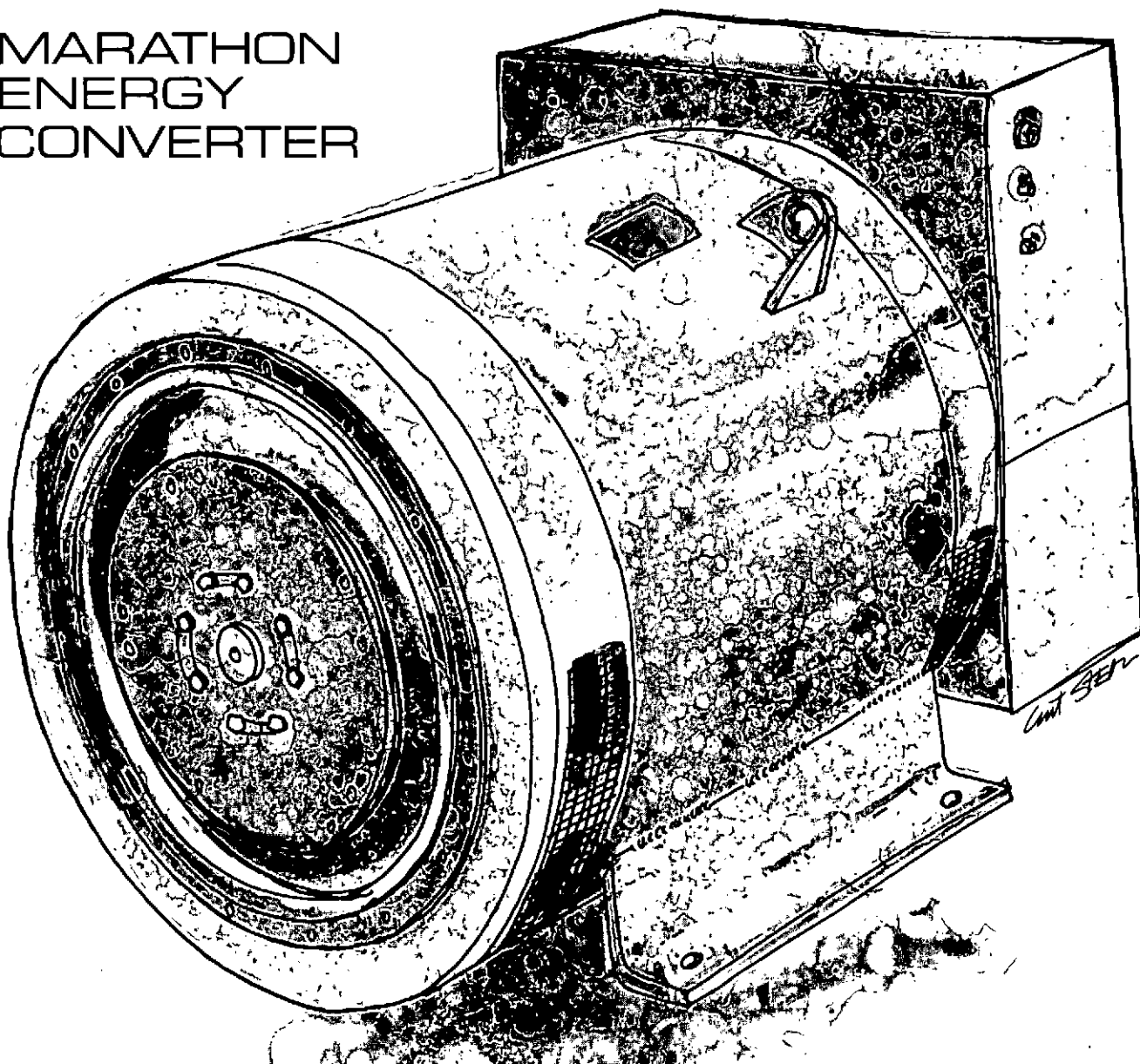


● MARATHON

* MARATHON ENERGY CONVERTER



Foreword

This service manual applies to MECon brushless AC generators manufactured by Marathon Electric Manufacturing Corporation. It contains instructions for installation, operation, and maintenance of these generators. The basic construction of this line of generators is also covered and a section on renewal parts ordering information is included.

WARNING

These instructions must be followed to ensure 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.

WARNING

Failure to follow all safety information can result in serious personal injury or death. Disconnect all power before servicing. 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. Marathon Electric shall submit to the above for approval rotor weight and WK² information, along with such other data as is deemed necessary when requested to do so.

Marathon Electric shall 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 shall be responsible for manufacturing charges incurred as a result of manufacturing prior to torsional approval.

Marathon Electric shall 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.

Introduction and Description

GENERAL

A generator is a device which transforms mechanical energy, as supplied by a prime mover, into electrical energy. The generators described herein are 4-pole generators of the brushless design. 4-pole generators produce 60 Hz power at 1800 RPM or 50 Hz power at 1500 RPM. The units are rated at 80 percent power factor.

NOTE

Hz (Hertz) = cycles per second.

The generators are available as single-bearing units with an SAE adapter and flexible disc-type coupling, or as two-bearing generators with a shaft extension. Alignment of the generator and engine is automatically assured in the case of single-bearing generators by the concentricity of the flywheel housing and the generator adapter. The flexible disc coupling is piloted in a rabbet in the flywheel itself, again assuring perfect alignment. However, it may be necessary to shim the generator feet on the base for solid support.

AC generators require direct current flowing through the rotor winding in order to set up the magnetic flux which allows the unit to generate. Brushless exciters have eliminated the use of slip rings and brushes. A small AC exciter which actually is a miniature replica of the main generator except with a rotating armature, is provided 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 with the main rotor. The output from this exciter is fed into rectifying elements which are mounted on a heat sink located opposite the drive end of the generator so that no brushes or collector rings are required.

The AC exciter itself requires direct current for its excitation, and this excitation is supplied by rectifying a portion of the output of the main generator by means of a static voltage regulator. At the same time, 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. In this manner, a completely self-contained unit is obtained.

Before the generator can produce a voltage, it is a pre-requisite that a small amount of direct current shall flow through the field winding of the generator. In brush-type generators this is frequently accomplished by flashing the field from a battery. In the case of the brushless generator, the exciter generally has enough residual voltage to produce a voltage and flashing is not required. If flashing ever should be required, it is a simple matter to flash the exciter field from a battery or other source of DC or rectified AC.

The completely packaged units make it possible to furnish meters, controls, or other features needed to satisfy all installation requirements.

This manual deals with the generator itself. Instructions covering the voltage regulators, and any other components used in the packaged generator sets, are contained in other publications issued by Marathon Electric Manufacturing Corporation.

MECHANICAL CONSTRUCTION

MECon brushless generators are designed and manufactured with the same care that has been used for years in the statically excited generator line which has gained an outstanding reputation in the field. Cast-iron frames and end brackets and fabricated steel frames are machined by the latest methods to assure a rigid, highly efficient generator.

ROTOR CONSTRUCTION

A unique feature of the MECon brushless generator is that the four poles which carry the field windings are not made individually, but are made in one piece. Each lamination contains all four poles and the field windings are wound directly on these poles. The shaft is pressed into the rotor pole assembly and is keyed thereto, forming a very rigid rotating element. This method has proved to be far superior to separate pole pieces, either dovetailed to a spider or fastened by screws to the shaft. A thermo-setting bonding epoxy is applied between layers of the field windings and is applied to the finished rotor. The completed rotor is baked under a controlled cycle to ensure a solid, mechanically stable rotor. All rotors are dynamically balanced and then tested at a speed of 125 percent of operating speed.

In the generators in 500 frames and smaller, the amortisseur bars, the end rings which connect the bars together, as well as the coil supporting elements are made an integral part of the structure by the die-casting process.

In the generators in the 680 frame and up, the amortisseur bars are copper bars placed in slots in the rotor poles. Copper laminations of the same configuration as the steel laminations are placed at the ends of the steel laminations and the copper bars are brazed to these copper end plates, thereby assuring a continuous electrical connection between the bars. Nodular iron coil supports are placed at each end of the rotor laminations to support the coils.

The AC exciter armature and the heat sink which carries the diodes are mounted on an assembly which is placed on the generator shaft outboard of the front generator bearing.

STATOR

The laminations of the stator are of a thin, low-loss, non-aging silicon steel, notched on precision presses. Up to 600 volts, random-wound coils are placed in slots insulated with Class F materials. The cores are supported in rigid frames. Properly insulated coils using high temperature insulation are inserted in the stator core and the entire stator core is then given multiple dips and bakes in a thermosetting varnish by a special process which insures complete impregnation. Subsequently, the wound core is placed in the frame.

END BRACKET

The end brackets are of cast iron for the ultimate rigidity required to support the anti-friction bearings. The front bracket supports the stationary exciter field structure.

A flexible coupling of special spring-steel discs is used for single-bearing units. This affords flexibility in the axial direction, while in radial direction it acts as a rigid coupling to maintain a uniform air gap. Two-bearing units allow the generator to be coupled or belt drive. (Belt drive is through 125 KW. See Table 1.)

VENTILATION

The end next to the prime mover carries a fan which provides the ventilation for the generator. It discharges the air through openings in the frame. For single-bearing units, the frame terminates in a SAE adapter by means of which the generator is attached to the prime mover. For two-bearing generators, a rear end bracket is provided.

A hub, made of nodular iron, is keyed and attached to the shaft by the heat shrink method. This hub carries a number of flexible spring-steel discs provided with holes for the mounting bolts that fasten these discs to the driving element. (For some adapter-disc combinations, a spacer is used between the hub and discs to maintain the proper distance between the discs and SAE adapter face.)

ELECTRICAL CONNECTIONS

The generator conduit box is constructed of sheet metal to allow conduit to be used on the top, bottom, or either side of the box. A hole-saw or any suitable tool can be used to provide a hole for the conduit entrance and an approved connector must be used in conjunction with the conduit. The regulator can be moved 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 diagram 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 the system, with a ground wire which is at least the same size conductor as the load leads. Terminal lugs* are provided on all generators except for 600 KW and larger with voltage ranges 600 volts and below, on this a buss-bar arrangement will be used. Clean all contact surfaces to assure good electrical bonding with the generator lugs or buss bars. Use heavy duty terminal lugs or good quality clamps for making all connections. Tape all connections in accordance with the national and local regulations.

* CSA certified terminal lugs to be used.

APPLICATION OF V-BELT SHEAVES TO TWO BEARING MECon GENERATORS

GENERATOR FRAME SIZE	RATING KW	MAXIMUM KW FOR V-BELT DRIVE	GENERATOR V-BELT SHEAVE (NARROW 3V, 5V, & 8V)	
			MINIMUM DIA.	MAX. WIDTH
360	60	60	9.2	5-7/8
360	75	75	11.5	5-7/8
440	100	100	10.0	8-1/2
440	125	125	12.5	8-1/2
440	150	128	12.8	8-1/2

NOTE

Narrow sheaves as covered by "Standard Specifications for Drives Using Narrow V-Belts (3V, 5V, 8V) Cross-Sections" dated July, 1964. The width of the sheave shall not be greater than that required to transmit the indicated horsepower, but in no case wider than the length of the generator shaft extension. The center line of the sheave shall be located on the mid point of the shaft extension.

Installation

BASIC INSTRUCTIONS

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

UNPACKING AND HANDLING

Read instruction cards packed with the generator.

When lifting, attach an overhead crane to the eye bolts in the generator frame. Apply lifting forces in a vertical direction.

WARNING

Eyebolts or lifting lugs on generator frame are to be used only for lifting the generator. Using the generator eyebolts or lifting lugs for lifting the generator plus attached equipment such as a diesel or turbine could result in eyebolt or lug failure and injury and damage to personnel and equipment.

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.

INSPECTION

It is recommended that the insulation resistance of the generator stator be checked with a megohmmeter. In order to do this, all stator leads must be connected together and the insulation resistance measured from the lead terminals to the stator frame. A reading of at least 0.5 megohm (500,000 ohms) indicates the insulation is in good condition. A record should be kept of the resistance readings for comparing them with future data. A drop in resistance values indicates wet, dirty or grounded insulation. In this case, clean and dry the winding and check for grounds.

CAUTION

Do not use a megger on the rotor without disconnecting the diode bridge. Do not use a megger on the exciter field without first disconnecting the field leads from the regulator.

DRYING OUT

Machines that have been idle for some time in unheated and damp locations, or have "sweated" as a result of sudden changes in temperature of the surrounding air, or have become wet by accident, should be dried out thoroughly before being put in service. If possible, place the machine in an oven and bake it at a temperature not to exceed 90 degrees C or 194 degrees F. If this is not possible, the same results can be obtained by enclosing the generator with a covering, inserting heating units ("space heaters", lamps, or coils of steam pipe) to raise the temperature, leaving a hole at the top of the enclosure to permit the escape of moisture. Machines may also be dried out by passing a current at low voltage through the field windings or stator windings, raising the temperature to a value not exceeding 85 degrees C or 185 degrees F, while the machine is at rest. These temperatures can be established by means of a thermometer on the surface of the coils. A portable forced-air heater can also be used by directing heat to the end of the generator opposite the coupling and running the generator with no-load and without excitation; and, by letting the generator fan draw the warm air through the generator (heat at point of entry should not exceed 150 degrees F at the bearing hub). The time for drying out depends on the method of applying the heat and may take as long as 72 hours. Insulation resistance tests should be taken every three or four hours until a fairly constant value is obtained. This value should be equal to, or greater than, that calculated by the following formula:

$$\text{Megohms} = \frac{\text{Rated Voltage}}{1000} \text{ or } 0.5 \text{ Min.}$$

PREPARATION FOR USE

While the generator is carefully inspected and tested in operation before it leaves the factory, it is recommended that the unit be thoroughly inspected for indications of shipment damage. The insulation on the wire should be inspected and all bolts should be checked for tightness.

Remove all shipping tapes, blocks, strips and other material which is used to prevent vibration and rotor movement during shipment. (On some single-bearing units, a shipping strip is placed in the air cap between rotor O.D. and stator I.D. at bottom side in connection end, and this should be removed.) Dry, low-pressure compressed air of approximately 25 PSI 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.

If the machine has been in storage for a considerable length of time, it is recommended that the grease be checked in the bearing or bearings.

INSTALLATION AND ALIGNMENT

NOTE

Generators are shipped from the factory with approximately 3/16" to 5/16" bearing end clearance.

Before starting to assemble the generator to the engine, the following must be checked:

1. Measure the distance from the surface on the generator adaptor to the mounting face of the generator drive discs.
2. Measure the distance from the machined surface on the engine flywheel to the bottom of the drive disc recess in the flywheel.

If the distance from the diesel flywheel housing to drive disc recess is more than the distance from the generator adaptor to the drive discs, additional spacers between the drive discs and generator drive hub should be added. The factory must be contacted if additional spacers or removal of spacers are required.

SINGLE-BEARING GENERATOR MOUNTING

Single-bearing generators are provided with an SAE flywheel adapter and a flexible disc coupling. Very close tolerances are maintained in the manufacture of the generator so that the alignment procedure is extremely simple. A coupling hub of nodular iron is shrunk on the shaft extension and special spring-steel coupling discs are bolted to the hub. Holes are provided in the periphery of the coupling disc which correspond to tapped holes in the flywheel, while the outside diameter of the discs fits in a rabbet in the fly-wheel so that concentricity is assured at all times.

The SAE adapter and the fly wheel housing are designed to match each other with no further alignment necessary with the possible exception of shims under the feet of the generator to give it a solid mounting.

TWO-BEARING GENERATOR MOUNTING

In the case of two-bearing generators, a suitable shaft extension with a keyway is provided. The assembler furnishes a flexible coupling which is installed between the engine and on the generator shaft. In this case it is necessary to align the two very carefully, although a slight misalignment can be accommodated by the flexible coupling. It is necessary to shim the generator feet for proper support.

ELECTRICAL CONNECTIONS

The electrical connections in the conduit box are made in accordance with the diagram appropriate for the required voltage range. 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.

Operation

PRE-START INSPECTION

Before operating the generator for the first time, the following checks are recommended:

1. Check all wiring against the connection diagrams and make sure all connections are properly insulated.
2. Inspect for loose packing materials and remove loose cloths and all tooling.
3. Check that all covers and guards are installed and tight.
4. Check bearing lubrication.

IDLING

PERMANENT EQUIPMENT DAMAGE can be caused by idling the engine between 650 and 1400 generator RPM. If engine adjustment requires this, the **REGULATOR FUSES MUST BE REMOVED** before engine start-up and adjustment. If your generator is supplied with the **OPTIONAL** regulator power "Off-On" switch, simply turn the switch to "Off" position; or if supplied with the **OPTIONAL** under frequency module, this is not necessary (see Figure 14). **WHEN IN DOUBT, REMOVE THE FUSES.** After engine adjustment, the regulator fuses can be replaced. The engine should be brought through the 650-1400 RPM range in not more than 45 seconds.

VOLTAGE ADJUSTMENTS

A means for adjusting the voltage is incorporated in the regulator. For details refer to the Voltage Regulator manual applicable to this unit.

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

1. The generator output must be disconnected from the load. Open the circuit breaker.
2. Start the prime mover and adjust it for the proper speed (1800 RPM for 60 Hz, 1500 RPM for 50 Hz).
3. Adjust the voltage to the required value by means of the rheostat in the voltage regulator. If the generator fails to produce a voltage after it has come up synchronous speed, it may be necessary to flash the field; this may be accomplished by applying battery voltage to the output terminals of the regulator for a few seconds. Do not leave the battery connected after flashing. Observe the proper polarity. **THIS MUST BE DONE** while the generator is at a standstill. (See Trouble Shooting Chart, pages 18, 19 and 20.)
4. Close the circuit breaker and apply the load.
5. Before stopping the engine, trip the circuit breaker.

PARALLELING PROCEDURE

In many cases where electric power is required, it may be advantageous to install two or more smaller generator sets

instead of one single set of higher rating. This condition also exists when it becomes necessary to increase the capacity of the existing plant by adding generator sets.

When two or more generators are connected and operated together so that they deliver electrical power to a common system, they are said to be operating in parallel. Parallel operation is considered successful when the generators deliver power to the external system without delivering power to each other.

The division of the kilowatt load among generator sets is controlled by the engine governors. The generators and voltage regulators cannot and do not influence this division. The reactive power division depends on the proper relationship of the excitation values of the generators. This excitation is supplied by the AC exciter and is controlled by the regulators. The engine governors cannot and do not influence this division. In order to divide the reactive power in proportion to the generator ratings, the amount of excitation supplied to the generators must be continuously controlled during varying loads and this must be done by the voltage regulators.

CONDITIONS FOR PARALLELING

Certain conditions must be met before generators can be successfully paralleled.

1. The voltage and frequency must be the same for all sets.
2. The voltage regulation characteristics of the individual generators should be similar.
3. The generators must have the same phase rotation.
4. The driving engines should have the same speed regulation characteristics and the governors should be adjusted to give the same speed regulation.

CONNECTIONS

All generating units must be electrically connected to the load system. The interconnection is referred to as the "bus."

Each generator must be connected to the bus through a power circuit breaker.

The connecting cables to the bus should be connected to the proper phases. Phase 1 of one unit should be connected to the same bus as Phase 1 of the other units, etc. In the case of three-phase, four-wire generators, the neutral terminals must also be connected together.

The phase rotation of all generators must be the same.

Paralleling accessory equipment should be provided.

INITIAL OPERATION

NOTE

When conducting these tests, make sure that the main switches (line circuit breakers, contactors or transfer switches) are open except for the line circuit breaker of the set which is being tested.

Before operating generator sets in parallel, each set should be checked by starting, operating and adjusting the sets as individual units before attempting paralleling.

PRELIMINARY STEPS

Three-phase generators which are to be operated in parallel must have the same phase sequence.

WARNING

IF AN ATTEMPT IS MADE TO PARALLEL GENERATORS WHICH HAVE OPPOSITE PHASE SEQUENCE, EXTREMELY LARGE CURRENTS WILL BE GENERATED WHICH MAY BE INJURIOUS TO EQUIPMENT AND DANGEROUS TO PERSONNEL.

The governors of the engines should be adjusted to have the same speed droop characteristics. If this is properly done, the units will share the kilowatt loads proportional to their ratings.

The voltage regulator droop characteristics of each unit to be paralleled should be the same. These characteristics should be checked and adjusted if necessary on each unit individually. For further details, see the voltage regulator publication.

Start unit number one and bring it up to the governed speed and close the circuit breaker connecting it to the bus. Then adjust the no-load voltage to the desired value.

Start the second unit and bring it up to governed speed.

CAUTION

Do not close the second circuit breaker.

Adjust the no-load voltage of the second unit to the same voltage as the first unit.

Adjust the no-load speed of the first unit to the desired value.

Adjust the no-load speed of the second unit to equal that of the first unit. When the speeds are the same, the synchronizing lights or the voltmeter across the open circuit breaker will be changing very slowly.

PHASE ROTATION TEST

If the phase rotation on both generators is the same, both the synchronizing lights will go light and dark simultaneously.

If the synchronizing lights do not go light and dark simultaneously, the generators have opposite phase rotation. The phase rotation may then be made the same by interchanging any two leads of either generator at the circuit breaker.

VOLTAGE REGULATOR DROOP ADJUSTMENT

At this point, proceed as described in the paralleling instructions.

BASIC INTERCONNECT

Parallel Operation

This circuit is phase sensitive and the following test will verify the correct connections:

1. With one system operating at the rated speed and voltage, apply a lagging power factor load. (Unity power factor load cannot be used for this test.)
2. Adjust R1 in the paralleling assembly to its maximum resistance position and record the generator voltage.
3. Short the secondary of CT1 with S1 (unit-parallel mode switch) and record the generator voltage.
4. The voltage obtained when CT1 is shorted should be greater (up to 5 percent depending on load) than when CT1 is not shorted.
5. If a lower voltage is obtained when CT1 is shorted, shut down the system and verify CT is in correct generator line. If so, interchange the secondary leads from CT1.
6. If step "5" is required, steps "1" through "4" should be repeated.
7. With full load 0.8 power factor, a droop of 4 to 5 percent is obtainable and is usually adequate for parallel operation.
8. The preceding test must be performed on all systems that are to be paralleled.

NOTE

During Single unit operation, the current transformer secondary (CT) must be shorted; otherwise a voltage droop which appears to be poor regulation will result. A unit-parallel mode switch (S1) is included on the paralleling assembly for this purpose.

9. If cross-current compensation is desired, Figure 1 is applicable with the following additional connections. Connect the finish of the parallel current transformer (CT1) on generator System Number 1, to the start of the parallel CT on generator System Number 2; the finish of the parallel CT in System Number 2 to the start of the parallel CT in System Number 3; etc. Continue until all parallel CT's of the systems to be paralleled are connected in series; then connect the finish of the last CT to the start of the first CT.

10. The basic difference between droop and cross-current compensation is that when a reactive load is applied to a system using droop compensation, all the regulators receive a signal to decrease the generator output voltage. When a reactive load is applied to a generator system

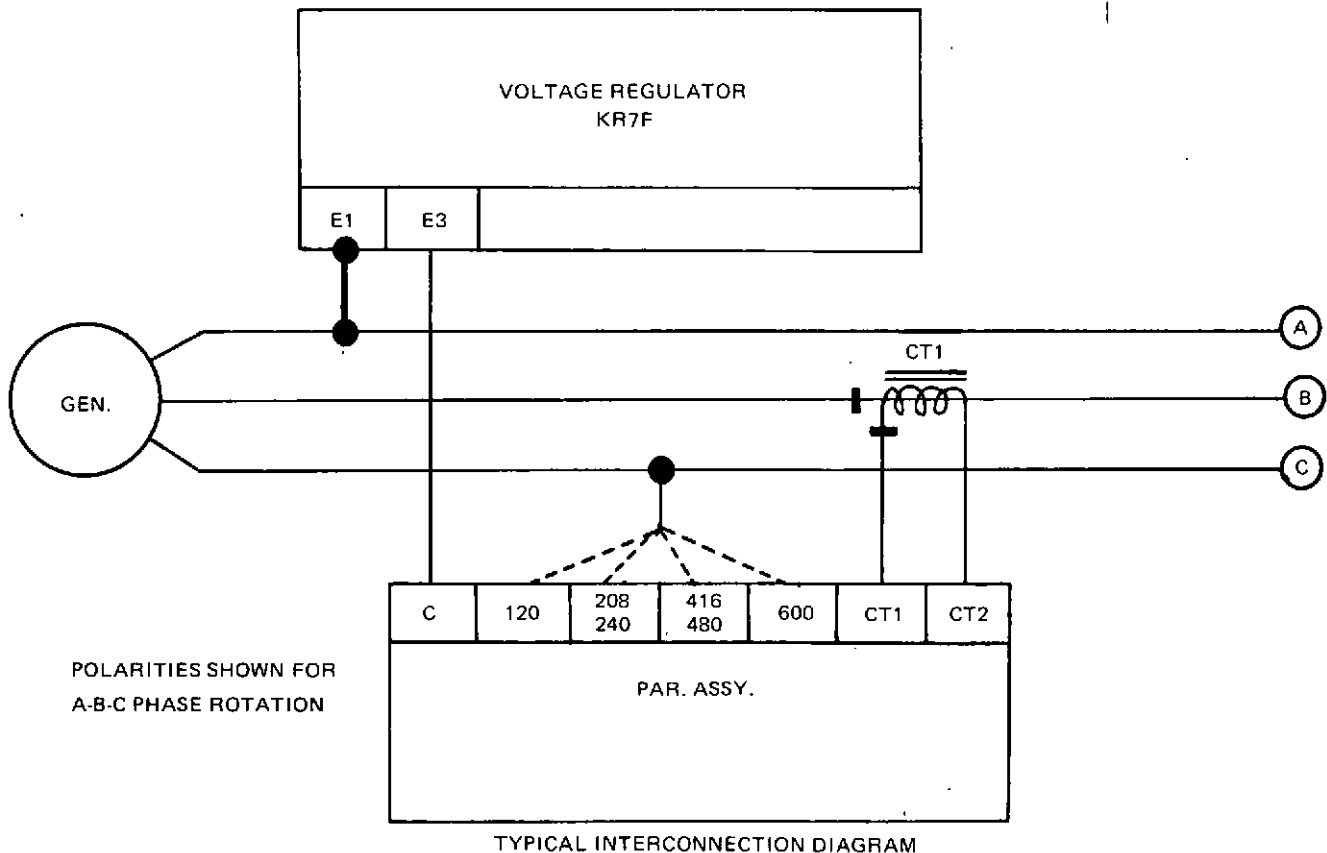


Figure 1. Typical interconnection diagram.

using cross-current compensation, the current signal applied to one regulator cancels the signal applied to another regulator so no decrease in generator output voltage occurs.

Cross-current compensation allows parallel generators to share reactive current loads with no decrease in the generator system voltage.

SYNCHRONIZING

Once the preliminary tests have been performed and adjustments have been made, the settings will remain correct as long as the respective cable connections remain unchanged. It is not necessary to make these tests every time the generators are to be paralleled. Observe the following steps:

1. Make sure both main switches, breakers or contactors are open.
2. Start both sets and adjust the frequency without load by adjusting governor controls.
3. Adjust both sets to the same voltage.
4. Put both synchronizing switches in the "on" position.
5. Close the circuit breaker on one of the sets.
6. The synchronizing lamps will flash on and off rapidly at a frequency depending on the difference in speeds of the two units.
7. Adjust the speed of the unit whose breaker is open until the lamps flash on and off slowly (about once every two seconds). After making the speed adjustment, it may be necessary to wait a few seconds until the lamp fluctuations slow up.
8. When the lamps are dark, close the set main breaker.

NOTE

The above procedure can be followed if one of the sets is already on the line. Follow the above directions with the loaded set taken to be the one with the closed main switch.

LOAD DIVISION

The only way to divide the kilowatt load proportionally among the sets operating in parallel is by speed adjustment of the prime mover. The voltage regulator rheostat will have no effect on this at all.

The load on a machine with the lesser amount of total load can be increased by increasing the governor throttle control. This increase will be indicated on the wattmeter.

When two loads are correctly divided as indicated by the wattmeters, the frequency can be checked as indicated on either frequency meter. If the frequency is too high it will be necessary to re-adjust both the governor controls to lower speed. Conversely, if the combined speed is too low, increasing the governor controls on both machines will increase the frequency. When raising or lowering the frequency, care must be taken to re-adjust the load divisions so the wattmeter readings will again be equal or proportional to the size of the generators if the sets are not of the same size.

REACTIVE LOAD DIVISION

After the kilowatt load has been proportionally divided, the reactive load should also be divided proportionally. If both generators have the same rating, both should show the same load amperes. If this is not the case, it indicates cross currents and these should be eliminated by adjustment of the voltage regulator rheostats on the sets.

Slowly turn the voltage adjusting knob on one of the units; first clockwise, then counter-clock-wise. One movement or the other should result in decreasing ammeter readings. Adjust both rheostats until both ammeters are at the lowest point at which they both read the same value on similar sets or proportional values in a case of unequal sets.

If after adjustment it is found that the output voltage is either too high or too low, then the voltage regulator rheostat on one of the sets must be re-adjusted and then the operation is to be repeated for the other set to balance the reactive load.

Preventive Maintenance

Dirt and heat are the enemies of a generator. Keeping the generator clean, the prevention of overloads, and proper alignment of the generator and its prime mover, will result in efficient operation.

CAUTION

Always shut down the unit and be sure main disconnect switch is open before performing a maintenance operation.

CLEAN THE VOLTAGE REGULATOR

Dirt and dust will conduct electricity between points of different electrical potential. The regulator must be kept free from excess amounts of dust and dirt. Low pressure, moisture-free compressed air may be used to blow out any dust and dirt that may have accumulated.

CLEAN THE GENERATOR

Accumulations of dust and dirt not only contribute to insulation breakdown, but they can also increase temperature through the restriction of ventilation and by blocking the dissipation of heat from the winding and frame surfaces. Some machines are exposed to accumulations of materials such as talc, lint, or cement dust, which, although harmless in themselves, may obstruct the ventilation. The most harmful types of foreign materials include carbon black, metallic dust and chips, and similar substances which not only impure the ventilation, but also form a conductive film over the insulation and increase the possibility of insulation failure. Machines operating in dirty places should be disassembled and cleaned periodically.

Both the interior and exterior of a machine should be kept free of dirt, oil, and grease. Foreign material may be blown out with a dry, compressed air of not more than 50 pounds per square inch. If possible, clean by suction to avoid blowing moisture or metal chips into the insulation.

Whenever the generator is disassembled, the windings should be given a thorough inspection and the insulation cleaned, if necessary. The inspection should cover the condition of the windings and insulation, the tightness of the windings in the slots, the effectiveness of the supporting ties as evidenced by the rigidity of the coil end turns.

As much oil, grease, and dirt as possible should be removed by wiping the windings with clean dry cloths and then with clean cloths which have been moistened with a solvent. A suitable solvent for most greases and oils (except silicones) is straight mineral spirits. If necessary, windings can be washed with mineral spirits, in which case it is recommended that the windings be drained for ½ hour and then placed in an oven for 1½ - 2 hours at 200° F to dry the windings.

WARNING

When using solvents or cleaning fluids, the area must be well ventilated and smoking or open flame prohibited for the protection of personnel and property. Rubber gloves or other suitable protection for the hands should be used.

AIR INTAKE AND EXHAUST

Check the area around the generator air intake and exhaust openings to be sure they are clean and unimpeded. Remove all foreign material and clean all screens.

BEARING TEMPERATURE

Check bearing temperature at the bearing hub with a thermometer. If the temperature is above 195 degrees F., replace the bearing, bearing grease and check alignment.

ELECTRICAL CONNECTIONS AND WINDINGS

Inspect for loose or contaminated connections. Check wires for cracked or frayed insulation. Tighten connections and replace defective or oil soaked insulation.

If inspection shows that varnish coatings on the windings have deteriorated, they should be recoated with insulating varnish.

LUBRICATION

All generators are lubricated before leaving the factory and are ready for operation. As a general rule, bearings should be relubricated annually or after every 3,600 hours of running time, whichever occurs first. Unusual severe operating conditions require more frequent additions of grease.

Use Shell Alvania # 2, Chevron SRI # 2, or equivalent anti-friction type, high quality, multi-purpose lithium base grease with a lubrication temperature range of lowest ambient temperature expected to +260° F.

During an overhaul, the grease reservoir should be thoroughly cleaned and new grease added. The reservoir should be 1/2 to 1/3 filled with new grease. On units with open bearings, also clean, wash and repack the bearing with grease. The quantity of grease is very important since over-greasing is as detrimental as under-greasing.

To add or renew grease, proceed as follows:

1. Stop unit.
2. Wipe clean the grease plugs and surrounding parts.
3. Remove filler and drain plugs.
4. Free drain hole of hard grease.
5. Add grease until grease is forced through drain plug.
6. Start unit.
7. Allow unit to run 15 minutes with drain plug removed to allow excess grease to drain. Replace drain plug.

NOTE

Use only clean grease from clean, closed containers and keep it from being contaminated while regreasing.

Generator Servicing

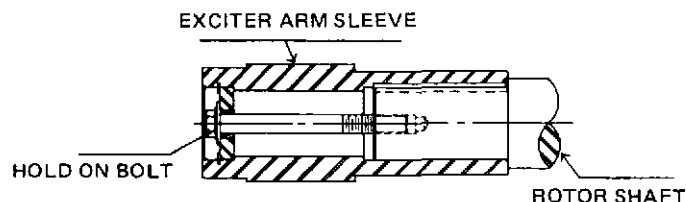
REMOVAL FROM PRIME MOVER

1. Disconnect all electrical leads in the junction box.
2. Disconnect the leads to the voltage regulator.
3. Attach a suitable hoist to the generator eyebolts.
4. a. For two-bearing generators, disconnect the coupling between generator and prime mover. (Follow coupling manufacturers instructions.)
b. For one-bearing generators, disconnect the coupling discs from the flywheel and remove the bolts holding the SAE adapter to the flywheel housing.
5. Remove the hold-down bolts which secure the generator to the base.
6. Raise the generator slightly and remove it from the base. Be careful of the drive assembly.

DISASSEMBLY OF GENERATORS WITH SLEEVE-TYPE EXCITERS (Figure 4)

Single-Bearing Generators

1. Remove capscrews which secure SAE adapter to adapter bracket and lift off SAE adapter. Remove capscrews which secure adapter bracket to frame and lift off adapter bracket.
2. Remove the capscrews securing the coupling discs to the coupling hub; lift off the coupling discs.
3. Remove the generator conduit box assembly.
4. Remove the exciter armature (rotor) by first disconnecting the field leads from the rotating rectifier assembly. Then remove the exciter hold-on bolt. The exciter armature is interference fit and should slip from the shaft by pulling while tapping it lightly with a soft-faced mallet. If not, use a puller bolt as shown in Figure 2. A 5/8-11 bolt is used as a puller bolt for 680-frame units, and a 1/2-13 bolt is used as a puller bolt on all other ratings.
5. Remove the capscrews which secure the end bracket to the frame.
6. Remove the end bracket from the frame.
7. Using a suitable lifting device, remove the rotor assembly from the generator housing through the adapter end.



Two-Bearing Generators

1. Remove coupling half from the shaft extension.
2. Remove the screws which secure the drive end bracket to the generator housing.
3. Remove the generator conduit box assembly.
4. Remove the exciter armature (rotor) by first disconnecting the field leads from the rotating rectifier assembly. Then remove the exciter hold-on bolt. The exciter armature is interference fit and should slip from the shaft by pulling while tapping it lightly with a soft-faced mallet. If not, use a puller bolt as shown in Figure 2. A 5/8-11 bolt is used as a puller bolt for 680 frame units and a 1/2-13 bolt is used as a puller bolt on all other ratings.
5. Remove the end bracket opposite the shaft extension from the frame.
6. Using suitable lifting devices, withdraw the rotor from the generator housing toward the shaft extension end.
7. Remove the shaft-extension end bracket from the rotor.

DISASSEMBLY OF GENERATORS WITH SLEEVELESS-TYPE EXCITERS (Figure 8A and 8B)

Single-Bearing Generators

1. Remove capscrews which secure SAE adapter to adapter bracket and lift off SAE adapter. Remove capscrews which secure adapter bracket to frame and lift off adapter bracket.
2. Remove the capscrews securing the coupling discs to the coupling hub; lift off the coupling discs.
3. Remove the generator conduit box assembly.
4. Remove the exciter armature (rotor assembly) by first disconnecting the field leads from the rotating rectifier assembly. Then remove the two (2) surge protector hold-on bolts and move the surge protector to the side. The exciter armature is held to the shaft by a 1/2-13 hold-on bolt and once this is removed the exciter armature, which is a slip fit, should slide from the shaft. If not, a 5/8-11 puller bolt should be used by inserting into the hole of the 1/2-13 hold-on bolt and turning it in; thereby, removing the armature from the shaft.
5. Remove the capscrews which secure the end bracket to the frame.
6. Remove the end bracket from the frame.

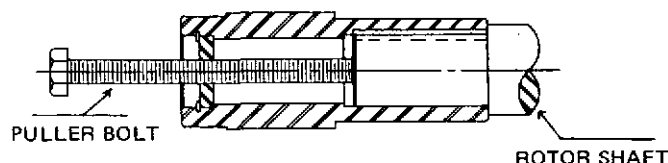


Figure 2. Installation and removal of bearings.

- Using a suitable lifting device, remove the rotor assembly from the generator housing through the adapter end.

Two-Bearing Generators

- Remove coupling half from the shaft extension.
- Remove the screws which secure the drive end bracket to the generator housing.
- Remove the generator conduit box assembly.
- This procedure for removal of the sleeveless exciter armature (rotor) is the same as the single-bearing generators.
- Remove the end bracket opposite the shaft extension from the frame.
- Using suitable lifting devices, withdraw the rotor from the generator housing toward the shaft extension end.
- Remove the shaft-extension end bracket from the rotor.

BEARING REPLACEMENT

- The bearing(s) can be removed from the shaft if they have to be replaced. This is done by means of a suitable bearing puller acting on the inner race of the bearing.

First, the end bracket(s) must be removed following the disassembly procedure for single- and/or two-bearing generators.

- Clean the shaft with a solvent and apply a light coat of oil to the bearing fit.
- Heat bearing in an oven having a maximum temperature of 100 degrees C.
- Place bearing over end of shaft and bring it up to its seat. Be sure it is square with the shaft and not cocked. Take a piece of tubing having a slightly larger inside diameter than the shaft; place one end against the inner race of the bearing and tap the other end of the tube with a soft mallet. The bearing should go on snugly but should not require heavy blows of the mallet.

NOTE

Under no circumstances should pressure be applied to the outer race of the bearing.

- Allow the bearing to cool for about one hour.

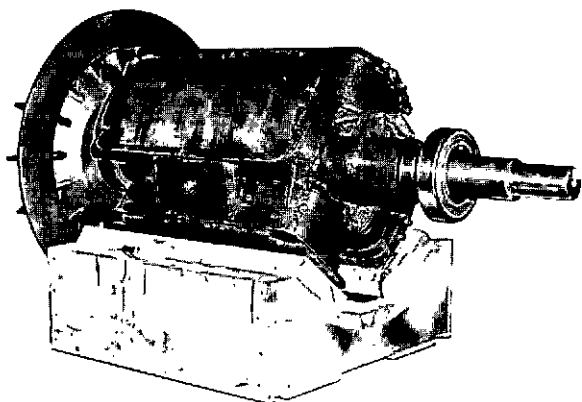


Figure 3

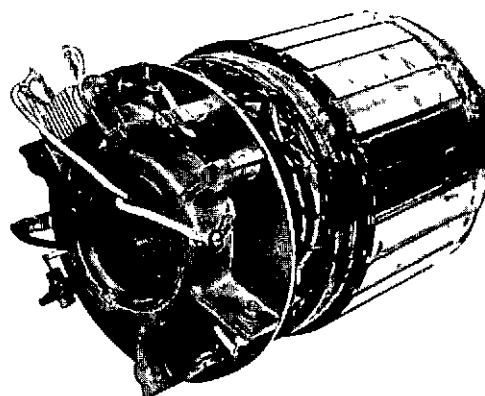


Figure 4

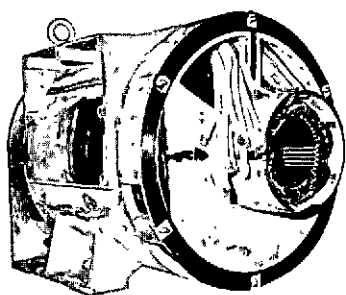


Figure 5

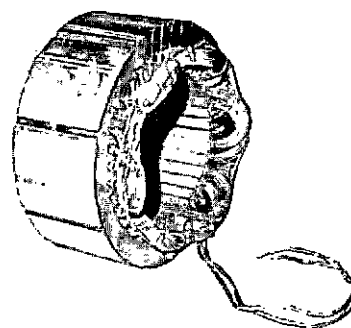


Figure 6

INSPECTION (figures 3, 4, 5, and 6)

End Bracket

1. Clean the end bracket, screws, washers and screens in an approved solvent and dry them thoroughly.
2. Inspect the screws for stripped thread or burred heads.
3. Inspect the bracket for cracks and for burred or rough mating surfaces. Inspect the bearing bore for damage.
4. Check the exciter stator winding located in the bracket for loose, frayed, or burned windings. Look for score marks in the bore of the exciter core caused by rubbing. The core is removable and can be rewound by a qualified service station.
5. On generators where the exciter stator frame is part of the end bracket, loosen the set screw (Item 5 on the sectional drawing) and slide the stator core out of the bracket.
6. On generators where the exciter frame is removable, remove the bolts holding the exciter frame to the end bracket.

Stator Frame and Winding

1. Clean the stator frame with a clean cloth. Clean any dust and dirt out of the frame with a low-pressure, moisture-free air.
2. Inspect the frame for cracks, burred mating surfaces or other damage.
3. Check the stator winding for loose, frayed or burned wires. Look for scoring of the stator bore caused by the rotor rubbing.
4. A faulty stator winding can be removed and a new winding installed by a qualified service station. A damaged core should be replaced.

Rotor Assembly and Winding

1. Clean all metal parts with an approved cleaning solvent and dry thoroughly.
2. Clean any dust and dirt from the rotor winding and exciter armature with a low-pressure air.

3. Wipe the bearing clean with a dry cloth.
4. Inspect the rotor winding(s) for loose, frayed or burned wires. Inspect the exciter rotor (armature) for loose, frayed or burned wires. The rotor winding can be replaced by a qualified service station familiar with Marathon Electric techniques. The exciter armature winding and the armature core can be removed from the shaft by following the disassembly procedure. The armature can be rewound by a qualified service station.
5. Inspect the heat sink and the diodes mounted thereon. Check the solder joints. The diodes can be removed by unscrewing them from the heat sink. Special care is required in replacing them by using the right torque values and proper soldering methods.
6. Inspect the coupling discs for distortion or worn mounting holes. Replace defective discs as necessary.
7. Inspect the fan for cracks and broken blades and other damage. Replace a defective fan if it is damaged.

ASSEMBLY OF GENERATORS WITH SLEEVE AND SLEEVELESS TYPE EXCITERS (Figure 4 – Sleeve) (Figure 8 – Sleeveless)

To re-assemble the generator after all corrective action has been taken, proceed as follows:

Single-Bearing Generators

1. Using a suitable lifting device, position the rotor assembly in the generator housing from the adapter end.

NOTE

Care must be taken to avoid damage to the winding during installation.

2. In case the exciter stator has been removed for rewind (on generators where the stator frame is part of the end bracket), replace it in position, slide the stator core into the bracket, and tighten the set screw (Item 5 on the sectional drawing).

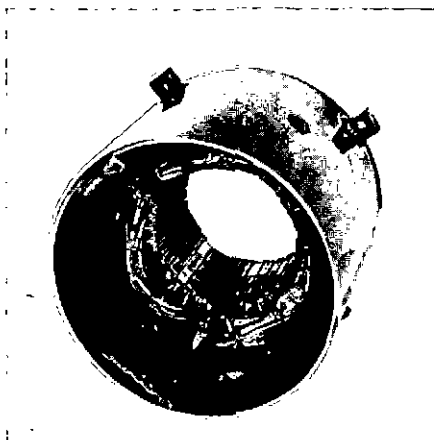


Figure 7

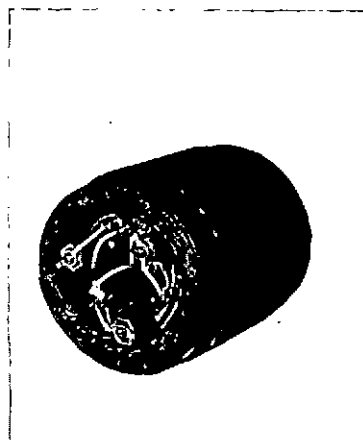


Figure 8A

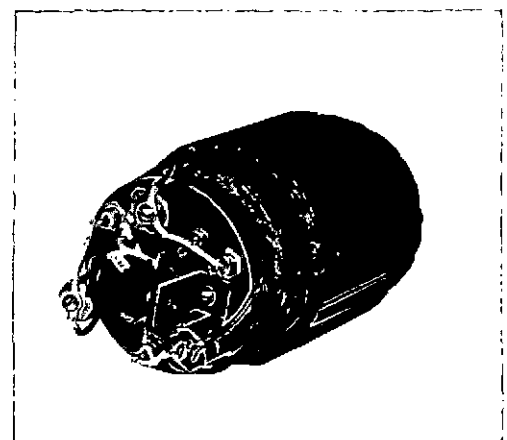


Figure 8B

ASSEMBLY (Con't.)

3. On generators where the exciter frame is removable, replace the bolts holding the exciter frame to the end bracket.
4. Apply a small amount of grease to the bearing bore of the end bracket and slide the bracket over the bearing.
5. Raise the bracket and rotor to line up the cap screw holes with the frame. Insert the cap screws and secure the bracket to the frame.
6. Position coupling discs to the coupling hub. To accomplish this, insert two studs into the coupling hub to facilitate alignment. Align discs by using a tapered plug in the hole. (See Installation of coupling discs below.) Secure it with lock washers and cap screws. Secure all coupling disc cap screws by lockwiring in pairs or reuse lockstraps.
7. Pass the exciter field leads through the appropriate opening in the exciter armature shaft hole. Push the armature on the generator shaft and attach with a hold-on bolt. (If the exciter hold-on bolt is a grade 8, it must be torqued to a value of 95 ft.-lbs. of torque.) Make necessary exciter connection.
8. Grease the bearing as specified under lubrication.
9. Re-assemble generator to the prime mover.

Two-Bearing Generators

To re-assemble two-bearing generators, proceed as follows:

1. Slide the shaft extension end bracket over the bearing. Apply a small amount of grease to the bearing bore bracket.
2. Using a suitable lifting device, position the rotor

NOTE

Care must be taken to avoid damage to the windings during installation.

3. Raise the bracket and rotor to line up the cap screw holes with the frame. Insert the cap screws and secure the bracket to the frame.
4. In case the exciter stator has been removed for rewind, replace it in position by tightening the set screw to lock the stator in position or on generators where the exciter frame is removable; replace the bolts holding the exciter frame to the end bracket. Slide the opposite end bracket over the bearing after applying a small amount of grease to the bearing bore.
5. Raise the bracket and rotor to line up the cap screw holes with the frame. Insert the cap screws and secure the bracket to frame.
6. Pass the exciter field leads through the appropriate openings in the exciter armature sleeve. Push the armature on the generator shaft and attach with the hold-on bolt. Make the necessary exciter connections.
7. Grease the bearings as specified under lubrication in Preventive Maintenance.

8. Turn the shaft by hand and check the end play.
9. Re-assemble the coupling half to the shaft. Follow the coupling manufacturer's instructions.
10. Re-assemble the generator to the prime mover.

INSTALLATION OF COUPLING DISCS

When installing coupling discs, torque to specification shown in chart, use sequence shown.

DRIVE DISC BOLT TORQUES

Size	Grade	Finish	Torque
1/2-13	5	Plated	60 Ft. Lb.
1/2-13	5	Oiled	68 Ft. Lb.
5/8-11	5	Plated	120 Ft. Lb.
5/8-11	5	Oiled	135 Ft. Lb.
5/8-11	8	Oiled	189 Ft. Lb.
3/4-10	8	Oiled	338 Ft. Lb.

SAE GRADE 5



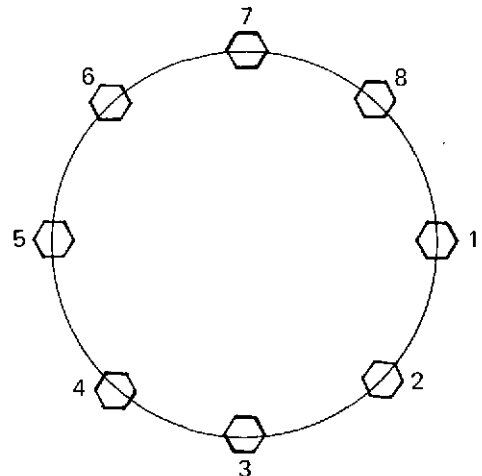
SAE GRADE 8



IMPORTANT

Grade 5 Bolt use locking plates and hardened washers must be used with grade 8 bolts.

Torquing sequence: position # 1, 5, 7, 3, 2, 4, 6, 8. Then check torque in the sequence 1, 2, 3, 4, 5, 6, 7 and 8 to insure all bolts are properly torqued.



*When torquing, use a downward force on the wrench to help keep the rotor from turning.

MECON INSTALLATION OPERATION AND MAINTENANCE MANUAL

INSTALLATION OF COUPLING DISCS.

When installing coupling discs, torque to specification shown in chart, use sequence shown below which corresponds to correct bolt pattern.

Drive Disc Bolt Torques

<u>Size</u>	<u>Grade</u>	<u>Finish</u>	<u>Torque</u>
1/2-13	5	Plated	60 Ft. Lb.
1/2-13	5	Oiled	68 Ft. Lb.
5/8-11	5	Plated	120 Ft. Lb.
5/8-11	5	Oiled	135 Ft. Lb.
5/8-11	8	Oiled	189 Ft. Lb.
3/4-10	8	Oiled	338 Ft. Lb.
5/8-18	8	Oiled	216 Ft. Lb.

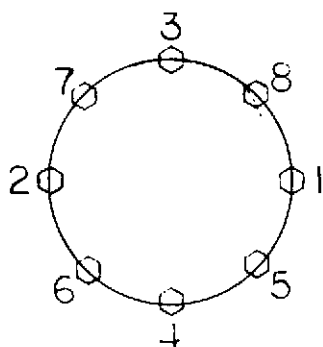
SAE GRADE 5



SAE GRADE 8

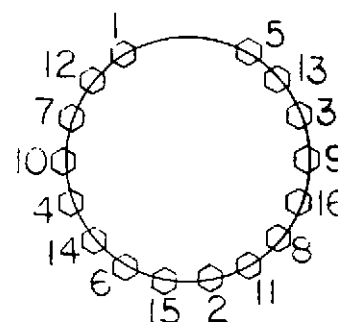
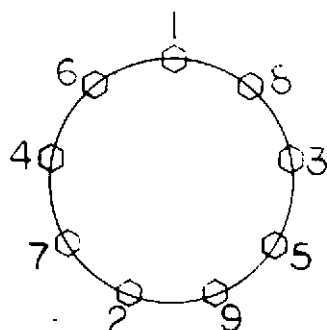
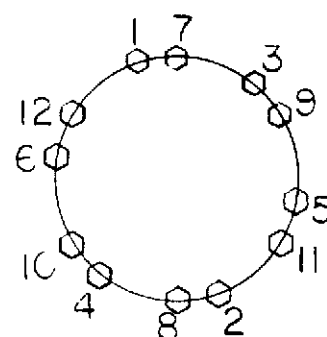
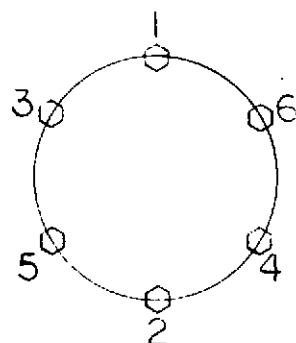


IMPORTANT: Grade 5 Bolts use locking plates.
Hardened Washers MUST be used with Grade 8 Bolts



TORQUING SEQUENCE: Torque bolts in this sequence according to bolt pattern, then check torque in each bolt in a clockwise direction around bolt circle to insure all bolts are properly torqued.

When torquing, use a downward force on the wrench to help keep the rotor from turning.



TROUBLE SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
No voltage build-up .	Residual voltage in generator reversed.	Reverse exciter field leads to terminals F+ and F— of regulator.
	No residual voltage in generator.	Apply 12 VDC flashing source (with the prime mover at rest) across terminals F+ and F— of voltage regulator. The positive of the flashing source must be connected to F+ and the negative to F—. If these leads are reversed, the regulator will be destroyed. A diode in the regulator allows the flashing source to be removed from the field without danger of inductive arcing. This action remagnetizes the exciter field and allows build up when the system is restarted.
CAUTION Do not attempt to flash the generator while it is rotating unless the following procedure is observed.		
	Generator or regulator defective.	If permanent field flashing is desired, connect as shown by Item 2, Figure 13, Page 22. (Always limit the flashing current to less than 50 percent of the no-load field current.) Diode must have a minimum rating of 15 amp, 800 volt, PIV. If field or flashing source is grounded, an isolation transformer is also required. (See Item 1, Figure 13, Page 22.) Without the transformer, a ground in the generator output will blow fuse F1 in the regulator and possibly destroy the control rectifier bridge in the voltage rectifier. To determine whether the problem is in the voltage regulator or generator, disconnect the voltage regulator. With the generator running at rated speed, apply a DC voltage to the exciter field. Approximately 12 volts DC on the exciter field will produce about one-half the rated AC output voltage (no load on generator.) If this AC voltage is obtained, the problem is in the voltage regulator. If not, or if a low AC voltage is obtained, the problem is in the generator or rotating rectifier assembly.

TROUBLE SHOOTING CHART

TROUBLE	PROBABLE CAUSE	REMEDY
No voltage build-up.	Loose or broken leadwires between rotating rectifiers and generator field or exciter armature.	Check lead wires and connections. Repair, replace or tighten as necessary.
	One or more defective diodes in rotating rectifier.	Test and replace diodes as necessary. To check each diode, disconnect the lead to the diode at the "quick-disconnect" terminal and measure the resistance between the terminal end and the base of the diode. Reverse ohmmeter leads and repeat the resistance measurement. A diode in good condition will have a very high resistance for one measurement and a resistance near zero when the ohmmeter leads are reversed. Failure to obtain these two extremes indicate a defective diode.
		CAUTION Be sure diode mounting torque is within the following limits: 30 inch pounds maximum 20 inch pounds minimum
	Generator or exciter unit windings open or shorted.	Check all connections. Test windings for continuity and shorts. Repair or replace as necessary.
	Defective voltage regulator.	Refer to applicable regulator manual.
	Defective Surge Suppressor.	Unsolder ungrounded lead to surge suppressor. Measure the resistance between the terminal and ground. Reverse ohmmeter leads and repeat the resistance measurements. A surge suppressor in good condition will have a very high resistance for both measurements. If resistance is low in one or both directions, replace surge suppressor.
Voltage build-up with wide swinging at low voltage.	Defective voltage regulator.	Refer to applicable regulator manual.

TROUBLE SHOOTING CHART

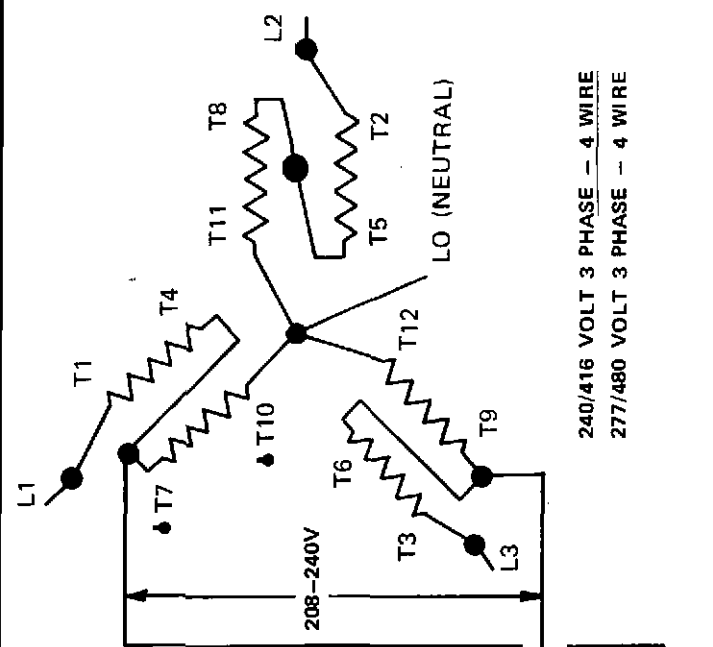
TROUBLE	PROBABLE CAUSE	REMEDY
Generator output voltage too low.	Voltage adjusting rheostat improperly adjusted.	Re-adjust.
	Generator overloaded or load unbalanced.	Reduce or balance load as necessary.
	Open diode in rotating rectifier.	Test and replace diodes as necessary. Refer to applicable instruction manual.
	Regulator sensing transformer incorrectly connected.	Verify correct tap.
Generator output voltage too high.	Voltage adjusting rheostat improperly adjusted.	Re-adjust.
	Defective voltage regulator.	Refer to applicable regulator manual.
	Regulator sensing transformer incorrectly connected.	Verify correct tap.
Excessive voltage oscillations.	Defective voltage regulator.	Refer to applicable regulator manual.
Poor voltage stability (hunting).	Frequency unstable.	Consult governor manufacturer.
	Stability adjust on regulator maladjusted.	Adjust CW for increased stability.
	Faulty regulator.	Replace regulator.
	Faulty exciter or generator.	Verify exciter and/or generator operation.

NOTE

The schematic and connection diagrams in this manual are for the standard generator using a KR7F Voltage Regulator. If special regulators or accessories are provided, refer to the connection diagram included with the generator.

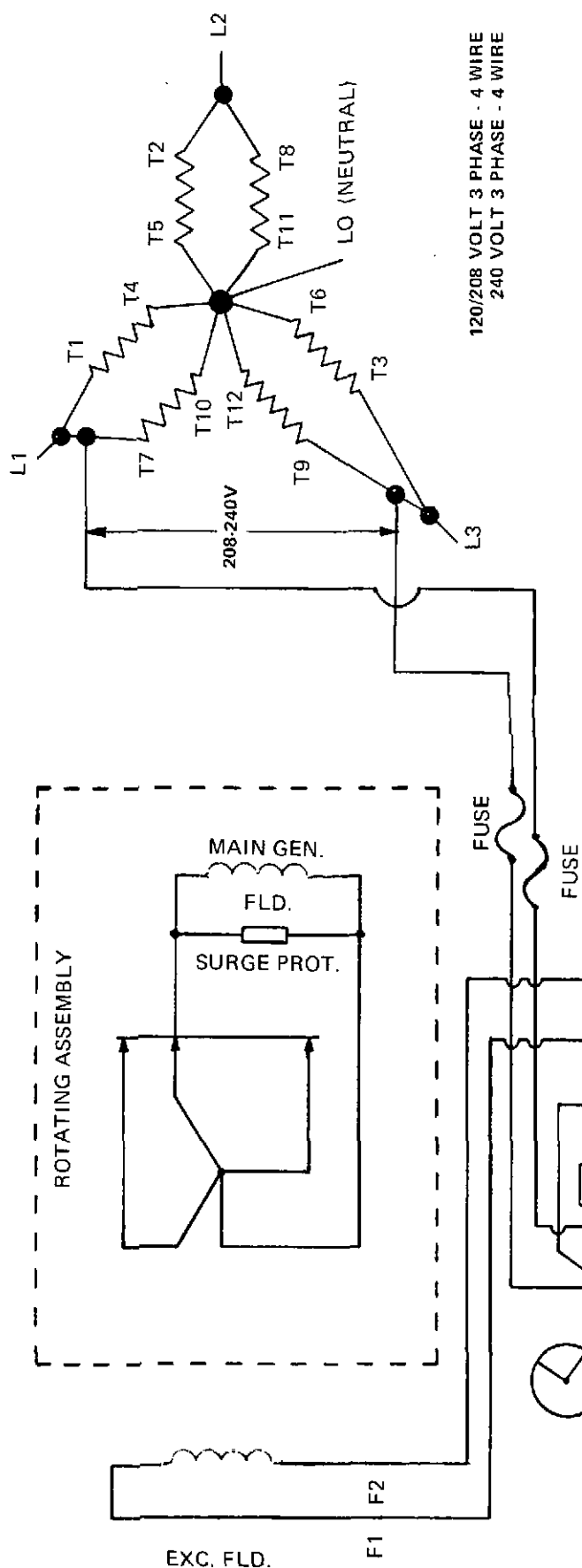
Sensing transformer tap on voltage regulator should be connected on 208 – 240 volt tap.

1. Connections shown external to KR-7F Regulator are typical only for packaged units.
2. On 10-lead generators T₁₁ and T₁₂ are internally connected to T₁₀ and brought out as "T₀".
3. 120 DELTA and 240 DELTA connections are for 12-lead generators only.
4. 120 DELTA connection will require a transformer to power the regulator.
(transformer not included as standard).
5. For four lead generator, refer to Figure 13.
6. For paralleling kits, refer to manufacturer.



VOLTAGE	CONNECT TOGETHER	L ₁	L ₂	L ₃	NEUTRAL
480 — 416 WYE	T ₁₀ T ₁₁ T ₁₂	T ₁	T ₂	T ₃	T ₁₀ T ₁₁ T ₁₂
	T ₄ T ₇ T ₅ T ₈ T ₆ T ₉				
	T ₁₀ T ₁₁ T ₁₂ T ₁ T ₇ T ₂ T ₈				
240 — 208 WYE	T ₃ T ₉	T ₁	T ₂	T ₃	T ₁₀ T ₁₁ T ₁₂ T ₄ T ₅ T ₆
	T ₄ T ₅ T ₆				
	T ₁₀ T ₁₁ T ₁₂ T ₁ T ₇ T ₂ T ₈				
240 DELTA	T ₄ T ₇ T ₅ T ₈ T ₆ T ₉	T ₁	T ₂	T ₃	
	T ₁ T ₁₂ T ₂ T ₁₀ T ₃ T ₁₁				
	T ₁ T ₇ T ₆ T ₁₂				
120 DELTA	T ₂ T ₈ T ₄ T ₁₀	T ₁	T ₂	T ₃	
	T ₃ T ₉ T ₅ T ₁₁				

Figure 9. 480 - 416 WYE schematic and connection diagrams.



VOLTAGE	CONNECT TOGETHER	L1	L2	L3	NEUTRAL
480 - 416 WYE	T10 T11 T12	T1	T2	T3	T10 T11 T12
240 - 208 WYE	T4 T7 T8 T9	T1	T2	T3	T10 T11 T12
240 DELTA	T10 T11 T12 T1 T7 T2 T8 T3 T9	T1	T2	T3	T10 T11 T12
120 DELTA	T4 T7 T8 T9 T1 T12 T2 T10 T3 T11 T1 T7 T6 T12 T2 T8 T4 T10 T3 T9 T5 T11	T1	T2	T3	T10 T11 T12

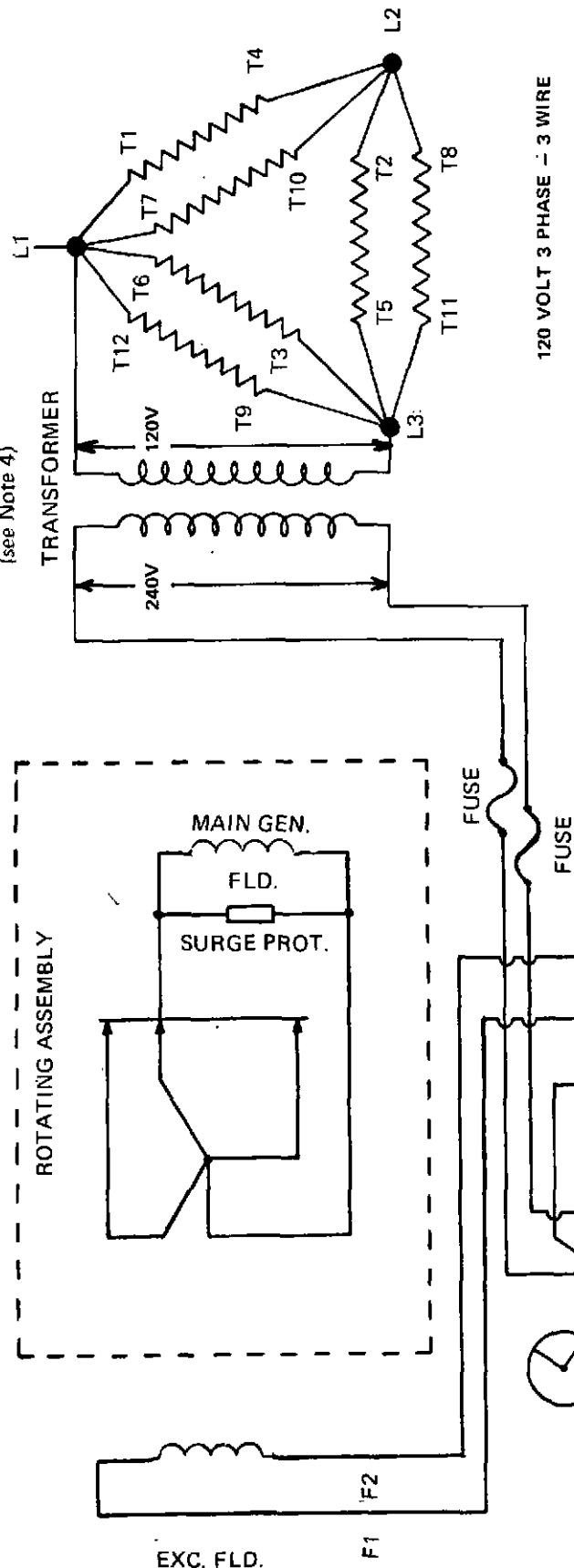
CAUTION: Some generators have multiple, identically marked, conductors for each lead. Connect all identically marked conductors together when making connection to load.

Sensing transformer tap on voltage regulator should be connected on 208 - 240 volt tap.

NOTES:

- Connections shown external to KR-7F Regulator are typical only for packaged units.
- On 10-lead generators T₁₁ and T₁₂ are internally connected to T₁₀ and brought out as "T₀".
- 120 DELTA and 240 DELTA connections are for 12-lead generators only.
- 120 DELTA connection will require a transformer to power the regulator. (transformer not included as standard).
- For four lead generator, refer to Figure 13.
- For paralleling kits, refer to manufacturer.

Figure 10. 240 - 208 WYE schematic and connection diagrams.



VOLTAGE	CONNECT TOGETHER	L1	L2	L3	NEUTRAL
480 - 416 WYE	T10 T11 T12	T1	T2	T3	T10 T11 T12
	T4 T7 T5 T8 T6 T9				
240 - 208 WYE	T10 T11 T12 T1 T7 T2 T8	T1	T2	T3	T10 T11 T12
	T3 T9 T4 T5 T6				T4 T5 T6
240 DELTA	T4 T7 T5 T8 T6 T9	T1	T2	T3	
	T1 T12 T2 T10 T3 T11				
120 DELTA	T1 T7 T6 T12	T1	T2	T3	
	T2 T8 T4 T10				
	T3 T9 T5 T11				

CAUTION: Some generators have multiple, identically marked, conductors for each lead. Connect all identically marked conductors together when making connection to load.

Sensing transformer tap on voltage regulator should be connected on 208 - 240 volt tap.

NOTES:

- Connections shown external to KR-7F Regulator are typical only for packaged units.
- On 10-lead generators T11 and T12 are internally connected to T10 and brought out as "T0".
- 120 DELTA and 240 DELTA connections are for 12-lead generators only.
- 120 DELTA connection will require a transformer to power the regulator.
(transformer not included as standard).
- For four lead generator, refer to Figure 13.
- For paralleling kits, refer to manufacturer.

Figure 11. 120 DELTA schematic and connection diagrams.

Note 1: Power matching transformer is required if (See A) volts AC is not available at generator terminals. If field or flashing circuit is grounded, an isolation transformer is required.

(A) 208 - 240 volts for KR-7F.
120 - 139 volts for KR-4F.

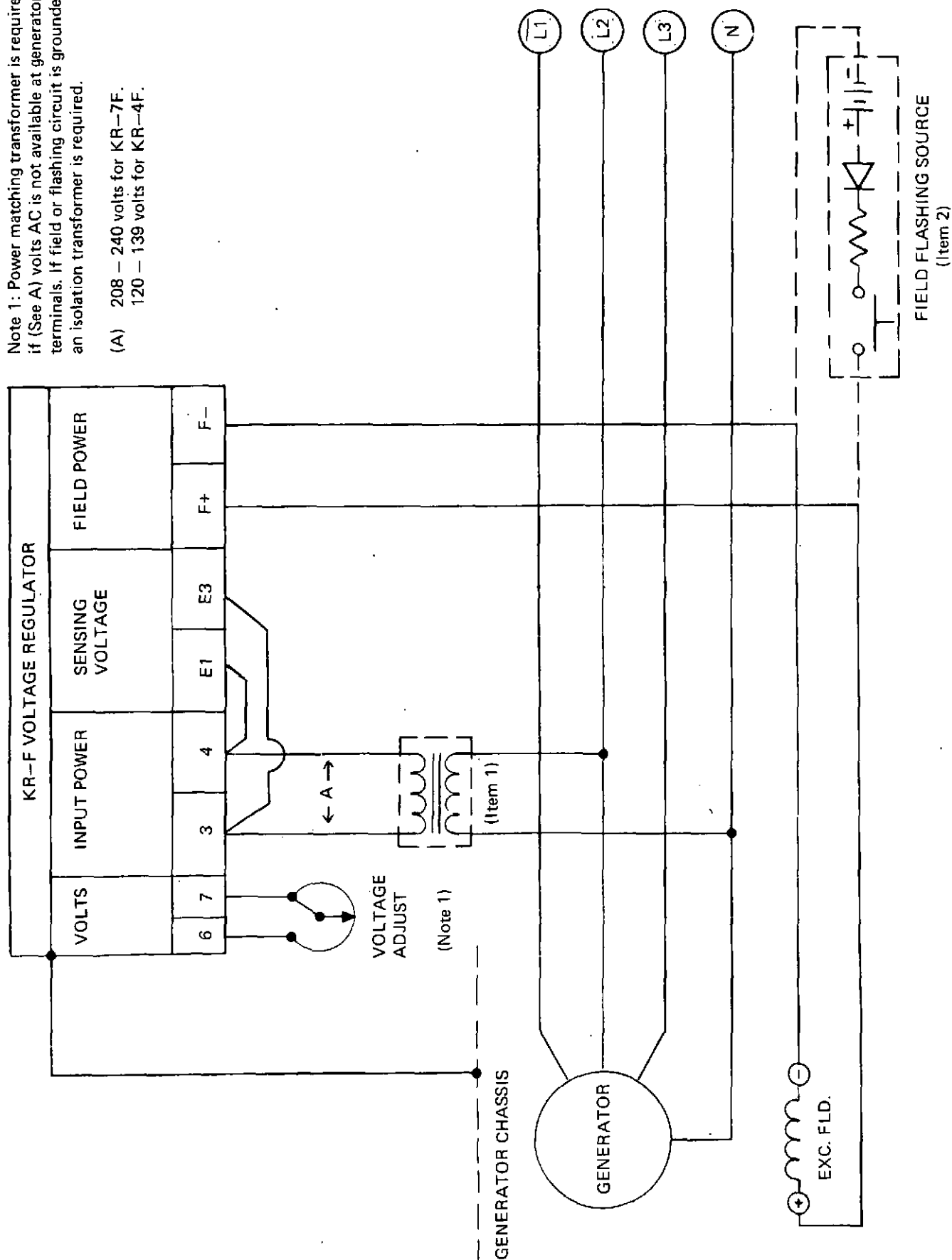


Figure 13. Schematic and connection diagram.

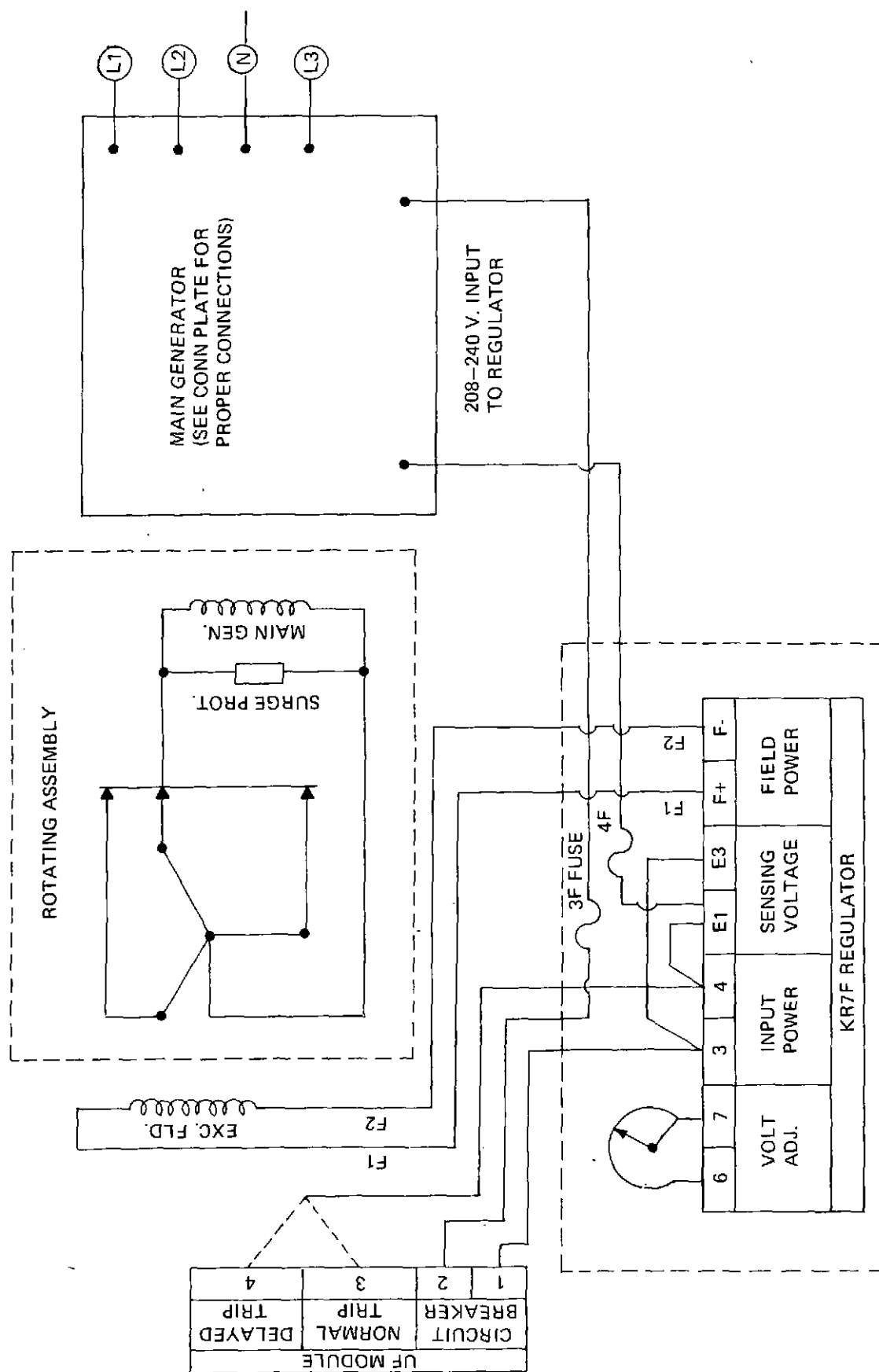
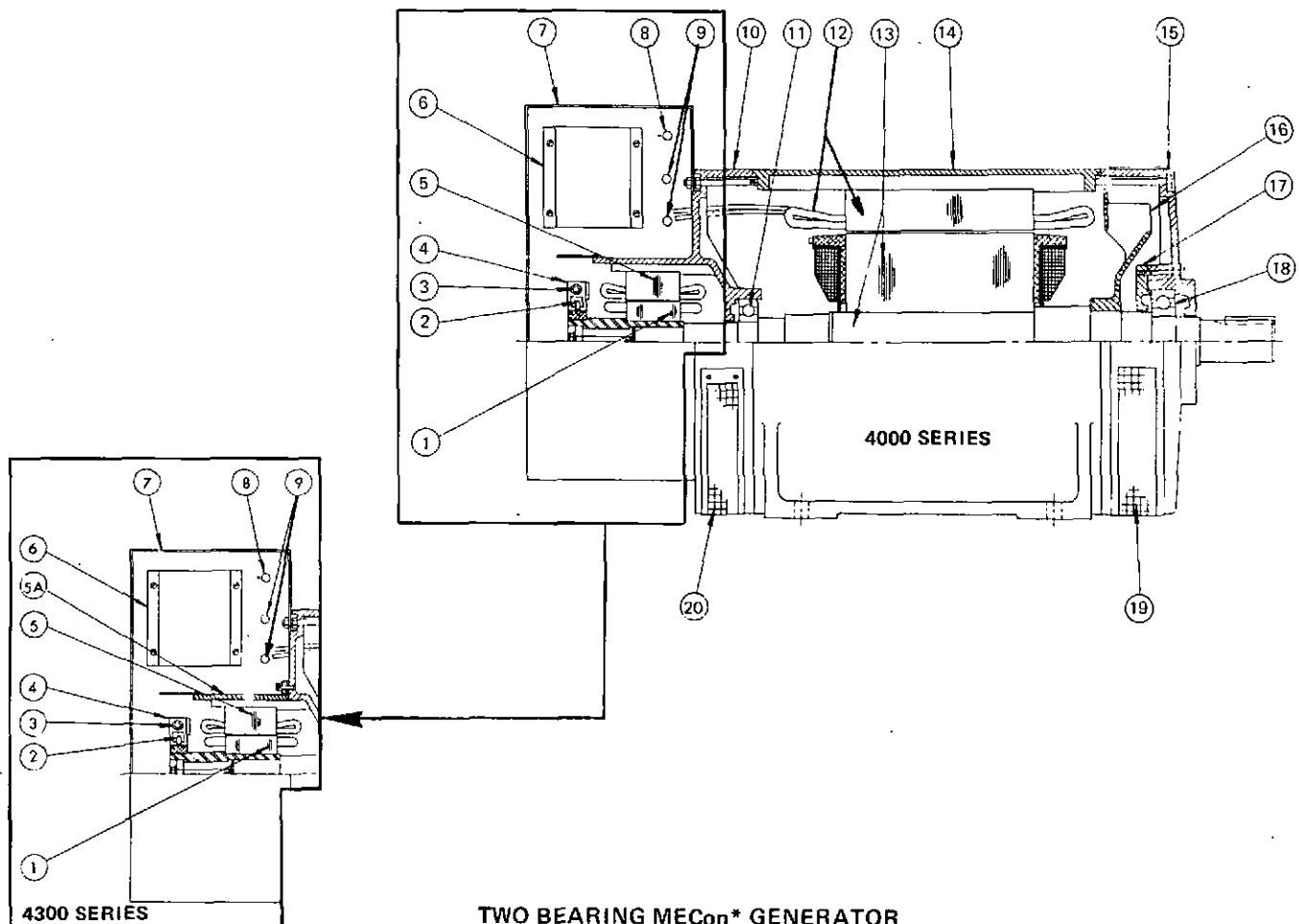


Figure 15. Schematic and connection diagram for generator with a Basler under-frequency module, type UF-24 and UF-324 (serial numbers up to 90-64100-103).

MECON* GENERATOR PARTS DESCRIPTION

Below is a sectional drawing of a typical MECon* generator. Significant parts have been numbered to aid in the familiarization of the generator. This numbered list is not designed to be used as a replacement parts listing; only a parts description. When ordering parts, always give a brief description of the part as given below; the number of parts required; the model and serial number of the generator and other pertinent nameplate data.



TWO BEARING MECon* GENERATOR
(Sleeve Type Exciter)

ITEM NO.	PART NAME	ITEM NO.	PART NAME
1.	EXCITER ARMATURE	11.	BEARING, BALL – EXCITER END (FRONT)
2.	SURGE SUPPRESSOR	12.	STATOR FRAME ASSEMBLY WITH WINDING
3.	DIODE (QTY. OF 3)	13.	ROTOR ASSEMBLY WITH WINDING (LESS ITEMS 11, 18, 19 & 20)
4.	EXCITER (INCLUDES ITEMS 2 & 3)	14.	FRAME
5.	EXCITER STATOR ASSEMBLY	15.	BRACKET, END (REAR)
5A.	EXCITER STATOR AND FRAME ASSEMBLY	16.	FAN, GENERATOR, DRIVE END
6.	VOLTAGE REGULATOR	17.	BEARING CAP, INNER
7.	CONDUIT BOX	18.	BEARING, BALL – DRIVE END (REAR)
8.	VOLTAGE ADJUST	19.	SCREEN, DRIVE END
9.	FUSE (QTY. OF 2)	20.	SCREEN, FRONT END
10.	BRACKET, END (FRONT)		

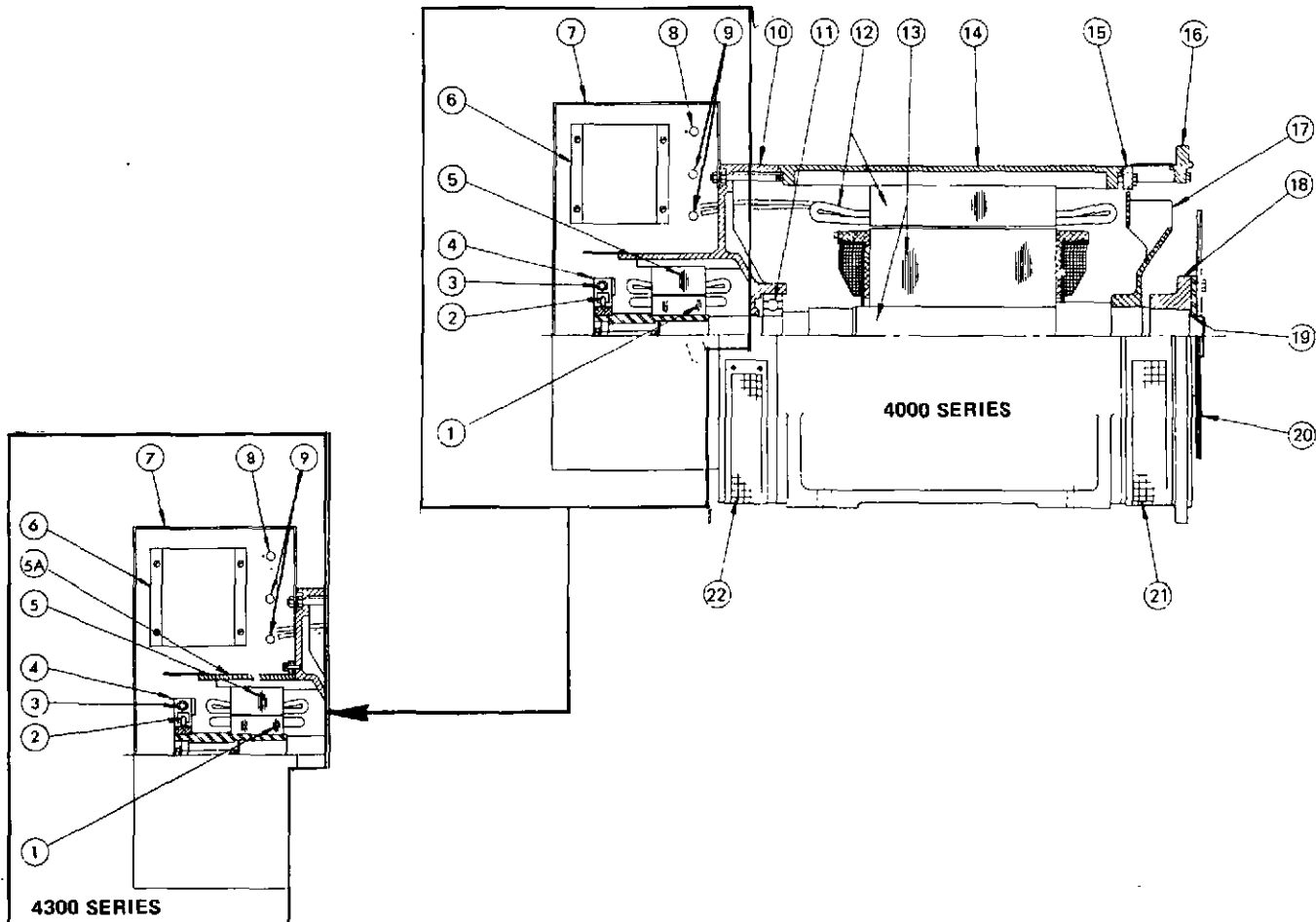
All replacement parts requirements are to be ordered direct from the factory.

* Marathon Energy Converter.

MECon Generator Parts Description

(Sleeve-Type Exciter)

When ordering parts for the sleeveless exciter always include a brief description of the part as listed below; the number of parts required; the model and serial number of the generator and other pertinent nameplate data.



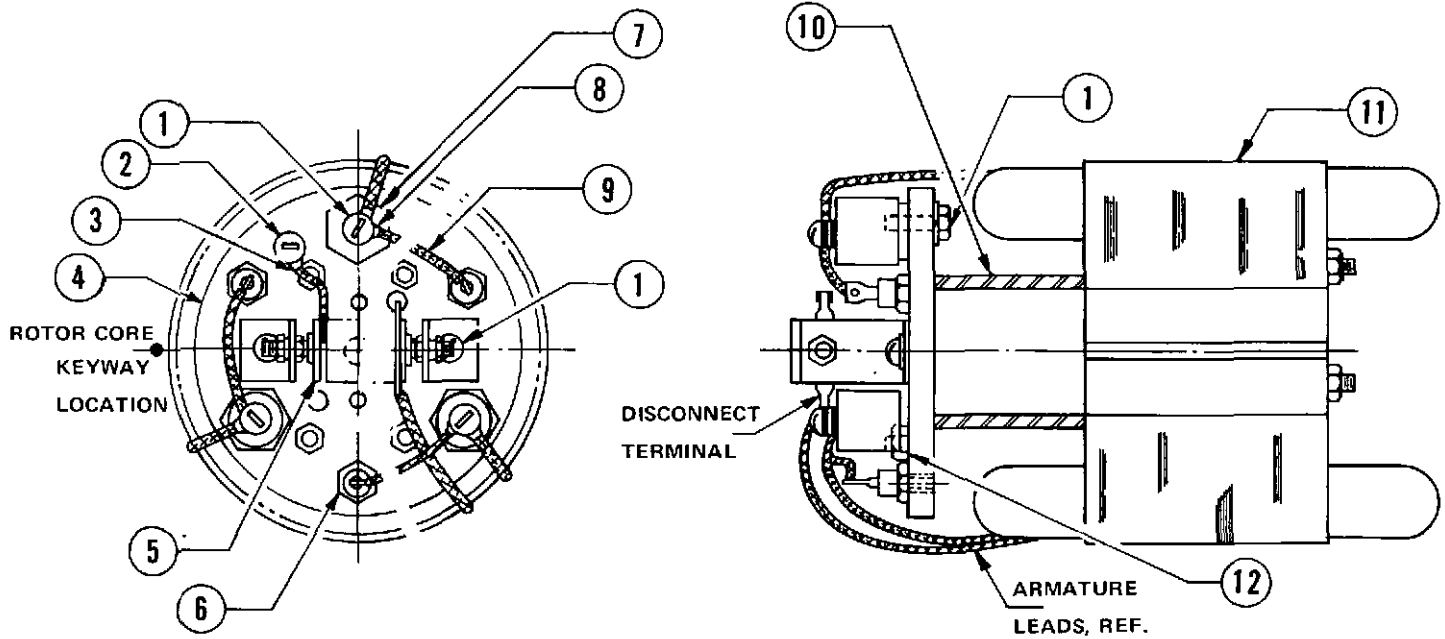
SINGLE BEARING MECon* GENERATOR (Sleeve-Type Exciter)

ITEM NO.	PART NAME	ITEM NO.	PART NAME
1.	EXCITER ARMATURE	12.	STATOR FRAME ASSEMBLY WITH WINDING
2.	SURGE SUPPRESSOR	13.	ROTOR ASSEMBLY WITH WINDING (LESS ITEMS 11, 18, 19 & 20)
3.	DIODE (QTY. OF 3)	14.	FRAME
4.	EXCITER ASSEMBLY (INCLUDES ITEMS 2 & 3)	15.	BRACKET ADAPTER
5.	EXCITER STATOR ASSEMBLY	16.	SAE ADAPTER
6.	VOLTAGE REGULATOR	17.	FAN, GENERATOR, DRIVE END
7.	CONDUIT BOX	18.	COUPLING HUB
8.	VOLTAGE ADJUST	19.	SPACER (WHEN USED)
9.	FUSE (QTY. OF 2)	20.	DRIVE DISCS
10.	BRACKET, END (FRONT)	21.	SCREEN, DRIVE END
11.	BEARING, BALL - EXCITER END (FRONT)	22.	SCREEN, FRONT END

All replacement parts requirements are to be ordered direct from the factory.

* Marathon Energy Converter.

MECon Generator Parts Description
(Sleeveless-type Exciter)
Armature



RECTIFIER MTG. TORQUE
30 IN. LB. MAXIMUM
20 IN. LB. MINIMUM

SLEEVELESS EXCITER

ITEM NO.	PART NAME
1.	SCREW AND LOCKWASHER
2.	SCREW, GROUND AND LOCKWASHER
3.	LEAD, GROUND
4.	MOUNTING DISC
5.	SURGE PROTECTOR
6.	RECTIFIER
7.	INSULATOR
8.	TERMINAL
9.	LEAD, RECTIFIER
10.	*SPACER
11.	WOUND ARMATURE ASSEMBLY
12.	DISC MOUNTING NUT AND LOCKWASHER

* This spacer is not required on 680 frame generators.



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