

User Programming

The following (recommended) 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 @ 25°C
3. Button Illumination (on / off) - ON
4. Restore Factory Settings - ON

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.Button Illumination. Press the top button to toggle between ON and OFF. Press OK to confirm the change and move to the next step.

3.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.

4. Re-Start. A re-refresh of the firmware automatically occurs when this reprogramming sequence completes. A re-start is necessary whenever a battery is added or removed at BAT 2 position.

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

Reprogramming for Other Battery Types

A PC App and Marlec Controller Interface Lead are available for programming parameters for use with other battery types. Features include Voltage levels, temperature compensation and low temperature shutdown. Contact Marlec for availability.

Manufactured in the UK by

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RUTLAND HRDi CHARGE REGULATOR

Installation & Operation



Doc No: SM-347C 28. 01..21



LIMITED WARRANTY

The Marlec Engineering Company Limited Warranty provides free replacement cover for all defects in parts and workmanship for 24 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" version of the Rutland Windcharger where Marlec or one of its authorised agents finds that a generator incorporating a furling device should have been used.

HRDi Layout & Main Features

LCD screen displays monitored data:

Line 1:	Displays Amps and Watts being generated. Scroll to view WG or PV or NET
Line 2:	Logged Ampere hours generated after elapsed hours
Line 3:	Battery 1 voltage or LOW if <11.7V (23.4V)
Line 4:	Battery 2 voltage or LOW if <11.7V (23.4V) or N/C not connected.
Battery Symbols 1 & 2	Indicate approximate charge levels and flash when operating in regulation mode.

Congratulations on purchasing Marlec's HRDi Charge Regulator.

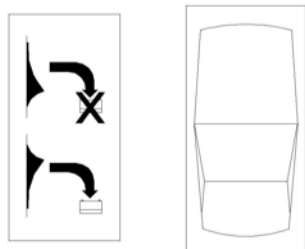
This is the latest technology for over charge regulation of Rutland wind turbines and solar panels. It is designed for use with Rutland 50"X" and 91"X" series models and ≤160Watts of solar panels charging up to 2 separate battery banks.

Follow the installation instructions and operating guidance provided in this manual.

Buttons: (These buttons become selectors in programming mode)

	Scroll - to view WG (turbine) or PV (solar) or NET readings. Screen can remain in any position.
	Zero - Press to reset logged Ah and follow the prompts
	Backlight - ON/OFF. Default ON for 60 seconds To enter programming mode press and hold for 3 seconds.

Charge / Stop Switch shown in stop position. Shut down for installation / maintenance.



Note: Do not operate in high winds until the turbine has been slowed down or restrained and solar panels covered or in darkness.



Install the HRDi upright on a flat surface and secure using the 4 wall mounting holes.

Ventilation slots must never be obstructed, leave a minimum of 5cm around the unit to allow air cooling.

Operating temperature: -10°C to +40°C (LCD 0°C to +40°C)



Included in the box:

- HRDi Controller
- External temperature sensor
- Installation & Operation Manual



Connection Panel includes:

Ports for optional remote display and external temperature sensor supplied.

Wiring block for inputs from Windcharger (WG) and solar panels (PV) and output to battery banks 1 and 2.

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.

1. Select a covered, dry, vertical wall location in a ventilated area close to the batteries. Fix the HRDi using four suitable screws with the wiring block downmost. Fit the external temperature sensor into its port and place the sensor tip in the vicinity of the batteries. If the sensor is not connected the temperature compensation feature is disabled. (Not recommended)
2. Select and prepare cables and connectors rated to continuously carry a **minimum** of 10 Amps, no less than 4mm² gauge cable, to link the HRDi to each battery. Keep lengths to a minimum to avoid voltage drop and ensure accurate voltage sensing. The maximum recommended length is 1.5m.
3. **Caution!**
 - Set the HRDi Charge / Stop switch to the Stop position.
 - Cover any solar panels and restrain the Windcharger from turning.
 - Ensure that any other charge sources to the battery are stopped.
4. Connect the battery link cables to the HRDi battery positions BAT1 and BAT2 if used but do not connect to the batteries. In service BAT1 must remain connected to provide the internal power to the HRDi.
5. Connect the 2 Windcharger cables to the WG + & WG - positions and the solar panel cables to the PV + & PV - positions ensuring correct polarity is observed or damage will occur. Note : Solar panels must be fitted with appropriate blocking diodes, parallel panels having one each. Keep the solar panels covered and Windcharger restrained.
6. Connect the other ends of the battery link cables directly onto the battery terminals + & - of **BAT2 first (if used) followed by BAT1**, ensuring correct polarity. The HRDi senses the battery voltage and establishes 12V or 24V operation.
7. The LCD displays an initialisation then the connection status report. Check this corresponds to your system:

System Voltage xxV
Battery 2 Connected or Not Fitted
External Temp or No Temp Sensor

If the status report does not correspond to your system disconnect the batteries and restart the procedure.

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

User Guidance & Warnings

- Wind & Solar Panel connections should never be made live or damage will result. Restrain the turbine or cover the solar panel to prevent power generation before connecting to the controller.
- Do not disconnect from the battery unless the Stop switch is activated. Reconnect the battery before setting to Charge.
- During installation or maintenance set the switch to the Stop position.
- Do not use the Stop switch as a brake. If possible first orient the turbine to a downwind position to reduce rotation and apply the switch to avoid shock loads that can damage the controller.
- The HRDi must be connected directly onto the battery. On-board battery management systems must not be allowed to break this connection.
- Solar PV Panels—do not exceed the 160W maximum rated input. *Note : in ambient temperatures >40°C the solar panel input must be de-rated.*
- In high levels of auxiliary charge, eg from an engine, the HRDi may enter regulating mode and the windcharger will run at a slow speed.
- The logging feature of the HRDi records up to 9999Ah before automatically returning to zero if not reset by user in the meantime.
- Latest settings are retained in the HRDi memory when it is disconnected. Reconnection re-activates the settings.
- Reprogramming of the Max V/Cell @ 25°C,(bulk,float and regulation), temperature compensation and shutdown may be necessary when using non lead-acid batteries. Check the battery manufacturer's advice and contact Marlec for details of the PC App and Marlec Controller Interface Lead.

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 @ 25°C	12V	24V
Maximum Float Voltage @ 25°C	13.8V	27.6V
Maximum Bulk Voltage @ 25°C	14.4V	28.8V

Wiring Schematic - HRDi Controller

