E490 Ladder VCF

www.synthtech.com/eurorack/E490

What is the E490?

The E490 Ladder VCF is a 10HP, Moog 904A 4-pole lowpass filter using modern transistors, but exactly matching the characteristics of the original. MOTM users will recall the MOTM-490 VCF, on which this circuit is based. Using these new, matched dual and quad transistors allows the E490 to have lower noise and better tracking than the 904A without changing all the 'quirks' in the sound.

The 904A has several distinct characteristics which the E490 duplicates:

- Low frequency self-resonance begins at 72Hz
- There is a mid-frequency 'dip and bump' due to the feedback phase shifts
- The output amplitude drops as resonance increases
- The resonance drops as the amplitude increases
- The filter will 'track sharp' past 400Hz (it tracks OK 100 – 400Hz)
- If you push the RANGE trimmer to max, it can oscillate to over 20KHz

Connecting to the power supply

The E490 uses a standard 16-pin to 10-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 being damaged if the cable is reversed.

OVERVIEW

The E490 has 2 audio inputs **IN1** and **IN2,** which accept standard 10V pk-pk Euro audio levels. Attenuators are set so that if 2 inputs are used, each at 12:00 position will not overdrive the filter. Note that there is a "sweet spot" for the classic Moog sound, balancing audio amplitude with resonance. The push-on/push-off **DIST** (Distortion) switch adds a 2x gain before the filter stage, which allows 'overdrive Moog' sounds based on patching MiniMoog's headphone out back to the external input.

There are 3 CV inputs: **1V/OCT** tracking (which has a rear trimmer to adjust), **2/3 OCT** tracking which is found on the Moog modular keyboards and some MiniMoogs, and **FM IN**, which is controlled by a reversing attenuator.

The 2 main panel controls are:

FREQUENCY: sets the filter's corner frequency from 10Hz to the upper limit of the RANGE trimmer. This trimmer is factory set to ~14KHz but can be adjusted from ~7KHz to 22KHz.

RESONANCE: sets the feedback amount, which in turn will reduce the output amplitude. When the E490 is in self-resonance, the sinewave output amplitude will increase as either RESONANCE or FREQUENCY is increased.

General Info

CV Inputs: -5V to +5V, DC to 8KHz.
Audio Input: +-5V pk-pk per input. Note internally, the filter starts to distort around +-3.8V pk-pk
Self-resonance range: 72Hz to 14KHz (factory set), trim adjust up to 20KHz.
Power supply range: +-11V to +-13V
Power supply current (typical): -12V @14ma +12V @18ma 10-pin male shrouded connector
Size: 10HP wide, 31.6mm depth behind panel (power cable inserted)

1V/OCT trimmer:
There is a trimmer to adjust the VCO scaling to 1V/OCT as needed. Use 100Hz – 400Hz (2 octave jumps) to set for best tracking over the audio range

RANGE trimmer: sets the maximum frequency of self-resonance