

PROJECT BOAT RESTORATION

Power management

Ali Wood gets some expert advice from Ecobat on setting up a sensible battery charging regime

PBO
PROJECT BOAT

Now we'd decided on batteries for *Maximus* (see page 60) the next conundrum was how to keep those batteries charged. Premier Marinas had kindly offered us a berth at Chichester Marina for the summer, to be followed afterwards with a berth at MDL's Cobbs Quay marina in Poole. Both marinas have excellent facilities, including shorepower, so that's what we'd use initially to top-up the batteries, but for cruising – and for our eventual home on a mooring – we needed to get it right.

There's a bit of a balancing act when it comes to battery capacity. Too little capacity, or 'storage', and you'll have to constantly recharge batteries. However, if your batteries are too powerful, or have too much capacity for your charging system, you'll never be able to fully charge them, which will shorten their life.

Lead carbon batteries can withstand a lower depth of discharge than most other battery types but would still need some looking after.

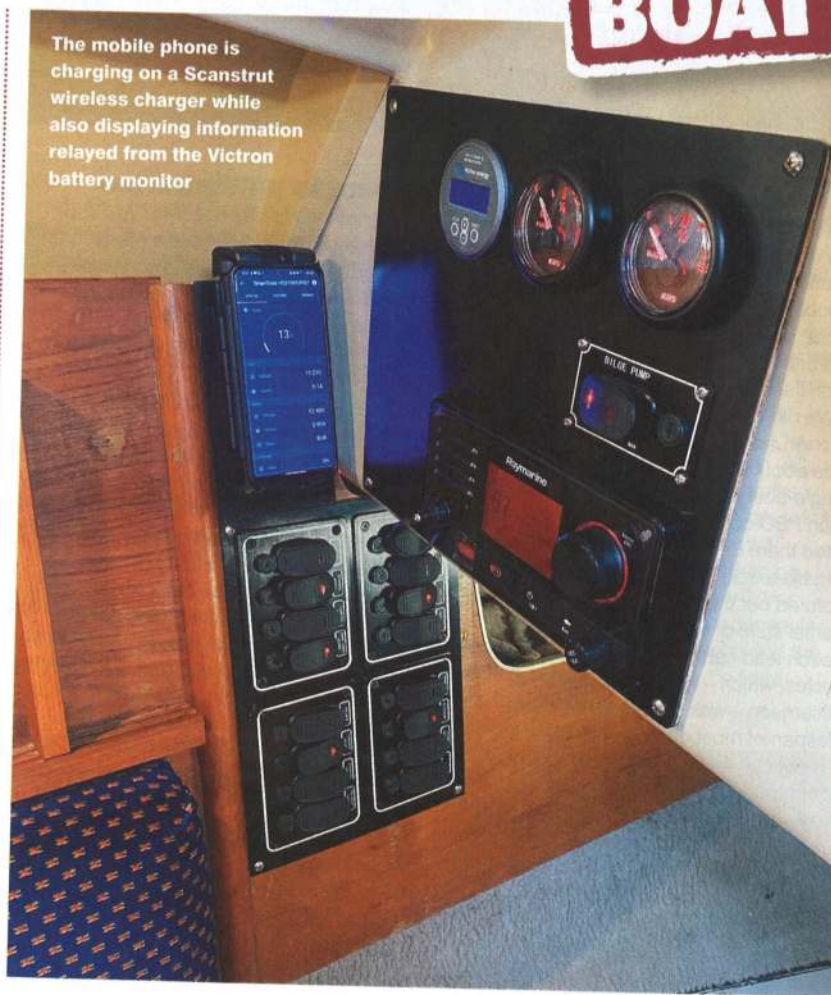
'There's a bit of a balancing act when it comes to battery capacity'

I met up with Peter Kennedy from Ecobat. Peter has worked in the business of battery management for 40 years. If anyone could give me advice, it was him.

"Unless you're using the boat on a daily basis, or are connecting to shorepower, you need to think carefully about charging," said Peter. "If you leave a lead acid battery it discharges and becomes sulfated. You can't recharge it. If you're using lithium, however, you can run it down to almost empty and leave it there."

Peter explained that while lithium batteries charge in a couple of hours, other battery types can take up to 18 hours. "You can put most of the charge in within 5 or 6 hours," he said. "However, that last 10% can take 8 to 12 hours. With lithium batteries or a very high quality AGM, solar will take care of the last bit of

The mobile phone is charging on a Scanstrut wireless charger while also displaying information relayed from the Victron battery monitor



charging as long as you have the right regulator."

Peter recommended charging the batteries once a month, but warned that depending on the power you take out, running the engine itself might not be enough to replace it.

"You need a proper shorepower charge. If the engine needs to start-up and is in idle you'd take a considerable amount of time to replace what you used simply through starting it."

With a catalogue and, by now, a very chewed biro, I got to work circling the items I wanted for *Maximus*. We sourced the Victron items from Ecobat but opted for the Sterling battery isolator, which we bought directly from sterling-power.com.

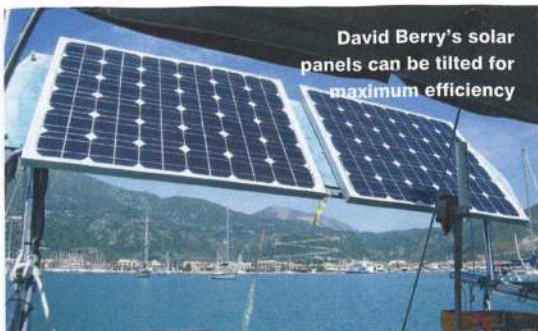
Maximus shopping list

Batteries

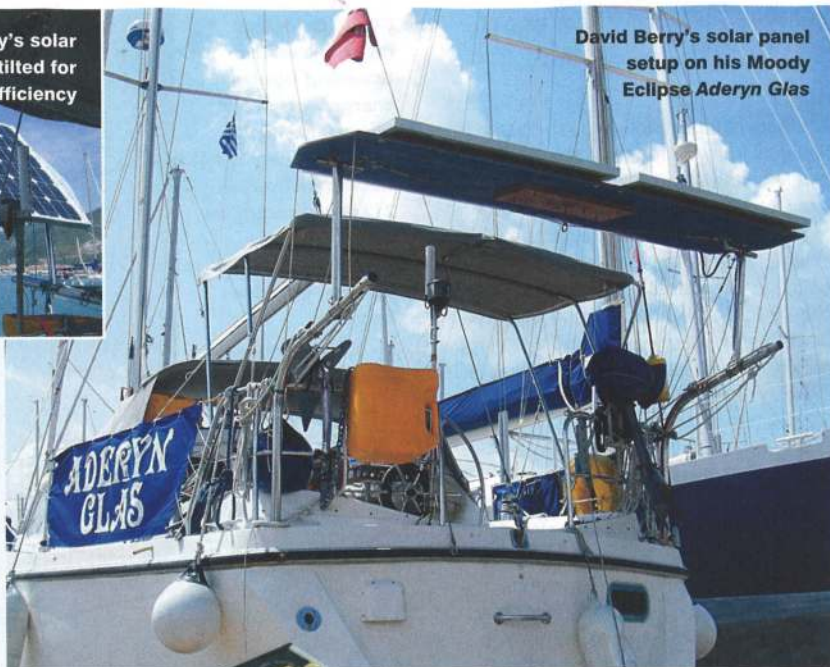
We chose 3 x Exide115A dual batteries. One of these would be for the starter motor, and the other two for the leisure batteries. The deep-cycle batteries guarantee a 550W hour output capacity, are maintenance-free, in that they require no electrolyte refilling, and are capable of withstanding tough charge and discharge demands. However, as with all batteries, they will still need looking after (see 'caring for batteries', page 65).

Solar panel

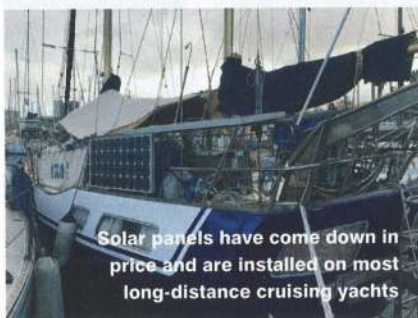
The cost of solar panels has fallen rapidly in recent years and for many boat owners solar has become the primary means of



David Berry's solar panels can be tilted for maximum efficiency



David Berry's solar panel setup on his Moody Eclipse Aderyn Glas



Solar panels have come down in price and are installed on most long-distance cruising yachts

charging. As *Maximus* will eventually live on a swinging mooring, I certainly felt this would be a good solution for us.

Peter's advice was to buy the biggest solar panel we had budget and space for, something PBO expert Stu Davies agreed with. He has three 110Ah batteries plus a single 8Ah starter batter and 250W solar power. With this he can live off the grid in Portugal indefinitely.

We could either mount it on the coachroof or on the side of the boat, on a pivot, like Stu does.

"My solar panels are 100W rigid ones from eBay," says Stu. "They've been on for nine years now. A notched stick adjusts the angle when we're on board."

PBO contributor David Berry has his solar panels mounted on a frame at the transom.

"We replaced our 75W bank of amorphous panels with 200W of monocrystalline panels in the same area," said David. "But with higher efficiency comes higher sensitivity to poor mounting conditions, so if you want the best from your panels you need to do your utmost to ensure they are not shaded, and also that they are tilted as close to a right-angle to the sun as possible. For this reason, liveaboards usually mount theirs on gantries at the stern or on the pushpit."

In the end we opted for Victron's 45W monocrystalline BlueSolar panel (425mm



Victron BlueSolar MPPT charge controller



LEFT Sterling Alternator Splitter Pro Split R. RIGHT Victron Phoenix IP43 smart charger

x 668 x 25mm) to be mounted on the stern. James, my husband, preferred the look of a semi-flexible solar panel on the coachroof, but the only space was under the boom, and then we'd have had the issue of shadow, and any strip of solar cells in shade can affect the performance of the whole panel.

Solar regulator

As well as having a solar panel, we needed a solar regulator, or 'solar charger/controller' to get the energy from the solar panels and store it in the batteries while making sure the batteries don't get overcharged. We chose Victron's BlueSolar controller, which uses MPPT (Maximum Power Point Tracking) technology (as opposed to PWM, pulse width modulation) meaning it draws the current out of the panel at the maximum power voltage, rather than just above battery voltage. A nice feature is that we can monitor and control this remotely via a Bluetooth dongle which is paired with our smartphone. A smart MPPT is also available which negates the need for a dongle.

Battery isolator

A battery isolator selects which battery you want to use for which purpose. When it comes to charging, it will prioritise the

engine first, and then move on to the domestic bank. Once charged, it will fit between batteries, topping up whichever needs more power. Adam recommended Sterling's Alternator Splitter Pro Split R, which uses a microprocessor to monitor multiple battery bank outputs and can disconnect the alternator and individual battery bank outputs in the case of problems.

I asked why this was a better option than a battery combiner, or split-charge system, which charges batteries in parallel. Adam explained that it would take much longer to try and charge all three batteries at the same time. I could see the logic; getting the starter battery up-and-running, before the house batteries made sense.

As Sterling explains on their website, usually one battery is already almost full (the engine battery) while one is empty. If you try to charge both, a conventional splitting system would be fooled by the higher voltage of the engine battery. The trick, says Sterling, is to isolate the engine battery so the only voltage presented to the standard regulator is the empty domestic battery. Then, when it's prudent to do so, re-engage the engine starter battery at a level where it doesn't affect the maximum charge of the regulator. Sterling's Pro Splitter does all this, while

promising a maximum voltage drop of less than 0.01V.

Battery charger

A battery charger allows you to charge the batteries from shorepower, and not have to rely on the engine. It converts the AC input into DC. Victron's Phoenix IP43 charger has three current outputs to charge three battery banks, or you can switch to two outputs to charge two battery banks, with the second, slightly lower output voltage, to top up a starter battery. Known as 'adaptive charging', all this can be monitored and controlled via a Bluetooth-enabled device.

Battery monitor

A battery monitor continuously monitors data such as voltage, current, state of charge, amp hours and the time to charge or discharge. With built-in Bluetooth, Victron's BMV 712 Smart monitor allows you to check on your batteries from an app on your phone. Bluetooth is now implemented in most Victron products to enable wireless communication between them, and also sending data to your device. You can read more about this on page 70.

Accessories – shorepower plug, lead and battery switch

Last but not least on our shopping list was the shorepower plug and lead and the Blue Sea on/off/1/2/ 1+2 battery switch. This will allow us to manually switch between the batteries without interrupting power.

Things we didn't choose
Inverter charger

Peter advised us to think about our future cruising needs. I explained we'd removed the gas oven, as the surveyor had condemned it, but weren't sure whether to put gas back on board. In the meantime, while we were staying in a marina, I queried if we could get away with a portable electric induction hob.

"I think they're absolutely brilliant," said Peter. "Lidl were selling some and they were quite power-efficient. A big induction hob would draw about 4kW, but these were only 1.6kW. On shore supply you could use one happily, or alternatively if you have a bigger house battery bank you could run an inverter [which converts DC to AC and also changes the voltage] and use that for a short period of time."

The Lidl hob sounded like a great deal, but was no longer available when I searched for it. Adam warned me anything larger than 2.7kW would probably trip the boat electrics in a marina, and appliances of 2kW or less would be better. I did see Sterling Power sells a single induction hob at 1.5kW

RIGHT Combined inverter and charger from Victron



RIGHT Charging my phone on the Scanstrut wireless charger, which sits above Maximus's new instrument panel
BELOW Victron BMV 712 smart controller display
BOTTOM Sterling portable induction hob



so I might try that one out.

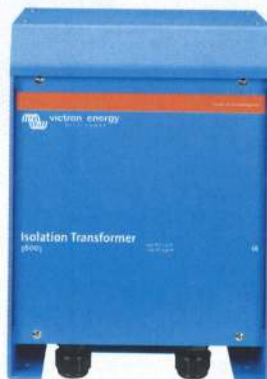
Peter also pointed out that a microwave could run from an inverter charger.

"Inverter chargers are not cheap – but the way they work, is when you're plugged into a shore supply or generator, it monitors the input supply to check it's OK, converts from being an inverter to being a charger, but at the same time closes an internal transfer supply to feed the mains supply to your equipment. This means if you have a generator or shore supply you're not depleting your battery bank. If there's more than enough power available from the shore supply the inverter will use that to top up the batteries."

Isolation transformer

With an inverter you're passing the mains supply into your boat equipment, and if you're cruising in an area where you don't trust the shorepower, then that's where an isolation transformer comes in.

"Safety is important, in fact incredibly important," insists Peter. "Quite often people buy a very cheap type of inverter which might not be approved for the system. You need a clean power system to get the best out of your batteries, hence the reason we've worked with Victron for 25



LEFT Victron Energy Isolation Transformer

years. With their isolation transformer, all your earthing is done on the output side, so you're protected in the case of any insubstantial wiring, for example if the wires are reversed or the earth has fallen off on the shore supply."

Inverters and inverter charges will draw current from batteries even when

not being used, so it's important then to switch them off completely.

Ready to go

Finally, we'd chosen our power management system. There would be many more meetings to come, including a walk around the boat with Adam to discuss where to mount the electronics, the LED lights, switch-panel and a handy Scanstrut phone charger and USB ports. However, for now, we'd made the decisions we needed to get the ball rolling.

I must confess, I rather enjoyed straining my brain cells on this one... though like the solar panel cells under the boom, I think a few may have stayed in the shade. My brain, like a battery, has been deep-discharged and now in need of some serious replenishment. Time for a G&T, I think...

■ Thanks to Adam at ACM Marine, Nigel at Victron (www.victronenergy.com), Gordon, Phil and Peter at Ecobat (uk.ecobat.tech), and PBO experts Stu Davies and Ben Sutcliffe-Davies.