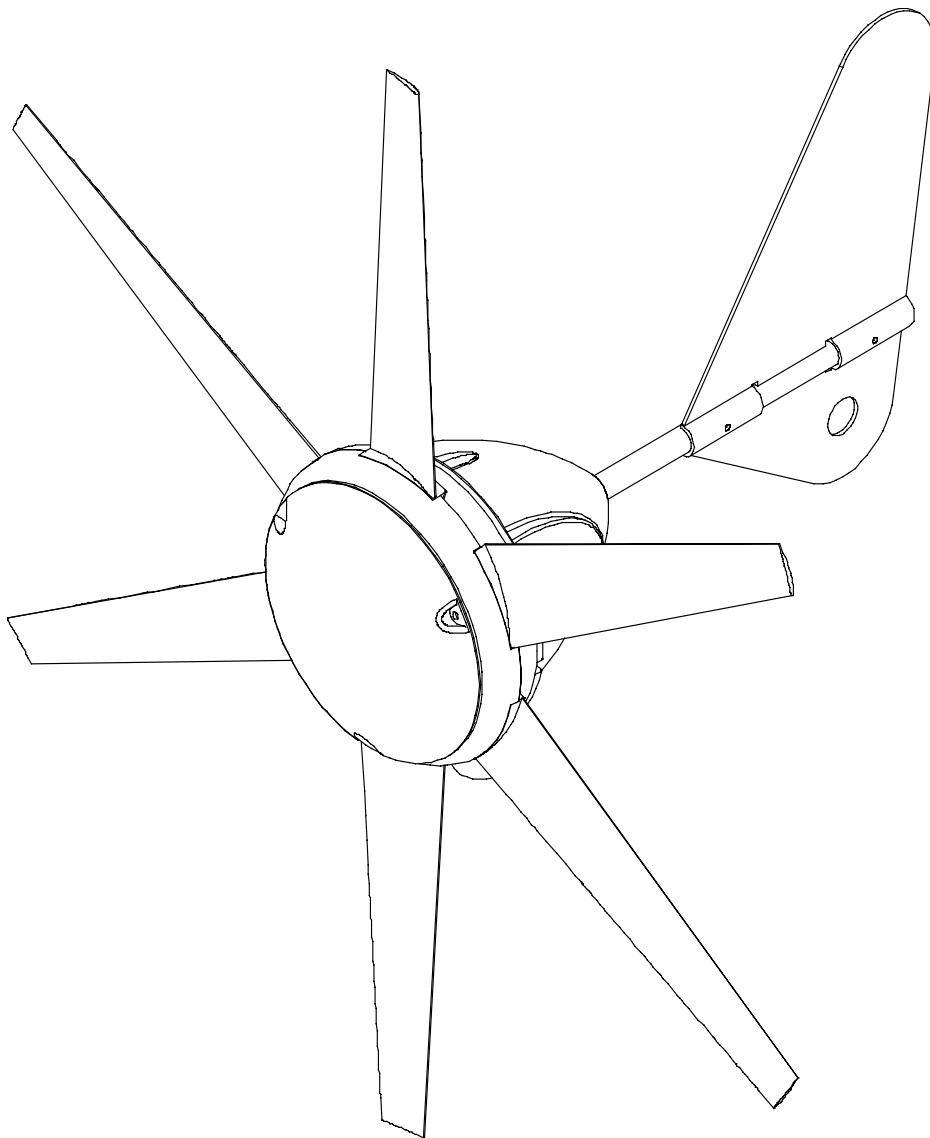


Rutland 913 Windcharger Owner's Manual



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INTRODUCTION

Congratulations on your Rutland 913 purchase! 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 913 Windcharger we recommend that you read this manual and familiarise yourself with its contents before installing and operating the Windcharger system.

The Rutland 913 is designed to provide a direct current (DC) power supply via a battery bank for 12/24V equipment, lighting, etc. It is robustly constructed and designed to give many years of trouble free service with the minimum of maintenance. Please take notice of our General Guidelines & Warnings and Inspection & Maintenance sections.

GENERAL GUIDELINES & WARNINGS!

- *Mounting pole outside diameter MUST NOT exceed 48.5mm for at least the top 0.5m. Larger section poles must not be used as this will reduce the tower to blade clearance. In high wind conditions this could cause damage to the windcharger by allowing the blade to come into contact with the mounting pole. A broken blade will cause turbine imbalance with consequent damage.*
- *When turning, the Windcharger is capable of generating voltages in excess of the nominal voltage. The turbine must never be allowed to rotate unless it is electrically connected to a regulator or batteries. Connecting an open circuit running turbine to the electrical system can cause serious damage to system components owing to excessive voltage. Caution must be exercised at all times to avoid electric shock.*
- *Stopping the turbine – this may be necessary to undertake battery maintenance. If possible stopping the turbine should be done in low windspeed conditions. The turbine can be slowed by rotating or orienting the tail fin upwind, this will slow the turbine sufficiently for it to be safely secured to the pole with rope. Avoid leaving the turbine tied up for any period of time, we recommend that the turbine either be covered to give protection from the weather or removed and stored in a dry location. The optional HRDX Controller incorporates a shutdown switch.*
- *Choose a calm day to install the equipment and consider other safety aspects. No attempt to repair the system should be made until the wind generator is restrained from turning.*

- *The Windcharger is fitted with ceramic magnets, which can be damaged by heavy handling. The main generator assembly should be treated with care during transit and assembly.*
- *It is essential to observe the correct polarity when connecting the Windcharger and all other components into an electrical circuit. Reverse connection will damage the Windcharger and incorrect installation will invalidate the warranty.*
- *The fuse supplied must be fitted to protect the system unless used in conjunction with a controller that is already fitted with a charge fuse.*
- *High winds – in high winds the windcharger's built-in thermostat may operate to prevent the generator overheating. In this mode the output will cease and the turbine will temporarily speed up until such time as the lower level temperature is reached and the generator is once again connected and charging. This may be seen to cycle in prolonged high winds particularly in high ambient temperatures. If safely accessible you may prefer to temporarily secure the turbine.*
- *The Rutland 913 Windcharger is suitable for sailing boats and some land based applications. When storm winds are forecast the turbine can be restrained to minimise wear and tear particularly when installed on land based applications where Furlmatic model windchargers are normally recommended. Note that where the manufacturer recommends a furling type windcharger should have been used the warranty is invalidated in cases of storm damage.*
- *If in doubt, refer to your dealer, a competent electrical engineer or the manufacturer.*

CHECK YOU HAVE RECEIVED

- 24 x No. 10x25mm special self-tapping screws
- 1 x fuse and fuse holder
- 1 x main generator assembly
- 6 x aerofoil blades
- 1 x nose cone + 3 x nylon fixing screws
- 1 x 6mm Allen key
- 1 x 2-way terminal block
- 2 x M10 buttoncap screws
- 2 x shakeproof washers
- HRS913 Regulator (USA "Mariner's Package" only)
- 600mm (23 1/2") Stainless Steel Tube (USA "Mariner's Package" only)

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

WHAT YOU WILL NEED

Tools

- Suitable wire stripper
- Small terminal screwdriver
- Large flat blade screwdriver
- Crosshead screwdriver

Other Items You Will Need

- Mounting pole
- Cable
- Batteries
- Battery terminals
- Connector blocks (as determined by your total system)

Other Items You May Have Selected

- HRS913 Regulator or HRDX Charge Controller
- Cable
- Rutland 913 Marine Mounting Kit (Part No: CA-12/02)
- Rutland 913 Land Tower & Rigging Kit (Part Nos: CA-12/08 & CA-12/07)
- Short section of stainless steel tube to adapt into your own mounting design.
- Voltmeter & Ammeter

SITING THE WINDCHARGER

General Considerations

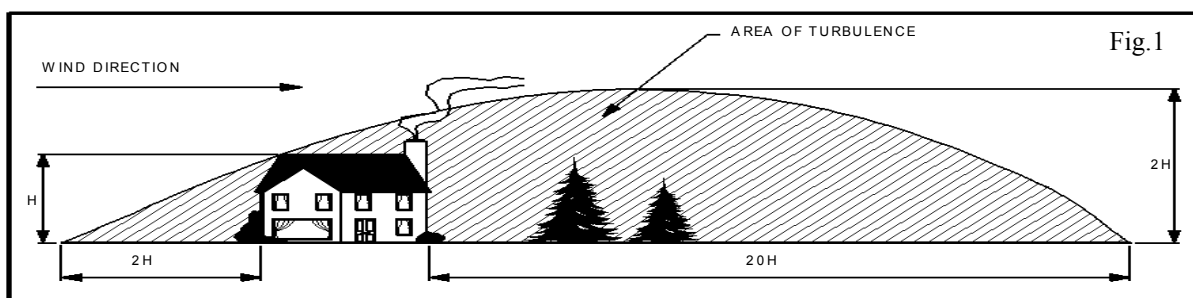
The location and height of the mounting pole or tower for your wind turbine will be the major factor in the overall performance of your system. The smooth flow of wind over land and water is often interrupted by a multitude of obstructions causing wind shear and turbulence.

Wind shear describes the interference between the fast moving upper air and the slow moving air close to the ground and the resulting decrease in average wind speed as one gets closer to the ground.

Turbulence is caused by the wind passing over obstructions such as moored boats, trees, and buildings.

Both wind shear and turbulence diminish with height and can be overcome simply by putting the turbine sufficiently high above them as shown in Fig 1. Windspeed decreases and turbulence increases where obstructions exist. Consider also that downwind obstructions can be as detrimental to performance as upwind obstructions.

It is therefore essential that the wind generator should be located in an area as free as possible from disturbed wind flow.



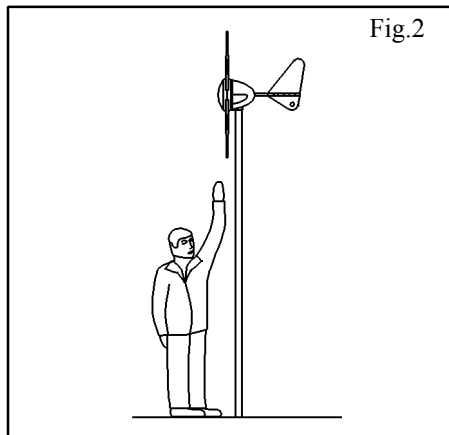


Fig.2

On Board Systems

The wind generator should be mounted in a safe position, a minimum of 2.3 metres (7.6 feet) above the deck and away from other obstacles which could interfere with the blades or tail assembly (Fig. 2).

The Rutland 913 Mounting Kit

(PartNo.CA-12/02) is available for deck mounting, or short sections of stainless steel tube of 1200mm (47") and 600mm (23") pre-drilled are also available for your own fabrication.

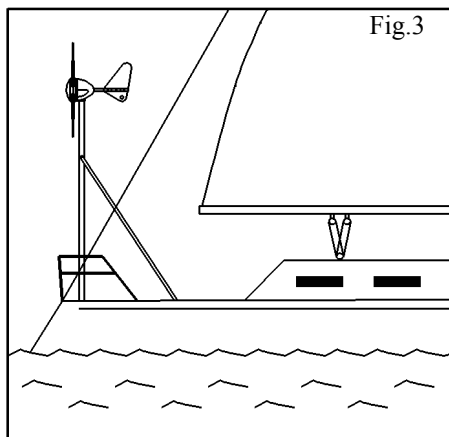


Fig.3

The Rutland 913 is designed to fit inside an aluminium or stainless steel tube with an internal diameter of 41mm (1⁵/₈"). **IMPORTANT:** The external diameter **MUST NOT** exceed 48.5mm (1⁷/₈), see Warning in Introduction.

Suitable tubes: Stainless Steel 1³/₄"16 SWG
Aluminium 1⁷/₈" 10 SWG

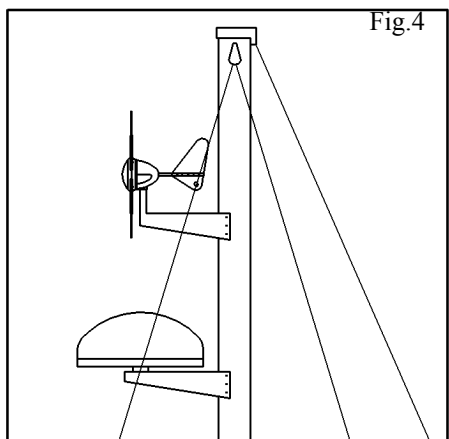


Fig.4

We suggest the following mountings according to preference and site conditions:-

- Push pit (Fig.3)

A suitable pole mounted to the deck with deck plates and guy ropes is the most popular method of mounting the Windcharger on yachts, eg. Rutland 913 Mounting Kit.

- Mizzen (Fig.4)

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

- River Boats (Fig.5)

A pivot pole is ideal for riverboats as the Windcharger can easily be raised and lowered.

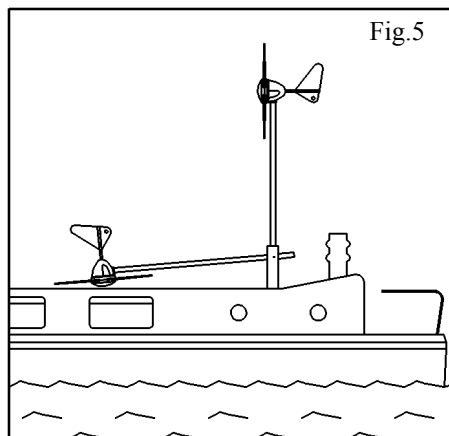
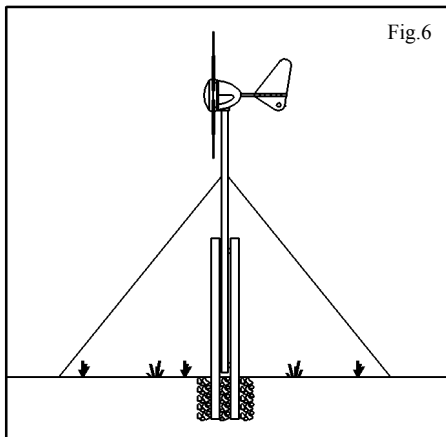
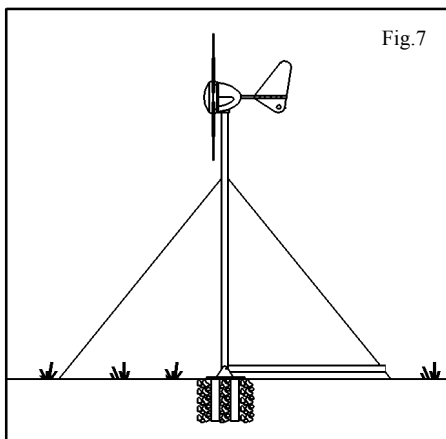


Fig.5

Land Based Systems



Centre pivoted pole



Base pivoted with gin pole

The Rutland 913 is suitable for some land based temporary and leisure applications.

We recommend the Furlmatic model windchargers for land based remote and exposed locations.

The Rutland 913 is designed to fit inside aluminium, stainless or steel tube with an internal diameter of 41mm. (1⁵/₈").

IMPORTANT: The external diameter **MUST NOT** exceed 48.5mm (1⁷/₈), see Warning in Introduction.

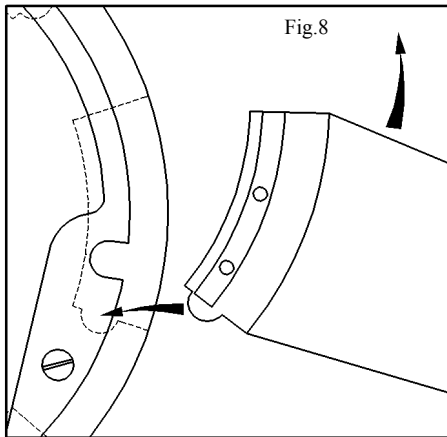
A suitable mounting pole can be erected using a 6.5 metre (21 feet) galvanised (medium) tube. The tube must be supported by a minimum of four guy lines. The attachment points for the guy lines to the tower should be securely fixed to the tower.

- The guy wires should be a minimum of 4mm (0.16") in diameter.
- The shackles should be a minimum of 5mm (0.20") in diameter.
- Rigging screws should be a minimum of 5mm (0.20") in diameter.
- All items should be galvanised or stainless steel for protection against corrosion.
- Where guy lines are looped, the loop must incorporate a thimble and be fitted with a minimum of three rope grips.
- All ground fixings must be made suitable according to the terrain.

We suggest pivot type towers as these allow for easier installation and lowering for access to the wind generator. Two forms of pivot tower are suggested in Figs 6 & 7.

A base-hinged 6.4m tall Land Tower Kit (Part No:CA-12/08) and Rigging Kit (Part No:CA-12/07) are available from Marlec.

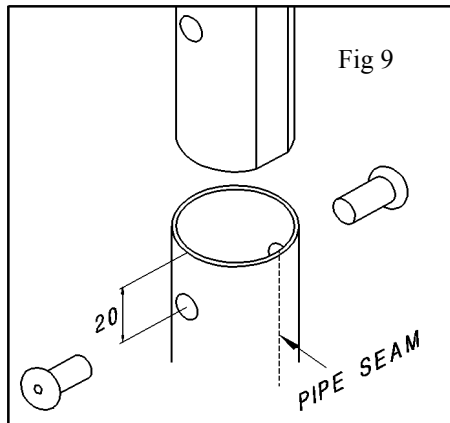
ASSEMBLY AND INSTALLATION OF THE WINDCHARGER



Blade Assembly (Fig.8)

1. Place the generator assembly on a flat surface hub-side down.
2. Position blade as shown. **The blades will only fit one way round.** Insert the protrusion at the trailing edge of the blade root fixing first into socket to align with the corresponding recess in the blade socket. The blade can then be easily inserted with a lever action. Gentle assistance with a soft-faced mallet may be required.
3. **Four screws are required for each blade.** Secure each blade with two special self-tapping screws provided by inserting each in turn through the cutout in the nacelle, rotating the generator each time until the holes align. Caution!- It is essential that all 4 screws are fitted!
4. Fit the remaining blade screws from the front of the generator hub.
5. Check tightness of all screws. (Do not over-tighten).
6. Fit the plastic nose dome in position on the front of the generator hub and secure in place with the three nylon screws provided.

Alternatively the blades and nose dome can be fitted after mounting the generator assembly to the tower.



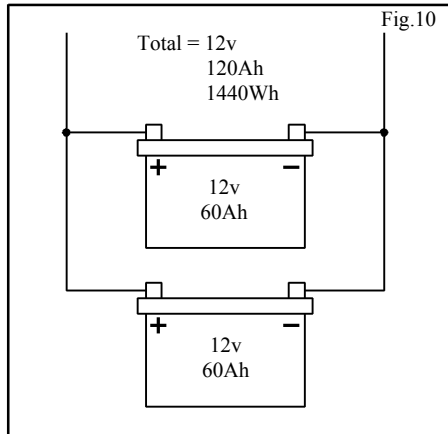
Tower Preparation (Fig.9)

Having selected a suitable pole from the guidelines on pages 6 and 7:

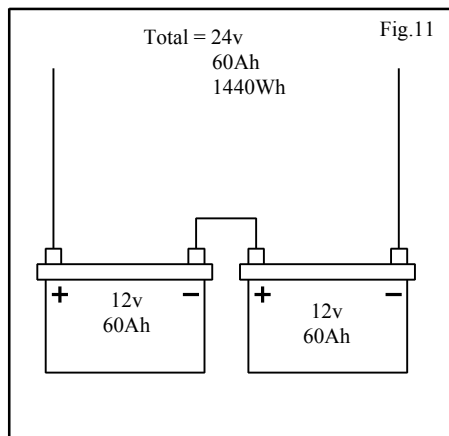
1. The post adapter fitted to the 913 is designed to fit inside a standard 41mm (1 $\frac{5}{8}$ ") internal diameter tube. The adapter is provided with a flat on one side to clear the weld seam on seamed pipe.
2. Mark and centre-punch two positions diametrically opposite, at 90° to the pipe seam if necessary, 20mm (*NOTE: Use metric measurements for this operation*) from top of the tube.
3. Drill two holes 10.5mm (*NOTE: Use metric measurements for this operation*) in diameter on centre-punch positions.

Note: When using the Rutland 913 Mounting Kit, items 2 and 3 can be ignored as the unit is pre-drilled.

BATTERIES



In parallel to increase amp hours



In series to increase voltage

Leisure/Deep Cycle batteries are specifically designed for good performance in terms of charge/discharge cycles. Batteries are the most important part of your battery charging system and should be sized according to your load requirements and 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.

Permanent connections should always be made to the battery terminals. Never use crocodile clips or similar devices. Battery terminals should be well greased with petroleum jelly or similar.

We strongly recommend that one of the voltage regulators available from Marlec is fitted to prevent batteries becoming overcharged in strong winds and is essential with gel/sealed batteries.

Batteries may be linked as shown in the figures 10 and 11. It is essential to observe polarity as follows:

Red is + Positive
Black is - Negative

CABLE SPECIFICATION

The cable used for connection of the Windcharger to the batteries should be in accordance with table 1. The use of a smaller cable than recommended will reduce the performance of the charging system.

Cable and connectors are available from your dealer or the manufacturer.

Cable Run (m)	Cable Size			
	12V		24V	
	mm ²	AWG	mm ²	AWG
0-20	2.5	13	1.5	15
21-30	4	11	2.5	13
31-45	6	9	4	11
46-80	10	7	6	9

ELECTRICAL CONNECTION & FITTING TO THE TOWER

1. Run the cable selected (see Table 1) down the inside of the pole.
2. Select one of the 2 basic wiring systems on page 12 and follow the manual provided with the voltage controller.
3. Fit the in-line fuse and fuse holder in the circuit where the HRS type or no regulator is used. *It is essential that a charge fuse is fitted but note that some Marlec controllers incorporate one negating the need for a separate fuse.* Cut the fuse holder cable and strip back the ends to allow connection in the circuit.

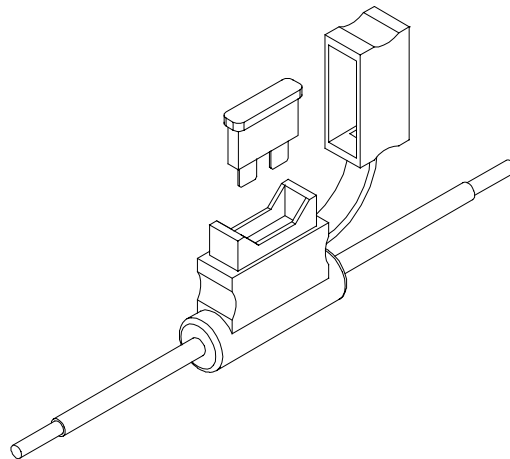


Fig. 12
20A Fuse
and Fuse holder

4. Connect the wind generator flying leads to the cable protruding from the tower using the connector block supplied, taking care to observe polarity. Connect the windcharger + to cable + and windcharger – to cable –

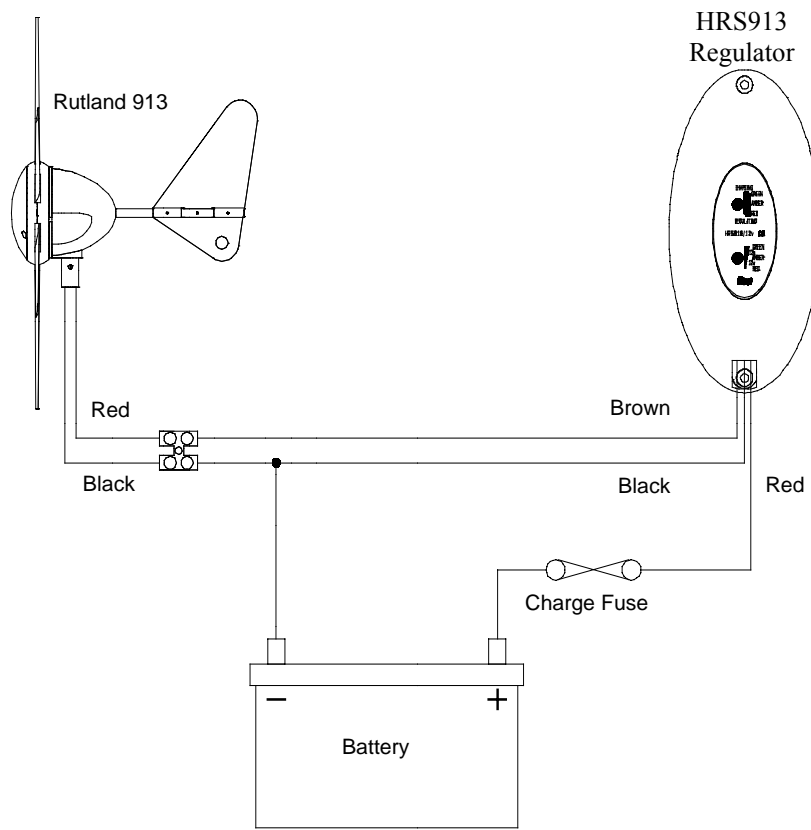
Red is + Positive
Black is - Negative

5. Wrap the connection with insulation tape to secure/protect from environment. Alternatively join the cables using a latching-type plug and socket.
6. Locate the wind generator into the tower whilst gently easing the cable from the tower base to ensure the cable is not trapped. Secure the wind generator to the tower using the button cap screws and shake proof washers provided, tighten using the 6mm Allen key provided.

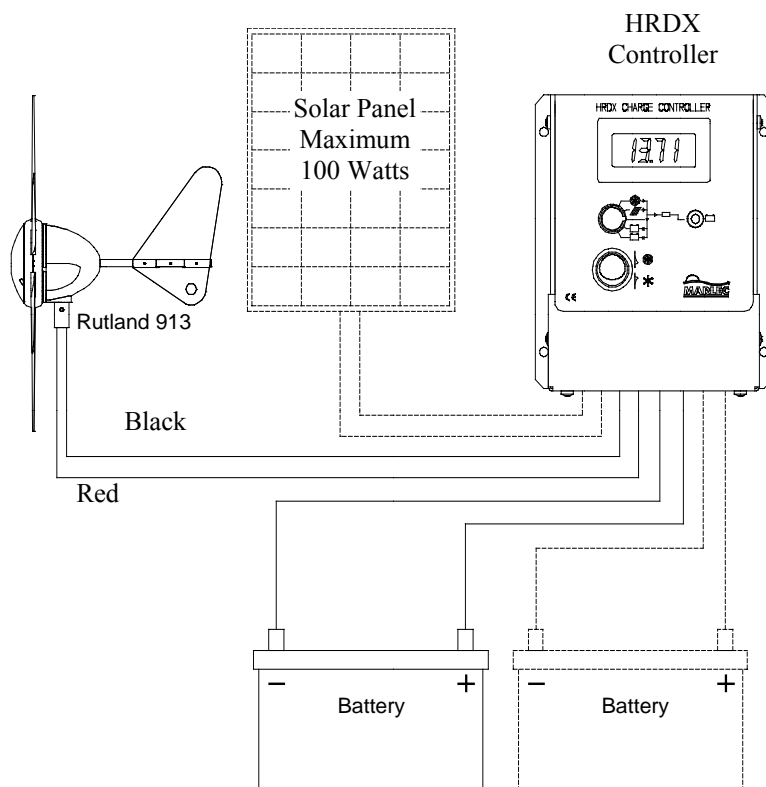
FINAL MECHANICAL CHECK

1. Check the tightness of the blade fixing screws and generator mounting screws.
2. Check free rotation of the hub and yaw axis.

Rutland 913 with HRS913 Regulator Wiring Diagram



Rutland 913 with HRDX Controller

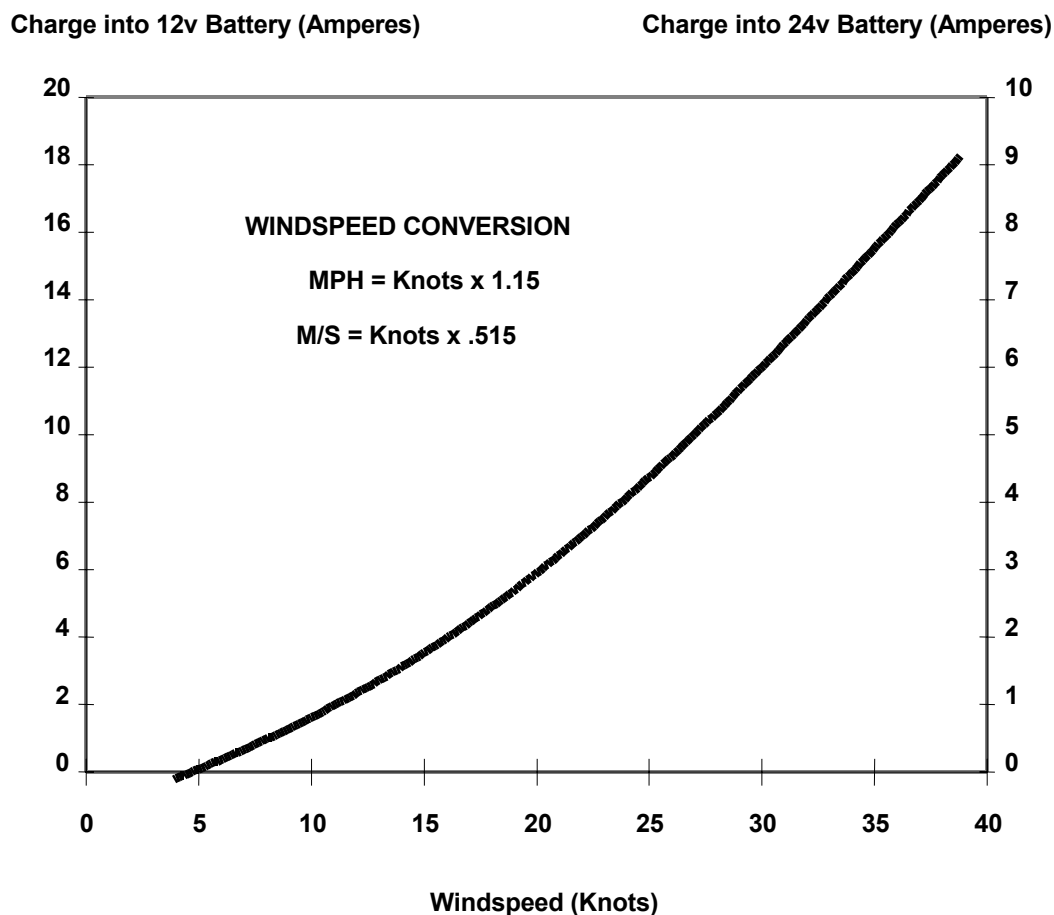


UP AND RUNNING

- Before raising and securing the wind generator, check that:
 1. All final mechanical checks have been made.
 2. The cable is not trapped.
 3. All electrical connections are secure and safe.
- The wind generator can now be raised into position.
Take care to avoid all moving parts when raising and lowering the wind generator.
- When raised, secure the structure firmly in an upright position. The performance of your Windcharger can be impaired if the pole is not vertical.

SPECIFICATION AND PERFORMANCE

The curve shown below is for ideal, non-turbulent wind conditions; this may not be achieved in some installations.



INSPECTION AND MAINTENANCE

The Rutland 913 requires no scheduled maintenance but an annual inspection should be carried out to monitor the general condition of the system to ensure the electrical and mechanical integrity and safety of the system.

WARNING! Before inspection, the turbine should either be lowered to the ground or tied to prevent the generator from turning. To stop the generator from turning proceed as follows:

1. Either rotate the switch to stall mode on the HRDX Controller if used OR turn the wind generator out of the wind (180°) using the tail, a hole is provided in the tail fin to assist in this. The generator will gradually slow down.
2. Tie a blade to the mounting pole to prevent it from rotating.

Whilst the generator is stationary, the following routine checks should be performed:

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 condition.
5. Check the tension of the guy wires if applicable. The tension of guy wires should be checked frequently during the first year.
6. The unit can be wiped with a mild detergent and rinsed with water to remove dirt and debris.

Note: The Windcharger is designed for continuous running to achieve maximum resistance to water ingress, should the unit be restrained for any extended period it is recommended that it be covered.

TROUBLESHOOTING

In the unlikely event that your Rutland 913 should develop a defect, the turbine should first be tied to prevent the blades from turning to perform the static tests below. (Follow the procedure described in the Inspection and Maintenance section) It will be necessary to let it run for the tests to check for power production.

1. **Read the Electrical Connection and Up and Running** sections and be satisfied that your system complies.
2. **Is there sufficient wind?** The Rutland 913 needs 5 knots wind speed to start charging. The wind speed across the turbine blades may be greatly reduced in a marina or built-up area compared with the reading on a masthead anemometer or weather reports.
3. Static Tests:
 - **Is the battery in good condition?** Check the voltage and electrolyte level of each battery.
 - **Check electrical continuity** throughout the system, especially corrosion and poor connections in cable joins and connector blocks.
4. Running Tests:
 - **Check for power output from the windcharger, following this procedure:**
 - A. Set a digital multimeter to DC Amps, scale of between 5 and 10 if possible. Connect the meter positive (+) probe to the wind generator output positive cable and the meter negative (-) to the regulator input positive. Provided there is sufficient wind there should be a current reading. This establishes that power is being delivered.
 - B. Using the same multimeter setting as above measure between the regulator to battery + and the battery +. Provided there is sufficient wind there should be a current reading. This establishes if power is passing through the regulator.
 - C. If both above are unsuccessful set the multimeter to DC Volts. Disconnect the wind generator from the regulator and connect the meter + to the wind generator + and the meter - to the wind generator -. Provided there is sufficient wind there should be a variable voltage reading according to the speed of the wind seen at the wind turbine. This will establish if the wind generator is able to deliver power or not.
 - D. If tests A and C are successful but test B fails to produce results connect the wind generator directly to the battery. Set the digital multimeter to DC Amps and measure power between the wind generator + and the battery +. If a reading is measured, providing there is sufficient wind, then the regulator is faulty.
 - E. If the wind turbine fails to deliver any current or open circuit V reading undertake the further tests below.

5. Mechanical inspection. It may be necessary to remove the windcharger from its pole for the following tests.

- **Check the brushes and slipring for wear or damage.** To inspect the brushes, remove the nacelle by removing the three fixing screws and slide the nacelle backwards towards the tail fin. The brushes and slipring can be inspected by removing the four self-tapping screws holding the brush holder assembly in place. Remove any black deposits from slipring with emery paper. Heavy deposits and reduced power indicate a possible reverse connection to the battery (see Page 10).
- **Check hub for free rotation with generator disconnected from battery.** If the hub does not rotate freely, check for a possible short circuit in the wiring. If no wiring fault is found refer to your dealer or manufacturer.

If the above checks have identified a need for spare parts or failed to identify the problem you should contact Marlec who can advise you of your nearest distributor in their world wide network. In the first instance we recommend that you contact the company from whom the product was originally purchased.

If in doubt, refer to your dealer or manufacturer.

For your future reference we recommend you note the following:

Serial Number:

Date of Purchase:

Date of Installation:

Type of Regulator:

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 user modification to the product or 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.

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