TM-52480-23

Operation & Maintenance Manual

Rev -
25 September 2007

23 KW GENERATOR
12 KW TOTAL HEATING
120/208 VOLT, 3 PHASE,
60 HERTZ AMPS, 25 KVA

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1. INTRODUCTION

1.1 Forward

This is the Operations and Maintenance Manual for 20kW diesel/JP8 fueled Generator. The Generator (Genset) is designed specifically to supply power to a variety of Environmental Control Units (ECU) and/or electrical equipment. The Genset will provide years of trouble free service if installed, operated, and maintained in accordance with the pertinent operations manuals, referenced herein. This manual provides user level information for operating, servicing, troubleshooting and repair of the system.

1.2 Notice to User

This is not a Commercial Generator

This Generator incorporates several self-contained safety and control features which are factory set and MUST NOT BE ADJUSTED. ANY ADJUSTING OF CONTROL DEVICES WITHOUT APPLED COMPANIES APPROVAL WILL VOID THE WARRANTY. This Generator consists of a 2.216 L (135 cubic inch) diesel/JP8 fired, turbo charge engine which produces 20 kW-25kVA, 208V, 3 Phase power* that is supplied to operate a variety of equipment. The system power is supplied through a 60 Amp export power connecter on the Generator control panel plus two 120 VAC, Single Phase, 15 Amp utility outlets. The Generator has provisions for charging its battery, which is used in start up, and a 24V DC auxiliary output.

NOTE: The 20kW-25kVA capacity is a de-rating for operation in the at altitude and Temperature. Full rated capacity is 23KW and 27KVA.

1.3 Safety Summary

Thoroughly read all instructions in this manual and any other related manuals prior to operating or servicing this system. Carefully read and understand all notes, cautions, and warnings contained in this manual and any other manuals that pertain to the intended task.

WARNING

This note alerts the operator of hazardous conditions that may result in injury or death.

CAUTION

This note warns operator of situations that could result in damage to the equipment.

Never operate the Generator with any cover, screen or panel removed unless specified by the instructions in this manual. When required to operate the Generator with any cover, screen or panel removed, do so with extreme caution and follow all procedures as outlined in the safety summary. Never operate Generator without properly installing the Ground Stake and electrically grounding the system.

1.4 Warnings and Cautions

The following is a condensed list of WARNINGS and CAUTIONS that are noted throughout this manual. All personnel operating, servicing, and maintaining this ECU should read and understand these WARNINGS and CAUTIONS.

NOTE

Use of Term:

The following definitions apply to words “Must”, “Shall”, “Will”, and “May”:

- Must, Shall, and Will – Used to indicate mandatory requirements.
- May – Indicates an acceptable or suggested means of accomplishment.

WARNING

HIGH VOLTAGE is used in the operation of this equipment. Death on contact or severe injury may result if you fail to observe safety precautions. Always disconnect the Generator from the power source before working on it. DO NOT operate the Generator without panels and grilles in place and tightly secured.

WARNING

ROTATING FAN BLADES and/or BELTS are used in this equipment. Severe injury on contact may result if you fail to observe precautions. Always stop the engine and turn the battery disconnect switch off. DO NOT operate fans without panels and grilles in place and secured.

WARNING

DO NOT allow anyone under equipment suspended from sling device. Do Not allow unit to swing while suspended from a sling device. Failure to observe warning may result in serious injury to personnel and damage to equipment.

WARNING

Compressed air used for cleaning purposes should NOT exceed 30 psig (2.1 kg/cm^3) DO NOT direct compressed air against skin. Wear goggles and/or full face shield when using compressed air to avoid eye injury.

WARNING

HIGH VOLTAGE 208VAC. DO NOT disconnect/connect SYSTEM POWER OUT cable unless power is shut off at both ends of the cable (GETT and PPDU) and amber indicator next to connector is off. Voltages used can be deadly. Shutting unit off at the control panel DOES NOT disconnect power to various components of the Genset. Contact with high voltage may cause severe injury or death.

WARNING

HOT SURFACES. Allow to cool before touching. Severe burns can result from touching hot elements.

2. WALK AROUND

2.1 Purpose

The purpose of this section is to provide the operator with an overall familiarity with the Generator. Study the images, and refer to them when conducting any service or operation of the system.

Figure 2-1 Walk Around – Right Side

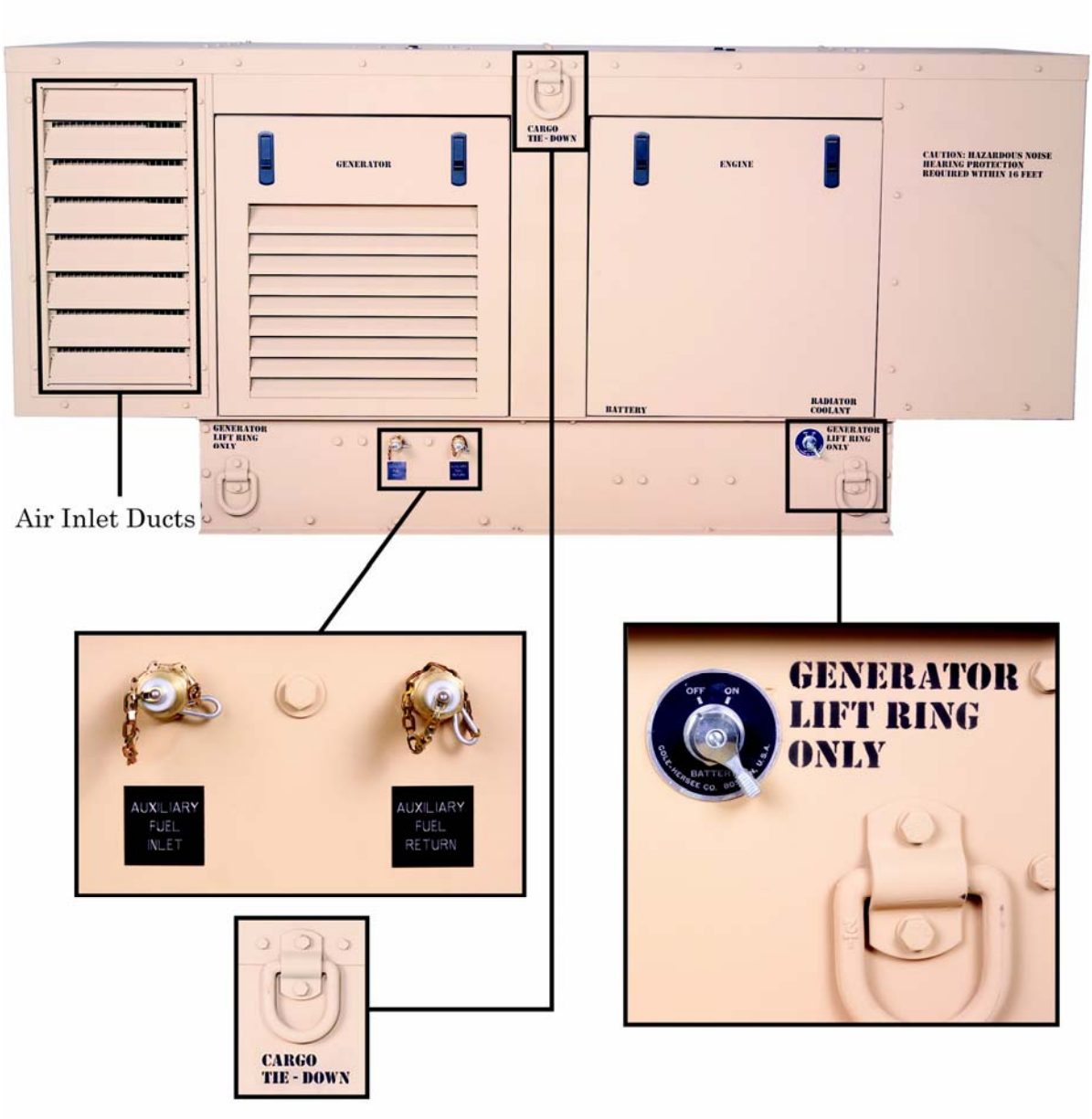


Figure 2-2 Walk Around – Left Side

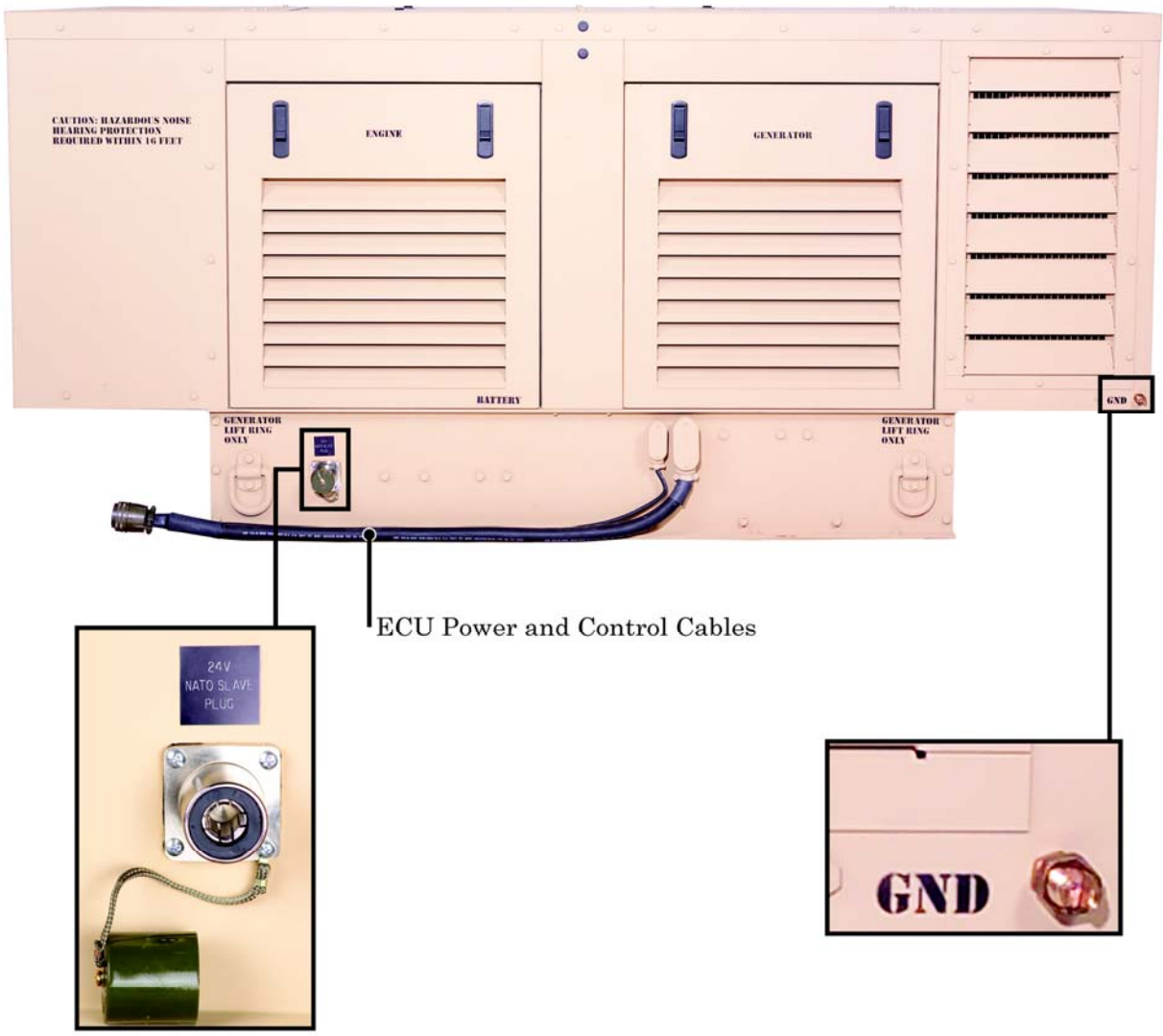


Figure 2-3 Walk Around – Left Front Door

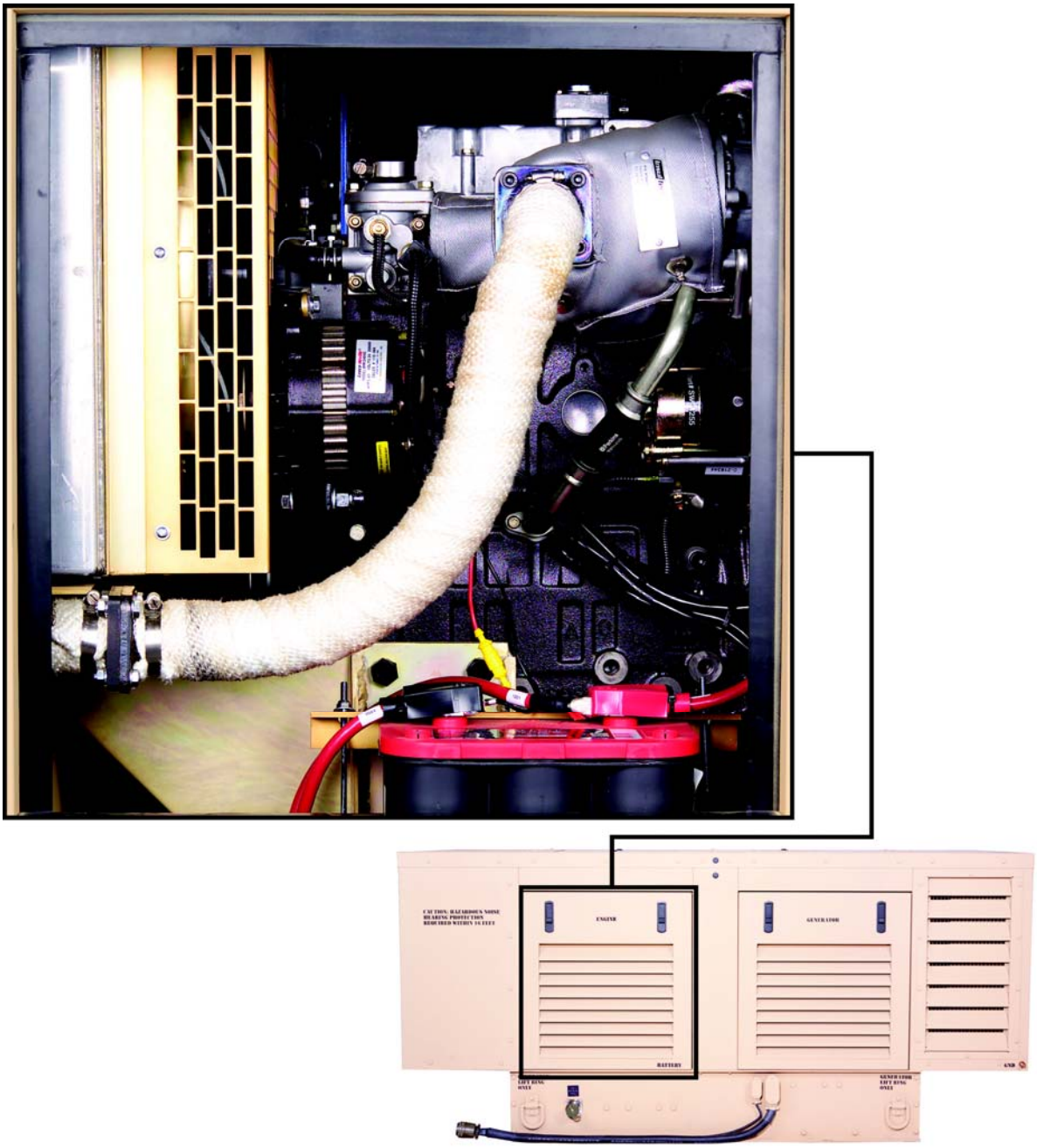


Figure 2-4 Walk Around – Right Front Door

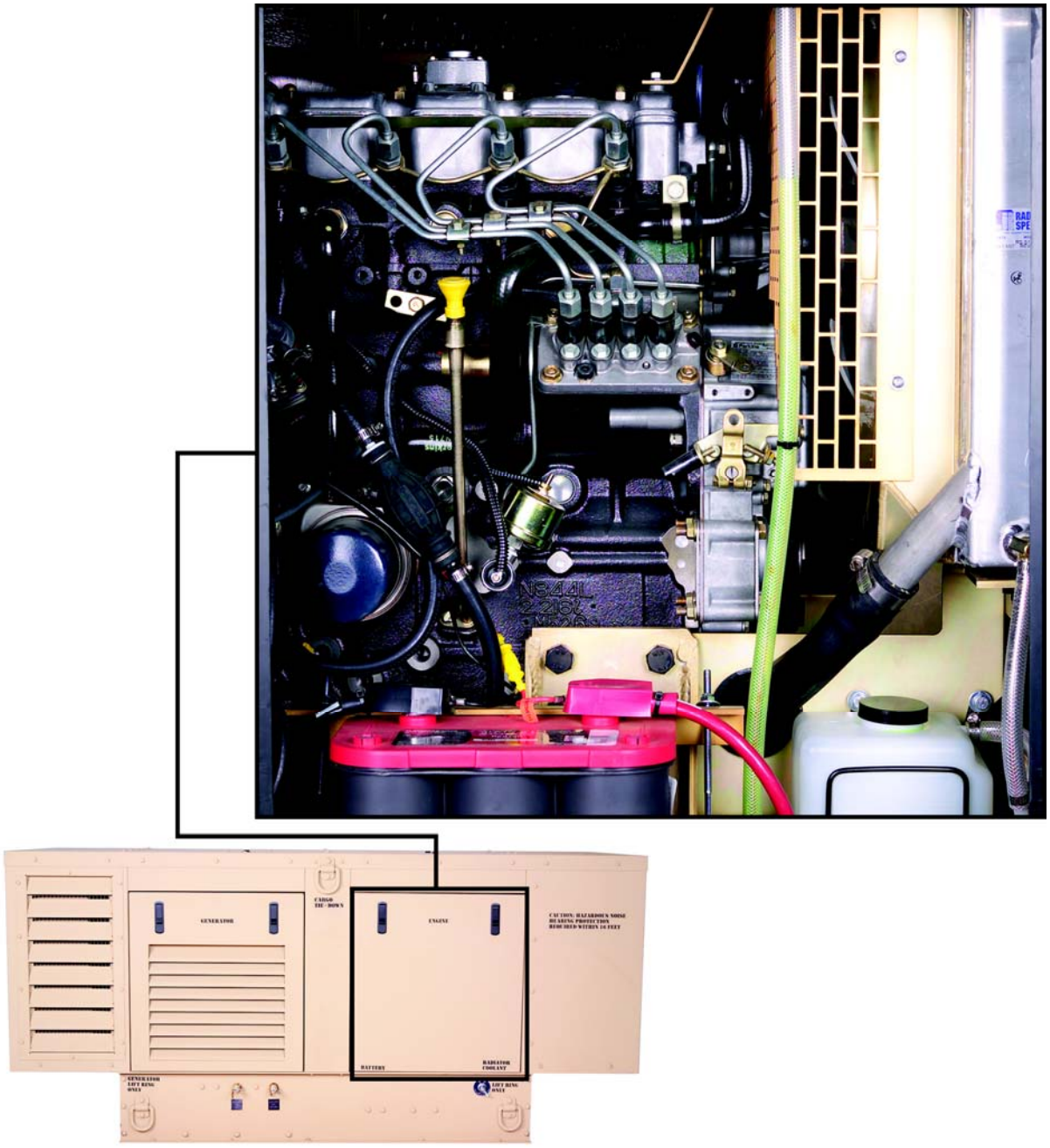


Figure 2-5 Walk Around – Right Rear Door

Item #	Description
1	Generator Buss Enclosure
2	ECO28-2PL/4/10

Figure 2-6 Walk Around – Top Radiator Fill and Oil Fill Door

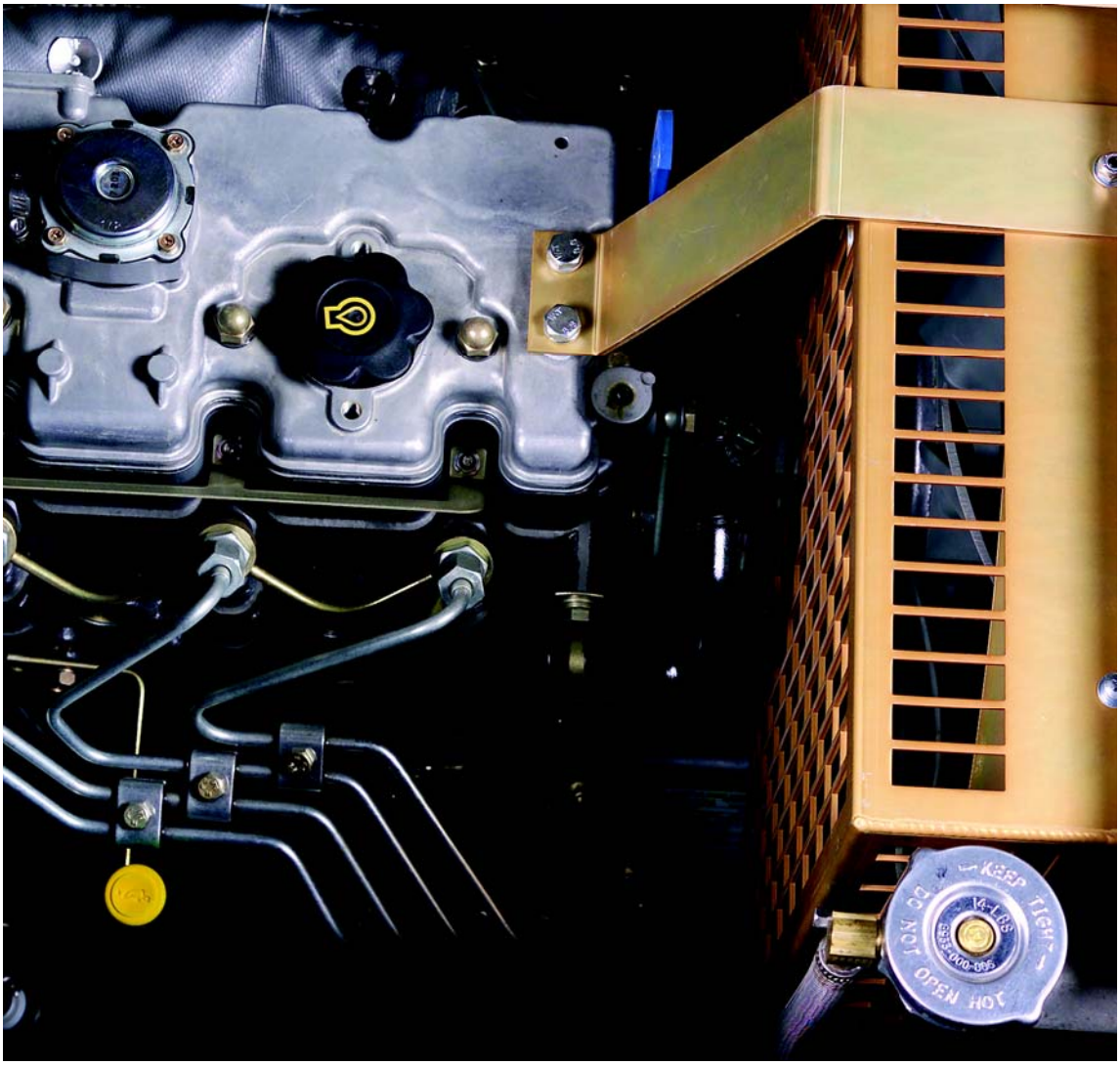


Figure 2-7 Walk Around – Aux Fuel System

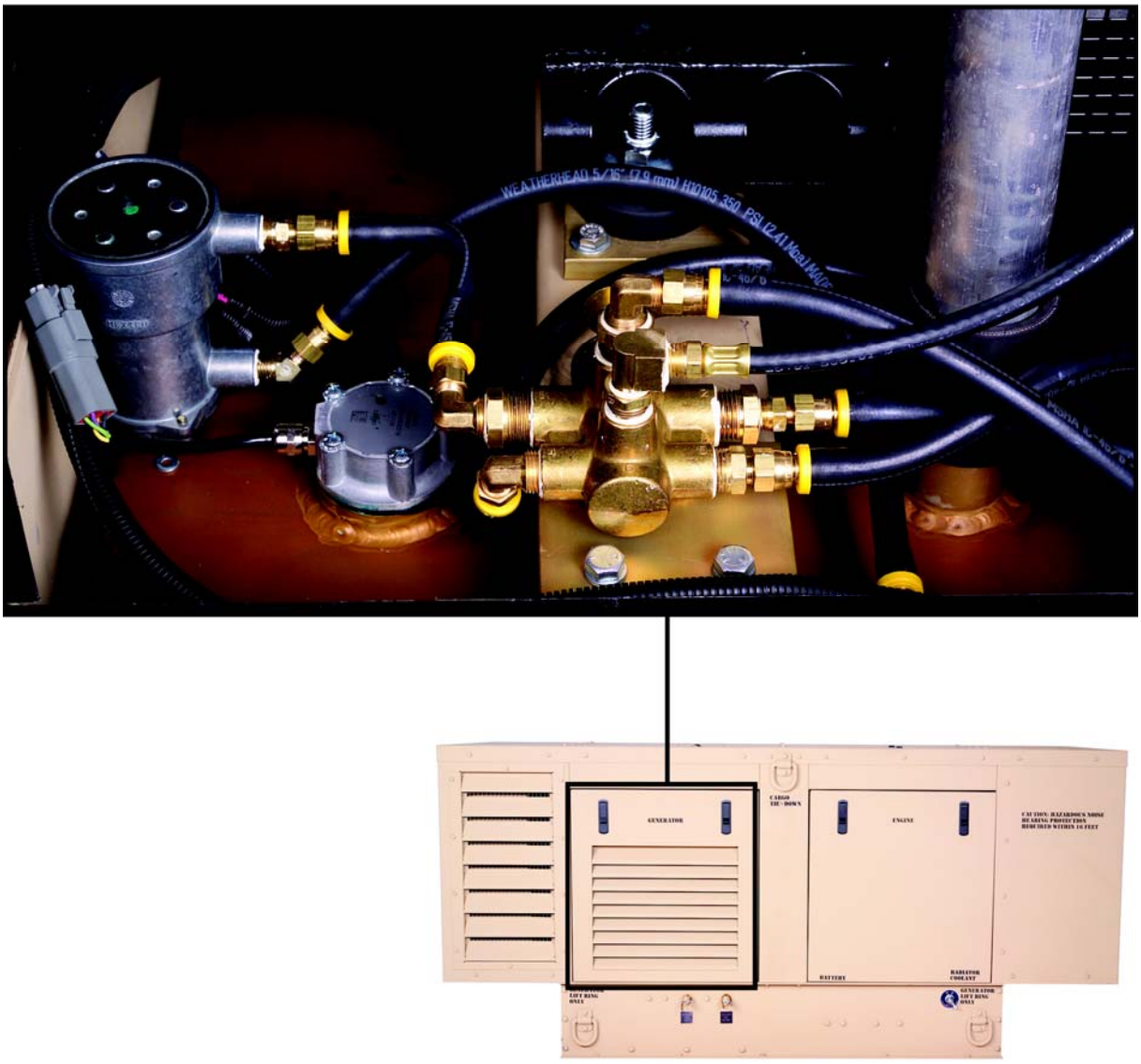
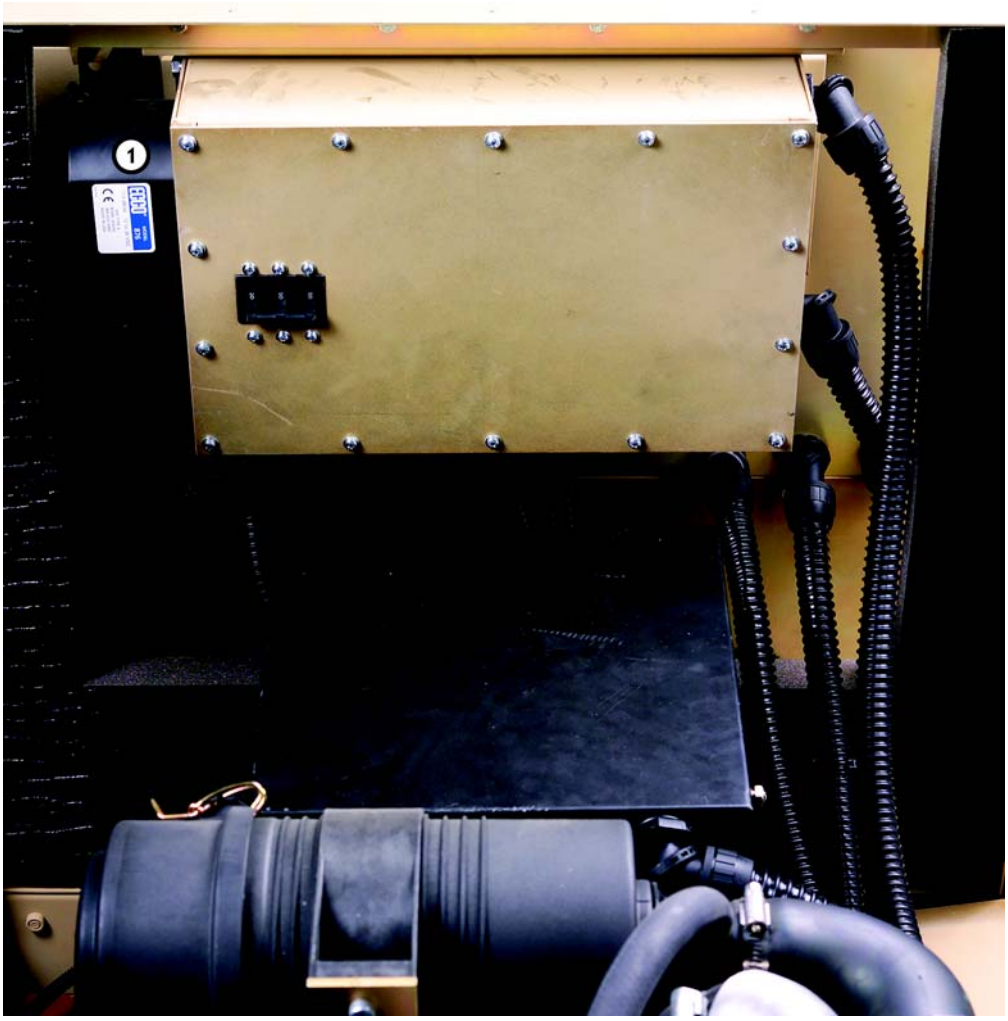
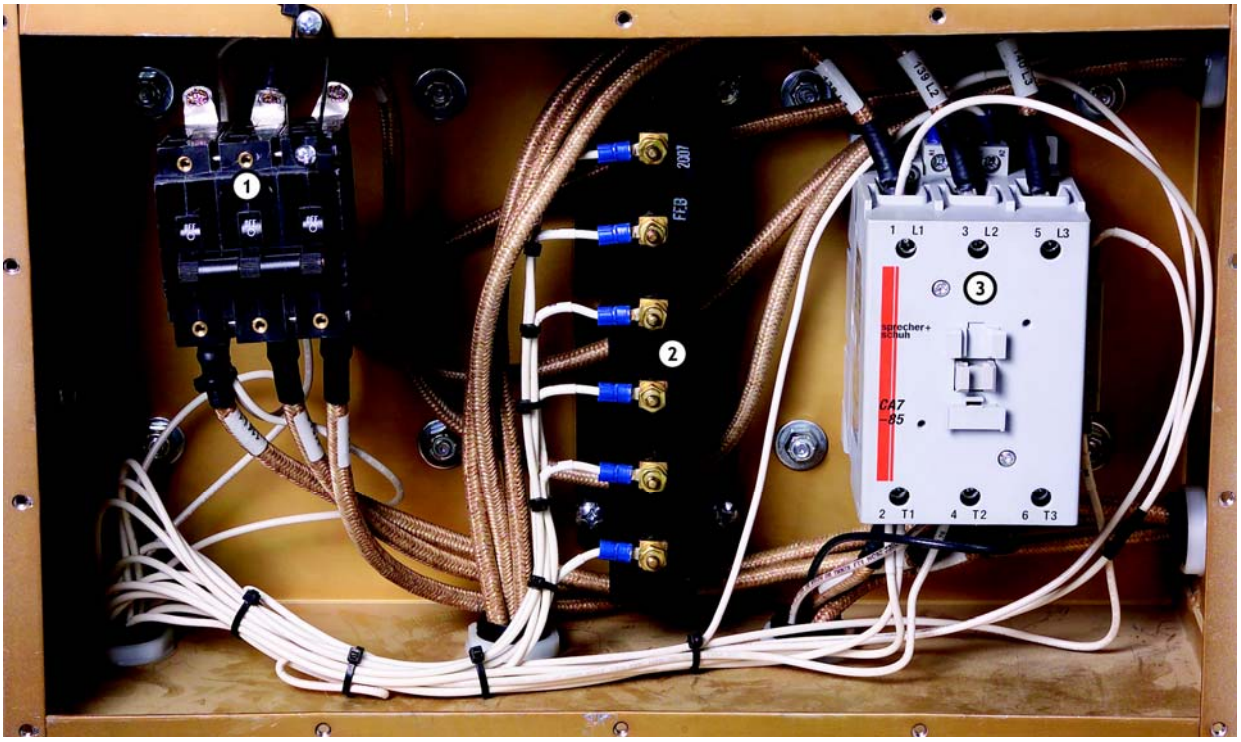


Figure 2-8 Walk Around – Mainline Circuit Breaker



Item #	Description
1	Fault Alarm

Figure 2-9 Walk Around – Mainline Circuit Breaker Open



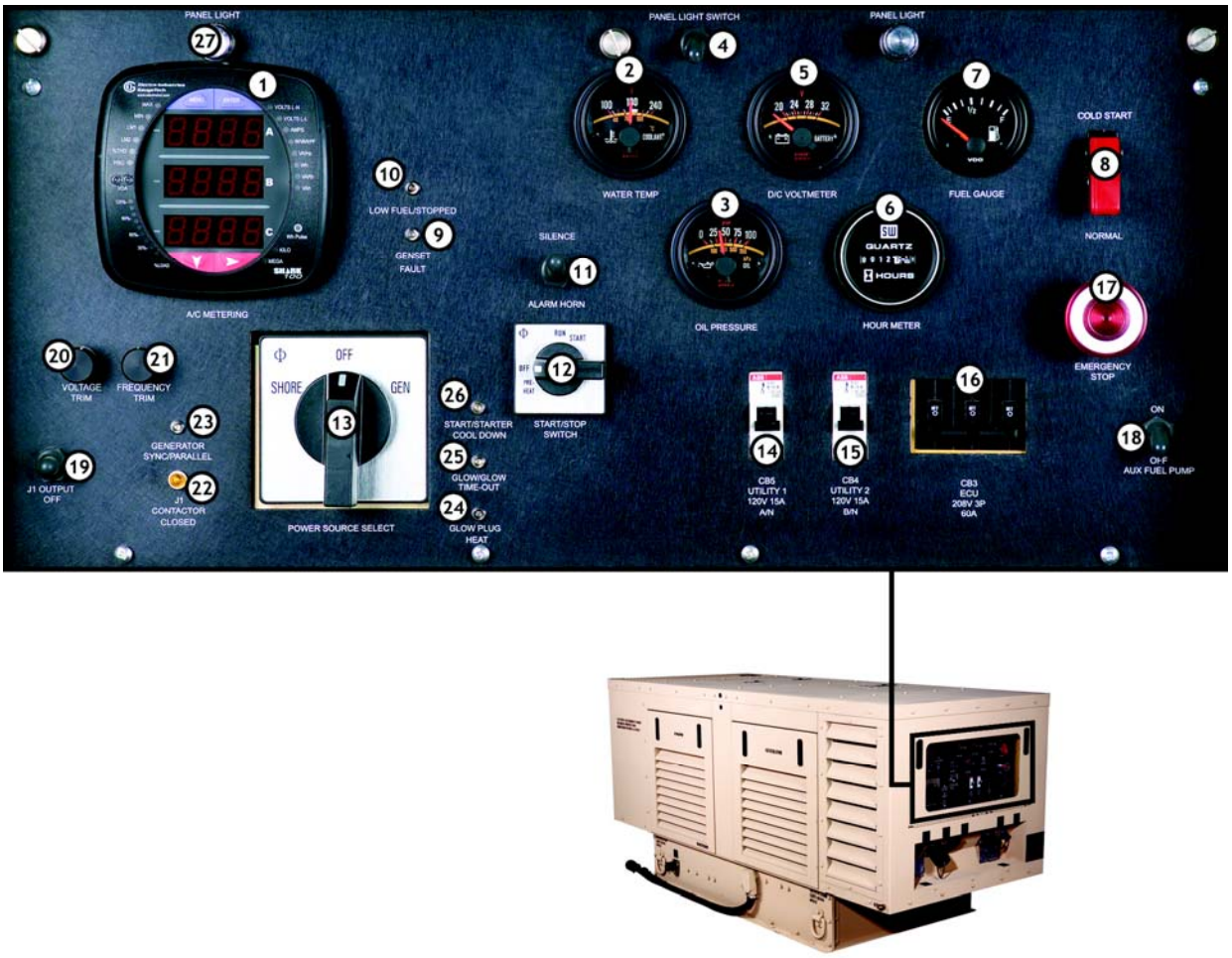
Item #	Description
1	Mainline Circuit Breaker
2	Paralleling CT's
3	Paralleling Contactor

Figure 2-10 Walk Around – Right Side Top

3. INSTALLATION AND OPERATION PROCEDURES

3.1 Generator Control Panel

Figure 3-1 Generator Control Panel



NOTE
The generator control panel should be monitored to ensure the system is functioning properly. Figure 3-1 and Table 3-1 show the components on the generator control panel. Note the location of the EMERGENCY STOP.

Table 3-1 Generator Control Panel

Item #	Name	Function
1	A/C METERING (SHARK 100)	Provides data/readings for voltage, frequency and amperage in all phases.
2	COOLANT TEMPERATURE	Indicates coolant temperature.
3	OIL PRESSURE GAUGE	Indicates engine oil pressure.
4	PANEL LAMP SWITCH	Turns on the panel lamps.
5	D/C VOLTMETER GAUGE	Indicates DC volts.
6	RUN TIME METER	Indicates engine run time.
7	FUEL GAUGE	Indicates fuel level.
8	COLD START SWITCH	Used for cold weather start-up.
9	GENSET FAULT LIGHT	Indicates a problem with generator.
10	LOW FUEL WARNING LIGHT	Lights when fuel drops below a present level.
11	ALARM HORN SILENCE SWITCH	Turns off the alarm horn.
12	START/STOP SWITCH	Turns the generator on or off.
13	POWER SOURCE SELECTOR SWITCH	Selects between shore power or generator.
14	UTILITY 1 CIRCUIT BREAKER	Supplies 120v, single phase power to Utility 1.
15	UTILITY 2 CIRCUIT BREAKER	Supplies 208v, three phase power to Utility 2.
16	ECU PWR OUT CB	Supplies power to ECU.
17	EMERGENCY STOP	Stops generator in case of emergencies.
18	AUX FUEL PUMP SWITCH	Turns on pump for auxiliary fuel source
19	J1 OUTPUT SWITCH	To supply power to tent, hold switch in UP position until J1 Contactor Closed Indicator lights.
20	VOLTAGE TRIM (adjustment)	For fine adjustment of voltage.
21	FREQUENCY TRIM (adjustment)	For fine adjustment of frequency.
22	J1 CONTRACTOR CLOSED LIGHT	Indicates power to tent is on.
23	GENSET SYN/PARALLEL LIGHT	Indicates when generator is in sync with another genset.
24	GLOW PLUG HEAT LIGHT	Indicates glow plug is heating.
25	GLOW PLUG TIME-OUT LIGHT	
26	STARTER COOLDOWN LIGHT	Indicates cool-down.
27	PANEL LAMP	

Figure 3-2 Connectors

Item #	Description
1	Block Heater
2	Shore Power
3	Battery Charger Input
4	System Power Out
5	Parallel Comm (J6)
6	Utility 1 120V, 15A Single Ø
7	Utility 2 120V, 15A Single Ø

4. DESIGN FEATURES

4.1 Operational and Physical Characteristics, Generator

Electrical Power Generation	20kW, Export Power
Maximum Design Ambient Temperature	55.0 ^{o}C (131^{o} F)
Coolant System Capacity (Engine Only)	3.6 liters (3.8 quarts)
Oil Sump and Filter Capacity	9 liters (9.5 quarts)
Fuel (JP 8 or Diesel Only, Cetane 45 Min)	71.9 liters (19 gals)
Height	39.10”
Width	85.72”
Depth	34.16”
Weight	1540 lbs

4.2 Special Features

Lifting Rings (see Figure 2-1)

There are four genset lifting rings that are used to lift the generator for air transport, or for mounting on a vehicle or trailer. These shackles must only be used with the proper spreader bar, while lifting, to ensure that no damage is caused to the components of the system. Do not allow anyone under the equipment while suspended from a sling device. Do not allow the unit to swing while suspended from a sling device. Failure to observe warning may result in serious injury to personnel and damage to equipment. The sling lifting rings are located at the front and rear corners of the genset base.

Cargo Tie Down Rings (see Figure 2-1)

The cargo tie down rings are used to secure auxiliary components on the unit while in transport or in shipment. The cargo must be secured properly during shipment or in transport to ensure no damage to the system components or to the cargo. DO NOT USE THE CARGO TIE DOWN RING TO SECURE THE TRAILER IN ANY WAY, ONLY THE TIE DOWN SHACKLES ARE TO BE USED FOR THIS PURPOSE. Failure to adhere to this requirement may cause damage to the system and its components and may cause injury or death to personnel. The cargo tie down rings are located at the upper center on the Generator. They must not be used for any other purpose.

Air Outlet Cover

The genset is equipped with a hinged air outlet cover on the exhaust end of the unit, (opposite the control panel). When operating in high ambient temperature conditions (in excess of 110 ^{o}F/43.3 ^{o}C), or in situations where additional generating capacity is required, ensure that air outlet cover is open. Loosen two thumb screws, lower the door to the mechanical stop on the right deflector, and pin the door in place. The air

outlet cover may also be deployed during normal operating conditions. Outlet cover must be securely closed prior to transporting.

WARNING

Grounding Stake and Slide Hammer Tool: A Ground Stake is a REQUIRED safety feature and must be properly installed before operation of the system. Instructions are located in the storage box on the trailer to the side of the Generator. The Slide Hammer Tool is used to insert the ground stake correctly. Improper installation of this feature may cause system to function improperly and could cause injury or death.

24VDC Auxiliary Output (see Figure 2-2)

24V DC Auxiliary Output: The generator is equipped with an auxiliary 24V DC output which may be used to jump start other vehicles requiring this voltage for start up. The 24V DC auxiliary output is located on the side of the generator.

Figure 4-1 24VDC Auxiliary Output

WARNING

HIGH VOLTAGE is used in the operation of this equipment. Death on contact or severe injury may result if you fail to observe safety precautions. Always disconnect the Generator from the power source before working on it. DO NOT operate the Generator without panels and grilles in place and tightly secured.

4.3 Operator Instructions

4.3.1 Prestart

NOTE

When operating in high ambient temperature conditions (in excess of 110 ^{o}F/43.3 ^{o}C), or in situations where additional generating capacity is required, ensure that air outlet cover is open, as shown in Figure 4-3.

Figure 4-2 Air Outlet Cover, Closed

Figure 4-3 Air Outlet Cover, Open

Item #	Description
1	Radiator
2	Lock Pin
3	Cover Fastener

a. Set Ground Rod
The Ground Rod has installation instructions located in the storage box. The ground rod is a REQUIRED safety feature and must be properly installed before operation of the Generator. Connect the ground cable to the ground rod and the ground lug on the generator.
Use minimum 6 Ga. copper wire.

b. Set engine START/STOP switch to OFF.

c. Check radiator coolant, engine lube oil and fuel level.

d. Set Battery Disconnect switch to ON.

4.3.2 Normal Start (Temperature Above +32 ^{o} F)

a. Pull emergency stop button to disengage.

b. Set AC circuit breakers CB3 thru CB5 to OFF.

c. Set Start/Stop switch to preheat and hold until the glow plug heat lamp goes off.

d. Rotate the engine Start-Stop switch to the START position to crank the engine. DO NOT CRANK THE ENGINE FOR LONGER THAN **15 SECONDS**.

e. When engine starts, release switch to RUN position.*

*If start is unsuccessful, immediately repeat preheat, then start. If second attempt is unsuccessful, wait 3 minutes, then repeat this process from the beginning.

CAUTION
Multiple start attempts without starter cool down will result in damage to the starter motor.

CAUTION
NEVER close CB3 thru CB5 or J1 output switch when in the cold start mode. NEVER switch power source selects switch to GEN when in the cold start mode. AC Frequency is higher than normal. Severe damage to electrical loads my result.

Under normal conditions, run the engine at no load for 5 minutes to warm up. If required, load may be applied immediately.

f. Move the power source select switch to GEN.

g. Adjust the AC voltage and the Frequency with the Voltage trim and the Frequency trim knobs located on the generator control panel.

4.3.3 Cold Start (Temperature Below +32 ^{o} F)

NOTE
Refer to Table 6.1 and 6.2 for cold weather operation fuel and oil requirements.

a. Pull emergency stop button to disengage.

b. Set AC circuit breakers CB3 thru CB5 to OFF.

c. Set the power source select switch to OFF.

d. Set Cold-Start/Normal switch to COLD START. Wait at least 60 seconds before continuing to next step.

e. Rotate the engine Start-Stop switch to Preheat and hold until the glow plug heat lamp goes OFF.

f. Immediately rotate the engine switch to the START position to crank the engine. DO NOT CRANK THE ENGINE LONGER THAN **15 SECONDS**.

g. When engine starts, release switch to run position.*

*If start is unsuccessful, immediately repeat preheat, then start. If second attempt is unsuccessful, wait 3 minutes, then repeat this process from the beginning.

h. Run engine for a minimum of 5 minutes or until the meter needle in the engine coolant temperature gauge begins to rise off the minimum reading (engine speed will be higher than normal).

i. Set Cold Start switch to NORMAL. Engine speed will drop to normal and stabilize.

j. Move power source selector switch to Gen.

k. Adjust the AC voltage and the Frequency with the Voltage trim and the Frequency trim knobs located on the generator control panel.

WARNING

Using the Cold Start Switch: Once the Generator is in operation, the Cold Start Switch MUST be turned to the OFF position prior to engaging the load. Failure to do so could result in an over-speed condition that seriously damages the equipment.

4.3.4 Apply Load Power

a. Close CB3.

b. If needed, close CB4 (J3) and CB5 (J5).

c. Hold J1 Output ON-OFF toggle up until J1 contactor closed light comes on, and then release toggle switch.

4.3.5 Stopping the Generator

a. Push down on J1 Output ON-OFF toggle until J1 contactor closed light is off, then release toggle switch.

b. Remove the load from AC circuit breakers (CB3, CB4 & CB5) by pulling the toggle handles down to the OFF position.

c. Rotate the power selector switch to the OFF position.

d. Allow the engine to run approximately 5 minutes at no load to cool down the turbocharger, then rotate the engine start-stop switch to OFF.

NOTE

NOTE: The Generator engine is equipped with a mechanical stop. In the event the engine control switch fails to shut off the engine, rotate the mechanical stop lever clock-wise and hold until the engine stops.

WARNING

To avoid shock hazard the generator frame MUST be grounded. Connect a 6 AWG wire or larger from the ground terminal (GND) to earth ground.

4.4 Shore Power Operating Instructions

4.4.1 Pre-Connection

a. Verify shore power source is 120/208 VAC, 3 phase, 60Hz 4 wire “WYE” connection with an earth ground (5th wire) connection point. Shore power source shall be capable of providing a minimum of 80 amps per line.

b. Verify or install a 3 phase circuit breaker in the shore power service panel. The 3 phase circuit breaker shall support a continuous load of 60 amps per line.

c. Verify or wire the 3 phase shore power circuit breaker in series with the power cables leads L1, L2, & L3 (phase A, B, & C).

d. Verify phase rotation is ABC at the P1 connector A, B, & C pins.

e. Verify or wire power cable neutral lead to shore power neutral connection point.

f. Verify or wire power cable earth ground terminal to shore power earth ground connection point.

g. Verify or set 3 phase circuit breaker in shore power service panel is in the OFF position.

4.4.2 Connection to Shore Power

a. Verify or set the power source select switch to the OFF position.

b. Verify or set AC circuit breakers CB3 through CB5 in the OFF position.

c. Verify or set the J1 output connector is open by holding the J1 output switch to the OPEN position. The J1 output bus hot lamp adjacent to the J1 output switch will turn off.

d. Connect the power cable connector P1 to the Genset J2.

e. Set 3 phase circuit breaker in shore power service panel to the ON position. Shore power indicator adjacent to J2 shore power connector will go on.

WARNING

NEVER engage shore power in a parallel load sharing connection with another Genset that is supplying power to the load. Genset is not designed to parallel with shore power.

4.4.3 Engage Shore Power

a. Rotate the power source selector switch to SHORE position.

b. Close the AC circuit interrupter breakers (CB3, CB4, & CB5) by lifting the circuit interrupter breaker toggle-handle to the ON position.

c. Close the J1 output power contactor by holding the J1 contactor switch in the UP position. The J1 output bus lamp adjacent to the J1 connector will illuminate.

4.4.4 Disengage Shore Power

a. Open the J1 output power contactor by holding the J1 contactor switch to the OFF position. The J1 output bus hot lamp adjacent to the J1 connector will go out.

b. Remove load by placing the AC circuit interrupter breakers (CB3, CB4 & CB5) by pulling the circuit interrupter breaker toggle-handle to the OFF position.

c. Move the power source selector switch to OFF position.

4.5 Parallel Power Operating Instructions

WARNING

To avoid shock hazard the generator frame MUST be grounded. Connect a 6 AWG wire or larger from the ground terminal (GND) to earth ground.

4.5.1 Power Off Preparation

a. Verify or set all generators to the OFF condition with the Start/Stop switch.

b. Connect only two generators to the inputs of the Parallel Power Distribution Unit (PPDU) or similar equipment.

c. Connect the parallel communication cable between the two generators.

d. Connect the output of the PPDU to the system loads.

e. Verify or set all input switches and all output circuit breakers on the PPDU in the OFF position.

f. Verify that generator(s) will NOT be supplying power from the shore power inputs.

WARNING

NEVER attempt parallel load share operation with shore power. Severe damage to electrical equipment will result.

4.5.2 Generator Start Up

a. Start and warm up each generator IAW the starting instructions.

b. Using the Voltage trim and the Frequency trim knobs located on the generator control panel, adjust the voltage and frequency of each generator to:

Voltage: 120VAC +/- 1 VAC, Phase to Neutral or
208VAC +/- 1 VAC, Phase to Phase

Frequency: 60Hz +/- 1 Hz

DO NOT CLOSE Output power contactor in either generator until instructed to do so in the following steps.

4.5.3 Engaging Parallel Operation

a. On the PPDU, verify or set output circuit breakers CB1 & CB2 to the OFF position.

b. Select one of the two generators (herein referred to as Genset 1) and, per Genset1 operating instructions, close the output power contactor to apply power to the input of the PPDU.

c. On the PPDU, close the second generator (herein referred to as Genset 2) input switch (S1 or S2). This routes Genset 1 power over to Genset 2.

d. At Genset 2, engage parallel connection and load share as follows: Press and hold J1 contactor switch in the UP position. J1 contactor indicator lamp will

illuminate.

e. Compare the AC line current readings of Genset 1 and Genset 2. They should be less than 5 amps. If more than 5 amps, slowly and carefully adjust voltage settings on Genset 2 to obtain a difference of less than 5 amps.

4.5.4 Engaging System Loads

a. If required, close ECU circuit breaker (CB3) and utility circuit breakers (CB4 & CB5).

b. On PPDU, close output circuit breakers CB1 and/or CB2.

c. Read the AC line current of Genset 1 and Genset 2. Add the two readings to obtain the load current. Amperages should be approximately the same.

d. To alter load current sharing, slowly and carefully adjust the frequency setting on Genset 1 and Genset 2.

4.5.5 Disengaging System Loads

a. On PPDU, open output circuit breakers CB1 and/or CB2.

b. Open ECU circuit breakers (CB3) and utility circuit breakers (CB4 & CB5).

c. On Genset 2, open output power contactor. Press and hold J1 contactor switch in the OFF position. J1 contactor closed indicator lamp will extinguish.

d. On Genset 1, open the output power contactor. Press and hold J1 contactor switch in the OPEN position. J1 contactor closed indicator lamp will extinguish.

4.5.6 Generator Shutdown

Refer to Paragraph 4.3.5, Stopping the Generator, for shut down procedure.

4.6 Switching to Auxiliary Fuel Source

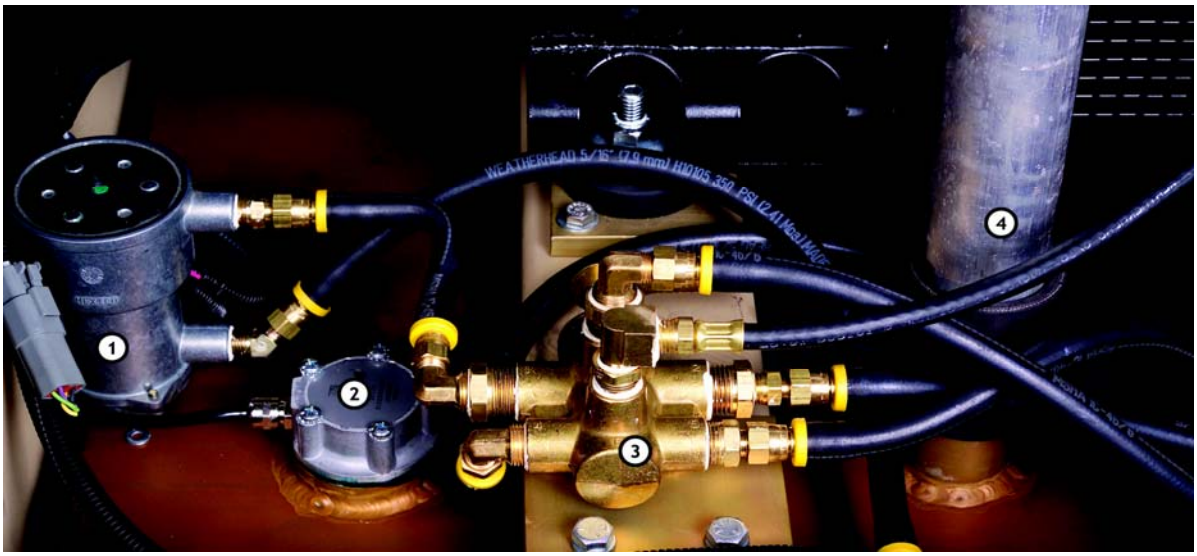
If the system is in operation:

a. Verify that there is sufficient fuel in the auxiliary fuel source.

b. Verify that the auxiliary fuel source is securely connected to the generator.

c. Slowly rotate the fuel selector lever to the left. The initial switch-over must be done slowly (approx. 1 minute) to allow air to bleed. Once the change over is accomplished, return to on-board fuel can be done normally.

Figure 4-4 Auxiliary Fuel Source Switch



Item #	Description
1	Auxiliary Fuel Pump
2	Fuel Sender & Low Fuel Level Light Switch
3	3-Way Auxiliary Fuel Source Valve
4	Fuel Filler Tube

5. USER LEVEL TROUBLESHOOTING

5.1 Generator will NOT start

Engine does not turn over

Check that emergency stop is pulled out.

Check that battery cables are properly installed on terminals or BOTH batteries. Make sure all battery connections are clean and secure.

Contact maintenance specialist for assistance.

Engine turns over but does NOT start

Check fuel level.

Check fuel selector lever.

Make sure selection is for correct fuel source (fuel tank or Aux.), if an auxiliary fuel source is used, make sure auxiliary fuel pump is on.

Squeeze primer bulb and try to start.

Contact maintenance specialist for assistance.

5.2 Generator runs, but there is no power output

Ensure power selector switch is set to “Generator”.

Check circuit breaker on main control panel. Should be in ON position.

Check that the Mainline Circuit Breaker inside the enclosure is in the ON position.

Check that output connector is fully engaged and secure.

Check gauge readings for voltage, current (amps) and frequency. Check 120V utility outlets for current.

Turn system OFF.

Check for loose connections between power selector switch and output.

Contact maintenance specialist for assistance.

5.3 Shore Power connected, but no power output

Check that power selector switch is set to SHORE POWER.

Check that circuit breaker is ON.

Check gauge reading.

If gauges register, turn off system and check for loose connections at input and output connecters.

Contact maintenance specialist for assistance.

6. MAINTENANCE

6.1 Maintenance Instructions

Preventive Maintenance Checks and Services (PMCS) are essential to ensure that the generator is ready for operations at all times. Regular service and maintenance can correct defects and deficiencies before they cause serious damage or complete failure to the equipment. Any effective preventive maintenance program must begin with the indoctrination of operators to report all unusual conditions noted during daily checks or actual operation to the appropriate maintenance personnel.

A systematic approach should be established to record all problems, defects, and deficiencies noted by operators and discovered during maintenance inspections together with the corrective actions taken.

A schedule for preventive maintenance inspection and service should be established immediately after installation of the unit. When operating under unusually adverse conditions, such as an extremely dusty, dirty, or sandy environment, it may be necessary to reduce the interval, depending on the severity of the environmental conditions. Cleaning the system may be done using water alone, or with a mild detergent. Steam cleaning may also be used where available.

Refer to the Major Components individual Technical or Operational and Maintenance Manuals for detailed information regarding maintenance schedules and intervals.

WARNING

DEATH or SERIOUS INJURY may result if personnel fail to observe the following safety precautions.

NOTE: REFER TO SAFETY PRECAUTIONS SECTION OF EACH INDIVIDUAL MANUAL. FAILURE TO ADHERE TO THESE RECOMMENDATIONS COULD RESULT IN DEATH OR SERIOUS INJURY.

NOTE: MAINTENANCE AND REPAIR TO THE GENERATOR ENGINE SHOULD BE PERFORMED BY A QUALIFIED DIESEL MECHANIC.

Figure 6-1 Battery Terminal Cables Removal

Item #	Description
1	Negative
2	Positive
3	Battery Hold-Down Clamp
4	Fuel Primer Bulb

Table 6-1 Engine Coolant Requirements

Ambient Temperature	Radiator Coolant
+40 to +130 ^{o}F	Additive MIL-A-53009
-40 to -131 ^{o}F	Anti-freeze 50/50 mix with water. Anti-freeze type: BS6580, ASTM D3306-89 or AS2108

Table 6-2 Engine Fuel and Oil Requirements

Ambient Temperature	Diesel Fuel	Lube Oil
+20 to +131 ^{o}F	A-A-52557, GR 2-D	MIL-L-2104C OE HDD-30
0 to +20 ^{o}F	A-A-52557, GR 1-D	MIL-L-2104C OE HDD-10
-40 to 0 ^{o}F	A-A-52557, GR 1-D	MIL-PRF-46167D

Table 6-3 Capacity

Fuel Tank	Lubricating Oil		Cooling System	
19 Gal.	Crank Case	Filter	Radiator & Overflow	Block
	11.2 qts	0.5 qts	3.57 qts	3.8 qts

6.2 Replace Batteries

a. Ensure engine is de-energized and that fan/belts are stopped rotating.

b. Turn Battery on/off switch to the off position,

c. Open generator battery covers.

d. Disconnect battery negative terminal cables.

e. Disconnect battery positive terminal cables.

f. Remove battery mounting nuts and withdraw J-bolts.

g. Lift battery and withdraw batteries through side doors.

Installing Replacement Battery

Reverse order of removal steps.

6.3 Replace Radiator

a. Open petcock to drain coolant.

b. Remove top supporting brackets.

c. Loosen fan guard retaining bolts and remove fan guard.

d. Remove fan bolts and withdraw fan tilting toward engine.

e. Loosen engine radiator hose clamps and disconnect.

f. Loosen overflow hose.

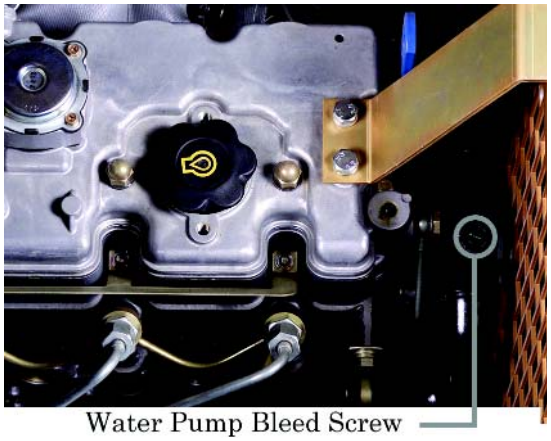
g. Remove (2) 1/4-28 nylocks in the bottom of the radiator support angle.

h. Withdraw radiator in an upward direction.

Install Radiator

Reverse order of removal steps.

After filling radiator open water pump bleed screw to remove trapped air.



6.4 Auxiliary Fuel Pump

a. Turn Battery Disconnect switch to Off.

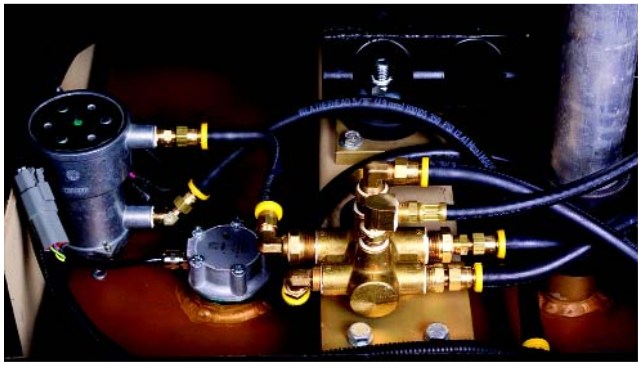
b. Disconnect inlet and outlet fuel hoses.

c. Unplug power wires from fuel pump.

d. Loosen fuel pump mounting bolts and remove pump.

Install Fuel Pump

Reverse order of removal steps.



6.5 Fuel Control Valve Replacement

a. Turn Battery Disconnect switch to Off.

b. Turn control valve to OFF position.

c. Disconnect hoses.

d. Loosen control valve mounting bolts.

e. Remove control valve.

WARNING

Precautions must be taken to catch and/or clean up any fuel spills.

Install Fuel Control Valve

Reverse order of removal steps.

6.6 Changing Out the Mag Pick-up

a. Disconnect wires from Mag Pick up.

b. Back out Mag Pick up.

c. Remove Mag Pick up adapter from Flywheel housing.

d. Center a Flywheel tooth in the center of the hole.

e. Install Mag Pick up adapter and verify tooth is still in center.

f. Install the Mag Pick up until it bottoms out on the flywheel tooth.

g. Back the Mag Pick up out a half a turn to two-thirds of a turn and lock down the captive nut.

h. With a volt meter measure across the Mag Pick up while cranking the engine over. Ensure you measure 1.8 VAC to 3.0 VAC.

i. If you do not measure at least 1.8 VAC bring the Mag Pick up closer to the flywheel just a little, but do not go closer than a half a turn from the bottom or you will do damage to the Mag Pick up.

j. Connect Mag Pick up back into the harness connections.

6.7 Replacing the Starter

a. Turn Battery Disconnect switch to Off.

b. Disconnect positive and negative wires from the starter.

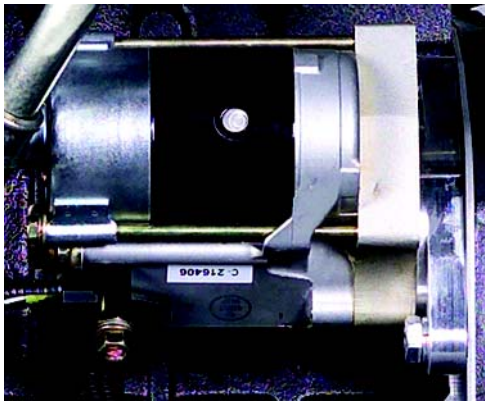
c. Remove the two bolts holding the starter to the flywheel housing.

d. Pull the starter to the straight out of the flywheel housing.

e. Install new starter and with new bolts.

f. Connect positive and negative wires.

g. Start engine.



6.8 Replacing the Turbo

a. Remove four bolts holding the exhaust flex tube to the turbo.

b. Remove the turbo blanket (970445/6) from around the turbo. Do not remove the insulation blanket from the exhaust manifold.

c. Disconnect both air hoses. One from the air cleaner and the other goes from the turbo to the air intake track on the Perkins engine.

d. Disconnect the oil lines (top and bottom) from the turbo.

e. Disconnect the turbo from its mounting bracket.

f. Remove the four mounting bolts that hold the turbo to the exhaust manifold.

g. Pull the turbo upward to remove.

h. Install turbo reverse of the way it was removed and mount to the exhaust manifold. Use a new exhaust gasket (p/n 314990013).

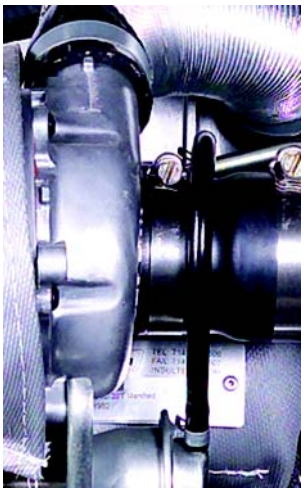
i. Connect the mounting bracket from the engine block to the turbo.

j. Connect the oil lines back up to the turbo. The top oil line is the inlet and you will need to use a new banjo bolt (p/n TPN532) and two new copper seals (p/n 2131A506) and the bottom oil line is the return and use a new gasket (p/n 3688A035).

k. Connect air inlet from air cleaner to turbo and air outlet to air intake track.

l. Install the turbo blanket using tie wire.

m. Install the exhaust flex exhaust back to the turbo exhaust flange using a new gasket (p/n 314990013).



6.9 Replacing the Alternator

a. Remove the three wires coming from the engine harness to the back of the Alternator.

b. Loosen top bolt on the Alternator and push Alternator toward the engine to loosen belt. You may have to remove the finger guard if you can not get the belt off the pulley.

c. Once you remove the belt remove top and bottom bolts from Alternator.

d. Install new Alternator leaving the top bolt loose.

e. Put belt back around the pulley and tighten leaving 1/8” of play in the belt after you have tighten the belt. To check the tension try and turn the belt side, if you can turn it sideways 90 degrees the belt is tight.

f. Connect the three wires from the engine harness to the back of the alternator and start the engine.

g. Check batteries to see if Alternator is charging.

6.10 Change Mechanical Lift Fuel Pump

a. Remove fuel lines going to the lift pump, be careful of fuel drainage from fuel lines and pump.

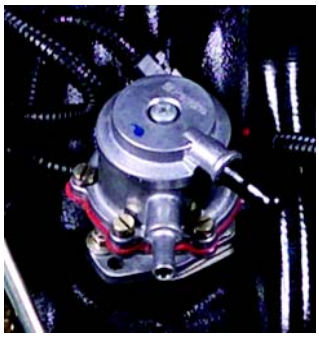
b. Remove two bolts from flange, mounting lift pump to engine block.

c. Lift pump is removed by pulling straight out of the block.

d. Install new pump (the fuel inlet can be rotated 360 degree in 15 degree increments) the fuel lift pump has two sets of locating holes, this allow the pump to have four positions for the outlet connection. (Use new "O" ring p/n. 2415A070).

e. Connect appropriate fuel lines to the inlet and the outlet of the lift pump.

f. Using primer bulb, prime engine (squeeze 10-15 times or until bulb is hard) and start engine.



6.11 Fuel Primer Bulb Replacement

a. Loosen inlet and outlet hose clamps.

b. Disconnect fuel primer bulb.

Install Fuel Primer Bulb

Reverse order of removal steps.

6.12 Block Heater Replacement

a. Remove radiator cap, open petcock to drain coolant.

b. Disconnect block heater power cord from block heater.

c. Loosen block heater from engine block.

d. Withdraw block heater from engine block.

Install Block Heater

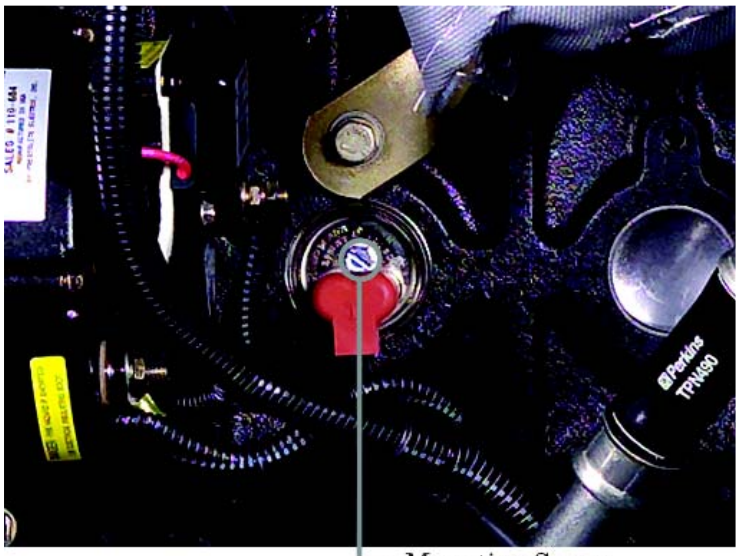
a. Lubricate heater O-Ring with ethylene glycol (coolant).

b. Install block heater element at 6 o'clock position.

c. Tighten heater mounting screw.

d. Refill coolant, replace cap.

e. Reconnect heater power cord.



6.13 Replacing Control Panel Components

a. Turn Battery Disconnect switch to Off.

b. Open control panel door by loosening three thumb screws along the top.

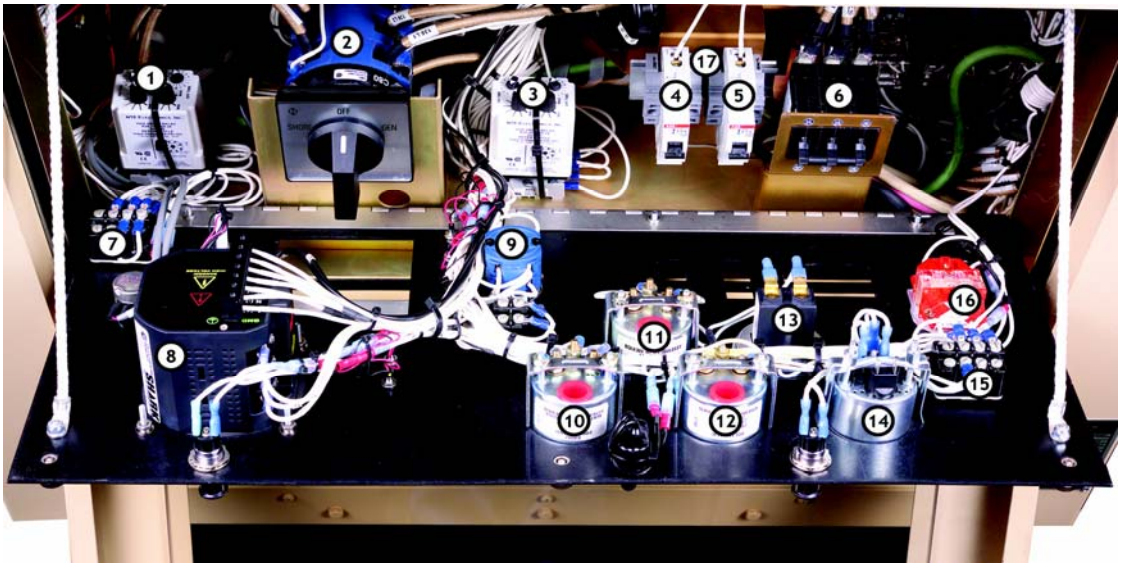
c. Disconnect connecting wires of defective components.

d. Remove defective components.

Install Control Panel Components

Reverse order of removal steps.

Figure 6-2 Control Panel Components



Item #	Description	Item #	Description
1	Glow Plug Timer	2	Shore Power Switch
3	Starter Timer	4	Utility 2 120V, 15A Single
5	Utility 1 120V, 15A Single	6	ECU Power Output
7	J1 Output Switch	8	A/C Meter
9	Start/Stop Switch	10	Coolant Temp
11	Oil Pressure Gauge	12	DC Voltmeter
13	Hour Meter	14	Fuel Gauge
15	Cold Start Switch	16	Emergency Stop Switch
17	Din Rail Lock		

6.14 Engine Speed Control (ESC) Module Replacement

a. Turn Battery Disconnect switch to Off.

b. Disconnect connecting wires (note wire placement).

c. Remove control panel.

Install Engine Speed Control

a. Install control module inside control panel cabinet.

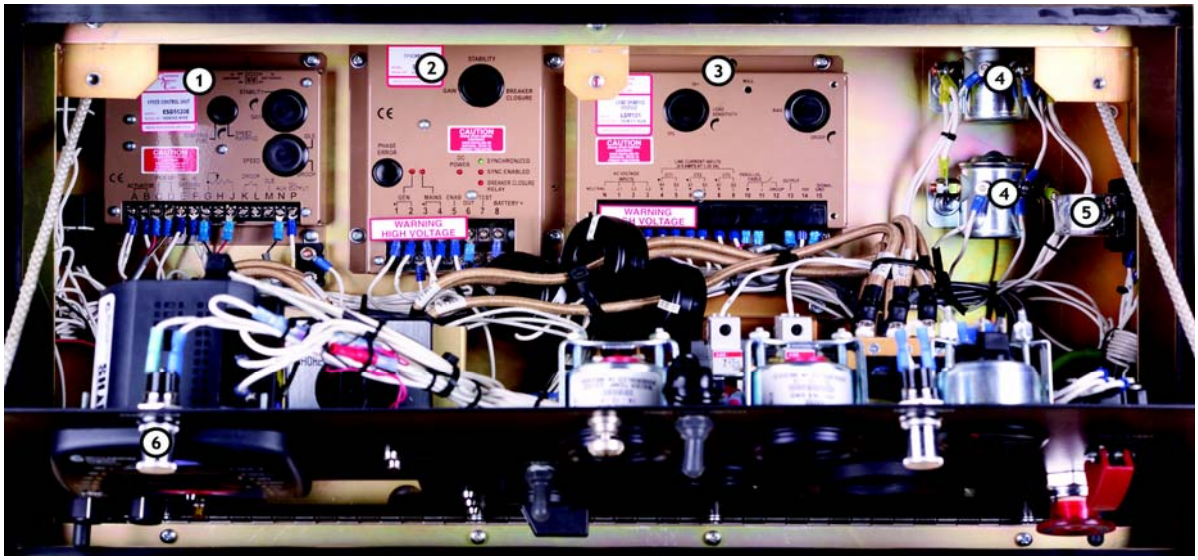
b. Reconnect connecting wires (as noted above).

c. Reconnect batteries.

CAUTION

Load Share Module #3 and Synchronizer Module #2 are not replaceable at this level.

Figure 6-3 ESC Module



Item #	Description	Item #	Description
1	Engine Speed Module	2	Synchronizer Module
3	Load Share Module	4	24V Relays
5	4PDT Relay and base	6	Panel Lamp

6.15 Voltage Regulator Replacement

a. Shut down the generator by turning the Start/Stop Switch to “Off ”.

b. Remove generator bus enclosure.

c. Disconnect voltage regulator connecting wires (note wire replacement).

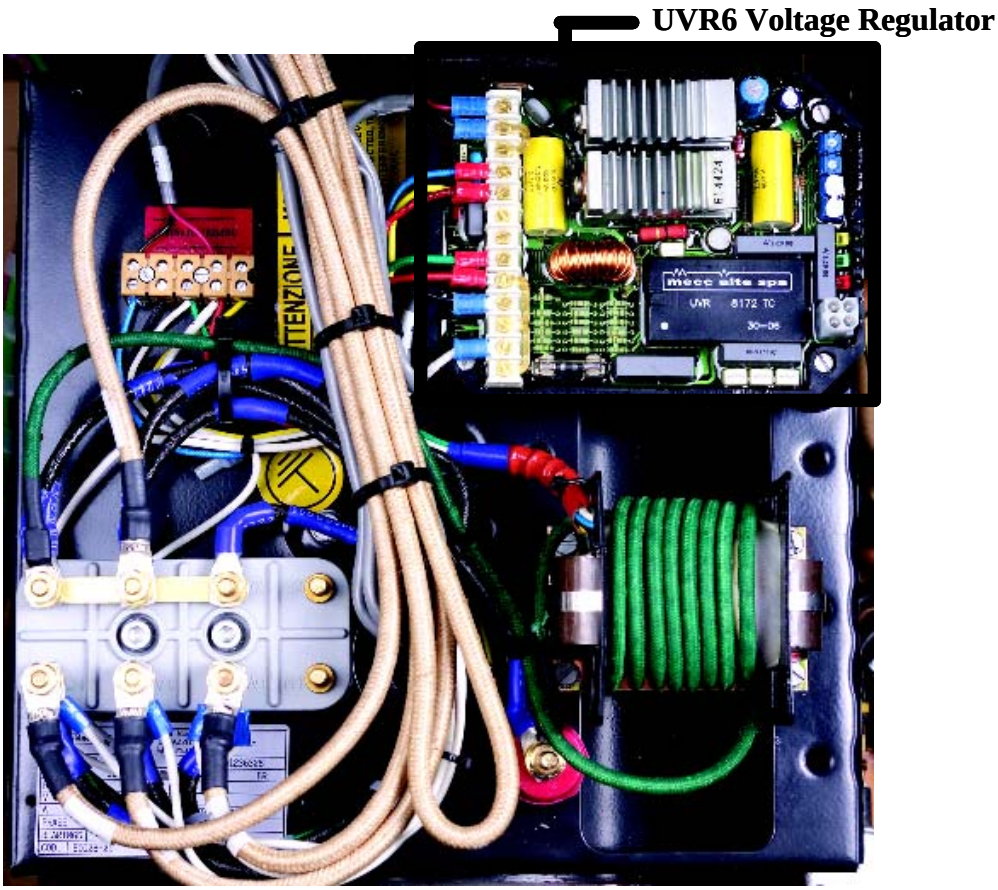
d. Refer to wiring diagram for appropriate configuration.

e. Remove voltage regulator.

Install Voltage Regulator

Reverse order of removal steps.

Figure 6-4 Voltage Regulator



6.16 Remove and Replace Generator Assembly

a. Verify that generator is de-energized and all moving parts have stopped.

b. Disconnect power cables from ECU.

c. Disconnect drain hoses.

d. Remove fire extinguisher.

e. Remove Ground Rod Stowage Tube.

f. Remove Generator Mounting Bolts.

g. Disconnect chassis ground cable from trailer.

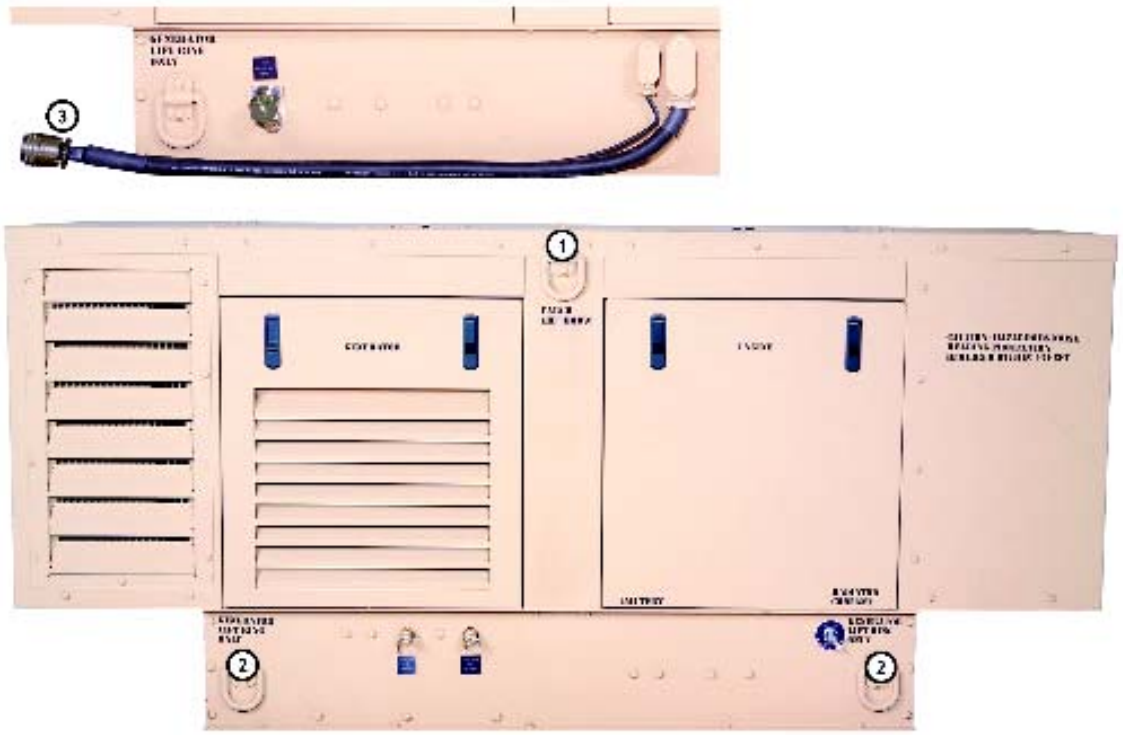
h. Attach slings and spreaders are required to lifting hooks.

i. Lift Generator from trailer.

Install Generator Assembly

Reverse order of removal steps.

Figure 6-5 Generator Mounting



Item #	Description
1	Cargo Tie down Only (Do not lift)
2	Lifting Hooks 4 Places
3	ECU Power & Control Cables

6.17 Remove and Replace Engine Oil Filter

a. Verify that generator is de-energized and all moving parts have stopped.

b. Allow engine to cool, if required.

c. Drain engine oil into approved receptacle for proper disposal or recycling.

d. Remove engine oil filter.

Install Engine Oil Filter

a. Lubricate rubber seal on new filter with clean engine oil.

b. Install oil filter. Do not over tighten.

c. Replace engine oil.

d. Start engine and check for leaks.

Item #	Description
1	Engine Oil Indicator
2	Oil Filter

6.18 Remove and Replace Alternator Drive Belt

a. Verify that generator is de-energized and all moving parts have stopped.

b. Loosen mounting bolt.

c. Loosen belt tension adjusting bolt.

d. Remove alternator drive belt.

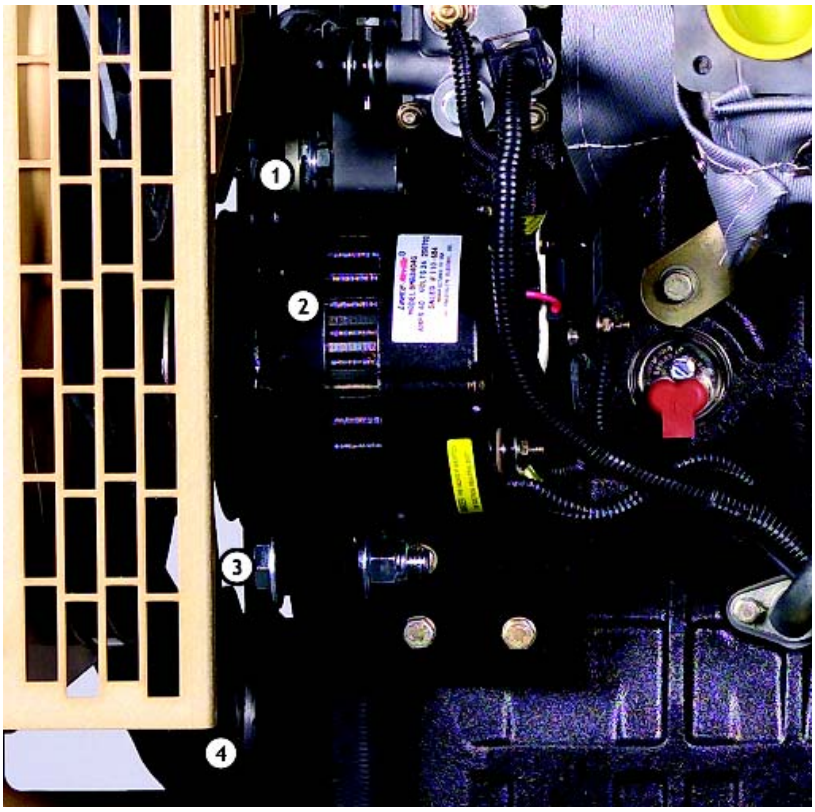
e. Replace as required.

Install Alternator Drive Belt

a. Tighten belt. The belt should have 1/8” of movement while pushing on it between pulleys with your index finger.

b. Tighten belt tension adjusting bolt.

c. Tighten mounting bolt.



Item #	Description
1	Belt Tension Adjustment
2	Alternator
3	MIL-90725-117 1/2 - 13 X 2 - 1/2” HHCS w/ Flat & Nylock Nut
4	Drive Belt

6.19 Remove and Replace Engine Air Filter

a. Verify the engine is de-energized and all moving parts have stopped.

b. Open cover clamp.

c. Remove filter.

Install Air Filter

a. Install cover.

b. Install cover clamp.

Figure 6-6 Air Filter (Refer to Generator Repair Parts List)

Item #	Description
1	Cover Retaining Clips
2	Air Filter Cover

6.20 Remove and Replace Fuel Filter

a. Verify the engine is de-energized and all moving parts have stopped.

b. Clamp fuel lines to prevent spills.

c. Disconnect fuel lines.

d. Remove mounting bolt.

e. Remove fuel filter.

Install Fuel Filter

a. Tighten mounting bolt.

b. Connect fuel lines.

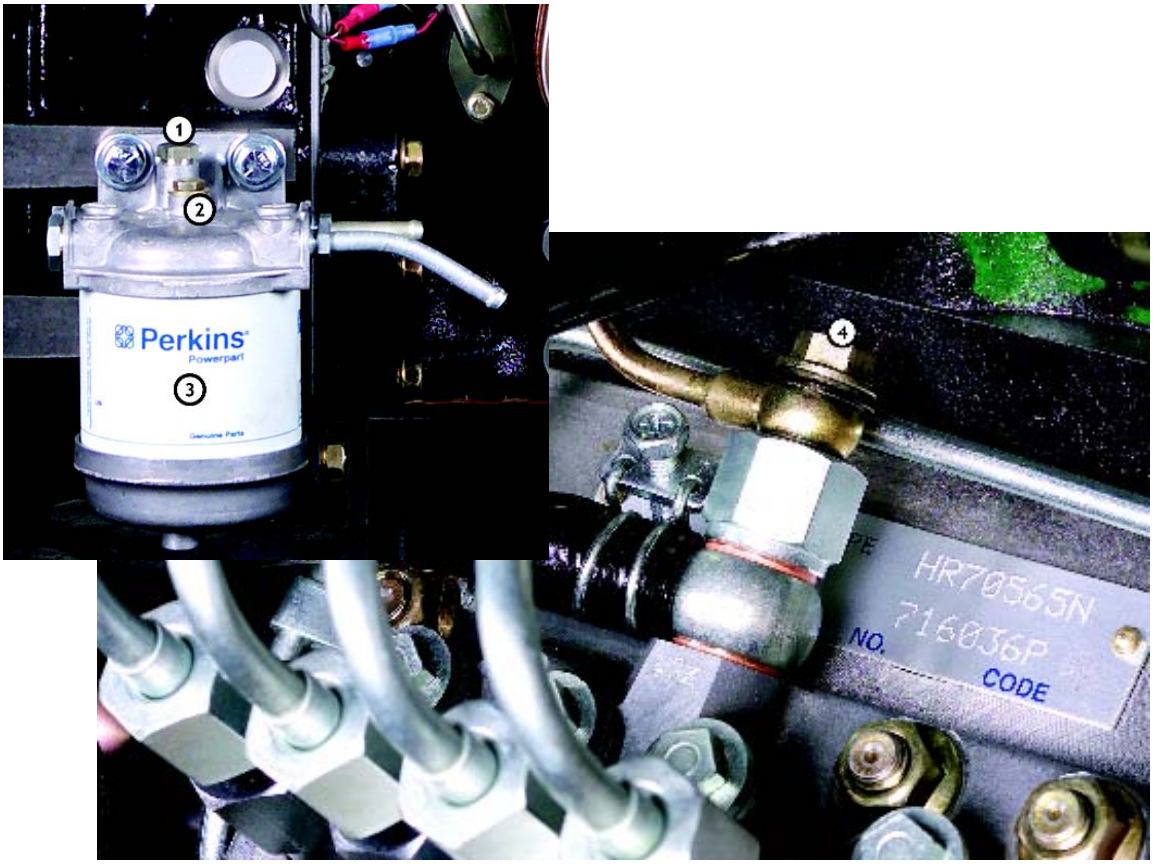
c. Bleed air from fuel lines with primer bulb.

d. Crack primary bleed screw until all the air is out then tighten.

e. Crack the secondary bleed screw until all the air is out then tighten.

f. Start and check for leaks.

Figure 6-7 Fuel Filter (Refer to Repair Parts List)



Item #	Description
1	Primary Bleed Screw
2	Fuel Filter Mounting Screw
3	Fuel Filter
4	Secondary Bleed Screw

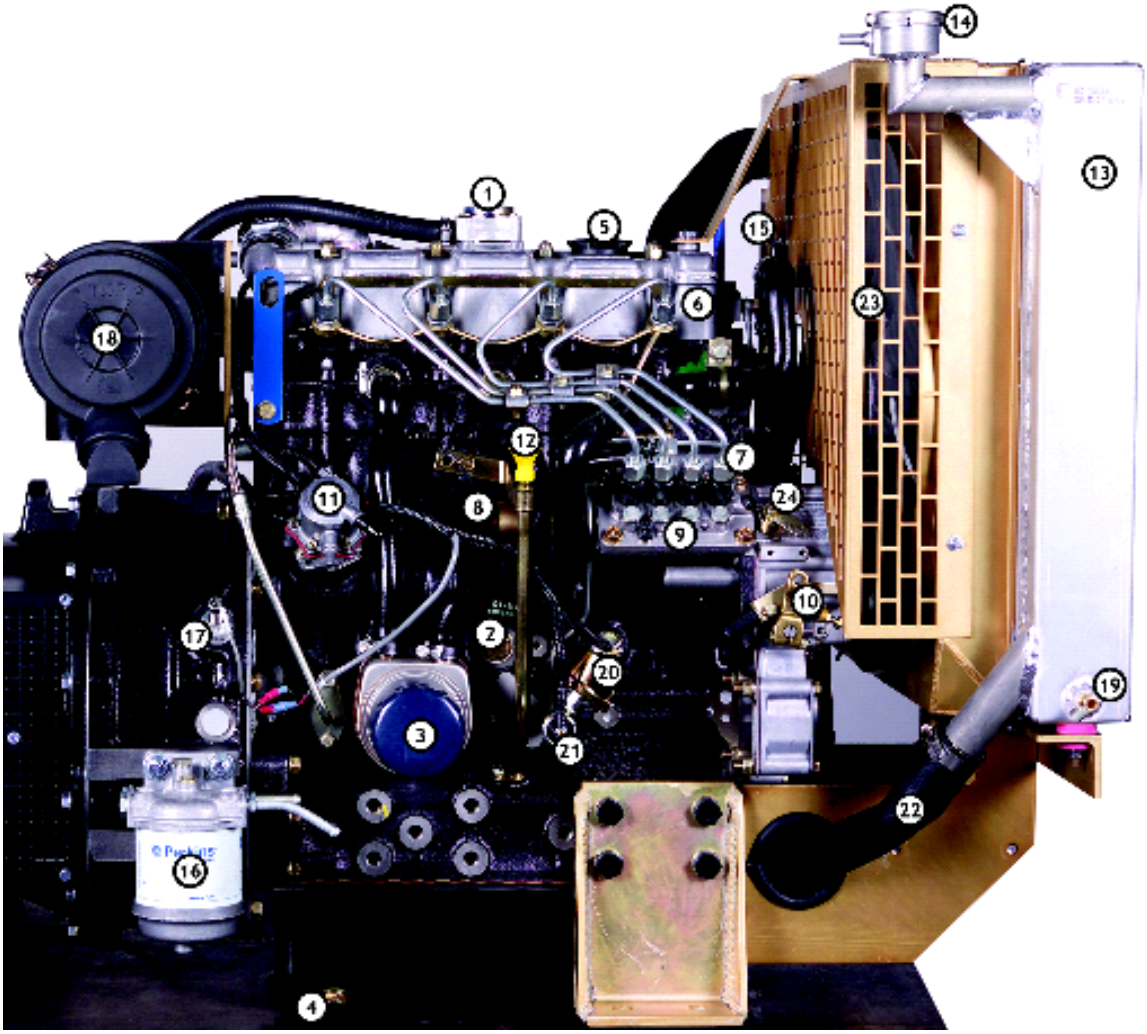
7. GENERATOR REPAIR PARTS LIST

AC Part #	Description	Page #	Item #	Cage Code
SWP188M130	Radiator	46	13	1SAF5
SWP093	Auxiliary Fuel Pump	28	1	1SAF5
5582-10	Switch, Auxiliary Fuel Pump	16	18	022F2
130506300	Fuel Primer Bulb	32	4	K5436
3100049	Block heater	47	28	1SAF5
ESD5520E	Controller, Electronic Governor	38	1	OBXW5
SA5155-24	Actuator, Electronic Governor	46	8	78388
SWP24V	Glow plug	46	6	1SAF5
140517050	Filter, Engine oil	46	3	K5436
26560017	Filter, Fuel	46	16	K5436
P821575	Filter Primary Air	46	18	V3631
P822858	Filter, Secondary air	46	18	V3631
SWP3255	Starter	47	27	1SAF5
280EDF	Sender, Water Temp	47	33	5F130
HA149	Shut down, Oil pressure	46	21	1SAF5
385720480	Water temp shut down	47	32	K5436
130506351	Pump, Fuel lifting	46	11	K5436
080109109	Belt, Alternator fan	41	4	K5436
3482V063	Hose, lower radiator	46	22	K5436
3482T038	Hose, upper radiator	47	25	K5436
145017951	Water pump	47	38	K5436
145206220	Thermostat			K5436
876	Fault Alarm	13	1	OWK30
20635116	Din Rail Lock	37	17	1UCBO
PT301-OUR-024V-W6	Red LED	16	9	8Z410
PT301-1AG-024V-W6	Green LED	16	23	8Z410
PT301-OUY-024V-W6	Amber LED	16	25	8Z410
2TL1-3	Toggle switch	16	11	1YDG5
3P3-101	3 in one block ct	14	2	02929
4TL1-3	switch, cold start	16	8	1YDG5
4TL1-72	J1 Contactor switch	16	19	1YD5G
664-1854	Rheostat knob	16	20 & 21	1YD5G
753-1140	500 omega voltage droop ADJ			1YDG5
753-1385	Trim pot, 25K voltage	16	20	1YDG5
753-1445	Trim pot, 5K freq	16	21	1YDG5
821-2021	Relay, 4 pole, DT	38	5	1YDG5
821-3027	Mount Clip	38	5	1YDG5
821-3029	Relay Mount	38	5	1YDG5
ESD5520E	Controller	38	1	0BXW5

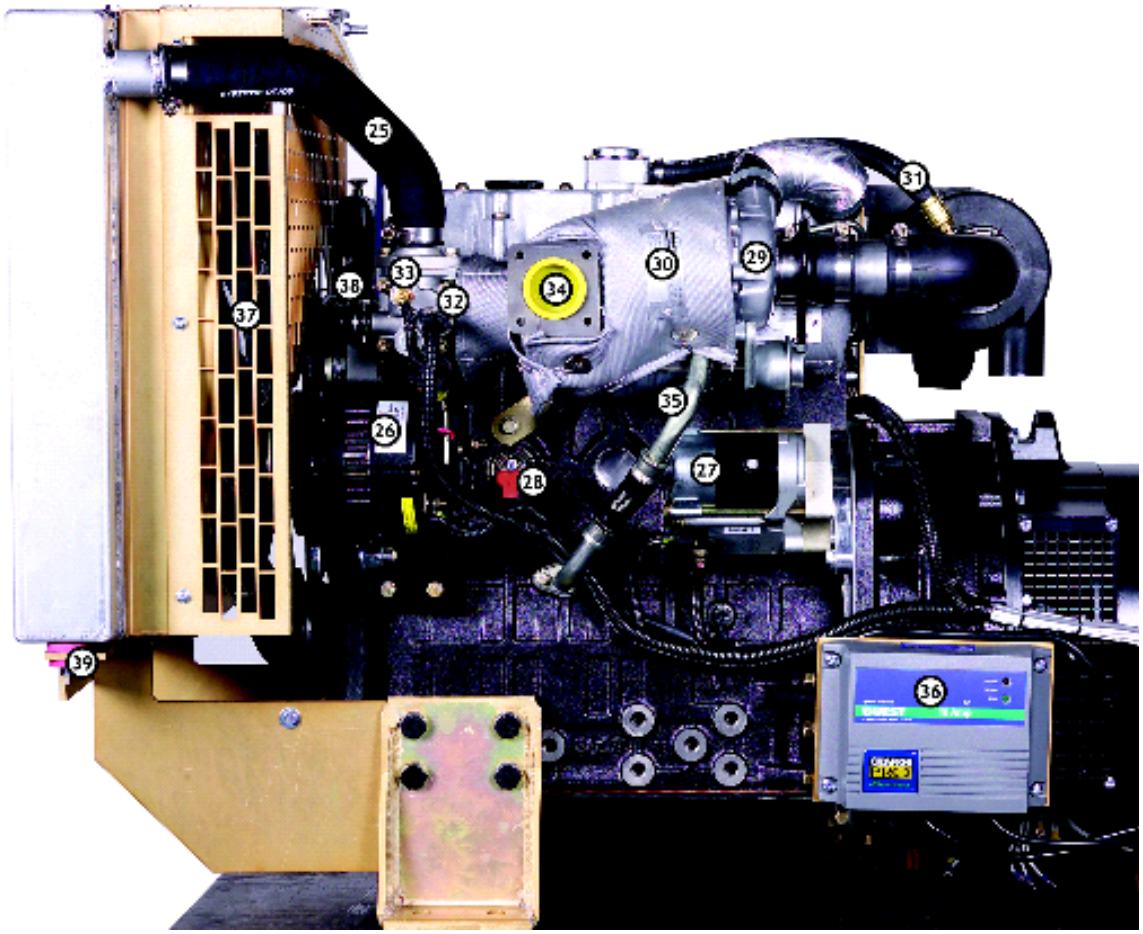
AM3RZ9271	Mainline breaker	14	1	16071
C80A212/USB003E	Shore Power Switch	37	2	7F539
CA7-85-10-120	120 V Contactor	14	3	0XC15
ECO28-2LP/4/10	20KW SAE4 C110 Parallel	10	2	A4626
LSM101	GOA load share module	38	3	0BXW5
R26-11AD10-24	Time delay relay	37	1 & 3	0JYM4
R95-113	Socket	37	1 & 3	0JYM4
SHARK1006010V2M60	A /C meter, 120/208V	37	8	42625
SYC6714	GOA Synchronizer	38	2	0BXW5
UVR6	Voltage Regulator	39		3CS03
279BF	Sender, Oil pressure	46	20	5F130
SWP11007	Alternator,24V	47	26	1SAF5
24008	Solenoid	38	4	5F130
83503	Hour meter	16	6	5F130
84000	Oil Pressure Gauge	16	3	5F130
84002	Water Temp Gauge	16	2	5F130
84008	D/C Voltmeter	16	5	5F130
	Radiator Cap	46	14	1SAF5
2611B	Battery Charger			
2484	Battery Disconnect Switch	6		
CA11USL927-600EF	Start / Stop Switch	37	9	7F539
9001K A3	Contact Block	37	16	
9001KR9R	Controller	37	16	
AM3RA3LC97DA752	ECU Breaker	37	6	
S201-KS15	15A Breaker	37	4 & 5	
1818	Panel Lamp	16	27	

8. ENGINE NOMENCLATURE

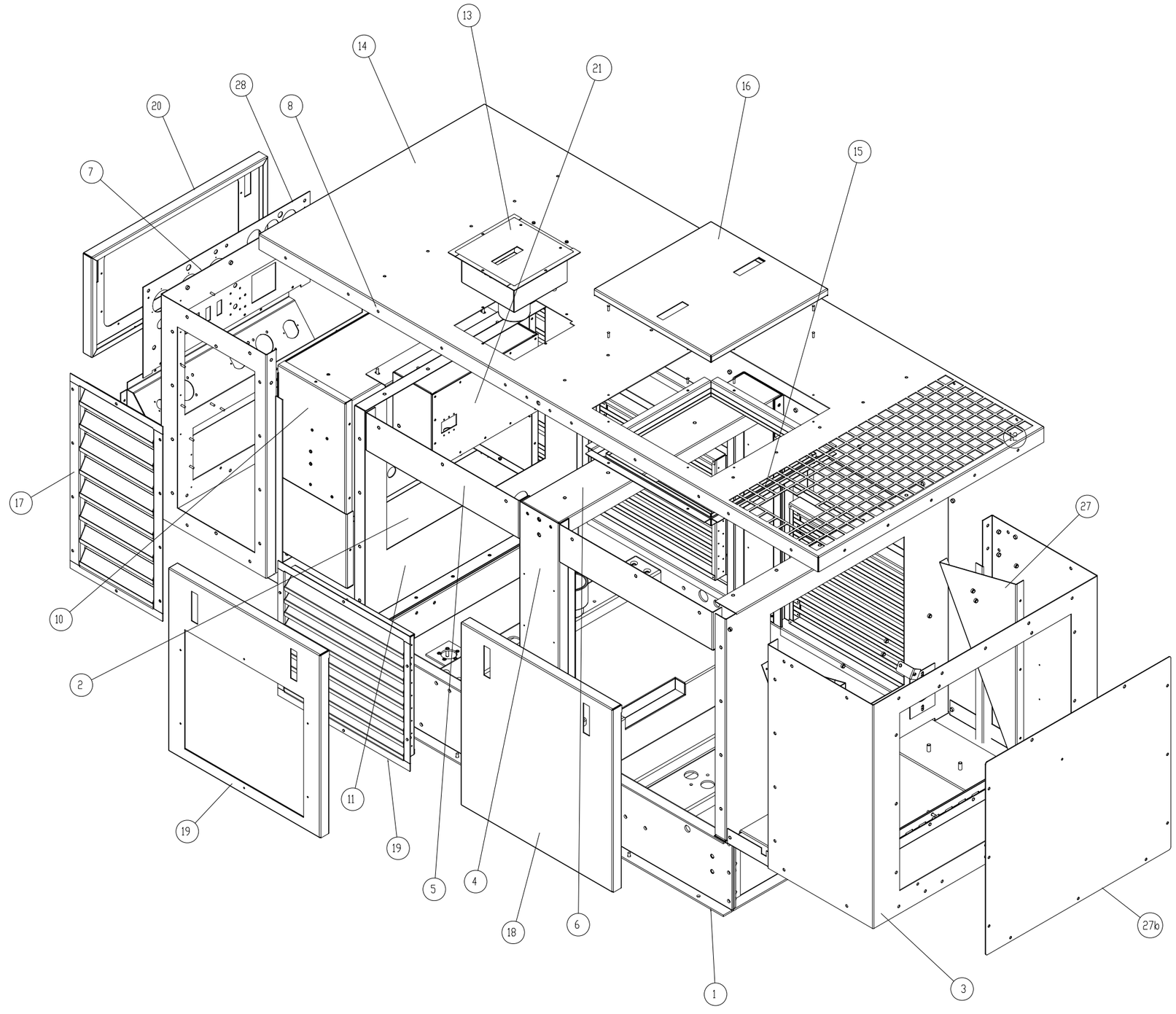
Item #	Description	Item #	Description
1	Engine Breather	2	Coolant Drain Plug
3	Lubricating Oil Filter	4	Lubricating Oil Drain Plug
5	Lubricating Oil Filler Cap	6	Atomizer
7	Engine Identification Label	8	Electronic Governor Actuator
9	Fuel Injection Pump	10	Speed Control Lever
11	Fuel Lift Pump	12	Lubricating Oil Dipstick
13	Radiator	14	Radiator Cap
15	Water Pump Bleed Screw	16	Fuel Filter
17	Magnetic Pickup	18	Air Filter
19	Radiator Drain	20	Oil Pressure Sender
21	Oil Pressure Shutdown	22	Lower Radiator Hose
23	Finger Guard	24	Manual Shutdown

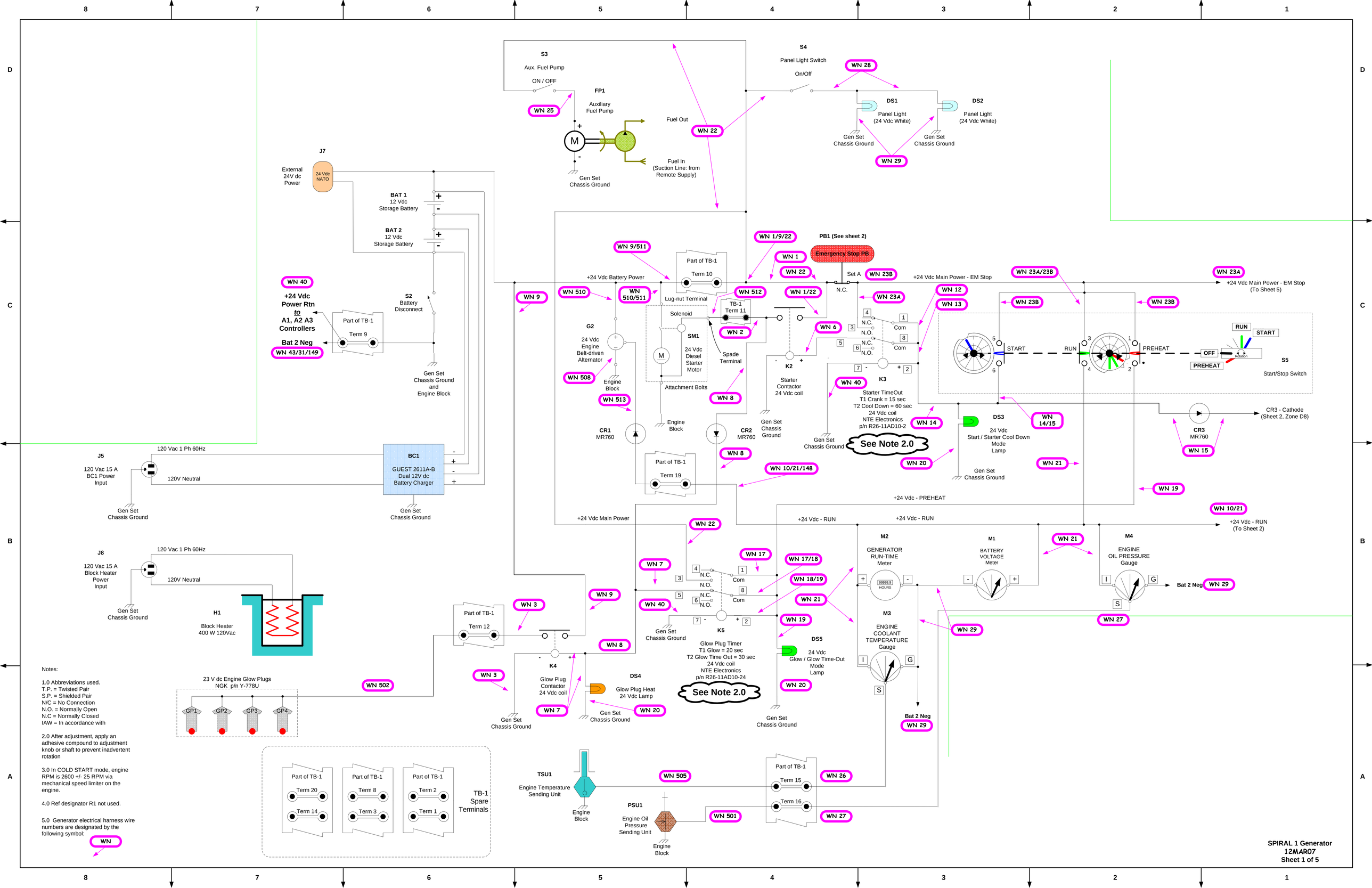


Item #	Description	Item #	Description
25	Upper Radiator	26	Alternator
27	Starter	28	Block Heater
29	Turbo Charger	30	Turbo Blanket
31	Crankcase Vent Hose	32	Hightep Shut Down
33	Water Temp Sender	34	Exhaust Outlet
35	Turbo Oil Drain	36	Battery Charger
37	Engine Fan	38	Water Pump
39	1/4-28 NyLock Nuts		



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	BASE	BASE, ASSEMBLY	1
2	SWP-401	BOTTOM PAN	2
3	SWP-405	FRONT, WRAPPER	1
4	SWP-407	DOOR DIVIDER	2
5	SWP-406-ASM	DOOR HEADER	4
6	SWP-410-ASM	MIDDLE, SUPPORT	1
7	SWP-408-ASM	REAR WRAPPER	1
8	SWP-414	DOOR, FRAME	2
9	SWP-432	POWER OUTLET	1
10	SWP-416-ASM	ELECTRICAL BOX	1
11	SWP-413-ASM	REAR INSIDE WALL	1
12	SWP-412-ASM	RADIATOR WALL	1
13	SWP-456	FUEL FILL DOOR	1
14	SWP-411	TOP COVER	1
15	SWP-441	TOP PANEL, CATCH	2
16	SWP-442	TOP ACCESS PANEL	1
17	LOUVER	INLET END LOUVERS	2
18	SWP-420	SOLID DOOR	1
19	SWP-402I	LOUVER DOOR, ASM.	3
20	SWP-426	CONTROL PANEL DOOR	1
21	SWP-435	BACK COVER, ELECTRICAL BOX	1
22	DOOR-HINGE	DOOR HINGE	1
23	SWP-431	MUFFLER MOUNTING PLATE	1
24	SWP-452	BREAKER BOX SUPPORT ANGLE	1
25	SWP-431O	MUFFLER MOUNTING PLATE, OPPOSITE	1
26	SWP-461	ACCESS PANEL, FRONT	1
27	EXHAUST DUCT	AIR OUTLET DUCT	1
28	SWP-419C	CONTROL PANEL, AGH1-1	1




S3
Aux. Fuel Pump
ON / OFF
WN 25
FP1
Auxiliary Fuel Pump
Fuel Out
WN 22
Fuel In (Suction Line: from Remote Supply)
Gen Set Chassis Ground
S4
Panel Light Switch
On/Off
WN 28
DS1
Panel Light (24 Vdc White)
DS2
Panel Light (24 Vdc White)
Gen Set Chassis Ground
Gen Set Chassis Ground
WN 29
J7
External 24V dc Power
24 Vdc NATO
BAT 1
12 Vdc Storage Battery
BAT 2
12 Vdc Storage Battery
WN 40
+24 Vdc Power Rtn to A1, A2 A3 Controllers
Bat 2 Neg
WN 43/31/149
Part of TB-1
Term 9
S2
Battery Disconnect
Gen Set Chassis Ground and Engine Block
WN 9/511
WN 1/9/22
PB1 (See sheet 2)
Emergency Stop PB
WN 1
WN 22
Set A
WN 23B
N.C.
+24 Vdc Main Power - EM Stop
WN 23A/23B
WN 23A
+24 Vdc Main Power - EM Stop (To Sheet 5)
WN 9
WN 510
WN 510/511
+24 Vdc Battery Power
Part of TB-1
Term 10
Lug-nut Terminal
WN 512
WN 1/22
TB-1
Term 11
WN 23A
WN 12
WN 13
WN 23B
WN 23B
G2
24 Vdc Engine Belt-driven Alternator
Solenoid
SM1
24 Vdc Diesel Starter Motor
WN 2
WN 6
Spade Terminal
N.C.
N.O.
N.C.
N.O.
Com
Com
START
RUN
PREHEAT
OFF
RUN
START
PREHEAT
Rotation
S5
Start/Stop Switch
WN 508
Engine Block
Attachment Bolts
WN 513
WN 8
K2
Starter Contactor 24 Vdc coil
K3
WN 40
Starter TimeOut
T1 Crank = 15 sec
T2 Cool Down = 60 sec
24 Vdc coil
NTE Electronics
p/n R26-11AD10-2
WN 14
DS3
24 Vdc Start / Starter Cool Down Mode Lamp
WN 14/15
CR3 - Cathode (Sheet 2, Zone D8)
CR3
MR760
WN 15
CR1
MR760
CR2
MR760
Gen Set Chassis Ground
Gen Set Chassis Ground
See Note 2.0
WN 20
Gen Set Chassis Ground
WN 21
Part of TB-1
Term 19
WN 8
WN 10/21/148
WN 19
+24 Vdc - PREHEAT
WN 10/21
+24 Vdc - RUN (To Sheet 2)
+24 Vdc Main Power
WN 22
+24 Vdc - RUN
+24 Vdc - RUN
M2
GENERATOR RUN-TIME Meter
M1
BATTERY VOLTAGE Meter
M4
ENGINE OIL PRESSURE Gauge
WN 21
WN 7
WN 17
WN 17/18
WN 18/19
WN 21
WN 19
WN 40
K5
Glow Plug Timer
T1 Glow = 20 sec
T2 Glow Time Out = 30 sec
24 Vdc coil
NTE Electronics
p/n R26-11AD10-24
See Note 2.0
DS5
24 Vdc Glow / Glow Time-Out Mode Lamp
WN 20
M3
ENGINE COOLANT TEMPERATURE Gauge
WN 29
Bat 2 Neg
WN 29
Bat 2 Neg WN 29
WN 27
J5
120 Vac 1 Ph 60Hz
120 Vac 15 A BC1 Power Input
120V Neutral
BC1
GUEST 2611A-B Dual 12V dc Battery Charger
Gen Set Chassis Ground
Gen Set Chassis Ground
J8
120 Vac 1 Ph 60Hz
120 Vac 15 A Block Heater Power Input
120V Neutral
Gen Set Chassis Ground
H1
Block Heater 400 W 120Vac
WN 9
WN 3
Part of TB-1
Term 12
WN 8
WN 3
K4
Glow Plug Contactor 24 Vdc coil
DS4
Glow Plug Heat 24 Vdc Lamp
WN 7
WN 20
Gen Set Chassis Ground
Gen Set Chassis Ground
23 V dc Engine Glow Plugs NGK p/n Y-778U
GP1
GP2
GP3
GP4
WN 502
TSU1
Engine Temperature Sending Unit
Engine Block
WN 505
PSU1
Engine Oil Pressure Sending Unit
Engine Block
WN 501
Part of TB-1
Term 15
Term 16
WN 26
WN 27
Part of TB-1
Term 20
Term 14
Part of TB-1
Term 8
Term 3
Part of TB-1
Term 2
Term 1
TB-1 Spare Terminals
Notes:
1.0 Abbreviations used.
T.P. = Twisted Pair
S.P. = Shielded Pair
N/C = No Connection
N.O. = Normally Open
N.C = Normally Closed
IAW = In accordance with
2.0 After adjustment, apply an adhesive compound to adjustment knob or shaft to prevent inadvertent rotation
3.0 In COLD START mode, engine RPM is 2600 +/- 25 RPM via mechanical speed limiter on the engine.
4.0 Ref designator R1 not used.
5.0 Generator electrical harness wire numbers are designated by the following symbol:
WN
SPIRAL 1 Generator
12MAR07
Sheet 1 of 5

S6

COLD START / NORMAL
Keyway is DOWN
(Shown with Toggle Down in NORMAL)
See Note 3.0

Term No 10,11,12 Not Used

+24 Vdc Main Power - EM Stop – S1 AUX
(From Sheet 5)

WN 24

N/C

WN 32

CSS1 to Sheet 5

CSS2 from Sheet 5

WN 32

WN 34

PB1 (See sheet 1)

Emergency Stop PB

Set B

N.C.

WN 33

WN 33
EmStop 1
EmStop 2
WN 34
To Sheet 5

WN 15

CR3 - Cathode
(from Sheet 1)

+24 Vdc - RUN2

WN 16

+24 Vdc - RUN2 equals 24Vdc
IF
K7 Safety Relay is De-Energized
or
Start/Stop switch is in START position.

Cold Start

N/C

WN 36

WN 35

WN 37

CB6
15A max
(Cool down to reset)

WN 36/147

WN 53R

S.P.

A set

B set

N.C.

N.O.

WN 55R

S.P.

WN 53B

J6

Parallel Comm

A
B
E
C
D

Parallel +
Parallel -
Shield Ground

Part of K6

Control Relay
(Sheet 3)

K6 coil energized if
K1 PWR contactor
is closed.

WN 57

J6 = p/n MS3102E18-11P

Cold Start

WN 36

+24 CB6 Vdc

+24 Vdc Rtn

To Sheet 3
Zone D8

WN 40

+24 Vdc Power Rtn
to
A1, A2 and A3 Controllers
(FROM SHEET 1)

WN 40

WN 16

WN 37

3780 Hz at 1800 RPM

WN 147

WN 40

+24 Vdc - RUN
(from Sheet 1)

WN 10/21

Com

30

87a N.C.

87 N.O.

WN 10

86

85

K7
Safety Relay
GenSet Shut Down
Hella 87427 or equiv.
with integral diode.
24 Vdc coil
10 Amp
Contacts

WN 41

WN 20

DS6

GenSet
Fault
Lamp
24Vdc

Gen Set
Chassis Ground

0 to 24V PWM at 500 Hz

SS1

Speed Sensor
401016-20

WN 504

WN 504

S.P.

C

D

Pick-up

Pick-up & Vcc RTN

A1 Chassis

Vcc

Vcc
RTN

F

E

WN 50

P

G

WN 51

+10 Vdc Output

+10 Vdc Output RTN

Off

Full

THS1
Throttle Solenoid
SA5155-24

Part of TB-1
Term 18

Term 17

WN 38

WN 39

T.P.

A

B

WN 37/38

Actuator Drive

Actuator RTN (Vcc RTN)

WN 10/21

WN 503

+24 Vdc - RUN

WN 10

WN 21

HRN1
Alarm Horn
Eccolink
p/n 876
24 Vdc
112 db(A)

RED

BLK

WN 45

Part of TB-1

Term 13

WN 500

WN 507

PS1

Low Oil
Pressure Switch

Open > 6 psig

Engine
Block

TS1

Coolant High
Temp Switch

CLOSE> 250F

Engine
Block

WN 506

Fault = Low/Ground
OK = Open Circuit

WN 150

DS7
Low Fuel
or
STOPPED
24 Vdc Lamp

K4 p/n 17-102-24
LED Lamp

WN 44

S7
Alarm
SILENCE
(Shown in
audible position)

WN 44

N.C. 87a

N/C

30 Com

Bat 2 Neg

WN 43

N.O. 87

85

86

Low Fuel or STOPPED = Ground

WN 46

K11
Hella 87427 or equiv.
with integral diode.
24 Vdc coil

WN 10/21

R2

OPERATOR
Freq Trim
Adj

5K Ohms

3

CW

2

1

WN 47R

WN 47B

S.P.

J

G

Pot CW

A1 Chassis

Pot CCW
(CTRLR GND)

R2

RV4SAYSD502A
or
RV6SAYSD502A
per
Mil-PRF-94F

R2
Rear View

3

2

1

A1

ESD5520E
Speed Control
Module

N/C L Droop Mode

N/C K Droop Mode RTN

N/C M Idle Mode Switch

N/C G Idle Mode Switch RTN

N/C H Hi Current Actuator Select

Speed Modulate In

A1 Chassis

GenSet
Housing

WN 49

N

WN 49/52

13

Speed Modulate
Output

15

+10 Vcc RTN

WN 52

WN 53R

WN 50

S.P.

WN 51

WN 51

WN 53B

15

14

+10V
Vcc
RTN

+10V
Vcc

A2

LSM101
Load Share Control
Module

Parallel +

Parallel -

10

11

GEN L1 - Phase A

GEN L2 - Phase B

To A3
on sheet 3

WN 61

WN 62

L1 - Phase A

L2 - Phase B

L3 - Phase C

NEUTRAL

1

2

3

N

WN 58

From G1 on Sheet 4 WN 59

WN 60

AC NEUTRAL from Sheet 5 WN 63

Local
Generator
Voltage
Sense
Inputs

Droop Mode

Droop Mode
RTN

N/C 12

N/C 11

Local
Generator
Current
Sense
Inputs

CT1 - Phase A +

CT1 - Phase A -

CT2 - Phase B +

CT2 - Phase B -

CT3 - Phase C +

CT3 - Phase C -

4

5

6

7

8

9

WN 64

WN 65

WN 66

From CT2 on Sheet 4

WN 67

WN 68

WN 69

A2 Chassis

GenSet Housing

Speed Modulation
(from sheet 3)

WN 52

VDO Fuel Level Gauge

LOFA p/n 550-5000-06

M5
ENGINE
FUEL LEVEL
Gauge

G

I

S

Bat 2 Neg

WN 29

WN 151

WN 46

Low Fuel = Ground
Isink = 500 ma Max.

WN 72

WN 73

WN 74

WN 75

WN 148

WN 71

WN 70

TB-1
Term 4

TB-1
Term 7

TB-1
Term 6

TB-1
Term 5

GREEN

BLK

VIOLET

YELLOW

RED

BLK

Bat 2 Neg

WN 31/149

FLS1
Level
and
Lo Fuel

FLS2
Tank Full

YELLOW

Full Tank = Ground

WN 76

WN 74

DS8
Tank Full Lamp
24Vdc

(Near Fuel Filler Inlet)

FLS1

Fuel Level Sensor 1

BEDIA type ITS60

LOFA p/n 565-2506-00

FLS2

Fuel Level Sensor 2

BEDIA Type PLS40

LOFA P/N = 561-4204-70

Mounting Thread: ¼" NPTF
Level Probe: MAXIMUM
Power Up Lamp Check: 2 SECONDS
Monitor Delay: 0 SECONDS
Signal Output: MINUS
Output Type: OPERATING CURRENT
Twist Lock Connector: DIN 72 585
Mating Pig Tail Cable: 15 ft long

Useful formulas:

Frequency (speed sensor) = 63 x Frequency (AC-Power)

Frequency (speed sensor) = 2.1 x Engine RPM

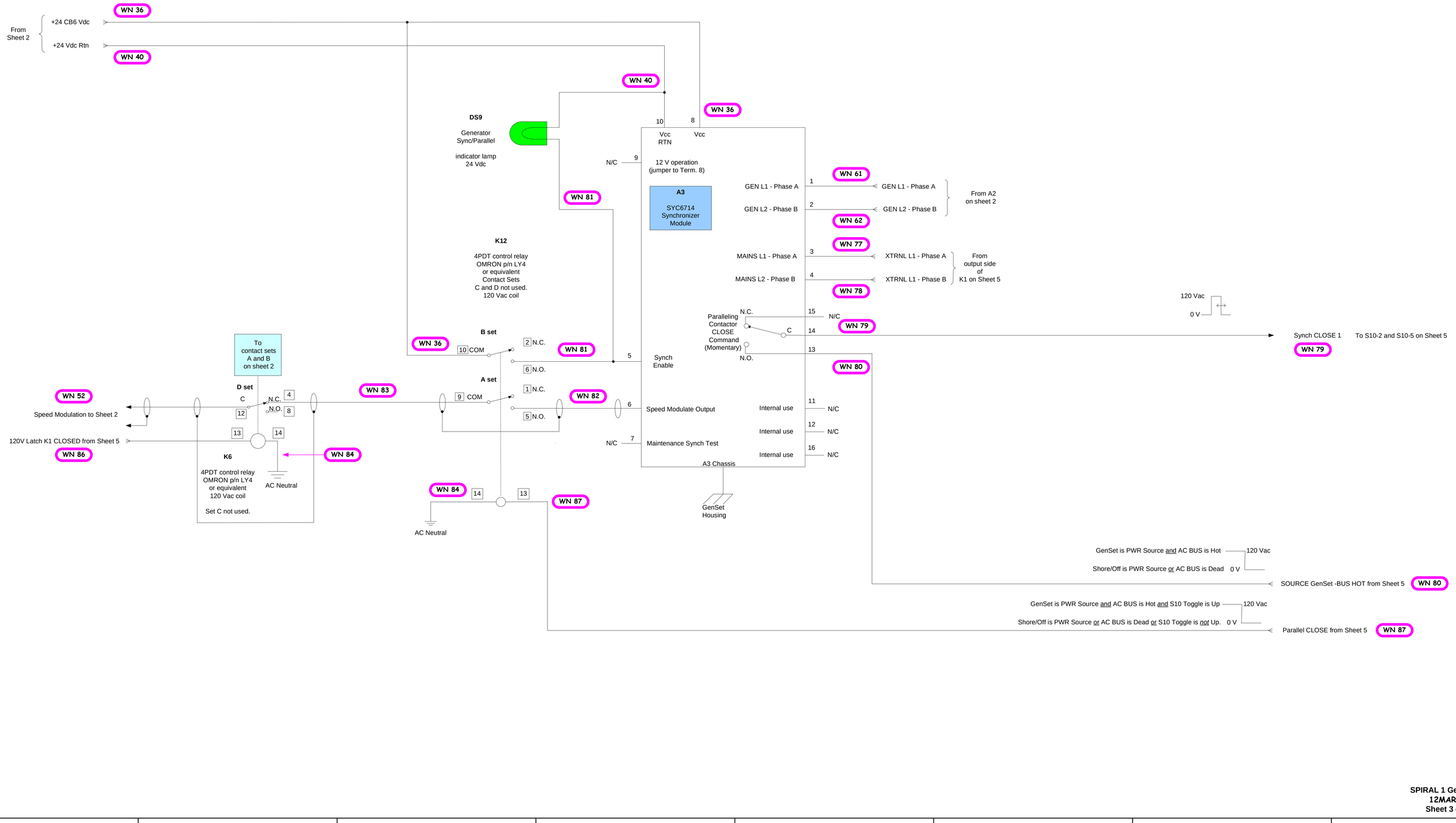
Engine RPM = 30 x Frequency (AC-Power)

STOPPED = Ground
(No AC PWR on Phase B)

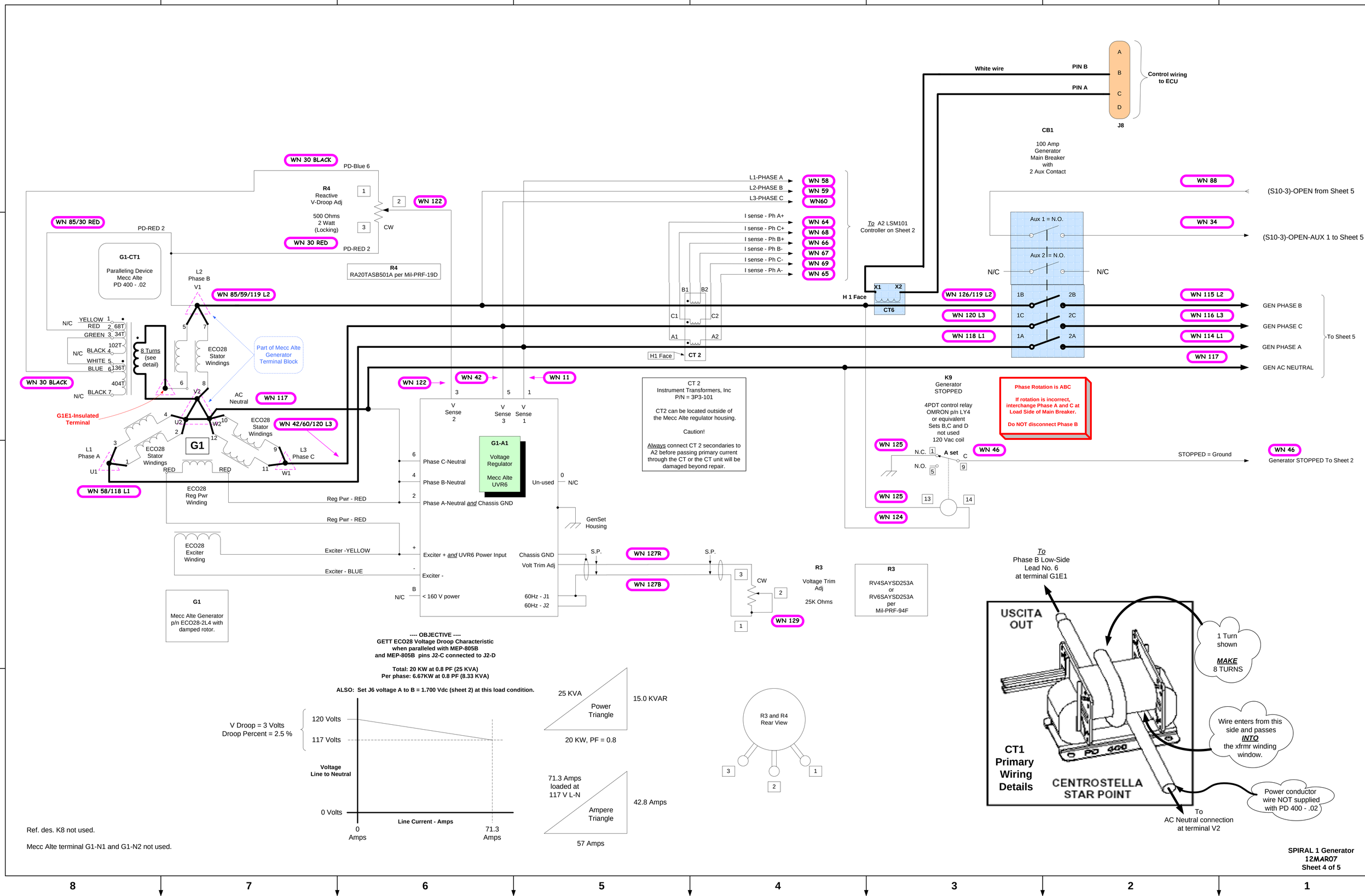
WN 46

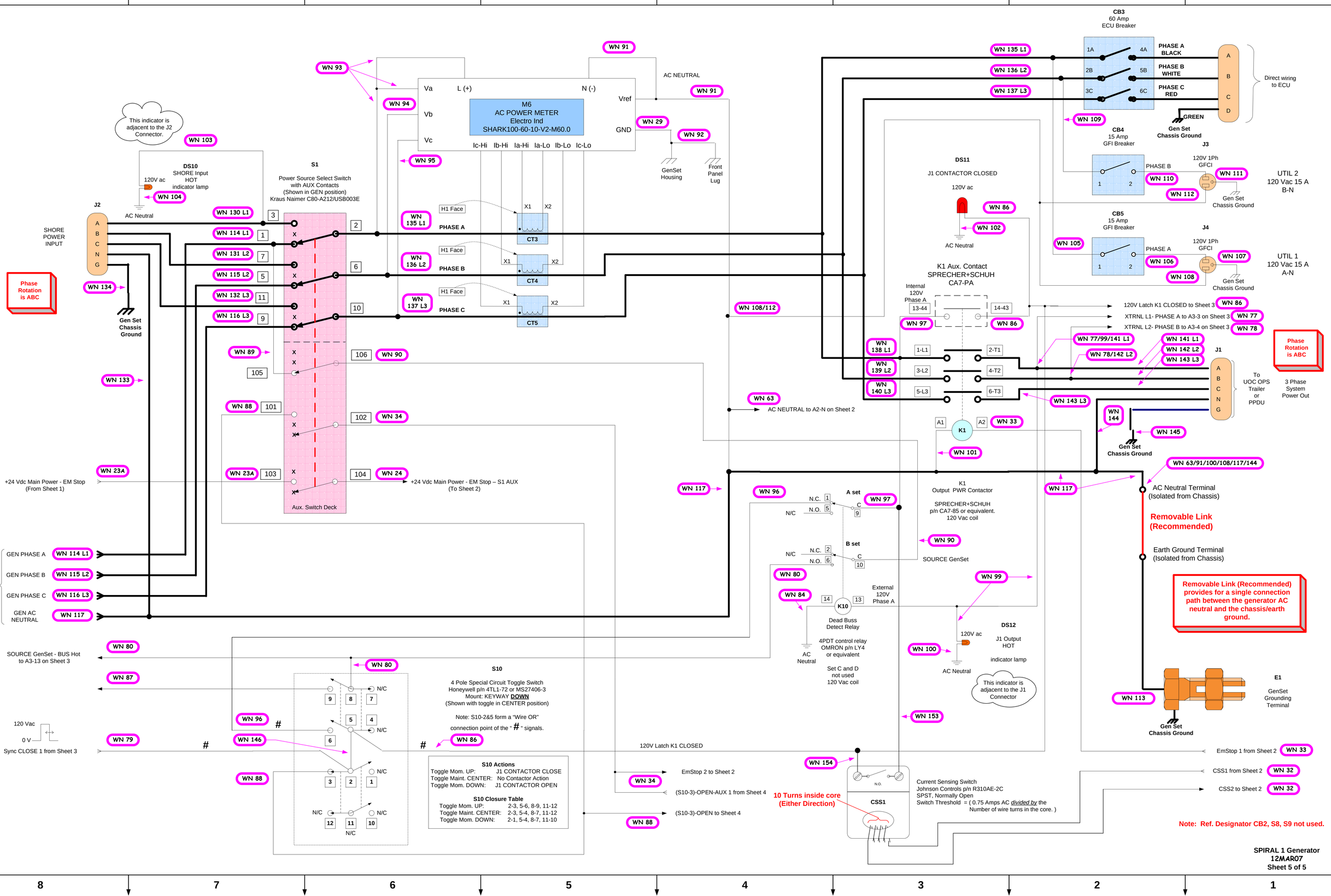
Generator STOPPED from Sheet 4

SPIRAL 1 Generator
12MAR07
Sheet 2 of 5



SPIRAL 1 Generator
12MAR07
Sheet 3 of 5


WN 30 BLACK
PD-Blue 6
R4
Reactive
V-Droop Adj
500 Ohms
2 Watt
(Locking)
CW
WN 122
WN 30 RED
PD-RED 2
WN 85/30 RED
PD-RED 2
R4
RA20TASB501A per Mil-PRF-19D
G1-CT1
Paralleling Device
Mecc Alte
PD 400 - .02
L2
Phase B
V1
WN 85/59/119 L2
N/C
YELLOW 1
RED 2 68T
GREEN 3 34T
102T
N/C
BLACK 4
WHITE 5
BLUE 6
136T
404T
N/C
BLACK 7
8 Turns
(see
detail)
ECO28
Stator
Windings
Part of Mecc Alte
Generator
Terminal Block
WN 30 BLACK
G1E1-Insulated
Terminal
V2
AC
Neutral
WN 117
WN 42/60/120 L3
U2
W2
L1
Phase A
L3
Phase C
U1
W1
G1
ECO28
Stator
Windings
RED
RED
WN 58/118 L1
ECO28
Reg Pwr
Winding
Reg Pwr - RED
Reg Pwr - RED
ECO28
Exciter
Winding
Exciter -YELLOW
Exciter - BLUE
G1
Mecc Alte Generator
p/n ECO28-2L4 with
damped rotor.
WN 122
WN 42
WN 11
V
Sense
2
V
Sense
3
V
Sense
1
G1-A1
Voltage
Regulator
Mecc Alte
UVR6
Phase C-Neutral
Phase B-Neutral
Phase A-Neutral and Chassis GND
Un-used
N/C
GenSet
Housing
Exciter + and UVR6 Power Input
Exciter -
< 160 V power
Chassis GND
Volt Trim Adj
60Hz - J1
60Hz - J2
S.P.
S.P.
WN 127R
WN 127B
WN 129
R3
Voltage Trim
Adj
25K Ohms
CW
R3
RV4SAYSD253A
or
RV6SAYSD253A
per
Mil-PRF-94F
CT 2
Instrument Transformers, Inc
P/N = 3P3-101
CT2 can be located outside of
the Mecc Alte regulator housing.
Caution!
Always connect CT 2 secondaries to
A2 before passing primary current
through the CT or the CT unit will be
damaged beyond repair.
L1-PHASE A
L2-PHASE B
L3-PHASE C
WN 58
WN 59
WN60
I sense - Ph A+
I sense - Ph C+
I sense - Ph B+
I sense - Ph B-
I sense - Ph C-
I sense - Ph A-
WN 64
WN 68
WN 66
WN 67
WN 69
WN 65
To A2 LSM101
Controller on Sheet 2
B1
B2
C1
C2
A1
A2
H1 Face
CT 2
H 1 Face
X1
X2
CT6
White wire
PIN B
PIN A
A
B
C
D
J8
Control wiring
to ECU
CB1
100 Amp
Generator
Main Breaker
with
2 Aux Contact
WN 88
(S10-3)-OPEN from Sheet 5
WN 34
(S10-3)-OPEN-AUX 1 to Sheet 5
Aux 1 = N.O.
Aux 2 = N.O.
N/C
N/C
WN 126/119 L2
WN 120 L3
WN 118 L1
1B
2B
1C
2C
1A
2A
WN 115 L2
WN 116 L3
WN 114 L1
WN 117
GEN PHASE B
GEN PHASE C
GEN PHASE A
GEN AC NEUTRAL
To Sheet 5
K9
Generator
STOPPED
4PDT control relay
OMRON p/n LY4
or equivalent
Sets B,C and D
not used
120 Vac coil
Phase Rotation is ABC
If rotation is incorrect,
interchange Phase A and C at
Load Side of Main Breaker.
Do NOT disconnect Phase B
WN 125
N.C.
A set
C
N.O.
WN 46
STOPPED = Ground
WN 46
Generator STOPPED To Sheet 2
WN 125
WN 124
To
Phase B Low-Side
Lead No. 6
at terminal G1E1
USCITA
OUT
1 Turn
shown
MAKE
8 TURNS
Wire enters from this
side and passes
INTO
the xfrmr winding
window.
CT1
Primary
Wiring
Details
CENTROSTELLA
STAR POINT
PD 400
Power conductor
wire NOT supplied
with PD 400 - .02
To
AC Neutral connection
at terminal V2
--- OBJECTIVE ----
GETT ECO28 Voltage Droop Characteristic
when paralleled with MEP-805B
and MEP-805B pins J2-C connected to J2-D
Total: 20 KW at 0.8 PF (25 KVA)
Per phase: 6.67KW at 0.8 PF (8.33 KVA)
ALSO: Set J6 voltage A to B = 1.700 Vdc (sheet 2) at this load condition.
V Droop = 3 Volts
Droop Percent = 2.5 %
120 Volts
117 Volts
Voltage
Line to Neutral
0 Volts
Line Current - Amps
0
Amps
71.3
Amps
25 KVA
Power
Triangle
15.0 KVAR
20 KW, PF = 0.8
71.3 Amps
loaded at
117 V L-N
Ampere
Triangle
42.8 Amps
57 Amps
R3 and R4
Rear View
Ref. des. K8 not used.
Mecc Alte terminal G1-N1 and G1-N2 not used.
SPIRAL 1 Generator
12MAR07
Sheet 4 of 5


CB3
60 Amp
ECU Breaker
PHASE A
BLACK
PHASE B
WHITE
PHASE C
RED
GREEN
Direct wiring
to ECU
Gen Set
Chassis Ground
CB4
15 Amp
GFI Breaker
CB5
15 Amp
GFI Breaker
J3
J4
120V 1Ph
GFCI
UTIL 2
120 Vac 15 A
B-N
UTIL 1
120 Vac 15 A
A-N
DS11
J1 CONTACTOR CLOSED
120V ac
AC Neutral
K1 Aux. Contact
SPRECHER+SCHUH
CA7-PA
Internal
120V
Phase A
120V Latch K1 CLOSED to Sheet 3
XTRNL L1- PHASE A to A3-3 on Sheet 3
XTRNL L2- PHASE B to A3-4 on Sheet 3
J1
To
UOC OPS
Trailer
or
PPDU
3 Phase
System
Power Out
Phase
Rotation
is ABC
K1
Output PWR Contactor
SPRECHER+SCHUH
p/n CA7-85 or equivalent.
120 Vac coil
SOURCE GenSet
AC Neutral Terminal
(Isolated from Chassis)
Removable Link
(Recommended)
Earth Ground Terminal
(Isolated from Chassis)
Removable Link (Recommended) provides for a single connection path between the generator AC neutral and the chassis/earth ground.
E1
GenSet
Grounding
Terminal
Note: Ref. Designator CB2, S8, S9 not used.
SPIRAL 1 Generator
12MAR07
Sheet 5 of 5
M6
AC POWER METER
Electro Ind
SHARK100-60-10-V2-M60.0
Va
Vb
Vc
L (+)
N (-)
Vref
GND
Ic-Hi Ib-Hi Ia-Hi Ia-Lo Ib-Lo Ic-Lo
AC NEUTRAL
GenSet Housing
Front Panel Lug
DS10
SHORE Input
HOT
indicator lamp
120V ac
This indicator is adjacent to the J2 Connector.
J2
SHORE POWER INPUT
AC Neutral
Gen Set Chassis Ground
Phase Rotation is ABC
S1
Power Source Select Switch
with AUX Contacts
(Shown in GEN position)
Kraus Naimer C80-A212/USB003E
Aux. Switch Deck
H1 Face
PHASE A
PHASE B
PHASE C
CT3
CT4
CT5
+24 Vdc Main Power - EM Stop
(From Sheet 1)
+24 Vdc Main Power - EM Stop – S1 AUX
(To Sheet 2)
From Sheet 4
GEN PHASE A
GEN PHASE B
GEN PHASE C
GEN AC NEUTRAL
SOURCE GenSet - BUS Hot
to A3-13 on Sheet 3
120 Vac
0 V
Sync CLOSE 1 from Sheet 3
S10
4 Pole Special Circuit Toggle Switch
Honeywell p/n 4TL1-72 or MS27406-3
Mount: KEYWAY DOWN
(Shown with toggle in CENTER position)
Note: S10-2&5 form a "Wire OR"
connection point of the " # " signals.
S10 Actions
Toggle Mom. UP: J1 CONTACTOR CLOSE
Toggle Maint. CENTER: No Contactor Action
Toggle Mom. DOWN: J1 CONTACTOR OPEN
S10 Closure Table
Toggle Mom. UP: 2-3, 5-6, 8-9, 11-12
Toggle Maint. CENTER: 2-3, 5-4, 8-7, 11-12
Toggle Mom. DOWN: 2-1, 5-4, 8-7, 11-10
AC NEUTRAL to A2-N on Sheet 2
120V Latch K1 CLOSED
EmStop 2 to Sheet 2
(S10-3)-OPEN-AUX 1 from Sheet 4
(S10-3)-OPEN to Sheet 4
A set
B set
N.C.
N.O.
C
N/C
SOURCE GenSet
External
120V
Phase A
Dead Buss
Detect Relay
4PDT control relay
OMRON p/n LY4
or equivalent
Set C and D
not used
120 Vac coil
DS12
J1 Output
HOT
indicator lamp
This indicator is adjacent to the J1 Connector
10 Turns inside core
(Either Direction)
CSS1
Current Sensing Switch
Johnson Controls p/n R310AE-2C
SPST, Normally Open
Switch Threshold = (0.75 Amps AC divided by the
Number of wire turns in the core.)
EmStop 1 from Sheet 2
CSS1 from Sheet 2
CSS2 to Sheet 2