

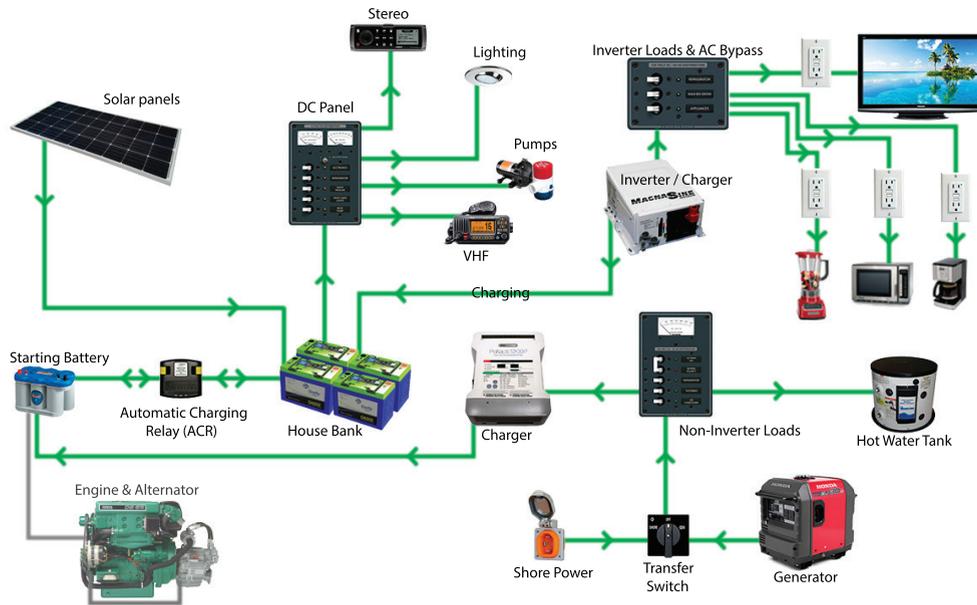


# WIRING SCHEMATICS

How to create an electrical wiring diagram for your boat

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**M**ost new boats include a drawing that outlines the entire electrical system, however these become outdated very quickly as new equipment is installed. For older boats, they can be completely out-of-date or non-existent. Putting together a simple diagram of your boat's electrical system may seem overwhelming but it isn't as hard as you think. It just takes time, patience and the realization that it cannot be completed in a day and will be an on-going project.

If you have an existing drawing, we recommend you enlarge it and make clear notes regarding any changes. If you don't have a drawing, start with a large sheet of paper, and begin with the batteries and the main DC system such as battery chargers, inverters, busbars and switches. Also include wire size and fuses.

In order to complete the schematic drawing, you will have to figure out what each wire is for and where it goes. Once you have established the purpose of the wire, attach a label to identify it. Use marine specific labels or a high-quality labeller. Oils and moisture in the engine room can cause most home office labels to dissolve. While you are tracing each wire, look for signs of chafing or small bumps and change as required.

Many electrical problems start with the connectors, the wires

are in a damp environment and are subject to constant vibration. A good connection starts with a good crimp and the secret to a great crimp tool is that it does not pierce the insulation on the wire. Our favourite is the FTZ Cycle Crimp tool that is specifically designed for heat shrink terminals and splices. The bare wire at each end of the connector sleeve must be sealed with heat shrink. Make sure you have a number of different sizes on board, both for correct wire gauge and ring size, along with a good heat shrink torch, such as the Acor Mini Butane or Butane Pro.

Marine terminals feature pure electrolytic copper to offer the least electrical resistance for best current flow. They are tinned to prevent corrosion from salt and

moisture. Ensure that they are UL listed and designed to be used on flexible stranded wire. Look for terminals with a seamless, flared barrel design that makes it easy to insert the wire and gives maximum strength when crimped. A closed end seals out moisture so your cables stay dry and do not corrode over time. You may be tempted to use less expensive terminals designed for your car or truck but don't.

Along with your crimper, terminals and heat shrink, you should pick up a small tinned wire brush. To ensure you have the best connection possible, keep the posts and connectors free of corrosion. Your onboard fuse kit should include a complete set of both glass and blade (automotive

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style) fuses. As you are going through and identifying each wire run, make a list of fuses you use. Many marine stores carry small, inexpensive kits with a great assortment. A really great tip is to zap strap or tape an extra fuse in or near the location of the actual fuse. If you have an inverter/charger, make sure you have a Class T fuse onboard as they can be difficult to source while boating.

If you are thinking of doing any wiring as a DIY project, get a copy of the appropriate American Boat and Yacht Council (ABYC) standards. Boat manufacturers use these standards as an absolute rulebook to design and build safer boats.

There are symbols used by engineers and electricians for each device, but if you don't know the symbols don't worry. Draw a square, label it with the name of the device (inverter, switch) and show the wires that are connected to it. For DC wiring, positive wires are red, negative wires are yellow (or black in some cases).

Your boat wiring system should have a marine grade main battery disconnect switch, which allows you to open the switch to turn everything off at once. There are some devices on your boat that you do not want to shut off when you turn off the battery switch such as the automatic bilge pump, an automatic fire-fighting system, or propane detector. These will be wired directly to the battery and must be protected with an inline fuse at the beginning of the circuit.

On most boats the ground reference is the engine block, which is in turn connected to the water via the propeller shaft. Determine if you have a bonding buss for the underwater metals, this is a green wire (or a copper strap) that runs through the length of the boat and connects all of the underwater metals. Although grounding and bonding are frequently referred to interchangeably, a bonding

system electrically connects the boat's underwater metal fittings, such as thru-hulls, seacocks, rudders and struts through zincs to protect them from corrosion.

While you are putting together your schematic, make a note of each of the components (inverter, charger, generator) with the model number. Then collect all of your owner's manuals, we recommend storing them in an accordion file or binder. While all of this information is available on-line, boaters do not always have access to the internet. The back pages of these manuals typically contain a list of common error messages and resets along with proper installation wiring diagrams. Many boaters include the original bill of sale inside the front cover of the actual manual, which includes a description and date of purchase.

Most yacht clubs, cruising groups or power squadrons offer electrical courses either in the evening or on the weekend. For those of you who really want to get to the next step of understanding the what and the why of marine electrical, purchase and read Nigel Calder's book called *Boatowner's Mechanical and Electrical Manual*, it is the industry go-to for marine electrical repair.

A good electrical diagram will save you money because there is nothing more beneficial to a technician or mechanic than an up-to-date schematic. It can save hours of trouble-shooting. As well, the process of spending time with your electrical system will help you become more familiar with your boat and get you back on the water faster. 

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