

# Synthrotek MST VCO Calibration Guide

## Tools:

- **Accurate tuner or frequency counter** (there's a free App called PitchLab for smart phones-it works well)
- **Small flat-tip screwdriver** for the **1V/O adjust**
- **Larger flat-tip screwdriver** for the rear trim pots, insulated (if not, don't push the tip completely in the slots)
- **1 Volt/ octave CV source**
- **Headphones** or a connection to an amplifier

## Setup:

### **Calibrated 1V/O CV source:**

- Verify the calibration of the CV source. C1 should be 0 volts and maybe a small offset. Check C4 (3V + offset) and C7 (6 volts + offset).
- If you don't have a voltmeter, use another calibrated oscillator to verify.

### **Rear trim pots:**

- Verify that all trim pots on the rear of the module are centered. They usually are from the factory.

### **Front Panel Controls:**

- Turn all rotary controls fully counter-clockwise. Then, center the **MANUAL PW** to 12:00. Or, straight up.
- Set the **OCTAVE** switch to the 0, center position.

### **Front Panel connections:**

- **1V/O jack:** Insert a patch cord from your calibrated 1 Volt/Octave source. Make sure it is on C1, or zero volts.
- **TRI output:** With your amplifier volume at zero, insert your headphones and a patch cable to your amplifier or output module.

## Calibration:

*Note: Any time you adjust something that may change the pitch, turn down the volume on your output (if using an amp) or take your headphones off. The pitch may swing widely during calibration and can get quite loud at the higher pitches.*

### **Power up:**

Connect the supplied Eurorack power cable between your system power and the 16-pin boxed header on the VCO. Turn up your volume. You should hear the **TRI** waveform output.

- If you don't, verify your connections. Make sure the rear jumper isn't connected and turn the **COARSE** control up and down to verify that you hear the VCO. Also, listen to other waveform outputs.
- If, you still can't hear it, refer to the Synthrotek troubleshooting page (at the bottom of the VCO assembly instructions). Once you hear the VCO, continue.

### **Setting the heartbeat:**

1. There is a set of two header pins on the back of the PCB. Seat the jumper across both pins.
2. Adjust TR202 (**LIN CURVE ADJ**) trimmer until you hear the VCO clicking close to once per second (a little slower is ok). Your VCO's "heartbeat" may actually sound like a heartbeat, or it may just sound like equally spaced clicking. Use very small adjustments with the trim pot, as it is quite sensitive.
3. Remove the jumper and store it by placing it on one of the pins.

### **Setting the reference base:**

Center the **COARSE** and **FINE** controls to 12:00 (straight upward).

Adjust trim pot TR201 (**BOT KEY ADJ**) until the pitch is C1 (32.7Hz). You don't have to get it exact, just very close.

### **Adjusting the V/O range:**

1. Set your V/O source to C1. Adjust the **FINE** control until the VCO output is C1 (32.7 Hz).
2. Set your VCO source to C7 (6 octaves higher). Adjust the **1V/O ADJ trim** on the front panel until the VCO output is C7 (2093 Hz).  
*Hint: Increase the V/O source up an octave at a time and adjust the trim roughly for each octave and walk it up to C7.*
3. Verify C1 (32.7Hz) and C7 (2093 Hz) are still accurate. Adjust the **FINE** control for C1 and the **1V/O ADJ trim** for C7.

*Note: Some tuners don't have a fast enough sample rate for C7. The frequency may vary between ~2080 and 2110. That's OK.*

- Set your V/O source for C4 (261.6 Hz) middle C, 3 octaves above C1. If C4 (261.6 Hz) is OK, continue to **Octave Adjustments**. If it's sharp or flat, go to **Warp Adjustments**.

**Warp Adjustments:**

Once the range is set, check the warp of the V/O curve to make sure it is tracking properly. If the C1 and C7 are set correctly and the C4 is sharp or flat, adjust the warp.

- If C4 is sharp, adjust TR203 trim (**WARP**) trim *very slightly clockwise* to make it *more* sharp.
- If C4 is flat, adjust TR203 trim (**WARP**) trim *very slightly counter-clockwise* to make it *more* flat.
- Go back to **Adjusting the V/O range** and repeat steps 1-4. (You may end up repeating this several times until it's accurate.)

**Octave Adjustments:**

With the **OCTAVE switch** set to the "0" center position, set the pitch at C4 (middle C).

**+ 1 Octave:** Place the **OCTAVE switch** in the +1 position.

- If the pitch change is exactly 1 octave higher than the 0 position. It's OK.
- If not, adjust the TR204 trim (**+ OCT ADJ**) until the pitch is 1 octave higher.

**- 1 Octave:** Place the **OCTAVE switch** in the -1 position.

- If the pitch change is exactly 1 octave lower than the 0 position. It's OK.
- If not, adjust the TR205 trim (**- OCT ADJ**) until the pitch is 1 octave lower.

**Sine output balance:**

The Sine wave output should be OK. If you can monitor the waveform on an oscilloscope, adjust the TR200 trim (**SINE SHAPE TRIM**) until the positive and negative parts of the waveform are rounded and balanced.

# SYNTHROTEK MST VOLTAGE CONTROLLED OSCILLATOR QUICK START GUIDE

**FACTORY ASSEMBLED MODULES COME PRE-CALIBRATED AND READY FOR 1V/O USE.  
WHEN PURCHASING A KIT PLEASE CONSULT THE MST VCO CALIBRATION GUIDE.**

