Fit a digital alternator regulator

Step by step guide

PBO reader David Berry explains how he installed a digital alternator regulator to the engine of his Moody Eclipse 33, *Aderyn Glas*

When we travelled down through the canals of France to the Mediterranean we asked the people we met what they considered essential to support a life afloat in a climate so different to Britain. The answers generally fell into two categories: staying cool and power management.

To help with power management we fitted solar panels with 200W of output that can deliver a staggering 10A on a sunny day. Along with the solar panels, another way of maintaining maximum charge in our batteries was an advanced alternator regulator.

Choice of regulator for us boiled down to either Adverc or Sterling, with the Sterling unit marginally cheaper. Sterling reckoned their Digital Advanced Regulator (DAR) was the most cost-effective solution for simple alternator installations, and as our 1992 Volvo-Penta 2003T falls into that category we bought one. In the box is the unit itself and a set of instructions.

The DAR is designed to control the charging power fed into the battery bank from the alternator. Instead of relying on the default proportional power curve that the inbuilt alternator regulator provides, the DAR is microprocessor-controlled to provide boost power and float maintenance power outputs that will ensure the quickest and fullest charge.

These units have one drawback: they require connection to the brushes inside the alternator itself, and many people are put off by the thought of taking the alternator apart. On our standard-fit 50A Valeo alternator it's not too difficult, but you do have to be able to solder. Be sure to disconnect the power from the alternator before disconnecting its wires (turn the 1-2-Both switch to 'off', for example).

Installation help

The instructions that came with the unit were adequate, and Charles Sterling also provided rapid support to my queries by email or phone.

The best thing about the instructions is that they walk you through the installation in a logical, step-by-step manner requiring you to learn necessary facts about your alternator and leading you to the final setup for your installation. They help you determine whether you have a positive or negative ground system, and which of the wires from the brushes is the one to connect to the device.

One point the instructions make clear is that the output power from your alternator will be far greater than before, and you need to ensure that the rest of your system – the cables, switches, terminals, connectors, the alternator drive belt and the batteries themselves – are up to it. You will also have to get used to topping up the batteries with water more often.

They also tell you which DAR wire goes where, but there are some alternatives that are worth mentioning – my thanks go to Charles Sterling for suggesting some of these solutions and taking the time to explain a few of the finer points. In summary:

The red sense wire needs to know the voltage at the battery you want to charge. That's fine in theory, and if you only have one battery it's fine in practice – just connect it to the positive terminal of the battery and you're done. But most of us have a number of batteries grouped into domestic and engine start banks, so where do we put the sense wire? The answer is as near the common point of the battery banks as possible. In my installation this is the 1-2-Both switch – I just have to connect the red wire to the 'common' post of the switch and the DAR will sense the voltage there which should be pretty close to the voltage of the battery I'm charging.

Unfortunately, in my case Moody built the switch first and the boat around it and I can't get to the common post at the back of the switch, so I followed the largest diameter wire from the common post until I found a place where I could get the sense wire onto it. This was back at the engine, at the starter solenoid.

Sensing the voltage there is not perfect, but not too bad either – the wire from the switch is so large that the voltage drop will be small and, again, as the charging current drops so does the voltage difference.

The unit comes with a temperature sensor which you can fit to a battery terminal. It will measure the temperature of that battery terminal and adjust the charging cycle to suit. Here, of course, is the next problem. If you fit the sensor to battery 'A' and charge battery 'B' then the unit may overheat 'B' because it has no information about its temperature.

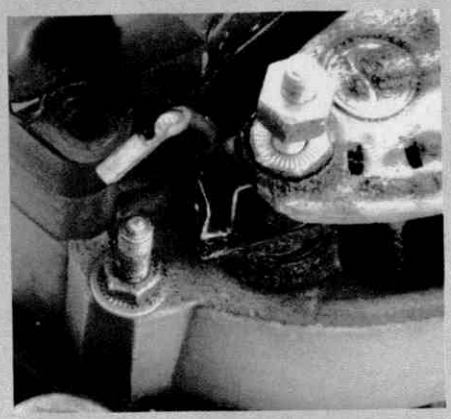
Sterling suggest ignoring the temperature sensor in all but the simplest cases and relying on the unit to sense the ambient temperature wherever it is mounted. While this isn't going to be optimal it sounds sensible, so I left the sensor out of my installation. If you want to fit it, the instructions show how.

Wire colour	Connect to...
Brown	The D+ terminal on the back of the alternator.
Red	This is the voltage sense and should go to a point near the battery you want the DAR to charge. However, the choice is not so simple in the real world – see main text.
Black	The B- terminal on the alternator. There are two black wires in parallel: don't separate them, they're both needed.
Yellow	The instructions refer to this as a 'simple ignition feed', which doesn't mean much to me. However, you can either connect this to a feed to the engine which is live when the 'ignition switch' is on (there isn't a wire like this on the 2003T, which is live all the time), or you can connect it to the D+ terminal on the alternator.
White	Join to the selected wire from the alternator brushes.

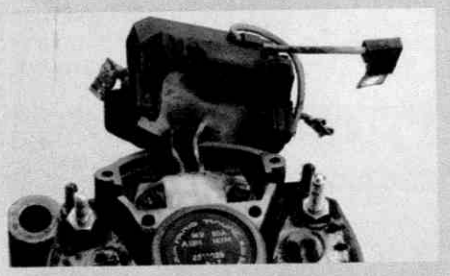
Wiring into the alternator step by step

1 With my original-fit Valeo Paris-Rhône 50A alternator the first thing to do is to disconnect the yellow wire from the terminal post and spade connector, but leave it attached to the built-in regulator housing. Then, with a wide tool such as a flat screwdriver, carefully lever the main plastic cover off the rear of the alternator: it's a clip fit – there are no screws holding it.

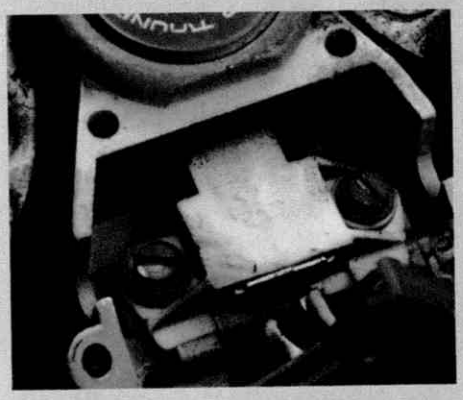
2 You now have access to the four slotted-head screws that hold the regulator (the black plastic assembly) in place. This is probably a good time to clean up a bit with some meths. Remove the screws, but do not remove the regulator yet.



3 Disconnect the spade connectors on each side of the regulator by gently easing them upwards with a small screwdriver.

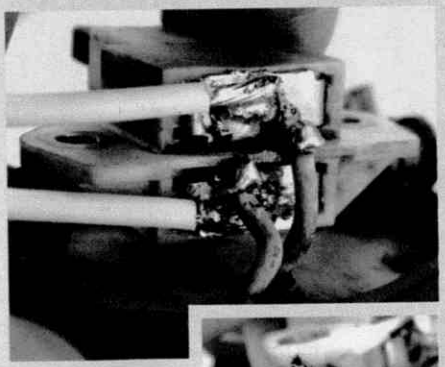


4 The regulator may be reluctant to come free, in which case you have to be firm but careful. There are no other screws holding it so just keep working around it with a suitable tool until it moves. In this shot you can see the two wires running from the white plastic brush holder into the potting beneath the regulator. This is the fragile bit: if you break these wires you will have to buy a new assembly, so don't wriggle it around too much!

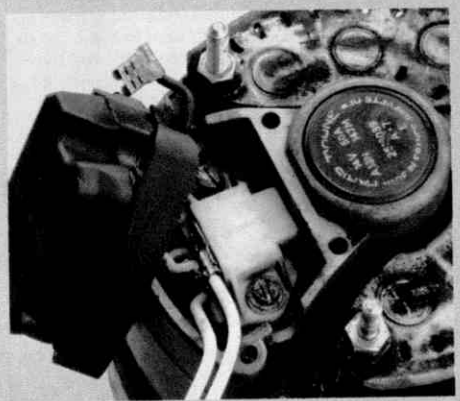


5 Remove the two slotted screws that secure the white plastic brush holder, lift the end where the wires are attached and slip it out backwards and upwards.

6 This is the assembly you have to attach wires to. The brushes and the regulator wires are soldered to the tags at the top of the holder and you have to attach two more wires, one to each tag, and lead them to the outside world. It's a good time to clean the unit of any carbon dust with a small brush and some meths (not white spirit, since that leaves a residue).

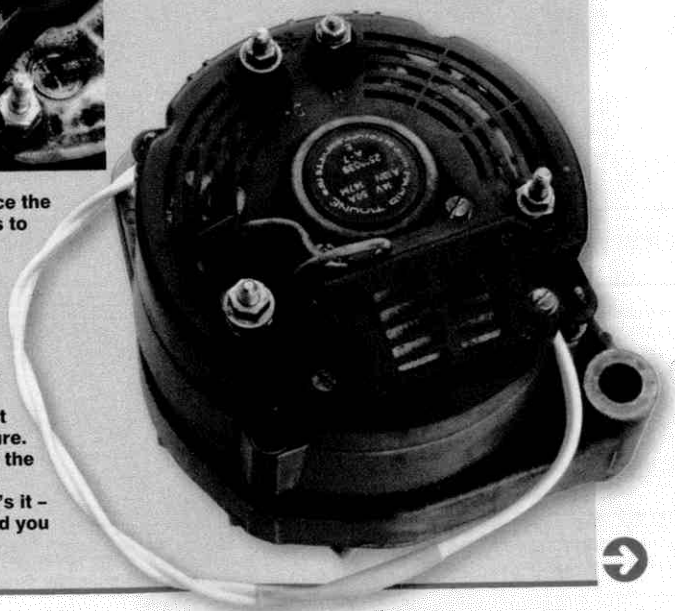


7 Choose minimum 10A flexible wire with insulation that can withstand the temperature generated by the alternator, and use a hot iron. Tin the wire and tin the tag because you want to make the joint quickly to avoid melting the existing soldered joints. I'm not sure if the brush will fall out if you melt its connection, so it's wise to hold it while you solder. The best route out for the new wires is through one of the moulded seals at the side of the regulator housing. Choose the seal that has only one existing wire and carve the rubber away very carefully with a scalpel – remember, the existing moulded-in wire must not be cut or bared.

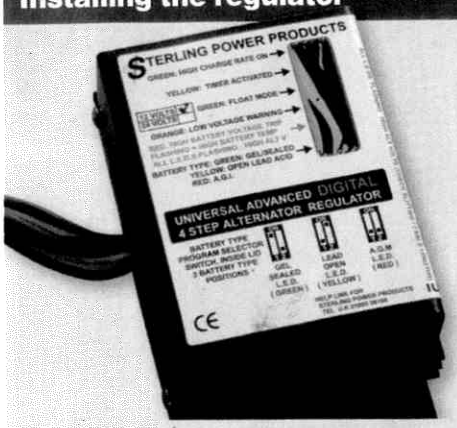


8 That's the hard bit done! Replace the brush holder and lead the wires to the modified seal.

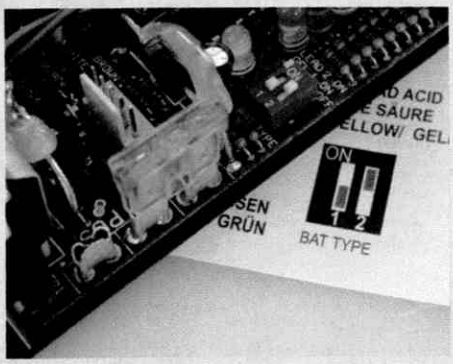
9 Reassemble everything, remembering to remake the spade connections from the alternator's regulator and to reconnect the yellow cable. Seal the space around the exit of the new wires with a squirt of something that can take the engine room temperature. Temporarily insulate the cut ends of the new wires to prevent them touching anything, including each other. That's it – the alternator has been modified and you can bolt it back onto the engine.



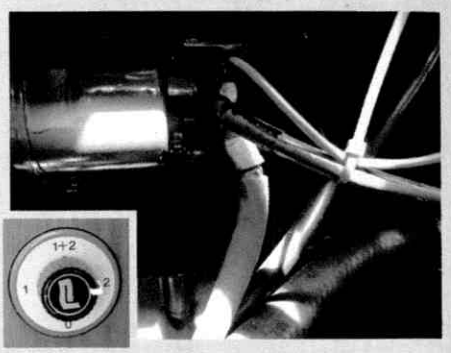
Installing the regulator



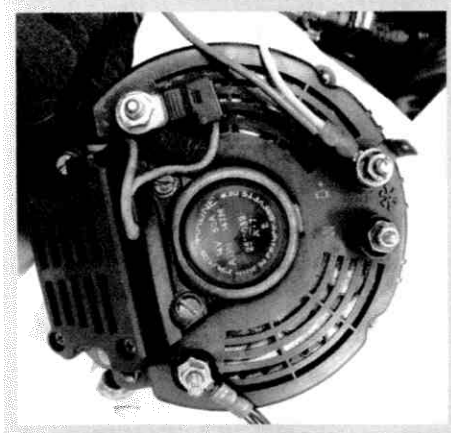
1 The DAR is built on a circuit board enclosed in a case. Undoing four screws gets you access to the things you have to select – the ground arrangement (positive or negative) and the battery type. The circuit is carried on a heat sink: Sterling report that it will happily run at 90°C, so mounting it in the engine compartment in my Moody in the Med is not a worry.



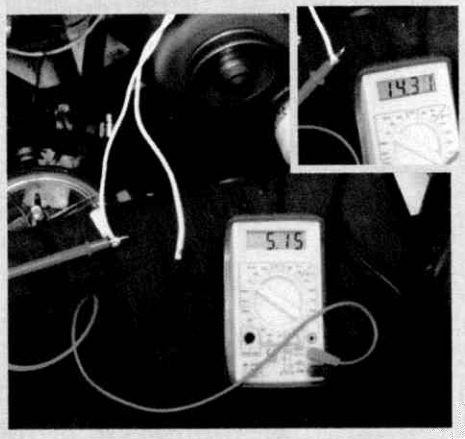
2 The orange fuse is positioned to select between positive and negative grounds, and the instructions will tell you how to determine which you have. The blue DIL switches are there for you to select your battery type – mine is 'open lead acid' and the picture shows the setting for that type. Others are 'gel sealed' and 'glass mat' types. The setting determines the charge profile the unit will follow.



3 Because I couldn't get to the back of the battery selector switch (inset photo) in my Moody I attached the red voltage sense wire to the fat supply at the starter motor. The sense wire is the thinner of the two red wires. This is acceptable since the voltage loss in the large supply cable is minimal during charging. However, don't take this easy way out if you can do better. Get the end of the sense wire as close as you can to the batteries you want to charge.



4 Because the Volvo 2003 is a little tight to work on I decided to make the DAR wire connections to the alternator before replacing it on the engine. Here you can see the twin black wires on the B- terminal, and the yellow and brown wires on the D+ terminal. The yellow wire is the 'ignition feed' and is normally taken to the 'ignition switch' – a supply that is switched on before the engine can run. Since the Volvo electrics are live all the time this option was not available to me, so I took the alternative and connected the yellow wire to the D+ terminal along with the brown.



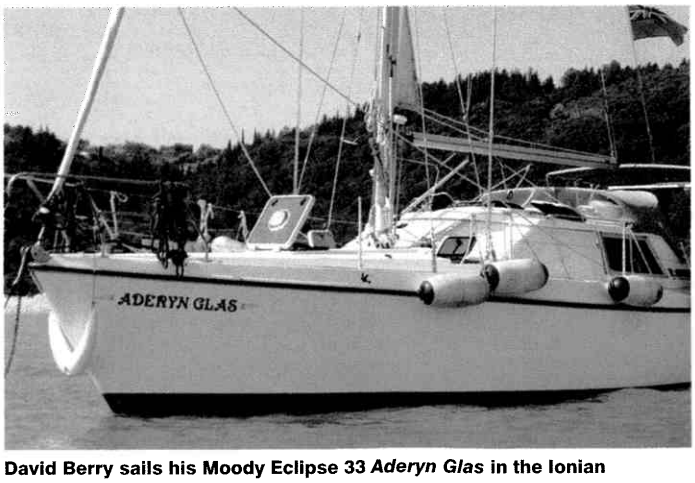
5 With the engine running, measure the voltage from one of the new (white) brush wires to ground. Make sure you mark the two wires so you can identify them afterwards. Of the two wires, the one with a voltage reading between the 2V and 10V predicted by the instructions is the one I'm after. The other wire (inset photo) measured 14.31V and is the one I therefore don't need. After the test I cut this one back and sealed it with heatshrink sleeving to prevent it making contact with anything.

It's worthwhile measuring the output from the alternator at the same time, just to be sure your alternator is up to scratch.

6 The white wire can be switched – I used a crimp bullet connector – which allows you to disconnect the unit for whatever reason. One good reason is to see the difference in charging voltage when the unit is working. If everything works, you should get a pretty light show when the engine runs.

Has it worked in practice?

Did we benefit from fitting a digital alternator regulator? Ironically, maybe not for our Med cruising. We fitted the unit in France before sailing to Greece and expected there to be a constant supply of wind as we sailed south, but in fact the wind was either too much or too little: hands up those who've heard this before. This meant we motored much more than we anticipated and the batteries would have been fully charged by the normal alternator-regulator combination. We also have those lovely solar panels which provide lots of amps while we rest in the heat of the day, of course.



David Berry sails his Moody Eclipse 33 *Aderyn Glas* in the Ionian

In Britain, we often found ourselves swinging on a mooring or on anchor for a few days and having to run the engine for hours to top up the batteries. This is bad for the engine, especially with a turbo, and not much good for the crew. So my view now is that, if this is your cruising pattern in Britain, you could benefit from fitting a digital alternator regulator.

Multi-stage regulators: what's on the market?

Adverc Mk.IVa Std £213

Available for single or twin alternators in positive or negative excitation guises, and for 12V or 24V, Adverc claim their Mk.IVa unit can charge a battery to over 95% of its capacity compared with 70% for a conventional regulator.

■ www.adverc.co.uk

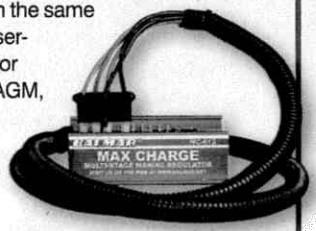
Balmar ARS-5 £384.10

Designed for a single alternator, the ARS-5 features five programs for charging deep-cycle flooded, gel, AGM and spiral-wound batteries, plus a universal default program for standard flooded batteries. Belt load management software allows you to reduce the load to limit belt slippage and wear.

■ www.balmar.net

Balmar Max Charge MC-612-DUAL £446.39

Intended for use with dual alternators on the same engine, the MC-612-DUAL has seven user-adjustable battery programs designed for standard and deep-cycle flooded, gel, AGM, spiral-wound AGM batteries, voltage-sensitive halogen systems, plus a default program that Balmar say is safe for most battery types.



■ www.balmar.net

Driftgate X-ALT From £108

Driftgate's X-ALT regulator is available in three forms: the single-battery Buccaneer; Skipper, sensing up to three batteries, or two with a single point temperature control; and Captain, which can handle up to three batteries and two alternators with temperature compensation and alternator over-temperature protection.

■ www.dg2k.co.uk

Merlin AMS 12V £163.39

Merlin's Alternator Management System offers four-stage charging, and compensates for voltage drop problems by sensing at the battery. Suitable for flooded lead-acid, gel and AGM batteries, the unit also has built-in temperature compensation.

■ www.power-store.com

Sterling ProReg B £119.90

The unit fitted by David Berry has been superseded by Sterling's ProReg B. Although the same in the essentials, the new model has support for US-spec sealed gel batteries.

■ www.sterling-power.com

Sterling ProReg D £179.90

An alternative product from Sterling, the ProReg D adds the facility for a remote panel, is compatible with both 12V and 24V systems, and has an extra cooling fan to cope with larger alternators.

■ www.sterling-power.com