TS500 Assembly guide

Safety warning

The kits are main powered and use potentially lethal voltages. Under no circumstance should someone undertake the realisation of a kit unless he has full knowledge about safely handling main powered devices.

Please read the "DIY guide" before beginning.
Print or open the following documents :

- TS500 Schematics
- TS500 Components layout
- TS500 Parts list
- TS500 Setup guide

Follow this guide from item number 1 till the end, in this order. The assembly order is based on components height, from low to high profile, in order to ease the soldering process : The component you are soldering is always taller than the previously assembled ones and it is pressing nicely against the work area foam.

Soldering

All the PCB holes are metallized. It means the connection between the top and bottom pads is already done. The parts must be soldered only from below (unless differently stated).

Use only small diameter solder, 0.5 or 0.7 mm, 1mm maximum. Use the minimum possible amount of solder. Bad joints are almost always caused by too much solder.

Cut the component leads and pins totally flush with the PCB after soldering. A too long tail could create an electric connection with the side plate.

Here are two excellent introduction to soldering videos:
http://www.eevblog.com/2011/06/19/eevblog-180-soldering-tutorial-part-1-tools/
http://www.eevblog.com/2011/07/02/eevblog-183-soldering-tutorial-part-2/

TS500 Assembly guide – Main PCB

1. Diodes

Start by D1 and D2. Then add D3, D4, D5, D8, D9 and finally D6, D7. Use a lead forming tool to bend the leads at 0.4".

Warning : Make sure to respect the direction of the diodes which is marked by a ring on the component and a double line on the PCB marking.

D1 and D2 are Zener diodes and must not be confused with the 1N914. They are in a group of 2 while the 1N914 are a group of 5 in the kit.

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2. Resistors – (1)

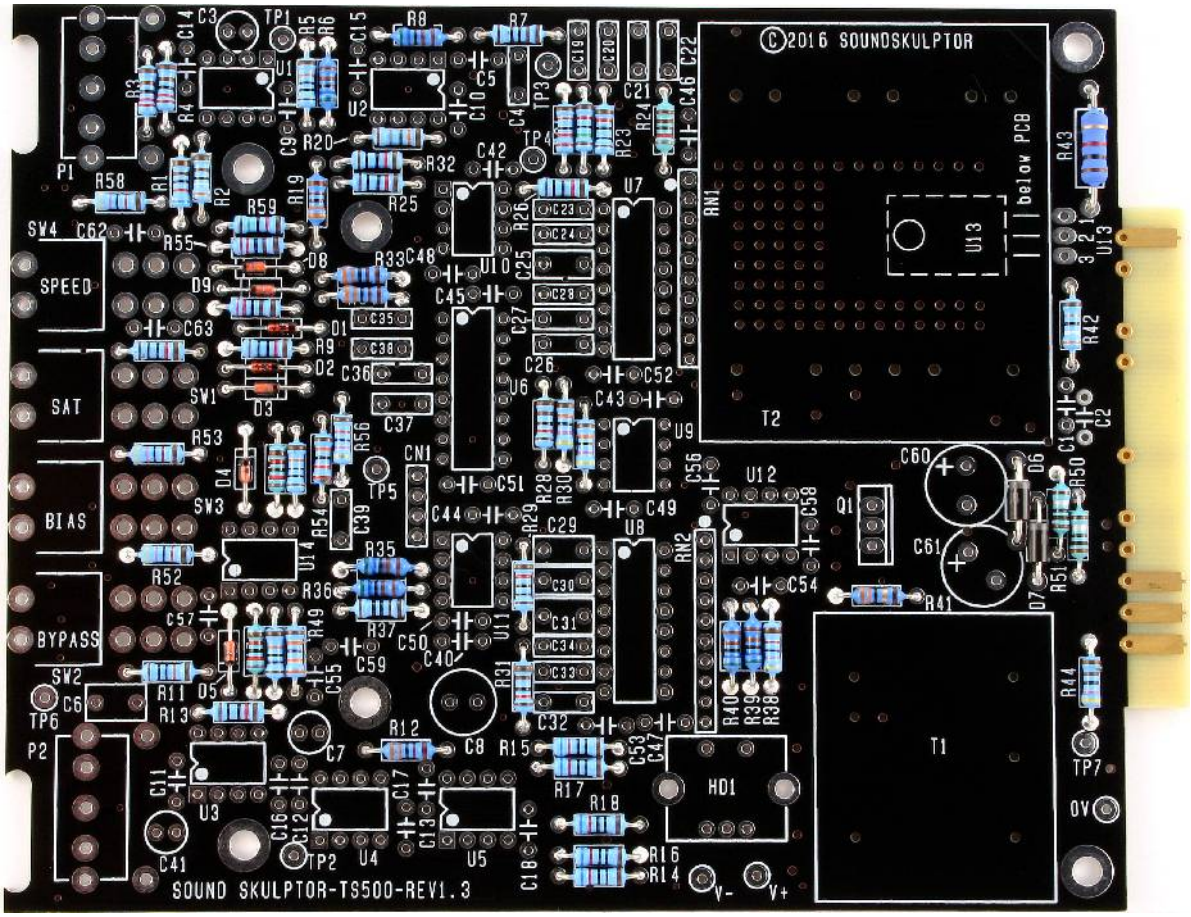
The best method to select and install the resistors is the following:
1. pick a row of resistors in the resistors bag,
2. Measure one of the resistors with your DMM,
3. Look up the parts-list PDF for the closest value,
4. Check the color code and quantity for confirmation,
5. Use the search function on the Layout PDF page with the resistor value: All the corresponding resistors are highlighted,
6. Insert and solder.

(You can use the same method later, for the capacitors)

3. Resistors - (2)

Add R1 to R59. Control the resistor values with a digital multimeter. Bend the leads at 0.4" with a lead forming tool, except for R43 which is bent at 0.6".

Warning : It is very important to check the resistors value with a DMM because the colour code can be ambiguous. For example 1K (brown-black-black-brown-brown) can be confused with 110R (brown-brown-black-black-brown).

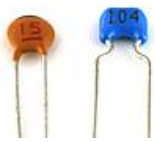


4. IC Sockets

Insert and solder the ten 8 pins sockets and three 16 pins sockets.

Warning : Make sure to respect the socket direction, marked by a notch.

TS500 Assembly guide – Main PCB



5. Ceramic capacitors

Add C54, C1, C2, C5, C40, C55.
Add C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C56, C57, C58, C59, C62, C63.

6. Resistor networks

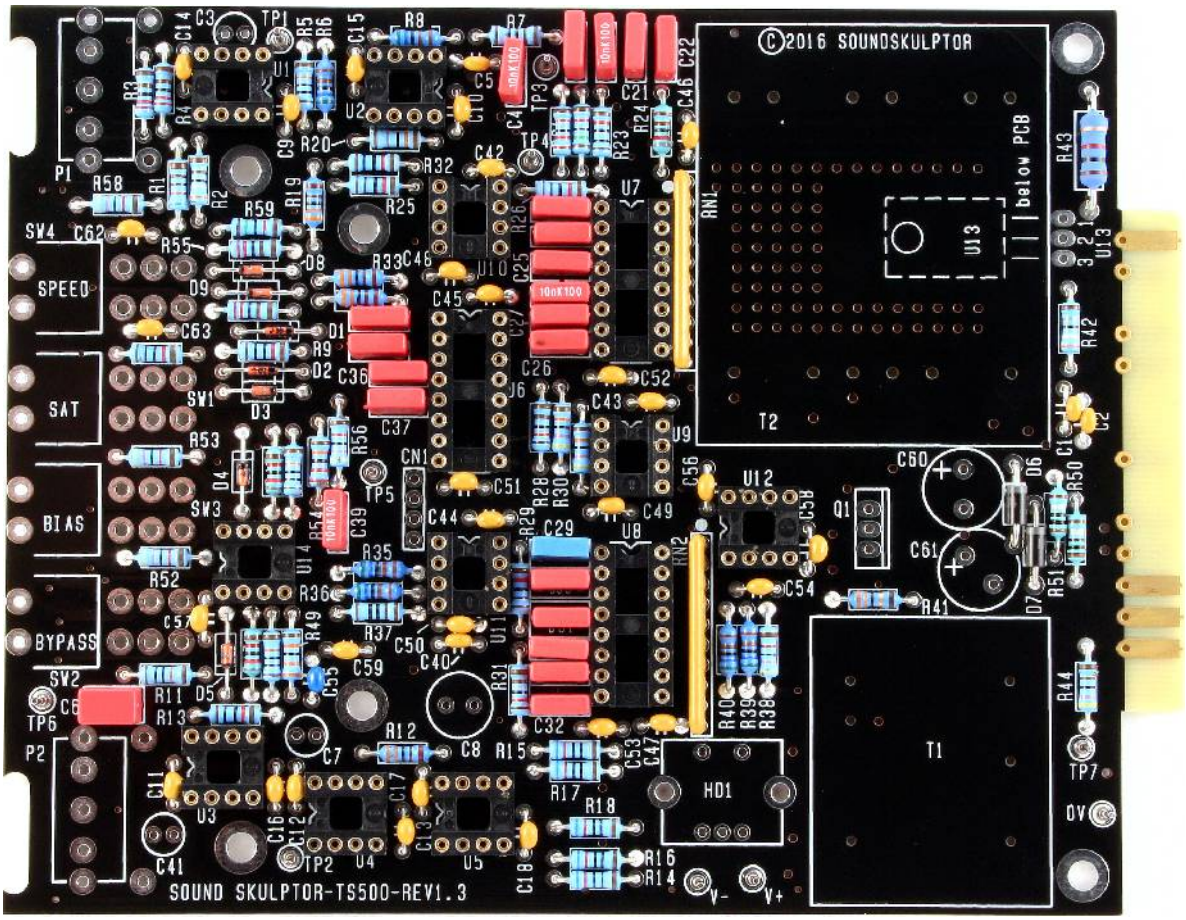
Add RN1 and RN2.
Warning : the resistor networks are polarized and must be mounted in the right direction identified by a dot on the resistor network and a dot on the PCB.

7. Test pins

Solder the 10 test pins TP1 to TP7, V+, V- and OV.

8. Film capacitors

Add C35, C22, C36, C37, C21, C38, C27, C4, C20, C28, C39, C26, C33, C19, C34, C24, C32, C25, C23, C30, C31, C29, C6.
Warning : Be very careful to place the right caps in the right places because once soldered, it is impossible to read their value.



9. Connector

Add CN1. Solder one pin, check verticality then solder the other pins.

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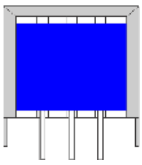
10. Non polarized electrolytic capacitors

Add C3, C7, C41, C8.
These caps are not polarized and can be inserted in any direction.

11. Polarized electrolytic capacitors

Add C60, C61.
Warning : The +lead must go into the +hole. Do not reverse (they may explode !)

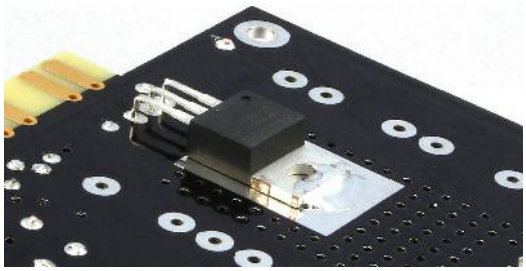


12. Tape head simulation coil

Insert and solder HD1

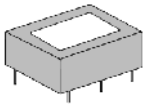
13. U13

U13 must be installed *on the back* of the PCB. Bend the leads at the correct distance and insert the part flat on the PCB. The U13 body must rest entirely on the shiny metal. Solder leads.
Now solder the metal tab to the PCB. Start by heating the metal tab any apply solder to it until the solder flows down to the PCB.



14. Switches

Add SW1 to SW4. The position of the switches is critical for a good front-plate matching. They must sit flat on the PCB. Press firmly the switch on the PCB and solder one of the front pins (housing). Check verticality and horizontality. Then solder the other pins.



15. Input transformer

Insert and solder the input transformer.

16. Potentiometers P1 & P2

Place the bracket on the potentiometer bushing, and attach it with the lock washer and nut. Tighten. Insert potentiometer and bracket into the PCB holes. Solder the central potentiometer pin. Now check that the potentiometer shaft is perfectly parallel to the board.

Warning : Do not only rely on the bracket being flat on the PCB, it sometimes need little visually made adjustments to get a perfect position.

Warning : The two potentiometers have the same Ohmic value but P1 is linear and P2 is logarithmic.

Once the position is correct, solder the other pins.

17. Power transistor Q1

Mount Q1 on the heatsink with a M3x6 mm screw and a self locking nut.
Insert Q1 and solder one pin. Check the verticality then solder the other pins.

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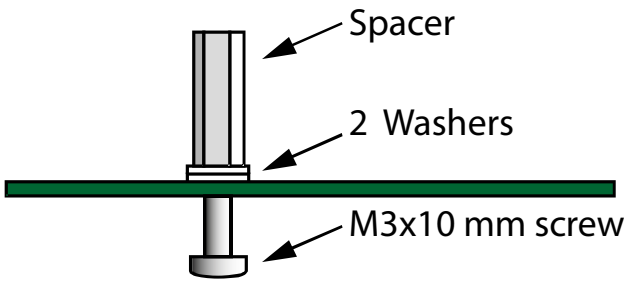
18. Output transformer

Insert and solder the output transformer.

19. Gain reduction meter spacers

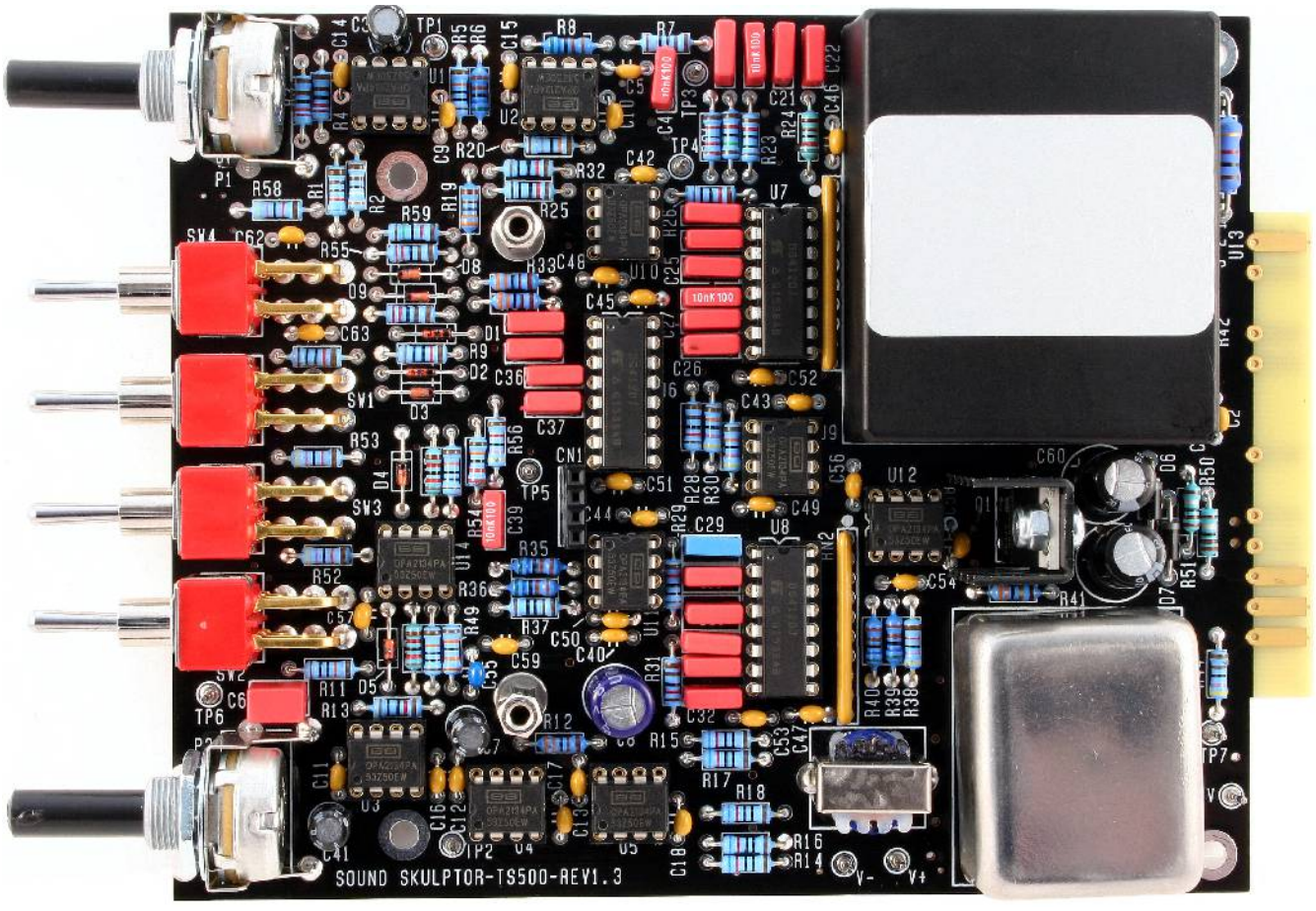
Insert a M3x10 mm screw from below PCB, add two metal washers and the 20mm spacer.
Repeat for the second spacer.



20. IC's

Insert U1 to U12, U14 into their sockets. It is necessary to bend the pins slightly inward before inserting.

Warning : Make sure to insert the IC's in the correct direction which is identified by a notch.



21. Visual check

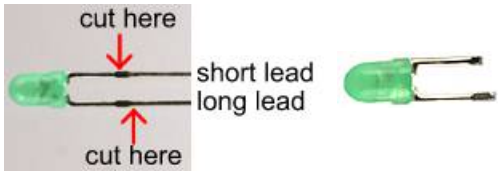
Brush the solder side with a hard tooth brush to remove any remaining solder bits.

Make a full visual check. Any missing component on the board ? Any remaining component in the box ?

When everything looks correct, proceed with the meter PCB assembly.

TS500 Assembly guide – Meter

1. LEDs

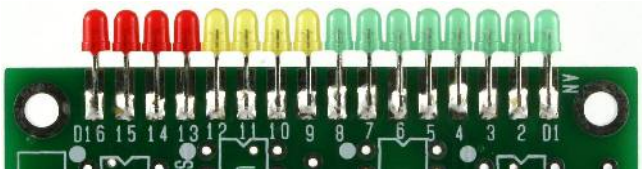


For each one of the 16 LED's cut the short leg (cathode) at 5mm from body and cut the long leg (anode) at 6mm.

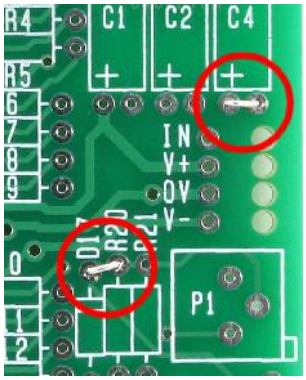
Then insert the first green LED on the PCB, long leg (anode) on top. Make sure that the leg is perfectly parallel to the pad. Solder the anode but leave the cathode free for now. The position is still easy to adjust until both legs are soldered.

Insert and solder the next LED and repeat until the 16 LEDs are in position.

Make a last visual check and correct LED's that are not perfectly lined up, then solder the cathodes on the PCB back side.



2. Straps



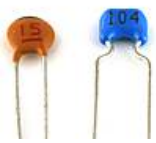
Solder the 2 straps indicated in red on the layout schematic. Use resistors leads that were previously cut.

3. Resistors

Add R1 to R23.
The resistors marked NC in the parts list are not installed.
Control the resistor values with a digital multimeter. Bend the leads at 0.4" with a lead forming tool.

4. Integrated Circuits

Insert U1, U2, U3 and U4 and solder. You will need to bend the pins slightly inwards before inserting.
Warning : Make sure to respect the IC direction, marked by a semi-circular notch on the IC and a dot on the PCB.



5. Ceramic capacitor

Add C3.

6. Trimmer potentiometer

Add P1.

TS500 Assembly guide – Meter

7. Regulator IC's

Add U5 and U6. Press the IC's down as far as possible in order to keep the components height low.

Warning : Watch out the IC direction.

8. Electrolytic capacitors

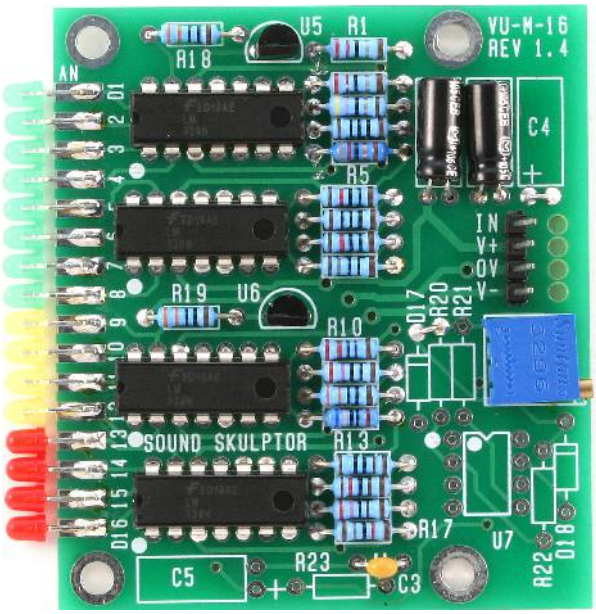
Add C1, C2, flat on the PCB.

Warning : The +lead must go into the +hole. Do not reverse (they may explode !)

9. 4 pins connector

Solder the 4 pins connector. Solder one pin first, check verticality, then solder the other pins.

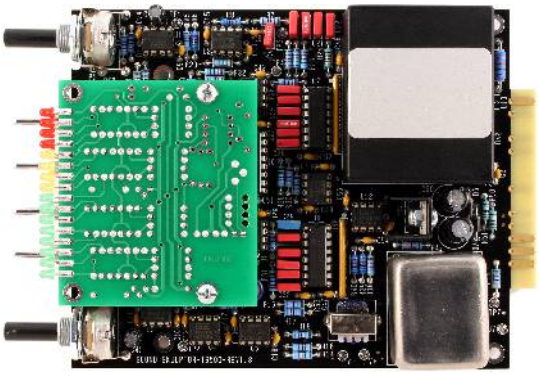
Warning : the connector pins must be exactly perpendicular to the PCB to allow proper insertion into the TS500 board.



TS500 Assembly guide – Final assembly

10. Meter assembly

Insert the meter connector into the corresponding socket and attach on the two 20mm spacers with two M3x6 screws.



TS500 Assembly guide – Final assembly

11. Front panel and Side plate assembly

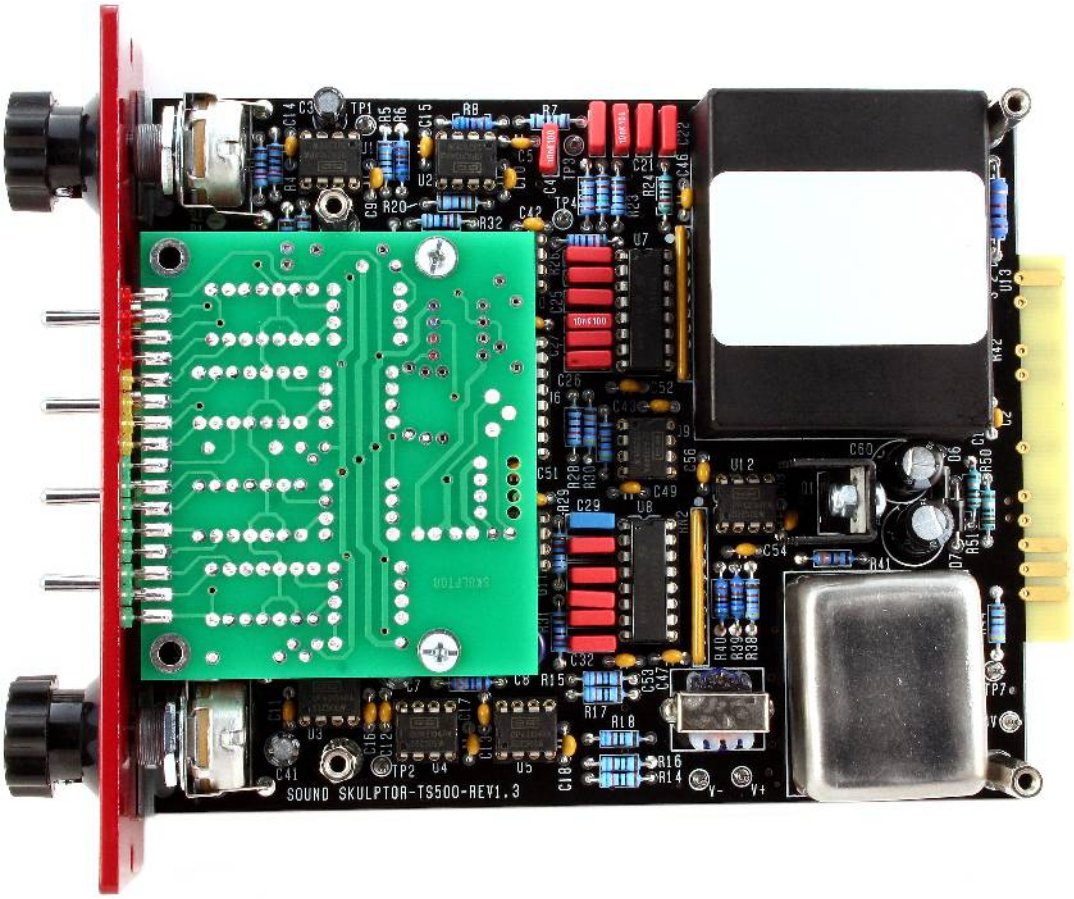
Attach the side panel to the front plate with two M3x6 black countersunk screws.

12. PCB assembly

Put the PCB in place, switches and pots going through the front panel. Attach the PCB with 4 M3x25mm spacers and 4 lock-washers.

13. Knobs

Attach the 2 knobs to the 2 potentiometers.



14. Test and setup

It is time for test and setup. Follow instructions on TS500-setup-guide.pdf.

15. Closing

Attach the cover PCB with four M3x6 countersunk screws.

16. Congratulations !

You're done !