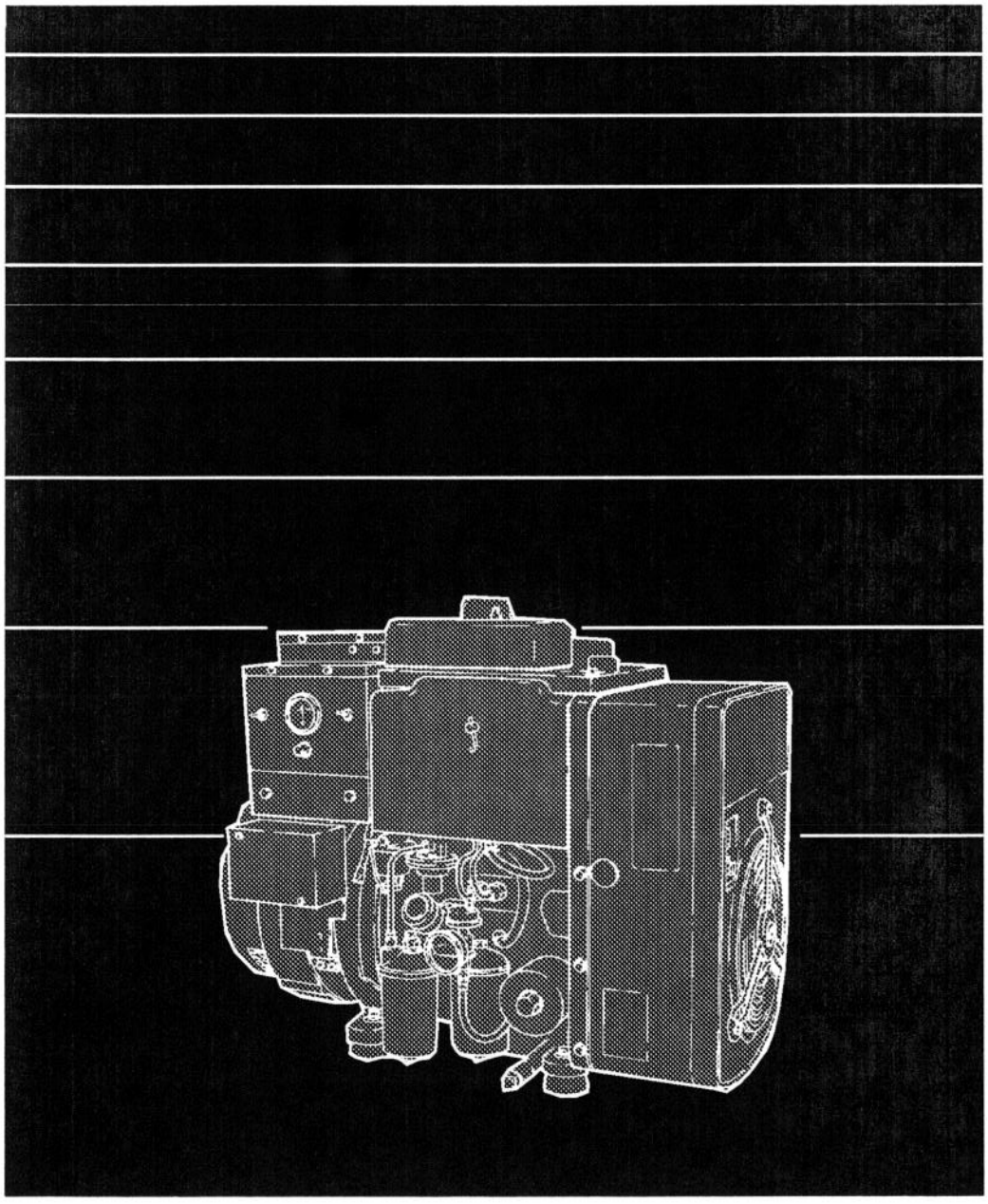
Cummins

Onan

Service Manual

DJB
DJC
DJE
GENERATOR SETS



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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, explosion, and personal injury or death 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, arcing equipment, 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 away from enclosed or sheltered areas and areas where individuals are likely to congregate. 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.

KEEP THIS MANUAL NEAR THE GENSET FOR EASY REFERENCE

1. Introduction

ABOUT THIS MANUAL

This service manual includes a guide for engine and generator troubleshooting. Engine service instructions are in the applicable engine service manual. Operating and maintenance instructions are in the applicable Operator's Manual.

This manual does not have instructions for servicing printed circuit board assemblies. After determining that a printed circuit board assembly is faulty, replace it. Do not repair it. Attempts to repair a printed circuit board can lead to costly damage to the equipment.

This manual contains basic (generic) wiring diagrams and schematics that are included to help in troubleshooting. Service personnel should use the actual wiring diagram and schematic shipped with each unit. The wiring diagrams and schematics that are maintained with the unit should be updated when modifications are made to the unit.

Read ***Safety Precautions*** and carefully observe all instructions and precautions in this manual.

HOW TO OBTAIN ASSISTANCE

When seeking additional service information or replacement parts, always give the complete model and serial number as shown on the genset data tag or nameplate. The genset data tag or nameplate is on the A.C. output box.

TEST EQUIPMENT

Most of the test procedures in this manual can be performed with a multimeter like the Simpson Model 260 VOM, or a digital VOM. Other instruments that should be available are:

AC Voltmeter
DC Voltmeter
Frequency Meter
Jumper Leads
Load Test Panel
Variac
Tachometer or Strobotach
Megger or Insulation Resistance Meter
Wheatstone Bridge or Digital Ohmmeter

⚠WARNING ***Improper service can lead to equipment damage, severe personal injury or death. Service must be performed by qualified persons who know about fuel, electrical and mechanical hazards. Read the safety precautions page and carefully observe all instructions and precautions in this manual.***

2. AC Control

GENERAL

This section describes the AC control components of the genset. The AC control box, which contains the AC controls and components, is mounted on top of the control panel assembly (Figure 2-1).

AC CONTROL BOX CONTROLS

Field Circuit Breaker (CB21) The field circuit breaker protects the generator from prolonged over-excitation.

Output Voltage Trimmer (R21) (Optional) The output voltage trimmer can be used to adjust output voltage plus or minus five percent of nominal voltage.

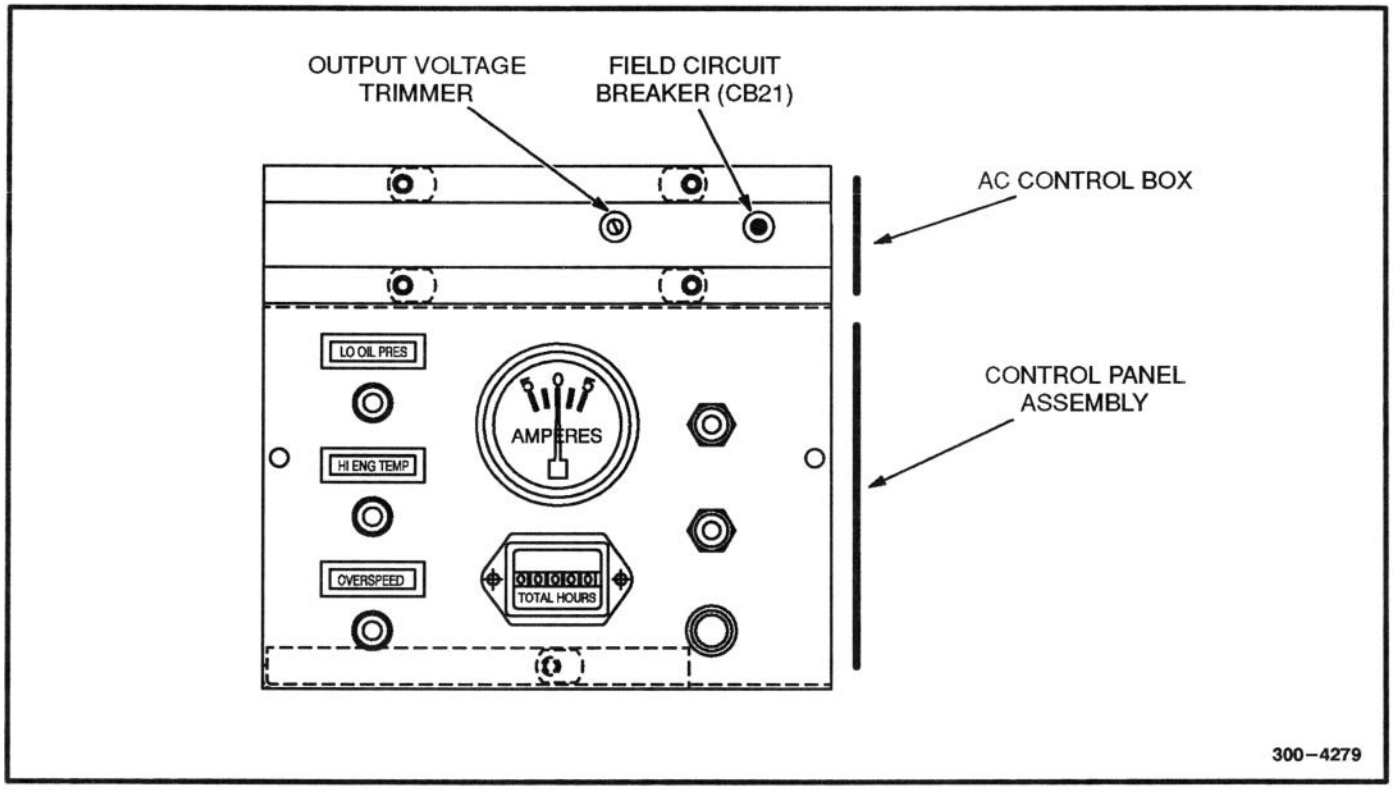


FIGURE 2-1. AC CONTROLS

OPTIONAL AC CONTROL COMPONENTS (HOUSED UNITS ONLY)

The optional control panel (Figure 2-2) used on housed units only (DJC and DJE), has the following components.

AC Voltmeter (M1). The voltmeter indicates output voltage for the phase selected.

Voltmeter Phase Selector Switch (S1). Selects the phase of the generator output voltage to be measured.

Running Time Meter (M5). This meter indicates the accumulated number of hours the set has run.

Frequency Meter (M6). Indicates the frequency of the output voltage in hertz. It can be used to check engine speed (30 rpm-produces one hertz).

AC Ammeter (M2, M3, M4). The ammeter indicates output amperage for each phase. The third ammeter is used on three phase units only.

Line Circuit Breaker (CB1). Protects generator from line overloads.

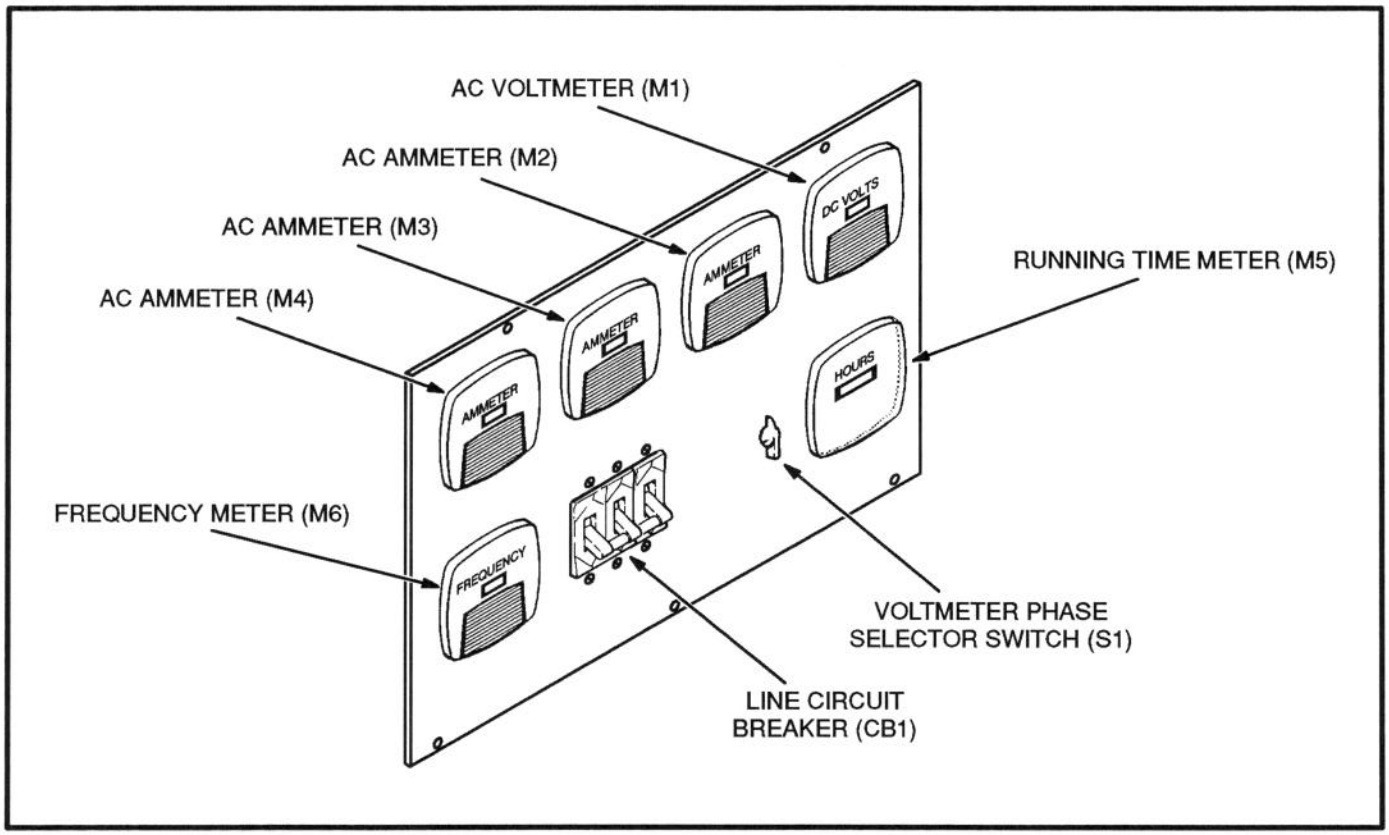


FIGURE 2-2. AC METER PANEL

AUTOMATIC VOLTAGE REGULATOR (AVR) ADJUSTMENTS

The voltage regulator controls the output of the generator so that a constant voltage is maintained under varying load conditions. There are two types of automatic voltage regulators used on these sets, which are shown in Figures 2-3 and 2-4. For reference purposes only, they are identified as **AVR-A** and **AVR-B.**

The automatic voltage regulator is mounted inside of the AC control box. It can be adjusted by means of the potentiometer (pot) shown in Figure 2-3 and 2-4. Figures 2-5 and 2-6 show typical voltage regulating circuits.

These measurements and adjustments are done while the set is running and require access to uninsulated high voltage parts in the control and power output boxes.

⚠ DANGER ***HAZARDOUS VOLTAGE Touching uninsulated live parts inside the control and power output boxes can result in severe personal injury or death. Measurements and adjustments must be done with care to avoid touching uninsulated live parts.***

For your protection, stand on a dry wooden platform or rubber insulating mat, make sure your clothing and shoes are dry, remove jewelry from your hands and use tools with insulated handles.

Voltage Adjustments (AVR-A and B)

Use the control panel mounted output voltage trimmer (see Figure 2-1), if provided, for small voltage adjustments. Measure generator output voltage while the set is running without load at the nominal frequency. If the trimmer does not provide enough adjustment, set it at its midpoint. Then turn the **VOLTS ADJUST** pot (Figure 2-3 or 2-4) until rated voltage is obtained. Turn clockwise to increase output voltage; counterclockwise to decrease output voltage.

Voltage Stability Adjustment (AVR-A Only)

Voltage stability is set at the factory, but if printed circuit board AVR-A has been replaced or if damping potentiometer **R27** has been unnecessarily adjusted it may be necessary to reset stability. Set stability as follows.

1. With generator set running at no load, turn potentiometer **R27** (Figure 2-3) to a position where voltage tends to be unstable or hunt.
2. Turn **R27** clockwise slowly until voltage first stabilizes. This setting will result in stable voltage under all conditions in maximum voltage regulator response time.

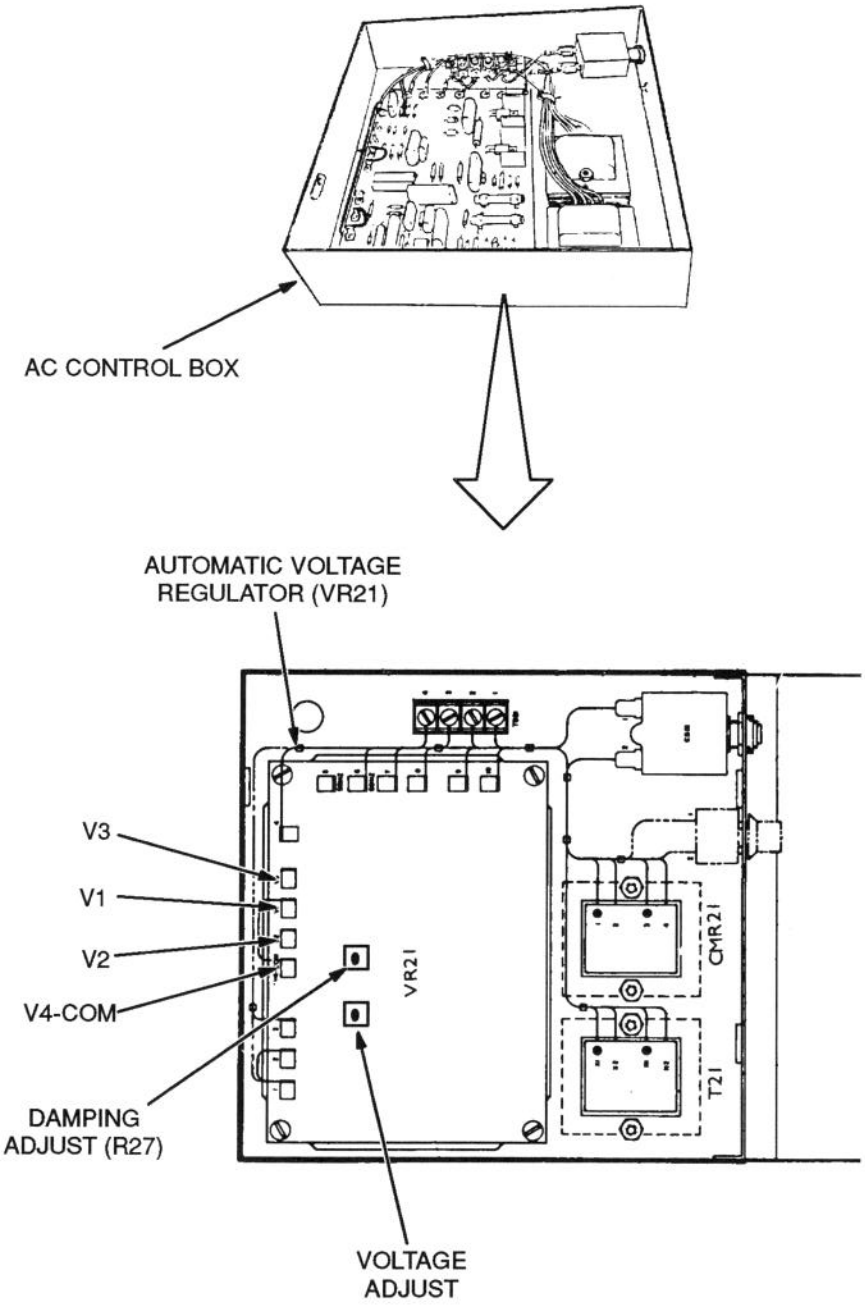


FIGURE 2-3. AVR-A VOLTAGE REGULATOR

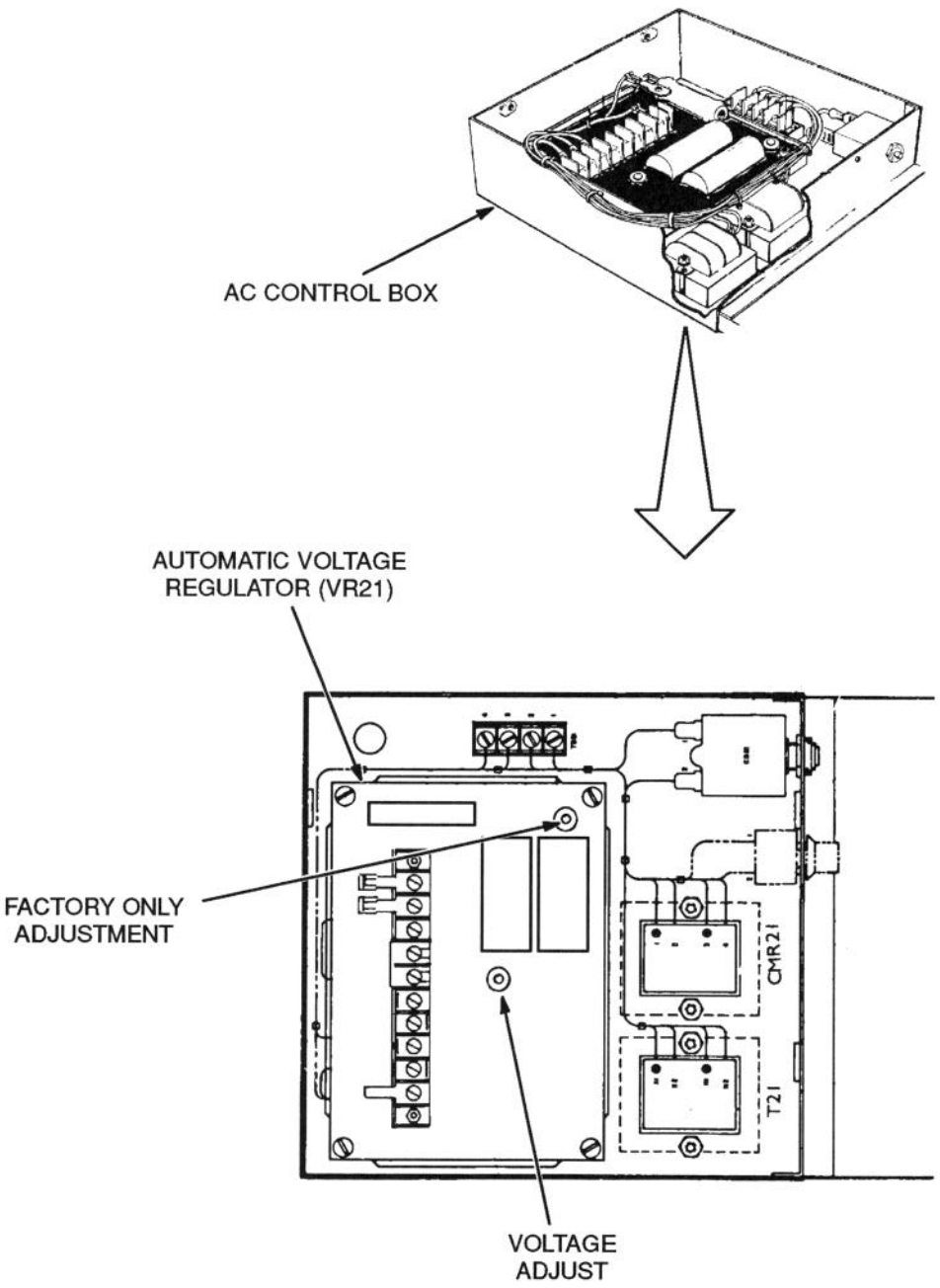
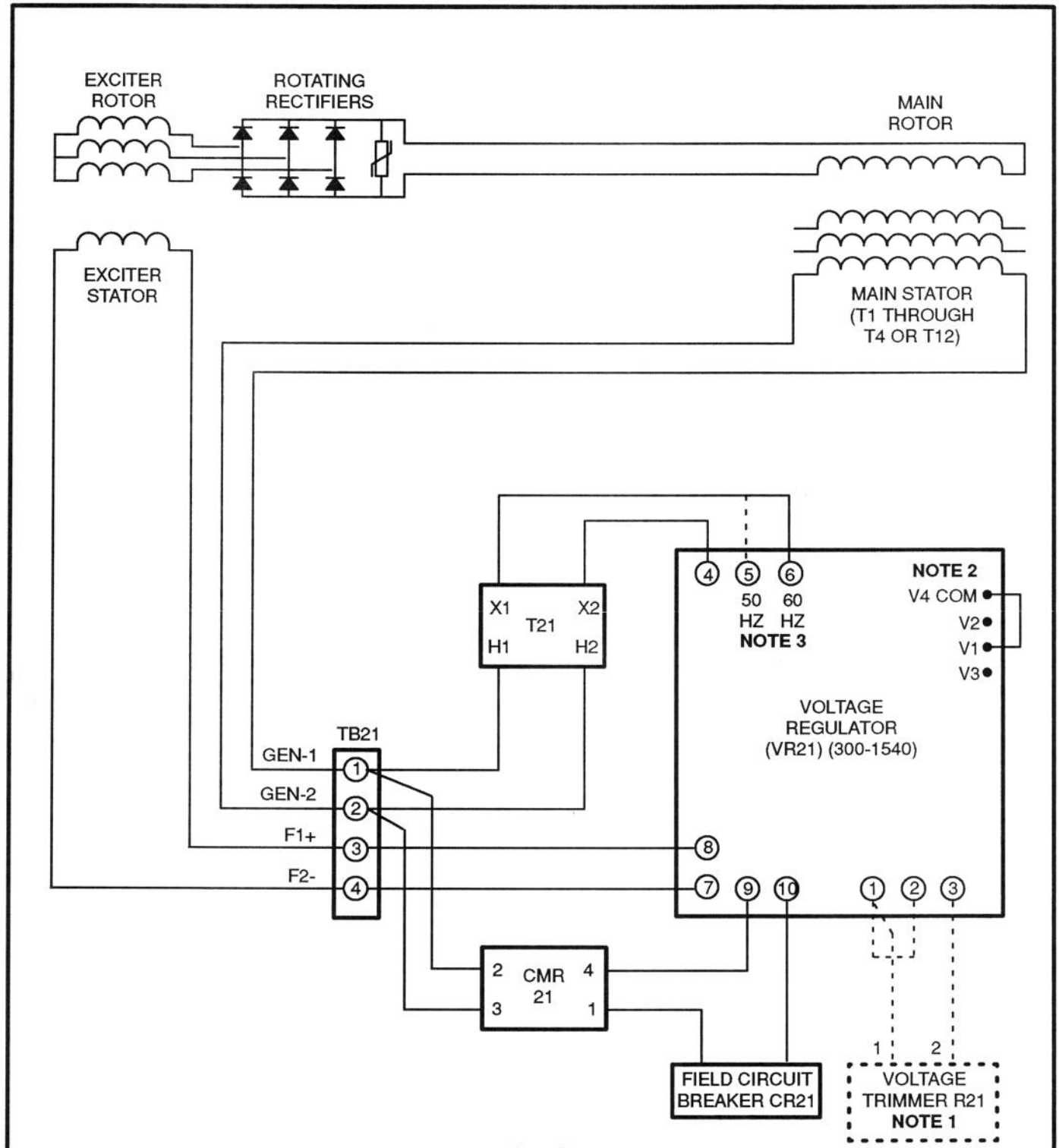


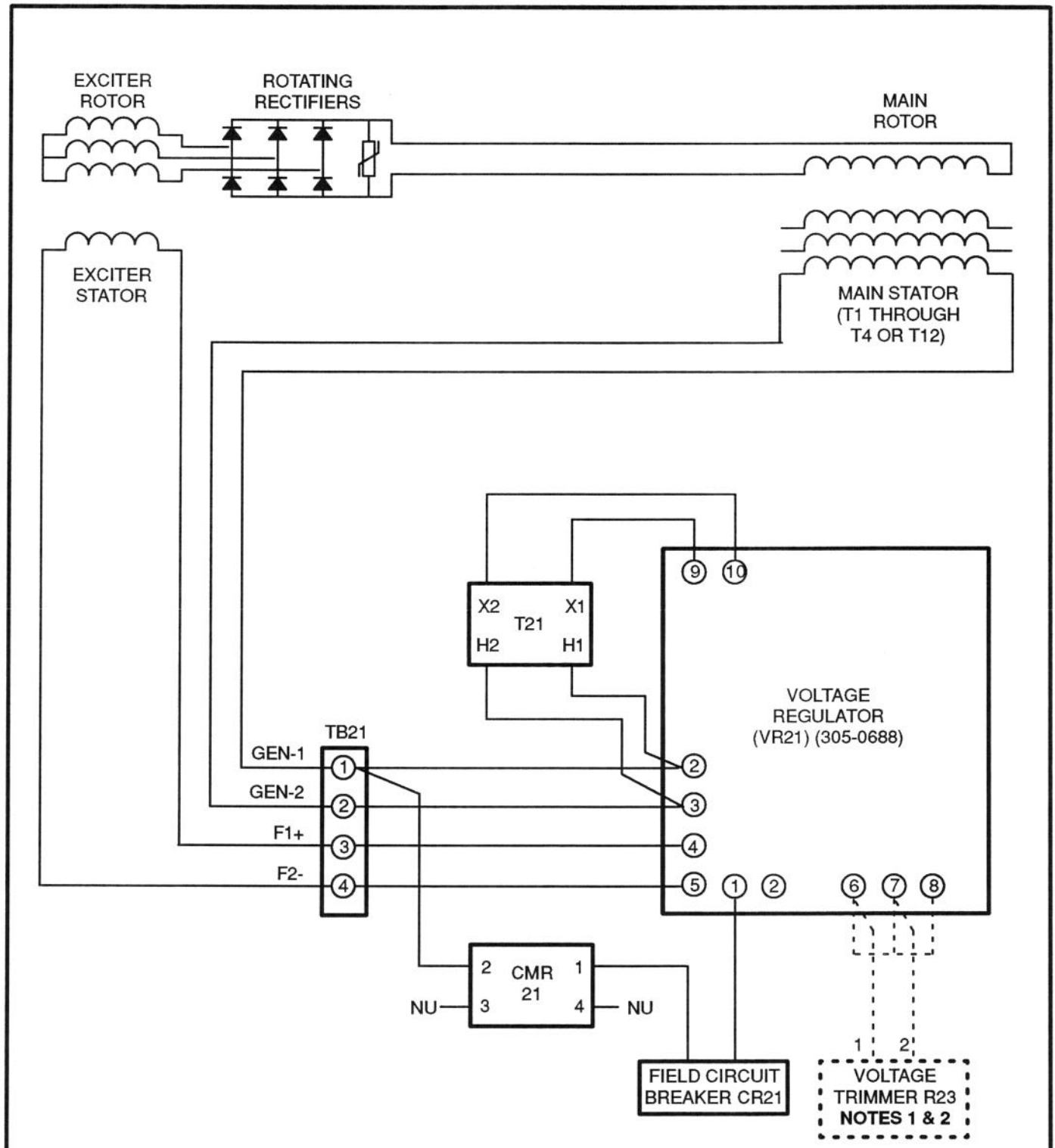
FIGURE 2-4. AVR-B VOLTAGE REGULATOR



— NOTES —

1. Without voltage adjust option: connect jumper from VR21-1 to VR21-2. With Voltage adjust option: connect R21 to VR21-1 & VR21-3. Remove jumper.
2. Connect jumper from V4-COM to V1, 2 or 3 according to voltage reconnecting diagram. Applies to 300-1540 only.
3. 60 Hz operation: connect T21-X1 to VR21-6. 50 Hz operation: connect T21-X1 to VR21-5. Generators are not 50/60 Hz reconnectable.

FIGURE 2-5. VOLTAGE REGULATING CIRCUIT USING AVR-A (P/N 300-1540)



— NOTES —

1. For 50 Hz operation, jumper is required between TB1-7 & TB1-8. Not required for 60 Hz. Generators are not 50/60 Hz reconnectable.
2. Without voltage adjust option: connect jumper from TB1-6 to TB1-7. With voltage adjust option: connect R23 to TB1-6 & TB1-7. Remove jumper.

FIGURE 2-6. VOLTAGE REGULATING CIRCUIT USING AVR-B (P/N 305-0688)

PRINCIPLE OF GENERATOR OPERATION

1. The generator field (main rotor) is rotated by the engine to induce output current (AC) in the main stator windings.
2. Generator output current is proportional to field strength, which is varied to match the load. Output voltage and frequency are held constant by the voltage regulator and engine governor, respectively.
3. Generator field strength is proportional to field current, which is supplied by the exciter.
4. The exciter field (stator) induces current in the exciter rotor windings. A full wave rectifier bridge (rotating rectifiers) mounted on the exciter rotor converts exciter output (3-phase AC) to DC. The exciter rotor is mounted on the main rotor shaft.
5. Exciter output current is proportional to exciter field current.
6. The automatic voltage regulator (AVR) regulates exciter field current by comparing generator output voltage and frequency with reference values.
7. The exciter field current is supplied by the generator stator through the voltage regulator. Residual field magnetism in the exciter rotor and a permanent magnet embedded in one exciter stator field pole, initiate "self-excitation" during startups.

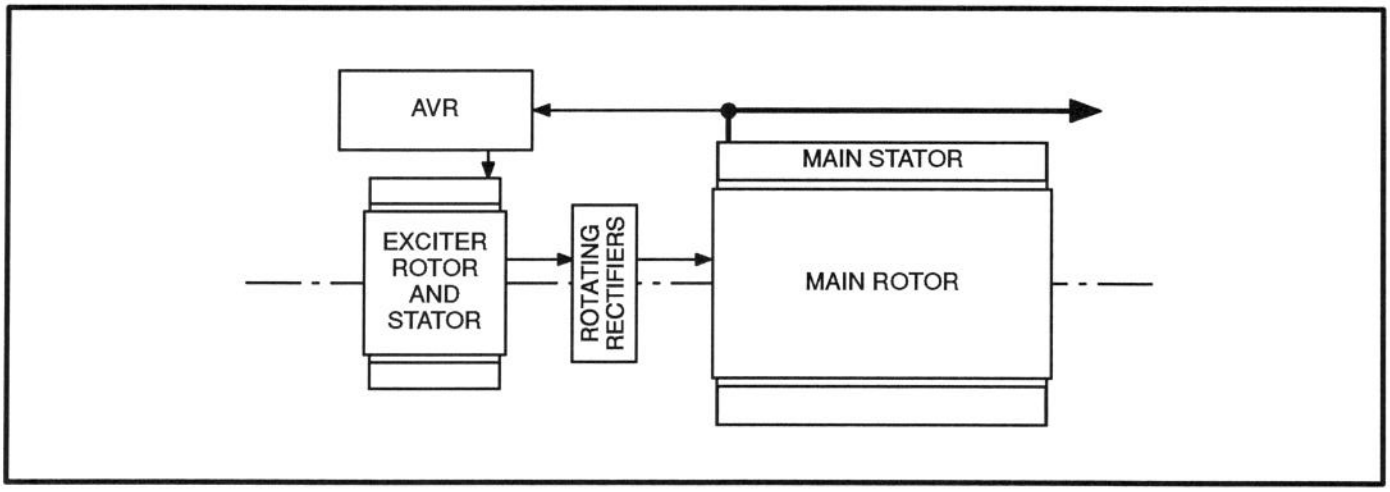


FIGURE 2-6. SCHEMATIC OF GENERATOR OPERATION

3. Engine Control

GENERAL

This section describes the engine control system. The control system includes all the functions that relate to the operation of the engine. This includes starting and stopping, instrumentation, monitoring for fault conditions, and battery charging. Note that the genset can be configured with either the standard control panel (Figure 3-1) or the optional deluxe control panel (Figure 3-2).

STANDARD CONTROL PANEL COMPONENTS

Start / Stop Switch (S11): This switch is a single-pole, double-throw (SPDT) rocker type switch used for starting and stopping the generator set.

Holding the switch in the Start position will initiate engine cranking. When the engine reaches approximately 900 rpm, the starter motor will automatically disengage, preventing starter motor damage. The switch will automatically return to the center (Run) position when released.

Pushing the switch to the Stop position will initiate the stop function.

Preheat Switch (S13): Holding the switch in the Preheat position energizes the manifold heater and glow plugs for cold diesel engine starting.

DC Ammeter (M21): The DC ammeter indicates the rate in amperes at which the battery is being charged.

Running Time Meter (M12): This meter indicates the accumulated number of hours the set has run.

Common Fault Circuit Breaker (CB4): This fault circuit breaker shuts down the engine by de-energizing fuel solenoid K1, when any fault shutdown switch functions (contacts close). A fault shutdown is indicated when the breaker reset button extends out past normal. Push the button to restore operation (after the engine has been properly serviced).

Fuse (F1): A 10-ampere fuse that provides protection to the control box wiring and remote wiring from short circuits or overload.

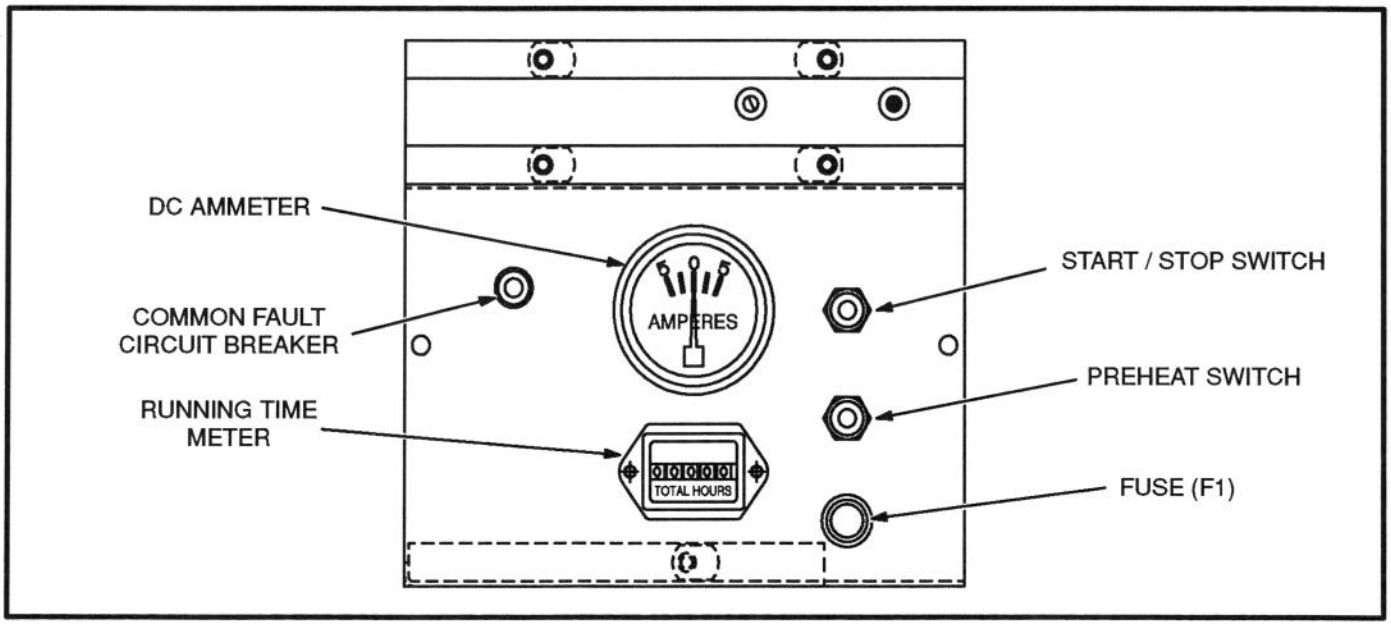


FIGURE 3-1. STANDARD CONTROL PANEL

DELUXE CONTROL PANEL COMPONENTS

The deluxe control panel (Figure 3-2) has the following fault indicators and circuit breakers in addition to the standard control panel controls.

Start / Stop / Test Switch (S11): In addition to the Start / Stop function provided on the standard control panel, a test position is provided on the deluxe control panel. In the Stop / Test position, this switch will light all fault indicator lamps on the deluxe control panel and the corresponding lamps on the remote annunciator panel. (Replace lamps that do not light.) The remote signals that are tested via the Test switch are LOP, HET, OS and Common Alarm. The LET and generating signals are not tested.

Individual Fault Circuit Breakers (CB4, CB5, CB6). An individual fault circuit breaker is provided in connection with each fault shutdown switch to shut down the engine (de-energize fuel solenoid (K1) when the contacts of a fault switch close. Each breaker is identified according to fault by the fault indicator next to it on the panel. Fault shutdown is indicated when the fault indicator lights and the breaker reset button extends out past normal. Push the button to restore operation (after the engine has been properly serviced).

Fault Indicator Lamps. An individual fault lamp is provided in connection with each fault shutdown switch to indicate the following fault conditions.

- **Low Oil Pressure.** This lamp indicates that the engine has shut down due to low oil pressure (less than 14 psi ±2 psi).
- **High Engine Temperature.** This lamp indicates that the engine has shut down due to high temperature (greater than 375° F [190.5° C]).
- **Overspeed.** This lamp indicates that the engine has shut down due to an overspeed condition (2100-2200 RPM 60 Hz, 1800-1900 RPM 50Hz).

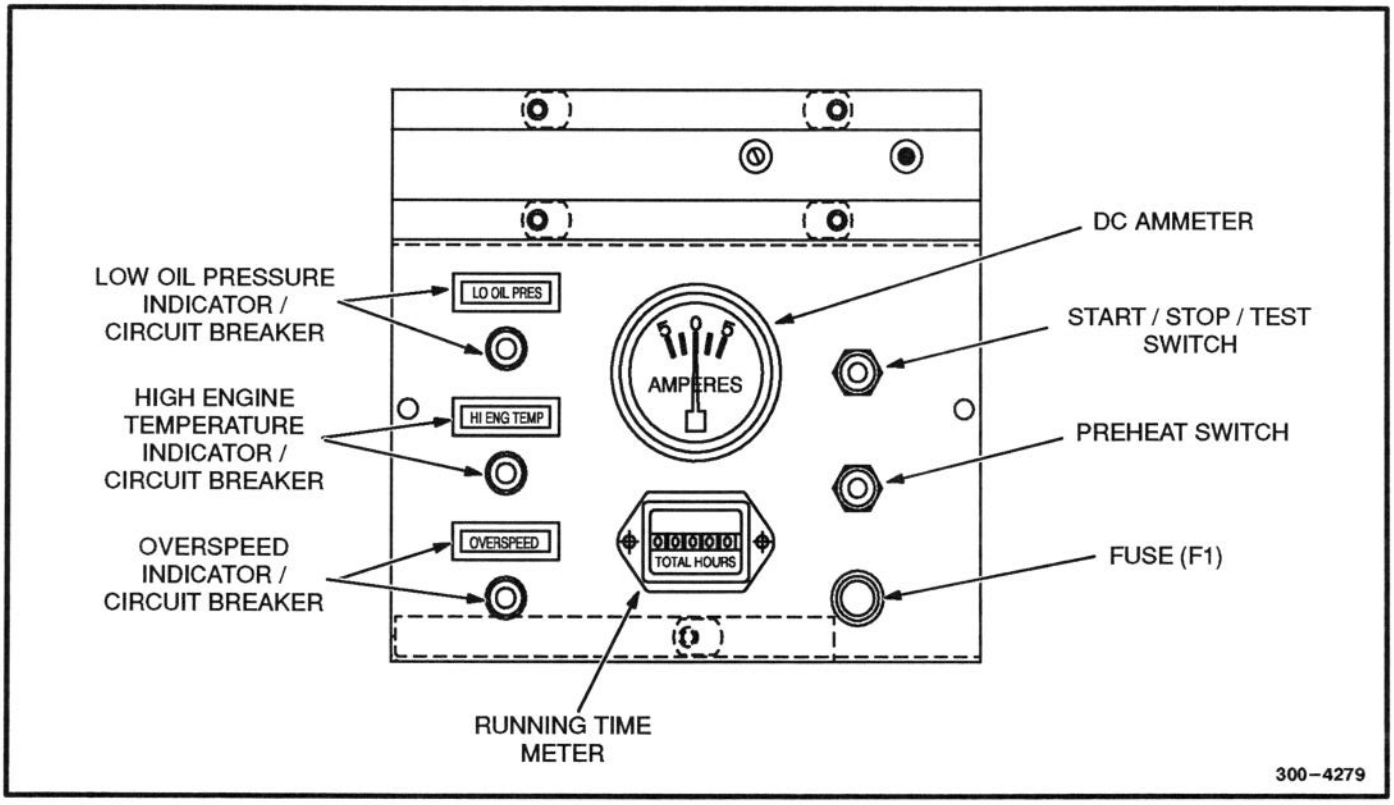


FIGURE 3-2. DELUXE CONTROL PANEL

SEQUENCE OF OPERATION

The sequence of operation is as follows. Refer to the schematic on Page 6-4 or 6-6, as appropriate.

1. For cold engine starting, engage the **Preheat** switch **S13**. Holding **S13** in the **Preheat** position closes contacts 2-3 which energizes relay **K13** (Preheat). This action connects battery B+ to the manifold and glow plug heaters **HR1-5**.
2. The start circuit is completed by the panel **Start** switch contacts 2-3, or automatically by a remote controller connected at terminal **TB11-3**.

   This action energizes **K11** (Start Solenoid) via NC contacts of relay **K15** (Start Disconnect) and also energizes **K13** (Preheat) via jumper located between terminals **TB11-3** and **TB11-H**.

   ⚠ CAUTION ***If the remote controller contains a preheat switch, remove jumper between terminals TB11-3 and TB11-H. If the jumper is not removed, the preheat switch will also start the genset.***

   If a remote preheat switch is not used, do not remove the jumper. With the jumper installed, the remote start switch will energize the preheat circuitry during the start mode.
3. Relay **K11** has two sets of NO contacts that perform the following functions when energized.
   a. One set connects battery B+ to the starter motor shift solenoid **B1**. Engine cranking begins.
   b. The other set energizes relay **K12** (Run). Relay **K12** connects B+ to the fuel solenoid **K1** and optional fuel tank solenoid **K2**.
4. The engine starts and runs up to governed speed in a matter of seconds.
5. When the engine speed reaches approximately 900 RPM, the centrifugal switch **S1** closes and energizes relay **K15**.
6. Relay **K11** is de-energized (by relay **K15**) which disconnects the battery B+ to the starter motor.
7. Deluxe Control Panel only: Relay **K17** is powered by the generator output voltage (120 VAC) through **TB21-1** and **TB21-2**. The remote **AC AVAILABLE** indicator lamp should light (connected through terminal **TB13-58**).
8. Relay **K12** (Run) remains energized via centrifugal switch **S1** and through all the fault circuit breakers, which are connected in series.

   When any fault switch closes, the individual circuit breaker de-energizes relay **K12** which opens B+ circuit to the fuel solenoid. On the deluxe control panel, the appropriate fault indicator lamp lights and common alarm terminal **TB13-12** is powered.
9. To restore operation after a shutdown fault has been serviced, reset the appropriate fault circuit breaker. The set is ready to start when the panel switch is pushed to **Start** position.
10. The stop circuit is completed by the panel **Stop** switch contacts 1-2, or automatically by a remote controller connected at terminal **TB11-2**. This action energizes **K14**.
11. Relay **K12** is de-energized (by relay **K14**) which disconnects the battery B+ to the fuel solenoid **K1**. De-energizing **K1** shuts off the fuel flow and stops the engine.

Genset with optional fault indicators - Holding S11 in the Stop / Test position closes momentary contacts 4-5, which applies battery B+ via CR7 to the fault indicators. All fault indicators should light.

ENGINE SENSORS

Figure 3-3 shows the locations of the engine sensors to which the fault circuit breakers and fault indicators respond. The sensors function by closing the fault sensing circuit to the engine chassis ground (battery negative [–] terminal).

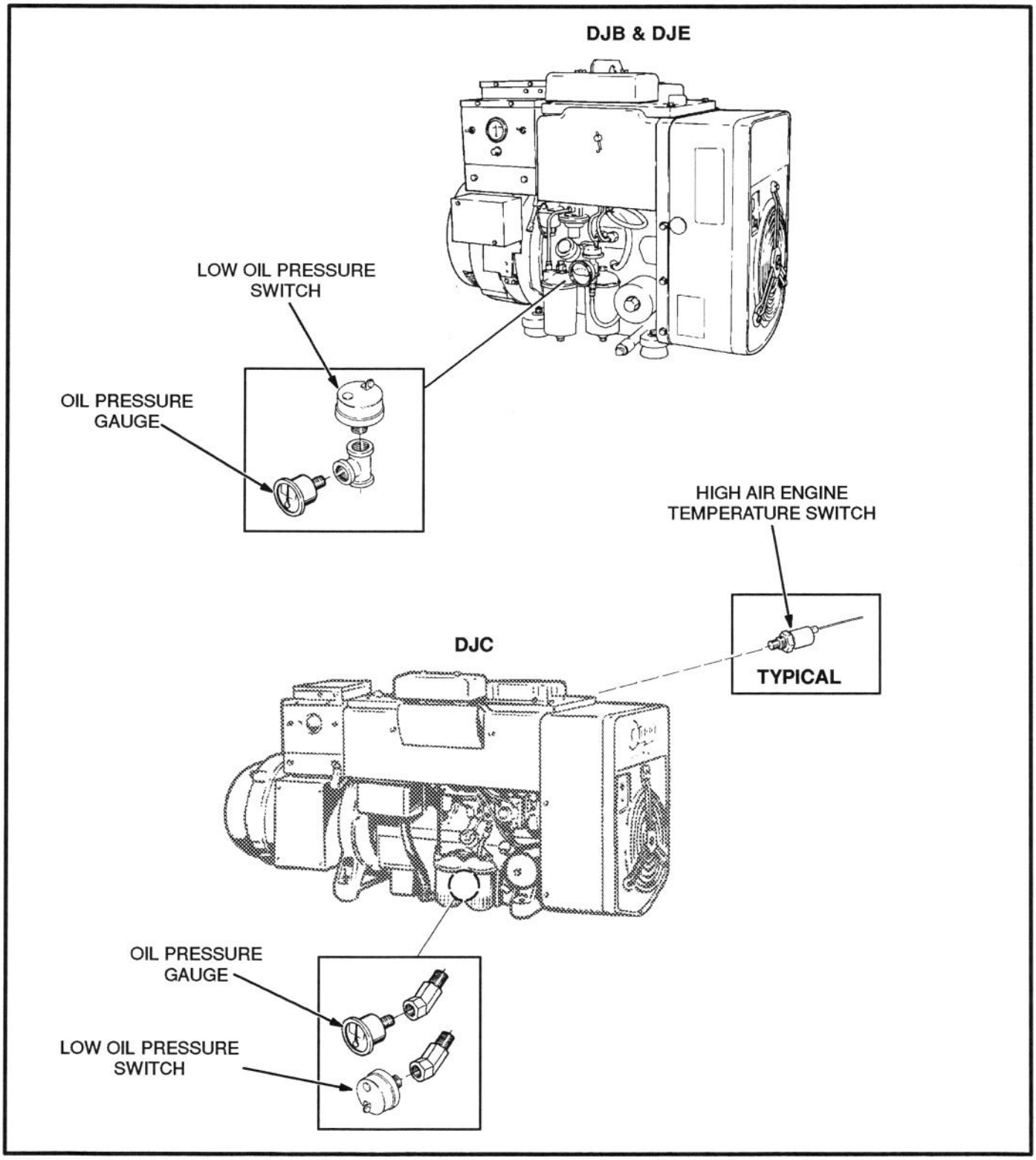


FIGURE 3-3. ENGINE SENSOR LOCATIONS

4. Troubleshooting

The following charts are a guide to help you think through problems with the generator set. You can save time if you read through the manual ahead of time and understand the system.

Try to think through the problem. Go over what was done during the last service call. The problem could be as simple as a loose wire or a tripped circuit breaker.

Figure 4-1 shows the location of the components within the control panel that are referenced in the following troubleshooting procedures. Pages 6-3 through 6-5 show the control wiring connections.

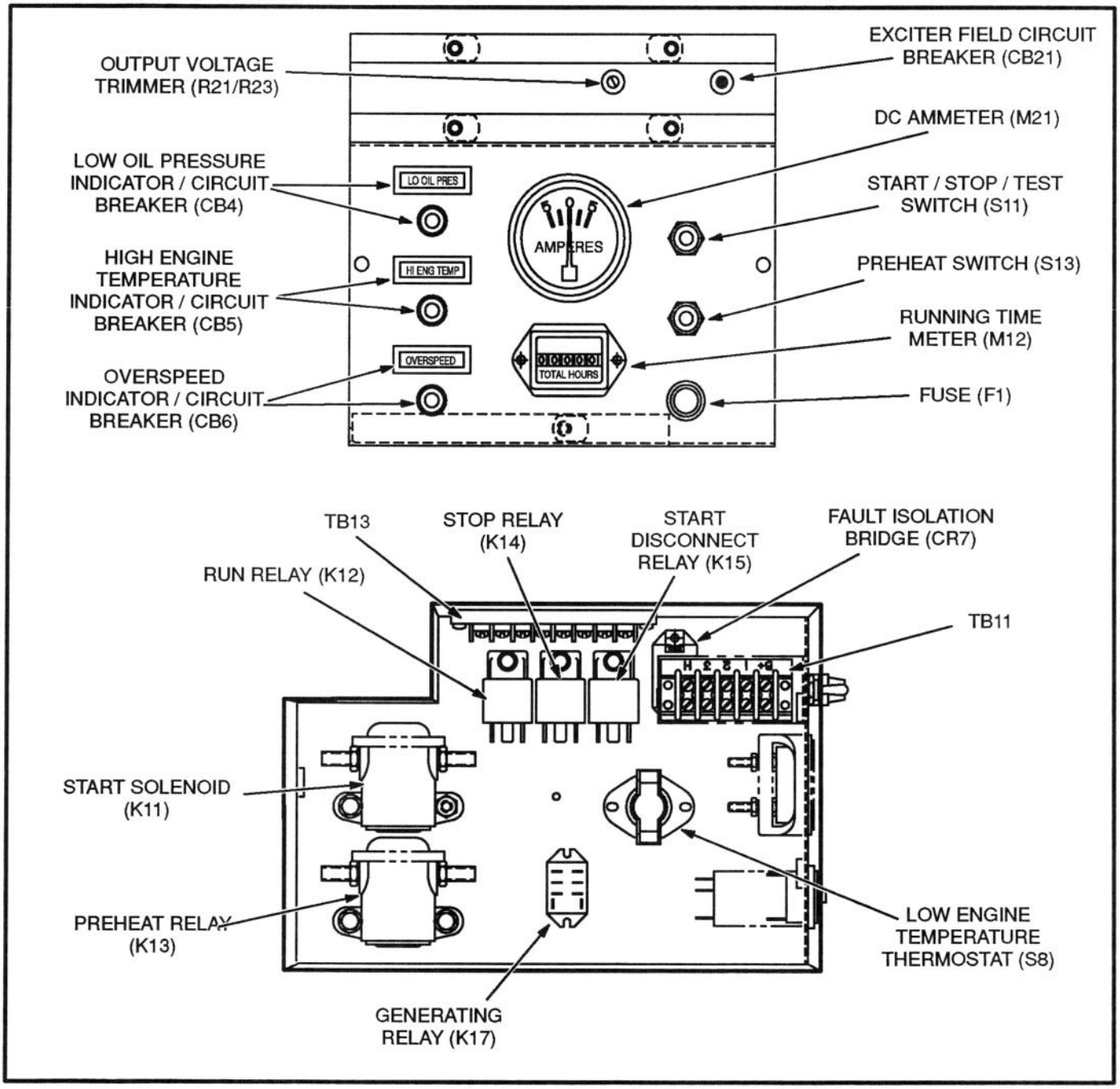


FIGURE 4-1. CONTROL PANEL COMPONENT LOCATIONS

PREHEAT - MODE

The preheat heat mode uses glow plugs to aid cold weather starting. The preheat circuitry is energized when the Preheat switch is placed in the Preheat position.

⚠ CAUTION ***Do not hold the Start/Stop/Preheat switch in the Stop/Preheat position for longer than one minute (unless ambient temperature is below 0° F [-18° C]), or damage to the glow plugs can occur.***

⚠ WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 4-1. CONTROL TROUBLESHOOTING - PREHEAT MODE

Trouble	Possible Cause	Corrective Action
Glow Plugs/Manifold Heater Do Not Heat	1. Fuse F1 on the control panel is blown.	1. Replace the fuse with one of the same type and amp rating. If fuse F1 blows again, refer to wiring diagram to locate short or defective component.
	2. Insufficient battery voltage due to: a. Batteries not charged. b. Battery connections loose or dirty. c. Insufficient battery charging voltage.	2a. Recharge or replace the battery. Specific gravity for a fully charged battery is approximately 1.260 at 80° F (27° C). 2b. Clean and tighten or replace the battery cable connectors and cables at the battery and the set. 2c. Adjust charge rate of battery charging circuit. Refer to *Battery Charge Rate Adjustment* in Section 5.
	3. Preheat relay (K13) not energized due to: a. Defective Preheat switch (S13). b. Defective relay (K13).	3a. Test Preheat switch and wiring. 3b. Test relay K13 and wiring.
	4. Defective glow plug(s).	4. Check wiring continuity between relay contacts (K13) and glow plug(s). Also check continuity of glow plug(s). Replace glow plug(s) with infinite resistance.

START - CRANKING MODE

Holding the Start / Stop / Test switch in the Start position activates the start/ignition circuitry.

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 4-2. CONTROL TROUBLESHOOTING - CRANKING MODE

Trouble	Possible Cause	Corrective Action
Engine Does Not Crank.	1. Fuse F1 on the control panel is blown.	1. Replace the fuse with one of the same type and amp rating. If fuse F1 blows again, refer to wiring diagram to locate short or defective component.
	2. Insufficient battery voltage due to: a. Batteries not charged. b. Battery connections loose or dirty. c. Insufficient battery charging voltage.	2a. Recharge or replace the battery. Specific gravity for a fully charged battery is approximately 1.260 at 80° F (27° C). 2b. Clean and tighten or replace the battery cable connectors and cables at the battery and the set. 2c. Adjust charge rate of battery charging circuit. Refer to *Battery Charge Rate Adjustment* in Section 5.
	3. Start solenoid (K11) not energized due to: a. Defective Start / Stop / Test switch (S11). b. Defective solenoid (K11).	3a. Test Start / Stop / Test switch and wiring. 3b. Test solenoid K11 and wiring.
	4. Starter (B1) not energized due to: a. Open circuit between battery (B+) and the start solenoid contact (BAT). b. Defective starter (B1).	4a. Check wiring continuity between battery (B+) and start solenoid (BAT). 4b. Test starter, see engine service manual.

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 4-2. CONTROL TROUBLESHOOTING - CRANKING MODE (CONT.)

Trouble	Possible Cause	Corrective Action
Engine Cranks But Does Not Start	1. Restricted fuel supply due to: a. Fuel level below pickup tube in tank. b. Closed shutoff valve in supply line. c. Fuel injectors clogged.	1a. Add fuel if low. Prime the fuel system. 1b. Open any closed shutoff valve in the fuel line supplying the engine. 1c. Refer to engine service manual.
	2. Run relay (K12) not energized due to: a. Defective start solenoid (K11). b. Defective run relay (K12).	2a. Test solenoid K11 and wiring. 2b. Test run relay K12 and wiring.
	3. Fuel solenoid (K1) not energized due to: a. Open in fuel solenoid circuit. b. Defective fuel solenoid.	3a. Check wiring continuity of fuel solenoid circuit. 3b. Test fuel solenoid.
	4. Fuel tank solenoid (K2) not energized due to: a. Open in fuel tank solenoid circuit. b. Defective fuel tank solenoid.	4a. Check wiring continuity of fuel tank solenoid circuit. 4b. Test fuel tank solenoid.
	5. Engine fuel injection or other engine problem.	5. Refer to the engine service manual.

RUN MODE

When the engine starts, release the Start / Stop / Test switch and it will return to the center run position. The control assembly begins the run mode when the switch is released or the engine speed exceeds 900 rpm.

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 4-3. CONTROL TROUBLESHOOTING - RUN MODE

Trouble	Possible Cause	Corrective Action
Engine Starts But Stops When Start Switch is Released	1. Low oil level.	1. Check oil level and add oil if low.
	2. Centrifugal switch (S1) faulty or out of adjustment.	2. Refer to engine service manual.
	3. Defective fault sensor switch (low oil pressure, high air temp., or overspeed switch).	3. Refer to engine service manual.
	4. Open or defective fault circuit breaker (CB4, CB5, or CB6).	4. Check breakers. If open, locate and correct cause of fault.
Engine Starts, but Lacks Power or Stops	1. Fuel delivery to the set is inadequate.	1a. Check for and replace clogged fuel lines and filters. 1b. Check for air in the fuel lines and repair all air leaks. 1c. Measure the vertical distance between the fuel lift pump on the engine and the bottom of the dip tube in the supply tank. Make necessary provisions so that lift does not exceed 6 feet (1.8 metres).
	2. Fuel is contaminated.	2. Connect the set to a container of fuel of known quality and run the set under various loads. Replace the contents of the fuel supply tank if there is a noticeable improvement in performance.
	3. Dirty air filter.	3. Check air filter and clean if dirty.
	4. The governor adjustment is incorrect.	4. Refer to engine service manual.
	5. The engine fuel system (lift pump, injection pump, injectors, timing) is faulty.	5. Service the fuel system according to the engine service manual.
	6. No fault condition.	6. Check condition of all control wiring to ensure correct and secure terminal connections.

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 4-3. CONTROL TROUBLESHOOTING - RUN MODE (CONT.)

Trouble	Possible Cause	Corrective Action
Engine Starts, but Lacks Power or Stops (Cont.)	7. Fault shutdown occurs, but no fault lamp indication.	7. Perform lamp test by engaging Alarm Test switch. All lamps should light. Replace defective lamp.
	8. Fault lamp illuminated: a. Overspeed b. Low Oil Pressure c. High Engine Temperature.	8a. Refer to engine service manual to verify operation of overspeed switch (S5).. 8b. Check oil level and add oil if low. Monitor oil pressure gauge. If gauge reading is within normal range, switch S4 is defective. If oil pressure is low, stop engine immediately. Refer to engine service manual. 8c. Check air inlet to make sure it is open and free of debris. Refer to engine service manual to verify operation of high engine temp switch (S6).

BATTERY CHARGE MODE

With the genset running, AC voltage is produced in the B1-B2 windings for the battery charge circuit. The AC output voltage from the B1-B2 winding is converted to DC voltage when it passes through the half-wave rectifier diode (CR21). The voltage is then supplied through battery charge resistor (R21). The 12-volt DC output (two-ampere maximum) is used to prevent discharge of the generator set starting battery during genset operation. This output is not sufficient to charge a low or dead battery.

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 3-4. BATTERY CHARGE MODE

Trouble	Possible Cause	Corrective Action
Low Battery Voltage	1. Weak or discharged battery due to: a. Low charge rate. b. Low electrolyte level in battery. c. Long periods of non-use. d. Improperly wired battery.	1a. Adjust slide tap on adjustable resistor R21 for proper charge rate. Refer to *Battery Charge Rate Adjustment* in Section 6. 1b. Replenish electrolyte and recharge battery. 1c. Connect a separate battery charger to bring battery up to full charge. 1d. Reconnect and check battery connection.
	2. Generator set charging circuit not functioning due to: a. Open in circuit between generator B1-B2 winding and battery (B+). b. Open charging resistor (R21). c. Diode CR21 defective. d. Generator B1-B2 defective.	2a. Check all wiring connections between the generator B1-B2 windings and the battery B+ connections, including all connections to the diode CR21 and battery charge resistor (R1). 2b. Remove wires from the charge resistor (R21) and measure its resistance. A normal reading is 2 ohms. 2c. A good diode has a higher reading in one direction than the other. If both readings are high, or low, diode is defective. 2c. Refer to servicing the generator section.

STOP MODE

Momentarily pushing the Start / Stop / Test switch (S11) to the Stop / Test position begins the stop mode.

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 4-5. CONTROL TROUBLESHOOTING - STOP MODE

Trouble	Possible Cause	Corrective Action
Generator Set Does Not Stop When Switch Is Pushed To Stop	1. Stop relay (K14) not energized due to: a. Defective Start / Stop / Test switch (S11). b. Defective relay (K14).	1a. Test Start / Stop / Test switch and wiring. 1b. Test relay K14 and wiring.

GENERATOR TROUBLESHOOTING

Use the following troubleshooting guide to help locate problems related to the generator. Refer to the wiring diagram in Section 6 for wiring connections.

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 3-6. GENERATOR TROUBLESHOOTING

Trouble	Possible Cause	Corrective Action
No AC Output voltage	1. The line circuit breaker is OFF.	1. Find out why the circuit breaker was turned OFF, make sure it is safe to reconnect power, and then throw the circuit breaker ON.
	2. The line circuit breaker has TRIPPED.	2. Shut down the set and service as necessary to clear the short circuit or ground fault that caused tripping, and then RESET the circuit breaker and start the set.
	3. The line circuit breaker is faulty.	3. Shut down the set, make sure the power output lines from the set have been disconnected from all other sources of power, attempt to RESET the circuit breaker and throw it ON and check for electrical continuity across each line contact. Replace the circuit breaker if there is measurable resistance across any contact.
	4. Field circuit breaker CB21 has TRIPPED.	4. RESET the circuit breaker. If it keeps tripping, troubleshoot according to Trouble heading, *Field Circuit Breaker Keeps Tripping.*
	5. Field circuit breaker CB21 is faulty.	5. Shut down the set, attempt to RESET the circuit breaker and disconnect either lead. Replace the circuit breaker if there is measurable resistance across the terminals.
	6. The field has lost its residual magnetism.	6. If reference voltage across TB21-1 & 2 is not 20VAC or more, flash the field according to *Servicing the Generator* in Section 5.
	7. The generator is faulty.	7. Disconnect stator leads 1 & 2 from TB21-1 & 2. Reference voltage across leads must be 20 VAC or more. If not, troubleshoot according to Trouble heading, *Field Circuit Breaker Keeps Tripping.*
	8. Defective commutating reactor CMR21.	8. Shut down the set and check CMR21 winding resistances according to *Servicing the Generator* in Section 5.
	9. Defective voltage reference transformer (T21).	9. Shut down the set and check T21 winding resistances according to *Servicing the Generator* in Section 5.

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 3-6. GENERATOR TROUBLESHOOTING (CONT.)

Trouble	Possible Cause	Corrective Action
No AC Output voltage (Cont.)	10. Voltage Regulator VR21 is faulty.	10. Check voltage across TB21-3 & 4. Voltage across leads must be 7.0VDC or more. If not, check all connections against the wiring diagrams on page 6-5 and rewire as necessary. Replace the voltage regulator if the wiring is correct and there is no output voltage. **⚠ CAUTION** ***Replacing the voltage regulator before servicing other faults can lead to damage to the new voltage regulator.***
Output Voltage Is Too High Or Too Low	1. Engine speed is too high or too low.	1a. Adjust engine speed according to engine service manual. 1b. If engine speed is unstable, troubleshoot according to *Table 3-3, Control Troubleshooting - Run Mode*
	2. The voltage has been adjusted improperly.	2. Adjust output voltage according to *AC Control* in Section 2.
	3. Improper connections have been made at the generator output terminals.	3. Shut down the set and reconnect according to the appropriate reconnection diagram (Page 6-5).
	4. The rotating rectifier assembly (diodes CR1 through CR6) is faulty.	4. Shut down the set and check each diode according to *Servicing the Generator* in Section 5. Service as necessary.
	5. Defective reference transformer T21.	5. Shut down the set and check T21 winding resistances according to *Servicing the Generator* in Section 5.
	6. Voltage Regulator VR21 is faulty.	6. Replace the voltage regulator. **⚠ CAUTION** ***Replacing the voltage regulator before servicing other faults can lead to damage to the new voltage regulator.***

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 4-6. GENERATOR TROUBLESHOOTING (CONT.)

Trouble	Possible Cause	Corrective Action
Output Voltage Is Unstable	1. The voltage has been adjusted improperly.	1. Adjust output voltage according to *AC Control* in Section 2.
	2. The voltage adjusting rheostat on the control panel is faulty (if provided).	2. Unlock the voltage adjusting screw on the front of the control panel and disconnect either lead from the rheostat. Measure resistance between terminals 1 and 2 while turning the adjusting screw fully one way and then the other. Replace the rheostat if it is open at any point, or if resistance does not vary smoothly from zero to approximately 100,000 ohms.
	3. Voltage Regulator VR21 is faulty.	3. Replace the voltage regulator. **⚠ CAUTION** ***Replacing the voltage regulator before servicing other faults can lead to damage to the new voltage regulator.***

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 3-6. GENERATOR TROUBLESHOOTING (CONT.)

Trouble	Possible Cause	Corrective Action
Field Circuit Breaker Keeps Tripping	1. The rotating rectifier assembly (diodes CR1 through CR6) is faulty.	1. Shut down the set and check each diode according to *Servicing the Generator* in Section 5. Service as necessary.
	2. The exciter field winding is shorted.	2. Shut down the set and check exciter field winding resistance according to *Servicing the Generator* in Section 5. Replace the exciter field assembly if winding resistance does not meet specifications.
	3. The exciter rotor windings are shorted.	3. Shut down the set and check exciter winding resistances according to *Servicing the Generator* in Section 5. Replace the generator rotor assembly if exciter rotor winding resistances do not meet specifications.
	4. The main rotor winding is shorted.	4. Shut down the set and check main rotor winding resistance according to *Servicing the Generator* in Section 5. Replace the generator rotor assembly if main rotor winding resistance does not meet specifications.
	5. The stator windings are shorted.	5. Shut down the set and check stator winding resistances according to *Servicing the Generator* in Section 5. Replace the generator stator assembly if stator winding resistances do not meet specifications.
	6. Voltage Regulator VR21 is faulty.	6. Replace the voltage regulator. **⚠ CAUTION** ***Replacing the voltage regulator before servicing other faults can lead to damage to the new voltage regulator.***

⚠WARNING ***Many troubleshooting procedures present hazards that 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 pages ii and iii.***

TABLE 4-6. GENERATOR TROUBLESHOOTING (CONT.)

Trouble	Possible Cause	Corrective Action
Phase Currents Are Unbalanced	1. The connected loads are distributed unevenly among the phases.	1. Shut down the set and redistribute the loads so that there is a difference of less than 10 percent between phases.
	2. Improper connections have been made at the generator output terminals.	2. Shut down the set and reconnect according to the appropriate reconnection diagram (Page 6-6).
	3. The stator windings are faulty (open or shorted).	3. Shut down the set and check stator winding resistances according to *Servicing the Generator* in Section 5. Replace the generator stator assembly if stator winding resistances do not meet specifications.
	4. A load has a ground fault or short circuit.	4. Service the faulty equipment as necessary

5. Generator Tests and Adjustments

GENERAL

The following tests and adjustments can be performed without disassembly of the generator. Before starting resistance measurements, disconnect the starting battery cables (negative [–] first) to make sure the engine will not start while performing these tests.

⚠ CAUTION ***Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the set.***

⚠ WARNING ***Accidental starting of the generator set while working on it can cause severe personal injury or death. Prevent accidental starting by disconnecting the starting battery cables (negative [–] first).***

Arcing can ignite the explosive hydrogen gas given off by batteries, causing severe personal injury. Arcing can occur if the negative (–) battery cable is connected and a tool being used to connect or disconnect the positive (+) battery cable accidentally touches the frame or other grounded metal part of the set. To prevent arcing, always remove the negative (–) cable first, and reconnect it last.

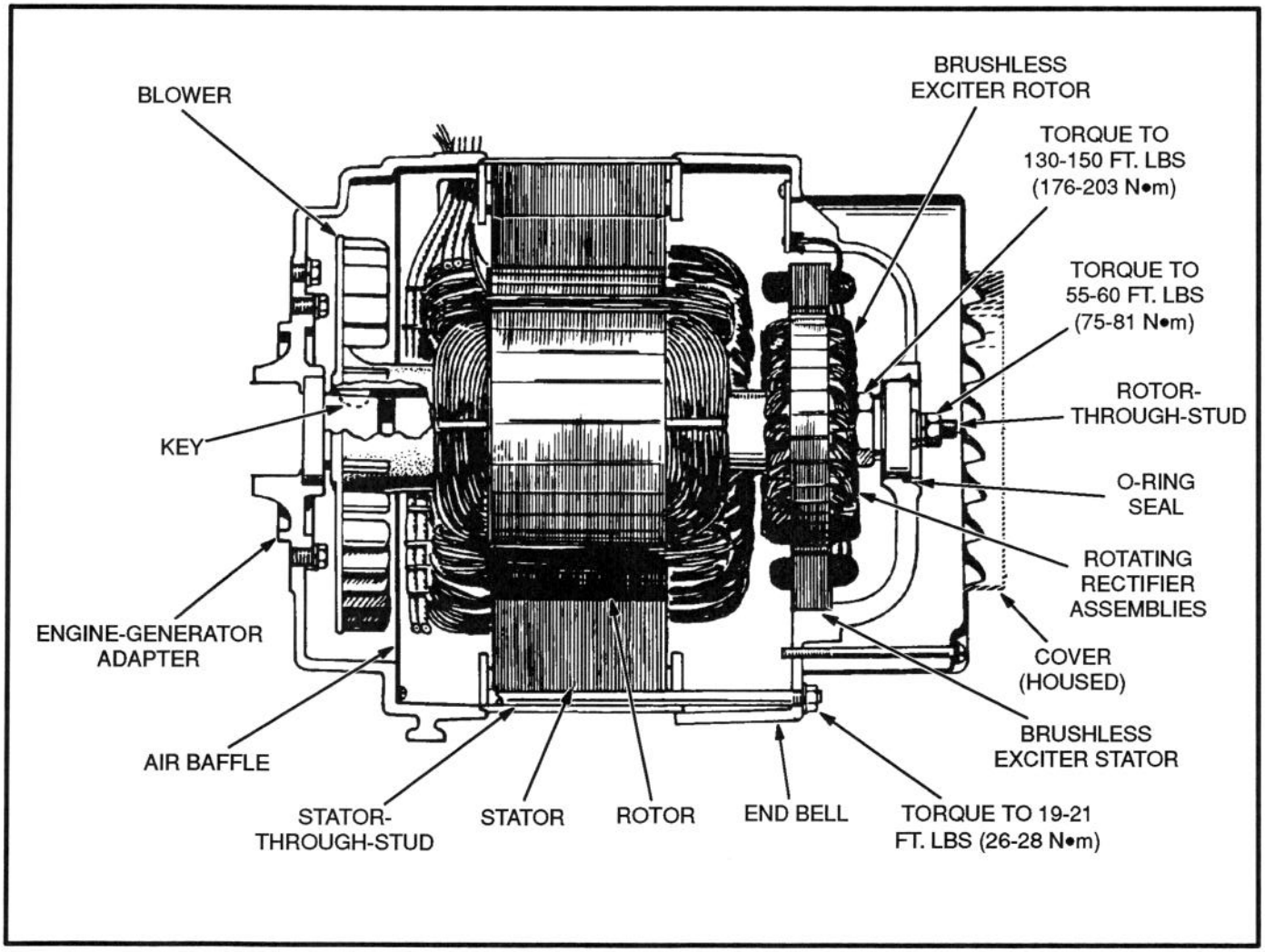


FIGURE 5-1. GENERATOR

BATTERY CHARGE RATE ADJUSTMENT

One generator winding (leads B1 and B2) supplies current for the battery charging circuit. The current flows through diode CR21, resistor R21 and ammeter M21 to the battery.

1. The slide tap on adjustable resistor R21 (see Figure 5-2), should be set to give about 2 amperes charging rate. For applications requiring frequent starts, check battery charge condition (specific gravity) periodically, and if necessary, increase charging rate slightly (slide tap nearer ungrounded lead) until it keeps battery charged. Having engine stopped when readjusting avoids accidental shorts. Avoid overcharging.
2. If charge winding AC output is below:
   a. 19 volts on 12 volt battery charge models,
   b. 38 volts on 24 volt battery charge models,

   test the charging circuit for opens or grounds in the leads and charging winding. If leads are defective, replace them. If winding is defective, replace generator stator.
3. If a separate automatic demand control for starting and stopping is used, adjust charge rate for maximum 4.5 amperes. This normally keeps battery charged even if starts occur as often as 15 minutes apart.

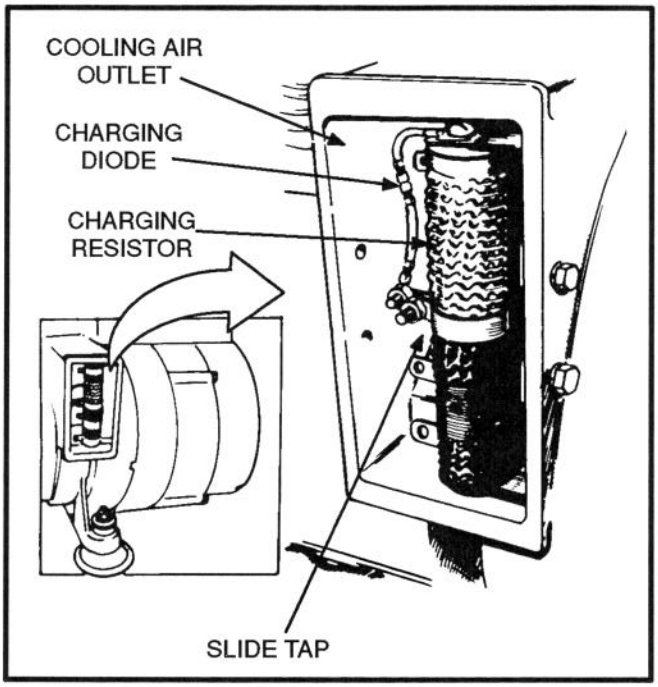


FIGURE 5-2. BATTERY CHARGE RATE RESISTOR (R21) LOCATION

FLASHING THE EXCITER FIELD

The following procedure is used for momentarily flashing the exciter field with a low voltage to restore the residual magnetism in the alternator rotor. Flashing the field is usually necessary when installing a new brushless exciter stator wound assembly, but seldom is necessary under other circumstances. If the residual voltage is missing, it might be necessary to restore magnetism by flashing the exciter field as follows.

⚠ DANGER ***HAZARDOUS VOLTAGE. Touching uninsulated high voltage parts inside the control box can result in severe personal injury or death. Measurements and adjustments must be done with care to avoid touching high voltage parts.***

For your protection, stand on a dry wooden platform or rubber insulating mat, make sure your clothing and shoes are dry, remove jewelry from your hands and wear elbow length insulating gloves.

1. There are two types of voltage regulators (VR21) that are available for this genset. Refer to Figure 5-3 to locate the appropriate terminals for battery lead connection.
2. Use a six volt dry cell battery with two clip leads and a 12 amp., 300 volt diode as shown in Figure 5-3. If a six volt battery is not available, a 12 volt automotive battery can be used by adding a 20-ohm resistor in series; or a 24 volt automotive battery can be used by increasing the resistance to 40-ohms.

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

3. After starting engine, touch positive (+) battery lead to TB1-4 or PIN 8, and negative (-) lead to TB1-5 or PIN 7 terminals just long enough until voltage starts to build up or damage may occur to exciter-regulator system.

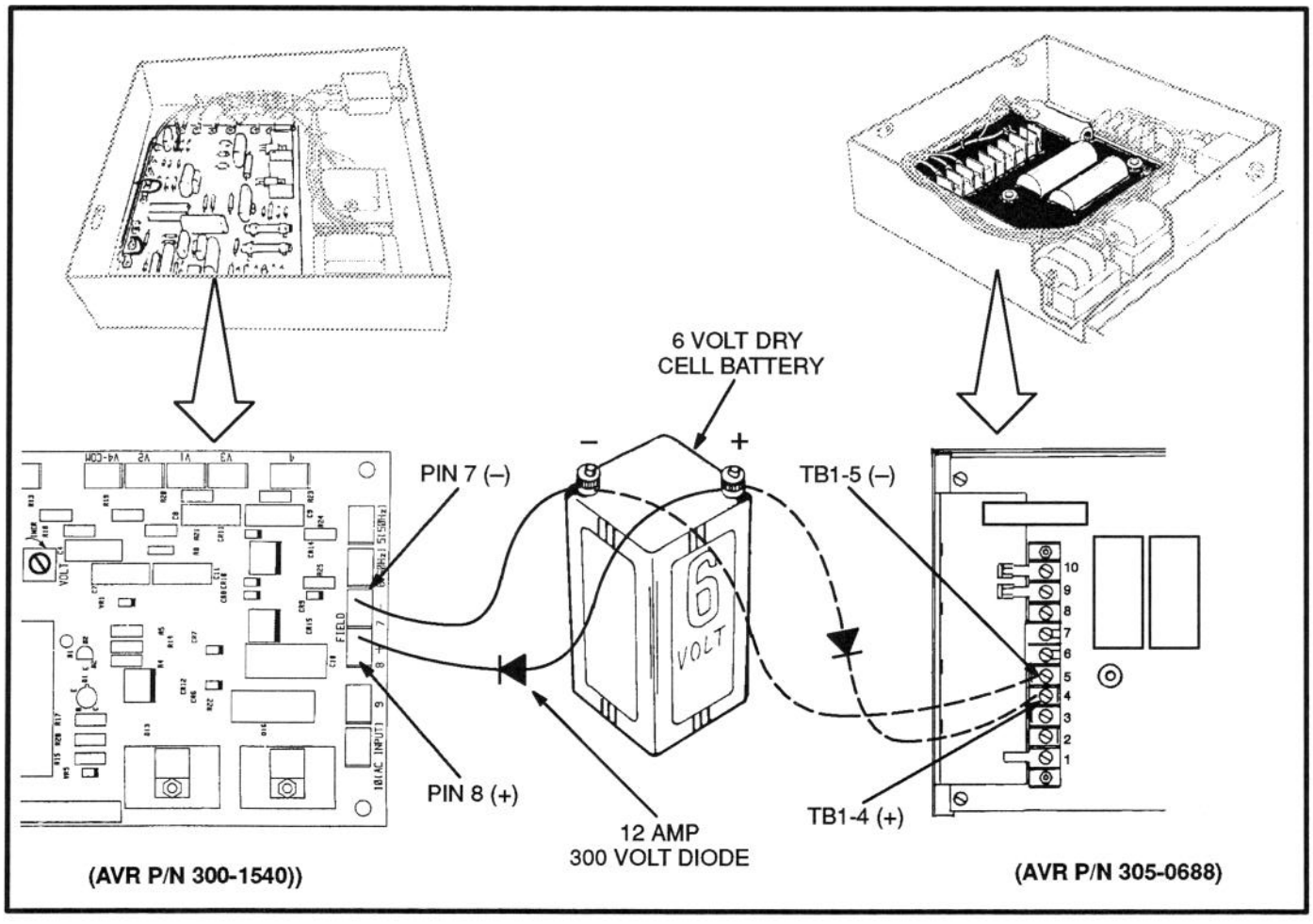


FIGURE 5-3. FLASHING THE EXCITER STATOR

TESTING REACTOR CMR21

The reactor assembly CMR21 leads are marked 1, 2, 3 and 4. Wires 1-2 and 3-4 are wound on the same iron core.

Resistance between 1-2 and 3-4 should be 0.38 to 0.39 ohms and 0.38 to 0.46 ohms respectively at 77° F (25° C). Resistance between coils (e.g. 1-3) and from any terminal to reactor frame should be infinity.

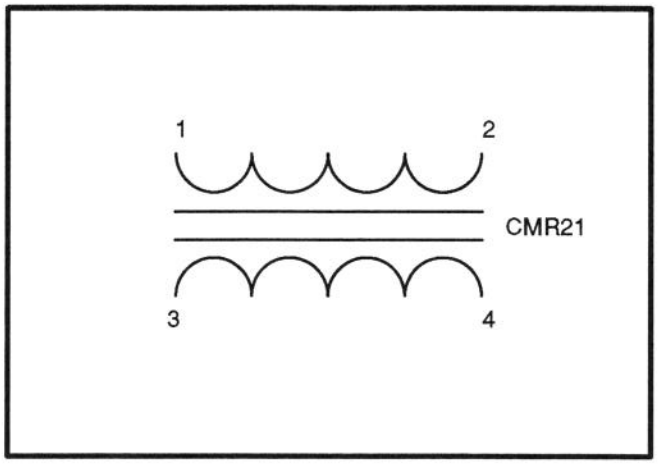


FIGURE 5-4. REACTOR CMR21

TESTING REFERENCE TRANSFORMER T21

The reference transformer T21 has four leads marked H1, H2, X1 and X2. H1-H2 are the primary leads. X1-X2 are the secondary leads.

Resistance between H1-H2 should be 133 to 139 ohms, between X1-X2, 133 to 163 ohms at 77° F (25° C). Resistance between coils and from any terminal to transformer frame should be infinity.

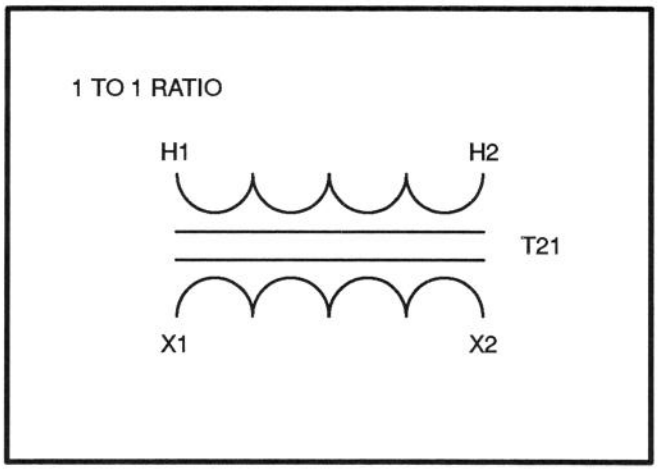


FIGURE 5-5. TRANSFORMER T21

TESTING EXCITER ROTATING RECTIFIERS

Two different rectifier assemblies make up the rotating rectifier bridge assembly (Figure 5-6). Using an accurate ohmmeter, test each CR using negative and positive polarities.

⚠ CAUTION ***Layers of dust can cause diodes to overheat and fail. Brush dust off regularly.***

1. Disconnect all leads from assembly to be tested.
2. Connect one test lead to F1+ stud and connect other lead to CR1, CR2, and CR3 in turn; record resistance value of each rectifier.
3. Connect one lead to F2- stud and connect other lead to CR4, CR5 and CR6 in turn; record resistance value of each rectifier.
4. Reverse ohmmeter leads and repeat steps 2 and 3. Record resistance value of each rectifier F1+ to CR1, CR2, and CR3 and F2- to CR4, CR5 and CR6.
5. All three 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.
6. Replace defective rectifier assembly with new, identical part.

   Use 24 lbs-in. (2.7 N•m) torque when tightening nuts on F1+ and F2- and CR1 through CR6.

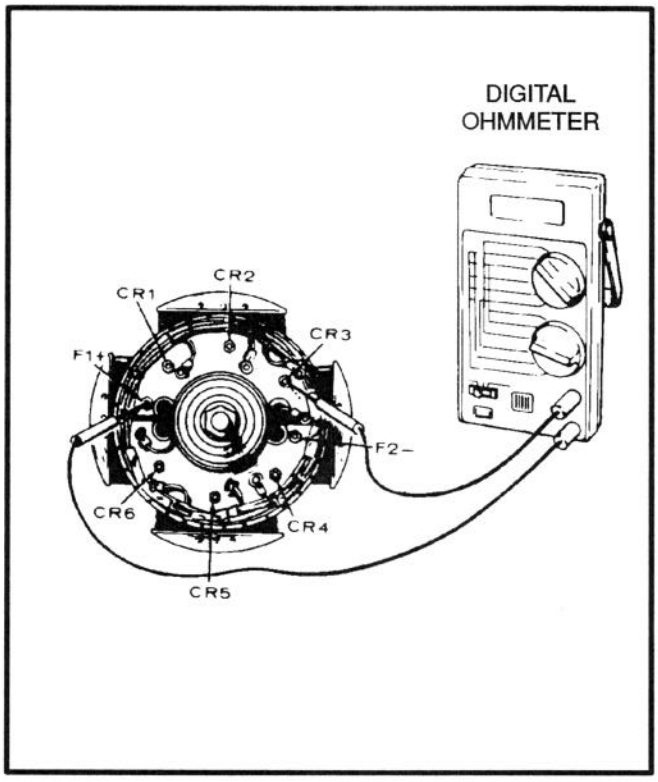


FIGURE 5-6. TESTING ROTATING RECTIFIERS

TESTING EXCITER STATOR

Test the exciter stator (Figures 5-7 and 5-8) for open or shorted windings and grounds as follows.

Testing For Open or Shorted Winding

Measure winding resistance with a Wheatstone bridge or digital ohmmeter.

Disconnect F1+ and F2– exciter field leads from terminal block in generator end bell. The resistance between field leads should be 10.98 to 13.42 ohms at 68° F (20° C). Replace the stator if winding resistance is not as specified.

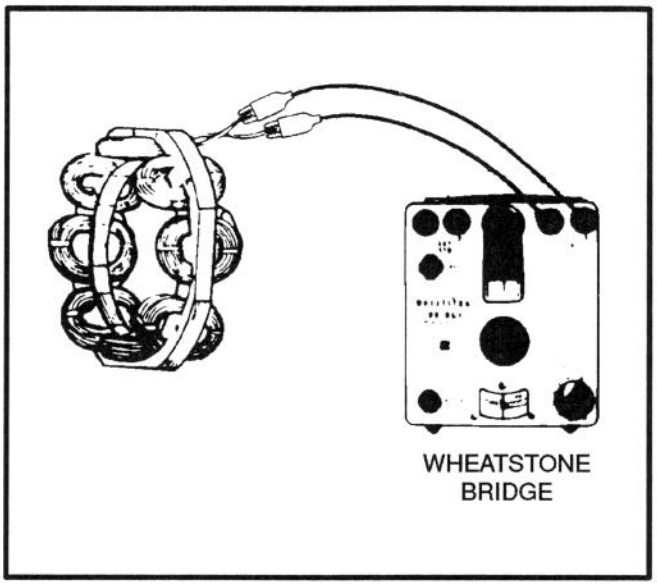


FIGURE 5-7. TESTING WINDING RESISTANCE

Testing For Grounds

Use a Megger or insulation resistance meter that applies 500 VDC or more for this test.

Disconnect F1+ and F2– exciter field leads from terminal block in generator end bell. Measure resistance between either lead and the stator laminations. Reading should be 1 megohm (1,000,000 ohms) or greater. If not, the exciter stator is questionable and might require removal for oven drying and retest. A shorted stator must be replaced.

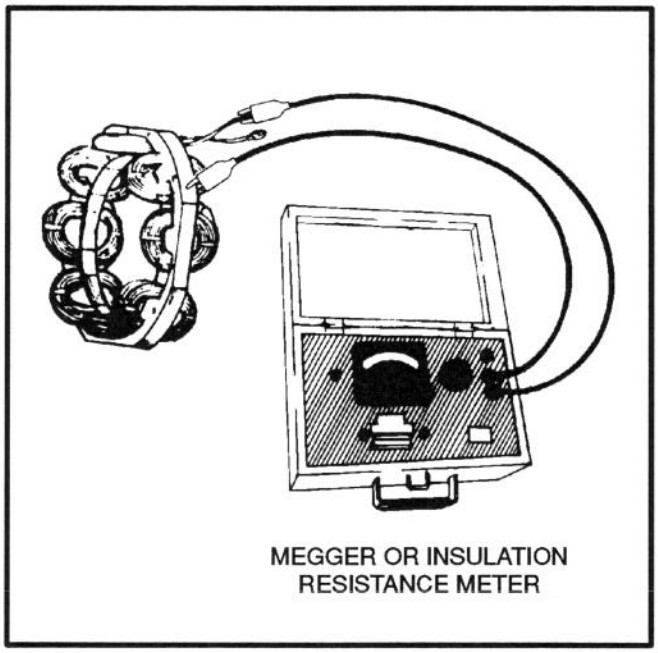


FIGURE 5-8. TESTING WINDING FOR GROUNDS

TESTING EXCITER ROTOR

Disconnect the main rotor field leads that connect to the rotating rectifier assemblies at F1+ and F2-.

Testing For Open or Shorted Winding

Use a Wheatstone Bridge or a digital ohmmeter for this test.

Disconnect main rotor field leads which connect to rotating rectifier assemblies at F1+ and F2-. Disconnect lead wires from diodes CR1 through CR6. Test between exciter lead pairs T1-T2, T2-T3 and T1-T3. Resistance should be 0.5 to 0.6 ohms at 68° F (20° C).

Testing For Grounds

Use a Megger or insulation resistance meter that applies 500 VDC or more for this test.

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 1 megohm (1,000,000 ohms) or greater. If not, the exciter rotor is questionable and might require removal for oven drying and retest. A shorted rotor must be replaced.

Use 24 lbs-in. (2.7 N•m) torque when tightening nuts on F1+ and F2- and CR1 through CR6.

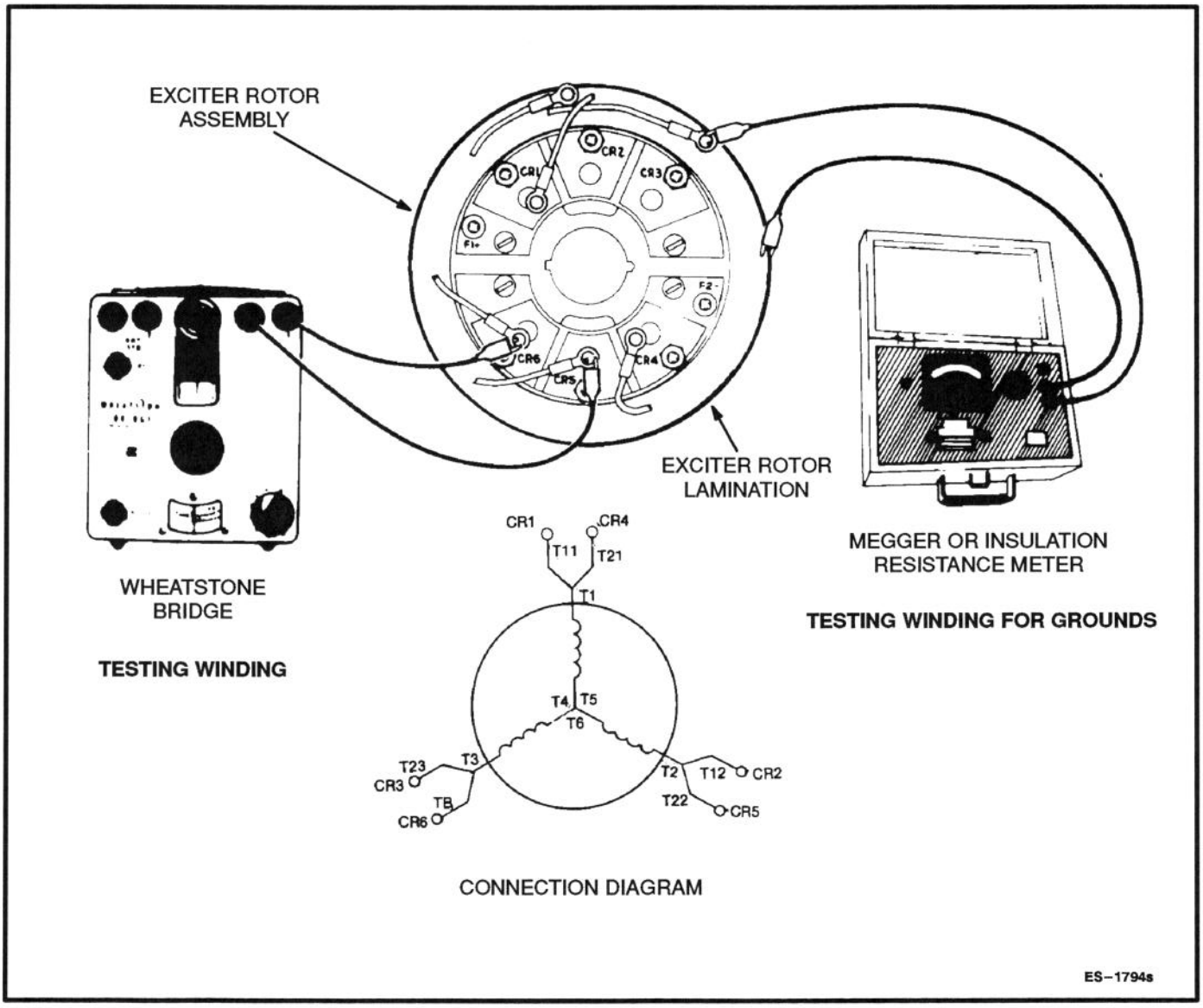


FIGURE 5-9. TESTING THE EXCITER ROTOR

TESTING MAIN ROTOR WINDING

Test the main rotor winding (Figures 5-10 and 5-11) for grounds, opens, and shorts as follows.

Testing For Open or Shorted Winding

Use a Megger or insulation resistance meter that applies 500 VDC or more for this test.

1. Disconnect main rotor field leads which connect to rotating rectifier assemblies at F1+ and F2-.
2. Check resistance across F1+ and F2- leads. Resistance should be 2.50 to 2.55 ohms at 77° F (25° C). If resistance is low, there are shorted turns. If resistance is high, rotor winding is open. In either case, rotor must be replaced.

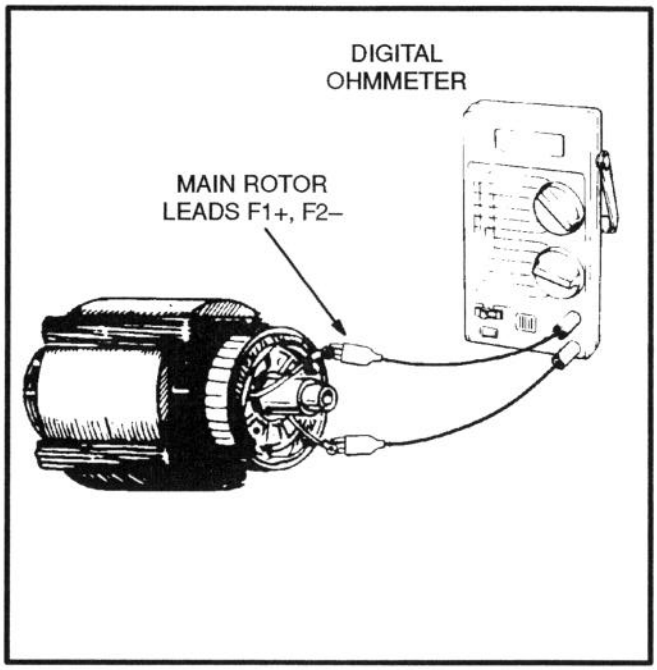


FIGURE 5-10. TESTING WINDING RESISTANCE

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 for this test.

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

1. Disconnect main rotor field leads which connect to rotating rectifier assemblies at F1+ and F2-.
2. Connect test leads between one of the two leads and the rotor shaft. Meter should read 1 megohm (1,000,000 ohms) or greater. If not, the rotor is questionable and might require removal for oven drying and retest. A shorted rotor must be replace.

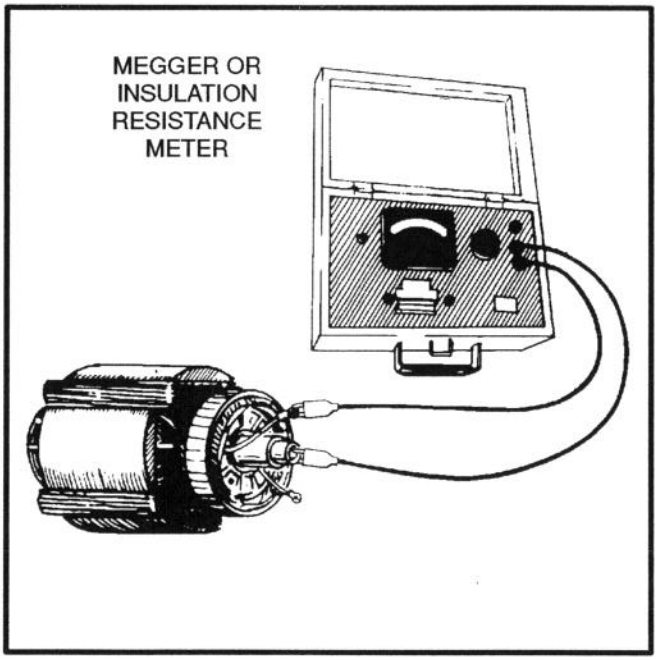


FIGURE 5-11. TESTING MAIN ROTOR WINDING

TESTING MAIN STATOR WINDINGS

Test the main stator (Figure 5-12) for opens, shorted windings, and grounds as follows.

Testing For Open or Shorted Windings

Use a Wheatstone bridge or ohmmeter having at least 0.001 ohm precision for this test.

Measure electrical resistance across each pair of stator leads as shown in Figure 5-12. The proper resistance values are shown in Table 5-1. All resistances should be ±10% of value shown at 68° F (20° C).

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

TABLE 5-1. RESISTANCE VALUES FOR STATORS

GENERATOR	RESISTANCE
12 Lead 60Hz	0.220 ohms
12 Lead 50Hz	0.198 ohms
4 Lead 60Hz	0.087 ohms
4 Lead 50Hz	0.110 ohms

Testing For Grounds

Use a Megger or insulation resistance meter that applies 500 VDC or more for this test.

Some generators have ground connections to the frame. Check wiring diagram.

Disconnect all stator leads and winding taps from their respective terminals and make sure the ends do not touch the generator frame. Measure electrical resistance between any stator lead and the stator laminations. Replace the stator if insulation resistance is less than 1 megohm.

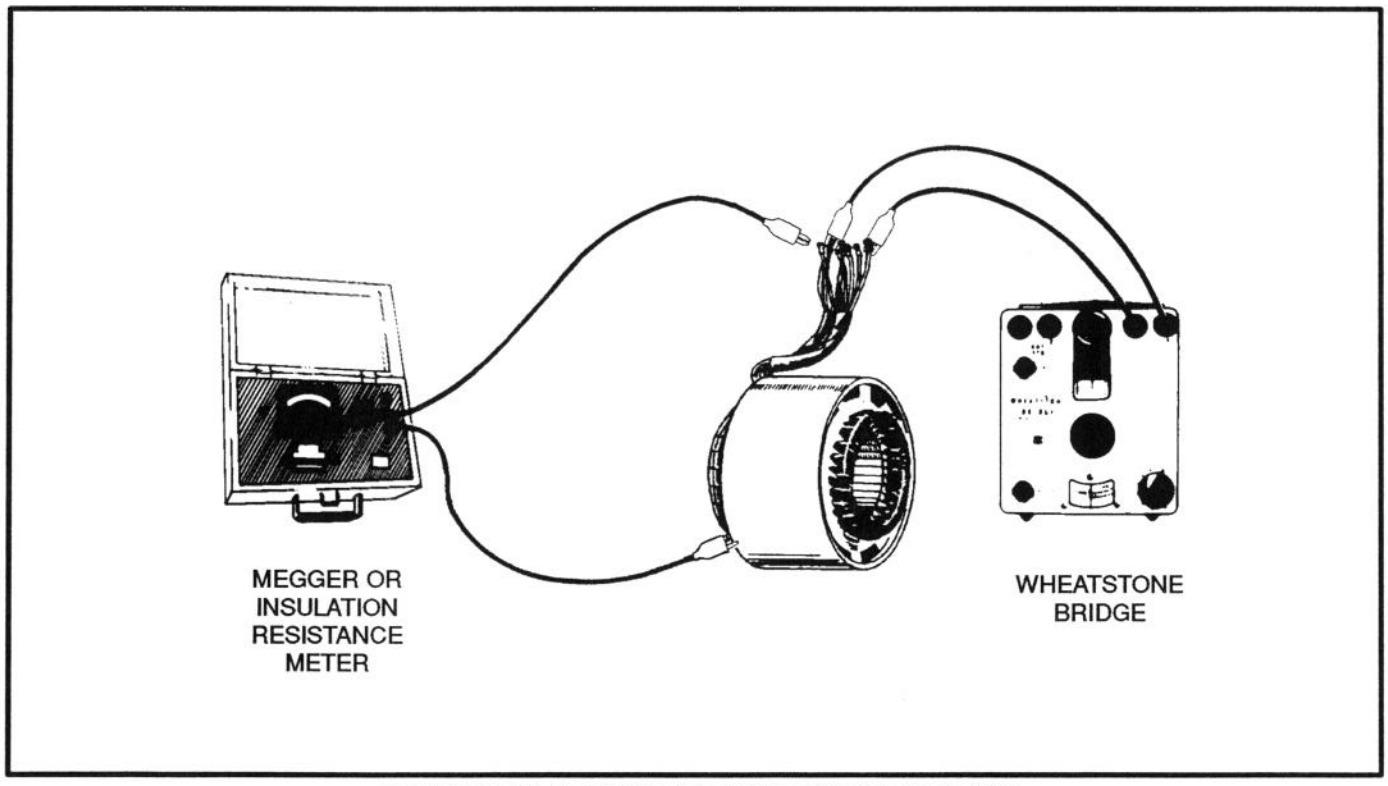


FIGURE 5-12. TESTING THE GENERATOR STATOR

REMOVING AND DISASSEMBLING THE GENERATOR

The generator is heavy. You will need an assistant and a hoist of sufficient capacity to remove and service the generator.

⚠WARNING ***Accidentally dropping the generator can damage it and cause severe personal injury and death. The hoist, straps and chains must have sufficient capacity and be attached properly so that the load cannot shift.***

Before starting, disconnect the starting battery cables (negative [–] first) to make sure the set will not start while working on it.

⚠ CAUTION ***Always disconnect a battery charger from its AC source before disconnecting the battery cables. Otherwise, disconnecting the cables can result in voltage spikes high enough to damage the DC control circuits of the set.***

⚠WARNING ***Accidental starting of the generator set while working on it can cause severe personal injury or death. Prevent accidental starting by disconnecting the starting battery cables (negative [–] first).***

Arcing can ignite the explosive hydrogen gas given off by batteries, causing severe personal injury. Arcing can occur if the negative (–) battery cable is connected and a tool being used to connect or disconnect the positive (+) battery cable accidentally touches the frame or other grounded metal part of the set. To prevent arcing, always remove the negative (–) cable first, and reconnect it last.

Disconnecting Generator Leads

1. Disconnect the line cables and conduit. For reconnections later, make sure each cable is clearly marked to indicate the correct terminal.
2. Disconnect the remote control wiring and conduit. For reconnections later, make sure each wire is clearly marked to indicate the correct terminal.
3. Disconnect all engine wiring harness connections in the generator control and output boxes. For reconnections later, make sure each wire is clearly marked to indicate the correct terminal.
4. Disconnect all generator control leads (winding taps) from connections in the output box. For reconnections later, make sure each wire is clearly marked to indicate the correct terminal.
5. If the set has a mounted line circuit breaker, disconnect the cables to the circuit breaker. For reconnections later, make sure each cable is clearly marked to indicate the correct terminal.
6. Remove B1 lead from tapped adjustable resistor in generator air outlet opening (Figure 5-13).

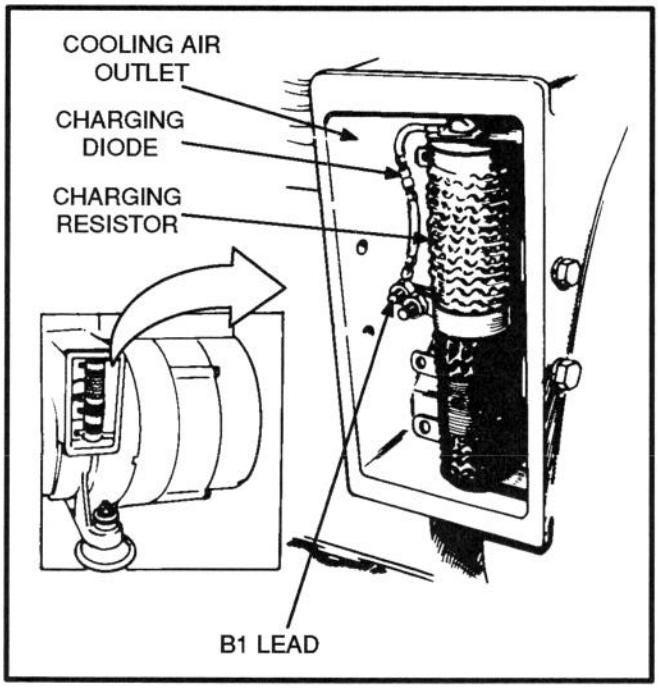


FIGURE 5-13. B1 LEAD LOCATION

Removing The Generator From The Set

7. Remove stator-through-stud nuts, end bell, and stator assembly (Figure 5-14). Screwdriver slots in adapter provide a means for prying stator loose from the adapter. Be careful not to let stator touch or drag on rotor.
8. Remove air baffle from adapter.
9. Support rotor with hoist and sling to avoid bending rotor through-stud (Figure 5-15).
10. Loosen rotor-through-stud nut and turn out until nut is at the end of the shaft.
11. While pulling rotor outward with one hand, strike nut a sharp blow. Use a heavy, soft faced hammer to loosen the rotor from its tapered shaft fit. If rotor does not come loose, strike it a sharp downward blow in the center of the lamination stack. Rotate rotor and repeat until it comes loose. Be careful not to hit bearing or windings.
12. Raise the generator end approximately one inch (12 mm) and securely block the engine under the flywheel housing. Lower the generator slightly so that the blocks carry most of the weight.
13. After disassembly, all parts should be wiped clean and visually inspected.

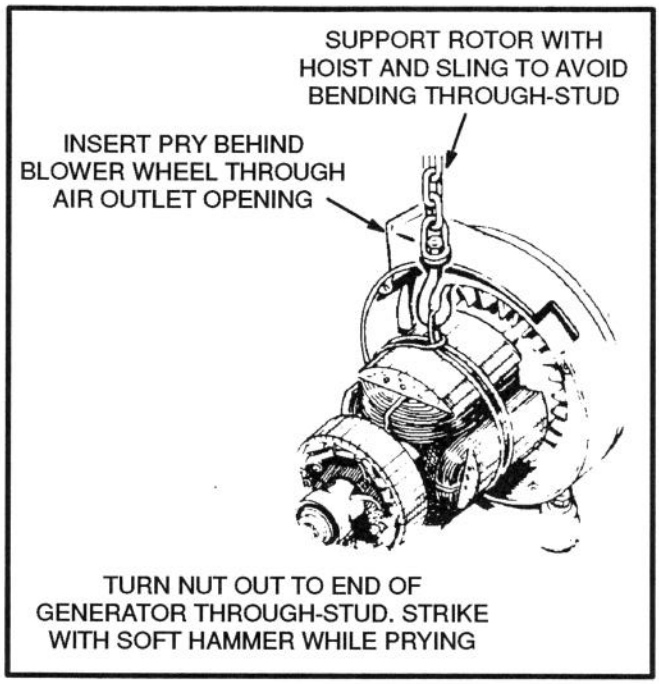


FIGURE 5-15. ROTOR REMOVAL

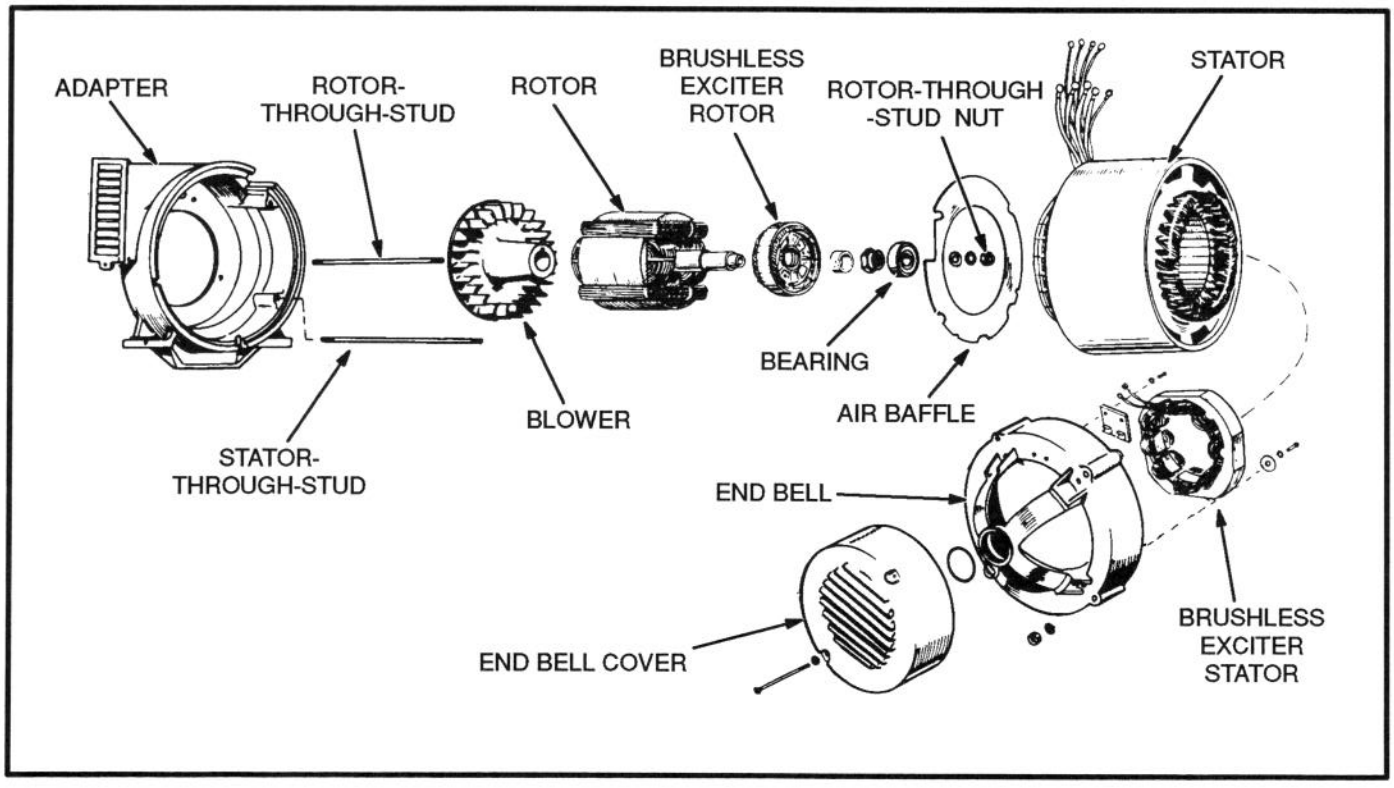


FIGURE 5-14. GENERATOR ASSEMBLY

REASSEMBLING THE GENERATOR

Reassembling is the reverse of disassembling. Note the following.

1. Clean and inspect all mating surfaces.
2. Coat mating area between generator bearing and end bell bearing hole with a thin film of Molykote or equal.
3. Install rotor-through-stud in engine crankshaft.
4. Install key in the crankshaft.
5. Slide rotor over through-stud and onto crankshaft. Be careful not to let weight of rotor rest on or bend the through-stud.
6. Install air baffle.
7. Install stator through-studs in adapter.
8. Install stator and end bell. Torque nuts on through-studs to 19-21 ft-lbs (26-28 N•m).

   Make certain the B1 lead is placed through the grommet in the baffle ring and out the air discharge opening in the adapter.

9. Torque the rotor-through-stud nut to 55-60 ft-lbs (75-81 N•m). The rotor and stator are automatically aligned because the stator and bearing support were tightened in Step 8.
10. Tap end bell to align at horizontal and vertical plane; use a lead hammer to relieve stresses on components (recheck torque).
11. Reconnect all generator leads.
12. Reconnect lead B1 on adjustable resistor, R21.

    ⚠ CAUTION ***Check B1 lead to see that it is short and is kept away from the blower. If necessary when installing a new stator or leads, cut B1 lead shorter and reinstall the connector.***

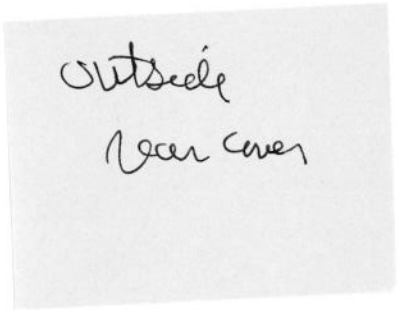
13. Install end bell cover.

6. Wiring Diagrams

GENERAL

This section consists of the schematic and connection wiring diagrams referenced in the text. The following drawings are included.

- Page 6-3 and 6-4 – Standard Genset DC Control Diagrams
- Page 6-5 and 6-6 – Deluxe Genset DC Control Diagrams
- Page 6-7 – Generator Reconnection/AC Control Diagram



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