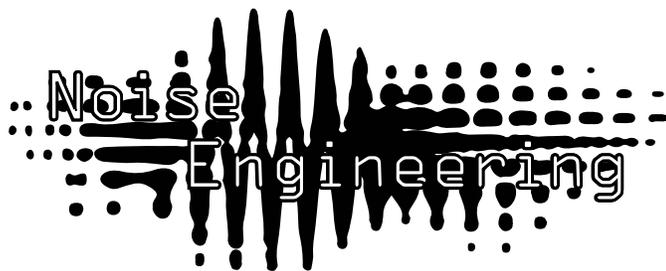


# Noise Engineering Soleo Vero

Patch-through stroboscope tuner



## Overview

Type	Tuner
Size	4HP Eurorack
Depth	.8 Inches
Power	2x5 Eurorack
+12 mA	42 mA
-12 mA	5 mA

Soleo Vero is a 4HP stroboscope tuner for up to three oscillators. Patch directly through the SV to avoid patching and repatching. Stroboscope allows tuning across a range of octaves on the fly...and even without audio monitoring. No more bumped oscillator surprises! Optional mode allows tuning to either the 440Hz and 432Hz standards.

## Etymology

Soleo -- from Latin *solere*: “to be accustomed to”

Vero -- from Latin *vero*: “without a doubt”

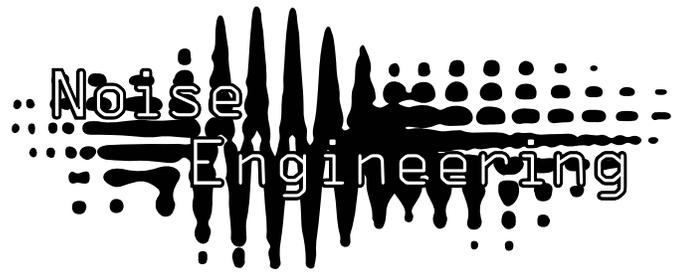
“I am in the habit of truth”

## Tuning Range

Soleo Vero tunes from the lowest A of 27.5 Hz to a highest A of 3520 Hz.

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## Patch Tutorial

Patch the output of an oscillator into Input 1. Choose input 1 with the input switch. Choose a note you'd like to tune to. Use your oscillator's pitch control to move to the octave you'd like to be in. When the pitch is close, the sharp or flat indicator LED will illuminate. Adjust the oscillator in the opposite direction and continue to tune up or down until the strobe stops moving. Optional: plug the output into a mixer to listen.

## Interface

**In:** three inputs, each normaled horizontally across the module to its output.

**Through:** output

**1/2/3 Switch:** selects which input is being tuned.

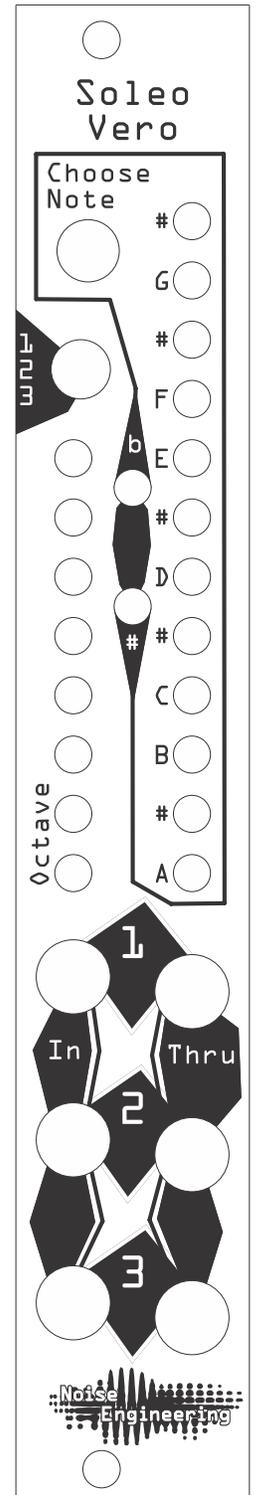
**Note:** Chooses which note you wish to tune to. Tap once to see current setting. Tap again to select another note. The selected note will be applied to all three channels.

**Octave:** The green octave readout gives a quick indication of the octave of oscillator's pitch. Use to cross reference across channels.

**Flat/Sharp:** blue LEDs that illuminate when coarse tuning an oscillator to tell you whether the oscillator is flat or sharp.

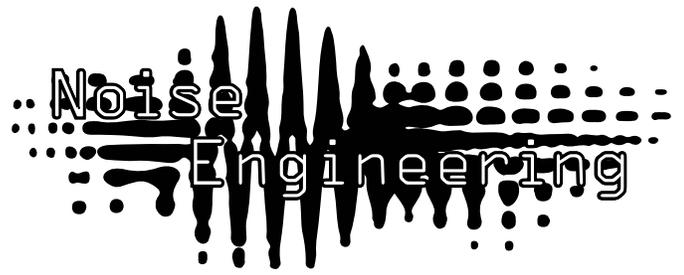
**Stroboscope:** The stroboscope portion of the display is the fine tuning readout. As with other stroboscope tuners, when the display stabilizes, the input oscillator is identical in pitch to the internal reference. As long as the strobe is stable or moving very slowly, the input oscillator will be in tune.

**Mode:** To change between



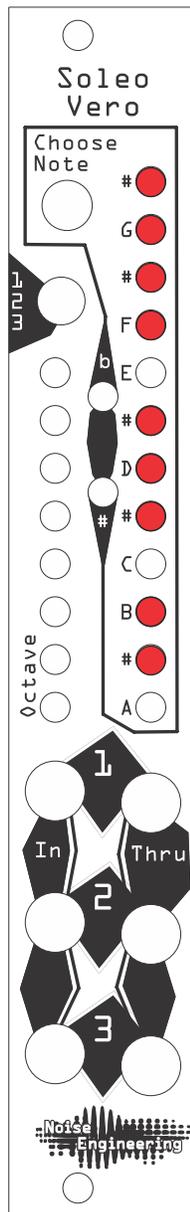
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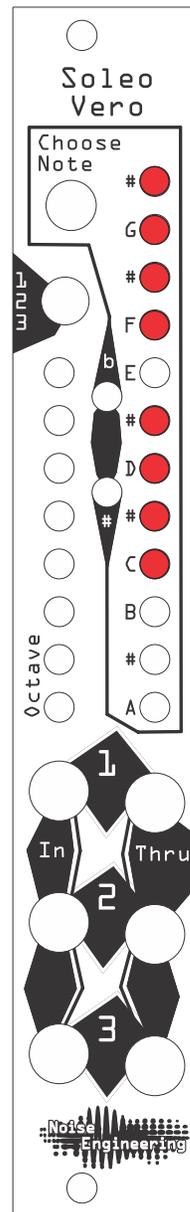


## Changing modes

**Mode:** To change between A=440Hz and A=432 Hz tuning standard modes, power cycle the SV while pressing the Note button. The illuminated lights on the stroboscope at startup will indicate the current mode



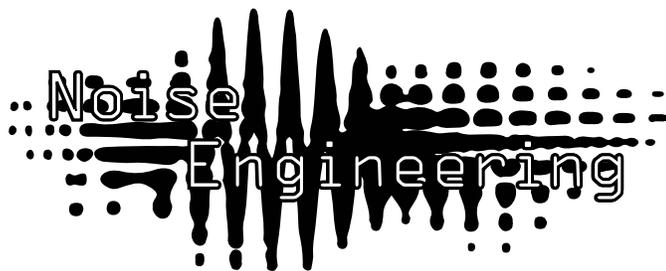
A=432Hz Mode



A=440Hz Mode

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Patch-through stroboscope tuner



## Technical Details

Stroboscopes are a really clever electro/mechanical/visual hybrid device that allow one to measure relative frequency with extremely high accuracy. A signal is generated from an accurate reference clock; this can modulate the signal to be measured. In older mechanical strobes, this modulation was performed by a disk with stripes painted on it rotated at an accurate speed while the input signal controlled the brightness of a lamp. This setup is a mechanical/optical computer that determines the correlation between the reference signal (a square wave at a particular frequency) and the input signal. Adjusting the input signal to have a stable correlation to the reference will minimize the frequency difference for clean input signals.

Soleo Vero uses similar principals but ditches the motor and disc with LEDs that are driven by the input signal and modulated by the reference clock. An accurate, precise and temperature/time stable crystal timebase forms the basis of this control and a microcontroller manages the various time base divisions and coarse measurements required for the display. The user's eye performs the final "calculation" which is significantly more precise than the ability of the ear to hear pitch differences.

Soleo Vero will work with any oscillator, but some with very complex waveforms may be tricky. For example the Loquelic Iteritas, with two oscillators, can be tuned through the following process:

Use the Master switch to choose the oscillator (A or B) you which to tune. Turn all tone settings low (if you are in PM Mode, turn Damp CCW for A and CW for B).

## Calibration

No calibration is needed during the lifetime of Soleo Vero.

## Design Notes

This module was borne out of the continuous feedback we both received from modular users on the difficulty of tuning oscillators (and keeping them in tune through transport, long patches, temperature changes, etc.). Tyler and Alex of WMD made a lot of helpful suggestions that affected the initial design. The idea of doing an electrical/optical correlation computer involving human perception as an integral feature was also of purely personal interest to Stephen as he has been deeply fascinated by analog, mechanical and various hybrid-technique computers for much of his adult life.

## Special Thanks

Joey Blush

Matt Lange

Instagrammers Deweythomas & Pozztronics for the 432Hz suggestion

Alex Anderson

Tyler Thompson