E330 Multi-Mode VCO

www.synthtech.com/eurorack/E330

What is the E330?

The E330 Multi-Mode VCO is a digital audio-rate oscillator with 3 different modes of operation, selected by a front panel switch. There are 2 parameter controls/CV inputs that vary the behavior of the E330 based on the mode.

The E330 is not designed to be a LFO, the SynthTech E355 Dual Morphing LFO is better suited and makes a great modulator for driving the E330.

Connecting to the power supply

The E330 uses a standard 16-pin Euro power cable. The -12V is the Red Stripe (Pin 1), and this is indicated on the pc board. Reverse-supply diodes will prevent the module from damage if the cable is reversed.

OVERVIEW

The E330 has 2 audio outputs **OUT1** and **OUT2,** which are controlled by **MODULATION A** and **MODULATION B** panel controls, respectively. Depending on the mode selected, these controls will alter the outputs in different ways.

The 2 CV inputs **MOD A** and **MOD B** are ***summed*** with the setting of the panel controls, so there is no attenuation built-in. The input voltage range is -5V to +5V, but in order to use this full-range the corresponding panel pot must be in the 12:00 (straight up) position, or the CV will be internally limited to the min or max endpoint(s). It is strongly suggested to use an external attenuator or VCA module to first attenuate the incoming CVs to get the widest range of possible sounds from the E330.

COARSE and **FINE** set the output frequency. **FM CV** input is attenuated by the **FM** panel control and summed with the **COARSE/FINE** settings. **1V/OCT** is a tracking 1V/octave CV input (no attenuator).

SYNC input will reset the VCO in all 3 modes, to minimum phase value if the sync signal exceeds 0.45V (positive-level sensitive).

2-OP FM Mode

2-OP is an abbreviation for Yamaha's '2-operator' FM synthesis. The E330 generates 2 sine oscillators and FM modulates one with the other. The modulated result is on **OUT 1**, while **OUT 2** has just the sine VCO which is modulating the carrier (the audio). The 2 parameters you can control are the Depth of Modulation (or the 'Index') using **MODULATION A/MOD A** and the 'Ratio', which is the ratio of the frequency of the modulator to the carrier, using **MODUALTION B/MOD B**.

The Index can vary from 0% (**OUT 1** is just a pure sine wave) to over 400% (harmonic sidebands). The Ratio is a 64-level, quantized look-up table as in the original Yamaha chips, from 0:0 (which means **OUT 2** is muted) to 7.875:1 (**OUT 2** is 7.875 times the frequency of **OUT 1**). The steps are in ratios of 0.125. This allows **OUT 2** to 'track' **OUT 1** as either a sub-harmonic of $1/8^{th}$ of **OUT 1** (a RATIO of 0.125:1) all the way past the 7^{th} harmonic (RATIO of 7.00:1).

OUT 2 can be used in many ways. Common patches are using an external mixer to 'add back in' the harmonics, or using a VCA to modulate **OUT 2**, then patching it back into the E330's **FM** input. This can create a wild assortment of audio from **OUT 1**, from gongs and cymbals to white noise bursts. Another common patch is to apply an envelope to **MOD A** CV in, which will produce drum sounds.

It is important to note that the internal audio sample rate of the E330 is 41KHz, so if the main audio out (**OUT 1**) has high INDEX and/or high RATIO, the sine output on **OUT 2** can be aliased which will result in 'odd and strange' waveforms. This may be useful in some situations.

MORPH Mode

MORPH mode generates 2 identical frequencies, but independent waveforms on **OUT 1** and **OUT 2**. The 32 wavetables used are from the E350 Morphing Terrarium and are listed at the website link at the top of Page 1. **MODULATION A/MOD A** selects the wavetable for **OUT 1**, and **MODULATION B/MOD B** selects the wavetable for **OUT 2**.

CLOUD Mode

Cloud mode is a 4-oscillator Sine and Saw VCO with variable detuning, called 'Spread'. This is equivalent to a subset of the E340 Cloud Generator, without the independent 'CHAOS BANDWIDTH" control.

OUT 1 has the Sine VCO and **OUT 2** has the Sawtooth VCO. With the 2 MOD controls at '0' and no CV inputs, the VCOs are a single pitch ('unison' tuned). As **MODULATION A/MOD A** is increased, the 4 frequencies spread apart ('detune') to cause beating, which richens the sound. The range of 'Spread' is from very small to very wide.

The second control, **MODUALTION B/MOD B**, also detunes the 4 VCOs but does so using filtered noise (similar to the 'CHAOS' in an E340). At small settings, this adds a 'shimmer' effect to the overall detuned sound. As the depth is increased, the outputs evolve into a mass of buzzing clusters of audio (the 'angry bees' setting). In general, just a small amount of effect is needed to get the deep 'detuned lead sound'. Setting Spread to '0' and Chaos to '10' will generate noise out of both outputs.

General Info

CV Inputs: -5V to +5V, DC to 8KHz.
Audio Output: 9V pk-pk (typical 10V pk-pk max), 41KHz sample rate, 16bits.
Frequency Range (OUT 1): 16Hz to 18KHz (OUT 2) 2Hz to ~21KHz.
Power supply range: +-9V to +-15V
Power supply current (typical): -12V @10ma +12V @ 48ma

1V/OCT trimmer:
There is a trimmer to adjust the VCO scaling to 1V/OCT as needed.