Onan

Service Manual

YD

Generator and Control

DL Series Generator Sets with Torque Match-2™ Regulator

943-0020
8-88
Printed in U.S.A.

Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and the equipment. **Safe and efficient operation can be achieved only if the equipment is properly operated and maintained.** Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

⚠DANGER ***This symbol warns of immediate hazards which will result in severe personal injury or death.***

⚠WARNING ***This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.***

⚠CAUTION ***This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.***

FUEL AND FUMES ARE FLAMMABLE. Fire and explosion can result from improper practices.

- DO NOT fill fuel tanks while engine is running, unless tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT permit any flame, cigarette, pilot light, spark, or other ignition source near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines as copper will become brittle if continuously vibrated or repeatedly bent.
- Be sure all fuel supplies have a positive shutoff valve.
- Do not smoke while servicing lead acid batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

EXHAUST GASES ARE DEADLY

- Provide an adequate exhaust system to properly expel discharged gases. Visually and audibly inspect the exhaust daily for leaks per the maintenance schedule. Ensure that exhaust manifolds are secured and not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Keep your hands, clothing, and jewelry away from moving parts.
- Before starting work on the generator set, disconnect starting batteries, negative (-) cable first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry in the vicinity of moving parts, or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surface to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death. DO NOT tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- DO NOT CONNECT GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved isolation switch or an approved paralleling device.

GENERAL SAFETY PRECAUTIONS

- Coolants under pressure have a higher boiling point than water. DO NOT open a radiator or heat exchanger pressure cap while the engine is running. Allow the generator set to cool and bleed the system pressure first.
- Benzene and lead, found in some gasoline, have been identified by some state and federal agencies as causing cancer or reproductive toxicity. When checking, draining or adding gasoline, take care not to ingest, breathe the fumes, or contact gasoline.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Provide appropriate fire extinguishers and install them in convenient locations. Consult the local fire department for the correct type of extinguisher to use. Do not use foam on electrical fires. Use extinguishers rated ABC by NFPA.
- Make sure that rags are not left on or near the engine.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage which present a potential fire hazard.
- Keep the generator set and the surrounding area clean and free from obstructions. Remove any debris from the set and keep the floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

Table of Contents

Section 1. Introduction

ABOUT THIS MANUAL

This manual has troubleshooting and repair information for the Onan series YD generators using the Torque Match-2 (VRAS-2) AC voltage regulator. For operation, service, and troubleshooting information on the engine or DC control components, refer to support manuals specific to the generator set model.

Study this manual carefully and observe all warnings and cautions found in the *Safety Precautions* (page ii) and other pages of this manual. Knowing the generator set and instructing the operator on how to follow a regular maintenance schedule will help obtain longer unit life, better performance, and safer operation.

Repair information for solid state printed circuit board components (other than fuses) is not provided as the board lends itself to replacement rather than repair. Application of meters or hot soldering irons can cause unnecessary and expensive damage. Repair of the printed circuit boards is not recommended except by the factory.

⚠CAUTION ***High voltage resistance testing of generator windings can cause damage to solid state components. Isolate these components before testing.***

TEST EQUIPMENT

Most of the test procedures in this manual can be performed with an AC-DC multimeter such as a Simpson Model 260 VOM or a digital VOM. Some other instruments to have available are:

- Onan Multitester
- Wheatstone Bridge
- Jumper Leads
- Onan Load Test Panel
- Variac
- AC Voltmeter
- DC Voltmeter

See Tool Catalog 900-0019.

HOW TO OBTAIN HELP

Always supply the **complete model number and serial number** on the generator set nameplate (see Figure 1-1) when seeking additional service information or replacement parts. The nameplate is located on the side of the control box.

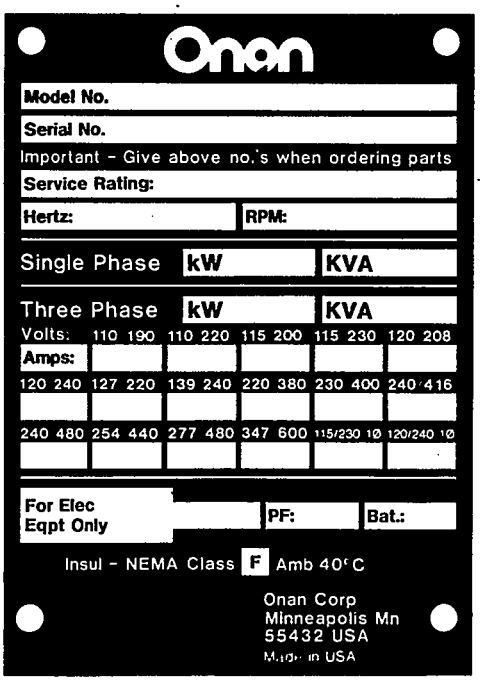

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FIGURE 1-1. ONAN NAMEPLATE

⚠WARNING

INCORRECT SERVICE OR REPLACEMENT OF PARTS CAN RESULT IN SEVERE PERSONAL INJURY, DEATH, AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE.

Section 2. Generator/Voltage Regulator

GENERATOR DESCRIPTION

The YD generator is a four-pole, revolving field, brushless exciter design. Single and three phase generators are available in both 50 and 60 hertz.

The generator rotor is directly coupled to the engine flywheel with a flexible drive disc. The engine speed determines output frequency. A centrifugal blower on the drive disc pulls cooling air through the end bell and discharges it through an outlet near the blower.

A ball bearing in the end bell supports the rotor shaft. The end bell is attached with four studs that thread into the generator adapter casting. The exciter stator mounts in the end bell, the exciter rotor and its rotating rectifier assemblies mount on the rotor shaft. Within the end bell, leads F1(+) and F2(-) from the exciter stator winding connect to the output terminals of the voltage regulator.

The composite illustration in Figure 2-2 shows the generator output and control/meter leads for the various voltage codes that may appear on the nameplate. The number of wires is dependent upon the model and selected code options. Voltage codes B and N (single-phase units), and F and H (3-phase units) have four leads. Voltage codes L and Z have 12 output leads for 3-phase, broad-range connections.

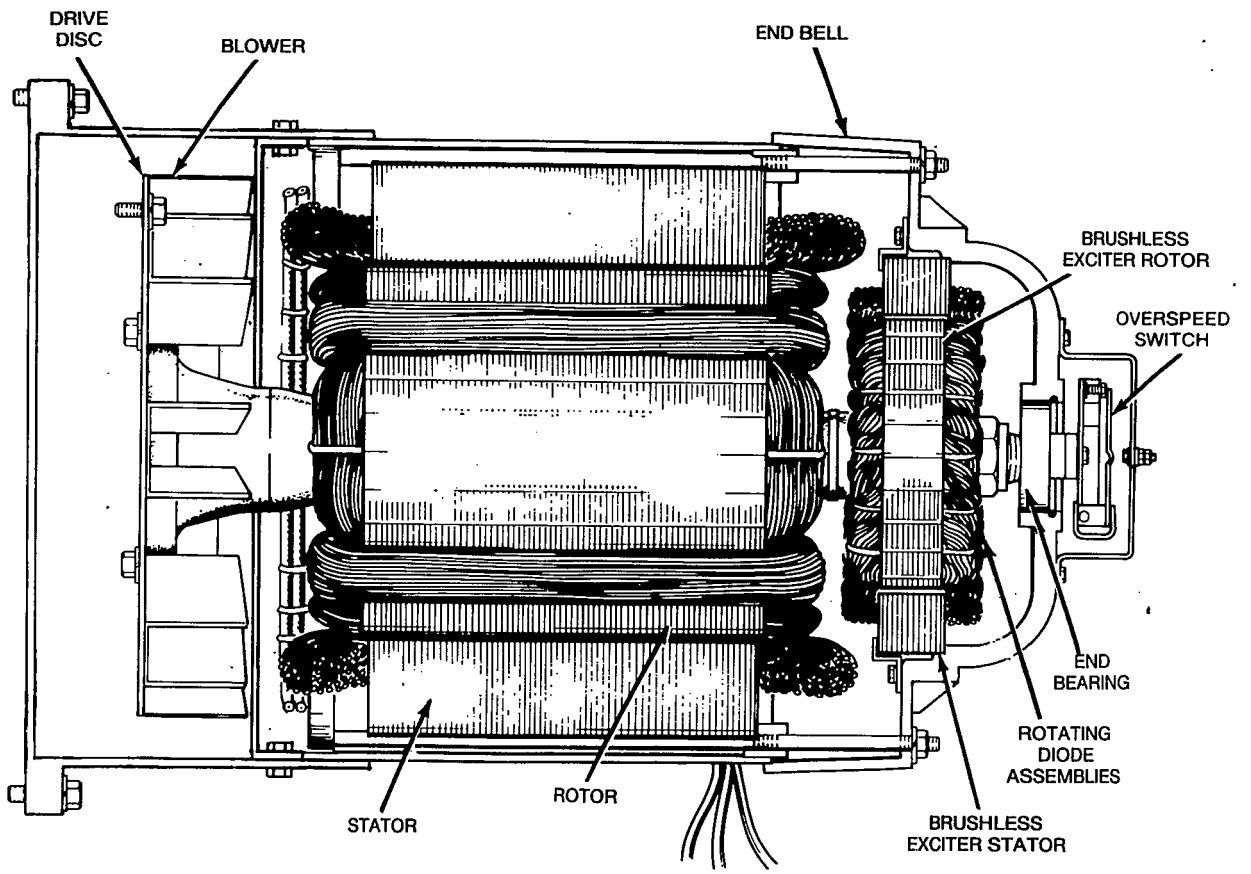

FIGURE 2-1. TYPICAL YD SERIES GENERATOR

Voltage code reconnection diagrams appear in *Section 4. Generator/Regulator Tests/Adjustment,* and in *Section 6. Wiring Diagrams.* Generator sets ordered from Onan with the optional circuit breaker have the leads connected for the nameplate voltage.

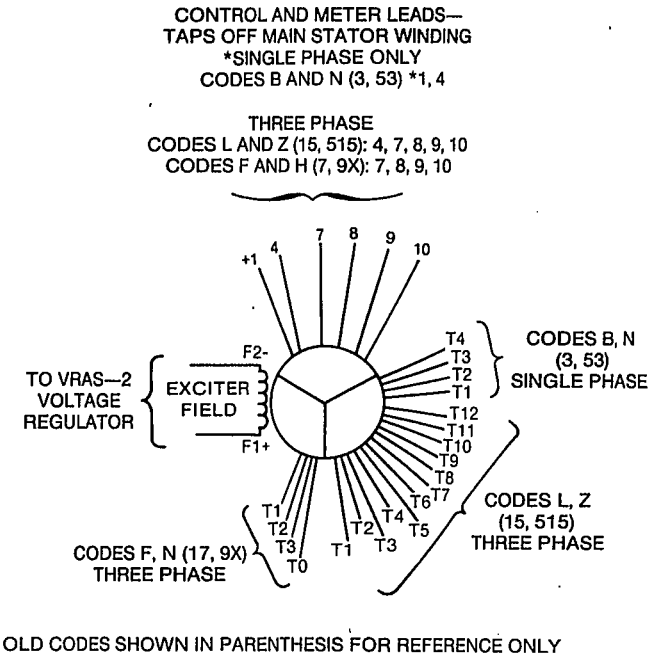

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FIGURE 2-2. SINGLE AND THREE PHASE GENERATOR SCHEMATIC (COMPOSITE)

GENERATOR OPERATION

Power generation involves the generator components shown in Figure 2-3. These components are italicized in the following text. A *permanent magnet* embedded in an *exciter stator* field pole begins the voltage build-up process as the generator set starts. Single-phase AC voltage, taken from a *main stator* winding, is connected to the *VRAS-2 voltage regulator* as a reference for regulating the generator output voltage. The *regulator* DC output is coupled to the *exciter stator.*

The *exciter rotor* produces three-phase AC voltage that is converted to DC by the full wave *rotating rectifier assemblies.* The DC voltage excites the *rotor main field* winding to produce *main stator* AC for the load.

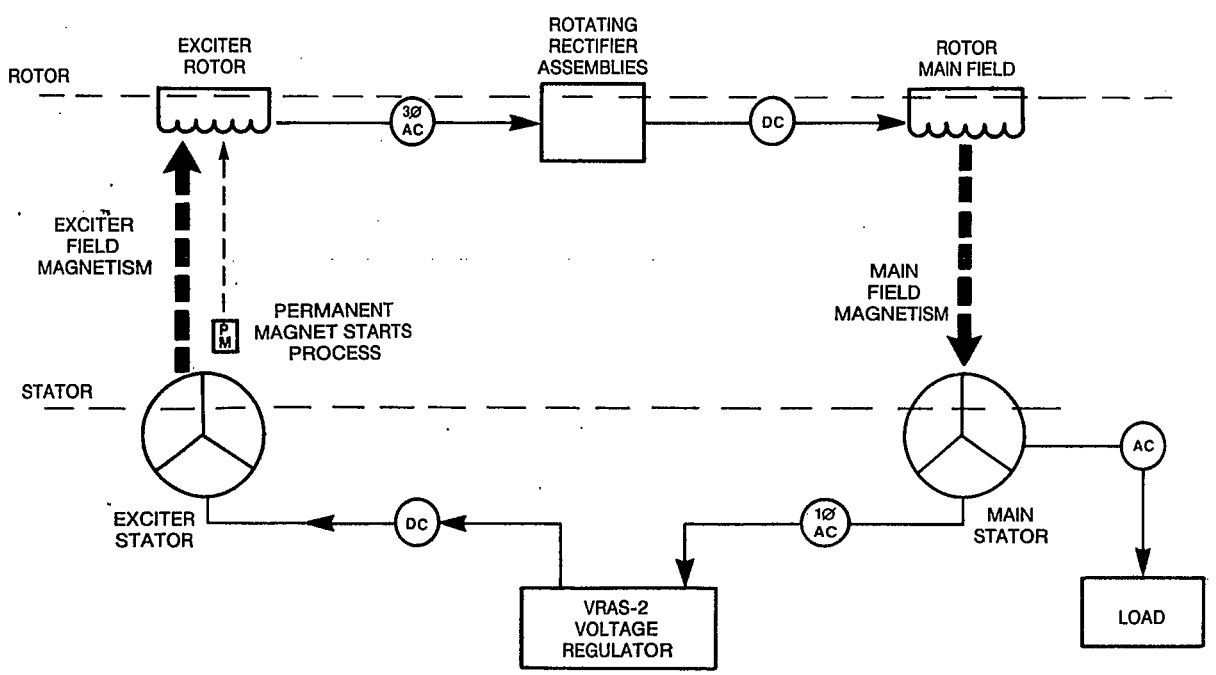

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FIGURE 2-3. GENERATOR EXCITATION BLOCK DIAGRAM

VOLTAGE REGULATOR

Description

The VRAS-2 voltage regulator (Figure 2-4) provides switch selections that alter its sensing and command signals for maximum performance in a variety of generator sizes and applications. Review the sections titled Operation Modes and Operating Stability, then the Adjustments section for switch locations and settings specific for the generator set kilowatt rating.

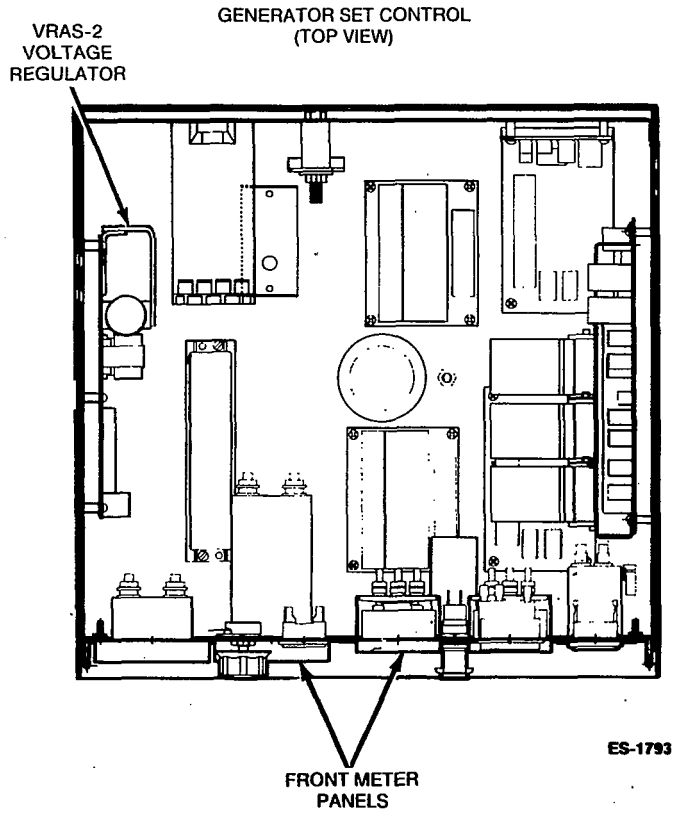


FIGURE 2-4. LOCATION OF VOLTAGE REGULATOR (CONTROL TOP VIEW)

Operating Modes

Torque-Matching: Matching the torque characteristics of the engine and generator is required to properly manage momentary application of overloads such as motor starting. Because of variance in engine characteristics, different torque matching may be applied. Switches on the regulator provide flexibility to test and set the torque-matching function for different engine/generator combinations. When properly set, the regulator is able to maintain output voltage within reasonable limits under transient conditions. It allows use of the engine's full power to prevent an unstable response.

Non-Torque-Matching: Even though the voltage regulator can also be switch-selected to a non-torque-matching constant voltage mode, independent of engine speed, this mode will not prevent the generator set from stalling during momentary overload conditions. This setting is not recommended. Consult an Onan service representative before selecting this mode to be sure that load demands specific to the installation would not cause unstable operation of the generator set.

Operating Stability

Different regulator gain compensation is required because of differences in the exciter and main field time constants of various generator sizes. The VRAS-2 voltage regulator is switch-selectable to a kilowatt range that best suits the generator set application.

Voltage Regulator Adjustments

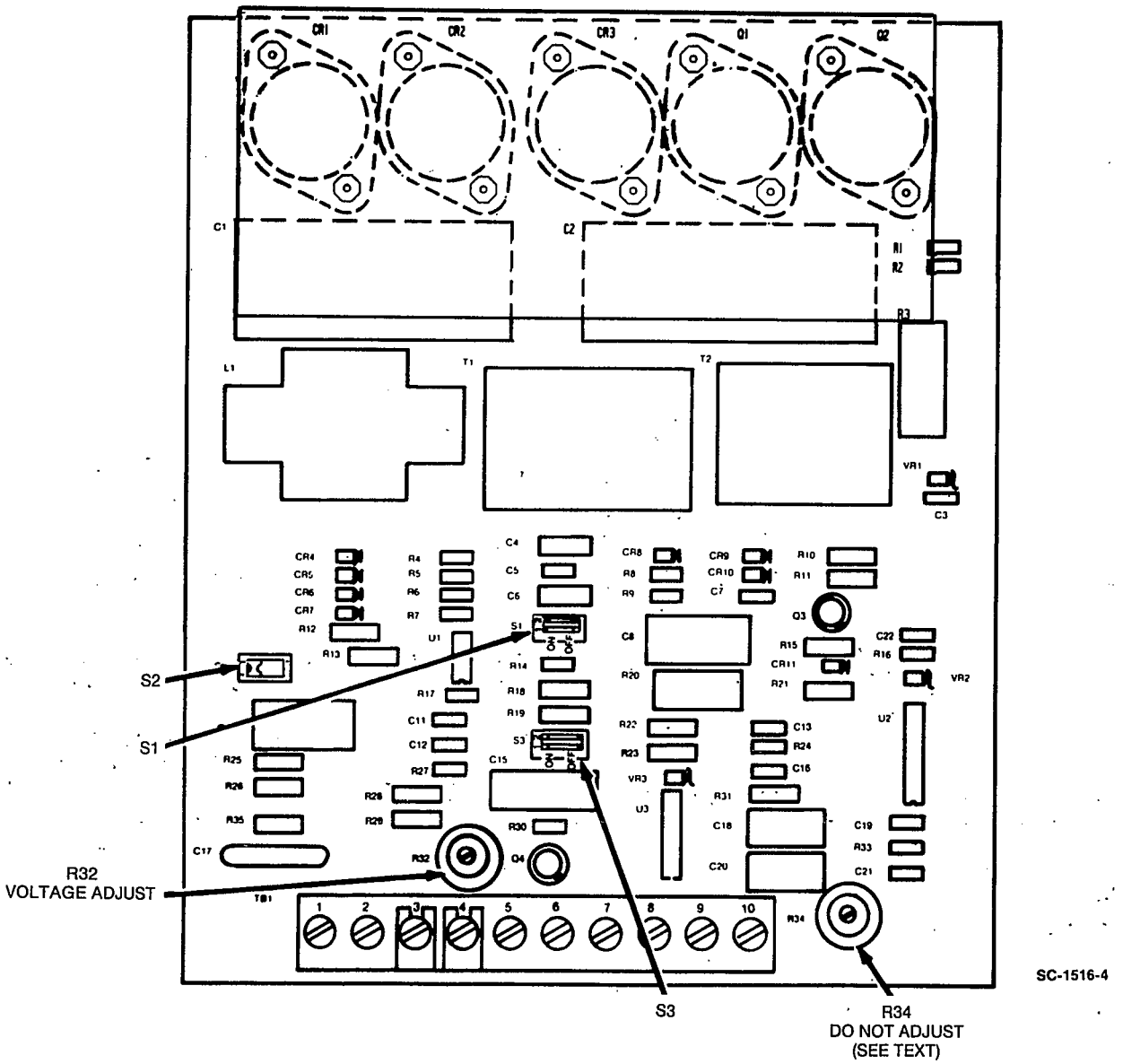
The VRAS-2 Voltage Regulator board is shown in Figure 2-5. Three switches and two potentiometers provide the following functions:

- Switch S1 - Selects the overall range of operation for the regulator. Refer to Table 2-1.
- Switches S2 and S3 - Determine the mode of regulation (Torque-Matched or Non-Torque-Matched). Refer to Table 2-1.
- Potentiometer R32 - Provides adjustment to increase or decrease generator voltage to proper setting.
- Potentiometer R34-Is adjusted at the factory to set the frequency breakpoint, and does not require further adjustment.

See Section 4 of this manual for replacement and adjustment procedures.

TABLE 2-1. VRAS-2 SWITCH SETTINGS

GENSET kW RATING	STABILITY RANGE		REGULATION MODE								
			60 Hz TORQUE-MATCHING			50 Hz TORQUE-MATCHING			NON-TORQUE-MATCHING		
	S1-1	S1-2	S2	S3-1	S3-2	S2	S3-1	S3-2	S2	S3-1	S3-2
16-35	OFF	OFF	POS 2	OFF	ON	POS 2	ON	ON	POS 2	OFF	OFF
40-50	OFF	ON	POS 2	OFF	ON	POS 2	ON	ON	POS 2	OFF	OFF



TB1-2, -3 AC INPUT VOLTS
TB1-3, -4 CROSS-CURRENT COMPENSATION
TB1-7, -8 VOLTAGE ADJUSTING RHEOSTAT
TB1-9, -10 EXCITER FIELD
F1 — TB1-9
F2 — TB1-10

FIGURE 2-5. VRAS-2 VOLTAGE REGULATOR ADJUSTMENTS

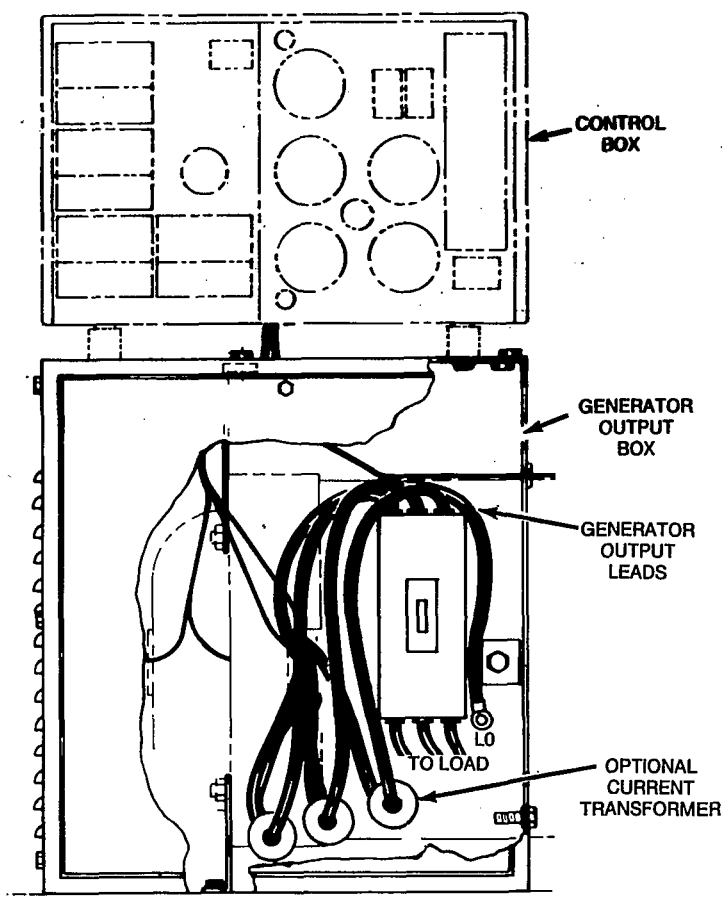
OPTIONAL CIRCUIT BREAKER

Depending on site specifications and applicable code requirements, an optional circuit breaker may be mounted in the generator AC output box.

Description

All Onan supplied breakers are thermal and magnetic trip type. Depending on customer requirements, the breaker may also include shunt trip and remote alarm connections. Review the following functions/requirements and Figure 2-6.

- Generator set output is connected to the load through the circuit breaker.
- When an overload or short circuit occurs on any one conductor, a common trip bar will disconnect all three conductors.
- The thermal trip action of the breaker is accomplished by bimetal strips. A sustained overcurrent condition will cause a thermal reaction of the bimetal and trip the breaker. Response of the bimetal is proportional to current; high current-fast response, low current slow response. This action provides a time delay for normal inrush current and temporary overload conditions such as motor starting.
- The magnetic trip action of the breaker is caused by an electromagnet which partially surrounds the internal bimetal strips. If a short circuit occurs, the high current through the electromagnet will attract the bimetal armature and trip the breaker. Some breaker models provide front adjustment of the magnetic trip action. These adjustments are normally set at the factory at the high position, but provide for individual conductor settings to suit customer needs.
- The shunt trip mechanism (if equipped) consists of a solenoid tripping device mounted in the breaker with external lead connections for remote signaling. A momentary signal to the solenoid coil will cause the breaker to trip.
- This feature is available in AC or DC voltages, and is normally installed at the factory to meet customer needs. The shunt trip mechanism is most often connected to a common fault shutdown circuit of the generator set. This quickly disconnects the set from the load on shutdown and avoids a reverse power condition.



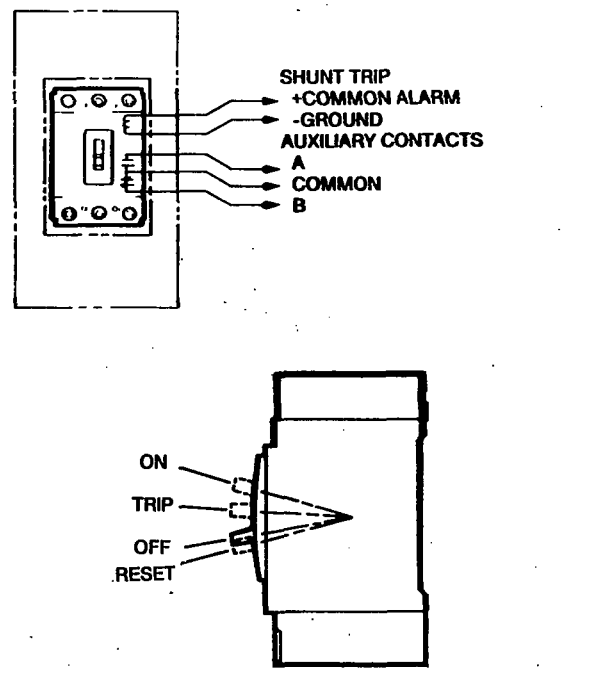


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FIGURE 2-6. GENERATOR-MOUNTED CIRCUIT BREAKER

- Auxiliary contacts (if equipped) are used for local or remote annunciation of the breaker status. They usually have one normally-open and one normally-closed contact (1 form C contacts) to comply with the annunciator requirement.

- The trip actuator is for periodic exercise of the breaker to clean and maintain its proper operation. Rotating this actuator mechanically simulates overcurrent tripping through actuation of linkages not operated by the On/Off handle. See *Section 4. Generator/Regulator Tests/Adjustments* for further information.

- Operation of the circuit breaker is determined by site-established procedures. In emergency standby installations, the breaker is often placed to the On position, and is intended for safety trip actuation in the event of a fault condition. If the breaker trips open, investigate the cause and perform remedial steps per the troubleshooting procedures. To close the breaker, the handle must be placed to the Reset position and then to On. Refer to Sections 3 and 4 for troubleshooting and further information.

Section 3. Generator/Regulator Troubleshooting

COMPONENT LOCATIONS

The following listing of components with their locations are referenced in the troubleshooting charts of the Troubleshooting Procedures section. The charts will only be calling them by name, so become familiar with their locations before proceeding. Other components are located on the control panel and are not listed here.

- ***AC Output Circuit Breaker:*** Mounted in the generator AC output box.
- ***Voltage Regulator VRAS-2:*** Inside the control box.
- ***Terminal Board TB21:*** Inside the control box.
- ***Current Transformers CT21, 22, and 23:*** Inside the generator AC output box.
- ***Rotating Rectifiers:*** Within the generator end bell on the exciter rotor.

PREPARATION

Before preparing or starting any troubleshooting procedure, be sure to disable the generator set by disconnecting the starting battery cables (negative [-] cable first).

⚠WARNING ***Accidental starting of the generator set can cause severe personal injury or death during service procedures. Be sure to disable the generator set by disconnecting the starting battery cables (negative [-] cable first).***

A few simple checks and a valid troubleshooting procedure can quickly locate the trouble source and cut service time. The following are inspection areas often overlooked when troubleshooting.

- Check modifications, repairs, and replacements performed since the last satisfactory operation of the set to be sure that all generator leads are correctly connected. A loose or incorrect wire terminal connection, or an open circuit breaker overlooked when replacing a part could cause problems. A thorough visual check can quickly eliminate these potential problems.
- Visually inspect the components of the VRAS-2 Voltage Regulator. Look for dust, dirt, or moisture and cracks in the printed conductors or solder connections. Burned resistors and arcing tracks are readily identifiable. Do not mark on the board with a graphite pencil as this can cause leakage or short circuit between components. Visually inspect the exciter rotor assembly for burned components, broken wires, loose connections, and carbon tracks caused by arcing between parts or between parts and ground. Also check for shorted paths between terminals caused by dust, dirt, and moisture.

Unless absolutely sure that panel instruments are accurate, use portable test meters for troubleshooting.

⚠CAUTION ***To prevent meter damage, ohmmeter checks must be made with the generator set stopped and the starting battery disconnected.***

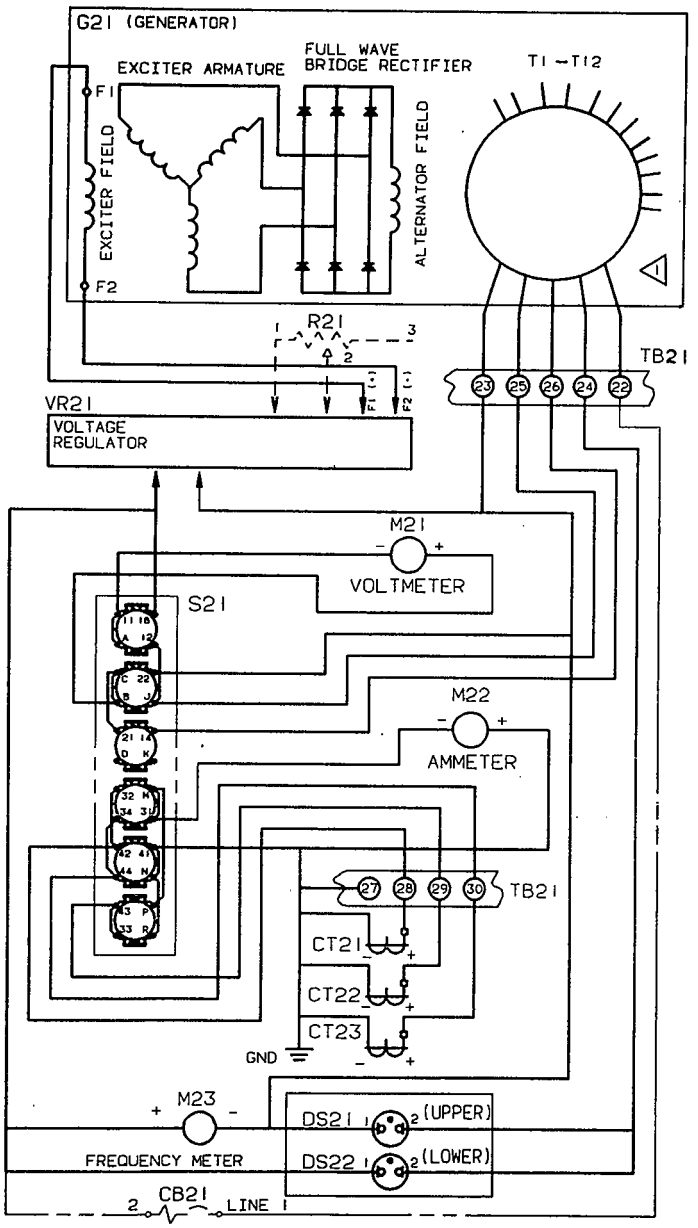
TROUBLESHOOTING PROCEDURES

The information in this section is divided into Troubleshooting Flow Charts as follows:

A. No AC output Voltage at Rated Engine Speed
B. Unstable AC Output Voltage, Engine Stable at Rated Speed.
C. AC Output Voltage Too High or Low.
D. Exciter Field Breaker Trips.
E. Unbalanced AC Output Voltage.
F. No AC Output Through Set-Mounted Circuit Breaker.

After determining the problem, refer to the applicable troubleshooting flow chart. Start at the chart upper left-hand corner and answer all the questions either YES or NO. Follow the chart until the problem is found, performing the referenced Adjustment and Test Procedure(s) following the flow charts.

The referenced components in the flow charts and in the Adjustment and Test Procedures can be found on the electrical schematic in Figure 3-1, and on assembly and wiring diagrams.



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COMPONENT DESCRIPTION

REF	DESCRIPTION
CB21	Field Circuit Breaker
CT21-23	Current Transformer Assembly
DS21-22	Lamp Assembly (Upper/Lower Scale)
G21	Generator
M21	AC Voltmeter
M22	AC Ammeter
M23	Frequency Meter
R21	Volts Adjust Potentiometer
S21	Rotary Switch, Volt & Ammeter
TB21	Terminal Block
VR21	Voltage Regulator

S21 PHASE SELECTOR SWITCH

POSITION	CONTACTS CLOSED				
L1-L2 3Ø	11-18	C-22	32-M	44-N	33-R
L2-L3 3Ø	A-12	C-22	44-N	42-41	43-P
L3-L1 3Ø	11-18	B-J	34-31	42-41	33-R
L1-L0 3Ø	11-18	21-14	44-N	42-41	33-R
OFF	—	—	44-N	42-41	33-R
L1-L2 1Ø	11-18	C-22	32-M	44-N	33-R
L1-L2 1Ø	11-18	C-22	44-N	42-41	43-P

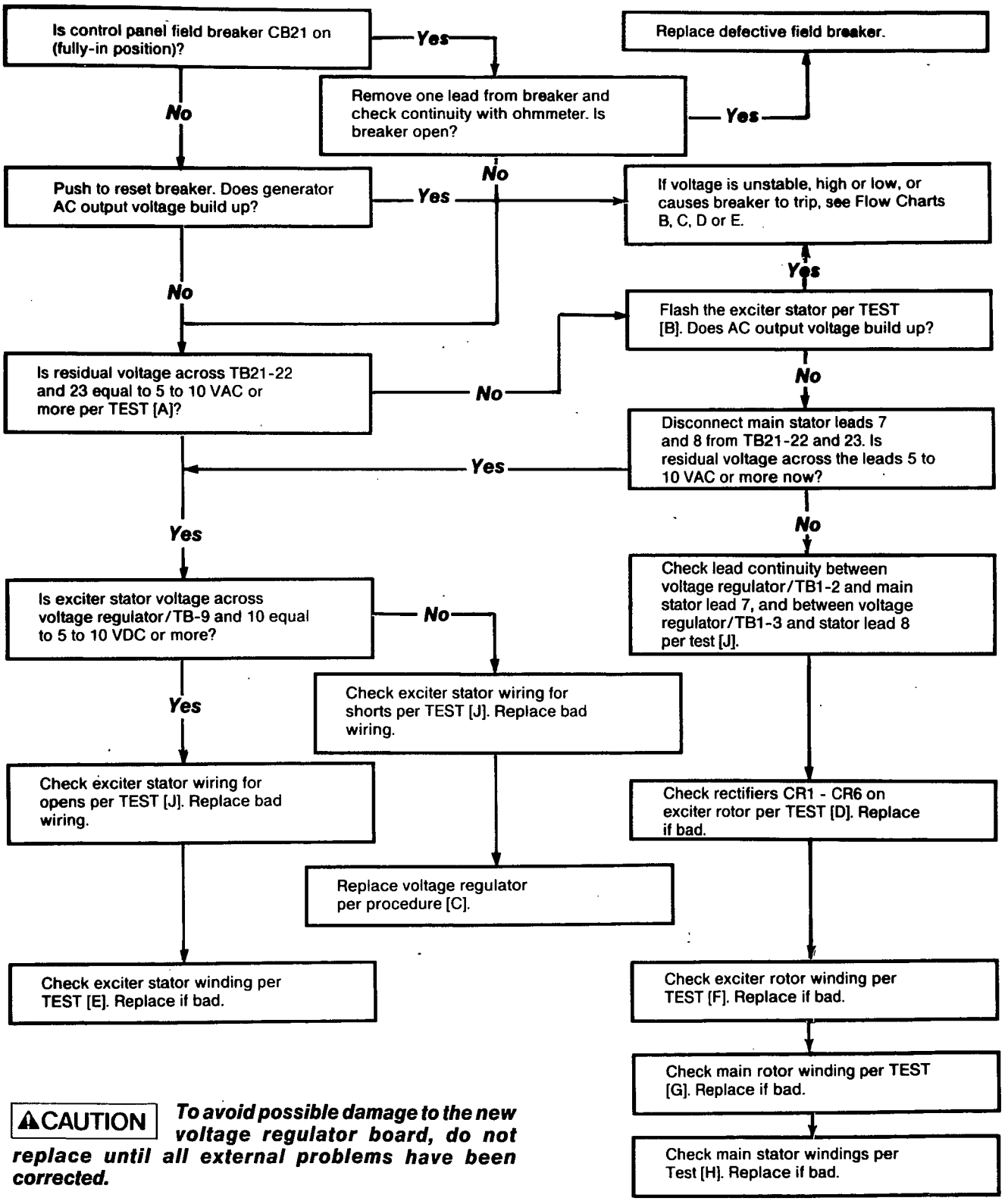
NOTES

1. **See generator connection diagram 625-2108 in Section 6 for input connections.**
2. **Dashed components and leads indicate when used.**
3. **This figure is for reference only. Use the electrical schematic specific to the application when troubleshooting.**

FIGURE 3-1. AC ELECTRICAL SCHEMATIC (INCLUDES METER OPTIONS)

FLOW CHART A. NO AC OUTPUT VOLTAGE AT RATED ENGINE SPEED

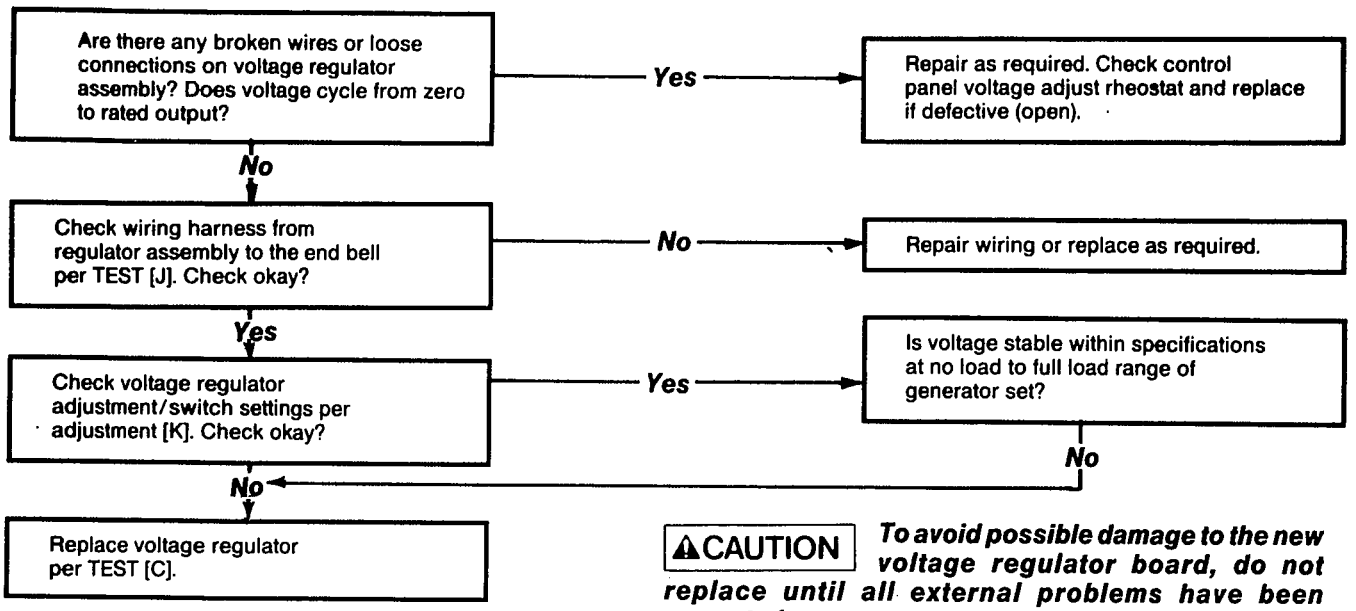
⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***



⚠CAUTION ***To avoid possible damage to the new voltage regulator board, do not replace until all external problems have been corrected.***

FLOW CHART B. UNSTABLE AC OUTPUT VOLTAGE, ENGINE STABLE AT RATED SPEED

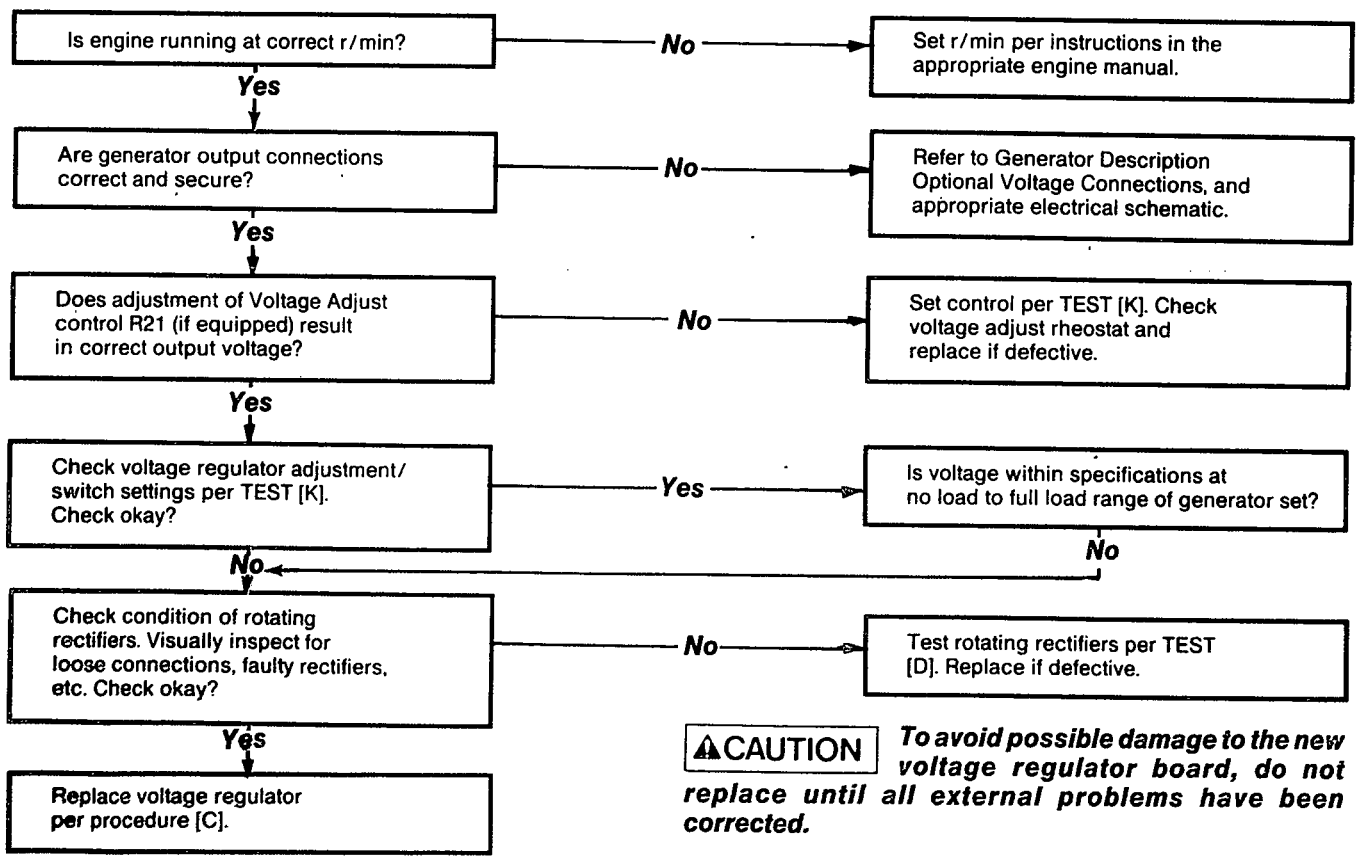
⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***



⚠CAUTION ***To avoid possible damage to the new voltage regulator board, do not replace until all external problems have been corrected.***

FLOW CHART C. AC OUTPUT VOLTAGE TOO HIGH OR LOW

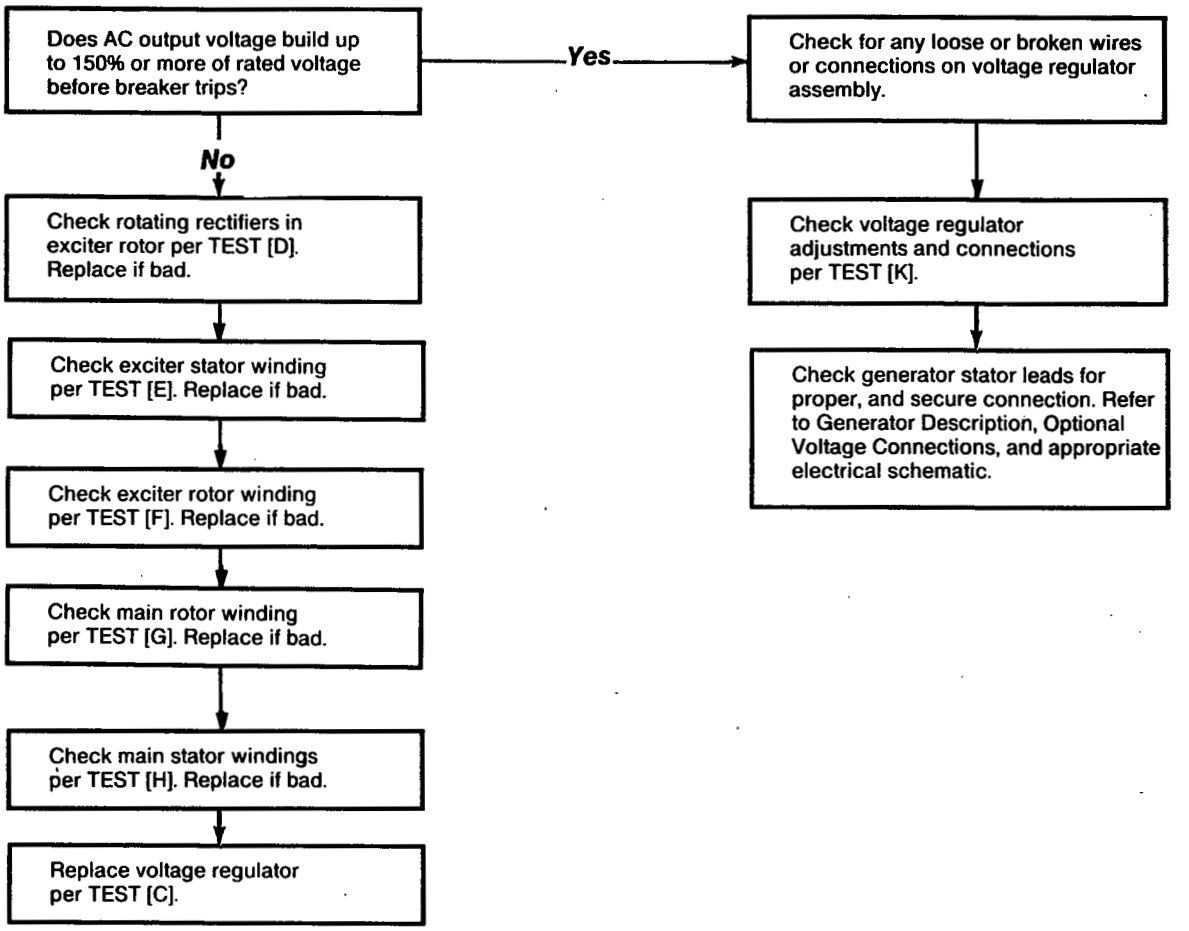
⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***



⚠CAUTION ***To avoid possible damage to the new voltage regulator board, do not replace until all external problems have been corrected.***

FLOW CHART D. EXCITER FIELD BREAKER TRIPS

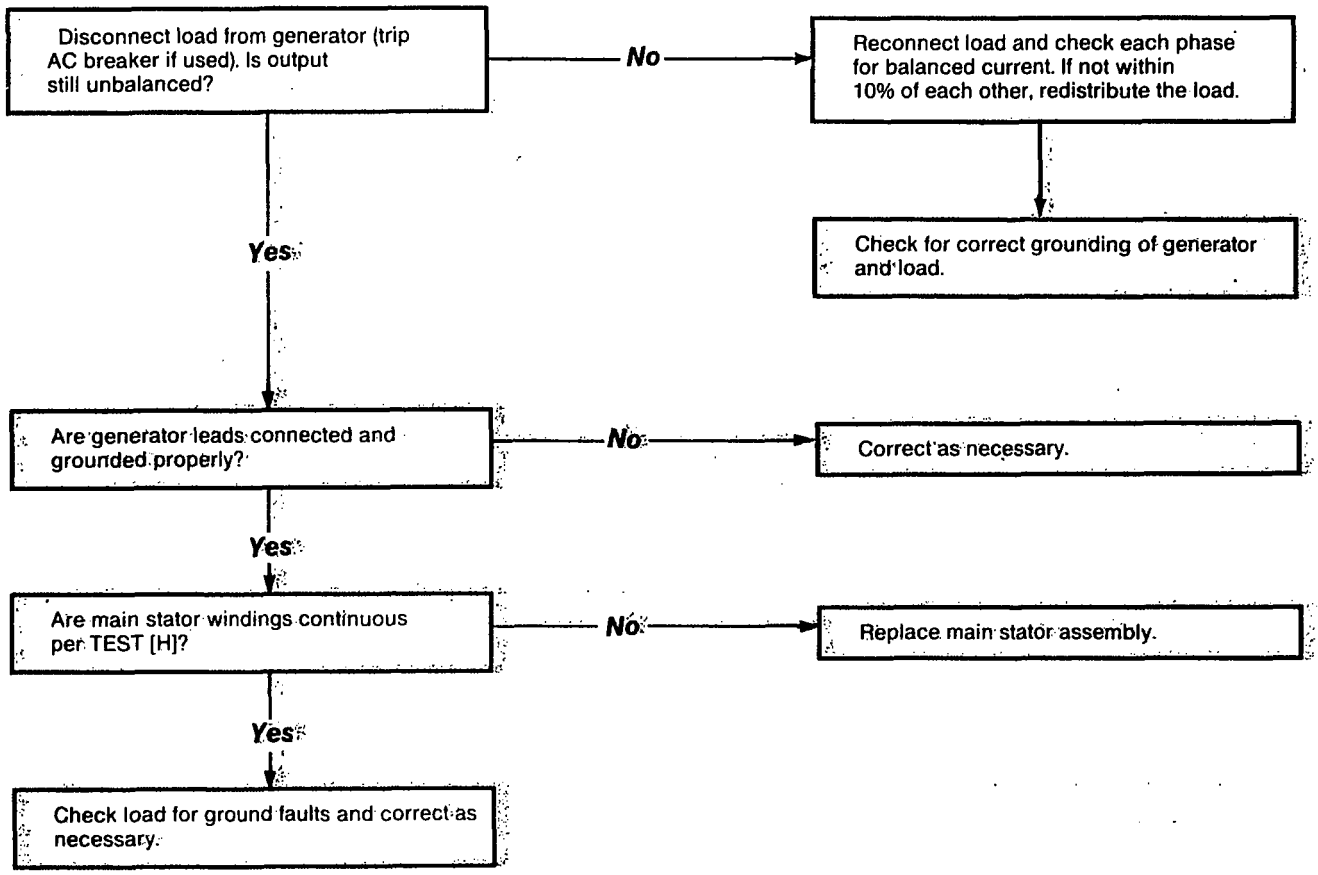
⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***



⚠CAUTION ***To avoid possible damage to the new voltage regulator board, do not replace until all external problems have been corrected.***

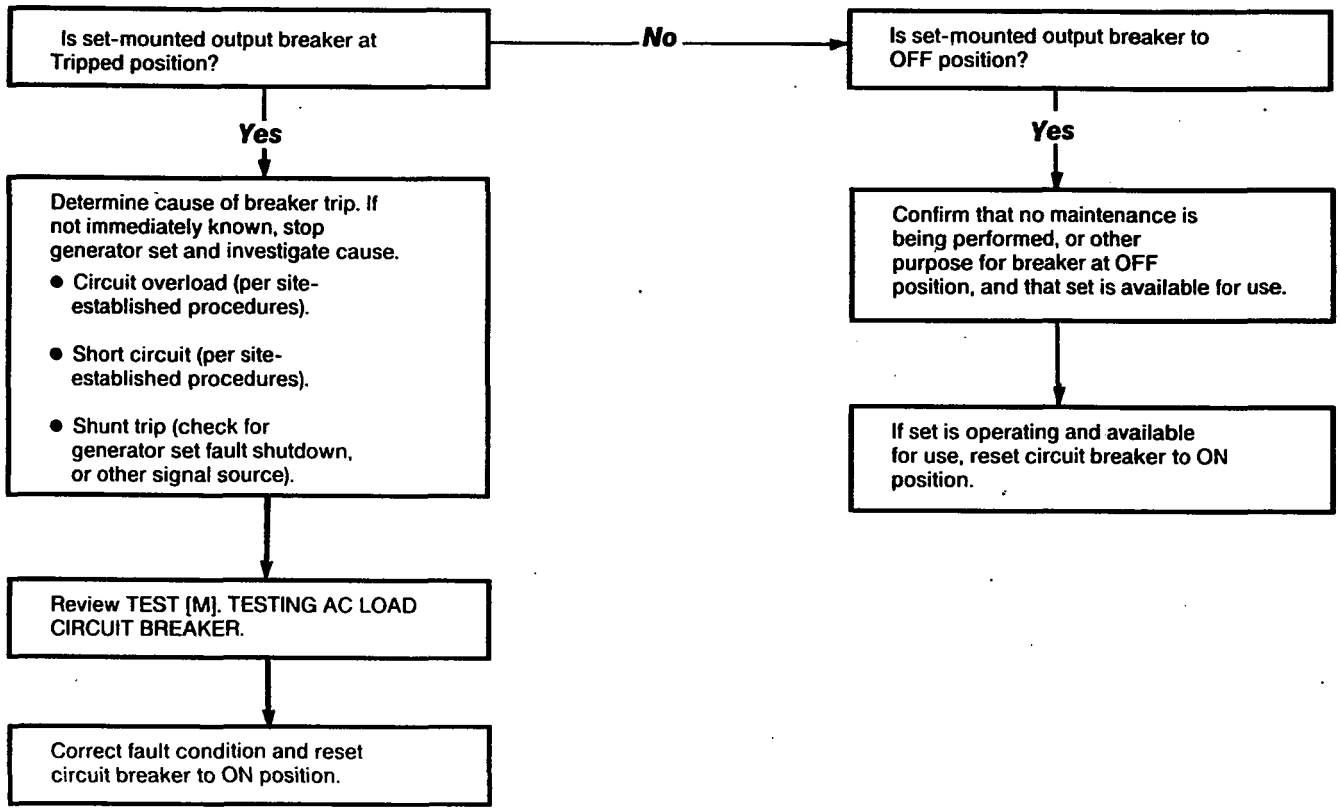
FLOW CHART E. UNBALANCED AC OUTPUT VOLTAGE

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***



FLOW CHART F. NO AC OUTPUT THROUGH SET MOUNTED CIRCUIT BREAKER

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***



Section 4. Generator/Regulator Tests/Adjustments

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

GENERAL

The following tests and adjustments can be performed without disassembly of the generator. They should be used for testing the generator components and regulator in conjunction with the Troubleshooting Flow Charts in Section 3. All resistance measurements must be made with the unit stopped to prevent instrument damage.

[A]

TESTING AC RESIDUAL VOLTAGE

Test for generator residual AC voltage if there is no power output. A good check point is across terminals 22 and 23 at terminal block TB21. See Figure 4-1. Residual voltage should be 5 to 10 VAC minimum at normal operating r/min and no load. The voltage can be as high as 35 to 50 VAC.

If residual voltage is present at TB21, check voltage at VRAS-2 terminals 2 and 3. If none, check continuity of field circuit breaker CB21, wiring, and connections with the generator set shut down.

[B]

FLASHING THE FIELD

If the residual voltage is missing, it may be necessary to restore magnetism by flashing the exciter field. This requires a 12-volt battery, 10-ampere fuse, momentary-on switch, and diode assembled as shown in Figure 4-2.

Field flashing can be done during generator set operation or when stopped. Either method should be sufficient to restore magnetism.

⚠CAUTION ***Incorrect flashing procedure can damage the voltage regulator. Do not keep excitation circuitry connected longer than five seconds.***

During Generator Set Operation

1. Connect the positive lead to VRAS-2 terminal 9 (+) and the negative lead to terminal 10 (D) (Figure 4-1).
2. Start the generator set and operate at normal speed. Close the switch just long enough for the generator output voltage to build up, but not longer than five seconds.

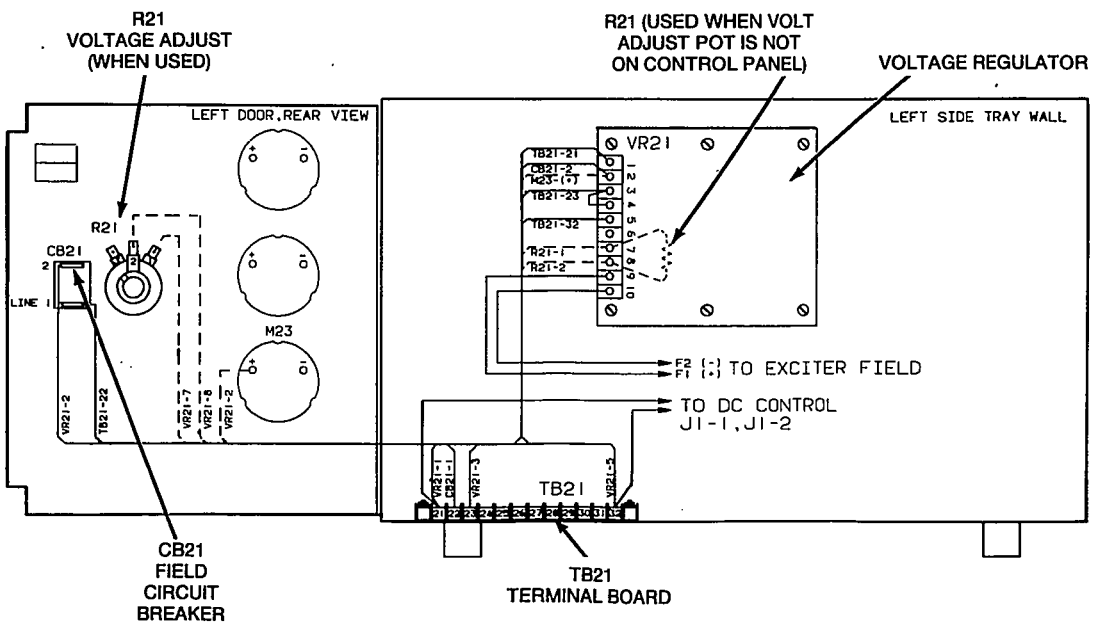


FIGURE 4-1. COMPONENT LOCATION

3. Check the output voltage, then shut down the generator set. Restart the generator set and operate at no load. Output voltage must build up without field flashing. If not, shut down the generator set and perform continuity check of all related wiring.

With Generator Set Stopped

1. Connect the positive lead to VRAS-2 terminal 9 (+) and and the negative lead to terminal 10 (-) (Figure 4-1).
2. Hold the switch closed no longer than five seconds.
3. Disconnect the flash circuit leads. Start the generator set and operate at no load. The output voltage must build up without field flashing. If not, shut down the generator set and perform continuity check of all related wiring.

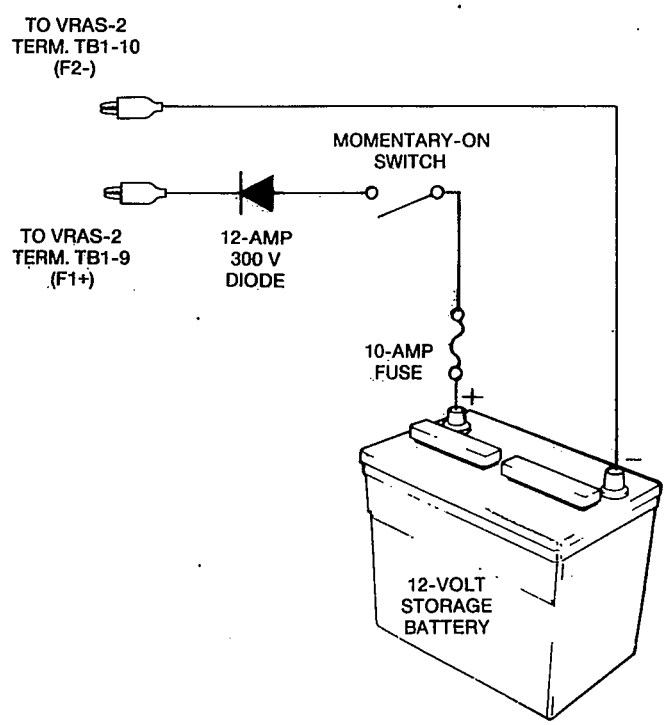


FIGURE 4-2. FIELD-FLASHING CIRCUIT

[C]

AC VOLTAGE REGULATOR REPLACEMENT

Use the following procedure to replace the VRAS-2 voltage regulator assembly (Figure 4-1).

1. Stop the generator set and disconnect the starting battery leads, negative (-) lead first.
2. Disconnect (and label if necessary) the wires from voltage regulator VRAS-2/TB1. Refer to the AC control wiring diagram.
3. Remove mounting screws from the old VRAS-2 regulator, then install new regulator.
4. Reconnect wires removed in Step 2 to the proper terminals.
5. Perform the voltage regulator adjustment/switch settings for specific voltage and method of regulation desired per procedure [J].

[D]

TESTING ROTATING RECTIFIERS

Two different rectifier assemblies make up the rotating rectifier bridge assembly, Figure 4-3. Using an ohmmeter, test each CR rectifier using negative (-) and positive (+) polarities. Use the following procedure.

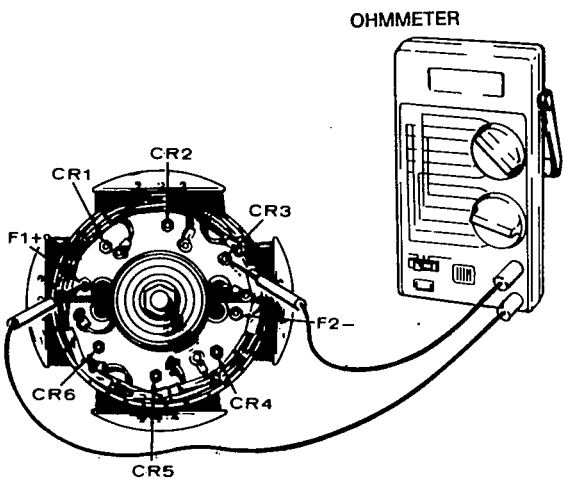
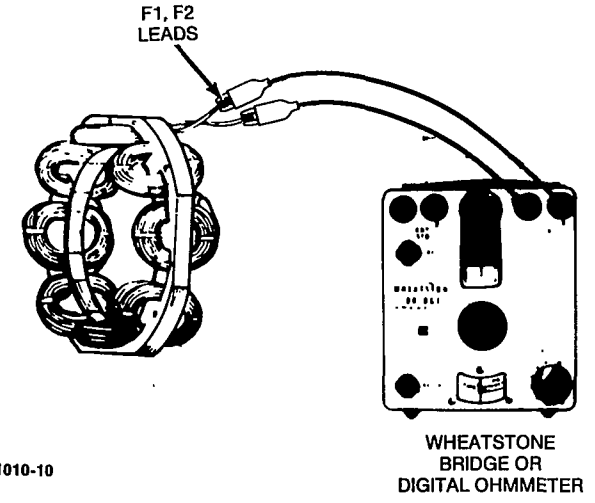


FIGURE 4-3. TESTING ROTATING RECTIFIERS

1. Disconnect all leads from the assembly to be tested.
2. Connect one ohmmeter test lead to F1+ stud and connect the other test lead to CR1, CR2, and CR3 in turn. Record resistance value of each rectifier.
3. Connect one lead to F2- stud and connect other test lead in turn to CR4, CR5, and CR6. Record resistance value of each rectifier.
4. Reverse ohmmeter test leads in Steps 2 and 3 and record resistance value of each rectifier.
5. All resistance readings should be high in one test and low in the other test. If any reading is high or low in both tests, rectifier assembly is defective.

Use 23 to 26 inch pounds (2.6 to 2.9 N•m) torque when replacing nuts of F1+ and F2- leads, CR1, CR2, CR3, CR4, CR5, and CR6.



TESTING FOR OPEN OR SHORTED WINDING

[E]

TESTING EXCITER STATOR

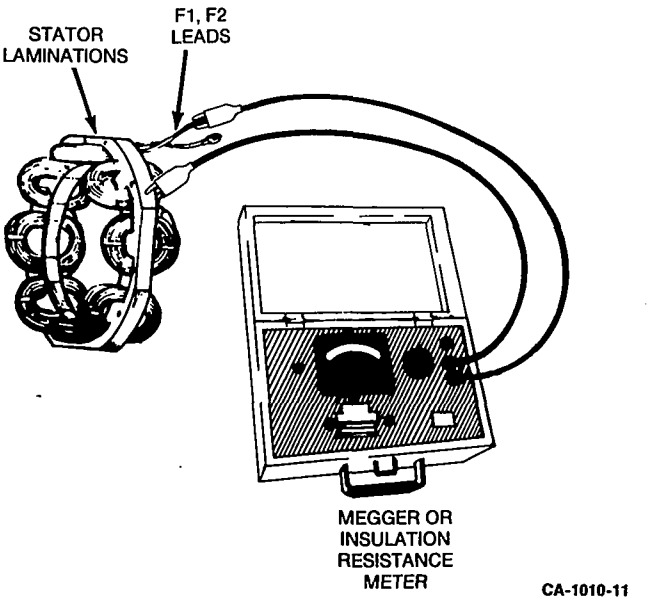
Test the exciter stator (Figure 4-4) for open or shorted windings and grounds as follows.

Testing For Open or Shorted Winding

Use a Wheatstone Bridge or digital ohmmeter for this test. Disconnect F1+ and F2- exciter field leads from the terminal block in the generator end bell. Resistance should be 14.5 ohms ±10% at 77°F (25°C).

Testing for Grounds

Connect a megger or insulation resistance meter that applies 500 VDC or more between the field and the exciter stator lamination. Be sure both exciter leads are disconnected from the terminal block. Reading should be 100,000 ohms or greater. If not, the exciter stator is questionable and may require removal for oven drying and retest. A shorted stator must be replaced.



TESTING FOR GROUND TO LAMINATION

FIGURE 4-4. TESTING EXCITER STATOR WINDING

[F]

TESTING EXCITER ROTOR

Test the exciter rotor winding (Figure 4-5) for open or shorted winding, or grounds as follows:

Testing For Open or Shorted Windings

Use a Wheatstone Bridge or digital ohmmeter for this test. Disconnect the main rotor leads that connect to rotating rectifier assemblies at terminals F1+ and F2-. Disconnect exciter rotor leads from diodes CR1, CR2, CR3, CR4, CR5 and CR6. Test between exciter lead pairs T1-T2, T2-T3, and T1-T3. See connection diagram in Figure 4-5. Resistance readings should be 0.645 ohms ±10% at 77°F (25°C).

Testing For Grounds

Test with an insulation resistance meter or Megger that applies at least 500 volts to the test leads. With all generator leads disconnected from rotating rectifiers CR1 through CR6, apply test leads between any CR lead and the rotor laminations. Reading should be 100,000 ohms or higher. If not, the exciter rotor is questionable and may require removal for oven drying and retest. A shorted rotor must be replaced.

Use 23 to 26 inch pounds (2.6 to 2.9 N•m) torque when replacing nuts of F1+ and F2- leads, CR1, CR2, CR3, CR4, CR5, and CR6.

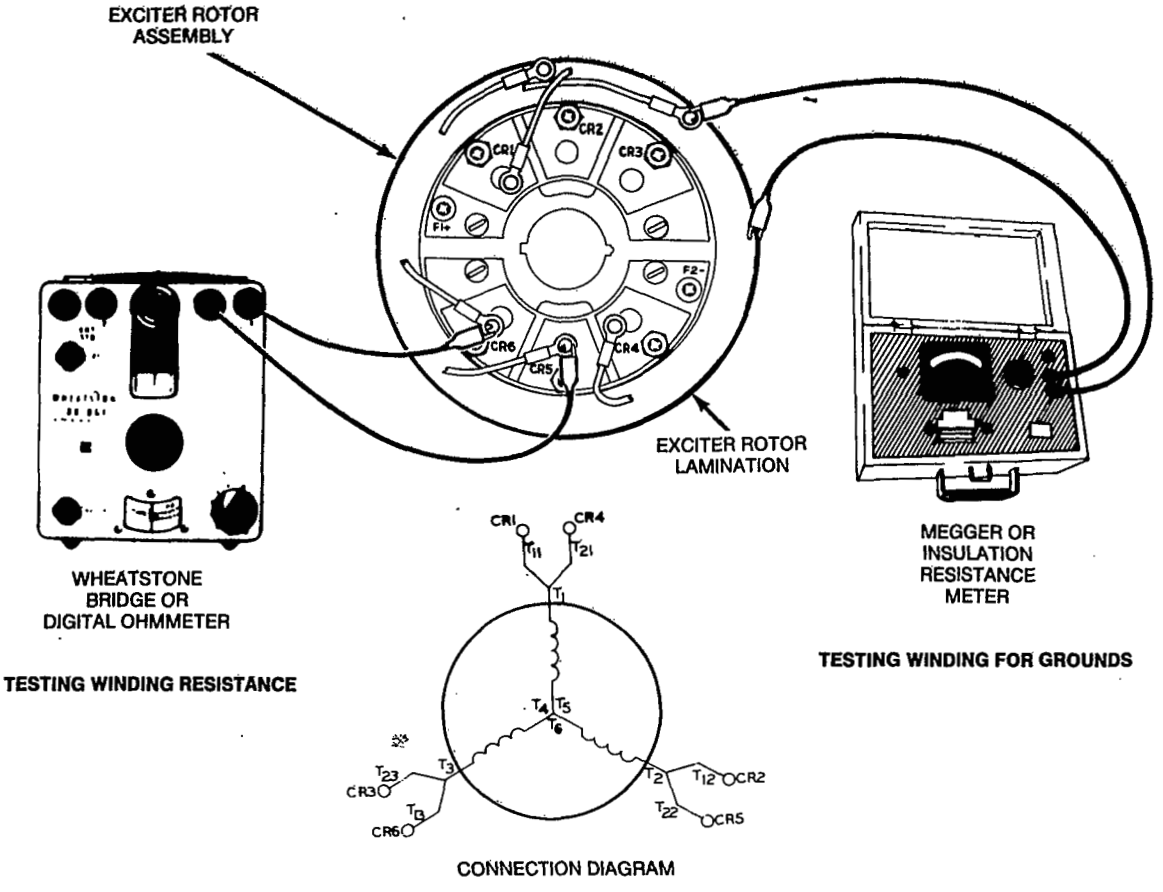


FIGURE 4-5. TESTING EXCITER ROTOR

[G]

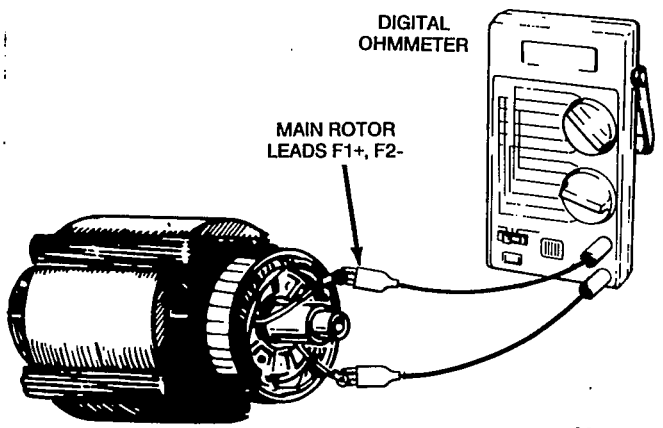
TESTING MAIN ROTOR WINDING

Test the main rotor winding (Figure 4-6) for grounds, opens, and shorts as follows.

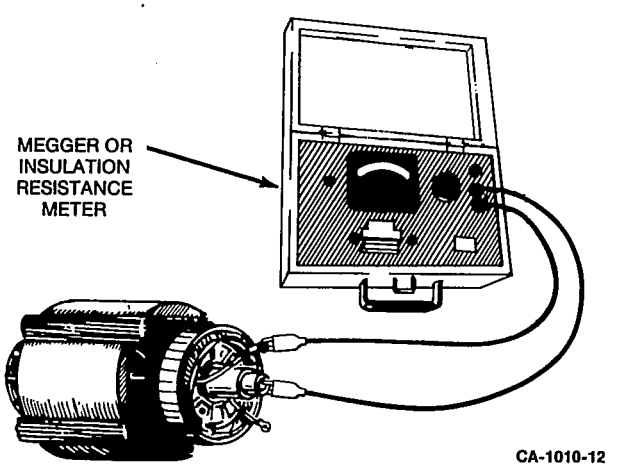
Testing For Open or Shorted Winding

Perform this test with a known, accurate instrument such as a digital ohmmeter.

1. Remove rotor leads F1+ and F2- from the rotating rectifier assemblies.
2. Check resistance across F1+ and F2- leads. The resistance values at 77°F (25°C) should be as shown in Table 4-1. If not, replace the defective rotor with a new, identical part.



TESTING WINDING RESISTANCE



TESTING WINDING FOR GROUNDS

FIGURE 4-6. TESTING MAIN ROTOR WINDING

Testing for Grounds

Check for grounds between the rotor winding and the rotor shaft as shown. Use a Megger or insulation resistance meter which applies 500 VDC or more at the test leads. Perform test as follows:

1. Remove rotor leads F1+ and F2- from the rotating rectifier assemblies.

⚠CAUTION ***Be sure to remove both rotor leads so the rotating rectifiers are isolated. Failure to do this will damage the rectifiers.***

2. Connect test leads between one of the two leads and the rotor shaft. Meter should read 100,000 ohms or greater.
3. If less than 100,000 ohms, the rotor is questionable and may require removal for oven drying and retest.
4. Replace a grounded rotor with a new identical part.

TABLE 4-1. MAIN ROTOR RESISTANCE

kW	[1]STACK LENGTH	[2]RESISTANCE VS CODE					
		B (3)	N (53)	F (7)	H (9X)	L (15)	Z (515)
16	5.88 (149)						2.75
16	7.12 (181)	1.80	1.80				
20	5.88 (149)			2.75	2.75	2.75	2.75
20	7.12 (181)	1.80	1.80				
25	7.12 (181)			1.80	1.80	1.80	
25	8.75 (222)	2.04					2.04
25	10.50 (267)		2.55				
30	8.75 (222)			2.04	2.04	2.04	
30	10.50 (267)	2.55	2.55				
32	10.50 (267)						2.55
40	10.50 (267)			2.55	2.55	2.55	

[1]Lamination Stack Length in Inches (mm)
[2]Resistance in Ohms @ 77°F (25°C) ±10%; Old Voltage Code in ( )

[H]

TESTING MAIN STATOR WINDINGS

Test the main stator (Figure 4-7) for opens, shorted windings, and grounds as follows.

Testing For Open or Shorted Windings

Test for continuity across coil leads. Each coil should have equal resistance. Use an accurate instrument for this test such as a Wheatstone Bridge. Resistance readings should be as shown in Table 4-2 at 77°F (25°C) ±10%.

If a winding is shorted, open or grounded, replace the stator assembly. Before replacing the assembly, check the leads for broken wires or insulation.

Testing For Grounds

Use a Megger or insulation resistance meter which applies 500 VDC or more at the test leads. Test each stator winding for short to laminations. If less than 100,000 ohms, the stator is questionable and may require removal for oven drying and retest.

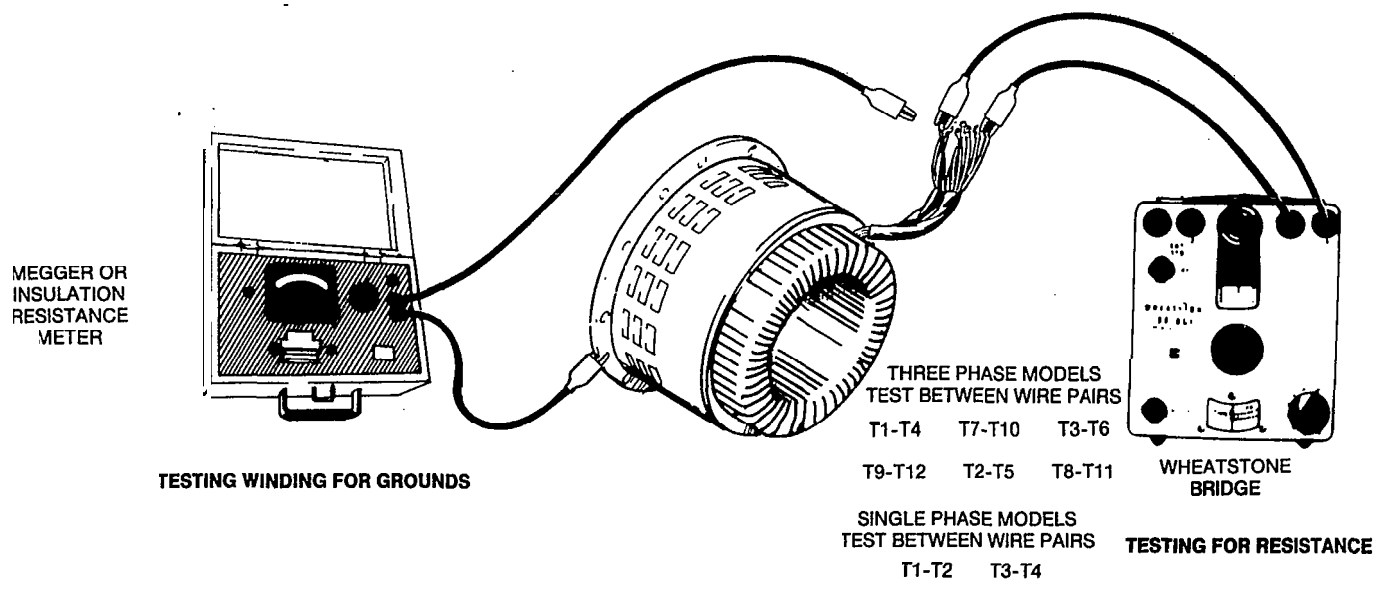


FIGURE 4-7. TESTING MAIN STATOR WINDINGS

TABLE 4-2. MAIN STATOR RESISTANCE

kW	[1]STACK LENGTH	[2]RESISTANCE VS CODE			
		B (3)	N (53)	F (15)	Z (515)
16	5.75 (146)				0.186
16	7.00 (178)		0.071		
20	5.75 (146)			0.127	
20	7.00 (178)	0.049			
25	7.00 (178)			0.100	
25	8.62 (219)	0.039			
25	8.62 (219)				0.084
25	10.38 (264)		0.036		
30	8.62 (219)			0.072	
30	10.38 (264)	0.029			
32	10.38 (264)				0.059
40	10.38 (264)			0.045	

[1]Lamination Stack Length in Inches (mm)
[2]Resistance in Ohms @ 77°F (25°C) ±10%; Old Voltage Code in ( )

[J]

WIRING HARNESS CHECK

1. Inspect all wires for breaks, loose connections, and reversed connections. Refer to applicable wiring diagram.
2. Remove wires from terminals at each end and using an ohmmeter, check each wire end to end for continuity or opens.
3. Using an ohmmeter, check each wire to other wires and to ground for possible shorts or insulation breaks under areas covered by wrapping material.
4. Reconnect or replace wires/harness per the applicable wiring diagram.

[K]

VOLTAGE REGULATOR VRAS-2 ADJUSTMENT

After replacement, the voltage regulator VRAS-2 adjustment is performed as follows. Also refer to the VRAS-2 Regulator Specifications in this section.

1. Open the control panel doors. Refer to Figure 4-8 for the proper setting of S1 (Stability Range) and S2, S3 (Mode Selection) switches.
2. ***Control with AC meter option:*** Refer also to adjustment [K]. ***Control without AC meter option:*** Connect an accurate voltmeter to VRAS-2/TB1-2 and -3 terminals.
3. Start the generator set and operate to bring temperature up to normal.
4. As a precaution against electrical shock, place an insulating mat or a dry wood platform on the floor in front of the control panel.

GENSET kW RATING	STABILITY RANGE		REGULATION MODE								
			60 Hz TORQUE-MATCHING			50 Hz TORQUE-MATCHING			NON-TORQUE-MATCHING		
	S1-1	S1-2	S2	S3-1	S3-2	S2	S3-1	S3-2	S2	S3-1	S3-2
16-35	OFF	OFF	POS 2	OFF	ON	POS 2	ON	ON	POS 2	OFF	OFF
40-50	OFF	ON	POS 2	OFF	ON	POS 2	ON	ON	POS 2	OFF	OFF

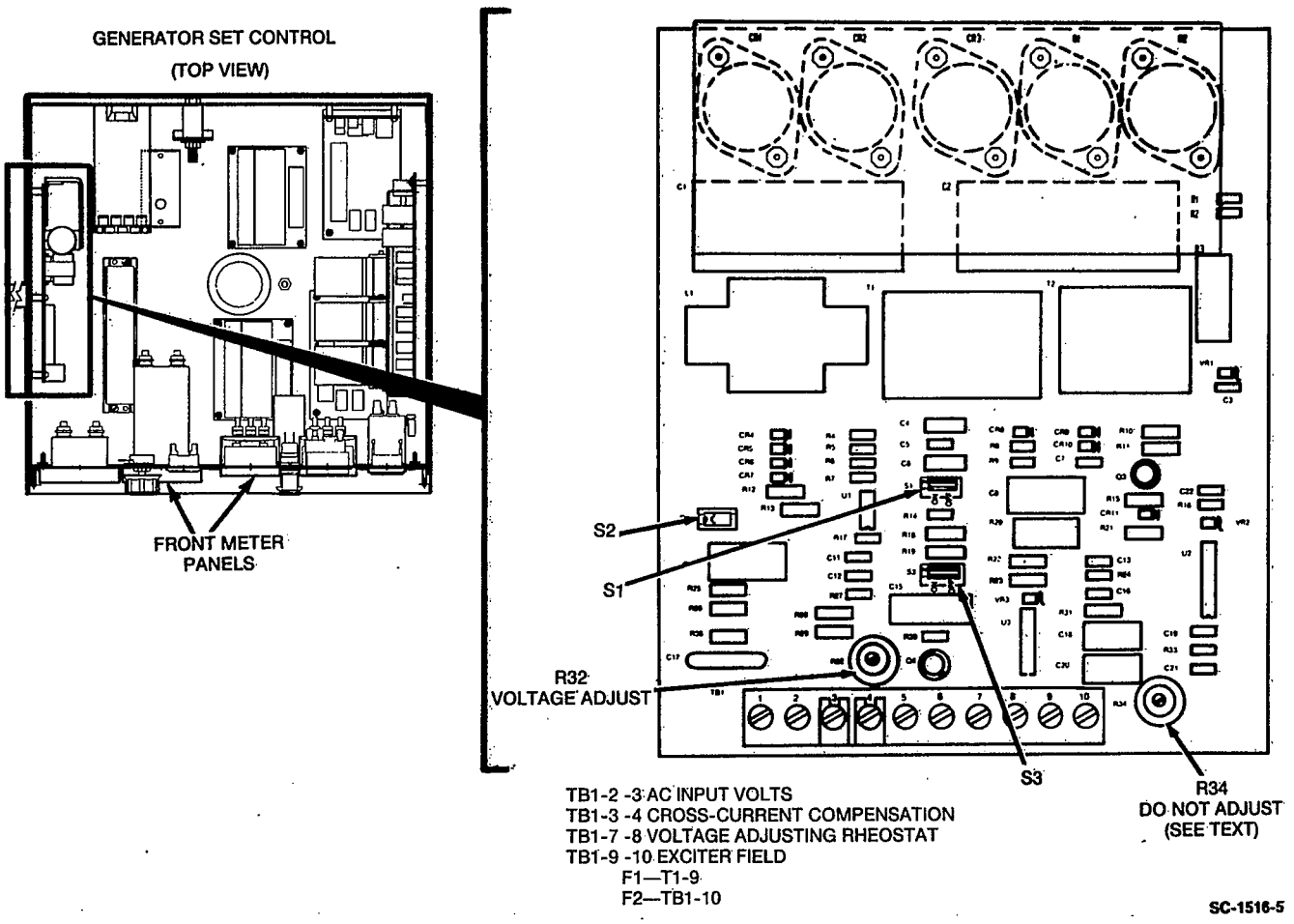


FIGURE 4-8. VRAS-2 VOLTAGE REGULATOR LOCATION/ADJUSTMENTS

⚠WARNING ***Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any body part, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.***

5. Using an insulated screwdriver, turn R32 potentiometer on VRAS-2 to increase or decrease the voltage for proper setting with no load. ***Example:*** For a 120/240 volt generator connection, set no-load voltage for approximately 246 volts. If voltage is unstable or tends to hunt, refer to the applicable troubleshooting flow chart.

Potentiometer R34 is for factory adjustment only. Setting requires special calibration equipment. Do not adjust.

6. Stop the generator set and close the control panel doors. Set control for operation readiness.

VRAS-2 Regulator Specifications

Input Power

Input voltage across TB1 terminals 2 and 3: 208 to 240 volts RMS ±10% (depending on wiring configuration)
Input frequency: 45 to 65 Hz
Maximum burden: 800 VA

Output Power

Continuous Rating: 3.0 A
One Minute Rating: 6.5 A (in current limit)
Current Limit: 6.5 A, ±0.75 A

Minimum Field Resistance

0.6 ohms @ 77°F (25°C) copper winding exciter

Regulator Sensing

Single-phase average voltage directly proportional to generator frequency to breakpoint. Independent of frequency after breakpoint. Nominally set to 59 Hz (49 Hz for 50 Hz sets).

Operating Temperature

-40° to +176°F (-40° to +80°C)

[L]

VOLTAGE ADJUST POTENTIOMETER R21

The following procedure is for generator sets equipped with the Detector AC option only. Perform adjustment as follows:

1. Loosen the locking nut of R21 Voltage Adjust potentiometer on the control front panel. Adjust R21 to mid-range.
2. Start the generator set and operate to bring temperature up to normal.
3. As a precaution against electrical shock, place an insulating caution mat or a dry wood platform on the floor in front of the control panel.

⚠WARNING ***Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any body part, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when the control doors are open.***

4. With no load on the generator, turn the Phase Selector switch to read output voltage/current while performing the following adjustments.

   A. Open the control panel doors and adjust R32 on VRAS-2 for the approximate desired voltage .

   B. Fine-adjust the voltage with R21 on the control panel. When set at correct voltage, carefully tighten the locking nut using care not to change the setting.

   C. If correct voltage cannot be obtained by R21 refer to voltage adjustment procedure [K].

5. Move the Phase Selector switch to the Off position.

6. Stop the generator set and set the control for unit standby readiness.

[M]

TESTING AC LOAD CIRCUIT BREAKER

General

The AC circuit breaker does not require any special maintenance other than periodic exercise and a check of conductor security. Circuit breaker options vary by customer requirements.

Review the Optional Circuit Breaker Description in *Section 2. Generator/Voltage Regulator* and perform checks and adjustment applicable to the breaker. A typical breaker diagram is repeated in Figure 4-9 for reference.

When performing tests and adjustments, avoid accidental start-up by placing the Run-Stop-Remote switch in Stop position and disconnecting the battery negative (-) cable.

⚠WARNING ***Accidental starting of the generator set during service procedures can result in severe personal injury or death. Place the Run-Stop-Remote switch in Stop position, and disconnect the battery negative (-) cable.***

Exercising Breaker: Actuate the breaker handle to the On and Off positions several times. If the breaker is equipped with a Trip Test button, the breaker should be tripped, reset and actuated to On several times. This will remove any dust from the mechanism and latch surfaces.

Checking Insulation Resistance: Disconnect the load and line conductors from the breaker, and place the breaker in the On position. Use an insulation resistance meter that will apply at least 500 volts to the test leads. Measure the insulation resistance between each pole, and to ground. Also test between the line and load terminals with the breaker in the Off position.

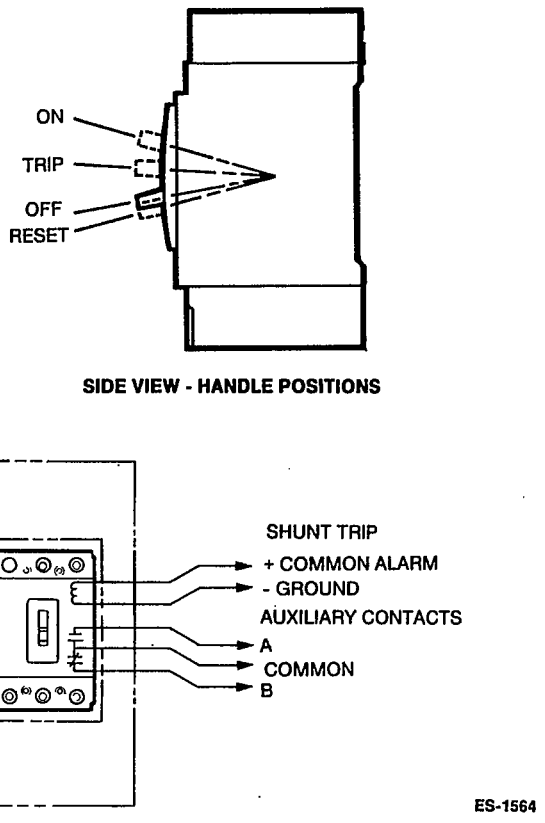


FIGURE 4-9. OPTIONAL CIRCUIT BREAKER DIAGRAM

A resistance reading less than 100,000 ohms indicates a ground. Investigate for possible contamination on the breaker case surfaces, clean if necessary and retest.

Checking Contact Resistance: Extensive operation of the breaker under load may eventually cause contacts to deteriorate. Test by a Resistance Check, or by a Voltage Drop Check across the breaker poles.

Except when generator set operation is required for testing, avoid accidental start-up by placing the Run-Stop-Remote switch in Stop position and disconnecting the battery negative (-) cable.

⚠WARNING ***Accidental starting of the generator set during service procedures can result in severe personal injury or death. Place the Run-Stop-Remote switch in Stop position, and disconnect the battery negative (-) cable.***

Resistance Check:

1. Disconnect the line and load wires from the circuit breaker.
2. Move the breaker handle to the On position and check the resistance across each pole (line to load).
3. Resistance should be very low (near zero) and relatively equal across all poles.

Voltage Drop Check:

This test is done with the conductors connected, generator set operating, and load applied. As a precaution against electrical shock, place an insulating mat or a dry wood platform on the floor to stand on when taking measurements.

⚠WARNING ***Contact with high voltage can cause severe personal injury or death. Do not touch any exposed wiring or components with any body part, clothing, tool or jewelry. Do not use non-insulated tools inside the control. Stand on an insulating mat or dry wood platform when taking measurements.***

1. Operate the generator set with the breaker in the On position and load applied.
2. Take voltage readings at the line connections, then the load connections.
3. There should only be slight variation in the voltage dropped across each pole of the breaker. Unequal or excessive millivolt drops across the complete breaker, or one pole, indicates contaminated contacts or loose connections.
4. Stop the generator set by placing the Run-Stop-Remote switch in Stop position and disconnecting the battery negative (-) cable.

⚠WARNING ***Accidental starting of the generator set during service procedures can result in severe personal injury or death. Place the Run-Stop-Remote switch in Stop position, and disconnect the battery negative (-) cable.***

Checking Shunt-Trip Operation: The shunt-trip feature is available in varying AC or DC voltages. Proper circuit breaker model is selected and installed at the factory to meet customer requirements.

Check the shunt-trip function as follows:

1. Refer to the original equipment order, installation wiring diagrams, and unit wire routing to identify and confirm proper AC or DC signal source connections.
2. Check security of the wire connections.
3. Apply the appropriate signal voltage (12-, 24-VDC; 240-, 480-VAC). The shunt-trip solenoid should energize and trip the breaker open.
4. If the breaker did not trip open, remove the signal source. Perform continuity check of interconnect wiring and shunt-trip solenoid lead wires. Replace interconnect wiring if defective.

Checking Auxiliary Contacts: If equipped, the breaker will have three leads for wiring to an internal single-pole, double throw switch. The switch allows connection of a remote annunciator (see installation wiring diagrams).

Perform continuity checks of the switch with the breaker in On and Off positions to confirm operation.

Adjusting Magnetic Trip Operation: If equipped with front-adjustable magnetic trip controls, the short circuit protection feature for each pole of the breaker can be adjusted equally or individually as required. Surge current above the trip settings will actuate the trip mechanism. These adjustors are set equally to the high position at the factory. Consult on-site requirements and adjust to proper position.

Section 5. Generator Disassembly/Assembly

GENERAL

If testing determines that the generator needs service, use the following disassembly and assembly procedures. The procedures cover major components of the generator as shown in Figure 5-1.

DISASSEMBLY

Access to the generator requires removal of the control box and the generator output box.

1. Disconnect the generator set starting battery (negative [-] cable first) before performing service procedure.

   ⚠WARNING ***Accidental starting of the generator set can cause severe personal injury or death during service procedures. Be sure to disable the generator set by disconnecting the starting battery cables (negative [-] cable first).***

2. Remove the back grille from the rear of the generator (six 1/4-20 screws).

3. Remove output box cover by removing four screws (1/4-20).

4. Open the control box doors and disconnect generator control wires. Check wire stamping legibility to ease reassembly. If necessary, attach identification with tape. Arrange leads so they can be withdrawn easily through the control box grommet opening.

5. Remove four screws (5/16-18) and lockwashers securing the control box to the generator output box. Carefully lift the control box free of leads and set aside.

6. Remove all leads from the circuit breaker and free the output box of all electric conduit.

7. Remove four 3/8-inch nuts securing the upper and lower output box brackets at the rear of the end bell.

8. Remove three capscrews at the front of the output box (two on the outside [5/16-18 x 1.25 and flatwashers], and one inside the output box beside the breaker [5/16-18 x 0.62]).

9. Slide the engine harness/grommet free as the output box is removed from the generator.

10. Remove lead from the overspeed switch (if used), and control leads F1+ and F2- from the end bell terminal board.

11. Remove the overspeed switch and bracket (if used) from the end bell and rotor shaft.

12. Remove the end bell and exciter stator assembly. It may be necessary to pry or jar the assembly loose from the main stator assembly.

13. Use a hoist and safe lifting device (stator handling tongs, nylon lifting strap or chain and lifting hooks) to support the main stator assembly.

14. Remove 12 (M10) screws and lockwashers securing the main stator assembly to the engine adapter.

15. Remove the main stator being careful not to touch or drag it on the rotor. Place the stator on its side and block to prevent rolling, especially if placed on a workbench.

    ⚠WARNING ***Falling, heavy objects can cause severe personal injury or death. Be sure to block or support heavy objects to prevent falling. Wear protective shoes and keep hands and feet clear.***

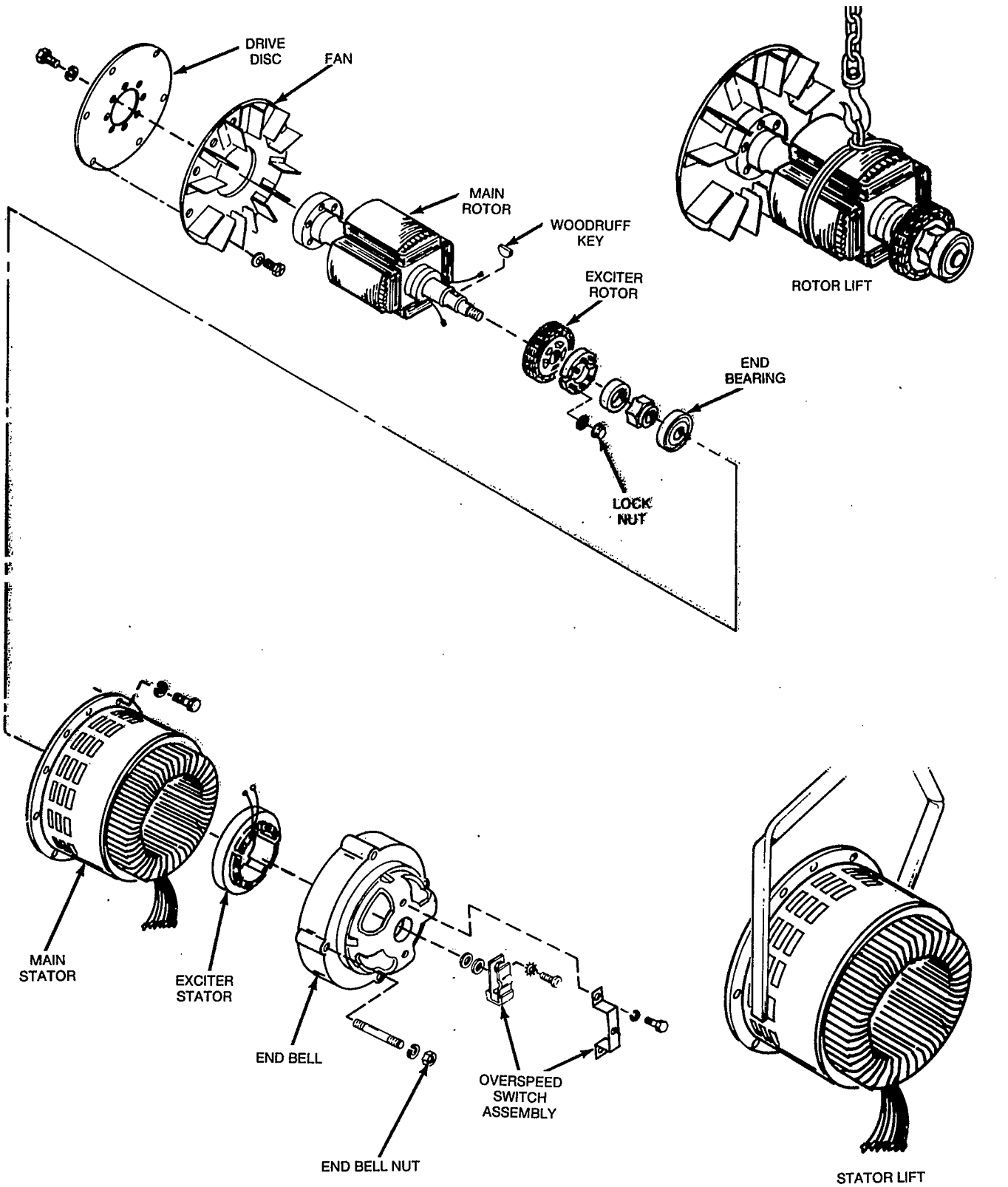


FIGURE 5-1. GENERATOR DISASSEMBLY/ASSEMBLY

16. Using a hoist and sling to support the rotor, carefully remove the capscrews that attach the drive disk to the engine flywheel (Figure 5-1).

17. Remove the rotor assembly and place upon wood block in the horizontal position. The drive disk and fan should not be resting on anything or distortion may occur.

18. Remove bolts that hold the drive disk and fan to the rotor shaft.

19. Use a gear puller to remove the end bearing from the rotor shaft (Figure 5-2). If bearing is to be reused, be sure to apply puller to the inner race.

⚠CAUTION ***Improper removal of the end bearing will damage it. If intended for reuse, the bearing must be pulled off by the inner race.***

20. Clamp the rotor in a fixed position and remove the exciter rotor lock nut.

21. Remove the generator field leads from the exciter rotor and slide the exciter off the rotor shaft.

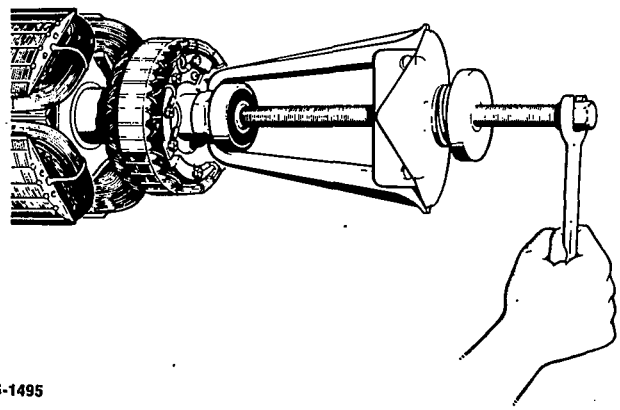


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FIGURE 5-2. END BEARING REMOVAL

REASSEMBLY

Reassembly procedures are basically the reverse of disassembly. The following steps should be used as a guide. Apply the torque specs as specified.

1. Slide the exciter rotor over the generator shaft and woodruff key. Install the exciter nut and apply torque values specified in Figure 5-3.

2. Connect the main rotor leads to terminals F1+ and F2- on the exciter rotor. Torque to values shown.

3. Press the end bearing onto the rotor shaft. Spacing between the shaft end and bearing side surface must be as specified in Figure 5-3.

4. Assemble rotor fan and drive disk to the engine flywheel. Use a hoist and sling to support the rotor. Be sure the drive disk is assembled with the chamfer on the flywheel side. Apply torque values as shown.

5. With a hoist and safe lifting device, carefully move the main stator into position over the rotor. The stator leads should exit in the 4 o'clock position.

6. Secure the main stator to the engine adapter with 12 (M10 x 1.5) screws and lockwashers. Torque bolts to 39 ft-lb (52 N•m).

7. Apply a thin film of grease to the mating surfaces of the end bearing and the end bell. Install the end bell over the stator stud bolts. Do not install nuts and lockwashers until later.

8. Install the overspeed switch and bracket to the rotor shaft and end bell. Apply torque values from Figure 5-3.

9. Connect control leads to the F1+, F2- terminals, and to the overspeed switch.

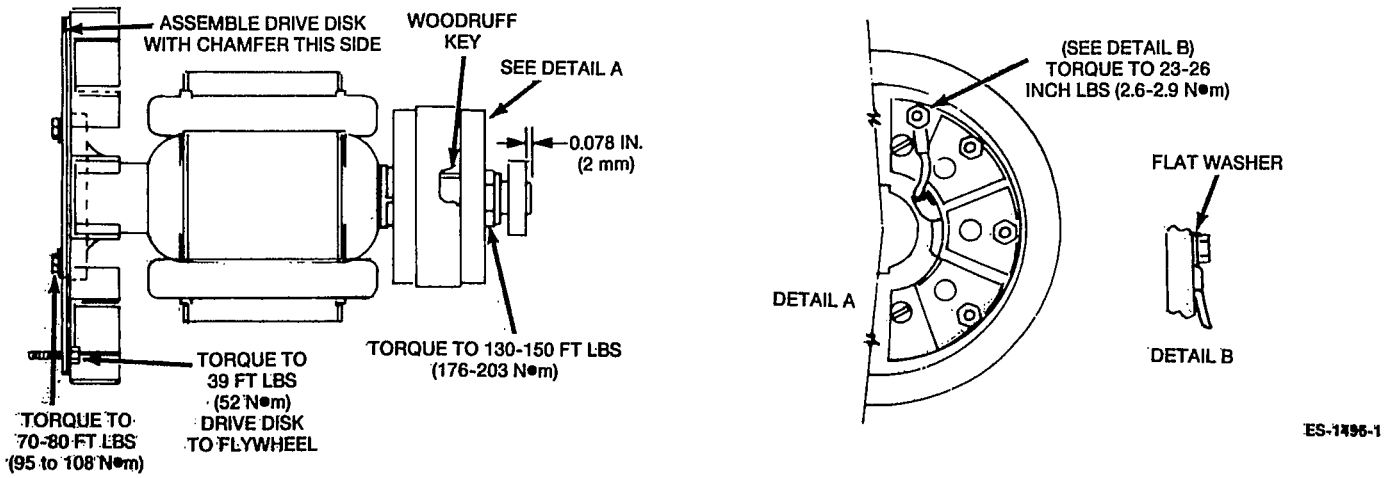


FIGURE 5-3. ROTOR ASSEMBLY TORQUE VALUES

10. Place the AC output box into position. Slide the engine harness/grommet into the slot opening.

11. Install four (3/8-16) nuts and lockwashers to the end bell studs; then three capscrews and flat washers at the front of the AC box. Torque the end bell nuts to 20 ft-lb (27 N•m).

12. Tighten the output box capscrews. Using a lead hammer, tap the end bell at the horizontal and vertical plane to relieve stress. Retorque the four end bell nuts.

13. Assemble wire conduit to the generator output box. Connect the generator, load, and auxiliary wires to the AC circuit breaker (if used).

14. Set the control box on the output box. Route all control leads through grommet in control box bottom. Secure control box with four screws (5/16-18) and lockwashers.

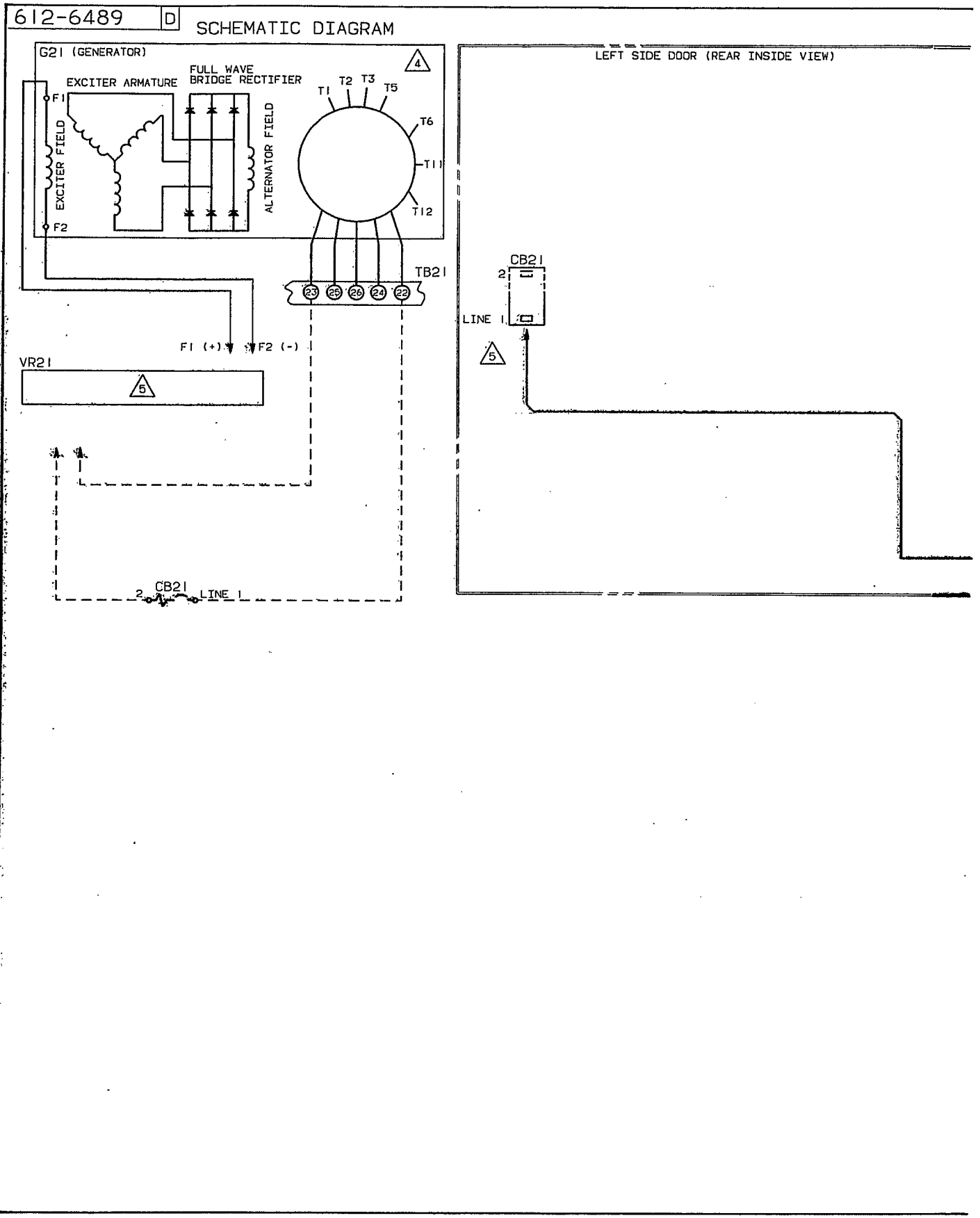
15. Carefully connect all control leads to their marked terminations.

16. Close and secure the control box doors. Do not install the output box back grille until the overspeed switch setting has been checked.

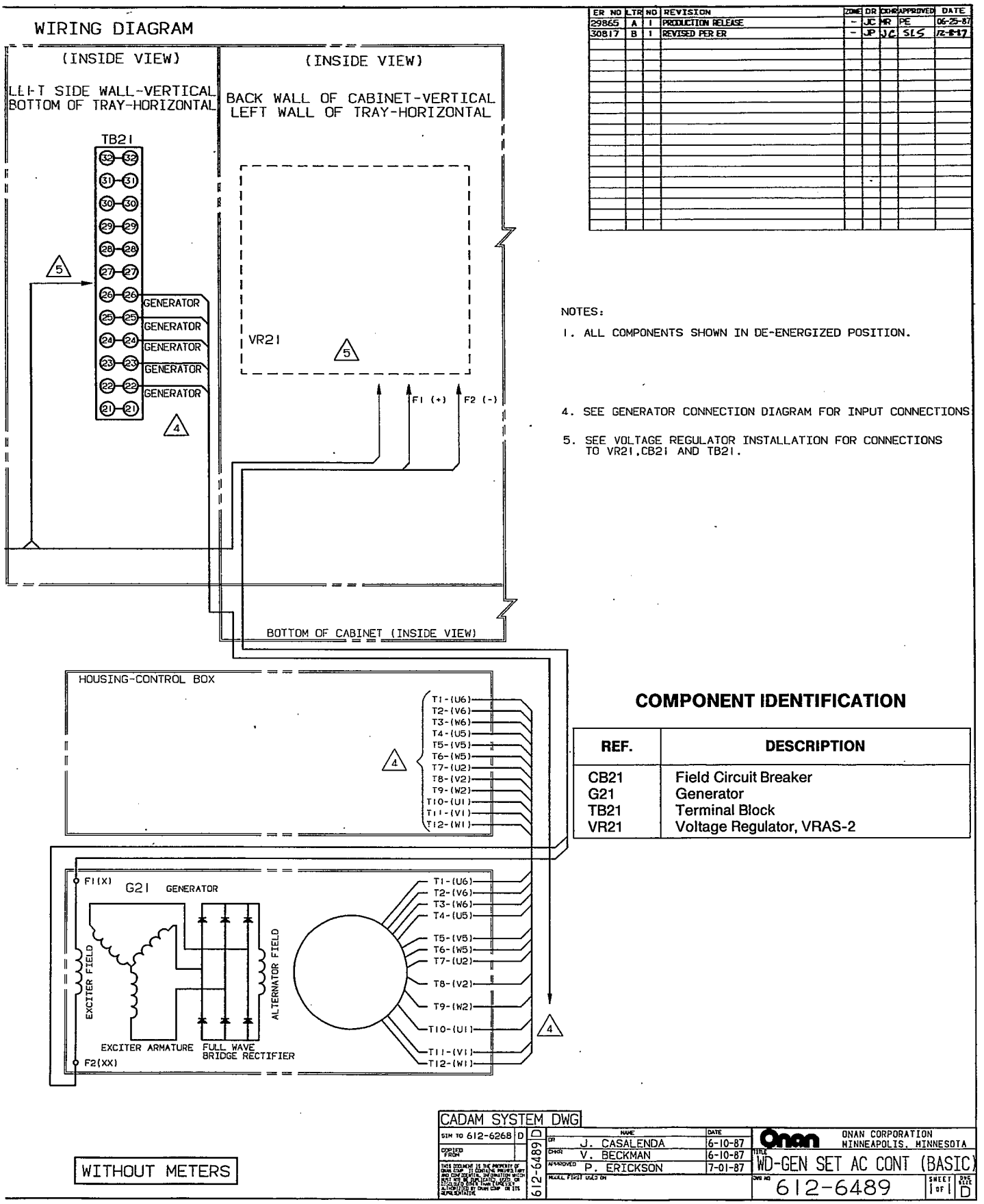
17. Connect the generator set starting battery (positive [+] lead first) and test generator operation.

18. The r/min at which the overspeed switch shuts down the generator set can be changed by the adjust screw. Turning this screw in or out changes the magnetic air gap. When set correctly, the switch closes and shuts down 60 hertz units at 2100 r/min ±90 r/min; 50 hertz units at 1800 r/min ±90 r/min. An accurate frequency meter or strobotach is needed to check the overspeed trip point when the engine speed is increased (see the engine service manual). The air gap must not be less than 0.005 inch (0.13 mm).

Section 6. Wiring Diagrams



612-6489 GENERATOR SET AC CONTROL SCHEMATIC DIAGRAM (W/O METERS)



ER NO	LTR	NO	REVISION	ZONE	DR	CHKR	APPROVED	DATE
29865	A	1	PRODUCTION RELEASE	-	JC	MR	PE	06-25-87
30817	B	1	REVISED PER ER	-	JP	JC	SLS	12-8-87

NOTES:

1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.

4. SEE GENERATOR CONNECTION DIAGRAM FOR INPUT CONNECTIONS

5. SEE VOLTAGE REGULATOR INSTALLATION FOR CONNECTIONS TO VR21,CB21 AND TB21.

COMPONENT IDENTIFICATION

REF.	DESCRIPTION
CB21	Field Circuit Breaker
G21	Generator
TB21	Terminal Block
VR21	Voltage Regulator, VRAS-2

CADAM SYSTEM DWG

SIM TO 612-6268 D

COPIED FROM

	NAME	DATE
DR	J. CASALENDA	6-10-87
CHKR	V. BECKMAN	6-10-87
APPROVED	P. ERICKSON	7-01-87

MICRO FILM USED ON

612-6489 D

ONAN CORPORATION
MINNEAPOLIS, MINNESOTA

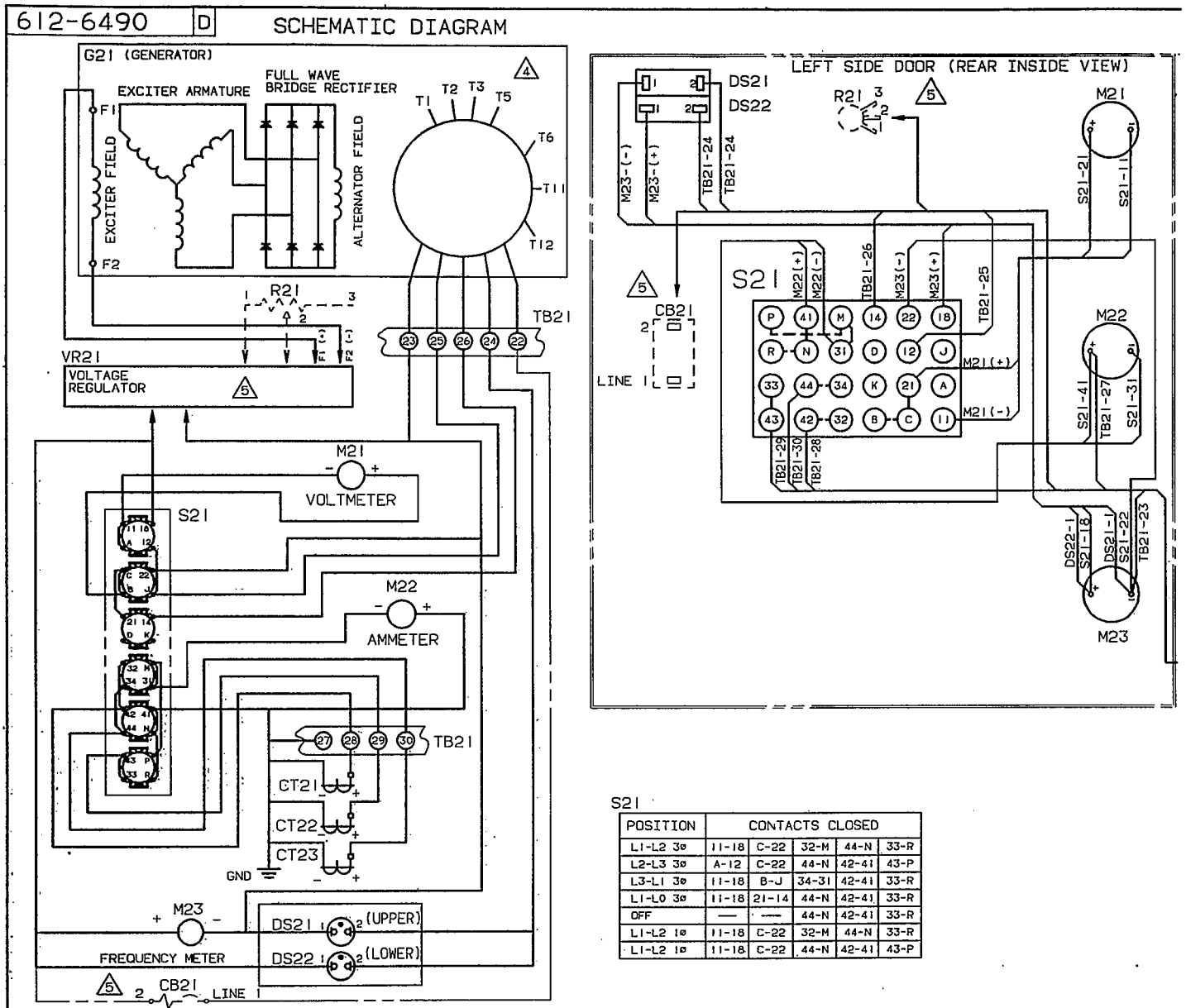
TITLE WD-GEN SET AC CONT (BASIC)

DWG NO 612-6489

SHEET 1 OF 1

SIZE D

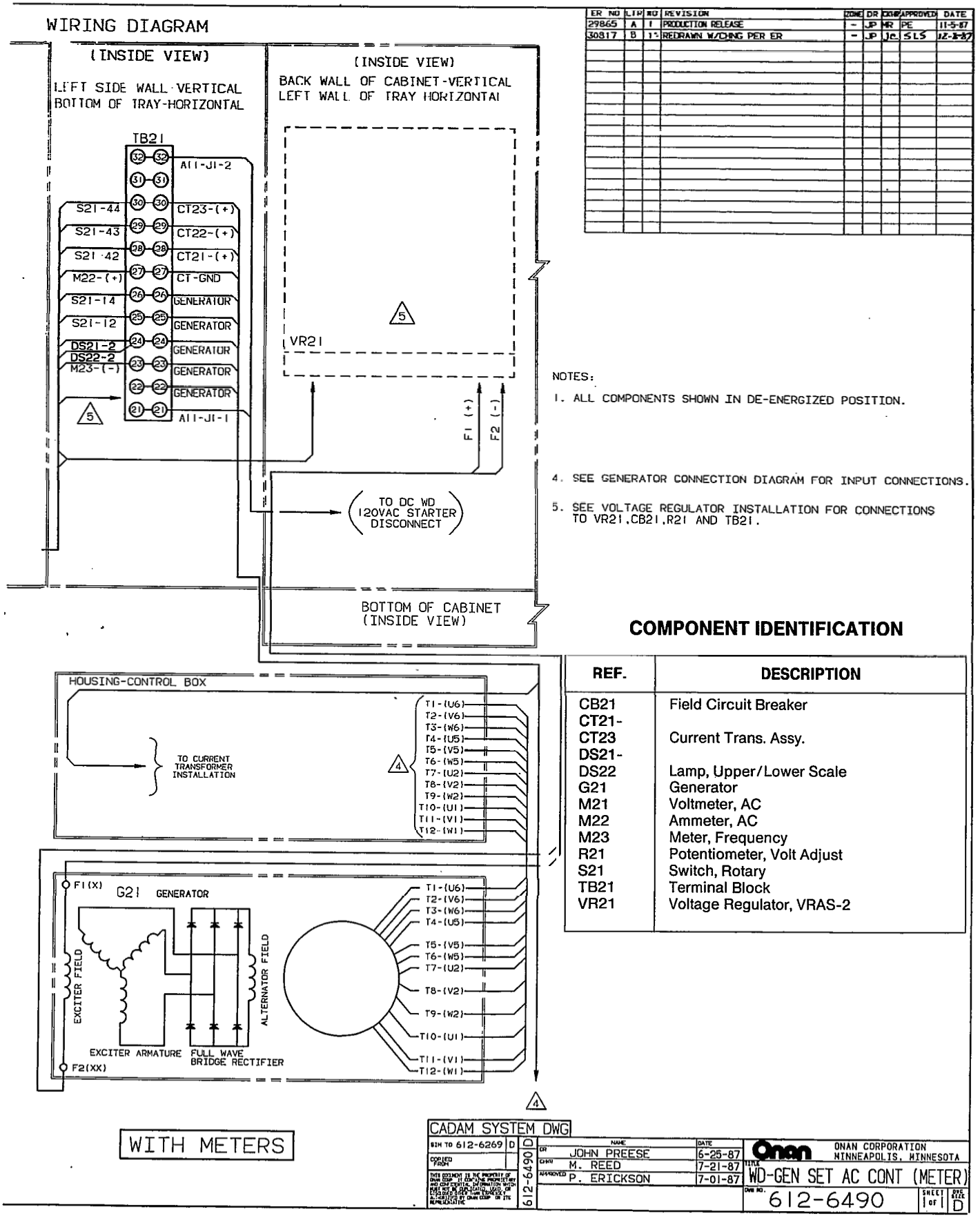
612-6489 GENERATOR SET AC CONTROL WIRING DIAGRAM (W/O METERS)



S21

POSITION	CONTACTS CLOSED				
L1-L2 3ø	11-18	C-22	32-M	44-N	33-R
L2-L3 3ø	A-12	C-22	44-N	42-41	43-P
L3-L1 3ø	11-18	B-J	34-31	42-41	33-R
L1-L0 3ø	11-18	21-14	44-N	42-41	33-R
OFF	—	—	44-N	42-41	33-R
L1-L2 1ø	11-18	C-22	32-M	44-N	33-R
L1-L2 1ø	11-18	C-22	44-N	42-41	43-P

612-6490 GENERATOR SET AC CONTROL SCHEMATIC DIAGRAM (METER)



ER NO	LTR	REV	REVISION	ZONE	DR	CHK	APPROVED	DATE
29865	A	1	PRODUCTION RELEASE	-	JP	MR	PE	11-5-87
30317	B	1	REDRAWN W/CHNG PER ER	-	JP	JC	SLS	12-1-87

NOTES:

1. ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.

4. SEE GENERATOR CONNECTION DIAGRAM FOR INPUT CONNECTIONS.

5. SEE VOLTAGE REGULATOR INSTALLATION FOR CONNECTIONS TO VR21,CB21,R21 AND TB21.

COMPONENT IDENTIFICATION

REF.	DESCRIPTION
CB21	Field Circuit Breaker
CT21-CT23	Current Trans. Assy.
DS21-DS22	Lamp, Upper/Lower Scale
G21	Generator
M21	Voltmeter, AC
M22	Ammeter, AC
M23	Meter, Frequency
R21	Potentiometer, Volt Adjust
S21	Switch, Rotary
TB21	Terminal Block
VR21	Voltage Regulator, VRAS-2

CADAM SYSTEM DWG

SIM TO 612-6269 D

COPIED FROM

	NAME	DATE
DR	JOHN PREESE	6-25-87
CHKD	M. REED	7-21-87
APPROVED	P. ERICKSON	7-01-87

612-6490 D

ONAN CORPORATION
MINNEAPOLIS, MINNESOTA

TITLE: WD-GEN SET AC CONT (METER)

DWG NO. 612-6490

SHEET 1 OF 1

REV LTR D

612-6490 GENERATOR SET AC CONTROL WIRING DIAGRAM (METER)

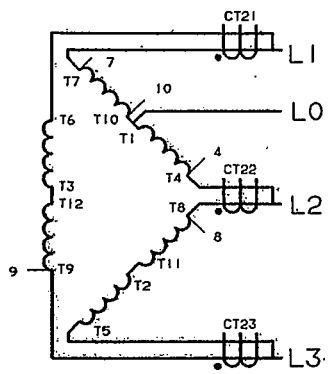
YD GENERATORS

18 L 518 Z

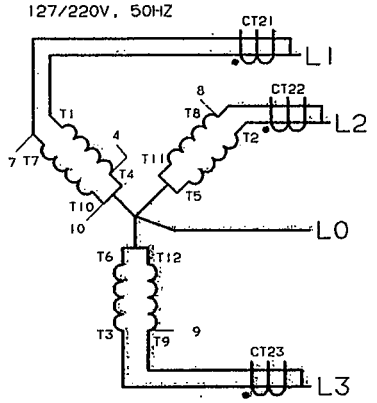
3 PHASE RECONNECTABLE

SECONDARY CURRENT TRANSFORMER CONN. 1-3

110/220V, 50HZ
115/230V, 50HZ
120/240V, 60HZ

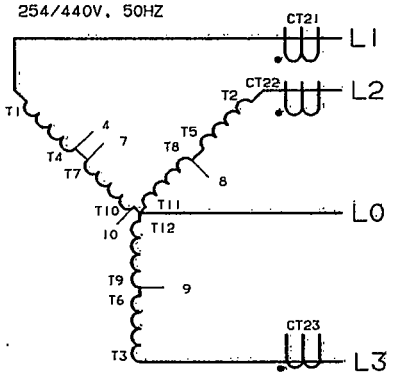


110/190V, 50HZ 120/208V, 60HZ
115/220V, 50HZ 127/220V, 60HZ
120/208V, 50HZ 139/240V, 60HZ
127/220V, 50HZ



SECONDARY CURRENT TRANSFORMER CONN. 1-2

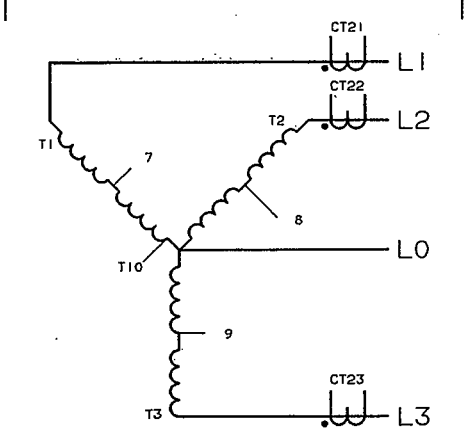
220/380V, 50HZ 240/416V, 60HZ
230/400V, 50HZ 254/440V, 60HZ
240/416V, 50HZ 277/480V, 60HZ
254/440V, 50HZ



7/F: 270/380V 60HZ

9X/H: 347/600V 60HZ

SECONDARY CURRENT TRANSFORMER CONN. 1-2

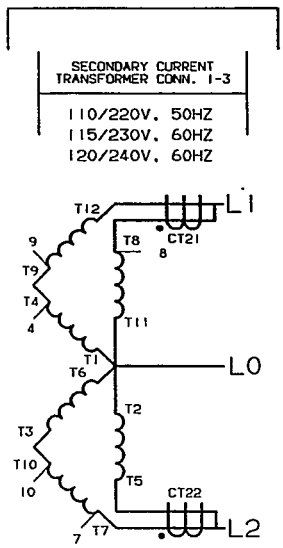


625-2108 GENERATOR RECONNECTION WIRING DIAGRAM

ER NO	LTR	NO	REVISION	ZONE	DR	CKD	APPROVED	DATE
30817	A	1	PRODUCTION RELEASE	-	JP	JJ	JLS	11-25-87

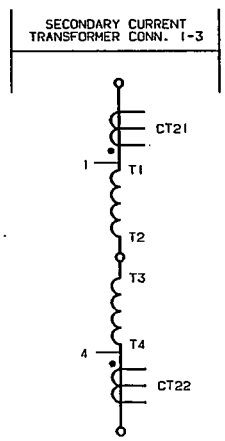
18 518 / L Z

1 PHASE RECONNECTABLE



3R / B: 120/240V 60HZ

1 PHASE



NOTES:

1. CURRENT TRANSFORMER SECONDARY MUST BE MANUALLY SELECTED. HIGH VOLTAGE (ABOVE 300 VOLTS) TERMINALS 1&2, LOW VOLTAGE BELOW 300 VOLTS USE TERMINALS 1&3. TERMINAL #1 IS COMMON
2. GENERATORS 7/F AND 9X ARE NOT RECONNECTABLE AND ARE WOUND FOR A SPECIFIC VOLTAGE
3. THESE CONNECTIONS ARE FOR SPEC E "L" WITH THE STANDARDIZED CONTROL

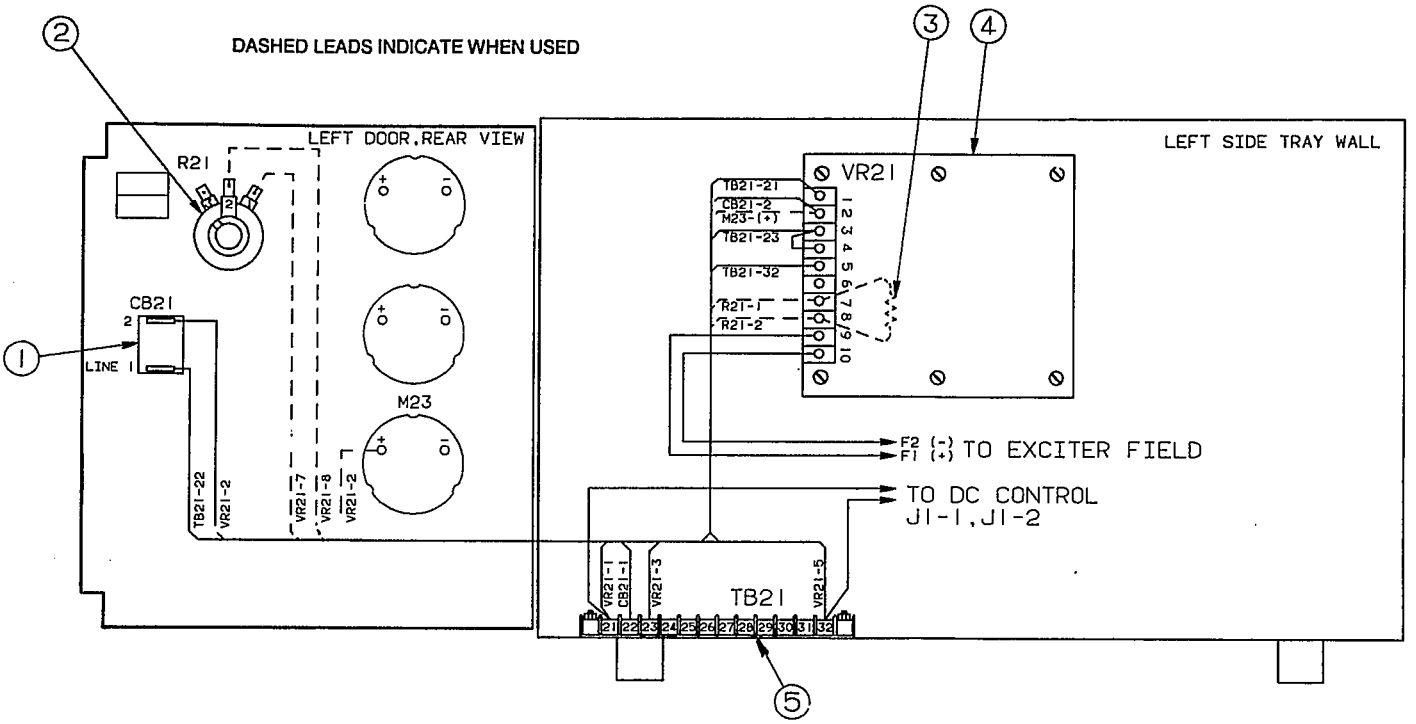
VOLTAGE CODE				
CONT INPUT TB21	18 518 / L Z	7 / F	3R / B	9 / H
22	T7	T7	T1	T7
23	T8	T8	T4	T8
24	T4	-	-	-
25	T9	T9	-	T9
26	T10	T10	-	T10
JUMPER	-	22-24	23-24	22-24

CADAM SYSTEM DWG

				ITEM	PART NO	*BULK	QTY	DESCRIPTION OR MATERIAL
DR	JOHN PREESE	11-18-87						ONAN CORPORATION MINNEAPOLIS, MINNESOTA
CHKR		12-9-87						
APPROVED	J S SWENSON	11-25-87						TITLE WD-GEN RECONNECT
	DL-E							DWG NO 625-2108 SHEET 1 of 1 SIZE D

625-2108 D

625-2108 GENERATOR RECONNECTION WIRING DIAGRAM

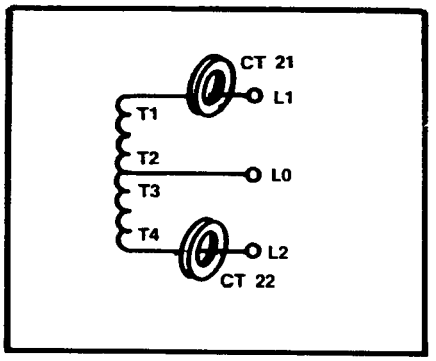


COMPONENT IDENTIFICATION

ITEM	REF.	DESCRIPTION
1	CB21	Field Circuit Breaker
2	R21	Voltage Adjust Potentiometer
3	—	Resistor (Used W/O R21)
4	VR21	Voltage Regulator, VRAS-2
5	TB21	Terminal Block

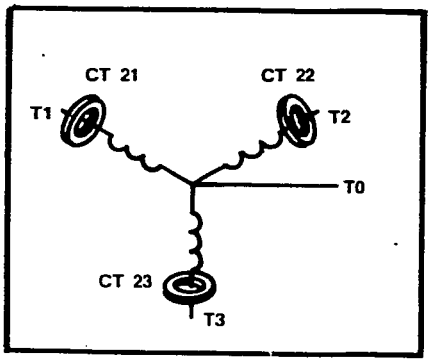
300-3303 VOLTAGE REGULATOR INSTALLATION WIRING DIAGRAM

120/240 VOLT, 3 PHASE, 60 HERTZ (CODE B)

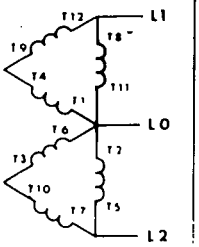
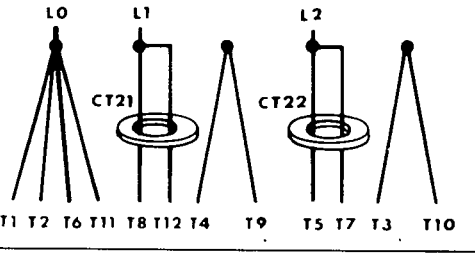
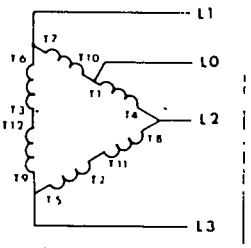
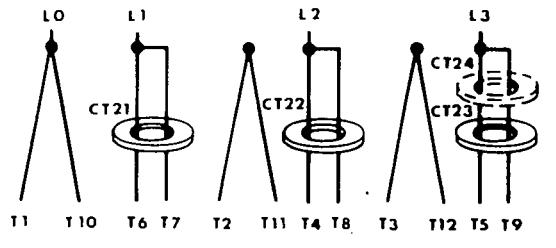
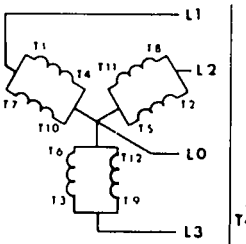
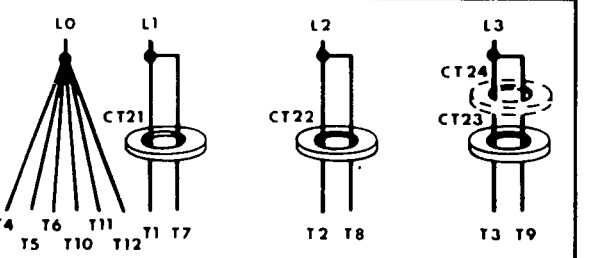
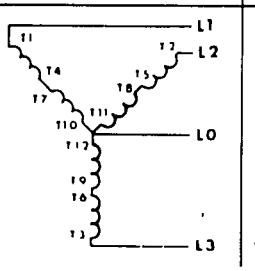
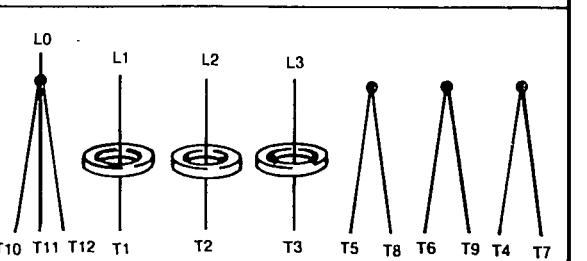


SECONDARY CURRENT TRANSFORMER CONN. 1-3

220/380 VOLT, 3 PHASE, 60 HERTZ (CODE F)
347/600 VOLT, 3 PHASE, 60 HERTZ (CODE H)



SECONDARY CURRENT TRANSFORMER CONN. 1-2

NAMEPLATE VOLTAGE CODE	VOLTAGE	PHASES	HERTZ	CURRENT TRANSFORMER SECONDARY CONNECTION	GENERATOR CONNECTION	GENERATOR CONNECTION SCHEMATIC DIAGRAM	GENERATOR CONNECTION WIRING DIAGRAM (WITH CURRENT TRANSFORMERS WHEN USED)
L	120/240	1	60	1-3	DOUBLE DELTA		
Z	115/230	1	50	1-3			
	110/220	1	50	1-3			
E	240/480	3	60	1-2	SERIES DELTA		
L	120/240	3	60	1-3			
Z	115/230	3	50	1-3			
	110/220	3	50	1-3			
L	120/208	3	60	1-3	PARALLEL WYE		
	127/220	3	60	1-3			
	139/240	3	60	1-3			
Z	110/190	3	50	1-3			
	115/200	3	50	1-3			
	120/208	3	50	1-3			
	127/220	3	50	1-3			
L	240/416	3	60	1-2	SERIES WYE		
	254/440	3	60	1-2			
	277/480	3	60	1-2			
Z	220/380	3	50	1-2			
	230/400	3	50	1-2			
	240/416	3	50	1-2			
	254/440	3	50	1-2			

98C2193 GENERATOR RECONNECTION DIAGRAM

Onan

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