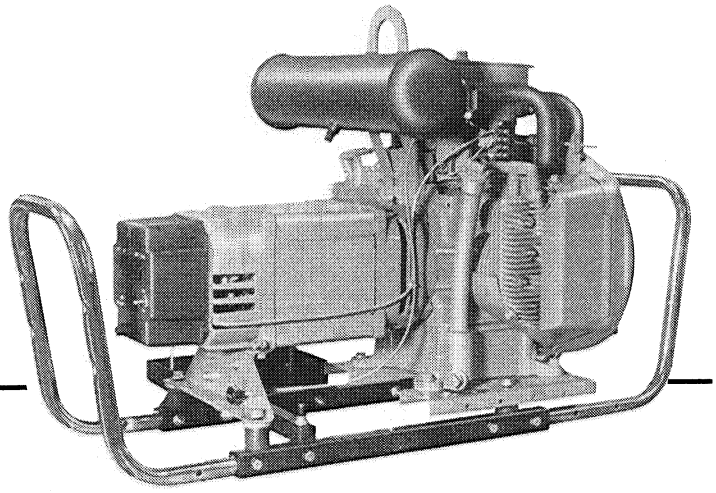
Onan

Operator's Manual

BFAB

GenSet



Portable Generator Set

965-0123
2-87
Printed in U.S.A.

Safety Precautions

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

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

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

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

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

FUEL AND FUMES ARE FLAMMABLE. Fire and explosion 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 ALLOW AN OPEN FLAME near the generator set or fuel tank.
- 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

- Engine exhaust contains CARBON MONOXIDE, a dangerous gas that is potentially lethal. Avoid carbon monoxide inhalation by operating the generator set out doors where exhaust gases can be discharged directly into the open air.
- Do not operate the generator set in any type of enclosure that could allow exhaust gases to accumulate. Direct exhaust away from areas where people are gathered and away from buildings or enclosures.

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 severe injury or death.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician.
- Jewelry is a good conductor of electricity and should be removed when working on electrical equipment.
- 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.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

- Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be worn because of the danger of becoming caught in moving parts.
- Before starting work on the generator set, disconnect starting battery. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- If adjustments must be made while the unit is running, use extreme caution around hot exhaust, moving parts, etc.

GENERAL SAFETY PRECAUTIONS

- Have a fire extinguisher nearby. Be sure extinguisher is properly maintained and be familiar with its proper 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.
- Remove all unnecessary grease and oil from the generator set. Accumulated grease and oil can cause overheating and engine damage and can also present a fire hazard.
- Do not store anything on or around the generator set such as oil cans, oily rags, chains, wooden blocks, etc. A fire could result or operation may be adversely affected. Keep the generator set 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

Introduction

ABOUT THIS MANUAL

This manual provides information for operating and maintaining the Onan BFAB 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 and a parts manual 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 receptacle panel.

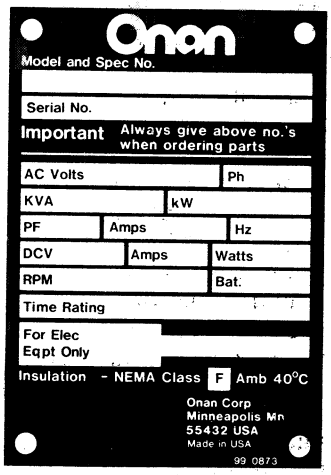


FIGURE 1. ONAN NAMEPLATE

⚠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.

Specifications

	MODEL BFAB
GENERAL	
Nominal Dimensions	
Height	24.0 in. (610 cm)
Width	18.75 in. (476 cm)
Length	35.52 in. (902 cm)
Weight	220 lb (99.8 kg)
ENGINE DETAILS	
Engine Design	Four Cycle, Air-cooled, Horizontally Opposed
Number of Cylinders	2
Displacement	43.3 cu. in. (713 cm^3)
Engine Speed	3600 RPM
GENERATOR DETAILS	
Generator Design	Revolving Field, 2-pole, Single Phase
Maximum Power Rating	6,500 watts
Output Voltage (AC)	120/240
CAPACITIES AND REQUIREMENTS	
Recommended Fuel	Unleaded Gasoline
Oil Capacity	1.75 qt. (1.66 L)
Battery Requirements	One 12-Volt Battery
BCI Group	U1
Cold Cranking Amps @ 0°F (-1.8°C)	220 Amps
AVERAGE FUEL CONSUMPTION	
Half Load	1.23 gph (4.66 L/h)
Full Load	1.89 gph (7.15 L/h)
TUNE-UP SPECIFICATIONS	
Spark Plug Gap	0.025 in. (.64 mm)
Breaker Point Gap (Cold)	0.021 in. (.53 mm)
Ignition Timing (Static)	21° BTC

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.

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

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.

Engine Oil

Make sure the generator set is level when you are checking the engine oil. Otherwise, you will have an inaccurate oil level indication. Keep oil level near as possible to the dipstick full mark. Do not overfill.

⚠WARNING ***Crankcase pressure can blow out hot oil and cause serious burns. Do not attempt to check oil while the generator is running.***

Fuel

Make sure the fuel tank is full and the fuel system is primed for operation (see *Maintenance* section).

⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Never fill the fuel tank when the engine is hot or running. Do not permit any flame, spark, pilot light, cigarette or other ignition source near the fuel system.***

LOCATION

Operate the generator set outdoors where the exhaust gases and engine waste heat can be discharged directly into the open air. Do not operate the generator set indoors or in any type of enclosure that may allow exhaust fumes to accumulate. Do not operate the generator set near an open window, door, air intake, or any other place where exhaust gases may enter the interior of a building.

⚠WARNING ***Inhalation of exhaust gases can cause severe personal injury or death. DO NOT operate the generator set indoors or near an open window, door, air intake, or other place where exhaust gases can enter the interior of a building. Do not operate generator set in poorly ventilated areas such as confined areas, depressions, or any areas where exhaust gases might accumulate.***

⚠WARNING ***Because a generator set presents the hazard of electrical shock that can cause severe personal injury or death, never expose the generator set to rain, snow, or other similar wet conditions when operating.***

⚠WARNING ***Due to the danger of personal injury or death, do not operate the generator set in hazardous areas where it might ignite gases, combustibles, or explosive materials.***

BATTERY CONNECTIONS

A 12-volt battery is required to power the electric starter. (See *Specifications* section for battery size requirements.)

Fasten positive (+) and negative (-) cables to corresponding battery terminals. Attach negative cable last to decrease the possibility of arcing.

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

GROUNDING REQUIREMENTS

Local code enforcement might require that the generator set be electrically connected to a grounding electrode (water pipe, earth-driven grounding rod, etc.) during operation. A grounding lug is provided for connecting the generator set to a grounding electrode conductor if required. See Figure 2.

Use only properly maintained and grounded electrical equipment with the generator set. Use only properly maintained extension cords that have a separate ground conductor. It is recommended that ground fault interrrupters be used in addition to (but not instead of) properly maintained and grounded equipment.

⚠WARNING ***If faulty electrical equipment is connected to the generator, an electrical shock hazard exists which can result in severe personal injury or death. Check all electrical equipment for frayed cords or breaks in the insulation before using.***

Properly applied and maintained ground fault circuit interrupters, often required by local codes, can afford additional protection against the hazard of electrical shock.

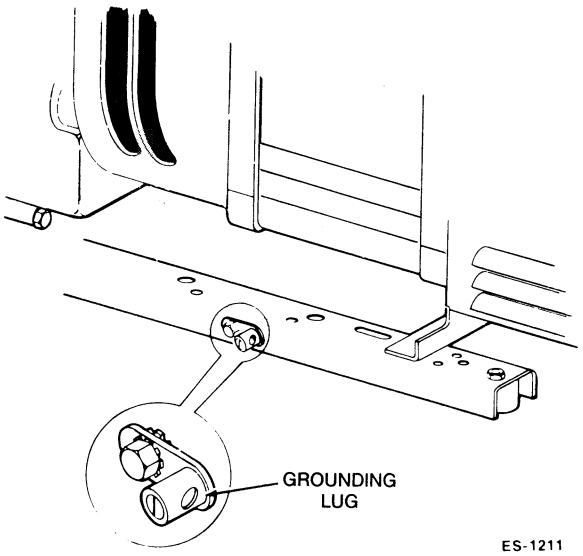


FIGURE 2. GROUNDING CONNECTION

STARTING AND STOPPING

The following sections cover starting and stopping the generator set.

Give the generator set a visual inspection for loose bolts and nuts, oil leaks, fuel leaks, and exhaust leaks. Repair any problems before starting the generator set.

New engines sometimes fail to start because the rust inhibitor oil used at the factory during assembly may have fouled the spark plugs. Remove the spark plugs and clean in a suitable solvent. Dry the plugs thoroughly and reinstall. Heavy exhaust smoke when the engine is first started is normal and is caused by the rust inhibitor oil.

Electric Start

Refer to Figure 3 for the location of the Start/Stop switch and choke control. Use the following procedure to start the engine.

1. Pull choke control all the way out unless the engine is already warm from previous operation.
2. Push the Start/Stop switch on the receptacle panel to the START position.
3. Release Start/Stop switch and push the choke control all the way in as soon as the engine starts.

Use short starting cycles (2 to 3 seconds) to provide the longest battery life.

Manual Start

A rope sheave, located at the front of the engine, can be used for manual starting. Wind the pull rope around the sheave for each starting attempt. Use the following procedure to start the engine:

1. Pull choke control all the way out unless the engine is already warm from previous operation.

   The choke knob is located near the receptacle panel as shown in Figure 3.
2. Place the Start/Stop switch in the center (run) position.
3. Pull the starting rope with a fast steady pull to crank the engine.
4. Push the choke control all the way in as soon as the engine starts.

Stopping

Push the Start/Stop switch on the receptacle panel to the STOP position.

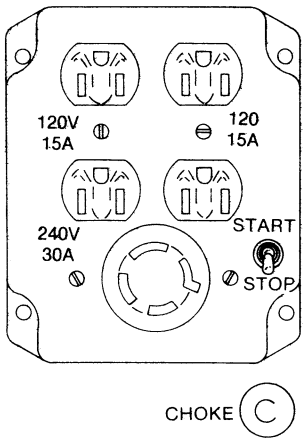


FIGURE 3. RECEPTACLE PANEL AND CHOKE

CONNECTING A LOAD

If practical, allow the generator set to warm up before connecting a load. Receptacles are located on a panel on the end of the generator set as shown in Figure 3. Connect the load by inserting the load wire plugs into the proper output receptacle. Use the 120-volt, 15-ampere duplex receptacles or the 240-volt, 30-ampere twist-lock receptacle that corresponds to the equipment plug.

Power Output Rating

The generator set maximum power output is stamped on the nameplate. Do not exceed the maximum power output rating by connecting too many loads.

⚠CAUTION ***Continuous overloading will cause high operating temperatures that can damage the generator set. Keep load within the generator set rating.***

To determine if the load is within the maximum power output rating of the generator set, add up the wattage requirements of all the electrical loads that will be operated simultaneously. Most applicances or tools have the wattage requirements imprinted on the nameplate. Table 1 can be used as a guide if the wattage requirements are not listed on the equipment. The total should be LESS than the maximum power output rating of the generator set. See Derating section for factors that affect the maximum power output.

TABLE 1
POWER REQUIREMENTS FOR APPLIANCES

Appliance or Tool	Approximate Running Wattage
Air Conditioner	800-4000
Attic Fan	375
Battery Charger	Up to 800
Broiler	1325
Clothes Dryer	4500
Clothes Washer	250-1000
Coffee Percolator	550-700
Dishwasher (conventional)	300
Dishwasher (heating element)	1150
Electric Blanket	50-200
Electric Broom	200-500
Electric Drill	250-750
Electric Frying Pan	1000-1350
Electric Iron	500-2000
Electric Saw	400-1500
Electric Stove (per element)	350-1000
Electric Water Heater	1000-1500
Electric Water Pump	500-600
Freezer	300-1000
Furnace Fan	225
Garbage Disposal Unit	325
Hair Dryer	350-500
Microwave Oven	1000-1500
Oil Burner	250
Radio	50-200
Refrigerator	600-1000
Space Heater	1000-1500
Sump Pump	250-500
Television	200-600
Vacuum Cleaner	500-1500
Well Water Pump	250-1000

Derating

The generator set maximum power output is based on operation at sea level at 60°F ambient temperature. When the generator set is operated at altitudes above sea level or at temperatures above 60°F, the power rating must be derated. The reduction in the power rating is necessary to compensate for the reduction in engine horsepower that occurs at higher altitudes or higher temperatures.

A general rule applies for derating a generator set because of changes in temperature or altitude. A one percent derating can be expected for every 10°F rise in temperature above 60°F (16°C). A 3.5 percent deration can be expected for every 1000 foot increase in altitude above sea level.

For example: A 6500 watt alternator operating at 80°F (27°C) ambient temperature and at 3000 feet above sea level should be derated by 12.5 percent or 813 watts.

6500 - 813 = 5687 (derated power output)

VOLTAGE BUILD UP

The AC voltage should quickly build up as soon as the generator set is started. If no AC voltage is present, it is possible that the generator field laminations have lost their residual magnetism. This can happen when the generator is not used for long periods of time or if the unit is dropped. Contact an authorized service center for assistance if no AC voltage is present.

BREAK-IN PROCEDURE

Controlled break-in with the proper oil and a conscientiously applied maintenance program will help to provide satisfactory service from your generator set. Break-in is as follows:

1. One half hour at 1/2 load (approximately 3,250 watts). Refer to Table 1 for approximate wattages of common appliances.
2. One half hour at 3/4 load (approximately 4,875 watts).
3. Change crankcase oil after the first 25 hours of operation.
4. Use regular grade leaded gasoline for the first 25 hours of operation then use unleaded gasoline.

The generator set is designed to operate with a load applied. When possible, avoid running the generator set for extended periods of time without a load, especially during the first 50 hours of operation. Failure to follow the recommended break-in procedure may result in poor piston ring seating.

HIGH/LOW OPERATING TEMPERATURES

The generator will operate satisfactorily in both high and low temperatures. Use the oil recommended in the *Maintenance* section for the expected temperature conditions.

High Operating Temperatures

1. See that nothing obstructs airflow to and from the generator.
2. Keep cooling fins clean. Cylinder air housings should be properly installed and undamaged.
3. Keep ignition timing properly adjusted.

Low Operating Temperatures

1. Use fresh gasoline and keep the tank filled to avoid condensation.
2. Keep the spark plug clean and correctly gapped.

EXTREMELY DUSTY OR DIRTY CONDITIONS

Observe the following when operating the generator set in extremely dusty or dirty conditions:

1. Keep the generator set clean and do not allow dust and dirt to accumulate on the set.
2. Check the air cleaner element at least every 25 hours and replace if necessary.
3. Change the crankcase oil every 25 operating hours.
4. Keep oil and gasoline in dust-tight containers suitable for the storage of fuels.

TABLE 2. TROUBLESHOOTING

The following is a simplified troubleshooting guide. If these recommendations fail to resolve the problem, contact your Onan service organization or authorized generator set repair service.

⚠WARNING ***Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

Problem	Probable Cause	Solution
FAILS TO CRANK	1. Low battery 2. Bad battery connection.	1. Check battery electrolyte level. 2. Clean and tighten all battery and cable connections.
CRANKS SLOWLY	1. Low battery. 2. Bad battery connection. 3. Oil is too heavy. 4. Load connected.	1. Check battery electrolyte level. 2. Clean and tighten all battery and cable connections. 3. Replace with lighter oil. 4. Disconnect load while starting.
CRANKS BUT WON'T START	1. Out of fuel. 2. Carbon deposits on spark plugs.	1. Refill fuel tank. 2. Remove spark plugs and clean.
EXHAUSTING BLACK SMOKE	1. Rich fuel mixture. 2. Dirty air filter. 3. Choke stuck.	1. Refer to Carburetor Adjustments in the *Adjustments* section. 2. Replace air filter. 3. See Onan representative.
UNIT RUNS THEN STOPS	1. Out of fuel. 2. Low oil level.	1. Refill fuel tank. 2. Add oil if necessary.
UNIT RUNS BUT SURGES	1. Worn breaker points.	1. Adjust breaker points as shown in the *Adjustments* section.

Maintenance

Establish and adhere to a definite schedule for maintenance and service. If the generator set is subjected to extreme operating conditions, you should reduce the intervals accordingly.

Consult your Onan dealer if the generator set will be subjected to any extreme operating conditions and determine a suitable maintenance schedule. Keep an accurate log of all service and maintenance performed for warranty support.

Perform all the maintenance at the time period indicated or after the number of operating hours indicated, whichever comes first. Use the schedule to determine the maintenance required, and then refer to the sections that follow for the correct procedures.

⚠WARNING ***Accidental starting of the generator set during maintenance procedures can cause severe personal injury or death. Disconnect the generator set starting battery ground (-) cable before performing maintenance.***

⚠WARNING ***A hot generator set can cause severe burns. Always allow the generator set to cool before performing maintenance.***

TABLE 3. PERIODIC MAINTENANCE SCHEDULE

SERVICE THESE ITEMS	Interval				
	Daily or after 8 hours	25	50	100	200
General Inspection	x[1]				
Check Oil Level	x				
Change Crankcase Oil		x[2,3]			
Service Air Cleaner Polyband Filter		x[3]			
Clean Cooling Fins			x[3]		
Clean Spark Arrester			x		
Replace Spark Plugs				x	
Inspect Breaker Points				x	
Clean Governor Linkage					x[3]
Replace Air Cleaner Element					x
Adjust Valve Lash					x[4]
Clean Crankcase Breather					x
Check Battery and Recharge	Monthly				
Clean Alternator Brushes	Yearly[4]				

[1] - Check for oil, fuel, 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 25 hours of operation on new sets.
[3] - Perform more often in extremely dusty or dirty conditions.
[4] - Contact an authorized service center for service.

GENERATOR MAINTENANCE

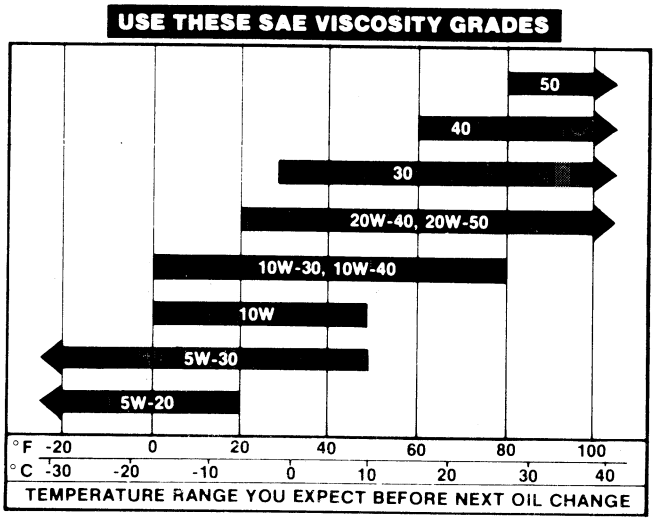
The generator normally needs little maintenance other than a yearly check of the brushes and collector rings by an authorized service center. If a major repair job on the generator should become necessary, the electrical equipment must be checked by a competent electrician who is thoroughly familiar with the operation of electric generators.

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 oil with the API (American Petroleum Institute) designation SE or SE/CC. Oil should be labeled as having passed MS Sequence Tests (also known as having passed ASTMG-1V Sequence Tests). Refer to oil chart for recommended viscosity.



Oil consumption may be higher with a multigrade oil than with a single grade oil if both oils have comparable viscosities at 210°F (99°C). Therefore, single grade oils are generally more desirable, unless anticipating a wide range of temperatures.

Oil Fill

Fill the crankcase until the oil reaches the FULL mark on the oil level indicator (see Figure 4). DO NOT OVERFILL. Overfilling may cause foaming and result in engine damage.

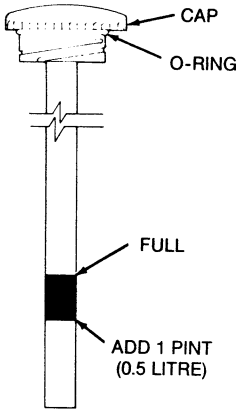


FIGURE 4. OIL LEVEL INDICATOR

Oil Level Check

Check the oil level daily or after every 8 operating hours and add as required. Check more frequently on a new or reconditioned engine as oil consumption is higher until the piston rings seat. Use the same brand of oil as in the crankcase when adding oil between changes. BE SURE OIL LEVEL IS MAINTAINED.

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

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

Changing Engine Oil

Change the oil after the first 25 hours of operation. Thereafter, change oil at recommended intervals. Remove the oil drain plug and drain oil while the engine is warm. Replace drain plug. Remove oil level indicator and refill with new oil of the proper grade and viscosity. Replace oil level indicator. See Figure 5.

⚠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.***

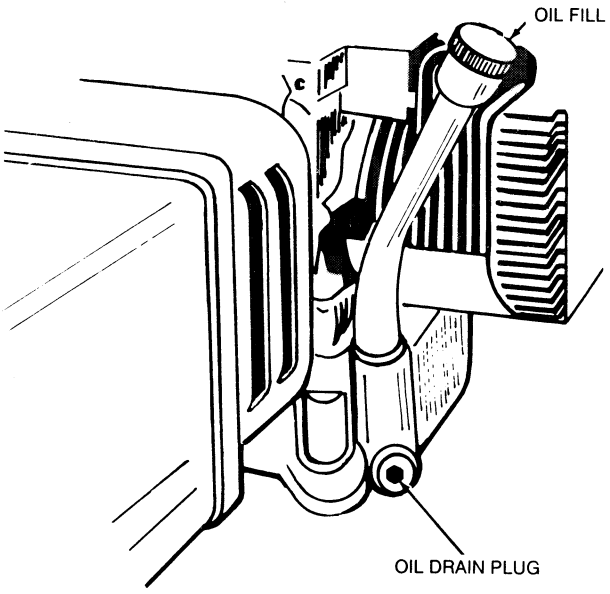


FIGURE 5. OIL CHANGE

FUEL SYSTEM

Use clean, fresh, unleaded or regular grade gasoline for fuel. Using unleaded gasoline will result in longer spark plug life and better overall performance. If regular grade gasoline is used, carbon and lead deposits must be periodically removed from the cylinder heads to avoid power loss. Do not use highly leaded premium fuels.

⚠CAUTION ***If an engine is switched to unleaded gasoline after an extended period of operation with regular gasoline, all carbon and lead deposits must be removed from the cylinder heads. Failure to remove deposits could lead to preignition and result in damage to the engine if operated with unleaded gasoline.***

A remote fuel tank (see Figure 6) is optional. Fill the tank with the recommended fuel and connect the fuel line to the tank using quick disconnect fittings. Route the fuel line away from any hot exhaust system components or moving parts. Squeeze the primer bulb to pump fuel through the fuel line and to the carburetor.

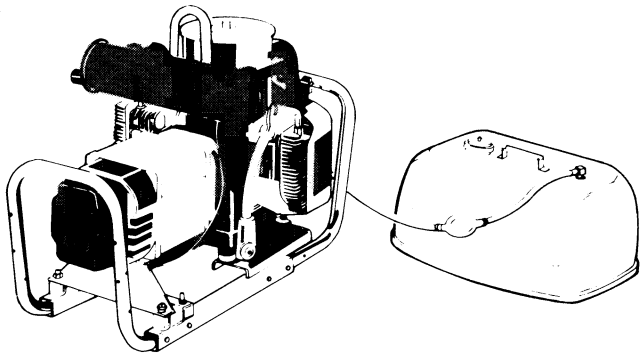


FIGURE 6. OPTIONAL FUEL TANK

⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Never fillll the fuel tank when the engine is hot or running. Do not permit any flame, spark, pilot light, cigarette or other ignition source near the fuel system.***

Fuel Filter

Remove and replace the fuel filter after every 500 hours. When installing, make certain the inlet and outlet sides of the filter are consistent with the fuel flow. See Figure 7.

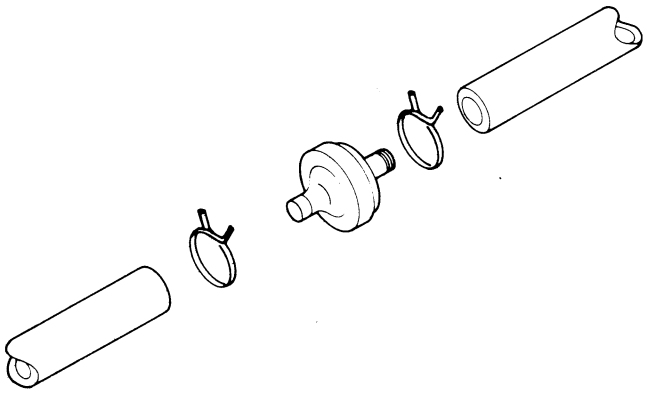


FIGURE 7. FUEL FILTER

GENERATOR SET INSPECTION

Make a daily inspection of the generator set. Check for loose or missing parts or for damage that may have occurred during use. Inspect the following items making certain that all connections are secure and all fasteners are tight.

- Battery cable connections
- Fuel line and fittings
- Muffler and exhaust system
- Intake manifold cap screws
- Grounding strap
- Air cleaner wing nut
- Carburetor hold down screws
- Spark plug lead
- Inspect visually and audibly for exhaust leaks.

COOLING SYSTEM

A flywheel blower fan cools the generator set by blowing air over the cylinder and cooling fins. The air path is directed by the sheet metal shrouds and plates. These shrouds and plates must always be kept in place.

⚠CAUTION ***Do not operate the generator set without shrouds and plates in place or the engine will overheat.***

Check and clean (if necessary) the cooling fins at least every 50 hours of operation. Remove any dust, dirt or oil which may have accumulated.

⚠CAUTION ***Plugged or clogged cooling fins can cause overheating and engine damage.***

GOVERNOR LINKAGE

The linkage must be able to move freely through its entire travel. Every 200 hours of operation, clean the joints and lubricate as shown in Figure 8. Also inspect the linkage for binding, excessive slack and wear.

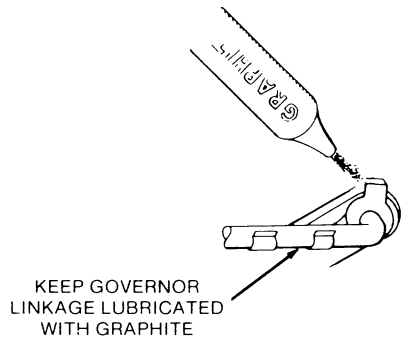


FIGURE 8. GOVERNOR LINKAGE

Air Cleaner Polyband Filter: Wash in water and detergent and squeeze dry like a sponge. Allow to dry, then coat evenly with three tablespoons (42.5 grams) of SAE 30 engine oil. Knead into and wring excess oil from pre-cleaner. Reinstall over cartridge.

Air Cleaner Element: Check and clean air cleaner element every 100 hours. Clean by gently tapping element on a flat surface. Replace the element every 200 hours. Clean or replace more frequently in dusty operating conditions (see Figure 9).

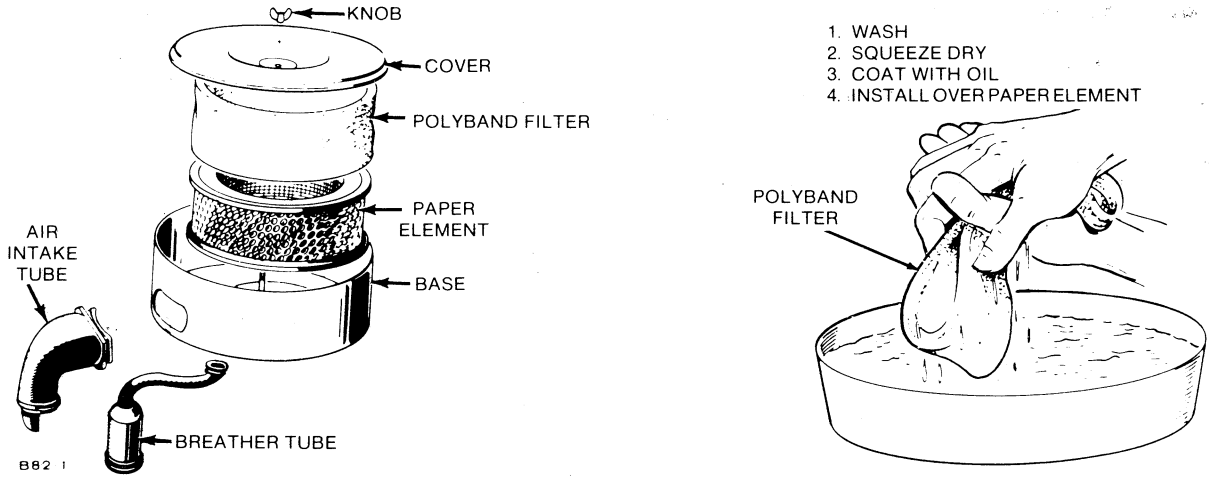


FIGURE 9. AIR CLEANER

CRANKCASE BREATHER

The engine uses a crankcase breather valve and "Pack" for maintaining crankcase vacuum. If the crankcase becomes pressurized as evidenced by oil leaks at the seals, clean baffle, valve, and pack in a commercial parts cleaning solvent. See Figure 10.

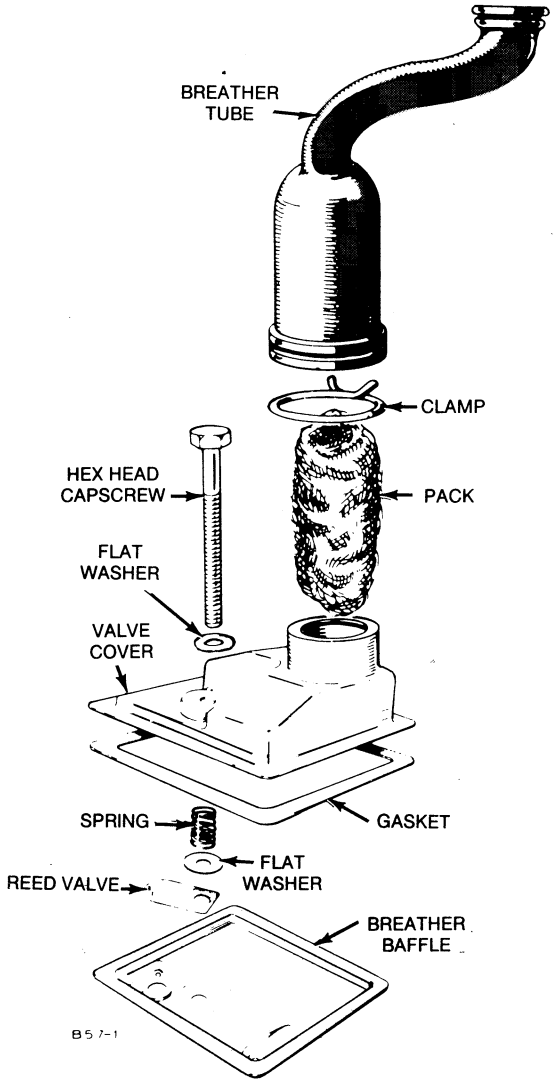


FIGURE 10. CRANKCASE BREATHER

BATTERY CARE

To increase battery life, the operator can perform a number of routine checks and preventive maintenance.

1. Keep the battery case clean and dry.
2. Make sure the battery cable connections are clean and tight.
3. Coat the battery terminals with a mineral grease or petroleum jelly to reduce corrosion and oxidation.
4. Identify each battery cable to be positive or negative before making any connection. Always connect the ground (negative) cable last.
5. Maintain the electrolyte level by adding distilled water as needed for filling to split level marker.

The water ingredient of the electrolyte evaporates, but the sulphuric acid ingredient remains. For this reason, add water, not electrolyte.

⚠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.***

6. Avoid overcharging when recharging. Stop the boost charge when the electrolyte specific gravity is 1.260 at about 80°F (27°C).

⚠WARNING ***Batteries present the hazard of explosion which can result in severe personal injury. Do not smoke or allow any arc-producing devices around the battery area. Do not disconnect battery cables while the generator set is cranking or running. Batteries give off explosive gases.***

SPARK PLUGS

A spark plug with heavy combustion deposits can cause misfiring, poor operation, or stopping when a load is applied. Each time the spark plugs are removed, inspect, and regap (Figure 11). If a plug looks discolored or fouled, replace it.

- Black deposits indicate a rich mixture.
- Wet plug indicates misfiring.
- Badly or frequently fouled plug indicates the need for a major tune-up.

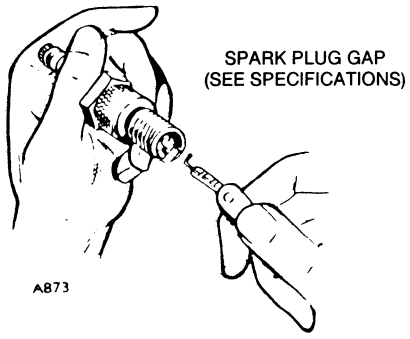


FIGURE 11. SETTING SPARK PLUG GAP

⚠CAUTION ***Do not clean spark plug by sandblasting. Deposits remaining on the plug can cause premature engine wear.***

EXHAUST 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.

OUT-OF-SERVICE PROTECTION

Protect a unit that will be out of service for more than 6 months as follows:

1. Run the engine until it reaches normal operating temperature.
2. Turn off the fuel supply and run the engine until it stops.
3. Drain oil from oil base while the engine is still warm. Refill with fresh crankcase oil and attach a tag stating viscosity used.

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

4. Remove spark plugs. Pour 1 ounce (2 tablespoons or 28 grams) of rust inhibitor or SAE #50 oil into the cylinders. Crank the engine over a few times. Reinstall spark plugs.
5. Service air cleaner as outlined in *Maintenance* section.
6. Clean governor linkage and protect by wrapping with a clean cloth.
7. Tie a plastic bag over the exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
8. Wipe entire generator set. Coat rustable parts with a light film of grease or oil.
9. Provide a suitable cover for the entire unit.
10. If battery equipped, disconnect battery and store in a cool dry place.

To Return to Service

1. Remove cover and all protective wrapping. Remove plug from exhaust outlet.
2. Check tag on oil base and verify that oil viscosity is still correct for existing ambient temperatures.
3. Clean and check battery. If the electrolyte level is low, add distilled water and charge. DO NOT OVERCHARGE.

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

4. Check that fuel filter and fuel lines are secure, with no leaks. If any leaks are detected, have them corrected immediately. Replace worn fuel line components before leaks occur.

⚠WARNING ***Fuel presents the hazard of fire or explosion which can cause severe personal injury or death. Never fill the fuel tank when the engine is hot or running. Do not permit any flame, spark, pilot light, cigarette or other ignition source near the fuel system.***

5. Remove spark plug and crank engine to clear any remaining oil from the combustion chamber. Check spark plug gap and reinstall.
6. Connect battery and start engine. After engine has started, blue smoke is exhausted until the excess oil has burned away.
7. After starting, apply load to at least 50 percent of the maximum power output.
8. The generator set is ready for service.

Adjustments

⚠WARNING ***Many adjustment procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review safety precautions on inside cover page.***

CARBURETOR ADJUSTMENTS

The carburetor idle and main adjustment screws were set at the factory and should normally not be disturbed. If adjustments seem necessary, first make certain the ignition is not the source of the problem. If the factory setting has been disturbed, it may be necessary to make an initial adjustment to allow the engine to be started. Turn both adjustment screws in until lightly seated and then back the idle adjustment screw out 1 turn and the main adjustment screw out 1-1/4 turn. See Figure 12.

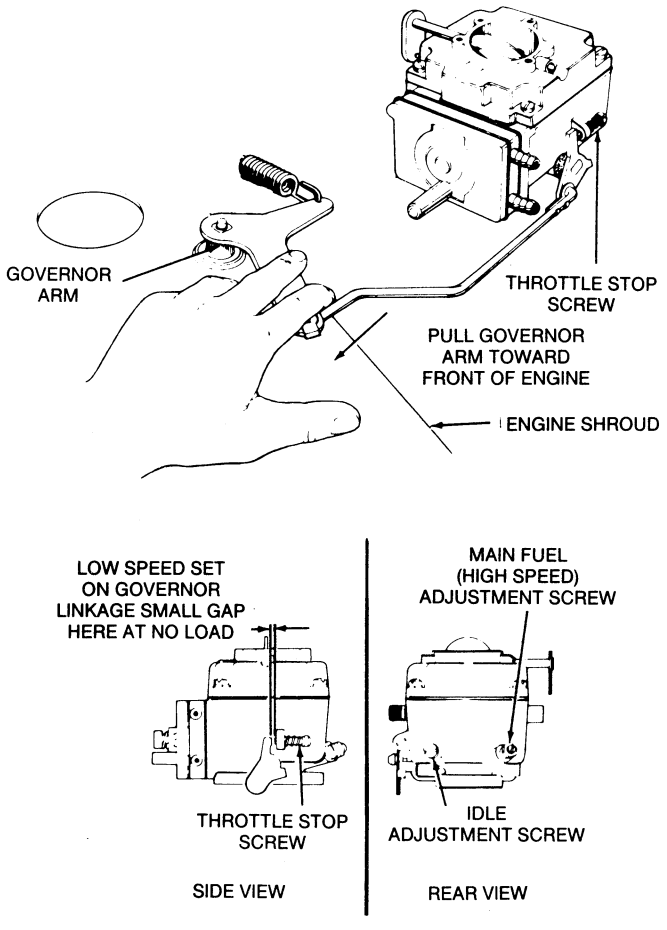


FIGURE 12. CARBURETOR ADJUSTMENTS

⚠WARNING ***To avoid severe personal injury, use extreme caution when making adjustments while the engine is running. Do not touch hot exhaust pipes or moving parts; do not wear loose clothing that may be caught in moving parts.***

Start generator set and allow it to warm up for at least 10 minutes before making any adjustments. When the procedure calls for full load, connect several loads or use a load test panel.

⚠CAUTION ***When determining fuel mixture settings, never force the fuel mixture adjustment needles against their seats. Forcing will damage the needles and seats and make accurate adjustment impossible.***

1. Remove all electrical loads and connect a tachometer or voltmeter to the generator.
2. Pull the governor linkage toward the front of the set so that the throttle lever on the carburetor is resting against the throttle stop screw. Adjust the throttle stop screw to obtain a setting of 1800 RPM on the tachometer or 60 volts on the voltmeter.
3. Continue to hold the governor linkage. Determine the best idle mixture setting by first turning the idle adjustment screw inward until set RPM (or voltage) drops (indicating a lean mixture) and then outward until set RPM (or voltage) drops again (rich mixture). Over a narrow range between these two settings the alternator RPM (or voltage) will remain at its highest. Set the idle adjustment screw 1/8 turn outward (rich) from the midpoint of this highest range. Readjust the throttle stop screw as needed to retain the 1800 RPM or 60 volts setting.
4. Release the governor and apply a full load to the set. Set the main adjustment screw using the same procedure as given above for idle adjustment. Final adjustments should be to a point slightly outward (rich) from the midpoint of the highest RPM range (highest voltage).
5. Remove the load and observe the stability of the generator set. Add and remove a full load several times to make certain the generator does not bog down.

Refer to GOVERNOR ADJUSTMENTS section when all carburetor adjustments are complete. Making adjustments to the carburetor usually changes the governed speed of the engine which affects the set output voltage.

GOVERNOR ADJUSTMENTS

Before making governor adjustments, run the unit about 10 minutes under light load to reach normal operating temperature. If governor is completely out of adjustment, make a preliminary adjustment at no load to first obtain safe voltage operating range.

Engine speed determines the output voltage and frequency of the generator. By increasing the engine speed, generator voltage and frequency are increased, and by decreasing the engine speed, generator voltage and frequency are decreased. An accurate voltmeter or frequency meter (preferably both) should be connected to the generator output in order to correctly adjust the governor. A small speed drop not noticeable without instruments will result in an objectionable voltage drop.

⚠WARNING ***Do to the danger of severe personal injury, use extreme caution when making adjustments while the engine is running. Do not touch hot exhaust pipes or moving parts; do not wear loose clothing that can get caught in moving parts.***

1. Adjust the carburetor before making any adjustments to the governor (see CARBURETOR ADJUSTMENTS section).
2. Check the governor linkage and throttle shaft for binding or excessive looseness. The engine starts at wide open throttle.
3. With the warmed-up unit operating at NO LOAD, adjust the tension of the governor spring (see Figure 13). Turn the speed adjusting nut to obtain a voltage of 130 volts (for 120 volt operation) or 260 volts (for 240 volt operation).
4. Check the voltage with no load connected and again with a full load and note the voltage difference. Adjust the governor sensitivity to give the closest regulation (least voltage difference between no load and full load) without causing a hunting condition. Moving the governor spring closer to the governor shaft increases sensitivity. See Figure 13.

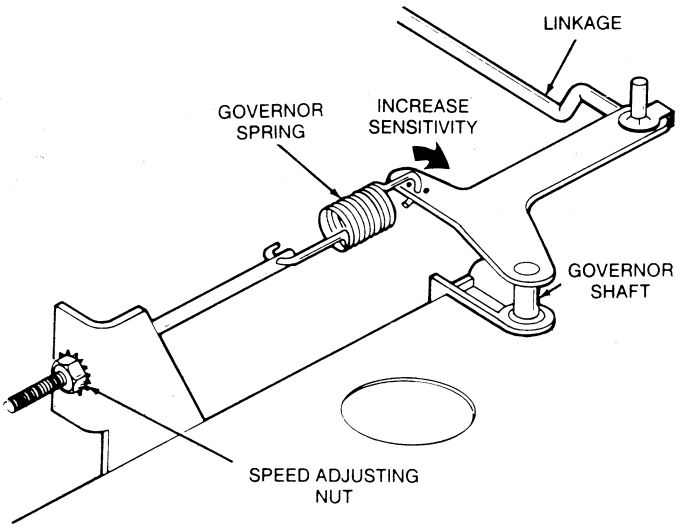


FIGURE 13. GOVERNOR ADJUSTMENTS

5. Recheck the voltage adjustment made in step 3 and readjust if necessary.

BREAKER POINTS AND IGNITION TIMING

The *Specifications* section lists the correct breaker point gap for your model. To adjust the setting, use the following procedure.

1. Remove the starting battery negative (-) cable for the generator set.
2. Remove cover by loosening screw and lift off.
3. To set the point gap, turn the engine crankshaft with rotation until the maximum breaker point gap is obtained. See Figure 14.

Make adjustments with the engine turned off and cold.

4. Using an allen head wrench, adjust set screw (A) for the specified gap. Measure point gap with a flat thickness gauge.

Make sure the feeler gauge is clean and free of grease, oil, or dirt.

The timing is adjusted during initial engine assembly and is fixed by the point gap adjustment. No other adjustment or alignment is necessary.

5. Replace the point box cover.

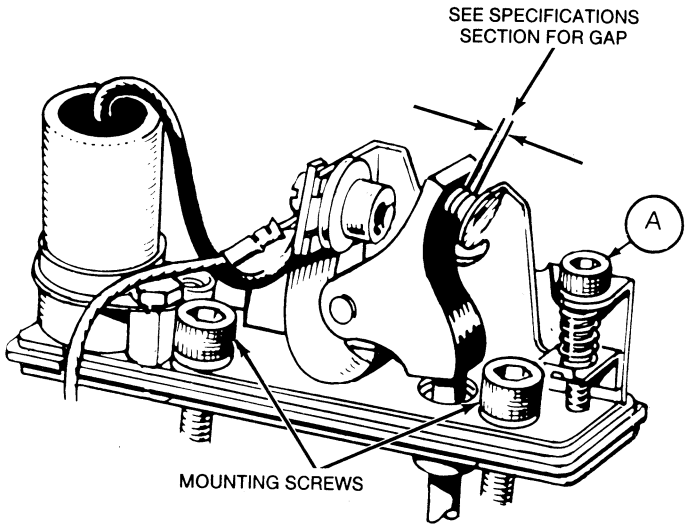


FIGURE 14. SETTING BREAKER POINTS

Onan

Onan Corporation
1400 73rd Avenue N.E.
Minneapolis, Minnesota 55432

Telephone: (612) 574-5000
Telex: 275477
Cable ONAN