Sonigen Modular

User Manual

Sonigen

Introduction

Sonigen Modular is a modular software synthesizer. Modular synthesizers allows the user to connect individual modules together to form a preset or “patch”. This gives you great freedom in designing the overall signal flow and structure and hence the actual sound that is produced.

Features

Sonigen Modular is fully modular with as many modules and patch cables as you want.

It seamlessly combines polyphonic voice and static effect processing. You design the signal flow for voices and use a VoiceMixer to convert that into a single stereo signal that can then be processed by a static effect section.

It is fast and intuitive to use. Almost everything is done in the main module window. There's no separate schematic / GUI views, no macro modules, no separate FX window. You can see what is going on just by looking at the main window.

Great sound quality. A huge amount of time has been put into developing high quality algorithms. It has very high anti-aliasing in most cases.

It is CPU efficient. This doesn’t mean corners have been cut. It means hand tuned assembly and run time optimization. The audio processing code is dynamically assembled and optimised in real time as you edit and play.

User Interface Basics

Knobs and faders are adjusted with the mouse. In general, left mouse drag will do coarse adjustment and right mouse drag will do fine adjustment.

Double clicking on a fader will set it to its default value.

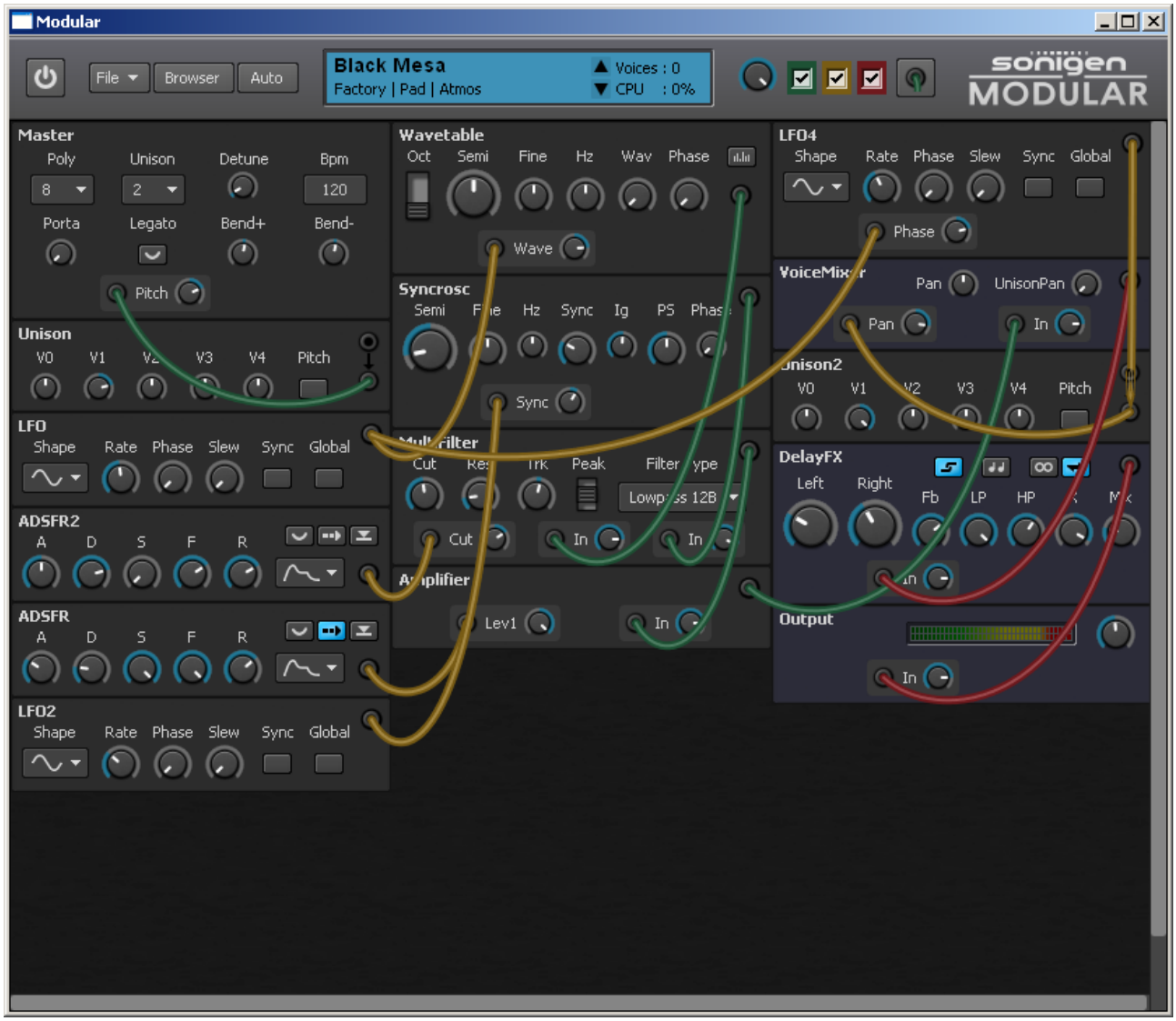
Right click will open the automation menu where you can select from the VST or MIDI automation inputs.

Buttons, menu options, drop down lists, and text input boxes can be activated with a left click.

Cables can be dragged to change their position or you can double click to toggle between automatic straight or curved shapes. You can right click on them to change what group they belong to.

For context menus you click the right mouse button.

Main Window



The main window is split into two areas, the toolbar and the module panel. The toolbar contains the following controls from left to right...

- Power On/Off button, (standalone mode only).
- File Menu, save, load, preferences, help and info.
- Browser button, toggles the patch browser on and off.
- Automation button, toggles the display of automation assignments.
- Info Panel, shows patch info, voices & CPU usage, previous / next patch buttons.
- Cable opacity control, allows adjustment of cable opacity.
- Cable visibility buttons, turn individual cable groups on and off.
- Tidy all cables button, automatic cable tidying, toggles between straight and curved.
- Sonigen Modular logo.

The module panel is where you build your patch by adding modules and making

connections between them.

To add a new module right click on the empty area of the module panel and select the module from the pop up context menu.

To delete a module right click on the module and select “delete” from the pop up context menu.

To rename a module double click on the name.

To make a connection between two modules you right click on the target module, select the target from the first menu and the source signal from the second menu.

You can right click on the input panel or on a cable to to assign the cable to a specific group or to delete it.

The Patch Browser

The patch browser allows you to look through and filter the patches included in the library. Click on the Browser button at the top of the main window and the browser will pop up. In the browser window you will see two columns, the left hand column is a list of the tags associated with the patches, the right hand column is a list of the patches.

You can filter the patch list by selecting tags in the tag column. A left click will select that tag only and exclude all others. A right click you will toggle that tag on and off. The patch list will only display patches that match all the tags you have selected.

For example : If you left click “Factory” and then right click “Bass” the patch list will be filtered to only show patches with those two tags.

Note that the filtering of the patch list persists even when the browser is closed so that if you use the up and down patch buttons in the main window it will cycle through only those patches in the filtered list.

How Sound Is Generated

A software synthesizer generally takes MIDI input from a sequencer or controller keyboard and turns it into audio output. Sonigen Modular is no different, it takes MIDI input and gives you audio output. At the heart of this process is a “patch”, a collection of modules that are “patched” together in order to make a sound.

Sonigen Modular generates and processes sound in two different ways. The voice process and the staticfx process.

The voice process generates the sound for each voice. Voices are akin to strings on a guitar

or voices in a choir. A voice is a single instance of a pitched sound generating element. When you press a key on your midi controller keyboard it will send a note_on message which will result in one or more voices being triggered by the voice process.

The staticfx process is like an output effect section applied to all the sound generated by the voice process. There is a special module called a VoiceMixer that will mix a voice input signal to a staticfx output signal. This signal can then be processed by staticfx modules. (There is currently only one effect but more will come in time).

So you can have multiple voices all playing at the same time, generally one for each active MIDI note. These voices are mixed into a single stereo audio signal by a VoiceMixer module. This stereo signal can then be processed by the staticfx modules.

Each module is generally either a voice module or a staticfx module in that it either generates or processes voice signals or it does staticfx signals. This means that the modules can be separated into these two categories, those that make up the voice structure or those that make up the static effect processing. The two kinds of modules are coloured differently to make this more clear.

Polyphony And Unison

Polyphony is the number of notes that can be active at one time. A polyphony of three means you can play three separate midi notes at once. If you try to play more than three one of the existing notes will be "stolen". That means the voice(s) used to play one of the existing notes will be re-assigned to play the new note.

Unison is how many voices are used per note. With a setting of 2 you will get 2 complete voices playing for each active midi note. It is like the way a 12 string guitar uses two strings for each note, or a piano uses 2 or 3 strings for each note on the keyboard. The unison voices can be detuned via the unison detune parameter or they can individually adjusted with the Unison and UnisonSpread modules..

Patching It All Together

There are some limits on how modules can be connected but it generally boils down to the fact that you cant connect voice modules to staticfx modules. The exception to this is the VoiceMixer module, it takes voice input and provides staticfx output. So it effectively provides the bridge between the voice section and the staticfx section.

To make a connection right click on a module and select the input target from the first menu, and the source signal from the sub-menu. Once done a new cable will appear showing the connection.

Most modules have multiple inputs and can take any number of connections to those. In that

case when you make a connection a new input panel will appear with a label signifying the target input and a fader to adjust the amount.

There are some modules that accept only a single input. In this case the cable will go directly to the input terminal and no extra input panel or fader is added. The reason for this is that they are the kind of modules that are almost always used as a direct source signal, or to modify a single input signal.

Master Voice Control

In order to save CPU usage voices will be turned off when it is determined that they are no longer producing any audible sound. The VoiceMixer module has a built in envelope follower which tracks the level of each voice signal coming into it. When a note off message has been received and all the VoiceMixers in the patch determine that the voice has effectively gone silent it will turn the voice off.

You may occasionally find a situation where voices are being cut off prematurely. In this case you need to provide a dummy signal to a VoiceMixer to keep the voice active. For example you could patch an ADSFR into a VoiceMixer and the ADSFR will keep the voice alive until it ends its release section.

A Simple Patch

Click the “file” menu button and select “new”. This will load a basic patch which shows all that is needed to make a sound.

- An oscillator to generate sound.
- A filter to process it. (Not strictly essential)
- An amplifier to modify the output level.
- An ADSFR to control the amplifier level.
- A VoiceMixer to mix the voice signal into a static signal.
- An Output module to send the audio to the soundcard.
- A Master module.

The last two are added automatically and cannot be deleted since you must always have exactly one of each.

Data Directory

All patches, wavetables and the init patch are stored in the Sonigen Modular Data directory. You can change the location of this directory in the preferences. The default data directory location is...

"My Documents\Sonigen Modular Data"

This contains a sub folder called “Patches” and this folder and all its sub folders will be scanned when the program starts in order to populate the patch browser. The actual location on disk has no effect on the organization of the patches in the browser, that is solely down the meta tags.

You will also find a “wavetable” folder which is the default location for wavetables. You can however put wavetables wherever you like since the wavetable editor remembers the last folder you loaded from and will always cycle through its contents with its back and forward buttons.

In the data folder you will find a patch named “Init.smp”. When you select “New” from the file menu this patch will be loaded. You can overwrite this file if you would like to set your own default init patch.

There two files “vstparams.txt” and “midicc.txt”. You can edit these files if you wish to customize the names used for VST automation and MIDI controllers.

The Modules

The following pages detail the modules currently included in Sonigen Modular.

ADSFR Module

This module is an envelope generator. It generates a control signal that varies its level across the lifetime of a voice. When a new voice is triggered the envelope will start at the attack phase and work its way through to the sustain phase. Once the note associated with the voice is released it will enter the release stage. A typical use would be to control the output level of the voice. It is essentially the same as an ADSR envelope with the added ability to fade out the sustain stage.

Parameters:

A : How long it will take for the attack stage to reach its maximum value.

D : The rate at which the envelope will decay to the sustain level.

S : The level at which the envelope begins the sustain stage. It will remain in this section until a note off message is received.

F : The rate at which the sustain level will fade to zero. When turned fully clockwise it will not fade out, meaning the envelope will act like a classic ADSR.

R : The rate at which the release stage of the envelope will decay to zero.

 This enables “legato” envelope mode. When the polyphony is set to one and this mode is enabled the envelopes will not re-trigger when notes are played legato.

 This enables “free running” mode. The envelope will always complete the attack and decay sections irrespective of whether the note has been released.

 This enables “Reset” mode. The envelope level will be reset to zero when the envelope is re-triggered instead of retaining its current level and starting the new attack phase from there.

 This controls the envelope “Shape”, it can be exponential or linear, and compressed or not. (The attack stage is always linear)

Amplifier Module

This module allows one signal to be modulated by two others. It implements the following function...

output = input * level1 * level2

The multiplication is only performed if a signal is actually connected to the respective level input. So if you have nothing connected to either level input you get...

output = input

If you then connect a signal connect to the level1 input you get this..

output = input * level1

ChorusFX Module

This module is a stereo chorus effect. A chorus effect creates multiple delayed and detuned copies of the original signal in order to emulate the sound of multiple voices playing in unison. It has 3 modes of operation.

Dual Mode : In this mode there are 2 chorus voices added to the input signal. This is a typical “stomp box” type chorus effect.

Ensemble Mode : In this mode there are 3 chorus voices added to the input signal. Each voice is modulated by one slow LFO for chorusing and one fast LFO for vibrato. The rate of each LFO is somewhat randomized. The vibrato rate can be controlled relative to the base rate of the chorus.

Space Mode : In this mode there are 4 chorus voices added to the input signal with each voice having a single LFO. The LFOs are all somewhat randomized and free running. The LFOs cross modulate each other a bit and the feedback is also diffused between all voices. This mode creates the most dense and smooth effect of the 3 modes.

Mode : The mode of operation.

Rate : The average rate of the chorusing LFO.

Delay : The average delay of the chorus voices.

Depth : The depth of the chorusing (and vibrato in ensemble mode).

Fbk : Feedback amount.

Vbr : In ensemble mode this controls the vibrato speed relative to the chorus speed.

Mix : Controls how much of the chorus voices to mix in with the direct signal.

CombFilter Module

This module applies comb filtering to a signal that is passed through it. The frequency response of a comb filter is an harmonic series of troughs and peaks. Somewhat differently than most comb filters ours allows the resonance and mix (usually termed the mode) to be independently adjusted from positive to negative.

Parameters:

Tune : This controls the length of the delay line and hence tunes the fundamental frequency of the harmonic series.

Fine : Fine tuning for the delay line length / base frequency.

Res : This controls the resonance / feedback of the delay line.

Trk : The amount of keytrack applied to the tuning.

Mix : How much filtered signal to mix with the dry signal. To get what is typically termed a positive comb use +100%, for a negative comb use -100%.

Constant Module

This module outputs a constant value that is set by the fader. Simple!

Controller Module

This Module gives you access to various controller signals. With no input connected the module outputs the control signal directly. When an input is connected the output is the input multiplied by the control signal. The two faders allow you to set the range over which the control signal will be mapped.

Clicking on the list box will enable you to select from the available controllers. Selecting a new controller will rename the module since the list box also serves to display the module name. It also means the module can not be renamed.

DelayFX Module

This module is a stereo delay effect. It has separate left and right delay lines, feedback with low and high pass filtering, variable crossover and stereo or ping pong delay modes. It can also be synced to tempo either local or VST host.

Parameters:

Left : The length of the left delay line. (milliseconds or beats)

Right : The length of the right delay line. (milliseconds or beats)

Fb : The amount of feedback.

LP : Cutoff frequency of the lowpass filters in the feedback paths.

HP : Cutoff frequency of the highpass filters in the feedback paths.

X : Feedback crossover amount.

Mix : Amount of delay output to mix in with the dry signal.

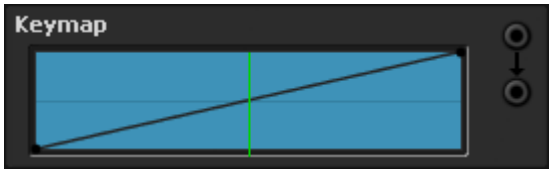
This "Links" the left and right delay times, it locks their ratio.

This enables tempo sync mode. (Delay time can be set in beats)

This enables "stereo" delay mode. Each delay is fed directly by the input signal and the crossover crosses over the feedback paths.

This enables "ping pong" delay mode. In this mode the crossover parameter will apply pan to the input signal while also applying crossover to the feedback paths. For example at -100% the input will be panned fully left and crossover will be 100%. At 0% no panning and no crossover is applied. At +100% input is panned fully right with 100% crossover.

Keymap Module



The Keymap module allows you to create a custom value map across the MIDI keyboard. With no input connected this module will output the map signal as it is. When an input is connected it will output the input signal multiplied by the

map signal.

Horizontally across the map you have MIDI notes 0 through to 127.

Vertically you have the value -1 through to +1.

Left double click to add a new node.

Right click on a node to remove it.

Left mouse drag to move a node.

The green horizontal line shows the last MIDI note played. This is useful for editing since it helps you can place the node exactly for the note you are currently hearing.

KeyTrack Module

This modules gives you access to keytracking, basically the pitch of the note being played. The two faders allow you to set the range over which the keytrack signal will be mapped. With no input connected this module will output the keytrack signal as it is. When an input is connected it will output the input signal multiplied by the keytrack.

LFO Module

This module is a low frequency oscillator. It generates a slow periodic signal useful for modulation of other parameters.

Parameters:

Shape : Selects the LFO wave shape.

Rate : The rate of oscillation.

Phase : The start phase for the LFO. (for Voice and V-Sync modes)

Slew : This applies slew rate limiting to the LFO output. It will slopes the sharper edges of the square, random and sawtooth waveforms. It doesn't do anything to the sine and triangle waveforms.

Mode : The LFO can be operated in five different modes....

1. Voice Mode, each voice has it's own LFO, rate is controlled in Herz and the phase knob controls the LFO start phase when the voice is triggered. (Lowest setting is random).

2. V-Sync Mode, voice synced, this is the same as Voice mode except that the LFO rate is now tempo synced either to the host temp or the standalone BPM.

3. Global Mode, one LFO shared between all voices, rate control is in Herz. The start phase knob is redundant in this mode as are the rate and phase modulation inputs.

4. G-Sync Mode, this is the same as Global mode except that the LFO rate is now tempo synced either to the host temp or the standalone BPM. Note that only the actual LFO rate is synced, the phase is free running.

5. Song Mode, the same as G-Sync mode except that the LFO phase is hard synced to song position. Song position is a global counter derived from either the Host or locally in standalone and is essentially how many quarter beats have elapsed since the beginning of the song.

Note that the rate and phase modulation inputs only work in the Voice and V-Sync modes.

The level modulation input works in all modes.

Master Module

This module provides the master controls for how the synthesizer manages voicing and polyphony among other things.

All modules get their pitch and key tracking information from the Master module, so if you use its pitch modulation input it will propagate to all other modules. If you want vibrato on a patch you should apply it here rather than on each oscillator individually.

Parameters:

Poly : Polyphony is how many midi notes can be playing at once.

Unison : This controls how many voices are used per midi note. So if you have unison set to 3 and hold down 5 notes on your midi keyboard, you will get 15 voices total.

Detune : This controls how much detune is applied to the unison voices.

BPM : The local or host BPM rate. In stand alone mode this shows the local BPM rate and can be changed by clicking on the text. In VST mode this will display the BPM reported by the host application and cannot be changed.

Porta : This controls the portamento time. How long it takes for a note to glide to its new pitch.

Legato : This enables "Mono Legato" mode. What this mode does is it only glides between notes if polyphony is set to one and the midi notes overlap.

Bend+- : These control the depth of the pitch bend wheel in each direction.

Math Module

This module allows you to scale and offset a signal passing through it. The multiplication is applied first and then the addition. If no there is no input signal the output will be zero.

ModWheel Module

This modules gives you access to MIDI modwheel. The two faders allow you to set the range over which the modwheel signal will be mapped. With no input connected this module will output the modwheel signal as it is. When an input is connected it will output the input signal multiplied by the modwheel.

MultiFilter Module

This module provides a range of different filter types. There are two kinds of lowpass plus most of the usual suspects. A feature not usually found in existing synthesizer filters is the ability to choose from three different resonant peak responses.

Parameters:

Cut : This sets the cutoff frequency.

Res : This sets the resonance of the filter.

Trk : This sets the key tracking of the filter.

Peak : This selects the peak response width.

Filter Type : This selects the filter type.

NoteRandom Module

This module can be used to add random variation to notes. With no input connected this module will output the random signal as it is. When an input is connected it will output the input signal multiplied by the random value.

Parameters:

Trigger : This controls what triggers a new random value.

Chaos : This controls how chaotic the values are.

Glide : Controls glide from previous value to new value.

Min & Max : Controls the range over which the values are generated.

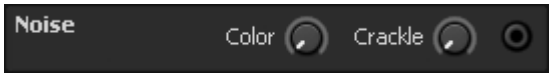
Trigger Modes:

Voice mode means each new voice gets a new random value.

Unison mode means each set of unison voices get a new random value.

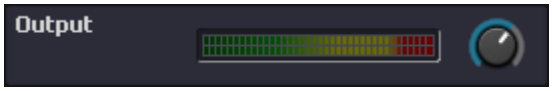
Chord mode means a random value will generated for each new chord. This works by only generating a random value when a note on is received and there are no other notes currently held down. It works like “mono legato” mode for glide. In fact it can be used as a “legato” mode also.

Noise Module



The noise module outputs noise. You can change the colour and adjust how crackly the noise is.

Output Module



This module is the final output to the sound card or host application. The meter displays the current output level and has overload bars at the top of the range. You can click on the level meter to reset it. The knob controls the output level.

Polysine Module

This is a sine oscillator that features phase modulation, self modulation and a novel method for colouring the feedback to create different tonality.

Parameters:

Ratio : This controls the ratio of the base frequency of the oscillator to the base pitch of the voice. For example 0.5 is an octave down, 2 is an octave up and 7 is the 7th harmonic up.

Freq : This allows you to set a frequency offset in herz. For example if you set this to 5 the note would always be detuned 5hz from the pitch arrived at from the Ratio. It allows you to have a fixed beat frequency across the whole keyboard.

Fbk : This sets the amount of feedback or self modulation. As you increase this the oscillator will generate more harmonics.

Clr : This controls the color of the feedback. At -1 the feedback is modified to be an octave down, at 0 it the same picth, at +1 it is modified to be an octave up. You must have feedback greater than zero to hear the effect of this.

HFD : This allows you to limit the production of high frequency content. It is kind of like key tracking the modulation depth but it is a little more sophisticated than that. If you hear aliasing you can turn this up to limit it. (Aliasing is notoriously difficult to avoid with phase modulation).

Amt : This is a global control for phase modulation amount. This will affect the feedback amount and the amount of phase modulation patched in.

SP : This sets the start phase of the oscillator. (Can be set to random)

Pulsaw Module

This began as a pulse and sawtooth oscillator but now it also does a triangle waveform. I couldnt think of a snappy name that included all three so it has remained as “Pulsaw”.

Parameters:

Semi : Sets the oscillator pitch in semitones. Left mouse changes by octaves, right mouse by semitones.

Fine : Adjust the oscillator pitch in cents.

Hz : Detune the oscillator in hertz.

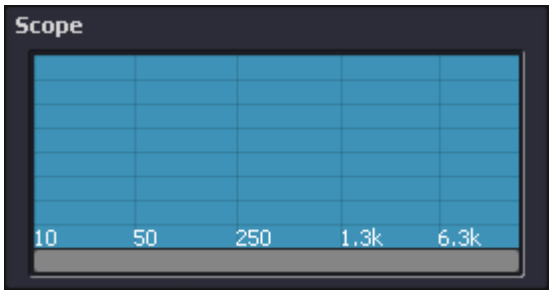
Width : Sets the width of the pulse waveform.

TPS : Allows you to blend between the triangle, pulse and sawtooth waveforms.

Phase : Controls the start phase of the oscillator.

Scope Module

This module displays frequency analysis of the incoming signal. You can zoom in, out and scroll the display by dragging the display window.



Supersaw Module

This module produces 5 detuned sawtooth waveforms in one. You can adjust the detune and how it tracks across the keyboard.

Parameters:

Oct : Sets the oscillator pitch in octaves.

Semi : Sets the oscillator pitch in semitones.

Fine : Sets the oscillator pitch in cents.

Hz : Sets the oscillator detune in hertz.

Spread : Sets the detune spread of the 5 sawtooths.

Trk : Applies keytrack to the detune spread. It reduces the detune on higher notes.

Syncrosc Module

This module is a sawtooth and square oscillator with oscillator sync. It is like a master and slave oscillator all rolled into one, so you don't need an external sync signal. The main pitch controls set the master pitch, the sync control / input allow you to set the slave pitch relative to the master. You can control integration of the waveform, at full integration (120) the square becomes a triangle, and the sawtooth becomes a kind of half parabola. Integration is very much like processing the oscillator with one pole lowpass filter that follows its pitch.

Parameters:

Semi : Sets the oscillator pitch in semitones. Left mouse changes by octaves, right mouse by semitones.

Fine : Adjust the oscillator pitch in cents.

Hz : Detune the oscillator in hertz.

Sync : Sets the ratio between the slave and master frequencies.

Ig : Controls waveform integration. At full integration the square will become triangular and the sawtooth will be parabolic.

PS : Controls the blend between sawtooth and square waveshape.

Phase : Set the start phase of the oscillator.

Unison Module

This module allows you to set a custom value for each unison voice. It will either output the unison value or if there is an input connected it will output that signal multiplied that by the unison

value.

The “Pitch” button changes the faders so they work in a way that makes it easier to control pitch. You need to set the pitch input fader of the target to +48 semitones so it is working on the same scale as the unison faders.

UnisonSpread Module

This module gives each voice in a unison set a value spread out across the given range. The two faders allow you to set the range over which the unison signal will be mapped. With no input connected this module will output the unison signal as it is. When an input is connected it will output the input signal multiplied by the unison.

Velocity Module

The velocity module gives you access to MIDI velocity. With no input connected this module will output the velocity signal as it is. When an input is connected it will output the input signal multiplied by the velocity.

Parameters:

Curve : Velocity response curve.

Amt : Velocity amount.

Glide : Glides from previous velocity to new one.

Legato : Only glide on notes played “Mono Legato”

VoiceMixer Module

This module mixes all the active voices down to a single stereo static signal. This means the output of this module can be used in the output effect processing chain.

Parameters:

Pan : This sets the output panning of the mixer module.

UnisonPan : This enables you to pan the voices in a unison set. So it will allow you to spread unison voices across the stereo field.

Wavetable Module

This is a wavetable oscillator module. It allows you to smoothly sweep the oscillator through an array of waveforms.

Parameters:

Oct : Adjust the oscillator pitch in octaves.

Semi : Set the pitch in semitones.

Fine : Adjust the pitch in cents.

Hz : Detune the oscillator in hertz.

Wav : Set the position in the wavetable.

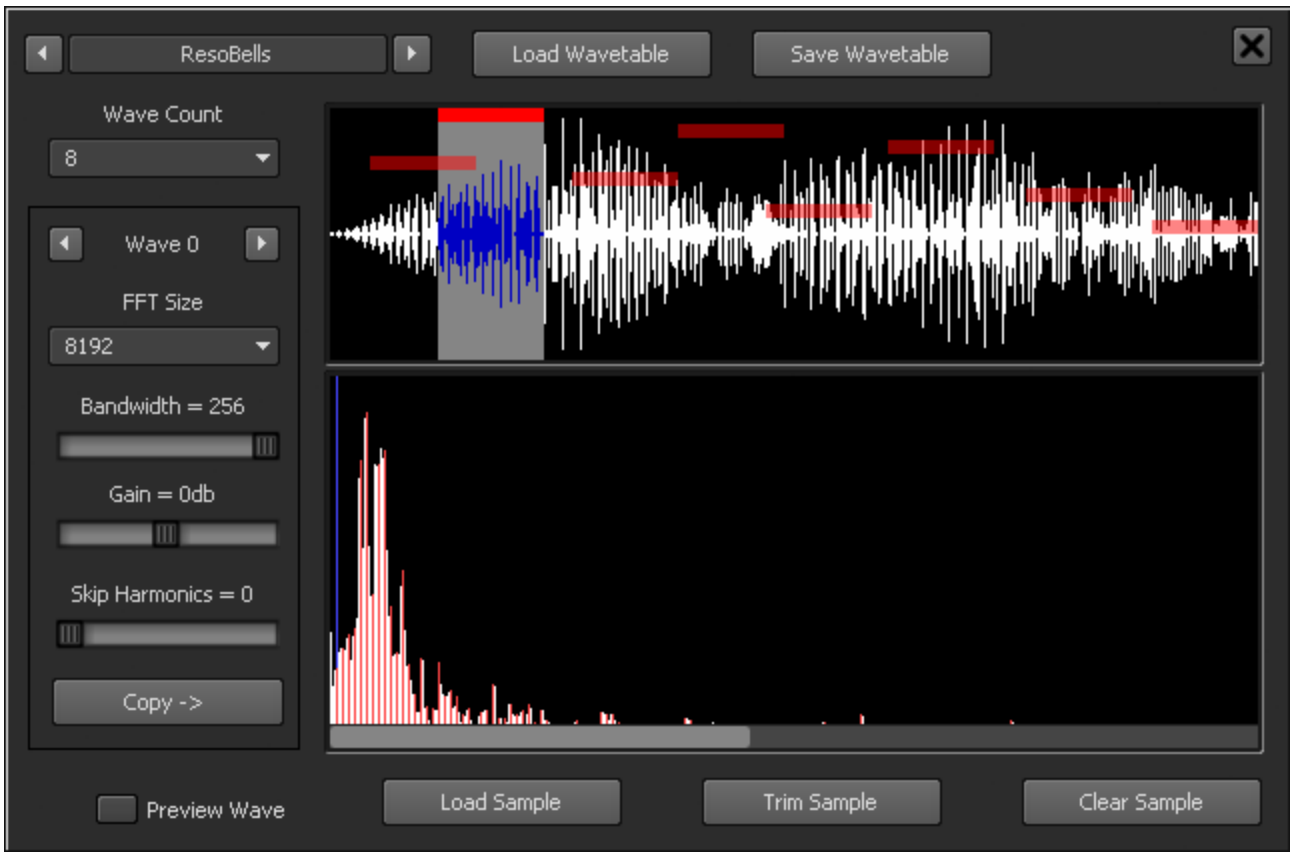
Phase : Sets the start phase of the oscillator.

Opens the WaveMaker window which allows you to edit and create wavetables. See the user guide info for WaveMaker.

XFader Module

This module allows you to cross-fade between two signals.

WaveMaker



This window allows you to edit wavetables. A wavetable is made up of a series of harmonic snapshots (from now on called waves) taken from an audio sample. Each wave has settings that determine how its harmonic series is extracted from the audio sample.

Wave Panel : The wave panel displays the audio sample, the position and the FFT size of each wave. You can select a wave by clicking on its red bar and you can use the left and right mouse buttons to adjust the positioning of current wave as follows...

Left button : This sets the absolute position, the wave will be centered
where you click.

Right button : This allows fine adjustment of the wave position.

Frequency Panel : The lower panel shows the FFT frequency analysis of the current wave and also the harmonic series that has been extracted based on the current settings for the wave. Editing is as follows...

Left mouse drag : This controls the zoom and positioning of the display.

Right mouse drag : This controls the 'root frequency' of the series.

Basically it allows you to adjust how the harmonics series aligns on top of the data created by the frequency analysis.

Wave Settings : The individual settings for each wave in the wavetable.

FFT Size : Larger FFT sizes will give increased frequency resolution, but at the expense of lower time resolution.

Bandwidth : This allows you to limit the bandwidth of the harmonic series.

Gain : Allows you to adjust the gain of the wave.

Skip Harmonics : This skips the first N harmonics of the series.

Miscellaneous Controls :

Preview Wave : This will override the wave position of the underlying wavetable oscillator so you hear the wave that is currently being edited. Note that it doesn't override wave modulation so you would need to turn that off yourself.

Trim Sample : This will trim the sample so that it only includes the area currently in use. It discards any data to either side of the leftmost and rightmost waves.

Clear Sample : This clears the sample from the wavetable. It won't affect the actual wavetable but it will prevent editing until a sample is loaded again.

For the sake of keeping patch files small you should always “clear sample” once you are done editing. You can always reload if you want. But otherwise the sample will be saved along with the patch file and could result in very large patches size.

Miscellaneous Information

Website : www.sonigen.com
Email : chris@sonigen.com

For technical support either email me or try our forum over at KvR audio.

http://www.kvraudio.com/forum/viewforum.php?f=178