# THONK SYNTH T01
# VCO


## Fine tune

VCO range - 0.5Hz to 8KHz
LFO range - 200S (0.0047Hz)
to 12mS (80Hz)

## Frequency LED

Shows the current voltage level of the output.
Orange = positive volage
White = negative voltage

## 3 way octave switch

## Coarse tune

## LFO switch

LED lit when LFO mode is enabled

## 1V/Oct input

## Linear FM input

AC coupled
Linear FM varies the frequency of oscillation in a linear scale, without changing the average pitch of the oscillator.

## PWM CV input

Input range -5V to +5V
0V = 50% duty cycle
Note: at 0% or 100% duty cycle, you may hear nothing!

## Hard sync input

Hard sync occurs at any point in the oscillating cycle - a rising edge on the sync input will force the oscillator to GND and begin rising.

## Wave outputs

Square, saw, triangle and sine.
All outputs 10Vpp

## Specs

Power draw: +12V 30mA
-12V 26mA
+5V 0mA
Depth: 37mm (including power header)
Size: 4hp

All inputs are +/-12V tolerant

# CALIBRATION

## Volt per octave calibration

### 'Quick n dirty'

For this method you will need:

- A way to listen to the output of the VCO, an output module or mixer
  connected to speakers or headphones
- Small flathead screwdriver
- Your ears!

1. Plug any of the VCO outputs into your headphones or speakers so you can hear it
2. Start with the octave switch on '-' and tune the coarse tune to a reasonable frequency you can hear well
3. Flip the octave switch all the way up to the '+' setting and listen to the note - it should be 2 octaves above the first note.

   If the note is **higher** than what it should be:

   Turn the v/oct trimmer **counter clockwise** half a turn

   If the note is **lower** than what it should be:

   Turn the v/oct trimmer **clockwise** half a turn

   Quickly flip between the three octave settings, listening and comparing the notes, and making small adjustments of the v/oct trimmer until you are
   happy with how in tune the octaves are sounding - its completely up to your taste how precise you want to be!

### 'Precise'

For this method you will need:

- A way of plugging the output into a tuner e.g. Eurorack tuner / pedal tuner / audio interface and computer
- A precise/reliable voltage source e.g keyboard with CV output / midi to CV interface / voltage source Eurorack module such as Befaco Voltio
- Small flathead screwdriver

1. Connect your voltage source into the v/oct input of the VCO

2. Play a low C note on your keyboard, or set your voltage source to 0V

3. Tune the VCO (using the coarse and fine tune knobs) to the lowest C note that your tuner reliably picks up (usually C1)

4. Once that is perfectly tuned, play a note one octave up on your keyboard,  or set your voltage source to 1V

5. Now check your tuner - the note should be 1 octave higher than the first note

   If the note is **higher** than what it should be:

   Turn the v/oct trimmer **counter clockwise** half a turn

   If the note is **lower** than what it should be:

   Turn the v/oct trimmer **clockwise** half a turn

6. Now go back and play the original low C on your keyboard, or put your voltage source back to 0V

7. Any adjustment of the v/oct trimmer will have changed the original tuning, so now go back and repeat steps 3 - 6, making small adjustments at a time to the trimmer, until your two octaves are perfectly in tune.

8. When you are happy, you can now move through some higher octaves. Repeat the same procedure as before, making small adjustments to the v/oct trimmer at a time, until you have solid tracking over a wide range of octaves.

## Sine calibration

The sine output of the VCO is achieved using a discrete sine shaper, turning the triangle wave into a sine wave.

It should be pretty close out of the box, but may require some simple adjustment to get a purer sine wave.

The easiest way to do this is just by listening to the sine wave output, and adjusting the trimmer until the harmonics disappear.

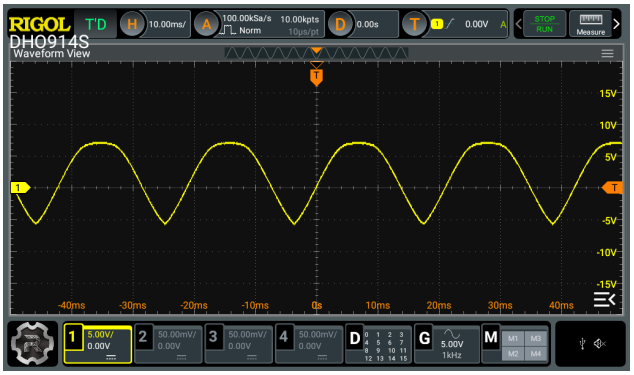
If you go too far one way, harmonics will start appearing and it will start to sound more like a triangle wave.

Keep adjusting the trimmer until you have a nice sine wave that is as pure (or not) as you like it!Alternatively, you can view the sine output on an oscilloscope.

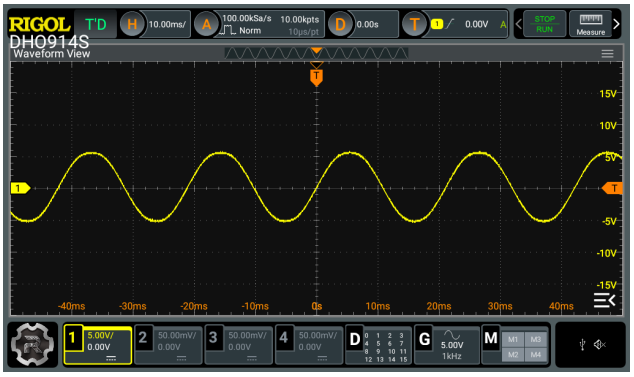
By adjusting the trimmer you will see the sine wave morph into a weird asymmetric triangle wave.

The goal here is to find the perfect middle point where the waveform looks as close to a perfect sine as possible.

We recommend listening to the output while doing this, and trusting your ears. What looks ideal may not always sound the best.




Uncalibrated sine




Calibrated sine