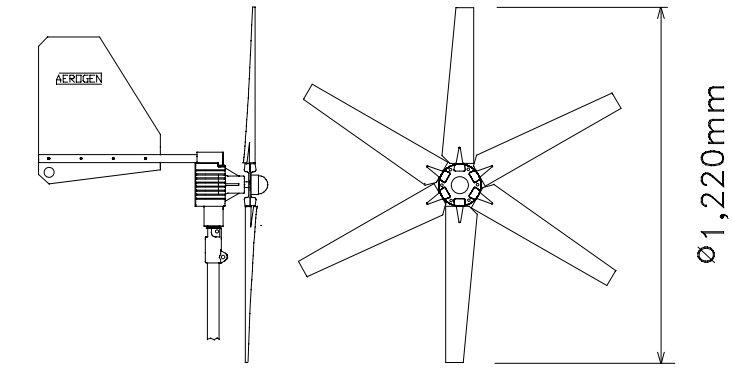
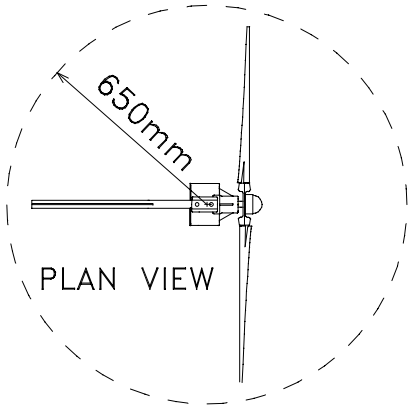
AERO6GEN OWNERS MANUAL CE

LVM612 : (12 Volt) LVM624 : (24 Volt)



WEIGHT 12.5 Kg

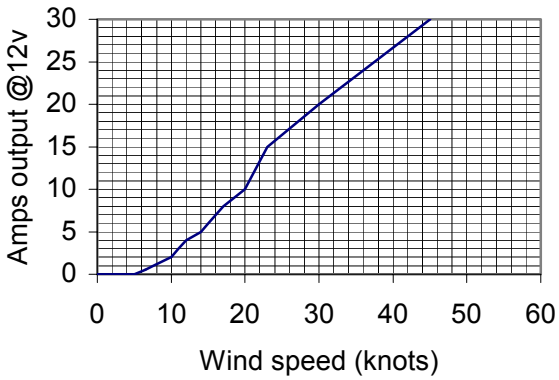


PARTS CHECK LIST

1 x Generator (M10 grub screws fitted)
1 x Tail Tube
1 x Tailfin
1 x Fan Hub Outer
1 x Fan Hub Inner
6 x Fan Blades
1 x Hub Cover
6 x M6 X 25 Stainless Steel Screws
10 x M6 Stainless Steel Nyloc Nuts
10 x M6 Stainless Steel Washers
6 x M6 Plastic Nut Covers
4 x M6 X 35 Stainless Steel Screws
1 x Allen Key 5 mm A/F
1 x Allen Key 6 mm A/F
1 x M8 X 25 Allen Bolt With Spring Washer
2 x Butt Slice Connectors (Heat Sealed Type)
1 x Safety Circlip

The powerful Aero6gen is designed specifically for the live aboard yachtsman; it operates safely and continuously in wind speeds up to 45 knots producing 30 amps (12v model) and 15 amps (24v model). Above this wind speed we suggest manually stopping and tying off the fan assembly to stop it turning. The Aero6gen is therefore not suitable for unattended applications.

Aero6gen Performance



Note: Amps output of a 24v model will be half shown above

Guarantee

Thank you for purchasing this product. It has been manufactured to exacting standards and LVM Products guarantees that should any defect in materials or workmanship occur within ONE YEAR of the date of purchase we will repair or replace the defective part free of charge.

Damage caused by misuse, failure to follow instructions, negligence, and modification or transit damage will not be warranted.
LVM Products will not be liable for any loss of revenue or any consequential loss or damage to property or persons from any cause whatsoever. Retain your purchase invoice, as it will be needed in the event of a warranty claim.

What is Not Covered –

- Damage due to lightening
- Damage due to improper installation
- Damage due to improper wiring
- Damage from flying debris causing blade damage.

LVM
ITT
Engineered for life

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MOUNTING

Great care should be taken to site the unit to avoid personal injury from the rotating blades.

SITING AND CONSRUCTING A MOUNTING ARRANGEMENT FOR THE AERO6GEN

The Aero6gen is fitted with an aluminium bronze-mounting adaptor, this is designed to clamp onto a 1.5 inches (38.1 mm) diameter tube. LVM Products manufactures two mounting kits in marine grade 316 stainless steel details of which are included in these instructions.

A turning radius of 650mm should be allowed when selecting a position to mount the generator as shown in the plan view above.

Great care must be taken to site the generator in such a way to avoid personal injury from the rotating blades. When constructing a mounting system for the Aero6gen make sure it can withstand the weight of the generator together with the additional wind forces shown in the table opposite.

If the Aero6gen is to be mounted on a yacht/boat care should be taken where to position it, as the Aero6gen will always produce a very slight magnetic cogging vibration when rotating and an electrical vibration whilst charging. This noise will obviously be greatly amplified if mounted on a very hollow section of a yacht/boat.

Description of wind	Mean velocity in knots	Force Lbs.	Force Kg.
Gentle breeze	9	1.3	0.6
Moderate breeze	13	3	1.4
Fresh breeze	19	6	3.0
Strong breeze	24	10.5	5.0
Moderate gale	30	16.5	7.5
Fresh gale	37	24.5	11.2
Strong gale	44	35	16
Whole gale	52	47.5	22
Storm	60	63	29
Hurricane	68	81	37

If mounted directly over sleeping quarters it may well be necessary to stop the generator and tie off the blades at night. Well-known methods that can reduce vibration noise in the mounting are –

1. Rubber mount as many fixings within the system as possible.
2. Insert round insulation material (the type used around cold water pipes in winter to stop them freezing) into the bore of the 1.5 inch mounting tube.
3. Coil a length of rope around the outside diameter of your mounting tube. (Full length)

MIZZEN MAST MOUNTING – For safety reasons and because of the difficulty to easily shut down the generator, we would not recommend the Aero6gen be mounted on a missen mast.

RADIO / RADAR / DECCA / SAT.NAV. INTERFERENCE

The Aero6gen should be mounted at least 2 Metres from any form of aerial to avoid air born interference. The output cable from the generator together with the dump regulator cables, if fitted, should be routed at least 1 Metre from aerial cables. It is most important, particularly on yacht installation, that the negative (-) return cable to the battery is clean and fully tightened. The safety cable fitted around a yacht/boat is tensioned by a bottle screw or turnbuckle and this cable has been known to cause interference. The remedy is to rope tension or use an insulated connector.

ASSEMBLY

FAN BLADE ASSEMBLY

Assemble the fan using the M6 X 25 screws, M6 Nyloc Nuts, and M6 Washers. The best way to assemble the fan is to lay the Inner Fan Hub on a flat surface, blade sockets upwards and then insert the 6 blades concave side (hollow side) upwards. See Fig. 1. Place the Outer Fan Hub on top locating the blades in the sockets. Insert the 6 off M6 screws, washers and nuts, and at this stage only tighten the nuts sufficiently to lightly grip the blades. See Fig. 2.

Turn each blade until the indicator mark on the blade and hub align as shown in Fig. 3 note how the right hand side of the blade indicator mark is set to align with the indicator mark on the outer hub. This sets the blade tip angle to 10 deg. Then finally fully tighten the nuts and fit on the M6 plastic nut covers. We recommend that the fan assembly is fitted after the generator is mounted

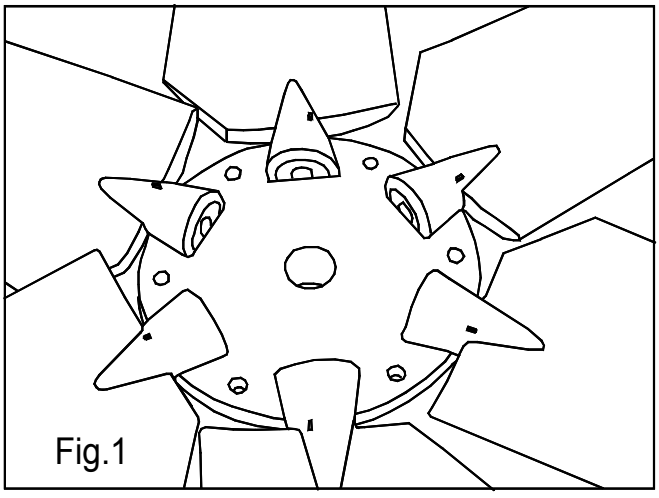


Fig.1

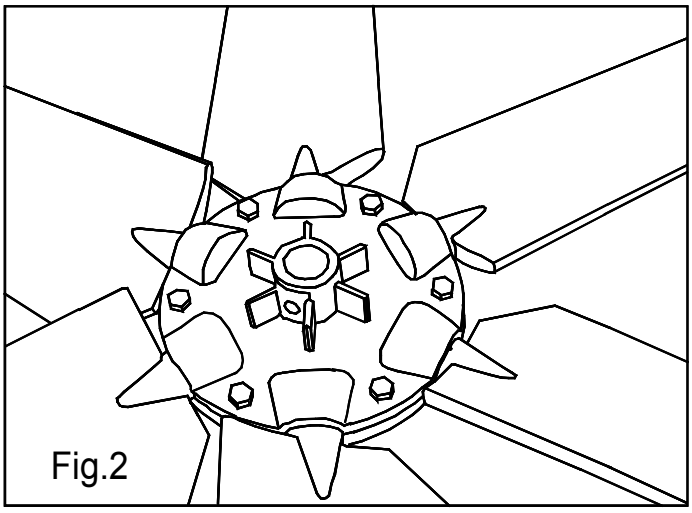


Fig.2

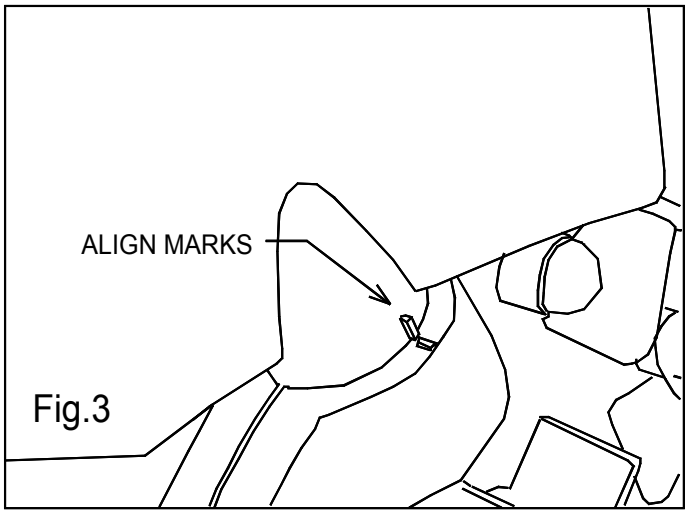


Fig.3

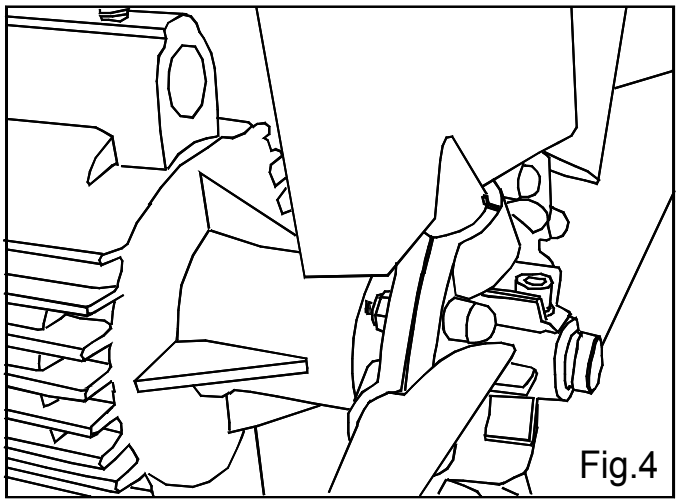


Fig.4

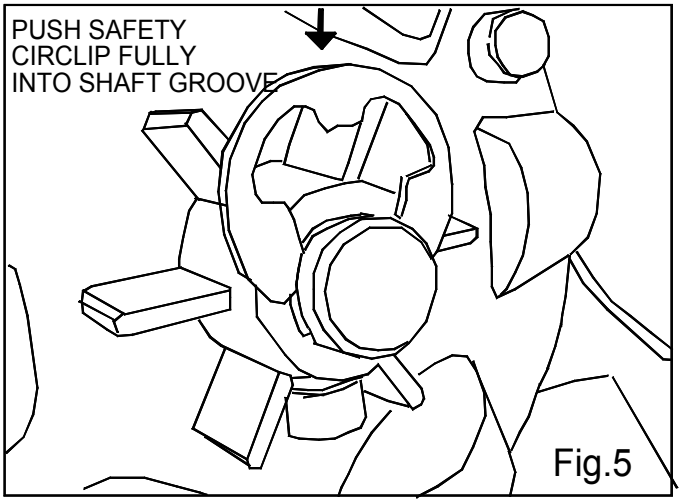


Fig.5

TAILFIN ASSEMBLY

Attach the tailfin onto the tail tube using the M6 X 35 long screws, washers, and M6 Nyloc nuts.

ELECTRICAL DATA

Aero6gen output wire colour Code - The Red output wire is POSITIVE (+) The Black output wire is NEGATIVE (-)
Wire Rating - The output wires of the Aero6gen will require extending. Electrical systems lose energy from the resistance of the wire size used. The larger the wire size the smaller the loss, however larger cross sectional area wire can be costly and in some cases more difficult to source. The following table shows recommended wire sizes, they are based on a 3% and 5% energy loss at an average wind speed of 20 knots. It is recommended a minimum wire size of 4.0 sq mm be used.

Single Wire Length

	0 – 5 Metres		6 – 10 Metres		11 – 20 Metres	
Voltage Drop (%)	3%	5%	3%	5%	3%	5%
12 volt Aero6gen	6.0 mm^2	4.0 mm^2	10 mm^2	6.0 mm^2	25 mm^2	16 mm^2
24 volt Aero6gen	4.0 mm^2	4.0 mm^2	4.0 mm^2	4.0 mm^2	6.0 mm^2	4.0 mm^2

Useful wire cross sectional area mm^2 conversion to AWG
2.5 mm^2 = 14AWG, 4.0 mm^2 = 12 AWG, 6.0 mm^2 = 10 AWG, 10.0 mm^2 = 8 AWG, 16.0 mm^2 = 6 AWG, 25.0mm^2 = 4AWG

If the Aero6gen is connected directly to the battery terminals we recommend a 30 Amp fuse for 12V Models and a 15 Amp fuse for 24v Models is fitted in the red (positive) wire from the generator to the battery, so that if a dead short occurred it would prevent serious damage to the wiring and the generator.
The RED OUTPUT WIRE output is connected to the POSITIVE + terminal of the battery.
The BLACK OUTPUT WIRE to the NEGATIVE – terminal of the battery.

VOLTAGE REGULATION

The output wires of the Aero6gen can be connected directly to the terminals of the battery that requires charging, as shown in Fig 6., however, if the terminal voltage of the battery is not continually monitored for over voltage (14.2v for 12v batteries) and (28.4v for 24v batteries) the battery can be seriously damaged. Fitting an LVM 6TB voltage regulator will protect the battery from becoming over charged.
The 6TB12 (12v model) or the 6TB24 (24v model) is designed to regulate the Aero6gen output voltage and enable two independent batteries to be charged, making it ideal for the typical yacht installation i.e. engine starting battery, and domestic battery bank. There is no problem if other charging systems (engine alternator, shore power etc) are connected to the batteries. The regulator can also be used on installations charging only one battery. To charge a third or fourth independent battery a 6DU (diode unit) must be added. Full details and wiring diagrams are supplied with each regulator. Contact LVM Products Technical sales for more information.
WARNING! If you fit another manufacturers regulator, it must be the type that diverts the generators output to a load when the batteries are fully charged. It must not be a type which simply open circuits the generator!

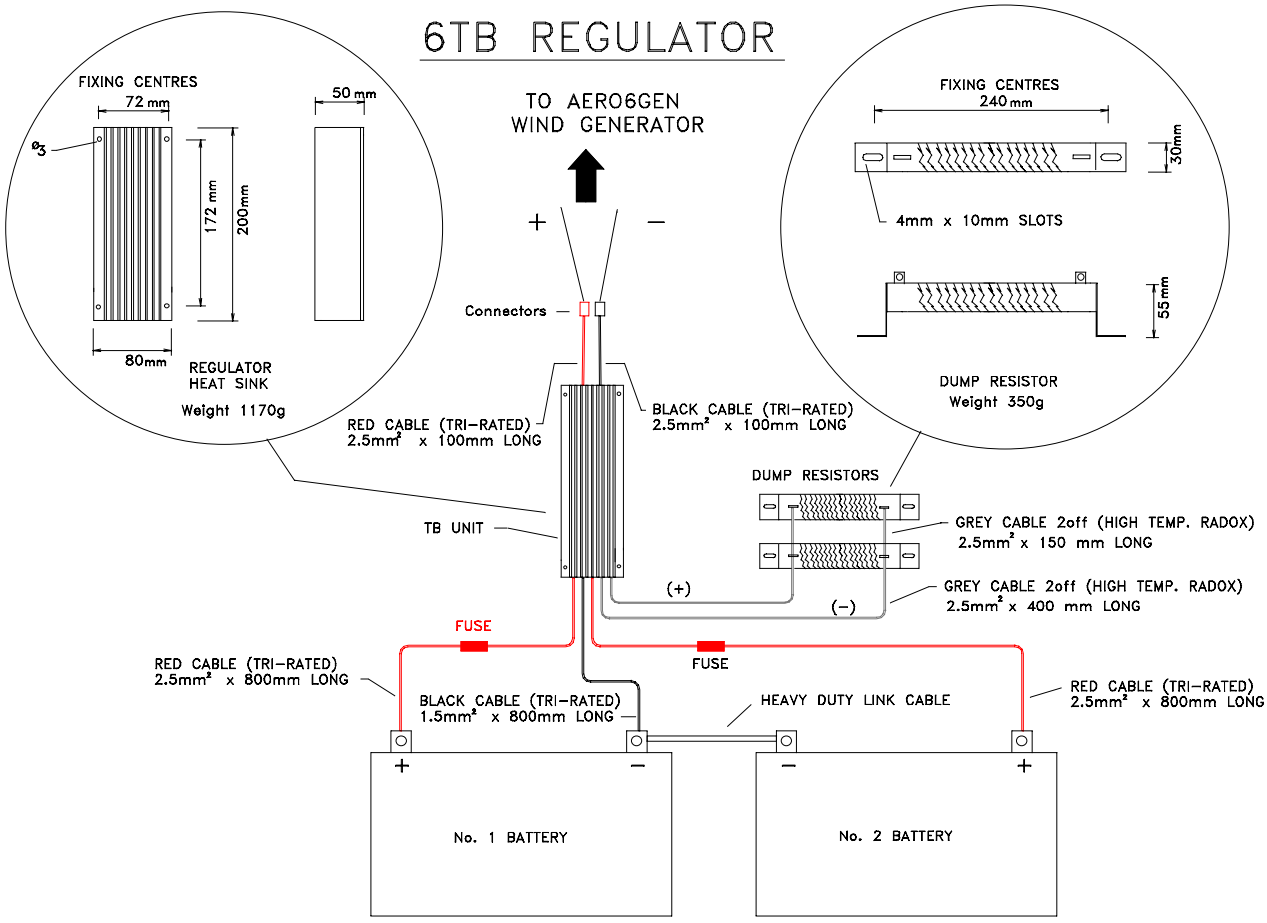
There are three models of 6TB regulator –

STANDARD - As described above

TEMPERATURE COMPENSATION - This additional feature is available on the LVM 6TB regulator. If the battery is located in a building where the ambient temperature is always around 20 deg.C then standard regulators can be used. However if you intend to locate a battery where temperatures may go down to freezing and perhaps rise to tropical temperatures then you should install a regulator that is fitted with a temperature compensation circuit. This automatically allows the battery to be charged at a higher voltage as the temperature drops, and a lower voltage if the temperature increases. Simply add (-T) after the LVM Product No. ie. LVM 6TB12 –T.

LOW BATTERY ALARM DRIVE - This additional feature is available on the 6TB12 and 6TB24 regulators. The built in circuitry continually monitors the terminal voltage of both batteries and if either of them fall to 11v (12v models) or 22v (24v models) a voltage output is applied to the alarm output cable. It is then a simple matter of connecting either a piezo or buzzer to this alarm output cable via a small single pole switch, and then a negative connection to the piezo or buzzer. Simply add (-A) after the LVM Product No. ie. 6TB12 –A or 6TB12-TA for temperature compensation and alarm.

You may also consider installing an ammeter, voltmeter or an amphour meter – all are available from LVM Products, part number as follows -
(LVM67) 0 –20A Ammeter, (LVM68) 0-30A Ammeter), (LVM69) 0-15v dc Voltmeter (LVM200) Digital Amp Hour Meter



INSTALLATION

PLEASE FOLLOW THESE PRECAUTIONS DURING INSTALLATION

- Choose a calm day.
- Have someone available to help during installation.
- Do not install the blade assembly until the generator is mounted.
-

Whilst initially installing the generator, or carrying out future maintenance, it is important that the fan assembly is stationary.

1. The Aero6gen output cables are stripped ready to insert into one end of a butt sealed splice. This type of connector is suitable for 2.5 sq. mm cables. Strip one end of your output cable 5 - 6 mm, observing polarity insert them into the other end of the butt sealed splices and using a crimping tool crimp them. A hot air gun can seal the joints or by carefully using a cigarette lighter with the naked flame well away from the actual plastic, just use the heat. This will make the plastic ends contract and grip the cable giving a waterproof joint. If you decide to use some other type of connector, which can accommodate a larger cable size, it must be rated at 30 Amps.

2. Thread the output cable carefully through the centre of your mounting tube. If the bottom of the tube is not accessible a hole must be drilled to enable the cable to be brought out. Be sure to leave enough slack in the cable so that if necessary the generator can be removed.

3. Locate the generator on top of your mounting tube, and then fully tighten the M10 clamp bolt nut on the adaptor.

4. The tail assembly can now be inserted into the hole at the top of the generator ensuring that the tailfin is positioned vertically and tighten the M10 grub screws.

5. Fitting the fan blade assembly onto the main shaft of the generator. Grease fan hub bore then fit the fan assembly onto the generator main shaft aligning the M8 clearance hole in the fan hub boss with the M8 tapped hole in the main shaft. Fit the M8 spring washer under the head of the M8 x 25 Socket Cap Screw. Insert the bolt through the M8 clearance hole in the outer fan hub boss and fully tighten it into the main shaft using the Allen key supplied (best to increase the leverage on the allen key by fitting a tube or something similar to make sure it is fully tightened). See Fig. 4. Push safety circlip into the shaft groove as shown in Fig. 5 then finally push fully into the groove, the black hub cover is then pushed onto the hub boss.

6. The output wires are then connected to the battery. See Fig.6
The RED WIRE is connected to the POSITIVE + terminal and the BLACK WIRE to the NEGATIVE - terminal. We recommend a 30 Amp fuse for 12V Models and a 15 Amp fuse for 24v Models is fitted in the red positive) cable from the generator to the battery, so that if a dead short occurred it would prevent serious damage to the wiring and the generator.

Note: Do NOT reverse the connections from the generator to the battery (ie. Generator Positive to battery Negative and generator Negative to battery Positive). Doing this will damage the rectifier and void your warranty.

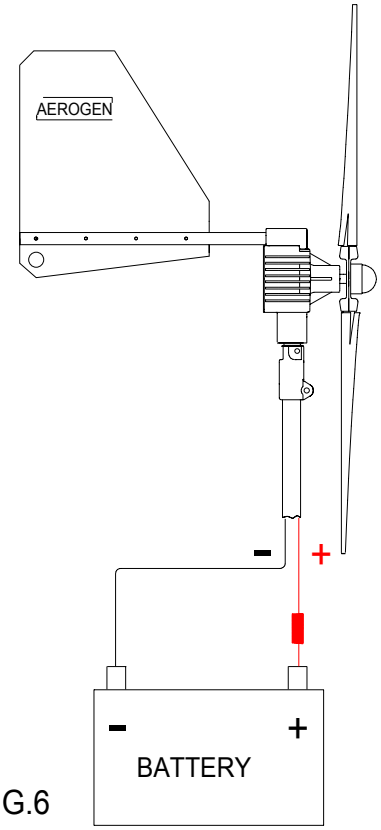


FIG.6

WARNING THE AERO6GEN SHOULD NOT BE ALLOWED TO RUN OPEN CIRCUIT. IN HIGH WINDS HIGH VOLTAGES WILL BE PRODUCED: THE SUPPRESSION CAPACITORS CAN BE DAMAGED: THE FAN WILL TURN FASTER SUFFERING UNNECESSARY STRESS

MAINTENANCE

The Aero6gen is designed to operate for long periods without needing any maintenance. The life of the generator and its performance will be enhanced if periodic inspection is carried out. For personal safety reasons before carrying out any inspection make sure you stop the generator from rotating.
The following should be checked every 6 months.

- Check blades for damage and replace if necessary. Do not use the generator with damaged or unbalanced blades. This will cause unnecessary wear and possibly damage to the main bearings.
- Check the fan hub assembly for tightness.
- Check the mounting adaptor and your mounting system for tightness.
- Check all external electrical connections for tightness and corrosion.
- Wash down the generator with fresh clean water to remove debris and salt deposits that can build up.

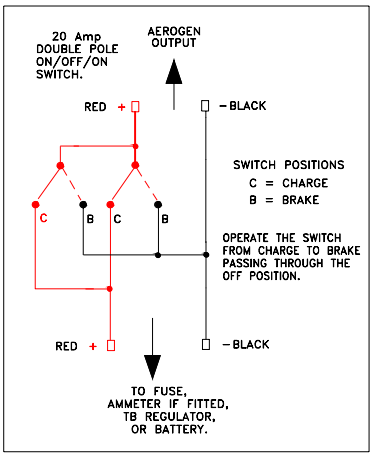
- The main bearings life is generally between 3 to 7 years depending on the amount of use and operating conditions. To ensure long life and quiet running the bearings can be greased via the small grease nipple located on the front nose section of the housing (see sectional view). A good quality ball bearing grease should be used preferably Castrol Spheerol L-EP2 or equivalent, just a couple of pumps with a grease gun till you see the grease just start to come out of the front bearing seal. After several years use, the carbon brushes which collect current from the slip rings may require replacement. Carbon brushes Pt. No. BRUSHES 781 are available, complete with full instructions.

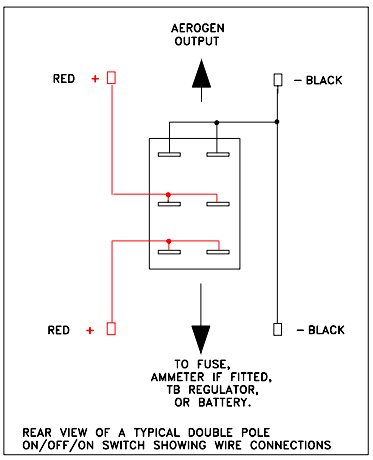
If you experience a problem with your Aero6gen contact LVM Products to determine the nature of the problem, LVM Products will send you replacement parts and instructions needed to repair the generator. In the event that the generator is returned for repair/service you will be notified of the cost for carrying out the work and will incur the transport costs.

STOPPING OR LIMITING THE AERO6GEN OUTPUT

The Aero6gen is designed to operate safely and continuously in wind speeds up to 45 knots, above this wind speed we suggest the generator is manually or electrically stopped and then the fan assembly is secured by rope to stop it turning. However if the Aero6gen is difficult to reach or has to be left unattended for long periods in high wind speeds, then by wiring in two dump resistors in series and a switch as shown on page 7 the Aero6gens output can be limited.
The limiter circuit is intended to protect the Aero6gen from the most damaging periods during wind speeds above 45 knots combined with severe gusting conditions, where its output can swing violently to produce very high output currents, which can cause damage to the stator windings and rectifier.
Manual stopping –
The Aero6gen tailfin has a hole into which should be fixed a small loop of rope. Using a boat hook attached to this loop of rope, the generator can then be safely turned out of the wind. The blades will slow down and stop, and then the fan assembly can be tied off to the tail tube. (See sketch below)
Electrical stopping –
A 20A double pole on/off/on switch can be fitted as shown in the wiring diagram below. This will short circuit the Aero6gen's output and the fan assembly will stop or slow down considerably, then the fan assembly can be tied off to the tail tube.

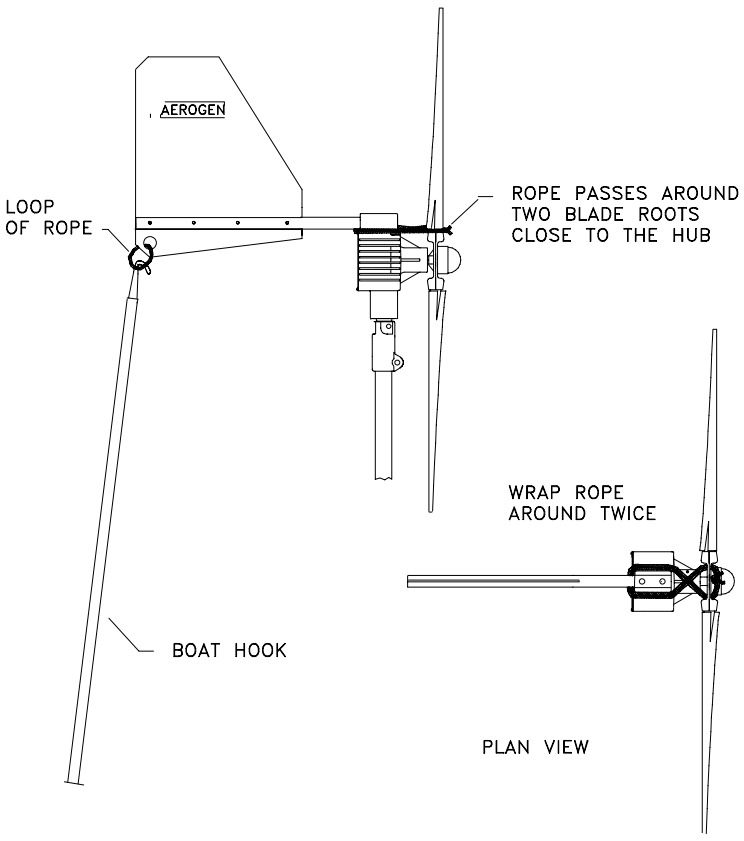
WARNING – THE BRAKE SWITCH SHOULD ONLY BE USED TO STOP/SLOW DOWN THE FAN ASSEMBLY PRIOR TO SECURING WITH ROPE – IT SHOULD NOT BE USED AS A PERMANENT PARKING BRAKE





REAR VIEW OF A TYPICAL DOUBLE POLE ON/OFF/ON SWITCH SHOWING WIRE CONNECTIONS

SUGGESTED METHOD OF TYING OFF THE FAN ASSEMBLY USING A LENGTH OF 5mm DIA. NYLON ROPE.



AERO6GEN LIMITER WIRING DIAGRAM

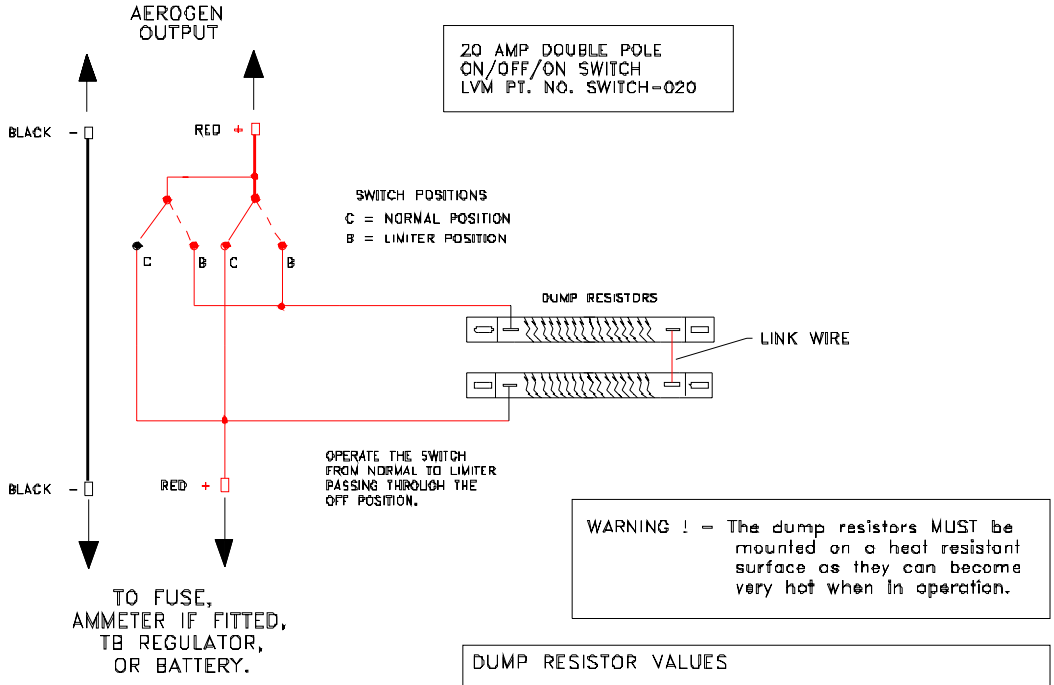
FILE MANLIMIT

DESCRIPTION

The Aero6gen was originally designed for live aboard yachtsmen, who if very high winds were forecast would stop the generator with a brake switch then tie off the blades to stop them turning.
However if the Aero6gen is difficult to reach or has to be left unattended for very long periods, then by wiring in two dump resistors and a switch as shown below the Aero6gen's ouput can be limited.

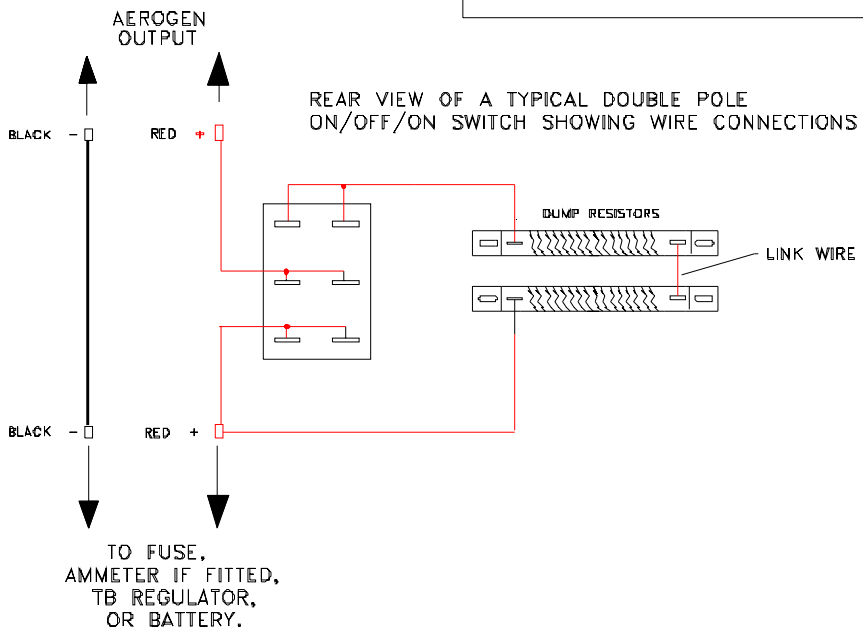
The limiter is intended to protect the Aero6gen from the most damaging periods during wind speeds above 45 knots combined with severe gusting conditions, where its output can swing violently to produce very high output currents, which can cause damage to the stator windings and the rectifier.

NOTE : During operation in very high winds with the limiter switched in circuit the fan speed will slightly increase as the generators output is reduced by the limiter.
The limiter can be left permanently in circuit when the Aero6gen is left unattended.



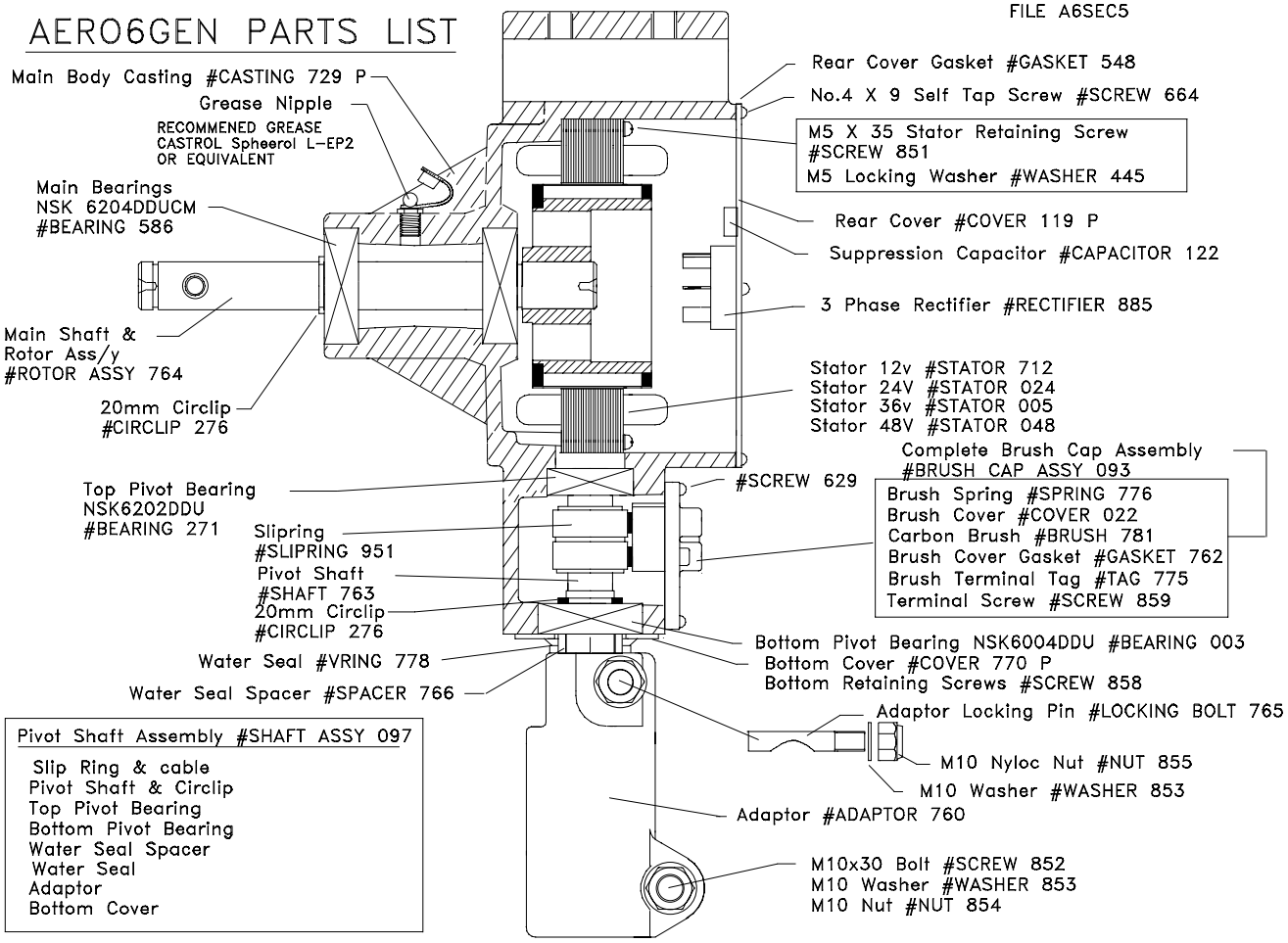
DUMP RESISTOR VALUES

12v Model	0.68 ohms	LVM Pt No. Resistor 021
24v Model	2.7 ohms	LVM Pt No. Resistor 030



AERO6GEN PARTS LIST

FILE A6SEC5

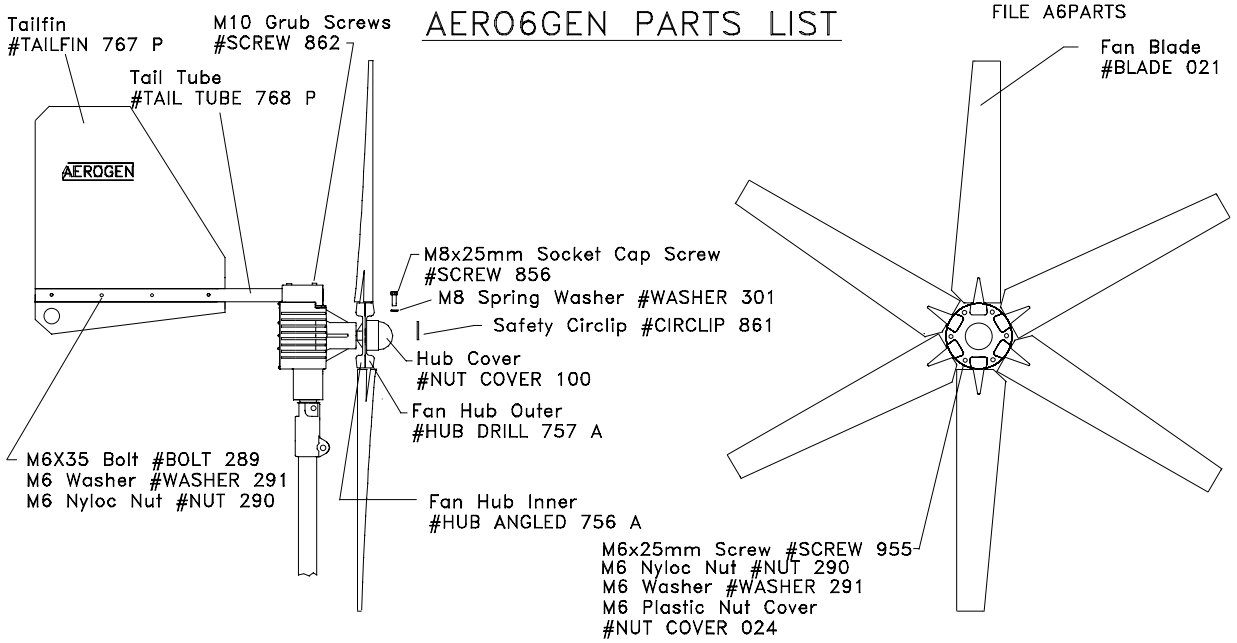


Pivot Shaft Assembly #SHAFT ASSY 097

- Slip Ring & cable
- Pivot Shaft & Circlip
- Top Pivot Bearing
- Bottom Pivot Bearing
- Water Seal Spacer
- Water Seal
- Adaptor
- Bottom Cover

AERO6GEN PARTS LIST

FILE A6PARTS

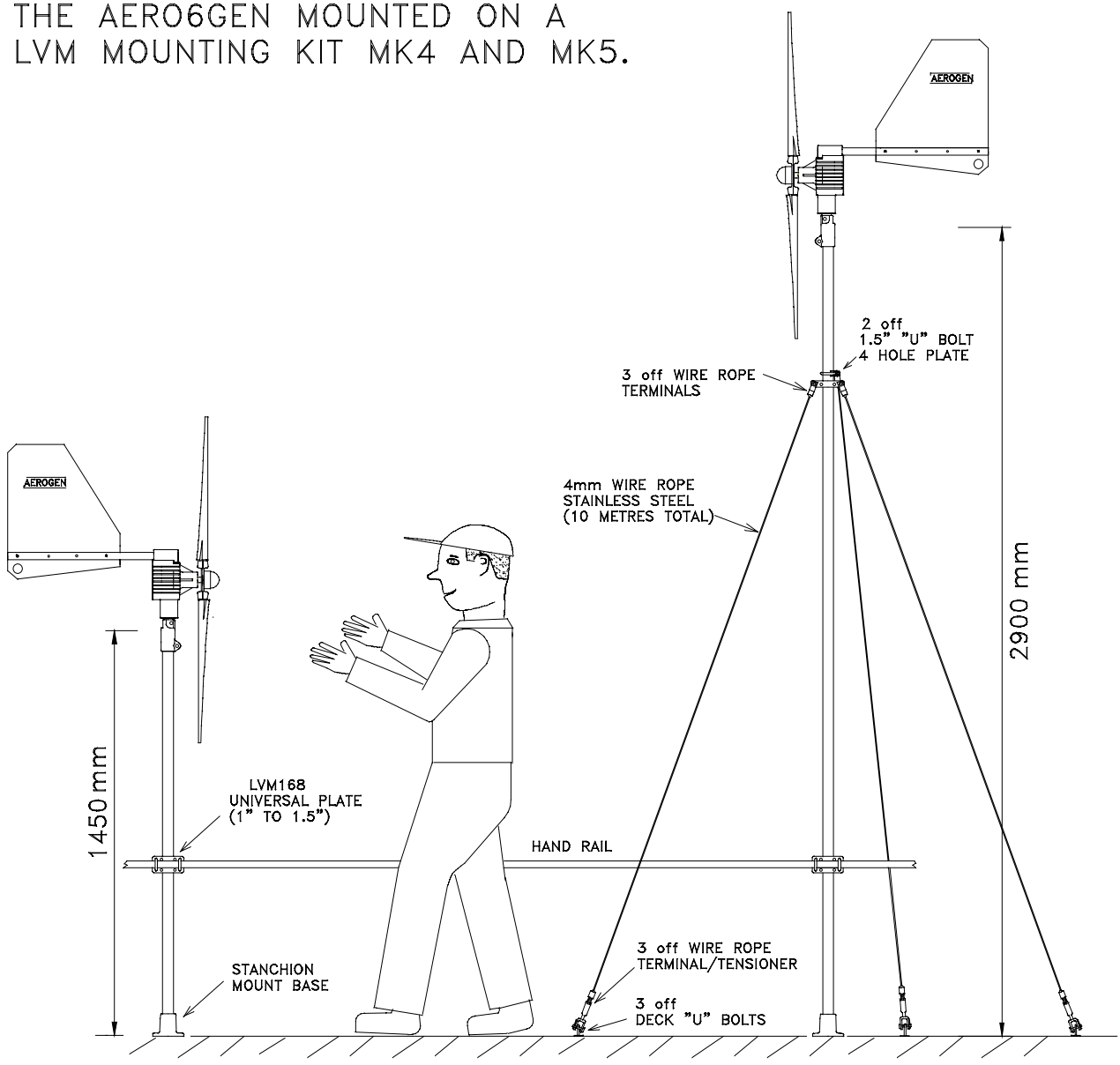


THE BLADES SUPPLIED WITH THE GENERATOR ARE A MATCHED SET.
ANY REPLACEMENTS SHOULD BE ORDERED QUOTING PT. NO.BLADE 021 AND THE BLADE WEIGHT WHICH IS SHOWN BELOW. HOWEVER 2 BLADES OF THE SAME WEIGHT (ANY WEIGHT) CAN BE FITTED PROVIDED THEY ARE PLACED OPPOSITE EACH OTHER.
IN AN EMERGENCY FOLLOWING THE BREAKAGE OF ONE BLADE, REMOVE OPPOSITE BLADE AND THE UNIT WILL RUN BALANCED. THE FAN ASSEMBLY WILL RUN WITH 3 OR EVEN 2 BLADES.

BLADE WEIGHT _____ GRAMS

MKIT8

DRAWING SHOWING THE COMPARATIVE HEIGHT OF A PERSON (6 foot tall) AGAINST THE AERO6GEN MOUNTED ON A LVM MOUNTING KIT MK4 AND MK5.



MK4 MOUNTING KIT

MK5 MOUNTING KIT

MK4 Mounting kit includes –

1 x 1.5" Stainless steel tube
1450mm long
1 x 1.5 Stanchion mount base.
1 x 1" to 1.5" Universal plate

MK5 Mounting kit includes - –

1 x 1.5" O.D. Stainless steel tube
2,900mm long
1 x 1.5" Stanchion mount base
1 x 1" to 1.5" Universal plate
10 Metres of 4mm Dia. Stainless steel wire rope
3 x Wire rope terminal/tensioners
3 x Wire rope terminals
3 x Deck 'U' bolts
2 x 1.5" U bolts
1 x 4 hole plate

TROUBLE SHOOTING

The AERO6GEN is designed to give many years of reliable service as it contains really only two moving parts and one electronic component; they are the permanent magnet rotor, the slipring brush assembly and a rectifier.
The only parts that can wear are: Main bearing ball races, pivot shaft ball races, and the carbon brushes which make contact with the sliprings. For safety reasons fan blades are designed to brake off, if by accident an arm or hand is caught in the fan.

SIMPLE TEST

A simple test to prove there is an output voltage from the generator can be carried out whilst the generator is in it's working position. Disconnect the generators output cable from the battery, or the TB regulator if fitted. With the fan turning in the wind and the two output leads open circuit, allow the fan to build up speed, then touch the two output leads together (shorting them) the fan should noticeably slow down and act as a brake. If this does not happen, check that your extension wire connection from the actual generators output cables are not corroded or have become disconnected. If there is a fuse fitted in the output cable, check it has not blown.
The above test can also be carried out by turning the generators main shaft by hand (any direction) to check the braking action.
Note: Although the instruction sheets supplied with the generator warns you not to run the generator in an open circuit condition the tests can be carried out safely at wind speeds of up to 20 knots.
(The reason we do not recommend generators be left in an open circuit condition is that at very high wind speeds the suppression capacitors maximum voltage may be exceeded and destroy them.

The following tools and equipment will be needed to carry out tests and repairs to the generator.

Multimeter, which can read 0 - 100 volts DC, measure resistance, have a diode test, and a continuity (buzzer test).
Pozi drive screwdriver.
Circlip pliers.
Soldering iron and solder.
Hammer.
Piece of hardwood, and a brass rod 12mm diameter X 250mm long or similar.
For pivot bearing replacement, a bench vice will be required.

MEASURING OUTPUT VOLTAGE

With the generator in its operating position, disconnect the generators output cable from the battery or the TB regulator if fitted, and attach a multimeter set on 0 - 100 volts dc range to the two output leads.
The following open circuit voltages should be obtained at the wind speeds shown below. It is most important that the wind speed is measured at the same height the wind generator is mounted.

12v Model
6 knots = 12v 10 Knots = 20v 15 knots = 32 20 knots = 45v

24v Model
6 knots = 24v 10 Knots = 40v 15 knots = 62v 20 knots = 90v

Open circuit voltage
0.06 Volts D.C. per rev. Aero6gen (12v) 0.12 Volts D.C. per rev. Aero6gen (24v)

If no voltage is present, check that your extension wire connection from the actual generators output cables are not corroded or have become disconnected. If there is a fuse fitted in the output cable check it has not blown. Check output voltage again at the generators actual output cable. If there is still no voltage output, go to the instructions and tests listed under heading NO OUTPUT.

REDUCED OUTPUT

Check blades are set at the correct angle, and the concave side (hollow side) of the blade faces the wind.
The main shaft of the generator should turn freely, however there will always be a slight resistance, which is called the cogging effect. To check the starting torque/cogging effect of the generator is correct Sellotape 4 - 5 pound coins. (40 - 50 grams) on the tip of a blade. Set this blade by turning the fan till it is horizontal, let go of the blade and the fan should just start to turn. If the fan turns ok as described above, then follow instructions under heading NO OUTPUT, with particular attention to the rectifier test. If the fan did not turn as described in the test above, follow the instructions and tests listed under headings KNOCKING/SCRAPING SOUND ONCE PER REVOLUTION, MECHANICAL NOISE, and NO OUTPUT.

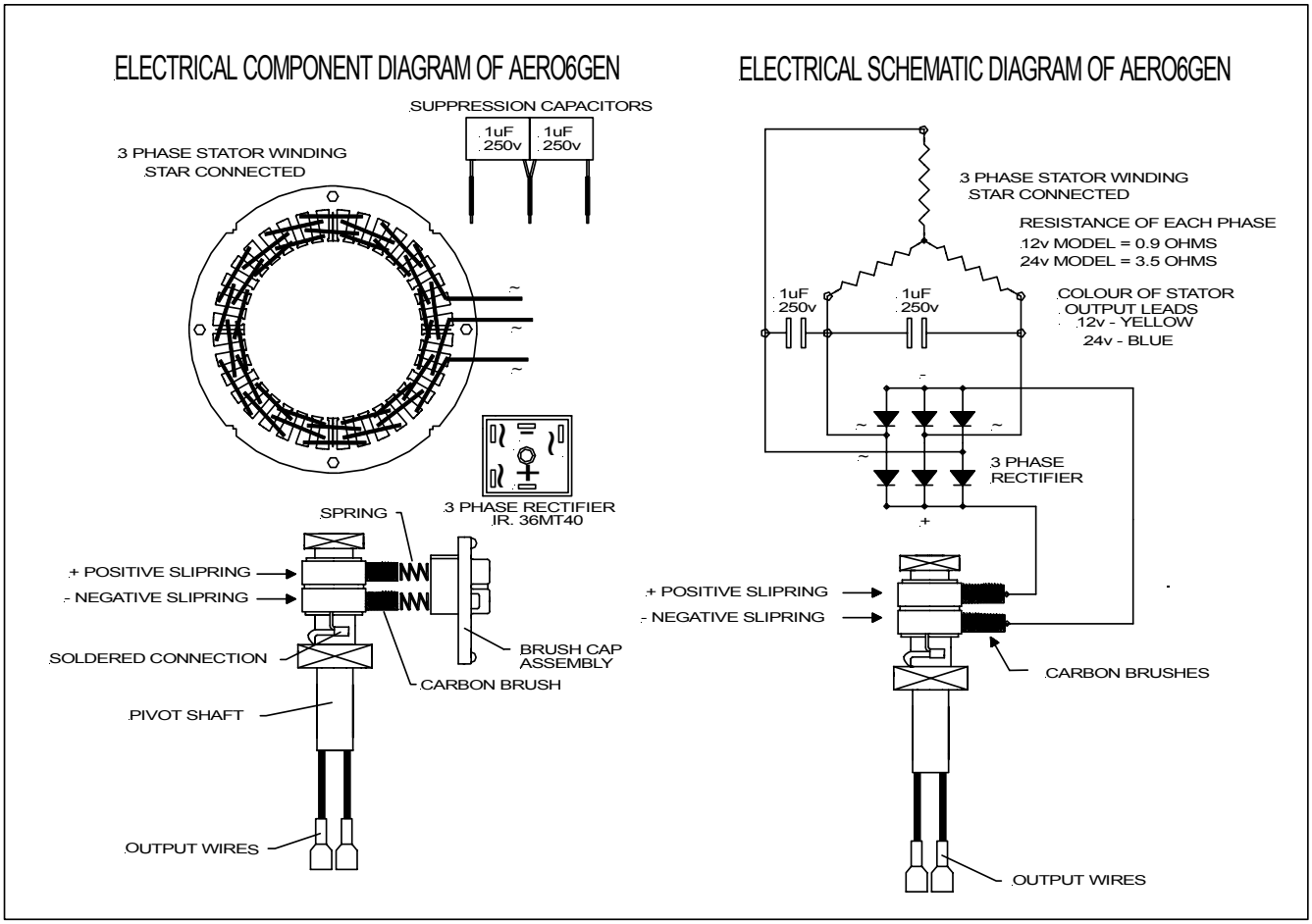
NO OUTPUT

Remove the generator from it's mounting, taking off the tailfin and fan assembly. Remove the rear cover (6 off screws) and hinge back the cover. A component called a rectifier that converts the 3 Phase A/C output voltage of the stator into

D.C voltage is mounted on the inside of the cover. (Note later models have also suppression capacitors soldered to the rectifier.)
You will note that the rectifier has 5 terminals, 2 of which are marked + and - , the remaining 3 unmarked terminals are connected to the 3 output wires from the stator (3 phase a/c ~). Disconnect these 3 push fit connectors from the rectifier, then using a multimeter set on resistance measurement (ohms) check the resistance in turn of the of 3 output wires (in pairs) from the stator. They should read 0.9 ohms 12v model, 3.5 ohms 24v model.
When replacing the push fit connectors to the rectifier after the test there is no need to remember which order or terminal they came from, as they can fit on any of the 3 unmarked terminals.

CHECKING A/C OUTPUT VOLTAGE OF STATOR

Set the multimeter to read A/C volts, attach test leads to the 3 off stator output wires (in pairs) then turn the main shaft of the generator by hand (any direction) small voltage should be indicated on the multimeter.
Check the stator and suppression capacitors do not look burnt or overheated. Check tightness of stator retaining screws.
If at any time the generators output leads have ever been connected to battery terminals the wrong way round, or the generator has been struck by lightening then the rectifier may be have been damaged.



RECTIFIER TEST (Test and readings of a good rectifier)

Set a multimeter to diode test, then check: -

1. Disconnect all connectors from the rectifier.

2. Attach the red test lead from multimeter to the + plus terminal of the rectifier, attach the black test lead to the - negative terminal. RESULT No Reading.

3. Reverse the test leads i.e. attach the red test lead to the - negative terminal of the rectifier then the black test lead to the + plus terminal. RESULT 0.8 - 0.9 volts

4. Connect the test leads to the 3 unmarked ~ terminals of the rectifier in pairs. RESULT No Reading.

RECTIFIER TEST (Test and readings of a faulty rectifier)

Set a multimeter to diode test, then check: -

1. Disconnect all connectors from the rectifier.

2. Attach the red test lead from multimeter to the + plus terminal of the rectifier, attach the black test lead to the - negative terminal. RESULT 0 Volts

3. Reverse the test leads i.e. attach the red test lead to the - negative terminal of the rectifier then the black test lead to the + plus terminal. RESULT 0 Volts

4.Connect the test leads to the 3 unmarked ~ terminals of the rectifier in turn in pairs. RESULT 0 Volts

Refit the 3 off 3 phase stator output leads to the unmarked ~ terminals of the rectifier.
Set the multimeter to read DC. volts. Attach the red test lead of the multimeter onto the + plus terminal of the rectifier, then the black test lead onto the - negative terminal. Turn the main shaft of the generator by hand (any direction) this should indicate a voltage on the multimeter. Refit Red and Black DC. output leads from the rectifier. Refit rear cover using a new gasket making sure all wires are clear of the rotor.

If in doubt about the condition of the rectifier, replace with a new one.

CHECKING SLIPRINGS AND BRUSHES
Remove the brush cover assembly (4 screws). Hinge back brush cover assembly leaving the red and black wires attached. Check the condition of the sliprings and clean them if necessary.
Check the spring-loaded carbon brushes are clean and are free to move in the brush holder.
Set a multimeter to continuity check (buzz test).
Check there is continuity between the top carbon brush and the positive + terminal of the rectifier, then check there is continuity between the bottom carbon brush and the negative terminal of the rectifier.
Check there is continuity between the top slipring and the red output cable of the generator.
Then check there is continuity between the bottom slipring and the black output cable of the generator.
If no continuity is found on one or both output leads, check the soldered joint on the slipring. Resolder if necessary.
Set multimeter to read 0-15 volts DC connect test leads of multimeter to the brushes top brush is (Positive +) bottom brush is (Negative -) turn generator main shaft by hand in any direction. If a voltage is present then refit brush cover using a new gasket. Attach the test leads of the multimeter to the output wires of the generator, then turn main shaft again to check a voltage is present.

KNOCKING/SCRAPING SOUND ONCE PER REVOLUTION
Whilst the generator is in it's working position, check that the M8 allen screw which retains the fan assembly to the main shaft is fully tightened. Also check tightness of all other fasteners on the fan assemble, mounting adaptor and tailfin.
Check that the safety circlip which is fitted on the end of the main shaft, in front of fan assembly, is not loose and making a noise. Remove rear cover and check the condition of the rotor, it may be rubbing on the stator.
Inner main bearing could be worn, check for axial and radial movement. Check the tightness of the 4off M5 stator retaining screws, this can cause a noise if slightly loose.

MECHANICAL NOISE

If the generator did not make the noise when first installed, but has very gradually developed a noise.
Check the following –

1. Grease main bearings (recommended grease Castrol Spheerol L-EP2 or equivalent)
2. If the generator has been operating for 3 years or more, it may be the main bearings need replacing.
3. If the generator is only quite new, the main shaft may have worn where the bearing inner race is located on the shaft.
4. Stator assembly has worked loose.
5. Fan assembly locking bolt not fully tightened
6. Generator mounting arrangement not fully tightened.

If the generator did not make the noise when first installed, but has very suddenly developed a noise.
Check the following -

1. If the noise developed after the generator had been subjected to very high wind speeds during storms, it may be the three-phase rectifier has been damaged
2. If the generator is only quite new, the main shaft may have worn where the bearing inner race is located on the shaft
3. Stator assembly has worked loose.
4. Fan assembly locking bolt not fully tightened
5. Generator mounting arrangement not fully tightened.

CHECKING MAIN BEARINGS

Remove fan and check axial and radial play in the main front bearing. Remove rear cover and check inner main bearing in the same manner. If large amount of play is found replace main bearings. Follow instructions listed REPLACING MAIN BEARINGS. Whilst the rear cover is removed check the tightness of the 4 off stator retaining screws

ELECTRICAL VIBRATION NOISE

As described on page one, it is normal for the Aero6gen to produce a very slight magnetic cogging vibration when rotating, and an electrical vibration whilst charging. This noise will be greatly amplified if the Aero6gen is mounted on a very hollow section of a yacht/boat. If mounted directly over sleeping quarters it may well be necessary to stop the Aero6gen at night.

Well-known methods that can reduce vibration noise are listed below.
1. Rubber mount as many fixings within the system as possible.
2. Insert round insulation material (the type you fit around cold water pipes to stop them freezing during winter) into the bore of the 1.5" mounting tube. (15mm pipe sized insulation normally fits just perfect).
3. Coil a length of rope around the outside diameter of the mounting tube (full length).

SLIGHT ELECTRIC SHOCK FROM HAND RAIL

Remove the generator from mounting, taking off the tailfin and fan assembly. Remove the rear cover (6 off screws) and hinge back cover. Using a multimeter set on continuity/buzzer test, check the 3 Phase output wires from the stator assembly do not have continuity with the main casting.
i.e. The casting/main housing of the generator should be totally isolated from the electrical output of the generator.
If they do have continuity a new stator assembly must be fitted - contact LVM Products.

REPLACING PIVOT BEARINGS

Remove the generator from it's mounting, taking off the tailfin and fan assembly. Remove adaptor-locking bolt, and brush cover. Remove bottom cover (2 screws).
Clamp the pivot shaft in a vice, using jaw protectors so as not to damage the pivot shaft. Then using a hammer against a piece of wood to protect the casting paintwork, tap out pivot shaft assembly by hitting the base of the casting.
The bearings can now be removed from the pivot shaft. Use Loctite bearing fit when refitting the new bearings to the pivot shaft, and to the generator housing. Apply silicone sealant to the bottom cover, and the output wires within the adaptor when reassembling the pivot shaft assembly. Refit brush cover using a new brush cover gasket.

INSTRUCTIONS FOR REMOVING AND REPLACING MAIN BEARINGS

Parts required:

2 off - Main bearings	LVM Part No. Bearing 586
1 off - Rear cover gasket	LVM Part No. Gasket 548
2 off - Circlips 20mm	LVM Part No. Circlip 276
6 off - Rear cover retaining screws	LVM Part No. Screw 664
1 off - Small amount of Loctite 638 in tube.	

Tools and materials required: Hammer, Circlip pliers, Pozi drive screwdriver, Piece of hardwood, and a brass rod 12mm diameter X 250mm long or similar. A grease gun filled with good quality ball bearing grease preferably Castrol Spheerol L-EP2 or equivalent.

1. Disconnect output leads, and remove generator from mast. Remove fan, and tailfin assembly.

2. Remove the front circlip on the main shaft.

3. Remove 6 off self-tapping screws retaining the rear cover.

4. Place a piece of hard wood on a concrete floor. Holding the generator with the rear cover held back and main shaft downwards, lift and force downwards the generators main shaft onto the piece of hard wood. This should displace the main shaft inwards. Alternatively the main shaft can be pressed out, or hammered out, but take care not to bruise the end of the main shaft.

5. The main shaft/ rotor assembly should now have moved inwards into the main housing.

6. Using a piece of brass rod, or similar, so as not to damage the end of the main shaft - tap the shaft through both the bearings and remove rotor assembly from the rear of the main housing.

7. Having removed the rotor from casting. Check the main shaft for wear, particularly the areas where the main bearings were positioned. If the shaft wear is found to be excessive a new shaft will have to be fitted. Contact LVM Ltd.

8. Using the brass rod and a hammer knock out the main bearings from the casting.

9. Clean all the main bearing grease from the casting.

10. Refit new main bearings (sealed side of bearings outwards) using a little Loctite Bearing Fit smeared on the O.D. of the bearings.

11. Clean the main shaft, then clean the rotor magnet with sellotape (sticky side) to remove small pieces of steel pickup.

12. Smear a little Loctite Bearing Fit onto the main shaft close to the rotor, and in the bore of the outer main bearing.

13. Insert the main shaft/rotor assembly into the generator main bearings. WARNING! The rotor magnets are very powerful and will quickly draw the assembly into the stator. When the main shaft/rotor assembly is fully inserted check it rotates without rubbing.

14. Smear a little Loctite Bearing Fit on the outer main bearing inner race to shaft. i.e. between the O.D. of the shaft and the I.D. of the inner race. Push the main shaft in and out a little to spread the Loctite between the outer main bearing bore and the main shaft.

15. Fit new circlip

16. Refit rear cover using a new gasket, make sure all internal wiring is clear of the rotor.

17. Using a grease gun filled with a good quality ball bearing grease (preferably Castrol Spheerol L-EP2 or equivalent) attached to the grease nipple, pump till you see the grease just start to come out of the front bearing seal.

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