TB-Super-O Build Guide

TB-303 Inspired Super Oscillator

V1.0.6 July 2022

The TB-Super-O consist of three copies of the TB-O saw core and square wave shaper.

The thee input V/Oct CV jacks are normalised in the order :

CV1 -> CV2 -> CV3

So if you only input to CV1 then all three oscillators will get the same CV note. Add a second V/Oct signal at CV2 and the 2nd and 3rd oscillator will share this second input etc

The module allows the normal TB-303 tuning control on each oscillator independently, so you can detune to create thick waveforms.

Each square also has its own pulse width control, so again you can layer 3 squares with different pulse widths and tuning.

Calibration is independent for each oscillator with the width and tune trimmers on the rear.

The module has a pair of mini mixers for the Super waveforms, this allows the gain of each of the three oscillators to be blended as required before outputting from the Super Saw or Super Square jacks.

As you may want to just use this as three independent voices, the individual waveform outputs can be accessed via the 6 output jacks along the bottom.

Phasing, 5ths, this module can really get some lovely harmonics.

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!!! Important Notes !!!

During the time Roland were making 303's they basically used whatever they had in stock for the 3 pin transistors, real machines have any of 2SC536F, 2SC945P and 2SC1815G. The most common is the 536, but any ECB pinout NPN will work just fine. These aren't particularly important to the sound, I've experimented with all of these and NOS/new parts, including cheapo Aliexpress variants of the 945P (marked P331) and all of them work.

The PNP is usually a 2SA733P, which are not really made any more either, you can find some NOS ones and Q variants are fine too. The equivalent matching PNP to the NPN you are using is fine also, so 2SA608, 2SA733 or 2SA1015 all work just fine. Even things like the 2SA1115 and 2SC2603 used in other Roland products of that era will be suitable.

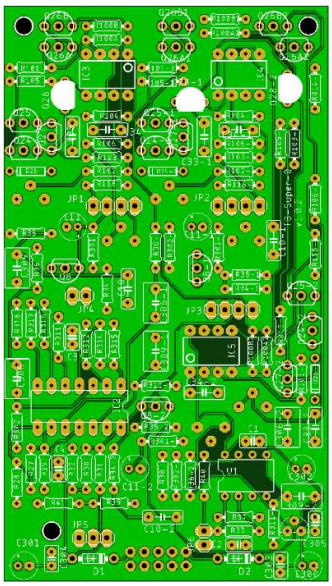
Because the 1980's dual transistor pairs are getting harder to find, or are often fakes, the 2SC1583F/G and 2SC2291 can be replaced with a pair of matched 2SC945P (or equivalent). Again you can match these or just take a gamble and pair some up.

Unlike the other TB- modules there just isn't enough room on the board for both the 5pin and pair of 3 pin footprints. For this module it only includes the pair of 3 pin footprints, so just measure and match 3 pairs of your chosen NPN. For the partial kit versions, 6 high hfe 945's are included.

Note on electrolytics. I've tried to make it possible to use normal 11mm capacitors, so you will see a marking on the silkscreen showing where you can lay the capacitor on its side. The solid white line designates the side where the -ve stripe should end up. You can of course use <11mm high caps and stand them up, but if you are like me I have loads of 11mm normally.

Enjoy!

Lower – Voice Board



Start with the board marked as the voice board.

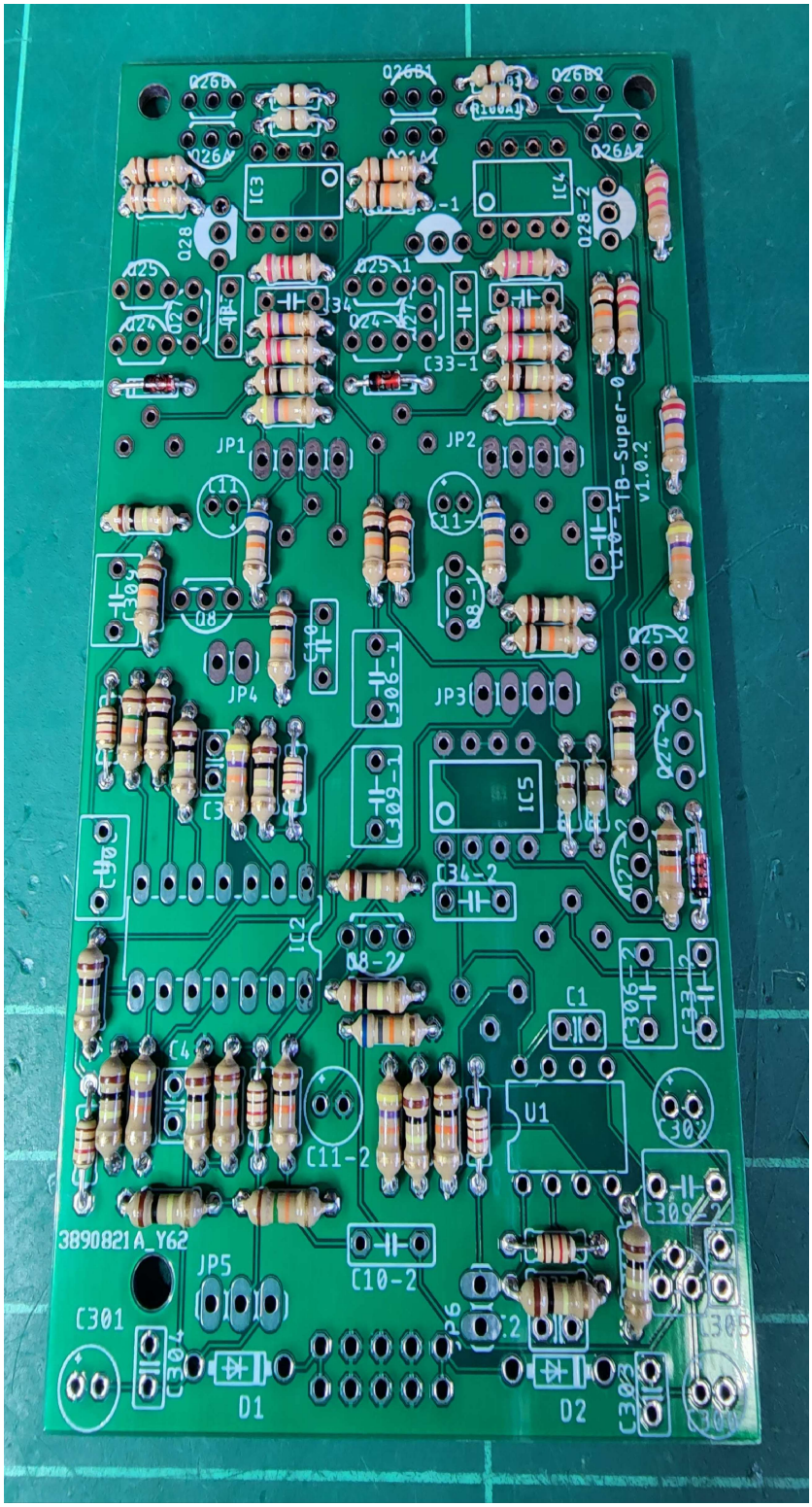
1. Solder the 1N4148 diodes.
2. Solder all the resistors.

   Parts on the upper board are numbered 400+

   For now, just look for and solder all the resistors that are numbered <400.

   The board should look something like this; some pictures are of prototype boards and may differ slightly and in this case have vastly different component number to those shown here.

TAKE CARE around R44 and R45, they are close together but make sure not to bridge these two, as marked in yellow circle below.


TB-Super-0
v1.0.2
JP1
JP2
JP3
JP4
JP5
JP6
IC1
IC2
IC3
IC4
IC5
U1
D1
D2
3890821A_Y62

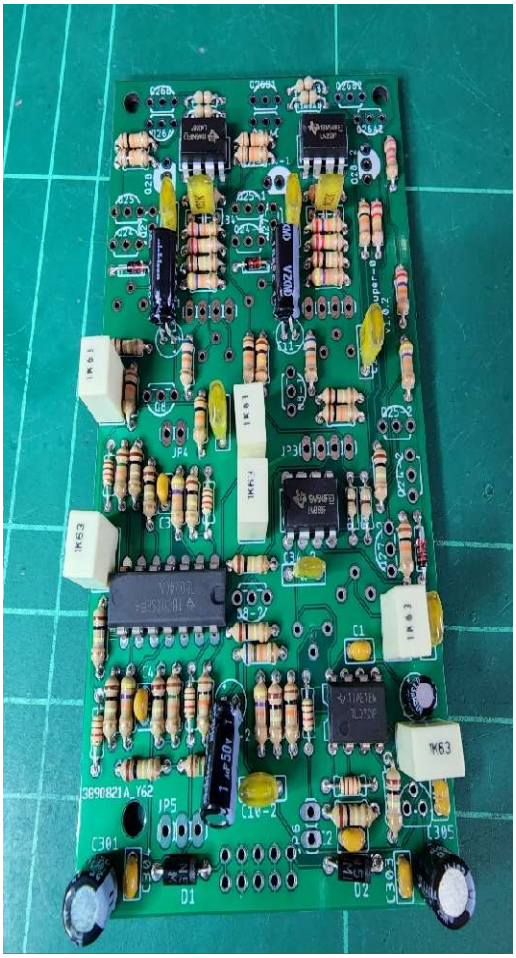
3. Solder the two 1N5817 diodes.
4. I like to add the IC sockets next, so if you are using them, place the single 14 pin and 4x 8 pin DIP sockets.
5. Next comes the capacitors, again my routine is usually;

    a. MLCC small ceramics
    b. Polyester/polypropylene yellow/greenies and the poly box ones

    The 100nF poly caps maybe quite tall and could cause problems with clearance for the upper board. If you have large ones, you can angle the 4x 33nf next to them so you can lean the 100nF over and reduce their height.

    c. Finally, the electrolytics.

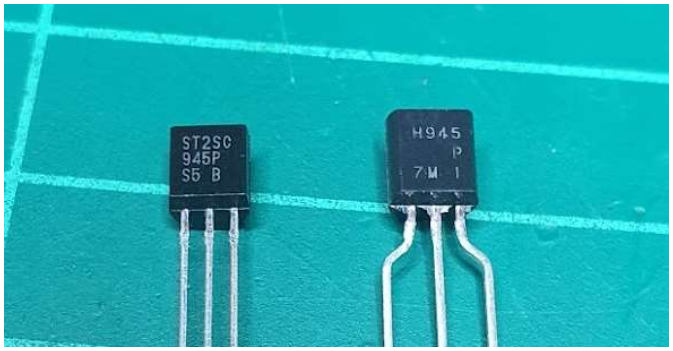
    Due to the stacking of the boards you cannot stand up the electrolytics if the are standard 11mm. If you have low profile electrolytics, all good, but otherwise insert the caps and bend them over to sit parallel to the board in the space marked in the silkscreen.The solid white line marks the side where the -ve marking should end up.
    NB The 0.33uF must be low profile



6. Now we can add the transistors.

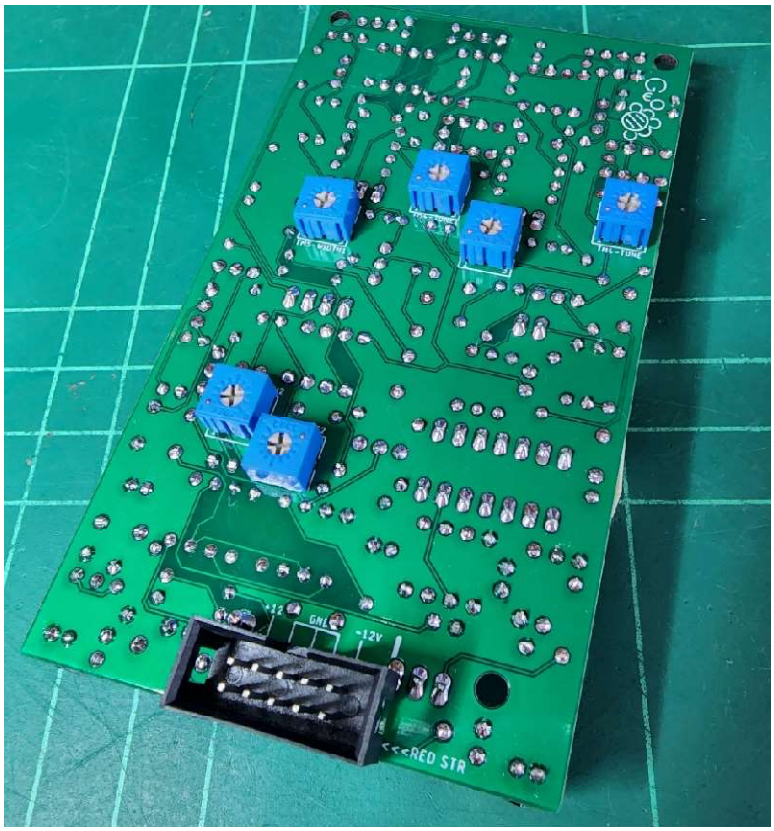
   Q4,Q8,Q12, – here you are using a matched pair using 2x 3pin NPN such as 2SC945P then install two in QxxA and QxxB

   *** If you purchased the partial kit, you will have 6x 945 transistors in the smaller bag. Use these for the dual transistors are they are already matched. They will either have "ST2SC925P" or "H945P" marked on them. The other 6x 945/1815/536 in the larger bag should be used in the other 945 positions. ***



DO NOT POPULATE ALL 3, if Q26 is used Q26A+Q26B should be empty, and vice versa.

7. Add the ICs into the sockets and solder the VR IC1.
8. Add the Euro 10pin header and the 3pin trimmer **on the reverse side of the board.**

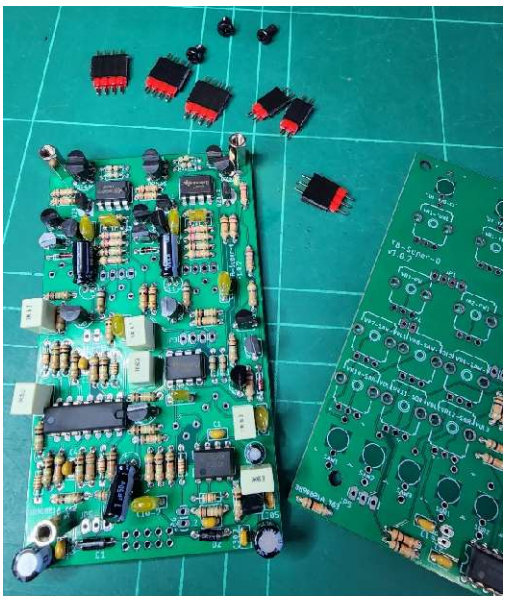


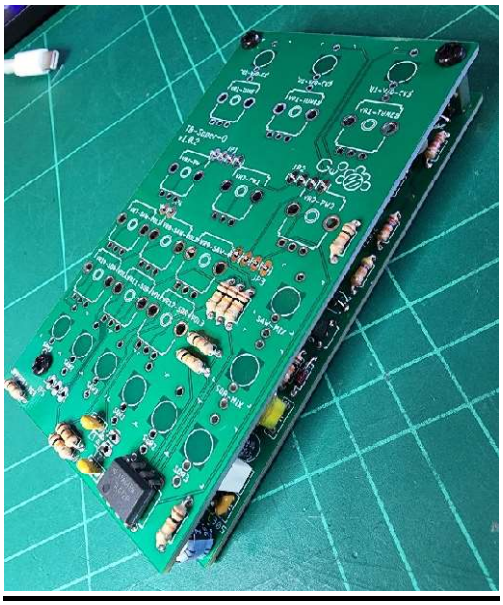
9. Finally, the headers to join the two boards.

   Use your usual technique for this but I find the following makes it easy.

   a. Screw the three 11mm standoffs to the voice board. The standoff should be on the same side as the components, so screw from the underside.
   b. Cut / prepare both the male and female connectors and join them together.
   c. Place all 6 (JP1 to JP6) into the voice board sticking up the same way as the standoffs. **Don't solder yet.**
   d. Bring the control board to the stack and place it carefully so the standoffs line up with the holes and most importantly so that all the connector pins go through the corresponding holes in the control board.
   e. Screw the control board to the standoffs and you should now have a nice, neat sandwich and you can simple solder all the connector pins from the top and bottom.
   f. Unscrew one of the boards from the standoffs and carefully pull apart the connectors. Perfectly lined up every time!

      (NB: I usually leave the standoffs attached to the upper board, so unscrew the bottom board. This is because I am lazy and if they are already attached to the upper board, you can fit the panel later and not have to worry about access to the screw holes!)



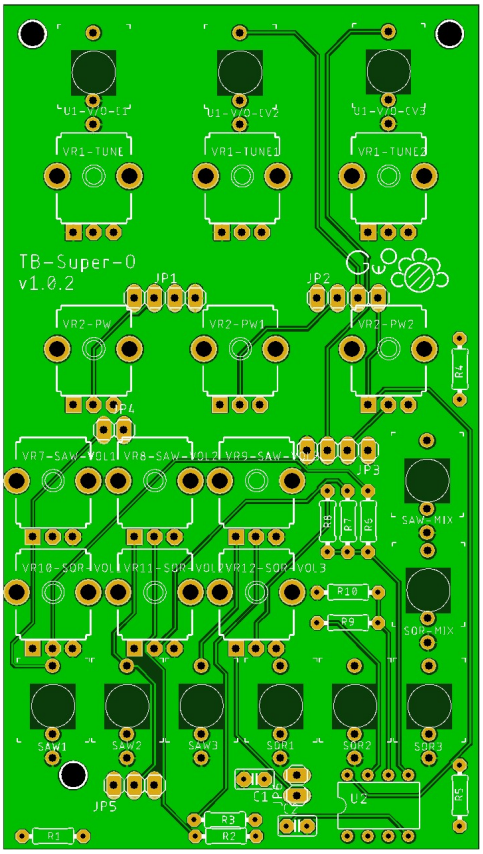


Upper - Control Board

Not much to do here, solder the 10x resistor, 2x caps and add the 8 pin socket if using and don't forget to insert the TL072 IC! Nothing worse than having to unscrew all the nuts because you forgot – amazing how easy it is to do!

Insert the 12 pots and the 11 jack sockets and place the front panel over them so you can ensure they line up with the holes. Here, as I don't want to have to take all the nuts off again I make sure I have the standoffs attached to the upper control board, fit all the 5 jack nuts, 6 washers and nuts to the pots

Once you are happy everything fits, is lined up solder them all from the underside. Check that none of the pots or jacks foul against the components on the lower board, you may need to trim the solder joints a little. Connect the two boards, check everything over and time to power on.



Simple Checks - optional

If you want to check everything is OK, you can check the power rails before fitting the ICs on the lower board. You should get a nice steady +12v and -12v on pins 4 and 11 of the TL074 socket.

Similarly, on the 3x AN6562 sockets you should see a steady +5v on pin3, and +12v on pin8. The TL072 should see -12v on pin4 and +12v on pin8.

If all good, insert the ICs and power up.

Calibration

The calibration process is the same as described in the TB-303 service notes – (google) – but basically you are wanting to adjust both the width and the tune trimpots.

The width defines the gap between octaves and the tune sets the base tune.

Make sure the TUNE pot on the panel is in the middle.

Start with VCO1, listen to the SAW 1 output only and scope the output.

Standard analog 1V/Oct tuning technique, so play C1 and C2 and adjust width so you get a doubling of frequency between the two etc. Adjust tune to get ~~32.7Hz on C1, 65.41Hz on C2~~ etc etc – as with all analog tuning, it's a pain, but keep going and eventually you find the right place for both trimmers. If you can't get it to work, try randomising the width and start again!

Tuning / Calibration Update : 29th July 2022

Depending on where you look, there is much debate about what frequency equates to what octave range, I had been using an old reference that suggested that C1 for example should be 32.7hz - and that is what I've been calibrating the pre-built modules to, and the build guide up until now has suggested.

After some analysis and testing with various sequencers it would seem that C1 at 65.41hz makes more sense and in reality matches the usable range of the oscillator (for example when driven by the MSW Choronovore - which btw is an excellent choice for getting the 303 slides and accents)

You maybe able to adjust your TB-Super-O by simply turning the three TUNE trimmers on the rear counter-clockwise to increase the pitch - you should not need to change the WIDTH trimmers if you have previously calibrated them.

However, you may find you can't quite get enough range to get to 65.41Hz (without moving the TUNE POT on the front away from its center position) - if this bugs you, as it did me, then you can either replace R2, R10 and R19 with a 47K ohm resistor, or add a second 100K ohm resistor in parallel to R2, R10 and R19. This should extend the range of the tune trimmer to allow you to set the correct value. **NOTE THAT THE BOM SINCE V1.0.6 HAS THE CORRECT 47K OHM PARTS, YOU DO NOT NEED TO ADD THESE IF YOU BUILT FROM BOM V1.0.6 OR LATER**

These pictures show the location of the three resistors in question, and the back picture shows where you should add the resistors on the reverse

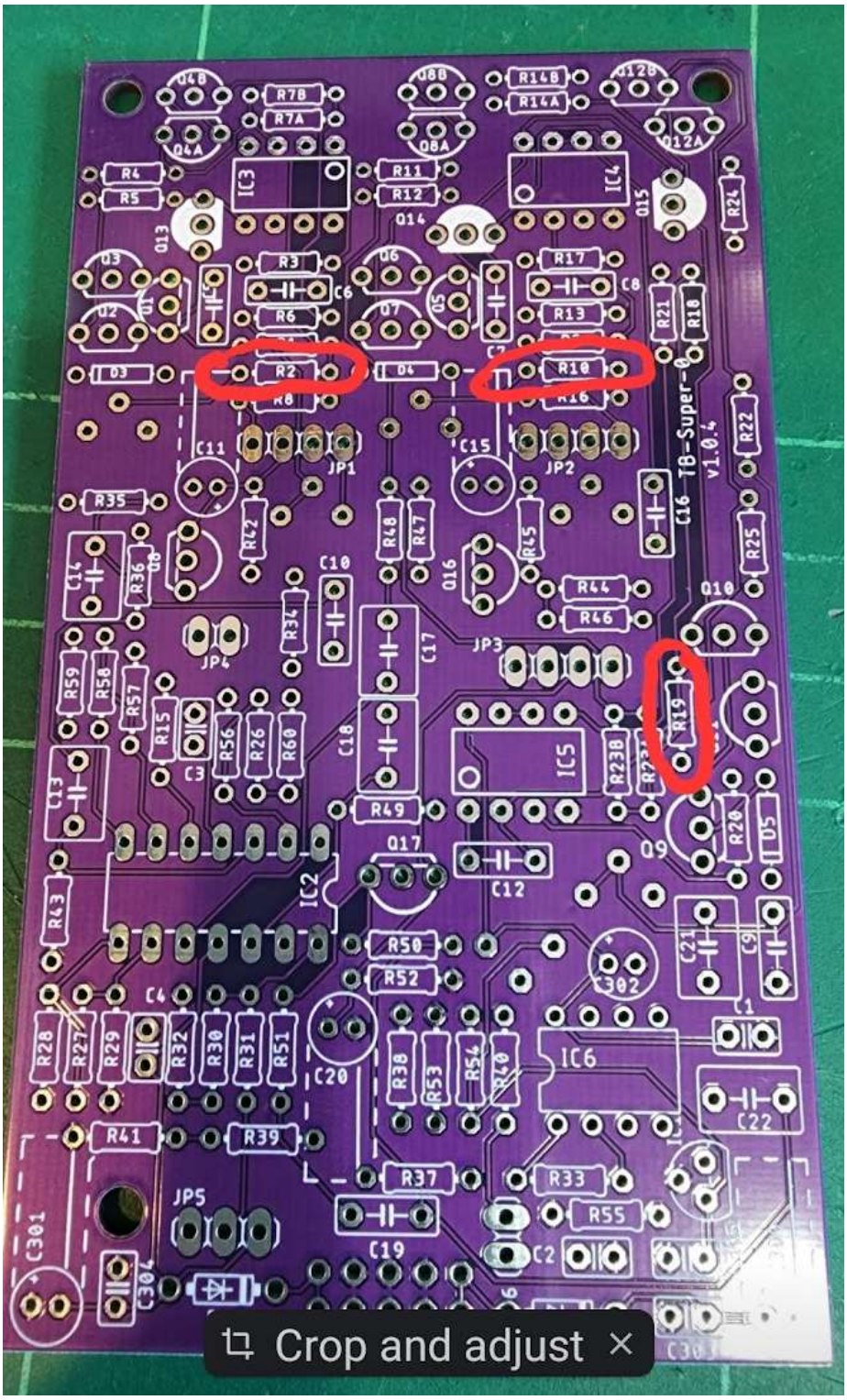
Procedure

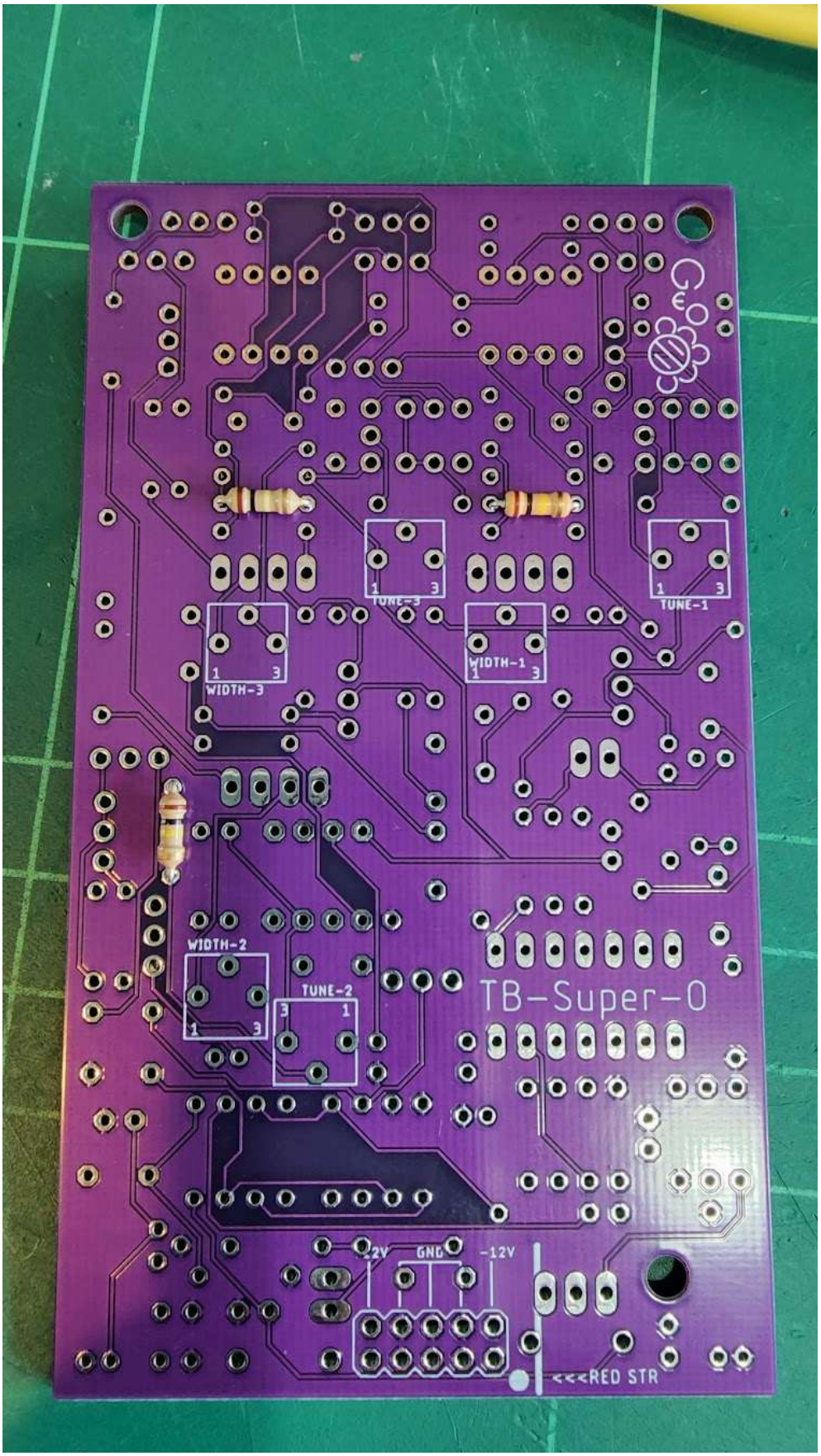
I usually set **tune** trimpot so C1 is 65.4Hz

Play C2 and adjust **width** trimpot until I get 130.8Hz

Iterated back and forward and you should home in on the right width and then can adjust the tune accordingly. i.e. Repeat, repeat, repeat!!! Get pissed off, decide this is impossible, randomly turn one of them, try again, want to throw the module across the room, calm down, have a beer, start again but this time go the other way… repeat… repeat… get super excited when its finally done, go tell your better half who couldn't care less…

Now that you've done OSC1, repeat the process for OSC2 and OSC3, remember to switch the output leads to the corresponding OSC output! You can leave the V/Oct in input1 as all 3 are normalised to input 1.




TUNE-3
TUNE-1
WIDTH-3
WIDTH-1
WIDTH-2
TUNE-2
TB-Super-O
12V
GND
-12V
<<<<RED STR