



Onan

RV GenSet

Operator's Manual

BGM, NHM



 **WARNING:** 

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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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 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.

MBL-1

Introduction

ABOUT THIS MANUAL

This manual covers the operation and maintenance of the the Marquis™ BGM and NHM series of generator sets (gensets). Study this manual carefully and observe all of its instructions and precautions.

Component Locations, Starting and Stopping, Powering Equipment and Varying Operating Conditions cover basic operation of the genset. *Periodic Maintenance and Troubleshooting* cover the maintenance and care necessary for top performance. The owner is responsible for maintaining the genset according to the maintenance schedule (Table 4 on page 14).

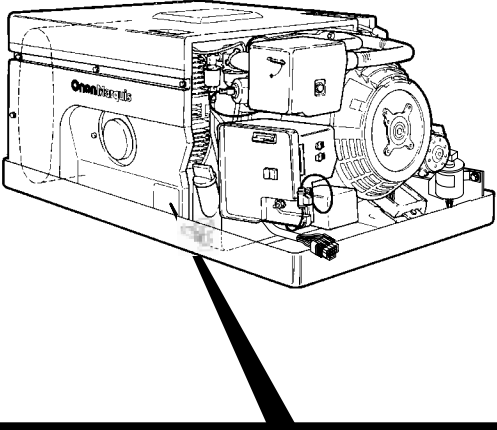
This manual also covers genset break-in, exercise and storage, how to obtain service, genset specifications and important information for California genset users.

Each operator of the genset should become thoroughly familiar with the information in this manual. Keep this manual and the genset Installation Manual with the other vehicle manuals.

MODEL IDENTIFICATION

When contacting an Onan® dealer or distributor for parts, service or product information, be ready to provide the model and serial numbers on the genset nameplate (Figure 1). Every character in these numbers is significant. (The last character of the model number is the specification letter, which is important for obtaining the right parts.)

To make the model and serial numbers easy to find when you need them, record them in the boxes provided in Figure 1.



NAMEPLATE WITH TYPICAL MODEL AND SERIAL NUMBER DATA

IMPORTANT ENGINE INFORMATION			
Onan ®	ONAN CORPORATION 1400 73rd Ave. NE Minneapolis, MN 55432 Made in U.S.A.		
Model No.: 7NHM-FA/26105F			
S/N: A953123456			
AC Volts:	Ph:	kW:	
Amps:	Pf:	RPM:	
Fuel:	Hz:	Bat:	12V
Insulation - NEMA Class	Ambient: 40° C	INI 3461	URC
REFER TO OPERATOR'S MANUAL FOR MAINTENANCE SPECIFICATIONS AND ADJUSTMENTS.			
THIS ENGINE MEETS 1995-1998 CALIFORNIA EMISSIONS REGULATIONS FOR ULGE ENGINES.			EM
SN5980U1G2RA		980 cc	

RECORD NUMBERS HERE

MODEL NUMBER:
SERIAL NUMBER:

FIGURE 1. TYPICAL NAMEPLATE

Marquis is a trademark of the Onan Corporation.

FUEL RECOMMENDATIONS

⚠️WARNING *Gasoline and LPG are highly flammable fuels and can cause severe personal injury or death. Do not smoke if you smell gas or gasoline or are near fuel tanks or fuel-burning equipment or are in an area sharing ventilation with such equipment. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other sources of ignition well away. Keep a type ABC fire extinguisher in the vehicle.*

Gasoline Models

Use clean, fresh unleaded gasoline having a minimum octane rating (Anti-Knock Index) of 87.

During some times of the year only mandated “oxygenated” gasolines may be available. These are acceptable for use, but not preferable. Leaded gasoline may be used but will result in the extra maintenance required for removing combustion chamber and spark plug deposits. Do not use gasoline or gasoline additives (de-icers) containing methanol because methanol can be corrosive to fuel system components.

⚠️CAUTION *Do not use gasoline or gasoline additives containing methanol because methanol can be corrosive to fuel system components.*

Avoid using highly leaded gasolines and lead additives because of the extra engine maintenance that will be required.

LPG Models

Use clean, fresh HD-5 grade liquified petroleum gas or equivalent product consisting of at least 90 percent propane. Commercial liquified petroleum gas fuels may contain more than 2.5 percent butane which can result in poor fuel vaporization and poor engine starting in low ambient temperatures (below 32° F (0° C)).

Satisfactory performance requires that the LPG vapor (vapor-withdrawal models only) be supplied at a pressure within the range indicated in *Specifications*.

⚠️WARNING *High LPG supply pressure (vapor withdrawal models only) can cause gas leaks which can lead to fire and severe personal injury or death. LPG supply pressure must be adjusted to Specifications by qualified personnel.*

ENGINE OIL RECOMMENDATIONS

Use premium quality motor oil. Look for the API (American Petroleum Institute) classification and use Class SG or SH oil (also SG/CD, SG/CE, SH/CD or SH/CE). Also look for the SAE (Society of Automotive Engineers) viscosity grade. Referring to Table 1, choose the viscosity grade appropriate for the ambient temperatures expected during the period of time until the next scheduled oil change.

Single-grade SAE 30 oil is preferable when temperatures are consistently above freezing. Multigrade oils are better when wide temperature variations are expected.

TABLE 1. OIL VISCOSITY VS. TEMPERATURE

EXPECTED AMBIENT TEMPERATURES	SAE VISCOSITY GRADE
32° F (0° C) and higher	30
10° F to 100° F (-12° C to 38° C)	15W-40 (OnaMax)
0° F to 80° F (-18° C to 27° C)	10W-30 10W-40
-20° F to 50° F (-28° C to 10° C)	5W-30

STARTING BATTERIES

These gensets have a 12 volt, direct current (DC) starting and control system. Usually, the 12 volt battery used for vehicle lighting and other 12 volt DC vehicle loads is used for genset cranking and start-up. See *Specifications* for minimum battery requirements for genset cranking.

Regular, monthly maintenance of batteries may be required. See *Periodic Maintenance* and any instructions available from the vehicle manufacturer or battery manufacturer. Battery recharging depends upon the vehicle’s DC converter/battery charger, which is powered either by the genset AC output or the utility when it is connected.

Reliable genset starting and starter service life depend upon an adequate battery system capacity and proper maintenance.

Component Locations

COMPONENTS REQUIRING PERIODIC ATTENTION OR MAINTENANCE

The control panel and the components requiring attention during periodic maintenance (see *Periodic*

Maintenance) are located as shown in Figure 2. The genset itself is usually located behind a door in a compartment somewhere around the perimeter of the vehicle.

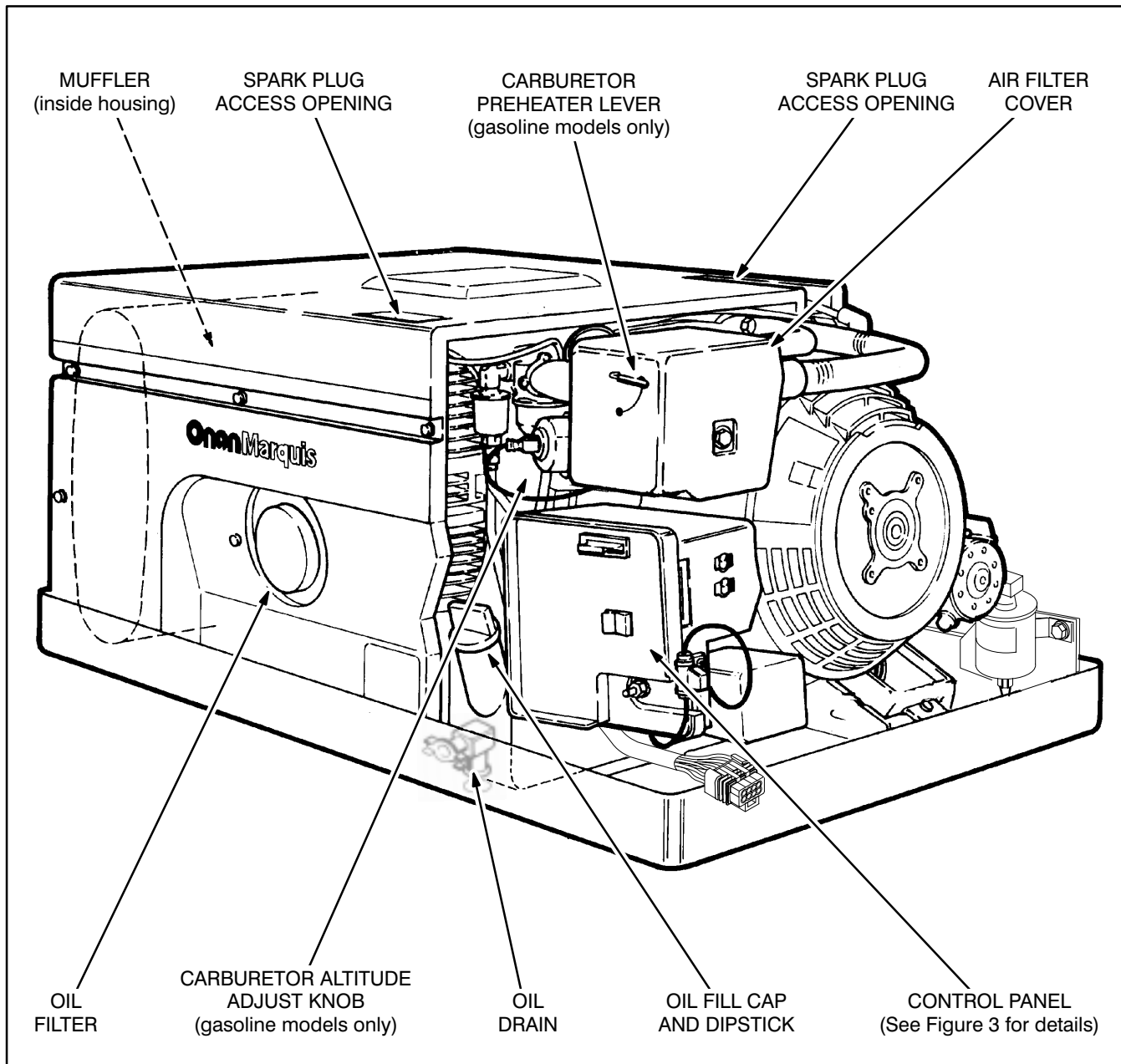


FIGURE 2. COMPONENT LOCATIONS

GENSET CONTROL PANEL

The genset control panel (Figure 3) and box include the following features:

START-STOP Switch - This is a rocker switch which returns to its neutral position when you let go. Hold it in the START position to crank and start the genset and push it momentarily to the STOP position to stop the genset.

Control Fuse F1 - This fuse provides short circuit protection for the control and remote control circuits.

Control Fuse F2 - This fuse provides short circuit protection for the autochoke and fuel pump circuits on gasoline models.

Line Circuit Breaker - The line circuit breakers protect the AC power leads connected to the genset from overloads and equipment short circuits.

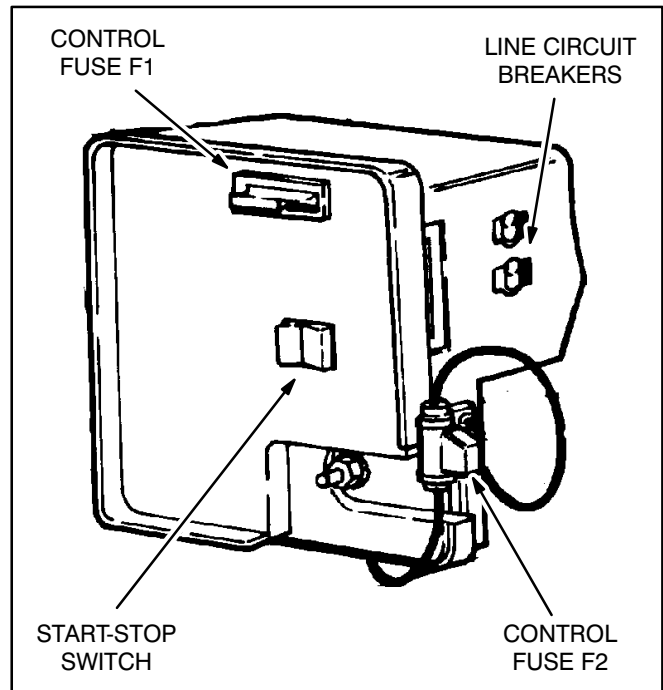


FIGURE 3. GENSET CONTROL PANEL

REMOTE CONTROL

The vehicle probably has a control panel in the cab or at some other location on the vehicle for controlling genset operation. There may also be an enable switch in the cab or other space which can be locked to prevent unauthorized operation of the genset.

Onan offers optional remote control kits that can be connected to the genset. There are three models available:

- Remote panel with start/stop switch and indicator lamp only (see Figure 4).
- Remote panel with start/stop switch, indicator lamp, and running (elapsed) time meter (see Figure 5).
- Remote panel with start/stop switch, indicator lamp, and battery DC voltmeter (see Figure 6).

The hour meter records genset operating time in hours. Use it for periodic maintenance as a record of operating time.

The battery battery DC voltmeter indicates whether voltage across the 12 VDC control system and battery is normal. If the indicator consistently stays above or below the normal zone, see BATTERY CARE under *Periodic Maintenance*.

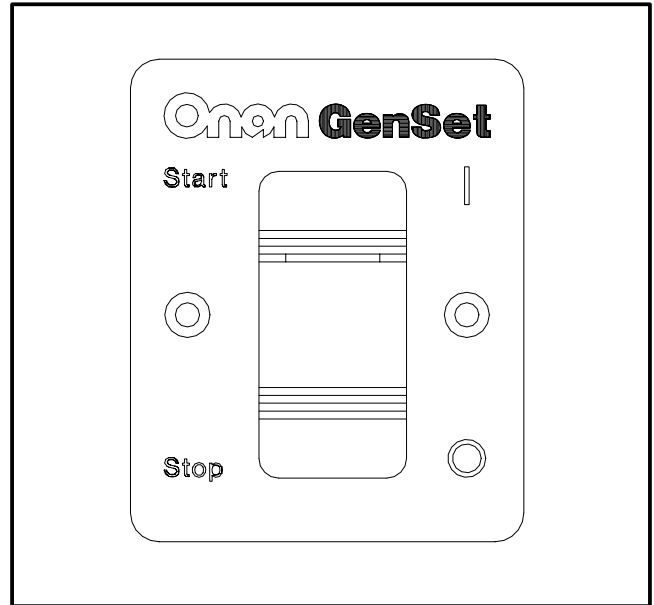


FIGURE 4. START/STOP SWITCH ONLY PANEL

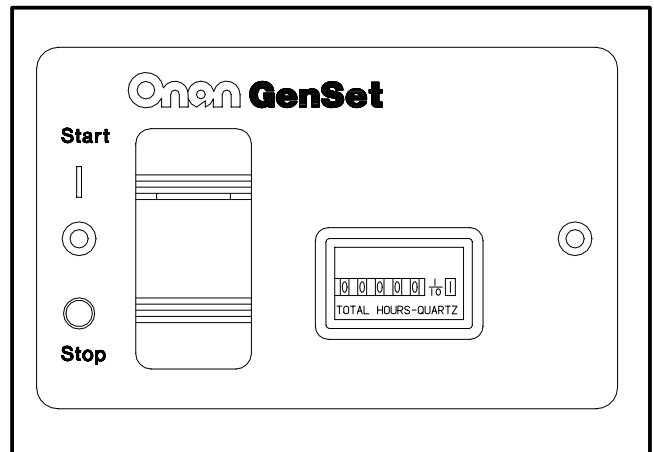


FIGURE 5. START/STOP SWITCH WITH TIME METER

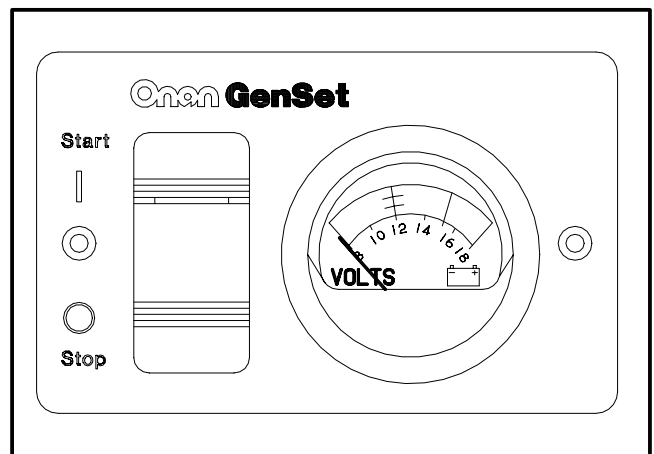


FIGURE 6. START/STOP SWITCH WITH BATTERY DC VOLTMETER

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 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 genset and do not operate it until it has been inspected and repaired.

Never sleep in the vehicle with the genset running unless the vehicle is equipped with a working carbon monoxide detector. Primary protection against inhaling carbon monoxide, however, is the proper installation of the exhaust system and the daily (every eight hour) inspection for visible and audible exhaust system leaks.

PRE-START CHECKS

Before the first start of the day and after every eight hours of operation perform the maintenance instructed in OIL LEVEL CHECK AND GENERAL INSPECTION (Page 15) under *Periodic Maintenance*. **Note: Check exhaust and fuel system at each start.** Keep a log of maintenance and the hours run and perform any maintenance that may be due. Also, see *Genset Break-In, Exercise and Storage* to return the genset to service if the vehicle has been in storage.

STARTING

The genset can be started and stopped from the genset control panel or from a remote control panel inside the vehicle (if so equipped).

1. Perform the PRE-START CHECKS and turn off the air conditioner and other large electrical loads. Open the manual shutoff valve at the LPG container if this is an LPG genset.
2. Push and hold the genset or remote START switch (Figures 4, 5 and 6) until the genset starts. (The remote START switch inside the vehicle should have a lamp which lights to indicate that the genset has started and is running.)

⚠ CAUTION Cranking the starter for longer than 10 seconds at a time can overheat and damage the starter. Do not crank for more than 10 seconds at a time and wait at least 30 seconds before trying again.

3. For top performance and engine life, especially in colder weather, let the engine warm up for at least two minutes before connecting the genset to the vehicle electrical loads (appliances). See *Powering Equipment*.
4. Check for fuel and exhaust leaks. Stop the genset immediately if there is a fuel or exhaust leak and have it repaired before continuing operation.
5. See *Troubleshooting* if the engine does not crank or start after several tries or stops running.

STOPPING

1. Turn off the air conditioner and other large electrical loads and let the genset run two minutes before stopping it. This allows the engine to cool down, reducing the incidence of backfiring and engine run-on.
2. Push the STOP switch momentarily.

Powering Equipment

GENSET LOADING

The AC output of the genset powers the vehicle air conditioner, the DC converter/battery charger and the appliances that may be plugged into the electrical outlets of the vehicle. How much electrical equipment (power consuming appliances) can be operated at one time depends upon how much power is available from the genset. If the genset is “overloaded”, either the genset will stall or its circuit breaker(s) will trip.

To get an idea of how much equipment can be operated at one time add up the watt ratings of the individual appliances that are likely to be used at the same time and compare the sum to the kW (kilowatt) rating of the genset. Use Table 2 or the ratings on the appliances themselves (if so marked) to obtain the appliance watt values. Note that 1 kW = 1000 watts. If power consumption, as totaled up, exceeds genset power output, you may have to consider operating some appliances in sequence, one after another, rather than all at the same time.

Note that when the genset is loaded nearly to full power it is possible that it may stall when the air conditioner (or other large motor load) “cycles on”. The reason for this is that for a brief moment at startup a motor draws up to three times the power stated on its nameplate. You may, therefore, have to consider operating some appliances at times when the air conditioner or other large motor load is not “On”.

Note also that as altitude increases air density decreases, causing genset engine power to decrease (even when the altitude adjust knob is set correctly—see *Varying Operating Conditions*). Power decreases approximately 3.5 percent of rated power each 1000 feet (305 m) of increase in elevation above sea level. See Table 3 for the results of calculations for a typical genset. Therefore, at higher altitudes consider operating fewer appliances at the same time.

Electrical equipment and tools must be properly grounded and in good working condition.

⚠WARNING *Electrical shock can cause severe personal injury or death. Read and follow the equipment and tool manufacturer’s instructions and warnings.*

TABLE 2. TYPICAL APPLIANCE POWER CONSUMPTION

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

TABLE 3. POWER VS. ALTITUDE—5.0 KW GENSET

Elevation above Sea Level	Maximum Genset Power Output*
at 500 feet (152 m) and below	5000 watts (rated)
at 2500 feet (762 m)	4650 watts
at 5500 feet (1676 m)	4150 watts
above 5500 feet (1676 m)	4150 watts minus 175 watts for each additional 1000 feet (305 m)
* This table does not take into account the effect circuit breakers may have in limiting maximum continuous power output.	

RESTARTING A STALLED GENSET

If the genset stalls, disconnect or turn off as many appliances as possible and try restarting the genset as instructed under *Starting and Stopping*. Reconnect the loads (appliances) one by one up to a total load that does not overload the genset or cause the circuit breaker to trip.

RESETTING CIRCUIT BREAKERS

If a circuit breaker in the main power distribution panel of the vehicle or on the genset (Figure 7) trips, there is either a short circuit or too many appliances being operated at the same time. Note that the genset will continue to run after a circuit breaker trips.

If a circuit breaker trips, disconnect or turn off as many appliances as possible and reset the circuit breaker (typically, push the circuit breaker to Off to reset it and then to On to reconnect the circuit). If the circuit breaker trips right away, either the vehicle electrical distribution system has a short or the circuit breaker is faulty. Call a qualified electrician.

If the circuit breaker does not trip, reconnect the appliances, one by one, up to a total load that does not overload the genset or cause the circuit breaker to trip. If a circuit breaker trips right away when an appliance is connected, the appliance probably has a short.

CONNECTING THE VEHICLE TO UTILITY POWER

When the vehicle has provisions for connecting to utility power, such as a cord for plugging into a power outlet receptacle, it must also have an approved device to keep the genset and utility from being interconnected. See the genset Installation Manual for more information.

⚠WARNING *Interconnecting the genset and the public utility (or any other power source) can lead to the electrocution of personnel working on the utility lines, damage to equipment and fire. An approved switching device must be used to prevent interconnections.*

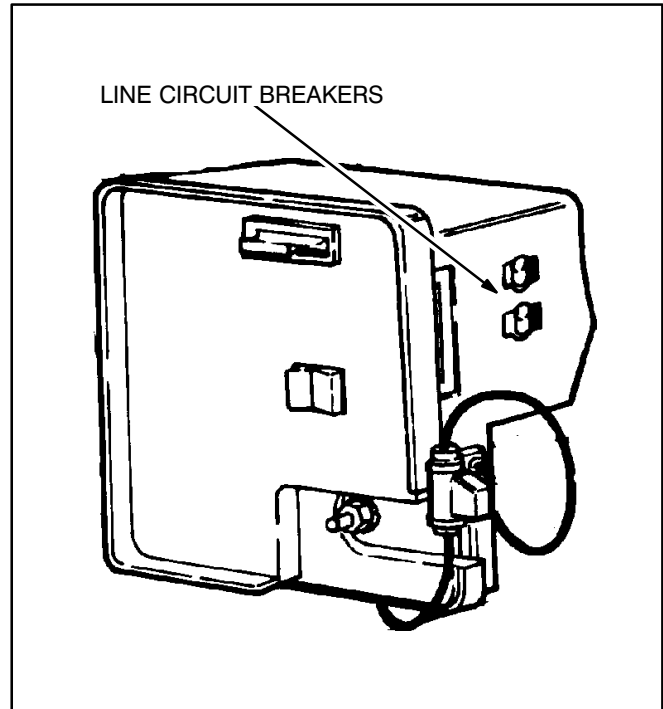


FIGURE 7. SET MOUNTED CIRCUIT BREAKER

Varying Operating Conditions

COLD WEATHER

Pay particular attention to the following items when operating the genset in cold weather:

1. Make sure the engine oil viscosity is appropriate for the cold weather temperatures. See Table 1. Be sure to change the oil if a sudden drop in temperature occurs.
2. At temperatures below 40° F (4° C), push the carburetor air preheater lever down to the WINTER position (gasoline models only). The lever is located on the front of the air cleaner (Figure 8). At temperatures between 40° F (4° C) and 70° F (21° C), the preheater may be left in either position.

CAUTION *Operating the genset with the preheat lever in the SUMMER position when temperatures are below 40° F (4° C) may cause the genset to run roughly, stop running or overspeed due to carburetor icing.*

3. Set the altitude adjust knob (Figure 9) for your altitude (gasoline models only).

HOT WEATHER

Pay particular attention to the following items when operating the genset in hot weather:

1. Make sure nothing blocks the airflow to and from the set.
2. Make sure the engine oil viscosity is appropriate for the hot weather temperatures. See Table 1.
3. Keep the genset clean.
4. Perform maintenance due. See *Periodic Maintenance*.

5. At temperatures above 70° F (21° C) push the carburetor preheater lever up to the SUMMER position (gasoline models only). The lever is located on the front of the air cleaner (Figure 8).

CAUTION *Operating the genset with the preheat lever in the WINTER position when temperatures are above 70° F (21° C) can cause erratic operation, reduced power and reduced engine life.*

6. Set the altitude adjust knob (Figure 9) for your altitude (gasoline models only).

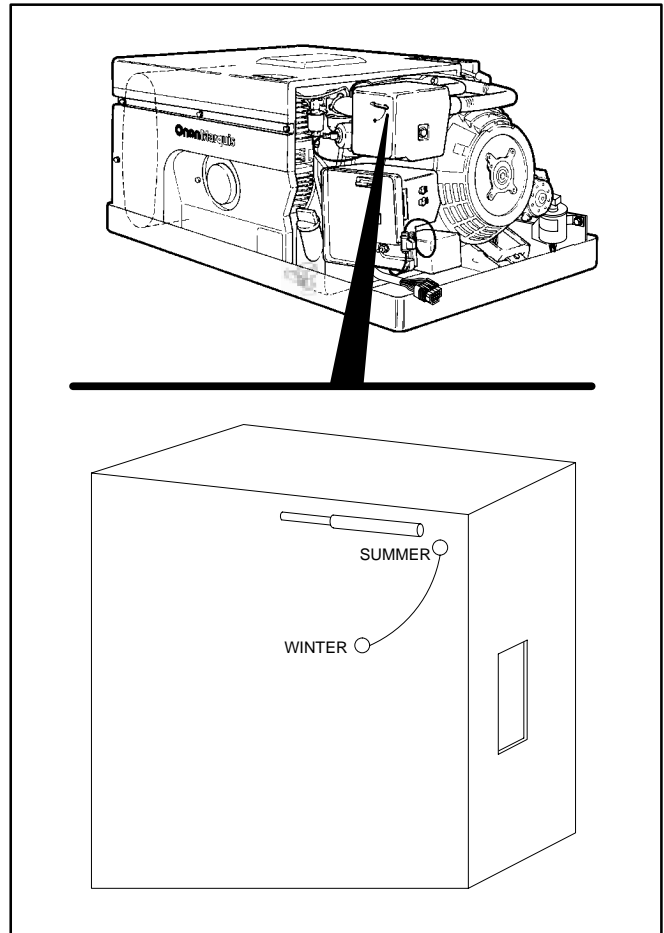


FIGURE 8. CARBURETOR PREHEATER LEVER (GASOLINE MODELS ONLY)

HIGH ALTITUDE

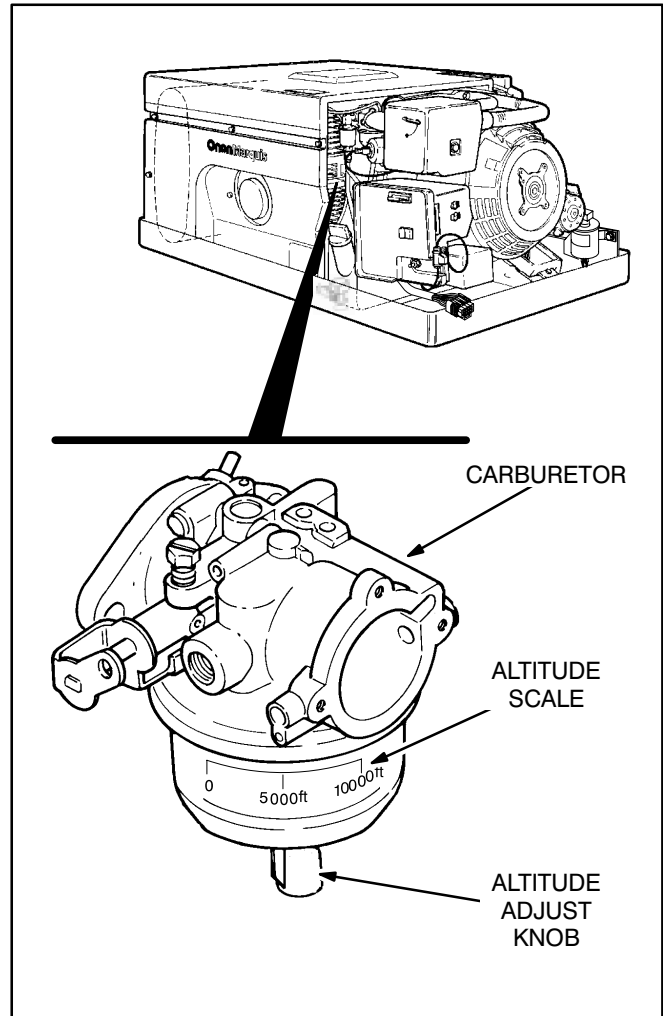
For best fuel economy and genset operation set the carburetor altitude adjust knob (Figure 9) for your altitude (gasoline models only). Look at road maps, travel atlases and road signs for altitude. (See *Powering Equipment* for information on how altitude affects the maximum power output of the genset.)

⚠ CAUTION *Operating the genset at low altitude with a high altitude setting can cause power loss, overheating and engine damage. Always reset the altitude adjust knob when returning to lower altitudes.*

DUSTY CONDITIONS

Pay particular attention to the following items when operating the genset in dusty conditions:

1. Do not let dirt and debris accumulate inside the genset compartment. Keep the genset clean.
2. Perform air cleaner maintenance more often than usual. See *Periodic Maintenance*.
3. Change engine oil every 50 hours.
4. Keep opened containers of engine oil tightly closed to keep out dust.



**FIGURE 9. ALTITUDE ADJUST KNOB
(GASOLINE MODELS ONLY)**

Periodic Maintenance

Periodic maintenance is essential for top performance and long genset life. Use Table 4 as a guide for normal periodic maintenance. Under hot or dusty operating conditions some maintenance operations should be performed more frequently, as indicated

by the footnotes in the table. Keep a log of maintenance performed and the hours run. See *Maintenance Record*. Recording maintenance will help you keep it regular and provide a basis for supporting warranty claims.

TABLE 4. PERIODIC MAINTENANCE SCHEDULE

MAINTENANCE OPERATION	MAINTENANCE FREQUENCY							Page
	Every Day or Every 8 Hours	Every Month	Every 50 Hours	Every 150 Hours	Every 300 Hours	Every 500 Hours		
General Inspection	X							15
Check Engine Oil Level	X							16
Clean and Check Starting Battery		X ³						18
Clean the Spark Arrestor			X					20
Change Engine Oil and Oil Filter				X ^{1, 2, 3, 4}				17
Replace Engine Air Filter				X ^{2, 4}				19
Clean Carburetor and Combustion Chambers with Onan "4C"				X				20
Clean Engine Cooling Fins					X ^{2, 6}			-
Replace Spark Plugs						X ⁴		19
Replace Fuel Filter(s) and Clean Fuel Pump Screen						X ^{5, 6}		-
Adjust Engine Valve Clearance						X ⁶		-
Remove Cylinder Heads and Clean Combustion Chambers						X ⁶		-
Inspect and Clean Governor Linkage						X ⁶		-

1 - As a part of engine break-in, change the engine oil after the first 50 hours of operation.
2 - Perform more often when operating in dusty conditions.
3 - Perform more often when operating in hot weather.
4 - Perform at least once a year.
5 - Perform sooner if engine performance deteriorates.
6 - Must be performed by a qualified mechanic (authorized Onan dealer).

OIL LEVEL CHECK AND GENERAL INSPECTION

Inspect the genset before the first start of the day and after every eight hours of operation as follows:

Oil Level

Check the engine oil level as explained under CHECKING ENGINE OIL LEVEL in this section.

Exhaust System

Look and listen for exhaust system leaks while the genset is running. Shut down the genset if a leak is found and have it repaired before operating the genset.

Look for openings or holes between the genset compartment and vehicle cab or living space if the genset engine sounds louder than usual. Have all such openings or holes closed off or sealed to prevent exhaust gases from entering the vehicle.

Replace dented, bent or severely rusted sections of the tailpipe and make sure the tailpipe extends at least 1 inch (25.4 mm) beyond the perimeter of the vehicle.

Park the vehicle so that the genset exhaust gases can disperse away from the vehicle. Barriers such as walls, snow banks, high grass and brush and other vehicles can cause exhaust gases to accumulate in and around the vehicle.

Do not operate power ventilators or exhaust fans while the vehicle is standing with the genset running. The ventilator or fan can draw exhaust gases into the vehicle.

⚠ WARNING ***EXHAUST GAS IS DEADLY! Do not operate the genset if there is an exhaust leak or any danger of exhaust gases entering or being drawn into the vehicle.***

⚠ WARNING ***Do not park the vehicle in high grass or brush. Contact with the exhaust system can cause a fire.***

Fuel System

Check for leaks at the hose, tube and pipe fittings in the fuel supply system while the genset is running and while it is stopped. *Do not use a flame to check*

for LPG leaks. Check flexible fuel hose sections for cuts, cracks, and abrasions. Make sure the fuel line is not rubbing against other parts. Replace worn or damaged fuel line parts before leaks occur.

If you smell gas, close the LPG container shutoff valve and have the genset serviced before using it again.

⚠ WARNING ***LPG leaks inside a garage or other inadequately ventilated space or near a pit or basement or other below-grade space can lead to explosive accumulations of gas because LPG “sinks” when it is released into the air. Check for and comply with all local ordinances regarding the garaging of vehicles with LPG engine fuel systems.***

⚠ WARNING ***Gasoline and LPG are highly flammable fuels and can cause severe personal injury or death. Repair leaks right away.***

Battery Connections

Check the battery terminals for clean, tight connections. Loose or corroded connections have high electrical resistance which makes starting harder. Shut the genset off and disconnect corroded or loose battery cables (negative [-] cable first) and clean and reconnect them as instructed under BATTERY CARE in this section.

⚠ WARNING ***Batteries give off explosive gases that can cause severe personal injury. Do not smoke near batteries. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other ignition sources well away.***

Do not disconnect the battery cables while the genset is cranking or running: the arcing can ignite the explosive battery gases.

Mechanical

Look for mechanical damage. Start the genset and look, listen and feel for any unusual noises and vibrations.

Check the genset mounting bolts to make sure they are secure.

Check to see that the genset air inlet and outlet openings are not clogged with debris or blocked.

Clean accumulated dust and dirt from the genset. Do not clean the genset while it is running or still hot. Protect the generator, air cleaner, control panel, and electrical connections from water, soap and cleaning solvents. Always wear safety glasses when using compressed air, a pressure washer or a steam cleaner.

⚠ WARNING *Always wear safety glasses when using compressed air, a pressure washer or a steam cleaner to avoid severe eye damage.*

CHECKING ENGINE OIL LEVEL

Park the vehicle on level ground and shut off the genset before checking the engine oil level.

1. Remove the oil fill cap/dipstick (Figure 10) and wipe it clean.

⚠ WARNING *Crankcase pressure can blow hot engine oil out the fill opening causing severe burns. Always stop the genset before removing the oil fill cap.*

2. Screw the oil fill cap back on and remove it to check the oil level on the dipstick.
3. Add oil as necessary until the full mark is reached. Use API Class SG or SH oil (also SG/CD, SG/CE, SH/CD or SH/CE) having an SAE viscosity grade appropriate for the expected temperatures, as indicated in Table 1.

DO NOT FILL TO A LEVEL ABOVE THE FULL MARK ON THE DIPSTICK. Drain the excess oil if too much has been added.

⚠ CAUTION *Too much oil can cause high oil consumption, high operating temperatures and oil foaming. Too little oil can cause severe engine damage. Keep the oil level between the Full and Add marks on the dipstick.*

4. Screw the oil fill cap on securely to prevent oil leakage.

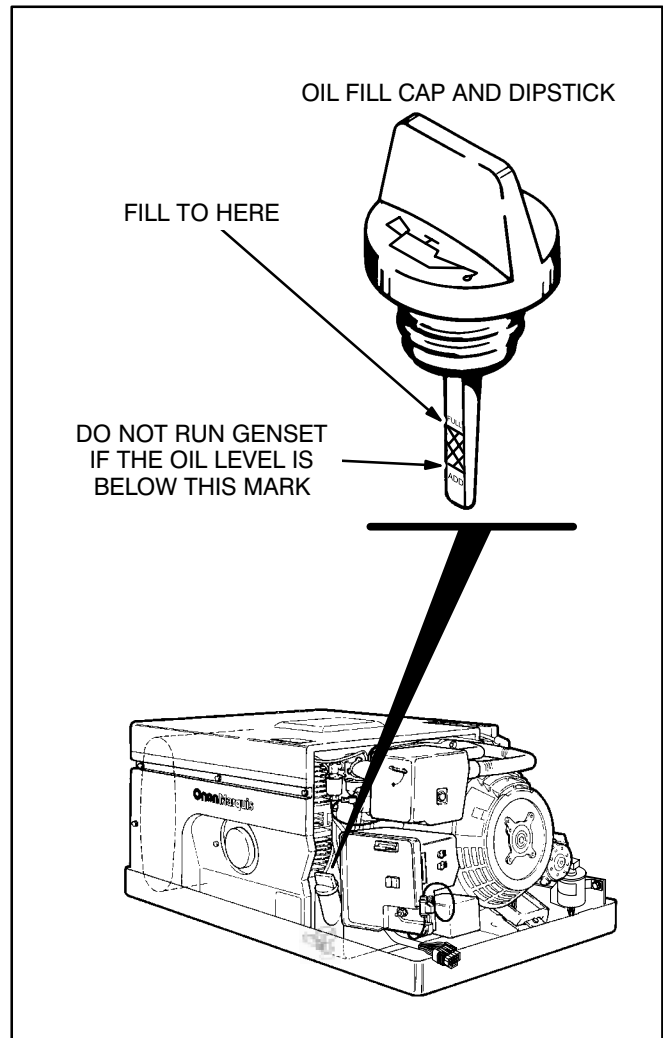


FIGURE 10. OIL LEVEL CHECK

CHANGING ENGINE OIL AND OIL FILTER

Refer to Table 4 for scheduled engine oil change. In hot weather and dusty conditions the oil should be changed more often.

⚠WARNING *State and federal agencies have determined that contact with used engine oil can cause cancer or reproductive toxicity. Take care to limit skin contact and breathing of vapors as much as possible. Use rubber gloves and wash exposed skin.*

1. Place a pan under the oil drain plug. Run the engine until it is warm, then shut it off.
2. Remove the oil fill cap (Figure 10).

⚠WARNING *Crankcase pressure can blow hot engine oil out the fill opening causing severe burns. Always stop the genset before removing the oil fill cap.*

3. Open the oil drain valve (Figure 11) and allow all of the oil to drain from the engine.
4. Close the oil drain valve.
5. Spin off the oil filter canister (Figure 11), drain it of oil and discard it according to local regulations.
6. Thoroughly wipe off the filter mounting surface.
7. Make sure the gasket is in place on the new filter canister and apply a thin film of oil to the gasket.
8. Spin on the new filter canister by hand until the gasket just touches the mounting pad and then turn it an additional 1/2 to 3/4 turn. Do not over-tighten.

9. Refill with API Class SG or SH oil (also SG/CD, SG/CE, SH/CD or SH/CE) having an SAE viscosity grade appropriate for the expected temperatures, as indicated in Table 1. See *Specifications* for oil capacity.
10. Check the oil level and add oil until the full mark is reached.

DO NOT FILL TO A LEVEL ABOVE THE FULL MARK ON THE DIPSTICK. Drain the excess oil if too much has been added.

⚠CAUTION *Too much oil can cause high oil consumption, high operating temperatures and oil foaming. Too little oil can cause severe engine damage. Keep the oil level between the Full and Add marks on the dipstick.*

11. Used oil is harmful to the environment if it is not disposed of properly. Pour used oil into a sealed container and deliver it to the nearest recycling center or automotive service station.

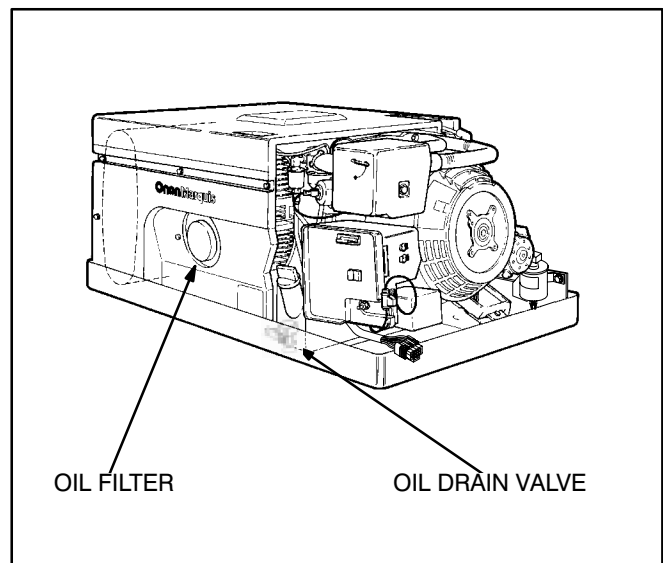


FIGURE 11. OIL DRAIN PLUG AND OIL FILTER

BATTERY CARE

Refer to Table 4 for scheduled battery maintenance and to the battery manufacturer's recommendations and instructions for battery care. Check the electrolyte level more frequently during hot weather on batteries which are not of the "maintenance-free" type.

⚠WARNING *Batteries give off explosive gases that can cause severe personal injury. Do not smoke near batteries. Keep flames, sparks, pilot lights, electrical arcs and arc-producing equipment and all other ignition sources well away.*

Do not disconnect the battery cables while the genset is cranking or running: the arcing can ignite the explosive battery gases.

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

Maintain the battery as follows unless the battery manufacturer has other instructions and recommendations:

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.
3. Identify the cable as positive (+) or negative (-) before making the battery connections. Always remove the negative (-) cable first and connect it last, to reduce the risk of arcing.
4. To remove corrosion from the battery terminals, 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.

5. If the battery is not of the "maintenance-free" type, 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.
6. Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell (Figure 12). 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).
7. If the remote battery condition meter (Figure 6) continues to indicate that battery voltage is abnormally low or high after battery maintenance has been performed, the vehicle battery charging system may need to be serviced by a qualified mechanic.

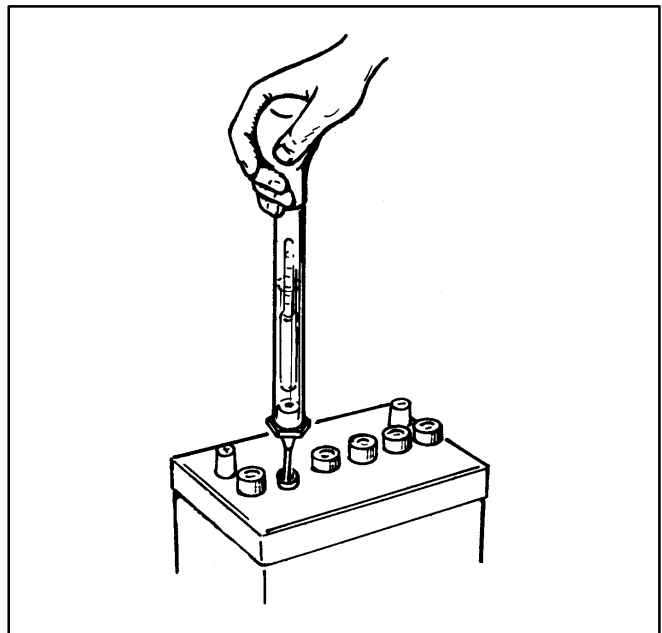


FIGURE 12. BATTERY CHECK WITH HYDROMETER

AIR FILTER

Refer to Table 4 for scheduled air filter replacement. In dusty conditions the air filter element and wrapper should be inspected and changed more frequently for best operation.

To change the air filter element and wrapper, remove the through-bolt and cover (Figure 13). Re-assemble the air filter with a new air filter element and wrapper. Do not over-tighten the through bolt as that can distort the filter element or cover and lead to air leaks around the air filter element.

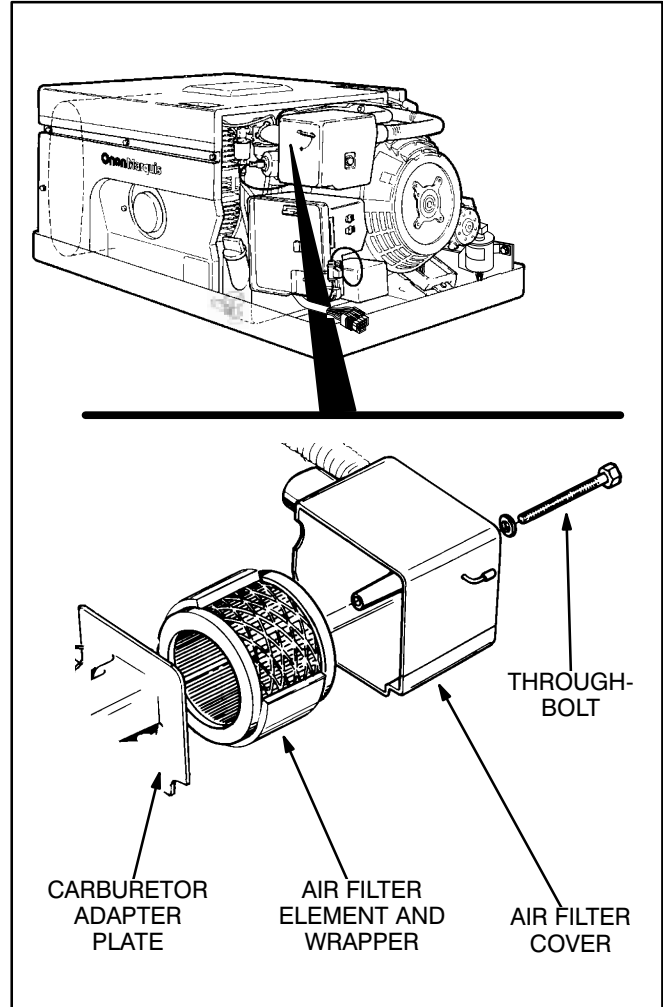


FIGURE 13. AIR FILTER ELEMENT AND WRAPPER

SPARK PLUGS

Refer to Table 4 for scheduled spark plug replacement. (The genset has two spark plugs, Figure 12.) The spark plugs must be in good condition for proper engine starting and performance. A spark plug that fouls frequently or has heavy soot deposits indicates the need for engine service. See *Troubleshooting*.

To prevent crossthreading a spark plug, always thread it in by hand until it seats. If the spark plug is being reused, turn it with a wrench an additional 1/4 turn. If the spark plug is new, turn it an additional 3/8 to 1/2 turn. If you have a torque wrench, tighten the spark plug to 8 lbs-ft (10 N-m).

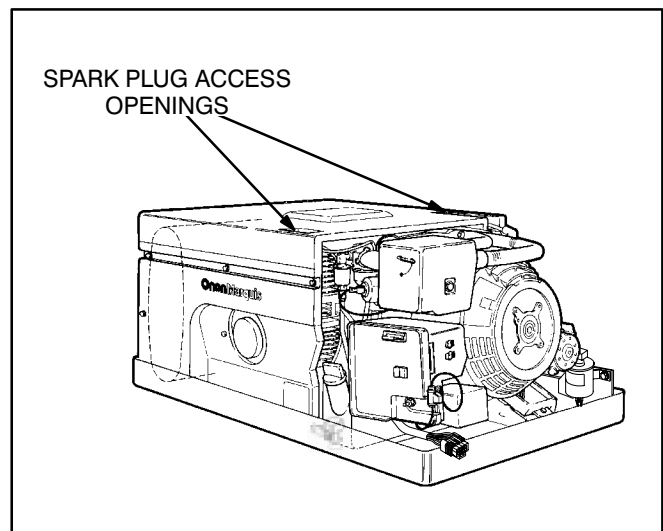


FIGURE 14. SPARK PLUGS

CLEANING THE CARBURETOR AND COMBUSTION CHAMBERS WITH ONAN "4C"

Refer to Table 4 for scheduled cleaning of the carburetor and combustion chambers. It is important to keep to this periodic cleaning schedule so that carbon deposits do not continue to build. The alternative is to have a qualified mechanic remove the cylinder heads to clean the combustion chambers. (Note the scheduled cleaning of the combustion chambers after 500 hours in Table 4.)

Always park the vehicle outside where the fumes and soot can disperse when performing this operation.

⚠WARNING *Chemical combustion chamber cleaners are caustic, toxic and flammable and can cause severe personal injury. Park the vehicle outside where the fumes can disperse. Wear safety goggles and rubber gloves to prevent eye and skin contact. Keep your face well away and out of line of cleaner fluid that may spit back from the carburetor.*

If there is skin or eye contact, flush with water for 15 minutes and seek medical attention if necessary.

Do not smoke while performing this operation.

Clean the carburetor and combustion chambers as follows:

1. Run the genset until it is up to normal operating temperature.
2. Stop the genset and remove the air filter for access to the carburetor throat and choke plate. See AIR FILTER in this section.
3. Restart the genset and spray "4C" into the carburetor throat, washing down the choke plate and carburetor throat. Spray as fast as possible without causing the engine to stall. Just before the can empties flood the engine so that it does stall.
4. Let the genset sit for 15 minutes to allow time for the cleaner to soften the carbon deposits.

5. Restart the genset and load it nearly to full power (see *Powering Equipment*). Let the genset run for about five minutes to expel the carbon loosened by the cleaner.

SPARK ARRESTOR

Refer to Table 4 for scheduled cleaning of the spark arrestor muffler (which meets U.S. Forest Service requirements). Cleaning is required for maximum genset performance.

⚠WARNING *A hot muffler can cause severe burns. Let the muffler cool down before removing or installing the cleanout plug.*

The muffler is mounted inside the genset housing. The cleanout plug is located on the bottom side of the muffler, accessible through the air outlet opening in the bottom of the genset. Clean out the spark arrestor muffler as follows:

1. Remove the cleanout plug from the bottom of the muffler (Figure 15).
2. Restart the genset and load it nearly to full power (see *Powering Equipment*). Let the genset run for about five minutes to expel the soot in the muffler.
3. Stop the genset, allow the muffler to cool down and then reinstall the plug.

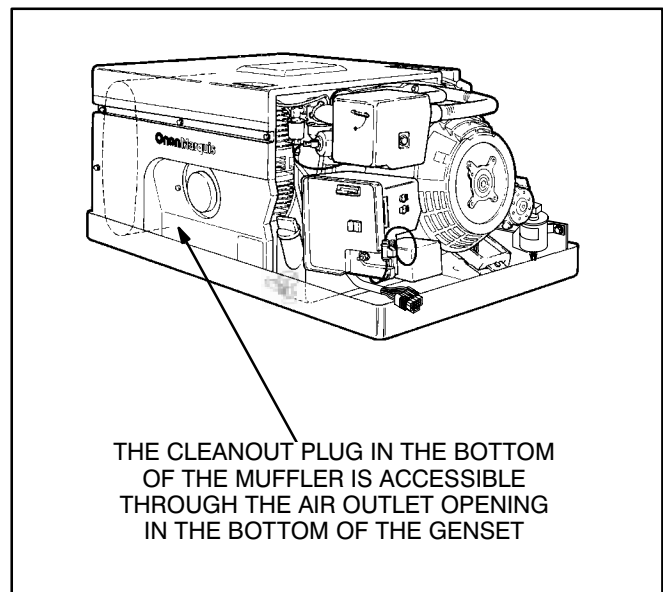


FIGURE 15. SPARK ARRESTOR CLEANOUT PLUG

Genset Break-In, Exercise and Storage

BREAK-IN

Proper engine break-in on a new genset or on one with a rebuilt engine is essential for top engine performance and acceptable oil consumption.

For proper break-in, run the genset at approximately 1/2 rated power for the first 2 hours and then at 3/4 rated power for 2 more hours. See *Powering Equipment*.

Proper engine oil and oil level are especially critical during break-in because of the higher engine temperatures that can be expected. See RECOMMENDED ENGINE OIL in *Introduction*. Change the oil if its viscosity (Table 1) is not appropriate for the ambient temperatures during break-in. Check the oil level twice a day or every 4 hours during the

first 24 hours of operation and change the oil after the first 50 hours of operation.

EXERCISE

If use is infrequent the genset should be exercised at least 2 hours each month at approximately 1/2 rated power. See *Powering Equipment*. Exercising the genset drives off moisture, re-lubricates the engine, replaces the stale fuel in the fuel lines and carburetor with fresh fuel and removes oxide from electrical contacts and generator slip rings, thereby promoting better starting, more reliable operation and longer engine life.

A single two hour exercise period is better than several shorter periods. See STORAGE as an alternative if it is impractical to have someone exercise the genset on a regular basis.

STORAGE

Proper storage is essential for preserving top genset performance and reliability when the genset cannot be exercised regularly and will be idle for more than 120 days.

Storing the Genset

1. For gasoline models only, fill the fuel tank with fresh fuel and add a fuel preservative (OnaFresh™), following the instructions on the container label. Unless a preservative (stabilizer) is added, the gasoline will deteriorate causing fuel system corrosion, gum formation and varnish-like deposits which can lead to hard starting and rough operation.

⚠WARNING *Gasoline preservatives (stabilizers) are toxic. Follow the instructions on the container label. Avoid skin contact. Wash your hands with soap and water after dispensing the fluid.*

2. Run the genset (gasoline models only) for about 10 minutes at approximately 1/2 rated power (see *Powering Equipment*) to fill the fuel lines and carburetor with the fresh fuel and preservative and to bring the genset up to operating temperatures. Then turn off the air conditioner and other large loads, push the genset line circuit breaker to OFF (Figure 7) and stop the genset.
3. Remove the air filter and restart the genset. While the genset is running, spray an engine fogger (OnaGard™) into the carburetor, following the instructions on the container label, and then stop the genset. (A fogger coats the intake, cylinder and exhaust systems with a protective coat of oil.)
4. Change the air filter element if it is dirty.
5. Change the engine oil and attach a tag indicating its oil viscosity (Table 1).
6. Disconnect the battery cables (negative [-] cable first) from the starting battery and store the battery according to the battery manufacturer's recommendations.

OnaFresh and OnaGard are trademarks of the Onan Corporation.

7. Plug the exhaust tail pipe to keep out dirt, moisture, bugs, etc.
8. Close the fuel supply valve (if so equipped).
9. If the vehicle is to be garaged and is equipped with an LPG genset, first check for local ordinances regarding the garaging of vehicles with LPG engine fuel systems. Generally, the ordinances require that the LPG system be leak-free, that the LPG container not be filled beyond specified limits, that the container shutoff valve be closed and that the vehicle not be parked near sources of heat or ignition.

⚠WARNING *LPG leaks inside a garage or other inadequately ventilated space or near a pit or basement or other below-grade space can lead to explosive accumulations of gas because LPG "sinks" when it is released into the air. Check for and comply with all local ordinances regarding the garaging of vehicles with LPG engine fuel systems.*

Returning The Genset To Service

1. Check the oil tag on the genset and change the oil if the viscosity indicated is not appropriate for the temperatures expected (Table 1).
2. Reconnect the starting battery (negative [-] cable last). See BATTERY CARE under *Periodic Maintenance*.
3. Remove the plug from the exhaust tailpipe.
4. Open the fuel supply valve (if so equipped).
5. Inspect the genset. See OIL LEVEL CHECK AND GENERAL INSPECTION under *Periodic Maintenance*.
6. Start the genset at the genset control panel. The initial startup may be slow and there may be smoke and rough operation for a few minutes until the oil in the cylinders from the fogger burns off. If the engine does not start, clean or replace the spark plugs as they may have been fouled by the fogger.
7. Push the genset line circuit breaker ON (Figure 7) when the genset is ready to power appliances.

Troubleshooting

Table 5 provides basic troubleshooting guidance. If you fail to resolve the problem after taking the corrective actions suggested, contact an authorized Onan dealer. See *How to Obtain Service*.

sonnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review the safety precautions on the inside cover page.

⚠WARNING Many troubleshooting procedures present hazards that can result in severe personal injury or death. Only qualified service per-

⚠WARNING Hot engine parts can cause severe burns. Always allow the engine time to cool before performing any maintenance or service.

TABLE 5. TROUBLESHOOTING

Problem	Corrective Action
1. The engine fails to crank.	<ul style="list-style-type: none"> a. Try starting at the genset rather than at the remote control. b. Replace fuse F1 on the control panel if it has blown. c. Clean and tighten the positive (+) and negative (-) battery cable connections at the battery and the genset. d. Recharge the battery. Refer to the battery manufacturer's recommendations.
2. The engine cranks slowly.	<ul style="list-style-type: none"> a. Disconnect the air conditioner and other large loads. b. Clean and tighten the positive (+) and negative (-) battery cable connections at the battery and the genset. c. Recharge the battery. Refer to the battery manufacturer's recommendations. d. Change the engine oil to oil having the proper viscosity for the ambient temperature. See Table 1.
3. The engine cranks but fails to start.	<ul style="list-style-type: none"> a. Check the fuel tank and fill if necessary. b. Open any closed fuel shut off valve. c. Check engine oil level and add oil as necessary. d. Replace fuse F2 (side of control panel) if it has blown (gasoline only). e. Service the air cleaner. f. Secure the spark plug leads on the spark plugs. g. Replace the spark plugs.
4. The engine runs and then stops or surges.	<ul style="list-style-type: none"> a. Check the fuel tank and fill if necessary. b. Check the engine oil level and add oil as necessary. Drain excess oil if the level is above the dipstick Full mark. c. Check and reset the carburetor preheater lever and altitude adjust knob. See <i>Varying Operating Conditions</i>. (Gasoline models only.) d. Secure the spark plug leads on the spark plugs. e. Replace the spark plugs.
5. The genset keeps stalling or the circuit breaker keeps tripping.	<ul style="list-style-type: none"> a. Try running with fewer appliances connected. See <i>Powering Equipment</i>. b. Check the fuel tank (LPG, vapor-withdrawal models) and fill as necessary. <i>On cold days the LPG container may have to be kept at least half full to provide the rate of vaporization necessary to keep up with the genset fuel demand.</i>
6. There is no electrical power even though the genset runs.	<ul style="list-style-type: none"> a. Reset tripped circuit breakers. See <i>Powering Equipment</i>. b. Unless there is an automatic power transfer switch, plug the vehicle power cord into the genset power output receptacle (if so equipped) or turn the vehicle power selector switch to its genset position (if so equipped).
7. The remote battery condition meter (Fig. 4) indicates low voltage.	<ul style="list-style-type: none"> a. Clean and tighten the positive (+) and negative (-) battery cable connections at the battery and the genset. b. Recharge the battery. Refer to the battery manufacturer's recommendations.
8. Black smoke exits the tail-pipe.	Service the air cleaner.

Specifications

	GASOLINE MODELS		
	BGM	NHM	NHM
GENERATOR: 4-Pole Revolving Field, Self-Excited, Electronically Regulated, 1-Phase			
Power (watts)	5000	6000	6800
Frequency (Hertz)	60	60	60
Voltage	120	120	120
Current (amperes)	41.7	50	56.7
Speed (RPM)	1800	1800	1800
FUEL CONSUMPTION:			
No load gph (l/h)	0.3 (1.3)	0.4 (1.5)	0.4 (1.5)
Half load gph (l/h)	0.5 (1.9)	0.6 (2.27)	0.7 (2.6)
Full load gph (l/h)	0.9 (3.4)	1.3 (4.9)	1.3 (4.9)
ENGINE: 2-Cylinder Opposed, 4-Cycle, Spark-Ignited, Side-Valve, Air Cooled			
Bore	3.250 inches (83 mm)	3.563 inches (90 mm)	3.563 inches (90 mm)
Stroke	2.875 inches (73 mm)	3.000 inches (76 mm)	3.000 inches (76 mm)
Displacement	48 inches ³ (782 cc)	60 inches ³ (980 cc)	60 inches ³ (980 cc)
Compression Ratio	7.0 : 1	7.0 : 1	7.0 : 1
Oil Capacity (with filter)*	3.5 quarts (3.3 l)	3.5 quarts (3.3 l)	3.5 quarts (3.3 l)
Intake Valve Clearance (Cold)	0.005 inches (0.13 mm)	0.005 inches (0.13 mm)	0.005 inches (0.13 mm)
Exhaust Valve Clearance (Cold)	0.013 inches (0.33 mm)	0.013 inches (0.33 mm)	0.013 inches (0.33 mm)
Spark Plug Gap	0.025 inches (0.64 mm)	0.025 inches (0.64 mm)	0.025 inches (0.64 mm)
Spark Plug Tightening Torque	8 lbs-ft (10 N-m)	8 lbs-ft (10 N-m)	8 lbs-ft (10 N-m)
Ignition Timing (electronic ignition)	12° BTDC, non-adjustable	12° BTDC, non-adjustable	12° BTDC, non-adjustable
CONTROL AND CRANKING SYSTEM: 12 VDC			
Nominal Battery Voltage	12 volts	12 volts	12 volts
Minimum Battery Cold Cranking Capacity: Above/Below Freezing	360/450 amperes	360/450 amperes	360/450 amperes
Fuse F1 (control circuit)	5 amperes	5 amperes	5 amperes
Fuse F2 (autochoke/fuel pump)	10 amperes mini-bayonet	10 amperes mini-bayonet	10 amperes mini-bayonet
* -See <i>Periodic Maintenance</i> for oil filling instructions.			

	LPG MODELS
	NHM
GENERATOR: 4-Pole Revolving Field, Self-Excited, Electronically Regulated, 1-Phase	
Power (watts)	6500
Frequency (Hertz)	60
Voltage	120
Current (amperes)	54.2
Speed (RPM)	1,800
FUEL CONSUMPTION:	
No load lbs/h (kg/h)	2.1 (.95)
Half load lbs/h (kg/h)	4.1 (1.86)
Full load lbs/h (kg/h)	6.6 (3)
ENGINE: 2-Cylinder Opposed, 4-Cycle, Spark-Ignited, Side-Valve, Air Cooled	
Bore	3.563 inches (90 mm)
Stroke	3.000 inches (76 mm)
Displacement	60 inches ³ (980 cc)
Compression Ratio	7.0 : 1
Oil Capacity (with filter)*	3.5 quarts (3.8 l)
Intake Valve Clearance (Cold)	0.005 inches (0.13 mm)
Exhaust Valve Clearance (Cold)	0.013 inches (0.33 mm)
Spark Plug Gap	0.025 inches (0.64 mm)
Spark Plug Tightening Torque	8 lbs-ft (10 N-m)
Ignition Timing (electronic ignition)	12° BTDC, non-adjustable
LPG Vapor Supply Pressure (Range)—Vapor-Withdrawal Models Only	9 to 13 inch (229 to 330 mm) W. C. (water column)
CONTROL AND CRANKING SYSTEM: 12 VDC	
Nominal Battery Voltage	12 volts
Minimum Battery Cold Cranking Capacity: Above/Below Freezing	360/450 amperes
Fuse F1 (control circuit)	5 amperes
* -See <i>Periodic Maintenance</i> for oil filling instructions.	

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 approved Onan engine or genset dealer.

California genset users may use Table 6 as an aid in locating information related to the California Air Resources Board requirements for emissions control.

TABLE 6. 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 Valve Clearance	See <i>Specifications</i> .
Engine Ignition Timing	See <i>Specifications</i> .
Engine Fuel Requirements	Gasoline Models: The engine is certified to operate on unleaded gasoline. See Fuel Recommendations in <i>Introduction</i> . LPG Models: The engine is certified to operate on LPG. See Fuel Recommendations in <i>Introduction</i> .
Engine Lubricating Oil Requirements	See ENGINE OIL RECOMMENDATIONS in <i>Introduction</i> .
Engine Fuel Mixture Settings	These genset engines have precision-manufactured carburetors which are not adjustable.
Engine Adjustments	Gasoline Models: See Figures 8 and 9. LPG Models: Not applicable.
Engine Emission Control System	The engine emission control system consists of internal engine modifications.

How to Obtain Service

When you need parts or service for your genset contact the nearest authorized dealer or distributor. Onan has factory-trained representatives to handle your needs for genset parts and service. To locate the nearest authorized distributor:

1. Check the North American Sales and Service Directory (F-118) and the International Sales and Service Directory (IN-1013) supplied with your Onan genset. These directories list authorized distributors who will assist you in locating the nearest authorized dealer.
2. Consult the Yellow Pages. Typically, our distributors are listed under:

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

3. Call 1-800-888-ONAN for the name and telephone number of the nearest Cummins/Onan or Onan-only distributor in the United States or Canada. (This automated service utilizes touch-tone phones only). By calling this num-

ber you can also request a directory of authorized RV servicing dealers: RV Sales and Service Directory F-919.

To get service, contact the authorized dealer or distributor nearest you, explain the problem and make an appointment. 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.

Before calling for service, have the following information available:

1. *The complete genset model number and serial number (see Model Identification on page 4)*
2. *The date of purchase*
3. *The nature of the problem (See Troubleshooting)*

⚠WARNING *Improper 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.*



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