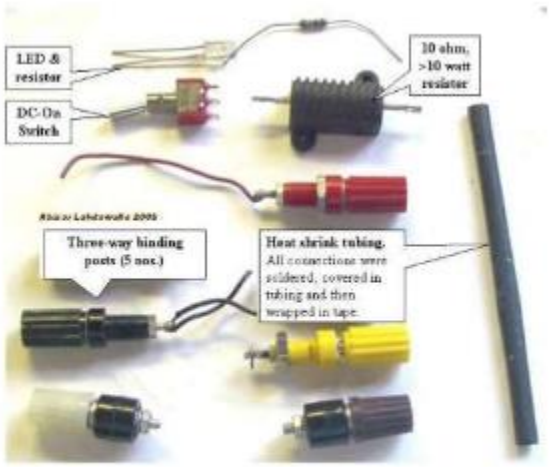
Bench Top Power Supply originated by:Abizarl, Krystle C., Jack H,

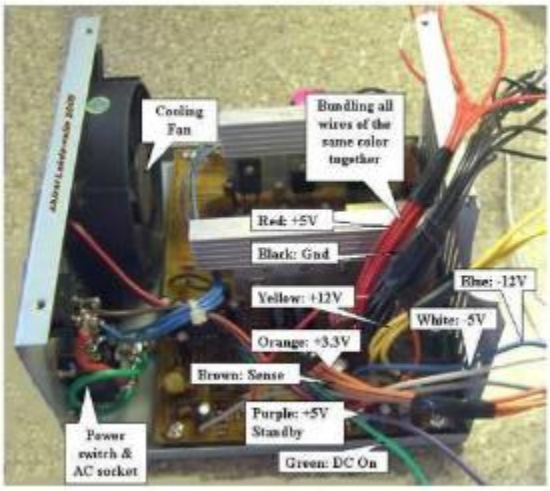
Things You'll Need

An obsolete computer with an ATX power supply of any rating above 150 Watt. Wire cutters, Needle nose pliers, Drill, Reamer, Soldering wire, Soldering iron, Any kind of tape that sticks, Heat shrink tubing(found at some electronics stores[IE: frys, radioshack, and ebay]) Heat gun for heat shrink tubing, Binding posts for output terminals, LED, current limiting resistor for the LED(330 ohms[also can be found on the net or some electronics stores (IE: Radioshack)]), power resistor to load

Steps

1. **Unplug the power cord from the back of the computer.** "Harvest" a power supply from a computer by opening up the case of the computer, locating the gray box that is the power supply unit, tracing the wires from the power supply to the boards and devices and disconnecting all the cables by unplugging them.
2. **Remove the screws (typically 4) that attach the power supply to the computer case and remove the power supply.**
3. **Discharge the power supply by either letting it sit unconnected for a few days.** Some people suggest attaching a 10 ohm resistor between a black and red wire (from the power cables on the output side), however this is only guaranteed to drain the low voltage capacitors on the output - which aren't dangerous to begin with! It could leave the high-voltage capacitors charged, resulting in a potentially dangerous - or even lethal - situation.
4. **Gather the parts you need:** binding posts (terminals), a LED with a current-limiting resistor, a switch (optional), a power resistor (10 ohm, 10W or greater wattage, see Tips), and heat shrink tubing.

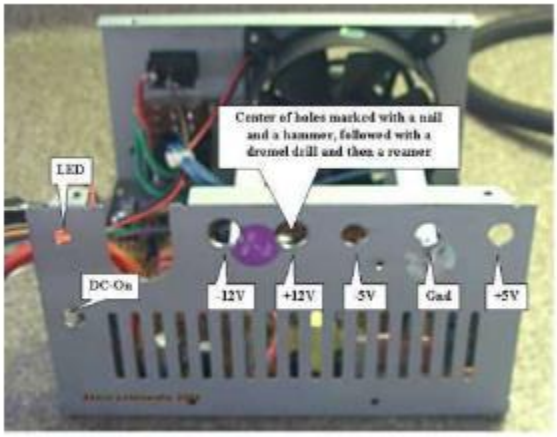


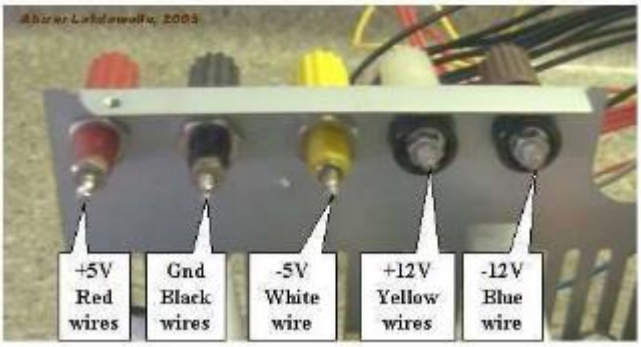


5. **Open up the power supply unit by removing the screws connecting the top and the bottom of the PSU case.**
6. **Bundle wires of the same colors together.** If you have wires not listed here (brown, etc), see the Tips.

The color code for the wires is: Red = +5V, Black = Ground (0V), White = -5V, Yellow = +12V, Blue = -12V, Orange = +3.3V, Purple = +5V Standby (not used), Gray = power is on (output), and Green = Turn DC on (input).

7. **Drill holes in a free area of the power supply case by marking the center of the holes with a nail and a tap from the hammer.** Use a Dremel to drill the starting holes followed by a hand reamer to enlarge the holes until they are the right size by test fitting the binding posts. Also, drill holes for the power ON LED and a Power switch (optional).





8. **Screw the binding posts into their corresponding holes and attach the nut on the back.**
9. **Connect all the pieces together.**

Connect one of the red wires to the power resistor, all the remaining red wires to the red binding posts;

Connect one of the black wires to the other end of the power resistor, one black wire to a resistor (330 ohm) attached to the cathode (shorter lead) of the LED, one black wire to the DC-On switch, all the remaining black wires to the black binding post;

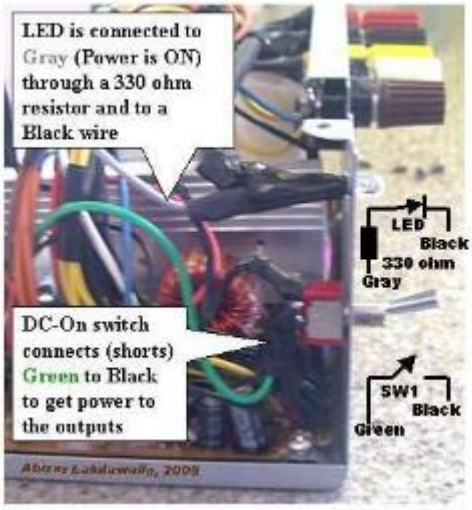
Connect the white to the -5V binding post, yellow to the +12V binding post, the blue to the -12V binding post, the gray to the anode (longer lead) of the LED;

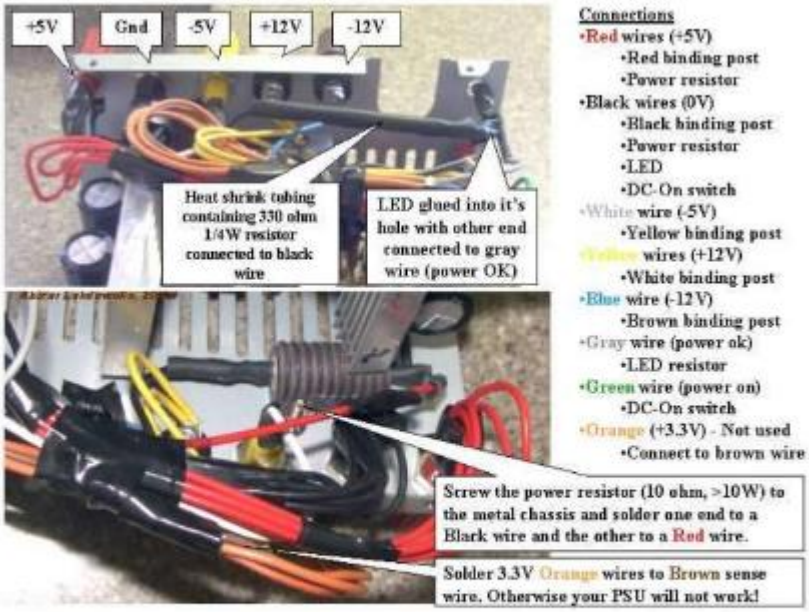
Note that some power supplies may have either a gray or brown wire to represent "power good"/"power ok". (Most pSU's have a smaller orange wire that is used for sensing-- 3.3V- and this wire is usually paired at the connector to another orange wire. Make sure this wire is connected to the other orange wires, otherwise your lab power supply won't stay on.) This wire should be connected to either an orange wire (+3.3V) or a red wire (+5V) for the power supply to function. When in doubt, try the lower voltage first (+3.3V). If a power supply is non ATX or AT compliant, it may have its own color scheme. If yours looks different that the pictures shown here, make sure you reference the position of the wires attached to the AT/ATX connector rather than the colors.

Connect the green wire to the other terminal on the switch.

Make sure that the soldered ends are insulated in heatshrink tubing.

Organize the wires with a electrical tape or zip-ties.





Connections
- Red wires (+5V)
  - Red binding post
  - Power resistor
- Black wires (0V)
  - Black binding post
  - Power resistor
  - LED
  - DC-On switch
- White wire (-5V)
  - Yellow binding post
- Yellow wires (+12V)
  - White binding post
- Blue wire (-12V)
  - Brown binding post
- Gray wire (power ok)
  - LED resistor
- Green wire (power on)
  - DC-On switch
- Orange (+3.3V) - Not used
  - Connect to brown wire

10. **Check for loose connections by gently tugging on them.** Inspect for bare wire, and cover it to prevent a short circuit. Put a drop of super-glue to stick the LED to its hole. Put the cover back on.
11. **Plug the power cord into the back and into an AC socket.** Flip the main switch on the PSU. Check to see if the LED light comes on. If it has not, then power up by flipping the switch you placed on the front. Plug in a 12V bulb into the different sockets to see if the PSU works, also check with a digital voltmeter. It should look good and work like a charm!

Tips

If the power supply does not work, that is, no LED light, check to see if the fan has come on. If the fan in the power supply is on, then the LED may have been wired wrong (the positive and negative leads of the LED may have been switched). Open the power supply case and flip the purple or gray wires on the LED around (make sure that you do not bypass the LED resistor).

If you are not sure of the power supply, test it in the computer before you harvest. Does the computer power on? Does the PSU fan come on? You can place your voltmeter leads into an extra plug (for disk drives). It should read close to 5V (between red and black wires). A supply that you have pulled may look dead because it does not have a load on its outputs and the enable output may not be grounded (green wire).

Options: You don't need an additional switch, just connect the green and a black wire together. The PSU will be controlled by the rear switch, if there is one. You also don't need an LED, just ignore the gray wire. Cut it short and insulate it from the rest.

Some newer power supplies will have "voltage sense" wires that need to be connected to the actual voltage wires for proper operation. In the main power bundle (the one with 20 wires), you should have four red wires and three orange wires. If you only have two orange wires, you should also have a brown wire which must be connected with the orange. If you only have three red wires, another wire (sometimes pink) must be connected to them.

ATX power supplies are switched-mode power supplies (info at http://en.wikipedia.org/wiki/Switched_mode_power_supply); they must always have some load to operate properly. The power resistor is there to "waste" energy, which will give off heat; therefore it should be mounted on the metal wall for proper cooling (you can also pick up a heatsink to mount on your resistor, just make sure the heatsink doesn't short anything out). If you will always have something connected to the supply when it is on, you may leave out the power resistor. You can also consider using a lighted 12v switch, which will act as the load necessary to turn on the power supply.

Feel free to add some pizazz to the dull gray box.

You can also convert this to a variable power supply - but that is another article (hint: Uses a 317 IC with power transistor).

The voltages that can be output by this unit are 24v (+12, -12), 17v (+5, -12), 12v (+12, 0), 10v (+5, -5), 7v (+12, +5), 5v (+5, 0) which should be sufficient for most electrical testing. Many ATX power supplies with a 24-pin connector for motherboards will not supply the -5V lead. Look for ATX power supplies with a 20-pin connector, a 20+4-pin connector, or an AT power supply if you need -5V.

If you DO have a sense wire for the 3.3v. , connecting the the 3.3 v. part of the supply, using the 3.3v. voltage as a buck voltage against, say the 12v. to get 8.7v. will not work. You will see 8.7 v. with a volt meter but when you load that 8.7v. circuit the power supply may go into protective mode and shut the whole supply down.

You can add a 3.3 volt output (such as to power 3V battery-powered devices) to the supply by hooking the orange wires to a post (making sure the brown wire remains connected to an orange wire) but beware that they share the same power output as the 5 volt, and thus you must not exceed the total power output of these two outputs.

To get more room you can mount the fan on the outside of the PSU case

If you don't feel like soldering nine wires together to a binding post (as is the case with the ground wires) you can snip them at the PCB. 1-3 wires should be fine. This includes cutting any wires that you don't ever plan on using.

The +5VSB line is +5V standby (so the motherboard's power buttons, Wake on LAN, etc. work). This typically provides 500-1000 mA of current, even when the main DC outputs are "off". It might be useful to drive an LED from this as an indication that the mains are on.

The -5v rail was removed from the ATX specification and does not exist on all ATX power supplies.

The fan on a PS can be quite loud, its designed to cool a relatively heavily loaded PS as well as the computer. The is the possibility of just clipping the fan but is not a good idea. A work around is to cut the red wire going to the fan (12V) and connect it to a red wire going out of the PS (5V). Your fan will now be spinning significantly slower and thus quieter, but still provide some cooling. If you plan to draw a lot of current from the PS this might be a bad idea, be your own judge and see how hot the thing gets.

Warnings

If you suspect the power supply is damaged, **do not** use it! If it is damaged, the protection circuitry may not work. Normally, a protection circuit will slowly discharge the high voltage capacitors - but if the supply was connected to 240V while set at 120V (for example), the protection circuits have probably been destroyed. If so, the power supply might not shut down when it is overloaded or when it begins to fail.

Do not touch any lines leading to capacitors. Capacitors are cylinders, wrapped in a thin plastic sheath, with exposed metal at the top with a + or K usually. Solid-state capacitors are shorter, a little wider in diameter, and do not have a plastic sheath. They retain a charge much like batteries do, but unlike batteries, they can discharge extremely fast. Even if you have discharged the unit, you should avoid touching any points on the board except where necessary. Use a probe to connect anything you might touch to ground before beginning any work.

When drilling the metal case, make sure no metal filings get inside the PSU. These could cause shorts, which in turn could cause a fire, extreme heat or dangerous electrical spikes on one of your outputs which will break your new lab power supply which you worked so hard on.

Line voltage can **kill** (anything above 30 milliamps/volts can kill you in a matter of time if it somehow penetrates your skin), and at the very least give you a painful shock. Make sure that you have removed the power cord before doing the conversion and have discharged the capacitors as described in the steps above. If in doubt, use a multimeter.

Do not remove the circuit board unless you must. The traces and solder on the underside could still have high voltage on them if you didn't let the PSU sit long enough. If you must remove it, use a meter to check for voltage on the pins of the largest capacitors. When you replace the board, make sure that the plastic sheet goes back under the board.

A computer power supply is fine for testing purposes, or for running simple electronics (eg battery chargers, soldering irons) but will never produce power like a good lab power supply, so if you intend on using your power supply for more than just testing, buy yourself a good lab supply. There is a reason they cost so much.

It is strongly recommended that you discharge the capacitors. Plug in the power supply, turn on the power (short the Power (green) wire to ground, then unplug the power supply until the fan stops spinning.