
SPECTRA MIRROR
FREQ
1
2
PW
1
2
IN
MORPH
IN
RES
PW 1
NOTE
PW 2
FM 1
MORPH
OSC
S&H
VCA
MORPH
FM 2
CLOCK
MYSTIC
circuits
3BA

SPECTRA MIRROR BUILD DOCUMENTATION

BRIEF EXPLANATION – PLEASE READ!

Im going to include a fairly boiler plate warning about the perils of DIY at the start of this. I am glad that you bought this kit, and I will do everything that I can in order to get your kit working. That said, buying this kit or PCB/ panel is in NO WAY a guarantee that your kit will work. While it isn't necessary it is extremely helpful for anyone who does DIY to have a basic amount of knowledge about how to solder, debug, and other common sense knowledge of electronics. Also it is extremely helpful to have an oscilloscope or at least a multimeter. Without a multimeter, if you contact me asking why your kit doesn't work I will have almost no way to help you. That being said this kit is not super difficult to build, its just a somewhat large project. I wouldn't suggest doing it as your first kit but after having a couple other working kits under your belt this project shouldn't pose much of a problem. While I do my best to make thorough instructions I will not hold your hand for stuff like what a capacitor is so again, a certain amount of knowledge is expected.

Before we start working I just want to say a few things about the transistor pair. As it turns out I made this board so that it could be built one of two ways: with a set of through hole transistors (the way made easy for DIY) or with a SMD matched transistor pair (for the production model). Now there is no reason that you can not do the SMD transistor pair yourself and I will provide instructions to do so, but because the transistor pair is quite small and definitely not suited for an SMD beginner I do not include it in the kit because I want the process of sourcing the part to be a sort of "barrier for entry". Basically if you do not feel completely comfortable soldering SMD already, do NOT attempt this as your first SMD soldering adventure. There are plenty of kits out there which are designed to teach people to solder SMD, this is not one of them.

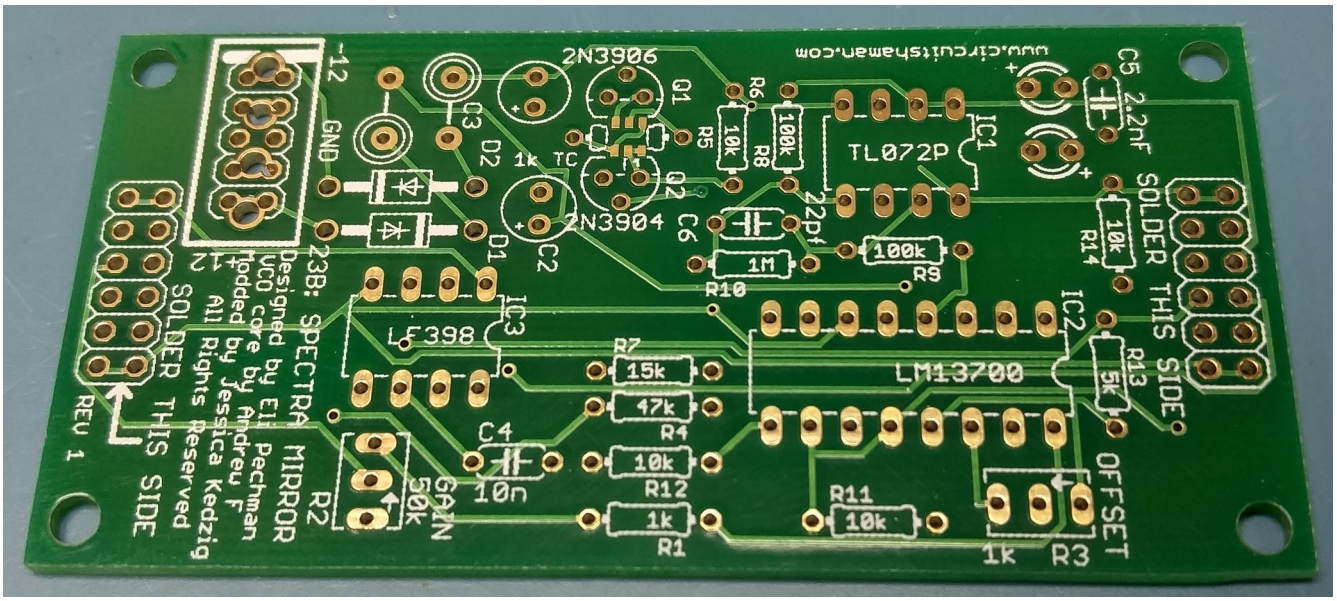
Also I included a place to put a tempco resistor in contact with the transistor pair on the board. However, through my own experimentation I am not entirely convinced that it does very much. I haven't included a tempco with the kits but you are welcome to use one in this position, both synthcube and thonk sell them. I purchase mine from Akahane in Japan if you want to get crazy about it. The resistor is 1k 3300 ppm.

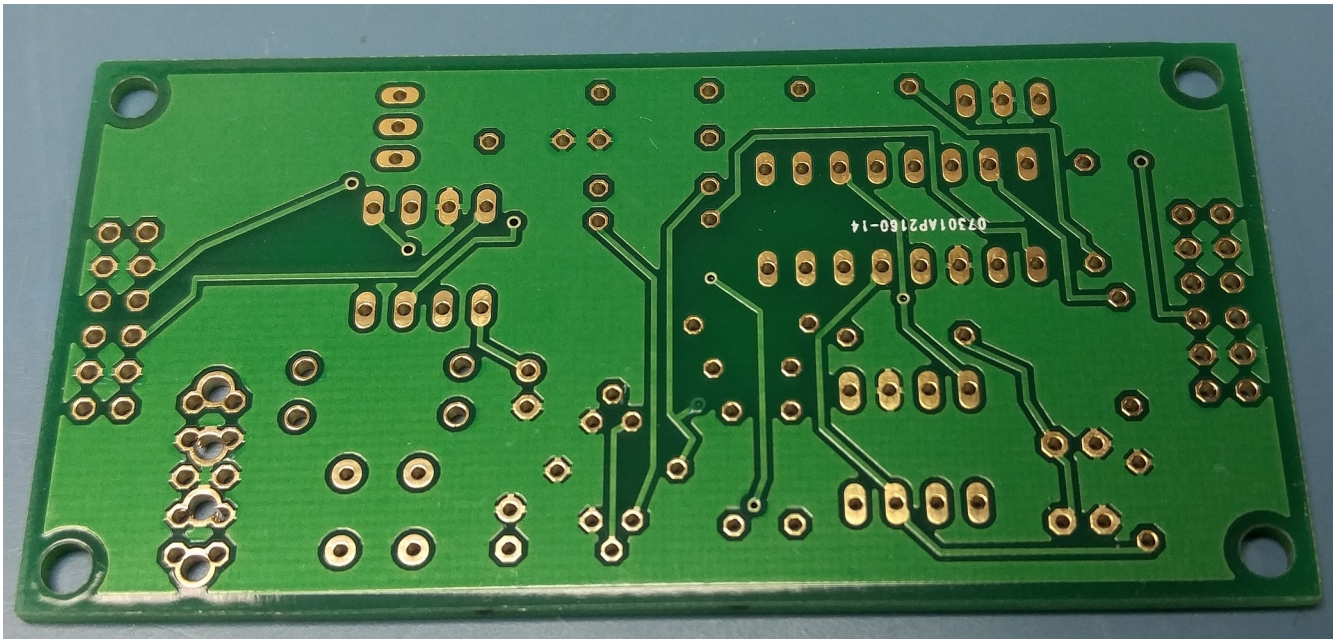
Finally about the through hole transistors – one is a NPN and the other is a PNP. While it is entirely possible to match these, it is a real pain in the buns. I would advise against even trying it. I got the oscillator design from Andrew F of Non-linear circuits and he reports having consistent tracking over about 3 octaves with his oscillators. Since this is a downsampler, I would say 3 octaves of tracking will do fine for our purposes.

Also, no matter your level of skill I HIGHLY suggest reading the entire build documentation before you start building, it will stop you from making some easily preventable mistakes.

Whew ok, was that boring enough for you? Lets start building stuff!

TOP BOARD



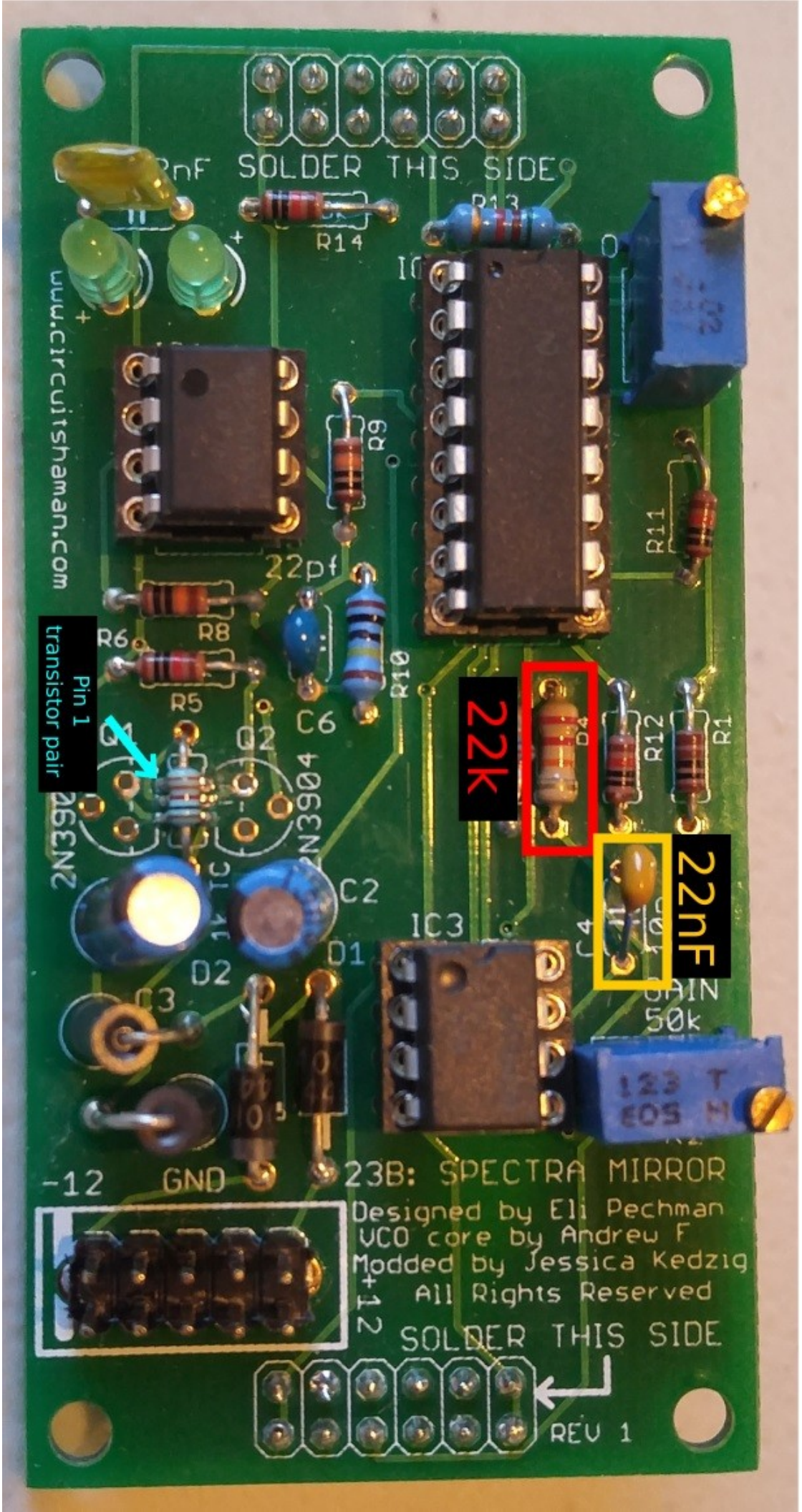


Ok, first of all I will just mention the slight modifications to the board which must be made if you decide to go for the SMD transistor pair. If that is your choice just go ahead and start with these parts so that you don't accidentally put in the wrong value later.

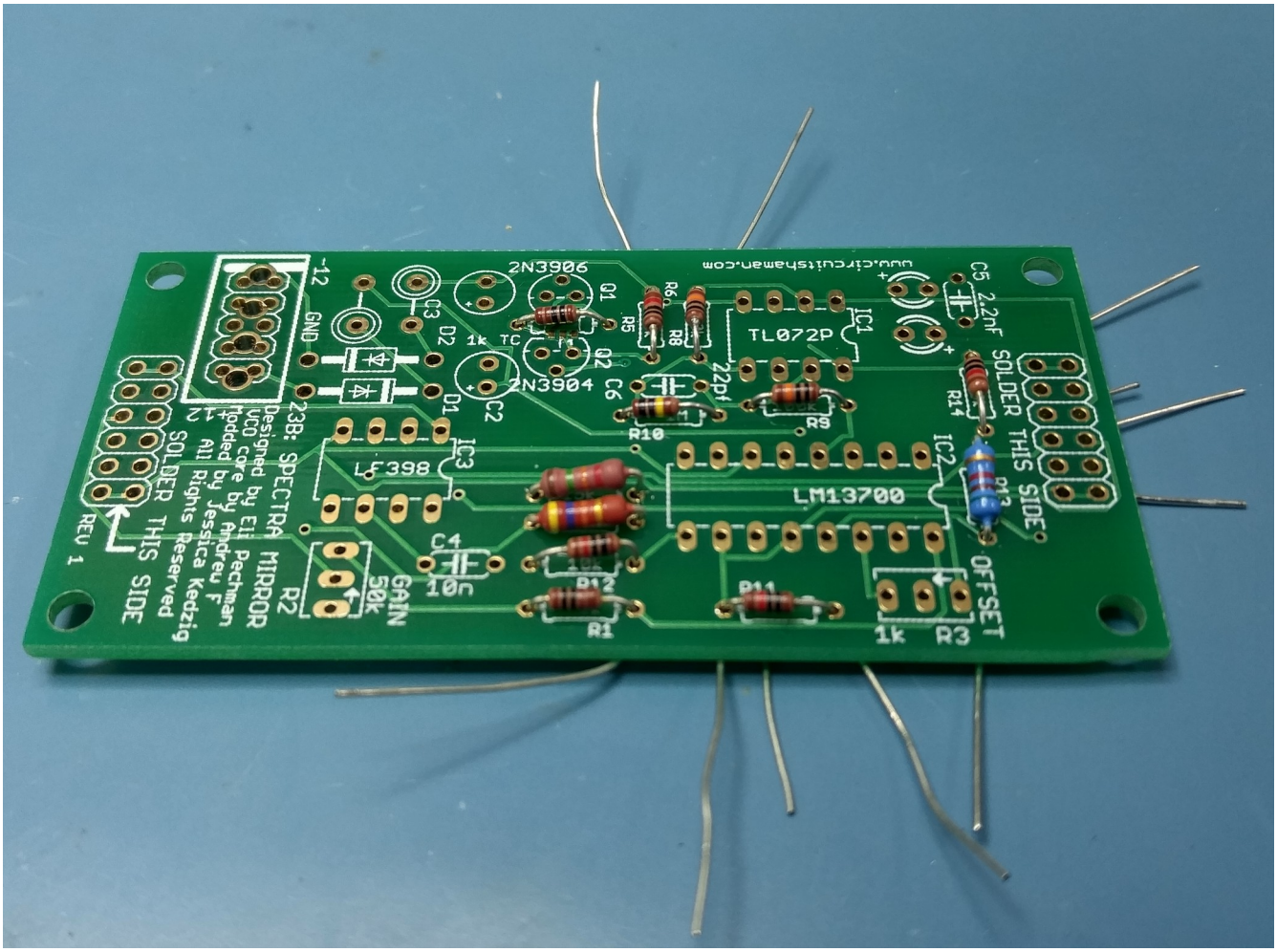
Change R4 to 22k rather than 47k

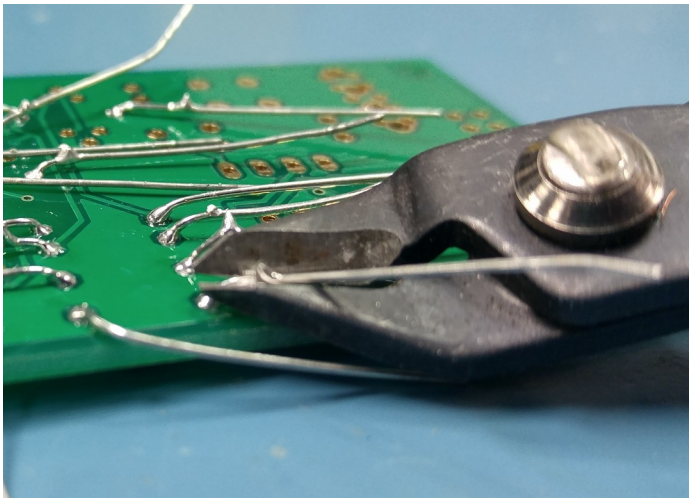
Change C4 to 22nF rather than 10nF

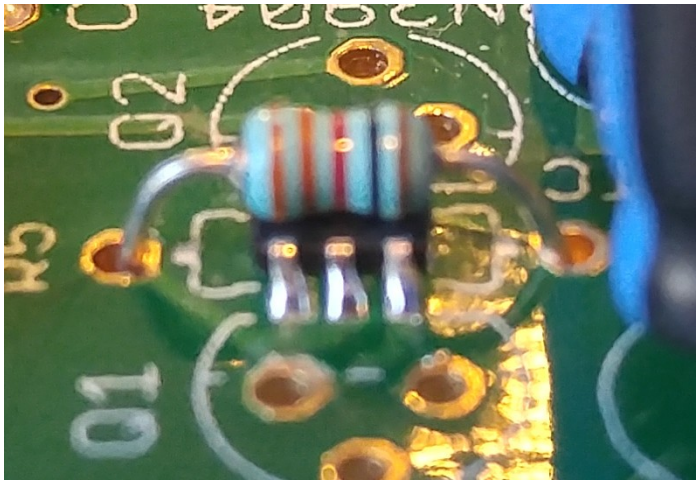
For the transistor pair unfortunately the silkscreen marking of pin 1 did not show up correctly. There should be a tiny dot on your transistor pair which faces AWAY from the power headers.


SOLDER THIS SIDE
R14
R13
www.circuitshaman.com
R9
R11
22pf
R6
R8
R5
R10
C6
Pin 1
transistor pair
Q1
Q2
2N3904
2N3904
22k
D4
R12
R1
22nF
C2
IC3
D1
D2
C3
C4
GAIN
50k
-12
GND
23B: SPECTRA MIRROR
Designed by Eli Pechman
VCO core by Andrew F
Modded by Jessica Kedzig
All Rights Reserved
+12
SOLDER THIS SIDE
REV 1

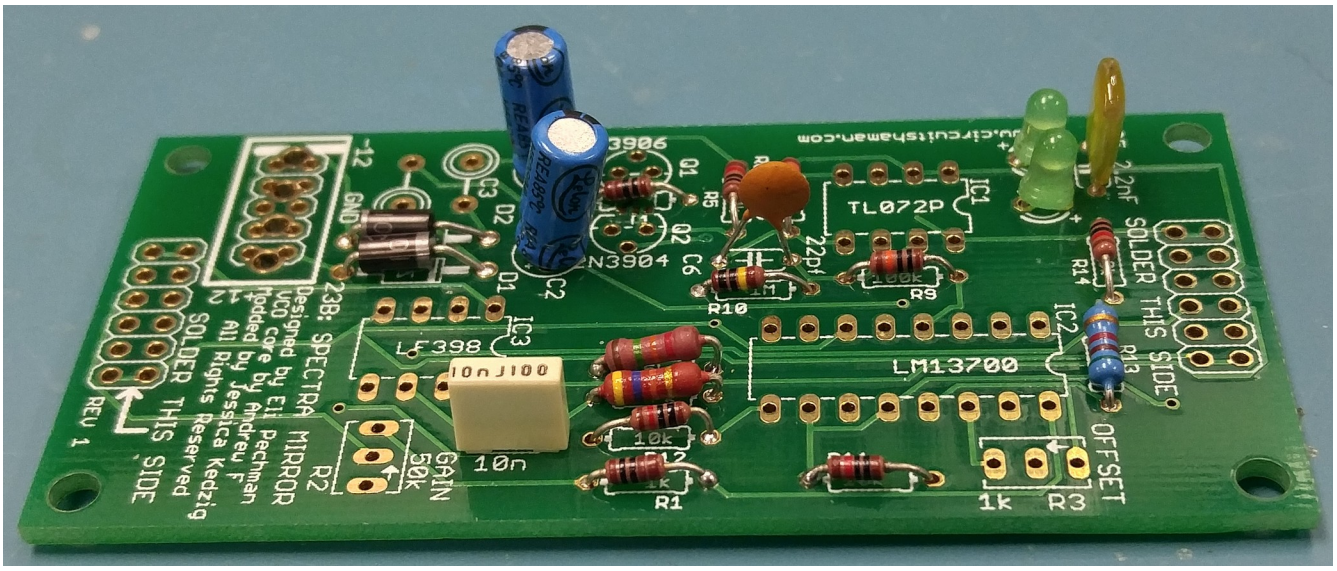
Ok, from here on we can all progress together. Go ahead and populate all of the resistors. If you have the SMD transistor your 1k will go over the top as shown below. Once the resistors are soldered in place trim the leads. From here on out after you have done a wave of soldering take it as a given that you will trim leads afterward.



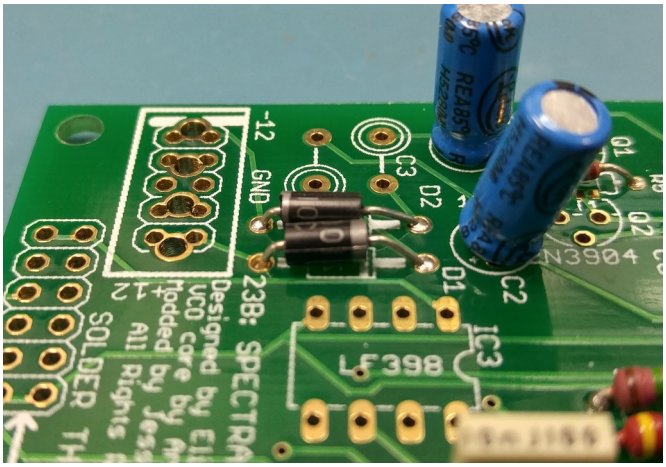




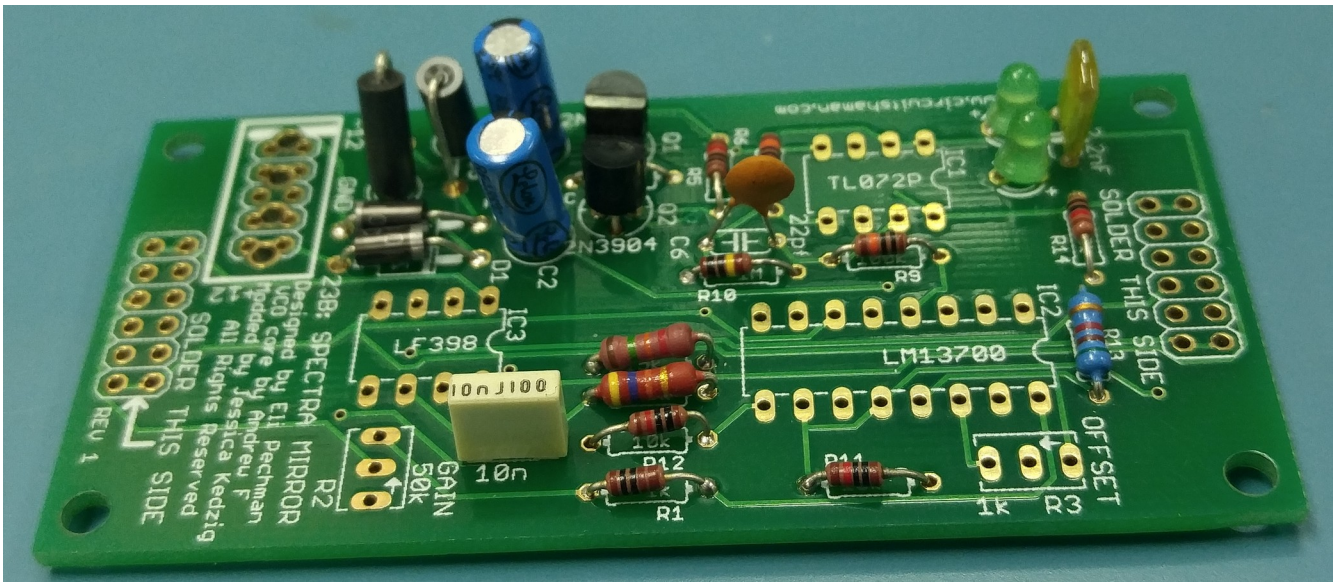
Next solder in the capacitors. On the large electrolytics the orientation matters, longer leg goes in the side labeled with a plus. You may have two capacitors which are each labeled “10nF”, the small boxy one with short leads goes in the board, save the other one for later.



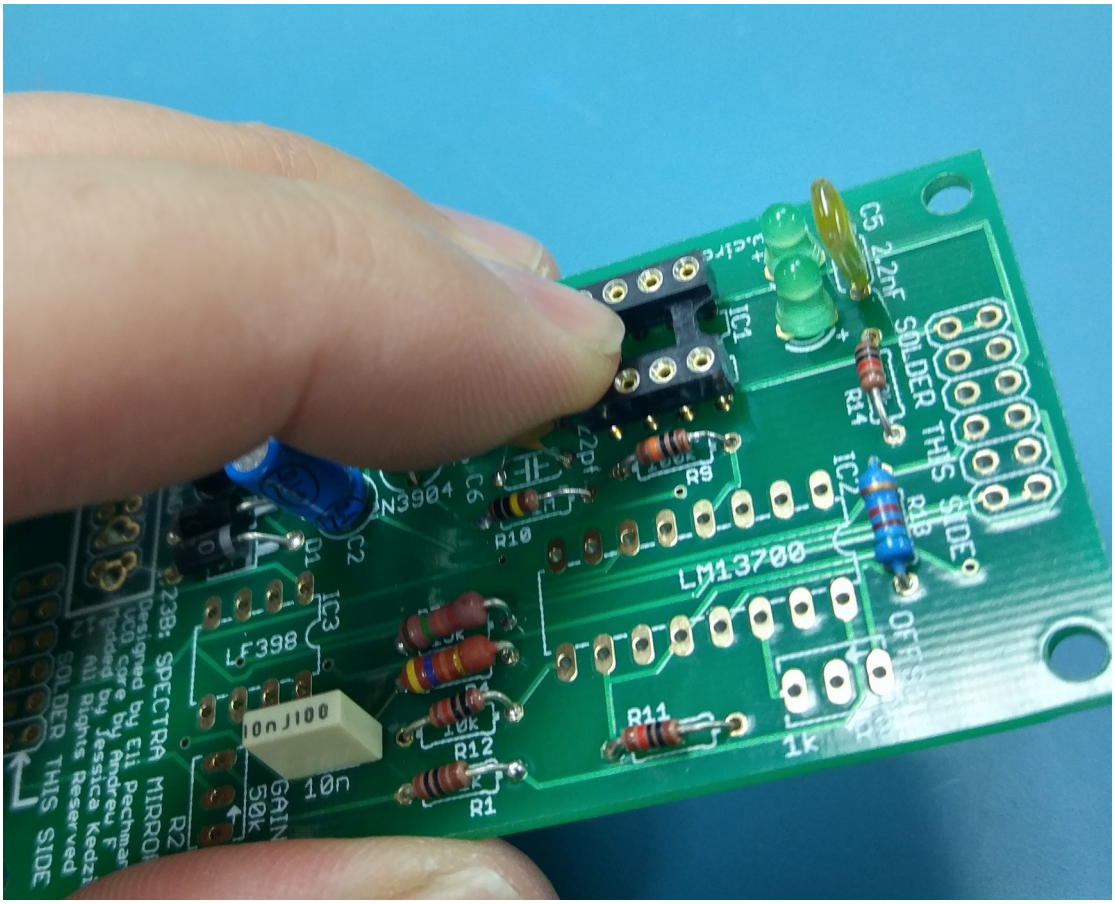
Now move on to the diodes, again orientation matters. For the larger, cylindrical diodes line up the white line on the package with the thicker white line on the board. If you mess up the orientation here your module will 100% not work because it is being protected from reverse voltage in the wrong direction! For the LEDs, again the long leg goes in the hole marked with a +.

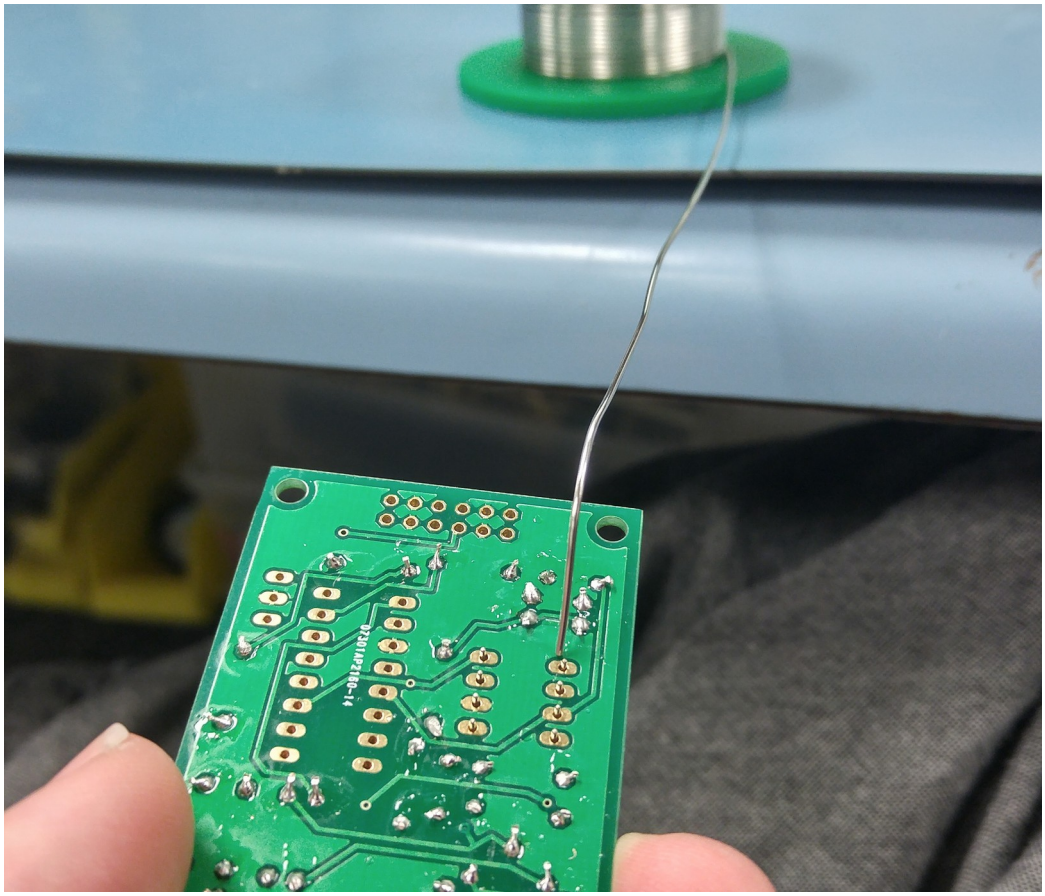


Next we will solder in the transistors and power filtering beads. For the beads the direction does not matter but keep in mind that the transistors are not the same. One is a 2N3904 and the other is a 2N3906. Just be careful when placing them in the correct footprint.



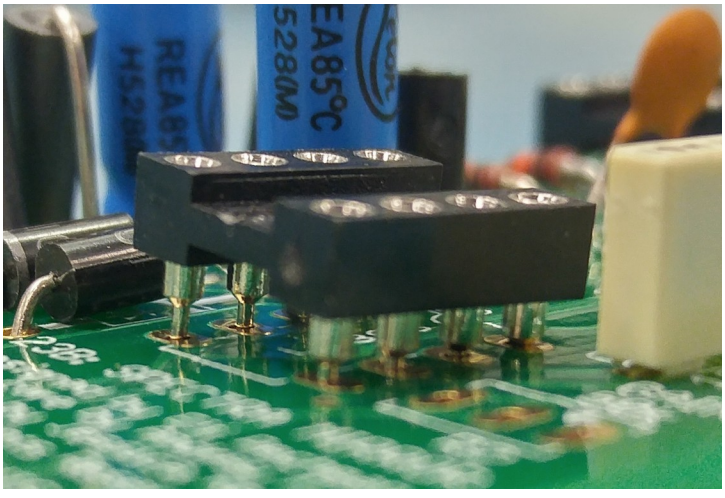
Solder in all of the IC sockets. I do this kind of methodically in the following way: press the socket into the board with your finger, then dangle a strand of solder off the corner of your desk.



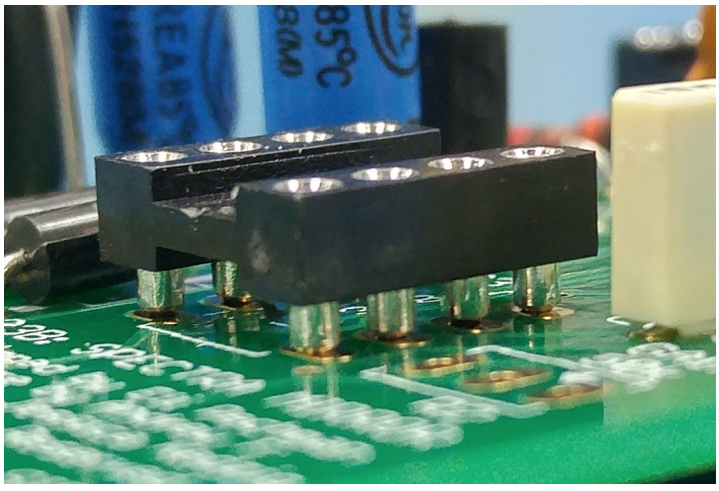


Hold the corner pin of the socket that you are pressing into the PCB against the solder and use the iron in your other hand to melt the solder, holding the socket in place. Be EXTREMELY CAREFUL not to burn your finger, as the heat from the soldering iron will be conducted into the top of the pin close to where your hand is. I just press into a different part of the socket so that my finger is not in contact with the pin that is being soldered.

After you do this once or twice you will easily get the hang of it. Now make sure your socket is flat against the board and if it isn't then heat up the pin again while pressing it down.

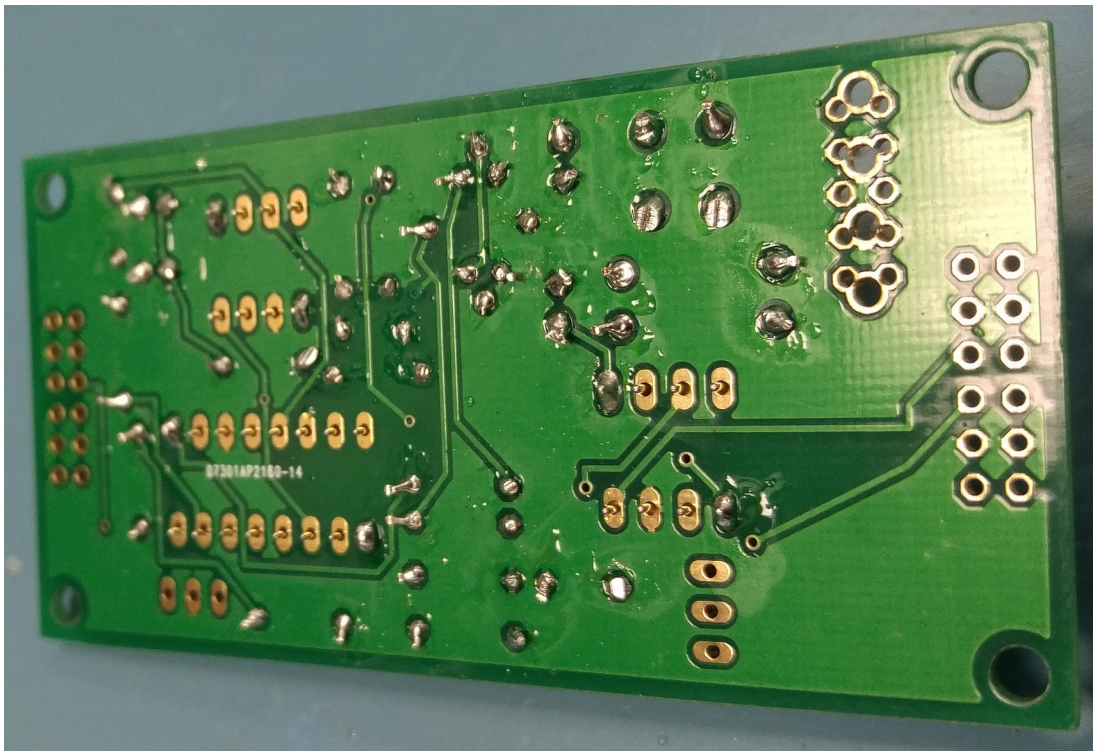


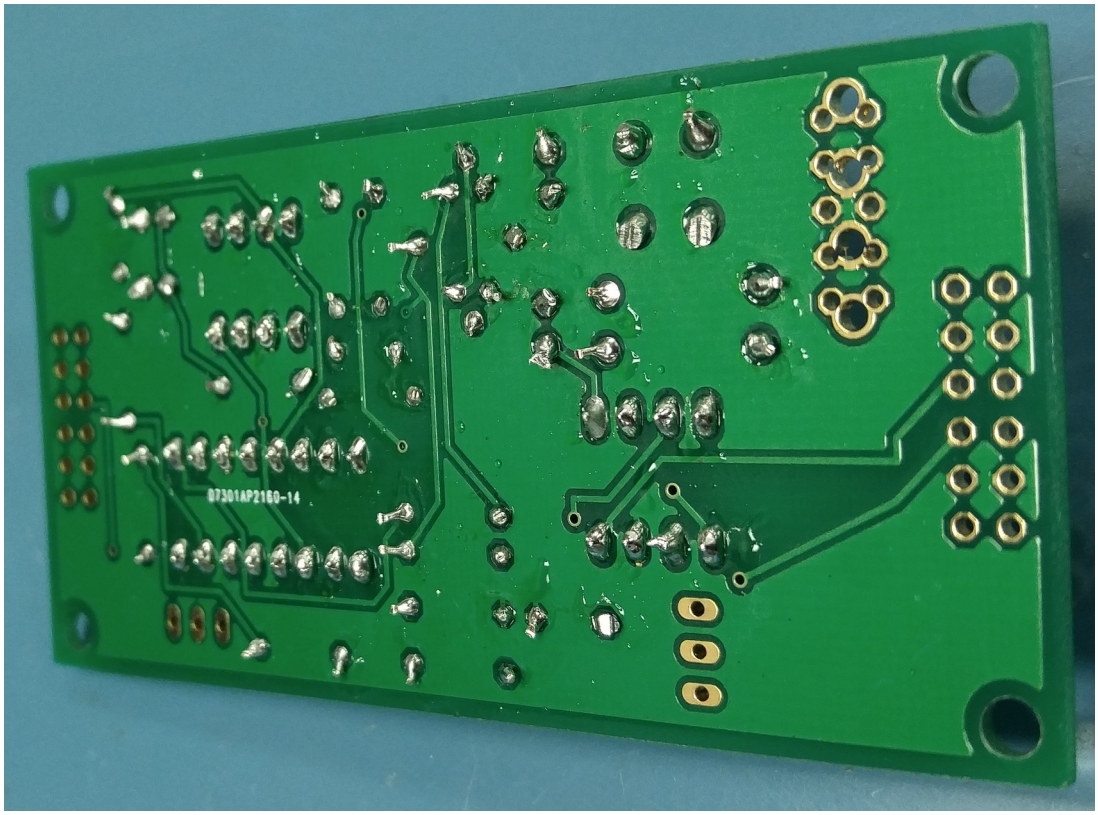
BAD – tilted socket



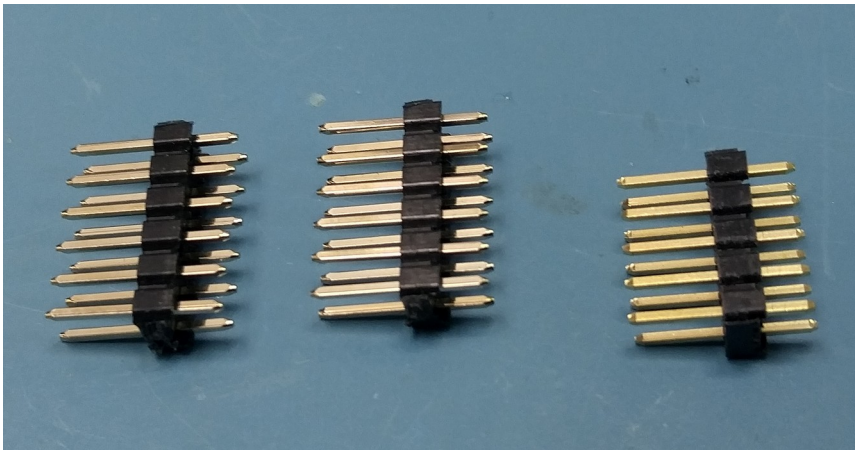
GOOD – flat socket

Once the socket is flat solder the pin in the other corner to keep the socket in place before you move on to the next socket. After all the sockets are in place with 2 corners of each socket soldered in place go ahead and solder the rest of the pins. I find that this is the fastest way to do this, if you know a faster way please let me know as I do a lot of soldering :D.

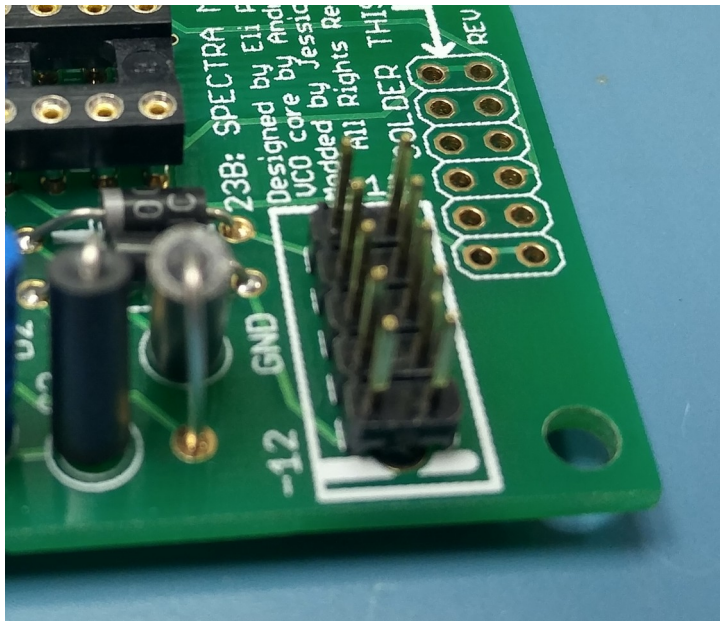


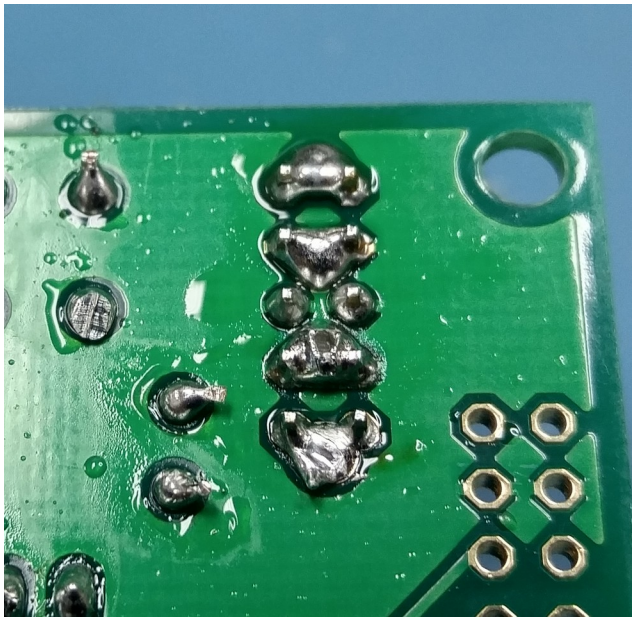


Now we will solder in the headers. Since all of the headers come in long single rows, they need to be cut to size. Take out the strips of male breakaway headers and cut 2 sections of 5 pins and 4 sections of six pins.

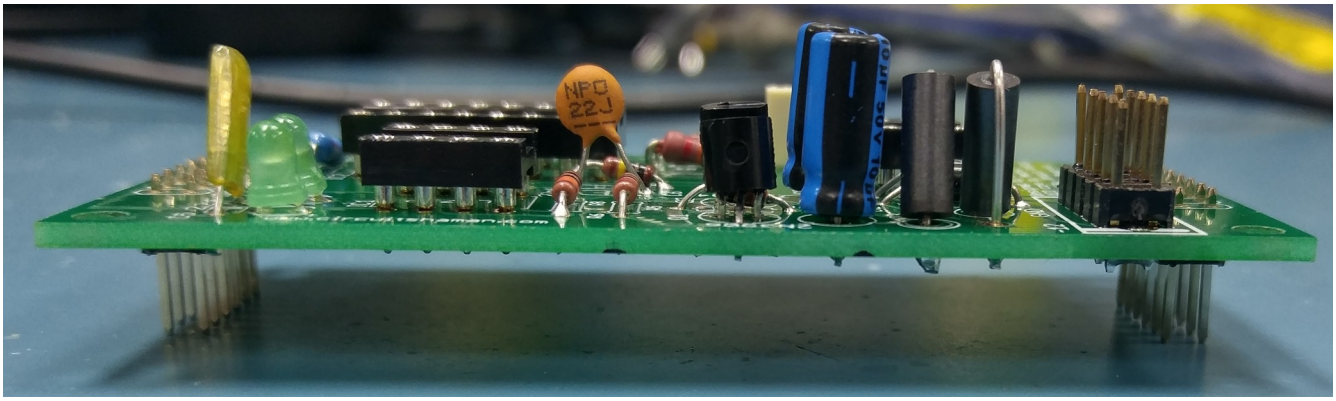


Lets start with the power header, the 2 x 5 pin header. Make sure that it is sticking out of the board facing the same way as all of the other components/ sockets (aka on the component side of the board). Be sure that the header is laying flat against the board before you solder all of the pins.



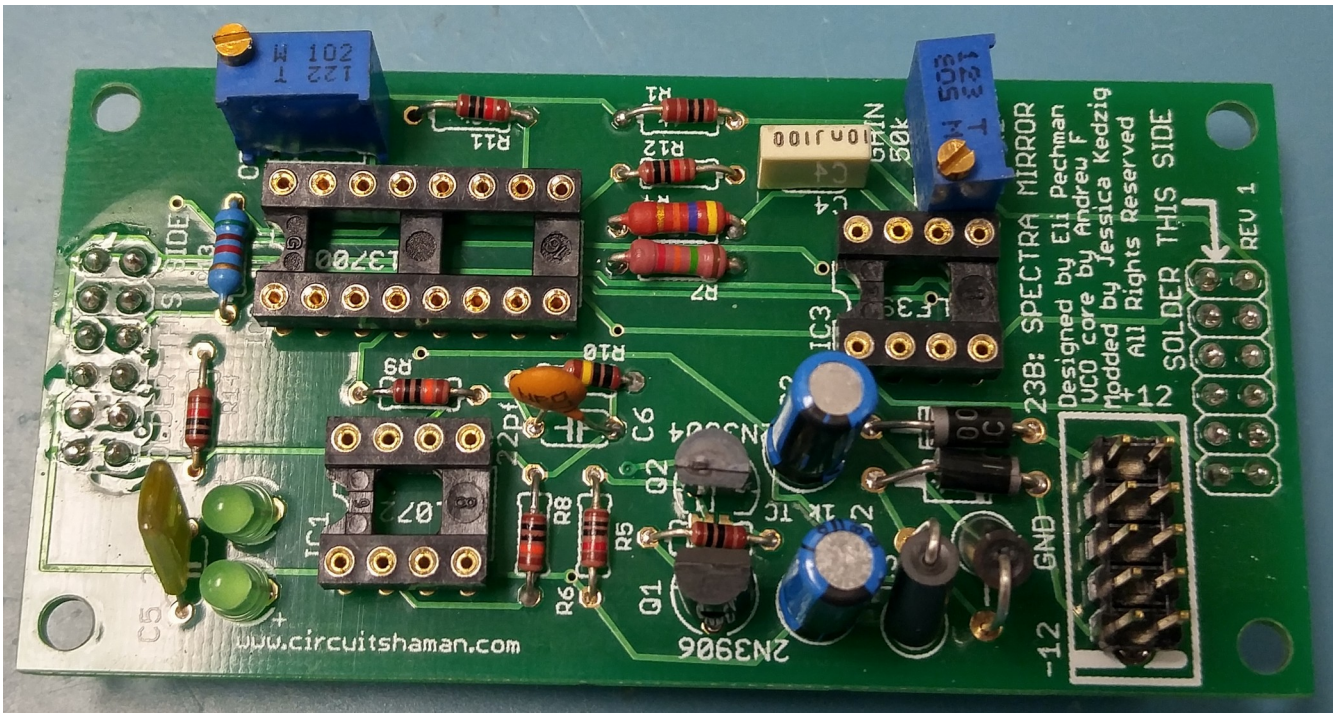


Now move on to the side headers which connect the two PCBs. These will face out of the other side of the board, so you will be soldering on the component side of the board.

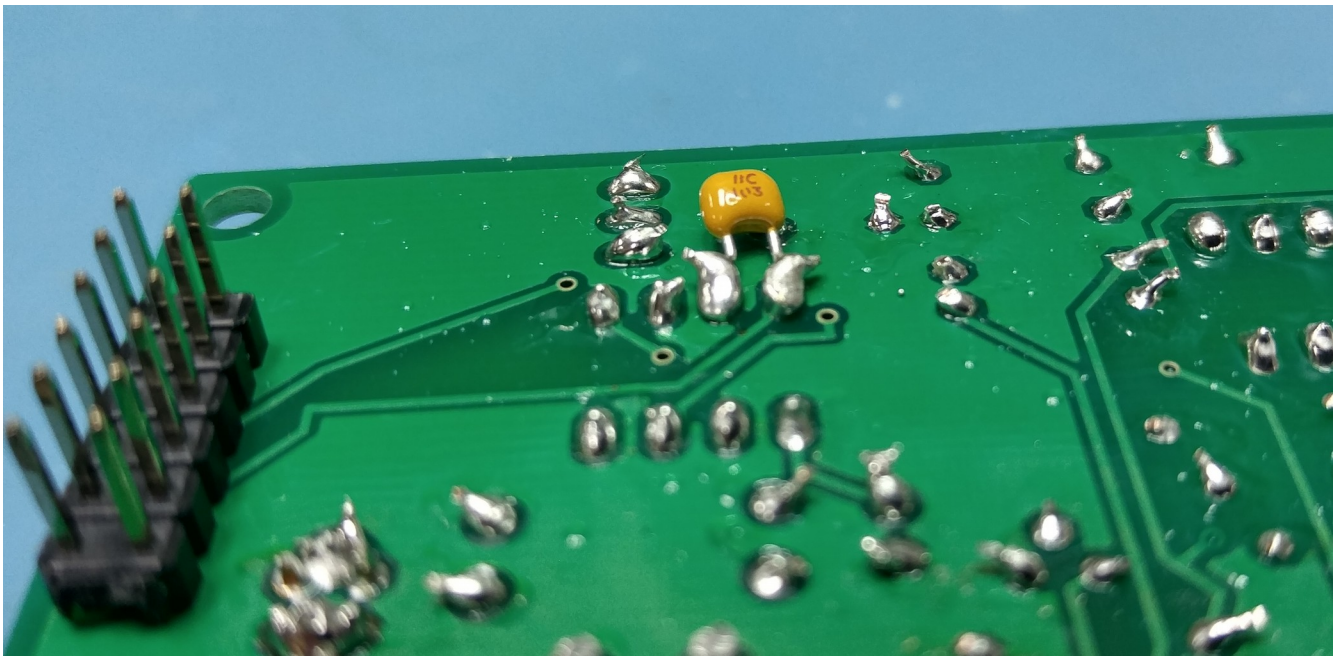


If you like to clean your PCBs to remove the rosin, this is a good time to do it.

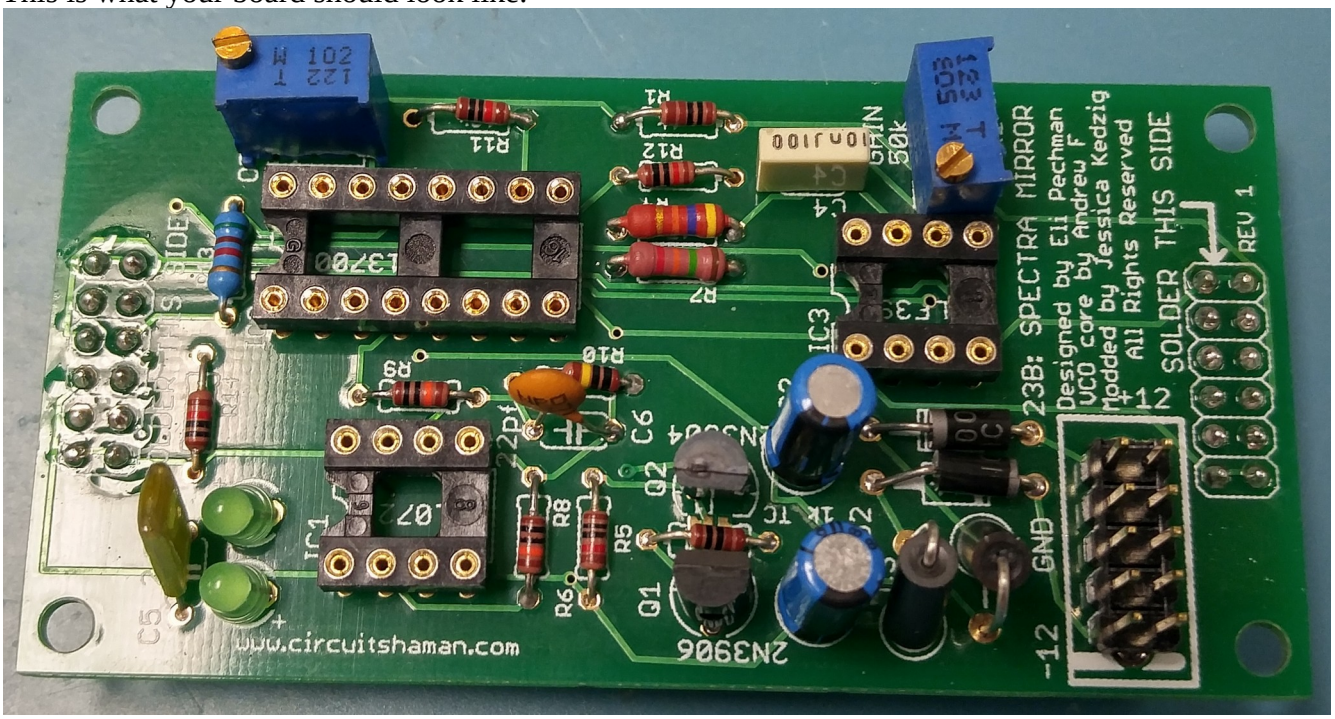
Solder the trim pots in place. 50K goes to the GAIN trim pot and 1K to the OFFSET trim pot.

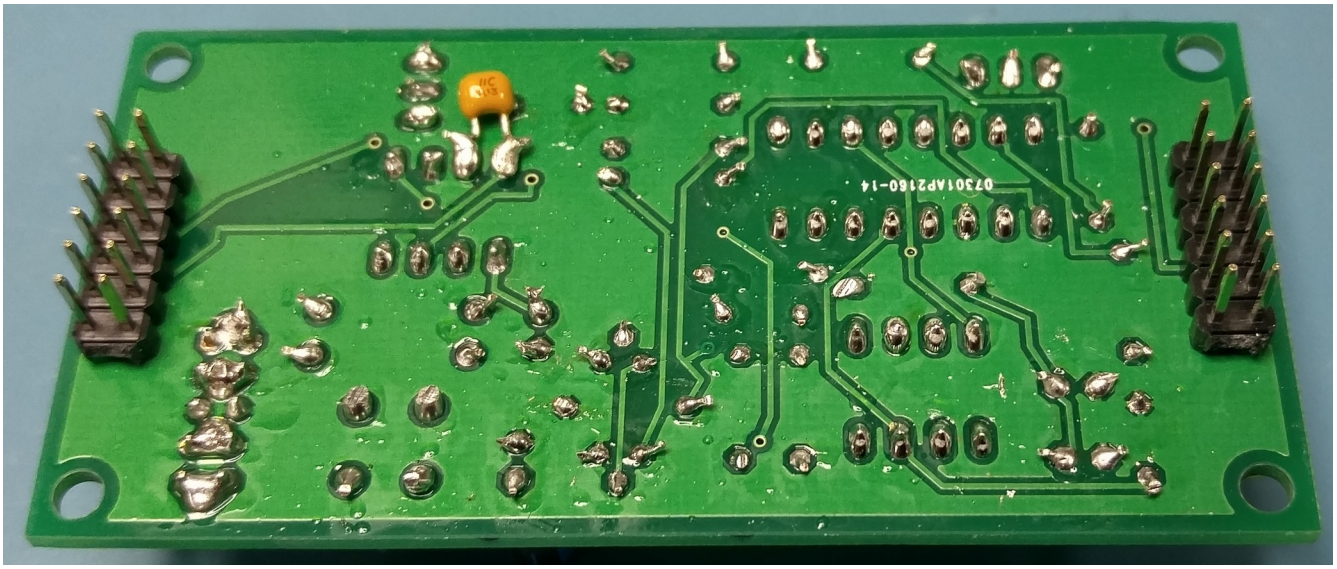


There is one last thing which is not on the board, which is that a bypass capacitor on the bottom of the board. It goes between pins 7 & 8 on the LF398. It helps to deal with clock bleed on the output signal.

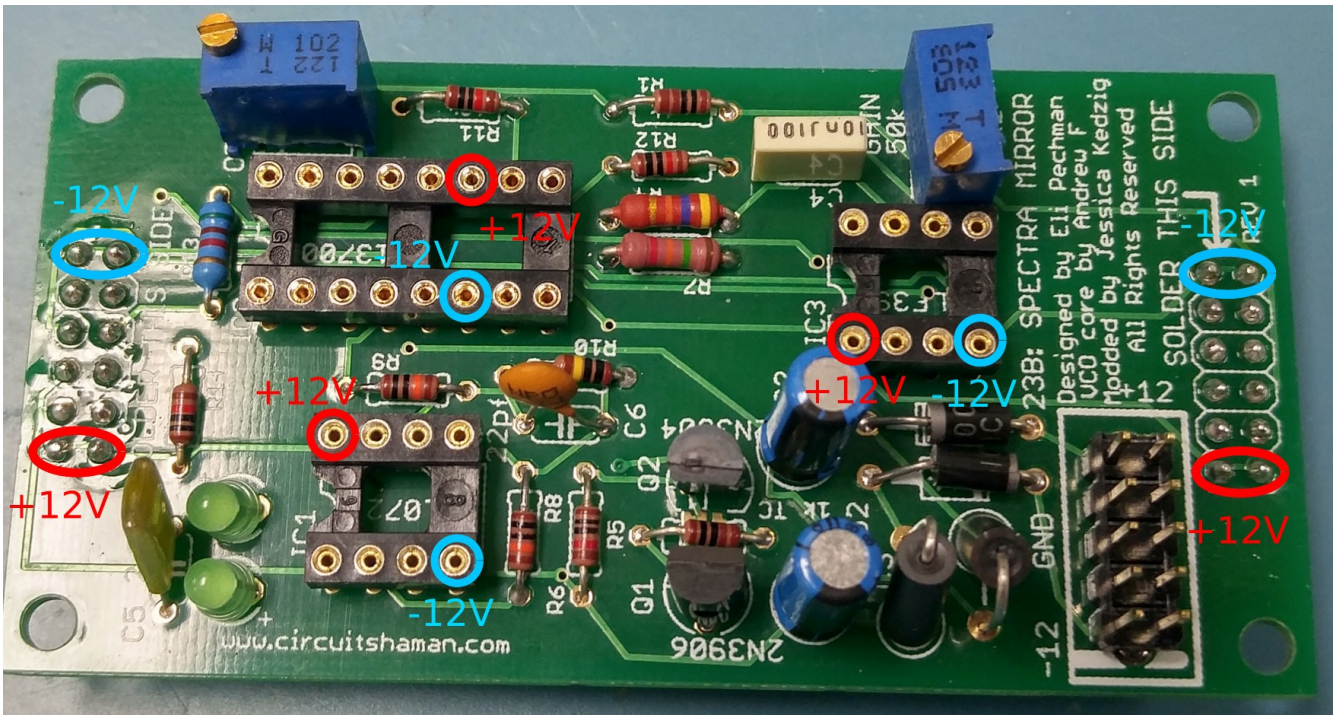


This is what your board should look like.



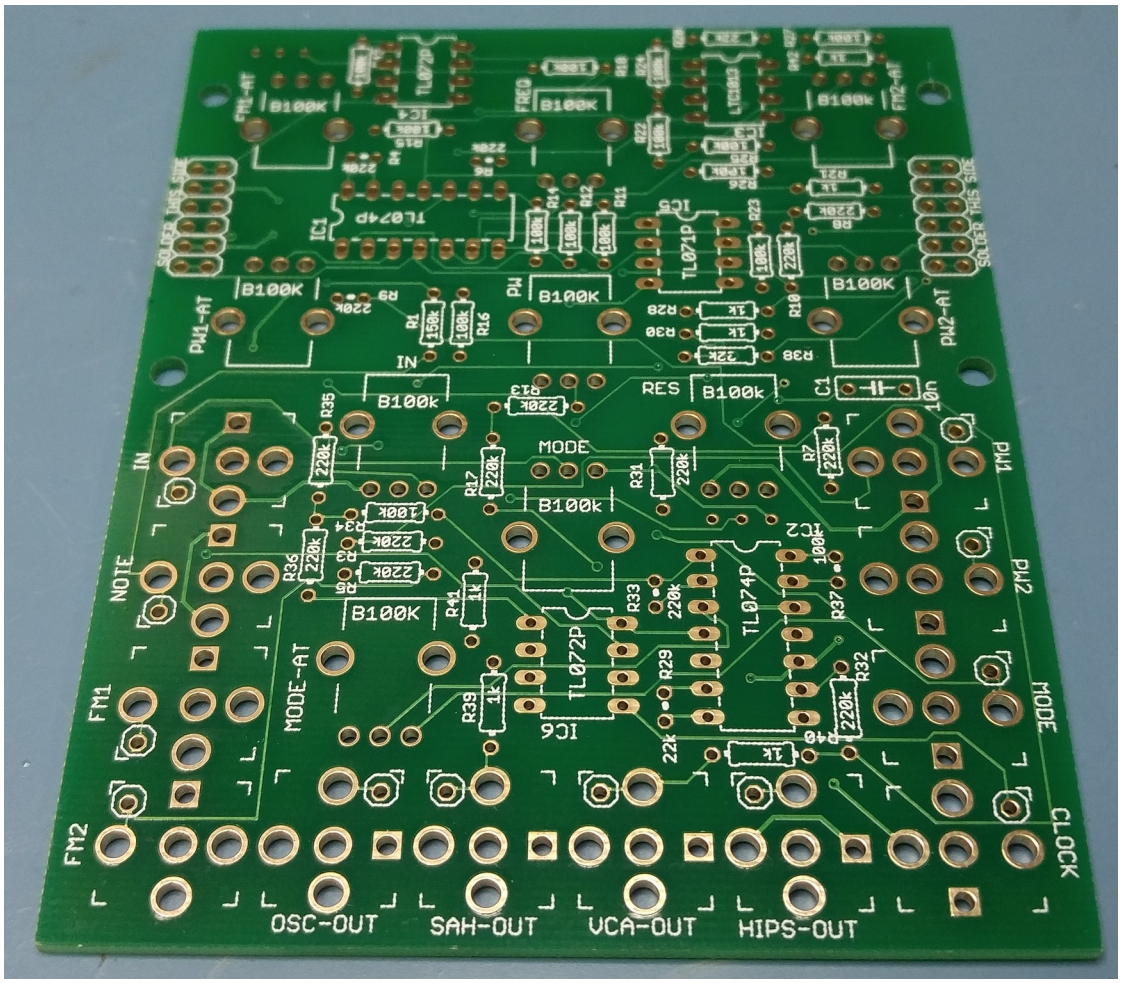


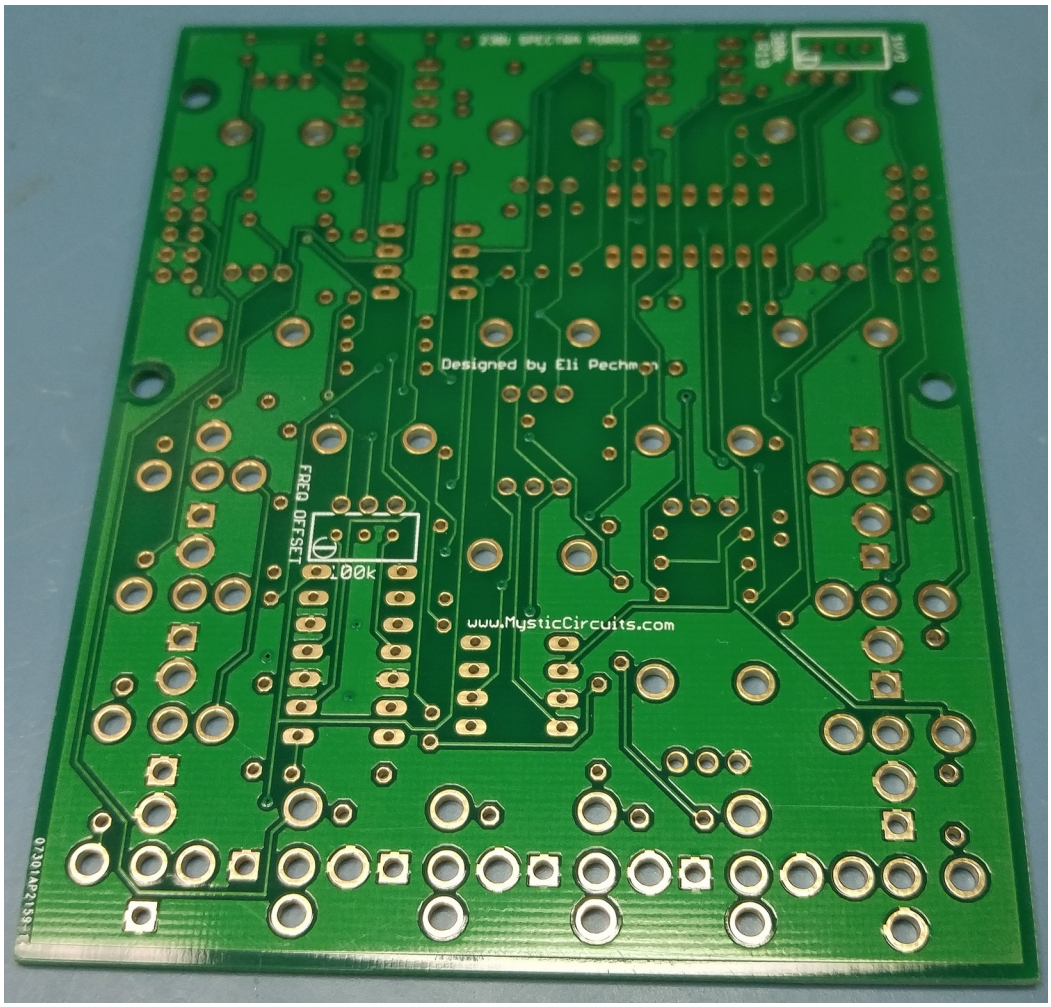
Plug in the board to your power and test the following points for the correct voltage. If you do not see something close to the correct voltage look for things like solder bridges or cold joints, backwards diodes etc.



Before we move on I highly suggest taking a break, tired minds make mistakes.

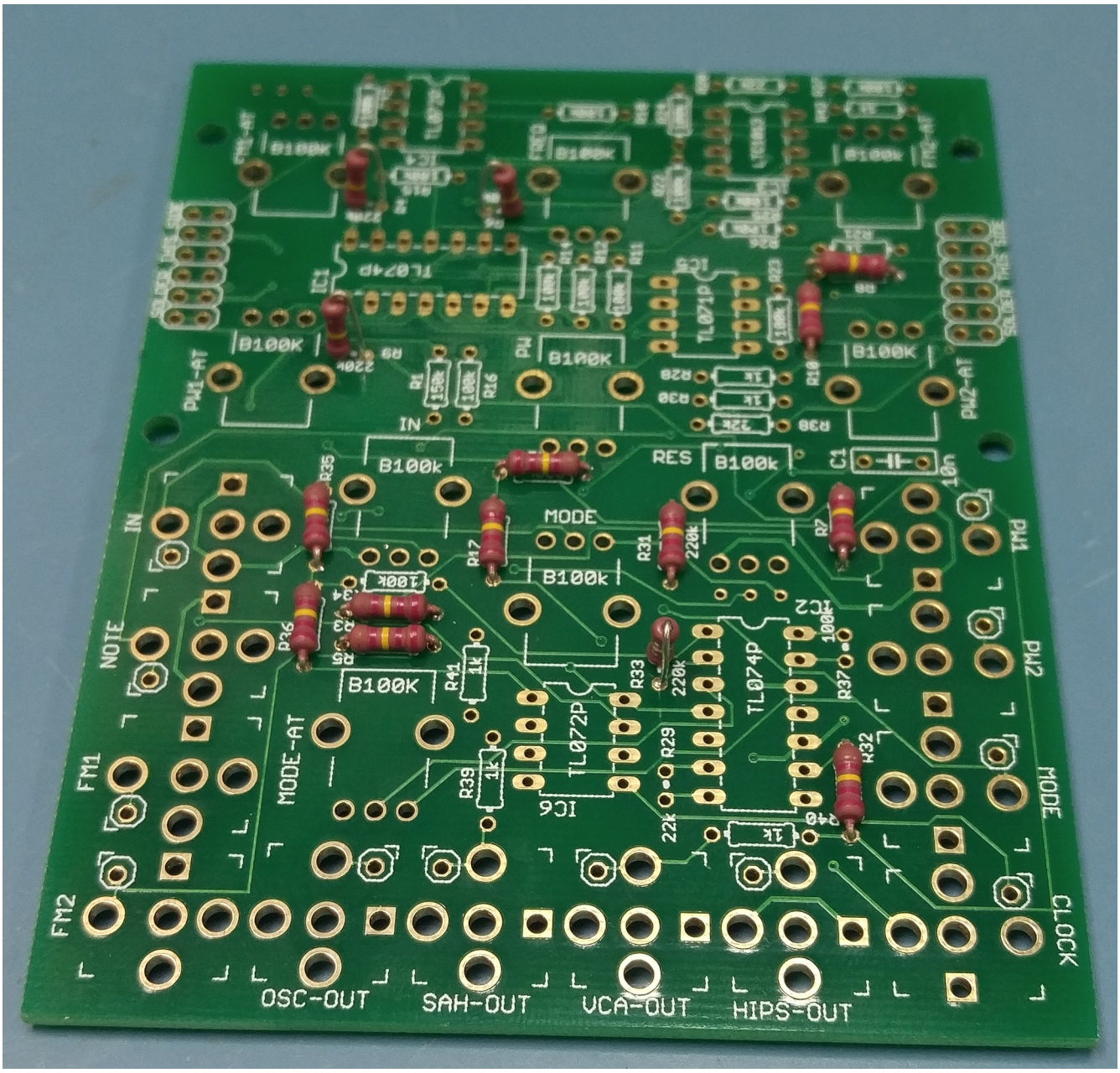
BOTTOM BOARD



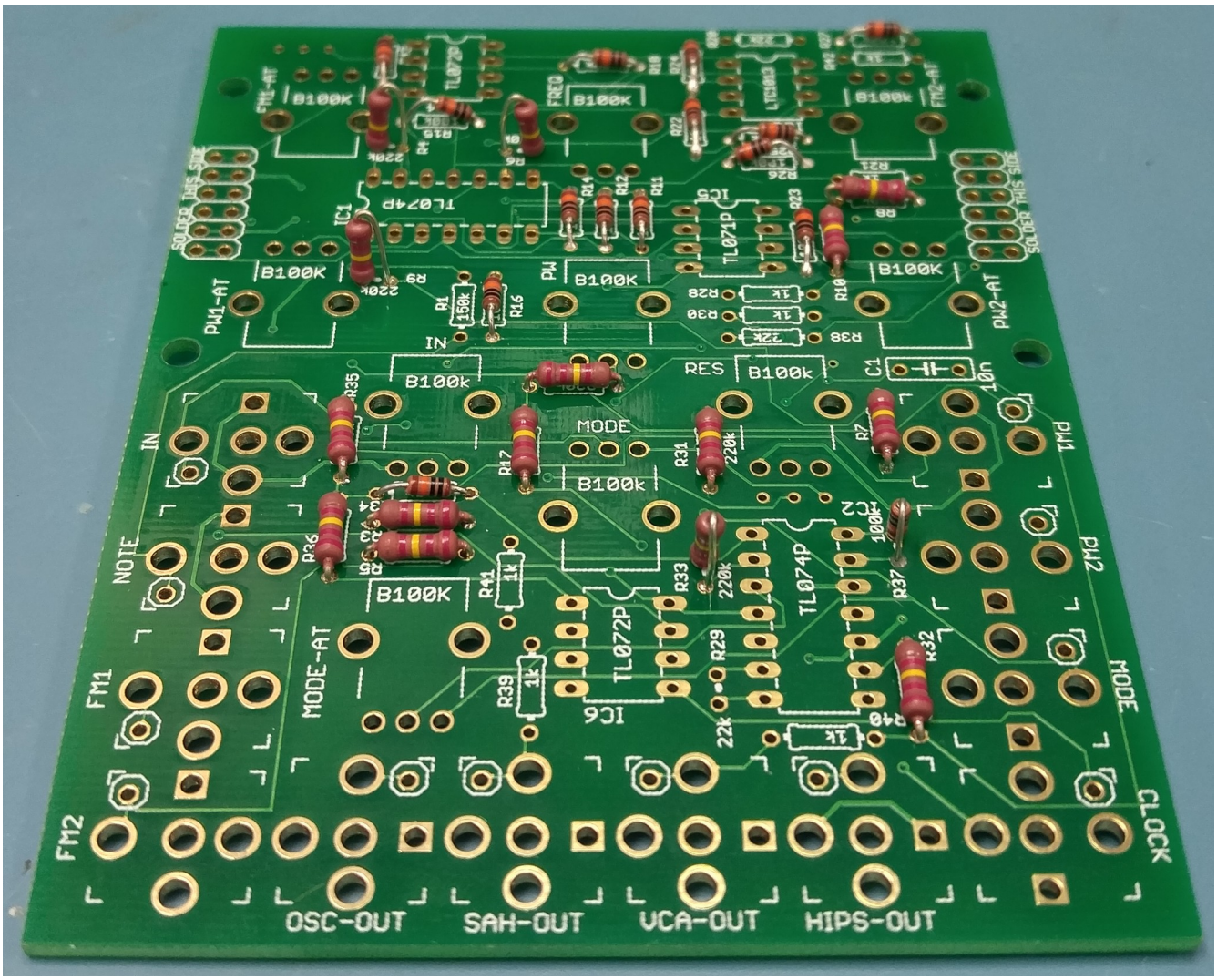


The bottom board is pretty straight-forward but because there are lots of resistors fairly closely packed I prefer to solder them in a few phases and then cut the leads before going to the next phase. This prevents a “jungle of leads” which can make soldering tight spaces a real pain. Obviously you can solder these in whatever order you like but this is how I do it:

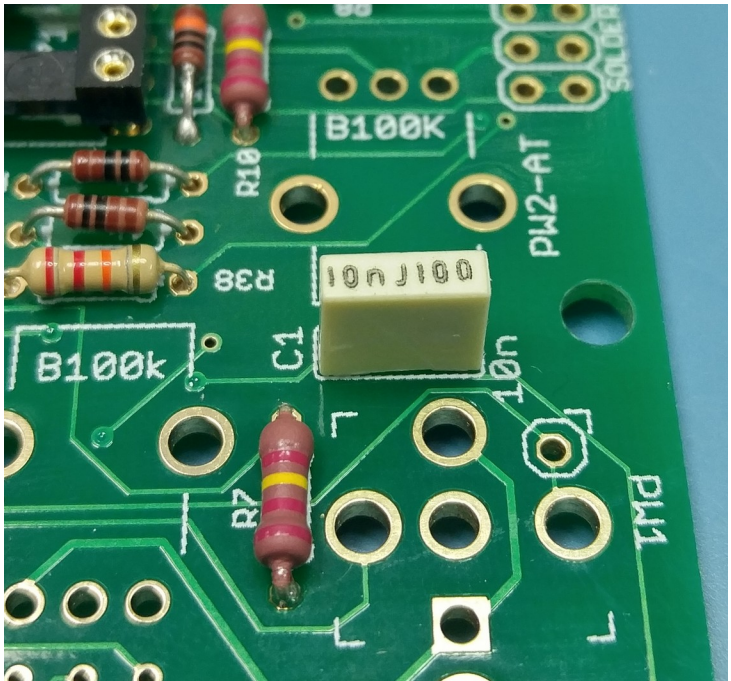
Start with the 220k resistors, these are the most plentiful and therefore the best to get out of the way first. Be aware that some of these resistors are upright and some are flat. Trim the leads before moving to the next round of resistors.



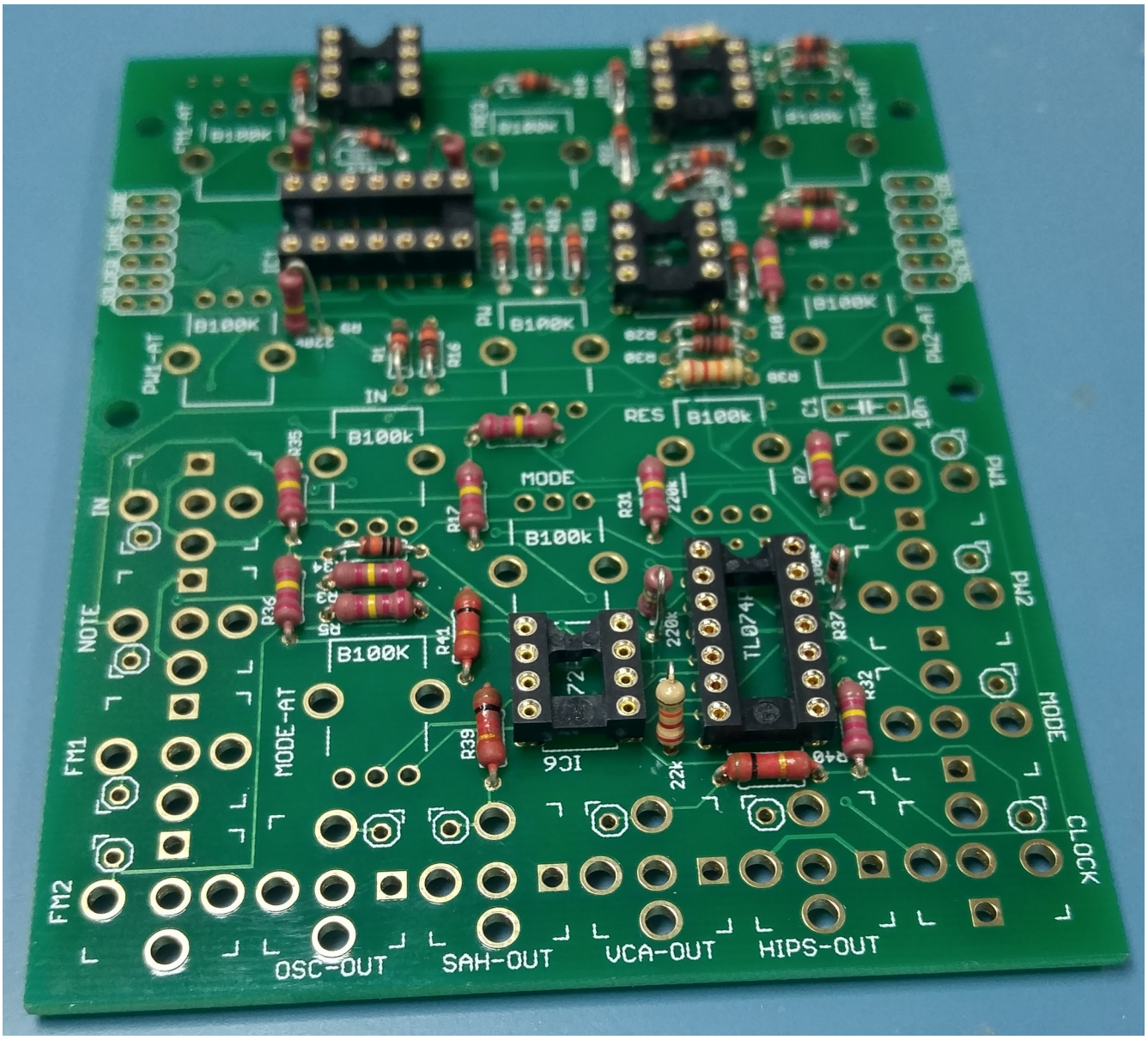
Next solder in the 100k resistors, trim the leads before moving to the final round.



Finish up with the 1k and 22k resistors. Also There is only one capacitor on this board, go ahead and solder it in.



Solder in all of the IC sockets using the method described earlier.



If you are the kind of person who cleans your boards, this is a good time to do it. All the rest of the parts are moisture sensitive.