



der Regler | a solder-free benchtop-lab-PSU made from an ATX power supply



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Summary

You ever wanted to reuse an ATX PSU as a lab-PSU but were too intimidated by the build? This one might be for you!

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There are many instructables, models and tutorials for transforming an old ATX power supply into a fancy benchtop-lab-PSU, but opening the unit, desoldering cables and combining different lanes always intimidated me. I am no electrician and I just didn't feel comfortable with those kinda mods. By accident I found simple ATX breakout boards online - they are not without downsides, but I finally felt comfortable building my own. This build can be done without any soldering (you are still free to do so, of course), but with crimping and Wagos.

Still, it's worth mentioning that I am not an electrician and you should only do this project at your own risk. Electrics can be dangerous for you and others, so proceed with care.

In the default-setup, it features dedicated outputs for 3.3V, 5V, 12V, 2x 5V over USB, as well as a variable buck-boost converter for outputs of 6-36V (80W max).

This build was designed to be easy to make, of course this comes with some costs (in a meta as well as a literal sense). I do understand that everyone might have different needs or has trouble to source the same parts I used, so for the first time in my life I will share a STEP file for the main body.

what it can't do.

Let's first glance over the downsides.

As you may know, ATX power supplies divide their called wattage over different lanes; a 500W PSU will supply those 500W over the 3.3V, 5V, and 12V outputs combined - so not in one place to hookup e.g. a 12V 40A device. However, the 12V output is often then further divided into separate lanes (to properly feed the mainboard, GPUs, harddisks, etc). The PSU I used, for example, is 750W - however, the 12V is divided into two lanes of 19A each, so roughly 230W per lane. As the breakout board I use only utilizes the main ATX connector (the big one going into the mainboard), I won't be able to pull more than the power of one lane max.

As we won't use the other cables and outputs, they are in the way - so I cut them off. I secured the live ones with closed end crimp terminals, the GND I just wrapped with cable ties. If you happen to have a modular PSU with detachable cables, that is a big plus for this build!

The buck-boost converter gets fed by the 12V output; I wasn't comfortable to have it connect and used at the same time, though. I installed a simple switch to choose if the 12V or buck-boost converter is active - of course, anyone can change that for their own build if they feel more adventurous. I didn't feel this device needed a dedicated switch on the front, as every ATX PSU I know has one on the back; if you don't deem them a waste of space, you can of course add them at your leisure.

The USB connectors are stripped from a PCI-mainboard-adapter; switching the connector from an internal to a normal USB-A one is actually the only thing I soldered on my personal unit, but adapters are available (and I really don't feel like I have anything to prove to anyone by going the whole nine yards myself, ha)

what it can do.

It is simple to make. But for that, you need a crimping tool (or two, depending on what connectors you want to crimp) as well as an assortment of different crimping terminals (mostly rings, wire ferules, and the aforementioned end stop terminals; they are often bundled with tools). The breakout board has four fuses directly on board, one for each output (also the -12V ATX we don't use, which is nice). All outputs can be used

simultaneously (except the buck-boost and 12V, as mentioned before); because the housing is rather cramped, I decided to add “a few” holes for breathing as well as three 40mm fans for constant active cooling. I use Xilence XPF40, in this config they are audible but they don't bother me; however, you can use more expensive silent fans or hook up a voltage adjustment to make them turn slower.

The pairs of banana plug terminals have a distance of 19mm, which is seemingly some kind of standard for lab configs. While things like banana plugs or crimping supplies can be bought locally in an affordable manner, the buck-boost converter might cost a pretty hefty markup and crimping tools are also often a bit pricey. These parts might better be bought at AliExpress, at least to Europe the shipping is quite fast (when looking for the 12 day delivery options, but they are plenty these days). If you only need to order a single piece from there, you can as well order other materials as well and save some cash :)

BOM - what you will need.

Anytime I find an older 3D printable project that links items to various shops, at least half of those links are dead. Therefore, I will try to name the parts as precise as I can and add some images to this page for your reference (I will still link the parts where I got them from myself, hoping they won't go down soon - as those are also links to German stores, just treat them as reference).

This list will only be for the default-config I build myself. Have a look at the photos and files and decide for yourself what you want to use and what you can ignore.

- an ATX power supply (preferably a discarded one without better use), 20pin or 24pin is fine, incl fitting power cable
- “HU-M28W” ATX power board lead-out / breakout module
- “SK80H” DC buck-boost converter 6-36V 80W
- four pairs of banana plug terminals (I used the short ones; they are also available in many colours in case you want to colour-code)
- mini flip switch, 125V 6A, ON-ON positions (I bought mine a long time ago, but it's these)
- USB bracket for 2x USB-A to mainboard adapter (I bought this one from Bolwins, but other manufacturers make basically the same thing; you will either need to solder a USB-A plug to them, or get an adapter from internal to USB-A)
- crimping tool for wire ferrules
- crimping tool for general terminals (I got a different one in a local store, but I like these)
- closed end crimp terminals
- 3x Xilence XPF40 (or any other 40x40x10 mm fans)

- either 4x very long (~300mm) cable ties, or 8x shorter ones (~150mm), width of 2,5mm (if your PSU is very large, you will need longer ones accordingly)
- cable for wiring (I used 18AWG silicone cable in red and black; 1m of both colours will be more than enough; you might want to use thicker cables at high currents, please refer to spec tables for wire thickness vs voltage/current)
- **WAGO 221 connectors**
- 12x M2.5 nuts and screws, 20mm length, for fan installation (you can also get away with six pairs, I did that too)
- 5x M3 nuts and screws, 5mm length, to install the feet
- 4x of those PSU-screws you use to install them on a PC case (optional but slick)
- a ~3mm flathead screwdriver for all the screw terminals
- a Multimeter to check for potential issues
- I recommend PETG filament for the housing, as well as TPU for the feet and some vibration-dampeners for the 40mm fans
- alternatively to TPU feet, you can get 12mm self-adhesive rubber feet; I prefer them printed and screwed though

the Amazon links are affiliate ones - not because I want to get rich, but because it's the easiest way to get a proper link on that webstore, sorry for the inconvenience

how you make it.

Print all parts you need or want (duh). The assembly is pretty straight forward - I will tell you the order of how I did it.

If you have a non-modular ATX PSU, you should cut off all cables but the large 20/24pin ATX plug. Bundle all live wires of the same colour and crimp them with end stops, you might need more than one. Alternatively you can open the PSU and cut off the unused cables from the PCB or desolder them, but I didn't feel comfortable doing so myself. Set the ATX PSU on the side for now.

Put M3 nuts into the housing parts and screw on the feet (better do it now before it's cramped in there).

Then just get all the terminals, switches, buck-boost converter, and other adapters in place of the printed Front - if you use the same flip-switch as me, you can remove all washers etc and just keep one nut to secure it from the front.

Crimp or solder ring-terminals to cables for the banana plug terminals and screw them tight; if you use the same terminals as me, you only need one of the plastic parts of the terminal, the one with the "step" in it. I

recommend doing the wires a bit longer, you can always shorten them later.

Crimp a spade connector (if they are called like that; the counterpart for the blade connectors on the switch) to the other side of the red cable of the 12V out. Connect said spade connector to the flip switch. **NOTE** that the polarity of the switch may be confusing at first: middle pin is for the live wire from the breakout board, the upper pin is live when the switch points down and the lower pin is live when the switch points up (I guess you could add LEDs which light up when power is running on the designated output, but I didn't deem that necessary as the buck-boost converter has a display that lights up on its own). I wanted the switch to point in the direction of the plugs, so down for 12V and up for the buck-boost converter. Therefore, I had to connect the 12V out to the upper pin, buck-boost to the lower pin.

Connect the wires of the varV out the the output screw-terminals of the buck-boost converter; I like to crimp the wires with wire ferrules for added grip. Then crimp a spade connector to a new red cable to run from the flip switch (in my case lower pin) to the In+ on the buck-boost converter.

Cut off the plugs of the 40mm fans and crimp the red as well as the black wires of all units together, using wire ferrules. Install the fans in their designated positions with M2.5 screws, it's up to you if you want to use the dampeners or fan grills.

Connect the 3.3V, 5V, and USB to the breakout board; I like wire ferrules for their grip here as well. Run a new black and red cable from the breakout board into a Wago connector each. Connect the black wires of the fans, the 12V out, and the In- of the buck-boost converter to the Wago running the black wire; to the "red Wago", connect the red connector from the fans; then prepare a new cable with a spade connector to run from the Wago to the center pin of the flip switch.

Now it's time to do a dry-run. Connect the PSU to the breakout board as well as your wall-outlet. Switch on the PSU and the breakout board; check if all fans are running and if the switching-direction suits your needs. Check all outputs with your multimeter if they are running and display the correct voltage. Fix everything that isn't working (like a faulty connection or a wire that slipped out). When everything works, disconnect the wall-outlet and ATX plug, and turn off all switches (except the breakout board), then we can finish everything up :)

Place the printed Rear onto the rear of the ATX PSU, the holes should align with the threads (screwing them is optional, but slick). Make sure the switch of the breakout board is ON, as we won't be able to reach it later. Now the nastiest part - cramp everything into the Front, fold the cable

from the PSU a bit (some cable ties can help as well), connect it to the breakout board in a “favorable position”, and push the Front into the PSU. There are some “rails” inside so you can't over push. If you are as paranoid as me, you check if everything is still working after all that cramping before we close up the build.

To finish, put cable ties (either two connected or a very long one) through the latches on your printed Front and Rear, two on the top and two on the bottom, zip them tight (do not overtighten, the printing orientation isn't favorable for strong pull in this direction and might lead to layer split).

Cable ties are really not very elegant to close it up, but as PSUs greatly differ in their depth I didn't want to design some “modular” approach that just works worse in the end. If you have a better idea, I'm all ears

And that's it, you are done :)

the name.

Es ist halt der Regler. Der regelt die Dinge.

printing advice.

All files are already oriented for recommended printing orientation.

As mentioned in the BOM, I recommend PETG for the Front and Rear. Print with 3-4 outer walls, 30% infill is fine. Facing down the Front should print easily without support (my cheapo printer got the bridges like a champ, so yours will too). However the latches on the rear do make some issues without; either place them manually or increase the support roof thickness, they are easy enough to remove.

For some added strength for the cable tie, I recommend some increased flow of 103-105% (given your printer is properly calibrated).

Print feet, fan grill, and dampener how you like - your default settings for the designated material will do just fine.

Model files

labpsu_fangrill.stl

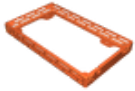




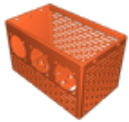
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