ELECTRICS

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Adding a domestic battery bank

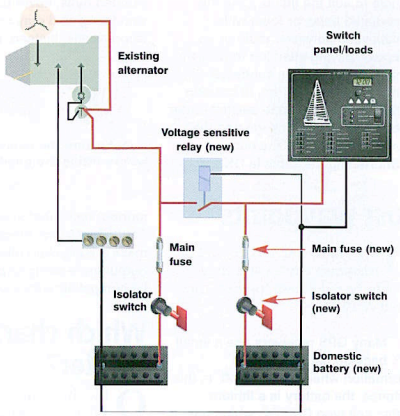
Q I have a Boston Whaler. The battery is constantly flattened by deck lights and stereo. How can I fit a second battery bank?

A Fitting an additional battery for lights, stereo and instruments not only enhances life on board but dramatically increases safety as it reserves power for engine starting.

Additional batteries should be carefully sited (ideally adjacent to the existing battery), secured to prevent movement, and vented. The battery should be protected by its own battery switch and fuse.

Charging this extra battery needs consideration. Various methods exist including fitting a '1, 2, Both and Off' switch, blocking diode or Voltage sensitive relay (VSR). A VSR is the most efficient and easily fitted split charging device available and is now favoured by the majority of boat builders and electricians. A VSR works by constantly monitoring the engine battery. When it senses that the engine is charging, it will allow power through to the domestic battery. Once the engine is turned off, the unit will deactivate.

VSRs cost around £50.



Battery life

Q How do I determine how long my battery will last?

A Most battery manufacturers (Lifeline, Delphi/Delco etc.) recommend the following method for getting approximate run times:

Divide Ah capacity of the battery by 2 (because you only discharge the battery to 50%). This will provide a 'useable' battery Ah rating. Divide this usable capacity by the current (amps) of the equipment you want to run. This will provide approximate run time in hours.

Blinking electronics

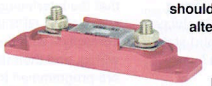
Q Whenever I start my engines, my electronics (plotter, radar and GPS) reset. How can I prevent this happening? My boat has 1 x 75Ah engine start and 2 x 105Ah domestic batteries and a '1, 2, Both and Off' switch?

A Resetting electronics is down to voltage drop caused by the starter motor. Because it uses so much power, voltage on a fully charged battery can drop as low as 10 or 11V.

This occurs because your electronics are run from the switch panel, which in turn is fed from the battery switch's common terminal. The engine connections are also made here – when you start the engine, it 'robs' power from the other loads. This is worsened by poor-quality switches and weak batteries.

Most owners switch to 1 for engine starting, then switch to Both, allowing charging of both batteries. With the engine off, the switch is turned to 2 for running domestic loads, while battery 1 is reserved for engine starting.

Reposition the switch panel's feed so that it runs directly from the number 2 battery. By doing this, you will ensure that the engine starter cannot rob power while the main switch is in the number 1 position. The only issue by doing this is that your switch panel will stay live permanently – so installing a second battery switch in the panel feed is advisable.



▲ Typical main battery fuse

▼ Typical '1, 2, Both & Off' switch

Battery fuses

Q Are main battery fuses necessary?

A Main battery fusing is a source of fierce argument among electrical experts.

The argument against this is that should a fuse blow on an alternator circuit, its internal diodes will be damaged. However, most professional electricians insist that main battery fusing is essential.

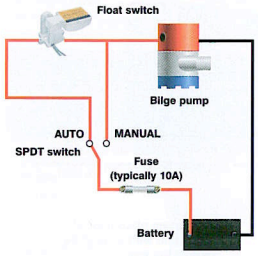
Starter cables are connected to terminals that are millimetres away from the negative engine block. A dropped metal object or the terminal coming undone could cause a major fire. Also, many cables running up to engines are not oil-resistant and their insulation eventually breaks down leading to potential short-circuit scenarios. I argue that it is better to lose the alternator than the whole boat! Every electrical system I design has proper fusing for all cables rather than chancing possible short-circuits.

Note that every cable (even small ones) connected to the battery should have an appropriately sized fuse.

Bilge pump circuit

Q How do I wire up my electric bilge pump?

A Most of us want a bilge pump controlled by a Manual/Off/Automatic Switch (automatic mode running via a float switch). This is achieved with a single pole, double pole (SPDT) switch (see diagram). Ensure that correct sized fuses are used within the circuit, since it will be left in automatic mode unsupervised.



Typical bilge pump control panel

Single switch

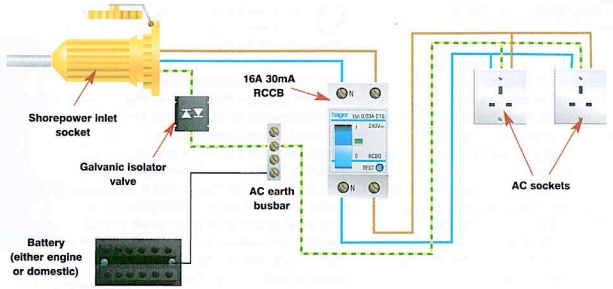
Q I've just taken delivery of my new boat and was puzzled to find that I have just one battery switch disconnecting the negatives of my engine and domestic batteries. Is this normal practice?

A Using a single isolator switch in the negative of both batteries (allowing the supply to be turned on/off) is a classic case of cutting electrical corners. While better than having no switch at all, you would be unable to switch out a battery should it begin to fail. Rewire the system with separate engine and domestic battery switches in the positive DC cabling.

Basic shorepower circuit

Q Please can you provide me with a simple shorepower system diagram so that I can install it on my boat.

A Below is a basic shorepower circuit. Note the presence of a DC/AC earth bond (see bonding question) and residual current circuit breaker (RCCB) – this unit is a combined RCCB and ordinary circuit breaker. Cabling should be completed using Arctic Grade 1.5mm multi strand cable. If in doubt, consult a qualified electrical engineer.



Earth bonding

Q I get conflicting information about whether I should or shouldn't bond my shorepower's AC earth to my DC negative system. Which is right?

A For all GRP boats, complete electrical safety is ensured with AC earth and DC negative connected. Most boat builders and good electrical engineers now bond AC and DC on all installations as required by international standards.

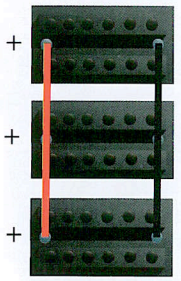
The major issue with DC/AC bonding is that a galvanic circuit is created with the shore. To prevent this occurring, a galvanic isolator or isolation transformer is required (see PBO 421). For steel and aluminium hulled boats, this subject is considerably more complex.

More batteries

Q I want to add an additional battery to my domestic battery bank. How should this be done?

A Assuming you have a 12V system, batteries can easily be added by connecting them in parallel. Parallel means connecting the positive of the existing battery to the positive of the new battery, and negative of the existing battery to negative of the new battery.

However, a word of caution – adding more batteries will mean extended running times and charging will also take longer. Ensure your charging system is capable of handling the additional load.



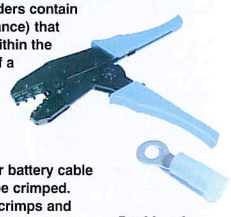
Three batteries connected in parallel

Crimp or solder?

Q When making electrical connections, should I solder, crimp or crimp and solder?

A All connections should always be crimped. Most solders contain flux (a corrosive substance) that could cause damage within the terminal. In the event of a short circuit, the solder may melt, causing the cable to drop out of the terminal – possibly making your electrical problems worse. Larger battery cable terminals should also be crimped.

Standard automotive crimps and crimping pliers don't provide reliable connections. Try to source good quality double crimp terminals and use a professional double crimp ratchet tool – which will provide terminations that are virtually impossible to pull off.



Double crimp terminals and ratchet crimper provide the most reliable terminations