



Owners Manual

Onan Generator Set for Hydraulic

RBAB 6kW (Spec A–G)

RBAB 8kW (Spec A–G)

RBAB 10kW (Spec A–G)

RBAB 15kW (Spec A–G)

California

Proposition 65 Warning

Warning: Natural Gas/Liquid Propane Gas engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.



WARNING



**Do not use this genset on a boat
Such use may violate U. S. Coast Guard
regulations and can result in
severe personal injury or death from
fire, electrocution, or
carbon monoxide poisoning**

Table of Contents

SECTION	PAGE
SAFETY PRECAUTIONS	iii
1. INTRODUCTION	1-1
About this Manual	1-1
Product Description	1-1
2. OPERATION	2-1
Starting and Stopping	2-1
Display Module	2-1
3. MAINTENANCE	3-1
Oil Level	3-1
Oil Filter	3-1
Breather Filter	3-1
Generator	3-1
4. INSTALLATION	4-1
Generator set	4-1
Oil Reservoir	4-2
Genset Display Module	4-2
Genset On / Off Switch	4-2
Battery	4-2
Wiring Connections	4-3
Hydraulic Pump	4-4
Hydraulic Connections	4-6
Startup	4-7
5. SERVICE	5-1
Hydraulic Pump Service	5-1
Hydraulic Motor Service	5-1
Replacing the Display Module	5-1
Generator Service	5-2
Control	5-6
6. TROUBLESHOOTING	6-1
Noisy Pump or Motor	6-1
Noisy Generator	6-1
No AC Output or Air Discharge—Engine Running	6-2
No AC Output—Display Module Indicates Voltage	6-3
Voltage, Current and Frequency Are Present But Not Displayed	6-4
Hydraulic Oil Temperature Does Not Display	6-4
No AC Output—Genset Running and Air Discharging	6-5
Frequency Too High, Too Low or Unstable	6-5
Voltage Too Low or Unstable	6-6
Voltage Too High	6-7
7. SPECIFICATIONS	7-1
8. OUTLINE DRAWINGS	8-1
9. WIRING SCHEMATICS	9-1

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SAFETY PRECAUTIONS

Thoroughly read Operation and Installation before operating the generator set. 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 that can result in severe personal injury or death.

GENERAL PRECAUTIONS

- Make sure all fasteners are secure and torqued properly.
- Do not work on the generator set when mentally or physically fatigued or after consuming alcohol or drugs.
- You must be trained and experienced to make adjustments while the generator set 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)

- Generator set 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.

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1. Introduction

ABOUT THIS MANUAL

This is the Operation, Installation, and Service Manual for the hydraulic generator sets listed on the front cover.

PRODUCT DESCRIPTION

The generator set 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 appropriate Outline Drawing (beginning on Page 8-2).

- **Generator set** – The generator set is an AC generator driven by a hydraulic motor. An automatic voltage regulator maintains nominal AC output voltage under varying generator loads. An oil-to-air heat exchanger in the generator box cools the oil (hydraulic fluid) 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 generator set) 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 (50 or 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 generator set is designed for use with Dexron III or 10 wt Anti-Wear Hydraulic Fluid (oil). Heavier oil can cause seal/gasket failures, and can also cause abnormal operating conditions.

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2. Operation

STARTING AND STOPPING

Generator set operation involves switching the generator set ON or OFF and monitoring the generator set display module (Figure 2-1) and oil level sight glass (Figure 3-1).

Starting

Start the vehicle engine and engage the PTO clutch (if so equipped). Allow 2 seconds for the PTO to fully engage. Switch the generator set **ON** and connect or turn on loads.

Note: It takes 4 to 8 seconds for the generator set to get up to normal speed (frequency).

Note: When switching the truck's engine speed from low idle to high idle while the generator is running, the engine's acceleration should be at the rate in which it takes at least 3 seconds to climb to high idle.

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

Stopping

First disconnect all loads and then switch the generator set OFF. The PTO need not be disengaged when switching the generator set OFF because pump piston stroke goes to zero.

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 generator set components. Always switch OFF the generator before parking the vehicle in standby.

DISPLAY MODULE

AC Output

The display module continuously displays the AC output frequency and voltage and current (amps) in each leg. See Figure 2-1.

Hour Meter

Press the MODE button once to display the number of hours run. The display will revert to AC output.

Oil Temperature

Press the MODE button twice to display the temperature of the oil returning to the oil reservoir. The display will revert to AC output.

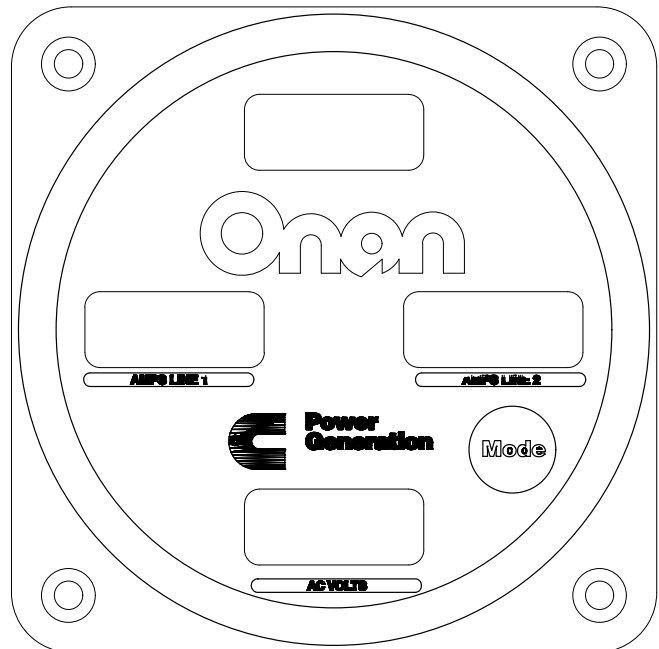


FIGURE 2-1. DISPLAY MODULE

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3. Maintenance

OIL LEVEL

CAUTION *The slightest amount of dirt in a hydraulic system can damage precisely machined internal parts 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.*
- *Cap all openings in components and hoses with proper JIC caps when disassembling.*
- *Before connecting, thoroughly flush each hose and blow sponge projectiles through until they come out clean.*
- *Regularly replace the oil filter.*
- *Never reuse drained hydraulic fluid.*

Check oil level often and keep it within 1/4 inch of the top of the sight glass (Figure 3-1). Only use Dexron III or 10 wt Anti-Wear Hydraulic Fluid. Pump the oil

through a 10 micron filter (SAE Class 4) when filling the reservoir.

OIL FILTER

Replace the oil filter after 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 after every 1000 hours of operation.

GENERATOR

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

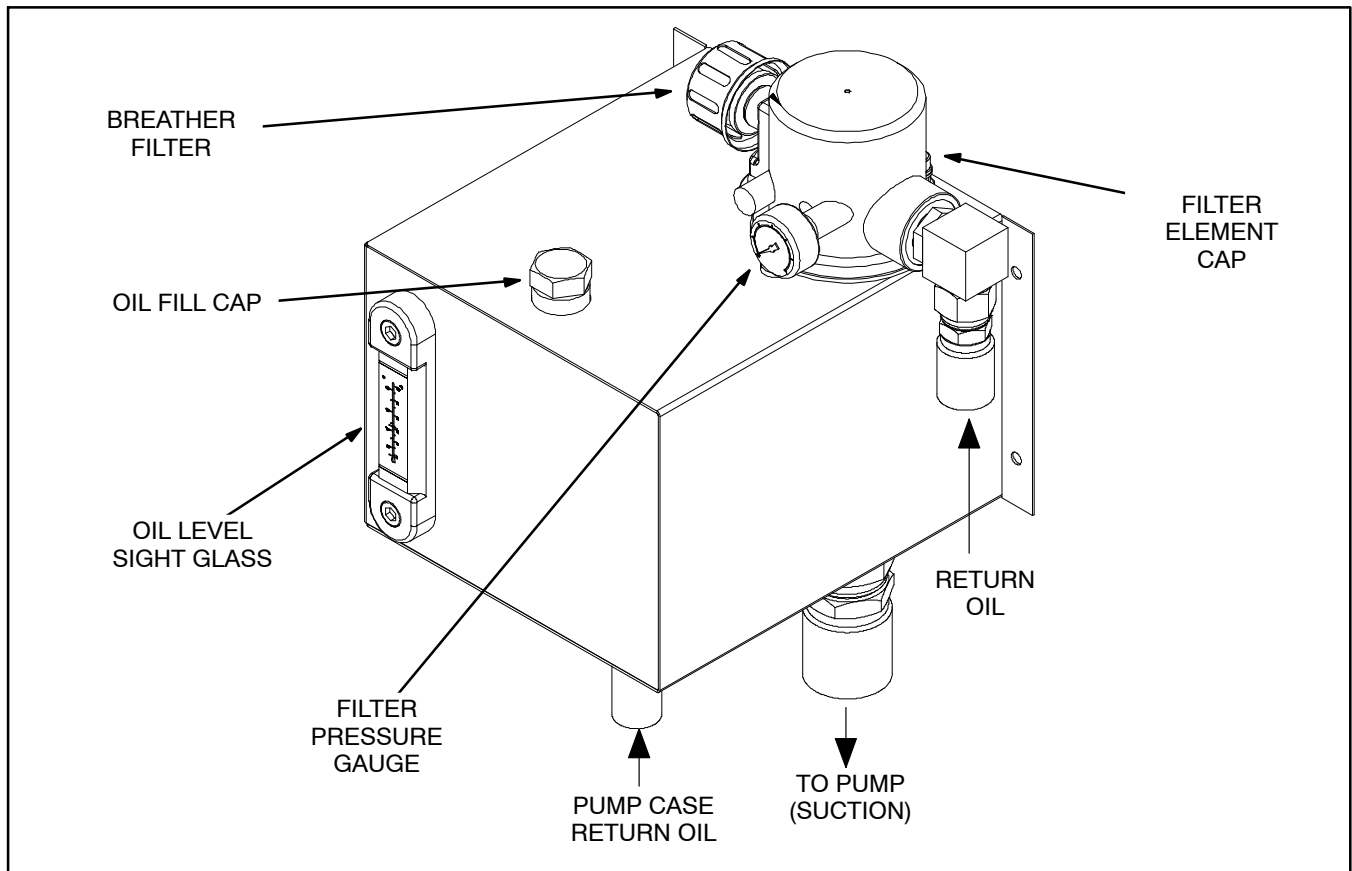


FIGURE 3-1. OIL RESERVOIR

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4. Installation

GENERATOR SET

⚠WARNING *Improper installation can result in severe personnel injury or death. The installer must be trained and experienced in the installation of electrical, mechanical and hydraulic equipment.*

Note: Manuals are updated from time-to-time to reflect changes in the equipment and its specifications. For this reason, only the copy of the installation manual supplied with the generator set should be used as a guide for the installation.

The builder of the vehicle bears sole responsibility for the selection of the appropriate generator set, for its proper installation and for obtaining approvals from the authorities (if any) having jurisdiction over the installation. The generator set is suitable for Installation in accordance with the National Electrical Code (NFPA No. 70) or the Canadian Electrical Code (C22.1). When properly installed it will meet the certification requirements of NFPA 1903.

Before mounting the generator set, pump or oil reservoir, carefully consider the routing of all hydraulic hoses and wiring.

Refer to the Outline Drawings (beginning on Page 8-2) regarding outside dimensions, weight, mounting bolt holes, cooling air inlet and outlet openings and hydraulic and wiring connections.

Cooling Air Flow

For sufficient air flow to cool the generator set, provide at least 3 inches (76 mm) of clearance in front of and across the entire face of the finned heat exchanger (air outlet) and in front of both air inlets. Two (2) air inlets must be open. Rearrange the plates and screens, as necessary, between the four or five air inlet openings. *The location with respect to bulkheads and other equipment must be such that the warm air does not recirculate back into the generator set air inlets.*

Cooling Air Test

To determine whether the installation allows for sufficient generator set cooling, monitor oil temperature with the display module while running the generator set under full load for at least two hours. Oil temperature must not exceed 185° F (85° C). If it does, check inlet air temperature.

- Inlet air temperature should not exceed ambient air temperature by more than 25° F (14° C). If it does, cooling air is recirculating between the outlet and inlets or is being heated some other way, such as by passing through the hot engine compartment. The generator set must be relocated or the air inlets and outlets baffled to prevent recirculation or the entrance of hot air from another source.
- If inlet air temperature exceeds ambient air temperature by less than 25° F (14° C) but oil temperature exceeds 185° F (85° C), inlet or outlet air is being blocked or restricted. The generator set must be relocated or the obstructions removed.
- If inlet air temperatures exceed 120° F (49° C) the generator set must be derated to prevent oil temperatures from exceeding 185° F (85° C).

NFPA Certification Test

As oil temperature rises, hydraulic efficiency falls off slightly. Therefore, load the generator set to 103-104 percent of rated load at the start of the 2-hour NFPA Certification Test. If the inlet air temperature does not exceed 120° F (49° C), the generator set will finish the test carrying at least 100 percent of rated load, meeting the certification requirements. See Cooling Air Test if air temperature exceeds specifications.

Hydraulic and Electric Interconnections

See WIRING CONNECTIONS (Page 4-3) and HYDRAULIC CONNECTIONS (Page 4-6) regarding interconnections between components in the system.

OIL RESERVOIR

When locating and mounting the oil reservoir, consider the following:

1. The bottom of the oil reservoir must be at least 2 feet (610 mm) higher than the top of the pump. It is recommended that the oil reservoir be the highest point in the hydraulic system.
2. The fill cap and filter must be readily accessible for filling oil and changing filters (Page 3-1). *There must be at least 8 inches (204 mm) of clearance for withdrawing the filter element.*
3. The oil level sight glass and filter pressure gauge must be readily visible. The generator set display module and ON/OFF switch should be in view from the location of the oil reservoir.
4. See HYDRAULIC CONNECTIONS regarding hose connections (Page 4-6).

GENERATOR SET DISPLAY MODULE

Locate the generator set display module at a convenient location. The ON/OFF switch and oil reservoir gauges should be in view from the location of the

display module. Mount the display module with four (4) 1/8 inch screws. Interconnect it with the other system components with lead harness Nos. 338-4087, 338-4088 and 338-4089.

GENERATOR SET ON / OFF SWITCH

Provide an ON/OFF switch rated at least 20 amps at 12 VDC to switch the generator set ON and OFF (see schematic, Page 9-3). Locate the switch at a convenient location. The generator set display module and oil reservoir gauges should be in view from the location of the switch. Interconnect the ON/OFF switch and generator set with lead harness No. 338-4084.

BATTERY

generator set control and monitoring requires connection to a 12 volt battery. Use lead harness No. 338-4085 to connect the generator set 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 generator set control circuits from shorts to ground.

WIRING CONNECTIONS

See the appropriate Outline Drawing (beginning on Page 8-2) for wiring connections between the components of the system. Also refer to the wiring schematic on Page 9-3.

AC Output Connections

AC power output is through four Type CCXL conductors 12 ft (3.6 m) long in rain-tight flexible conduit. Conductors and conduit are sized according to Table 4-1. Refer to the wiring schematic on Page 9-3.

TABLE 4-1. WIRING GAUGE AND CONDUIT SIZE

KW	Wire Gauge	Conduit Size
6 & 8	12 AWG	1/2 inch
10	10 AWG	3/4 inch
15	8 AWG	1-1/4 inch

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 4-2) that match the connectors on the component leads.

⚠️WARNING *The generator set could overspeed and be damaged and cause serious personal injury or death if Display Harness 338-4087 is connected to the Pump. Make sure to connect the black connector on Pump Harness 338-4086 to the black connector on the generator set and the tagged connector on the other end to the Pump.*

TABLE 4-2. WIRING HARNESSSES

HARNESS	CONNECTIONS
338-4084	generator set to Remote ON/OFF Switch
338-4085	generator set to Battery
338-4086	generator set to PV Valve*
338-4087	For Display Power (from generator set)
338-4088	For Oil Temperature Display from Sensor
338-4089	For AC Display from generator set
A046M769	generator set to SP Valve
A048J782	generator set Control Harness
A048N050	Control Jumper Harness

* – Use 338-4086 and A046M769 to connect hydraulic valves to external generator set connections.

Wiring Methods

⚠️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.*

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. Install vibration-proof switches and controls that won't open and close circuits when the vehicle is in motion.
4. Provide ground fault circuit interrupters (GFCIs) for all convenience power receptacles.
5. Route AC power wiring and remote control wiring separately.
6. Seal 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.)
7. Bond the generator set and all connected AC and DC equipment and controls to a common grounding point in accordance with applicable codes.

HYDRAULIC PUMP

Interconnect the pump actuator valves and generator set with lead harnesses No. 338-4086 and A046M769.

Refer to *Specifications* regarding minimum and maximum pump speeds, SAE mounting flanges, drives, and hose connections. Pumps are available for clockwise or counterclockwise rotation, as determined by looking at the drive shaft end.

Note: When selecting a PTO, make sure it will turn the pump in the right direction within the speed range specified.

When locating and mounting the pump (Figure 4-1) consider possible interference with frame rails, cab floor, exhaust pipes and other vehicle components.

The pump must be mounted such that one of the three case drain ports points up.

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

Mount the pump on a frame cross member and connect it to the PTO by means of a drive shaft, observing the following:

1. The drive shaft can turn at a very high rpm. To minimize vibration and wear, locate the pump 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 at a shaft angle of 5 degrees or less. Use standard practice in designing, fabricating and assembling the pump bracket and drive shaft.
2. On models that have splined drive shafts, grease the splines with the tube of grease provided.
3. Use lock wires to secure hub set screws.
4. Provide guards around drive shafts at locations where they could accidentally be touched.

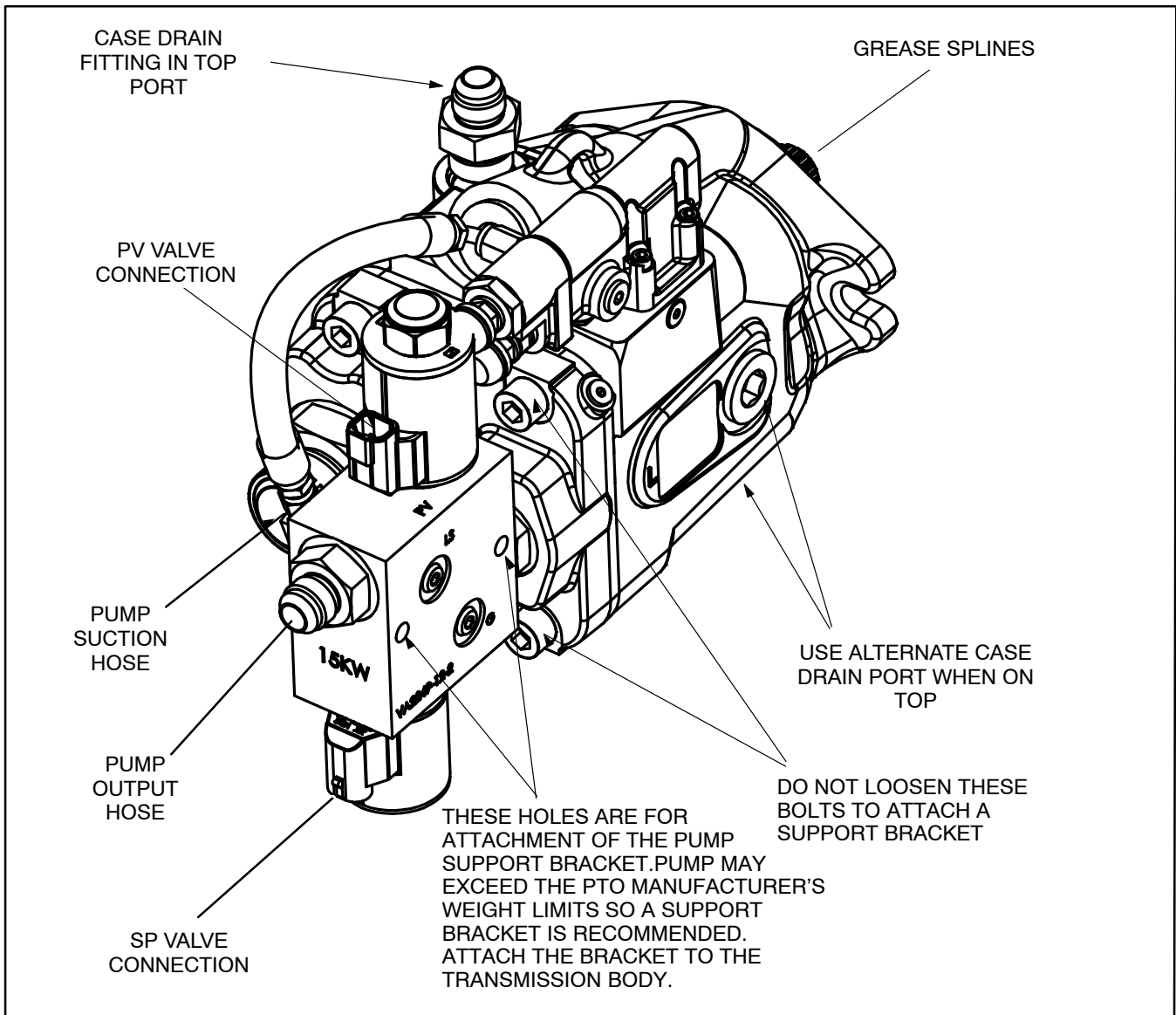


FIGURE 4-1. PUMP ASSEMBLY

HYDRAULIC CONNECTIONS

⚠ CAUTION *The slightest amount of dirt in a hydraulic system can damage precisely machined internal parts 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.*
- *Cap all openings in components and hoses with proper JIC caps when disassembling.*
- *Before connecting, thoroughly flush each hose and blow sponge projectiles through until they come out clean.*
- *Regularly replace the oil filter.*
- *Never reuse drained hydraulic fluid.*

See the appropriate Outline Drawing (beginning on Page 8-2) for the hydraulic interconnections between the components of the system. Specially note the following:

1. Hoses shrink slightly in length and expand slightly in diameter under pressure.
2. To avoid trapping air, hoses should slope up from the pump. The hose between the generator set and oil reservoir should slope up to the reservoir.
3. Do not bend hoses tighter than the hose manufacturer recommends.
4. Flush hoses and cap them with JIC caps after cutting and terminating their ends.
5. Use wide-sweep 90-degree fittings.
6. Always use two wrenches when tightening fittings.
7. Support, restrain and protect hydraulic hose as necessary to prevent chaffing.
8. Do not apply engine power to the pump before filling the pump and system with oil as instructed under STARTUP.

STARTUP

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

⚠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.*

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

Filling Hydraulic System

1. Complete all hydraulic and electric connections and secure drive shaft guards.
2. Turn the generator set switch **OFF**.
3. Disconnect all electrical loads.
4. Disconnect the case drain hose and fill the pump case (top case drain port). Use a 10 micron filter (SAE Class 4) to filter the oil.
5. Fill the oil reservoir to within 1/4 inch of the top of the sight glass with Dexron III or 10 wt Anti-Wear Hydraulic Fluid only. Use a 10 micron filter (SAE Class 4) to filter the oil. The level will

drop as the system fills. If possible, wait 1/2 hour for air to escape from the system and then refill the reservoir.

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.
7. Refill the reservoir if the level drops (Step 5).
8. Repeat Steps 6 and 7 until the oil level stops dropping in the reservoir.
9. When the system is full, turn the generator set 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 **ON** the generator set switch and check voltage, frequency and current under various loads and engine speeds.

These generator sets do not require a final speed adjustment. If the generator set does not come up to rated frequency check for proper minimum pump speed. Call an authorized Cummins dealer if stable voltage and frequency or rated current cannot be attained.

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5. Service

HYDRAULIC PUMP SERVICE

Have an authorized *Eaton* representative service the hydraulic pump. Refer to HYDRAULIC PUMP for installation and startup instructions when replacing the pump.

HYDRAULIC MOTOR SERVICE

As the motor wears full-load frequency can become harder to maintain. To replace the motor (Figure 5-2):

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).

REPLACING THE DISPLAY MODULE

Connections

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

To Set kW

Check the label on the back of the display module for its kW setting. If it does not match the generator set rating, reset the display module as follows:

1. Press the hidden MENU button twice and then the MODE button twice (Figure 5-1).
2. The display will show the current kW setting.
3. Press MENU as many times as necessary to match generator set rating. The next higher rating displays each time you press MENU. It starts over at 6 kW after displaying 45 kW.
4. To save the setting, press and hold MODE and then MENU. Release both buttons when the normal display returns.

To Calibrate Voltage and Amperage

Calibrate the display as follows:

1. Start the generator set and connect approximately half of its rated load.
2. Measure output voltage and current with a meter of known calibration.
3. Press the hidden MENU button three times, MODE twice, and MENU once again (Figure 5-1).
4. The display will show generator set output voltage and amperage.
5. Change the value of the blinking digit by pressing MENU as many times as necessary to match the value of the calibrated meter. Then press MODE to go to the next digit to reset.
6. To save the settings, press and hold MODE and then MENU for 3 seconds. Release both buttons when the normal display returns.

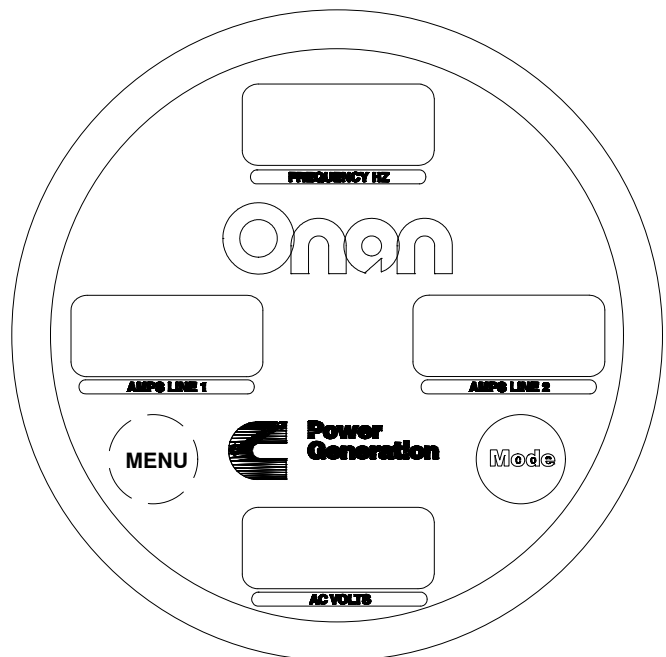


FIGURE 5-1. DISPLAY MODULE

GENERATOR SERVICE

These are 2-pole (3600 rpm), revolving field generators with brushes and slip rings (Figure 5-2). 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.

generator set 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).

Generator-Regulator Test

If the problem is low or unstable generator voltage, determine first whether the problem is with the generator or with the loads. To do this, test with a resistive load bank set for rated generator set output. Run the generator set with and without full-load. If the generator set maintains nominal voltage under full-load and no-load, the problem is with the loads and not with the generator set.

If the generator set cannot maintain nominal voltage, determine whether the problem is with the generator or with the regulator. To do this, disconnect the voltage regulator and apply 12 volts DC from a battery (preferably 24 volts DC from two batteries connected in series) while the generator is running without load. If output voltage and quad voltage are approximately as specified in Table 5-1, replace the voltage regulator. If not, service the generator.

Note: The meters and battery switch should be connected prior to starting the pump, otherwise there won't be time to take voltage readings. The pump controller shuts down the generator set a few seconds after driving it to nominal frequency because it senses less than threshold output voltage during this test.

TABLE 5-1. GENERATOR VS FIELD VOLTAGES

Model	6, 8 & 10 kW	15 kW
F- to F+	12/24 VDC	12/24 VDC
L1 to L2	54/110 VAC	67/130 VAC
Q1 to Q2	34/69 VAC	39/80 VAC

Stator / Rotor Removal

Conduct the Generator-Regulator Test before servicing the generator.

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

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.
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.

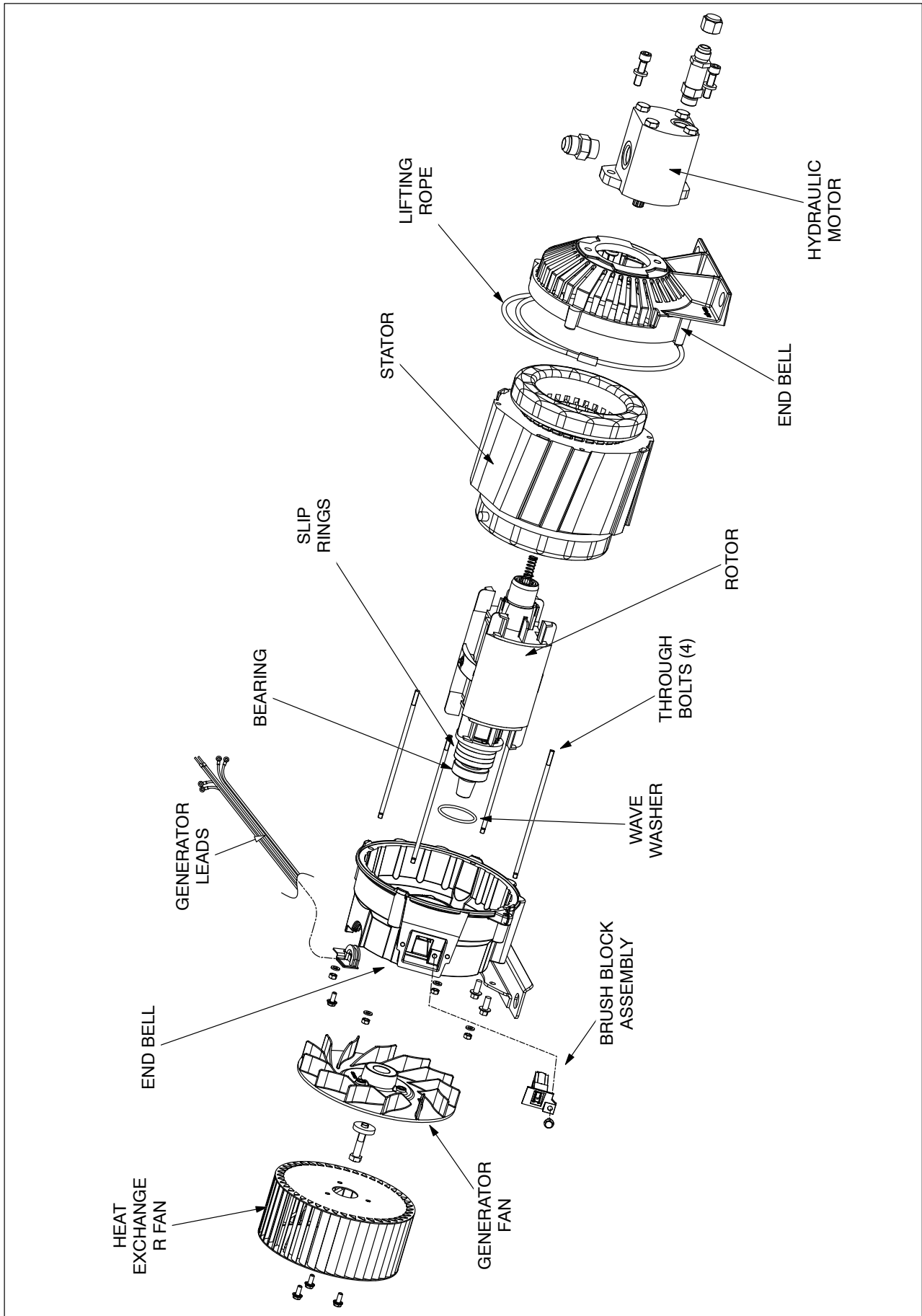


FIGURE 5-2. GENERATOR

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 (0524-0118 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 (0524-0781).
4. Torque the stator through bolts (4) 6 – 6.5 lb-ft (8.1 – 8.8 N-m), end bell foot bracket screws (2) 13.3 – 14.8 lb-ft (18 – 20 N-m) and fan-to-hub screws (3) to 6.4 – 9.6 lb-ft (8.7 – 13.0 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.

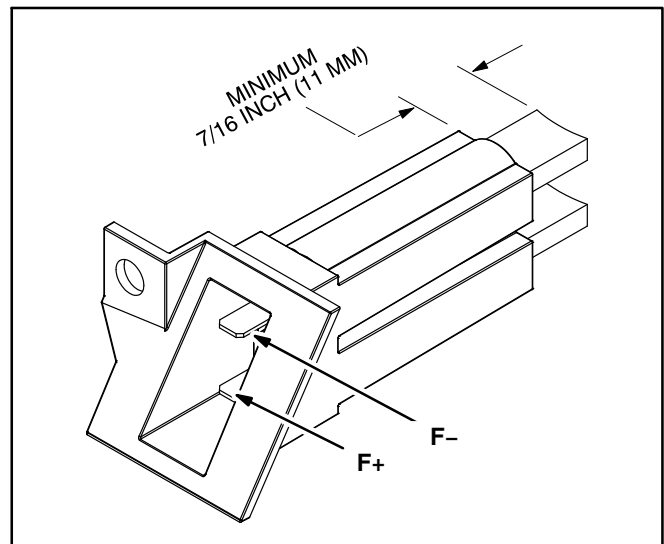


FIGURE 5-3. BRUSH BLOCK

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. Replace the brush block if a high resistance is due to the brushes.

Ground Tests: Set the ohmmeter to the highest resistance scale, or use a megger. Touch one test probe 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 Tests: Touch the slip rings with the meter test probes. Replace the rotor if resistance is not as specified in Table 5-2.

TABLE 5-2. 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 to T2, T3 to T4	0.130	0.100	0.095
Q1 to 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.

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

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

Winding-to-Winding Resistance Tests: Set the ohmmeter to the highest resistance scale, or use a megger. Touch the test probes across each of the following pairs of stator leads: T1—Q1, T1—T3, T3—Q1. Replace the stator if any reading is less than one megohm (one million ohms) on a megger, or infinity on an ohmmeter.

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 5-2.

CONTROL

Figure 5-4 illustrates the generator set control box. See Page 9-3 for the control schematic.

Hydraulic Pump Control

The control may be secured using either screws or zip ties depending on the specific model. Replace a faulty control; it has no serviceable parts.

Automatic Voltage Regulator (AVR)

Two screws secure the automatic voltage regulator (AVR) inside the control box. All connections are through connector J11/P11. The AVR has no provisions for field adjustments or serviceable parts. Conduct the Generator-Regulator Test (Page 5-2) before replacing a faulty control.

Isolation Transformer VT2

Isolation transformer VT2 steps down sense voltage between L1 and L2 from 240 VAC to 120 VAC for AVR sensing. Replace if either winding is open or shorted. Two screws secure the transformer to the back side of the control box.

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 13 and 14. The normally closed (NC) contacts across terminals 4 and 12 should open. Replace the relay if the contacts do not open or close properly.

Step Down Transformer VT1

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

Current Transformers CT1 & CT2

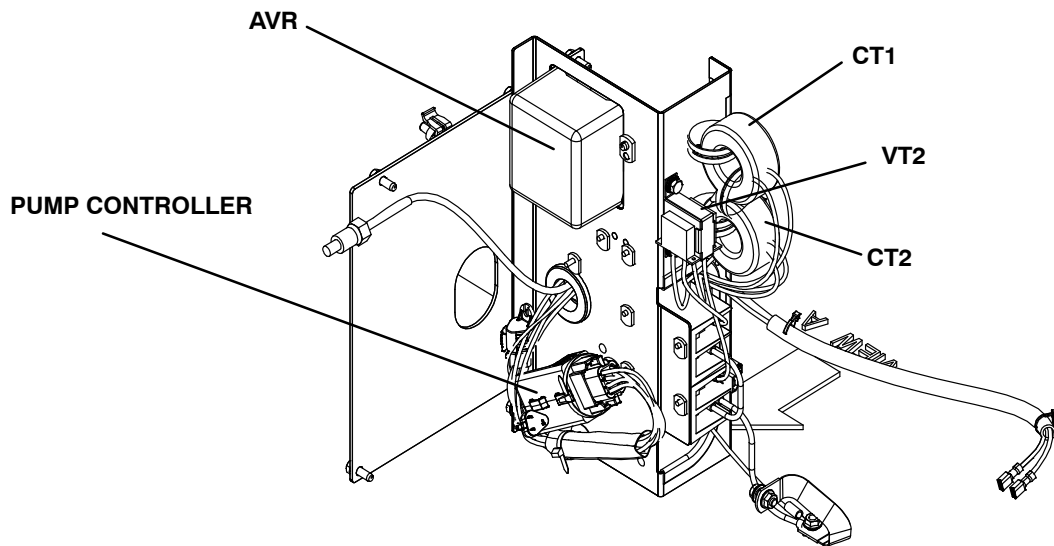
Current Transformers CT1 and CT2 are the sources for displaying I1 and I2 currents, respectively, on display module M1.

Generator Terminal Block TB1—6, 8 and 10 kW Models

Torque the terminal screws to 18 in-lbs (2 N-m).

Generator Terminal Block TB1—15 kW Models

Torque the terminal screws to 53 in-lbs (6 N-m).



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 out to **TB1-3**.

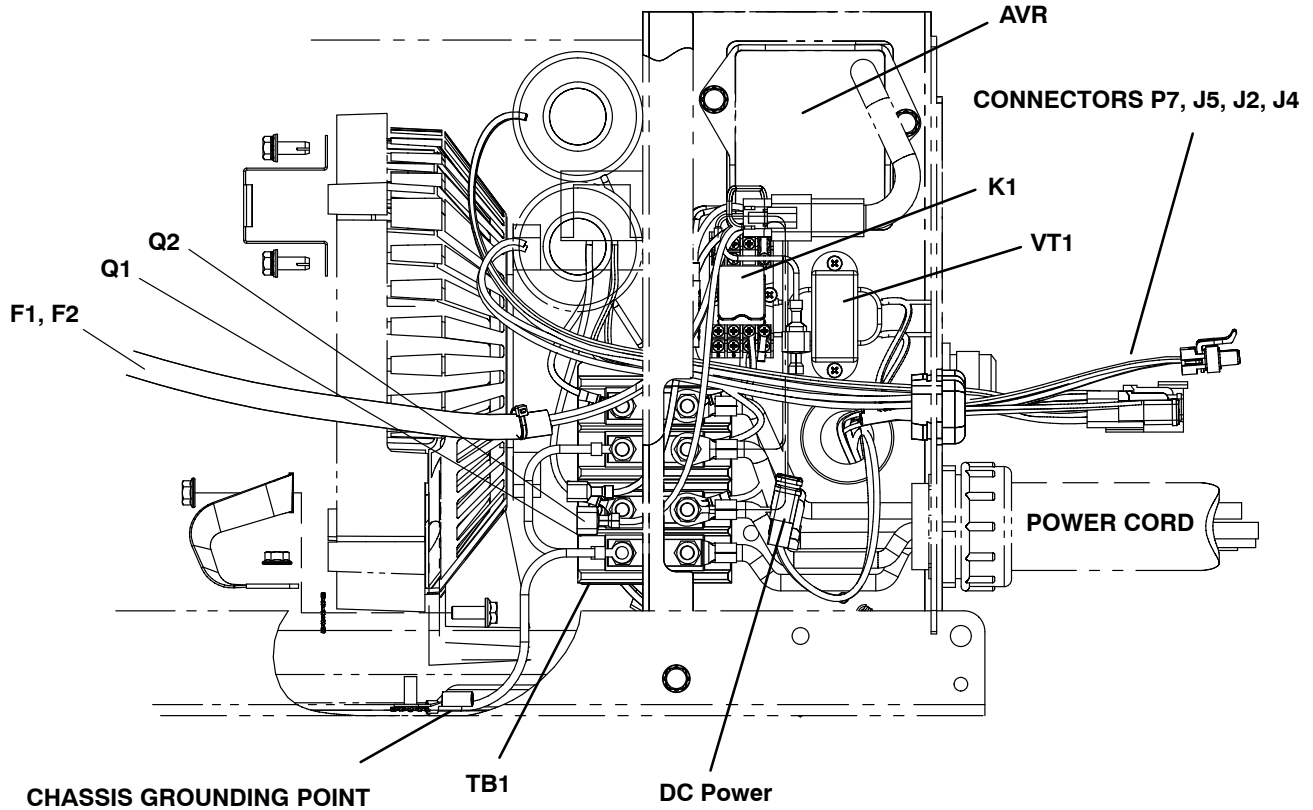


FIGURE 5-4. CONTROL BOX

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6. Troubleshooting

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

NOISY PUMP OR MOTOR	
<p>⚠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></p>	
Possible Cause	Corrective Action
1. Air trapped in hydraulic fluid	A. Purge the air and refill the oil reservoir as necessary. Running the pump without oil will quickly destroy the pump.
2. Improper or loose hydraulic connections	A. Check hydraulic connections (especially suction side) and repair or reconnect as necessary.

NOISY GENERATOR	
<p>⚠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></p>	
Possible Cause	Corrective Action
1. Loose or rubbing fan, worn bearing, misaligned rotor and motor, loose brush block	A. Tighten or repair as necessary. See Page 5-2.

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
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 (Page 9-3). If the new fuse blows, check for ground faults in harnesses 338-4084, 338-4085 and 338-4087 and replace as necessary.
5. Hydraulic fluid leak	A. Check for and repair any leaks in the system and refill as necessary.
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. Service or reconnect as necessary. See Page 9-3.
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. Replace a faulty switch. See Page 9-3.
8. Faulty Lead Harness	A. Check for bent, corroded or missing connector pins and damaged leads in harnesses 338-4084, 338-4085, 338-4086, and A046M769 and replace as necessary. See Page 9-3.
9. Blown Fuse (F2) or faulty pump controller speed sense connections inside control box (applies on to Spec A–C)	A. Replace with a 0.125 amp fast-blow fuse. B. Check for and repair faulty speed sense connections (White and Black leads from pump controller). See Page 9-3.
10. Faulty Field Flash Relay K1 or connections	A. Test and service as necessary. See Page 5-6.
11. Worn brushes or slip rings or open rotor winding	A. Test and service as necessary. See Page 5-2.
12. Open Main or Quadrature winding	A. Test and service as necessary. See Page 5-2.

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
13. Faulty Isolation Transformer VT2 or connections	A. Test and service as necessary. See Page 5-6.
14. Faulty AVR	A. Replace. See Page 5-6.
15. Faulty hydraulic pump	A. Have an authorized <i>Eaton</i> representative service the hydraulic pump.
16. Faulty pulse pickup connection inside control box (begin Spec D)	A. Check for faulty pulse pick up connections (three wires coming out of hydraulic motor) and repair.

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	<p>A. If the circuit breaker is OFF, find out why, make sure it is safe to reconnect power, and then switch it ON.</p> <p>B. If the circuit breaker TRIPPED, shut down the genset and repair the shorted or grounded equipment that caused tripping.</p> <p>C. Replace a faulty circuit breaker.</p>
2. Misconnected Generator or Power Supply Cord	<p>A. Check for proper generator and power supply cord connections on Terminal Block TB1 and reconnect as necessary. See Page 5-6.</p> <p>B. Reconnect the genset power supply cord correctly at the vehicle AC distribution panel.</p>

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. See Page 9-3.</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. Service or reconnect as necessary. See Page 9-3.</p>
2. Misconnected or faulty CT1, CT2 or VT1	A. Replace or reconnect components as necessary in the control box. See Page 5-6.
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. See Page 9-3.
2. Misconnected or faulty oil temperature sensor	A. Replace or reconnect the oil temperature sensor as necessary.
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. Line circuit breaker (vehicle AC distribution panel) OFF, TRIPPED or faulty	<p>A. If the circuit breaker is OFF, find out why, make sure it is safe to reconnect power, and then switch it ON.</p> <p>B. If the circuit breaker TRIPPED, shut down the genset and repair the shorted or grounded equipment that caused tripping.</p> <p>C. Replace a faulty circuit breaker.</p>
2. Misconnected Generator or Power Supply Cord	<p>A. Check for proper generator and power supply cord connections on Terminal Block TB1 and reconnect as necessary. See Page 5-6.</p> <p>B. Reconnect the genset power supply cord correctly at the vehicle AC distribution panel.</p>

FREQUENCY TOO HIGH, 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. 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. Failed speed sense (F2) fuse (Spec A-C only)	A. Inspect F2 fuse and replace if failed. Check and repair faulty speed sense connections. See Page 9-3.
3. Damaged or worn brushes or slip rings	A. Remove brush block. Inspect the block, brushes, and slip rings. Service as necessary.
4. The Hydraulic Pump needs service	A. Have an authorized <i>Eaton</i> representative service the hydraulic pump.

FREQUENCY TOO HIGH, TOO LOW OR UNSTABLE (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
5. The Pump Controller is faulty	A. Replace pump controller.
6. Pump control valves are connected incorrectly (begin Spec D)	A. Make sure harness A046M769 and 0338-4086 are connected properly.

VOLTAGE 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. Misconnected Generator	A. Check for proper generator and power supply cord connections on Terminal Block TB1 and reconnect as necessary. See Page 5-6. B. Reconnect the genset power supply cord correctly at the vehicle AC distribution panel.
3. Worn brushes or slip rings or shorted rotor winding	A. Test and service as necessary. See Page 5-2.
4. Shorted main or quadrature winding	A. Test and service as necessary. See Page 5-2.
5. Faulty AVR	A. Replace. See Page 5-6.

VOLTAGE TOO HIGH

⚠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. Open Resistor R1	A. Test and service as necessary. See Page 5-6.
3. Faulty AVR	A. Replace. See Page 5-6.

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7. Specifications

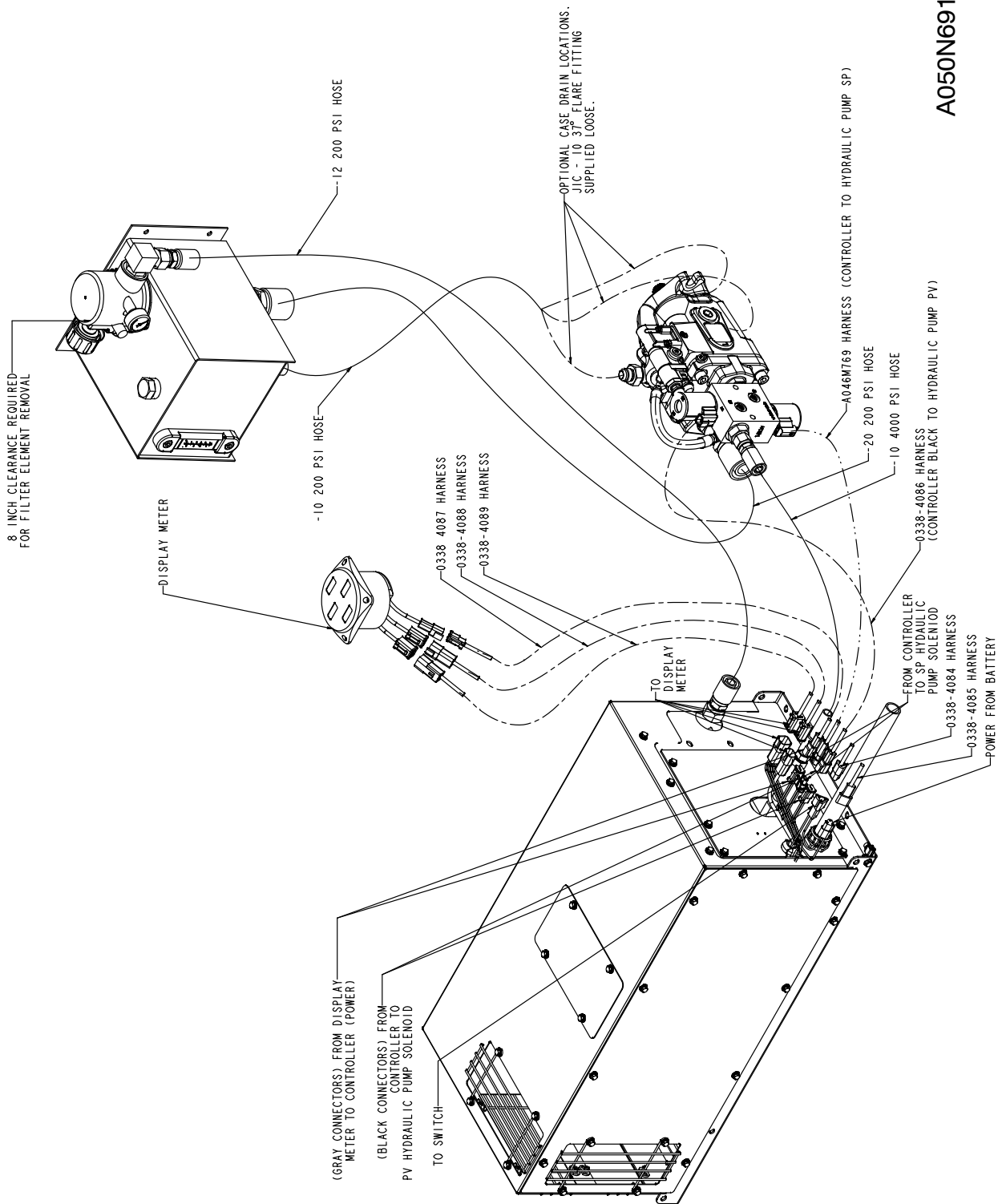
	6 kW Models ¹	8 kW Models ¹	
GENERATOR: 2-Pole Revolving Field, 1-Bearing, 1-Phase, Electronic Voltage and Frequency Regulation			
Frequency	60 Hertz	60 Hertz	50 Hertz
Voltage (3-Wire)	120 / 240 volts	120 / 240 volts	115 / 230 volts
Current	50 / 25 amps	66 / 33 amps	66 / 33 amps
Speed	3600 rpm	3600 rpm	3600 rpm
DC SYSTEM:			
Battery Voltage	12 volts	12 volts	12 volts
Control Fuse (F1)	20 amp blade-type	20 amp blade-type	20 amp blade-type
Control Fuse (F2)*	0.125 amp fast-blow	0.125 amp fast-blow	0.125 amp fast-blow
INSTALLATION: Hydraulic Pump			
Min – Max Pump Speed	950 to 3200 rpm	950 to 3200 rpm	950 to 3200 rpm
SAE Flange	B	B	B
SAE Spline Shaft	B—13 Tooth or BB—15 Tooth	B—13 Tooth or BB—15 Tooth	B—13 Tooth or BB—15 Tooth
SAE Straight Key Shaft	B—1 inch	B—1 inch	B—1 inch
Flow	14 gpm	14 gpm	14 gpm
Maximum Pressure	4000 psi	4000 psi	4000 psi
Hydraulic Fluid	Dexron III or 10 wt Anti-Wear Hydraulic Fluid	Dexron III or 10 wt Anti-Wear Hydraulic Fluid	Dexron III or 10 wt Anti-Wear Hydraulic Fluid
Weight	55 lb (25 Kg)	55 lb (25 Kg)	55 lb (25 Kg)
Max Engine Draw	23.3 hp	26.0 hp	23.0 hp
INSTALLATION: Hydraulic Hose & Fittings			
Pump to Motor	#10, 4000 psi Hose; 37° Fittings	#10, 4000 psi Hose; 37° Fittings	#10, 4000 psi Hose; 37° Fittings
Genset to Oil Reservoir	#12, 200 psi Hose; 37° Fittings	#12, 200 psi Hose; 37° Fittings	#12, 200 psi Hose; 37° Fittings
Pump Case to Oil Reservoir	#10, 200 psi Hose; 37° Fittings	#10, 200 psi Hose; 37° Fittings	#10, 200 psi Hose; 37° Fittings
Oil Reservoir to Pump	#20, 200 psi Hose; 37° Fittings	#20, 200 psi Hose; 37° Fittings	#20, 200 psi Hose; 37° Fittings
INSTALLATION: Generator Module			
Noise	72 dB(A) ²	72 dB(A) ²	72 dB(A) ²
Weight	179 lb (81 Kg)	179 lb (81 Kg)	179 lb (81 Kg)
Dimensions (L x W x H)	31.98 x 15.79 x 13.72 in (812.4 x 401.1 x 348.4 mm)	31.98 x 15.79 x 13.72 in (812.4 x 401.1 x 348.4 mm)	31.98 x 15.79 x 13.72 in (812.4 x 401.1 x 348.4 mm)
Cooling Air Flow	1450 cfm	1450 cfm	1450 cfm
Max Ambient Temp			
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.			
* – Applies only to Spec A–C			

	10 kW Models ¹	15 kW Models ¹
GENERATOR: 2-Pole Revolving Field, 1-Bearing, 1-Phase, Electronic Voltage and Frequency 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
DC SYSTEM:		
Battery Voltage	12 volts	12 volts
Control Fuse (F1)	20 amp blade-type	20 amp blade-type
Control Fuse (F2)*	0.125 amp fast-blow	0.125 amp fast-blow
INSTALLATION: Hydraulic Pump		
Min - Max Pump Speed	850 to 3200 rpm	1000 to 3200 rpm
SAE Flange	B	B
SAE Spline Shaft	B—13 Tooth or BB—15 Tooth	BB—15 Tooth
SAE Straight Key Shaft	B—1 inch	B—1 inch
Flow	14 gpm	16.1 gpm
Maximum Pressure	4000 psi	4000 psi
Hydraulic Fluid	Dexron III or 10 wt Anti-Wear Hydraulic Fluid	Dexron III or 10 wt Anti-Wear Hydraulic Fluid
Weight	55 lb (25 Kg)	55 lb (25 Kg)
Max Engine Draw	28.7 hp	40.0 hp
INSTALLATION: Hydraulic Hose & Fittings		
Pump to Motor	#10, 4000 psi Hose; 37° Fittings	#10, 4000 psi Hose; 37° Fittings
Genset to Oil Reservoir	#12, 200 psi Hose; 37° Fittings	#12, 200 psi Hose; 37° Fittings
Pump Case to Oil Reservoir	#10, 200 psi Hose; 37° Fittings	#10, 200 psi Hose; 37° Fittings
Oil Reservoir to Pump	#20, 200 psi Hose; 37° Fittings	#20, 200 psi Hose; 37° Fittings
INSTALLATION: Generator Module		
Noise	72 dB(A) ²	72 dB(A) ²
Weight	179 lb (81 Kg)	225 lb (102 Kg)
Dimensions (L x W x H)	31.98 x 15.79 x 13.72 in (812.4 x 401.1 x 348.4 mm)	39.17 x 15.81 x 13.7 in (995 x 401.5 x 348 mm)
Cooling Air Flow	1450 cfm	1600 cfm
Max Ambient Temp		
Continuous Full Load	120° F (49° C)	120° F (49° C)
Intermittent Load	140° F (60° C)	140° F (60° C)
1 - Rated @ 1.0 PF		
2 - Rated @ 10 ft (3 m), before installation, under full load.		
* - Applies only to Spec A-C		

8. Outline Drawings

OUTLINE DRAWINGS

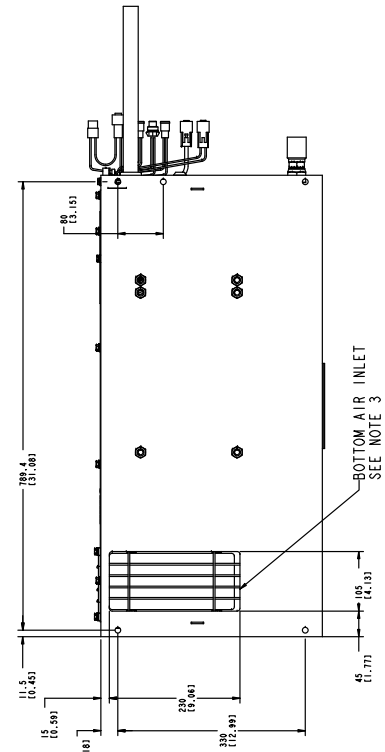
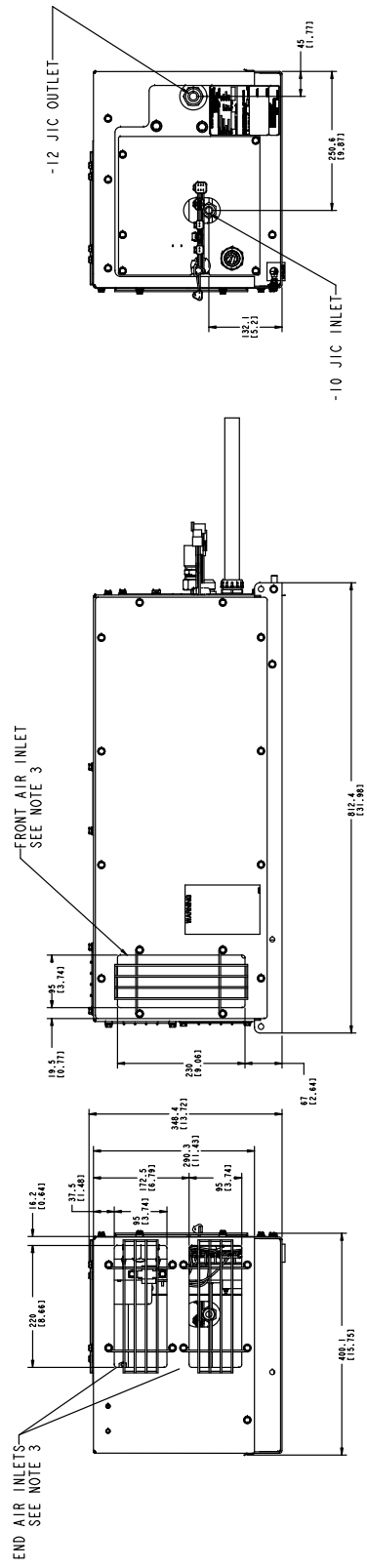
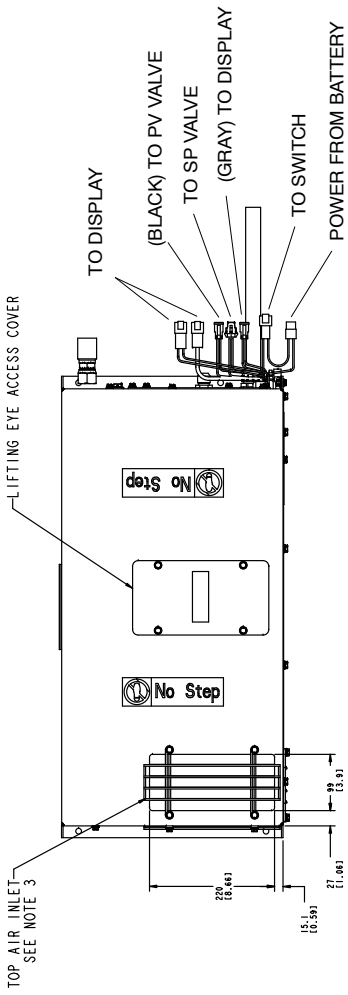
Refer to the appropriate Outline Drawing for the model being installed or serviced.



A050N691

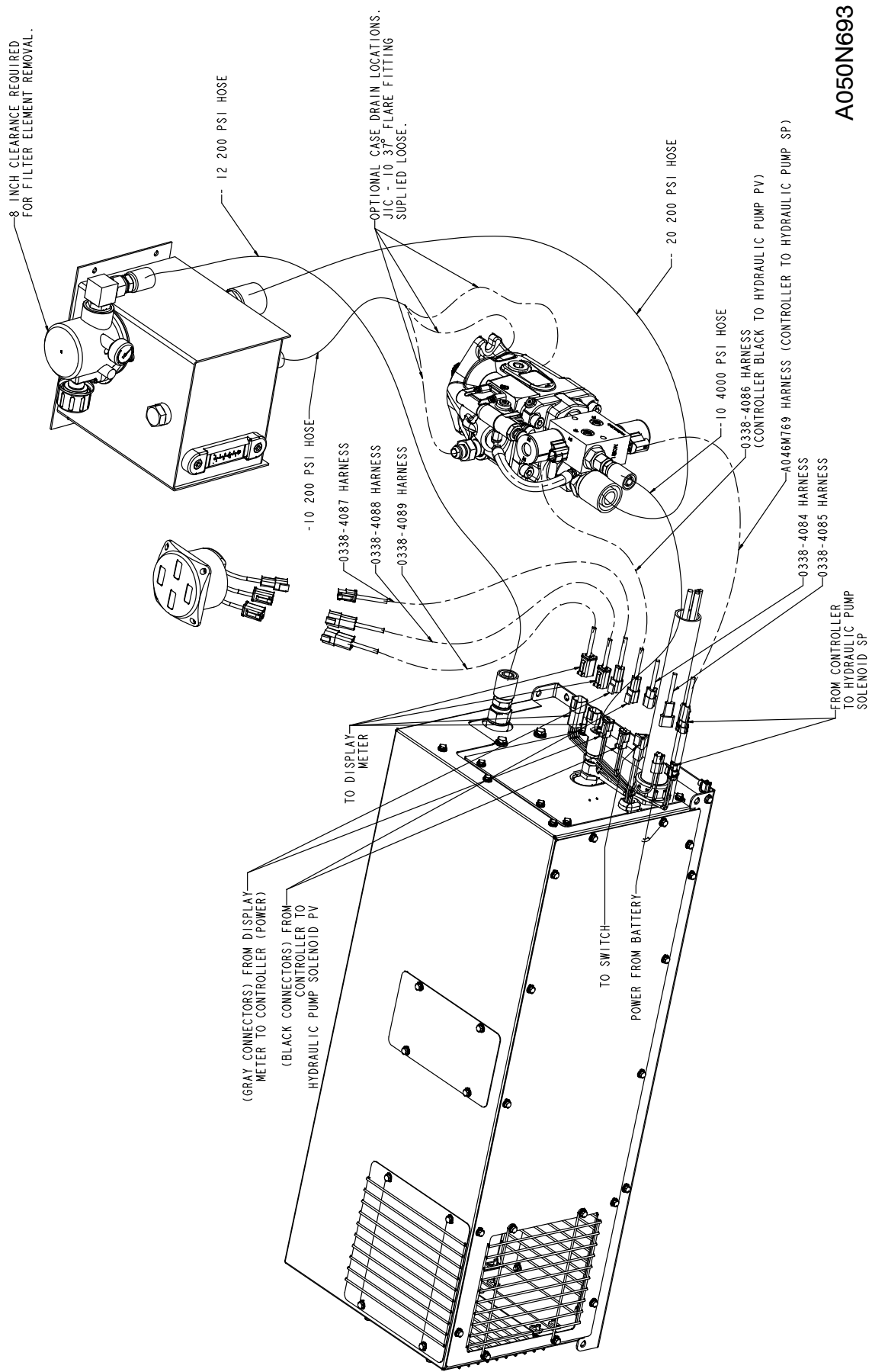
OUTLINE DRAWING (6KW, 8KW, 10KW)—SHEET 1

NOTES:
 3.4 MINIMUM OF 2 AIR INLETS ARE
 REQUIRED TO BE OPEN.



A050N691

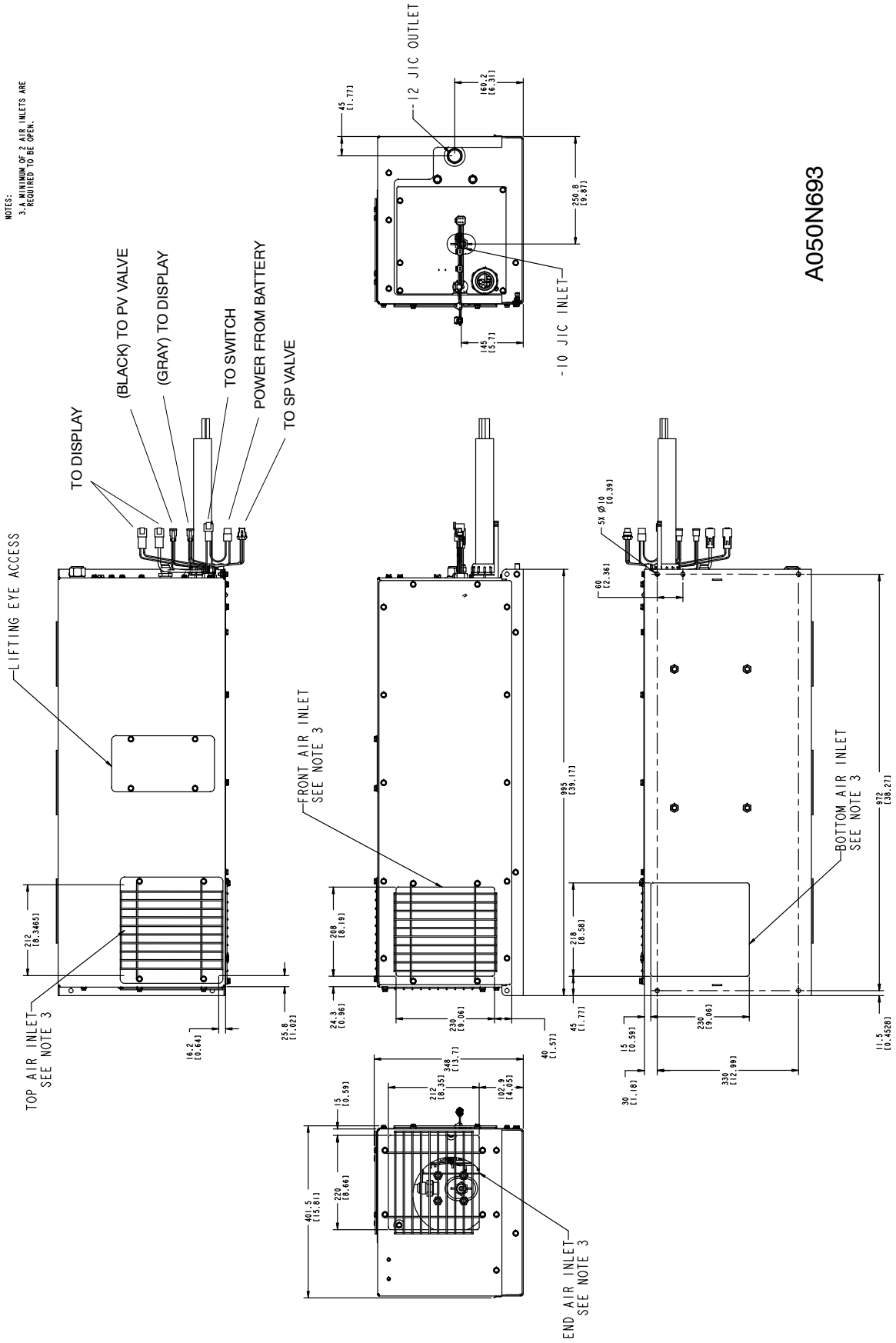
OUTLINE DRAWING (6KW, 8KW, 10KW)—SHEET 2



A050N693

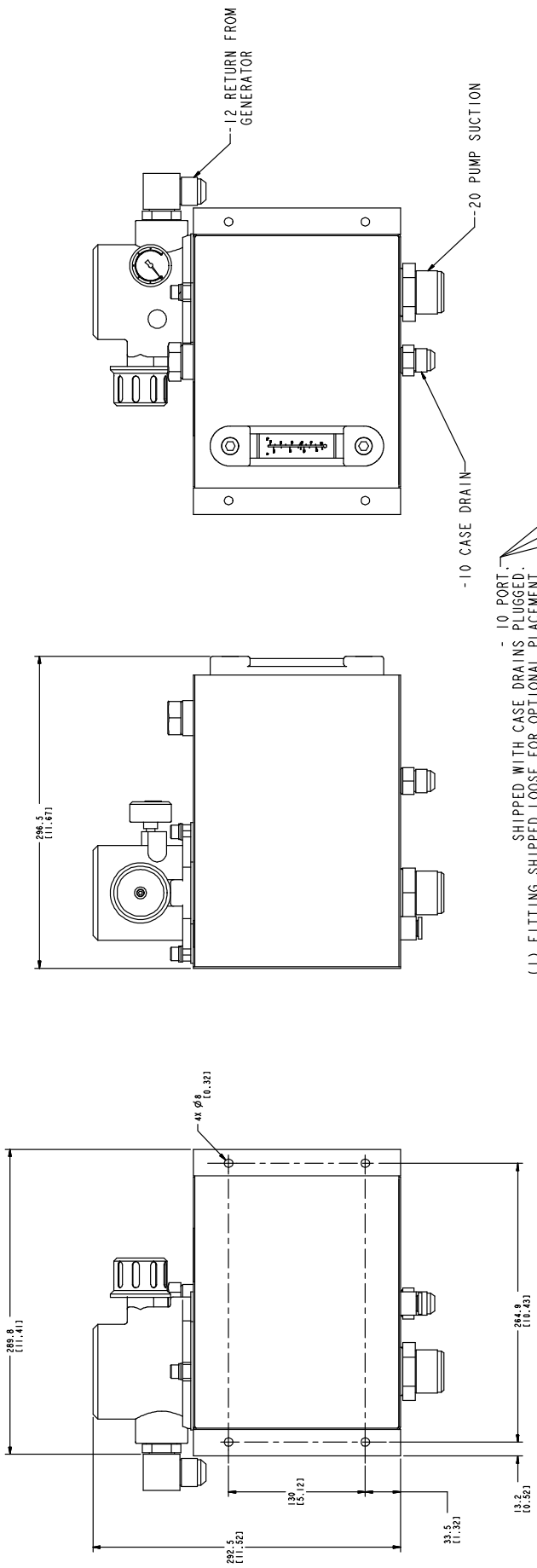
OUTLINE DRAWING (15 KW)—SHEET 1

NOTES:
 3. A MINIMUM OF 2 AIR INLETS ARE
 REQUIRED TO BE OPEN.

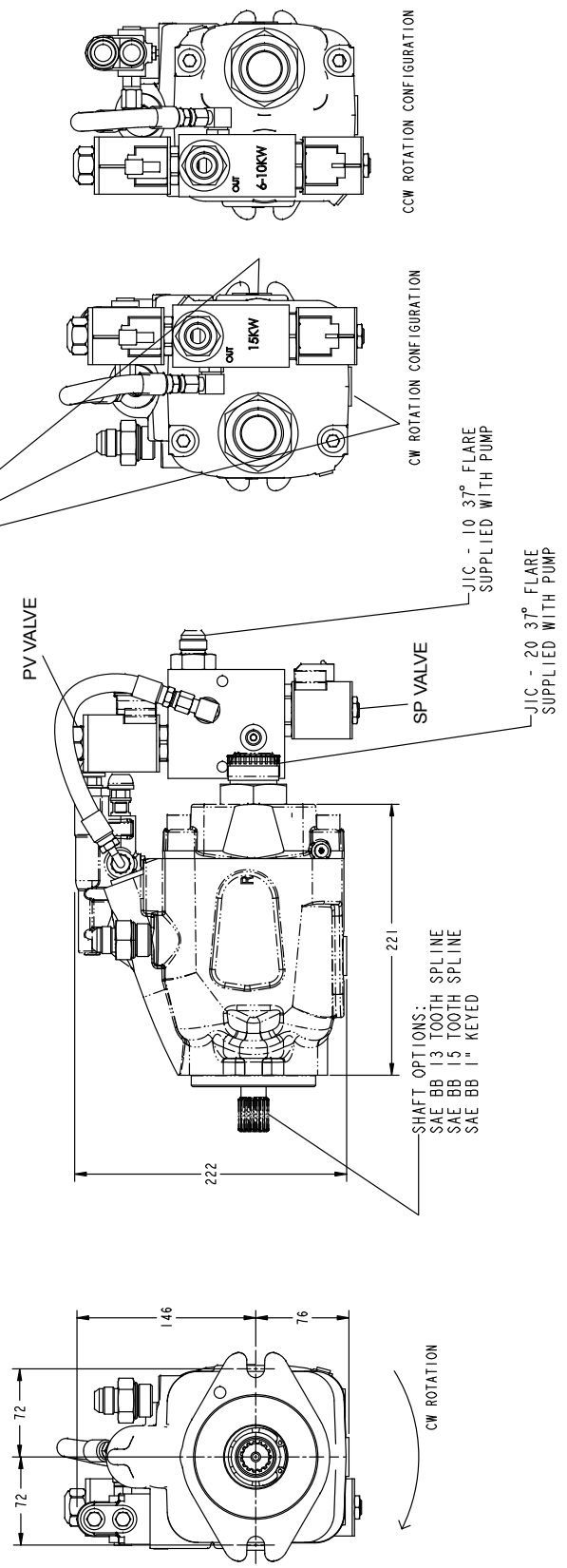


A050N693

OUTLINE DRAWING (15 KW)—SHEET 2



- 10 PORT. SHIPPED WITH CASE DRAINS PLUGGED.
 (1) FITTING SHIPPED LOOSE FOR OPTIONAL PLACEMENT.



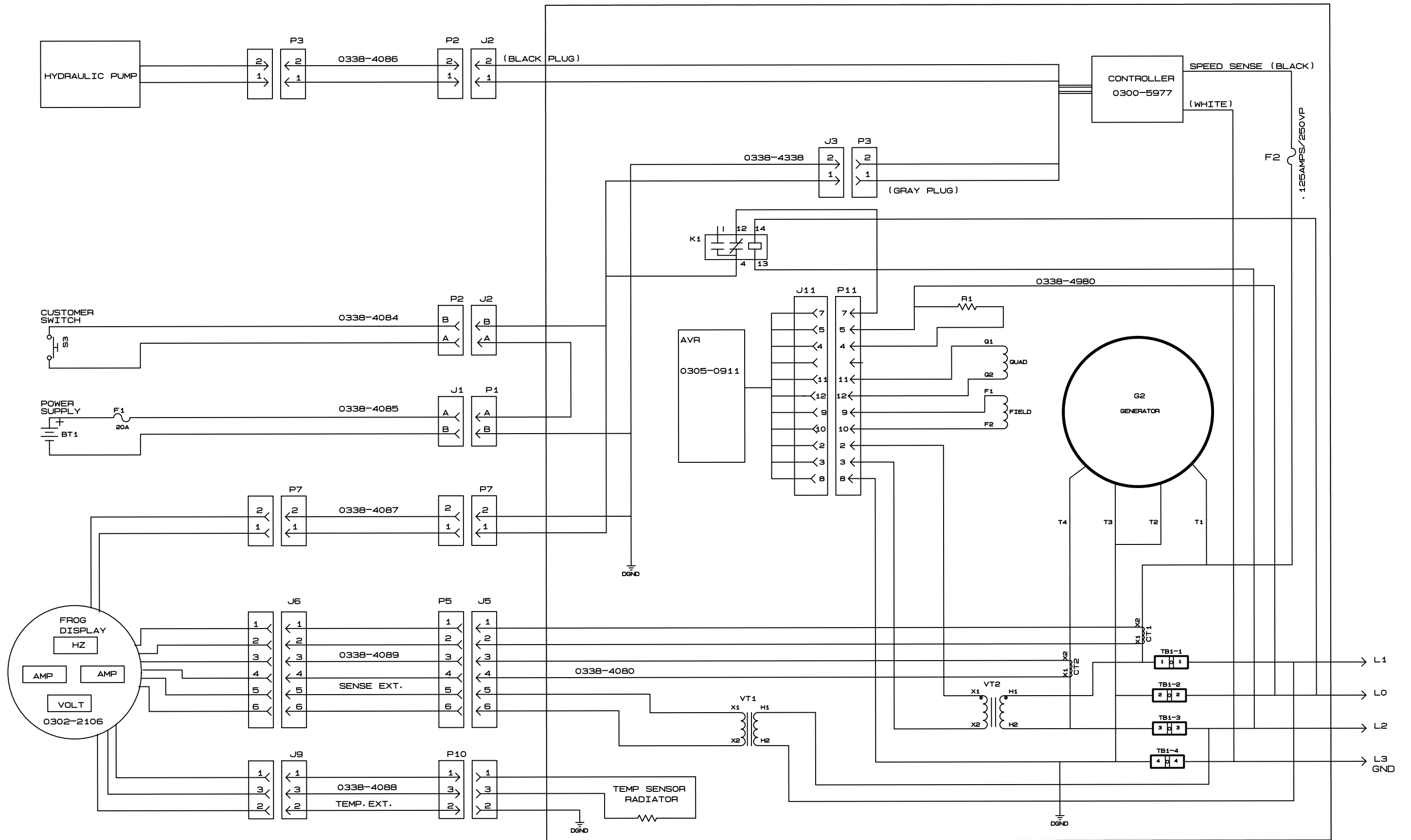
OUTLINE DRAWING (ALL MODELS)

9. Wiring Schematics

WIRING SCHEMATICS

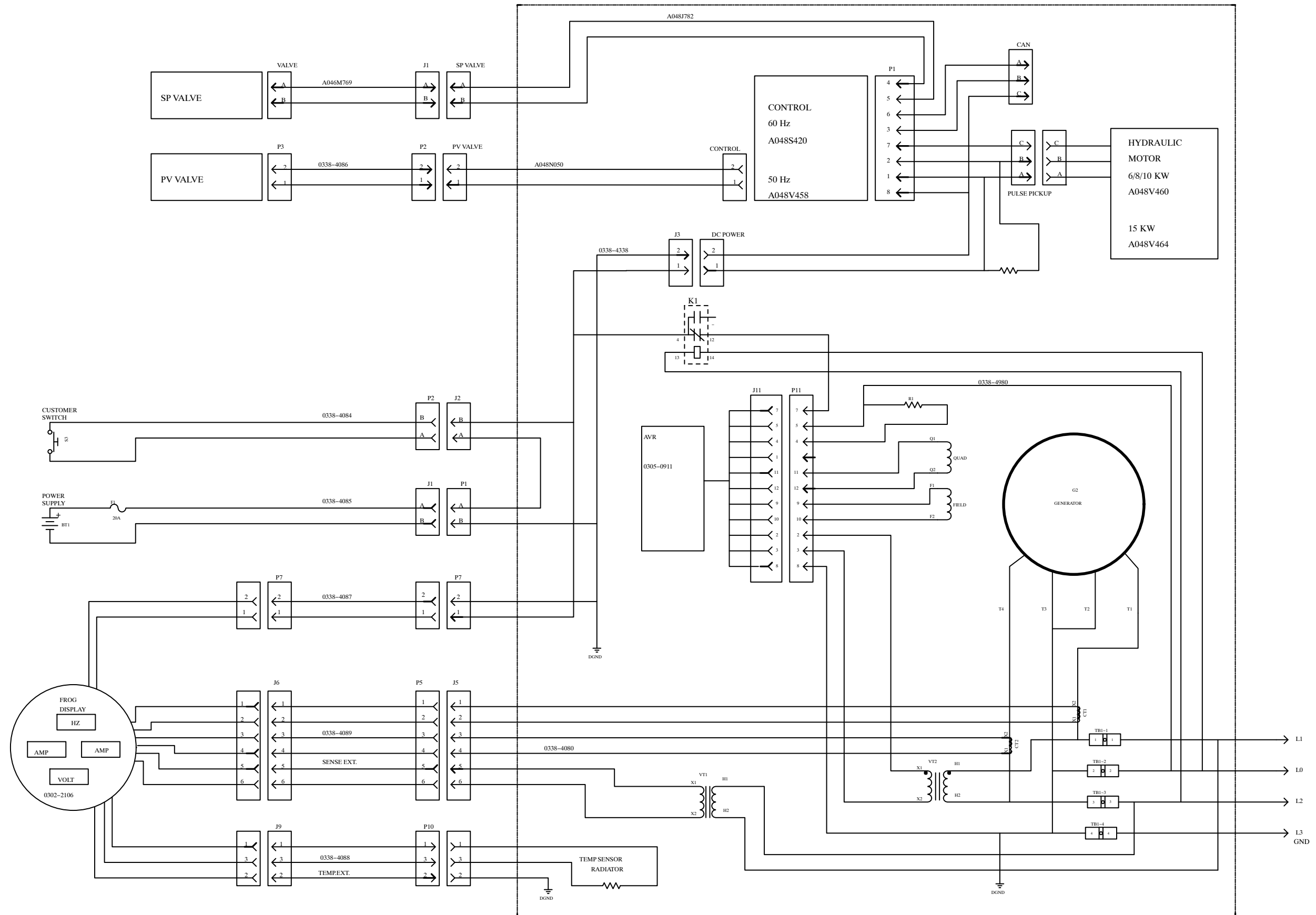
Refer to the appropriate Wiring Schematic for the model being installed or serviced.

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WIRING SCHEMATIC (SPEC A-C)

625-5013



WIRING SCHEMATIC (BEGIN SPEC D)

A049A828 Rev B

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