

## Ampair Regulator Instructions: Model SM1B; SM3B; DM1B

### Description

Ampair manufacture three 100 watt power **Charge Control Regulators** in 12-volt or 24-volt options for protecting lead acid batteries from overcharge. They are not "shunt" type regulators, which dissipate excess charge as heat, but an electronic power switch which disconnects the generator from the battery at the regulation voltage.

Model	Voltage V (nominal)	Number of inputs (Aquair, Ampair, UW or solar)	Number of outputs (battery banks)	Setpoint V (low)	Setpoint V (high)	Equalisation V (eqn)
<b>S-1B-12</b>	12	1	1	13.6	14.0	14.4
<b>S-1B-24</b>	24	1	1	27.2	28.0	28.8
<b>S-3B-12</b>	12	1	3	13.6	14.0	14.4
<b>S-3B-24</b>	24	1	3	27.2	28.0	28.8
<b>D-1B-12</b>	12	2	1	13.6	14.0	14.4
<b>D-1B-24</b>	24	2	1	27.2	28.0	28.8

Regulators S-1B & S-3B have a single 100 watt input (Ampair, Aquair, UW, or solar) and 2 level sensing. Regulator type S-M1B has one output battery connection and regulator S-M3B has three output connections to serve up to three battery banks. The third Regulator D-M1B has two 100 watt inputs (any two from Ampair, Aquair, UW or solar), supplying a single battery bank at a fixed regulation voltage.

Ampair charge control regulators continuously monitor the battery voltage. The lower voltage (Lo) connection regulates at 0.4 Volts below the high (Hi) connection, "Hi" connection is appropriate for liquid electrolyte batteries and/or live aboard situations. "Lo" connection for gel batteries and/or infrequent use. The battery voltage is sensed at the regulator output connection therefore install the regulator as near the battery as practicable and keep the connecting cables short. All regulators feature the same multi-stage regulation programme which has regulation voltages of Lo = 13.6v Hi = 14.0v. for 12V systems (27.2V & 28V for 24V systems). Charging is continuous until the Lo or Hi voltage is reached, depending on the battery output used. The generator is now disconnected from the battery. Off-charge, the battery voltage will fall. At a voltage of 0.5V below the regulation voltage a 30 second time delay is activated. This delay prevents the regulator from oscillation (hunting) when charging batteries under load. After 30 seconds has elapsed the generator/battery connection is remade and charging continues to the regulation cut-out voltage. A cycle counter counts the charge/disconnect cycles and at the tenth cycle increases the regulation voltage for one cycle only by 0.4 volt to Lo = 14.0v or Hi = 14.4v for 12 volt systems (0.8V for 24V systems Lo = 28.0V, Hi = 28.8V). This provides an equalisation charge for the battery. Subsequent cycles return to the lower settings until a further 9 cycles are completed.

### Installation of charge control regulator

Make sure the generator is not operating whilst connecting to the regulator. Connecting with live wires will damage the electronics.

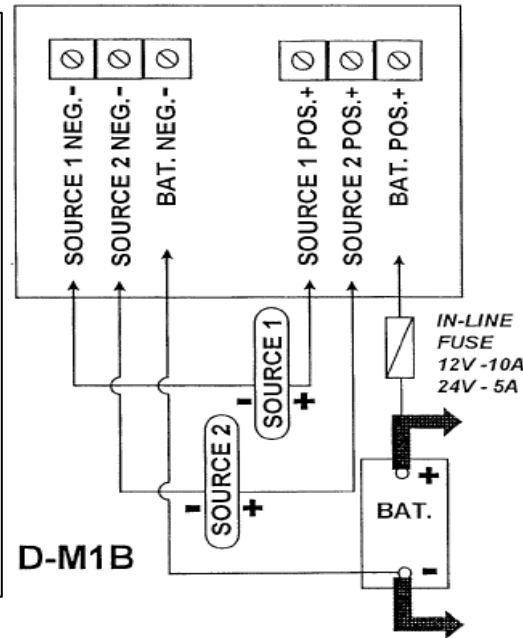
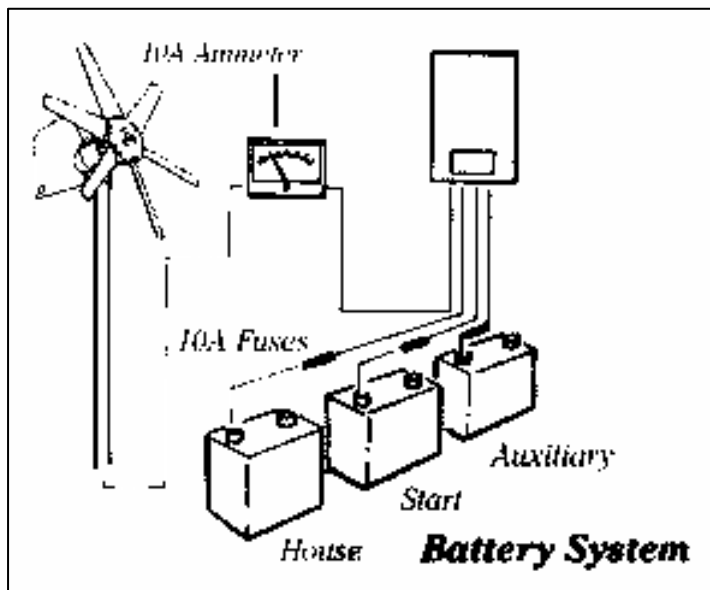
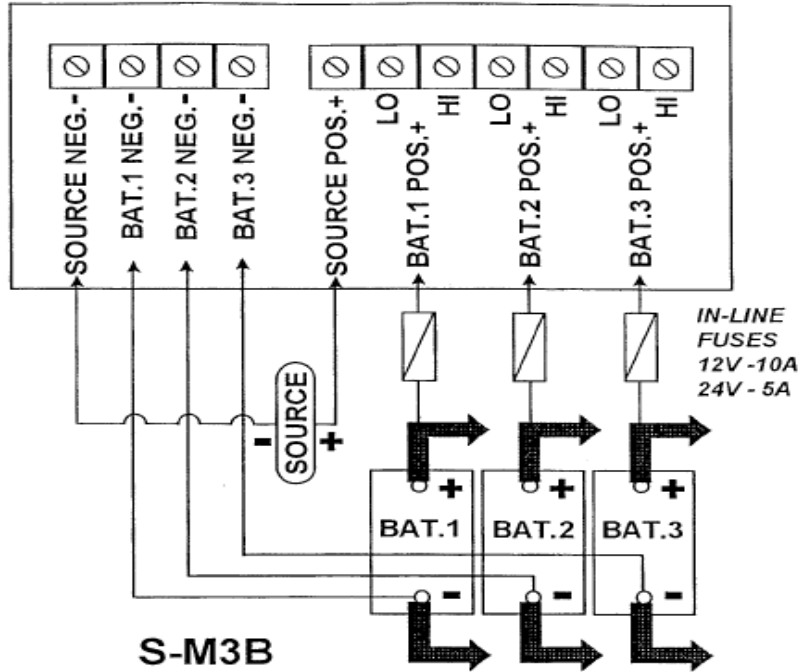
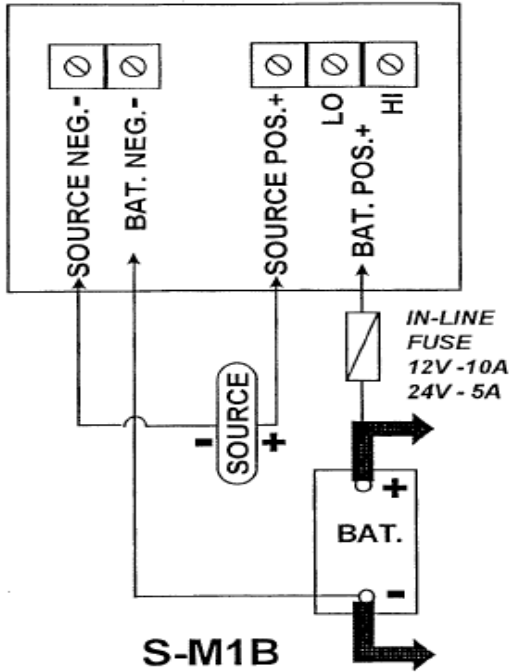
**Protecting the system:** Fuse warning - never omit fuses, simple in-line fuse carriers may be used; they protect your system from excessive battery currents in the event of a serious electrical fault. If they keep blowing, find out why. The regulators are internally protected by SAE fuses, which are not substitutes for battery protection fuses. The fuses must be next to the battery terminals since, in the event of a fault, the batteries would source the fault current. Check and double-check polarities before making connections, insert the fuses in the fuse carriers last of all. Fuses = 10A for 12V systems; 5A for 24V systems.

**Corrosion and cable selection:** This is the enemy of all electrical connections, especially in marine environments. Site regulators in a weather proof location: as dry as possible, and splash proof. Inspect all terminations and connections for signs of corrosion. Rectify by cleaning, remaking etc. Use tinned copper wire for extension leads to prevent corrosion spreading inside cable insulation. The use of screened cables is recommended if the cables run close to equipment radiating strong electrical fields e.g. radio transmitters or aerials.

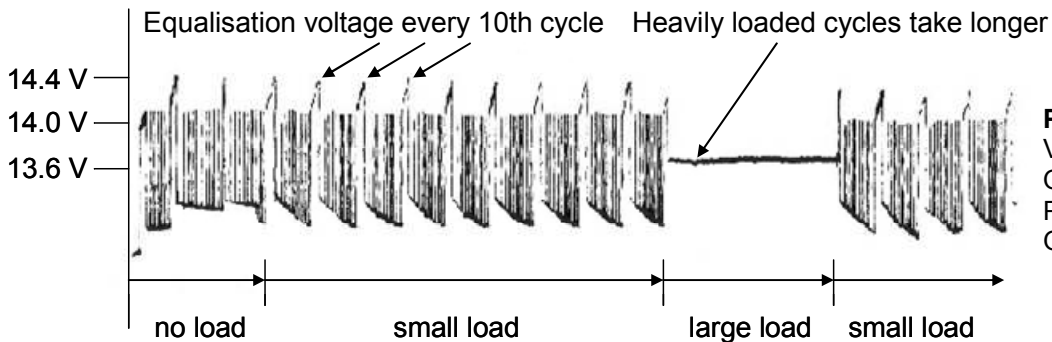
**Operation:** After initial start-up allow 1-minute for circuit timing functions to become active. When installed, the generator and regulator will run and maintain the batteries automatically. The unit may be run in conjunction with any other charge-source with no known interactive problems. Regular battery inspection and topping up must still be carried out to obtain maximum battery life.

**Operating problems:** A digital multi-meter is useful for checking operational faults, if no permanent monitoring instruments are used. Battery voltage levels and those of the charging source can be read directly. Charging current readings will require the multi-meter to be installed in line. In this way current into and out of the regulator can be observed. Do not remove battery connections since regulator operation depends on a very small supply current. If the regulator is suspect then it can be temporarily bypassed by connecting the source positive direct to a battery positive. The negative connections are common and do not need disturbing unless regulator replacement is necessary. Use the multi-meter continuity range to confirm all cable runs are low resistance.

**Faulty regulator:** Each regulator is individually tested and a chart recording kept of its operation. Each regulator has a unique serial number and a test date. Please provide these with any queries. If the regulator is suspect, then it can be temporarily bypassed i.e. connect the rectifiers directly to the battery terminals observing correct polarity. If this reinstates correct charging, then the regulator must be serviced or replaced. Regulators draw a small current (typically 1mA at 12V) from the battery to activate the sense and control circuits. Without this connection the regulator will be inoperative.



**Typical regulation sequence:**



**Performance:**  
 Voltage accuracy: 2%  
 Quiescent current: 2mA  
 Power handling: 100W  
 Operating temp: -10 +45° C