Operator Manual

Our energy working for you.™

Power Generation

Generator Set
with PowerCommand® 2.2 Controller

DSGAA (Spec A–F)
DSGAB (Spec A–F)
DSGAC (Spec A–F)

English – Original Instructions 8–2010 961–0125 (Issue 3)

MODEL IDENTIFICATION

To avoid errors or delay in filling your parts order, always give the MODEL, SPEC NO. and SERIAL NO. from the Onan nameplate.

For handy reference, insert your nameplate information in the spaces below.

_____

MODEL AND SPEC NO.

_____

SERIAL NO.

_____

DIGITAL CONTROL SOFTWARE VERSION AND DATE (IF APPLICABLE)

SAFETY PRECAUTIONS

The following symbols are used in Onan manuals to alert users to the potentially dangerous conditions relating to maintenance of equipment and replacement of parts. Please read and observe.

⚠ DANGER ***This symbol warns of immediate hazards which will result in severe personal injury or death.***

⚠WARNING ***This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.***

⚠CAUTION ***This symbol refers to a hazard or unsafe practice which can result in severe personal injury or product or property damage.***

PRODUCT SAFETY PRECAUTIONS

⚠WARNING

Service and repair of Onan equipment must be performed by trained, experienced personnel only. Improper service or repair may result in property damage, severe personal injury or death. Do not use this catalog as a guide to servicing your equipment. Read and follow the IMPORTANT SAFETY INSTRUCTIONS in the Service Manual appropriate for the equipment you are working on.

⚠WARNING

Contact with USED ENGINE OILS has been identified by a United States federal agency and some USA state agencies as causing CANCER or REPRODUCTIVE TOXICITY. When checking or changing engine oils take all necessary precautions not to ingest, breathe the fumes or contact the used oil.

⚠WARNING

Contact with ASBESTOS has been identified by a United States federal agency and some USA state agencies as causing CANCER or REPRODUCTIVE TOXICITY. When handling engine gaskets take all necessary precautions not to ingest, breathe or contact the dust from the gaskets! Use adequate ventilation and wear protective gloves, masks and clothing!

⚠WARNING

Contact with BENZINE and LEAD, found in gasoline, fuel additives and solvents has been identified by a United States federal agency and some USA state agencies as causing CANCER or REPRODUCTIVE TOXICITY. When checking, draining or adding gasoline and fuel additives or using solvents take all necessary precautions not to ingest, breathe the fumes or contact the liquids. Use adequate ventilation and wear protective gloves, masks and protective clothing!

Table of Contents

California

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

SECTION	TITLE	PAGE

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS – This manual contains important instructions that should be followed during installation and maintenance of the generator and batteries.

Before operating the generator set (genset), read the Operator's Manual and become familiar with it and the equipment. **Safe and efficient operation can be achieved only if the equipment is properly operated and maintained.** Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

⚠ DANGER ***This symbol warns of immediate hazards which will result in severe personal injury or death.***

⚠ WARNING ***This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.***

⚠ CAUTION ***This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.***

FUEL AND FUMES ARE FLAMMABLE

Fire, explosion, and personal injury or death can result from improper practices.

- DO NOT fill fuel tanks while engine is running, unless tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT permit any flame, cigarette, pilot light, spark, arcing equipment, or other ignition source near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible line. Do not use zinc coated or copper fuel lines with diesel fuel.
- Be sure all fuel supplies have a positive shutoff valve.
- Be sure battery area has been well-ventilated prior to servicing near it. Lead-acid batteries emit a highly explosive hydrogen gas that can be ignited by arcing, sparking, smoking, etc.

EXHAUST GASES ARE DEADLY

- Provide an adequate exhaust system to properly expel discharged gases away from enclosed or sheltered areas and areas where individuals are likely to congregate. Visually and audibly inspect the exhaust daily for leaks per the maintenance schedule. Make sure that exhaust manifolds are secured and not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.
- Engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Keep your hands, clothing, and jewelry away from moving parts.
- Before starting work on the generator set, disconnect battery charger from its AC source, then disconnect starting batteries, negative (–) cable first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing or jewelry in the vicinity of moving parts, or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts.
- If adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS

Flammable vapor can cause an engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. Do not operate a genset where a flammable vapor environment can be created by fuel spill, leak, etc., unless the genset is equipped with an automatic safety device to block the air intake and stop the engine. The owners and operators of the genset are solely responsible for operating the genset safely. Contact your authorized Cummins Power Generation distributor for more information.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surface to be damp when handling electrical equipment. Do not wear jewelry. Jewelry can short out electrical contacts and cause shock or burning.
- Use extreme caution when working on electrical components. High voltages can cause injury or death. DO NOT tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag and lock open switches to avoid accidental closure.
- DO NOT CONNECT GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved isolation switch or an approved paralleling device.

GENERAL SAFETY PRECAUTIONS

- Coolants under pressure have a higher boiling point than water. DO NOT open a radiator or heat exchanger pressure cap while the engine is running. To prevent severe scalding, let engine cool down before removing coolant pressure cap. Turn cap slowly, and do not open it fully until the pressure has been relieved.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Keep multi-class ABC fire extinguishers handy. Class A fires involve ordinary combustible materials such as wood and cloth; Class B fires, combustible and flammable liquid fuels and gaseous fuels; Class C fires, live electrical equipment. (ref. NFPA No. 10).
- Make sure that rags or combustible material are not left on or near the generator set.
- Make sure generator set is mounted in a manner to prevent combustible materials from accumulating under or near the unit.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage which present a potential fire hazard.
- Keep the generator set and the surrounding area clean and free from obstructions. Remove any debris from the set and keep the floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.
- Substances in exhaust gases have been identified by some state or federal agencies as causing cancer or reproductive toxicity. Take care not to breath or ingest or come into contact with exhaust gases.
- Do not store any flammable liquids, such as fuel, cleaners, oil, etc., near the generator set. A fire or explosion could result.
- Wear hearing protection when near an operating generator set.
- To prevent serious burns, avoid contact with hot metal parts such as radiator system, turbo charger system and exhaust system.

KEEP THIS MANUAL NEAR THE GENSET FOR EASY REFERENCE

1. Introduction

GENERAL

This manual provides generator set maintenance and operating recommendations.

Operating and troubleshooting information is provided in the appropriate control Operator Manual.

Each operator should read this manual and the control Operator Manual before operating the generator set (genset) for the first time. A genset must be operated and maintained properly if you are to expect safe and reliable operation. This manual includes a troubleshooting guide and a maintenance schedule.

⚠WARNING ***Improper operation and maintenance can lead to severe personal injury or loss of life and property by fire, electrocution, mechanical breakdown or exhaust gas asphyxiation. Read Important Safety Instructions pages and carefully observe all instructions and precautions in this manual.***

HOW TO OBTAIN SERVICE

When the generator set requires servicing, contact your nearest Cummins Power Generation distributor (www.cumminspower.com). Factory-trained Parts and Service representatives are ready to handle all your service needs.

To contact your local Cummins Power Generation distributor in the United States or Canada, call 1-800-888-6626 (this automated service utilizes touch-tone phones only). By selecting Option 1 (press 1), you will be automatically connected to the distributor nearest you.

If you are unable to contact a distributor using the automated service, consult the Yellow Pages. Typically, our distributors are listed under:

GENERATORS-ELECTRIC or
ELECTRICAL PRODUCTS

For outside North America, call Cummins Power Generation, 1-763-574-5000, 7:30 AM to 4:00 PM, Central Standard Time, Monday through Friday. Or, send a fax to Cummins Power Generation using the fax number 1-763-528-7229.

When contacting your distributor, always supply the complete Model, Specification, and Serial Number as shown on the generator set nameplate.

⚠ WARNING

INCORRECT SERVICE OR PARTS REPLACEMENT CAN RESULT IN SEVERE PERSONAL INJURY, DEATH, AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE TRAINED AND EXPERIENCED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE.

THIS PAGE LEFT INTENTIONALLY BLANK

2. Specifications

MODEL	DSGAA, DSGAB, DSGAC		
Engine Cummins Diesel Series	QSB7–G3		
Generator Set Control	PowerCommand 2.X		
Generator kW Rating	See Genset Nameplate for rating information.		
Engine Fuel Connection Inlet/Outlet Thread Size	Refer to Generator Outline Drawing		
Fuel Flow Max. Fuel Inlet Restriction Max. Fuel Return Restriction	5 in. Hg. (127 mmHg) 6 in. Hg. (152 mmHg)		
Exhaust Outlet Size Max. Allowable Back Pressure Exhaust Flow at Rated Load Exhaust Temperature	3 in. NPD 40 in. H_2O (10 kPa) 996 cfm (28.2 m^3/min) 832° F (444° C)	3 in. NPD 40 in. H_2O (10 kPa) 1129 cfm (32 m^3/min) 871° F (466° C)	3 in. NPD 40 in. H_2O (10 kPa) 1256 cfm (35.6 m^3/min) 924° F (496° C)
Electrical System Starting Voltage Battery Group Number CCA (minimum) Cold Soak @ 0°F (-18° C)	12 Volts DC One, 12 Volt 4D 1080		
Cooling System Capacity with Standard Radiator	6.1 Gal (23.1 L)		
Lubricating System Oil Capacity with Filters Oil Type*	18.5 Qts (17.5 L)		
* Refer to Cummins engine *Owners Manual* for lubricating oil recommendations/specifications.			

FUEL CONSUMPTION (STANDBY/FULL LOAD/60HZ)

MODEL	DSGAA	DSGAB	DSGAC
US gph (L/hr)	8.45 (32.0)	10.0 (37.9)	12.25 (46.4)

OIL PRESSURE/COOLANT TEMPERATURE WARNING AND SHUTDOWN LIMITS	
Normal Oil Pressure Warning Limit Shutdown Limit	**40-60 psi (276-414 kPa)** 34 psi (236 kPa) 30 psi (207 kPa)
Coolant Temperature Warning Limit Shutdown Limit	**Normal** 220° F (104° C) 230° F (110° C)

THIS PAGE LEFT INTENTIONALLY BLANK

3. Prestart Checks

GENERAL

This section covers prestart checks. Before starting, be sure the following checks have been made and the unit is ready for operation.

PRESTART CHECKS

Lubrication

Check the engine oil level. Keep the oil level as near as possible to the dipstick high mark without overfilling.

Coolant

Check the engine coolant level. Refer to “Cooling Systems” in the Maintenance section of this manuals for proper procedure.

Fuel

Make sure the fuel tanks have sufficient fuel and that fuel system is primed. Check to make sure there are no leaks and that all fittings are tight.

Ventilation

Make sure the generator set cooling inlet/outlet and exhaust ventilation openings are clear (not blocked) and operational.

Remove all loose debris from surrounding area of generator set. Air flow from the radiator fan can blow loose items around and into ventilation openings.

Exhaust

Check to make sure entire exhaust system is tight, that no combustible materials are near system, and gases are discharged away from building openings.

EXHAUST GAS IS DEADLY!

Exhaust gases contain carbon monoxide, an odorless and colorless gas. Carbon monoxide is poisonous and can cause unconsciousness and death. Symptoms of carbon monoxide poisoning can include:

- ***Dizziness***
- ***Nausea***
- ***Headache***
- ***Weakness and Sleepiness***
- ***Throbbing in Temples***
- ***Muscular Twitching***
- ***Vomiting***
- ***Inability to Think Coherently***

IF YOU OR ANYONE ELSE EXPERIENCE ANY OF THESE SYMPTOMS, GET OUT INTO THE FRESH AIR IMMEDIATELY. If symptoms persist, seek medical attention. Shut down the unit and do not operate it until it has been inspected and repaired.

Protection against carbon monoxide inhalation includes proper installation and regular, frequent visual and audible inspections of the complete exhaust system.

THIS PAGE LEFT INTENTIONALLY BLANK

4. Troubleshooting

GENERAL

The generator set control continuously monitors the engine for abnormal conditions when genset is operating, such as low oil pressure and high coolant temperature. If any of these conditions occur, the control will display a message on the graphical display.

Refer to the appropriate control Operator Manual which lists the warning and shutdown codes/messages, and suggests troubleshooting procedures.

SAFETY CONSIDERATIONS

⚠WARNING ***Contacting high voltage components can result in severe personal injury or death. Keep the control box and circuit breaker box covers in place during troubleshooting.***

High voltages are present when the generator set is running. Do not open the generator control box or the circuit breaker box while the generator set is running.

⚠ CAUTION ***Before disconnecting battery cable(s), press the Emergency Stop button and wait at least 30 seconds. Engine performance may be affected (i.e., engine dying or hard starting) if battery cable(s) is removed during the 30 second waiting period. Service personnel may be required to correct fault.***

⚠WARNING ***Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switch or other equipment, flame, pilot lights and sparks can ignite battery gas. Do not smoke, or switch trouble light ON or OFF near battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.***

Ventilate battery area before working on or near battery—Wear goggles—Stop generator set and disconnect charger before disconnecting battery cables—Disconnect negative (–) cable first and reconnect last.

⚠ CAUTION ***Disconnect battery charger from AC source before disconnecting battery cables. Otherwise, disconnecting cables can result in voltage spikes damaging to DC control circuits of the generator set.***

⚠WARNING ***Accidental starting of the generator set can cause severe personal injury or death. Prevent accidental starting by disconnecting the negative (–) cable from the battery terminal.***

When troubleshooting a generator set that is shut down, make certain the generator set cannot be accidentally restarted as follows:

1. Press the O button to switch to the **Off** mode.
2. Turn off or remove AC power from the battery charger.
3. Press the emergency stop button and wait at least 30 seconds before completing Step 4.
4. Remove the negative (–) battery cable from the generator set starting battery.

READING FAULT CODES

Refer to appropriate control Operator Manual, which describes how to view fault codes using the graphical display.

LINE CIRCUIT BREAKER (OPTIONAL)

The optional line circuit breaker is mounted on the power output box. If the load exceeds the circuit breaker current rating, the line circuit breaker will open. If the circuit breaker trips, locate the source of the overload and correct as necessary. Manually reset the breaker to reconnect the load to the generator.

CONTROL AND DIAGNOSTICS VIA NETWORK OR PC (LAPTOP)

See your authorized Cummins Power Generation dealer regarding software, hardware and network requirements for control and diagnostics via network or personal computer.

5. Maintenance

GENERAL

Establish and adhere to a definite schedule for maintenance and service based on the application and severity of the environment. Table 5-1 covers the recommended service intervals for a generator set on STANDBY service. If the generator set will be subjected to extreme operating conditions, the time between service intervals should be reduced accordingly. Some of the factors that can affect the maintenance schedule are the following:

- Use for continuous duty (prime power)
- Extremes in ambient temperature
- Exposure to weather
- Exposure to salt water
- Exposure to dust, sand or other airborne contaminates

Consult with your local Cummins Power Generation distributor if the generator set will be subjected to any extreme operating conditions and determine a suitable schedule of maintenance. Use the *Engine* and *Control Hours* display to keep an accurate log of all service performed for warranty support. Perform all service at the time period indicated or after the number of operating hours indicated, whichever comes first. Use Table 5-1 to determine the maintenance required and then refer to the sections that follow for the correct service procedures.

TABLE 5-1. MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	SERVICE TIME				
	Daily or after 8 Hours	Weekly or after 50 Hours	Monthly or after 100 Hours	Yearly or after 250 Hours	Yearly or after 500 Hours
General Genset Inspection	X[1, 2]				
Check Coolant Heater	X				
Check Oil Level	X				
Check Coolant Level	X				
Check Fuel Level	X				
Check Charge Air Piping		X[1]			
Check Air Cleaner		X[3]			
Check Battery Charging System		X			
Drain Fuel Filter(s)		X[1, 5]			
Drain Water and Sediment from Fuel Tank			X[5]		
Drain Exhaust Condensate Trap			X		
Check Starting Batteries			X		
Check Drive Belt			X[4]		
Check Anti-freeze and DCA Concentration				X[1]	
Check Radiator Hoses for Wear & Cracks				X	
Change Air Cleaner Element				X[3]	
Change Crankcase Oil and Filter					X[6]
Change Fuel Filters					X[1]
Clean Cooling System					X[1, 3]
Test Rupture Basin Leak Detect Switch					X[8]
Check Valve Lash	After 5000 hours[1, 7]				

X[1] Refer to Cummins Engine Owners Manual for maintenance information.

X[2] Check for oil, fuel, cooling and exhaust system leaks. Check exhaust system audibly and visually with set running and repair any leaks immediately.

X[3] Perform more often in dusty conditions.

X[4] Visually check belt for evidence of wear or slippage. Replace if hard or brittle.

X[5] Drain 1 cup or more of fuel to remove water and sediment.

X[6] If used for prime power application, refer to Cummins Engine Owners Manual for maintenance interval.

X[7] Contact an authorized service center for service.

X[8] Check leak detect switch in sub-base fuel tank, once a year or as required by safety code. Contact your authorized service center.

GENERATOR SET INSPECTION

During operation, be alert for mechanical problems that could create unsafe or hazardous conditions. The following sections cover several areas that should be frequently inspected for continued safe operation.

Exhaust System

With the generator set operating, inspect the entire exhaust system visually and audibly including the exhaust manifold, muffler and exhaust pipe. Check for leaks at all connections, welds, gaskets and joints and also make sure that exhaust pipes are not heating surrounding areas excessively. If any leaks are detected, shut down the generator set and have leaks corrected immediately.

⚠WARNING ***Inhalation of exhaust gases can result in severe personal injury or death. Be sure deadly exhaust gas is piped outside and away from any windows, doors, vents or other inlets to building and not allowed to accumulate in inhabitable areas.***

Fuel System

Inspect the fuel supply lines, return lines, filters and fittings for cracks and abrasions and make sure they are not rubbing against anything that could cause breakage. With the generator set operating, check the fuel system for leaks. If any leaks are detected, have them corrected immediately.

⚠WARNING ***Ignition of fuel can cause severe personal injury or death by fire or explosion. Do not permit any flame, cigarette, arcing switch or equipment, pilot light, or other igniter near the fuel system or in areas sharing ventilation.***

AC Electric System

Check the following while the generator set is operating.

Frequency/RPM (Alternator/Engine Menu): The generator frequency should be stable and the reading should be the same as the genset nameplate rating (50 or 60 Hz/1500 or 1800 RPM).

AC Voltmeter (Alternator Menu): At no load, the line-to-line or line-to-neutral voltage(s) should be the same as the genset nameplate rating.

AC Ammeter (Alternator Menu): At no load the current ratings should be zero. With a load applied, each line current should be about the same.

DC Electrical System

Check the terminals on the batteries for clean and tight connections. Loose or corroded connections create resistance which can hinder starting. Refer to *BATTERIES* later in this section for cleaning and safety precautions.

Engine

Monitor fluid levels and oil pressure and coolant temperatures frequently. Most engine problems give an early warning. Look and listen for changes in engine performance, sound, or appearance that can indicate service or repair is needed. Some engine changes to look for are as follows:

- Misfire
- Vibration
- Unusual noises
- Sudden changes in engine operating temperatures or pressures
- Excessive exhaust smoke
- Loss of power
- An increase in oil consumption
- An increase in fuel consumption
- Fuel, oil, or coolant leaks.

GENERATOR SET MAINTENANCE (BATTERY DISCONNECTED)

⚠ CAUTION ***Before disconnecting battery cable(s), press the Emergency Stop button and wait at least 30 seconds. Engine performance may be affected (i.e., engine dying or hard starting) if battery cable(s) is removed during the 30 second waiting period. Service personnel may be required to correct fault.***

⚠ WARNING ***Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switch or other equipment, flame, pilot lights and sparks can ignite battery gas. Do not smoke, or switch trouble light ON or OFF near battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.***

Ventilate battery area before working on or near battery—Wear goggles—Stop generator set and disconnect charger before disconnecting battery cables—Disconnect negative (–) cable first and reconnect last.

⚠ CAUTION ***Disconnect battery charger from AC source before disconnecting battery cables. Otherwise, disconnecting cables can result in voltage spikes damaging to DC control circuits of the set.***

⚠ WARNING ***Accidental starting of the generator set can cause severe personal injury or death. Prevent accidental starting by disconnecting the negative (–) cable from the battery terminal before beginning maintenance procedures.***

When performing the following maintenance procedures, make certain the generator set cannot be accidentally restarted as follows:

1. Press the O button to switch to the **Off** mode.
2. Turn off or remove AC power from the battery charger.
3. Press the emergency Stop button and wait at least 30 seconds before completing Step 4.
4. Remove the negative (–) battery cable from the generator set starting battery.

Mechanical Inspection

With the generator set stopped, check for loose belts and fittings, leaking gaskets and hoses, or any signs of mechanical damage. If any problems are found, have them corrected immediately.

LUBRICATION SYSTEM

Gensets are shipped with oil added. Be sure to check oil level before initial start.

Oil API Classification

Refer to the Cummins engine *Owners Manual* for lubricating oil classification.

Oil Viscosity

Refer to the Cummins engine *Owners Manual* for lubricating oil recommendations/specifications.

Engine Oil Level

Check the engine oil level during engine shutdown periods at the intervals specified in the Maintenance Table. The dipstick is stamped with high and low marks to indicate the level of oil in the crankcase. For accurate readings, shut off the engine and wait approximately 15 minutes before checking the oil level. This allows oil in the upper portion of the engine to drain back into the crankcase.

⚠WARNING ***Crankcase pressure can blow out hot oil and cause severe burns. Do NOT check oil while the generator set is operating.***

Keep the oil level as near as possible to the high mark on the dipstick. Remove the oil fill cap and add oil of the same quality and brand when necessary. Install the oil fill cap after adding oil.

⚠CAUTION ***Do not operate the engine with the oil level below the low mark or above the high mark. Overfilling can cause foaming or aeration of the oil while operation below the low mark may cause loss of oil pressure.***

OIL AND FILTER CHANGE

Change the oil and filter at the intervals recommended in the maintenance table. Use oil that meets Cummins recommendations/specifications.

Engine Oil Change

Refer to the Cummins engine *Owners Manual* for lubricating oil and filter changing procedure. Refer to *Specifications* in Section 2 of this manual for oil capacity. Use oil that meets Cummins recommendations/specifications.

⚠WARNING ***State or federal agencies have determined that contact with used engine oil can cause cancer or reproductive toxicity. Do not contact oil or breath vapors. Use rubber gloves and wash exposed skin.***

Used oil and filters must be disposed of properly to avoid environmental damage and clean-up liability. Check all federal, state and local regulations for disposal requirements.

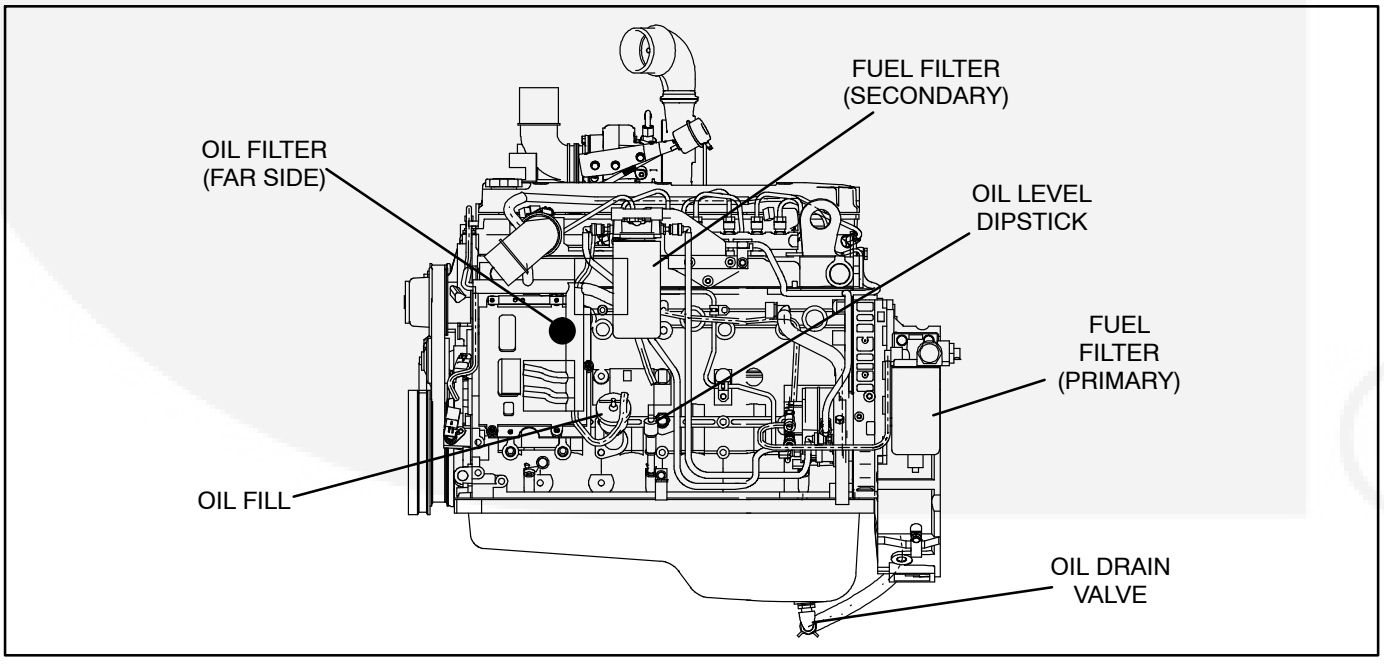

FIGURE 5-1. LOCATION OF OIL/FUEL SYSTEM COMPONENTS

COOLING SYSTEM

Gensets are shipped with coolant added. Be sure to check coolant level before initial start.

⚠ CAUTION ***The coolant heater must not be operated while the cooling system is empty or when the engine is running or damage to the heater will occur.***

⚠ CAUTION ***Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool to below 120° F (50 °C*) before adding coolant.**

Coolant Level

Check the coolant recovery tank level. Note the normal level when the engine is cool. Add coolant to the recovery tank to replace the normal loss of coolant.

Refer to the Cummins engine *Owners Manual* for coolant recommendations/specifications.

⚠WARNING ***To prevent severe scalding, let engine cool down before removing coolant pressure cap. Turn cap slowly, and do not open it fully until the pressure has been relieved.***

⚠ CAUTION ***Loss of coolant can allow engine to overheat without protection of shutdown device and cause severe damage to the engine. Maintain coolant level for proper operation of the high engine temperature shutdown system.***

Coolant Requirements

Heavy duty diesel engines require a balanced coolant mixture of water, antifreeze and coolant additives.

Refer to the Cummins engine *Owners Manual* for all cooling system maintenance, such as, coolant requirements, filling of cooling system, coolant filter replacement and flushing and cleaning.

Radiator

Inspect the exterior of the radiator for obstructions. Remove all dirt or foreign material with a soft brush or cloth. Use care to avoid damaging the fins. If available, use low pressure compressed air or stream of water (maximum of 35 psi/242 kPa), in opposite direction of normal air flow to clean radiator. If using water, protect the engine and the generator from over spray.

Coolant Heater

Check the operation of the coolant heater by verifying that hot coolant is being discharged from the outlet hose. ***Do not touch outlet hose*** – if heater is operational, radiant heat should be felt with hand held close to outlet hose.

⚠WARNING ***Contact with cooling system or engine can result in serious burns. Do not touch cooling system or engine during genset maintenance until they are cool.***

FUEL SYSTEM

Refer to the Cummins engine *Owners Manual* for fuel system maintenance.

Fuel Handling Precautions

⚠WARNING ***Ignition of fuel can cause serious personal injury or death by fire or explosion. Do not permit any flame, cigarette, arc, spark, pilot light, or other igniter near the fuel system.***

To avoid condensation problems, keep fuel supply tanks as full as possible by filling up each time the engine is used. In cold weather, warm fuel returning from the injectors heats the fuel in the supply tank. If the fuel level is low, the upper portion of the tank tends to form condensation. In warm weather, both the fuel and the tank will be warm during the daytime. At night, cool air tends to lower the temperature of the tank more rapidly than the temperature of the fuel. If the fuel level is low, the upper portion of the tank will cool more rapidly and tend to form condensation.

Condensation (water) can cause clogging of fuel filters with the sulphur in the fuel forms acid which can corrode and damage engine parts.

AIR CLEANER

The filter element should be replaced yearly or sooner if the service indicator indicates excessive air restriction.

The vacuator valve dumps collected dust automatically.

⚠ CAUTION ***Holes, loose end seals, dented sealing surfaces and other forms of damage render the cleaner inoperative and requires immediate element replacement.***

Inspect all components of the air filtering system including all ducts and hoses. Verify that all connections and clamps are tight and inspect each component for cracks, dents, or other damage. Repair or service as required.

⚠ CAUTION ***Filters should be handled with care to prevent damage. If the filter does become damaged, install recommended replacement part.***

The following procedure should be followed when replacing the element.

1. Release the cover clip and turn the air cleaner cover counterclockwise to remove.
2. Slowly remove the air filter to reduce the amount of dust dislodged. There may be some initial resistance when removing the filter. Gently move the end of the filter up and down and side to side or twist to break the seal.
3. Wipe out the interior of the air cleaner housing and cover with a clean, damp cloth. Make sure that **ALL** dust is removed from **ALL** interior surfaces of the air cleaner housing. Be careful not to damage the sealing area on the outlet tube.
4. Inspect new air filter for shipping damage. Pay attention to the inside of the open end (sealing area). Do not install a damaged filter.
5. Install new air filter. The seal area is on the inside of the open end of the filter. The sealing area will stretch slightly and adjust itself over the outlet tube. To complete the seal, apply pressure at the outer rim of the filter, not the flexible center. No cover pressure is required to hold the seal.
5. Put on the air cleaner cover and rotate clockwise until cover clip engages.

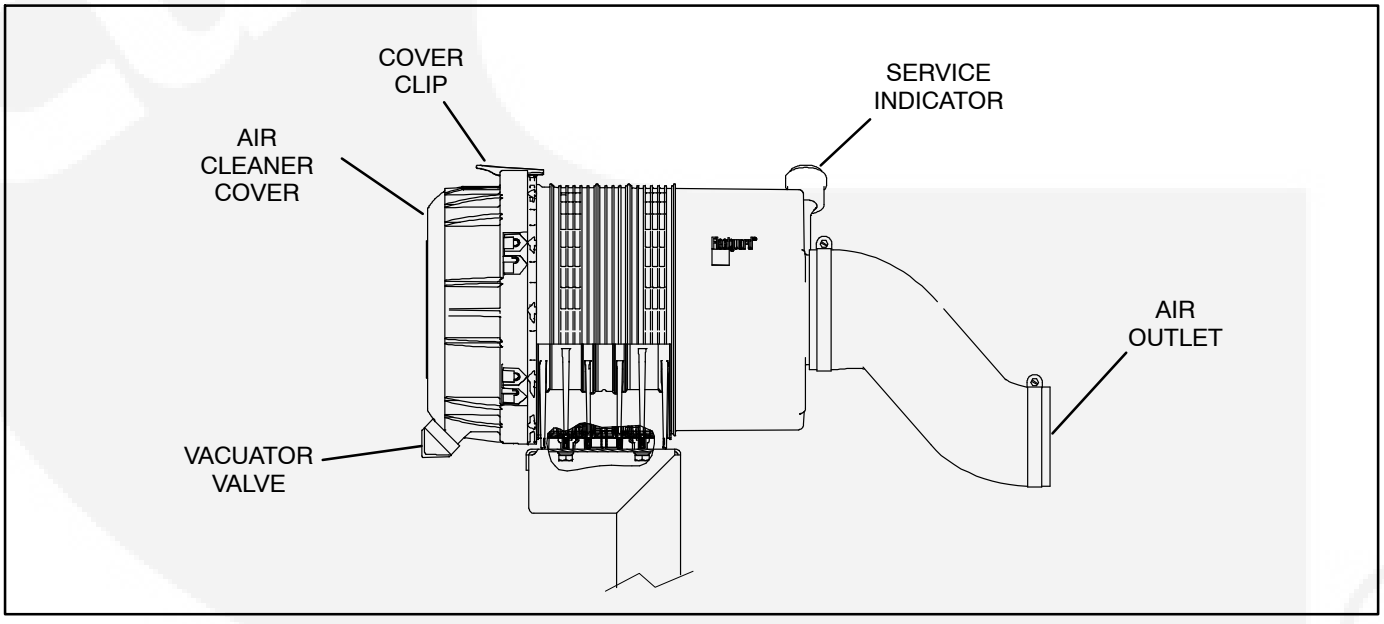

FIGURE 5-2. AIR CLEANER

BATTERIES

⚠ CAUTION ***Before disconnecting battery cable(s), press the Emergency Stop button and wait at least 30 seconds. Engine performance may be affected (i.e., engine dying or hard starting) if battery cable(s) is removed during the 30 second waiting period. Service personnel may be required to correct fault.***

⚠WARNING ***Ignition of explosive battery gases can cause severe personal injury or death. Arcing at battery terminals, light switch or other equipment, flame, pilot lights and sparks can ignite battery gas. Do not smoke, or switch trouble light ON or OFF near battery. Discharge static electricity from body before touching batteries by first touching a grounded metal surface.***

Ventilate battery area before working on or near battery—Wear goggles—Stop genset and disconnect charger before disconnecting battery cables—Disconnect negative (–) cable first and reconnect last.

⚠ CAUTION ***Disconnect battery charger from AC source before disconnecting battery cables. Otherwise, disconnecting cables can result in voltage spikes damaging to DC control circuits of the set.***

Check the condition of the starting batteries at the interval specified in the Maintenance Table. To prevent dangerous arcing, always disconnect the negative ground cable from the battery before working on any part of the electrical system or the engine. Disregard the sections On Checking Specific Gravity and Checking Electrolyte Level if using a “maintenance-free” battery.

Cleaning Batteries

⚠WARNING ***Electrolyte is a dilute sulfuric acid that is harmful to the skin and eyes. Do not get the substance in your eyes or contact with skin. Wear goggles and protective, rubber gloves and apron when servicing batteries.***

In case of contact, immediately wash skin with soap and water. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. IMMEDIATELY CALL A PHYSICIAN.

Keep the batteries clean by wiping them with a damp cloth whenever dirt appears excessive.

If corrosion is present around the terminal connections, remove battery cables and wash the terminals with a solution consisting of 1/4 pound of baking soda added to 1 quart of water. (This solution is also used for washing down spilled electrolyte.)

Be sure the vent plugs are tight to prevent cleaning solution from entering the cells.

After cleaning, flush the outside of the battery and surrounding areas with clean water.

Keep the battery terminals clean and tight. After making connections, coat the terminals with a light application of petroleum jelly or non-conductive grease to retard corrosion.

Checking Specific Gravity

Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell.

Hold the hydrometer vertical and take the reading. Correct the reading by adding four gravity points (0.004) for every ten degrees the electrolyte temperature is above 80° F (27° C). A fully charged battery will have a corrected specific gravity of 1.260. Charge the battery if the reading is below 1.215.

Checking Electrolyte Level

⚠ CAUTION ***Do not add water in freezing weather unless the engine will run long enough (two to three hours) to assure a thorough mixing of water and electrolyte.***

Check the level of the electrolyte (acid and water solution) in the batteries at least every 200 hours of operation.

Fill the battery cells to the bottom of the filler neck. If cells are low on water, add distilled water and recharge. If one cell is low, check case for leaks. Keep the battery case clean and dry. An accumulation of moisture will lead to a more rapid discharge and battery failure.

Battery Replacement

Always replace the starting battery with the same number and type (vented, lead acid). Properly dispose of battery in accordance with local environmental agency requirements.

⚠WARNING ***Electrolyte or explosion of battery can cause severe personal injury or death. Do not mutilate or burn the battery in a fire for disposal.***

Damage to case will release electrolyte which is harmful to the skin and eyes and is also toxic. Burning of battery may cause an explosion.

NiCad Batteries

NiCad (nickel-cadmium) battery systems are often specified where extreme high or low ambient temperature is expected because their performance is less affected by temperature extremes than that of lead-acid batteries.

NiCad batteries require special battery chargers in order to bring them to the full-charge level. These chargers must be provided with filter to reduce “charge ripple” which can disrupt engine and generator control systems.

THIS PAGE LEFT INTENTIONALLY BLANK

6. Operating Recommendations

NO-LOAD OPERATION

Periods of no load operation should be held to a minimum. If it is necessary to keep the engine running for long periods of time when no electric output is required, best engine performance will be obtained by connecting a load bank of at least 30 percent of nameplate rating.

EXERCISE PERIOD

Generator sets on standby duty must be able to go from a cold start to being fully operational in a matter of seconds. This can impose a severe burden on engine parts.

Regular exercising keeps engine parts lubricated, prevents oxidation of electrical contacts and in general helps provide reliable engine starting.

Exercise the generator set at least once a month for a minimum of 30 minutes, under not less than 30 percent of the nameplate rating.

LOW OPERATING TEMPERATURE

Use a coolant heater if a separate source of power is available. The optional heater will help provide reliable starting under adverse weather conditions. Be sure the voltage of the separate power source is correct for the heater element rating.

HIGH OPERATING TEMPERATURE

Refer to the genset *Specification/Data Sheet* for the maximum ambient operating temperature, if applicable.

THIS PAGE LEFT INTENTIONALLY BLANK

Cummins Power Generation
1400 73rd Ave. NE
Minneapolis, MN 55432 USA

Phone 1 763 574 5000
Toll-free 1 800 888 6626
Fax 1 763 574 5298
Email ask.powergen@cummins.com
www.cumminspower.com