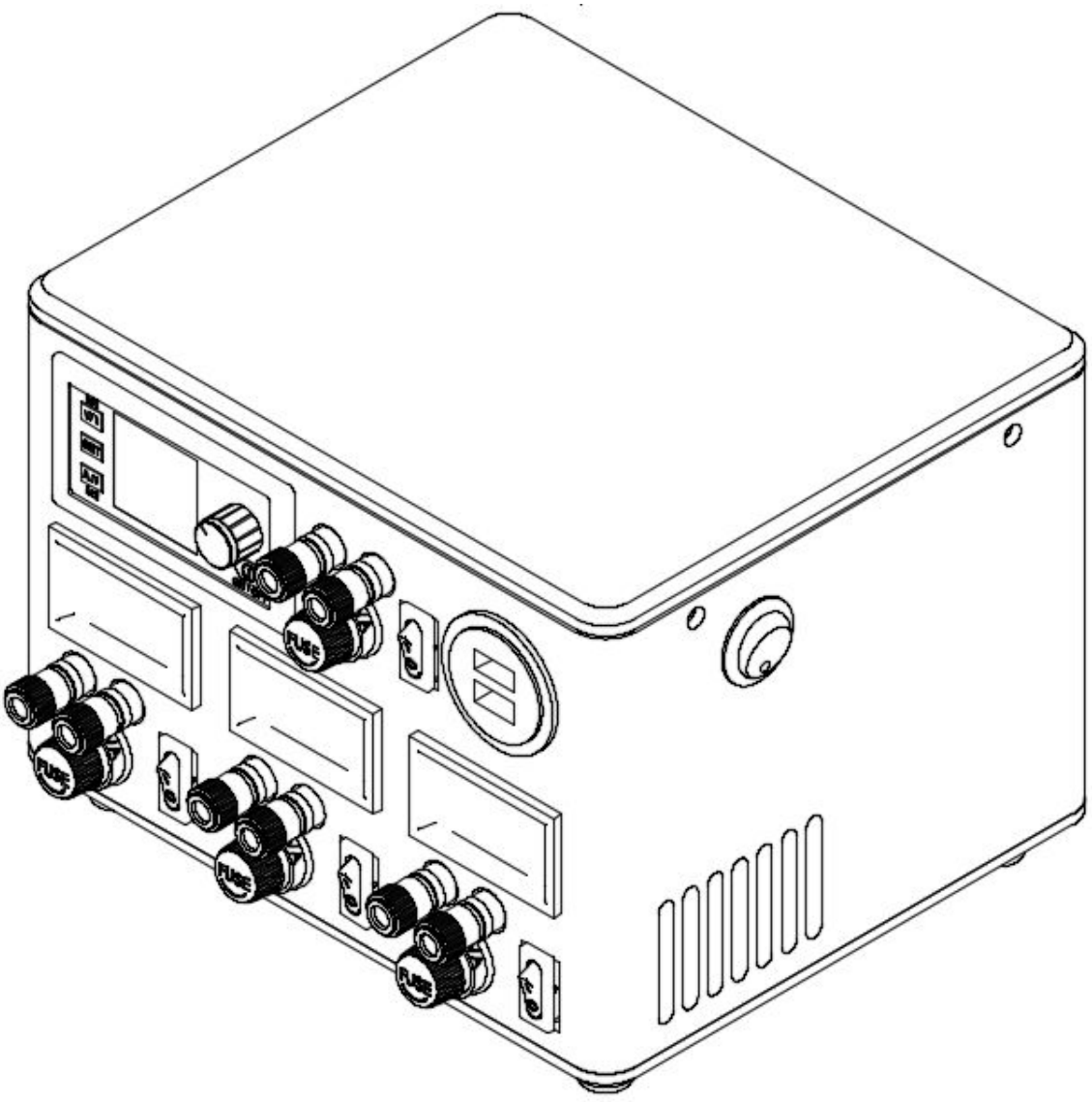


DIY BENCH TOP POWER SUPPLY

ASSEMBLY INSTRUCTIONS

DISCLAIMER

I did my best to make this design safe but overall I am an amateur and hobbyist. I can't guarantee you won't hurt yourself during making this thing, so if you feel uncomfortable to work with electricity, please don't start playing with it.

As well, this is not laboratory power supply. I don't know the level of noise or any other parameters which is required for lab PSUs, so don't even think about this thing that way.

INTRODUCTION

This is a bench power supply built on top of an old TFX 250W power supply (you can probably buy one on your local market for about $10-15). TFX is a standard, (65x85x175mm), so you can probably use any of this. Some of the PSU's (including mine) has additional pocket to the fan. The case I designed has a notch to fit this kind of TFX.

The design is inspired by the "Back Horn Speaker V2.0 BL2 - Bluetooth, Active, Passive" by guppyk (https://www.thingiverse.com/thing:4668173)

BILL OF MATERIALS

Product	Amount	Link
Rocker switch	5	https://aliexpress.com/item/1000005699023.html
Dual USB charger	1	https://s.click.aliexpress.com/e/_AmzlmT
12V LED rocker switch	1	https://s.click.aliexpress.com/e/_ANc8qP
Step up buck converter	1	https://s.click.aliexpress.com/e/_9vhU95
Buck Converter CC CV 1.8-32V 5A Power Module	1	https://s.click.aliexpress.com/e/_Ac5D8P
0.56'' 0-100V 10A LED Digital Voltmeter Ammeter	3	https://s.click.aliexpress.com/e/_9vbHCJ
Fuses (5x20, 10A)	4	https://s.click.aliexpress.com/e/_AaPtEL
Fuse holders	4	https://s.click.aliexpress.com/e/_9jOzf9

Banana socket (red)	4	https://s.click.aliexpress.com/e/_AU55QT
Banana socket (black)	4	https://s.click.aliexpress.com/e/_AU55QT
2x 22 Ohm 10W resistors or 1x 8 Ohm 50W resistor with heatsink	2(1)	https://s.click.aliexpress.com/e/_AVklGr https://s.click.aliexpress.com/e/_9gjnQx
IEC socket	1	https://s.click.aliexpress.com/e/_9xd9PH
LM2596 step down converter (optional, for fan speed voltage control)	1	https://aliexpress.com/item/4000064597454.html
Sunon 6010 12V fan	1	https://s.click.aliexpress.com/e/_A7tuKR
Insulated connectors	1 set	https://s.click.aliexpress.com/e/_AnuYWR
Brass Hot Insert Nuts	12	https://s.click.aliexpress.com/e/_A1hMur

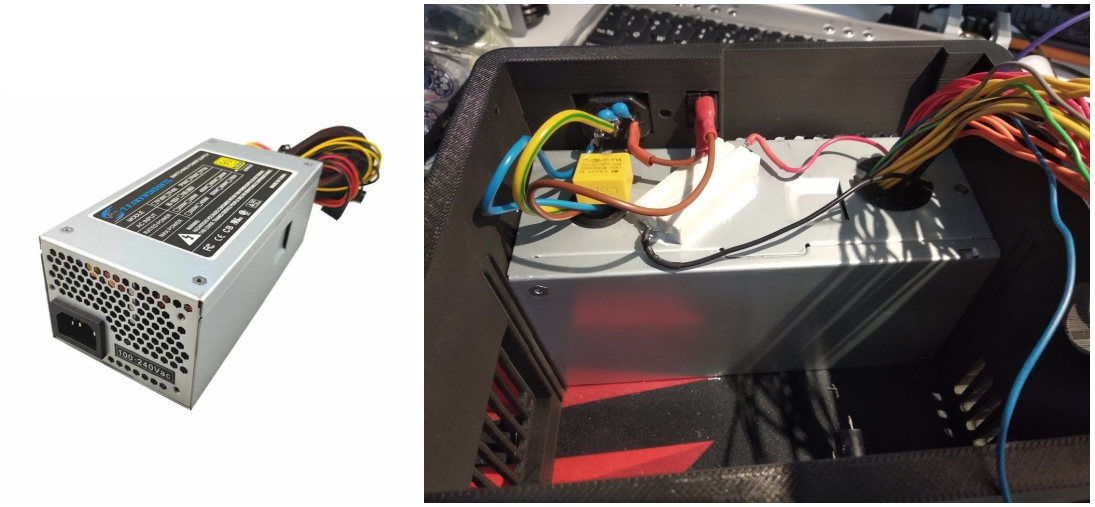
ADDITIONAL HARDWARE AND TOOLS:

- M3x10 screws, M3x16 screws or maybe other, which depends on the hardware you will use.
- M3 nuts
- computer fan screws (I don't know theirs name)
- 3x8 wood screws (optional)
- soldering iron
- wires (24-22 AWG)
- some glue to attach bottom plywood part to the case
- hot glue gun to secure some components on the front panel and secure wires
- drill and step drill bit to make additional holes in the TFX PSU case
- universal crimping tool
- heat-shrink tubes

ASSEMBLY

1. TFX PSU Preparation

Standard TFX PSU has an IEC socket on the side. Also wires with standard 24 pin connector come out from the opposite side. We have to move them to the longer side of power supply as on the photo below



Original vs modified TFX PSU.

You have to unscrew and take off the cover, drill the holes using a step drill bit and put the cables through new holes. Remember to secure the sharp edges of new holes somehow (I printed litle tubings but you can use ie. insulation tape). You will also have to unsolder original IEC (C13) terminal to be able to put the cables through the hole. Check the orientation of the cover (don't drill on the wrong side). 230AC wires and PE goes through left, others DC wires go through right.

Be careful. Don't start if you don't know what you are doing. PSU uses 230V AC voltage, so any mistake may be harmful.

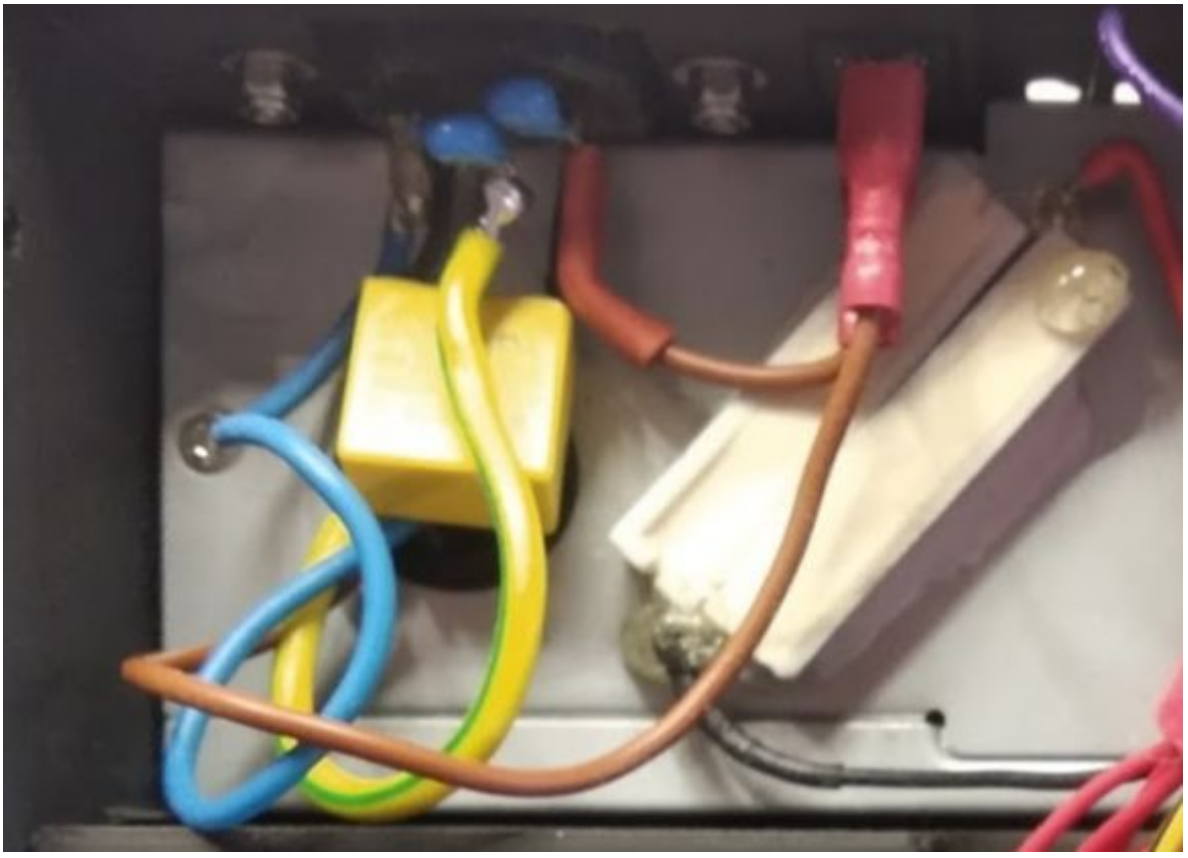
2. IEC and power switch

Now you have to put IEC and power switch in place as on the image below:

The socket has to be fastened using M3x16 or M3x20 screws and nuts (which fits better). The switch should be press fitted. If you fill it's loose just fix it in place using a little bit of hot glue. Now connect the wires from PSU, the socket and the switch as described on the wiring diagram.

3. “Dummy load”

If you decided to use 2x22Ohm 10W resistors as a dummy load, you can now connect them parallel as on the wiring diagram (one end to the 5V - red, second one to the GND - black), and fix them using thermal conductive glue. To be sure the wires are correctly insulated, you can secure them using hot glue as I did on the photo below. If you decided to use 8/10 Ohm resistor with radiator you can also attach it the same way or you can use designated place on the printed inner plate, which I will describe further.

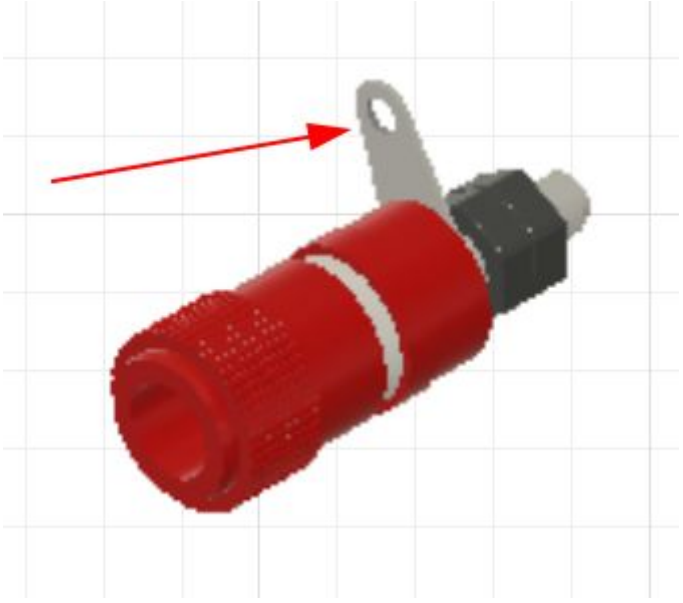


4. Mounting fan, front panel elements and side switch.

Now you can start putting all the hardware in place.

- start from fastening the fan on the side of the case using standard fan screws
- attach banana connectors on the front
- attach fuse holders on the front and solder the wires (one wire will be connected to the switch, second one to the red banana connector). Do it before fastening other elements because the lack of space. These wires should already have crimped connectors (flat 4.6mm for the switch and eyelet M4 for the banana)
- fasten eyelets from fuse holders to red bananas
- press fit switches on the front panel and connect wires from fuse holders
- prepare voltmeters-ammeters modules:
    - crimp M4 eyelet connectors on thick red wire

- remove thin black (cut and secure or remove pin with wire from plastic housing)
- solder the yellow thin wire to the M4 eyelet delivered with the banana connectors:



- crimp 4.6 flat connectors on 3.3V, 5V and 12V wires from PSU (orange, red and yellow) - you can use one pair per connector (as I did) to be sure the wire can handle higher current
- connect the rest of the wires that come out from the voltmeter module (thin red and thick black) to the corresponding PSU outputs (red and black, 5V and GND). You can directly solder them or use ie. male-female flat crimp connectors:

- attach and connect the buck converter with display as shown on the wiring diagram (it may be a little bit tricky, because the connected wires will collide with the body hole edge, so you will have to disconnect the pcb from the display module, put the housing with display into place and then reattach the pcb to the back)

- attach the usb socket and side switch and connect them as shown on the wiring diagram (use flat female connectors)
  Please note: I didn't have to use the buck converter for the 12V switch. I just connected PG wire to the golden leg of the switch and it works on 5V PG output.
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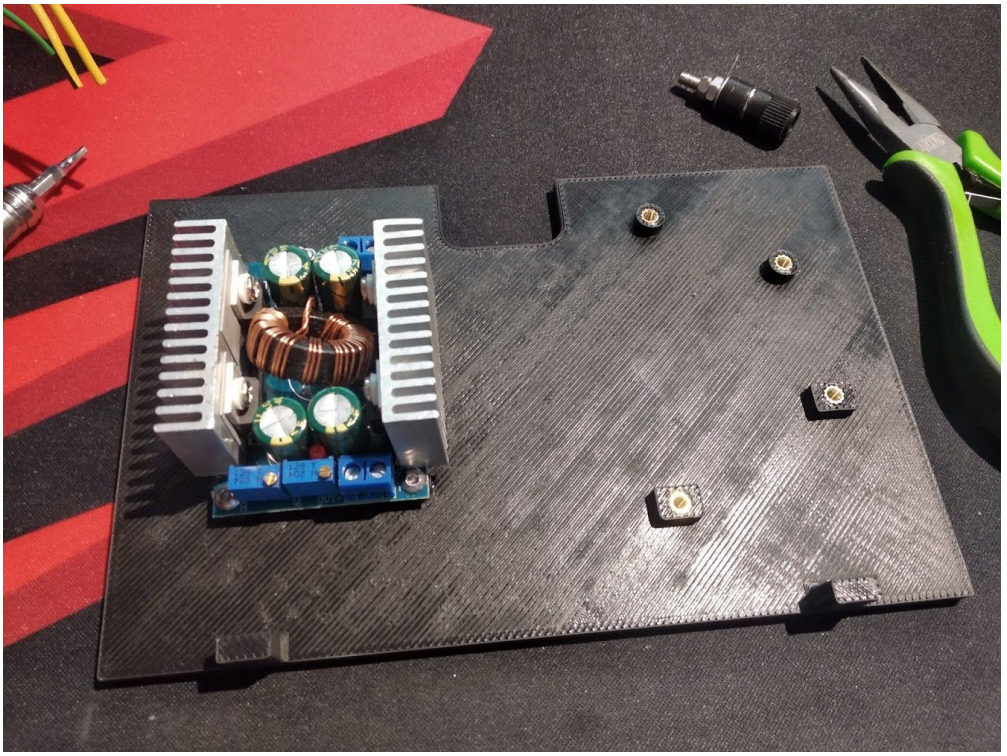
5. Inner wall

Now you can assemble the inner wall with mounting holes for the rest of hardware:



Melt-in the brass inserts into the holes using the soldering iron. Please google for how to do it properly. Then fasten the buck converter and optional step down converter for fan power supply (the fan running on 12v is pretty loud, I connected mine directly to 3.3V and it seems to work fine. You may also check the 5v). The two holes on the bottom right are prepared for the 10/8Ohm resistor with heatsink, but I didn't tested it.

You also have to check if the wall slides in place without much friction. If so, please sand the edges a little bit using P240 sandpaper grit. If all hardware is attached and the wires are connected (see wiring diagram), you can slide the wall in starting from the bottom of the case (it will be impossible to do it from top if you already connect the output from PSU to the terminals on the front).

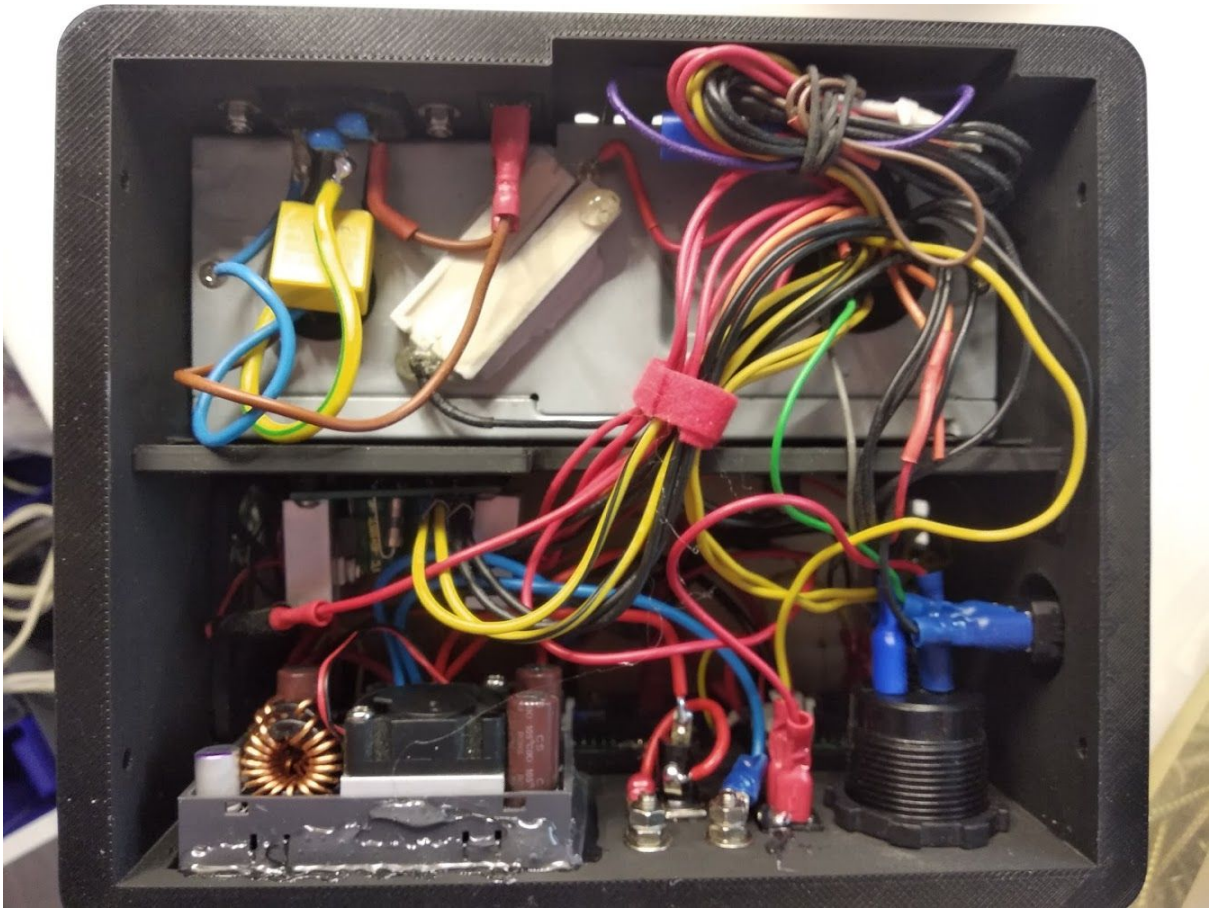
The bottom holes are designed to fasten the wall to the bottom plywood plate to prevent from slide out (Use 3x8 wood screws), but mine fitted with a little snug, so I ommited this step.

6. Testing the functionality

Now it is a good time to check if everything works. Before you plug the power coord check if everything is fine:

- check for any shorts
- check if any terminal doesn't touch metal PSU case
- temporarily cover somehow the top of the case to prevent accidentally touching the AC cords and terminals
- tie the cables properly to make it look tidy and neat

Now plug in the coord, turn it on and check if everything works. You may want to calibrate the voltmeters now or you can do it later.



7. Top and bottom plywood plates

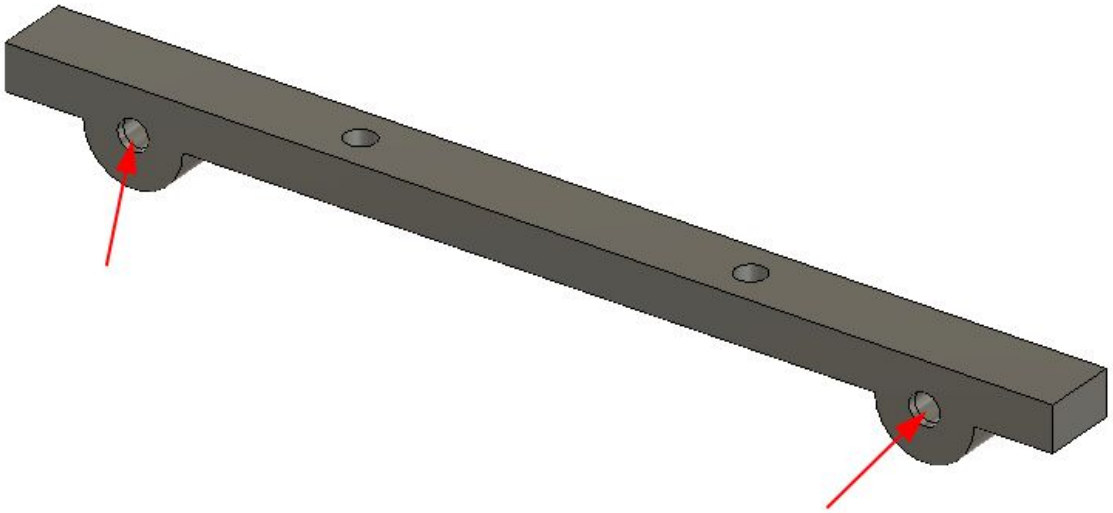
If you decided to make the top and bottom plates from plywood, you have to cut them out now. Everyone have his own techniques, so I just describe how I did this:

- I cut the plates on my miter saw with about 0.5-1mm of reserve (please find a cutting template in thing files, you can print them as a reference).

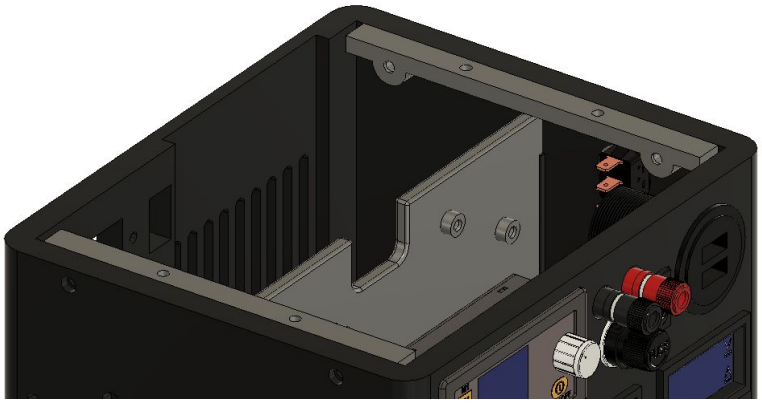
- I sanded them using my orbital sander (80, 180 and 240 grit), the rounded corners and the fillets are also made using sander. If you have one, you can use a router to create clean and neat edge profiles.
- I put two coats of an oil on the plates

If they fit, you can start assembling. I didn't have any idea how to fasten the bottom plate to the case, so I decided to just glue it. I used two-factor epoxy glue, which gives strong connection within few minutes.

The top plate is attached using screws, but I didn't want to make them visible on the top, so I designed the holders (lid-holder.stl). Print them two times and fasten to the body using M3 screws. The holders requires brass inserts to be melted into holes pointed on the picture below:



To attach the holders to the lid properly, I screwed the on to the body first and put a little bit of thick super glue (gel) on the top of it (be careful to not put the glue on the body edges). Then lay the plate on it and align it properly. Gel CA glue should give you enough time to manipulate.



Finally you can unscrew it gently and take the lid off with the glued holders. Fasten them properly using 3x8 wood screws and designated holes.

FINAL NOTES

I am writing this guide few weeks after assembly, so it may be inconsistent. If you have any questions feel free to contact me:

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