How to make a 20A power supply for youre base station use of a mobile/amplifier.

I did not develop this project. I just found it. But... I DID build the project, and can add useful notes and tips. I can report it works extremely well, does not seem to degrade signal transmission quality, on AM or SSB. It is very cheap or free to build, and requires no real technical skill normally associated with homebrewing a power supply "from scratch".

Compter power supplies are cheap, even free, and plentiful. You can take three (3) old computer power supplies to make a base station power supply for the radio, and it is very well filtered and robust. The computer's electronics demands fairly well filtered power, and in so the resulting power supply is very "clean". I fix computers for money on the side, so i have power supplies around, but even if you DONT, you can get them from junkyards and trash piles when people "upgrade". If you have to buy them, look for junk computers and piles of stuff at yard sales and flea markets. Junkyards usually have many as well. I wouldnt pay more than 5 bucks for a computer Power Supply, personally, and usually end up with more than i ever need, because i take any i find home in case they work. Hamfests i have heard have guys selling old computer power supplies for like a dollar or two each in bulk... I wonder why hams like old computer power supplies so much??? LOL

Heres the basic premise: a computer power supply makes several different voltages:

+12
-12
+5
-5
Ground (0v)

We are primarily concerned with only the +5v wires, and the GND wires. Usually these are red and black, for +5v and Gnd, respectively. Usually. take a meter to them if you have any doubt.

Computer power supplies need a good ground to work at all. Once, my computer "died" in my house, and every power supply i put in it wouldnt work either. Within ten minutes i solved this, but only because i once went crazy in an old apartment getting a small refrigerator to work... it needed a ground on the third plug, and it was an ancient two wire system...i sent a ground to the radiator and it worked fine. Remembering this, i went to my basement, and sure enough the ground to the water pipe from the electrical box was corroded. I cleaned it and reattached it, and all of a sudden all the power supplies "worked" again.

Now... how these computer power supplies work, is that they use GND as a reference. In this power supply, +5v is +5 volts "with respect to ground", GND= 0V (typically...lol)

The power supply NORMALLY will make +5V out of the red wires...but "with respect to ground", if GND becomes something other than 0V, it will change the output. Youre water pipe (electrical box ground...) is where the power supply taks its reference to ground from, and hopefully you dont have electricity in your water pipes, LMAO. Just keep in mind, the power supply typically makes GND+5V which is 0V+5V = +5V output.

We are going to number our 3 PS (power supplies...) #1, #2, and #3. PS #1 we will leave alone, and the red wires will make +5V like normal. But... power supply #2, we are going to interrupt the ground plane, and send the +5V from PS #1 in as GND, so it will make GND +5V = 5V+5V = +10V out.

Then, we take that +10V output and send THAT in as GND to PS #3, which will make GND+5V, which will be 10V+5V = 15V or so output.

If you dont follow this electronically very well, dont sweat it... just remember that PS #1 will run normally, and we will take the +5V wires(red) and send them into the GND (black) wires of PS #2, and the +5V wires(red) of PS#2 into ps#3 GND(black) wires, and get 15V or so out the end... the original PS #1, will have "normal" 0v ground (black) wires since it runs "normally". If you dont follow the electronics of it, just think of the three power supplies as "batteries in a flashlight", and each battery is adding +5V to the output.

This system is called "floating the ground" of PS #2 and PS #3.

NOTE: the total voltage in this fashion, will be the electrical sum of the three +5V of the individual power supplies, or around +15V or so. All three power supplies had specs on the sides that were 20A max for the +5V portion of the supply. So... the end result will be a 15Volt 20Amp power supply. Again, the computer needed a lot of filtering, so this is a pretty "clean" power supply. Youre mobile radio will like it more than what the alternator fed it, LMAO.

Remember, power supply #1,leave it alone to run normally. Power supply #2, and #3, we are going to modify to "float" the ground plane. take #2 and #3 apart carefully. CAUTION: do not touch the leads of capacitors. BE CAREFUL OF THIS! capacitor can store a surprisingly large electrical charge for a surprisingly long period of time, enough to potentially kill you. Fortunately, these supplies SEEM to "bleed off" the charge by "winding down" slowly when you unplug them... but i wouldnt trust that. Be careful and stay away from capacitors. Make sure you unplug the damn thing before touching it, too. I know, I know, but i HAD to say it. Now then....

Take #2 and #3 and pop the metal boxes off. A few screws. carefully undo the 4 screws that hold the circuit board down to the bottom of the metal box. Typically, two out of the four things that the board is screwed into is where the board gets its ground from. We will interrupt this. Look at the bottom of the board... you will see that some screws are part of the copper trace that connect parts of the board to the metal box...knock out the metal standoff the screw goes into. MOST PS's will have the two screws "grounded" on opposing corners... just delete those two metal posts, i knocked mine out with a screwdriver and a whack with a small hammer. If the two connjected posts happen to be on the same side...put a small piece of particle board in to keep it up. There will be a small piece of plastic under the board... replace it when you are done. NOTE: if you lack basic electronics knowledge, all is not lost... just knock out ALL the metal standoffs (posts) and screw the power supply boards #2 and #3 back in the box bottom with a piece of particle board or other non-conductor under the board... THAT will keep the circuit from sensing a ground. DO NOT disconnect the ground from the wall plug to the side of the metal box... this prevents the box from becoming "hot" should somethign untowards occur.

Do this to both #2 and #3 PS's. You have just "floated" or interrupted the ground sense on these...

Now test it... take youre meter, and test the original unmodified power supply. a black wire, and a (usually...) red +5V wire... you will likely see about +5.3V. Now... take the red +5V output wire you just tested, and attach itto a black GND wire on the modified PS #2... using clips on the meter test leads, you will see +10.6v or so out of the ps#2 red wire... you get the ground from the original black wire from PS #1.

Congratulations, you havev just made it all work. take the red wire giving you +10.6V from PS#2, and attach it to the black GND wire of modified PS #3... then a red wire from PS#3 should show about +15.9V or thereabouts output.... youre test is done, all is well.

Notes:

If theres a switch for power on the outside of the PS box, great. If theres a wire wnding with a switch, fine and dandy... a junked PS might not have a switch at the end... in that case, you will see four wires, probably black and white pair, and blue and brown. The Black and white wires are the line voltage, and the other two wires you "jump" to like closing a switch. I did mine white to blue, and black to brown, and it worked fine.

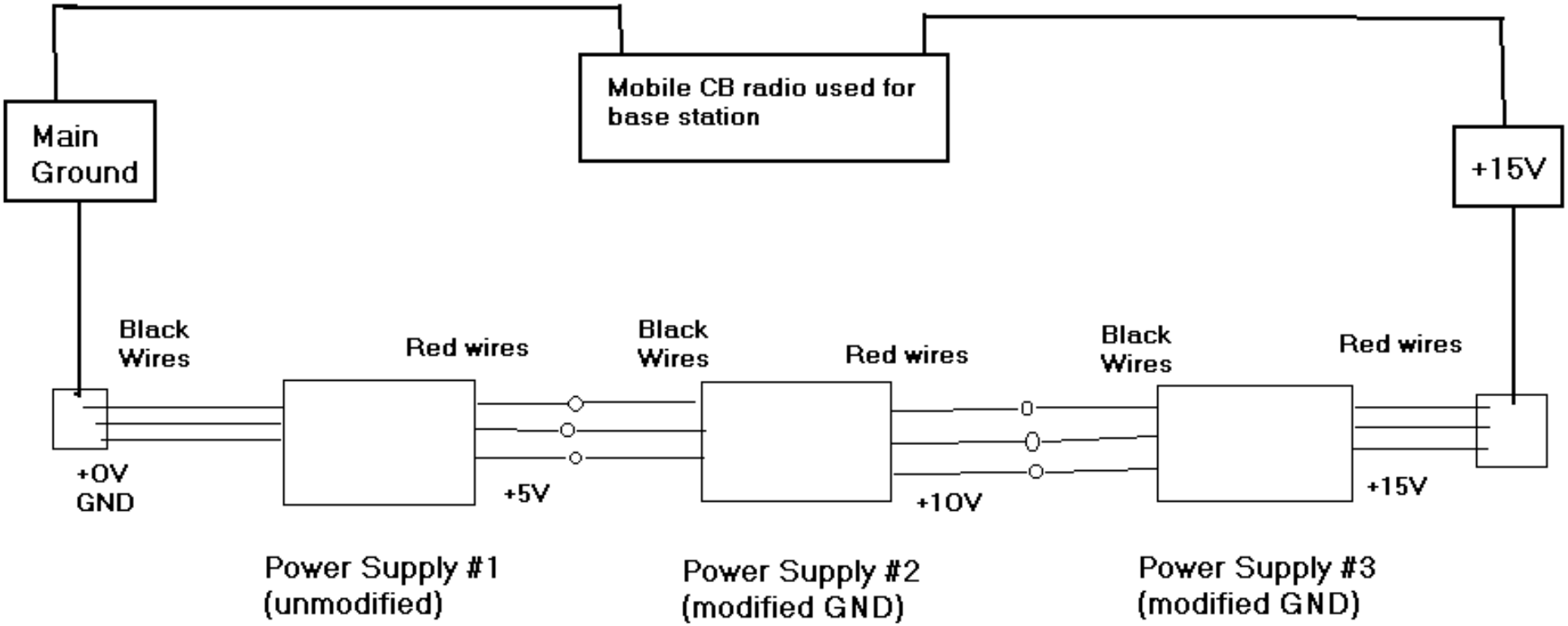
There MAY be some goofy sensing wires to make it run. You may have to send a small wire to ground to turn it on, or send a small wire to +5V to make it work. This will be only newer supplies, older ones are what you want anyways. The older ones tend to be built heavier from an electrical point of view, and have a big switch to turn it on.

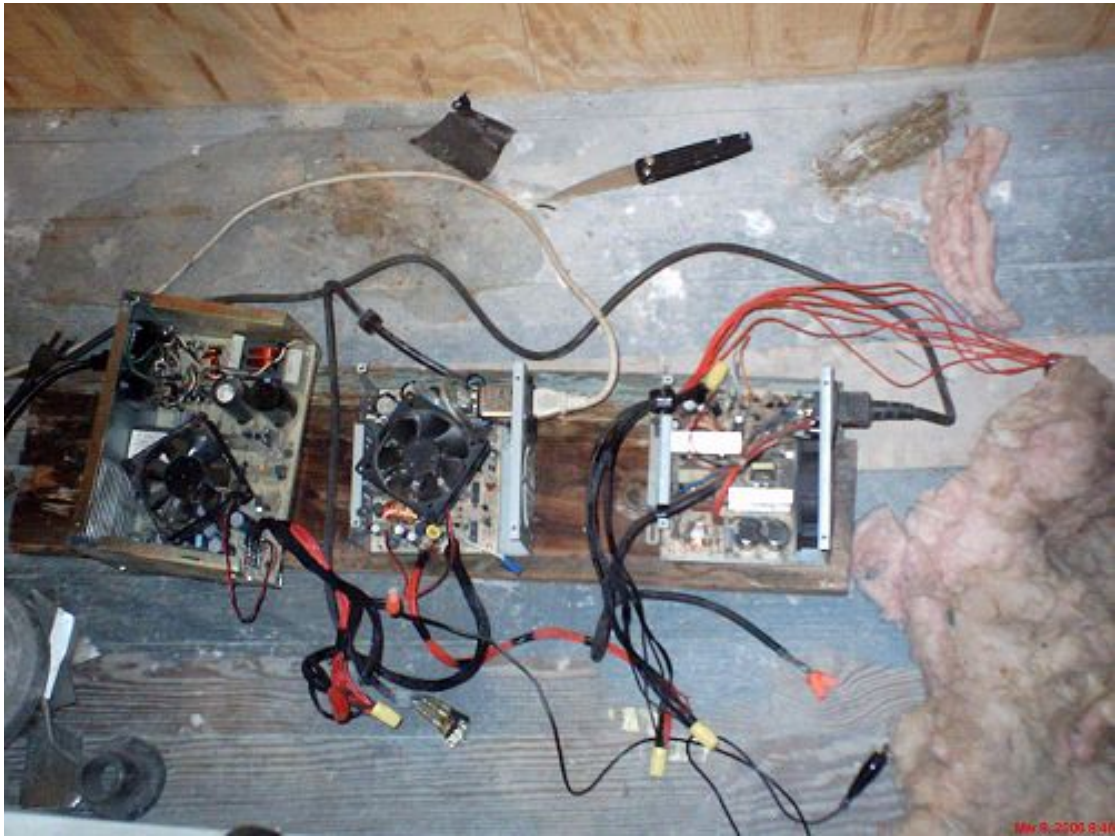
Remember, we are only concerned with the black and red wires, GND and +5V output... cut the rest down to the circuit board and dont make a "short" anywhere. I screwed all three open boxes to a board, and made the connections with wire nuts, and called it a day. A powerstrip will get it all down to a single "on" swich for you. If you want to pretty it all up, you can make a sheet metal box to contain it all. Remember... PS#2, and PS#3, you dont want it getting a ground! mount those two boards on wood and it will prevent this. If youre worried about a fire, dont be...if its over 450 degreees at the power supply, you have bigger problems anyways, LMAO. I had no problems whatsoever. instead of cutting unwanted wires (-5v, +12v, -12v, etc etc) I unsoldered them from the back of the board and popped them out.

PS - older power supplies, somewhere in there, you will find an "ADJ" tiny pot. Turn it slowly up and down, watching the meter, and you can adjust the voltage... only ONE of mine had an adjustment, the others were "set" at 5.3V and i had to deal with it. I lowered the one that was adjustable all i could, and left it at that. I ended up with 4.2 + 5.3 + 5.3 = 14.8V CAUTION: you are watching a power meter, with the power on!! to a unit with possibly an interrupted ground!! be careful what you touch with a metal crosshead!! it is BEST to use a plastic screwdriver for operations like this, but if you dont have one, like I dont have one, just be CAREFUL!! Power supplies can develop some MUCH higher voltages that the output voltages than you might think! Theres also naked LINE VOLTAGE (120V) in there in portions of the circuit...be careful... if you are completely clueless, get someone electricity/electronics savvy to watch over you.

If youre lucky enough to find three older, bigger, supplies so much the better, not only are the older ones "beefier" components, they also tend to have volage adjustments... with three adjustments, you can really fine tune the final voltage! Most all power supplies i look at have about 19 to 21 Amps rating max for the +5V output. The supplies are all filtered so well, I run mine with the covers of the metal boxes open to keep them cool. This might not be a good idea if you have little kids or clueless women (or men...lol) or curious pets running around.

If this all seems as clear as mud, see the diagram, and a picture is worth about ten thousand words.


Main Ground
Mobile CB radio used for base station
+15V
Black Wires
Red wires
Black Wires
Red wires
Black Wires
Red wires
+0V
GND
+5V
+10V
+15V
Power Supply #1 (unmodified)
Power Supply #2 (modified GND)
Power Supply #3 (modified GND)



Picture: I apologize for not having closeups. My cheap digital camera does not allow for any kind of closeup. You will note several things in the photo :

1. it will work fine as a very rough affair.

2. they run fine with the covers off the boxes. I ran it for over an hour with the fans OUT of the circuit, with no detectable heat of any kind. MInd you, I was only drawing about 6 amps total at 15V or so. thats a pretty light load, and the covers were off for heat dissipation.

3. lacking the detail close up i would like, still, you can see how i bundled several wires together and used wire nuts. electrical tape works well for bundling the wires together. You can also see I removed the extraneous wires, and basically only kept the black GND wires and the red +5V wires.

4. at about the right center, you can see the final 15V output of the new system...

5. I will go back at a later date and make a pretty box, but this is fine for now to get it working.

NOTE: if you need mroe than 15 or 20 amps, you CAN make two (or more...) identical units like this, and run them in parallel. Tie the main ground, and main power wires, together. Thinking of it like car batteries, it would be like you are adding a second battery in parallel... the voltage will stay the same, you will just have more cold cranking amps available...

Special notes from the original project developer: if you run 2 or more final units in parallel for more total amps, you will want to add appropriate diodes as the voltages will be slightly different. Between ps#1 and ps#2, in both projects, add a large power diode with correct polarity (5V or so...) and between #2 and #3, in both projects, a 10V or so power diode. The final outputs of both power supplies would have 15V diodes. Thsi will prevent the differences in voltage from "leaking back into" the system and keep the juice flowing in the proper direction.

An overall voltage regulator of slightly less voltage can be added right before input to the device's (CB, AMP, whatever...) power wire, but unless you are running a large power amplifier and multiple supplies in parallel, it is unnecessary.

A power strip will give you a single on/off switch. In my picture, I am using three 250 or 300 watt computer power supplies... giving me a draw of about 900watts MAX (I am using far less, until i get an amp) A hair dryer uses more wattage, so all is well for the average houses electrical outlets. You will want to add a fuse on the CB power lead of appropriate amps.