# Easy ATX Bench Top Power Supply.

by klee27x on August 21, 2008

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## Intro: Easy ATX Bench Top Power Supply.

There have been a few good writeups and Instructables on this subject, recently. This picture I found on dutchforce.com finally inspired me to make my own.
http://www.dutchforce.com/~eforum/index.php?showtopic=20741

Not being familiar with the inner workings of an ATX power supply, I applied one of my favorite hacking methods... I ported all the lines to a tidy little color-coded row, where I can mess with them at my leisure.

This also allowed me to bypass a lot of hard work, and resulted in a very compact design that is easy to further adapt and modify.

## step 1: WHY ARE THERE SO MANY DARN WIRES???

Ok, relax. There's a ton of redundancy in the wiring here. For the life of me, I'll never figure out why they need so many wires in this stupid power supply, especially when so many of them go to the same place.

1.There is a green wire that goes to the 20/24 pin ATX connector. When it's pulled to ground, it turns on the supply. Unless it's held low, the only DC power that comes out of the thing is a low current 5V standby power from the purple line.

2. There is a grey "Power Good" line. I can't find a lot of info on this, but several people suggest you should put a small load on it, like an LED and resistor. Mine appears to work fine without doing that, and the voltage measured on this line is 4.7V or so.

3. There may or may not be a brown line, which is the 3.3V feedback line, which should be attached to one of the orange 3.3V lines. On my supply, this wire was already in continuity with 3.3V output on the pcb itself. So I wonder why they even bother using this wire, cuz it goes into the ATX connector, sharing a pin with a 3.3V line, anyway... more redundancy.

4. There may or may not be a small thin red and/or yellow wire, which are the +5V/+12V feedback lines, which should be attached to the respectively colored +5V/+12V power line. Mine had just a the small red wire.

There are several red, yellow, and orange large diameter output wires. You can remove them all but one of each color, unless you are going to keep long lengths of this wiring and can't afford a miniscule voltage drop from this already relatively poorly regulated type of high output supply, then there's really no point in connecting big bunches of them together, like many other people have done in their own version.

Anyways.. those are the basics. The only other thing to add is that some supplies need a minimum load on the 5V line before the output voltage (of the 12V line) becomes stable.

I experimented with the 12V output on my power supply, using a 1 ohm piece of resistance wire. This was done with and without an 80 ohm load resistor between 5V and ground.

Without load: The 12V output when open circuit was 13.06V. The output with the resistance wire attached and glowy hot was 11.53V. The spec on the supply states 15A output. So this seems perfectly acceptable to me.

With load resistors between 5V rail an ground: The 12V when open circuit was 13.06V. With resistance wire attached was 11.55V. The difference was statistically insignificant, with my low quality multimeter.

After a deeper investigation, I found out why the load resistor makes no difference on my supply: There is already a resistive load built in. Even without the load resistor, there is an 8 ohm resistance between 5V rail and ground! So no, my power supply isn't magically efficient... but at least that's one less part to worry about. I also found that the 3.3V line was loaded with a 10 ohm resistor. I actually opened it up to take a look and I spotted both of these power resistors inside the supply. I also took some pictures while I was in there, but I had an irritating flash card reader problem, and I'm too annoyed to do it over again.

## step 2: Walkthrough:

First off, unplug the supply. Then hack off all the wires, leaving a few inches hanging out of the power supply. If it has been plugged in within the last day or two, be sure to bleed the capacitors off. There are many tricky ways to do this.. but you can easily do this without even opening up the supply. Cut the green wire. Turn on the power switch, if there is one. Then touch the green wire to the chassis and wait till the fan stops moving.

Open the chassis. If you want to remove some of the extraneous wires, you can either cut them off or desolder them. I desoldered mine. If you choose to desolder them, you'll need to remove the pcb. Remove the screws and lift the pcb, carefully. Then touch a conductor between the contacts of the big high voltage caps, just to be sure they're completely bled. Be sure to use only one hand while doing this, so you aren't forming a circuit that goes near your heart.

I left only a single wire for each output, and two for ground. You can then solder up the voltage sensing lines and/or the green line, right now, as outlined in the previous step. Or if you aren't sure exactly how to connect these yet, don't worry about it. You can just port over all the lines onto the outside of the power supply and figure it out, later.

## step 3: Output connectors

One popular type of connector to use for the power output is a binding post. These handy connectors screw up/down over a post with a hole in it. If you buy a breadboard, they often come with a set of these binders integrated on the backboard. I have never liked them, and I have removed and discarded them from all of my breadboards.

Another popular type of connector is the banana plug/jack. I don't have any of these, either.

One could alse use RCA jacks. If one had any.

I used the universal connector: solder.

I took some half ounce copper pcb material and cut to size with a jigsaw so it fits over the side of the chassis, next to the hole where the wires come out.

I drilled four screw holes, so that it affixes firmly to the chassis.

Then I took out a tape measure and marked off a spot for each wire

Mark off your lines with a marker

Remove copper with a carbide tipped hand-etching tool

Test "pcb" with a continuity tester

Solder wires.

Cover the connections with epoxy, leaving some exposed pad for soldering connections to. This serves to keep the wires from falling off when you solder other large wires to the solder pads.

I added a thinner copper board over top of this pcb as a "scratch pad." I can remove and replace this "scratch pad" by loosening the screws and cutting any soldered jumpers. This provided a good place for my initial testing, and I'll use it for fabbing up ideas I have for additional control circuitry. Eventually, I may end up making a cover panel with some standard output jacks.

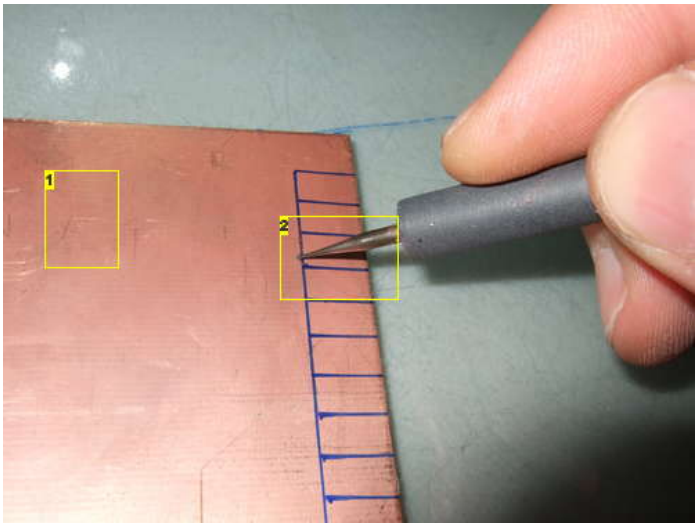



**Image Notes**
1. Half ounce pcb material. It's easily cut with a jigsaw, or you can score and snap it.

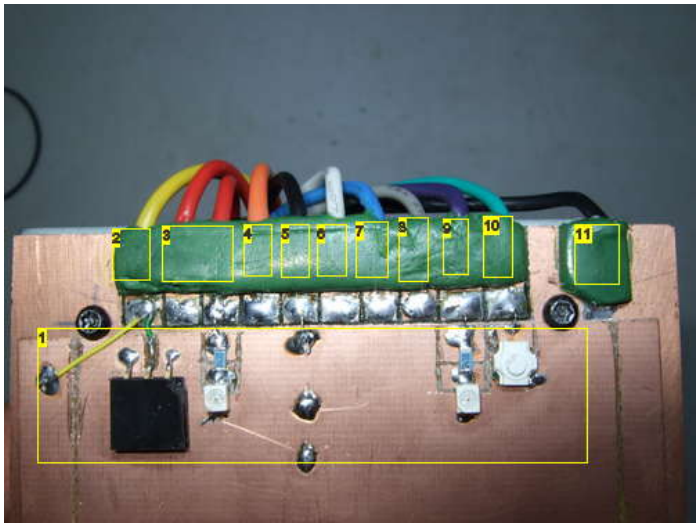



**Image Notes**
1. I did my initial testing on this super thin, disposable piece of pcb stock.
2. +12

2. This is a post-contruction mockup. But on the original, I ended up with 10 pads with 0.5cm spacing. I ended up soldering 11 wires to this pcb, including two ground wires. Oh, btw, this is a Dremel engraving tip, but I found it easier to do by hand, so I rolled a handle for it out of 1 minute epoxy putty. Then I turned it down on my "lathe"/hand drill.

3. +5. I accidentally left two wires, so I just soldered them both.
4. 3.3V
5. ground
6. -5V
7. -12V
8. Power Good???
9. +5 Standby power
10. green wire. Pull low to turn on the main power output.
11. Ground wire.

## step 4: The End

Well, I know that I didn't add much new information or near as many pics as I wanted, due to the aforementioned card reader malfunction. But at least I did some actual testing and uncovered one reason that some supplies may not require loading of the 5V output... So probe the resistance between 5V rail and ground on your supply. It may be good-to-go right out of the box, like mine was. And if you really wanna know what's going on, pull out the multimeter and do some testing. There' s no substitute for checking and knowing things for yourself.

## Related Instructables

**Take a Look Inside a ATX computer power supply** by thermoelectric

**ATX Power Supply --> Cheap Bench-Top Power Supply** (slideshow) by mortaldoom780

**Convert A Computer Power supply to a Variable Bench Top Lab Power Supply** by prodlad

**Converting a computer ATX power supply to a really useful lab power supply** by abizar

**Cheap (AXT) Bench Power Supply 30 Amps!** (slideshow) by muttyfutty

**How to power up an ATX Power Supply without a PC!** by FixedHDD

**ATX benchtop power supply** (slideshow) by LinuxH4x0r


**Yet Another ATX Lab Bench Power Supply Conversion** by netangler

## Comments

**23 comments** **Add Comment**

**gfioro** says: May 11, 2009. 10:38 AM **REPLY**

Actual power supplies can deliver very high currents, up to 18 or more Amps depending on the voltage. As far as I know, that is the reason why there are so many wires of the same voltage: if you demand the 18 Amps on 1 wire, you might burn it, as I´ve seen on a friend´s computer. You need thick wires (or many thin wires) for such high loads, specially if you want precise voltages at the end of the wire.

Thank you for the assembly idea! It´s handy! :-)

**hboyce4** says: Apr 18, 2009. 7:56 AM **REPLY**

Ive been building one, and ive discovered that you can ajust the voltage by adjusting the tiny variable resistor connected to the brown "sensor" wire. I simply jumped it right on the board as you said, but there was not enough resistance, so i got 11v on the 12v line, 4 on the 5 etc... i just adjusted the potentiometer and i came back to normal.

**Flea** says: Aug 23, 2008. 10:23 PM **REPLY**

Looks pretty dangerous. You should implement some safety barriers into it.

The reason there are multiple wires with the same voltage is because the device the wires connect to (motherboard) have much smaller wires to transfer the power. If all the power from say the 12V line went to a single location on the motherboard, that location would need to be thick enough to transfer the power without excessive heat and interference to nearby wires.

**klee27x** says: Aug 24, 2008. 3:55 AM **REPLY**

That doesn't explain anything at all. All the power goes to the mobo at the SAME spot! Well, aside from the 4-pin 12V molex... which is again completely redundant - It's got 2x 12V wires and 2X ground wires in a 4 pin connector. You just don't need that much wire. My current computer is working fine with just one pair (small form factor psu that didn't have that connector, so I soldered directly).

There is actually a mini computer case/PSU out there that does away with half the ground wires by using the chassis itself. Now that's refreshing.

As for safety barriers: if I was to ever use it for something semi permanent, I might put a cover plate on it.

**gilbert2048** says: Mar 11, 2009. 8:52 PM **REPLY**

I don't know what PSU your using, or what molex connectors your using for that matter. Yes there are two ground wires (black) but there is a +12V (yellow) and a +5V (red). The reason there are so many connectors on the ATX connector is to due to the variety of voltages to supply, and the current that is pulled is to great(on most machines), to be on a single wire for an extended period of time.

**klee27x** says: Mar 12, 2009. 5:07 AM **REPLY**

I'm not talking about the wires carrying different voltages. I'm talking about the sets of 3-4 wires carrying the same voltage all connecting at the same place... then a "sense wire" that is actually in continuity with the other wires. It's mind boggling. Yes, I know copper has some resistance, and if you run too much current through a wire, you will end up with some voltage drop and heat. But..

Check out the pics of the computer I posted, below. Granted, I'm not running a high end graphics card, but that's a 2.8 GHz P4. It's also my most used computer. I probably use it 6 hours a day, and have had no problems.

**gilbert2048** says: Mar 16, 2009. 8:22 AM **REPLY**

Yes I realize that it does work, however I would NOT recommend it on newer computers or to those who do not understand why the there is redundancy. A P4 @ 2.8GHz is not going to be pulling all that much power, and like you said you don't have may accessories (ie. graphics cards, sound cards, physics cards, raid card, etc...), nor do you have a mass of fans, and you do not have an array of HDDs
Some of my computers require 2 PSUs, this is because they use a mass of power and they need redundancy in case of failure of one the PSUs, there servers

**klee27x** says: Mar 16, 2009. 12:10 PM **REPLY**

Huh? By newer computers do you mean Core 2's which use slightly less power than a P4? There are only a few Quad core and a couple AMD chips which use more power than a 2.8GHz P4. Also, they run off 1.5V or so, which means onboard voltage regulation. So a thinner wire from the powersupply is probably not going to cause any change in voltage at the CPU, as long as it's not so thin it's melting.

Fans? At most 125mA @12V each. Add as many as you can fit and that still doesn't even compare to 1 hard drive motor spinning up.

Backup PSU redundancy has nothing to do with the amount of redundant wires, unless you are afraid of a spontaneous wire failure.

**gilbert2048** says: Mar 18, 2009. 9:47 PM **REPLY**

125mA for a fan, maybe a small cpu fan but some case fan can be connected strait to the mobo, and those can pull a range of 300mA to 1A

My AMD (atholn x64, atholn x64 X2, and all those quad and higher) chips defiantly pull more power, I know that. I also think my P3 pulls more my P4 2.80GHz box, I think that could be do to some heat type issues. Another thin to consider is the RAM, i know depending on the size of the sticks they can draw quite a bit, knocked a hour off my battery life on my laptop :(

I wasn't so much referring to the redundancy, as more the ones that need to just to get the required power, and they don't have any real power cables in those, the PSUs connect to a slot on the mobo.

One last thing, the wires are 18 AWG which are rated for a Current Carrying of 2.32A and I couldn't imagine putting more on it than 5 amps at the max, and even then only for a short time

**klee27x** says: Mar 21, 2009. 8:28 PM **REPLY**

Strictly speaking, you are right. But while I don't completely ignore current ratings on wires, I think they are a bit on the conservative side. In fact, the wires on the PSU which I pared down were only 22 AWG to begin with! These are the skinniest wires I have ever seen on an ATX PSU. But I'd not recommend anyone else try this at home.

**klee27x** says: Aug 24, 2008. 3:58 AM **REPLY**

Actually, the redundant wires would act as heat sinks.. but that's a cumbersome way to go for a crappy heatsink.

**klee27x** says: Aug 24, 2008. 4:00 AM **REPLY**

Hmmm.. I'm going to rebuild an older computer soon as some parts get here. That gives me an idea for a power supply mod to streamline the wiring a tad. I'll post the results when it's done.

**klee27x** says: Aug 30, 2008. 12:48 AM **REPLY**

Well, the parts finally arrived: New computer case and graphics card. Here's end tally.

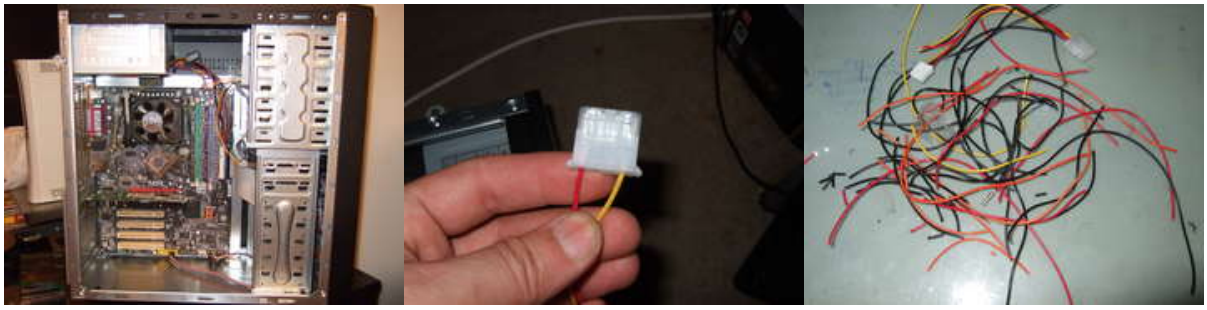
ATX connector: removed 3/4 red wires, removed 3/4 orange wires, removed 4 of 6 ground wires. P4 connector, removed one pair of yellow/black. Molex connectors: removed both ground wires.

On the ATX and P4 connectors I soldered all corresponding pins together, just to be on the safe side.

The unforseen side benefit of removing some of the wires at the pcb level is that it leaves space for you to shove the extra length of the remaining wires.

Just look at the aftershot. A midget hobo could live in there, and I only removed one molex!

Does it work? I'm using it to post this comment. I will post any updates if things turn south.



**joinaqd** says: Mar 19, 2009. 6:00 PM **REPLY**
why does your instructable have no rating?

**klee27x** says: Mar 21, 2009. 8:02 PM **REPLY**
Because no one has rated it??

**joinaqd** says: Dec 9, 2008. 7:11 PM
(removed by author or community request)

**klee27x** says: Dec 10, 2008. 4:18 AM **REPLY**
I can't argue with the first remark. But the *worst ever* ?? Luckily, you haven't seen *all* of my Instructables. :)

**joinaqd** says: Dec 10, 2008. 4:50 PM **REPLY**
do you have any others related to real "tech" stuff..like real electronics with transistors and capacitors and stuff?send me a link k dude?sry i said ur nolife lol.

**klee27x** says: Dec 10, 2008. 10:00 PM **REPLY**
No offense taken. I freely admit I have no life. :)

But all seriousness aside, I barely know which end of a transistor is up. The most technical Instructable I have is how to make a 5 transistor PIC programmer.... and the electronics aren't really very exciting. It's basically just using transistors as signal buffers. Analog electronics is largely fascinating voodoo to me. :)

All you have to do is click on my name , up there, to see a list of all my Instructables and even all comments I have left for other people. I'm sure you can find at least 5 of my Instructables that are even worse than this one!

**Dms12444** says: Sep 27, 2008. 3:41 PM **REPLY**
ive used this for an electrolysis machine, works really well.
By the way marshavoc813 this would work well where u need low voltage power supplies.

**cyrozap** says: Aug 25, 2008. 5:42 AM **REPLY**
looks very nice, should design for apple ;)

**marshavoc813** says: Aug 23, 2008. 4:26 PM **REPLY**
Complete noob question, but what exactly could you use this for? Would you use it like a power supply for electronics experiments or what? Thanks!

**klee27x** says: Aug 23, 2008. 5:40 PM **REPLY**
Yeah, pretty much. :) It puts out a good bit of amps, so it could probably charge a car battery pretty quick. I don't have any need for it at the moment, but I'm sure I'll find something.