



HUMPBACK OVERVIEW

For the most recent version of this document please visit -
<http://thonk.co.uk/documents/gbox/>

For all technical support please visit on Muffwiggler - <http://bit.ly/1CThqVE>

There is also a GOD's BOX troubleshooting manual here -
<http://thonk.co.uk/documents/gbox/>



All Thonk kits are sold under our standard Terms and Conditions -
<http://www.thonk.co.uk/faq/>

DIY INSTRUCTIONS

This document gives detailed instructions that assume you have purchased a complete kit from www.thonk.co.uk. It also assumes no previous knowledge of electronics.

To learn to solder try <https://www.youtube.com/watch?v=lpkkfK937mU> and the **Adafruit guide to excellent soldering** – <http://bit.ly/1I77tF4>

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

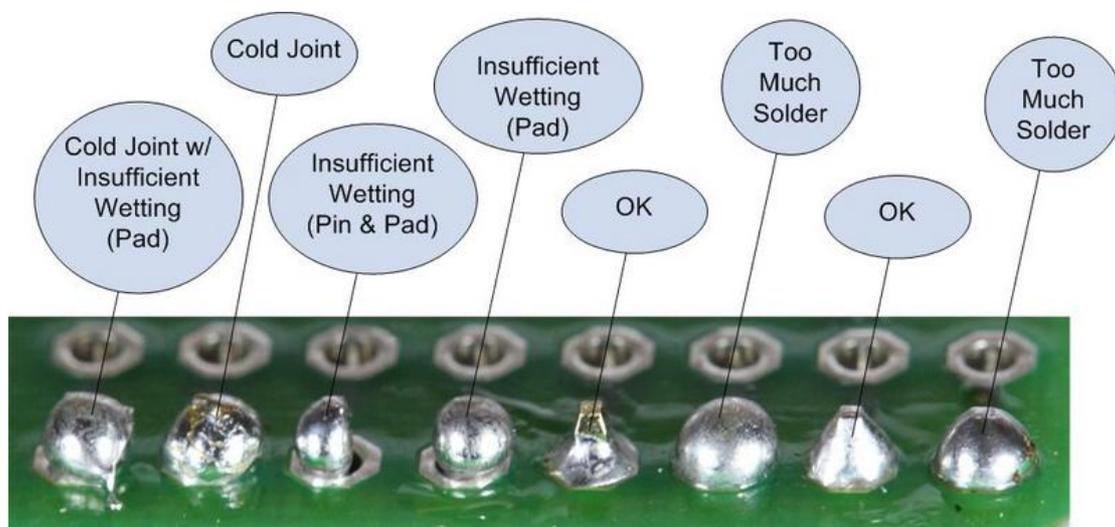
Soldering iron, snipe nose pliers, wire strippers, small flat head screwdriver and diagonal cutters AKA snips AKA side-cutters. A Digital Multimeter is always helpful for checking for bad solder joints and continuity. Thonk sell a range of inexpensive tools here - <http://bit.ly/1jxqF3n>



SOLDER JOINTS

Your solder joints should look like those shown as 'OK' below, they should have that neat conical shape on **BOTH sides of the PCB**. If they don't look the same on both sides then stop! Work out why from the soldering guides linked and don't continue until you are getting those results.

This isn't about perfectionism, you are very likely to end up with a destroyed, damaged or defective unit if you're not hitting that standard.



This photo is from the **Adafruit guide to excellent soldering** - <http://bit.ly/1I77tF4> and is reproduced under an Attribution-Sharealike creative commons license - <http://creativecommons.org/licenses/by-sa/3.0/>



HUMPBACK BUILD INSTRUCTIONS

1.

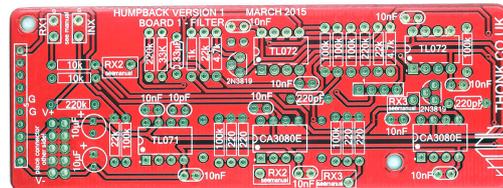
Start by emptying **BAG A** into one bowl or container and **BAG B** into another. This makes it much easier to pick parts as you need them and you're a lot less likely to lose anything.

NOTE : In kits marked 'July 2015' a 3.3k resistor was included but is not required in any version of the PCB that has been shipped or manufactured. It can be discarded or added to your spare parts box!



2.

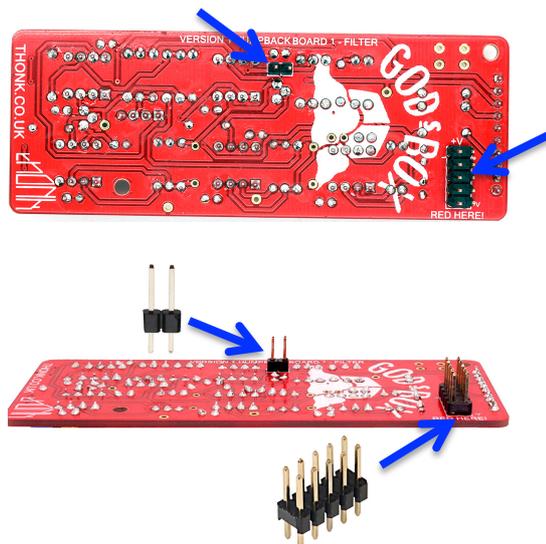
Start by taking the 'back' PCB from **BAG A** which looks like this:



3.

BAG B : Identify and solder into place the small male 2 pin header, and the male 5x2 or ten pin Eurorack power header.

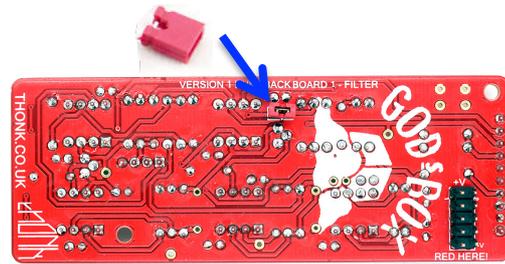
NOTE : Make sure the components are sticking out of the side of the PCB with **GOD's BOX logo** on as shown!





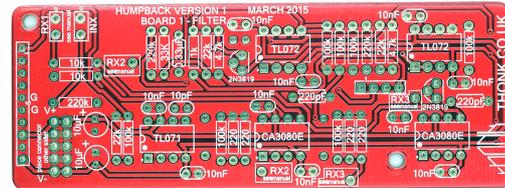
4.

BAG B : Identify the red shunt and put into position on the two pin male header to keep it safe. The shunt is in the small bag with screws, washers etc.



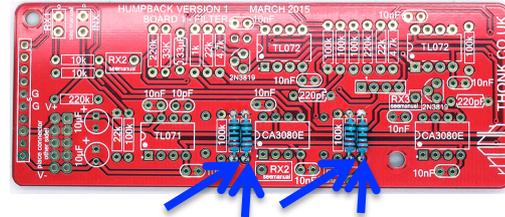
5.

Flip the PCB over and we'll start populating resistors.



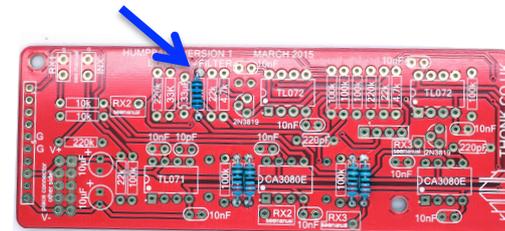
6.

Start by soldering the **4 x 220R** resistors in the positions shown.



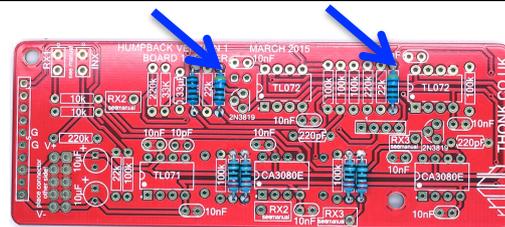
7.

Take just **one** of the five **1K** resistors provided and solder into place as shown. The others will be soldered onto the other PCB.



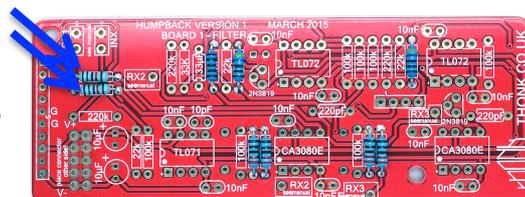
8.

Next solder the **2 x 4.7K** resistors into the positions shown.



9.

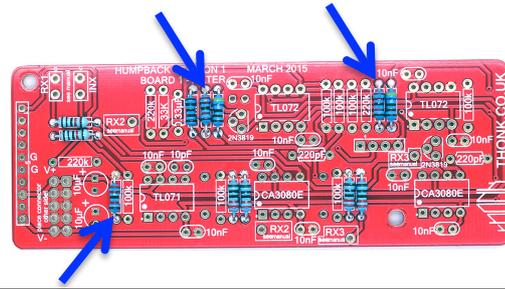
Next solder the **2 x 10K** resistors into the positions shown.





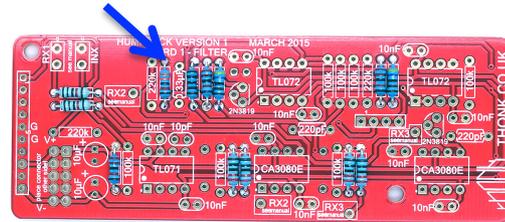
10.

Take just **three** of the five **22K resistors** provided and solder into place as shown. The others will be soldered onto the other PCB.



11.

Next solder the **1 x 33K resistor** into the position shown.

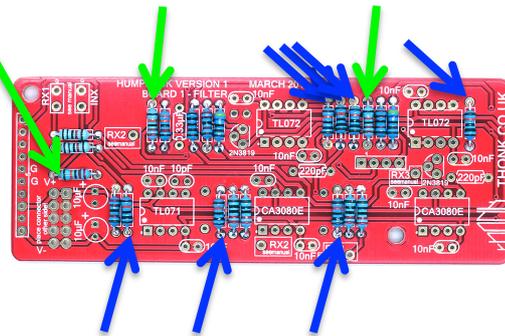


12.

Next solder all remaining resistors on this board.

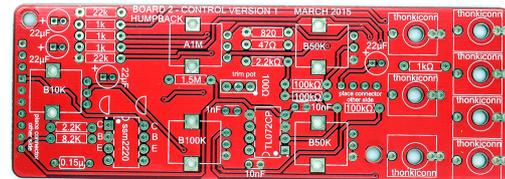
3 x 220K resistors (green arrows)

7 x 100K resistors (blue arrows)
(three 100k resistors will be left for the other PCB)



13.

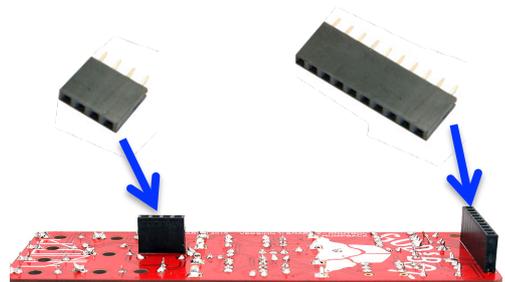
Switch to the other PCB, the front PCB.



14.

BAG B : Identify and solder into place the female 4 pin socket and the female ten pin socket as shown.

NOTE : Make sure the components are sticking out of the side of the PCB with **GOD's BOX logo** on as shown!



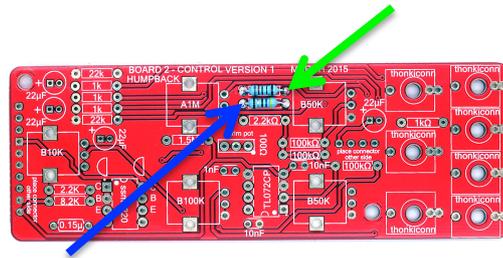


15.

First solder the:

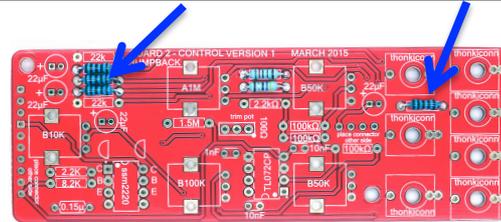
1 x 820R resistor (green arrow)

7 x 47R resistor (blue arrow)



16.

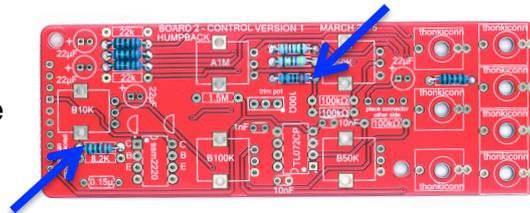
Solder the remaining **4 x 1K resistors** into the positions shown.



17.

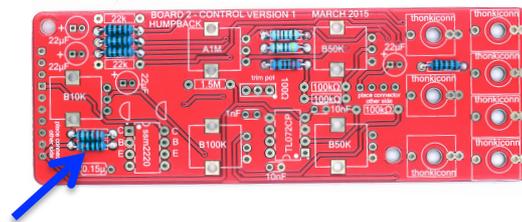
Solder the **2 x 2.2K resistors** into the positions shown.

NOTE : In the July 2015 revision of the kit the 2.2k resistors are provided in two bags with single resistors in.



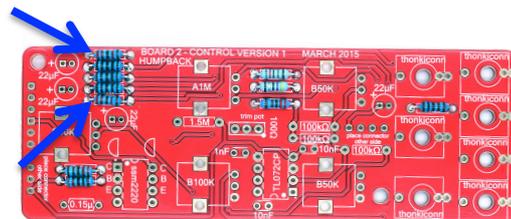
18.

Solder the **single 8.2K resistor** into the position shown.



19.

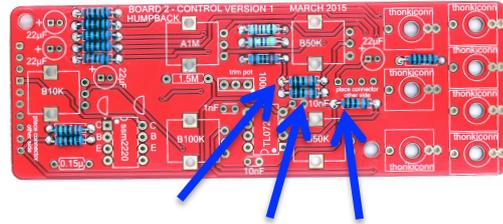
Solder the remaining **2 x 22K resistors** into the positions shown.





20.

Solder the remaining **3 x 100K resistors** into the positions shown.

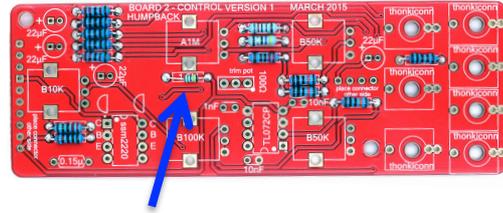


21.

Solder the single (small) **1.5M resistor** into the position shown.

You have now finished soldering all resistors; if you're tired then go to bed, soldering tired never ends well!

If not then let's switch back to the back PCB again.



22.

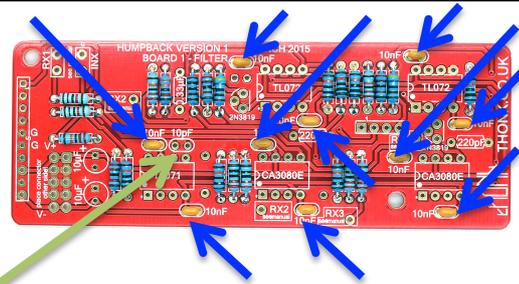
BAG A : Identify the capacitor bag and take out the **12 x 10nF caps**, these are the small orange caps on a cardboard tape and marked '103'

- 220pF x 2 - Large Blue
- 0.33uF x 1 - Dark red '334'
- 0.15uF x 1 - Red Box 'MKS 4'
- 10uF -x 2 - Black Electro (tape)
- 22uF x 4 - Gold Electro
- 1nF x 1 - Ceramic '102K'
- 10nF x 12 - Ceramic '103' (tape)

23.

Solder **10 x 10nF caps** into positions shown. The two remaining caps are for the other PCB.

NOTE : The **10pF cap** marked on the PCB is obsolete and is not required for a standard Humpback build.





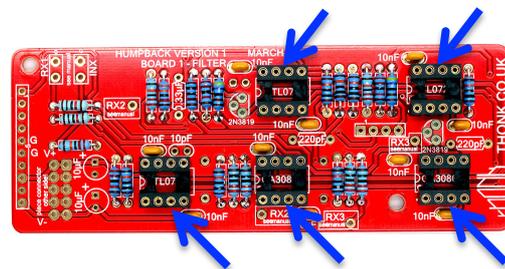
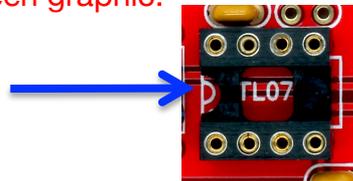
24.

Next open up the silver ESD proof bag.

NOTE the instruction about not installing the socket for the SSM2220, we'll come back to this later.

Identify five of the 8 pin IC sockets and solder into the positions shown.

NOTE make sure the 'notch' in one end of the IC socket matches the notch in the silkscreen graphic.

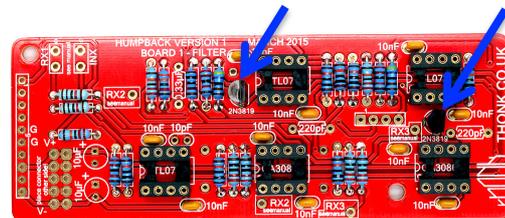


24.

Next identify the two 2N3819 transistors; these are pressed into the black foam. **DO NOT INSTALL THE MATCHED 2N3906 PAIR IN THESE POSITIONS!**

The 2N3819 parts should be soldered into the positions shown.

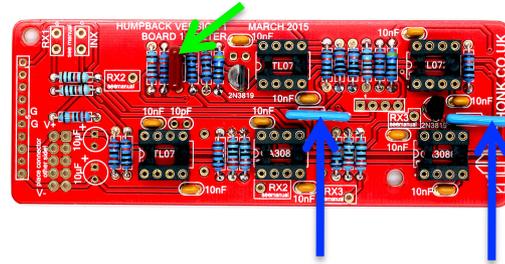
NOTE: The polarity of this part is **vital**, the middle lead should be bent back a little so it forms a tripod; the curve on the back of the component body should match the shape on the silkscreen.



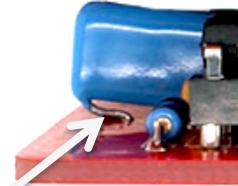


25.

Next take the **Dark Red** rounded **0.33uF cap** from the cap bag and solder into the position shown (green). The cap is marked 334, NOT the brighter red 'MKS 4' part.



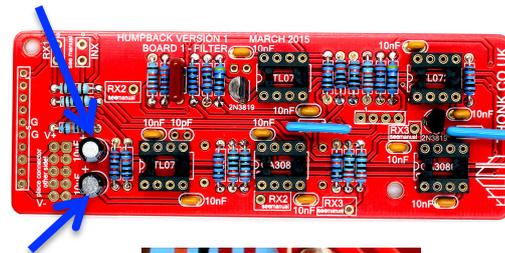
Next take the two large **Light Blue** rounded **220pF caps** and solder into the positions shown (blue)



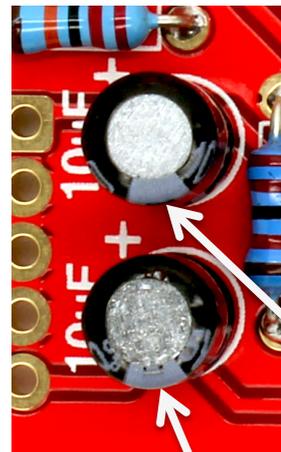
NOTE You need to bend over one leg of the light blue caps slightly to fit the PCB layout. Make sure they are fitted as closely to the PCB as possible, no taller than 10mm from the surface.

25.

Next take the two black and grey **10uF electrolytic** cylindrical caps and solder into the positions shown. They are on a card tape.



NOTE: The polarity of these parts is **vital**, the grey stripes on the body of these caps should be facing towards the edge of the PCB as shown, AWAY from the + signs on the silkscreen.

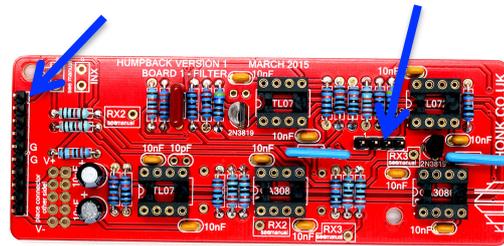




26.

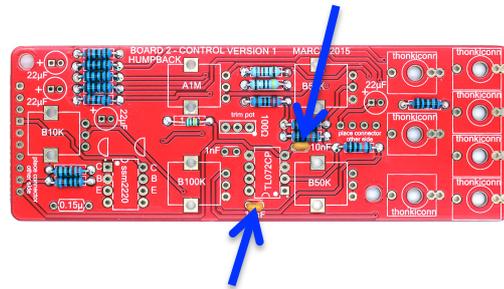
Finally solder the remaining male 4 pin and 10 pin headers into the positions shown.

DO NOT SOLDER THE HEADERS ON THE WRONG SIDE OF THE BOARD!



27.

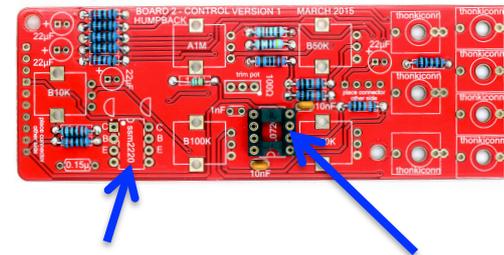
Moving back to the Front PCB, solder the two remaining **10nF caps** into the positions shown.



28.

Take the final IC socket remaining and solder into the position shown...

NOTE – Make sure the 'notch' in one end of the IC socket matches the notch in the silkscreen graphic.



NOT HERE!



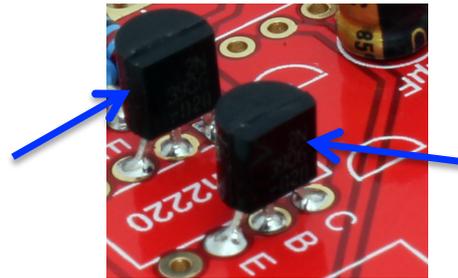
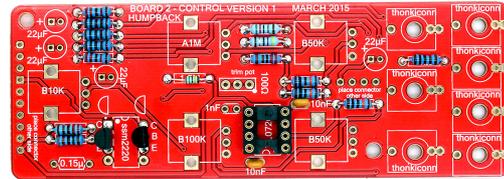
29.

The humpback requires a matched pair of PNP transistors to operate. The Humpback PCB allows the builder to either install a single SSM2220 IC chip or a pair of hand matched 2N3906 transistors.

Tests have concluded that transistors matched using the Ian Fritz method (<http://bit.ly/1RRgZlm>) perform identically to the SSM2220 in this specific case.

The Thonk kit is provided with a **matched pair of 2N3906**, they are provided in a small labeled bag in the silver ESD bag.

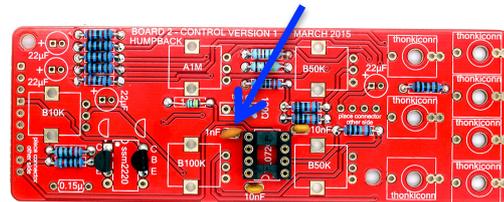
NOTE - orientation is vital!



Solder the 2N3906 into the positions shown. Notice the semi-circular images on the silkscreen which indicate the orientation.

30.

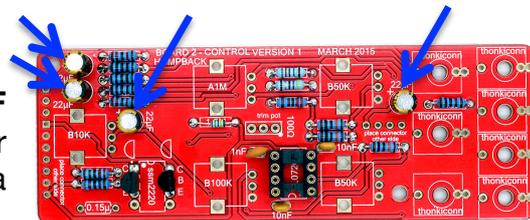
Solder the single **1nF cap** in the position shown. The cap is marked **102K**.



31.

Next take the four black and gold **22uF electrolytic** cylindrical caps and solder into the positions shown. They are on a card tape.

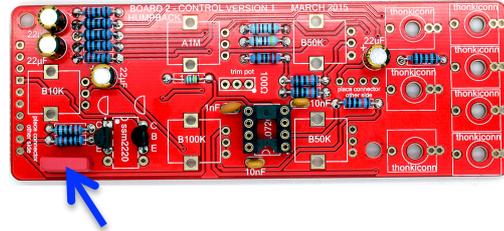
NOTE: The polarity of these parts is **vital**, the black stripes on the body of these caps should be facing in the same direction, **AWAY** from the + signs on the silkscreen.





32.

Solder the single bright red 0.15uF box cap into the position shown. The cap is marked **MKS 4**.

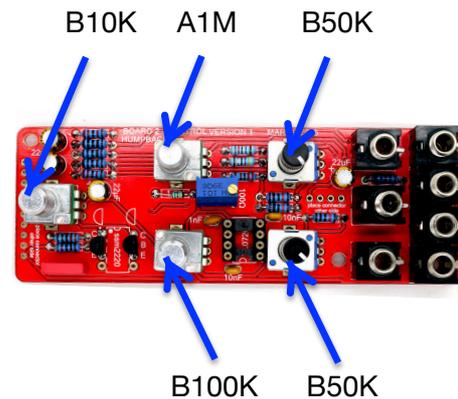


33.

Next you're going to place all the panel components into place **but you will not solder them yet**. 5 pots, 1 trimmer* and 7 jacks. * If your kit does **not** contain a blue trimmer then follow the instructions to fit the 47 ohm resistors in the labeled bag instead.

Note the positioning and rotation of all these parts, particularly the position of the brass screw on the trimmer.

Take extra care to solder the pots in the correct positions! De-soldering them can be a very destructive process. Triple check. **Do not solder anything yet.**

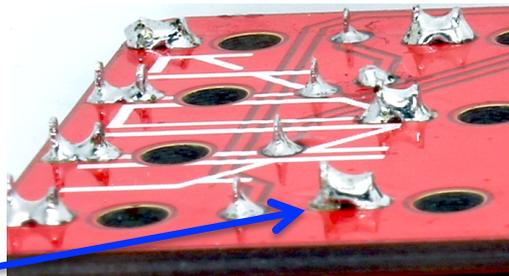


34.

Put the metal panel into place. Make sure the panel is sitting parallel and flush to the highest components. Secure the panel with the two nuts shown to keep everything together temporarily.

Now solder the 5 pots, the trimmer (or replacement resistors) and the 7 jacks.

Note that the two pins at the end of each jack have a tendency to flow together when soldered. This is completely normal and does not affect the operation negatively.



This is the last of the soldering and you can now switch off your iron.



35.

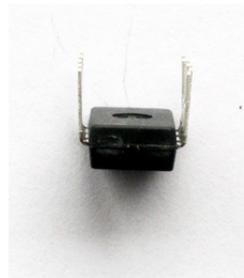
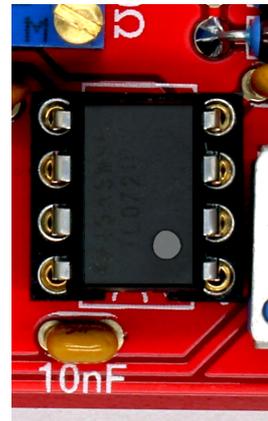
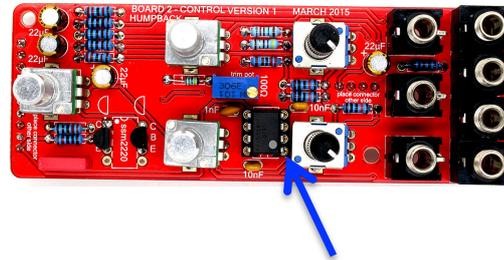
Remove the metal panel again.

Put one of the three TL072 IC chips into the position show. **Take care to not install the single TL071 in this position!**

Make sure the circular depression in one end of the face of the chip is at the same end as notch in the IC socket.

NOTE – Orientation is vital!

NOTE! You will need to bend the pins on the IC inwards slightly so they are at 90 degrees to the body of the chip. They will come slightly splayed out. This can be done safely by clasping the 4 pins in a pair of pliers and very gently bending inwards together. Repeat for the other side.





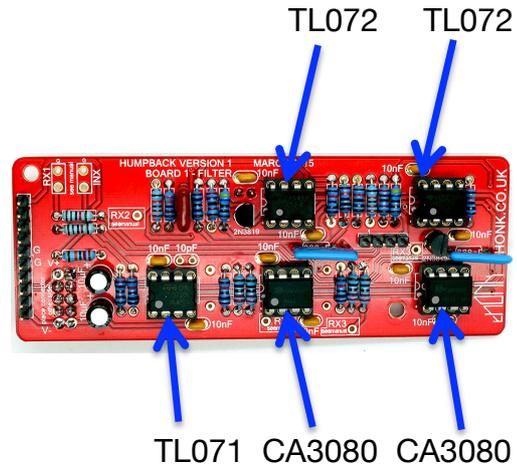
36.

Now fit the remaining five IC's in the back PCB. Follow the same steps as previously.

The IC's are all oriented in the same direction, with the circular depression in the face of the chip at the same end as the notch in the socket.

NOTE – Orientation is Vital.

Powering up the module with the IC's in the wrong positions will be destructive and irreversible.



NOTE THE THREE TL072 CHIPS PROVIDED ARE IDENTICAL.

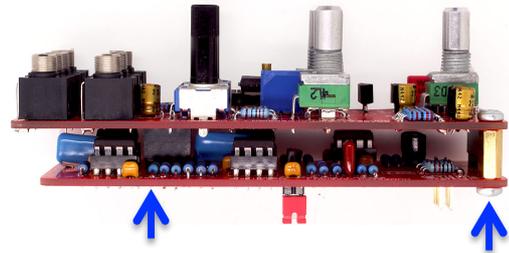
37.

Take the two brass hex spacers and fit into place on the front PCB as shown with two of the screws provided.



38.

Fit the two boards together. Ensure the ten pin and four pin headers mate between the boards and secure them together with another two screws.



39.

Screw the 7 knurled nuts onto the jacks and the three washer/nut sets onto the metal shafted pots.



40.

Turn the pots fully anti-clockwise, line up the knob pointers with the bottom left of the legend and tighten the screws.

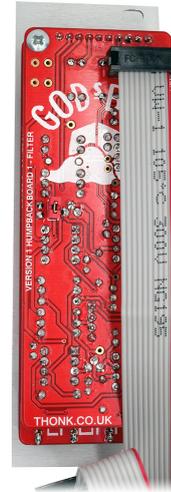




41.

Attach the power cable as shown with the red stripe facing the RED HERE!! and -V text.

PLEASE NOTE: THE MODULE CAN BEHAVE INCORRECTLY OR UNPREDICTABLY IF YOU DON'T SCREW THE PCBS TOGETHER WITH BOTH HEX POSTS AS SHOWN IN STEPS 37-38. A SOLID CONNECTION ON BOTH HEADERS IS VITAL.



42.

Power up the module and play.

Note that when the **red two pin shunt/jumper** is on the back of the module it pushes the resonance into more extreme levels of self-oscillation which can result in extreme distortion.

This can be controlled to some degree by the input and res levels, but you may prefer the more classic 2-pole SEM style sound with the jumper removed; It's worth experimenting with.