

**The Rutland Windcharger
910 Series Owners Manual**

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1. INTRODUCTION

This manual contains important information concerning your 910 Series Windcharger and its operational characteristics.

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

The 910 Series Windcharger provides a direct current (DC) power supply for various applications, including remote dwellings, telecommunication and navigation systems through a battery bank.

WARNING!

- 1. When turning, the Windcharger is capable of generating very high voltages. Extreme caution must be exercised at all times to avoid electrical shock.***
- 2. No attempt to repair the system should be made until the wind generator is restrained from turning.***
- 3. The Windcharger is fitted with ceramic magnets which can be easily damaged by heavy handling. The main generator assembly should be treated with care during transit and assembly.***
- 4. It is essential to observe the proper polarity when connecting the Windcharger into an electrical circuit. Reverse connection will damage the Windcharger and incorrect installation will invalidate the warranty.***

Please note that the 15amp fuse supplied must be fitted to protect the machine.

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

2. CHECK YOU HAVE RECEIVED

1. 24 No 10x25mm special self tapping screws
2. 1 fuse and fuse holder
3. 1 two way terminal block
4. 1 main generator assembly
5. 1 tail fin
6. 6 aerofoil blades

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

3. WHAT YOU WILL NEED

Tools

1. 10mm spanner or socket
2. Suitable wire stripper
3. Small terminal screwdriver
4. Large flat blade screwdriver (FM 910 only)
5. Grease
6. Phillips (cross head) screwdriver

Other Items

1. Mounting pole
2. Cable
3. Batteries
4. Battery terminals
5. Connector blocks (as determined by your total system)

Other Items You May Have Selected

1. Shunt regulator
2. Charge splitter
3. Low voltage cutout.
4. Voltmeter and Ammeter

4. PRE-ASSEMBLY

(Land based systems 910 STD & FM)

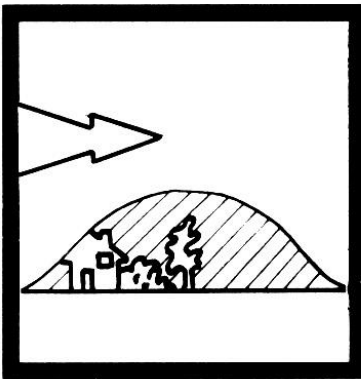


figure 1

Site Consideration

The location and height of the tower for the wind generating system can be the major factors in the overall system performance. The smooth flow of wind over land is often interrupted by a multitude of obstructions including 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 trees and buildings. However, both wind shear and turbulence diminish with height and can be overcome simply by putting the machine sufficiently high above them.

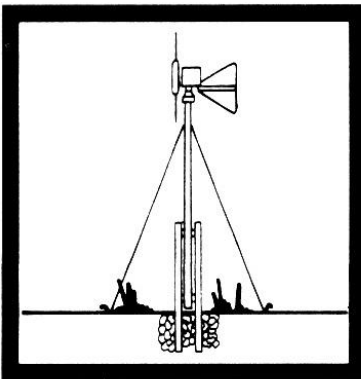


figure 2a

It is therefore recommended that the wind generator should be located in an area as free as possible from disturbed wind flow, caused by trees buildings and other similar structures. Bear in mind that downwind obstructions can be as detrimental to performance as upwind obstructions. (Figure 1)

Tower Consideration

The WG 910 Standard and FM910 models are designed to fit over a 61mm outside diameter steel tube of at least 5 mm wall thickness (Standard 2" bore water pipe).

You may choose according to preference and site conditions between:

- Pivot pole supported by guy ropes (Figure 2a)
- A permanent tower supported by guy ropes (2b)

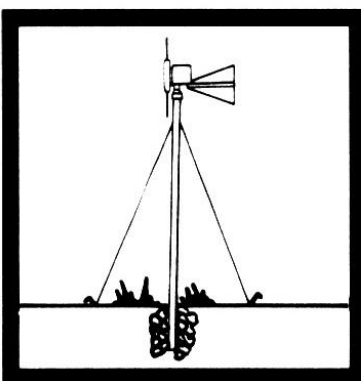


figure 2b

Suggested Tower Constructions

A suitable mounting tower can be erected using a 6.5 metre (21 feet) length of 61mm O/D; (2") I/D galvanised heavy duty water pipe to British Standard No. 1387. The tube must be a continuous length and be supported by a minimum of four guy lines as shown in drawing .

The attachment points for the guy lines to the tower should be securely welded after removing local areas of galvanised material. Protection should be reinstated to these areas when welding has been completed.

- The guy wires should be a minimum of 4mm in diameter.
- The shackles should be a minimum 5mm.
- Rigging screws should be 5mm in diameter.
- All items should be galvanised or stainless steel for protection against the weather.

Where guy lines are looped, the loop must incorporate a thimble and be fitted with a minimum of three rope grips.

PRE-ASSEMBLY

(On Board Systems - 910 Marine)

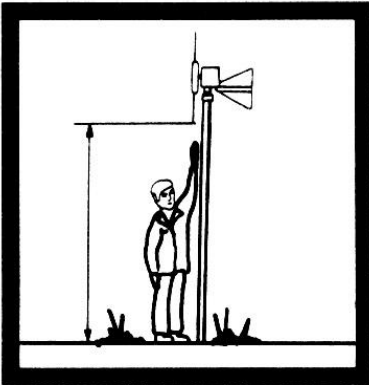


figure 3

Site Considerations

The wind generator should be mounted in a safe position, a minimum of 2.4 metres above the deck and away from other obstacles which could interfere with the blades or tail assembly. (*Figure 3*).

Care should be taken when choosing the position for the wind charger to reduce vibration in strong winds.

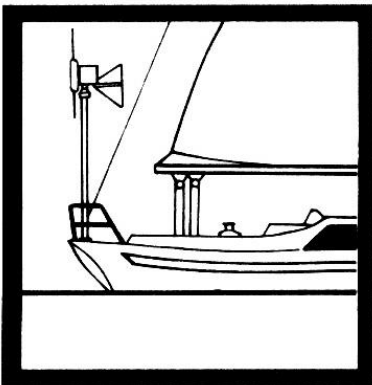


figure 4a

Tower Considerations

The WG910 Marine is designed to fit over 64mm (2½ inch) outside diameter aluminium tube of a minimum 5 mm wall thickness.

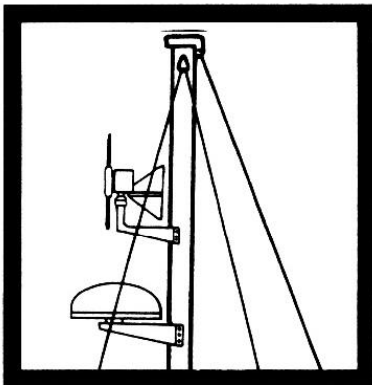


figure 4b

Suggested Tower Constructions

Figure 4a Pushpit

A suitable mounting pole of 3.0 metres (10 feet) in length and 64mm (2½ inch) diameter aluminium tube mounted to the deck with a deck plate and guy ropes is the most popular method of mounting the windcharger on yachts.

Figure 4b Mizzen

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

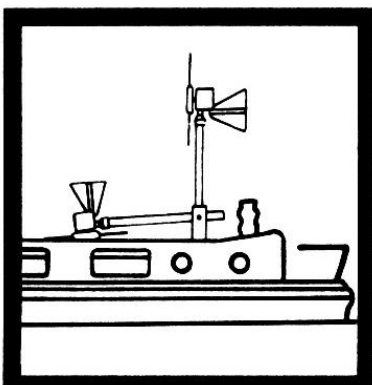


figure 4c

Figure 4c Pivot

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

PRE-ASSEMBLY (Batteries)

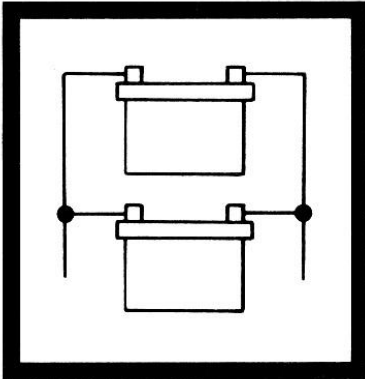


figure 5a

Leisure/Deep Cycle 12 volt batteries are specifically designed for good performance in leisure applications in terms of charge and discharge cycles. We recommend this type of battery or nickel cadmium type batteries in either 2 or 6 volt cells.

Linking two or more batteries

In parallel to increase storage capacity (amp hours) (*Figure 5a*).

In series to increase voltage (*Figure 5b*).

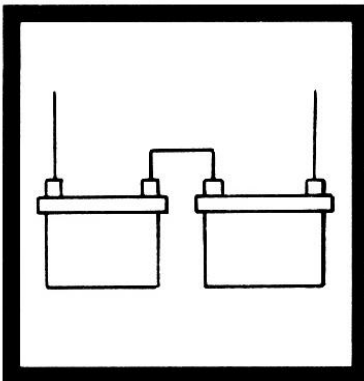


figure 5b

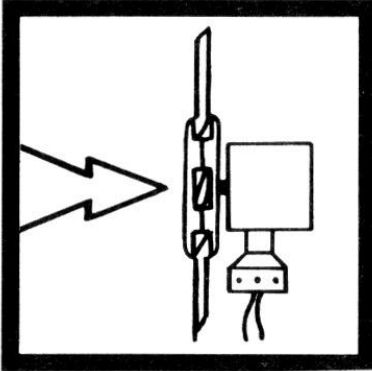
Permanent connections should always be made to the battery terminals. Never use crocodile clips or similar devices.

Battery terminals should be well greased with petroleum jelly or similiar.

PRE-ASSEMBLY (Cable Specification)

<i>Cable Run (m)</i>	<i>Cable Size(mm)</i>
01-20m	2.5 mm
21-30m	4.0 mm

5. ASSEMBLY AND INSTALLATION OF THE WINDCHARGER



1. Blade Assembly

1. Place the generator assembly on a flat surface hub-side down.
2. Position blade as shown in drawing (it is essential the blade is inserted the correct way round see *figure 6a*) push blade into socket until fully home.
3. Secure the blade using 2 special self-tapping screws through the holes provided.
4. Repeat procedure for the remaining blades.
5. Turn the machine over and secure blades from front using 2 further screws per blade.
6. Re check tightness of all screws.
7. The screws supplied have special threads for fixing into plastics, (do not over-tighten).

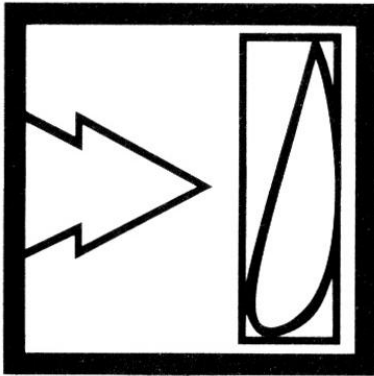


figure 6a

2. Install the cables from the tower head to the battery location. Do not connect to the battery. It may be necessary to drill a hole close to the bottom or the top of the pole to feed the cables through.
3. Position the wind generator assembly on the ground as near as possible to the tower on which it is to be mounted. Connect the two cables protruding from the main generator using the terminal block provided.

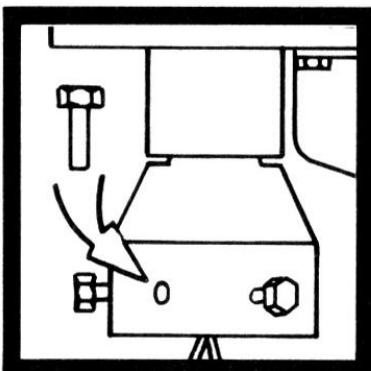


figure 6b

4. (a) Fitting Generator to the Tower (Standard and Marine Models)

The aluminium mounting casting is supplied with 6 holes tapped M6 and 6 screws (*see Figure 6b*).

1. Remove completely the 3 long screws and slacken back the 3 short screws sufficiently to mount the wind generator on top of its tower.

2. Grease all screws.
3. Tighten the 3 short screws to hold the wind generator firmly in place ensuring that it is seating right down on its tower.
4. Mark the positions of the three remaining tapped holes onto the post with a scribe.
5. Remove the wind generator and drill the tower with a 8mm diameter drill through the marked positions.

Do not attempt to drill the tower with the wind generator in position.

6. Reposition the windgenerator on its tower with the short screws slackened, such that the 3 drilled holes in the tower are in line with the vacant tapped holes in the wind generator casting.
7. At the same time ease the main output leads down the middle of the tower, ensuring that the conductors are not trapped between the mounting casting and the tower.
8. In this position, insert each of the long screws and fully tighten ensuring that they pass through the drilled holes in the tower.
9. The 3 short screws must now be fully tightened.

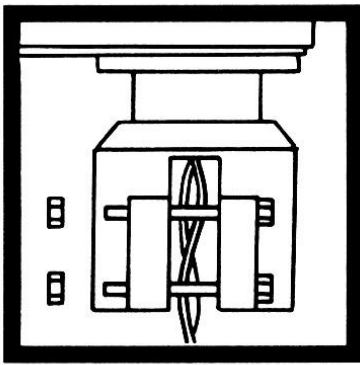


figure 7a

4. (b) **Fitting Generator to Tower (Furlmatic)**
(Figure 7a)

1. Ensure that the 4 clamping bolts in the tower mounting casting are fully slackened.
2. Push the appropriate end of the tower onto the mounting casting of the main generator assembly.
3. At the same time ease the main output leads down the middle of the tower, ensuring that the conductors are not trapped between the mounting casting and the tower.
4. With the generator assembly fully engaged on the tower, secure with the 4 clamping bolts on the mounting casting, using the 10mm spanner.

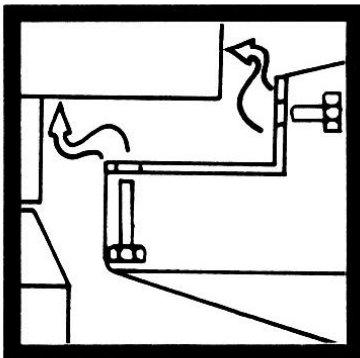


figure 7b

5. (a) **Tail Fin Assembly (Standard and Marine Model) - (Figure 7b)**

1. Remove the 4 M6 bolts
2. Position the tail fin and replace the bolts through the tail fin mounting holes and tighten using the 10mm spanner.

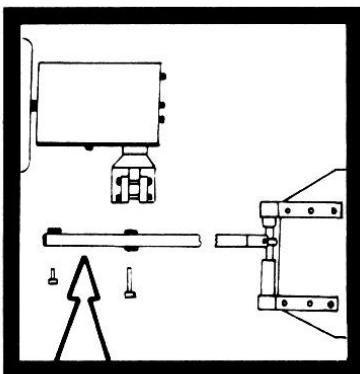


figure 7c

5. (b) **Tail Fin Assembly (Furlmatic) - (Figure 7c)**

1. Remove the lid on main housing.
2. Remove the 2 M6 nuts and screws nearest the front (as shown in drawing c)
3. Remove the M6 nut, washer and bolt from tail.
4. Position tail assembly and replace 3 M6 screws (Tighten front two before fitting nuts)
5. Fit M6 nuts and tighten using 10mm spanner.
6. Replace lid.

6. Final Mechanical Check

Carry out the following checks to ensure that the system is properly assembled.

1. Check that the areofoil blades are inserted the correct way round
2. Check the tightness of all nuts, bolts and screws
3. Furlmatic Only: Check the tail fin for free movement

Do not raise the wind generator at this stage. Output voltages can increase to a dangerous level if the wind turbine is running without connection to the battery.

WARNING!

If whilst the windcharger is running the battery is disconnected the output volts from the generator can increase to a dangerous level. It is therefore recommended that the turbine be stopped before connecting or disconnecting the batteries. The windcharger can be stopped by turning the tail fin into the wind until the blades are stationary and can be secured to the pole with a bungy. If a pivot type mounting is used the generator can be lowered to a horizontal position.

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

6. ELECTRICAL CONNECTION

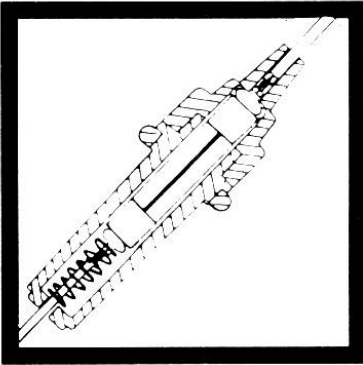


figure 7d

Connect the two cables from the tower to the battery bank observing the correct polarity using suitable connectors. Refer to Section 4.
PRE-ASSEMBLY (Batteries).

RED to POSITIVE + BLACK to NEGATIVE —

It is essential the 15A fuse and fuseholder supplied is fitted at this stage!

Suggested Wiring Diagrams

Select the one most appropriate for your system (If in any doubt consult dealer or manufacturer).

Typical caravan or remote power installation (Figure 8a)

Typical wind/solar hybrid installation (Figure 8b)

Typical marine wind/diesel or petrol hybrid installation with charge splitter. (Figure 8c)

Shunt Regulator

The shunt regulator protects batteries from overcharge by sensing battery terminal voltage. On reaching maximum voltage the unit diverts excess power from the battery which is dissipated in the form of heat. This method of regulating ensures that the wind generator remains “on load” at all times.

Connect two cables from the battery to the shunt regulator observing the correct polarity. The length of wire should be as short as possible and be of suitable size to carry 15 amps continuously thus keeping voltage drop to a minimum.

CAUTION

When connecting the Shunt Regulator the heat sink (black aluminium part) will be at positive potential (LIVE) therefore care should be taken not to inadvertently allow the negative battery cable to make contact with the heat sink as this will effectively short circuit the battery, with the associated risk of fire and burns. Thus when connecting the regulator to the battery always connect the negative lead first and then the positive lead.

Figure 8a.

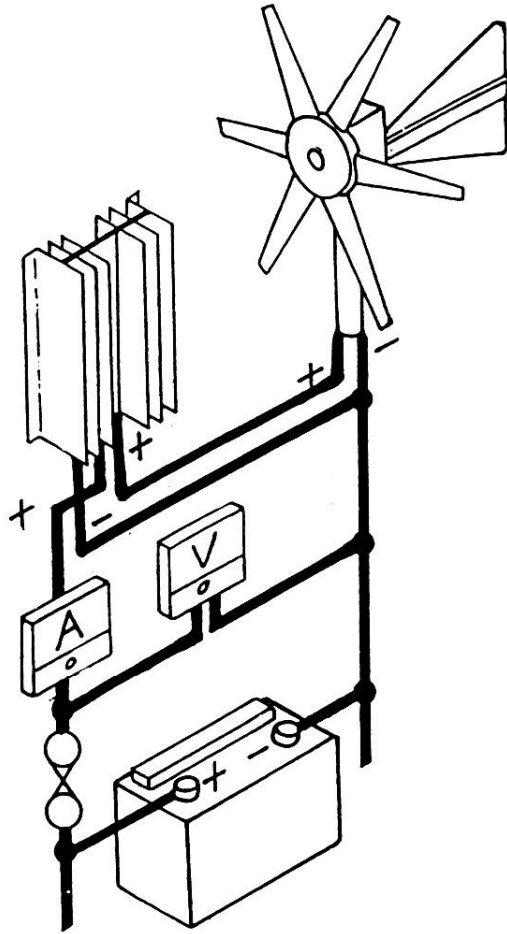


Figure 8b.

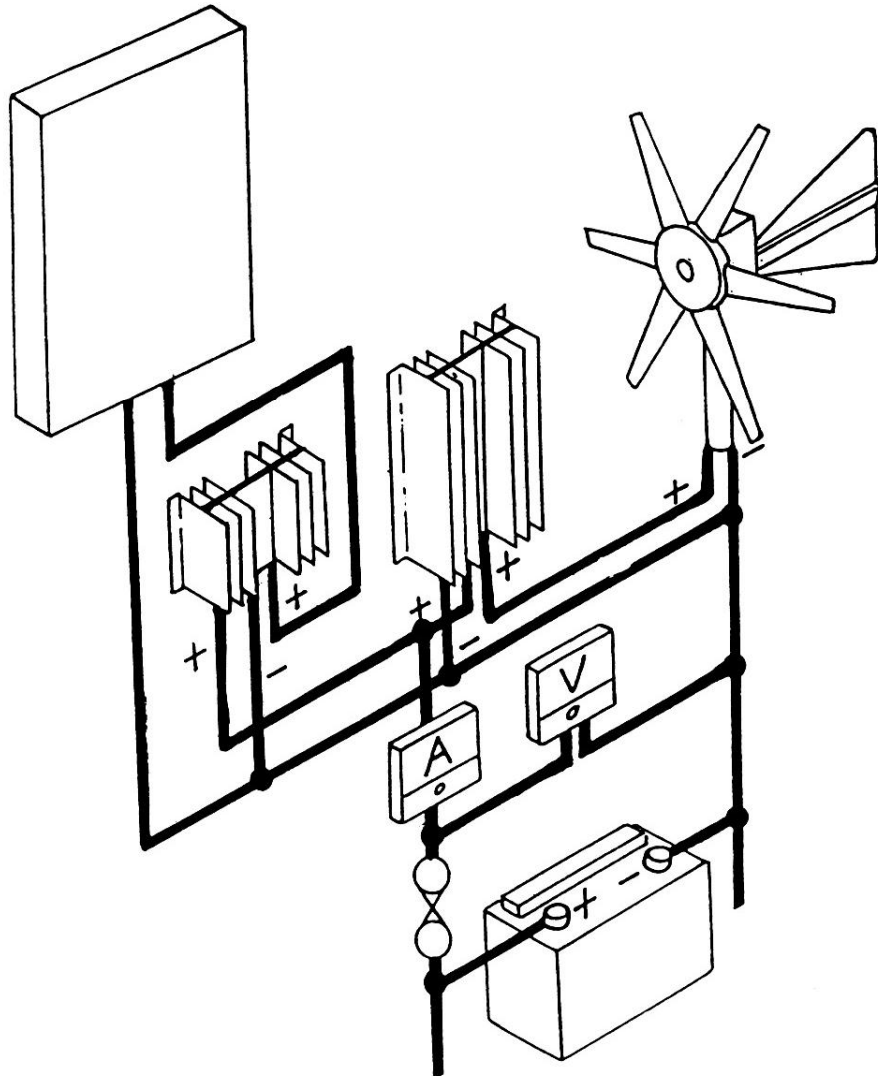
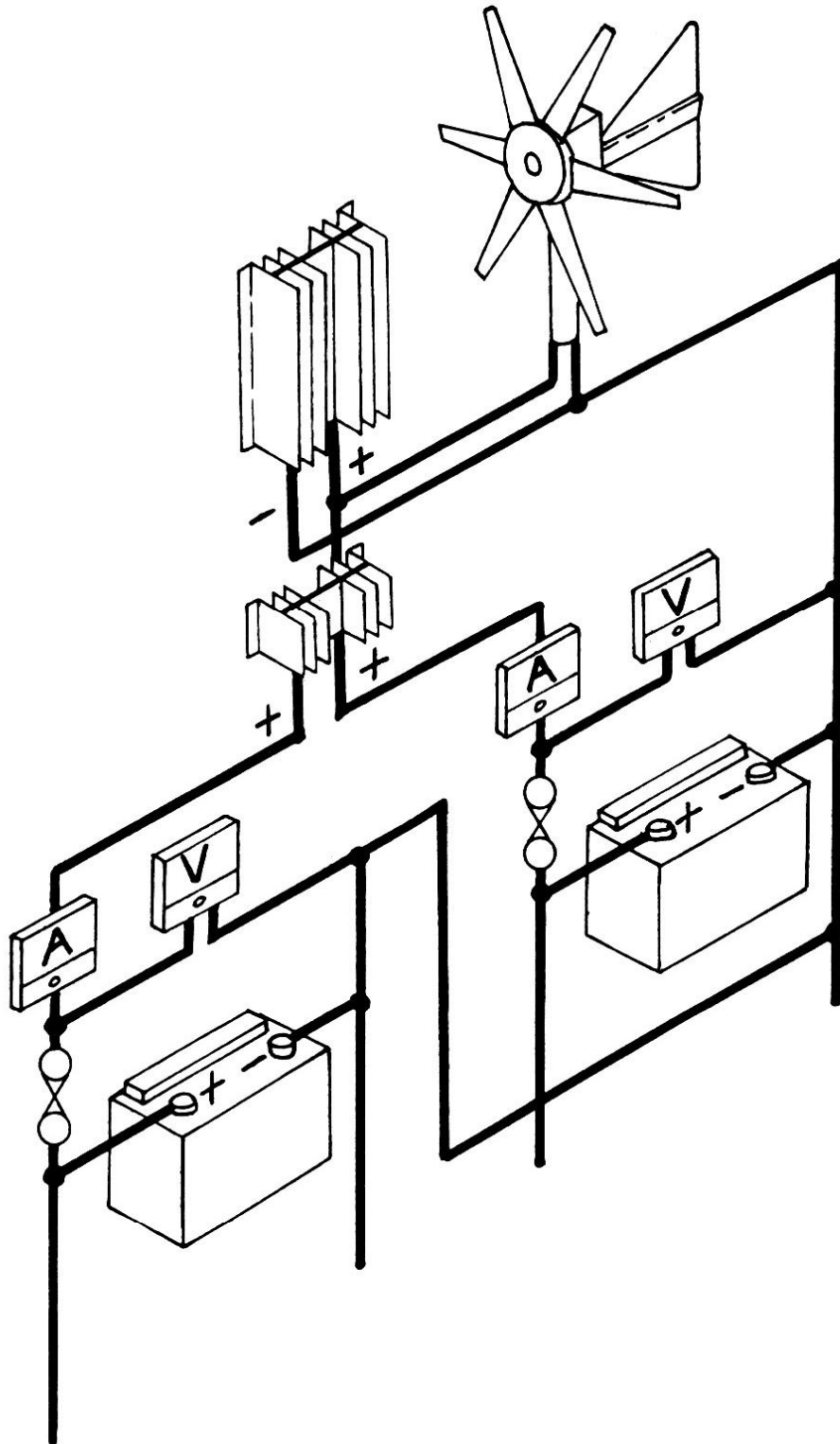


Figure 8c.



N.B. When the Charge Splitter is fitted the SR120 Regulator will need setting to a higher voltage to allow for the voltage drop across the Charge Splitter. Please consult your dealer or the manufacturer for adjustment procedure.

7. UP AND RUNNING

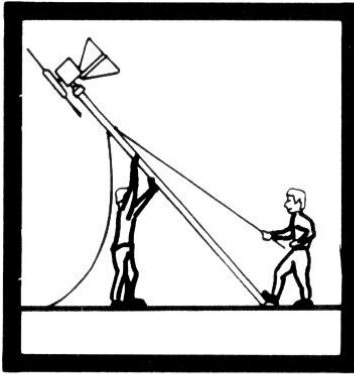


figure 9a

Before raising and securing the wind generator check that :

1. All final mechanical checks have been made.
2. The cable is not trapped particularly between the generator and the top of the pole.
3. All electrical connections are secure and safe.

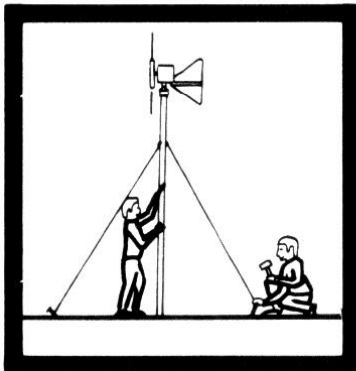
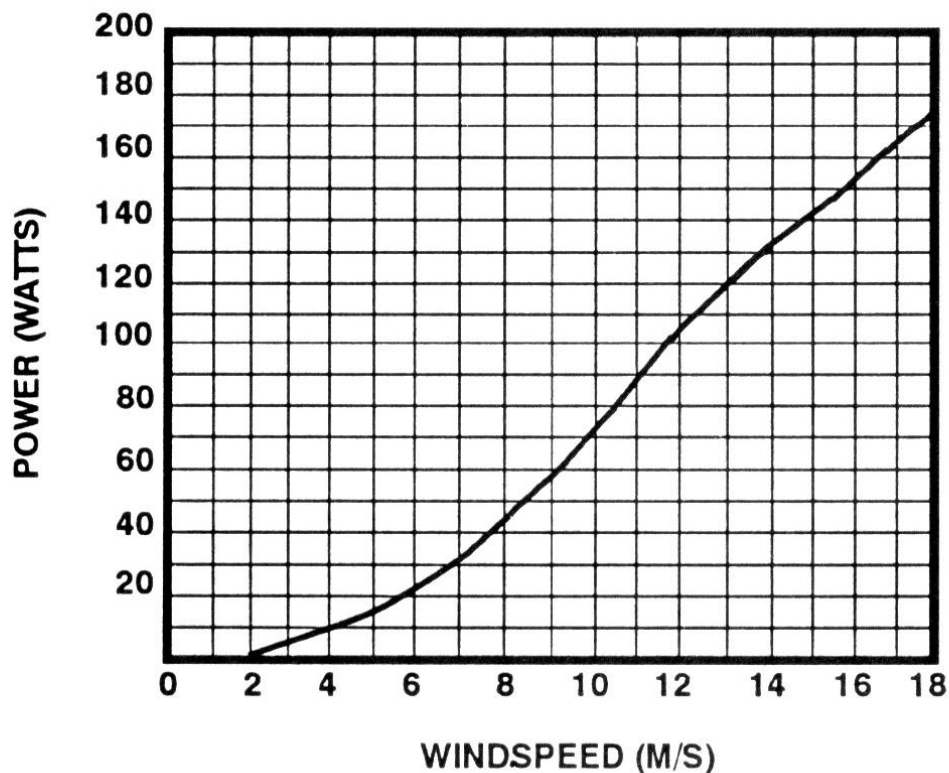


figure 9b

The wind generator can now be raised into position. (Figure 9a). 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 wind charger can be impaired if the pole is not vertical. (Figure 9b).

8. SPECIFICATION AND PERFORMANCE

Output Curve



Energy Stored

Ampere Hours (AH) of energy stored in leisure batteries from a Rutland Windcharger over 24 hours.

<i>Average Windspeed</i>	<i>910 Series 12v Output (Amps)</i>	<i>910 Series 12v Total AmpHrs</i>	<i>910 Series 24v Output (Amps)</i>	<i>910 Series 24v Total Amp Hrs</i>
6 m/s	1.6	38.1	0.8	19.2
8 m/s	3.75	90.0	1.86	45
10 m/s	6.0	144	3.0	72
12 m/s	8.75	210	4.38	105
14 m/s	10.8	259.2	5.4	129.6

Wind Measurement Conversion Table

<i>Beaufort Scale</i>	<i>Description of wind force</i>	<i>Average velocity in miles per hour</i>	<i>Knots</i>	<i>Metre/Second</i>
0	Calm	1	0.87	0.45
1	Light Air	3	2.61	1.34
2	Light Breeze	7	6.08	3.13
3	Gentle Breeze	12	10.42	5.35
4	Mod Breeze	18	15.63	8.04
5	Fresh Breeze	24	20.84	10.72
6	Strong Breeze	30	26.05	13.40
7	Mod Breeze	38	33.00	16.99
8	Fresh Gale	47	40.81	21.01
9	Strong Gale	56	48.62	25.03
10	Whole Gale	66	57.31	29.50
11	Storm	76	66.00	33.97
12	Hurricane	82	71.20	36.65

9. INSPECTION & MAINTENANCE

The 910 Series requires no scheduled maintenance, but an annual inspection should be carried out to monitor the general condition of the system. 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. Whilst holding the tail turn the generator out of the wind (180 degrees)the generator will eventually slow down.
2. Then 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 blade screws for tightness
2. Check all other nuts bolts and screws for tightness
3. Check the yaw axis for for free rotation
4. Furlmatic only: check tail fin moves freely
5. Check tower assembly for condition
6. Check the tension of guywires if applicable. The tension of guywires should be checked frequently.
7. The unit can be wiped with a mild detergent and rinsed with water to remove dirt and debris.

10. TROUBLESHOOTING

Before inspection the turbine should be lowered to the ground or tied to prevent the generator from turning.

Read the Electrical Connection section and be satisfied that your system complies.

Read the Up and Running section and be satisfied that all checks have been carried out.

If your windcharger fails to turn or produces low output, check the following:-

1. Is there sufficient wind? The windcharger needs over 4mph windspeed to start charging.
2. Are the blades fitted correctly? Refer to Section 5.1
3. Is the battery in good condition? Check the voltage and electrolyte level of each battery.
4. Check brushes for wear and damage.
5. Check slipping condition. Remove any black deposits with emery paper. Heavy deposits and reduced power indicate reverse connection to the battery has been made, see section 4.
6. Check hub for free rotation when disconnected. If the hub does not rotate freely refer to dealer or manufacturer.
7. Check electrical continuity throughout system.

If in any doubt refer to dealer or manufacturer.

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 by the purchaser as having been in his opinion defective and are so found by Marlec upon inspection.

Defective parts must be returned by prepaid post to Marlec Engineering Company Limited, Rutland House, Trevithick Road, Corby, Northants, NN17 1XY, England or to an authorised Marlec Agent.

This Warranty is void in the event of improper installation, owner neglect or natural disaster and does not extend to support posts, invertors or batteries.

No responsibility is assumed for incidental or consequential damage, damage caused by mis-use, or damage by the use of any unauthorised components.

No responsibility is assumed for non 'furling' versions of the Rutland Windcharger (ie the Standard and Marine models) where Marlec or one of its authorised agents finds that a generator incorporating a furling device should have been used.

Serial Number: