attention | disclaimer

This project is presented as artwork, and is solely intended as such.

build at your own risk

this pdf is for information purposes only

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Due to the high voltages and possibilities of human error, e-licktronic or HECKEL Vincent hereby assumes no liability for injury/damage/loss which might unintentionally occur

SAFETY WARNING

RISK OF ELECTRIC SHOCK

This kit is main powered and uses potentially lethal voltages. Under no circumstance should someone undertake the realization of a kit unless he has full knowledge about safely handling main powered devices.

What skills are needed?

Meticulous care is the first skill you will need to build one of those kits. One single component that is not in the right place, in the right direction, one single solder joint that is deficient and the whole thing won't work! So, the secret to success is simple: follow the assembly guide down to the letter and **triple check all your moves**.

Good soldering practice is also needed. Your boards will be as weak as your weakest solder joint. So, this is very important. But it is easy to learn. If you have no soldering experience, start practicing with a piece of Veroboard and a handful of resistors. You should be perfectly operational after half an hour. Please have a look on those tutorials:
EEVblog #180 - Soldering Tutorial Part 1 - Tools
EEVblog #183 - Soldering Tutorial Part 2

Basic electrical and electronic understanding. Do you know what is a Volt, an Ohm, an Ampere? Can you use a digital multimeter? These are the questions you must ask yourself. If the answers are no, you might try to find a friend that knows

If you own these 3 skills, your kit will work for the first time!

✔ Perfect!   ✘ Too Much Solder   ✘ Not Enough Solder   ✘ Cold Joint   ✘ Too Much Heat

What tools do you need?

- A good soldering iron, preferably thermally regulated, 60W, with a medium size tip (1.5-2.5mm wide), screwdriver shape.

- Solder. **Only use first grade solder**, 0.7 to 1 mm diameter, "no clean" type. Good quality solder will make the soldering process easier and you will get nice shiny joints.

- Cutting plier. If you plan to go ahead with DIY, buy good quality cutters.

- Flat nose pliers.

- Phillips screwdriver, Slot screwdriver 3mm for trimmers, Nut driver ø5.5mm

- Digital multimeter with thin, insulated test hooks. If you can afford it, choose an RMS voltmeter with a good resolution.

What is included in the M-191X kit?

- 1x black powder coated and silk-screened metal sheet case with a top.

- 2x tropical hardwood side panels

- 4x PCBs: PSU board, XLR board, Multiple jack board and the Jack boards

- 41x audio jacks 3.5mm

- 5x 8 Pin DIN Female Solder Panel Mount Connector

- 2x 6 Pin DIN Female Solder Panel Mount Connector

- 1x power switch with a white cap

- 31x M3x6mm **Pan head** pozi machine screw

- 33x M3x6mm Pan head pozi machine screw

- 5x M3 Full nut

- 6x M3x6mm Countersunk pozi machine screw black

- 12x M3x25mm Pan head pozi machine screw black

- 15x M3x6mm Pan head pozi machine screw black

- 3x 3 Pins JST 2.54 cable 30cm length

- 1x 3 Pins JST 2.54 audio shielded cable 20cm length

- 2x 4 Pins JST 2.54 cable 30cm length

- 5x 8 Pins JST 2.54 cable 30cm length

- 2x wire 80mm and 150mm long (yellow/green and black)

MOUNTING THE TRANSFORMER

Start with the AC power connector. Before we wire up the power transformer, we'll make sure the power connector is grounded to chassis ground. Take the 60mm piece of yellow/green wire and remove a piece of insulation on one end with a wire stripper. Twist the bare end slightly and cover it with a little bit of solder. This will make it easier later to get a proper connection when soldering the wire to the pins. **By the way, this procedure will be the same with all the wires we'll need throughout the build.** Solder it to the ground pin of the power connector marked "E" for Earth.
Cut a piece of shrink tube and put it over the wire as shown. Then strip off a piece of insulation on the remaining end and solder it to the terminal lug you get in the Mouser BOM
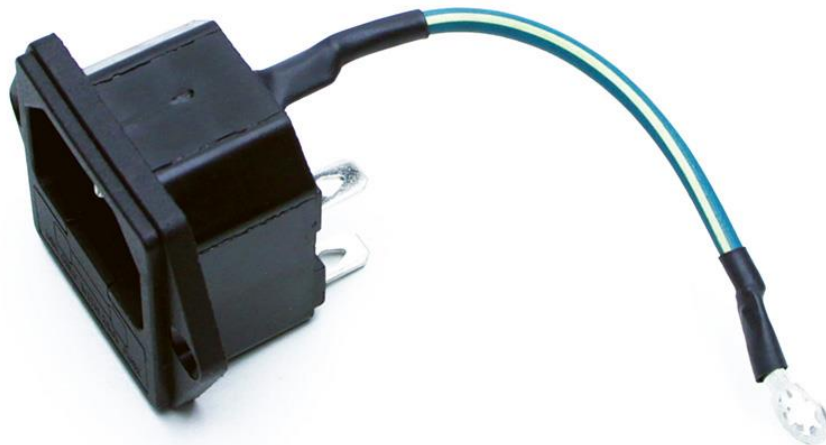
Take the 150mm piece of black or white wire. Strip off insulation on both ends (stripping & tinning with a bit of solder is pretty much always necessary, so I won't mention it from now on). Solder it to the one end to the live terminal on the power connector marked "L". You can also use a piece of shrink tube here if you want. Connect the other end to the front pin of the power switch. **Don't forget the shrink tube!**

Coming up next, we can mount the AC power connector. Use 2x 6mm M3 countersunk black screws and feed them through the mounting holes from the back and fasten them.
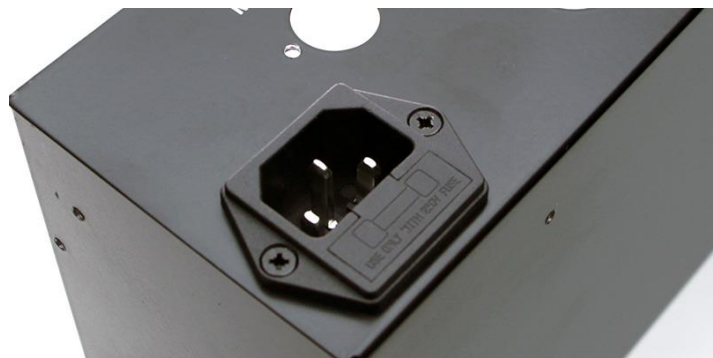
Now you can finally mount the power transformer and start working on the power supply…
We assume that you use the TRIAD VPT30-1670 from the Mouser BOM. For other transformer types please refer to the datasheet.
Primary wires are: **BLUE, GRAY, VIOLET and BROWN**
Secondary wires are: **BLACK, RED, ORANGE, YELLOW**

First, we need to set the primary transformer wiring.
If you're wiring up your power supply for **115V** mains, you have to connect primary wires as follows. Cut the blue, gray, violet and brown wires to be 10mm shorter (just to remove the solder part). Then strip off a piece of insulation on all four wires. Twisted blue to violet and twisted gray to brown and cover it with a little bit of solder. Cut two pieces of shrink tube and put it over the wire, then solder the blue/violet one end to the live terminal on the power connector marked "N" and the gray/brown to the back pin of the power switch.
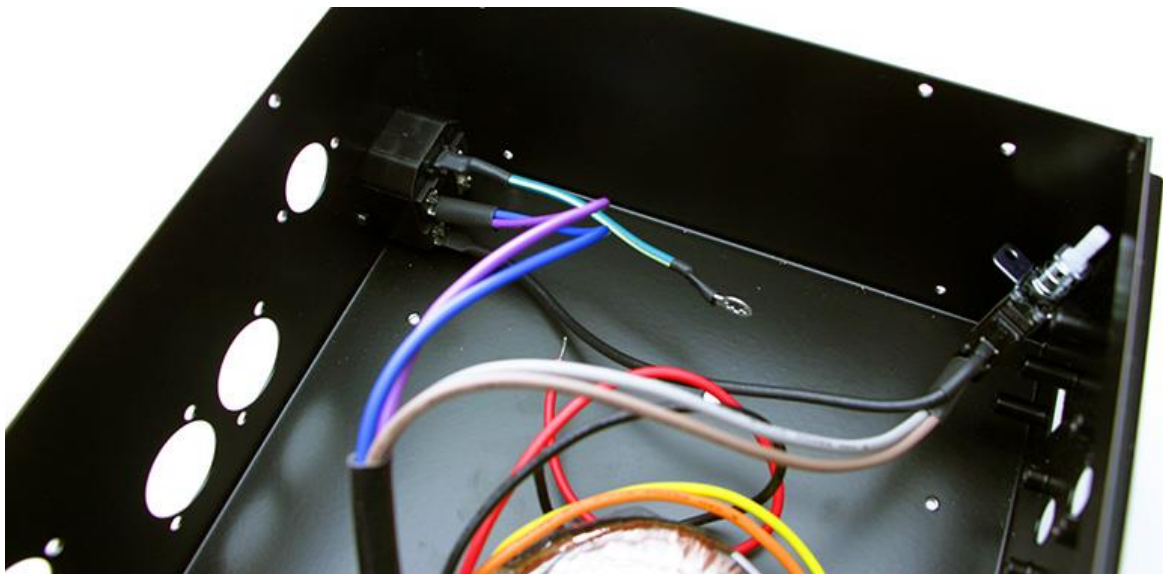
But if you need to wire up your unit for **230V** mains you have to connect primary wires as follows. Cut the gray and violet wires to be 100mm shorter. Then strip off a piece of insulation on these two wires. Twisted gray to violet and cover it with a little bit of solder. Cut one piece of shrink tube and put it over the wire like on the picture (use the flat pliers to seal the shrink tube when it is hot). Then solder the blue one end to the live terminal on the power connector marked "N" and the brown to the back pin of the power switch.
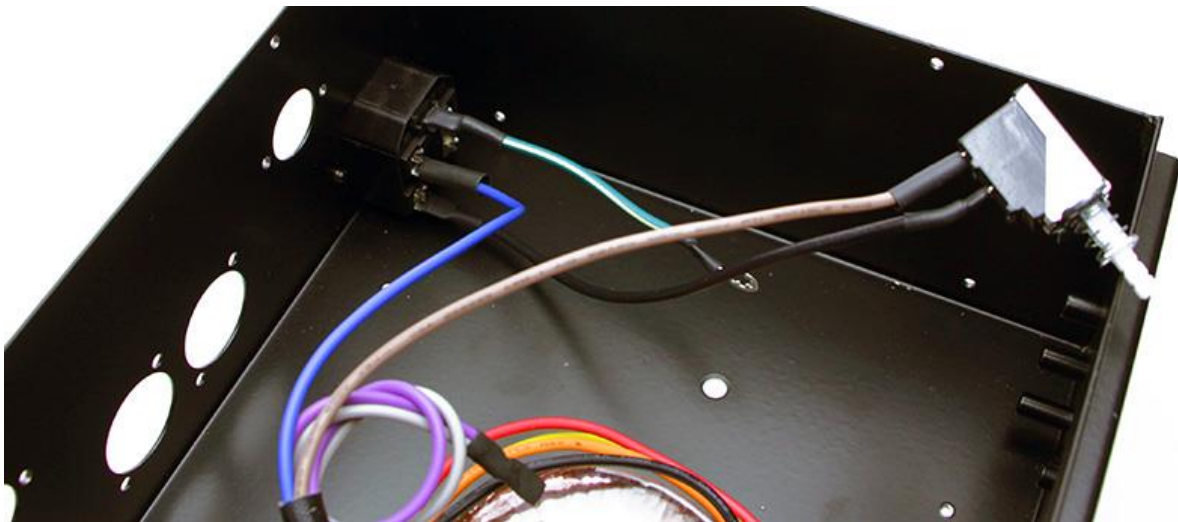
Mount the power switch to the front panel using two M3x6 Pan head pozi machine screw. Add the white cap
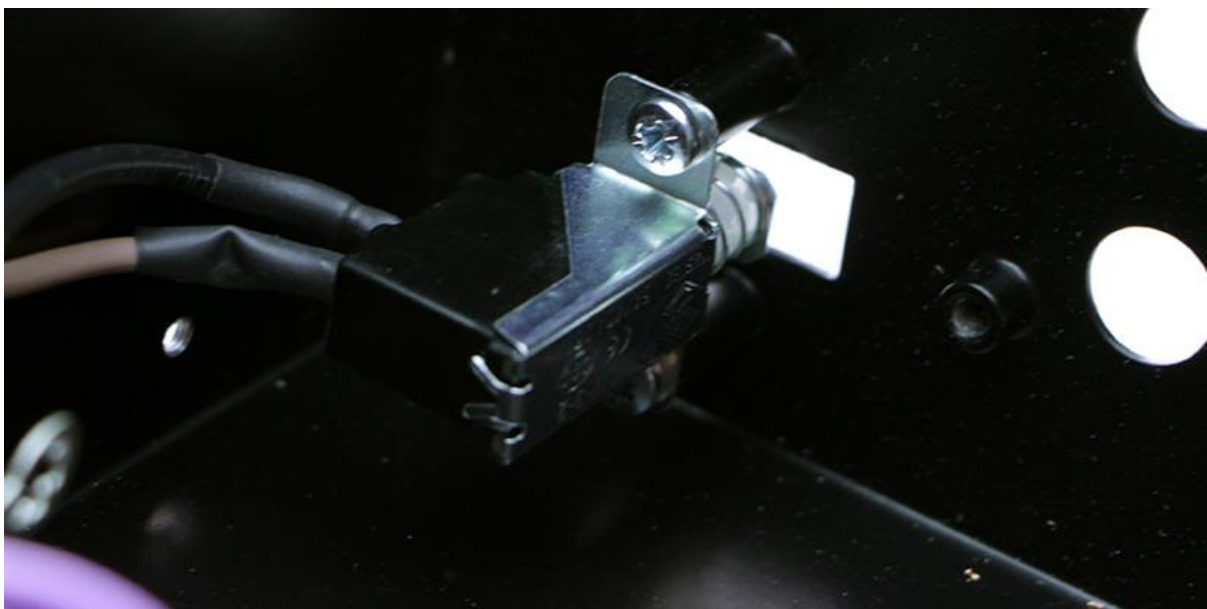
Next, mount the power transformer with the metal mounting plate, the two rubber pads, the M5 x 45mm bolt, the nut, spring and flat washer provided.
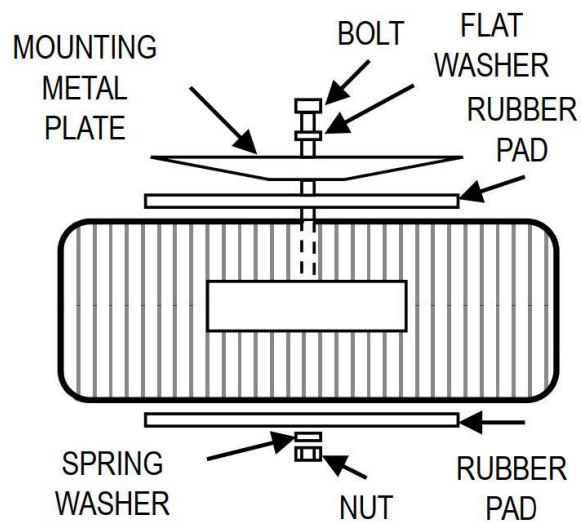
DON'T PLUG THE POWER FOR NOW!!!!!!

SOLDER THE PSU BOARD

Use the **iBOM PSU** to help you to place the components.
Pictures could show different parts color than the one you have.

Ok, now we're getting serious! Let's start stuffing the psu board, beginning with the little 1N4004 diodes. Once the diodes are insert in the PCB, bend a little bit the legs then turn over the Pcb to solder them. Cut the excess part of the leg with the cutting plier. Take your time to solder, **you can't burn the diodes**. Check the "placed box" on the diodes line in the iBOM.
Warning: Make sure to respect the direction of the diodes which is marked by a ring on the component and a line on the PCB.
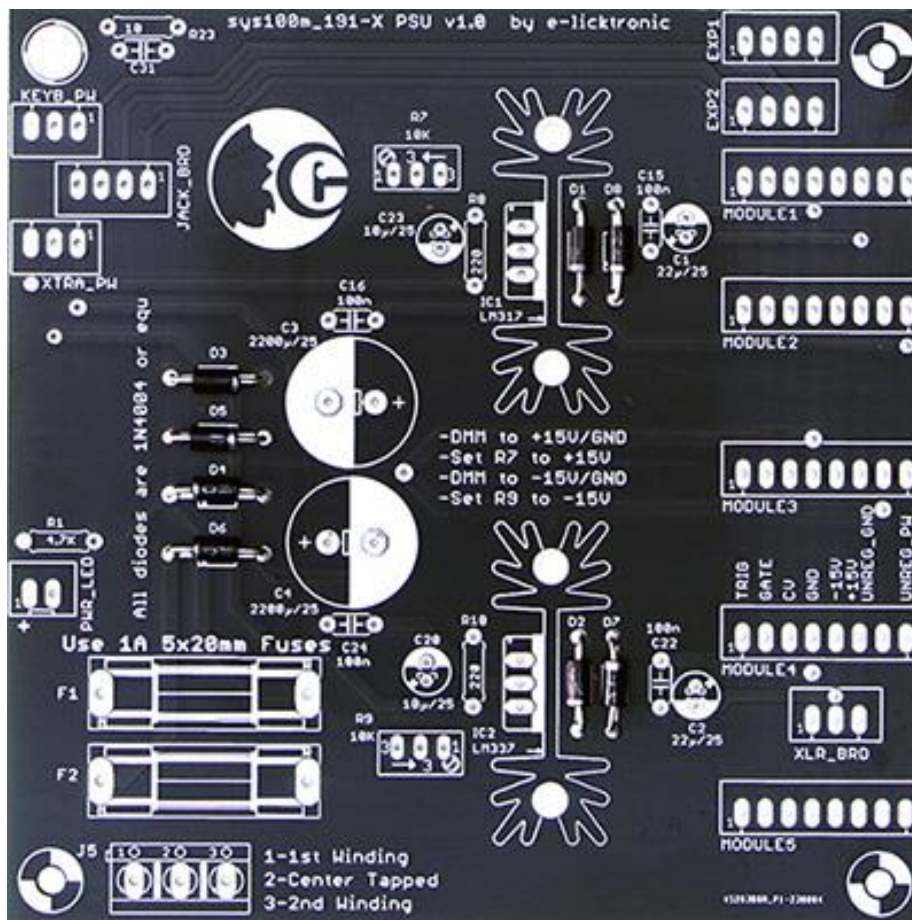
After soldering the diodes in place, you can move on resistors.
The best method to select and install the resistors is the following:
-Take a marker and note the value of the resistors on the bag
-Look up the **iBOM PSU**
-Choose the first resistors coming in the column
       example: R8 and R10 who is 220 ohms
-Take two 220 ohms resistors in the bag and solder it on the PCB.
-Check the "placed box" on the resistor line in the iBOM.

It is one of the best ways to not mix resistor values.
And so on for all resistors. Once resistors are solder, cut the leg on the
solder side.
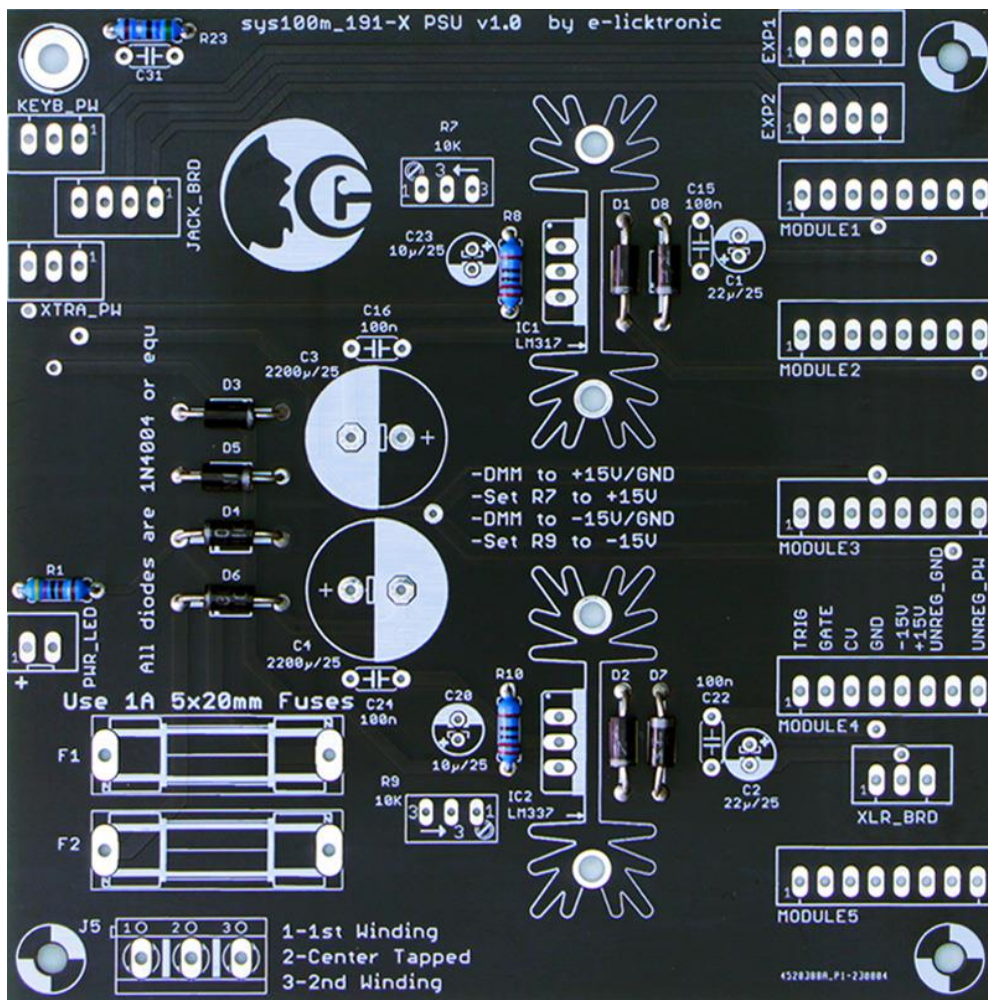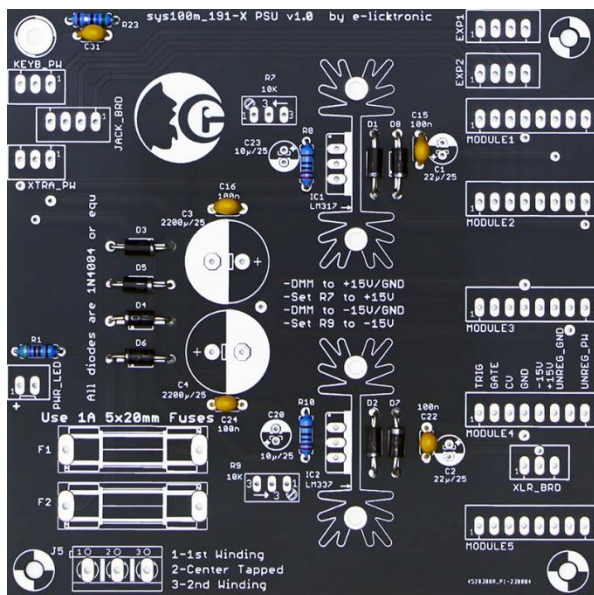
Next solder the ceramic capacitor. Use the same method as resistor for the ceramic capacitors C15, C16, C22, C24 and C31

Now solder the connectors. Confirm they sit tight and square. When you insert all connectors in the pcb, put a piece of cardboard on the connector and flip the psu board while holding the cardboard.
Solder the first pin only of all connectors, then heat the pin and press on the connector to sit tight and square. **DO NOT SOLDER XTRA_PW and EXP2 CONNECTORS**

Warning: Make sure to respect the direction of the connector. It has to fit perfectly the PCB silkscreen. (See picture)

Now solder the fuses holder and J5 connectors
Then solder the 10Kohm trimmers R7 and R9. Confirm they sit tight and square
Solder the first of the connector only, then heat the pin and press on the connector to sit tight and square like on the connectors.
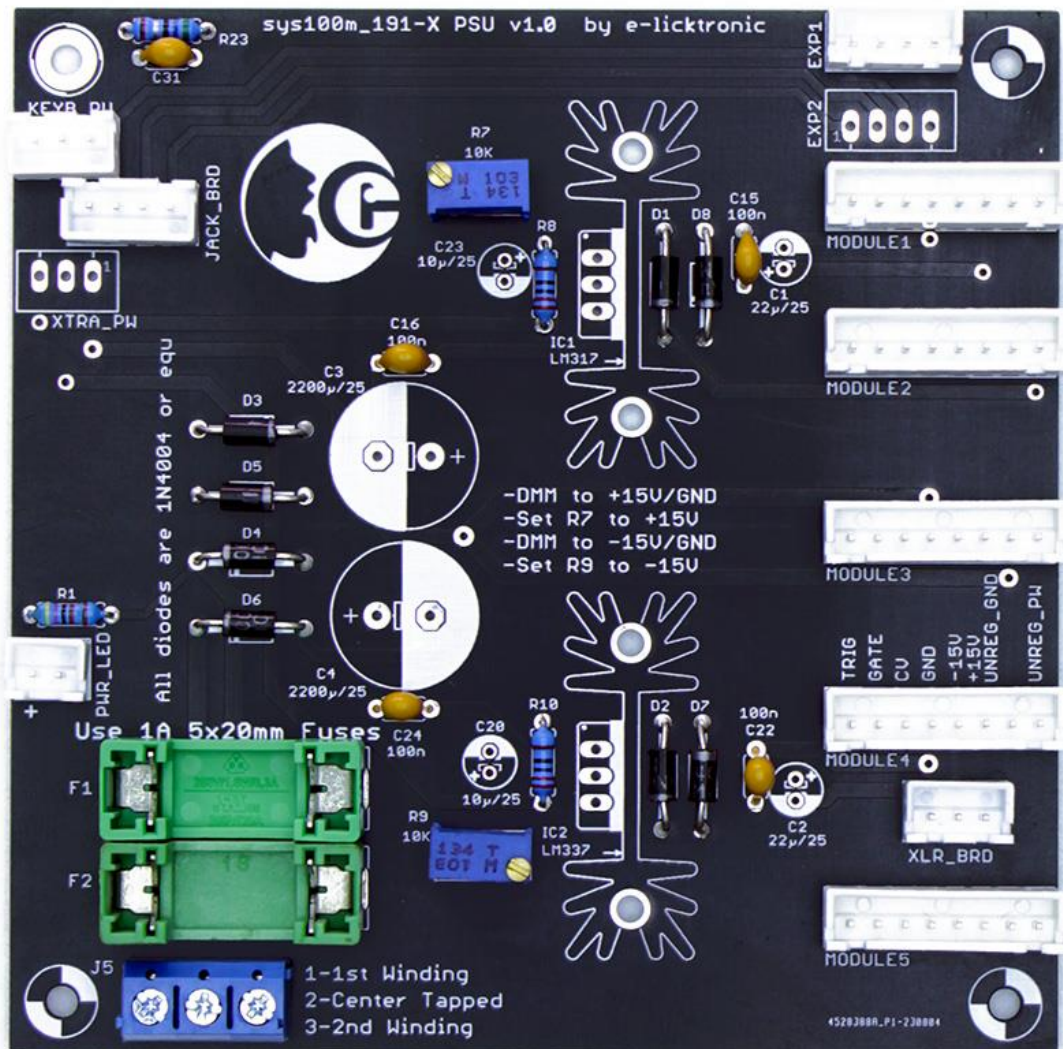
Next solder the electrolytic capacitors. Take care of the value and direction.

Warning: Make sure to respect the direction of the electrolytic capacitors. The negative side of the capacitor is marked by the white part on the PCB and on the capacitor. **It has to match.**
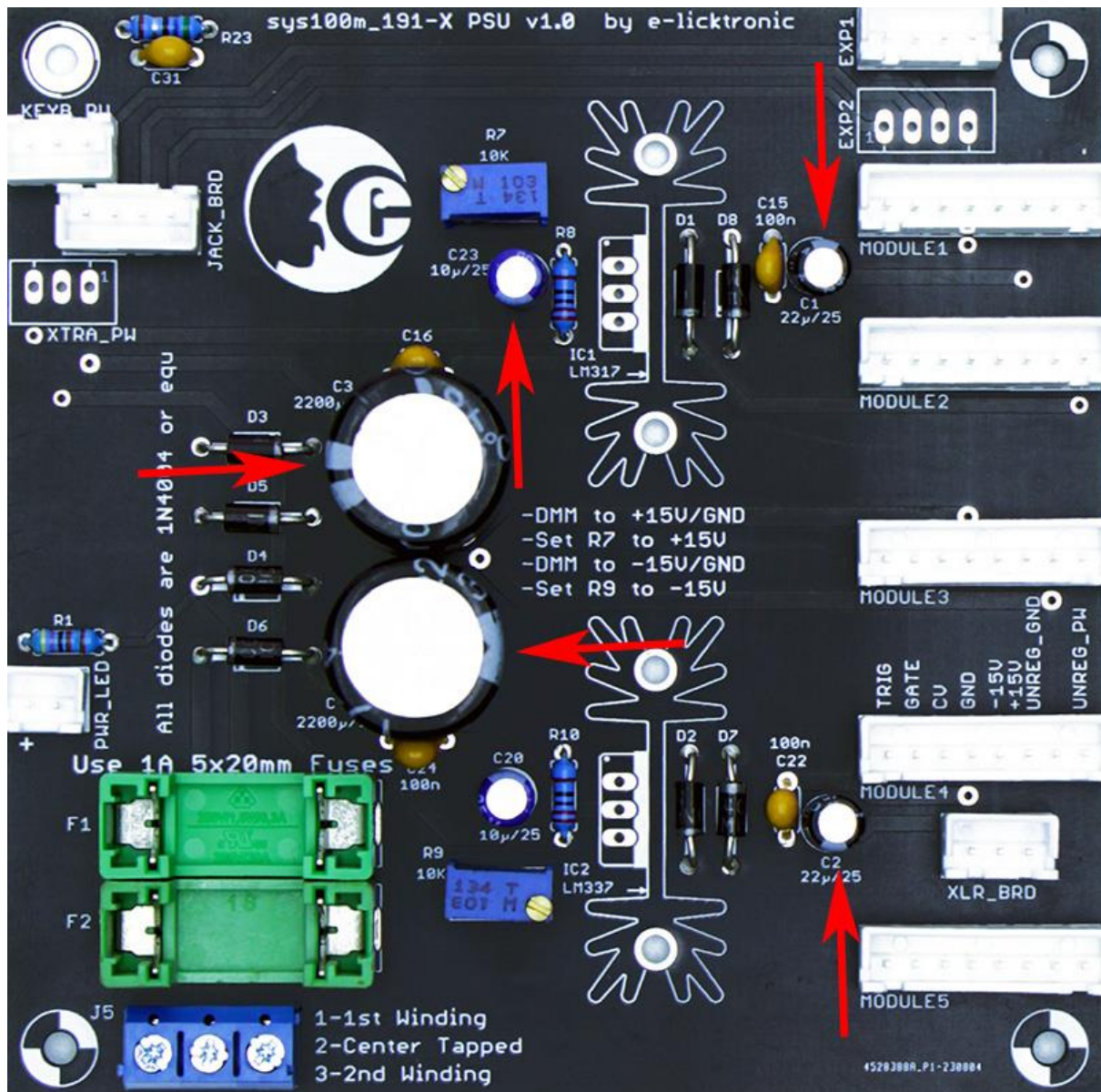
Last parts to solder on the PSU board are the regulator but before that, you need to mount it on the heatsink. Use two M3x6 Pan head pozi machine screws and two M3 nuts with the two thermafilm from the Mouser BOM, then screw regulators on the heatsink. On the picture we do not use thermafilm but thermic paste but you have to use thermafilm between the regulator and heatsink.
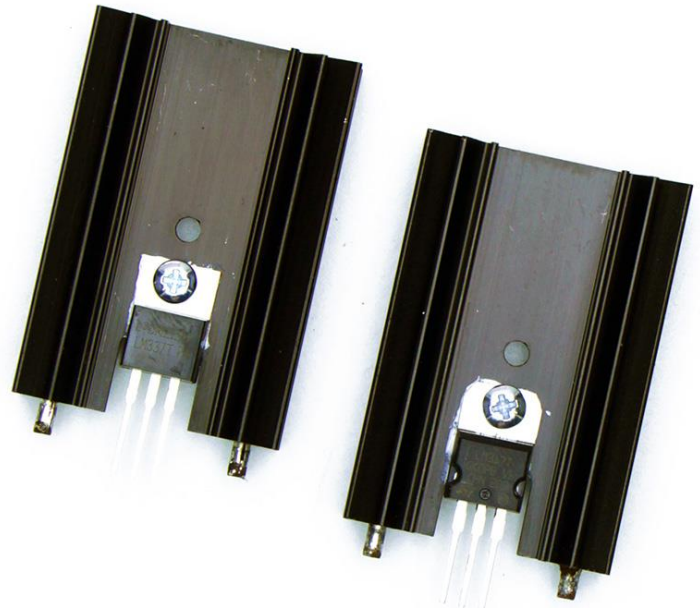
Solder the heatsink and regulator on the pcb. Confirm they sit tight and square.
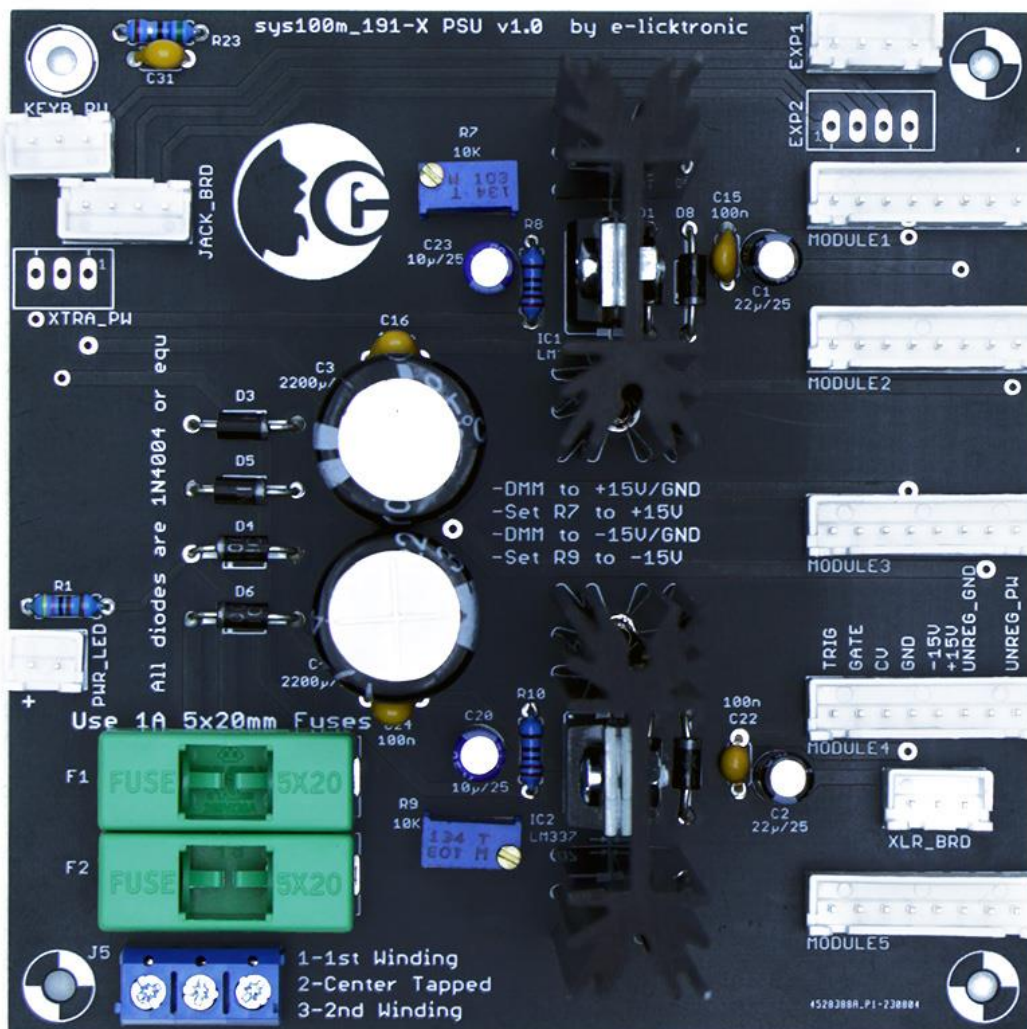
Now the PSU board is finished. Let's mount it and test it!
Use four M3x6 Pan head pozi machine screws to screw the PSU board
in the case. Take care of the direction, J5 connector must point the
transformer.

It is time to connect the secondary of the transformer to J5.
Black wire connects to J5 Pin1, Red and Orange wires connect to J5
Pin2 and Yellow wire connect to J5 Pin3
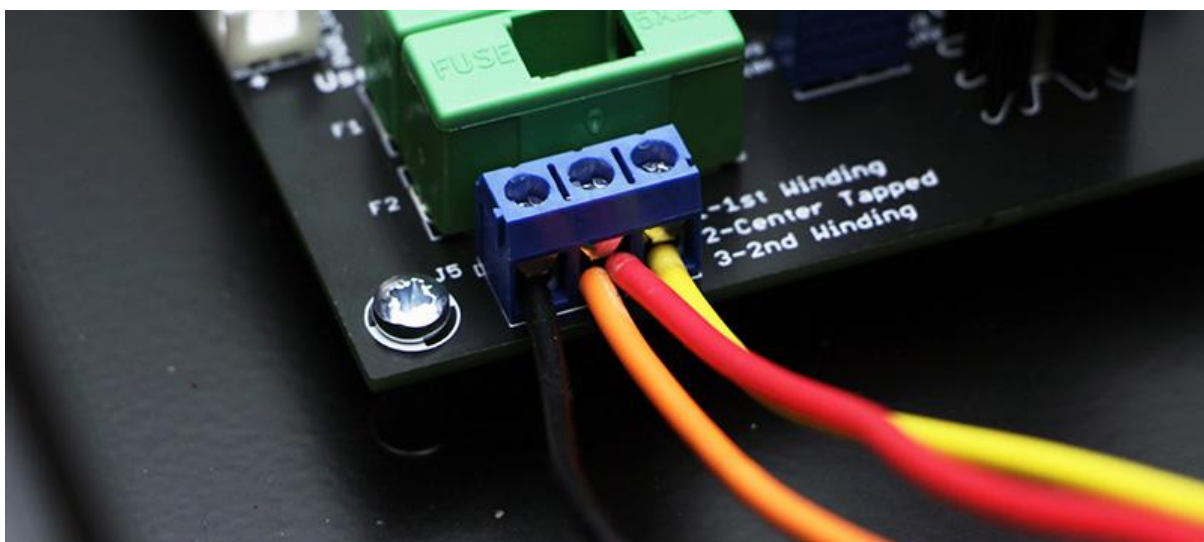
Add the two 1A fuses on the fuses holder and insert 315mA fuse in the power connector as shown and press the drawer firmly in place until it closes completely.

We are ready to test the power supply unit.
STILL DO NOT PLUG THE POWER FOR NOW!
Set your multimeter on continuity mode and set the black probe of your digital multimeter on XTRA_PW pin1. Then set the red probe on pin2 and on pin3. You should **NOT** find any continuity between those pins. If it is the case, you should check your solder joint and wiring.
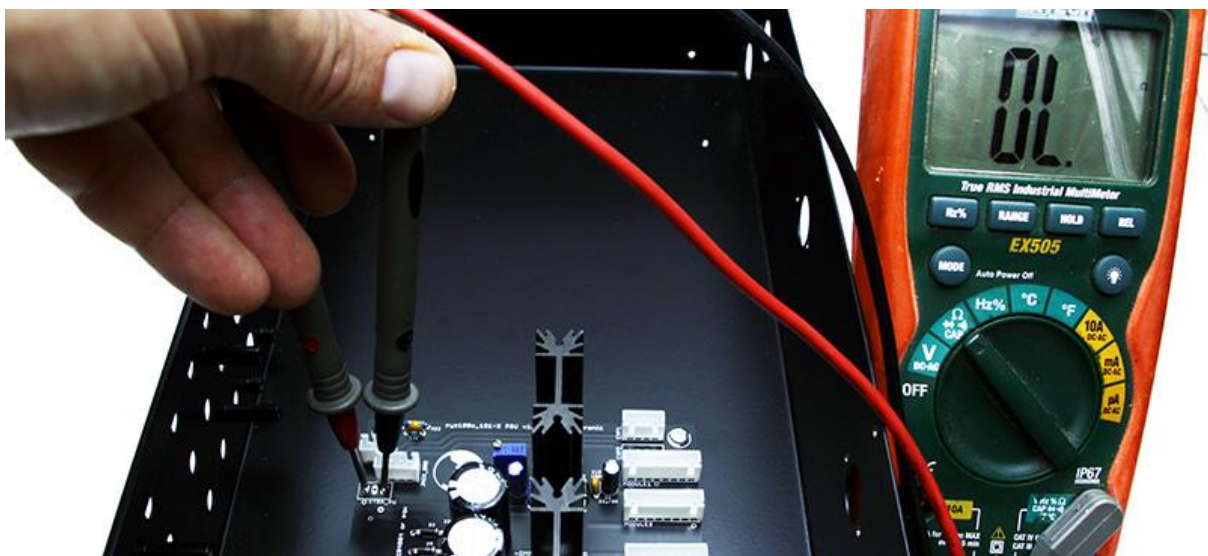
Now plug the power and depress the power switch button.
TAKE CARE TO NOT TOUCH THE BACK OF THE POWER CONNECTOR, IT TICKLES ¨_¨
 Wait 5 seconds and if no magic smoke appears it should work properly, but if you see smoke **TURN OFF THE POWER IMMEDIATELY.**
Let's check voltages now.
Set your digital multimeter to DC volt on a 20V scale.
Set the black probe on XTRA_PW Pin1 and the red probe on XTRA_PW connector Pin3. With a flat screwdriver, set R7 trimmers to measure +15V more or less 0.1V.
Set the red probe on XTRA_PW Pin2. With a flat screwdriver, set R9 trimmers to measure -15V more or less 0.1V.
Turn off the power supply and unplug the power cable.
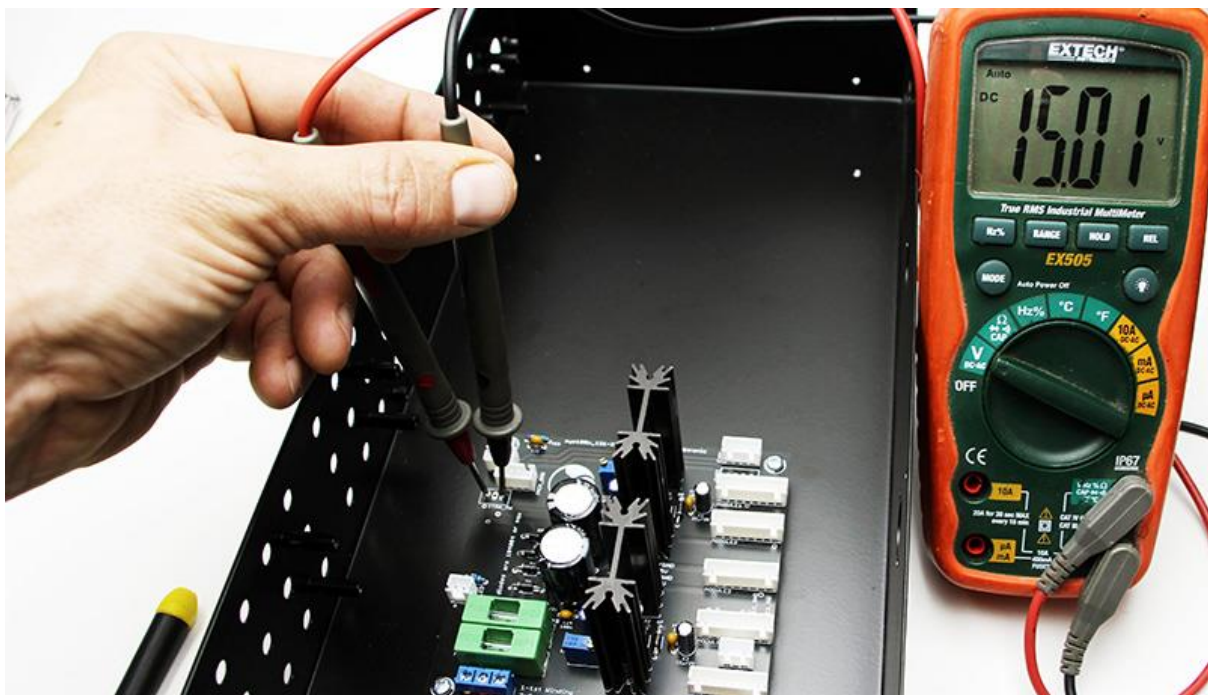
CONGRATULATION! THE HARDEST PART IS DONE! FEW...

SOLDER THE SYM BOARD

Use the **iBOM XLR** to help you to place the components.

Let's start by resistors.
Use the same method to select and install the resistors as previously.
Don't forget to check the "placed box" on the resistor line in the iBOM. And so on for all resistors
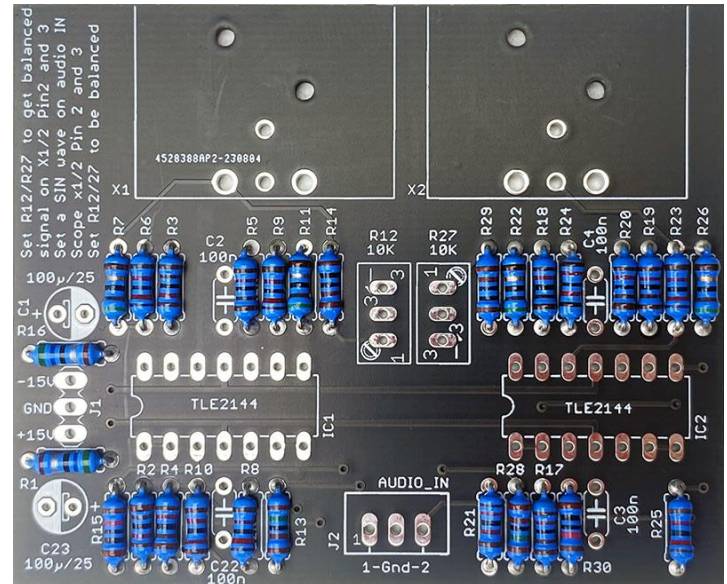
Next solder the ceramic capacitor C2, C3, C4 and C22
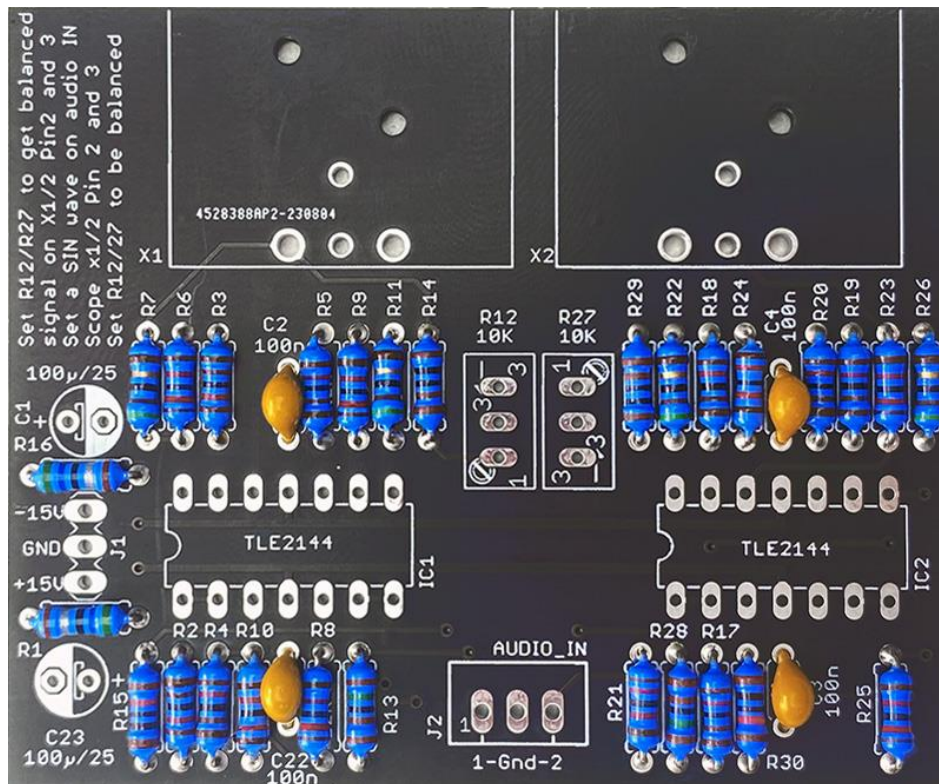
Then solder J2 and IC1, IC2 DIP14 integrated circuit socket.
Warning: Take care of the direction of the socket and the connector, it
has to match the PCB silkscreen.
Use the same method, solder the first pin of the connector only, then
heat the pin and press on the connector to sit tight and square. **DO NOT
PUT THE ICs NOW**
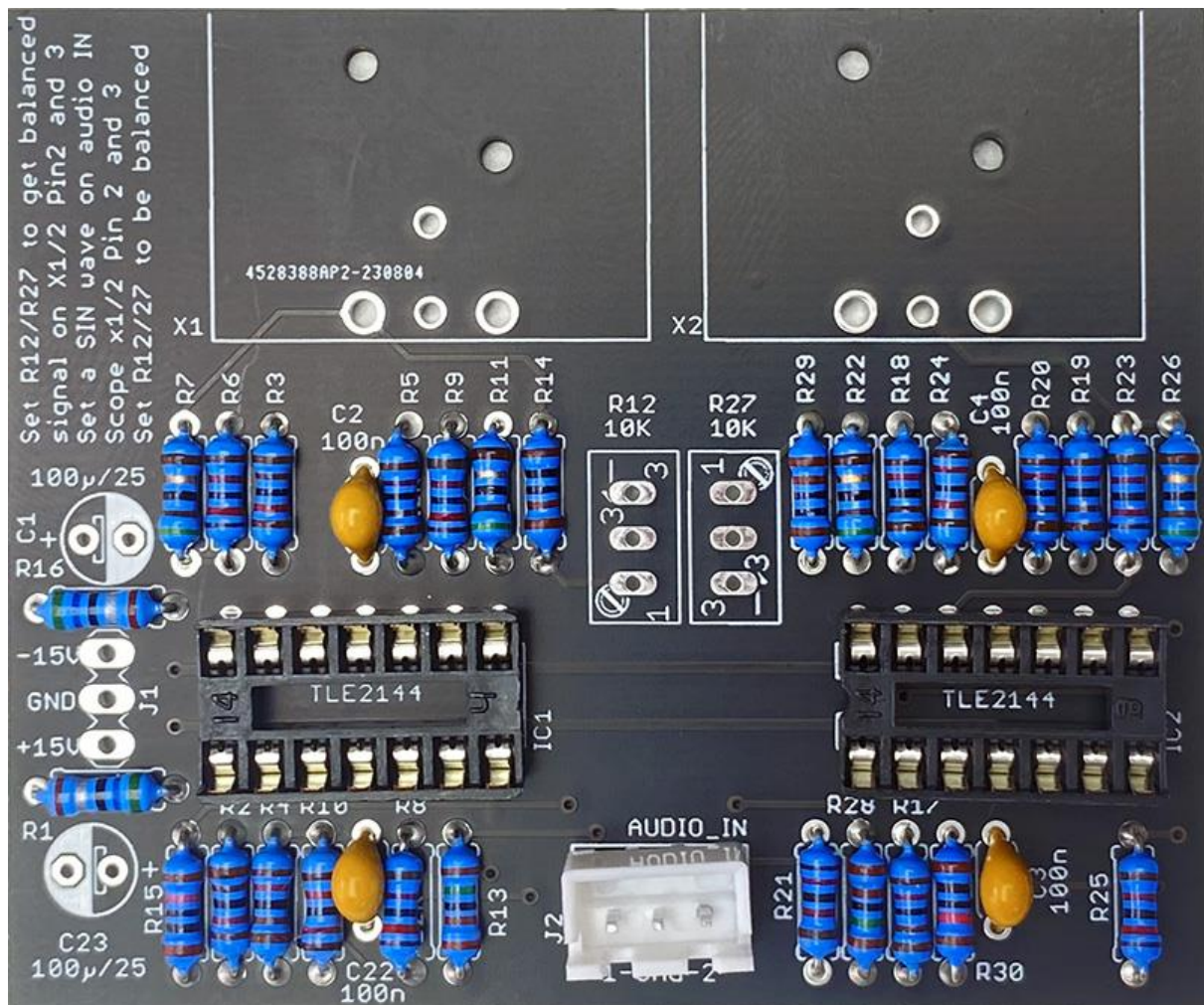
Next solder C1 and C23 the electrolytic capacitors. Take care of the value and direction.
Warning: Make sure to respect the direction of the electrolytic capacitors. The negative side of the capacitor is marked by the white part on the PCB and on the capacitor. **It has to match.**
Solder the both trimmers R12 and R27 too.
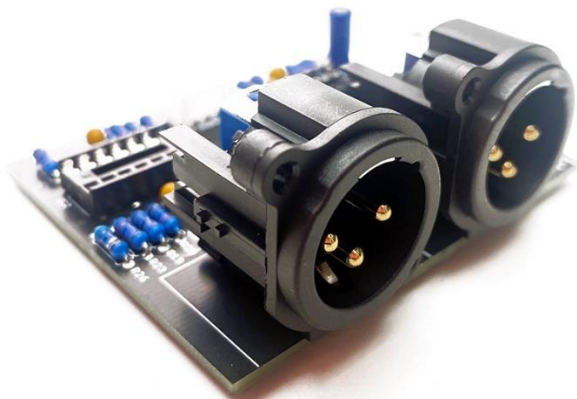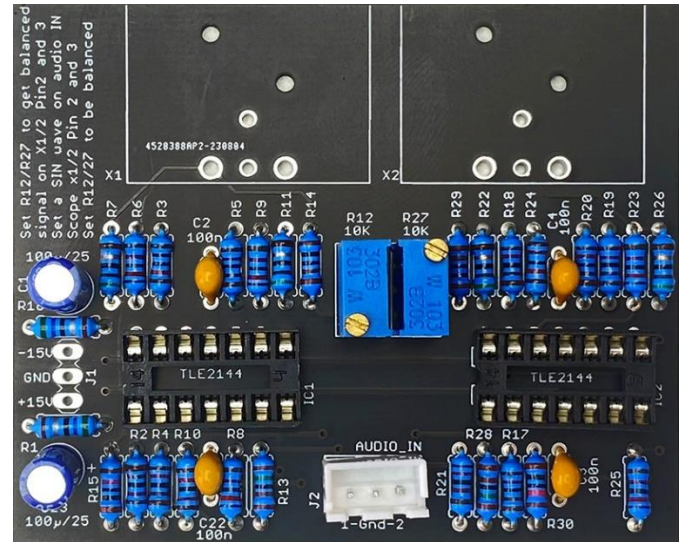
Next, solder the XLR connector. It has to sit tight and square. So, solder one pin, then heat the pin and press on the connector to sit tight and square.

Last thing to solder is the 3 pins JST cable on J1
You can shorten the cable by 150mm. Then strip off a piece of insulation on these three wires and twist and add solder.
Solder the cable as follow, RED wire to GND, WHITE wire to -15V and the BLACK wire to +15V
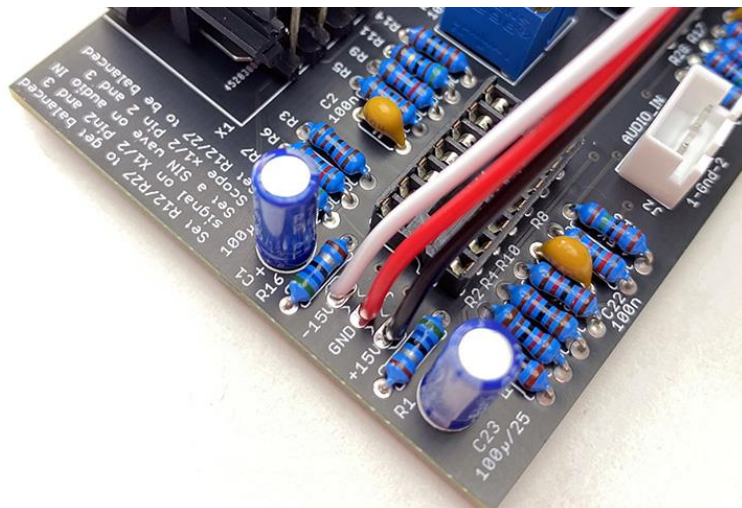
It's time to make a visual check to the board then test it properly. Take a piece of card board and put the SYM Board on the card board in the Psu case near the Psu pcb. The card is used to isolate the pcb from short circuit. Plug the 3 pin JST cable to the XLR_BRD connector on the PSU board.

Turn on your power supply.

Set your digital multimeter to DC volt on a 20V scale.

Set the black probe on J5 Pin2 (on the PSU board) and the red probe on IC1 and IC2 Pin11. You should measure -15V

Set the black probe on J5 Pin2 (on the PSU board) and the red probe on IC1 and IC2 Pin4. You should measure +15V
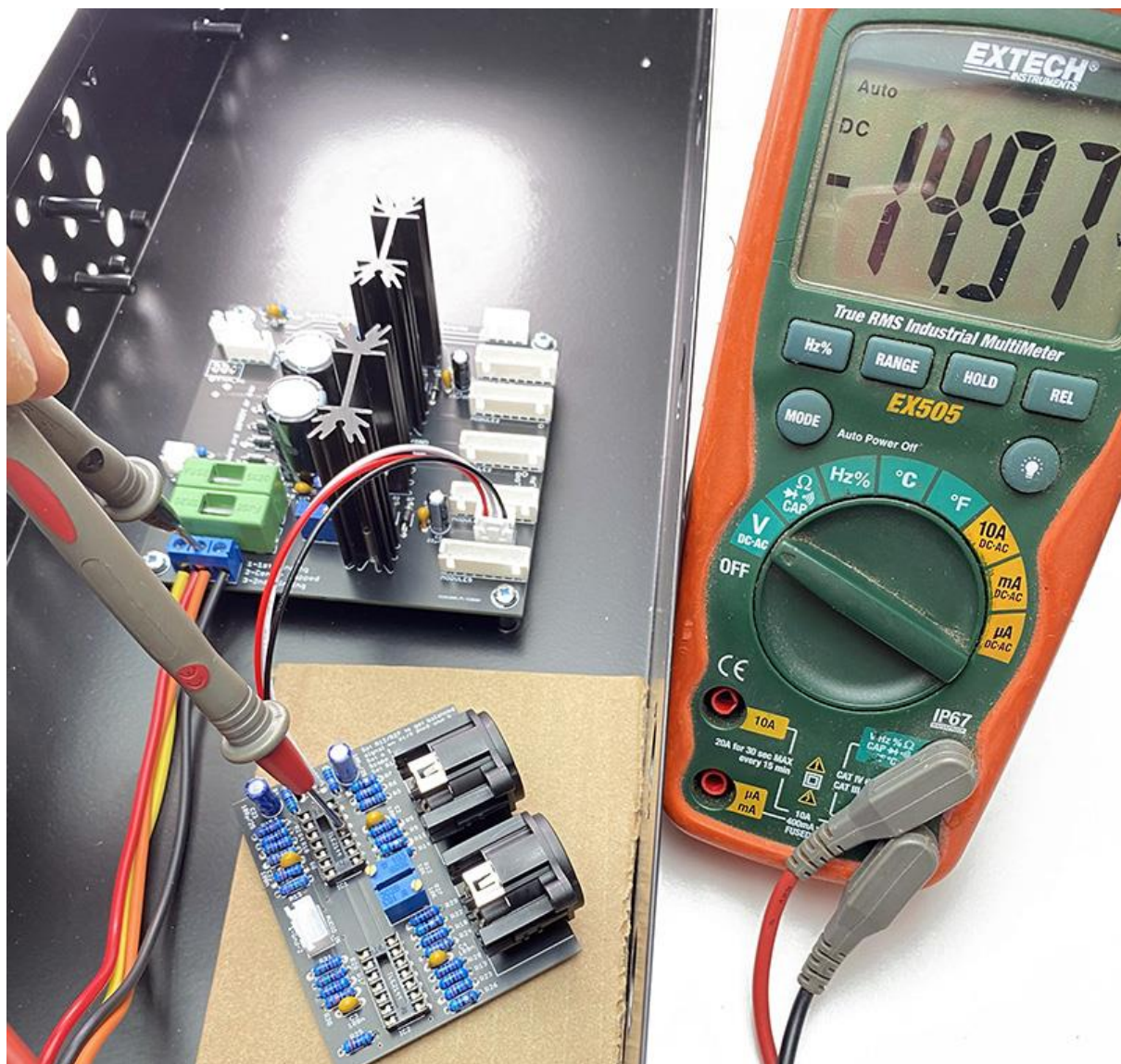
If everything thing is ok, you can put the TLE2144 in the socket (Any quad OPA like TL074 will work here but we choose the TLE2144 for his very good propriety, low noise and high speed)

Warning: Make sure to insert the ICs in the correct direction which is identified by a notch
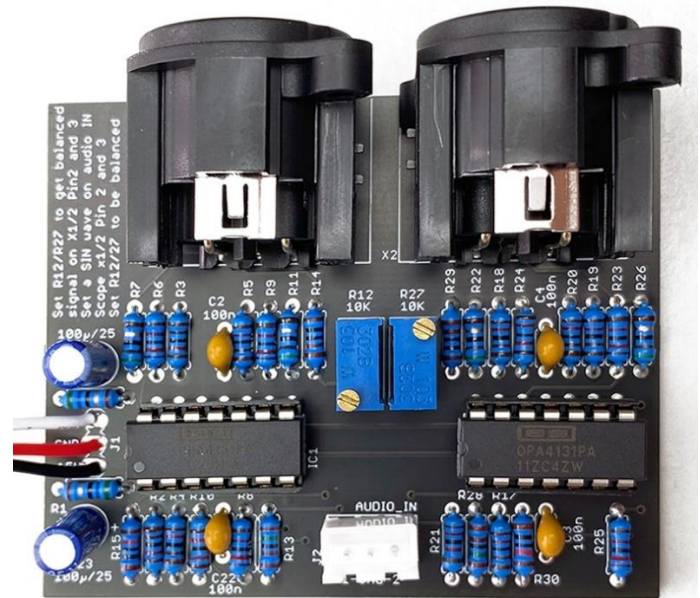
Screw the XLR board in the case using the four Neutrik A-screw-1-8 provided in the Mouser BOM.
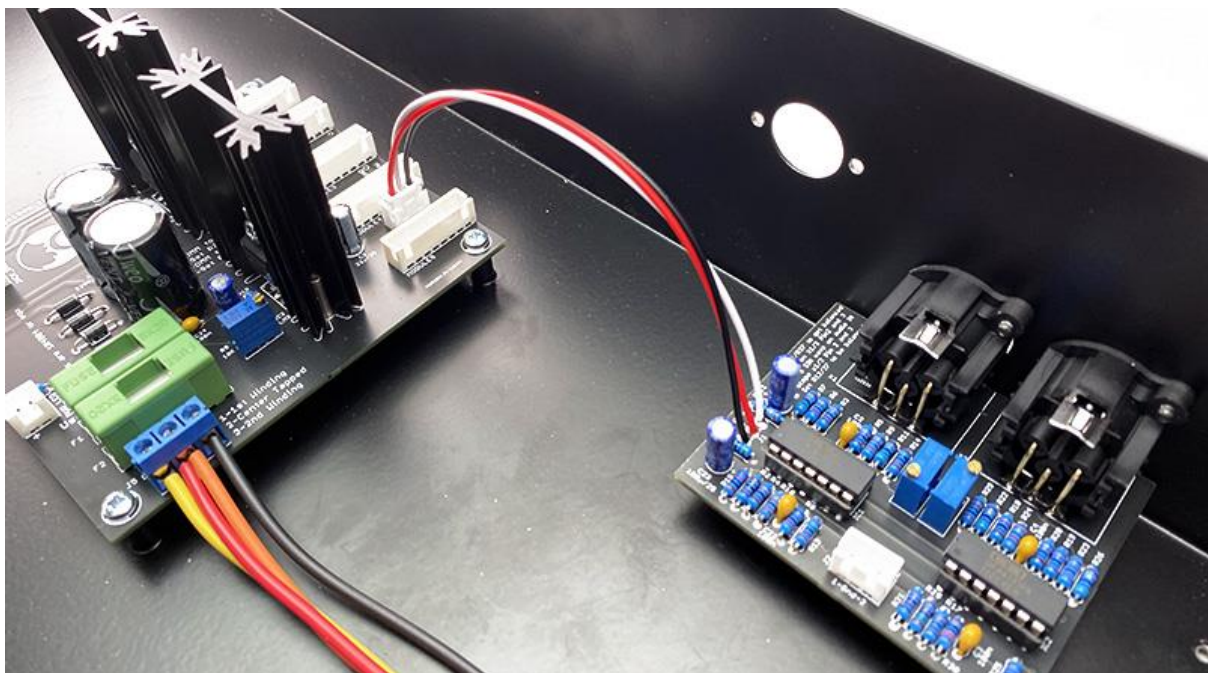
MOUNT DIN CONNECTORS

Take the five 8 pins cables and one 4 pins cable.
Short two of the 8pins cable by 100mm and one by 200mm.
Now you should have two long, two medium and one short 8 pins cable.
Then strip off a 5mm piece of insulation on these wires and twist and
add solder. **Keep the cut pieces we need it later**.
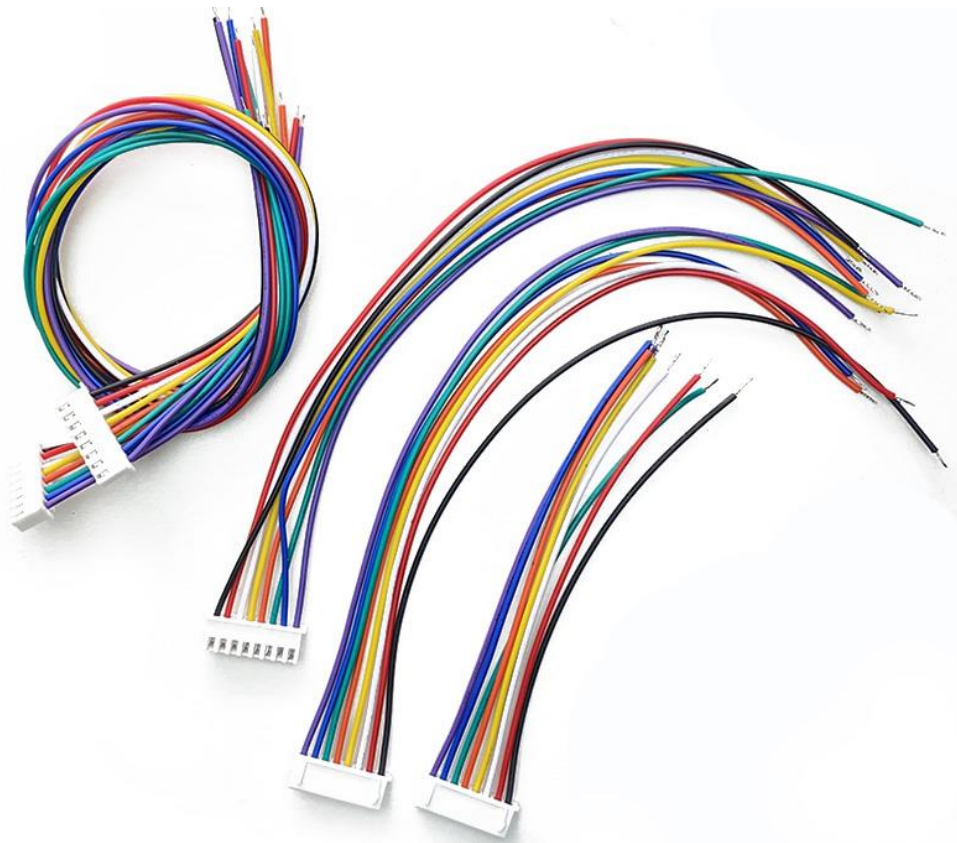
Cut 46 pieces of 10mm heat
shrink tubing

Start with longer 8 pins cable. Put a piece of shrink tube on each wire.
Make a hook with the end of the **GREEN** wire.
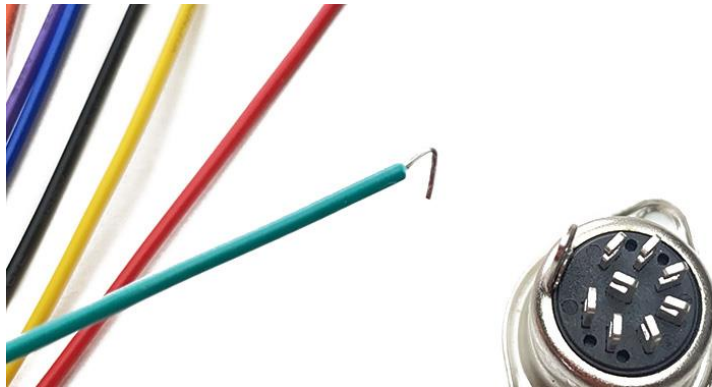
Solder this hook on the **center pin**.
Warning: Do not heat the pin to much it will burn the isolation between pins.
Put the shrink tube over the pin and heat it.

Tips and tricks: *Glue a piece of double-sided tape on your table and glue the din connector to hold it*

Repeat this operation for each wire of the five cables. Here is wire color and his corresponding pin. **Don't forget the shrink tube**

GATE

TRIG

GND

CV
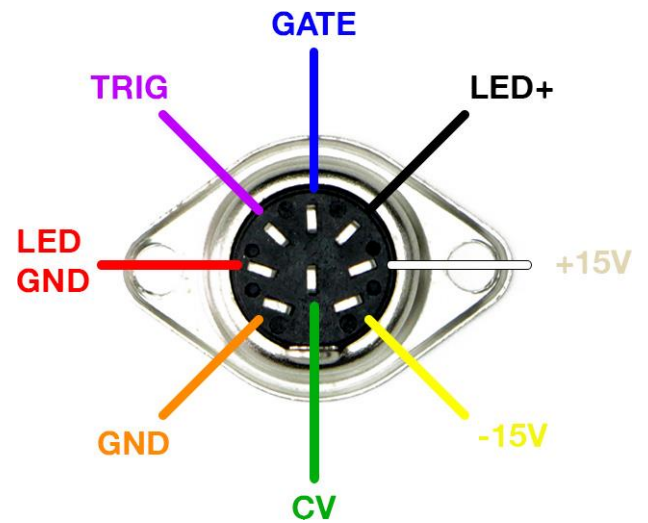
Make the same thing with the Din 6 connector and the 4 pins cable. Start with the red wire
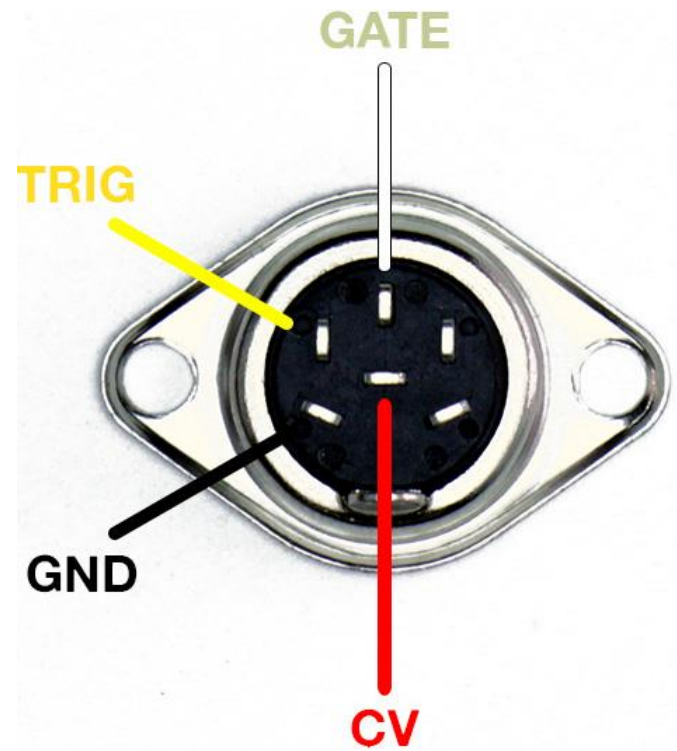
It is time to mount Din8 assembly cables and the Din6 cable.
Use twelve black M3x6mm Pan head pozi machine screw.
The Din6 cable goes in the expander hole, Din8 cable goes to the
MODULE holes. The two longest cables in module 5 and 1, the shorter
in module 3.
Do not tighten the screws too hard, these risks breaking the thread.

Connect the cable to the
corresponding connector on the
PSU board

Use a M3 nut to attach the power connector earth cable to the module-5
din8 screw.
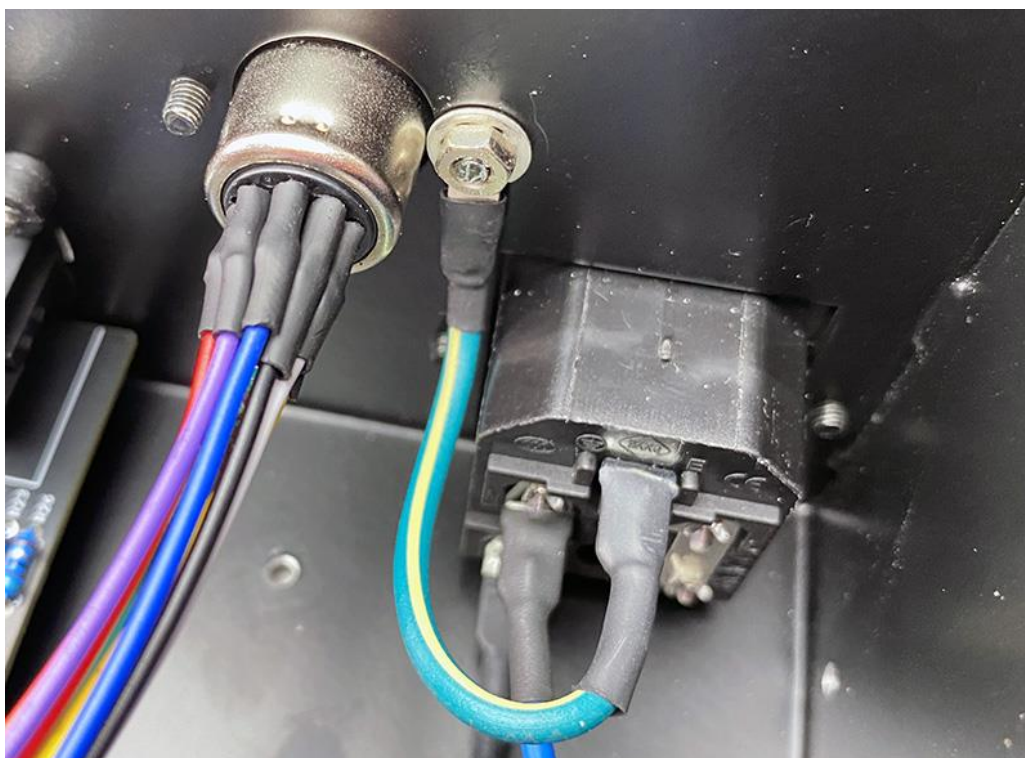
SOLDER THE JACK BOARDS

First you must split the CV jack board from the Multiple jack board
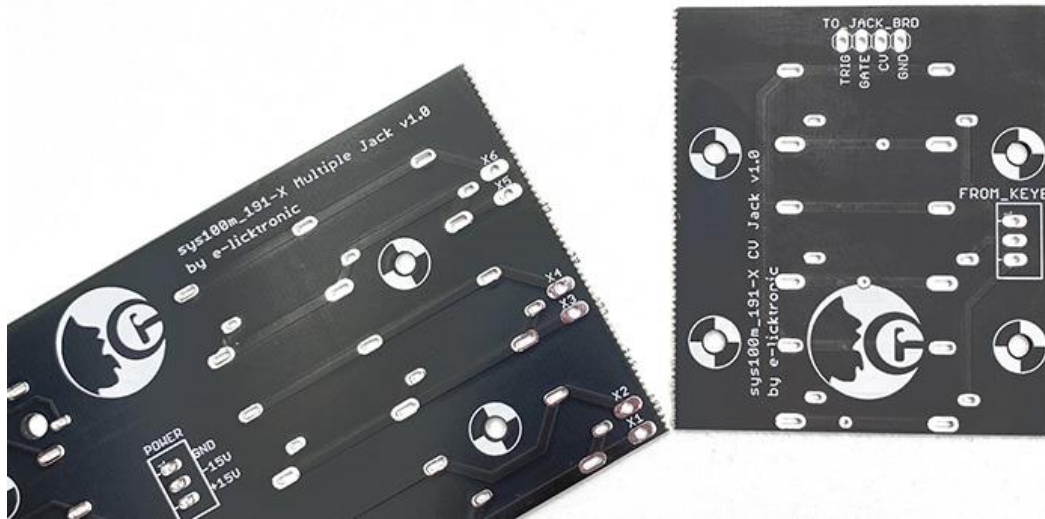
The position of the 3.5mm jack is critical for a good front plate matching. Start with the CV jack board. Put six jacks on the board. Press the jacks on the pcb, flip the board and put it as flat as possible on the table. Solder **ONLY ONE PIN** on each jack for now, the big bottom one (look at the picture)
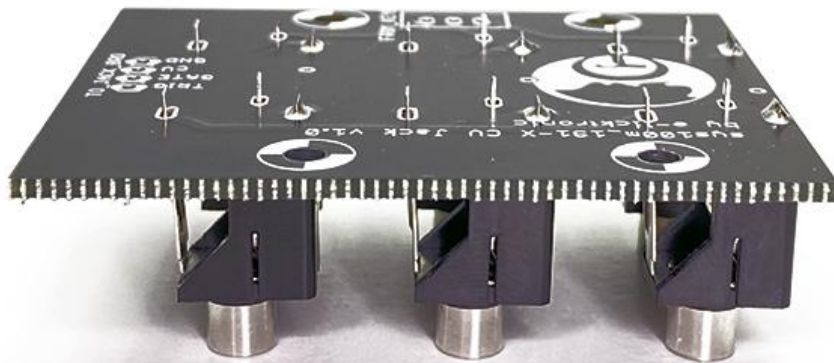
Screw the CV jack board in place using four M3x6 Pan head pozi machine screws
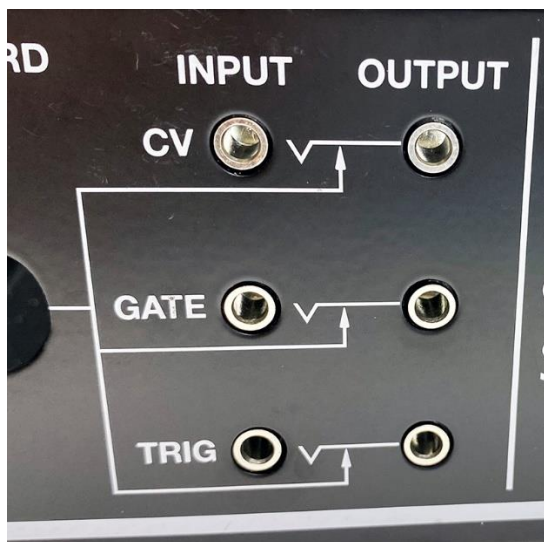
Align all jacks with the front panel holes and solder a second pin on each jack. Check that jacks are well aligned with the front panel holes

Then, solder the third pin of the jacks.
Disassemble the CV jack board to solder the 3 pins connector "FROM_KEYB" on the back side.
Finally, solder the 4 pins cable: YELLOW wire to TRIG pin, WHITE wire to GATE pin, RED wire to CV pin and the BLACK wire to GND.
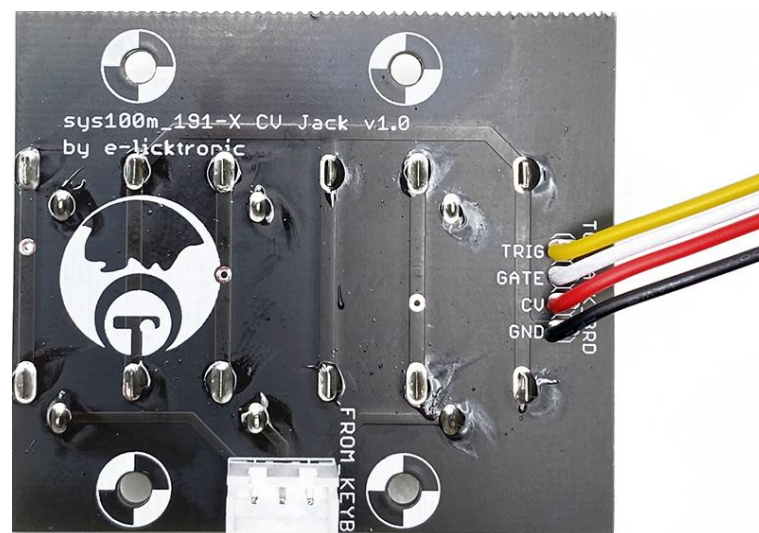
It is time to solder the last Din6 connector. You need two 3 pins cables.

Short one of the cables to 100mm. Then strip off a 5mm piece of insulation on these wires and twist and add solder like you already know. Put a piece of shrink tube on each wire. Then solder the wire of the short cable
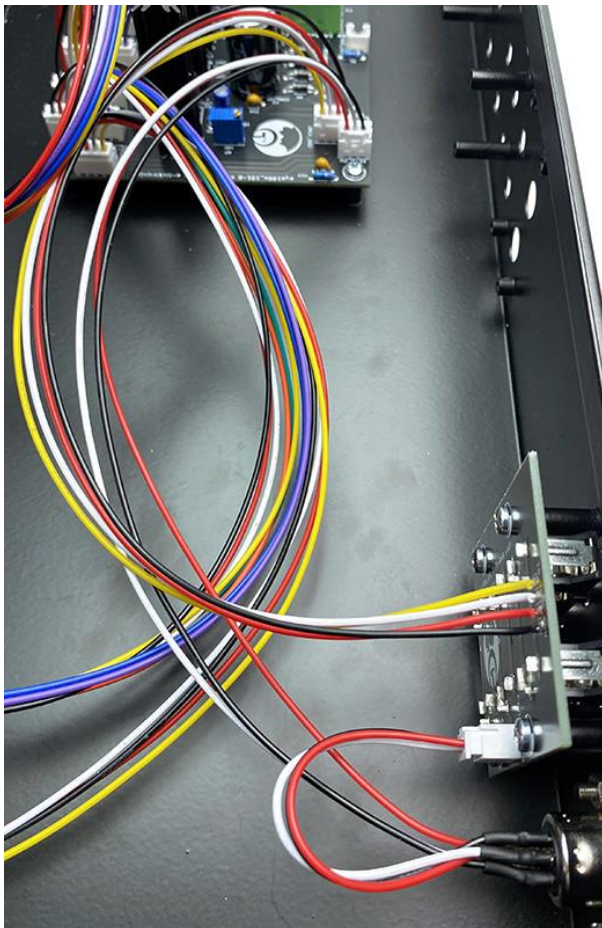
like follow:
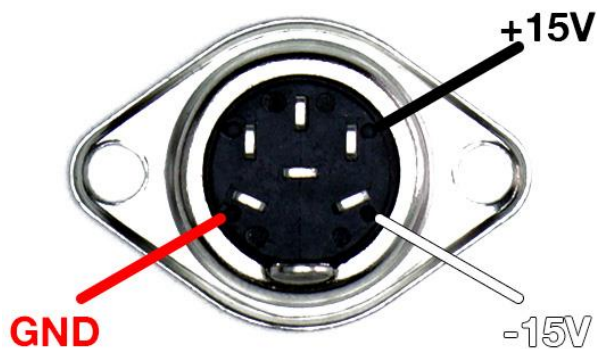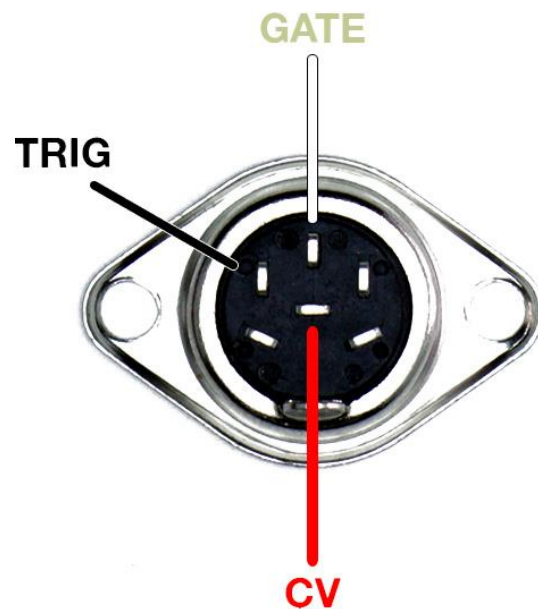
Now solder the **LONG** cable as follow.

Warning: As cables has the same color DO NOT MIX IT. Don't forget the shrink tube too.

Now screw the Din6 connector with two M3 full nuts. Use a flat nose plier to tight the nut.

Finally mount the jack board in the case and connect the short cable to the Jack board, the long cable to "KEY_PW" and the four pin cable to "JACK_BRD" on the psu pcb.

Now, assembly Multiple Jack board.
First, solder the 14 pins and 12 pins headers. Solder one pin and check that it sits flat.
**Info:** *Those headers are used for an optional expansion board that will be add extra fixture to the multiple jack board)*
Now put a shunt on headers where is the white dot (see attached picture)
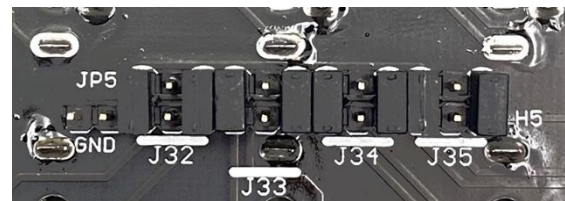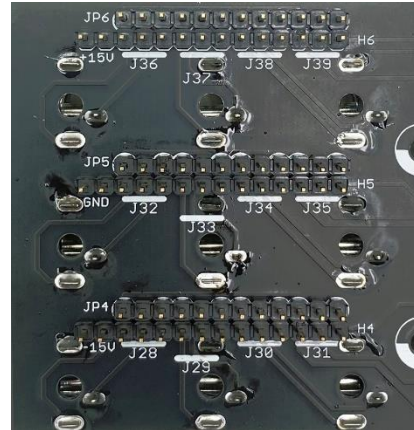

It's time to solder the jack on the Multiple jack board. Use the same process to align jack you already know. Put the thirty-three jacks on the board. Press the jacks on the pcb, flip the board and put it as flat as possible on the table.
Solder **ONLY ONE PIN** on each jack for now, the big bottom one
Screw the Multiple jack board in place using eight M3x6 Pan head pozi machine screws
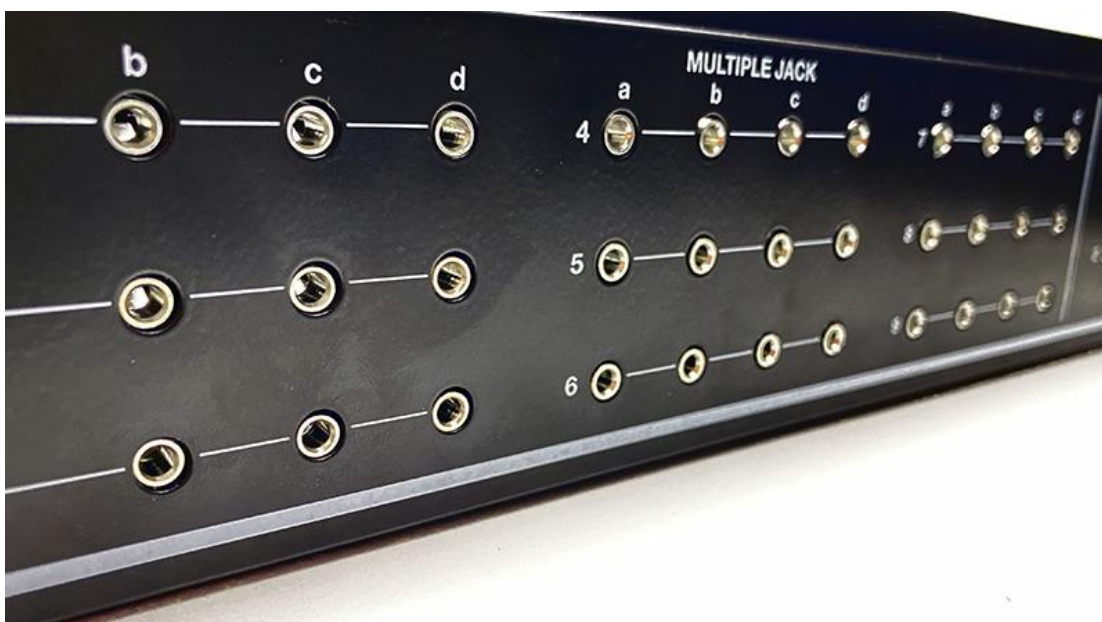
Align all jacks with the front panel
holes and solder a second pin on
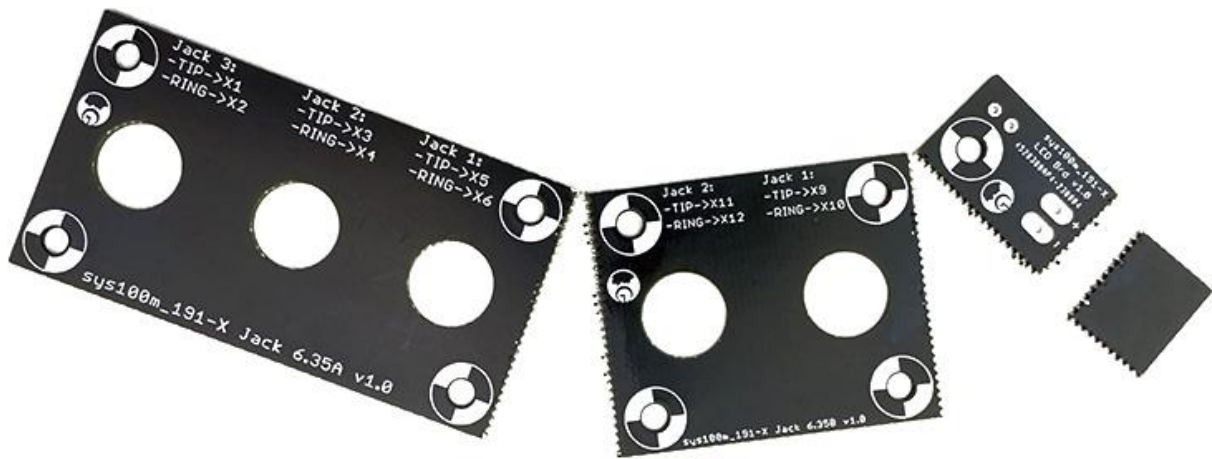each jack. Check that jacks are
well aligned with the front panel
holes
Unmount the jack board and
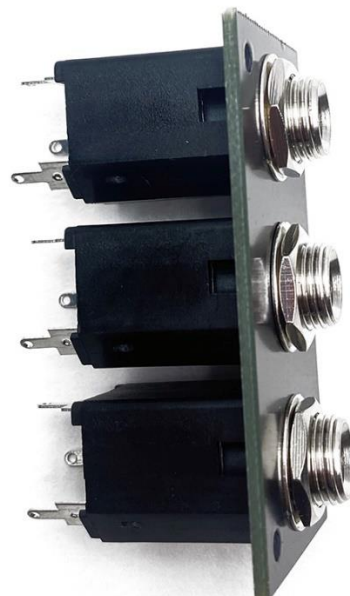solder the third pin of the jacks.
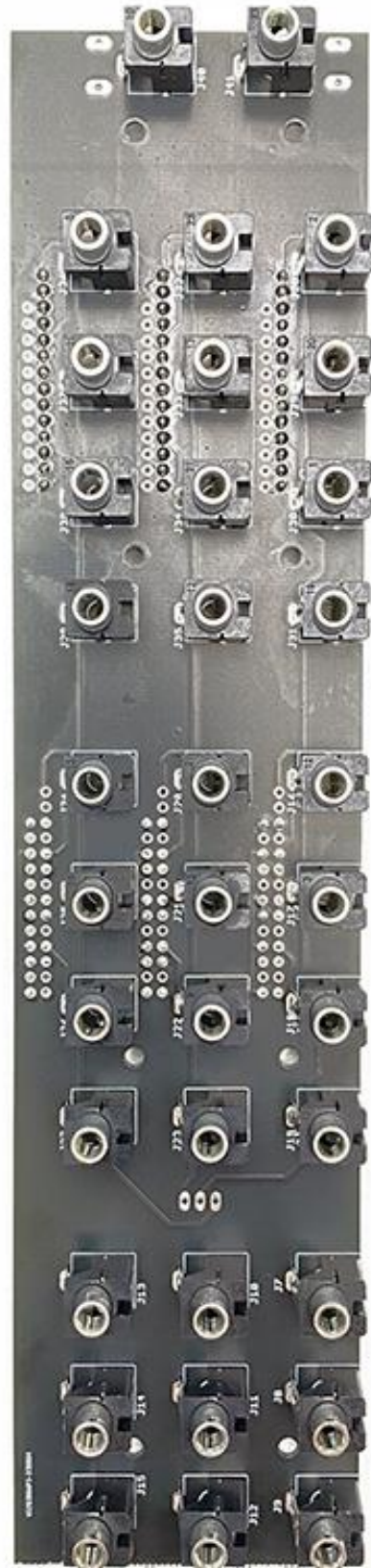
MOUNT THE 6.35mm JACKs AND POWER LED

Now it is time to add the 6.35mm Jack board.
First you must split the Jack 6.35A board to the Jack 6.35B board and the LED board.

Take the Jack 6.35A board and screw three of the 6.35mm mono jack

Take six pieces of wire (use different color wire) you kept previously and cut it to 80mm.
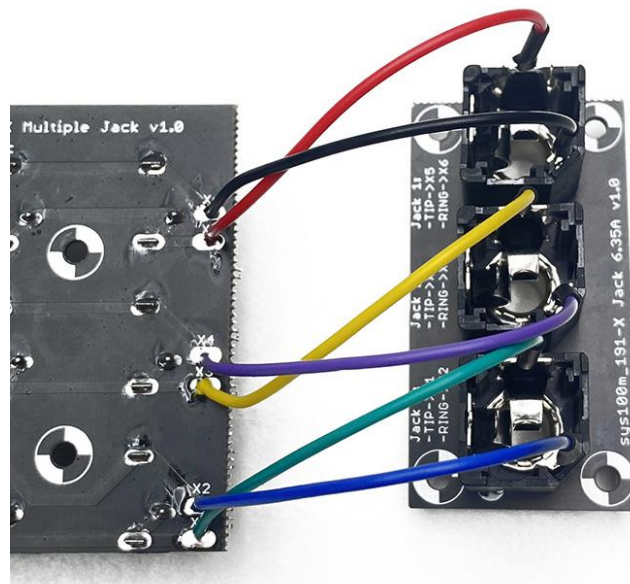
Then strip off a 5mm piece of insulation on both side of these wires and twist and add solder. Then solder one wire on each pin of the three 6.35mm mono jack.

Add a piece of shrink tube on the six pins

Solder each wire to the corresponding X pin on the Multiple jack board. X1, X3 and X5 are Tips. X2, X4 and X6 are sleeves.

Now mount two 6.35mm mono jack on the Jack 6.35B board
Take five pieces of wire (one red, one white and three black) and cut it to 80mm. Then strip off a 5mm piece of insulation on both side of these wires. Take the 3pins shielded cable and twist a wire on the white and red end of the cable and add solder.
Now twist two wires on the black end of the 3pins shielded cable and add solder.

Solder the customized 3pins Shielded cable to the 6.35mm mono jack. Black wire to the Sleeve and white wire to the Tip of jack one and red wire to the tip of jack two. Don't forget the shrink tube.

Short one of the two black wire and twist the fifth black wire on it, then solder the wire link between the two sleeves of the 6.35mm mono jack

Now solder the four wires to the Multiple jack board X pins. Top jack sleeve to X10, Tip to X9. Bottom jack sleeve to X12 and tip to X11.
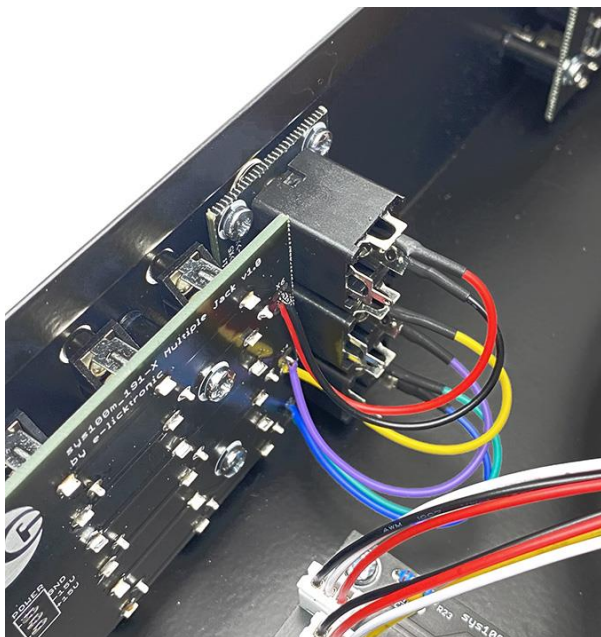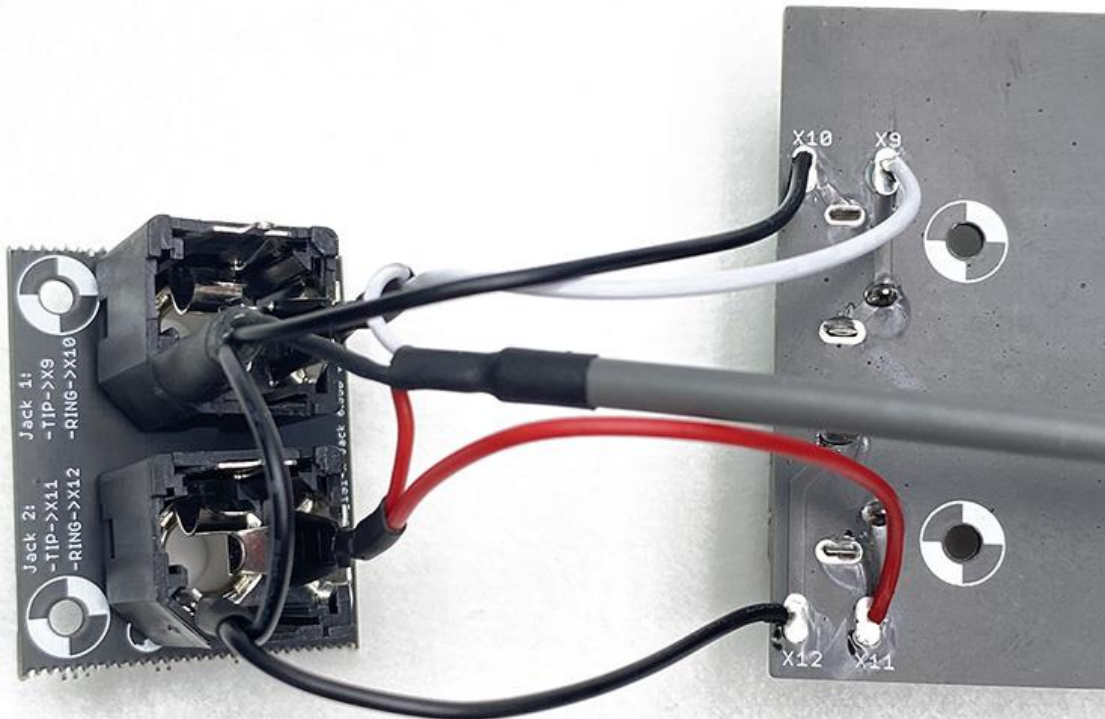
Now you can mount the jack multiple board and jack 6.35 boards in case using sixteen M3x6 Pan head pozi machine screws. Start with the two jack 6.35 board then the big board. *Tips: You can remove transformer and psu board to access to the screw*
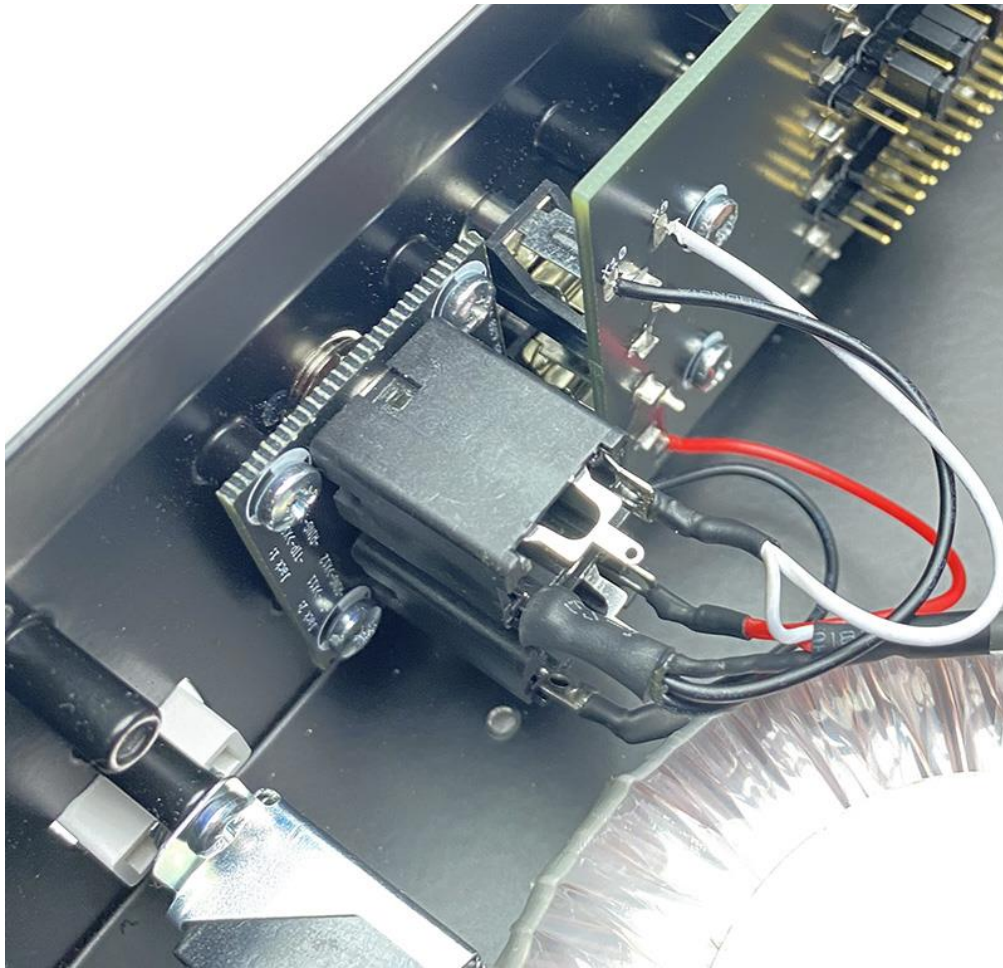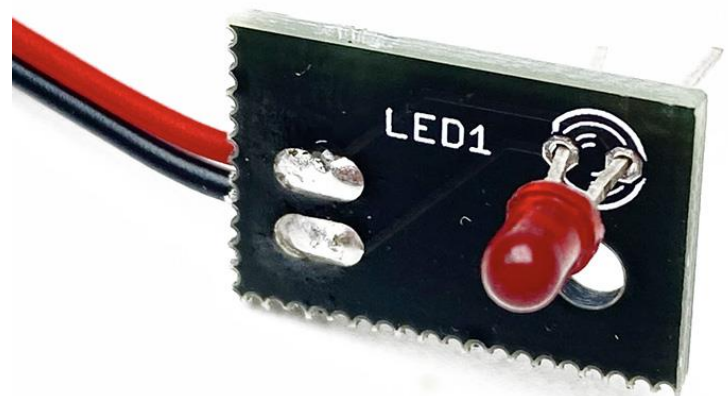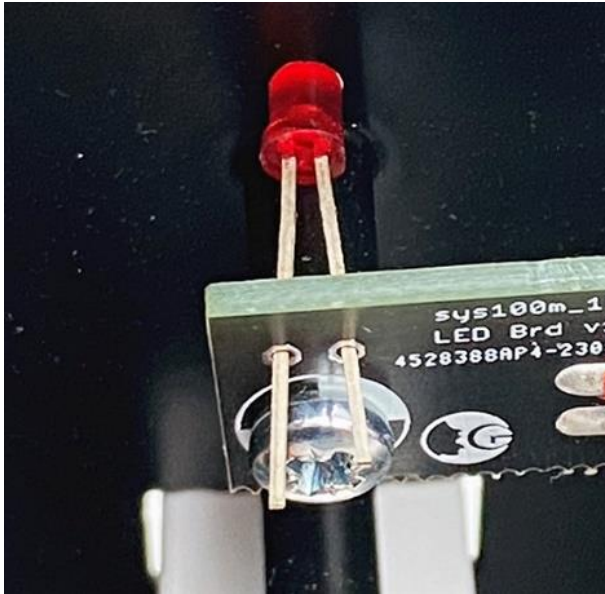
Connect the 3 pins shielded cable to the Xrl board
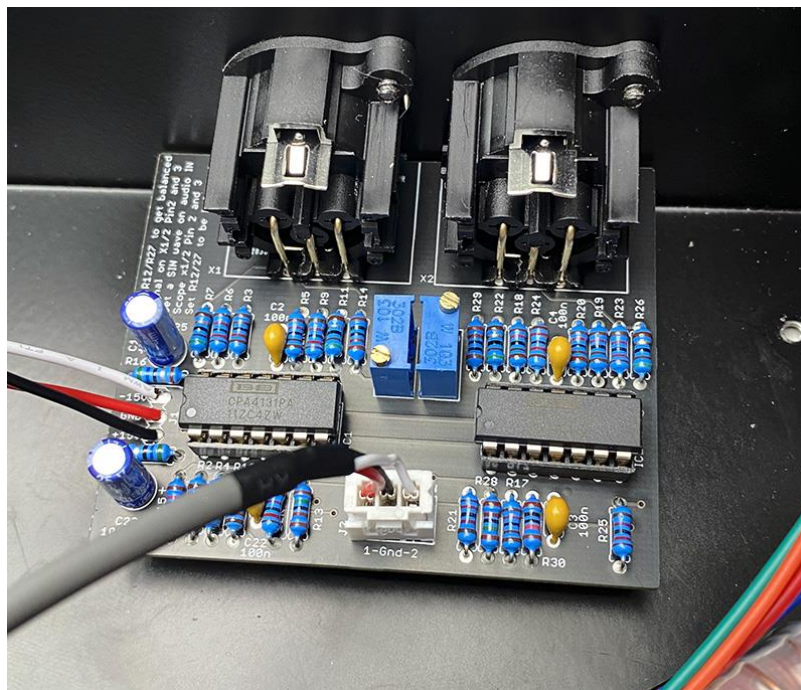
It is time to add the power led. Take the last 2 pins cable and solder the end on the led board. Red wire on the + and black wire on the –

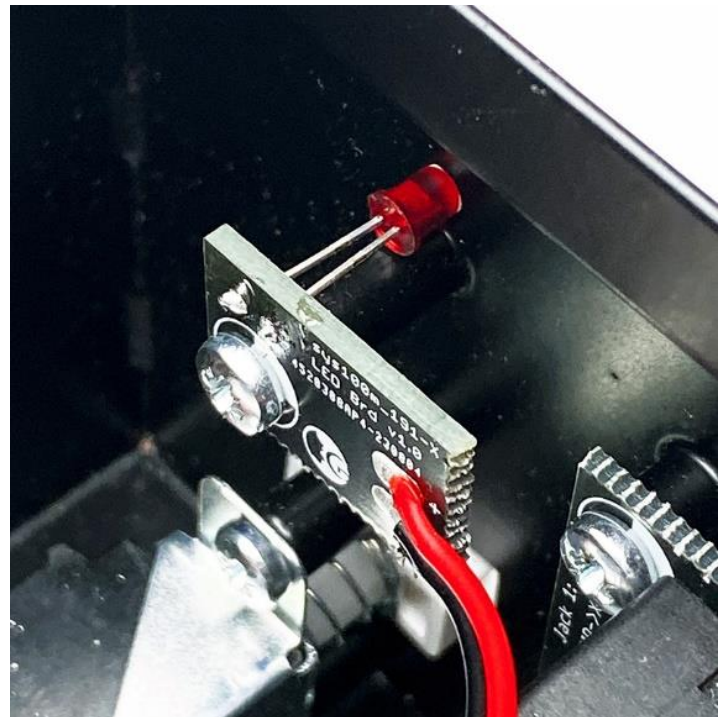Mount the led on the pcb but **DO NOT SOLDER IT NOW**.
Warning: The led silkscreen is in the wrong side. You have to insert the led in the opposite way. (Sorry for this mistake)
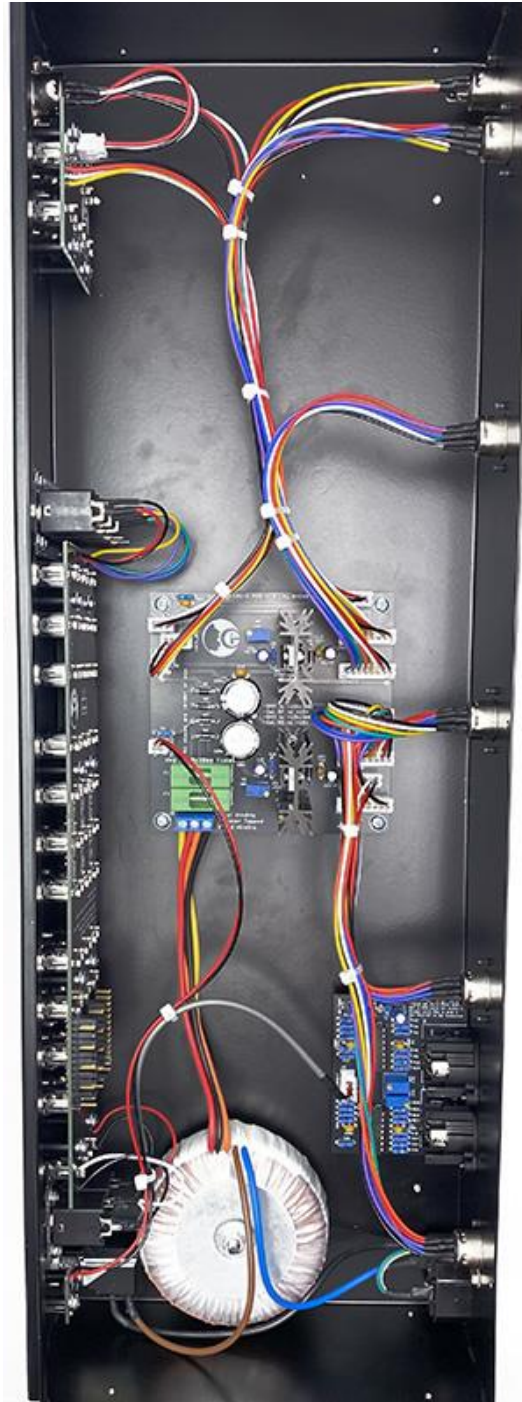
Mount the led board in the case using one M3x6 Pan head pozi machine screw. Then push the led leg that it fits the hole

Now solder the led and connect the cable to the PSU board

CONGRATULATION! ELECTRONICS IS DONE!!!!! TIME TO MAKE A CABLE MANAGEMENT USING CABLE TIES

BALANCED SIGNAL ADJUSTMENT

Before you assembly the case you must set the trimmers on the XLR board. Connect the triangle output of a VCO module (M-110, M-112 or M-111) to Jack A1. Set frequency around 1KHz no need to be very accurate). Then connect C1 XLR output to a balanced input of your soundcard or console. (You can also set the balanced signal with an oscilloscope)

**Warning:** Make sure to use a balanced xlr to jack TRS cable
Open your best DAW (if you don't have one download **Room EQ Wizard**) and monitor the input signal with a vu meter
Adjust R27 with a screwdriver until you reach the maximum level. Screw in one direction as the level increases and stop as soon as it decreases
Repeat the same thing to set R12. Input the signal to A2 and connect your soundcard input to C2.

CASE ASSEMBLY AND FINISHING

Mount the four rubber feet with four M3x6 Pan head pozi machine
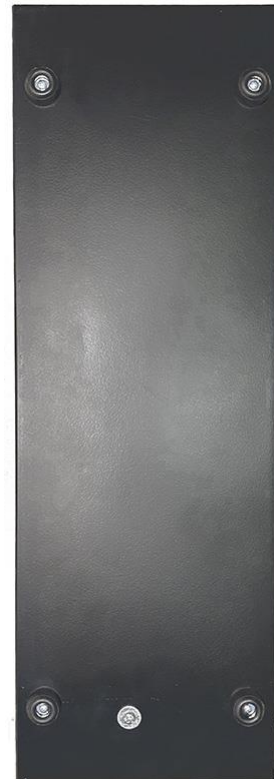
Mount the top cover of the box using four black M3x6mm **Countersunk** pozi machine screw black and three black M3x6 Pan head pozi machine screw

Now, take two modules and set one of each side of the case like shows on the picture.

Mount the second top cover of the box on the module and screw the module on the case
Take six M3x25mm black Pan head pozi machine screw and six M3x8 black washer and screw one of the wood sides. Repeat the same process for the second wood side.

YOU ARE DONE AND OWNER OF A BRAND NEWS SYSTEM100M CASE. CONGRATULATION!

(don't forget to write on the back sticker the voltage and serial number with a marker)