



Intro

Thank you for purchasing the RE-101 base kit bundle. Please read through this build guide before starting so that you have a good idea of what's involved.

This guide is the first draft and may contain some errors we didn't notice, please make sure you have downloaded the latest version of this document before starting your build.

You will need the usual tools such as a soldering iron, solder, side cutters, perhaps some rework tools like solder sucker or solder wick to take care of any mistakes. You will also need a crimp tool, wire, crimps and headers (listed in bom)

The build is relatively straightforward except for the wire loom. There are quite a lot of crimps to do and it should be noted that you really need to take your time with this section. A bad crimp will often manifest as something not working right or not at all. We can't emphasise enough how important it is to take your time and do good crimping. You will need to do this before the first power on, so if you have no experience with crimping please check this short tutorial and practise on some spare wire to learn <https://www.youtube.com/watch?v=8jcfD1UW8SE>

Part numbers listed in the BOM are **only recommendations** that have the data for the correct size and type of part. Most of the parts we list are from mouser and tayda. You can always download the datasheet from mouser and buy equivalent parts at your favourite supplier. Another point with parts is that often by the time a BOM is written certain values may be out of stock or have huge unnecessary amounts to buy. In these cases, especially with resistors, just choose another brand, CFR-25JB-52 YAGEO CFR series for example will work equally well for the 5% resistors. As long as the tolerance and size is correct this is all that matters.

As usual some things in the service manuals are incorrect, even if it feels counter intuitive, only place the components and values specified in the bom. If a part appears on the pcb but not in the BOM, do NOT place it. Likewise if you see a value difference between the BOM and the service notes, use the value from the BOM. We took apart an actual SH-101 for this project and there are some subtle differences between the service notes and the actual machine.

The pictures in this document are mostly correct as they were taken from the release candidate build. Where there is any difference it will be noted in italics under the first picture it occurs.

Pin headers, we are using a standard molex style crimp system. When there is a need for a 12pin header we use 2x6pin. In the cases where the requirement is non standard 7pins we use an 8pin socket and remove the last pin from the header.

Board to board straps can be purchased and cut down to the width needed from mouser 571-FSN-23A-xx. Alternatively these can be replaced with the same molex header crimps used in the wire loom (not recommended unless you plan to detach the control board often) or simply wire straps.

The power switch cap can be substituted with a 611-PEBK from mouser (the same cap as used on x0xb0x keyboards) it's a little smaller and tighter fit on the stalk than the original part but makes a good alternative.

There currently doesn't (yet) exist a good solution for the bender hardware but we are working on a solution. However the bender board still needs to be built because the volume and portamento are integrated. It's probably not worth fitting a rare 1583 transistor to this board, and perhaps better to use a matched pair in the footprint. Also meanwhile the mini faders may have an effect on cv and filter so should be zeroed when in use.

We have been unable to find a correct mini jack for J10 on the modgrip pcb, if we can source them in the future we will issue a new pcb here but currently it seems unlikely. However you could use any switch jacks here (with wires from pcb to jack) to build a modgrip but take note that the ground of J11 is not actually ground so if mounted to the chassis it will cause problems. Use a plastic sleeved jack or some kind of grommet to isolate it if you plan to use it like this.

Finally, there are some small differences that need to be taken care of between using an original 101 case and our eventual case, these are covered in the appendixes and you will be reminded before any stage where this is relevant.

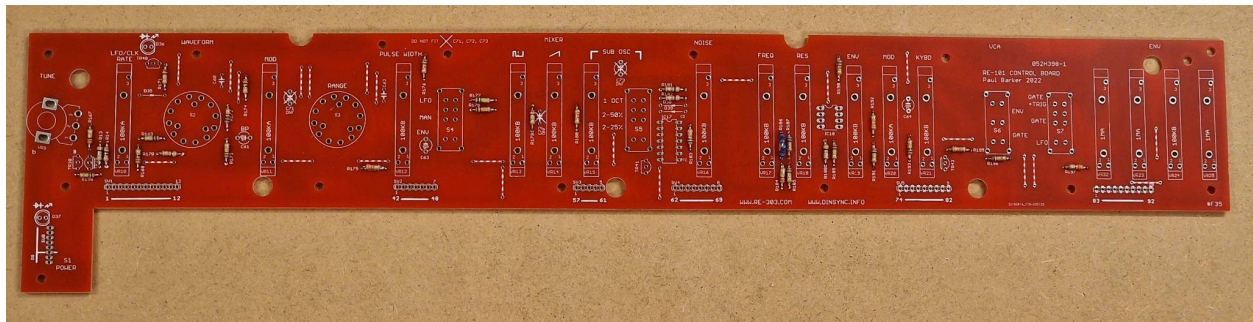
Finally we hope you enjoy the build and your eventual RE-101 We are really happy with how this came out and like our other replica spares, it really is the real deal.

Paul

CONTROL BOARD

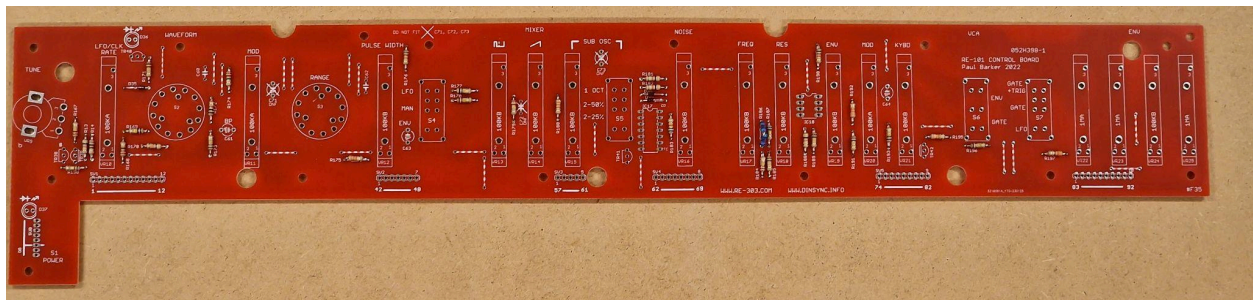
The control board is fairly straightforward, there are some capacitors that should not be placed, these are marked already on the silkscreen with an X and their designations are not in the BOM. Wire jumpers have been premade in all the upper copper layer of all pcbs so you do not need to fit those.

Fit the resistors.



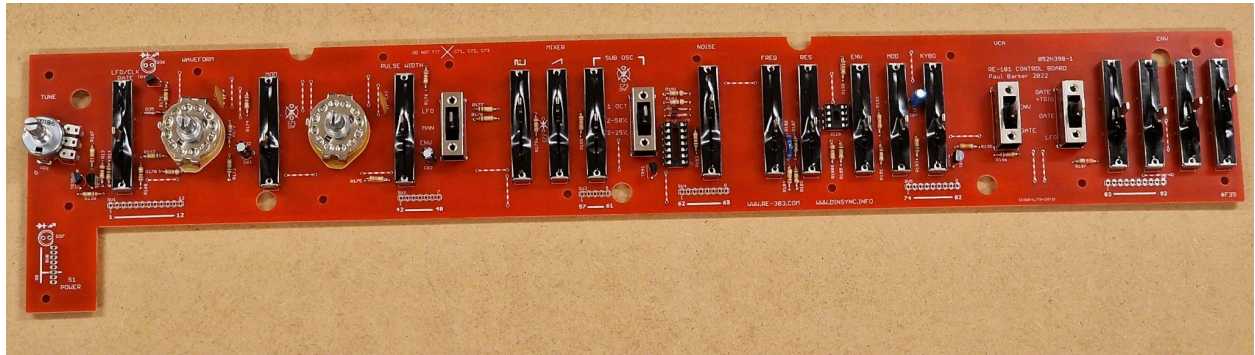
R186 looks a little odd here, but it's just two resistors in parallel to make the value we needed.

Place the diodes, make sure they are orientated correctly.

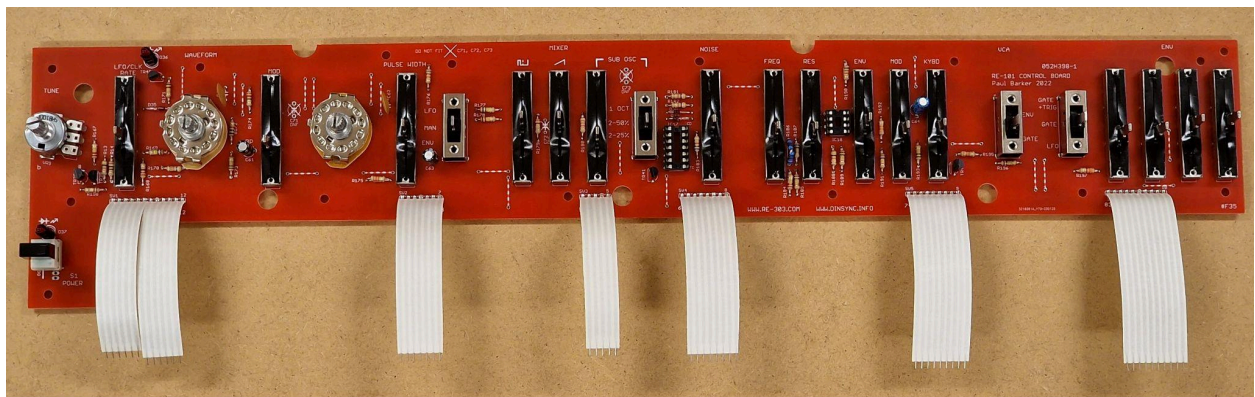


IC sockets are optional

Place the faders, take your time placing the correct values. Place the slide switches, the env/gate switch is a two position type. Place the transistors also.



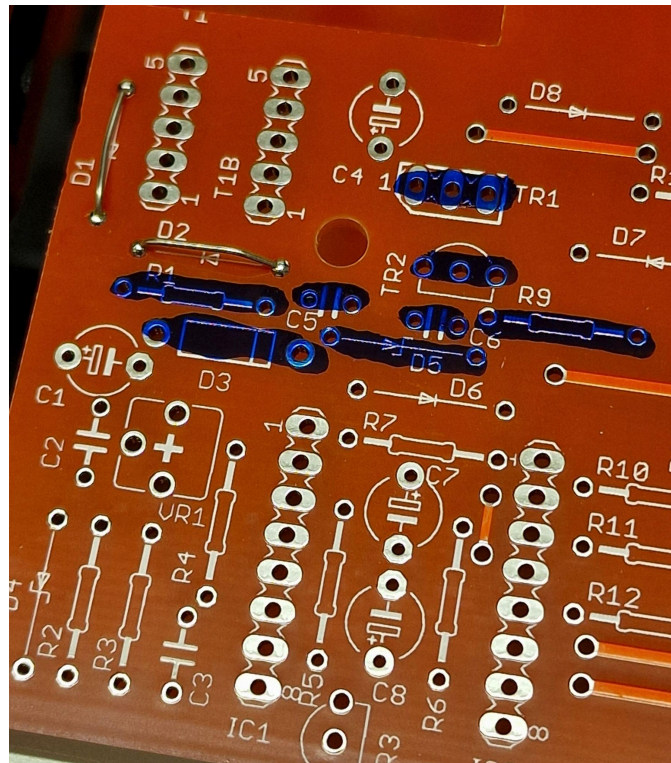
Before placing the LEDs check appendix B about height



After placing the leds you can place the power button and wire straps. The control board is now done except the IC's and you can place it to one side for now.

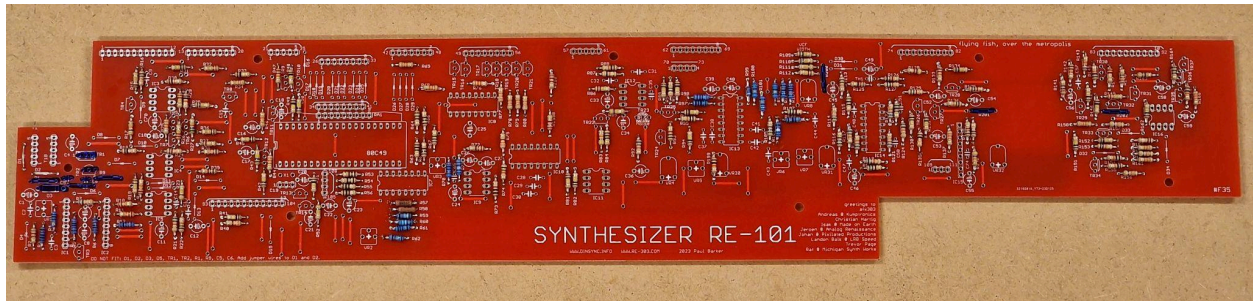
Synth board

Some slight preparation before starting. First place jumpers on D1 and D2, then use a marker (optional) to mark off the parts not to place, it'll make life easier when the board gets more populated. There is a full list of parts not to place in the BOM.



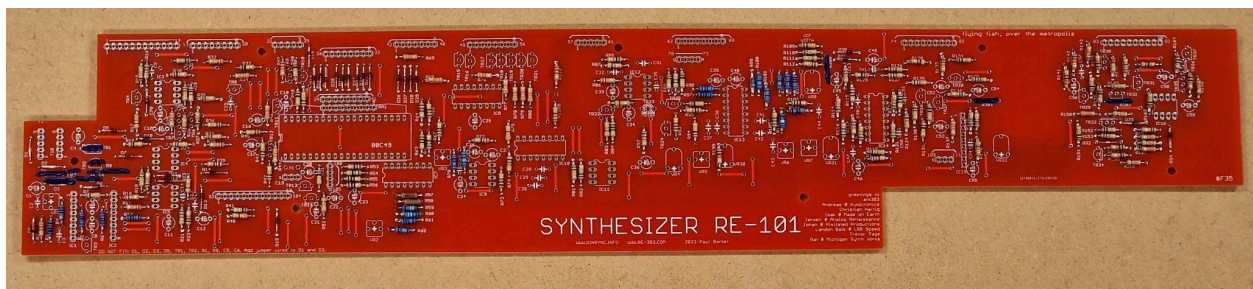
C1 and C8 in the picture should also be marked and not placed.

Place the resistors.

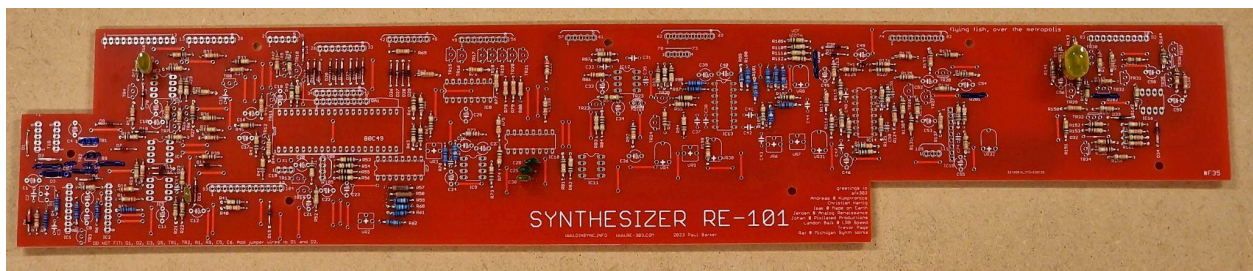


R71 in this picture (and all subsequent pictures) is the wrong value, please ignore.

Place the diodes, make sure they are orientated correctly.



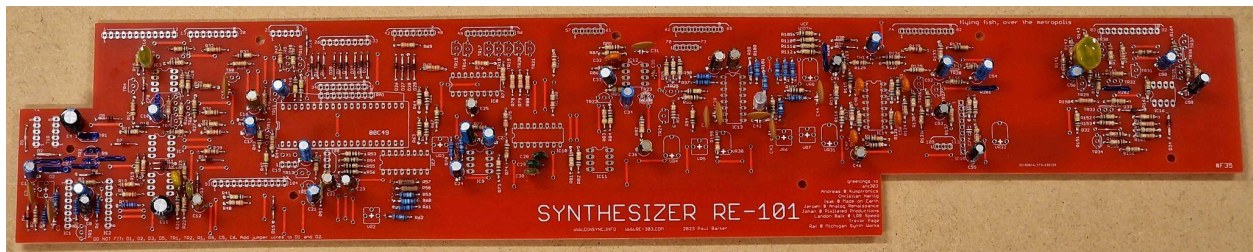
Place the poly caps



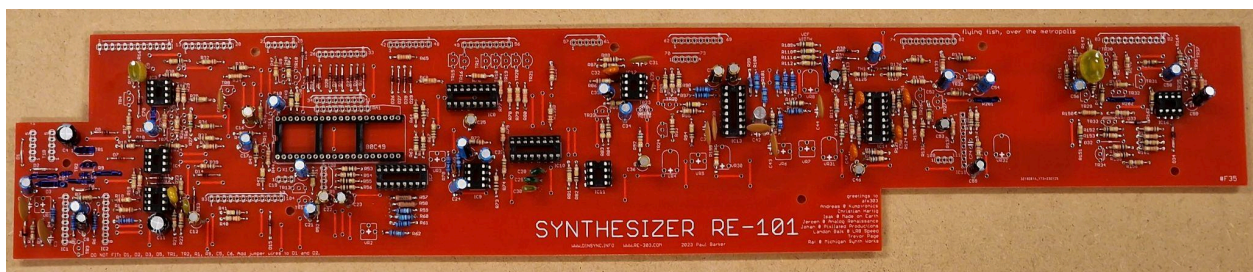
Place the electro caps. These are polarised except the BP at C45 and C53



Place the ceramic caps. You can also place the tempco at TH1



Place IC sockets (optional)



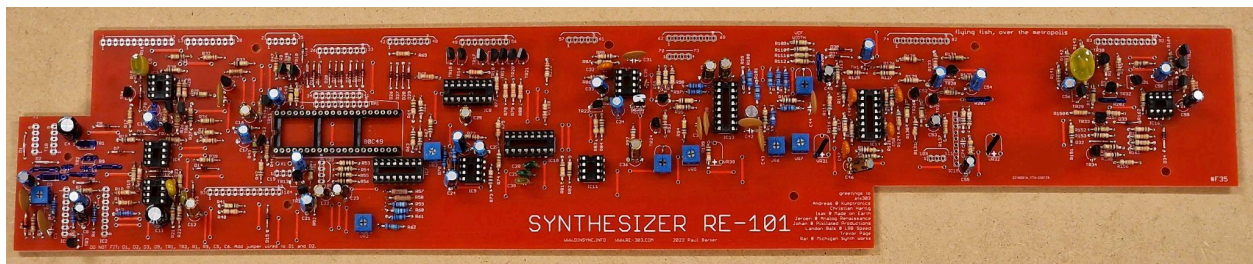
Even though the sockets are optional they are recommended for the cpu

Place the transistors

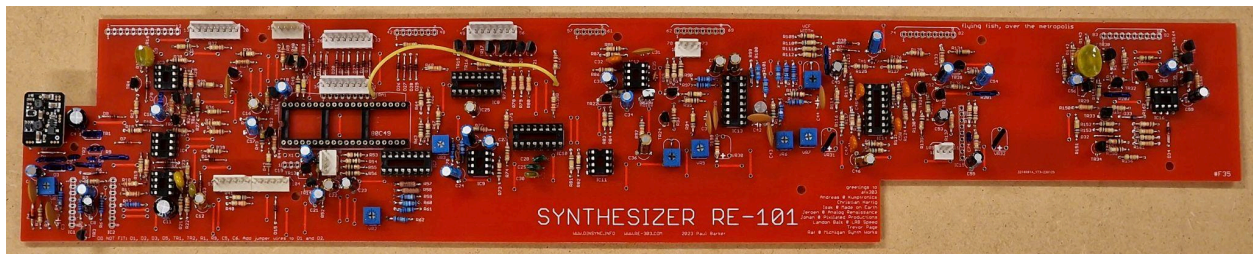


TR23 is the noise transistor, place this or leave this out until you have a working build if you want to select it by ear

Place the trimmers, VR4 has a unique length but you can use a regular trimmer just bend up and extend the middle leg (zoom into the pic to see)



Add the molex headers and RA1 yellow patch wire, any colour will do. Also place the DC/DC T1 replacement, this must be orientated as in the picture (far left on the pcb).

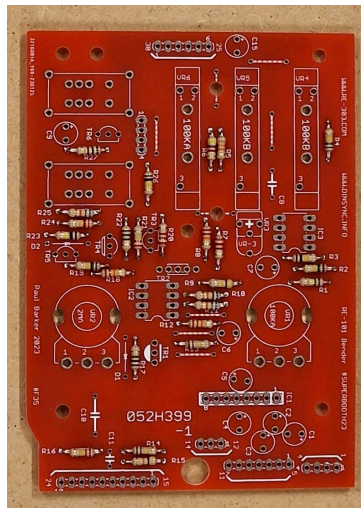


The synth board is now done except the IC's and you can place it to one side for now.

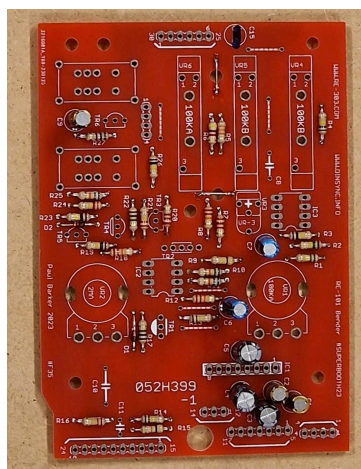
Bender board

The board pics are rotated for the best label reading

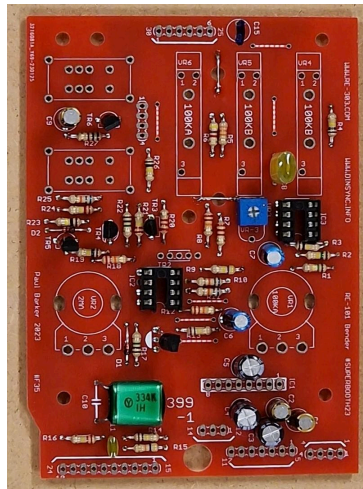
Place the resistors.



Place the diodes and electro caps, make sure they are orientated correctly. There are also two jumpers to be placed.



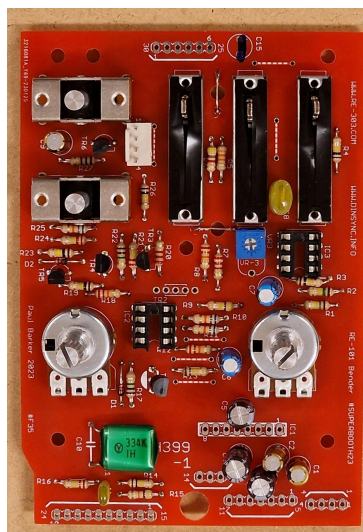
Place the poly caps, ic sockets (optional) and transistors



In this image TR2 is not placed, in the 101 a rare 2sc1583 is used here but a matched pair of 945s should suffice but is not needed until bender hardware is fitted so can be passed for now.

Before placing the headers, it's important to read appendix C about header placement.

Fit the last parts except the ICs, no need for the top molex header (in the picture) for the bender.



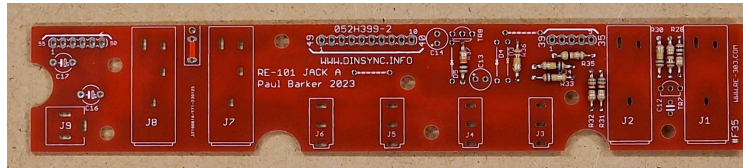
There are two jumpers to place, they go across the two holes near the mini faders and are used as test points. Also you can also (optional) place a jumper between mod grip header pins 3 and 4 (the small 4 pin header between the toggle switches and mini faders) this will set mod grip to off (for now)

The bender board is now done except the IC's and you can place it to one side for now.

JACK BOARD A

Fairly straightforward. Note C14 is not placed.

Place the resistors



Place the diodes



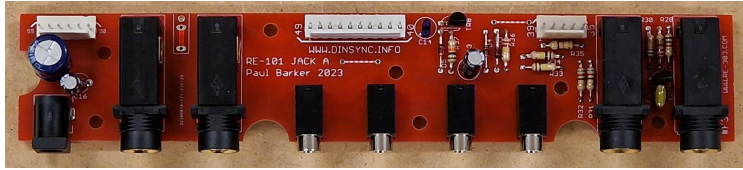
Before placing the headers, it's important to read appendix C about which side to place them

Place the electro caps and headers.



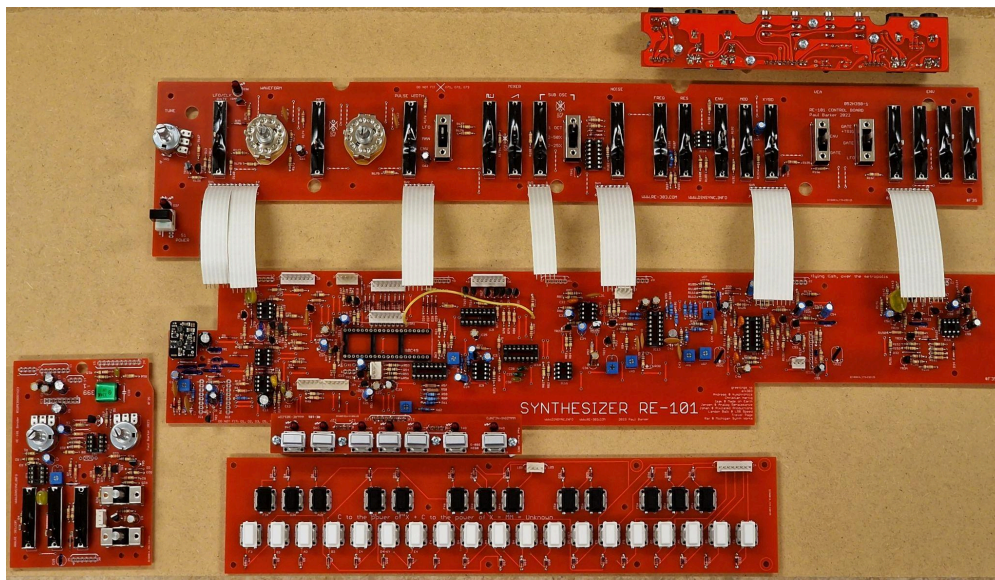
Do not place the headers until you checked the appendices

Place the jacks and transistor.



Jack A board is now done and you can place it to one side for now.

TIME TO REVIEW



What you have built so far should resemble the above except the mini keys and mini seq board. Those quite are straightforward so you can build them from the bom listing easily.

Now take your time and inspect your work, it may feel like you are close to the end and that eagerness is not your friend. The reality is actually you still have the wire loom to build before you can test and this is quite a time consuming process. So before we do that let's now carefully check your solder work with magnification. Look for bad or missed welts and shorts, misplaced parts etc etc. Any mistake you find now will save you potentially hours of head scratching later. Don't rush this stage. Once you are done, take a break and then check it all once again (no joke).

If you are happy that everything is ready then you can proceed to build the mini seq board and the mini keys. These are quite easy but you must again set the LED height for the seq board correctly.

Once you have decided what case type you are using from Appendix A, double check the headers are on the correct side and orientation. If you are satisfied you can connect the ribbons between the control board and the synth board.

You are now ready to build the wire loom.

Wire Loom

PLEASE NOTE THAT WE NOW SELL MACHINE MADE WIRE LOOMS IN THE RE-303 WEBSHOP WHICH WILL SAVE YOU FROM MANUAL CRIMPING!!!!

This requires a lot of manual crimping, rather than doing them one at a time it's a lot faster to batch prepare the needed wires before assembling the loom.

First cut these lengths of wire and put a crimp header on each end.

13 x 24 cm cables
16 x 28 cm cables
6 x 32 cm cables
1 x 38 cm cable
1 x 40 cm cables
10 x 42 cm cables
10 x 44 cm cables
2 x 57 cm cables
5 x 65 cm cables

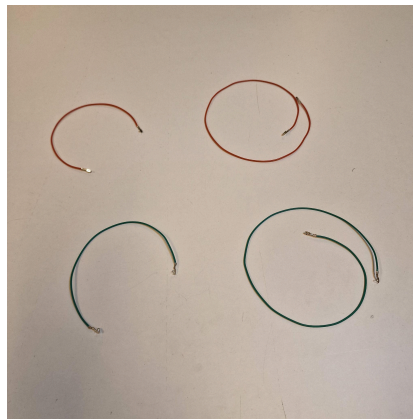
That's 64 wires, which means 128 crimps (crimp both ends).

So first cut all the wires, crimp both ends and then you can start to build the loom. Start with the wire loom page of the bom, it will tell you how many pins in the header, the source and destination and the length of the wire. So for example referring to the wire loom tab of the bom you can see

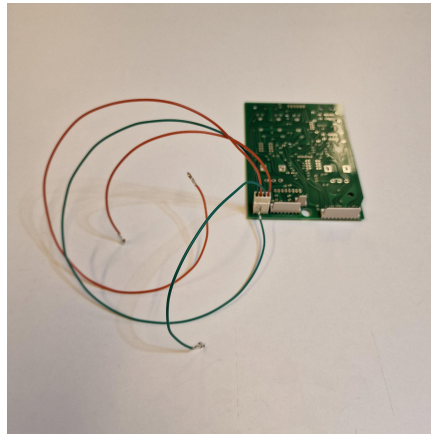
BEND 1-4	4 pin header		MAIN	LENGTH CM	NOTES
1	Vcf bend		70	44	
2	Vcf lfo		71	44	
3	Vco mod in		13	24	
4	5v		16	24	

The first column is saying BEND 1-4, the next says 4 pin header. So that means we will populate a 4 pin header with 4 wires, the length of wires 1 and 2 is 44cm and the length of wires 3 and 4 is 24cm. The destinations for the other end of the wires are MAIN and as you can probably deduce from the above table they don't all go to the same places. Wires 1 and 2 go to MAIN 70 and 71, while wires 3 and 4 go to MAIN 13 and 16. You'll notice that these are two different headers on the board which is why we haven't written the header size for the destinations.

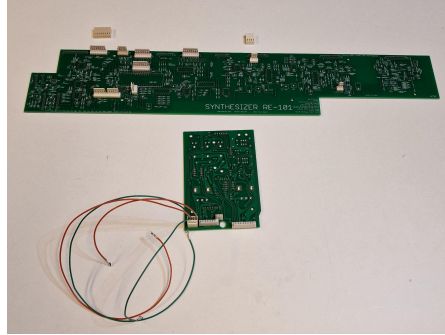
Let's make this example cable,



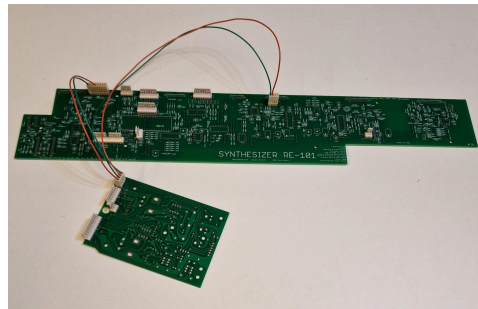
From your pre-crimped wires, take two 24cm and two 44cm wires.



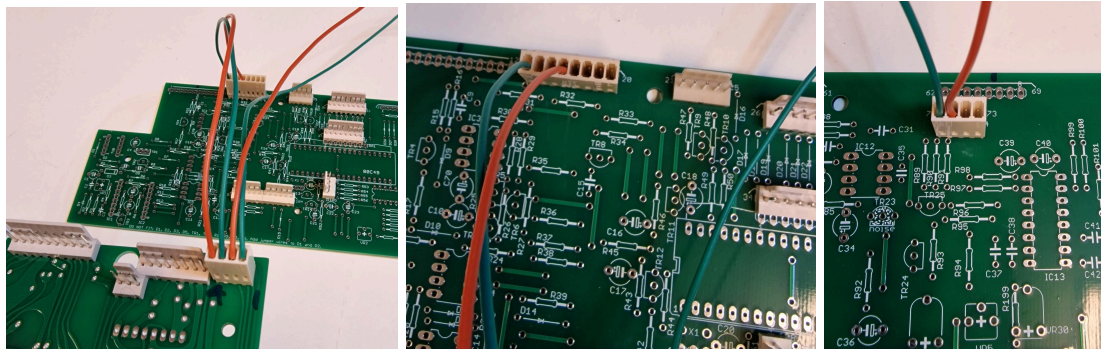
Place the wires as per the bom table (pin1 44cm, pin2 44cm, pin3 24cm and pin4 24cm)



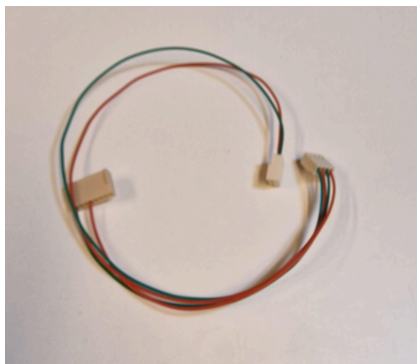
I put some connectors out next to the destinations to make life easier



Connect the wires to the correct destinations listed in the bom table, make sure you have the header the right way round before you place the wires.



Some close ups, notice the destinations are not always consecutive.



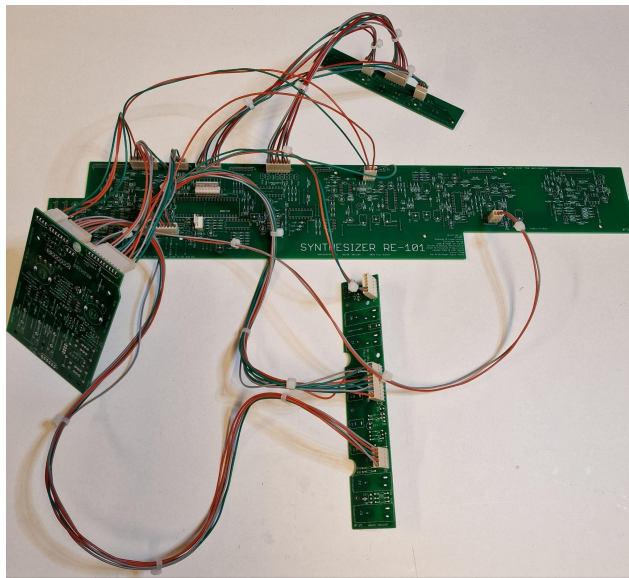
So far the wire loom looks like this, so let's add the next section

BEND 5-11	8 pin header 7 used		MAIN		NOTES
5		vca out	111	57	
*6		gnd	110	57	
			JACK		
7		out	35	65	
8		phone	36	65	
9		phone	37	65	
*10		gnd	38	65	
11			39	65	

From the wire loom page of the bom

For this section we need 2x 57cm cables and 5x 65cm cables. Follow the table above as we did last time and connect up the wires. Take note that while connections 5-6 go to MAIN, connections 7-11 go to the JACK board!

Continue on using the wire loom tab of the bom and the pin map diagrams on the next page to finish your wire loom, tidy it up with some cable ties and it should look something like this. (the mini keyboard cables aren't made or fitted here)



Once you have completed your wire loom, check all connections are good and move on to the next section of the build.

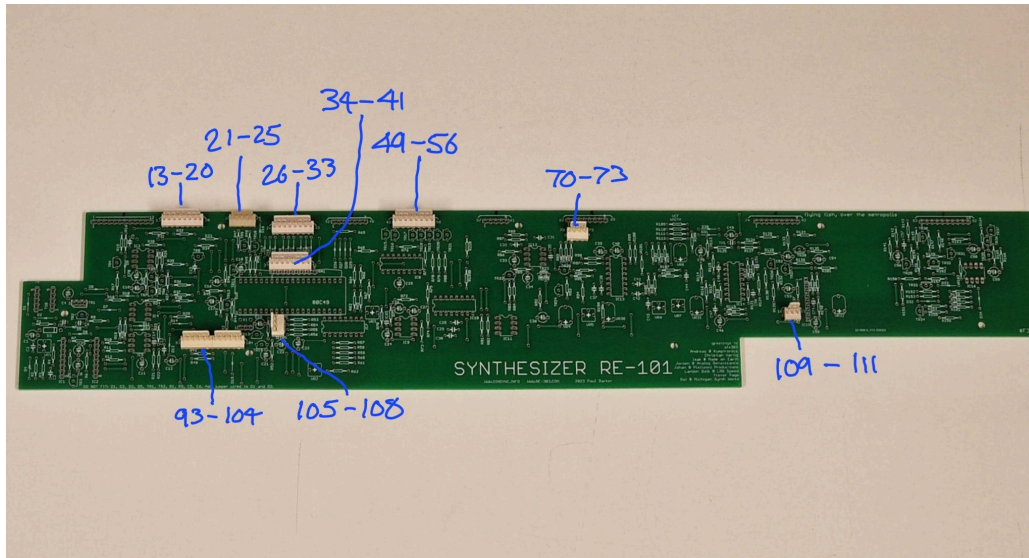
HEADER MAP

A list of the header sizes for source and destinations is listed below as well as pics of all boards with pin numbers for convenience. Use these as reference and don't forget sometimes we use a 8 pin for a 7 pin connection. As previously stated the destinations can have cables from various sources.

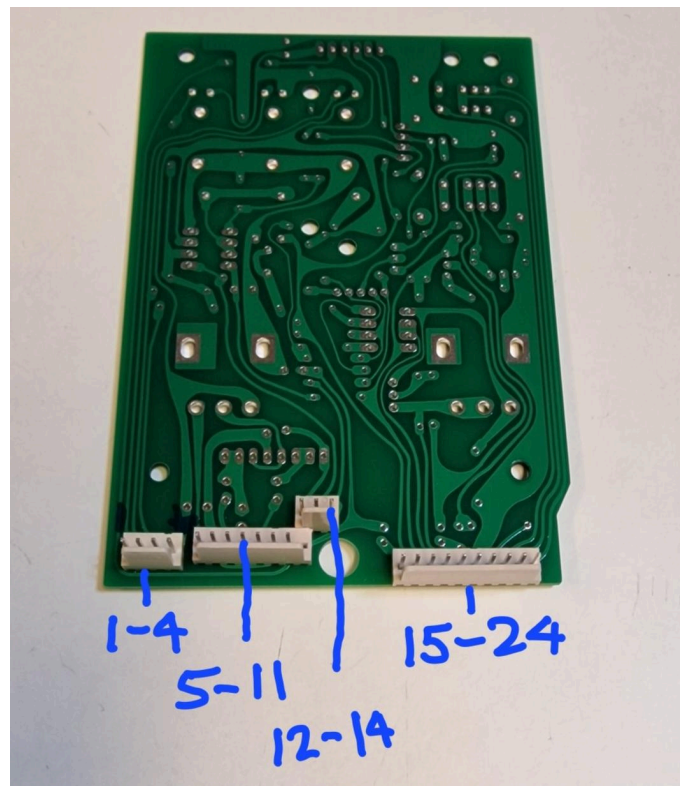
Please note in regards to which side the headers are placed the pin numbers always remain the same, pin designations are marked on the pcb, take care to wire your headers accordingly so that the header is wired the correct way round!

BEND 1-4	4 PIN HEADER
BEND 5-11	8 PIN HEADER WITH PIN 8 REMOVED
BEND 12-14	3 PIN HEADER
BEND 15-24	10 PIN HEADER
JACK 39-35	5 PIN HEADER
JACK 40-49	10 PIN HEADER
JACK 50-55	6 PIN HEADER
SEQ 112-115	4 PIN HEADER
SEQ 116-123	8 PIN HEADER
SEQ 124-127	4 PIN HEADER
MAIN 13-20	8 PIN HEADER
MAIN 21-25	5 PIN HEADER
MAIN 26-33	8 PIN HEADER
MAIN 34-41	8 PIN HEADER

MAIN 49-56	8 PIN HEADER
MAIN 70-73	4 PIN HEADER
MAIN 93-104	2X 6 PIN HEADERS
MAIN 105-108	4 PIN HEADER
MAIN 109-111	3 PIN HEADER

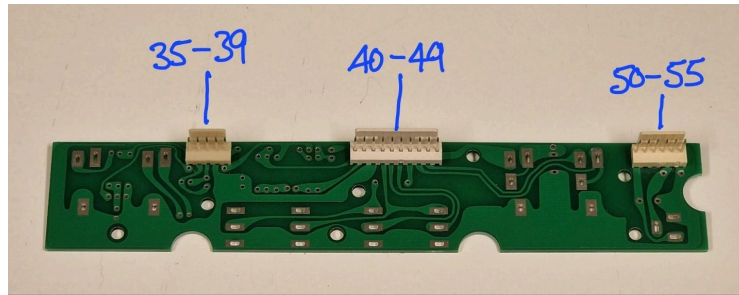


Pin number locations for the synth board.

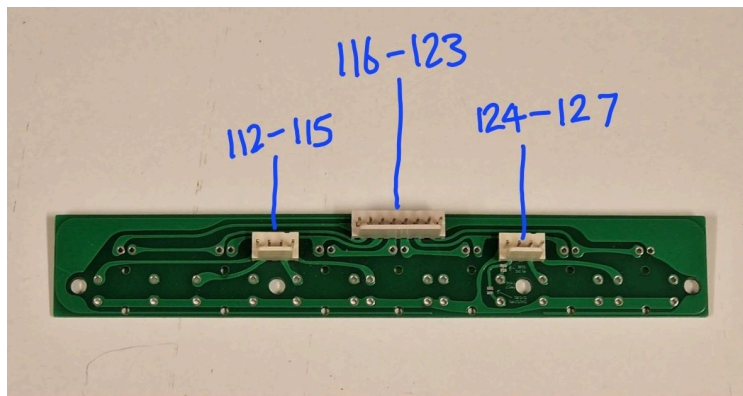


Pin number locations for the bender board.

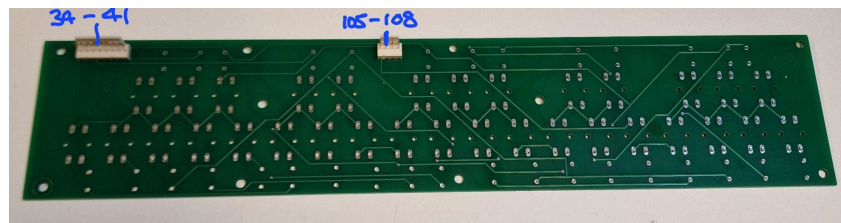
NOTE the 5-11 header is an 8 pin with last pin removed



Pin number locations for the jack board.



Pin number locations for the seq board.

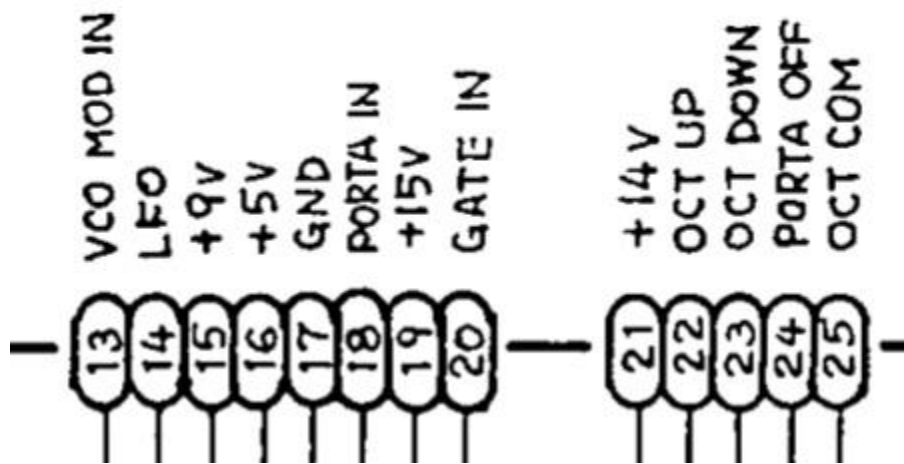


Pin number locations for the mini key board.

Power test

Before you connect your boards, solder in IC1 and IC2 in the power section (bottom left on synth board. Now connect the wire loom, pay attention not to stress the crimps (handle them gently, never pull them from the wires etc)

Once you have done this, connect a 9v DC centre pole negative supply to the dc input, press the power button and get your multimeter out and measure voltages on the mainboard headers 13-20 and 21-25 (poke your probe into the side slot or thru the top of the hole to touch the contact.)



Put your black probe to pin 17 (gnd) and use your red probe to measure pin 15 (9v) pin 16 (5v) pin 19 (15v) and pin 21 (14v)

Don't worry if they aren't exact, they should be close. However since we didn't yet calibrate the machine then the 5v line may not be correct, we can check this after calibration.

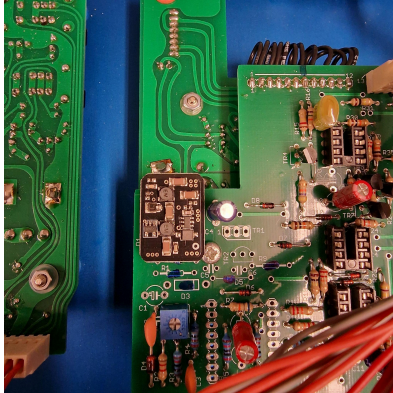
If your voltages look good, then go ahead and place the rest of the IC's except the Goblin.

Repeat the power test, some values may change a little with load but not significantly. If the power rails look good, then you can place the Goblin CPU and power up the unit again. Please refer to the Goblin manual for install specifics. <https://trevorpage.github.io/goblin/>

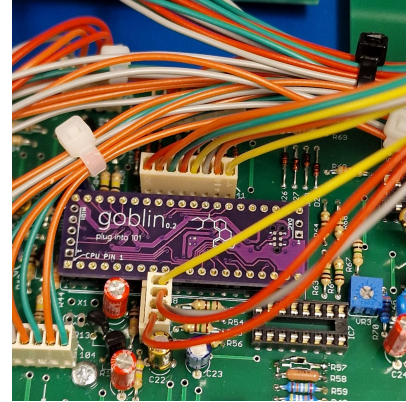
If all went well you will now see power led lit and also the lfo led should blink and the rate should adjust with the lfo rate slider.

At this point you should get some audio and can proceed to calibrate the synth. Download the SH-101 service notes from www.dinsync.info and look at page 3, follow the calibration procedure and if all goes well by the end you should have a working unit.

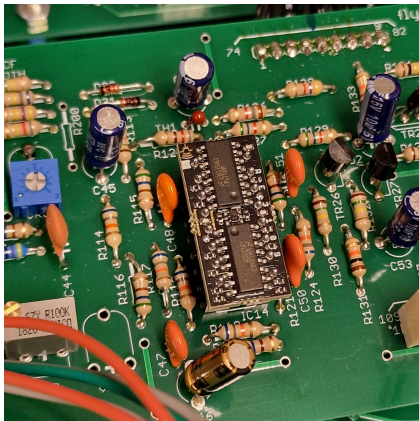
Orientation for the custom chips



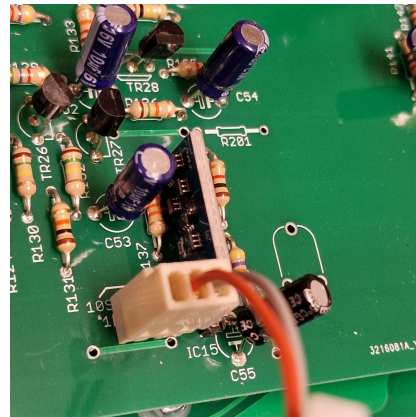
DC/DC T1 replacement



Goblin CPU



RE3109 (the white dot shows pin1)



BA662 (note transistors face left)

WHAT IF IT DIDN'T WORK

If you didn't pass power tests, or something is feeling wrong, the first thing to check is your wire loom and/crimps. Gently inspect them, is one frayed, loose or broken? Replace the bad crimp and test again. Is it working now?

If not still, then don't keep power cycling to see if it will, there's a problem, let's find it.

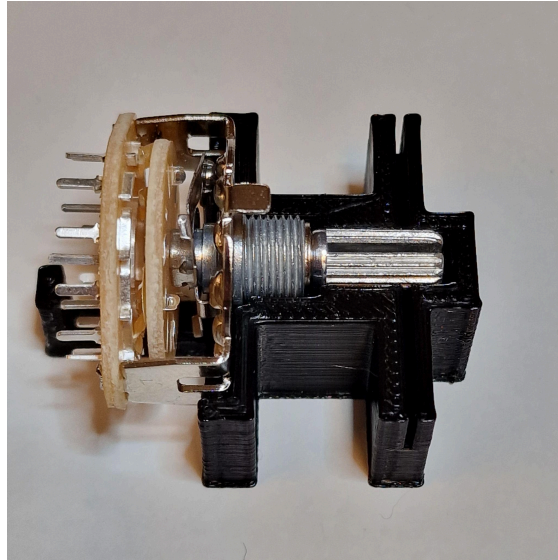
Check all your diodes, polarised capacitors and ICs are all in the correct way, did you find a problem? Is it now solved?

Again check your soldering, although you should have thoroughly checked this in a previous section, it doesn't mean you didn't miss something, check again, look for shorts, solder splashes or missed pads etc.

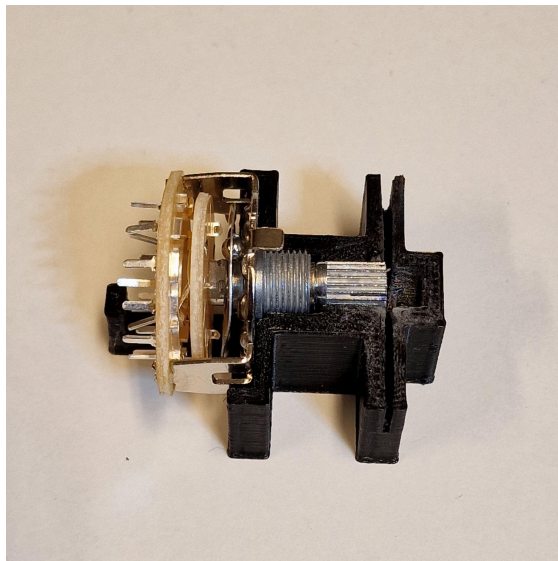
If you are still unable to solve the problem then join the facebook group RE-101 or the webforum (under refurbishment atm) and ask there, we'll try to help you solve it.

Appendix A

If you are **using our enclosure** or another panel mount design you will want to trim the two rotary switches (waveform and range) so that they are all flush.

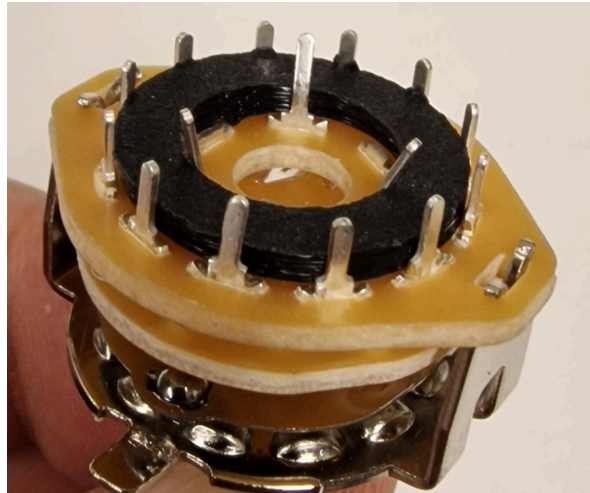


Place the rotary switch into the cutting jig with the tab facing up



use a dremel tool or hack saw to trim to size.

DON'T FORGET THE SPACERS FOR THE ROTARY SWITCHES!



Place the spacer as shown and splay the 3 switch pins of the rotary switch outwards a little as it will help to hold the spacer and with placing the part on the pcb. Finally bend or cut the tab so that it does not hit the panel.

Appendix B

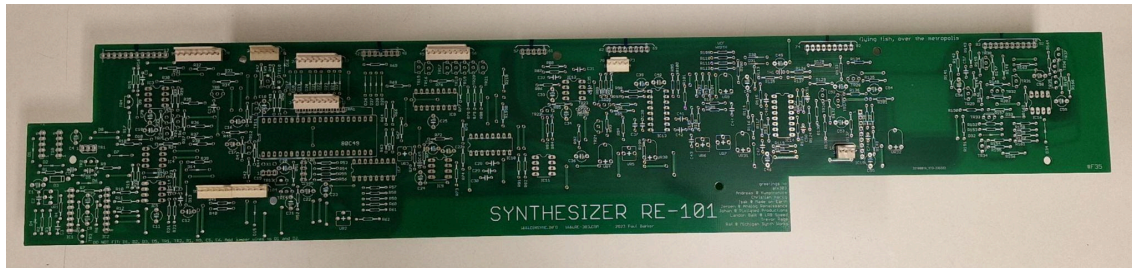
LED height

While we are still developing the enclosure we recommend you fit the leds with full legs, then when you get your enclosure it should be simple to either remove them or just heat the pads while placing the panel to push the LED to correct height.

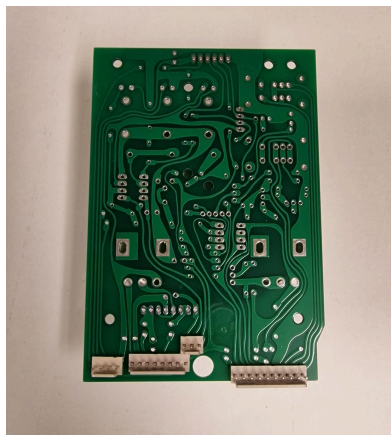
With the Original 101 case, place the leds without soldering and mount the pcbs to the case, push the led into place until its the right height and then solder in place.

Appendix C

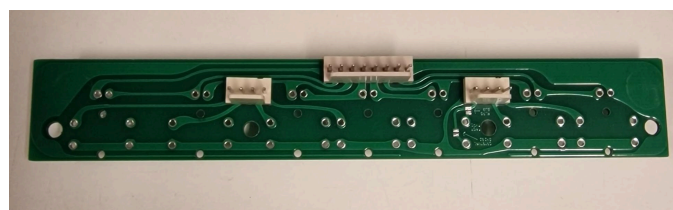
If using our enclosure or an alternative panel you will want to place the headers on the pcbs like so.



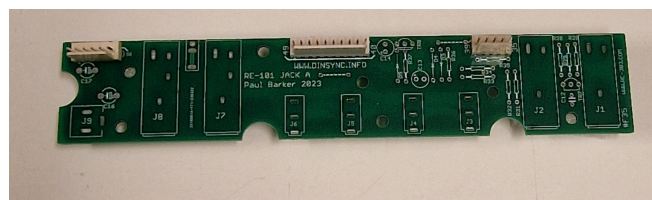
Synth board header placement



Bender board header placement

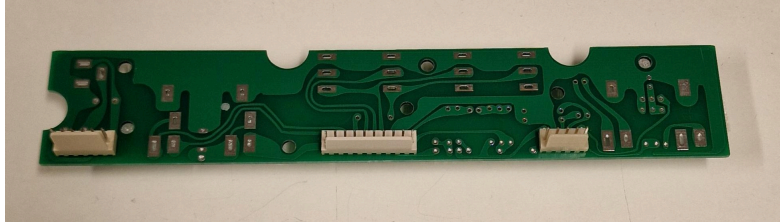


Seq board header placement



Jack board header placement

If you are **using an original SH-101 case** you will want to place the headers the same as above except for the jack pcb, otherwise you will not be able to fit the board into the case when the wires are connected.



Jack board header placement

Change log

230622

Change log added.

-

230622-RE101_BOM 0.19

Added noise transistor to bom

-

230622-re-101_build_guide_0.06

description about noise transistor selection

-

230626-RE101_BOM 0.20

missing D4, added.

Fixed 1n4148 amount from 28 to 29 (synth board).

Added link to Goblin manual and install guide.

Removed duplicate VR1 and VR1 from synth page (these are bender parts)

-

230628-RE101_BOM 0.21

Fixed typo in 150R (synth board)

-

230702-RE101_BOM 0.22

Added C70 and C74 to do not place list (synth board)

-

230704-RE101_BOM 0.23

Added missing D35 (control board)

Added missing TR7 (synth board)

-

230718-RE101_BOM 0.24

Changed some cable lengths for bender board wire loom (added some length to reduce cable strain after prototype case measurement). Bender sections 1-4, 12-14 and 15-24 of the loom are changed.

Added lengths for minikey (fitting to prototype case)

-

230718-re-101_build_guide_0.11

Updated wire loom section to reflect changes.

Added close up pics of IC orientation for Goblin, RE3109, BA662 and DC/DC converter.

-

230722-RE101_BOM 0.25

Changed R188 from 47k (service note value) to 100k (actual value used on original sh101) result is increased modulation depth.

-

230718-re-101_build_guide_0.12

Added note about machine made wire looms being available at the re303 webshop.

Added note to place jumpers on bender board.

Added note to place (optional) jumper to set mod grip to off

-

230722-RE101 _BOM 0.26

Added note about machine made wire looms being available at the re303 webshop.

-

231109-RE101 _BOM 0.27

Due to a mistake in service documentation, R143 is actually R142 and R142 is mislabelled R41 (which is a duplicate) R143 is already 12K so only change is R142 to 33K.

-

231109-re-101_build_guide_0.14

No change

-

240219-RE101 _BOM 0.28

C55 in the bom was listed as BP, this was incorrect and should be a polarised electrolytic. This has been fixed and now C55 in the bom is polarised.

-

231109-re-101_build_guide_0.14

No change