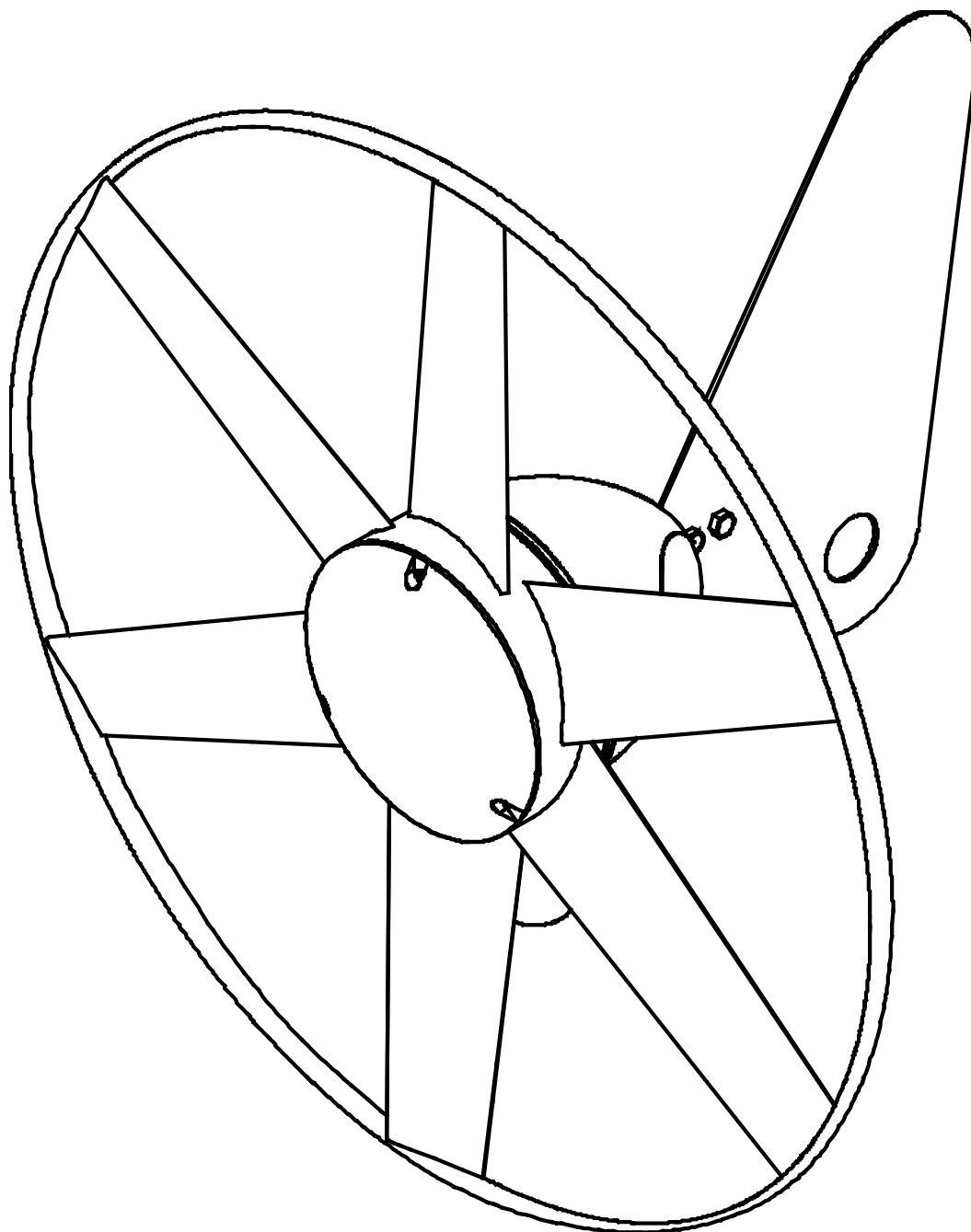


Rutland 503 Windcharger

Owner's Manual



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INTRODUCTION

This manual contains important information concerning your Rutland 503 Windcharger and its installation and operation.

It is strongly recommended that you read this manual and familiarise yourself with its contents before installing and operating the Windcharger system.

The Rutland 503 Windcharger is designed to provide a direct current (DC) power supply via a battery bank for 12V equipment, lighting, etc. It is intended for use on small to medium size sailing vessels and can be used for temporary installation on caravans and motorhomes. 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 and Maintenance sections.

GENERAL GUIDELINES & WARNINGS!

- *Mounting pole outside diameter MUST NOT exceed 38.1mm 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 or rim 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. Avoid applying a short circuit to the Windcharger particularly in high winds. If a short circuit is necessary first slow the turbine as described below. 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*
- *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 - the Rutland 503 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 high windspeed site 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

- 1 x main generator assembly
- 1 x Tail Fin
- 2 x M8 x 16 Button Cap Screws & Shakeproof Washers
- 2 x M6 x 12 Hex Head Screws, spring washers & plain washers
- 1 x fuse and fuse holder. Fuse Rating 7.5A.
- 1 x 2-way terminal block
- 1 x 5mm Allen Key

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

WHAT YOU WILL NEED

Tools

- Suitable wire stripper
- Small terminal screwdriver
- 10mm Spanner or Socket

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

- HRS503 Regulator or HRDX Charge Controller
- Cable
- Rutland 503 Marine Mounting Kit (Part No: CA-12/01)
- Rutland 503 Land Tower & Rigging Kit (Portable) (Part Nos: CA12/12 & CA-12/13)
- Short section of stainless steel tube to adapt to your own mounting design.
- Voltmeter & Ammeter

SITING THE WINDCHARGER

General Considerations

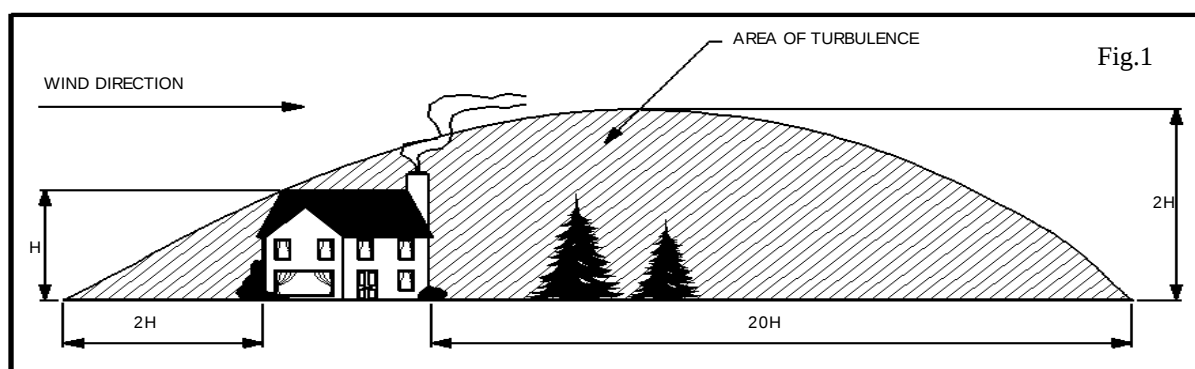
The location and height of the mounting pole or tower for your wind turbine will be the major factor in the overall performance of your system.

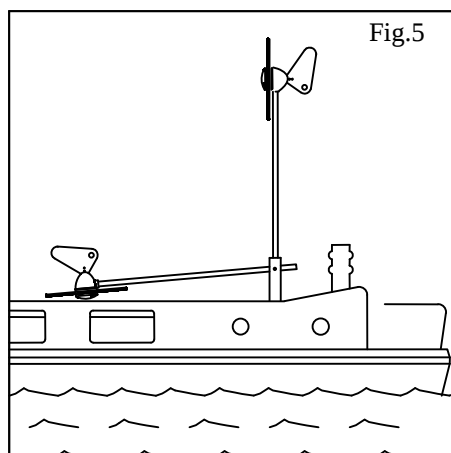
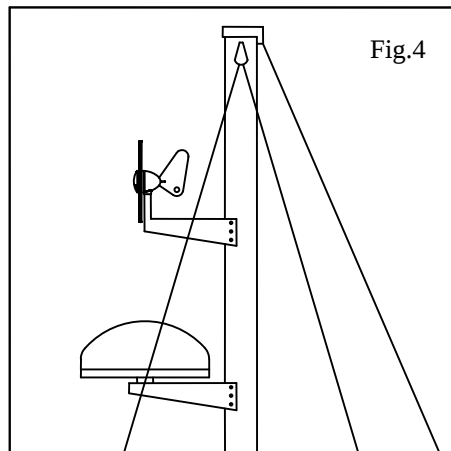
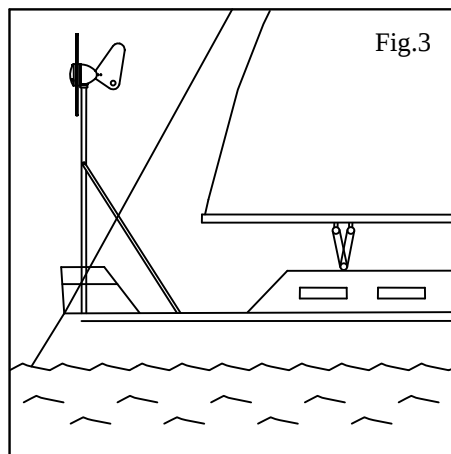
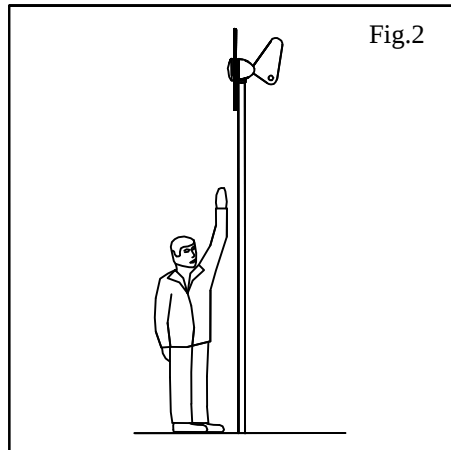
The smooth flow of wind over land and water is often interrupted by a multitude of obstructions causing wind shear and turbulence.

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.

It is therefore essential that the wind generator should be located in an area as free as possible from disturbed wind flow. Bear in mind that downwind obstructions can be as detrimental to performance as upwind obstructions (Fig.1).





On Board Systems

The wind generator should be mounted in a safe position, a minimum of 2 metres (6.5 feet) above the deck and away from other obstacles which could interfere with the blades or tail assembly (Fig. 2).

The Rutland 503 Mounting Kit (Part No: CA-12/01) is available for deck mounting or short sections of stainless steel tube of 500mm & 1m pre-drilled are available to adapt to your own fabrication.

The Rutland 503 is designed to fit inside an aluminium or stainless steel tube with an internal diameter of 31.7mm (1 $\frac{1}{4}$ ""). The external diameter must not exceed 38.1mm (1 $\frac{1}{2}$ ""), see Warnings! Suitable tube: 1 $\frac{1}{2}$ " 10 SWG aluminium or Stainless Steel 35mmx1.5mm.

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

- Pushpit (Fig.3)

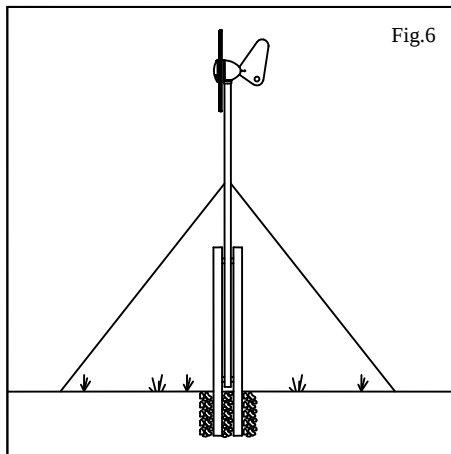
A suitable pole mounted to the deck with deck plates and rigid guys is the most popular method of mounting the Windcharger on yachts, e.g. Rutland 503 Mounting Kit.

- Mizzen (Fig.4)

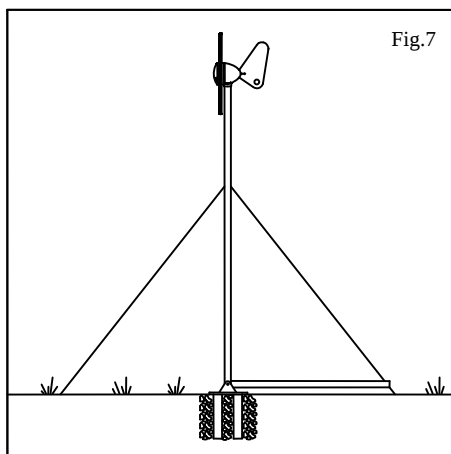
Mizzen mounting is suitable on larger yachts, taking advantage of greater wind flow the higher the wind turbine is mounted.

- River Boats (Fig.5)

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



Centre pivoted pole



Base pivoted with gin pole

Land Based Systems

The Rutland 503 is designed to fit inside an aluminium or stainless steel tube with an internal diameter of 31.7mm (1¹/₄"). Max external diameter 38.1mm (1¹/₂").

A suitable mounting pole can be erected using a 6.5 metre (21 feet) length of 50mm (2") galvanised water pipe adapted down to 31.7mm for a minimum length of 500mm at the top section.. The tube must be supported by a minimum of two sets of three guy lines.

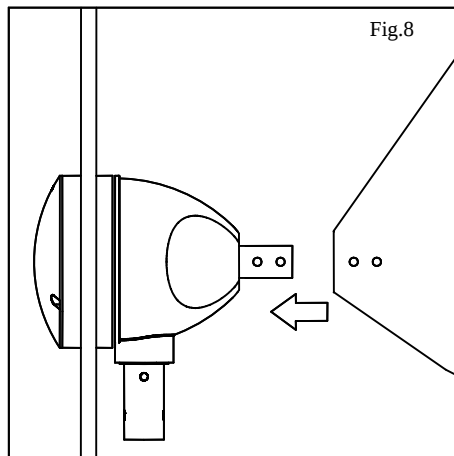
The attachment points for the guy lines to the tower should be securely fixed to the tower.

- The guy wires should be a minimum of 3mm in diameter.
- The shackles should be a minimum of 5mm in diameter.
- Rigging screws should be a minimum of 5mm 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 portable Land Tower and Rigging Kit is available from Marlec.

Part Nos: CA-12/12 & CA-12/13



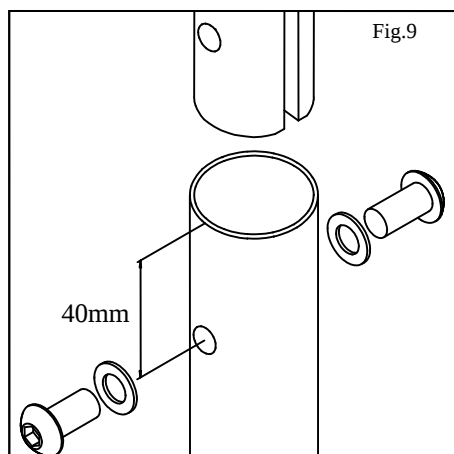
ASSEMBLY AND INSTALLATION OF THE WINDCHARGER

Tail Assembly (Fig.8)

1. Place the generator assembly on a flat soft surface, Nose Cone down.
2. Fit the tail into position on the protruding portion of casting and against the Nacelle, ensuring the holes in the casting align with the corresponding holes in the tail fin.
3. Secure the Tail fin in position with the 2 M6 screws and washers, ensuring the plain washers are against the tail fin.
4. Check tightness of all screws. (Do not over-tighten).

Tower Preparation (Fig.9)

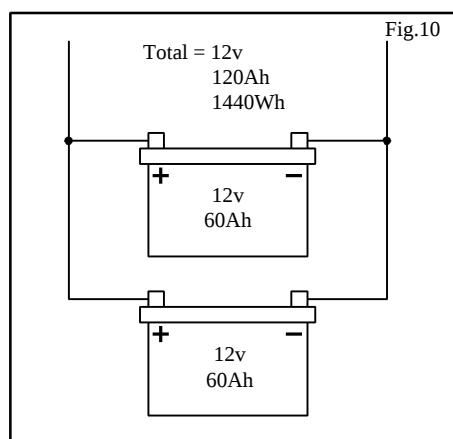
Having selected a suitable pole from the guidelines on pages 6 and 7:



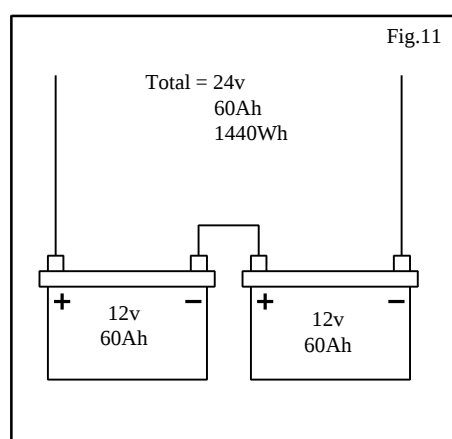
1. The post adapter fitted to the 503 is designed to fit inside a standard 31.7mm internal diameter tube. Max external diameter 38.1mm (1½").
2. Mark and centre-punch two positions diametrically opposite, at 90° to the pipe seam if necessary, 40mm from top of the tube.
3. Drill two holes 8.5mm in diameter on centre-punch positions.

Note: When using the Rutland 503 Mounting Kits, items 2 and 3 can be ignored, as these are pre-drilled.

BATTERIES



In parallel to increase amp hours (Fig.10).



In series to increase voltage (Fig 11).

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 charge regulators available from Marlec is fitted to prevent batteries becoming overcharged in strong winds and is essential with gel and 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

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

Table.1

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.

ELECTRICAL CONNECTION & FITTING TO THE TOWER

1. Run the cable selected 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 regulator or controller. Fit the fuse according to the instructions "Assembly of the In-Line Fuse Holder." It is essential that a charge fuse is fitted but note that some Marlec Controllers incorporate one negating the need for a separate fuse.
3. 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 the cable + and windcharger – to cable –

Red is + Positive

Black is - Negative

4. Wrap the connection with insulation tape to secure/protect from environment. Alternatively join the cables using a latching-type plug and socket.
5. 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 buttoncap screws and shakeproof washers provided, tighten using the 5mm Allen key provided.

FINAL MECHANICAL CHECK

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

ASSEMBLY OF THE IN-LINE FUSE HOLDER

Note: It is not necessary to fit the in-line fuse holder if a HRDX controller is to be used.

Select a suitable position to mount the in-line fuse, this should be in the positive lead between the regulator and the battery.

Each Pack consists of: -

- Item 1 & 2 One Plastic Holder.
- Item 3 Two Electrical Connections.
- Item 4 One Spring.
- Item 5 One Fuse.

1. Insert the positive wire from the battery and regulator into each half of the plastic holder (1 & 2)[See fig.12].
2. Place the spring over the cable inside the longer (1) of the two plastic holders [See fig.12].
3. Bare a small amount of wire from the ends of the cable, twist the copper wire crimp and solder the electrical connections (3) onto the ends.
4. Insert the fuse and twist the two halves of the holder together to complete the electrical circuit [See fig.13].

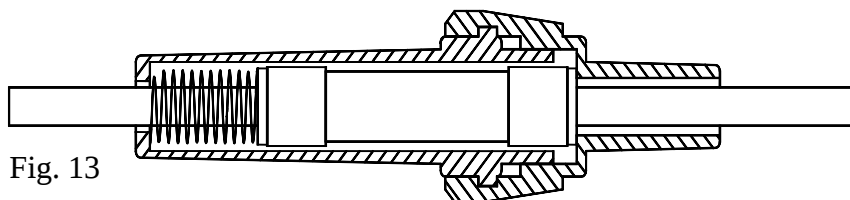


Fig. 13

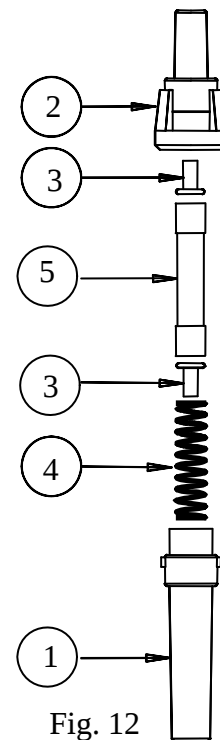
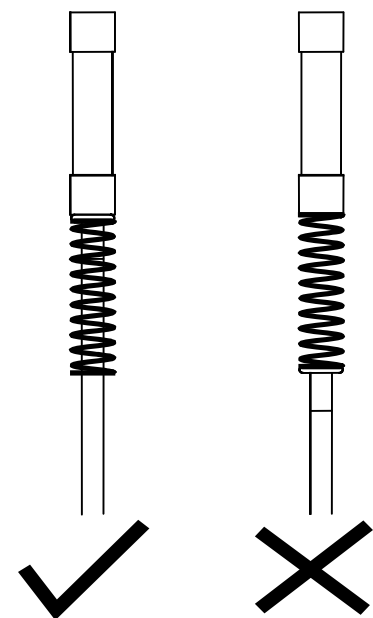
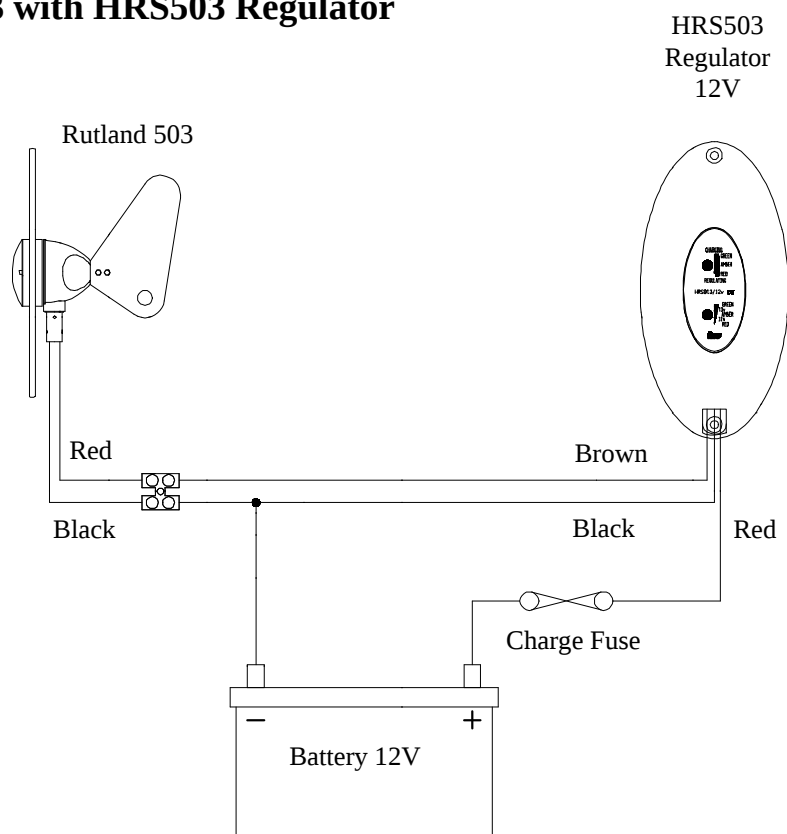


Fig. 12

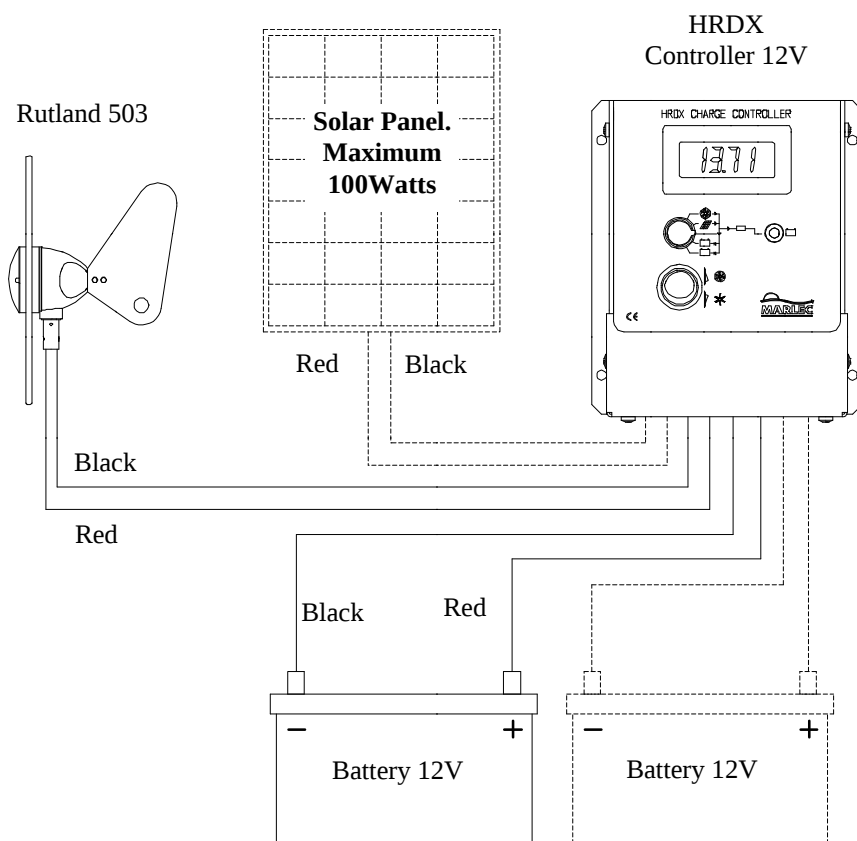


Note: When fully assembled please ensure the electrical connections make direct contact with the fuse.

Rutland 503 with HRS503 Regulator



Rutland 503 with HRDX Controller

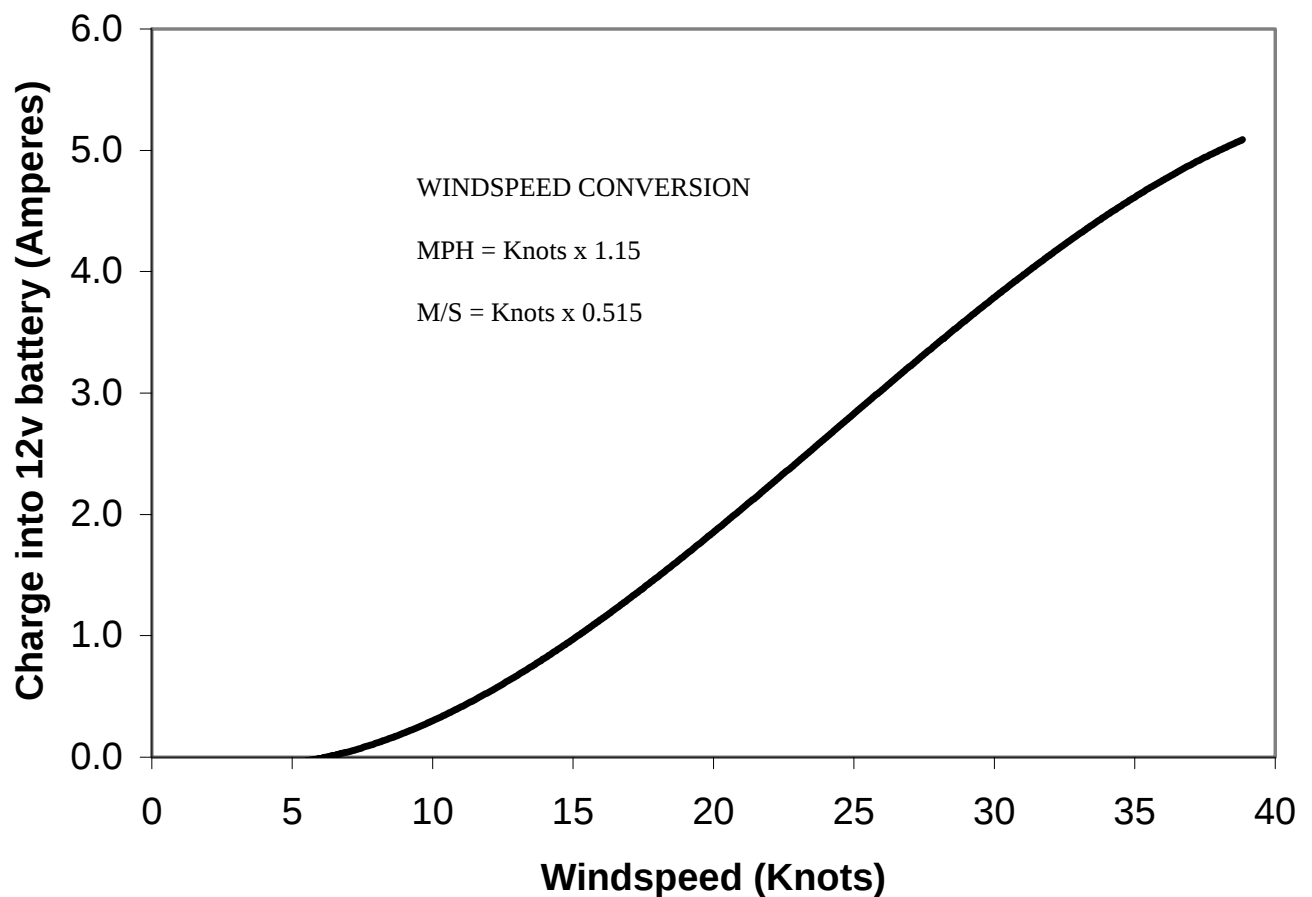


UP AND RUNNING

- 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 503 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) 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 eventually 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 all nuts, bolts and screws for tightness.
 - 2) Check the yaw axis for free rotation.
 - 3) Check tower assembly for condition.
 - 4) Check the tension of the guy wires if applicable. The tension of guy wires should be checked frequently during the first year.
 - 5) 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 503 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 503 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 up to 5A or less if possible. Connect the meter positive (+) probe to the wind gen 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 gen + and the meter – to the wind gen -. 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 gen directly to the battery. Set the digital multimeter to DC Amps and measure power between the wind gen + 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 tail fin and the plastic nacelle. The brushes can be inspected by removing the caps from the brush holders & withdrawing the brushes. Heavy deposits on the slipring and reduced power indicate a possible reverse connection to the battery.

- **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 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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