Rottnest FatKeys SSI2131 VCO/LFO User's Manual for Eurorack

Hello and thank you for using the Rottnest Voltage-Controlled Oscillator for Eurorack modular. We hope you will find its tones most pleasing!

Technical Specifications (Eurorack standard)
Width: 8hp
Depth: 28mm
Peak Current Draw: 36mA @ +12V, 30mA @ -12V
Output voltage range (Saw/Ramp, Pulse, Triangle): approx +/-5V (10Vpp)
Output voltage range (Complex): approx +/-4V (8Vpp) in "1-Fold" mode; +/-5V (10Vpp) in "2-Fold" mode

1. Connecting your Rottnest

Connect a power cable to the pin header at the top of the Rottnest pcb. The -12V side of the connector must be aligned with the silkscreen stripe indicator for proper use. This module is reverse diode protected, but it is still not recommended that you plug it in backwards to see what happens.

2. Theory of Operation

Rottnest Island (Wadjemup in Noongar, colloquially known as Rotto) is a 19-square-kilometer (7.3 sq mi) island off the coast of Western Australia. Rottnest is well known for its population of quokkas, a small native marsupial found in very few other locations. (*Source: Wikipedia*)

The Rottnest VCO is, at its core, a simple oscillator designed around the FatKeys SSI2131 VCO-on-a-chip and made possible by the incredible [documentation](link) provided by Sound Semiconductor. This chip performs outstandingly well both in terms of technical performance and sound, which makes it easy to design a great oscillator.

In designing the Eurorack-format Rottnest, we set out to create a great-sounding, performance-friendly and space-efficient VCO with as much useful functionality as possible, delivering everything a user could want in a "basic" VCO (well, apart from a sine!), while also nudging them in the direction of the weird and wild by way of a two-stage onboard Lockhart Wavefolder (inspired by the CGS52 Lockhart Wave Folder by Ken Stone, who was in turn inspired by "Nonselective Frequency Tripler Uses Transistor Saturation Characteristics" by R. Lockhart, Jr.) and two ranges of LFO.

The rich and thick harmonics generated by this oscillator, it's worth noting, will become wild monsters when paired with a nice resonant oscillator, for example our Marsupial Dual VCF or many other worthy contenders. As an LFO, meanwhile, the Rottnest can go really, really slow across all waveform types, making it very useful for generative ambient patches, for example.

3. Summary of Functions

Coarse Tune: Sets the starting frequency of the oscillator over a 10-octave range.
Fine Tune: Adjusts the starting frequency of the oscillator over approximately 1.5 semitones.
Lin FM Amt: Amount of Linear Frequency Modulation. Full CCW = 0 modulation.
Lin FM: Control Voltage input which changes the oscillator's frequency linearly. (Note: this output is AC coupled above approx. 1 Hz to preserve pitch in VCO mode.)

Expo FM Amt: Amount of Exponential Frequency Modulation. Full CCW = 0 modulation.

Expo FM: Control Voltage input which changes the oscillator's frequency exponentially.

Lo/Hi/Super Lo Switch: Sets the frequency range of the oscillator. (Lo = .02 Hz-30Hz; Hi = 10 Hz-20kHz; Super Lo = 0.0015 Hz-2Hz approx)

1V/Oct: Control Voltage input offering equal-temperament tracking with 1V/Oct scale.

S-Sync: Input for Soft Sync pulses, which will reset the Rottnest's waveform if it is close to the end of its own cycle. Note: for versions 1.5 and earlier, Soft Sync may cause the Rottnest to "lock up" at higher frequency settings. Sorry about that! The oscillator will be restarted by allowing the input signal (Gate, etc) to return to 0V, while unplugging it while the input is "high" will leave it locked. Don't worry, the "locking up" will not damage anything.

Pulse Width: Adjusts Pulse Width present at "Pulse" output jack and acts as an offset for the "PWM CV" input. With no CV input, full CCW = 0% Duty Cycle and full CW = 100% Duty Cycle.

H-Sync: 0-5V Pulse input which will reset the Rottnest's waveform. Note that the waveform will only partially reset at lower-rate LFO settings.

PWM CV: Control Voltage input determining the duty cycle of the Pulse output in conjunction with the "Pulse Width" knob. The full Pulse Width "window" can be spanned with an input range of 0-5V with the "Pulse Width" knob at Full CW, or bipolar voltage can be used with the "Pulse Width" knob adjusted further clockwise.

Saw/Ramp Switch: Selects the waveform present at the "Saw/Ramp" output jack. The upper position will produce a waveform which starts at +2.5V and linearly decreases to -2.5V before resetting, while the lower position will produce the opposite.

1-Fold/2-Fold Switch: Selects the number of Lockhart Wavefolder stages used for the Complex output. "1-Fold" produces a slightly asymmetrical Triangle wave triple the frequency of the root, while "2-Fold" adds harmonic folds.

Saw/Ramp: Output for the Saw or Ramp waveform, depending on the position of the Saw/Ramp switch.

Pulse: Output for the Pulse waveform, produced by a comparator on the Triangle wave.

Triangle: Output for the Triangle waveform.

Complex: Output for the Complex waveform, which is created by processing the Triangle waveform through 1 or 2 stages of wavefolder. The number of folds is controlled by the 1-Fold/2-Fold switch.

4. Patch Ideas

"Stepped LFO"
Set Range switch to "Super Lo" range and Coarse knob full CCW. Feed a Gate input into the Expo FM and adjust the level to taste. While the Gate is high, the LFO will move somewhat rapidly, while with the Gate low it will hold relatively steady, producing a "Staircase" in the shape of the nominal waveform output.

"Self Control"
Patch the Complex waveform output into the Lin FM input for a crazy FM-like sound in the "Hi" frequency range.

"Enveloped Pulses"
Turn the "Pulse Width" knob full CCW and feed a 0-5V envelope such as the output from a Serge DUSG into the "Pulse Width" input. This will cause the Pulse output to be muted at 0V input all the way up to 100% duty cycle at 5V input.

These are but three patch ideas, and a thorough exploration of the Rottnest can surely yield many more.