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Onan

Service Manual UV Generator

UV Generator
with Torque Match-2™ Regulator

943-0018
10-86
Printed in U.S.A.

Safety Precautions

The following symbols in this manual highlight conditions potentially dangerous to service personnel, or equipment. Read this manual carefully. Know when these conditions can exist. Then take necessary steps to protect personnel as well as 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.***

PROTECT AGAINST MOVING PARTS

Avoid moving parts of the unit. Avoid use of loose jackets, shirts or sleeves due to danger of becoming caught in moving parts.

Make sure all nuts and bolts are secure. Keep power shields and guards in position.

If you must make adjustments while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

Do not work on this equipment when mentally or physically fatigued.

GUARD AGAINST ELECTRIC SHOCK

Disconnect 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 surfaces to be damp when handling electrical equipment.

Disconnect batteries to prevent accidental engine start. Jewelry is a good conductor of electricity and should be removed before working on electrical equipment.

Use extreme caution when working on electrical components. High voltages cause injury or death.

Follow all state and local codes. To avoid possible personal injury or equipment damage, a qualified electrician or an authorized service representative must perform installation and all service.

⚠WARNING

EXHAUST GAS IS DEADLY!

Exhaust gases contain carbon monoxide, an odorless and colorless gas formed during the combustion of hydrocarbon fuels. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning are the following:

- ***Inability to Think Coherently***
- ***Vomiting***
- ***Muscular Twitching***
- ***Throbbing in Temples***
- ***Dizziness***
- ***Headache***
- ***Weakness and Sleepiness***

If you or anyone else experience any of these symptoms, shut down the unit and get out into fresh air immediately. If symptoms persist, seek medical attention. DO NOT OPERATE THE UNIT UNTIL IT HAS BEEN INSPECTED AND REPAIRED.

The best protection against carbon monoxide inhalation is proper installation and regular, frequent visual and audible inspections of the complete exhaust system.

Table of Contents

Section 1. Introduction

ABOUT THIS MANUAL

This manual provides troubleshooting and repair information regarding the Onan series UV generator in connection with a Torque Match-2 (VRAS-2) voltage regulator. For further operation, service, and troubleshooting information regarding engine or controller components, refer to support manuals specific to your generator set.

Study all manuals carefully and observe all warnings and cautions found on page ii and throughout this manual. Knowing your generator set, using it properly, and following a regular maintenance schedule will result in longer unit life, better performance, and safer operation.

Repair information in this manual for printed circuit board components other than fuses is not extensive as solid state printed circuit boards lend themselves more to replacement than repair. Application of meters or hot soldering irons to printed circuit boards by other than qualified personnel can cause unnecessary and expensive damage. Repair of the printed circuit boards is not recommended except by the factory.

⚠CAUTION ***High voltage testing or high potential (or Megger) 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:

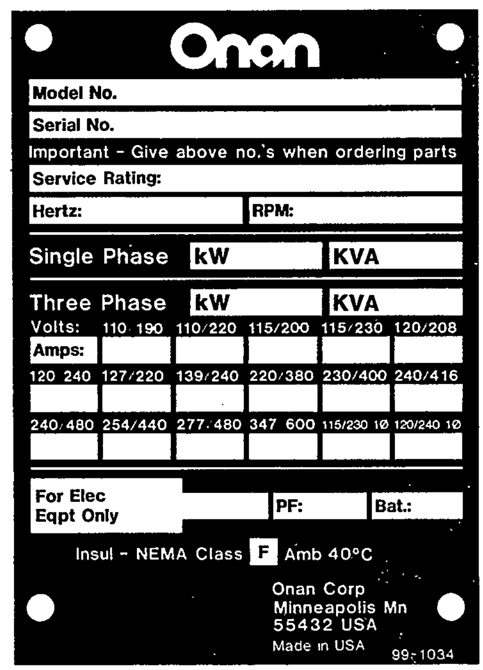
- Onan Multitester
- Jumper Leads
- AC Voltmeter
- DC Voltmeter
- Frequency Meter
- Wheatstone or Kelvin Bridge

See Onan Tool Catalog 900-0019.

HOW TO OBTAIN SERVICE

In the event the generator requires servicing beyond the scope of information contained in this manual, contact an Onan Distributor for assistance. Onan factory trained Parts and Service representatives are ready to handle all your service needs.

When contacting an Onan Distributor, always supply the complete Model number and Serial number as shown on the Onan nameplate. The Onan nameplate is located on the side of the generator control box.



M-1641

FIGURE 1-1. ONAN NAMEPLATE

⚠WARNING

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

Section 2. Generator and Voltage Regulator

GENERATOR DESCRIPTION

The UV generator is a four pole, revolving field generator designed for 1500 (50 Hz) or 1800 (60 Hz) r/min operation. Excitation is provided with a brushless exciter mounted inboard of the generator endbell. The generator rotor is directly coupled to the engine flywheel with a flexible drive disc. Engine speed determines generator frequency. A centrifugal blower (on the drive disc) circulates discharged air through an outlet in the blower end. See Figure 2-1.

Stator coil leads are connected to the bus-bar assembly to produce parallel wye, series wye, or series delta windings to achieve the desired voltage/current option. These options are factory connected to customer requirements. See Figure 2-2 and Table 2-1.

AC output leads extending from the stator housing are tapped with control wires (leads: 7,8,9 and 10). These control wires are routed into the control box and used for control input and metering. Figure 2-3.

The brushless exciter stator mounts in the endbell while the exciter rotor and its rotating rectifier assemblies mount on the generator rotor shaft. Within the endbell, leads F1+ and F2- from the exciter stator winding are connected to the output terminals of the voltage regulator, Figure 2-3.

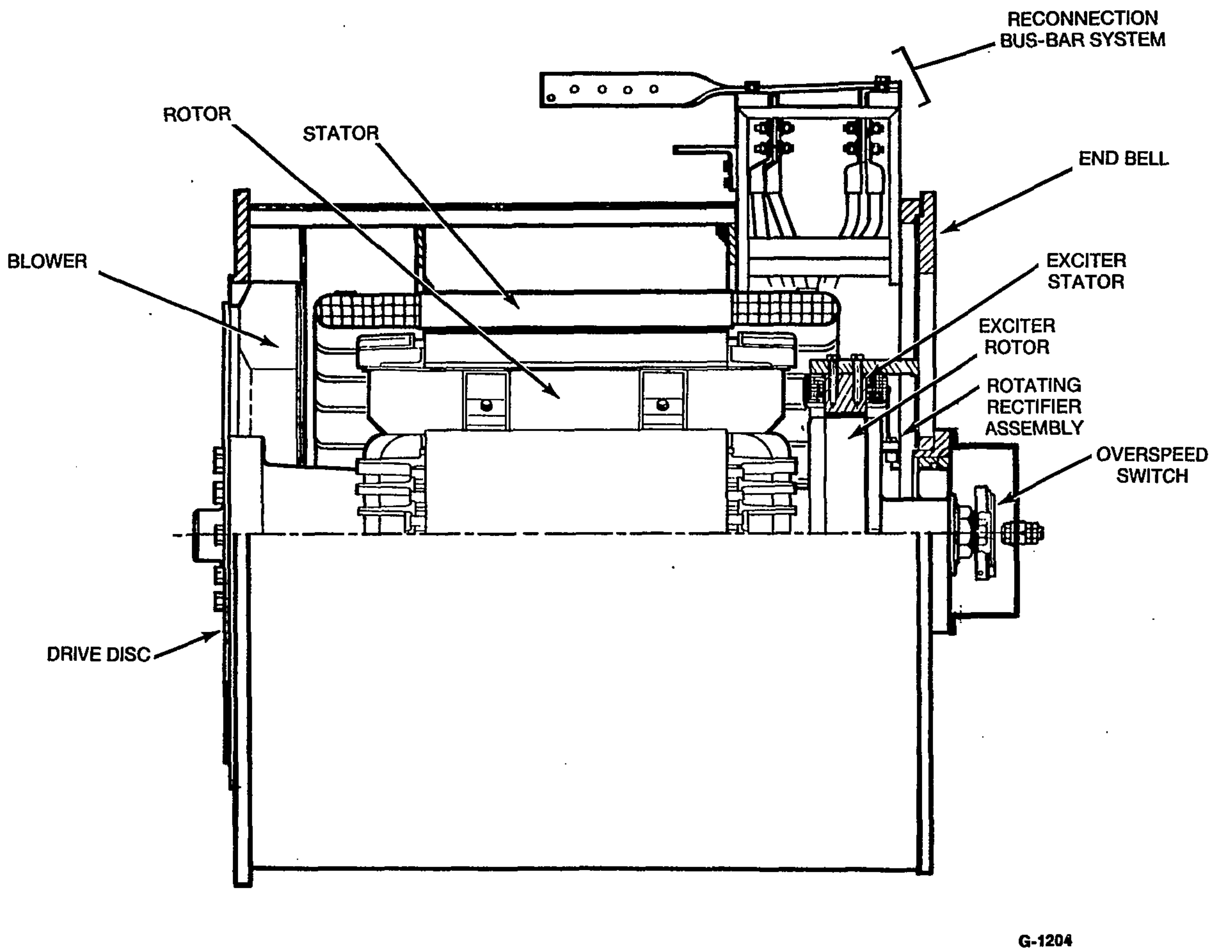
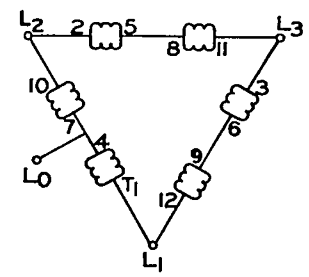
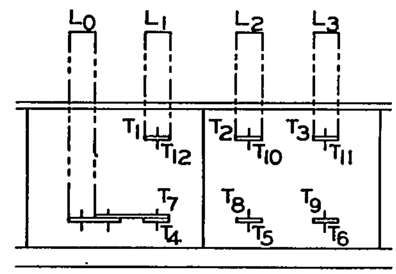
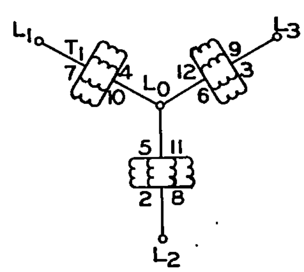
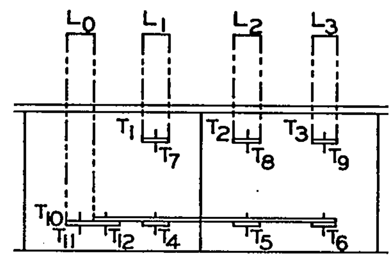
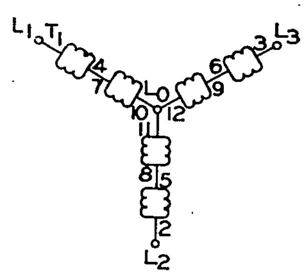
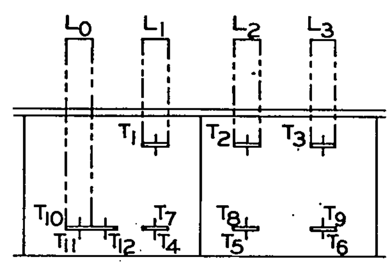


FIGURE 2-1. UV GENERATOR

VOLTAGE CODE	VOLTAGE	PHASE	FREQ.	GENERATOR CONNECTION DIAGRAM	RECONNECTION BUS BARS
5D 6D	120/240 240/480	3 3	60 60	 DELTA	
4 7 9X 519 521	120/208 220/380 347/600 110/190 115/200 120/208 127/220	3 3 3 3 3 3 3	60 60 60 50 50 50 50	 PARALLEL WYE	
7X 4X 520 522	240/416 277/480 220/380 230/400 240/416 254/440	3 3 3 3 3 3	60 60 50 50 50 50	 SERIES WYE	

NOTE: This figure is for reference only. Refer to electrical schematic specific to your generator for further connection information.

ES-1678

FIGURE 2-2. OPTIONAL VOLTAGE CONNECTIONS

TABLE 2-1. UV VOLTAGE CODE/CURRENT OPTIONS*

VOLTAGE	FREQ.	MAXIMUM CURRENT (AMPERES) 400 kW	450 kW	500 kW	600 kW	750 kW	PARALLEL WYE	SERIES WYE	SERIES DELTA
CODE 4									
120/208	60 Hz	1388	1561	1735	2082	2602	x		
CODE 5D									
120/240	60 Hz	1203	1353	1504	1804	2255			x
CODE 7									
220/380	60 Hz	760	855	950	1140	1424	x		
CODE 7X									
240/416	60 Hz	694	781	867	1041	1301		x	
CODE 6D									
240/480	60 Hz	601	677	752	902	1128			x
CODE 4X									
277/480	60 Hz	601	677	752	902	1128		x	
CODE 9X									
347/600	60 Hz	481	541	601	722	902	x		
CODE 31									
110/190	60 Hz	1519	1709	1899	2279	2849	x		
115/200	60 Hz	1444	1624	1804	2165	2707	x		
120/208	60 Hz	1388	1562	1735	2082	2603	x		
127/220	60 Hz	1312	1476	1640	1986	2461	x		
220/380	60 Hz	760	855	950	1140	1425		x	
230/400	60 Hz	722	812	902	1083	1353		x	
240/416	60 Hz	694	781	868	1041	1301		x	
254/440	60 Hz	656	738	820	984	1230		x	
		MAXIMUM CURRENT (AMPERES) 330 kW	**385 kW**	**450 kW**	**550 kW**	**625 kW**			
CODE 519									
110/190	50 Hz	1254	1462	1709	2090	2374	x		
115/200	50 Hz	1191	1389	1624	1986	2255	x		
CODE 521									
120/208	50 Hz	1145	1336	1561	1910	2169	x		
127/220	50 Hz	1083	1263	1476	1805	2050	x		
CODE 520									
220/380	50 Hz	627	731	855	1045	1187		x	
230/400	50 Hz	596	695	812	992	1128		x	
CODE 522									
240/416	50 Hz	573	668	781	955	1084		x	
254/440	50 Hz	542	631	738	902	1025		x	

***NOTE:** Generators are wound for specific voltage. It is possible to reconnect to obtain either a high or low voltage connection from the generator. Consult Onan service representative for assistance.

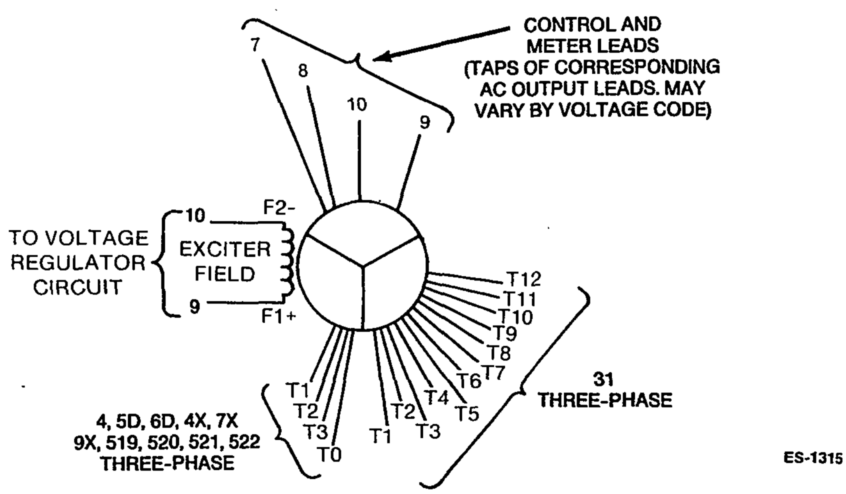


FIGURE 3. GENERATOR SCHEMATIC (COMPOSITE)

Optional Circuit Breaker

Depending on site specifications and any applicable code requirements, an optional circuit breaker may be mounted on the side of the generator housing.

All Onan supplied circuit breakers are thermal and magnetic trip type. Depending on customer requirements, the circuit breaker may also include shunt trip and remote alarm connections. Review the following and refer to Figure 2-4.

- 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 circuit breaker is accomplished by bimetal strips (inside breaker). A sustained overcurrent condition will cause a thermal reaction of the bimetal, and thereby 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 (i.e., motor starting).
- The magnetic trip action of the circuit breaker is caused by an electromagnet which partially surrounds the internal bimetal strips. In the event of a short circuit, the high current through the electromagnet will attract the bimetal armature and trip the breaker. Some circuit breaker models provide front-adjustability of the magnetic trip action. These adjustors are normally set at the factory at the high position, but provide for individual conductor settings to suit customer requirements.
- The shunt trip mechanism (if equipped) consists of a solenoid tripping device mounted in the circuit breaker and 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 and DC voltages, and is normally installed at the factory to meet customer requirements. For paralleled generator set installations, the shunt trip mechanism is most often connected to a common fault shutdown circuit of the generator set; in order to quickly disconnect the set from the load during a fault shutdown and thereby avoid a reverse power condition. Refer to site requirements for further information regarding the intended use of this feature.
- Auxiliary contacts (if equipped) consist of a set of contacts (one normally-open, and one normally-closed) intended for local or remote annunciation of breaker status. Refer to site requirements and proper wiring diagram for further information.
- 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. Refer to Section 4 -Tests/Adjustments for further information.
- Operation of the circuit breaker is determined by site-established procedures. In emergency standby installations, the circuit breaker is most often placed to the On position, and is intended for safety trip actuation in the vent of a fault condition. When the breaker is caused to trip open, operator action is required; firstly, to investigate the cause of the trip and perform remedial steps required (see Troubleshooting), and secondly, the circuit breaker handle must be placed to the Reset position and then to On to reclose the breaker. Refer to Troubleshooting and Tests/Adjustment sections for further information.

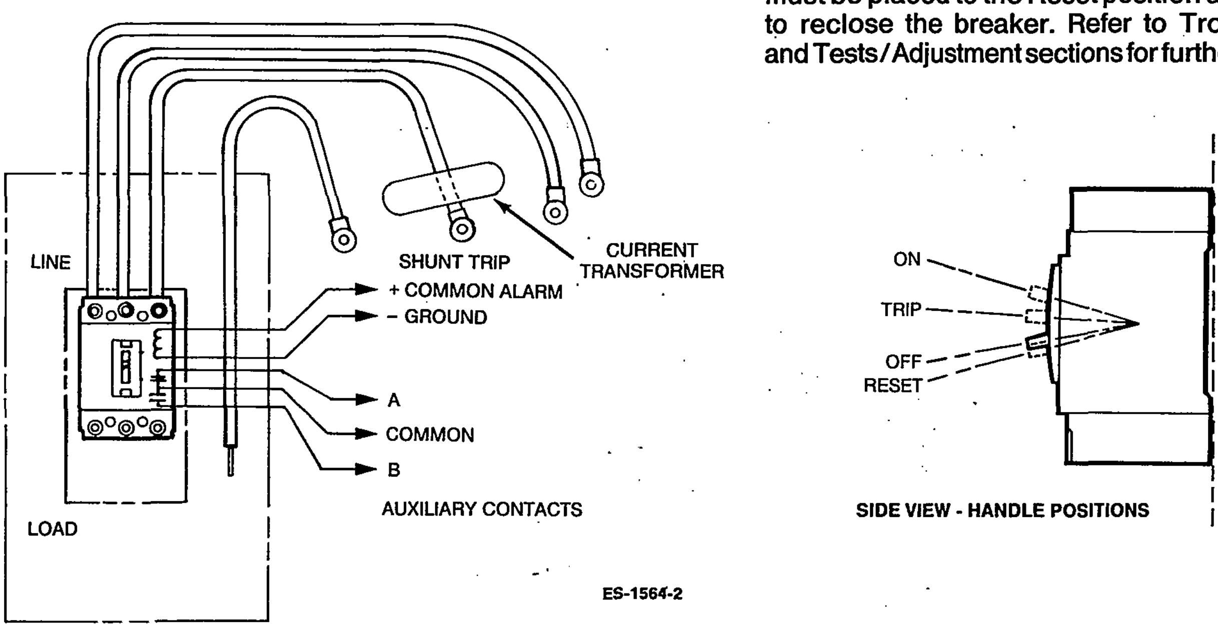


FIGURE 2-4. OPTIONAL CIRCUIT BREAKER

GENERATOR OPERATION

With the generator directly coupled to the engine flywheel, full rated output voltage is accomplished in a matter of seconds. The following briefly describes generator operation and voltage regulator interaction, in reference to Figure 2-5.

Refer to Voltage Regulation for further specifics regarding regulator operating modes.

1. Demand for power starts the engine, thereby turning the generator rotor.
2. Residual magnetism in the rotor's main field, induces voltage in the main stator.
3. Single-phase AC voltage is taken from the main stator winding and fed to the Torque Match-2 Voltage Regulator (VRAS-2) as a reference voltage.
4. The voltage regulator compares the input with the preset requirements, rectifies AC to DC, and sends a DC voltage to the exciter field.
5. The exciter stator field induces voltage in the exciter armature.
6. Three-phase AC voltage is tapped from the exciter and fed to the rotating full-wave bridge rectifiers.
7. DC voltage from the rotating rectifiers is fed to the main field of the generator rotor.
8. The main field continues to build until rated (or preset) voltage is reached.

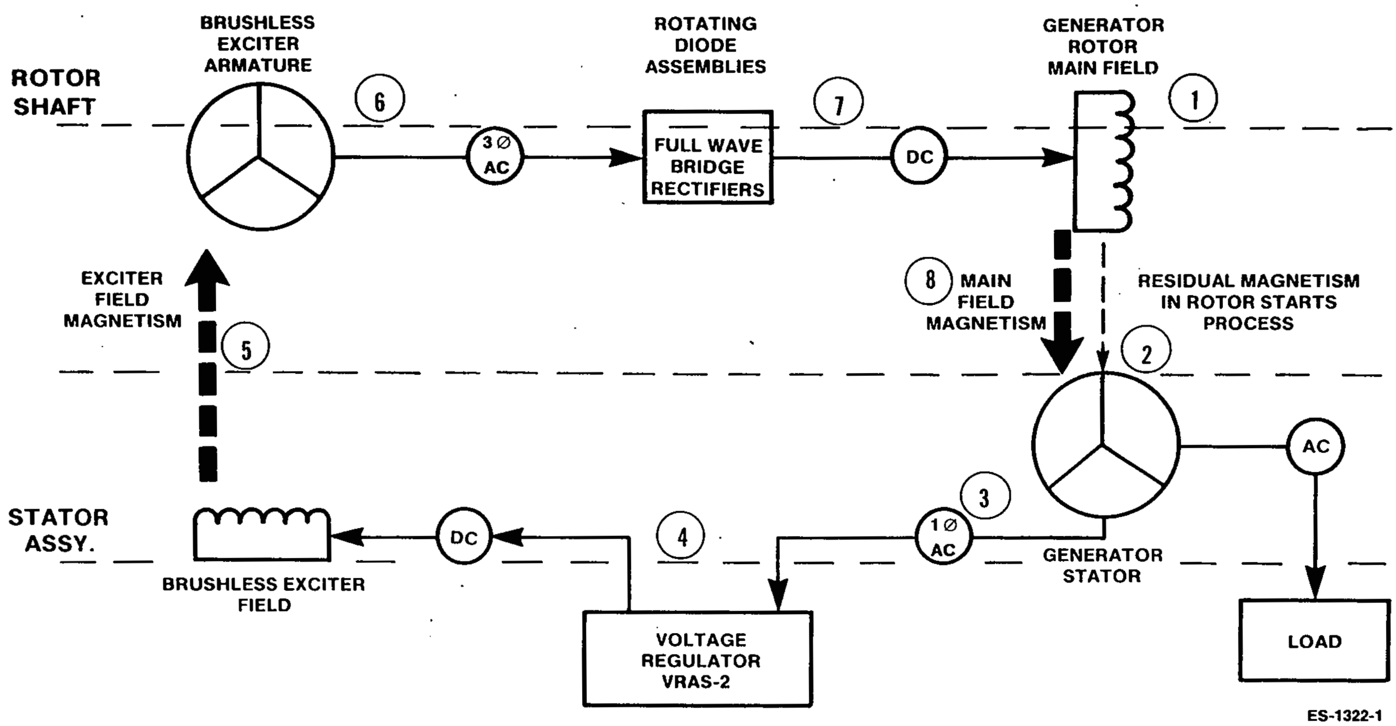


FIGURE 2-5. EXCITATION BLOCK DIAGRAM

VOLTAGE REGULATOR DESCRIPTION

The design of the Torque Match-2 Voltage Regulator (VRAS-2) provides switch selections that alter its sensing and command signals in order to achieve maximum operating performance in a variety of generator sizes and applications. Review the following, then refer to Voltage Regulator Adjustments for switch locations and settings specific to your generator set model.

Operating Modes

Torque-Matching: In most applications, in order for the generator set to accept the application of a large momentary overload, such as motor starting, matching the torque characteristics of the engine and generator is required.

Because of the differences in engine characteristics, different torque matching may be used for various engine/generator combinations. The switch-selectable design of the VRAS-2 provides Onan the flexibility to test and set the torque-matching function to best suit each engine/generator configuration.

When set to the proper torque-matching switch settings, the VRAS-2 voltage regulator is able to maintain output voltage, within reasonable limits, by reducing the voltage just enough to take full advantage of the engine's full available power under transient conditions and 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, and is not recommended for use. Consult an Onan service representative before selecting this voltage regulation mode to ensure that load demands specific to your installation would not cause an unstable operation of the generator set.

Operating Stability

Because of the differences in exciter and main field time constants, different gain compensation is required for the various generator sizes and applications. The VRAS-2 voltage regulator is switch-selectable to a kW range of operation that best suits the generator set application.

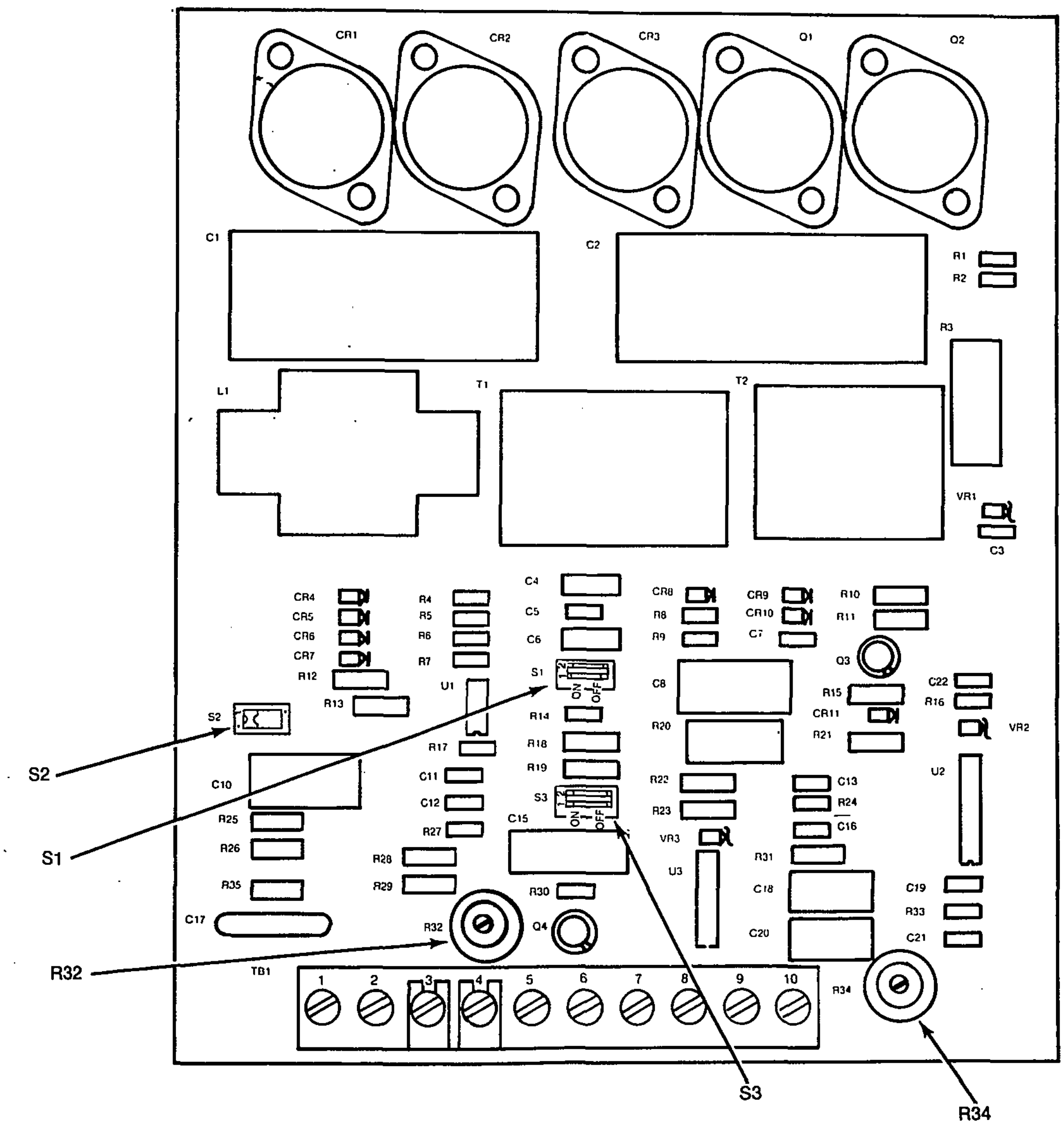
VOLTAGE REGULATOR ADJUSTMENTS

The VRAS-2 Voltage Regulator is shown in Figure 2-6. There are three switches that require actuation and two potentiometers on the voltage regulator as follows:

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

TABLE 2-2. 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
325-400	OFF	OFF	POS 2	OFF	ON	POS 2	ON	ON	POS 2	OFF	OFF
385-450	OFF	ON	POS 2	OFF	ON	POS 2	ON	ON	POS 2	OFF	OFF
500-600	ON	OFF	POS 2	OFF	ON	POS 2	ON	ON	POS 2	OFF	OFF
625-750	ON	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 2-6. VOLTAGE REGULATOR

Section 3. Generator/Regulator Troubleshooting

CONTROL LOCATIONS

Review the following listing of component parts involved in generator troubleshooting. Because, the following Troubleshooting Flow Charts will only be calling them by name and not location.

Generator Set Output Circuit Breaker: Mounted on outside of generator control/output box housing.
Voltage Regulator - VRAS-2: Inside control box.
Terminal Board TB21: Inside control box.
Field Breaker CB21: On AC control box door.
Current Transformer CT21, 22, and 23. Inside output box, behind control box.
Reconnection Bus-Bar System: Inside output box, behind control box.
Rotating Rectifiers: Inside generator, on exciter rotor.

⚠WARNING ***Accidental generator set starting can result in severe personal injury or death during service procedures. Disconnect battery cable before performing any checks on generator.***

PREPARATION

A few simple checks and a proper troubleshooting procedure can locate the probable source of trouble and cut down service time.

1. Check all modifications, repairs, and replacements performed since the last satisfactory operation of the set to ensure that all generator leads are correctly connected. A loose wire connection overlooked when installing a replacement part could cause problems, as could an incorrect connection, an opened circuit breaker, or a loose connection on a printed circuit board. A thorough visual check can quickly eliminate these potential problems.
2. Visually inspect the components of Voltage Regulator VRAS-2. Look for dust, dirt, or moisture and cracks in the printed solder conductors. Burned resistors and arcing tracks are readily identifiable. Do not mark on PC boards with a pencil; graphite lines conduct and can cause leakage or short circuits between components.
3. 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 unit stopped.***

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

To troubleshoot a problem, determine the problem and then refer to the appropriate troubleshooting flow chart. Start at the upper left-hand corner of chart, and answer all the questions with either a YES or NO. Follow the chart until the problem is found, performing the referenced Adjustment and Test Procedures 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.

This figure is for reference only. Use electrical schematic specific to your application when troubleshooting.

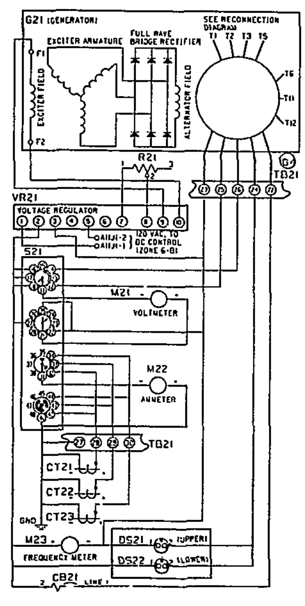
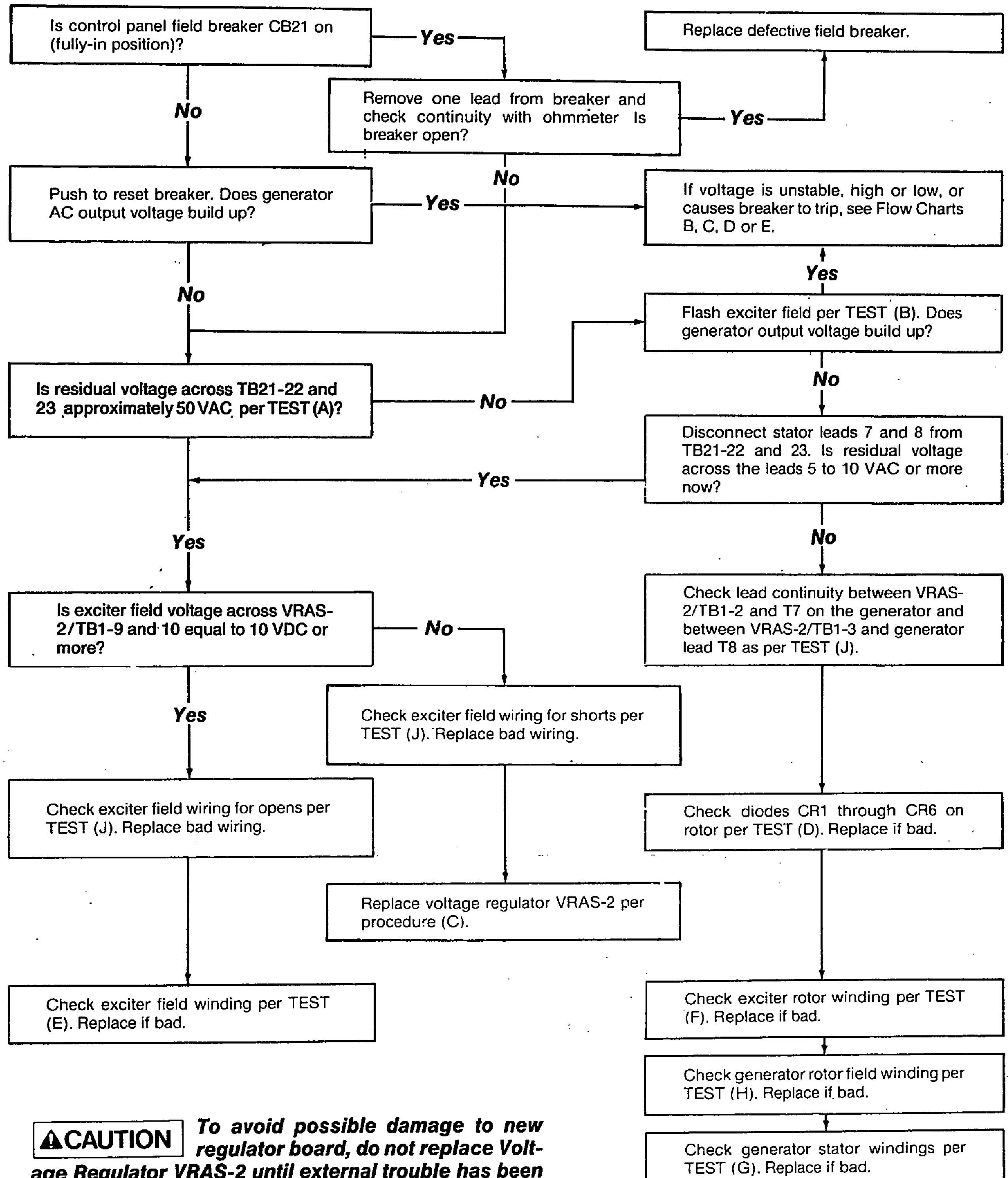


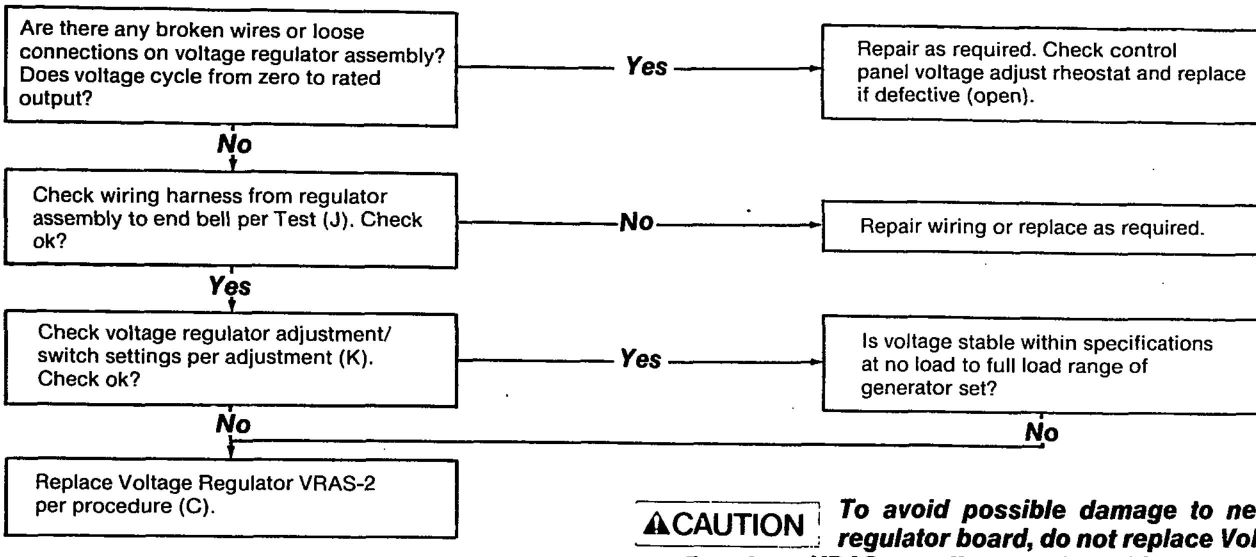
FIGURE 3-1. ELECTRIC SCHEMATIC (Includes Detector AC Meter Option)

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



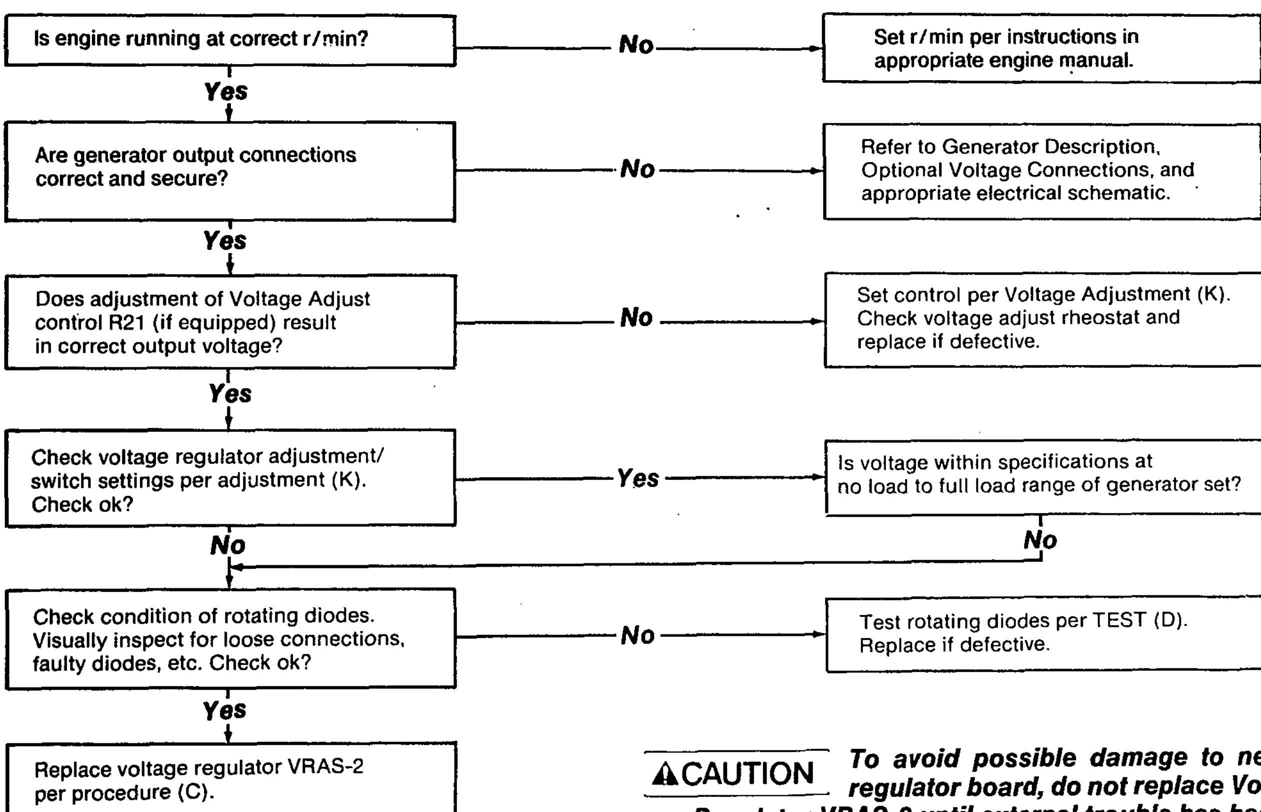
⚠CAUTION ***To avoid possible damage to new regulator board, do not replace Voltage Regulator VRAS-2 until external trouble has been corrected.***

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



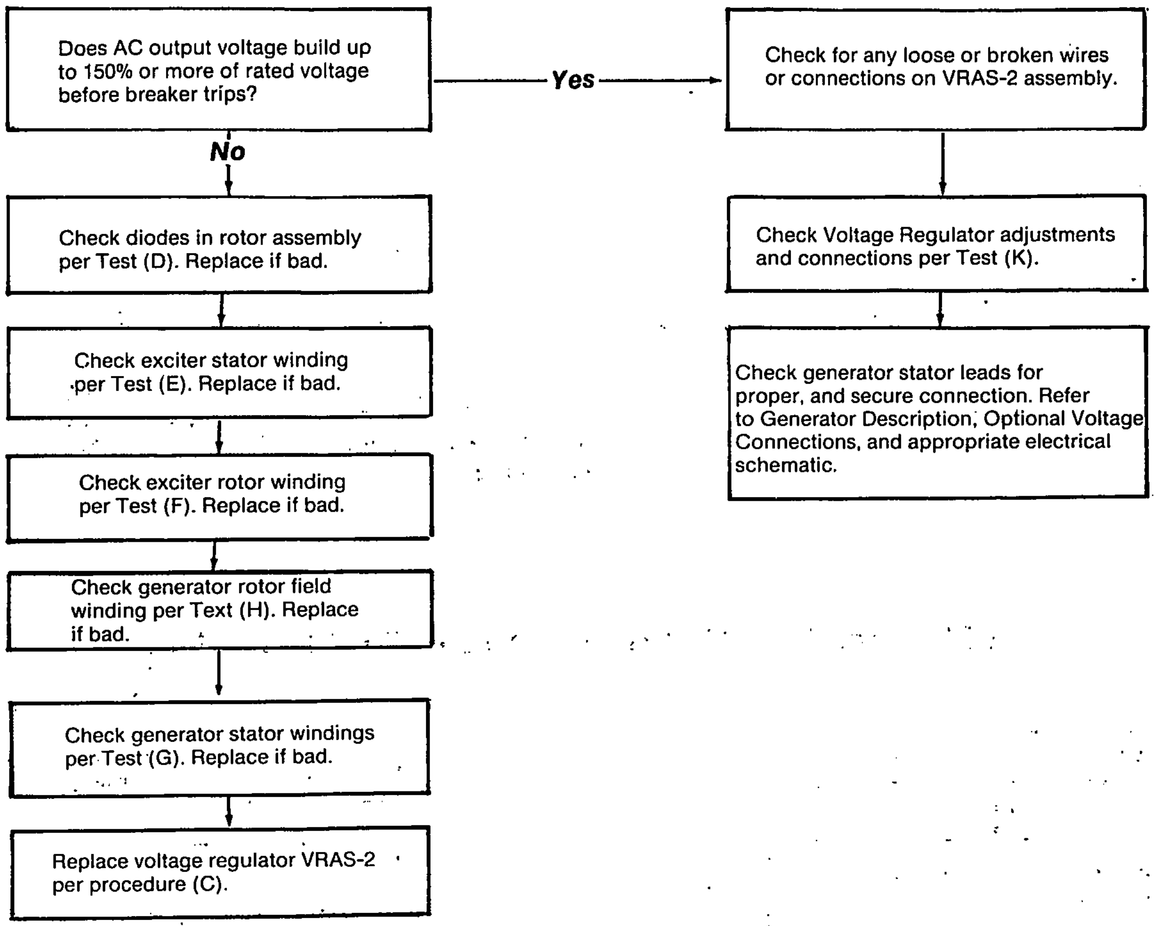
⚠CAUTION ***To avoid possible damage to new regulator board, do not replace Voltage Regulator VRAS-2 until external trouble has been corrected.***

FLOW CHART C. OUTPUT VOLTAGE TOO HIGH OR LOW.



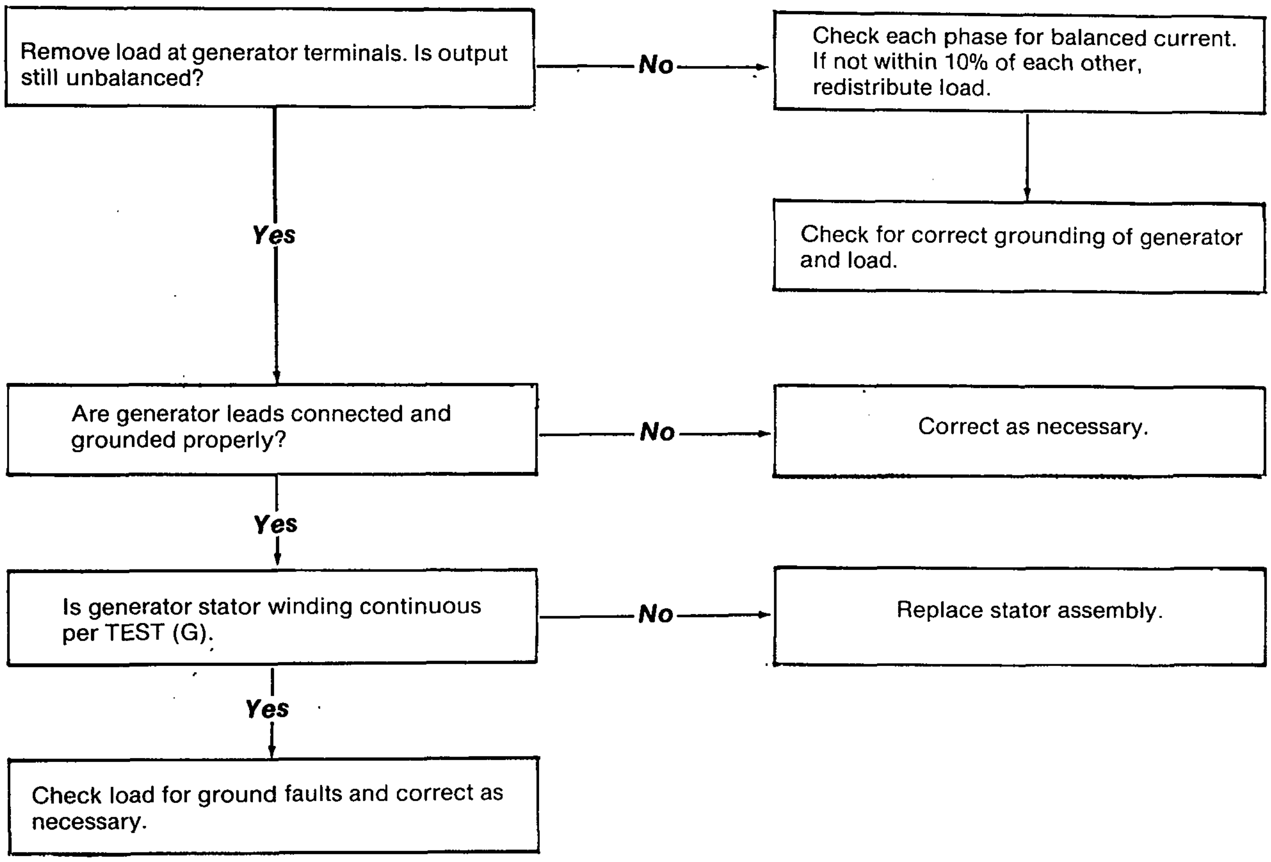
⚠CAUTION ***To avoid possible damage to new regulator board, do not replace Voltage Regulator VRAS-2 until external trouble has been corrected.***

FLOW CHART D. EXCITER FIELD BREAKER TRIPS.

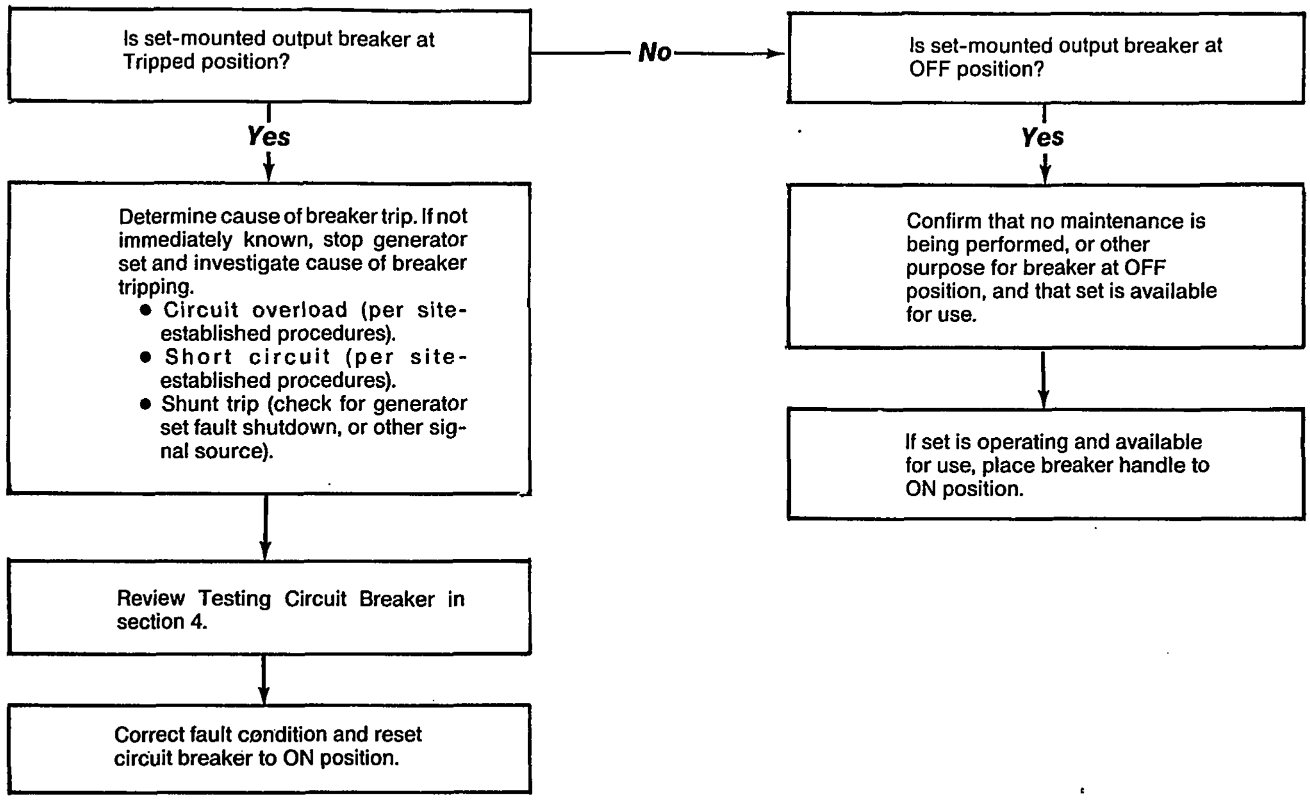


⚠CAUTION ***To avoid possible damage to new regulator board, do not replace Voltage Regulator VRAS-2 until external trouble has been corrected.***

FLOW CHART E. UNBALANCED GENERATOR OUTPUT VOLTAGE



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



Section 4. Generator/Regulator Tests/Adjustments

All of the following adjustments and tests can be performed without disassembly of the generator. They should be used for testing generator and regulator components in conjunction with the troubleshooting flow charts. All ohmmeter tests must be made with the unit stopped to prevent meter damage.

(A)

TESTING AC RESIDUAL VOLTAGE

Generator residual AC voltage should be checked first if there is no AC power output. A good place to check is at terminal block TB21, across terminals 22 and 23. Residual voltage should be approximately 50 VAC (no-load) at normal operating r/min. If none, flash the field following the instructions in Test B.

If residual voltage is present at TB21, then check the continuity of circuit breaker CB21. If CB21 is okay, proceed to voltage regulator VRAS-2 and check for residual voltage between terminal numbers 2 and 3. If none, check continuity between these points with the generator set shut down.

(B)

FLASHING THE FIELD

If output voltage does not build up, it may be necessary to restore residual magnetism by flashing the field. This requires a 6-volt battery and a 12-amp 300-volt diode wired as shown in Figure 4-1.

A 3-volt source will also work, as will a 12- or 24-volt source. However, if a 12- or 24-volt source is used, a 2-watt, 20- or 40-ohm resistor, respectively, must be in series with the diode to drop the voltage to 6-volts.

Flashing the field can be accomplished with generator set operating or not. Either of the following procedures should be sufficient to restore residual magnetism.

With Generator Set in Operation

1. Start the generator set and operate at normal r/min.
2. Touch the positive battery lead to TB1-9 of VRAS-2, and the negative lead to TB1-10. Hold the leads in place just long enough for the voltage to build up to the normal operating level, then remove the leads.
3. Check generator voltage, and shut down generator set. Restart generator set, and run at no load. Unit must build up voltage without field flashing. If it does not, shut down set and perform continuity check of all related wiring.

With Generator Set Shut Down

1. Touch the positive battery lead to TB1-9 and the negative lead to TB1-10 of VRAS-2.
2. Hold the leads in place for no longer than 5 seconds.
3. Start generator set and run at no load. Unit must build up voltage without field flashing. If it does not, shut down generator set and perform continuity check of all related wiring.

⚠CAUTION ***Incorrect field flashing procedures can damage regulator. Do not maintain field flash connection to exciter circuit longer than 5 seconds.***

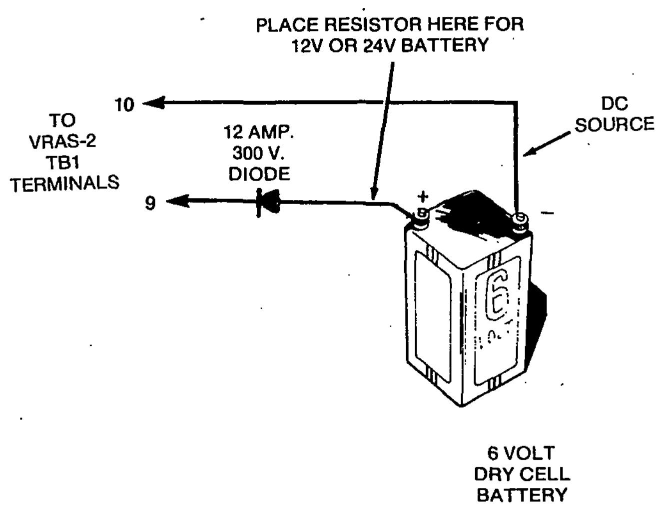


FIGURE 4-1. FIELD FLASHING CIRCUIT

(C)

VOLTAGE REGULATOR VRAS-2 REPLACEMENT

Use the following procedure for replacing the voltage regulator assembly:

1. Stop the engine, and disconnect starter batteries.
2. Disconnect, and if necessary label the wires from VRAS-2/TB1. Refer to AC control wiring diagram.
3. Remove the mounting screws, replace old VRAS-2 with new, and secure in place with mounting screws.
4. Reconnect wires removed in step 2 to proper terminals.
5. Perform voltage regulator adjustment/switch settings for specific voltage and method of regulation desired per procedure (K).

(D)

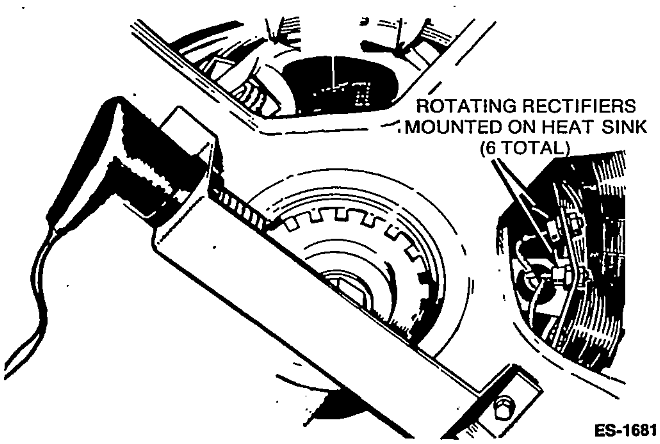
TESTING ROTATING RECTIFIERS (DIODES)

The six diodes mount on the rotating exciter assembly are tested as follows:

1. Disconnect one diode at a time (Figure 4-2) by removing diode from heat sink.

   A. Use proper size wrenches to hold the diode body while removing the nut.

   B. Push the diode free of the heat sink mounting hole.



USE 24-IN-LB (2.7 N•m) TORQUE WHEN REPLACING NUTS OF F1+ and F2-, CR1, CR2, CR3, CR4, CR5 and CR6

FIGURE 4-2. DIODE ASSEMBLY

⚠CAUTION ***Excessive dust or dirt on diodes and other components will cause overheating and eventually failure. Keep these assemblies clean!***

2. Test that diode before proceeding to the next one.

   A. Use an accurate ohmmeter to check the resistance of the diode. Connect one lead to the flag of the diode and the other lead to the stud. See Figure 4-3. Observe reading.

   B. Now reverse leads and again observe reading. A good diode should have a much higher reading in one direction than the other. If both readings are high, or if both readings are low, diode is defective and must be replaced with a new, identical part.

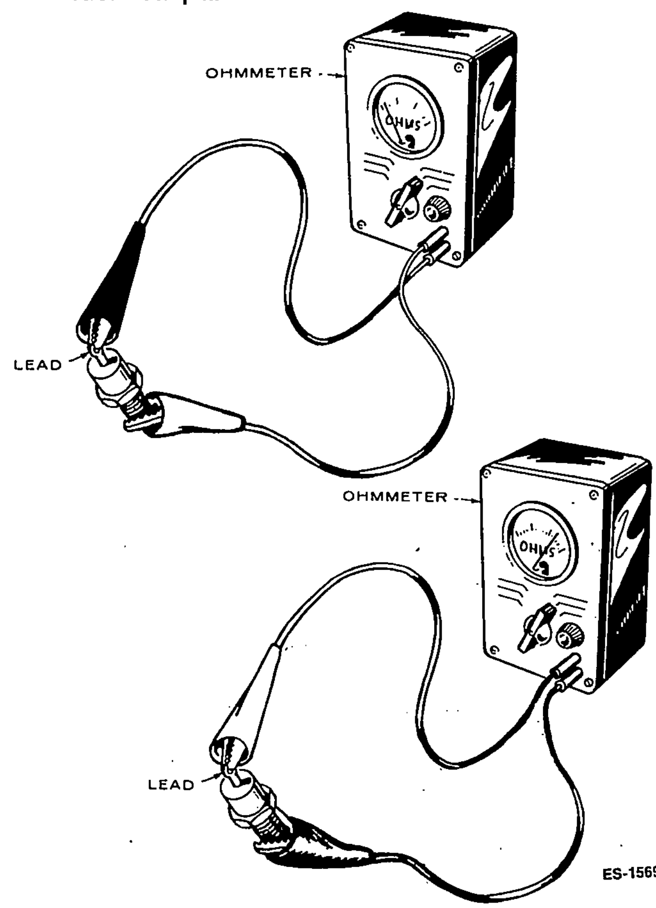


FIGURE 4-3. TESTING DIODES

3. To replace diodes, use the following procedure:

   A. Unsolder leadwires of defective diodes from flag terminals.

   B. Insert new diode into heat sink mounting hole. Using nut and washer provided, secure diode to heat sink.

   C. Use proper size wrenches to hold the diode body while tightening the nut. Torque diodes on rotating exciter assembly to 24 in-lb (2.7 N•m).

   D. Solder leadwires to new diode flag terminals.

⚠CAUTION ***Excessive heat on these rectifiers (diodes) will destroy them. Use a 40 watt soldering iron. Hold a needlenose pliers between diode and soldering point to prevent destructive heating.***

(E)

TESTING EXCITER STATOR

Testing for Grounds

Using an ohmmeter, R x 10K scale, measure the insulation resistance between either lead F1 or F2 and the generator frame. A reading of less than one megohm indicates a ground.

Testing Winding Resistance

Measure coil resistance between leads F1 and F2 with an ohmmeter, scale R x 1. See Figure 4-4. Resistance should be approximately 15 to 18.5 ohms at 20°C (68°F).

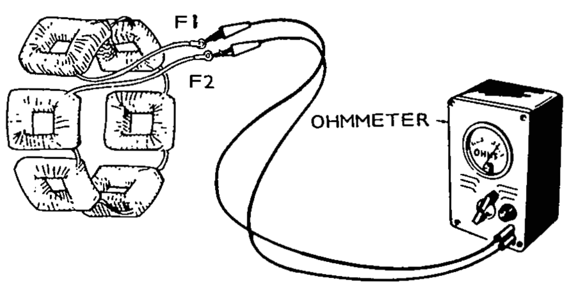


FIGURE 4-4. MEASURING FIELD RESISTANCE

(F)

TESTING EXCITER ROTOR

Testing for Grounds

Remove diodes CR1, CR2, CR3, CR4, CR5, and CR6 from diode heat sink assemblies. Using an ohmmeter (R x 100 scale), measure insulation resistance between any of the leads and the laminations (exclude the diodes from the test circuit). A reading of less than one megohm indicates a ground.

Testing Winding Resistance

Using a Kelvin Bridge meter, measure resistance between leads pairs T1-T2, T2-T3, and T1-T3. Resistance should be approximately 0.17 to 0.21 ohms (50 Hz: 0.21 to 0.25 ohms) at 20°C (68°F). See Figure 4-5.

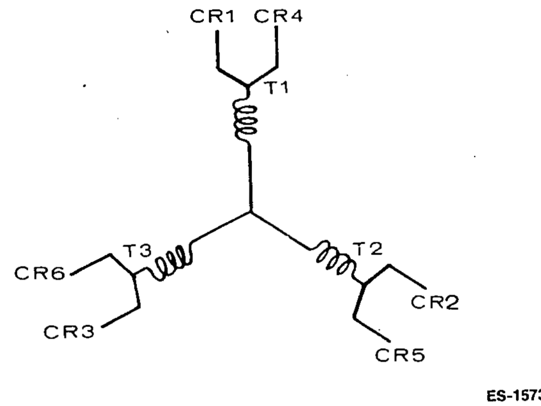


FIGURE 4-5. TESTING EXCITER ARMATURE

(G)

TESTING GENERATOR STATOR

Testing for Grounds

Before testing stator, disconnect control wire 7, 8, 9, and 10 from TB21. Isolate from ground and each other.

Connect all stator output leads (T1-T12) together. Use an ohmmeter set on the R x 10K scale and measure the insulation resistance between these windings and the stator frame. A reading of less than one megohm indicates a ground. Field circuit breaker can be either open or closed for this test.

Testing for Shorts

To check for shorts between individual windings, first refer to electrical schematic to determine individual coil lead wires (T1-T4, T7-T10, etc.). Be sure to disconnect the instrumentation leads and stator leads T7, T8, T9, and T10. Connect an ohmmeter, R x 10K scale, to one lead of a stator winding, and the other ohmmeter to all other stator leads connected together. Except, leaving the other end of coil winding being tested, open.

Example:
- Ohmmeter lead to: T1 coil winding lead.
- Ohmmeter lead to: T9, 12, 7, 10, 2, 5, 3, 6, 8, and 11 connected together.
- Coil windings lead T4: Open

A reading of less than infinity indicates a short. Repeat until all six coils have been tested.

Measure resistance of windings using a Kelvin Bridge meter. Refer to Figure 4-6 and Table 4-1. If any windings are shorted, open, or grounded, replace the stator assembly. Before replacing the assembly, check the leads for broken wires or damaged insulation.

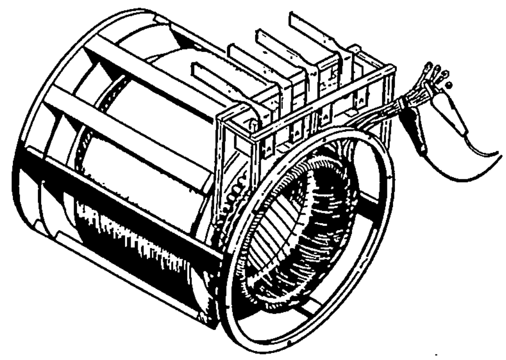


FIGURE 4-6. TESTING STATOR WINDINGS

TABLE 4-1. RESISTANCE VALUES FOR STATORS

All resistances should be within the values shown at 20°C (68°F)
Use an accurate instrument such as a Kelvin Bridge for this test.
Test between the following coil leads:

T1-T4	T7-T10	T3-T6
T9-T12	T2-T5	T8-T11

50 Hz		60 Hz	
kW RATING	RESISTANCE Ohms (±10%)	kW RATING	RESISTANCE Ohms (±10%)
330	0.0042	400	0.0030
385	0.0029	450	0.0031
450	0.0024	500	0.0024
550	0.0015	600	0.0017
650	0.0013	750	0.0013

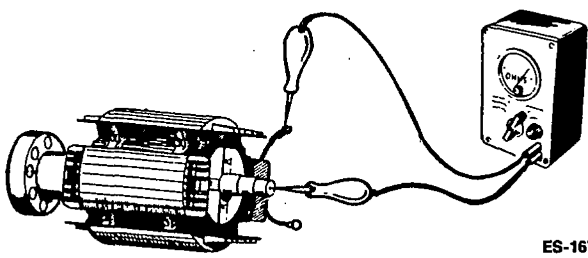
(H)

TESTING GENERATOR ROTOR

Testing for Grounds

Use an ohmmeter (R x 10K scale) and measure as follows:

1. Disconnect F1 and F2 rotor leads from the rotating diode heat sink.
2. Measure between either lead and the rotor shaft (Figure 4-7).
3. A reading of less than one megohm indicates a ground.



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CONTACT ONE PROD TO EACH OF THE FIELD LEADS AND THE OTHER PROD TO THE ROTOR SHAFT. IF ROTOR IS GOOD THERE SHOULD BE NO READING ON OHMMETER.

FIGURE 4-7. TESTING ROTOR FOR GROUNDS

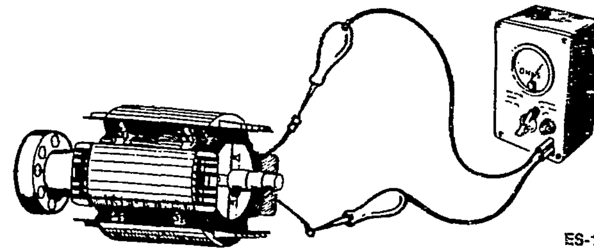
Testing for an Open Circuit

1. Disconnect and test between F1 and F2 leads (Figure 4-8).
2. Refer to resistance values given in the following table.

TABLE 4-2. ROTOR RESISTANCES

50 Hz		60 Hz	
kW RATING	RESISTANCE Ohms (±10%)	kW RATING	RESISTANCE Ohms (±10%)
330	2.00	400	2.00
385	2.16	450	2.16
250	2.37	500	2.37
550	2.60	600	2.60
650	2.87	750	2.87

3. Replace the rotor if it is grounded or has an open or short.



ES-1679

CONTACT ONE PROD TO ONE FIELD LEAD AND THE SECOND PROD TO THE OTHER FIELD LEAD.

FIGURE 4-8. TESTING ROTOR FOR AN OPEN CIRCUIT

(J)

WIRING HARNESS CHECK

Carefully check wiring harnesses as follows:

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 wire end to end for continuity or opens.
3. Using an ohmmeter, check each wire against each of the other wires for possible shorts or insulation breaks under areas covered by wrapping material.
4. Reconnect or replace wires according to applicable wiring diagram.

(K)

VOLTAGE REGULATOR (VRAS-2) ADJUSTMENT

After replacement, voltage regulator VRAS-2 adjustment is performed as follows:

1. Loosen locking nut of Voltage Adjust potentiometer R21. Locate adjustment screw to mid-position and retighten locking nut.
2. Open controller panel doors.

   ⚠WARNING ***High voltages in the control present an electrical shock hazard which can cause severe personal injury or death. Proceed with care!***

3. Refer to Figure 2-6 Voltage Regulator for proper Stability Range (S1) and Mode Selection (S2 and S3) switch settings.
4. Ensure that all connections are proper and secure.
5. **Controller with Detector AC meter option:** Refer also to adjustment (M).

   Controller without Detector AC meter option: Connect an accurate voltmeter to VRAS-2/TB1-2 and -3 terminals.

6. Start generator set.
7. Using a screwdriver, turn R32 potentiometer on printed circuit board VRAS-2 to increase or decrease the voltage as required to achieve proper setting. Observe voltmeter while making adjustment. Set voltage with no load connected to generator. (Example: For a 120/240 volt connection, set at no-load voltage for approximately 246 volts). If voltage is unstable or tends to hunt, refer to troubleshooting section.
8. Stop generator set, and prepare all installation and generator set controls for operation readiness.

Regulator Specifications

Input Power

Input voltage across terminals 2 and 4:
208 to 240 volts RMS +/-10%,
depending on wiring configuration
Input frequency: 45 to 65 Hz
Maximum burden: 800 VA

Output Power

Continuous Rating: 3.0A
One minute rating: 6.5A (in current limit)
Current limit: 6.5A +/-0.75A

Minimum Field Resistance

0.6 ohms @ 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 +80°C (-40° to 176°F)

(L)

RECONNECTION

Figure 2-2 and Table 2-1 reflect the reconnection possibilities for the UV series generators. (Note limitations indicated on Table 2-1.) When reconnecting bus-bars for a different voltage, be sure to set the switches on the voltage regulator to conform to the mode of regulation and stability range for the new configuration. Refer to Figure 2-6.

(M)

GENERATOR VOLTAGE ADJUST (R21)

The following procedure pertains to generator sets equipped with Detector AC option only.

1. Start generator set.
2. Prepare installation equipment for Test Without Load.
3. Operate Phase Selector switch to read generator output current and voltage, while performing the following steps:

   A. Insert a screwdriver into the Voltage Adjust control on the front of the generator set control and carefully loosen the locking nut.

   B. Slowly turn the screwdriver clockwise to increase voltage, or counterclockwise to decrease voltage.

   C. When set at correct voltage, tighten the locking nut. Be careful not to change adjustment.

   If correct voltage cannot be attained by R21 adjustment refer to VRAS-2 adjustment procedure (K).

   Observe that ammeter does not register any output current. If output current is observed on the ammeter, contact an Onan representative.

4. Move the Phase Selector switch to the Off position.
5. Stop generator set, and prepare all installation and generator set controls for operation readiness.

(N)

TESTING CIRCUIT BREAKER

General

Common maintenance practices is normally all the attention the circuit breaker should require. Such as periodic exercise of breaker, and checking conductor connections cleanliness and security. Circuit breaker options vary by customer requirements. Review the Optional Circuit Breaker description in Section 2 and perform the following checks and adjustment as applicable to your specific breaker model.

When performing tests and adjustments of the circuit breaker, remove the generator set from available service by placing the Remote-Stop-Run switch to Stop position and disconnect the battery negative (-) cable to avoid accidental start-up of unit.

⚠WARNING ***Accidental generator set starting can result in severe personal injury or death during service procedures. Place the Remote-Stop-Run switch to Stop position, and disconnect battery cable before performing circuit breaker tests and adjustments.***

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 accumulation on the mechanism and latch surfaces.

Checking Insulation Resistance: Disconnect the load and line conductors from the breaker, and place the breaker to the ON position. Using an ohmmeter (R x 10K scale), measure the insulation resistance between each pole and ground. Tests should be made between phases of opposite polarity as well as current carrying parts of the circuit breaker to ground. Also, a test should be made between the line and load terminals with the breaker in the OFF position. A resistance reading of less than one megohm indicates a ground. Investigation should be made for possible contamination on the case surfaces of the breaker.

Checking Contact Resistance: Extensive operations of the breaker under load conditions may cause deterioration of the contacts. Testing for contact deterioration can be accomplished by performing a resistance check or voltage drop check across the breaker poles.

1. Resistance Check.
   - A. Isolate the breaker by placing the Remote-Stop-Run switch to Stop position, disconnecting the generator set starting battery, and disconnecting the line and load wires from circuit breaker.
   - B. Place circuit breaker handle to ON position.
   - C. Check resistance values across each pole (line to load).
   - D. Resistance readings should be relatively equal for all three phases.
2. Voltage Drop Check.
   - A. Ensure that line and load wire connections are proper and secure.
   - B. Start generator set.
   - C. Place breaker handle to Reset and then to ON position.
   - D. Perform voltage check at line connection then load connection.
   - E. Compare the voltage drop readings across each pole. The comparisons should show each poles voltage drop as being only slight variation. And also the comparisons of phase to phase should be relatively equal. Unequal or excessive millivolt drops across a complete breaker can be an indication of contaminated contacts or loose connections.

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.

To check shunt-trip operation, perform the following:

1. Refer to original equipment order, installation wiring diagrams, and unit wire routing to identify and confirm proper AC or DC signal source connections.
2. Check that wire connections are secure.
3. Place circuit breaker to ON position.
4. Apply appropriate signal voltage (DC: 12-, 24-volts, etc.; or AC: 120/240-, 480-volts). The shunt-trip solenoid should energize, and trip open the breaker.
5. If breaker did not trip open, remove signal source and perform continuity check of interconnect wiring and shunt-trip solenoid lead wires. Replace interconnect wiring if defective. Replace shunt-trip solenoid if found to be shorted or open. Contact Onan distributor for assistance.

Checking Auxiliary Contacts: If equipped, the circuit breaker will have three leads for wiring interconnect of a set of internal contacts (form C; 1 -normally-open, and 1 - normally-closed). This feature provides for remote annunciator connections. Review installation wiring diagrams for specifics of interconnect. Perform continuity checks of wiring with breaker at ON and OFF position to confirm proper lead selection for interconnect. Replace internal contact circuits if shorted or open. Contact an Onan distributor for assistance.

Adjusting Magnetic Trip Operation: If equipped with front-adjustable magnetic trip controls, the short circuit protection feature for each pole of the circuit breaker can be adjusted equally or individually to best suit customer requirements. Any current surge 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

GENERATOR DISASSEMBLY

1. Disconnect the negative (-) battery cable to prevent accidental starting of the generator set while servicing.

⚠WARNING ***Accidental starting of the generator set during this procedure presents the hazard of severe personal injury or death. Make sure to disconnect the negative battery cable before beginning.***

2. Remove housing side panels as necessary to disconnect and remove load wires.
3. Disconnect lead wires from the control box. Check wire markings for legibility to ease assembly. Arrange leads so they can be withdrawn easily from the control box.

Disconnect all engine and generator control wire leads from inside control box as follows:

DC Wiring

- A11/TB1-8, -10, and terminals -1 through -7 as required.
- Unplug A11/J1, and J2.
- Unplug P5, P6 (battery charge connections).

AC Wiring

- VRAS-2/TB1-9, and -10.
- TB21-22 to -30.

4. Withdraw the DC and AC control lead wires from rear of control box. Ensure that all leads are disconnected and removed from control box.
5. Remove generator end bell cover. Then remove the overspeed switch/sensor and bracket from the end bell and rotor shaft. See Figures 5-1 and 5-2.

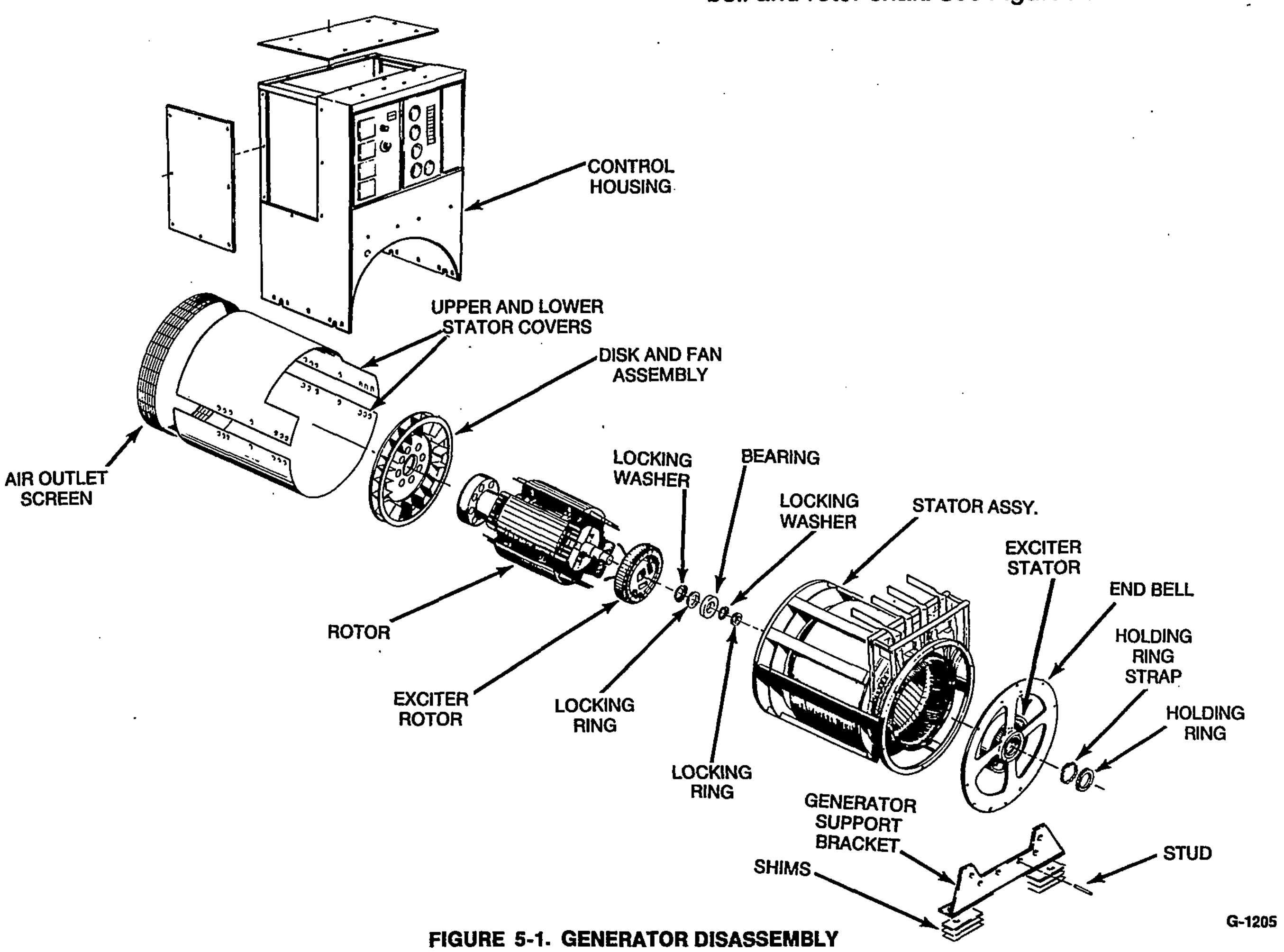
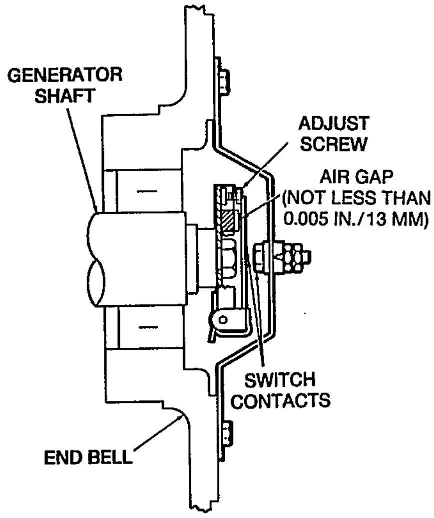
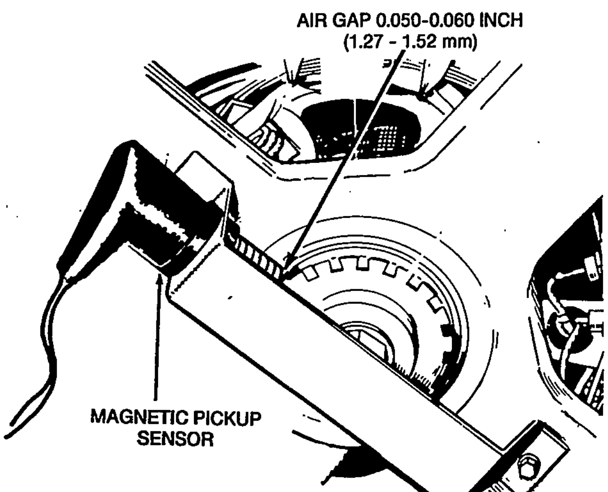


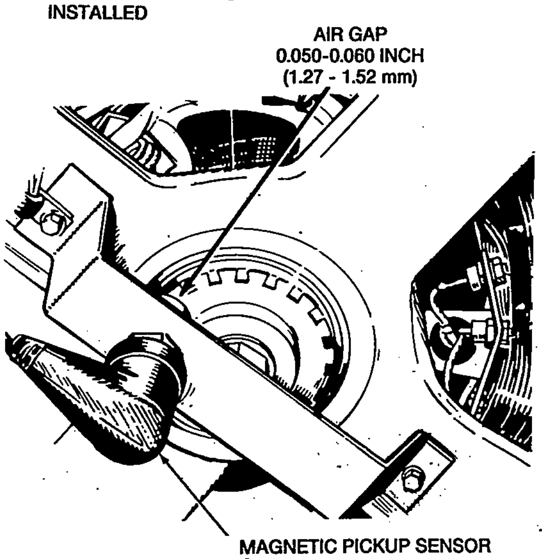
FIGURE 5-1. GENERATOR DISASSEMBLY



MECHANICAL OVERSPEED SWITCH (STANDARD)



MOUNTING MAY DIFFER BY GENSET MODEL AND OPTIONS INSTALLED



MAGNETIC PICKUP OVERSPEED SENSING (OPTIONAL)

FIGURE 5-2. OVERSPEED SWITCH, AND MAGNETIC PICKUP SENSOR

6. Attach a sling and hoist to the control cabinet. Loosen fasteners securing the control housing to stator assembly. Remove control housing from generator and set to rest on smooth floor.
7. Remove the generator air outlet screen, and upper and lower stator covers.
8. Remove the bracket-to-end bell mounting bolts and studs. Remove the bracket-to-chassis mounting bolts. Remove the support bracket from skid base. Identify any shims with placement reference, and save shims for reinstallation.
9. Attach a sling and hoist to the end bell. Loosen fasteners that secure the end bell to the stator assembly (includes exciter stator assembly). Set to rest (lay flat) on wooden blocks so not to damage exciter stator or bearing ring.

⚠WARNING ***To prevent personal injury, use adequate lifting devices to support heavy components. Keep hands and feet clear while lifting.***

10. Attach a sling and hoist to the stator assembly. Tension hoist sufficiently to take weight of stator. Remove the capscrews securing the stator assembly to the engine flywheel housing. Remove stator assembly clear of rotor.

⚠WARNING ***To prevent personal injury, use adequate lifting devices to support heavy components. Keep hands and feet clear while lifting.***

⚠CAUTION ***Do not allow the rotor to hang unsupported for any extended period. Otherwise, drive disk damage can occur.***

11. Install support under rotor when stator is clear of rotor, Figure 5-3. Set stator assembly to rest on clean surface, and block up to prevent from rolling.

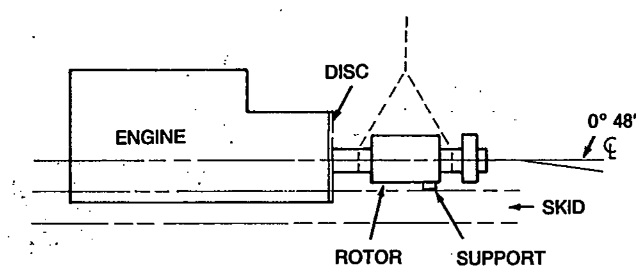


FIGURE 5-3. ROTOR REMOVAL

12. Attach a sling and hoist to rotor assembly. Tension hoist to take weight of rotor.

⚠WARNING ***To prevent personal injury, use adequate lifting devices to support heavy components. Keep hands and feet clear while lifting.***

13. Remove capscrews securing the drive disk to engine flywheel, and remove rotor assembly from engine. Set the rotor on wooden blocks so fan is not supporting any of the rotor weight.
14. Perform thorough tests of all generator components while generator is disassembled. See Section 4. Refer to parts manual for replaceable parts and assemblies.

GENERATOR ASSEMBLY

Pre-assembly Procedure

Perform the following component assembly and checks.

1. Assemble the rotor components. Figure 5-4.

   A. Mount the disk and fan assembly. Tighten capscrews to a torque of 200 to 240 ft-lb (271 to 325 N●m).

   B. Mount exciter rotor onto keyed shaft so that rectifiers face out. Locate toothed locking washer flush against exciter rotor with keyway tab properly positioned. Mount the locking ring against the toothed locking washer and tighten to a torque of 450 to 500 ft-lb (610 to 678 N●m). Bend over a locking washer tooth (tab) into groove of locking ring.

   C. If any diodes require replacement, refer to Section 4, test and adjustment (D).

   D. Install bearing onto rotor shaft. Use proper bearing installation tool to press bearing onto shaft, applying pressure to inner race of bearing only. Locate toothed locking washer flush against bearing with keyway tab properly positioned. Mount the locking ring against the toothed locking washer and tighten to a torque of 150 to 200 ft-lb (203 to 271 N●m). Bend over a locking washer tooth (tab) into groove of locking ring.

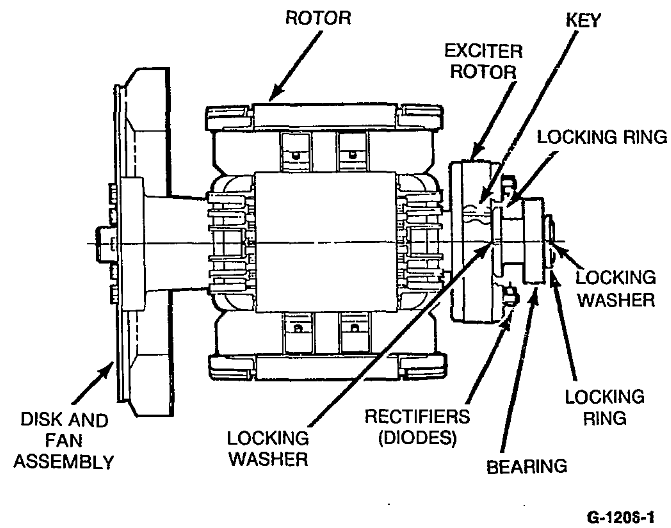


FIGURE 5-4. ROTOR ASSEMBLY

2. Assemble the end bell components. Figure 5-5.

   A. Mount the field coil set and pole shoe assembly (exciter stator). Locate F1 and F2 leads at position shown. Tighten capscrews to a torque of 18 to 20 ft-lb (24-27 N●m). Verify radial alignment and 11.239 inch (285.47 mm) diameter (minimm) across pole faces.

   B. Install metal bearing ring strap and rubber holding ring into inner groove of end bell bore. Apply Molykote to ring before installing.

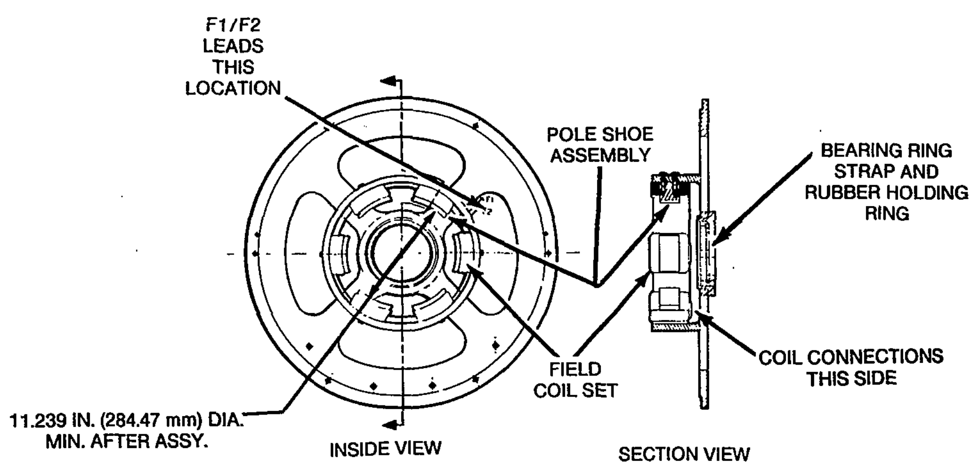


FIGURE 5-5. END BELL ASSEMBLY

3. Assemble the stator components. Figure 5-6.

   A. Refer to Figure 2-3 and wiring diagram specific to generator set application. Connect stator leads to appropriate bus-bar terminal tabs. Tighten capscrews, lock washers, and nuts to a torque to 30 to 33-ft-lb (41 to 45 N•m).
   B. Confirm that terminal board mounting brackets are secured to stator housing. Tighten the capscrews to a torque of 25 to 30 ft-lb (34 to 41 N•m).
   C. Confirm that bus-bars and insulating boards are secured to mounting brackets. Tighten the capscrews, lock washers, and nuts to a torque of 14 to 16 ft-lb (19 to 22 N•m).
   D. Confirm that current transformers and shelf fasteners are secure (if equipped). Tighten the capscrews, lock washers, and nuts to a torque of 9 to 11 ft-lb (12 to 15 N•m).

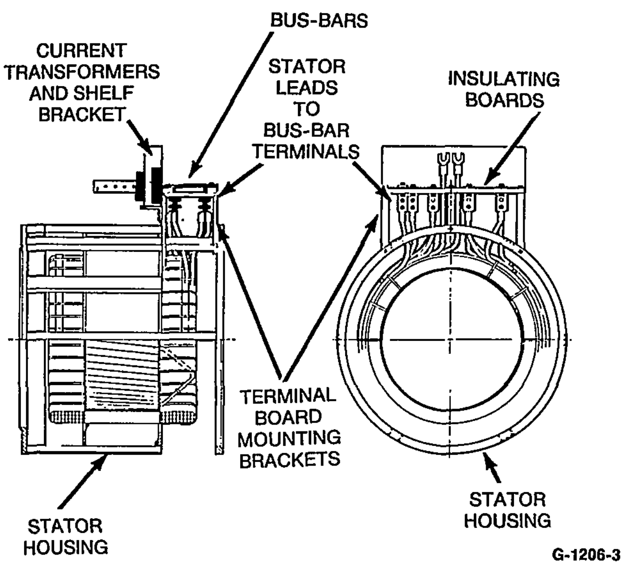


FIGURE 5-6. STATOR ASSEMBLY

Assembly Procedure

1. Attach a sling and hoist to the rotor assembly and mount the drive disk and fan assembly to the engine flywheel. See Figure 5-7. Tighten the capscrews to a torque of 120 to 200 ft-lb (163 to 271 N•m).

WARNING ***To prevent personal injury, use adequate lifting devices to support heavy components. Keep hands and feet clear while lifting.***

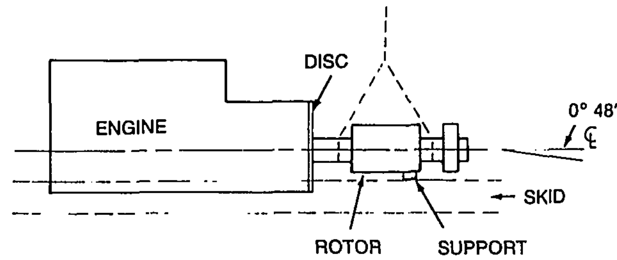


FIGURE 5-7. ROTOR INSTALLATION

2. Place a support under rotor (Figure 5-7), and remove sling from rotor assembly.

CAUTION ***Do not allow the rotor to hang unsupported for any extended period. Otherwise, drive disk damage can occur.***

3. Attach a sling and hoist to the stator assemby. Place stator in position over free end of rotor support rod and remove support from beneath rotor.

WARNING ***To prevent personal injury, use adequate lifting devices to support heavy components. Keep hands and feet clear while lifting.***

4. Guide the stator over rotor assembly and fasten to engine flywheel housing. Tighten the stator mounting capscrews to a torque of 65 to 70 ft-lb (88 to 95 N•m).
5. Attach a sling and hoist to the end bell assembly (includes exciter stator assembly). Apply a layer of Molykote grease, Onan #524-0118 on end bell bearing bore before mounting over bearing.

WARNING ***To prevent personal injury, use adequate lifting devices to support heavy components. Keep hands and feet clear while lifting.***

6. Install end bell assembly. Ensure rubber holding ring is not distorted while end bell is being positioned on rotor bearing. Rock the end bell assembly gently into place and pull up evenly with capscrews and washers. Tighten capscrews to a torque of 30 to 35 ft-lb (41 to 48 N•m).

7. Mount the generator support bracket as follows:

   A. Place shims in same position from which they were removed.
   B. Place the support bracket and all mounting bolts, studs, nuts, and washers in position. Confirm that all fasteners can mount without interference. In order for the bracket to support the weight of the generator properly, slight lifting of generator assembly may be required to fit the mounting bracket to the end bell.
   C. Tighten the mounting bolts and stud nuts to a torque of 195 to 200 ft-lb (264 to 271 N•m).

8. Install the upper and lower covers and air outlet screen onto stator assembly. Align holes and only snug tighten capscrews.
9. Using a sling and hoist, place the control cabinet onto generator stator. Align mounting holes of cabinet with those of upper and lower stator covers. Insert capscrews and lock washers and tighten securely.

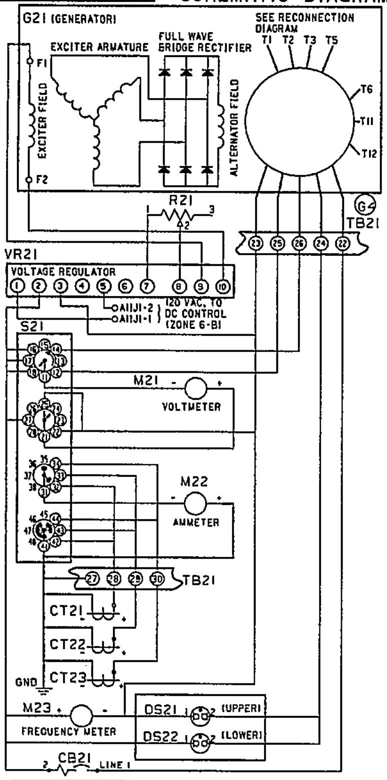
⚠WARNING ***To prevent personal injury, use adequate lifting devices to support heavy components. Keep hands and feet clear while lifting.***

10. Refer to Figure 5-2. Mount and adjust Mechanical Overspeed Switch or mount and adjust Magnetic Overspeed Sensor. Set to proper air gap.
11. Reconnect generator output leads to load connections, and all control wire leads and plug-ins to proper terminals or plug-in jacks. Refer to proper wiring diagram, and Voltage Connections, Figure 2-2.
12. Verify that all connections are proper and secure and then install the generator output box cover, and end bell cover. Secure all fasteners.
13. Connect the negative (-) battery cable and test the generator for operation.

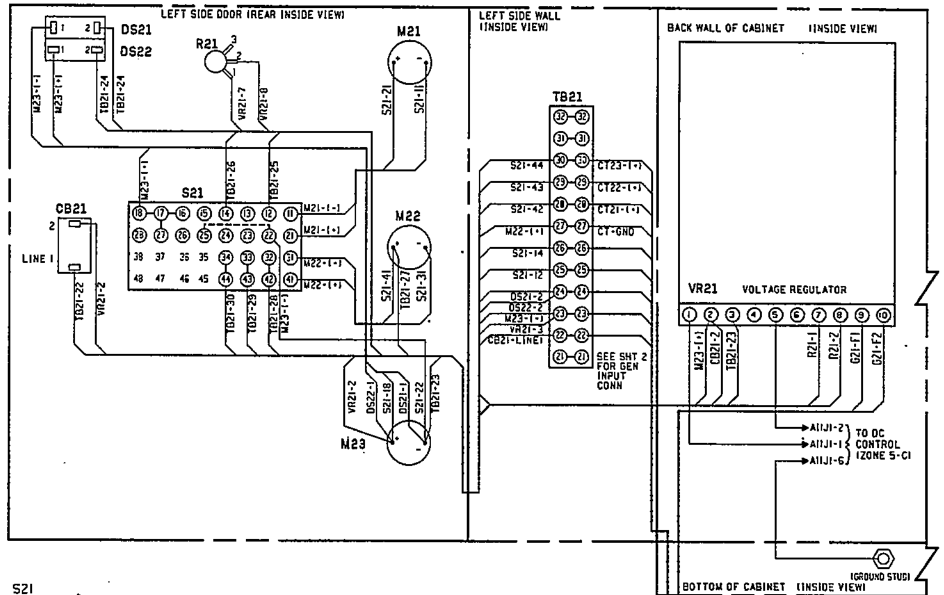
Section 6.
Wiring Diagrams

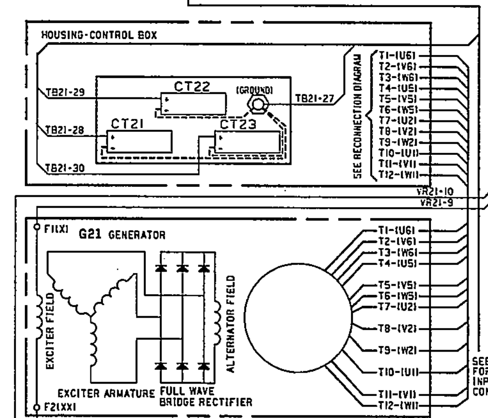
612-6269 SHT 1 OF 2 D

SCHEMATIC DIAGRAM



WIRING DIAGRAM





S21

POSITION	CONTACTS CLOSED			
L1-L2 3PH	11-18	21-25	31-32	41-43-44
L2-L3 3PH	11-12	21-25	31-33	41-42-44
L3-L1 3PH	11-12	21-27	31-34	41-42-43
L1-L0 3PH	11-14	21-27	31-35	41-42-43-44
OFF	11-14	21-28	31-36	41-42-43-44
L1-L2 1PH	11-16	21-22	31-32	41-43-44
L1-L2 1PH	11-16	21-22	31-33	41-42-44

(C1)

DASH NUMBERS	-01	-02	-03	-04	-05	-06	-07	-08	-09
QTY ( ) CT21-23	302-0868 (1)	302-0869 (1)	302-0746 (1)	302-0747 (1)	302-0748 (1)	302-0908 (1)	302-0909 (1)	302-0910 (1)	302-0911 (1)
M22	302-1683	302-1684	302-1685	302-1724	302-1725	302-1726	302-1727	302-1728	302-1729
AMMETER SCALE (M22)	(0-100,0-200)	(0-150,0-300)	(0-200,0-400)	(0-250,0-500)	(0-375,0-750)	(0-400,0-800)	(0-500,0-1000)	(0-600,0-1200)	(0-750,0-1500)

(H1)

DASH NUMBERS	-11	-12	-13	-14	-15	-16	-17	-18	-19
QTY ( ) CT21-23	302-0876 (3)	302-0625 (3)	302-0589 (3)	302-0644 (3)		302-0643 (3)	302-0644 (3)	302-0645 (3)	302-1073 (3)
M22	302-1728	302-1729	302-1798	302-1799		302-1728	302-1729	302-1798	302-1799
AMMETER SCALE (M22)	(0-600,0-1200)	(0-750,0-1500)	(0-1000,0-2000)	(0-1500,0-3000)		(0-600,0-1200)	(0-750,0-1500)	(0-1000,0-2000)	(0-1500,0-3000)

DASH NUMBERS	-31	-32	-33	-34	-35	-36			
QTY ( ) CT21-23	302-0608 (3)	302-0547 (3)	302-1090 (3)	302-0963 (3)	302-0643 (3)	302-1090 (3)			
M22	302-1725	302-1727	302-1725	302-1727	302-1728	302-1729			
AMMETER SCALE (M22)	(0-375,0-750)	(0-500,0-1000)	(0-375,0-750)	(0-500,0-1000)	(0-600,0-1200)	(0-750,0-1500)			

(D1) (G1) (E-1) (J1)

DASH NUMBERS	-51	-52	-53	-54	-55	-56	-57		
QTY ( ) CT21-23	302-1794-09 (3)	302-1794-09 (3)	302-1794-10 (3)	302-1794-11 (3)	302-1794-12 (3)	302-1794-13 (3)	302-1794-14 (3)		
M22	302-1726	302-1727	302-1728	302-1729	302-1798	302-1799	302-1800		
AMMETER SCALE (M22)	(0-400,0-800)	(0-500,0-1000)	(0-600,0-1200)	(0-750,0-1500)	(0-1000,0-2000)	(0-1500,0-3000)	(0-2000,0-4000)		

PARTS LIST

ITEM	REF DES	DESCRIPTION	DASH #
1		BOX WLDMT-CONTROL	ALL
2		ISOLATOR-VIBRATION	ALL
3		SCREW-HHC (5/16-18 X 3/8)	ALL
4		WASHER-LK (5/16)	ALL
5		GROMMET (3/4")	ALL
6		GROMMET (2")	ALL
7		RECEPTACLE-FASTENER	ALL
8		STUD-FASTENER	ALL
9		WASHER-STUD RTNR	ALL
10		CLIP-WIRE (5/8")	ALL
11		NUT-HEX W/ET (10-32)	ALL
12		NUT-HEX (1/4-20,UNC-2B)	ALL
13		WASHER-ET LK (1/4)	ALL
14		BOND STRAP	ALL
15		SCREW-HHC (5/16-18 X 1/2)	ALL
17		WASHER-EIT LK (5/16)	ALL
18		SCREW-RHM XREC W/IT (6-32 X 1/2)	ALL
20		SCREW-LK H (10-32 X 5/8)	ALL
21		DOOR WLDMT-CONTROL (LH)	ALL
22		SILKSCREEN-PNL FR (AC,VERT)	ALL
23		SILKSCREEN-PNL REAR (AC,VERT)	ALL
25		HARNESS AC (VERT)	ALL
29	CB21	CIRCUIT BREAKER-MAG (FIELD)	ALL
	CT21-23	TRANSFORMER ASSY-CUR	
30	DS21-22	LAMP ASSY (UPPER/LOWER SCALE)	ALL
	G21	GENERATOR	ALL
31	M21	VOLTMETER-AC (0-300, 0-600)	ALL
32	M22	AMMETER AC (SEE CHART)	
33	M23	METER-FREQUENCY (45-65 HZ)	ALL
38	R21	RHEOSTAT (VOLTS ADJUST)	ALL
39		KNOB-RHEOSTAT	ALL
40	S21	SWITCH-ROTARY (VOLT & AMMETER)	ALL
(25)	TB21	PART OF AC HARNESS (ILLUS #25)	ALL
41		MARKER STRIP	ALL
42		SCREW-RHM (6-32 X 5/8)	ALL
43	VR21	VOLTAGE REGULATOR	ALL
		LABEL-DANGER	ALL
		PARTS LIST-AC CONTROL	(-3),-32 -33,-34

(B1) (F1)

NOTES:

1. ALL COMPONENTS SHOWN IN THE DE-ENERGIZED POSITION.
2. ILLUSTRATION NUMBERS REFER TO DRAWING 539-074 [illegible]
3. LOCATE ONE (1) DANGER LABEL ON EXTERIOR AND ONE (1) ON INTERIOR OF LEFT SIDE DOOR IN ANY READILY VISIBLE AREA AVAILABLE. (F2)

ER NO.	LTR.	NO.	REVISION	ZONE	DR	CHKR	APPROVED	DATE
		2	SEE SHT 3	-	[illegible]	BG	[illegible]	[illegible]
29,813	J	1	ADD -35,-36	5-A	[illegible]	BG	[illegible]	[illegible]
28,311	H	1	ADD TAB FOR -11 THRU -19	6-A	[illegible]	[illegible]	PE	[illegible]
		4	DEL "T" DESIGNATION	[illegible]	DY	[illegible]	KLC	12-24-85
		3	SEE SHEET 3	-	DY	[illegible]	KLC	12-24-85
		2	SEE SHEET 2	-	DY	[illegible]	KLC	12-24-85
27,795	G	1	-31 SCALE WAS (0-400,0-800)	6A	DY	[illegible]	KLC	12-24-85
		2	ADD NOTE 3	2-C	[illegible]	[illegible]	PE	12-17-85
27,841	F	1	98-5307 WAS QTY 1	2-C	[illegible]	[illegible]	PE	12-17-85
		2	SEE SHEET 2	-	KS	MAJ	PE	11-26-85
27,351	E	1	ADDED -33,-34,-56,-57	5-A	[illegible]	MAJ	PE	11-26-85
		2	SEE SHT 2	-	[illegible]	[illegible]	PE	9-27-85
26,979	D	1	ADD MODEL BLOCKS -31,-32,-51 THRU -55	6-A	[illegible]	[illegible]	PE	9-27-85
		2	ADDED SHEET 2	-	[illegible]	DTC	PE	4-5-85
26,193	C	1	ADDED PART NOS. TO -06,-07,-08,-09	5-A	[illegible]	DTC	PE	4-5-85
25,051	B	1	RHEO KNOB QTY WAS 2 (#39)	2-C	LA	MAJ	SLS	12-26-84
24,354	A	1	PRODUCTION RELEASE	-	MM	LLN	SLS	5-15-84

CADD SYSTEM DWG

SIM TO 612-6267	D	NAME	DATE
DR		MAUREEN C. MANN	5-15-84
CHKR		L L NELSON	5-16-84
APPROVED		S L SWENSON	5-16-84

MODEL FIRST USED ON 50-250KW (50 & 60 HZ)

Onan — ONAN CORPORATION, MINNEAPOLIS, MINNESOTA

TITLE: WD-GEN SET AC CONT (VERT,MTR)

DWG NO. 612-6269 SHT 1 of 3 SIZE D

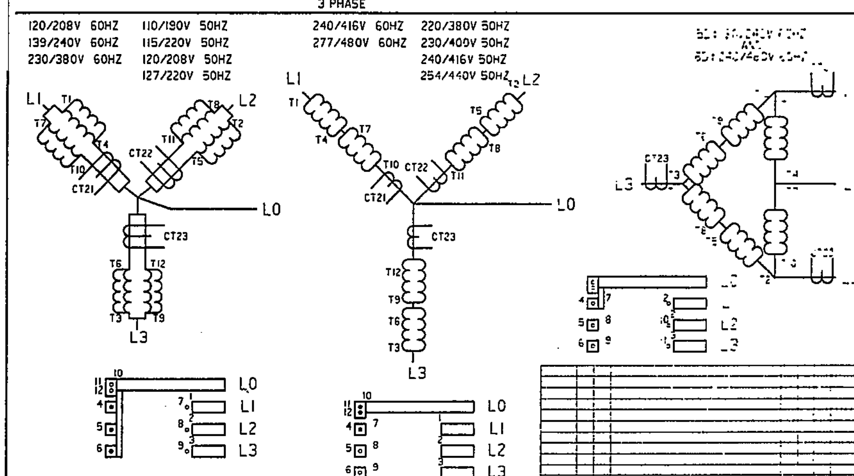
612-6269 D SHT 1 OF 2

612-6269 D

UV GENERATORS (J2)

4,4X,7,7X,8,9X

3 PHASE



VOLTAGE CODE							
CONT INPUT TB21		5D	6D	7			4,4X 7X 8,9X
22		T1	T1-X1	T7			T7
23		T2	T2-X1	T8			T8
24		–	–	–			T4
25		T3	T3-X1	T9			T9
26		T4	T1,2,3-X2	T10			T10
JUMPER		23-24	22-24	–			–

ER NO.	LTR.	NO.	REVISION				DATE
28,813	J	12	ADD UV GENERATOR CONNECTIONS	–	MAC BG		10-3-86
27,795	G	13	ADDED SHEET 3	–	CY EE	GLC	13-25-86

CADD SYSTEM DWG

SIM TO 612-6257 D

COPIED FROM

612-6269 D

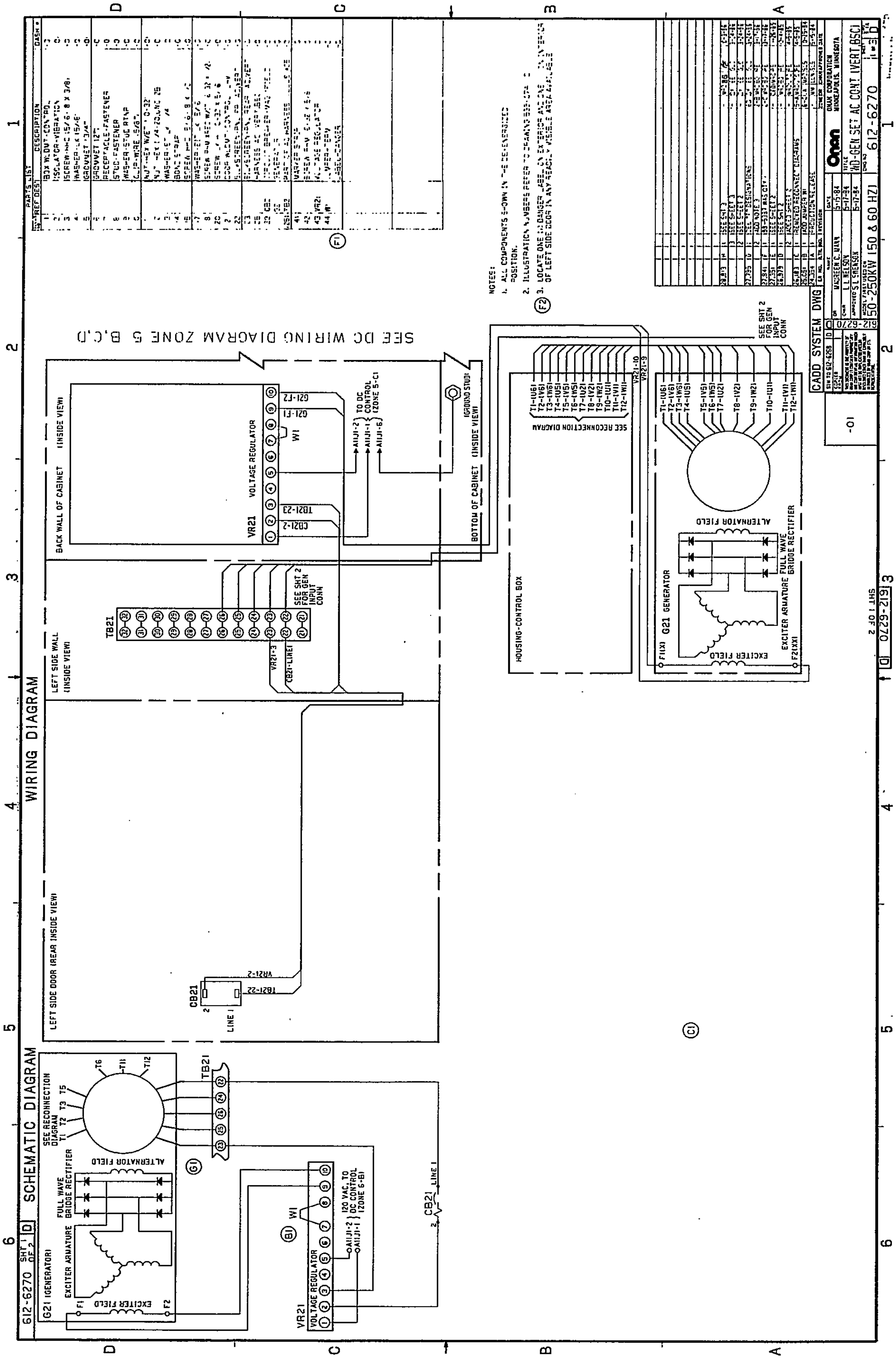
	NAME	DATE
DR	D. YOUNG	3-21-86
CHKR	E. ENGLE	4-1-86
APPROVED	G. L. CARLSON	4-1-86

MODEL FIRST USED ON 50KW (60 HZ)

Onan ONAN CORPORATION MINNEAPOLIS, MINNESOTA

TITLE WD-GEN SET AC CONT (VERT,BSC)

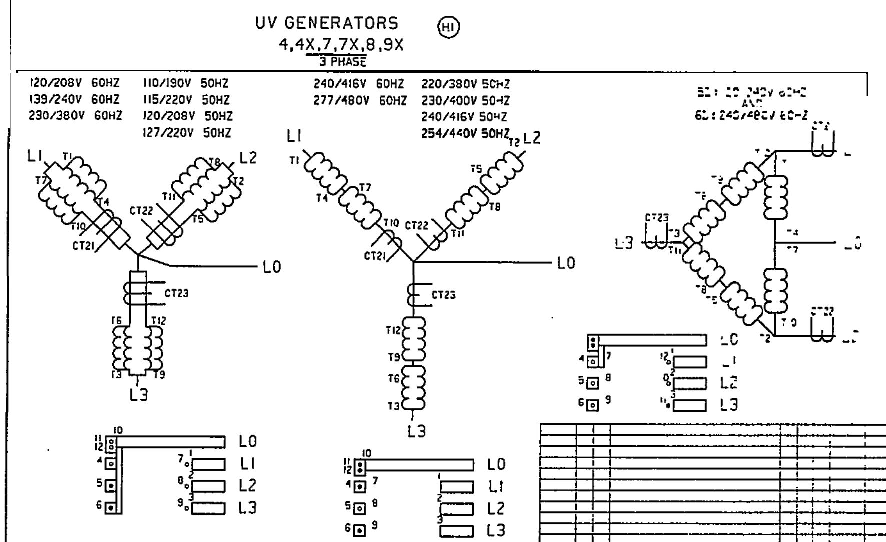
DWG NO 612-6269 SHEET 3 of 3 SIZE D



WIRING DIAGRAM
SCHEMATIC DIAGRAM
SEE DC WIRING DIAGRAM ZONE 5 B,C,D
BACK WALL OF CABINET (INSIDE VIEW)
LEFT SIDE WALL (INSIDE VIEW)
LEFT SIDE DOOR (REAR INSIDE VIEW)
BOTTOM OF CABINET (INSIDE VIEW)
VOLTAGE REGULATOR
VR21
TB21
CB21
LINE 1
G21 GENERATOR
EXCITER ARMATURE
EXCITER FIELD
ALTERNATOR FIELD
FULL WAVE BRIDGE RECTIFIER
SEE RECONNECTION DIAGRAM
HOUSING-CONTROL BOX
SEE SHT 2 FOR GEN INPUT CONN
TO DC CONTROL (ZONE 5-C1)
120 VAC. TO DC CONTROL (ZONE 6-B1)
GROUND STUD
NOTES:
1. ALL COMPONENTS SHOWN IN THE DE-ENERGIZED POSITION.
PARTS LIST
CADD SYSTEM DWG
ONAN CORPORATION MINNEAPOLIS, MINNESOTA
50-250KW 150 & 60 HZ
612-6270
SHT 1 OF 2

6-5

612-6270 D



VOLTAGE CODE							
CONT INPUT TB21		5D	6D	7			4,4X 7X 8,9X
22		T1	T1-X1	T7			T7
23		T2	T2-X1	T8			T8
24		–	–	–			T4
25		T3	T3-X1	T9			T9
26		T4	T1,2,3-X2	T10			T10
JUMPER		23-24	22-24	–			–

612-6270 D

ER NO.	LTR.	NO.	REVISION				DATE
28,913	H	11	ADD UV GENERATOR CONNECTIONS	–		BG	10-3-86
27,795	G	3	ADDED SHEET 3	–			

CADD SYSTEM DWG

SIM TO 612-6268 D

COPIED FROM

612-6270 D

	NAME	DATE
DR	D. YOUNG	3-21-86
CHKR	E. ENGLE	4-1-86
APPROVED	G L. CARLSON	4-1-86

MODEL FIRST USED ON 50-250KW (50 & 60 HZ)

Onan — ONAN CORPORATION, MINNEAPOLIS, MINNESOTA

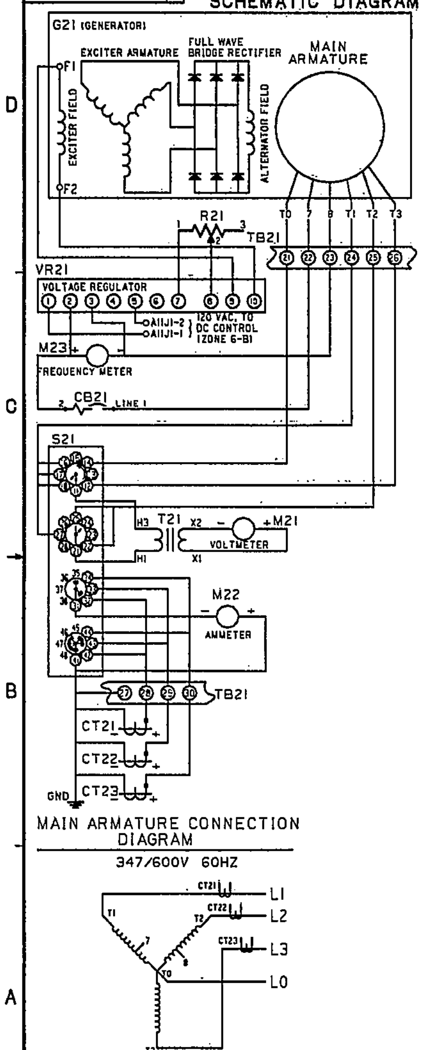
TITLE WD-GEN SET AC CONT (VERT.BEC)

DWG NO 612-6270 SHEET 3 of 3 D

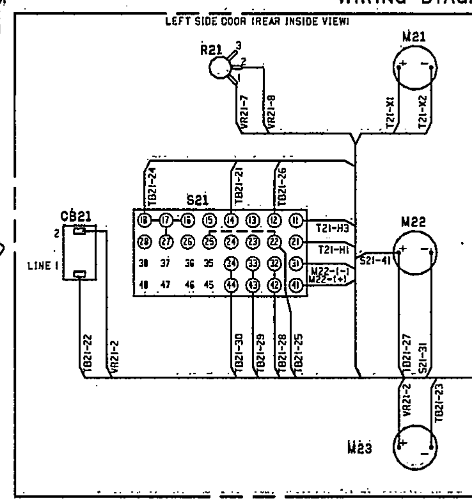
MICROFILMED

612-6414 D

SCHEMATIC DIAGRAM

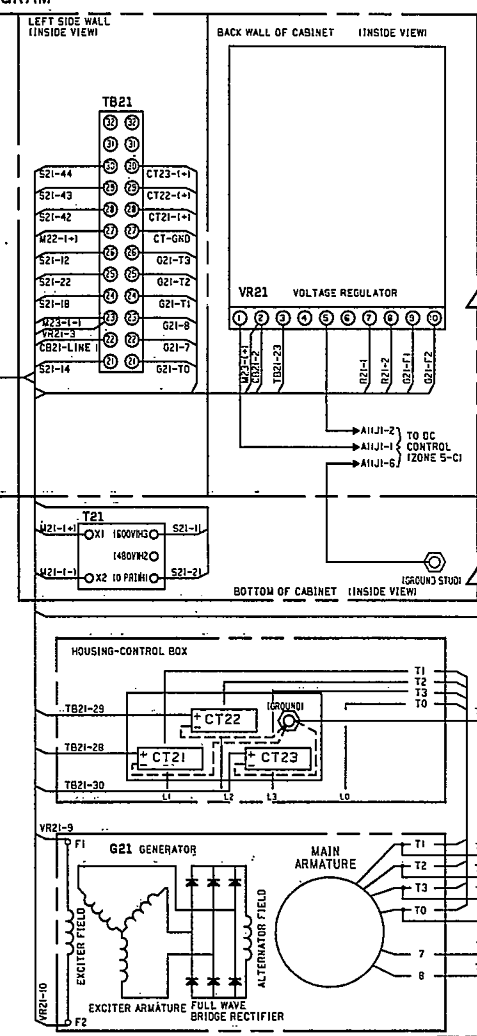


WIRING DIAGRAM



S21

POSITION	CONTACTS CLOSED			
L1-L2 3PH	11-18	21-25	31-32	41-43-44
L2-L3 3PH	11-12	21-25	31-33	41-42-44
L3-L1 3PH	11-12	21-27	31-34	41-42-43
L1-L0 3PH	11-14	21-27	31-35	41-42-43-44
OFF	11-14	21-28	31-36	41-42-43-44
L1-L2 3PH	11-16	21-22	31-32	41-43-44
L1-L2 3PH	11-16	21-22	31-33	41-42-44



SEE DC WIRING DIAGRAM ZONE 5-B,C,D

PARTS LIST

NO.	REF DES	DESCRIPTION	DASH #
1		BOX WLDMT-CONTROL	ALL
2		ISOLATOR-VIBRATION	ALL
3		SCREW-HHC (5/16-18 X 3/8)	ALL
4		WASHER-LK (5/16)	ALL
5		GROMMET (3/4")	ALL
6		GROMMET (2")	ALL
7		RECEPTACLE-FASTENER	ALL
8		STUD-FASTENER	ALL
9		WASHER-STUD RTNR	ALL
10		CLIP-WIRE (5/8")	ALL
11		NUT-HEX W/ET (10-32)	ALL
12		NUT-HEX (1/4-20,UNC-2B)	ALL
13		WASHER-ET LK (1/4)	ALL
14		BOND STRAP	ALL
15		SCREW-HHC (5/16-18 X 1/2)	ALL
17		WASHER-EIT LK (5/16)	ALL
18		SCREW-RHM XREC W/ET (6-32 X 1/2)	ALL
20		SCREW-LK H (10-32 X 5/16)	ALL
21		DOOR WLDMT-CONTROL (LH)	ALL
22		SILKSCREEN-PNL FR (AC,VERT)	ALL
23		SILKSCREEN-PNL REAR (AC,VERT)	ALL
25		HARNESS-AC (VERT)	ALL
29	CB21	CIRCUIT BREAKER-MAG FIELD	ALL
	CT21-23	TRANSFORMER ASSY-CUR	
30	DS21-22	LAMP ASSY	ALL
	G21	GENERATOR	ALL
31	M21	VOLTMETER-AC (0-750)	ALL
32	M22	AMMETER-AC (SEE CHART)	
33	M23	METER-FREQUENCY	ALL
38	R21	RHEOSTAT (VOLTS ADJUST)	ALL
39		KNOB-RHEOSTAT	ALL
40	S21	SWITCH-ROTARY (VOLT & AMMETER	ALL
(25)	TB21	PART OF AC HARNESS (ILLUS #25)	ALL
41		MARKER STRIP	ALL
42		SCREW-RHM (6-32 X 5/8)	ALL
43	VR21	VOLTAGE REGULATOR	ALL
44		LABEL-DANGER	ALL
45	T21	TRANSFORMER	ALL
46		SCREW-RHM (#8-32 X.38)	ALL
47		WASHER-EIT LK (#8)	ALL

C1 B1

NOTES:

1. ALL COMPONANTS SHOWN IN THE DE-ENERGIZED POSITION.
2. ILLUSTRATION NUMBERS REFER TO DRAWING 539-074 (C).
3. C2 LOCATE ONE (1) DANGER LABEL ON EXTERIOR & ONE (1) ON INTERIOR OF LEFT SIDE DOOR IN ANY READILY VISIBLE AREA AVAILABLE.

ER NO.	LTR.	INCL	REVISION	ZONE	DR	CHKR	APPROVED	DATE
		2	MODEL WAS 45-225KW, DR GEN	2A	CY	[illegible]		5-13-86
28,156	D	1	ADDED NOTE 4	2B	CY	[illegible]		5-5-86
		2	ADD NOTE 3	2-B	WMC	SG	PE	3-7-86
27,841	C	1	ADD 98-5387 (2) QTY 2	2-C	WMC	SG	PE	3-7-86
27,238	B	1	T21 WAS 315-0595	2-C	CY	EE	DK	11-2-85
26,972	A	1	PRODUCTION RELEASE	-	CY	CY	DK	10-17-85

CADD SYSTEM DWG

SIM TO 612-6311 D

	NAME	DATE
DR	D. YOUNG	10-15-85
CHKR	D. YOUNG	10-17-85
APPROVED	D. KOENIG	10-17-85

MODEL FIRST USED ON: 250-350 KW 347/600V 60 HZ
YD GEN (VOLTAGE CODE 9T)

Onan ONAN CORPORATION MINNEAPOLIS, MINNESOTA

TITLE: WD-GEN SET AC CONT (VERT,MTR)

DWG NO 612-6414 SHEET 1 of 1 SIZE D

D2

MICROFILMED

Onan

Onan Corporation
1400 73rd Avenue N. E.
Minneapolis, MN 55432
612-574-5000
Telex: 275477
Fax: 612-574-8087