Hampshire Electronics

3340 VCO in Eurorack Format
Instructions and Details

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Overview

The Hampshire Electronics 3340 VCA is a 100% analogue voltage controller oscillator in the popular Eurorack format.

The oscillator utilises the famous 3340 analogue oscillator integrated circuit popularised by a range of classic analogue synthesizers from the 1980s onwards. The 3340 has recently re-entered production, enabling a new generation of synth enthusiasts to enjoy its stability and sound quality.

The key details of the oscillator are:

- 14HP Wide Eurorack module with thin profile (20mm deep from faceplate)
- Controls designed and laid-out with performance in mind
- 100% analogue circuitry
- Excellent stability and temperature compensation from the 3340 analogue oscillator IC
- 2 x 1v per octave inputs with excellent tracking across all octaves
- Coarse and fine-tuning knobs with a tuning defeat switch
- Output frequencies of all wave shapes from less than 1Hz to over 40kHz
- Standard 16-pin Eurorack power connector with clear markings to ensure correct connection orientation
- Simultaneous ramp, square, triangle and sine wave outputs
- 2 x exponential FM inputs accepting the standard +5v to -5v levels, each featuring an attenuator
- 1 x linear FM input accepting standard +5v to -5v levels, featuring an attenuator
- Pulse width control of the square wave output
- Pulse width modulation input for the square wave output, accepting the standard +5v to -5v levels and featuring an attenuator
- Classic 3340 hard and soft sync inputs accepting a 0v to 5v square wave input
- Diode protected power input
- 23ma @ +12v
- 24ma @ -12v

Installation

Power Availability

The 3340 VCO module draws the following current from your power supply:

23ma @ +12v

24ma @ -12v

You should first ensure that your power system has enough power capacity to drive the module before considering installation. If you are in doubt, please consult with your power supply manufacturer.

Connecting the Power

Refer to the writing on the back of the module next to the 16-pin power connector to ensure that you connect the power supply correctly. The +12v, -12v and ground (GND) pins will be clearly marked.

The power inputs are diode protected but damage may occur if the unit is connected incorrectly.

Fitment

Use the screws provided to firmly fit the module into your case. You should make sure that the module does not move when you insert and remove patch cables.

Using the 3340 VCO Module

The 3340 VCO module is the core of any synth system. It is the module that generated the initial sounds (waveforms) which are then manipulated by the rest of your modular synth set-up through patching.

The 3340 VCO module has a number of outputs and inputs which can be used to manipulate the sounds generated by the module.

Output jacks differ from inputs on the faceplate by virtue of having a white surrounding ring.

Tuning

The 3340 VCO module can be tuned using the defeat switch, coarse control and fine control.

The defeat switch is labelled 'Tuning On/Off'. Switching tuning off disables the coarse and fine tune knobs. With no other inputs into the module, all four of the outputs will output a waveform of frequency 32.7Hz, which represents the note C1. By switching tuning off you can quickly sync multiple oscillators when, for example, you are driving your synth from a MIDI source.

When the tuning switch is turned on, the coarse-tuning and fine-tuning knobs can be used to vary the base pitch of the waveforms generated by the module.

The module can be tuned to produce frequencies of less than 1Hz and greater than 30Hz.

Output Waveforms

The 3340 VCO module outputs four waveforms simultaneously and at the same pitch:

- Sawtooth
- Triangle
- Square
- Sine

The waveform outputs all have the voltage levels of -5v to +5v.

The sawtooth and square waveforms produce very rich harmonics and classic synth sounds. The triangle and sine waveforms produce less harmonics and are therefore softer, more subtle sounds. These can be very useful for producing a range of effects, such as sine for sub-bases or triangles for pads, as well as being used as modulation sources.

The output one of the waveforms, simple insert a patch lead into the appropriate jack socket. Voltage sources should NOT be inserted into the waveform output jacks under any circumstances.

CV Inputs

The module provides two CV inputs for 1 volt per octave control voltages. These are the main control inputs used to change the pitch of the outputs. The 1v/Oct standard is used across Eurorack oscillator modules and is compatible with most sequencing sources.

Both of the CV inputs are independent and can be used interchangeably.

The allowable voltages for CV 1 and CV 2 inputs is 0v to 10v.

Frequency Modulation

The 3340 VCO module provides a number of inputs and controls for frequency modulation.

Exponential Frequency Modulation

The two input jacks, FM 1 and FM 2, can be used to apply exponential frequency modulation to the output waveforms. The amount of modulation applied can be varied by the FM 1 and FM 2 attenuator knobs.

Exponential frequency modulation will double the frequency output for every volt added at either FM 1 or FM 2 jack, if no attenuation is used.

FM 1 and FM 2 jack inputs can accept voltages between –5v and +5v.

Linear Frequency Modulation

There is one linear frequency modulation input and an associated attenuator knob. This input performs a similar function to the exponential frequency modulation inputs but is linear in its operation. For every volt applied at the linear input the waveform output frequency is modulated by the same frequency amount, not a doubling as in exponential FM.

This leads to a more subtle FM sound.

The linear FM input can accept voltages between –5v and +5v.

Pulse Width and Pulse Width Modulation

Pulse width is a feature of the square wave output only. Using the PW knob will vary the duty cycle of the square wave meaning that the two phases of the wave, up and down, will no longer be equal but will become uneven as you turn the knob to either the left or the right.

The central position of the PW knob will result in a symmetrical square wave, turning either to the left or right will change the duty with the effect becoming more pronounced the further to either extremity the knob is turned.

The pulse width modulation input (PWM) enables the pulse width to be modulated from a voltage source. An attenuator enables the level of modulation to be changed.

The PWM input accepts voltage sources from –5v to +5v.

Hard and Soft Sync

The hard (H–Sync) and soft (S–Sync) jack inputs both have the effect of 'resetting' or 'reversing' the waveform at a frequency dictated by a square (pulse) wave inserted into the relevant inputs.

Using these inputs can generate a range of very interesting tones.

Both H–Sync and S–Sync can accept voltage sources from –5v to +5v.

The behaviour of the sync function changes depending on whether a negative or positive pulse is received. Experimentation is the best option when it comes to these intriguing sync inputs!

Trimming the 3340 VCO Module

The 3340 VCO module has a number of trim pots on the back, which serve both to set the core oscillator and the wave shaping behaviour.

Care must be taken when adjusting the trims pots and it is highly recommended that a good quality oscilloscope is used when making any adjustments.

Oscillator Core Trimming

The four multi-turn trim pots at the top of the back of the module relate to the core oscillator trimming. These have been factory set but may need fine tuning on a periodic basis to ensure tuning stability.

The module features the four trim pot model outlined by Rob Hordijk.

The trimming process should be carried out with the TUNING SWITCH TURNED OFF. The process is be as follows:

1. Using a voltmeter across the Tempco TP test point, adjust the *tempco adj* pot until the voltmeter reads 0mV.

2. Place a jumper over the two pins on the back of the module, connect a counter or oscilloscope to one of the outputs and adjust the *ref pitch* trim pot until the output frequency is 1046.5Hz. Remove the jumper.

3. Apply 5v to the CV1 input, connect a counter or oscilloscope to one of the outputs and adjust the *refind C6* trim pot until the output frequency is again 1046.5Hz.

4. Apply 0v to the CV1 input, connect a counter or oscilloscope to one of the outputs and adjust the *scale adj* trim pot until the output frequency is 32.7Hz.

The oscillator core will now be trimmed correctly. 0v at CV1 or CV2 will produce a C1 note (32.7Hz), while 5v will produce a C6 note (1046.5Hz), with correct scaling between.

Triangle and Saw Trimming

There are four trim pots that can be used to set both the overall scale and the offset for both the triangle and saw waves.

The trim pots have been factory set to produce a –5v to +5v output for both waveforms but this can be adjusted if required.

Sine Shaping

The sine shaping circuit can be trimmed using the *sine level* and *sine shape* trim pots. The *sine level* pot adjusts the squashing of the wave into a sine shape. The *sine shape* trim pot adjusts the balance of the waveform.

The trim pots have been factory set to produce a clear sine wave but they can be adjusted if required.