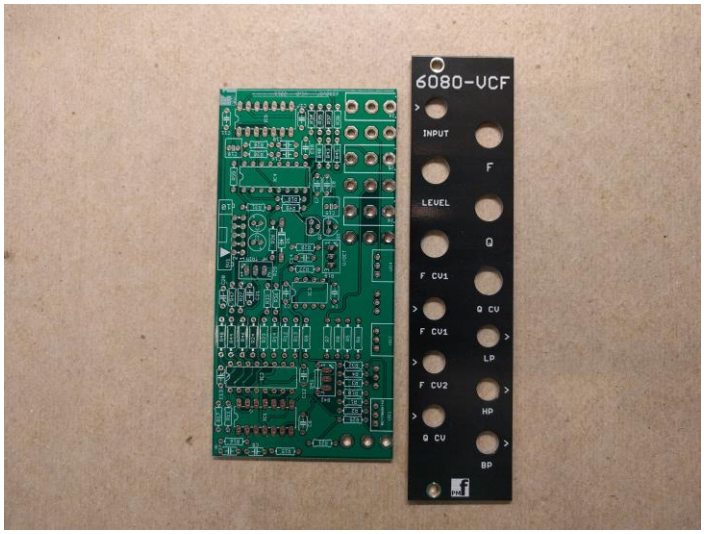
6080-VCF v1.0 – Assembly Guide

Thank you for purchasing this module! This is an average build with tightly packed components and some precision integrated circuits. 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.



The module is designed and sized for **Eurorack** 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 1 PCB board and a front panel.
There are components installed on BOTH sides of the boards. Please ensure that you place the components on the correct side. When referring to the TOP of a board we mean the side with the ***pmF*** logo. The BOTTOM has no logo.

Constructing the board

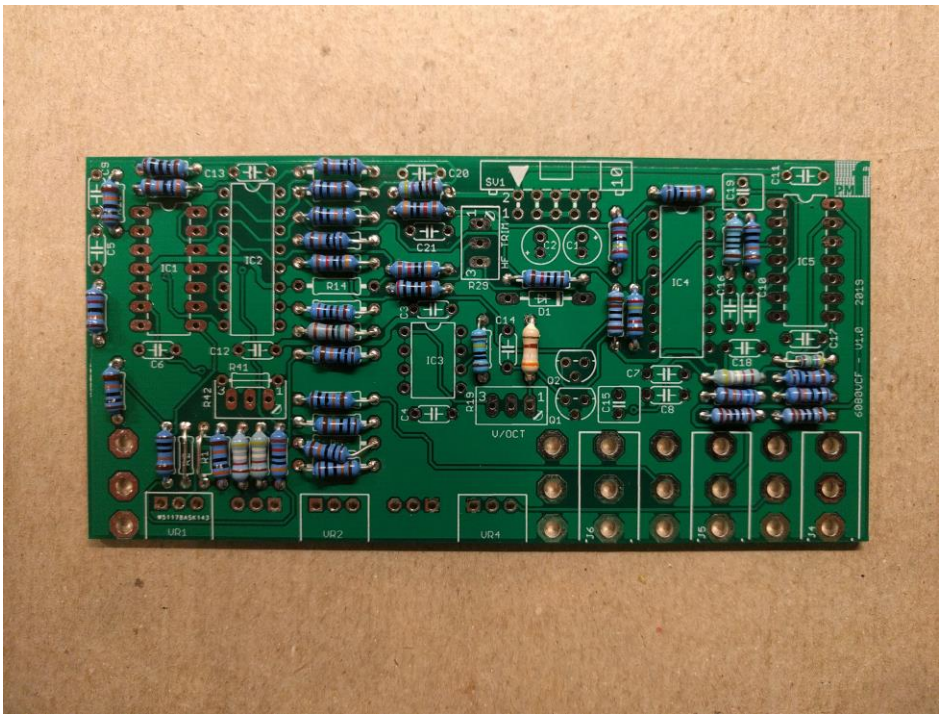
1. Resistors

   R41 and R42 or OPTIONS for the resonance circuit. The fixed resistor R41 will fix the performance of the resonance circuit within the designed in tolerances. Alternatively, the trimmer R42 will allow the resonance circuit to be adjusted to individual preferences as explained in the user guide. Determine if you will use R41 (fixed) or R42 (trimmer). If you are using R41, install it here along with the other resistors.

   R14 is part of the High Frequency trim circuit consisiting of (R14, R29, D1). If you do not need a High Frequency trim function, you do not need to install R14.

   R1 and R2 set the upper and lower frequency range of the filter. Use wire links for R1 and R2 if you want the full range with a resonably coarse feel to the Frequency cutoff control. You can try other values (up to 75k) to compress the range but improve the accuracy of the cutoff control.

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

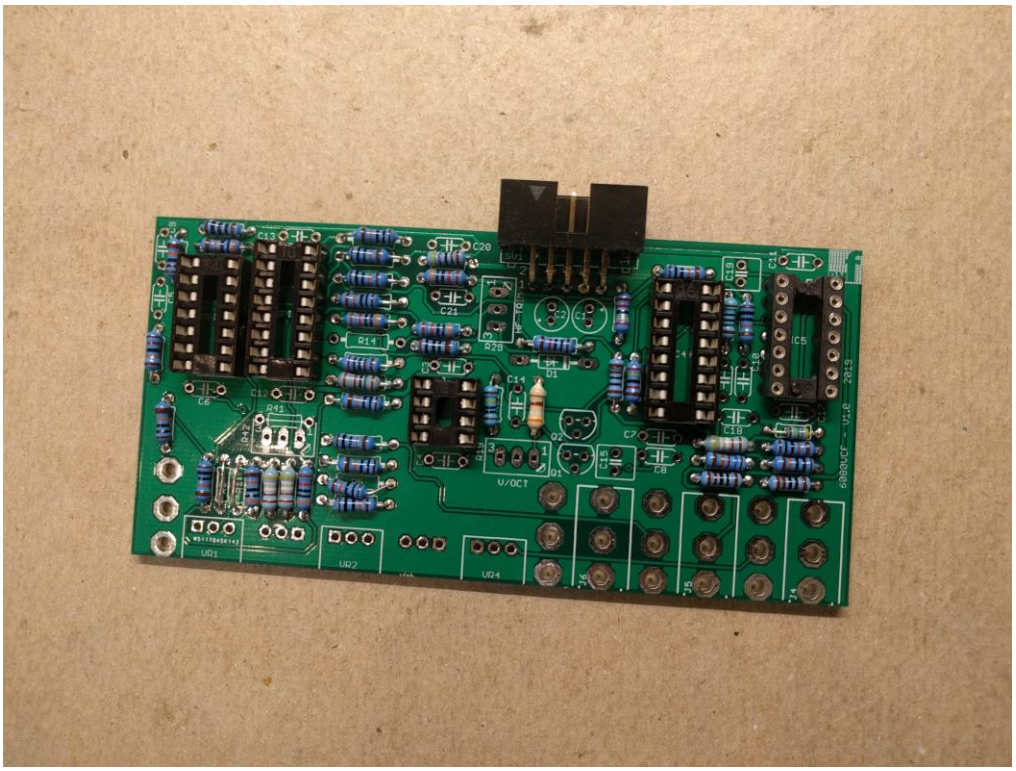


2. Diode

   D1 is part of the High Frequency trim circuit consisiting of (R14, R29, D1). If you do not need a High Frequency trim function, you DO NOT need to install D1. If you will be installing the diode, install the diode on the TOP of the board. These are polarized components. Align the stripe on the diode with the stripe marked on the board. Solder and clip the leads.

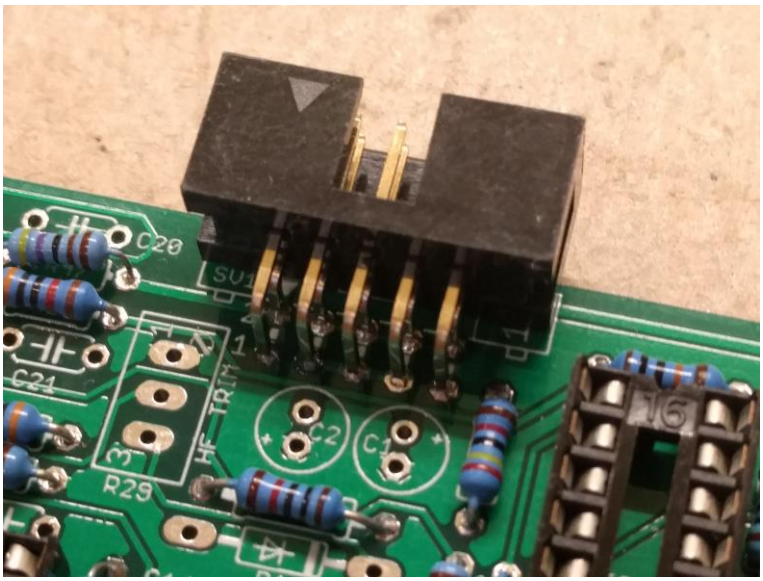
3. IC Sockets

   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.



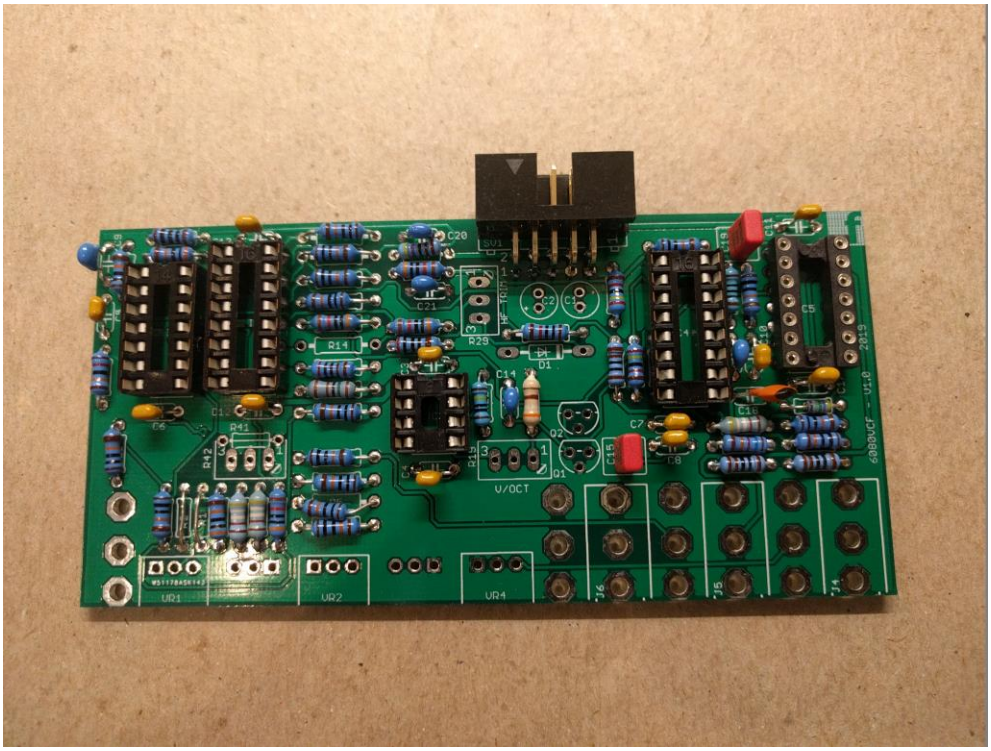
4. Power socket

   Install the 10 pin power socket on the TOP of the board. The opening in the right angle socket should face OUT from the board as shown in the photo. Solder.



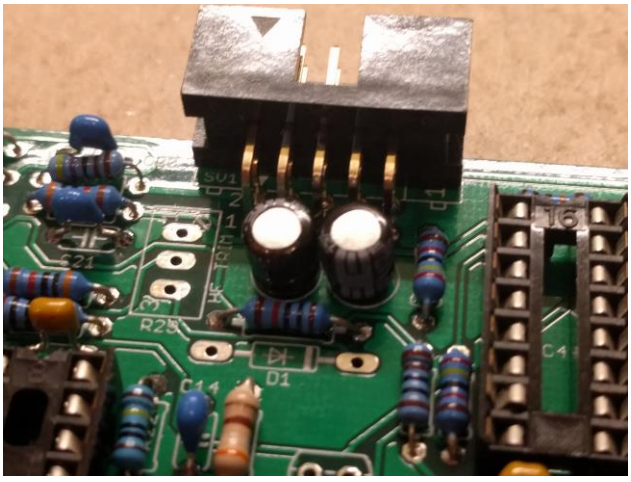
5. Ceramic/film/polypropylene capacitors

Install the ceramic/film capacitors on the TOP of the board. The 220 pf film capacitors are recommended for C15 and C19. Solder and clip the leads.



6. Electrolytic capacitors

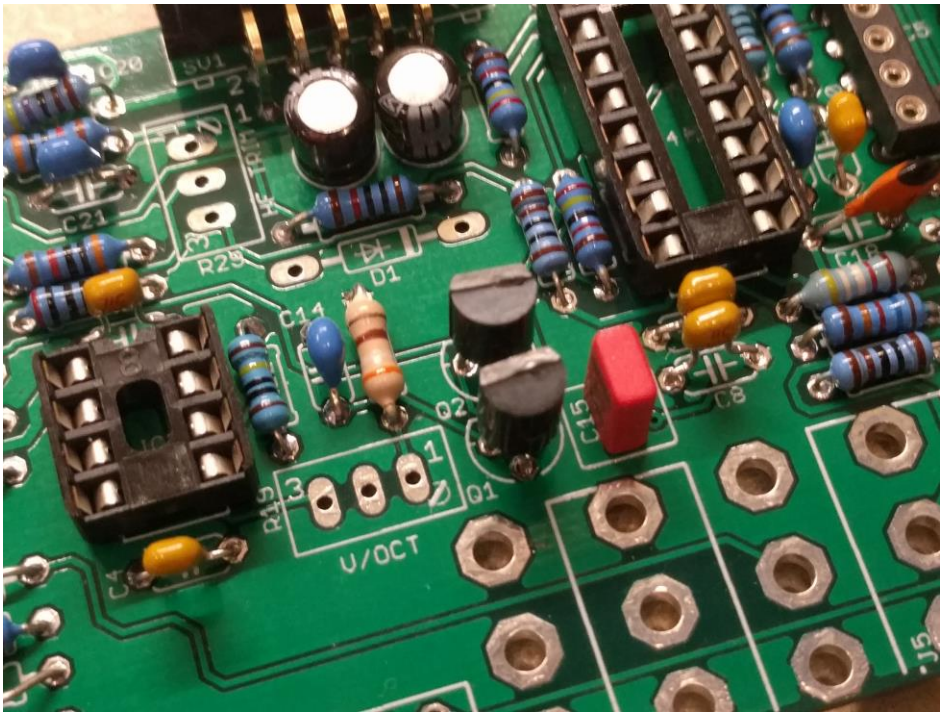
   Install these on the TOP. Make sure you orient these capacitors correctly. The longer lead and/or the lead marked with a + needs to be inserted into the hole that has the "+" marking near it. Leads marked with "-" go in the board hole WITHOUT the "+". Solder and clip the leads.



7. Transistors

   Install the transistors on the TOP of the board. 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.

Try and move the two transistors Q1,2 close together and tie them together with a small zip tie or with epoxy.



8. Trimmer resistors

   R41 and R42 or OPTIONS for the resonance circuit. The fixed resistor R41 will fix the performance of the resonance circuit within the designed in tolerances. Alternatively, the trimmer R42 will allow the resonance circuit to be adjusted to individual preferences as explained in the user guide. If you are using R42, install it here along with the other trimmers. R34 is part of the High Frequency trim circuit consisiting of (R14, R29, D1). If you do not need a High Frequency trim function, you do not need to install R29.

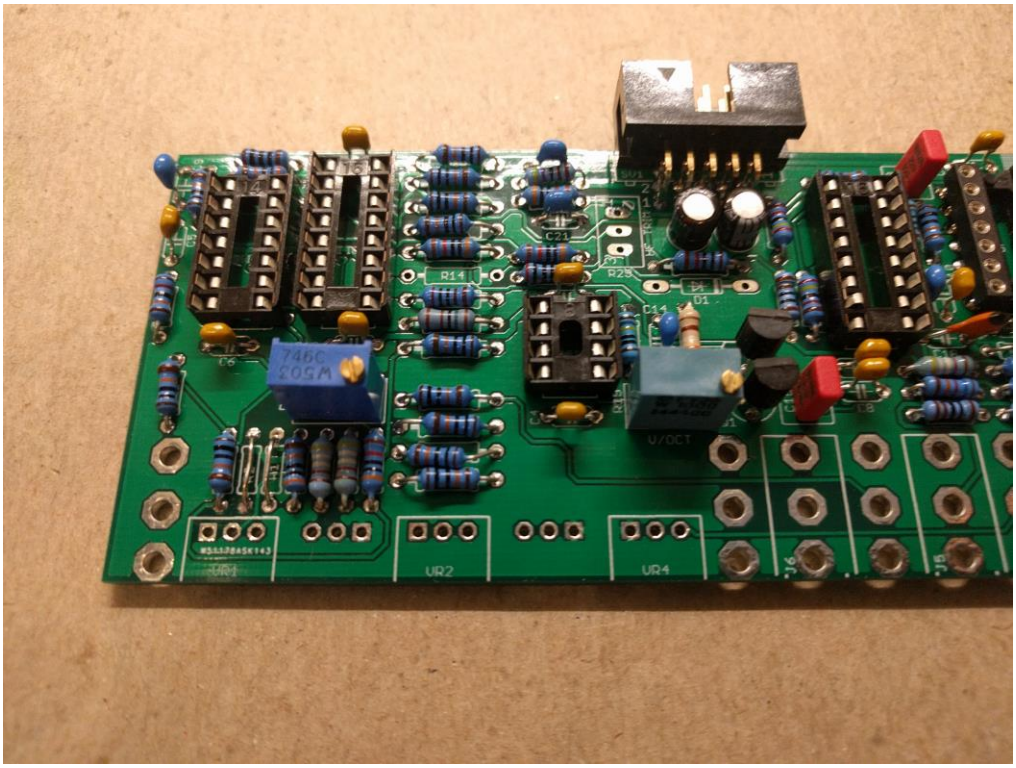
   Use a voltmeter to preset the trimmers between Pin1 and Pin2 as follows:

   R19 - 50R

   R42 (if using) 50k

   R29 (if using) turn fully CCW until click stop

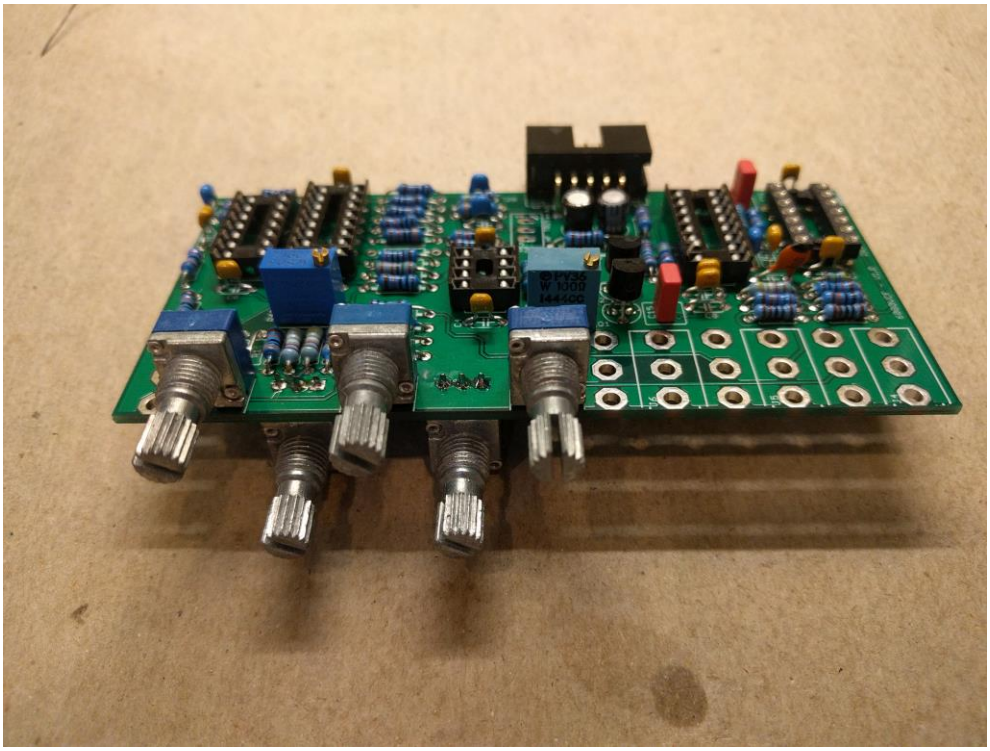
Now populate the trimmer pots on the PCB. Make sure they are oriented so that the screw is above the circle on the silk screen.



9. Potentiometers

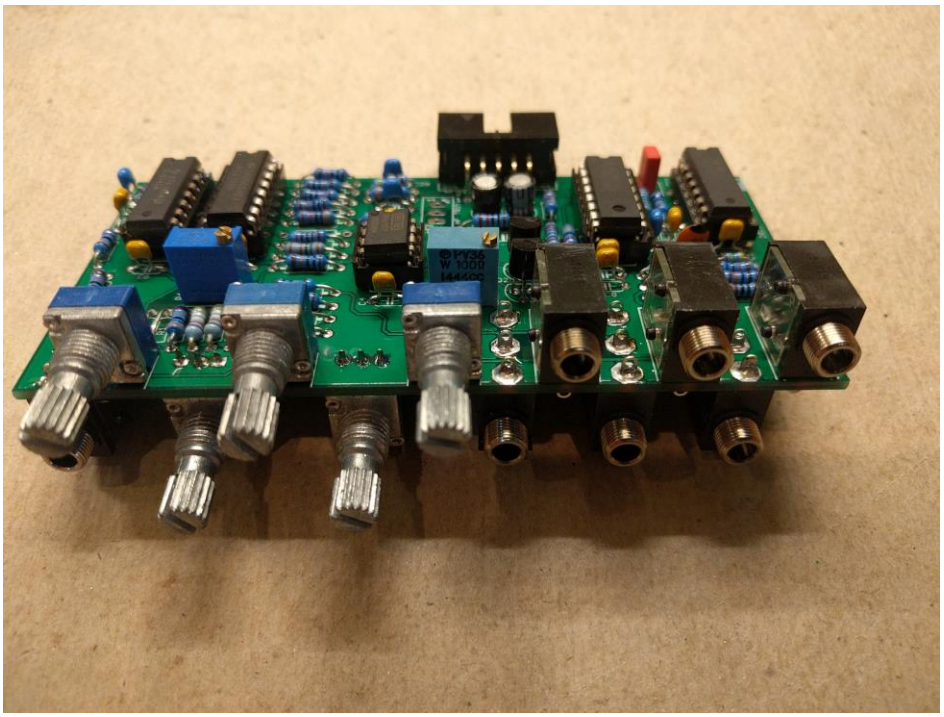
   If the pots have positioning lugs on the front, cut these off with a sharp pair of flush cutting pliers. The front of the pot (where the shaft prtrudes) needs to be flat.

   Install SOME pots on the top and SOME on the BOTTOM. Tack one pin only with solder. These will be finalized later. Please ensure they are on the CORRECT SIDE OF THE BOARD. See Photo.



10. 3.5mm Jack Sockets

    Install SOME jacks on the top and SOME on the BOTTOM. Fully solder each one as it is installed. The easiest order for installation is: J1, 6, 2, 5, 7, 4, 3. Please ensure they are on the CORRECT SIDE OF THE BOARD.



11. Alignment
    1. Place a washer over each pot shaft.

2. Place the front panel over the board so that the pots and 3.5mm jacks align with the holes in the panel.
3. Put nuts on the jacks and pots and FULLY TIGTEN all of them. Do not overtighten!
4. Now fully solder as many unsolderd pins as you can reach of each jack and pot.
5. Remove the front panel and solder all the remaining pins on the jacks and pots.

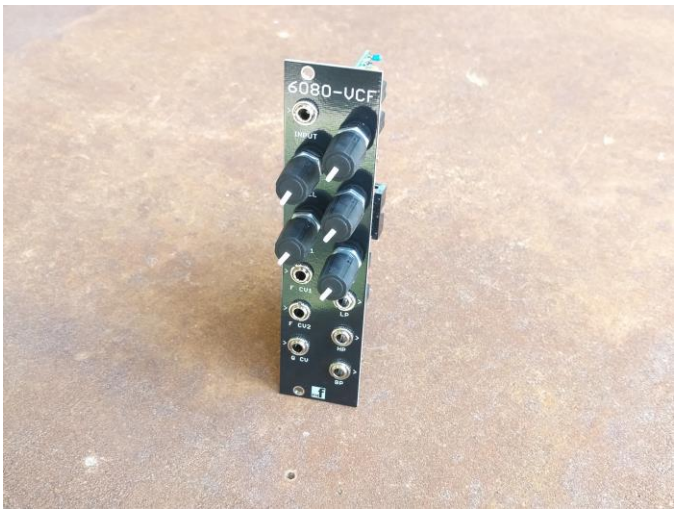
12. Do not install the ICs until the voltage tests are complete.
13. If you do not trust all your soldering and connections, carry out the voltage tests below before installing the ICs

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 board:
    a. At IC1 pin 4 approx = +12V
    b. At IC1 pin 11 approx = -12V
    c. At IC1 pin 3, 5, 12 = 0V
    d. At IC3 pin 4 approx = -12V
    e. At IC3 pin 8 = +12V
    f. At IC3 pin 3, 5 = 0V
    g. At IC4 pin 6 approx = -12V
    h. At IC4 pin 11 approx = +12V
    i. At IC4 pin 3, 14 = 0V
    j. At IC2 pin 6 approx = -12V
    k. At IC2 pin 11 approx = +12V
    l. At IC2 pin 4 = 0V
    m. At IC5 pin 4 approx = +12V
    n. At IC5 pin 11 approx = -12V
    o. At IC5 pin 12 = 0V
4. 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.
2. Place a washer over each pot shaft.
3. Place the front panel over the board so that the pots and 3.5mm jacks align with the holes in the panel.
4. Put nuts on the pots and jacks and fully tighten.
5. Install the knobs.



Calibrating the RESONANCE circuit

1. The resonance circuit is needed to calibrate the rest of the VCF so this is done first.
2. If you are using the fixed R41 30k resistor instead of the R42 trimmer, the resonance circuit will self oscillate at some point as the Q control is turned. This point is not adjustable when the fixed resistor is installed.
   The remainder of this calibration procedure is dependent on the R42 trimmer being installed.
3. Disconnect all CV sources from the inputs.
4. Set the level control to 0.
5. Set the F control to the center.
6. Set the Q control to FULL.
7. Connect the LP output to an oscilloscope and/or an audio system and observe or listen to the resulting sine wave.
8. Turn R42 counter clockwise until the sine wave is 10V peak to peak (-5 to +5) .
9. This sets the self resonance amplitude of the self reonance.
10. You can continue turning the trimmer counter clockwise until the sine wave is 0 amplitude. The VCF will then not self resonate as the Q control is turned up.
    You can set the trimmer between these two points to fine tune the amplitude of the self resonance.

Calibrating the FREQUENCY tracking

1. Disconnect all CV sources from the inputs.
2. Set the level control to 0.
3. Set the F control to the center.
4. Set the Q control to FULL.
5. Set the V/OCT trimmer R19 to its center position and the HF trimmer R29 (if using) is fully CCW if you did not already do this before soldering.
6. Connect the LP output to a frequency counter and an audio system and observe and listen to the resulting sine wave.
7. Supply 0V to one of the FCV inputs from a keyboard controller or other voltage source.
8. Adjust the F panel control until the frequency is 100Hz.
9. Supply 2V to one of the FCV inputs from a keyboard controller or other voltage source.
10. Adjust the trimmer R19 until the frequency is 400Hz.
11. Reduce the FCV input voltage back to 0V.
12. Now readjust the F panel control until the frequency is 100Hz.
13. Repeat steps 7 to 12 until the frequency doubles for each 1V increase in FCV input without needing to adjust the F control or the trimmer.
14. You can also try 3V = 800Hz, 4v = 1600Hz, 5V = 3200Hz. Try and get the best tracking across the voltage range.
15. You can turn the HF trimmer R29 (if installed) to get better tracking at the higher frequencies.