

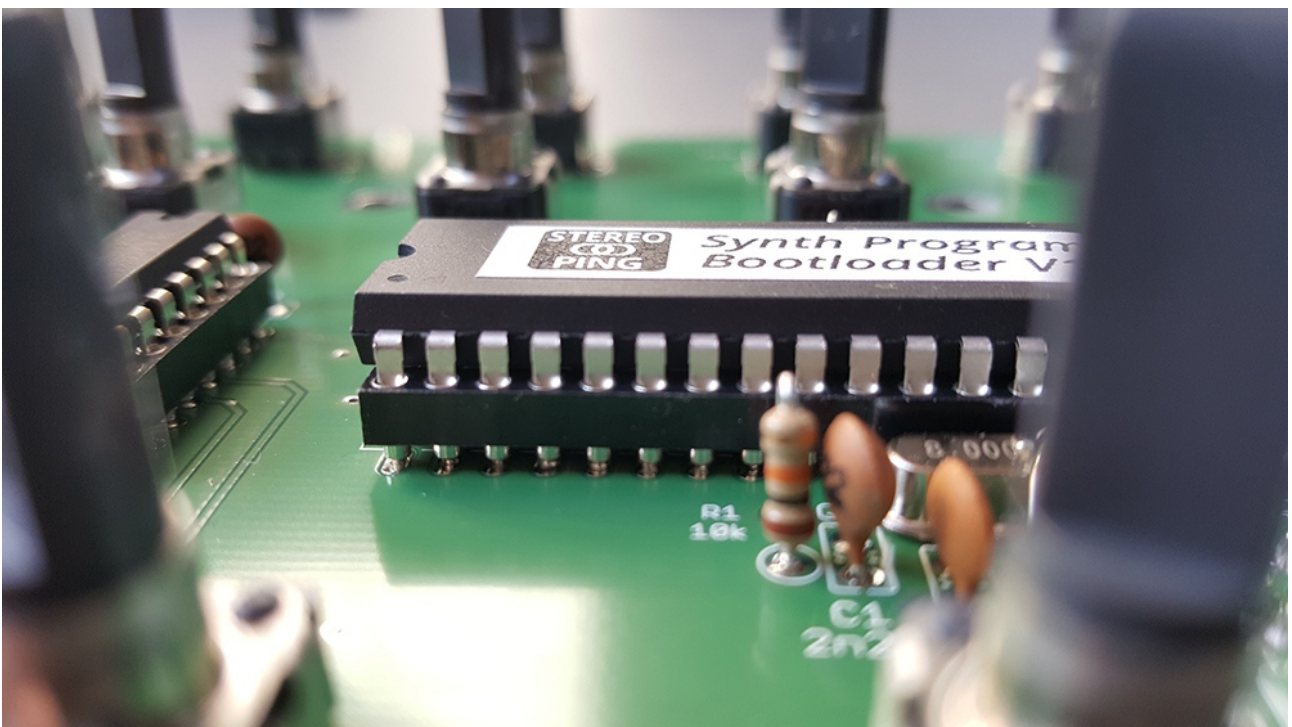
STEREOOPING

Synth Programmer Building instructions V1.4

Power-Midi PCB V1.1

Main PCB V1.3

07/2018



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1. Hello

Hi and thank you for having chosen the Stereoping Synth Programmer assembly kit. If you were looking for the user manual you are unfortunately wrong here, this is the building instructions for getting together the assembly kit. You can find the manual here

www.stereoping.com -> Products -> Synth Programmer-> Downloads.

If you experience any problems during building this kit, are coming up with a genius improvement feature, if you wish special photographs or simply are enjoyed by something, even if you just want to write us that you LOVE our product - go ahead. We are looking forward to receiving your email to hello@stereoping.com

These building instructions came out quite large because we don't want you to make mistakes or experience any bad emotions while building the Synth Programmer. The kit and the instructions were developed very thoroughly and are verified multiple times. If you follow the instructions carefully, your Programmer will work perfect right from the beginning.

Please note: this DIY kit demands quite advanced skills, we could not recommend it for beginners. Please have a thorough look at the chapters for the flatcable socket and the display on pages 14, 24 and 28. Both contain quite small solder pads which need to be soldered very proper. If you are unsure here, we'd recommend to go for the assembled programmer.

We can not be held responsible for any problems or damage caused by the building or usage of this assembly kit. Nor can we replace or repair PCBs, parts or complete kits, damaged or destroyed by inappropriate building or usage.

2. Kit's content, hints and notes

The DIY kit contains everything to build a complete Synth Programmer:

- Case with already stucked faceplate in your edition
- Power-Midi circuit board (screwed with case bottom)
- Main PCB (screwed with case's upper half)
- Bag A with electronic parts for Power-Midi PCB and for case assembly
- Bag B with parts for main PCB. Content is identical for all editions
- Bag C with edition specific parts
- Bag D containing 45 pot knobs and 4 encoder knobsn, suitable for your edition
- Owner's manual

Tools you will need

For building the DIY kit you will need the following tools:

- Soldering iron or station, small tip (ca. 0.5 - 1mm)
- leaded or leadfree solder (works both)
- a side cutter to cut the wires from the parts after having them soldered onto the pcb
- philips screwdriver (PZ 1)
- normal screwdriver and 5 mm nut (simple pliers will also do) for display installation
- a multimeter to check the operation voltage before attaching the ICs

Before we start ...

Building the kit will take about 2-3 hours. Please take your time, enjoy the process of building your controller, concentrate on what you are doing. It happens quite fast to mix up two parts or solder one on the wrong side of the pcb. This manual describes the whole process very detailed. If you follow it thoroughly, your Programmer will work perfect immediately.

Important notes pointing to pitfalls are printed in red. If you are a professional and do not need this manual ... perfect. But please take a look at least onto these red passages.

If something goes wrong, is missing or unclear

... do not panic. Send us an email, we surely will help you.

Some hand soldering hints

Hand soldering is easy – if the parameters are fitting. Using a cheap 15W soldering iron, an oxygenized soldering tip and tin from the 70ies, the best professional can only produce junk. Before we start, some hopefully helpful hints about soldering:

- Solder marks are more often screwed up by to less heat than to much. If tin does not want to flow, it's most likely due to one (or a mix) of 3 reasons: a) not enough heat or b) not enough flux or c) bad tin.
 - Heat 'can' be archived by holding a weak soldering iron on the solder pad for some minutes. As a consequence it starts to stink, the PCB gets black and the electronic component you try to solder is dying by heat – whereas the pad still is not soldered. It would be better to use a strong soldering iron or – even better – a soldering station. A good soldermark does not take much longer than 3 seconds.
 - Flux is part of the soldering tin, makes the hot tin flow into the smallest corners and helps connecting the different parts (PCB, component, tin) to a homogenous, clean solder mark. Only fresh soldering tin contains flux as most of it fumes away when the tin is heated up. Therefore your solderings get much better by permanently providing (small amounts of) fresh tin during soldering. If you get to much tin on the solder mark, take some part away with a pump or desolder braid and add new tin again.
 - Soldering tin is a highly complex chemical product with lots of ingredients. It's the same as with other products: there is crap, there is quality and there is a lot in between – do not take the cheapest. For DIY it is legal to solder with leaded tin – that's what we also would advice to go for. Leaded tin is much easier to handle. If you want to solder lead free, try to get tin with some percent of silver (Ag for Argentum). It's a bit more expensive but you will definately have much more fun. All Photos in this instructions show soldering with leadfree tin containing 3,8% silver.

- After at least 10 solder marks it's time cleaning the solder tip by dipping it into steel wool or clean it with a humid sponge. Afterwards the tip should be tinned again immediately. The tin protects the tip from getting oxygenized. Otherwise it will become black and can not fulfil it's function any more.
- Even though we said a good solder mark hardly takes longer than 3 seconds – take your time. Solder must flow. To be precise: it must flow to the other side of the PCB. Solder tin only flows on surfaces being hotter than it's melting point. If you remove the tip too early, the tin might get cold again before it was pulled thru the via onto the solder pad on the other side of the PCB. The chapter *Power-Midi PCB - Midi jacks / power jack* shows some good photos where you can see how beautiful the tin crawled onto the other side – leadfree tin by the way.
- A solder mark must not look like a square – in other words: as soon as you think you got the idea how soldering works, try to start using tin economically. The profile of a good soldermark looks more like a triangle, maybe even with concave sides.
- ... if you got further questions you are welcome to drop us an email.

Health advice

- While soldering, toxic smoke will come up which should not be breathed in, the smoke is also not good for your eyes. First action is to open a window. Sound funny but: if you do not have a solder smoke extraction, try to blow slowly in the direction where you solder. The toxic smoke logically will be blown away from you and you can not breathe it in in high concentration. Breathing in is only allowed in soldering breaks :-)
- Solder tin contains lead which is toxic. Even leadfree solder contains highly concentrated chemical ingredients. It is highly advised not to eat or drink while soldering. After your solder session, the hands should be washed thoroughly.

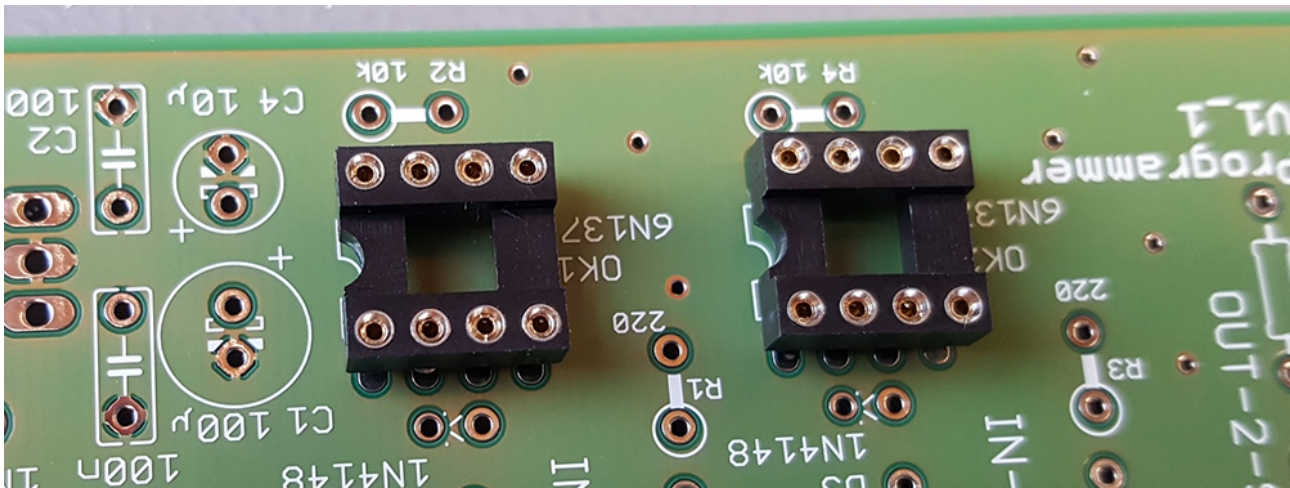
3. Power-Midi board – Bag A

As a warm up we start with the small Power-Midi PCB. All parts for this board are contained in bag A. At the end of this chapter there is a nice photo of the finished PCB which you can compare to your progress.

IC-sockets

Note: if you are skilled soldering veteran you can as well leave out the sockets and solder the ICs directly onto the PCB. The optocouplers practically never fail and the electrical conductance as well as EMI properties of soldered parts are better than using sockets. If you are unsure, go for the sockets. The electronic component will not be exposed any heat and if you manage to place it the wrong way it's easy to turn it around.

We start with the sockets because it's the flattest part on the board. All IC sockets got a little notch on one side. This must of course fit the silkscreen on the PCB:

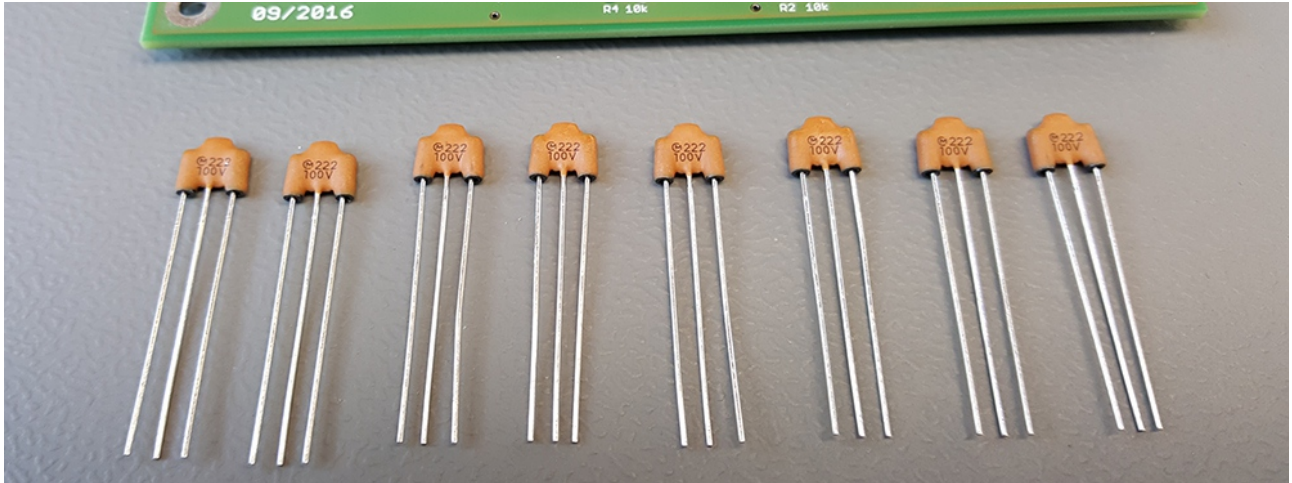


The notch indicates where to put leg Nr. 1 of the IC – leg 1 is indicated by a notch in the case or a point printed together with the device name. Putting an IC into the socket the wrong way sometimes (not always) can damage the part. There is no reason to worry here for the optocouplers.

Now place one of the sockets and solder just one leg first. This allows you to check if the socket really lies flat on the PCB from all sides. If it does, solder the rest of the legs.

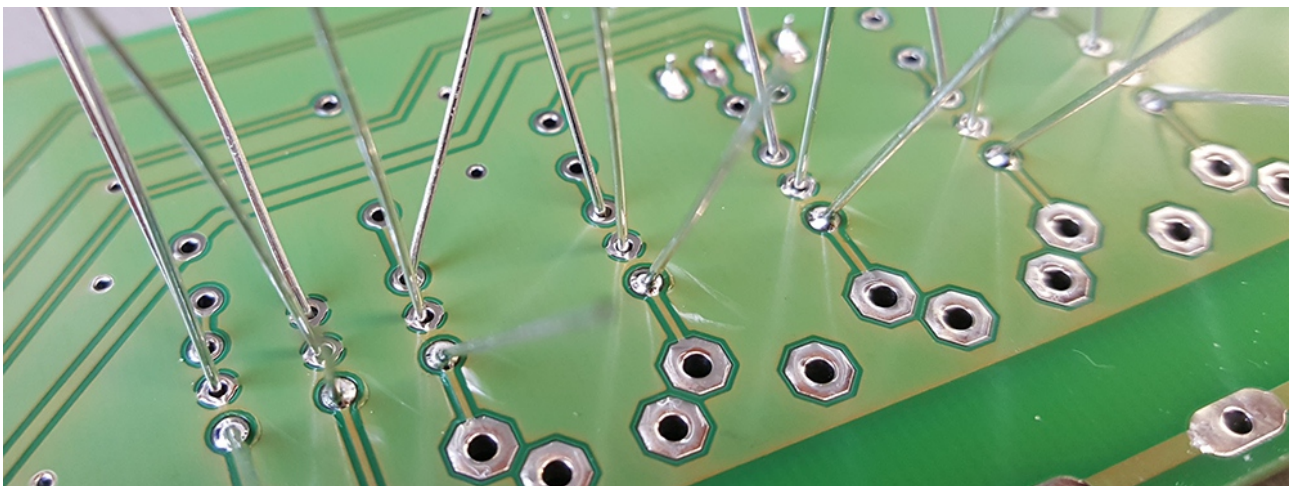
LCL-parts

Next we go for the 8 LCL-parts. In short their task is to filter out unwanted high frequency noise and signals caught by long cables – the part improves signal quality to avoid midi data errors. The part has no polarity, place it the way you like.

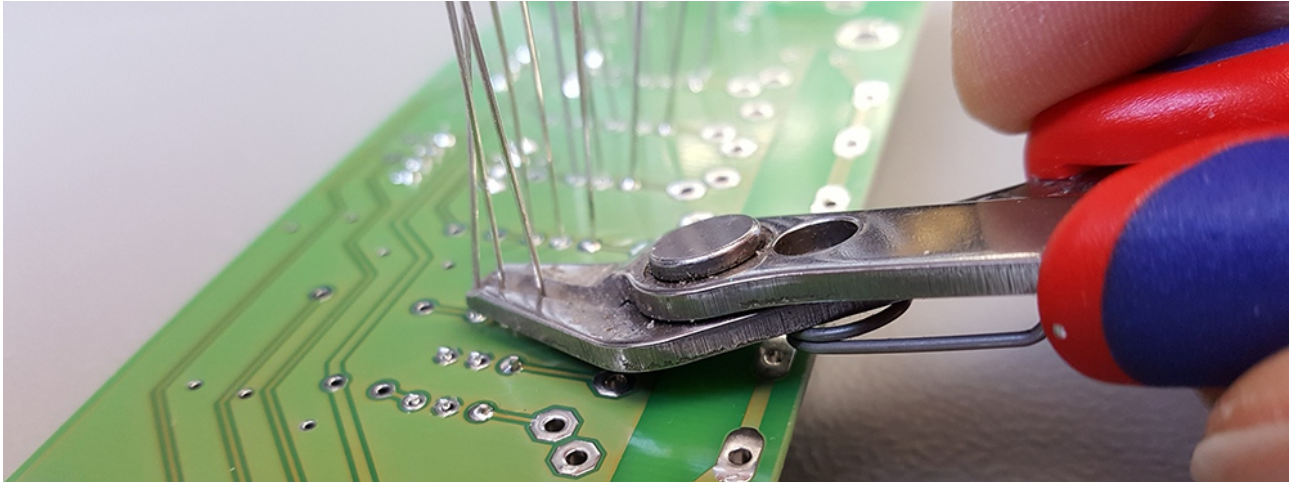


We do it like this:

- Put all 8 parts into their position, bend both outer legs away from the middle leg to keep the part in position. It should be as narrow to the PCB as possible.
- Solder just one leg first. If it happened to slip away from the PCB you can heat the single leg and push it back into the right position. Solder pads NOT connected to the groundplane (without the 4 connection fillets like on the middle pin pads of this part) are easier to be soldered as they do not deviate so much heat to the surrounding groundplane.



- Now cut off all 3 legs in one turn, not to short, leave about 1mm.



- Then solder the rest of the legs.

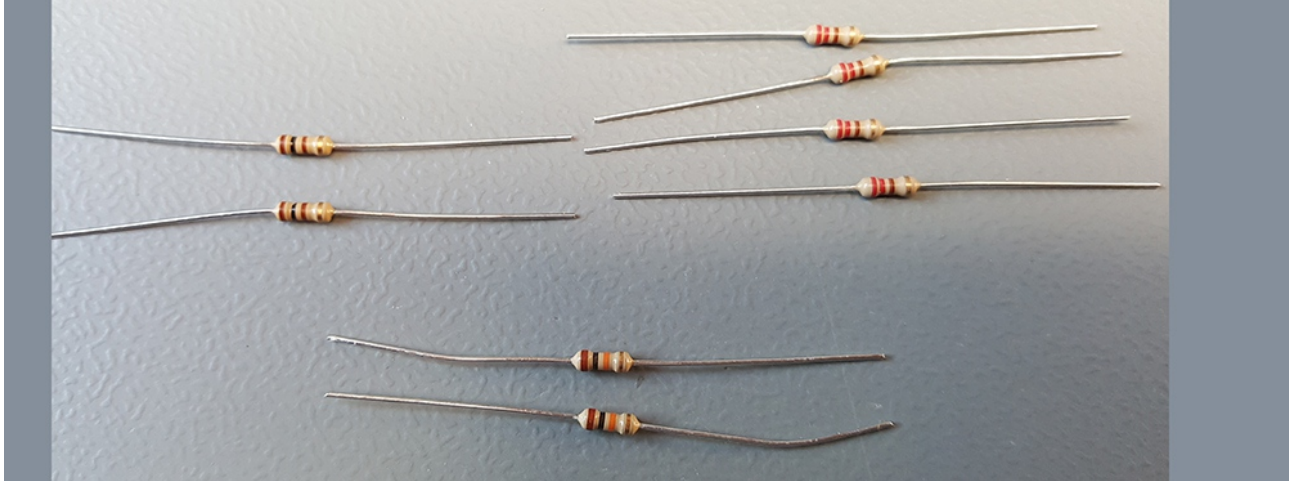
Why cutting off the legs before soldering? It's easier to solder because the shortened wire does not conduct so much heat away from the solder pad into the long metal wire.

Resistors

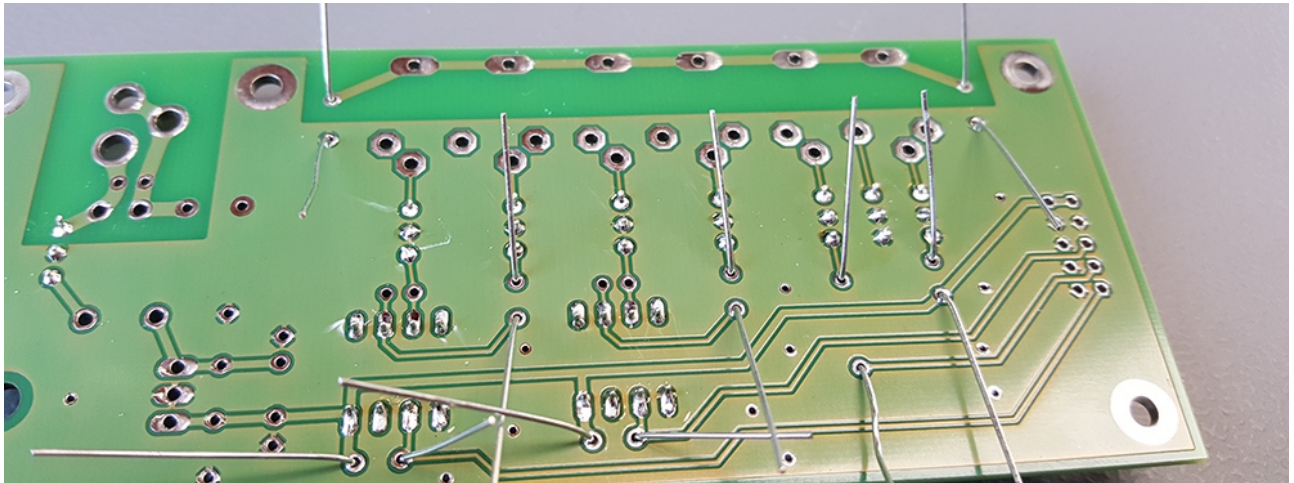
The resistors are marked with an 'R' (e.g. 'R5'), the value (e.g. '220' for 220 Ohm) can be found right besides the name.

There are three values:

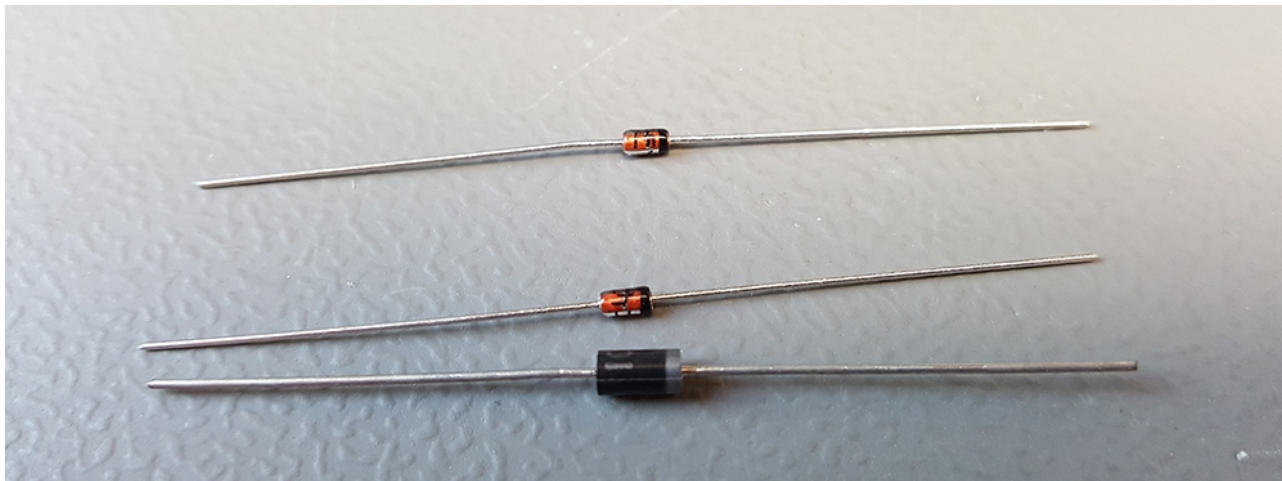
- 100 having the color rings Brown, Black, Brown, Gold
- 220 - Red, Red, Brown, Gold
- 10k – Brown, Black, Orange, Gold



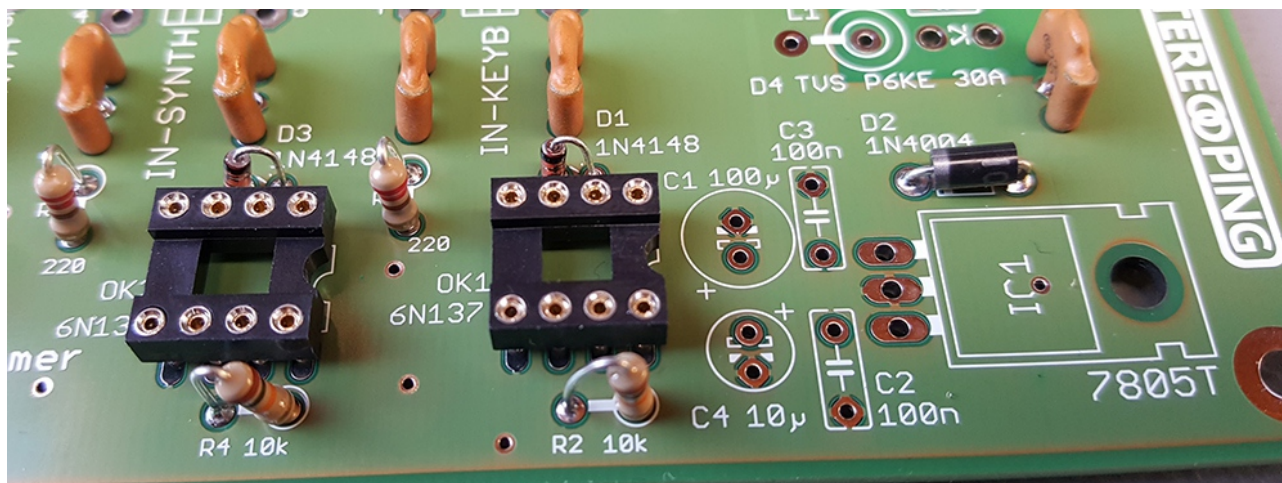
Resistors also do not have any polarity, place them as you like. As all parts, they should be soldered as narrow to the PCB as possible. To fit their solder pins one leg must be bent 180 degrees. On the solderside bend the legs away from each other to prevent them slipping out of their holes when turning the PCBs. After soldering cut off the legs and we're done here.



Diodes

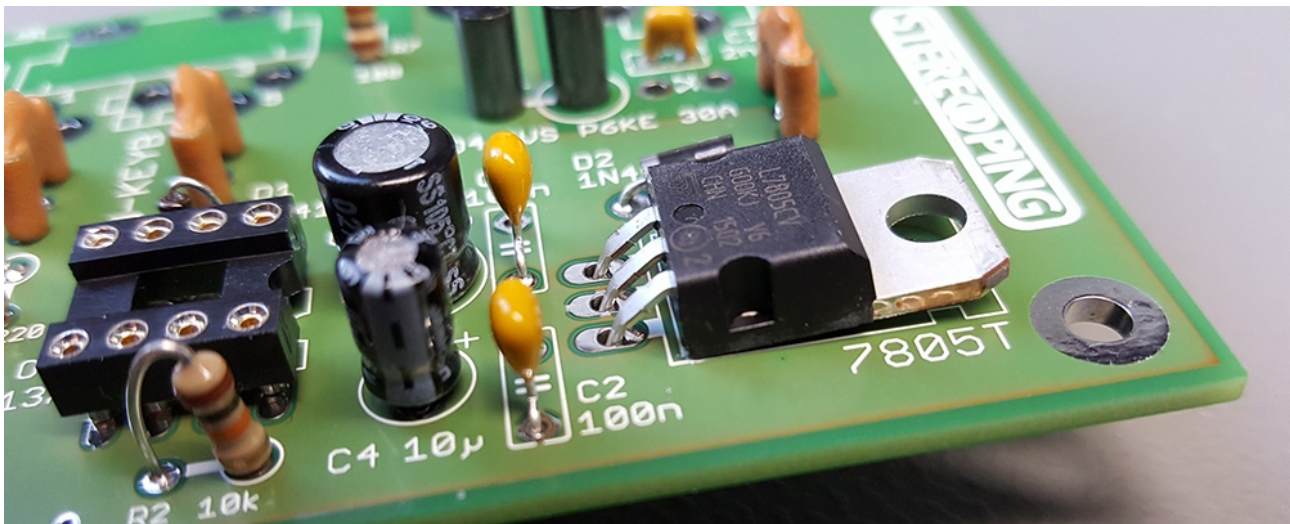


Now on to the 3 diodes. The big black one blocks wrong polarity when plugging a wrong power supply for your Programmer not to take any damage. The smaller red ones are for MIDI. They all have a black mark on one side. This mark can also be found on the PCB and should match the mark on the diode. Well, the mark for the red diodes unfortunately can hardly be seen on the silkscreen. We therefore provided the following photo. Looking onto the PCB with the type 'Stereoping Programmer, Power-Midi V1_1' to the left bottom, the mark of the red diodes must point to the RIGHT.



Voltage regulator

Put the 7805 into position with the type facing into the direction of the IC sockets. Push it down onto the PCB and bend it over until it's lying flat onto the PCB.

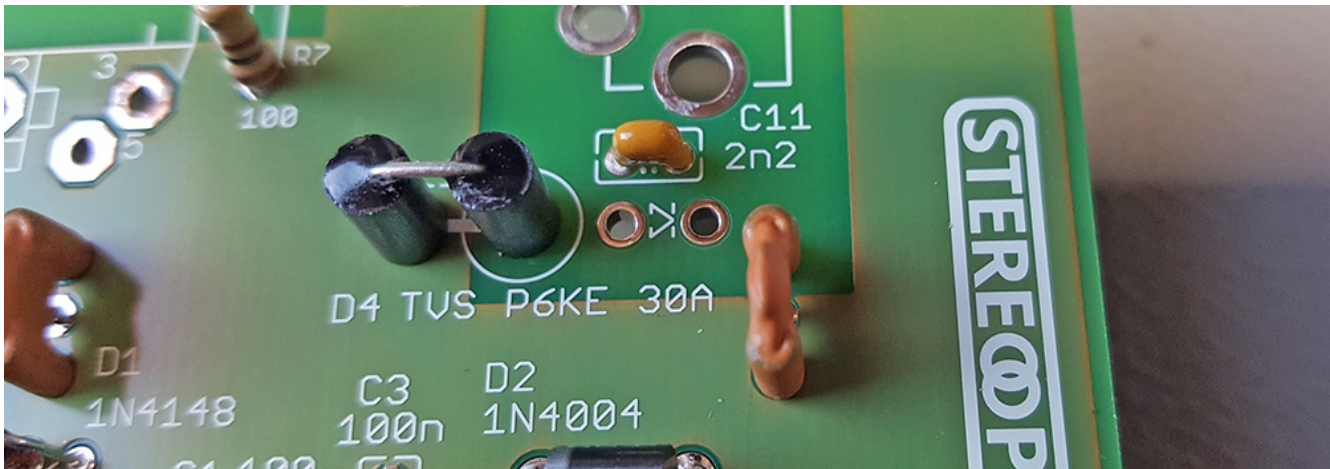


The regulator pulls the legs a bit out of the PCB automatically, that's ok. Now you can solder it from the backside. Take care to make clean soldering marks. Especially the middle pin is important. The goal is not to use much solder tin, but to make a clean and proper soldermark.

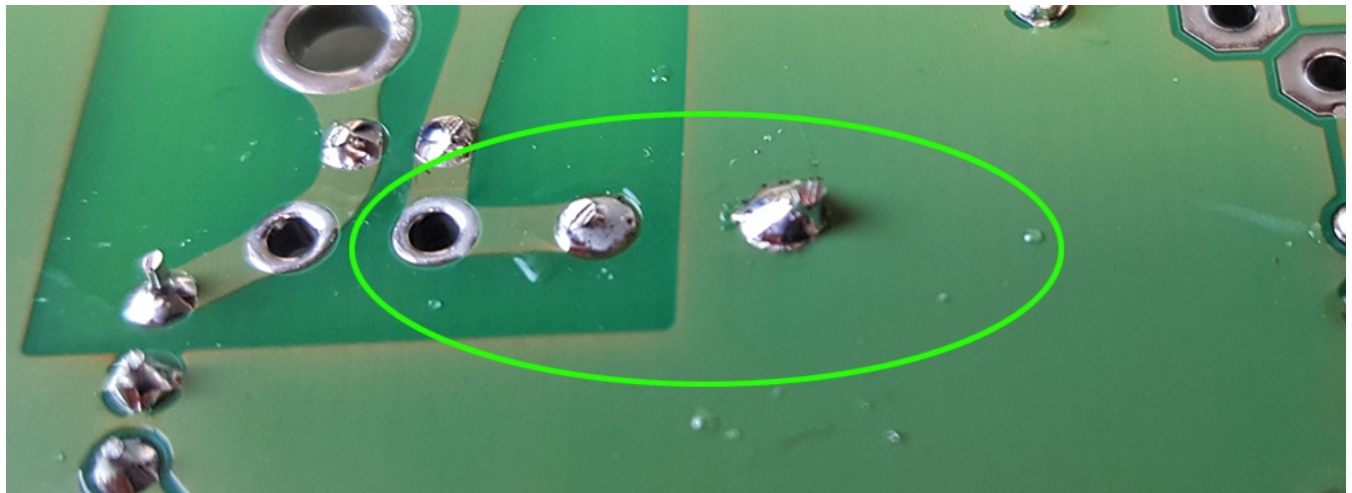
In normal operation it will not even get lukewarm, there is no need to screw it with the PCB or use any heat sinks. It's metal head is internally connected to ground, as well as the screw holes. Means: it is perfectly ok if the screw near the regulator will touch the metal part of the 7805 later, both got the same electrical potential.

Bead and empty position for D4

The ferrite bead is for position L1.



This is your main ground connection! Take extra care for providing a beautiful and proper solder mark, preferably somehow resembling the following photo :-)

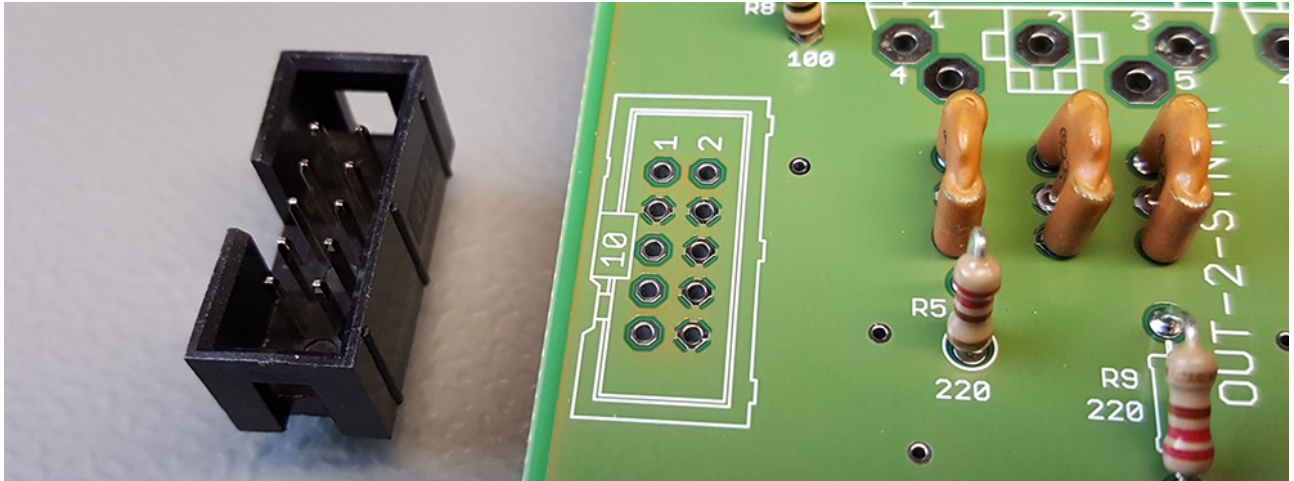


You might ask what about 'D4'? ... D4 will stay empty – forever.

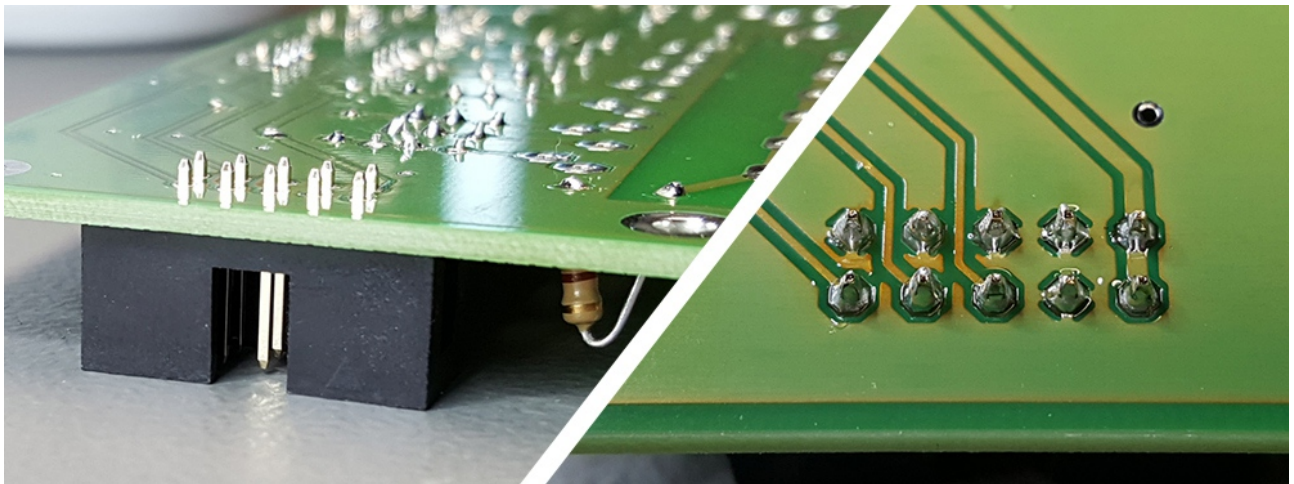
Connector for flat cable

Note: it might be the case, this connector is already soldered onto the PCB to avoid problems.

Ok, take a deep breath, clean your solder tip and we can dare to continue with the 10 pin connector. The pins are quite near together. This is the cable where Midi data gets in and out as well as the power supply – this is the aorta of your programmer and should be soldered thoroughly.



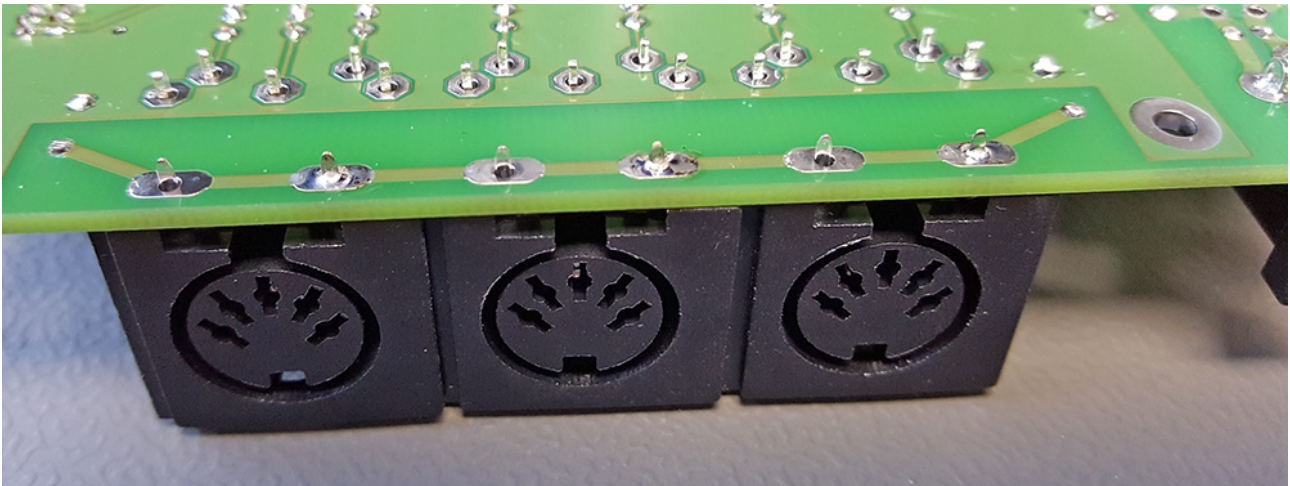
Place the connector from above – **take care for the right direction of the cavity!** It should be on the same side as the silkscreen shows. We recommend soldering one leg first and check again for the connector to sit flat on the PCB. Then the other legs can be soldered. Take your time (4-5 seconds per leg) to allow the tin to flow through the via onto the other side of the pad.



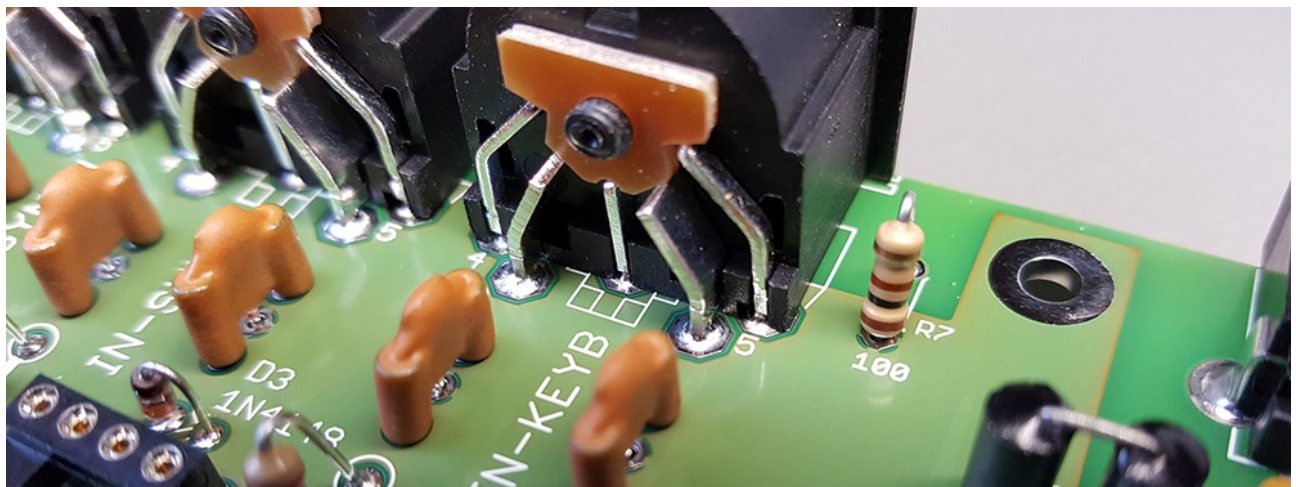
Power supply - and Midi jacks

For the power supply and Midi jacks it is important they are perfectly flat on the PCB. Otherwise your powercord or midi cables will stand crooked – that's not what you want.

Put the PCB with midi jacks upside down and relaxed onto the table. Solder one of the front pins of each jack. Now look from the other side for all the jack's edges to sit perfectly flat on the PCB.

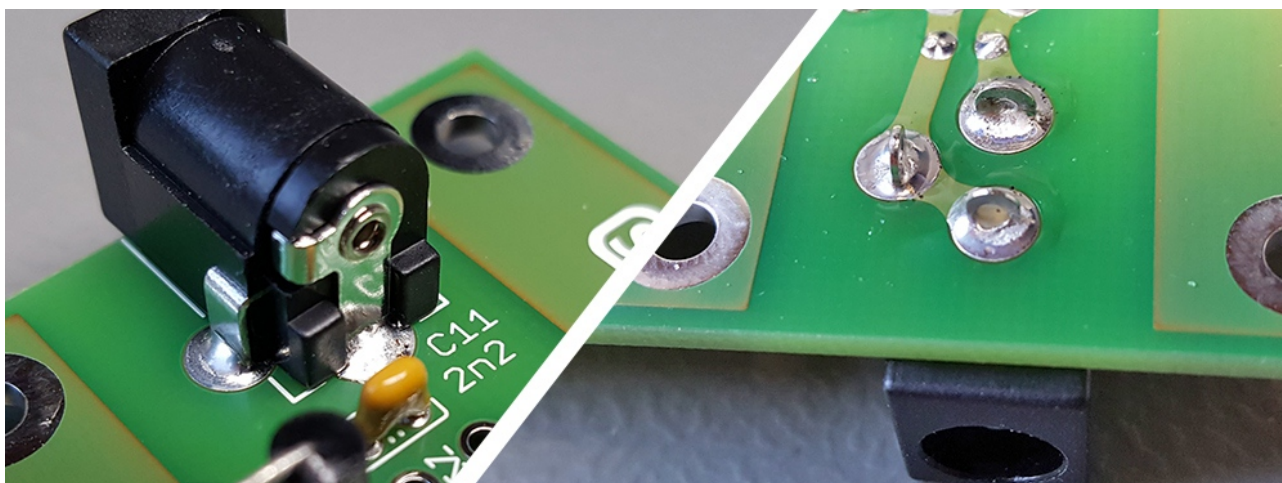


Preferably there should not be any space between jack and PCB. Otherwise take PCB and jack between thumb and trigger finger and heat up the single solder mark again. The jack will snap into optimal position.

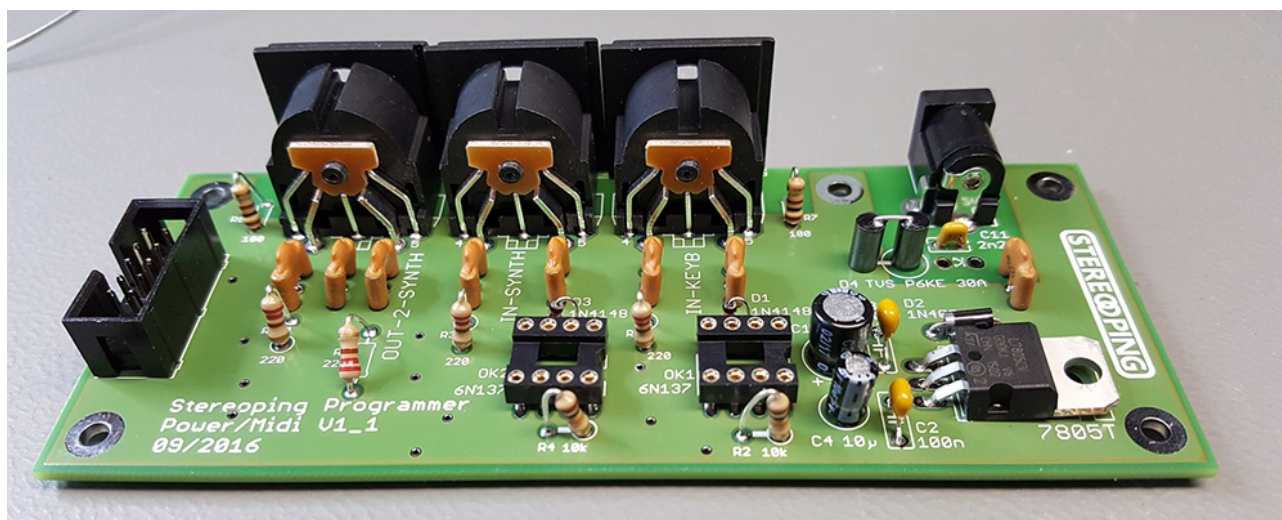


Solder all remaining pins and do not be grasping with tin and time. If the pin and the leg are heated up properly and you give the tin a bit time to flow, it will crawl through the via onto the other side of the PCB as the picture above shows quite well. That's what we want - the jack will be stressed mechanically later by midi cabled being pushed in and ripped out.

It's perfectly the same with the power supply jack. Allow your soldermark some time, lots of heat and a good amount of quality tin. It will look like shown on the following picture then:



That's it, you got it! The rest of bag A's content is for case assembly which we will need later. The Power-Midi board is finished and hopefully it looks even better than the one on the picture:



4. Main PCB – Bag B

We go on with **Bag B** containing parts common for all editions.

IC-sockets

Note: if you are a skilled solder-pro you can leave out the 7 sockets with 16 pins and solder the ICs directly. But it's quite advisable to solder the 40 pin for the main processor in any way.

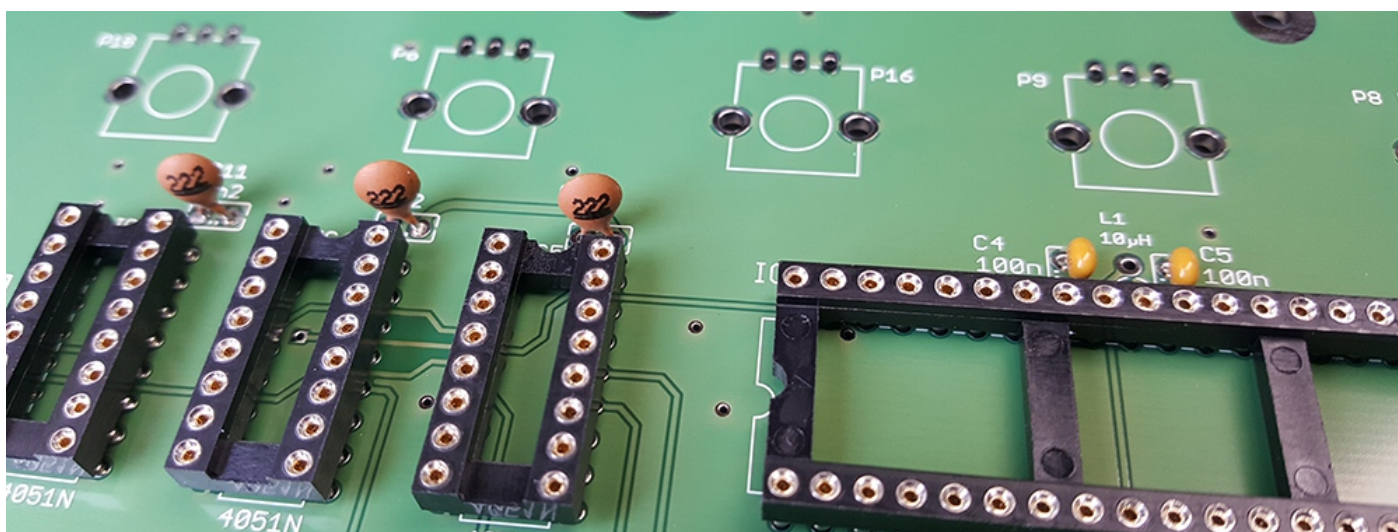
The same here as with the Power Midi PCB: place the sockets with their mark fitting the silkscreen. Solder one leg first to go sure it's flat on the PCB.

Ceramic capacitors



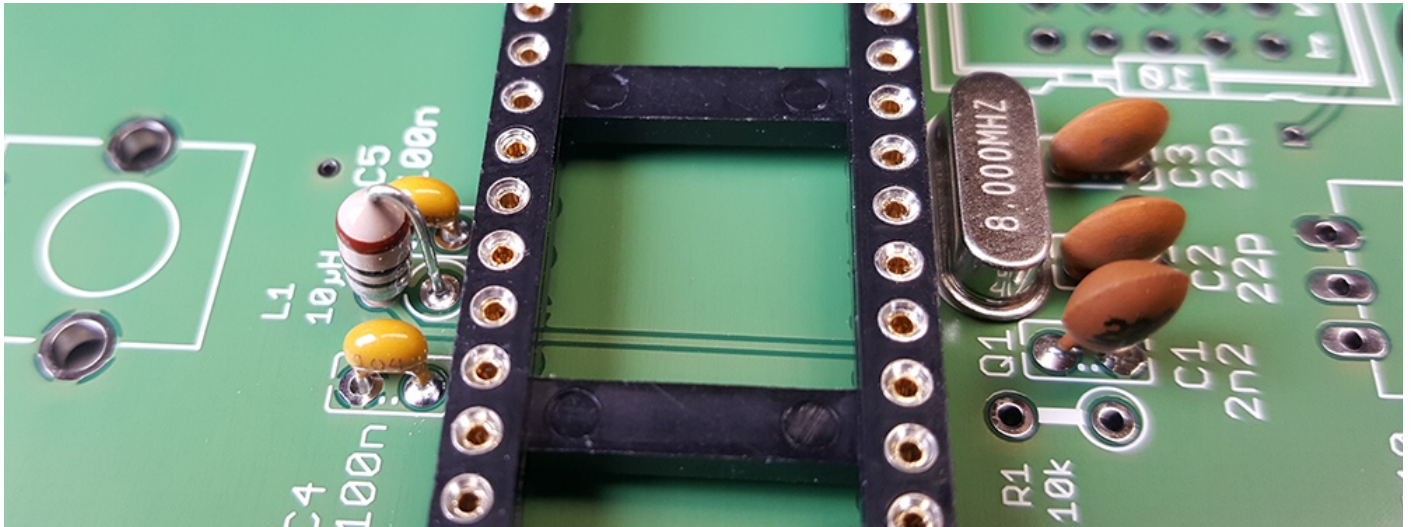
Ceramic capacitors ('Kerko') do not have polarity. Place them as you like, bend the legs a bit, solder them and cut off the wires. Their real color might be different than shown on the picture above! There are 4 different values:

- 2 x 22p, bright brown with label '22' for positions C2 and C3
- 2 x 1n with label '102' for positions C10 and C14
- 8 x 2,2n with label '222' for positions C11, C12, C13, C1, C9, C15, C16 and C17
- 3 x 100n with label '104' for positions C4, C5 and C7

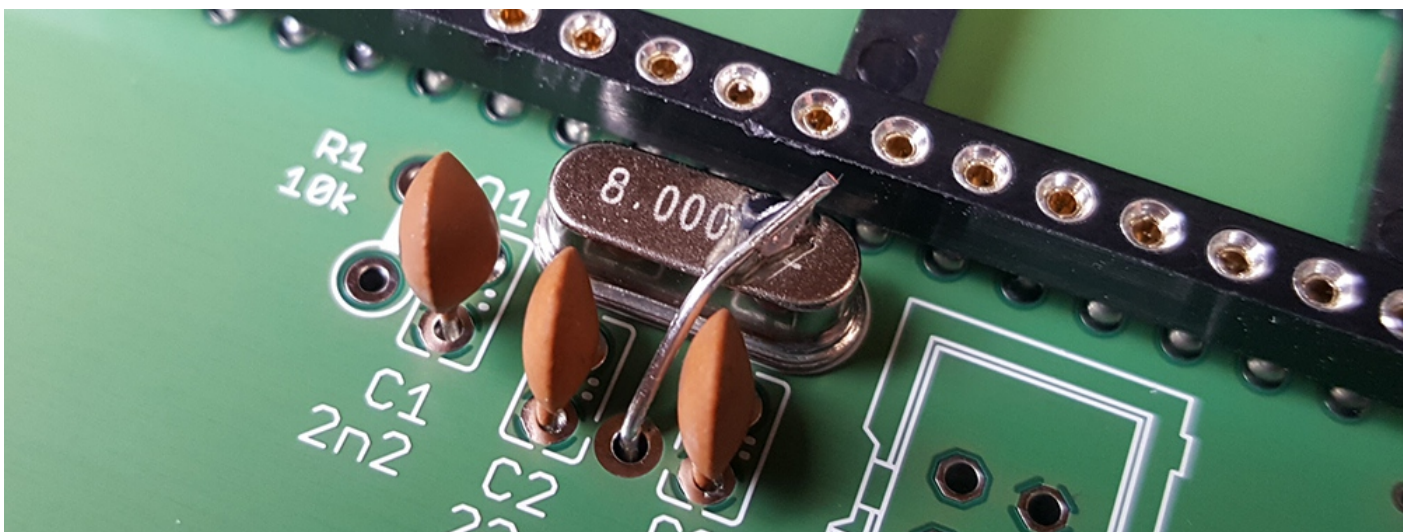


Crystal and inductor L1

The crystal is below the 40 pin socket, L1 is above (in the picture to the right and left of the socket). Both can be soldered either way, no polarity. For the crystal it is especially important to sit flat on the PCB.



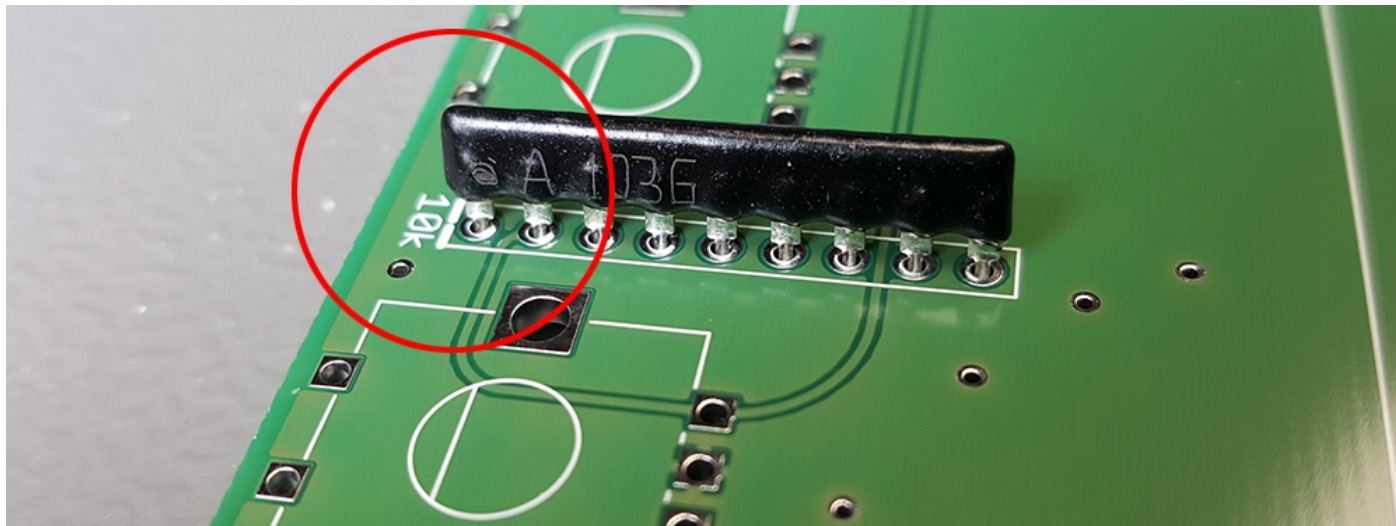
After both are soldered you should ground the crystal's case with one of the numerous wires you cut off in the meantime. There is a pad between C2 and C3. Put some wire in there, bend it onto one of the crystal's sides and solder it directly onto the crystal. Not too long, crystals do not like heat very much. The other side of the wire in the solder pad of the PCB also wants to get soldered of course.



Resistor array

Pitfall! Please pay extra attention here to place the resistor array the right way! There is a printed point on the part. This is the side which must fit the fat line of the silkscreen's rectangle where '10k' is printed.

A picture hopefully clears this up:



Potentiometers

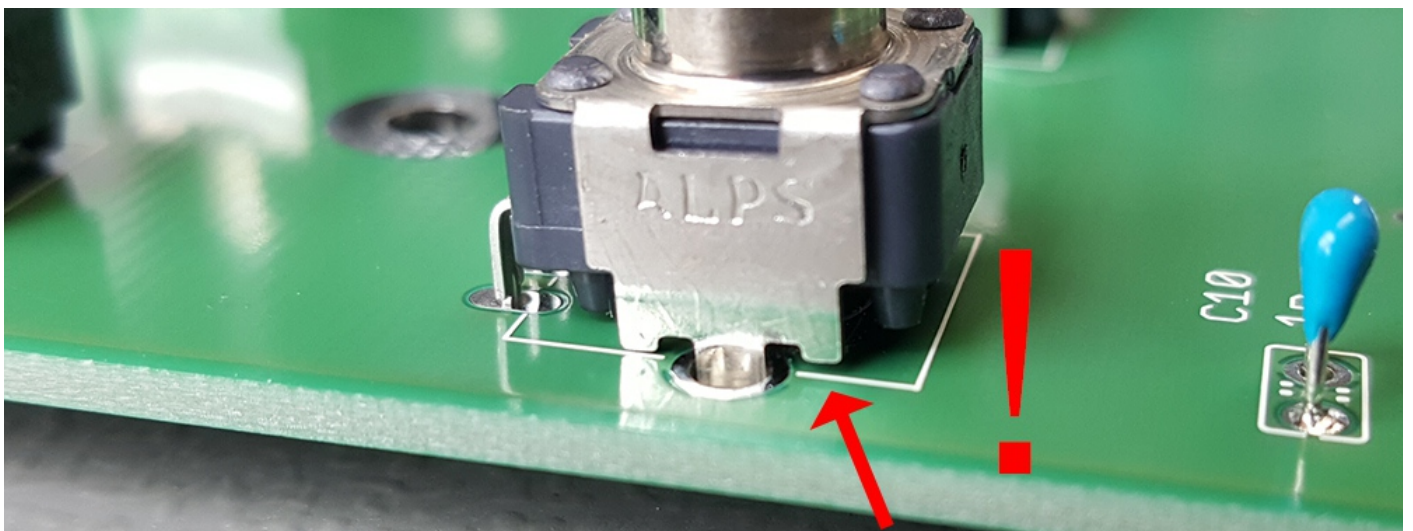
Now is the time for the 45 potentiometers. It's easier to put in all 45 pots altogether as the PCB sits much better on the table than.

Attention: there are some pitfalls here. To get a crooked pot out again is not much fun. Please do not solder them before having read the following!

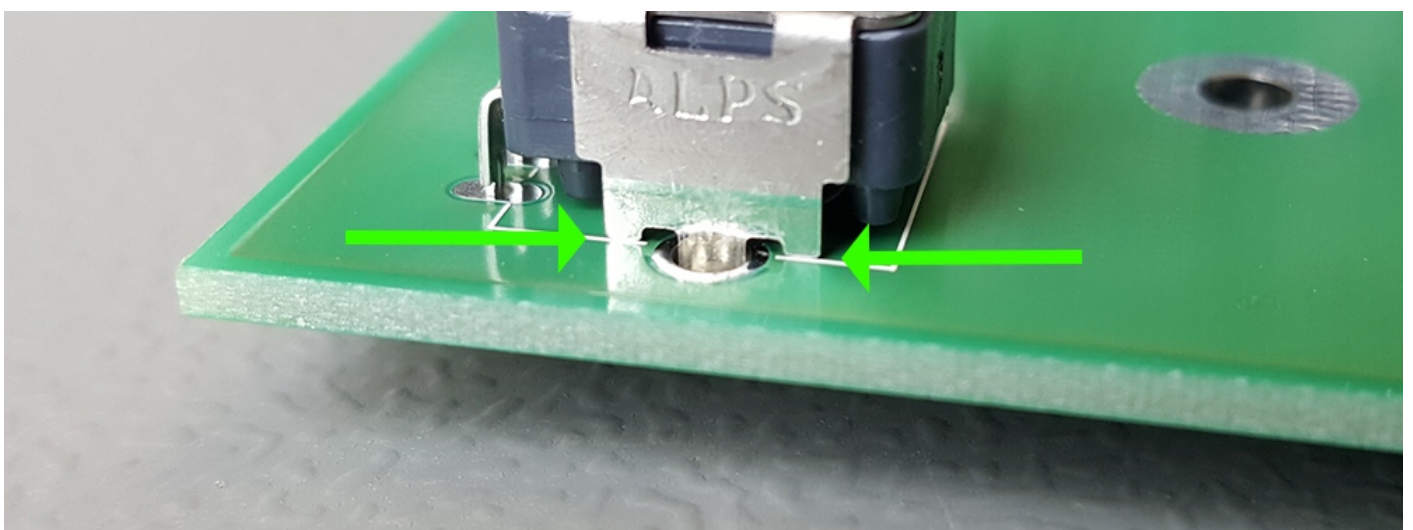
Pitfall 1: when putting them into position go sure the 3 contact pins find their holes. The legs can be slightly bent from transport. It sometimes happens when pushing a pot with a slightly bent leg into position, the leg gets bent even more when missing the drilling hole.

Pitfall 2: Even if you got the impression all pots are snapped in with their metal brackets, they still can tilt a bit. It's not unlikely the one or other pot is not perfectly aligned. You should check every single one of the 45 pots from both sides. We found it easiest to examine the end of the metal pins to touch the PCB (see photos). The pin and it's mirror on the PCB should be in touch.

NOT this way please:

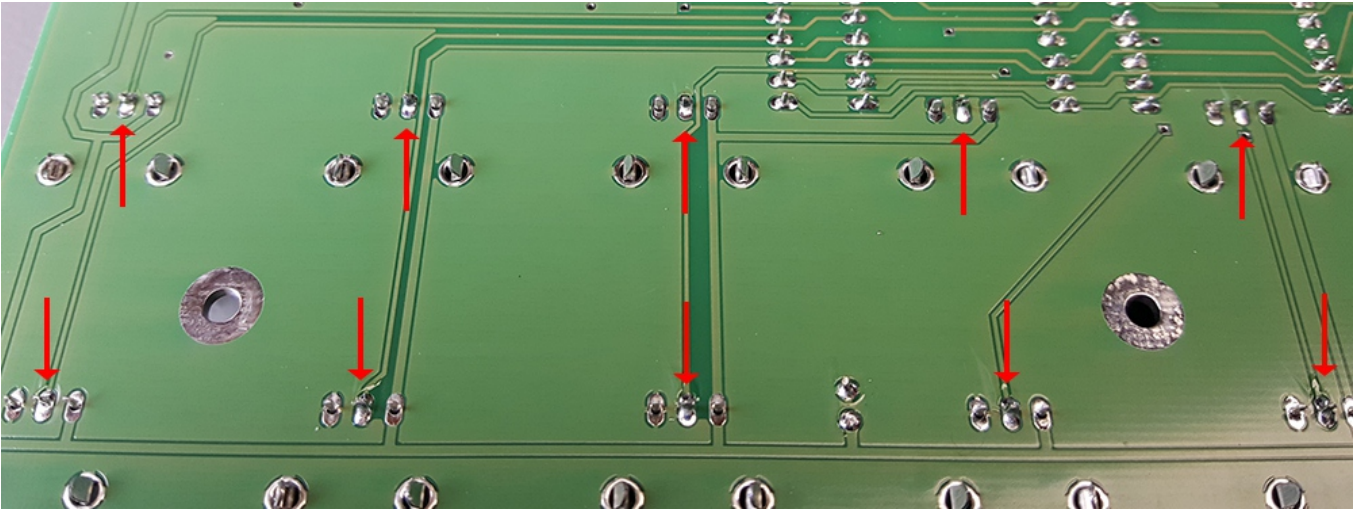


Yeah, looks much better:



Best practice:

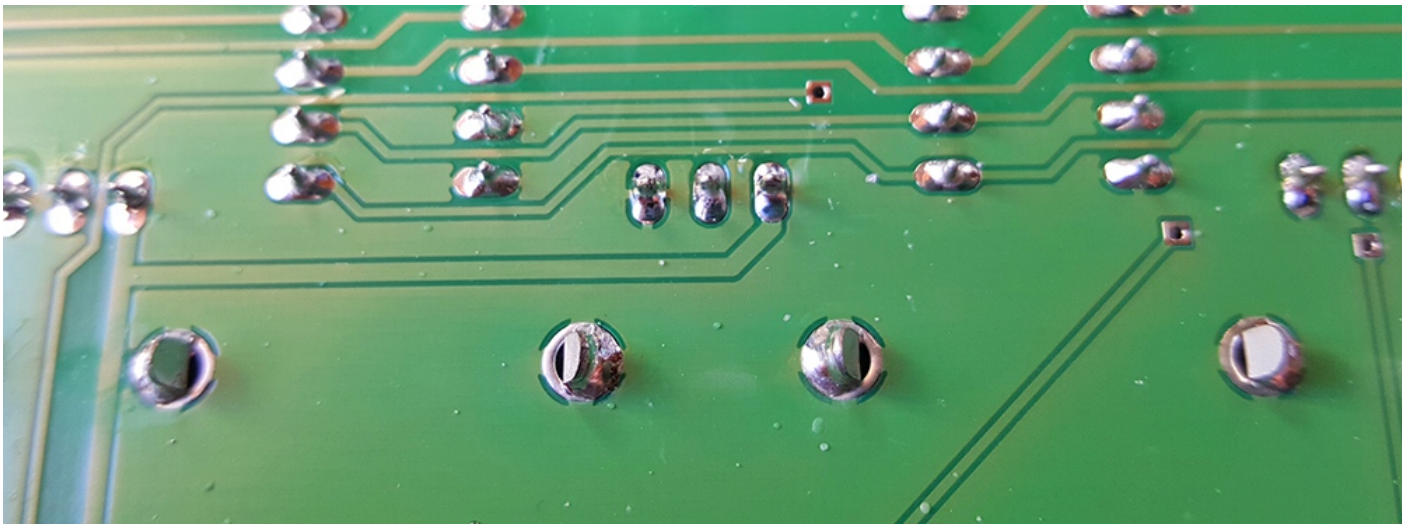
- align all pots as described above
- turn over the PCB and carefully put it on the table
- solder the middle pin for all pots:



Now they are kind of fixed although they still can tilt a bit. Now you can examine all pots once again, maybe one got tilted by putting the PCB on the table. If one must be corrected you simply can do that by just heating up this middle pin.

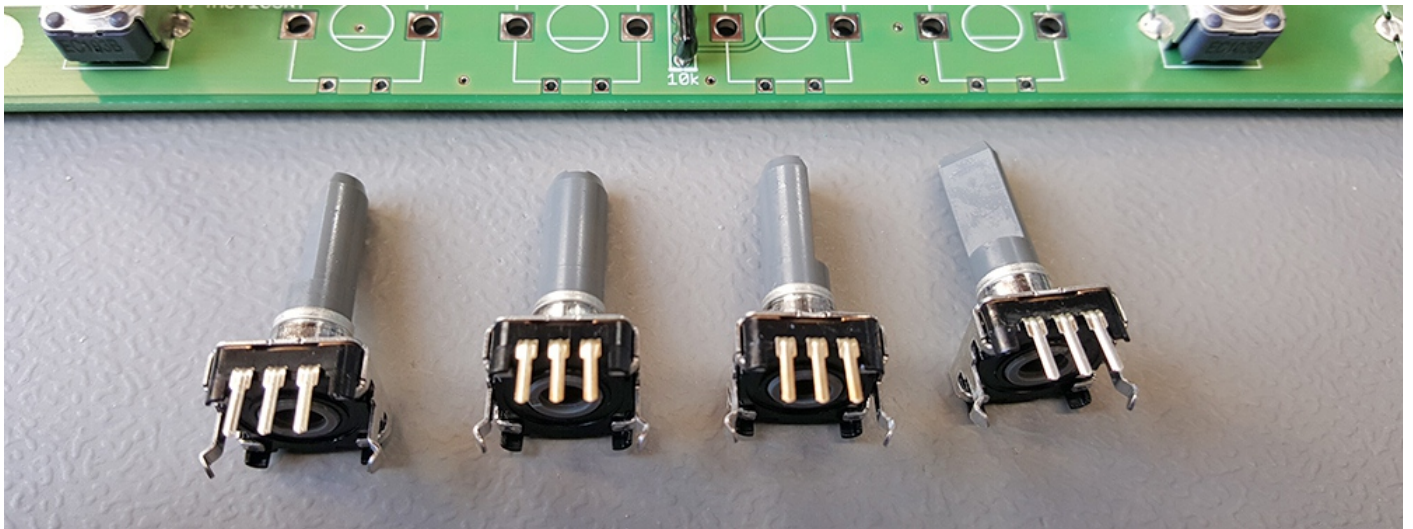
- We then solder the metal bracket
- At last both remaining pins

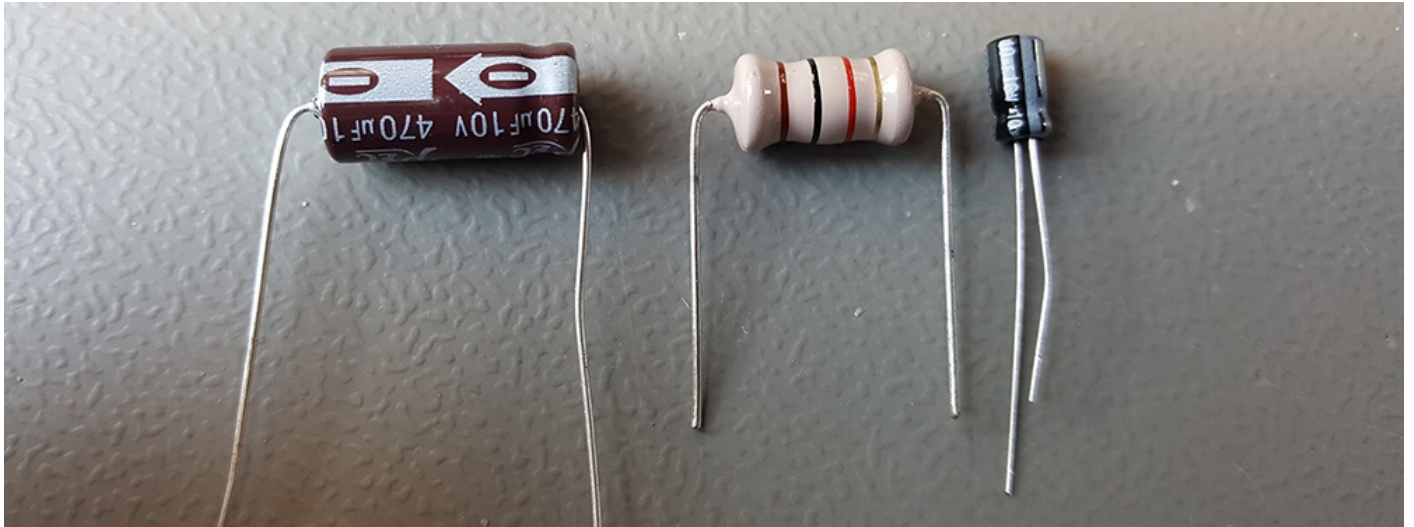
It's not necessary to flood the whole opening on the metal brackets with lots of tin. If the inside gets flooded like shown in the picture that is perfectly enough:



Encoder

Not much to say. Snap them in, check their position to be straight and solder all legs. The solder pins are quite small here.

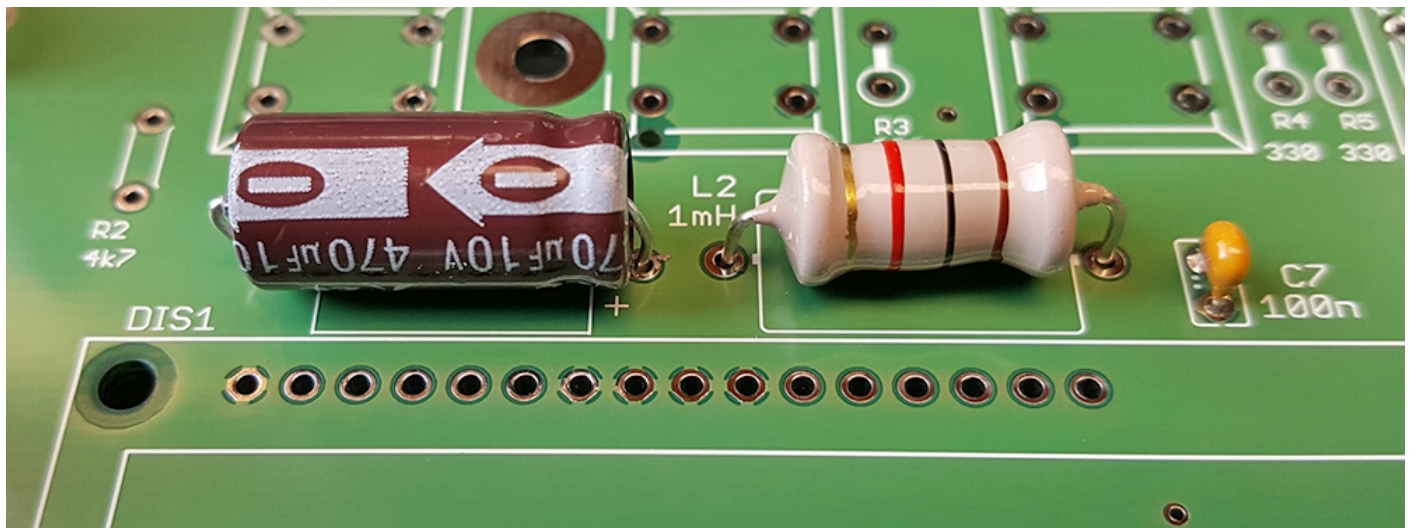


Elcos und inductor L2

Note: it might be easier to solder the big 470µ cap and L2 to the end after the display got soldered. There is more room for the soldering tip when soldering through the display connection row. If you got a fine soldering tip and a practised hand it's also perfect to keep the order we suggested in this manual.

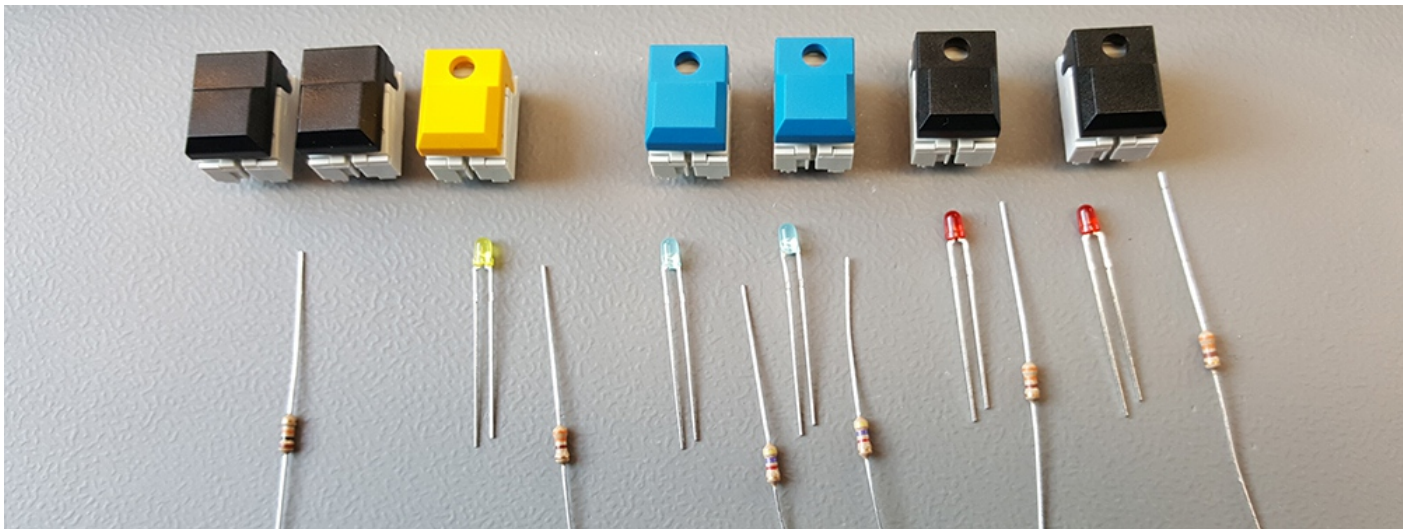
You already know the smaller 10µF cap from the power midi board. It is for position C6, mind the polarity! Long leg into the pad where the small + is in the silkscreen.

It's perfectly the same for the big 470µ capacitor. As the picture shows, the PLUS is to the right, so the minus leg should go to the left, in direction of the grey arrow mark. The inductivity L2 works in either direction. On both parts the legs should be bent tight down the housing for them to fit into their positions.



5. Main PCB – Bag C

On to bag C. It contains parts especially collected for your edition. Each edition got different button- and LED colors, as a consequence the resistors also are sometimes different.



10k resistor

You know this part already, ring colors Brown, Black, Orange, Gold. It's the same throughout all editions but we wanted to have all resistors for the main PCB in one bag. It comes into position R1 near the 40 pin socket.

LED colors and their resistor values

The Synth Programmer's Editions all in all have 3 LED colors: red, blue and yellow. Red and yellow LEDs always get a 330 Ohm resistor – colorcode Orange, Orange, Brown, Gold. The blue LEDs have a 4,7k resistor – Yellow, magenta, red, gold. In the following we provide button and LED colors for all editions as well as the resistors:

Matrix

- 'Request' & 'Compare' – Button black without LED
- 'Chord' – Button red, LED red, R7=330 Ohm
- 'Matrix' – Button blue, LED blue, R2=4,7 kOhm
- 'Rnd/Mlt', 'Peek', 'Prefs' – Button black, LED red, R3/R4/R5=330 Ohm

Microwave

- 'Request' & 'Compare' – Button red without LED
- 'Chord' – Button red, LED red, R7=330 Ohm
- 'Matrix' – Button blue, LED blue, R2=4,7 kOhm
- 'Rnd/Mlt', 'Peek', 'Prefs' – Button black, LED red, R3/R4/R5=330 Ohm

80

- 'Request' & 'Compare' – Button black without LED
- 'Chord' – Button yellow, LED yellow, R7=330 Ohm
- 'Matrix' – Button blue, LED blue, R2=4,7 kOhm
- 'Rnd/Mlt' – Button blue, LED blue, R2=4,7 kOhm, **R3=4,7 kOhm**
- 'Peek' & 'Prefs' – Button black, LED red, 330 Ohm

Attention in Edition '80': R3 will be populated with 4,7k due to the blue LED in the UPPER button ('Rnd/Mlt') although the silkscreen sais 330!

Pulse

- 'Request' & 'Compare' – Button black without LED

- 'Chord' – Button black, LED red, R7=330 Ohm
- 'Matrix' – Button blue, LED blue, R2=4,7 kOhm
- 'Rnd/Mlt' – Button black, LED red, 330 Ohm
- 'Peek' & 'Prefs' – Button red, LED red, 330 Ohm

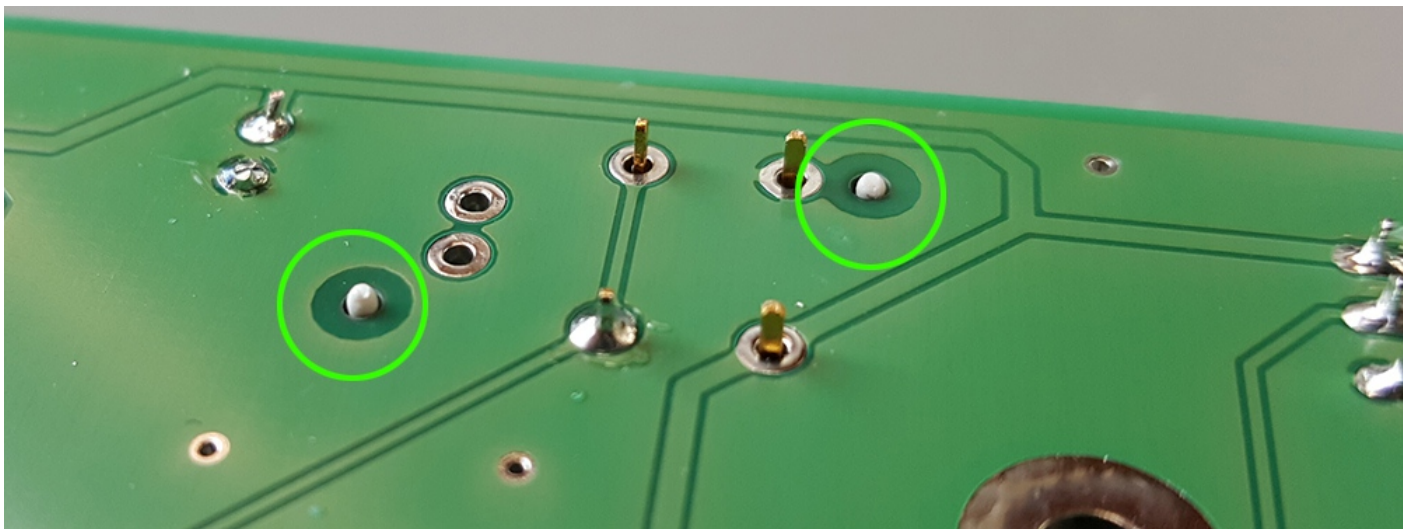
Chroma

- 'Request' & 'Compare' – Button black without LED
- All other buttons black, LED red, resistors all 330 Ohm

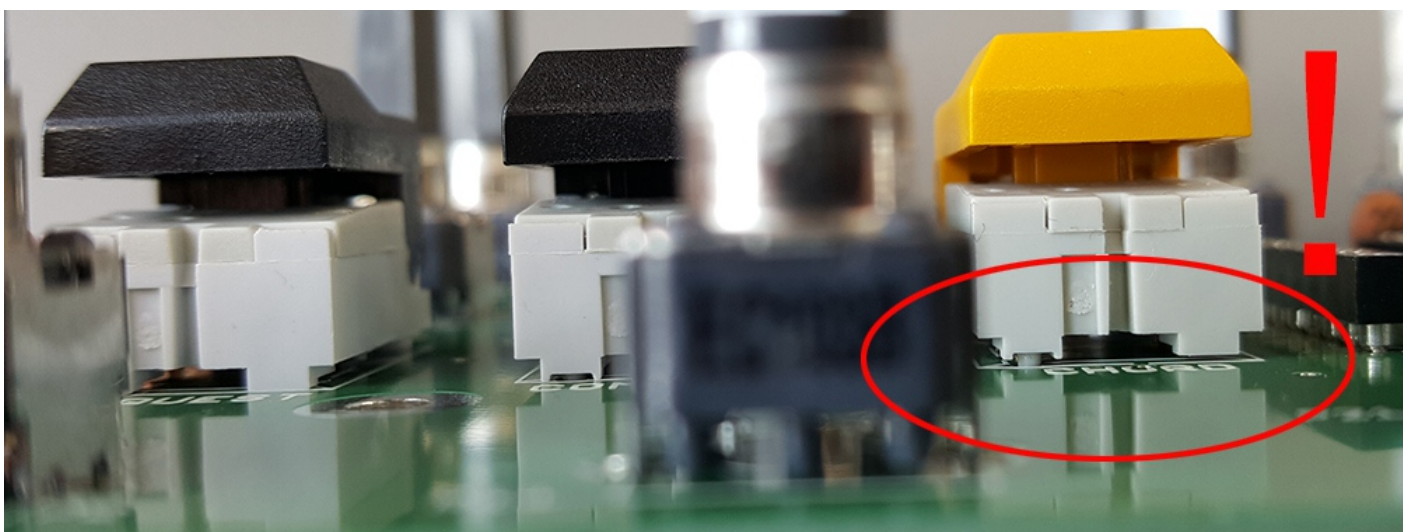
The resistors should not make any problems. Place part, bend legs, solder wires, cut wires.

Now on to the buttons. We solder the buttons without LEDs, the LEDs can be pushed into the buttons easily after they are soldered on the PCB.

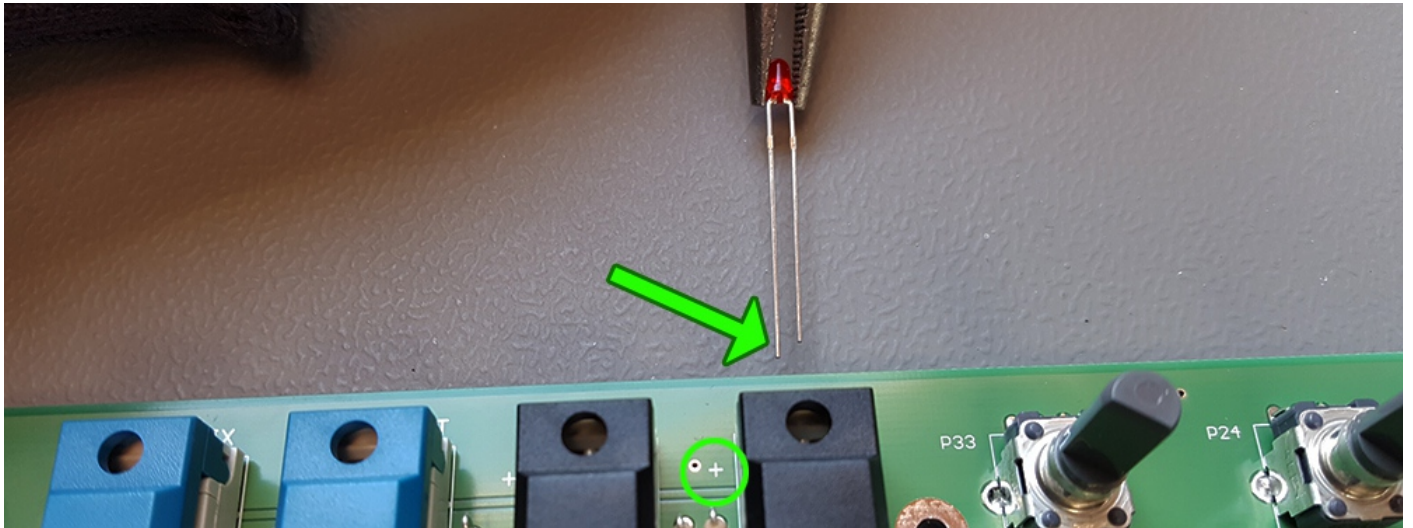
It's the same as with the pots. The buttons tend to sit in their positions not perfectly flat. The old trick also works here: solder just one leg, turn PCB and examine all edges. Correct position if necessary by heating up the solder mark. Then solder the rest of the legs. There is another help: the buttons got 2 plastik pins going through PCB drills. They help to evaluate from the solder side if the button sit right or not.



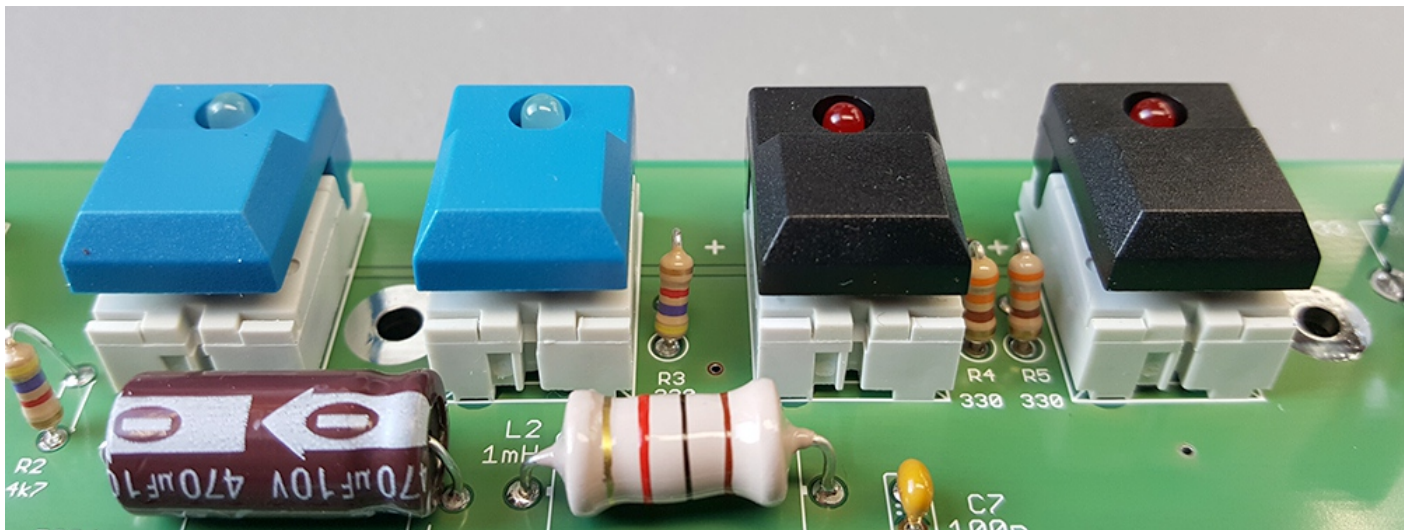
It's never wrong to double check. An example of a button sitting bad is shown in the photo:



After the buttons you can push the LEDs into position. **Attention – mind the polarity!**
To the left of the button near the LED you find a little '+', this is the side for the longer LED leg to go.



Note: the blue LEDs are a bit longer than the red ones, it's perfectly normal they stand out ½ mm more.

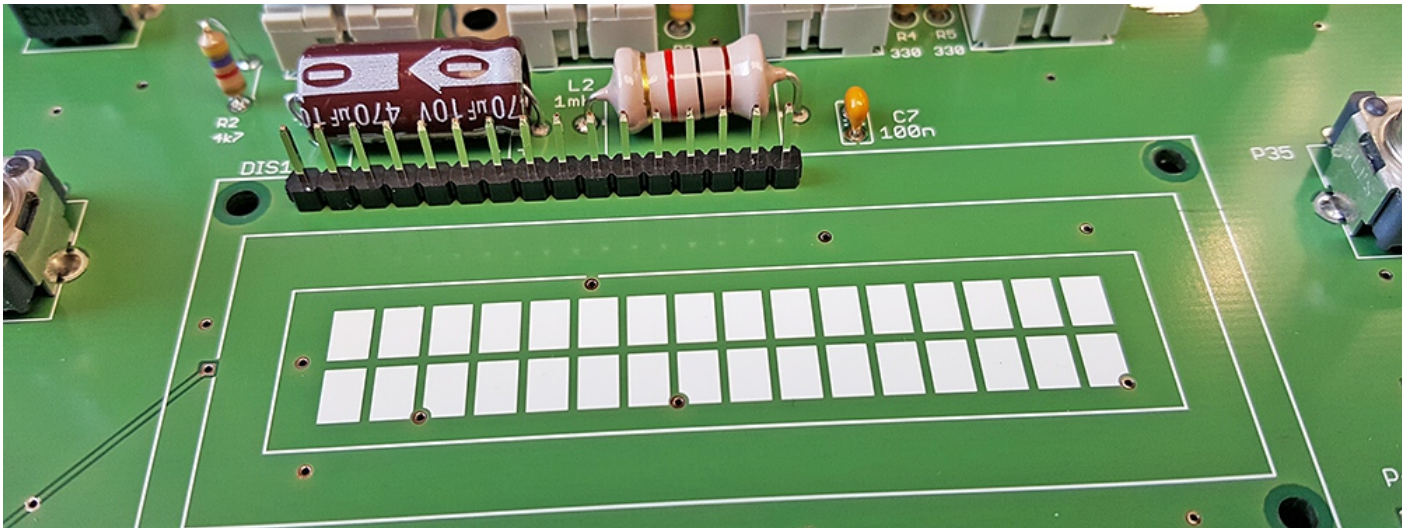


Display

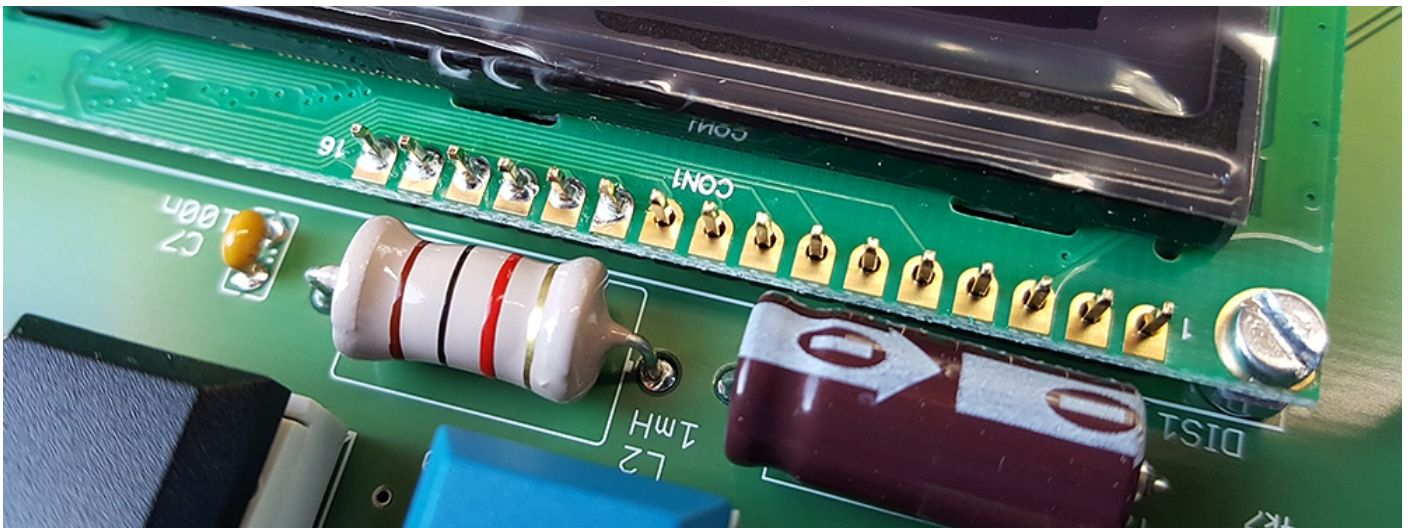
The last chapter – the display. Please leave the display's protection foil into place until the whole PCB is screwed into the case in the last chapter.

The display comes last as it is the most sensitive part. It would be a pity if by accident you would scratch the screen with the soldering iron or a pliers. **Please handle the display with care and grab it on the edges if possible. You don't want to scratch off some of the exposed SMD parts on the backside of the display.**

The display is already prepared with 4 screws with distance nuts to make it easier for you. Provide the contact row with the longer pins pointing away from the PCB.



Position the display and attach it with 4 safety nuts from the other side. Not TO tight – as the securing nut touches the PCB and you feel a little resistance it's enough. Turn the PB for the display to look towards you, the contact row should fall on the PCB by gravity. Now you can solder the contact row of the display. The display's pads and the contact row are gold plated and very well to solder. As you can see in the picture it is not necessary to flood the whole pin or make a fat tin bubble.



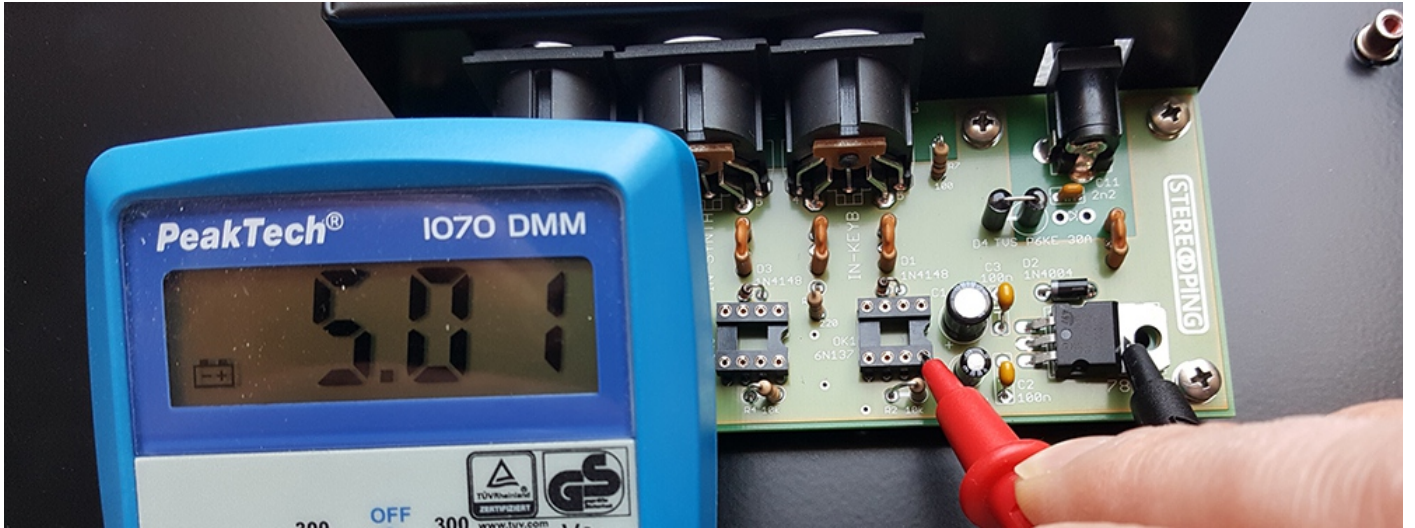
Turn over the PCB and solder the other side of the contact row.

Bag C should now be empty. Time for the finish.

6. Checking voltage and getting everything together

Checking voltages

Before putting the ICs into position we should check the 5V to be ok. Screw the Power Midi board into the lower half of the case and plug in your power supply. The Multimeter's black power cable can be held onto the metal part of the 7805 regulator. The red cable will be held to pin 8 of one of the optocouplers. You should get 5V here.



Now connect the main PCB with the flat cable to the Power Midi board. Be sure to use the right cable plug onto the right connector. Although you can not do any harm technically, the cable fits better in one direction than the other. It should point away from the Power midi PCB as shown in the picture to the end of this chapter.

Pin 16 of the Multiplexer sockets should also provide 5V. It's enough just to test one point.



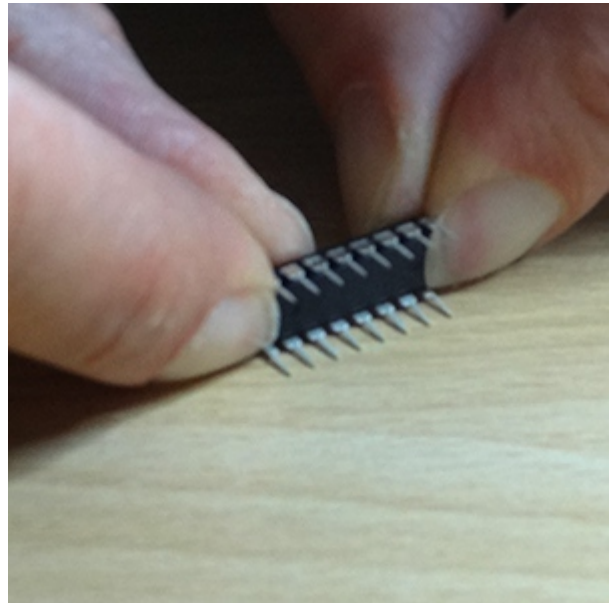
ICs plugging

Please remove the power supply as we place the ICs now into position. Coming from factory, the IC's legs often are bent much to wide to fit the sockets You need to bend them together a tiny bit.

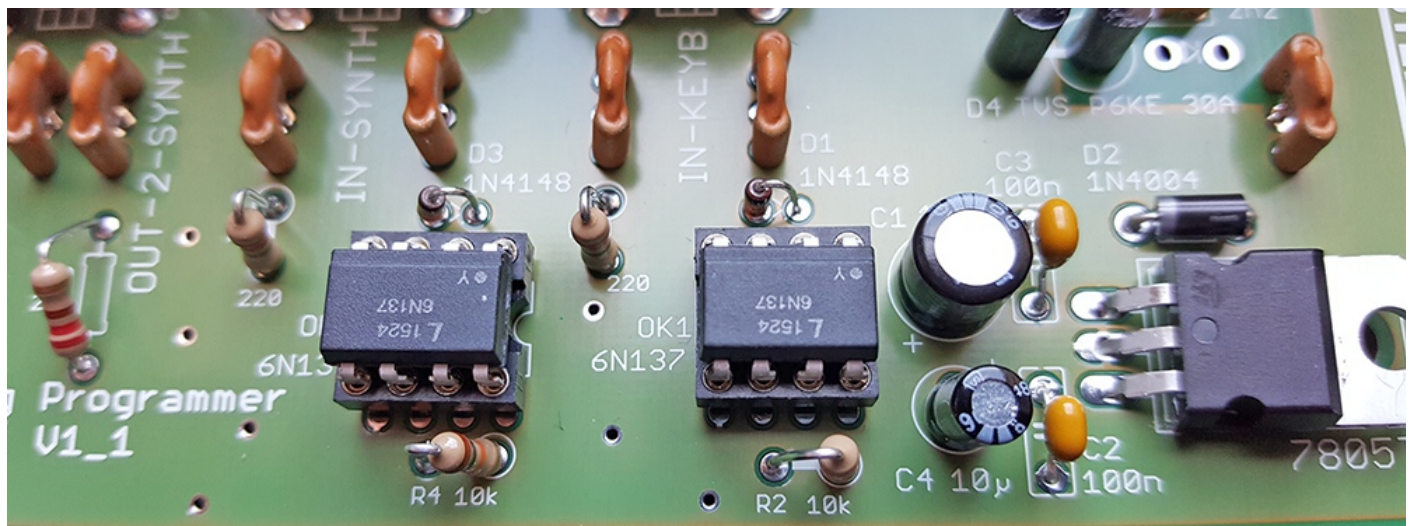
If the IC's legs do not fit, one or more legs could be bent completely crazy or break apart while pressing the IC into it's socket!

To match the IC's legs with the socket's holes you can do the following: grab the IC with both forefingers and thumbs from the top on it's short sides. Then press it on the table with the complete leg row and bend the whole leg row a bit inside by twisting the IC carefully away from you. Try to not only bend the thin part of the leg, bend the WHOLE leg which starts directly at the devices body.

When pushing them into the sockets mind the orientation and push them in the whole way down. On the main PCB the orientation is quite clear: all 16-pin ICs got their indentation towards the top edge of the PCB. The big MPU got it's marking to the left with the sticker's text running normally from left to right.



On the Power Midi board the ICs are sitting upside down:



Screwing the main PCB

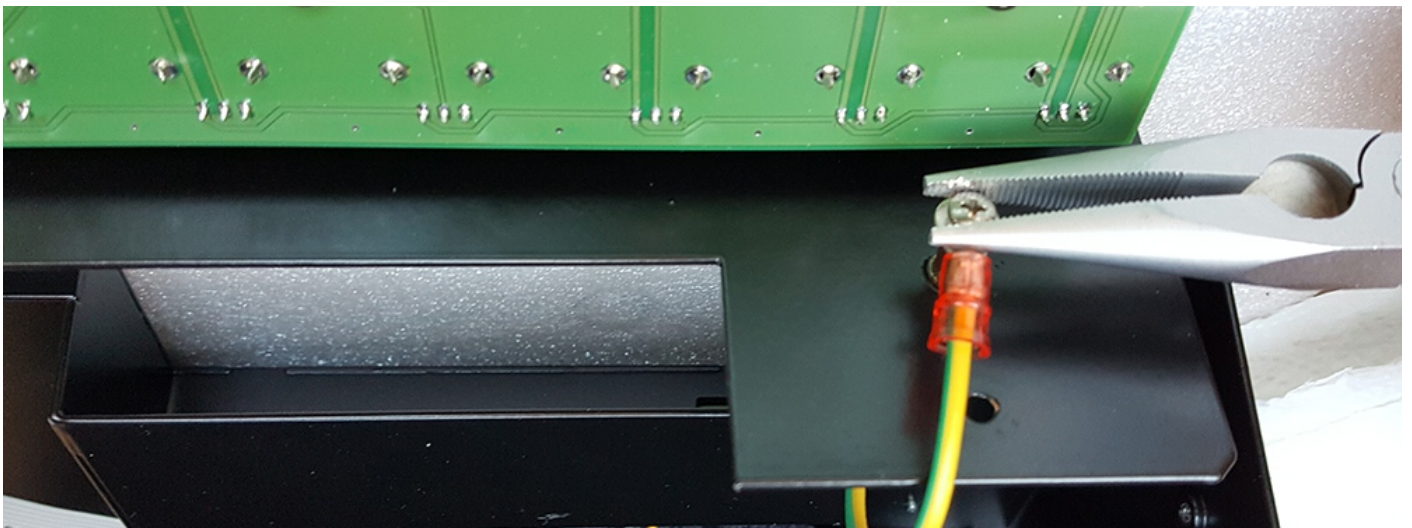
Before screwing the main PCB into the upper half of the case you should peel of the protection foil from the display. Also inspect the inside of the transparent part of the faceplate. It might have happened there is some dust which you would see later. If you got some airspray you can blow it off. A vacuum cleaner will also do. What we can not recommend is trying to blow the dust off with your own breath, especially after having eaten dry cookies

Screwing the ESD-cable

The ESD-cable is kind of a lightning rod – it connects upper and lower case part to deflect static charge to the power supply jack for protecting the electronics. Put one of the chopper discs between o-connector and screw.

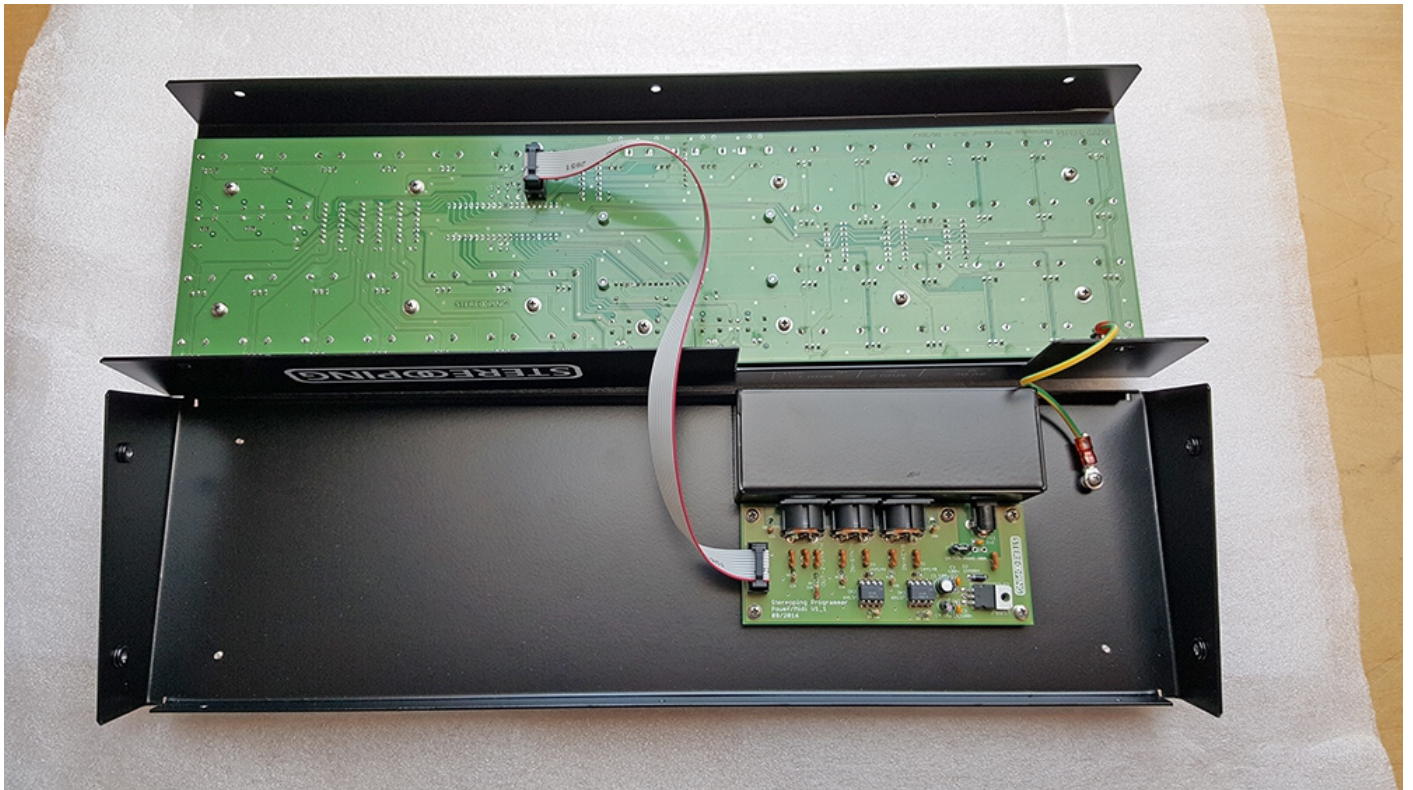


The ESD-cable screw of the upper case is a bit more difficult as the opposing case wall is in the way when trying to use a screwdriver. It's easier to fix it with a pliers as shown in the picture.



Finish

This is how it should look now:



Now you can put both halves of the case together. Mind the ESD and the flatcable to fold nicely together when attaching the upper half. It would not be good if one or both got clamped between the case parts.

Concrats, that was it. You are the greatest :-)

Firmware upload

Now we blow some life into the device by uploading the firmware. The firmware files are free to download on the Stereoping website. Use one of the free SysEx-dump tools like e.g. 'MidiOX' on PC or 'SysEx Librarian' for Mac.

- Switch off the Stereoping Programmer
- Connect **MIDI OUT** of your Midi-Interface directly to the jack **MIDI 2 IN** of the Programmer using a short cable of good quality
- There are some preferences in most SysEx-Dump Programs like 'Delay between Buffers' or 'Delay after F7'. Please choose something around 100mS (Milliseconds) here.
- Hold the first button of the row of 4 above the display. Power up your Programmer. The Display should read '*BOOTLOADER V1.0 - OS to MIDI IN 2 ...*'
- Load the new Firmware into your SysEx-Dump Program and send it out
- The display shows OS-Version and progresst. After about 2 minutes the Programmer restarts
- If you will get an error on the screen please try another cable or increase the delay mentioned above.

7. Imprint

Stereoping is a registered trademark of Gregor Zoll, Germany.

Adress Gregor Zoll Musikelektronik
Hermann-Voss-Str. 21
59872 Meschede
Germany

E-Mail hello@stereoping.com

Homepage <http://www.stereoping.com>