

RUTLAND HRDi CHARGE REGULATOR

INSTALLATION AND OPERATION



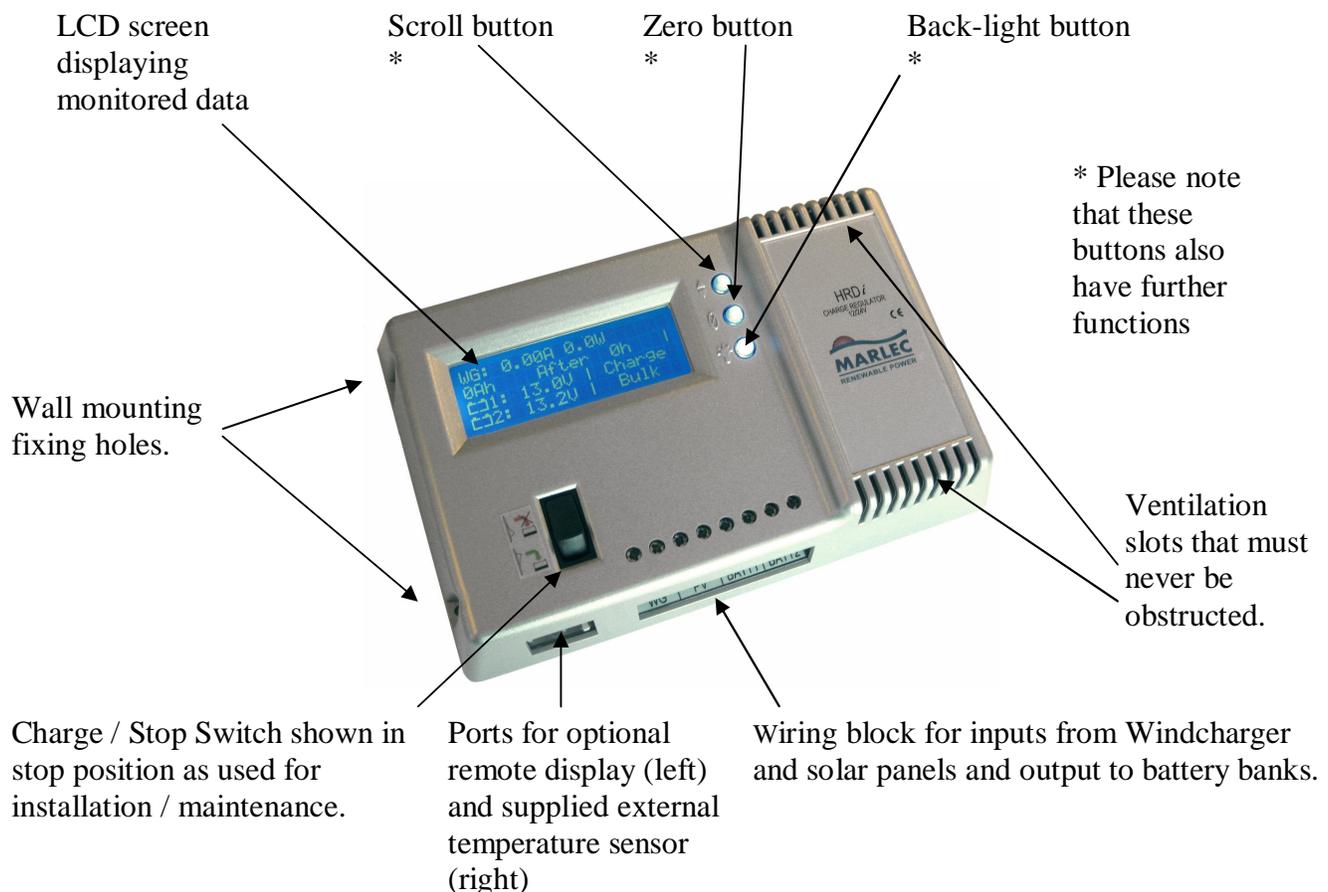
Introduction

Congratulations and thank you for purchasing Marlec's HRDi Charge Regulator. This is the latest technology for charge 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 with internal and external sensor.
- Multi stage charging for optimum charge regime.
- Built in charge / stop switch for installation & maintenance.
- For use **ONLY** with Rutland 503, 504, 504-e, 913, 914i and FM-910-3 Windchargers.
- Input for up to 160Watts of solar panels. *Note : in ambient temperatures >40°C the solar panel input must be de-rated. Contact your dealer or the manufacturer for advice.*
- May be connected in parallel with other charge sources (not through the HRDi)
- For use with a single or dual battery bank.
- Clear alpha-numeric digital LCD screen with user display options.
- Push button activated and timer controlled backlight.
- Accepts up to 6 mm² cable (SWG 11 or AWG 9).
- Optional remote display can be added to dedicated port.
- Operating temperature: -10°C to + 40°C (LCD 0°C to + 40°C)

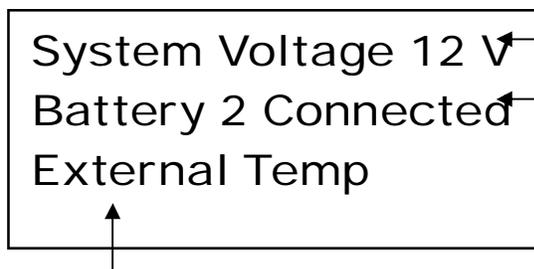
HRDi Layout & Main Features



Eleven Step Quick Start Guide

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

1. Select a covered dry vertical wall location in a ventilated area close to the batteries. Using the four screw holes in the casing, firmly attach the HRDi with the wiring block downmost. At this stage we recommend that the external temperature sensor be inserted into its dedicated port so that the sensor is in the vicinity of 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 HRDi to the battery.
3. Cut the minimum cable necessary to link the HRDi 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 HRDi 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 HRDi Charge / Stop switch to the Stop position.
6. Connect the battery link cables to the HRDi battery positions, BAT1+ & BAT1- and if a second bank is used, BAT2+ & BAT2-. It is **ESSENTIAL** that BAT1 is connected as this link provides internal power for the HRDi. Connect BAT2 before BAT1 if both are to be used.
7. 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.
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. The LCD screen and buttons will now illuminate. Do not press any buttons.
9. The screen shows a brief introduction screen, then a status report that must be checked as corresponding to the set up as shown below:



Other option = **Internal**

Other option = **24 V**

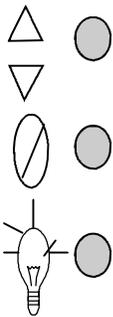
Other option = **Not Fitted**

Note : With the shutdown switch still in the stop position wires may be disconnected in order to start again should the settings not be as required.

10. Press **Continue** (back light button) > or wait for 10 seconds for the operating screen to display.
11. Move the Charge / Stop switch to the Charge position, uncover any solar panels and untether the Rutland Windcharger. The system is now fully operational and will begin to monitor & log.

HRDi Display

Button Functions



-   : Scroll Button - Press to scroll through the settings displayed.
-   : Zero Button - Press to zero the logged Ah displays.
-   : Light - Switches the back light on/off. Default setting is is on for 60 seconds

All three buttons have further functions when the HRDi is put into programme mode. In this mode the buttons become selectors where choices have to be made

Understanding The LCD Display

WG = Windcharger

PV = Solar Panel(s)

NET = Combined WG + PV (less Regulation reduction)

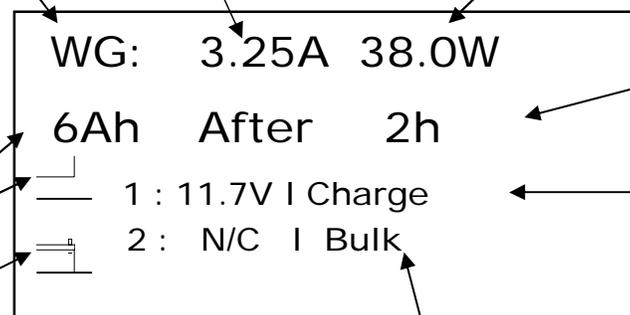
3.25 Amps of current generated by the Windcharger in this case

38 Watts of power generated by the Windcharger in this case

6 Amp hours of stored charge have been accumulated by the battery after 2 hours of charging

Battery 1 is 11.7 Volts
Battery 2 is not connected

Low will alternate with the voltage reading for values below 11.0 V @ 25°C



Elapsed time since last reset

Charging Mode - Either :

Charge - Current may be flowing into the battery bank(s)

Charge/

Reg - Regulation has begun but some current may still flow into battery bank(s)

Reg -

No current is flowing to the battery bank(s) as the mode has shifted to Regulation and the Windcharger will run very slowly

Multistage Charge Mode - Either :
Bulk - Bulk rapid charging or absorption stages.
Float - Float stage maintaining and slowly building to full charge.

User Guidance

 Use the Scroll Button to scroll between **WG, PV & NET** to see the displays of current, power inputs and Ah from these charge sources. The display can be left in any of the three positions and the quantities refer only to the featured input.

 Press once to open the menu for zeroing ALL the Amphours & elapsed time previously logged. The NO and YES options are on the top two buttons.

 Charge / Stop Switch should be kept in upper position during maintenance / setting up. The switch should NOT be operated during high winds.

User Programming

Default Settings

The following settings are factory programmed :-

- | | |
|---|-------------------------------------|
| 1.Backlight on LCD display | -remains illuminated for 60 seconds |
| 2.Charge Level (maximum voltage per cell) | -2.400 V / Cell * |
| 3.Button Illumination (on / off) | -ON |
| 4.Restore Factory Settings | -ON |

We strongly recommend retaining these at all times. *Note -A delay of 30 seconds in the reprogramming procedure will automatically return normal operating mode without saving changes.*

Reprogramming

To change programmed settings press the back light button for 3 seconds continuously to begin the sequence of reprogramming options. The Software version & serial number briefly appears. Press the back light button once within the next 5 seconds to go to the first option below. (*Note : Failure to do so returns you to the normal working mode*)

- 1.Backlight. Press the UP button to increase the time or DOWN button to decrease the time in 10 second steps. Press OK to confirm the change and move to the next step.
- 2.Max V/Cell *
@ 25° C Press the UP button to increase voltage or DOWN button to decrease voltage. Press OK to confirm the change and move to the next step.
- 3.Button Illumination. Press the top button to toggle between ON and OFF. Press OK to confirm the change and move to the next step.
- 4.Restore Factory Setting. Default is YES. Toggle to NO and press OK to save the changes made. Or Press OK and factory settings are restored.

Note : At any time in reprogramming procedure, if no button is pressed for 30 seconds then normal operation is returned without any changes being saved.

- * It is not recommended that this value be changed for all lead-acid batteries. Temperature compensation adjusts charging level to optimise it for the ambient temperature of the battery bank(s). The external temperature sensor should be placed on or near to the battery bank(s) where possible and may be attached to a battery lead for convenience.

Operating Principles

The HRDi 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. Some 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.

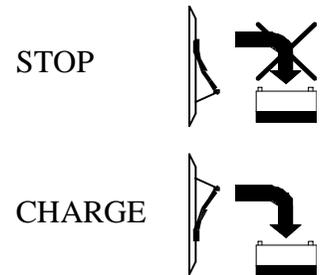
Default settings are:

Nominal Battery Voltage at 25°C	12.0V	24.0V
Maximum Float Voltage at 25°C	13.8V	27.6V
Maximum Bulk Voltage at 25°C *	14.4V	28.8V

Easy Steps To Avoiding Damage / Ensuring Optimum Operation

1. During installation or maintenance set the “Stop” position. See **Fig 1 :-**
2. Do not use the “Stop” switch as a brake to stop a Windcharger that is in fast rotation. If possible first orient the turbine to a downwind position to slow it down.
3. During installation the first “live” connection must be to the battery. This configures the 12V or 24V operation.
4. Never disconnect the HRDi 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 HRDi as this will cause permanent damage.
6. Never make the connection of a solar panel in direct sunlight to the HRDi .
7. Do not exceed the recommended 160W of solar panels. *Note : in ambient temperatures >40°C the solar panel input must be de-rated. Contact your dealer or the manufacturer for advice.*
8. Always fit an appropriate blocking diode to each solar panel input.
9. Never connect the HRDi to the battery or any charge sources in reverse polarity.
10. Avoid exceeding the recommended wiring distance between HRDi and battery. Longer distances require heavier gauge cable or charging efficacy will be affected.
11. Never obstruct the ventilation slots of the HRDi.

Fig 1 Charge / Stop Switch



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

Notes

In high levels of auxiliary charge, eg from an engine, the HRDi may enter regulating mode and thus the windcharger will run at a slow speed.

The logging feature of the HRDi will continue to record up to 9999 Ah or 9999 hours duration before automatically returning to zero. (if not reset by user in the meantime)

The memory in the HRDi saves the latest settings made and these are retained even if the unit is disconnected. Reconnection immediately re-activates these settings.

The reprogramming of the Max V/Cell @ 25° C (see *) may only be necessary when using non lead-acid batteries and limited types of Gel batteries. See battery manufacturers advice. We strongly advise against making any changes in this value as batteries may be permanently damaged.

Cut Away of HRDi Wiring Block

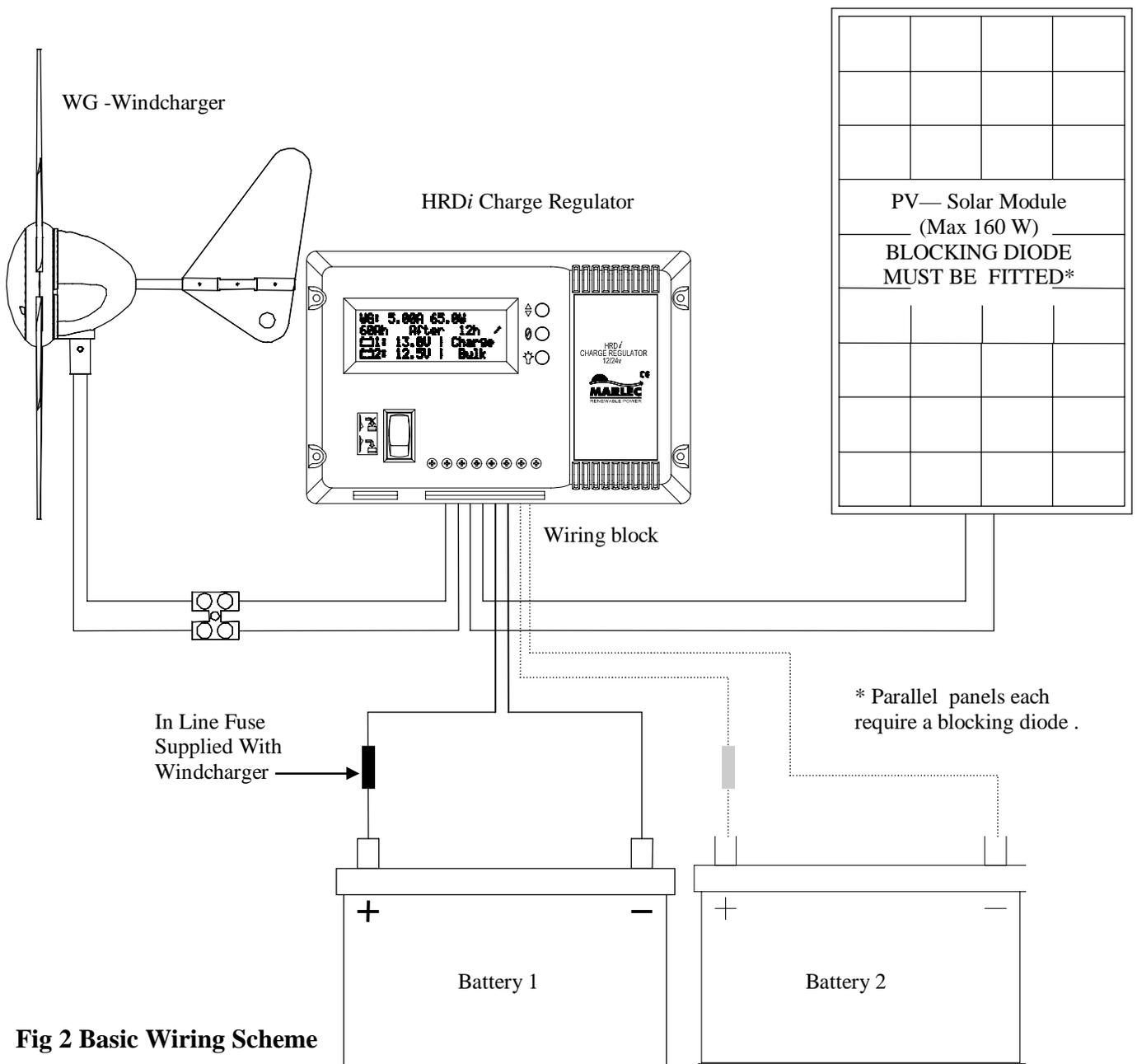
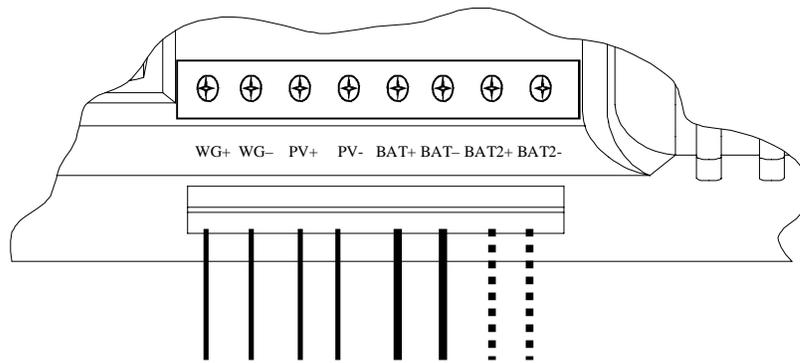


Fig 2 Basic Wiring Scheme

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
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