Onan *Mobile GenSet*

Operator's Manual

HDKAL, HDKAQ, HDKAR, HDKAS Generator Sets

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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.

Safety Precautions

Thoroughly read the OPERATOR'S MANUAL before operating the genset. Safe operation and top performance can be obtained only with proper operation and maintenance.

The following symbols in this Manual alert you to potential hazards to the operator, service person and equipment.

⚠ DANGER ***Alerts you to an immediate hazard which will result in severe personal injury or death.***

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

⚠CAUTION ***Alerts you to a hazard or unsafe practice which can result in personal injury or equipment damage.***

Electricity, fuel, exhaust, moving parts and batteries present hazards which can result in severe personal injury or death.

GENERAL PRECAUTIONS

- Keep ABC fire extinguishers handy.
- Make sure all fasteners are secure and torqued properly.
- Keep the genset and its compartment clean. Excess oil and oily rags can catch fire. Dirt and gear stowed in the compartment can restrict cooling air.
- Before working on the genset, disconnect the negative (–) battery cable at the battery to prevent starting.
- Use caution when making adjustments while the genset is running—hot, moving or electrically live parts can cause severe personal injury or death.
- Used engine oil has been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not ingest, inhale, or contact used oil or its vapors.
- Benzene and lead in some gasolines have been identified by some state and federal agencies as causing cancer or reproductive toxicity. Do not to ingest, inhale or contact gasoline or its vapors.
- Do not work on the genset when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.

GENERATOR VOLTAGE IS DEADLY!

- Generator output connections must be made by a qualified electrician in accordance with applicable codes.
- The genset must not be connected to the public utility or any other source of electrical power. Connection could lead to electrocution of utility workers, damage to equipment and fire. An approved switching device must be used to prevent interconnections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry and stand on a dry wooden platform on the ground or floor.

FUEL IS FLAMMABLE AND EXPLOSIVE

- Keep flames, cigarettes, sparks, pilot lights, electrical arc-producing equipment and switches and all other sources of ignition well away from areas where fuel fumes are present and areas sharing ventilation.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.
- Use approved non-conductive flexible fuel hose for fuel connections at the genset.

ENGINE EXHAUST IS DEADLY!

- Learn the symptoms of carbon monoxide poisoning in this Manual.
- Never sleep in the vehicle while the genset is running unless the vehicle has a working carbon monoxide detector.
- The exhaust system must be installed in accordance with the genset Installation Manual.
- Do not use engine cooling air to heat the vehicle interior.
- Make sure there is ample fresh air when operating the genset in a confined area.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Keep guards in place over fans, belts, pulleys, etc.

BATTERY GAS IS EXPLOSIVE

- Wear safety glasses and do not smoke while servicing batteries.
- When disconnecting or reconnecting battery cables, always disconnect the negative (–) battery cable first and reconnect it last to reduce arcing.

DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS

Flammable vapor can cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. ***Do not operate a diesel-powered 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 the ones solely responsible for operating the genset safely. Contact your authorized Onan/Cummins dealer or distributor for more information.

Mobile-3

Introduction

ABOUT THIS MANUAL

This manual shows how to operate and maintain the Onan® HDKAL, HDKAQ, HDKAR, and HDKAS generator set. Study the manual and heed all warnings and cautions. Using the genset properly and maintaining it regularly will promote longer set life, better performance, and safer operation.

The *Operating Recommendations* section covers the break-in procedure and the effects of high altitude and variations in climate. The *Wattage Requirements* section describes the wattage capacity of the set and lists the wattage use of common appliances and tools. Familiarize yourself and others who will operate this set with this information.

⚠WARNING ***This genset is not a life support system. It can stop without warning. Children, persons with physical or mental limitations, and pets could suffer personal injury or death. A personal attendant, redundant power or a warning system must be used if genset operation is critical.***

MODEL IDENTIFICATION

Have the following information ready when you call a distributor:

- Model number
- Serial number

These are found on the nameplate (Figure 1).

Record these numbers from your generator set in the area provided in Figure 1. Make sure that all numbers are recorded correctly.

FEATURE AND COMPONENT LOCATIONS

The standard control panel and the routine maintenance items are shown in Figure 2.

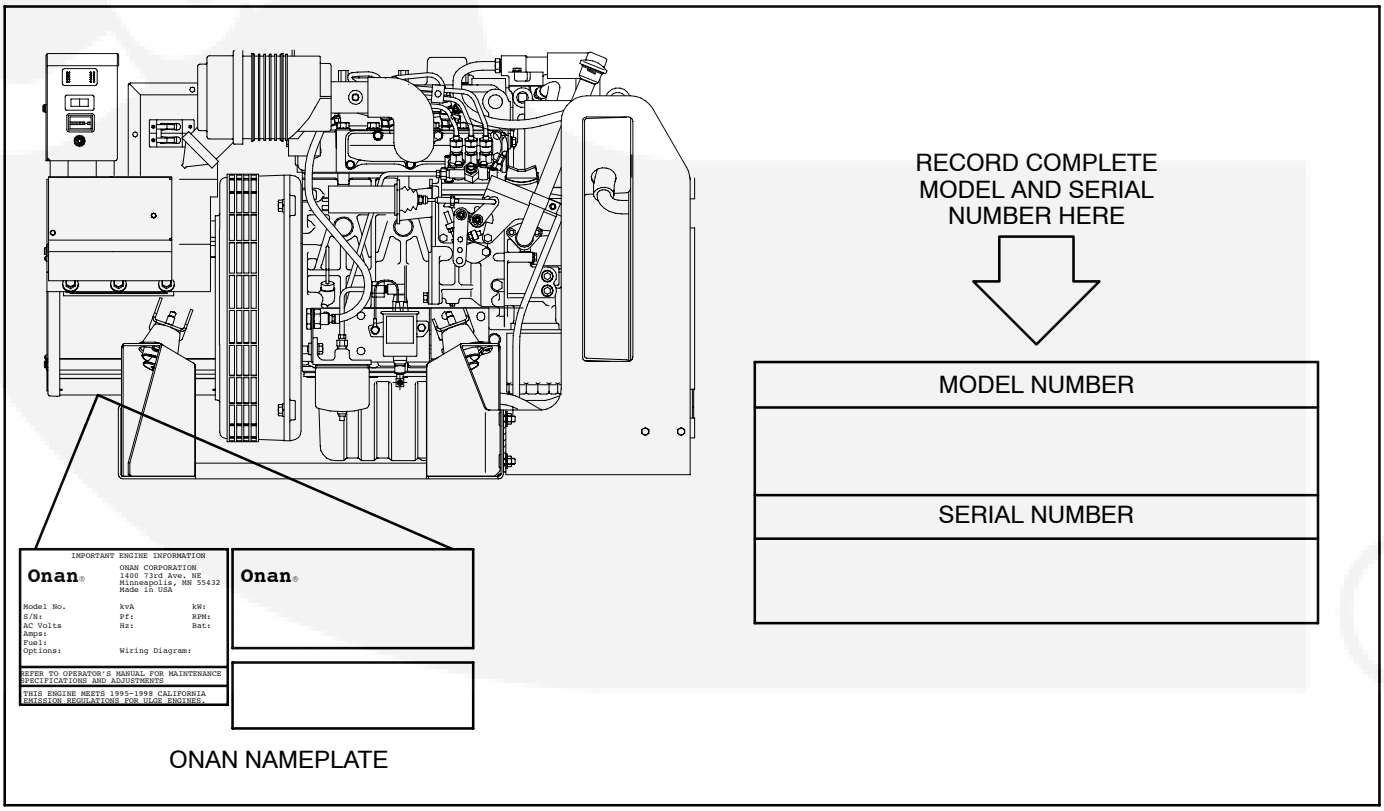


FIGURE 1. MODEL IDENTIFICATION

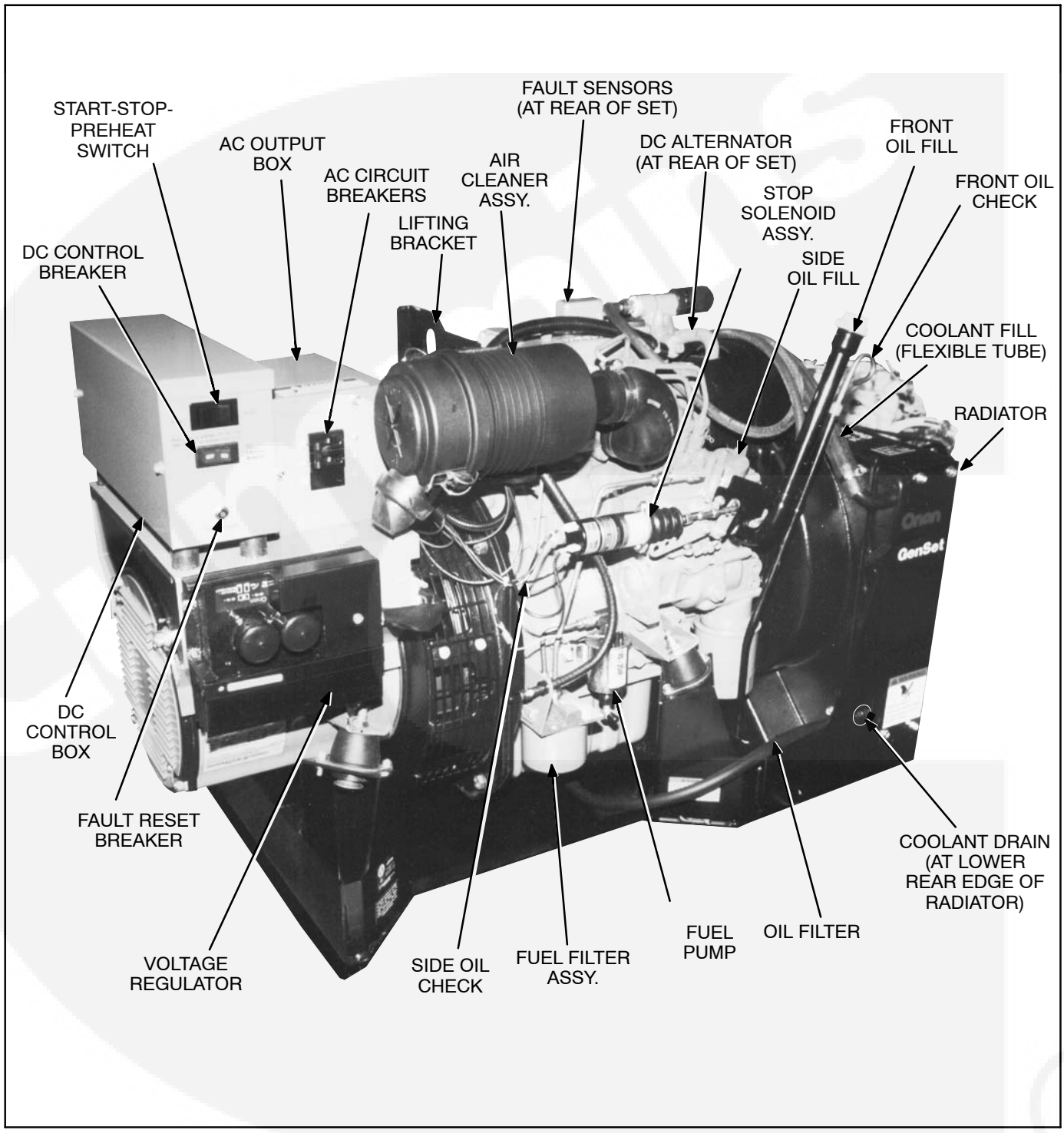


FIGURE 2. HDKAL/HDKAQ/HDKAR/HDKAS GENERATOR SET

Control Panel

This section describes the features of the standard control panel. The set controls and breakers are located on the front of the DC control box. The line circuit breaker is located on the front of the AC control box. See Figure 3.. In some installations the DC control box and line circuit breaker is remotely mounted. The commercial HDKAL/HDKAS generator set has environmental covers over the switches and circuit breakers, and rubber boots over the electrical connectors.

Controls and Breakers

Start/Stop/Preheat Switch: Starts and stops the generator set. Operates the engine cylinder preheaters.

DC Control Breaker: A 15 ampere DC breaker that protects the control box and remote wiring from short circuits or overload. Also serves as an emergency stop switch.

Fault Reset Breaker: A manual reset breaker that shuts down the engine for:

- Low oil pressure
- High coolant temperature
- Overspeed

Line Circuit Breaker(s): A circuit breaker or breakers that protect customer wiring from a short circuit or other overload. They are mounted on the front of the AC control box. Different sizes and configurations are supplied depending on the model.

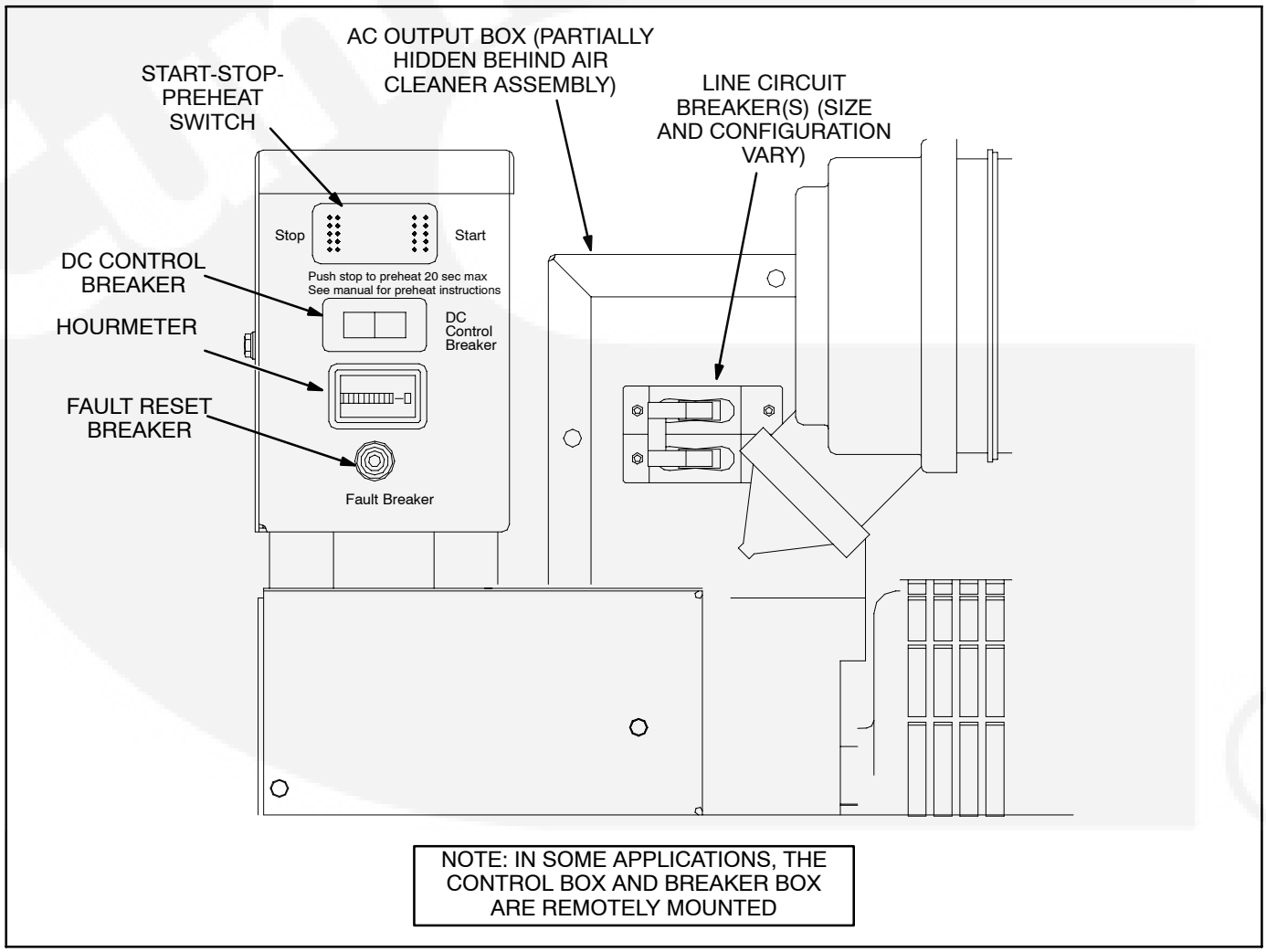


FIGURE 3.. GENERATOR SET CONTROLS AND BREAKERS

Pre-Start Checks

ENGINE OIL

Check the engine oil level (with the coach on level ground) before each start. When the generator set is new, the engine must be filled with oil before the initial start. The engine oil capacity is 4.26 liters (4.5 quarts).

If adding oil between changes, use the same brand because different brands might not be compatible when mixed. Be careful not to overfill the crankcase because the oil may foam or overflow through the breather, resulting in engine shutdown.

Oil Recommendations

Use oils with the American Petroleum Institute (API) classification CC and later in viscosities shown below in Table 1.

Select the oil viscosity that is right for the lowest temperature expected. Oil that is too thick may not lubricate when the engine is started. Use a lower viscosity oil as the ambient temperature gets colder.

Do not use synthetic oil or non-detergent oil. Do not mix different brands of oil.

Checking Engine Oil Level

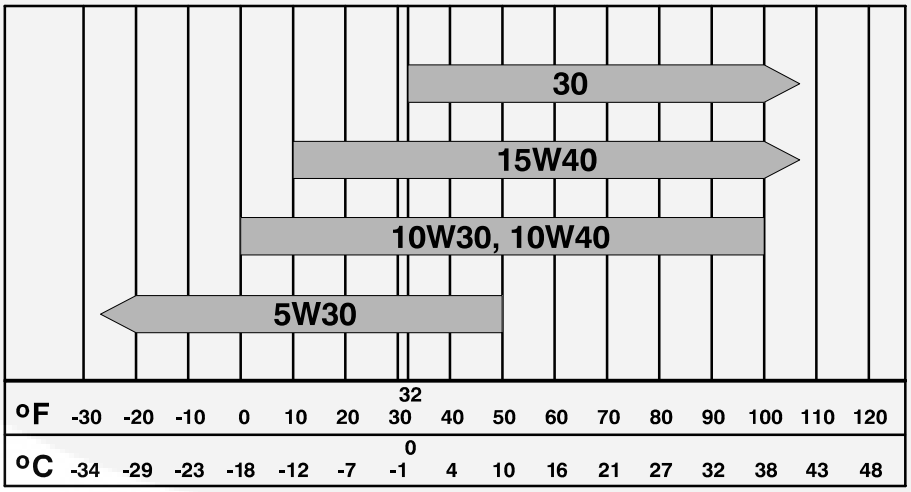
⚠ CAUTION ***Do not operate the engine with the oil below the ADD mark or above the FULL mark. Overfilling can cause foaming or aeration of the oil, while operation below the ADD mark might cause loss of oil pressure.***

Check the engine oil level at the intervals shown in Table 4. The oil dipstick and fill are located as shown in Figure 4. The dipsticks are stamped with FULL and ADD to indicate the oil level in the crankcase. For an accurate reading, shut off the engine and wait 10 minutes before checking the level. This lets oil in the upper part of the engine drain into the crankcase.

Keep the oil level near as possible to the FULL mark on the dipstick. Remove the oil fill cap and add the same type of oil when necessary.

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

TABLE 1. OIL VISCOSITY VS. TEMPERATURE



Anticipated Ambient Temperature

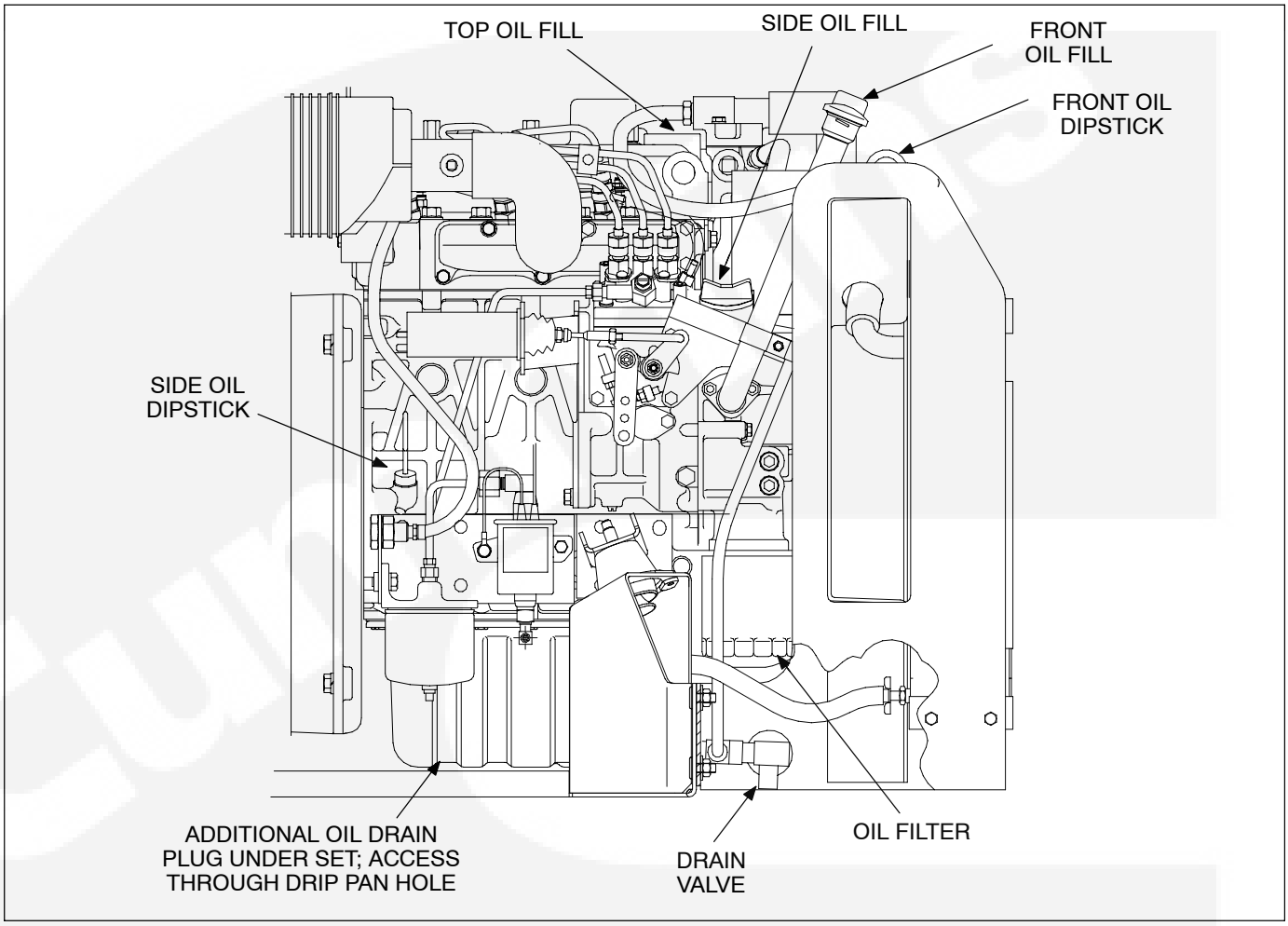


FIGURE 4. ENGINE OIL

EXHAUST CHECK

Thoroughly inspect the exhaust system for leaks or corrosion. Make certain that the tailpipe extends an inch beyond the perimeter of the vehicle. Have any problems repaired before operating the generator set.

⚠WARNING ***Exhaust gas presents the hazard of severe personal injury or death. Make certain that all exhaust components are operational and that there are no exhaust leaks.***

Do not start the set if exhaust gases will not effectively expel away from the vehicle. Be aware that any vent, window or opening that is not permanently sealed from the vehicle living space can be an avenue for carbon monoxide.

⚠WARNING ***Exhaust gases can cause severe personal injury or death. Never operate the generator set unless the exhaust outlet is clear of walls, snow banks, or any obstructions that can prevent exhaust gases from dissipating. Never operate any exhaust fan in the vehicle when the generator set is running: an exhaust fan can draw exhaust gas into the vehicle.***

FUEL CHECK

Carefully inspect the fuel system for leaks or corrosion. Have any problems repaired immediately.

⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Do not permit any flame, spark, pilot light, cigarette, or other ignition source near the fuel system.***

Use the best fuel available. Fuel quality is important for dependable performance and satisfactory engine life.

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

Fuel Recommendation

Use ASTM 2-D (No. 2 Diesel) or ASTM 1-D (No. 1 Diesel) fuel with a minimum Cetane number of 45. Number 2 diesel fuel gives the best economy and performance under most conditions. Use number 1 diesel fuel when ambient temperatures are below 32° F (0° C), and during long periods of light engine load.

Use low sulfur content fuel which has a cloud point at least 10 degrees below the lowest expected fuel temperature. (Cloud point is the temperature at which wax crystals begin to form in diesel fuel.)

GENERAL INSPECTION

Check the generator set for damaged or loose parts. Make sure the air inlet and outlet areas are not blocked. Investigate any abnormal operating noises. Make sure that the generator set is securely mounted in its compartment or under-floor housing.

Check to see that the vehicle is not parked in high grass or brush.

⚠WARNING ***Do not operate the generator set when the vehicle is parked in high grass or brush. Engine exhaust could ignite the grass, and the resulting fire could cause severe personal injury or death, and/or property damage.***

Starting and Stopping

⚠WARNING

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 until it has been inspected and repaired.

Never sleep in the vehicle with the generator set running unless the vehicle interior is equipped with an operating carbon monoxide detector. Protection against carbon monoxide inhalation also includes proper exhaust system installation and visual and audible inspection of the complete exhaust system at the start of each generator set operation.

STARTING

Starting at Set

1. Press the Start/Stop/Preheat switch to **Stop**/**Preheat**. Hold for up to 20 seconds, depending on the temperature (see Table 2).

   ⚠CAUTION ***Preheat time longer than 20 seconds may damage glow plugs.***

TABLE 2. PREHEAT TIME vs. TEMPERATURE

Ambient Temperature	Preheat Time
Above 50° F (10° C)	10 seconds
Between 0° to 50° F (-17° to 10° C)	15 seconds
Below 0° F (-17° C)	20 seconds

2. Press the Start/Stop/Preheat switch to **Start**. Release the switch when the engine starts.
3. If the engine does not start after cranking 30 seconds, release the switch. Wait two minutes, then repeat Step 1 (preheat).

   ⚠CAUTION ***Excessive cranking can overheat the starter, damaging it. Do not engage the starter longer than 30 seconds without allowing two minutes for cooling.***

4. If the engine does not start on the second try:

   - Check the fuel supply.
   - Make sure the fuel system has been primed.

   With an empty tank, the fuel system may need priming before the set can start. See *Fuel System* in the *Maintenance* Section.

Starting at Remote Panel

The same procedures and cautions for normal starting apply to remote starting.

Start-up Checks (Optional Remote Panel)

Check the gauges (if equipped) on the control box after the engine starts. Check the oil pressure gauge immediately.

Oil Pressure Gauge: Oil pressure should be 40 to 60 psi (276 to 414 kPa) when the engine is at operating temperature.

DC Voltmeter: Battery voltage during operation should be 14 to 15 volts, depending on the state of battery charge.

Water Temperature Gauge: Water temperature should be 165° to 195° F (74° to 91° C) depending on load and ambient temperature.

STOPPING

Before Stopping

Run the genset at no load three to five minutes before stopping. This lets the lubricating oil and engine coolant carry heat away from the combustion chamber and bearings.

⚠ CAUTION ***Failure to allow running time for engine cooling without load can cause engine damage. Make sure the generator set runs unloaded at least three minutes.***

To Stop: Press the Start/Stop/Preheat switch to the stop position.

Wattage Requirements

AC WATTAGE CAPACITY

The AC power output from the generator will power appliances and other equipment. (The wattage requirement of appliances and electrical equipment may be referred to as “electrical load”.)

Connecting a Load

To determine the maximum amount of electrical load that can be applied, follow these steps:

1. Determine the maximum load which your generator can operate. In most cases this will be determined by the rating which is listed on the nameplate. There are a few cases where the circuit breaker rating is the limiting factor. Choose the lower of the circuit breaker rating or name plate rating.

2. Check the wattage requirement of each device to be connected (See Table 3.). The appliance nameplate should list the wattage or current rating.

3. Add the wattages of all items to be powered at the same time. Make sure that the total wattage (or current) does not exceed the rating of the generator set or circuit breaker, whichever is smaller.

   Example:

Air Conditioner	1800 watts
Converter	500 watts
Coffee Percolator	600 watts
Television	300 watts
Total	3200 watts

4. Start the generator set and let it warm up a few minutes before applying electrical load.

Make sure that each appliance or tool is properly grounded and in good working condition before using it.

⚠WARNING ***Electrical shock can cause severe personal injury or death. Appliances should be in good working condition and be properly grounded to provide additional protection from electrical shock.***

TABLE 3. APPROXIMATE POWER DRAW OF COMMON APPLIANCES

Appliance or Tool	Approximate Running Wattage
Air Conditioner	1400-2000
Battery Charger	Up to 800
Coffee Percolator	550-750
Converter	300-500
Electric Blanket	50-200
Electric Broom	200-500
Electric Drill	250-750
Electric Frying Pan or Wok	1000-1500
Electric Iron	500-1200
Electric Stove (Per Element)	350-1000
Electric Water Heater	1000-1500
Hair Dryer	800-1500
Microwave Oven	1000-1500
Radio	50-200
Refrigerator	600-1000
Space Heater	1000-1500
Television	200-600

Motorized Devices

Motorized devices (such as air conditioners) consume more power during startup than they do when running at normal speed (Some motors draw as much as three times their operating power during startup). If you plan to use a motorized device, turn it on **before** starting other appliances. When the motor is running at normal speed, more devices may be added.

Circuit Breakers

Circuit breakers on the electrical distribution panel or on the genset will open if their current ratings are exceeded. This may be caused either by running too many appliances at once, or by a short circuit.

The genset will continue to run after a breaker trips. Turn off all loads, then reset the breaker. If it trips again, a short circuit is indicated. Turn off the set and contact a qualified technician for assistance.

If the breaker does not trip, turn on only as many devices as the breaker size allows (see *Connecting A Load* in this section). If the breaker trips again, this may indicate a defective load or circuit breaker. Contact a qualified technician to measure the exact current requirements of your specific loads to determine if the breaker or the load is defective.

Connection to Utility Power

Connect the RV or commercial vehicle to utility power (power from an outside source such as a plug-in outlet) **only** through an approved device, to protect against the possibility of generator power and utility power being connected. Consult the Installation Manual (publication 981-0605) for information on isolating the genset from utility-supplied power.

⚠WARNING ***Connecting the generator set directly to the public utility or any other power system can cause electrocution, damage to equipment, or fire. Hazardous voltages can flow from the generator set into the utility line. An approved switching device must be used to prevent interconnections.***

DC POWER

A 30-amp belt-driven alternator on the engine supplies DC power to recharge the starting battery for the set.

Operating Recommendations

BREAK-IN PROCEDURE

Change the crankcase oil after the first 50 hours of operation. See the *Maintenance* section of this manual for the procedure.

NO-LOAD OPERATION

Hold no-load operation to a minimum. With no load, combustion chamber temperatures can drop so low that fuel does not burn completely. This can create carbon deposits which clog injectors, glaze cylinders and cause piston rings and valves to stick. If it is necessary to run the engine for long periods, **connect an electrical load to the generator output.**

EXERCISE PERIOD

Infrequent use can result in difficult starting and moisture condensation problems. This moisture is a result of the engine not being run long enough to reach normal operating temperature. In extreme cases, water may be deposited in the oil. If this happens, severe engine damage can result. To prevent this possibility, run the generator set under load at least one hour per week.

Exercising for one long period each week is better than several shorter periods of operation. Do NOT operate the set for long periods at no load.

LOW TEMPERATURE/HIGH ALTITUDE OPERATION

1. Use the correct SAE oil rating for the current temperature conditions. Change the oil only when it is warm. See Table 1.
2. Use No. 1 diesel fuel for temperatures lower than 14° F (-10° C) or for all temperatures if altitude is above 5000 feet (1500 m). The fuel should have a cetane rating of at least 40. Shorten the oil change interval by half if the sulfur content of the fuel is higher than 0.5%.

EXTREMELY DUSTY OR DIRTY CONDITIONS

If running the genset in extremely dusty or dirty environments, do the following:

- Keep genset and radiator cooling surfaces clean.
- Service the air cleaner more frequently (as necessary).
- Change crankcase oil every 50 operating hours.
- Clean the generator as necessary. See *Maintenance* section.

Maintenance Schedule

Following the maintenance schedule and using the generator set properly will result in longer genset life, better performance, and safer operation. Perform each maintenance procedure at the time period indicated or after the number of operating hours indicated, whichever comes first. Refer to the *Maintenance Procedures* section for instructions.

NOTE: Many of these procedures are best performed by an authorized Onan service center. If you are at all in doubt about your ability to perform genset maintenance, have the Onan service center nearest you perform these tasks.

Consult an Onan service center if the generator set will be subjected to extremely hot or dusty conditions; a more frequent maintenance schedule may be necessary. Log all service and maintenance for warranty support (see the *Maintenance Record* section).

⚠WARNING ***Accidental starting of the generator set during maintenance can cause severe personal injury or death. Disconnect both generator set starting battery cables before performing maintenance. Remove the negative (-) cable first to reduce the risk of arcing.***

TABLE 4. PERIODIC MAINTENANCE SCHEDULE

	SERVICE TIME				
SERVICE THESE ITEMS	**Every 8 hours**	**Every 50 hours**	**Every 100 hours**	**Every 250 hours**	**Every 500 hours**
Inspect set	x[1]				
Check oil level	x				
Check coolant level	x				
Check fuel level	x				
Clean out spark arrester		x			
Check air cleaner dust cap (clean if required)		x[3]	x		
Check battery charging system			x		
Check drive belt tension			x[4]		
Clean air cleaner element			x		
Check battery specific gravity			x		
Change crankcase oil and filter			x[2,7]		
Drain water/sediment from fuel filter			x[5]		
Check anti-freeze				x	
Clean generator assembly				x	
Check fuel shut-off linkage				x	
Change fuel filter element				x	
Check generator brushes				x[6]	
Change air cleaner element					x[3]
Clean cooling system					x
Check valve clearance					x[6]

1 - Check for oil, fuel, cooling and exhaust system leaks. Check exhaust system audibly and visually with genset running and repair any leaks immediately.
2 - Perform after first 50 hours of operation on new genset.
3 - Perform more often in extremely dusty conditions.
4 - Visually check belts for evidence of slippage.
5 - Drain one cup of fuel to remove water and sediment.
6 - To be performed by authorized service technician.
7 - Perform every 200 hours.

Maintenance Procedures

GENERATOR SET INSPECTION

Inspect the generator set daily or after every eight hours of operation, whichever comes first. Check the exhaust, fuel, and DC electrical systems as described below. Also check the mechanical condition of the set.

Engine Gauges (Remote Installation)

Check these gauges while the set is running.

Oil Pressure Gauge: Oil pressure should be 40 to 60 psi (276 to 414 kPa) when the engine is at operating temperature.

Coolant Temperature Gauge: Coolant temperature should be 165° to 195° F (74° to 91° C), depending on load and ambient temperature.

DC Voltmeter: Battery voltage during operation should be 14 to 15 volts.

Exhaust System

With the set running, inspect the entire exhaust system including the exhaust manifold, exhaust elbow, muffler and exhaust pipe. Visually and audibly check for leaks at all connections, welds, gaskets, and joints. If any leaks are detected, **shut down the genset and do not operate until corrected.** Replace corroded exhaust components before leaks occur.

⚠WARNING ***Inhalation of exhaust gases can result in severe personal injury or death. Inspect exhaust system audibly and visually for leaks daily. Repair all leaks immediately.***

Fuel System

With the set running, inspect the fuel supply lines, return lines, filters, and fittings for leaks. Check flexible sections for cuts, cracks and abrasions. See that the fuel lines do not rub against anything that could break them. Replace worn fuel line components before leaks occur.

⚠WARNING ***Fuel leakage will create a fire hazard which can result in severe personal injury or death if ignited. While checking for leaks, do not smoke or allow any spark, flame, pilot light or other ignition source in the area. If any leaks are detected, have them corrected immediately.***

DC Electrical System

With the genset off, check the battery terminals for clean and tight connections. Loose or corroded connections create resistance which can impede starting. Clean and reconnect loose battery cables. Always disconnect the negative battery cable first and connect it last, to reduce the possibility of arcing.

⚠WARNING ***Ignition of explosive battery gases can cause severe personal injury. Do not smoke. Wear goggles, protective rubber gloves and apron when servicing batteries.***

Mechanical

Check for any signs of mechanical damage. Start the set and listen for any unusual noises that may indicate mechanical problems. Have any problems corrected immediately.

Check the mounting fasteners to make sure the set is secure in its compartment. If an under-floor housing is used, make sure that the set is secured to the housing. Check the condition of the housing components and make sure they are secure to the vehicle.

Make sure that the generator set air inlet and outlet areas are not blocked.

Clean the generator set whenever dust and dirt begin to accumulate. Dust and dirt can usually be removed with a damp cloth. Steam cleaning may be needed to remove road contaminants. Do not clean the genset while the engine is running. Protect the generator, air cleaner, control panel, and electrical connections from cleaning solvents. Cleaning solvents can damage electrical connectors.

OIL AND FILTER CHANGE

The generator set was shipped with oil installed. See the *Specifications* section for oil capacity.

Change the oil and filter at the intervals listed in Table 4. Use oil that meets the API classification and SAE viscosity grade indicated in the previous section.

Engine Oil Change

Run the engine until thoroughly warm (but not hot). Stop the engine, open the drain valve or remove the drain plug (Figure 5) and drain the oil into a container. When completely drained, close the valve or reinstall the plug and refill the crankcase with new oil.

On side compartment mount applications, the front oil drain valve may be rotated to the side and a hose attached and extended through the radiator mounting bracket, or in any available direction.

⚠WARNING ***Hot crankcase oil can cause burns if it is spilled or splashed on skin. Keep fingers and hands clear when removing the oil drain plug and wear protective clothing.***

⚠WARNING ***State or federal agencies have determined that used engine oil can cause cancer or reproductive toxicity. When adding, changing or working with used oil, take care not to breathe, ingest or come into excessive contact with these substances. Wash hands after use. Wear protective clothing and equipment. Provide adequate ventilation.***

Oil Filter Change

Spin off the oil filter and discard it. Thoroughly clean the filter mounting surface. Apply a thin film of oil to the filter gasket, and spin the filter on until the gasket just touches the mounting pad. Then turn an additional 3/4 turn. Do not over-tighten the filter.

With oil in the crankcase, start the set and check for leakage around the filter gasket. Tighten the filter only enough to eliminate leaks.

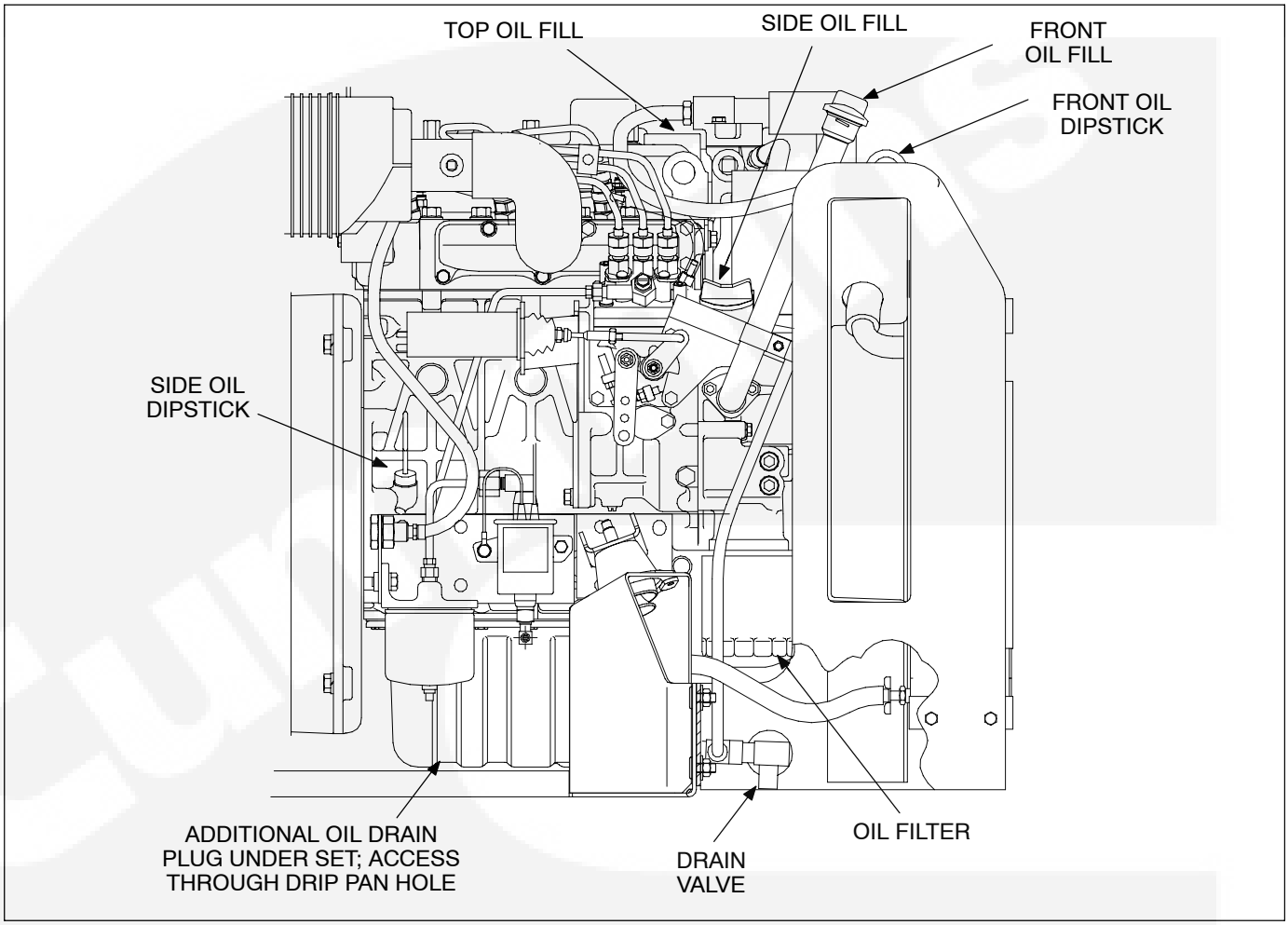


FIGURE 5. ENGINE OIL

COOLING SYSTEM

The generator set is shipped with coolant installed. Cooling system capacity is listed in the *Specifications* section.

Coolant Requirements

Engine coolant must inhibit corrosion and protect against freezing. A 50/50 mixture of ethylene glycol antifreeze and water is recommended for normal operation and storage. Use only a reliable brand of antifreeze that contains a rust and corrosion inhibitor. **The antifreeze must not contain a stop-leak additive.**

Do not exceed a 50/50 mixture of ethylene glycol and water. A higher proportion of ethylene glycol will alter the heat transfer properties of the coolant. A 50/50 mixture will provide freeze protection to -34° F (-37° C).

Water used for engine coolant should be clean, low in minerals, and free of corrosive chemicals. Use distilled or soft water if available. Avoid the use of well water, which may contain minerals that can clog the heat exchanger core and reduce cooling efficiency.

Flushing and Cleaning

Once a year, drain, flush and refill the cooling system with new coolant. To drain the system, open the radiator coolant drain (located on the service side and has a hose) and the cylinder block drain on the the rear (non-service access) side of engine. See Figure 6.

⚠WARNING ***Contact with hot coolant can cause severe burns. Do not bleed hot, pressurized coolant from a closed cooling system.***

Chemical Cleaning: Rust and scale slow heat absorption and can block coolant flow. Clean the cooling system if rust and scale have collected on the engine water jacket or in the heat exchanger. Use a good cleaning compound and follow its instructions.

Flushing: After cleaning, or before filling the system with new coolant, drain the system and fill with clean water. Run the genset for 10 minutes, then drain the system completely. Refill with the coolant mixture.

⚠CAUTION ***Never pour hot water into a cold engine or cold water into a hot engine. Doing so can crack the head or the cylinder block. Do not operate the unit without water for even a few minutes.***

Filling the Cooling System

Verify that all drain cocks are closed and all hose clamps are secure. Remove the fill neck hose from the clamp, then remove the cooling system pressure cap and slowly fill the cooling system with the coolant mixture. Replace the cap and reclamp the hose.

⚠WARNING ***Coolant in a warm engine is under pressure and can flash to steam causing severe burns if the radiator cap or drain cock are opened. Let the engine cool down before opening the radiator cap or drain cock.***

⚠CAUTION ***Exceeding the recommended fill rate can cause incomplete filling of the engine block, leading to engine damage during warm-up. Always follow the recommended fill procedure.***

Start the engine, then remove the pressure cap and monitor the coolant level. As trapped air is expelled from the system, the coolant level will drop. Add coolant to replace it. Replace the pressure cap when the coolant level is stable.

Add coolant to the recovery tank or separate expansion tank (if equipped) to the full-cold level.

Coolant Level

Check the coolant level at the intervals specified in the Periodic Maintenance Schedule. Check by observing the coolant level in the recovery tank or separate expansion tank (if equipped), or at the fill location, when the system is cold. See Figure 6 for a typical cooling system. Engine coolant is at the proper level when the recovery tank level is between FULL and LOW marks, or the coolant can be seen in the fill hose.

⚠WARNING ***Coolant in a warm engine is under pressure and can flash to steam causing severe burns if the radiator cap or drain cock are opened. Let the engine cool down before opening the radiator cap or drain cock.***

⚠CAUTION ***The high engine temperature cutoff will shut down the engine in an overheat condition only if the coolant level is sufficiently high to physically contact the shutdown switch. Loss of coolant will allow engine to overheat without protection of shutdown device, thereby causing severe damage to the engine. Adequate engine coolant levels must be maintained for operational integrity of the cooling system and engine coolant overheat shutdown protection.***

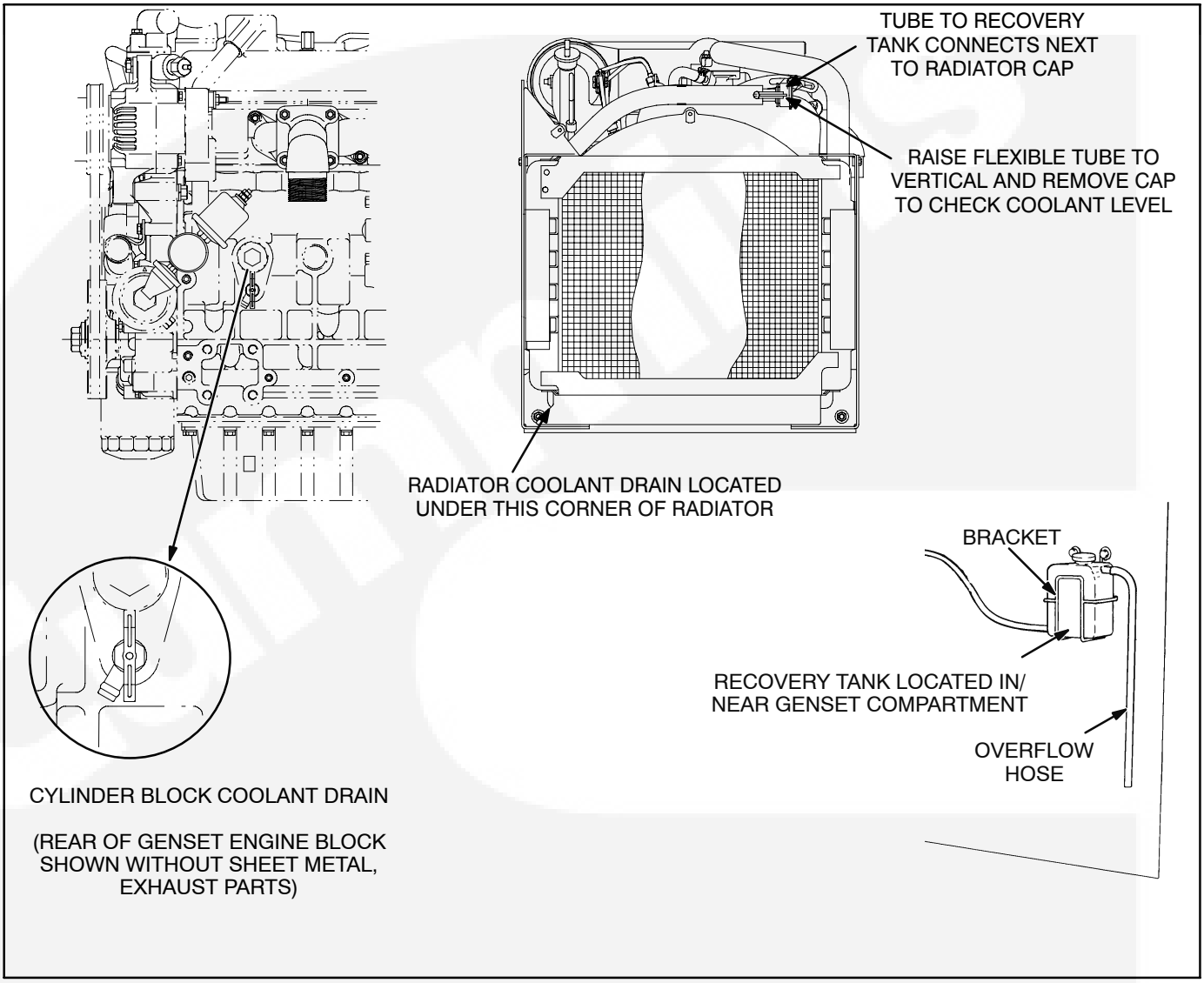


FIGURE 6. COOLING SYSTEM COMPONENTS

Thermostat

If the engine overheats or does not reach and maintain a minimum operating temperature, have the thermostat removed and tested. Replace the thermostat with its gasket if necessary. See the Service Manual for instructions.

Pressure Cap

Closed cooling systems use a pressure cap to increase the boiling point of the coolant and allow higher operating temperatures. Replace the pressure cap every two years, or sooner if it malfunctions.

FAN BELT

A loose fan belt can cause the engine to overheat. The belt tension must be correct for the set to run well.

First, remove the generator set's starting battery cables (negative [-] cable first).

⚠WARNING ***Accidental starting of the set can cause severe personal injury or death. Stop the generator set and disable it by disconnecting the starting battery cables (negative [-] cable first) when maintaining or repairing the engine, controls, or generator.***

To reach the fan belt, remove the belt guard from the front of the set. **Do not operate the genset without the belt guard in place.**

To adjust the belt, loosen the bolt that passes through the long slot in the alternator mounting bracket and slide the alternator until the tension is right. See Figure 7.

Belt tension is correct when a finger pressure of 22 pounds (10 kg) at the middle of the belt deflects it about 0.4 inch (10 mm).

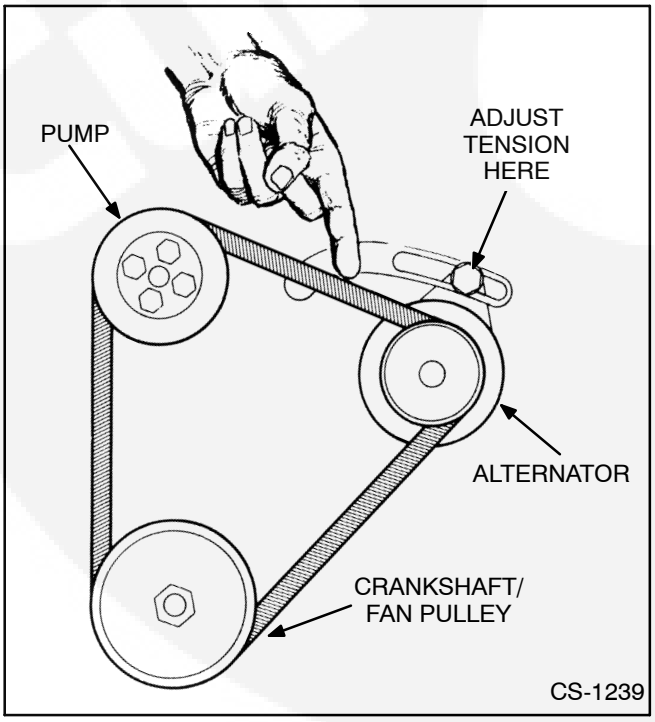


FIGURE 7. FAN BELT ADJUSTMENT

FUEL SYSTEM

Use the best fuel available. Fuel quality is important for dependable performance and satisfactory engine life.

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

Fuel Recommendation

Use ASTM 2-D (no. 2 Diesel) or ASTM 1-D (No. 1 Diesel) fuel with a minimum Cetane number of 45. Number 2 diesel fuel gives the best economy and performance under most conditions. Use number 1 diesel fuel when ambient temperatures are below 32° F (0° C), and during long periods of light engine load.

Use low sulfur content fuel which has a cloud point at least 10 degrees below the lowest expected fuel temperature. (Cloud point is the temperature at which wax crystals begin to form in diesel fuel.)

Fuel Handling Precautions

Prevent dirt, water or other contaminants from entering the fuel system. Filter or strain the fuel as the tank is filled.

⚠CAUTION ***Due to the precise tolerances of diesel injection systems, dirt or water in the system will cause severe damage to both the injection pump and the injection nozzles. It is extremely important the fuel be kept clean and water free.***

Condensation (water) can cause clogging of fuel filters as well as freezing problems. Water mixing with the sulfur in the fuel forms acid which can corrode and damage engine parts.

Low fuel in the tank promotes condensation. In warm weather, the fuel tank cools at night quicker than the fuel. If the fuel level is low, the upper portion of the tank will cool more rapidly, forming condensation. In cold weather, the warm fuel returning from the injectors heats the fuel in the supply tank. If the fuel is low, condensation may form on the upper part of the tank. **To avoid condensation, fill the fuel tank every time the genset is used.**

Fuel Filter

The wrong fuel or dirty fuel will shorten the life of the fuel filter. See the *Periodic Maintenance Schedule* Table 4 for the filter change interval.

⚠ CAUTION ***Dirt or water in the system will cause severe damage to both the injection pump and the injection nozzles. It is extremely important that the fuel be kept clean and free of water.***

The commercial HDKAL/HDKAS generator set offers an optional Racor fuel filter/water separator unit in place of the fuel filter. Periodically check the contamination bowl and drain if water is present. (Water settles to the bottom of the bowl and is a distinctive lighter color.) Refer to Figure 8.

To drain the Racor fuel filter/water separator:

1. Attach a rubber hose to the drain hose nipple to drain the water away from the generator set and into a container.
2. Loosen the vent plug.
3. Loosen the contamination drain valve until the water begins to exit.
4. When all the water has drained, tighten both the contamination drain valve and the vent plug.
5. Remove the rubber hose.
6. Clean up any fuel that may have spilled during the draining procedure.

⚠WARNING ***Leakage of fuel presents the hazard of fire or explosion that can cause severe personal injury or death. Make certain all spilled fuel is properly cleaned up. Be certain there are no ignition sources such as flame, spark, pilot light, arcing switch or equipment, cigarette, etc., near the generator set. Keep an ABC type fire extinguisher nearby.***

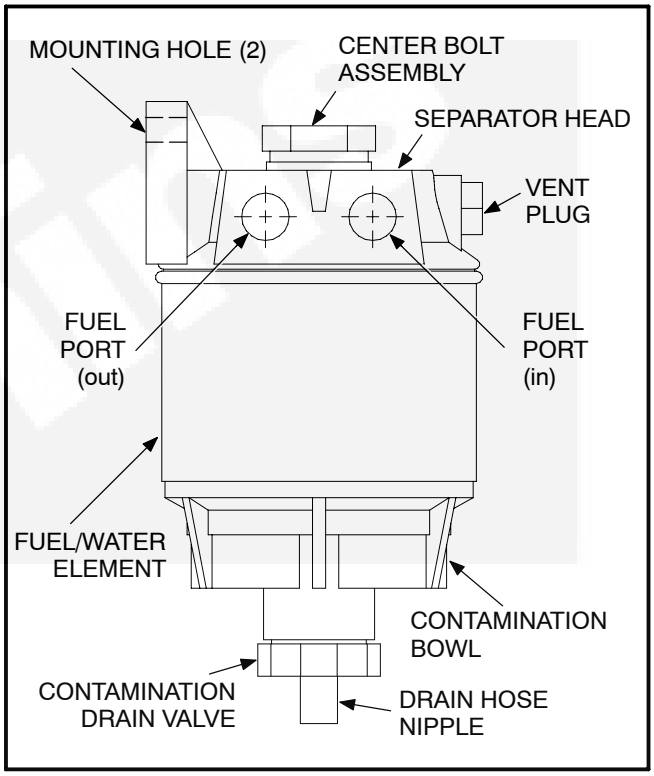


FIGURE 8. FUEL/WATER SEPARATOR

The degree of contamination of the fuel determines the frequency of fuel filter/water separator element replacement. Difficult starting and loss of full power usually signify an immediate need to change the element.

To replace the Racor fuel filter/water separator element:

1. Follow steps 1 through 3 for draining unit.
2. When the entire contents of the fuel/water element and contamination bowl has drained, tighten both the contamination drain valve and the vent plug.
3. Unscrew the center bolt assembly until you can remove the element and bowl as a unit.
4. Unscrew the bowl from the filter and properly discard the filter.
5. Clean the bowl, the O-ring, and the O-ring channel.
6. Lubricate the O-ring with a light oil and place in the O-ring channel.

7. Screw the bowl onto the new element (Onan Part Number 149-2577). *Do not overtighten.*

8. Lubricate the element gasket with a light oil.

9. Thread the element and bowl as a unit onto the center bolt assembly until the element makes contact with the separator head.

10. Tighten the center bolt assembly with a torque wrench to 65 inch-pounds.

11. Clean up any fuel that may have spilled during the element replacement procedure.

⚠WARNING ***Leakage of fuel presents the hazard of fire or explosion that can cause severe personal injury or death. Make certain all spilled fuel is properly cleaned up. Be certain there are no ignition sources such as flame, spark, pilot light, arcing switch or equipment, cigarette, etc., near the generator set. Keep an ABC type fire extinguisher nearby.***

Low Pressure Fuel System

The electric fuel pump, fuel filter and injection pump inlet comprise the low pressure fuel system. See Figure 9. These components are normally primed (purged of trapped air) at set installation. Be sure to check the fuel level in the tank and that the shutoff valve is open.

NOTE: Priming the fuel system and replacing the fuel filter are procedures that are best performed by an Onan service technician. If you are at all in doubt about these procedures, consult an authorized Onan service center.

Refer to the Periodic Maintenance Schedule for the recommended filter change interval. However, if the engine shows signs of fuel starvation (reduced power or surging), the fuel filter must be changed. This involves bleeding the fuel system of trapped air.

Bleeding the system means loosening the fittings of the low-pressure fuel lines one by one, and cranking the electric fuel pump to drive out trapped air. **This procedure must be done by an Onan service center or a professional diesel technician.**

High Pressure Fuel System: The injection pump, fuel injection lines and fuel injectors are the high pressure fuel system. See Figure 9. The high-pressure system is self-priming; trapped air is forced out through the injection nozzles.

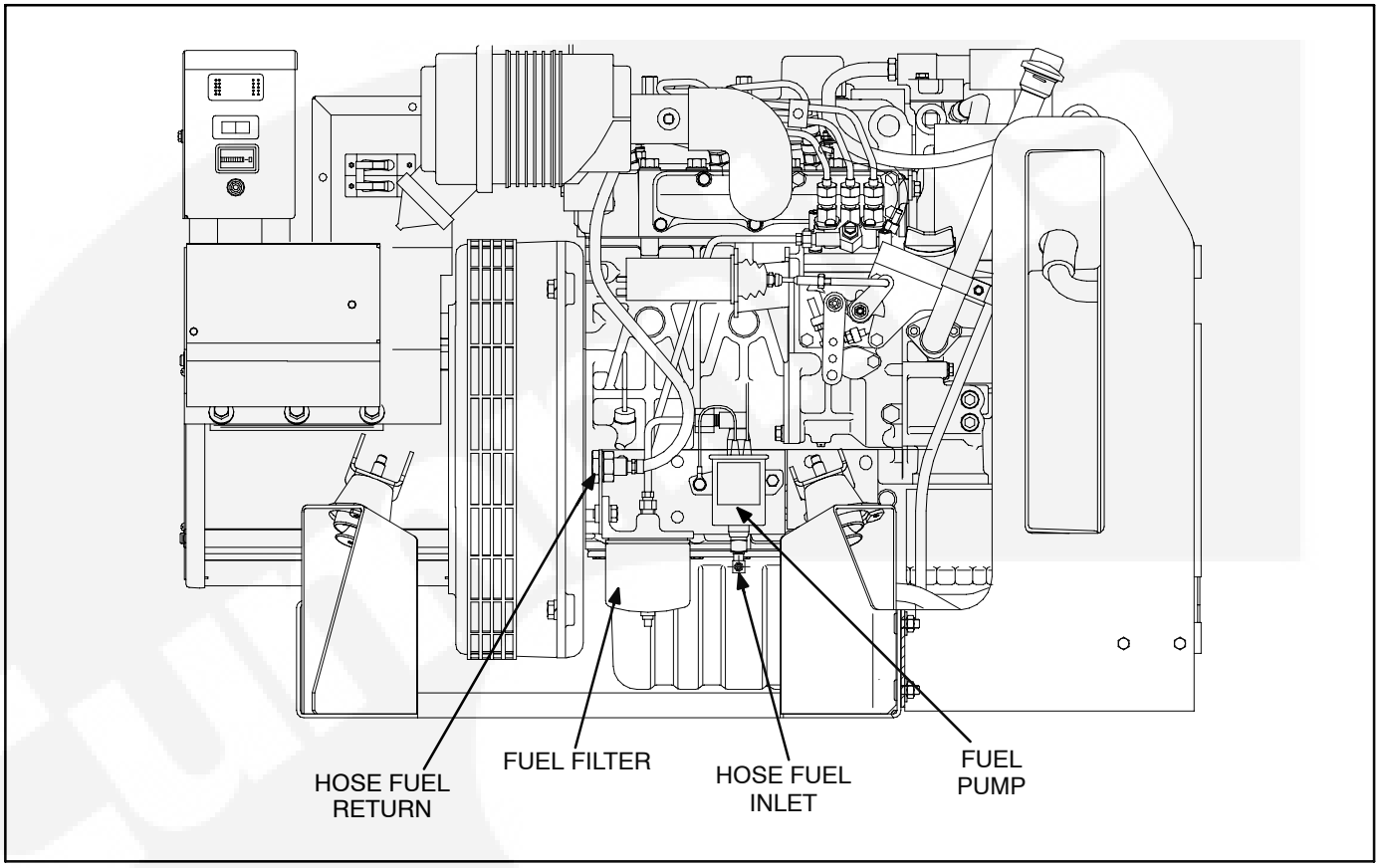


FIGURE 9. FUEL SYSTEM

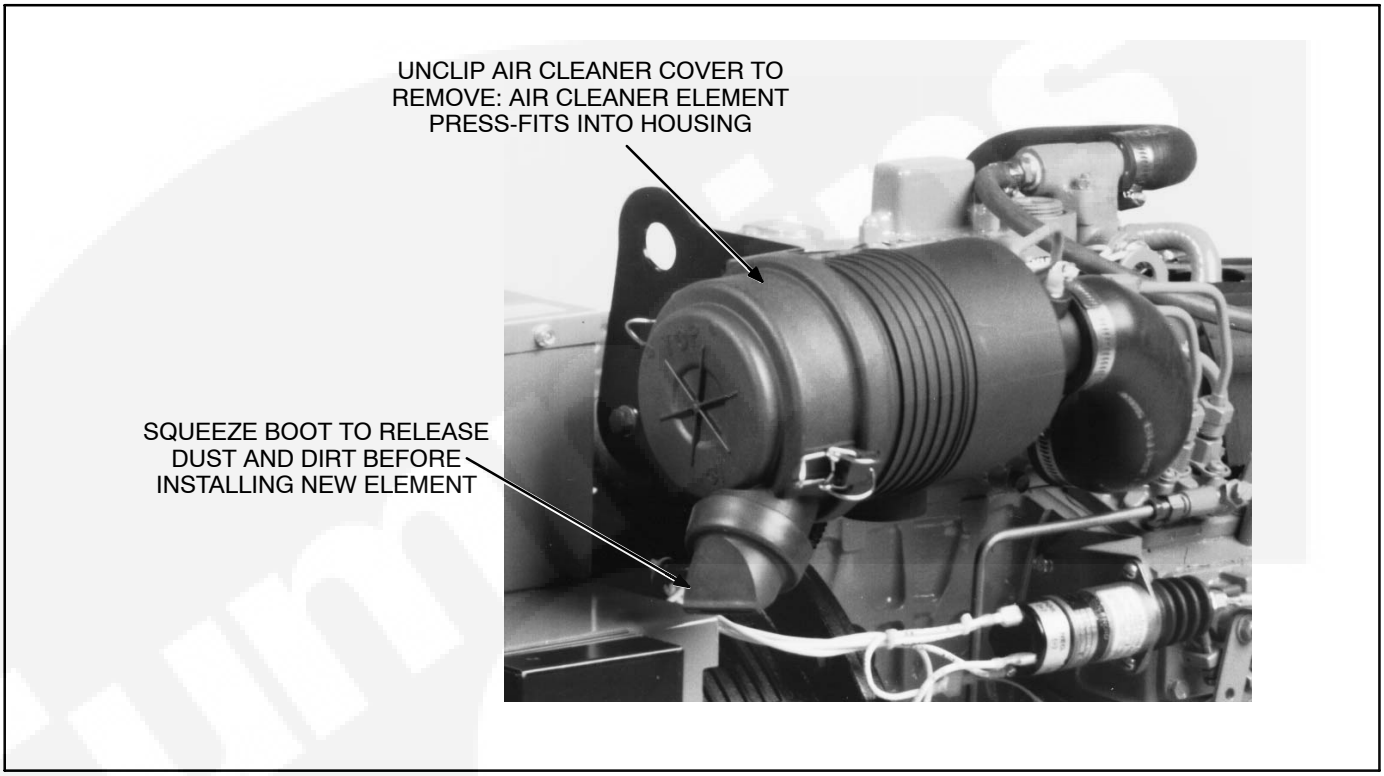


FIGURE 10. AIR CLEANER ASSEMBLY

AIR CLEANER

The air cleaner element is a dry type, and should never have oil applied to it. Avoid touching the element except when cleaning it. Before beginning installation, squeeze the dust boot to release any trapped dust or dirt. Install the new filter as follows:

12. Unclip the cover.
13. Pull the filter out gently to reduce the amount of dust dislodged. Gently move the filter side to side or twist to disengage the seal.
14. Pull the filter off the outlet tube and out of the housing. Avoid dislodging dirt inside the housing, which can enter the engine.
15. Clean the sealing surface and the inside of the outlet tube. Remove all dust and dirt from inside the housing.
16. Examine the old filter for dust on the clean air side of the filter. This could indicate leakage on the sealing surface; correct the situation if necessary.
17. Inspect the new filter for damage. Do not install a damaged filter.
18. Insert the filter into the housing. Apply pressure at the outer rim of the filter, not its flexible center.
19. Check all connections for tight fit.

Change the element yearly or after 500 hours, or more often in extremely dusty conditions.

BATTERY CARE

Service the battery at the intervals shown in the maintenance schedule. Check the electrolyte level more frequently during hot weather. Consult the battery manufacturer's maintenance instructions. If the battery is not the sealed type, service as follows:

⚠WARNING ***Batteries present the hazard of explosion that can result in severe personal injury. Do not smoke or allow any fire, flame, spark, pilot light, arc-producing equipment or other ignition sources around the battery area. Do not disconnect battery cables while the generator set is cranking or running because explosive battery gases could be ignited.***

⚠WARNING ***Battery electrolyte can cause severe eye damage and burns to the skin. Wear goggles, rubber gloves and a protective apron when working with batteries.***

1. Keep the battery case clean and dry.
2. Make certain that the battery cable connections are clean and tight. Use a terminal puller tool to remove the battery cables.

   Remove corrosion from the battery terminal connections. Wash the terminals with an ammonia solution or a solution consisting of 1/4 pound (about 100 grams) of baking soda in 1 quart (about 1 liter) of water. Be sure the vent plugs are tight to prevent cleaning solution from entering the cells. After cleaning, flush the outside of the battery and the surrounding areas with clean water.
3. Identify the cable as positive (+) or negative (-) before making the battery connections. Always connect the negative (-) cable last, to reduce the risk of arcing.
4. Maintain the electrolyte level by adding distilled water. Fill each cell to the split-level marker in the battery. The water component of the electrolyte evaporates, but the sulfuric acid component remains. For this reason, add water, not electrolyte to the battery.
5. Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell (Figure 11). Charge the battery if the specific gravity measures less than 1.215. Do not overcharge the battery. Stop charging the battery when the electrolyte specific gravity reaches 1.260, at approximately 80° F (27° C).

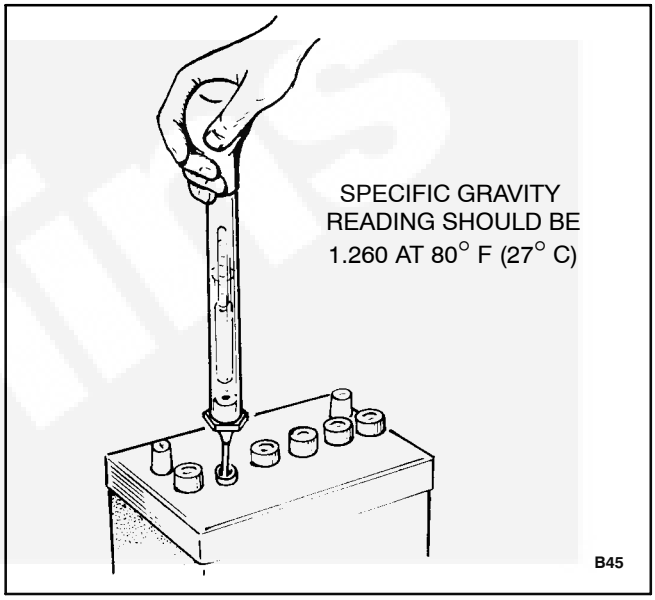


FIGURE 11. BATTERY CHECK

AC GENERATOR

Generator Brushes

The generator should be inspected for brush wear and cleaning as required per the Periodic Maintenance Schedule. This procedure should be performed by an authorized Onan service technician.

⚠WARNING ***Accidental starting of the generator set can cause severe personal injury or death. Stop the generator set and disable by disconnecting the starting battery cables (negative [-] cable first before inspecting the generator.***

Generator Bearing

Inspect the bearing for evidence of outer case rotation every 1000 hours of use. The bearing should be replaced every five years, because the bearing grease gradually deteriorates due to oxidation. See the Service Manual (publication 981-0516) for the bearing replacement procedure. If the generator requires major repair or service, contact an authorized Onan dealer or distributor.

MUFFLER/SPARK ARRESTER

The exhaust spark arrester mounted inside the muffler is necessary for **safe operation**. It must be periodically cleaned out for maximum efficiency, and to meet Forest Service requirements (RV use). See the maintenance schedule for cleaning intervals.

To clean the spark arrester, remove the 1/8 inch pipe plug from the bottom of the muffler. Run the generator set with a full load for five minutes. Stop the generator set and allow the muffler to cool. Replace the pipe plug in the muffler. See Figure 12.

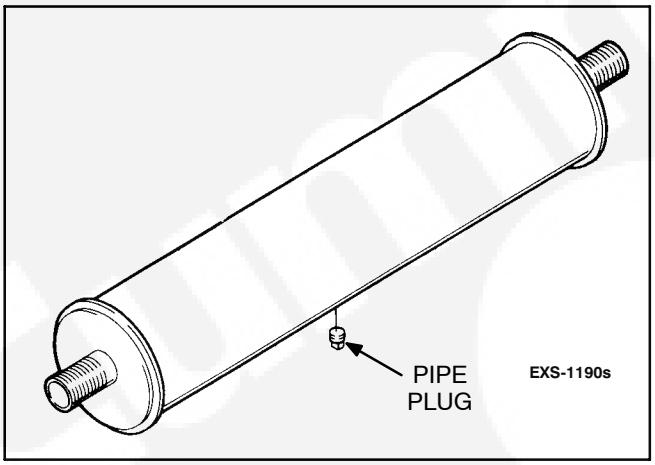


FIGURE 12. EXHAUST MUFFLER

CLEANING THE GENERATOR SET

Clean the generator set at least every six months. Dust usually can be removed with a damp cloth. Some road contaminants may require steam cleaning. Do not steam clean the generator set while the engine is running. When cleaning, protect the area so spray is not directed into the generator, air cleaner, control box, fuel solenoid, or electrical connections. Do not clean with solvents; they can damage electrical connectors.

Generator Set Storage

OUT-OF-SERVICE PROTECTION

The lubricating qualities of No. 2 diesel fuel should protect the cylinders of a diesel engine at least 30 days when the set is not being run. For storage longer than 30 days, proceed as follows:

1. Exercise the genset (see *Operation* section) until the engine is at operating temperature.
2. Shut down the genset and disconnect the battery cables (negative [-] cable first). Store the battery in a cool, dry place and connect to a trickle charger once every 30 days to maintain full charge.

   ⚠WARNING ***Battery electrolyte can cause severe eye damage and burns to the skin. Wear goggles, rubber gloves and a protective apron when working with batteries.***

3. Drain the crankcase oil while still warm. Replace oil filter. Refill crankcase and attach a tag indicating oil viscosity.
4. Check the coolant level. Add more coolant if low. If freezing temperatures are possible, test the coolant mixture.
5. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
6. Clean and wipe the entire genset. Lightly coat parts that may rust with grease or oil.

Returning the Genset to Service

Refer to the preceding paragraphs in this *Maintenance* section for specific service procedures.

1. Remove plug from the exhaust outlet.
2. Check tag on oil base and verify that oil viscosity is still correct for existing ambient temperature.
3. Clean and check the battery. Measure the electrolyte specific gravity with a hydrometer (1.260 @ 80° F [27° C]) and verify the proper level. If the specific gravity is low, charge the battery until the value is correct. If the level is low, add distilled water and charge until the specific gravity reading is correct. DO NOT OVERCHARGE.

   ⚠WARNING ***Battery electrolyte can cause severe eye damage and burns to the skin. Wear goggles, rubber gloves and a protective apron when working with batteries.***

4. Prime the fuel system.
5. Connect the starting battery, negative (-) cable last.
6. Remove all loads before starting the genset.
7. After starting, apply load of at least 50 percent rated capacity.
8. Check all gauges for normal readings. Genset is ready for operation.

Troubleshooting

DC CONTROL

The DC control has a number of sensors that continuously monitor the engine for abnormal conditions such as low oil pressure and high coolant temperature. If any one of these conditions occur, the control stops the engine. See Figure 13.. If a major problem is indicated, contact an Onan dealer or distributor for help or service.

Fault Reset Breaker

The control panel fault reset breaker will trip for any one of the fault conditions described separately below. The red breaker reset button pops out about 1/4 inch (6 mm) when a fault occurs. Locate the problem and make the necessary corrections before resetting breaker and starting the generator set. All fault shutdowns except overspeed are delayed five seconds to avoid nuisance tripping.

Low Oil Pressure

Remove dipstick and check oil level. If low, add oil to bring level up to the Full mark. Inspect engine exterior for leaks and repair as necessary. The oil pressure switch actuates the fault circuit if pressure drops below 7 psi (49 kPa).

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

High Coolant Temperature

If fault occurred during operation, observe Coolant Temperature Gauge (option) for indication of temperature over 230° F (110° C). The coolant thermostat switch closes at this temperature and actuates the fault circuit.

Check coolant level in radiator after allowing engine to cool down. See that the pump belt is OK and has proper tension. Also check cooling system cleanliness (freedom from contaminants, rust, sludge buildup, etc.).

⚠WARNING ***Contact with hot coolant can result in SEVERE burns. Allow cooling system to cool before releasing pressure and removing radiator cap or release of hot coolant can result.***

AC CONTROL

The AC control consists of the line circuit breakers connected between the generator output and the load.

If the breaker trips, the electrical load is too great for the generator set. This may be caused either by running too many appliances at once, or by a short circuit.

Consult the Wattage Requirements section of this manual to determine the wattage needed by typical appliances.

FAULT CODE BLINKING

At fault shutdown, the status indicator light will repeatedly blink sets of 1, 2, 3 or 4 blinks.

- **One blink** indicates shutdown due to high engine coolant temperature.
- **Two blinks** indicate shutdown due to a loss of engine oil pressure.
- **Three blinks** indicate a service fault. Press **Stop** once to cause the two-digit, second-level shutdown code to blink. (Pressing **Stop** again will stop the blinking.) The two-digit code consists of 1, 2, 3, 4 or 5 blinks, a brief pause, and then 1 to 9 blinks. The first set of blinks represents the tens digit and the second set of blinks the units digit of the shutdown code number. For example, **shutdown code No. 36** appears as:

blink-blink-blink—*pause*—blink-blink-blink-blink-blink-blink—*long pause*—repeat

- **Four blinks** indicate that cranking time exceeded 35 seconds.
- *Fault Code Nos. 1, 2, 3, and 4 are first level faults. Pay close attention to the pause sequence to avoid interpreting first level faults as second-level Fault Codes Nos. 11, 22, 33, or 44.*
- *To avoid the possibility of anyone misinterpreting Code Nos. 3 and 4 as Code Nos. 33 and 44, the latter have not been assigned faults.*

RESTORING FAULT CODE BLINKING

The fault code stops blinking after five minutes. Press **Stop** three times within three seconds to restore fault code blinking.

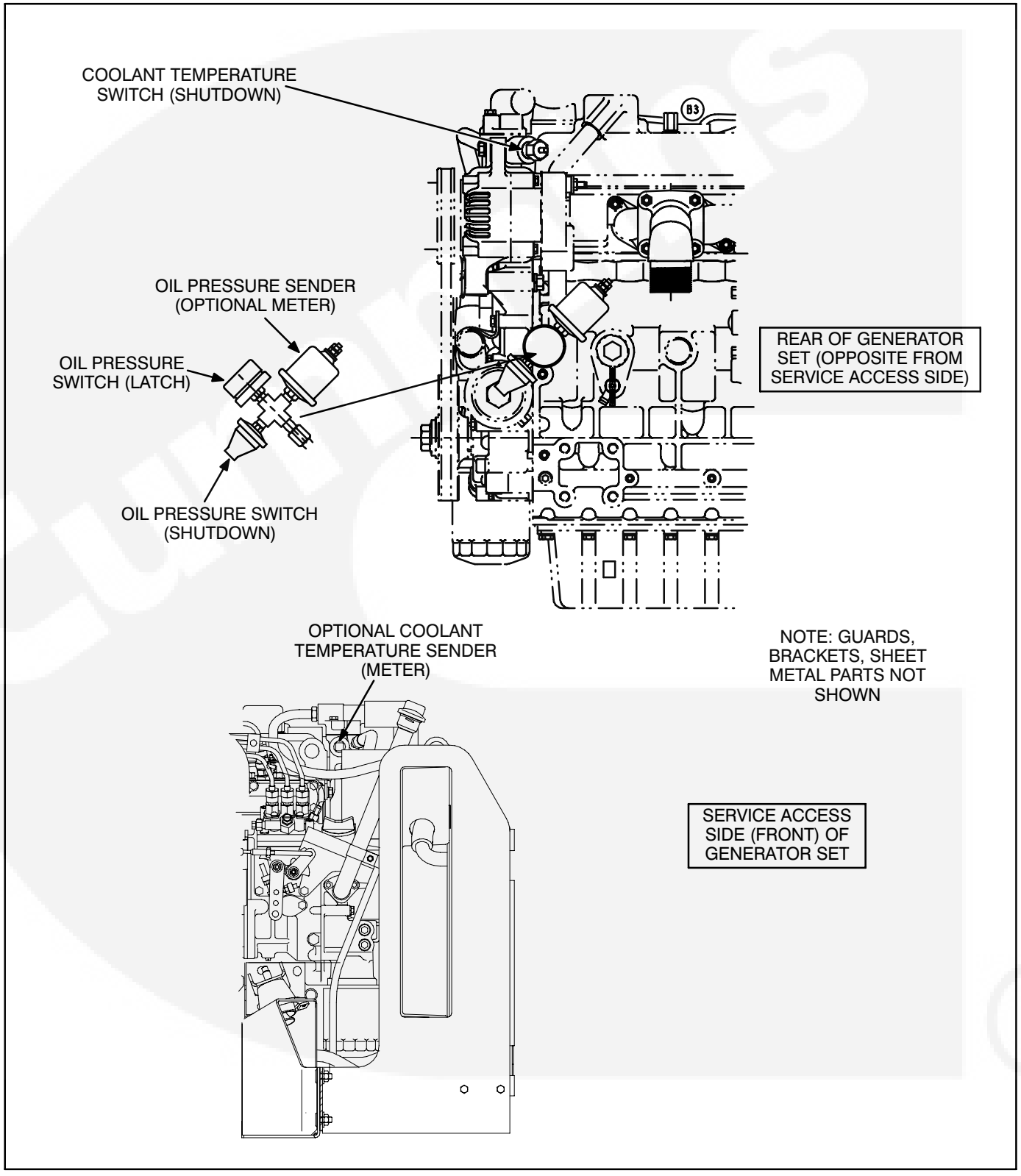


FIGURE 13. OIL AND COOLANT SENSOR LOCATIONS

Specifications

Control System

- Unit Mounted, Drip-Proof, Vibration Isolated Console
- **DC Controls - 12-Volt System**
  - Start/Stop/Preheat Switch
  - Sealed Remote Connector for Start/Stop/Preheat Switch Gauge Package
  - Manual Reset Fault Relay Indicating Engine Shutdown for High Coolant Temperature, Low Oil Pressure
- **AC Controls**
  - Voltage Regulator (See Generator Detail)
  - One or Two Circuit Breakers

Engine Detail

Design: 4-Cycle, Liquid-cooled Diesel Engine
Cylinders: Inline Vertical - 3
Bore:
HDKAL/HDKAQ 2.99-in (76 mm)
HDKAR/HDKAS 2.83 IN (72 MM)
Stroke: 2.90-in (73.6 mm)
Displacement
HDKAL/HDKAQ 61.08in^3 (1001 cm^3)
HDKAR/HDKAS 54.8 in^3 (898 cm^3)
Compression Ratio: 23 to 1
Lube Oil Capacity: 4.5 qt (4.25 L) Including Filter
Cooling System Capacity:1.25 gal (4.73 L)
Engine Power (max) at 1800 r/min:
HDKAL/HDKAQ 13.1 bhp
HDKAR/HDKAS 11.9 bhp
Starting System: Remote, 12-volt

Fuel Injection Pump: Bosch K mini
Combustion Chamber: Spherical
Fuel Consumption: No. 2 Diesel Fuel, gph/lph

	No Load	Half Load	Full Load
HDKAL	0.24 gph	0.49 gph	0.85 gph
	0.90 lph	1.85 lph	3.2 lph
HDKAQ	0.25 gph	0.56 gph	0.9 gph
	0.95 lph	1.93 lph	3.41 lph
HDKAR	0.23 gph	0.46 gph	0.8 gph
	0.87 lph	1.74 lph	3.03 lph
HDKAS	0.23 gph	0.46 gph	0.8 gph
	0.87 lph	1.74 lph	3.03 lph

Generator Detail

Design: Onan, Brush type, Drip-proof Construction.
Insulation System Rise: Class F per NEMA MGI-1.65 and BS 2757 Insulating Varnish Conforms to MIL-1-24092, Grade CB, Class 155 C.
Exciter System: Electronic Voltage Regulator

Bearing: Double Sealed Prelubricated Ball Bearing
Cooling: Direct Drive Centrifugal Blower
Damper Bar: Improves Harmonics and Voltage Waveforms (Comm HDKAL/HDKAS Only)

GenSet Performance

Regulation, No Load to Rated Load
Voltage: ±2.5°%
Frequency: ±2.5%
Battery Charging: 12-Volt Battery Charging DC Alternator (30 amp output)
Sound Level: 78 dB(a) @ 3 m rated load
Random Frequency Variation for Constant Loads from No Load to Full Load is ±1%

Random Voltage Variation: Under These Conditions is ±1%

Maximum Operating Ambient Temperature: Efficient Radiator Cooling System Permits Operation at Ambient Temperatures up to 120°F (49°C).

Accessories

Required Accessory
- (USDA Forest Service Approved Spark Arrester Muffler.
- Exhaust Resonator

Optional Accessories
- Battery - 12 volt, 475 Cold Cranking Amps at 0°F (-17.8°C)
- Remote Gauge Package with Start/Stop/-Preheat Switch, Voltage Meter, Water Temperature Gauge, Oil Pressure Gauge, Hour Meter (Standard on Comm HDKAL/HDKAS)
- Remote Circuit Breaker Kits
- Remote Wiring Harness, 15 or 25 ft.
- Coolant Recovery Kit
- Engine Block Heater (Comm HDKAL/HDKAS Only)
- RACOR Fuel/Water/Separator (Comm HDKAL/HDKAS Only)
- Remote DC Gauge Kit (Comm HDKAL/HDKAS Only)

Information for California Genset Users

These gensets meet the requirements of California's Exhaust Emissions Standards for 1995 and later for Utility and Lawn and Garden Equipment Engines.

As a California user of these gensets, please be aware that unauthorized modifications or replacement of fuel, exhaust, air intake, or speed control system components that affect engine emissions are prohibited. Unauthorized modification, removal or replacement of the genset label is prohibited.

You should carefully review Operator (Owner), Installation and other manuals and information you receive with your genset. If you are unsure that the installation, use, maintenance or service of your genset is authorized, you should seek assistance from an authorized dealer.

California genset users may use Table 5 as an aid in locating information related to the California Air Resources Board requirements for emissions control.

TABLE 5. EMISSIONS CONTROL INFORMATION

Genset Warranty Information	The California emissions control warranty statement is located in the same packet of information as this manual when the engine is shipped from the factory.
Engine Fuel Requirements	The engine is certified to operate on diesel fuel. See FUEL RECOMMENDATIONS in *Pre-start Section*.
Engine Lubricating Oil Requirements	See ENGINE OIL RECOMMENDATIONS in *Pre-start Section*.
Engine Adjustments	High Idle Speed. This is a service procedure requiring trained personnel and proper tools. See the Service Manual.
Engine Emission Control System	The engine emission control system consists of engine design and precision manufacture. (IFI)

How to Obtain Service

LOCATING SERVICE ASSISTANCE

When your generator set needs parts or service, contact the nearest authorized dealer or distributor. Onan Parts and Service representatives are factory-trained to handle all of your service needs. Locate the nearest authorized distributor as follows:

1. Check the North American Sales and Service Directory (F-118) supplied with your Onan genset. This directory lists authorized distributors who will assist you in locating the nearest authorized dealer.

   -or-

2. Consult the Yellow Pages. Typically, our distributors are listed under:

   GENERATORS-ELECTRIC,
   ENGINES-GASOLINE OR DIESEL, OR
   RECREATIONAL VEHICLES-EQUIPMENT,
   PARTS AND SERVICE.

   -or-

3. For the name of your local Cummins/Onan or Onan-only distributor in the United States or Canada, call 1-800-888-ONAN (this automated service utilizes touch-tone phones only). By entering your area code and the first three digits of your local telephone number, you will receive the name and telephone number of the distributor nearest you.

If you need additional assistance, please call Onan Corporation, 1-612-574-5000, 7:30 AM to 4:00 PM, Central Standard Time, Monday through Friday.

You can obtain an individual directory of authorized RV servicing dealers by calling Onan at 1-800-888-ONAN or by writing to Onan ("Attn: Marketing") at the address listed on the rear cover. Please ask for: RV Sales and Service Directory F-919.

SCHEDULING SERVICE

1. Before calling for service, have the following information available:

   The complete Onan product model number and serial number (see Model Identification on page 1)

   Date of purchase

   Nature of the problem

   Approximate hours in service

2. Contact the authorized dealer or distributor nearest you to explain the problem and make an appointment.
3. If you have difficulty in arranging for service or resolving a problem, please contact the dealer coordinator or service manager at the nearest Cummins/Onan distributor for assistance.

⚠WARNING

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

Maintenance Record

Keep a record of all periodic and unscheduled maintenance. Record the service date and the number of operating hours from the optional hour meter (if equipped).

DATE	HOUR METER READING	SERVICE PERFORMED / NOTES

Record the name, address, and phone number of your authorized Onan service center.

Onan

Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432
763-574-5000
Fax: 763-528-7229