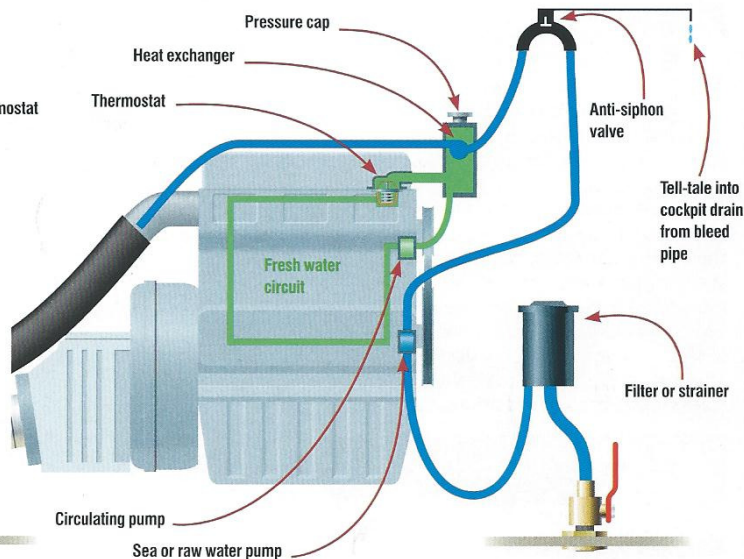
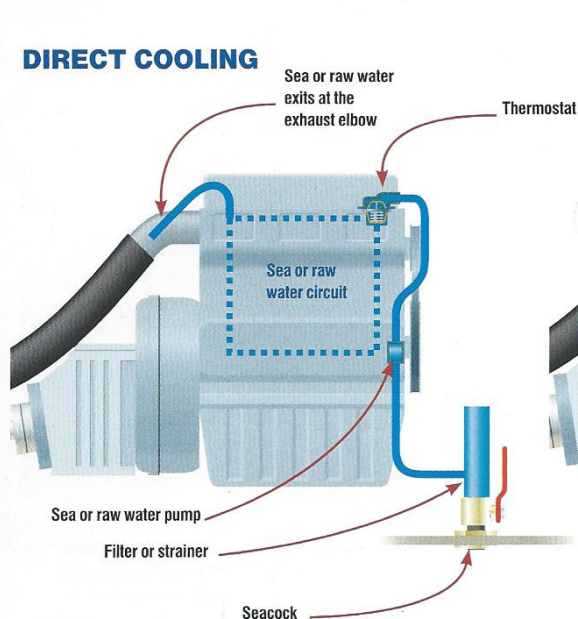


Cooling system problems

These simplified diagrams will give you a clue where to look for possible faults. Spend some time tracing your own cooling system through, because each engine is different and some components can be hard to find

DIRECT COOLING



INDIRECT COOLING

HOW IT WORKS

■ Basically seawater is pumped around the engine cooling it directly, or it passes through a heat exchanger where it indirectly takes the heat from a freshwater cooling system. Both systems have a thermostatic valve, often near the top of the engine, that opens when the engine gets hot and lets water flow around the engine block. Finally the seawater exits the engine through the exhaust pipe, which is then cool enough to allow plastic components to be used. Some engines discharge the seawater directly overboard, however, which means the exhaust pipe can get extremely hot and therefore needs to be insulated.

DIRECT COOLING

■ In a directly cooled engine the seawater circulates around the engine block through a series of small waterways. It comes in through a hole in the hull, which could be fitted with an external coarse grille to keep out large bits of weed and plastic, or through the slots in a saildrive leg. Next it passes through a seacock, or valve, which allows us to turn the seawater

off and work on the cooling system without flooding the boat. There could be a filter or strainer fixed to the seacock, or it could be remotely fitted further along the system – the latter is more common nowadays. From the strainer it goes to the seawater (or raw water) pump, which sucks it in and blows it through the system and out of the back of the boat.

If the engine is below the waterline there should be an anti-siphon valve somewhere in the system. This is basically a large loop of pipe that goes well above the heeled waterline, with either a small pipe that vents to atmosphere, or a small valve fitted at the apex of the loop. As the name suggests this device stops water siphoning through the system and building up in the exhaust pipe, where it could then flood the engine via an open exhaust valve. The type with a tell-tale of water spurting into the cockpit drain clearly shows that it is working, but the type with a valve needs checking regularly.

INDIRECT COOLING

■ In an indirect system the seawater goes through a heat exchanger. This

often consists of a series of small pipes (to give a large surface area) inside a fresh water tank, which has a pressure cap either on the tank, or on a remote expansion tank. Check the water levels when the engine is cold. Do not open it when it is hot, or you could be scalded.

OVERHEATING

■ Keep an eye on the water temperature gauge (if fitted) because the seawater pump impeller might already be damaged before the overheat alarm works. If the engine overheats throttle back and investigate immediately because the uncooled exhaust gases can get very hot and melt plastic exhaust components. Turn the engine off and take great care when looking for the leak because boiling water could be pumping through the overflow valve, or out of a split pipe.

Just stopping the engine and the boat might be enough to let, say, a plastic bag sticking over the inlet fall off. But if it isn't, start by making sure that the seacock is fully open – it has been known for the spindle to break so the handle moves and the valve

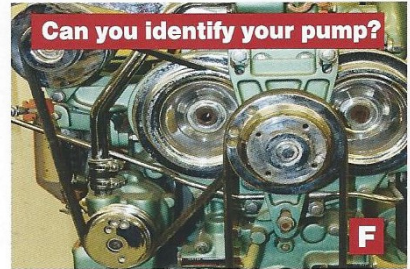
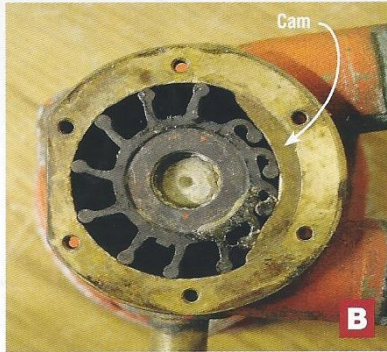
doesn't open fully. It has also been known for the lever to be put on 90° out, so when it is in line with the pipe it is off rather than on!

Close the seacock and open the top of the strainer. Check that it is clear of



weed and gently open the seacock. If the strainer is below sea level there should be a good flow of water. If it is above the waterline remove the inlet pipe and lower it over a bucket, open the seacock and see if the water flows. If it doesn't gush in there's a blockage, which we might be able to poke out with a stiff wire, or blow out with a dinghy pump. If water is getting to the strainer then next check that the seawater pump is working.

How to change the seawater pump impeller and thermostat



Changing the impeller

The seawater pump can be in an awkward place so practise changing the impeller in harbour. Sometimes it might be easier to remove the whole pump **A** or fit it with a quick-release cover.

1. If you can get at it, use a decent screwdriver, slacken off all the machine screws and put your hand underneath to catch them or any bits that might fall out. The biggest cause of impeller failure is running it dry – if this has been the case the pump cover might be hot to the touch.
2. Carefully ease off the cover. Try and save the gasket and note which way the pump turns **B**.
3. If the impeller is damaged, lever it out using two screwdrivers **C** but first wrap some tape around their shafts to help protect the edges of the sealing face of the pump.
4. If blades have come off then you must find them, or they can block the system. Some might be upstream towards the heat exchanger and will need to be flushed out, but often bits can fall into the inlet pipe. Thin nosed pliers, or forceps, are the ideal tools for picking out pieces of impeller from the pipes and heat exchanger.
5. Sometimes the impeller might look fine, but there can be cracks in the blades which only become apparent when you squeeze them **D**. Alternatively, the rubber can become unstuck from the central metal hub, which just spins inside the impeller.

6. When it is out, check that the two are bonded together and also make sure the cam in the chamber is not detached.

7. Clean off all the bits of the old gasket from the pump face and lubricate the new impeller with water pump grease or washing up liquid.

8. Some people find the impeller easier to get in if they squash the blades in the right direction with a cable tie or piece of string **E**. Put it in the right way round, so it engages on the drive shaft, and smear grease around the pump face to stick the gasket on while you position the cover. Put all the screws in finger-tight then tighten them evenly to pull the cover on squarely. Take care they don't drop in the bilge!

Check the flow

Now we can see if we are getting water through the system. Some engineers put a few drops of washing up liquid in the seawater strainer to make bubbles at the exhaust, or to be a marker if the water exits under the boat. Make sure the strainer cover is tight (as we don't want air drawn in there), the seacock is open and the fresh water is topped up with the correct mixture of antifreeze/rust inhibitor.

Circulating pump and thermostat

If the engine is still too hot when we have the seawater running properly, then either the freshwater circulating pump or thermostat might not be working. The pump is generally very reliable but the belt driving it can slip – check the belt feels tight and only flexes about 10mm when pushed hard **F**.

A thermostat **G** either works or it doesn't and is another item worth practising changing alongside – because it can sometimes be awkward to get at. Undo the housing, save the gasket and put in a spare thermostat. If you don't have a spare, stick it in a saucepan of water on the galley stove and heat it up – it should open before the water boils. If you are stuck in the middle of nowhere you can run the engine without a thermostat, but often it is better to cut the moving part out of the thermostat and put the surrounding bit back to restrict the water flow.



Cutaway engine showing thermostat

Safety

■ If the engine overheats beware of boiling water and steam which can cause serious scalds or burns

■ Check that the seacock works