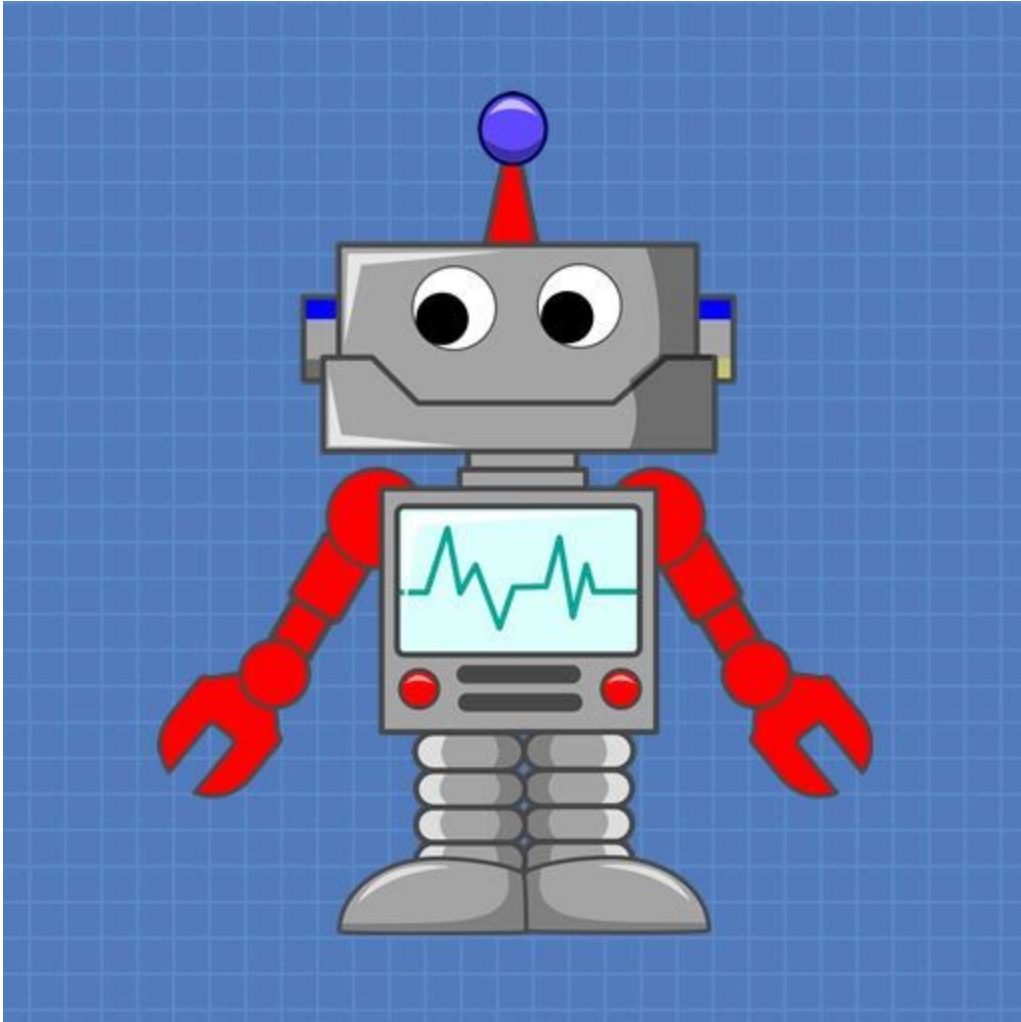


Convert an ATX Computer Supply to a Bench Supply



DroneBot Workshop Tutorial

<https://dronebotworkshop.com>

Table of Contents

Introduction	2
ATX Supply	4
Main Power Connector	4
Other Power Connectors	6
Hooking it up	7
Wiring	8
Inside the Box	10
My Build	11
Testing it out	18
Adding a Power Meter	19
DSN-VC288 Power Meter	20
Wiring the Power Meter	21
Conclusion	22

Introduction

Every workbench should have at least one power supply.

When you're experimenting with electronics and microcontrollers a good power supply can be an essential piece of equipment. While you can certainly make do with USB power bricks and "battery eliminators" nothing beats having a dedicated power supply with plenty of voltage selection and current capability.

An ideal workbench power supply should have both 5-volt and 12-volt outputs, with 3.3-volts being a nice option as well. It should be capable of providing several amperes of current for each voltage.

You can buy bench power supplies of course, but they are not inexpensive. As the current capability and number of output voltages go up so does the price.

While a commercial bench power supply is certainly a worthwhile investment there is a cheaper solution that you might want to consider. Adapt an old computer power supply to use on your workbench.



Computer power supplies have all the voltages you'll need and some very impressive current capabilities. And, thanks to mass production, they are cheap when compared to dedicated bench power supplies.

In fact, if you have access to an old computer that is on its way to the junk heap you can rescue its power supply and put together a nice bench power supply for just a few dollars.

That's what I did actually – an old Windows XP desktop computer has now become a useful addition to my workshop.

ATX Supply

ATX (*Advanced Technology eXtended*) is a computer motherboard configuration developed by Intel in 1995. It still is the most common motherboard configuration.

ATX Power supplies have standard sizes and connectors for use with ATX motherboards. There are actually a few different ATX power supplies, all of them are designed to provide 3.3, 5 and 12 volt outputs.

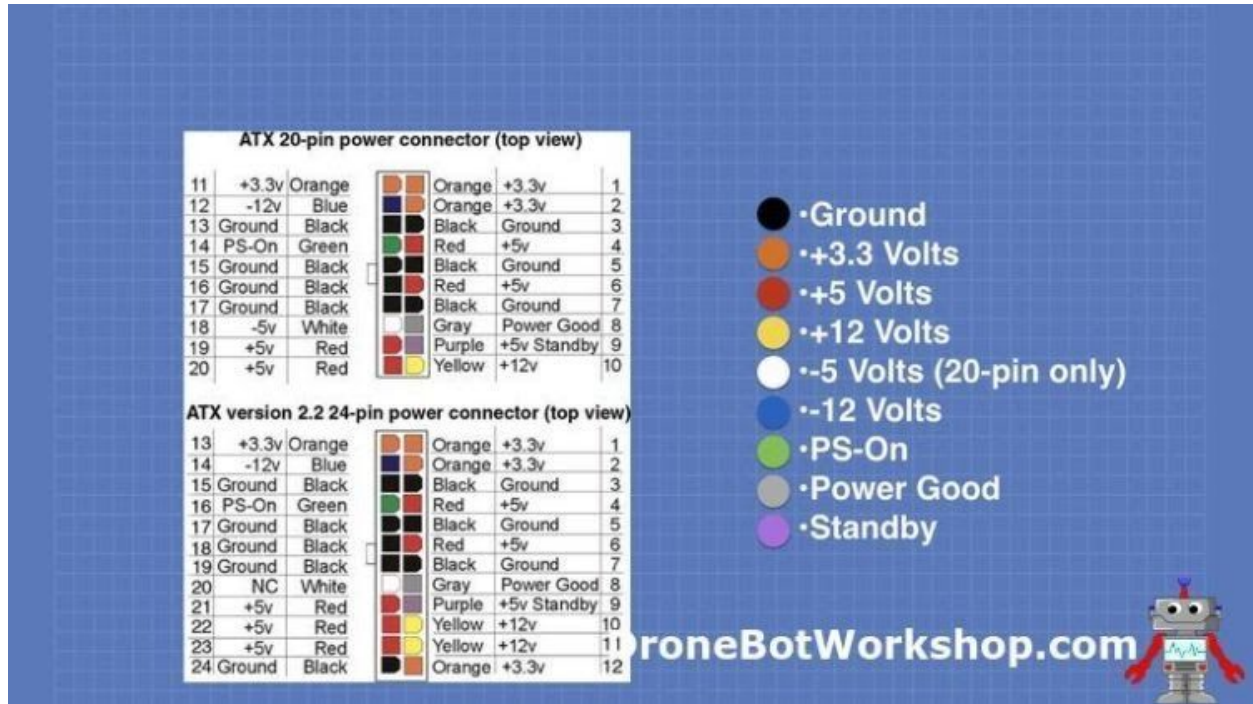
Main Power Connector

The main power connector supplies power to the motherboard of the computer. It also has connections for power switches and indicators.

There are two types of connectors commonly used here, an older 20-pin variety (Version 1) and a newer one (Version 2) with 24-pins. Both use Molex connectors.

The unit I will be experimenting with uses an older 20-pin power supply connector.

Here are the two power connectors.



Note that the primary difference is that the 24-pin connector has additional voltage and ground lines.

You'll notice that many connections (i.e. ground) have been repeated, this is done to increase the current carrying capability. The actual connections from the power supply are as follows:

- ; fci bX – (BLACK) – The Ground or reference.
- Ž) `J – (RED) – Positive 5 volts.
- Ž%&J – (YELLOW) – Positive 12 volts.
- Ž' " `J – (ORANGE) – Positive 3.3 volts.
- !%&J – (BLUE) – Negative 12 volts.
- !) `J – (WHITE) – Negative 5 volts (not on later models).
- DG!CB – (GREEN) – Power Switch On. Connect to Ground to turn on the power supply.
- D; – (GREY) – Power Good. A status voltage that is 5 volts when power is good.

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- **PURPLE** – Standby voltage, 5-volts at up to 2 amps. On when supply is powered up.

The output voltages are self-explanatory, I'm not planning on using any of the negative ones, but you can if you wish, of course. Older ATX supplies (like the one I'm using) have a -5-volt output as well as a -12-volt one, newer (24-pin) Type 2 models only have the -12-volt output.

Other Power Connectors

The ATX type power supplies also have other connectors, used to power up peripherals such as hard disks and DVD drives.

These connectors have four connections

- **Red** – Red
- **Yellow** – Yellow
- **Black (Two wires)**

I just plan to remove these from my power supply. I'm saving them as they may be useful in a future computer build.

There is also a 12-volt 4-pin connector that is used to supply power to the motherboard CPU fan. Its connections are pretty simple:

- **Yellow (Two wires)**
- **Black (Two wires)**

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I'm planning on using the additional 12-volt wires in my final design so I will just be removing the Molex connector.

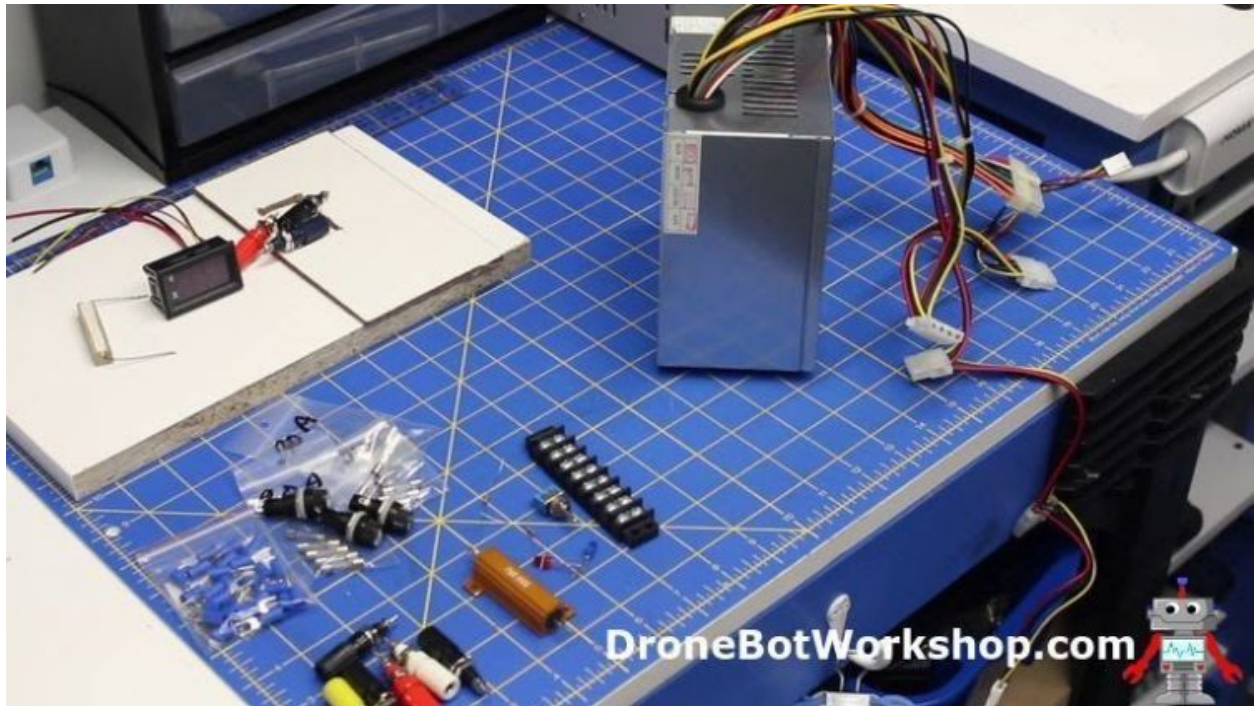
Hooking it up

Aside from the ATX power supply itself, we will need a few additional components to build our bench supply.

The exact parts list will vary depending upon what you want to build your supply into. Here is what I used to build my supply (not including the materials I used for an enclosure).

- ATX Power supply (mine was used from an old Windows XP Desktop, it has a 20-pin connector).
- Binding posts for outputs.
- Fuses and Fuse Holders (optional but I thought it was a good idea)
- 2 LEDs, any color, for Power On and Standby indicators.
- 2 330-ohm dropping resistors for the LEDs
- Power Switch
- 8-20 ohm 10w power resistor

As I wasn't able to find a 20-pin Molex connector to mate with the one on my power supply I had to cut the wires. I used an 8-pin terminal strip to make my connections from the power supply.



I also elected to add a power meter to my project. I'll have details on that near the end of the article.

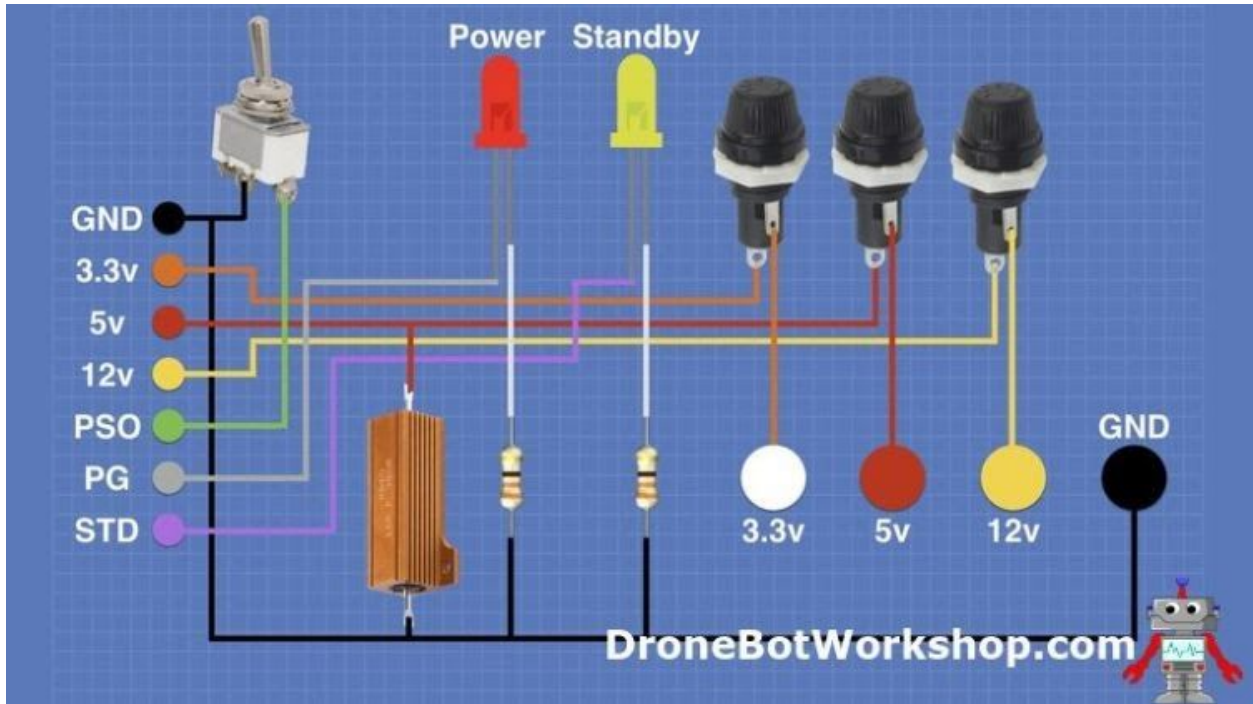
Wiring

The wiring is pretty simple but you do need to be careful as the supply is capable of sourcing a lot of current, so a mis-wired connection could be pretty spectacular.



You also may elect (as I did) to open the supply and remove some of the wires you won't be using, if so

The connections are as follows:



Pay attention to the colors of the wires as they are standard and will help you confirm their identity.

If you decide not to use fuses you can just bypass them. I added them as an extra level of protection.

Inside the Box

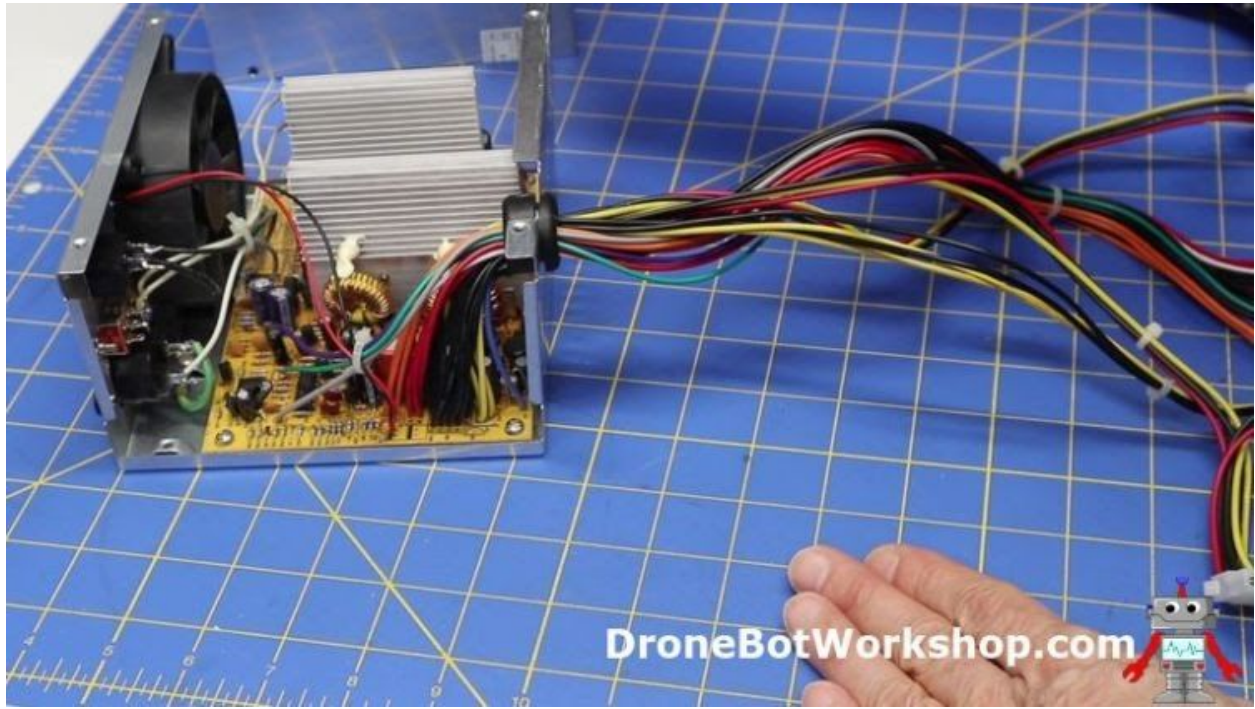
One thing you might be tempted to do is to wire all of the connections inside the existing power supply box. This can produce an attractive and compact self-contained unit.

While you CAN do this I would advise against it unless you are very experienced.

Remember, there is lethal voltage inside the power supply box and it also has been designed to dissipate heat correctly. You have to be sure that any design change you make doesn't put you in danger or affect the heat dissipation.

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If you do decide to do it this way be careful not to splash any solder onto the circuit board of your power supply.



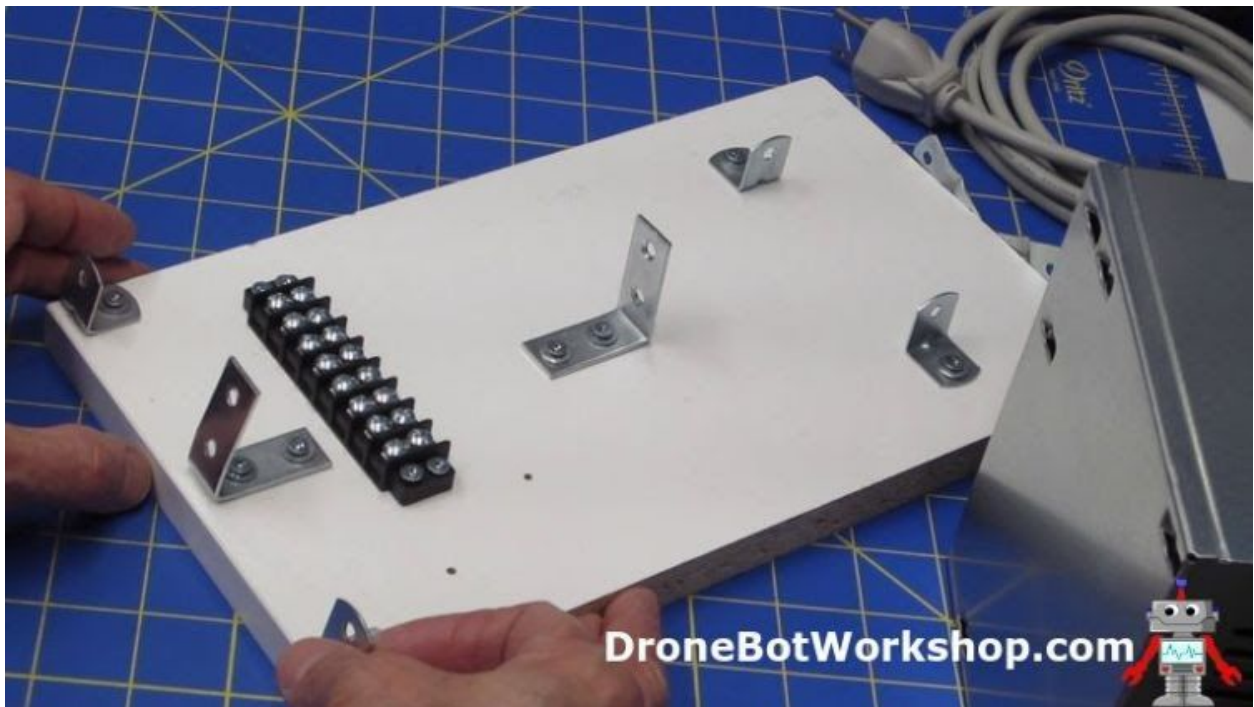
I built mine “outside the box” and suggest that you do the same.

My Build

I chose a very simple method of building the final product, I suspect that you can come up with something far more exciting but this design gets the job done.



I mounted my supply on a block of wood, along with a terminal strip for breaking out the connections from the ATX supply.



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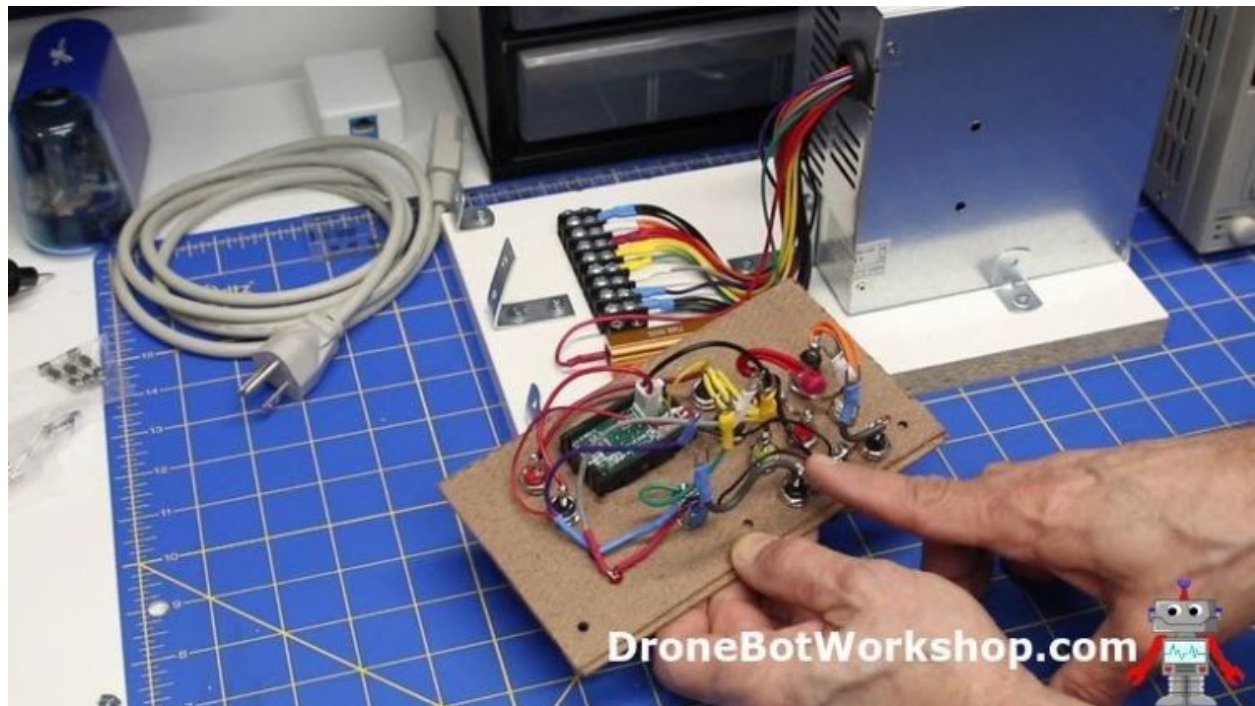
I used the existing threaded screw holes on the back of the ATX supply and a couple of homemade brackets (actually just flattened a couple of small angle brackets in my bench vise) to mount the ATX power supply to the base.



I also constructed a very simple front panel with a thin piece of wood, it's not pretty but it is functional. In addition to the binding posts, switch, fuse holders and LEDs I also mounted a small Voltage and Current meter on my front panel. More on that later.



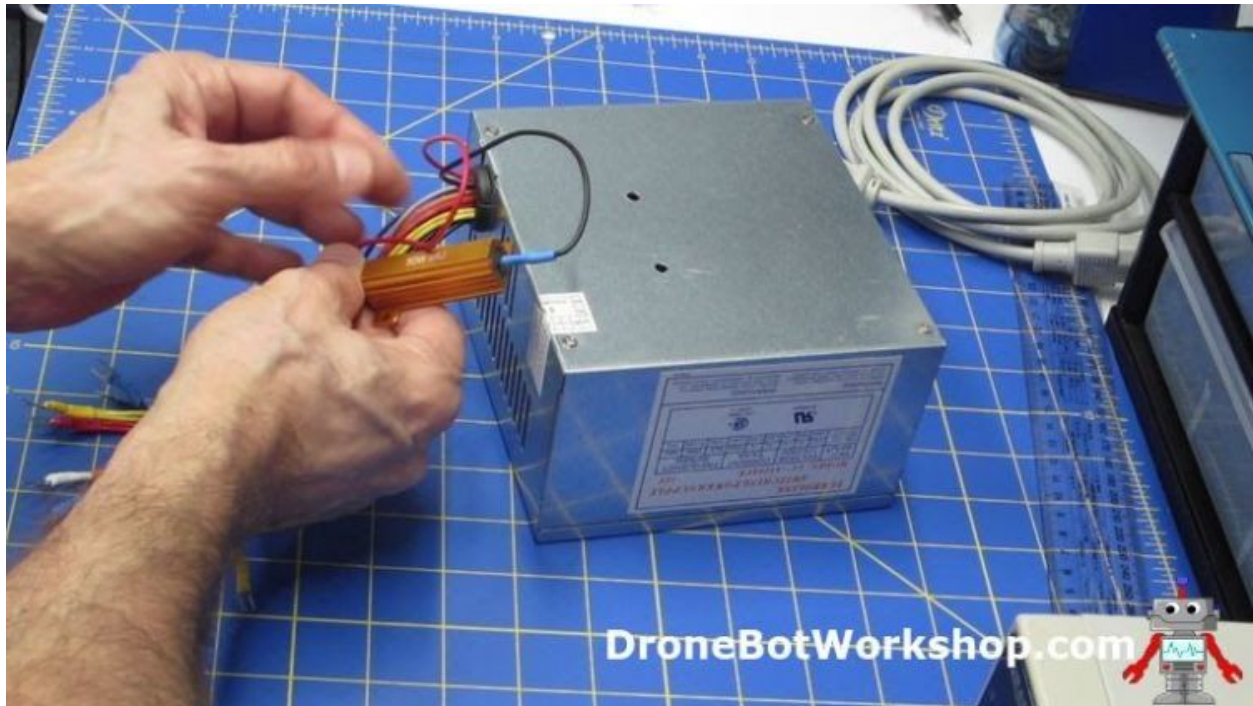
I used lugs on all of the wires to neaten up the hookup. I crimped and soldered the wires to the lugs and covered everything with heat-shrink tubing to keep the connections insulated.



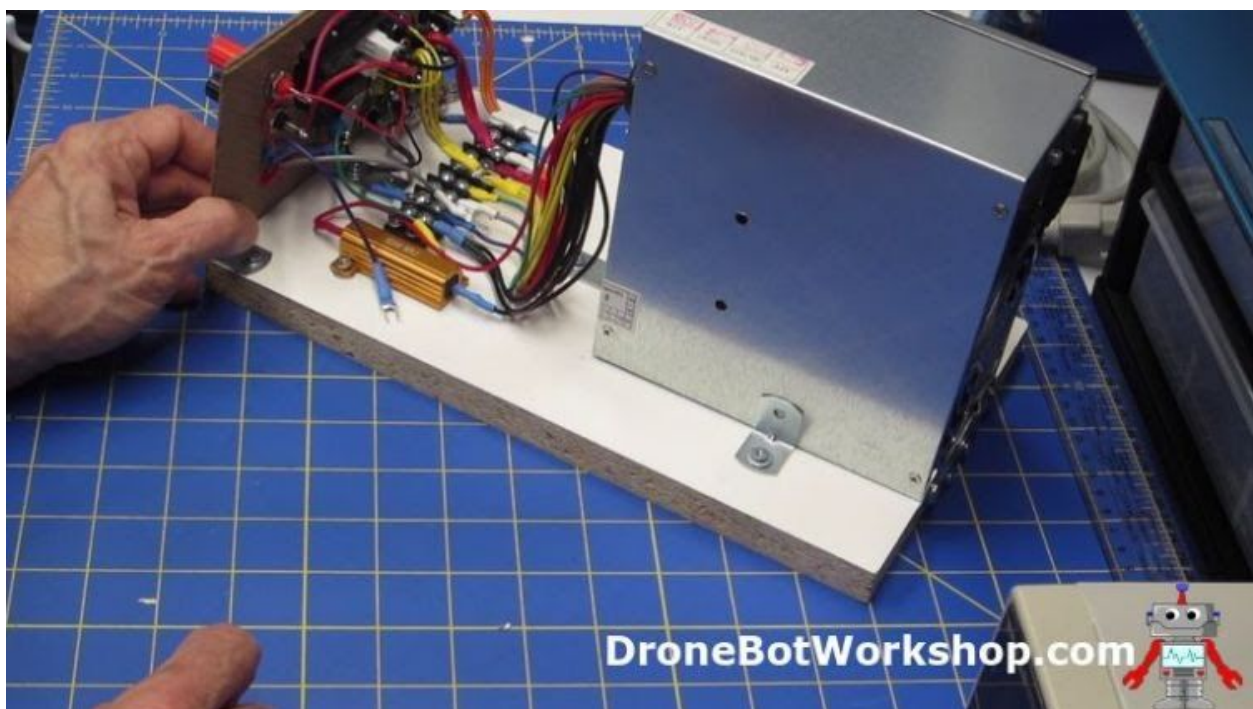
For the power and ground wires I used groups of three wires, this increases the current output capability of the supply (and its the reason there are so many connections on the ATX power supply in the first place). I also have two sets (total six wires) for ground.



I brought out an additional 5-volt (red) and ground(black) wire to attach to the power resistor that I'm using as a load. If your supply doesn't require a 5-volt load on startup you can eliminate this.



Finally, I fastened the front panel with a few bent angle brackets (to give it a tilt) and connected the wires to the terminal strip.



Testing it out

Once you have everything wired up and have double-checked your connections give everything a good shake to loosen any stray solder bits.

Now it's time to give it a test.

Before you plug in the supply check the voltage selector switch near the power inlet. It needs to be set correctly for your line voltage. Assuming that you grabbed this supply from one of your old computers it likely is set correctly.

Also, don't forget to put fuses in the fuse holders!

Power up the supply by plugging it in and switching the main power switch on. Keep the switch on your control panel in the Standby position. You should observe the Standby LED is now illuminated.

If you were to test for voltage at the three outputs you should get nothing. The power supply fan should be silent as well.

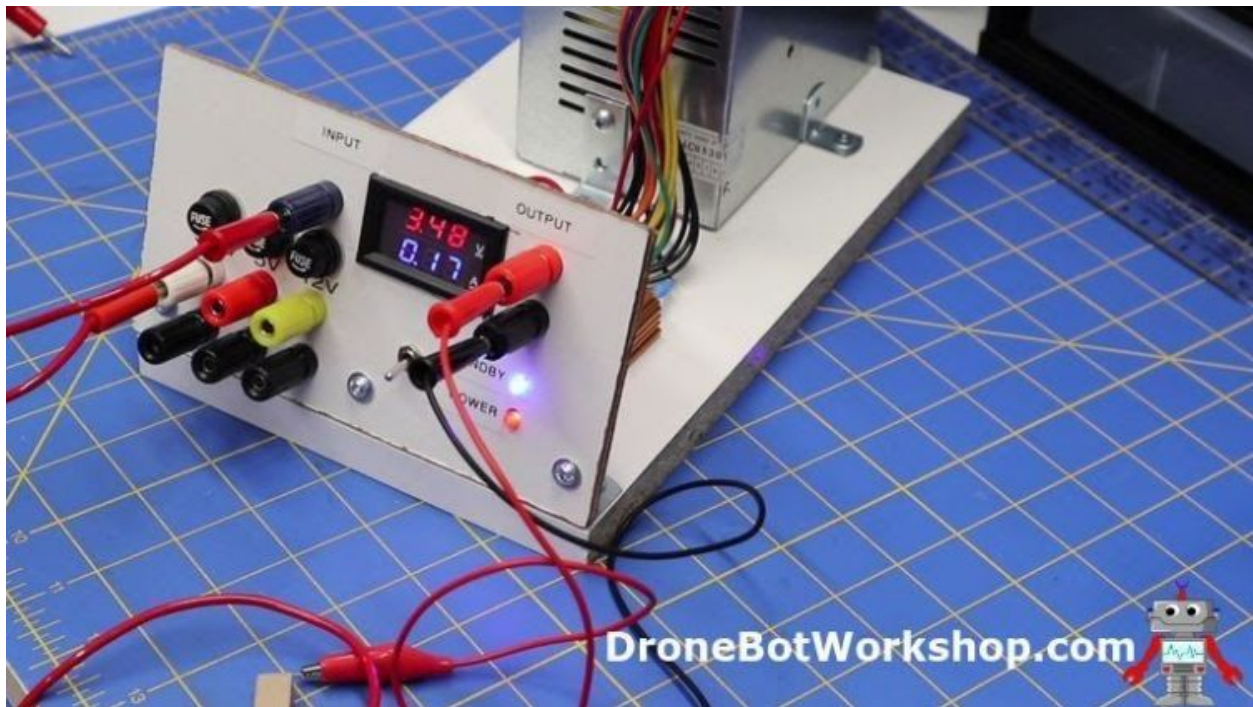
Now switch the power On using the SPST switch on your panel. The Power LED should now illuminate and, chances are, you should hear some fan noise from your supply.

If you were to test for output voltages you should now see them present and at the correct levels.

Your new power supply should now be working!

Adding a Power Meter

I decided to add a meter to my power supply as I want to be able to monitor the amount of current my project is drawing.



I decided to take the easy road here and use a pre-wired module, there are many to choose from.

I had originally intended to buy two of these meters, one for each 5 and 12 volts. However, my local vendor only had one left. I decided to take it and mount it on my panel so I could patch it into whatever output I wanted to monitor.

DSN-VC288 Power Meter

The module that I grabbed at the vendor was a DSN-VC288 Digital Volt/Ampere meter. It is a tiny panel-mount unit that was pretty inexpensive. It is rated at up to 100 volts at 50 amperes, more than enough for my power supply.

The meter has two LED displays, a red one for voltage and a blue one for current.



There are two connectors at the bottom of the meter, and it is supplied with cables for each of them.

AcXi `YDck Yf/ `Jc`HJ Y`GYbgY`

- VCC
- GND
- Voltage Sensing Input

7 i ffYbhGYbgY`G i bh

- Current In
- Current Out

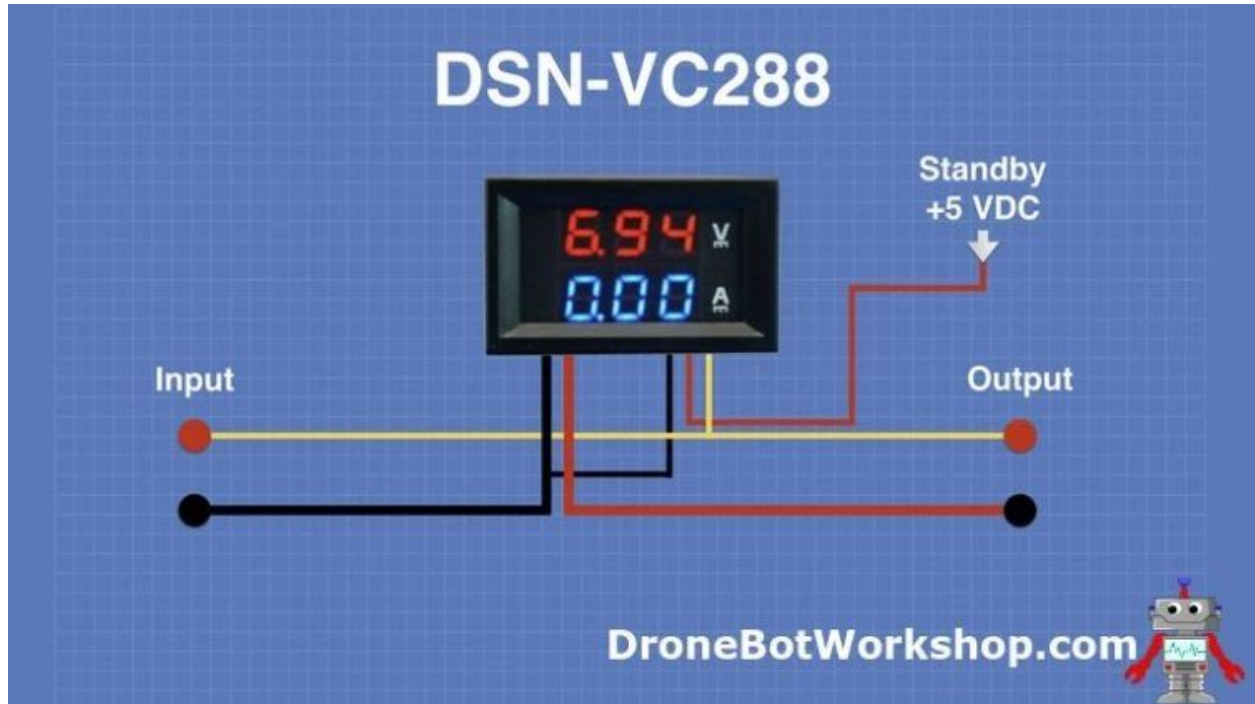
The DSN-VC288 has a built-in current shunt, you can see it beside the Current Sense connector.

Wiring the Power Meter

I decided to mount the power meter on its own, you could also permanently wire it into one of the voltages you wish to monitor.

One thing to look out for is that the meter uses a shunt in the ground connection to measure current. This means that the ground on the supply voltage you are monitoring should be kept away from any other ground to ensure an accurate measurement.

Here is the wiring diagram



Note that I decided to use the Standby voltage to power the meter, I need to do that because the module requires 4.5 to 30 volts to work and my lowest supply voltage is 3.3-volts.

Testing the meter is simply a matter of connecting your load to the meter output and the input to the appropriate power supply voltage. The meter should spring to life with a voltage and current display. You can use your multimeter to verify its accuracy.

If you find the readings to be incorrect there is a small trimpot on the circuit board that can be adjusted.

Conclusion

The thing I like most of all about this project is that it allows you to reuse components that would otherwise end up being needlessly discarded. You're saving the planet while saving some dollars, always a good arrangement.

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For most of your electronics experimenting a power supply built from an ATX power supply will be more than sufficient.

So dig up your old computer and put some of it back to use as a trusty workbench power supply.