

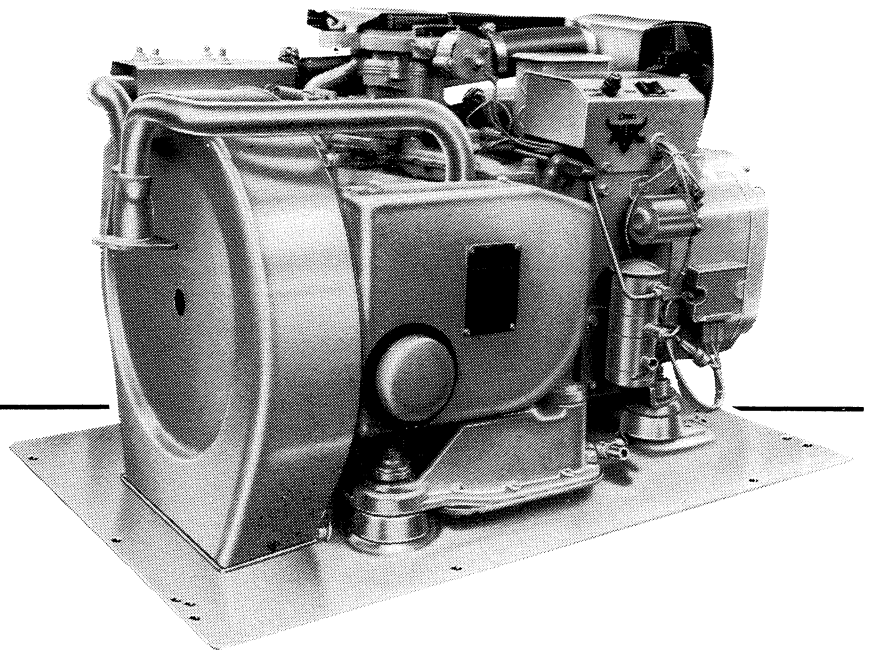
Onan

Operator's Manual

**BFA
GenSet**



For Truck Applications



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 damage.*

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 USE AN OPEN FLAME near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible, non-conductive line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure all fuel supplies have a positive shutoff valve.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

EXHAUST GASES ARE DEADLY

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

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Before starting work on the generator set, disconnect batteries. This will prevent accidental starting.
- Keep your hands away from moving parts.

- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- Do not wear loose clothing near moving parts, or jewelry while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Disconnect starting battery before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages can cause injury or death.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- DO NOT CONNECT GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved device and after building main switch is open. Consult an electrician in regard to emergency power use.

GENERAL SAFETY PRECAUTIONS

- Have a fire extinguisher nearby. Maintain extinguisher properly and become familiar with its use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and engine damage, which presents a potential fire hazard.
- Do not steam clean the generator set while the engine is running. When cleaning, provide cover or protection so spray is not directed into the generator, air cleaner, control box, fuel solenoid, or electrical connectors. Do not clean with solvents. They may damage electrical connectors.
- DO NOT store anything in the generator compartment such as oil or gas cans, oily rags, chains, wooden blocks, portable propane cylinders, etc. A fire could result or the generator set operation (cooling, noise and vibration) may be adversely affected. Keep the compartment floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

Important Safety Precautions

Read and observe these safety precautions when using or working on electric generators, engines and related equipment. Also read and follow the literature provided with the equipment.

Proper operation and maintenance are critical to performance and safety. Electricity, fuel, exhaust, moving parts and batteries present hazards that can cause severe personal injury or death.

FUEL, ENGINE OIL, AND FUMES ARE FLAMMABLE AND TOXIC

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

- Used engine oil, and benzene and lead, found in some gasoline, have been identified by government agencies as causing cancer or reproductive toxicity. When checking, draining or adding fuel or oil, do not ingest, breathe the fumes, or contact gasoline or used oil.
- Do not fill tanks with engine running. Do not smoke around the area. Wipe up oil or fuel spills. Do not leave rags in engine compartment or on equipment. Keep this and surrounding area clean.
- Inspect fuel system before each operation and periodically while running.
- Equip fuel supply with a positive fuel shutoff.
- Do not store or transport equipment with fuel in tank.
- Keep an ABC-rated fire extinguisher available near equipment and adjacent areas for use on all types of fires except alcohol.
- Unless provided with equipment or noted otherwise in installation manual, fuel lines must be copper or steel, secured, free of leaks and separated or shielded from electrical wiring.
- Use approved, non-conductive flexible fuel hose for fuel connections. Do not use copper tubing as a flexible connection. It will work-harden and break.

EXHAUST GAS IS DEADLY

- Engine exhaust contains carbon monoxide (CO), an odorless, invisible, poisonous gas. Learn the symptoms of CO poisoning.
- Never sleep in a vessel, vehicle, or room with a genset or engine running unless the area is equipped with an operating CO detector with an audible alarm.
- Each time the engine or genset is started, or at least every day, thoroughly inspect the exhaust system. Shut down the unit and repair leaks immediately.

- Warning: Engine exhaust is known to the State of California to cause cancer, birth defects and other reproductive harm.

Make sure exhaust is properly ventilated.

- Vessel bilge must have an operating power exhaust.
- Vehicle exhaust system must extend beyond vehicle perimeter and not near windows, doors or vents.
- Do not use engine or genset cooling air to heat an area.
- Do not operate engine/genset in enclosed area without ample fresh air ventilation.
- Expel exhaust away from enclosed, sheltered, or occupied areas.
- Make sure exhaust system components are securely fastened and not warped.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not remove any guards or covers with the equipment running.
- Keep hands, clothing, hair, and jewelry away from moving parts.
- Before performing any maintenance, disconnect battery (negative [–] cable first) to prevent accidental starting.
- Make sure fasteners and joints are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- If adjustments must be made while equipment is running, use extreme caution around hot manifolds and moving parts, etc. Wear safety glasses and protective clothing.

BATTERY GAS IS EXPLOSIVE

- Wear safety glasses and do not smoke while servicing batteries.
- Always disconnect battery negative (–) lead first and reconnect it last. Make sure you connect battery correctly. A direct short across battery terminals can cause an explosion. Do not smoke while servicing batteries. Hydrogen gas given off during charging is explosive.
- Do not disconnect or connect battery cables if fuel vapors are present. Ventilate the area thoroughly.

DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS

Flammable vapor can be ignited by equipment operation or cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. **Do not operate diesel equipment where a flammable vapor environment can be created by fuel spill, leak, etc., unless equipped with an automatic safety device to block the air intake and stop the engine.**

HOT COOLANT CAN CAUSE SEVERE PERSONAL INJURY

- Hot coolant is under pressure. Do not loosen the coolant pressure cap while the engine is hot. Let the engine cool before opening the pressure cap.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not service control panel or engine with unit running. High voltages are present. Work that must be done while unit is running should be done only by qualified service personnel.
- Do not connect the generator set to the public utility or to any other electrical power system. Electrocution can occur at a remote site where line or equipment repairs are being made. An approved transfer switch must be used if more than one power source is connected.
- Disconnect starting battery (negative [-] cable first) before removing protective shields or touching electrical equipment. Use insulative mats placed on dry wood platforms. Do not wear jewelry, damp clothing or allow skin surface to be damp when handling electrical equipment.
- Use insulated tools. Do not tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- With transfer switches, keep cabinet closed and locked. Only authorized personnel should have cabinet or operational keys. Due to serious shock hazard from high voltages within cabinet, all service and adjustments must be performed by an electrician or authorized service representative.

If the cabinet must be opened for any reason:

1. Move genset operation switch or Stop/Auto/Handcrank switch (whichever applies) to Stop.
2. Disconnect genset batteries (negative [-] lead first).
3. Remove AC power to automatic transfer switch. If instructions require otherwise, use extreme caution due to shock hazard.

MEDIUM VOLTAGE GENERATOR SETS (601V TO 15kV)

- Medium voltage acts differently than low voltage. Special equipment and training are required to work on or around medium voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures will result in severe personal injury or death.
- Do not work on energized equipment. Unauthorized personnel must not be permitted near energized equipment. Induced voltage remains even after equipment is disconnected from the power source. Plan maintenance with authorized personnel so equipment can be de-energized and safely grounded.

GENERAL SAFETY PRECAUTIONS

- Do not work on equipment when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.
- Never step on equipment (as when entering or leaving the engine compartment). It can stress and break unit components, possibly resulting in dangerous operating conditions from leaking fuel, leaking exhaust fumes, etc.
- Keep equipment and area clean. Oil, grease, dirt, or stowed gear can cause fire or damage equipment by restricting airflow.
- Equipment owners and operators are solely responsible for operating equipment safely. Contact your authorized Onan/Cummins dealer or distributor for more information.

KEEP THIS DOCUMENT NEAR EQUIPMENT FOR EASY REFERENCE.

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WARNING

EXHAUST GAS IS DEADLY!

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

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

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

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

Introduction

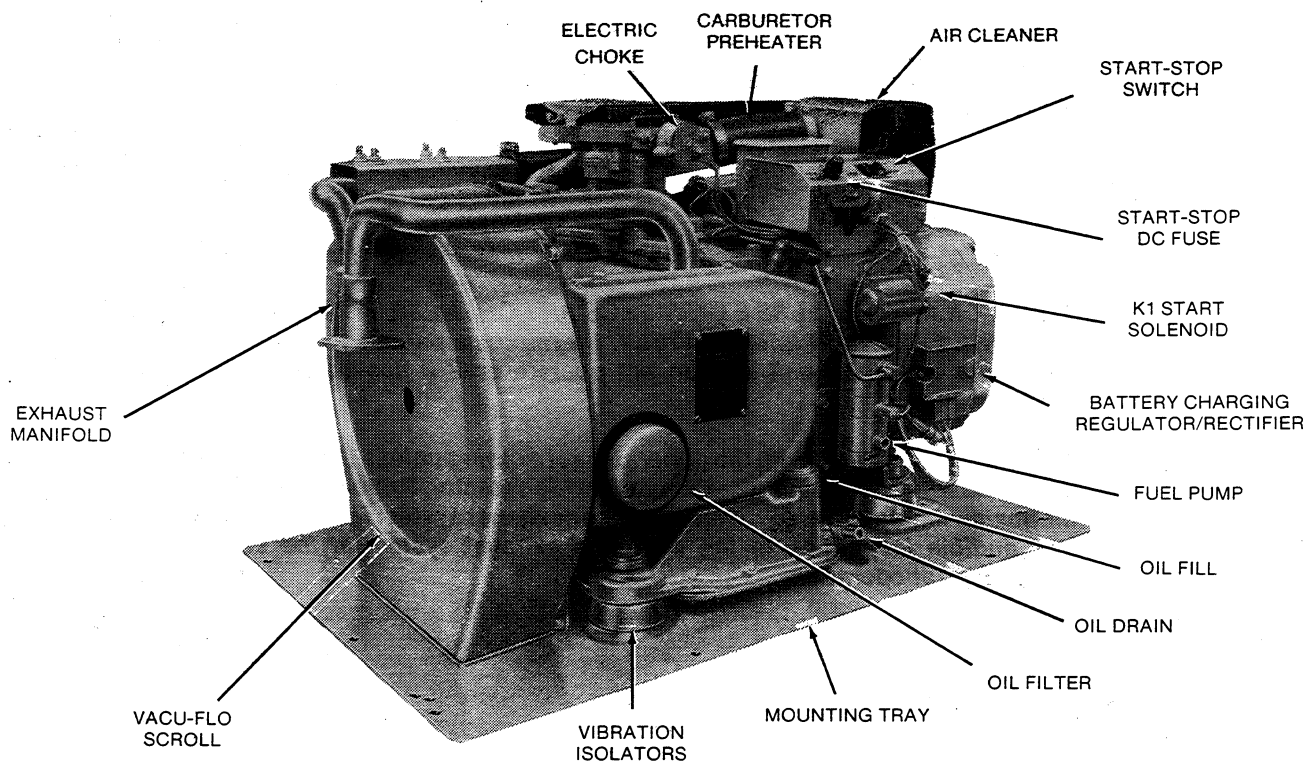
YOUR MANUAL

This manual contains operation and other information to properly maintain, service, and make adjustments on your generator set. Study and follow the instructions carefully. A well-planned service and maintenance program will result in longer unit life and better performance. Because the most important part of repair is diagnosis, a troubleshooting chart is included.

Throughout the manual, engine end of the generator set is the front. Left and right sides are determined when facing the engine (front) end.

When contacting your Onan dealer, distributor, or the factory about the generator set, always supply the complete model number and serial number as shown on the nameplate (see *Model Designation* following). This information is necessary to identify your generator set among the many types manufactured by Onan.

Upon receiving your unit, check it thoroughly for any damage that may have occurred during shipping or installation. Tighten loose parts, replace missing parts, and repair any damage before operating the unit.



TYPICAL BFA AUXILIARY POWER GENERATOR SET

Specifications

4.0 BFA Model

GENERAL

Nominal Dimensions of Compartment

Height	23.62 in. (600 mm)
Width	23.12 in. (587 mm)
Length	38.94 in. (989 mm)
Weight (Without Housing)	235 lbs. (107 kg)

ENGINE DETAILS

Engine Design	Four Cycle, Air-cooled, Horizontally Opposed
Horsepower (bhp)	8.5
Number of Cylinders	2
Displacement	43.3 cu.in. (713 cm ³)
Cylinder Bore	3.25 in. (82.55 mm)
Stroke	2.625 in. (66.68 mm)
Compression Ratio	7.0 to 1
Engine Speed	1800 RPM

GENERATOR DETAILS

Generator Design	Revolving Armature, 4-pole
Maximum Power Rating	4,000 watts
Output Voltage (AC)	120 Volts
Maximum Current Rating (120 Volts)	33 Amps
Battery Charge Rate (Max.)	20 Amps
Phase	Single

CAPACITIES AND REQUIREMENTS

Recommended Fuel	Nonleaded Gasoline
Fuel Tank Capacity	11.5 gal (43.5 L)
Gasoline Fuel Consumption	
Full Load (4,000 watts)	0.88 gal/hr (3.3 L/hr)
3/4 Load (3,000 watts)	0.68 gal/hr (2.6 L/hr)
1/2 Load (2,000 watts)	0.50 gal/hr (1.9 L/hr)
1/4 Load (1,000 watts)	0.39 gal/hr (1.5 L/hr)
Oil Capacity	3 U.S. quarts plus 1/2 quart for filter
Starting System Voltage	12
Ventilation (Total Area With No Restriction)	85 sq. in. (548 cm ²)

TUNE-UP SPECIFICATIONS

Spark Plug Gap025 in. (0.64 mm)
Breaker Points Gap (Cold Setting)021 in. (0.53 mm)
Valve Lash (Cold)	
Intake005 in. (.127 mm)
Exhaust013 in. (.330 mm)

ASSEMBLY TORQUES

Cylinder Head Stud Nuts (Cold)	17 lb-ft (23.1 N•m)
Intake Manifold Cap Screws	8 lb-ft (10.8 N•m)
Exhaust Manifold Cap Screws	10 lb-ft (13.5 N•m)
Flywheel Cap Screw	38 lb-ft (51.5 N•m)

WARNING

ONAN RECOMMENDS THAT ALL SERVICE INCLUDING INSTALLATION OF REPLACEMENT PARTS ONLY BE DONE BY PERSONS QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE. TO PREVENT POSSIBLE INJURY AND/OR EQUIPMENT DAMAGE IT IS IMPERATIVE THAT THE SERVICE PERSON BE QUALIFIED.

Pre-Start

PRE-START INSPECTION

Make a daily inspection of the engine and generator before starting. Check for loose or missing parts or for any damages 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
- K1 start solenoid wire leads
- Fuel inlet fitting on fuel pump
- Exhaust manifold cap screws
- Intake manifold cap screws
- Grounding strap
- Air cleaner wing nut
- Choke wire
- Remote control panel wire leads
- Carburetor hold down screws
- Spark plug leads and ignition coil wires

Verify that the air inlet is free of any obstructions that may reduce the air flow.

CRANKCASE OIL

The set oil capacity is 3 U.S. quarts (2.8 L) plus 1/2 quart for oil filter change. Fill the crankcase until the oil reaches the "FULL" mark on the oil level indicator (Figure 1). Do NOT OVERFILL. (Overfilling may cause foaming and engine shutdown.) Always change the oil filter when changing oil.

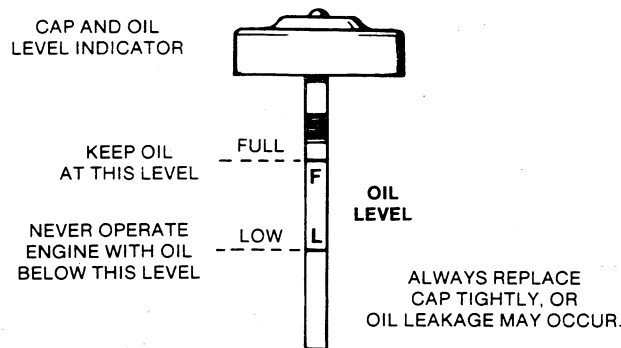
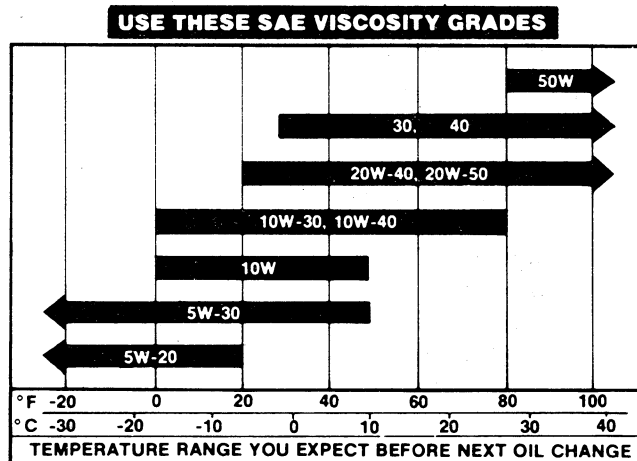


FIGURE 1. CHECKING OIL LEVEL

Fill the crankcase with oil to the "FULL" mark on the oil level indicator. 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 ASTM-G-1V Sequence Tests). Refer to oil chart for recommended viscosity and temperature.

Oil consumption may be higher with a multigrade oil than with a single grade oil if both oils have compara-

ble viscosities at 210°F (99°C). Therefore, single grade oils are generally more desirable, unless anticipating a wide range of temperatures.



Check the oil level daily or after every 8 operating hours and add as required. Use the same brand of oil as in the crankcase when adding oil between changes. It is not unusual to have to add oil when the oil level is checked. Small air-cooled gasoline engines have a higher rate of oil consumption than larger automotive type engines. This is a normal characteristic of small air-cooled engines and does not indicate poor ring seating except in extreme cases.

The time between oil changes should NOT exceed 200 normal operating hours. This is equivalent to running a vehicle engine 8,000 miles before changing oil. If operating in extremely dusty or dirty conditions, it is recommended that the oil be changed twice as often. See Figure 2 for location of the oil drain.

WARNING Do NOT check oil while the generator set is operating. Hot oil could cause burns by blowing out of oil fill tube due to crankcase pressure.

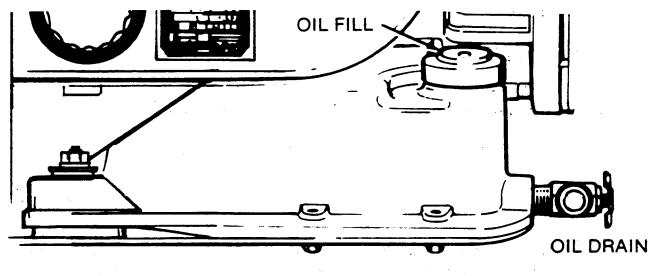


FIGURE 2. OIL DRAIN AND FILL

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RECOMMENDED FUEL

Use clean fresh NONLEADED gasoline. Do not use regular gasoline or highly leaded premium fuels. Using nonleaded gasoline results in reduced valve wear and less combustion chamber deposits. The fill pipe on the Onan fuel tank is built to accept only nonleaded fuel pump nozzles. Using regular leaded gasoline will eventually cause a loss of engine power

because of carbon and lead deposits on the cylinder heads.

DO NOT use gasohol or gasoline de-icers in Onan engine/generator sets. The use of either item could possibly disturb internal carburetor and fuel pump parts, deteriorate the binders of gaskets, or adversely affect engine valve life.

Operation

CONTROL PANEL COMPONENTS

The generator set has a control panel mounted on the generator set and a remote starting control panel inside the truck cab. The function of the control on the set is limited to starting and stopping. The function of the remote control panel inside the truck cab is to provide for starting and stopping the generator set and for monitoring its operation. A 120 volt receptacle is also part of the cab mounted control panel.

Generator Set Control Panel

The generator set control panel (Figure 3) has the following components:

Start-Stop Switch: Starts and stops unit.

Fuse (F1): Ten amp fuse for start solenoid circuit.

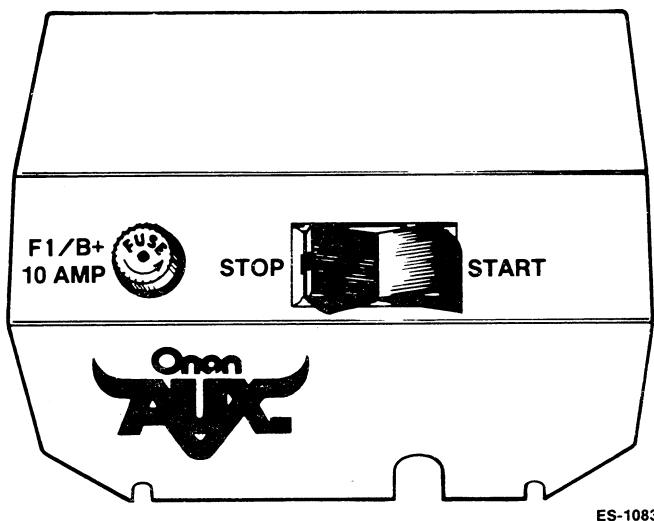


FIGURE 3. GENERATOR SET CONTROL

Remote Control Panel

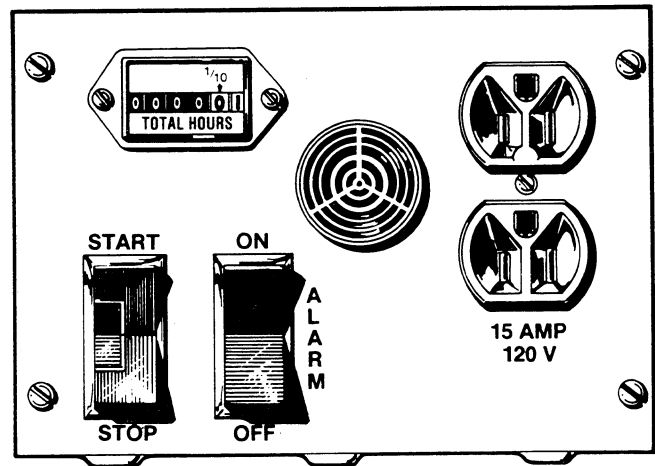
The remote control panel used in the truck cab (Figure 4) has the following components:

Start-Stop Switch: Starts and stops unit. Indicator light glows when unit is running.

On-Off Switch: Turning switch to ON position while generator set is running activates shut down warning system. A warning alarm will sound if generator set stops while switch is in ON position. Turn switch to OFF position to turn off alarm.

Running Time Meter: Registers the total number of hours (to nearest 0.1 hour) that unit has run. Time on meter is accumulative and cannot be reset.

Receptacle: Heavy duty nylon faced duplex receptacle with 15 amp rating.



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FIGURE 4. REMOTE CONTROL PANEL

DISTRIBUTION BOX

The distribution box (see Figure 5) may be located in the tool box or in the storage compartment directly under the sleeper. All load wires are routed to the distribution box for connection to one of the load circuits. Each circuit is protected by a combination circuit breaker/switch. The amp rating is stamped on each circuit breaker.

Circuit Breakers: When a circuit is overloaded or a short occurs, the circuit breaker will automatically open the faulty circuit. The switch on the open circuit breaker will be in the CENTER position. When the fault is corrected, turning the switch handle to OFF and then to ON resets the circuit breaker.

Road vibration or shock may sometimes cause the circuit breakers to trip to the center position.

Two standard circuit breakers (15 and 20 amp) and a ground fault circuit breaker (15 amp) are provided with the distribution box. Additional circuit breakers may be added if necessary.

Ground Fault Circuit Interrupter (GFCI): Protection against ground fault hazards is provided by a special circuit breaker which is included with the distribution

box. The ground fault circuit breaker is wired to all duplex receptacles mounted in or on the truck cab. Any receptacles added at a later date must also be wired to a ground fault circuit breaker.

A test should be made each month to verify that the ground fault protection device operates properly. With the generator set running and the switch in the ON position, push the TEST button on the ground fault circuit breaker. The switch handle should immediately move to the center position. Replace if the test indicates the ground fault protection device is faulty. Reset circuit breaker by moving the switch to the OFF position and then to the ON position. Record the date of test on the special sticker provided with the distribution box.

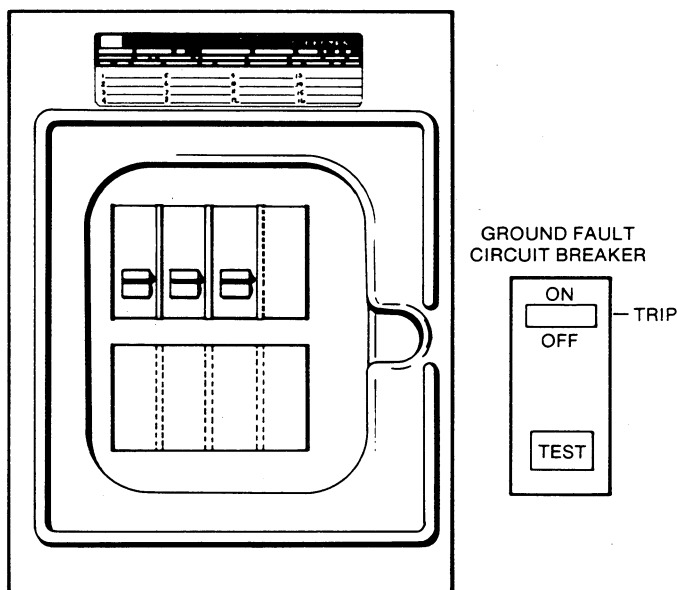


FIGURE 5. DISTRIBUTION BOX

STARTING/STOPPING

The generator is constructed with an excitor cranking winding that allows it to operate as the starting motor. During cranking, current from the battery is supplied to the starting windings in the generator. This causes the generator to operate as a motor until the engine starts and battery current is cut off.

Normal Starting Procedure

The generator set can be started from the set control panel or from the remote control panel in the truck cab. Push the stop-start switch to the start position. Release the switch when the engine starts. Refer to cold weather starting procedure if generator set fails to start and temperature is below 32°F (0°C).

First Start: 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.

Cold Weather Starting Procedure

During cold weather (32°F or below), the generator set choke may have to be manually assisted in order for the engine to start. If the normal starting procedure fails, hold the choke in the ON position (see Figure 6) and then push the stop-start switch on the generator set control panel to the ON position. Release the switch and the choke when the engine starts.

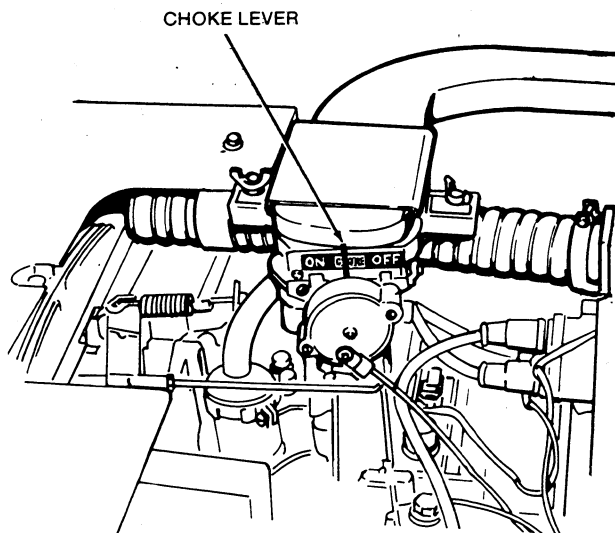


FIGURE 6. CHOKE

Stopping

Push the start-stop switch to the stop position and hold until set stops completely.

APPLYING LOAD

If practical, allow set to warm up before connecting a heavy load. All generator sets have a maximum power output rating which is stamped on the nameplate. Exceeding the power rating by turning on too many accessories will overload the generator. Continuous overloading will cause high operating temperatures that can damage the windings.

To determine if the load is within the power rating of the generator set, add up the wattage requirements of the accessories to be operated. The total should be LESS than the maximum power rating of the generator set. (See *Derating* section for factors affecting power rating.) Keep the load within the nameplate rating to avoid overloading. Use Table 1 to determine the approximate power requirements for various appliances and accessories.

REFER TO SAFE OPERATION INSPECTION SECTION ON PAGE 10 FOR RECOMMENDED SAFETY INSPECTIONS.

BREAK-IN PROCEDURE

Controlled break-in with the proper oil and a conscientiously applied maintenance program will help to assure satisfactory service from your Onan electric generating set. Break-in as follows:

1. One half hour at 1/2 load (approximately 2,000 watts).
2. One half hour at 3/4 load (approximately 3,000 watts).
3. Change crankcase oil after the first 50 hours of operation.

The generator set is designed to be operated 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.

DERATING

The generator set maximum power rating is based on operation at 1000 feet above sea level at 85° F ambient temperature. When the generator set is operated at altitudes above 1000 ft. or at temperatures above 85° F, the power rating must be reduced or 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 deration can be expected for every 10° F rise in temperature above 85° F. A four percent deration can be expected for every 1000 foot increase in altitude above 1000 feet. Table 2 shows the derated power ratings at various temperatures and altitudes. Limit the TOTAL load (watts) to the power rating shown in Table 2 when deration is necessary.

TABLE 1
POWER REQUIREMENTS FOR
APPLIANCES AND ACCESSORIES

Winter Starting Aids	Approx. Running Wattage
Block Heater	1000-4000
Lube Oil Heater	300
Battery Charger	1000
Battery Heater	300
Vehicle Accessories	
Sleeper Heater	300-1000
Air Conditioner	1400-2200
Microwave Oven	1200-1500
Refrigerator	240
Appliances and Tools	
Television	50-200
Electric Fry Pan	1000-1350
Coffee Pot	550-700
Radio	50-200
Electric Drill	250-750
Electric Blanket	50-200
Toaster	1000

TABLE 2
DERATING TABLE FOR 4000 WATT GENERATOR SET

ALTITUDE ABOVE SEA LEVEL	TEMPERATURE (° F)			
	85°	95°	105°	115°
1000	4000	3960	3920	3880
2000	3840	3800	3760	3730
3000	3690	3650	3610	3580
4000	3540	3500	3470	3430
5000	3390	3360	3330	3290
6000	3260	3230	3190	3160
7000	3130	3100	3070	3040

BATTERY CHARGING

A flywheel alternator is used for charging the battery. The alternating current produced by the flywheel alternator is converted to direct current (DC) by a rectifier/regulator. The battery charger operates continuously whenever the generator set is running. The battery charging current is carried by the center terminal of the regulator. A 30 amp fuse is placed in the lead wire that connects the center terminal to the start solenoid.

The flywheel alternator can provide a charge rate of up to 20 amps when needed. This is a sufficient rate to allow the operation of the legally required perimeter lights (headlights, taillights, and signal lights but not decorative lights) without discharging the battery. The regulator prevents overcharging the batteries when they are already fully charged by cutting the charge rate.

HIGH/LOW OPERATING TEMPERATURES

The generator set has been designed to operate satisfactorily in both high (above 100°F) and low (below 0°F) temperatures. Included as standard equipment is a carburetor air preheater which is used to prevent carburetor icing. Use the oil recommended in the *PRE-START* section for the expected temperature conditions.

High Operating Temperatures

1. See that nothing obstructs air flow to and from the set.
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. Below 0°F (-18°C), adjust the carburetor main adjustment screw to give a slightly richer mixture (see *ADJUSTMENTS* section).
2. Keep the ignition system in good condition and maintain the batteries in a well charged condition.

EXTREMELY DUSTY OR DIRTY CONDITIONS

1. Keep unit clean. Keep cooling surfaces clean.
2. Replace air cleaner as frequently as necessary.
3. Change crankcase oil every 100 operating hours.
4. Keep oil and gasoline in dust-tight containers.
5. Keep governor linkage clean.
6. Clean generator brushes, slip rings, and commutator. Do *not* remove normal dark brown film and do *not* polish. Contact your nearest Onan Service Center for assistance.

HIGH ALTITUDE OPERATION

For operation at altitudes of 2500 feet (775 m) above sea level, close carburetor main jet adjustment slightly to maintain proper air-to-fuel ratio (refer to the *ADJUSTMENTS* section). Maximum power will be reduced approximately four percent for each 1000 feet (310 m) above sea level after the first 1000 feet. See *DERATING* section.

Safe Operation Inspection

INSPECTION

An *Installation Guide* is furnished with each new AUX generator set. The guide outlines the installation procedures that should be followed to insure safe and trouble-free operation of the generator set. Even when all safety codes are observed by the installer, certain problems can arise after the unit has been operated and subjected to vibration. The operator should be aware of these problem areas and make the recommended inspections to insure continued safe operation. If in doubt about any aspect of your generator set's operation or safety, contact your nearest authorized Onan Service Center. A daily inspection of your installation should include the following:

Exhaust System

Check for leaks around manifolds, gaskets, and welds. Make sure exhaust lines are not heating surrounding areas excessively. If so, have corrected immediately. Remember, EXHAUST GASES CONTAIN DEADLY CARBON MONOXIDE. Be sure all holes to the inside of the truck cab are sealed to prevent poisonous exhaust gases from entering the interior. Use a silicone/rubber sealant to seal around all openings made for electrical wiring.

WARNING *The exhaust tailpipe must not terminate underneath the vehicle. Exhaust gases contain carbon monoxide and are deadly poisonous. While the generator set is running, all vents to the interior should be closed as well as doors and windows on the same side of the truck as the set.*

Fuel System

While the set is running, check fuel lines for leaks. Raw fuel will cause fumes which could EXPLODE. Check around the carburetor and fuel pump inlets and fuel tank outlet. Look for cuts, fraying, weathering cracks, and abrasions. Make sure fuel lines are not rubbing against anything which could cause breakage. Stop set immediately and repair if fuel line

leaks are detected. Fuel lines must NOT be bundled together with electrical wiring.

Electrical System

AC Output: All AC output leads from the generator terminate in the generator set junction box. These wires are connected to the distribution box with multi-strand wire. Check all wires (to and from the generator set) for cuts, fraying, weathering cracks, abrasions, and loose connections.

Battery Connections: Battery positive (+) connection connects to start solenoid. Battery negative connects to location on rear of generator. Check terminals on set and battery for clean and tight connections.

WARNING *Do not disconnect battery cables from battery while generator set is cranking or running. Sparks may cause an explosion or damage to the regulator may occur.*

Grounding: Generator must be effectively bonded to the truck chassis.

Vehicle chassis (frame) ground and the battery and generator set ground should all be electrically connected to be at 0 ground potential. All Onan units are designed for negative ground application.

Ventilation

The biggest enemy of electric generating sets installed in a compartment or housing is excessive heat. Make sure the set's air inlet and outlet are not plugged with dust, dirt, bugs, leaves, or anything that could restrict cooling air.

WARNING *Don't use discharged cooling air for compartment heating since it could contain poisonous exhaust gases.*

WARNING

If the odor of gasoline is detected, immediately turn the generator set off and check for fuel leaks. Do not smoke or use an open flame. Gasoline fumes are extremely flammable and may explode if ignited by a spark.

Maintenance

BATTERY CARE

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

1. Keep the battery case clean and dry.
2. Make sure the battery cable connections are clean and tight. Use a terminal puller when removing cables for any reason.
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 water (drinking quality or better) as needed for filling to split level marker.

ELECTRIC FUEL PUMP

Service of the fuel pump is limited to cleaning the filter. Drain the fuel pump and check the filter element. Turn the hex nut on the base of the pump to gain access to the filter element. If the element appears dirty, clean it. Be sure to replace gaskets when reassembling (Figure 7).

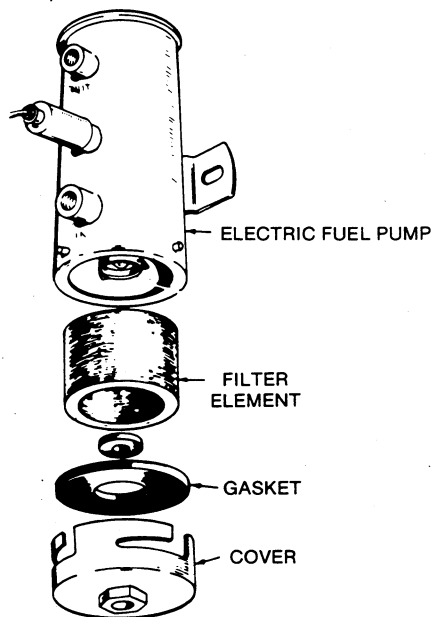


FIGURE 7. FUEL PUMP

AIR CLEANER ELEMENT

Check air cleaner element (Figure 8) every 100 hours and more often in dusty conditions. To remove, unclamp the air cleaner wrapper and loosen the wing nut. Take off the end cover and remove the element. Clean by blowing low pressure air (35 psi or less) through the inside surface of the element.

Air cleaner element has been UL tested for fire control and should never be cleaned by immersing in a liquid.

Replace element at least every 200 operating hours and more often in dusty conditions. Replace wing nut with a 1/4-20 locking nut if original wing nut is lost.

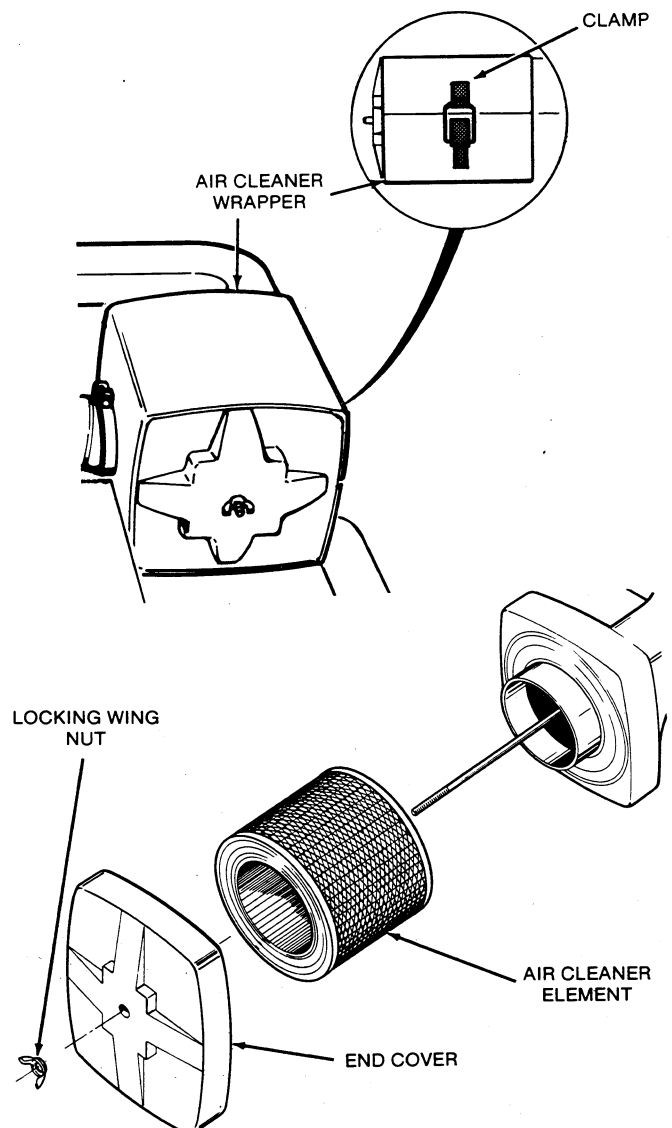


FIGURE 8. AIR CLEANER

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CRANKCASE OIL

Oil Level: Check oil level at least every 8 hours of operation. Check more frequently on a new or reconditioned engine as oil consumption is higher until the piston rings seat properly.

Oil Change: Drain the oil from the crankcase while the engine is warm. When completely drained, close the valve and refill the engine with the recommended oil (see *PRE-START* section). The interval between oil changes should never exceed 200 operating hours.

Oil Filter: Change the oil filter every 200 hours or whenever the oil is changed. Remove the filter (see Figure 9) by turning counterclockwise, using a filter wrench. Install the sealing strip over the filter to prevent air loss in the area indicated. It is advisable to wipe dry the drip pan located below the filter. Coat rubber gasket on filter with a film of oil before installing. Install the filter finger-tight plus 1/4 to 1/2 turn. If oil becomes so dirty that the markings on the oil level indicator cannot be seen, change the filter and shorten the filter service period.

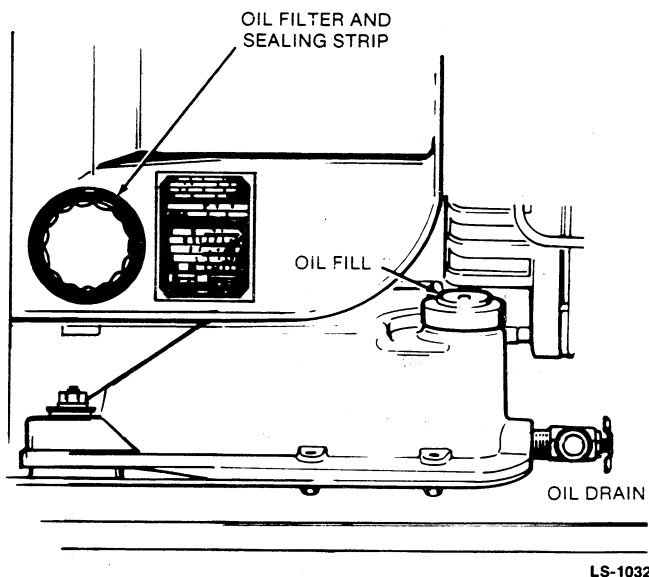


FIGURE 9. OIL AND FILTER CHANGE

COOLING SYSTEM

The generator set is cooled by a flywheel blower fan which pulls air over the cylinders and cooling fins. The air path is directed by sheet metal shrouds and plates. These shrouds and plates must always be installed properly so unit does not overheat.

Check and clean (if necessary) the cooling fins at least every 200 hours of operation. Remove any dust, dirt or oil which may have accumulated. Check compartment air inlet and generator set air outlet for buildup of dirt, chaff, mud, etc.

SPARK PLUGS

Remove and replace the spark plugs every 600 hours. A badly fouled plug will cause misfiring, poor operation, or stopping when a load is applied.

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

Set spark plug gap at .025 in. (see Figure 10) when replacing.

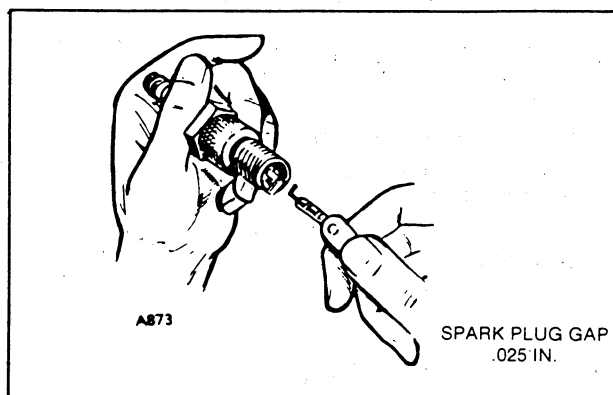


FIGURE 10. CHECKING SPARK PLUG GAP

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 11. Also inspect the linkage for binding, excessive slack and wear.

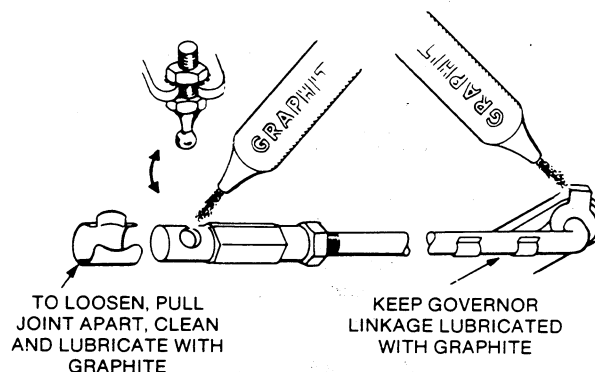


FIGURE 11. GOVERNOR LINKAGE

GENERATOR MAINTENANCE

The generator normally needs little care other than a periodic check of the brushes, commutator and collector rings. If a major repair job on the generator

should become necessary, have the equipment checked by a competent electrician who is thoroughly familiar with the operation of electric generator equipment. Contact your nearest Onan Service Center.

CRANKCASE BREATHER

This engine uses a crankcase breather valve for maintaining crankcase vacuum. No maintenance is generally required. If the crankcase becomes pressurized as evidenced by oil leaks at the seals, clean baffle and valve in a suitable solvent (Figure 12). Check for cracks or breaks in the breather hose and replace if necessary.

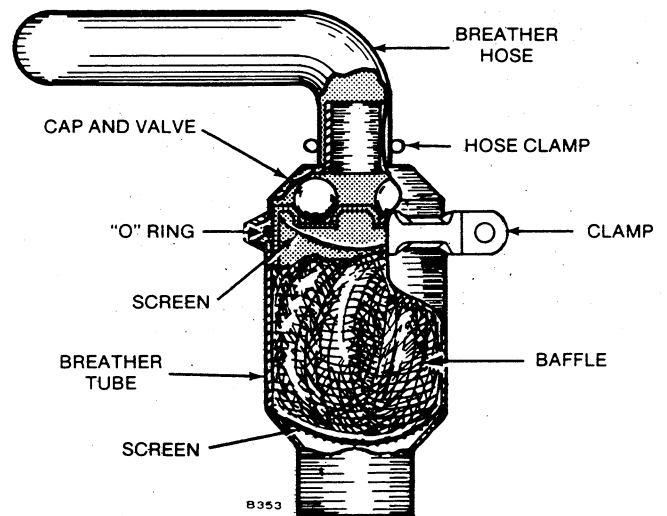


FIGURE 12. CRANKCASE BREATHER

Periodic Maintenance Schedule

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the generator set. The time intervals shown in the *Periodic Maintenance Schedule* should be used as a guide for regular maintenance. However, actual operating conditions should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions or hot and cold temperature extremes within days of each other, the maintenance time intervals must be reduced.

All maintenance time intervals are based on the use of nonleaded gasoline. Using leaded gasoline instead of nonleaded gasoline will INCREASE the maintenance requirements of the set. Leaded gasoline usage will cause an excessive build-up of combustion chamber deposits. This will reduce spark plug and valve life and will require frequent cleaning of the cylinder head combustion chamber.

WARNING Always allow generator set to cool off before performing any maintenance or installation work on the set. Working on a hot set could cause severe burns. SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS			
	Daily or after 8 hours	200	600	1000
General Inspection	X ¹			
Check Oil Level	X			
Change Crankcase Oil and Filter		X ²		
Replace Air Cleaner Element		X ²		
Clean Cooling Fins		X ²		
Clean Governor Linkage		X ²		
Replace Spark Plugs			X	
Adjust Valve Lash			X ³	
Replace Breaker Points			X	
Clean Carbon From Cylinder Heads				X ³
Check Generator Brushes and Commutator				X ³
Blow Out Generator (Dry Air)				X ³
Test Ground Fault Circuit Breaker	Monthly			
Clean Fuel Pump Filter	As Required			
Clean Crankcase Breather	As Required			

X¹ - With set running, visually and audibly check exhaust system for leaks.

X² - Perform more often in extremely dusty conditions.

X³ - Contact your nearest Onan Service Center.

WARNING All exhaust system connections must be checked regularly for any leaks and tightened as necessary. Do not terminate exhaust pipe under vehicle or near any window, vent, or door openings. Inspect the vapor tight seals around all openings made in the truck cab for wiring, conduit, etc., to prevent entrance of any noxious fumes to truck interior.

Adjustments

Satisfactory generator set performance depends on correct adjustments. If trouble develops, follow an orderly procedure to determine the cause before making changes in adjustments. Refer to *ENGINE TROUBLESHOOTING* and *PERIODIC SERVICE GUIDES* for additional help.

CARBURETOR

The carburetor has two mixture adjustments: An idle mixture which affects operation mainly at no load and a main (power) adjustment which affects operation at maximum load (Figure 13). If your generator set has a "hunting" (sudden surges and drops in speed) condition at no load or full load and cannot be corrected by carburetor adjustments, check governor adjustment (see *Governor Adjustments*). A hunting condition at no load can usually be corrected by an idle mixture adjustment.

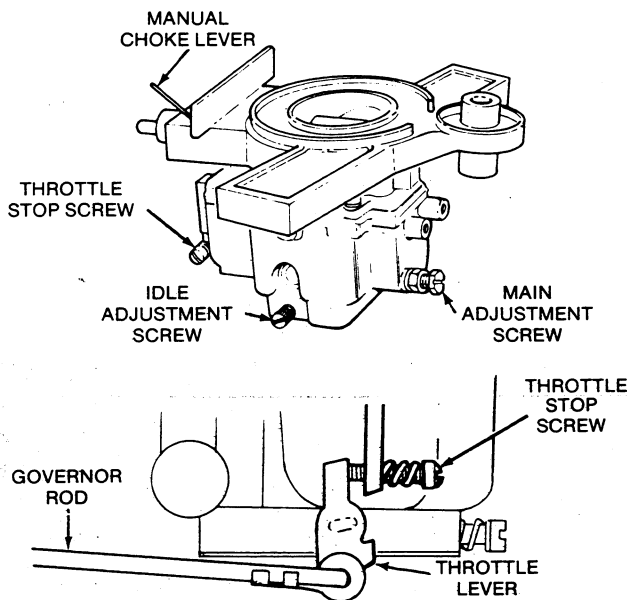


FIGURE 13. CARBURETOR ADJUSTMENTS

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 $7/8$ to $1-1/8$ turns and the main adjustment screw out $1-1/4$ to $1-1/2$ turns.

CAUTION When determining fuel mixture settings, never force the fuel mixture adjustment needles against their seats (damages the seats and needles).

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, turn on the truck accessories or use an Onan load test panel.

1. Remove all electrical loads and connect a voltmeter or frequency meter to the generator set.
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 stop screw to obtain a setting of 90 to 100 volts on the voltmeter or 50 hertz on the frequency meter.
3. Continue to hold the governor linkage. Determine the best idle mixture setting by first turning the idle adjustment screw inward until set voltage (or frequency) drops (indicating a lean mixture) and then outward until set voltage (or frequency) drops again (rich mixture). Over a narrow range between these two settings the generator set voltage (or frequency) will remain at its highest. Set the idle adjustment screw slightly outward (rich) from the midpoint of this highest voltage range. Readjust the throttle stop screw as needed to retain the 90 to 100 volt or 50 hertz 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. Once again, final adjustment should be to a point slightly outward (rich) from the midpoint of the highest voltage range (highest frequency). Set the governor to the generator set's rated full load voltage (or frequency) as specified in the *GOVERNOR ADJUSTMENTS* section.
5. Remove the load from the generator, then observe the stability of the generator set. Adjust the sensitivity of the governor as necessary (see *GOVERNOR ADJUSTMENTS* section). Add and remove a full load several times to make certain the generator set does not bog down or hunt.

CARBURETOR FLOAT ADJUSTMENT

1. Normal operation seldom requires any adjustment of the float level. Disconnect throttle control, choke leads, air cleaner inlet hose and fuel line from carburetor.
2. Remove the four bolts that hold the intake manifold assembly in place and remove the complete carburetor and intake manifold assembly as one

unit. Then remove carburetor from intake manifold for easier handling when checking float level.

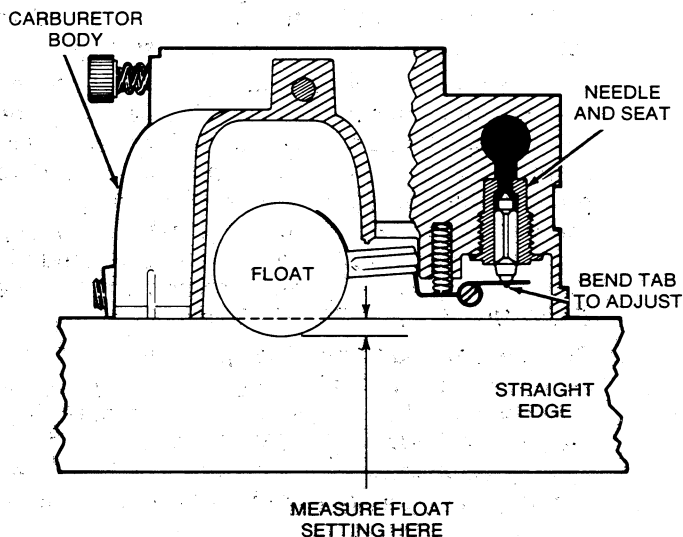
3. Remove the four phillips head screws on the top of the carburetor and lift it off.
4. Invert the carburetor and check the float setting (see Figure 14). The float should have a 0.02 ± 0.02 inch (0.5 ± 0.5 mm) drop from the machined mating surface (without gasket). Place a straight edge across the body of the fuel bowl and measure at the point shown in Figure 14.
5. If the setting is incorrect, remove the float assembly to adjust. Bend the assembly slightly at the location specified in Figure 14.

CAUTION *Attempting adjustments with the float assembly installed may result in deformation of the inlet needle and seat.*

6. Reassemble carburetor and reinstall carburetor on intake manifold assembly and then replace complete assembly on the engine.
7. Check carburetor for proper operation.

An exceedingly high float setting will usually result in an engine that is hard to start when warm. If the setting is too low, the engine may not receive enough fuel under sudden acceleration or load change.

CAUTION *If float adjustment is necessary, be careful not to lose the buoyancy spring or the viton tip float needle and seat assembly.*



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FIGURE 14. FLOAT LEVEL ADJUSTMENT

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 attain a safe voltage operating range.

Engine speed determines the output voltage and current 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. The engine speed can be checked with a tachometer.

A binding in the bearings of the governor shaft, in the ball joint, or in the carburetor throttle assembly will cause erratic governor action or alternate increase and decrease in speed (hunting). A lean carburetor adjustment may also cause hunting. Springs of all kinds have a tendency to lose their calibrated tension through fatigue after long usage. If all governor and carburetor adjustments are properly made, and the governor action is still erratic, replacing the spring with a new one and resetting the adjustments will usually correct the trouble.

Adjustments to the governor should be made in the following sequence:

1. Adjust the carburetor idle adjustment screw with no load applied. (See **CARBURETOR ADJUSTMENTS** section.)
2. Adjust the carburetor main adjustment screw for the best fuel mixture while operating the set with a full load connected. (See **CARBURETOR ADJUSTMENTS** section.)

WARNING *Use extreme caution when making adjustments while the engine is running. Touching hot exhaust pipes or moving parts may result in serious injury.*

3. Adjust the length of the governor linkage and check linkage and throttle shaft for binding or excessive looseness. The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle shaft assembly is adjusted by rotating the ball joint. Adjust this length so that with the engine stopped and tension on the governor spring, the stop on the throttle shaft assembly almost touches the throttle stop screw housing on side of carburetor (one more turn of governor ball joint would allow throttle shaft linkage to rest against stop screw housing). See Figure 15.
4. With the warmed-up unit operating at no load, adjust the tension of the governor spring. Turn the speed adjusting nut to obtain a voltage and speed reading within the limits shown in the *Voltage and Speed Charts* (Table 3).
5. Check the voltage and speed first with no load connected and again with a full load. Adjust the sensitivity to give the closest regulation (least speed and voltage difference between no load and full load) without causing a hunting condi-

tion. To increase sensitivity (closer regulation), shift the spring toward the governor shaft.

6. Recheck the speed adjustment made in step #4.
7. Set the carburetor throttle stop screw. (See **CARBURETOR ADJUSTMENTS** section).

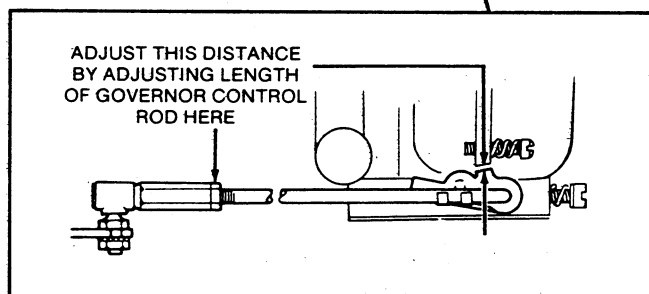
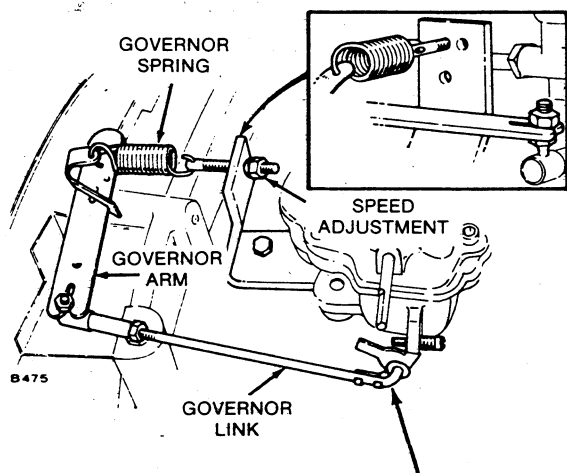


FIGURE 15. GOVERNOR ADJUSTMENTS

TABLE 3.
VOLTAGE AND SPEED CHARTS

VOLTAGE CHART FOR CHECKING GOVERNOR REGULATION	120 VOLT 1 PHASE 2 WIRE
MAXIMUM NO-LOAD VOLTAGE	132
MINIMUM FULL-LOAD VOLTAGE	108

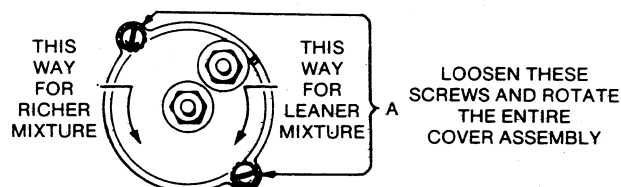
SPEED CHART FOR CHECKING GOVERNOR REGULATION	
MAXIMUM NO-LOAD SPEED (RPM)	1890
HERTZ (CURRENT FREQUENCY)	63
MINIMUM FULL-LOAD SPEED (RPM)	1770
HERTZ	57

ELECTRIC CHOKE

If extremes in starting temperatures require a readjustment of the choke, loosen slightly the two cover retaining screws. See Figure 16. For less choking action, turn the cover assembly a few degrees in a clockwise direction. For more choking action, turn

counterclockwise. Retighten the cover screws. Choke may be closed manually if desired to adjust choke settings or for troubleshooting purposes.

If the engine starts and runs roughly after a minute or two of operation, the choke is set too rich. If the engine starts, and assuming that fuel, ignition and compression are adequate, but the engine sputters or stops before it warms up, the choke is set too lean.



AVERAGE CHOKE SETTING	
AMBIENT TEMP (F°)	CHOKE OPENING
58 (14° C)	closed
66 (19° C)	1/4 open
72 (22° C)	1/2 open
76 (24° C)	3/4 open
82 (28° C)	open

FIGURE 16. CHOKE ADJUSTMENT

BREAKER POINTS AND IGNITION TIMING

The correct point gap setting is .021 in. (.53 mm) and should be adjusted as follows:

1. Remove cover by loosening screw and lift off.
2. To set the point gap turn the engine crankshaft with rotation until the maximum breaker point gap is obtained.
3. Using an allen head wrench, adjust set screw (B) for .021 in. (.53 mm). Measure point gap with a flat thickness gauge. See Figure 17.

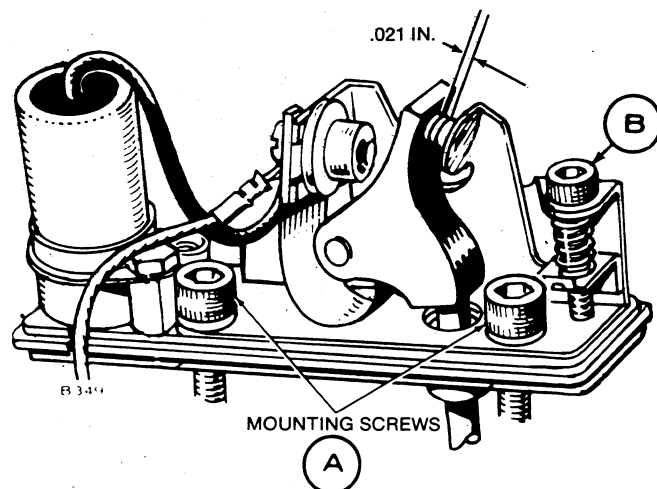


FIGURE 17. TIMING AND BREAKER POINTS ADJUSTMENT

Make sure feeler gauge is clean and free of any 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.

4. Replace point box cover.

The ignition adjustments should be made with the engine in a static condition and cold.

CARBURETOR AIR PREHEATER

The carburetor air preheater is adjusted at the factory and will seldom require adjustment unless disturbed. Adjustment is as follows:

1. Loosen the lock nut (see Figure 18).
2. With ambient temperature at 80°F (27°C), turn vernatherm in or out so plunger just touches shutter lever with shutter door closed.
3. Hold vernatherm in place and tighten lock nut.
4. Start generator set and check for proper operation and normal power output from set. After warm up and with compartment temperature above 100°F (38°C), shutter door should be fully open.

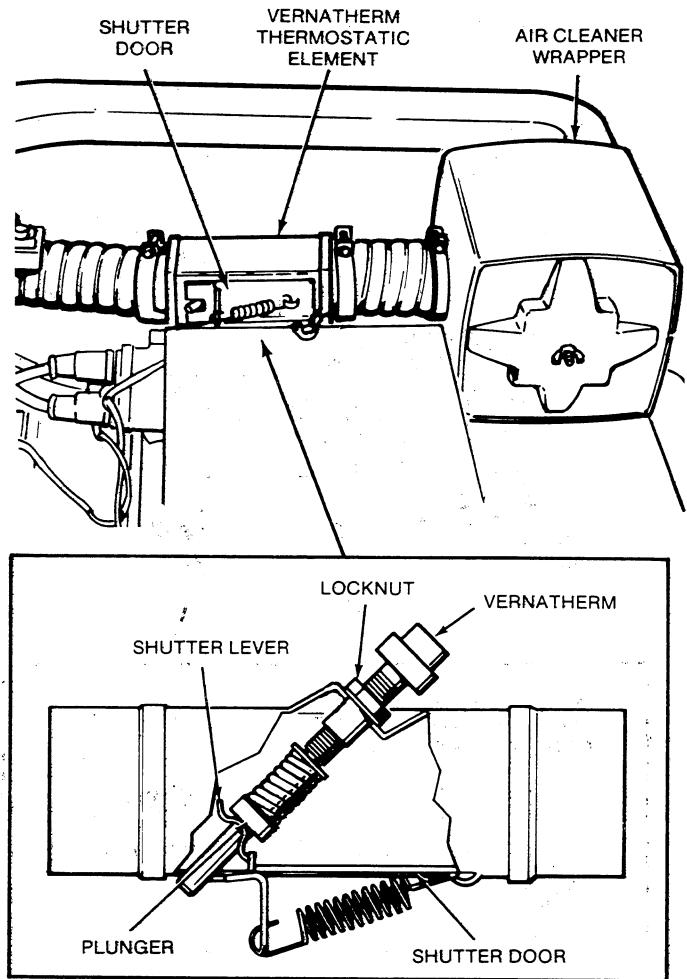
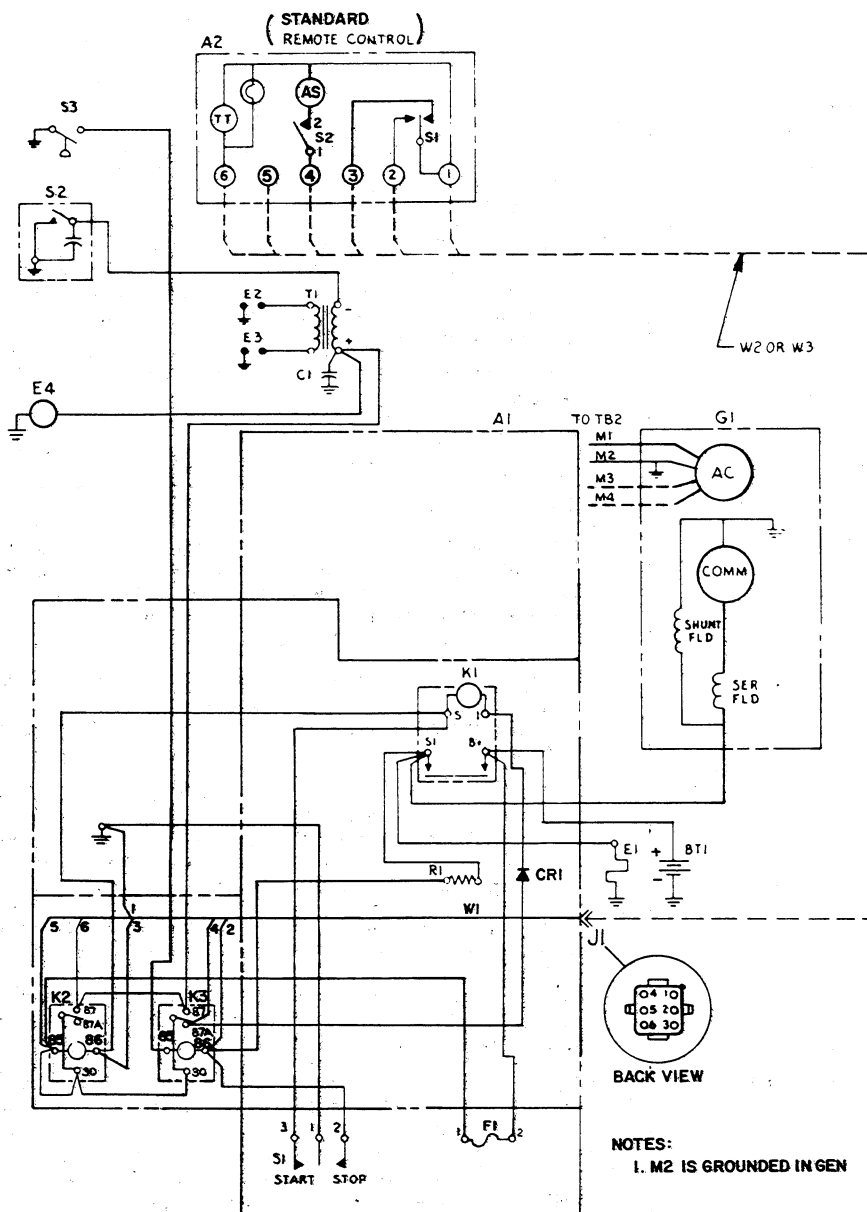


FIGURE 18. CARBURETOR AIR PRE-HEATER ADJUSTMENT

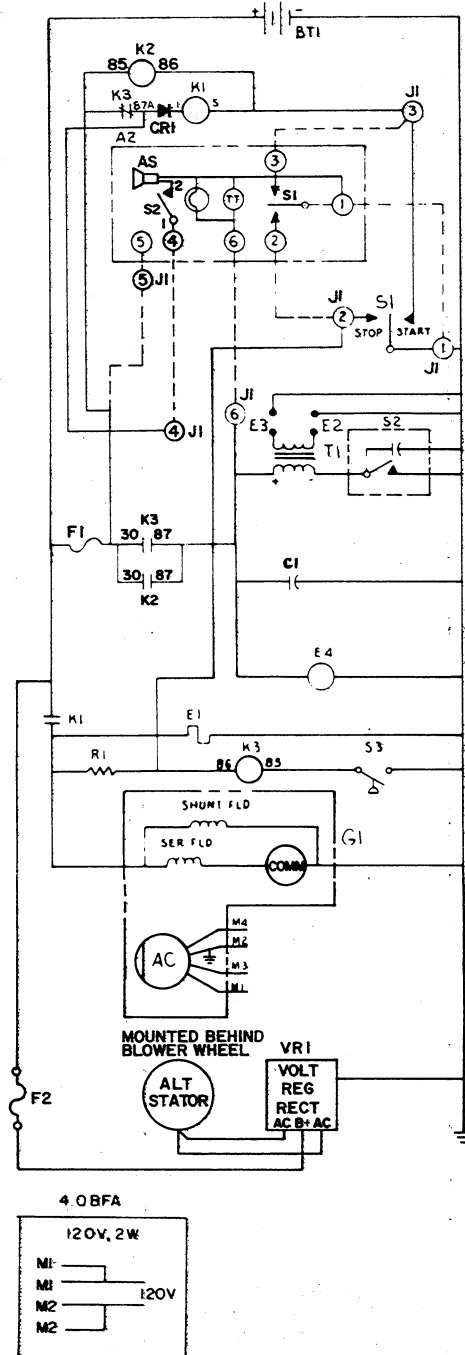
Control Troubleshooting

PROBLEM	PROBABLE CAUSE	REMEDY
FAILS TO CRANK	1. Bad Battery Connection	1. Clean and tighten all battery and cable connections.
	2. Low Battery	2. Check specific gravity. Recharge or replace if necessary.
	3. Faulty Start Solenoid (K1)	3A. Check for Battery Voltage at K1 "I" terminal. 3B. Push start switch. Check start solenoid "S1" terminal voltage to ground. When battery voltage at start solenoid "B-" terminal is present, battery voltage should also appear at "S1" terminal. If not, check K3.
	4. Faulty Start Switch	4. Jumper switch (#3 terminal) to ground. If solenoid energizes, replace switch.
	5. Blown Fuse (F1)	5. Replace fuse (F1) on control.
CRANKS SLOWLY	1. Bad Battery Connection	1. See 1 above (FAILS TO CRANK)
	2. Low Battery	2. See 2 above (FAILS TO CRANK)
CRANKS BUT WON'T START	1. Faulty Fuel Solenoid Or Fuel Pump	1. Fuel solenoid must open during cranking and running. Check by removing steel line from carburetor and crank engine. If fuel solenoid is open, fuel will pulsate out of this line. If it does not, the fuel solenoid and fuel pump must be checked separately to determine defective part. <div>WARNING Use extreme care for this test. Direct fuel flow into a suitable container and make sure area is well ventilated to prevent accumulation of gasoline fumes.</div>
	2. Faulty Ignition	2. Check to see if points open and close during cranking. If they do not open and close, adjust and set points. Plug and plug wires must be in good condition. Voltage at ignition coil negative terminal (-) must alternate from +12 volts to zero volts as points open and close during engine cranking.
	3. Inoperative Choke	3. With engine not running, check choke vane movement by pushing choke lever arm. Choke must be in closed position with cold engine and must be free to move against bimetal spring. As engine warms up, bimetal spring relaxes and allows choke vane to open fully. The lever will pulsate as engine warms up. See <i>ADJUSTMENT</i> section.
	4. Faulty Crank Ignition Relay (K2)	4. Check voltage from relay terminal 87 to ground while cranking unit. Battery voltage should appear at this terminal. If not, check for voltage at relay terminals 30 and 85. If battery voltage is present at terminals 30 and 85 but not at 87, place a ground lead on terminal 86 and recheck. Replace relay if voltage is not present with ground lead in place. If no voltage is present at terminals 30 and 85 while cranking, check wiring between start solenoid (K1) and crank ignition relay (K2).
UNIT STARTS, BUT STOPS IMMEDIATELY AFTER RELEASING START SWITCH S1	1. Resistor R1 may be open	1. Check voltage on both sides of R1. With set running, voltage should be 24-32 volts DC.
	2. Run Ignition Relay K3	2. Check voltage on both sides of K3. Should be 12 volts.
	3. Low Oil Level	3. Check oil level. If low or empty, refill to proper level.
	4. S3 Low oil pressure switch may be defective	4. Check S3. Switch should close with set running at 10 lbs. minimum oil pressure.
UNITS RUNS THEN STOPS	1. Low Oil Level	1. Check oil level. If low or empty, refill to proper level.
UNIT RUNS BUT SURGES	1. Stuck Choke	1. See 3 above (CRANKS BUT WON'T START).
	2. Governor Not Adjusted Properly	2. Readjust governor.
UNIT STOPS	1. Faulty Ignition	1. See 4 above (CRANKS BUT WON'T START).
	2. Out of Fuel	2. Refill fuel tank.
	3. Low Oil Level	3. Check oil level. If low or empty, refill to proper level.
REMOTE RUNNING TIME METER OR GENERATOR LAMP INOPERATIVE	1. Blown Fuse (F1)	1. Replace F1 fuse on control.

WIRING DIAGRAM



SCHEMATIC



A1 Control Assembly
 A2 Standard Remote Control
 BT1 12 Volt Battery
 C1 Capacitor
 CR1 Silicon Rectifier
 E1 Onan Choke
 E2, E3 Spark Plugs
 E4 Electric Fuel Pump
 F1 Fuse (10-amp, 32 volt)
 F2 Fuse (30 amp)
 G1 Generator

K1 Start Solenoid
 K2 Crank Ignition Relay
 K3 Ignition Run Relay
 R1 Resistor (fixed value)
 J1 Connector
 S1 Start-Stop Switch
 S2 Breaker Points Assembly
 S3 Low Oil Pressure Switch
 T1 Ignition Coil
 VR1 Regulator-Rectifier

Engine Troubleshooting

TROUBLE																					GASOLINE ENGINE TROUBLESHOOTING GUIDE															
Backfire at Carburetor	Bearing Wear	Black Exhaust	Blue Exhaust	Burned Valves	Connecting Rod Wear	Crankshaft Slowly	Cylinder Wear	Engine Stops	Failure to Start	Governor Hunting	High Oil Pressure	Low Oil Pressure	Loss of Coolant (Water Cooled)	Misfiring	Overheating (Air Cooled)	Overheating (Water Cooled)	Piston Wear	Poor Compression	Ring Wear	Sticking Valves	CAUSE															
																					STARTING SYSTEM															
																					Loose or Corroded Battery Connection															
																					Low or Discharged Battery															
																					Faulty Starter															
																					Faulty Start Solenoid															
																					IGNITION SYSTEM															
																					Ignition Timing Wrong															
																					Wrong Spark Plug Gap															
																					Worn Points or Improper Gap Setting															
																					Bad Ignition Coil or Condenser															
																					Faulty Spark Plug Wires															
																					FUEL SYSTEM															
																					Out of Fuel - Check															
																					Lean Fuel Mixture - Readjust															
																					Rich Fuel Mixture or Choke Stuck															
																					Engine Flooded															
																					Poor Quality Fuel															
																					Dirty Carburetor															
																					Dirty Air Cleaner															
																					Dirty Fuel Filter															
																					Defective Fuel Pump															
																					INTERNAL ENGINE															
																					Wrong Valve Clearance															
																					Broken Valve Spring															
																					Valve or Valve Seal Leaking															
																					Piston Rings Worn or Broken															
																					Wrong Bearing Clearance															
																					COOLING SYSTEM (AIR COOLED)															
																					Poor Air Circulation															
																					Dirty or Oily Cooling Fins															
																					Blown Head Gasket															
																					COOLING SYSTEM (WATER COOLED)															
																					Insufficient Coolant															
																					Faulty Thermostat															
																					Worn Water Pump or Pump Seal															
																					Water Passages Restricted															
																					Defective Gaskets															
																					Blown Head Gasket															
																					LUBRICATION SYSTEM															
																					Defective Oil Gauge															
																					Relief Valve Stuck															
																					Faulty Oil Pump															
																					Dirty Oil or Filter															
																					Oil Too Light or Diluted															
																					Oil Level Low															
																					Oil Too Heavy															
																					Dirty Crankcase Breather Valve															
																					THROTTLE AND GOVERNOR															
																					Linkage Out of Adjustment															
																					Linkage Worn or Disconnected															
																					Governor Spring Sensitivity Too Great															
																					Linkage Binding															



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