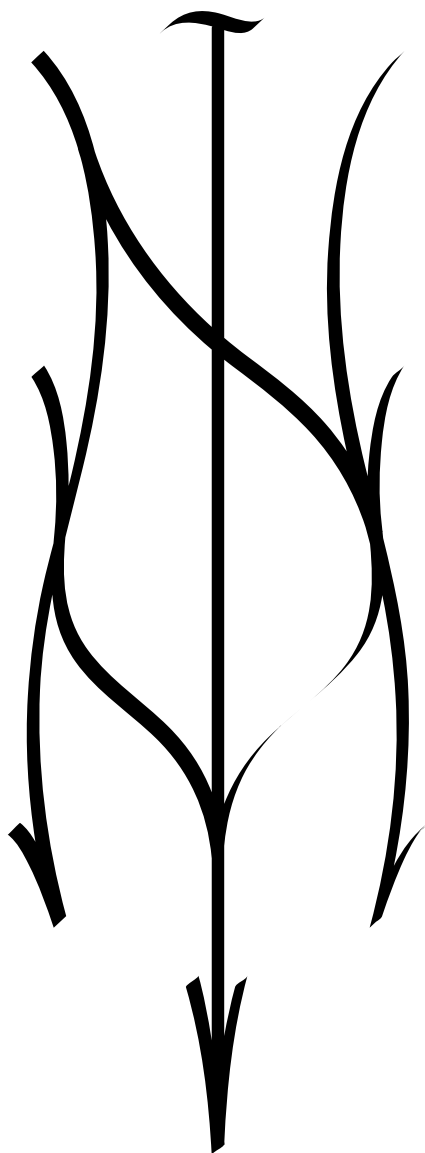# Infernal Noise Machine

flight of harmony

I.N.M. Features

IMP:
- Domains (frequency range groups)
  - 4 switch-selected
- Frequency adjustment
  - Coarse and Fine
  - Fine scaling adjustment (relative to Coarse)
    - 5:1 to 25:1
- Range adjustment (range of frequency variance within domain)
  - Coarse and Fine
  - Fine scaling adjustment (relative to Coarse)
    - 5:1 to 25:1
- "Tone" control
  - Variable between low-pass and all-pass
    - Adjustment also varies phase interaction
- Control Voltage (CV) inputs
  - Frequency: 0 to +5V
  - Range: 0 to +5V

Voltage-Controlled Oscillator (VCO):
- Waveforms
  - Square
  - Saw
  - Ramp
  - Triangle
  - Sine
- Variable base frequency
  - ~0.5Hz – ~140kHZ
  - Temperature compensated
  - 1V/oct
  - CV input: ±12V
- Frequency Modulation
  - Selectable modulation source
    - Noise Signal from Imp
    - External signal
  - Variable modulation depth
  - External signal input
  - Level control

Dual Voltage-Controlled Bandpass Filter (VCBPF), one per channel:
- Selectable Input signal
  - VCO waveforms

- o IMP output
- • Variable Center Frequency (f_c)
  - o CV input: ±12V
  - o CV attenuator
- • Variable Gain
  - o Q varied with Gain

Dual Voltage-Controlled Amplifier (VCA), each channel:
- • Variable level
  - o CV input: ±12V
  - o CV attenuator
- • V_{out}max. = ±5V ($10V_{p-p}$)

<u>What is it?</u>

THIS IS NOT A MUSIC SYNTHESIZER

Get that out of your head right now.

The Infernal Noise Machine was designed towards the creation of noise, sound effects, and for the general field of sound design. Having said that, the INM can create "musical" tones and sound – and quite a few of them – but that was not the goal. It is semi-modular, which means part of the signal path is hard-wired and cannot be changed, but it does allows some variation and external control. It can be used completely independently, but is intended for use with external control voltage (CV) sources to affect or modulate various parameters, which is where the INM truly comes <u>alive</u> (you will see what I mean).

So what can you do with it? Incidental sounds and ambiences, unholy caterwauling, soundscapes from melancholy to manic, even percussion and other traditional musical sounds. The Infernal Noise Machine is particularly effective for making drones that evolve with time as well, with no external sources required. The internal architecture allows for a wide range of self-evolving, beat-frequency style tonal variations over an infinite range of rates. There is really no simple way to describe what the INM can do – you have to find out for yourself. This is a unique device. It requires a bit of time and patience to get a feel for how it works, but it is worth the effort.

The INM does not operate the same way as a traditional synth. The traditional signal path in a synthesizer can be generalized as the following:

oscillator → filter/effects/mixing → output

The oscillator is the "heart", so to speak, and everything else comes further down the line. External modulation sources are used to vary different aspects of the components of the chain, e.g.: oscillator frequency, filter cutoff frequency and resonance, output level, and so on.

With the INM, the signal path is a bit different:

fig. 1

Infernal Noise Machine
flight of harmony
Block Diagram
11/11/2009
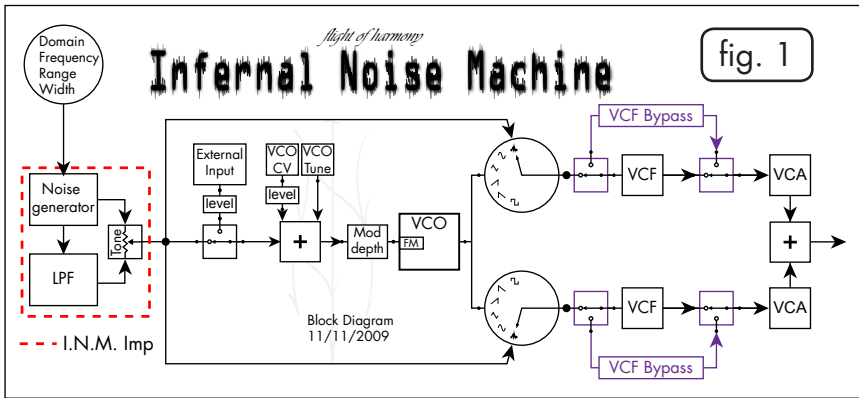
The voltage-controlled oscillator (VCO) is <u>not</u> the heart, but an effect. The heart of the INM is the **Imp**, a voltage-controlled noise source. The VCO is used to "color" the tone of the noise. While the actual signal path is technically the same as traditional synths, with the Imp being used to modulate the frequency of the VCO, the key to proper use of the INM is that the Imp is the core, and the VCO is an effect. The control panel is specifically laid out to enforce this relationship (figure 2).

fig. 2

Infernal Noise Machine

Main filter section — Filter bypass — VCA section — IMP — VCO
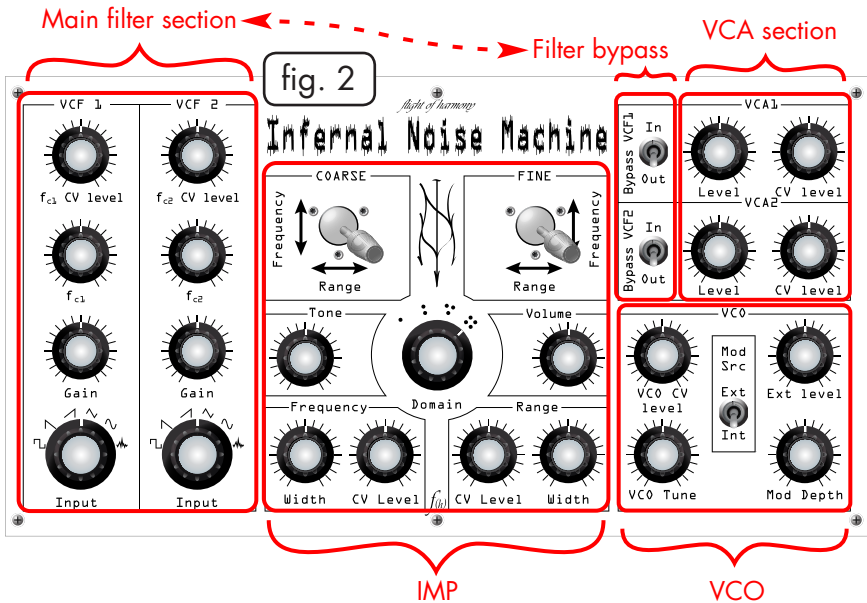
CONTROLS AND USAGE

Here is a brief explanation of the controls and their usage, described in the same order as the signal path (see figure 1).

IMP

• **Domain, Frequency, Range and Width:** Technically, all four describe the same Function: what frequency the Imp puts out. The total possible range of the Imp, however, is from subsonic to ultrasonic, and accessed in different ways requiring multiple controls for fine-tuning.

• **Domain:** The first stage of frequency selection. Domain selects one of four wide bands of the overall range. Four Domain is lowest, One is highest (in frequency). Four is audio, One is nearly ultrasonic. The One Domain is where you will find the oddest/most ethereal Noises: static, wind, the impression of voices. It has a lot of what seem to be dead spots, but it is worth the time to wander the Domain and see what can be found.

When modulating the VCO, the greater effect is when the VCO and the Noise frequencies are closer together, i.e., the effect is minimal when the VCO is in the bass range and the Noise Domain is in One, but extremely dominant when similar in frequency.

• **Frequency:** This is the main frequency control within the selected Domain - it sweeps over the entire Domain (depending on Range, see following). The Fine control sweeps up to 1/5 of the size of the band that Coarse does.

• **Range:** This controls how wide of a sweep Frequency covers. Fine control same as with Frequency.

• **Width:** This one is a bit more esoteric: it controls the "width" of the band of the current domain that the Fine controls cover, hence the "up to 1/5". In Domain 1, wide open is best. In Domain 1 the bands of sound are very narrow, so it is best to set the width all the way down to find the hidden sweet spots.

In other words, a quarter of the possible frequency range is selected by Domain, and the other controls select how much of that Domain the frequency control can sweep across. The Coarse joystick is for a broad sweep over the Domain, and the Fine joystick is for finding the perfect "sweet spot".
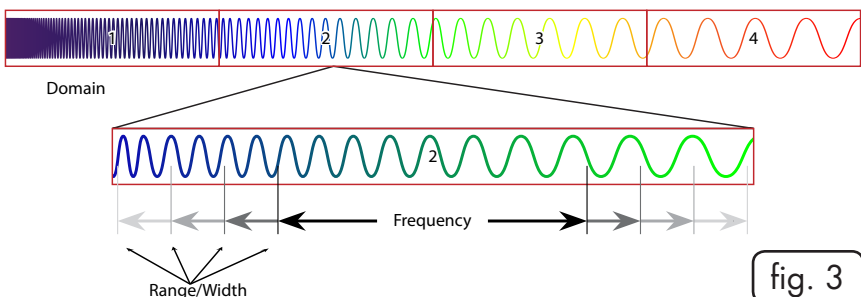

fig. 3

CV Level: The CV inputs have attenuators to adjust the level of external signals. Fully clockwise is the actual CV level, fully counter-clockwise is full attenuation.

Tone: The Noise generator has two output amplifiers - a boost/buffer and a low-pass filter (LPF), the Tone knob controls the mix between these two outputs. The phase relationship between these two outputs varies depending on the Noise frequency; sometimes in phase, sometimes 90°, sometimes 180°, and everything in between.

VCO

CV Level: Controls the attenuation of the external CV signal.

VCO Tune: Tuning control to adjust the frequency of the VCO.

Mod Src: Selects which signal is used to modulate the frequency of the VCO. **Int** selects the Imp, **Ext** selects the **Ext In** input. The switch should be to the **Int** position when no external source is connected.

Ext Level: Controls the attenuation of the **Ext In** signal.

Mod Depth: Controls how "deeply" the selected frequency modulation (FM) source affects the VCO. Turn fully clockwise for maximum modulation, fully counter-clockwise for zero modulation.

Main Filter Section:

After the VCO, the signal is routed the filter section, where it is split into two paths to feed into the two VC bandpass filters.

Input: These switches select one of the available waveforms to send to the filter. The first five are supplied by the VCO - Square, Ramp, Saw, Triangle, and Sine, while the sixth connects the filter input directly to the output of the **IMP** – think of it as a VCO bypass.

Filter Bypass

Here we take a quick jump up by the VCA section, to the **Bypass VCF1** and **Bypass VCF2** switches. These two switches allow you to bypass the voltage-controlled filters (VCF) and send the selected signal (selected with the **Input** rotary switches) directly to its voltage-controlled amplifier (VCA) with no filtering. Now back to the filters:

Gain: Controls the gain of the filter. Fully counter-clockwise is (almost) full attenuation, fully clockwise is maximum gain. The gain is similar to "depth", but also greatly varies the filter character. Actual quantitative gain is dependent on the input frequency, so it's all over the place.

fc1 & fc2: These should be read as: "center frequency of filter 1 & center frequency of filter 2". These controls are used to change the f_c of the filter, changing what frequency band is emphasized and the overall tone of the signal.

CV Level: Controls the attenuation of the external CV signal. For the VCBPF, the CV varies the center frequency.

VCA section

This is the output section. Each of the two signals is sent to a VCA, and the outputs of the two VCA are summed together and sent to the output jack.

Level: The level control for the VCA. Fully clockwise is maximum (±5V), and fully counter-clockwise is full attenuation.

CV Level: Controls the attenuation of the external CV signal, used here to vary the level of the output signal.

Volume control

This is the last stop for the signal on its way to the output jack, the volume control. Turn clockwise for full volume, counter-clockwise for full attenuation.

Rear Panel

fig. 4
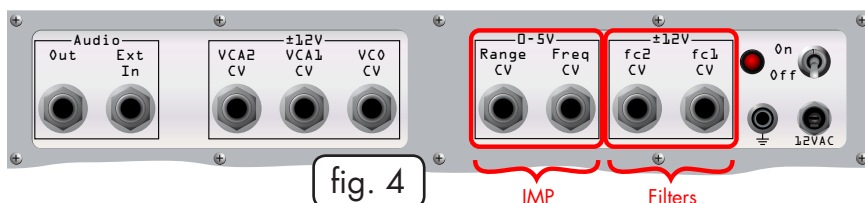
Here are the I/O jacks (Input/Output). Only one "O" – **Out**, the Output, the rest are "I" – the CV inputs mentioned above with the various CV Level attenuators, **Ext In**, the external audio input, and the power connections.

The CV inputs have their recommended input signal voltage range specified above the jack – please do not exceed these values. The **Range** and **Freq** are specified for 0-5VDC, but also have zener protection diodes, just in case the wrong signal is connected.

Power

The power section, with the ubiquitous power switch and power-on indicator. The INM requires a 12VAC 250mA source. The power jack accepts a 2.1mm x 3.5mm cylindrical-style power plug.

A binding post is provided for connection to equipment ground if required. The barrel of the post accepts the standard 4mm banana plug, and can be unscrewed to attach wires or other forms of connector.

Guarantee

All f(h) products are guaranteed against defects in manufacturing and workmanship for the lifetime of the product. Please contact us via email at: support@flightofharmony.com

Stuff

There is a lot of discussion about the Infernal Noise Machine on the Muffwiggler forums, come check it out! People have posted some excellent demos on there. I haunt the forums as well, and new things are posted there long before they hit the f(h) website.

http://www.muffwiggler.com/forum/index.php

A big thank you to those who have sent in suggestions and comments, keep them coming!

Send samples to: samples@flightofharmony.com

Comments, suggestions, complaints to: flight@flightofharmony.com

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http://www.flightofharmony.com

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