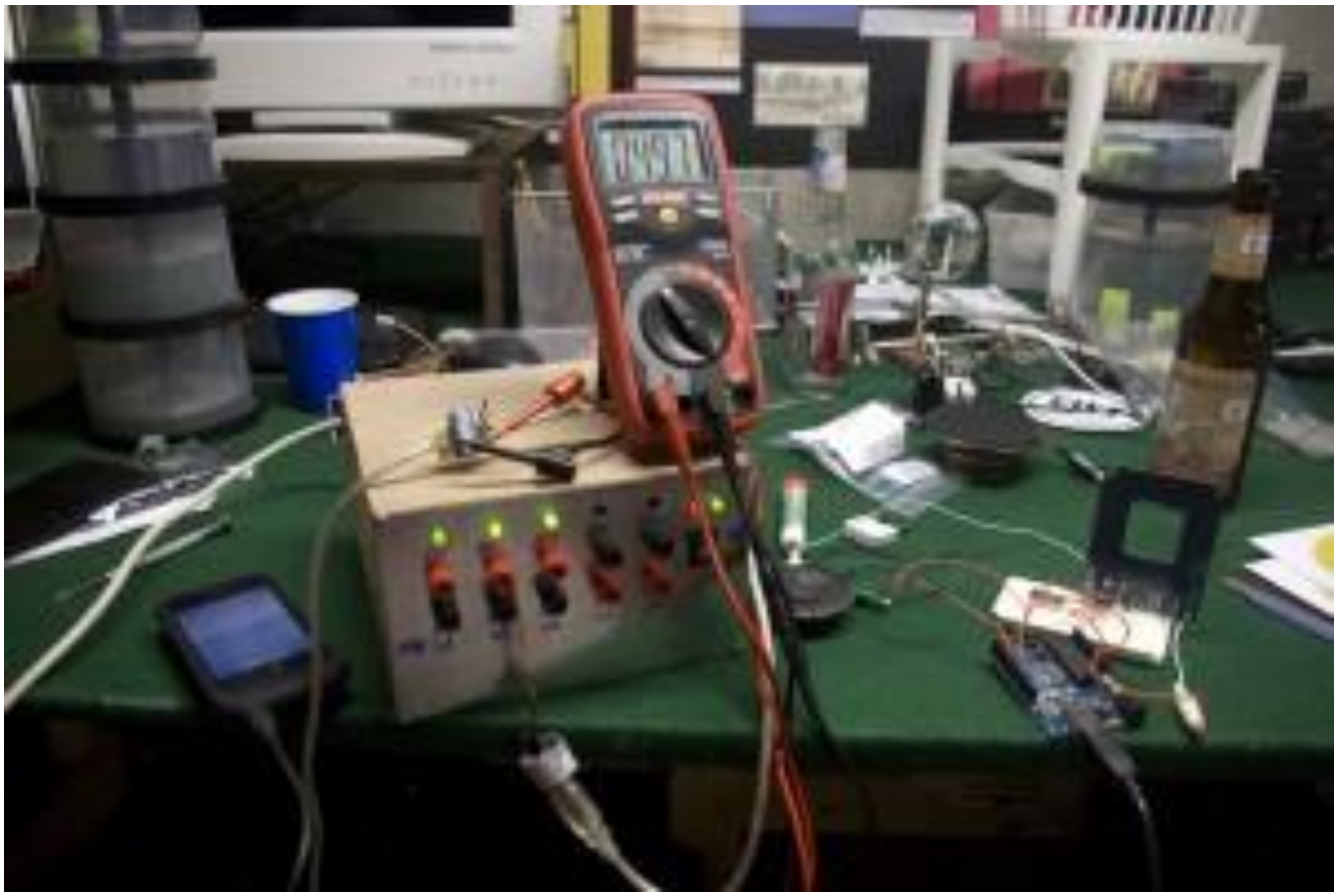
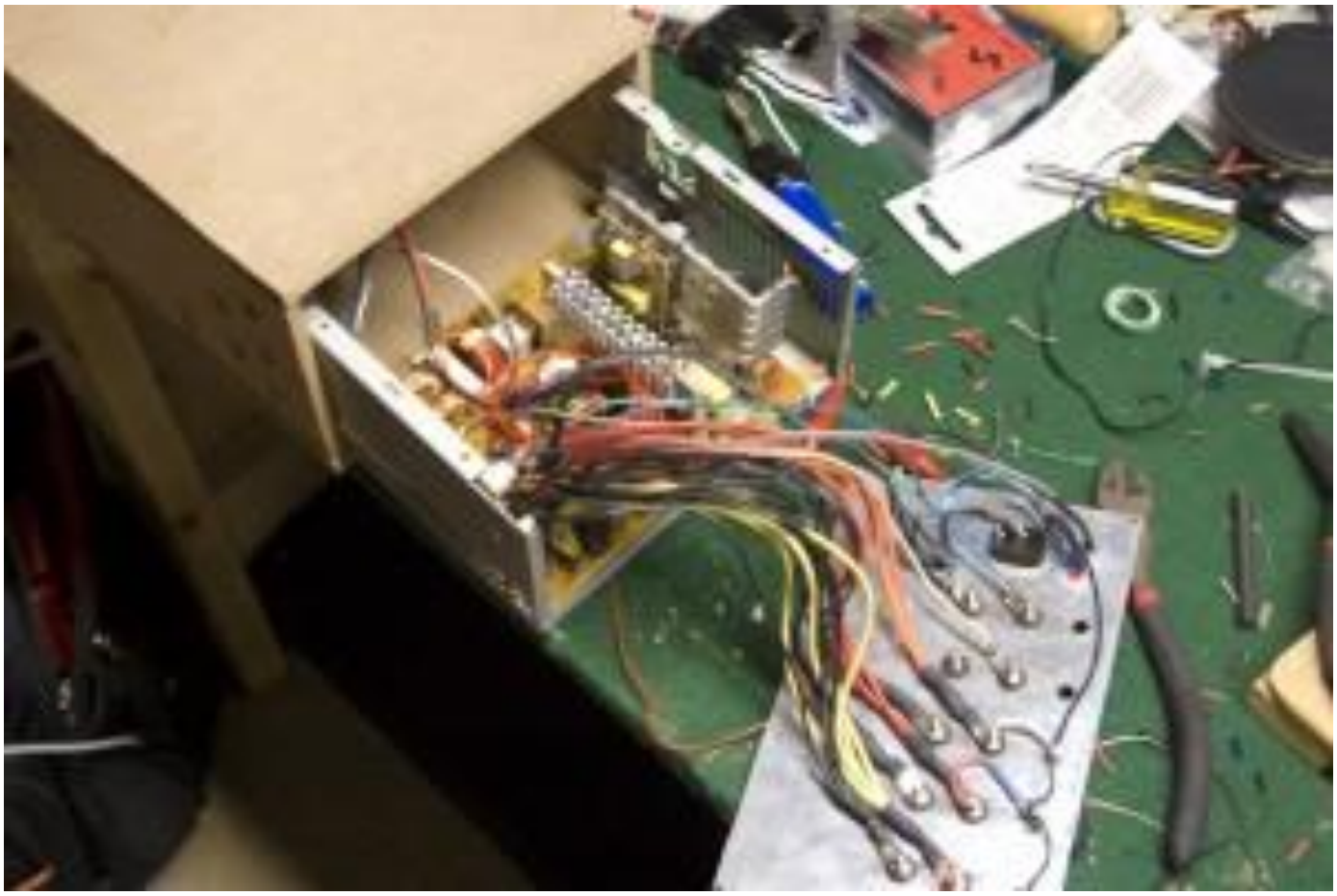
ATX -> Bench Power Supply Mod



WARNING WARNING WARNING! *Switching power supplies have many BACs (beefy-ass capacitors) that can hold lots of juice long after you've unplugged the unit. Do not crack one open like I did without knowing what you're doing, it could seriously injure you or at least be really uncomfortable when you shock the crud out of yourself. I'm not responsible if you do just that, don't say I didn't warn you. I have a cable I made with a brush at the end that grounds everything it touches, I use it to brush the back of all power electronics before I work on them. You should too.*

This is a pretty common one, but I like to add flair. I needed a bench power supply. Sadly, bench power supplies are very expensive, and I'm a poor college student. What I do have are computers. Lots of computers. In fact, I just brought to the recyclers about 100lbs of computer waste from machines that are too slow for even *my* standards. Luckily, one thing computers have going for them is very refined, VERY powerful power supplies. To put it in perspective, a really good bench PSU is adjustable from around 0 to 30V, and is current limited adjustable from around 0-3A. ATX power supplies are fixed, but for almost all purposes, they're very accurate, they have a good

selection of voltages (12, 5, 3.3, -5, -12), and they're extremely powerful – the one I'm using can supply 6A on the +12 rail, and this is a pretty crappy old power supply. They also have two other REALLY nice features – over-current protection (if you draw too much, they just turn off, no harm no foul. Remove the load, turn it on, everything's back to normal), and short-circuit protection (this one's already saved me. If you short circuit anything, same deal. The PSU just turns itself off and waits). So the logical conclusion is to just cut the power plugs off of one and use it as a bench power supply. And you can do that, but I did some other things to make it look a bit prettier on my bench.



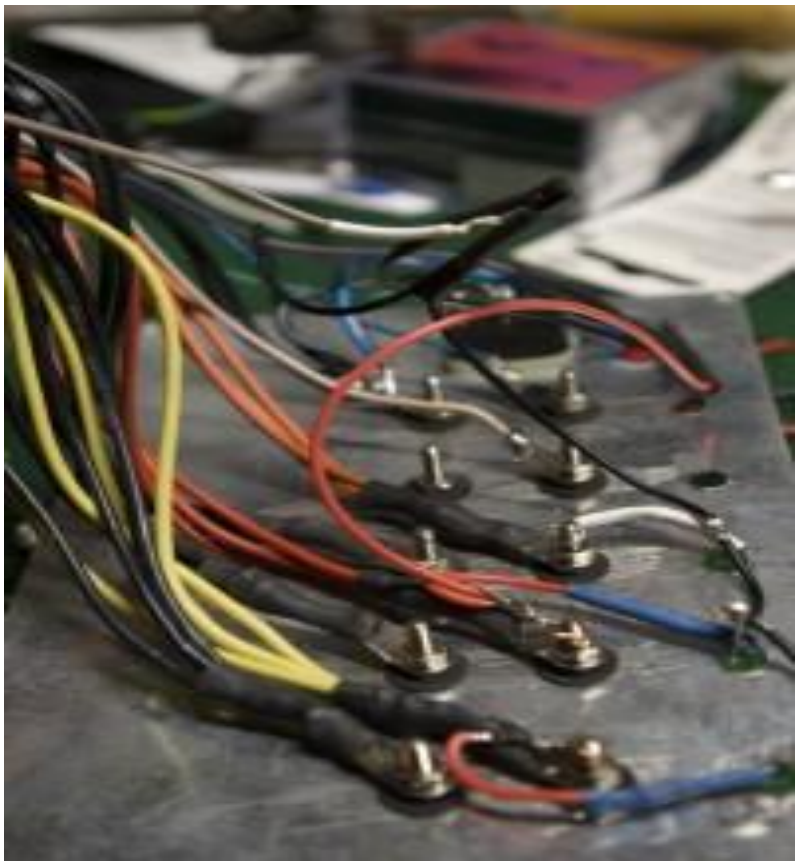
Guts!

Transistor for the TTL all-systems-go indicator

1. The most obvious is that I made a pretty box out of 1/4 inch MDF (medium density fiberboard – it's a favorite building material of mine since it's GREAT for speaker enclosures, which I like to make). I originally planned to use screws for the whole thing, but even using pilot holes, that didn't work out too well – drilling the holes was hard enough, and the screws still tended to split the boards down the middle. I ended up just using clamps and wood glue.
2. I drilled holes on the sides for air intake, and I used a Dremmel router tool to cut a fan hole in the back to relocate the built-in fan. One thing about MDF is that it's made up of a lot of wood pulp and a lot of glue. It's acutally a lot like really carcinogenic (wear a mask or respirator cutting it), really flammable paper. As such, I don't want things getting too hot.
3. I made a pretty front panel out of sheet stainless steel.
4. I added a lot of LEDs. There are some interesting notes here. First, all ATX power supplies are switching DC supplies, and as such, they don't really work without a load. If you tried to turn it on with nothing plugged in, it'd probably just fail into protect mode. As such, you need to prevent this by using a small ballast on at least one of the rails to essentially burn a little power and complete the circuit. I've seen guides online that recommend using a 10W beefy power resistor on the +12 line, but A. I didn't have one, and B. I thought that might be overkill. My alternate plan was to jut put a single LED+series resistor on each line. You can never know too

much about what's going on, this configuration means that the ballast doubles as an indicator of power. Perfect! (note: in the end, I decided NOT to put an LED on either the -12 or -5 lines [hence the empty LED holes] because this PSU only supplies 300mA on either one. I figured that if I had need for them in the future, I might as well not waste such limited power).

5. ATX power supplies are smart – they monitor themselves. As such, there's a 5V TTL line that's pulled high when the PSU thinks that all of it's rails are within ATX spec bounds. Similarly, there's a +5VSB line that supplies limited current when the PSU is off to keep things like the power button working. I figured that I'd use the 5VSB line to light a red LED, indicating mains power presence, and I figured I'd use the indicator line to light a green LED in addition to the others to say that the PSU is on and operating within spec (I'd expect it to enter protect mode if it weren't, but maybe someday I'll be surprised to find that the PSU is dying and the all-ok led is off even though the rails are on). There was only one problem. Since the indicator lead is TTL, it supplies barely any current – not enough to light an LED. I'm not the best EE in the world (just finished freshman year, so barely an EE at all), but I put on my EE hat and just put an NPN transistor from my box in the way. I wired the base of this to the TTL line, the emitter to ground, and the collector to the cathode of the LED. The anode is wired through a resistor to the +5 line. Basically, when the TTL line is high, the transistor sinks current for the LED and it's lit.
6. The last thing to do is add the switch. I chose to wire my switch between the green control line and ground – when this line is connected to ground (typically by the motherboard when it's on), the PSU is on. When it's not, only +5VSB is on. I could also have just shorted this and used the switch on the mains side, but I guess I just thought that was lame.



Exposed posts. Drat!

The only other point of interest is that I made the mistake of selecting the cheapest binding posts from RadioShack. These happen to have exposed posts, and while they come with insulating spacers to screw on on either side of your panel, I was worried that they might shift side to side and short out against my panel, which I've chosen to be ground. To combat this, I just put the first spacer on, slipped a ~.5mm long sliver of heatshrink tube on and shrunk it, then made sure that my holes were big enough to take both the post and heatshrink insulation. This has worked fine – I just put the other insulating washer on and screwed everything on, crushing the excess heatshrink into the gap between post and panel. I'm sorry I don't have any good pictures of that part.

The next project will involve making a current and voltage variable power supply for those times when these selections don't satisfy, but for now, I've got a great PSU that can run my Arduino, case fans I have kicking around to exhaust soldering fumes (I just screwed the +12 half of the molex connectors I cut off into the binding posts), and whatever other projects I'm working on. The best part is that I can test the 12V-based audio project I'm working on up to about half volume, since the thing has so much juice behind it.

I hope I've inspired you to go off and make your own el-cheapo PSU now!