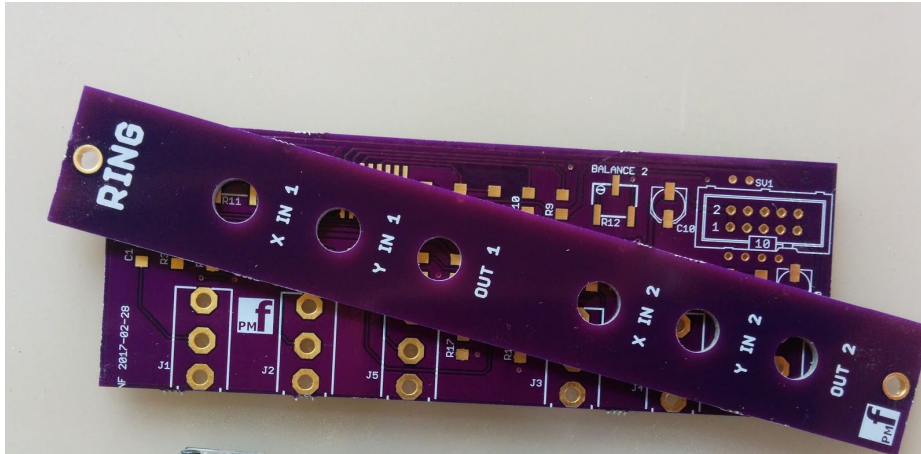


Ring Modulator – Assembly Guide

Thank you for purchasing this module! This is an easy build but with some surface mount parts including precision integrated circuits. Some of the pads are quite small and you will need a chisel tip or screwdriver tip soldering iron, fine solder and the skill to solder these tiny joints. If you have not soldered SMD before, we recommend watching some of the many YouTube guides. Our favorite: [EEVBlog](#).



The module is designed and sized for **Euro rack** systems. You will need a 16-pin euro rack 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.

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.

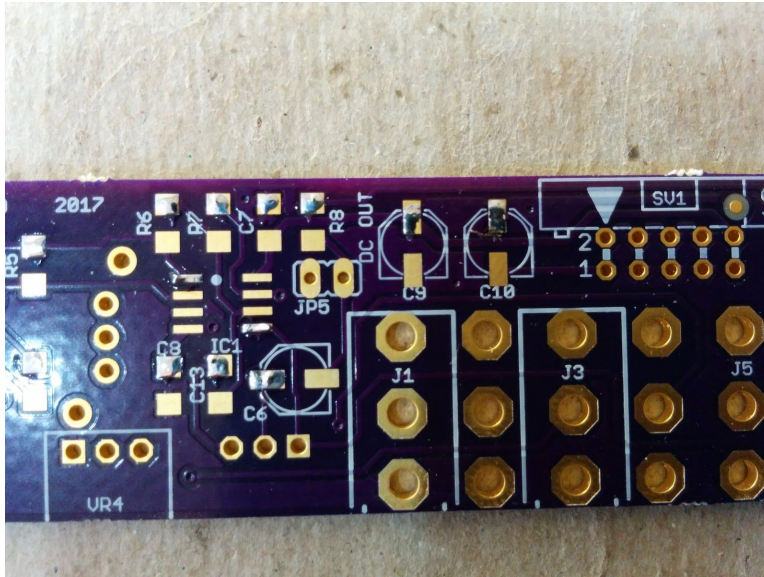
You should follow the order of assembly as described below since some components will be soldered underneath other components.

Some of the photos included here are used to guide you through the SMD soldering process and may not be of the specific board you are constructing.

Constructing the board

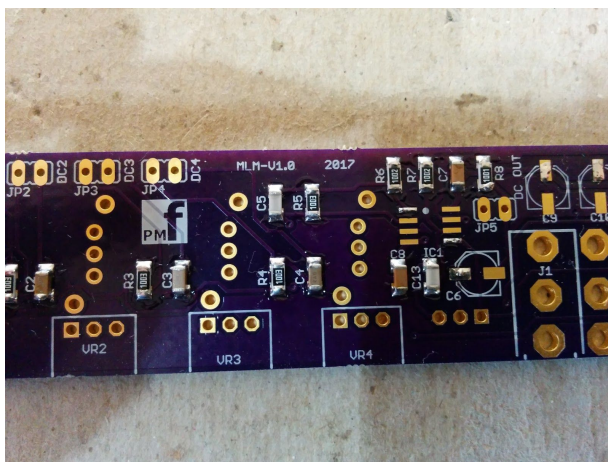
Board preparation

Apply flux to the SMD pads. Tin one pad of each SMD footprint with a SMALL amount of solder. For the ICs, apply a tiny amount of solder to two opposite corner pins.



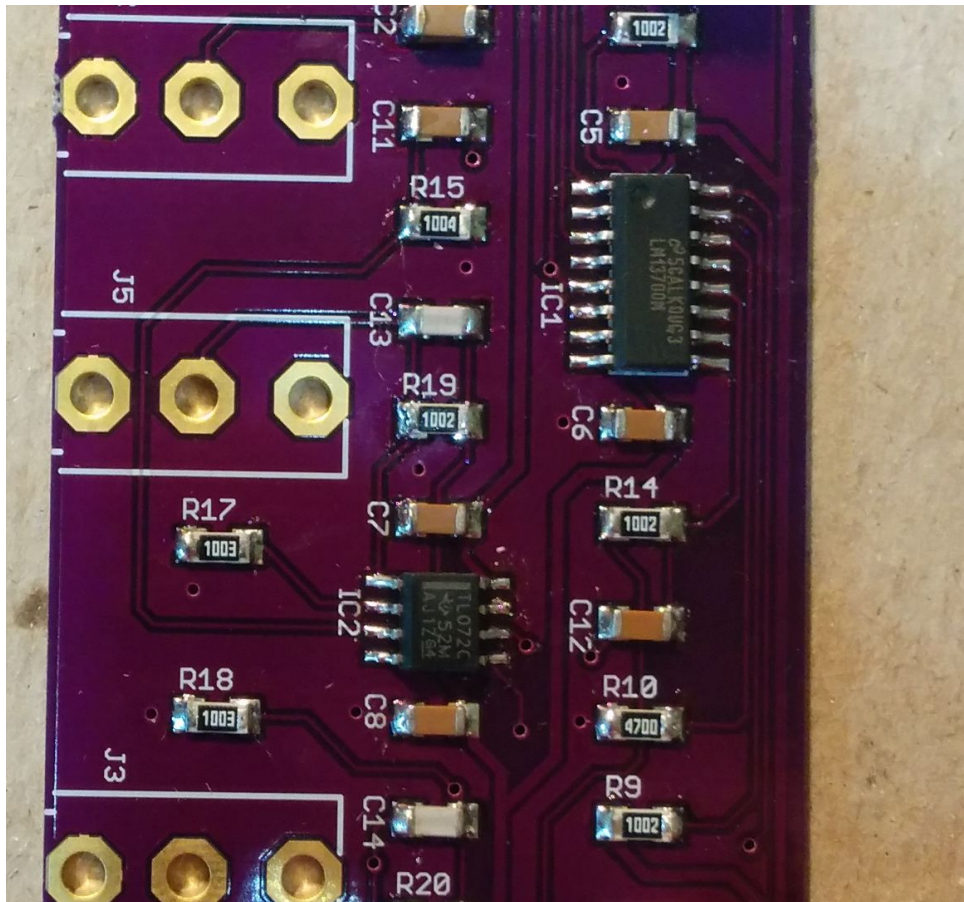
1206 Size Resistors and ceramic capacitors

Install the 1206 resistors and 1206 capacitors on the TOP of the board by positioning on the footprint and heating the cap and tinned pad until the part is attached. When all 1206 parts have been attached. Solder the opposite pad of each part. Finally, reheat and add solder if necessary to finalize the first pad of each part.



ICs

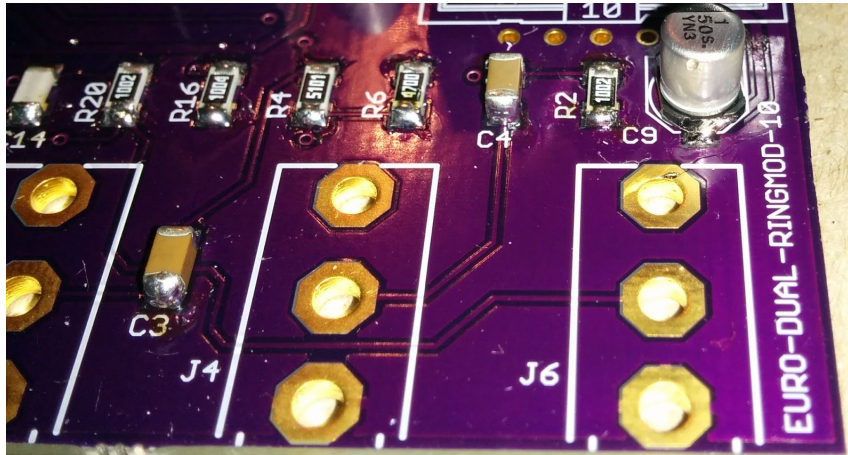
Install the ICs with the correct orientation. Align the dot or other marker with the corresponding mark on the board. If you solder the ICs the wrong way round, they will explode and render the board useless. Position on the footprint and heat the pin and tinned pad in one corner until the part is attached. Position and heat the pin and tinned pad in the opposite corner until the part is attached and aligned with all pins and pads. Solder the remaining pins and pads. Finally reheat and add solder if necessary to finalize the corner pads of each part. Check for and remove any bridges between pins.



Electrolytic capacitors

Install these on the TOP. Make sure you orient these capacitors correctly. The lead marked with a + needs to be placed on the pad that has the "+" marking near it. Leads marked with "-" go on the pad WITHOUT the "+". C6 is NON-POLARIZED and does not have a +/- marked.

Position on the footprint and heat the pin and tinned pad until the part is attached. When all have been attached. Solder the opposite pad of each part. Finally reheat and add solder if necessary to finalize the first pad of each part.



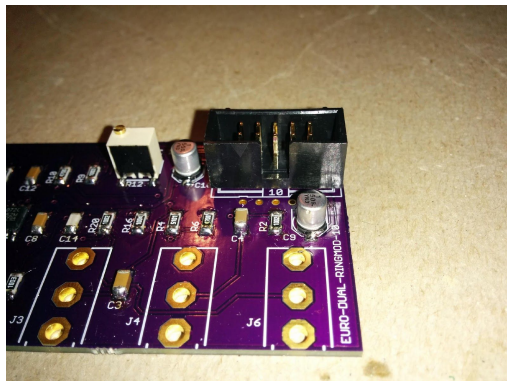
Trimmer resistors

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

Power socket

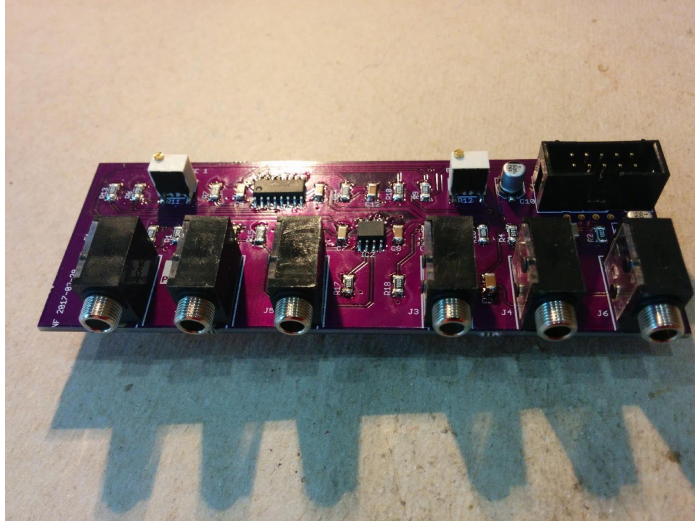
Install the 10 pin power socket on the TOP of the board. **This must be installed with the correct orientation or the module will be damaged when the power is connected.**

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



3.5mm Jack Sockets

Install the jacks on the top. Tack one pin only of each socket with solder. These will be finalized later. Please ensure they are on the CORRECT SIDE OF THE BOARD. See Photo.



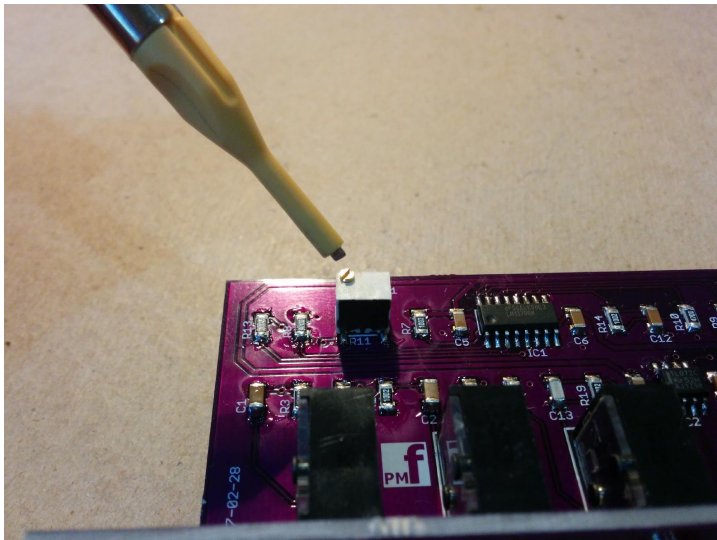
Alignment

1. Place the front panel over the board so that the 3.5mm jacks align with the holes in the panel.
2. The bottom of the panel must be nearest the power socket. If you install it upside down the jacks will be labeled incorrectly.
3. Put nuts on the jacks and FULLY TIGHTEN all of them. Do not overtighten!
4. Now fully solder all the pins of the jack sockets.



Calibrating the Ring Modulator

1. Double check again that you have installed the power socket the correct way around.
2. Connect the power supply from the synth.
3. Connect the OUT 1 to a mixer or other output device.
4. Supply an approximately 200Hz sine wave into the X IN 1 input.
5. Turn up the mixer until you hear the sine wave.
6. Adjust the Balance 1 trimmer left and right until the signal volume is minimized. There should be very minimal feedthrough when there is no signal on Y IN 1.
7. Repeat for the second set of inputs and outputs, using Balance 2.



Using the Ring Modulator

1. To get started with this module, run a 200Hz sine wave directly from a VCO into the Y input and another sine wave into the X input from a Keyboard/VCO/ADSR/VCA patch. Patch the output to your mixer or output module and play notes on the keyboard while adjusting the tuning of the two VCOs. Then you can experiment with other waveforms and patches.