

Rutland 1200 Wind Turbine & Hybrid MPPT Controller

# Owner's Manual

Installation and Operation

12V and 24V



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## Introduction

Congratulations and thank you for purchasing your Rutland 1200 Wind Turbine and Hybrid MPPT Charge Controller. Our range of Rutland Wind Turbines are well known as reliable, quiet and efficient in service and have been used worldwide by sailors and many off-grid power specialists since 1979.

The utmost of care goes into the manufacture of all our products in our ISO9002 approved factory. To ensure you get the very best out of the Rutland 1200 we recommend that you read this manual and familiarise yourself with its contents before installing and operating the wind turbine and charging system.

## How to Use This Manual

Guided by the 10 step installation sequence follow the detailed sections as recommended to complete the tasks leading to the final commissioning of the turbine and controller.

## General Guidelines and Warnings

*Safety is the primary concern during both installation and operation of your wind turbine. You should familiarise yourself with the risks associated with electrical and mechanical installation and if in doubt seek professional advice. The key safety risk factors to be assessed are:*

### *Handling DC voltages and batteries*

- Never allow the wind turbine or a solar panel to generate electricity without connection to a battery. Cover solar panel and lower or stop the turbine and short circuit it to prevent operation.*
- Do not make live connections to controllers or batteries as high open circuit voltages will permanently damage electronics.*
- Observe correct polarity to avoid permanent damage to equipment.*
- Do not open electronic equipment during live operation.*
- Always use cable suitable for carrying the expected currents and ensure good quality electrical connections to avoid arcing and fire risks.*
- Damages as a consequence of failure to follow these guidelines will invalidate the warranty.*

*Working at height—use suitable equipment. Effect as much of the installation at ground level as possible and choose a calm day to install the turbine.*

### *The rotating turbine*

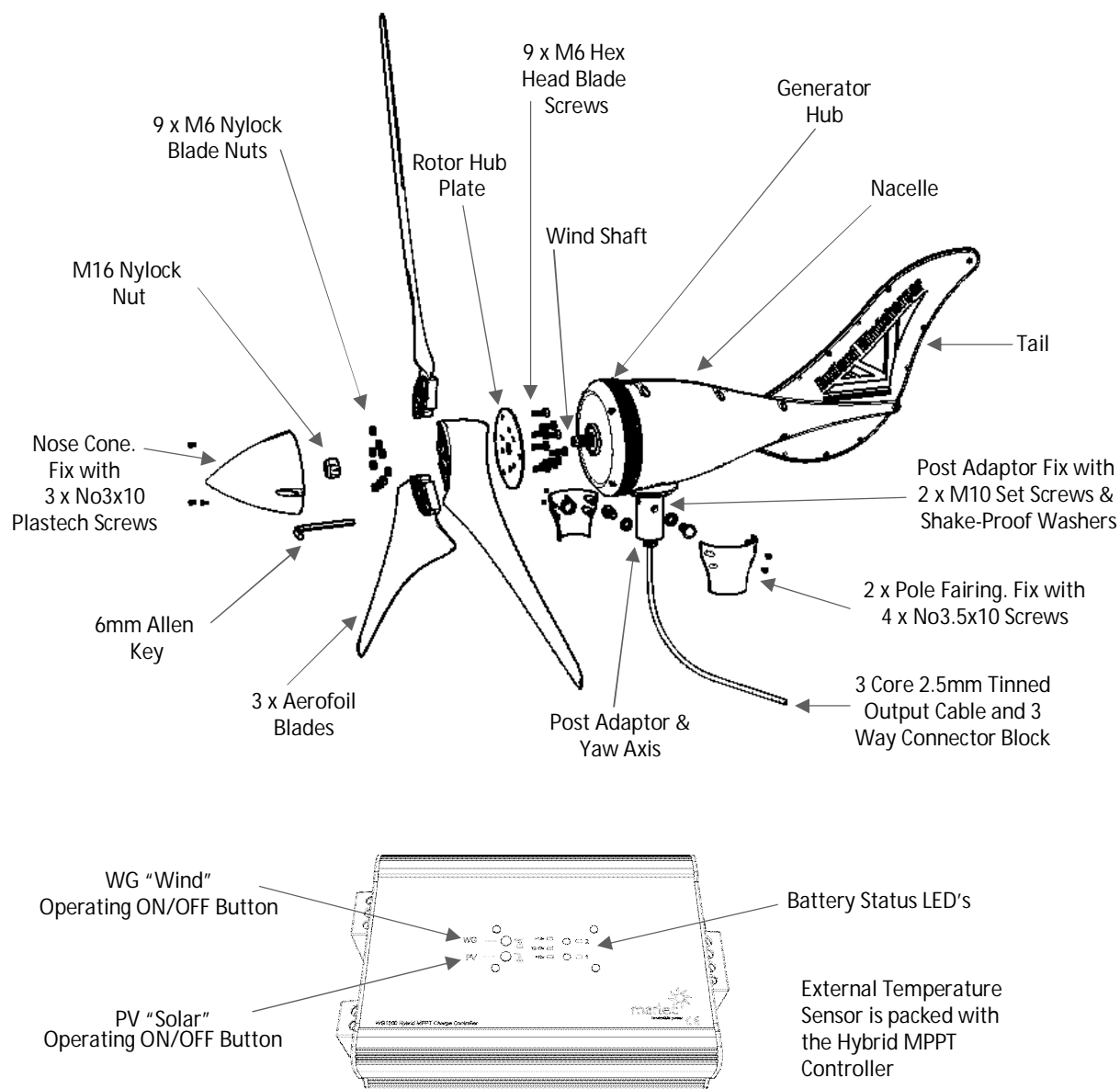
- Install the turbine at a location and height where persons cannot interfere with the path of the blades. No attempt to access the turbine should be made until it has been restrained from turning, if possible lower the tower to ground level.*
- Use the electronic stall switches to stop power production of both the turbine and solar panel. The turbine speed will eventually reduce to an idle for safer access.*
- Caution: The aerofoil blades are very sharp by design, gloves are recommended for handling and every precaution must be made to avoid them in rotation as there is risk of harm to persons if struck.*

*If in doubt refer to your dealer, a competent electrical engineer or the manufacturer.*

Check you have received:

1 x Rutland 1200 Wind turbine with fixings

1 x Hybrid MPPT Charge Controller with External Temperature Sensor



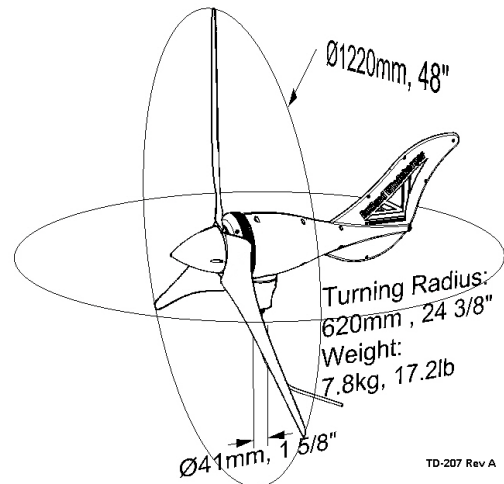
In the event of loss or damage consult your dealer or the manufacturer.

Tools Required	Other Items you may require
10mm and 17mm Spanner	Tower/Mounting Pole
PZ1 Crosshead Screwdriver	Turbine, Solar and Battery Cables
PZ2 Crosshead Screwdriver	Deep Cycle Batteries and Terminals
Terminal Screwdriver	Connector Blocks
Wire Strippers	Solar PV Panels and Diodes
Multi-meter (useful)	Controller Fixing Screws

These and other accessories are available from [www.marlec.co.uk](http://www.marlec.co.uk) or your dealer.

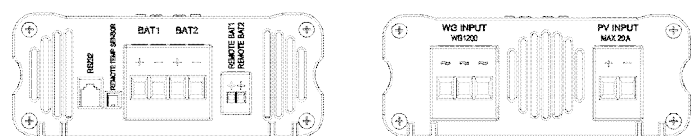
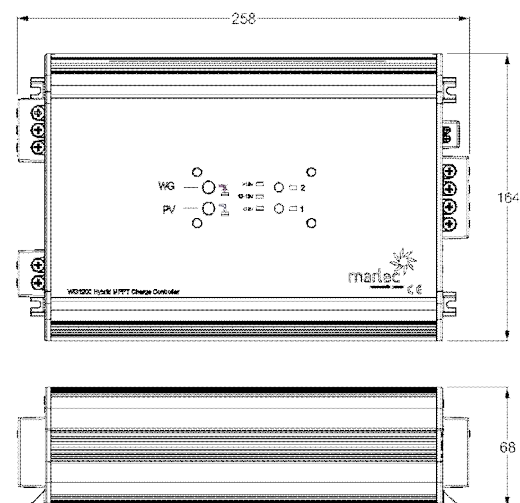
## Rutland 1200 Wind Turbine Features and Uses

- The Rutland charge system provides a direct current (DC) to charge a battery bank and power low voltage equipment connected to the batteries.
- The Maximum Power Point Tracking (MPPT) technology continuously adjusts the turbine speed to achieve its optimum power performance. This increases the generator efficiency and delivers more ampere hours to the battery.
- Aerodynamic Tri-Namic efficient aerofoil blades uniquely combine powerful power production at low and high wind speed whilst maintaining almost silent operation. Their sleek design that ensures a smooth and stable operation.
- Low wind speed start up maximises power generation in the most common winds.
- The Rutland 1200 uses rare earth magnets with an ironless core to create an efficient axial flux generator with no cogging torque.
- Electronic High Wind Current Protection Mode.
- High grade materials are used throughout to deliver durable service even in harsh environments.
- Sealed long life bearings & stainless steel fasteners.
- Designed for domestic uses such as on board sailing yachts, remote and off-grid living, static caravans and professional applications such as navigation, pumping, lighting, monitoring equipment, cameras etc at remote sites where off grid power is required.
- Ideally mounted on the Rutland Marine Mounting or Land Tower Kits - see [www.marlec.co.uk](http://www.marlec.co.uk)



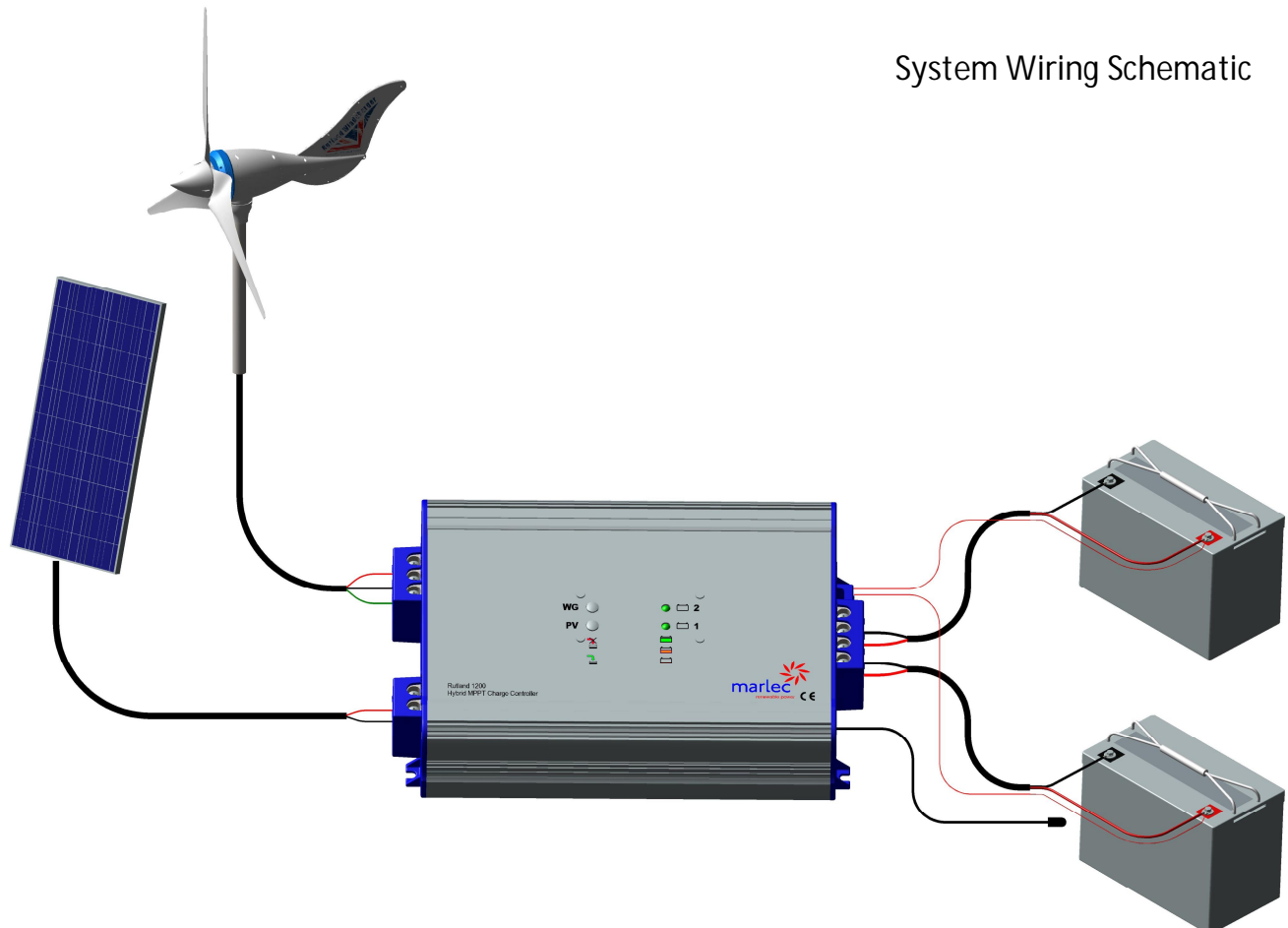
## Hybrid MPPT Charge Controller Features

- Hybrid MPPT Charge Controller for Rutland 1200 and up to 20 Amps of Solar (250W@12V or 500W@24V). NOTE: Maximum 50V DC input.
- Multi stage battery charging for an optimum charge regime. PWM voltage regulation protects batteries from overcharging and increases lifetime.
- Separate MPPT Control of the Wind Turbine and Solar PV increases energy yields.
- Designed for lead acid batteries; Wet, AGM and Gel.
- Automatic 12 or 24 Volt battery bank detection.
- Built in Charge Splitter for single or dual battery banks.
- Temperature compensated for optimum charge with supplied remote sensor.
- Remote voltage sensing feature negates battery cable volt drop for precise voltage regulation.
- Built in charge stop switches for independent shutdown of wind or solar.
- Built in cooling fan for efficient operation.
- Optional remote display via serial cable.
- Weight 1.3kg



## 10 Step System Installation Sequence

1. Select a site and prepare a suitable mounting pole or land tower for the Rutland 1200—Read Siting the Wind Turbine and Tower Selection.
2. Select an indoor location for the Hybrid MPPT Controller close to the battery bank.—Read Battery Specification and Charge Controller Installation.
3. Fix the controller to the surface selected and install all the cables to it but DO NOT connect onto the batteries. - Read Install the Cables and Connect the Charge Controller.
4. Feed the cables from the controller to the top of the pole leaving 1-2m of additional cable to allow for handling and secure the Rutland 1200 to the pole. - Read Fitting the Rutland 1200 to the Tower.
5. Assemble the Rutland 1200 blades and hub—Read Blade Assembly and Fit the Main Shaft Nut in Assemble and Install the Turbine.
6. Follow carefully the instructions Fitting the Turbine to the Generator.
7. Follow the remaining instructions in the Assemble and Install the Rutland 1200 section to fit the Nose Cone and Pole Fairing.
8. If selected install the solar panels and feed the cables from the controller to solar panel connection point. Read Solar PV Specifications. Note the maximum input voltage is 50V.
9. Commissioning—carefully follow the sequence for Up and Running.
10. Read Guide to Operation to understand how the system operates and how to shutdown.



## Siting the Wind Turbine

The location and height of the mounting pole or tower for the wind turbine will be the major factor in the overall performance and lifetime of the system. The smooth flow of wind over land and water is often interrupted by a multitude of obstructions causing wind shear and turbulence.

Wind Shear is the frictional affect of the ground on the wind, the amount that it reduces wind speed by depends on the terrain and tower height above ground. The interference between the fast moving upper air and the slow moving air closer to the ground also creates turbulence and eddy currents.

To negate the effect of wind sheer we recommend a minimum mounting height of 6m above the ground for land based turbines. On yachts this is not practical to achieve but as the sheer affect of water is much less than land so a lower turbine height can still give good yields.

Turbulence is the effect of obstructions creating eddy currents, swirling the wind in different directions and changing the velocities of the air particles, in their wake.

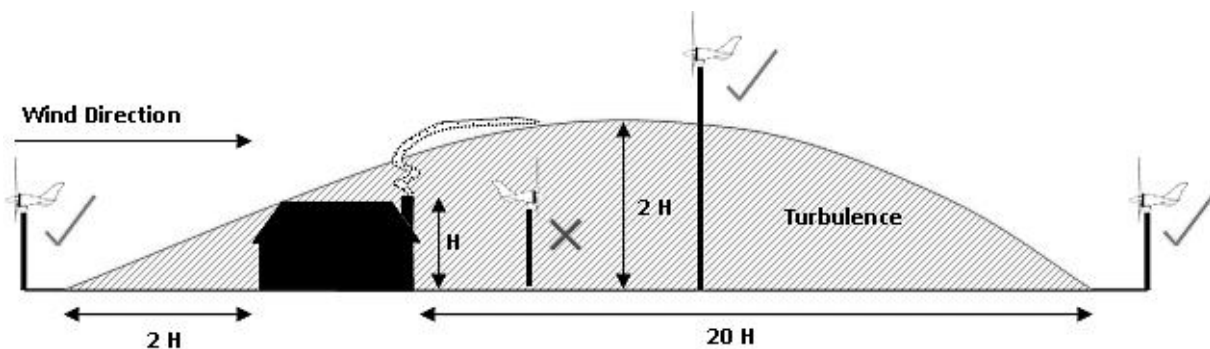
The effects are greatest downstream of the obstruction so the direction of the prevailing wind needs to be considered for your site, but turbulence also occurs above and in front of an obstruction. As a general rule a tower can raise a turbine out of the turbulent wind, but it is often more practical to move the turbine further upstream or downstream of the obstruction as shown below.

Both wind sheer and turbulence diminish with increasing height and can be overcome simply by putting the turbine sufficiently high above them as shown.

Wind speeds decrease and turbulence increases where obstructions exist so the siting of the turbine is very important to avoid unnecessary turbulence in order to ensure good yields and turbine lifetime.

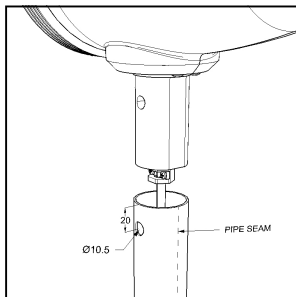
## Turbine Orientation

The Rutland 1200 is designed for use in the orientation shown in this manual it should not be installed and operated upside down.





## Tower Selection

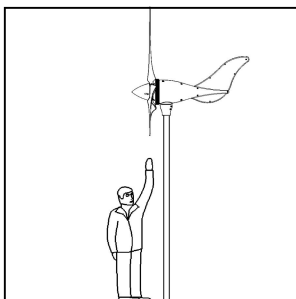


Select an aluminium or stainless steel tube with internal diameter of 41mm (1½"). The external diameter **MUST NOT** exceed 48.5mm (2") for the top 0.6m of the tower to avoid blade strike.

### Drill the Pole

On the selected pole drill two 11mm holes on centre-punch positions diametrically opposite, 20mm from the top at 90° to any seam.

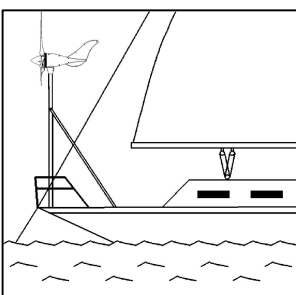
## On Board Systems



The Wind Turbine should be mounted in a safe position, a minimum of 2.7 metres above the deck and away from other obstacles which could interfere with the blades or tail assembly.

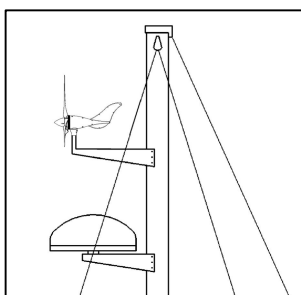
The pole should be supported to maintain it in the upright position against lateral movement in high winds.

The Rutland Marine Mounting Kit & Stays Kits are available for deck mounting. We suggest the following mountings according to preference:



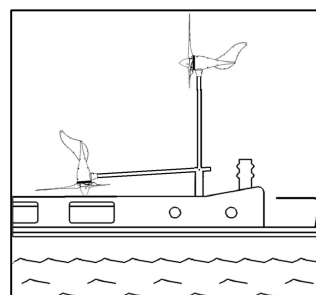
Push Pit

A suitable pole mounted to the deck with deck plates and solid guys is the most popular method of mounting the wind turbine on yachts, eg. Rutland Marine Mounting & Stays Kit.



Mizzen

Mizzen mounting is suitable on larger yachts, taking advantage of greater wind flow the higher the wind turbine is mounted.



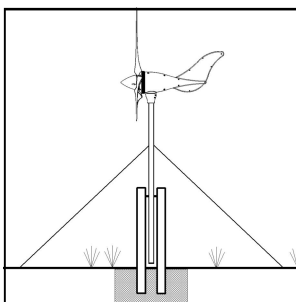
River Boats

A pivot pole is ideal for riverboats as the wind turbine can easily be raised and lowered

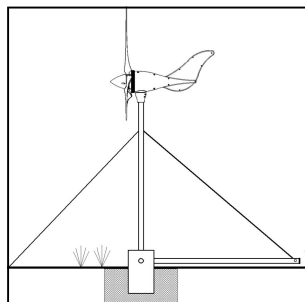
## Land Based Systems

For good performance mount the Rutland 1200 at a minimum of 6m above ground following the siting guidelines. The Marlec Land Tower & Tower Rigging Kit are available at [www.marlec.co.uk](http://www.marlec.co.uk)

Two forms of pivot type towers are suggested for ease of raise and lowering. Both can be erected using a 6.5 metre (21 feet) galvanised (medium) tube and must be supported by a minimum of four sets of guy lines. Performance is impaired if the tower is not maintained vertical in operation.



Centre Pivot Tower



Base Pivot Tower with Gin Pole

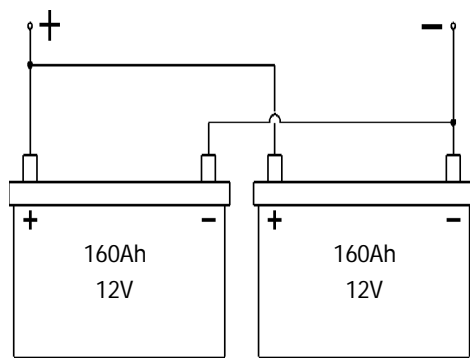
## Battery Specifications

Leisure / Deep Cycle batteries are specifically designed for good performance in terms of charge and discharge cycles. Batteries are the most important part of the renewable energy battery charging system and should be sized according to the load requirements to provide at least 3 days reserve capacity. This will reduce cycling, prolong the life of the battery and ensure system reliability during periods of low wind or solar generation.

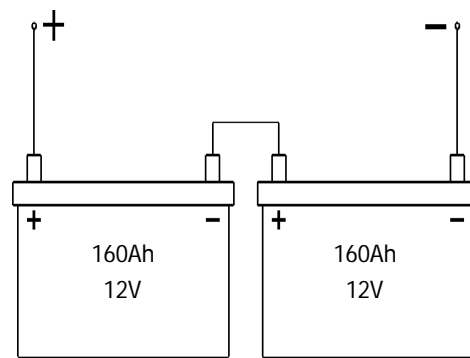
- The controller is designed for use with lead acid batteries. Wet, AGM and Gel.
- Permanent connections should always be made to the battery terminals. Never use crocodile clips or similar devices. Battery terminals should be clean and well greased.
- Note that a 24V battery must be charged to a minimum of 20V for the automatic battery voltage detection.
- It is essential to observe correct polarity.

Brown/Red is + Positive & Grey/Black is - Negative

Batteries may be linked as follows:



In Parallel to increase Ampere hours  
Total = 12V, 320Ah, 3840Wh



In Series to increase Voltage  
Total = 24V, 160Ah, 3840Wh

## Battery Bank Capacities

The table below shows the MINIMUM capacities recommended only. Additional parallel charge sources increase these minimum capacity ratings.

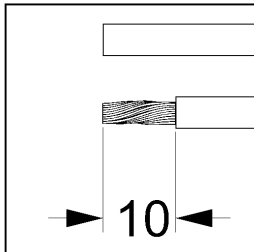
Charge Source Options	Minimum Battery Capacity @ C20 Rate	
	12V	24V
Rutland 1200 Only	175Ah	85Ah
Rutland 1200 & 10A Solar	225Ah	110Ah
Rutland 1200 & 20A Solar	275Ah	135Ah

## Install the Cables

Install the cables for all the controller connections following the Cable Specifications below.

Install the cables from the controller location to the top of the turbine tower. Leave approximately one extra metre of cable over the tower to allow for handling the turbine on and off, take care not to pull all this through later so that it is available to pull through at servicing times.

When using the Marlec Mounting Kits ensure the cables are threaded through the pole sections before securing them together.



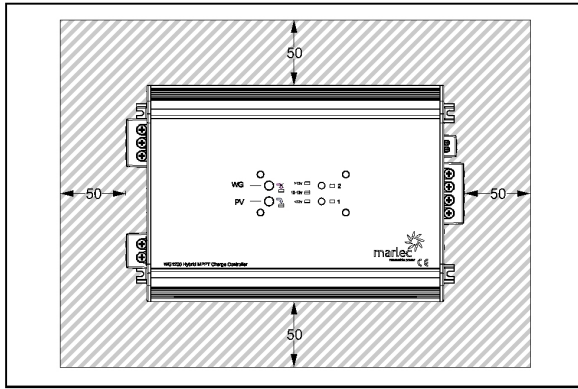
For all power cables that are to be connected strip the insulation back 10mm.  
Tighten all power cable terminals with a PZ2 Crosshead Screwdriver

## Cable Specifications

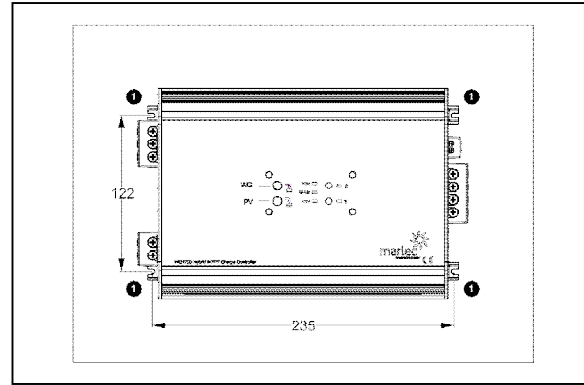
Select cables in accordance with the minimum guidelines table, the use of smaller cables will reduce performance and may present a potential fire hazard. Always use flexible, stranded cables.

Cable Run Description	Minimum Cable Sizes	
	mm <sup>2</sup>	AWG
Controller to Battery Cables		
Rutland 1200 Only – up to 35A DC	6	10
Rutland 1200 & 20A Solar - up to 55A DC	10	8
Turbine Tower to Controller Cables 3 Core Stranded Cable—sized according to cable run		
0-50m	2.5	14
50-100m	4	12
Solar PV to Controller Cables 2 stranded conductors		
Up to 10A DC rated PV panels:		
0-5m	4	12
5-10m	6	10
Up to 20A DC rated PV panels:		
0-5m	6	10
5-10m	10	8
Remote Temperature Sensor	Supplied with Controller	
Voltage Sensing Wires—single conductor. Optional to fit but recommended if battery cables exceed 1.5m	0.5 to 0.75mm	

## Charge Controller Installation



1. Select a covered dry flat vertical wall within 1.5m cable run of the battery. Always maintain 50mm clearance all around for ventilation.

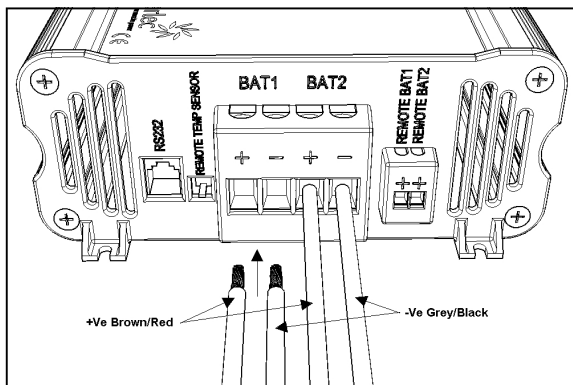


2. Install with the inputs on the left. Use appropriate screws to mount the controller at the 4 fixing points.

## Connect the Charge Controller

Caution! Do not make any live connections to the controller. It is essential to:

1. Restrain the turbine
2. Cover the solar panels
3. Do not have batteries connected.



1. Install the battery cables onto the controller only, in accordance with Cable Specifications in preparation for later connection to the batteries.

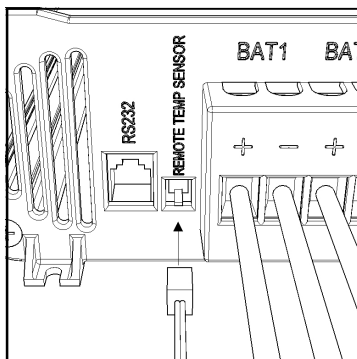
### Notes:

*Observe correct polarity—reverse connection will damage the controller.*

*The Controller auto-configures to operate at the connected battery voltage*

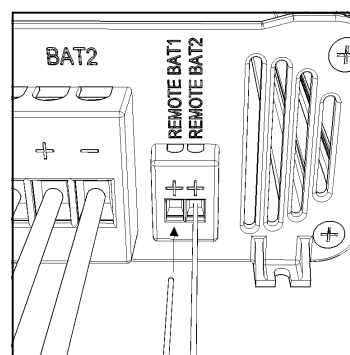
*Batt 1 must always be connected to provide power to the controller.*

*When 2 battery banks are used, the Batt 2 final connection onto the battery must be made first, followed by Batt 1.*



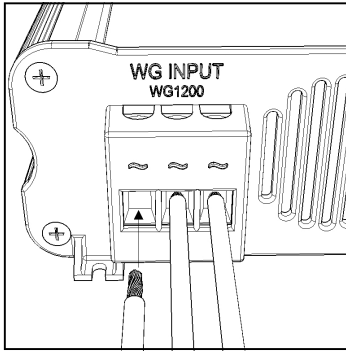
2. Position and secure the tip of the remote temperature sensor close to the batteries. Connect the plug end into its port.

*Note: When the sensor is not connected temperature compensation is disabled.*



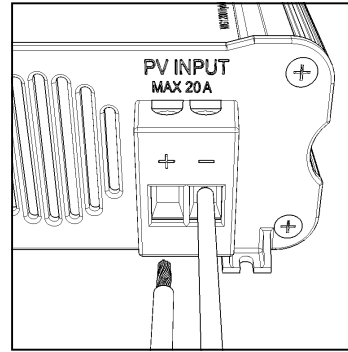
3. Connect the sensing wires on the battery + to the respective Remote Bat terminals.

*Note: If not connected the BAT1 and BAT2 terminal voltage is used for sensing and any associated voltage drop will reduce the*



4. Connect the 3 core wind turbine tower cable to the WG INPUT position in any order and colour.

*Note: The Rutland 1200 must be connected directly to the controller with no switches or fuses and remain restrained at this stage.*



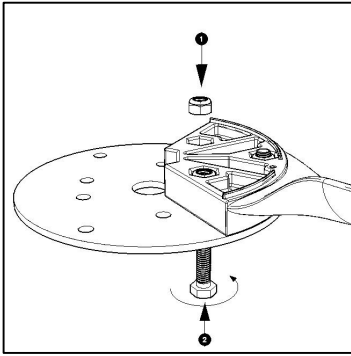
5. Observing correct polarity connect the solar pv cables to the PV INPUT

*Note: Do not uncover the solar panels at this stage.*

**WARNING:** input voltage must not be >50V. Permanent damage will occur above 50V.

**Safety:** Ensure all electrical connections are permanent. Check that cable runs are secure from tripping and any strain or damage.

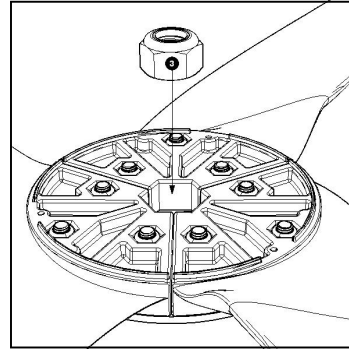
## Assemble and Install the Turbine



### Blade Assembly

1. Place a M6 Nylock Nut (supplied) into the nut recess in the aerofoil blade.
2. Align with a hole in the Rotor Hub Plate and partly tighten a M6 Screw (supplied) in from the back of the plate. Repeat with 3 fasteners on all 3 blades.

Caution - All 9 screws must be fitted!

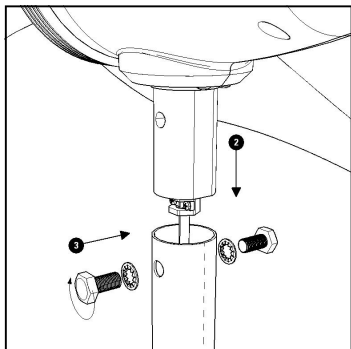


### Fit the Main Shaft Nut

1. Fit the M16 Nylock Nut (supplied) into the recess created by the 3 blades.
2. Finish tightening the M6 blade screws using a 10mm spanner from the back of the Rotor Hub Plate. Hold the blades near the root to avoid damaging the aerofoils. Check tightness of all screws but do not over-tighten.

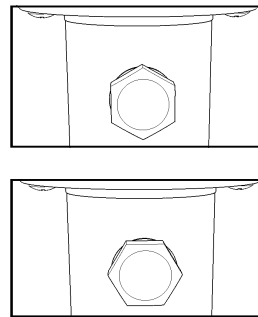
At this time you may choose to fit the generator section to the tower before fitting the turbine to the generator.

## Fitting the Rutland 1200 to the Tower



### Connect the Cables

1. Thread the 3 core turbine cable through the pole allowing at least 1m of extra cable in case of need to lift off the turbine for later service.
2. Strip back 10mm on the wind turbine and tower cables. Join them using the 3-way connector block provided. Wrap the connection with insulation tape to secure / protect from the environment. We recommend looping back the cable and securing with a cable tie to provide strain relief to the joint. *Alternatively join the cables using a latching plug and socket.*
3. Coat the post adaptor with petroleum jelly to protect it

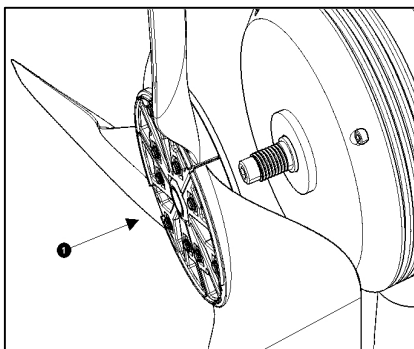


Finish rotating the nuts to either of these positions so the pole fairings fit over them

### Secure to the Pole

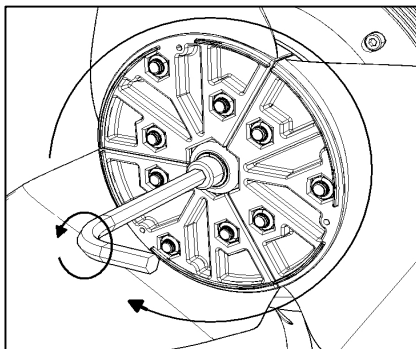
4. Carefully push the cables down the pole then slide the post adaptor into the pole whilst keeping the screw holes lined up. The flat of the post adaptor should be positioned along the line of any internal pole seam.
5. Secure in place with the M10 screws and shake-proof washers (supplied). Using a 17mm spanner tighten the M10 screw against the shake-proof washer ensuring the head is secured in a upright or horizontal position as shown above. This allows the fitting of the pole fairing.

## Fit the Turbine to the Generator



1. Offer up the turbine to the generator and place the M16 Nut at the centre over the windshaft.

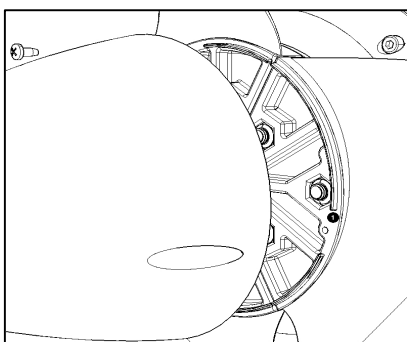
Ensure that the turbine hub plate is squarely located on the shaft's shoulder.



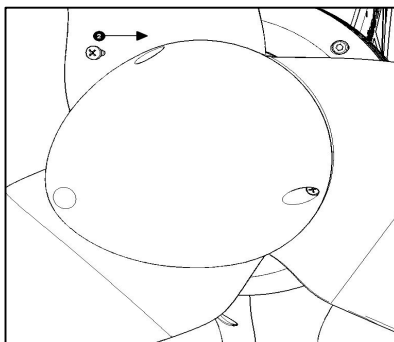
2. Carefully screw the turbine onto the windshaft by turning the turbine clockwise. When engaged place the 6mm Allen key provided at the centre of the shaft. Hold this firmly as you continue to screw the turbine to full tightness. Hold the blades near the root to avoid damaging the aerofoil. Ensure that the Rotor Hub Plate is squarely located on the shoulder of the wind shaft.

At this time you should restrain the turbine from turning or keep the mounting pole lowered. If the cable is already connected to the controller the turbine will be prevented from turning.

## Fit the Nose Cone

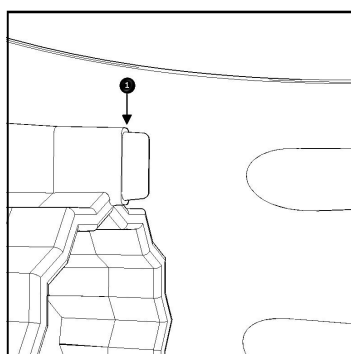


1. Locate the Nose cone over the rib on the Turbine and align the 3 screw holes.



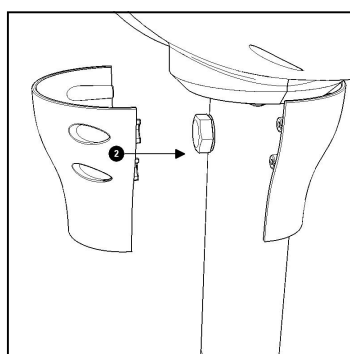
2. Secure nose cone using the 3 No3x10 Plastech Screws (supplied) and a PZ1 Screwdriver

## Fit the Pole Fairing

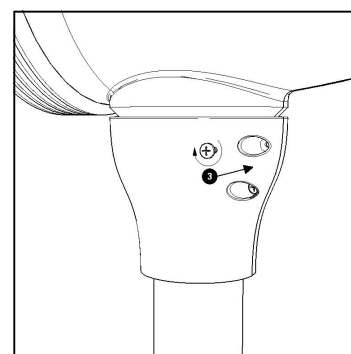


1. For thick wall galvanised steel poles the tab on the inside of the fairings should be trimmed back to the step as indicated.

*Note: For fitting to thin wall stainless steel poles proceed to Step 2.*



2. Push the Pole Fairing over the M10 Hex Head. This also acts as a locking device.



3. Screw together the pole fairing using the 4 No3.5x10 Plastech Screws (supplied) and a PZ2 Screwdriver.

## Solar PV Specifications

Maximum Charge Current	20 Amps
Maximum PV Panel Power	250W @ 12V 500W @ 24V
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

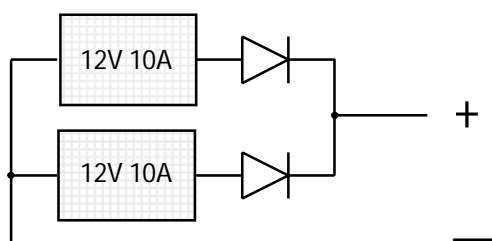
### Guidance notes:

- The voltage of the PV array must exceed the battery voltage across the operating range.
- Blocking diodes must be fitted when connecting PV panels in parallel strings to prevent backflow of current when shaded. A single panel or series string is protected by the controller's built in diode.
- Diodes must be rated according to the current and fitted in the positive "+" conductor.
- Consult PV panel datasheets to check the open circuit Voltage and to ensure the array temperature co-efficient ratings remain within these specifications.

### Parallel & Series Connection of Solar Panels

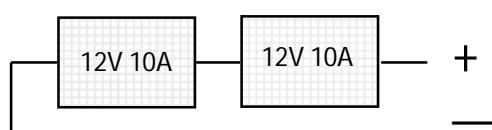
Blocking diodes are shown where needed as: 

**WARNING!** 24V solar panels, normally grid connect types, must only be connected in parallel to avoid over voltage which will permanently damage the controller.



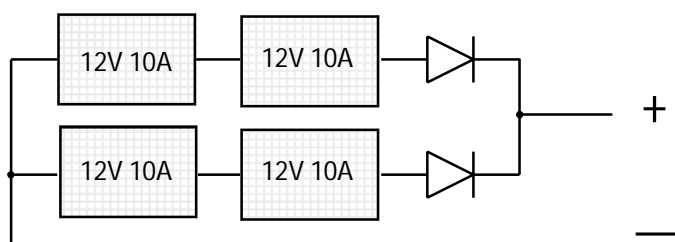
Parallel connection to increase current whilst maintaining voltage.

Total = 20A @ 12V 250W



Series connection to increase voltage whilst maintaining current.

Total = 10A @ 24V 250W



Parallel and Series connection combined.

Total = 20A @ 24V 500W

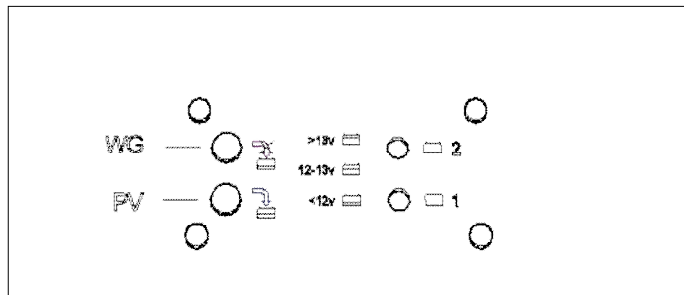
Always refer to the PV panel instructions.



## Up and Running

1. With the turbine tower lowered, check that the turbine blades rotate freely and the generator rotates freely on the pole axis.
2. The Rutland 1200 can now be raised into position. Secure the structure firmly in an upright position. The charge controller will hold the turbine in the stall position.
3. The Solar array can be uncovered. The controller will prevent current flowing at this stage.
4. Final Electrical Connection—connect the link cables from the controller onto the batteries observing the following :
  - When 2 battery banks are used, Batt 2 must be connected first, followed by Batt 1.
  - Observe correct polarity as reverse connection will irreparably damage the controller.
  - Batt 1 must always be connected to provide power to the controller.

When connected the battery status LED's illuminate and the controller auto-configures to operate at the connected battery voltage, 12V or 24V only.



5. Switching On—Release the electronic stall on the turbine by pressing the WG (wind generator) button on the controller. Switch on the solar charging by pressing the PV (photovoltaic) button. Each LED will change from solid red to display the current charging status.

Charging will commence automatically as wind and solar energy are available.

## Guide to Operation

### LED Indicators and Buttons

The BAT 1 LED is always lit if the charge controller is connected to a battery

Battery LEDs	Battery Status
No Colour	Battery is not connected or Voltage is too low to power the controller
Flashing Red	<11V or < 22V, recommend disconnect loads or charge batteries separately OR Stall Protection Mode is activated
Solid Red	<12V
Amber	12-13V
Green	>13V
Flashing Green	Fully charged. Controller is in regulation mode, turbine and PV are voltage limited. Turbine runs very slowly
WG and PV LED Buttons	Charging Status
Solid Red	PV or WG are manually shutdown. Press button to release and run
Flashing Red	Automatic shutdown for regulation OR Stall Protection Mode is activated
No Colour	No charge output voltage detected
Flashing Green	Standby Mode, insufficient out put voltage detected
Solid Green	Charging by renewable power
Further functionality and system indicators are added with the use of the optional remote display	

### Operating Features

- Maximum Power Point Tracking—Wind and PV
- Multi-stage Charging
- Electronic Stall Protection—Wind and PV
- Temperature Compensation

### Maximum Power Point Tracking

Wind—All wind turbines have a characteristic relationship of output power to blade speed. The Rutland 1200 Maximum Power Point Tracking (MPPT) technology continuously adjusts the turbine speed to achieve its optimum power performance. This increases the generator efficiency and delivers more ampere hours to the battery.

Solar—“Off Grid” PV panels typically have a nominal voltage of 12V for battery charging. Their  $V_{mpp}$  is slightly above battery voltage so that they are operating near their maximum power. Using an MPPT controller will further increase their efficiency.

“Grid Connect” PV panels have a higher  $V_{mpp}$ , when connected onto 12 or 24V batteries they are unable to generate their full power as they are limited by the battery voltage. MPPT detaches pv panel voltage from battery voltage allowing the pv panel to operate towards its  $V_{mpp}$ . The advantages of this are:

- Higher voltage grid connect modules can be used for battery charging
- Increased yields as the full I-V curve can be used up to the panel's  $V_{mpp}$
- Higher voltage on the solar input reduces cable losses

## Multi-Stage Charging

The pre-programmed settings are suitable for lead acid, AGM and most Gel batteries. If in doubt refer to your dealer or the manufacturer. Remote Battery Sensor terminals REMOTE BAT 1 and REMOTE BAT 2 are provided to maintain precise regulation set points. It is highly recommended these are installed to negate voltage drop inaccuracies and improve the rate of charging.

Bulk Charge	All available wind and solar power is used to charge the battery as quickly as possible up to 13.8V / 27.6V
Absorption	Constant voltage regulation is used to fully charge up to 14.4V / 28.8V
Float Charge	Holds the battery up to 13.8V / 27.6V and maintains this with a trickle charge minimising gassing and prolonging battery life
Note: If the battery is discharged below 12.5V the charge cycle recommences	

## Temperature Compensation

The Hybrid MPPT controller uses temperature compensation to adjust the voltage regulation settings according to deviation from 25°C. A colder battery requires charging to a higher voltage level, a warmer battery to a lower level. Install the external temperature sensor supplied as close to the batteries as possible to maintain the accuracy of the charge controller.

## Electronic Stall Protection Mode—High Winds and Over Temperature

This protection mode monitors the charge from the wind turbine. If excessive currents are reached the turbine is stalled by the charge controller. The turbine will be automatically released after approximately 5 minutes to resume charging. The charge controller is also protected against over temperature conditions and should this occur the wind turbine will be also be temporarily stalled. Under both these conditions the "Wind Button" flashes red.

## Electronic Stall Protection Mode—PV Over-Current & Temperature Protection

The over-current protection condition occurs if the current rating of the PV panels is exceeded i.e. 20 Amps (I<sub>pm</sub>). If this occurs check the rating of the PV and downsize if necessary. In this condition the controller must be manually reset with the "Solar Button". If the over-temperature condition is activated the charge controller automatically resets itself. Under both these conditions the "Solar Button" flashes red.

## Inspection and Maintenance

The Rutland Wind Turbine requires no scheduled maintenance except an annual inspection to monitor the general condition of the system to ensure the electrical and mechanical integrity and safety of the system.

For maintenance demonstrations and advice see [www.marlec.co.uk](http://www.marlec.co.uk) or watch our videos at Marlec TV on YouTube.

**WARNING!** Before inspection, the turbine should be stalled and lowered to the ground or tie a blade to the pole to prevent rotation and possible injury. Handle the blades with gloved hands.

To stop the turbine:

1. Press the shutdown button on the charge controller. The turbine will slow to an idle but will not accelerate with the wind.
2. Tie a blade to the mounting pole to prevent it from rotating.

### Routine Checks

The following routine checks should be performed whilst the turbine is stationary:

1. Check the blades for damage, eg chips or nicks. Replace any damaged blades. The turbine should not be operated with damaged blades as this may cause imbalance resulting in premature wear and possible failure. Check the blade screws for tightness.
2. Check all other nuts, bolts and screws for tightness.
3. Check the yaw axis for free rotation.
4. Check tower assembly for good condition.
5. Check the tension of any guy wires if applicable. The tension of guy wires should be checked frequently during the first year.
6. The Rutland 1200 can be wiped with a mild detergent and water to remove dirt and debris.
7. Ensure that the solar array is clean and has not become shaded over time.
8. Check that the charge controller is in a well ventilated area, and that the fan and the vents on the controller are free from dust or blockage.
9. Check the condition of all electrical cables and that terminal connections are tight.

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## For Your Records

We recommend owners record the following information for future reference:

Serial Number of Rutland 1200 Turbine	
Serial Number of Hybrid MPPT Controller	
Date of Purchase	
Purchased From	
Date of Installation	
Notes:	
Support:	
Visit <a href="http://www.marlec.co.uk">www.marlec.co.uk</a> for support and spare parts. We offer a full testing and repair service at our UK based factory. Many maintenance demonstrations and further advice are available on our website and at Marlec TV on YouTube.	
Contact Details:	
Marlec Engineering Co Ltd	
Rutland House, Trevithick Rd, Corby, Northants, NN17 5XY	
Tel: +44 (0)1536 201588      Skype: marlecengineering	
Email: <a href="mailto:sales@marlec.co.uk">sales@marlec.co.uk</a>	

## 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 so found by Marlec upon inspection. A valid proof of purchase is required if making a warranty claim.

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

This Warranty is invalid in the event of improper installation, owner neglect, mis-use, damage caused by flying debris or natural disasters including lightning strike 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 or loss. No responsibility is assumed for damage caused by user modification to the product or the use of unauthorised components.

Manufactured in the UK by

**Marlec Engineering Co Ltd**

[www.marlec.co.uk](http://www.marlec.co.uk)

