



**BEAST-TEK**  
INSTRUMENTS

# Mutagen V1.5

## BUILD GUIDE

[www.beast-tek.com](http://www.beast-tek.com)

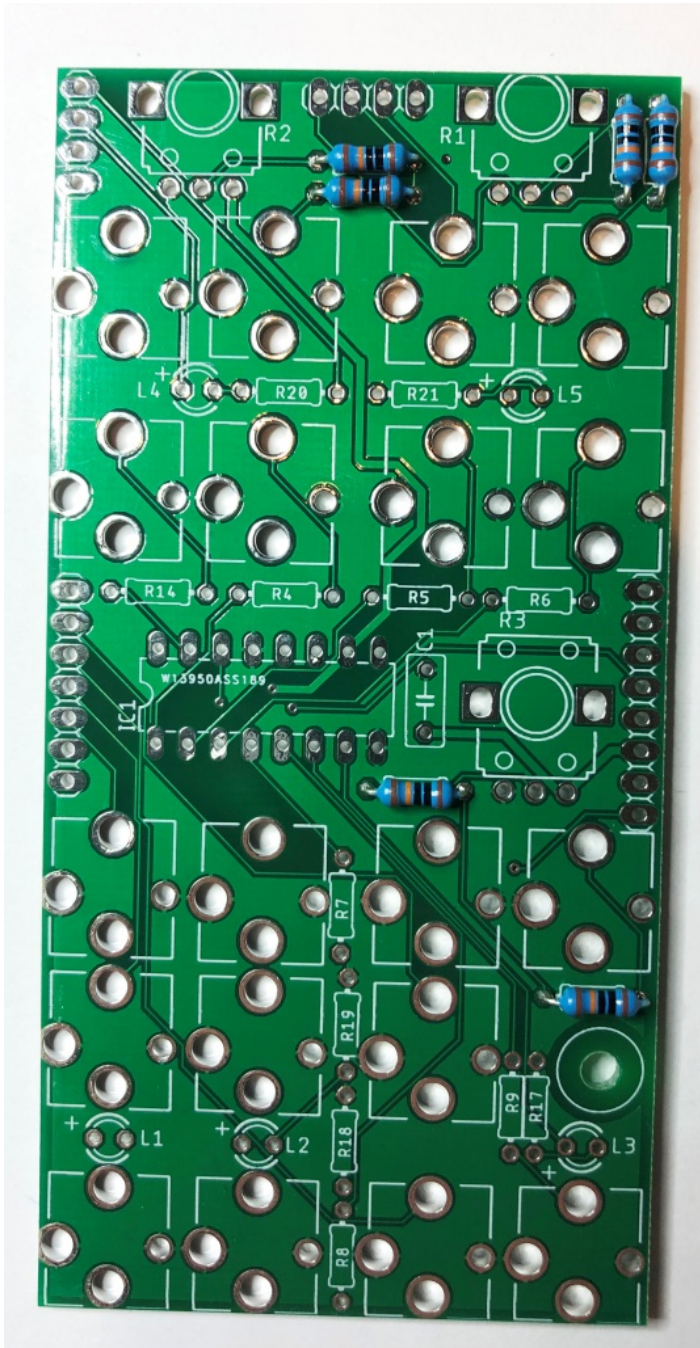


Mutagen IO Board BOM			
IC1	74HC595		1
R1, R2	9mm Round shaft 10KB Potentiometer		2
R3	9mm Trimmer Potentiometer 10KB to 25KB		1
R17, R18, R19, R20, R21	220 Ohm Resistor 1%	Red-Red-Black-Black-Brown	5
R4, R5, R6, R7, R8, R9, R14	1K Ohm Resistor 1%	Brown-Black-Black-Brown-Brown	7
R10, R11, R12, R13, R15, R16	100K Ohm Resistor 1%	Brown-Black-Black-Orange-Brown	6
L1, L2, L3	3mm Red LED		3
L4, L5	3mm Bi-colour LED (2 pin)		2
C1	100nf Blue Monolithic Capacitor	104	1
JP1, JP4	4 Way Pin Header Single Row MALE		2
JP2	8 Way Pin Header Single Row MALE		1
JP3	7 Way Pin Header Single Row MALE		1
	PJ301BM "Erthenvar" 3.5mm Mono Jack		19

Mutagen Main (CPU) Board BOM			
IC1	74HC595		1
IC3	ATMEGA328P-PU		1
IC2, IC6, IC7, IC8, IC9, IC10, IC11	MCP602/MCP6022 High precision op-amp		7
IC4	7805 5v 1A Voltage Regulator	7805	1
IC5	79L05 -5v 0.1A Voltage Regulator	79L05	1
Q1	20mhz Crystal		1
R24	100uH Inductor R.F. Choke		1
C8, C9	22pf Ceramic Capacitor	22	2
D1, D2	IN4004 Power Diode	IN4004	2
C1, C2, C4, C5, C7, C10, C12, C13, C14, C15, C16, C17, C18	100nf Blue Monolithic Capacitor	104	13
C3, C6, C11	100uf Electrolytic Capacitor	100uf	3
R12, R13, R23	10K Ohm Resistor 1%	Brown-Black-Black-Red-Brown	3
R7, R8, R35, R37, R38, R39	100K Ohm Resistor 1%	Brown-Black-Black-Orange-Brown	6
R1, R2, R3, R4, R5, R6, R9, R10, R11	1M Ohm Resistor 1%	Brown-Black-Black-Yellow-Brown	9
JP1, JP4	4 Way Pin Header Single Row FEMALE		2
JP2	8 Way Pin Header Single Row FEMALE		1
JP3	7 Way Pin Header Single Row FEMALE		1
ICSP	ICSP - do not populate		
CFG-A, CFG-B	2 Way Pin Header Single Row MALE		2
POWER	Shrouded 10pin (2x5) IDC Header (Eurorack Power)		1

## IO Board – Step 1

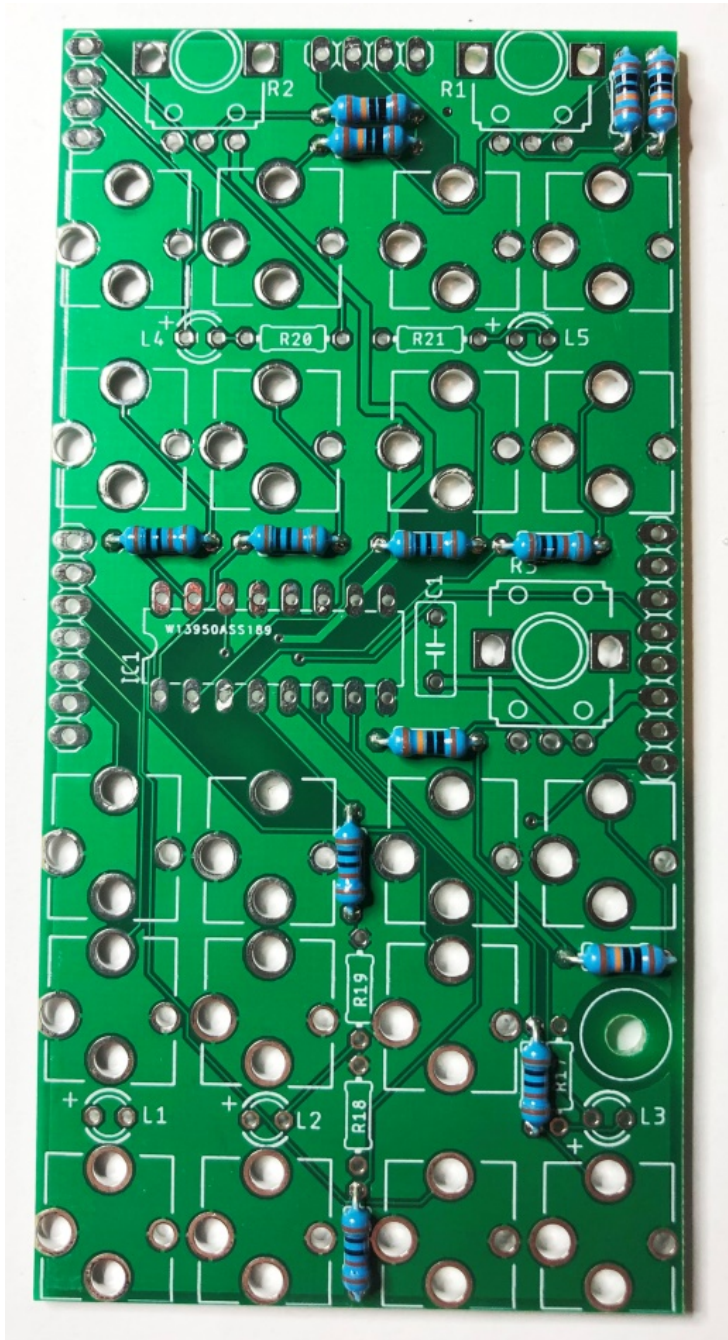
Install and solder the six 100K resistors R10, R11, R12, R13, R15 and R16





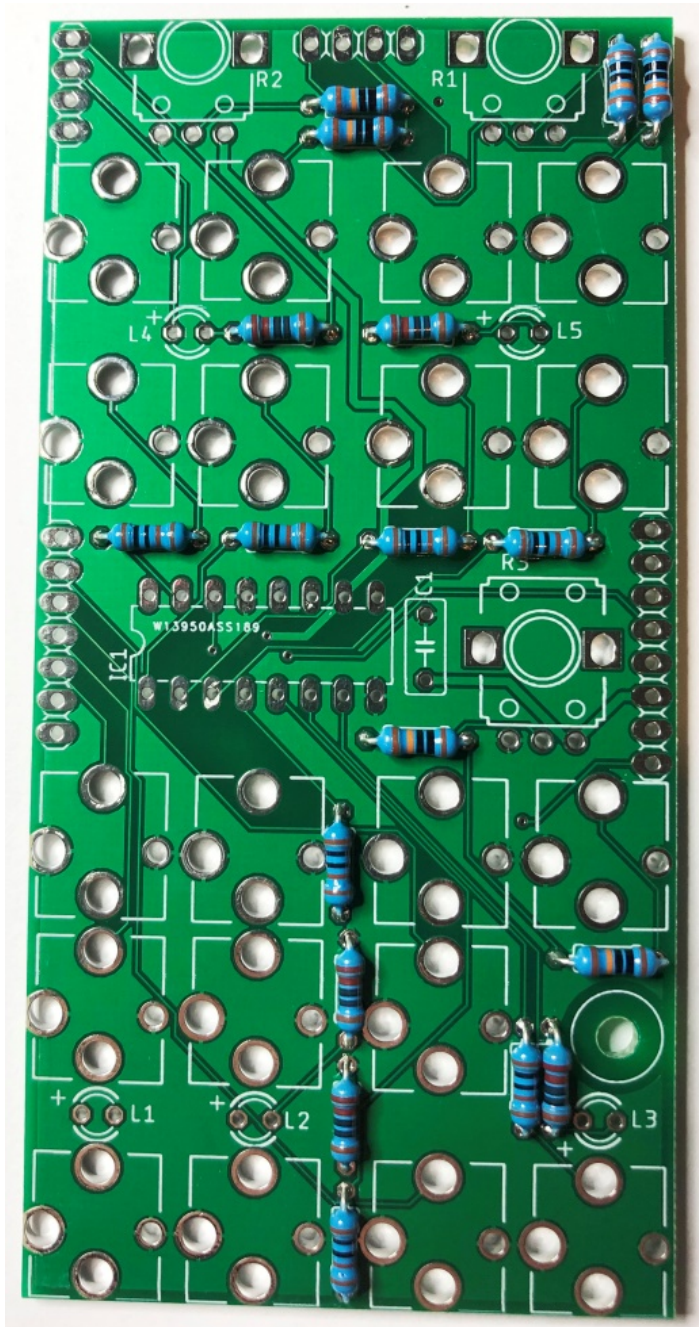
## IO Board – Step 2

Install and solder the seven 1K resistors R4, R5, R6, R7, R8, R9 and R14



### IO Board – Step 3

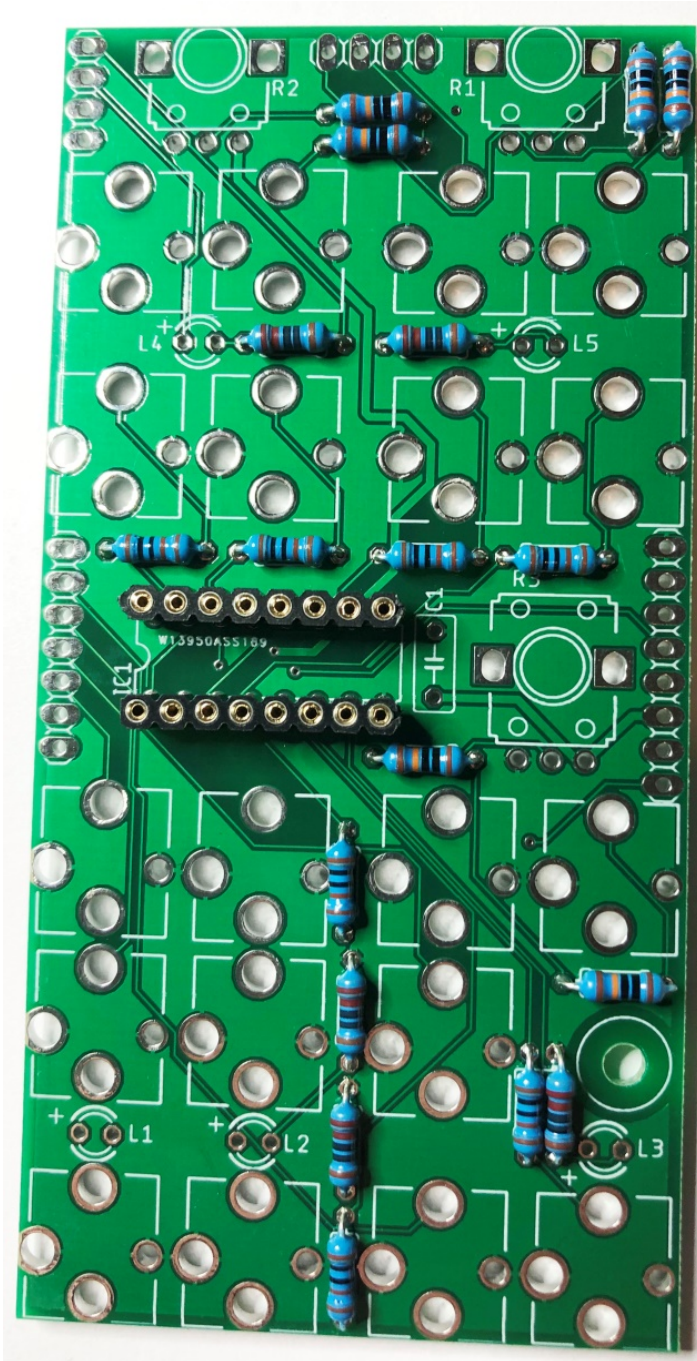
Install and solder the five 220R resistors R17, R18, R19, R20 and R21





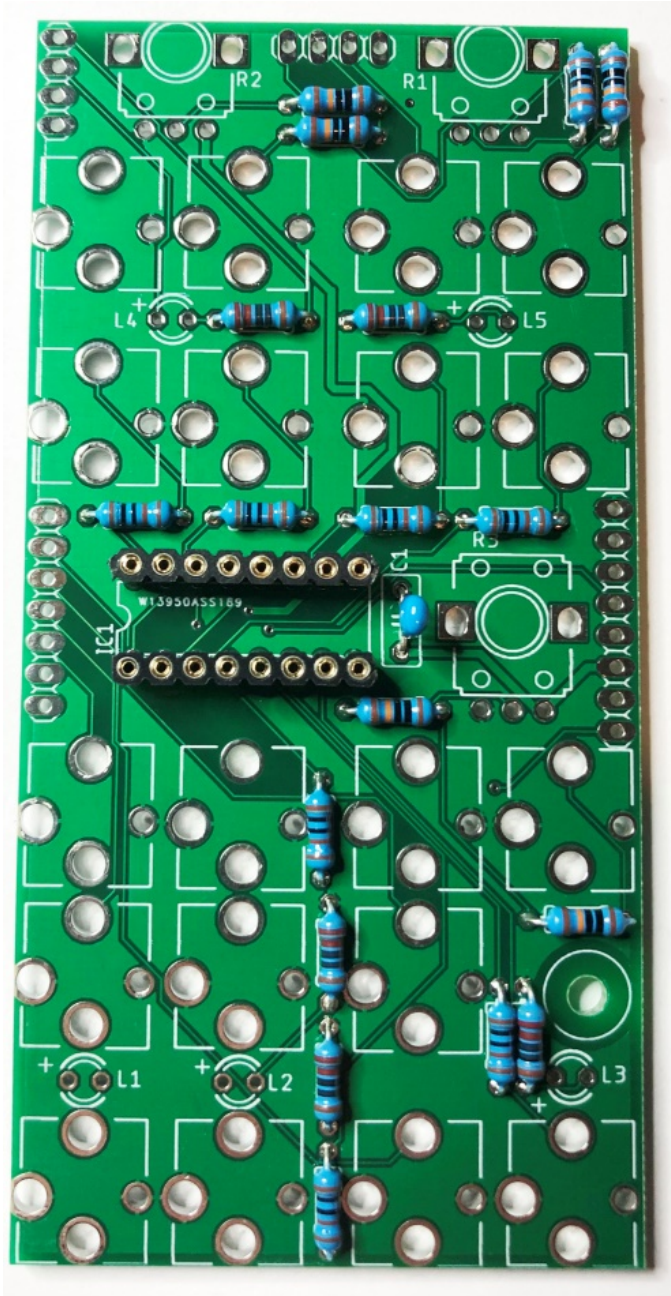
## IO Board – Step 4

Cut two 8 pin pieces from the IC socket strip and solder and install into IC1



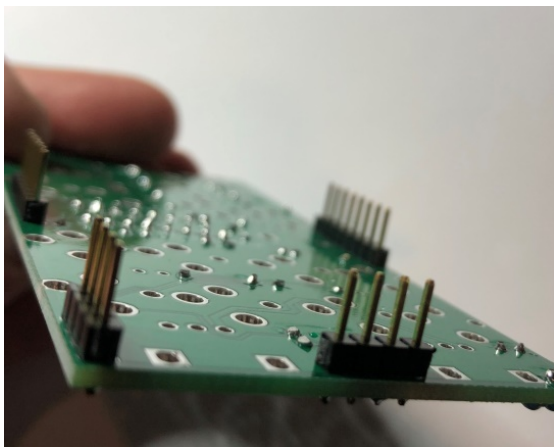
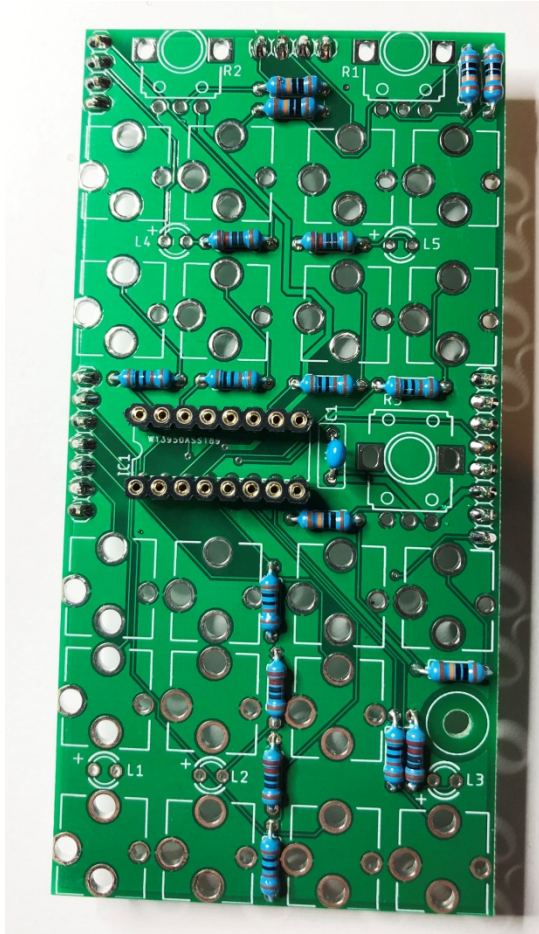
## IO Board – Step 5

Install and solder 100nf capacitor C1



## IO Board – Step 6

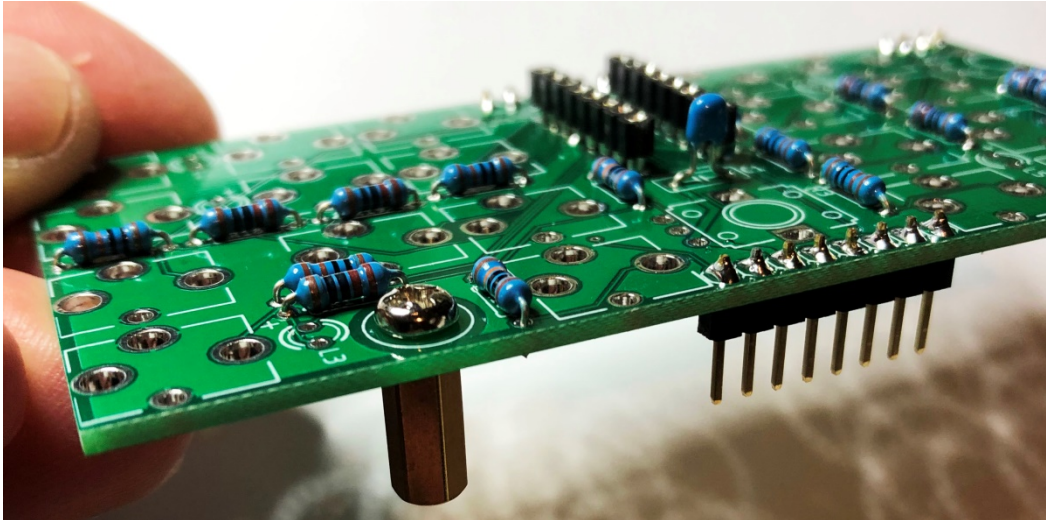
Cut two 4 pin, one 8 pin and one 7 pin pieces from the male pin header strip. Install and solder into JP1, JP4, JP2 and JP3





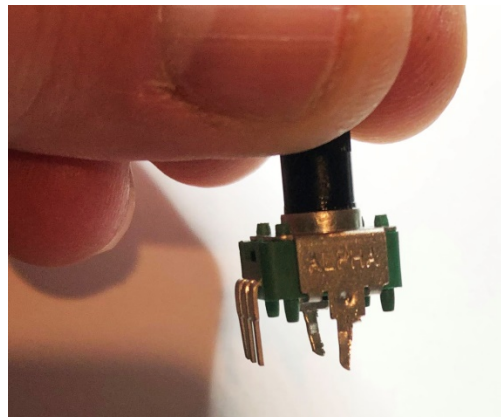
## IO Board – Step 7

Using a 6mm M3 screw, attach the 11mm brass stand-off



## IO Board – Step 8

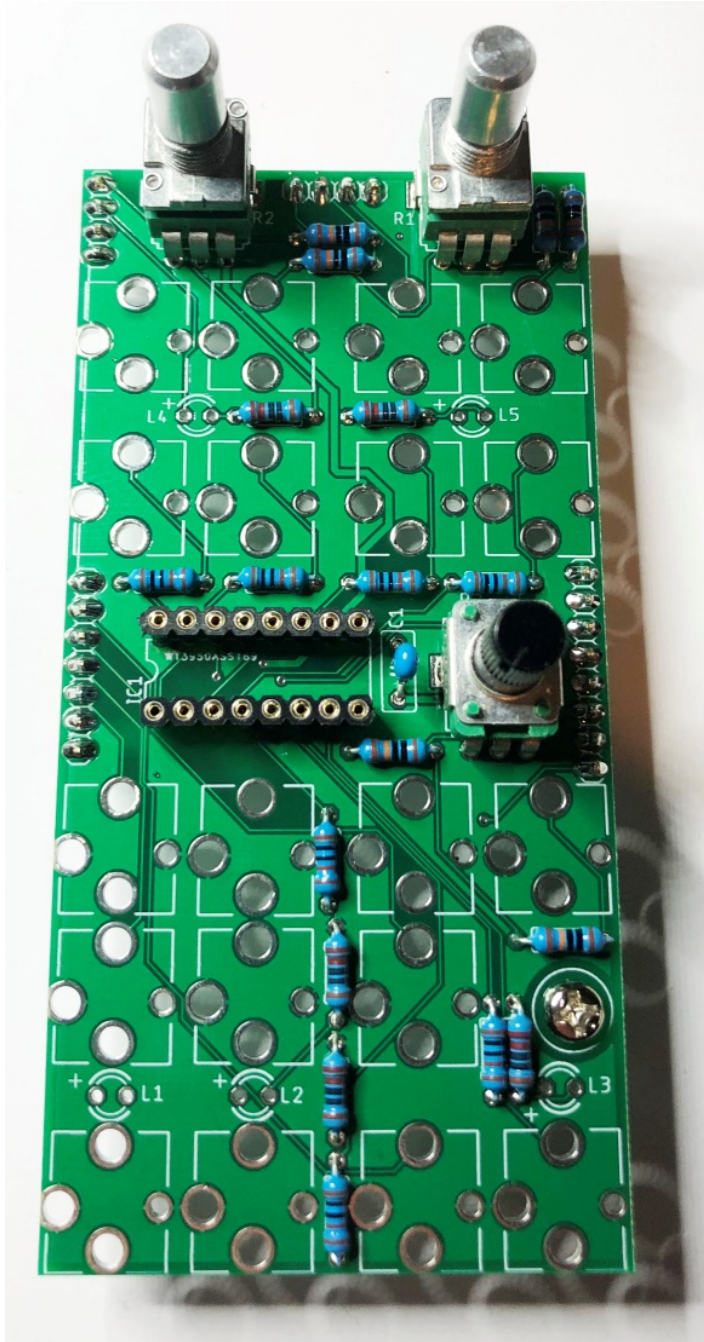
The trimmer pot needs its mounting supports trimmed in half so that they will fit into the PCB footprint. Use side cutters, go slow and be gentle.





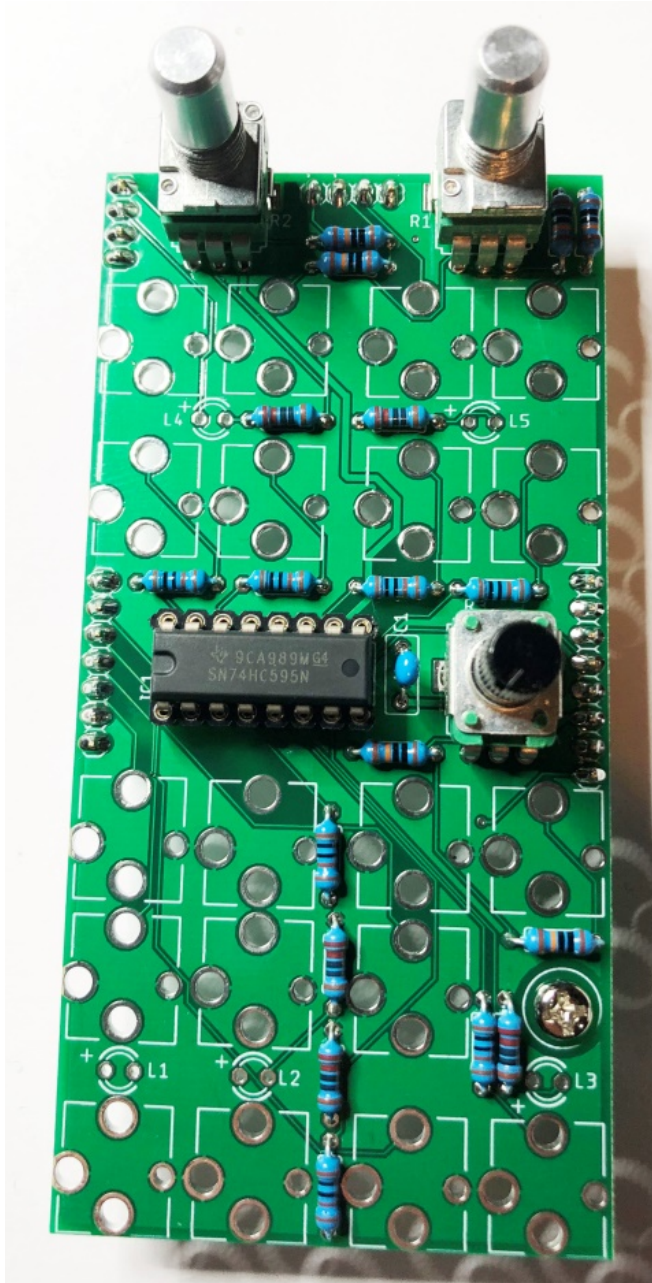
## IO Board – Step 9

Install the three potentiometers into place – DO NOT SOLDER THEM YET



## IO Board – Step 10

Install the 74HC595 integrated circuit into IC1



## IO Board – Step 11

Seat the jacks (DO NOT SOLDER) and install the three red LEDs into L1, L2 and L3 along with the two bi-color LEDs L4 and L5. Again do not solder them yet. You may need to gently bend the pins on the LEDs to allow the board to rest on the desk unless you are using something to hold the PCB off the desk.

Note: the longer pin on the LED is the positive pin which is marked with a + on the silkscreen.





## IO Board – Step 12

Carefully slide the panel over all of the seated components.



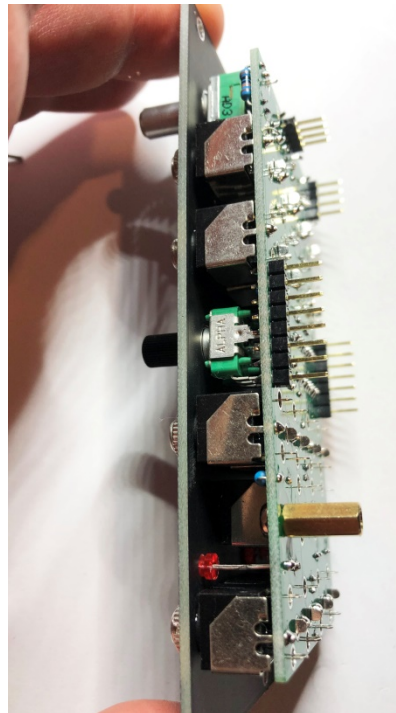
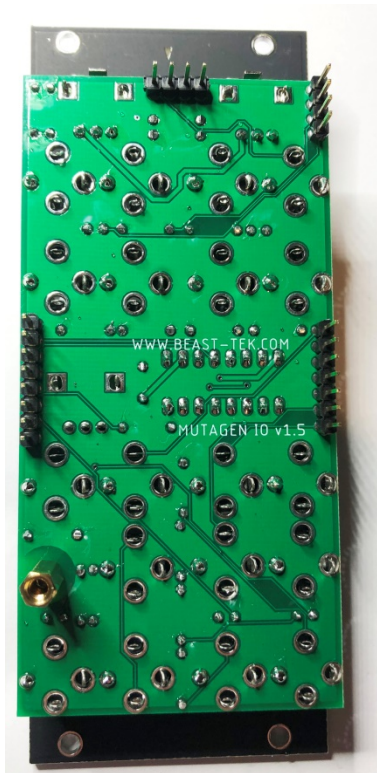
## IO Board – Step 13

Install a few of the knurled nuts (I did 6) firmly and install washers and nuts onto the two bushed potentiometers – FINGER TIGHTEN only otherwise if you overtighten the potentiometers will lift off the PCBs and/or twist. This was enough tension to allow me to flip the board over to solder everything without it falling apart. Carefully test it out – you may need to install knurled nuts onto more jacks to get more tension.



## IO Board – Step 14

Flip the board over and solder one pin of each jack and potentiometer to hold it into place. If you bent the LED pins to sit it against the desk, bend them straight again. Direct the LEDs into their holes and push them in firmly. Turn the board on its side and inspect the LEDs are seated correctly and that everything is seated nicely. When you are happy that everything is seated well, solder the rest of the remaining jack, pots and LEDs.





## IO Board – Step 15

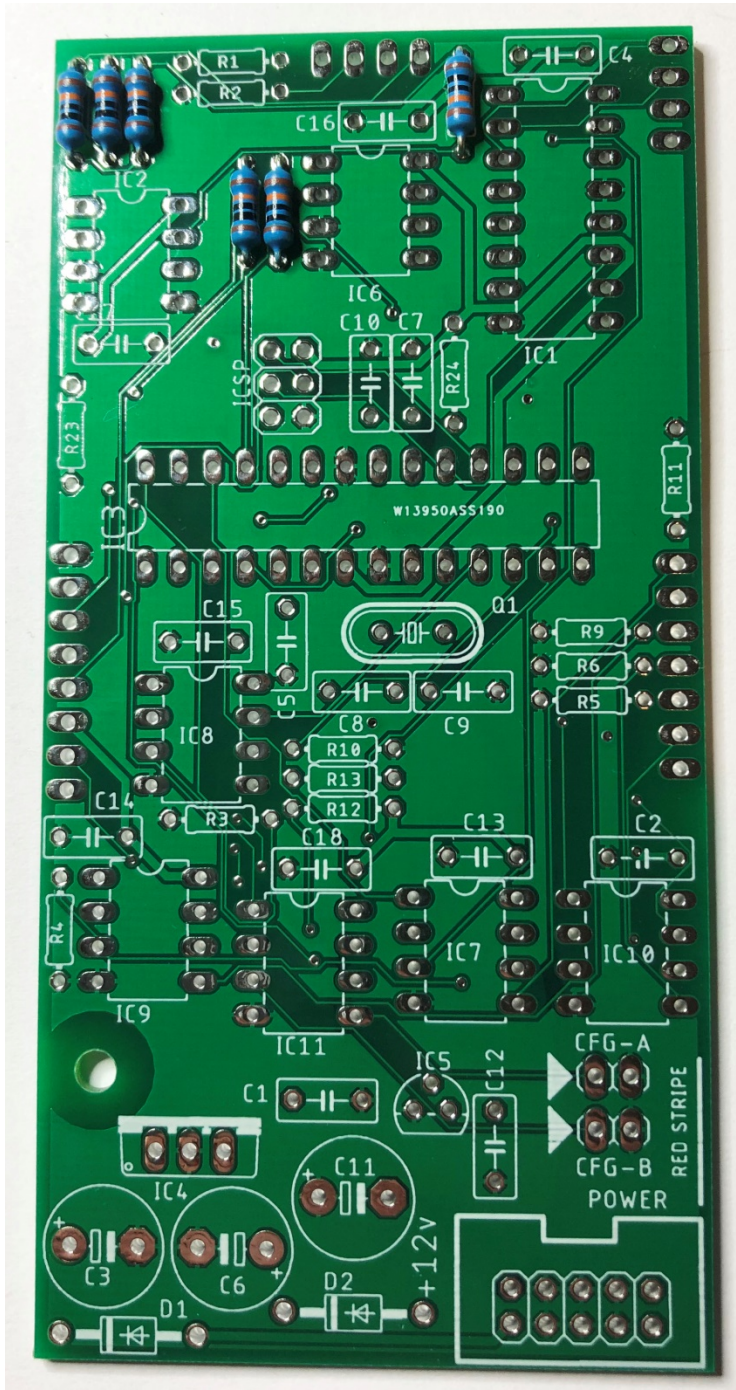
Install the remaining knurled jack nuts. Now that the potentiometers are soldered in tight, you can tighten the nuts but don't go overboard.

Lastly install the two knobs and then move onto the Main board assembly.



## Main Board – Step 1

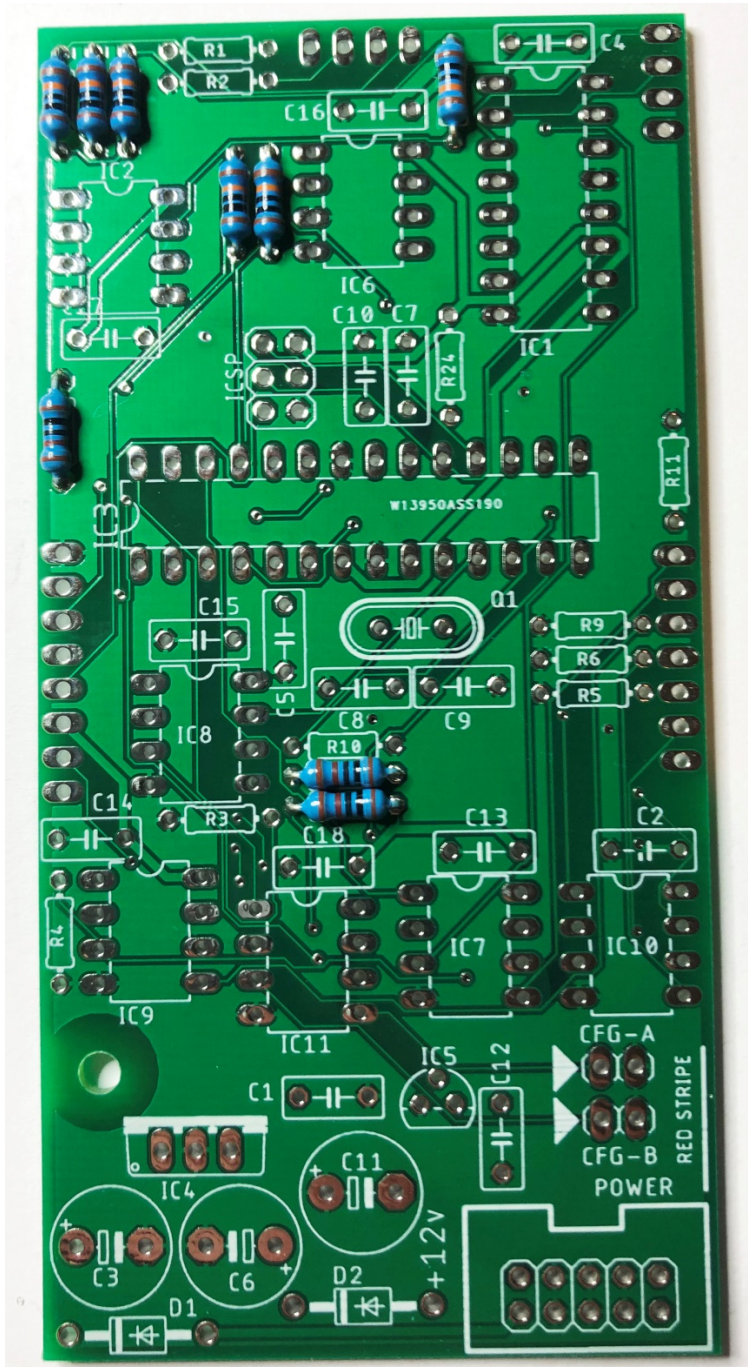
Install and solder the six 100K resistors R7, R8, R35, R37, R38 and R39





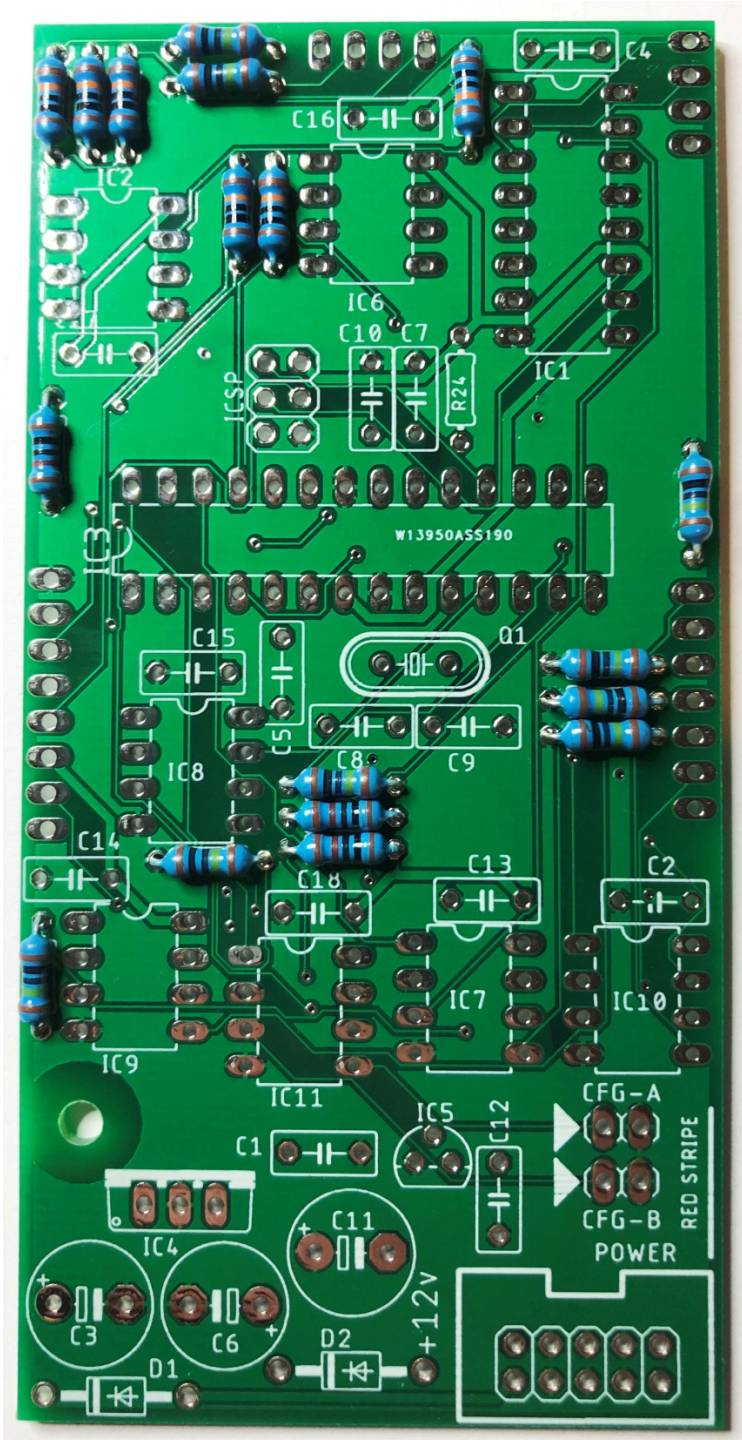
## Main Board – Step 2

Install and solder the three 10K resistors R12, R13 and R23



### Main Board – Step 3

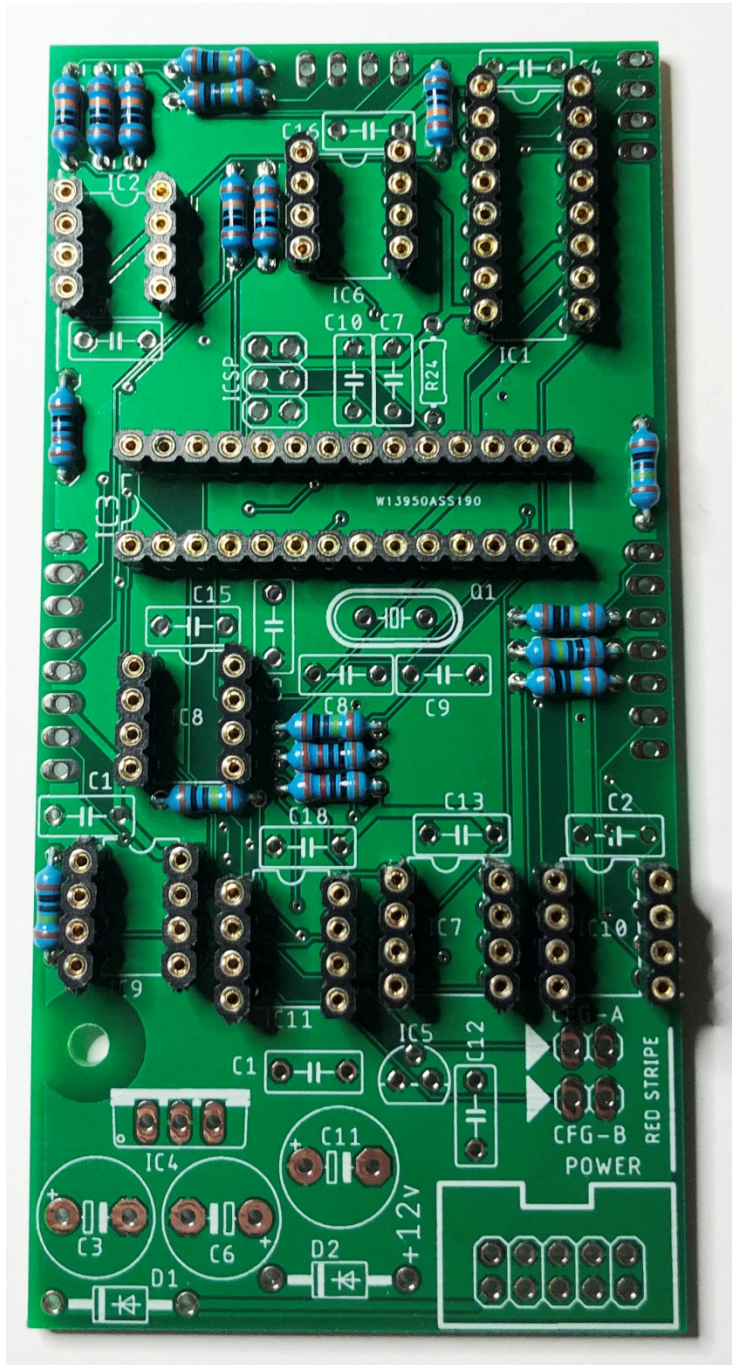
Install and solder the nine 1M resistors R1, R2, R3, R4, R5, R6, R9, R10 and R11





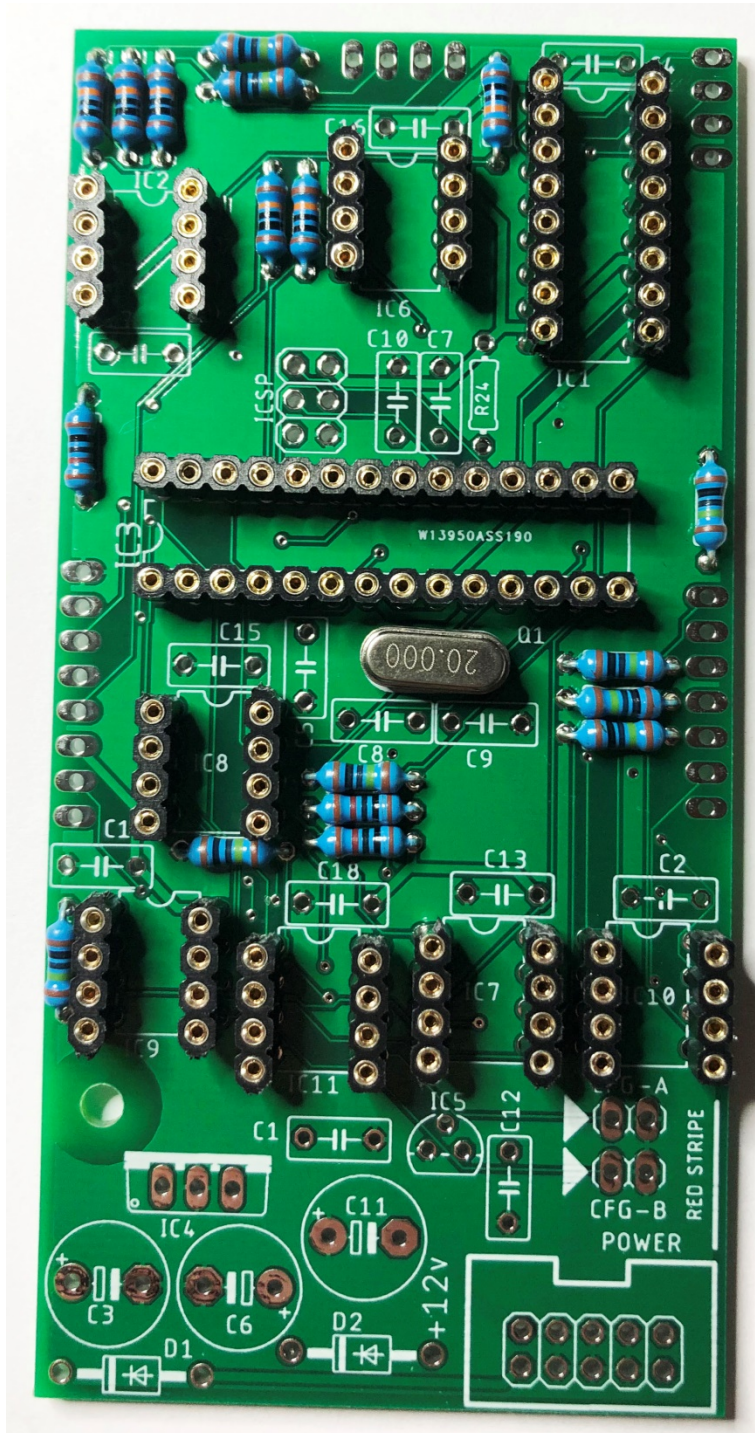
## Main Board – Step 4

Cut the IC sockets into the appropriate sizes. Install and solder them into place.



## Main Board – Step 5

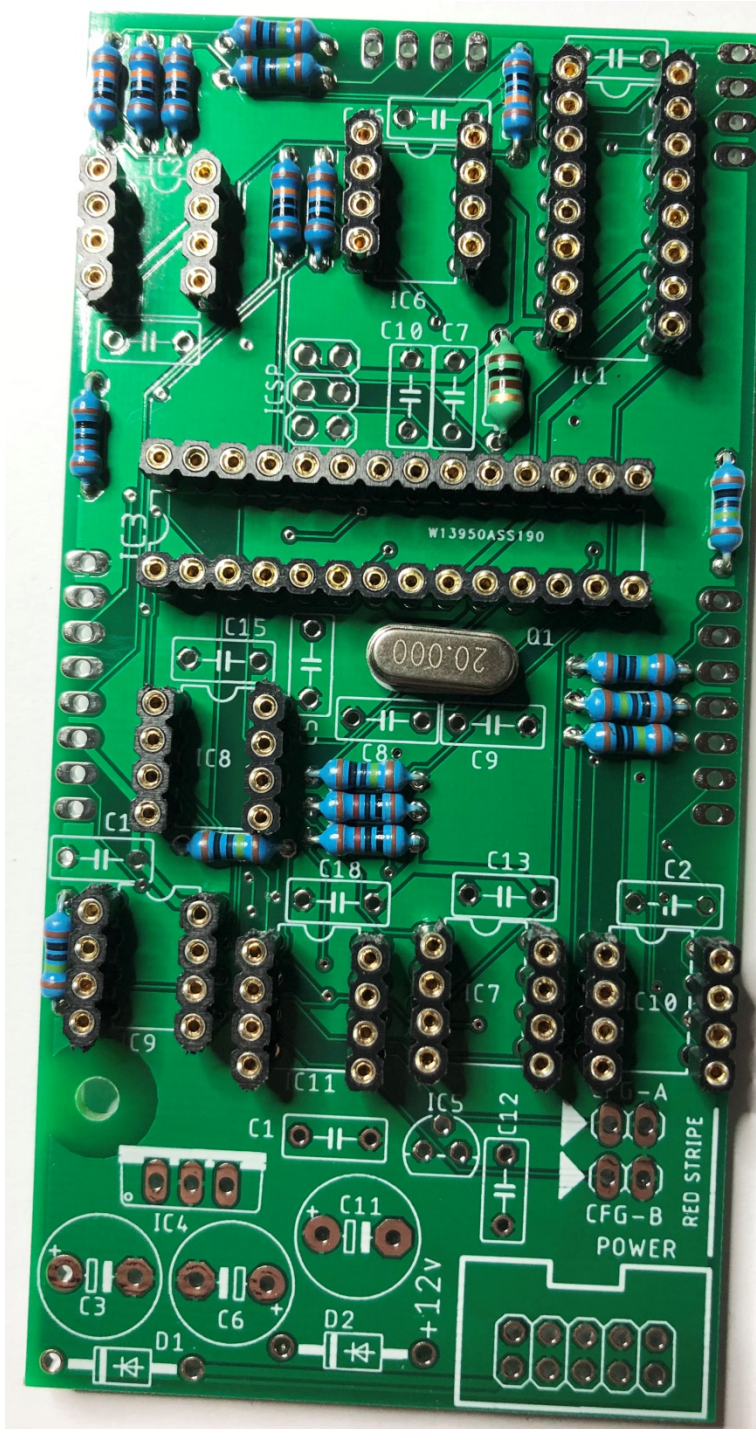
Install and solder the 20 MHz crystal Q1





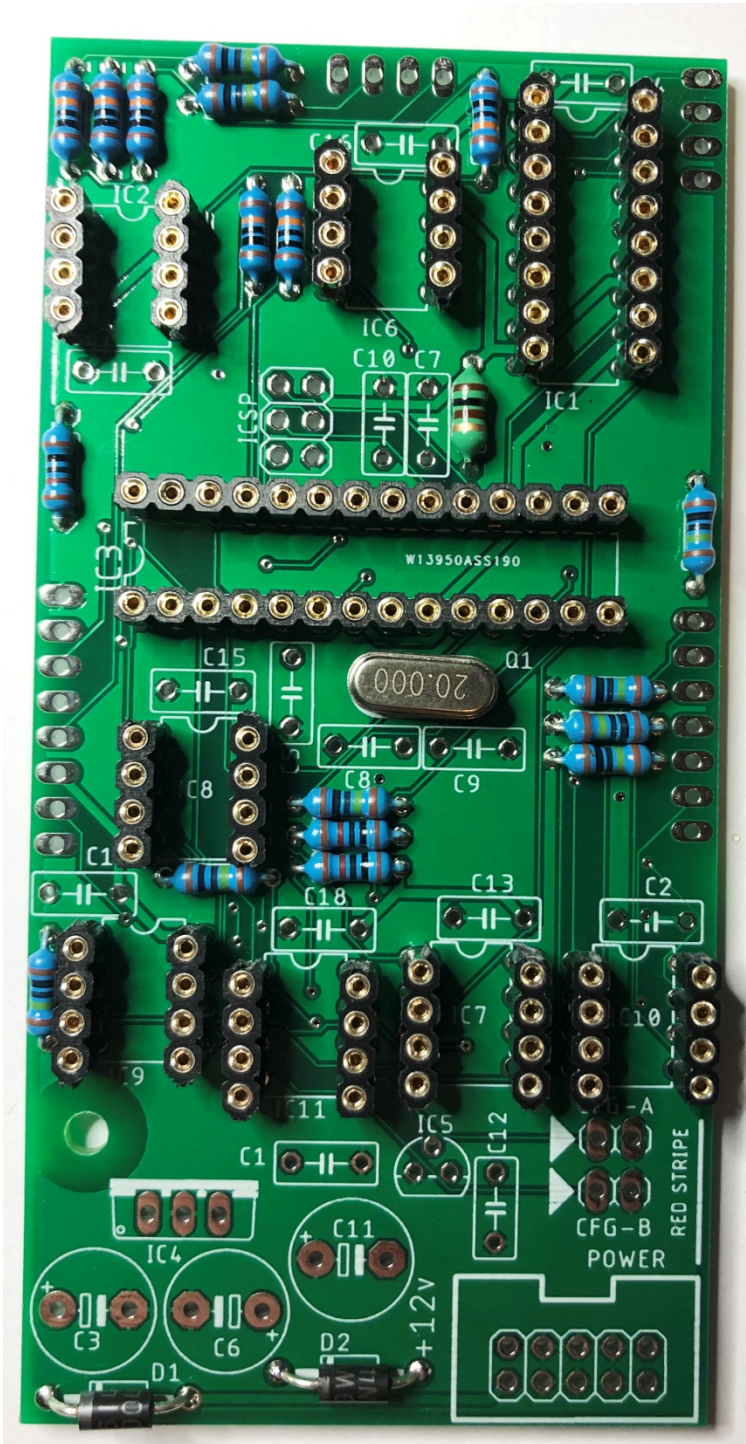
## Main Board – Step 6

Install and solder the inductor into R24



## Main Board – Step 7

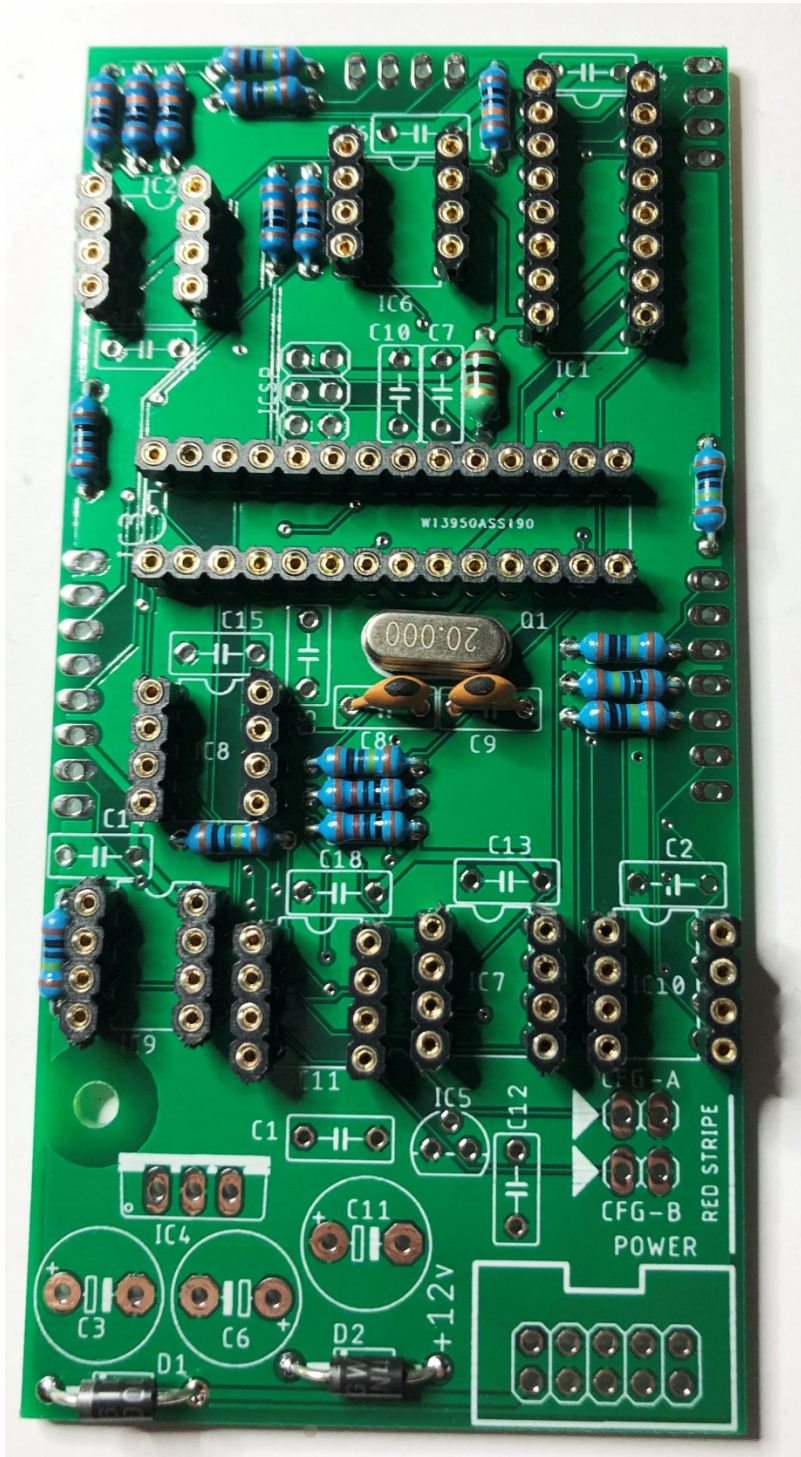
Install and solder the two power diodes D1 and D2





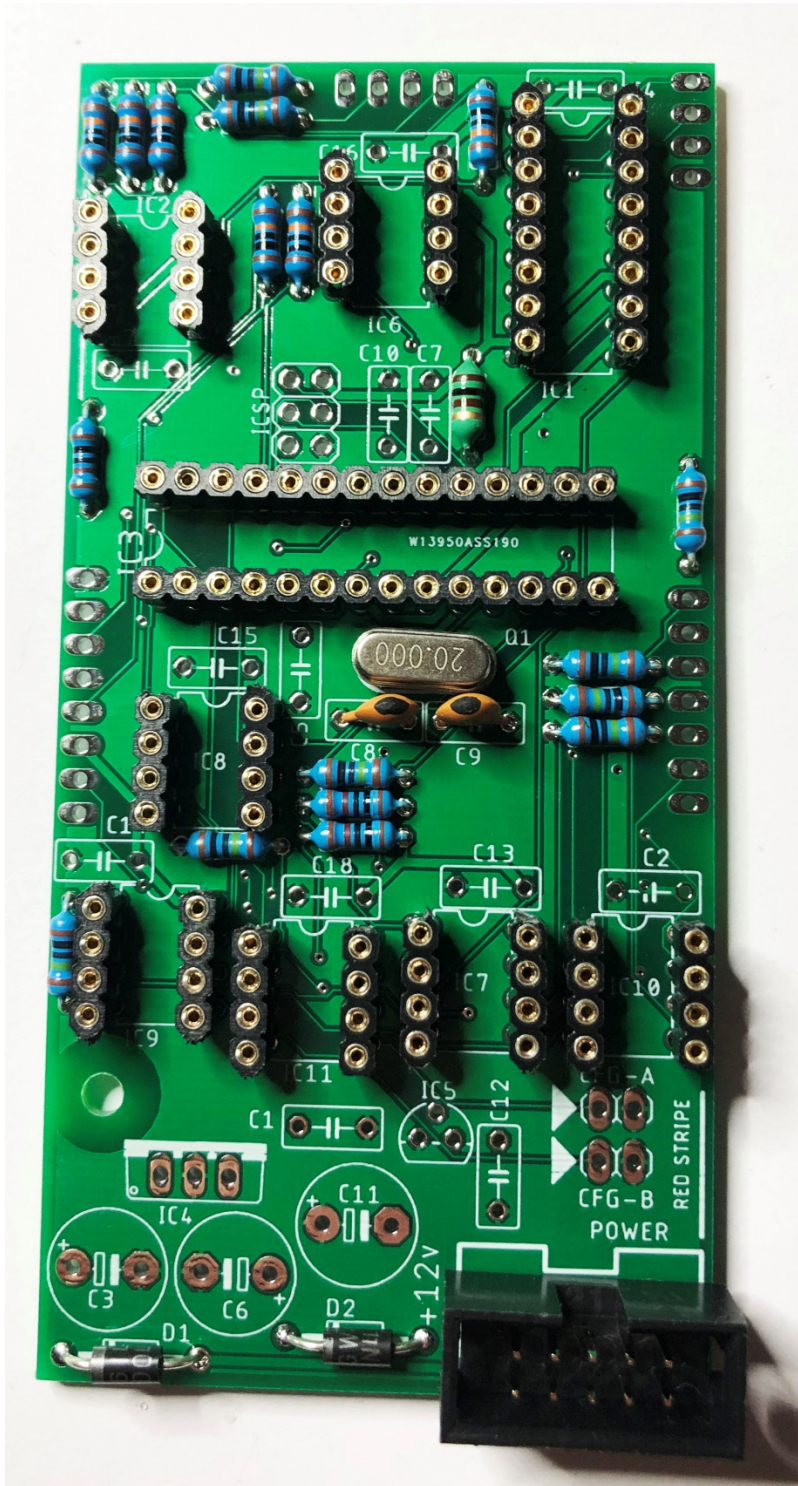
## Main Board – Step 8

Install and solder the two 22pf capacitors into C8 and C9



## Main Board – Step 9

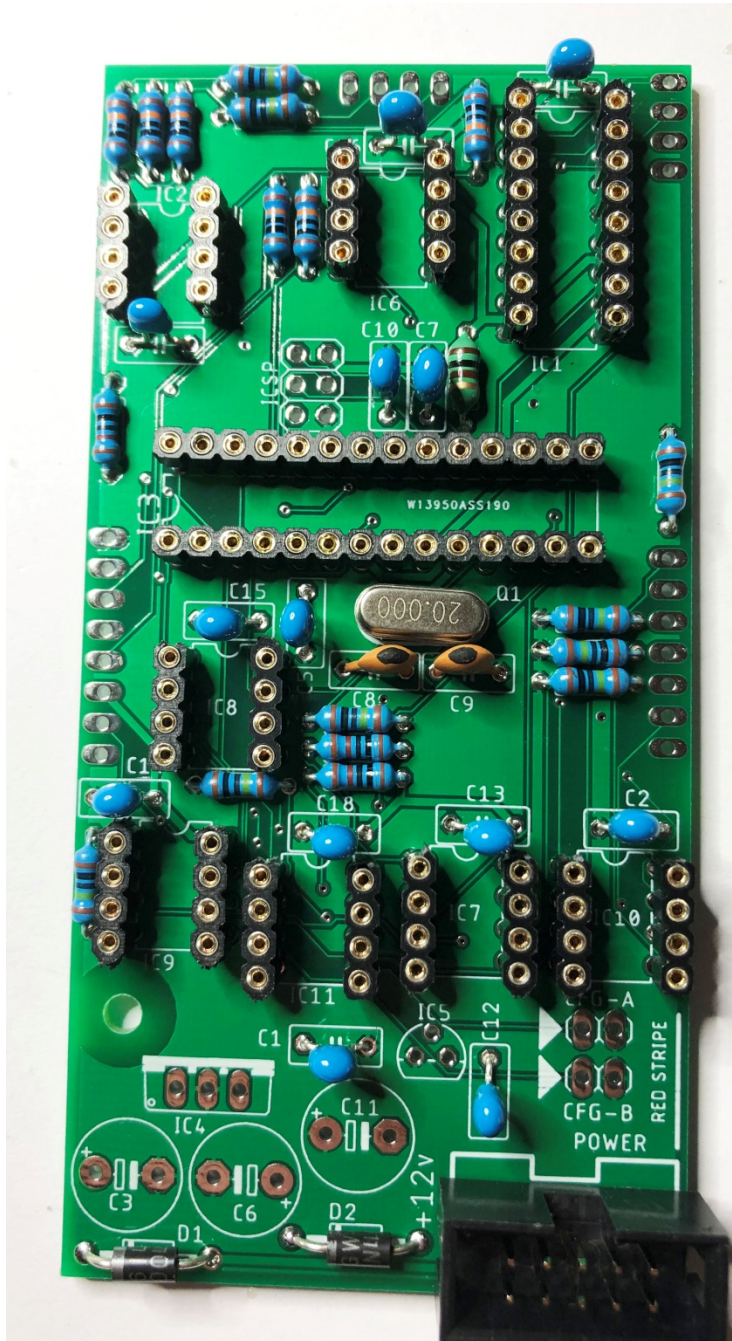
Install and solder the IDC power header





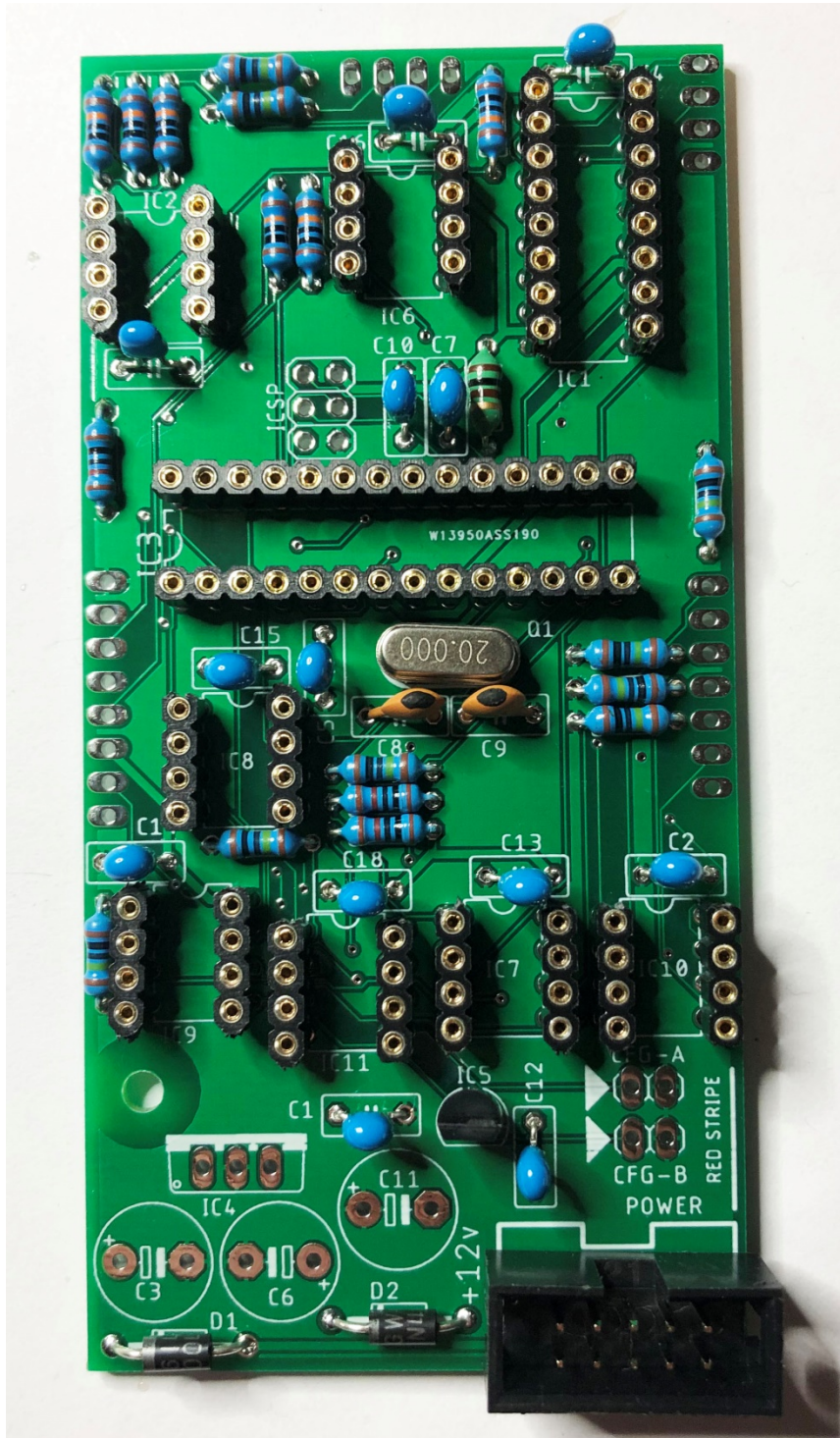
## Main Board – Step 10

Install and solder the thirteen 100nf capacitors C1, C2, C4, C5, C7, C10, C12, C13, C14, C15, C16, C17 and C18



## Main Board – Step 11

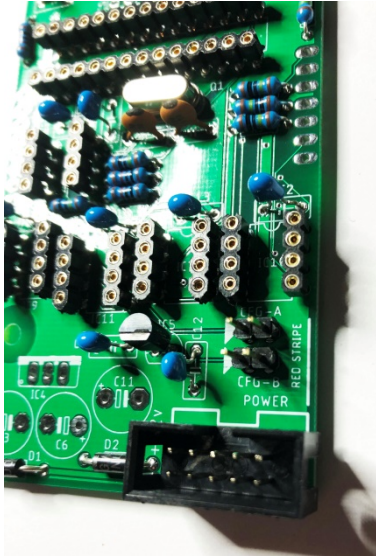
Install and solder the 7905 voltage regulator IC5





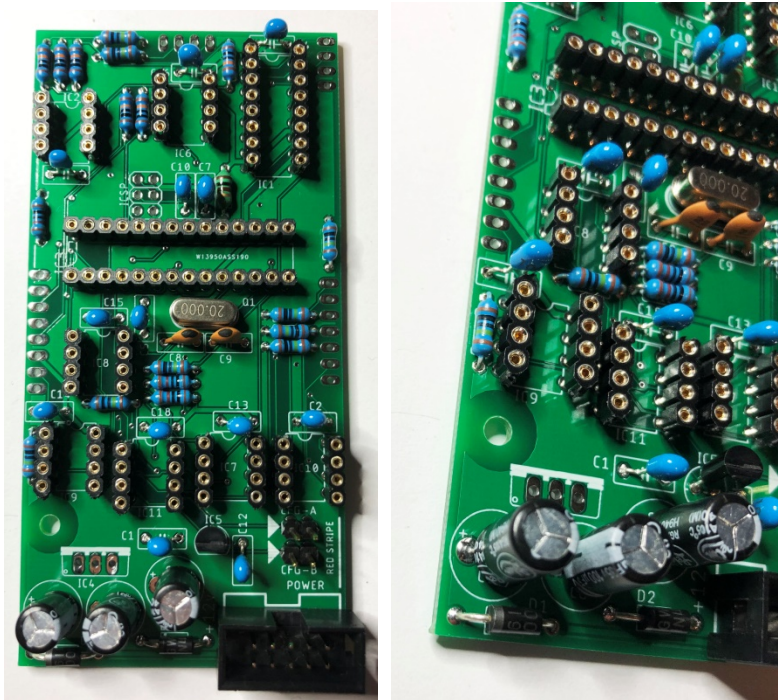
## Main Board – Step 12

Cut two 2 pin pieces of male header pin from the strip and install and solder into CFG-A and CFG-B



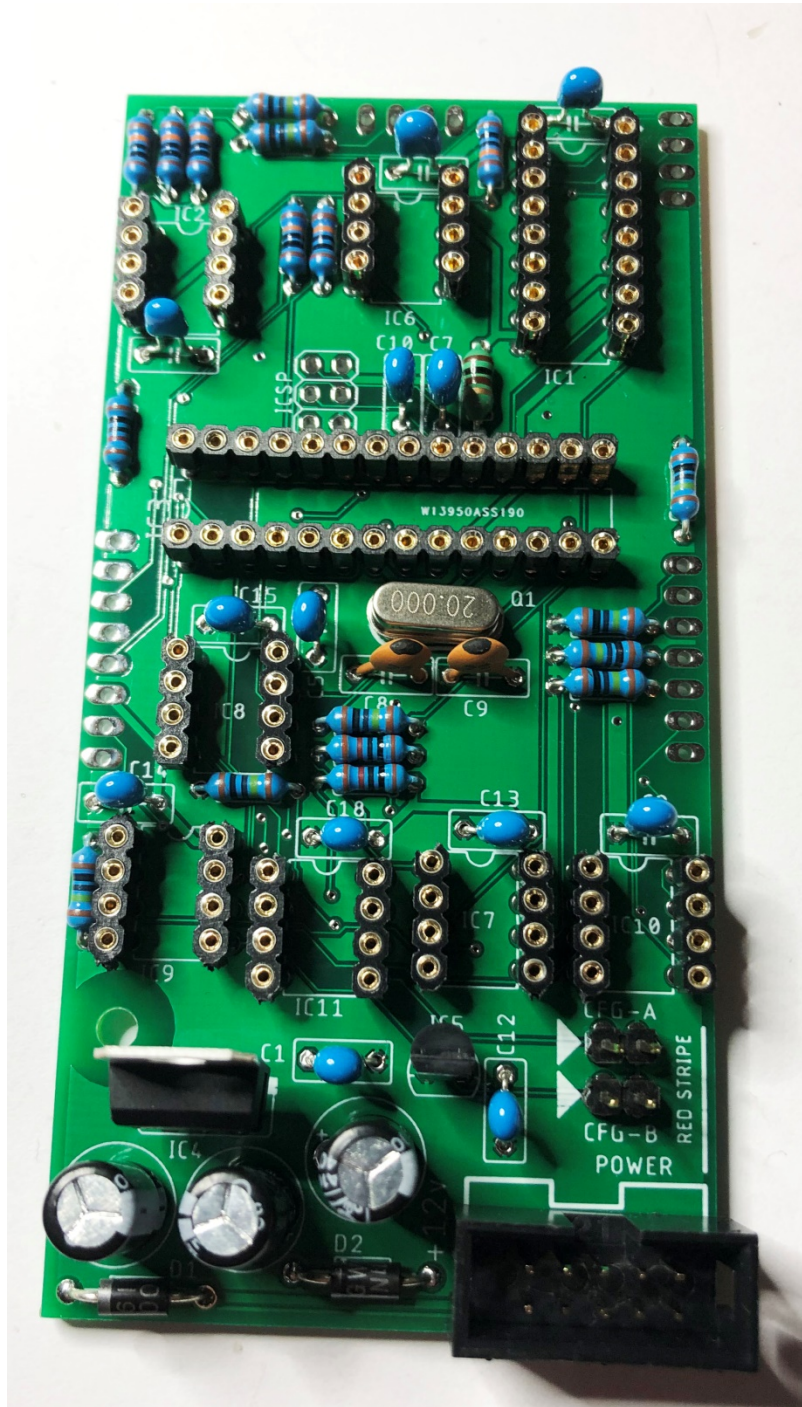
## Main Board – Step 13

Install and solder the three 100uf capacitors C3, C6 and C11 paying close attention to the polarity. The longer pin is positive and the shorter negative pin is marked with a stripe.



## Main Board – Step 14

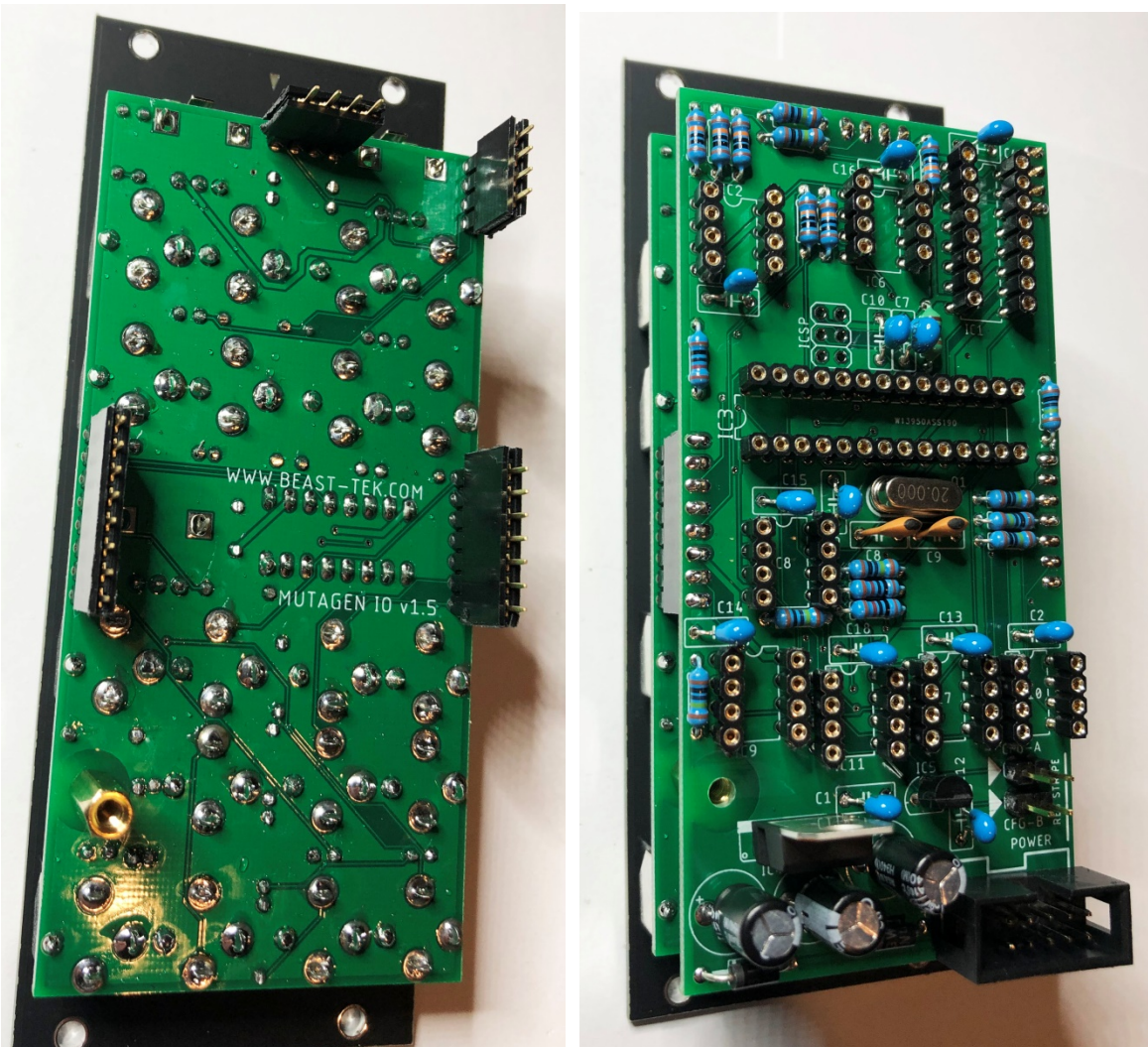
Install and solder the 7805 voltage regulator IC4





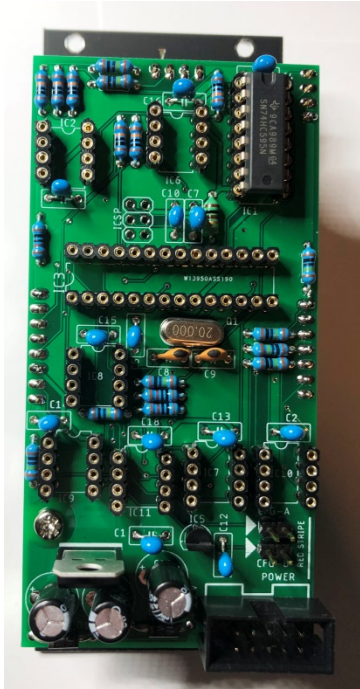
## Main Board – Step 15

Cut two 4 pin, one 8 pin and one 7 pin piece from the female header strip. Place onto the male headers on the back of the IO board. Align and seat the main board onto the IO board then when everything is seated nicely, solder the headers. Separate the boards and perform a final inspection for shorts, dry or missing solder joints etc. When you are happy everything is perfect, join the two boards back together and secure in place with a 6mm M3 screw.

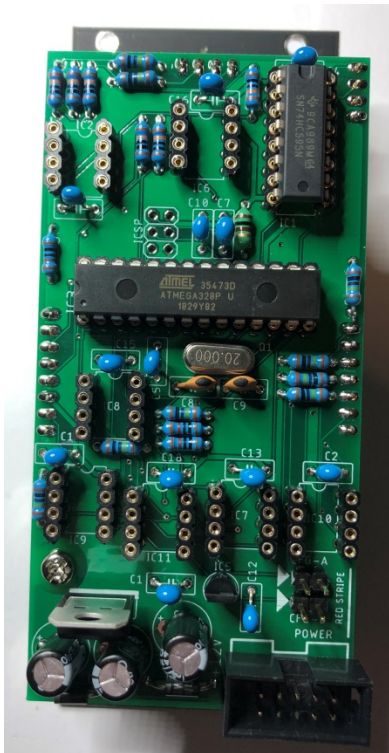


## Main Board – Step 16

Install the 74HC595 into IC1



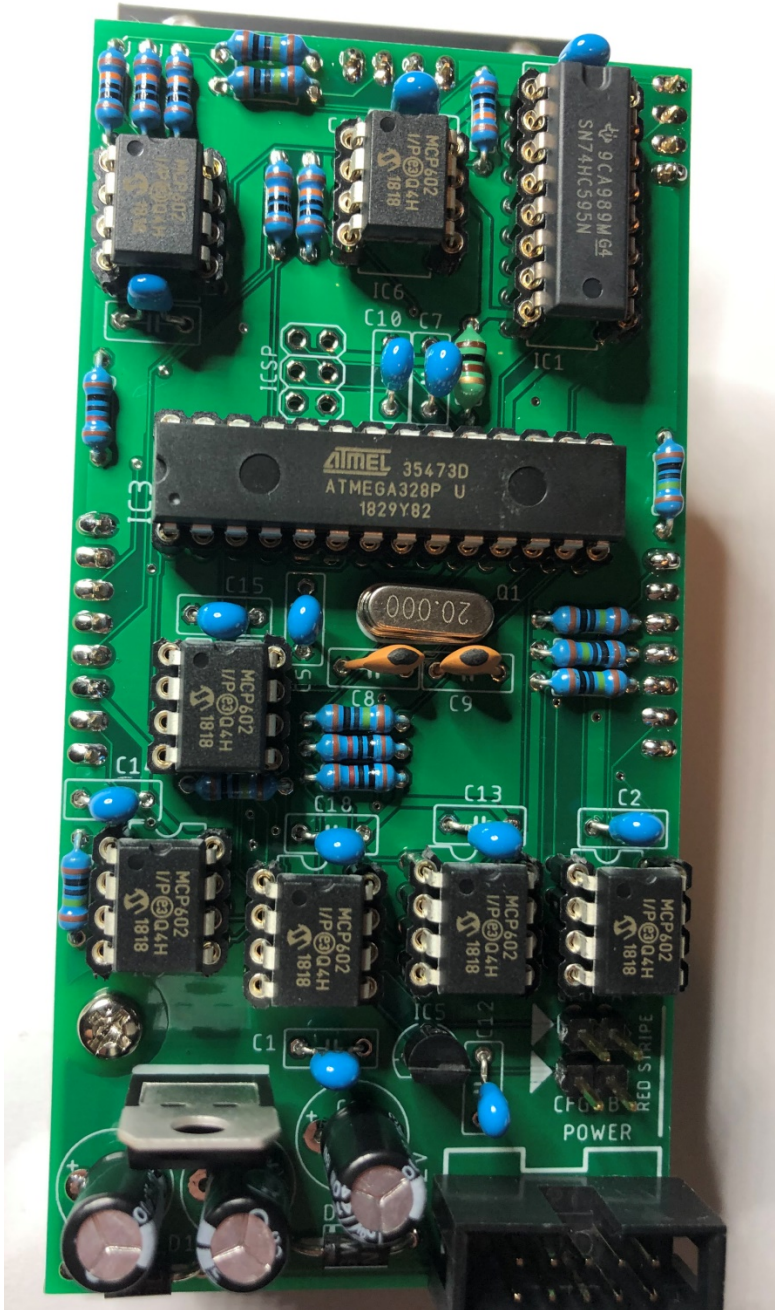
Install the CPU into IC3





## Main Board – Step 17

Install the seven MCP602 op-amps into the remaining sockets



## MG – Mutagen Expander (optional)



## MG Expander – Step 1

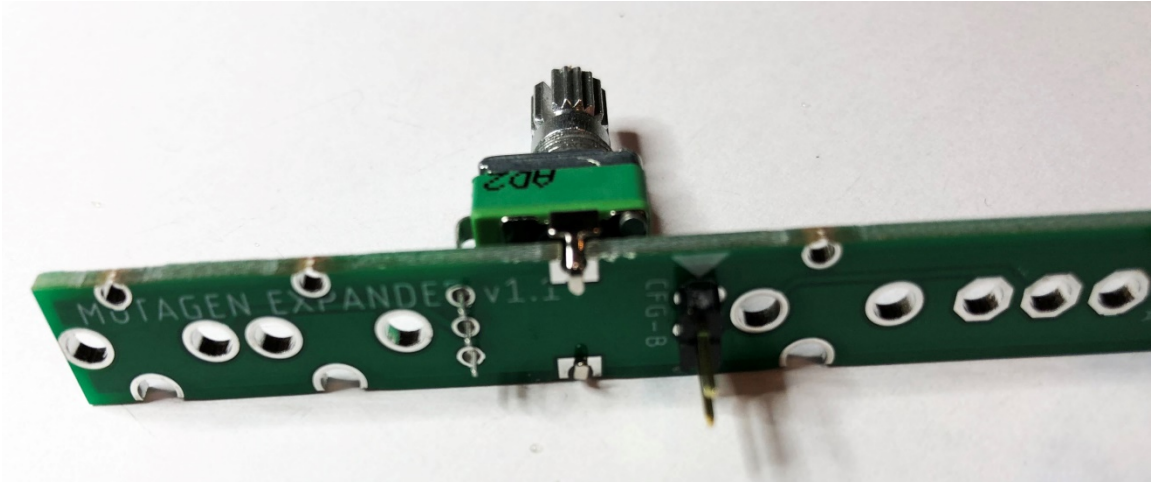
Install and solder the two 2 pin male header pins





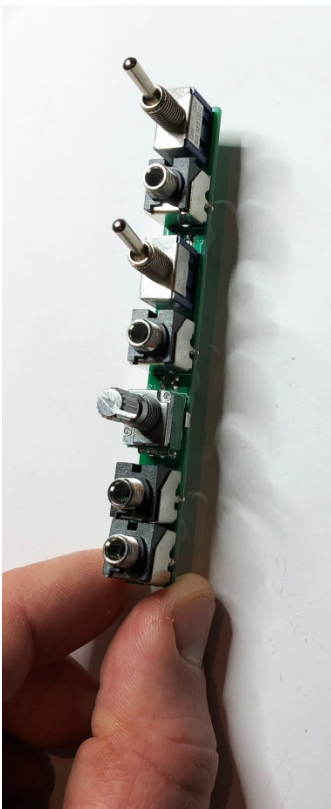
## MG Expander – Step 2

Seat the potentiometer into place. Bend the support pins into place using pliers to make sure they are not sticking out. DO NOT SOLDER YET.



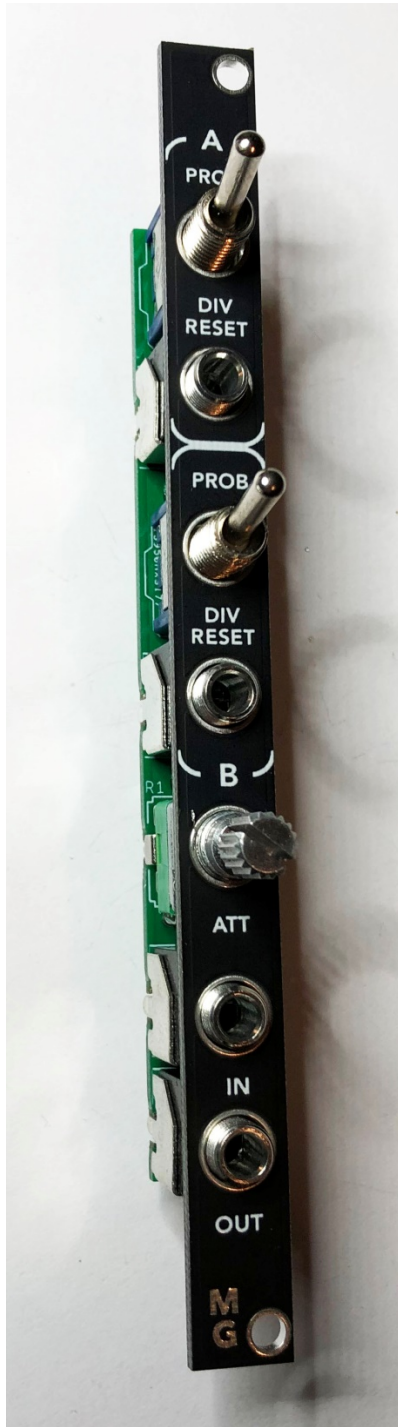
## MG Expander – Step 3

Seat the switches and jacks into place. DO NOT SOLDER YET



## MG Expander – Step 4

Carefully slide the panel over the switches and jacks



## MG Expander – Step 5

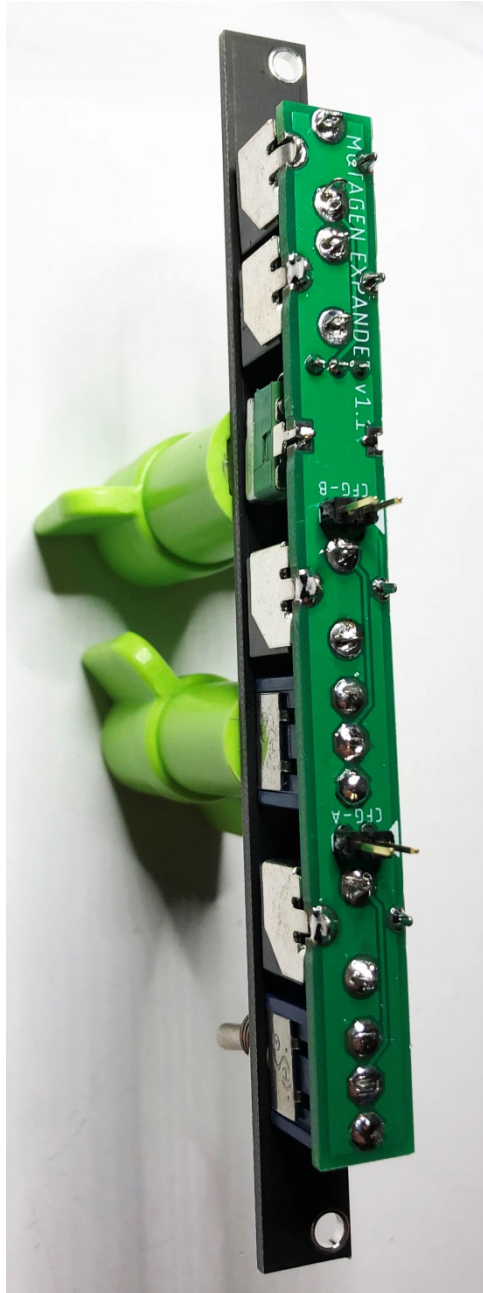
Install the knurled jack nuts, switch nuts and tighten. Place a nut on the potentiometer and finger tighten until firm and the nut is aligned perfectly with the side of the panel. The potentiometer may rise slightly from the board (less than 1mm) but this is okay so that the nut is aligned and not jutting out over the side of the panel.





## MG Expander – Step 6

Flip it over and solder everything into place. You will need to use something to hold it whilst soldering as it will not stay upright due to the switches.



## MG Expander – Step 7

Flip over and install the knob onto the potentiometer. Refer to the user guide for instructions on how to connect the expander to Mutagen.

