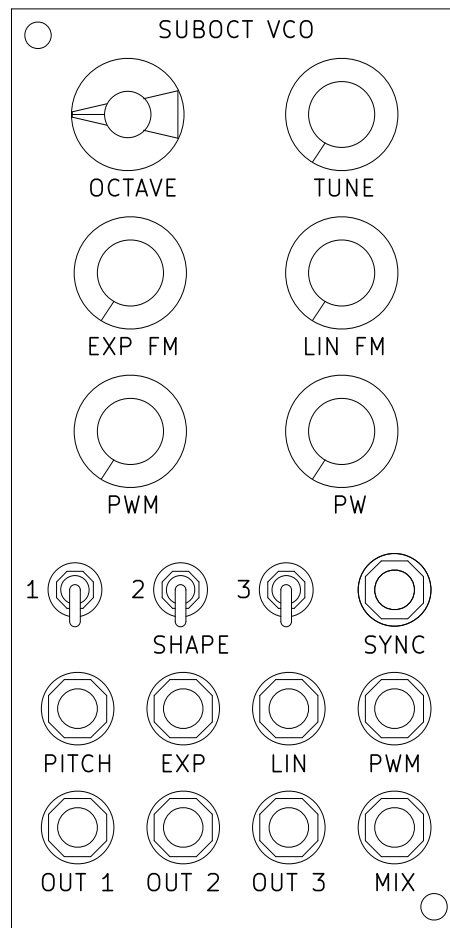


.: Sub-Octave VCO User Manual .:

Brief:

Voltage Controlled Oscillator with two sub-octave generators. Each of the three octaves has a switch to select either Triangle, Pulse, or Sawtooth waveforms. Additionally, a mix of the three octaves is available as an output as well. 1 volt per octave control, exponential and linear Frequency Modulation are available, as well as Sync and Pulse Width Modulation. All waveform outputs have a range of +/- 5 volts.

Panel layout:



Description of the controls:

- OCTAVE: rotary octave switch.
- TUNE: fine tune control.
- EXP FM: attenuator for the EXP (exponential FM) input.
- LIN FM: attenuator for the LIN (linear FM) input.
- PWM: attenuator for the PWM (pulse width modulation) input. The PMW signal is applied to the pulse waves of all three of the octaves.
- PW: manual Pulse Width control. The manual pulse width control signal is applied to the pulse waves of all three of the octaves.
- SHAPE switches: selects the waveform for octaves 1, 2, and 3. In the UP position, Triangle waves are selected, the MIDDLE position selects Pulse waveforms, and the DOWN position selects Sawtooth waveforms.

Description of the jacks:

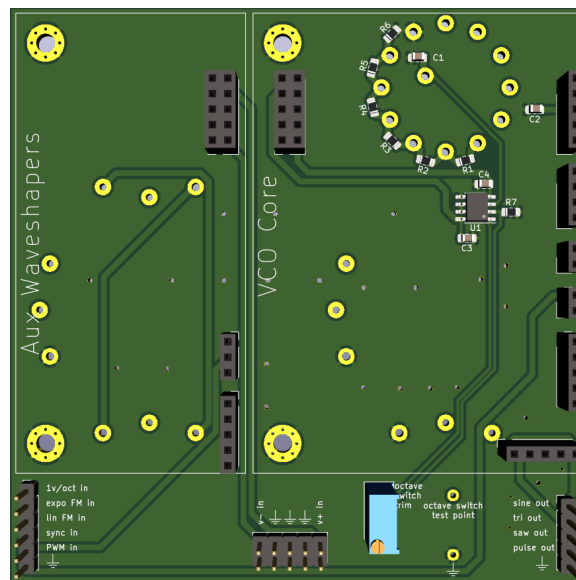
- SYNC: synchronization input. Plug the output of a different VCO into this jack for sync effects. For typical sync sounds, the “master” VCO (the one plugged into the sync jack) should be tuned to a lower frequency than the “slave” VCO.
- PITCH: 1 volt per octave input jack.
- EXP: attenuated exponential frequency modulation input.
- LIN: attenuated linear frequency modulation input.
- PWM: attenuated pulse width modulation input.
- OUT 1: output for the base octave. Triangle, pulse, or sawtooth wave depending on the position of the SHAPE 1 switch.
- OUT 2: output for the first sub-octave, one octave below OUT 1. Triangle, pulse, or sawtooth wave depending on the position of the SHAPE 2 switch.
- OUT 3: output for the second sub-octave, one octave below OCT 2. Triangle, pulse, or sawtooth wave depending on the position of the SHAPE 3 switch.
- MIX: output containing a mix of the three octaves.

Mechanical structure:

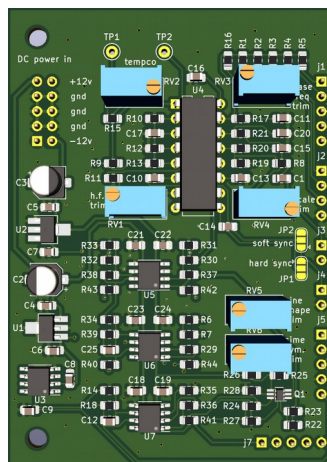
The VCO is constructed with a “motherboard” which houses the potentiometers and octave switch, and a “VCO core” pcb that plugs into a port on the motherboard. The motherboard also has a port for an auxiliary waveshaper pcb, but the dual-range VCO does not use this feature.

Below is an illustration of the boards and how the VCO core plugs into the motherboard:

The motherboard pcb:



The VCO core pcb:



The sub-oscillator auxiliary waveshaper board:

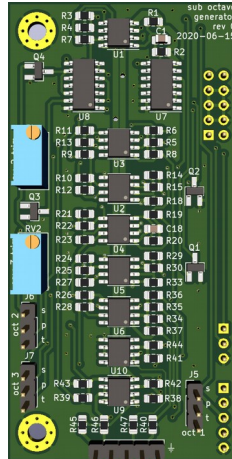
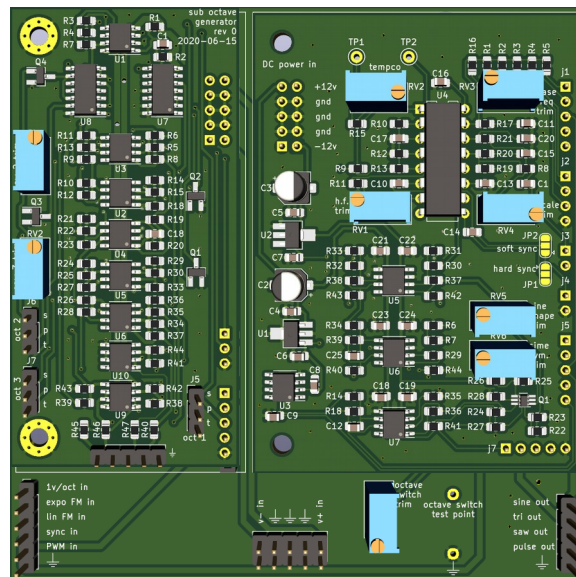


Illustration of mating the pcbs together:



Calibration:

Sub-oscillator calibration:

- Monitor the 1-octave-down sawtooth wave with an oscilloscope.
- Adjust the “saw 2 trim” until the ramp connects smoothly.
- Repeat this process with the 2-octave-down sawtooth wave and the “saw 3 trim”.

VCO tuning calibration:

- First turn down the high-frequency compensation circuit by turning the “h.f. trim” clockwise ten turns, or until you hear a small click.
- Next calibrate the temperature compensation by adjusting the “tempco trim” until the difference between test points TP1 and TP2 is as close to zero volts DC as you can get.
- To calibrate the octave scaling, connect the 1volt per octave signal you intend to use to the PITCH jack. Play octaves while adjusting the “scale trim” trimpot until the octaves between about 30Hz and 500Hz are in tune with each other. Use either a frequency counter or a guitar tuner, or even your ears to do this.
- The VCO may go flat a bit at higher frequencies. To compensate for this, adjust the “h.f. trim” trimpot to cause higher frequencies to become more sharp.
- You may need to go back and forth with the “scale trim” and “h.f. trim” adjustments to get the VCO to be as in-tune as possible over the widest frequency range.
- Finally, set the octave switch to the lowest octave and rotate the TUNE potentiometer to 12 o’clock. Now adjust the “base freq trim” so that the VCO plays C1, or 32.7 Hz.

Octave switch calibration:

- After the VCO tuning is well calibrated, simply rotate the octave switch through its positions and adjust the “octave switch trim” trimpot until the octaves are in tune.
- You can also monitor the octave switch voltage at the “octave switch test point” and ensure that the switch creates 1 volt steps.

Current draw:

+12 volts: 70mA

-12 volts: 65mA