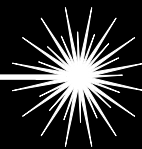


**Caution: This document contains mixed page sizes (8.5 x 11 or 11 x 17), which may affect printing. Please adjust your printer settings according to the size of each page you wish to print.**

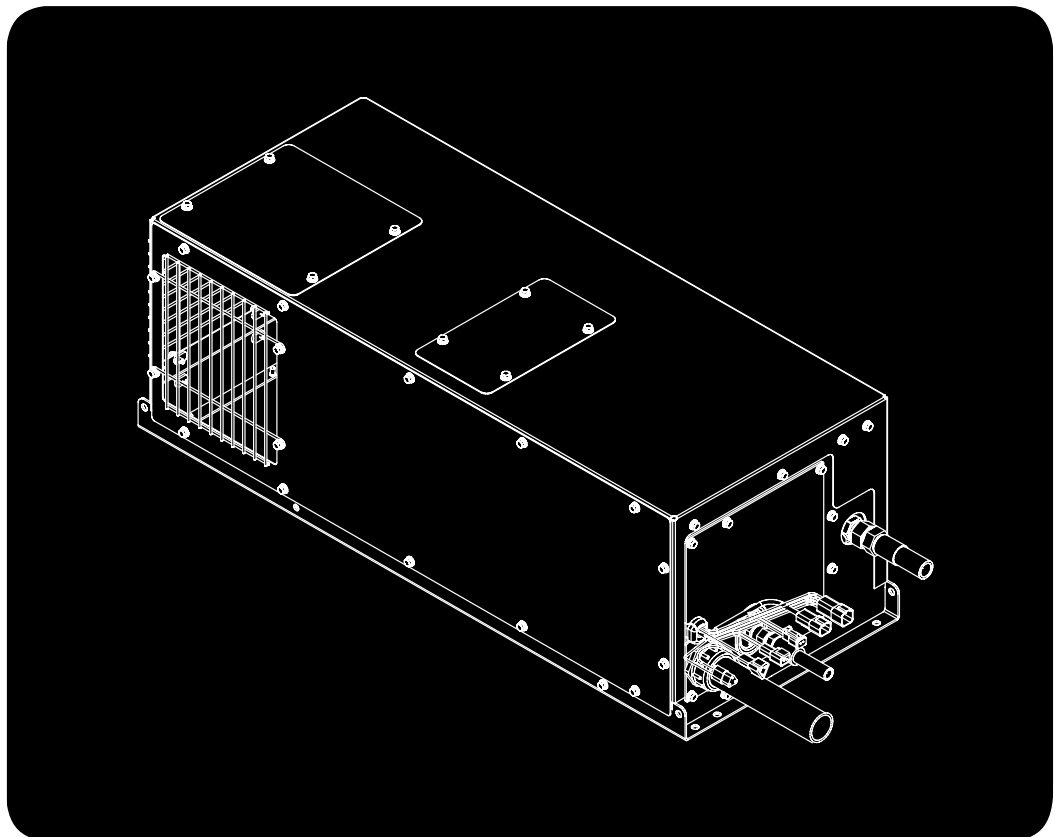


**Commercial Mobile Power**



## **Service**

### **RBAA Hydraulic Generator Sets (6-15 kW)**



# Table of Contents

---

SAFETY PRECAUTIONS .....	2
SPECIFICATIONS .....	3
INTRODUCTION .....	6
About this Manual .....	6
Product Description .....	6
OPERATION .....	7
Starting and Stopping .....	7
Genset Display Module .....	7
MAINTENANCE .....	8
Oil Level .....	8
Oil Filter .....	8
Breather Filter .....	8
Generator .....	8
SERVICE .....	9
Replacing Hydraulic Hose .....	9
Wiring Reconnections .....	9
Genset On/Off Switch .....	10
Battery Connections .....	10
Hydraulic Pump Service and Installation .....	11
Hydraulic Motor Service .....	15
Generator Service .....	15
Control .....	18
TROUBLESHOOTING .....	20
Noisy Pump or Motor .....	20
No Output or Air Discharge — Engine Running .....	20
No Output — Genset Running and Air Discharging .....	21
Frequency too High or too Low or Erratic .....	22
Output Voltage too Low .....	22
Noisy Generator .....	23
15 KW GENSETS .....	24
6, 8 & 10 KW GENSETS—BEGINNING SPEC C .....	25
6, 8 & 10 KW GENSETS—SPECS A & B .....	26
WIRING SCHEMATIC .....	27

# 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 which will result in severe personal injury or death.*

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

**⚠ CAUTION** *alerts you to a hazard or unsafe practice which 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

	6 kW Models <sup>1</sup>		
	Spec A	Spec B	Spec C
<b>GENERATOR:</b> 2-Pole Revolving Field, 1-Bearing, Self-Excited, 1-Phase, Electronic Voltage Regulation			
Frequency	60 Hertz	60 Hertz	60 Hertz
Voltage (3-Wire)	120 / 240 volts	120 / 240 volts	120 / 240 volts
Current	50 / 25 amps	50 / 25 amps	50 / 25 amps
Speed	3600 rpm	3600 rpm	3600 rpm
<b>DC SYSTEM:</b>		<b>DC SYSTEM:</b>	<b>DC SYSTEM:</b>
Battery Voltage	12 volts	12 volts	12 volts
Control Circuit Fuse (F1)	20 amp blade-type	20 amp blade-type	20 amp blade-type
<b>INSTALLATION:</b> Hydraulic Pump		<b>INSTALLATION:</b> Hydraulic Pump	<b>INSTALLATION:</b> Hydraulic Pump
Min – Max Pump Speed	850 – 3000 rpm	900 – 3200 rpm	900 – 3200 rpm
SAE Flange	B2	B	B
SAE Spline Shaft	B2	B	B
SAE Straight Key Shaft	B2	7/8 inch B	7/8 inch B
Flow	8 gpm	8 gpm	8 gpm
Maximum Pressure	5000 psi	4000 psi	4000 psi
Hydraulic Fluid	Dextron III	Dextron III	Dextron III
Weight	70 lb (32 Kg)	58 lb (27 Kg)	58 lb (27 Kg)
Max Power Draw on Engine	22.4 hp	22.4 hp	22.4 hp
<b>INSTALLATION:</b> Hydraulic Hose & Fittings			
Pump to Motor	#8, 4000 psi Hose; 37° Fittings	#8, 4000 psi Hose; 37° Fittings	#8, 4000 psi Hose; 37° Fittings
Genset to Oil Reservoir	#8, 200 psi Hose; 37° Fittings	#8, 200 psi Hose; 37° Fittings	#8, 200 psi Hose; 37° Fittings
Pump Case to Oil Reservoir	#8, 200 psi Hose; 37° Fittings	#8, 200 psi Hose; 37° Fittings	#8, 200 psi Hose; 37° Fittings
Oil Reservoir to Pump Hose Fitting at Reservoir Fitting at Pump	#20 (Min), 200 psi 37° Fitting SAE Size 32, Code 61 Flange Head at Pump	#20 (Min), 200 psi 37° Fitting 37° Fitting	#20 (Min), 200 psi 37° Fitting 37° Fitting
<b>INSTALLATION:</b> Generator Module			
Noise	72 dB(A) <sup>2</sup>	72 dB(A) <sup>2</sup>	72 dB(A) <sup>2</sup>
Weight	179 lb (81 Kg)	179 lb (81 Kg)	179 lb (81 Kg)
Dimensions (L x W x H)	31.0 x 15.8 x 13.7 in (764 x 402 x 348 mm)	31.0 x 15.8 x 13.7 in (764 x 402 x 348 mm)	31.08 x 15.96 x 13.79 in (789.4 x 405.38 x 350.33 mm)
Cooling Air Flow	1450 cfm	1450 cfm	1450 cfm
Max Ambient Temperature Continuous Full Load Intermittent Load	120° F (49° C) 140° F (60° C)	120° F (49° C) 140° F (60° C)	120° F (49° C) 140° F (60° C)
1 – Rated @ 1.0 PF			
2 – Rated @ 10 ft (3 m), before installation, under full load.			

	8 kW Models <sup>1</sup>		
	Spec A	Spec B	Spec C
<b>GENERATOR:</b> 2-Pole Revolving Field, 1-Bearing, Self-Excited, 1-Phase, Electronic Voltage Regulation			
Frequency	60 Hertz	60 Hertz	60 Hertz
Voltage (3-Wire)	120 / 240 volts	120 / 240 volts	120 / 240 volts
Current	50 / 25 amps	50 / 25 amps	50 / 25 amps
Speed	3600 rpm	3600 rpm	3600 rpm
<b>DC SYSTEM:</b>			
Battery Voltage	12 volts	12 volts	12 volts
Control Circuit Fuse (F1)	20 amp blade-type	20 amp blade-type	20 amp blade-type
<b>INSTALLATION:</b> Hydraulic Pump			
Min – Max Pump Speed	850 – 3000 rpm	900 – 3200 rpm	900 – 3200 rpm
SAE Flange	B2	B	B
SAE Spline Shaft	B2	B	B
SAE Straight Key Shaft	B2	7/8 inch B	7/8 inch B
Flow	8 gpm	8 gpm	8 gpm
Maximum Pressure	5000 psi	4000 psi	4000 psi
Hydraulic Fluid	Dextron III	Dextron III	Dextron III
Weight	70 lb (32 Kg)	58 lb (27 Kg)	58 lb (27 Kg)
Max Power Draw on Engine	22.4 hp	22.4 hp	22.4 hp
<b>INSTALLATION:</b> Hydraulic Hose & Fittings			
Pump to Motor	#8, 4000 psi Hose; 37° Fittings	#8, 4000 psi Hose; 37° Fittings	#8, 4000 psi Hose; 37° Fittings
Genset to Oil Reservoir	#8, 200 psi Hose; 37° Fittings	#8, 200 psi Hose; 37° Fittings	#8, 200 psi Hose; 37° Fittings
Pump Case to Oil Reservoir	#8, 200 psi Hose; 37° Fittings	#8, 200 psi Hose; 37° Fittings	#8, 200 psi Hose; 37° Fittings
Oil Reservoir to Pump Hose Fitting at Reservoir Fitting at Pump	#20 (Min), 200 psi 37° Fitting SAE Size 32, Code 61 Flange Head at Pump	#20 (Min), 200 psi 37° Fitting 37° Fitting	#20 (Min), 200 psi 37° Fitting 37° Fitting
<b>INSTALLATION:</b> Generator Module			
Noise	72 dB(A) <sup>2</sup>	72 dB(A) <sup>2</sup>	72 dB(A) <sup>2</sup>
Weight	179 lb (81 Kg)	179 lb (81 Kg)	179 lb (81 Kg)
Dimensions (L x W x H)	31.0 x 15.8 x 13.7 in (764 x 402 x 348 mm)	31.0 x 15.8 x 13.7 in (764 x 402 x 348 mm)	31.08 x 15.96 x 13.79 in (789.4 x 405.38 x 350.33 mm)
Cooling Air Flow	1450 cfm	1450 cfm	1450 cfm
Max Ambient Temperature			
Continuous Full Load	120° F (49° C)	120° F (49° C)	120° F (49° C)
Intermittent Load	140° F (60° C)	140° F (60° C)	140° F (60° C)
1 – Rated @ 1.0 PF			
2 – Rated @ 10 ft (3 m), before installation, under full load.			

	10 kW Models <sup>1</sup>	15 kW Models <sup>1</sup>
<b>GENERATOR:</b> 2-Pole Revolving Field, 1-Bearing, Self-Excited, 1-Phase, Electronic Voltage Regulation		
Frequency	60 Hertz	60 Hertz
Voltage (3-Wire)	120 / 240 volts	120 / 240 volts
Current	83 / 42 amps	125 / 62.5 amps
Speed	3600 rpm	3600 rpm
<b>DC SYSTEM:</b>		
Battery Voltage	12 volts	12 volts
Control Circuit Fuse (F1)	20 amp blade-type	20 amp blade-type
<b>INSTALLATION:</b> Hydraulic Pump		
Min – Max Pump Speed	850 – 3000 rpm	850 – 3000 rpm
SAE Flange	B	C
SAE Spline Shaft	B	C
SAE Straight Key Shaft	1–1/4 inch C	1–1/4 inch C
Flow	10.5 gpm	17 gpm
Maximum Pressure	5000 psi	5000 psi
Hydraulic Fluid	Dextron III	Dextron III
Weight	70 lb (32 Kg)	70 lb (32 Kg)
Max Power Draw on Engine	28 hp	35 hp
<b>INSTALLATION:</b> Hydraulic Hose & Fittings		
Pump to Motor	#8, 4000 psi Hose; 37° Fittings	#10, 4000 psi Hose; 37° Fittings
Genset to Oil Reservoir	#10, 200 psi Hose; 37° Fittings	#12, 200 psi Hose; 37° Fittings
Pump Case to Oil Reservoir	#8, 200 psi Hose; 37° Fittings	#10, 200 psi Hose; 37° Fittings
Oil Reservoir to Pump Hose Fitting at Reservoir Fitting at Pump	#20 (Min), 200 psi 37° Fitting SAE Size 32, Code 61 Flange Head at Pump	#20 (Min), 200 psi 37° Fitting SAE Size 32, Code 61 Flange Head at Pump
<b>INSTALLATION:</b> Generator Module		
Noise	72 dB(A) <sup>2</sup>	72 dB(A) <sup>2</sup>
Weight	190 lb (86 Kg)	225 lb (102 Kg)
Dimensions (L x W x H)	31.08 x 15.96 x 13.79 in (789.4 x 405.38 x 350.33 mm)	39.2 x 15.8 x 13.7 in (995 x 402 x 348 mm)
Cooling Air Flow	1450 cfm	1600 cfm
Max Ambient Temperature Continuous Full Load Intermittent Load	120° F (49° C) 140° F (60° C)	120° F (49° C) 140° F (60° C)
1 – Rated @ 1.0 PF		
2 – Rated @ 10 ft (3 m), before installation, under full load.		

# 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 Page 24, 25 or 26, respectively.

- **Genset** – The genset is an AC generator driven by an hydraulic motor. An automatic voltage regulator maintains nominal output voltage (120 / 240 VAC) under varying generator loads. An integral oil-to-air heat exchanger cools the

oil (hydraulic fluid) before it is returned to the reservoir.

- **Hydraulic Pump** – The hydraulic pump powers the generator motor and is driven by a power takeoff on the vehicle transmission. The pump maintains constant flow, and thus nominal generator frequency (60 Hz), by automatically adjusting piston stroke as engine speed varies in response to other concurrent tasks, such as vehicle propulsion or pumping.
- **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

If not running or engaged, start the vehicle engine and engage the PTO clutch (if so equipped). Switch ON the genset and then switch ON the loads individually or at the vehicle AC distribution panel.

**⚠ CAUTION** *Although the genset is capable of starting up with all loads connected, to save wear and tear, start the genset first and then connect the loads.*

### Stopping

First switch OFF the loads individually or at the vehicle AC distribution panel and then switch OFF the genset.

*The PTO need not be disengaged when shutting down the genset. Switching OFF the genset shuts off oil to the generator drive motor, thus stopping the generator. (Some oil continues to circulate between pump and reservoir as long as the engine is running.)*

**⚠ 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.*

## GENSET DISPLAY MODULE

### AC Output

The genset display module normally displays AC output voltage, frequency and current in each leg (Figure 1).

### Hour Meter

Press “Mode” once to display the number of hours run. The display will revert to AC output. (The generator module also has an hour meter.)

### Oil Temperature

Press “Mode” twice to display the temperature of the oil returning to the oil reservoir. The display will revert to AC output.

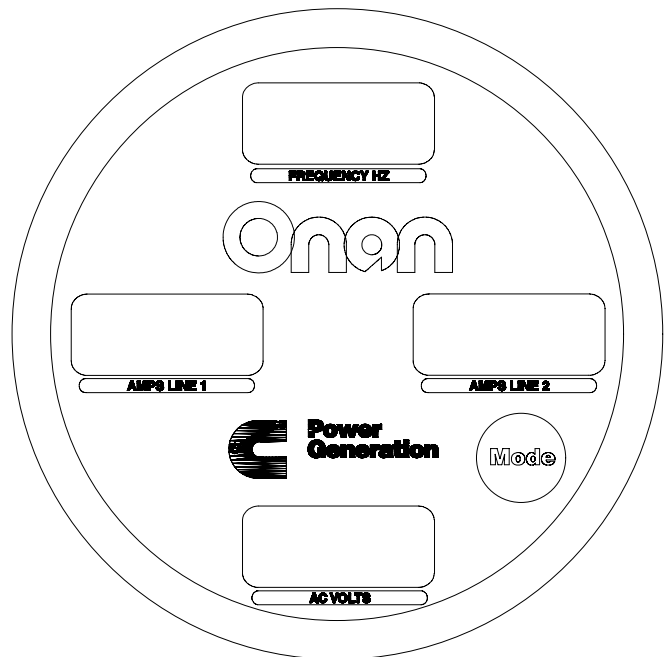


FIGURE 1. GENSET DISPLAY MODULE

# Maintenance

**⚠ 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.*

## 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 and brushes 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).

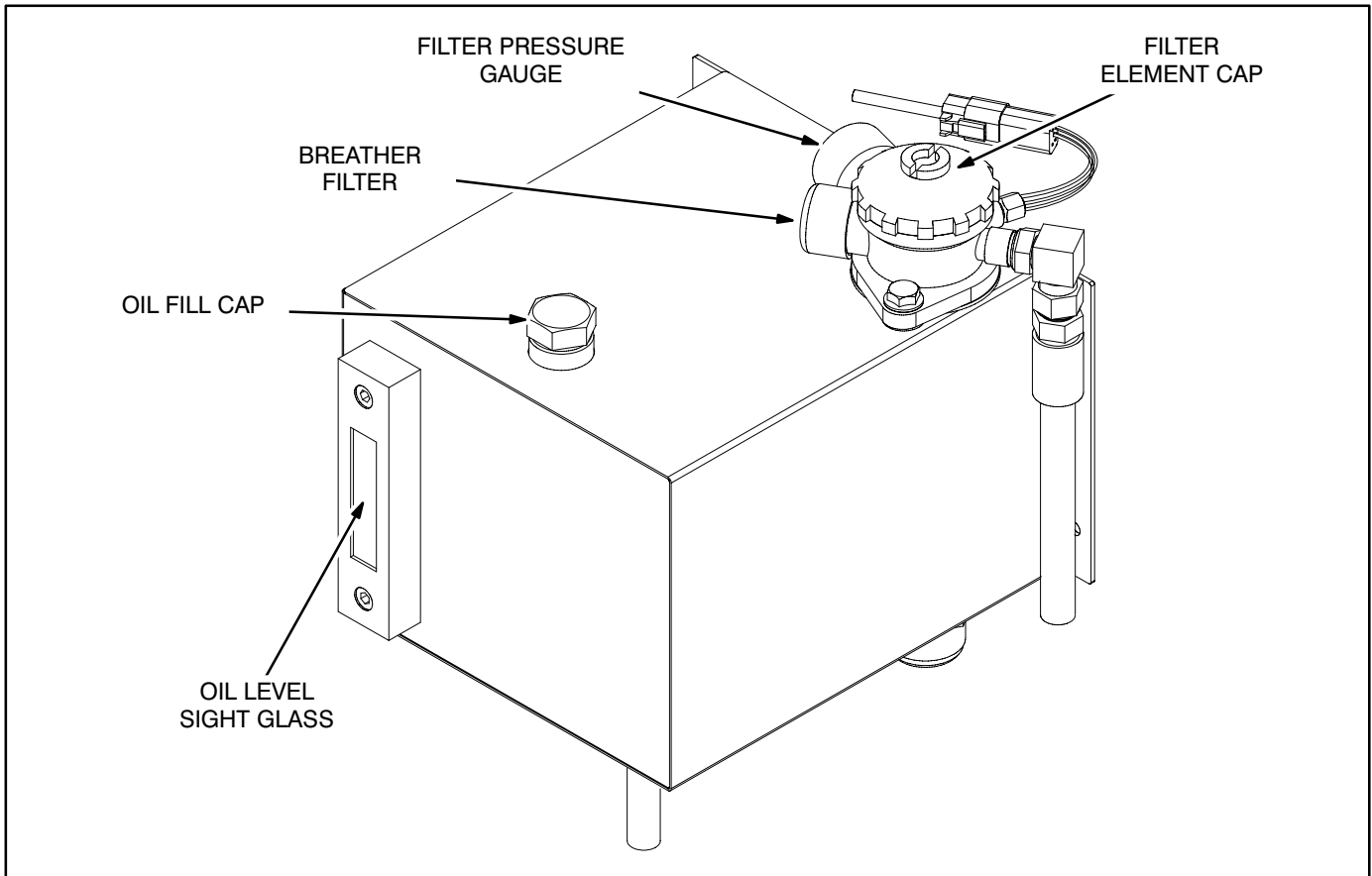


FIGURE 2. OIL RESERVOIR

# Service

## REPLACING HYDRAULIC HOSE

Page 24, 25 or 26 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.*

## Hose Length and Routing

1. Consider that hoses shrink slightly in length and expand slightly in diameter under pressure.
2. If the pump is bolted to a transmission mounted on vibration isolators, there must be enough slack in the connected hoses to prevent strain due to pump movement.
3. 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.
4. Do not bend hose tighter than the hose manufacturer recommends.
5. Flush hoses and cap them with JIC caps after cutting and terminating their ends.
6. Use wide-sweep 90-degree fittings.
7. Always use two wrenches when tightening fittings.
8. Support, restrain and protect hydraulic hose as necessary to prevent chaffing.

## WIRING RECONNECTIONS

Page 24, 25 or 26 illustrates the wiring interconnections between the components of the system. Also see the wiring schematic on Page 27.

## AC Output Connections

Gensets rated up to 10 kW have a 4-conductor, 10 ft (3 m) long, 8 AWG, Type SOOW power cord.

Gensets rated 15 kW have four (4) 6 AWG conductors, 12 ft (3.6 m) long, in flexible non-metallic conduit.

Replace wiring as necessary with like wiring.

## Control and Monitoring Connections

All wiring interconnections between components of the system are done with sealed connectors on the ends of short external leads which mate with matching connectors on 15 foot (4.3 m) long extension harnesses (Table 1-1). Replace harnesses as necessary.

**TABLE 1-1. 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. Route AC power wiring and remote control wiring separately.

4. 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.)

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

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

## **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 27). Interconnect the ON/OFF switch and genset with lead harness No. 338-4084.

## **BATTERY CONNECTIONS**

Genset control and monitoring requires connection to a 12 volt battery. Lead harness No. 338-4085 is available 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.

## HYDRAULIC PUMP SERVICE AND INSTALLATION

### Pump ON/OFF Solenoid Valve E1

Solenoid valve E1 (Figure 3) must be energized (12 VDC) for oil to flow from the pump to the motor. (Some oil circulates between the pump and oil reservoir when the valve is closed.)

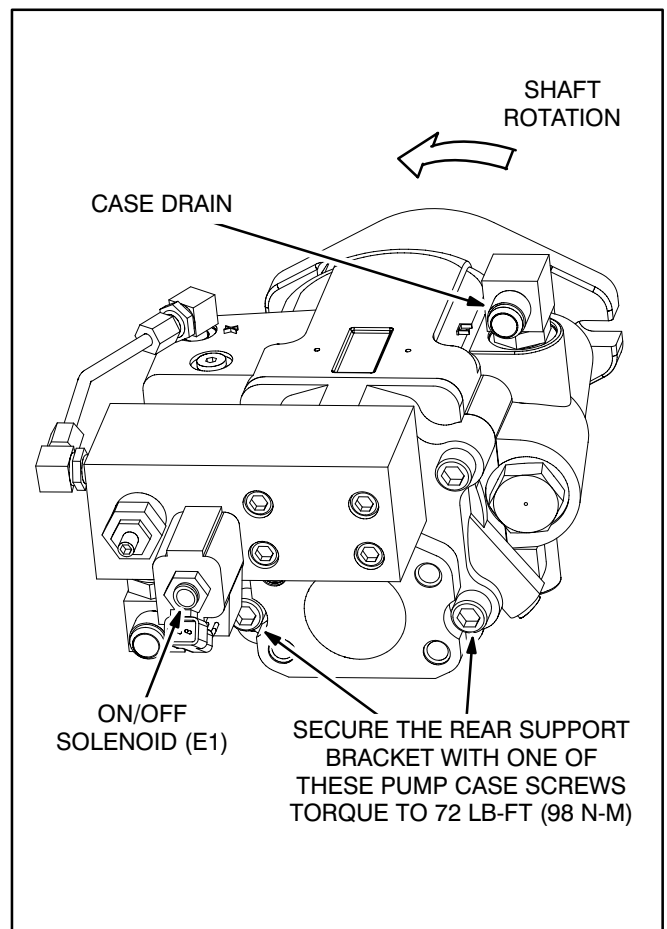
If the solenoid valve appears not to be functioning (no generator output), disconnect the wiring harness and check for electrical continuity across the solenoid coil. Remove the retaining nut and replace the coil if it is open or does not cause the valve to function when 12 VDC is applied. Replace the valve if it does not function with a new coil.

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

### Pump Removal

**⚠ CAUTION** *Do not use the pump solenoid (Figure 3) as a handle to lift or maneuver the pump. Doing so can damage the solenoid so that it hangs up when closing or opening.*

Remove the pump as an assembly if it needs to be replaced. It might be bolted directly to the PTO flange or to the vehicle frame and be driven by a drive shaft from the PTO (Figure 4).



**FIGURE 3. PUMP ASSEMBLY**

## Pump Installation

See *Specifications* regarding minimum and maximum pump speeds and SAE mounting flanges if it is necessary to replace the PTO (Figure 4).

Always remount the pump so that the case drain is on top to vent air from the pump (Figures 3 and 4).

**Direct Mount:** The pump (Figure 3) is bolted directly to the PTO flange (Figure 4) and should be supported on the other end by a bracket to the vehicle transmission. When remounting the bracket, torque the pump case screw to 72 lb-ft (98 N-m) and the transmission case screws as specified in the transmission service manual.

**Remote Mount:** When reinstalling a remote mounted pump:

1. Use lock wires to secure the set screws on the hubs of the drive shaft.

2. Make sure to secure all guards around the drive shaft.

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

## Filling the Pump and Connecting Hoses

Connect all of the hoses of the system (Page 24, 25 or 26), *except the pump case drain hose*. Then remove the plug in the case drain hose fitting (Figure 4) and fill the pump to the brim through the fitting. Finally, connect the case drain hose between pump and reservoir.

**Note:** Filling the pump this way is the only way to make sure that the pump will not start up dry and be seriously damaged.

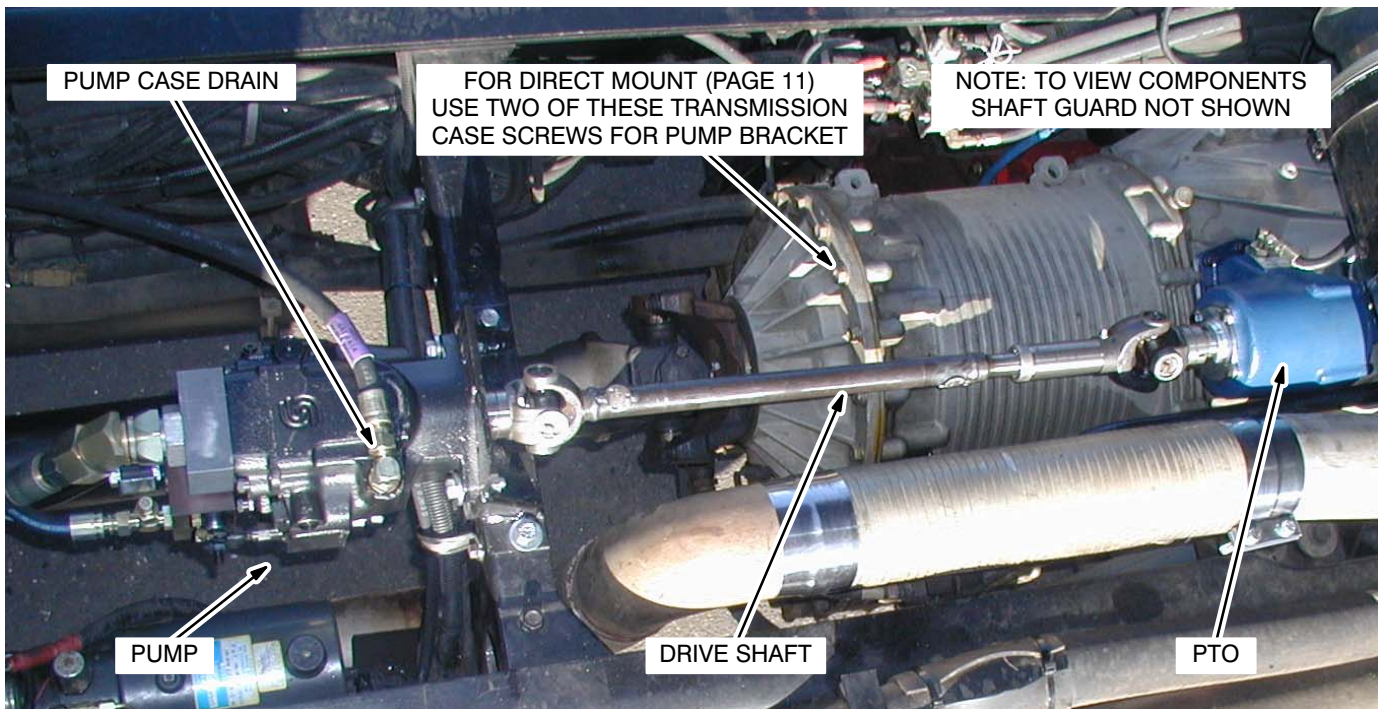


FIGURE 4. TYPICAL ARRANGEMENT OF PTO, HYDRAULIC PUMP, DRIVE SHAFT AND CASE DRAIN

## Filling Hydraulic System and Purging Air

Before filling the hydraulic system, make sure all hydraulic and electric connections have been made and that the pump has been filled through its case drain (Page 12). Fill the system as follows:

1. Switch OFF the line circuit breaker on the vehicle AC distribution panel to disconnect all loads.
2. Fill the oil reservoir to within 1/4 inch of the top of the sight glass (Page 8). The level will drop as the suction and case drain hoses fill.

**⚠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.*

3. Turn the genset **ON**, engage the PTO clutch (if so equipped) and crank the engine for a few seconds (disabling start if possible).
4. Refill the oil reservoir. The level will drop as hoses, motor and heat exchanger fill.
5. Repeat Steps 3 and 4 as necessary until the oil level in the reservoir stabilizes 1/4 inch from the top of the sight glass.

6. Listen for pump noise (metallic sound) with the engine running and genset **ON**. Shut down the engine or disengage the PTO clutch immediately if the pump is noisy and repeat Steps 3 and 4.

**⚠CAUTION** *Continuing to run or load a noisy pump or motor can destroy it. Purge all air before continuing.*

## Adjusting Frequency

**New Pump Assembly:** It will be necessary to adjust frequency before connecting loads. The factory sets frequency slightly low to reduce the likelihood of overspeeding and damaging the generator and fan during startup.

1. Switch OFF the line circuit breaker on the vehicle AC distribution panel to disconnect all loads.
2. Start the engine and engage the PTO clutch (if so equipped). Stop the engine or disengage the PTO clutch immediately if the pump is noisy (metallic sound) and purge the system of air.
3. Turn the genset switch **ON** and observe the gauges on the genset display module. Frequency should be approximately 55 Hz.

**Note:** Frequency is adjusted while the pump is in operation.

- Loosen the locknut on the frequency adjusting screw on the pump manifold (Figure 5) and slowly turn the screw **counterclockwise** to increase frequency. One half-turn will increase frequency approximately 8 Hz. Set the locknut when frequency stabilizes at 62.5 Hz.

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

- Set the locknut and recheck frequency.
- Connect full-load and check frequency. Frequency should not drop below 59 Hz.
- If frequency remains erratic or droop cannot be adjusted to within 62.5 to 59 Hz, air may be trapped in the pump spool valve. To bleed air,

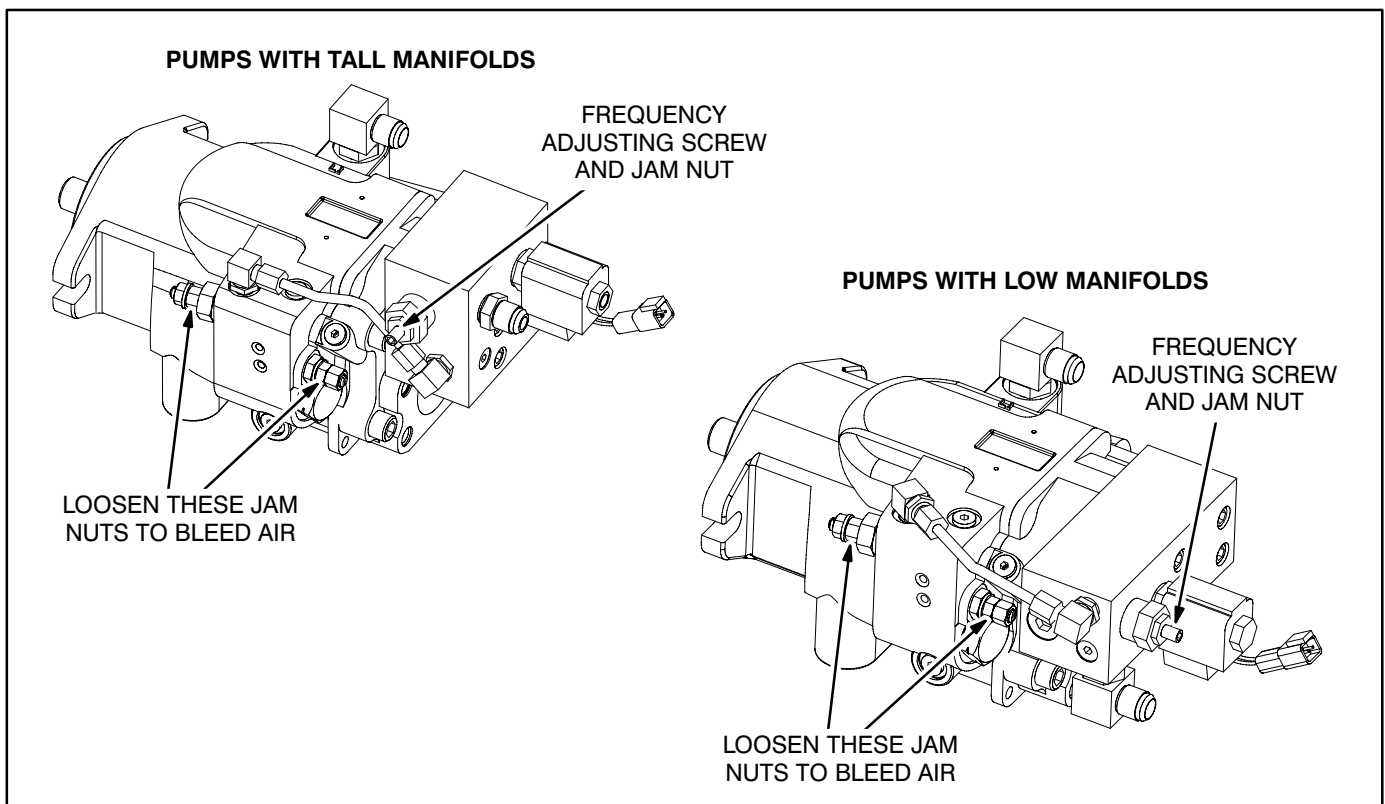
loosen the two jam nuts shown in Figure 5. *First note the position of each adjusting screw so that the adjustment can be restored if disturbed.* Run the pump and retighten the jam nuts when oil appears around the screws, indicating that the air has been displaced.

- Recheck frequency and droop.

**Old Pump Assembly:** If the pump manifold or adjusting screw have been replaced or you have lost track of the frequency adjustment (Figure 5), first turn the adjustment screw in all the way (clockwise) to make sure you do not overspeed the generator. Then adjust frequency as for a new pump assembly.

### Installing Pump Manifold

Make sure to install the O-ring between pump and manifold and torque the four (4) screws to 34 lb-ft (46 N-m).



**FIGURE 5. FREQUENCY ADJUSTING SCREW AND AIR BLEED POINTS**



## HYDRAULIC MOTOR SERVICE

As the motor wears full-load frequency can be expected to decrease. Replace the motor when frequency is no longer adjustable within the limits of 62.5 Hz (no-load) to 59 Hz (full-load).

To replace the motor (Figure 6):

1. Remove the housing cover (top and side).
2. Disconnect the hydraulic inlet and outlet 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 (57 N-m).

## GENERATOR SERVICE

These are 2-pole (3600 rpm), revolving field generators with brushes and slip rings (Figure 6). Output voltage is regulated by the automatic (electronic) voltage regulator (AVR).

### Stator

The stator consists of steel laminations with two sets of windings in the lamination slots. The main windings (T1-T2, T3-T4) are for powering the connected loads and the quadrature windings (Q1-Q2) are for field excitation.

### Rotor

The rotor consists of a shaft with steel laminations wrapped with field windings. A molded slip ring assembly is pressed on to supply field current to the rotor windings through the brush block assembly. The rotor shaft is supported on one end by a sealed ball bearing assembly and on the other end by the splined shaft of the hydraulic motor.

### Genset and Heat Exchanger Cooling Fans

The heat exchanger cooling fan is bolted back to back to the generator cooling fan (three screws),

which is on a tapered hub secured by a through bolt to the generator rotor.

### Brush Block

Field current passes through the brush block which has two spring-loaded carbon brushes that make contact with the rotor slip rings.

### Automatic Voltage Regulator

The automatic voltage regulator (AVR) varies field current to maintain constant output voltage under varying load conditions. During startup it flashes the field with battery current for fast buildup. In response to transient loads it lowers the voltage setpoint to allow for engine recovery. Power for field excitation is supplied through the AVR by the quadrature windings (Q1-Q2).

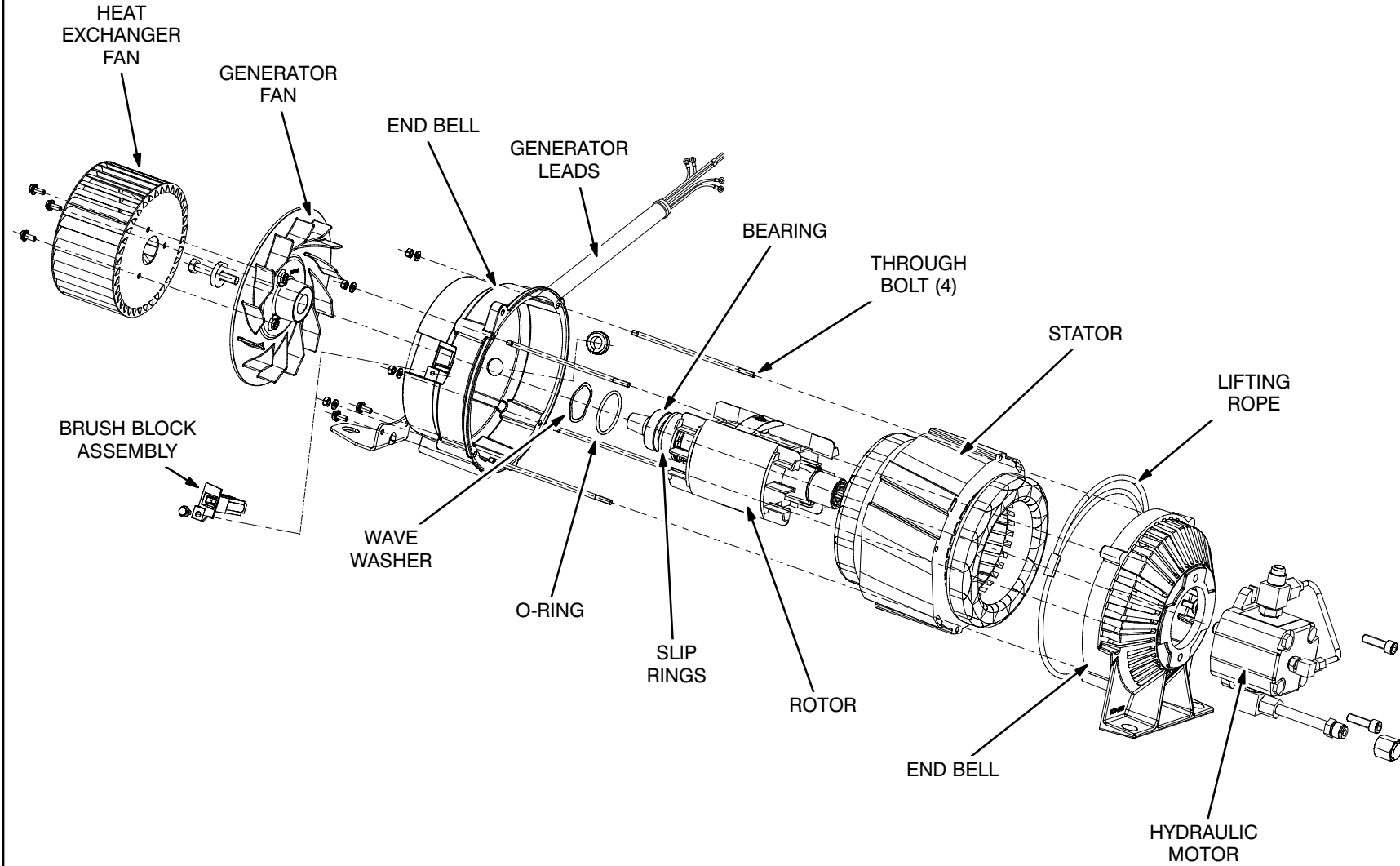
### Stator / Rotor Removal

The motor and generator end bell can be left in place when removing the generator stator and/or rotor.

1. Remove the housing cover (top and side).
2. Disconnect the stator lead quick connects.
3. Remove the brush block (Page 17).

**⚠ CAUTION** *The brushes can be damaged if the brush block is not removed before removing the end bell.*

4. Remove the fan scroll assembly.
5. Remove the fan hub through bolt.
6. Remove the three fan mounting screws and use the screws with a gear puller to break the taper fit of the fan hub to rotor.
7. Remove the through bolt in the end bell (fan end) vibration mount.
8. Remove the four generator through bolts.
9. Pull the generator end bell straight out.
10. Pull the stator and/or rotor assemblies straight out.

**FIGURE 6. MOTOR AND GENERATOR**

## Stator / Rotor Reassembly

Reassembly is the reverse of removal.

1. Align the stator so that the leads exit on the heat exchanger side.
2. Relubricate the end bell bearing bore with molybdenum disulfide paste (Onan PN 524-0118 or equivalent), making sure the wave washer and O-ring are in place in the bearing bore.
3. Lubricate the motor shaft spline with Cummins spline lubricant (524-0781).
4. Torque the stator through bolts (4), end bell foot bracket screws (2) and fan-to-hub screws (3) to 8 lb-ft (11 N-m).
5. Torque the fan hub through bolt to 41 lb-ft (57 N-m).
6. Torque the three vibration mount through bolts to 41 lb-ft (57 N-m).

## Rotor Bearing

Use an adhesive when installing a new bearing on the rotor shaft. Apply the adhesive to the shaft (Loctite 680 or equivalent) and primer (activator) to the bearing (Loctite 747 or equivalent). Press the bearing on up to its shaft shoulder using a bench press.

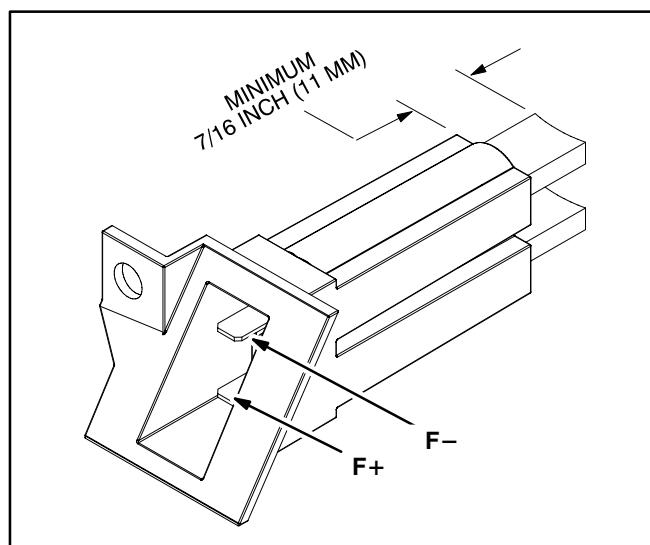
**⚠ CAUTION** *Apply force only to the bearing inner race to avoid damage to the bearing.*

## Brush Block

Remove the mounting screw and withdraw the brush block from the generator end bell. Replace the brush block assembly if either brush is shorter than 7/16 inch (11 mm), binds in the brush block or is damaged in any way.

## Slip Rings

Remove the brush block and inspect the slip rings for grooves, pits, or other damage. Use a Scotch Brite pad or commutator stone to remove light wear or corrosion.



**FIGURE 7. BRUSH BLOCK**

## Rotor Tests

Test the rotor for grounded, open and shorted windings using an ohmmeter. First test at the brush block terminals. If the resistance is high, remove the brush block and test directly on the slip rings (Figure 6). Replace the brush block if a high resistance is due to the brushes.

**Ground Test:** Set the ohmmeter to the highest resistance scale, or use a megger. Touch one test prod to the rotor shaft and the other to one of the slip rings. Replace the rotor if the reading is less than one megohm (one million ohms) on a megger, or infinity on an ohmmeter.

**Winding Resistance Test:** Touch the slip rings with the meter test prods. Replace the rotor if resistance is not as specified in Table 1-2.

**TABLE 1-2. GENERATOR WINDING RESISTANCES**

WINDING	RESISTANCE (OHMS) @ 77° F (25° C) ± 10%		
	107 mm Stack*	129 mm Stack*	150 mm Stack*
ROTOR	21.62	23.65	25.47
T1-T2, T3-4	0.130	0.100	0.095
Q1-Q2	1.02	1.16	0.21

\* Rotor stack is reference length, which is slightly longer than stator stack.

## Stator Tests

Use an ohmmeter to test for open windings and a megger or ohmmeter to test for grounded windings. Remove the side access cover and disconnect T1, T2, T3 and T4 from terminal block TB1.

**Ground Test:** Set the ohmmeter to the highest resistance scale, or use a megger. Touch one test prod to the stator laminations and the other to each stator lead, in turn. Replace the stator if any reading is less than one megohm (one million ohms) on a megger, or infinity on an ohmmeter.

**Open Winding Test:** Connect the ohmmeter test prods across each pair of winding leads. Replace the stator if any winding is open (zero ohms).

**Winding Resistance Test:** Use a meter (Wheatstone Bridge) having a precision down to

0.001 ohms to measure resistance across each pair of winding leads. Replace the stator if resistance is not as specified in Table 1-2.

## CONTROL

Figure 8 illustrates the control box.

### Automatic Voltage Regulator (AVR)

Two screws secure the automatic voltage regulator (AVR) to the back of the control box. All connections are through connector J11/P11. The AVR has no provisions for field adjustments.

### Resistor R1

Resistor R1 is tied into the wiring harness and is connected across pins P11-4 and P11-5. If open, the AVR will regulate to maximum voltage (256 VAC), dependent on frequency.

### Field Flash Relay K1

Relay K1 opens the field flash circuit when output voltage has been attained. To test, apply line voltage (120 VAC) across terminals 7 and 8. The normally closed (NC) contacts across terminals 1 and 5 should open. Replace the relay if the contacts do not open or close properly.

### Step Down Transformer T1

Step down transformer T1 is the source for displaying output voltage and frequency on display module M1. Output (green leads) should be 24 VDC for input (black leads) of 230 VAC (T1-T4). Replace if either winding is open or shorted.

### Current Transformers CT1 & CT2

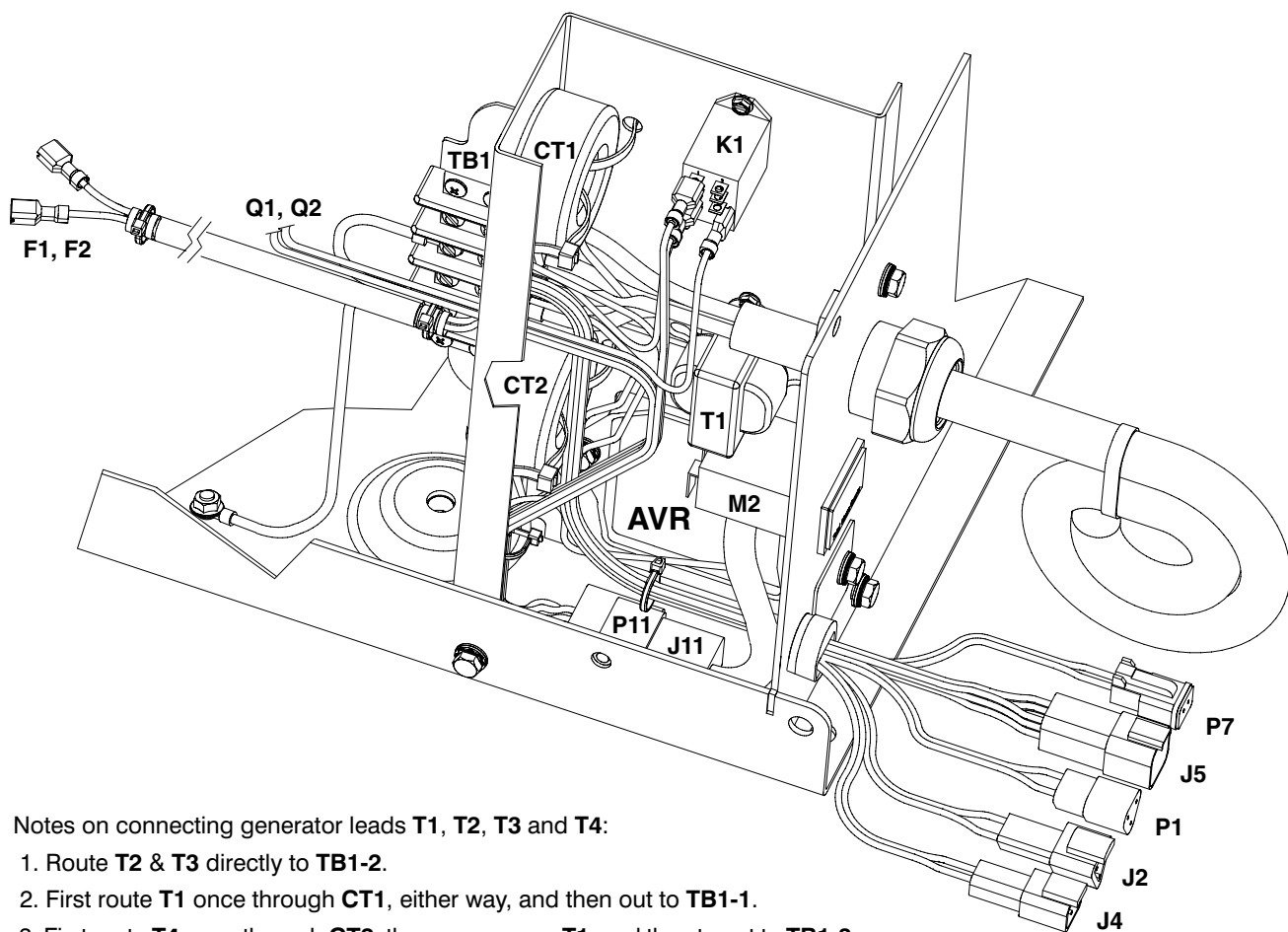
Current Transformers CT1 and CT2 are the sources for displaying LI and L2 currents, respectively, on display module M1.

### Hour Meter M2

Hour meter M2 records hours run and cannot be reset. It runs when the genset switch is ON.

### Pump ON/OFF Solenoid E1

See Page 11.



Notes on connecting generator leads **T1**, **T2**, **T3** and **T4**:

1. Route **T2** & **T3** directly to **TB1-2**.
2. First route **T1** once through **CT1**, either way, and then out to **TB1-1**.
3. First route **T4** once through **CT2**, the same way as **T1**, and then to out to **TB1-3**.
4. On 15 kW gensets **CT1** and **CT2** are located outside the control box.

**FIGURE 8. CONTROL BOX**

# Troubleshooting

The following tables cover problems that may be encountered and suggests possible causes and corrective actions.

NOISY PUMP OR MOTOR	
<b>⚠ WARNING</b> <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	Purge the air and refill the oil reservoir as necessary (Page 13). <b>⚠ CAUTION</b> <i>Continuing to run or load a noisy pump or motor can destroy it. Purge the air before continuing.</i>

NO OUTPUT OR AIR DISCHARGE — ENGINE RUNNING	
<b>⚠ WARNING</b> <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 <b>OFF</b>	Turn the switch <b>ON</b> .
2. Disengaged PTO	Engage the PTO.
3. Blown Fuse (F1)	Replace with a 20 amp (yellow) blade-type fuse (Page 27). If the new fuse blows, check for ground faults in harnesses 338-4084, 338-4085 and 338-4087 and replace as necessary (Page 24, 25 or 26).
4. Hydraulic fluid leak	Check for and repair any leaks in the system and refill as necessary (Page 13).
5. 12 VDC not available	Check for 12 VDC at terminal 2 of the ON/OFF Switch (S1 on the Wiring Schematic, Page 27). Service as necessary.
6. Faulty ON/OFF Switch	Turn <b>ON</b> the ON/OFF switch (S1) and check for 12 VDC at switch terminal 1 (Wiring Schematic, Page 27). Service as necessary.

## NO OUTPUT OR AIR DISCHARGE — ENGINE RUNNING (CONTINUED)

**⚠ 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 Lead Harness	Check for bent, corroded or missing connector pins and damaged leads in harnesses 338-4084, 338-4085 and 338-4086 and replace as necessary (Page 24, 25 or 26).
8. Faulty Pump ON/OFF Solenoid E1	Test and service as necessary (Page 11).
9. Faulty Pump	Test and service as necessary (Page 11).

## NO 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. Line circuit breaker (vehicle AC distribution panel) OFF, TRIPPED or faulty	<ul style="list-style-type: none"> <li>a. If the circuit breaker is <b>OFF</b>, find out why, make sure it is safe to re-connect power, and then switch it <b>ON</b>.</li> <li>b. If the circuit breaker <b>TRIPPED</b>, shut down the genset and repair the shorted or grounded equipment that caused tripping.</li> <li>c. Replace a faulty circuit breaker.</li> </ul>
2. Misconnected Genset Power Supply Cord	Reconnect the genset power supply cord correctly at the vehicle AC distribution panel (Wiring Schematic, Page 27).
3. Open main winding	Test and service as necessary (Page 18).
4. Open quadrature winding	Test and service as necessary (Page 18).
5. Worn brushes and slip rings or open rotor winding	Test and service as necessary (Pages 17 and 18).
6. Faulty AVR	Replace the automatic voltage regulator (AVR) (Page 18).

## FREQUENCY TOO HIGH OR TOO LOW OR ERRATIC

**⚠ 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. Misadjusted frequency	Adjust frequency as necessary (Page 14).
2. Pump speed too high or too low	Verify that the combination of PTO speed ratio and engine speed range results in pump speeds that fall within the specified range of 850 to 3000 rpm. If pump speed falls outside the range, reinstall the PTO with a gear ratio that will keep pump speed within the specified range at all engine speeds.
3. Worn motor or pump	If frequency drops off under load or cannot be adjusted up to the minimum, replace the worn motor (Page 15) or worn pump (Page 11).

## OUTPUT VOLTAGE TOO LOW

**⚠ 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.*

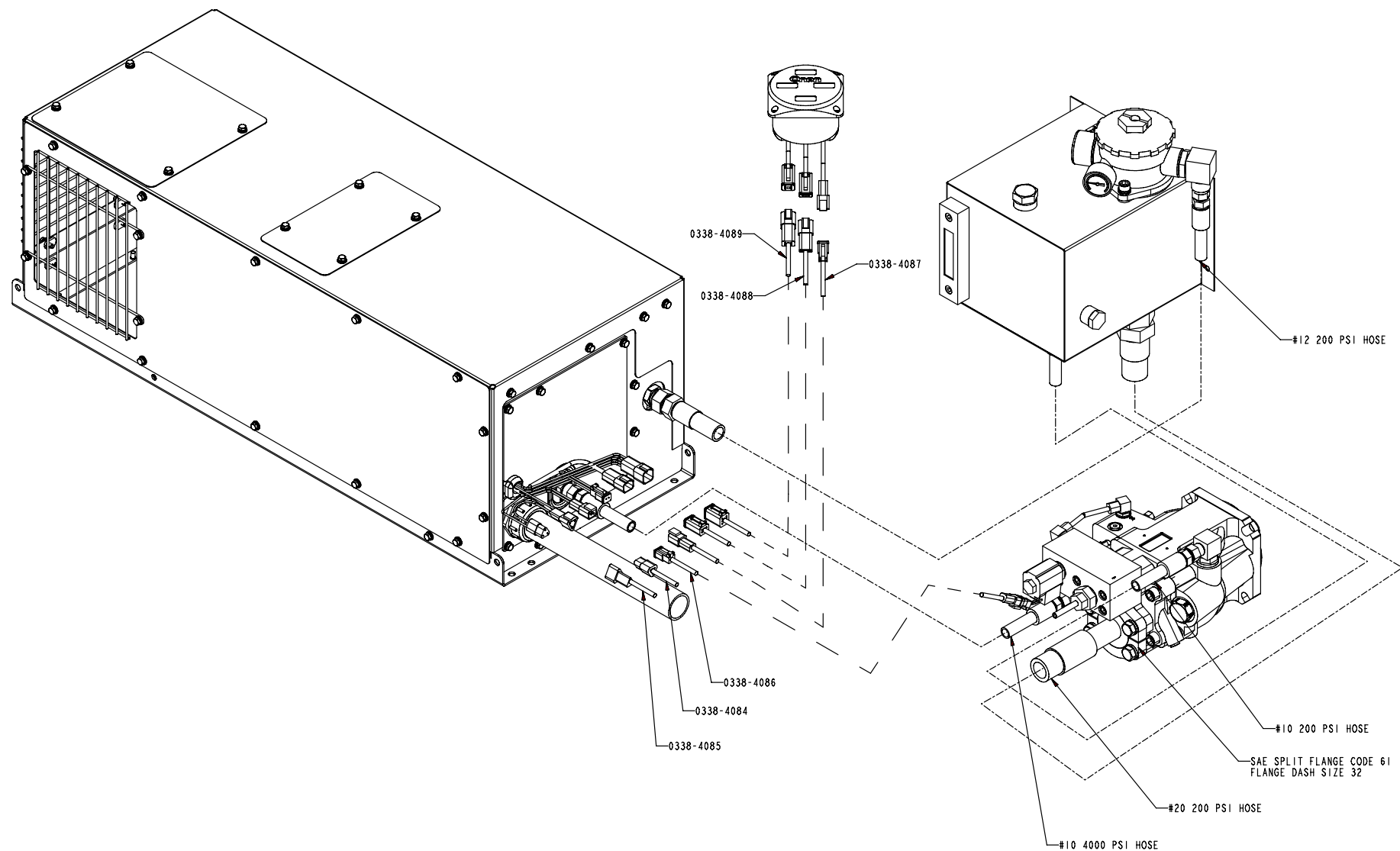
Possible Cause	Corrective Action
1. Misadjusted frequency	Adjust frequency as necessary (Page 14).
2. Misconnected Genset Power Supply Cord	Reconnect the genset power supply cord correctly at the vehicle AC distribution panel (Wiring Schematic, Page 27).
3. Shorted main winding	Test and service as necessary (Page 18).
4. Shorted quadrature winding	Test and service as necessary (Page 18).
5. Worn brushes and slip rings or shorted rotor winding	Test and service as necessary (Pages 17 and 18).
6. Faulty AVR	Replace the automatic voltage regulator (AVR) (Page 18).



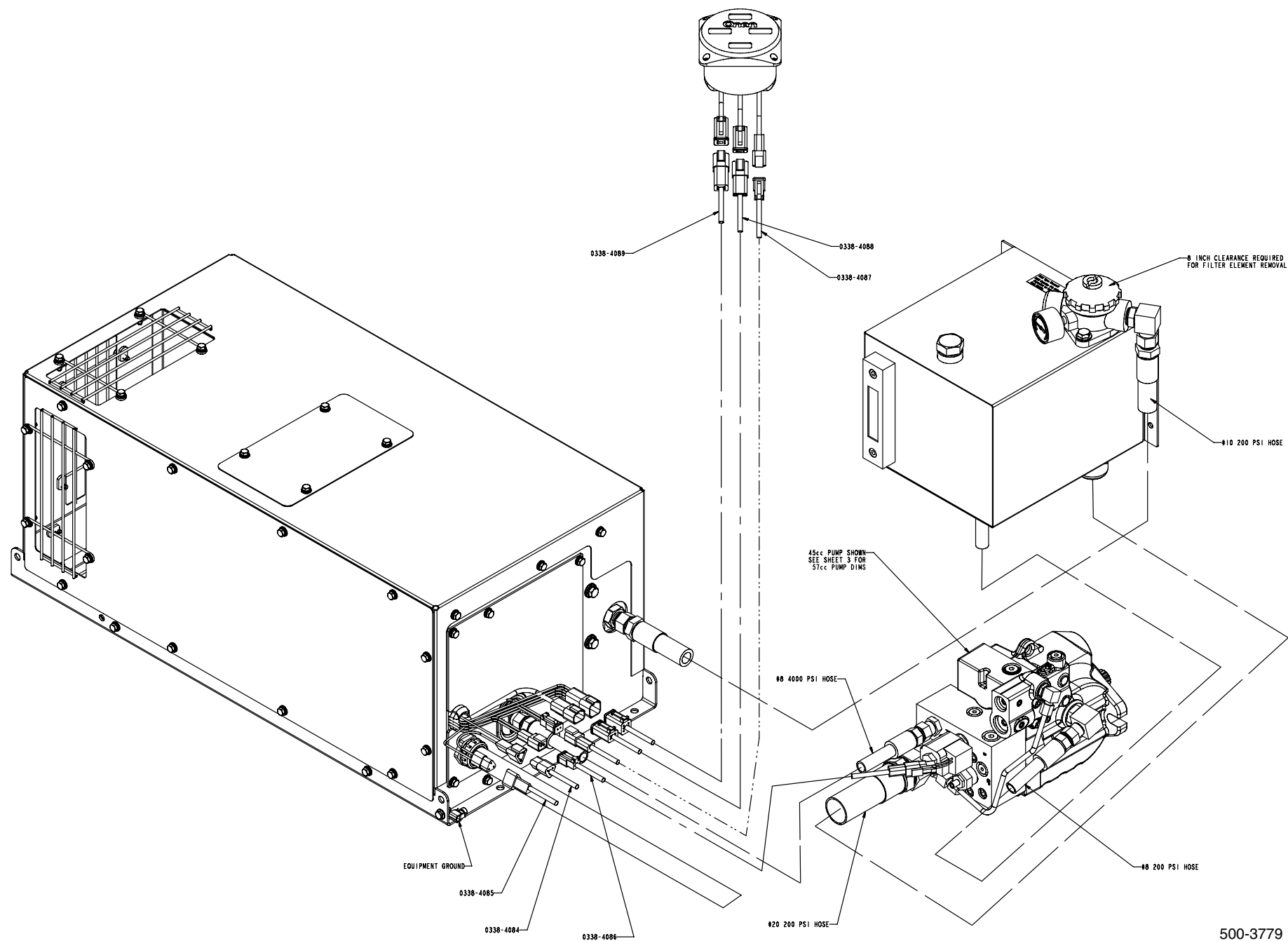
## NOISY GENERATOR

**⚠ 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.*

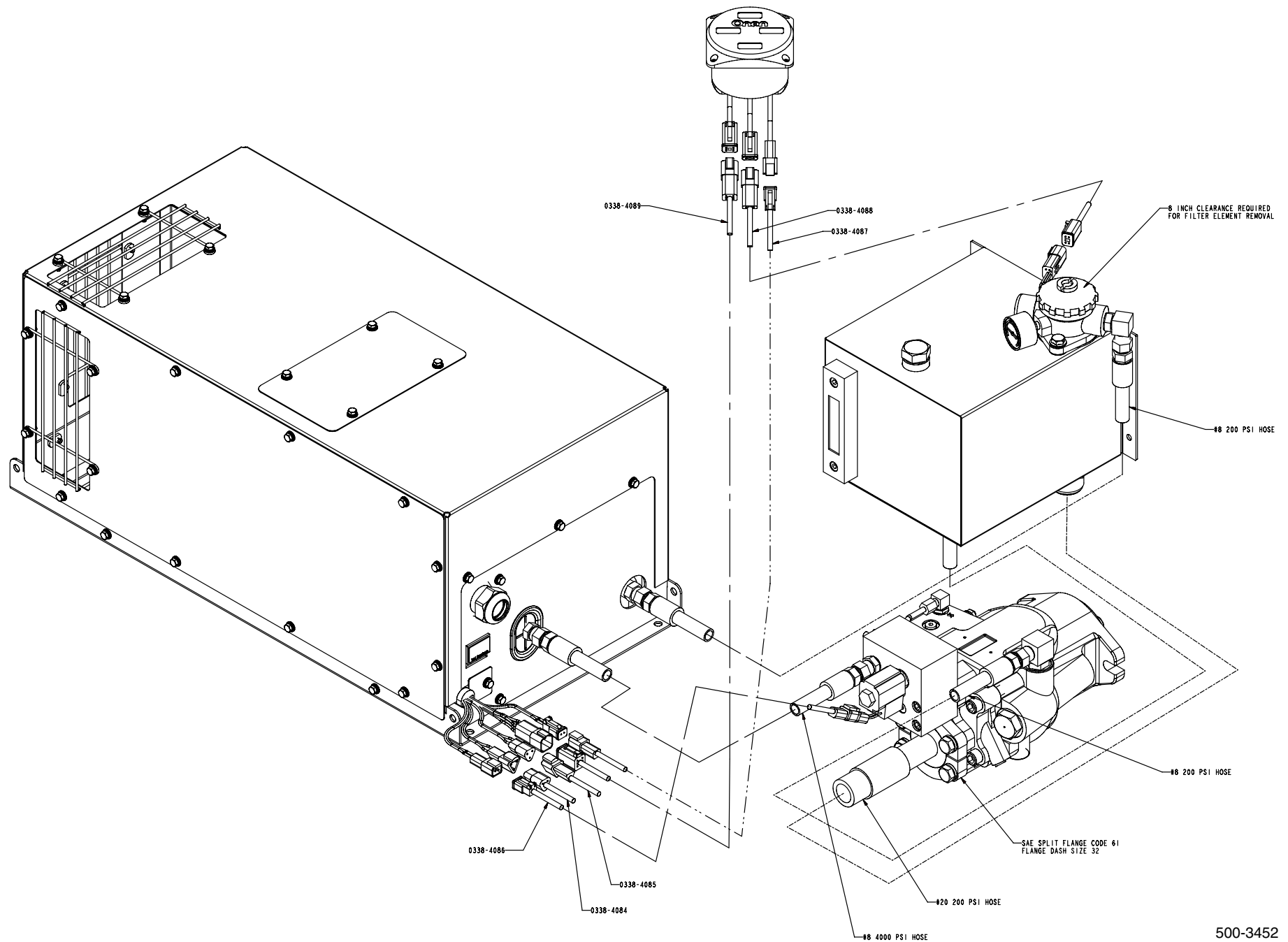
Possible Cause	Corrective Action
1. Loose brush block	Tighten the mounting screw as necessary (Page 17).
2. Loose fan	Tighten as necessary (Page 17).
3. Worn rotor bearing	Replace as necessary (Page 17).
4. Misaligned rotor and motor	Reassemble correctly (Page 17).



# 15 KW GENSETS



6, 8 & 10 KW GENSETS—BEGINNING SPEC C



6, 8 & 10 KW GENSETS—SPECS A & B





Cummins Power Generation  
1400 73rd Avenue N.E.  
Minneapolis, MN 55432  
1-800-888-6626  
763-574-5000 International Use  
Fax: 763-528-7229

Cummins and Onan are registered trademarks of Cummins Inc.