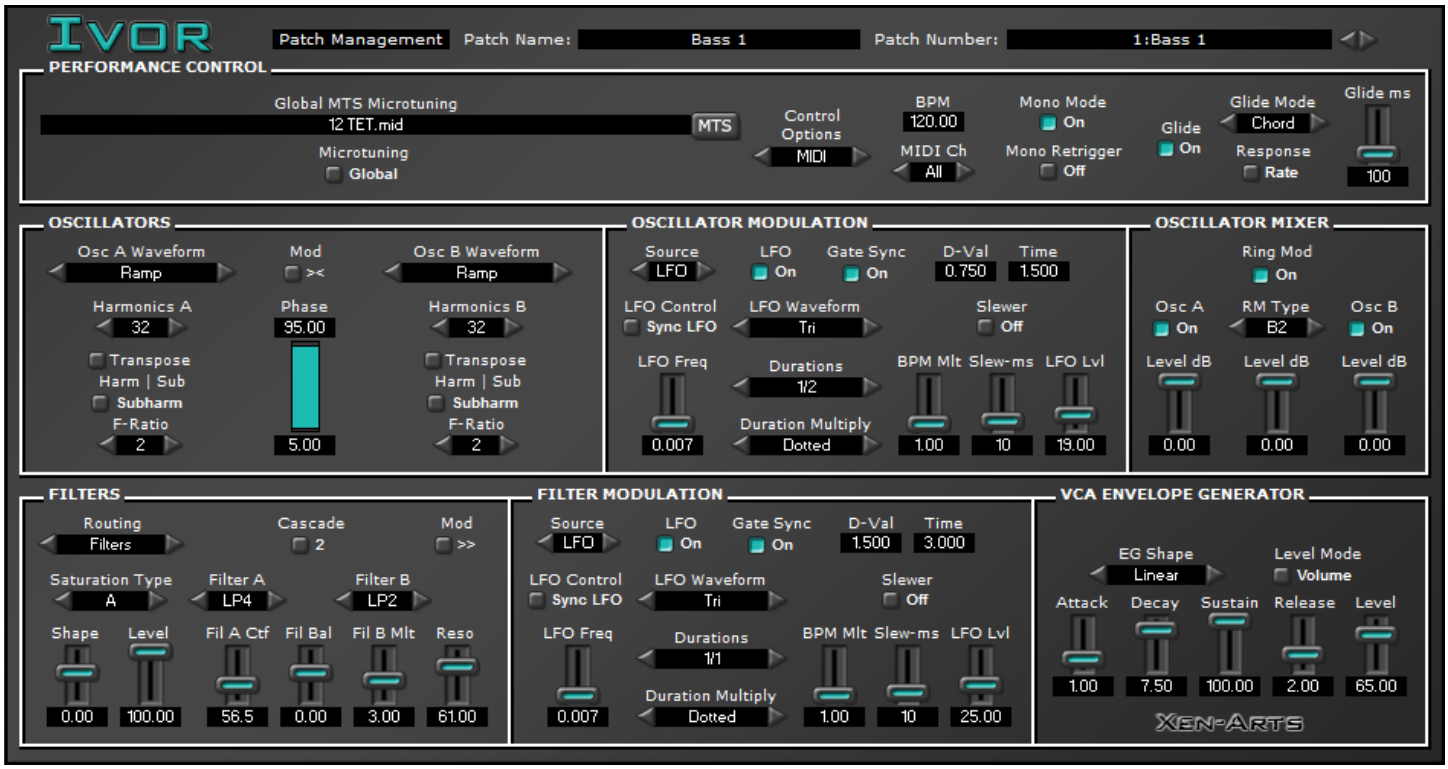
XEN-ARTS

presents

MICROTONAL VIRTUAL ANALOG SYNTHESIZER



A Subtractive Synthesis VSTi for the Creation of Microtonal and Xenharmonic Music

INSTRUCTION MANUAL

Ivor | Manual | Table of Contents

IVOR
The Microtonal Virtual Analog Synthesizer
by Xen-Arts

IVOR is a two-oscillator subtractive synthesizer that features full-controller MIDI Pitch Microtuning using MTS (MIDI Tuning Standard), where any MIDI Note Number can be freely microtuned to any desired pitch across the MIDI range, thereby enabling musicians and composers to explore the vast expressive possibilities of composing music with alternative intonation systems.

IVOR is a microtonal sound-designer's virtual analog synthesizer with a carefully designed ergonomic workflow for quickly creating powerful sounding and musical useful timbres.

IVOR excels at making categories of timbres that include bass, distortion, keys, pads, broken, weird, leads and other analog synthesis types of sounds.

IVOR is an educational tool for learning about subtractive sound synthesis and musical instrument intonation (aka microtuning and xenharmonics).

IVOR embodies a design philosophy of simplicity for microtonal music sound-design…
- A 'knob-less' design featuring slider controls only, which enables intuitive direct control with a computer mouse.
- A dedicated control signal system mapped to the most important synthesis functions.
- Settings are made by typing values into fields, dropdown lists, left-and-right arrows, switches and sliders.
- Enables musicians to specify precise microtonal pitch-bend settings.
- Features arbitrary microtonal oscillator transposition settings.
- Velocity modulation of harmonics enables dynamically playing harmonics of the fundamental pitch.

Features...

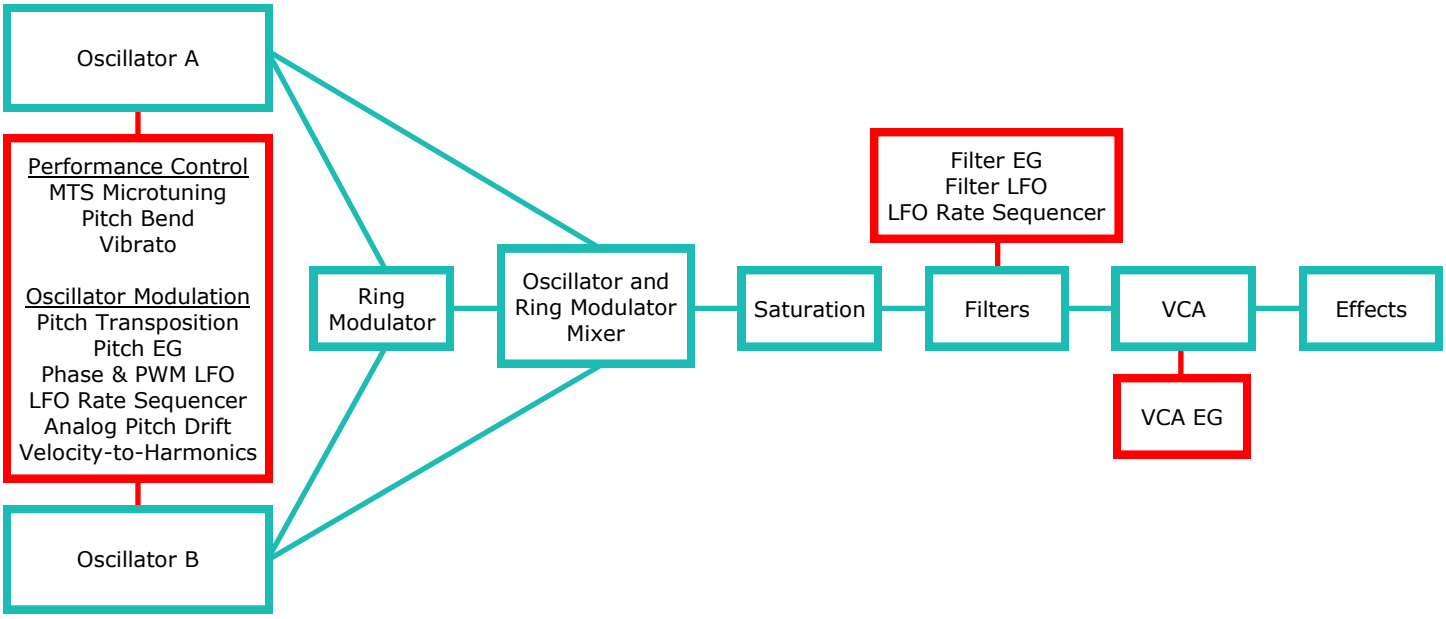
Oscillator Section
- Two Oscillators with 22 Waveforms
- Microtonal, Harmonic Series and Subharmonic Series Oscillator Transposition
- LFO (with Rate Sequencer) and Envelope Generator for Phase, Pulse-Width and Pitch Modulation
- LFO and Envelope Generator features both Unidirectional and Bidirectional Modulation
- Analog Pitch Drift Emulator with both Unidirectional and Bidirectional Modulation
- Velocity-to-Harmonics Modulation enables oscillators to dynamically sound harmonics of the fundamental pitch
- Ring Modulation with 23 RM Types
- Oscillator and Ring Modulator Mixer

Filter Section
- Pre-Filter Saturation Stage with 20 Saturation Types
- Two Independent Filters with Six Filter Types: LP4, LP2, HPF, BPF, BRF, APF
- One and Two Stage Filter Cascade
- LFO (with Rate Sequencer) and Envelope Generator for Filter Cutoff Frequency Modulation
- LFO and Envelope Generator enables both Unidirectional and Bidirectional Filter Modulation

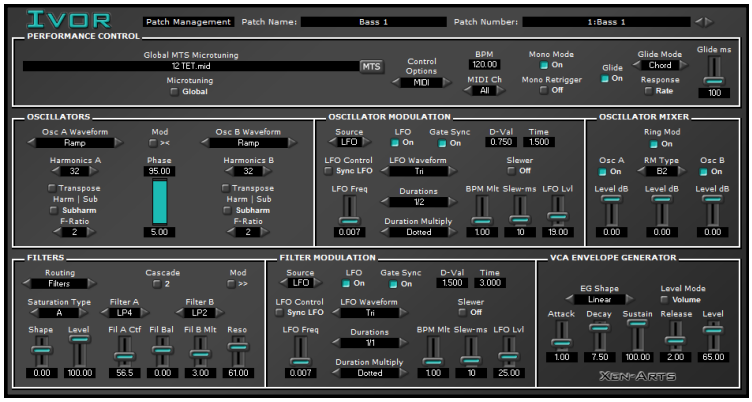
VCA Section
- Dedicated Envelope Generator
- Switchable Velocity Sensitivity and Fixed Volume Control

Performance Control
- MIDI Pitch Microtuning with MTS (MIDI Tuning Standard)
- MTS Support for both Single Note and Bulk Dump
- Loads MTS Microtuning Format Files Internally and Receives MTS Externally
- Local (Per-Patch) and Global Microtuning (Static Microtuning for All Patches)
- Microtunings can be loaded from any directory on hard drives or storage devices connected to the computer
- Ten Note Polyphonic
- Monophonic Legato Mode
- Polyphonic Portamento with Three Glide Modes
- Microtonal Pitch Bend
- Vibrato
- Effects include Warm Filter and Stereo Ensemble

IVOR | SIGNAL FLOW BLOCK DIAGRAM



Blue = Audio Signal Flow Red = Modulation Sources



IVOR | SYSTEM REQUIREMENTS

System Requirements
OS: Ivor is a 32-bit VSTi For Windows XP Pro or higher.

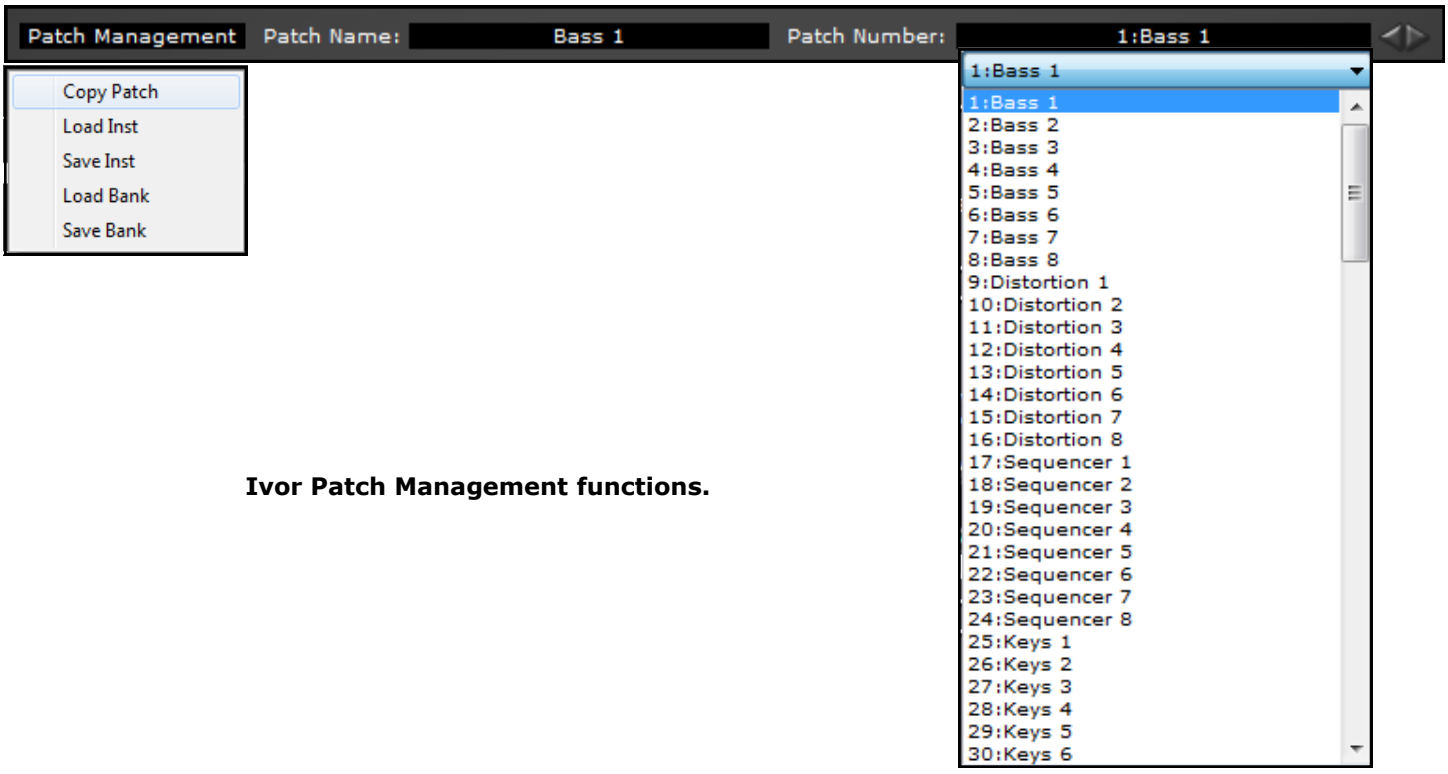
Host DAW: The VSTi was rigorously tested in Reaper, Cubase, Ableton Live and FL Studio and is known to work without problems in these hosts.

MTS Microtuning Creation: Install and use Scala to create your own custom microtunings for this instrument. http://www.huygens-fokker.org/scala/downloads.html

MIDI Controller: Requires the use of an external MIDI Controller such as a USB Halberstadt keyboard (standard 12-tone keyboard), a Generalized Keyboard such as the Axis-64 from C-Thru Music, the Opal Chameleon available from The Shape Of Music, the Starr Labs Microzone U-648 or U-990.

End User: Basic knowledge and experience with the subtractive synthesis method is assumed for the use of this instrument and manual.

Installation
Extract the entire contents of the archive to your VST directory. This will place the VST DLL and all of the dependent files for the plugin in the required place and will insure the correct operation of all the synthesis features. Win 7 users should install the plugin in My Documents or some other directory other than Program Files due to UAC.



Ivor Patch Management functions.

Use the Patch Management features at the top of the VSTi to load, create and store your instrument patches and banks.

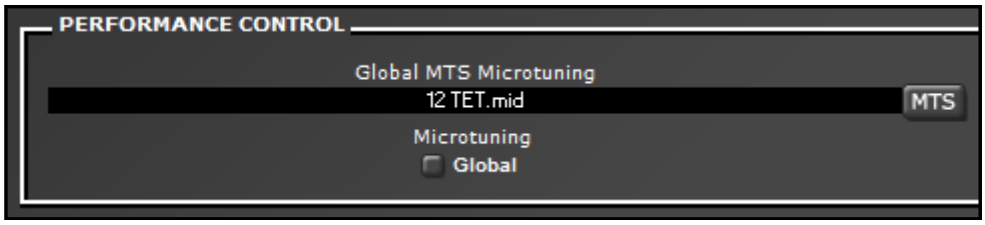
Click the **Patch Management** button to access patch **Copy**, **Load** and **Save** options:

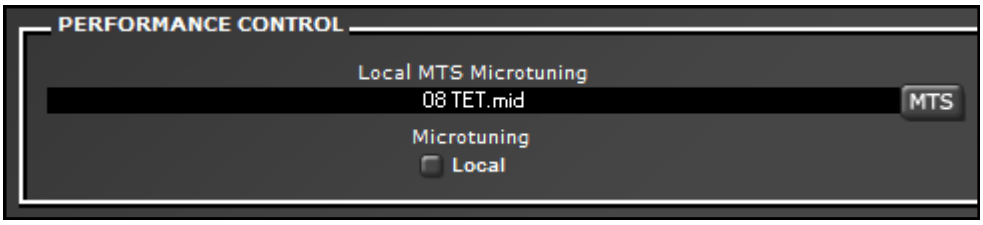
- Copy patches to a single location or to a range of patches with the **Copy Patch** menu option.
- Load an FXP single instrument patch file with the **Load Inst** menu option.
- Save an FXP single instrument patch file with the **Save Inst** menu option.
- Load an FXB bank file that can contain up to 128 patches with the **Load Bank** menu option.
- Save an FXB bank file that can contain up to 128 patches with the **Save Bank** menu option.

Type a new name for the current patch into the **Patch Name** field when designing custom timbres.

Select from the available 128 patches stored in the current bank by clicking the **Patch Number** drop-down menu, or alternatively use the left and right arrow buttons found to the right of the menu to step through the available patches in a bank.

Any changes made to the currently selected patch are automatically saved with that patch number.





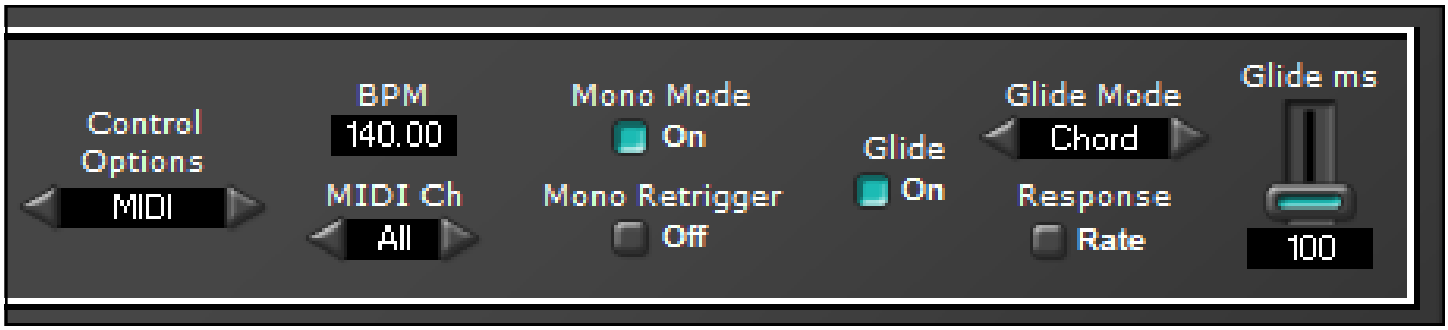
Ivor can load both a Global and Local MTS microtuning.

PERFORMANCE CONTROL | Microtuning

The **Ivor** VSTi enables musicians to load both a **Global MTS Microtuning** as well as a **Local MTS Microtuning**. The Global MTS Microtuning will stay loaded even on patch changes and can be used to play in a constant tuning while previewing the patches in a bank. The Local MTS Microtuning, however, is saved at the patch level and is restored whenever a patch with an associated microtuning is opened. Load the desired Global and Local MTS Microtuning files by clicking the appropriate **MTS** button.

Choose to play the current patch with either the loaded Global or Local MTS Microtuning by using the **Microtuning** button beneath the MTS file loading features.

An important feature of all Xen-Arts VSTi is that they enable musicians and composers to load, and make music with, MTS microtunings that are stored in any directories on their computers. This includes connected external drives and USB storage devices.



The MIDI page of Control Options in the Performance Control section.

There are three pages of **Control Options** in the **Performance Control** section: **MIDI**, **Pitch** and **Effects**. Switch between these pages using the **Control Options** left and right arrows.

PERFORMANCE CONTROL | Control Options | MIDI

The **BPM** display reports the tempo of the host DAW.

Use the **MIDI Ch** selectors or drop-down list to choose the MIDI reception channels All or 1-16.

Activate or deactivate **Monophonic Mode** with the **Mono Mode** selector. While in **Mono Mode** the synthesizer will only be capable of playing one note at a time, which is useful for bass and single note melodic lines and leads.

Activate or deactivate **Mono Retrigger** using the selector. Enabling **Mono Retrigger** while the synthesizer is in **Mono Mode** causes **Envelope Generators** to be retriggered with each note-on. Leave this in the Off position to play smooth mono-legato passages.

Activate or deactivate **Glide** – aka **Portamento** – using the selector. There are three Glide Modes:

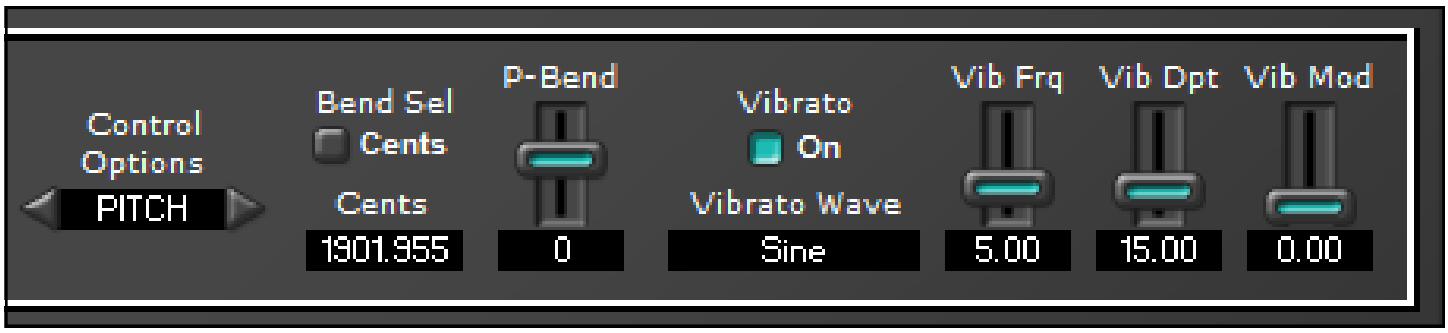
Chord - Enables glide between held notes of chords.
Note 1 – Glides from the last voice.
Note 2 – Glides between notes.

Each of these modes behaves quite differently depending on whether the synth has **Mono Mode** activated or not. Generally speaking, **Chord** mode is useful for polyphonic playback, while **Note 1** and **Note 2** may be more suitable for monophonic lines, although all three may be freely used as the music requires.

Choose between the two **Glide Response** modes using the selector. They are **Rate** and **Time**:

Rate – The glide transition between pitches is determined by interval distance.
Time – The glide transition is a fixed value in milliseconds as specified by the Glide ms slider.

Set the **Glide Time** in milliseconds using the **Glide ms** slider.



The Pitch page of Control Options in the Performance Control section.

PERFORMANCE CONTROL | Control Options | Pitch

Choose between the two **pitch-bend modes** using the **Bend Sel** selector:

9/8 – Sets the pitch bender to bend a precise interval of **9/8** at a value of **204 cents**. This is a fundamental musical interval for pitch bend.

Cents – This mode enables musicians to type in a pitch bend value in cents. The maximum range is 4800 cents, which is four full octaves. This unique feature enables musicians to precisely specify arbitrary microtonal pitch bend values as needed for any imaginable intonation system.

The **P-Bend** slider displays the value and position of movements of a MIDI Pitch Bend controller.

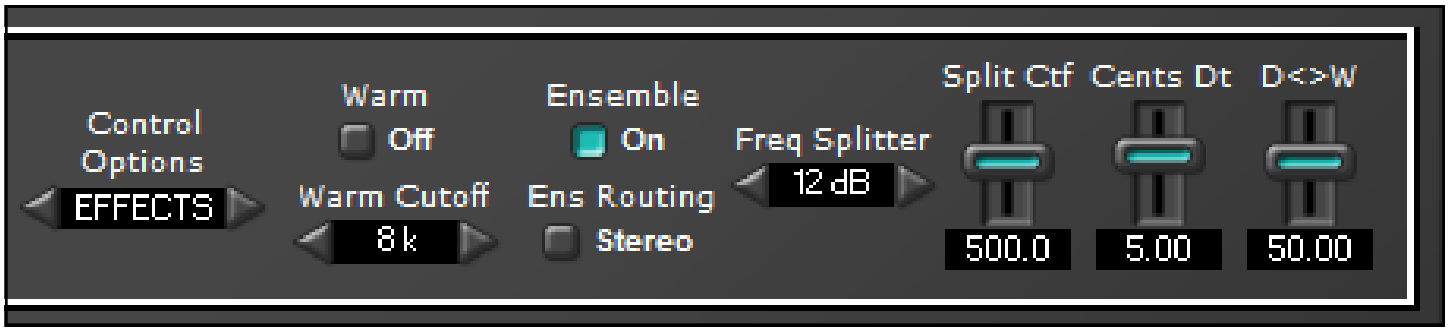
Activate or deactivate **Vibrato** using the selector.

Choose from the available **vibrato waveforms** using the **Vibrato Wave** dropdown list.

Set the **vibrato rate** in Hertz using the **Vib Frq** slider.

Set the **depth of vibrato** using the **Vib Dpt** slider.

Vibrato is by default mapped to the **MIDI Modulation** controller. Movements of the **Mod-Wheel** on an attached MIDI controller will move the **Vib Mod** slider. It is possible to map this parameter to other MIDI Continuous Controllers if needed.



The Effects page of Control Options in the Performance Control section.

PERFORMANCE CONTROL | Control Options | Effects

Activate or deactivate the **Warm** filter using the selector. This is a 6 dB per octave filter that can be used to gently roll of high frequencies in complex synthesis waveforms.

Select the cutoff frequency of the **Warm** effect using the **Warm Cutoff** left and right arrows.

Activate or deactivate the **Ensemble** effect using the selector. This is a four-voice ensemble detuning effect that can be used to make waveforms more rich sounding by playing copies of the sound at different closely spaced intervals.

Choose to place the four voices of the **Ensemble** effect in either a stereo arrangement, or otherwise collapse all of them to mono using the **Ens Routing** options.

The **Ensemble** effect has a **frequency crossover splitter** that passes frequencies in the synthesizer signal above the filter cutoff which are then processed by the four-voice stereo (or mono) Ensemble effect, while frequencies beneath the cutoff frequency are not processed and are in heard mono.

Set the filter response of the **Frequency Splitter** using the **Freq Splitter** selectors. The options are:

6 dB - 6 dB per octave Low-Pass and High Pass filters.
12 db - 12 dB per octave Low-Pass and High Pass filters.
18 dB - 18 dB per octave Low-Pass and High Pass filters.
Bypass - In the Bypass mode, the Frequency Splitter is disabled and the full frequency range of the synthesizer signal is processed by the Ensemble effect.

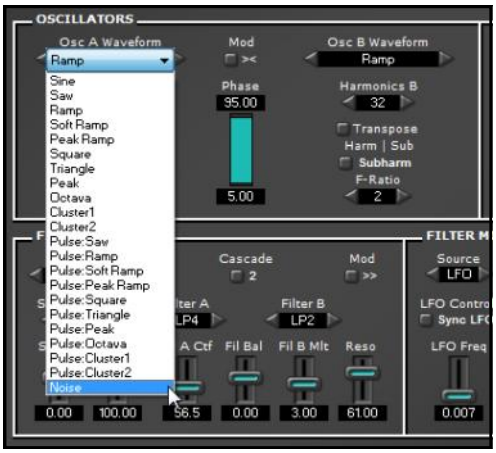
Set the **cutoff crossover frequency** in Hz of the **Frequency Splitter** using the **Split Ctf** slider. This can radically transform and shape the sound of the synthesizer in quite musically useful ways.

Set the depth of detuning of the **Ensemble** effect using the **Cent Dt** slider. The maximum range is -/+ 55 cents.

Set the **dry-to-wet balance** of the **Ensemble** effect using the **D<>W** slider. Values below 50 have less of the effect, while greater than 50 makes the effect more pronounced. It is often a good idea to allow some of the dry signal to pass through by keeping the slider in the middle range, as the dry synth sound is also a 'voice' in the effect.

Special Note: Xen-Arts cares about protecting musician's audio gear and has added to the effects section of this VSTi a steep low-cut filter. This hidden filter attenuates extremely low frequencies that are typically beneath the reproducible range of most consumer monitors and headphones.

Ivor oscillators have 22 waveforms.



OSCILLATORS | Oscillator Waveforms

There are two oscillators, A and B, with identical features. Select the waveform of the oscillators using the **Osc A Waveform** or **Osc B Waveform** dropdown list or left and right arrows.

There are 22 waveforms available. The first 11 are basic synthesis waveforms:

1. Sine
2. Saw
3. Ramp
4. Soft Ramp
5. Peak Ramp
6. Square
7. Triangle
8. Peak
9. Octava
10. Cluster1
11. Cluster2

These 11 waveforms may be subjected to **Phase Modulation** using the dedicated **LFO** in the **Oscillator Modulation** section.

Waveforms 12 through 21 have a Pulse prefix:

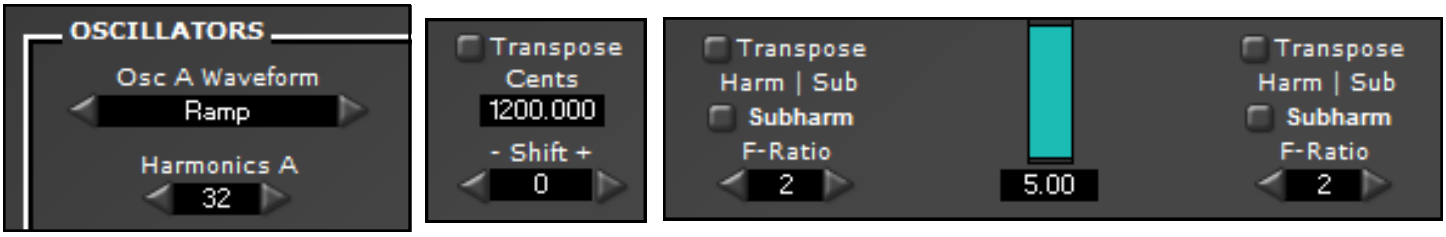
12. Pulse: Saw
13. Pulse: Ramp
14. Pulse: Soft Ramp
15. Pulse: Peak Ramp
16. Pulse: Square
17. Pulse: Triangle
18. Pulse: Peak
19. Pulse: Octava
20. Pulse: Cluster1
21. Pulse: Cluster2

These waveforms may be subjected to **Pulse Width Modulation** using the dedicated **LFO** in the **Oscillator Modulation** section.

A final waveform is available:

22. Noise

The noise waveform has no specific pitch and may be used to synthesize percussion oriented sounds, as a Ring Modulation source, or may be blended with the above pitched waveforms to create breathy or blown types of sounds.



The Harmonics and Transpose functions of the Oscillators section.

OSCILLATORS | Waveforms | Harmonics

Direct control is provided for the number of harmonics that will be sounded with the selected waveform. Specify the number of harmonics for Oscillators A and B using the **Harmonics A** and **Harmonics B** selectors. Selection can be made with the dropdown list or left-and-right arrows. The range is from 1 to 256 harmonics.

Using lower numbers of harmonics creates simpler waveforms, while adding more harmonics creates increasingly complex timbres. It's important to recognize that the Sine waveform only sounds a single harmonic with the fundamental pitch, no matter what settings are made with the Harmonics selectors.

OSCILLATORS | Transpose

Oscillators A and B feature versatile transposition controls enabling musicians to directly specify precise pitch offsets as required by particular musical settings. There are two transposition modes available:

Cents – Enables musicians to type in any desired offset value into the provided **Cents** field, then using the **- Shift +** selector, transpose the oscillators between -16 to 16 times the specified value. For instance, typing 1200 cents into the Cents field and shifting -1, will lower the pitch of the oscillator 1 octave. Conversely, shifting to 1 will raise the pitch of the oscillator 1 octave.

The flexibility of the **Cents** transposition mode becomes more apparent though when working with intonation systems which do not repeat at an interval of an octave (2/1 @ 1200 cents), such as the **Bohlen-Pierce** microtuning, which instead has a repeat value of 3/1 @ 1901.955 cents. Worth mentioning are three other rather famous microtonal tunings discovered by Wendy Carlos which feature both narrow and wide 'pseudo-octaves':

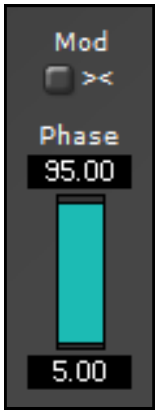
Alpha (78.00 Cents Equal Temperament)
Degree 15, Lower Pseudo-Octave: 1170.00 cents
Degree 16, Upper Pseudo-Octave: 1248.00 cents

Beta (63.80 Cents Equal Temperament)
Degree 19, Lower Pseudo-Octave: 1148.40 cents
Degree 20, Upper Pseudo-Octave: 1212.20 cents

Gamma (35.10 Cents Equal Temperament)
Degree 34, Lower Pseudo-Octave: 1193.40 cents
Degree 35, Upper Pseudo-Octave: 1228.50 cents

Most synthesizers only permit transposition offsets of the oscillators in terms of octaves and cents, while this instrument permits musicians to directly specify any arbitrary transposition values as required by particular musical and intonation settings. The permitted range is a maximum of 4800 cents, or four octaves.

Harm | Sub – The second transposition mode enables the oscillators to be transposed by degrees of either the **Harmonic Series** or **Subharmonic Series**. Switch between **Harmonic** and **Subharmonic** modes using the selector switch. Use the **F-Ratio** selectors to specify the desired offsets. The range is from 1 to 32, and when **Harmonic** mode is active, increasing the value will raise the pitch of the oscillator by harmonics, while conversely, when **Subharmonic** mode is active, increasing the value will lower the pitch by degrees of the subharmonic series.



Configure the minimum and maximum range for phase and PWM using the Phase Min-Max Bar. Set the LFO modulation to either unidirectional or bidirectional using the Mod mode switch.

OSCILLATORS | Phase and Pulse Width Modulation Range Control

Another of the powerful features in the oscillator section of this synthesizer is the ability to precisely control the range of the LFO modulation source for **Phase and Pulse Width Modulation** using the **Phase Min-Max Bar**.

The **Phase Min-Max Bar** performs four simultaneous functions with one convenient control:

1. Sets the Minimum range for Phase or Pulse Width Modulation.
2. Specifies the Phase Center around which bipolar modulation will occur.
3. Sets the Maximum range for Phase or Pulse Width Modulation.
4. Specifies an LFO scaling factor as the difference between the Min and Max range, which always keeps the LFO within a valid modulation range.

The range for the **Phase Min-Max Bar** is from 0 to 100. Specify the **Minimum** range by typing a value into the lower field, or by clicking on the lower edge of the blue bar and moving it. Specify the **Maximum** range by typing a value into the upper field, or by clicking on the upper edge of the blue bar and moving it. Move the Min and Max boundaries together by holding the Shift key, Clicking on the blue bar and moving it.

The LFO control signal that is used for modulating the **Phase and Pulse Width Modulation** of both oscillators may be set to either **Unidirectional** or **Bidirectional** modulation. Use the **Mod** switch to change between these two modes:

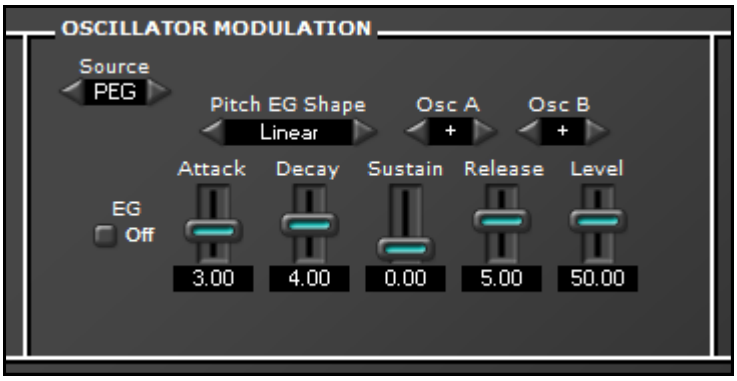
Unidirectional Modulation Mode = **>>**
The unidirectional modulation mode causes the LFO control signal to modulate the Phase or PWM of both oscillators in the same direction.

Bidirectional Modulation Mode = **><**
The bidirectional modulation mode causes the LFO control signal to modulate the Phase or PWM of both oscillators in an opposite direction.

Phase and Pulse Width Modulation can be utilized to create complex and evolving timbres. When modulated at slower rates, the effect can be similar to chorusing, while modulation at audio-rates can create complex sidebands in the composite signal. **Pulse Width Modulation** can progressively add or remove harmonics from the oscillator waveforms. An in depth discussion of Phase and Pulse Width Modulation is outside of the scope of this brief manual. It is suggested to read these two articles as an introduction to these important synthesis concepts:

Synth Secrets, Part 12: An Introduction to Frequency Modulation
http://www.soundonsound.com/sos/apr00/articles/synthsecrets.htm

Synth Secrets, Synthesizing Strings - PWM & String Sounds
http://www.soundonsound.com/sos/Mar03/articles/synthsecrets47.asp



The Pitch Envelope Generator.

OSCILLATOR MODULATION

The **Oscillator Modulation** section provides dedicated modulation sources for both oscillators and there are four pages in this section that give access to the various functions. Switch between these pages using the Source selectors. The available options are as follows:

OSCILLATOR MODULATION | Source: PEG | Pitch Envelope Generator

This is the page for the dedicated **Pitch Modulation Envelope Generator**.

Activate or deactivate the **Pitch Modulation Envelope Generator** using the **EG** selector.

Set the **ADSR** timings for the **PEG** using the provided sliders, or otherwise type values into the fields beneath them.

Set the depth of the interaction of **MIDI Velocity** with the **PEG** using the **Level** slider, or otherwise type values into the field beneath it.

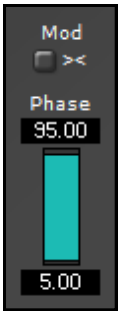
Specify the shape of the **PEG** control signal using the **Pitch EG Shape** selectors. When in **Linear** mode, the **Attack**, **Decay** and **Release** slider values represent seconds, while the other modes radically change the timing and rate of the control signal, which can be useful for synthesizing plucked-string-like timbres, percussive sounds, as well as wild pitch sweep effects.

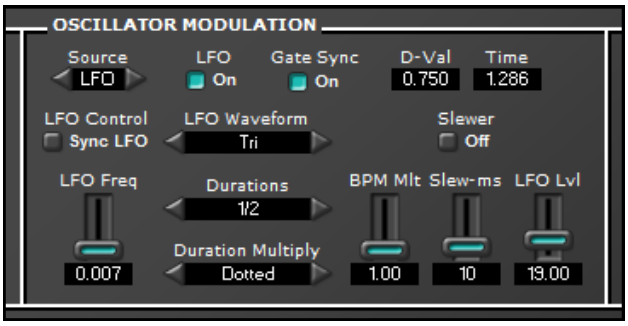
Set the polarity of the **PEG** control signals going to Oscillators A and B using the **Osc A** and **Osc B** selectors. The options are:

+ Modulates pitch in a positive direction.

- Modulates pitch in a negative direction.

Off disables the **PEG** for the oscillator. This can be useful for keeping the pitch of one oscillator static, while bending the other.





The Phase and Pulse Width Modulation LFO interacts with the Phase Min-Max Bar in the Oscillator section.

OSCILLATOR MODULATION | Source: LFO | Low Frequency Oscillator

This is the page for the dedicated **Low Frequency Oscillator** that is used for **Phase and Pulse Width Modulation**. Settings here directly interact with those made to the **Phase Min-Max Bar** in the **Oscillator** section.

Activate or deactivate the LFO using the **LFO** selector.

Choose whether or not to sync the LFO waveform to each **MIDI Note-On** using the **Gate Sync** selector. Leave this **Off** for pad type sounds for a continuously evolving modulation effect, and **On** for timbres that use the LFO as a kind of periodic envelope generator, where one needs the LFO waveform to consistently start at the beginning.

Specify whether or not to have the LFO synchronize to the host tempo using the **LFO Control** selector. The options are Sync LFO and Frequency.

When in the **Freq LFO** mode, use the **LFO Freq** slider to specify the LFO rate in Hertz. When in the **Sync LFO** mode, the period of LFO modulation is set using the **Durations** and **Duration Multiply** selectors and the LFO is synchronized to the host DAW tempo.

Select the modulation waveform using the **LFO Waveform** selectors.

Select the modulation period of the LFO using the **Durations** selectors. The range is from 128/1 to 1/128.

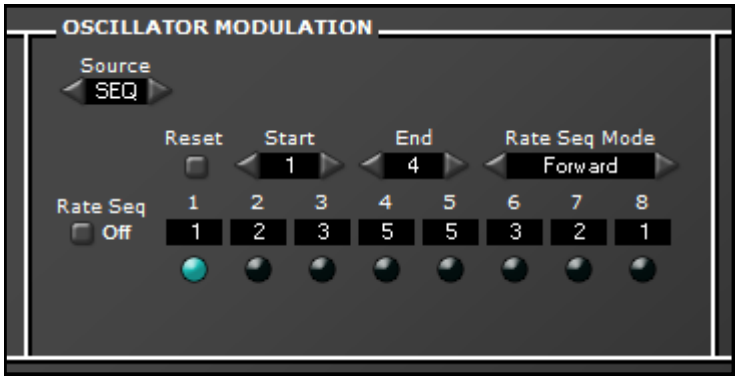
Switch between **Normal** (multiple-of-two), **Dotted**, **Triplet** and **Quintuplet** duration values using the **Duration Multiply** selectors.

The decimal value for the selected LFO duration is show in the **D-Val** display, while the Time in seconds is shown in the **Time** display.

Use the **BPM Mlt** slider or data field to multiply the rate of the LFO. The range is 1 to 2048 times the host DAW tempo. Higher values can modulate Phase and PWM at audio-rates, which can introduce complex sidebands into the composite synthesizer signal.

Activate or deactivate the slewer using the **Slewer** selector. Set the timing of the Slewer in milliseconds using the **Slew-ms** slider or data field. The slewer can be used to smooth the LFO modulation signal, which can be useful for removing clicks when, for instance, modulating with square, pulse and ramp waves. Range is from **0** to **250 ms**.

Set the depth of the LFO using the **LFO Lvl** slider. This slider directly interacts with the settings made to the **Phase Min-Max Bar** in the oscillator section. The LFO control signal is always attenuated to fit within a valid modulation range, although the depth of the modulation may be controlled with this slider. For instance, if the Phase Min-Max Bar is set to a range of 0-100 and the LFO Lvl slider is set to 100, the LFO control signal will modulate across the full Phase or PWM range.



The LFO Rate Sequencer has eight steps that multiply the rate of the LFO with each MIDI Note-On.

OSCILLATOR MODULATION | Source: SEQ | LFO Rate Sequencer

This page accesses the functions for the **LFO Rate Sequencer**. The LFO Rate Sequencer is an innovative 8-step sequencer that multiplies the LFO modulation rate with each MIDI Note-On.

Activate or deactivate the LFO Rate Sequencer using the **Rate Seq** selector.

There are eight numbered data fields for creating a rate-sequence. Type integers into these fields which will be used to multiply the LFO rate with each MIDI Note-On. The range is from 1 to 2048 times the host tempo. When triggering a rate-sequence from a MIDI controller, the current step is visualized with the LED beneath each step.

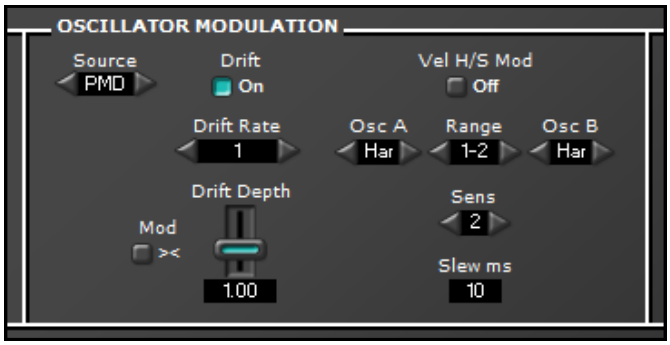
Reset the rate-sequence to the beginning using the **Reset** button. Creative rate-sequencing can be achieved by mapping the **Reset** button to a button on a MIDI controller so that resetting the sequence can be performed without having to do it on the synth UI.

Set the range of the rate-sequence using the **Start** and **End** selectors.

Set the direction of the rate-sequence using the **Rate Seq Mode** selectors.

The LFO Rate Sequencer can be used to create astonishing host-synchronized Phase and Pulse Width Modulation patterns that dynamically and rhythmically change the sound of the instrument. Slower modulation rates can create chorus-like effects, while rapid modulation at audio-rates can introduce complex sidebands into the composite signal of the synthesizer.

IVOR | OSCILLATOR MODULATION



The Pitch Modulation (PMD) Source in the Oscillator Modulation section features both an Analog Pitch Drift Emulator as well as Velocity-to-Harmonics Modulation.

OSCILLATOR MODULATION | Source: PMD | Pitch Modulation

The Drift feature of the oscillator section emulates the oscillator pitch instability and drift of some older analog synthesizers.

Activate or deactivate the emulation of analog synthesizer pitch drift using the **Drift** selector.

Set the rate of the pitch drift emulation using the **Drift Rate** selectors.

Set the depth of the pitch drift emulation using the **Drift Depth** slider, or alternatively, type in a depth value using the field beneath the slider.

The Drift control signal that is used for modulating the pitch of both oscillators may be set to either **Unidirectional** or **Bidirectional** modulation. Use the **Mod** switch to change between these two modes:

Unidirectional Modulation Mode = **>>**
The unidirectional modulation mode causes the Drift control signal to modulate the pitch of both oscillators in the same direction.

Bidirectional Modulation Mode = **><**
The bidirectional modulation mode causes the Drift control signal to modulate the pitch of both oscillators in an opposite direction, creating rich detuning effects between the two oscillators.

Ivor has a unique feature not found in any other synthesizer: **Velocity-to-Harmonics Modulation**, which enables musicians to dynamically break out harmonics (or subharmonics) of the fundamental pitch in a manner similar to acoustic instruments such as winds and strings, where force from MIDI Velocity directly controls the harmonic level.

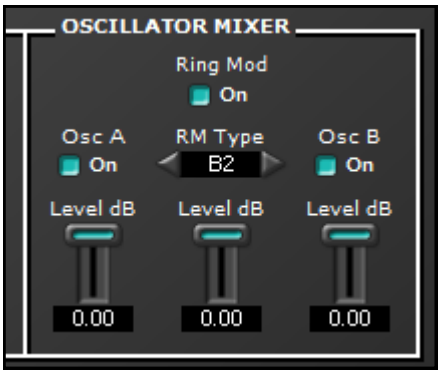
Activate or deactivate Velocity-to-Harmonics Modulation using the **Vel H/S Mod** selector.

Set the harmonic range using the **Range** selector. Options are harmonics **1-2**, **1-4**, **1-8** and **1-16**.

Specify whether MIDI Velocity will modulate the oscillator pitch according to a **Harmonic Series** or **Subharmonic Series** using the **Osc A** and **Osc B** harmonic selectors. Options are **Har**: Harmonic Series, **Sub**: Subharmonic Series and **Off**: which disables harmonic modulation for the selected oscillator and can be used to play the fundamental pitch of one oscillator, while another is harmonically modulated by MIDI Velocity.

Set the sensitivity response of MIDI Velocity for harmonic modulation using the **Sens** selectors. Options are **1**, **2** and **3**. A lower setting sets the sensitivity such that stronger force is required to break out higher harmonics, while higher settings require lighter force on the MIDI controller.

Type in the slew rate in milliseconds using the **Slew ms** field. This can be used for creating short pitch glides that smooth the transitions of dynamic harmonic modulation. Range is from **0** to **250 ms**.



The Oscillator Mixer combines signals from Oscillators A and B with the Ring Modulator.

OSCILLATOR MIXER

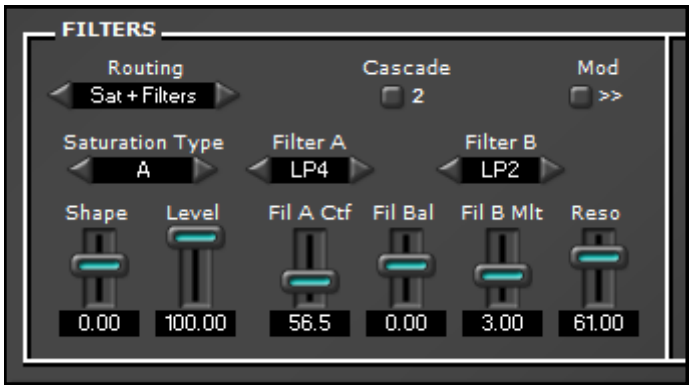
The **Oscillator Mixer** section provides a simple mixer for setting the relative volume balance between Oscillators A and B. This section also includes a powerful Ring-Modulator, into which Oscillators A and B are routed, which is treated here as another discrete signal that can be mixed with the oscillators for creating complex composite waveforms. Extraordinarily rich and evolving timbres can be created with the ring-modulator, especially when the Phase and PWM of Oscillators A and B are being modulated by the LFO.

Activate or deactivate **Oscillator A**, the **Ring-Modulator** and **Oscillator B** using the appropriate selectors.

It is important to understand that even when Oscillators A and B have been turned off, they are still internally routed into the ring-modulator. This enables making timbres in which only the RM signal is sounded, while Oscillators A and B are in the Off position.

Ring Modulation is a signal processing technique in which two signals are multiplied and the resulting waveform contains both the sum and difference frequencies of the two source signals. Select from the available 23 ring-modulation types using the **RM Type** selectors. Each of these RM Types imparts a different quality to the composite timbre that is created from the source Oscillators A and B that are routed to its input.

Set the relative volume levels (in decibels) of Oscillator A, the Ring-Modulator and Oscillator B using the **Level dB** sliders.



The Filter section features a saturation stage followed by two parallel filters with six filter types.

FILTERS
This section features a pre-filter saturation stage followed by two parallel filters.

Configure the way the source oscillators and ring modulator signals are processed by the filter section using the **Routing** selectors. The options are:

Bypass – In this mode the source signals bypass the saturation and filters entirely.

Saturation – The source signals are passed through the saturation stage only and the filters are by-passed.

Sat + Filters – The source signals are passed through both the Saturation stage and Filters.

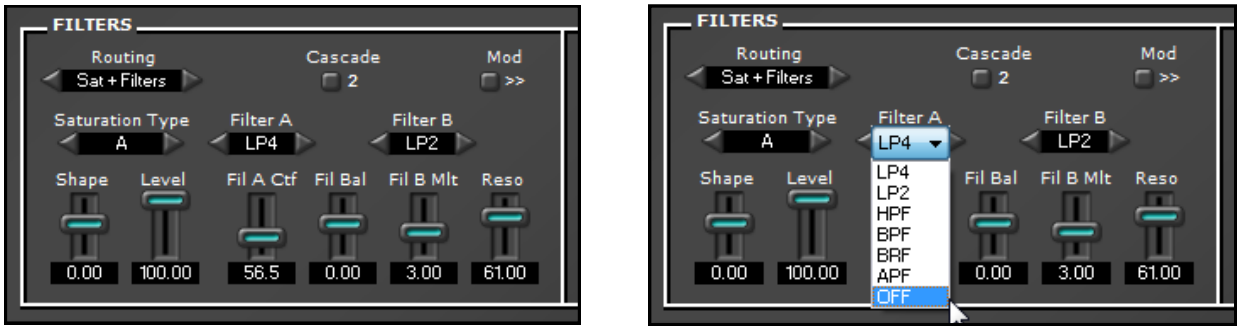
Filters – The source signals are passed through the filters only and the saturation stage is bypassed.

Using the **Saturation Type** selectors, select from the available 20 different saturation types, each of which imparts a unique quality of saturation, from subtle wave-shaping to extreme distortions.

Use the **Shape** slider to change the wave-shaping and tone quality of the saturation.

Control the relative wet and dry balance between the unprocessed source signals and the saturation effect using the **Level** slider. Lower settings let more of the unprocessed signal pass through, while when set to 100%, the source signals are fully processed by the saturation stage.

Use the **Cascade** selector to switch between (1) a single filter for filters A and B, and (2) two filters in series for each filter.



Choose from the six different filter types using the Filter A and Filter B selectors.

There are two parallel filters with six different filter types. Select from the filter types using the **Filter A** and **Filter B** selectors. When the **Cascade** selector is set to **1**, the available filter responses are as follows:

LP4 – 4-Pole, 24 dB per octave, Low-Pass filter with a saturation stage and aggressive resonance, which sounds similar to a Moog style filter.

LP2 – 2-Pole, 12 dB per octave, Low-Pass Filter.

HPF – 2-Pole, 12 dB per octave, High-Pass Filter.

BPF – 1-Pole, 6 dB per octave, Band-Pass Filter.

BRF - 1-Pole, 6 dB per octave, Band-Reject Filter.

APF - 2-Pole, 12 dB per octave, All-Pass Filter.

OFF – Disable the filter.

When the **Cascade** selector is set to **2**, then the filter responses for filters A and B are doubled.

Set of the cutoff frequency for Filter A using the **Fil A Ctf** silder. The range is 30 Hz to 8 kHz.

Use the **Fil Bal** slider to set the relative balance between Filter A and Filter B. Negative values balance towards Filter A, while positive ones toward Filter B. This enables creating unique and complex composite filter sounds. A setting of 0 creates an equal balance between the filters.

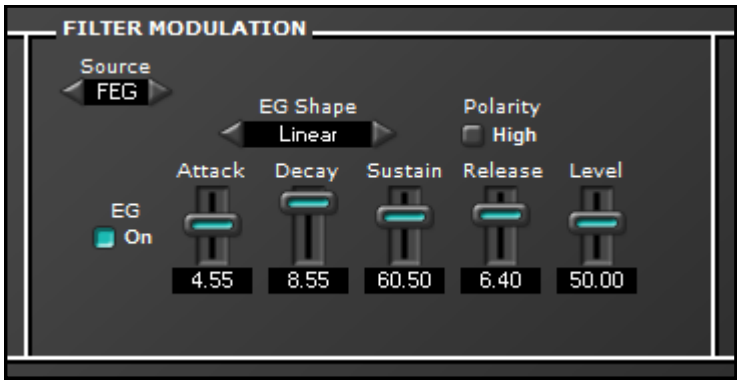
The cutoff frequency of Filter B is specified as a multiple of the Filter A cutoff frequency using the **Fil B Mlt** slider. Range is from 1 to 8 times the setting for the Filter A cutoff frequency. For instance, if the cutoff frequency of Filter A is set to 100 Hz, and the Fil B Mlt slider is set to a value of 3, then the cutoff frequency of Filter B is 300 Hz.

Set the resonance of Filters A and B using the **Reso** slider. Be aware that high resonance settings, especially with the Cascade selection of 2, can produce exceedingly loud audio signals. It is advised to take precautions to protect both hearing and audio gear in the event that one chooses to generate loud audio signals in this manner.

The modulation signals that are used for modulating the cutoff frequencies of Filter A and Filter B may be set to either **Unidirectional** or **Bidirectional** modulation. Use the **Mod** switch to change between these two modes:

Unidirectional Modulation Mode = **>>**
The unidirectional modulation mode causes the modulation signals to modulate the cutoff frequencies of Filter A and Filter B in the same direction.

Bidirectional Modulation Mode = **><**
The bidirectional modulation mode causes the modulation signals to modulate the cutoff frequencies of Filter A and Filter B in an opposite direction. This modulation mode for the filters is capable of creating some extraordinary filtered synthesizer sounds.



The Filter Envelope Generator can be used to modulate the cutoff frequencies of Filters A and B.

FILTER MODULATION

The **Filter Modulation** section provides dedicated modulation sources for both filters and there are three pages in this section that give access to the various functions. Switch between these pages using the Source selectors. The available options are as follows:

FILTER MODULATION | Source: FEG | Filter Envelope Generator

This is the page for the dedicated **Filter Modulation Envelope Generator**.

Activate or deactivate the **Filter Modulation Envelope Generator** using the **EG** selector.

Set the **ADSR** timings for the **FEG** using the provided sliders, or otherwise type values into the fields beneath them.

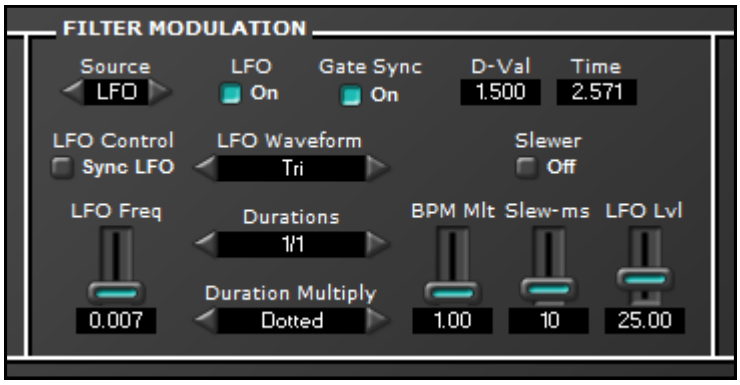
Set the depth of the interaction of **MIDI Velocity** with the **FEG** using the **Level** slider, or otherwise type values into the field beneath it.

Specify the shape of the **FEG** control signal using the **EG Shape** selectors. When in **Linear** mode, the **Attack**, **Decay** and **Release** slider values represent seconds, while the other modes radically change the timing and rate of the control signal, which can be useful for synthesizing plucked-string-like timbres, percussive sounds, as well as wild filter sweep effects.

Set the polarity of the **FEG** control signal **Polarity** selector. The options are:

Low - In this mode, the Filter Envelope Generator modulates the cutoff frequency within a range of –5 to 5 volts. This can be useful when one wants the EG to sweep the filter starting from below the cutoff frequency specified by the **Fil A Ctf** slider in the Filters section.

High - In this mode, the Filter Envelope Generator modulates the cutoff frequency within a range of 0 to 10 volts. This can be useful when one wants the EG to open the filter starting at the cutoff frequency specified by the **Fil A Ctf** slider in the Filters section.



The Filter LFO can be used to modulate the cutoff frequencies of Filters A and B.

FILTER MODULATION | Source: LFO | Low Frequency Oscillator

This is the page for the dedicated **Low Frequency Oscillator** that is used for modulating the cutoff frequencies of Filters A and B.

Activate or deactivate the LFO using the **LFO** selector.

Choose whether or not to sync the LFO waveform to each **MIDI Note-On** using the **Gate Sync** selector. Leave this **Off** for pad type sounds for a continuously evolving modulation effect, and **On** for timbres that use the LFO as a kind of periodic envelope generator, where one needs the LFO waveform to consistently start at the beginning.

Specify whether or not to have the LFO synchronize to the host tempo using the **LFO Control** selector. The options are Sync LFO and Frequency.

When in the **Freq LFO** mode, use the **LFO Freq** slider to specify the LFO rate in Hertz. When in the **Sync LFO** mode, the period of LFO modulation is set using the **Durations** and **Duration Multiply** selectors and the LFO is synchronized to the host DAW tempo.

Select the modulation waveform using the **LFO Waveform** selectors.

Select the modulation period of the LFO using the **Durations** selectors. The range is from 128/1 to 1/128.

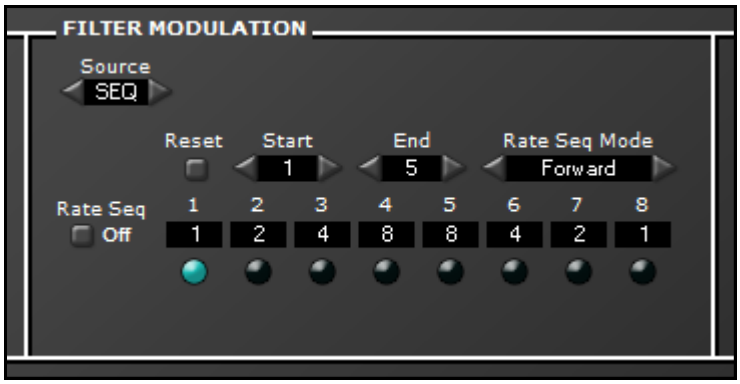
Switch between **Normal** (multiple-of-two), **Dotted**, **Triplet** and **Quintuplet** duration values using the **Duration Multiply** selectors.

The decimal value for the selected LFO duration is show in the **D-Val** display, while the Time in seconds is shown in the **Time** display.

Use the **BPM Mlt** slider or data field to multiply the rate of the LFO. The range is 1 to 2048 times the host DAW tempo. Higher values can modulate the filter's cutoff frequencies at audio-rates, which can introduce complex sidebands into the composite synthesizer signal.

Activate or deactivate the slewer using the **Slewer** selector. Set the timing of the Slewer in milliseconds using the **Slew-ms** slider or data field. The slewer can be used to smooth the LFO modulation signal, which can be useful for removing clicks when, for instance, modulating with square, pulse and ramp waves.

Set the depth of the LFO using the **LFO Lvl** slider.



The LFO Rate Sequencer has eight steps that multiply the rate of the LFO with each MIDI Note-On.

FILTER MODULATION | Source: SEQ | LFO Rate Sequencer

This page accesses the functions for the **LFO Rate Sequencer**. The LFO Rate Sequencer is an innovative 8-step sequencer that multiplies the LFO modulation rate with each MIDI Note-On.

Activate or deactivate the LFO Rate Sequencer using the **Rate Seq** selector.

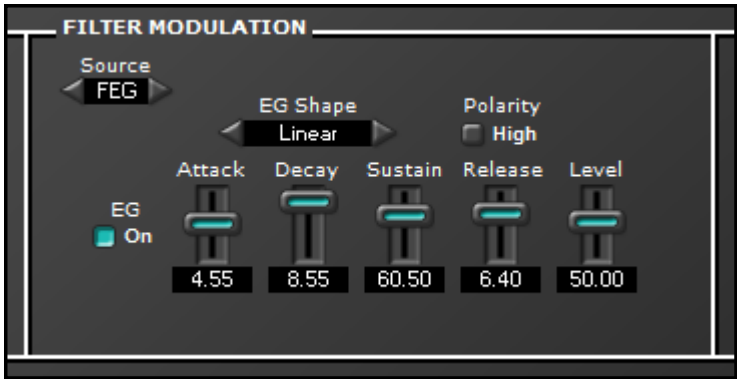
There are eight numbered data fields for creating a rate-sequence. Type integers into these fields which will be used to multiply the LFO rate with each MIDI Note-On. The range is from 1 to 2048 times the host tempo. When triggering a rate-sequence from a MIDI controller, the current step is visualized with the LED beneath each step.

Reset the rate-sequence to the beginning using the **Reset** button. Creative rate-sequencing can be achieved by mapping the **Reset** button to a button on a MIDI controller so that resetting the sequence can be performed without having to do it on the synth UI.

Set the range of the rate-sequence using the **Start** and **End** selectors.

Set the direction of the rate-sequence using the **Rate Seq Mode** selectors.

The LFO Rate Sequencer can be used to create many types of musically useful host-synchronized Filter Modulation patterns that dynamically and rhythmically change the sound of the instrument. Slower modulation rates can create typical sounding filter modulation effects, while rapid modulation at audio-rates can introduce complex sidebands into the composite signal of the synthesizer.



The VCA Envelope Generator modulates the amplitude of the instrument.

VCA ENVELOPE GENERATOR

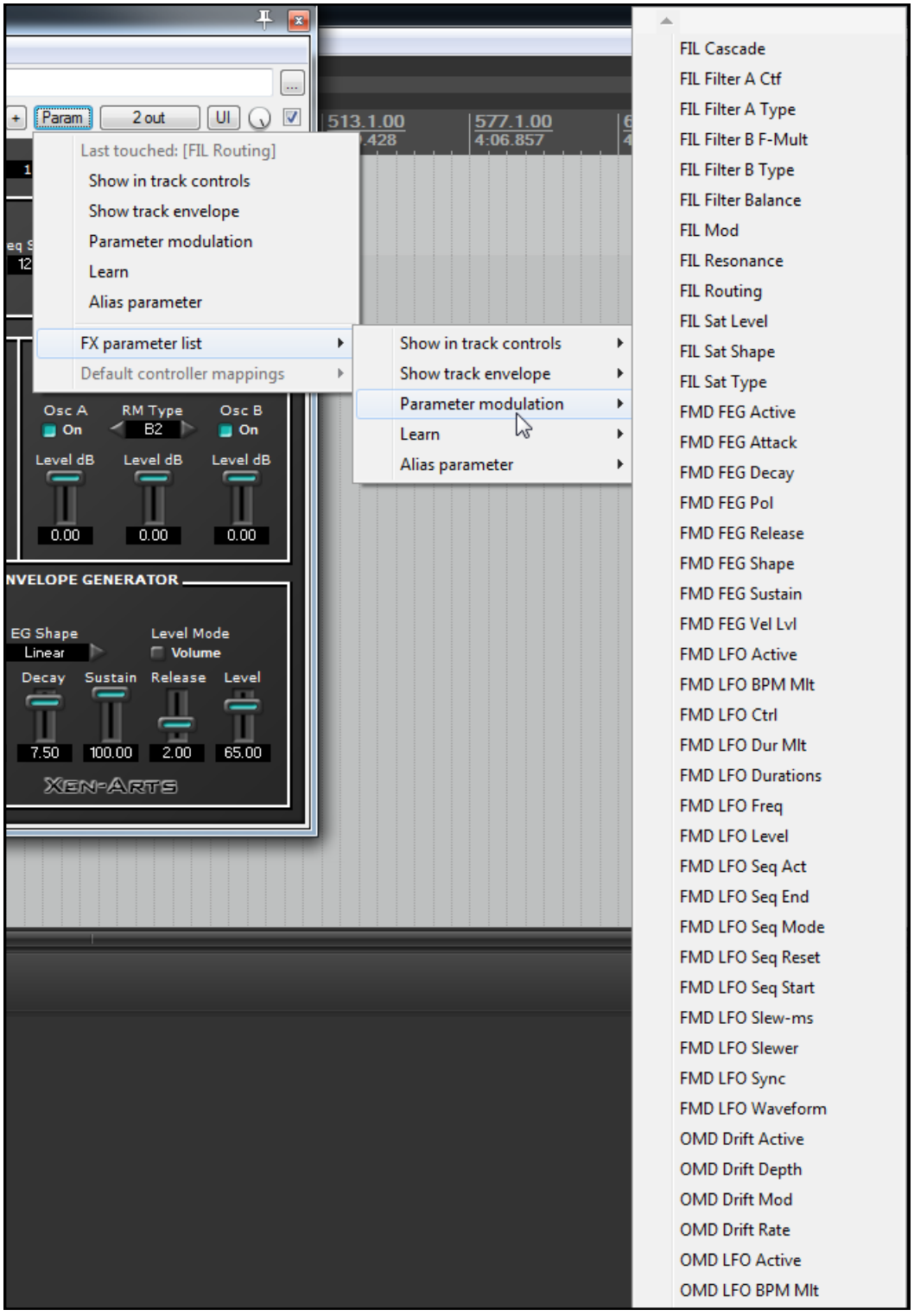
Set the **ADSR** timings for the **VCA Envelope Generator** using the provided sliders, or otherwise type timing values into the fields beneath them.

Specify the shape of the **VCA EG** control signal using the **EG Shape** selectors. When in **Linear** mode, the **Attack**, **Decay** and **Release** slider values represent seconds, while the other modes radically change the timing and rate of the EG control signal, which can be useful for synthesizing plucked-string-like timbres and percussive sounds.

Use the **Level Mode** selector to switch between the two level modes, which also determines the behavior of the **Level** slider:

Volume - In this mode the overall volume of the synthesizer is set with the **Level** slider and the VCA does not respond to MIDI Velocity.

Velocity - In this mode the **Level** slider sets the depth of MIDI Velocity amplitude modulation, enabling dynamic performance volume control. Softer play on the MIDI controller will sound quieter, while harder play will be louder.



The Parameter Modulation list in the REAPER DAW showing some of the available automation targets.

This VSTi exposes **120 MIDI Automation Targets** to the host DAW and practically every function of the synth can be track automated. Consult your DAW manual for instructions on how to automate these parameters.

Pages 25 through 28 contain a reference list of all these automation targets including brief explanations and the page numbers in this manual for more detailed information about each synthesis function.

IVOR | MIDI AUTOMATION | HOST DAW AUTOMATION TARGETS

Automation Label	Synth Section	Automation Function	Manual Page
FIL Cascade	Filters	Set the Filter Cascade.	18-19
FIL Filter A Ctf	Filters	Set the Cutoff Frequency of Filter A.	18-19
FIL Filter A Type	Filters	Set the filter type for Filter A.	18-19
FIL Filter B F-Mult	Filters	Set the Cutoff Frequency of Filter B as a multiple of the Cutoff Frequency of Filter A.	18-19
FIL Filter B Type	Filters	Set the filter type for Filter B.	18-19
FIL Filter Balance	Filters	Set the Balance between Filters A and B.	18-19
FIL Mod	Filters	Switch the Filter Modulation relationship of Filters A and B between Unidirectional and Bidirectional.	18-19
FIL Resonance	Filters	Set the Resonance level for the filters.	18-19
FIL Routing	Filters	Select Filter Routing options.	18-19
FIL Sat Level	Filters	Set the Saturation Level.	18-19
FIL Sat Shape	Filters	Set the Saturation Shape.	18-19
FIL Sat Type	Filters	Select Saturation options.	18-19
FMD FEG Active	Filter Modulation | Filter EG	Enable or disable the Filter Envelope Generator.	20-22
FMD FEG Attack	Filter Modulation | Filter EG	Controls the Attack Rate of the Filter Envelope Generator.	20-22
FMD FEG Decay	Filter Modulation | Filter EG	Controls the Decay Rate of the Filter Envelope Generator.	20-22
FMD FEG Pol	Filter Modulation | Filter EG	Set the Polarity of the Filter Envelope Generator.	20-22
FMD FEG Release	Filter Modulation | Filter EG	Controls the Release Rate of the Filter Envelope Generator.	20-22
FMD FEG Shape	Filter Modulation | Filter EG	Controls the Shape of the Filter Envelope Generator.	20-22
FMD FEG Sustain	Filter Modulation | Filter EG	Controls the Sustain Level of the Filter Envelope Generator.	20-22
FMD FEG Vel Lvl	Filter Modulation | Filter EG	Controls the Level of Velocity Modulation for the Filter Envelope Generator.	20-22
FMD LFO Active	Filter Modulation | LFO	Enable or disable the Filter LFO.	20-22
FMD LFO BPM Mlt	Filter Modulation | LFO	Use this slider to Multiply the LFO Rate when the LFO Control mode switch is set to Sync LFO.	20-22
FMD LFO Ctrl	Filter Modulation | LFO	Switch between Host Sync LFO and Frequency LFO modes.	20-22
FMD LFO Dur Mlt	Filter Modulation | LFO	Select the LFO Duration Multiplier value.	20-22
FMD LFO Durations	Filter Modulation | LFO	Select the Duration of the LFO modulation.	20-22
FMD LFO Freq	Filter Modulation | LFO	When LFO Control mode is set to Freq LFO, this slider controls the LFO Frequency (Hz).	20-22
FMD LFO Level	Filter Modulation | LFO	Set the Level of the Filter LFO Modulation.	20-22
FMD LFO Seq Act	Filter Modulation | LFO	Enable or disable the LFO Rate Sequencer.	20-22
FMD LFO Seq End	Filter Modulation | LFO	Set the End Position of the LFO Rate Sequencer.	20-22
FMD LFO Seq Mode	Filter Modulation | LFO	Set the LFO Rate Sequencer Mode.	20-22
FMD LFO Seq Reset	Filter Modulation | LFO	Reset the LFO Rate Sequencer.	20-22
FMD LFO Seq Start	Filter Modulation | LFO	Set the Start Position of the LFO Rate Sequencer.	20-22
FMD LFO Slewer	Filter Modulation | LFO	Enable or disable the LFO Slewer.	20-22
FMD LFO Slew-ms	Filter Modulation | LFO	Set the Slewer time in milliseconds.	20-22
FMD LFO Sync	Filter Modulation | LFO	Enable or disable LFO Sync.	20-22
FMD LFO Waveform	Filter Modulation | LFO	Select the LFO Waveform for modulating the Filters Cutoff Frequency.	20-22
OMD Drift Active	Oscillator Modulation | Pitch Mod	Enable or disable the Analog Pitch Drift Emulation.	13-16
OMD Drift Depth	Oscillator Modulation | Pitch Mod	Controls the Depth of the Analog Pitch Drift Emulation.	13-16

IVOR | MIDI AUTOMATION | HOST DAW AUTOMATION TARGETS

Automation Label	Synth Section	Automation Function	Manual Page
OMD Drift Mod	Oscillator Modulation | Pitch Mod	Switch the Analog Pitch Drift Emulation between Unidirectional and Bidirectional Modulation.	13-16
OMD Drift Rate	Oscillator Modulation | Pitch Mod	Controls the Rate of the Analog Pitch Drift Emulation.	13-16
OMD LFO Active	Oscillator Modulation | Phase & PWM LFO	Enable or disable the Phase & PWM LFO.	13-16
OMD LFO BPM Mlt	Oscillator Modulation | Phase & PWM LFO	Use this slider to Multiply the LFO Rate when the LFO Control mode switch is set to Sync LFO.	13-16
OMD LFO Ctrl	Oscillator Modulation | Phase & PWM LFO	Switch between Host Sync LFO and Frequency LFO modes.	13-16
OMD LFO Dur Mlt	Oscillator Modulation | Phase & PWM LFO	Select the LFO Duration Multiplier value.	13-16
OMD LFO Durations	Oscillator Modulation | Phase & PWM LFO	Select the Duration of the LFO modulation.	13-16
OMD LFO Freq	Oscillator Modulation | Phase & PWM LFO	When LFO Control mode is set to Freq LFO, this slider controls the LFO Frequency (Hz).	13-16
OMD LFO Lvl	Oscillator Modulation | Phase & PWM LFO	Set the Level of the LFO Phase or PWM Modulation.	13-16
OMD LFO Seq Act	Oscillator Modulation | LFO Rate Seq	Enable or disable the LFO Rate Sequencer.	13-16
OMD LFO Seq End	Oscillator Modulation | LFO Rate Seq	Set the End Position of the LFO Rate Sequencer.	13-16
OMD LFO Seq Mode	Oscillator Modulation | LFO Rate Seq	Set the LFO Rate Sequencer Mode.	13-16
OMD LFO Seq Reset	Oscillator Modulation | LFO Rate Seq	Reset the LFO Rate Sequencer.	13-16
OMD LFO Seq Start	Oscillator Modulation | LFO Rate Seq	Set the Start Position of the LFO Rate Sequencer.	13-16
OMD LFO Slewer	Oscillator Modulation | Phase & PWM LFO	Enable or disable the LFO Slewer.	13-16
OMD LFO Slew-ms	Oscillator Modulation | Phase & PWM LFO	Set the Slewer time in milliseconds.	13-16
OMD LFO Sync	Oscillator Modulation | Phase & PWM LFO	Enable or disable LFO Sync.	13-16
OMD LFO Waveform	Oscillator Modulation | Phase & PWM LFO	Select the LFO Waveform for modulating the Oscillators Phase or PWM.	13-16
OMD PEG A Pol	Oscillator Modulation | Pitch EG	Controls the Polarity of the Oscillator Pitch Envelope Generator for Oscillator A.	13-16
OMD PEG Active	Oscillator Modulation | Pitch EG	Enable or disable the Oscillator Pitch Envelope Generator.	13-16
OMD PEG Attack	Oscillator Modulation | Pitch EG	Controls the Attack Rate of the Oscillator Pitch Envelope Generator.	13-16
OMD PEG B Pol	Oscillator Modulation | Pitch EG	Controls the Polarity of the Oscillator Pitch Envelope Generator for Oscillator B.	13-16
OMD PEG Decay	Oscillator Modulation | Pitch EG	Controls the Decay Rate of the Oscillator Pitch Envelope Generator.	13-16
OMD PEG Level	Oscillator Modulation | Pitch EG	Controls the Level of the Oscillator Pitch Envelope Generator.	13-16
OMD PEG Release	Oscillator Modulation | Pitch EG	Controls the Release Rate of the Oscillator Pitch Envelope Generator.	13-16
OMD PEG Shape	Oscillator Modulation | Pitch EG	Controls the Shape of the Oscillator Pitch Envelope Generator.	13-16
OMD PEG Sustain	Oscillator Modulation | Pitch EG	Controls the Sustain Level of the Oscillator Pitch Envelope Generator.	13-16
OMD Vel-HS Active	Oscillator Modulation | Pitch Mod	Enable or disable Velocity Harmonic Modulation.	13-16
OMD Vel-HS OA	Oscillator Modulation | Pitch Mod	Specify the Velocity Harmonic Modulation type for Oscillator A.	13-16
OMD Vel-HS OB	Oscillator Modulation | Pitch Mod	Specify the Velocity Harmonic Modulation type for Oscillator B.	13-16
OMD Vel-HS Range	Oscillator Modulation | Pitch Mod	Set the Range for Velocity Harmonic Modulation.	13-16
OMD Vel-HS Sens	Oscillator Modulation | Pitch Mod	Set the Sensitivity level for Velocity Harmonic Modulation.	13-16

IVOR | MIDI AUTOMATION | HOST DAW AUTOMATION TARGETS

Automation Label	Synth Section	Automation Function	Manual Page
OMX Osc RM Active	Oscillator Mixer	Mute or unmute the Ring-Modulator.	17
OMX Osc-A Active	Oscillator Mixer	Mute or unmute Osc-A.	17
OMX Osc-A Level	Oscillator Mixer	Set the Level of Osc-A in dB.	17
OMX Osc-B Active	Oscillator Mixer	Mute or unmute Osc-B.	17
OMX Osc-B Level	Oscillator Mixer	Set the Level of Osc-B in dB.	17
OMX RM Level	Oscillator Mixer	Set the Level of the Ring-Modulator in dB.	17
OMX RM Type	Oscillator Mixer	Select the Ring-Modulator Type.	17
OSC Harmonics A	Oscillators	Control the number of Harmonics for the selected Waveform A.	10-12
OSC Harmonics B	Oscillators	Control the number of Harmonics for the selected Waveform B.	10-12
OSC Phase Center	Oscillators	Controls Phase Center Slider for both Oscillators A and B.	10-12
OSC Phase Mod	Oscillators	Switch the Phase Modulation relationship of Oscillators A and B between Unidirectional and Bidirectional.	10-12
OSC Trans Cents A	Oscillators	When the Transposition Mode of Oscillator A is set to Cents, use this selector to Transpose the pitch according the value set in the Cents field.	10-12
OSC Trans Cents B	Oscillators	When the Transposition Mode of Oscillator B is set to Cents, use this selector to Transpose the pitch according the value set in the Cents field.	10-12
OSC Trans H-S A	Oscillators	When the Transposition Mode of Oscillator A is set to Harmonic-Subharmonic, use this switch to change between Harmonic or Subharmonic Series Transposition.	10-12
OSC Trans H-S A	Oscillators	When the Transposition Mode of Oscillator A is set to Harmonic-Subharmonic, use this selector to Transpose by degrees of either the Harmonic or Subarmonic Series as specified.	10-12
OSC Trans H-S B	Oscillators	When the Transposition Mode of Oscillator B is set to Harmonic-Subharmonic, use this switch to change between Harmonic or Subharmonic Series Transposition.	10-12
OSC Trans H-S B	Oscillators	When the Transposition Mode of Oscillator B is set to Harmonic-Subharmonic, use this selector to Transpose by degrees of either the Harmonic or Subarmonic Series as specified.	10-12
OSC Trans Mode A	Oscillators	Switch the Transposition Mode of Oscillator A between Cents and Harmonic-Subharmonic.	10-12
OSC Trans Mode B	Oscillators	Switch the Transposition Mode of Oscillator B between Cents and Harmonic-Subharmonic.	10-12
OSC Waveform A	Oscillators	Oscillator A Waveform Selection.	10-12
OSC Waveform B	Oscillators	Oscillator B Waveform Selection.	10-12
PC Glide Active	Performance Control	Enable or disable Glide (aka Portamento).	6-9
PC Glide Mode	Performance Control	Switch between Glide Modes.	6-9
PC Glide ms	Performance Control	Glide time (aka Portamento) in milliseconds.	6-9
PC Glide Resp	Performance Control	Switch Glide Response between Rate and Time.	6-9
PC Microtune G-L	Performance Control	Switch between Global and Local Microtuning.	6-9
PC MIDI Ch	Performance Control	MIDI Channel.	6-9

IVOR | MIDI AUTOMATION | HOST DAW AUTOMATION TARGETS

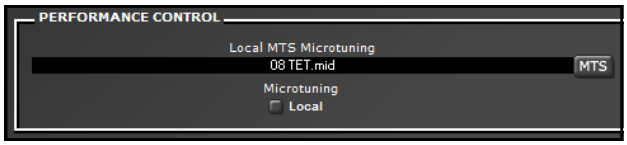
Automation Label	Synth Section	Automation Function	Manual Page
PC Mono Mode	Performance Control	Enable or disable Monophonic Mode.	6-9
PC Mono Retrig	Performance Control	Enable or disable Retriggering Envelope Generators in Monophonic Mode.	6-9
PC P-Bend Opts	Performance Control	Switch between Pitch Bend options.	6-9
PC P-Bender	Performance Control	MIDI Pitch Bend Controller.	6-9
PC Vibrato Active	Performance Control	Enable or disable Vibrato.	6-9
PC Vibrato Dpth	Performance Control	Vibrato Depth.	6-9
PC Vibrato Frq	Performance Control	Vibrato Frequency (Hz).	6-9
PC Vibrato Mod	Performance Control	Vibrato Modulation (1 - Mod Wheel).	6-9
PFX Ens Active	Performance Control | Effects	Enable or disable the Ensemble Effect.	6-9
PFX Ens Cents Dt	Performance Control | Effects	Cents Detune offset of the Ensemble Effect.	6-9
PFX Ens D<>W	Performance Control | Effects	Dry and Wet balance of the Ensemble Effect.	6-9
PFX Ens Frq Split	Performance Control | Effects	Change the filter response of the Ensemble Frequency Splitter.	6-9
PFX Ens Routing	Performance Control | Effects	Switch the Ensemble Effect between Stereo and Mono Routing.	6-9
PFX Ens Split Ctf	Performance Control | Effects	Filter Cutoff Frequency of the Ensemble Frequency Splitter.	6-9
PFX Warm Active	Performance Control | Effects	Enable or disable the Warm Filter.	6-9
PFX Warm Ctf	Performance Control | Effects	Specify the Cutoff Frequency of the Warm Filter.	6-9
VCA EG Attack	VCA Envelope Generator	Controls the Attack Rate of the VCA Envelope Generator.	23
VCA EG Decay	VCA Envelope Generator	Controls the Decay Rate of the VCA Envelope Generator.	23
VCA EG Level	VCA Envelope Generator	Controls the Level of either the Volume or Velocity Modulation for the VCA Envelope Generator, depending on the setting made with the Level Mode switch.	23
VCA EG Release	VCA Envelope Generator	Controls the Release Rate of the VCA Envelope Generator.	23
VCA EG Shape	VCA Envelope Generator	Controls the Shape of the VCA Envelope Generator.	23
VCA EG Sustain	VCA Envelope Generator	Controls the Sustain Level of the VCA Envelope Generator.	23
VCA Level Mode	VCA Envelope Generator	Switch the VCA Envelope Generator between the Volume and Velocity Modes.	23

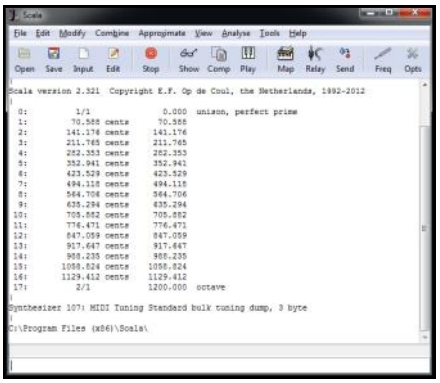
IVOR | MICROTUNINGS

MTS Microtuning Files	Description
05 TET.mid	5 Tone Equal Temperament
07 TET.mid	7 Tone Equal Temperament
08 TET.mid	8 Tone Equal Temperament
09 TET.mid	9 Tone Equal Temperament
10 TET.mid	10 Tone Equal Temperament
11 TET.mid	11 Tone Equal Temperament
12 TET.mid	12 Tone Equal Temperament
13 TET.mid	13 Tone Equal Temperament
14 TET.mid	14 Tone Equal Temperament
15 TET.mid	15 Tone Equal Temperament
16 TET.mid	16 Tone Equal Temperament
17 TET.mid	17 Tone Equal Temperament
18 TET.mid	18 Tone Equal Temperament
19 TET.mid	19 Tone Equal Temperament
20 TET.mid	20 Tone Equal Temperament
21 TET.mid	21 Tone Equal Temperament
22 TET.mid	22 Tone Equal Temperament
23 TET.mid	23 Tone Equal Temperament
24 TET.mid	24 Tone Equal Temperament
25 TET.mid	25 Tone Equal Temperament
26 TET.mid	26 Tone Equal Temperament
27 TET.mid	27 Tone Equal Temperament
28 TET.mid	28 Tone Equal Temperament
29 TET.mid	29 Tone Equal Temperament
30 TET.mid	30 Tone Equal Temperament
31 TET.mid	31 Tone Equal Temperament
Bohlen-Pierce.mid	13 Tone Division of 3/1
Harmonics 05-10.mid	Harmonics 5-10
Harmonics 06-12.mid	Harmonics 6-12
Harmonics 07-14.mid	Harmonics 7-14
Harmonics 08-16.mid	Harmonics 8-16
Harmonics 09-18.mid	Harmonics 9-18
Harmonics 10-20.mid	Harmonics 10-20
Harmonics 11-22.mid	Harmonics 11-22
Harmonics 12-24.mid	Harmonics 12-24
Harmonics 13-26.mid	Harmonics 13-26
Harmonics 14-28.mid	Harmonics 14-28
Harmonics 15-30.mid	Harmonics 15-30
Harmonics 16-32.mid	Harmonics 16-32
Subharmonics 10-05.mid	Subharmonics 10-5
Subharmonics 12-06.mid	Subharmonics 12-6
Subharmonics 14-07.mid	Subharmonics 14-7
Subharmonics 16-08.mid	Subharmonics 16-8
Subharmonics 18-09.mid	Subharmonics 18-9
Subharmonics 20-10.mid	Subharmonics 20-10
Subharmonics 22-11.mid	Subharmonics 22-11
Subharmonics 24-12.mid	Subharmonics 24-12
Subharmonics 26-13.mid	Subharmonics 26-13
Subharmonics 28-14.mid	Subharmonics 28-14
Subharmonics 30-15.mid	Subharmonics 30-15
Subharmonics 32-16.mid	Subharmonics 32-16
Wendy Carlos - Alpha.mid	78 Cents Equal Temperament
Wendy Carlos - Beta.mid	63.8 Cents Equal Temperament
Wendy Carlos - Gamma.mid	35.1 Cents Equal Temperament

The microtunings included with this VSTi have the 1/1 mapped to C60 @ 262 Hz.

IVOR | MICROTUNINGS | SCALA: CREATING MTS MICROTUNING FILES





Create MTS microtuning files for this VSTi with the popular Scala microtuning software application developed by Manuel Op de Coul.

MTS is the **MIDI Tuning Standard**, which is a kind of MIDI System Exclusive (SYSEX) that is able to do full keyboard microtunings in the same way that the popular TUN format can, although there are distinct advantages over these kinds of fixed tuning-table formats, such as the ability to retune ensembles of MTS-enabled VSTi from a single track in a DAW by transmitting the MTS to a number of VSTi instrument tracks simultaneously.

MTS files can be created in **Scala** in the same way that TUN files are, with the variation of setting the synth type to a different number (107).

MTS is really just a MIDI file, with a file extension of MID, and this kind of file is basically 'played' into, or transmitted, to the synth. In the Xenharmonic FMTS VSTi, the transmission of the MTS file can be done internally using the MTS file open dialogs, or it can receive MTS externally by playing it from a track in your DAW and routing the MIDI to the VSTi track.

To create MTS files in Scala:

1. Open Scala.

2. Using the menus File/New/Scale or Ctrl+N, open the Input Current Scale dialog to create a new scale. Paste or type your tuning values into the Pitches field and click OK. Obviously, there are a number of ways to create tunings, such as opening SCL files from the Scala archive, or using the other File/New options.

3. To see your scale, type Show then press Enter, or press the Show button on the toolbar, or even press F6 on your keyboard.

4. To set Scala to create the MTS (Synthesizer 107: MIDI Tuning Standard bulk tuning dump, 3 byte), type 'set synth 107' into the command line at the bottom of the program and press Enter. Alternatively, click the Opts button on the toolbar to display the User Options dialog. Click the Synth button on the left to switch the dialog to the Synth options. Under Synthesizer Tuning Options, choose Tuning Model: "107: MIDI Tuning Standard bulk tuning dump."

5. On the File menu choose Export Synth Tuning, or press Shift+Ctrl+T, to open the export dialog (Curiously, this dialog is titled Select MIDI File To Save).

6. Use the Places navigation pane on the left to navigate to a directory where you wish to save your MTS file. Type a file name at the bottom with the file extension MID, such as '5-tet.mid'. Press OK.

Now you have saved an MTS file that can be opened by this VSTi.

Scala: http://www.huygens-fokker.org/scala/

Please note that the microtunings included with this VSTi have the 1/1 mapped to C60 @ 262 Hz.

Bass and Distortion Timbres

Ivor was originally conceived as a bass and distortion synthesizer capable of creating deep basses and heavy distorted guitar-like timbres. The key features that are involved in creating these kinds of distortion patches are the Pitch Envelope Generator and Phase and Pulse Width Modulation LFO found in the Oscillator Modulation section, as well as the Saturation stage found in the Filters section. Emulation of guitar-like sounds relies heavily on being able to synthesize the plucked attack and the PEG with its many control Shapes makes this possible. The Analog Pitch Drift feature also contributes to this kind of sound by emulating the random micro-fluctuations of pitch observable in many analog, acoustic and electro-acoustic musical instruments.

Polyrhythmic LFO

Using the Low Frequency Oscillators found in the Oscillator Modulation and Filter Modulation sections, together with the LFO Rate Sequencers, makes it possible to create myriad kinds of polyrhythmic transformations to the timbre of the instrument. Setting each LFO and Rate Sequencer to different durations that change with each MIDI Note-On is capable of creating incredibly complex and sonically alluring rhythmic timbral effects that can be synced to the musician's host DAW.

Microtunings

In designing the patch bank for this synth (unlike Xen-FMTS) no attempt has been made to assign specific microtunings to patches and the default Global microtuning is 12-ED2, and the default Local microtuning is set to 8-ED2. The choice of what microtunings to use - or whether to use them at all - is left entirely to musician's and composer's choice.

It was not the design goal for this synthesizer to try to feature a comprehensive selection of microtunings and only a very basic set are included as factory defaults, and these should be regarded as starting points for further investigation. In this case too, the creation and exploration of custom microtunings is left to the discretion of musicians. Microtonal and xenharmonic music - and musical instrument intonation in general - is a vast topic and a field in which one should anticipate working with lots of different intonations and spending a significant number of years to understand and master the use of alternative intonation systems in one's music.

Microtonal Pitch Bends

One of the powerful features of this synthesizer is the ability for musicians and composers to precisely specify the pitch-bend range in cents. While there are many possible applications for this functionality, one use for this is to is to configure a pitch bend range that lies directly between a single step of an equal temperament.

For example, in the case of 8 tone equal temperament, we know that the tuning is made up of equal step sizes of 150 cents. To set a pitch bend range at 1/2 of this step size, we can type in 75 cents into the pitch bend cents field, and with the Bend Selector in the Cents mode, when we bend the pitch wheel of the MIDI controller we are able to precisely play pitches that lie between the steps of 8-TET, which, are in fact, notes found in the next highest multiple of this temperament: 16-TET. So in effect we are able to move the pitch wheel to precisely play notes from a higher multiple of a given equal-temperament, and with this same kind of logic, we can examine any microtuning to determine what would be other musically useful settings for expressive microtonal pitch-bends that are contextual to a given intonational setting.

Microtonal Oscillator Transposition

In addition to the microtonal pitch bend functions, this VSTi also features the ability to precisely configure transposition offsets of the oscillators in terms of cents, harmonic series and subharmonic series.

While most synthesizers and samplers force musicians to use octaves, semitone steps of 12 tone equal temperament and cents, the Ivor VSTi enables musicians to easily make oscillator transposition settings that fit with any intonational context required by the music at hand. This is especially useful for musical composition scenarios in which the intonation system does not repeat at an exact interval of 2/1 @ 1200 cents, and there are many beautiful microtunings of this nature, such as Bohlen-Pierce, and the wonderful Wendy Carlos, Alpha, Beta and Gamma, all of which are included as default microtunings in this instrument.

MIDI Velocity Modulation of Harmonics

Musicians and composers who are familiar with playing acoustic instruments such as winds and strings will appreciate the expressive ability to sound harmonics of the fundamental pitch by over-blowing or plucking at harmonic nodes. The Ivor VSTi has a completely unique feature that enables direct modulation of the harmonic (and subharmonic) series using MIDI Velocity, where, when activated, increased force on the controller can be used to break out higher harmonics, which are in effect, integer multiples of the fundamental frequency of the sounding waveform. As previously explained in the Oscillator Modulation section of this manual, the range options are from 1-2, 1-4, 1-8 and 1-16 harmonics. The interaction between the sensitivity setting and the range of harmonics can be easily configured by musicians to fit with the requirements of a particular musical or performance scenario.

IVOR | ACKNOWLEDGEMENTS

Concept, user interface, design, patch bank and this manual by **Jacky Ligon**.

Xen-Arts
xen-arts.com

This instrument was created in the **SynthEdit** environment from developer **Jeff McClintock**. The highest possible level of gratitude goes out to Jeff for implementing MTS (MIDI Tuning Standard) in SynthEdit; the ultimate microtonal tuning format.

SynthEdit
synthedit.com

This instrument features many fine 3rd party SynthEdit modules developed by **Chris Kerry**, **Kelly Lynch** and **David Haupt**:

CK Modules & VST
chriskerry.f9.co.uk/CK_Modules.html

KDL Modules
rubyhex.com/synthedit

SE-Enabler Modules by Dave Haupt
dehaupt.com/SynthEdit/semodules.htm

Very special thanks to **X. J. Scott** for many deep discussions, inspirations and insights about microtonal synthesis.

L'il Miss' Scale Oven™
nonoctave.com/tuning/LilMissScaleOven

Beta-testing and patch design:

Sean B. Archibald
seanarchibald.co.uk

NOTE: All patches in the default patch bank with the prefix **SA** were designed by **Sean B. Archibald**.

Beta-testing - **Tony Dubshot**:

Dubbhism
dubbhism.com

The **MTS** microtunings included with this synthesizer were created using the **Scala** application developed by **Manuel Op de Coul**. Many thanks goes out to Manuel for his decades long support of microtonal musicians and composers and for offering his application as freeware.

Scala Home Page
huygens-fokker.org/scala

This instrument is dedicated to the memory of **Ivor Darreg**.

IVOR | EULA

End User License Agreement

This instrument is offered as freeware as a way to inspire musicians and composers experiment with subtractive synthesis and alternative musical instrument intonations (aka microtonal and xenharmonic music).

The instrument can be used in any kind of musical production, commercial or otherwise, completely free of charge.

Selling this VSTi is not permitted.

It is not permitted to distribute this VSTi in any way without prior permission.

Xen-Arts assumes no responsibility for any kind from damages resulting from the use of this software.

The exploration of alternative intonation systems, xenharmonic and microtonal music is largely about a quest for aesthetic beauty and expression, and one would hope that through the act of sharing, that others might be compelled to do the same. If you make microtonal or xenharmonic music with this VSTi, consider sharing your work with other people, including the developer, who would greatly appreciate getting to hear any music created with this instrument.