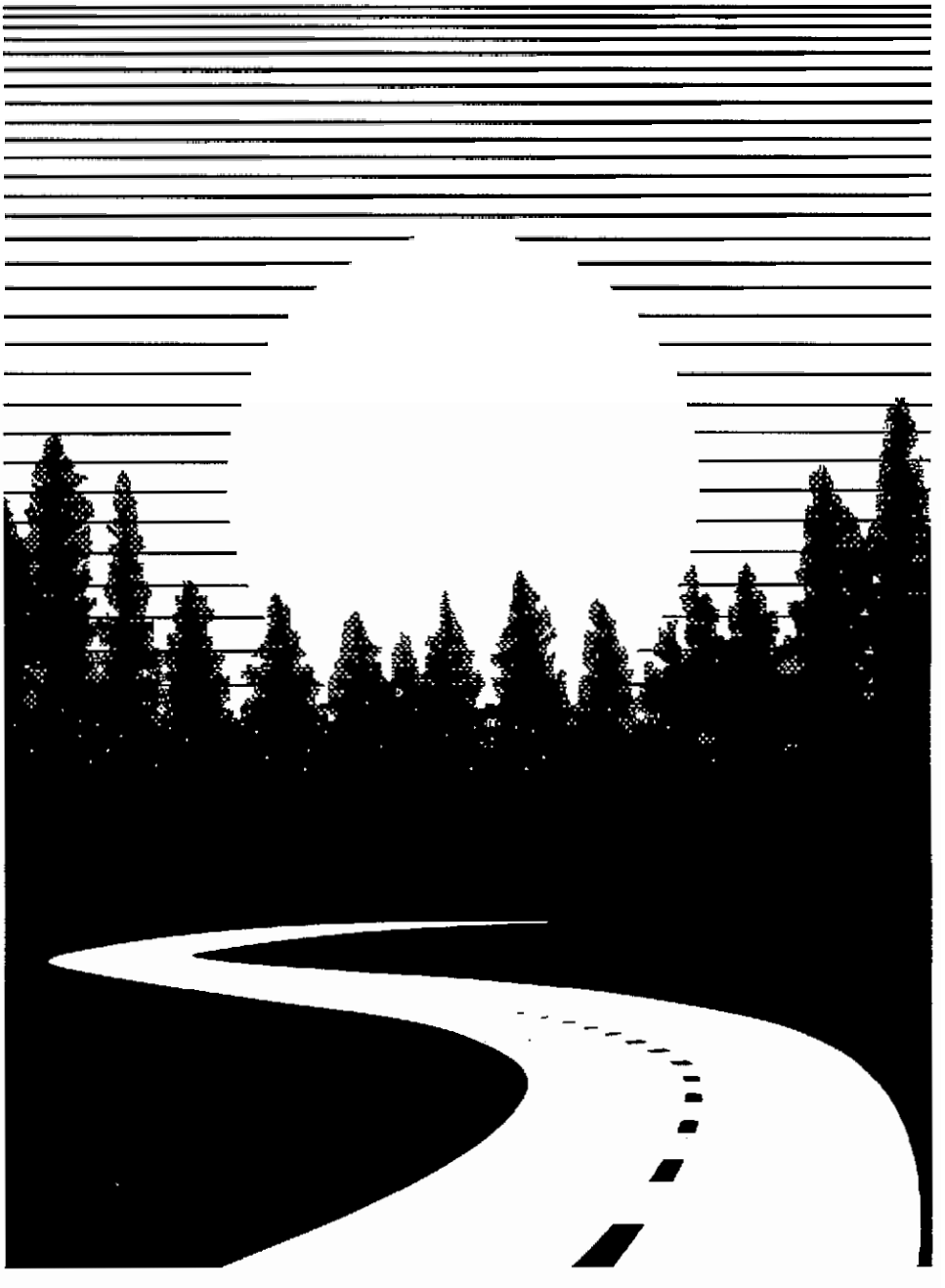
Onan RV GenSet

Operator's Manual

DKD



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Power Generation

Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and the equipment. **Safe and efficient operation can be achieved only if the unit 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 can result from improper practices.

- DO NOT fill fuel tanks while engine is running. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR USE AN OPEN FLAME 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, non–conductive line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure all fuel supplies have a positive shutoff valve.

GASOLINE AND LPG FUEL MAY BE ACCIDENTALLY IGNITED BY ELECTRICAL SPARKS, presenting the hazard of fire or explosion, which can result in severe personal injury or death. When installing the generator set:

- Do not tie electrical wiring to fuel lines.
- Do not run electrical lines and fuel lines through the same compartment openings.
- Keep electrical and fuel lines as far apart as possible.
- Place a physical barrier between fuel lines and electrical lines wherever possible.
- If electrical and fuel lines must pass through the same compartment opening, make certain that they are physically separated by running them through individual channels, or by passing each line through a separate piece of tubing.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

EXHAUST GASES ARE DEADLY

- Never sleep in the vehicle with the generator set running unless vehicle is equipped with an operating carbon monoxide detector.
- Provide an adequate exhaust system to properly expel discharged gases. Inspect exhaust system daily for leaks per the maintenance schedule. Be sure that exhaust manifolds are secure and not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Before starting work on the generator set, disconnect batteries. This will prevent accidental arcing.
- Keep your hands away from moving parts.
- 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 while working on generator sets. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment must be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Disconnect starting battery 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 surfaces to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag 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 device and after building main switch is open. Consult an electrician in regard to emergency power use.

GENERAL SAFETY PRECAUTIONS

- Have a fire extinguisher nearby. Maintain extinguisher properly and become familiar with its use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.
- Hot coolants under pressure can cause severe personal injury. DO NOT open a radiator pressure cap while the engine is running. Stop the engine and carefully bleed the system pressure.
- Benzene and lead, found in some gasoline, have been identified by some state and federal agencies as causing cancer or reproductive toxicity. When checking, draining or adding gasoline, take care not to ingest, breathe the fumes, or contact gasoline.
- 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.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage, which presents a potential fire hazard.
- DO NOT store anything in the generator compartment such as oil or gas cans, oily rags, chains, wooden blocks, portable propane cylinders, etc. A fire could result or the generator set operation (cooling, noise and vibration) may be adversely affected. Keep the compartment 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.

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.

Introduction

ABOUT THIS MANUAL

This manual provides information for operating and maintaining the Onan DKD generator set. Study this manual carefully and observe all warnings and cautions. Using the generator set properly and following a regular maintenance schedule will result in longer unit life, better performance, and safer operation.

HOW TO OBTAIN SERVICE

When the generator set requires servicing, contact an Onan dealer or distributor for assistance. Onan factory trained parts and service representatives are ready to handle all service needs.

A copy of the warranty (form AB355) and a parts catalog is in the literature package included with the unit. A service manual is available on special order through the Onan dealer or distributor.

When contacting an Onan dealer or distributor, always supply the complete Model number and Serial number as shown on the Onan nameplate. See Figure 1.

The Onan nameplate is located on the side of the generator control box on the 7.5 DKD, 6.5 DKD, and 6.0 DKD, and is located on the side of the belt guard on the 8.0 DKD.

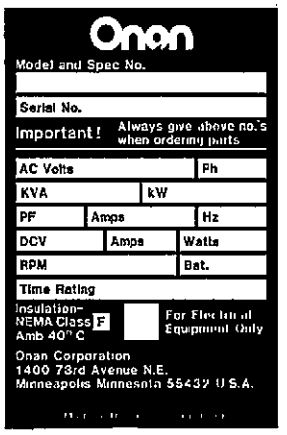


FIGURE 1. ONAN NAMEPLATE

⚠WARNING

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

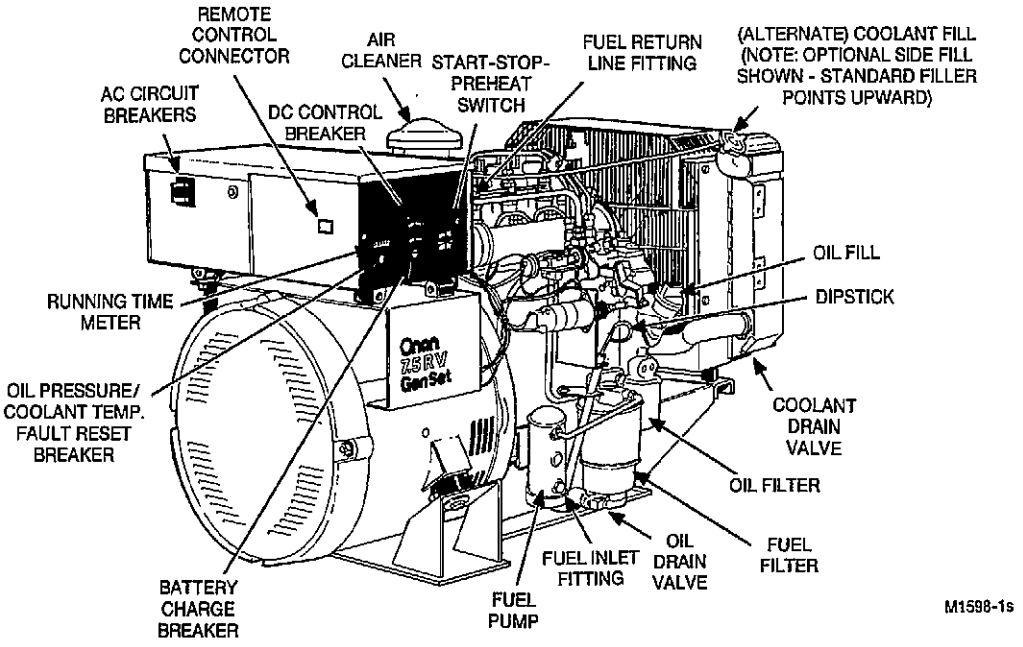


FIGURE 2. 6.5/7.5 DKD GENERATOR SET FOR RECREATIONAL VEHICLE

Specifications

GENERATOR DETAILS

Type ..... Onan, YD Revolving Field, 4-Pole, Brushless
Phase ..... Single
Standby ratings:
60 Hertz
6.5 DKD ..... 6.5 kW (6.5 kVA @ 1.0 PF)
7.5 DKD ..... 7.5 kW (7.5 kVA @ 1.0 PF)
8.0 DKD ..... 8.0 kW (8.0 kVA @ 1.0 PF): Includes fan load if required
50 Hertz
6.0 DKD ..... 6.0 kW (6.5 kVA @ 1.0 PF)
Frequency regulation under varying load:
60 Hz ..... ±5 percent
Voltage regulation under varying load: ..... 3 Hz maximum
Random voltage variation: ..... ±2 percent

GENERATOR SET DETAILS

Air requirements
60 Hertz ..... 1200 ft³/min (34 m³/min)
50 Hertz ..... 1000 ft³/min (28.3 m³/min)
Engine Speed
60 Hertz ..... 1800 r/min
50 Hertz ..... 1500 r/min
Fuel ..... No. 2 Diesel
Fuel Pump Inlet Thread Size ..... 1/8 NPTF
Fuel Return Outlet Thread Size ..... 1/8 NPTF
Fuel Pump Maximum Lift ..... 3 ft. (0.9 m)
Exhaust Outlet ..... Flange or 1-1/4 in. NPT External
Starting System Voltage 12
Battery Requirements
Battery Voltage 12
Quantity Required 1
Cold Cranking Amps @ 0° F (-17.8° C) 425
*Cooling System Capacity (Engine and Radiator) ..... 4 qt (3.8 L)
Engine Oil Capacity with Filter ..... 4 qt (3.8 L)

*Remote mount radiator systems may require additional coolant.

THE 6.5, 7.5 AND 8.0 DKD ARE LISTED BY NATIONWIDE CONSUMER TESTING INSTITUTE, INC.

Operation

⚠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 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.

GENERAL

This section covers starting and operating the generator set. It is recommended that the operator read through this entire section before attempting to start the set. It is essential that the operator be completely familiar with the set for safe operation.

PRE-START CHECKS

Before starting, be sure the following checks have been made and the unit is ready for operation. Refer to the *MAINTENANCE* section for the proper procedures.

Lubrication

Check the engine oil level. Keep oil level near as possible to the dipstick full mark. Do not overfill.

Coolant

The coolant level should be near the top of the fill cap. Do not check while the coolant is hot.

⚠WARNING ***The sudden release of pressure from a heated cooling system can result in possible severe personal injury from the hot coolant. Remove the expansion tank pressure cap slowly after the engine has cooled.***

Fuel

Make sure the fuel tanks are full and the fuel system primed for operation (see *MAINTENANCE* section).

⚠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.***

CONTROL PANEL

The following describes the function and operation of the generator set controls. Control switches and circuit breakers are located on the face of the control panel as shown in Figures 3 and 4.

The 8.0 DKD DC control box is designed for remote mounting applications.

Gauges/Meters and Switches

Start-Stop Switch: Starts and stops the unit locally. The unit may also be operated from a remote switch wired to the control panel.

Running Time Meter: Registers the total number of hours that the unit has run.

Use it to keep a record for periodic servicing. Time is cumulative; meter cannot be reset.

If equipped, the running time meter on the 8.0 DKD will be remotely located.

Circuit Breakers

Fault Breaker: A manual reset breaker that shuts down the engine for low oil pressure, high coolant temperature, high exhaust temperature and overspeed.

Battery Charge Breaker: A 15 ampere breaker protecting the DC voltage regulator, alternator and wiring from short circuits or overload.

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

Line Circuit Breaker: The AC output line circuit breaker(s) is mounted on the side of the control box on the 7.5 DKD, 6.5 DKD and 6.0 DKD. See Figure 3. The line circuit breaker is customer supplied on the 8.0 DKD and location may vary.

The line circuit breaker protects the generator from a short circuit or other overload.

Fan Circuit Breaker: The 8.0 DKD has a 15 ampere circuit breaker mounted on the side of the AC control box (see Figure 4). It protects the generator from a short or overload in the circuit provided for operating an AC remote radiator cooling fan (not used if a 12 VDC fan is used).

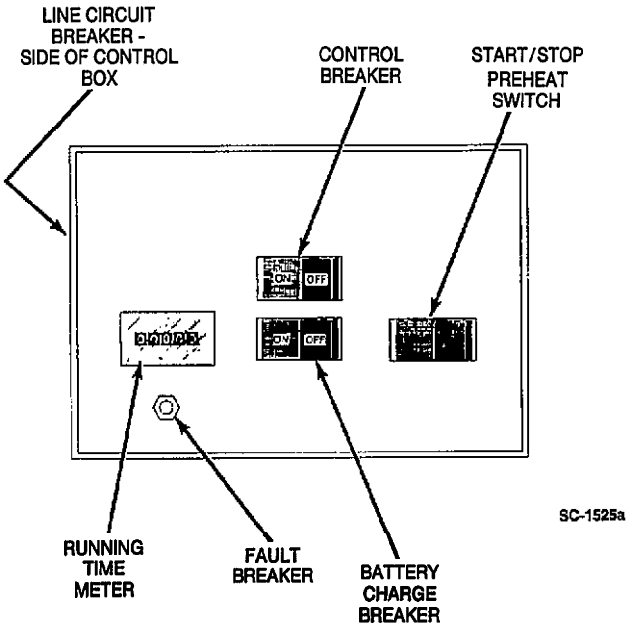


FIGURE 3. 7.5, 6.5 AND 6.0 DKD CONTROL BOX FRONT PANEL

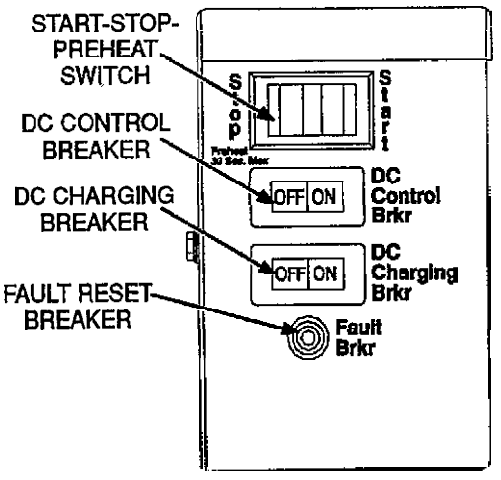


FIGURE 4. DC CONTROL BOX FRONT PANEL (REMOTE-MOUNT VERSION)

STARTING

Starting at Control Panel

The following steps outline the correct procedures for starting the generator set at the generator control panel. The DC Control Breaker must be in the ON position.

1. Press the Start/Stop/Preheat switch toward the Preheat/Stop position for 10 to 30 seconds depending upon temperature as shown in Table 2. Do not exceed 30 seconds.

⚠CAUTION ***Preheat time longer than 30 seconds can damage glow plugs.***

TABLE 2. PREHEAT TIME

Ambient Temperature	Preheating Time
Above 86°F (30°C)	About 10 sec.
Between 50° to 86°F (10° to 30°C)	About 15 sec.
Between 32° to 50°F (0° to 10°C)	About 20 sec.
Below 32° F (0°C)	About 30 sec.

2. Release the switch from the Preheat position and push it toward the Start position. This activates the engine control and starting system. The starter will crank and after a few seconds the engine should start. The starter will automatically disconnect when the generator AC voltage builds up.
3. If engine does not start after cranking 30 seconds, release Start switch. Wait two minutes and then repeat Steps 1 and 2.

⚠CAUTION ***Excessive cranking periods can overheat and damage the starter. Do not engage starter for periods longer than 30 seconds without allowing two minutes for starter to cool.***

4. If engine does not start on second try, check the fuel supply and be sure system has been primed. If the generator set runs out of fuel, the fuel system may need priming before it will start. See Fuel System in the *MAINTENANCE* section.

Remote Starting

If generator set is started from a remote location, the same procedures and cautions as for starting at the control panel should be followed.

Start-up Checks

Check gauges on the remote control panel (if equipped) after the engine is started. Observe the oil pressure gauge immediately.

Oil Pressure Gauge: The oil pressure should be in the range of 35 to 50 psi (241 to 345 kPa) when the engine is at operating temperature, but may vary below this range under various conditions.

DC Voltmeter: Normal B+ battery voltage during operation should be 14 to 15 volts.

Water Temperature Gauge: The water temperature should be in the range of 165° to 195°F (74° to 91°C) depending on the load and ambient temperature.

STOPPING

Before Stopping

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

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

To Stop: Place the Start-Stop switch or the remote starting switch to the Stop position.

OPERATING RECOMMENDATIONS

Break-In

Drain and replace the crankcase oil after the first 35 hours of operation on new generator sets. Refer to the *MAINTENANCE* section of this manual for the recommended procedures.

No-Load Operation

Hold periods of no-load operation to a minimum and avoid if possible. No-load operation allows combustion chamber temperatures to drop so low that the fuel does not burn completely. This results in carbon deposits which can clog injectors, cause piston rings and valves to stick and can cause cylinder glazing. If it is necessary to run the engine for long periods at no load, connect a "dummy" electrical load to the generator.

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 and might show up as water in the oil in extreme causes. If this happens severe engine damage might result. Operate the generator set under load, at least one hour per week.

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

Low Temperature, High Altitude Operation

1. Use correct SAE oil for temperature conditions. Change oil only when warm. See Table 4.
2. Use No. 1 diesel fuel for temperatures lower than 14°F (-10°C) or for all temperatures if altitudes are above 5000 feet (1500 m). The fuel should have a cetane rating of at least 40 and have less than 0.5 percent sulfur if possible. Decrease oil change interval by half if sulfur content is higher.

Extremely Dusty or Dirty Conditions

Observe the following items during operation in extremely dusty or dirty environments:

- Keep unit and radiator cooling surfaces clean.
- Service air cleaner more frequently as necessary.
- Change crankcase oil every 50 operating hours.
- Clean generator as necessary. See *MAINTENANCE* Section.

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 5.

The following sections describe the operation of the fault systems and suggested items the operator can check. 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 white 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 5 seconds to avoid nuisance tripping.

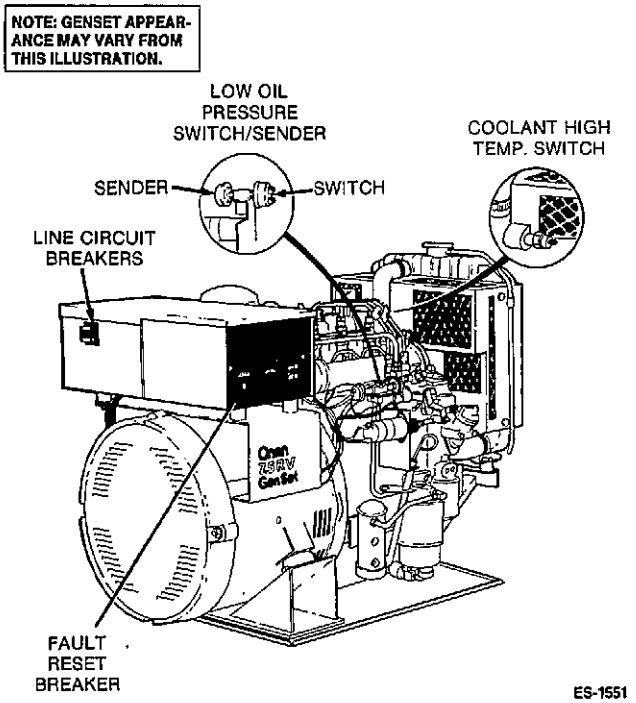


FIGURE 5. FAULT SENSOR LOCATION (7.5 DKD SHOWN FOR REFERENCE ONLY)

Low Oil Pressure: Remove dipstick and check oil level. If low, add oil to bring level up to full mark. Inspect engine exterior for leaks and repair as necessary. The oil pressure switch actuates the fault circuit if pressure drops below 9 psi (62 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 250° *F (121°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. Ensure pump belt is OK and has proper tension. Also check cooling system cleanliness (freedom from contaminants, rust, sludge build-up, 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. Breakers are required to protect the generator from shorts or overload. When supplied by Onan they mount on the side of the control box on the 7.5, 6.5 and 6.0 DKD. See Figure 5. The 8.0 DKD has a fan circuit breaker mounted on the side of the AC control box as shown in Figure 4. Line circuit breakers are customer supplied on the 8.0 DKD and their location may vary.

Maintenance

Establish and adhere to a definite schedule for maintenance and service. If the set will be subjected to extreme operating conditions, the service intervals should be reduced accordingly.

Consult with an authorized Onan dealer or distributor if the generator set will be subjected to any extreme operating conditions and determine a suitable schedule of maintenance. Use the running time meter as a reference 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 the table to determine the maintenance required and then refer to the sections that follow for the correct service procedures.

⚠WARNING ***Accidental starting of the set can cause severe personal injury or death. Disconnect the negative battery cable when repairs are made to the engine, controls, or generator.***

TABLE 3. PERIODIC MAINTENANCE SCHEDULE

SERVICE THESE ITEMS	SERVICE TIME				
	Daily or after 8 hours	Weekly or after 50 hours	Monthly or after 100 hours	6 Months or after 250 hours	Yearly or after 500 hours
Inspect Set	x[1]				
Check Oil Level	x				
Check Coolant Level	x				
Check Fuel Level	x				
Check Air Cleaner Dust Cap (clean if req.)		x[3]	x		
Check Battery Charging System			x		
Check Drive Belt Tension			x[4]		
Clean Out Spark Arrester		x			
Check Battery Specific Gravity			x		
Change Crankcase Oil and Filter			x[2]		
Drain Water and Sediment from Fuel Filter			x		
Check Anti-freeze				x	
Clean Generator Assembly				x	
Drain Sediment from Fuel Tank				x[5]	
Clean Crankcase Breather				x[3]	
Check Fuel Shut-Off Linkage				x	
Change Fuel Filter Element				x	
Change Air Cleaner Element					x[3]
Clean Cooling System					x

1 - Check for oil, fuel, cooling and exhaust system leaks. Check exhaust system audibly and visually with set running and repair any leaks immediately. Replace corroded exhaust and fuel line components before leaks occur.
2 - Perform after first 35 hours of operation on new sets.
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.

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 to provide continued safe operation.

Engine Gauges (Optional)

Check gauges on the remote control panel (if equipped) while the generator set is operating.

Oil Pressure Gauge: The oil pressure should be in the range of 35 to 50 psi (241 to 345 kPa) when the engine is at operating temperature, but may vary below this range under various conditions.

Coolant Temperature Gauge: The water temperature should be in the range of 165° to 195°F (74° to 91°C) depending on the load and ambient temperature.

DC Voltmeter: Normal B+ voltage during operating should be 14 to 15 volts.

Exhaust System

With the generator set operating, 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 generator set and do not operate until corrected. Replace corroded exhaust components before leaks occur.

⚠WARNING ***Exhaust gas presents the hazard of severe personal injury or death. Inspect exhaust system audibly and visually for leaks daily. Repair any leaks immediately.***

Fuel System

With the generator set operating, inspect the fuel supply line, return line, filter, and fittings for leaks. Check any flexible sections for cuts, cracks and abrasions and make sure they are not rubbing against anything that could cause breakage. Replace worn fuel line components before leaks occur.

⚠WARNING ***Fuel presents the hazard of fire or explosion which can result in severe personal injury or death if ignited. If any leaks are detected, have them corrected immediately.***

DC Electrical System

With the generator set off, check the terminals on the battery for clean and tight connections. Loose or corroded connections create resistance which can hinder starting. Clean and reconnect the battery cables if loose. Always connect the negative battery cable last to reduce the possibility of arcing.

⚠WARNING ***Ignition of explosive battery gases can cause severe personal injury. Do not smoke while servicing batteries.***

Mechanical

With the generator set stopped, check for loose belt, fittings, leaking gaskets and hoses, or any signs of mechanical damage. If any problems are found, have them corrected immediately. With the set running, listen for any unusual noises that may indicate mechanical problems and check the oil pressure frequently. Investigate anything that indicates possible mechanical problems.

LUBRICATION SYSTEM

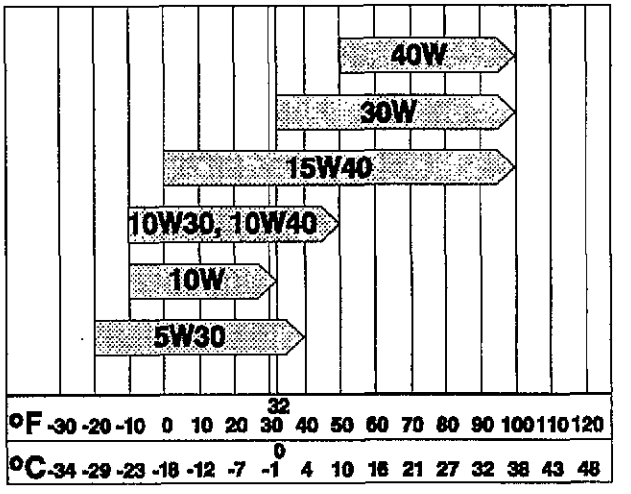
The engine oil was drained from the crankcase prior to shipment. Before the initial start, the lubrication system must be filled with oil of the recommended classification and viscosity. Refer to the Specifications section for the lubricating oil capacity.

Oil Recommendations

Use oils with the American Petroleum Institute (API) classification SF/CD in viscosities per temperature as shown in Table 4.

TABLE 4. OIL SELECTION

OIL VISCOSITY VS. TEMPERATURE



Anticipated Ambient Temperature

When selecting the oil viscosity, pick the viscosity that is right for the lowest temperature expected. Oil that is too thick may result in a lack of lubrication when the engine is started. Use a lower viscosity oil as the ambient temperature reaches the lower end of the scale.

Do not use synthetic oil, non-detergent oil, and do not mix different brands of oil.

Engine Oil Level

Check the engine oil level during engine shut-down periods at the intervals specified in the Maintenance Table. The oil dipstick and oil fill are located on the side of the engine (see Figure 6). The dipstick is stamped with FULL and ADD to indicate the level of oil in the crankcase. For accurate readings, shut off the engine and wait approximately 10 minutes before checking the oil level. This allows oil in the upper portion of the engine to drain back into the crankcase.

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

⚠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.***

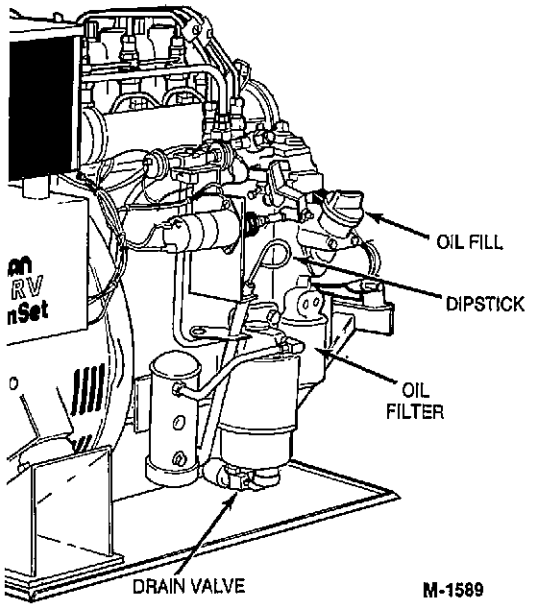


FIGURE 6. ENGINE OIL

Oil and Filter Change

Change the oil and filter at the intervals recommended in the maintenance table. Use oil that meets the API classification and viscosity requirements as indicated in the previous section.

Engine Oil Change: Run engine until thoroughly warm before draining oil. Stop the engine, place a pan under the drain outlet and open the drain valve. After the oil is completely drained, close the drain valve. Refill with oil of the correct API classification and appropriate SAE viscosity for temperature conditions.

⚠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.***

Oil Filter Change: Spin off oil filter and discard it. Thoroughly clean filter mounting surface. Apply a thin film of oil to filter gasket and install new element. Spin element on by hand until gasket just touches mounting pad and then turn an additional 1/2 turn. Do not overtighten.

With oil in crankcase, start engine and check for leaks around filter element. Retighten only as much as necessary to eliminate leaks, but do not overtighten.

COOLING SYSTEM

The cooling system on each set is drained prior to shipping and must be refilled before being operated. The cooling system capacity of the standard unit with set mounted radiator is shown in the *SPECIFICATIONS* section.

The 8.0 DKD does not have an Onan supplied radiator. This unit is provided for custom installations and may have a vertical or horizontal mount remote radiator. Horizontal mounted radiator systems require an expansion tank that must be mounted at the highest point of the cooling system.

⚠CAUTION ***Improper operation can result in overheating and equipment damage. With custom installations that use a common radiator for both vehicle engine and generator set cooling, do NOT operate the vehicle engine and the generator set at the same time or equipment damage can result due to overheating.***

Coolant Requirements

A satsifactory engine coolant inhibits corrosion and protects against freezing. A solution of ethylene glycol anti freeze (permanent type) and water is recommended for normal operation and storage periods. Choose only a reliable brand of antifreeze that contains a rust and corrosion inhibitor but does not contain a stop-leak additive.

The water used for engine coolant should be clean, low in mineral content, and free of any corrosive chemicals such as chloride, sulphate, or acid. Use soft water whenever available. Well water often contains lime and other minerals which eventually may clog the radiator core and reduce the cooling efficiency.

Be sure the antifreeze solution will protect the cooling system during the coldest weather. A 50/50 solution of ethylene glycol and water is applicable for most applications. This solution will protect the cooling system to -35°F (-37°C) temperature.

Filling the Cooling System

Verify that all drain cocks are closed and all hose clamps secure. Remove the radiator pressure cap and slowly add coolant until level is near the top of radiator.

⚠CAUTION ***Exceeding the recommended fill rate can cause incomplete filling of the engine block which can result in possible engine damage during warm-up. Always follow the recommended fill procedure.***

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

When the engine is first started, remove the pressure cap and monitor the coolant level. As trapped air is expelled from the system, the coolant level will drop and additional coolant should be added. Replace the pressure cap when the coolant level is stable.

Coolant Level

Check the coolant level during shutdown periods 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) when the system is cold. See Figure 7 for typical cooling system. Engine coolant is at proper level when the recovery tank level is between Full and Low marks.

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

⚠CAUTION ***The High Engine Temperature Cutoff will shut down engine in an overheat condition only if coolant level is sufficiently high to physically contact shutdown switch. Loss of coolant will allow engine to overheat without protection of shutdown device, causing severe damage to engine. It is therefore imperative that adequate engine coolant levels be maintained for operational integrity of the cooling system and overheat shutdown protection.***

Flushing and Cleaning

For efficient operation, the cooling system should be drained, flushed, and refilled once a year. To drain the system completely, the radiator drain and the cylinder block drain located on the left side of engine must be opened. See Figure 7.

Chemical Cleaning: Thoroughly clean the cooling system if rust and scale have collected on the engine water jacket or in the radiator. Rust and scale slow down heat absorption and can block the coolant flow. Use a good radiator cleaning compound in accordance with instructions furnished by the supplier.

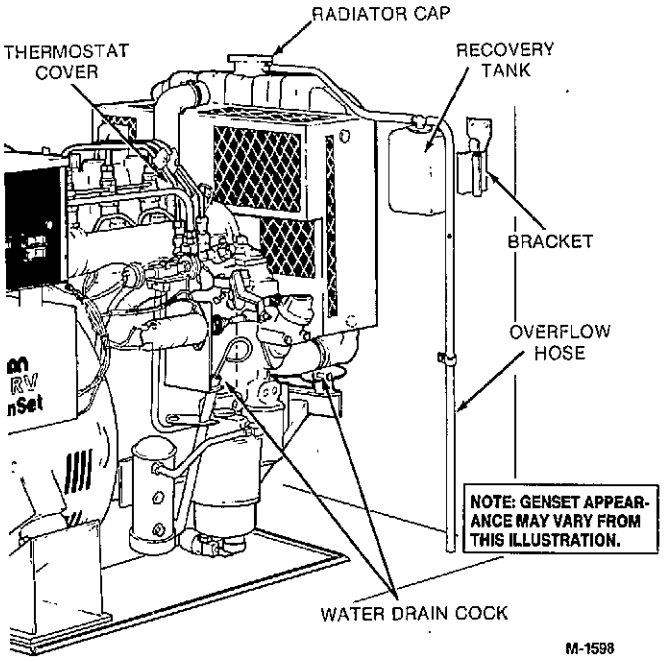


FIGURE 7. TYPICAL COOLING SYSTEM COMPONENTS

Flushing: After cleaning or before filling the system with new coolant, drain the block and radiator and fill with clean water. Operate the set for 10 minutes and then drain the system completely. Refill with the recommended coolant.

⚠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.***

Thermostat

Replace thermostat when it is broken, corroded, or sticks in the open or closed position. If engine overheats or does not reach and maintain a minimum operating temperature, the thermostat should be removed and tested as a possible cause.

The thermostat can be removed for testing or replacement using the following procedure:

1. Drain cooling system.
2. Remove capscrews and washers that secure thermostat cover to water pump housing.
3. Raise thermostat cover with radiator hose intact and position it to one side.
4. Remove thermostat cover gasket and thermostat.
5. Clean, inspect, and remove any gasket material from the thermostat cover and housing.

Use a new gasket when replacing thermostat. Refill cooling system with the recommended antifreeze coolant.

Pressure Cap

Closed cooling systems make use of a pressurized cap to increase the boiling point of the coolant and allow higher operating temperatures. Pressure caps should be replaced every two years or sooner if they malfunction.

FAN BELT (MODELS EQUIPPED WITH RADIATOR)

A loosened fan belt can cause the engine to overheat. If this occurs, loosen the adjusting nut and tighten the belt. Be sure to retighten the adjusting nut after the adjustment.

Proper fan belt tension is such that the belt deflects about 0.4 in. (10 mm) at the middle when pressed with a finger [at a force of 22 lbs. (10 kg)]. See Figure 8.

The belt can be removed for inspection or replacement by loosening the adjustment nut and pushing alternator inward. Inspect fan belt for excessive slickness, oil soak, wear, tear, cracks and overstretching. Replace if needed.

⚠WARNING ***Contact with rotating machinery can cause severe personal injury or death. Stay clear of rotating components and secure guards and shields in place before operating machinery.***

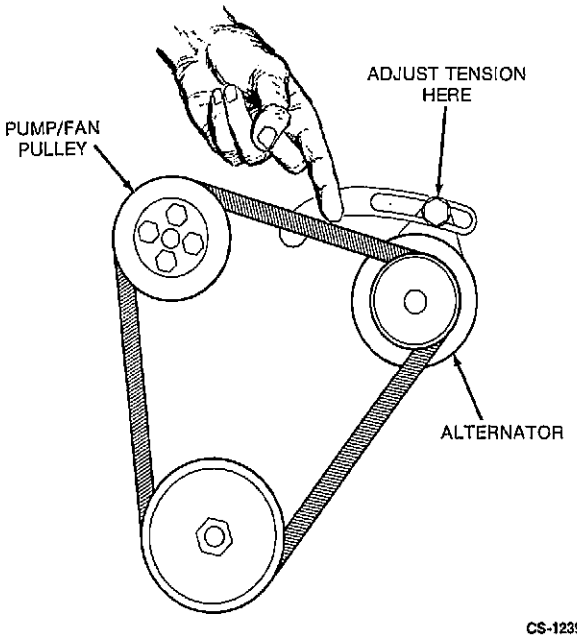


FIGURE 8. BELT TENSION ADJUSTMENT

FUEL SYSTEM

Use only a good quality fuel obtained from a reputable supplier. The quality of fuel used is important in obtaining dependable performance and satisfactory engine life. Fuels must be clean, completely distilled, well refined, and non-corrosive to fuel system parts.

⚠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.***

Fuel Recommendations

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 operating 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 having a cloud point of at least 10°F (6°C) below the lowest expected fuel temperature. Cloud point is the temperature at which wax crystals begin to form in diesel fuel.

Fuel Handling Precautions

Take appropriate precautions to prevent the entrance of dirt, water or other contaminants into 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 fuel can cause severe damage to both the injection pump and injector nozzles. Take special precautions to keep the fuel clean and free of water.***

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 as well as freezing problems. In addition, water mixing with the sulphur in the fuel forms acid which can corrode and damage engine parts.

Priming the Fuel System

The fuel system must be primed prior to initial start up or after the engine has run out of fuel.

Low Pressure Fuel System: The electric fuel pump, fuel filter and injection pump inlet comprise the low pressure fuel system. To prime these components, follow the same procedure as when the fuel filter is replaced (following section).

Be sure to check fuel level in fuel tank and that shut off valve is open.

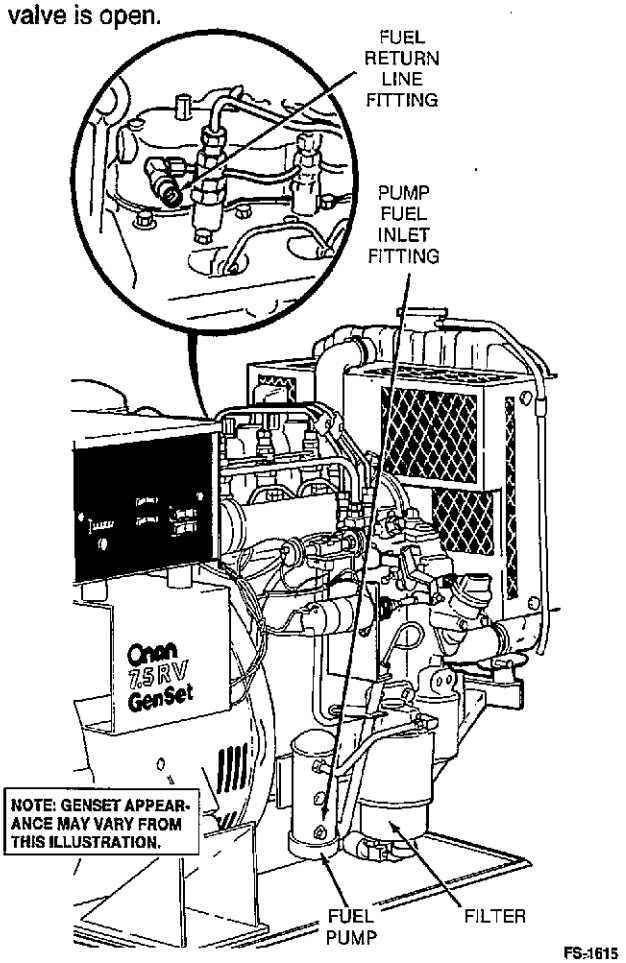


FIGURE 9. INJECTION PUMP FUEL SYSTEM (7.5 DKD SHOWN FOR REFERENCE ONLY)

Fuel Filter

The filter replacement interval will vary according to the fuel quality and cleanliness. Using the wrong fuel or dirty fuel will shorten the service life of the filter.

⚠CAUTION ***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 free of water.***

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), change the fuel filter.

To Service 7.5 DKD, 6.5 DKD and 6.0 DKD:

1. Loosen drain and bleed screws. Collect fuel in suitable container. Remove bleed plug. See Figure 10.
2. Remove filter element from head with the bowl connected.
3. Clean bowl, O-ring gland and O-ring.
4. Lubricate O-ring with clean diesel fuel and place in bowl gland.
5. Spin bowl onto new element. DO NOT OVERTIGHTEN.
6. Lubricate element and gasket and fill bowl and element with clean diesel fuel.
7. Spin bowl and element assembly onto head and hand tighten.
8. Disconnect starter solenoid lead at terminal connector. This allows fuel pump operation without cranking engine.
9. Depress Start switch until fuel purges at bleed screw and bleed plug opening.
10. Replace bleed plug and close bleed screw. Reconnect starter lead.

To Service 8.0 DKD:

1. Loosen drain and bleed screws. Collect fuel in suitable container. Remove bleed plug. See Figure 10.
2. Remove filter element from head.
3. Lubricate new element and gasket and fill element with clean diesel fuel.
4. Spin element onto head and hand tighten.
5. Disconnect starter solenoid lead at terminal connector. This allows fuel pump operation without cranking engine.
6. Depress Start Switch until fuel purges at bleed plug opening.
7. Replace bleed plug and close bleed screw. Reconnect starter lead.

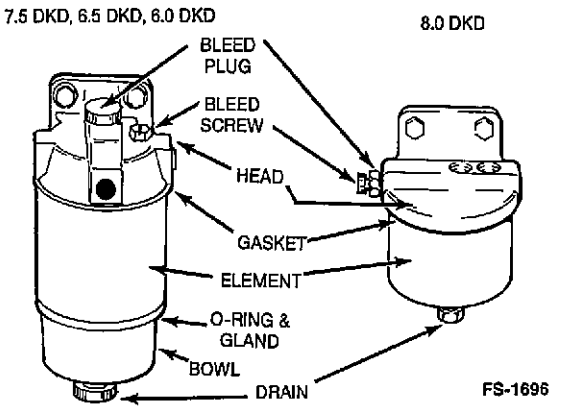


FIGURE 10. FUEL FILTER ASSEMBLY

High Pressure Fuel System: The injection pump, fuel injection lines and fuel injectors comprise the high pressure fuel system. This part of the system is usually self-priming since any trapped air is usually forced out through the injection nozzles.

AIR CLEANER

The air cleaner is not Onan supplied on the 8.0 DKD and may vary from the air cleaner described here.

The air cleaner element is a dry type and should never have oil applied to it. Avoid touching the element except when cleaning it (Figure 11). Instructions for cleaning the element are on a label attached to the element.

The dust cup should be cleaned once a week, or every day in extremely dusty conditions. Be sure the dust cup "TOP" or arrow on the rear of cup is in the upright position.

⚠CAUTION ***If the dust cup is mounted incorrectly, dust does not collect in the cup and can shorten life of the filter element.***

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

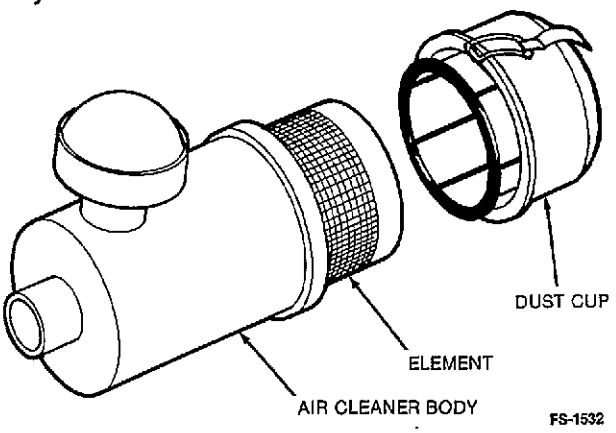


FIGURE 11. TYPICAL AIR CLEANER COMPONENTS

BATTERY

Check the condition of the starting battery at the interval specified in the Periodic Maintenance Schedule. Always disconnect the negative ground strap 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 type battery.

⚠WARNING ***Ignition of explosive battery gases can cause severe personal injury. Do not smoke while servicing batteries.***

Cleaning Battery

Keep the battery clean by wiping it with a damp cloth whenever dirt appears excessive.

If corrosion is present around the terminal connections, remove battery cables and wash the terminals with an ammonia solution or a solution consisting of 1/4 pound (about 100 grams) of baking soda added to 1 quart (about 1 litre) 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 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.

⚠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.***

Hold the hydrometer vertical and take the reading. Correct the reading by adding four gravity points (0.004) for every five degrees the electrolyte temperature is above 80°F (27°C) or subtracting four gravity points for every five degrees below 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

Check the level of the electrolyte (acid and water solution) in the battery at least every 100 hours of operation. If the cells are low on water, fill cells to the bottom of the filler neck with distilled water and recharge. If one cell is low, check case for leaks or for a bad cell. Keep the battery case clean and dry. An accumulation of moisture will lead to a more rapid discharge and battery failure.

⚠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.***

AC GENERATOR

There are no brushes, brush springs or collector rings on these generators, therefore they require very little servicing. Periodic inspections, to coincide with engine oil changes, will provide good performance.

Remove the generator end bell cover and inspect the rotating rectifier assembly to make sure the diodes (see Figure 12) are free of dust, dirt and grease. Excessive foreign matter on these diodes and heat sinks will cause the diodes to overheat and will result in their failure. Blow out the assembly periodically with filtered low pressure air.

⚠WARNING ***Accidental starting of the set can cause severe personal injury or death. Move the Operation Selector switch to STOP and disconnect the starting battery before inspecting rotating rectifier assembly.***

⚠CAUTION ***Excessive foreign matter on diodes and heat sinks will cause overheating and possible failure.***

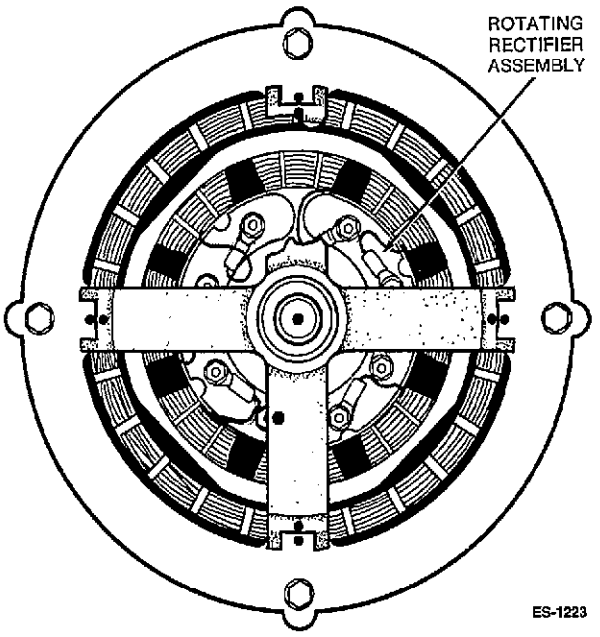


FIGURE 12. GENERATOR END VIEW

Generator Bearing

Inspect the bearing for evidence of outer case rotation every 1000 hours of operation. Replace the bearings every five years. Deterioration of the bearing grease due to oxidation makes this replacement necessary.

If generator requires major repair or servicing, contact an authorized Onan dealer or distributor.

CRANKCASE BREATHER

Clean the crankcase breather element at the scheduled intervals. Service using the following procedure. Refer to Figure 13.

1. Remove three cap nuts and O-rings from the top of cylinder head cover. Carefully remove the cover trying not to damage gasket.
2. From inside the cover, remove two machine screws securing the breather baffle, element, plate and shield.
3. Clean element in a suitable solvent. Dry element, then saturate with engine oil before replacing.

⚠WARNING ***Many cleaning solvents present a hazard of severe personal injury or death. Follow the manufacturer's instructions and proceed with care.***

4. If necessary, clean other breather components in a suitable solvent before reassembling.

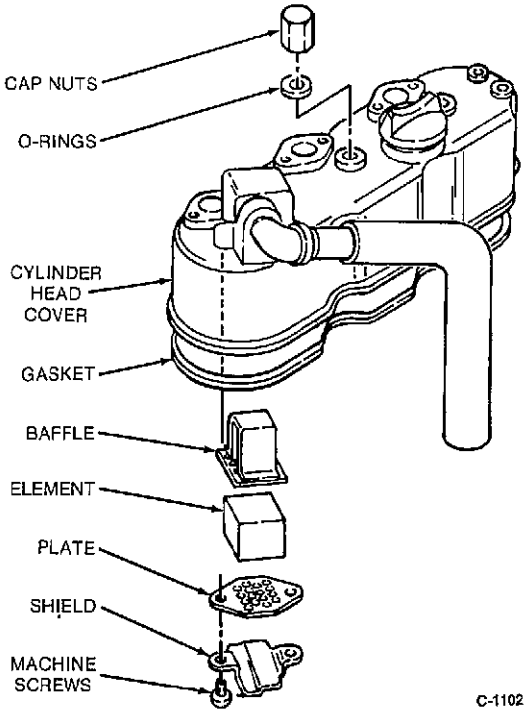


FIGURE 13. CRANKCASE BREATHER ASSEMBLY

MUFFLER/SPARK ARRESTER

Exhaust spark arresters are necessary for SAFE OPERATION. All require periodic clean-out to maintain maximum efficiency. See the maintenance schedule for recommended 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 load for five minutes. Stop the generator set and allow the muffler to cool. Replace the pipe plug in the muffler. See Figure 14.

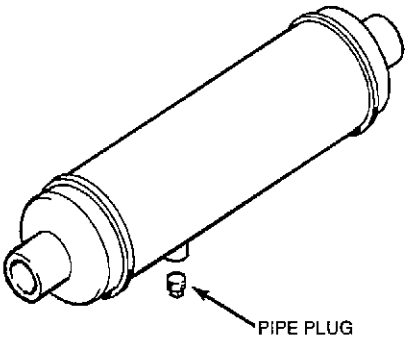


FIGURE 14. EXHAUST MUFFLER

Cleaning the Generator Set

The generator set should be cleaned every six months or sooner if severe road contamination or dusty conditions are encountered. Dust usually can be removed with a damp cloth. Some road contaminants however, may require steam for removal. Do not steam clean the generator set while the engine is running. When cleaning, provide cover or protection so spray is not directed into the generator, air cleaner, control box, fuel solenoid, or electrical connectors. Do not clean with solvents; they can damage electrical connectors.

OUT-OF-SERVICE PROTECTION

The inherent lubricating qualities of No. 2 diesel fuel should protect the cylinders of a diesel engine for at least 30 days when the unit is not in service. To protect an engine that will be out of service for more than 30 days, proceed as follows:

1. Exercise the generator set as described in the *OPERATION* section until the engine is up to operating temperature.
2. Shut down engine and disconnect the battery. Store battery in a cool dry place and connect to a charger 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 oil base while still warm. Replace oil filter. Refill crankcase and attach a tag indicating viscosity of oil used.
4. Check the coolant level and add more coolant if the level is low. If freezing temperatures are possible, test strength of coolant mixture.
5. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, ect.
6. Clean and wipe entire unit. Coat parts susceptible to rust with a light coat of grease or oil.

Returning a Unit to Service

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

1. Remove plug from exhaust outlet.
2. Check tag on oil base and verify that oil viscosity is still correct for existing ambient temperature.
3. Clean and check battery. Measure specific gravity [1.260 at 80°F (27°C)] and verify level to be at split ring. If specific gravity is low, charge until correct value is obtained. If level is low, add distilled water and charge until specific gravity 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 battery.***

4. Prime the fuel system.
5. Connect starting battery (ground terminal last).
6. Remove all loads before starting the engine.
7. After start, apply load to at least 50 percent of rated capacity.
8. Check gauges for normal readings. Set is ready for service.

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