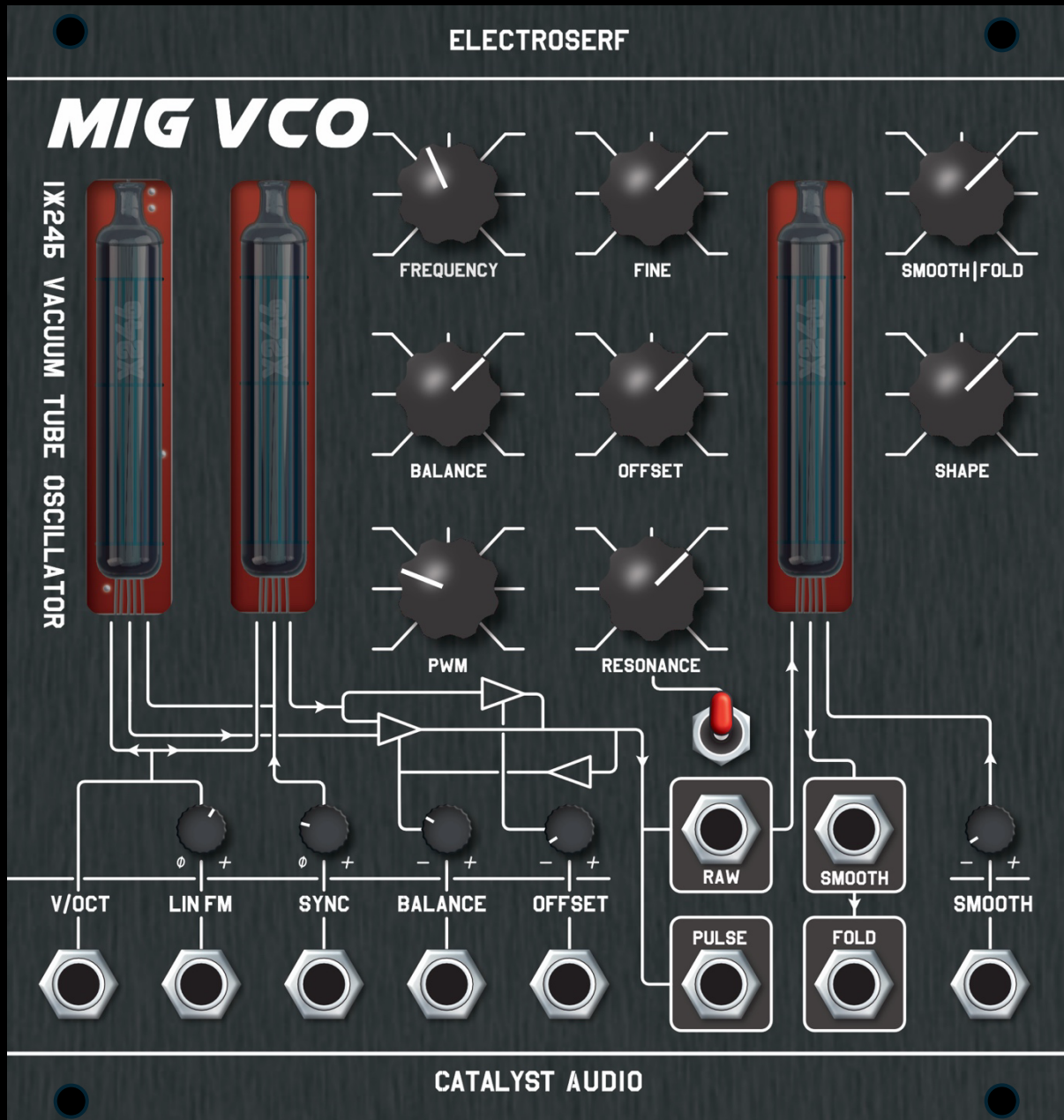


MIG VCO

DUAL VACUUM TUBE OSCILLATOR

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[01 DESCRIPTION]

The Catalyst Audio / Electroserf Mig VCO is an analog voltage-controlled oscillator designed around a dual tube-based oscillator core. Two matched tubes reset each other at double the oscillator output frequency with each individual tube creating 1/2 of the final output waveform.

These two halves are then offset and shifted from one another to create a variety of different waveshapes. These waves can be further dynamically altered by using the internal feedback pathway available via the resonance control.

The waveshapes produced by the oscillator are then sent through various analog processing stages to further alter the outputs. Pulse / Square waves are available at the Pulse output, and the main RAW output is sent through a third tube dedicated to saturating and smoothing the waveforms. This signal is available at the Smooth output. The signal from the Smooth output is then sent through a 4-stage discrete transistor based waveshaper where it appears at the Fold output.

[02 SPECIFICATIONS]

HP	24
POWER DRAW (+RAIL)	88 mA
POWER DRAW (-RAIL)	116 mA
MODULE DEPTH	approx. 25mm

[03 MAIN CONTROLS]

>> FREQUENCY

The main tuning pot sets the initial VCO frequency.

>> FINE

Offsets the main tuning pot for fine tuning adjustments.

>> OFFSET

Adds or subtracts an offset between the outputs from each vacuum tube.

>> BALANCE

Vacuum tube #2 can be set to output a sawtooth wave (ramp down) or a ramp wave (ramping up) or a mix of both. The balance control determines where in the oscillation cycle that vacuum tube #2 output switches between ramp up and ramp down.

>> PWM

The PWM pot determines the comparator threshold for the Pulse output. Any time that the waveform is above this threshold the pulse output will be HIGH; when it is below this threshold the pulse output will be LOW.

NOTE: The PWM pot only affects the pulse output. No change will be heard on any other output.

>> RESONANCE

The resonance parameter is unique to this oscillator and something that is (to our knowledge) impossible with other types of oscillator cores. This feeds some of the output signal back into the vacuum tubes and dynamically alters the waveshapes even further. The switch below the resonance control offers two different "flavors" of resonance.

>> SMOOTH / FOLD

Controls amplification of vacuum tube #3. At full CCW the tube is essentially off and there will be no output from either the Smooth or Fold outputs. As the pot is turned CW the amount of amplification increases and as the tube begins to saturate, the waveform edges smooth. After the tube is fully saturated, additional amplification will begin to smoothly clip and turn the wave into a soft square.

>> SHAPE

The shape pot essentially controls the biasing of vacuum tube #3. When CCW the waveforms amplified by tube #3 will have more high end emphasis, in the center the waveforms should be (mostly) linear, and going beyond the pot's 12:00 position will smooth out some of the high end and overemphasize the low frequency content.

[04 CV INPUTS]

>> 1/V OCT INPUT

Allows the oscillator to track pitch CV across 4 to 5 octaves.

>> LIN FM INPUT

Adjustable FM CV parameter.

>> SYNC INPUT

The MiG VCO has an adjustable sync system that will synchronize to almost any type or size of input waveform. Due to the unique nature of the tube oscillator core, there is no single device to retrigger in order to synchronize the oscillator. The MiG VCO sync system can instead reset either or both oscillator tubes depending on the type, phase, and frequency of sync waveform being input, as well as the setting of the sync input level control.

>> BALANCE INPUT

CV input for controlling the Balance parameter. The Balance pot sets the initial balance level and the CV attenuverter (just above the input jack) determines if CV is either added (clockwise) or subtracted (counterclockwise) from the initial pot setting.

>> OFFSET INPUT

CV input for controlling the Offset parameter. The Offset pot sets the initial offset level and the CV attenuverter (just above the input jack) determines if CV is added (clockwise) or subtracted (counterclockwise) from the initial pot setting.

>> SMOOTH / FOLD INPUT

Controls the amplification of Tube #3 and alters the waveshape at the Smooth output and going into the wavefolder.

[05 OUTPUTS]

>> RAW OUTPUT

Main output from the oscillator core as described above.

>> PULSE OUTPUT

Runs the RAW output through an adjustable comparator with it's own threshold control via the PWM pot. Since this output is based on the RAW output, the more complex the waveform is, the more complex the pulse output will be. PWM effects can be created by modulating the Offset and Balance CVs.

>> SMOOTH OUTPUT

This output is the RAW output run through a third vacuum tube that can be pushed into saturation to "round off" the edges of the waveform produced at the RAW output. The Smooth/Fold pot controls amplitude of the third vacuum tube and can vary between completely off, wll the way to full tube saturation. This parameter is also under CV control and can additionally be used as a crude VCA. The Shape pot essentially controls the biasing of the third vacuum tube and allows the curvature of the waveform to be altered.

>> FOLD OUTPUT

Takes the "smoothed" waveform from above and runs it through a 4 stage discrete transistor wavefolder.

[06 ADDITIONAL INFORMATION]

All the VCOs are calibrated to track at least +/- 10 cents across 4 octaves and are temperature compensated. To put this into context - they track about as well as a 1970s era analog synth. However, if you are looking for +/- 1 cent accuracy across 8 octaves, these are not the oscillators for you.

NOTE: As pitch of the oscillator decreases, the amount of current running through the tubes also decreases. Under certain conditions (very low pitch with high levels of FM modulation or negative voltage on 1/V oct input) the tubes can become so starved of current that they cannot oscillate anymore. This is a very rare occurrence and we have taken great care to ensure that this doesn't happen. However, if your oscillator ever stops oscillating, a quick turn of the tune knob to a higher pitch should immediately restart oscillation.

The effect of the balance and offset parameters can be hard to visualize without access to an oscilloscope. Here is a simple visualization to help explain how these functions work.

