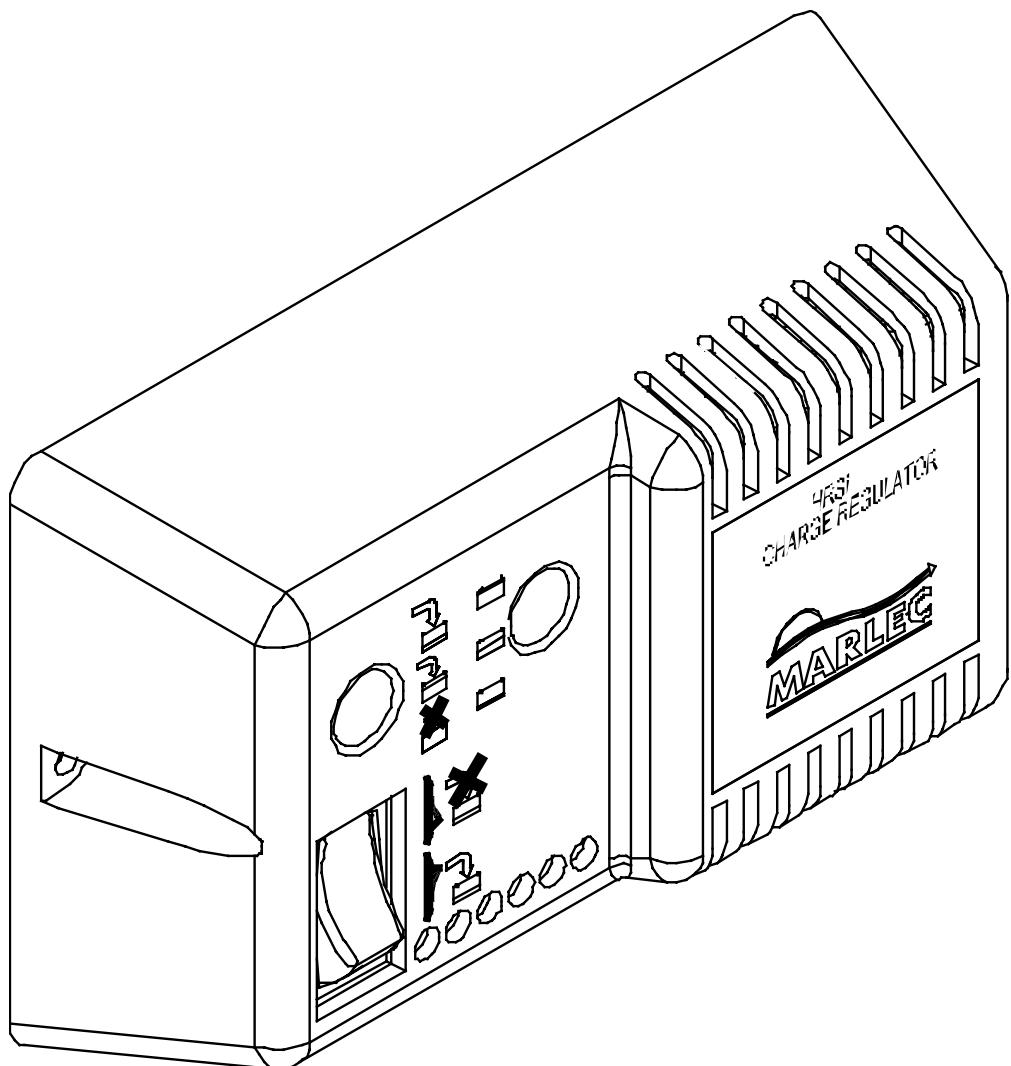


RUTLAND HRS*i* CHARGE REGULATOR

INSTALLATION & OPERATION



Congratulations and thank you for purchasing Marlec's new HRS*i* Charge Regulator. This product has been introduced as the latest technology for voltage regulation of small wind turbines and solar panels. You may have ordered the previous model, the HRS, and we have substituted this with the new HRS*i* type regulator to give you improved performance and simpler installation. We are confident that you will be fully satisfied with this product and if you have any questions please contact your local dealer.

WARNINGS!

Never disconnect the battery from the system without first switching off the charge current by moving the Charge/Stop switch to the Stop position. Note that even a momentary disconnection that may occur when applying a changeover or similar switch between batteries can cause system damage. It is therefore necessary to operate the stop switch on the HRS*i* prior to any other switching.

To avoid damage from any potential surges from other charge sources always move the Charge/Stop switch to the Stop position before starting, e.g. an engine or mains battery charger. Once running the Charge/Stop switch can be moved back to the Charge position. In high levels of auxiliary charge the HRS*i* may enter regulation mode.

Never connect an open circuit running wind turbine to the regulator, ensure the turbine is stationary and the Charge/Stop switch is in the Stop position before connecting.

If a solar module or array exceeding 160W is to be used, it must be regulated using a separate regulator & not connected through the HRS*i*.

INTRODUCTION

Please read and understand these instructions before installing the regulator.

The HRSi Charge Regulator is designed for regulating the charge current to a single battery bank from any one of the Rutland 503, 913, FM910-3 or 914 Windchargers plus a solar array up to 160W maximum. An internal blocking diode allows connection of additional charge sources (e.g. engine alternator, mains charger) to the system.

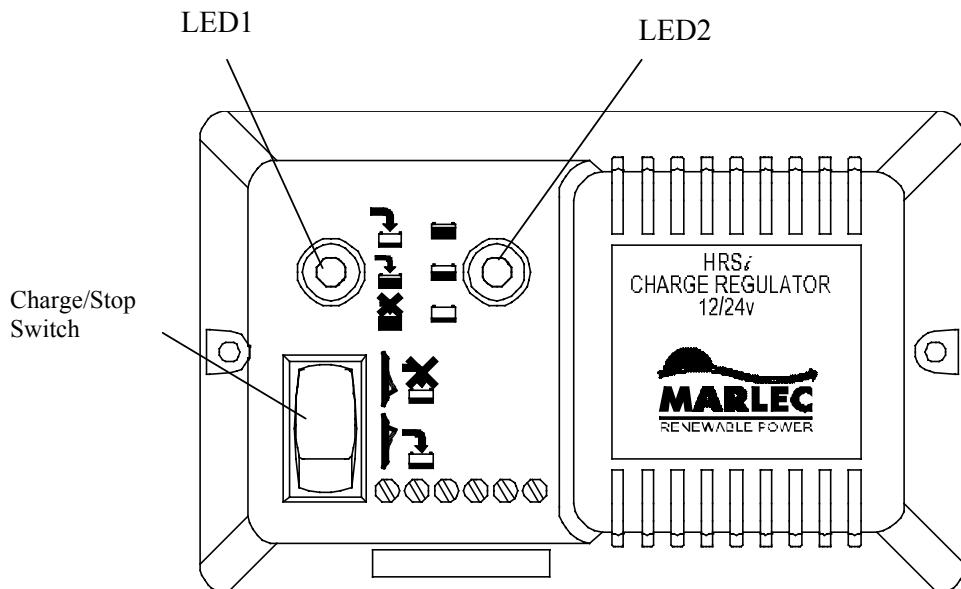
Note: Additional charge sources must be connected directly to the battery and not to the input of the HRSi regulator.

The HRSi protects batteries from overcharge, avoiding the loss of electrolyte through gassing and prolongs battery life. This also helps protect other electronic equipment from damage due to high battery voltage.

The HRSi can be used on 12 or 24v systems & will automatically configure itself for the system voltage when the correct connection sequence is observed. Temperature compensation & multi stage charging features ensure the optimum charge regime for your battery. A built in switch enables the charge current to be switched off & the wind turbine to be stalled during installation/maintenance.

PRINCIPLE OF OPERATION

The HRSi uses multi stage charge regulation to ensure optimum charging of your battery. During the Bulk/Absorption phase, the unit controls all available wind/solar power to ensure the batteries are fully charged as quickly as possible. Following a full charge the Float phase ensures charge is maintained while minimising gassing & maximising battery life. Discharging the battery will re-trigger the Bulk/Float cycle. Battery charge voltage levels are automatically adjusted for the ambient temperature to always ensure optimum battery charging. During regulation of charging current the Charge/Reg LED on the front of the unit will light Red or Amber & the wind turbine will be seen to slow down.



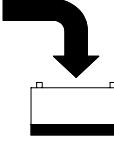
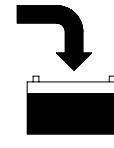
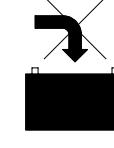
Unless stated otherwise when ordered, the regulator is programmed in accordance with table 1. This setting is suitable for lead-acid, absorbed glass matt and most gel batteries. **(Check the max voltage rating for the battery before wiring your system)**. If the regulator is to be used with any other battery type e.g. Nickel Cadmium and some gel types, the regulator may require re-programming according to the battery manufacturer's recommendations.

Table 1

Nominal Battery Voltage	Max Voltage (Float)	Max Voltage (Bulk)
12	13.8	14.4v
24	27.6	28.8v

* voltages stated above are at 25°C, these will be automatically adjusted for different ambient temperatures.

LED1 Indicates the mode of operation, either charging or regulating or both.

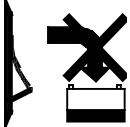
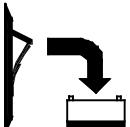
Green		All available power from both the wind and solar inputs is charging the battery.
Amber		The HRSi is regulating the charge current to the battery, current is still flowing into the battery but at a reduced level.
Red		The HRSi is in fully regulating mode & no charge current will be flowing into the battery. The wind turbine will be running at a slow idle speed.

LED2 Indicates the approximate battery voltage

Green		Battery voltage is above 13v (26v)
Amber		Battery voltage is between 12v & 13v (24v & 26v)
Red		Battery voltage is below 12v

Flashing Red – Warning battery voltage is very low. Loads should be switched off

Charge/Stop Switch

	All charge current switched off, wind turbine in stall mode. Refer to Warnings section with reference to battery disconnection and other system switches.
	Charge mode

INSTALLATION

Mounting

- Choose a suitable location for the regulator within a maximum run of 1.5m of cable from the battery. Mount the regulator to a vertical flat, surface via the mounting holes provided. Ensure the ventilation slots are not obstructed.

Electrical Connection

- Select suitable wiring and connectors for the interconnections that are capable of continuously carrying 10Amps minimum.
- Keep wiring lengths to a minimum to eliminate unnecessary voltage drop, maximum cable length between regulator and battery should be 1.5m to ensure accurate voltage sensing.
- **Ensure that the wind generator is restrained from turning, solar panels are covered, the Charge/Stop switch is in the Stop position, all other charge sources are switched off and the battery cables are not connected to the battery before connecting the regulator to the system. Ensure correct polarity is observed at all times during connection. Failure to do this at time of installation and on subsequent disconnection and reconnection may irreparably damage the regulator, invalidating the warranty.**
- Follow the basic wiring diagram overleaf. Connect wires to the appropriate terminals on the regulator. If a solar array is connected ensure the appropriate blocking diodes are fitted to each solar module.

Commissioning

- Connect the wires to the battery. It is important that this is the first live connection to allow the regulator to measure the battery voltage when first connected, to determine the system voltage.
- Uncover the solar modules & remove the restraint from the wind turbine.
- Move the Charge/Stop switch to the Charge position.

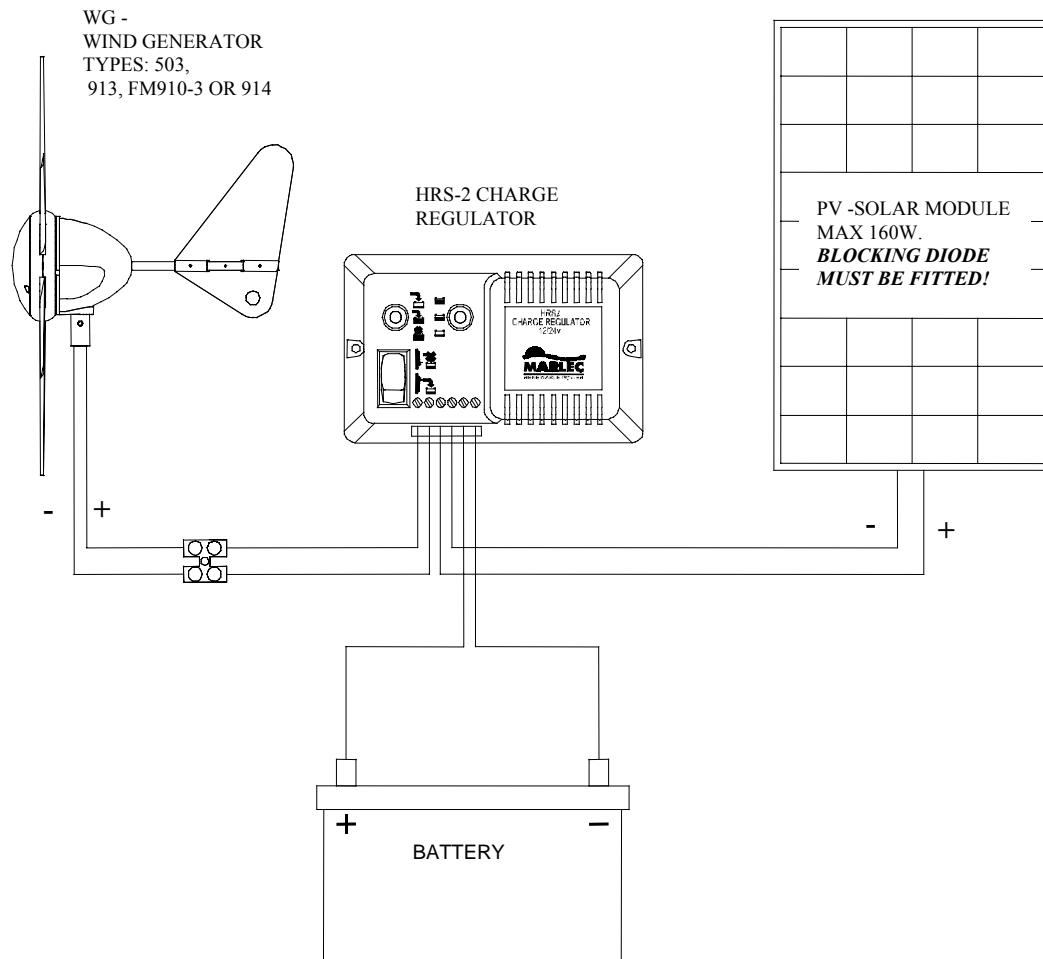


Fig 2. Basic wiring schematic – Windcharger + Solar Module + HRS*i* Regulator

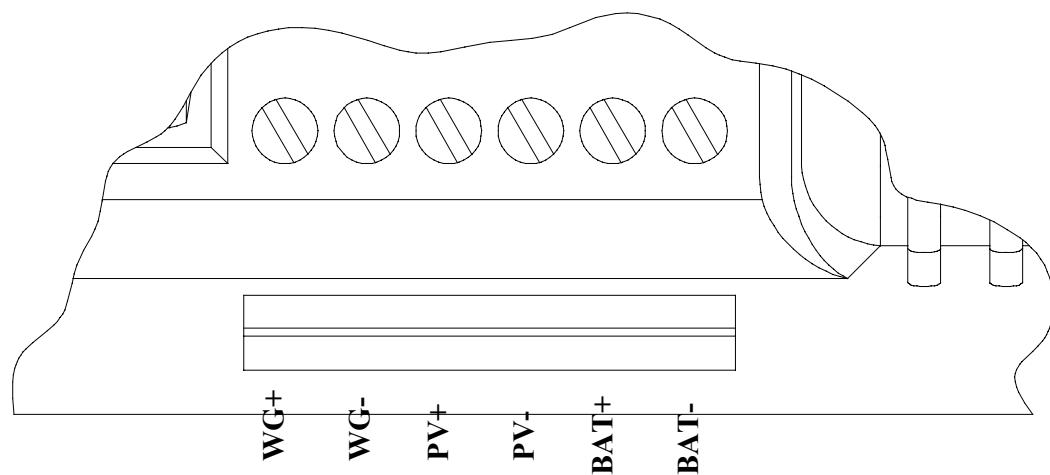


Fig 3. Terminal identification

L I M I T E D W A R R A N T Y

The Marlec Engineering Company Limited Warranty provides free replacement cover for all defects in parts and workmanship for 12 months from the date of purchase. Marlec's obligation in this respect is limited to replacing parts which have been promptly reported to the seller and are in the seller's opinion defective and are so found by Marlec upon inspection. A valid proof of purchase will be required if making a warranty claim.

Defective parts must be returned by prepaid post to the manufacturer Marlec Engineering Company Limited, Rutland House, Trevithick Road, Corby, Northamptonshire, NN17 5XY, England, or to an authorised Marlec agent.

This Warranty is void in the event of improper installation, owner neglect, misuse, damage caused by flying debris or natural disasters including lightning and hurricane force winds. This warranty does not extend to support posts, inverters, batteries or ancillary equipment not supplied by the manufacturer.

No responsibility is assumed for incidental damage. No responsibility is assumed for consequential damage. No responsibility is assumed for damage caused by the use of any unauthorised components.

No responsibility is assumed for use of a non "furling" versions of the Rutland Windcharger where Marlec or one of its authorised agents finds that a generator incorporating a furling device should have been used.

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