter Par [n1] [n2]` | Filter parameters n1 (1/2) set to n2 value. |
| `Filter Before [s]` | Do filtering before waveshaping (ON other). |
| `Modulation Par [n1] [n2]` | Overall modulation parameter n1 (1 - 3) set to n2 value. |
| `SPectrum Type [s]` | Spectrum adjust type (OFF, Power, Down/Up threshold). |
| `SPectrum Par` | Spectrum adjust amount. |
| `ADdaptive Type [s]` | Adaptive harmonics (OFF, ON, SQUare, 2XSub, 2XAdd, 3XSub, 3XAdd, 4XSub, 4XAdd) |
| `ADdaptive Base [n]` | Adaptive base frequency. |
| `ADdaptive Level [n]` | Adaptive power. |
| `ADdaptive Par [n]` | Adaptive parameter amount. |
| `APply` | Fix settings (only for PadSynth). |

This list shows the "basic waveform type" settings available.

- SINe
- TRIangle
- PULse
- SAW
- POWer
- GAUss
- DIOde
- ABSsine
- PULsesine
- STRetchsine
- CHIrp
- ASIne
- CHEbyshev

- SQUare
- SPIke
- CIRcle

### 21.4.4 Engine Envelopes

Table 16: Engine Envelopes, Type

| | |
|---|---|
| `AMplitude` | Amplitude type. |
| `FRequency` | Frequency type. |
| `FIlter` | Filter type. |
| `BAndwidth` | Bandwidth type (SubSynth only). |

Table 17: Engine Envelopes, Controls

| | |
|---|---|
| `Expand [n]` | Envelope time on lower notes. |
| `Force [s]` | Force release (ON / other). |
| `Linear [s]` | Linear slopes (ON / other). |
| `FMode [s]` | Set as Freemode (ON / other). |

Table 18: Engine Envelopes, Fixed

| | |
|---|---|
| `Attack Level [n]` | Initial attack level. |
| `Attack Time [n]` | Time before decay point. |
| `Decay Level [n]` | Initial decay level. |
| `Decay Time [n]` | Time before sustain point. |
| `Sustain [n]` | Sustain level. |
| `Release Time [n]` | Time to actual release. |
| `Release Level [n]` | Level at envelope end. |

Example: ”S FR D T 40” is ”set frequency decay time 40”.

Note: Some envelopes have limited controls.

Table 19: Engine Envelopes, Freemode

| | |
|---|---|
| `Points` | Number of defined points (read only). |
| `Sustain [n]` | Point number where sustain starts. |
| `Insert [n1] [n2] [n3]` | Insert point at n1 with X increment n2, Y value n3. |
| `Delete [n]` | Remove point n. |
| `Change [n1] [n2] [n3]` | Change point n1 to X increment n2, Y value n3. |

### 21.4.5 Engine Filters

Table 20: Engine Filters

| | |
|---|---|
| `CEnter [n]` | Center frequency. |
| `Q [n]` | Q factor. |
| `Velocity [n]` | Velocity sensitivity. |
| `SLope [n]` | Velocity curve. |
| `Gain [n]` | Overall amplitude. |
| `TRacking [n]` | Frequency tracking. |
| `Range [s]` | Extended tracking (ON, other) - goes from 0 to 198. |
| `STages [n]` | filter stages (1 to 5). |
| `CAtegory [s]` | Analog, Formant, State variable. |
| `TYpe [s]` | Category dependent, and not formant filters. See the filter types below. |
| `EDit ...` | Formant filter only. Enter the format editor. See below. |

The list of filter types:

- Analog filters:
  - **l1**. One stage low pass.
  - **h1**. One stage high pass.
  - **l2**. Two stage low pass.
  - **h2**. Two stage high pass.
  - **band**. Two stage band pass.
  - **stop**. Two stage band stop.
  - **peak**. Two stage peak.
  - **lshelf**. Two stage low shelf.
  - **hshelf**. Two stage high shelf.
- State variable filters:
  - **low**. Low pass.
  - **high**. High pass.
  - **band**. Band pass.
  - **stop**. Band stop.

Table 21: Engine Filters, Formant Editor

| | |
|---|---|
| `Invert [s]` | Invert effect of LFOs, envelopes (ON, OFF). |
| `CEnter [n]` | Center frequency of sequence. |
| `Range [n]` | Octave range of formant. |
| `Expand [n]` | Stretch overall sequence time. |
| `Lucidity [n]` | Clarity of vowels. |
| `Morph [n]` | Speed of change between formants. |
| `SIze [n]` | Number of vowels in sequence. |
| `COunt [n]` | Number of formants in vowels. |
| `VOwel [n]` | Vowel being processed. |
| `Point [n1] [n2]` | Sequence position n1 vowel n2. |
| `Formant [n]` | Formant being processed. |
| `per formant` | |
| `- FRequency [n]` | Center frequency of formant. |
| `- Q [n]` | Bandwidth of formant. |
| `- Gain` | Amplitude of formant. |

### 21.4.6 Engine LFOs

Table 22: Engine LFOs

| | |
|---|---|
| `AMplitude` | Amplitude type. |
| `FRequency` | Frequency type. |
| `FIlter` | Filter type. |
| `- Controls -` | |
| `Rate [n]` | Frequency. |
| `Intensity [n]` | Amount of effect. |
| `Start [n]` | Start position in cycle. |
| `Delay [n]` | Time before effect. |
| `Expand [n]` | Rate / note pitch. |
| `BPM [s]` | Sync frequency to MIDI clock (ON / other). |
| `Continuous [s]` | Free running - ignore start position (ON / other). |
| `Type [s]` | LFO oscillator shape. See the list below. |
| `AR [n]` | Amplitude randomness. |
| `RR [n]` | Rate (frequency) randomness. |

Example: "S FI T RU" sets the filter type, ramp up. Filter types (s parameter, LFO oscillator shape):

- SIne
- Triangle
- SQuare
- RUp (ramp up)
- RDown (ramp down)
- E1dn
- E2dn
- SH (sample / hold)

- RSU (random square up)
- RSD(random square down)

## 21.5 MLearn

There are actually two entry points for MLearn. The first takes the same form as set/read and initiates the MIDI learning process for a given control. The second is within 'set' and is for editing current lines.

To enter the context for the second form start out with:

```
set mlearn
```

and to find out what lines have been set:

```
list mlearn
```

This will show all the current learned lines with their list numbers. In the same way as for the other numbered contexts, one can set the number of the line directly to edit it.

The available commands are:

- `MUte [s]`, Set to ON disables or, for any other provided token restores this line.
- `SEven` will interpret a learned NRPN as a 7-bit value.
- `CC [n]` will set the incoming controller value that will be recognised. This command might re-order the list.
- `CHan [n]` will set the incoming channel number that will be recognised. This command might re-order the list.
- `MIn [n]` will set the conversion for the incoming value to a minimum percentage.
- `MAx [n]` will set the conversion for the incoming value to a maximum percentage.
- `LImit [s]` set to Enable will use limiting instead of compression. The conversion uses the minimum and maximum limits.
- `BLock [s]` set to ON, prevents this CC/channel pair from being passed on to any other lines or system controls. It has no effect if the line has been muted.

## 21.6 EFfects Commands

Since V 1.5.10 all effects controls have been exposed. However those available change dependent on the specific effect that is being managed. These controls are the same for System, Insertion and individual part effects. However, the exception is the 'Level' control that most of these have. This refers to the 'Dry/Wet' proportion of the effect apart from in System effects where it behaves as a volume control, without changing the 'through' content.

While part effects are 'immediate', in that one hears the results as soon as an effect type is selected, System effects need the part's **send** level to be increased, as it defaults to zero. Insertion effects however, need to have a **send** route selected as well as the effect type.

There is some extra information given in V 1.5.11. When one chooses a new effect the first preset is always selected, which can then be edited to taste. Up to now, there was no indication that it had been altered apart from checking each control against its default. One could easily forget having edited this - especially if saving everything and coming back to it some days later.

In more recent *Yoshimi* versions there is a '?' on the end of the line if any of the controls on that preset are not the default values. So:

```
yoshimi> s sys 2 rev
yoshimi Sys eff 2 REverb-1> s pre 4
yoshimi Sys eff 2 REverb-4> s pan 36
```

This has now changed the preset.

```
yoshimi Sys eff 2 REverb-4?> s pre 4
yoshimi Sys eff 2 REverb-4>
```

Notice how even re-selecting the same preset will return it to its default settings, and would be an easy mistake if there was no warning.

Just leaving the effects to work on another part of *Yoshimi*, then returning to them won't change anything of course, and will again correctly show whether the current one has been altered.

### 21.6.1 Effects List

Below is the list of the effects themselves:

- OFF
- REverb
- ECho
- CHorus
- PHaser
- ALienwah
- DIstortion
- EQ
- DYnfilter

Here, in detail are the controls available for each effect:

Table 23: Reverb

| | |
|---|---|
| `LEVel [n]` | Amount of the effect. |
| `PANning [n]` | Left-right panning. |
| `TIMe [n]` | Reverb time. |
| `DELay [n]` | Initial delay. |
| `FEEdback [n]` | Delay feedback. |
| `LOW [n]` | Low pass filter. |
| `HIGh [n]` | High pass filter. |
| `DAMp [n]` | Feedback damping. |
| `TYPe [s]` | Reverb type (Random, Freeverb, Bandwidth). |
| `ROOm [n]` | Room size. |
| `BANdwidth [n]` | Actual bandwidth (only for bandwidth type). |
| `PREset [n]` | Select numbered preset (sets all above controls). |

Reverb presets:

1. cathedral 1
2. cathedral 2
3. cathedral 3
4. hall 1
5. hall 2
6. room 1
7. room 2
8. basement
9. tunnel
10. echoed 1
11. echoed 2
12. very long 1
13. very long 2

Table 24: Echo

| | |
|---|---|
| `LEVel [n]` | Amount of the effect. |
| `PANning [n]` | Left-right panning. |
| `DELay [n]` | Initial delay. |
| `LRDelay [n]` | Left-right delay. |
| `CROssover [n]` | Left-right crossover. |
| `FEEdback [n]` | Echo feedback. |
| `DAMp [n]` | Feedback damping. |
| `SEPerate` | Change DELay to left delay and LRDelay to right delay. |
| `BPM [s>]` | delay BPM sync (ON / other) |
| `PREset [n]` | Select numbered preset (sets all above controls). |

Echo presets:

1. echo 1
2. echo 2
3. simple echo
4. canyon
5. panning echo 1
6. panning echo 2
7. panning echo 3
8. feedback echo

Table 25: Chorus

| | |
|---|---|
| `LEVel [n]` | Amount of the effect. |
| `PANning [n]` | Left-right panning. |
| `FREquency [n]` | LFO frequency. |
| `RANdom [n]` | LFO randomness. |
| `WAVe [s]` | LFO waveshape (sine, triangle). |
| `SHIft [n]` | Left-right phase shift. |
| `DEPth [n]` | LFO depth. |
| `DELay [n]` | LFO delay. |
| `FEEdback [n]` | Chorus feedback. |
| `CROssover [n]` | Left-right routing. |
| `SUBtract [s]` | Invert output (ON / other). |
| `BPM [s]` | LFO BPM sync (ON / other). |
| `STArt [n]` | LFO BPM phase start. |
| `PREset [n]` | Select numbered preset (sets all above controls). |

Chorus presets:

1. chorus 1
2. chorus 2
3. chorus 3
4. celeste 1
5. celeste 2
6. flange 1
7. flange 2
8. flange 3
9. flange 4
10. flange 5

Table 26: Phaser

| | |
|---|---|
| `LEVel [n]` | Amount of the effect. |
| `PANning [n]` | Left-right panning. |
| `FREquency [n]` | LFO frequency. |
| `RANdom [n]` | LFO randomness. |
| `WAVe [s]` | LFO waveshape (sine, triangle). |
| `SHIft [n]` | Left-right phase shift. |
| `DEPth [n]` | LFO depth. |
| `FEEdback [n]` | Phaser feedback. |
| `STAges [n]` | The number of filter stages. |
| `CROssover [n]` | Left-right routing. |
| `SUBtract [s]` | Invert output against source (ON / other). |
| `HYPer [s]` | Hyper-sine (ON / other). |
| `OVErdrive [n]` | Distortion. |
| `ANAlog [s]` | Analog emulation (ON / other). |
| `BPM [s]` | LFO BPM sync (ON / other). |
| `STArt [n]` | LFO BPM phase start. |
| `PREset [n]` | Select numbered preset (sets all above controls). |

Phaser presets:

1. phaser 1
2. phaser 2
3. phaser 3
4. phaser 4
5. phaser 5
6. phaser 6
7. aphaser 1
8. aphaser 2
9. aphaser 3
10. aphaser 4
11. aphaser 5
12. aphaser 6

Table 27: Alienwah

| | |
|---|---|
| `LEVel [n]` | Amount of the effect. |
| `PANning [n]` | Left-right panning. |
| `FREquency [n]` | LFO frequency. |
| `WAVe [s]` | LFO waveshape (sine, triangle). |
| `SHIft [n]` | Left-right phase shift. |
| `DEPth [n]` | LFO depth. |
| `FEEdback [n]` | Filter feedback. |
| `DELay [n]` | LFO delay. |
| `CROssover [n]` | Left-right routing. |
| `RELative [n]` | Relative phase. |
| `BPM [s]` | LFO BPM sync (ON / other). |
| `STArt [n]` | LFO BPM phase start. |
| `PREset [n]` | Select numbered preset (sets all above controls). |

AlienWah presets:

1. alienwah 1
2. alienwah 2
3. alienwah 3
4. alienwah 4

Table 28: Distortion

| | |
|---|---|
| `LEVel [n]` | Amount of the effect. |
| `PANning [n]` | Left-right panning. |
| `MIX [n]` | Left-right mix. |
| `DRIve [n]` | Input level. |
| `OUTput [n]` | Output balance. |
| `WAVe [s]` | Function waveshape (ATAn, ASYm1, POWer, SINe, QNTs, ZIGzag, LMT, ULMt, LLMt, ILMt, CLIp, AS2, PO2, SGM) |
| `INvert [s]` | Invert ? (ON / other). |
| `LOW [n]` | Low pass filter. |
| `HIGh [n]` | High pass filter. |
| `STEreo [s]` | Stereo (ON / other). |
| `FILter [s]` | Filter before distortion (ON / other). |
| `PREset [n]` | Select numbered preset (sets all above controls). |

Distortion presets:

1. overdrive 1
2. overdrive 2
3. exciter 1
4. exciter 2
5. guitar amp
6. quantisize

Table 29: EQ

| | |
|---|---|
| `LEVel [n]` | Amount of the effect. |
| `BANd [n]` | EQ band number for following controls. |
| `- FILter [s]` | Filter type (LP1, HP1, LP2, HP2, NOT, PEA, LOW, HIG). |
| `- FREquency [n]` | Cutoff/band frequency. |
| `- GAIn [n]` | Makeup gain. |
| `- Q [n]` | Filter Q. |
| `- STAges [n]` | The number of *extra* filter stages. |

EQ has no presets.

Table 30: Dynfilter

| | |
|---|---|
| `LEVel [n]` | Amount of the effect. |
| `PANning [n]` | Left-right panning. |
| `FREquency [n]` | LFO frequency. |
| `RANdom [n]` | LFO randomness. |
| `WAVe [s]` | LFO waveshape (sine, triangle). |
| `SHIft [n]` | Left-right phase shift. |
| `DEPth [n]` | LFO depth. |
| `INVert [s]` | Reverse effect of sensitivity (ON / other). |
| `RATe [n]` | Speed of filter change with amplitude. |
| `FILter ...` | Enter the dynamic filter context. (a stock filter) |
| `BPM [s]` | LFO BPM sync (ON / other). |
| `STArt [n]` | LFO BPM phase start. |
| `PREset [n]` | Select numbered preset (sets all above controls). |

DynFilter presets:

1. wahwah
2. autowah
3. vocal morph 1
4. vocal morph 2

## 21.7 Bank Commands

During the development of *Yoshimi* V 1.6 it was realised that the command line had little control of instrument bank management. This was expanded in V 1.6.1. One can read the list of **Bank** commands from any level with '? b'.

```
yoshimi> ? b
```

In the table that follows, we leave off the commands already noted above in the first table (see Section 21.4.1 "Top Commands" on page 243).

Table 31: Yoshimi Bank Commands

| | |
|---|---|
| `Bank` | Enters the Bank context. |
| `[n]` | Sets the current bank to the one at slot n of the current bank root or reads the current bank's slot and name. |
| `Name [s]` | Changes or reads just the name of the current bank. |
| `Root [n]` | Sets the current bank root to n or reads the current full path. |
| `Root ID [n]` | Changes the current bank root ID to n. |
| `INstrument Rename [n] [s]` | Changes the name of the instrument in slot n of the current bank. |
| `INstrument SAve [n]` | Saves the current part's instrument to bank slot n. |

## 21.8 Vector Commands

Although **Vector** is a top-level control, one can read the list of commands from any level with '? ve'.

```
yoshimi part 1+> ? ve
```

A vector can be set on any standard MIDI channel, and allows a two or four part column to be managed as pairs for the given controls. The commands at this level deal with control of an X axis and a Y axis. The CC for the X axis must be set before everything else. Then the CC for the Y axis must be set. Finally, the other Y controls can be set.

In the table that follows, we leave off the commands already noted above in the first table (see Section 21.4.1 "Top Commands" on page 243).

Note that for vectors, n by itself is the base channel.

Table 32: Yoshimi Vector Commands

| | |
|---|---|
| `VEctor` | Enters the Vector context. |
| `[n]` | Changes the channel number for setting/editing. |
| `[X/Y] CC [n]` | CC n is used for the X or Y axis sweep. |
| `[X/Y] Features [n] [s]` | Sets X or Y features n = 1 to 4 (s = "Enable", "Reverse", other = off). |
| `[X] PRogram [l/r] [n]` | Sets X program change ID n for left or right part. |
| `[Y] PRogram [d/u] [n]` | Sets Y program change ID n forL DOWN or UP part. |
| `[X/Y] Control [n1] [n2]` | Sets n2 CC to use for X or Y feature n1 = 2 to 4. |
| `Off` | Disables vector control for this channel. Parts are unchanged. |
| `Name [s]` | Sets the internal name to s for this complete vector. |

The **X/Y Features** command sets the features for the selected axis, and also if they are to be off or reversed.

The **X/Y Control [n1] [n2]** command sets the n2 CC to use for the X or Y feature n1 = 2 to 4. This allows a change of the actual CC associated with features 2 through 4. They can be any CC that *Yoshimi* recognises.

Feature 1 is always fixed as Volume, and cannot be reversed. It is arranged such that it will try to maintian a constant overall volume from the paired instruments.

## 21.9 Scales Commands

A fairly new one is the scales list:

```
yoshimi> ? sc
```

In the table that follows, we leave off the following commands, already noted above in the first table (see Section 21.4.1 "Top Commands" on page 243): **?**, **Help**, **STop**, **RESet**, **EXit**, **..**, and **/**.

Table 33: Yoshimi Scales Commands

| | |
|---|---|
| `[ON/OFF]` | Enable/disable microtonal tuning. |
| `IMPort [s1] [s2]` | Import Scala file s2 to s1 TUNing or KEYmap. |
| `EXPort [s1] [s2]` | Export s1 TUNing or KEYmap to Scala file s2. |
| `FRequency [n]` | Set the reference note's actual frequency to n, usually 69 (A4) to 440 Hz. |
| `NOte [n]` | Set the reference note's number to n. |
| `Invert [s]` | Invert the entire scale (ON / other) |
| `CEnter [n]` | Set the note number of the key's center to n. |
| `SHift [n]` | Shift the entire scale up or down by n. |
| `SCale [s]` | Activate microtonal scale (ON / other). |
| `MApping [s]` | Activate keyboard mapping (ON / other). |
| `FIrst [n]` | Set the first note number to be mapped to n. |
| `MIddle [n]` | Set the middle note number to be mapped to n. |
| `Last [n]` | Set the last note number to be mapped to n. |
| `Tuning [s1]` | Set the CSV tuning values. Tuning sets the CSV tuning values, which are decimal numbers or ratios (n1.n1 or n1/n1, n2.n2 or n2/n2, etc.). |
| `Keymap [s]` | Set the CSV keymap (n1, n2, n3, etc.) Keymap sets the keyboard mapping values as a comma separated list. |
| `SIze [n]` | Sets the actual keymap size. |
| `NAme [s]` | Set the internal name for this scale. |
| `DEscription [s]` | Sets the description of this scale. |
| `CLEar` | Clear all settings and revert to the standard scale. |

## 21.10 Help List

One can now clearly see which items can be listed with:

```
yoshimi> list
yoshimi> help
```

In general **?** and **help** indicate what can be changed, while **list** reports what the current status is. In fact in most contexts just 'L' by itself works!

In the table that follows, we leave off commands noted above (see Section 21.4.1 "Top Commands" on page 243).

Table 34: Yoshimi Help Commands

| | |
|---|---|
| `Roots` | List all available root paths. |
| `Banks [n]` | List the banks in root ID [n] or the current root. This command shows all of the banks present in either the numbered ([n]) bank root, or in the current one (if no number is provided). |
| `Instruments [n]` | List instruments in bank ID [n] or current bank. This command shows all of the instruments present in either the numbered (n) bank root, or in the current one (if no number is provided). |
| `Group [s1] [s2]` | List instruments types, s1 (name) list all of that type with list number,<br>s2 'Location' include root, bank, instrument numbers. |
| `Parts` | List parts with instruments installed. ('More' for extra details) |
| `Vectors` | List settings for all enabled vectors. |
| `Config` | List dynamic configuration. |
| `Tuning` | Microtonal scale tunings. See the Scales section. |
| `Keymap` | Microtonal scale keyboard map. See the Scales section. |
| `Config` | Show the current configuration. See the Config section. |
| `MLearn [s[n]]` | MIDI learned controls ('@ n' for full details on one line). |
| `History [s]` | Show recent files. See the extensive description below. |
| `Effects [s]` | List the effect types ([s] = 'all' includes preset numbers and names). If this command is called from the Effects level, then one see only the name of the current effect and the number of presets. |
| `PREsets` | Show all the presets for the currently selected effect. |

A few more detailed descriptions occur in the following sections, where there is not enough room in the table above.

### 21.10.1 List Group [s]

By itself, **List Group** or **L G** will show what instrument types are available. Repeating the command with one of these names will then search the entire bank structure listing the ones of that type, along with an index number. Assuming one is at part level, load this instrument into the current part with:

```
set instrument group (n)
```

Unfortunately many instrument authors didn't identify a type, so the **undefined** list is the longest (although with revision of banks in V 2.0, this has reduced somewhat).

## 21.11 List History [s]

Show the recent history of the following items [s]: Instruments, Patchsets, SCales, STates, Vectors, and MLearn). If no parameter is provided, show them all.

The last-used file in any section is now always at the top of its history list, so it's easier to pick up where one left off. Instruments, patch sets, vectors, scales, MIDI-learn and state all offer the most recent entry whenever one wants to load or save. On first-time use (when there is no history) the home directory will be offered as a location, regardless of where *Yoshimi* was called from.

In the specific case of instruments, when *saving*, one is offered the instrument in the currently-selected part to the home directory, otherwise, when saving these 'managed' files, one won't be offered the previous last-used entry unless it was seen on that session, either by being loaded, or saved by name. This is to give some protection against accidental overwrites.

For example: You have been working on the 'foo' instrument for a whole day, saving the whole patch set as you go. Then, the following day, you start up *Yoshimi* and immediately have a completely new idea 'bar' and start working on it. Without thinking, you save and hit Enter. Oops, you just wiped out 'foo'. Only now you haven't, because loading *Yoshimi* afresh would not have seen the older file, so now, saving will offer the home directory to put a new name in.

### 21.11.1 List Load/Save

And the same for load and save:

```
yoshimi> ? lo
yoshimi> ? sa
```

In the tables that follow, we leave off the commands noted above (see Section 21.4.1 "Top Commands" on page 243).

Table 35: Yoshimi Load Commands

| | |
|---|---|
| `Instrument [s]` | Load instrument to current part from a named file [s]. |
| `SCale [s]` | Load and activate scale settings from named file [s]. |
| `VEctor [n] [s]` | Load and activate vector to channel n (or saved) from named file [s]. |
| `Patchset [s]` | Load and activate a complete patch set from named file [s]. |
| `MLearn [s]` | Load the full MIDI learned list from named file [s]. |
| `STate [s]` | Load all system settings and patch sets from named file [s]. |

For the **Load Instrument** command, the instrument is enabled if it is configured to be enabled. For the **Load Vector** command, if there is no number parameter, the vector is loaded to the channel it was originally saved from. For the **Load Patchset** command, all instruments, scales, and vectors are loaded from the named file. For the **Load STate** command, all configuration, system settings, patch sets, and MIDI-learned lines are loaded from the named file. These notes also apply to the **Save** version of these commands.

Table 36: Yoshimi Save Commands

| | |
|---|---|
| `Instrument [s]` | Save current part to named file [s]. |
| `SCale [s]` | Save current scale settings to named file [s]. |
| `VEctor [n] [s]` | Save vector on channel n to named file [s]. |
| `Patchset [s]` | Save complete set of instruments to named file [s]. |
| `MLearn [s]` | Save midi learned list to named file [s]. |
| `STate [s]` | Save all system settings etc. to named file [s]. See above. |
| `Config` | Save current configuration. |

### 21.11.2 Config Commands

Finally there is the (quite big) COnfig command level:

```
yoshimi> ? con
```

In the table that follows, we leave off the commands noted above (see Section 21.4.1 "Top Commands" on page 243). Also note that more complete descriptions follow this table.

Table 37: Yoshimi Config Commands

| | |
|---|---|
| `Oscillator [n]` | * Add/Pad size (power 2 256-16384). This sets the size of the buffer used for both AddSynth and PadSynth oscillators, and is always a power of 2. |
| `BUffer [n]` | * Internal size (power 2 16-4096). This is the size of the audio buffer that *Yoshimi* uses. For ALSA audio, it will always be the same size as ALSA's buffering, but for JACK it can be the same, bigger, or smaller. It is always a power of 2. |
| `PAdsynth [s]` | Interpolation type (Linear, other = cubic). Sets the quality of the interpolation that PadSynth uses on its wavetables. 'Linear' is faster, but 'Cubic' is (potentially) very slightly better quality. |
| `BUIldpad [s]` | PADSynth wavetable build mode (Muted, Background, Autoapply) |
| `Virtual [n]` | Keyboard layout (0 = QWERTY, 1 = Dvorak, 2 = QWERTZ, 3 = AZERTY). This setting controls the layout of the virtual keyboard, and can match the commonest computer keyboards. |
| `Xml [n]` | Set the XML compression level to [n] (0-9). This is the amount of compression used on all *Yoshimi*'s data files. 9 is the most-compressed setting. 0 is no compression, so that the configuration file can be read in an ordinary text editor. |
| `REports [s]` | Destination for reporting (Stdout, other = console). Determines where almost all information and error messages will be sent. A few will always go to `stderr` (such as the ones reporting a GUI problem). |
| `SAved [s]` | Saved instrument type. (Legacy - .xiz, Yoshimi - .xiy, Both). |

| | |
|---|---|
| `ENGine [s]` | Enable instrument engines and types info (OFF, other) Slower initial start, but bank instruments can be selected by type and engines will be identified in lists. |
| `EXPose [s]` | Show current context level (ON, OFF, PRompt). |
| `STate [s]` | * Autoload default at start (Enable; other = disable). Sets whether a pre-saved default state file will be loaded on start-up. |
| `SIngle [s]` | * Force 2nd startup to open new instance instead (ON / other) |
| `Hide [s]` | Hide non-fatal errors (Enable; other = disable). Sets to ignore non-fatal system errors, or verbose messages. |
| `Display [s]` | GUI splash screen (Enable; other = disable). Enables *Yoshimi*'s start-up splash screen (which is enabled at first time start). |
| `Time [s]` | Add to instrument load message (Enable; other = disable). Attaches the time an instrument took to load and initialise to the loading message. |
| `Include [s]` | Include XML headers on file load (Enable; other = disable). |
| `Keep [s]` | Include inactive data on all file saves (Enable; other = disable). Sets up to include all data on file saves, including data for inactive and random elements. |
| `Gui [s]` | * Run with GUI (Enable, Disable). Run with the command-line interface enabled or disabled. |
| `Cli [s]` | * run with CLI (Enable, Disable). Run with the command-line interface enabled. |
| `LOCk [s1][s2]` | Lock history of group s1 (ON, OFF). Groups - INstrument, PAtchset, SCale, STate, VEctor, MLearn. |
| `MIdi [s]` | * connection type (Jack, Alsa). Sets whether MIDI input comes from JACK or from ALSA. If not specified, JACK is the default, if it is present. Otherwise, *Yoshimi* falls back to ALSA. |
| `AUdio [s]` | * connection type (Jack, Alsa). Sets whether audio is passed out to JACK or ALSA. Again, JACK is the default, and ALSA is the fall-back. |
| `ALsa Type [s]` | * midi connection type (Fixed, Search, External) Sets whether to use the list below, search for sources, or none at all. |
| `ALsa Midi [s]` | * comma separated source name list. Sets the entries of a list of ALSA MIDI sources to which *Yoshimi*i will try to connect. |
| `ALsa Audio [s]` | * Name of ALSA audio hardware device. Sets the name of a hardware (or software) audio device to which ALSA will try to connect. |
| `ALsa Sample [n]` | * ALSA sampling rate (0 = 192000, 1 = 96000, 2 = 48000, 3 = 44100). Sets the sampling rate when using ALSA audio. |
| `Jack Midi [s]` | * Name of JACK MIDI source. Sets the name of a JACK MIDI source to which *Yoshimi* will try to connect. |

| | |
|---|---|
| `Jack Server [s]` | * Name of JACK server. Sets the name of an audio server to which JACK will try to connect. |
| `Jack Auto [s]` | * Connect JACK on start (Enable; other = disable). Determines whether JACK will try to connect the main L=R audio outputs at start-up time. |
| `ROot [s]` | Root CC (Msb, Lsb, Off). Provides the MIDI CC that *Yoshimi* expects bank root changes to come from. |
| `BAnk [s]` | Bank CC (Msb, Lsb, Off). Provides the MIDI CC that *Yoshimi* expects bank changes to come from. |
| `PRogram [s]` | MIDI program change enabling (OFF / other). Determines whether MIDI program changes are honoured or ignored. |
| `ACtivate [s]` | MIDI program change activates part (ON / other). Enables a part when it gets a MIDI program change message, if it was disabled. |
| `EXtended [n]` | Extended program change. Sets a MIDI CC for receiving program changes for the top (extra) 32 instruments in a bank, or disable if above 119 |
| `Quiet [s]` | Ignore 'reset all controllers' (ON / other). Sets up to ignore MIDI 'reset all controllers' messages. |
| `Nrpn [s]` | enable incoming NRPNs (ON / other). Displays the value of received MIDI CCs. |
| `Log [s]` | Log incoming MIDI CCs (ON / other). Displays the value of received MIDI CCs. |
| `SHow [s]` | GUI MIDI learn editor (ON / other). A setting for the GUI MIDI learn editor, where s is "Enable", or some other token to disable the feature. This setting indicates to automatically open the MIDI-learn editor window when a successful "learn" has been made. |

'*' marks entries that need to be saved, and *Yoshimi* restarted, to activate them.

## 21.12 Command Descriptions

This section describes the command-line commands in more detail. Obviously, some more needs to be written about some of the commands. Note that all the parameters for the `load` and `save` parameters are strings, and the parameters are compulsory, not optional.

**1. "..".** Step back up one command context level. This command can immediately precede another command, so that the second command takes places at the context above the current context. Note that it is like the OS's "cd .." command to change to the parent directory.

**2. /.** Step back up to the top command context level. This command can immediately precede another command, so that the second command takes places at the top context. Note that it is like the OS's "cd /" command to change to the root directory.

**3. add bank [s].** Define a new bank, *s*, where *s* is a bank name, and add it to the current root.

**4. remove bank [s].** Delete the bank named *s*, and all its contents, from the current root path.

**5. export bank** [**s** [**n1**]] [**n2**] [**s**]. The command line now has two commands to provide access to the new bank export and import controls. These are top level controls and are used as below. The command above is used to export a bank. The square bracket term is optional, and enables one to select a different root to export from and would be in the form:

```
EXport Root (root ID number) (bank ID number) (full path name to export to)
```

If one is happy to export from the currently selected root, then this simplifies to:

```
EXport (bank ID number) (full path name to export to)
```

**6. import bank** [**s** [**n1**]] [**n2**] [**s**]. Import of a bank uses the identical syntax of the export command. A full example using the normal abbreviations is:

```
im r 5 25 /home/will/downloads/some new bank
```

This will look for the directory "some new bank" (spaces are accepted) in the download directory of user "will". It will then copy it into bank number 25 of root number 5. It first checks to ensure that the new named bank exists, root 5 exists, and bank 25 is empty.

**7. add root** [s]. Define a new root path, *s*, and add it to the list of root paths.

**8. remove root** [s]. De-list the root path named *s*, but doesn't alter the contents.

**9. list banks** [n]. List the instruments and IDs in bank *n* or the current bank/root.

**10. list effects** [s]. List effect types for *s*. If the parameter is the word *all*, then list every effect and all its presets along with the preset number.

**11. list history** [s]. Displays the recently-used files, including patchsets, scales, and states. If no parameter is given, then this command lists all three files in sequence. The shortest version of this command is `l h p` (for patchsets, which returns the last-seen patchset list).

Once that list is displayed, the `@` operator can be used to access the item by number. For example, to load the patch set at location 4 in the list:

```
yoshimi> lo p @4
```

**12. list instruments** [n]. List all instruments and IDs in bank *n* or the current bank/root. Listing instruments will identify the current one with an asterisk, and shows the current bank and root one is listing from, and adds a suffix to the entry with **A**, **S**, or **P** depending on the combination of AddSynth, SubSynth, and PadSynth.

**13. list parts.** Lists the number of parts available and parts with instruments currently installed along with any enabled with the default sound. Also shows their audio destination: $M$ = main L/R, $P$ = part L/R, $B$ = both, and - = disabled or unavailable. This way one can tell if an instrument patch is installed even if it is not currently usable. To avoid unnecessary list length, the default "Simple Sound" is not shown unless it is enabled.

**14. list roots.** Displays all defined root paths. Listing roots will identify the current ones with an asterisk.

**15. list setup.** Displays the current dynamic system settings.

**16. list vector** [n]. Lists the settings for vector on channel *n*.

**17. load instrument** [s]. Loads an instrument into the current part from the named file.

**18. load patchset** [s]. Load a complete patch set from a named file, *s*. A variation on this command is `load patchset @4`, which loads the patchset at location 4, the 4th item in the list.

**19. load vector [s].** Loads an vector setup from the named file. The file-name parameter *s* is mandatory.

**20. save patchset [s].** Saves the current patchset to the file named *s*.

**21. save instrument [s].** Saves the instrument of the current part to the named file. The file-name parameter *s* is mandatory.

**22. save setup.** Save the current dynamic system settings. Most settings get saved to the state file for the current instance, but a few are saved in the master config file.

**23. save vector [s].** Saves the vector setup to the named file. The file-name parameter *s* is mandatory.

**24. set activate [n].** Set part-activate on MIDI program change. *n*=0 disables this feature, and 1 or any non-zero value enables this feature. This feature applies to command line program change as well.

**25. set alsa audio [s].** Sets the name of the audio hardware device ALSA looks for. Requires a restart of *Yoshimi*.

**26. set alsa midi [s].** Sets the name of the MIDI source ALSA looks for. Requires a restart of *Yoshimi*.

**27. set available [n].** Set the number of available parts (16, 32, 64). Note that 32 and 64 are supported in the newest versions of *Yoshimi*. Also note that a single two-part vector setup (the **X** vector) requires 32 parts, while the dual two-part vector setup (both **X** and **Y**) requires 64 parts.

**28. set bank [n].** Set the MIDI CC for bank changes ((Msb, Lsb, Off)).

**29. set root [n].** Set the MIDI CC for root path changes ((Msb, Lsb, Off)).

**30. set extend [n].** Set CC value for extended program change (values above 119 disables this feature).

**31. set insert effect [n].** Set insertion effect for editing. Where *n* is from 1 to 8.

**32. set jack midi [s].** Sets the name of the JACK MIDI source for *Yoshimi*. Requires a restart of *Yoshimi*.

**33. set jack server [s].** Sets the name of the JACK server *Yoshimi* tries to connect to. Requires a restart of *Yoshimi*.

**34. set part [n1] program [n2].** Load instrument *n2* into part *n1*. Example: `set part 4 program 130`

**35. set part [n1] channel [n2].** Set the MIDI channel *n2* for part *n1*. If the channel number is greater than 15, no further MIDI messages will be accepted by that part.

**36. set part [n1] destination [n2].** Set the audio destination of part *n1* to main (*1*), part (*2*), both (*3*). Also enables the part if not already enabled.

**37. set preferred audio [s].** Set the audio connection type. The parameter should be either "jack" or "alsa".

**38. set preferred midi [s].** Set the MIDI connection type. The parameter should be either "jack" or "alsa".

**39. set - preset [n].** Set effect preset. Set numbered effect preset.

**40. set program [n].** Set MIDI program change (0 disables, anything else enables).

**41. set reports [n].** Sets the report destination or where messages are displayed, and, to some extent, which messages are displayed. Here are the variations on this command that are supported:

- `set reports gui` or `s r g`. All reports are sent to the GUI console window.
- `set reports stderr` or `s r s`. All reports are sent to stderr.

- `set reports show` or `s r sh`. All messages are displayed.
- `set reports hide` or `s r h`. Non fatal low-level messages are discarded.
- `set reports (any other word or nothing at all)` or `s r (other)`. This sets the default condition of sending reports to the CLI and displaying all of them.

**42. set root [n].** Set current root path to ID *n*.

**43. set shift [n].** Set the master key shift for following notes in semitones (+- octave, 64 for no shift).

**44. set system effects [n].** Set System Effects for editing.

**45. set vector [n1] x/y cc [n2].** CC *n2* is used for channel *n1* X or Y axis sweep. For X, this also enables vector control for the channel.

The individual features are now numbered 1-4 and can be `enabled` or `reversed` (any other word disables the feature). "Reversed" means that, instead of the X left rising in value with increasing CC value, it decreases. X right does the opposite of course.

Feature 1 is always fixed as 7 (volume) and is not reversible. Features 2 to 4 can also have the outgoing CC changed to any valid one. The vector is just about the only command-line entry that starts from 1.

The original system where bits were ORred together was done to make NRPN control as efficient as possible. That hasn't changed, but log messages refer to the command-line numbering.

A more detailed discussion of command-line vector control is presented in Section 18.4 "Vector / Command Line" on page 226.

**46. set vector [n1] x/y features [n2].** Sets channel *n1* X or Y features to *n2*.

**47. set vector [n1] x/y program [l/r] [n2].** Loads program *n2* to channel *n1* X or Y *left* or *right* part.

**48. set vector [n1] x/y control [n2] [n3].** Sets `n3` CC to use for X or Y feature `n2` (2, 4, 8). *n3* is the CC to be used for feature number *n2* on X vector channel *n1*. The *x* is a sort of hidden parameter as the code uses an offset dependent on whether it is *x* or *y*. Also *n1* can be omitted in which case it will use the last defined channel number. Using alternate words and numbers gives a great deal of flexibility like this.

**49. set vector [n] [off].** Disables vector control for channel *n*.

**50. set volume [n].** Set the master volume.

**51. reset.** Return to the start-up conditions, if 'y' selected.

**52. stop.** Cease all sound immediately!

**53. ? or help.** List commands for current mode. All of the minimum command-line abbreviations are capitalised in the help listing.

**54. exit.** Tidy up and close *Yoshimi* down.

## 21.13 Direct Access

*Direct Access* is a very low-level access method for most of the controls in *Yoshimi* control. It is a test feature accessible only from the command line. There are virtually no error checks on direct-access, so one can easily crash *Yoshimi* with out of range values. It mostly updates the GUI too.

Since V 1.6.0 direct access has been disabled as it no longer produces valid data. Also, all available controls are now provided in a fully protected manner.

For developers there is relevant information within the source code.

## 22 LV2 Plug-in Support

*Yoshimi* now runs as an LV2 plugin.

Supported features:

1. Sample-accurate MIDI timing.
2. State save/restore support via LV2_State_Interface.
3. Working UI support via LV2_External_UI_Widget.
4. Programs interface support via LV2_Programs_Interface.
5. Multi channel audio output. 'outl' and 'outr' have LV2 index 2 and 3. All individual ports numbers start at 4.
6. Irrelevant GUI settings are deactivated for LV2.

Planned feature: Controls automation support. This will be a part of a common controls interface.

Download and build the source code found at the *Yoshimi* site [19], and one will find a file named `LV2_Plugin/yoshimi_lv2.so`

*Yoshimi*'s LV2 implementation is frequently tested using the latest versions of *Ardour*, *Muse*, and *Qtractor* as LV2 hosts. Like *Yoshimi*, these are also in continuous development. Since *Yoshimi* version 2.3.0 it has also been tested and works correctly with Carla and Reaper.

At some point we hope to document the process of setting up and using the *Yoshimi* LV2 plugin.

## 23 Yoshimi Man Page

This version *Yoshimi* manual page is actually the output of the `yoshimi --help` command, which prints out the command-line options that are discussed in this section. Note that further descriptions might be found in other sections of this advanced user manual, for example, in Section 6.1.3 "Menu / Yoshimi / Settings.." on page 43.

Yoshimi 1.5.1 (and above!), a derivative of ZynAddSubFX - Copyright 2002-2009 Nasca Octavian Paul and others, Copyright 2009-2011 Alan Calvert, Copyright 20012-2013 Jeremy Jongepier and others, Copyright 20014-2017 Will Godfrey and others.

`-a --alsa-midi[="device"]`
Use ALSA MIDI input. From the command line, as well as auto-connecting the main L & R outputs to JACK, with ALSA MIDI one can now auto-connect to a known source.

```
./yoshimi -K --alsa-midi="Virtual Keyboard"
```

ALSA can often manage with just the client name. This command is case sensitive, and quite fussy about spaces, etc., so it's wise to use quotes for the source name, even if they don't seem to be needed.

`-A --alsa-audio[=device]`
Use ALSA audio output.

`-b --buffersize=size`
Set ALSA internal audio buffer size.

`-c --show-console`
Show the console on startup.

`-D --define-root`
Define the path to a new bank root. *Yoshimi* will then immediately scan this path for new banks, but won't make the root (or any of its banks) current. The final directory doesn't in fact have to be 'banks' but traditionally *Yoshimi* has always done this. Also, when running from the command line there is now access to many of the system, root, bank, etc. settings. See Section 21 "The Yoshimi Command-Line Interface" on page 237.

`-i --no-gui`
Do not show the GUI. See Section 21 "The Yoshimi Command-Line Interface" on page 237 for more information about this mode of operation. Note that the command-line and the GUI can be available simultaneously. Also note that this switch allows *Yoshimi* to run on a dumb terminal or virtual console.

`-j --jack-midi[=device]`
Use JACK MIDI input. From the command line, as well as auto connecting the main L & R outputs to JACK, with JACK MIDI one can now auto-connect to a known source.

```
./yoshimi -K --jack-midi="jack-keyboard:midi_out"
```

JACK needs the port as well as the name. This command is case sensitive, and fussy about spaces. Use quotes.

`-J --jack-audio[=server]`
Use JACK audio output. Connect to the given JACK server if given.

`-k --autostart-jack`
Auto-start the JACK server. Note that this can cause some odd behaviour on some systems, so be aware of that possibility.

`-K --auto-connect`
Auto-connect JACK audio. Note that, if the auto-connect feature has been specified in the user-interface, and saved to the *Yoshimi* configuration file, there is then no way to disable this feature from the command-line, at this time.

`-l --load=file`
Load an `.xmz` file.

`-L --load-instrument=file`
Load an `.xiz` file The '=' is optional, but must not be surrounded by spaces if present.

`-N --name-tag=tag`
Add tag to client-name.

`-o --oscilsize=size`
Set ADDSynth oscillator size (OscilSize).

`-R --samplerate=rate`
Set ALSA audio sample rate.

`-S --state[=file]`
Load saved state from file, where the file defaults to `$HOME/.config/yoshimi/yoshimi.state`, which is loaded automatically if present and not overridden by the `--state` option. The '=' is mandatory, no spaces allowed.

`-u --jack-session-file[=file]`
Load the named JACK session file.

`-U --jack-session-uuid[=uuid]`
Load the named JACK session by UUID.

`-? --help`
Give this help list.

`--usage`
Provide a short usage message.

`-V --version`
Print the program version.

Mandatory or optional arguments to long options are also mandatory or optional for any corresponding short options.

From the command line, as well as auto-connecting the main L & R outputs to JACK, with either JACK or ALSA MIDI one can now auto-connect to a known source.

ALSA can often manage with just the client name, but JACK needs the port as well. These commands are case sensitive, and fussy about spaces.

# 24 Concepts

*Yoshimi* requires the user to understand many concepts and terms. Understanding them makes it easier to configure *Yoshimi* and to drive it from a sequencer application.

Significant portions of this section are shamelessly copied (and tweaked) from Paul Nasca's original *ZynAddSubFX* manual [28] or [29]. However, even the *Yoshimi* developers sometimes refer to *Zyn*.

Note that there are some audio/electrical concepts discussed in greater detail in Section 8 "Stock Settings Elements" on page 86. Perhaps they belong in this "concepts" section, but they are directly tied to user-interface items.

## 24.1 Concepts / Terms

This section doesn't provide comprehensive coverage of terms. It covers mainly terms that might puzzle one at first, or have a special meaning in *Yoshimi*.

### 24.1.1 Concepts / Terms / Cent

The **cent** is a logarithmic unit of measure for musical intervals. Twelve-tone equal temperament divides the octave into 12 semitones of 100 cents each. Typically, cents are used to measure extremely small pitch intervals, or to compare the sizes of comparable intervals in different tuning systems. The interval of one cent is much too small to be heard between successive notes.

### 24.1.2 Concepts / Terms / Frame

The audio **sample** is the instantaneous value of an audio stream taken at a specific time. In software, this is usually represented as a float (floating point value), but in hardware will be a 24 or 32 bit integer, or a short (16 bit integer).

The audio **frame** is a sample group of however many channels an application is handling. If one is using JACK, a mono signal will have frames of 1 float, 2 floats for stereo, etc. A six-channel device will have six samples in a single frame. An audio or JACK buffer will contain more than one frame of data. Buffers generally range in size from 16 to 1024 frames. Low values provide less latency (time delay), but make the CPU work harder.

#### 24.1.3 Concepts / Terms / Instrument

In *Yoshimi*, an *instrument* is a complex sound that can be constructed using ADDsynth, SUBsynth, PADsynth, and kits. Each instrument is loaded into a *part* (see Section 24.1.4 "Concepts / Terms / Part" on page 281).

In our documentation, we will sometimes use the terms "instrument", "patch", and even "program" interchangeably and loosely. However, "part" now has a different meaning, as seen in the next term.

#### 24.1.4 Concepts / Terms / Part

In *Yoshimi*, a *part* is one of 16, 32, or 64 "slots" into which one can load an instrument (see Section 24.1.3 "Concepts / Terms / Instrument" on page 281). Each part can be enabled or disabled, and assigned to a particular MIDI channel, one of the 16 MIDI channels. Note that the previous *Yoshimi* limit on parts was 16. Since 1.3.5, this limit has been raised to 64.

#### 24.1.5 Concepts / Terms / Patch

In MIDI jargon, a *patch* is a sound played on one of 16 channels in a MIDI device. Many synthesizers can handle several waveforms per patch, mixing different instruments together to create synthetic sounds. Each waveform counts as a MIDI voice. Some sound cards can support two or more waveforms per patch. *Yoshimi* has some ability to combine waveforms ("voices") into one instrument (Section 24.1.3 "Concepts / Terms / Instrument" on page 281), which can then be loaded into a *Yoshimi* part (Section 24.1.4 "Concepts / Terms / Part" on page 281).

Before General MIDI, which standardised patches, MIDI vendors assigned patch numbers to their synthesizer products in an arbitrary manner.

Instrument patches are per part. When changing patches, one can't silence the entire synthesizer; a silent change requires being done when that part is not sounding. *Yoshimi* turns off the part during the patch load, and doesn't do a fade.

#### 24.1.6 Concepts / Terms / Patch Set

A patch set (also known as "patchset") is basically a group of instruments related simply by the user wanting to have them all loaded at once into *Yoshimi*. A patch set is stored in a `.xmz` file. A patch set is akin to a preset, in that it stores a combination of items, that took awhile to set up, for easy retrieval later.

As with most applications, *Yoshimi* allows for one to save one's work and reload it. *Yoshimi* has a number of different files that make up the current configuration. Together, they make up the concept of a *patch set* (also called a *patchset*). See Section 3 "Configuration Files" on page 29.

#### 24.1.7 Concepts / Terms / Presets

Presets allow one to save the settings for any of the components which support copy/paste operations. This is done with preset files (`.xpz`), which get stored in the folders indicated by **Paths / Preset Dirs...**. Note that the number of presets in a directory as well as the number of preset *directories* that can be set is limited to 128 (like roots and banks).

In MIDI jargon, a *preset* is an instrument that can be easily loaded. It is also called a *program* or a *patch*. A program is selected via a "program-change" message. A *preset* is any collection of settings that can be saved to the clipboard or to a file, for later loading elsewhere.

#### 24.1.8 Concepts / Terms / Program

In MIDI jargon, a *program* is the same as a *preset* (24.1.7).

#### 24.1.9 Concepts / Terms / Voice

In MIDI jargon, a *voice* is the same as a *preset* or a *program*. In *Yoshimi*, a *voice* is a single configurable waveform that is just one of up to eight waveforms in an ADDsynth setting. Such voices can also be used as modulators for other voices.

### 24.2 Concepts / ALSA Versus JACK

Some discussion from the *Yoshimi* wiki, for clarification.

A bit of a question mark was raised over ALSA MIDI support. A lot of people seem to be giving this up and relying on bridges like *a2jmidi* for legacy software and hardware inputs. JACK MIDI is already synchronous so should be jitter-free whereas ALSA MIDI runs on a "best effort" basis. Added to which JACK is available for OSX and Windows, so concentrating on this could make a possible port to other platforms more attractive.

*Seq24* (a nice old sequencer) uses ALSA MIDI. To connect applications that exclusively support JACK MIDI, *a2jmidid* will do the translation.

ALSA is more complex as it handles the sound card's format, commonly 16-bit integers, 24 bit integers (low byte ignored), and short integers. Less commonly it may be floats or the weird 24-bit long integers. We're still not sure if these are packed or low-aligned (top byte ignored). We've assumed they are low-aligned, but we don't know anyone who has such a card, in order to prove it. The only ALSA format *Yoshimi* doesn't support is float.

Something that's not obvious is the way that ALSA audio is controlled and who takes command. If one sets a specific destination, then *Yoshimi* says what it wants. It's often a negotiation on bit depth and channel count, but *Yoshimi* nearly always gets to decide the buffer size (it will be set to the internal buffer size). However, if the destination is "default", then ALSA decides on the sound card, bit depth, number of channels and the buffer size, and *Yoshimi* will set its internal buffer size to match. On most machines this always seems to be 1024.

*Yoshimi* can use a 192000 Hz sample rate in both ALSA and JACK... if one has a suitable soundcard!

If *Yoshimi* is configured for JACK, but cannot find the JACK server, it will try for ALSA. If neither JACK nor ALSA works, it will run with a null client so one can try to work out what went wrong. This status is reported to the command-line or Reports window.

For JACK, if one has started *Yoshimi* from the command-line with the `-K` option, it will auto-connect the main left and right outputs. On some machines, using the `-k` argument to also start JACK ends up running *jackdbus* which seems to route all JACK audio to `/dev/null`.

## 24.3 Concepts / Banks and Roots

In *Yoshimi*, a *root* is a location in which banks can be stored. It is basically a directory, though it ultimately is assigned a number by *Yoshimi*, to be able to access it in an automated way. By choosing a root, one can hone in on a smaller collection of banks.

Sometimes, one will see the term *path*. In *Yoshimi*, a *path* is simply the directory location of a root. This change is reflected in the user-interfaces, both graphical and command-line. Note that there are other file categories, such as presets, that are located via paths.

Another important concept in *Yoshimi* is *banks*. Instruments can be stored in banks. These are loaded and saved automatically by the program. On program start, the last used bank is loaded. A single bank can store up to 128 instruments normally, and 160 using extended programs. A bank isn't a file... it is a directory, managed by *Yoshimi*, which contains instrument (`.xiz`) files.

These concepts are discussed in great detail in Section 5 "Banks and Roots" on page 37.

## 24.4 Concepts / Basic Synthesis

This section describes some of the basic principles of synthesis, and contains suggestions on how to make instruments that sound like they have been made with professional equipment. This applies to *Yoshimi* or to any synthesizer (even if one wrote it oneself with a few lines of code). All the ideas from *Yoshimi* are derived from from the principles outlined below.

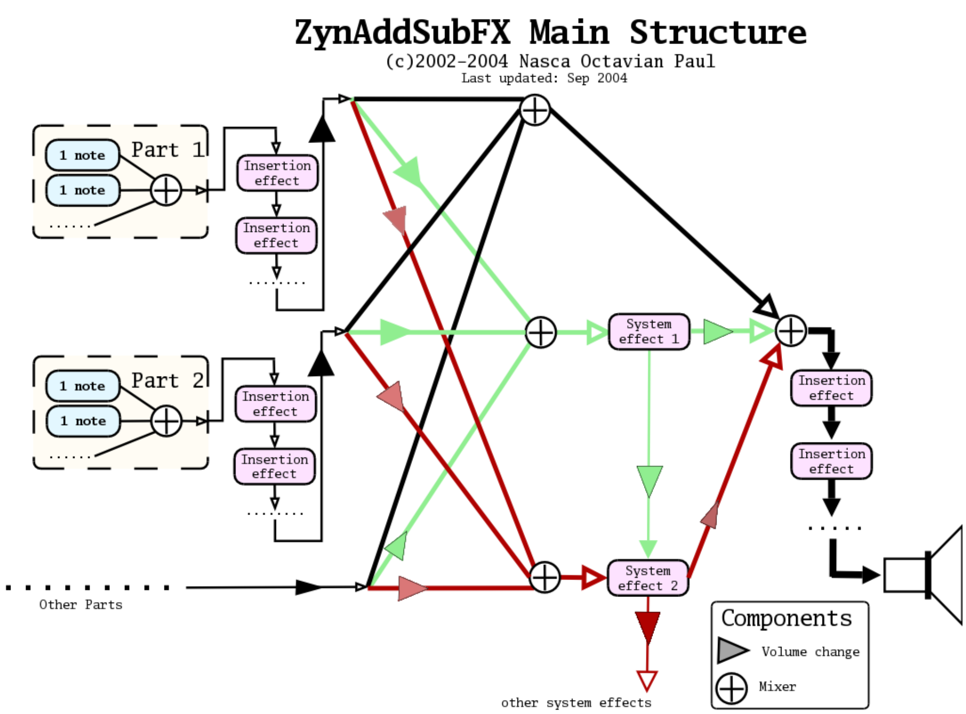



Figure 185: Yoshimi Main Structure

For a given part, the synthesizer first creates a note. Each note's waveform (for example, in a chord) is summed (mixed). This complex waveform is then sent to the series of Insertion effects (if any) that are defined. Each part is then sent to a System effect and (depending on the wetness of the mix) directly to a mixer. Additional Insertion effects (if any) are then applied. The result is the final output of the synthesizer.

The synthesizer has three major types of parameters:

1. **Master settings/parameters**. Contains all parameters (including effects and instruments).
2. **Instrument parameters**. Contains ADDnote/SUBnote/PADnote parameters for a part.
3. **Scale settings**. Contains the settings of scales (*Yoshimi* is a micro-tonal synth) and few other parameters related to tunings.

### 24.4.1 Concepts / Basic Synthesis / Panning

Pan lets one apply panning, which means that the sound source can move to the right or left. Set it to 0.0 to only hear output on the right side, or to the maximum value to only hear output on the left side.

### 24.4.2 Concepts / Basic Synthesis / Wetness

Wetness determines the mix of the results of the effect and its input. This mix of input and effect output is the total output. If an effect is wet, it means that none of the input signal is bypassing the effect. If it is dry, then the effect is bypassed completely, and has no impact on the sound.

### 24.4.3 Concepts / Basic Synthesis / Single Note

The idea of this synthesis model is from another synthesizer Paul Nasca wrote years ago, released on the Internet as "Paul's Sound Designer". The new model is more advanced than that project (adding SUBsynth, more LFOs/Envelopes, etc.), but the idea is the same.

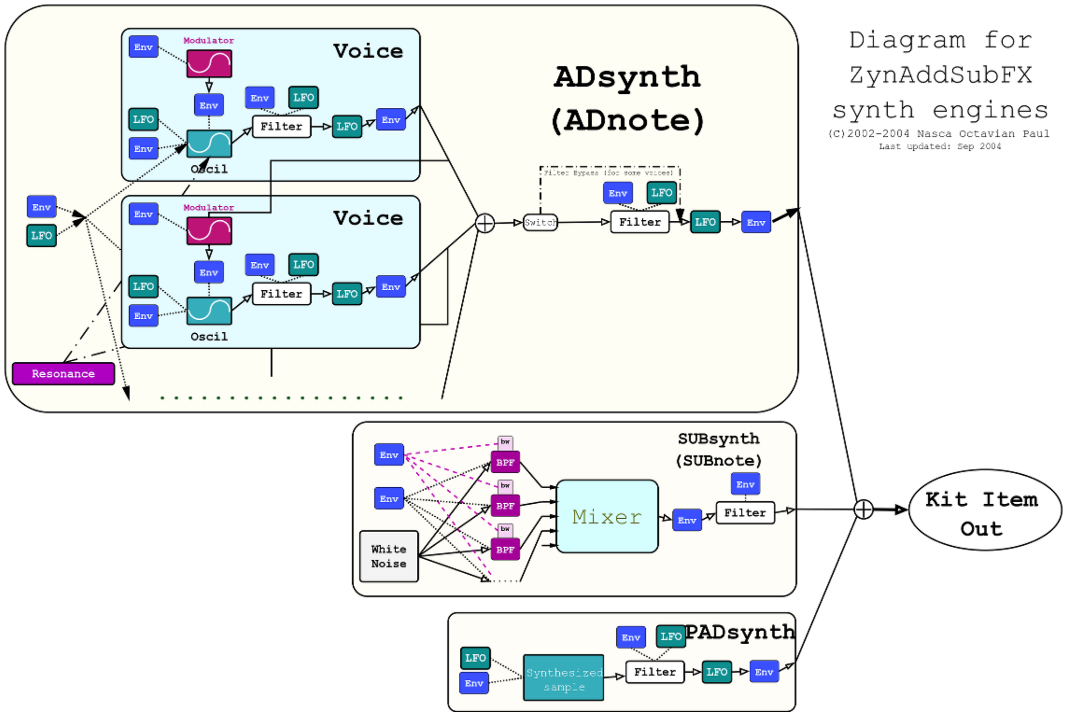



Figure 186: Yoshimi Note Generation

The figure represents the synthesizer module components. The continuous lines are the signal routing, and the dotted lines are frequency controlling signals (they control the frequency of something). The dashed lines control the bandwidths of bandpass filters. "Env" are the envelopes, "LFO" the Low Frequency Oscillators, "BPF" are band pass filters, "bw" are the bandwidth of the BPFs. If one uses instrument kits, the "note out" represents the output of the kit item.

### 24.4.4 Concepts / Basic Synthesis / Harmonics

Harmonics are sine waves that are multiples of the base frequency of a note. *Yoshimi* introduces the concept of increasing the bandwidth of a harmonic so that it is not quite a sine wave.

#### 24.4.4.1 Harmonic Bandwidth

"Harmonic bandwidth" does not refer to sample-rate, it refers to the frequency "spread" of each harmonic. This is the most important principle of making instruments that sound good. Unfortunately there is very little documentation about it.

Often it is believed that the pitched sounds (like piano, organ, choir, etc.) for a single note have a frequency, but it's actually harmonics and nothing more. Many people try to synthesise a sound using an exact frequency plus the harmonics, and observe that the result sounds too "artificial". They might try to modify the harmonic content, add a vibrato, tremolo, but even that doesn't sound "warm" enough. The reason is that the natural sounds don't produce an exact period; their sounds are quasi-periodic. Please note that not all quasi-periodic sounds are "warm" or pleasant. (Nasca's discussion of periodic vs. quasi-periodic, and the figures he shows, are not included here.) Basically, by slightly increasing the bandwidth of a periodic sound, it is possible to make it quasi-periodic.

A very important thing about bandwidth and natural sounds is that the bandwidth has to be increased if one increases the frequency of the harmonic. If the fundamental frequency is 440 Hz and the bandwidth is 10 Hz (that means that the frequencies are spread from 435 to 445 Hz), the bandwidth of the second harmonics (880Hz) must be 20 Hz. A simple formula to compute the bandwidth of each harmonic if one knows the bandwidth of the fundamental frequency is $BWn = n * bw1$, where `n` is the order of the harmonic, `bw1` is the bandwidth of fundamental frequency and `BWn` is the bandwidth of the n'th harmonic. If one does not increase the bandwidth according the frequency, the resulting instrument will (usually) sound too 'artificial' or 'ugly'. There are at least three methods of making good sounds with the above considerations:

1. **Detuning**. By adding slightly detuned sounds (in *Yoshimi* it is called "ADDsynth"). The idea is not new: it has been used for thousands of years in choirs and ensembles. That's why choirs sound so beautiful.
2. **Noise sculpting**. By generating white noise, subtracting all harmonics with band-pass filters and adding the results (in *Yoshimi* it is called "SUBsynth").
3. **Generation by spectrum**. By "drawing" the above graph that represents the frequency amplitudes on a large array, put random phases and do a single IFFT for the whole sample.

##### 24.4.4.2 Harmonic Amplitude

An important principle of natural harmonics is to decrease the amplitude of higher harmonics on low-velocity notes.

All natural notes have this property, because on low-velocity notes there is not enough energy to spread to higher harmonics. On artificial synthesis one can do this by using a low-pass filter that lowers the cutoff frequency on notes with low velocities or, if one uses FM (frequency modulation), by lowering the modulator index. The spectrum of the sound should be almost the same according to the frequencies and not the harmonics.

This means that, for example, the higher the pitch is, the smaller the number of harmonics it will contain. This happens in a natural instrument because of the resonance. In this case there are many instruments that don't obey this, but sound quite good (example: synth organ). If one records the C-2 note from a piano and one plays it at a very high speed (8 times), the result will not sound like the C-5 key from the piano. The pitch is C-5, but the timbre is very different. This is because the harmonic content is preserved (the n-th harmonic will have the same amplitude in both cases) and not the spectrum (eg. the amplitudes of the harmonics around 1000 Hz are too different from one case to another).

In artificial synthesis one can use filters to add resonance or FM synthesis that varies the index according to the frequency. In *Yoshimi* one can add the resonance:

1. **ADDsynth**: Use the Resonance, a high harmonics sound content, and filters or FM.
2. **SUBsynth**: Add some harmonics and use the Global Filter.

#### 24.4.5 Concepts / Basic Synthesis / Randomness

The main reason why the digital synthesis sounds too "cold" is because the same recorded sample is played over and over on each key-press. There is no difference between a note played the first time and second time. Exceptions may be the filtering and some effects, but these are not enough. In natural or analog instruments this doesn't happen because it is impossible to reproduce exactly the same conditions for each note. To make a warm instrument one must make sure that it sounds slightly different each time. In *Yoshimi* one can do this:

1. **ADDsynth**: Set the "Randomness" function from Oscillator Editor to a value different than 0, or change the start phase of the LFO to the leftmost value.
2. **SUBsynth**: All notes already have randomness because the starting sound is white noise.
3. **PADSynth**: The engine starts the sample from random positions on each keystroke.

In setting the randomness of the oscillator output, there are two types of randomness. The first is *group randomness*, where the oscillator starts at a random position. The second is *phase randomness*: from -64 (max) to -1 (min) and each harmonic (the oscillator is phase distorted) is from 1 (min) to 63 (max). 0 is no randomness. One could use this parameter for making warm sounds like analog synthesizers.

See the ADDSynth oscillator editor, Section 12.5.5 "ADDsynth / Voice Parameters / Voice Oscillator" on page 171, for this kind of control, named **Ph.rnd** or **rnd**.

In *yoshimi* there is the possibility to add 'naturalising' random pitch and velocity elements to a part. This is found in the part-edit window. The settings are saved in patch sets, and also in *yoshimi* format instruments files. See the **Humanise** settings in the part-edit window.

#### 24.4.6 Concepts / Basic Synthesis / Components

*Important*: All indexes of MIDI Channels, Parts, Effects starts from 0, so, for example, the first Part is 0. However, in other discussions of MIDI, part numbers, programs, or channels are often described as starting from 1.

*Yoshimi* components:

1. **Parts**. They receive the note messages from MIDI Channels. One may assign a part to any channel. A part can store only one instrument. "Add.S" represents ADDsynth and "Sub.S" is SUBsynth. In recent versions of *Yoshimi*, the number of parts available has been increased from 16 to 64.
2. **Insertion Effect**. This effect applies only to one part; one can have any number of insertion effects for one part, but the number of these cannot be bigger than NUM.INS.EFX.
3. **Part Mixer**. Mixes all parts. Also known as the "Panel" or "Mixer Panel".
4. **System Effects**. Applied to all parts, one can set how much signal is routed through a system effect.
5. **Master mixer**. Mixes all outputs of Parts, Mixers and System Effects.

#### 24.4.7 Concepts / Basic Synthesis / Filters

*Yoshimi* offers several different types of filters, which can be used to shape the spectrum of a signal. The primary parameters that affect the characteristics of the filter are the cutoff, resonance, filter stages, and the filter type.

**Cutoff**: This value determines which frequency marks the changing point for the filter. In a low pass filter, this value marks the point where higher frequencies are attenuated.

**Resonance**: The resonance of a filter determines how much excess energy is present at the cutoff frequency. In *Yoshimi*, this is represented by the Q-factor, which is defined to be the cutoff frequency divided by the bandwidth. In other words higher Q values result in a much more narrow resonant spike.

**Stages**: The number of stages in a given filter describes how sharply it is able to make changes in the frequency response. The affect of the order of the filter is roughly synonymous with the number of stages of the filter. For more complex patches it is important to realise that the extra sharpness in the filter does not come for free as it requires many more calculations being performed. This phenomena is the most visible in SUBsynth, where it is easy to need several hundred filter stages to produce a given note.

The **Q**: value of a filter affects how concentrated the signal's energy is at the cutoff frequency. For many classical analog sounds, high Q values were used on sweeping filters. A simple high Q low pass filter modulated by a strong envelope is usually sufficient to get a good sound.

**Filter Type**: There are different types of filters. The number of poles define what will happen at a given frequency. Mathematically, the filters are functions which have poles that correspond to that frequency. Usually, two poles mean that the function has more "steepness", and that one can set the exact value of the function at the poles by defining the "resonance value". Filters with two poles are also often referenced as Butterworth filters.

For the interested reader, functions having *poles* means that we are given a quotient of polynomials. The denominator has degree 1 or 2, depending on the filter having one or two poles. In the file `DSP/AnalogFilter.cpp`, `AnalogFilter::computefiltercoefs()` sets the coefficients (depending on the filter type), and `AnalogFilter::singlefilterout()` shows the whole polynomial (in a formula where no quotient is needed).

Filters are thoroughly described in Section 8.3 "Filter Settings" on page 90.

### 24.4.8 Concepts / Basic Synthesis / Envelopes

Envelopes are long-period wave forms that are applied to frequency, amplitude, or filters. Envelopes generate effects such as tremolo and vibrato, as well as effects that occur when a sound-generating physical component changes shape. Envelopes are thoroughly described in Section 8.6 "Envelope Settings" on page 104.

### 24.4.9 Concepts / Basic Synthesis / Formants

Formants are basically peaks in the spectrum of the human voice that are created by the various resonant features of the human vocal tract. They can be used in *Yoshimi* to produce human-like sounds. Paul Nasca describes formants:

> The easiest way to understand the formants/vowel is to imagine at first that each vowel contains a single formant.
>
> In that case, each vowel consist of a sequence of bandpass filters (with Q/frequency/amplitude). These vowels are arranged on a line (sequence) and the space between them is controlled by the **Strch** (lower right). This sequence could be used to create some simple words and the current position in that line is controlled by the filter LFO/Envelope.
>
> So for example, you can define two vowels like: "vowel_1" which has the formant at 1000Hz and the "vowel_2" with the formant at 2000Hz and define a simple raising envelope. You should get a sliding bandpass filter between these (eg: you get a bandpass filter which rises in the frequency from 1000Hz to 2000Hz).
>
> If you define a second formant (you set **Num formants**) to 2, each vowel will get another formant. The sound is processed using the first formant (like in the above example) and is added to the sound processed using the second formant. The formants are bandpass-filtered in parallel as you've guessed.
>
> I preferred for a vowel to have several formants (than the other way around) because I've arranged the data according to the high level of abstraction (that the vowel contains several formants) instead of how it was implemented.

It is the filter *envelope* that sets the rate and degree to which formants are traversed. Also, the richer the original harmonic content (e.g. a square wave), the more pronounced the effect will be.

Table 38: Yoshimi MIDI Messages

| | |
|---|---|
| **0** | Bank MSB (user selectable, usually selects banks from a bank root) |
| **1** | Modulation Wheel |
| **2** | Breath Control (Yoshimi only) |
| **6** | Data MSB |
| **7** | Volume |
| **10** | Panning |
| **11** | Expression |
| **32** | Bank LSB (user selectable, usually selects instruments from a bank) |
| **38** | Data LSB |
| **64** | Sustain pedal |
| **65** | Portamento |
| **71** | Filter Q (Sound Timbre) |
| **74** | Filter Cutoff (Brightness) |
| **75** | BandWidth (different from GM spec) |
| **76** | FM amplitude (different from GM spec) |
| **77** | Resonance Center Frequency (different from GM spec) |
| **78** | Resonance Bandwidth (different from GM spec) |
| **96** | Data Increment |
| **97** | Data Decrement |
| **98** | NRPN LSB |
| **99** | NRPN MSB |
| **120** | All Sounds OFF |
| **121** | Reset All Controllers |
| **123** | All Notes OFF |
| **192** | Program Change (voices 1-128; see notes below) |
| **224** | Pitch Bend (see notes below) |

## 24.5 Concepts / MIDI

It is useful to discuss some of the details of MIDI in order to understand *Yoshimi*. Obviously, we assume some knowledge already, or one wouldn't be running *Yoshimi*.

### 24.5.1 Concepts / MIDI / Learn

*MIDI Learn* is the ability to assign DAW, sequencer, and plugin controls to physical knobs and faders on a MIDI control surface.

MIDI Learn is available on many software synthesizers, including *Yoshimi*, allowing one to control virtually any on-screen parameter with a MIDI controller. It is a very flexible system that can adapt to a particular MIDI device. It also allows changes made to any learned parameter to be recorded by the host application.

### 24.5.2 Concepts / MIDI / Messages

*Yoshimi* responds to the following MIDI controller messages (38).

For the controllers (numbers 75 to 78) that are not defined in GM:

- **Bandwidth** control (75) increases or decreases the bandwidth of instruments. The default value of this parameter is 64.
- **Modulation amplitude** (76) decreases the amplitude of modulators on ADDsynth. The default value of this parameter is 127.
- **Resonance Center Frequency** control (77) changes the center frequency of the resonance.
- **Resonance Bandwidth** control (78) changes the bandwidth of the resonance.

Some standard MIDI messages are handled a bit differently by *Yoshimi*:

- **Bank Change (0 or 32)** These are interchangeable and do *not* force a program change).
- **Program Change (192)** also provides user selectable CC for voices 128-160. There is now an option to make Program Change enable a part if it's currently disabled.
- **Key pressure (aftertouch)** is internally translated as CC 130.
- **Channel Pressure** is internally translated as CC 129.
- **Pitch Bend** is internally translated as CC 128.
- **Modulation** The wheel only affects AddSynth and PadSynth, and then only the frequency LFO depth. Just to make it more confusing, it changes the level from 0 up to its current (GUI) setting only. Therefore, if the LFO depth is set to zero, the Mod Wheel will have no effect.
- **User selectable CC for Bank Root Path change** For more details of bank changes see Section 24.3 "Concepts / Banks and Roots" on page 283.

Instruments inside banks should *always* have file-names that begin with four digits, followed by a hyphen. Otherwise the results can be rather unpredictable.

#### 24.5.3 Concepts / MIDI / NRPN

NRPN stands for "Non Registered Parameter Number". NRPNs can control all System and Insertion effect parameters. Using NRPNs, *Yoshimi* can now directly set some part values regardless of what channel that part is connected to. For example, one may change the reverb time when playing to keyboard, or change the flanger's LFO frequency.

NRPNs are described in greater detail in section Section 17 "Non-Registered Parameter Numbers" on page 210.

##### 24.5.3.1 Concepts / MIDI / NRPN / Vector Control

Vector control is a way to control more than one part with the controllers. Vector control is only possible if one has 32 or 64 parts active in *Yoshimi*. In vector mode, parts will still play together but the vector controls can change their volume, pan, filter cutoff in pairs, controlled by user defined CCs set up with NRPNs.

Vector control is described in greater detail in section Section 18.3 "Vector / Vector Control" on page 225.

##### 24.5.3.2 Concepts / MIDI / NRPN / Effects Control

NRPNs are very useful in modifying the parameters of the *Yoshimi* effects.

Effects control is described in greater detail in section Section 17.4 "NRPN / Effects Control" on page 213.

## 24.6 Concepts / Instances

Like many programs, it is possible to run multiple copies (”instances”) of *Yoshimi*. However, the risk of doing so is that these instances cannot always communicate with each other, and so can readily write to the same files. *Yoshimi* regards these as external instances. It also supports internal instances, which are started within the running main instance, and will have separate files for most settings. A description of how this can be used follows.

> Internal instances are created from the Yoshimi drop-down menu, and Yoshimi can keep track of them, also numbering the title bars so one knows which one is being dealt with (applies to all their sub-windows, too). External instances are where Yoshimi is restarted from the desktop or some other system such as a session manager. Although JACK/ALSA will give them independent IDs the Yoshimi instances themselves don’t know about these IDs, which can cause a lot of confusion when saving/loading and especially when changing configuration settings or root/bank/instrument.
>
> So, two external instances will save **default** state files to the same location, and the actual saved default will be the one last saved. Two internal ones will save to their own numbered defaults.
>
> Previously, states were not being re-loaded. Under the new system, they are. Currently internal-instance **bank** saves can still get out of step. This is an issue that will eventually be put right. This kind of synchronisation would be impossible with external instances as they can’t directly communicate with each other.
>
> The beauty of having per-instance independent, re-loadable default states is that they can have quite different setups, audio destinations, learned MIDI, and patch sets. For example:
>
> **Simple user:** Only has the main instance, and sets the default state to always set Ch10 as separate parts only, for mixing with other percussion stuff. It also does a master keyshift so that **C** sounds as **Bb**, as it’s used mostly working with brass players.
>
> **Power user:** The main instance (0) gets MIDI via ALSA from an external keyboard that it specifically looks for at startup. It has learned MIDI for the controls this keyboard can send. It also gets other channels from Rosegarden. It sends its audio to JACK.
>
> Instance 1 is all JACK and has a MIDI sequencer and arpeggiator connected. It is also configured for separate part outputs only, for further processing.
>
> Instance 2 is all ALSA, has its MIDI from a different keyboard, which it is set to recognise. It has its own learned MIDI setup and and a pattern generator. Its audio is connected to a second sound card, which is then mixed in the analog domain.
>
> Finally, internal instances have a slightly smaller memory footprint, and marginally lighter processor load.

Now that *Yoshimi* can be configured to auto-load last-seen instances when it starts, this all becomes even more useful.

One other note... copy-and-paste will work across instances. One can copy from the main instance’s AddSynth part 3 to instance 3’s kit item 6 AddSynth.

## 24.7 Concepts / Command Line

This section covers a few terms useful in discussing the command line.

### 24.7.1 Concepts / Command Line / level

The term **level** is used in the description of the new command-line facility of *Yoshimi*. A **level** is simply a related group of parameters or a location where one can go to for making changes. Important levels are: the top level; system effects; part; and more.

## 24.8 Concepts / LV2 Plugin

*Yoshimi* now runs as an LV2 plugin. TODO: Describe LV2 at a high-level.

### 24.9 Concepts / Numbering

When implementing CLI access, the decision was made to use the internal counting system which, like almost everything else in computer programming, starts at zero. This caused a few anomalies, as most of the GUI numbering is from one. This discordance was becoming much more of a problem, most obviously with the Vector Control and MIDI learn windows. Now all the messages use the GUI number bases. This makes MIDI learn look more sensible; when sending reports to the console window there is no difference in numbering re the user-interface.

CLI entries have also been converted. All standard CLI inputs, as well as the return message numbers, should start from 1 with the following exceptions:

- Bank roots
- Banks
- CCs

These items follow standard MIDI practice (and do the same in the GUI). One of our most prolific CLI users who, while preferring all zero as a base, appreciates the difficulties and can manage as long as things are consistent.

Banks and bank roots continue to start from zero - this is what everyone expects from these as MIDI commands. Indeed, all MIDI CC numbers will do so. However, channel numbers, program change, part numbers, engines, etc. start from one. Effects are an outlier. They seem to already start from one but that's because zero is the value for 'no effect'.

## 25 Building Yoshimi

This section describes building and debugging *Yoshimi*. Building *Yoshimi* requires getting the source code, making sure all of the necessary dependencies are installed, and using CMake to set up the build.

The source-code is located at its main location ([19]) or its alternate location ([20]).

*Yoshimi* uses CMake as its build system [25]. CMake is a preprocessor that can generate project build setups for Visual Studio, UNIX make, and Xcode.

### 25.1 Yoshimi Source Code

Get the source code version you want from SourceForge (`http://sourceforge.net/projects/yoshimi/files/2.2/`). Download the desired tar-ball and unpack it in your work area.

Since SourceForge has had some issues, the *Yoshimi* team has wisely hosted the source code at another site as well, `https://github.com/abrolag/yoshimi`. One can grab the whole git repository there using the following command in your work area:

```
$ git clone https://github.com/abrolag/yoshimi.git
```

Please note that this code base comes with two files, `INSTALL` and `INSTALL_CUSTOM` which elaborate on build options well beyond what is discussed here.

## 25.2 Yoshimi Dependencies

For all versions since *Yoshimi* 1.3.9, building *Yoshimi* requires C++11. For GNU builds, this requires *gcc 4.7* and above.

To save some wasted time, make sure the *development versions* of the following packages have been installed using your Linux distribution's package manager:

- `pkg-config`
- `libz`
- `fftw3f`
- `mxml`
- `ALSA` (libasound)
- `JACK`
- `fontconfig`
- `libcairo`
- `FLTK`
- `lv2`

These package names are from *Debian Jessie*:

- `automake`
- `build-essential`
- `cmake-curses-gui`
- `dssi-dev`
- `fluid`
- `libboost-dev`
- `libcairo2-dev`
- `libfftw3-dev`
- `libfltk1.3-dev`
- `libglu1-mesa-dev`
- `libjack-jackd2-dev`
- `libjpeg-dev`
- `libmxml-dev`
- `libncurses5-dev` (new dependency)
- `libreadline-dev` (new dependency)
- `libxft-dev`
- `libxinerama-dev`
- `libxml2-dev`
- `xutils-dev`
- `zlib1g.dev`

LV2 plugin adds one more dependency:

`lv2-dev` with version 1.0.0 or greater.

Other distros may have slightly different names or version numbers, and may even have these installed by default. If in doubt, try looking for just the main part of the name, but with the `-dev` extension where appropriate.

## 25.3 Build It

The following instructions are for an in-source build. An in-source build is simpler if you just want to build and install *Yoshimi*.

We will also show how to set up for an out-source-build, which keeps the build products out of the way.

The location of `CMakeList.txt` does not appear to be standard. Basically, the build is based in the project's `src` directory, instead of its root directory. And it is recommended to use an out-of-source build.

1. Enter the source directory where the code was unpacked.
2. Generate the project build-files:

```
$ mkdir build
$ cd build
$ cmake ..
$ cmake .
```

3. Build the code and install it (as root):

```
$ make
# make install
```

Here is how to make an out-of-source debug build. Despite what cmake documentation (and Googling) says, using a command like the following *does not work* unless you have `ccmake` installed.

```
$ cmake -DCMAKE_BUILD_TYPE=Debug ..
$ ccmake
```

In Debian Linux, install the `cmake-curses-gui` package to get access to `ccmake`. Or use the shorter `cmake -DBuildForDebug=on ..` command below.

1. Enter the source directory where the code was unpacked.
2. Create a "Debug" or "Release" directory for an out-of-source build:

```
$ cd src
$ mkdir Debug
```

3. Generate the project build-files in the `Debug` directory.

```
$ cd Debug
$ cmake -DBuildForDebug=on ..
$ make
```

The output file, and executable name `yoshimi` is now ready to run (and be debugged).

Here is a debugging use case we used in *Yoshimi 1.3.5.1* and slightly earlier versions. Here is how to verify the bug:

1. Run the following command:

```
$ yoshimi -a -A
```

2. Navigate the following command path: Menu / Instrument / Show Banks
3. Select the **RENAME** button.
4. Select the bank (e.g. Arpeggios).
5. In the file prompt that comes up, click **Cancel**.
6. Observe a "Segmentation fault".

To avoid a lot of debugging, let *valgrind* find the bug for you. Install *valgrind*. Then, in the `src/Debug` directory, run:

```
$ valgrind --log-file=yoshvalgrind.log ./yoshimi -a -A
```

In the log file, one sees that the last good call was in the `Bank :: readOnlyBank()` function. That would be a good place to put a breakpoint.

However, even without *valgrind*, this particular bug is easy to find under the *debugger*. The steps are simple:

```
$ cd src/Debug
$ gdb ./yoshimi
(gdb) r -a -A
```

Then repeat the steps above that trigger the bug. One sees

```
Program received signal SIGSEGV, Segmentation fault.
```

Issue the command "backtrace" at the `(gdb)` prompt. There will be a list of stack frames starting at 0. Frame 1 is in *Yoshimi*, so issue the command "frame 1", and you'll see:

```
if (strlen(tmp) > 2) ...
```

`tmp` is a null pointer here; we need to add an initial check for the null pointer there to avoid triggering the crash.

Of course, the bug has long since been officially fixed.

## 25.4 Yoshimi Code Policies

Yes, we actually have *Yoshimi* code policies. Look how many there are! :)

If the version string contains a 4th number this will always be just a bugfix, and will never have features added or changed from the main version. For example:

- yoshimi-1.3.5 Main version.
- yoshimi-1.3.5.1 First bugfix.
- yoshimi-1.3.5.2 Second bugfix. (Surely not!)

We won't accept fixes for spelling errors in the *code*. For a start, from bitter experience it is fatally easy to change two variables to the same name! Also, there's no point, after all they are only a mnemonic for memory addresses etc. 'volume' and 'LFO' could just as well be 'turnyfing' and 'derfingwotwiggles'.

To avoid possible confusion, from now on 'master' will display the last released version number (without bugfix digits) with an 'M' suffix - unless it is a release candidate in which case the suffix will be rc[n]. For example:

- Last release was yoshimi-1.3.5.2
- Master is shown as yoshimi-1.3.5 M

XML files created with this release will have: major version 3 and minor version 5.

If using Fluid to edit GUI files, please close all windows and collapse all menus *before* the last save. I know it's tedious, but it avoids storms of spurious 'changes' that make genuine ones harder to see.

## 26 Summary

In summary, we can say that you will absolutely love *Yoshimi*.

> A car analogy: A sample player is a drive along a straight, wide, almost new highway with only 2 other cars in sight, on a lightly overcast summer's day in a Ford Fiesta at around 40 MPH. Yoshimi is a white-knuckle trip over a Swiss mountain pass in a blizzard, at night, facing donkeys, trucks and bandits, while driving an open-frame kit car doing 90 + In recent times we've been able to dispose of the donkeys, and the bandits are on the run :)

## 27 References

This section provides references for this *Yoshimi* user's manual, as well as some other information.

Although the *Yoshimi* project is based on SourceForge, it also has a mirror on GitHub, and a mailing list on FreeLists.Org. One can subscribe with an e-mail to: yoshimi-request@freelists.org or by visiting: `http://www.freelists.org/list/yoshimi`. To post to the list, email to: yoshimi@freelists.org The archive of the old SourceForge mailing list is found at: `https://www.freelists.org/archive/yoshimi`.

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