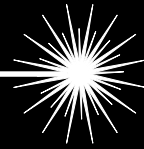


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Commercial Mobile Power



Service

RBAA Hydraulic Generator Sets (20 & 25 kW)

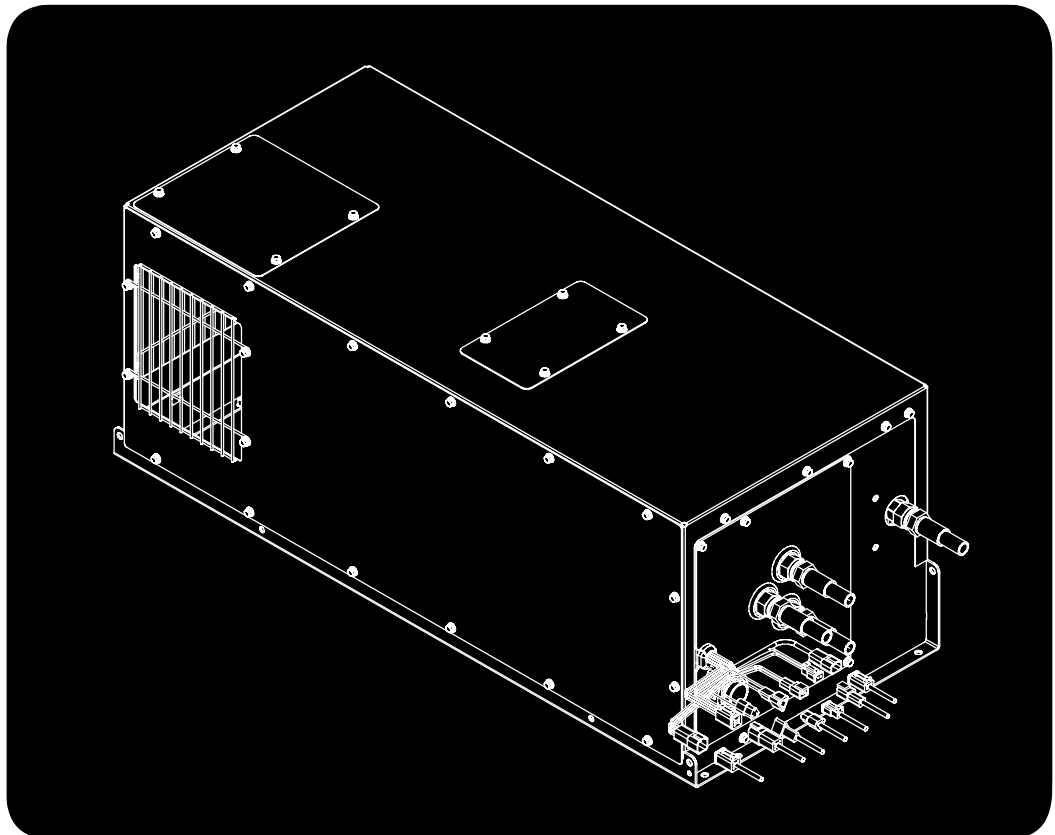


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Safety Precautions

Thoroughly read *Operation and Installation* before operating the genset. Safe operation and top performance can be only be attained when equipment is operated and maintained properly.

The following symbols in this manual alert you to potential hazards to the operator, service person and equipment.

⚠ DANGER alerts you to an immediate hazard that will result in severe personal injury or death.

⚠ WARNING alerts you to a hazard or unsafe practice that can result in severe personal injury or death.

⚠ CAUTION alerts you to a hazard or unsafe practice that can result in personal injury or equipment damage.

Electricity, moving parts, batteries and high-pressure hydraulic fluid present hazards which can result in severe personal injury or death.

GENERAL PRECAUTIONS

- Make sure all fasteners are secure and torqued properly.
- Do not work on the genset when mentally or physically fatigued or after consuming alcohol or drugs.
- You must be trained and experienced to make adjustments while the genset is running—hot, moving or electrically live parts can cause severe personal injury or death.
- Keep multi-class ABC fire extinguishers handy. Class A fires involve ordinary combustible materials such as wood and cloth; Class B fires, combustible and flammable liquid fuels and gaseous fuels; Class C fires, live electrical equipment. (ref. NFPA No. 10)

- Genset installation and operation must comply with all applicable local, state and federal codes and regulations.

GENERATOR VOLTAGE IS DEADLY!

- Generator electrical output connections must be made by a trained and experienced electrician in accordance with applicable codes.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry, stand on a dry wooden platform or rubber insulating mat and use tools with insulated handles.

BATTERY GAS IS EXPLOSIVE

- Wear safety glasses.
- Do not smoke.
- To reduce arcing when disconnecting or reconnecting battery cables, always disconnect the negative (–) battery cable first and reconnect it last.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, and other moving parts.

HYDRAULIC FLUID UNDER PRESSURE CAN CAUSE SEVERE PERSONAL INJURY

- Always shut down the engine that drives the hydraulic pump before loosening or tightening fittings.
- The high pressure spray from a leak or fitting in a hydraulic line can penetrate the skin, leading to possible blood poisoning. Wear safety glasses. Do not delay getting proper medical attention if exposed to high pressure oil spray.

Specifications

GENERATOR: 4-Pole Revolving Field, 2-Bearing, Self-Excited, with Electronic Voltage Regulation		
Power (1.0 PF)	20 kW	25 kW
No. of Phases	1	1
Voltage	120 / 240 volts	120 / 240 volts
Frequency	60 Hertz	60 Hertz
Current per Leg (L1 and L2)	83 amps	104 amps
Speed	1800 rpm	1800 rpm
DC SYSTEM:		
Battery Voltage	12 volts	12 volts
Control Circuit Fuse (F1)	20 amp blade-type	20 amp blade-type
INSTALLATION: Hydraulic Pump with Electronic Frequency Regulation		
Min–Max Pump Speed	1150–3900 rpm	1200–3900 rpm
SAE Flange	4-Bolt C Flange	4-Bolt C Flange
SAE C–C Straight Keyed Shaft	1–1/2 inch Diameter, 3/8 inch Key	1–1/2 inch Diameter, 3/8 inch Key
Flow (Heat Exchanger)	5 to 17 gpm	5 to 17 gpm
Maximum Oil Pressure	3500 psi	3500 psi
Hydraulic Fluid	Dextron III	Dextron III
Weight	124 lb (56 Kg)	124 lb (56 Kg)
Maximum Power Draw on Engine	43.2 hp	54 hp
INSTALLATION: Hydraulic Hose & Fittings		
Pump to Motor (Two)	#12, 4000 psi Hose; 37° Fittings (JIC)	#12, 4000 psi Hose; 37° Fittings (JIC)
Pump Case to Genset	#12, 200 psi Hose; 37° Fittings (JIC)	#12, 200 psi Hose; 37° Fittings (JIC)
Genset to Oil Reservoir	#12, 200 psi Hose; 37° Fittings (JIC)	#12, 200 psi Hose; 37° Fittings (JIC)
Oil Reservoir to Pump	#20, 200 psi Hose; 37° Fittings (JIC)	#20, 200 psi Hose; 37° Fittings (JIC)
INSTALLATION: Genset		
Noise	72 dB(A)*	72 dB(A)*
Weight	532 lb (241 Kg)	532 lb (241 Kg)
Dimensions (L x W x H)	44.49 x 19.31 x 17.30 in (1130 x 490.4 x 439 mm)	44.49 x 19.31 x 17.30 in (1130 x 490.4 x 439 mm)
Cooling Air Flow	1330 cfm	1330 cfm
Maximum Ambient Temperature		
Continuous Full Load	120° F (49° C)	120° F (49° C)
Intermittent Load	140° F (60° C)	140° F (60° C)
Maximum Oil Temperature	200° F (93° C)	200° F (93° C)
* @ 10 ft (3 m), before installation, under full load.		

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Introduction

ABOUT THIS MANUAL

This is the service manual for the hydraulic generator sets (gensets) listed on the front cover. It includes Specifications, Operation, Maintenance and Troubleshooting.

See the Parts manual for part identification numbers and required quantities. Genuine Cummins®/Onan® replacement parts are recommended for best results. Be ready to provide the model and serial numbers on the genset nameplate when calling for parts.

PRODUCT DESCRIPTION

The genset consists of several components or modules that are installed at various locations on the vehicle. The components are interconnected electrically and hydraulically as shown on the Outline Drawing (Page A-1).

- **Genset** – The genset is an AC generator driven by an hydraulic motor. An automatic voltage regulator maintains nominal AC output voltage under varying generator loads. An integral oil-to-air heat exchanger cools the oil (hydraulic

fluid) from the pump and motor case drains before it is returned to the reservoir.

- **Hydraulic Pump** – The hydraulic pump is driven by a power takeoff on the vehicle transmission to power the generator motor. The pump controller (located in the genset) senses AC output frequency and adjusts pump piston stroke as engine speed varies in response to other concurrent tasks, such as vehicle propulsion or pumping, to maintain constant flow and thus nominal generator frequency (60 Hz).
- **Oil Reservoir** – The oil reservoir has a three gallon oil capacity. It is equipped with a full-flow 6 micron oil filter, oil level sight glass, filter pressure gauge, breather filter and oil fill cap.
- **Generator Display Module** – The generator display module displays generator output voltage, frequency and current. It also displays the temperature of the oil returning to the oil reservoir and the number of hours run.
- **Generator ON / OFF Switch** – The vehicle builder provides the generator ON / OFF switch.
- **Hydraulic Fluid** – The genset is designed for use only with Dextron III hydraulic fluid (oil).

Operation

STARTING AND STOPPING

Genset operation involves switching the genset ON or OFF and monitoring the genset display module (Figure 1) and oil level sight glass (Figure 2).

Starting

Start the vehicle engine and engage the PTO clutch (if so equipped). Switch the genset ON and then connect or turn on the loads.

⚠ CAUTION *Although the genset is capable of starting up with all loads connected, generally, to save wear and tear, it is recommended that the genset be turned ON first before connecting loads.*

Stopping

First disconnect all loads and then switch the genset OFF. *The PTO need not be disengaged when switching the genset OFF because pump piston stroke goes to zero.* The charge pump will continue to circulate oil through the system but will not drive the motor.

⚠ CAUTION *Leaving the generator switch ON while the vehicle is standing by with the engine off can run down the engine starting battery and cause damage to genset components. Always switch OFF the generator before parking the vehicle in standby.*

DISPLAY MODULE

AC Output

The genset display module normally displays AC output voltage, frequency and current in each leg (Figure 1). The Display will blink the amp value as a

warning if current in either line is excessive. The Display will blink the voltage value as a warning if voltage is too low or too high.

Hour Meter

Press “Mode” once to display the number of hours run. The display will revert to AC output after about 10 seconds.

Oil Temperature

Press “Mode” twice to display the temperature of the oil returning to the oil reservoir. The display will revert to AC output. The Display will blink the oil temperature value as a warning if oil temperature exceeds 185° F.

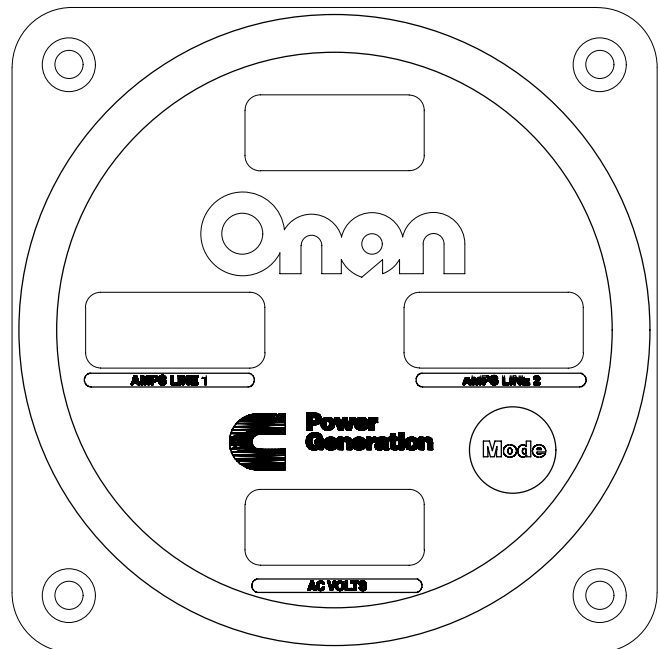


FIGURE 1. DISPLAY MODULE

Maintenance

⚠ CAUTION *The slightest amount of dirt in a hydraulic system can damage precisely machined internal components or cause the regulator spool valve to stick, resulting in erratic operation. Keep dirt out:*

- *Thoroughly clean the outside of a fitting or cap before disconnecting or removing it.*
- *Keep all openings in components and hoses capped with proper JIC caps until just before making connections.*
- *Thoroughly flush hoses before connecting.*
- *Regularly replace the oil filter.*
- *Never reuse hydraulic fluid that has been drained. Only use Dextron III hydraulic oil.*

OIL LEVEL

Check oil level often and keep it within 1/4 inch of the top of the sight glass (Figure 2). Only use Dextron III

hydraulic fluid. Pump the oil through a 10 micron filter (SAE Class 4) when filling the reservoir.

OIL FILTER

Replace the oil filter every 1000 hours of operation or sooner if the needle on the filter pressure gauge approaches the red area (25 psi).

BREATHER FILTER

Replace the breather filter on the oil reservoir every 1000 hours of operation.

GENERATOR

Have the generator bearing checked every 2000 hours of operation, or 5 years, whichever comes first. This must be performed by a trained and experienced mechanic (authorized Onan dealer).

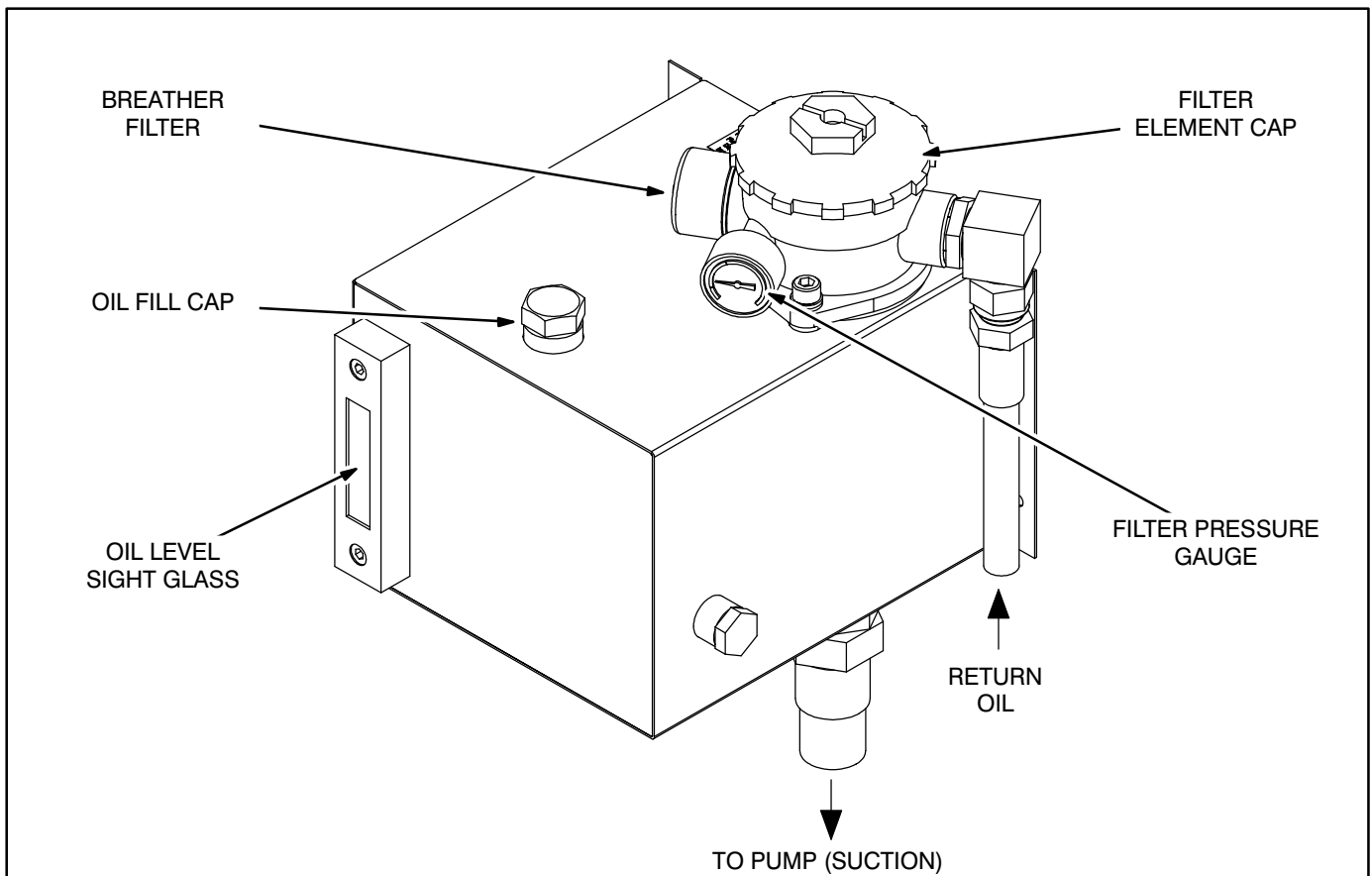


FIGURE 2. OIL RESERVOIR

Service

HYDRAULIC SYSTEM

Replacing Hydraulic Hose

The Outline Drawing (Page A-1) illustrates the hydraulic interconnections between the components of the system. Also see *Specifications* regarding hose and fitting specifications.

⚠ CAUTION *The slightest amount of dirt in an hydraulic system can damage precisely machined internal components or cause the regulator spool valve to stick, resulting in erratic operation. Keep dirt out:*

- *Thoroughly clean the outside of a fitting or cap before disconnecting or removing it.*
- *Keep all openings in components and hoses capped with proper JIC caps until just before making connections.*
- *Thoroughly flush hoses before connecting.*
- *Regularly replace the oil filter.*
- *Never reuse hydraulic fluid that has been drained. Only use Dextron III hydraulic oil.*

Specially note the following:

1. Consider that hoses shrink slightly in length and expand slightly in diameter under pressure.
2. To avoid trapping air, the hoses connected to the pump should slope up from the pump and the hose between the genset and oil reservoir should slope up to the reservoir.
3. Do not bend hoses tighter than the hose manufacturer recommends.
4. Make sure that the closed-loop lines are not reversed. It is recommended that they be color coded to match the fittings on the genset to aid service reconnections. Reversing the lines will cause the motor, alternator and fan to run backwards. Running the fan (blower) backwards will result in a substantial loss of cooling air flow.
5. Flush hoses and cap them with JIC caps after cutting and terminating their ends.
6. Use wide-sweep 90-degree fittings.

7. Support, restrain and protect hydraulic hose as necessary to prevent chaffing.
8. Always use two wrenches when tightening fittings. Torque fittings in accordance with Table 1.
9. Do not apply engine power to the pump before filling the pump and system with oil as instructed under STARTUP.

⚠ CAUTION *Running the pump without oil will quickly destroy it.*

TABLE 1. HYDRAULIC FITTING TORQUES

SAE 37° (JIC) FITTING SIZE	RECOMMENDED TORQUE (LB-FT)
#8	21
#10	60
#12	85
#16	120
#20	170
#24	200

Filling Hydraulic System With Oil

Referring to Figure 3, fill the system as follows:

1. Complete all hydraulic and electric connections and secure any shaft guards.
⚠ WARNING *Rotating drive shafts can cause severe personal injury or death. Guards must be provided to prevent accidental contact.*
2. Turn the genset switch **OFF** and make sure all loads are disconnected by turning the line circuit breaker in the vehicle AC distribution panel **OFF**.
3. Connect a 1000 psi gauge (with snubber) to system pressure port M2 or charge pressure gauge port M3.
4. Remove the fitting at the top pump case drain (Port L1 or L2), fill the pump with oil and reconnect the fitting and hose.
5. Fill the oil reservoir to within 1/4 inch of the top of the sight glass (Page 3). The level will drop as the system fills. If possible, wait 1/2 hour for air to escape from the system and refill the reservoir.

⚠WARNING *The high pressure spray from a leak or fitting in a hydraulic line can penetrate the skin, leading to possible blood poisoning — Wear safety glasses — Shut down the engine that drives the hydraulic pump before loosening or tightening fittings — Do not delay getting proper medical attention if exposed to high pressure oil spray.*

6. If possible, disable engine starting and crank the engine to fill the system with oil. Otherwise, start and run the engine for not more than 3 to 5 seconds at a time. If a PTO clutch is provided, leave the engine running and engage the clutch for not more than 3 to 5 seconds at a time.

⚠CAUTION *Running the pump without oil will quickly destroy the pump.*

7. Refill the reservoir if the level drops (Step 5).
8. Repeat Steps 6 and 7 until the system is full. The system probably is full when the oil level stops dropping in the reservoir and the pressure gauge indicates at least 200 psi. *Stop the engine when the pressure gauge indicates at least 200 psi so as not to damage the gauge.*
9. With the engine stopped, remove the pressure gauge and install the port plug. (Be prepared to do this quickly because all of the oil from the reservoir will drain out if this port is left open.)
10. When the system is full, turn the genset switch **ON**, let the engine run and listen for pump noise (metallic sound). Stop the engine or disengage the PTO clutch immediately if the pump is noisy. Repeat Steps 6 and 7.

Testing Operation

After the system has been filled, run the engine, turn the genset switch **ON** and check voltage, frequency and current (Page 2) under various loads and engine speeds.

Note: Frequency is maintained by an electronic controller. Have an authorized *Sunsource Inc.* representative service the hydraulic pump or controller if the generator set does not maintain nominal frequency.

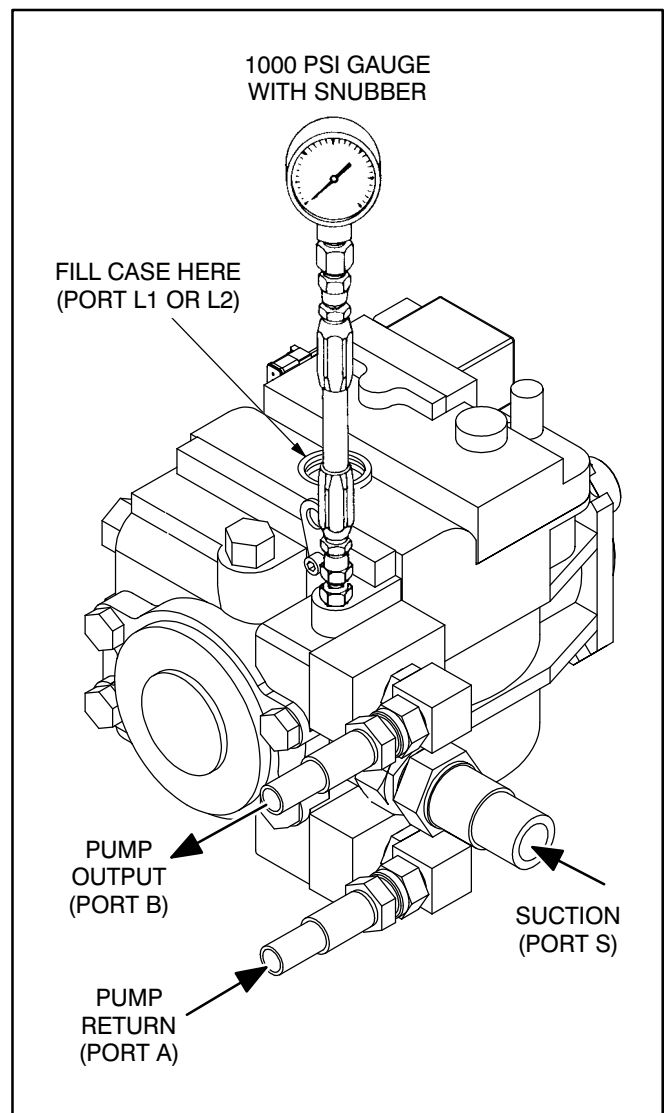


FIGURE 3. HYDRAULIC CONNECTIONS AT PUMP

WIRING RECONNECTIONS

The Outline Drawing (Page A-1) illustrate the wiring connections between the components of the system. Also refer also to the wiring schematic on Page A-2.

AC Output Connections

The genset has 04 AWG leads in 1-1/4 inch trade size non-metallic spiral conduit for AC connections at the vehicle AC distribution panel. Refer to the wiring schematic on Page A-2.

Genset On/Off Switch

If it is necessary to replace the ON/OFF switch, install a switch rated at least 20 amps at 12 VDC to turn the genset on and off (see schematic, Page A-2). Interconnect the ON/OFF switch and genset with lead harness No. 338-4084.

Note: If the PTO has a clutch, it is recommended that the genset ON/OFF switch also be connected to turn off the PTO clutch. That would prevent the operator from inadvertently turning off the PTO but not the genset. Otherwise, if the genset is left ON, the hour meter would record running hours when the genset is not running. Further, the vehicle battery could be run down and internal genset components could be damaged.

Battery Connections

Genset control and monitoring requires connection to a 12 volt battery. Use lead harness No. 338-4085 to connect the genset to a terminal block in a vehicle equipment cabinet that provides battery positive (+) and negative (–) terminals.

Lead harness No. 338-4085 has a 20 amp blade-type fuse holder and fuse (yellow) to protect the genset control circuits from shorts to ground.

Control and Monitoring Connections

All wiring interconnections between components of the system are done with 15 foot (4.3 m) long harnesses with sealed connectors (Table 2) that match the connectors on the component leads.

TABLE 2. WIRING HARNESSSES

HARNESS	CONNECTIONS
338-4084	Genset to Remote ON/OFF Switch
338-4085	Genset to Battery
338-4086	Genset to Pump ON/OFF Solenoid
338-4087	For Display Power (from Genset)
338-4088	For Oil Temperature Display from Sensor
338-4089	For AC Display from Genset

Wiring Methods

Follow the National Electrical Code (USA) or Canadian Electrical Code, as required. Especially note the following:

1. Have a trained and experienced electrician supervise and inspect the installation of all AC wiring.
2. Provide overcurrent protection as required at the vehicle AC distribution panel. See Article 445, NFPA No. 70 (USA) or Part 1, Section 14 of C22.1 (Canada).
3. Replacement switches and controls should be vibration proof so that they don't open and close circuits when the vehicle is in motion.
4. Route AC power wiring and remote control wiring separately.
5. Reseal all conduit openings into the vehicle interior to keep out vehicle engine exhaust. Apply silicone rubber or equivalent sealant inside and outside each conduit connector. (Flexible conduit is not vapor-tight and will allow exhaust gas to enter along the wires if not sealed.)
6. Reestablish the electrical bond between the genset and all connected AC and DC equipment and controls and the common grounding point on the vehicle in accordance with applicable codes.

⚠WARNING **EXHAUST GAS IS DEADLY!**
Seal all wiring openings into the vehicle interior to keep out exhaust gas.

⚠WARNING **Faulty grounding can lead to fire or electrocution, resulting in severe personal injury or death. Grounding must be in accordance with applicable codes.**

REPLACING THE DISPLAY MODULE

Interconnect the display module with the other system components with lead harness Nos. 338-4087, 338-4088 and 338-4089.

Check the label on the back of the display. It should indicate that it is calibrated for 20 kW. If it is not, recalibrate the display as follows:

1. Press the hidden Menu button twice and then the Mode button twice (Figure 4).
2. The display will show the current kW setting.
3. If not correct, press the Menu button as many times as necessary to select the correct setting. The next higher rating is displayed each time you press the Menu button. The display restarts at 6 kW after the highest rating is attained (45 kW) by pressing the Menu button.
4. Once the desired setting has been selected, press and hold the Mode button and the Menu button to save the setting. Hold both buttons until the display returns to its normal display.

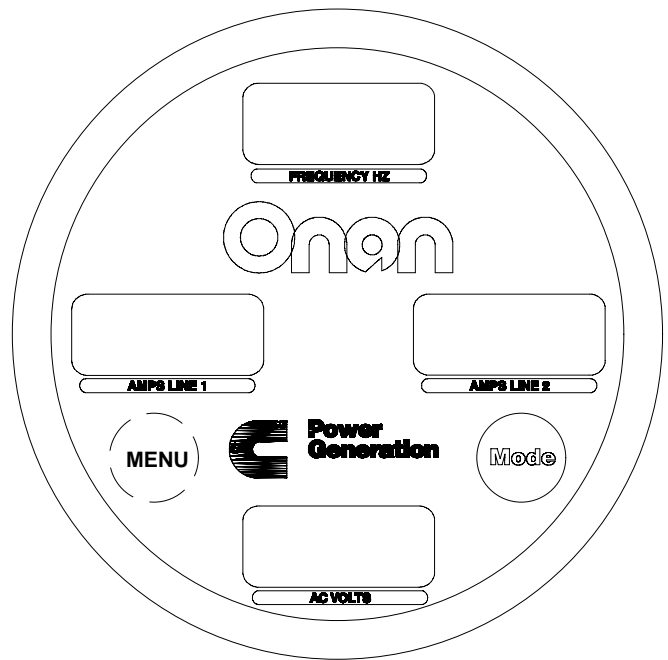


FIGURE 4. DISPLAY MODULE

HYDRAULIC PUMP SERVICE AND INSTALLATION

Pump Service and Installation

Have an authorized *Sunsource Inc.* representative service the hydraulic pump.

See *Specifications* regarding minimum and maximum pump speeds, SAE mounting flanges and SAE hose connections.

⚠ CAUTION *Do not use the pump actuator as a handle to lift or maneuver the pump. Doing so can damage the actuator.*

The pump must be remounted such that case drain port L1 or L2 is on top to vent air from the pump (Figure 5).

Note: The pump must be rotated clockwise, as viewed from the shaft end. Some PTOs turn counter-clockwise. Make sure to check for clockwise rotation when replacing a PTO.

Interconnect the pump actuator and genset with lead harness No. 338-4086.

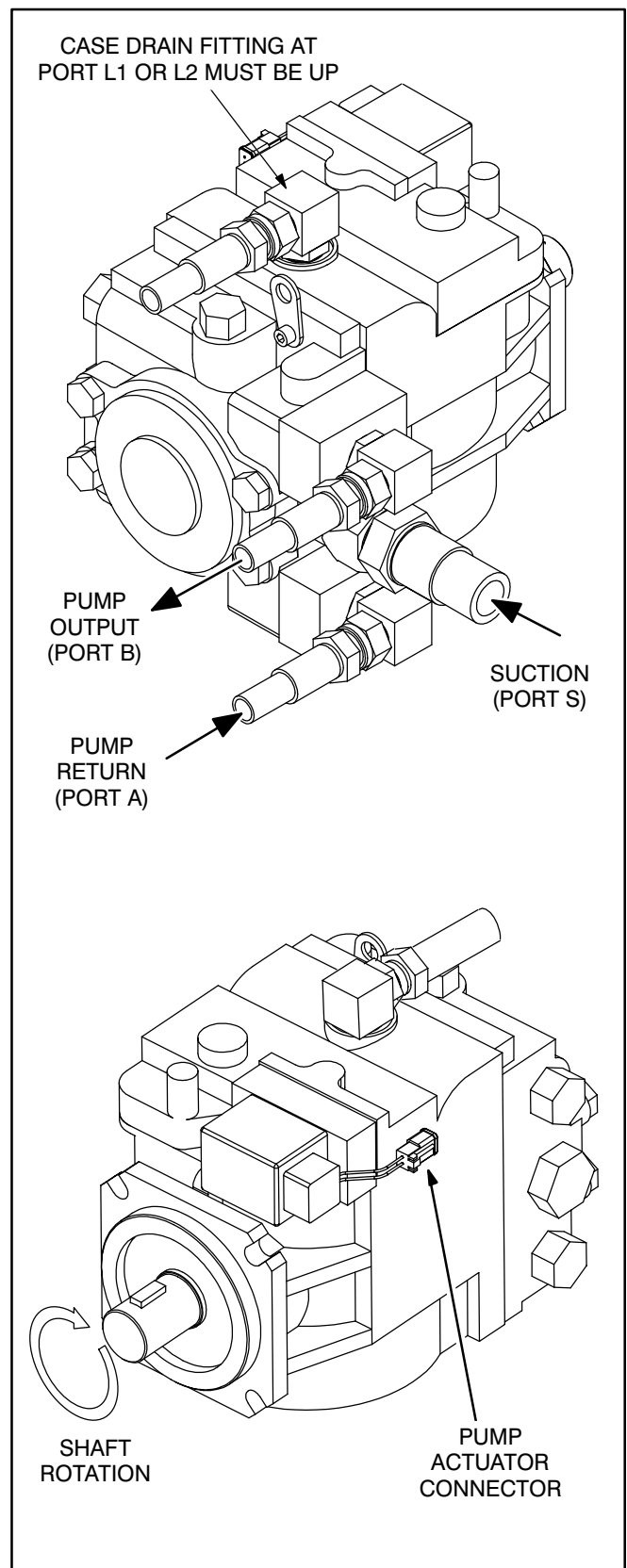


FIGURE 5. PUMP ASSEMBLY

Pump Drive

Remount the pump on the frame cross member and connect it to the PTO (Figure 6) by means of the drive shaft. Consider the following:

1. The drive shaft can turn as high as 3800 rpm. To minimize vibration and wear, the pump must be located such that the drive shaft U-joint angles will be as small as possible. The PTO and pump must be parallel within 1 degree and offset not more than would cause a 5 degree shaft angle.
2. Use lock wires to secure hub set screws.
3. Provide guards around drive shafts at locations where they could accidentally be touched.

⚠WARNING *Rotating drive shafts can cause severe personal injury or death. Guards must be provided to prevent accidental contact.*

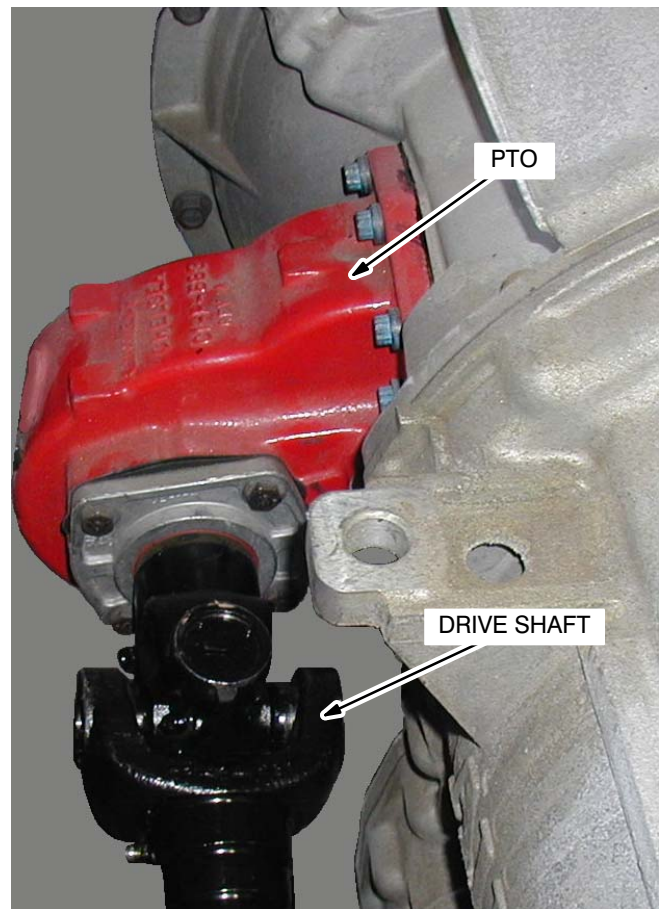


FIGURE 6. TYPICAL PTO AND DRIVE SHAFT

HYDRAULIC MOTOR SERVICE AND INSTALLATION

Pump Service and Installation

Have an authorized *Sunsource Inc.* representative service the hydraulic motor. To replace the motor:

1. Remove the housing cover (top and side).
2. Disconnect the four hydraulic connections.
3. Unbolt the old motor (2 bolts) and withdraw it.
4. Lubricate the shaft spline of the new motor with Cummins spline lubricant (524-0781) and bolt it on. Torque the bolts (2) to 41 lb-ft (56 N-m).

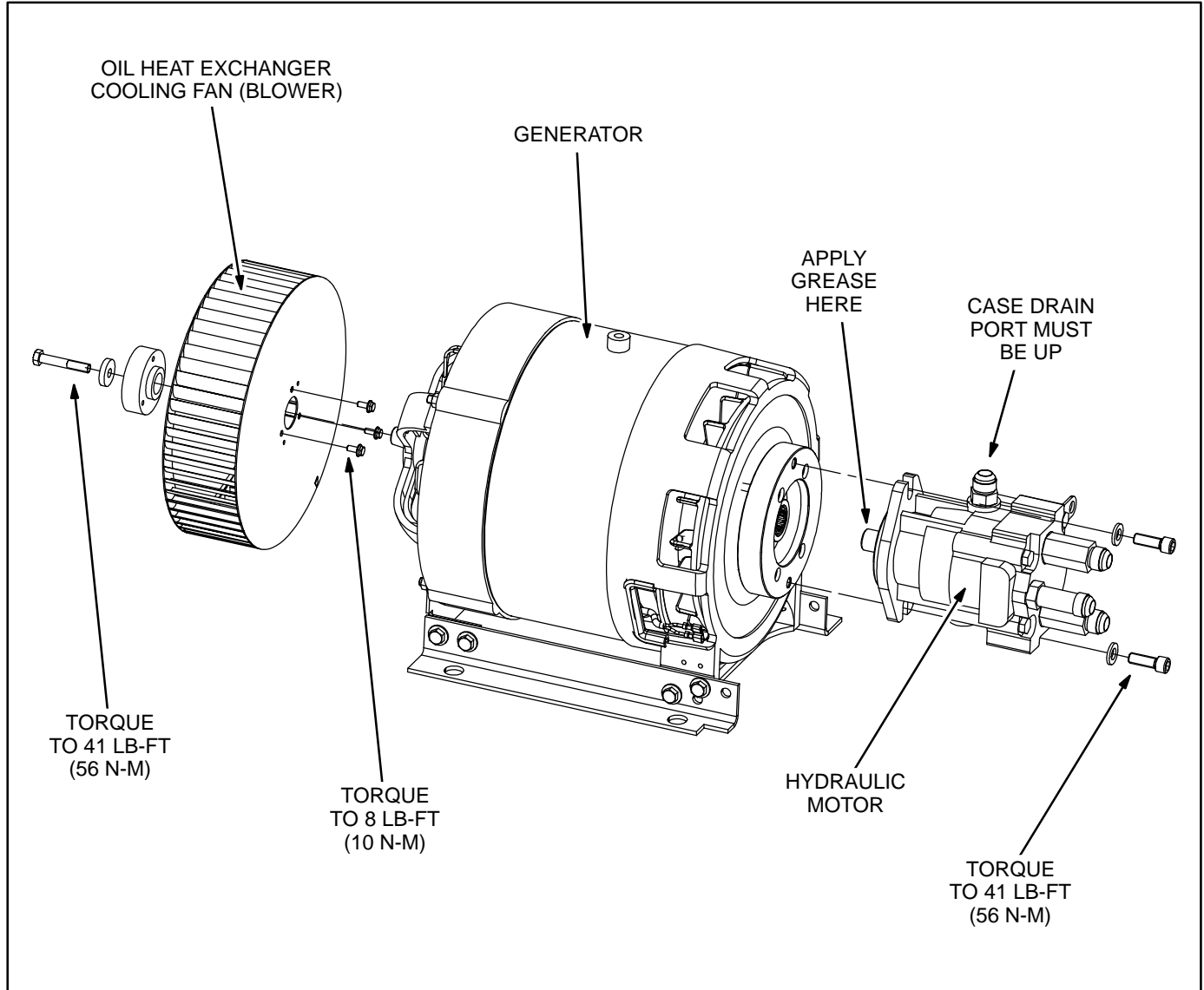


FIGURE 7. HYDRAULIC MOTOR

GENERATOR SERVICE

These are 2-bearing, brushless exciter, 4-pole (1800 rpm), revolving field generators (Figure 8). Output voltage is regulated by the voltage regulator and frequency by the hydraulic pump controller, which are located in the control box (Page 18).

Removal

The generator, hydraulic motor and cooling fan should be removed as an assembly from the generator set (Figure 7).

1. Disconnect all hydraulic lines and wiring from the generator set and remove the set from the vehicle.
2. Remove the enclosure assembly and the fan (blower) intake/scroll.
3. Disconnect the hydraulic line between the motor and the heat exchanger.
4. Disconnect the field leads from the voltage regulator, the generator leads from **TB1** and the grounding strap.
5. Remove the four nuts that secure the generator mounting feet to the vibration isolation mounts.
6. Thread the lifting eye into the top of the generator and lift the generator assembly away.

Installation

Installation is the reverse of removal.

Disassembly

1. Remove the fan and hydraulic motor (Figure 7). Use three M6 screws and a puller to remove the fan hub from the rotor shaft.
2. Remove the drive bearing retention ring so that the rotor can be pulled from the endbell (Step 12).
3. The generator wrapper has two holes on opposite sides to raise the generator with two hoist hooks. Place the generator on its adapter endbell.
4. Scribe lines before separating the endbells from the stator to get the parts back together the same way during reassembly.
5. Disconnect the field leads from the exciter endbell.
6. Remove the four nuts and washers on the stator through bolts.

7. Remove the exciter endbell bracket from the generator feet.
8. Tap the exciter endbell free and lift it away.
9. Lift the stator straight up free of endbell and rotor.
10. Remove the four through bolts.
11. Remove the air baffle.
12. Thread an M10 eyebolt into the end of the rotor and lift it out of the endbell.
13. Use a puller to remove a defective exciter rotor or bearing.

Reassembly

Reassembly is the reverse of disassembly. Note the following:

1. Press a new exciter rotor or bearing on up to its locating shoulder on the shaft. Do not lubricate the shaft. Make sure to reinstall the retention ring in the groove in the shaft in front of the large bearing.
2. To reduce the likelihood of damaging the windings, thread in the stator through bolts into the adapter endbell before installing the stator to help guide the stator down over the rotor. The ends with the shorter threads must thread into the endbell and bottom.
3. Make sure the lines scribed on the endbells and stator line up.
4. Torque the four exciter stator screws to 8 lb-ft (11 N-m) and connect the leads to the end bell terminal block.
5. Torque the four air baffle screws to 8 lb-ft (11 N-m).
6. Torque the four motor adapter hub screws to 20 lb-ft (27 N-m).
7. Torque the four through bolt nuts to 31 lb-ft (41 N-m).
8. Torque the three fan hub screws to 8 lb-ft (10 N-m).
9. Torque the center fan hub screw to 41 lb-ft (56 N-m).
10. Wipe the bearing bore in the exciter endbell lightly with molybdenum disulfide grease and make sure to install the rubber O-ring.
11. Wipe the bearing bore in the adapter endbell lightly with molybdenum disulfide grease and make sure to reinstall the bearing retention ring in the groove in the outer race.

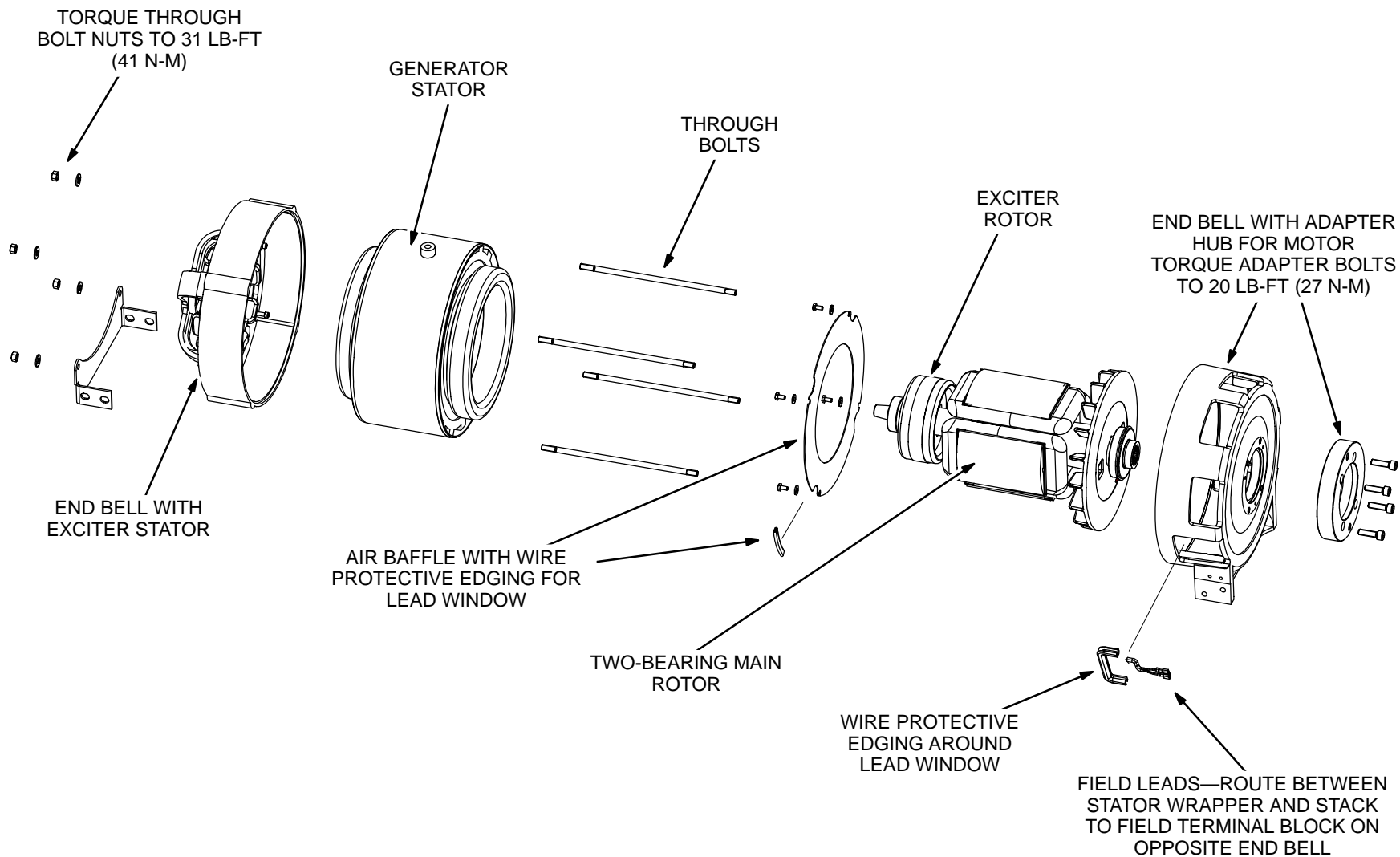


FIGURE 8. GENERATOR

Flashing the Field

Always flash the field of a replacement exciter stator before reinstallation the generator set.

While the set is running and disconnected from all loads, apply a 12 volt battery for one to two seconds. **Polarity must be correct: battery positive (+) to F1 and battery negative (-) to F2.**

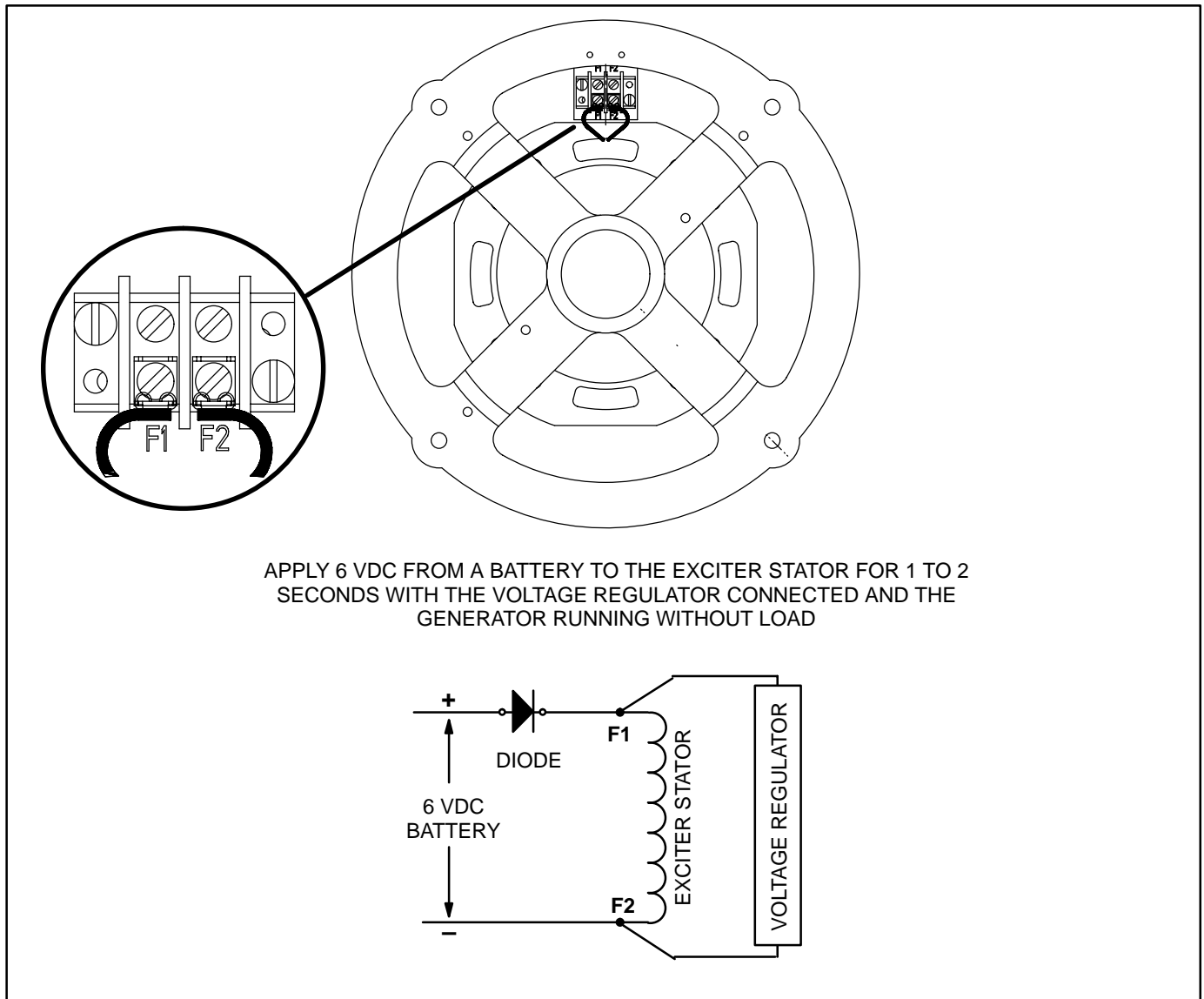


FIGURE 9. FLASHING THE FIELD

Isolating AC Output Problems

⚠ WARNING **HAZARDOUS VOLTAGE.** *Touching uninsulated parts inside the generator and control box can result in severe personal injury or death. Measurements and adjustments must be done with care to avoid touching hazardous voltage parts. Stand on a dry wooden platform or rubber insulating mat, make sure your clothing and shoes are dry, remove jewelry and use tools with insulated handles.*

⚠ CAUTION *These procedures involve unregulated excitation of the generator. To prevent damage to the generator due to overcurrent, make sure that all loads have been disconnected from the generator.*

If there is access to the terminals on the voltage regulator (Page 20), use the following procedure as a first step in diagnosing problems with AC output. The procedure is used to determine whether the problem is in the generator or in the voltage regulator.

1. Disconnect all loads from the generator set.
2. Remove the side access cover and disconnect the generator field leads **F1** and **F2** from the voltage regulator (Page 20).
3. Prepare to connect 12 volt battery positive (+) to the **F1** lead removed from the voltage regulator and battery negative (–) to the **F2** lead and to read AC output voltage across **L1-L0** and **L2-L0**.
4. Recheck polarity (the test will be inconclusive if polarity is reversed) and connect battery positive (+) to the **F1** lead and start the generator.
5. Connect battery negative (–) to the **F2** lead and read AC output voltage across **L1-L0** and **L2-L0**.
6. The generator circuitry is probably okay if rated output voltage or higher is obtained and the

voltages across **L1-L0** and **L2-L0** are approximately the same. (Normal excitation voltage ranges from approximately 10 VDC at no-load to approximately 40 VDC at full-load.)

7. If the voltages are not approximately the same, troubleshoot the main stator first. If the voltages are uniformly low, troubleshoot the exciter and field circuits first.

Winding Test Methods

Winding Insulation Resistance: A 500 VAC megger is recommended for the winding insulation resistance tests prescribed below. A test consists of applying the test potential between the winding and ground (winding laminations) for a period of 10 minutes and recording resistance at 1 minute and again at 10 minutes.

Resistance values of at least 5 megohms should be obtained for a new generator with dry windings. The polarization index should also be at least 2 (the ratio of the resistance reading at ten minutes to the reading at one minute). For a set that has been in service, the resistance reading should not be less than 1 megohm nor the polarization index less than 2.

Dry the windings if low readings are obtained or the set has been in standby for a long time in high humidity conditions and repeat the test.

Winding Resistance: Use a digital ohmmeter or Wheatstone bridge to measure winding resistance. The device should have a precision of at least 0.01 ohm. Replace a winding if resistance falls outside the range specified in Table 3.

TABLE 3. GENERATOR WINDING RESISTANCES

WINDING	RESISTANCE (OHMS) @ 77° F (25° C)
ROTOR	1.89 to 1.71
EXCITER STATOR	12.6 to 11.8
EXCITER ROTOR	0.638 to 0.522
T1–T2, T3–4	0.043 to 0.039

Stator

Winding Insulation Resistance: Test each winding separately. Disconnect the winding lead from its grounded neutral connection and isolate it. Leave the other winding grounded. Connect either or both winding leads to the megger and conduct the test as instructed for Winding Insulation Resistance.

Winding Resistance: Disconnect the stator leads from **TB1** and measure resistance across lead

pairs: **T1-T2** and **T3-T4**. Replace the stator if the resistance is not as specified in Table 3.

Exciter Stator Windings

Winding Insulation Resistance: Disconnect exciter stator leads **F1** and **F2** from the terminal block on the generator end bell (Figure 9). Conduct the test as instructed for Winding Insulation Resistance.

Winding Resistance: Measure winding resistance between **F1** and **F2**. Replace the exciter stator if the resistance is not as specified in Table 3.

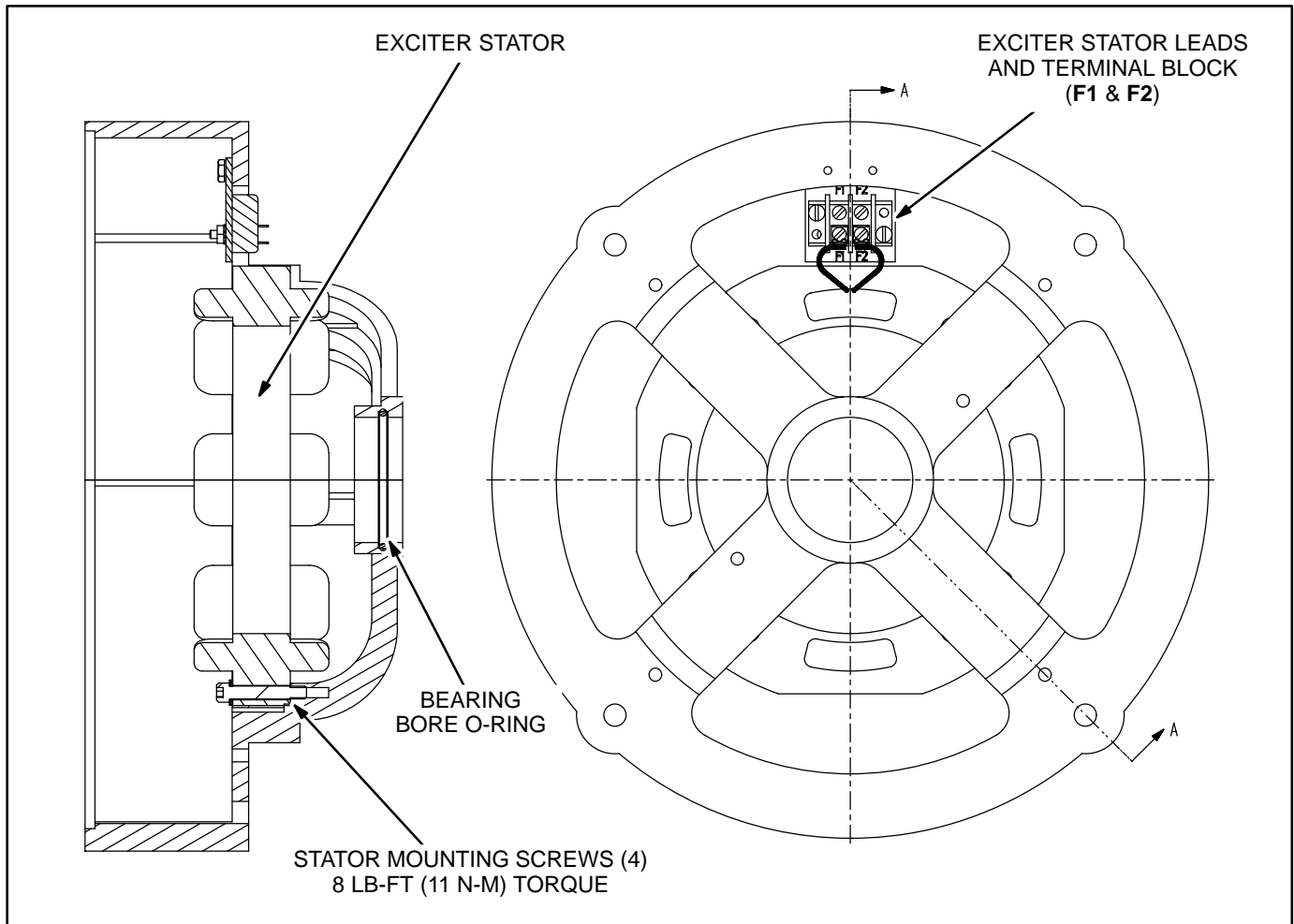


FIGURE 10. EXCITER STATOR AND END BELL

Exciter Rotor

Winding Insulation Resistance: Disconnect all six exciter rotor leads from diode terminals **CR1** through **CR6** and isolate them from ground. Connect any lead to the megger and conduct the test as instructed for Winding Insulation Resistance (Page 14).

Winding Resistance: Measure electrical resistance across each pair of rotor windings: **T11-T12**, **T21-T22**, **T12-T13**, **T22-T23**, **T13-T11** and **T23-T21**. See the connection schematic. Replace the exciter rotor if the resistance of any winding is not as specified in Table 3.

Rotating Rectifiers

The rotating rectifier assembly is mounted on the back face of the exciter rotor. It consists of one positive (+) and one negative (-) diode assembly. Each assembly carries three diodes in an epoxy potting. Each diode has a terminal for connecting the ap-

propriate lead from the exciter rotor (**CR1-CR6**). Each assembly has a field terminal (**F1+** or **F2-**) for connecting the leads from the main rotor (generator field).

Diode Resistance: Measure electrical resistance between diode terminals **CR1**, **CR2** and **CR3** and field terminal **F1+** on the positive diode assembly and between diode terminals **CR4**, **CR5** and **CR6** and field terminal **F2-** on the negative diode assembly. Reverse the meter test probes and repeat the tests. The electrical resistance across each diode should be high in one direction and low in the other. If the resistance is high or low in both directions, replace the whole diode assembly.

Replacing Diode Assembly: Make sure the replacement diode assembly is of the correct polarity, positive (+) or negative (-). Then disconnect all leads from the defective diode assembly and remove the two mounting screws. Mount the new diode assembly, reconnect all leads and torque the terminal screws to 24 lb-in (2.6 N-m).

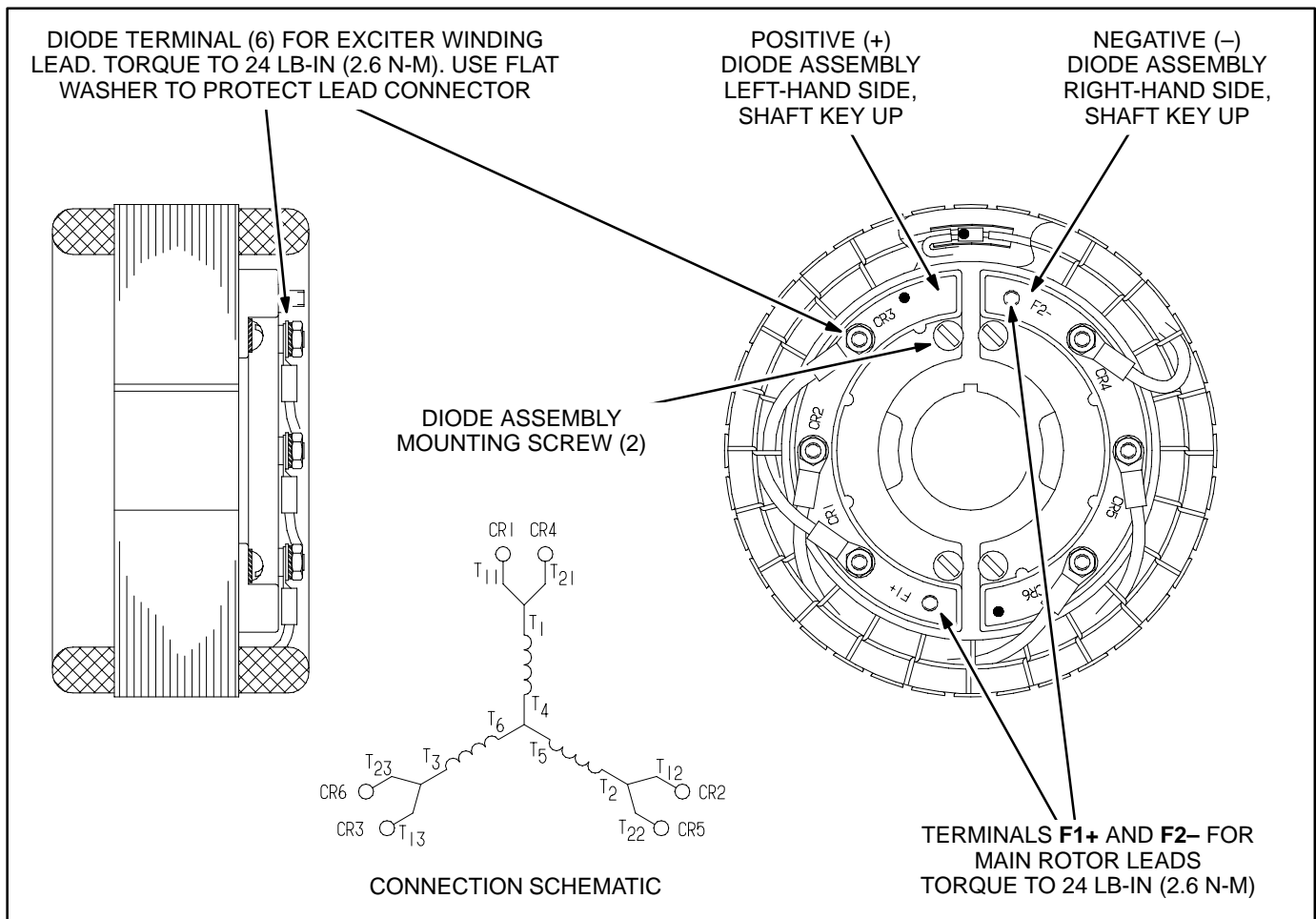


FIGURE 11. ROTATING RECTIFIER ASSEMBLY

Main Rotor

Winding Insulation Resistance: Disconnect the main rotor leads from terminals **F1+** and **F2+** on the rotating rectifier assemblies and isolate them from ground. Tag and mark each lead with its terminal number (**F1+** or **F2+**).

⚠ CAUTION *Because of the opposing residual magnetism of the rotor, it might be difficult to re-establish self excitation if the polarity of the main rotor leads is reversed upon reassembly.*

Connect either or both leads to the megger and conduct the test as instructed under Testing Winding Insulation Resistance.

Winding Resistance: Disconnect the main rotor leads from terminals **F1+** and **F2+** on the rotating rectifier assemblies and measure electrical resistance between them. Replace the rotor if the resistance is not as specified in Table 3.

Reconnect the rotor leads and torque the terminals to 24 lb-in (2.7 N-m) when reassembling.

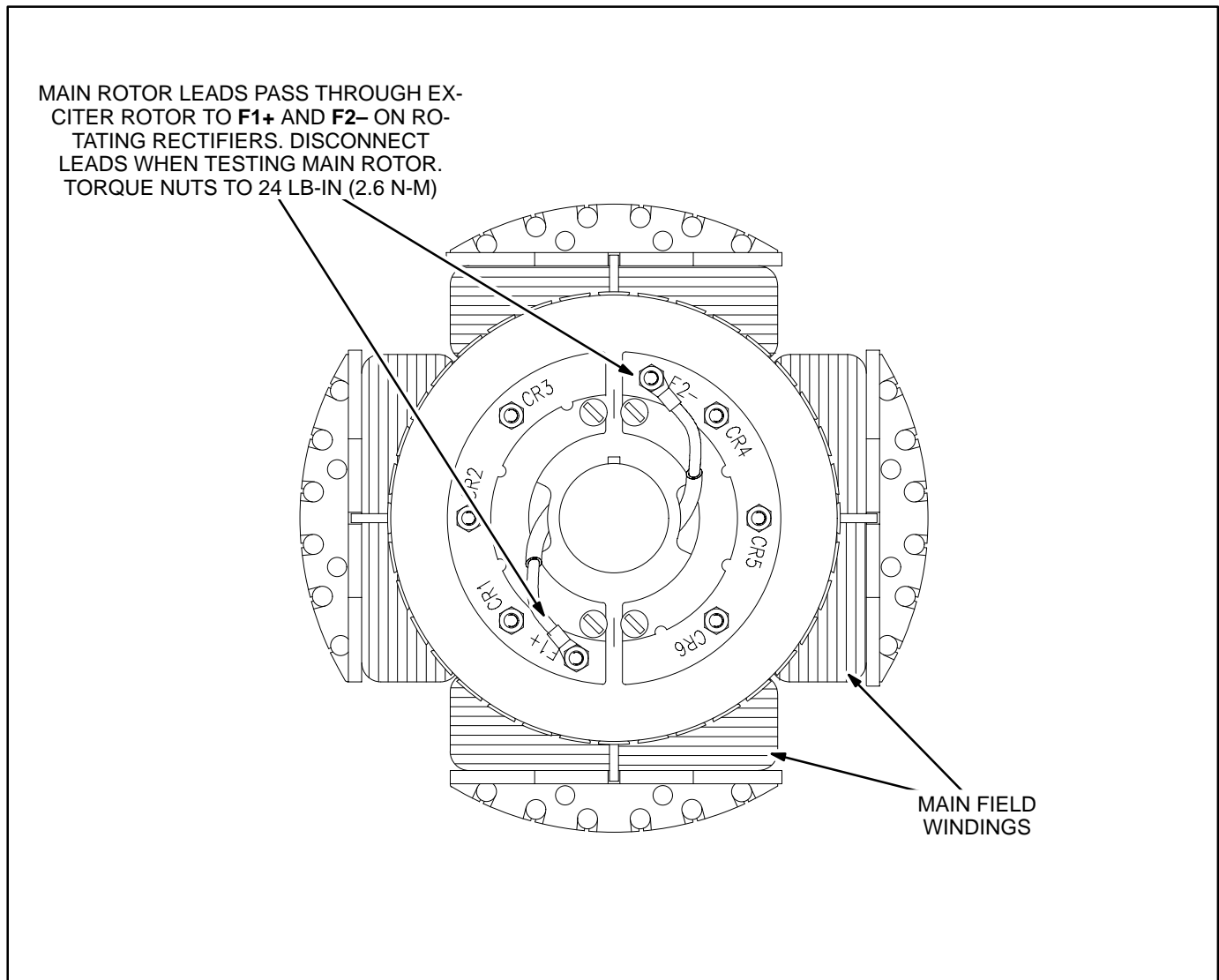


FIGURE 12. ROTOR ASSEMBLY

CONTROL BOX

Figure 13 illustrates the control box.

Voltage Regulator

Four screws secure the voltage regulator to the back of the control box. See VOLTAGE REGULATOR (Page 20) for details.

Hydraulic Pump Controller

Two screws secure the hydraulic pump controller to the side of the control box. Have an authorized *Sun-source Inc.* representative service the hydraulic pump controller.

Voltage Transformer VT1

Voltage Transformer VT1 output (green leads) should be 24 VAC when input (black leads) is

230 VAC (connected across TB1-5 and TB1-1). The 24 VAC signal is used for generator speed sense by the Hydraulic Pump Controller and for generator output voltage and frequency by the Display Module. Replace VT1 if either winding is open or shorted.

Current Transformers CT1 & CT2

Current Transformers CT1 and CT2 are the sources for displaying L1 and L2 currents on the digital display module. L1 and L2 must pass through their respective CTs the same way for the display module to work properly.

TB1 Terminals

Torque **TB1** terminal board terminal screws to 61 lb-in (7 N-m).

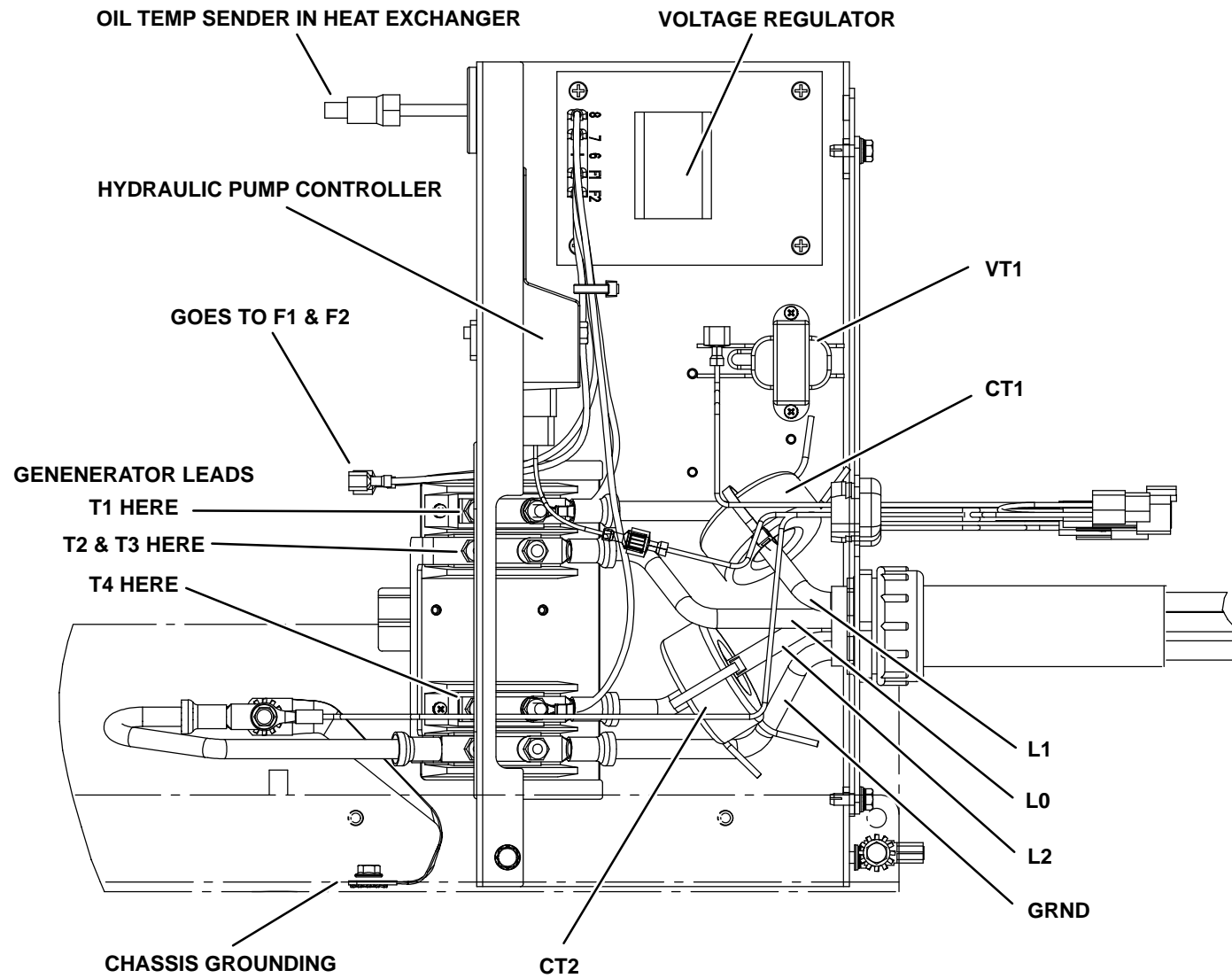


FIGURE 13. CONTROL BOX

VOLTAGE REGULATOR

The voltage regulator is mounted inside the control box (Figure 13). It is adjusted by means of the potentiometers (pots) shown in Figure 14. These measurements and adjustments are performed while the set is running and require access to uninsulated high voltage parts in the control box.

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

⚠WARNING *Stand on a dry wooden platform or rubber insulating mat, make sure your clothing and shoes are dry, remove jewelry and use tools with insulated handles.*

Field and Voltage Sense Connections

Connect the field and voltage sense leads to their

respective terminals on the voltage regulator. See Page A-2.

Jumper Reconnections

Jumpers are provided for various applications. Before installing a replacement voltage regulator:

- **Jumper C – 60:** The frequency selection jumper must be connected between terminals **C** and **60** for 60 Hz regulation.
- **Jumper 1 – 2:** There must be a jumper between terminals **1** and **2**.

Voltage and Voltage Stability Adjustments

Measure generator output voltage while the set is running without load at rated frequency. Turn the **VOLTS** pot fully counterclockwise and the **STABILITY** pot to its midpoint. Then turn the **VOLTS** pot clockwise until rated voltage is obtained. If voltage becomes unstable when a large load is connected, turn the **STABILITY** pot clockwise until voltage is stable. Check and readjust **VOLTS**, if necessary, each time **STABILITY** is readjusted.

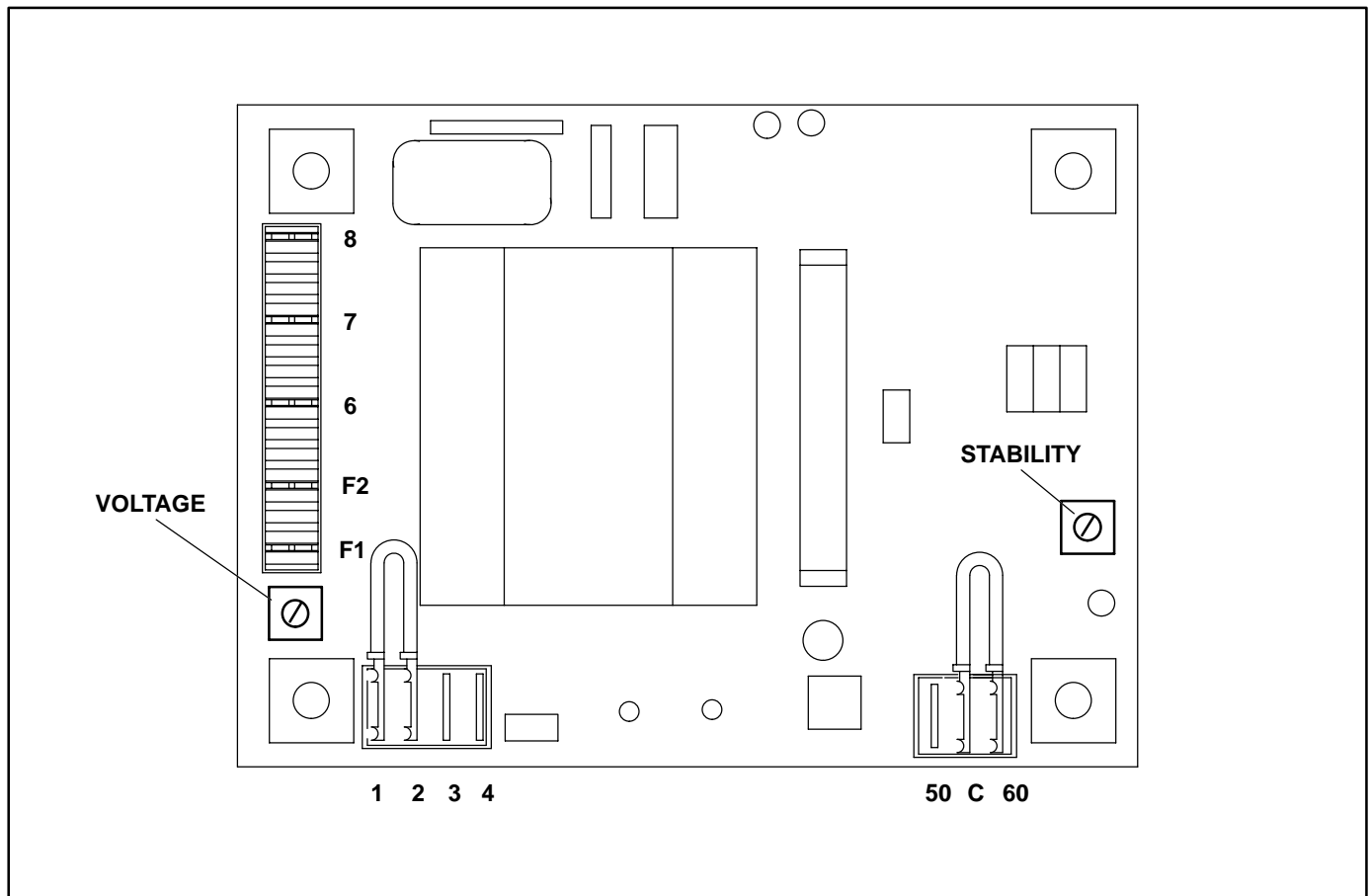


FIGURE 14. VOLTAGE REGULATOR

Troubleshooting

This section covers problems that may be encountered and suggests possible causes and corrective actions.

NOISY PUMP OR MOTOR	
⚠WARNING <i>There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.</i>	
Possible Cause	Corrective Action
1. Air trapped in hydraulic fluid	A. Purge the air and refill the oil reservoir as necessary (Page 4). ⚠CAUTION <i>Running the pump without oil will quickly destroy the pump.</i>

NO AC OUTPUT OR AIR DISCHARGE—ENGINE RUNNING	
⚠WARNING <i>There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.</i>	
Possible Cause	Corrective Action
1. ON/OFF Switch OFF	A. Turn the switch ON .
2. ON/OFF Switch was ON when the engine was started or the PTO was engaged	A. Turn the switch OFF and then ON .
3. Disengaged PTO	A. Engage the PTO.
4. Blown Fuse (F1)	A. Replace with a 20 amp (yellow) blade-type fuse (Pages A-1 and A-2). If the new fuse blows, check for ground faults in harnesses 338-4084, 338-4085 and 338-4087 and replace as necessary (Pages A-1 and A-2).
5. Hydraulic fluid leak	A. Check for and repair any leaks in the system and refill as necessary (Page 3).
6. 12 VDC not available or polarity reversed.	A. Disconnect connector J1 at the genset and check for 12 VDC across pins A and B and Positive (+) 12 VDC at pin A. See Pages A-1 and A-2. Service or reconnect as necessary.

NO AC OUTPUT OR AIR DISCHARGE—ENGINE RUNNING

⚠️WARNING *There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.*

Possible Cause	Corrective Action
7. Faulty ON/OFF Switch	A. Disconnect connector P2 at the genset and check for electrical continuity across pins A and B when the switch is turned on. See Pages A-1 and A-2. Replace a faulty switch.
8. Faulty Lead Harness	A. Check for bent, corroded or missing connector pins and damaged leads in harnesses 338-4084, 338-4085 and 338-4086 and replace as necessary (Pages A-1 and A-2).
9. Faulty Hydraulic Pump Controller speed sense connections inside control box (Page 18).	A. Check for bent, corroded or missing connector pins and damaged leads at controller connector P26–J26 and controller speed sense lead connector P20–J20. See Page A-2. B. If loose or misconnected, reconnect the primary leads (black) of voltage transformer VT1: H1 to TB1–6 and H2 to TB1–1 . C. Replace voltage transformer VT1 if faulty (Page 18).
10. The Hydraulic Pump or Controller needs service	A. Have an authorized <i>Sunsource Inc.</i> representative service the hydraulic pump or controller.

NO AC OUTPUT—DISPLAY MODULE INDICATES VOLTAGE

⚠️WARNING *There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.*

Possible Cause	Corrective Action
1. Line circuit breaker (vehicle AC distribution panel) OFF, TRIPPED or faulty	A. If the circuit breaker is OFF , find out why, make sure it is safe to reconnect power, and then switch it ON . B. If the circuit breaker TRIPPED , shut down the genset and repair the shorted or grounded equipment that caused tripping. C. Replace a faulty circuit breaker.
2. Misconnected Genset Power Supply Conductors	A. Reconnect the genset power supply conductors correctly at the vehicle AC distribution panel. See Page A-2.

VOLTAGE, CURRENT AND FREQUENCY ARE PRESENT BUT NOT DISPLAYED

⚠WARNING *There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.*

Possible Cause	Corrective Action
1. Faulty Lead Harness	<p>A. Check for bent, corroded or missing connector pins and damaged leads in harnesses 338-4087 and 338-4089 and replace as necessary (Pages A-1 and A-2).</p> <p>B. Disconnect connector P7 at the display module and check for 12 VDC across pins 1 and 2 and Positive (+) 12 VDC at pin 1. See Pages A-1 and A-2. Service or reconnect as necessary.</p>
2. Misconnected or faulty CT1, CT2 or VT1	A. Pages A-1 and A-2. Replace or reconnect components as necessary in the control box (Page 18).
3. Faulty Display Module	A. Replace.

HYDRAULIC OIL TEMPERATURE DOES NOT DISPLAY

⚠WARNING *There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.*

Possible Cause	Corrective Action
1. Faulty Lead Harness	A. Check for bent, corroded or missing connector pins and damaged leads in harness 338-4088 and replace as necessary (Pages A-1 and A-2).
2. Misconnected or faulty oil temperature sensor	A. Pages A-1 and A-2. Replace or reconnect the oil temperature sensor as necessary (Page 18).
3. Faulty Display Module	A. Replace.

NO AC OUTPUT—GENSET RUNNING AND AIR DISCHARGING

⚠WARNING *There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.*

Possible Cause	Corrective Action
1. Misconnected Generator or Voltage Regulator	<p>A. Check for proper generator and load connections on Terminal Block TB1 and reconnect as necessary. See Page A-2. Torque the terminal screws to 61 lb-ft (7 N-m).</p> <p>B. Check for proper voltage sense lead connections between the voltage regulator and Terminal Block TB1 and reconnect as necessary: 7 to TB1-1 and 8 to TB1-6.</p> <p>C. Check for electrical continuity and correct polarity between the Exciter Stator leads and the Voltage Regulator terminals and reconnect as necessary: F1 to F1 and F2 to F2. See Pages 15 and 20.</p>
2. Faulty Generator or Voltage Regulator	<p>A. If there is access to the terminals on the voltage regulator (Page 20), use the procedure on Page 14 to isolate the problem to the generator or to the voltage regulator, and then service as necessary. If not, remove the generator set and test the generator stator, rotor and exciter windings and diode assembly as instructed, beginning on Page 14. Replace the Voltage Regulator only if the tests indicate that the generator windings and diode assembly are sound.</p>

FREQUENCY TOO HIGH OR TOO LOW OR UNSTABLE

⚠WARNING *There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.*

Possible Cause	Corrective Action
1. Wrong PTO speed ratio	<p>A. Change the PTO gear ratio if pump speed at engine idle or at maximum engine speed falls outside the Min-Max pump speed range in <i>Specifications</i>.</p>
2. The Hydraulic Pump or Controller needs service	<p>A. Have an authorized <i>Sunsource Inc.</i> representative service the hydraulic pump or controller.</p>

VOLTAGE TOO HIGH OR TOO LOW OR UNSTABLE

⚠WARNING *There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.*

Possible Cause	Corrective Action
1. Wrong PTO speed ratio	A. Voltage is frequency dependent. Change the PTO gear ratio if pump speed at engine idle or at maximum engine speed falls outside the Min-Max pump speed range in <i>Specifications</i> .
2. Voltage misadjusted	A. Adjust voltage and voltage stability (Page 20).
3. Faulty Generator or Voltage Regulator	A. If there is access to the terminals on the voltage regulator (Page 20), use the procedure on Page 14 to isolate the problem to the generator or to the voltage regulator, and then service as necessary. If not, remove the generator set and test the generator stator, rotor and exciter windings and diode assembly as instructed, beginning on Page 14. Replace the Voltage Regulator only if the tests indicate that the generator windings and diode assembly are sound.

NOISY GENERATOR

⚠WARNING *There are hazards present in troubleshooting that can cause equipment damage, severe personal injury or death. Troubleshooting must be performed by trained and experienced persons who know about the hazards of electricity, hydraulic systems and machinery. Read Safety Precautions inside the front cover and observe all instructions and precautions in this manual.*

Possible Cause	Corrective Action
1. Loose fan, worn bearing or misaligned rotor and motor	A. Repair as necessary. See Pages 10 and 11.

[illegible]

200 PSI Hose — — — — —

4000 PSI Hose — - —

8 INCH CLEARANCE REQUIRED
FOR FILTER ELEMENT REMOVAL

—#12 200 PSI HOSE

—#20 200 PSI HOSE

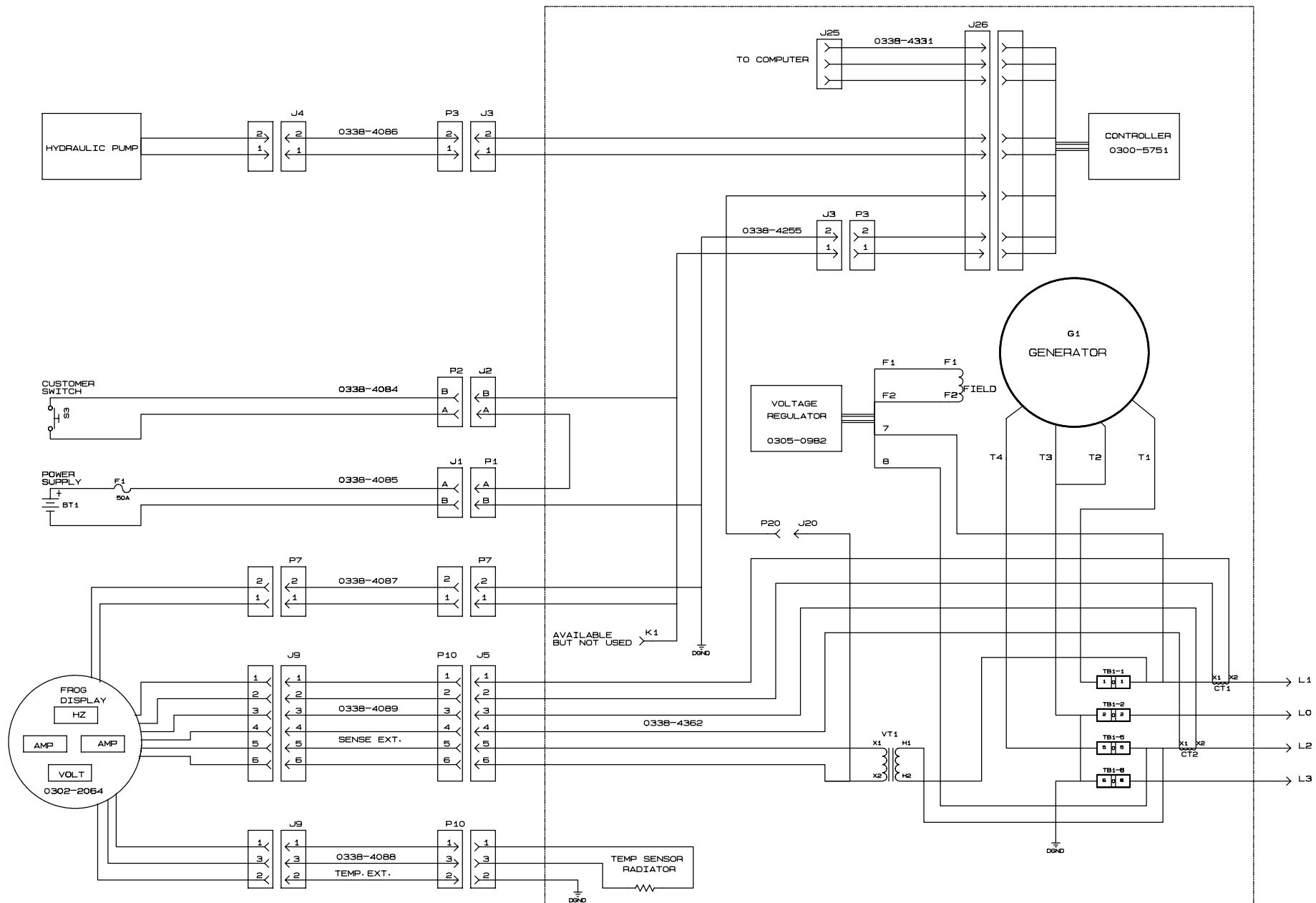
#12 200 PSI HOSE-

#12 4000 PSI HOSE

—#12 4000 PSI HOSE

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