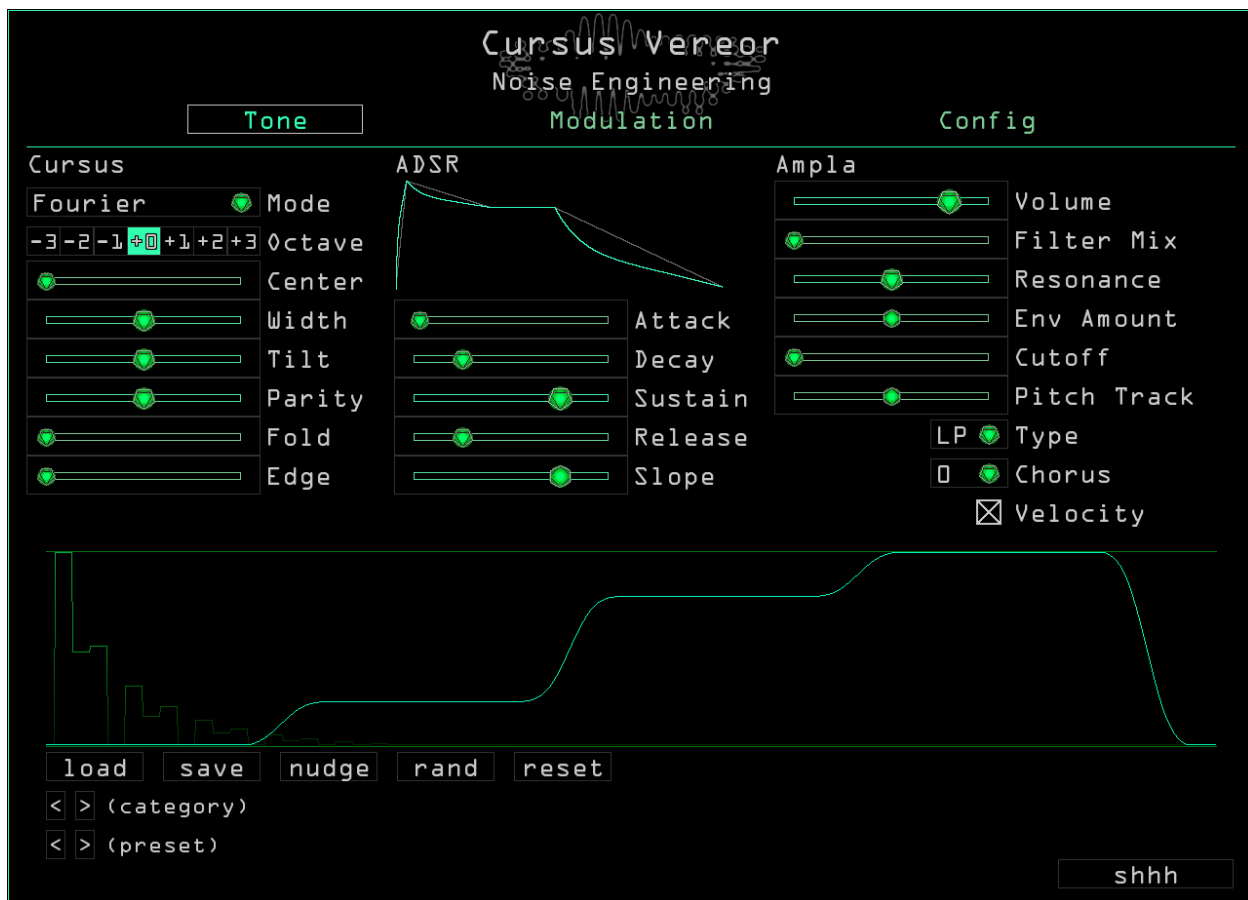# Noise Engineering

Cursus Vereor

Spectral synthesizer designed for intuitive
control over unique tones.

User Guide

Welcome to Cursus Vereor.

Cursus Vereor is a synthesizer that produces unique timbres from spectral controls. It features three synthesis modes based on different orthogonal conceptualizations of frequency: Fourier, which uses sine waves; Daubechies, using wavelets, and Walsh mode, using square waves. It has a musical tone structure and can produce an extremely wide variety of harmonic sounds, and with a powerful modulation system, you're in for a world of new sounds.

Installation

Windows

Log into portal.noiseengineering.us

Navigate to the "Plugins" tab, and click the link that says "Click here to download the installer for NE Products (W64)"

Double-click the downloaded file to run it.

NE Products will use your web browser to authenticate your plugins. Log into your Portal account on the webpage that opens if prompted, then return to NE Products.

Click on "Install/Update Plugins."

Close NE Products, run your DAW, and your plugins will appear!

Mac

Log into portal.noiseengineering.us

Navigate to the "Plugins" tab, and click the link that says "Download for Mac"

When the download completes, open the installer file and follow the instructions.

Open NE Products. On Mac, it can be found with Finder in Applications or with Spotlight.

NE Products will use your web browser to authenticate your plugins when you run it. Log into your Portal account on the webpage that opens if prompted, then return to NE Products.

Click on "Install/Update Plugins."

Once plugins are installed, the message at the top of the screen will display "Your plugins are up to date."

Close NE Products, run your DAW, and your plugins will appear!

Uninstallation

Run NE Products again, and click "Uninstall Plugins."

If you'd like to also remove their preset files, click "Uninstall Plugins and Presets."

Doing this removes all presets in the factory directories, **including user-created presets,** so please copy any files you'd like to save to a different location before performing this action.

Cursus History

Cursus Vereor's story starts with the Cursus Iteritas, a Eurorack oscillator released a few years back. It was designed to be a milder counterpart to the other more aggressive oscillators we'd made (like the Basimilus Iteritas), and when we started working on plugins, we decided it had a unique flavor we wanted to bring to the software world. Adding in an expanded dynamics section from one of our Eurorack firmwares rounded out the synthesizer with tone-shaping filters and versatile envelope control of the Cursus oscillator. Cursus Vereor is one that'll keep surprising you -- load up a preset, hit that Random button, or just start tweaking to see what kinds of new sounds you can make.

Function descriptions

Fourier: The Fourier series/transform was discovered by Jean-Baptiste Joseph Fourier in the early 19th century to help solve differential equations used in the physics of heat. Of the three function sets in Cursus, it is the most known to musicians as it is just a harmonic series of sine waves. It is the basis (pun intended) of a tremendous amount of mathematics, physics and engineering that make our modern world. Cursus uses a 16-frequency series. Learn more here.

Daubechies: The Daubechies wavelet was described by Baroness Ingrid Daubechies. It is in the family of Orthogonal functions called wavelets. Wavelets are a late 20th century discovery that parameterized a huge set of orthogonal functions. In many cases where a Fourier transform has been used in the past, a wavelet can do the same job but better and faster. For example, JPEG2000 moves the jpeg format to one using wavelets rather than a cosine transform and removes the blocking artifacts often seen in JPEG compression. The basis functions of the Daubechies wavelet look and sound a lot like low-passed sawtooth waves. Learn more here.

Walsh: The functions in the Walsh transform (named for Joseph Walsh) are similar to those in the Fourier series in that they generally increase in frequency content, but instead of using sine waves, the functions are composed of square waves. This is called "Sequency." The property that these functions are all square waves (bi-valued) was core to their adoption in a lot of technologies in the mid 20th century as this transform can be computed extremely efficiently on primitive computers or even on dedicated hardware. For example, it was used for image compression in early satellites, similar to the way the discrete cosine transform (a close relative to the Fourier series!) is used for JPEG compression. Not surprisingly, the square nature of these functions comes through in the way they sound. Walsh functions were presented in the 70s by Bernie Hutchens (of the obscure but incredibly informative series Electronotes) as an interesting synthesis technology, but they were not used much outside of hobbyist circles. Learn more here.

Shortcuts

Cmd/Ctrl+Click or Cmd/Ctrl+Mouse wheel

For finer control, hold Cmd (Mac) or Ctrl (PC) while moving a parameter.
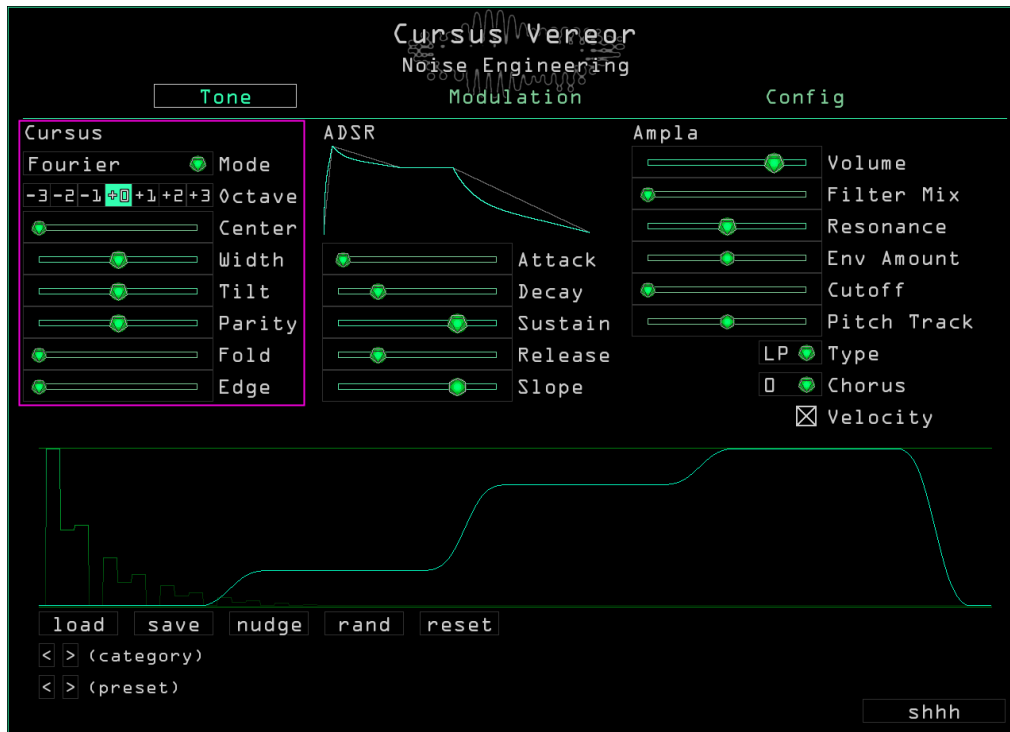
Double click

Resets any parameter to its default state.

Scroll

Hover over any parameter and scroll to adjust. Scroll+Cmd (Mac) or Scroll+Ctrl (PC) give finer control.

All of these work to edit step levels in LFO Step shape as well.

Tone page

Mode

Selects which function set is used: Fourier, Daubechies, or Walsh.

Octave

Transposes the synth up or down by octaves.

Center

Sets the center harmonic used to build the spectra.

Width

Controls how many different harmonics are used to create the waveform.

Tilt

Weights the spread of harmonics. In the middle it is symmetric; at left, lower harmonics are louder while at right, higher harmonics get more volume.
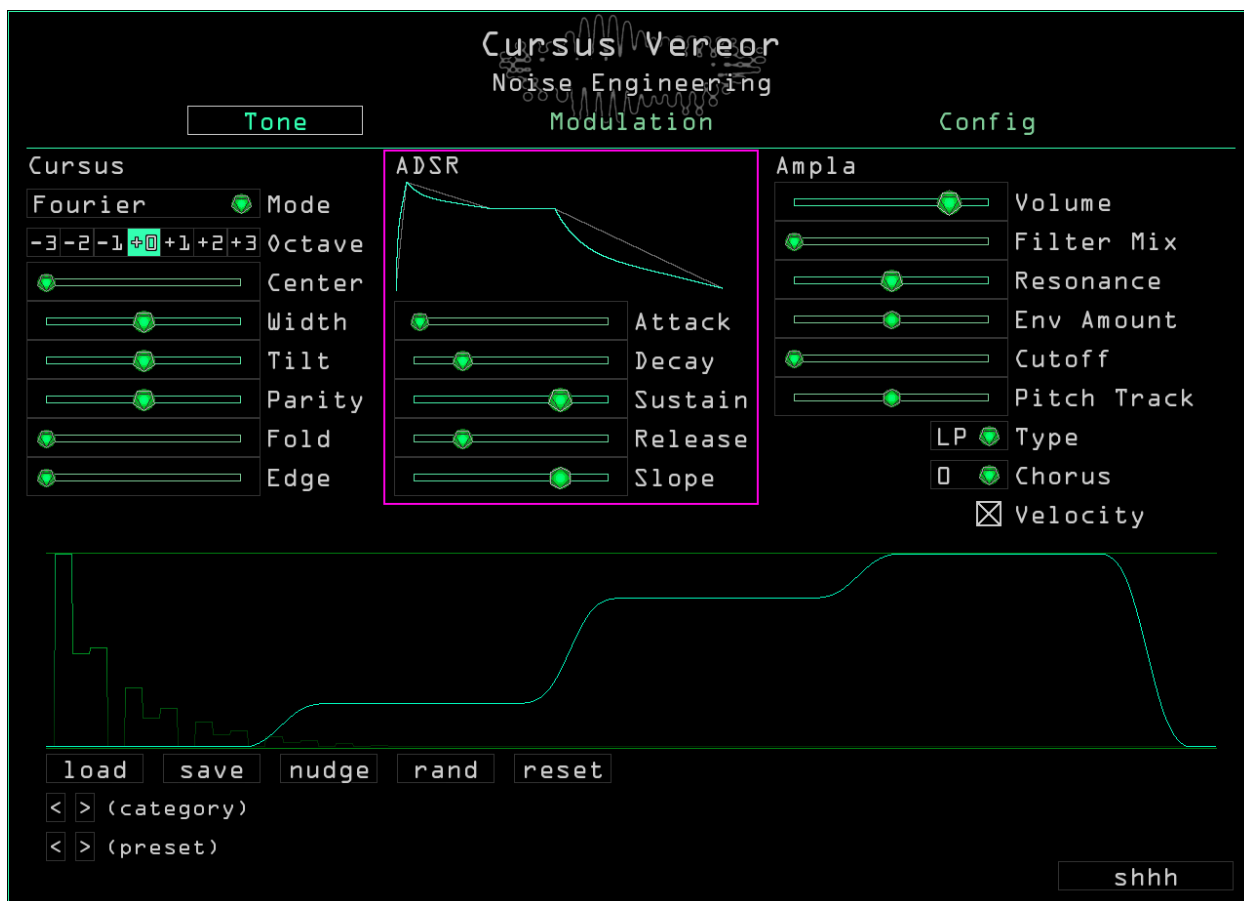
Parity

Controls what harmonics are included in the sound. In the center position, all harmonics are included. Fully left, only even harmonics; fully right, only odd.

Fold

Controls the infinifold section. For the first 3/4 of the range, this sets the threshold of the folder. CV will dynamically add multiple stages to maximize the amount of folding based on the threshold and signal amplitude. When the control is in the top quarter of its range, a pulse train based on the signal is mixed in to give even more harmonic content.

Edge

Controls the oversampling filter of the synth. As it is turned to the right, it will add musical overtones. Edge sounds something like a traditional "bitcrusher" effect.

Cursus Vereor
Noise Engineering

Cursus
Fourier ◉ Mode
-3 -2 -1 ±0 +1 +2 +3 Octave
Center
Width
Tilt
Parity
Fold
Edge

ADSR
Attack
Decay
Sustain
Release
Slope

Ampla
Volume
Filter Mix
Resonance
Env Amount
Cutoff
Pitch Track
LP ◉ Type
0 ◉ Chorus
☒ Velocity

load   save   nudge   rand   reset
< > (category)
< > (preset)
shhh

Attack

Controls the attack time for the envelope: this sets the amount of time it takes the envelope to go from minimum to maximum.

Decay

Controls the decay time for the envelope: this sets the amount of time it takes the envelope to go from the peak reached in the Attack stage to the level set in the Sustain stage.
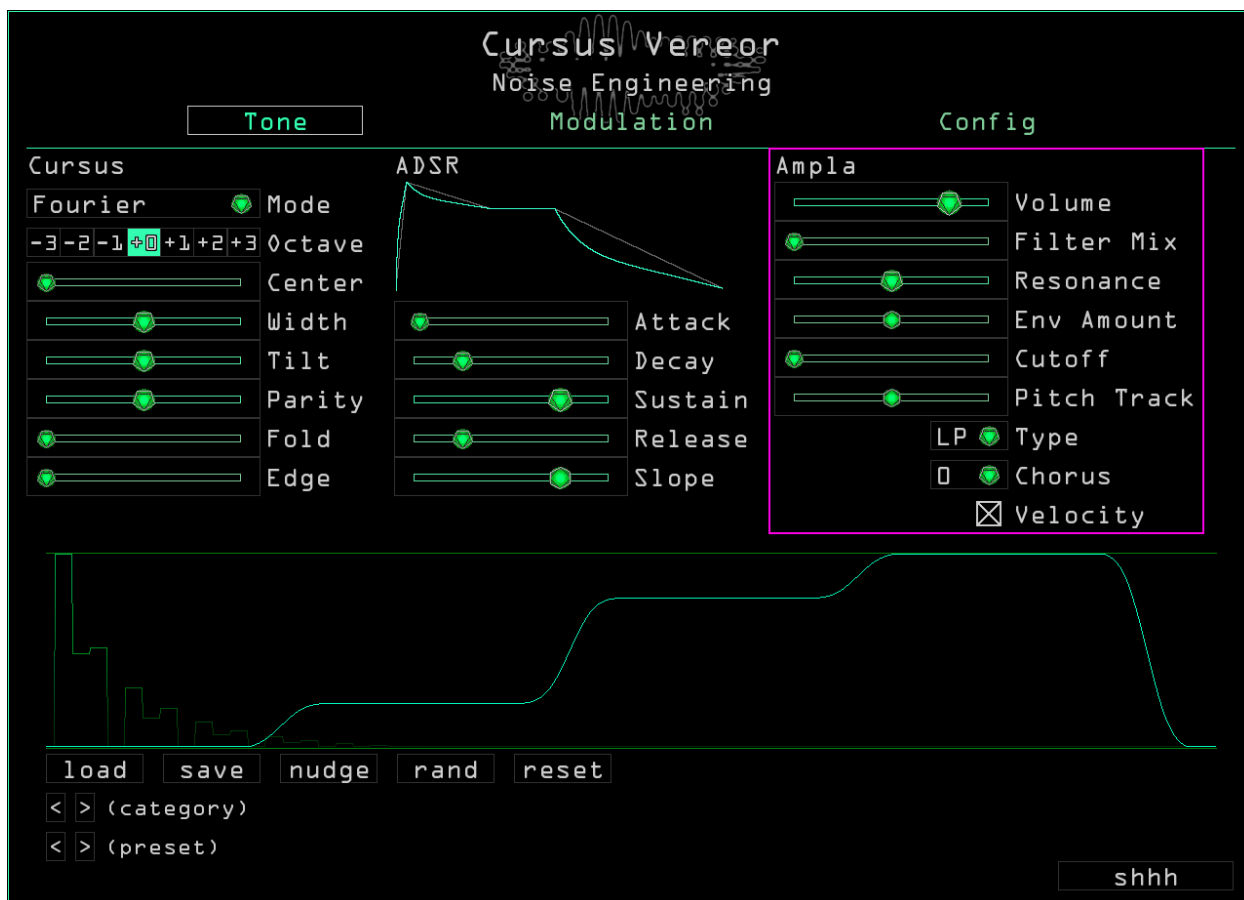
Sustain

Sets the sustain level of the envelope: this is the level the envelope holds at after the Attack and Decay stages while a note is held down.

Release

Sets the release time for the envelope: this is the amount of time it takes the envelope to go from the Sustain level to minimum.

Slope

Changes the curve of the Attack, Decay, and Release stages of the envelope.

Volume

Sets the output level of the plugin.

Filter Mix

Controls the mix between a VCA and a VCA+filter.

Resonance

Resonance control for the filter. At high values, the Resonance modulates the filter cutoff frequency for added harmonic content. This parameter will only be audible if the Blend parameter is set higher than minimum.

Env Amount

Controls how much the envelope opens the filter.

Cutoff

Sets the minimum frequency for the filter.

Pitch Track

Controls how much the filter's frequency tracks the notes being played.

Type

Sets the filter type: LP (lowpass), BP (bandpass), or HP (highpass). The filter will only be audible if the Filter Mix parameter is set higher than minimum.

Chorus

Enables a vintage-inspired chorus. 0 is off, I is some, and II is a lot.

Velocity On

Toggles whether or not the synth's dynamics change based on velocity.

Presets

```
load    save   nudge   rand   reset
< >  (category)
< >  (preset)
                                    shhh
```

Presets are stored in the computer's file system, and the controls below allow for modification and navigation through the files and folders of presets. You can create a new preset "Category" by creating a subfolder in the preset directory, and saving new presets within it.

load

Load a preset.

save

Save a new preset.

< > (category)

Loads the next/previous folder of presets in the preset directory.

< > (preset)

Loads the next/previous preset.

nudge

Applies a small amount of randomization all tonal parameters and modes. Randomization can be bypassed per control in their individual modulation menus. Useful for creating slight variations of sounds.

rand

Completely randomizes all tonal parameters and modes. Randomization can be bypassed per control in their individual modulation menus. Use this to create inspiring new sounds and ideas.

reset

Resets all parameters to their default settings.

shhh

Panic button; ends all notes.

Modulation

All plugins feature a comprehensive routing system making use of a variety of modulation types and sources. When modulation is enabled on a parameter, a box showing the range of enabled modulation will appear, and a small indicator will move within the range box showing the exact position of the modulation.

Types of modulation

Parameters can be modulated from a variety of sources:

LFOs

Four onboard LFOs that offer a variety of modes, from simple waveforms to envelopes to step sequencers. More detail on LFO modes can be found in the section below titled "[Modulation page.](#)"

Mac 1-4

Macros. Four macro sliders can be assigned to any number of parameters. The macros can in turn be mapped to MIDI controllers, automated, or modulated with other LFOs.

Note

Changes value based on what note is currently played; the note range can be changed in Modulation > Other.

Env

Envelope. The onboard dynamics envelope of the synth.

Vel

MIDI note velocity.

After

Channel and note aftertouch.

Learn CC

Parameters can be assigned to MIDI CC.

Modulation Assignment

When a parameter is right-clicked (Control+click on Mac), a context menu appears with modulation routing options:

Pitch

| -3 | -2 | -1 | +0 | +1 | +2 | +3 |

Qt	On		Index	Dir	Curve
☐	■	LFO 1		-->	
☐	■	LFO 2		-->	
☐	■	LFO 3		-->	
☐	■	LFO 4		-->	
☐	☐	Mac 1		-->	
☐	☐	Mac 2		-->	
☐	☐	Mac 3		-->	
☐	☐	Mac 4		-->	
☐	☐	Note		-->	
☐	☐	Env		-->	
☐	☐	Vel		-->	
☐	☐	After		-->	

Clear Modulation

Center

On		Index	Dir	Curve
☒	LFO 1		-->	
■	LFO 2		-->	
☒	LFO 3		-->	
■	LFO 4		-->	
☐	Mac 1		-->	
☐	Mac 2		-->	
☐	Mac 3		-->	
☐	Mac 4		-->	
☐	Note		-->	
☐	Env		-->	
☒	Vel		-->	
☐	After		-->	

☒ Allow Randomize

Learn CC

Clear Modulation

Parameter slider

A copy of the parameter being modulated, for easy adjustment.

Qt (pitch only)

Toggles whether incoming modulation directly affects pitch (unchecked), or is constrained to only play in-tune notes (checked).

On

Each modulation source has a checkbox; when checked, modulation from that source is enabled.

Index

Sets the amount of modulation from a particular source. Fully left, modulation is bypassed.

Dir

Direction. Sets the polarity and inversion of incoming modulation.

- **-->** unipolar; modulates from the point selected on the parameter up to the level indicated by the Index setting

- **<->** bipolar; modulates around the center point set by the parameter

- **<--** inverted unipolar; opposite modulation from unipolar

- **>-<** inverted bipolar; opposite modulation from bipolar

Curve

Each modulation source has a Curve slider that changes how modulation affects the parameter. In the center, modulation is linear, and the parameter movement matches incoming modulation exactly. To the right modulation is more logarithmic, and to the left more exponential.

Allow Randomize

When checked, this parameter can be randomized when "rand" (Tone page) is clicked.

Learn CC

Click this to enable MIDI CC learn on a parameter. Move a parameter on your MIDI controller and the plugin will exit learn mode and the parameter will now respond to that CC. If clicked by mistake, click "waiting on CC" to exit learn mode. Click "forget CC" to remove an assignment.
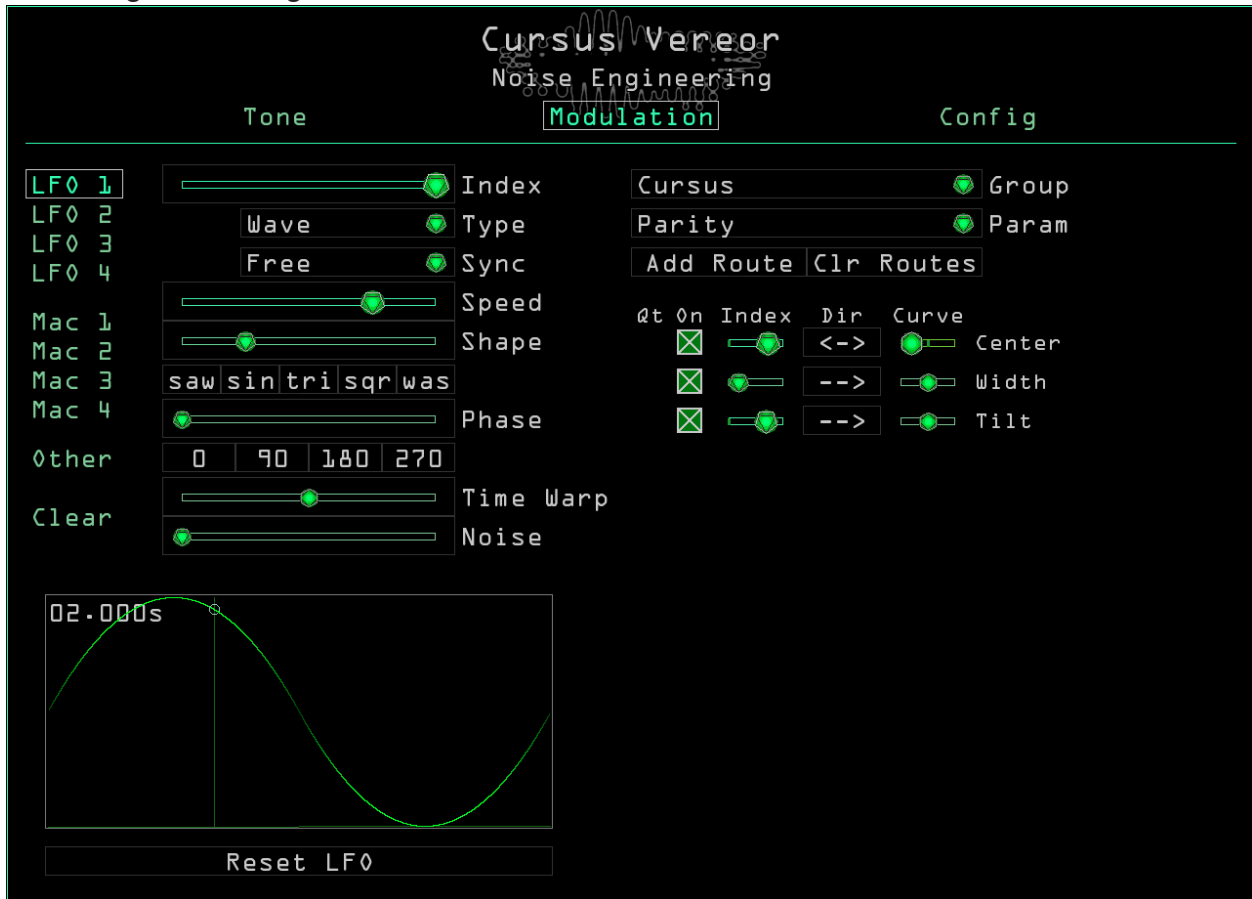
Clear modulation

Resets modulation checkboxes, amounts, direction, and curve. Does not affect CC assignments.
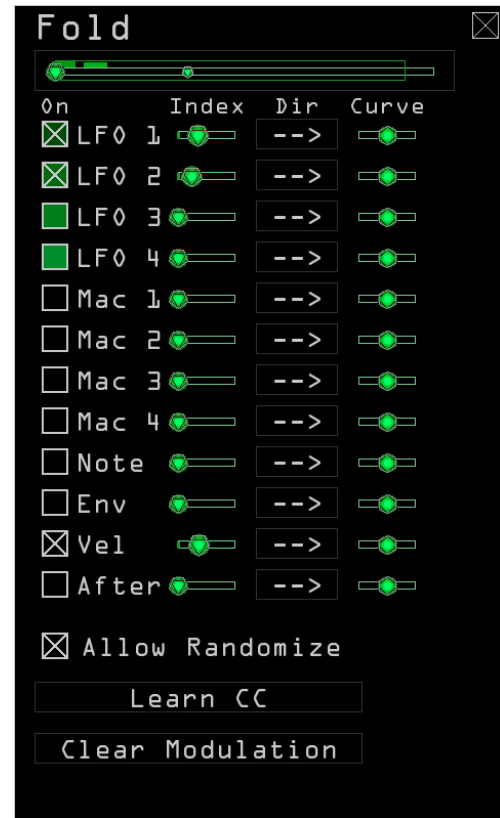
Modulation Page

Click the sections in the left column to navigate to that page and edit modulator settings and assigned routings.

LFO 1-4

Index
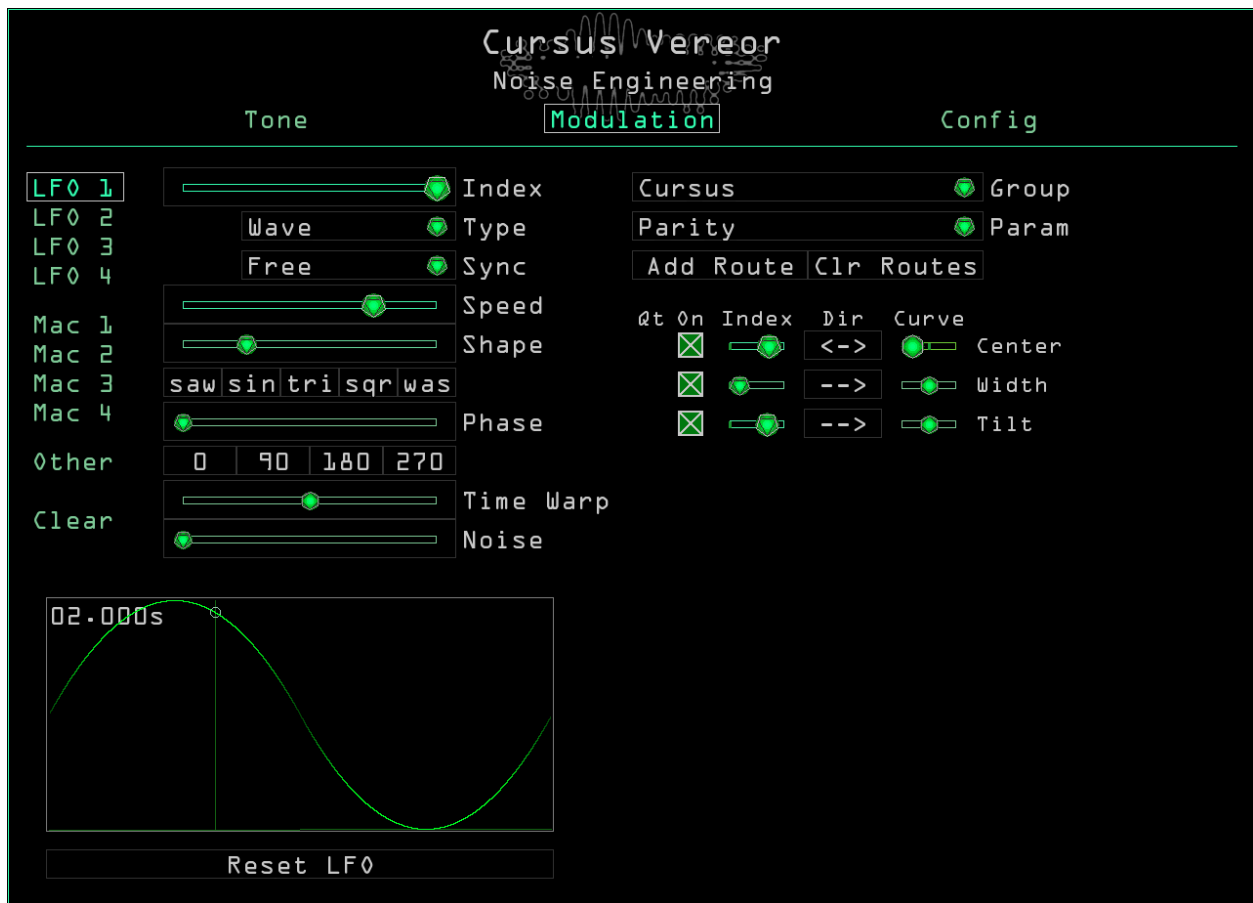
Sets the modulation range of the LFO.

Type

Sets the type of LFO. Options include Wave, Step, and ADSR, described in detail in the sections below.

Reset LFO

Resets the LFO back to its default settings.

Type: Wave

Sync

Sets the source of timing for the modulator.

- **Free:** A single completely freerunning LFO; never resets.
- **Transport:** Speed is set in seconds, but the LFO follows the transport of the DAW.
- **Tempo:** A single LFO that is synced to the DAW's tempo and transport.
- **Poly Free:** Each note played gets its own LFO; LFOs are reset at the start of each note.
- **Poly Tempo:** A tempo-synced LFO is created per note; LFOs reset at the start of each note.

Speed/Beats

Sets the rate of the LFO. In unsynced modes, this is a slider that sets the rate in seconds. In synced modes (Tempo and Poly Tempo), this is a fraction that sets the rate in beats. If a synced mode is selected, the rate can be doubled or halved with the *2 and /2 buttons respectively.

Shape

Morphs between different waveforms.

saw/sin/tri/sqr/was

Selects a shape preset for the waveform. Choose saw, sine, triangle, square, or inverted saw.

Time Warp

Skews the timing of the waveform.

Phase

Changes the starting point of the wave.

0/90/180/270

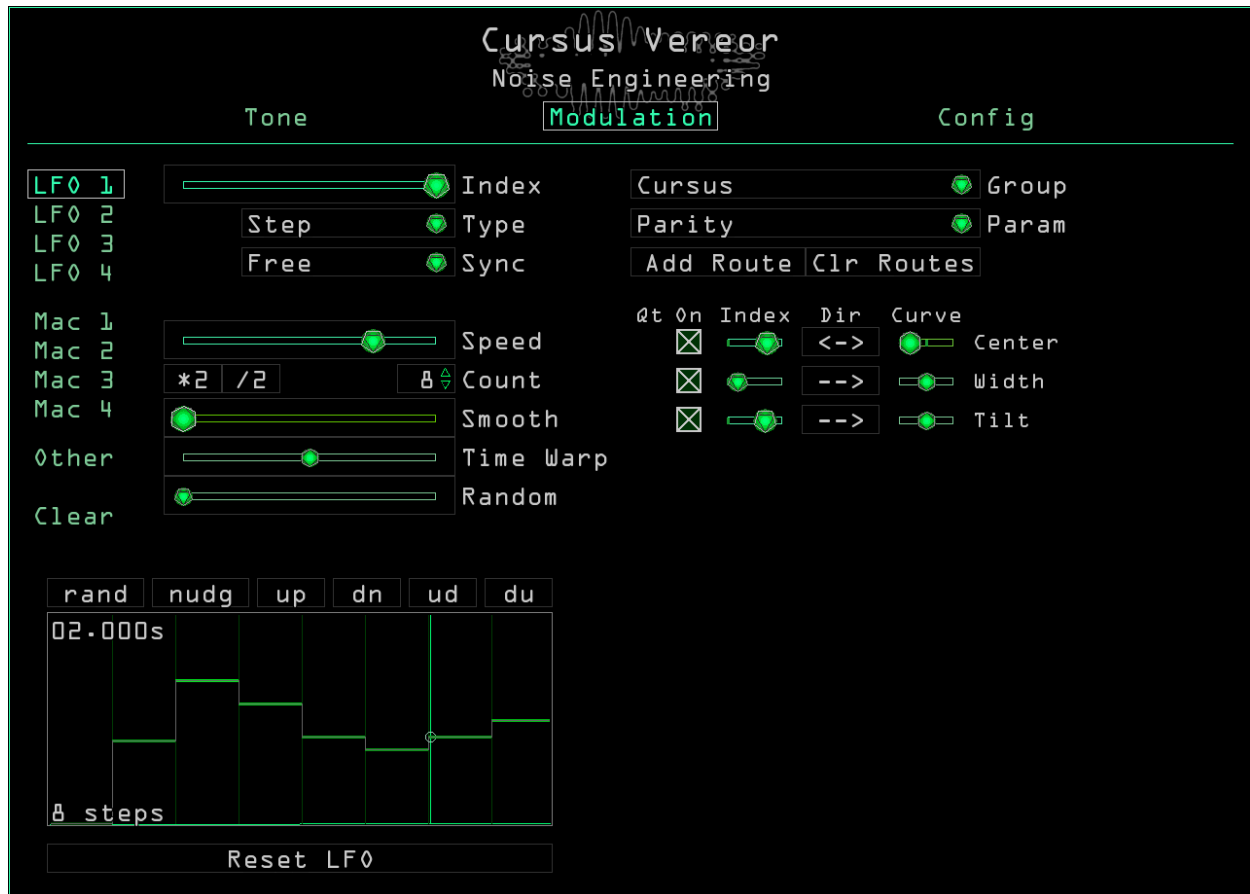Selects a preset for the phase of the waveform.

Noise

Adds randomness to the waveform.

Color (only visible when Noise is above minimum)

Changes the intensity of randomness added to the waveform.

Type: Step

Sync

Sets the source of timing for the modulator.

- **Free:** A single completely freerunning LFO; never resets.
- **Transport:** Speed is set in seconds, but the LFO follows the DAW's transport.
- **Tempo:** A single LFO that is synced to the DAW's tempo and transport.
- **Poly Free:** Each note played gets its own LFO; LFOs are reset at the start of each note.
- **Poly Tempo:** A tempo-synced LFO is created per note; LFOs reset at the start of each note.

Loop

Repeats infinitely when checked, or plays once when unchecked.

Speed/Beats

Sets the rate of the sequencer. In unsynced modes, this is a slider that sets the rate in seconds. In synced modes, this is a fraction that sets the rate in beats. If a synced

mode is selected, the rate can be doubled or halved with the *2 and /2 buttons respectively.

Count

Sets the steps in the sequencer; the up and down arrows change the count by one, and the *2 and /2 buttons respectively double or halve the count.

Smooth

Adjusts how smooth the transition between steps is.

Time Warp

Skews the timing of the sequencer.

Graph

Edit your sequence here by clicking and dragging or use the preset buttons:

rand: Randomizes the sequence entirely.

nudg: Slightly changes the values of each step.

up: Generates an ascending pattern across the steps.

dn: Generates a descending pattern across the steps.

ud: Creates a triangle pattern across the steps.

du: Creates an inverted triangle pattern across the steps.

Shape: ADSR

Polyphony

When checked, a new envelope is created for each voice. When unchecked, a single envelope is generated for all voices.

Loop

When set to once, the envelope goes through a single cycle per note press. When set to loop, the envelope will loop as long as a note is playing.

Attack

Controls the attack time for the envelope; this sets the amount of time it takes the envelope to go from minimum to maximum.

Decay

Controls the decay time for the envelope; this sets the amount of time it takes the envelope to go from the peak reached in the Attack stage to the level set in the Sustain stage.

Sustain

Sets the sustain level of the envelope; this is the level the envelope holds at after the Attack and Decay stages while a note is held down.

Release

Sets the release time for the envelope; this is the amount of time it takes the envelope to go from the Sustain level to minimum.

Slope
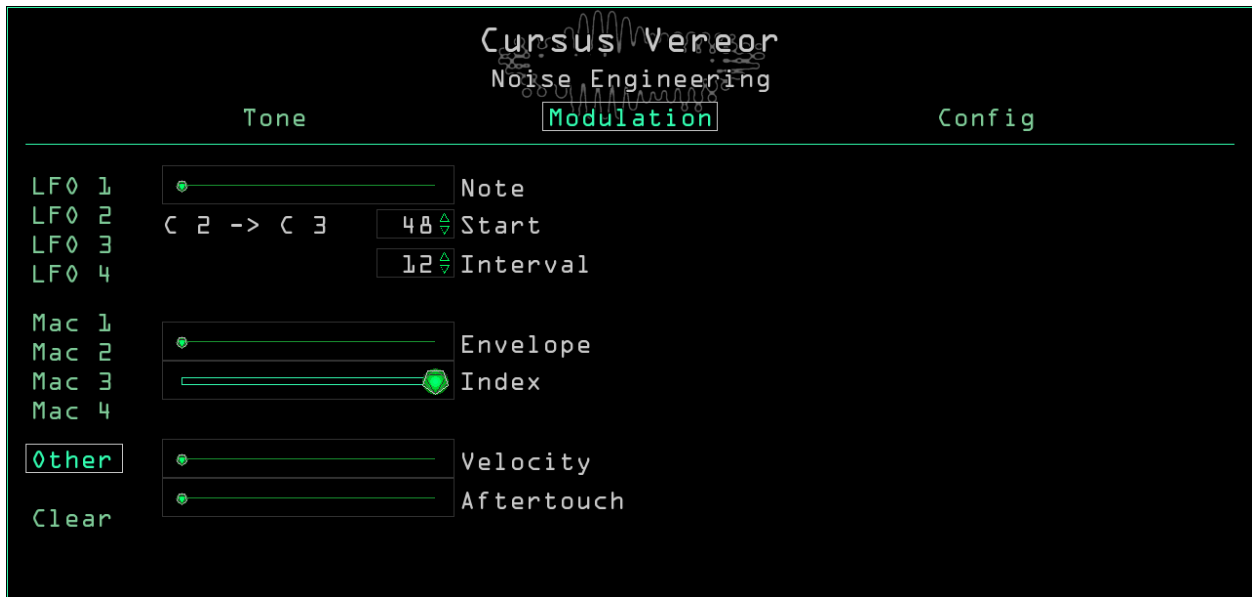
Sets the curve of the envelope with linear in the center.
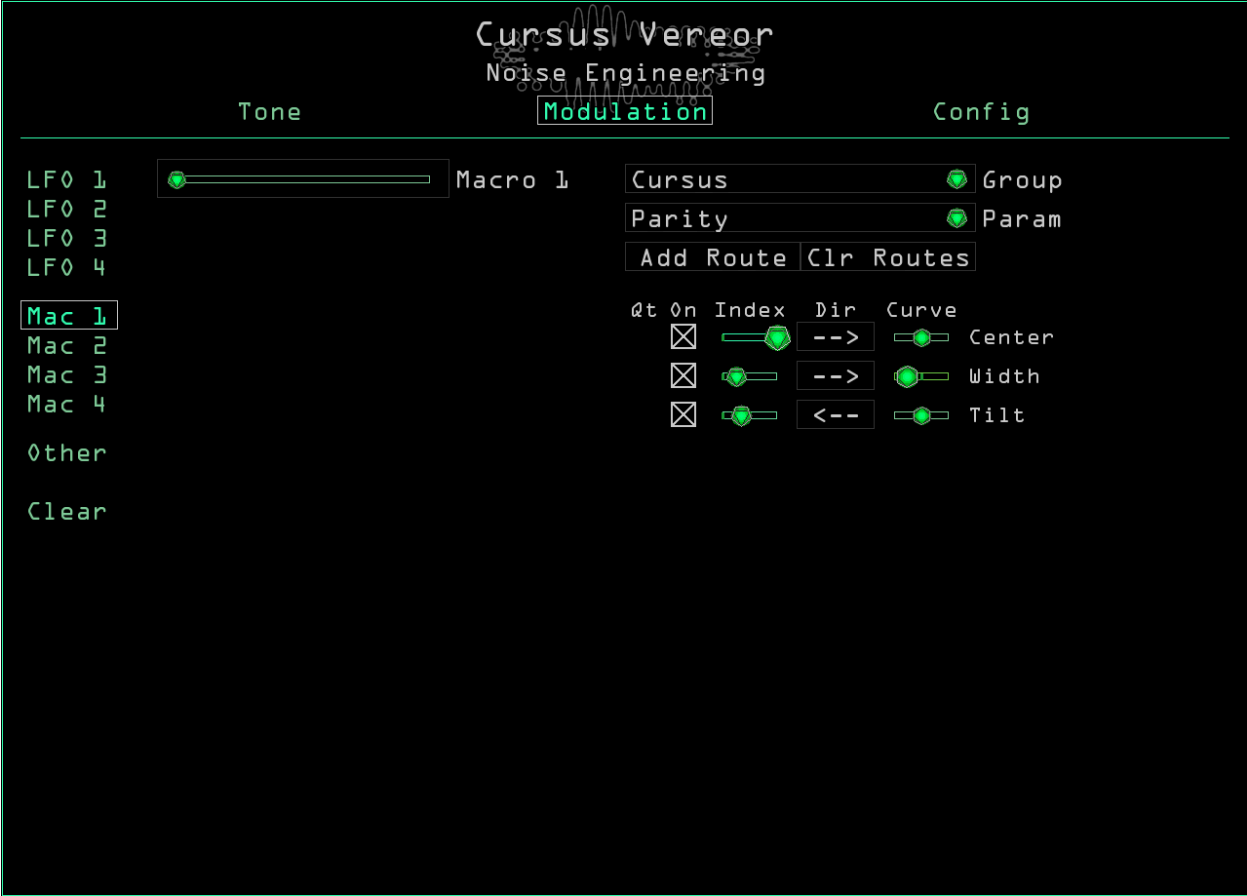
Macro

Mac 1-4

Four sliders that can be assigned to any number of other parameters, and modulated by LFOs or MIDI CCs.

```
                      Cursus Vereor
                    Noise Engineering
            Tone         Modulation          Config
   ──────────────────────────────────────────────────────

   LFO 1    ●─────────────────   Note
   LFO 2    C 2 -> C 3     48⇳ Start
   LFO 3                   12⇳ Interval
   LFO 4

   Mac 1
   Mac 2    ●─────────────────   Envelope
   Mac 3    ─────────────────◆ Index
   Mac 4

   Other    ●─────────────────   Velocity
            ●─────────────────   Aftertouch
   Clear
```

Other

Note

An indicator of the current Note modulator value.

Start

Sets the lowest note in the Note modulator range. Notes below this give the minimum value.

Interval

Sets the highest note in the Note modulator range. Notes above this give the maximum value.

Envelope

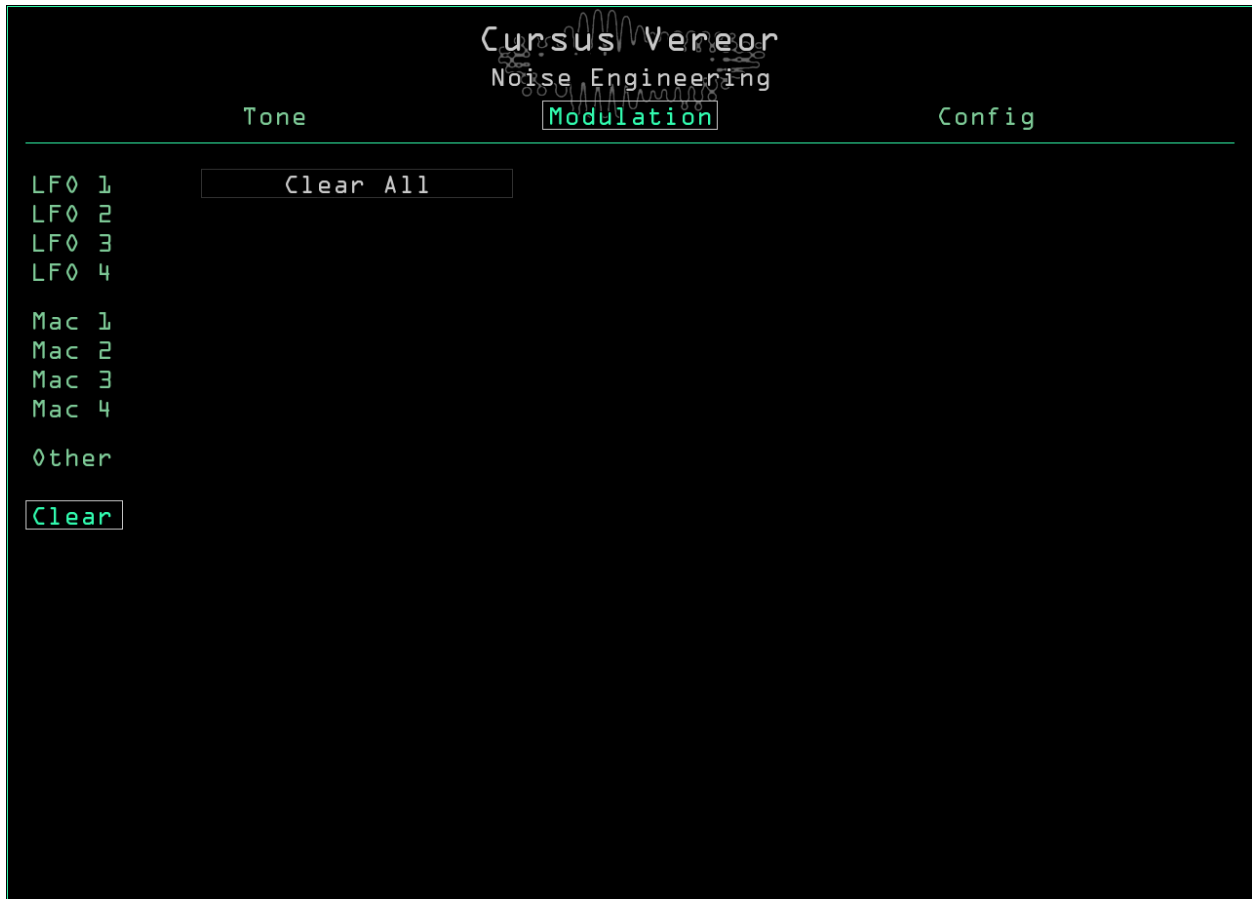An indicator of the current Envelope modulator value.

Index

Sets the range of the Envelope modulator.

Velocity

An indicator of the current Velocity modulator value.

Aftertouch

An indicator of the current Aftertouch modulator value.

```
                    Cursus Vereor
                  Noise Engineering
          Tone          Modulation          Config
 _____

 LFO 1         ┌──────────────────┐
 LFO 2         │     Clear All     │
 LFO 3         └──────────────────┘
 LFO 4

 Mac 1
 Mac 2
 Mac 3
 Mac 4

 Other

 ┌───────┐
 │ Clear │
 └───────┘
```

Clear

This page is home to the "Clear All" button. Clicking this removes all modulation routings from the patch. Use it wisely.

Modulated Parameters Column
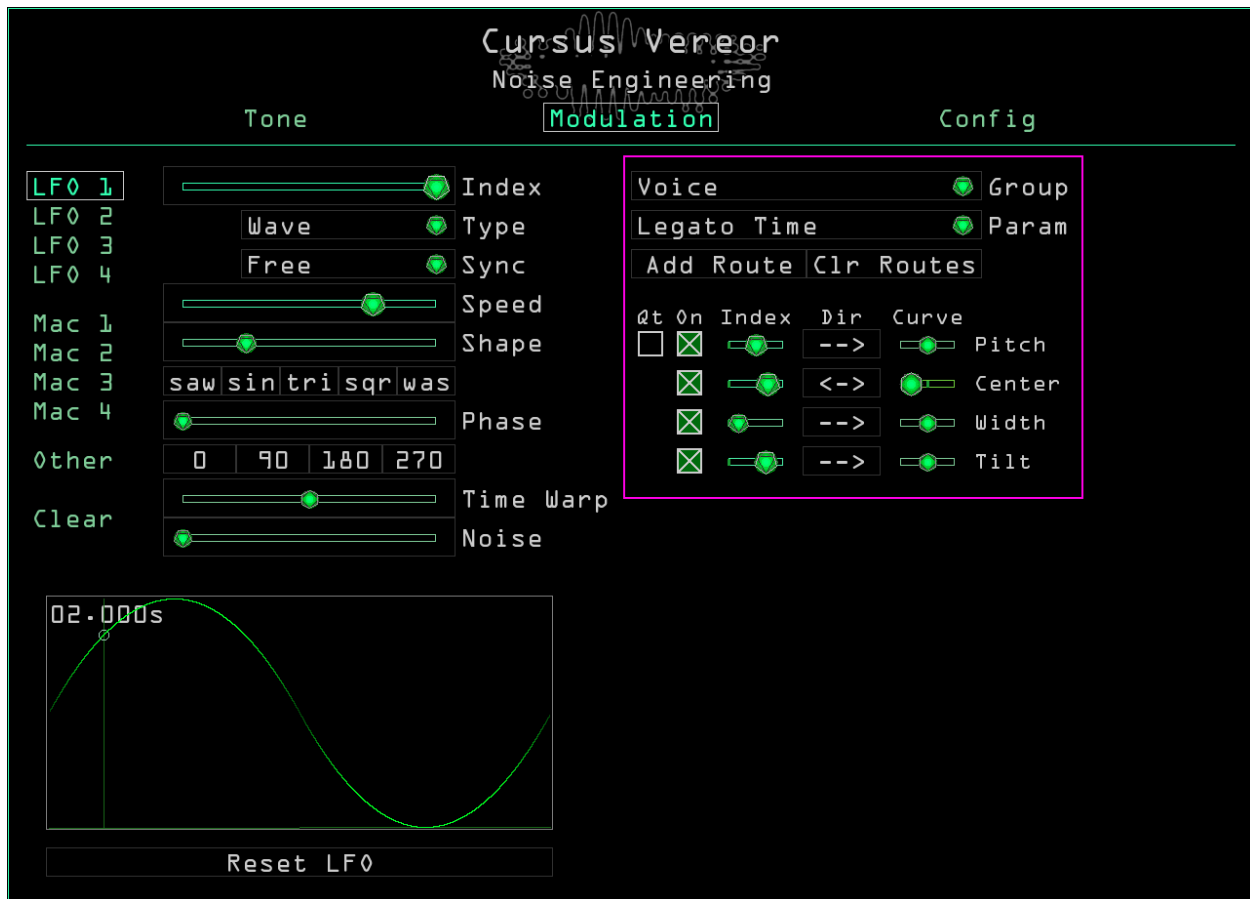
Find the parameters assigned to a modulator on its routing page. For instance, if LFO 1 is modulating Attack, click LFO 1 on the left side to view the modulation amount, curve, and checkbox for Attack (and any other LFO 1 modulated parameters) on the right.

Group

Selects a category of parameters.

Param

Selects a parameter from the current category.

Add Route

Adds modulation routing for the selected parameter from the selected modulator.

Clr Routes

Removes all modulation assignments for the current modulator.

Qt (pitch only)

Toggles whether incoming modulation directly affects pitch (unchecked), or is constrained to only play in-tune notes (checked).

On

Each modulation source has a checkbox; when checked, modulation from that source is enabled.

Index

Sets the amount of modulation from a particular source. Fully left, modulation is bypassed.

Dir (direction)

Sets the polarity and inversion of incoming modulation.

- --> unipolar; modulates from the point selected on the parameter up to the level indicated by the Index setting
- <-> bipolar; modulates around the center point set by the parameter
- <-- inverted unipolar; opposite modulation from unipolar
- >-< inverted bipolar; opposite modulation from bipolar

Curve

Each modulation source has a Curve slider that changes how modulation affects the parameter. In the center, modulation is linear, and the parameter movement matches incoming modulation exactly. To the right modulation is more logarithmic, and to the left more exponential.

Config Page
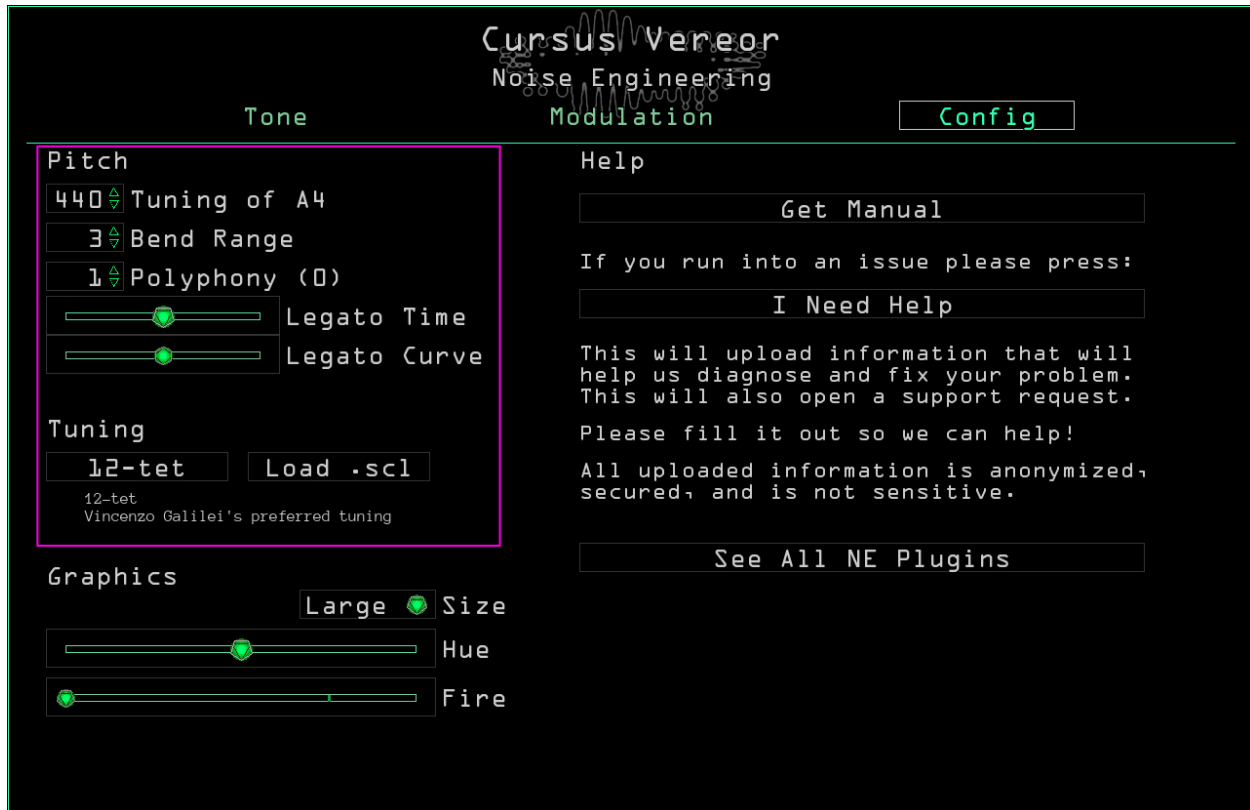
Pitch

Tuning of A4

Offsets the base pitch of the synthesizer; defaults to contemporary "concert pitch" (A=440hz).

Bend Range

Sets the pitch bend range in semitones.

Polyphony

Sets the maximum number of simultaneous voices the plugin can play.

**Legato Time** (visible only when Polyphony is set to 1)

If two notes overlap, this sets the amount of time it takes one note's pitch to slide to the next.

Legato Curve (visible only when Polyphony is set to 1)

Sets the curve of legato slides.

Tuning

The "12-tet" button sets the pitch scaling of the plugin to the default twelve-tone equal temperament tuning. The "Load .scl" button allows the user to load Scala files for different tuning systems.
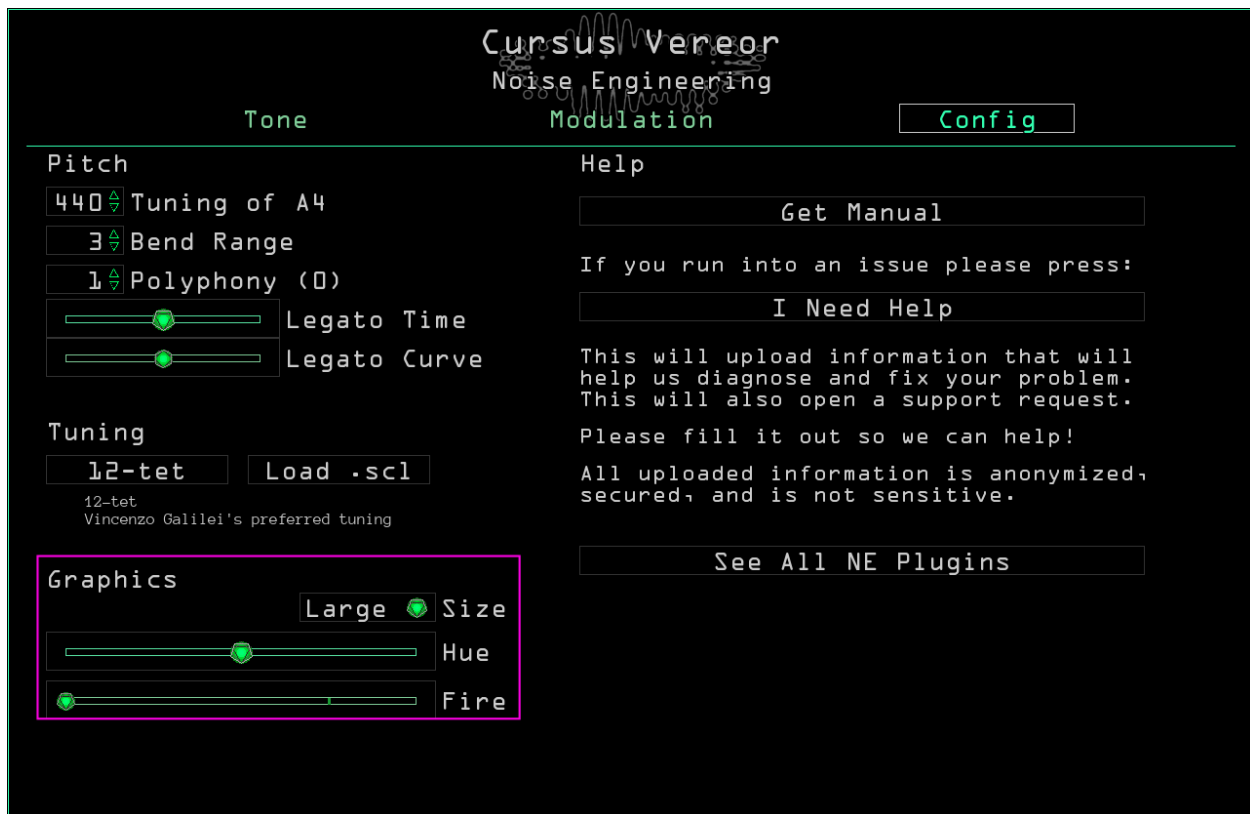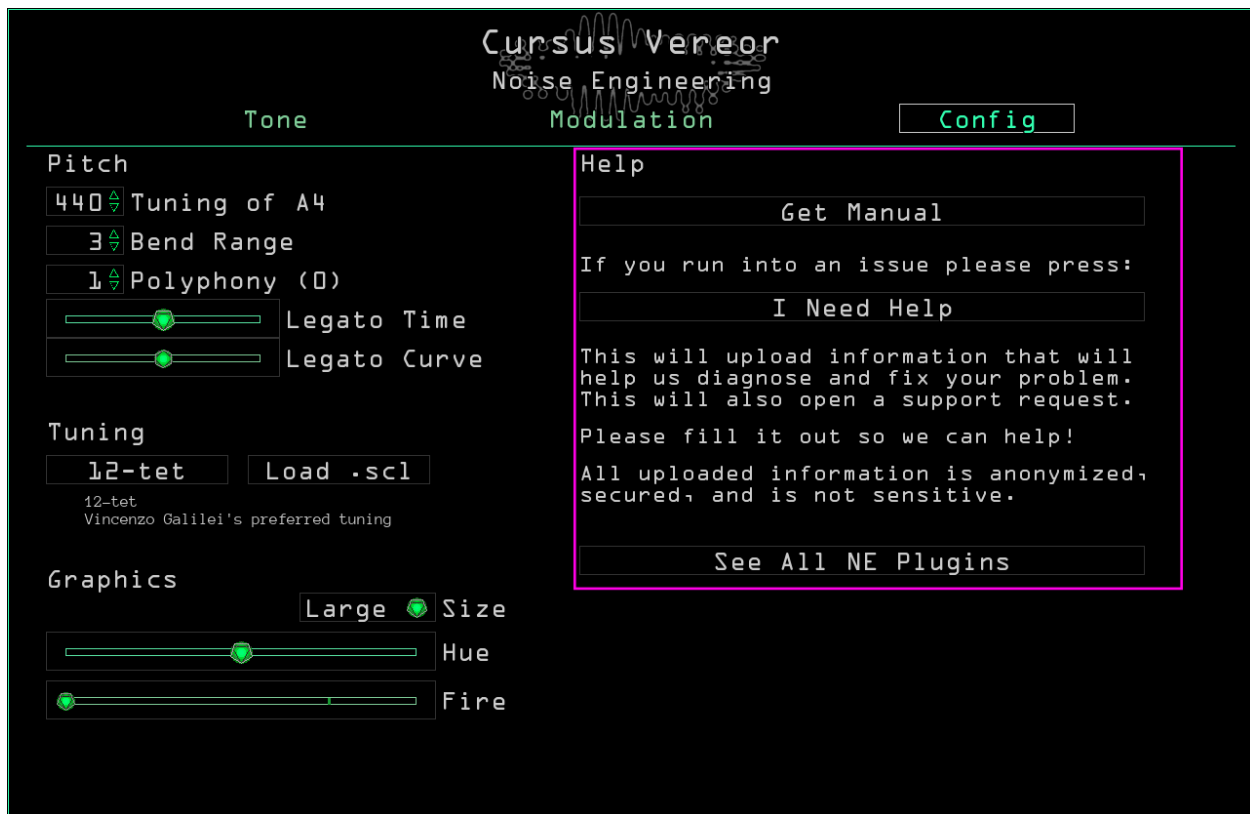
Graphics

Size

Sets the size of the plugin window.

Hue

Sets the color scheme of the plugin.

Fire

Adds some attitude to the plugin GUI.

Help

Get Manual

Opens the plugin product page.

I Need Help

Uploads anonymized system information used for troubleshooting and opens the support form. If you're having an issue please press this button and fill out the form to tell us what the problem is! You can also always reach us at noiseengineering.us/pages/contact

Drop us a line and we'll get back to you within two business days.

See All NE Plugins

Opens the plugin shop. Check out all the Noise!

Tone Generation

Cursus Vereor generates a spectral description based on slider positions. Center, Width, Tilt, Structure determine amplitudes for each harmonic. This description is fed into the inverse transform for the current function set to produce the time-domain waveform. The waveform is normalized to reduce amplitude variations across spectral changes. Oversampling depends on pitch: lower octaves have higher oversampling since the sample rate only varies by a factor of two. The Edge control interpolates the oversampling from point sampling to a cubic-spline interpolation (NURBS). Because the period of the full length of the waveform always evenly divides the sample rate, the additional aliasing is largely harmonic in nature.In many places in the signal path, there are soft-clipping stages that mimic analog-style clipping to give more warmth and complexity to the sounds generated.

Plugin Locations

Plugin presets install to:

Windows: C:\Users\Public\Documents\Noise Engineering\

Mac: /Users/[name]/Library/Audio/Presets/Noise Engineering/

Noise Engineering plugins are installed to the default locations for the specified plugin formats. In a majority of cases, plugins will not need to be moved. In the rare instance that you need to move your VST plugins, find them in the following locations.

Windows: C:/Program Files/Common Files/VST3/Noise Engineering/

Mac: /Library/Audio/Plug-Ins/VST3/

Note that AU and AAX plugins cannot be moved. For reference, they are installed here:

Mac AU: /Library/Audio/Plug-Ins/Components/

Mac AAX: /Library/Application Support/Avid/Audio/Plug-Ins/Noise Engineering/

Windows AAX: C:/Program Files/Common Files/Avid/Audio/Plug-Ins/Noise Engineering/

Preset Names

Plugin preset names are often weird. It's true. But you may find ours a little strange. Let us explain.

At Noise Eng, we are a small team of nerds. And faced with a daunting task like names for 500 presets for a single plugin, we do what we do best: we automate. We briefly considered using a dictionary, but if you've ever read a dictionary (at least one of us has), you'll know there are some words in there that at least one of our users is bound to not want popping up in their plugin. So we did a workaround.

Stephen, our chief noisemaker and also head engineer, went to the nerdiest resource he could find: the IETF, or the Internet Engineering Task Force. They produce documents for voluntary Internet standards. They are technical and cover things like Network File Systems, MD5, ISCSI, Secure Shell-2, and others. Want a nerdy list? Check it out [here](#).

The Requests for Comments series contain technical and organizational notes about the Internet. So we grabbed some of those and made our own dictionary. If some of the presets have very weird terms -- there is probably an esoteric technical meaning to it. If Joseph or some other name pops up, you can thank them for their contribution to trying to make the Internet a slightly more sane place.

Of course there was still the occasional questionable word here or there, so we went in and made a few adjustments. Now you may one day find a preset with the name Puppies_rainbows or with Unicorn in the name. You can thank Kris for that. Did we miss a questionable word you think we should take out? Get in touch and let us know!

And the categories? During early beta test (alpha beta?), one of our great testers let us know that some of the category names seemed like they were meant to be descriptive, but then were somewhat misleading. He was completely right, so we took a look at this and decided to revise. One thing we think about a fair amount here at Noise Engineering is creativity. In particular, we don't like telling people how to use something. This is part of why we name our products as we do (but that's a story for another day), and we decided to apply the same logic to the plugin categories. But we wanted to bring our normal sense of play to it so you'll find that each plugin has the presets categorized as themes suggested by the team here.

About NE

Noise Engineering is located in Los Angeles, California. We started around 2014 when Chief Noisemaker Stephen McCaul wanted a hobby for his off time from his day job and started making Eurorack modules in a spare bedroom at home. One thing led to another and a couple of years later, he and wife Kris Kaiser quit their day jobs and took the company full time. Noise Engineering has since grown in size and has established itself as a well-regarded and innovative synthesizer brand, with products in Eurorack, 5U, and multiple software platforms.

Special Thanks

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Douglas Hill

Josh Sager

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