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Virt Iter Legio

Three-algorithm stereo oscillator with phase modulation and a vintage-inspired chorus on a flexible oscillator/DSP platform.

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Overview

Virt Iter Legio is a three-algorithm stereo oscillator with stereo phase modulation inputs and a vintage-inspired chorus. Astute users may recognize the oscillator algorithms – Bass, Harm, and SawX – from our contributions to the Arturia Microfreak and from our Virt Vereor plugin. Its simple interface and unique, immersive sound make it a staple for any style of sound design. Use the hard sync input to add an aggressive edge to sounds when synced to another oscillator, or try patching VIL's left and right phase modulation inputs independently for even further sonic exploration in the stereo field: trust us, stereo PM is something you'll want to hear. Turn on the beautiful, wide chorus and you'll have an endless supply of beautiful sounds. Not only is Virt Iter Legio a fantastic oscillator, it's also a platform: head to the Customer Portal to swap the functionality of your module to a growing number of alternate firmwares, completely free.

- **Type:** Stereo oscillator/platform
- **Size:** 6 HP
- **Depth:** 1.5 inches
- **Power:** 2x5 Eurorack
- **+12 V:** 140mA
- **-12 V:** 22mA

Etymology

Virt -- from Latin: "*strength*"

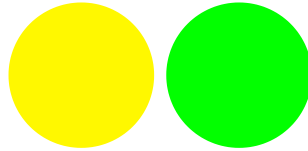
Iter -- Iteritas -- from Latin: "*repeat*"

Legio -- from Latin: "*legion, army*"

"Army of strong repetitions"

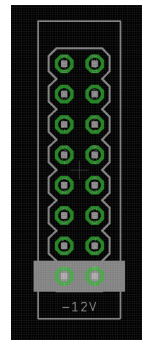
Color code

On boot, the Legio's LEDs will shine with this color pattern to indicate that it is running the current Virt Iter Legio firmware:



Power

To power your Noise Engineering module, turn off your case. Plug one end of your ribbon cable into your power board so that the red stripe on the ribbon cable is aligned to the side that says -12 V and each pin on the power header is plugged into the connector on the ribbon. Make sure no pins are overhanging the connector! If they are, unplug it and realign.



Line up the red stripe on the ribbon cable so that it matches the white stripe and/or -12 V indication on the board and plug in the connector.

Screw your module into your case **before** powering on the module. You risk bumping the module's PCB against something metallic and damaging it if it's not properly secured when powered on.

You should be good to go if you followed these instructions. Now go make some noise!

A final note. Some modules have other headers -- they may have a different number of pins or may say "not power". In general, unless a manual tells you otherwise, **do not connect those to power**.

Input & output voltages

Virt Iter Legio's CV-modulation inputs expect signals from 0 V to $+5\text{ V}$. The Pitch input's range is -2 V to $+5\text{ V}$. The Sync input responds to a rising edge around $+1.6\text{ V}$. The phase-modulation inputs are AC coupled and respond to any Eurorack audio signals. The audio output can reach up to 16 V peak-to-peak.

Calibration

Virt Iter Legio features an autocalibration system. The modules are autocalibrated and tested at the factory, but should you feel you need to recalibrate, just power the unit on with nothing patched to the Pitch CV input. The module will calibrate itself during startup.

Interface

Pitch (encoder)

Sets the pitch of the oscillator. Turn for fine tuning, press and turn for coarse tuning.

Pitch (CV)

1v/8va calibrated pitch CV input.

Flavor and Tang

The main tonal parameters on VIL. Their functions change depending on the selected algorithm: learn more in the section below called "Tone Generation."

Harm/Sawx/Bass

Changes the oscillator algorithm. More info on each algorithm can be found in the section below called "Tone Generation."

II/I/O

Activates the vintage-inspired chorus. 0 is off, I is some, II is lots.

Sync

Hard-sync input.

PM L/PM R

Phase-modulation inputs. Intended for use with audio-rate signals for complex harmonic patches, similar in sound to FM. Inputs can be used independently with separate signals, or with a single signal. Patching to **L In** will normal to **R In** for easy modulation.

Out L/Out R

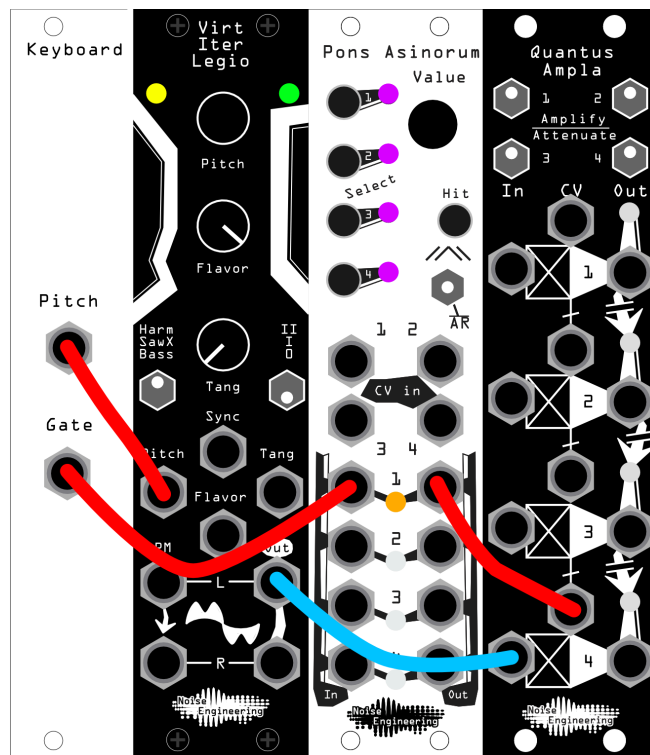
Main audio outputs.



Patch tutorial

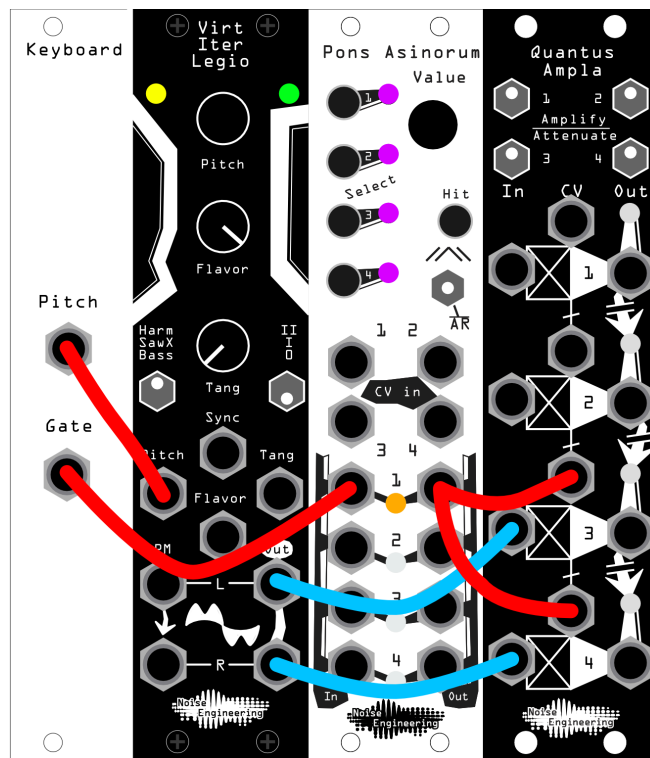
Simple mono voice

Patch Virt Iter Legio's **Out L** to a VCA. Monitor the output of the VCA. Patch an envelope generator to the input of the VCA. Patch the gate out of your keyboard or sequencer to the envelope generator, and the CV output to the **Pitch** input of VIL. Try out the **Bass**, **SawX**, and **Harm** algorithms, and modulate **Flavor** and **Tang** to hear the range of VIL.



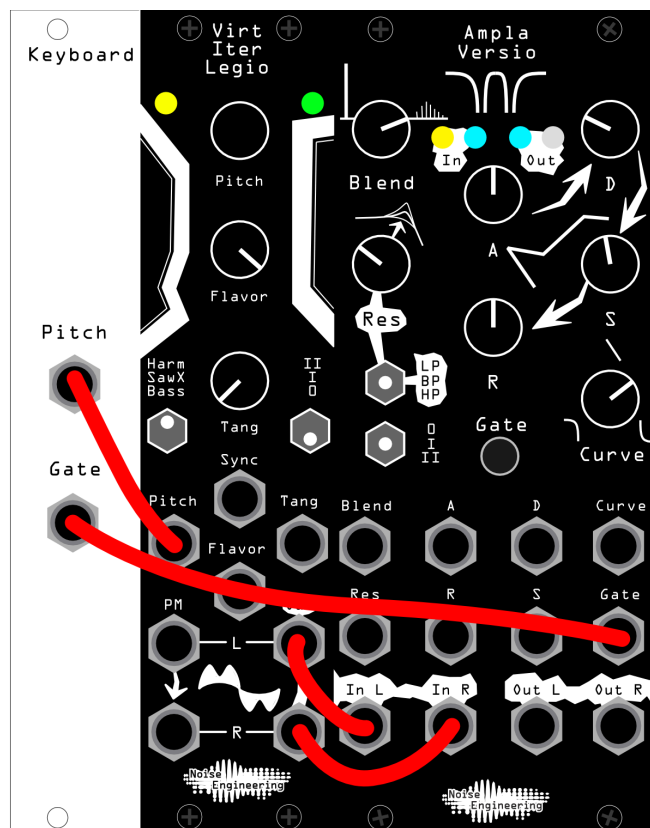
Simple stereo voice

Patch Virt Iter Legio's **Out L** and **Out R** to two VCAs. Monitor the output of the VCAs as a stereo pair. Mult an envelope generator to the input of the VCAs. Patch the gate out of your keyboard or sequencer to the envelope generator, and the CV output to the **Pitch** input of VIL. VIL's algorithms and parameters make use of the stereo field in different ways: try modulating them by hand or with CV to make things come alive. Try out different chorus settings with the **0/I/II** switch to make things even more lush.



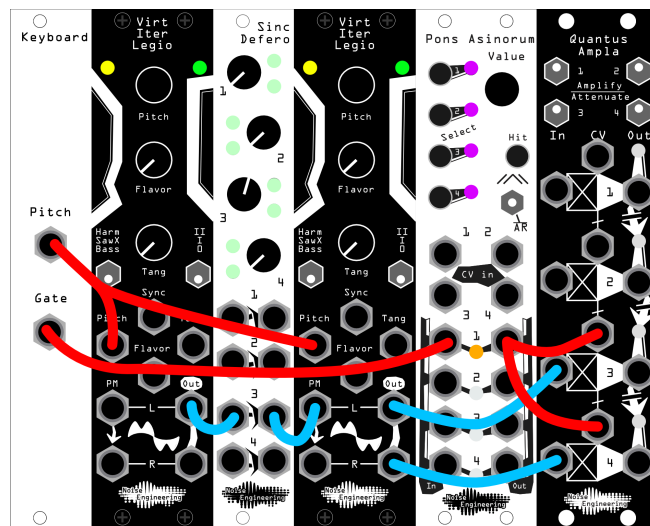
Simple stereo voice with Ampla Versio

If you have a Versio module, the Ampla Versio firmware is the perfect stereo dynamics controller for the Virt Iter. Simply patch the **Out L** and **Out R** of VIL into the inputs of Ampla Versio, patch your keyboard or sequencer's gate output to the gate in on Ampla Versio, and the CV output to the **Pitch** input of VIL. Adjust envelope and filter settings on Ampla Versio to taste.



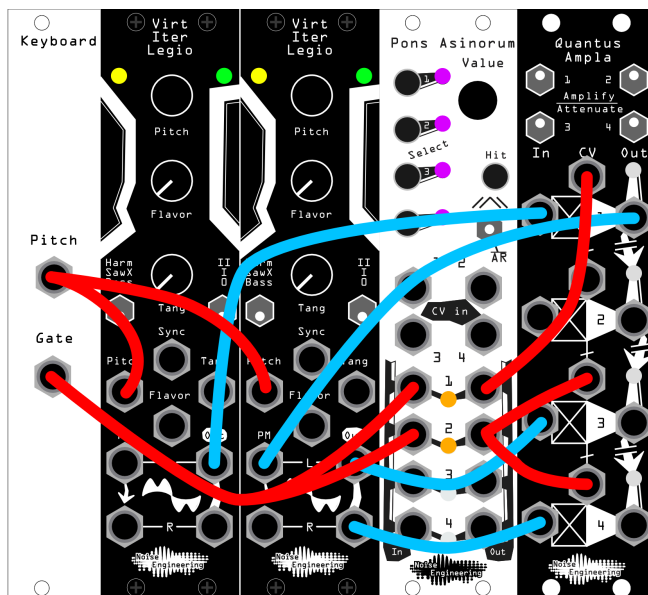
Simple PM voice

Patch Virt Iter Legio's **Out L** and **Out R** to two VCAs. Set VIL to match the settings shown. Monitor the output of the VCAs as a stereo pair. Mult an envelope generator to the CV inputs of the VCA. Patch a second oscillator (like another VIL!) through an attenuator and into the **L PM** input on VIL. Patch the gate out of your keyboard or sequencer to the envelope generator, and mult the CV output to the **Pitch** input of VIL and the 1v/8va input of your modulating oscillator. Adjust the pitch of the external oscillator and level of the attenuator to change the timbre of your sound. A second external oscillator can be patched through another attenuator and into the **R PM** input to create a wide stereo sound with different timbres in the left and right channels.



Complex PM voice

Patch Virt Iter Legio's **Out L** and **Out R** outputs to two VCAs. Set VIL to match the settings shown. Monitor the output of the VCAs as a stereo pair. Mult an envelope generator to the CV inputs of the VCA. Patch an oscillator through a VCA and into the **L PM** input on VIL. Patch a second envelope generator to that VCA. Mult the gate out of your keyboard or sequencer to the envelope generators, and mult the CV output to the **Pitch** input of VIL and the 1v/8va input of your modulating oscillator. Adjust envelope timing of both envelope generators and the pitch of the external oscillator to create different timbres. A second external oscillator can be patched through yet another VCA and into the **R PM** input to create a wide stereo sound with different timbres in the left and right channels.



The following patches demonstrate a variety of timbres possible with the Virt Iter Legio. They work well either as drones with the outputs patched directly to your mixer, or with the Simple Stereo Voice patches.

Reese



Hard sync

Optionally, modulate Flavor with an LFO and run the VIL output through a lowpass filter for traditional subtractive hard-sync sounds.



Organ



Firmware updating

Virt Iter Legio's firmware can be updated by the user via our firmware webapp on the [Noise Engineering Customer Portal \(https://portal.noiseengineering.us\)](https://portal.noiseengineering.us). Alternate firmwares available now transform the Virt Iter Legio into completely different modules, and open-source firmware development documentation is available [here \(https://noiseengineering.us/pages/world-of-legio\)](https://noiseengineering.us/pages/world-of-legio)..

To update the firmware on your Legio:

1. Turn off the power to your case and unscrew the module.
2. Remove the power connector on the back of the module.
3. Plug a micro USB connector into the port on the back of the module, and the other end into your computer.
4. Follow the instructions in the webapp.

Tone Generation

Virt Vereor contains three different algorithms for sound creation: Bass, Sawx, and Harm. These algorithms were originally developed as oscillators for the Arturia Microfreak and our Virt Vereor plugin, and now they can be a part of your Eurorack patches, too.

Bass

Some years ago, Bernie Hutchins, retired professor of Electrical Engineering at Cornell University, wrote a great series called Electronotes . Electronotes #73 includes reference to an algorithm called Bass (named after a person, not the clef). It's a simple algorithm that uses nonlinearities combined with quadrature modulation to produce a variety of tones. The Bass oscillator is based off of this algorithm, with a few Noise Engineering touches (fold anyone?) for more edgy sounds. Flavor controls the saturation of the cos oscillator. Tang controls a two-stage asymmetric wavefolder, and at the top 1/6th of the knob noise is added that is mixed in between fold stages, and also phase-modulates both oscillators.

Sawx

The SawX algorithm starts with a simple super-saw oscillator, and adds some saw-mod that can be ethereal or metal. SawX surprised us with its versatility. Flavor controls the gain into a modulus stage. Tang determines the amount of chorus added to the oscillator, and at the top 1/6th of the knob adds in phase modulation from subsampled white noise.

Harm

The basic Harm oscillator is a sinusoidal additive synth with a slight distortion stage: this time, a digital implementation of something similar to

our analog distortion module Pura Ruina. Flavor adjusts the relationship between the partials. At zero it is unison, at max it is octaves. The middle interpolates linearly in frequency. Tang controls an adjustable rectification of the individual partials, similar to half of a wavefolder. At the top 1/6th of the Tang knob, phase-modulated noise is mixed into the signal, too.

Design Notes

Virt Iter Legio was a long time coming. Announced in January of 2020 at NAMM, we were planning to launch soon after but... things happened. VIL has been in some stage of development ever since, and we regularly received questions about its release without being able to give any sort of definitive answer due to manufacturing and development hurdles, and parts shortages. We were able to order a final prototype in May of 2022 – more than two years after we had hoped it would be released – and verified the hardware so we could complete the testing of our first two firmwares. We appreciate each and every customer who asked about the Virt Iter Legio over the last couple of years, and we've shared your excitement: we're incredibly proud to launch the Legio platform, and we can't wait to share the other firmwares we've been working on.

Warranty

We will repair or replace (at our discretion) any product that we manufactured as long as we are in business and are able to get the parts to do so. We aim to support modules that have been discontinued for as long as possible. This warranty does not apply to normal wear and tear, including art/panel wear, or any products that have been modified, abused, or misused. Our warranty is limited to manufacturing defects.

Warranty repairs/replacements are free. Repairs due to user modification or other damage are charged at an affordable rate. Customers are responsible for the cost of shipping to Noise Engineering for repair.

All returns must be coordinated through Noise Engineering; returns without a Return Authorization will be refused and returned to sender.

Please [contact us \(https://noiseengineering.us/pages/contact\)](https://noiseengineering.us/pages/contact) if you think one of your modules needs a repair.

Special Thanks

- Arturia, especially Seb and Baptiste
- Jeffrey Horton
- ElectroNotes
- NAMM 2020
- All of the patient people who have been waiting since then...

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