

1.0.1 User Manual

Quick Start

Viking Synth is an Audio Unit Extension Instrument that works as a plug-in inside host apps. To start using Viking Synth, open up your favorite host that supports Audio Unit Instruments and select it from the list of available Audio Units.

Overview

Viking Synth is an emulation of a famous monophonic analog synthesizer. It has three continuously variable wave oscillators, two ladder filters with a Dual Lowpass or Highpass/Lowpass configuration, a multi-wave LFO, and two modulation busses. Viking Synth uses state of the art DSP technology to accurately reproduce the sound of the hardware.

Presets

Viking Synth comes with 178 presets in the categories Bass, Bright Lead, Electro Bass, FX (Effects), Perc Lead (Percussive Lead), and Soft Lead. These categories are well suited to a monophonic instrument like Viking that excels at bass and lead sounds. The 50 Electro Bass presets were designed by renowned sound designer eXode. To reset Viking to default settings, load the Default preset.

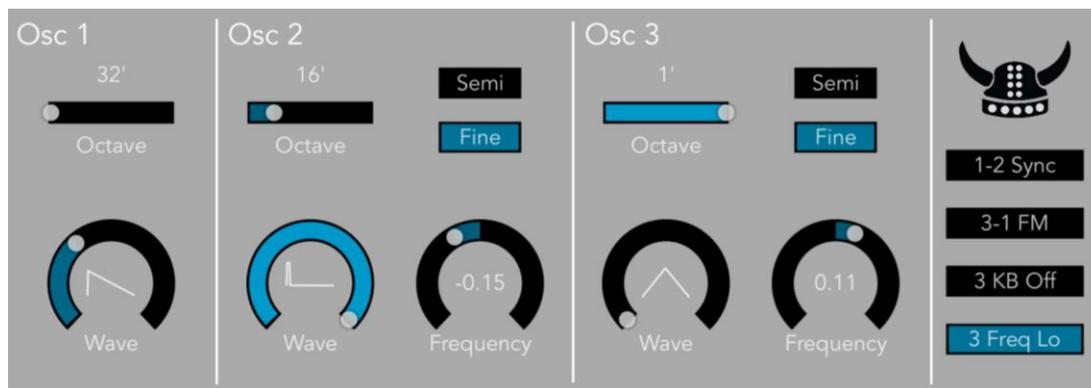
Pages



At the left edge of the synthesizer you can select the current page. This determines which controls are currently shown. The pages are Mod (Modulation), Osc (Oscillators), Mix (Mixer), Filt (Filters), Env (Envelopes), and Glob (Global).

Oscillators

Viking Synth has three continuously variable wave oscillators with a few extra settings to tweak how they operate.



Octave

The Octave slider sets the octave of the oscillator. Note that the octave labeled 4' directly matches the keyboard pitch.

Frequency

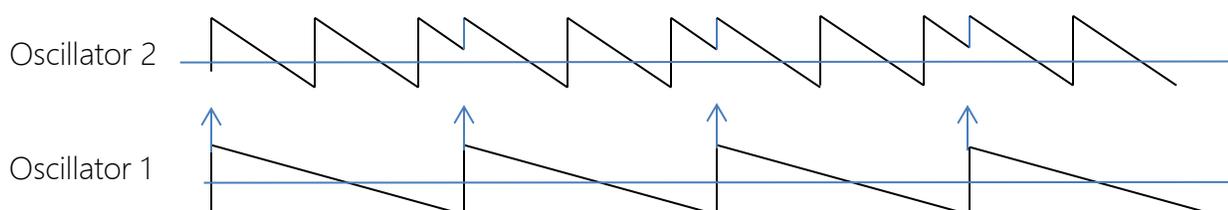
The Frequency knob adjusts the pitch of the oscillator. The knob adjusts the pitch in the range of -7 to +7 semitones away from the true pitch. When Fine mode is enabled, the knob adjusts the pitch in the range of -0.7 to +0.7 semitones. The fine adjustments are useful for subtly fattening the sound of a patch. Semi mode locks the frequency to semitones.

Wave

The Wave knob adjusts the waveform of the oscillator. The waveform changes from triangle to saw to square to pulse as the knob is swept from left to right. A triangle is useful as a mellow sound, a saw as a bright and buzzy sound, a square as a hollow digital sound, and a pulse as a thin grainy sound. Since the knob is continuously variable, the in-between settings offer many possibilities.

1-2 Sync

The 1-2 Sync button locks oscillator 2 to the frequency of oscillator 1. This is done by resetting oscillator 2 to the beginning of its waveform whenever oscillator 1 repeats its waveform.



3-1 FM

The 3-1 FM button hooks the output of oscillator 3 into the frequency control input of oscillator 1. Both the waveform and frequency of oscillator 3 can greatly affect the resulting sound.

3 KB Off

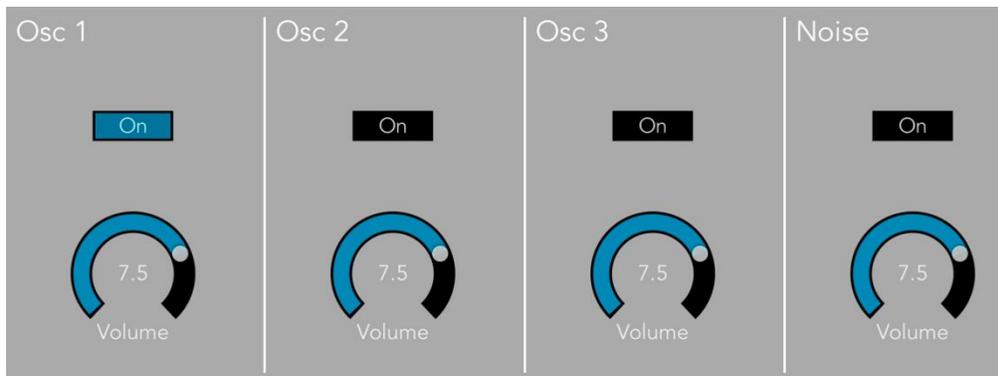
The Oscillator 3 Keyboard Off button selects whether or not the keyboard controls the pitch of Oscillator 3. Normally Oscillator 3 tracks the keyboard. When it is enabled, Oscillator 3 is a C#3 pitch.

3 Freq Lo

The Oscillator 3 Low Frequency button selects whether Oscillator 3 is high or low frequency. When it is off, octave 4' matches the keyboard notes as usual. When it is enabled, the pitch of Oscillator 3 is six octaves below what it would be in the high frequency setting.

Mixer

The Mixer page is used to adjust the volume of the oscillators and noise. The mixer sources are summed and fed to the filters.



Oscillators

The buttons enable the audio of each oscillator and the knobs adjust their level.

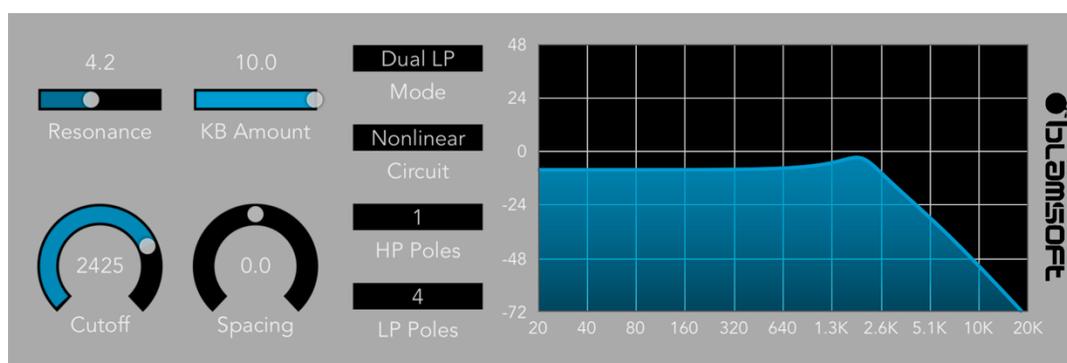
Noise

The button turns on the audio from the noise source and the knob adjusts its level.

Note that the oscillators and noise are always available as modulation sources. These buttons and knobs control the audio mix.

Filters

Viking Synth has dual filters modeled after the classic transistor ladder filter. In Dual Lowpass mode, the filters are in parallel in the left and right output channels. In HP/LP mode the filters are in series, one highpass and one lowpass. The number of poles is adjustable from 1 to 4. More poles create a steeper slope and a sharper cutoff.



Cutoff

The cutoff frequency is known by many names. It is called the 3dB point, transition point, or knee of the filter. It is where the pass-band ends and the slope begins. In a lowpass filter the response slopes down at 6 dB per octave per pole above this frequency. You can consider frequencies above this frequency to be mostly rejected or “filtered out” by the filter. And in Viking’s band-pass filter (HP/LP), the cutoff is at the high end of the pass-band, see Spacing for more detail.

Spacing

Spacing is where the two filters come into play. Spacing adjusts the frequency difference, in octaves, between the two filters. In Dual Lowpass mode, one filter is heard in the left channel and the other in the right. Spacing adjusts the cutoff frequency of the left filter with respect to the right.

In Highpass/Lowpass mode, Spacing also adjusts the difference in octaves. But in this case the two filters are in mono, and spacing adjusts the highpass filter with respect to the lowpass. The

highpass filter is one octave below the lowpass when the knob is fully turned to the right, and decreases in frequency as the knob is turned to the left. So, turning the knob to the left widens the pass band.

Resonance

The resonance knob adjusts the gain of positive feedback from the output of the filter to the input. It creates a peak in the filter response at the cutoff frequency. Frequencies near the resonance are amplified resulting in a ringing sound.

KB Amount

Keyboard Amount controls the tracking of the filter with respect to the keyboard notes. When Keyboard Amount is set to zero, the filter cutoff frequency does not depend on the note being played. When Keyboard Amount is all the way up, the filter cutoff frequency moves one semitone per key and exactly tracks the keyboard.

Mode

Mode selects whether the filter is Dual Lowpass, one filter in the left channel and the other in the right, or Highpass/Lowpass, a bandpass filter created by a highpass and lowpass in series.

Circuit

The Circuit setting chooses between various DSP algorithms, or Bypass. The Linear method uses a transfer function in the z domain and enables fast computation. The Nonlinear method uses approximate solutions to differential equations in the time domain. The Nonlinear algorithm requires more CPU usage than the Linear algorithm, but in return simulates real transistors which have nonlinear gain. A non-linear gain creates a slight distortion of larger amplitude signals, often called soft clipping. Both models have been carefully tuned to simulate the frequency response and resonant behavior of an analog transistor ladder filter.

The Drive settings use the nonlinear algorithm to create more distortion than the basic Nonlinear setting. Drive I, II, and III progressively provide more gain into the filter causing it to soft clip and add a gritty overdrive to the sound.

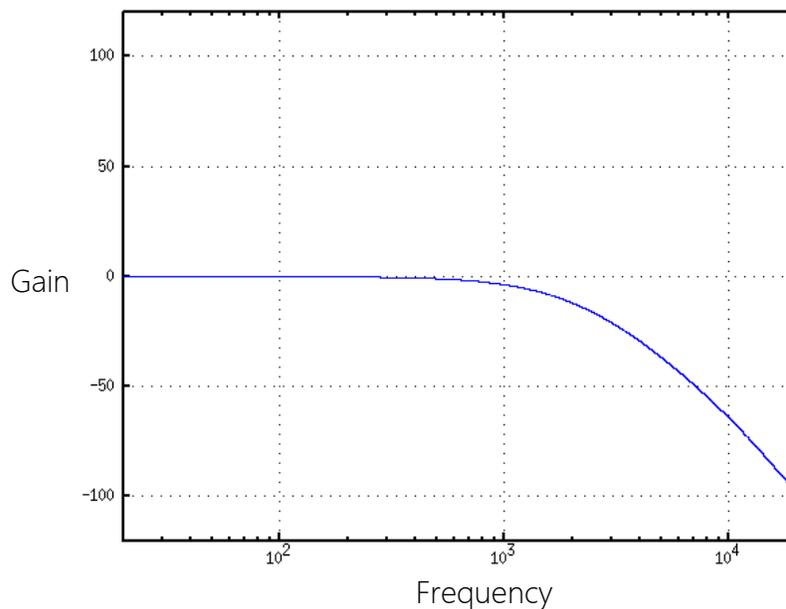
Poles

The number of poles sets the steepness of the filter frequency response. Each pole results in 6 dB per octave slope. Fewer poles result in a less filtered sound.

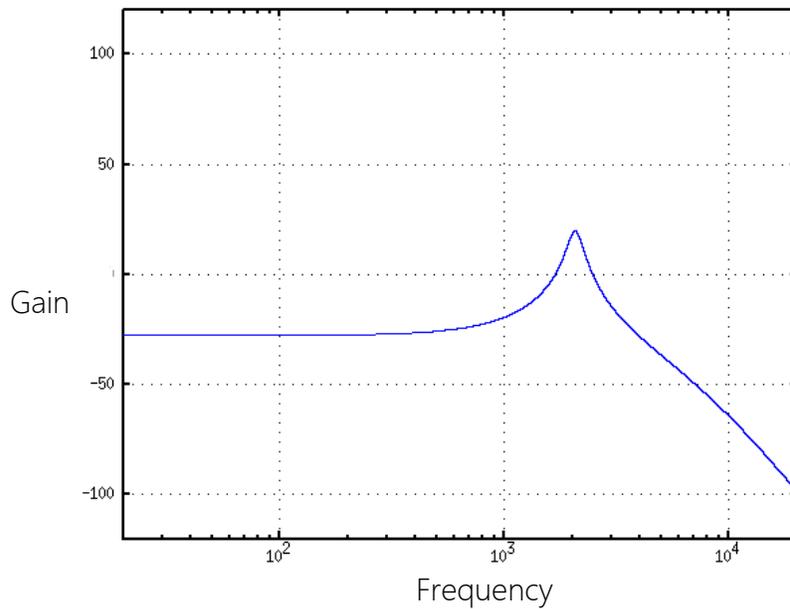
- 1 pole – 6 dB per octave
- 2 poles – 12 dB per octave
- 3 poles – 18 dB per octave
- 4 poles – 24 dB per octave

Frequency Response

This image shows the frequency response of Viking's 24 dB per octave lowpass filter. The low frequencies have a flat response and frequencies past the cutoff point are attenuated. When fewer the 4 poles are used, the slope is not as steep.



Now the resonance knob has been turned up. Notice the peak at the cutoff frequency.



When in Highpass/Lowpass mode, one of the filters is a highpass filter. The two filters are connected in series to create a bandpass filter. Note that the lowpass filter is always the resonant filter. The highpass filter does not resonate.

Envelopes

The envelopes control the filtering and volume of the sound to create movement within a note. The filter envelope controls the filter cutoff frequency. The volume envelope controls the output amplitude of the sound.



Attack

Attack is a measurement of the time it takes the envelope to go from zero to full amount in the initial phase. The attack time ranges from 1 millisecond to 10 seconds.

Decay

Decay is a measurement of the time it takes the envelope to go from the maximum to the sustain level in the second phase. The decay time ranges from 1 millisecond to 10 seconds.

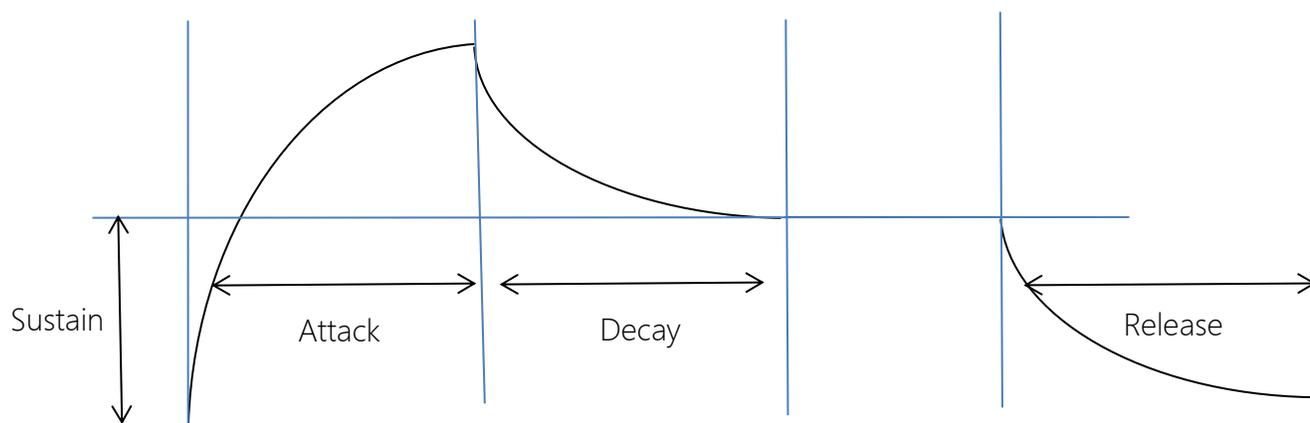
Sustain

Sustain is an amplitude measurement. It is the settling amplitude of the third phase of the envelope, while a key is held.

Release

Release is a measurement of the time it takes the envelope to go from the sustain level back to zero when a key is released.

When a key is pressed the first three phases occur. When the key is released the Release phase occurs.

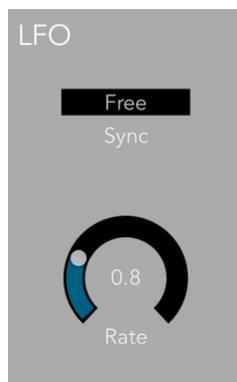


Amount

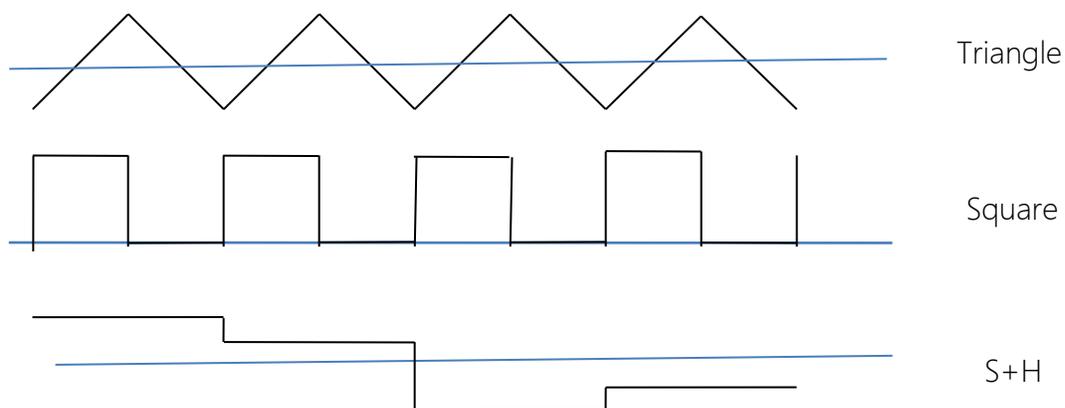
The Amount knob controls how the filter cutoff is affected by the filter envelope. When it is set to zero the envelope has no effect on the cutoff. When it is set to +5 the filter cutoff will move seven octaves above its original value at the envelope maximum. When it is set to -5 it will move a maximum of seven octaves below its original value.

Modulation

LFO



The LFO is a low frequency oscillator used for modulation. Its output is a triangle wave, a square wave, and sample and hold.



Note that the triangle wave is positive and negative, while the square wave is only zero and positive. The sample and hold signal is positive and negative. The Sample and Hold signal gets its name because an input is sampled and then that value is held during one period of the LFO. In this case the input is noise, so the held value is random.

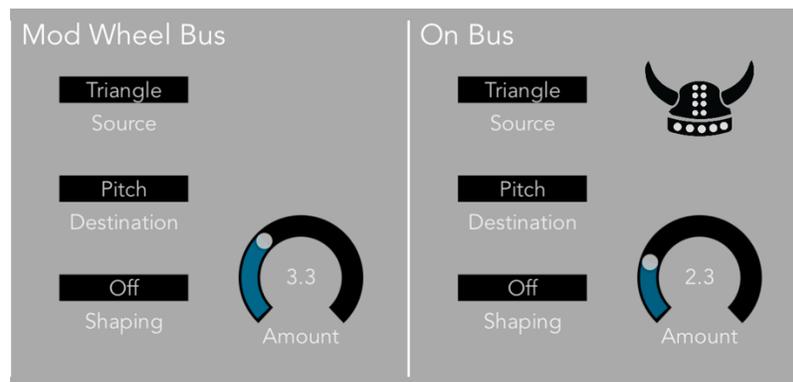
Sync

LFO Sync can be used to optionally reset the LFO or lock the LFO to the song tempo. When Free is selected the LFO is not locked to the tempo. When Gate is selected, the LFO waveform resets to the beginning of a period whenever the gate opens. This occurs when a key is pressed without another one held. When Keyboard is selected, the LFO waveform resets any time a key is pressed. Sync locks the LFO to the current tempo and changes the meaning of the Rate knob to beat divisions.

Rate

The Rate knob controls the rate of the LFO. In the free running modes, the frequency ranges from 0.2 Hz to 50 Hz. In synced mode, rhythmic divisions of the current tempo are available.

Modulation Busses



The Modulation Busses allow you to route signals that can subtly or drastically impact aspects of the sound depending on how much or what is modulated. They allow for much more complex sounds than can be achieved with the oscillators and filters by themselves.

There are two modulation busses, Mod Wheel, and On. The Mod Wheel bus has its final amount controlled by the Mod Wheel in addition to the Amount knob. The On bus is always on; its amount is set with the Amount knob.

Source

The busses can be thought of as electrical busses, or simply connections to a common circuit. The Source selects the input to be connected to the bus. The source can be one of several options described in the table.

Triangle	LFO triangle waveform
Square	LFO square waveform
Osc 3	Oscillator 3
S+H	LFO sample and hold waveform
Off	Zero
Constant, -Constant	A steady value
Noise	A noise source
Filt Env	The filter envelope
-Filt Env	Zero minus the filter envelope, or the envelope negated
S - Filt Env	The filter sustain amount minus the filter envelope. This results in a positive value initially, going to a zero value during the sustain phase, then back positive
Filt Env - S	The filter envelope minus the filter sustain amount. This results in a negative value initially, going to a zero value during the sustain phase, then back negative
Vol Env	The volume envelope
-Volume Env	Zero minus the volume envelope, or the volume negated
S - Vol Env	The volume sustain amount minus the volume envelope. This results in a positive value initially, going to a zero value during the sustain phase, then back positive
Vol Env - S	The volume envelope minus the volume sustain amount. This results in a negative

	value initially, going to a zero value during the sustain phase, then back negative
S+H Filt	The LFO sample and hold waveform smoothed by a filter
Osc 1	Oscillator 1
Osc 2	Oscillator 2

Destination

The Destination connects the bus to a control input of another part of the synth. It effectively connects the source to the destination. The destination can be one of several options described in the table.

Pitch	Affects the pitch of all three oscillators
Osc 2	Affects only the pitch of Oscillator 2
Osc 3	Affects only the pitch of Oscillator 3
Filt	Filter Cutoff
Wave	Controls all three oscillator wave-shapers concurrently
Constant, -Constant	A steady value
Noise	A noise source
LFO Rate	LFO Frequency
Resonance	Filter Resonance Amount
Spacing	Filter Spacing
Pan	Output panning
Osc 1 Amt	Oscillator 1 volume level
Osc 2 Amt	Oscillator 2 volume level
Osc 3 Amt	Oscillator 3 volume level
Noise Amt	Noise volume level
Master Vol	Master volume level

Shaping

Shaping can be used to increase the effect of the source on the destination, increasing the amount of modulation. Shaping values are in a positive range, zero or more. As the Shaping parameter increases the effect of the source increases. For example, if the shaping is set to Pressure, lightly holding down a key will result in the typical amount of modulation. But pushing the key down harder will increase the modulation. The shaping setting can be one of several options described in the table.

Filt Env	Filter Envelope
Velocity	MIDI velocity of the current note
Pressure	MIDI aftertouch
Off	No shaping
Constant	A steady value
PW	Pitch Wheel
MW	Mod Wheel
Note	MIDI Note
MW Bus	The other modulation bus
On Bus	The other modulation bus
Other	All of the other shaping values are simply knob settings with the same name.

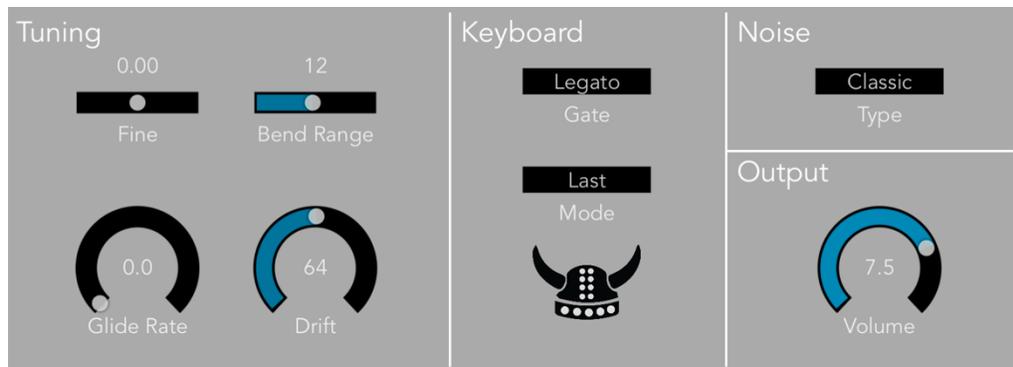
Common Tricks

One common trick is to use filter envelope (Filt Env) shaping with the filter envelope (Filt Env) as the source and the filter (Filt) as the destination. This technique can greatly increase the filter cutoff movement.

Another trick is to use velocity to control the filter cutoff. For this you can use Constant as the Source, filter cutoff (Filt) as the Destination, and Velocity as the Shaping. In general, when you want to use the shaping as an effect you may want to choose Constant as the Source.

Global

There are miscellaneous settings on the global page that affect operation of the synth.



Fine Tune

Fine Tune adjusts the overall tuning, including all three oscillators. Generally, it would be used to transpose the instrument or adjust the pitch of the oscillators simultaneously. It is the only way to adjust the pitch of Oscillator 1.

Glide Rate

Glide Rate, also known as portamento, adjusts how quickly the oscillator pitch changes to a new note. Turning the Glide Rate up makes the pitch transition smooth between notes.

Drift

Drift simulates the instability oscillators have in their frequency. Even when the tuning trim pots have been set very accurately the oscillator frequency of an analog oscillator drifts slightly up and down. Slight phase shifts result from the slightly out of tune oscillators. Turning this control down will fix the frequency at an exact rate. Turning it up magnifies the effect.

Bend Range

The Bend Range slider sets the maximum number of semitones that the Pitch Wheel can adjust the oscillator pitch.

Gate

This setting can be used to hold the gate open or set the retrigger mode. The gate controls when the envelopes reset based on a new note.

- Legato – Envelopes are only triggered if no keys are held
- On - Like always holding down a key
- Retrigger – Envelopes are triggered with every key

Keyboard Mode

Various monophonic keyboard settings are available to choose from:

- Last – The last key pressed sets the pitch.
- Lowest – The lowest key pressed sets the pitch
- Highest – The highest key pressed sets the pitch
- Single – A key will set the pitch as long as it is held regardless of other key presses

Noise

Choose classic for an old school sound, White for the typical noise, or Pink for another type of noise commonly used in audio.

Volume

The Volume knob is the last stage of the synth. It controls the overall volume after mixing and enveloping has occurred.

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