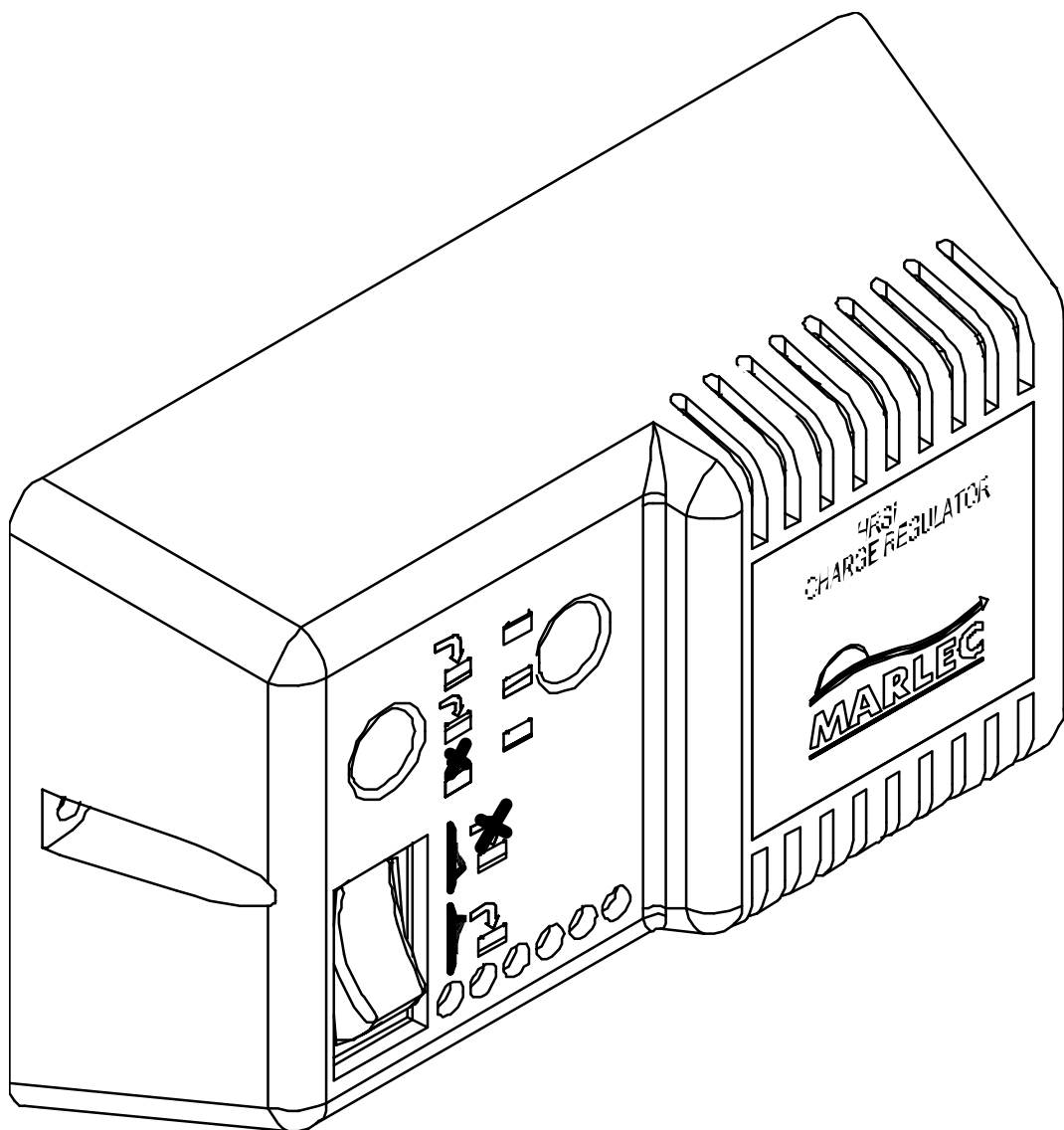


RUTLAND HRSi CHARGE REGULATOR

INSTALLATION AND OPERATION



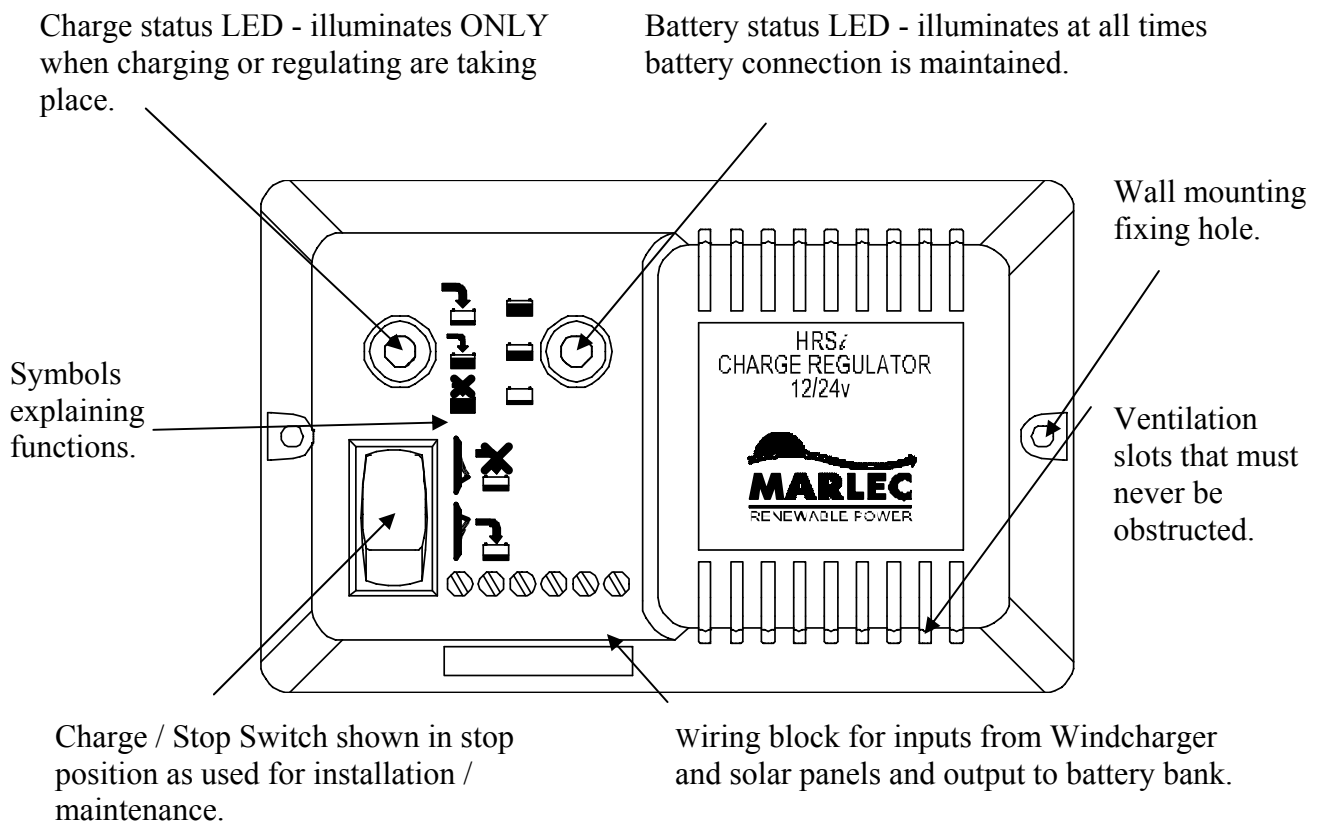
Introduction

Congratulations and thank you for purchasing Marlec's HRSi Charge Regulator. This is the latest technology for voltage regulation of small Rutland wind turbines and solar panels.

Summary of Features & Uses

- Protects batteries from overcharging.
- Protects electronic equipment from high battery voltage damage.
- Automatic 12 Volt or 24 Volt setting.
- Temperature compensation for optimum charge regime.
- Multi stage charging for optimum charge regime.
- Built in charge / stop switch for installation & maintenance.
- For use with Rutland 503, 504, 913, 914 and FM-910-3 Windchargers.
- Additional input for up to 160Watts of solar panels.
- May be connected in parallel with other charge sources (not through the HRSi)
- For use with a single battery bank.

HRSi Layout & Main Features



Ten Step Quick Start Guide

The sequence of connection is critical to the voltage set up of the HRSi. Follow these instructions carefully to ensure no connections are live. See Fig 2 for guidance.

1. Select a covered dry wall location in a ventilated area close to the batteries.
2. Select cables and connectors that will continuously carry a **minimum** of 10 Amps. No less than 4.0 mm² gauge cable should be used to provide the link from the HRSi to the battery.
3. Cut the minimum cable necessary to link the HRSi to the battery, thus avoiding voltage drop and ensuring accurate voltage sensing. The maximum recommended length is 1.5m.
4. Caution. Before any connections to the HRSi are made, cover any solar panels and restrain the Windcharger from turning. Ensure that any other charge sources to the battery are stopped.
5. Set the HRSi Charge / Stop switch to the Stop position.
6. Connect the 2 Windcharger cables to the Windcharger positions (WG + & WG -) and the solar panel cables to the solar panel positions (PV + & PV -) ensuring correct polarity is observed. Note : Solar panels must be fitted with appropriate blocking diodes , parallel panels having one each. Keep the solar panels covered and Windcharger tied.
7. Connect the battery link cables to the HRSi battery positions, (BAT+ & BAT-).
8. Connect the other ends of the battery link cables to the battery terminals, (+ & -) ensuring correct polarity. This senses the battery voltage and establishes 12V or 24V operation.
9. Uncover any solar panels and untether the Rutland Windcharger.
10. Move the Charge / Stop switch to the Charge position and the system is operational.

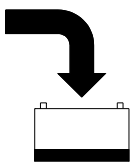

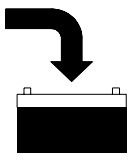

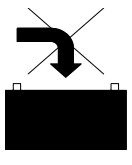

Operating Principles

The HRSi Regulator protects batteries from overcharge. It uses pulse width modulation and multi-stage charge technology to maximise the power delivered to and retained in the battery. In the **bulk/absorption phase** all the available wind and solar power is used to charge the battery as quickly as possible. The **float phase** ensures charge is maintained whilst minimising gassing thus prolonging battery life. Any discharging of the battery recommences this cycle.

The temperature compensation feature automatically adjusts the voltage regulation settings according to deviations of ambient temperature from 25°C. The pre-programmed settings are suitable for lead acid, AGM (absorbed glass matt) and most Gel type batteries. Other settings are available, contact Marlec to discuss your requirements. Default settings are:

Nominal Battery Voltage at 25°C	12V	24V
Maximum Float Voltage at 25°C	13.8V	27.6V
Maximum Bulk Voltage at 25°C	14.4V	28.8V

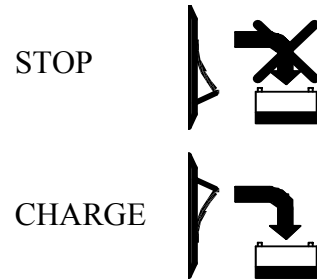
Understanding The LED Operating Symbols

LED Colour	Charge Status LED		Battery Status LED	
	Symbol	What is happening ?	Symbol	What is happening ?
Green		All available wind and solar power is charging the battery.		Battery voltage is above 13 V (26 V).
Amber		The HRSi is starting to regulate. Current is flowing to the battery at a reduced rate. The Windcharger may slow down.		Battery voltage is between 12 V and 13 V (24 V and 26 V).
Red		The HRSi is fully regulating and no charge current is flowing to the battery. The Windcharger will run at a slow “idle” speed.		Battery voltage is below 12 V (24 V).
No LED lit		Windcharger not rotating fast enough to produce a current or insufficient sunlight to generate power.		HRSi to battery connection not established or broken.
Flashing Red				Battery voltage is below 11V at 25°C. Switch load off to avoid deep discharge to the battery.

Easy Steps To Avoiding Damage To The HRSi Charge Regulator

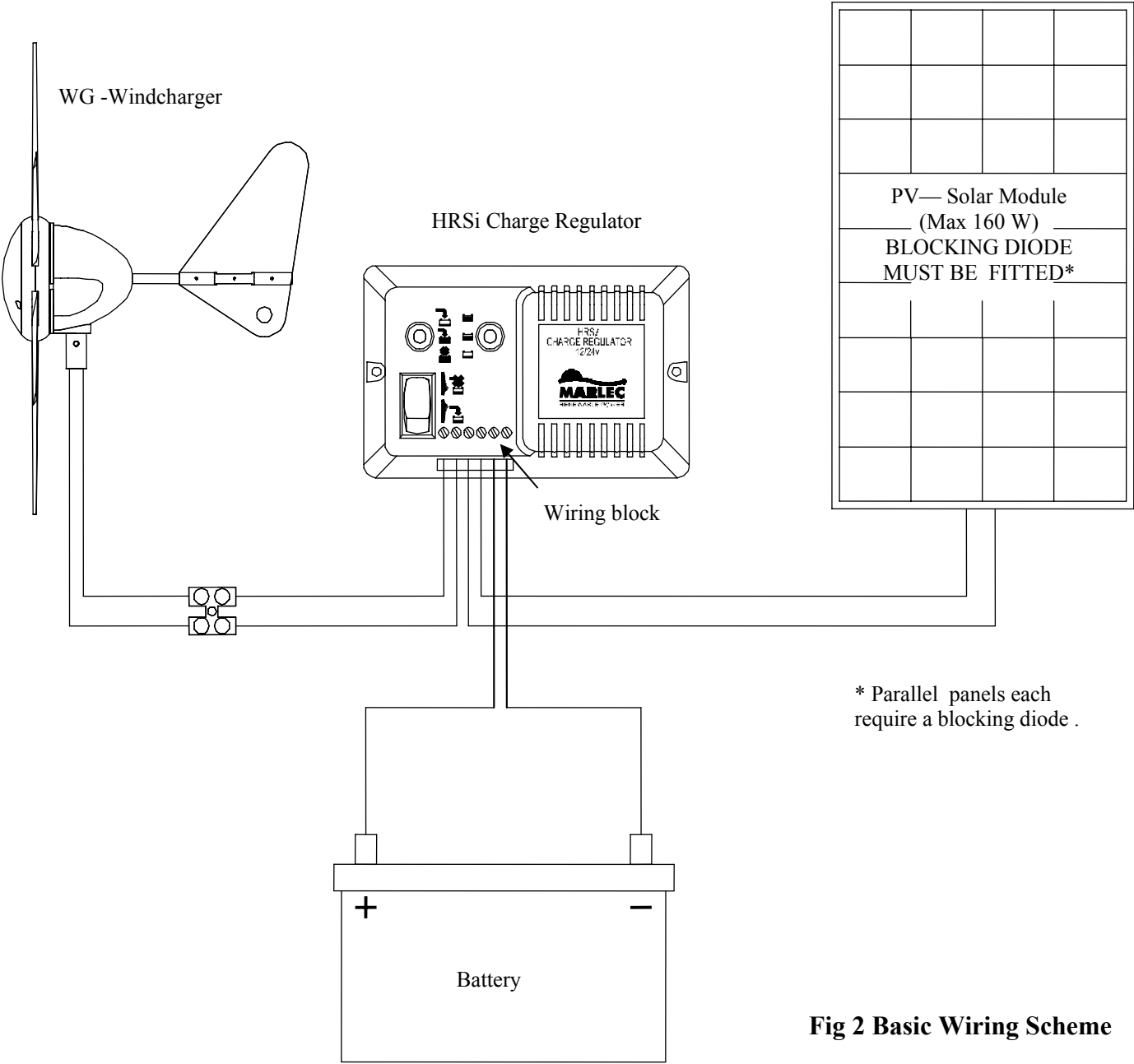
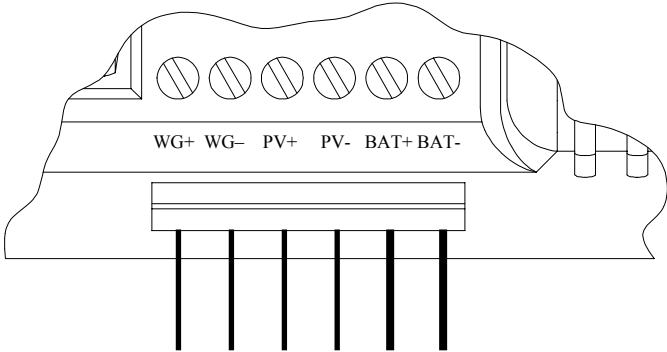
1. During installation or maintenance set the Stop position. See **Fig 1** :-
2. Do not use the Stop switch to brake a speeding Windcharger.
3. During installation the first “live” connection must be to the battery. This configures the 12V or 24V operation.
4. Never disconnect the HRSi from the battery unless the Stop switch is activated and ensure reconnection is made before returning to the Run position. Any on-board battery management systems must not break this connection.
5. Never connect an open circuit running Windcharger to the HRSi as this will cause permanent damage.
6. Never make the connection of a solar panel in direct sunlight to the HRSi .
7. Do not exceed the recommended 160W of solar panels.
8. Always fit an appropriate blocking diode to each solar panel input.
9. Never connect the HRSi to the battery or any charge sources in reverse polarity.
10. Avoid exceeding the recommended wiring distance between HRSi and battery. Longer distances require heavier gauge cable or charging efficacy will be affected.
11. Never obstruct the ventilation slots of the HRSi.
12. Note that in high levels of auxiliary charge, eg from an engine, the HRSi may enter regulating mode and thus the windcharger will run at a slow speed.

Fig 1 Charge / Stop Switch



Please take note of these steps to avoid the loss of warranty cover.

Cut Away of HRSi Wiring Block



* Parallel panels each require a blocking diode .

Fig 2 Basic Wiring Scheme

LIMITED WARRANTY

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.

**Manufactured in the UK by
Marlec Engineering Co Ltd
Rutland House,
Trevithick Rd,
Corby, Northants,
NN17 5XY UK
Tel: +44 (0)1536 201588
Fax: +44 (0)1536 400211
Email: sales@marlec.co.uk
www.marlec.co.uk**