Doosan Infracore
Portable Power

OPERATION and MAINTENANCE MANUAL

GENERATOR MODELS

G150WCU-3A-T4i (E77)
G150WCU-3Q-T4i ( )
G190WCU-3A-T4i (E57)
G190WCU-3Q-T4i ( )
G240WCU-3A-T4i (E51)
G240WCU-3Q-T4i ( )
G325WCU-3A-T4i (E44)
G325WCU-3Q-T4i ( )

This manual contains important safety information.
Do not destroy this manual.
This manual must be available to the personnel who operate and maintain this machine.

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Statesville, N.C. 28625
DoosanPortablePower.com

Book: 46579539 (3-13-2012) Rev B

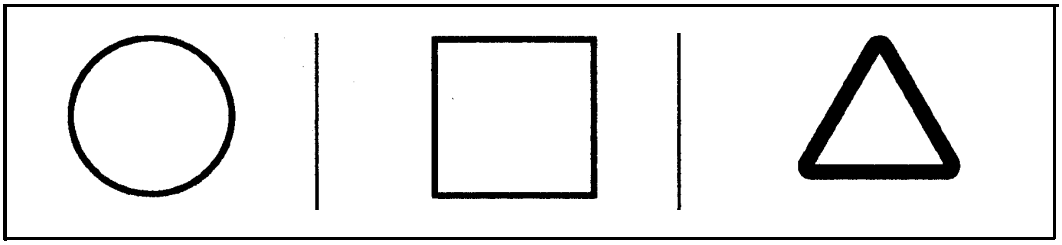
TABLE OF CONTENTS
Operation & Maintenance Manual

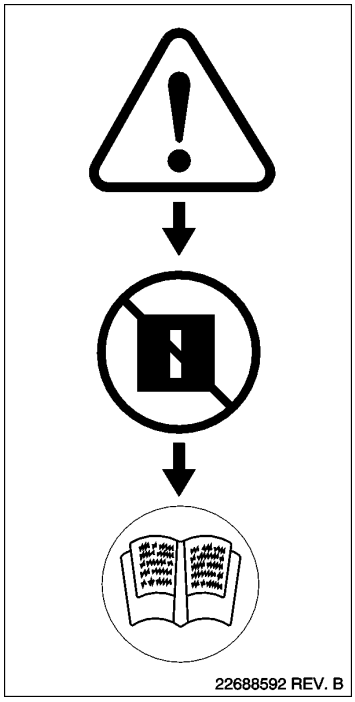
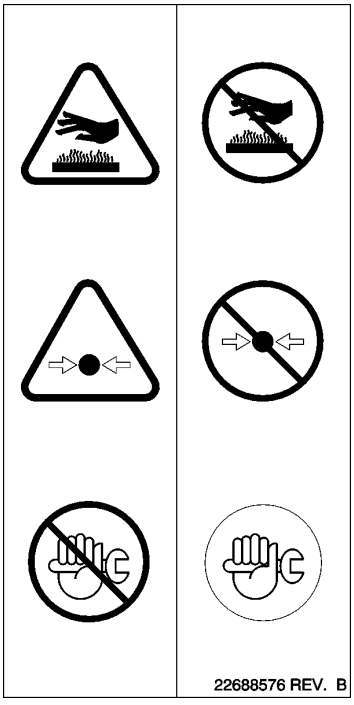
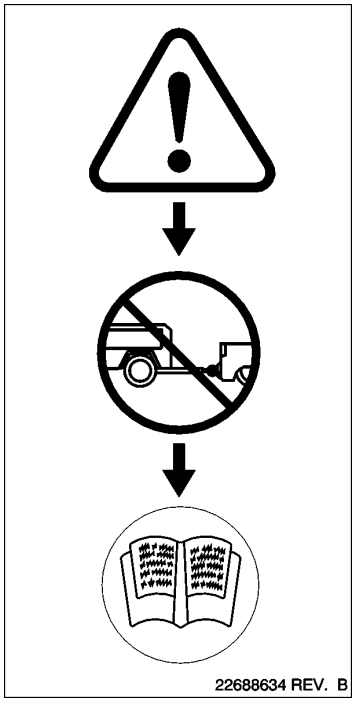
TABLE OF CONTENTS
Operation & Maintenance Manual

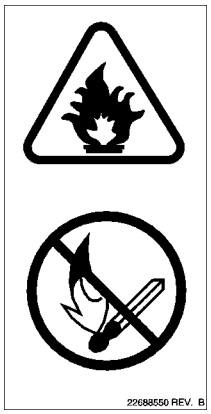
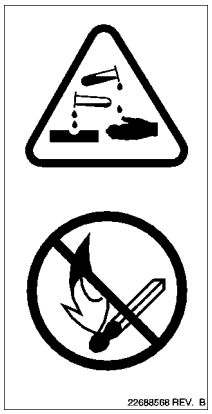
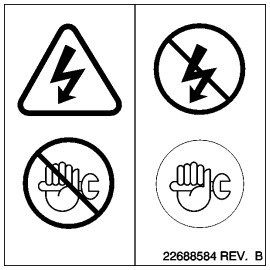
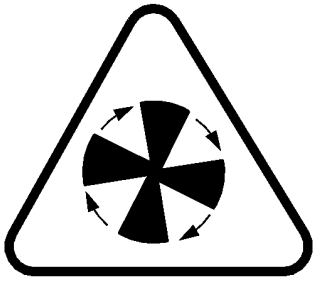
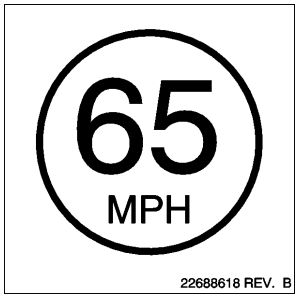
TITLE **PAGE**

Safety Symbols

Symbols below point out potential safety hazards and provide important information about this machine. Read and understand. Heed warnings and follow instructions. If you do not understand, inform your supervisor.



Prohibition/ Mandatory	Information/Instructions	WARNING
		
WARNING - Read the operator's manual before operating this machine.	WARNING - Do not open radiator until radiator is cool and pressure is relieved.	WARNING - Read the operator's manual before towing machine.

		
WARNING - Diesel fuel is flammable. No open flames or sparks.	WARNING - Battery contains acid. Gases are flammable. No open flames or sparks.	WARNING - Do not perform maintenance until all electrical power has been disconnected.
		
WARNING - Rotating fan.	65 MPH maximum towing speed.	

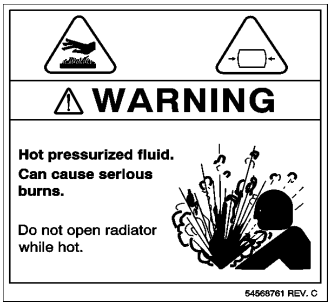
Safety Symbols

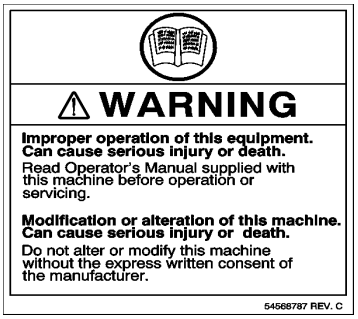
Look for these signs on machines manufactured in North America, which point out potential hazards to the safety of you and others. Read and understand thoroughly. Heed warnings and follow instructions. If you do not understand, inform your supervisor.

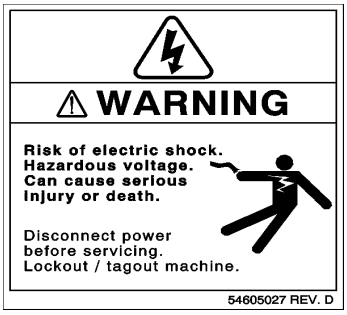
Safety Decals area available free of charge.
Safety decals are identified by the decal heading:
DANGER, WARNING or CAUTION
Decal part numbers are on the bottom of each decal and are listed in the parts manual. Help promote product safety! Assure that decals are present on the machines. Replace decals that are not legible.


WARNING
Improper grounding.
Can cause serious injury or death.
Comply with local electrical codes and Operator's Manual shipped with this unit.
54604996 REV. C

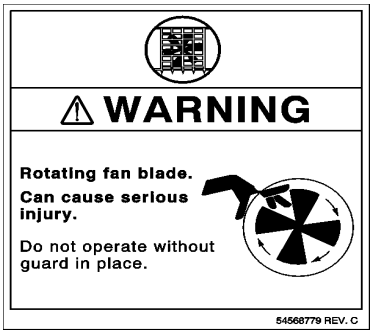

WARNING
Combustible gas.
Can cause serious burns, blindness or death.
Keep sparks and open flames away from batteries.
54568753 REV. C


WARNING
Hot pressurized fluid.
Can cause serious burns.
Do not open radiator while hot.
54568761 REV. C


WARNING
Improper operation of this equipment. Can cause serious injury or death.
Read Operator's Manual supplied with this machine before operation or servicing.
Modification or alteration of this machine. Can cause serious injury or death.
Do not alter or modify this machine without the express written consent of the manufacturer.
54568787 REV. C


WARNING
Risk of electric shock. Hazardous voltage. Can cause serious injury or death.
Disconnect power before servicing. Lockout / tagout machine.
54605027 REV. D

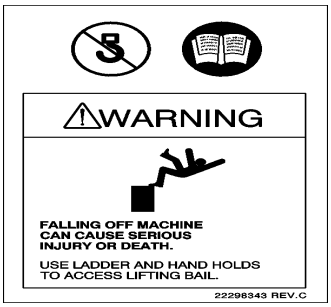

105 km/h
WARNING
Collapsing jackstand. Can cause serious injury.
Insert locking pin completely.
Excessive towing speed. Can cause serious injury or death.
Do NOT exceed 65 mph (105 km/hr.)
54568803 REV. C

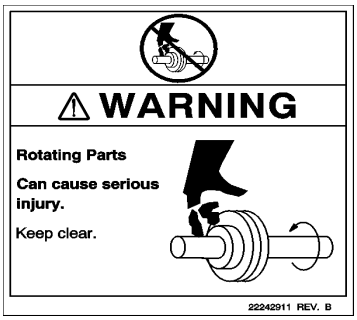

WARNING
Rotating fan blade.
Can cause serious injury.
Do not operate without guard in place.
54568779 REV. C

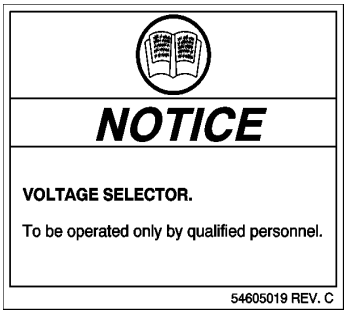

WARNING
Machine can START AUTOMATICALLY.
Can cause serious injury or death.
Read Operating Manual AUTOMATIC START/STOP Section supplied with this equipment before operating or servicing.
54687777 REV. B


WARNING
ARC FLASH AND SHOCK HAZARD
WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury when working on exposed or live parts with access doors or covers open.
46594400 REV. A


WARNING
DO NOT OPERATE UNIT WITHOUT GUARDS IN PLACE SERIOUS INJURY CAN OCCUR
46576740 REV. A


WARNING
FALLING OFF MACHINE CAN CAUSE SERIOUS INJURY OR DEATH.
USE LADDER AND HAND HOLDS TO ACCESS LIFTING BAIL.
22298343 REV.C


WARNING
Rotating Parts
Can cause serious injury.
Keep clear.
2242911 REV. B


NOTICE
VOLTAGE SELECTOR.
To be operated only by qualified personnel.
54605019 REV. C

Safety

Safety

⚠ DANGER

This machine is not designed for operating life-sustaining equipment. It is equipped with a safety shutdown system that will cause the machine to stop operating whenever a shutdown condition is present.

⚠ DANGER

Never operate the engine of this machine inside a building without adequate ventilation. Avoid breathing exhaust fumes when working on or near the machine.

⚠ WARNING

A battery contains sulfuric acid and can give off gases which are corrosive and potentially explosive. Avoid contact with skin, eyes, and clothing. In case of contact, flush area immediately with water.

⚠ WARNING

Improper operation of this equipment can cause severe injury or death. Read Operator's Manual supplied with this machine before operation or service.

⚠ WARNING

Modification or alteration of this machine CAN result in severe injury or death. Do not alter or modify this machine without the express written consent.

⚠ CAUTION

Exercise extreme caution when using booster battery. To jump battery, connect ends of one booster cable to the positive (+) terminal of each battery. Connect one end of other cable to the negative (-) terminal of the booster battery and other end to a ground connection away from dead battery (to avoid a spark occurring near any explosive gases that may be present). After starting unit, always disconnect cables in reverse order.

⚠ WARNING

Never inspect or service unit without first disconnecting battery cable(s) to prevent accidental starting.

Wear eye protection while cleaning unit with compressed air, to prevent debris from injuring eyes.

⚠ WARNING

HOT PRESSURIZED FLUID Remove cap slowly to relieve PRESSURE from HOT radiator. Protect skin and eyes. HOT water or steam and chemical additives can cause serious personal injury.

⚠ WARNING

Flammable Fuels - Do not fill tank when engine is running.

Do not smoke or use an open flame in the vicinity of the generator set or fuel tank.

Do not permit smoking, open flame, or sparks to occur near the battery, fuel, cleaning solvents or other flammable substances and explosive gases.

Do not operate Genset if fuel has been spilled inside or near the unit.

⚠ WARNING

Electrical Shock - Do not operate electrical equipment while standing in water, on wet ground or with wet hands or shoes.

Use extreme caution when working on electrical components. Battery voltage (12V/24V DC) is present unless the battery cables have been disconnected. Higher voltage (potentially 480V) is possibly present at all times.

⚠ WARNING

Always treat electrical circuits as if they were energized.

⚠ WARNING

Disable Start Control before attempting any repair service, disconnect all leads to electrical power requirements and disconnect battery to prevent start up.

⚠ WARNING

Towing - Do not tow this unit in excess of 65 mph (104 km/hr).

Do not tow this unit with a vehicle whose towing capacity is less than the gross vehicle weight.

Steps for determining correct load limit:

1. Locate the statement "The weight of cargo should never exceed xxx kg or xxx lbs" on your vehicle's placard.

2. This figure equals the available amount of cargo and luggage load capacity.

3. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity.

Always make sure the wheels, tires and towbar connectors are in safe operating condition and tow bar is properly connected before towing.

Chock the wheels of the unit when it is not connected to the tow vehicle.

Do not store or transport material or equipment in or on the unit.

⚠ WARNING

Drawbar/Hitch Hookup - Safety chains must be crossed under drawbar and attached to towing vehicle to prevent drawbar from dropping to ground in event of coupling failure.

⚠ WARNING

If the drawbar is removed from this machine, use new OEM fasteners, thread locking compound and torque per the tables included in this manual, when re-installing the drawbar.

⚠ WARNING

Voltage Selection - Do not turn Voltage Selector Switch while engine is running. Voltage selection, adjustment and electrical connections shall be performed only by qualified personnel.

⚠ CAUTION

Welding - Prior to any welding, disconnect alternator relays, diagnostic circuit board, voltage regulator circuit board, meters, circuit breakers and battery cables. Open all circuit breakers, and remove any external connections (except grounding rod). Connect the welding ground as close as possible to the area being welded.

⚠ WARNING

Electrical Loading - Never make electrical connections with the unit running.

⚠ WARNING

Before placing the unit in operation, verify the electrical rating of the Generator Set and do not exceed generator set ratings.

⚠ CAUTION

Use extreme care to avoid contacting hot surfaces (engine exhaust manifold and piping).

Hazardous Substance Precaution

Ensure that adequate ventilation of the cooling system and exhaust gases is maintained at all times.

The following substances are used in the manufacture of this machine and may be hazardous to health if used incorrectly.

Avoid ingestion, skin contact and breathing fumes for the following substances: Antifreeze, Engine Lubricating Oil, Preservative Grease, Rust Preventative, Diesel Fuel and Battery Electrolyte.

The following substances may be produced during the operation of this machine and may be hazardous to health:

- Avoid build-up of engine exhaust fumes in confined spaces.
- Avoid breathing exhaust fumes.
- Avoid breathing brake lining dust during maintenance.
- Always operate in a well ventilated area.

ARC Flash and Shock Hazard

⚠ WARNING

Warning indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury when working on exposed or live parts with access doors or covers open.

Grounding

Depending upon your application, it may be MANDATORY to ground this unit to earth or to NOT ground this unit to earth. Comply with local electrical codes and Operation Manual.

⚠ WARNING

The Generator Set can produce high voltages, which can cause severe injury or death to personnel and damage to equipment. The Generator Set should have proper internal and external ground when required by the National Electric Code (NEC).

The Generator Set is internally grounded neutral to the frame of the Generator Set. This internal ground connection is essential for proper Generator Set performance and personal protection.

External grounding consists of connecting the generator neutral to a solid earth ground, and is the responsibility of the operator, when grounding is required by National Electrical Code, Article 250, and other local codes as applicable. Several methods are employed to externally ground portable generator sets, depending on the intended use and code requirements. In all cases, a continuous length of splice-free copper cable, no smaller than AWG#8 and according to NEC Article 250-66, shall be used for the external ground conductor, when grounding is required. A typical generator grounding application, when required, is shown.

A qualified, licensed electrical contractor, knowledgeable in local codes, should be consulted.

The Generator Set has two main applications:

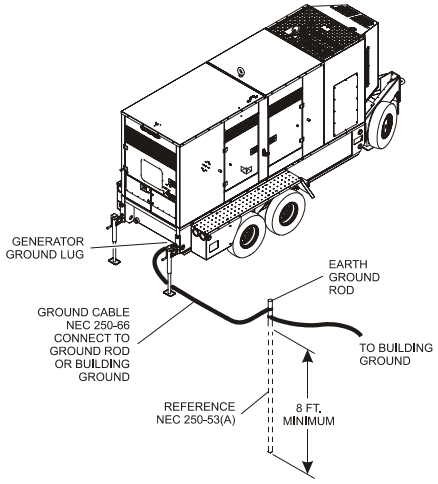
(1) If the Generator Set is supplying electrical power to portable equipment, the vehicle frame shall NOT be grounded to earth per National Electrical Code, Article 250-34 (a)(b). All other provisions of the Article shall be complied with.

(2) If the Generator Set is connected to a temporary or fixed distribution system (such as a building), grounding of the vehicle frame is required at the service entrance to the building, per National Electrical Code, Article 250-20 (b).

If the Generator Set is supplying power to more than one temporary or fixed wiring system, a separate ground cable must be connected from the generator neutral to each distribution systems ground as detailed above.

⚠ WARNING

Failure to properly ground the Generator Set can result in severe injury or death.



If used as an alternate power supply, connect only after the main service entrance switch has been DISCONNECTED and LOCKED OPEN. In addition, circuit overload protection must be provided in accordance with National Electrical Codes and local regulations.

General Data

General Data

MODEL	G150WCU-3A-T4i	G190WCU-3A-T4i	G240WCU-3A-T4i	G325WCU-3A-T4i
Terminal Connection	Series Y Parallel Y Zigzag	Series Y Parallel Y Zigzag	Series Y Parallel Y Zigzag	Series Y Parallel Y Zigzag
Phase	3	3	3	3
Prime Output	150 KVA (120 kW)	194 KVA (155kW)	238 KVA (190kW)	326 KVA (261kW)
Standby Output	165KVA (132kW)	214 KVA (171kW)	261 KVA (209kW)	358 KVA (286kW)
Voltage -3 Phase	208,220, 240, 416,440, 480	208,220, 240, 416,440, 480	208,220, 240, 416,440, 480	208,220, 240, 416,440, 480
Voltage - 1 Phase	120, 127, 139, 240, 254, 277	120, 127, 139, 240, 254, 277	120, 127, 139, 240, 254, 277	120, 127, 139, 240, 254, 277
Frequency	60 hz	60 hz	60 hz	60 hz
Power Factor	0.8	0.8	0.8	0.8
Engine Speed - RPM	1800	1800	1800	1800
ENGINE				
Manufacturer	Cummins	Cummins	Cummins	Cummins
Model	QSB7-G7	QSB7-G7	QSB7-G6	QSL9-G8
FLUID CAPACITIES				
Engine Crankcase Lubricant (gal)	4.5	4.5	4.5	7
Fuel Tank (gal)	368	368	368	480
Engine Coolant (gal)	10	10	10	15
Electrical System VDC	24 VDC	24 VDC	24 VDC	24 VDC
RUNNING GEAR				
Tire Size	ST235/80 R16/E			
Inflation Pressure (Cold)	80 psi	80 psi	80 psi	80 psi
Towing Speed (Maximum)	65 MPH	65 MPH	65 MPH	65 MPH
UNIT MEASUREMENTS/ WEIGHTS with RUNNING GEAR				
Overall length (inches)	216.7	216.7	216.7	237.6
Overall width (inches)	83	83	83	83
Overall height (inches)	102.9	102.9	102.9	113.0
Track width (inches)	71.5	71.5	71.5	71.5
Weight (with fuel)	10,900 lbs	10,900 lbs	10,900 lbs	13,595 lbs
Weight (less fuel)	8,702 lbs	8,702 lbs	8,702 lbs	10,510 lbs

MODEL	G150WCU-3Q-T4i	G190WCU-3Q-T4i	G240WCU-3Q-T4i	G325WCU-3Q-T4i
Terminal Connection	Series Y Parallel Y Zigzag	Series Y Parallel Y Zigzag	Series Y Parallel Y Zigzag	Series Y Parallel Y Zigzag
Phase	3	3	3	3
Prime Output @480/ 600	150 KVA (120 kW)	190 KVA (152kW)	220/238 KVA (176/ 190kW)	300/325 KVA (240/ 260kW)
Standby Output @480/ 600	165KVA (132kW)	209 KVA (167kW)	242/261 KVA (194/ 209kW)	330/358 KVA (264/ 286kW)
Voltage -3 Phase	208,220, 240, 416,440, 480,600	208,220, 240, 416,440, 480,600	208,220, 240, 416,440, 480,600	208,220, 240, 416,440, 480,600
Voltage - 1 Phase	120, 127, 139, 240, 254, 277,346	120, 127, 139, 240, 254, 277,346	120, 127, 139, 240, 254, 277,346	120, 127, 139, 240, 254, 277,346
Frequency	60 hz/50 hz	60 hz/50 hz	60 hz/50 hz	60 hz/50 hz
Power Factor	0.8	0.8	0.8	0.8
Engine Speed - RPM	1800/1500	1800/1500	1800/1500	1800/1500
ENGINE				
Manufacturer	Cummins	Cummins	Cummins	Cummins
Model	QSB7-G7	QSB7-G7	QSB7-G6	QSL9-G8
FLUID CAPACITIES				
Engine Crankcase Lubricant (gal)	4.5	4.5	4.5	7
Fuel Tank (gal)	368	368	368	480
Engine Coolant (gal)	10	10	10	15
Electrical System VDC	24 VDC	24 VDC	24 VDC	24 VDC
RUNNING GEAR				
Tire Size	ST235/80 R16/E			
Inflation Pressure (Cold)	80 psi	80 psi	80 psi	80 psi
Tow Speed (Maximum)	65 MPH	65 MPH	65 MPH	65 MPH
UNIT MEASUREMENTS/ WEIGHTS with RUNNING GEAR				
Overall length (inches)	216.7	216.7	216.7	237.6
Overall width (inches)	83	83	83	83
Overall height (inches)	102.9	102.9	102.9	113.0
Track width (inches)	71.5	71.5	71.5	71.5
Weight (with fuel)	10,900 lbs	10,900 lbs	10,900 lbs	13,595 lbs
Weight (less fuel)	8,702 lbs	8,702 lbs	8,702 lbs	10,510 lbs

Consumables Service Parts:

For Models:	G150WCU-3A-T4i	G190WCU-3A-T4i	G240WCU-3A-T4i	G325WCU-3A-T4i
For Models:	**G150WCU-3Q-T4i**	**G190WCU-3Q-T4i**	**G240WCU-3Q-T4i**	**G325WCU-3Q-T4i**
Air Cleaner Element (Engine) primary	54717145	54717145	54717145	89288971
Air Cleaner Element (Engine) Safety -	54717152	54717152	54717152	89288989
Engine Oil Filter Element	46558720	46558720	46558720	22177737
Fuel Water Separator Element	46554959	46554959	46554959	23061666
Engine Fuel Element	46558719	46558719	46558719	22765325
Crankcase Ventilation Filter	46567299	46567299	46567299	46575239
Engine Fan Belt	46588659	46588659	46588659	46576519
Coolant Conditioner/ Filter	N/A	N/A	N/A	46606919
Grease, Fan Drive Shaft	46570540	46570540	46570540	46570540
MAINTENANCE KITS				
250 hour Maintenance Kit (without fluids)	46589959	46589959	46589959	46570562
500 hour Maintenance Kit (without fluids)	46589960	46589960	46589960	46570563
2000 hour Maintenance Kit (without fluids)	46589961	46589961	46589961	46576599
Tier 4 Engine Oil - 5 gal	46557016	46557016	46557016	46557016
Tier 4 Engine Oil -1 gal	46557017	46557017	46557017	46557017

Setup Instructions

Setup Instructions

Never operate unit without first observing all safety warnings and carefully reading the operation and maintenance manual shipped from the factory with this machine.

Before Towing

⚠ WARNING

Failure to follow these instructions can cause severe injury or death.

⚠ CAUTION

Position the tow vehicle to align its hitch with the pintle eye or coupler.

Engage the parking brake and chock the wheels of the tow vehicle.

Stand to the side and ensure pin is FULLY inserted (secure) in tube of jack.

Crank jack to lower pintle eye coupler onto the hitch and to raise foot off the ground. Pull pin from tube of jack. Fold jack handle down and forward. Swing up jack tube and FULLY insert pin in tube.

Connect machine towing lights to tow vehicle.

Remove chocks from tow vehicle wheels.

Steps for determining correct load limit:

1. Locate the statement “The weight of cargo should never exceed xxx kg or xxx lbs” on your vehicle’s placard.
2. This figure equals the available amount of cargo and luggage load capacity.
3. Determine the combined weight of luggage and cargo being loaded on the vehicle. That weight may not safely exceed the available cargo and luggage load capacity.

Towing

⚠ WARNING

Failure to follow these instructions can cause severe injury or death.

- Ensure that tires, wheels and running gear are in good condition and secure.
- Ensure that tires are inflated to recommended pressure.
- Do not tow this unit in excess of 65 mph (104 km/hr).
- Use a tow vehicle whose towing capacity is greater than the gross weight of this unit.
- Adjust hitch to assure machine is level for towing.

Disconnect from Towing Vehicle

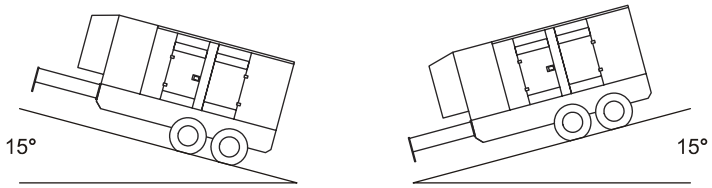
- Set the vehicle parking brake. Chock wheels of unit.
- Disconnect machine towing lights from tow vehicle.
- Standing to the side, remove pin from tube of jack. As jack tube swings down, FULLY insert pin in the tube.
- Disconnect safety chains. Crank jack to raise eye or coupler from hitch. Tow vehicle can be moved.

Leveling

Place the unit in an open, well ventilated area that is free of debris, bystanders, and overhead obstructions. Position as level as possible. The design of these units permits a 15 degree limit on out-of-level operation.

When the unit is to be operated out-of-level, it is important to keep the engine crankcase oil level near the high level mark (with the unit level).

Unit may experience reduced run time when operating in out of level condition due to reduced fuel pickup. To maximize run time, position the unit such that the towbar end of the package is above level.



Generator Grounding

To guard against electrical shock and possible damage to equipment, it is important to use appropriate grounding as required by the National Electrical Code. Refer to the Safety Grounding Section in this manual.

FUELING/INSPECTION/SETUP

Refueling Procedure

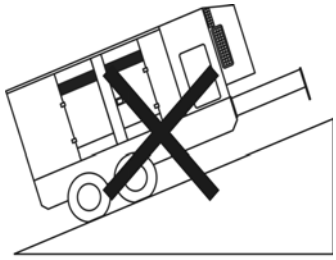
⚠ WARNING

Diesel fuel and its vapors are dangerous to your health and the surrounding environment. Avoid skin contact and/or inhaling fumes.

1. Level tanks. Make sure fuel cells are level with the ground. Failure to do so will cause fuel to spill from the tank before reaching full capacity.

⚠ CAUTION

Always place trailer on firm level ground before refueling to prevent spilling and maximize the amount of fuel that can be pumped into the tank.



UNLEVEL GROUND

2. Open rear curbside door of the generator. Remove the fuel fill cap and fill the tank.

⚠ CAUTION

Do not overfill fuel system. Leave room for fuel expansion. Fuel expands when heated.

⚠ WARNING

Do not mix gasoline, alcohol, or gasohol with diesel fuel. This mixture can cause an explosion.

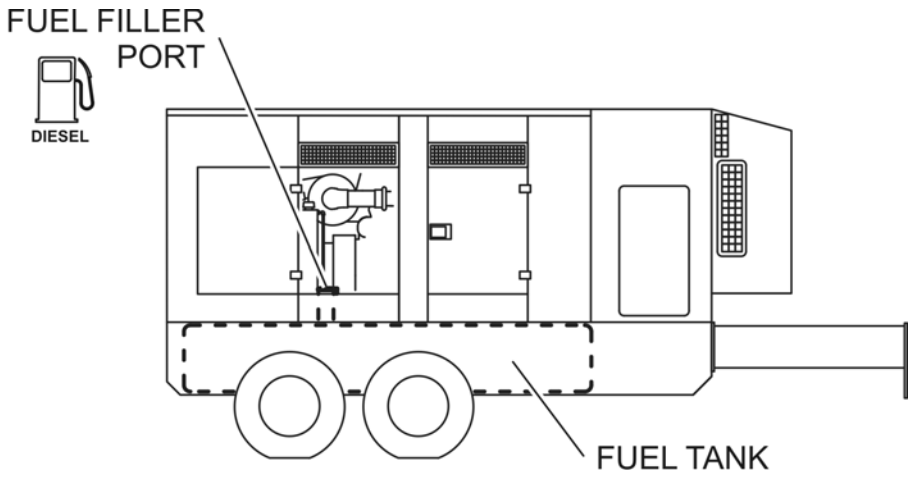
Refilling the Fuel System

⚠ CAUTION

Only properly trained personnel who have read and understand this section should refill the fuel tank system.

The generator has an internal fuel tank located inside the trailer frame. The frame provides containment of fluids. Always fill the fuel tanks with clean fresh #2 Ultra Low Sulfur diesel fuel. Do not fill the fuel tanks beyond their capacities.

Pay attention to the fuel tank capacity when replenishing fuel. The fuel tank cap must be closed tightly after filling. Handle fuel in a safety container. If the container does not have a spout, use a funnel. Wipe up any spilled fuel immediately.



⚠ CAUTION

Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the fuel pump and the fuel injectors.

⚠ CAUTION

Lighter fuels can reduce fuel economy or possibly damage fuel system components.

⚠ CAUTION

Do not use diesel fuel blended with lubricating oil in engines equipped with an aftertreatment system. Service intervals for aftertreatment systems will be reduced.

Cummins recommends the use of ASTM number 2D fuel. The use of number 2D diesel fuel will result in optimum engine performance.

⚠ CAUTION

Ultra-low sulfur diesel fuel is required for correct operation of the aftertreatment system. If ultra-low sulfur diesel fuel is not used, the engine could possibly not meet emission regulations and the aftertreatment system could possibly be damaged.

⚠ DANGER

Fuel spillage on a hot engine can cause a fire or explosion. If fuel spillage occurs, wipe up the spilled fuel completely to prevent fire hazards. Never smoke around or near the generator.

Coolant

Engine manufacturer recommends use of 50 percent ethylene glycol antifreeze and 50 percent water for the engine coolant mixture. Refer to engine owner's manual for further details.

⚠ WARNING

If adding coolant/antifreeze mix to the radiator, do not remove the radiator cap until the unit has completely cooled. The possibility of hot coolant exists which can cause severe burns.

Day to day addition of coolant is done from the recovery tank. When adding coolant to the radiator, do not remove the radiator cap until the unit has completely cooled. See General Data for coolant capacity. Make sure the coolant level in the recovery tank is always between the "high" and the "low" markings.

Coolant Recommendation for Cold Weather

It is possible to operate engines in extremely cold environments if they are properly prepared and maintained. Satisfactory performance of an engine in low ambient temperature conditions requires modification of the engine, surrounding equipment, operating practices and maintenance procedures.

Ambient Temperature

0 to -32°C (32 to -25°F)

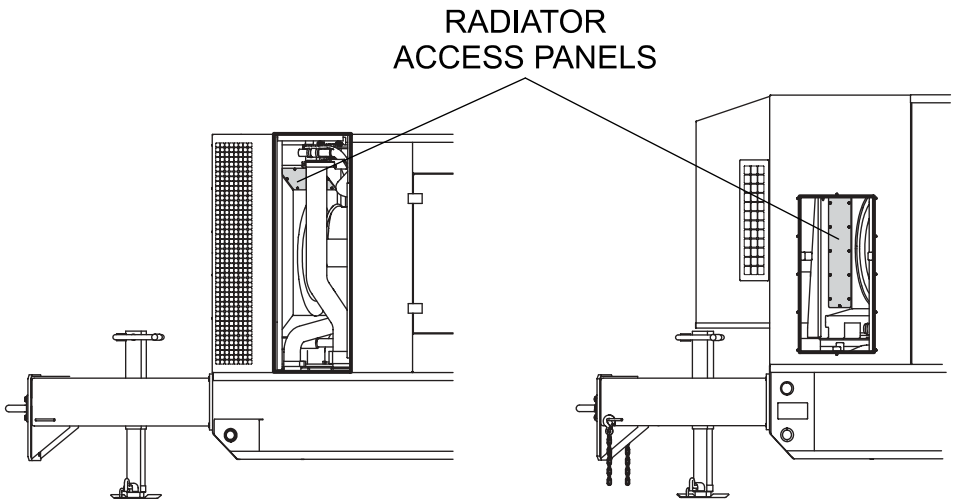
Use 50 percent ethylene glycol antifreeze and 50 percent water for the engine coolant mixture.

-32° to -54°C (-25 to -65°F)

Use 60 percent ethylene glycol antifreeze and 40 percent water for the engine coolant mixture.

Cleaning the Radiator

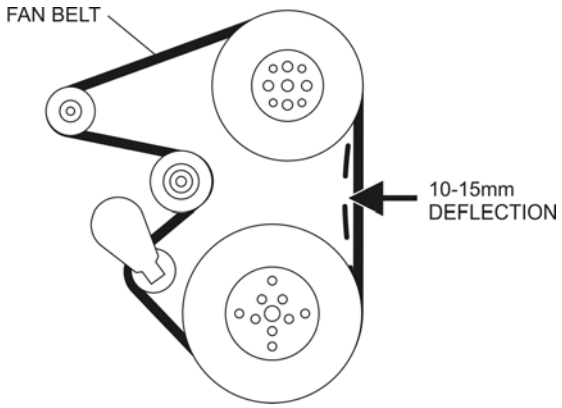
The engine may overheat if the radiator fins become overloaded with dust or debris. Periodically clean the radiator fins with compressed air or pressure washer (see Maintenance section). Cleaning inside the machine is dangerous, so clean only with the engine turned off and the negative battery terminal disconnected. The generator is equipped with removable panels to provide access to the radiator and oil cooler for easy cleaning.



G240 / 190 / 150 **G325**

Fan Belt Tension

A slack fan belt may contribute to overheating, or to insufficient charging of the battery. Inspect the fan belt for damage and wear and adjust it in accordance with the Engine Owner's Manual.The fan belt tension is proper if the fan belt bends 10 to 15 mm when depressed with the thumb as shown below.

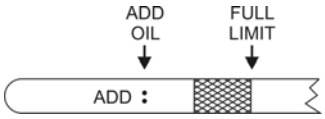


⚠ CAUTION

Never place hands near the belts, fan drive, or cooling fans while the generator set is running.

Lubricating Oil

Fill the engine crankcase with lubricating oil through the filler hole, but do not overfill. Make sure the generator is level and verify that the oil level is maintained between the two notches on the dipstick. See below for proper selection of engine oil.



When checking the engine oil, be sure to check if the oil is clean. If the oil is not clean, drain the oil by removing the oil drain plug, and refill with the specified amount of oil as outlined in the Engine Owner's Manual. Oil should be warm before draining.

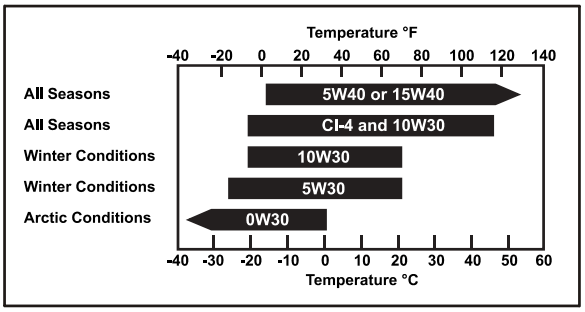
DOOSAN

Factory Filled With Doosan Protective Lubricants

Tier 4
Engine Oil

1 GALLON – 46557017
5 GALLONS – 46557016
55 GALLONS – 46557015

For Parts, Service or Distributors
1 800 633 5206 USA
1 800 727 8457 Canada
1 305 715 0009 Latin America
65 6499 0220 Asia Pacific
32 (2) 371 68 11 Europe, Middle East, Africa
doosanportablepower.com
46603179 REV. A



Oil Check

Low ash engine oil meeting API CJ-4 specification is required for compatibility with the engine's emission control equipment. Use of oil that does not meet the required specifications may damage the engine emission controls.

Battery

This unit is of negative ground. DO NOT connect in reverse. Always maintain battery fluid level between the specified marks. Battery life will be shortened if the fluid level is not properly maintained. Add only distilled water when replenishment is necessary.

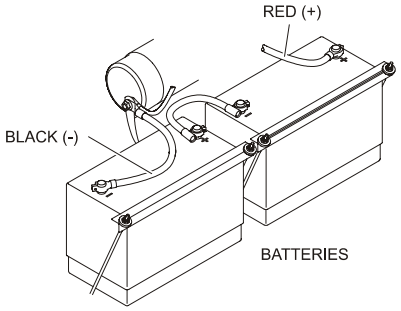
DO NOT overfill. Check to see whether the battery cables are loose. Poor contact may result in poor starting or malfunctions. Always keep the terminals firmly tightened. Coat the terminals with an approved battery terminal treatment compound. Replace battery with only recommended type battery. The standard battery type used in the generator is BCI Group 31.

The battery is sufficiently charged if the specific gravity of the battery fluid is 1.28 (at 68°F). If the specific gravity should fall to 1.245 or lower, it indicates that the battery is dead and needs to be recharged or replaced.

Before charging the battery with an external electric source, be sure to disconnect the battery cables.

Battery Cable Installation

Always be sure the battery cables are properly connected to the battery terminals as shown below. The red cable is connected to the positive terminal of the battery and the black is connected to the negative terminal of the battery.



When connecting battery, do the following:

1. Never connect the battery cables to the battery terminals when the Battery Disconnect switch is on.
2. Place a small amount of battery terminal treatment compound around both battery terminals. This will ensure a good connection and will help prevent corrosion around the battery terminals.

NOTICE

If the battery cable is connected incorrectly, electrical damage to the generator will occur. Pay close attention to the polarity of the battery when connecting the battery.

⚠ CAUTION

Inadequate battery connections may cause poor starting of the generator, and create other malfunctions.

Alternator

The polarity of the alternator is of negative grounding type. When a reversed circuit connection takes place, the circuit will be in short circuit instantaneously resulting in alternator failure.

DO NOT put water directly on the alternator. Entry of water into the alternator can cause corrosion and damage the alternator.

Wiring

Inspect the entire generator for bad or worn electrical wiring or connections. If any wiring or connections are exposed (insulation missing) replace wiring immediately.

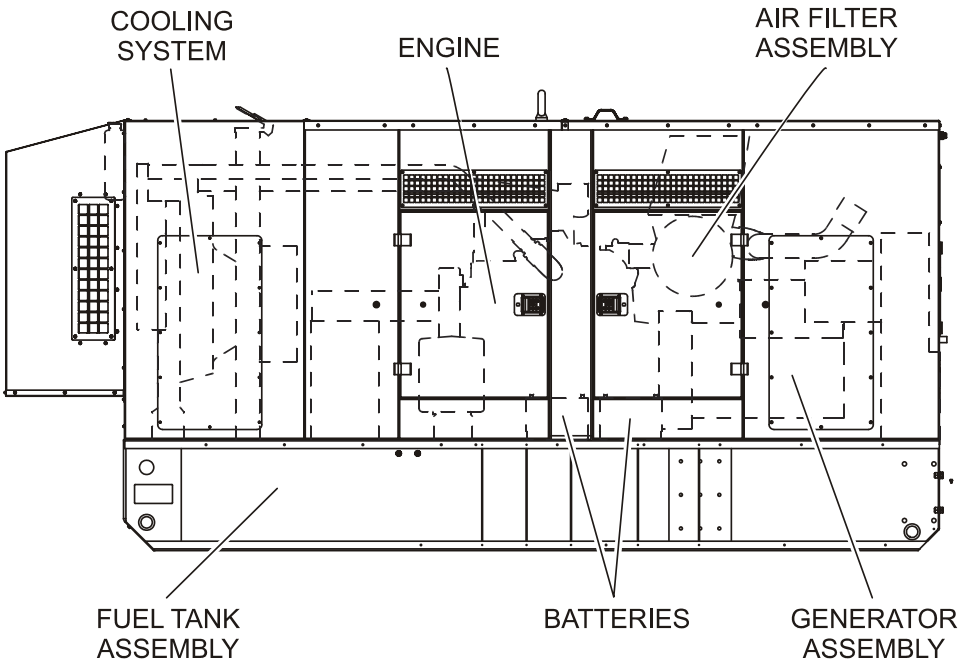
Piping and Hose Connections

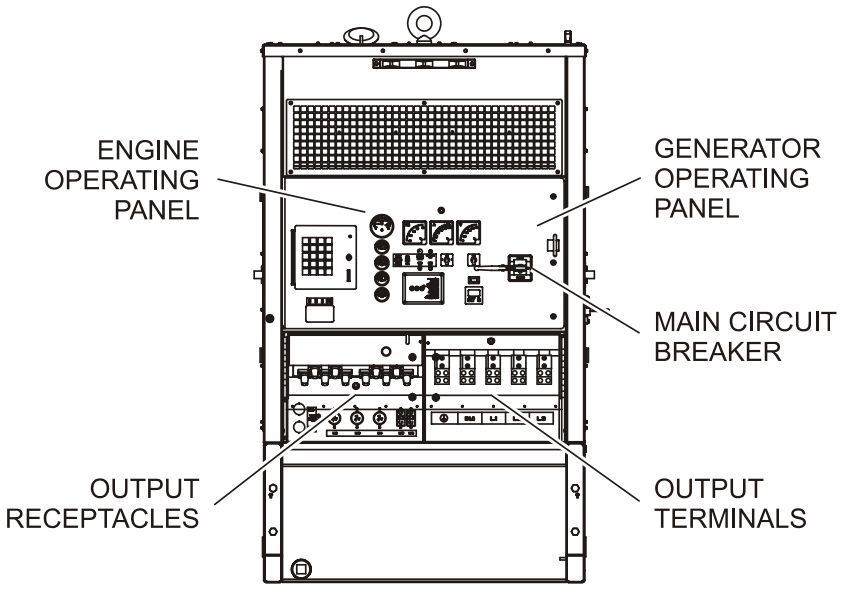
Inspect all piping, oil hose, and fuel hose connections for wear and tightness. Tighten all hose clamps and check hoses for leaks.

If any hose (fuel or oil) lines are defective, replace them immediately.

GENERAL INFORMATION and MAJOR COMPONENTS

Doosan mobile generators are designed as a high quality portable power source for telecom sites, lighting facilities, power tools, submersible pumps and other industrial and construction applications.





Major Components

Engine Operating Panel

The Engine Operating panel is provided with the following:

Engine Controller

Tachometer

Emergency Stop Switch

Water Temperature Gauge

Oil Pressure Gauge

Charging Voltmeter Gauge

Fuel Level Gauge

Pre-Heat

Engine Speed (Run/Idle) Switch

Engine Diagnostic Code Reader

Alarm Lamps (11)

60Hz/50Hz Engine Speed Switch (Located behind engine Operation Panel)

Generator Operating Panel

The Generator Operating Panel is provided with the following:

Frequency Meter (Hz)

AC Ammeter (Amps)

AC Voltmeter (Volts)

Ammeter Phase Selector Switch

Voltage Regulator

Panel Light

3-Pole Main Circuit Breaker

Receptacle Circuit Breakers

Cooling Fan Circuit Breakers

Control Box (located behind the Generator Control Panel)

- Automatic Voltage Regulator
- Current Transformer
- Overcurrent Relays
- Meter Protective Fuses
- Starter Relay
- Cooling Fan Relay
- Voltage Change-Over

Output Terminal Panel

The Output Terminal panel is provided with the following:

Three 120/240V output receptacles CS-6369), 50A

Two 120V output receptacles (GFCI), 20 A

Multiple output terminal lugs (3-Phase power) per phase

Battery Charger (optional)

Water Heater (optional)

Multiple CamLock connectors (optional)

Panel lights for night access

Boost Excitation System

Doosan generators are equipped with the state of the art “AREP” excitation system. The AREP system consists of an extra independent winding wound among stationary windings of the AC output section. This is in addition to the standard auxiliary winding that supplies normal power to the excitation system. During loads that are stable and not varying much, the auxiliary winding provides power to the excitation system. But for highly variable loads such as motor starting, the AREP winding boosts the power to provide higher excitation to the exciter section and thus better voltage response during the application of heavy loads, offering maximum motor starting capabilities.

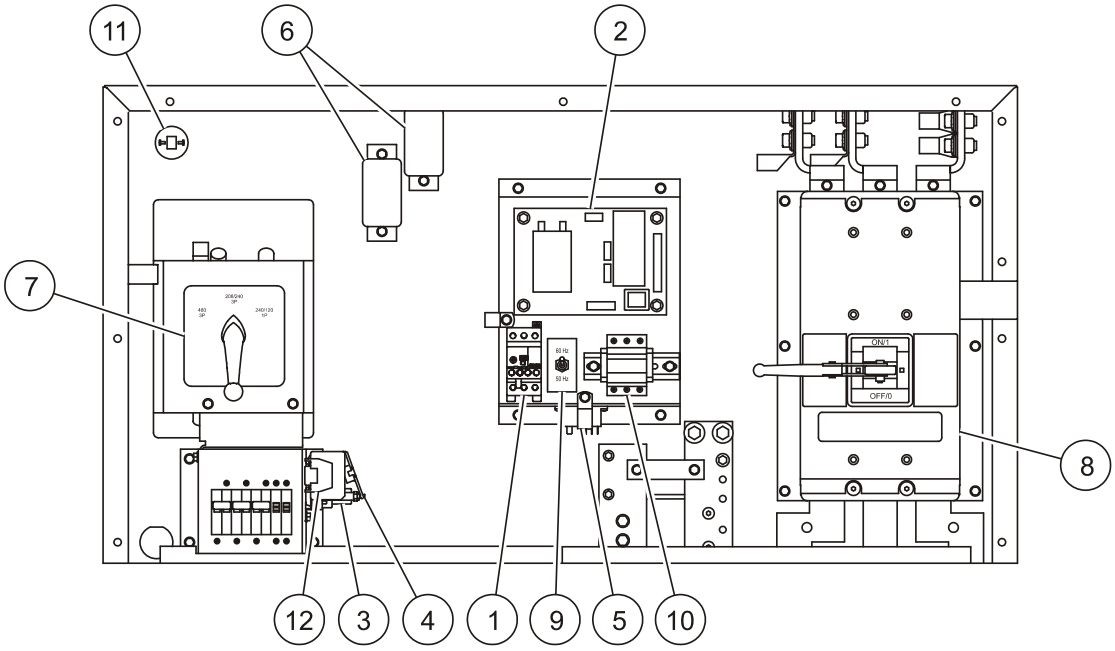
Engine

Doosan gensets use engines designed to meet every performance requirement for the generator. Generators are selected to maximize engine power. The advanced engines meet Federal EPA Tier 4i emissions standards.

Generator Service Panel

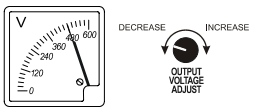
Located behind the Operating Panel is the Service Panel. This panel contains some necessary components required to make the generator Service Panel functional. The Service Panel is equipped with the following major components.

1. Overcurrent Relay (OCR)
2. Automatic Voltage Regulator (AVR)
3. Fuel (Engine Keyswitch) Relay
4. Cooling Fan Relay
5. Overcurrent Disable Relay
6. Current Transformers
7. Voltage Selector Switch
8. Main Circuit Breaker
9. 50Hz/60Hz Selector Switch
10. Panel Meter Fuse Block
11. AutoStart Alarm
12. AutoStart Controller Fuse

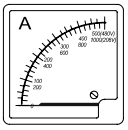


Generator Starting/Meter/Gauge Indications

The generator's frequency meter should be displaying the output frequency in HERTZ.

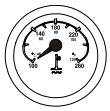


The generator's AC-voltmeter will display the generator's output in VOLTS. If the voltage is not within the specified tolerance, use the voltage adjustment control knob to increase or decrease the desired voltage.



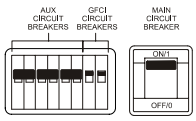
The ammeter will indicate zero amps with no load applied. When a load is applied, the ammeter will indicate the amount of current that the load is drawing from the generator.

The engine oil pressure gauge will indicate the oil pressure of the engine. Under normal operating conditions the oil pressure is approximately 28 to 85 psi (1.93-5.86 kPa).

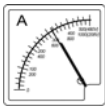


The coolant temperature gauge will indicate the coolant temperature. Under normal operating conditions the coolant temperature should be between 167°-203°F (75°-95°C).

The tachometer gauge will indicate the speed of the engine when the generator is operating. Under normal operating conditions this speed is approximately 1800 RPM for 60 Hz output or approximately 1500 RPM for 50 Hz output.



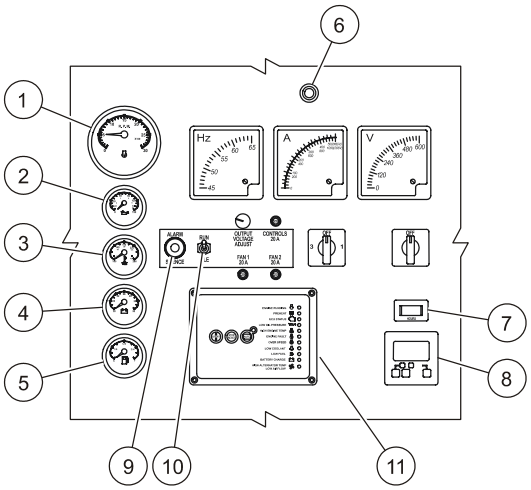
Place the main, GFCI, and aux. circuit breakers in the ON position.



Observe the generator's ammeter and verify it reads the anticipated amount of current with respect to the load. The ammeter will only display a current reading if a load is in use. The ammeter has dial scale and is designed to approximately reach full scale as the generator reaches 100% of its rating, regardless of selected voltage.

The generator will run until manually stopped or an abnormal condition occurs.

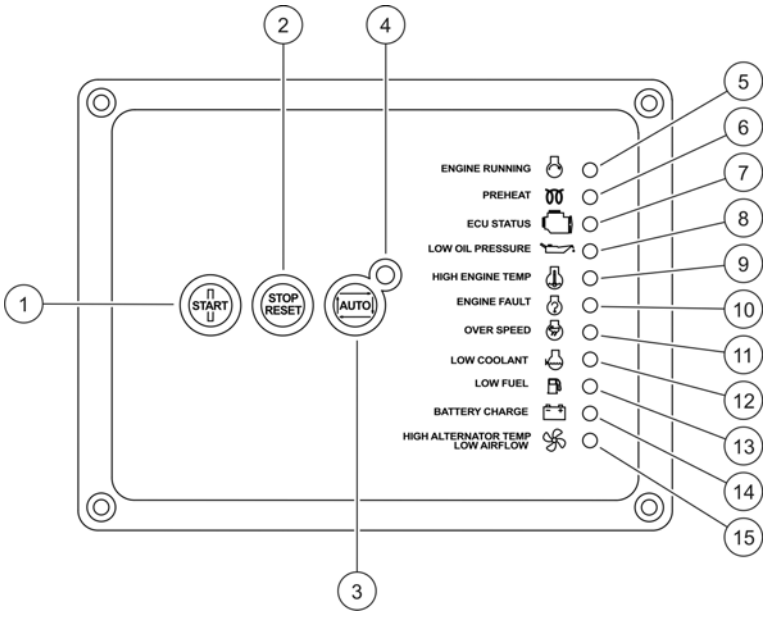
ENGINE OPERATING PANEL



The following definitions describe the controls and functions of the Operator Panel.

1. **Tachometer** - Indicates engine speed in RPM. This meter should indicate 1800 RPM when the rated load is applied at 60 Hz, or 1500 RPM when rated load is applied at 50 Hz.
2. **Oil Pressure Gauge** - During normal operation this gauge should read between 28 to 85 psi. (1.93-5.86 bar). When starting the generator the oil pressure may read slightly higher, but after the engine warms up, the oil pressure should return to the correct pressure range.
3. **Engine Coolant Temperature Gauge** - During normal operation this gauge should read between 167° and 212°F (75°-100°C).
4. **DC Voltage Gauge** - Indicates the voltage being supplied by the engine's alternator which provides current for generator's control circuits and battery charging system. During normal operation this gauge should read 24 to 28 volt.
5. **Fuel Gauge** - Indicates amount of diesel fuel available in the onboard fuel tank.
6. **Panel Lamp** - Illuminates the panel controls while the panel controls or alarms are active, when not in sleep mode.
7. **Hourmeter** - Displays engine running hours.
8. **Diagnostic Display** - Provides display of engine diagnostic trouble codes (DTC) with text descriptions, and Red/Shutdown and Amber/Warning lamps. This device also incorporates the controls and indicator lamps for the engine's exhaust aftertreatment system.
9. **Alarm Silence Button (optional)** - Push this button to silence the audible warning and shutdown alarm.
10. **Run/Idle Switch** - The RUN position sets the engine speed to rated speed for proper operation. The IDLE position sets speed to a lower RPM. The switch must be in the RUN position to enable generator voltage output and to allow selection of the AutoStart mode. The switch must be in IDLE to permit a manual DPF generation.
11. **AutoStart/Stop Engine Controller (ASSC)** - This controller has a vertical row of status LED lamps.

Auto-Start /Stop Engine Controller (ASSC)



1. **Engine Start Button** - Push to start engine provided there are no active warning lamps.
2. **Engine Stop/Reset Button** - Push to stop engine or to reset any warning lamps once the fault condition has been cleared. This button also awakens controller from sleep mode. Wait 15 seconds after a stop or reset before attempting to start.
3. **Autostart Mode Button** - Push to enter Autostart mode if the Run/Idle switch is set to RUN. Autostart cannot be enabled if Run/Idle is set to IDLE.
4. **Autostart Lamp** - This lamp goes on when Autostart is active.

Engine Status/Warning Lamps - There are eleven engine status and warning lamps defined as follows:

5. **Engine Running Lamp** - Green lamp flashes to indicate engine is cranking, then solid to indicate engine is running at a safe operating speed.

6. **Preheat Lamp** - Green lamp indicates engine preheat system is ON prior to cranking. Upon press of the start button, the preheat system will be active for 10 seconds prior to engine crank.

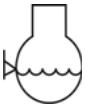
7. **Engine Communication Lamp** - Green lamp indicates the controller has communication with the engine ECU.

8. **Low Oil Pressure Lamp** - Red lamp indicates engine shutdown due to low engine oil pressure. Fault will activate if engine oil pressure drops below the minimum engine limit.

9. **High Engine Temperature Lamp** - Red lamp indicates engine shutdown due to high coolant temperature. Fault will activate if the engine coolant temperature exceeds the maximum engine limit.

10. **Engine Fault Lamp** - Red lamp indicates that engine service is required. Check the Diagnostic Display for diagnostic trouble codes (DTC). A slow blink indicates engine is sending an active warning which will be accompanied by yellow check engine lamp on the diagnostic display. Fast blink indicates engine is sending an active shutdown which will be accompanied by a red stop engine lamp on the diagnostic display.

11. **Engine Speed Lamp** - Red lamp indicates a shutdown for engine over-speed. Fault will activate if the engine speed exceeds the maximum engine RPM limit.



12. **Low Coolant Level Lamp** - Red lamp indicates engine shutdown due to low engine coolant level. Fault will activate if the coolant level in the radiator top tank falls below the top tank sensor.

13. **Low Fuel Level Lamp** - Red lamp indicates engine shutdown due to low fuel level. Fault will activate if fuel level falls to 5% of total fuel tank capacity to prevent introduction of air into the fuel system which may result in loss of prime.

14. **Battery Charge Fail Lamp** - Red lamp indicates DC charging system malfunction above normal. Indication serves as a warning of an abnormal condition and does not cause an engine shutdown. ON or SLOW blink indicates low battery voltage. Fast blink indicates high battery voltage.

15. **High Alternator Temp/Low Airflow Lamp** Red lamp engine shutdown indication due to high alternator discharge temperature, possibly caused by reduced package airflow, or overload.

AutoStart/Stop Engine Controller (ASSC)

The AutoStart/Stop Engine Controller (ASSC) is a microprocessor that controls the startup sequence through precise management of the preheat and cranking cycles upon the press of the START button. The ASSC ensures proper preheat of the engine for optimum starting performance and eliminates excessive cranking to prevent damage to the starter motor.

When the operator presses the START button, the ASSC takes over control of the system startup:

- Automatic preheat for 10 seconds (green Preheat LED is illuminated).
- Automatic crank for 10 seconds or until engine start (Green Engine Running LED flashes).
- Once engine starts, the starter motor automatically disconnects and is locked out (Green Engine Running LED is illuminated).
- If engine fails to start, the controller repeats this sequence for two additional start attempts.
- If the engine fails to start after three attempts, investigate potential engine problems and press STOP/RESET before attempting to start again.

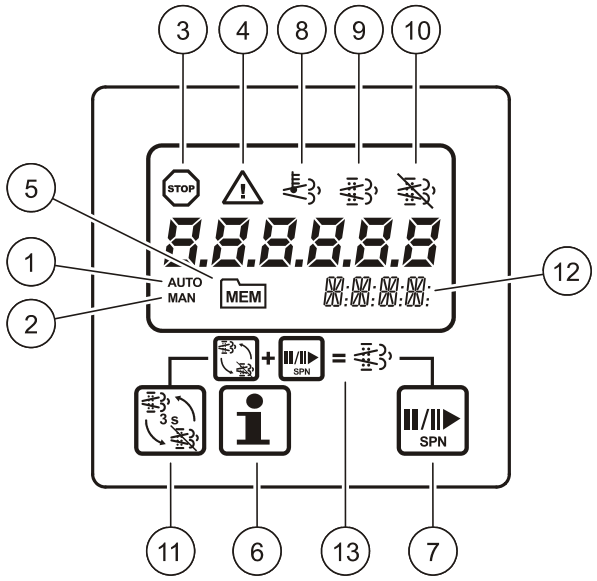
When the engine is running, the ASSC monitors the operation of the generator set against various fault conditions providing annunciation of the faults on the LED indicators and shutdown protection of the system to prevent damage in the event of a fault condition.

The ASSC is also capable of accepting a signal from an Automatic Transfer Switch (ATS) or similar device for remote automatic start and stop of the generator system. For details on the operation of the AutoStart system, see section on Remote Starting and Stopping.

Engine Diagnostic Trouble Code (DTC) Display Operation

The Diagnostic Display provides display of engine diagnostic codes (DTCs) with text descriptions and Red Engine Stop/Shutdown and Amber Engine Warning Lamps. Also included on this device are controls and indicators for regeneration of the Diesel Particulate Filter (DPF) that is part of the engine's emission control system.

Diagnostic Display



1. **Auto Mode** - Any active engine fault code will scroll every three seconds.
2. **Manual Mode** - Allows users to see more detailed data for each fault code.
3. **Stop Engine Lamp (SEL)** - Engine ECU has caused a shutdown. Check fault codes to determine cause.
4. **Check Engine Lamp (CEL)** - Engine ECU has detected an abnormal condition. Check fault codes.
5. **Memory Indicator** - Indicates previously active codes are stored in engine ECU memory.
6. **Information Button** - Button allows display of additional data about a fault code.
7. **SPN Button** - Button controls Auto or Manual display of fault codes.
8. **High Exhaust Temperature** - HEST Lamp Indicates higher exhaust temperatures which is normal during regeneration.
9. **Diesel Particulate Filter (DPF)** - Lamp Indicates the DPF is starting to get filled. Indicator blinks when nearly full.
10. **Regeneration Inhibited Lamp** - Lamp indicates Active Regeneration is inhibited.
11. **Regeneration Mode Button** - Press for three seconds to toggle between normal and regeneration inhibited mode.
12. **Text Display**
13. **Manual Regeneration Instructions**

Accessing Diagnostic Trouble Codes (DTCs)

If Engine Fault icon on the Engine Control Module is lit (solid or blinking), then the engine ECU is sending active Diagnostic Trouble Codes (DTCs). These active codes will scroll on the display if the Diagnostic Display is in AUTO mode.

To access detailed information for each fault code:

1. Press the SPN button icon to change the mode from AUTO to MANUAL.
2. Press the SPN button icon to scroll through fault codes.
    - Active fault codes will be displayed with the Engine Stop icon or Engine Warning icon indicator.
    - Previously active codes stored in the memory will also be displayed, with memory indicator icon.
3. When you reach the DTC code you wish to get more detailed information for, press the INFO icon button.
4. Each press of the INFO icon button will cycle through four pieces of data specific to the DTC: SPN number, FMI number, OC number, and SRC number.
    - SPN - Suspect Parameter Number: The System or Component fault.
    - FMI - Failure Mode Indicator: The type of failure and how it may have occurred.
    - OC - Occurrence Count: The number of times this failure has occurred.
    - SRC - Source: The CAN address of the ECU reporting the fault.
5. Each numeric code is accompanied by a scrolling text definition of the code. Note: Text definitions will only be displayed for fault codes defined by the SAE J1939 standard. Certain fault codes may be proprietary to specific engine manufacturers. Consult the engine manufacturer's shop manual for fault code definition and diagnostic information.
6. To return the Diagnostic Display to AUTO mode, press and hold the SPN icon button until the display switches from MAN to AUTO. The display will automatically go to AUTO mode in 30 seconds.

Diesel Particulate Filter Regeneration Controls

If the DPF indicator is on or blinking, the engine power may be reduced and a Stationary Regeneration may be necessary as follows:

1. Disconnect the generator from the load by opening the main circuit breaker and the branch circuit breakers for the receptacles.
2. Place the Run/Idle switch to the IDLE position.
3. Simultaneously press the Regeneration Mode icon button and SPN icon button.

Active Regeneration may occur anytime during normal operation, resulting in higher exhaust temperatures when active regeneration is occurring, the HEST lamp icon will illuminate. To prevent Active Regeneration:

1. Press and hold the Regeneration Mode icon button for 3 seconds. The Regeneration Inhibit lamp (10) will illuminate.
2. To cancel the Regeneration Inhibit, press and hold the Regeneration Mode icon button for 3 seconds. The Regeneration Inhibit lamp icon will go off.

Engine Diagnostic Trouble Codes (DTCs)

The following tables contain the diagnostic trouble codes common to the Cummins engines utilized in these generator models. A description of the fault condition can be determined by reading the SPN and the FMI from the Diagnostic Display. For more detailed fault information and troubleshooting information, consult the appropriate Cummins Service Manual.

SPN	FMI	Lamp	Comments	Fault Description	Cummins Fault Code
27	4	AMBER		EGR Valve Position Circuit - Voltage below normal, or shorted to low source	2272
81	16	AMBER		Engine Diesel Particulate Filter Intake Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	2754
95	16	AMBER		Fuel Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	2372
97	15	MAINTE NANCE		Water in Fuel Indicator - Data Valid but Above Normal Operational Range - Least Severe Level. Effect: Possible white smoke, loss of power, or hard starting.	418
97	3	AMBER		Water in Fuel Indicator Sensor Circuit - Voltage above normal, or shorted to high source	428
97	4	AMBER		Water in Fuel Indicator Sensor Circuit - Voltage below normal, or shorted to low source	429
100	3	AMBER		Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage Above Normal, or Shorted to High Source	135
100	4	AMBER		Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	141
100	18	AMBER	Torque Derate	Engine Oil Rifle Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level	143
100	1	RED	Speed Derate	Engine Oil Rifle Pressure - Data Valid but Below Normal Operational Range - Most Severe Level.	415
100	2	AMBER		Engine Oil Rifle Pressure - Data Erratic, Intermittent or Incorrect. Switch or Keyon Error.	435
101	16	AMBER		Crankcase Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	555
101	0	RED		Crankcase Pressure - Data Valid but Above Normal Operational Range - Most Severe Level	556
101	3	AMBER		Crankcase Pressure Circuit - Voltage Above Normal or Shorted to High Source	1843
101	4	AMBER		Crankcase Pressure Circuit - Voltage Below Normal or Shorted to Low Source	1844
101	2	AMBER		Crankcase Pressure - Data erratic, intermittent or incorrect	1942
102	3	AMBER	Power Gen Only	Intake Manifold 1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source.	122
102	4	AMBER	Power Gen Only	Intake Manifold 1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	123
102	2	AMBER		Intake Manifold 1 Pressure-Data Erratic, Intermittent, or Incorrect	2973
103	16	AMBER		Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Moderately Severe Level	595
103	18	AMBER		Turbocharger 1 Speed - Data Valid But Below Normal Operating Range - Moderately Severe Level	687
103	15	NONE		Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Least Severe Level	2288
105	3	AMBER		Intake Manifold 1 Temperature Sensor Circuit - Voltage Above Normal, or Shorted to High Source. Effect:Possible white smoke.	153
105	4	AMBER		Intake Manifold 1 Temperature Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Effect:Possible white smoke.	154
105	0	RED	Torque Derate	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Most Severe Level.	155
105	16	AMBER	Speed Derate	Intake Manifold 1 Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level.	488

SPN	FMI	Lamp	Comments	Fault Description	Cummins Fault Code
108	3	AMBER		Barometric Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source. Derate in Phase18 Core2 (52.7kPa)	221
108	4	AMBER		Barometric Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Derate in Phase18, Core2 (52.7kPa)	222
108	2	AMBER		AMBIENT_AIR_PRESS_KEYON_ERROR	295
110	3	AMBER		Engine Coolant Temperature 1 Sensor Circuit - Voltage Above Normal, or Shorted to High Source. Effect: Possible white smoke	144
110	4	AMBER		Engine Coolant Temperature 1 Sensor Circuit - Voltage Below Normal, or Shorted to Low Source. Effect: Possible white smoke	145
110	16	AMBER	Torque Derate	Engine Coolant Temperature - Data Valid but Above Normal Operational Range - Moderately Severe Level. Or Coolant Temperature Fueling Error	146
110	0	RED	Speed Derate	Engine Coolant Temperature - Data Valid but Above Normal Operational Range - Most Severe Level	151
110	14	RED	Power Gen Only	Engine Coolant Temperature - Indicates above engine protection warning limit. Gives external controller the opportunity to shutdown the engine with a cool down before FC151 is reached and shutdown without cool down occurs.	1847
111	3	AMBER		Coolant Level Sensor 1 Circuit - Voltage Above Normal, or Shorted to High Source.	195
111	4	AMBER		Coolant Level Sensor 1 Circuit - Voltage Below Normal, or Shorted to Low Source	196
111	18	AMBER		Coolant Level - Data Valid but Below Normal Operational Range - Moderately Severe Level	197
111	1	RED		Coolant Level - Data Valid but Below Normal Operational Range - Most Severe Level	235
157	0	RED/(YELLOW CM570)		Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Most Severe Level. ECM detects fuel rail pressure exceeded high-pressure relief valve. Effect: Fuel injection Noise. (Excessive fuel supply pressure detected at fuel pressure sensor, cm570)	449
157	3	AMBER		Injector Metering Rail 1 Pressure Sensor Circuit - Voltage Above Normal, or Shorted to High Source	451
157	4	AMBER		Injector Metering Rail 1 Pressure Sensor Circuit - Voltage Below Normal, or Shorted to Low Source	452
157	16	AMBER		Injector Metering Rail Pressure 1-	553
157	18	AMBER	replaces FC 2215 for accumulator pressure	Injector Metering Rail 1 Pressure - Data Valid but Below Normal Operational Range - Moderately Severe Level	559
157	0	AMBER		Injector Metering Rail 1 Pressure - Data Valid but Above Normal Operational Range - Most Severe Level. Mechanical high-pressure relief valve has tripped.	1911
168	18	AMBER		Battery 1 Voltage - Data Valid but Below Normal Operational Range - Moderately Severe Level. Effect: Engine can stop running or be difficult to start.	441
168	16	AMBER		Battery 1 Voltage - Data Valid but Above Normal Operational Range - Moderately Severe Level. Effect:Possible electrical damage to all electrical components.	442
168	17	AMBER		Battery 1 Voltage - Data Valid But Below Normal Operating Range - Least Severe Level	3724

SPN	FMI	Lamp	Comments	Fault Description	Cummins Fault Code
190	0	RED		Engine Crankshaft Speed/Position - Data Valid but Above Normal Operational Range - Most Severe Level. Effect: Fuel injection disabled until engine speed below overspeed limit	234
190	2	AMBER		Engine Crankshaft Speed/Position - Data Erratic, Intermittent, or Incorrect. Effect:Engine can run rough. Possibly poor starting. Runs using backup speed sensor. Engine power reduced.	689
190	16	RED	Power Gen Only	Engine Crankshaft Speed/Position - Data Valid but Above Normal Operational Range - Moderately Severe Level; Power Generation Operational Limit, 15% above rated.	1992
190	2	NONE		Engine Crankshaft Speed/Position - Data Erratic, Intermittent, or Incorrect	2321
411	2	AMBER		Exhaust Gas Recirculation Valve Delta Pressure - Data erratic, intermittent or incorrect	1866
411	3	AMBER		EGR_DELTA_P_OOR_HIGH_ERROR	2273
411	4	AMBER		EGR_DELTA_P_OOR_LOW_ERROR	2274
412	3	AMBER		Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage above normal, or shorted to high source	2375
412	4	AMBER		Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage below normal, or shorted to low source	2376
412	15	NONE		Exhaust Gas Recirculation Temperature-Data Valid but Above Normal Operational Range-Least Severe Level	2961
412	16	AMBER		Exhaust Gas Recirculation Temperature-Data Valid but Above Normal Operational Range-Moderately Severe Level **Engine will shut down on this fault code.	2962
612	2	RED		Engine Magnetic Crankshaft Speed/Position lost both of two signals - Data Erratic, Intermittent, or Incorrect. Effect: Fueling to Injectors disabled, engine will not start	115
627	12	AMBER		Injector Power Supply - Bad Intelligent Device or Component. Effect:Possible smoke, low power, engine misfire, and/or engine will not start.	351
627	2	NONE	replaces FC 434	Power Lost With Ignition On - Data Erratic, Intermittent, or Incorrect. ECM fell below 6.2V mementarily of ECM not allowed to power down correctly (retain battery voltage for 30 sec after key-off) Effect: Fault information, trip information, and maintenance monitor data can be inaccurate.	1117
629	12	RED	Effect:Engine May not Start	Engine Control Module Critical Internal Failure. Error internal to the ECM related to memory hardware failures or internal ECM voltage supply circuits. Effect: Engine may not start	111
629	12	AMBER		RAM_HARDWARE_ERROR or EEPROM_WRITE_ERROR or ECM_SW_MISSION_DISABLING_FAILURE_ERROR or POWEROFF_COMMAND_IGNORED_ERROR	343
629	31	RED		At Least One Unacknowledged Most Severe Fault - Condition Exists	2661
629	31	AMBER		At Least One Unacknowledged Moderately Severe Fault - Condition Exists	2662
630	12	RED		RAM_REFRESH_ERROR	3697
633	31	AMBER		Electronic Fuel Injection Control Valve Circuit - Condition Exists	2311
639	9	AMBER		SAE J1939 Multiplexing PGN Timeout Error - Abnormal Update Rate [Monitoring for PGN FEF1,8F00,E000]	285

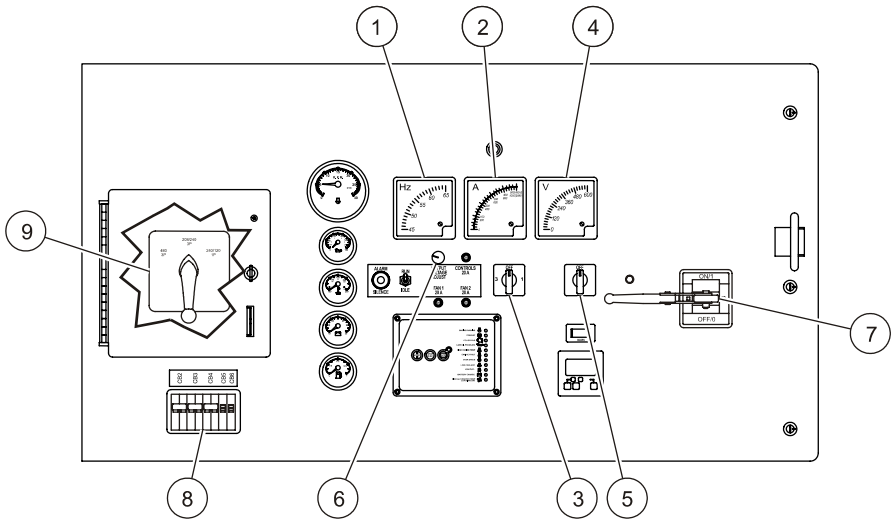
SPN	FMI	Lamp	Comments	Fault Description	Cummins Fault Code
639	13	AMBER		SAE J1939 Multiplexing Configuration Error - Out of Calibration. The ECM expected information from a multiplexed device but only received a portion of the necessary information. [Errors on PGN FEF1, 8F00,E000 Received by ECM]	286
639	2	NONE	Power Gen Only	SAE J1939 Datalink - Data Erratic, Intermittent, or Incorrect (Applies to PGNs FF69 and FF73)	426
639	9	NONE		SAE J1939 datalink - Abnormal update rate (FF69 and FF73)	427
641	13	AMBER		VGT Actuator Controller-Out of Calibration	1898
641	15	AMBER		VGT Actuator Driver Over Temperature (Calculated) - Data Valid But Above Normal Operating Range - Least Severe Level	1962
641	11	AMBER		VGT Actuator Driver Circuit - Root Cause Not Known	2198
641	7	AMBER		VGT Actuator Driver Circuit (Motor) - Mechanical system not responding or out of adjustment	2387
641	13	RED		VGT Actuator Controller - Out of Calibration	2449
641	12	RED		VGT Actuator Controller - Bad intelligent device or component	2634
641	31	RED		VGT Actuator Driver Circuit - Condition Exists	2635
641	9	RED		VGT Actuator Driver Circuit - Abnormal update rate	2636
647	4	AMBER		Fan Control Circuit - Voltage Below Normal, or Shorted to Low Source	245
647	3	AMBER		Fan Control Circuit-Voltage Above Normal or shorted to High Source. Effect: fan can stay on continuously or not run at all.	2377
651	5	AMBER		Injector Solenoid Driver Cylinder 1 Circuit - Current Below Normal, or Open Circuit. Effect: Engine misfire or possibly run rough	322
652	5	AMBER		Injector Solenoid Driver Cylinder 2 Circuit - Current Below Normal, or Open Circuit. Effect: Engine misfire or possibly run rough	331
653	5	AMBER		Injector Solenoid Driver Cylinder 3 Circuit - Current Below Normal, or Open Circuit. Effect: Engine misfire or possibly run rough	324
654	5	AMBER		Injector Solenoid Driver Cylinder 4 Circuit - Current Below Normal, or Open Circuit. Effect: Engine misfire or possibly run rough	332
655	5	AMBER		Injector Solenoid Driver Cylinder 5 Circuit - Current Below Normal, or Open Circuit. Effect: Engine misfire or possibly run rough	323
656	5	AMBER		Injector Solenoid Driver Cylinder 6 Circuit - Current Below Normal, or Open Circuit. Effect: Engine misfire or possibly run rough	325
723	7	AMBER		Engine Speed/Position Camshaft and Crankshaft Misalignment - Mechanical system not responding or out of adjustment. Effects: Possible smoke, hard start, and rough idle.	731
723	2	AMBER		EPS_Backup_No_Sync_Error	778
723	2	NONE		Engine Camshaft Speed/Position Sensor - Data Erratic, Intermittent, or Incorrect	2322
729	3	AMBER		Intake Air Heater 1 Circuit-Voltage Above Normal, or Shorted to High Source	2555
729	4	AMBER		Intake Air Heater 1 Circuit-Voltage Below Normal, or Shorted to Low Source	2556
1075	3	AMBER		Electric Lift Pump for Engine Fuel Supply Circuit - Voltage Above Normal, or Shorted to High Source	2265
1075	4	AMBER		Electric Lift Pump for Engine Fuel Supply Circuit - Voltage Below Normal, or Shorted to Low Source	2266
1110	31	RED		EGR inducement protection has shutdown engine.	3931
1172	3	AMBER		Turbocharger 1 Compressor Intake Temperature Circuit - Voltage above normal, or shorted to high source	691

SPN	FMI	Lamp	Comments	Fault Description	Cummins Fault Code
1172	4	AMBER		Turbocharger 1 Compressor Intake Temperature Circuit - Voltage below normal, or shorted to low source	692
1209	3	AMBER		EXHAUST_PRESS_OOR_HIGH_ERROR	2373
1209	4	AMBER		EXHAUST_PRESS_OOR_LOW_ERROR	2374
1209	2	AMBER		Exhaust Gas Pressure - Data erratic, intermittent or incorrect	2554
1347	4	AMBER		Fuel Pump Pressurizing Assembly 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Effect:Engine will run poorly at idle. Engine will have low power. Fuel pressure will be higher than commanded.	271
1347	3	AMBER		Fuel Pump Pressurizing Assembly 1 Circuit - Voltage Above Normal, or Shorted to High Source. Effect: Engine will not run or engine will run poorly.	272
1347	7	AMBER		Engine Fuel Pump Pressurizing Assembly 1-Mechanical System Not Responding Properly or Out of Adjustment	281
1378	31	MAINTE NANCE		Engine Oil Change Interval - Condition Exists	649
2791	13	AMBER		EGR Valve Controller - Out of Calibration	1896
2791	15	AMBER		EGR Valve Control Circuit Over Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	1961
2791	5	AMBER		EGR Valve Control Circuit - Current below normal or open circuit	2349
2791	6	AMBER		EGR Valve Control Circuit - Current above normal or grounded circuit	2353
2791	7	AMBER		EGR Valve Control Circuit - Mechanical System Not Responding Properly or Out of Adjustment. The EGR motor has exceeded the duty cycle limit, indicating a stuck open EGR valve.	2357
2797	13	NONE		Engine Injector Bank 1 Barcodes - Out of Calibration	2765
3242	16	RED		Aftertreatment Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	3253
3242	15	AMBER		Aftertreatment Diesel Particulate Filter Intake Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	3254
3242	0	RED		Aftertreatment Diesel Particulate Filter Intake Temperature - Data valid but above normal operational range - Most Severe Level	3311
3242	4	AMBER		Aftertreatment Diesel Particulate Filter Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	3316
3242	3	AMBER		Aftertreatment Diesel Particulate Filter Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	3317
3242	2	AMBER		Aftertreatment Diesel Particulate Filter Intake Temperature - Data erratic, intermittent or incorrect	3318
3246	16	RED		Aftertreatment Diesel Particulate Filter Outlet Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	3255
3246	15	AMBER		Aftertreatment Diesel Particulate Filter Outlet Temperature - Data Valid But Above Normal Operating Range - Least Severe Level	3256
3246	0	RED		Aftertreatment Diesel Particulate Filter Outlet Temperature - Data valid but above normal operational range - Most Severe Level	3312
3246	3	AMBER		Aftertreatment Diesel Particulate Filter Outlet Temperature Sensor Circuit - Voltage above normal, or shorted to high source	3319
3246	4	AMBER		Aftertreatment Diesel Particulate Filter Outlet Temperature Sensor Circuit - Voltage below normal, or shorted to low source	3321
3246	2	AMBER		Aftertreatment Diesel Particulate Filter Outlet Temperature - Data erratic, intermittent or incorrect	3322

SPN	FMI	Lamp	Comments	Fault Description	Cummins Fault Code
3251	3	AMBER		Aftertreatment Diesel Particulate Filter Differential Pressure Sensor Circuit - Voltage above normal, or shorted to high source	1879
3251	4	AMBER		Aftertreatment Diesel Particulate Filter Differential Pressure Sensor Circuit - Voltage below normal, or shorted to low source	1881
3251	2	AMBER		Aftertreatment Diesel Particulate Filter Differential Pressure Sensor - Data erratic, intermittent or incorrect	1883
3251	16	AMBER		Aftertreatment Diesel Particulate Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level	1921
3251	0	RED		Aftertreatment Diesel Particulate Filter Differential Pressure - Data valid but above normal operational range - Most Severe Level	1922
3509	4	AMBER		Sensor Supply 1 Circuit - Voltage Below Normal, or Shorted to Low Source. Effect: Loss of some sensor functionality	352
3509	3	AMBER		Sensor Supply 1 Circuit - Voltage Above Normal, or Shorted to High Source Effect: Loss of some sensor functionality	386
3510	4	AMBER		Sensor Supply 2 Circuit - Voltage Below Normal, or Shorted to Low Source. Effect:Loss of some sensor functionality. (camshaft engine position sensor, intake manifold pressure sensor, fuel supply pressure sensor, barometric air pressure sensor, or rail fuel pressure sensor.)	187
3510	3	AMBER		Sensor Supply 2 Circuit - Voltage Above Normal, or Shorted to High Source. Effect: Loss of some sensor functionality (camshaft engine position sensor, intake manifold pressure sensor, fuel supply pressure sensor, barometric air pressure sensor, or rail fuel pressure sensor)	227
3511	4	AMBER	Previous to Ph 18 was EPS_Main_Supply_OOR_Low_Error alone	Sensor Supply 3 Circuit - Voltage Below Normal, or Shorted to Low Source Effect: Loss of some sensor functionality (engine speed sensor) or EPS _Main_Supply_Low_Error	238
3511	3	AMBER	Previous to Ph 18 was EPS_Main_Supply_High_Error alone	Sensor Supply 3 Circuit - Voltage Above Normal, or Shorted to High Source Effect: Loss of some sensor functionality (engine speed sensor) or EPS_Main_Supply_High	239
3512	3	AMBER		Sensor Supply 4 Circuit - Voltage Above Normal, or Shorted to High Source. Effect: Loss of some sensor functionality [CM850:pin 22 50-pin OEM]	2185
3512	4	AMBER		Sensor Supply 4 Circuit - Voltage Below Normal, or Shorted to Low Source. Effect: Loss of some sensor functionality [CM850:pin22 50-pin OEM]	2186
3513	3	AMBER		SENSOR_SUPPLY_5_VOLTAGE_HIGH_ERROR	1695
3513	4	AMBER		SENSOR_SUPPLY_5_VOLTAGE_LOW_ERROR	1696
3514	3	AMBER		Sensor Supply 6 Circuit - Voltage above normal, or shorted to high source	515
3514	4	AMBER		Sensor Supply 6 Circuit - Voltage below normal, or shorted to low source	516
3597	18	AMBER		ECU Power Output Supply Voltage 1 - Data Valid But Below Normal Operating Range - Moderately Severe Level	1938
3610	3	AMBER		Aftertreatment Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source	3133

SPN	FMI	Lamp	Comments	Fault Description	Cummins Fault Code
3610	4	AMBER		Aftertreatment Diesel Particulate Filter Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source	3134
3610	2	AMBER		Aftertreatment Diesel Particulate Filter Outlet Pressure - Data erratic, intermittent or incorrect	3135
3703	31	NONE		Particulate Trap Active Regeneration Inhibited Due to Inhibit Switch - Condition Exists	2777
3936	7	AMBER		Aftertreatment Diesel Particulate Filter System - Mechanical system not responding or out of adjustment	3245
4765	16	RED		Aftertreatment Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level	3251
4765	4	AMBER		Aftertreatment Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage below normal, or shorted to low source	3313
4765	3	AMBER		Aftertreatment Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage above normal, or shorted to high source	3314
4765	2	AMBER		Aftertreatment Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect	3315
4765	13	AMBER		Aftertreatment Diesel Oxidation Catalyst Intake Temperature Swapped - Out of Calibration	3325
4795	31	AMBER		Aftertreatment Diesel Particulate Filter Missing - Condition Exists	1993
4796	31	AMBER		Aftertreatment Diesel Oxidation Catalyst Missing - Condition Exists	1664
5018	11	NONE		Aftertreatment Diesel Oxidation Catalyst Face Plugged - Root Cause Not Known	2637
5018	15	NONE		Aftertreatment Diesel Particulate Filter Differential Pressure - Data Valid But Above Normal Operating Range - Least Severe Level	2639
5298	18	AMBER		Aftertreatment Diesel Oxidation Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level	1691
5571	7	NONE		High Pressure Common Rail Fuel Pressure Relief Valve - Mechanical system not responding or out of adjustment	3727
5571	0	AMBER		High Pressure Common Rail Fuel Pressure Relief Valve - Data valid but above normal operational range - Most Severe Level	3741
524286	31	AMBER		EGR inducement shutdown is approaching. A fault that has a negative impact on engine emissions performance is active. (Temporary fault code to be used until fault code 4135 becomes available)	9258
TBD	TBD	AMBER		EGR inducement shutdown is approaching. A fault that has a negative impact on engine emissions performance is active.	4135

GENERATOR OPERATING PANEL



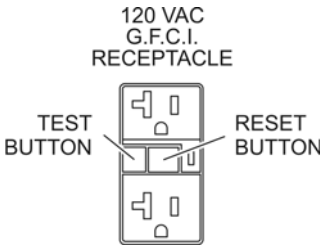
1. **Frequency Meter** - Indicates the output frequency in Hertz (Hz).
2. **AC Ammeter** - Indicates the amount of current the load is drawing from the generator per phase as selected by the Ammeter Phase-Selector switch (3).
3. **Ammeter Phase Selector Switch** - This switch allows the AC Ammeter to indicate the current flowing to the load connected to any phase of the output terminals, or to be switched off.
4. **AC Voltmeter** - Indicates the output voltage present at the output terminal lugs, as selected by the Voltmeter Phase Selector Switch (5).
5. **Voltmeter Phase Selector Switch** - This switch allows the AC Voltmeter to indicate phase-to-phase voltage or phase-to-neutral voltage for any of the output terminals or to be switched off.
6. **Voltage Adjust Control** - Allows approximately ± 8% manual adjustment of the generator's output voltage.
7. **Main Circuit Breaker** - This three-pole main breaker protects the L1, L2, and L3 output terminal lugs from overload.
8. **Receptacle Circuit Breakers** - These breakers protect the auxiliary power receptacles from overload.
9. **Voltage Selector Switch** - This switch enables easy selection of a variety of voltages on output terminal lugs L1, L2, and L3. The switch is accessed through a door on the control panel opening. Opening this door shuts down the generator. This switch must never be changed with the engine running.

OUTPUT TERMINAL PANEL FAMILARIZATION

120 VAC GFCI Receptacles

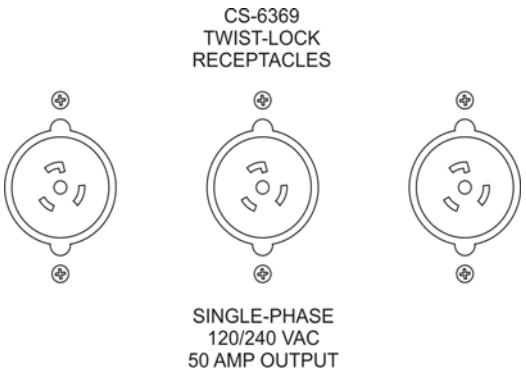
There are two 120 VAC, 20 amp GFCI (Duplex NEMA 5-20R) receptacles provided on the output terminal panel. These receptacles can be accessed in any voltage selector switch position. Each receptacle is protected by a 20 amp circuit breaker. These breakers are located behind the control panel access door above the receptacles. Remember that the load output current on the GFCI receptacles is in addition to the load applied to the L_1 and L_3 output terminal lugs.

Pressing the reset button resets the GFCI receptacle after being tripped. Pressing the test button on the receptacle will check the GFCI function. Both receptacles should be tested at least once a month.



Twist Lock Dual Voltage 120/240 VAC Receptacles

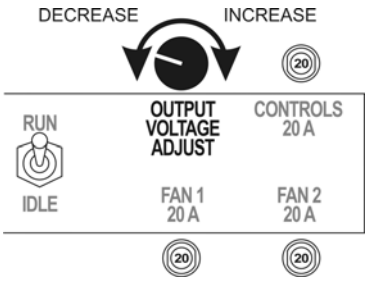
There are three 120/240V, 50 amp auxiliary twist-lock (CS6369) receptacles provided on the output terminal panel. These receptacles can be accessed in any Voltage Selector switch position.



Each auxiliary receptacle is protected by a 50 amp circuit breaker. These breakers are located behind the control panel access door above the receptacles. Remember the load output current on all three receptacles is in addition to the load applied to all of the output terminal lugs.

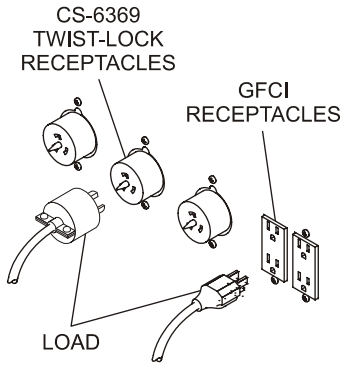
Voltage Adjustment

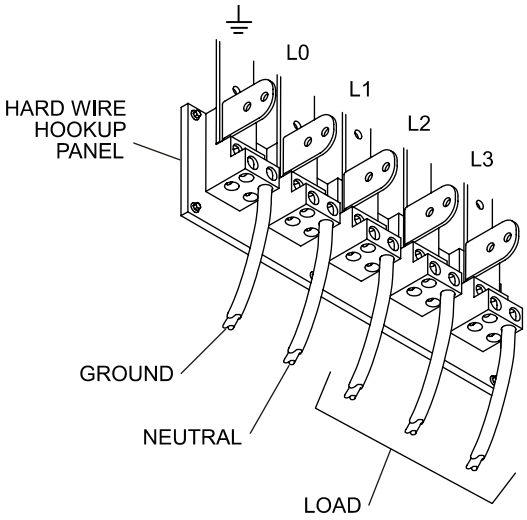
Turn the voltage regulator control knob on the control panel to obtain the desired voltage. Turning the knob clockwise will increase the voltage. Counter-clockwise will decrease the voltage.



Connecting Loads

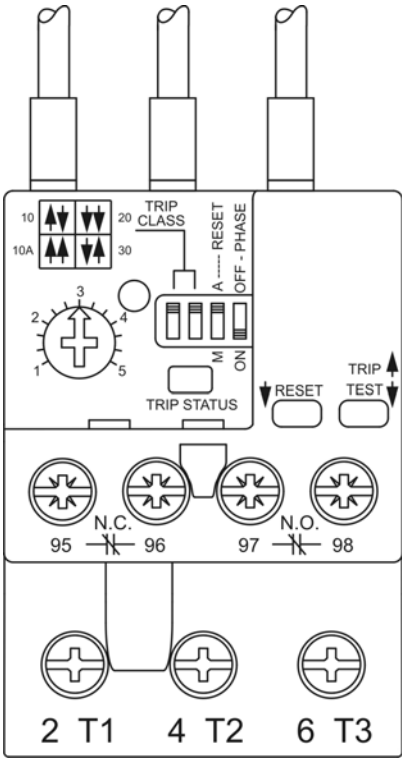
Loads can be connected to the generator by the output terminal lugs, the convenience receptacles or the optional camlock panel. Make sure to read the operation manual before attempting to connect a load to the generator. To protect the output terminals from overload, 3-pole main circuit breaker is provided. Make sure to switch ALL circuit breakers to the OFF position prior to starting the engine.





Over Current Relay

An over current relay is connected to the main circuit breaker. In the event of an overload, both the circuit breaker and the over current relay may trip. If the circuit breaker can not be reset, the overcurrent relay will automatically reset approximately one minute after a trip. The overcurrent relay is located in the operator service panel and is factory set for automatic reset.



Terminal Panel

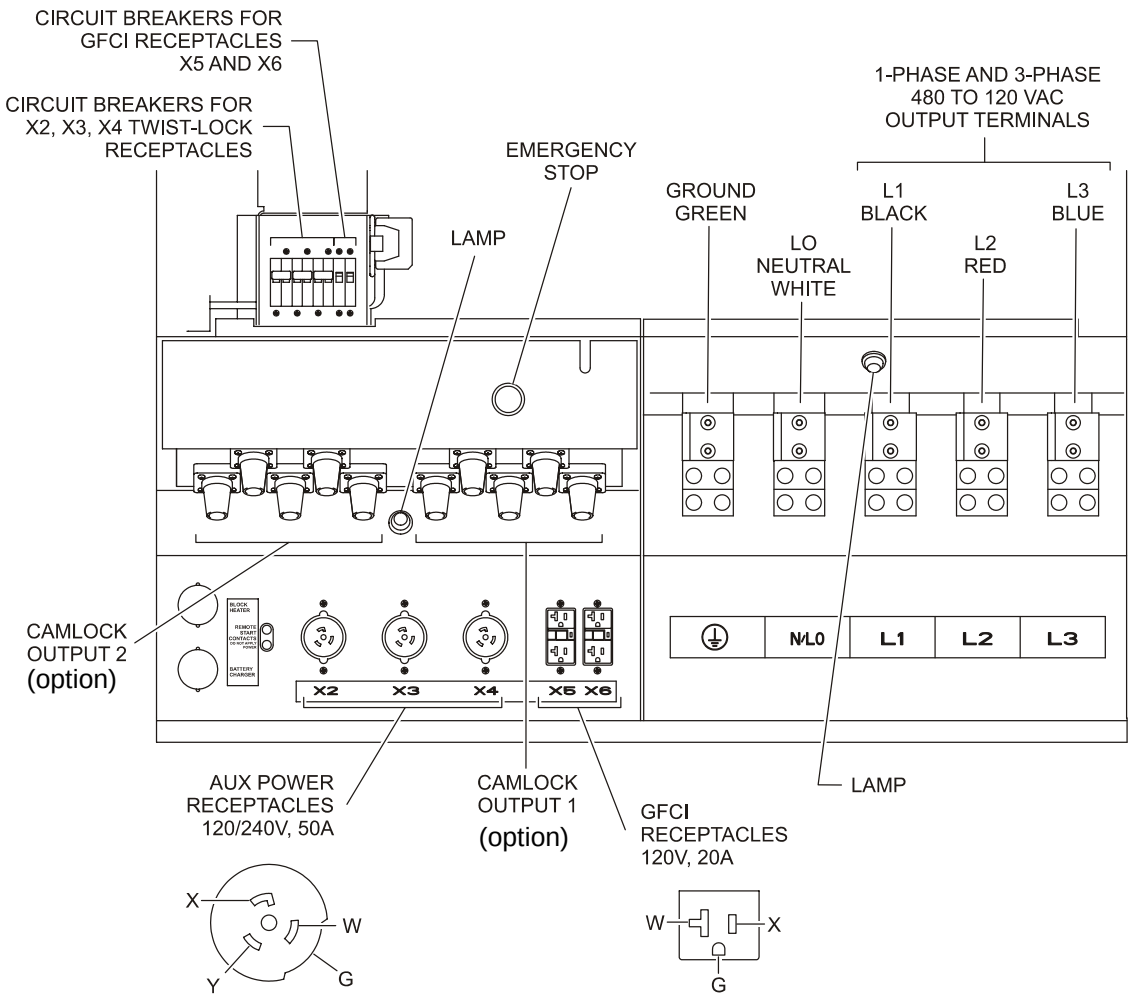
The output terminal panel is located at the rear of the generator. Use a screwdriver to open the two latches on the hinged doors to gain access to the receptacles and optional camloks on the left side. The main output terminal lugs are behind the door on the right side.

Lamps provide illumination to make connections when the access doors are open.

The Output Terminal Panel is proved with the following:

- Three (3) 120/240V, 50 Amp receptacles (CS6369)
- Three (3) Circuit Breakers @ 50 Amp
- Two (2) 120 V GFCI, 20 Amp receptacles (NEMA 5-20R)
- Two (2) GFCI Circuit Breakers @ 20 Amp
- Five (5) Output Terminal Lugs (L1, L2, L3, L0, Ground) with multiple options. For connecting terminated or bare wire cable up to 500 mcm.

NOTE: Terminal lugs “L0” and “Ground” are factory supplied bonded to Frame.



GENERATOR LOAD APPLICATION POWER REQUIREMENTS

Single Phase Loads

⚠ DANGER

Before connecting this generator to any building's electrical system, a licensed electrician must be consulted.

Always be sure to check the nameplate on the generator and equipment to insure the kVA/ wattage, amperage, frequency, and voltage requirements are satisfactorily supplied by the generator for operating the equipment.

Generally, the kVA/wattage listed on the nameplate of the equipment is its rated output. Equipment loads may require 130-150% more wattage than the rating on the nameplate, as the wattage is influenced by the efficiency, power factor and starting system of the equipment.

NOTE: If wattage is not given on the equipment's nameplate, approximate wattage may be determined by multiplying nameplate voltage by the nameplate amperage (WATTS =VOLTAGE x AMPERAGE).

The power factor of this generator is 0.8. See table below when connecting loads.

Power Factor of Common Loads	
Type of Load	**Power Factor**
Induction Motors	0.5 - 0.9
Electric heaters, incandescent lamps	1.0
Fluorescent lamps, mercury lamps	0.95 - 0.97
Electronic devices, communication equipment	1.0
Common power tools, transformers	0.8 - 0.95
3-Phase UPS (Rectifier)	0.7 - 1.0 Lagging
3-Phase UPS (Inverter)	0.7 - 0.95 Leading

Extension Cables

When electric power is to be provided to various tools or loads at some distance from the generator, extension cords are normally used. Cables should be sized to allow for distance in length and amperage so the voltage drop between the generator and point of use (load) is held to a minimum. Use the cable selection chart as a guide for selecting proper extension cable size.

Receptacle Cable Selection (60 Hz, Single Phase Operation)							
Current in Amperes	Load in Watts		Maximum Allowable Cable Length				
	At 120 volts	At 240 volts	#10 wire (ft)	#12 wire (ft)	#14 wire (ft)	#16 wire (ft)	#8 wire (ft)
2.5	300	600	1200	750	475	300	
5	600	1200	600	325	240	150	
7.5	900	1800	400	250	160	100	
10	1200	2400	300	190	120	75	
15	1800	3600	200	125	80		
20	2400	4800	150	95	60		
50	6000	12000					100

An inadequate size connecting cable which cannot carry the required load can cause a voltage drop which can burn out the appliance or tool and overheat the cable.

- When connecting a resistance load such as an incandescent lamp or electric heater, a capacity of up to the generating set's rated output (kW) can be used.
- When connecting a fluorescent or mercury lamp, a capacity of up to the generator set's rated output (kW) multiplied by 0.95 can be used.

Three Phase Load

When calculating the power requirements for 3-phase power use the following equation:

$$\frac{\text{KVA} = \text{VOLTAGE} \times \text{AMPERAGE} \times 1.732}{1000}$$

NOTICE

If 3-Phase load (KVA) is not given on the equipment nameplate, the approximate 3-Phase load may be determined by multiplying voltage by amperage by 1.732.

NOTICE

Motors and motor-driven equipment draw much greater current for starting than during operation.

GENERATOR OUTPUTS

Generator Amperage at 60 Hz

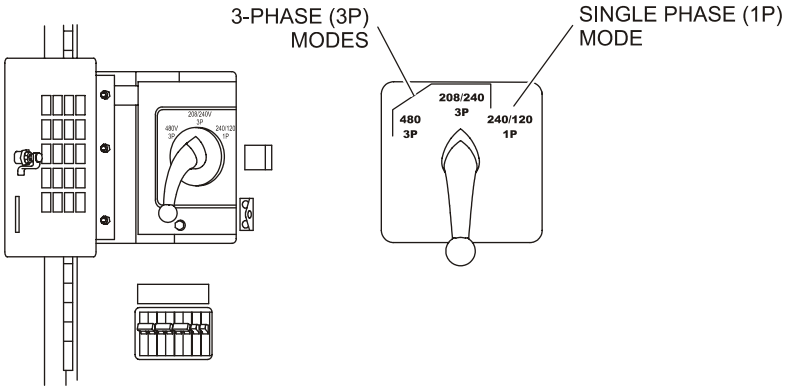
The following tables describe the generator's maximum current output capability for both single phase and 3-phase applications. At 60 Hz, do not exceed the maximum amps as listed.

Generator Output Voltages at 60 Hz

A wide range of voltages are available to supply power for many different applications. Voltages are selected by repositioning the Voltage Selector switch. To obtain some of the voltages as listed in the following tables will require a find adjustment using the Voltage Adjust Control knob located on the control panel.

Voltage Selector Switch

The Voltage Selector switch is located in the control box behind the generator control panel access door. This switch has been provided for ease of voltage selection.



⚠ CAUTION

Never attempt to change the Voltage Selector switch while the generator is in operation. Severe damage to the generator will occur. Opening the switch access door will shut down the generator.

Voltages Available (Switchable)						
3-Phase	208V	220V	240V	416V	440V	480V
Single Phase	120V	127V	139V	240V	254V	277V

Standard Model Ratings

Generator Ampere Rating Single Phase								
When connected in 3-Phase modes 480V/600V or 208V								
Models	kW	120V	139V	240V	277V	346V	480V	600V
G150WCU-3A	120	284	288	167	144	116	83	67
G190WCU-3A	155	380	372	215	187		108	
G240WCU-3A	190	462	456	264	229		132	
G325WCU-3A	261	667	626	362	314		181	

Calculations reflect the maximum amount of current the generator can provide at each output terminal pair. To obtain the total generator amperage, multiply by 3.

Example 1: 667 amps @ 120V per output terminal pair x 3 = 2001 amps.

Example 2: 362 amps @ 240V per terminal pair x 3 = 1086 amps.

Generator Ampere Rating 3-Phase					
Models	kVA	208V	240V	480V	600V
G150WCU-3A	150	355	361	180	144
G190WCU-3A	194	475	467	234	
G240WCU-3A	238	577	573	286	
G325WCU-3A	326	833	784	392	

Generator Ampere Rating Single-Phase when connected in Single-Phase mode 240/120V			
Models	kW	120V	240V
G150WCU-3A	75	313	313
G190WCU-3A	88	367	367
G240WCU-3A	109	454	454
G325WCU-3A	158	658	658

“Quad Voltage” Model Ratings

Optional Generator Ampere Rating Single Phase								
When connected in 3-Phase modes 480V/600V or 208V								
Models	kW 480/600	120V	139V	240V	277V	346V	480V	600V
G150WCU-3Q	120/120	284	288	167	144	116	83	67
G190WCU-3Q	152/152	356	365	211	183	146	106	84
G240WCU-3Q	176/190	411	422	244	212	183	122	106
G325WCU-3Q	240/260	567	576	333	289	250	167	144

Calculations reflect the maximum amount of current the generator can provide at each output terminal pair. To obtain the total generator amperage, multiply by 3.

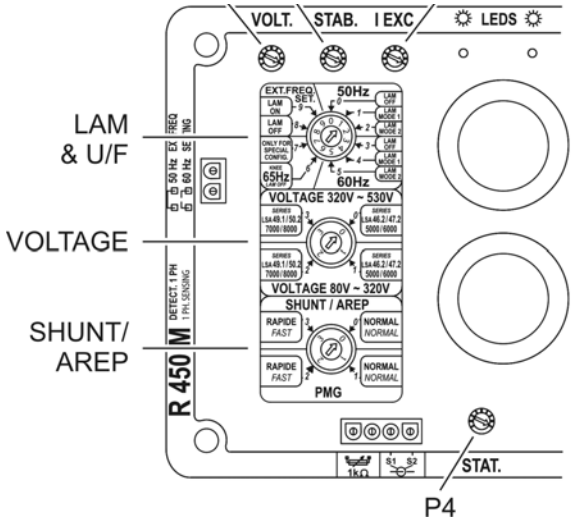
Example 1: 567 amps @ 120V per output terminal pair x 3 = 1701 amps.

Example 2: 333 amps @ 240V per terminal pair x 3 = 999 amps.

Optional Generator Ampere Rating 3-Phase					
Models	kVA 480/600	208V	240V	480V	600V
G150WCU-3Q	150/150	355	361	180	144
G190WCU-3Q	190/190	444	457	229	183
G240WCU-3Q	220/238	514	529	265	229
G325WCU-3Q	300/325	708	722	361	313

Optional Generator Ampere Rating Single-Phase when connected in Single-Phase mode 240/120V			
Models	kW	120V	240V
G150WCU-3Q	75	313	313
G190WCU-3Q	95	396	396
G240WCU-3Q	110	458	458
G325WCU-3Q	150	625	625

Generator Output Voltages at 50 Hz

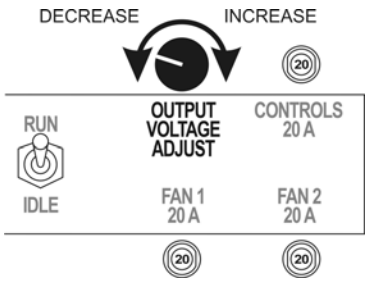


Action	Factory setting	Pot.
Voltage minimum fully anti-clockwise	400 V - 50 Hz	P1
Stability	Not set (centre position)	P2
Excitation ceiling - Factory-sealed	10 A maximum	P3
Voltage quadrature droop (// operation with C.T.) - 0 quadrature droop fully anti-clockwise	Not set (fully anti-clockwise)	P4

The generator models listed in this manual are capable of being configured to provide 50 Hz power. To prepare the generator for 50 Hz operation do the following:

1. Power down the generator and disconnect all loads by opening the main current breaker.
2. Use a screwdriver to access the Generator Service Panel.
3. Locate the Frequency Selector Toggle Switch and set to 50 Hz.
4. Locate the Voltage Regulator and set the top switch to Position 2, 50 Hz, LAM Mode 2.
5. Close and latch the Service Panel Access Door.
6. Set the Voltage Selector Switch to 480V, 3-Phase switch. Latch the VSS access door closed.
7. Set the Voltage Meter Phase Selector Switch to the L1-L2 position.
8. Start the generator utilizing the normal start procedure.
9. Verify the voltage reading on the voltmeter. Use the voltage adjust knob to set the voltage to 400 volts.

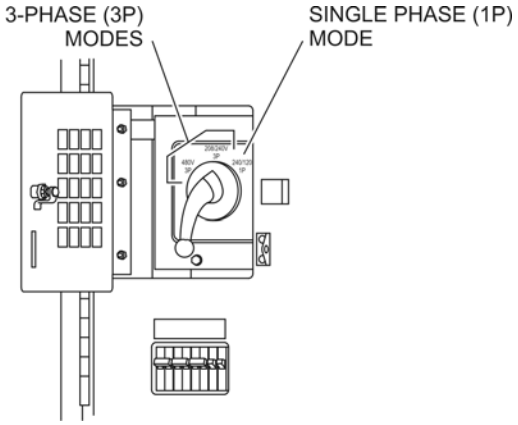
To obtain the voltage listed in table below will require a find adjustment using the Voltage Adjust Control Knob located on the control panel.



Voltages Available (Switchable)						
3-Phase	208V	220V	240V	416V	440V	480V
Single Phase	120V	127V	127V	240V	254V	277V

Voltage Selector Switch

The Voltage Selector switch is located in the control box, behind the generator control panel access door. This switch has been provided for ease of voltage selection.



Voltage Available
Three Phase 400V (480V Position)
Single Phase 230V

⚠ CAUTION

Never attempt to change the Voltage Selector switch while the generator is in operation. Severe damage to the generator will occur. Opening the switch access door will shut down the generator.

Generator Amperage at 50 Hz

The tables below describe the generator's maximum current output capability for both single phase and 3-phase applications. At 50 Hz, do not exceed the maximum amps as listed.

Generator Ampere Rating Single Phase when connected in 3-Phase mode 400V		
Model	**kW**	**230V AMPS**
G150WCU-3Q	108	157
G190WCU-3Q	132	191
G240WCU-3Q	144	209
G325WCU-3Q	196	384

Calculations reflect the maximum amount of current the generator can provide at each output terminal pair. To obtain the total generator amperage, multiply by 3.

Example 1: 290 amps @ 230V per output terminal pair x 3 = 870 amps.

Example 2: 139 amps @ 230V per terminal pair x 3 = 417 amps.

Generator Ampere Rating 3-Phase		
Model	**kVA**	**400V AMPS**
G150WCU-3Q	135	195
G190WCU-3Q	165	238
G240WCU-3Q	180	260
G325WCU-3Q	245	354

Generator Outputs/Meter Reading

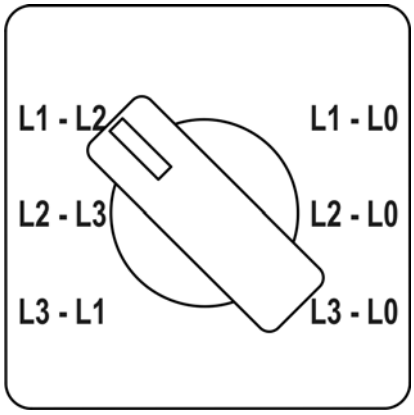
How to Read the Output Terminal Meters

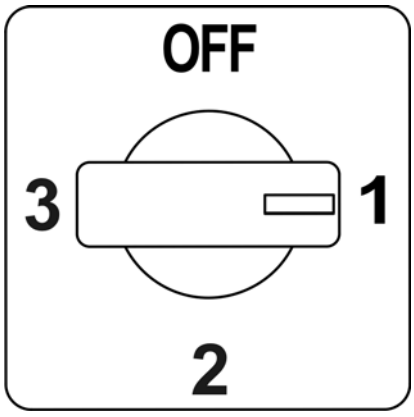
The AC Ammeter and AC Volt Meter switches on the control panel do not effect the generator output. They are provided to help observe how much power is being supplied at the main terminal lugs.

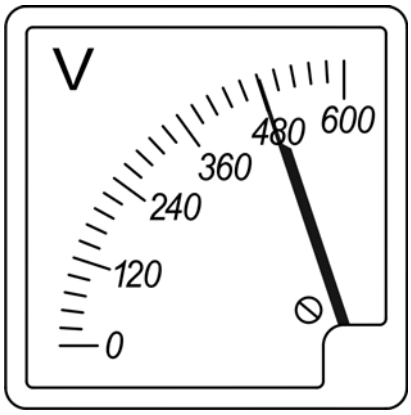
Set the AC Volt Meter switch to the L1-L2 position to read the voltage between L1-L2 on the main terminal lugs (see below). Set the AC Ammeter switch to the “1” position to read the current on L1.

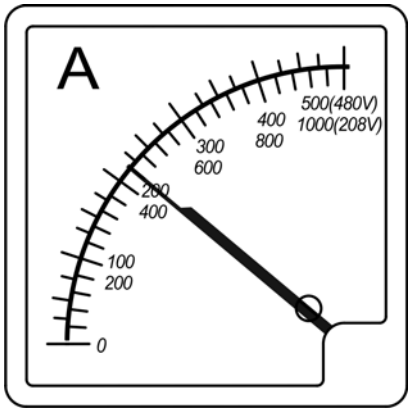
NOTICE

The Ammeter will only show a reading when the Output Terminal Lugs are connected to a load and in use.









Output Terminal Panel Connections

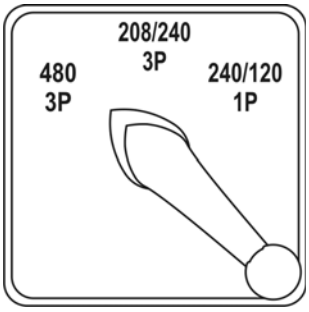
Main Terminal Output Voltages

Various output voltages can be obtained using the MAIN output terminal lugs. The voltages at the terminals are dependent on the position of the Voltage Selector switch and the setting of the Voltage Adjust Control Knob.

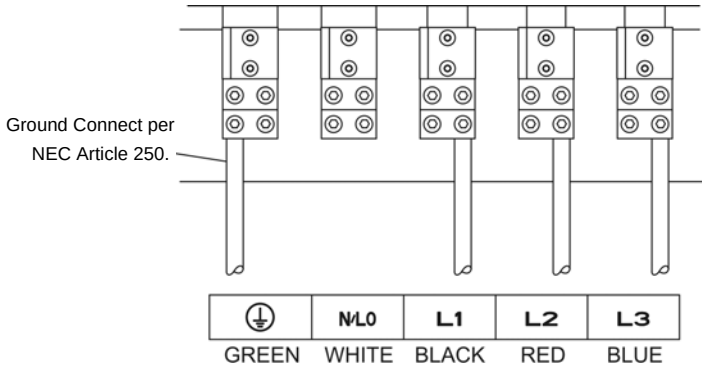
Remember the Voltage Selector Switch determines the range of the output voltage and can be configured in three different position that provide 6 different output voltages at the MAIN output terminals. The generator is shipped from the factory in the 480V configuration. The Output Voltage Adjustment Knob allows the user to increase or decrease the selected voltage.

3-Phase 480V MAIN Terminal Output Voltages

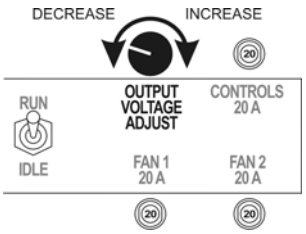
1. Position the Voltage Selector switch for 480V operation as shown below.



2. Connect the load wires to the MAIN terminals as shown below.



3. Turn the Output Voltage Adjust Knob shown below clockwise to increase voltage output. Turn counter clockwise to decrease voltage output. Use Output Voltage Adjustment Knob whenever fine tuning of the output voltage is required.

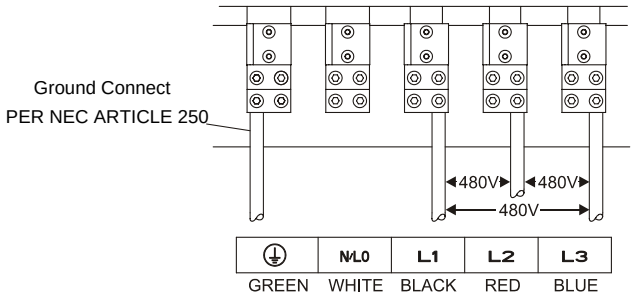


NOTICE

Always make sure that the connections to the MAIN terminals are secure and tight. The possibility of arcing exists, that could cause a fire.

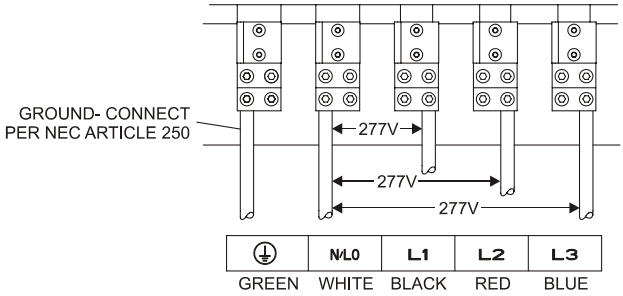
Three Phase 480V Main Terminal Output Voltages

1. Make sure the Voltage Selector switch is set for 480V operation.
2. Connect the load wires to the MAIN terminals as shown.



Single Phase 277V Main Terminal Output Voltages

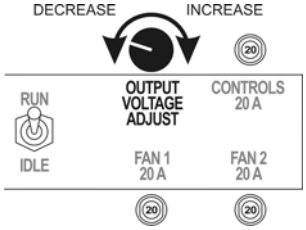
1. Make sure the Voltage Selector switch is set for 480V operation.
2. Connect the load wires to the MAIN terminals.
3. All load currents should be balanced within 25% of each other.



4. Connect the load wires to the MAIN terminals.

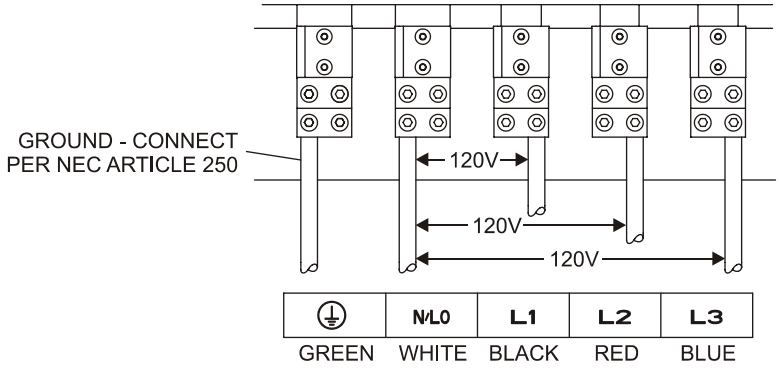
3- Phase 208V or 240V Main Terminal Output Voltages

1. Position the Voltage Selector switch is set for 208/240V 3-Phase operation.
2. Connect the load wires to the MAIN terminals.
3. Turn the Voltage Adjust knob clockwise to increase voltage output, turn counterclockwise to decrease voltage output. Use voltage adjustment knob whenever fine tuning of the output voltage is required or when adjusting from 240V to 208V.



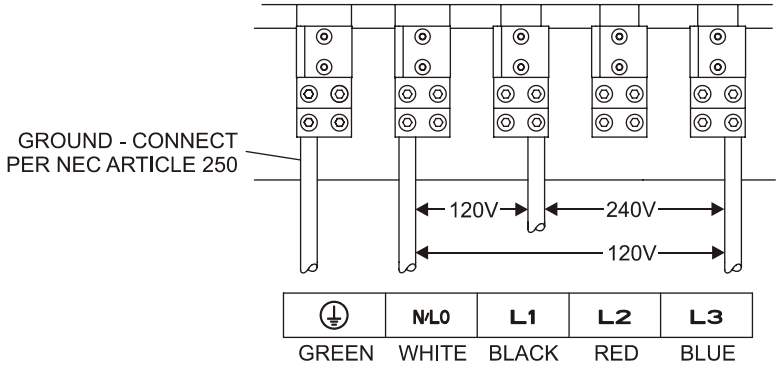
Single Phase-120V Main Terminal Output Voltages when connected in 3-Phase output mode.

1. Make sure the Voltage Selector switch is set for 208V 3-Phase operation as shown.
2. Set the Voltage Adjust knob for an output of 208V to obtain 120V at the main terminals.
3. Connect the 120V load wires to the MAIN terminals as shown.
4. All load currents should be balanced within 25% of each other.



Single Phase-120/240V Main Terminal Output Voltages

1. Make sure the Voltage Selector switch is set for 240/120V operation as shown.
2. Connect the load wires to the main terminals as shown.
3. Do not connect to L2.



Output Voltage Selection/Adjustments/Setup 50 Hz

⚠ DANGER

This set up procedure shall be performed only by knowledgeable qualified persons. Ensure all external electrical connections are disconnected. Use extreme CAUTION when working on electrical components. Battery voltage (12V or 24V) is present unless the battery cables are disconnected. Higher voltage (potentially 400V) is present at all times when the engine is running.

The generator set may be equipped with both panel convenience receptacles (230V,1-phase) and direct wiring hook-ups. Any of the voltage described below are obtainable by connection to the direct hook-up terminal block.

NOTICE

Do not hook-up electrical loads until following adjustments have been completed, otherwise damage to the equipment may result.

Setup Procedure

Before starting and making electrical connections:

1. Open the control panel door to access the generator service panel.
2. Select 50 Hz on the 50/60 Hz toggle switch on the AVR panel.
3. Select Position “2”, 50 Hz LAM Mode 2 on the rotating switch, LAM and U/F located on the R450M voltage regulator.
4. Close and Latch the panel door.
5. Open the Voltage Selector switch door.
6. Position the Voltage Selector switch to the 480V, 3-phase position.
7. Close and latch the Voltage Selector switch door.
8. Start the unit per the Engine Operating section instructions.

⚠ DANGER

Electric power is present at all times when the Generator Set Engine is running.

9. Fine tuning of the Voltage Adjustments are same as for 60 Hz.

Output Voltage Selection/Adjustments/Setup 60 Hz

⚠ DANGER

This set up procedure shall be performed only by knowledgeable qualified persons. Ensure all external electrical connections are disconnected. Use extreme CAUTION when working on electrical components. Battery voltage (12V or 24V) is present unless the battery cables are disconnected. Higher voltage (potentially 480V) is present at all times when the engine is running.

The generator set may be equipped with both panel convenience receptacles (120V and 240V, 1-phase) and direct wiring hook-ups. Any of the voltage described below are obtainable by connection to the direct hook-up terminal block.

NOTICE

Do not hook-up electrical loads until following adjustments have been completed, otherwise damage to the equipment may result.

Setup Procedure

Before starting and making electrical connections:

1. Open the Control Panel door to access the Control Box.
2. Select 60 Hz on the 50/60 Hz toggle switch on the AVR panel.
3. Select position “5”, 60 Hz LAM mode 2 on the rotating switch, LAM and U/F located on the R450M voltage regulator.
4. Close and Latch the panel door.
5. Open the Voltage Selector switch door.
6. Position the Voltage Selector switch to the desired voltage.
7. Close and latch the Voltage Selector switch door.
8. Start the unit per the Engine Operating section instructions.

⚠ DANGER

Electric power is present at all times when the Generator Set Engine is running.

9. Fine tuning of the Voltage Adjustments are as follows:

Switch Position - 208/240V 3 Phase

1. Turn Volt Meter Selector Switch to L_1-L_2 position.
2. Turn Output Voltage Adjust Knob to read 208V on AC Voltmeter.
3. Turn Volt Meter Selector Switch to L_2-L_3 position and verify 208V ± 5%.
4. Turn Volt Meter Selector Switch to L_3-L_1 position and verify 208V ± 5%.
5. Power is available on all panel receptacles.
6. Turn Volt Meter Selector Switch to L_1-L_0 position and verify 120V ± 5%.
7. Shutdown unit.
8. Make 120/208V connections at the direct hook-up terminal blocks.
9. At start-up, 120/208V will be present.

Switch Position - 277/480V 3 Phase

1. Turn Volt Meter Selector Switch to L_1-L_0 position.
2. Turn Output Voltage Adjust Knob to read 277V on AC Voltmeter.
3. Turn Volt Meter Selector Switch to L_2-L_0 position and verify 277V ± 5%.
4. Turn Volt Meter Selector Switch to L_3-L_0 position and verify 277V ± 5%.
5. Power is available on all panel receptacles.
6. Turn Volt Meter Selector Switch to L_1-L_2 position and verify 480V ± 5%.
7. Shutdown unit.
8. Make 277/480V connections at the direct hook-up terminal blocks.
9. At start-up, 277/480V will be available at the direct hook-up terminal blocks.

NOTICE

Applying single-phase loads or receptacle loads when in 3-phase voltage selections positions can cause unbalanced loading of windings in excess of the maximum recommended, which may shorten alternator life.

Switch Position - 240/120V 1Phase

1. Turn Volt Meter Selector Switch to L_1-L_3 position.
2. Turn Output Voltage Adjust knob to read 240V on AC Voltmeter.

⚠ CAUTION

When the Voltage Selector Switch is configured for 120/240-1P operation, L_2 is approximately 60V, Do not use L_2 due to the likelihood of equipment damage.

3. Turn Voltage Output Monitor to L_1-L_0 position and verify 120V ± 5%.
4. Turn Voltage Output Monitor to L_3-L_0 position and verify 120V ± 5%.
5. Power is available on all panel receptacles.
6. Shutdown unit.
7. Make 120/240V connections at either the panel receptacles or the direct hook-up terminal blocks.
8. At start-up, 120/240V will be present.

It may be necessary to check the voltage at the end of long drop cord and increase the voltage to compensate for losses.

Voltages required other than those specified above may be adjustable within the following ranges. Follow the National Electrical Code and Local Codes. DO NOT exceed recommended voltage output to equipment.

Output Voltage Adjustment Ranges

	Voltage Adjustment Range	
Selector Switch Position	Line-Neutral	Line-Line
	L_1-L_0	L_1-L_3
208/240 3 P	120V-142V	207V-245V
480/277 3 P	240V-285V	415V-490V
240/120 1 P	103V-123V	207V-245V
600 V Mode 480/277 3P	300-356	519-613

Before Starting

1. Check for fluid leaks.
2. Check for excessive fluid level in containment base.
3. Check engine oil and coolant level.

⚠ WARNING

Do not remove the cap from a HOT engine radiator. The sudden release of pressure from a heated cooling system can cause severe injury or death.

4. Check proper grounding circuit. Refer to section on Safety-Grounding.
5. Check for frayed or loose fan belts, hoses or wiring insulation.
6. Check for leaves, paper, debris in air vents.
7. Check Fuel Level. Add CLEAN diesel fuel.
8. Set the Voltage Selector Switch for desired voltage range and close and latch the Voltage Selector Switch door.
9. Turn Battery Disconnect switch ON.
10. Close enclosure doors for proper cooling performance and noise control.
11. Ensure load wiring connections are tight. Close and latch the main terminal direct hookup panel door.

STARTING (MANUAL)

⚠ CAUTION

Do NOT use engine starting fluids.

⚠ DANGER

POWER is present upon cranking the engine.

⚠ CAUTION

Allow starter to cool for one minute between start attempts. If engine does not start after a few attempts, refer to Trouble Shooting Section.
If engine shuts down, diagnostic lamps will indicate the problem. Correct the problem before continuing.

Verify the following:

1. Select IDLE on the Run/Idle switch on the Control Panel.
2. All external electrical power loads are turned “OFF”.
3. Main Breaker is “OFF”.
4. Battery Disconnect Switch is “ON”.
5. Ensure that both the Voltage Selector switch and Direct Hookup Doors are closed and latched.
6. Reset (pull to unlatch) Emergency Stop Button.
7. Press the Engine “START” Button.
8. Wait for preheating if enabled. The green pre-heat lamp will glow during pre-heating time of 10 seconds.
9. When pre-heating is complete, the engine will crank for up to 10 seconds and the green engine running lamp will blink.
10. Once engine starts, the green engine running lamp and engine ECU status lamps will glow.
11. Allow the engine to warm up for 1 to 2 minutes. If the engine stops unexpectedly, refer to Troubleshooting section.
12. Select RUN on the Run/Idle switch. The engine will go to 1800 RPM.
13. Check the Control Panel for proper voltages. Adjust voltage with the Voltage Adjust knob as needed. Red diagnostic lamps should not be glowing. Otherwise, shutdown the unit and refer to Troubleshooting section.
14. With main breaker “ON” power is present and available for use.
15. Close side doors for optimum cooling of the unit while running.

STOPPING

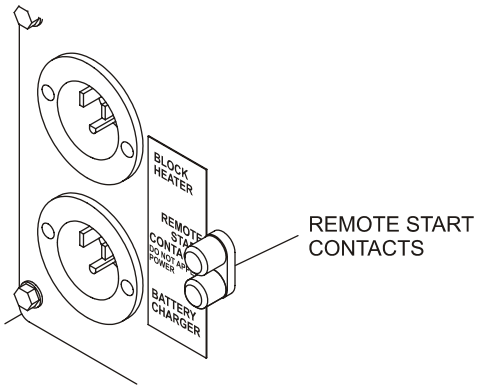
⚠ CAUTION

Use the EMERGENCY STOP button ONLY in the event of an emergency. NEVER use it for normal shut-down.

1. Turn off all external electrical power loads.
2. Turn Main Breaker “OFF”.
3. Set Run/Idle Switch to IDLE. Allow 5 minute cool down.
4. Push Engine “STOP/RESET” button on the Engine Control Module. Do NOT push the Emergency Stop button for normal shutdown.
5. Wait at least 15 seconds before restarting.
6. Fill fuel tank at end of working day to prevent condensate build-up in fuel tank.

REMOTE STARTING AND STOPPING (AUTO MODE)

1. Connect the remote start contacts (located in the Receptacle panel) to a customer-supplied dry. No power or ground) contact that closes to initiate a genset start.



2. Make sure the Run/Idle switch on the Control Panel is in the RUN position
3. Push the Autostart Mode switch to illuminate the Autostart Mode Lamp on control module. The green Auto-Start mode lamp will glow.
4. The generator circuit breakers must be turned ON.
5. When the customer contact closes, a 10-second warning alarm will sound prior to each of three crank cycles until the engine starts. Preheating will also occur if enabled, simultaneously with the warning alarm.
6. If the engine does not start after three attempts, automatic Autostart /Stop will be disabled. Refer to Troubleshooting.
7. The engine will stop when the customer-supplied contact opens, and the controller will return to the Auto Start Mode, until the Stop/Reset button is pressed.

Maintenance

Maintenance

⚠ CAUTION

Any unauthorized modification or failure to maintain this equipment may make it unsafe and potentially void the factory warranty.

⚠ WARNING

Before attempting any repair service, disconnect engine battery cables and all leads to electrical power loads. Failure to do so can result in severe personal injury, death or damage to the equipment.

General

In addition to periodic inspections, many of the components in this unit requires periodic servicing to provide maximum output and performance. Servicing may consist of pre-operation and post-operation procedures to be performed by the operating or maintenance personnel. The primary function of preventive maintenance is to prevent failure and consequently, the need for repair. Preventive maintenance is the easiest and the least expensive type of maintenance. Maintaining your unit and keeping it clean at all times will facilitate servicing.

Scheduled Maintenance

The maintenance schedule is based on normal operation of the unit. In the event unusual environmental operating conditions exist, the schedule should be adjusted accordingly.

Wiring Routing Clamps

Daily check for loose wire routing clamps. Clamps must be secure and properly mounted. Also check wiring for wear, deterioration and vibration abrasion.

Wiring Insulation

Daily check for loose, or frayed wiring insulation or sleeving.

Electrical Terminals

Check daily for evidence of arcing around electrical terminals.

Grounding Circuit

Daily check that the grounding circuit is in accordance with the National Electrical Code Article 250 and the local code requirements. As a minimum, the copper wire size should be American Wire Gauge 8 (AWG#8) from the grounding terminal, frame and generator.

Hoses

Each month it is recommended that the intake hoses from the air cleaner and all flexible hoses used for water and fuel be inspected for the following:

1. All rubber hose joints and the screw type hose clamps must be tight and the hoses showing no signs of wear, abrasion or deterioration.
2. All flexible hoses must be free of wear, deterioration and vibration abrasion. Routing clamps must be secure and properly mounted.

Fuel/Water Separator

Daily check for water in the fuel filter/water separator unit. Some engines have a translucent bowl for visual indication, and others have a drain valve below the primary element.

Every six months or 500 hours, or less if fuel is of poor quality or contaminated, replace the bowl element(s).

Air Vents

Daily clean the air vents of any obstruction or debris.

Air Cleaner

Proper maintenance of the air cleaner provides maximum protection against airborne dust. Squeeze the rubber valve (precleaner dirt dump periodically to ensure that it is not clogged).

To service the air cleaners, proceed as follows:

1. Remove filter element.
2. Inspect air cleaner housing for any condition that might cause a leak and correct as necessary.
3. Wipe inside of air cleaner housing with a clean, damp cloth to remove any dirt accumulation. This will permit better seal for gasket on filter element.
4. Install element.

The air cleaner assembly (housing) should be inspected every 3 months or 500 hours for any leakage paths.

Note: Make sure the inlet is free from obstruction.

Make sure the air cleaner mounting bolts and clamps are tight and the air cleaner is mounted securely. Check the air cleaner housing for dents or damage to the cleaner, which could lead to a leak.

Inspect/Grease Fan Drive

- Every six months or 500 hours inspect and grease the universal joints of the fan drive.
- Every two years or 2000 hours inspect and grease the fan drive bearings.

Replace the Crankcase Breather Element

- Every two years or 2000 hours inspect and replace the Crankcase Breather Element.

Fasteners

(See following inch torque chart, metric torque chart and wheel torque chart). All fasteners should be torqued in accordance to size and grade.

Torque Chart

TABLE 2 METRIC FASTENERS

CAPSCREW OR NUT THREAD SIZE AND PITCH	NOMINAL DESIGN TORQUE					
	PROPERTY GRADE 8.8 (HEAD MARKING)		PROPERTY GRADE 10.9 (HEAD MARKING)		PROPERTY GRADE 12.9 (HEAD MARKING)	
	(Nm.)	(FT–LBF)	(Nm.)	(FT–LBF)	(Nm.)	(FT–LBF)
M6 X 1.0	11	8	15	11	18	13
M8 X 1.25	26	19	36	27	43	31
M10 X 1.5	52	38	72	53	84	62
M12 X 1.75	91	67	126	93	147	109
M14 X 2	145	107	200	148	234	173
M16 X 2	226	166	313	231	365	270
M20 X 2.5	441	325	610	450	713	526

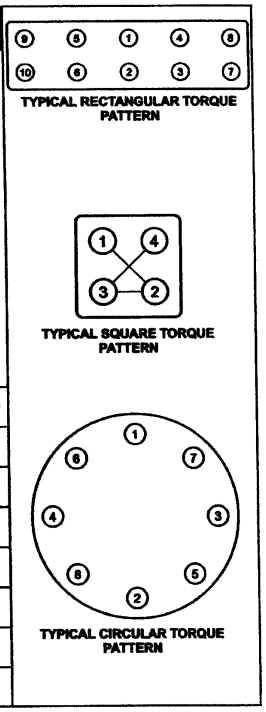
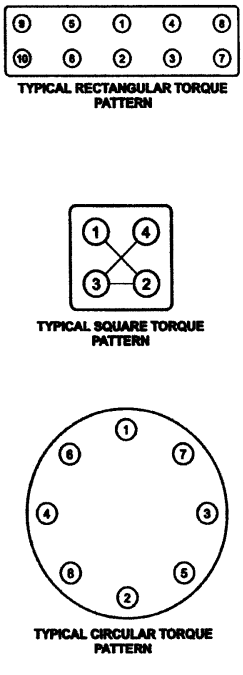


TABLE 1 INCH FASTENERS

CAPSCREW OR NUT THREAD SIZE AND PITCH	NOMINAL DESIGN TORQUE			
	SAE J249 GRADE 5 (HEAD MARKING)		SAE J249 GRADE 8 (HEAD MARKING)	
	(Nm.)	(FT–LBF)	(Nm.)	(FT–LBF)
1/4 – 20	11	8	16	12
5/16 – 18	24	17	33	25
3/8 – 16	42	31	59	44
7/16 – 14	67	49	95	70
1/2 – 13	102	75	144	106
9/16 – 12	148	109	208	154
5/8 – 11	203	150	287	212
3/4 – 10	361	266	509	376



Wheel Torque Chart	
M12 Bolts	**Torque (Ft-Lbs)**
13” wheel	60-70
1/2" lug nuts	
13” wheel	80-90
15” wheel	105-115
16” wheel	105-115
16.5 wheel	105-115
5/8" lug nuts	
16” wheel	190-210
17.5 wheel	190-210

Torque Specifications for G150-G325 Power Cable Electrical Connections

Torque Specifications (FT-LBS)		
Voltage Selector Switch Terminals	Wire to Lug w/M10: 16-21	
Receptacle Breakers	2.2-2.3	
Main Breakers (into breaker threaded Buss Bar)	23-25	
Wire Lugs to any Buss Bar	45-47	
Alternator Junction Box Terminal Studs	M10 Stud 14-16	M12 Stud 24-27

Tires

Weekly check the condition of the tires, and gauge the air pressure. Tires that have cuts or cracks or little tread should be repaired or replaced.

Engine Radiator

Check the coolant level in the radiator. The coolant must cover the tubes in the top tank (approximately 1 inch high on a clean measuring rod, stuck down filler neck).

⚠ WARNING

Remove cap slowly to relieve pressure from HOT radiator. Protect skin and eyes. Hot water or steam and chemical additives can cause serious personal injury.

The engine coolant system is normally filled with a 50/50 mixture of water and ethylene glycol. This permanent type anti-freeze contains rust inhibitors and provides protection to -35°F (-37°C). The use of such a mixture is recommended for both summer and winter operation. When using water alone, be sure to add a reputable brand of rust inhibitor to prevent internal corrosion.

It is recommended to test the freezing protection of the coolant every six months or prior to freezing temperatures. Replenish with a fresh mixture every twelve months.

Each month, inspect the radiator exterior for obstructions, dirt and debris. If present, blow water or compressed air containing a non-flammable solvent between the fins in a direction opposite the normal air flow. Should the radiator be clogged internally, reverse flushing, using a commercial product and the supplier's recommended procedure, may correct the problem.

Diagnostic Lamps

Each month the diagnostic lamps should be tested with unit shutdown and emergency stop pushed. Pull the ESTOP to apply power to the controller. All diagnostic lamps should glow. If not, refer to troubleshooting.

Diagnostic Trouble Code (DTC) Display

On models with Electronic (ECU) engines, each month, the DTC display should be tested. When unit is started, the DTC Display should show dashes (----) or a trouble code if there is a fault condition.

Emergency Stop Switch

Each month, check the operation of the Emergency Stop Switch. Running with no electrical loads and the main breaker "ON", press the EMERGENCY STOP SWITCH. The unit should shutdown immediately with cranking disabled and the ESTOP lamp should illuminate. Emergency Stop Switch must be reset (pull to unlatch) for operation.

Voltage Selector Door Interlock Switch

Every three months or 250 operating hours, the interlock switch should be checked. Running with no electric load, open the VOLTAGE SELECTOR door. This will shutdown the engine. To reset, close the door.

Engine CANBUS Communication System

The operation of the engine protection shutdown system should be checked whenever it appears not to be operating properly. The engine monitors its own oil pressure, coolant temperature, speed, and other parameters and shuts itself down when protection is required. To check the communication of the faults to the diagnostic panel, disconnect the “water in fuel” sensor and push RESET on the control panel engine controller. With the “Water In Fuel” sensor disconnected, the Diagnostic Trouble Code (DTC) reader should display the appropriate fault message.

High Alternator Temperature/Low Airflow Alarm System

The operation of the High Alternator Temperature alarm system should be checked every 3 months or whenever it appears not to be operating properly.

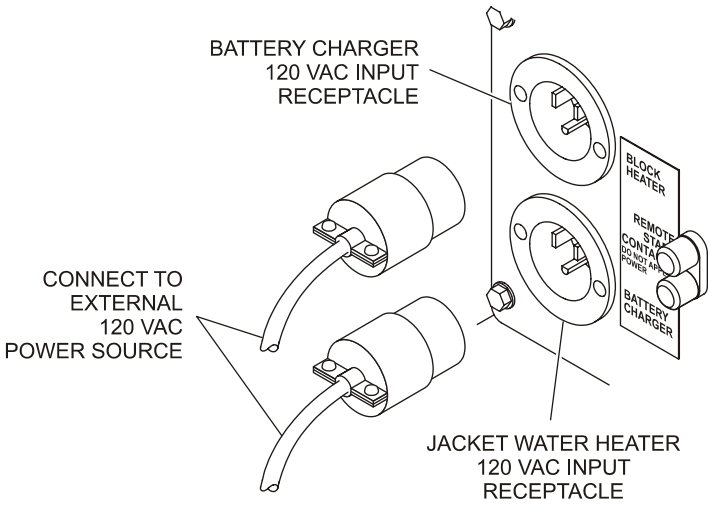
Jacket Water Heater and Internal Battery Charger 120VAC Input Receptacles (Optional)

This generator can be optionally equipped with two 120 VAC amp input receptacles located on the receptacle panel.

The purpose of these receptacles is to provide power to the jacket water heater and internal battery charger.

These receptacles will only function when commercial power has been supplied to them (See graphic below). To apply commercial power to these receptacles, a power cord of adequate size will be required.

When using the generator in hot climates, there is no reason to apply power to jacket water heater. However, if the generator will be used in cold climates it is always a good idea to apply power to the jacket water heater at all times. To apply power to the jacket water heater, simply apply power to the jacket water heater receptacle via commercial power using a power cord of adequate size.



If the generator will be used daily, the battery should normally not require charging. If the generator will be idle for extended periods of time, connect the battery charger receptacle to commercial power using an extension cord.

Adjustment Instructions and Testing Procedures

Accessing Generator Service Panel

1. Disconnect all electrical loads to the unit.

⚠ DANGER

High Voltage is present in alternator and control compartments when engine is running. Battery voltage is present whenever battery is connected.

2. With engine stopped, using a screwdriver, open the three latching fasteners at the right side of the control panel and open the panel door to gain access to the generator service panel.

Voltage Regulator Adjustment

Refer to Accessing Generator Service Panel Section

1. With all electric loads disconnected, engine stopped and main breaker turned on, turn VOLTAGE SELECTOR Switch to 277/480V position, and close and latch the VSS door.
2. Adjust “Voltage” POT(P1) on regulator to full counterclockwise position.
3. Adjust Output Voltage Adjust Knob on control panel to full clockwise position.
4. Start unit.
5. Verify generator frequency is 60-60.5 Hz.
6. Set the Voltage Selector Switch on the control panel to L_1-L_2 position.
7. Adjust “VOLTAGE” POT(P1) on the regulator to read 490V on AC voltmeter.
8. Adjust “Stability” POT(P2) to the center position.
9. Adjust Output Voltage Adjust Knob on control panel to read 480V on AC voltmeter.
10. Stop Generator Set.
11. Verify the range in each VOLTAGE SELECTOR switch position (480/277, 208/240, and 240/120) per the Output Voltage Adjustment Range Chart.

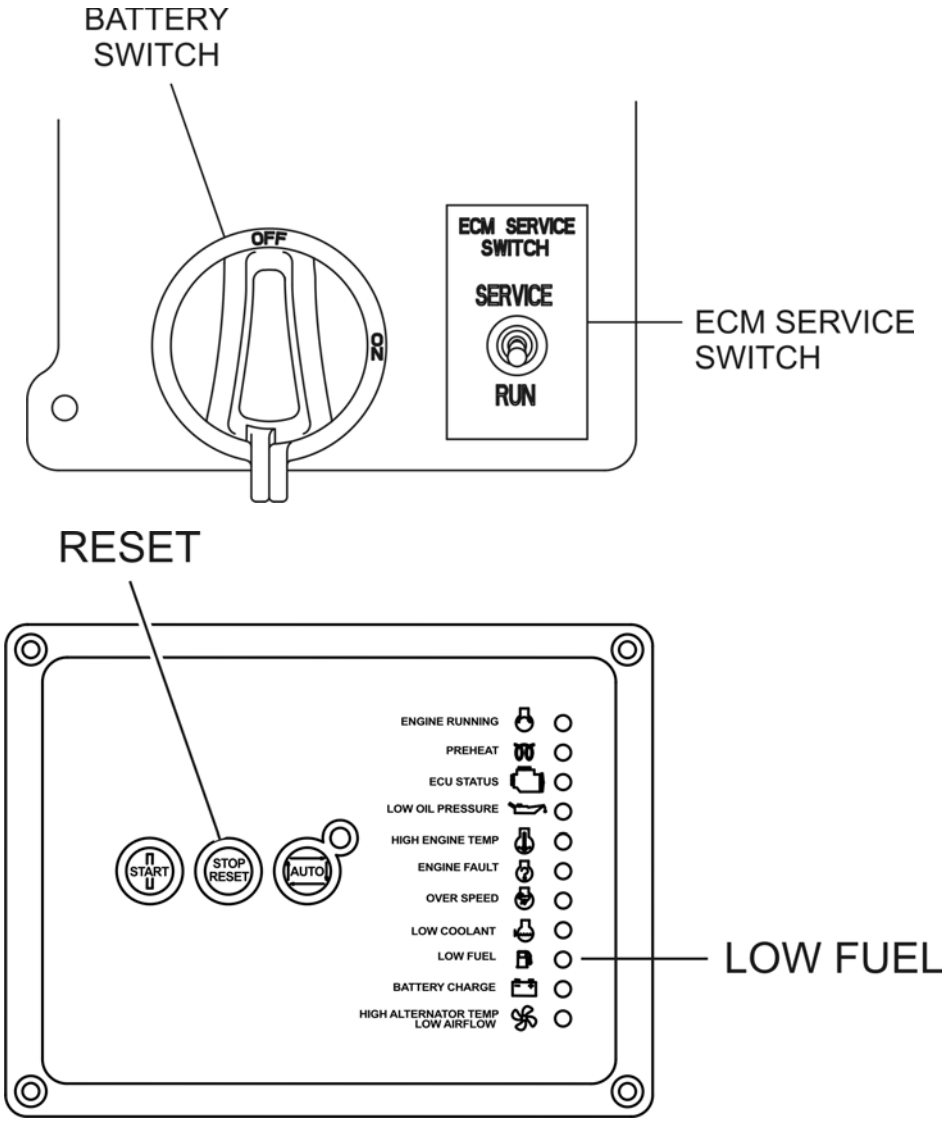
Overcurrent Relay Adjustment (Set Dial on the OCR Relay)

The OverCurrent (OCR) Relay provides overload protection when the generator is in the 480V or 600V output modes. The chart gives the Factory and other settings for protection levels less than the Factory setting.

Overcurrent Relay Adjustment									
Model kVA	480V 60Hz (OCR1)			600V 60Hz (OCR2)			400V 50Hz (OCR1)		
	kVA	Setting +/- 0.1	Amps	kVA	Setting +/- 0.1	Amps	kVA	Setting +/- 0.1	Amps
G150 STD Factory Setting	**150**	**3.6**	**180**						
G150 QUAD Factory Setting	**150**	**3.6**	**180**	**150**	**2.9**	**144**	**135**	**3.9**	**195**
	137	3.3	165				114	3.3	165
	125	3.0	150				104	3.0	150
	112	2.7	135	140	2.7	135	94	2.7	135
	100	2.4	120	125	2.4	120	83	2.4	120
	87	2.1	105	109	2.1	105	73	2.1	105
	75	1.8	90	94	1.8	90	62	1.8	90
	62	1.5	75	78	1.5	75	52	1.5	75
	42	1.0	50	52	1.0	50	35	1.0	50
G190 STD Factory Setting	**194**	**3.9**	**234**						
G190 QUAD Factory Setting	**190**	**3.8**	**228**	**190**	**3.0**	**183**	**165**	**4.0**	**240**
	179	3.6	216				149	3.6	216
	164	3.3	198				137	3.3	198
	149	3.0	180				124	3.0	180
	134	2.7	162	168	2.7	162	112	2.7	162
	119	2.4	144	149	2.4	144	100	2.4	144
	105	2.1	126	131	2.1	126	87	2.1	126
	90	1.8	108	112	1.8	108	75	1.8	108
	75	1.5	90	93	1.5	90	62	1.5	90
	50	1.0	60	62	1.0	60	41	1.0	60
G240 STD Factory Setting	**238**	**3.6**	**286**						
G240 QUAD Factory Setting	**220**	**3.3**	**264**	**238**	**2.9**	**229**	**180**	**3.2**	**256**
	200	3.0	240				166	3.0	240
	180	2.7	216				150	2.7	216
	160	2.4	192	224	2.7	216	133	2.4	192
	140	2.1	168	200	2.4	192	116	2.1	168
	120	1.8	144	175	2.1	168	100	1.8	144
	100	1.5	120	150	1.8	144	83	1.5	120
	80	1.2	96	125	1.5	120	67	1.2	96
	67	1.0	80	83	1.0	80	55	1.0	80
G325 STD Factory Setting	**326**	**3.9**	**392**						
G325 QUAD Factory Setting	**300**	**3.6**	**360**	**325**	**3.1**	**313**	**245**	**3.5**	**350**
	274	3.3	330				229	3.3	330
	249	3.0	300				208	3.0	300
	224	2.7	270	312	3.0	300	187	2.7	270
	200	2.4	240	281	2.7	270	166	2.4	240
	175	2.1	210	249	2.4	240	145	2.1	210
	150	1.8	180	218	2.1	210	125	1.8	180
	125	1.5	150	187	1.8	180	104	1.5	150
	100	1.2	120	156	1.5	150	83	1.2	120
	83	1.0	100	104	1.0	100	69	1.0	100

Engine ECM Service Switch

1. Select the “SERVICE” position on the ECM service switch to temporarily apply power to the engine ECM during engine computer diagnostics on a stopped engine. The switch is located on the side of the engine next to the Battery Switch as shown below.
2. It may be necessary to push the RESET button on the engine controller located on the control panel, after setting the ECM service switch.
3. When in the “SERVICE” position, the control panel will indicate a “Low Fuel” alarm, and the control panel and engine ECM power will remain active to enable any engine servicing via service computer.
4. Set the service switch to “RUN” to return to normal operation mode. Note: The generator will not start if left in “service” mode.



	Daily	Weekly	Mon.	3 Mon. 250 hrs	6 Mon. 500 hrs	12 Mon. 1000 hrs	24 Mon. 2000 hrs
Evidence of Arcing around electrical terminals	C						
Loose Wire Routing Clamps	C						
Engine Oil and Coolant Level	C						
Proper Grounding Circuit	C						
Instruments	C						
Frayed/Loose Fan belts, hoses, wiring insulation	C						
Fuel/Water Separator	drain						
Precleaner Dumps		C					
Tires		C					
Battery Connections		C					
Engine Radiator (exterior)			C				
Air Intake Hoses and Flexible Hoses			C				
Fasteners (tighten)			C				
Emergency Stop Switch Operation			C				
Engine Protection Shutdown System			C				
Diagnostic Lamps			C				
Voltage Selector/Interlock Switches				C			
Air Cleaner Housing				C			
Control Compartment (Interior)					C		
Fuel Tank (fill at end of each day)					drain		
Fuel/Water Separator Element					R		
Wheel Bearings & Grease Seals					repack		
Engine Shutdown System Switches (setting)						C	
Grease Fan Drive Universal Joints					C		
Grease Fan Drive Bearings							C
Inspect Power Leads and Check Torque of Cable Terminals						C	
Crankcase Vent Filter							R
Fuel Filter Element					R		
Air Cleaner Element					R		
Oil Filter Element					R		
Exterior Finish	As needed						
Engine	Refer to Engine Operation Section						
Decals	Replace decals if removed, damaged or missing						
C = Check (and adjust or replace if necessary)	WI = OR when indicated						
R = Replace	Hours:						
Unit:							
Date:	Serviceman:						

Alternator Installation and Maintenance

Leroy Somer Alternator LSA 40.2/42.3/44.2/46.2/47.2 - 4 POLE

This section concerns the alternator used in the generator set, which you have just purchased.

We wish to draw your attention to the contents of this maintenance section. By following certain important points during installation, use and servicing of your alternator, you can look forward to many years of trouble-free operation.

Our alternators comply with most international standards and are compatible with:

- The recommendations of the International Electrotechnical Commission IEC 34.1/ 34.2, (IEC60034).
- The recommendation of the International Standards Organization ISO 8528.
- NEMA MG 1.22.
- CSA.
- The European Community directive on Electromagnetic Compatibility (EMC) 89/336/ EEC).
- The European Community directives 73/23/EEC and 93/68/EEC (Low Voltage Directive).

The are CE marked with regard to the LVD (Low Voltage Directive) in their role as a machine component. A declaration of incorporation can be supplied on request.

Safety Measures

Before using your machine for the first time, it is important to read the whole of this installation and maintenance manual.

All necessary operations and interventions on this machine must be performed by a qualified technician.

Our technical support service will be pleased to provide any additional information you may require.

The various operations described in this manual are accompanied by recommendations or symbols to alert the user to potential risk of accident. It is vital that you understand and take notice of the different warning symbols used.

⚠ CAUTION

Warning symbol for an operation capable of damaging or destroying the machine or surrounding equipment.

⚠ WARNING

Safety symbol for an operation capable of damaging or destroying the machine or surrounding equipment or danger to personnel.

Safety symbol for electrical danger to personnel.

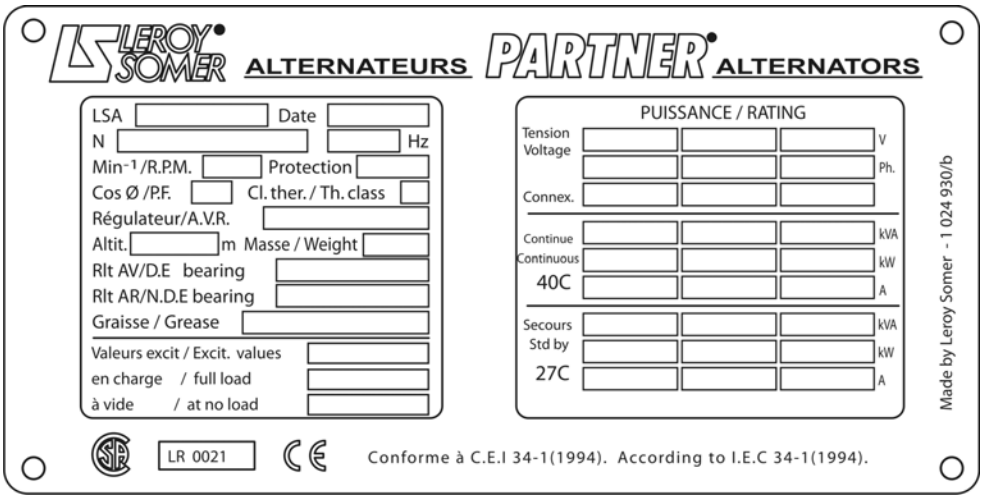
Identification

The alternator is identified by means of a nameplate glued to the frame. Make sure that the nameplate on the machine conforms to your order. The machine name is defined according to various criteria (see below).

Example of description: LSA 43.2 M45 J6/4

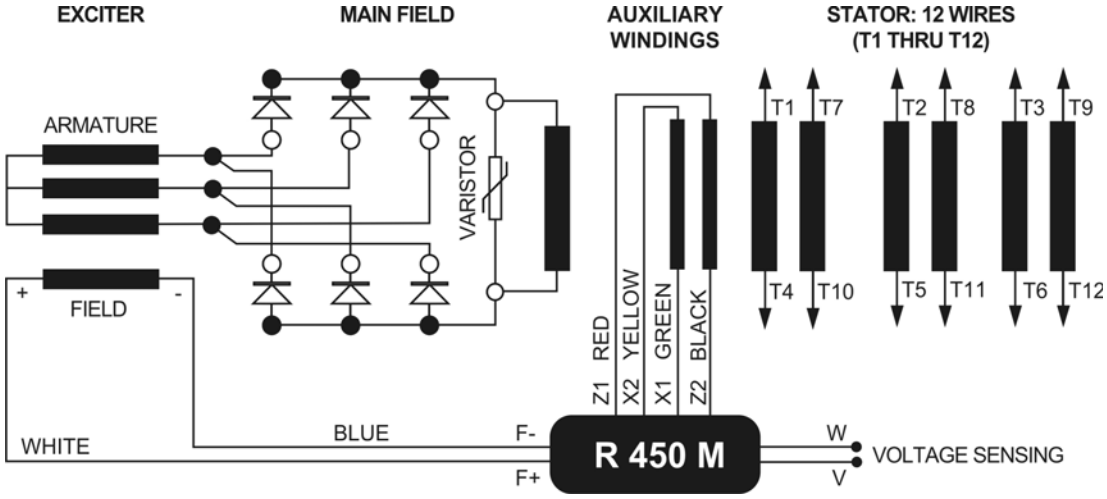
- LSA: Name used in the PARTNER range
- M: Marine
- C: Cogeneration
- T: Telecommunications
- 43.2: Machine Type
- M45: Model
- J: Excitation System (C: AREP/J: SHUNT or PMG/E: COMPOUND)
- 6/4: Winding number/number of poles

Nameplate



So that you can identify your machine quickly and accurately, we suggest you fill in its specifications on the nameplate below.

Voltage Regulation - AREP System with R450M AVR



AREP Excitation System

With AREP excitation, the R450M electronic AVR is powered by two auxiliary windings which are independent of the voltage sensing circuit. The first winding has a voltage in proportion to that of the alternator (shunt characteristic), the second has a voltage in proportion to the stator current (compound characteristic: booster effect). The power supply voltage is rectified and filtered before being used by the AVR monitoring transistor. This principle ensures that regulation is not affected by distortions generated by the load.

Installation - Commissioning

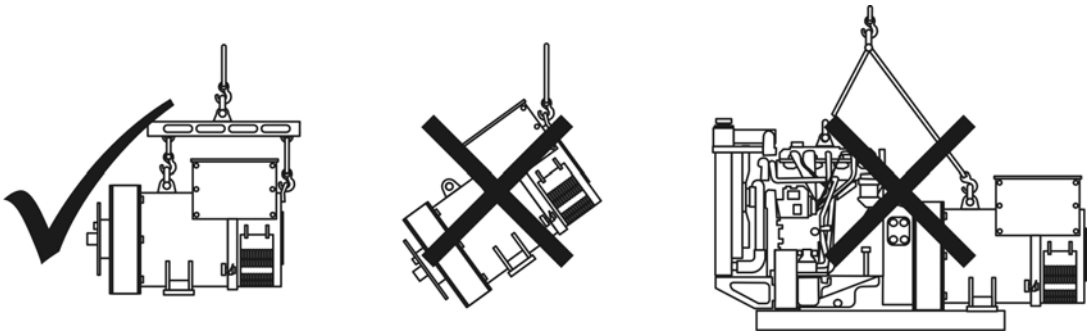
Assembly

All mechanical handing operations must be undertaken using approved equipment.

While being handled, the machine should remain horizontal (when travelling bar removed).

Handling

The generously sized lifting rings are for handling the alternator alone. They must not be used to lift the alternator alone. They must not be used to lift the genset. Choose a lifting system which respects the positioning of the rings (See Fig.)



Coupling (Single Bearing Alternator)

Before coupling to the prime mover, check that both are compatible by:

- Undertaking a torsional analysis of the transmission.
- Checking the dimensions of the flywheel and its housing, the flange, coupling discs and offset.

⚠ WARNING

When coupling the alternator to the prime mover, the holes of the coupling discs should be aligned with the flywheel holes by cranking the engine.

Do not use the alternator fan to turn the rotor.

Tighten the coupling discs screws to the recommended torque and check that there is lateral ply on the crankshaft.

Inspection Prior to First Use

Electrical checks

Under no circumstances should an alternator, new or otherwise, be operated if the isolation is less than 1 megohm for the stator and 100,000 ohms for the other windings.

There are three possible methods for restoring the above minimum values.

a) Dry out the machine for 24 hours in a drying oven at a temperature of approximately 110°C.

b) Blow hot air into the air input, having made sure that the machine is rotating with the exciter field disconnected.

c) Run in short-circuit mode (disconnect the AVR).

- Short-circuit the output phases using connections capable of supporting the rated current (try not to exceed 6 A/mm2).
- Insert a clamp ammeter to monitor the current passing through the short-circuit connections.
- Connect a 12 VDC battery in series with a rheostat of approximately 10 ohms (50 Watts), to the exciter field terminals, respecting the polarity.
- Open fully all the alternator orifices.
- Run the alternator at rated speed. Adjust the exciter field current using the rheostat to obtain the rated output current in the short-circuit connections.

Note: Prolonged standstill: In order to avoid these problems, we recommend the use of space heaters, as well as turning over the machine from time to time.

Space heaters are only really effective if they are working continuously while the machine is stopped.

R450 Adjustments (AREP System)

a. Initial rotating switch and potentiometer settings (see table on following page). Remote voltage adjustment potentiometer: wired per schematic.

b. Install a D.C. analogue voltmeter (needle dial) cal. 50V on terminals F+, F- and an A.C. voltmeter cal. 300 - 500 or 1000V on the alternator output terminals.

c. Make sure that the 50/60Hz strap or external switch is positioned on the desired frequency (50 or 60 Hz).

d. Voltage potentiometer P1 at minimum, fully to anti-clockwise (CCW).

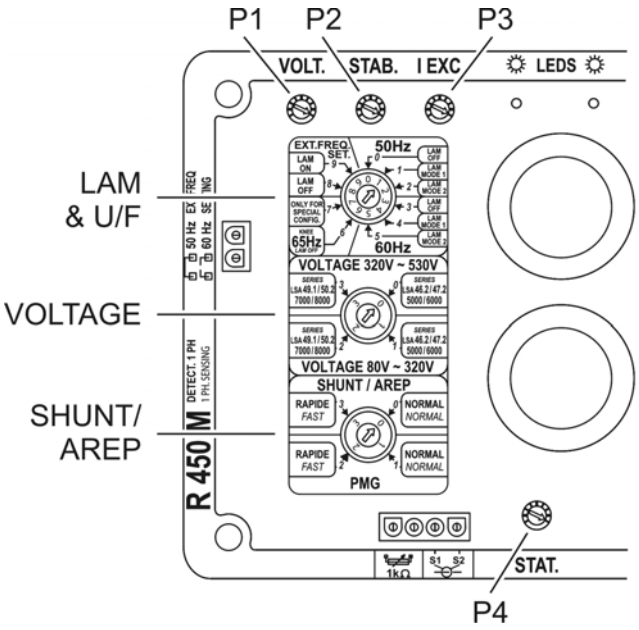
e. Stability potentiometer P2 approximately 1/2 of travel anti-clockwise (CCW).

f. Start the engine and if possible, set its speed to a frequency of 48 Hz for 50 Hz, or 58 for 60 Hz.

g. Adjust the output voltage to the desired value using P1.

If the voltage oscillates, use P2 to make adjustments (try both directions) observing the voltage between F+ and F- (approx. 10V D.C.). The best response times are obtained at the limit of the instability. If no stable position can be obtained, try selecting the FAST position on the Rotating switch Shunt/AREP.

h. Readjust the speed of the unit to its rated no-load value.



Action	Factory setting	Pot.
Voltage minimum fully anti-clockwise	400 V - 50 Hz	P1
Stability	Not set (centre position)	P2
Excitation ceiling - Factory-sealed	10 A maximum	P3
Voltage quadrature droop (// operation with C.T.) - 0 quadrature droop fully anti-clockwise	Not set (fully anti-clockwise)	P4

	ADJUSTMENT	SETTING
G150, G190, G240, G325 AREP		
1	Frequency and LAM - Lam & U/F	Position 5 (60 Hz), Position 2 (50 Hz)
2	Rotating Switch - Voltage Sensing	Position 1 (80V-320V)
3	Excitation/Time Response - Shunt/AREP	Position 0 (AREP-Normal)
4	External Potentiometer (Voltage Adjust)	Ext pot wired per wiring diagram
5	P1 (Voltage)	Set to limit remote pot to 490V max output (set 600V units to 610V max output)
6	P2 (Stability)	Center Position
7	P3 (Excitation Ceiling) Factory Set	No Adjustment
8	P4 (Voltage Quadrature Droop)	Fully Counter -Clockwise (not set)

Servicing - Maintenance

Safety Measures

Servicing or troubleshooting must be carried out strictly in accordance with instructions so as to avoid the risk of accidents and to maintain the machine in its original state.

All such operations performed on the alternator should be undertaken by personnel with training of electrical and mechanical components.

Before any intervention on the machine, ensure that it cannot be started by a manual or automatic system and that you have understood the operating principles of the system.

Checks After Startup

After approximately 20 hours of operation, check that all fixing screws on the machine are still tight, plus the general state of the machine and the various electrical connections in the installation.

Cooling Circuit

It is advisable to check that circulation of air is not reduced by partial blocking of the suction and discharge louvres: mud, fibre, grease, etc.

Bearings

The bearings are greased for life: approximate life of the grease (depending on use) = 20,000 hours or 3 years. Monitor the temperature rise in the bearings, which should not exceed 60°C above the ambient temperature. Should this value be exceeded, the machine must be stopped and checks carried out.

Electrical Servicing

Cleaning product for the windings.

⚠ WARNING

Do not use: Trichlorethylene, perchlorethylene, trichloroethane and any alkaline products.

Certain strictly defined pure volatile degreasing products can be used, such as:

- Normal petrol (without additives)
- Toluene (slightly toxic); flammable
- Benzene (or benzine, toxic); flammable
- Ciclohexare (non toxic); flammable

Cleaning the stator, rotor, exciter and diode bridge

The isolating components and the impregnation system are not at risk of damage from solvents (see the list of authorized products above).

Avoid letting the cleaning product run into the slots.

Apply the product with a brush, sponging frequently to avoid accumulation in the housing. Dry the winding with a dry cloth. Let any traces evaporate before reassembling the machine.

After cleaning the alternator it is essential to check the isolation of the windings.

Fault Detection

If, when first commissioned. the alternator does not work normally, the source of the malfunction must be identified.

To do this, check that:

- The protective devices are fitted correctly.
- All connections comply with the diagrams in the manuals supplied with the machine.
- The speed of the unit is correct. Repeat the operations instructions.

Mechanical Servicing

⚠ CAUTION

Cleaning the machine using a water spray or a high-pressure washer is strictly prohibited. Any problems arising from such treatment are not covered by our warranty.

The machine should be cleaned with a degreasing agent, applied using a brush. Check that the degreasing agent will not affect the paint. Compressed air should be used to remove any dust. If filters have been added to the machine after manufacturer and do not have thermal protection, the service personnel should clean the air filters periodically and systematically, as often as necessary (everyday in very dusty atmospheres). Cleaning can be performed using water for dry dust or in a bath containing soap or detergent in the case of greasy dust. Petrol or chloroethylene can also be used. After cleaning the alternator, it is essential to check the winding insulation.

Mechanical Defects

Mechanical Defects/Troubleshooting	
Bearing Defect	**Action**
Excessive overheating of one or both bearings (temp of bearings over 80°C) (With or without abnormal bearing noise)	If the bearing has turned blue or if the grease has turned black, change the bearing.
	Bearing race badly locked (moving in its housing)
Overheating	**Action**
Excessive overheating of alternator frame (temperature rise of more than 40°C above ambient)	Air flow (inlet-outlet) partially clogged or hot air is being recycled either from alternator or prime mover.
	Alternator is functioning at too high a voltage (over 105% of rated voltage on load).
	Alternator overloaded
Vibration Problem	**Action**
Too much vibration	Misalignment (coupling)
	Defective mounting or play in coupling
	Incorrect balancing of shaft (Engine-Alternator)
Excessive vibration and humming noise coming from the alternator	Three phase alternator is single phase loaded in excess of acceptable level.
	Short circuit in the alternator stator
Abnormal Noises	**Action**
Alternator damaged by a significant impact which is followed by humming and vibration	System short circuit
	MIS paralleling
	Possible consequences (according to the seriousness of the above faults):
	Broken or damaged coupling
	Broken or bent shaft end
	Shifting and short circuit of main field rotor
	Fractured fan or coming loose on shaft
	Blown rotating diodes, or and A.V.R

Electrical Faults/Troubleshooting

Fault	Action	Symptoms	Cause
No voltage at no load or startup	Connect a battery of 4 to 12 volts to terminals E+(F+) or E- (F-) respecting the polarity on the A.V.R. for 2 to 3 seconds	The alternator builds up and voltage is correct when the battery is removed.	Lack of residual magnetism in alternator
		The alternator builds up but voltage does not reach nominal value when the battery is removed.	- Check the connections of the sensing leads to the A.V.R. - Faulty rotating diode - Short-circuit on rotor windings
		The alternator builds up but voltage collapses when the battery is removed.	- Faulty A.V.R. - Exciter field short-circuited or open circuit (check windings) - Main field winding open circuit (check resistance).
Voltage too low	Check the prime mover speed	Incorrect speed	- Check A.V.R. connections (possible AVR failure) - Exciter field short-circuited - Rotating diode(s) burnt out. - Main field rotor short-circuited - Check the resistance.
		Speed too low	Increase the speed of primer mover. (Do not touch the AVR voltage pot. (P1) before running at the correct speed).
Voltage too high	Adjust potentiometer voltage	No adjustment of voltage, measure voltage F+/F- on AVR	Voltage between F+ and F- > 12V or AVR faulty - One Faulty Diode
Voltage oscillations	Adjust the stability potentiometer on A.V.R	If no effect: change recovery mode normal/ rapid.	Check speed for possible cyclic irregularity
			Loose connections
			Faulty A.V.R
			Speed below nominal when on load (or LAM set too high)
Voltage correct on no load too low on load (*)	Run on no-load and check voltage between F+ and F- on the AVR	Voltage between F+ and F- <10V (DC) Voltage between F+ and F- >15V (DC)	Check speed (orU/F knee point set too high)
			Faulty rotating diodes faulty
			Short circuit in the main field. Check resistance.
			Faulty exciter armature. Check resistance. Bad IEX setting (See LED status)

Fault	Action	Symptoms	Cause
Voltage collapses during normal operation (**)	Check the AVR, the surge suppressor, the rotating diodes and replace any defective part	The output voltage does not return the rated value	Exciter winding open circuit
			Faulty exciter armature
			Faulty AVR
			Main field rotor winding open circuit or short circuit overload (See LED status)
Circuit Breaker Tripped	Check for short circuit in load	Heat, smoke, burn or smell from load	Faulty load device
	Overcurrent	Repeated trips	Confirm load requirements and reduce
	Overcurrent relay (OCR activated. Confirm correct setting of the overcurrent relay dial	Repeated trips	Make correct setting on OCR.
			Replace OCR
	Defective circuit breaker or incorrect settings	Incorrect settings	Make correct settings
		Correct settings	Faulty trip coil
		Correct settings	Faulty breaker

Engine Faults/Troubleshooting

Fault	Possible Cause	Solution
Any Red Diagnostic Lamp is lit on the control panel	Refer to Manual sections on Engine Operating, Panel Operation & Engine Status/ Warning Lamps, and also Engine Diagnostic Trouble Code Display Operation	
Low Oil Pressure lamp is on	Low oil level	Fill if low
Low Coolant lamp is on	Low coolant level	Fill if low
High Coolant Temperature lamp is on	Doors are open	Close doors
	Low airflow circulating through radiator	Clean radiator, grill
	Fan slippage	Check fan drive and speed
	Leaking exhaust	Replace/repair gaskets or faulty parts
	Generator being overloaded	Check/reduce load
	Thermostat failure	Replace thermostat
	Air intake blocked	Clean all air intakes
	Temperature switch failure	Replace temperature switch
Overspeed lamp is on	Engine controller needs recalibration	Refer to dealer
Low Fuel lamp is on	Low fuel level	Add fuel
	Unit is excessively out of level	Level unit
No reaction from control panel when STOP/RESET button is pushed	Emergency stop actuated	Reset emergency stop button
	Batteries not connected	Connect batteries
	Voltage Selector Switch Door is not latched	Close and latch VSS door
	Main Terminal Door is not latched (if equipped)	Close and latch main terminal door
	Control Panel circuit breaker tripped	Reset breaker
	Controller fuse in control box blown	Replace fuse

Fault	Possible Cause	Solution
Engine fails to crank or start	Low battery charge	Check the battery alternator belt tension, battery and cable connections
	Bad frame ground connections	Check the ground cables, clean and tighten connections as needed.
	Fuel starvation	Check the fuel system components. Replace the fuel filter if necessary
	Faulty starter relay	Replace relay
	No crank signal from engine controller	Verify correct controller programming or replace controller
Engine speed too low	Unit set in IDLE mode	Set to RUN mode
	Generator is overloaded	Check load and reduce
	LAM is improperly set to enable step loading or motor starting	Check LAM setting and correct
	Blocked fuel filter	Check and replace
	Blocked air filter	Check and replace

⚠ WARNING

***During single-phase operation, check that the sensing wires from the AVR are connected to the correct output terminals.**

⚠ WARNING

**** The AVR internal protection may cut in (overload lost connection, short circuit).**

⚠ WARNING

The alternator excitation circuits to the AVR (6-pin connector) must be disconnected prior to manual excitation test of the alternator.

Checking the winding

You can check the winding insulation by performing a high voltage test. In this case you must disconnect the AVR excitation wires (6-pin connector).

During this procedure, make sure that the alternator is disconnected from any external load and inspect the terminal box to check that the connections are fully tightened.

Stop the unit. Disconnect the 6-pin connector located on the front side of the voltage regulator (AVR). This connector pin 6 is the E+(F+) lead and pin 3 is the E-(F-) lead. Install the “Field Excite Connector Test Kit” to the AVR.

Using test kit wires and a momentary normally open switch, connect the F+ lead to the positive (+) terminal of a 4-12 VDC dry cell battery. Then the F- lead to the negative (-) terminal of the battery.

Run the unit at its rated speed.

Connect a voltmeter to the direct hookups and shut the output breaker and the momentarily close the switch connected to the F+ lead and check the output voltage on the voltmeter. If the output voltage of the alternator is greater than its normal value then the machine is in good working order. The fault therefore comes from the AVR or its associated wiring(i.e. sensing, auxiliary windings).

R450 M&T AVRs

⚠ CAUTION

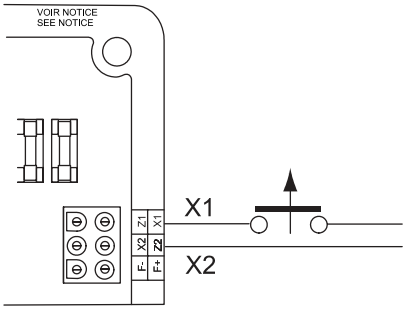
When the excitation current is set to the rated value, dip is observed in excitation current limit when the limitation is activated and the current limit is reached.

Special type of Use

⚠ WARNING

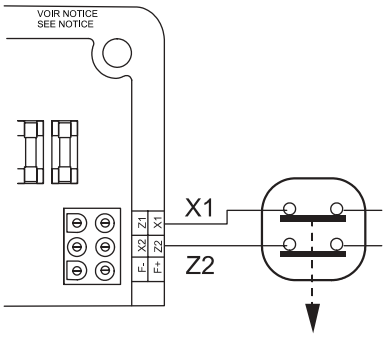
The excitation circuit F+, F- must not be left open when the machine is running. This will irreparably damage the AVR.

T (SHUNT Field Weakening



The exciter is switched off by disconnecting the AVR power supply (1 wire-X1 or X2). Contact rating 16A-250V A.C.

R450 M&T (AREP/PMG) Field Weakening

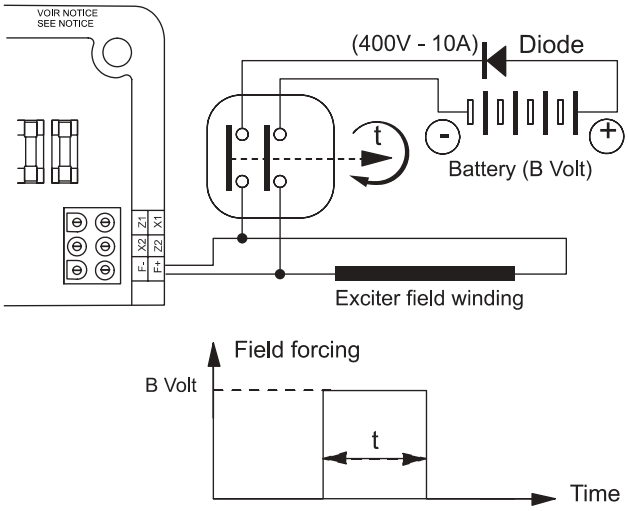


The exciter is switched off by disconnecting the AVR power supply (1 wire on each auxiliary winding). Contact rating 16 A-250V A.C. Connection is identical for resetting the AVR internal protection.

⚠ CAUTION

If field weakening is used, provide field forcing.

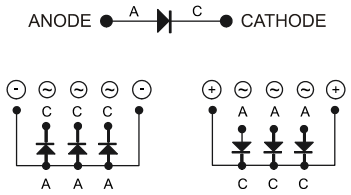
45 OM & T Field Forcing



Applications	Volt	Time t
Guaranteed voltage build-up	12 (1A)	1-2 s
Parallel operation, de-energized	12 (1A)	1-2 s
Parallel operation, at standstill	12 (1A)	5 -10 s
Frequency starting	12 (1A)	5 -10 s
Sustained voltage on overload	12 (1A)	5 -10 s

⚠ CAUTION

Damage caused to the AVR in such conditions is not covered by our warranty.



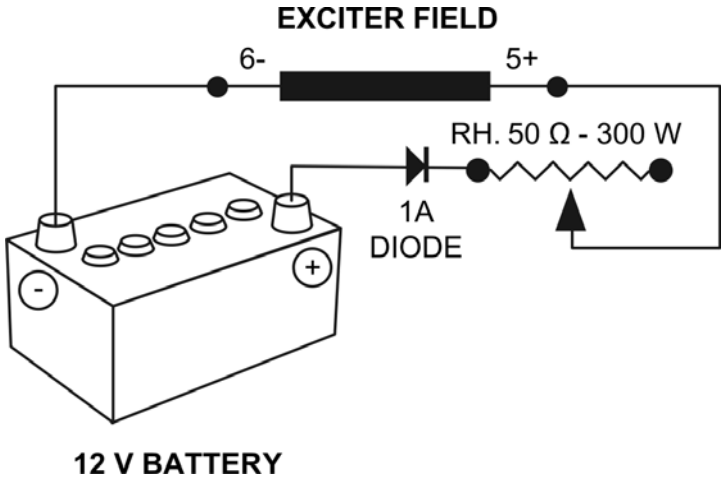
Checking the windings and rotating diodes using separate excitation

During this procedure, make sure that the alternator is disconnected from any external load and inspect the terminal box to check that the connections are fully tightened.

1. Stop the unit. Disconnect and isolate the AVR wires.
2. There are two ways of creating an assembly with separate excitation.

Assembly A

Connect a 12V battery in series with a rheostat of approximately 50 ohms-300W and a diode on both exciter field wires (5+) and (6-).



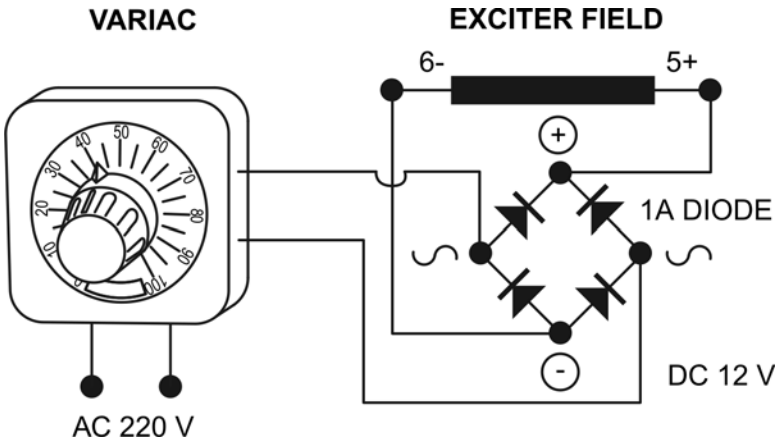
Assembly B

Connect a “Variac” variable power supply and a diode bridge on both exciter field wires (5+) and (6-).

Both these systems should have characteristics which are compatible with the field excitation power of the machine (see the nameplate).

3. Run the unit at its rated speed.
4. Gradually increase the exciter field current by adjusting the rheostat or the variac and measure the output voltages on L1-L2-L3, checking the excitation voltage and current at no load and on load (see the machine nameplate or ask for the factory test report).

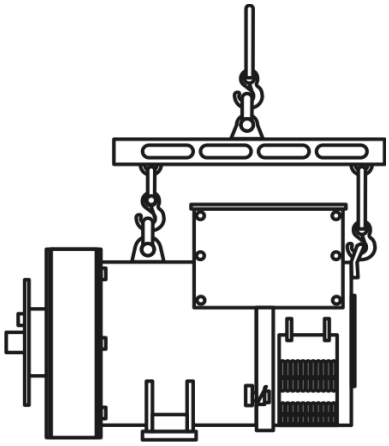
   When the output voltage is at its rated value and balanced within 1% for the rated excitation level, the machine is in good working order. The fault therefore comes from the AVR or its associated wiring (ie. sensing, auxiliary windings).



Dismantling Reassembly

During the warranty period, this operation should only be carried out in a LEROY SOMER approved workshop or in our factory, otherwise the warranty may be invalidated.

The machine must be horizontal when handled (when travelling bar removed).



Tools Required

To fully dismantle the machine, we recommend you have the tools listed below:

1. Ratchet spanner + extension
2. Torque wrench
3. 7 mm flat spanner
4. 8 mm flat spanner
5. 10 mm flat spanner
6. 12 mm flat spanner
7. 18 mm flat spanner
8. 8, 10, 13, 16, 18, 21, 24, 30 mm socket set
9. One socket with male ferrule 5mm
10. 15 mm Allen key (eg. Facom: ET5)
11. 16 mm Allen key (ego Facom: ET6)
12. TORX T20 bit
13. TORX T30 bit
14. Puller (eg. Facom: U35)
15. Puller (eg. Facom: U32/350)

Screw tightening torque chart

Identification	Screw Ø	Torque N•m	Torque FT-LBS
Field screw	M6 M4	10 4	7.2 2.9
Diode nut	M6	4	2.9
Flange/frame screw	M14 (M) M14 (L, VL)	80 190	58 137
NDE shield/frame screw	M12	50	36
Disc/Sleeve screw	M16	230	166
Earth screw	M10 M8	20 26	14.4 19
Grille screws	M6	5	3.6
Cover screws	M6	5	3.6
Terminal block nut	M12 M10	35 20	25 14.4
Earth screw	M12	35	25
Diode Bridge/RP	M6	5	3.6
Tie Rod (43.2)	M12	57	52
Tie Rod (44.2)	M14	90	65
Disc/Shaft Screw (43.32)	M12	110	79
Disc/Shaft Screw (44.2)	M16	250	180
Turbine Screw (44.2)	M6	5	3.6

Accessing connections and the regulation system

The terminals are accessed by removing the terminal box lid.

To access the adjustment potentiometers on the AVR, open the door on the control box.

Accessing, checking and replacing diodes

Dismantling

-Remove the terminal box lid.

-Remove the air intake louvre.

-Unscrew the fixing clamps on the power output cables, disconnect F+. F- on the exciter and R 791 module.

-Remove the 4 nuts on the tie rods.

-Remove the NDE bracket using an extractor: eg. U.32 -350 (FACOM).

-Remove the surge suppressor.

-Remove the 4 fixing screws from the diode bridges on the armature.

-Disconnect the diodes.

-Check the 6 diodes using either an ohmmeter or a battery lamp.

Reassembly

-Replace the diodes, respecting the polarity.

-Replace the surge suppressor.

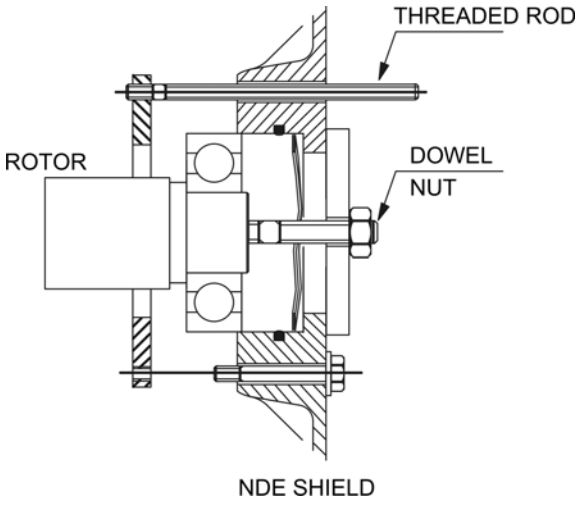
-Insert a new O ring in the bearing housing.

-Refit the NDE bracket (see fig 24) and pass the bundle of wires between the top bars of the flange.

-Replace the fixing clamps on the cables and the R791 module.

-Refit the air intake louvre.

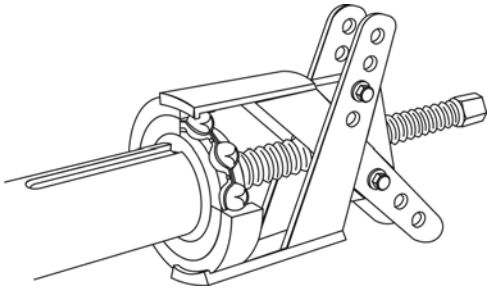
-Replace the terminal box lid.



Replacing the NDE bearing on a single-bearing machine

Dismantling

Dismantle the NDE bracket and remove the bearing using a puller.



Reassembly

-Heat the inner slipring of a new bearing by induction or in a drying oven at 80 °C (do not use an oil bath) and fit it to the machine.

-Place the preloading wavy washer in the flange and fit a new O ring seal.

-Replace the NDE bracket.

-Rest the rotor on one of its poles, then slide it out. Use the tube as a lever arm to assist dismantling.

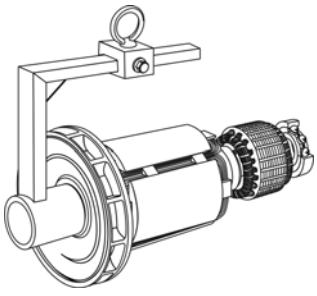
-After extraction, be careful with the fan. It is necessary to replace the fan in case of disassembling.

NOTE: If intervention is required on the main field (rewinding, replacement of components), the rotor assembly must be rebalanced.

Reassembly

-Follow the dismantling procedure in reverse order. Take care not to knock the windings when refitting the rotor in the stator.

-If you replace the fan, respect the assembly guide (fig). Use a tube and a screw.



Follow the procedure for reassembling the bearings.

After final adjustments, the access panels or cover should be refitted.

Electrical characteristics table

Alternator - 2/4 - pole - 50/60 Hz - No. 6 standard winding. (400V for the excitation values).

The voltage and current values are given for no-load operation and operation at rated load with separate field excitation. All values are given at ± 10% (for exact values, consult the test report) and are subject to change without prior warning.

Alternator 4 pole with AREP excitation Resistances at 20°C () -50/60Hz.

Resistances at 20°C (Ω)

LSA 46.2	Stator L/N	Rotor	Field	Armature
M3	0.022	0.23	8.8	0.035
M5	0.0182	0.24	8.8	0.035
L6	0.0148	0.264	8.8	0.035
L9	0.012	0.295	8.8	0.035
VL12	0.0085	0.343	10	0.037

Resistance of AREP auxiliary windings at 20°C (Ω)

LSA 46.2	Auxil wdg : X1, X2	Auxil wdg : Z1, Z2
M3	0.24	0.4
M5	0.215	0.36
L6	0.185	0.36
L9	0.19	0.32
VL12	0.17	0.32

Field excitation current i exc (A)
Symbols : “i exc”: excitation current of the exciter field.

LSA 46.2	No load	At rated load
M3	1.1	4
M5	1.1	3.8
L6	1.1	4.1
L9	1.2	4
VL12	1.1	3.5

For 60 Hz machines, the “i exc” values are approximately 5 to 10 % lower.

Voltage of auxiliary windings at no load

LSA 46.2/47.2	Auxil wdg : X1, X2	Auxil wdg : Z1, Z2
50 Hz	70 V	10 V
60 Hz	85 V	12 V

Resistances at 20 °C (Ω)

LSA 43.2	Stator L/N	Rotor	Field	Armature
S1	0,155	1,35	18,4	0,23
S15	0,155	1,35	18,4	0,23
S25	0,155	1,35	18,4	0,23
S35	0,128	1,41	18,4	0,23
M45	0,105	1,57	18,4	0,23
L65	0,083	1,76	18,4	0,23
L8	0,063	1,96	18,4	0,23

Field excitation current i exc (A) - 400 V - 50 Hz
"i exc": excitation current of the exciter field

LSA 43.2	no load	on load
S1	0,5	1,3
S15	0,5	1,5
S25	0,5	1,6
S35	0,5	1,8
M45	0,4	1,6
L65	0,4	1,6
L8	0,4	1,6

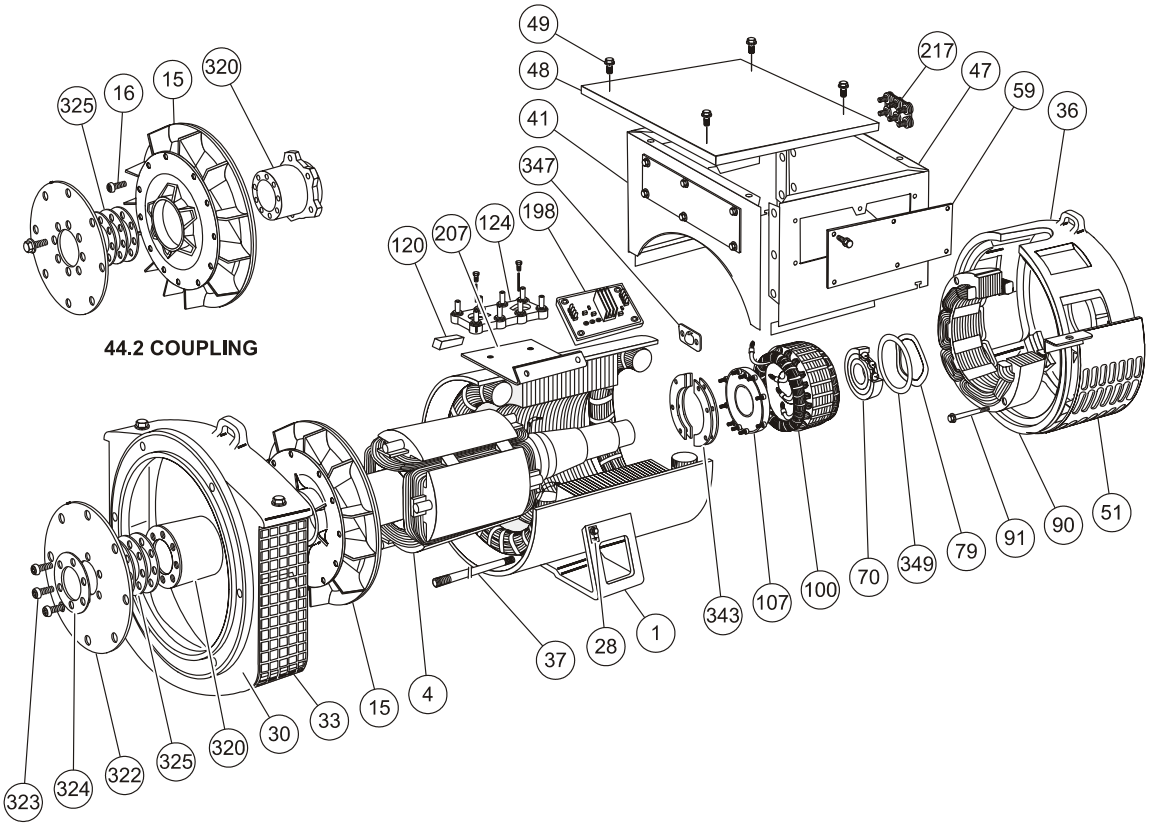
Resistances at 20 °C (Ω)

LSA 44.2	Stator L/N	Rotor	Wind. X1,X2	Wind. Z1,Z2	Field	Armat.
VS3	0,046	2,51	0,3	0,5	4,9	0,5
VS45	0,046	2,51	0,3	0,5	4,9	0,5
S7	0,036	2,91	0,21	0,32	4,9	0,5
S75	0,036	2,91	0,21	0,32	4,9	0,5
M95	0,024	3,32	0,17	0,28	4,9	0,5
L12	0,019	3,66	0,16	0,21	4,9	0,5

Field excitation current i exc (A) -400 V -50 Hz
"i exc": excitation current of the exciter field

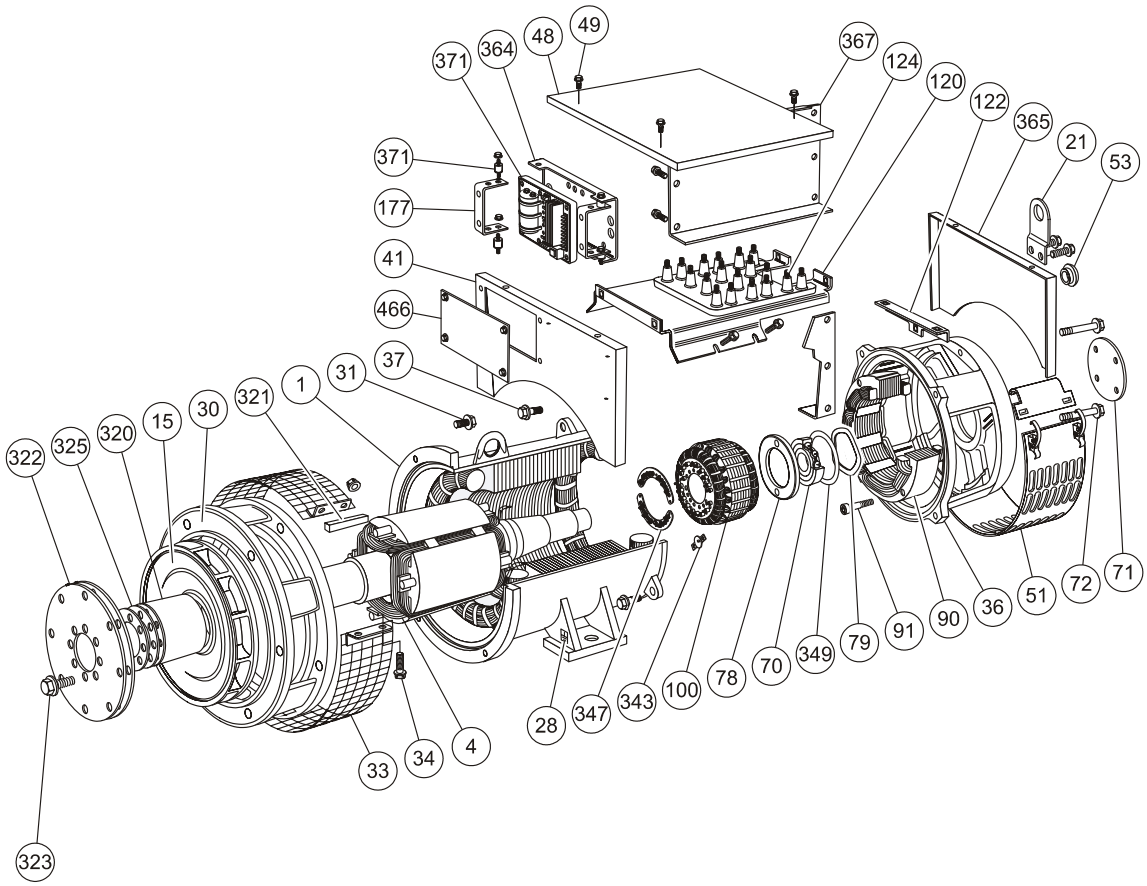
LSA 44.2	no load	on load
VS3	1	3,6
VS45	1	4,2
S7	1	3,8
S75	1	4,2
M95	1,2	4
L12	1	3,8

EXPLODED VIEWS - Single Bearing LSA 43.2/44.2



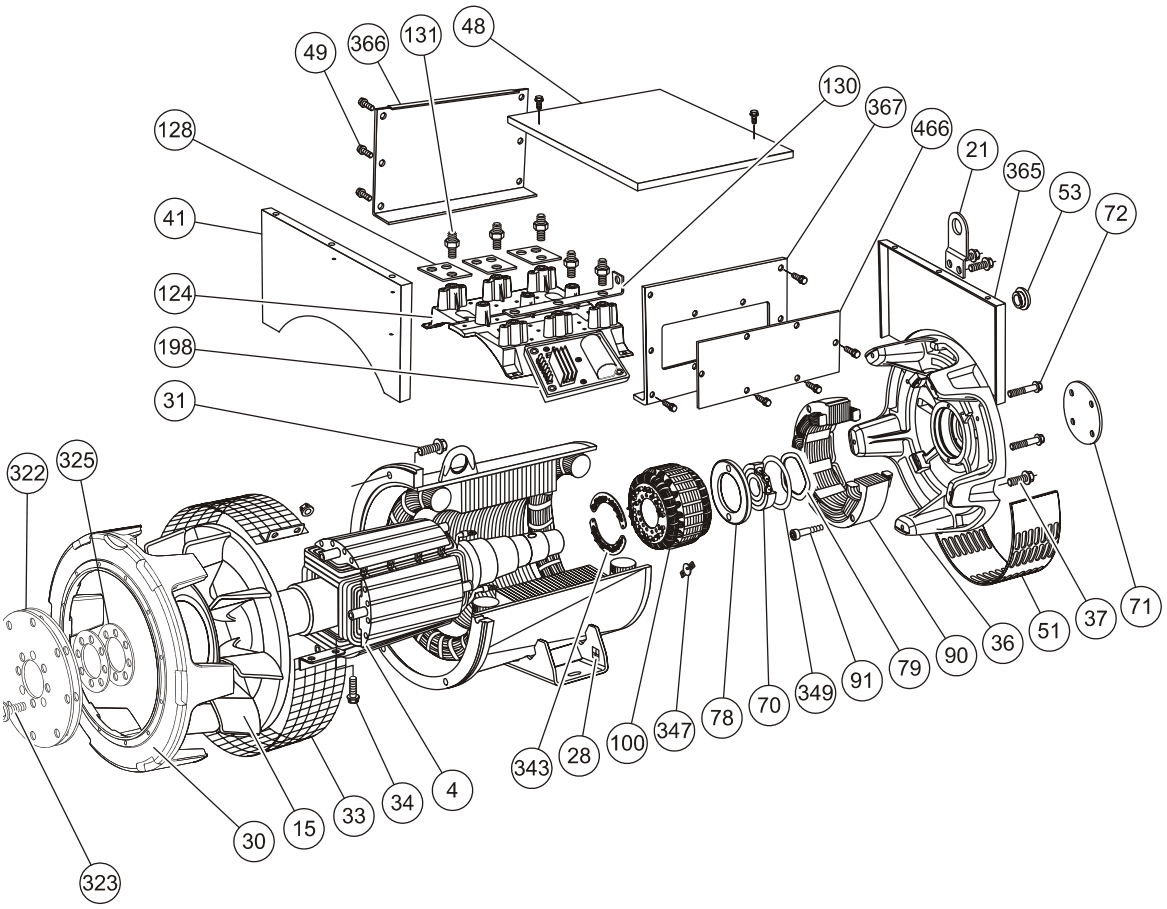
REF	QTY	DESCRIPTION	REF	QTY	DESCRIPTION
1	1	STATOR ASSY	90	1	EXCITER FIELD
4	1	ROTOR ASSY	91	4	EXCITER FIELD MOUNTING SCREW
15	1	FAN	100	1	EXCITER ARMATURE
16	6	MOUNTING SCREWS	107	1	DIODE CRESCENT SUPPORT
28	1	GROUND TERMINAL	120	1	TERMINAL BLOCK SUPPORT
30	1	DE SHIELD	124	1	TERMINAL BLOCK
33	1	AIR OUTLET GRILLE	198	1	VOLTAGE REGULATOR
36	1	EXCITER END SHIELD	207	1	AVR DAMPER SEAL
37	4	TIE ROD	217	1	TERMINAL BLOCK
41	1	FRONT PANEL COVER	320	1	HUB
47	1	REAR PANEL COVER	322	1	COUPLING DISC
48	1	TOP PANEL COVER	323	-	MOUNTING SCREWS
49	34	MOUNTING SCREWS	324	1	CLAMPING WASHER
51	1	AIR INTAKE GRILLE	325	-	SPACER SHIM
59	3	INSPECTION DOOR	343	1	DIODE BRIDGE ASSY
70	1	NDE BEARING	347	1	SURGE SUPPRESSOR
79	1	PRELOADING WAVY WASHER	349	1	O RING

EXPLODED VIEWS - Single Bearing LSA 46.2



REF	QTY	DESCRIPTION	REF	QTY	DESCRIPTION
1	1	STATOR ASSY	91	4	MOUNTING SCREWS
4	1	ROTOR ASSY	100	1	EXCITER ARMATURE
15	1	FAN	120	1	TERMINAL PLATE SUPPORT
21	1	LIFTING RING	122	1	PLATE SUPPORT
28	1	GROUND TERMINAL	124	1	TERMINAL PLATE
30	1	DE FLANGE	177	2	AVR SUPPORT BRACKET
31	6	MOUNTING SCREWS	198	1	VOLTAGE REGULATOR (AVR)
33	1	PROTECTIVE GRILLE	320	1	COUPLING SLEEVE
34	2	MOUNTING SCREWS	321	1	SLEEVE KEY
36	1	EXCITER END SHIELD	322	3	COUPLING DISC
37	5	MOUNTING SCREWS	323	6	MOUNTING SCREWS
41	1	FRONT PANEL COVER	325	-	SPACER SHIM
48	1	TOP PANEL COVER	343	1	DIODE BRIDGE ASSY
49	-	COVER SCREWS	347	1	PROTECTION VARISTOR (+PCB)
51	1	AIR INTAKE GRILLE	349	1	O RING
53	1	PLUG	364	1	AVR SUPPORT
70	1	NON DRIVE END BEARING	365	1	REAR PANEL COVER
71	1	COVER	367	2	SIDE PANEL
72	2	MOUNTING SCREW	371	4	DAMPER
78	1	INNER BEARING RETAINER	416	1	FILTER
79	1	PRELOADING WAVY WASHER	417	1	FILTER SUPPORT
90	1	EXCITER FIELD	466	2	AVR INSPECTION DOOR

EXPLODED VIEWS - Single Bearing LSA 47.2



REF	QTY	DESCRIPTION	REF	QTY	DESCRIPTION
1	1	STATOR ASSY	79	1	PRELOADING WAVY WASHER
4	1	ROTOR ASSY	90	1	EXCITER FIELD
15	1	FAN	91	4	MOUNTING SCREWS
21	1	LIFTING RING	100	1	EXCITER ARMATURE
28	1	GROUND TERMINAL	124	1	TERMINAL BLOCK
30	1	DE FLANGE	128	3	STARTING RANGE
31	6	MOUNTING SCREWS	130	1	NEUTRAL LINK
33	1	PROTECTIVE GRILLE	131	9	TERMINAL SCREWS
34	2	MOUNTING SCREWS	198	1	VOLTAGE REGULATOR (AVR)
36	1	EXCITER AND SHIELD	322	3	COUPLING DISC
37	5	MOUNTING SCREWS	323	8	MOUNTING SCREWS
41	1	FRONT PANEL COVER	325	-	SPACER SHIMS
48	1	TOP PANEL COVER	343	1	DIODE BRIDGE ASSY
49	-	COVER SCREWS	347	1	PROTECTION VARISTOR (+PCB)
51	1	AIR INTAKE GRILLE	349	1	O RING
53	1	PLUG	365	1	REAR PANEL COVER
70	1	NON DRIVE END BEARING	366	1	SIDE PANEL
71	1	COVER	367	1	SIDE PANEL WITH INSPECTION DOOR
72	2	MOUNTING SCREWS	466	1	AVR INSPECTION DOOR
78	1	INNER BEARING RETAINER			

Technical Characteristics

Electrical Characteristics

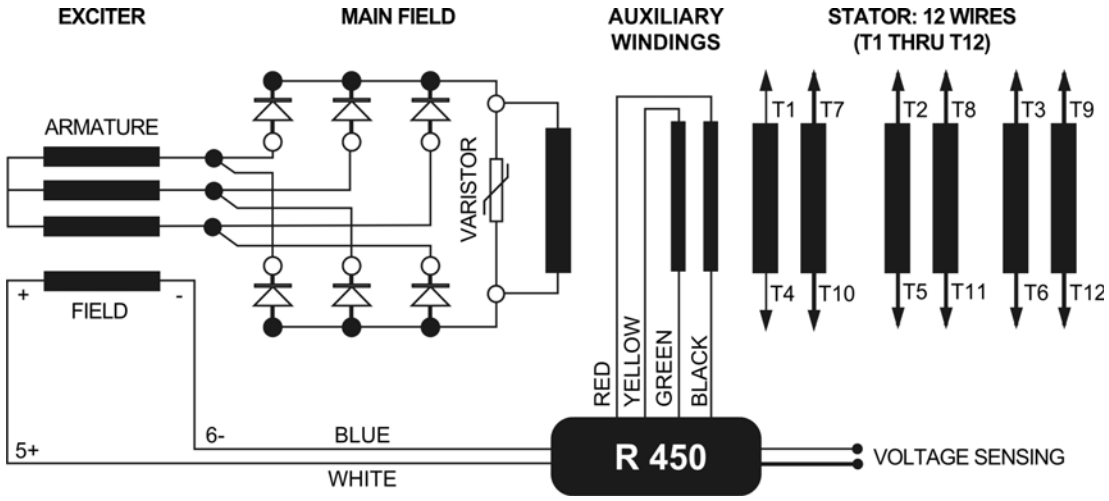
The PARTNER alternator is a machine without slip rings and revolving field brushes, wound as "2/3 pitch"; 12-wire, with class H insulation and a field excitation system available in either "SHUNT" or 'AREP" version. Interference suppression conforms with standard EN 55011, group 1, Class B.

Options: Stator temperature detection probes, space heaters.

Mechanical Characteristics

- Steel Frame
- End shields in cast iron or aluminium
- Ball bearings greased for life
- Mounting arrangement
- MD 35 STANDARD: single bearing, with standard feet and SAE coupling discs
- B 34 STANDARD: two bearing feet mounted with standard bare shaft key wayed
- Drip-proof machine, self-cooled
- Degree of protection: IP 23

Options-Air input filter, air output labyrinth cowling



AREP Field Excitation System

With AREP excitation, the R450 electronic AVR is powered by two auxiliary windings which are independent of the voltage sensing circuit. The first winding has a voltage in proportion to that of the alternator (shunt characteristic), the second has a voltage in proportion to the stator current (compound characteristic: booster effect). The power supply voltage is rectified and filtered before being used by the AVR monitoring transistor. This principle ensures that regulation is not affected by distortions generated by the load.

R 450 Regulator

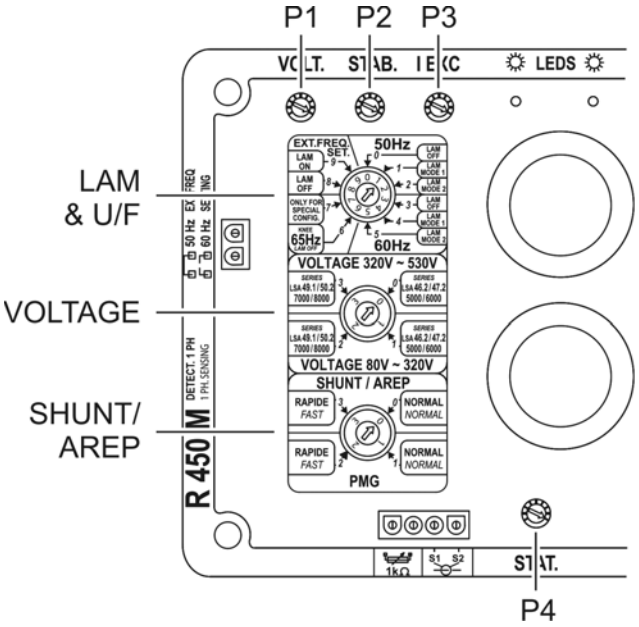
- Short-circuit current = 3 x IN for 10 seconds
- Standard power supply; 2 auxiliary windings
- Shunt power supply; max 150V -50/60 Hz
- Rated excitation overload current: 10A-10S
- Electronic protection (overload, short-circuit opening on voltage detection): excitation ceiling current for 10 seconds then return to approx. 1A

The alternator must be stopped (or the power switched off to both auxiliary windings) in order to reset the protection.

- Fuse F1 on input side (X1 and fuse F2 on Z2 auxiliary windings).
- Voltage detection: High range 320V to 530V, Low Range 80V to 320V set to low range for standard models.
- Voltage regulation ± 0.5%.
- Rapid or normal response time via rotating strap switch “Shunt/AERP”.
- Voltage adjustment via potentiometer P1 volt.
- Current detection: (parallel operation): C.T. 2.5VA cl1, secondary 1A or 5A according to potentiometer P4 STAT position.
- Quadrature droop adjustment via potentiometer P4 STAT.
- Underspeed protection (U/F and LAM. Frequency threshold adjustable via rotating switch LAM and U/F). Position 5 for 25% LAM at 60 Hz. Position 4 for 13% LAM at 60Hz. Position 2 for 25% LAM at 50 Hz. Position 1 for 13% LAM at 50 Hz.
- Potentiometer P3 Max. excitation current adjustment via 3:1.0 to 5.5A.
- 50/60 Hz selection via strap 50/60. Strap is often for 60 Hz operation.

R450 A.V.R Options

- **Current transformer** for parallel operation.
- Remote voltage adjustment potentiometer: 1K OHMS, 0.5 W min: adjustment range ± 10% (range limited via internal voltage potentiometer P1). Connect the potentiometer, attached to terminals St. (A 1 k potentiometer can also be used to extend the adjustment range).



Action	Factory setting	Pot.
Voltage minimum fully anti-clockwise	400 V - 50 Hz	P1
Stability	Not set (centre position)	P2
Excitation ceiling - Factory-sealed	10 A maximum	P3
Voltage quadrature droop (// operation with C.T.) - 0 quadrature droop fully anti-clockwise	Not set (fully anti-clockwise)	P4

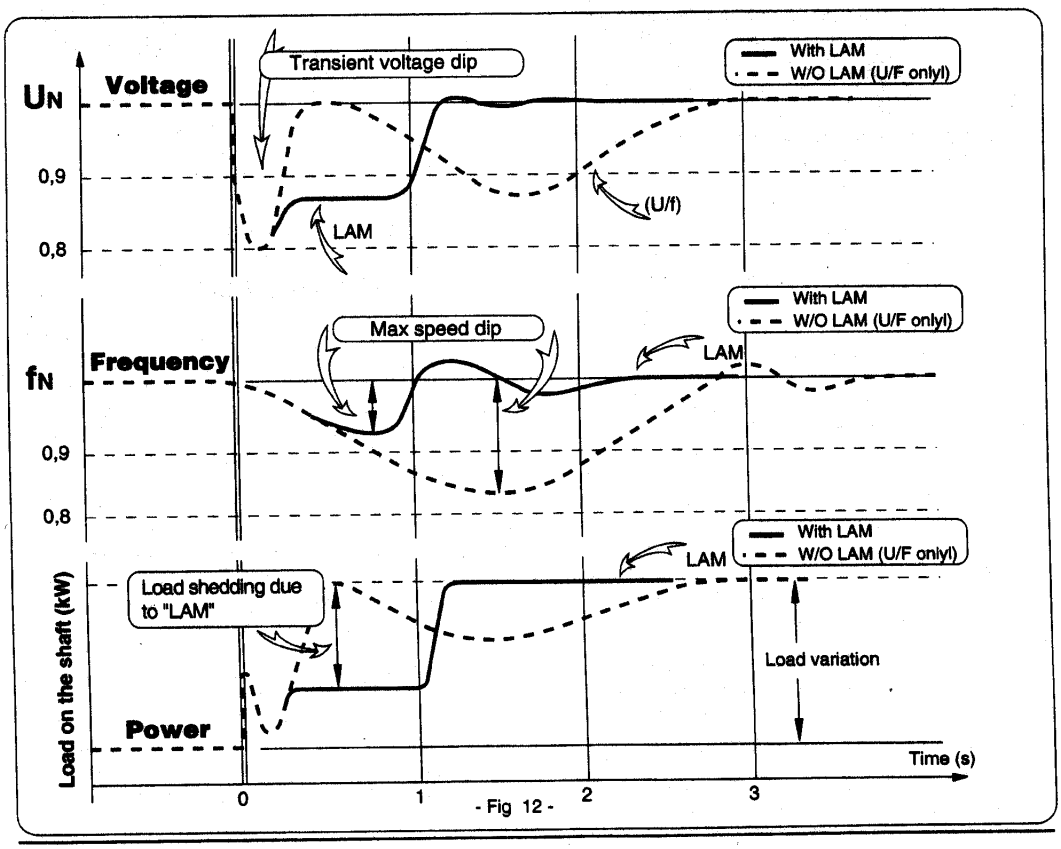
LAM Characteristics

The LAM system is integrated as standard in the R450 regulator.

Role of the "LAM" (Load Adjustment Module):

- On load impact, the rotation speed of the generator set decreases. When it passes below the preset frequency threshold, the "LAM" causes the voltage to drop by approximately 13% or 25% and consequently the amount of active load applied is reduced by approximately 25% to 50%, until the speed reaches its rated value again. Hence the "LAM" can be used either to reduce the speed variation (frequency) and its duration for a given applied load, or to increase the applied load possible for one speed variation (turbo-charged engine). To avoid voltage oscillations, the trip threshold for the "LAM" function should be set approximately 2 Hz below the lowest frequency in steady state.
- LAM: action eliminated by setting the rotating switch LAM & U/F to the “3” (60 Hz) position or to ”0” (50 Hz) position.

Typical effects of the “LAM” with a diesel engine.



- Fig 12 -

Revision History

Rev.	EC Number	Comments
A	CN009241	Original release of manual numbers
B	CN019162	Manual Release

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