Rutland 1200 Commissioning and Operation

Commissioning

1. Raise the turbine and secure the mounting pole firmly in an upright position. Uncover solar panels. The charge controller default start position is OFF and the wind and solar inputs hold the turbine in the electronic stall position to prevent current from flowing.

2. Final Electrical Connection—connect BAT2 first if used, followed by BAT1. The controller automatically self configures to operate at 12V or 24V according to the battery voltage and the WG and PV buttons are red.

3. Switch On—Press and hold the WG turbine ON/OFF button for 3 seconds to release the electronic stall. The LED will change from solid red to the current operating status. Repeat for the PV ON/OFF button. Charging will commence automatically as wind and solar energy are available.

**IMPORTANT:** In service BAT1 must always remain connected to provide power to the controller. DO NOT install any switches, relays, VSRs, fuses etc that can even momentarily disconnect the battery. If the battery needs to be disconnected follow the Procedure to Shutdown and Start the Turbine and Solar Panel.

**Guide to Operation—LED Indicators**

<table>
<thead>
<tr>
<th>Battery LEDs</th>
<th>Battery Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Battery is not connected or Voltage is too low to power the controller. Note: BAT1 LED is always lit when connected to a battery</td>
</tr>
<tr>
<td><img src="image" alt="Battery LED" /></td>
<td>Flashing. Battery is fully charged. Controller is in regulation mode, turbine and PV are voltage limited. Turbine runs very slowly</td>
</tr>
<tr>
<td><img src="image" alt="Battery LED" /></td>
<td>&gt;13V or &gt;26V</td>
</tr>
<tr>
<td><img src="image" alt="Battery LED" /></td>
<td>12-13V or 24-26V</td>
</tr>
<tr>
<td><img src="image" alt="Battery LED" /></td>
<td>&lt;12V or &lt;24V</td>
</tr>
<tr>
<td><img src="image" alt="Battery LED" /></td>
<td>Flashing. &lt;11V or &lt;22V, recommend disconnect loads or charge batteries separately</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Button LEDs</th>
<th>Charging Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Button LED" /></td>
<td>No charge output voltage detected</td>
</tr>
<tr>
<td><img src="image" alt="Button LED" /></td>
<td>Charging by renewable power</td>
</tr>
<tr>
<td><img src="image" alt="Button LED" /></td>
<td>Flashing. Standby Mode, insufficient output voltage detected</td>
</tr>
<tr>
<td><img src="image" alt="Button LED" /></td>
<td>Flashing. Automatic shutdown from Electronic Stall Protection Mode</td>
</tr>
<tr>
<td><img src="image" alt="Button LED" /></td>
<td>PV or WG are manually shutdown. Press button for 3 seconds to release and run</td>
</tr>
</tbody>
</table>

**Brief Guide to Operating Features**

**MPPT**—Maximum Power Point Tracking. The controller incorporates this technology on both the wind turbine and solar inputs, optimising the power production of both in low wind and light levels to increase daily energy yields.

**Multi-Stage Charging**—The controller is programmed to deliver Bulk, Absorption and Float phases of charge to ensure batteries reach and maintain full capacity. The use of the temperature sensors for Temperature Compensation and the Remote Battery Sensor facility maximise this feature and prolong battery life.

**Electronic Stall Protection Modes:**

- **High Winds and Over Temperature**—If excessive currents or internal temperatures are reached the turbine is stalled by the charge controller and is automatically released to resume charging. Under these conditions the "WG Button" flashes red.

- **PV Over-Current & Temperature Protection**—This is activated if the 20A current rating of the PV panels is exceeded, downsize the PV panel if necessary. The solar control must be manually reset, press and hold the "PV Button" for 3 seconds. If the over-temperature condition is activated the controller automatically resets itself. Under both these conditions the "PV Button" flashes red.

**Procedure to Shutdown and Start the Turbine and Solar Panel**—Each button is used respectively to start and shutdown operation. To activate press and hold each button in turn for a continuous 3 seconds, the WG LED flashes red during soft stall of the turbine and is shutdown when solid red. The batteries may now be disconnected, to reconnect install BAT2 first if fitted.

**Resetting the System**—In the event that the system has to be re-set ensure that the controller WG and PV switches are set to OFF, solid red, so they are shutdown. Remove the positive connection from BAT 1 then reconnect. Once connected BAT 1 must always remain connected to provide power to the controller.

Visit www.marlec.co.uk/support to see video installation and operating guides.
Rutland 1200 Controller Installation and Electrical Connection

Install The Controller and Cables

During installation the turbine must be restrained from turning and PV panels must be covered.

1. Fix the Rutland 1200 Charge Controller to a vertical surface as shown using 4 screws in a weatherproof environment. See H
2. Install the selected power cables from the turbine and solar panels to the controller. Strip back 10mm of insulation on all power cables. The turbine 3 phase cables have no polarity to observe but ensure solar panels are correctly connected + and -
3. Prepare cables to make a direct connection from the controller to the batteries but DO NOT connect to the battery at this time. The controller is internally fused but note that reverse polarity connection to the battery will cause permanent damage.

IMPORTANT: DO NOT install any switches, relays, VSRs, fuses etc in the cables that can even momentarily disconnect the battery. Avoid additional connections or terminations in the battery lines.
4. Installation of sensing wires is highly recommended for most efficient charging through the bulk, absorption and float phases. Important information about sensing wires:

   Remote Temperature Sensor — When installed the temperature compensation feature is activated and voltage regulation settings are automatically adjusted to ensure batteries are fully charged whatever the local temperature. Temperature compensation is disabled if not fitted.
   Remote Battery Voltage Sensing Wires — if not connected the BAT1 and BAT2 terminal voltage is used for sensing the battery voltage. Any voltage drop associated with long cable distances (>1.5m) will reduce the accuracy of the charging regime.

Cable Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Cable Length:</th>
<th>Minimum Cable Sizes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controller to Battery Cables</td>
<td>mm²</td>
<td>AWG</td>
</tr>
<tr>
<td>Rutland 1200 Only – up to 35A DC</td>
<td>1.5m</td>
<td>6</td>
</tr>
<tr>
<td>Rutland 1200 &amp; 20A Solar – up to 55A DC</td>
<td>1.5m</td>
<td>10</td>
</tr>
</tbody>
</table>

Controller to Battery Cables - Use 3 stranded cables of equal size: 12V Systems

- 0-10m: 8
- 10-20m: 6
- 20-30m: 10
- 30-50m: 4
- 50-75m: 6
- 75-100m: 8

24V Systems

- 0-10m: 4
- 10-20m: 6
- 20-30m: 10
- 30-50m: 6
- 50-75m: 8
- 75-100m: 6

Solar PV to Controller Cables - Use 2 stranded cables suitably sized to minimise losses. Refer to PV panel instructions. Use as large cable as possible, terminals accept up to 16mm²

Remote Temperature Sensor — 1.5m Supplied with Controller

Remote BAT 1 & 2 Voltage Sensing Wires — single conductor. Optional to fit but recommended if battery cables are >1.5m

Minimum Battery Capacity @ C20 Rate

<table>
<thead>
<tr>
<th>Charge Source Options</th>
<th>12V</th>
<th>24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rutland 1200 Only</td>
<td>175Ah</td>
<td>85Ah</td>
</tr>
<tr>
<td>Rutland 1200 &amp; 10A Solar</td>
<td>225Ah</td>
<td>110Ah</td>
</tr>
<tr>
<td>Rutland 1200 &amp; 20A Solar</td>
<td>275Ah</td>
<td>135Ah</td>
</tr>
</tbody>
</table>

Solar PV Panel Specifications

| Maximum Current on 12V or 24V battery systems | 20 Amps |
| Permissible configurations: | Nominally 250W |
| 12V PV panel charging 12V battery | Nominally 250W |
| 24V* PV panel charging 12V battery | Nominally 300W |
| 24V* PV panel charging 24V battery | |
| * from a single 24V panel or 2 x 12V panels in series |

Maximum Open Circuit Voltage (Voc) of array over entire operating temperature range | 50V |

Minimum maximum power point voltage (Vmpp) at STC | 12V panels — 15V |
| 24V panels — 30V |

Controller Orientation

Read in conjunction with Part 1 Rutland 1200 Turbine Installation manual. Find more information at www.marlec.co.uk