

reSEMble-VCO v1.3 – Assembly Guide

Thank you for purchasing this module! This is an easy build. Some of the pads are quite small and you will need a chisel tip or screwdriver tip soldering iron and the skill to solder these tiny joints.

This module is also used in the 8080-VCO Eurorack module. **YOU DO NOT NEED TO AND SHOULD NOT INSTALL THE PARTS** that are specific to the 8080-VCO module. These parts are not included in the BOM.

The module is designed and sized for **Euro rack** systems. You will need a 16-10 pin eurorack power ribbon connector with $-12/0/+12$ which is connected to a synth power supply.

Follow the parts lists, these instructions and the PCB silkscreen text to build the module.

The module consists of 2 PCB boards.

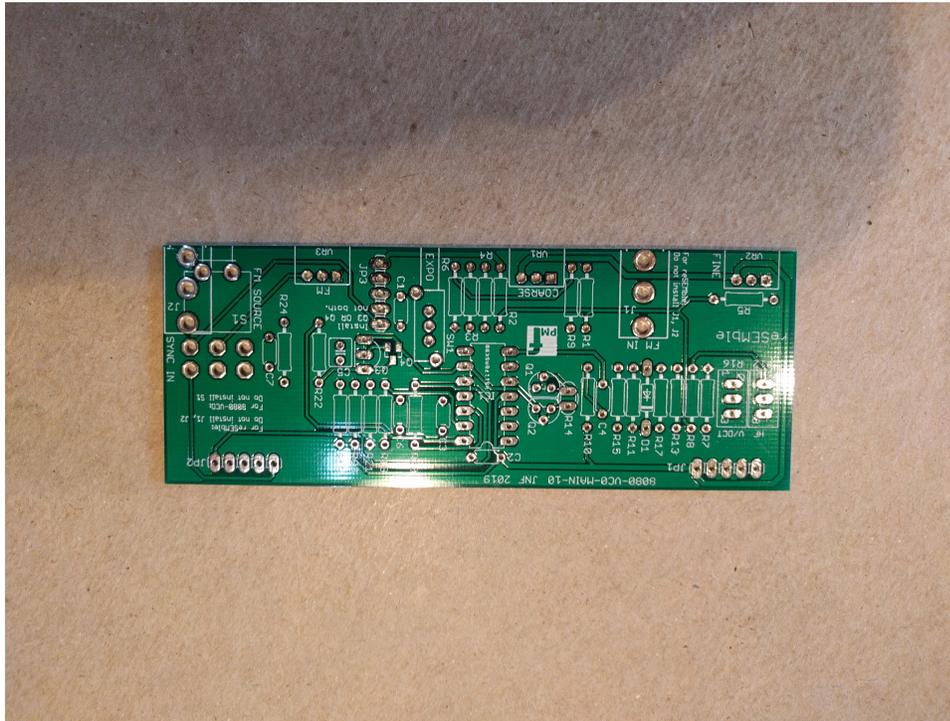
You must follow the order of assembly as described below since some components will be soldered underneath other components.

Note that VCO1 and VCO2 have a Sine output and a SYNC button. VCO3 has a triangle output, a LOW button and no SYNC button. These variations are made on the Shaper board and the instructions are covered there starting on page 12.

Constructing the Main board

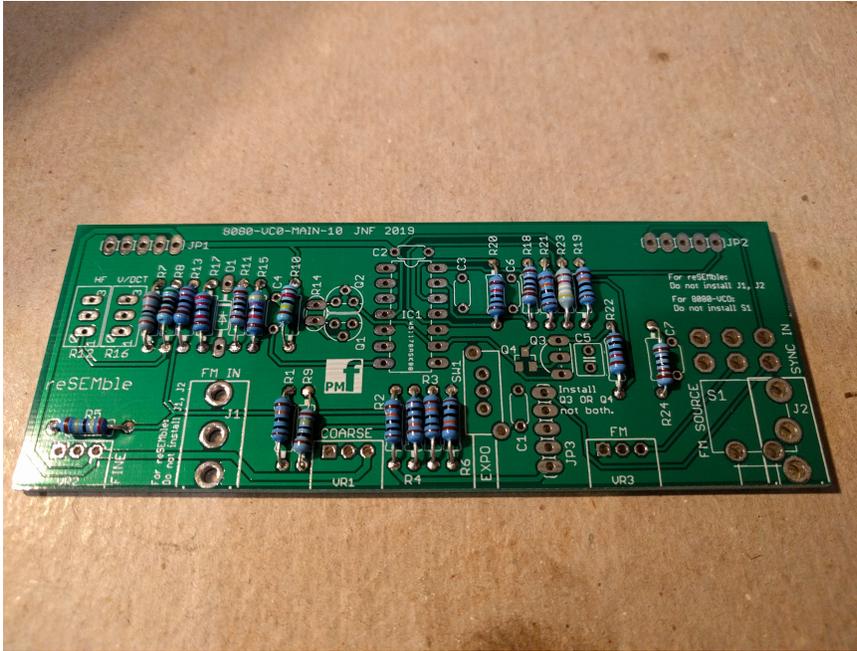
These are the parts marked on the PCB that are not required:

J1, J2.



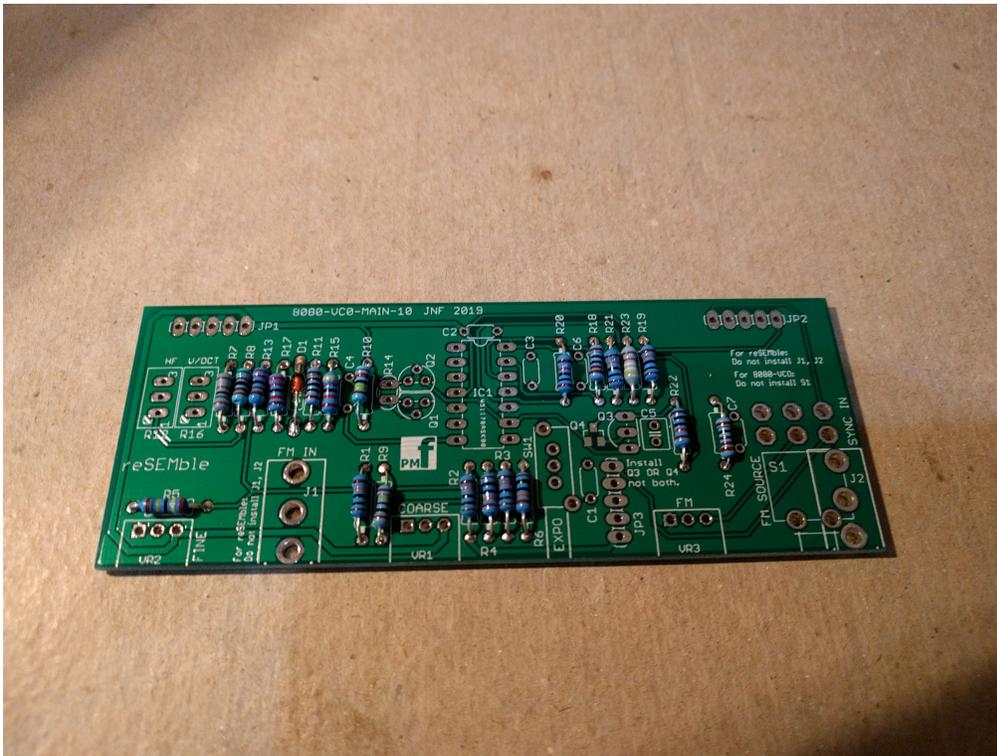
Resistors

Install the flat resistors on the TOP of the board. Solder and clip the leads.



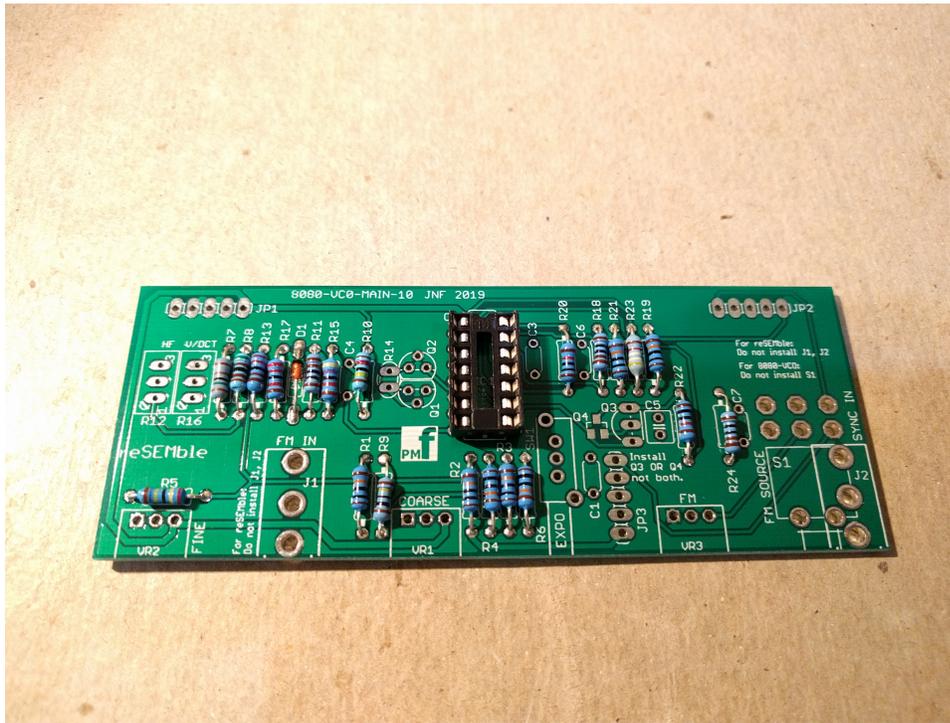
Diodes

Install the diodes on the TOP of the board. Align the stripe on each diode with the stripe marked on the board. Solder and clip the leads. Now go back and check the polarity against the silk screen for each diode.



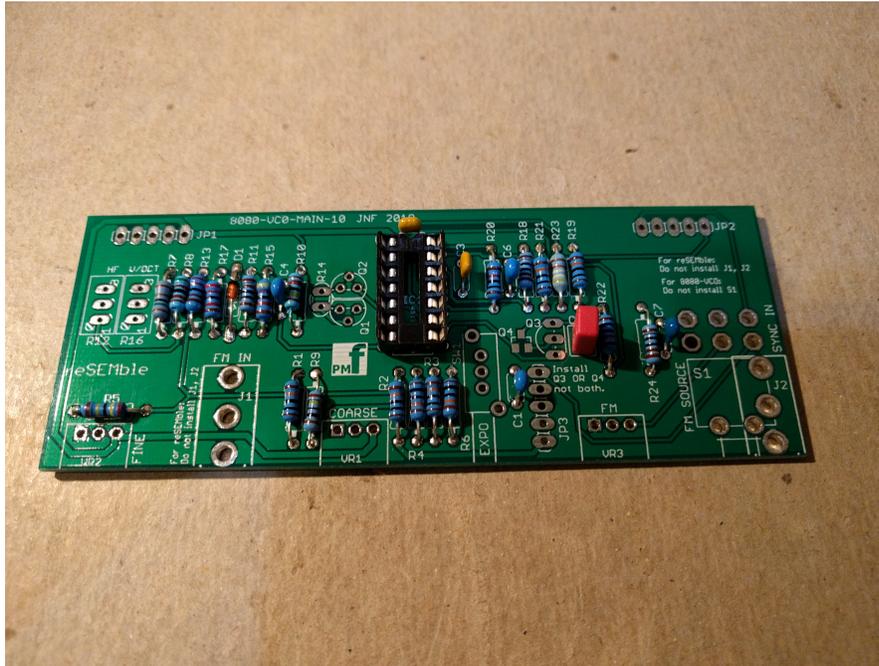
IC Sockets

Install the sockets on the TOP of the board. Observe the notch or mark on the sockets and align with the notch or mark on the board. Solder.



Ceramic/film capacitors

Install the ceramic/film capacitors on the TOP of the board. Solder and clip the leads.



Transistors

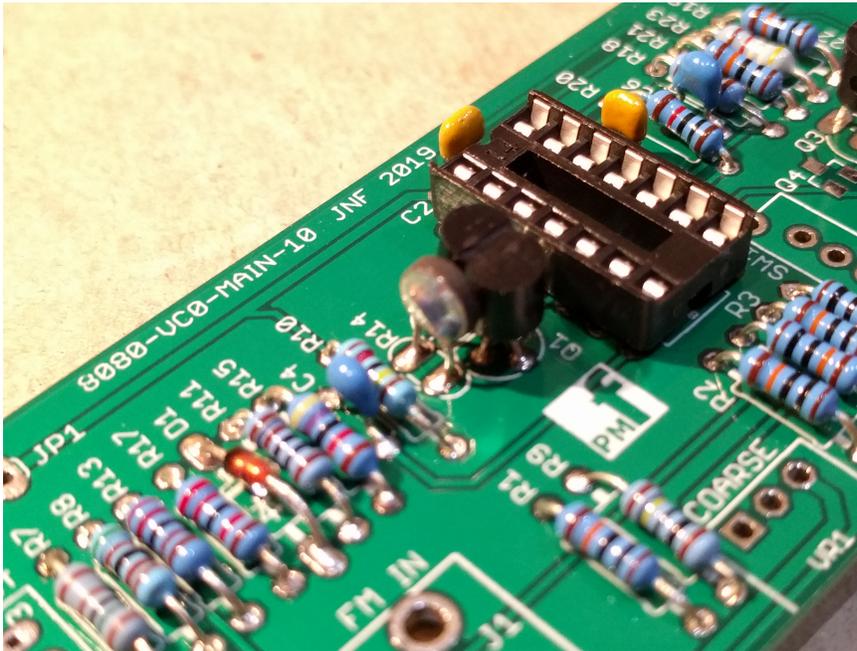
Install the transistors on the TOP of the board. Do not mix up the NPNs with the PNPs or JFETs.

Install Q4 (SMD) or Q3 (Through Hole). These are alternative parts. Do not install both.

These are polarized components. Align the outline with the outline on the board. They should be raised off the board surface slightly and at the same height. Solder and clip the leads.

NTC thermistor

Install the thermistor on the TOP of the board. It should be raised off the board surface slightly and at the same height as the adjacent transistors. Try and move the two transistors and the thermistor close together and tie them together with a small zip tie or with epoxy. Solder and clip the leads.

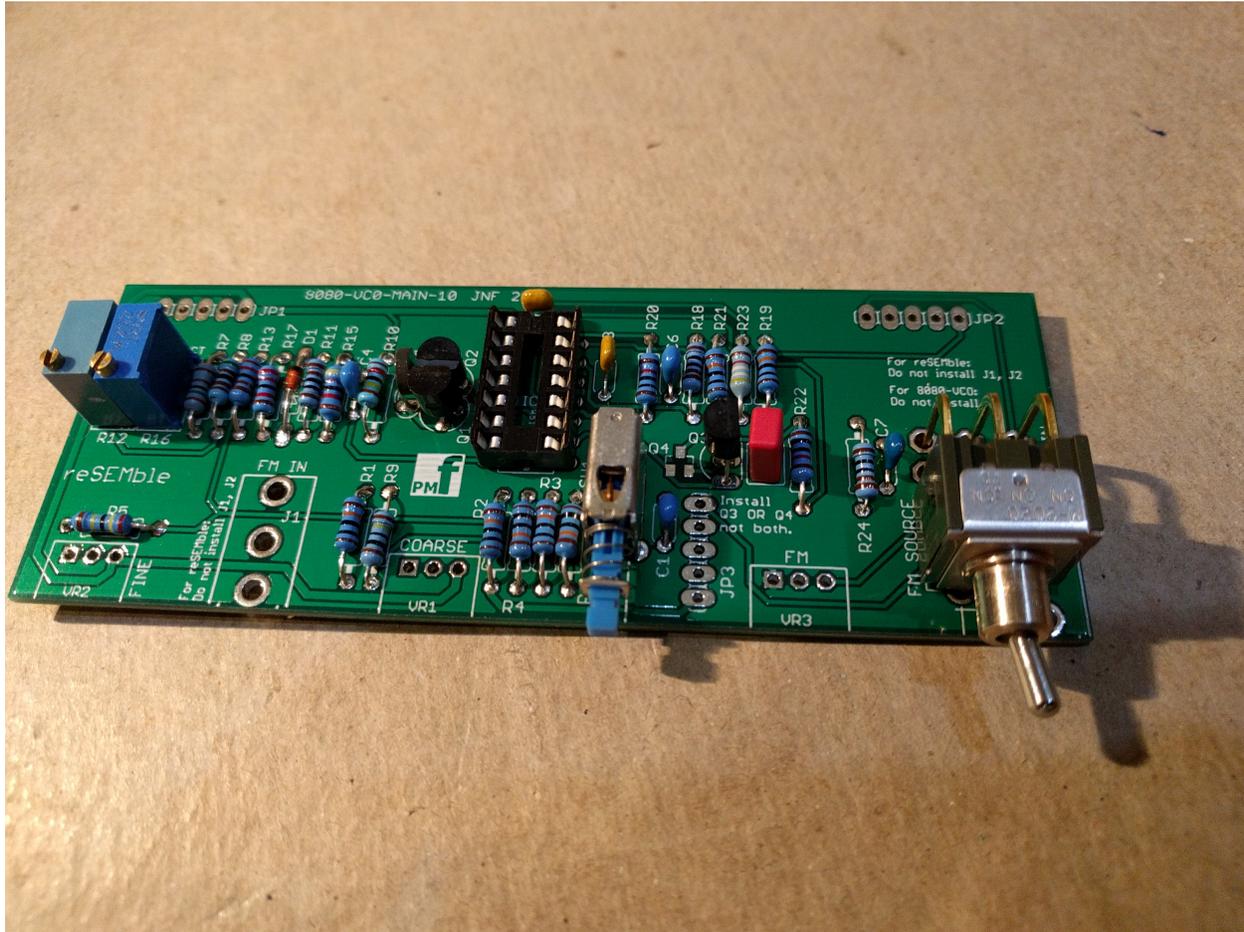


Trimmer resistors

Now populate the trimmer pots on the PCB. Make sure they are oriented so that the screws are accessible when the board is installed - either from the back or the side. Some photos show the screws on top and this will work but they will be inaccessible when the PCB is installed.

Toggle Switch

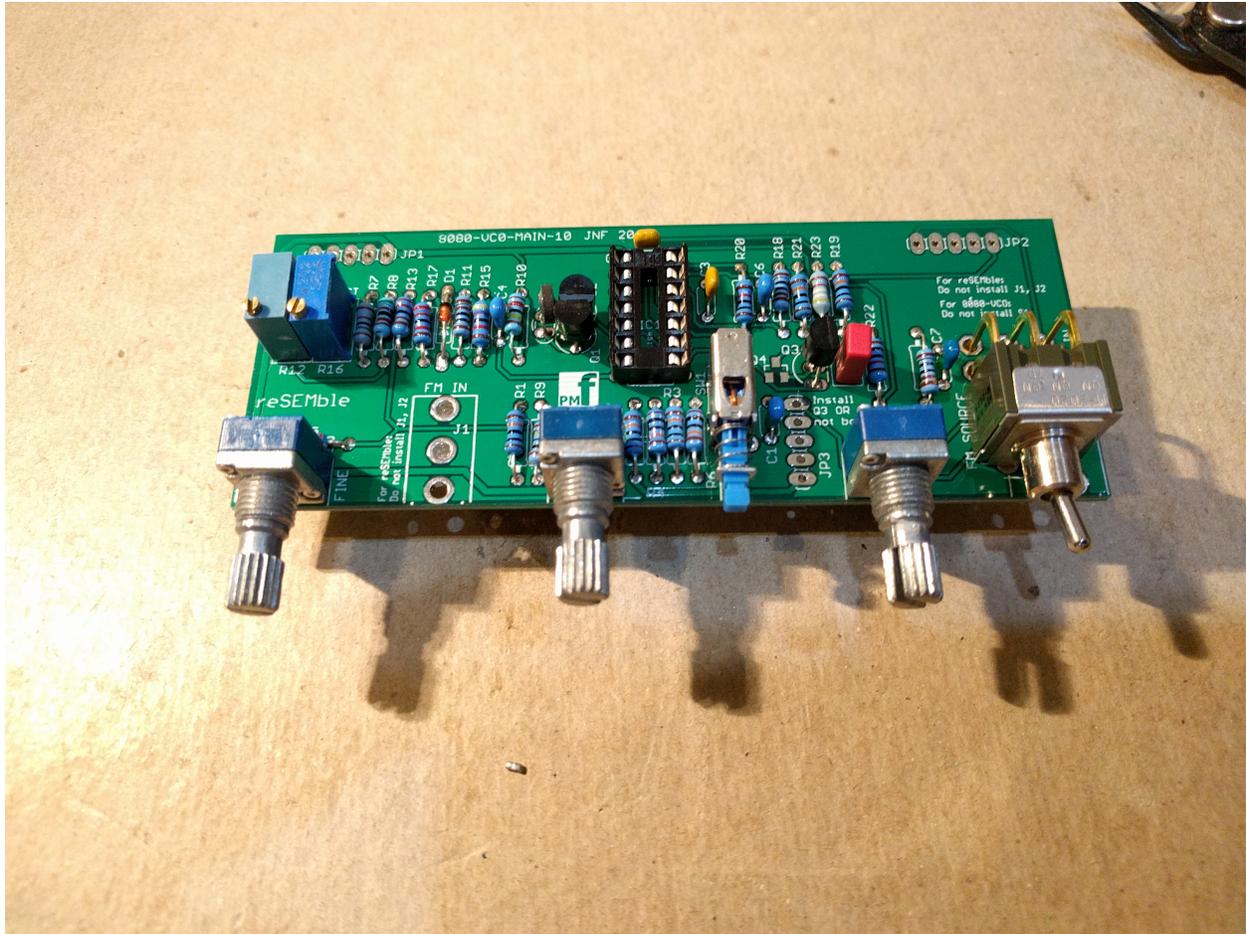
Insert the switch on the TOP so that the toggle faces the front of the PCB. Before soldering insert a thin temporary spacer such as a business card to keep the metal switch body from contacting pads underneath it. The switch is on the TOP. Do not bridge the contacts to nearby components.



Potentiometers

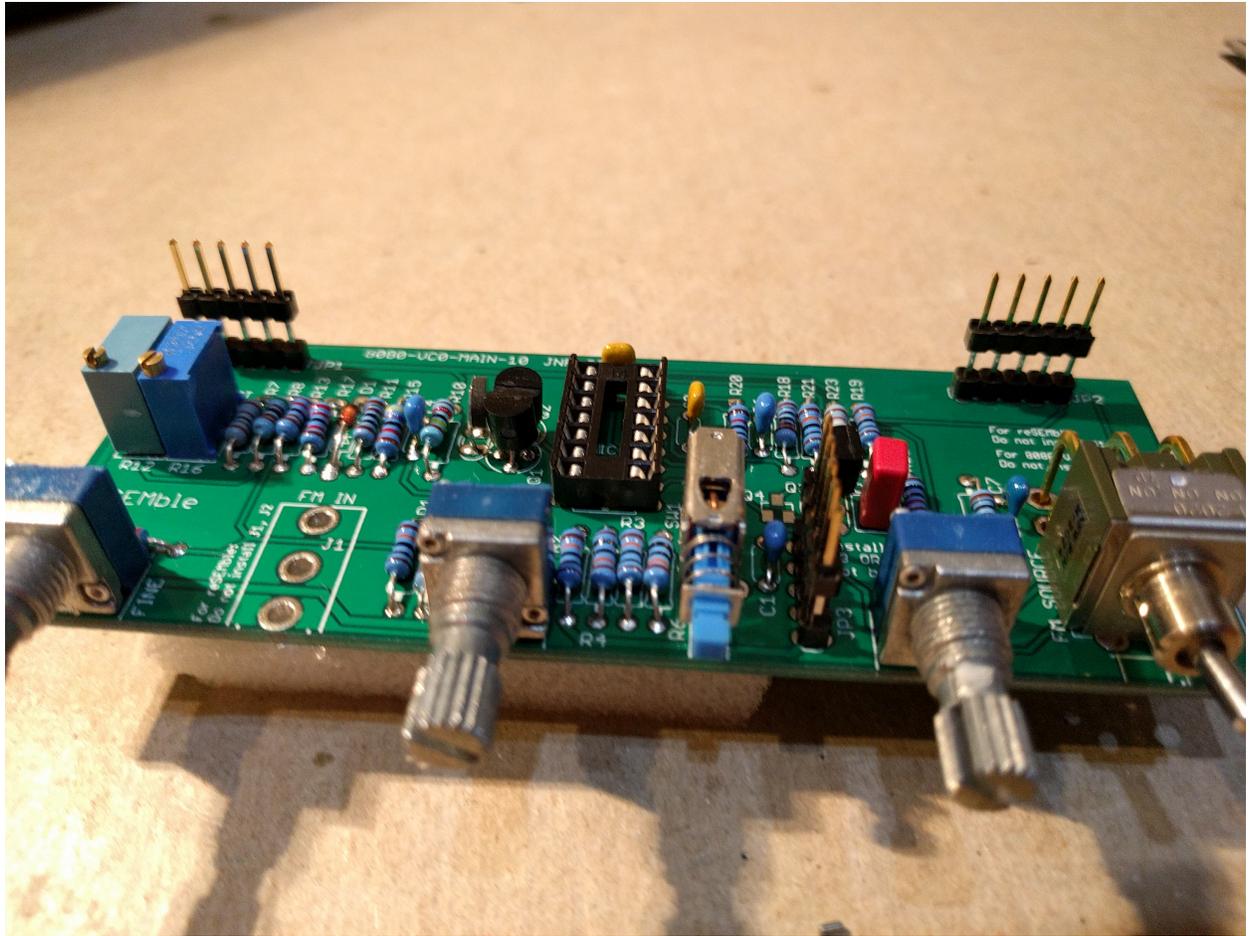
If the pots have positioning lugs on the front, cut these off with a sharp pair of flush cutting pliers. The front of the pot (where the shaft protrudes) needs to be flat.

Carefully align the pots so they are flush with the edge of the board and perfectly upright and tight to the board surface. Please ensure they are on the CORRECT SIDE OF THE BOARD before soldering otherwise PCB tracks and pads may be damaged if they are desoldered. See Photo.



Male Headers

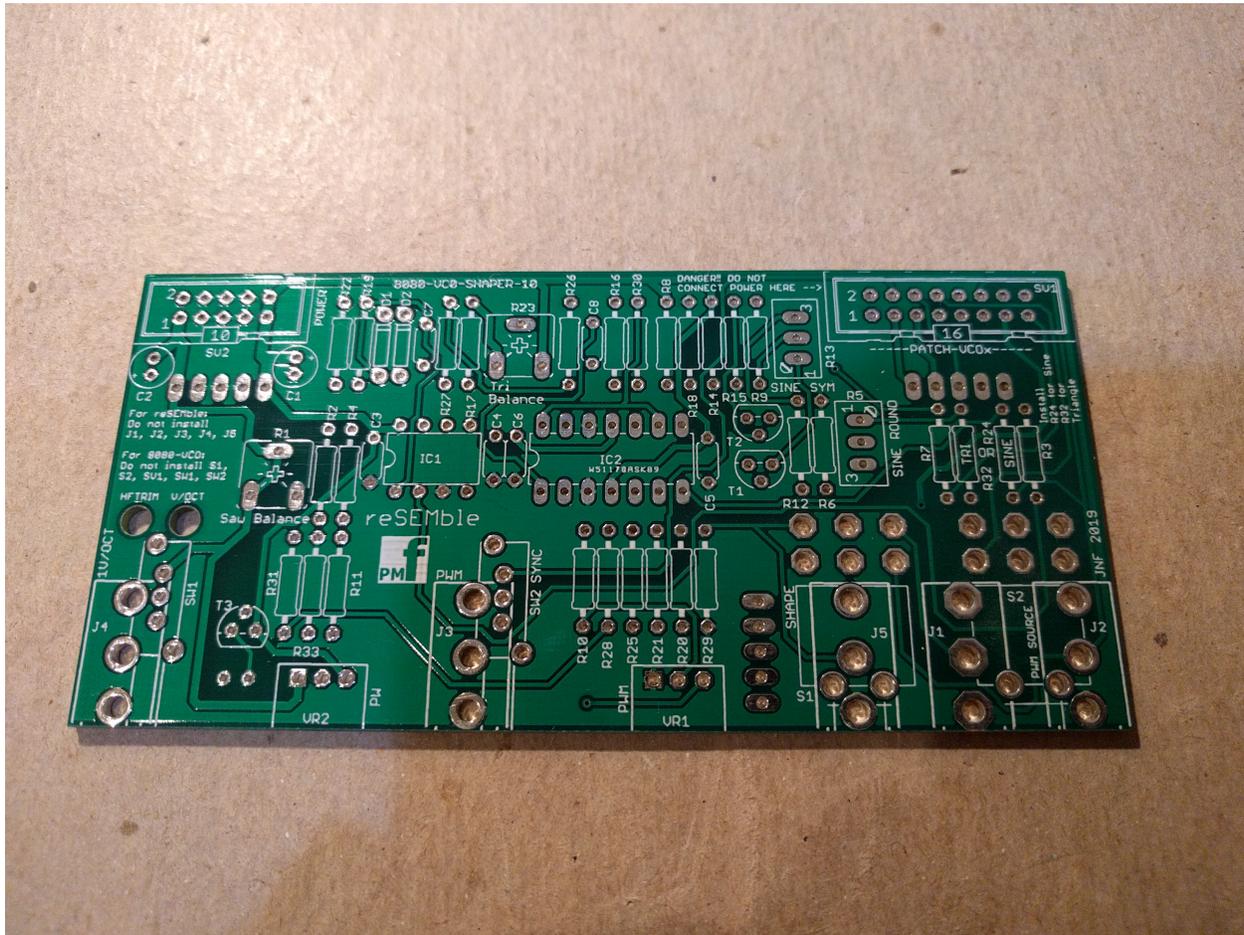
Install these on the TOP of the board and solder on the BOTTOM. They need to be perfectly perpendicular to the board and tight to the board surface. The short legs go into the board and the long legs stick out from the board.



Constructing the Shaper board

These are the parts marked on the PCB that are not required:

J1, J2, J3, J4, J5.

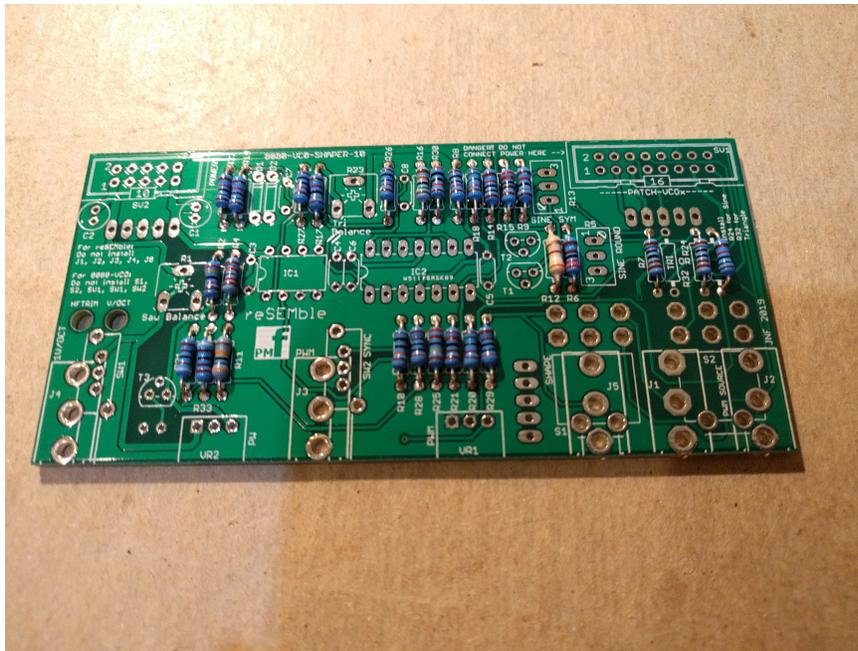


Resistors

For VCO1 and VCO2: Do not install anything in the space marked TRI R32.

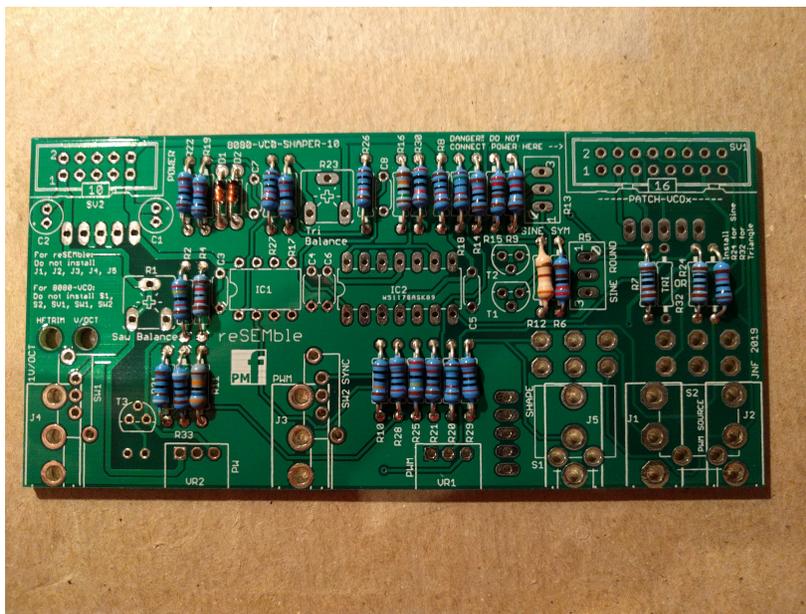
For VCO3: Do not install anything in the space marked SINE R24.

Install the flat resistors on the TOP of the board. Solder and clip the leads.



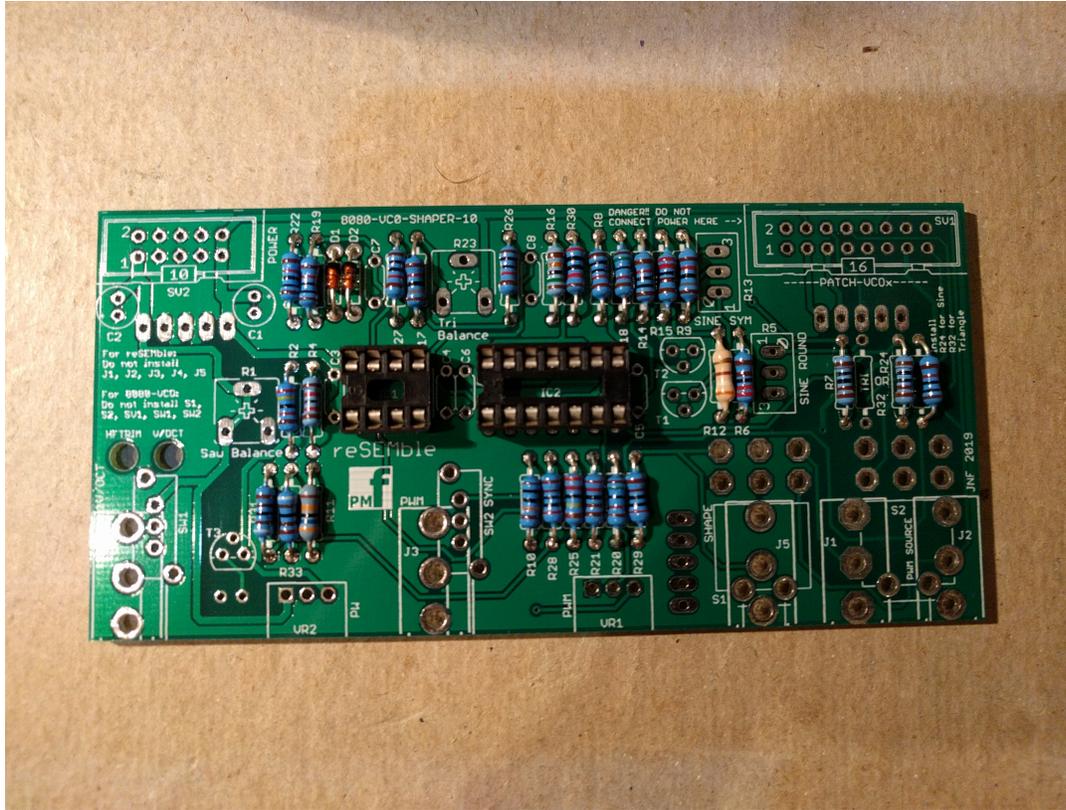
Diodes

Install the diodes on the TOP of the board. Align the stripe on each diode with the stripe marked on the board. Solder and clip the leads. Now go back and check the polarity against the silk screen for each diode.



IC Sockets

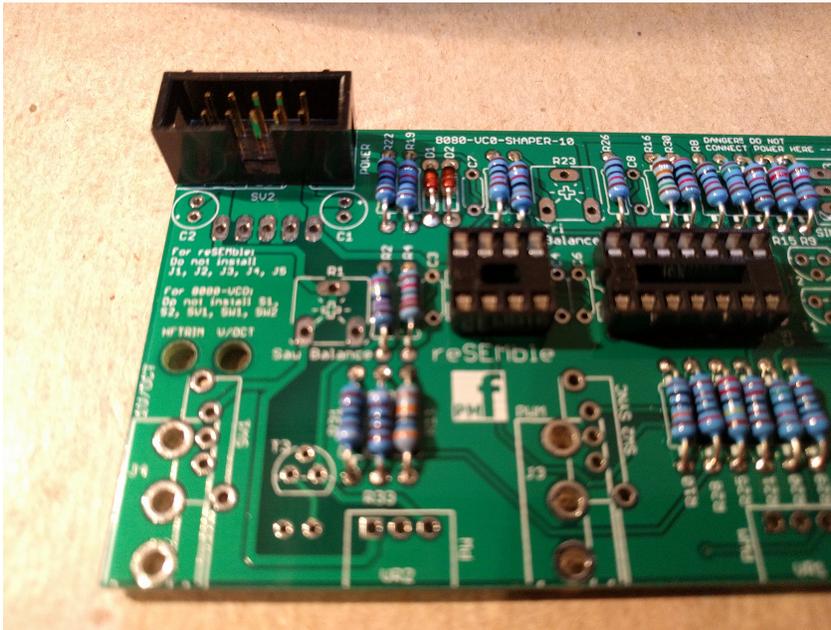
Install the sockets on the TOP of the board. Observe the notch or mark on the sockets and align with the notch or mark on the board. Solder.



Power socket

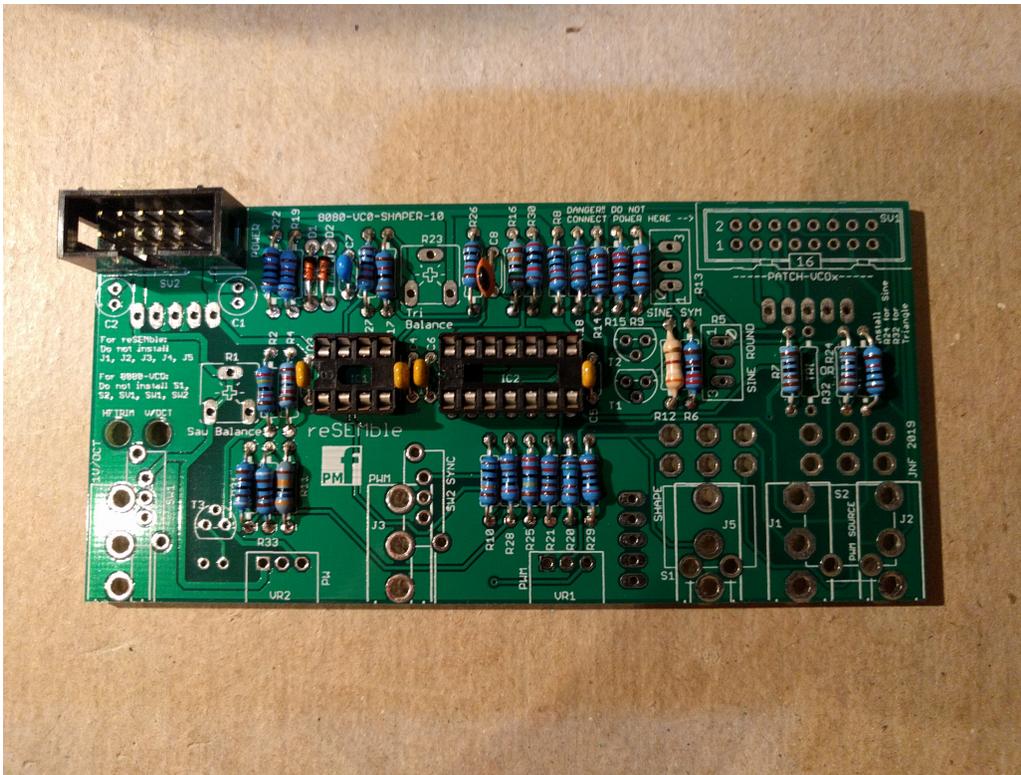
Install the 10 pin power socket on the TOP of the board. **This must be installed with the correct orientation or the module will be damaged when the power is connected.** A right angle header is used for reSEMBle and it needs to face the back.

The cut-out in the socket should face the pots, **aligning the cut-out with the "10" marking on the board** as shown in the photo.



Ceramic/film capacitors

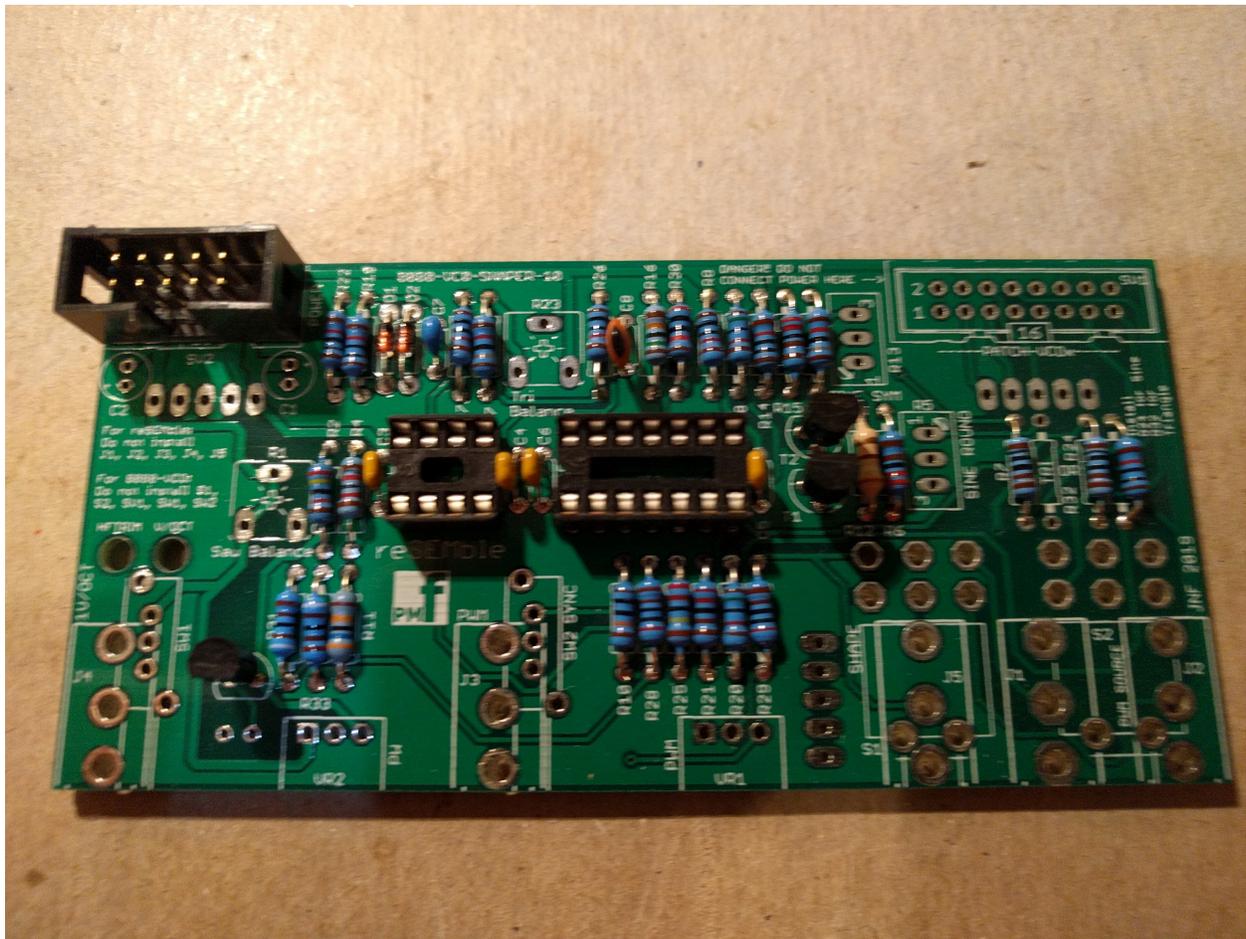
Install the ceramic/film capacitors on the TOP of the board. Solder and clip the leads.



Transistors

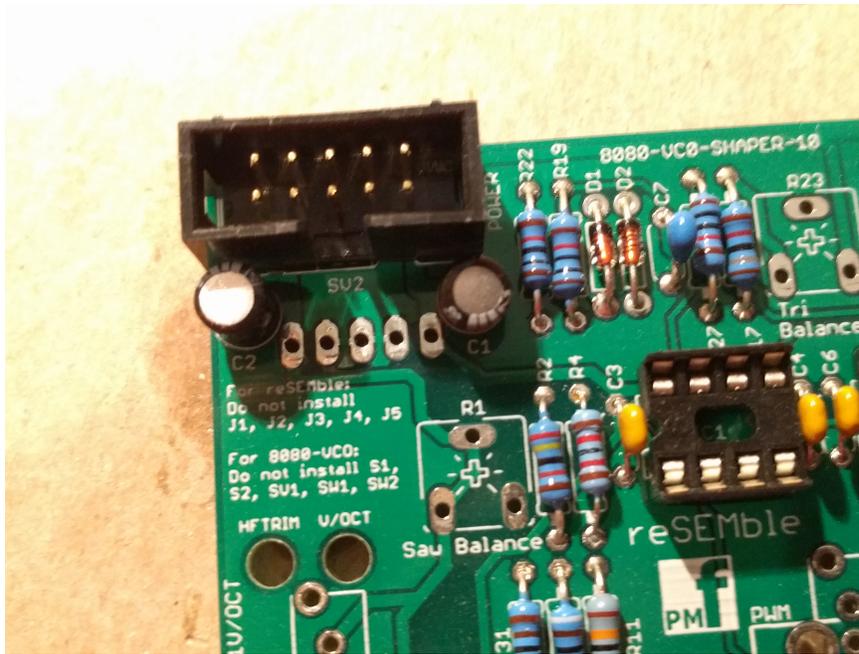
Install the transistors on the TOP of the board. Do not mix up the NPNs with the PNPs or JFETs.

These are polarized components. Align the outline with the outline on the board. They should be raised off the board surface slightly and at the same height. Solder and clip the leads.



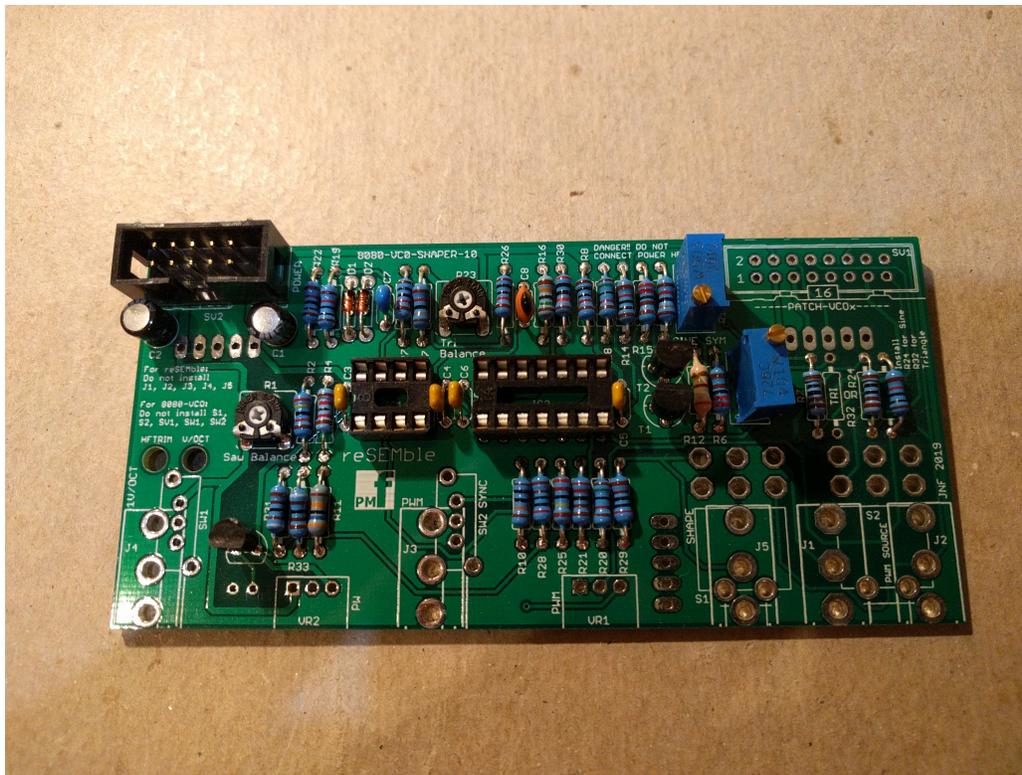
Electrolytic capacitors

Install these on the TOP. Make sure you orient these capacitors correctly. The longer lead and/or the lead marked with a + needs to be inserted into the hole that has the "+" marking near it. Leads marked with "-" go in the board hole WITHOUT the "+". Solder and clip the leads.



Trimmer resistors

Now populate the trimmer pots on the PCB. Make sure they are oriented so that the screws are accessible when the board is installed - either from the back or the side. Some photos show the screws on top and this will work but they will be inaccessible when the PCB is installed.

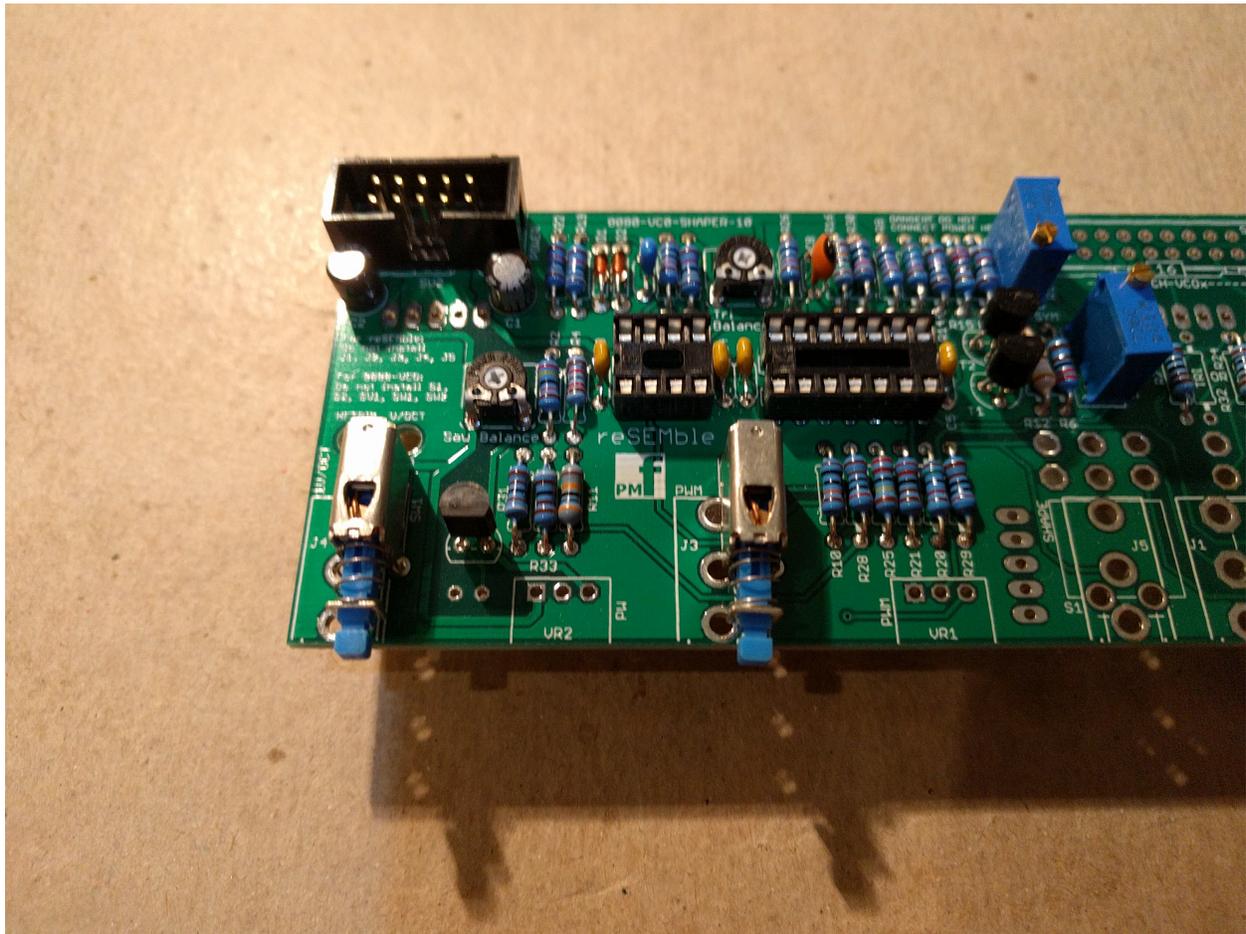


Switches

For VCO1 and VCO2: Do not install anything in the space marked SW1.

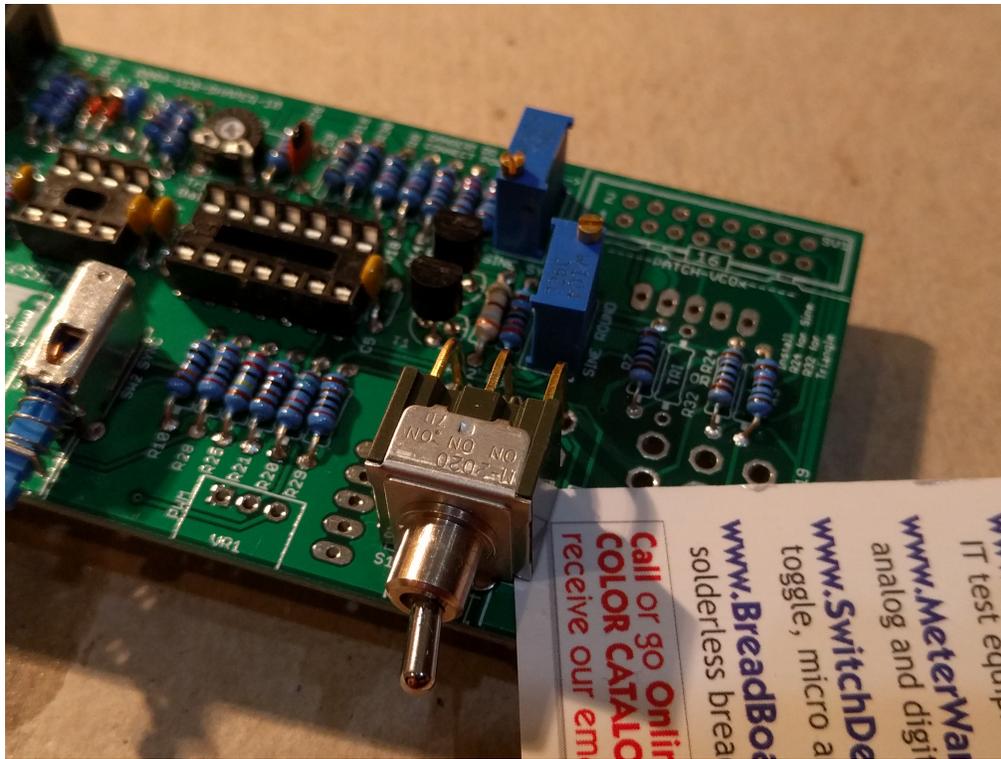
For VCO3: Do not install anything in the space marked SW2.

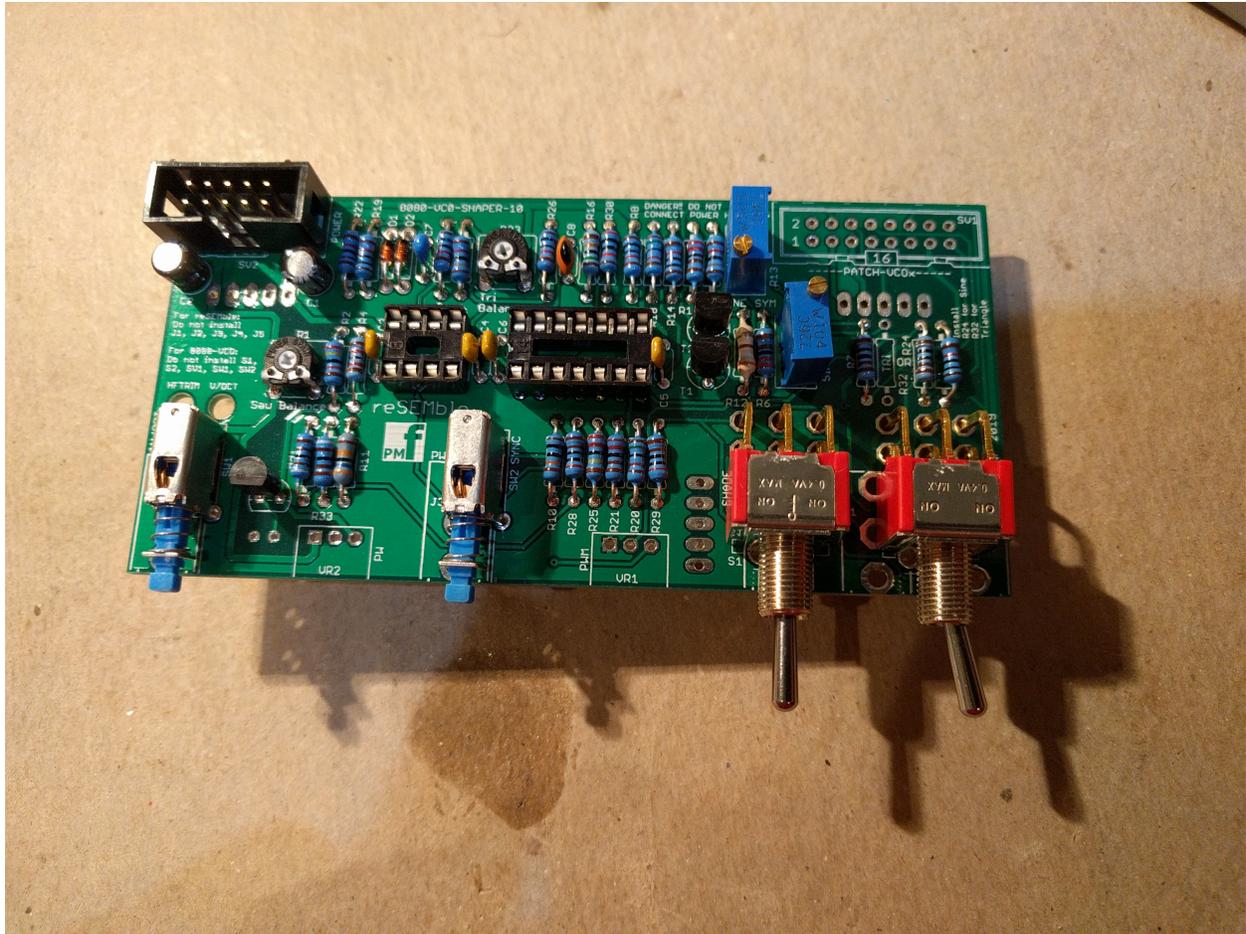
Insert the switches on the TOP so that the plunger faces the front of the PCB. Before soldering check that the switch is in the correct position by aligning the PCB with the front panel to ensure the switch plunger can be seen. Tack one pin of the switch, align with the front panel, then solder all the remaining pins and the locating lugs. The switches are on the TOP. Do not bridge the contacts to nearby components.



Toggle Switches

Insert the switches on the TOP so that the toggle faces the front of the PCB. Before soldering insert a thin temporary spacer such as a business card to keep the metal switch body from contacting pads underneath it. The switch is on the TOP. Do not bridge the contacts to nearby components.

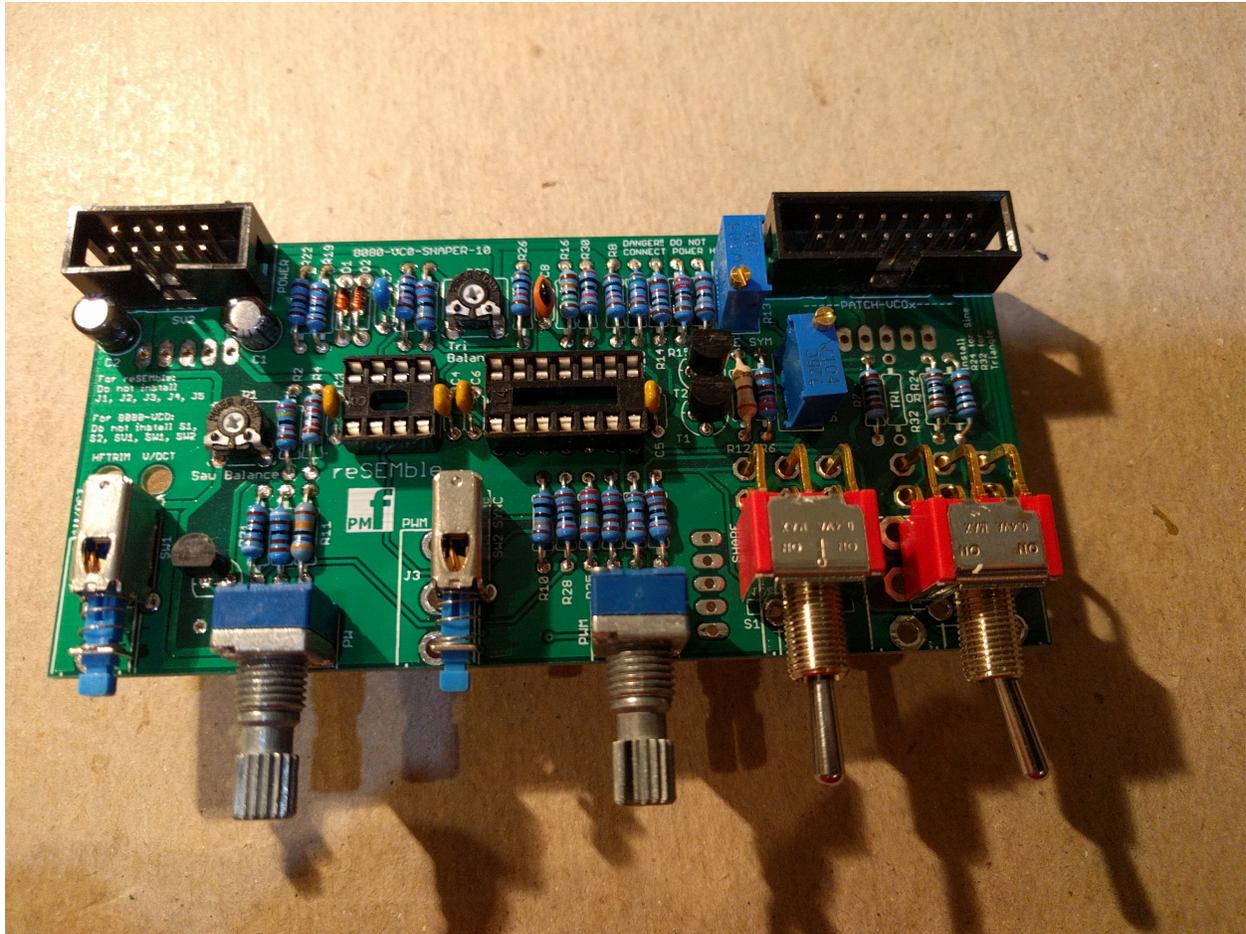




Potentiometers

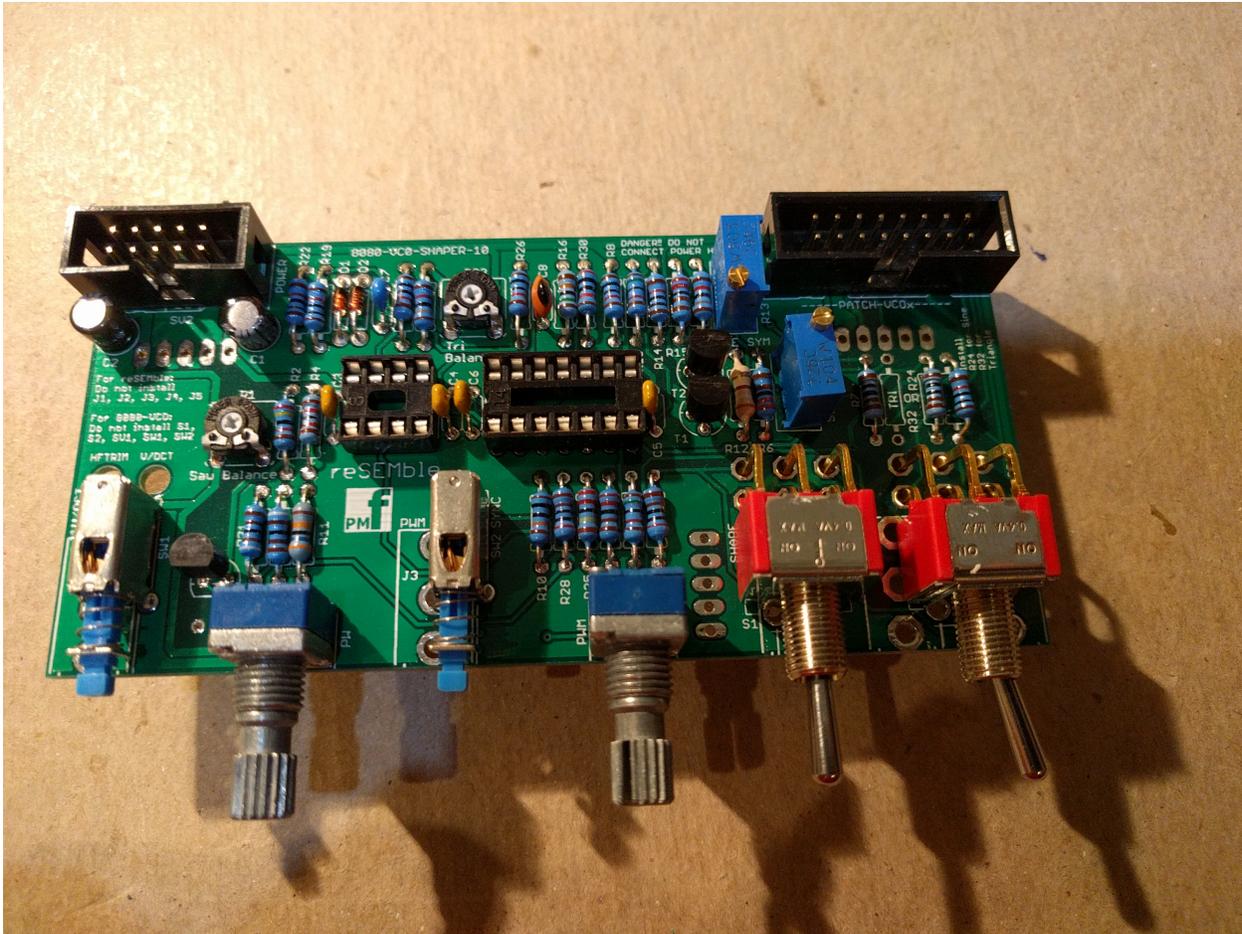
If the pots have positioning lugs on the front, cut these off with a sharp pair of flush cutting pliers. The front of the pot (where the shaft protrudes) needs to be flat.

Carefully align the pots so they are flush with the edge of the board and perfectly upright and tight to the board surface. Please ensure they are on the CORRECT SIDE OF THE BOARD before soldering otherwise PCB tracks and pads may be damaged if they are desoldered. See Photo.



Patch socket

Install the 16 pin patch socket on the TOP of the board. A right angle header is used for reSEMBle and it needs to face the back.



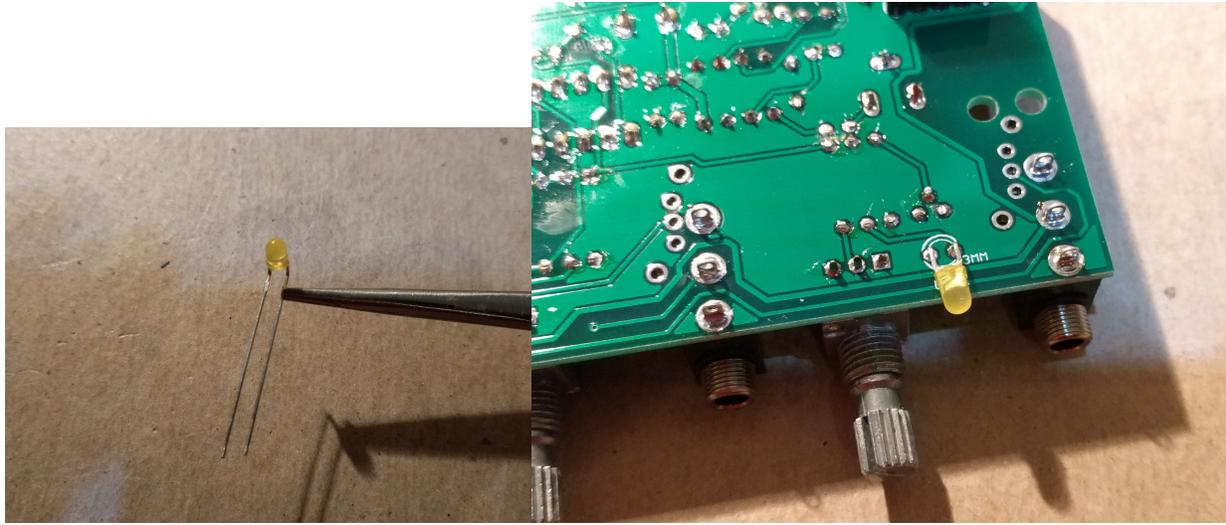
Female Headers

Install these on the **BOTTOM** of the board and solder on the **TOP**. They need to be perfectly perpendicular to the board and tight to the board surface.

LED

Bend the pins of the LED as shown in the photo. Note the location of the longest lead.

Install the LED on the **BOTTOM** of the board. Place the cathode (shorter lead) into the pad with the flat marking.



Join

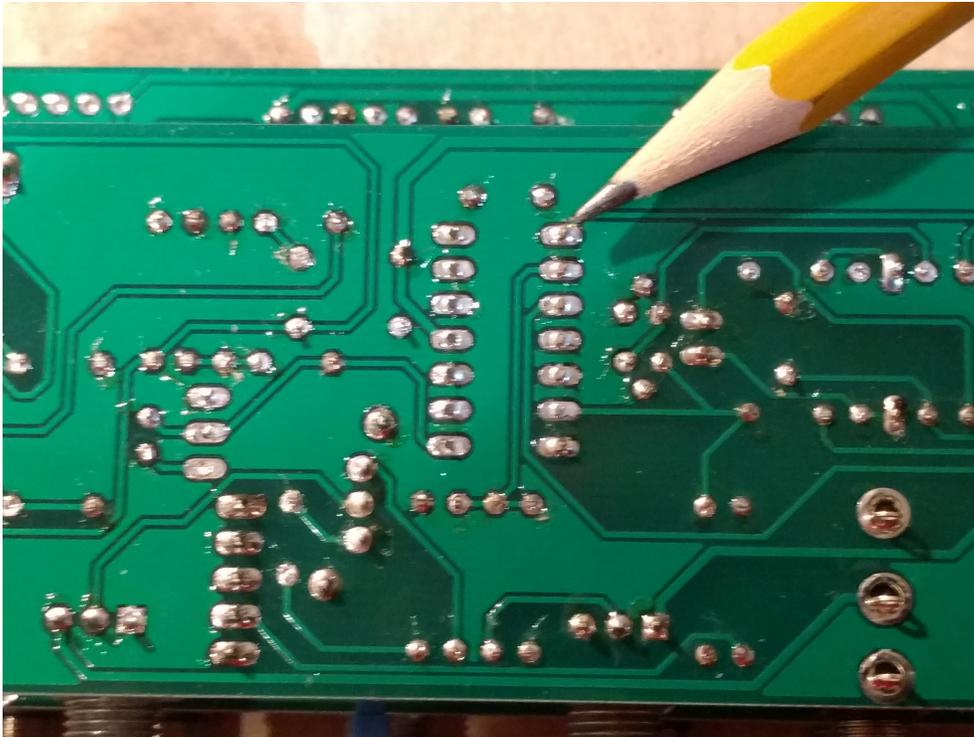
Join the two PCBs by aligning the 5 pin headers on the “Main” board with the ones on the Shaper board.

Do not install the ICs until the voltage tests are complete.

If you do not trust all your soldering and connections, carry out the voltage tests below before installing the ICs

Voltage tests

1. You do not have to do these tests if you are completely happy with your soldering and are sure there are no bridges or incorrectly placed components. However, these tests will ensure that the correct power supplies are sent to the IC pins to ensure they will not be damaged on power up.
2. Plug in the power supply and connect the –VE probe of a multimeter (set to the 20V DC range) to one of the GROUND pins of the jacks. The GROUND pin is nearest to the edge of the board.
3. Check the voltage at the following points on the MAIN board.
The main board has to be tested from below. The pencil shows pin 1 of the IC.



- a. At IC1 pin 4 approx = +12V
 - b. At IC1 pin 11 approx = -12V
 - c. At IC1 pin 3, 5, 10 = 0V
4. Check the voltage at the following points on the SHAPER board.
 - a. At IC1 pin 4 approx = -12V

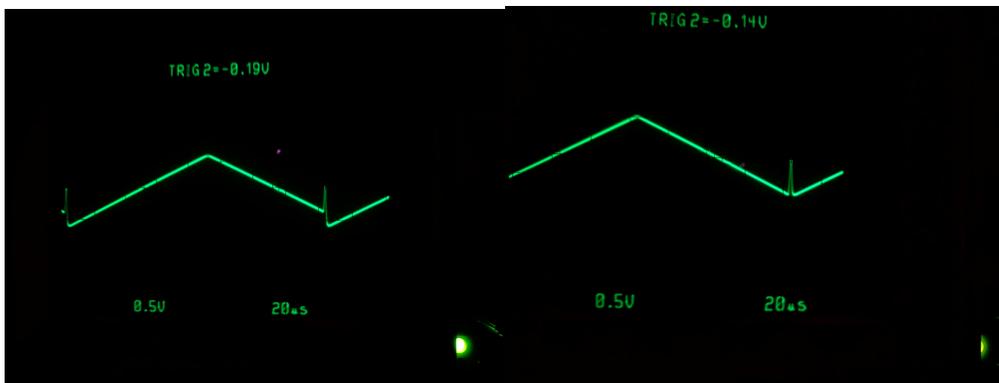
- b. At IC1 pin 8 approx = +12V
 - c. At IC1 pin 3, 5 = 0V
 - d. At IC2 pin 4 approx = +12V
 - e. At IC2 pin 11 approx = -12V
 - f. At IC2 pin 3, 12 = 0V
5. If any of these tests fail to match the readings given, you should check the components and soldering before progressing and/or check with us for further analysis.

Final Assembly

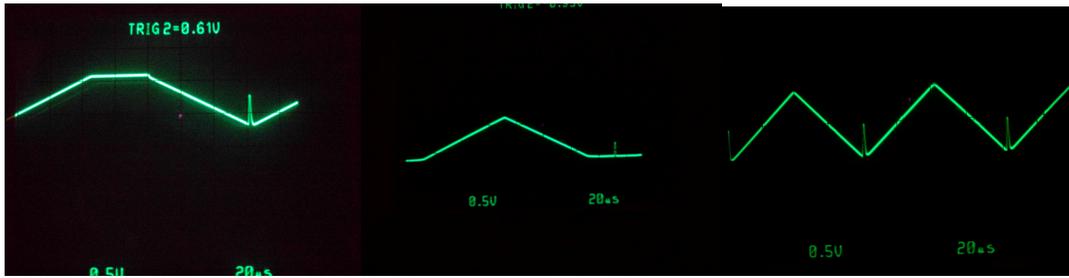
1. Place the ICs in place by aligning the notch with the notch graphic on the PCB Silk Screen and notch on the sockets.

Balance Calibration

1. Center Coarse and Fine tuning
2. Put FM, PWM to 0.
3. Put PW to center.
4. Put EXP switch out.
5. Monitor Pin 1 of Shaper IC2 on the oscilloscope. You should see a triangle-shaped wave. If you see only a line, adjust Tri Balance R23 until you see a triangle-shaped wave.
6. Monitor Pin 1 of IC2 and adjust Saw Balance R1 until the wave meets exactly at the bottom of the triangle.



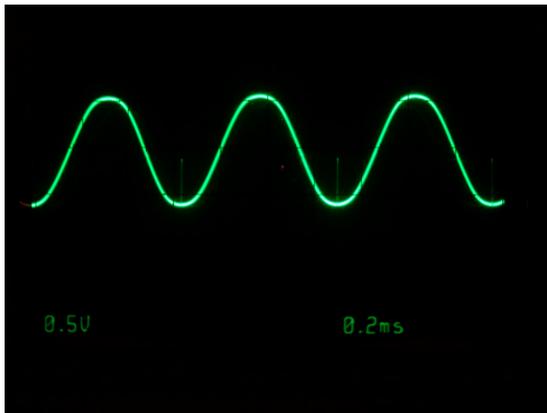
7. Monitor Pin 1 of IC2 and adjust Tri Balance R23 until the wave is centered on 0.



8. The glitch at the lower edge of the triangle can be changed by swapping C7 for 220pf. The glitch is only visible at high frequencies and it does not affect the sound.

Sine Calibration

1. Observe the SINE output on the oscilloscope
2. Adjust SINE ROUND and SINE SYM until you get the best sine wave shape and balance



V/OCT Calibration

1. Set HF Trim fully CCW. This is done by turning the screw counter clockwise until it hits the end stop. A quiet click can be heard.
2. **VOLTS/OCTAVE adjustment:** Repeatedly play two notes one octave apart at the low end (say C2 65.4 Hz and C3 130.8 Hz) and adjust R12 V/Oct until the frequency of the high note is exactly double that of the low note. Check the frequency of other notes separated by one octave. Fine tune R12 until the best tracking is obtained.

TIP: If the high note is flat, turn R20 to make it flatter still. This reduces the gap between the two notes. Then, while playing the lower note, turn the FINE tune panel control to the required lower frequency (e.g. 64Hz) and check both notes again.

3. **High Frequency trim:** Repeatedly play two notes one octave apart at the high end (say 1200 Hz and 2400 Hz) and adjust R16 HF trim until the frequency of the high note is exactly double that of the low note. Check the frequency of other notes separated by one octave. Fine tune R16 until the best tracking is obtained.

Repeat the adjustments until you have the tracking as close as possible to 1V per octave.

Patch Map

