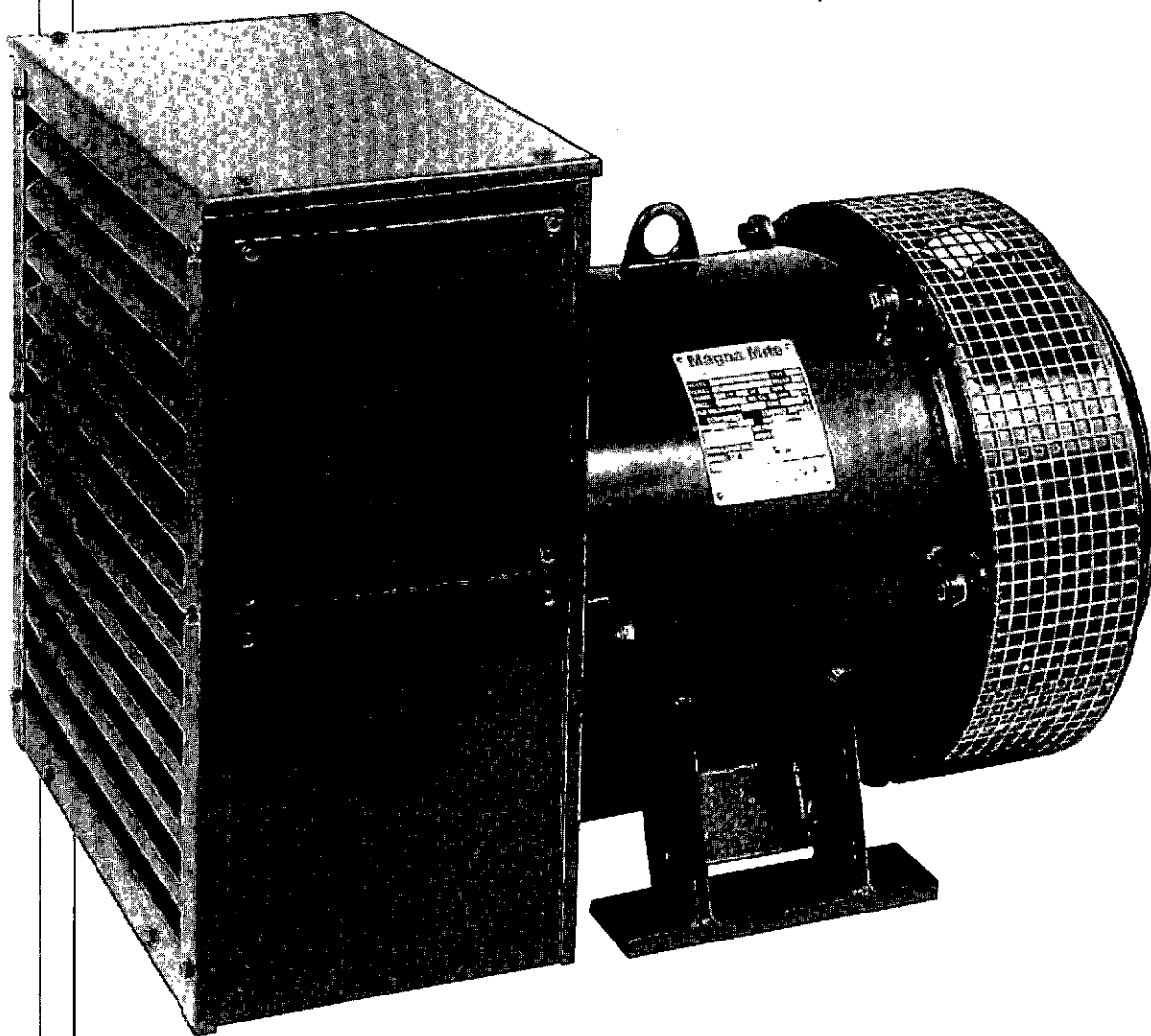


Magna Mite™ Generator Service Manual

20-105 kW
250, 340 Frame



**MARATHON®
ELECTRIC**
WAUSAU, WISCONSIN 54401 U.S.A.

INDEX

FOREWORD

This service manual applies to Marathon Electric Manufacturing Corporation Magna Mite brushless ac generators. It contains instructions for installation, operation, and maintenance of these generators.

WARNING

These instructions must be followed to insure safe and proper installation, operation and maintenance of the generator. They should be brought to the attention of all persons who install, operate or maintain this equipment.

Disconnect all power before servicing. Failure to follow all safety information can result in serious personal injury or death. Install and ground per local and national codes. Consult qualified personnel with any questions.

TORSIONAL VIBRATION

The factors which are most critical to torsional vibration are contained in the design of the engine.

The engine-generator set manufacturer, his representative or buyer shall be responsible for the torsional analysis and approval of the engine-generator combination. When requested to do so, Marathon Electric will submit to the above for approval, rotor weight and WK² information, along with such other data as is deemed necessary.

Marathon Electric will proceed with the manufacture of generators prior to the receipt of torsional approval unless specifically requested in writing to delay production for receipt of such approval from the buyer. The buyer will be responsible for manufacturing charges incurred as a result of manufacturing prior to torsional approval.

Marathon Electric will not be responsible for the torsional vibrational characteristics of an installation when the engine vibrates on its base or steel bed and such vibration is transmitted to the supporting structure, or when the construction of the base is such that the engine-generator-mount natural frequency approaches that of the floor or sub-base resulting in magnification of vibration, or where the engine-generator combination has been found torsionally compatible, yet develops vibration due to a base of insufficient strength or inadequate sway-bracing.

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GENERAL INFORMATION

GENERAL MECHANICAL CONSTRUCTION

GENERAL

A generator is a device which transforms mechanical energy into electrical energy. Magna Mite Generators are brushless, 4-pole machines producing 60 Hz power at 1800 rpm, or 50 Hz power at 1500 rpm (Hz = Hertz = cycles per second). All standard units are rated at 0.8 power factor.

Single bearing generators are supplied with an SAE adaptor and flexible drive discs on the drive end as standard. Alignment of the generator and engine is assured by the concentricity of the flywheel housing and the generator adaptor. Flexible drive discs are piloted in a rabbet in the flywheel itself, again assuring alignment. It may be necessary to shim the generator feet on the base for solid support. Two bearing units come standard with two brackets and a shaft extension for a drive coupling.

Ac generators require direct current flowing through the rotor winding to set up the magnetic flux which allows the unit to generate. A small ac exciter, which actually is a miniature replica of the main generator, provides this direct current. The exciter is mounted on the same shaft as the generator rotor. While the main generator field rotates and the armature is stationary, the exciter field is stationary and the armature rotates. The output from this exciter is fed into the rectifying elements mounted on a heat sink. This rectifier assembly is located on the shaft, opposite the drive end (see figure 1 below).

The ac exciter requires direct current for its excitation. This excitation is supplied by rectifying a portion of the output of the main generator by means of a static voltage regulator. The amount of

current going into the field of the exciter will determine the output voltage of the exciter, and this in turn will control the output voltage of the main generator. Meters, controls, or other features needed to satisfy installation requirements are available as options.

MECHANICAL CONSTRUCTION

Magna Mite brushless generators are designed and manufactured with the same engineering precision and craftsmanship that has, for years, gained Marathon Electric an outstanding reputation in this field. Precision machine parts, together with careful hand assembly, give the Magna Mite durability and reliability.

A solid, rolled steel frame, results in rigid support for the stator core and end brackets. The stator core is firmly anchored to the frame.

The end brackets and adaptors are made of cast iron for the ultimate rigidity required to support the heavy duty sealed bearings. The front bracket supports the stationary exciter field structure. For single bearing units, the frame is fitted with a rugged cast iron SAE adaptor, precision rabbeted to insure alignment with the prime mover. The drive hub is keyed and heat shrunk to the shaft. This hub carries a number of flexible steel drive discs which have holes for fastening to the flywheel (for some adaptor-disc combinations, spacers are used between the hub and discs to maintain the proper distance between the disc and SAE adaptor face). This affords flexibility, in the axial direction, while in the radial direction it acts as a rigid coupling providing a uniform air gap.

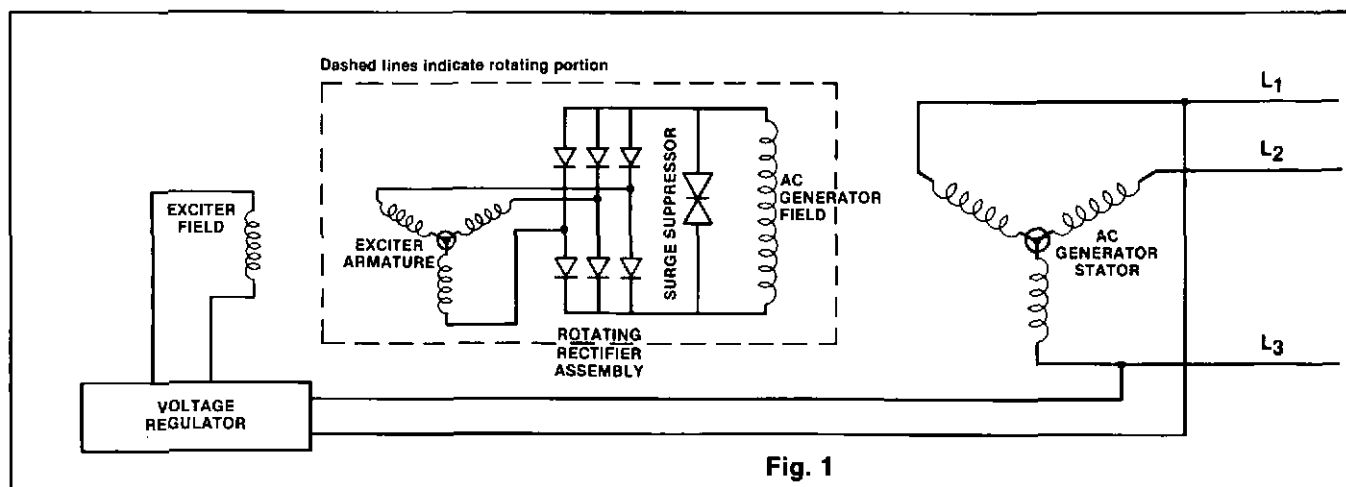


Fig. 1

GENERAL INFORMATION

ROTOR CONSTRUCTION STATOR CONSTRUCTION VENTILATION SYSTEM

For two bearing generators, a second bracket and standard shaft extension is substituted for the adaptor and flexible drive discs. When selecting a belt driven generator, refer to the chart on Page 6 for the drive details under which these units will operate successfully.

ROTOR CONSTRUCTION

The Magna Mite rotor has copper bars brazed to copper end laminations to form the amortisseur winding. The 4 poles which carry the field windings are one piece laminations providing high mechanical integrity, and low vibration at operating speeds.

Two dips and bakes of varnish are applied to the field winding. The completed rotor is baked under a controlled cycle to ensure a solid, mechanically stable rotor. The rotor pole assembly is pressed on to the shaft, forming a very rigid rotating element. All rotors are dynamically balanced and then tested at a speed of 125% of the operating speed.

The ac exciter armature and the heat sink which carries the rectifiers are mounted on an assembly which is placed on the generator shaft inboard of the front generator bearing. Access to the rectifiers is through windows in the front bracket. The exciter is designed for long life and trouble-free operation.

STATOR CONSTRUCTION

The stator laminations are made from electrical-grade steel, notched on precision presses. The cores are welded together, pressed into the frame assembly, and welded in place. Random-wound coils are placed in slots insulated with Class F or better materials. Once the properly insulated coils have been inserted in the stator, the assembly is given multiple dips and bakes in a thermo-setting varnish by a special process which ensures complete coverage. This premium insulation system utilizes all synthetic and non-hygroscopic materials making the standard windings fungus resistant and suitable for operation in high humidity and abrasive environments. Subsequently, the wound core is placed into the frame.

ELECTRICAL CONNECTIONS RECEIVING YOUR MAGNA MITE GENERATOR

VENTILATION SYSTEM

Magna Mite generators employ an advanced flow-through ventilation system. The cast aluminum alloy ventilation fan draws air through louvers in the conduit box, over the main stator and exciter windings and exhausts it through a ventilation screen on the adaptor. This exclusive design provides efficient cooling as air is distributed evenly throughout the generator, effectively reducing the recirculation of hot air. Since there is only one air intake, mounting of air filtration systems is easily accomplished.

ELECTRICAL CONNECTIONS

The large, front end mounted conduit box is constructed of formed sheet steel with ample room inside. It has 4 removable side panels to allow easy rework for accessory mounting. A hole-saw or any suitable tool can be used to provide a hole for the conduit entrance. An approved connector must be used in conjunction with the conduit. The regulator can be moved from the left to the right side with relative ease if the entrance of the conduit is needed in this location.

IMPORTANT: To minimize the transmission of vibration, it is essential that flexible conduit be used for all electrical connections to the generator. Refer to the connection diagrams supplied with the generator and install all intercomponent and external wiring in accordance with the regulations of the national and local regulatory bodies. Be sure the generator frame is grounded to all the other components of this system with the ground wire complying with national and local codes. Terminal lugs (CSA certified) are provided on all generator leads. Clean all contact surfaces to assure good electrical bonding with the generator lugs. Use heavy duty terminal lugs or good quality clamps for making all connections. Tape all connections in accordance with national and local regulations.

RECEIVING YOUR MAGNA MITE GENERATOR

Upon receipt of the generator, it is recommended that it be carefully examined to determine if any shipping damage has occurred before accepting the shipment from the transportation company.

INSTALLATION

UNPACKING AND HANDLING STORAGE

UNPACKING AND HANDLING

Read all instruction cards carefully. When lifting, attach an overhead crane to the lifting lug on the generator frame. Apply lifting force in a vertical direction.

WARNING

DO NOT LIFT COMPLETE GENERATOR SET BY MEANS OF LIFTING LUG ON GENERATOR. PERSONAL INJURY OR EQUIPMENT DAMAGE MAY RESULT.

WARNING

DO NOT APPLY ANY FORCE TO GENERATOR FAN FOR LIFTING OR ROTATING GENERATOR ROTOR. DISREGARDING THESE INSTRUCTIONS MAY CAUSE PERSONAL INJURY OR EQUIPMENT DAMAGE.

STORAGE

In the event that the generator is not to be installed on the prime mover immediately, it is recommended that it be stored in a clean, dry area which is not subject to rapid changes in temperature and humidity.

INSULATION RESISTANCE

It is recommended that the insulation resistance of the generator winding be checked with a megohmmeter prior to initial operation. A megohm reading of 1.5 (1,500,000 ohms) minimum indicates the winding is in good condition. If the reading is less than 1.5 megohms, the winding must be dried out before being put into service.

WARNING:

THE VOLTAGE REGULATOR AND ANY OTHER CONTROL OR MONITORING ACCESSORIES MUST BE DISCONNECTED BEFORE ANY PART OF THE GENERATOR IS TESTED WITH A MEGOHMMETER OR HIGH POTENTIAL TESTER.

1. Main Stator - Connect all stator leads together and measure insulation resistance from the leads to the stator frame assuring that the stator leads do not contact the frame.
2. Main Rotor - Disconnect the 2 rotor leads from the rectifier assembly and connect together

assuring that they do not contact the shaft. Measure insulation resistance between the leads and the shaft.

3. Exciter Stator - Connect the 2 leads together and measure insulation resistance between the leads and the bracket.
4. Exciter Rotor - Disconnect the 3 rotor leads from the rectifier assembly and connect together assuring that they don't contact the shaft. Measuring insulation resistance between the leads and the shaft.

GENERATOR DRYING SHORT-CIRCUIT METHOD

1. Disconnect exciter leads F1 and F2 from the regulator.
2. Connect a battery or other dc power source of approximately 12-24 volts (depending on the kW of your unit) to the exciter leads F1 and F2. An adjustable voltage source is desirable, however, a voltage adjust rheostat (rated approximately 2 amps) in series with the dc power source will accomplish the same result. Short circuit the generator lead wires to each other (L1 to L2 to L3).
3. Start the generator set and measure the current through the leads with a clip-on ammeter. Adjust the voltage source to produce approximately 80% of the rated ac nameplate current, but in no case exceed nameplate amps. Running time will be determined by the amount of moisture present in the generator. Insulation resistance checks should be taken every one to four hours until a fairly constant value is obtained (1.5 megohms or greater).
4. After the generator has achieved a constant insulation resistance value, disconnect the dc power source and reconnect the F1 lead from the exciter to F+ and F2 to F-. Make sure that all leads are reconnected properly.

GENERATOR DRYING OVEN METHOD

Place the machine in an oven and bake it at a temperature not to exceed 90 degrees C or 194 degrees F. The voltage regulator and any electronic component accessories must be removed from the generator when using this method.

INSTALLATION

PREPARATION FOR USE GENERATOR MOUNTING

PREPARATION FOR USE

Although the generator is carefully inspected and tested in operation before it leaves the factory, it is recommended that the unit be thoroughly inspected. The insulation on the wires should be inspected and all bolts should be checked for tightness.

Remove all shipping tapes, bags, blocks and skids which are used to prevent vibration and rotor movement during shipment. Dry, low-pressure compressed air of approximately 30 PSI (206 KPA) can be used to blow out the interior of the generator. In the case of two bearing machines, it is possible to turn the rotor by hand to make sure that it rotates smoothly without binding.

SINGLE BEARING GENERATOR MOUNTING

Single bearing generators are provided with an SAE flywheel adaptor and flexible drive discs. Very close tolerances are maintained in the manufacture of the generator so that the alignment procedure is extremely simple. A coupling hub is shrunk on the shaft and special steel drive discs are bolted to the hub. Holes are provided in the periphery of the coupling disc which correspond to tapped holes in the flywheel. The outside diameter of the discs fits in a rabbet in the flywheel so that concentricity is assured in all cases.

CAUTION: GRADE 8 CAPSCREWS AND HEAVY SERIES LOCKWASHERS OR GRADE 8 PLACE-BOLTS AND HARDENED WASHERS ARE RECOMMENDED TO MOUNT THE DRIVE DISCS TO THE FLYWHEEL.

The SAE adaptor and the flywheel housing are designed to match each other with no further alignment necessary. Shims may be necessary under the feet of the generator to insure a solid mounting.

TWO BEARING DIRECT DRIVE

Two bearing generators are provided with a shaft extension and keyway. For direct-coupled units, the assembler furnishes a flexible coupling which is installed between the driver and the generator shaft.

TWO BEARING BELT DRIVE

IMPORTANT: Aligning the two machines as accurately as possible will reduce vibration and insure minimum coupling wear. It may be necessary to shim the generator feet for proper support.

TWO BEARING BELT DRIVE

Two bearing generators can be belt driven. Please refer to Marathon Electric for application assistance involving belt driven installations. Sheave diameters should be chosen according to the table below.

Magna Mite Sheave Application for
Two Bearing Units^①

Model	Min. Sheave Dia. in Inches @ 20,000 Hr. B-10 Life ^③		Min. Sheave Dia. in Inches @ 40,000 Hr. B-10 Life ^③		Max. Sheave Width Inches
	60 Hz	50 Hz	60 Hz	50 Hz	
250FDR1002	4.9	4.4	6.4	5.9	4.62
250FDR1006	6.5	6.3	8.7	8.4	4.62
252FDR1010	8.5	7.5	11.6	10.3	4.62
252FDR1014	9.9	9.1	13.9 ^②	12.6	4.62
340FDR1022	9.5	8.2	12.7	10.9	5.88
340FDR1026	11.7	10.4	15.8 ^②	14.0	5.88
342FDR1030	15.5 ^②	13.7	21.6 ^②	18.9 ^②	5.88
342FDR1034	18.4 ^②	15.6 ^②	26.3 ^②	22.1 ^②	5.88

① Assumptions:

- A. Belting factor is 1.3.
- B. The drive and the driven sheaves are the same diameter.
- C. The sheave load is located at the center of the shaft extension.
- D. Based upon continuous kW ratings. (240/480V-60 Hz, 200/400V - 50 Hz)

② These sheave diameters exceed the maximum recommended belt speed of 6000 ft/min.

③ B-10 Life means 90% of the bearings will last this long or longer.

INSTALLATION

ELECTRICAL CONNECTIONS

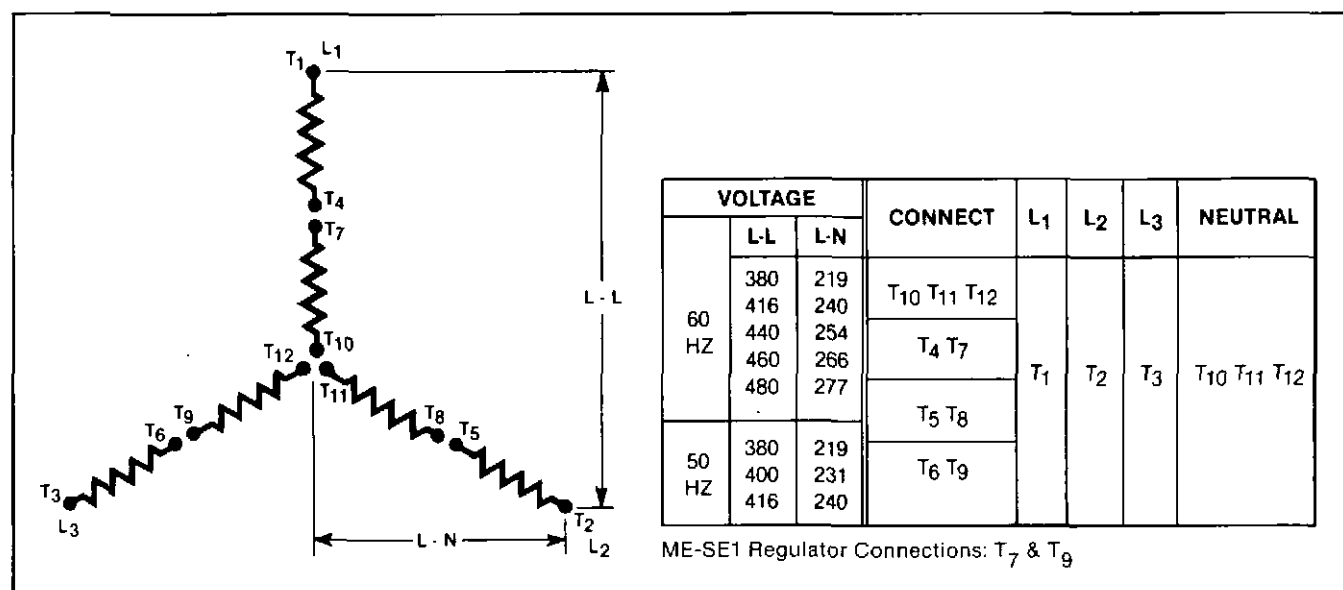
GENERATOR LEAD CONNECTIONS

The electrical connections in the conduit box should be made in accordance with the appropriate "connection diagram." Use the diagram appropriate for the voltage range required.

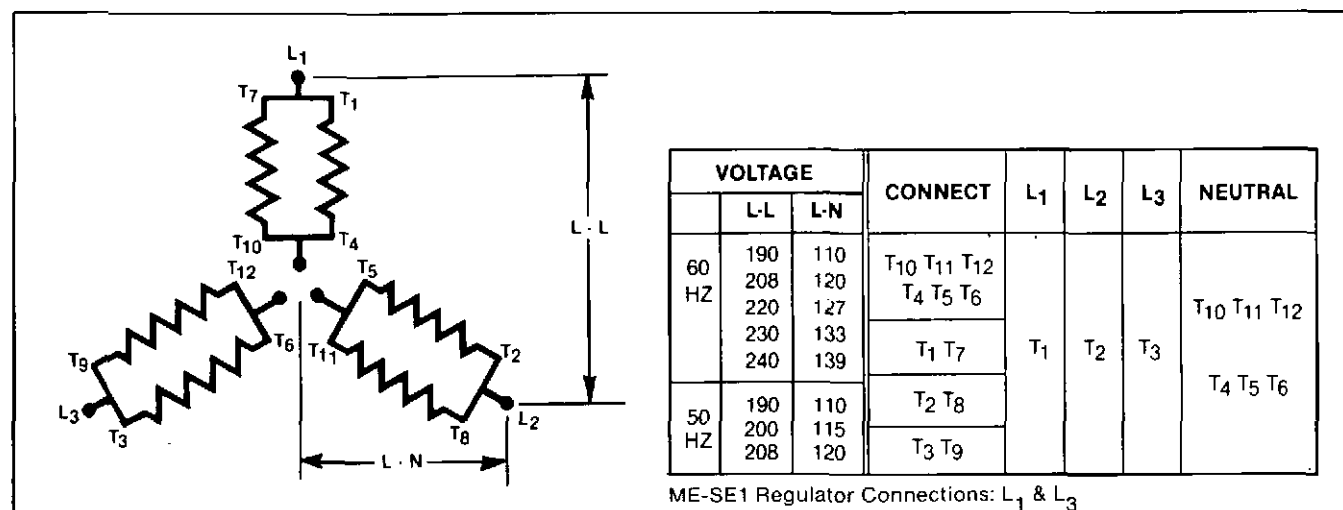
The final voltage setting is established within the selected range by an adjustment of the voltage regulator.

The use of flexible conduit is required to minimize the effect of the engine vibrations.

HI WYE



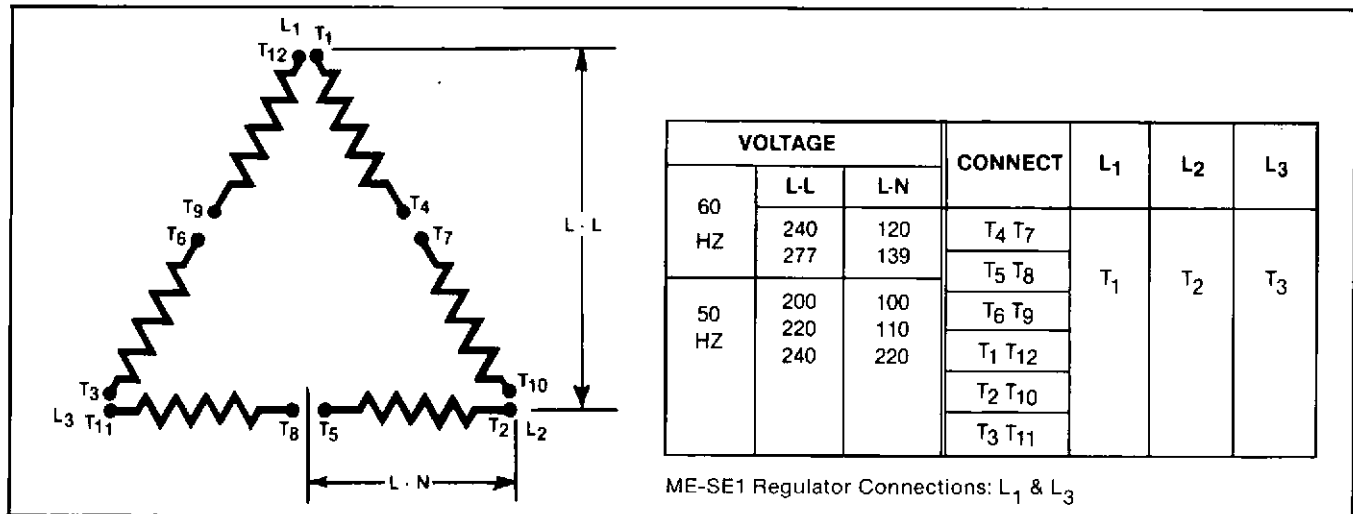
LOW WYE



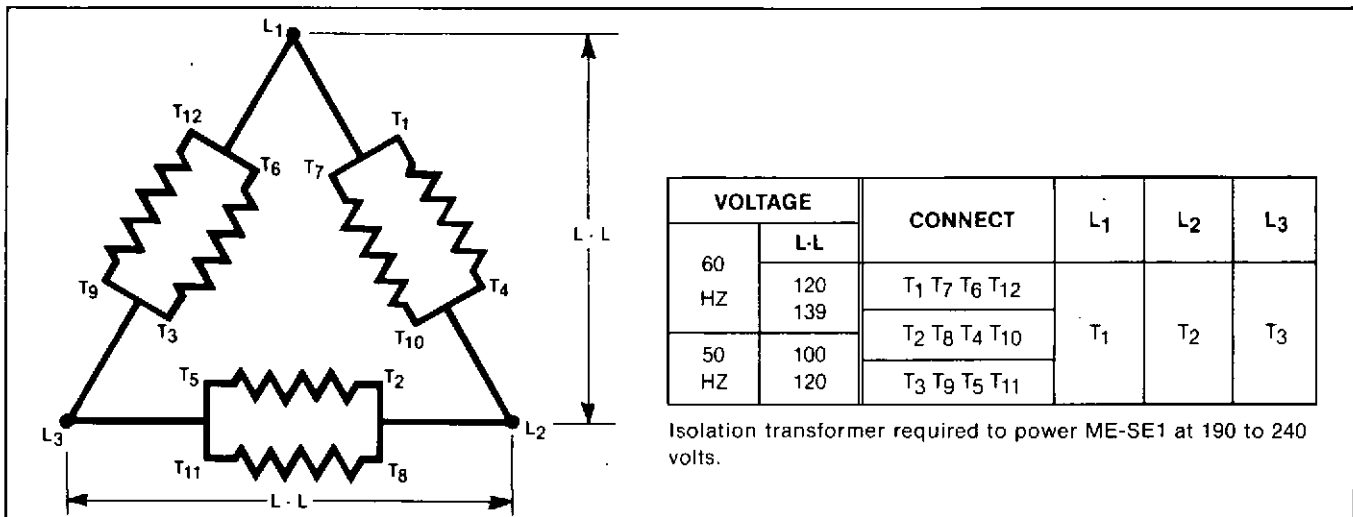
INSTALLATION

ELECTRICAL CONNECTIONS

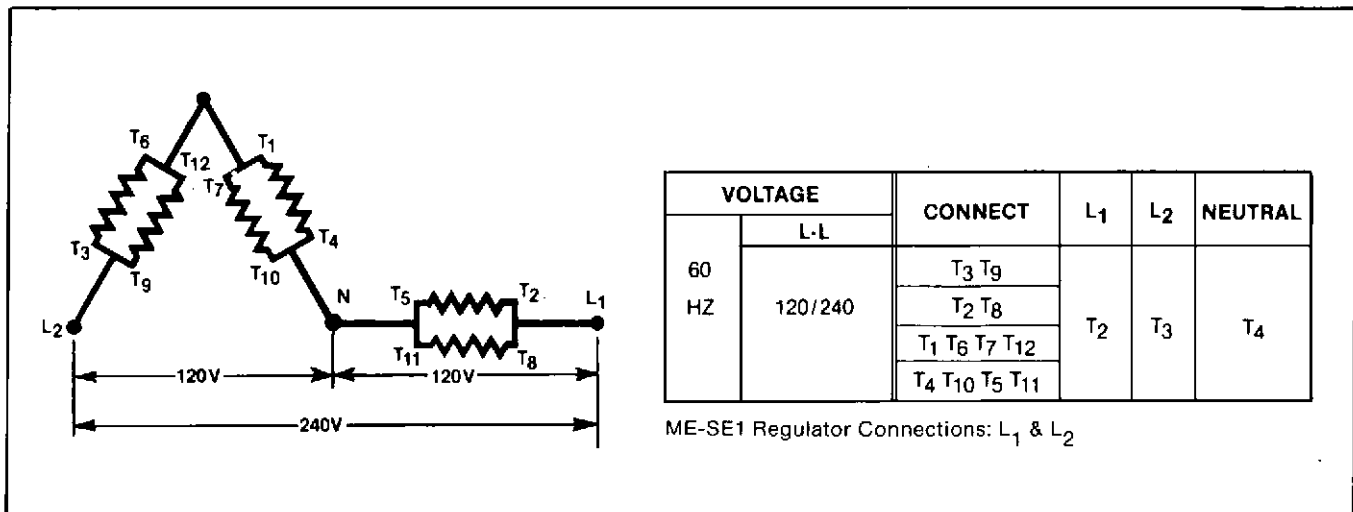
HI DELTA



LOW DELTA



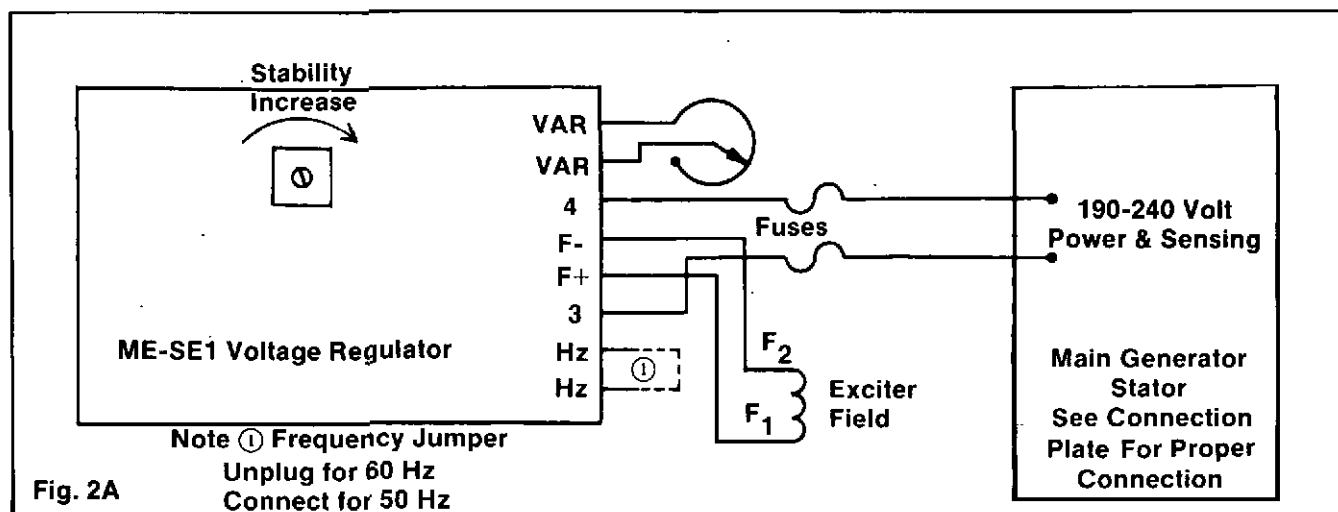
ZIG-ZAG



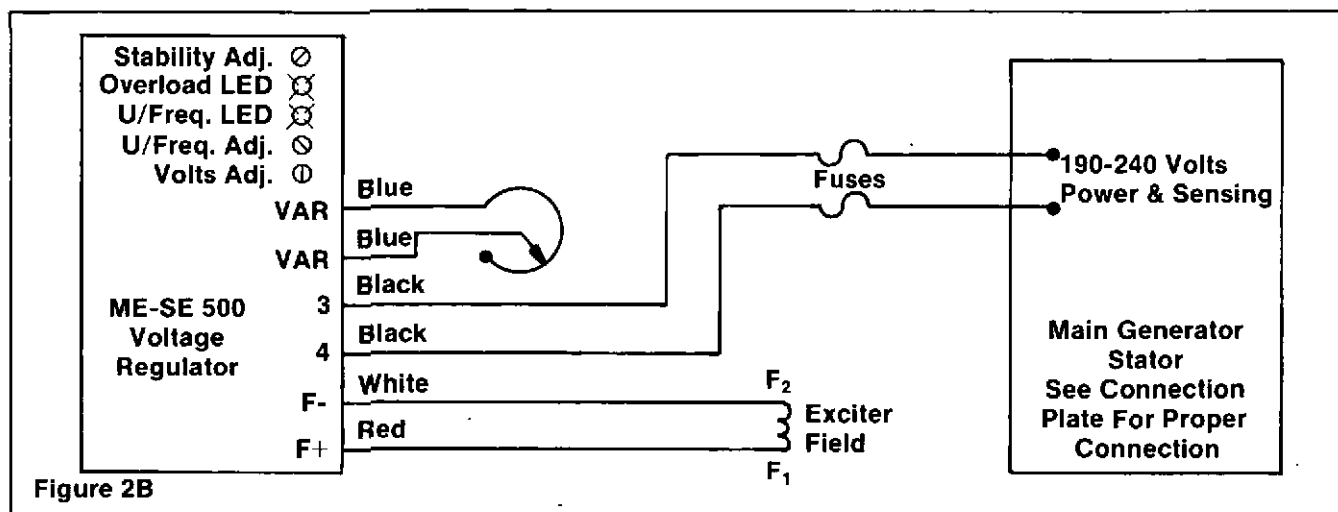
INSTALLATION

VOLTAGE REGULATOR

VOLTAGE REGULATOR CONNECTION DIAGRAM (ME-SE 1 Voltage Regulator)



VOLTAGE REGULATOR CONNECTION DIAGRAM (ME-SE 500 Voltage Regulator)



GENERAL

The voltage regulator is responsible for regulating the output voltage level produced by the generator. It does this by controlling the current in the exciter field. The standard voltage regulator used on the Magna Mite is the Marathon Electric ME-SE1 or ME-SE500. This regulator is a completely solid state unit which is encapsulated for mechanical and environmental protection. It includes underfrequency compensation, overexcitation shutdown, and electromagnetic interference (EMI) filtering as standard features. The regulator requires only a small amount of initial attention to insure long, trouble free service.

FREQUENCY SELECTION (ME-SE1 Voltage Regulator) (Figure 2A)

The underfrequency compensation characteristic is used to improve system block loading performance and to protect the generator during extended periods of underspeed operation. A jumper labeled "Hz" is used to select the compensation for the proper operating frequency. The jumper must be:

Unplugged for 60 Hz (1800 rpm) operation
Plugged together for 50 Hz (1500 rpm) operation

CAUTION: If this step is not carefully followed the system will not be properly protected and it may not perform as expected.

INSTALLATION

VOLTAGE REGULATOR

CAUTION: When the jumper is disconnected for 60 Hz operation, care must be exercised to prevent contact between the jumper conductors and any other conductive objects.

FREQUENCY SELECTION (ME-SE500 Voltage Regulator) (Figure 2B)

Initially set the "U/Freq." (underfrequency) adjust fully counter-clockwise. Run the generator at the desired full-load speed. Turn the "U/Freq." adjust slowly clockwise until the U/Freq. L.E.D. lights. Then turn the "U/Freq." adjust slowly counter-clockwise until the L.E.D. just goes out. The underfrequency control is now correctly set and it will come into operation below rated full-load frequency. The characteristic is approximately volts/hertz and the "U/Freq." may be adjusted to give volts/hertz operation continuously by setting the cut-in point just above the no-load speed.

STABILITY ADJUSTMENT

A small potentiometer is provided on the potted surface of the regulator to allow optimization of the system performance. Turning this adjustment counter-clockwise (CCW) decreases the level of stability while speeding up transient performance. Turning it clockwise (CW) increases the level of stability while slowing the transient response. The stability is adjusted at the factory, but if it is necessary to readjust it, the following procedure is suggested:

1. Connect an analog dc voltmeter across the exciter field. This will be used to determine when the regulator is stable. Alternatively, an analog ac voltmeter or a light bulb connected to the main generator stator may be used as an indicator of stability.
2. Operate the generator set at no load.
3. Reduce the generator voltage to 90% of the normal operating voltage.
4. Turn the stability adjustment CCW until the system is unstable.
5. Turn the stability adjustment CW until the system reaches the desired level of stability.
6. Readjust the voltage to its normal operating level.

OVEREXCITATION PROTECTION (ME-SE1 and ME-SE500)

The regulator has a unique protective feature which prevents it from providing full output for an extended period of time. This circuit allows regulator forcing for motor starting and other normal requirements, but limits the maximum forcing time. Extended regulator forcing could result from a failure in the generator, a regulator failure, or a fault or severe overload on the generator output. Extended periods of regulator forcing (overexcitation) can damage both the generator and the regulator.

When an overexcitation condition occurs, the voltage regulator turns off and maintains the generator voltage at residual voltage levels. The regulator can be reset by stopping the set or by removing its input power (leads #3 and #4) for at least 2 seconds. Repeated tripping of this protective feature indicates a problem with the generator, the connected load, or the regulator.

TEMPERATURE

The regulator is designed for an operating temperature range of -40°C (-40°F) to 60°C (140°F). These limits should not be exceeded.

TROUBLE SHOOTING

The regulator requires a minimum of 10 volts residual voltage on its power and sensing leads (#3 and #4) to insure voltage build-up. If this voltage level is not present, the rest of the system should be inspected to determine why residual voltage is not reaching the regulator. Field flashing procedures are given on page 12.

If the regulator has tripped out on its overexcitation shutdown feature, all residual voltage must be removed for a minimum of 2 seconds to reset the regulator. If, when the residual voltage is reconnected to the regulator, the regulator output momentarily goes high and then turns off, it is likely that the overexcitation function is latching the regulator off. The system should be inspected for any defects which would cause the regulator to go into a full on condition. If no defects exist in the system, but the regulator turns off on its overexcitation protection feature, it may be defective.

If residual voltage is present on regulator leads (#3 and #4), if no indication of overexcitation shutdown exists, and if there are no other defects in the system but voltage does not build up to normal levels, the voltage regulator may be defective.

OPERATION

PRE-START INSPECTION STARTING-UP THE GENERATOR FIELD FLASHING

PRE-START INSPECTION

Before operating for the first time, the following checks are recommended.

1. Check all wiring against the proper connection diagrams and make sure all connections are properly insulated.
2. Inspect for any remaining packing materials and remove loose clothes and all tools.
3. Check that all covers and guards are installed and tight.
4. Check that the "Hz" jumper on the ME-SE1 voltage regulator is in the proper condition. The jumper should be unplugged for 60 Hz (1800 rpm) operation or connected together for 50 Hz (1500 rpm) operation.

WARNING

RESIDUAL VOLTAGE IS PRESENT AT THE GENERATOR LEADS AND AT THE REGULATOR PANEL CONNECTIONS, EVEN WITH THE REGULATOR FUSES REMOVED. CAUTION MUST BE OBSERVED OR SERIOUS PERSONAL INJURY OR DEATH CAN RESULT. CONSULT QUALIFIED PERSONNEL WITH ANY QUESTIONS.

STARTING-UP THE GENERATOR

The following procedure should be followed for starting-up the generator set:

1. The generator output must be disconnected from the load. Be certain that the main circuit breaker is open.
2. Start the prime mover and adjust it for the proper speed.

3. Adjust the voltage to the required value by means of the voltage adjust rheostat.
4. Close the main circuit breaker and apply the load.
5. Adjust engine speed at full load to 1800 rpm for 60 hertz, 1500 rpm for 50 hertz.
6. Before stopping the engine, remove the load and trip the main circuit breaker.

FIELD FLASHING

The generator relies on residual voltage to start the generator action which in turn produces the rated voltage. If the generator fails to produce a voltage after it has come up to rated speed, it may be necessary to flash the field.

With the generator shut down, disconnect the F1 and F2 exciter stator leads from the regulator. Connect two diodes (2 amp, 50 volt minimum), a 12-24 volt battery, and a switch to the F1 and F2 leads per figure 3. The positive terminal of the battery must be connected to F1 and the negative terminal to F2. Close the switch for 1-2 seconds. Disconnect the flashing circuit from the F1 and F2 leads and reconnect the F1 lead to the F+ regulator lead and the F2 lead to the F- regulator lead. This action remagnetizes the exciter field and allows build-up when the system is restarted.

FIELD FLASHING CIRCUIT

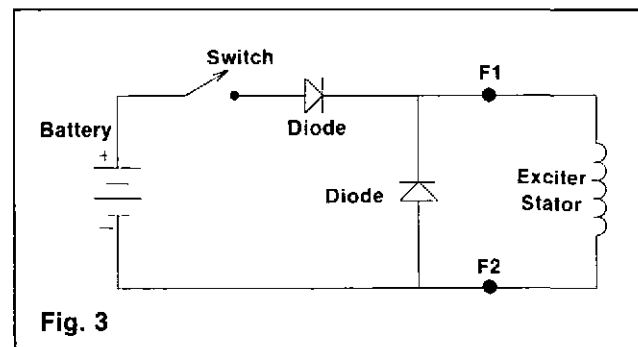


Fig. 3

SERVICE

GENERATOR CROSS-SECTION

SINGLE BEARING GENERATOR

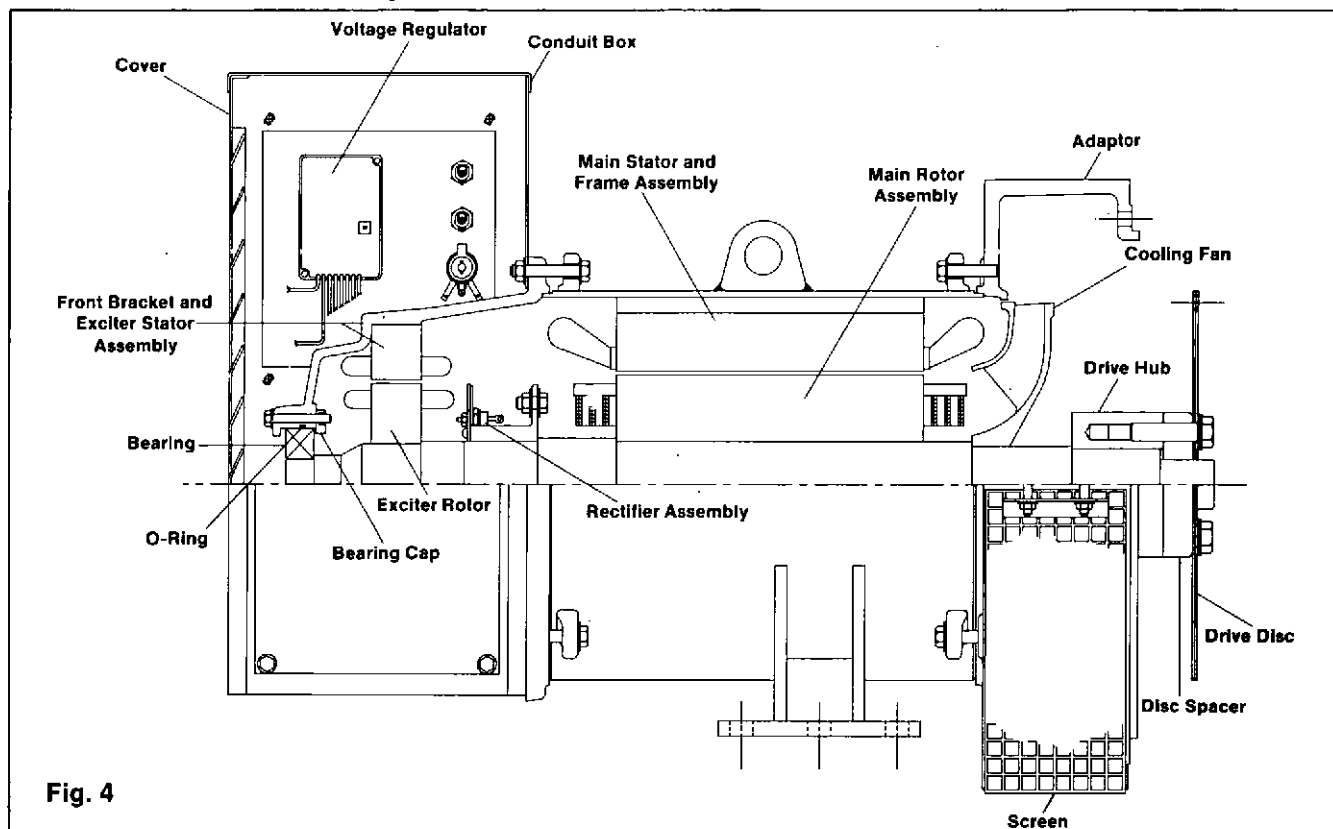


Fig. 4

DOUBLE BEARING GENERATOR

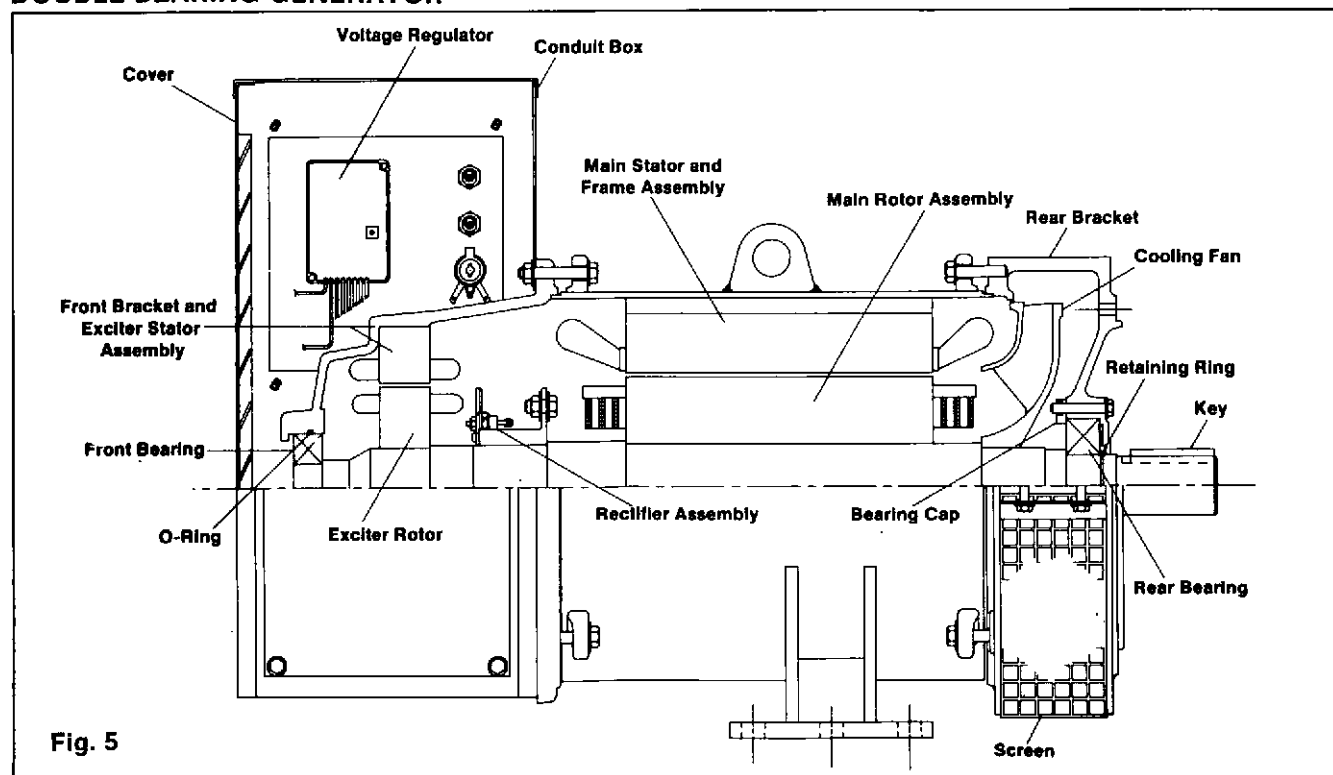


Fig. 5

SERVICE

DISASSEMBLY

WARNING

DISCONNECT ALL POWER BEFORE SERVICING. FAILURE TO FOLLOW ALL SAFETY INSTRUCTIONS CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

DISASSEMBLY INSTRUCTIONS

The disassembly instructions are setup for a single bearing unit. The instructions are the same for a double bearing unit except where noted. Refer to figures 4 and 5 for general part identification.

1. Remove conduit box cover.
2. Disconnect F1 and F2 leads of the exciter stator from the regulator and the power and sensing leads from the main stator leads (see figure 6).

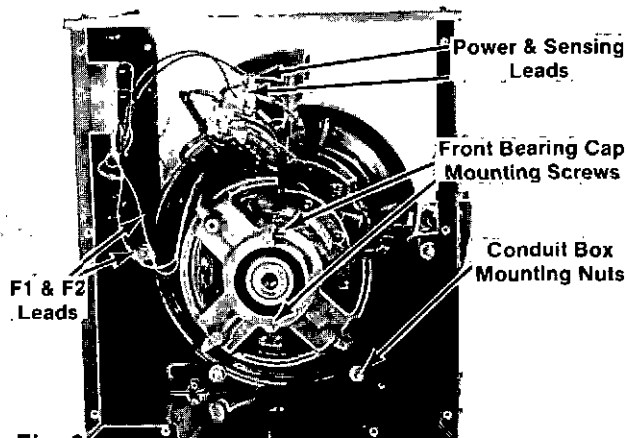


Fig. 6

3. Remove the front bearing cap screws and washers.
TWO BEARING: This step does not apply.
4. Remove the adaptor screen.
TWO BEARING: Remove the rear bracket screen.
5. Remove the adaptor mounting screws and washers (see figure 7). Remove the adaptor from the body assembly.
TWO BEARING: Remove the rear bearing lock screws and washers (see figure 8). Remove the rear bracket mounting screws and washers. Remove the rear bracket from the body assembly.

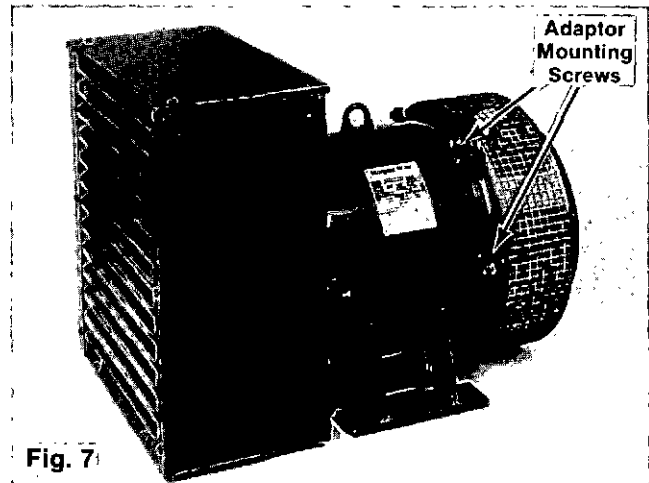


Fig. 7

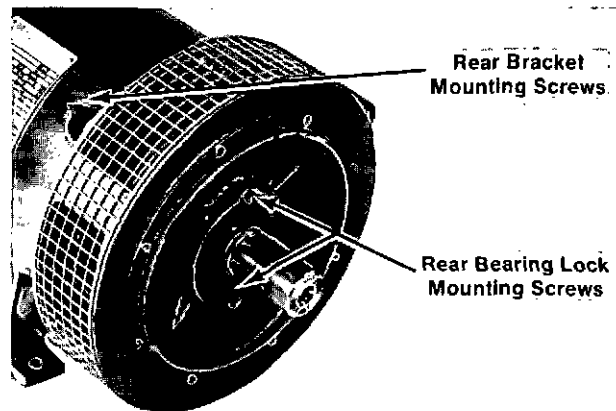


Fig. 8

Two Bearing Unit Only

6. Remove the drive disc mounting screws and washers. Remove the drive discs and disc spacer(s) (if equipped).
TWO BEARING: This step does not apply.
7. Slide a pipe, that is slightly larger in ID than the shaft extension OD, over the shaft extension (see figure 9). Wrap a suitable lifting strap around the shaft between the fan and the rotor core. Connect the lifting strap to a suitable hoist (1000# or more in capacity).

SERVICE

DISASSEMBLY INSPECTION

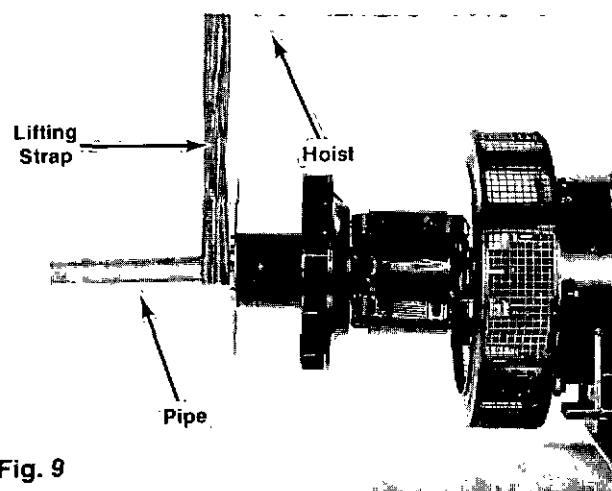


Fig. 9

WARNING

DO NOT APPLY ANY FORCE TO THE GENERATOR FAN FOR LIFTING OR ROTATING THE GENERATOR ROTOR. DISREGARDING THESE INSTRUCTIONS MAY CAUSE PERSONAL INJURY OR EQUIPMENT DAMAGE.

8. Raise the rotor assembly using the hoist to the point at which the rotor is centered in the stator assembly (rotor turns freely). Carefully pull the rotor assembly out of the stator assembly while applying the necessary force on the end of the pipe to maintain the rotor to stator centering.

CAUTION: SPECIAL CARE SHOULD BE USED IN THE ROTOR ASSEMBLY REMOVAL, OR WINDING DAMAGE COULD RESULT.

9. Set the rotor assembly on a suitable cradle to prevent winding damage.
10. Remove the conduit box mounting nuts and lift off the box (see figure 6).
11. Mark both the front bracket and body assembly to within .030" to assure proper alignment at reassembly. Remove the front bracket mounting screws and washers and lift off the bracket and exciter assembly.

CAUTION: FAILURE TO FOLLOW THESE INSTRUCTIONS MAY REDUCE THE GENERATOR'S STATED ELECTRICAL PERFORMANCE.

UNIT INSPECTION

A. INSULATION RESISTANCE

1. Check windings (main stator and rotor, exciter stator and rotor) for proper insulation resistance (see page 5). If the insulation resistance values are low and drying methods do not restore it to the required levels, then the winding should be rewound.
2. The main stator, exciter stator and exciter rotor can be field rewound. Call Marathon Electric for full rewind procedures and materials information.
3. The main rotor uses a special winding for improved cooling which is very difficult to rewind except at the factory. Call Marathon Electric regarding factory main rotor re-winding.
4. If the exciter stator is removed from the bracket for rewind, it must first be accurately marked (within .030") to maintain its angular alignment with the bracket. Mark both the bracket and the exciter stator for reassembly.

CAUTION: FAILURE TO FOLLOW THESE INSTRUCTIONS MAY REDUCE THE GENERATOR'S STATED ELECTRICAL PERFORMANCE.

B. CONNECTIONS

1. Check all connections on the rectifier assembly and in the conduit box to assure that all lead terminations are tight.

C. BEARING REPLACEMENT

1. Pull the bearing with a suitable bearing puller. *TWO BEARING: Remove the snap ring from the outside of the rear bearing. Pull the bearings with a suitable bearing puller.*
2. Heat the new bearing in an oven to a maximum temperature of 212°F (100°C). Using insulated gloves, install the bearing over the end of the shaft until it seats against the shaft shoulder. The bearing should slide on the shaft and be seated without excessive force.

SERVICE

INSPECTION

CAUTION: UNDER NO CIRCUMSTANCES SHOULD PRESSURE BE APPLIED TO THE OUTER RACE OF THE BEARING, AS PERMANENT BEARING DAMAGE COULD RESULT.

3. Allow the bearing to cool for one hour before attempting to assemble the generator. Check for proper seating of the bearing O ring in the front bracket.

TWO BEARING: Reinstall the snap ring at the rear bearing location. Allow the bearing to cool for one hour before attempting to assemble the generator. Check for proper seating of the bearing O ring in the front bracket.

D. FAN REPLACEMENT

1. Using a torch, rapidly, heat the drive hub at the outer diameter while tightening the puller (see figure 10). This must be done rapidly before the heat can expand the shaft. Remove the drive hub and key.

TWO BEARING: Remove the rear bearing per the Bearing Replacement procedure.

2. Using a torch, rapidly heat the backside of the fan. Using insulated gloves, slide the fan off the shaft.

3. Heat the new fan to 400°-500° F (204°-260° C). Using insulated gloves, slide the fan over the shaft until it seats against the shaft shoulder.

4. Allow the fan to cool for 30 minutes.

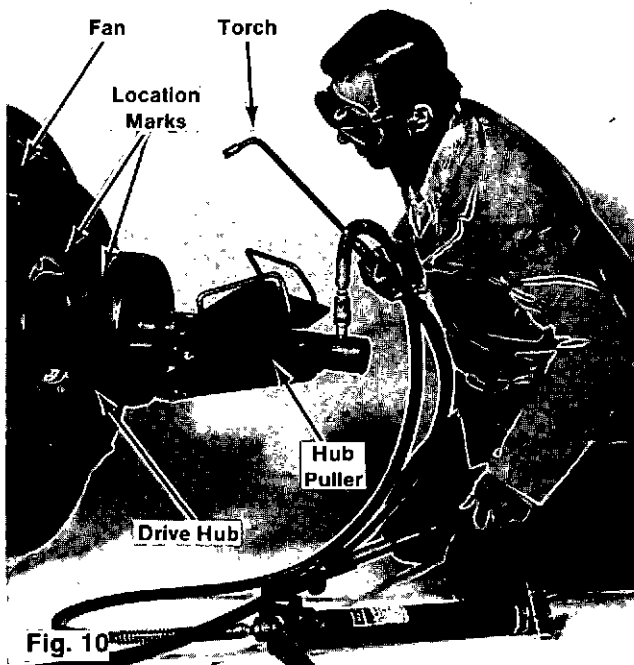


Fig. 10

5. Rebalance the rotor assembly.

TWO BEARING: Rebalance the rotor assembly. Mount a new bearing per the Bearing Replacement section.

E. RECTIFIER ASSEMBLY CHECK

1. The rectifier assembly consists of 3 standard polarity rectifiers, 3 reverse polarity rectifiers, and a surge protector (see figure 11).

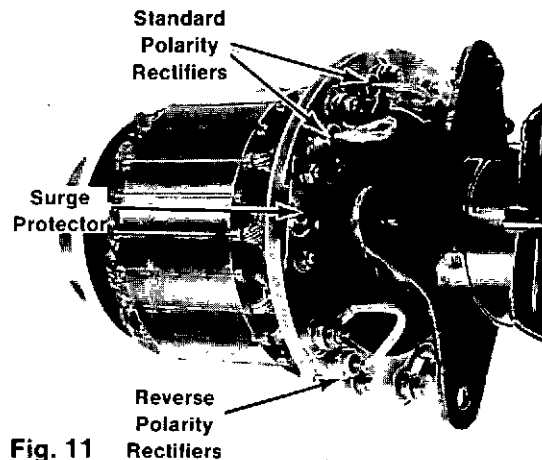


Fig. 11

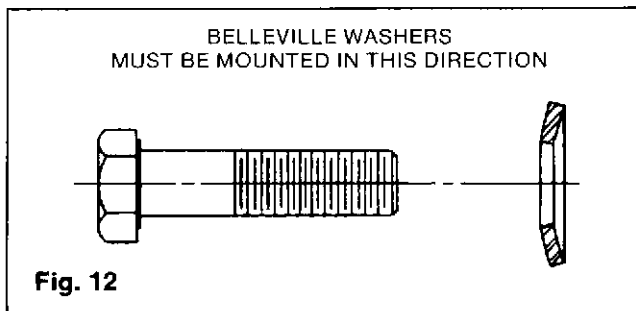
2. Test each rectifier with an ohmmeter. Remove the bolted leadwire from one rectifier at the terminal stud. Test the resistance between the disconnected leadwire and the rectifier base. Make sure you have a good connection. Note the reading and reverse the ohmmeter probes. One reading should be high and the other low if the rectifier is good. If the high and low readings are not achieved, the rectifier is defective and must be replaced. Assure that replacement rectifiers of the correct polarity are used.
3. Remove the surge protector circuit board from the rectifier assembly. Check the surge protector with an ohmmeter by measuring the resistance across the terminals. Reverse the ohmmeter probes and repeat the test. A high resistance should be measured in both directions. If not, replace the surge protector.

SERVICE

ASSEMBLY

ASSEMBLY INSTRUCTIONS

1. To assemble the generator, follow the disassembly instructions in a reverse sequence.
2. Assemble all Belleville washers per figure 12.
3. Torque all capscrews per figure 13.



SHIPPING INSTRUCTIONS

When installed, single bearing generator rotors are supported on the drive end by the drive discs bolted to the engine flywheel. When the generator is removed, the rotor must be supported by an appropriate fixture to prevent main rotor, main stator or exciter damage. The fixture must prevent axial movement of the rotor assembly during any shipping.

CAPSCREW TORQUE VALUES

Metric Grade	5.8		6.8		8.8	
Approx. SAE Grade	2		3		5	
Capscrew Head Markings						
Capscrew Body Size (mm) x Pitch (mm/thread)	Torque ft-lb kg-m		Torque ft-lb kg-m		Torque ft-lb kg-m	
M4 x .7	1.1	.16	1.7	.24	2	.29
M5 x .8	2.3	.32	3.5	.48	4	.57
M6 x 1.0	3.9	.54	5.8	.80	7	1.0
M7 x 1.0	6.5	.90	9.4	1.3	11	1.6
M8 x 1.25	10	1.3	14	2	18	2.5
M10 x 1.5	20	2.7	29	4	32	5
M12 x 1.75	34	4.7	50	7	58	8
M14 x 2.0	54	7	79	11	94	13
M16 x 2.0	80	11	122	17	144	20
M18 x 2.5	114	16	170	23	190	26

NOTE: 1 inch = 25.4 mm 1 ft-lb = .138 kg-m

Fig. 13

TROUBLE SHOOTING

WARNING

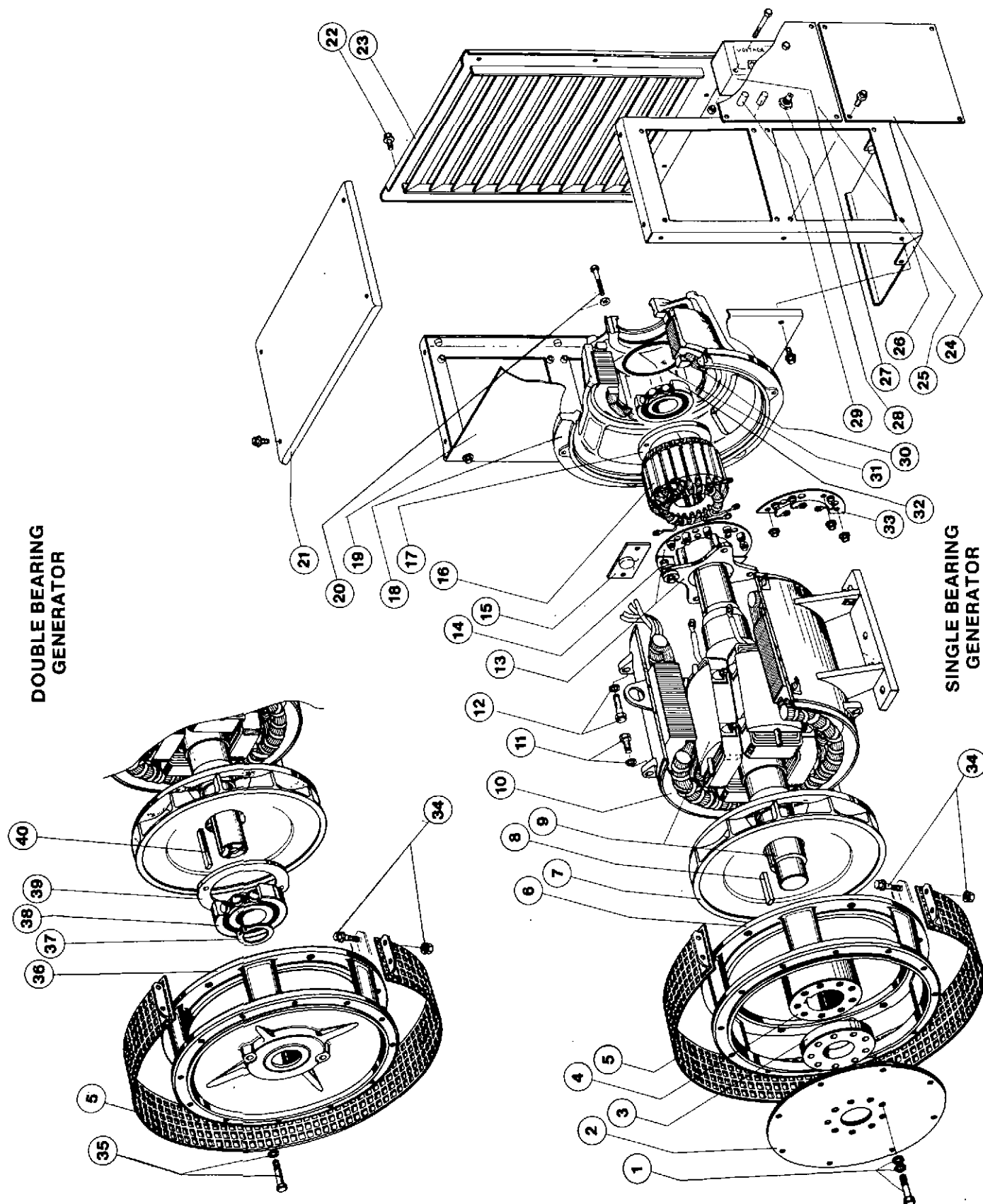
RESIDUAL VOLTAGE IS PRESENT AT THE GENERATOR LEADS AND AT THE REGULATOR PANEL CONNECTIONS. CAUTION MUST BE OBSERVED OR SERIOUS PERSONAL INJURY OR DEATH CAN RESULT. CONSULT QUALIFIED PERSONNEL WITH ANY QUESTIONS.

Note: Always include the Model Number and Serial Number of your generator when corresponding with Marathon Electric.

Symptom	Possible Cause	Remedy
No Voltage	Open or short circuit in exciter stator.	Check for broken or open lead wires. If fault is in winding coils, rewind or return to factory for repair.
	Loss of residual magnetism.	Flash field with dc source. See page 12 for field flashing procedure.
	Regulator fuse(s) blown.	Replace fuse(s). Correct cause of blown fuse(s).
	Open or short circuit in main stator.	Check winding for continuity. Rewind or return to factory if defective.
	Defective voltage regulator.	Trouble shoot regulator. Replace if defective.
	Open or shorted rectifier asy.	Check assembly according to page 16. Replace any rectifiers which are defective.
	Open or short circuit in main rotor.	Check for broken or open lead wires. If fault is in winding coils, return rotor to factory for repair.
	Regulator overexcitation shutdown.	Reset by stopping set or removing regulator power for 2 seconds. Correct cause of overexcitation condition.
	Open or short circuit in exciter rotor.	Check for broken or open lead wires. If fault is in winding, repair or replace rotor.
Fluctuating Voltage	Defective voltage regulator.	Replace if defective.
	Engine speed fluctuating.	Check engine governor.
	Improper voltage regulator stability adjustment.	Adjust voltage regulator stability control. Page 9.
	Open voltage adjust rheostat.	Check for continuity. Replace if defective.
	Generator overloaded.	Reduce load to rated value.
	Operating at 50 Hz with regulator Hz jumper open. (ME-SE1)	Connect regulator Hz jumper for 50 Hz.
	Loose internal or load connections.	Tighten connections.
High Voltage	High engine speed.	Reduce speed of engine to rated.
	Defective voltage regulator.	Replace if defective.
	Misadjustment of rheostat.	Adjust rheostat.
Low voltage	Defective voltage regulator.	Replace if defective.
	Misadjustment of rheostat.	Adjust rheostat.
	Voltage drop in line.	Increase size of wire.
	High resistance connections to load. Connections will be warm or hot.	Tighten connections.
	Open voltage adjust rheostat.	Check for continuity. Replace if defective.
	Operating at 50 Hz with regulator Hz jumper open. (ME-SE1)	Connect regulator Hz jumper for 50 Hz.
	Low power factor load.	Reduce inductive (motor) load to within nameplate amps.
	Generator overloaded.	Reduce load to rated value.
	Low engine speed.	Check engine governor.
Vibration	Defective or dry bearings.	Replace defective bearings.
	Misalignment of generator to engine.	Align generator to engine.

PARTS LIST

GENERATOR EXPLODED VIEW



PARTS LIST

GENERATOR PARTS LIST RECOMMENDED SPARE PARTS

GENERATOR PARTS LIST

Item	Description
1	Disc Mounting Screw and Washer
2	Drive Disc
3	Disc Spacers (when used)
4	Drive Hub
5	Screen
6	SAE Adaptor
7	Ventilating Fan
8	Drive Hub Key
9	Shaft and Main Rotor Core with Winding
10	Main Stator and Frame Assembly with Winding
11	Rear Bracket/Adaptor Mounting Screw and Washer
12	Front Bracket Mounting Screw and Washer
13	Balance Hub and Insulator Assembly
14	Rectifier Assembly-Reverse Polarity
15	Surge Protector
16	Exciter Rotor Assembly with Winding
17	Bearing Retainer
18	Front End Bracket
19	Conduit Box Back
20	Bearing Cap Mounting Screw and Washer
21	Conduit Box Top
22	Conduit Box Cover Mounting Screw and Washer Assembly
23	Conduit Box Cover
24	Conduit Box Panel
25	Regulator Panel
26	Conduit Box Side
27	Voltage Regulator
28	Voltage Adjust Rheostat
29	Fuse and Fuseholder
30	Exciter Stator Assembly with Winding
31	Bearing O Ring
32	Ball Bearing (Exciter End)
33	Rectifier Assembly-Standard Polarity
34	Screen Mounting Bolt and Nut and Washer Assembly
35	Rear Bearing Lock Mounting Screw and Washer
36	Rear Bracket
37	Rear Bearing Snap Ring
38	Ball Bearing (Shaft Extension End)
39	Rear Bearing Lock
40	Shaft Extension Key

- A1 Complete Single Bearing Rotor Assembly
Includes Items: 4, 7, 8, 9, 13, 14, 15, 16, 17, 32, 33
- A2 Complete Double Bearing Rotor Assembly
Includes Items: 7, 9, 13, 14, 15, 16, 17, 32, 33, 37, 38, 39
- A3 Complete Bracket and Exciter Stator Assembly Includes Items: 18, 30, 31
- A4 Complete Conduit Box Assembly Includes Items: 19, 21, 22, 23, 24, 26
- A5 Complete Regulator Panel Assembly Includes Items: 25, 27, 28, 29

RECOMMENDED SPARE PARTS

Item	Description	Qty.
27	Voltage Regulator	1
32, 38	Ball Bearing	1
15	Surge Protector	1
33	Rectifier Assembly - Std.	1
14	Rectifier Assembly - Rev.	1
29A	Fuse	6
29	Fuseholder	2
28	Voltage Adjust Rheostat	1

Always include the generator model number and serial number when corresponding with Marathon Electric.

Parts may be ordered direct from:

Marathon Electric Mfg. Corp.
P.O. Box 1407
Wausau, WI 54401
Phone: (715) 675-3311

Sales and Service Assistance

California

ANAHEIM
625 South Euclid Suite 15
Anaheim, CA 92802
Phone: (714) 956-7111

Florida

HIALEAH
Alvan C. Chaney & Assoc.
1670 W. 39th Place
Suite 1309A
Hialeah, FL 33012
Phone: (305) 558-2933

Georgia

SNELLVILLE
2442 Meadowglen Trail
Snellville, GA 30278
Phone: (404) 979-6502

Illinois

CHICAGO
655 Central Ave., Unit E
Wood Dale, IL 60191
Phone: (312) 350-1800

Indiana

INDIANAPOLIS
6520 E. 82nd Street
Indianapolis, IN 46250
Phone: (317) 842-4652

Louisiana

NEW ORLEANS
5622 Perrier Street
New Orleans, LA 70115
Phone: (504) 899-5426

Michigan

UNION LAKE
1177 Polvadera
Union Lake, MI 48085
Phone: (313) 363-0002

Minnesota

MINNEAPOLIS
6200 Excelsior Blvd.
Suite 101
Minneapolis, MN 55416
Phone: (612) 927-9005

Nevada

RENO
817 Plumas St., Suite 7
Reno, NV 89509
Phone: (702) 348-8448

New Jersey

ALLENDALE
39 Snowfence Road
Allendale, NJ 07401
Phone: (201) 327-7411

TOMS RIVER
899 Brookside Drive
Toms River, NJ 08753
Phone: (201) 240-9336

New York

SYRACUSE
Room 173 Pickard Building
5858 East Molloy Road
Syracuse, NY 13211
Phone: (315) 454-3279

Ohio

CINCINNATI
1313 E. Kemper Rd., Suite 104
Cincinnati, OH 45246
Phone: (513) 671-1677

CLEVELAND
20800 Center Ridge Rd-Suite 400
Cleveland, OH 44116
Phone: (216) 331-2910

Oklahoma

TULSA
2227 S. Garnett Road, Suite 106
P.O. Box 690115
Tulsa, OK 74169
Phone: (918) 438-3391

Pennsylvania

BRIDGEVILLE
Foster-McClinton, Inc.
2867 Washington Road
Bridgeville, PA 15017
Phone: (412) 941-4800

FOGELSVILLE
55 Snowdrift Road
Fogelsville, PA 18051
Phone: (215) 358-5482

South Carolina

GREENVILLE
100 Executive Center Drive
Greenville, SC 29615
Phone: (803) 288-8990

Tennessee

NASHVILLE
417 Welshwood Drive
Suite 201
Nashville, TN 37211
Phone: (615) 834-3930

Texas

DALLAS
1366 Exchange Drive
Richardson, TX 75081
Phone: (214) 699-0251

HOUSTON
13201 Northwest Freeway
Suite 202, #1
Houston, TX 77040
Phone: (713) 462-4445

Utah

SANDY
E.L. Pack & Associates
1830 East 9800 South
Sandy, UT 84092
Phone: (801) 571-4484

Wisconsin

MUKWONAGO
South 110, West 30410
YMCA Camp Road
Mukwonago, WI 53149
Phone: (414) 363-5498



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