



## OVERVIEW

For the most recent version of this document please visit [www.thonk.co.uk](http://www.thonk.co.uk)

For all technical support please visit <http://bit.ly/17CetJb> on Muffwiggler.

This document is an alternative to the build documentation available on the Music Thing Modular website.

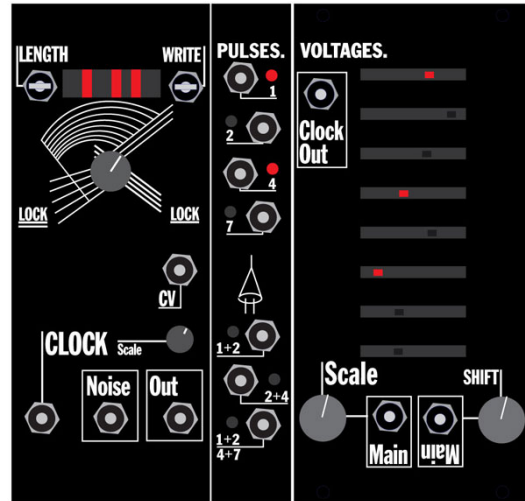
[http://musicthing.co.uk/modular/?page\\_id=323](http://musicthing.co.uk/modular/?page_id=323)

Vactrol Mix Info here:

<https://www.thonk.co.uk/documents/turing/expanders/vactrolmix/>

All Thonk kits are sold under our standard [Terms and Conditions](#).

**DON'T PEEL THE PAPER OFF  
THE PANELS BEFORE PAINTING!**



## DIY INSTRUCTIONS

This document gives detailed instructions that assume you have purchased a complete kit from [www.thonk.co.uk](http://www.thonk.co.uk). It also assumes no previous knowledge of electronics. To learn to solder try [http://youtu.be/l\\_NU2ruzyc4](http://youtu.be/l_NU2ruzyc4)

**Watch and understand that whole YouTube video! If you're not achieving the results shown in the video then you need to buy new tools or seek advice. You will not end up with a working module otherwise.**

## TOOLS REQUIRED

Soldering iron, pliers, wire strippers, small flat head screwdriver and diagonal cutters AKA snips AKA side-cutters. A Digital Multimeter is always helpful for checking for bad solder joints and continuity. Thonk sell a range of inexpensive tools [here](#).



## BACKPACK BUILD INSTRUCTIONS

1.

Start by emptying the **BACKPACK** bag into a bowl or container. This makes it much easier to pick parts as you need them and you're less likely to lose anything.

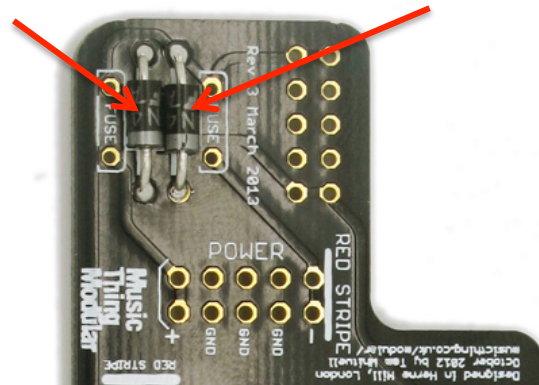


2.

Start by taking the two black and silver diodes from the protective ESD bag and solder into place. Note that the silver end of both diodes faces the Music Thing Modular logo on the PCB.

**NOTE: Correct orientation is vital.**

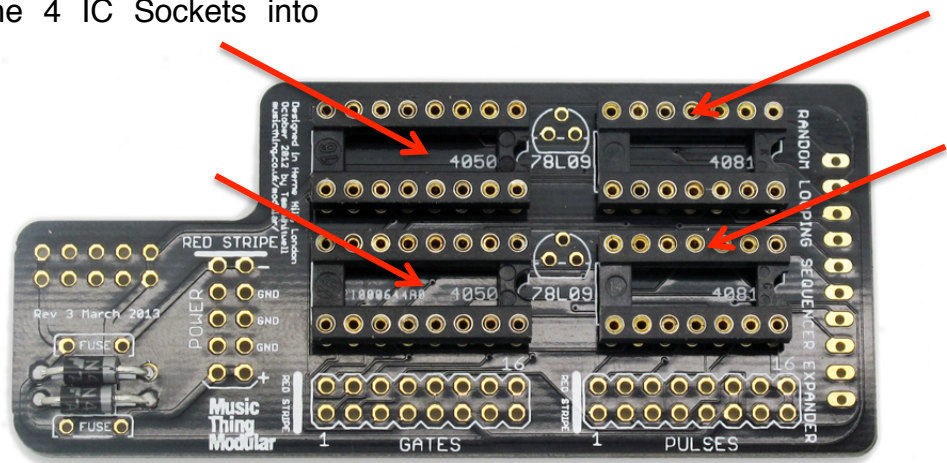
**NOTE: Diodes can be damaged by excessive heat from the soldering iron, solder quick, do not let the tip rest on the lead for more than 5 seconds.**





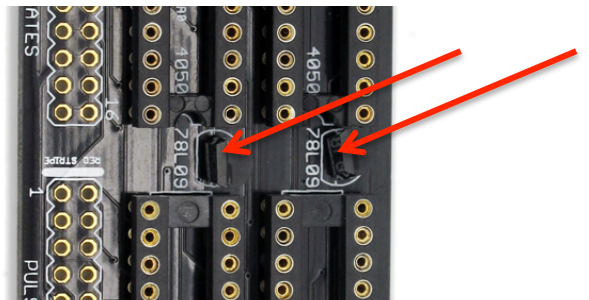
3.

Next solder the 4 IC Sockets into place.



4.

Take the two 78L09 regulators out of the protective ESD packaging and solder into place. The middle leg needs to be bent outwards slightly to fit. The flat face on the components should align with the flat edge on the silkscreen on the PCB.



**NOTE: Correct orientation is vital.**

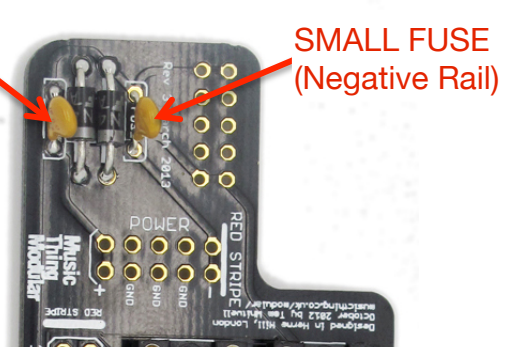
5.

Solder the two orange polyfuses into place next to the diodes. The orientation on these is not important – either way is fine.

**PLEASE NOTE!**

This image shows an older revision where both fuses were the same size. However all Backpack kits are now being issued with a new large fuse for the positive rail, this is required to run more than two expanders, e.g. when using PULSES, VOLTAGES and VACTROL MIX together. The smaller fuse doesn't need an upgrade. You can buy the fuse upgrade separately here:

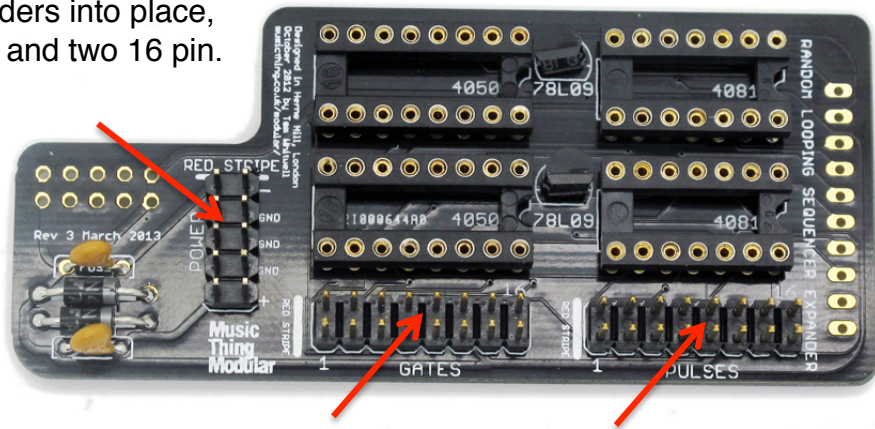
<https://www.thonk.co.uk/shop/fuse-upgrade/>





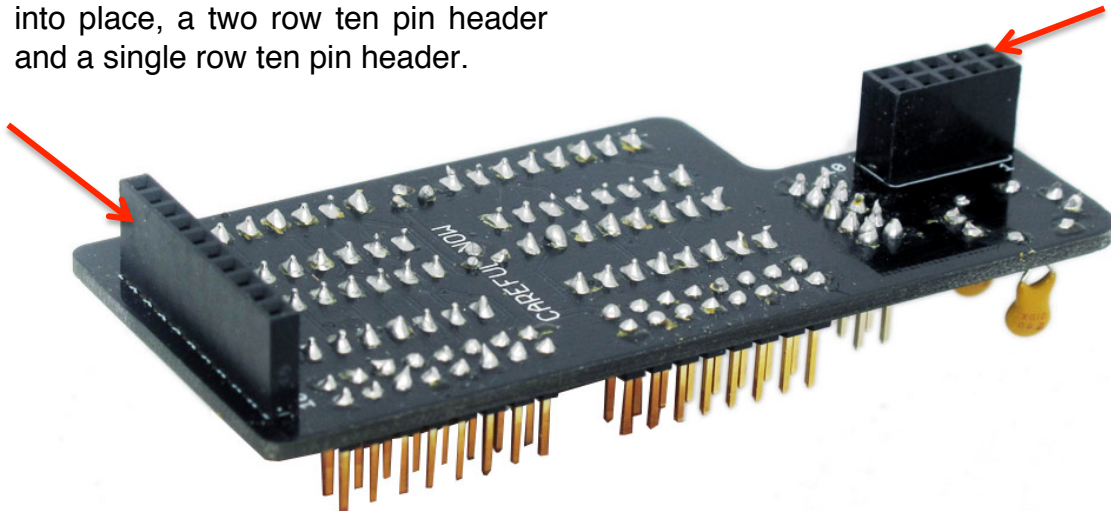
6.

Solder the 3 headers into place,  
the single 10 pin and two 16 pin.



7.

Now flip the board over and solder  
the two black plastic female headers  
into place, a two row ten pin header  
and a single row ten pin header.

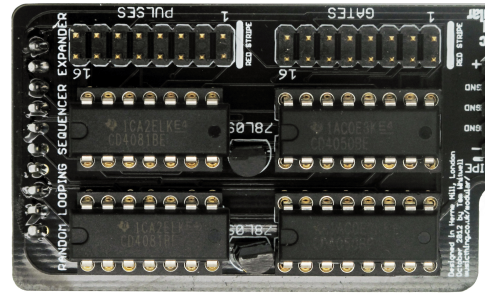




8.

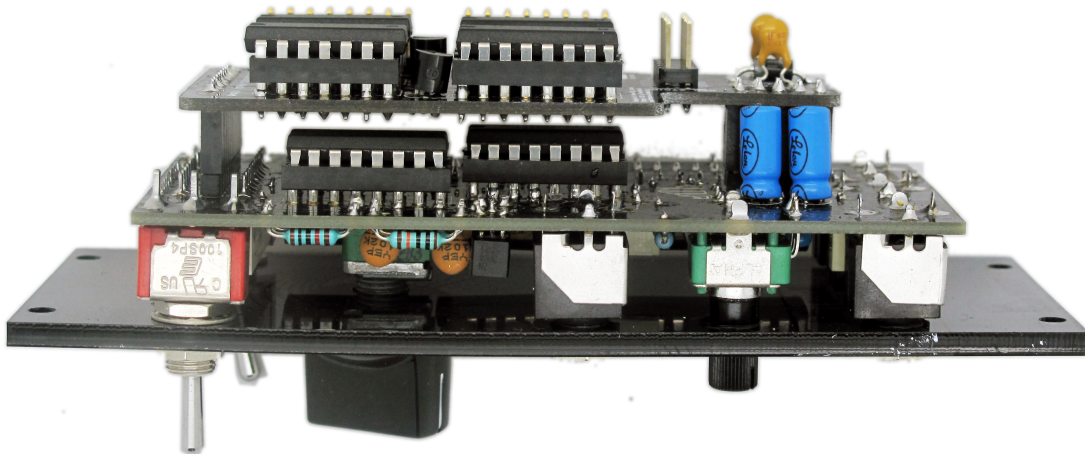
Now insert the four ICs as shown, make sure the notch in the top of the IC matches the notch in the socket.

**NOTE: Correct orientation is vital.**

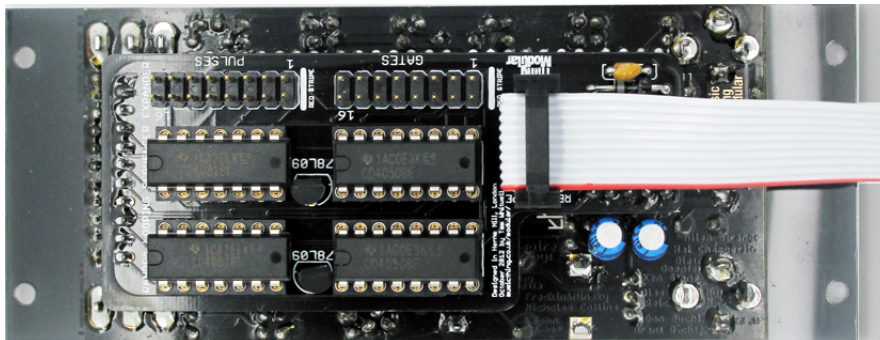


9.

Now take your Turing machine module, remove the power cable and fit the backpack into place like so.



Plug the original power cable into the backpack with the red stripe as shown.



This is a good point to just quickly test your Turing Machine with backpack attached. It should operate completely normally.

The only difference right now is that your Turing Machine is now also protected from having the power cable connected backwards! You don't want to be aggressively testing that feature though!

You're now ready to move onto building the expander modules, PULSES and/or VOLTAGES.



## PULSES BUILD INSTRUCTIONS

10.

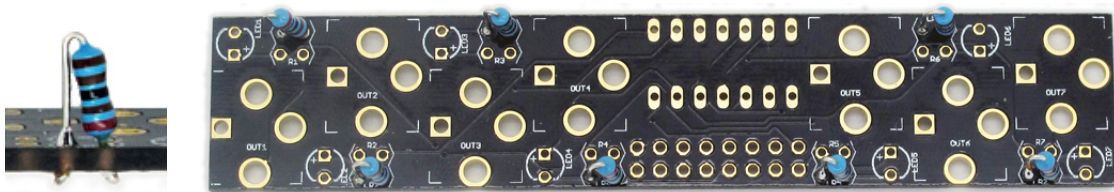
Start by emptying the **PULSES** bag into a bowl or container. This makes it much easier to pick parts as you need them and you're less likely to lose anything.

It's advised to paint the front panel **AFTER** the electronic construction is complete.



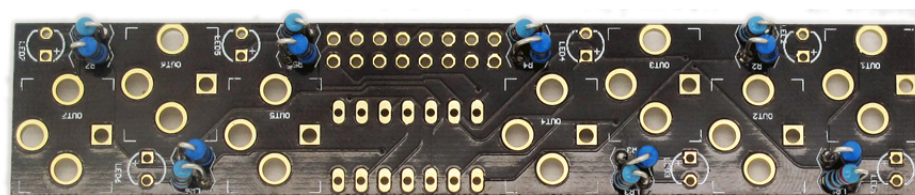
11.

Start with the seven 2.1K Resistors in positions LR1-LR7. These are the resistors on the **outside** edge of the board. These resistors are mounted vertically as shown below.



12.

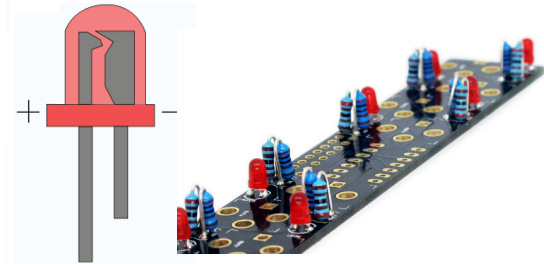
Next solder the remaining seven 1K Resistors in positions R1-R7. These are the resistors on the **inside** edge of the board. These resistors are also mounted vertically as shown below. They should be soldered in a mirrored formation. If fitted neatly there should be no chance of shorting with the paired resistor.



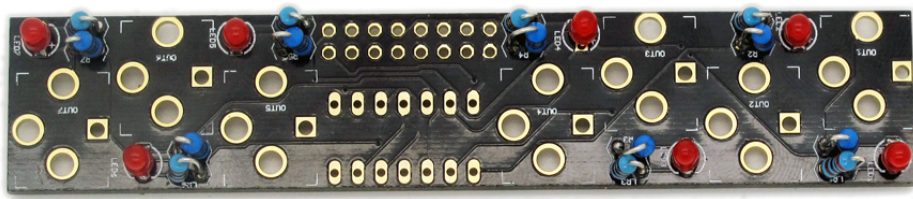


13.

Next solder the 7 red LEDs into place. The long lead/leg on the LED is the positive terminal, the Anode. This should go into the hole marked with a +.

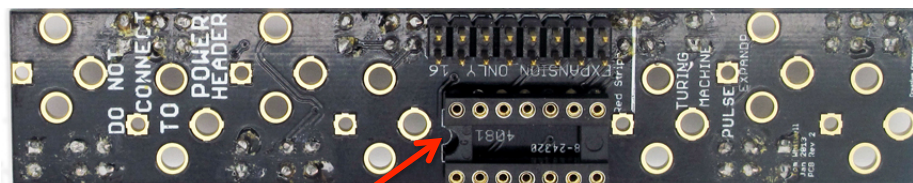
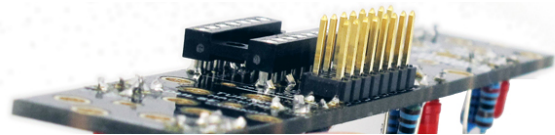


**NOTE!**  
IF YOU ARE USING  
A PANEL WITH HOLES  
FOR THE LEDS THEN  
DO NOT SOLDER  
THEM FLUSH TO THE  
PCB LIKE THIS!  
YOU MAY WANT TO  
SOLDER THE JACKS  
AT THE SAME TIME TO  
GET THE RIGHT  
HEIGHT



14.

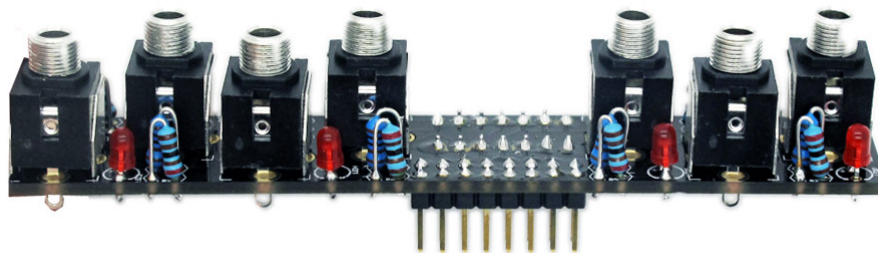
Now flip the PCB over and solder the IC socket and Expansion header into place.



**TAKE CARE:** Ensure the notch in one end of the IC Socket is aligned with the silkscreen outline on the PCB.

15.

Now put the seven jack sockets into place on the PCB but **DO NOT SOLDER YET.**

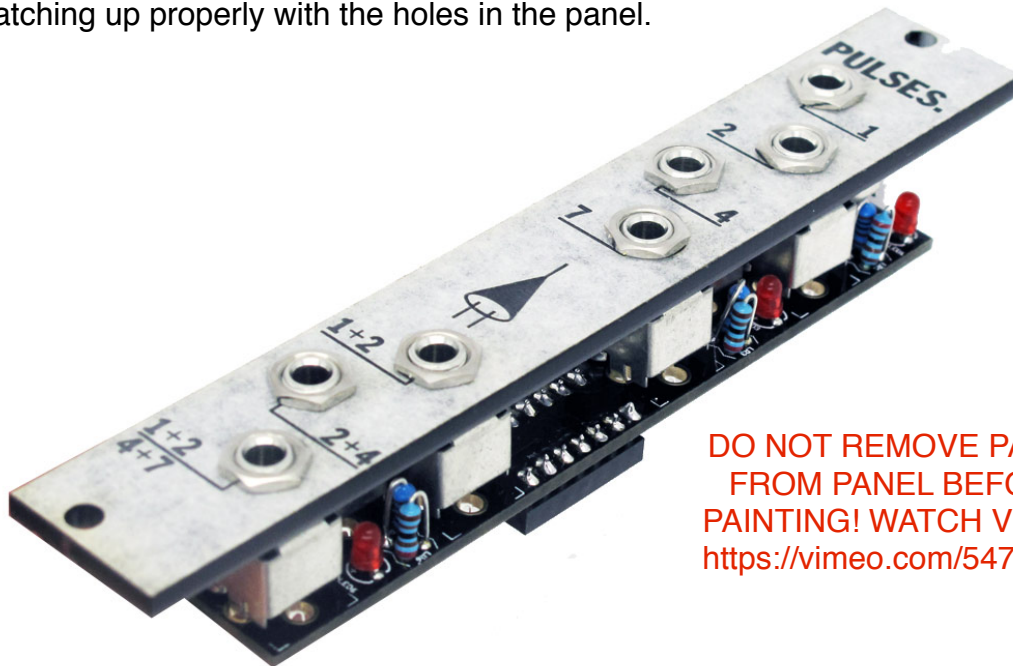




16.

With the jacks still **NOT** soldered, temporarily put the front panel on and hand tighten the nuts.

Make sure the PCB is parallel to the frontpanel and all the jacks are properly seated, then solder all 4 terminals on all 7 jacks. It's best to solder like this with the panel loosely in place as it eliminates the possibility of your jacks not matching up properly with the holes in the panel.



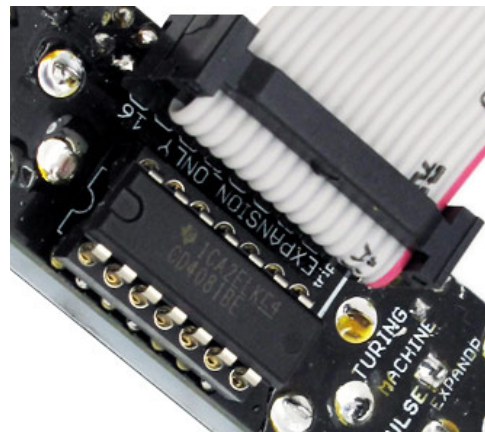
**DO NOT REMOVE PAPER  
FROM PANEL BEFORE  
PAINTING! WATCH VIDEO:  
<https://vimeo.com/54711135>**

You can now remove the panel for painting later.

17.

Insert the IC as shown, with the indentation in one end of the IC matching the notch in the IC Socket.

**NOTE: CORRECT ORIENTATION  
OF IC IS VITAL TO AVOID  
DAMAGE.**





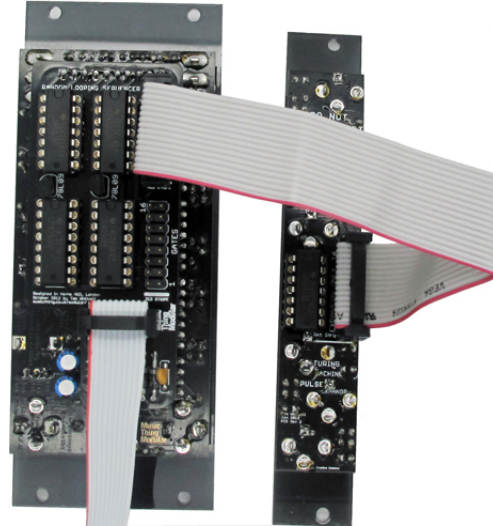


18.

Next you should test your PULSES module by hooking up to the BACKPACK which is fitted to your Turing Machine.

Use the 16 pin ribbon cable and attach to the top PULSES header on the BACKPACK. Ensure you correctly orient the red stripe of the ribbon cable on both modules.

Your PULSES expander is now ready for use.



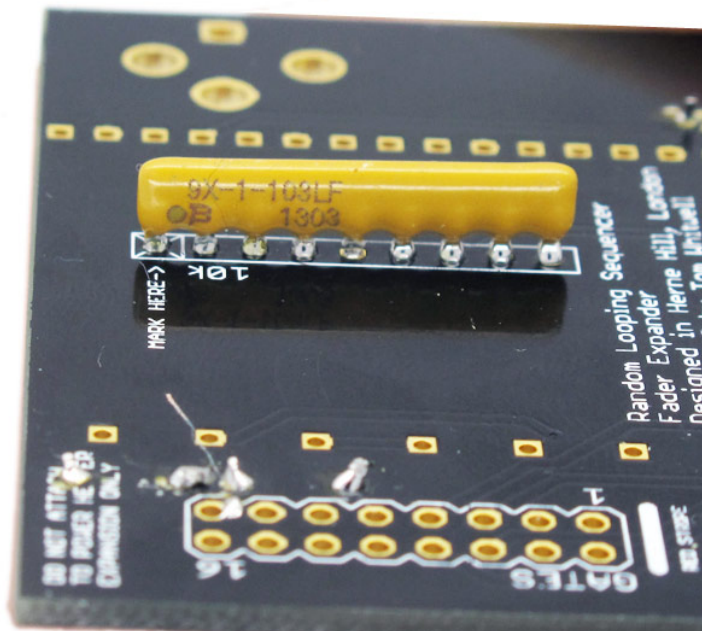
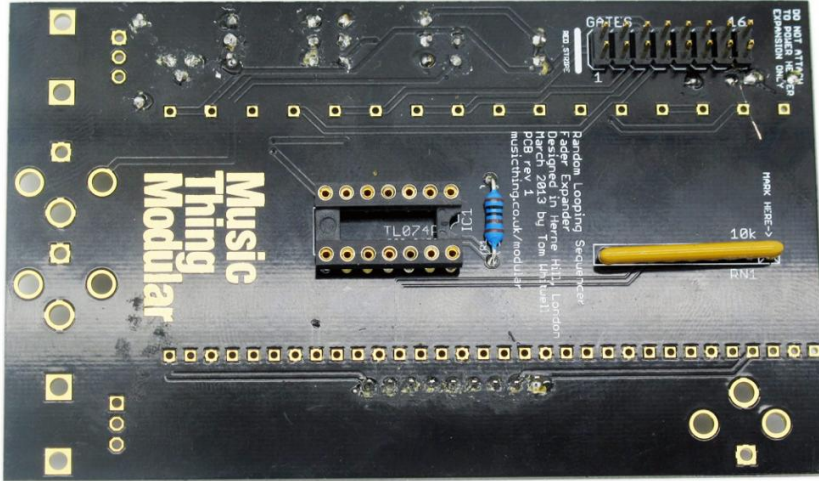


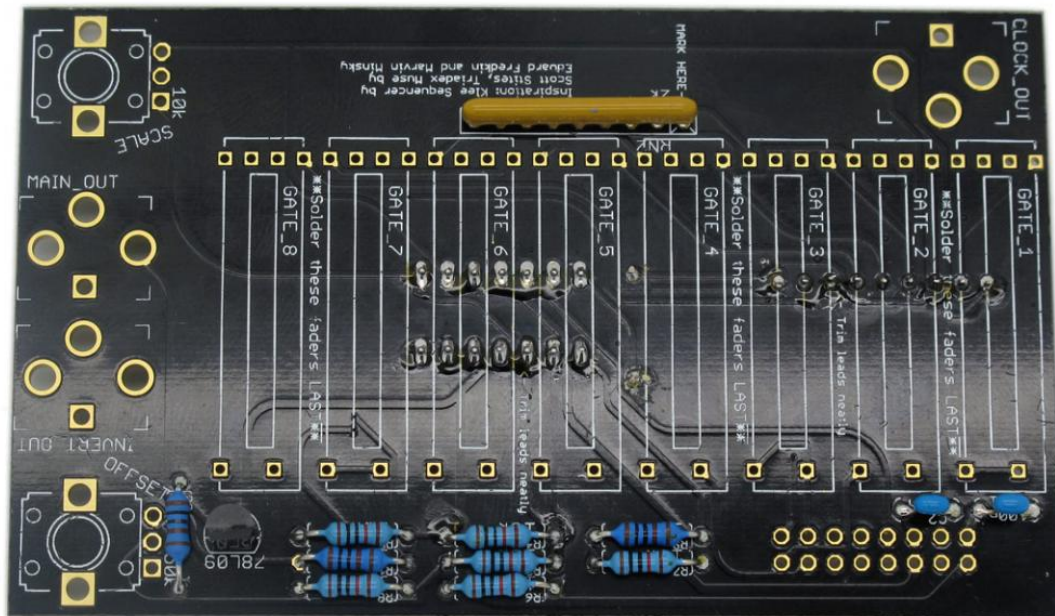
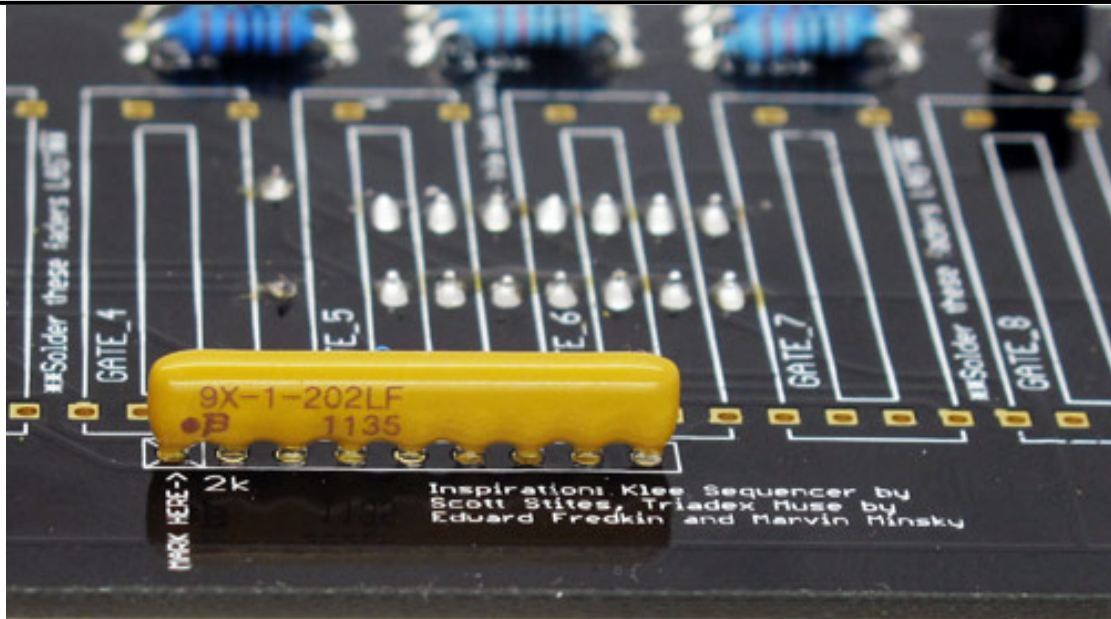
## **Voltages expander** (see photos after text)

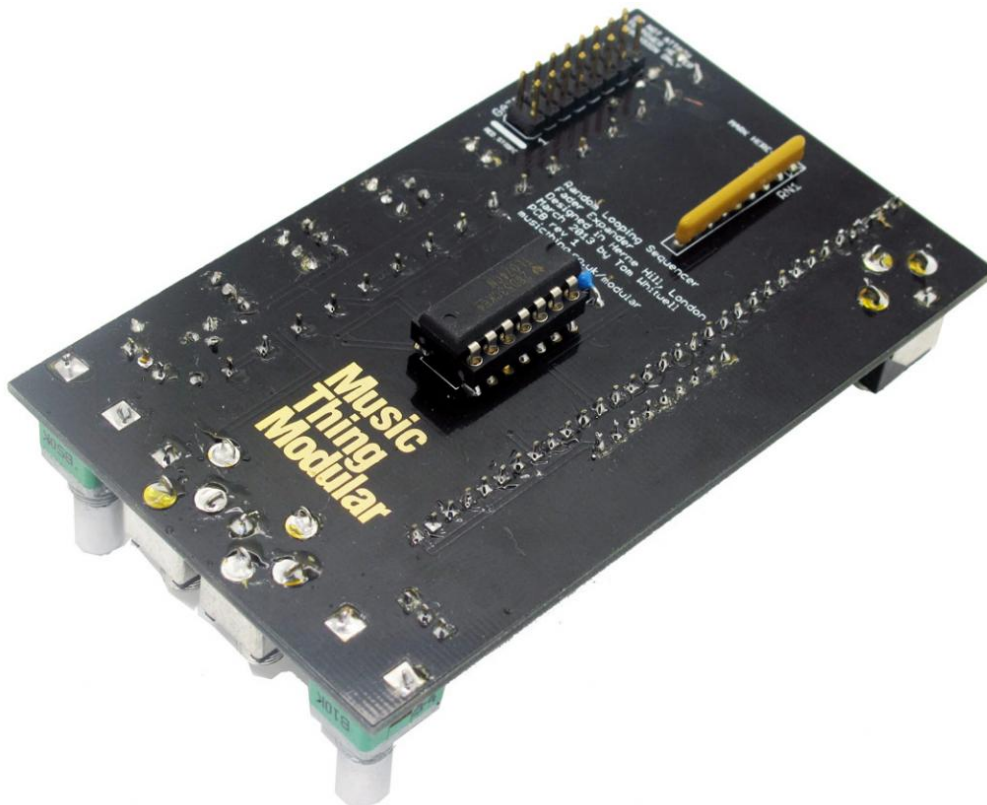
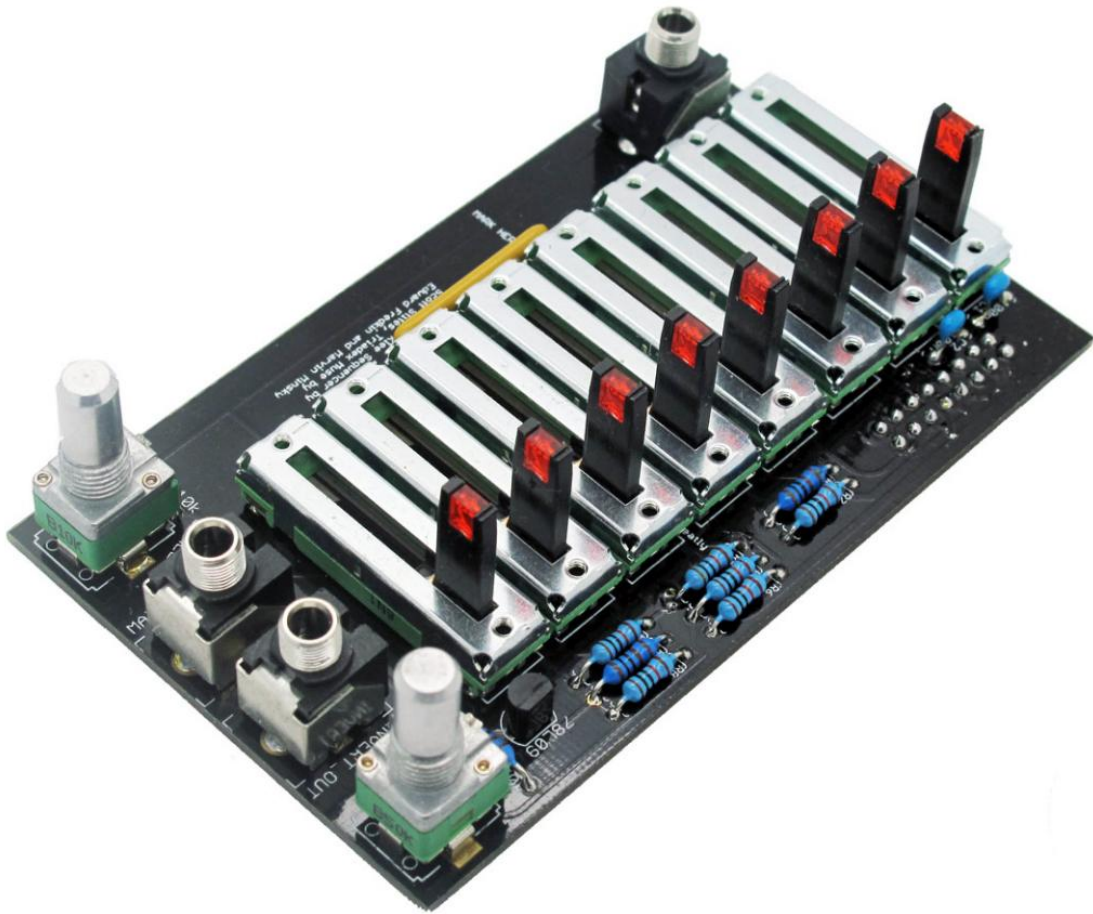
1. This is a very quick, straightforward build, so long as you do everything in the right order!
  2. Start on the back of the board, the side with the large 'Music Thing Modular' logo. Mount the IC socket, power header and R1.
  3. Two important notes about resistor networks:
    - a. Unlike normal resistors, they have a polarity. They have a mark at one end, usually a spot. Ensure the mark lines up with the cross on the silkscreen.
    - b. The two networks in this module look the same but are NOT interchangeable.

103LF = 10k = back of board, close to the power header

202LF = 2k = front of board, next to 'Inspiration'
  4. Once the back of the board is populated, carefully trim the leads as neatly as you can. If they stick up too far, they'll make it hard to get the faders in straight.
  5. Attach the other components on the front of the board, around the faders; resistors, capacitors, the 78109 voltage reference, sockets, and the 2k resistor network.
  6. Be careful with the potentiometers. Again, they look similar, but are different. Scale, on the left as you look at the faders, is 10k. Offset, on the right, is 50k.
  7. Finally, install the faders. They will slot neatly into place. Push them in firmly, ensure all the pins are through the holes and that the plastic 'feet' of the fader are flush against the PCB, then solder.
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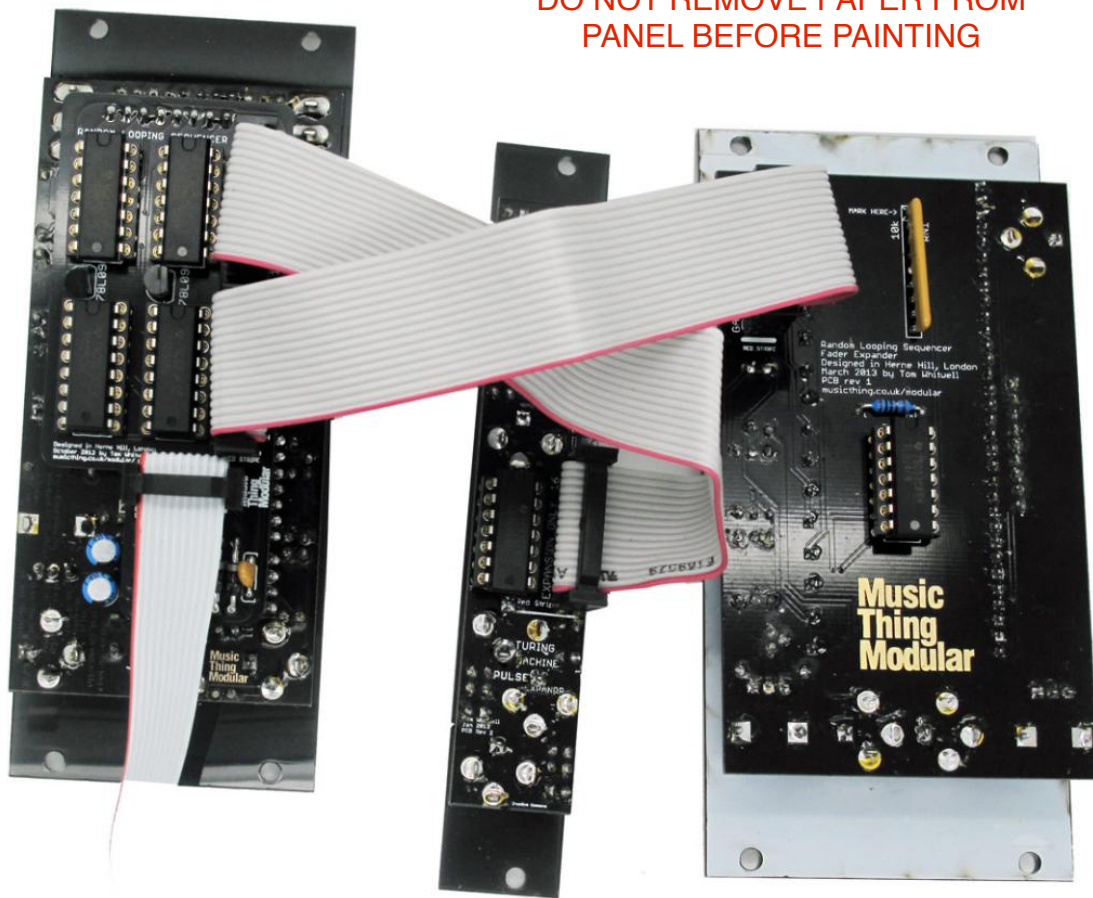








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PANEL BEFORE PAINTING**



**PAINTING THE PANEL:  
<https://vimeo.com/54711135>**

Vactrol Mix Expander info here:

<https://www.thonk.co.uk/documents/turing/expanders/vactrolmix/>