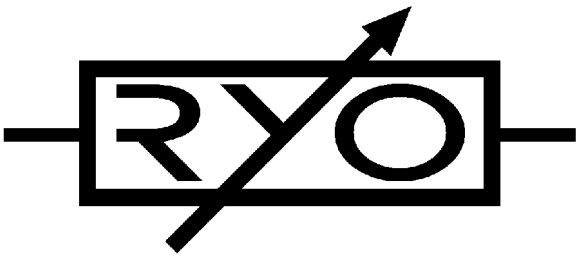
Ljunggren Audio Roll Your Own Penta



Version: Penta 1.0

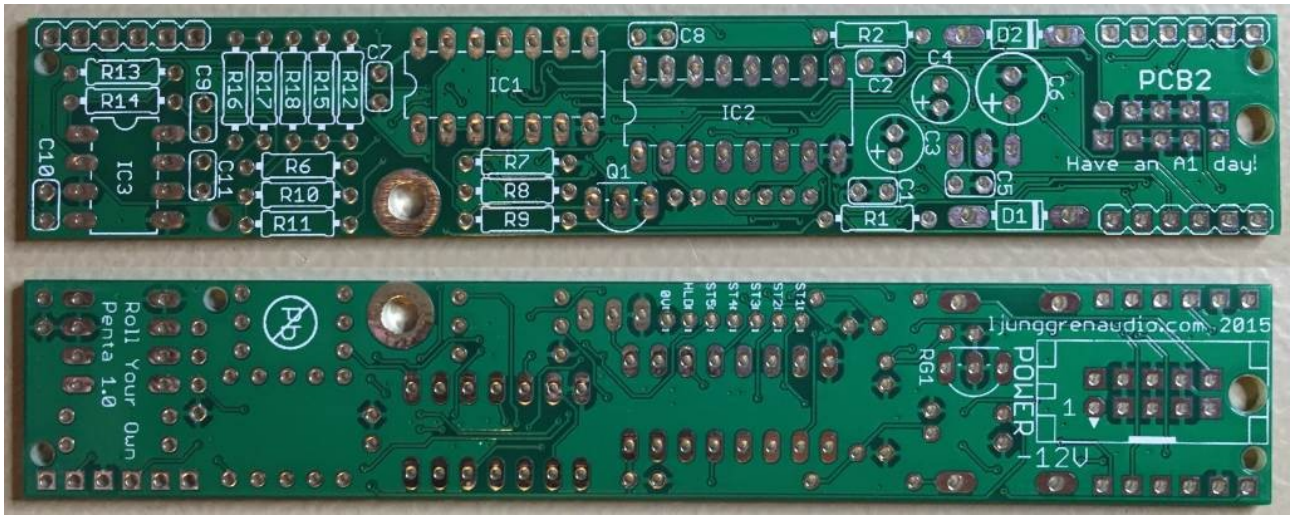
Bills Of Material

Bold = PCB1, The rest = PCB2

Type	Qty	Value	Parts	Description
Power header	1	2x5pin	POWER	Euro power connector
Jack	1	3.5mm	***J1, J2, J3***	PJ301M-12 / Thonkiconn / Inline
Potentiometer	5	100K lin	***POT1, POT2, POT3, POT4, POT5***	Tall Trimmer 9mm Pots 20K to 100K linear, 100K for rated current consumption.
Socket strip	3	1x6pin	***PCB1-CON1, PCB1-CON2, PCB1-CON3***	
Pin strip	3	1x6pin	PCB2-CON1, PCB2-CON2, PCB2-CON3	
LED 3mm	5	orange	***L1, L2, L3, L4, L5***	
Toggle switch	1	on-off-on	***SW1***	SPDT toggle switch on-off-on
Resistor	15	100k	***R3***, ***R4***, ***R5***, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R17, R18	Ca 7mm resistor 1%
Resistor	2	10R	R1, R2	Ca 7mm resistor 1/4W
Resistor	1	2.2k	***R19***	Ca 7mm resistor for LED
Resistor	1	330R	R16	Ca 7mm resistor
Diode	2	1N5818	D1, D2	Schottky rectifier. Power polarity protection. Alternatives: 1N5817, 1N5819, SB130.
Capacitor	7	100nF	C1, C2, C5, C7, C8, C9, C10	MLCC X7R
Capacitor	1	15pF	C11	Ceramic capacitor
Electrolytic	2	10uF	C3, C4	2mm pin pitch, 5mm dia, max 10mm height. Min 25V.
Electrolytic	1	100uF	C6	
Transistor	7	2N7000	Q1, ***Q2***, ***Q3***, ***Q4***, ***Q5***, ***Q6***, ***Q7***	
Volt regulator	1	LM2931 5V	RG1	VOLTAGE REGULATOR
IC socket	1	DIP14		
CD4xxx	1	CD40106	IC1	DIP14 CMOS Hex Schmitt Trigger
IC socket	1	DIP16		
CD4xxx	1	CD4017	IC2	DIP16 CMOS Counter
IC socket	1	DIP8		
OpAmp	1	LM358	IC3	DIP8
Solder pad	7	LSP10	0V, HLD, ST1, ST2, ST3, ST4, ST5	Drill 1 mm, Pin pitch 2mm, For homebrew expanders.
Power cable	1	16pin-10pin		
Mounting screws	2	M3x6 black		
Frontplate	1	4hp		2mm black PCB material
PCB1	1			
PCB2	1			
spacers	1	11mm		
nuts	1	for spacers		
screws	1	for spacers		

Assembly instructions

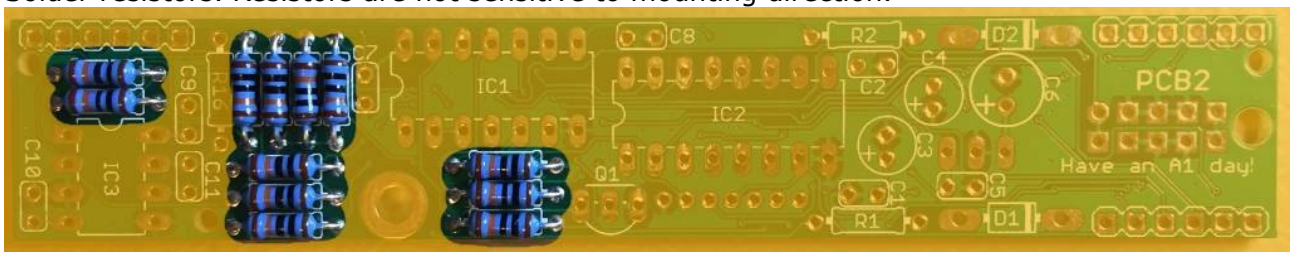
We start with PCB2.



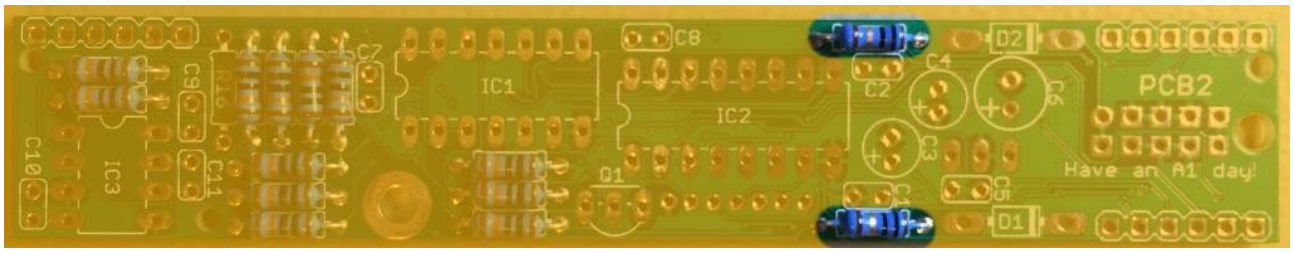
Empty PCB2 top & bottom.

Step 1

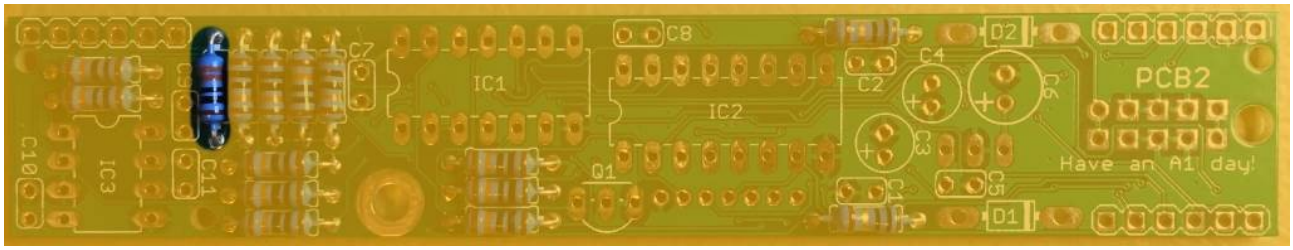
Solder resistors. Resistors are not sensitive to mounting direction.



R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R17, R18 *100K 12pcs*



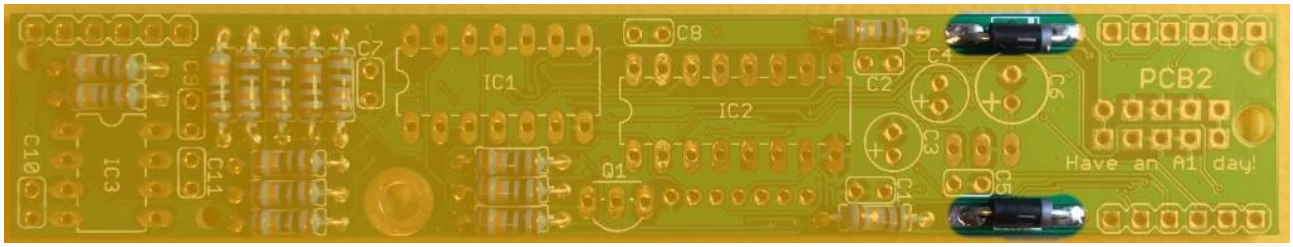
R1, R2 *10R 2pcs*



R16 *330R 1pcs*

Step 2

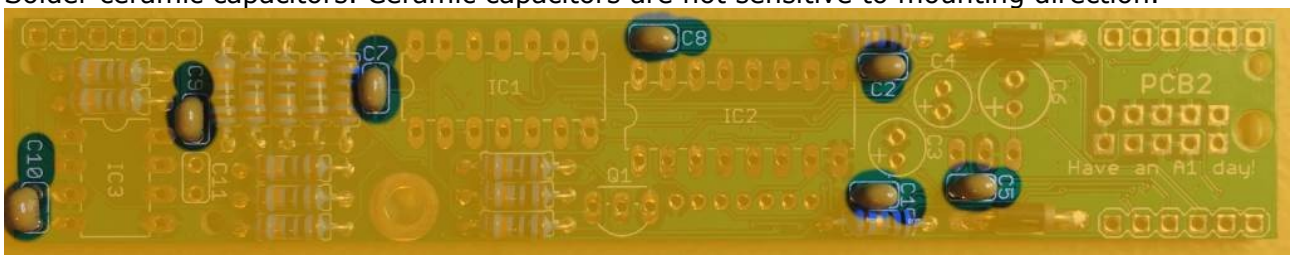
Solder power polarity protection diodes. Diodes are sensitive to mounting direction, make sure the stripe on the diode match the stripe on the silkscreen.



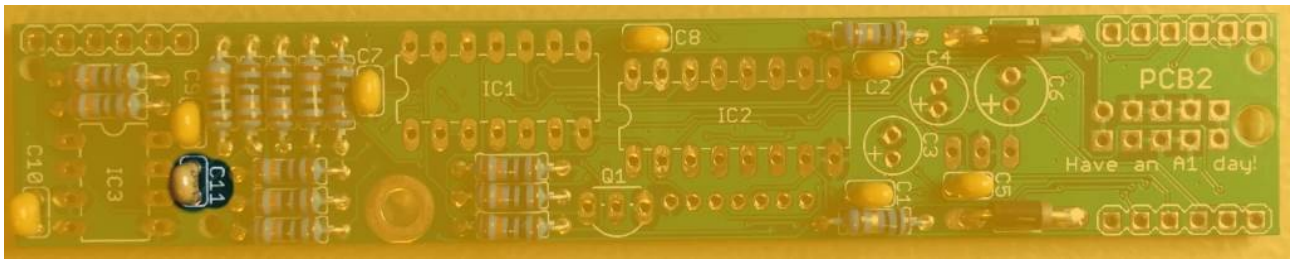
D1, D2 *1N5818 2pcs*

Step 3

Solder ceramic capacitors. Ceramic capacitors are not sensitive to mounting direction.



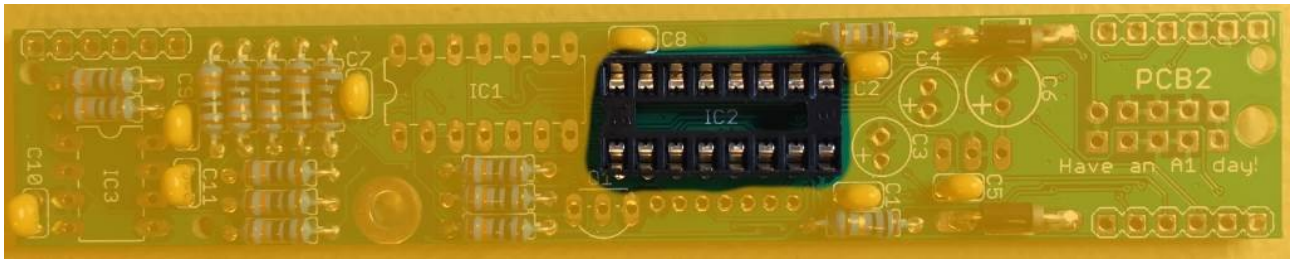
C1, C2, C5, C7, C8, C9, C10 *100nF 7pcs*



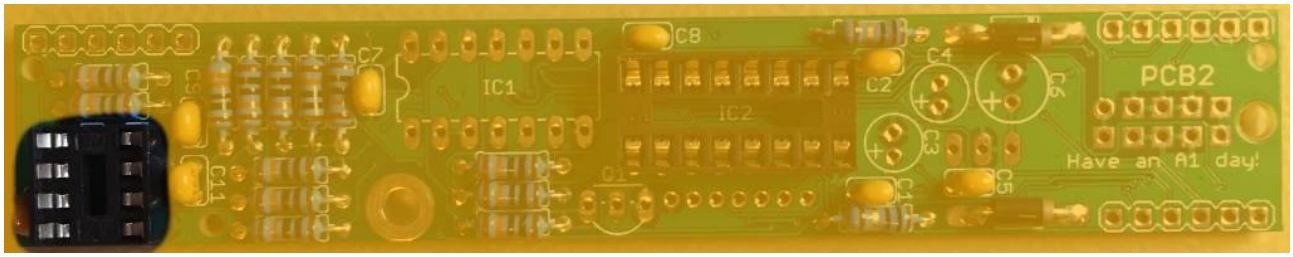
C11 *15pF 1pcs*

Step 4

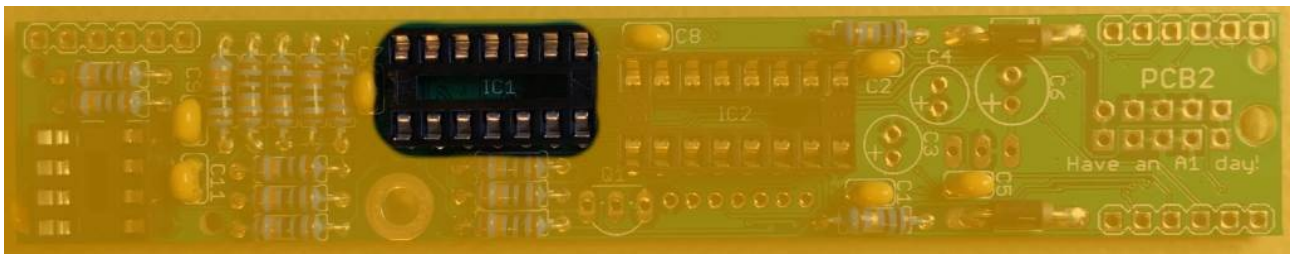
Solder IC sockets. Match the IC sockets indent (marking pin 1 side) with the silk screens.



IC2 *16 pin DIP socket. IC will be mounted later.*



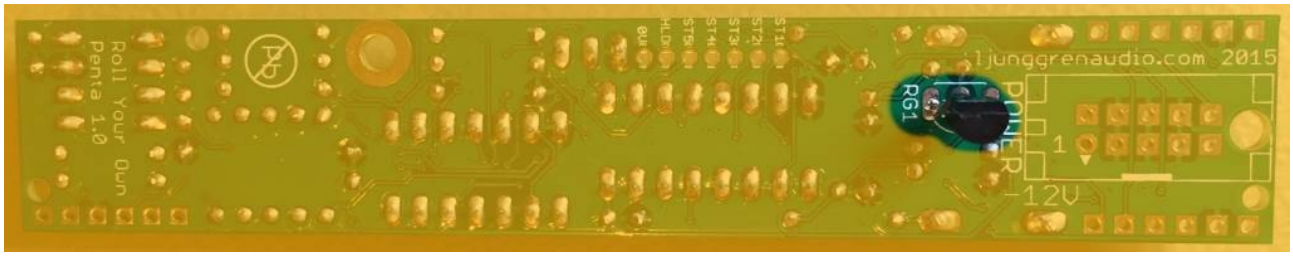
IC3 *8 pin DIP socket. IC will be mounted later.*



IC1 *14 pin DIP socket. IC will be mounted later.*

Step 5

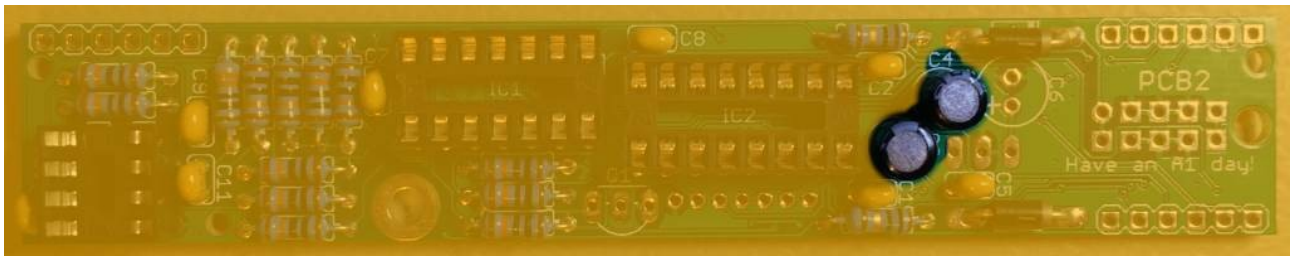
Solder Volt regulator on the back side of PCB2. Match the regulators curved side with the curved side in the silkscreen.



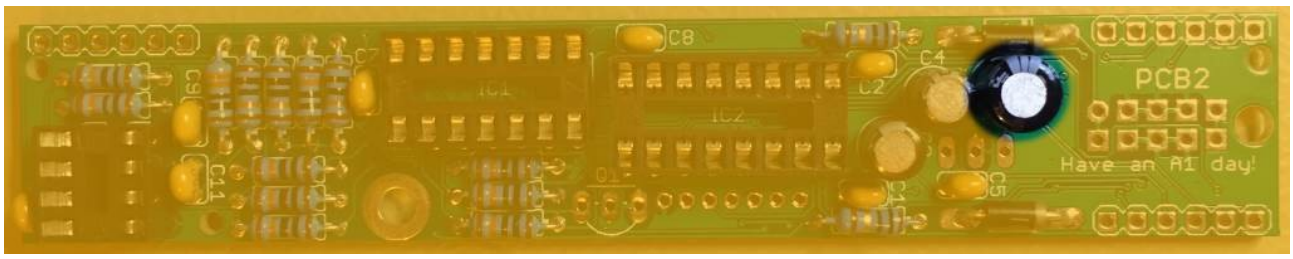
RG1 *LM2931 5V 1pcs*

Step 6

Solder electrolytic capacitors on the front side of PCB2. Electrolytic capacitors are sensitive to mounting direction. Put the long pin in the hole marked with a + (anode) on the silkscreen. The opposite side is marked with – (cathode) on the electrolytic capacitor.

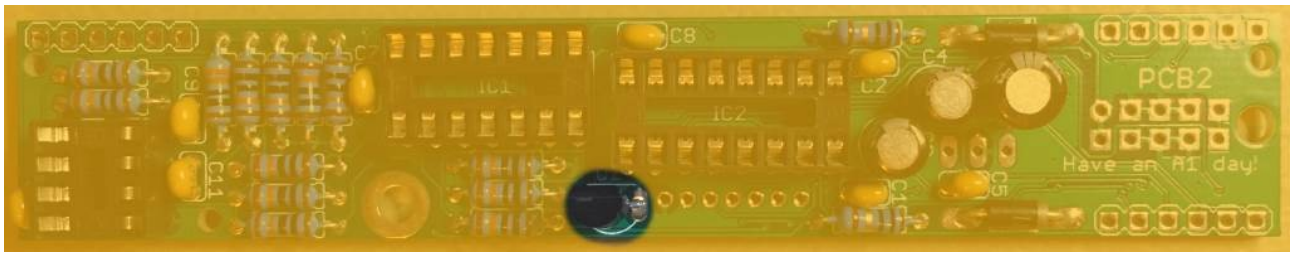


C3, C4 *10µF 2pcs*



C6 *100µF 1pcs*

Step 7
Solder Transistors. Match the curved side of the transistor with the curved side in the silkscreen.



Q1 *2N7000 1pcs*

Step 8
Solder the power header to the back of PCB2. Make sure the key opening is oriented in the same way as in the picture below, at the same side as the -12V marking. It's easier to avoid bent pins if you attach the power cable in the header while you are soldering.

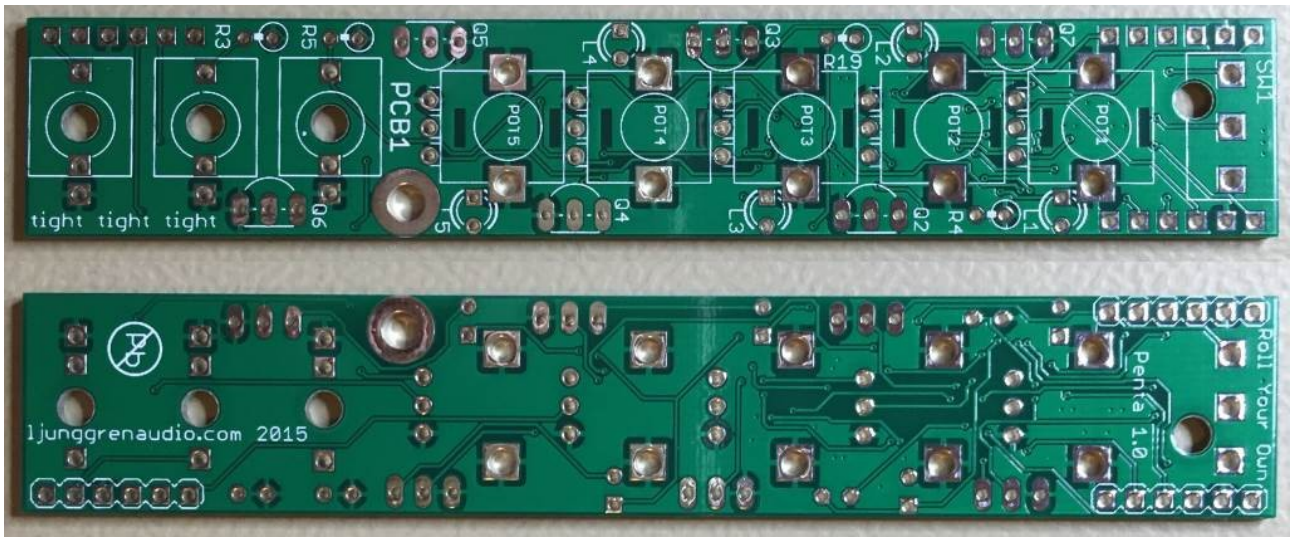
POWER *2x5pin*

Step 9
Turn PCB2 back to the front side again and insert the ICs in the sockets.

IC1 *CD40106*
IC2 *CD4017*
IC3 *LM358*

Step 10

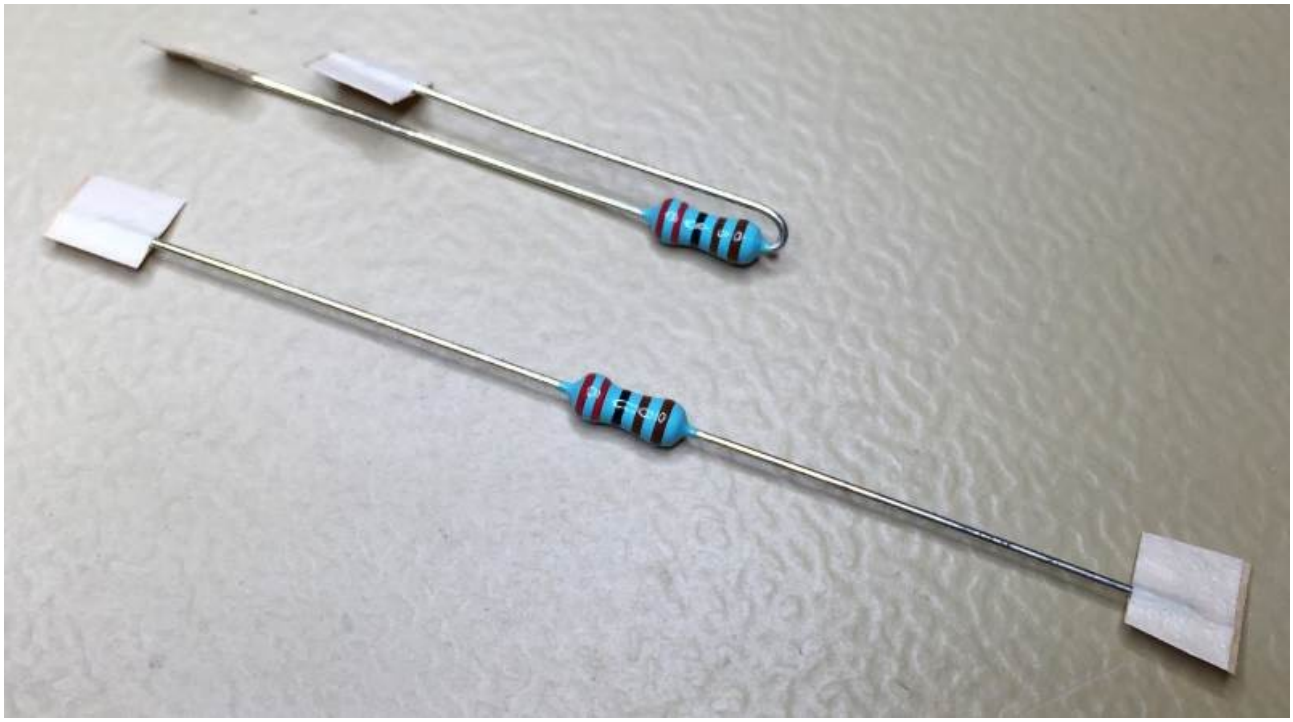
Leave PCB2 on the side with the 3pcs of 6pin pin-strips not soldered.
Now it's time for PCB1.

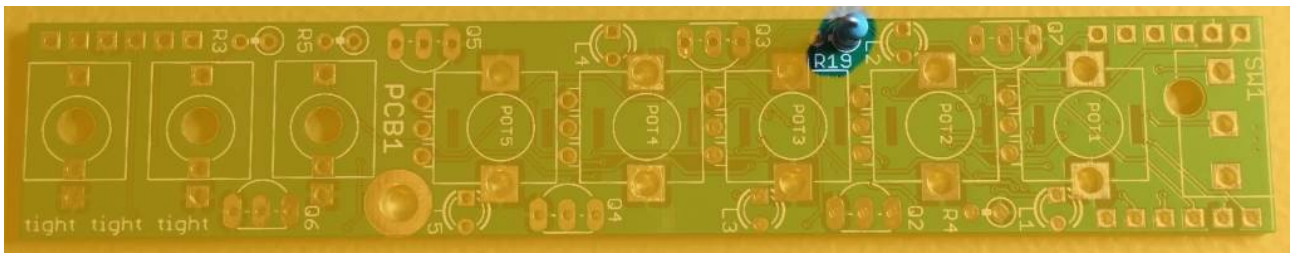


Empty PCB1 top & bottom.

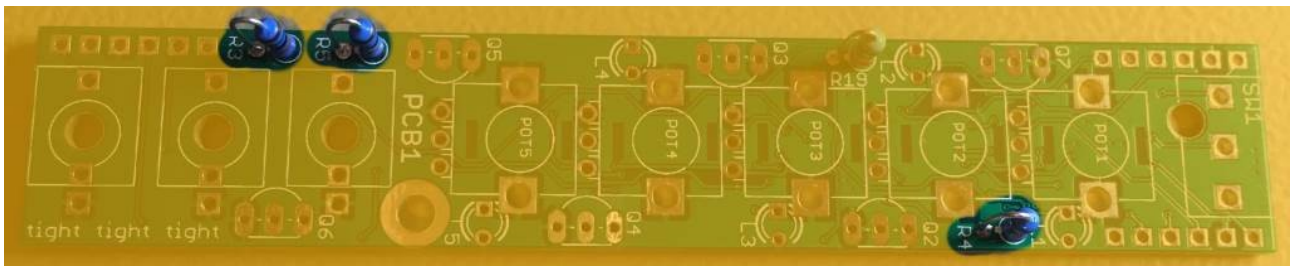
Step 11

Solder resistors. Resistors are not sensitive to mounting direction. The resistors of PCB1 need to be bent like in the picture below to fit in vertical.





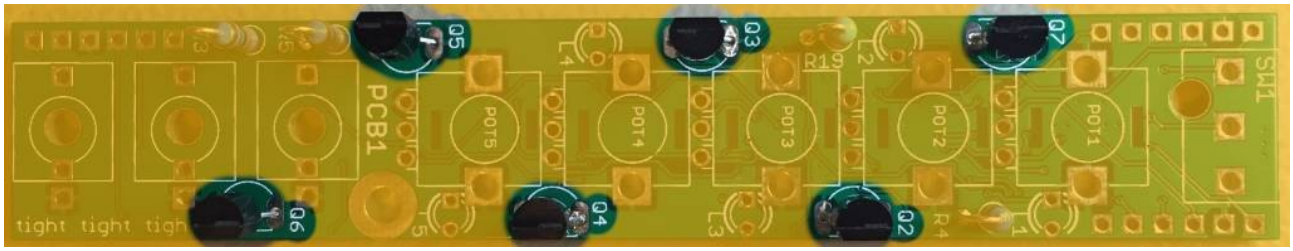
R19 *2.2K 1pcs LED resistor*



R3, R4, R5 *100K 3pcs*

Step 12

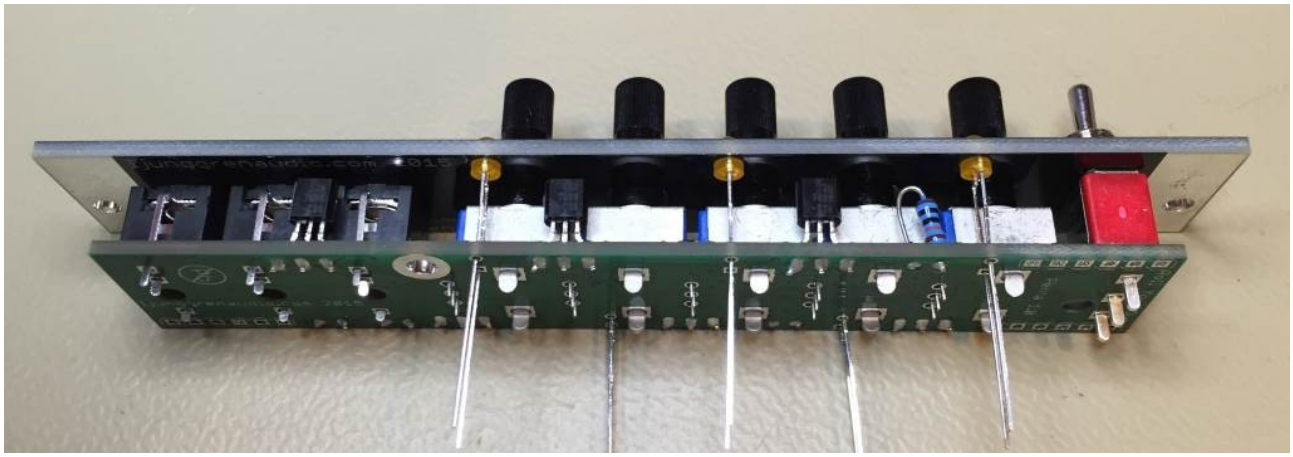
Solder Transistors. Match the curved side of the transistor with the curved side in the silkscreen.



Q2, Q3, Q4, Q5, Q6, Q7 *2N7000 6pcs*

Step 13

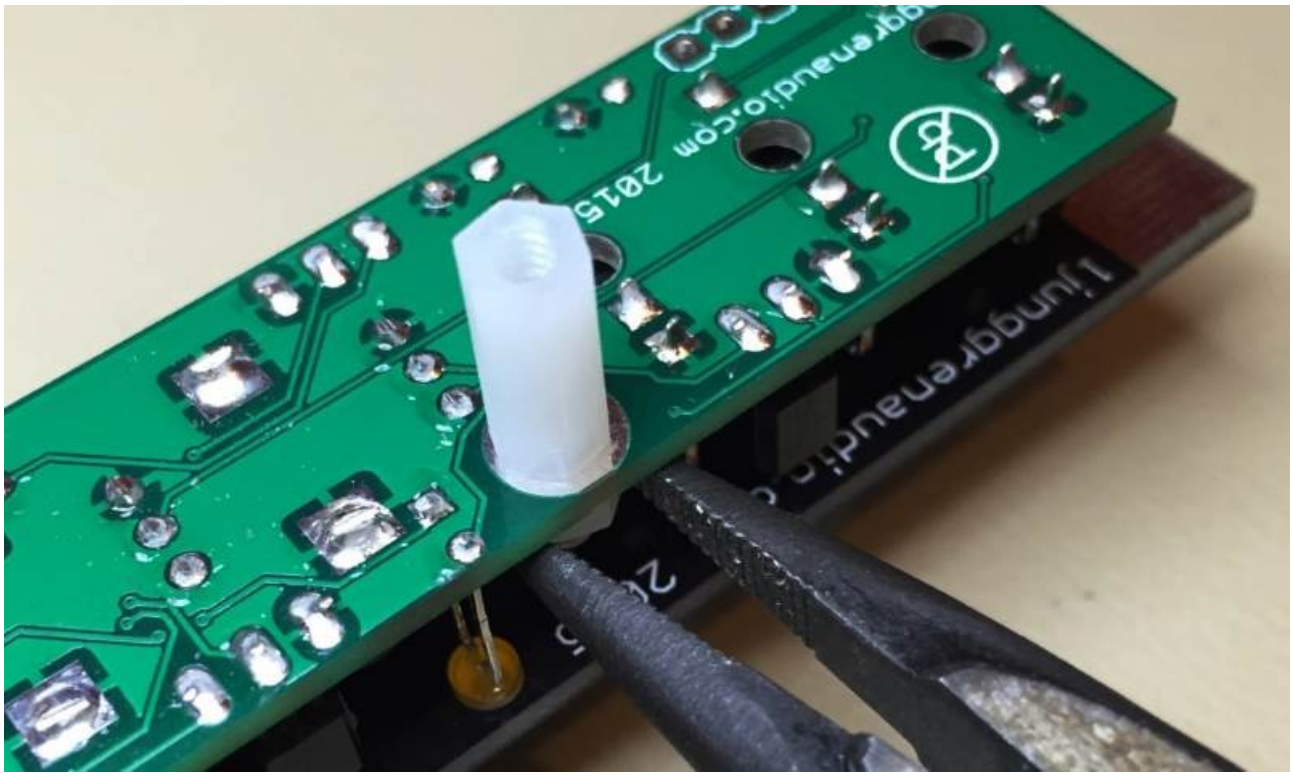
Place the potentiometers, jacks, switch and LEDs in their positions but don't solder them yet.
The long pin of the LEDs goes into the hole with a square pad.



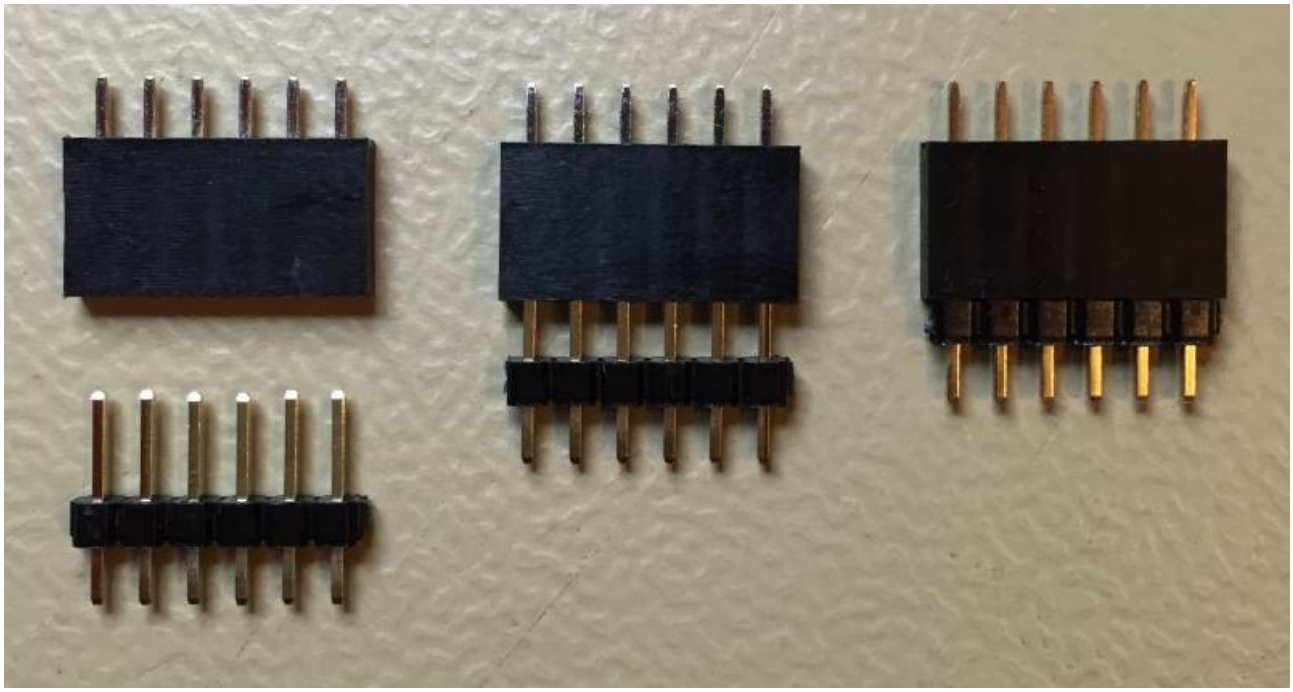
Place the front panel on top and add 1 washer and 1 nut to each jack and the switch. Use a socket wrench to avoid scratching of the frontplate. Keep the nuts for the jacks and the nuts on the switch separated as they look similar. The nut from the switch can fit on the jacks but the jacks nuts won't fit on the switch.

Turn it upside down and make sure the LEDs go into their respective panel hole properly. Now you solder all panel components in place.

Step 14
Mount the spacer with the nut on PCB1.

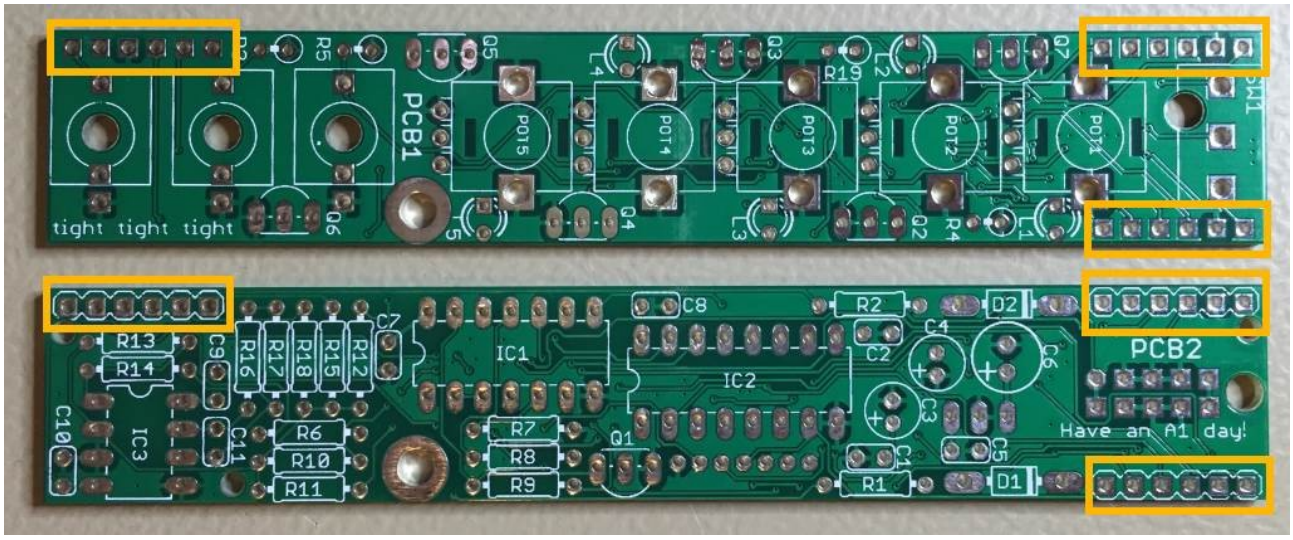


Step 15
Attach the 3pcs of 6pin socket strips and 3pcs of 6pin pin-strips together to prepare them for soldering.

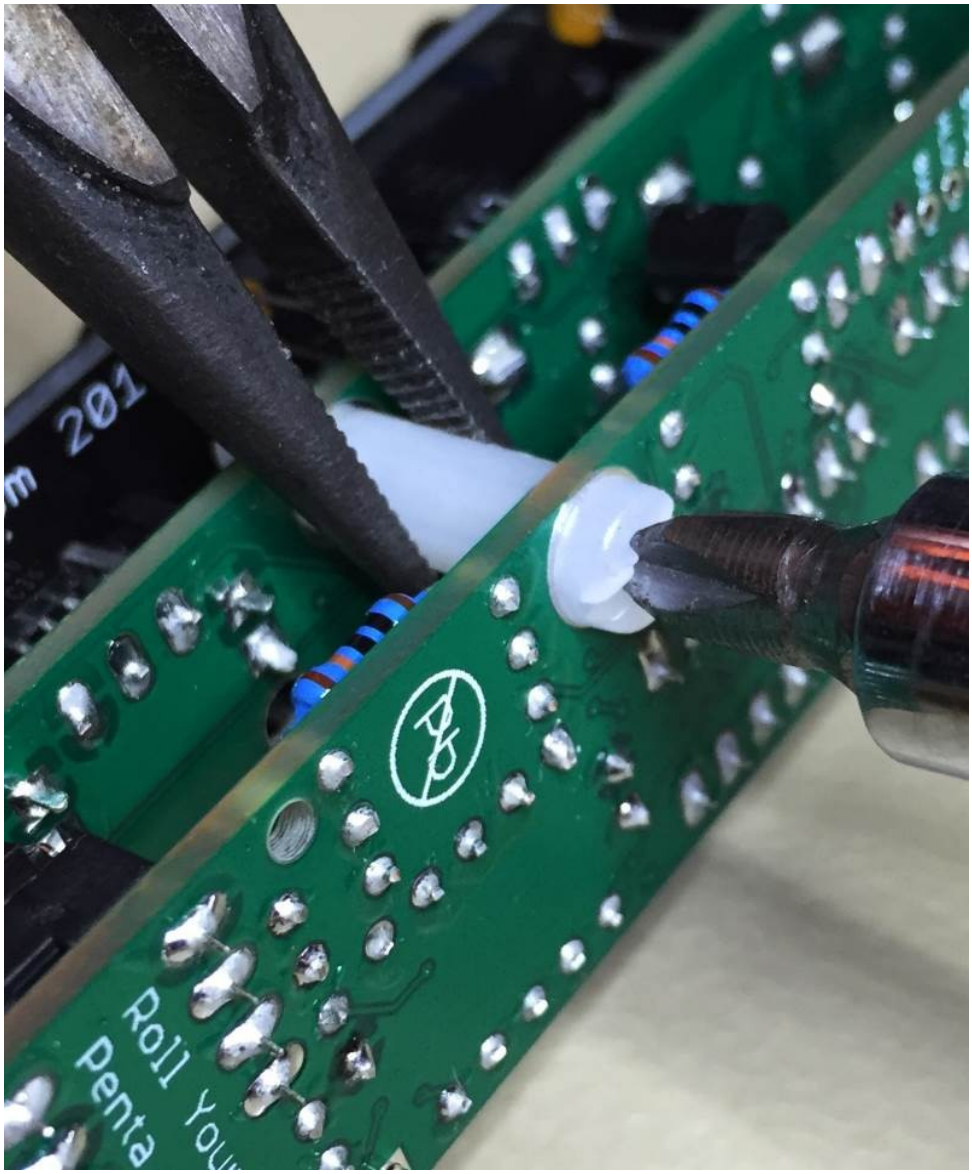


Step 16

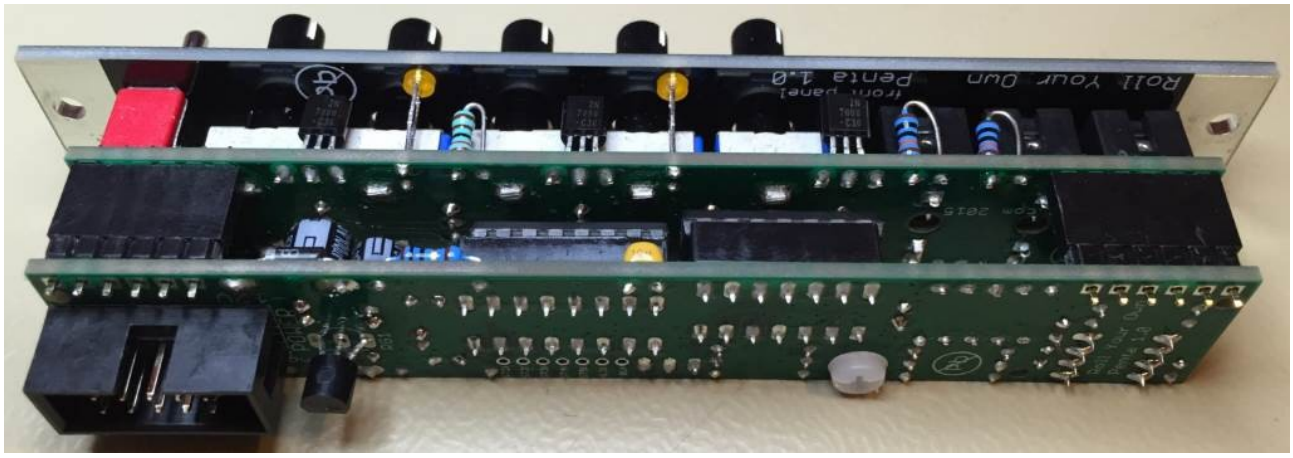
After putting the pin & socket strips into each other. Place them between PCB1 and PCB2 at the positions in the picture below.



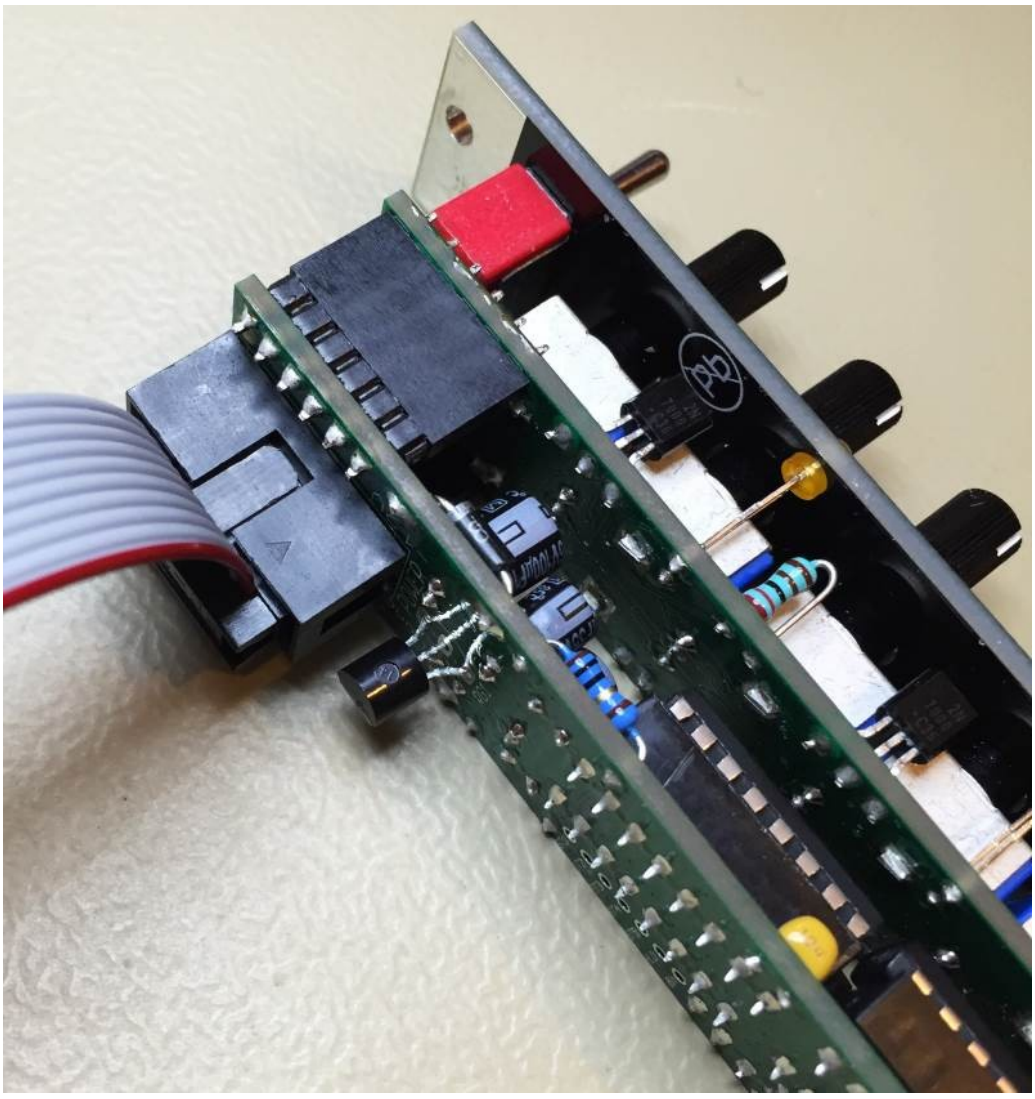
Take a firm grip with a plier around the spacers and screw the screws into place like in the picture below.



Step 17
Solder the connectors between PCB1 & 2 in place.



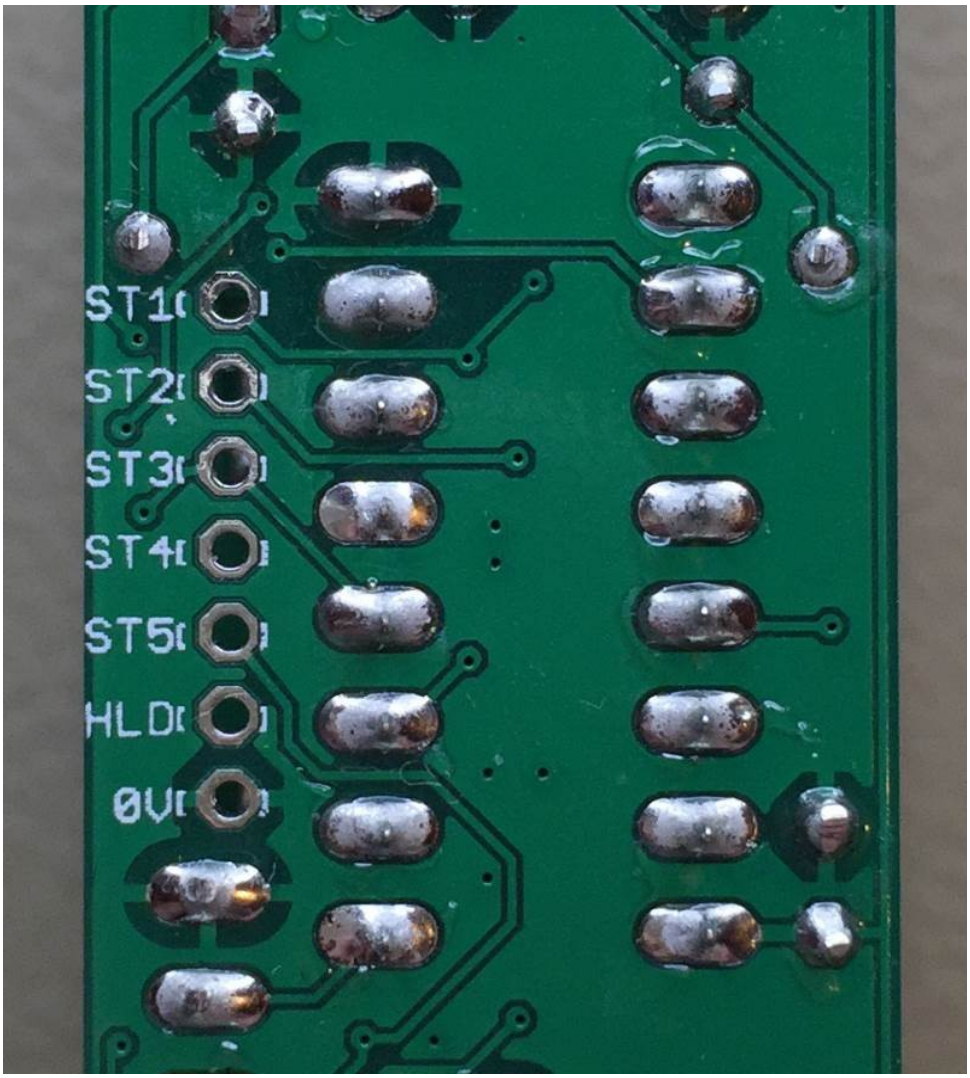
Step 18
Attach the power cable. The stripe indicating pin 1 should be at the -12V side.



Finished module!

Bonus pads

You can use these pads to further expand the usability of the Penta with your own homebrewed expander.



The pads ST1, ST2, ST3, ST4, ST5 are directly connected to each steps output pin of IC2 CD4017. They will output 5V while a step is active and 0V the rest of the time. The simplest way to get gate outputs is to connect them to jacks through 1k resistors.

The HLD pad is connected to the enable pin of IC2 CD4017 through the spare schmitt inverters of IC1 CD40107. It will give conditioned schmitt trigger input for the HLD function with a decent hysteresis for noise resitance. The HLD function when fed with a 5V gate it will hold the active step in the sequence until HLD returns to 0V. The simplest way to get the hold input is to connect a jack to the pad through a 10k resistor.

The 0V pad will provide 0V/GND to the jacks sleeves/your expansion.

If you wish to make more elaborate expansions or add extra safety or buffers on inputs and outputs Penta 1.0 Schematics can be found here.