Convert A Computer Power supply to a Variable Bench Top Lab Power Supply
by prodlad on November 26, 2008

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Hello, I live at the front of the mournes and know more about electronics and other rubbish that a young boy should. I run a website called kidzkool.co.nr (soon to be www.krkcrew.com).

**Intro:** Convert A Computer Power supply to a Variable Bench Top Lab Power Supply

Prices Today for a lab power supply well exceed $180. But it turns out an obsolete computer power supply is perfect for the job instead. With these costing you only $25 and having short circuit protection, thermal protection, Overload protection and varied output voltages of 3v, 5v and 12v but we will be modifying it to give out 1.5v to 24v. They are perfect for general electronics.

This is my first Instructable for what I think is a brilliant idea, I'm only 14 and I can build it

**WARNING:** This will void warranty's and can shock you if you don't have your wits about you

**NOTE:** This Tutorial is littered with bad grammar and spelling mistakes. English Teachers may want to look away now

**Your going to need:**
- Tape
- Screw Driver
- Computer PSU (I recommend 250W+)
- PSU Cable
- Wire Snaps
- Soldering Iron
- A 10ohm, 10W or greater power resistor (Some new power supply's don't work properly without some load so this can provide that)

**Optional:**
- Switch
- 2 LEDs of any colour (Red and Green is the best)
- If your using the leds you need a 1 or 2 330 OEM Resistor(s)
- Heat Shrink Tubing
- External Enclosure (Some people cram it all inside the Power supply case or you can put it in a external enclosure.)

**These Depend on which method you use:** (More on that later):
- Terminal Blocks
- Drill
- LM317 or LM338K Voltage regulator
- 100nF Capacitors (ceramic or tantalum)
- 1uF Capacitors Electrolytic
- 1N4001 or 1N4002 Power Diode
- 120 Ohm resistor
- 5k Ohm variable resistor
- Binding Posts
- Crocodile Clips

Step 1: Harvesting & Preparing The Power Supply

**Warnings:**
BEFORE WE CONTINUE MAKE SURE YOUR POWER SUPPLY IS UNPLUGGED.

Capacitors can bite and if not give a painful shock kill you. Please discharge the power supply by letting it sit unconnected for a few days or connecting a 10ohm resistor between the red and black wires.

If you hear buzzing when you turn on the power supply it means there is a short or another serious problem. If you hear buzzing (that not coming from the soldering iron) when soldering it mean your power supply is on. **There is still power flowing through the PSU if it plugged in but not switched on**

OK let's get straight into it remove the computer case and take out the screws (usually 4) at the back of the computer to release the power supply. Now take out the 4 screws on top of the case and take the wires out of the hole then group wires of the same colour together and snip off the ends.

Just to tell you, you've just void your warranty.

Step 2: Wiring It All Up!

Now comes the tricky part, this is where we really get into it and add LEDs and switches and other such objects. There are a lot of each type of wire so I recommend using 2-4 of each type. Some people cram everything inside the box I used another external enclosure but it depends which method you use in the next step.

If you want to add a Standby or a Mains On LED then you will need a LED (Reds recommended but not a necessity) and a 330 Ohm Resistor. Solder a black wire to one end of the resistor and the short leg of the LED to the other. The resistor will reduce the voltage down to stop it damaging the LED. Before you solder the other one on optionally slip on a little bit of heat shrink tubing to stop shorts. Solder the purple wire to the longer leg and when you plug it in but don't turn it on, it should light.

You can also have another LED (Green Works Best) to light when you turn the PSU on. Some say to use the grey wire for the power for the LED but you need another 330 Ohm resistor. I just connected it to the orange 3.3v wire.

If using the Grey wire:
Before you solder it on slip another bit of heat shrink tubing over it to stop shorts. Solder the grey wire to one end of the resistor and the other end of the resistor to the longer leg of the LED and a black wire the the shorter leg.

If using the Orange 3.3v Wire:
Before you solder it on slip yet another bit of heat shrink tubing over it to stop shorts. Solder the orange wire to the longer leg of the LED and a black wire the the shorter leg.

Now for the switch, if you have one on the back of your PSU i suppose you don't really need this but i think you should still use it regardless. Connect the Green wire to one contact on the switch and a black to the other. If your really against using a switch then just tape together the green and black wires.

You can also use a 1 amp fuse. All you do it get the clump of black wires you'll be using and cut them somewhere along the wire and then bridge them with a fuse in a fuse holder.

Some Power supply's need a load to work properly. To provide this load solder a red wire to one end of a 10 ohm, 10 watt resistor and a black wire to the other. This will trick the power supply into thinking its powering something.

If this is all confusing there is a diagram attached to help. The diagram shows the binding post method to connect the wires. I will explain more about these in the next step. It also connects the grey wire to the Power on LED but you can also use the orange wire and it also shows the wiring for the high wattage resistor.

Step 3: Presenting The Power

OK from all the other tutorials I've read there are a lot of different methods of connectors for connecting your devices to the power, Ill start with the best one and work my way down to the worst.

Some tutorials will tell you to stuff it all inside the one case but that is dangerous and will make it very warm and crushed. I recommend using a external enclosure.

1.Adding a Variable Resistor:
I personally think this is the best method as this can provide any voltage between 1.5 to 24 volts. The reason that its 22v and not 12 is because it uses the Blue wire which is -12 volts not the common earth (black wire). You will need:

- LM317 or LM338K Voltage regulator
- 100nF Capacitors (ceramic or tantalum)
- 1uf Capacitors Electrolytic
- 1N4001 or 1N4002 Power Diode
- 120 Ohm resistor
- 1x 5k Ohm variable resistor

First build the circuit from the main picture and connect your +12 and -12 volt lines. Now drill holes in either the power supply or an external case to fit the variable resistor, All the other circuitry should be kept inside. I suggest now adding Two terminal blocks so you can wire devices directly in. You could also connect some alligator clips in to the terminal blocks aswell. When you turn the variable resistor the voltage should range between 1.5 and 24 volts. **NOTE:** There is a typo in the main picture it
should read +24v variable instead of 22v. If you had an old volt meter you could wire it in to the output so it can tell you what voltage you are at.

2. Binding Posts

2nd is using binding posts to connect equipment. First drill hole for the binding posts (make sure to wrap the circuit board up in plastic as metal shards can short circuit it) then check they are the right size by inserting the posts and tightening the bolt behind them. You chose what voltage to hook up to what post and how many posts to put in. The colour Codes for all the wires are:

Red: +5v
Yellow: +12v
Orange: +3.3v
Black: Earth/Ground
White: -5v

There is a image below using the binding post method.

3. Basic Crocodile Clips

If you don't have that much experience or don't have the above parts and for some reason can't buy them you can just hook up whatever voltages you want to Crocodile clips. If you do chose this option I would suggest a sleeve over the Crocodile clips to prevent short circuits.

Tips and Troubleshooting:

- Don't be a bit afraid to spice the box up a bit, you could add leds, stickers or anything!
- Make sure you are using an ATX Power Supply. If it is a AT or older power supply it will most likely have a different colour scheme for the wires. Unless you have some data on the wiring don't attempt this as you could get caught on the wrong end of a wire and get your head blown off.
- PSU means Power Supply Unit
- If the LED on the front doesn't come on chances are you have the leg wired up the wrong way around just switch the wires on the legs and it should light.
- Some modern Power supply’s will have a "sense wire" this has to be connected to power for the Power supply to function. If the wire is grey connect it to an orange wire, if it is pink connect it to a red wire.
- The High wattage power resistor can become quite hot; you could use a heatsink to cool it down but make sure it doesn't short anything out.
- If you insist on putting everything inside, you can put the fan on the outside rather than the inside.
- The PSU fan can be noisy, it is powered by 12v. Since it isn't power computers anymore and doesn't heat up as much you can snip the red wire of the fan and connect the orange 3.3v wire. Keep an eye on your circuit after you do this, if it produces too much heat connect the fan back up to the red wire.

CONGRADS You have successfully finished your Power supply!

Thanks to other tutorials on Wikihow and Instructables because I used some of there pictures.

If you have any questions email me at prod_lad@hotmail.co.uk
This green slab is the power supply circuit board.

Related Instructables

Converting a computer ATX power supply to a really useful lab power supply by abizar
Cheap (AXT) Bench Power Supply 30 Amps! (Photos) by muttyfutty
ATX Power Supply -> Cheap Bench-Top Power Supply (Photos) by mortaldoom780
Cheap Laptop Cooling! by CalcProgrammer1
Convert an ATX Power Supply into a Regular DC Power Supply by Sitalta
Jump Start A PSU by F1X0R

Comments

43 comments Add Comment

Randel says: Aug 5, 2010, 2:15 PM REPLY
Hey...Just built one of these from a tower I was throwing out. And it works Great! I brought out the 3.3, 5, 12, and -12. And used the Gray wire for a power on LED, except used 220 ohm resistor. The 3.3 required the small orange and brown wire to be tied to it, for feedback. And didn't use the stand by wire...But like I said, It works Great! And I give you, prodlad, all the credit...Thanks for a fun and useful project! I've attached a picture..but still need to label output posts...

prodlad says: Aug 6, 2010, 3:36 AM REPLY
thanks

rfxcassey says: Jul 13, 2010, 12:45 PM REPLY
Something doesn't seem right here. Using a 120 ohm and 5k ohm the math doesn't work out right, I get 53.333 volts. Also you are extremely vague on when you state all you need is a 120 ohm and 5k ohm (which don't seem right anyways) as that really depends on whether you are using a LM317 or a LM338 as the LM317 is going to need something more like a 280 ohm R1 resistor and a 5k ohm R2 resistor to get 23.6V out. And no matter what you do your not going to be able to pull the max amps the supply is capable of on the 12 or 5 volt rails using a LM317 or LM338 as the LM317 is only good for about 1.2 amps and the 338 for 5 amps. Still pretty good though for a super cheap PSU with good regulation. And as others have stated you are not going to be able to get 24 volts with considerable amperage as you will be limited by the -12v rails current capability. But you could use say the +12 volt and -5volt as the ground to get +17 volts at the 5 amp limit of the LM338. I'm super rusty on my electronics theory so pardon me if I have said something completely a miss. I do however have an AS degree is electronics I just to practice much.
hitachi8 says:  
I made one, but I put my fuse on one of the AC wire (input 110AC)… is it correct?  
http://www.youtube.com/watch?v=0AGTKtaRflU  
Jun 13, 2010, 6:55 AM  
REPLY

Coolinst says:  
My PSU has no green wire. What should I do?  
Mar 9, 2010, 7:50 PM  
REPLY

prodlad says:  
Its not atx standard. It could say on the side or search for wiring schemes on google  
Mar 10, 2010, 8:13 AM  
REPLY

k2d2 says:  
What are the colors on the resistor?  
Jan 1, 2010, 8:28 AM  
REPLY

senafe says:  
(removed by author or community request)  
Oct 14, 2009, 7:00 PM  
REPLY

syfire says:  
Sorry, but every PSU are isolated from the power line. And your argument "There's a reason to have this type of power supply inside a steel case and another steel computer case well isolated from the user" don't stand the road because if a steel case touch another steel case, is will be just one big steel case not two. Also look inside the PSU, I can see 6 of small transformer, so you ARE isolated.  
Nov 14, 2009, 2:48 PM  
REPLY

muttyfutty says:  
How many amps output can you get? Nice Ible Thanks,  
Sep 27, 2009, 2:01 AM  
REPLY

syfire says:  
Well, most power supply can support up to 400 watts of power so it depend of what voltage you are using. You can know the maximum amperage with the Ohm Law $P = V \times I$ so $I = P/V$ where $P$ is power, $V$ is voltage and $I$ is amperage. You just have to check the maximum output of the PSU.  
Nov 14, 2009, 2:41 PM  
REPLY

MaXoR says:  
I love the hacked horse fence charger. I HATE that people are ripping apart old systems, because they think they are "Junk"…. What a waste, when you get older… I hope someone chops you up, because you were just old tech, and taking up space……  
Sep 8, 2009, 2:12 PM  
REPLY

adicontakt says:  
some times ago i made somethings like that  
it wanna watch  
http://www.youtube.com/watch?v=4vmA3CeisU0  
http://www.youtube.com/watch?v=J_DhI4I6FM  
Sep 4, 2009, 12:13 PM  
REPLY

albylovesscience says:  
i own the same soldering iron  
Aug 30, 2009, 5:40 AM  
REPLY

billy157 says:  
I like it, I'm going to try it. :)  
Aug 28, 2009, 9:08 PM  
REPLY

trammanaka says:  
Hi everyone! I love this post, I’ve been wondering of a way to avoid spending 100€ on a 24vdc++ voltage regulated supply source. So as soon as I could I went off bought most of the material required… and only after having my regulated circuit all ready to go with a lm338k indicated in this instructable did I go look at the current supply for each voltage output. And on my ATX for +12v I’ve got a max current of 8A (which is great) and for my -12v I have a max current of 1A (terrible) unfortunately because most -12v outputs on a PC don’t need that much current they have limited the current to a smaller value. This means that when I connect any equipment to my -12v and +12v the max current the power supply will be able to give me is 1A. In conclusion: -the power supply will be limited to the lowest current value. -there’s no need to waste more money on lm338k to get a max of 5A if it will only give you 1 amp. -Most equipments powered with 24v will need more current so they may not work correctly. If however there is a great brainiac out there who can figure out what components to switch to achieve higher current values on the -12v circuit, that would be great to here from, although I must recommend everyone else not even to think of it. !The ATX has a complex, well built structure that when tampered with may cause serious accidents!! keep instructing! o/  
May 22, 2009, 7:19 AM  
REPLY

prodlad says:  
Well if you can’t bear with the 1amp max just get the 12v line and put it directly onto the variable resistor bypassing all the other parts. Then you have 8amps of power which can be varied between 0 and 12v  
May 22, 2009, 9:58 AM  
REPLY

**sjeclistudent** says:
has this been tried and tested? because the -12V terminal can only handle .5A...The 12 V terminal can handle 30A...So would not that damage or overoad the -12V terminal???Please test and let know....

**sjeclistudent** says:
has this been tried and tested? because the -12V terminal can only handle .5A...The 12 V terminal can handle 30A...So would not that damage or overoad the -12V terminal???Please test and let know....

**BOOJAN** says:
how many amps can this power supply give at his outputs??(I mean the version with lm317)

**prodlad** says:
depends what voltage lines your using. if your adding the variable resistor i wouldnt draw any more than 3 but the 12v and the earth you could draw up to ten. I suggest fusing the -12v line or the earth. Dont fuse the positive as by the time the fuse blows the damage will be done.

**phozfate** says:
you know all i did was put the wires together and put some rca cables (the red and white ones) female end<< and i works perfect. so is there something unsafe about not have all those regulators. resistors and all that stuff????

**prodlad** says:
no, thats just if you were going to add the variable resistor.

**phozfate** says:
here i my mod of the supply the board fit really well eave coments of your oppinoins of what could be changed

**prodlad** says:
looks cool, good idea putting it into a nintendo game console case. Just make sure it has proper ventalation and a fan.

**jack shimano** says:
using +12 and -12v no good (as shown above diagram)
-can only drag 1-2 amps max out of supply since -12v almost useless now
-used to be used in 286 days-obsolete now most pc's

but if +12v and ground (black) used ,and any lm-305 (5v regulator used)
instead of lm-317,with lots of heatsinking ,of lm-305 regulator can drag up
to 20 amps at poor regulation out of +12v supply
-ok for semiregulated 5v to 12v @10 amps or more
but since no feedback to circuit,regulation will be poor
-but not bad for next to no price

jackshimano says:
both the dual shottky diodes marked ->i<- and h.o.t. transistor are usually large to -218 br to-220 plastic construction (not insulated from bare based backplate ) so must be isolated from common metal heatsink usually aluminium -use the plastic insulator(s) and hardware as mounted in supply and good thermal grease for best results the m.o.v.s in better supplies are good to use in surge bars-up to 2 per atx/at supplies-cheap supplies may not have m.o.v.'s- often blue,sometimes red

jackshimano says:
-inside all at and atx supplies is a very good dual shottky diode-ideal for low loss rectification for up to 24v dc supplies -up to,if heatsink properly, 6-30 amps with lower rectification losses than regular diodes that drop 2-3 volts -so also ideal for isolation of solar cells and 3-10 v dc circuits like dual battery packs to prevent discharge since they rectify with only 0.3 to 0.4 v drop at high current-most are common cathode so eg-if +15 is applied to anode,+14 v is available at cathode-(if reg diode +15 would only give you ~+12v at cathode at any real current) so diode losses way less and -being shottky construction 100's of times faster than regular diodes for switching on and off for high efficiency 20khz uses -also fast switching (H.O.T.)transistor good in older crt monitors in the high voltage section

nilimili says:
I was wondering if we can bypass the ac area and use old smps circuit to produce regulated DC voltage to charge battery for any solar projects? I mean using old smps as voltage regulator with solar panels!

pcmxla says:
Thanks, a troubleshooting section would be great. Where I am at now: The fuse on the circuit board is good, the capacitors hold a charge (When I plug in the PSU the standby LED comes on, when I turn on the switch on the PSU casing after a few seconds the standby led goes out. with a slight whine from the capacitors.). I have a circuit (tested using Ohm meter) from the green wire (the one originally connected to the 20 pin device) and the black(ground)wire bundle. There is no circuit between the black wire coming off the PSU casing switch to the board or to the white (hot ) wire coming from the power plug in. I also get a circuit from the second heat dispenser to a ground wire but not from anything before it in the circuit. So my best guess is I somehow shorted something out, or I don't have a sense wire connected properly. I will disconnect everything and see if I redo step by step, but I think something is shot. Thank you for the info.

rich_moe says:
without looking, I would say that the sense line (normally a small, brown wire) needs to be grounded, but through a resistor. something that is rated for 25W at about 2-5 Ohms should do it. other PSU's need a load on the +5VDC line in order to regulate properly and have a smooth output. i don't know which yours is, but if your sense line or the +5VDC line has no load on it, the PSU 'sees' this as a short to ground and shuts down. YMMV.

prodlad says:
Tips and troubleshooting added

Mikey73 says:
AT or ATX SMPS supplies, at first, may seem to the uninitiated to be too good to be true - cheap, clean, powerful and also to offer a variety of voltages that can be easily tapped to use in virtually any home project, etc. However, most SMPS, especially the AT (obsolete) and ATX family are complicated designs having been designed and built by power-electronics engineers - not children. Be careful using these things as bench power supplies especially if you have "modified" ANY part of the circuit! These are not toys and adding the -12V to the +12V rails to obtain (a possibly non-ground referenced)± 24V is plain stupidity. The -12V rail is only capable of supplying a small amount of current whereas the +12V rail supplies tens of Amps. Be very careful taking advice from a 13 year-old when it comes to these types of power supplies (or any other for that matter) - they can be deadly. Sorry to come across as a stick in the mud - just a warning for those who may not know. Happy instructing...

prodlad says:
yeah i suppose your right i am only 14, most power suplyys are really advanced but hey it isnt that hard to make this all your doing is shorting 2 wires and just making it provide power for a variable voltage circuit

World_Groove says:
I finally got around to making a power supply out of an old unit from a dell optiplex. I used a retro looking cool shell from an old electric fence box, mounted everything inside, and installed a secondary fan on the back side with the power switch. I also made the old electric fence terminal on top 12v for good measure. Thanks for the instructable!!

prodlad says:
looks great! good idea using volt meter leads
pcmxax says:
Nice tutorial. I am a total newbie at this and I was wondering if anybody had troubleshooting tips. I have wired one up (coolmax nw-650b) but it isn't working. Green is connected directly to black. I have connected the small orange wire (the 3.3v sense wire) to another orange wire. I have a 10ohm 10 watt resistor on one red wire and one black wire. The standby led lights when the unit is plugged in. But the mains power led connected to gray wire doesn't light when PSU is turned on. The fan doesn't come on either. The resistor doesn't heat up. There is a very faint whine a few seconds after power-up and power down. The capacitors on the PSU are holding a charge. There is an 8 ohm resistance on the red and the orange wires. Between the yellow and the black I am getting 9.85 kohms. There is no brown wire. The blue wire is not connected to anything. I have two yellow and black striped slightly smaller gauge wires that at first I had connected to nothing and then connected to other yellow wires. No difference. Any thoughts? Thanks

prodlad says:
There probably is a short some where. Make sure the mains on led is the right way around. Try disconnecting everything and just short the green and black wire. Make sure any wires arent touching any other wires except the green and black. If the capacitors dont hold charge your PSU has lost all hope. I'll add a troubleshooting section to the tutorial.

wierd idiot says:
Hmm... Very Nice. Just wanting to know can you change the fixed voltage lines ie the 12 and 24 volt ones?

prodlad says:
i don't get what you mean. If you mean change the voltage they give out the answer is no but you could if you put it through a variable resistor or ordinary resistor if you could calculate the what ohm you need. Tip: Look up "Ohms Law"

Geosync says:
i wouldn't recommend using a variable resistor. Also, IMHO, knowing Ohms Law alone won't address the construction issues involved in creating an adjustable output.

Probably the best way to provide an adjustable voltage is to attach a variable voltage regulator and associated parts to one of the fixed outputs.

Check out this link:
http://www.wikihow.com/Add-Variable-Voltage-to-Your-ATX-Based-Bench-Power-Supply

prodlad says:
I based the variable resistor method on this page!

Geosync says:
i should also say i marked this Instructable as a favorite. Nice job!