Installing an Inverter

There was a recent discussion on TF about how to install an inverter on a boat to only serve a few limited services and not serve the heavy loads: air conditioning and water heater. This article discusses how to “split the AC buss” to only serve the low or short term loads like the outlets, and a microwave This installation avoids serving all AC loads which would almost certainly overload the inverter or for sure run down your battery if one of these high wattage loads were left on the inverter.

AC Side of the Inverter

Look at the following pic of a typical AC breaker panel front side and back. Your panel probably may have more positions and also may be part of a DC panel, but the principle is the same.

The main breaker at the top is usually 30 amps and is supplied by the shore power cord. If you have two phase 50A 240/120V shore power, the above pic represents one leg of 120V power and usually has a 50 amp main breaker. If you look at the back side pic you can see the black wire from the right side of the main breaker which connects to the mid point of AC buss below the main breaker. The AC buss is the flat copper bar with the main breaker feed attached to its middle. You will cut this buss with a hack saw to divide it into two separate circuits: one that is fed by the main breaker as before and the other fed by the inverter's transfer switch.

Look again at the front of the panel. Typically you would want the water heater, battery charger and other heavy wattage users fed by the main AC breaker and the others fed by the inverter. So you have to rearrange the breakers so those you want fed by the main AC fed buss are at the top and the others are at the bottom. Also include the spare in the main breaker fed buss as you will use that to feed the input to the inverter's transfer switch.

Rearranging can be tedious as you have to reroute wiring and breakers. Sometimes there just isn't enough slack in the wires to make it work. Be creative and in some cases you will just have to splice a short piece of wire to make it fit. As long as the splice is inside the AC panel it should be ok. To move a breaker, unscrew it from the front and the AC buss in the back and pop it out and move it up or down with its load wire to the new position.

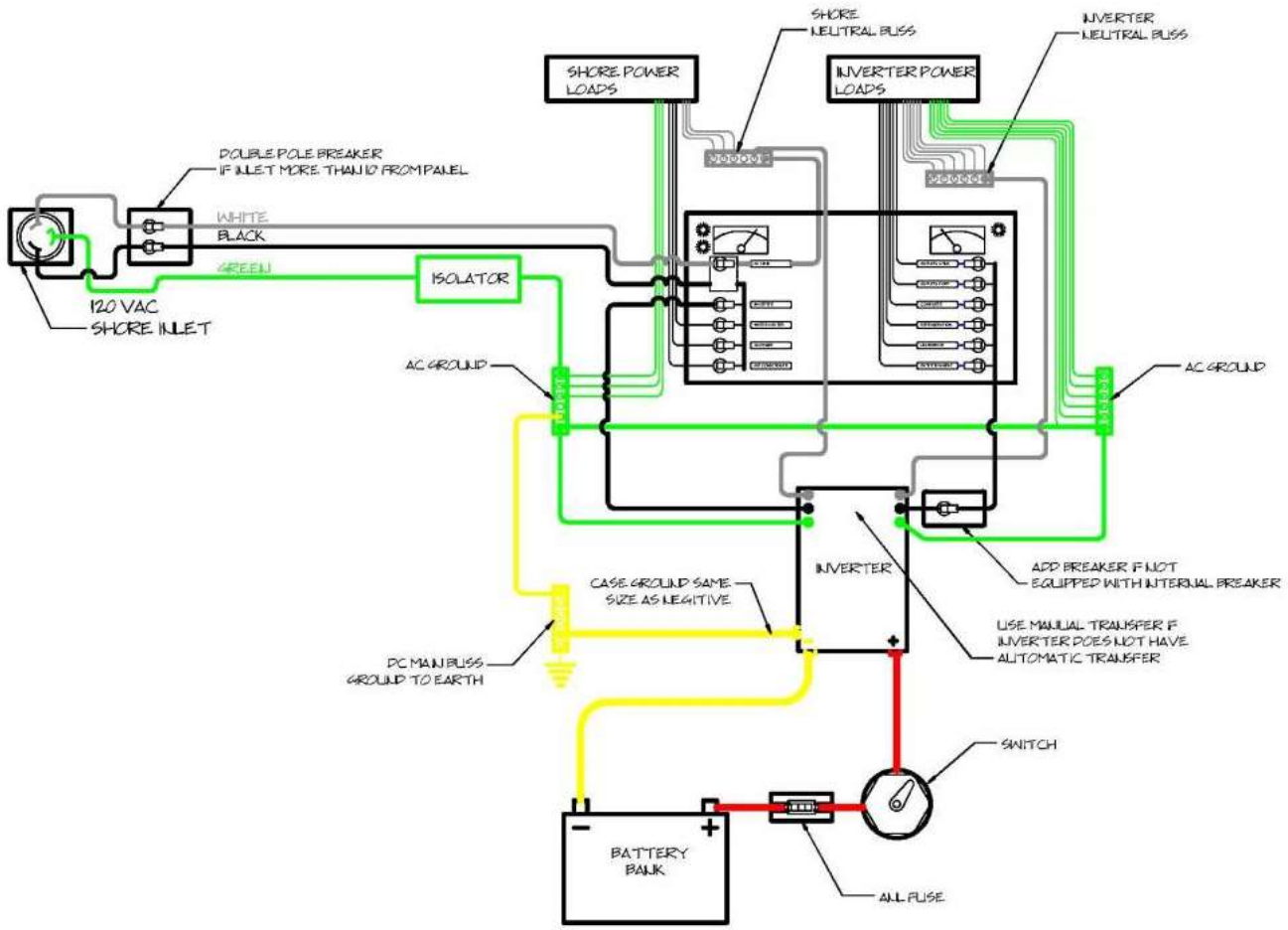
The pic shows a comb shaped tinned buss in the lower left. This is the neutral buss which also must be split. Having a neutral buss as part of the panel is a little unusual as most boats have a separate neutral buss mounted on a bulkhead behind the panel. So if yours is like the pic, cut the buss to divide it like the hot buss and if you have a separate neutral buss you will have to either split it or use two terminal strip busses.

Using the spare breaker which should be upgraded to 30 amps, wire a new 10 gauge cable from the load side of that breaker to the input of the automatic transfer switch of your inverter with its neutral taken from the neutral buss in the lower left of the backside pic and its ground from the ground point just below that. Then wire a similar cable from the output or load side of the transfer switch back to the lower buss and tie the black wire to one of the screw terminals. Same with neutral tied to the split or separate bus and the ground tied to the ground point on the panel or a separate ground buss.

When all is done, the circuits fed by the upper buss will not be supplied by the inverter but the circuits fed by the lower buss will be. The inverter will pass through power from the spare breaker when shore power is available but will supplied inverter power when it is not.

For those of you who are interested in schematics, here is a detailed diagram of a split buss inverter wiring scheme. It isn't immediately obvious but the schematic shows a separate buss for the inverter loads. This can either be a cut buss like in the discussion above, or a separate inverter panel. The schematic works for both schemes. Note that the hot, neutral and grounds are all split for inverter loads. It is not necessary to split the ground though.

Thanks to porman on TF for finding this schematic on the web.



DC Side of the Inverter

Hooking up the DC side to the inverter is generally simpler. First install the inverter as close to your house bank of batteries as possible to minimize voltage drop. The manufacturer will usually have tables that give you wire size depending on distance. A quick way is to take your inverter's rated output in watts and divide by 12 to give approximate DC amps at full load. Then use wire sizing tables available from WM, Blue Seas and others to calculate the wire size to keep the voltage drop down to about 5%.

This will usually mean pretty big cable: #6 for a 1,000 watt inverter within a few feet of your batteries up to #1/0 for a 2,500 watt inverter 10 feet away. Connect the cable to the DC terminals on your inverter and then connect the negative wire to the negative post on your battery or the load side of a shunt if you have one. Then connect the positive wire to a Class T fuse near the battery and then to the positive terminal of the battery. Size the fuse to be a little more than the expected maximum DC amperage that your inverter will draw and be within your cable's ampacity.

I don't quite understand why but inverters have a DC chassis ground terminal that must be connected to the boat's grounding system, usually the negative battery terminal, but an engine block ground will also work. Check your installation instruction for size, usually #8 or so.

That's it. Enjoy using your inverter.