WMF & WTF & WLF GENERATOR MODELS
OPERATION AND MAINTENANCE MANUAL

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INSTRUCTION MANUAL

ELECTRONIC REGULATED BRUSHLESS GENERATOR

1. INTRODUCTION:

THANK YOU FOR CHOOSING A WESTERBEKE CORPORATION ELECTRONIC REGULATED MARINE GENERATOR.
WESTERBEKE HAS BEEN IN BUSINESS OF BUILDING QUALITY MARINE GENERATORS FOR OVER HALF A CENTURY.

PLEASE READ THE INSTALLATION AND SERVICE SECTIONS OF THIS MANUAL CAREFULLY. A CLEAN, DRY, WELL VENTILATED ENVIRONMENT WITH PROPER INSTALLATION ARE AS CRITICAL TO THE GENERATOR'S PERFORMANCE AND SERVICE LIFE AS THE ENGINEERING OF THE GENERATOR'S INTERNAL COMPONENTS. IF YOU HAVE ANY PROBLEMS IN INSTALLING OR SERVICING THE UNIT CONTACT YOUR AREAS MASTER DISTRIBUTOR FOR ASSISTANCE.

2. GENERAL DATA:

Construction	Brushless Rotating Field
Speed: 60HZ	1800 RPM
50HZ	1500 RPM
Fan cooled	
40 degrees C.	Max. Ambient Temp.
Insulation	Class "H"

NOTE: If the generator is operated at 1500 RPM. The voltage and KW rating will be 5/6 of the 1800 RPM rating. Consult the manufacture if a higher voltage or KW rating is required at 50 HZ (1500 RPM).

3. INITIAL INSPECTION:

Your generator has been carefully inspected and tested before leaving the factory. However, it is wise to examine the generator before installation.

3.1 Carefully unpack generator and examine for any damage. If there is any damage, file a damage claim with the shipper or agent immediately. Save all packing materials for inspection by agent.

4. SAFETY GUIDELINES:

In order to avoid personal injury and to prevent damage to equipment, it is imperative that all the safety precautions listed below are followed when operating this equipment.

4.1 **READ THE OPERATIONS MANUAL CAREFULLY,** familiarize yourself with the equipment before operating. Consider the limitations and potential hazards of electrical equipment before operation.

4.2 **NEVER START THE GENERATOR WITH AN ELECTRICAL LOAD APPLIED.**

4.3 **PROTECT YOURSELF AGAINST ELECTRICAL SHOCK.** Never operate the generator, or handle any electrical equipment while wet, barefoot or while it is raining.

4.4 **MAINTAIN ALL ELECTRICAL CORDS IN GOOD CONDITION.** Worn, frayed oa bare wires will cause severe electrical shock.

4.5 **ALWAYS DISCONNECT ALL ELECTRICAL LOADS BEFORE WORKING ON THE GENERATOR.**

4.6 **ALWAYS PROVIDE ADEQUATE VENTILATION.** Engines consume oxygen and give off deadly monoxide gases.

5. INSTALLATION:

5.1 Location/Environment:
The engine-generator set must be installed in a protected environment. with minimal exposure to fumes, moisture, dust and dirt.
THE AMBIENT AIR TEMPERATURE MUST NOT EXCEED 40° C, (104° F) CONTINUOUS DUTY.

a. DO NOT obstruct the generator intake and outlet air passages.
b. Provide sufficient air circulation around the set to remove engine heat and to provide ample generator cooling.
c. Hot air from the radiator or engine should not pass through the generator.
d. Check the mounting surface to be sure that it is rigid enough to keep vibration and noise to a minimum.

5.2 Base Mounting:
Generator must be mounted securely. Use shims as necessary under generator feet to be sure that feet are uniformly supported before tightening hold-down bolts. If the generator is not uniformly supported, the frame could become distorted resulting in noise and vibration that could damage the generator.

5.3 Mechanical Mounting:
To mount a single-bearing generator to a engine. See FIG. 5.1.

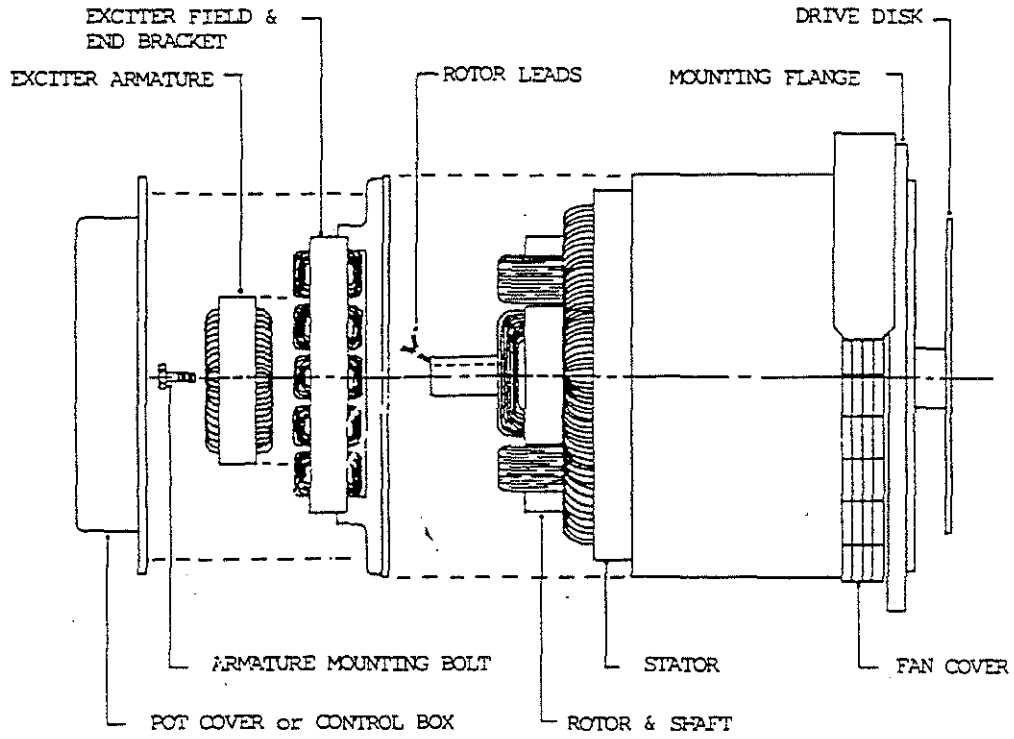


FIG. 5.1

a. Disconnect the positive (+) terminal from battery.
b. Place a jack or other support under the engine flywheel.
c. Remove the pot cover or control box cover from the back of the generator and disconnect all incoming power leads.

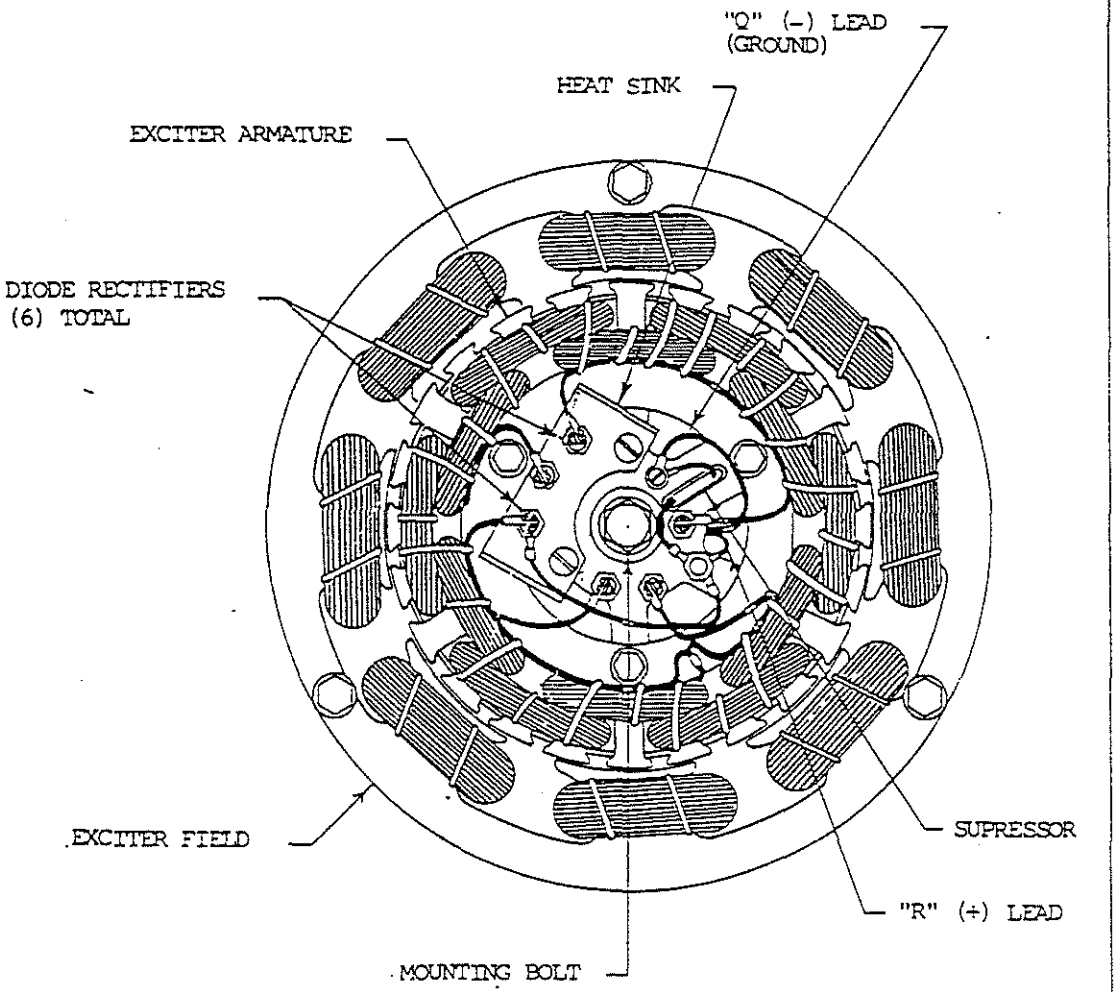


FIG. 5.2

d. Detach the ground lead "Q"(-) and "R"(+) lead from the rotor, on the exciter armature. See FIG. 5.2.
e. Remove the armature fastening bolt from the center of the shaft. (mark position of armature so it can be replaced in the same position).
f. Remove armature from shaft. (take care not to damage the lamination).
g. Remove the fan cover.
h. Use a strap around the generator rotor and shaft assembly and support from hoist.
i. After the armature is removed, the rotor, shaft, and drive disk assembly can be pulled from the frame. (CAUTION: Do not scratch or cut the copper stator windings when removing rotor.
j. DO NOT LOOSE the bearing anchor when the bearing is removed from exciter end bracket. See FIG. 5.3.

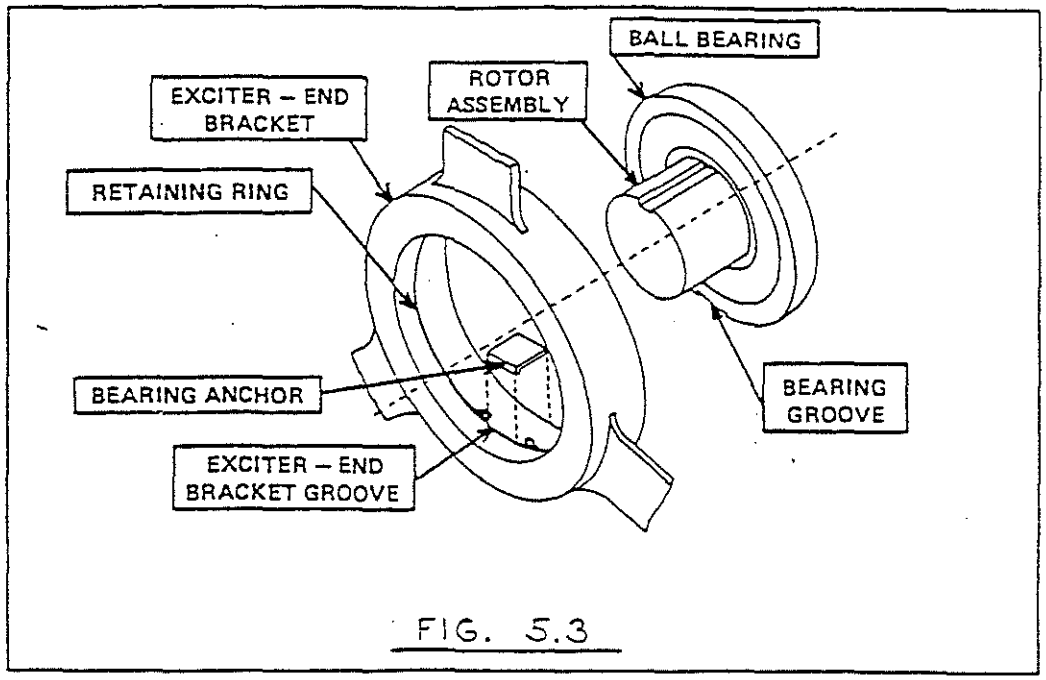


FIG. 5.3

k. Bolt the rotor and drive disk to the engine flywheel, using the proper size lock washers and SAE grade 8 bolts.

l. Push the generator frame assembly carefully back over the rotor. Replace the bearing anchor and carefully align the groove in the bearing with the bearing anchor before the bearing enters the bearing bracket.

m. Mount the frame assembly to the engine flywheel housing with the proper size bolts, lock washers and nut.

n. Remount the fan cover and hood.

o. To reassemble the exciter armature, pull the rotor leads through the opening in the armature spider. Turn the armature until it slips over the pins in the shaft. (CAUTION: DO NOT PINCH ROTOR LEADS).

p. Reassemble the armature to the shaft with the bolt and lock washer using Lock-tight. Use a 9/16" socket on the torque wrench and torque to 25 ft. lb.

q. Reconnect the "Q" and "R" leads to the proper connections.

r. Reconnect all incoming power leads to their proper connections, as shown on wiring diagram.

s. Return pot cover or control box cover.

t. Remove the jack support from under engine flywheel housing.

u. Reconnect the positive (+) battery terminal lead.

5.3 Electrical Connections:
The proper electrical connections required for your 1-PH or 3-PH generator can be found on the Schematic Wiring Diagram attached to the back of this manual.
NOTE: BE SURE THAT ALL ELECTRICAL CONNECTIONS ARE CORRECT BEFORE STARTING THE GENERATOR.

6. INITIAL START-UP:

6.1 Carefully inspect the unit before start-up. Check all electrical connections and be sure that all bolts have been securely mounted.

a. Rotate the shaft by turning the armature bolt, the shaft and rotor assembly are balanced and should turn freely.
b. Start engine.
c. Check vibration. If excessive check all mechanical connections.

6.2 The generator voltage is adjusted at the factory to a specified speed; however, it is advisable to verify upon installation. To supply 60 HZ, the speed should be 1800 to 1860 RPM at no load and should not fall below 1800 RPM by more than one percent at full load. To supply 50 HZ, the speed should be 1500 to 1550 RPM at no load and 1500 RPM at full load. The generator voltage should build to its rated value within 5 seconds after rated speed is attained. If voltage does not build, the cause may be loss of residual magnetism in the exciter field, do to improper installation. See the TROUBLE SHOOTING, section 8 of this manual for more information. To be sure that the generator voltage will always build. Operate the generator at full load before installing in service.

6.3 Observe and record the generator voltage at no load and at full load. Immediately after start-up (cold) and after 30 minutes of full load (hot). The voltage is easily adjusted to optimum values at no load and full load. See the ELECTRONIC REGULATION section. Test at actual load if possible.

6.4 If the voltage cannot be adjusted, see the TROUBLE SHOOTING, section 8 of this manual.

6.5 Check the temperature rise after running for 30 minutes at full load. If excessive, examine the generator for obstructed air flow, hot air feeding into the inlet of the generator or bypassed air (air not pulled through generator) because of air opening into unbaffled fan at engine side of generator fan.

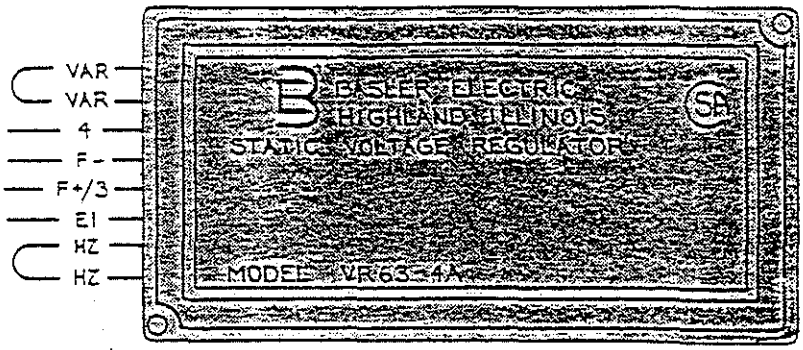
6.6 Examine ratings and actual load applied to determine if the generator rating may be too low for the load applied.

6.7 The ambient temperature must not exceed 40 degrees C. (104 degrees F.) FOR OPERATION AT AMBIENT TEMPERATURES ABOVE 40 degrees, DERATE KW RATING 1 PERCENT FOR EACH DEGREE C. ABOVE 40 degrees C.
For operations at high altitudes, ratings must be derated 2 percent for each 1000 ft. above sea level.
Frame temperatures above 60 degrees C. (140° F.) are too high and indicate a temperature rise in the copper windings of 105 degrees C. or (221° F.) or higher.

7. ELECTRONIC REGULATION:

An electronically regulated generator has superior voltage regulation than other types. (+/- 2%) within rated loads.

7.1 *WESTERBEKE CORPORATION* uses voltage regulators made by Basler Electric Co.



7.2 The electronic voltage regulator, regulates the voltage using a solid-state electronic circuit of transistors, integrated circuits, SCR's, resistors etc. to sense the generator voltage and feed a DC current into the exciter field of the proper average value to hold the generator voltage constant from no-load to full rated load and above.

7.3 Locate the electronic regulator in a well ventilated and protected location. The environmental air temperature must not exceed 104 degrees F. (40° C.).

7.4 NOTE: The generator RPM should drop in proportion to the engine to avoid damage to the electronic voltage regulator. See FIG. 7.2.

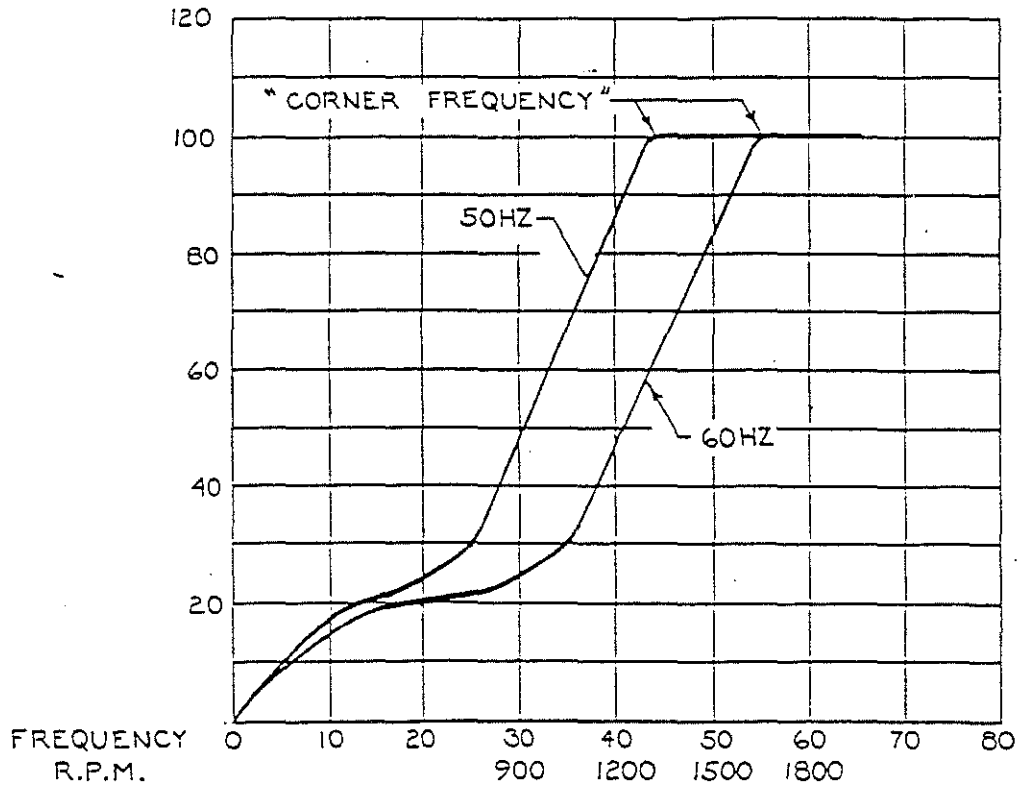


FIG. 7.2

7.5 Characteristics of the 34615 Regulator:

a. Overload Protection:
To prevent damage to devices receiving electrical power from the generator. The regulator provides both under load frequency and over load protection. The voltage regulator operates at 50 HZ or 60 HZ, or both. If the frequency and engine speed, falls below the rated value, the generator voltage decreases to provide underfrequency protection, but if the engine is over the speed required to give 50 HZ or 60 HZ, the voltage does not rise above that value set at the proper frequency (proper engine speed).

b. AC Power Input:

All EVR's must supply up to 4 amperes of DC output current into the exciter field at a voltage up to 70 volts DC. This voltage and current constitutes a power output of about 280 watts. This output power must come from the generator. The exciter field input power must be supplied at 190 to 240 volts AC at a volt-ampere burden of 500 VA maximum.

When the generator is operated at 208 volts to 240 volts this power comes from the generator load lines. When the generator is connected to deliver 120 volts, a separate winding in the stator provides 208 to 240 volts for the voltage regulator power input. When a generator delivers 390 volts to 480 volts, center taps on the phase windings provide 190 volts to 240 volts for both voltage sensing and power input for the exciter field. The AC power input always has one terminal common with one of the sensing voltage terminals. This common lead is identified by the lead or terminal label "4" in the

c. DC Output Power for the Exciter Field:

The EVR rectifies the AC power input with a full wave rectifier to provide DC current (a series of half sine waves) with a high ripple content at a frequency of 120 HZ. This DC current is fed to the exciter field through one or two SCR's to provide a pulsed output in one direction only. The resistance and impedance within the regulator is very low and the peak value of the current into the exciter field is limited only by the impedance and resistance of the exciter field. For this reason the exciter fields must have a minimum specified resistance or the peak current delivered by the regulator will be so high that the regulator components will be damaged. The regulator is commonly designed for a minimum exciter field resistance of 20 OHMS 8-10KW & 25 OHMS 12-50KW, although sometimes a slightly lower resistance can be tolerated. Connections to the exciter field are made at two DC output terminals, F+ and F-.

8. TROUBLE SHOOTING:
This section is intended to help the user isolate the cause of the most common generator malfunctions.

8.1 Visual Examination:
Inspect the generator visually. Look for obvious evidence, burned areas, pinched wires, cracked insulation, all connections should be fastened securely. Check the operating speed and see that the unit has been reassembled and reconnected correctly.

8.2 Very Low Voltage Output or no Voltage Build-up:

a. Loose or Broken Lead wires:
Check lead wires and connections. Tighten securely. Compare connections with the wiring diagram supplied with unit.

b. Rotor Opened or Shorted:
Measure the resistance between "R" and "Q" leads. (see FIG. 8.1. for normal OHM ratings).

c. Stator Ground or Shorted:
Run the generator for 5 minutes. (Stop immediately if smoke or a hot smell is detected). If the voltage does not build and the generator is hot, there is a short circuit in the stator windings. Examine the stator for burned insulation. (DO NOT REMOVE from frame). Measure stator resistance T1 and T2 and from T3 to T4, each should have equal resistance. (Disconnect leads at the terminal board and measure). If one of the voltage readings is lower than the other, the low voltage winding is shorted. Replace stator.

d. Exciter Field Opened or Shorted:
Measure the resistance at 77 degrees F. (see GENERATOR RESISTANCE VALUES on page 11 for normal OHM ratings).

e. Defective Diodes in the Armature:
See section 10.

f. Defective Voltage Regulator:
see section 9.

8.3 High Voltage Output:

a. Defective 165K OHM Resistor: (on 120/240 volts only.) Test and replace if necessary.

b. Defective Electronic Regulator: Replace. (Do not flash).

8.4 Voltage Builds but Oscillates Excessively:

a. Defective Electronic Regulator: See section 9.

GENERATOR RESISTANCE VALUES:

Armature: .470-.520 OHMs per phase, 5 - 10 KW
.655-.720 OHMs per phase, 12.5 - 50 KW

Field: 18 - 22 OHMs 5 - 10 KW
23 - 28 OHMs 12.5 - 50 KW

Stator: OHMs vary with KW rating, but less than 1.0 OHM per phase.

Rotor:

KWs	8	10	12.5	15	17.5	20	25	30 to 50
OHMs	1.47	1.58	1.73	1.84	2.00	2.1	2.2	2.5 to 3.8

FIG. 8.1

9. FLASHING THE FIELD:

To determine if the regulator is defective. Disconnect the "F" and "C" leads from the exciter field and open the circuit breaker/switch in lead 3 or 4 to the regulator. Using a 12 volt battery, connect the battery (+) to the regulator 3/F(+). Connect the battery (-) to the regulator F(-). Run generator at 1800 RPM.

a. If the residual voltage is now normal. the electronic regulator is defective and must be replaced.
b. If there is no voltage, check the exciter field.
c. If the voltage reading differs from what would be a normal reading, the electronic regulator is working properly and the problem is elsewhere. Return to the TROUBLE SHOOTING section.

10. CHECKING DIODES IN ARMATURE:

All Fidelity Electric armature have (6) diode rectifiers arranged in a full wave pattern. Three forward biased diodes are mounted on a heat sink and three reversed biased diodes mounted on the armature hub.

a. Use a Basic Analog OHM Meter and set to R*1 scale. (OHM meter leads (+) red, (-) black.
b. Check the diodes as a group with the following connections.
   (-) OHM meter lead to "R" terminal on armature hub.
   (+) OHM meter lead to "Q" ground.
   Diodes are good if the resistance reading is approx. 50 OHMs.
c. Check for leakage in the diodes by reversing their polarity. Diodes are good if the resistance reading is infinite .
d. Resistance values other than those indicated suggest 1 or more faulty diodes. Check each diode separately to isolate the defective diode.
e. Disconnect terminals to each diode. Check the Forward Biased Diode "FWD" group first. (3 diodes on heat sink).
   (-) OHM meter lead to "R" terminal on armature hub.
   (+) OHM meter lead to the (+) on diode (indicated by red dot).
f. Check for leakage in each diode by reversing polarity. Resistance = infinite .
g. Check Reversed Biased Diode "RVS" group.
   (-) OHM meter lead to "Q" ground on armature hub.
   (+) OHM meter lead to the (+) on each diode.
   Resistance = infinite .
h. Check for leakage in each diode by reversing polarity. Resistance = 10 OHMs.

NOTE: Resistance values other than those indicated means that the diode is defective. Replace. Reconnect terminals to each diode.

11. MAINTENANCE AND REPAIR:

11.1 Periodic cleaning and inspection:
Clean and inspect the generator every 200 hours of normal operating time.
If the generator is housed in a harsh environment clean and inspect more frequently. If dirt and grease is allowed to build-up, the generator will run hotter, loose efficiency and reduce the life of the generator.

11.2 Cleaning:
Remove all dust, dirt, oil and grease build-up from all external surfaces. Use a low pressure air hose (25 PSI maximum) to blow dirt and grease from the internal components through the fan opening. Clean inside the control box. Check for loose or damaged lead wires and loose components mounted in the box. Do not remove internal generator parts or the warranty is void.

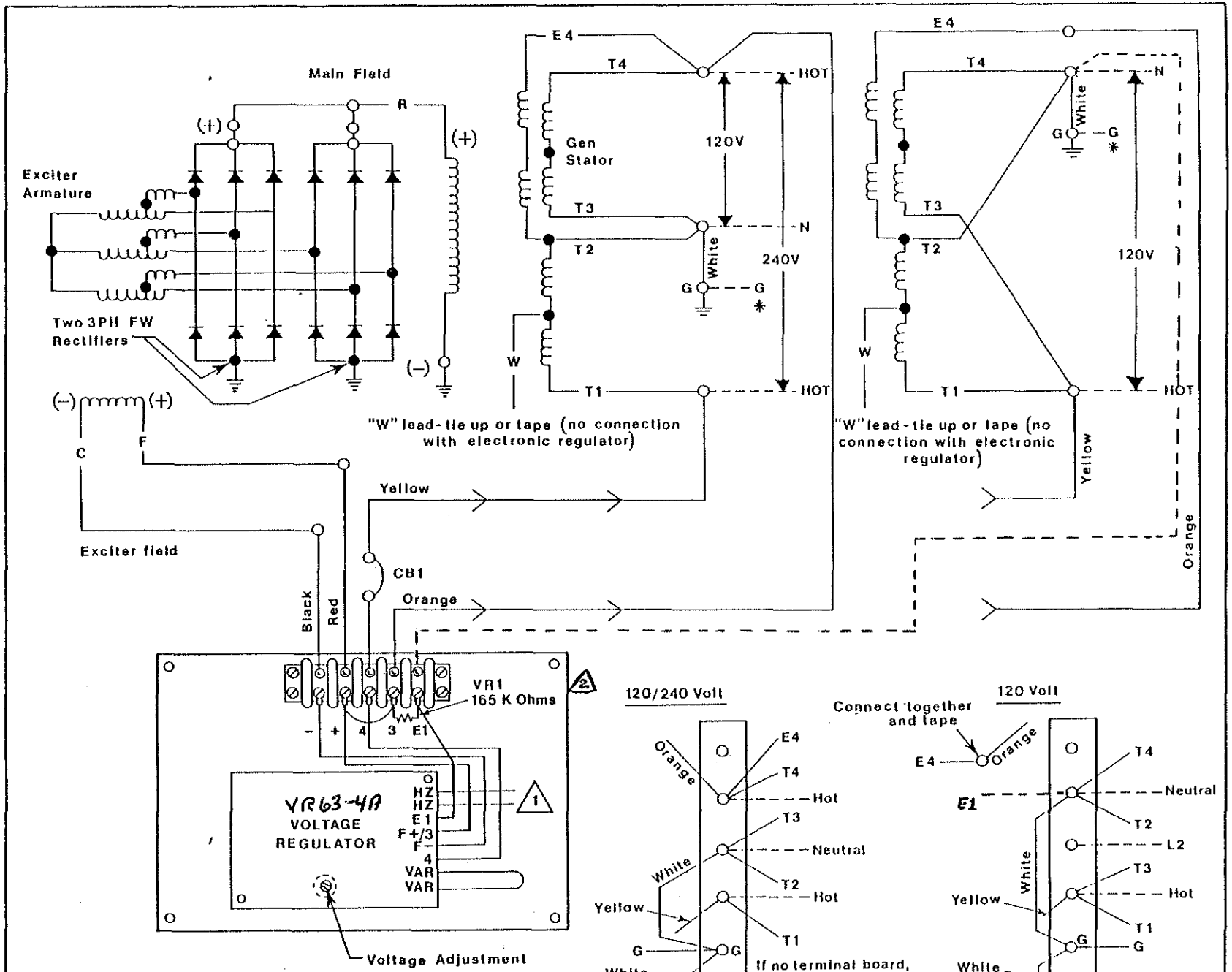
11.3 Inspection:
With the pot cover or control box cover removed, examine rotor, shaft and bearing for excessive wear. Replace bearings after 10,000 hours of normal operating time or sooner if wear is evident.

12. SPARE PARTS:

Always include the name of the part, the quantity of each part ordered and the serial and model numbers from the generator nameplate when ordering parts.

For ordering information, contact...

1. REGIONAL MASTER DISTRIBUTOR.
2. LOCAL WESTERBEKE DEALER



GENERATOR & REGULATOR DIAGRAM

SINGLE PHASE, 4 LEAD, ELECTRONIC REGULATION
120/240 VAC CONNECTIONS WMF & WML MODELS

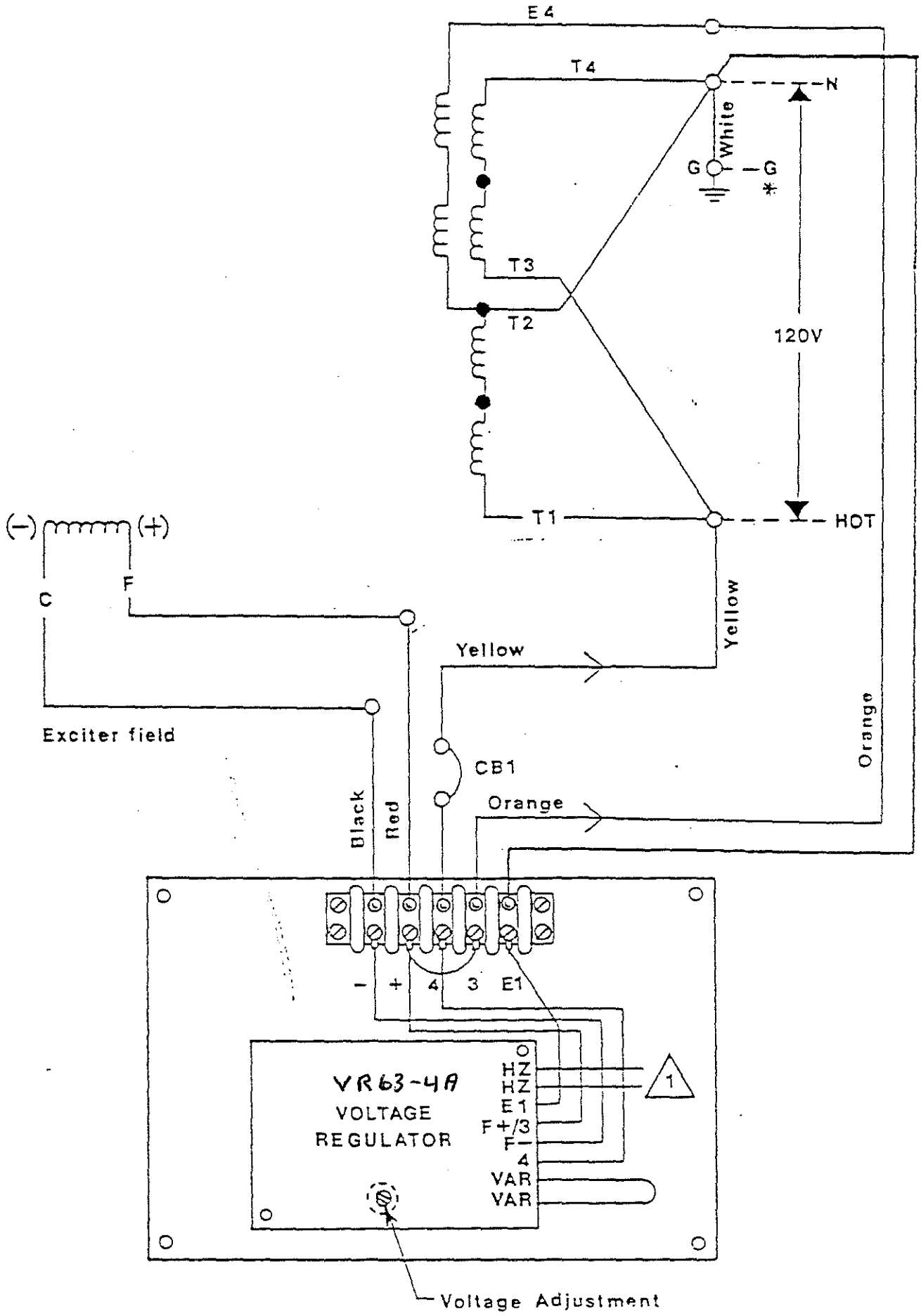
NOTES:

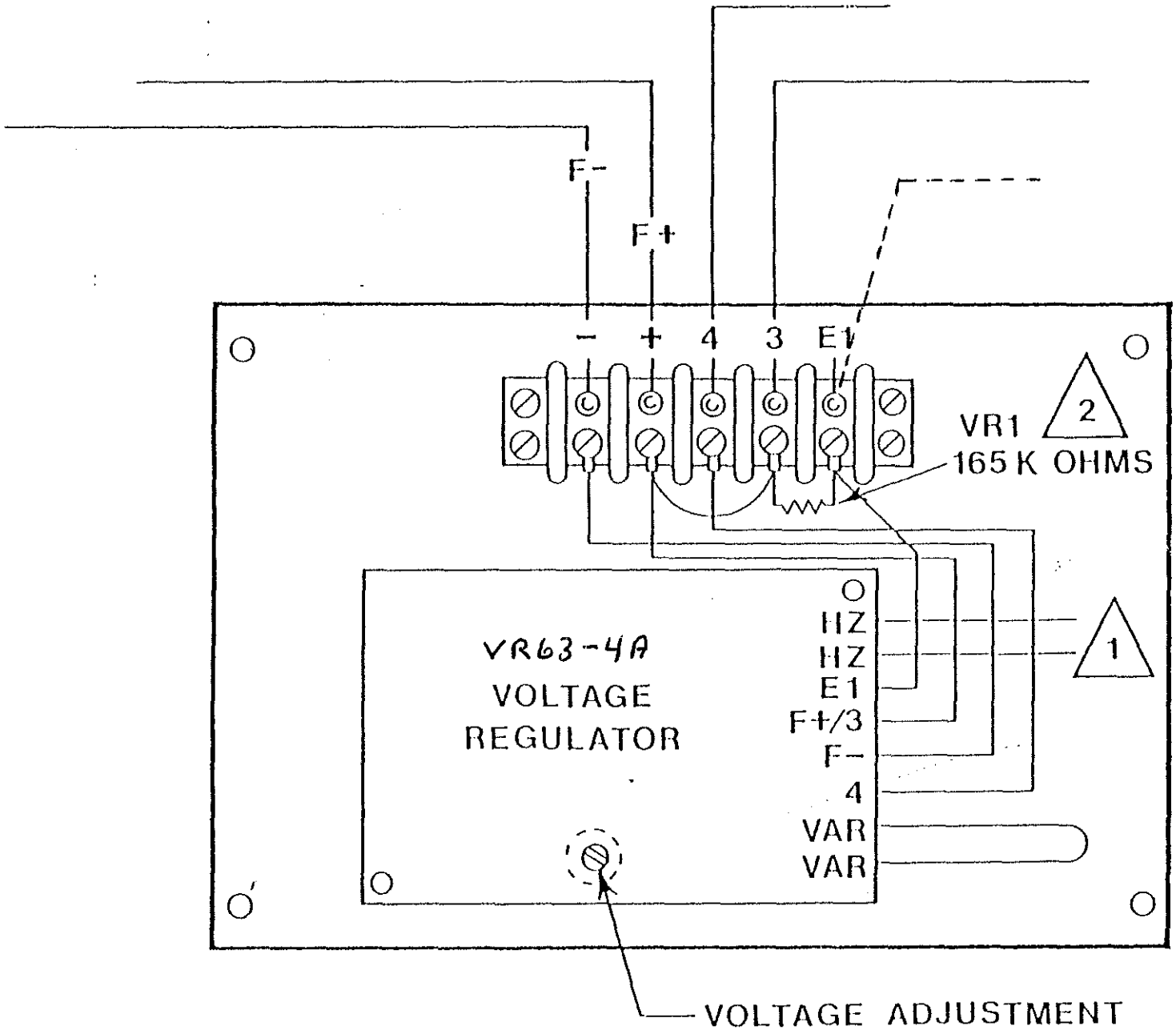
1. CUT HZ JUMPER FOR 60 HZ, LEAVE INTACT FOR 50 HZ.
2. Remove resistor when wired for 120 volt output.

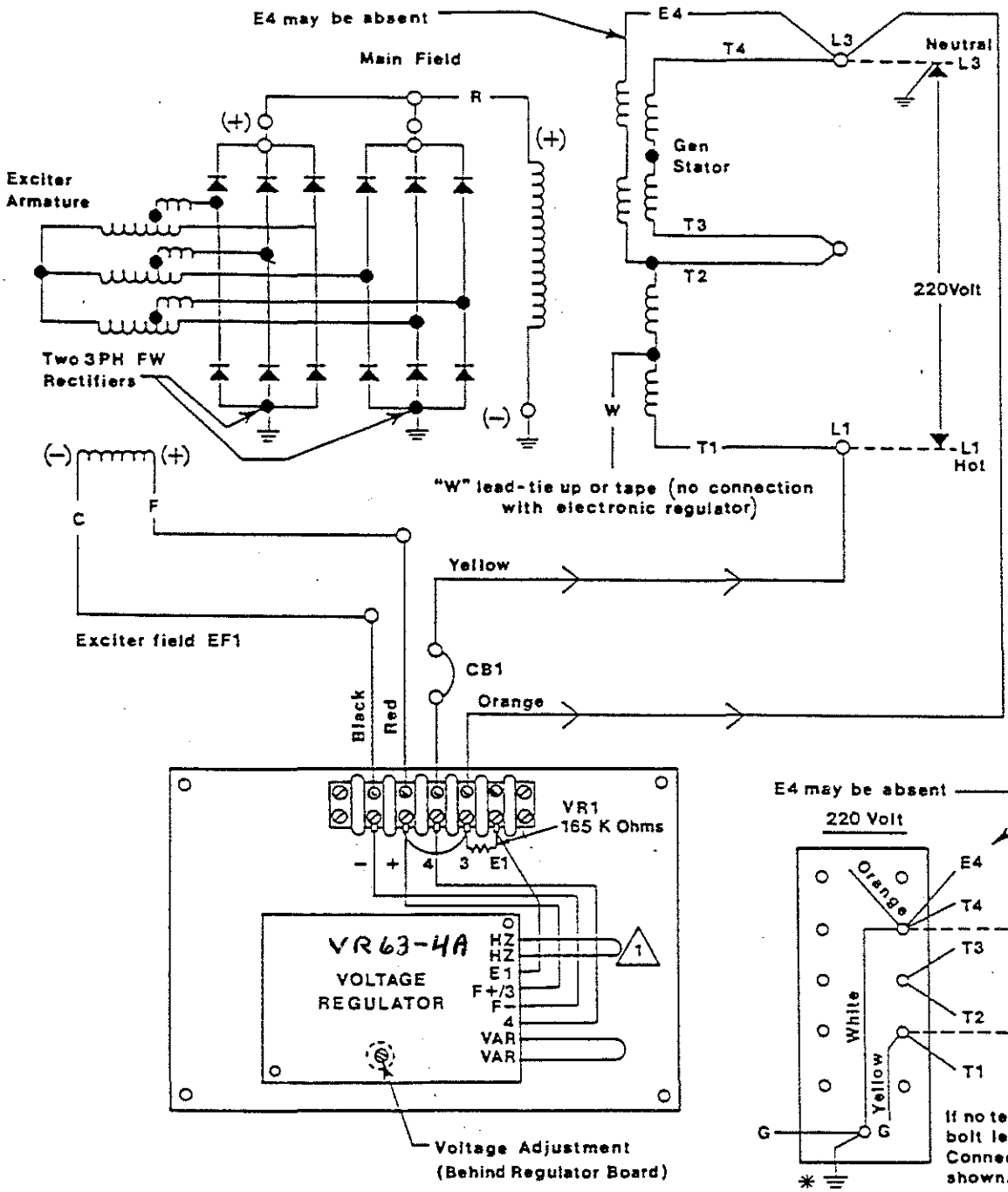
TERMINAL BOARD CONNECTIONS

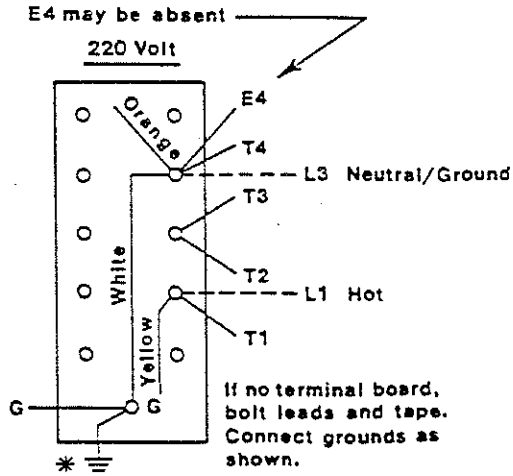
* NOTE: Ground Connection.
User to insure this ground connection is made.

PN33354 Rev.B


E4
T4
N
White
G
G
*
T3
T2
120V
T1
HOT
(-)
(+)
C
F
Yellow
Yellow
Exciter field
CB1
Orange
Orange
Black
Red
- + 4 3 E1
VR63-4A
VOLTAGE
REGULATOR
HZ
HZ
E1
F+/3
F-
4
VAR
VAR
1
Voltage Adjustment


F-
F+
-
+
4
3
E1
VR1
165 K OHMS
2
REMOVE RESISTOR WHEN
WIRED FOR 120VOLTS.
VR63-4A
VOLTAGE
REGULATOR
HZ
HZ
E1
F+/3
F-
4
VAR
VAR
1
JOIN BOTH LEADS
TOGEATHER FOR 50HZ
VOLTAGE ADJUSTMENT





GENERATOR & REGULATOR DIAGRAM

SINGLE PHASE, 4 LEAD, ELECTRONIC REGULATION
220 VAC CONNECTIONS WMF & WLF MODELS

NOTES:

1 JOIN BOTH LEADS TOGETHER FOR 50 HZ.

TERMINAL BOARD CONNECTIONS

* NOTE: Ground Connection.
User to insure this ground connection is made.

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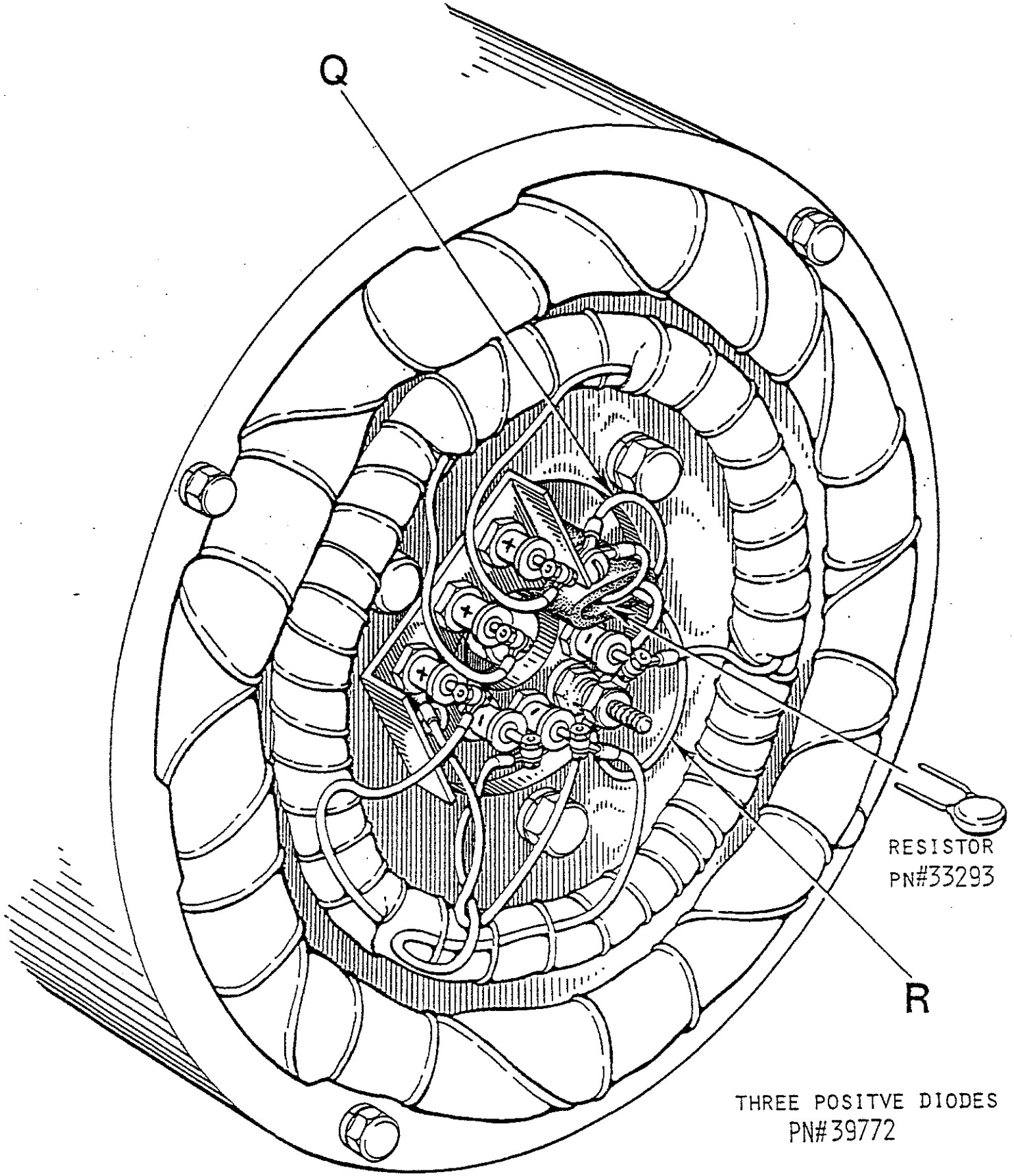
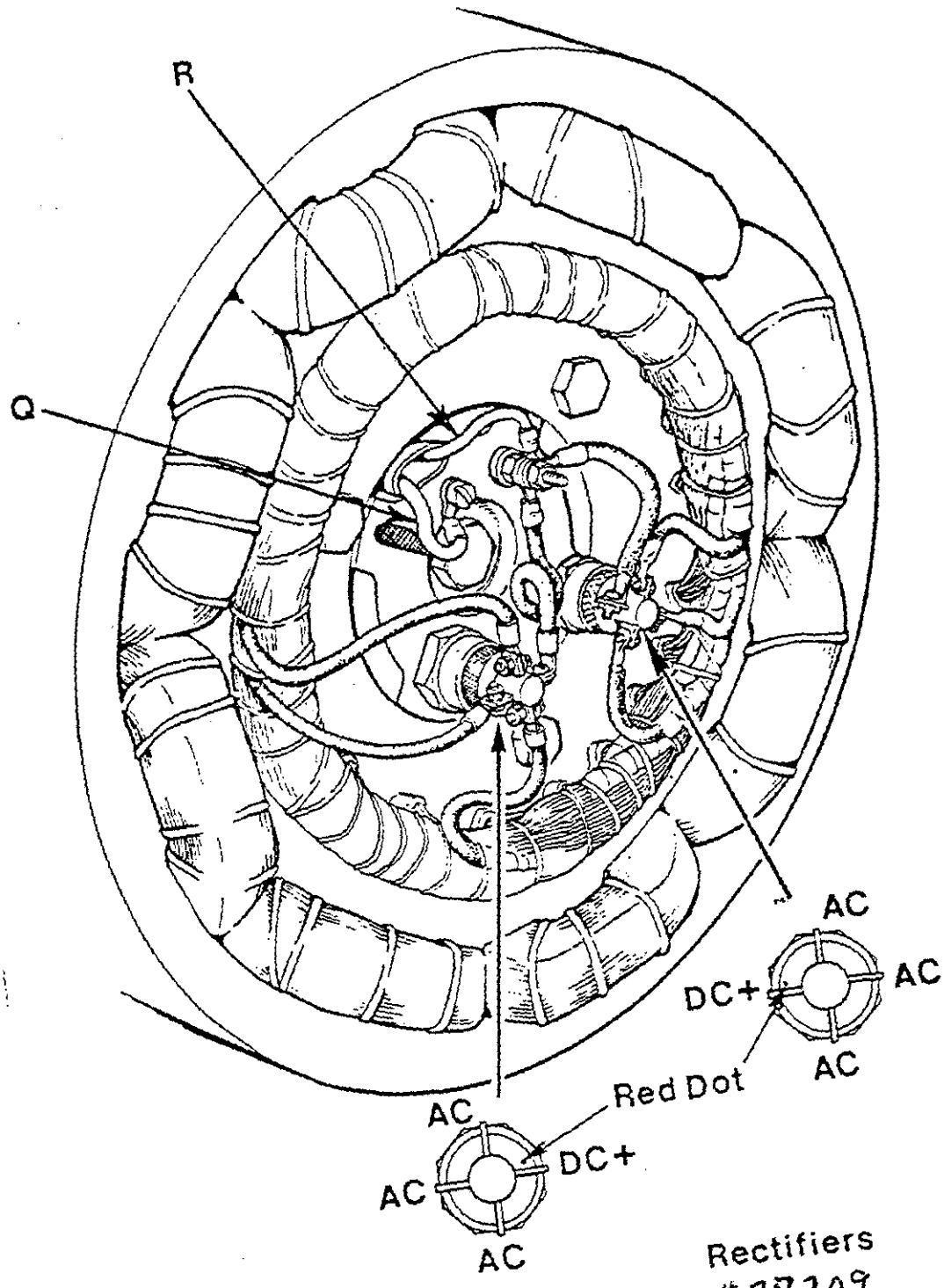


WMF. MODEL GENERATORS EXCITER ROTOR
(CURRENT MODELS)

THREE POSITVE DIODES
PN#39772

THREE NEGATIVE DIODES
PN#39773

ROTOR ASSEMBLY
PN#37128



Rectifiers
#37209