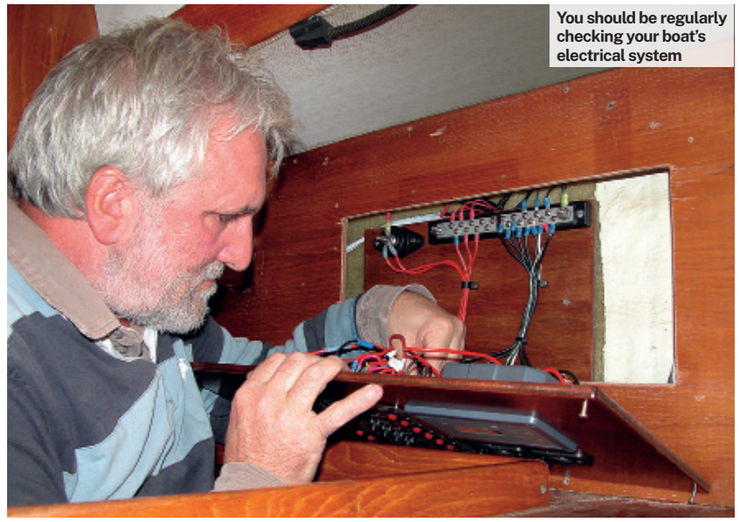
Checks to prevent electrical problems

Avoiding electrical issues on board is better than troubleshooting a problem later. The experts at boatcare show you what to look for

The heart that keeps everything running smoothly, from navigation lights to refrigerators, is a yacht's electrical system. Electrical problems on a yacht, however, can be frustrating and, in some cases, dangerous.

The good news is that by taking preventative measures and familiarising yourself with the warning signs, you can avoid many electrical issues and ensure a safe and enjoyable voyage.



You should be regularly checking your boat's electrical system

Duncan Kent

Preventing electrical problems

■ **Marine-grade everything** Unlike your home electrics a yacht's system is exposed to a harsh marine environment. Always use marine-grade wires, cables, and electrical components. These are designed to withstand moisture, salt, and vibration, which are the leading causes of electrical problems on boats.

■ **The right connections** Loose or corroded connections are a major culprit behind electrical woes. Regularly inspect your electrical connections, paying close attention to terminals on batteries, switches, and appliances. Tighten any loose connections and clean any corrosion with a wire brush and a marine-grade anti-corrosion spray.

■ **Don't overload the circuits** Yachts have limited electrical capacity. Be mindful of how much power you're drawing from each circuit. Avoid overloading circuits, which can lead to overheating, damaged wires, and even fire. Invest in a multimeter to monitor your voltage and identify overloaded circuits.

■ **Routine maintenance** Schedule regular electrical inspections by a qualified marine electrician. They can identify potential problems before they arise and ensure your system is operating safely and efficiently.

■ **Faulty equipment** If your appliances or electronics aren't working properly, it could be due to an electrical issue.

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Marine-grade wires, cables and electrical components should be used on board

Identifying problems

■ **Dimming lights** Dim or flickering lights can indicate a loose connection, low battery voltage, or a failing alternator.

■ **Burning electrical odours** This is a serious sign and should be addressed immediately. It could indicate overheating wires, a failing appliance, or even a potential fire hazard.

■ **Tripped Breakers** If a breaker trips frequently, it's a signal that the circuit is overloaded. Reduce the power draw on that circuit or investigate if there's a fault with an appliance. Breakers that pop frequently are signalling there is a problem which could either be the breaker itself or something in the circuit. Yet most people will keep on attempting to make the breaker engage. This can be dangerous because you may cause the contact points of the breaker to fuse together from arcing, in which case it will never trip again. You must allow it to cool down. If you are experiencing chronic problems with circuit breakers popping, first check how much current draw is involved. A single 30A circuit is not much when you're running things like air conditioners, water heaters and battery chargers.

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A typical high-current battery fuse at the primary source of power

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A heavy-duty regulator is required for high-power solar panels or wind generators to avoid overcharging

One simple way to check whether you're dealing with an overload problem is to add together the amperage draw of each piece of equipment. List both the start-up and run amperages. You'll usually find the amperage on the equipment label. By listing the total power demand, you'll get a good idea of what you can and cannot operate simultaneously, particularly when starting the equipment.

If you have an ammeter on your panel, check it against the amperage tally you made. Ideally, you should try to hold power consumption at 80% or less than the line rating.

Check the breaker by allowing it one hour (or whatever it takes) to cool down. Turn the equipment off and, after it is cool, re-engage the breaker. Now turn the equipment back on. Place your finger on the front of the breaker and note its temperature. If it does not heat back up again, then the problem is probably a start-up overload. If the temperature rises again, there is a fault in the circuit or the breaker. (Note: when the breaker contact points become eroded, the breaker itself can overheat).

Thoroughly check the cable before plugging into the marina's shorepower

Duncan Kent

■ **Shore Power leads** Inspect both plug ends and sockets for signs of corrosion and/or burning. Check the leads for burnout, fracturing or breakdown of the insulation. Inspect the wire cord at each end to ensure it is not pulled out of the plugs. Often when a shorepower lead is plugged into a bollard on the marina it is wound around a cleat or the electric bollard itself. This can lead to the wire being pulled away from the connections inside the plug and cause arching or a failure of the lead.

Shore power should only be connected while the boat is in use or simply to top up the batteries. If the power is left permanently on it may result in early degradation of the battery system and/or worst case result in explosions or fire.

Battery chargers and inverters should be checked to ensure they are dry and clean and that all 240V connections are tight and corrosion-free.

If your batteries are in a bank, they all need changed at the same time

Batteries

Only use a battery which has the correct specification as per the manufacturer's guidelines. If batteries in banks need to be changed, they should all be changed at the same time, not individually.

Battery terminals and connections should be inspected, ensured tight, and secured. Terminals should be greased.

Sulphurous fumes and bulging battery casings are clear signs of a damaged or overcharged battery. In these cases, immediate action is crucial. Overcharging occurs when accelerated parasitic reactions happen between the electrodes and electrolyte, with the release of heat and gases.

Here's a breakdown of what to do:

■ **Disconnect the device** Safely remove the battery from the device if possible, or unplug the device from the power source.

■ **Replace the battery** Do not attempt to use a damaged battery. Acquire a new, compatible battery for your device.

■ **Dispose of the old battery properly** Li-ion batteries (common in electronics) require specific disposal procedures. Look for designated e-waste recycling centres in your area.

On leaving your vessel, batteries should always be isolated. Neglecting to isolate batteries means all onboard systems remain positively charged and as such voltage loss may occur along with

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premature failing of connections in a marine environment. A properly isolated and maintained battery will hold a charge for several months without harm.

Ventilation

Batteries develop heat when charging, as well as hydrogen gas. For that reason, they need to be in a well-ventilated area. Gel cells are particularly vulnerable to overheating damage. Putting gel cells in covered, plastic boxes have proved to be a problem; for this reason, they are falling out of favour. Sometimes improved technology isn't an improvement after all.

Engine wiring

Due to vibration and high temperatures, damaged wiring on and around engines is one of the most common causes of stray current damage such as true electrolysis. It's extremely important to consider the routing of the wiring so that it's not in contact with hot manifolds, or vibrating on sharp edges or rough surfaces. Engine wiring should be inspected periodically for signs of damage.

Avoid using any kind of highly flammable plastic conduits.

If painting the engine, do not paint the wires; the solvents in the paint cause the insulation to become brittle and crack.

Locating internal equipment

Even if electrical equipment is inside the boat it doesn't always mean it stays dry. Boats are prone to leakage, and equipment located under these leaks can get wet. Pay close attention to where you put items.

When retrofitting new equipment, you'd be surprised how many people mount various bits of kit under the floorboards, in the nooks and crannies of the keel matrix, assuming that the bilge water will never rise. The bottom of the boat is the last place to mount something unless it's in an IP-rated full submersion enclosure or similar. Sooner or later the bilge pumps could fail and this may well result in the equipment being ruined.

Make sure there is plenty of ventilation where you store your batteries

IP (Ingress Protection) rated enclosures are ideal to protect equipment that must be mounted outside or exposed to the elements. Just make sure you select a suitable level of protection.

The first number in an IP rating signifies the dust protection level; 1 to 6. The second number, marked 1-8, relates to the water protection level; levels 1-6 run from a splash of rain to being blasted with a high-pressure hose. Levels 7 and 8 are full submersion.

An open cockpit or deck is not an area that should have equipment or generators. Ideally, if you have any exposed panels, these need to be kept covered and dry.

These areas are constantly exposed to seawater spray, rain, and waves which can lead to corrosion. Saltwater wreaks havoc on metal components in a generator, causing them to rust and seize.

Water can damage electrical components and connections, leading to malfunctions and potential shorts. Generators often create a lot of heat, but direct sunlight beating down on it can further elevate temperatures, reducing efficiency and lifespan.

Protect any equipment mounted in the keel matrix with IP-rated wire and coverings

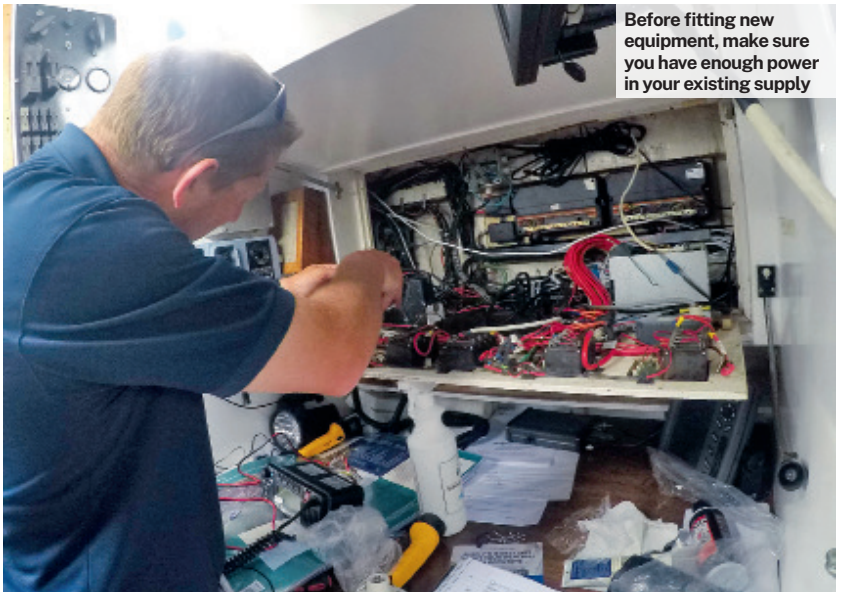
Richard Langdon

Adding new equipment

Most boats, particularly smaller ones, are not designed for adding big additional electrical equipment, like generators. It's recommended to seek the advice of a professional marine electrician if you want to do so. Check you have enough power in the existing supply and consider the best location to mount the new equipment. Check the power consumption and calculate if you have enough power in your existing supply.

If you don't have an adequate amperage supply on your electrical circuit then you need to consider upgrading your existing circuit to have a larger output – requiring a larger shore power connection, main breaker and upgraded distribution board. Consider the impact on your domestic or 'house' battery output.

For more on how boatcare can help prevent and repair electrical problems on your vessel or to find your nearest boatcare service centre, visit **boatcare.co.uk** or your local boatfolk marina.



Before fitting new equipment, make sure you have enough power in your existing supply

Theo Stocker