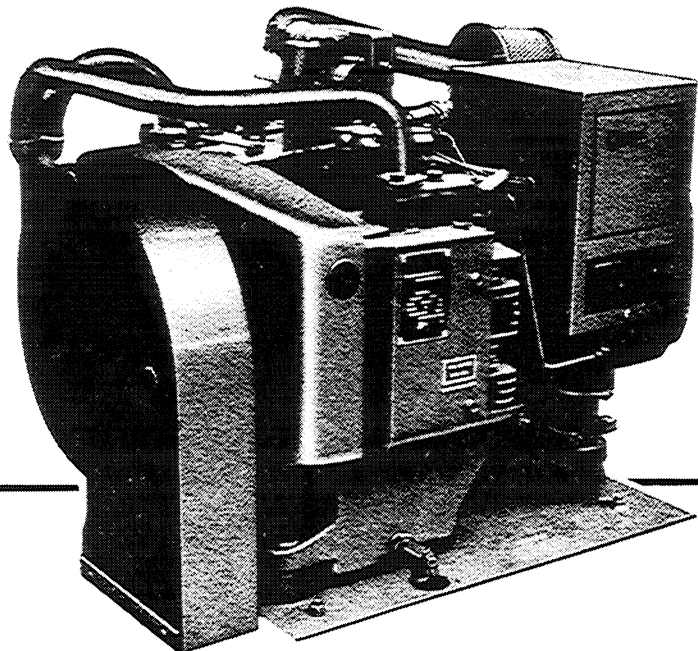


Onan

Operators Manual

CCK GenSet

**4 kW and 5 kW
Mobile Models**



Safety Precautions

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

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

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

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

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

FUEL AND FUMES ARE FLAMMABLE. Fire, explosion, and personal injury can result from improper practices.

- DO NOT fill fuel tanks while engine is running. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR USE AN OPEN FLAME near the generator set or fuel tank.
- Fuel lines must be adequately secured and free of leaks. Fuel connection at the engine should be made with an approved flexible, non-conductive line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure all fuel supplies have a positive shutoff valve.

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

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

EXHAUST GASES ARE DEADLY

- Never sleep in the vehicle with the generator set running unless vehicle is equipped with an operating carbon monoxide detector.
- Provide an adequate exhaust system to properly expel discharged gases. Inspect exhaust system daily for leaks per the maintenance schedule. 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 arcing.

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

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

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

GENERAL SAFETY PRECAUTIONS

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

TO THE OWNER

Welcome to the growing family of *Onan Power users*
... We are proud to have you as a customer.

Read this manual carefully and observe all safety rules within. Operating instructions, adjustments and periodic maintenance procedures are given so that you ... the owner, can keep your unit running like new and expect many years of dependable service from it. Remember ... any machine, regardless of design or type, will perform only in relation to the services it receives.

If your generator set needs special attention, ask your Onan dealer for assistance; the Onan Parts and Service Organization has been factory-trained to provide up-to-date know-how for keeping your RV electric generating set "on the road." A complete Parts Catalog is available at nominal cost and may be ordered under #927-0220.

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WARNING

**TO PREVENT FIRE OR ACCIDENT HAZARD ...
THIS UNIT MUST BE INSTALLED ACCORDING
TO THE MANUFACTURER'S DETAILED IN-
STALLATION PROCEDURES OBSERVING ALL
MINIMUM CLEARANCES.**

**TO AVOID POSSIBLE PERSONAL INJURY OR
EQUIPMENT DAMAGE, ANY INSTALLATION
AND ALL SERVICE MUST BE PERFORMED BY
QUALIFIED PERSONNEL.**

GENERAL INFORMATION

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* preceding). This information is necessary to identify your generator set among the many types manufactured by Onan.

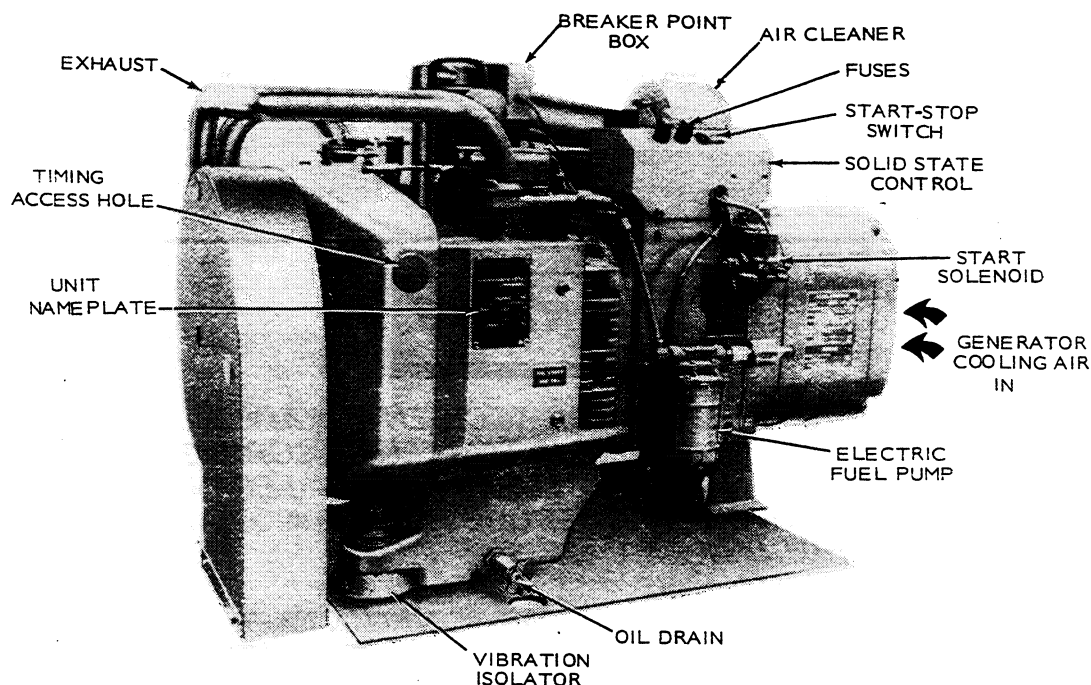


FIGURE 1. TYPICAL CCK FOR RECREATIONAL VEHICLES

SPECIFICATIONS

(Dimensions in parenthesis are metric values)

ENGINE DETAILS

Manufacturer	Onan
Number of Cylinders	Two
Displacement (in ³)	49.8 (816 cm ³)
Cylinder Bore	3.25 inch (82.5 mm)
Piston Stroke	3.00 inch (76.2 mm)
Compression Ratio	5.5 to 1
Engine Speed	1800 rpm
Engine Design	Four Cycle, Air Cooled, L-Head, Horizontally Opposed
Starting Method	Exciter Cranking (Generator)

GENERATOR DETAILS

Manufacturer	Onan
Generator Design	Revolving Armature, Four Pole, 1800 rpm
Rating (Watts)	
4.0 CCK	4000
5.0 CCK	5000
Voltage (AC)	120/240 Volts
Current Rating (Amperes)	
4.0 CCK	
120 Volts	33.3
240 Volts	16.7
5.0 CCK	
120 Volts	41.6
240 Volts	20.8
Phase	Single
Output Wires	Four Wire, Reconnectible
Output Rating	Unity Power Factor
Cranking Current	75-100 Amperes
Break-away Current	300-350 Amperes

CAPACITIES AND REQUIREMENTS

Oil Capacity	4 Quarts (3.78 Litres)
Recommended Battery	12 Volt, 74 Amp/hr (266.40 kC)
Battery Charged Rate Fixed	1-1-1/2 amperes
Average Fuel Consumption @ Rated Load	
4.0 CCK	0.88 gph
5.0 CCK	1.05 gph
Air Inlet Size Required (Minimum)	
4.0 CCK	100 in ² (645 cm ²)
5.0 CCK	100 in ² (645 cm ²)

TUNE-UP SPECIFICATIONS

Spark Plug Gap025 inch (0.64 mm)
Breaker Point Gap020 inch (0.51 mm)
Ignition Timing	19° BTC
Valve Tappet Adjustment	
Intake007 inch (0.18 mm)
Exhaust016 inch (0.41 mm)

INSTALLATION CHECKS

INSTALLATION

Nearly all Onan electric generating sets are installed by the motor home manufacturer. Although the manufacturer must follow safety codes when installing, certain installation problems could arise after the unit is installed and subjected to vibration. There are a few areas that you as the operator should be concerned with. 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

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 RV from set compartment are sealed to prevent poisonous exhaust gases from entering vehicles.

WARNING

All exhaust shielding supplied with unit **MUST** be properly installed to prevent overheating of compartment walls or the possibility of fire.

FUEL SYSTEM

With set running, check for leaks. Raw fuel will cause fumes which could EXPLODE. Check around carburetor and fuel pump inlets. Make sure fuel lines are not rubbing against anything which could cause breakage.

ELECTRICAL

AC Output: All AC leads (M1, M2, M3 and M4) terminate in generator sets junction box. These wires should be connected to distribution box with multistrand wire enclosed in a flexible conduit. Check all wires (to and from the generator set) for fraying and loose connections. For information on load connections refer to operation section following.

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

Separate installation area or compartment from living quarters by a vapor-tight wall to prevent entrance of noxious fumes to interior.

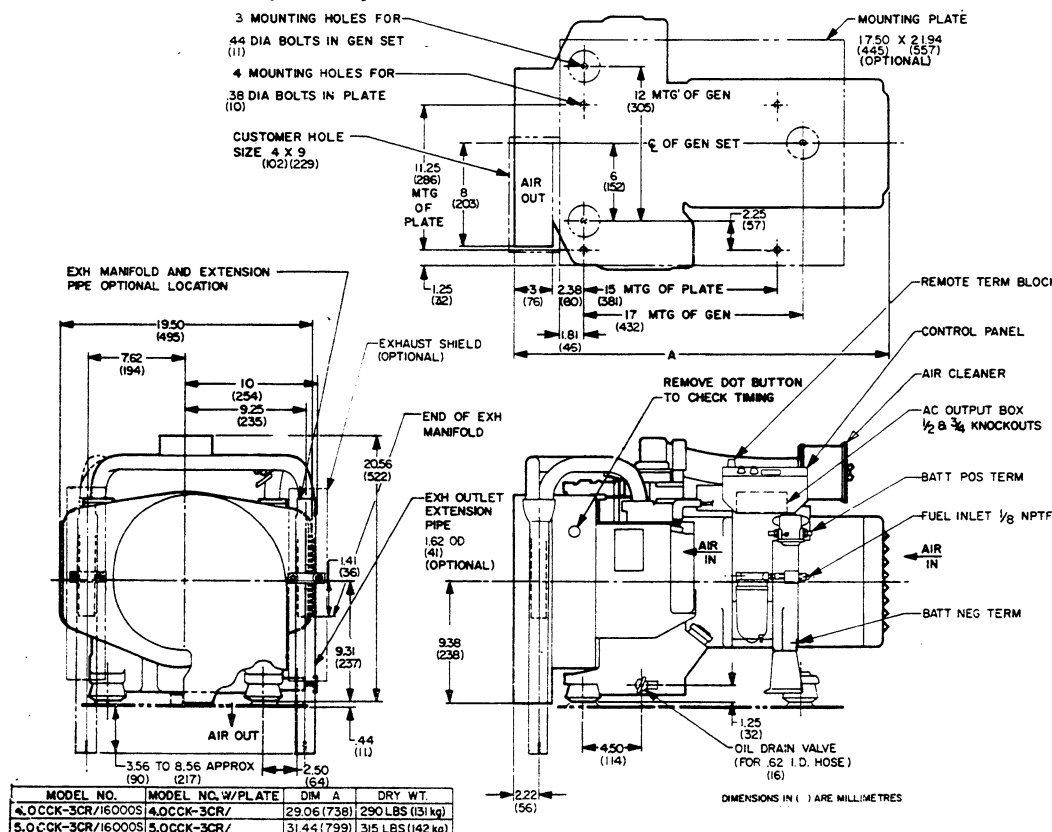


FIGURE 2. INSTALLATION OUTLINE

WARNING Do NOT use maintenance free, unvented batteries with this generator set. Malfunction of the starting-charging system can produce high charging currents, causing excessive gassing. An unvented battery can build up sufficient pressure to explode.

Grounding: Generator must be effectively bonded to recreational vehicle 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.

WARNING Mount the battery in a separate compartment from the set or any spark-producing device to prevent fire or explosion.

VENTILATION

The biggest enemy of electric generating sets installed in motor homes 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 Do not terminate exhaust under vehicle, as carbon monoxide gas is poisonous. Direct exhaust gases away from window and door openings.

WARNING On all listed models with exhaust shielding supplied with unit, shielding **MUST** be properly installed to prevent overheating of compartment walls or the possibility of fire. Refer to appropriate installation guide for each model for details.

WARNING DO NOT DISCONNECT BATTERY CABLES FROM BATTERY WHILE GENERATOR SET IS CRANKING OR RUNNING; SPARKS MAY CAUSE AN EXPLOSION.

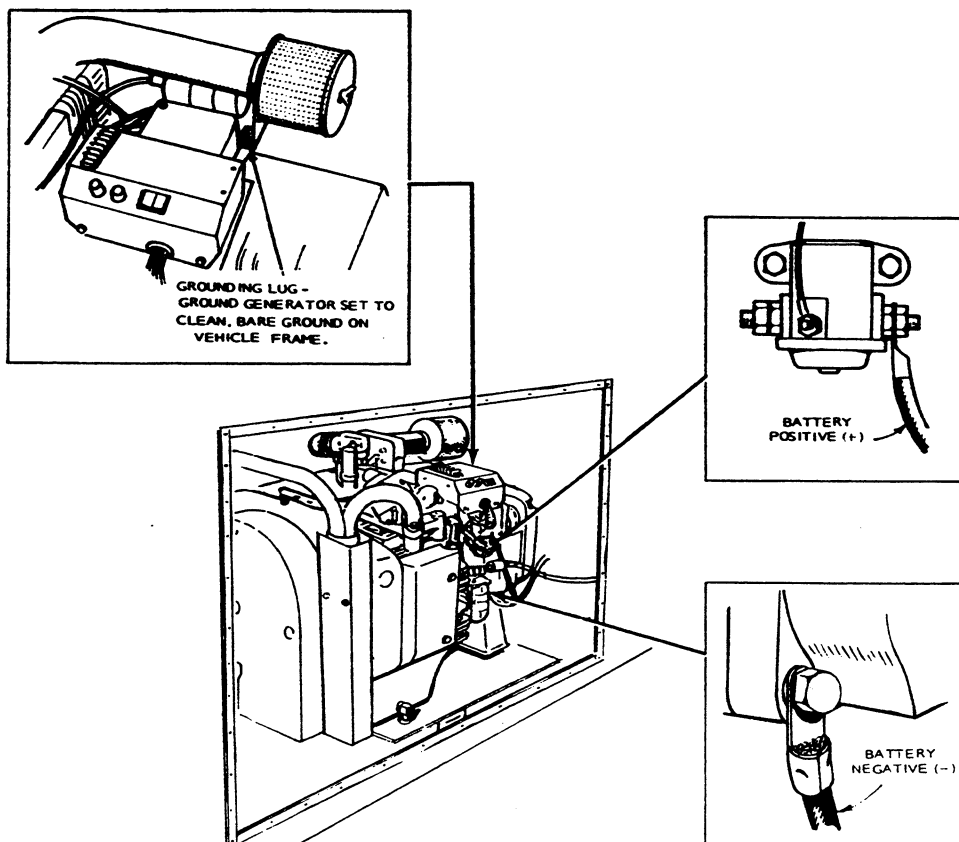


FIGURE 3. BATTERY AND GROUND CONNECTION

OPERATION

BEFORE STARTING

Crankcase Oil

Oil capacity of the CCK generator set is 4 U.S. quarts (3.79 lit). Fill the crankcase until the oil reaches the "FULL" mark on the oil level indicator (Figure 4). DO NOT OVERFILL.

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.

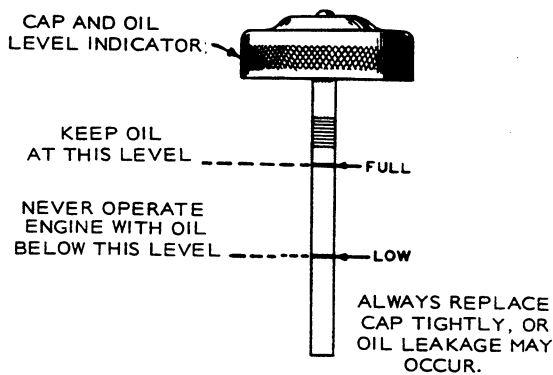


FIGURE 4. CHECKING OIL LEVEL

Use a heavy duty oil with the API (American Petroleum Institute) designation SE or SE/CC (gasoline operation only). If this oil is not available, SD or SD/CC designated oil can be used.

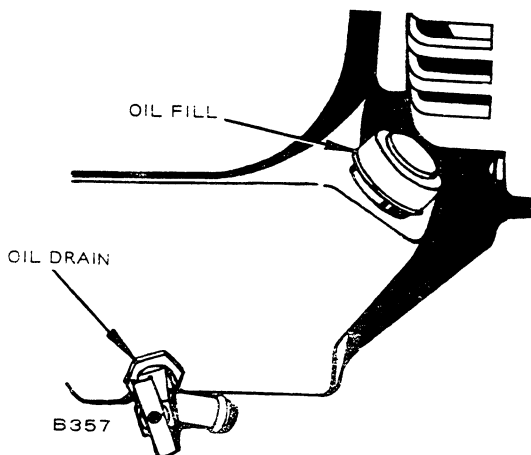


FIGURE 5. OIL DRAIN AND FILL

Check oil level daily and change oil every 100 normal operating hours. See Figure 5 for location of oil drain. If operating in extremely dusty or dirty conditions, the oil might have to be changed sooner. When adding oil between changes, use the same brand as in the crankcase. Various brands of oil might not be compatible when mixed.

TEMPERATURE

GRADE

Below 0° F (-18° C)	5W or 5W-30
0° to 32° F (-18° C to 0° C)	10W or 10W-40
Above 32° F (0° C)	30

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. Use the proper grade oil for the expected conditions.

Use of the same grade and quality oil as that used in your recreational vehicle engine is acceptable as long as unit is serviced regularly and oil meets API designation SE or SE/CC. Other factors (primarily temperature) should also be considered when selecting appropriate engine oil.

Recommended Fuel

All Onan AC electric generating sets for recreational vehicles use gasoline fuel. Because any AC electric generating set runs at a constant speed, lead deposits tend to build up in the combustion chambers. For this reason, use clean, fresh, lead free or low-lead gasoline. Regular grade gasoline may also be used, but DO NOT use highly leaded premium types of fuel.

For new engines, the most satisfactory results are obtained by using unleaded gasoline. For older engines that have previously used leaded gasoline, the cylinder heads must be taken off and all lead deposits removed from engine before switching to unleaded gasoline.

CAUTION

Lead deposits must be removed from an engine before switching from leaded to unleaded gasoline. If not, preignition can occur causing engine damage.

WARNING

Gasoline leakage in or around the compartment is a definite hazard. The ventilation system should provide a constant flow of air to expel any accumulation of fuel vapor while the vehicle is in transit. Compartments must be vapor tight to the interior to keep fumes from within the vehicle.

STARTING

Push the start-stop switch to the start position. Release the switch when engine starts. If engine fails to start, inhibitor oil used at the factory may have fouled the spark plugs. Remove the plugs, clean in a suitable solvent, dry thoroughly and re-install. Heavy exhaust smoke when the engine is first started is normal and caused by the inhibitor oil.

CONTROL FUSES

A 5 amp, 32 volt fuse (F2) is connected in the ignition circuit of the control. If unit cranks but fails to start when switch S1 is pushed, check fuse F2. If remote battery condition meter does not operate, check fuse F1.

STOPPING

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

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 (with one air conditioner only).
2. One half hour at 3/4 load (with one air conditioner and approximately 1000 watts additional load).
3. Change crankcase oil after the first 50 hours of operation.

APPLYING LOAD

If practical, allow set to warm up before connecting a heavy load. Continuous generator overloading may cause high operating temperatures that can damage the windings. Keep the load within nameplate rating.

VOLTAGE SELECTION

Voltage selection on reconnectable single-phase generators is for use as 120/240 volts, 3 wire; or 120 volts, 2 wire. Use the connection for two-wire service when one load exceeds one half the rated capacity. Balance the load when connecting for three wire service. Current for any one output lead must not exceed nameplate rating. When two or more single-phase circuits are available, divide the load equally between them. See Figure 6.

LOAD CONNECTIONS

1. Generator set load wires M1, M2, M3 and M4 terminate within the junction box. Connect and join wires within junction box in an approved manner for desired voltage code. See Figure 6.
2. Wires must be adequate size, properly insulated and supported.
3. Mount switches and controls securely to prevent damage from vibration and road shocks. All

switches must be vibration proof to prevent accidental opening or closing while the vehicle is in motion.

4. All wiring must meet applicable local electrical codes. Have a qualified electrician install and inspect the wiring.

EXERCISE

Infrequent use results in hard starting. Operate the generator set one 30-minute period each week. Run longer if battery needs charging. Exercising for one long period each week is better than several short periods.

BATTERY CHARGING

The battery charge rate is automatically controlled by a solid-state voltage regulator. The high charge rate was set at the factory for average operating conditions.

HIGH OPERATING TEMPERATURES

1. See that nothing obstructs air flow to and from the set.
2. Keep cooling fins clean. Air housing should be properly installed and undamaged.
3. Keep ignition timing properly adjusted.

LOW OPERATING TEMPERATURES

1. Use correct SAE oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move vehicle to a warm location.
2. Use fresh gasoline. Protect against moisture condensation. Below 0°F (-18°C), adjust carburetor main jet for a slightly richer fuel mixture.
3. Keep ignition system clean, properly adjusted and batteries in a well charged condition.
4. Partially restrict cool airflow, but use care to avoid overheating.

OPERATION IN DUST AND DIRT

1. Keep unit clean. Keep cooling surfaces clean.
2. Service air cleaner as frequently as necessary.
3. Change crankcase oil every 50 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. Do *not* polish.

HIGH ALTITUDES

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.

POWER REQUIREMENTS FOR APPLIANCES

Appliance or Tool	Approximate Running Wattage
Refrigerator	600-1000
Electric broom	200-500
Coffee percolator	550-700
Electric frying pan	1000-1350
Hair dryer	350-500
Electric stove (per element)	350-1000
Electric iron	500-1200
Radio	50-200
Electric water heater	1000-1500
Space heater	1000-1500
Electric blanket	50-200
Television	200-600
Electric drill	250-750
Battery charger	Up to 800
Electric water pump	500-600
Air Conditioner	1400-2200
Converter	300-350

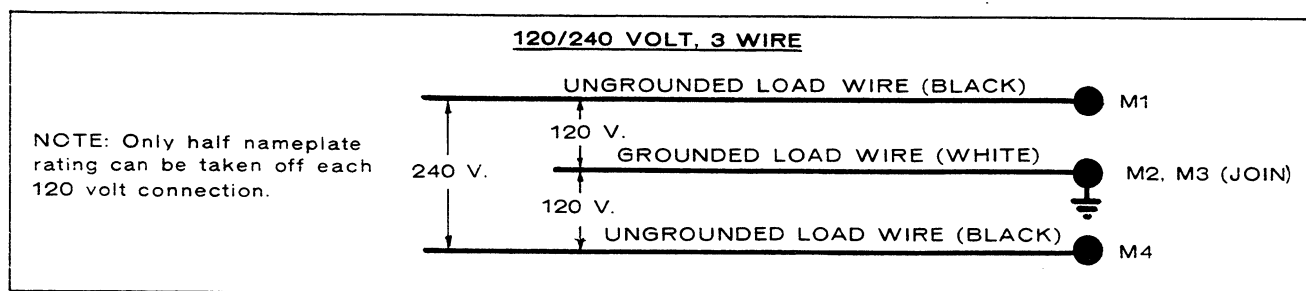
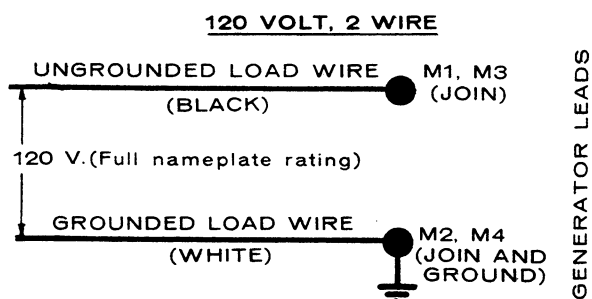


FIGURE 6. SINGLE-PHASE, "3C" VOLTAGE CODE GENERATOR CONNECTIONS

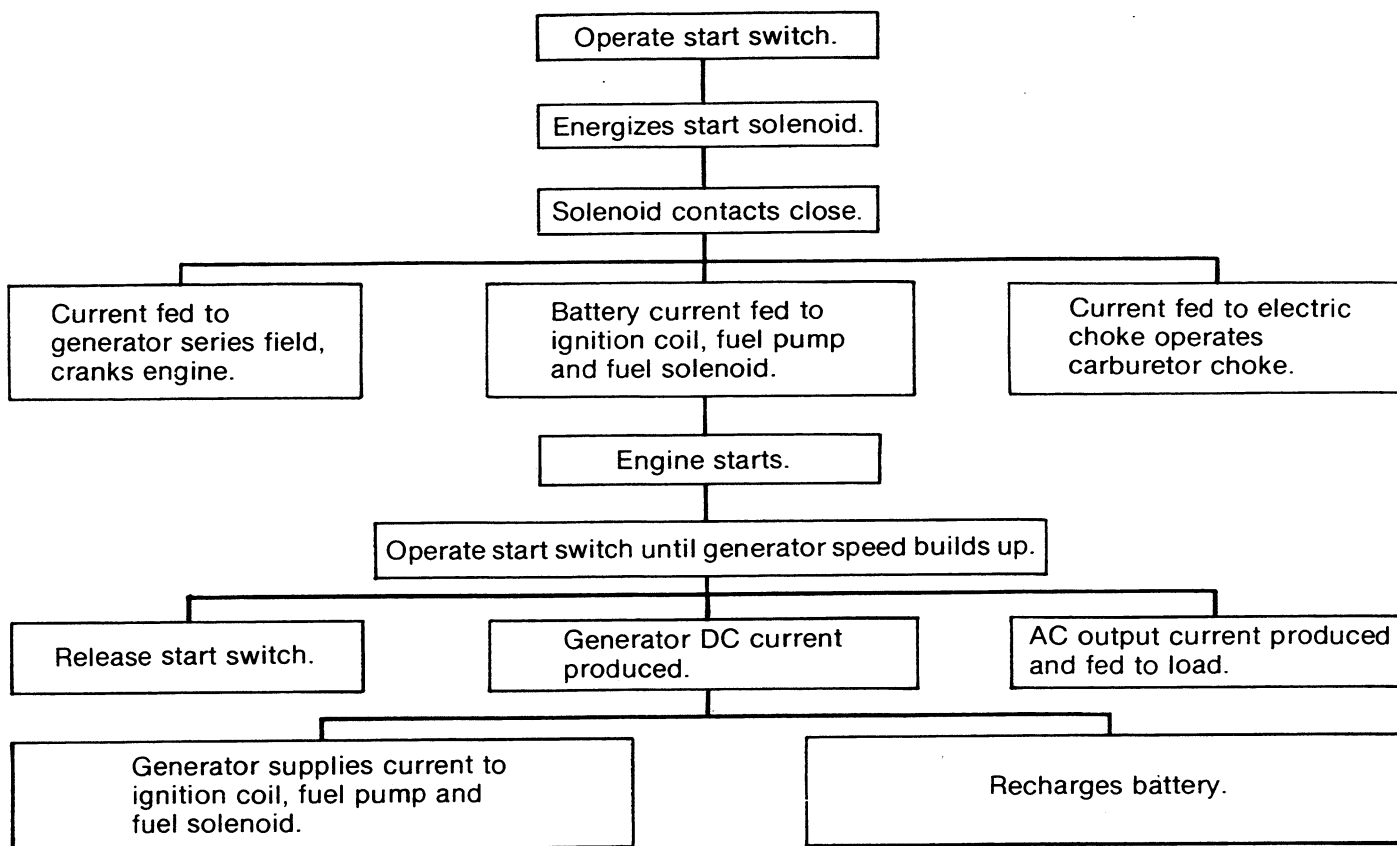


FIGURE 7. SEQUENCE OF OPERATION

OUT-OF-SERVICE PROTECTION

Protect a generator set that will be out of service for more than 30 days from damage caused by rust or corrosion. Use the following procedure to properly protect the set.

1. Run the generator set with at least a 50 percent load until thoroughly warm (usually about 1 hour).
2. Turn off fuel supply and allow the engine to run out of fuel. Also operate the choke manually as the engine stops to help drain the carburetor completely.
3. Drain the oil from oil base while engine is still warm. Replace the oil filter if so equipped. Replace drain plug and refill. Attach a warning tag stating type and viscosity of oil used.
4. Remove spark plugs. Pour 1 ounce of rust inhibitor oil (or SAE #10) into each cylinder. (Spray cans work well for this application.) Turn engine over by hand at least 2 complete revolutions. Replace the spark plugs.
5. Replace the air cleaner at least on an annual basis.
6. Plug the exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
7. Clean and oil all exposed engine parts including carburetor and governor linkage.
8. Wipe generator brushes, slip rings, housing, etc. Do not apply any lubricant or preservative.
9. Remove the battery and store in a cool dry place. Coat the battery terminals and cable connections with vasoline or grease to prevent any corrosion. Recharge the battery at least monthly or maintain with a trickle type battery charger.
10. Provide a suitable cover if the unit is exposed to the elements.

RETURNING THE UNIT TO SERVICE

1. Remove the cover and all protective wrapping. Wipe the oil film off all exposed engine parts. Remove the plug from the exhaust outlet.
2. Visually inspect the unit for any damage. Check to be sure the carburetor and governor linkage are free. Remove the generator end bell band and check to be sure the brushes work freely in their holders.
3. Check the tag to ensure oil of the proper brand and grade has been installed. Check the oil level.
4. Install the battery (be sure battery is fully charged), observing proper polarity. Ground is negative.
5. Remove spark plugs, clean and gap. Turn the engine over by hand several times. Reinstall spark plugs.

6. Turn on fuel, disconnect electric fuel pump lead and electric fuel solenoid shut-off lead if unit is so equipped. Jumper the fuel pump and electric fuel solenoid shut-off leads to the battery to prime the unit. Reconnect the leads.
7. Remove all load and start the generator set at the unit. Initial start may be slow due to oil or rust inhibitor in the cylinders. Excessive smoke and rough operation will occur until the oil or rust inhibitor is burned off.
8. Apply a 50 percent load after the set runs smooth. Allow the generator set to warm up (1 hour) with the load connected. Check speed and voltage.
9. Unit is now ready for service.

ENGINE TROUBLESHOOTING GUIDE

TROUBLE																CAUSE	
	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	Loss of Coolant	Mechanical Knocks	Misfiring	Overheating (Air Cooled)	Overheating (Water Cooled)
GASOLINE ENGINE TROUBLESHOOTING GUIDE																	
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

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. The water ingredient of the electrolyte evaporates, but the sulphuric acid ingredient remains. Therefore, add water, not electrolyte.
6. Avoid overcharging when recharging. Stop the boost charge when the specific gravity is 1.260 and the electrolyte is 80°F (26.7°C).

FUEL SOLENOID

The positive fuel shutoff valve prevents flooding of the generator set, when not in use, should the vehicle fuel tank become pressurized.

ONAN ELECTRIC FUEL PUMP

Every 100 operating hours or sooner, clean the filters. To gain access to the filters in the Onan fuel pump (Figure 8), remove the four top Phillips head screws and lift off the top filter assembly. Clean the two screen filters, reinstall and remount the top filter assembly. Be sure the gasket is in place.

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 100 hours of operation. Remove any dust, dirt or oil which may have accumulated. Check compartment air inlet and power plant air outlet for buildup of dirt, chaff, etc.

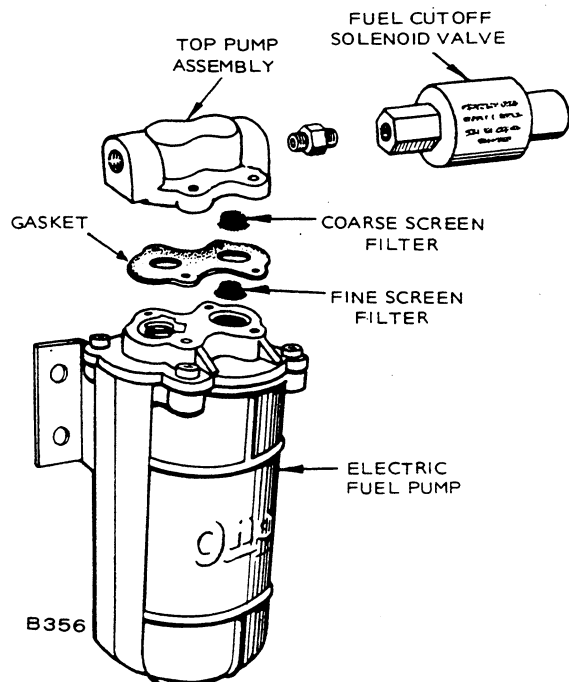


FIGURE 8. ONAN FUEL PUMP

AIR CLEANER

Under normal operating conditions clean the air filter every 50 hours. To clean, remove foam strip and element and tap element on a clean flat surface to dislodge the dirt particles. Do not use high pressure compressed air as damage may occur to paper pleats. Replace element every 200 hours. Replace more often in dusty conditions.

WARNING Replace with Onan fuel pump only (as listed in PARTS INFORMATION section). Standard automotive pumps are high pressure type which may force excessive gasoline into engine causing a fire or explosion.

WARNING Replace with "UL Tested" Onan air filter only. Improper filter may burn due to backfire.

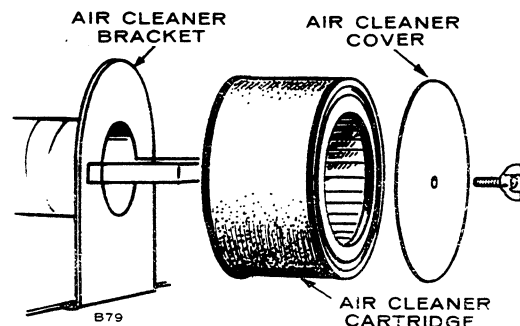


FIGURE 9. AIR CLEANER ELEMENT

SPARK PLUGS

Replace spark plugs every 100 hours or at least once a year. A badly leaded 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.

Each time the spark plugs are removed, inspect, clean and regap (Figure 10). If the plug looks discolored or has fouled, replace it.

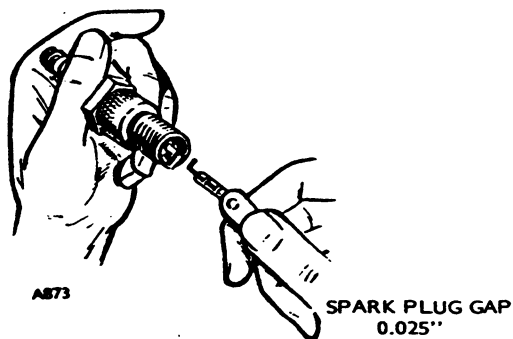


FIGURE 10. CHECKING SPARK PLUG GAP

GOVERNOR LINKAGE

The linkage must be able to move freely through its entire travel. Every 50 hours of operation, clean the joints and lubricate as shown in Figure 11. Also inspect the linkage for binding, excessive slack and wear.

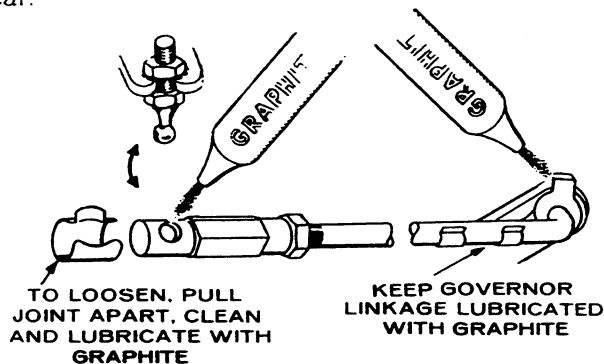


FIGURE 11. GOVERNOR LINKAGE

CRANKCASE BREATHER

Lift off the rubber breather cap and carefully pry valve from cap (Figure 12). Wash and rinse the whole valve in a suitable solvent. Dry the valve and re-insert. Be sure the valve flapper is toward the engine.

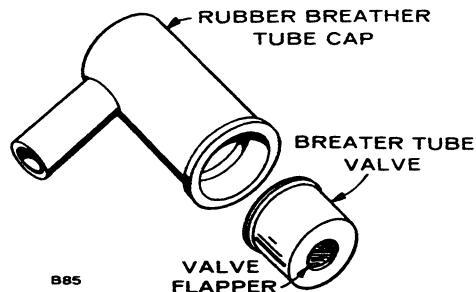


FIGURE 12. CRANKCASE BREATHER

SPEED BOOSTER (5.0 CCK Only)

Use a fine wire to clean the small hole in the short vacuum tube which fits into the hole in the top of the engine intake manifold. Do not enlarge this hole. If there is tension on the external spring when the unit is operating at no load or light load, it may be due to improper adjustment, restricted hole in the small vacuum tube, or a leak in the booster diaphragm or gasket.

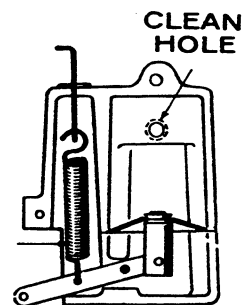


FIGURE 13. VACUUM SPEED BOOSTER

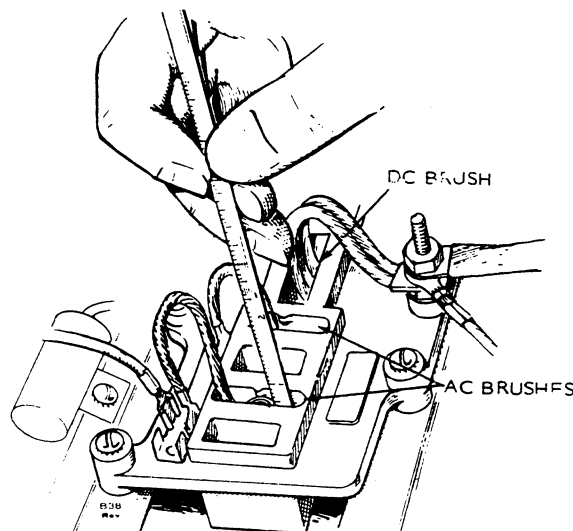
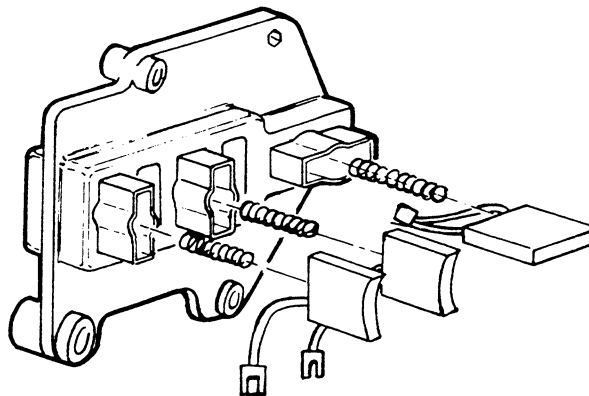
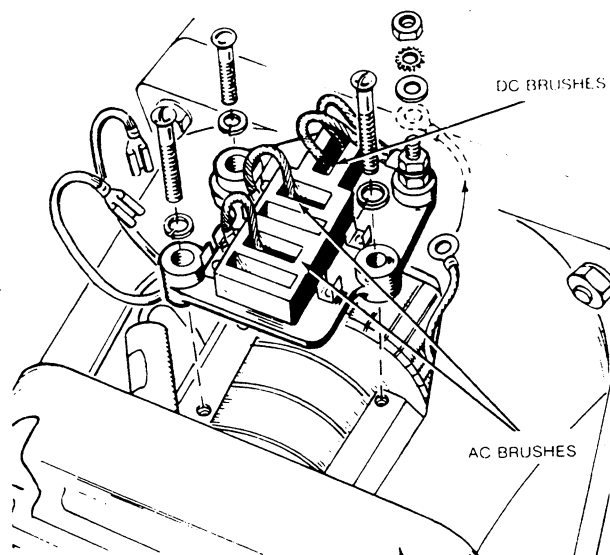
GENERATOR MAINTENANCE

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.

Brush Replacement

Install new brushes when the old ones are worn to the dimensions shown in Figure 14. Remove the end bell band to expose the brush holders. Remove the three screws holding each brush holder in place (Figure 14). Remove the old brushes and clean the holders so the new brushes can move easily in their holders. Install the new brushes in the same manner as the old ones. Always use the correct brush as listed in the *PARTS INFORMATION* section. Never substitute a brush which may appear to be the same for it may have different characteristics. New brushes are shaped to fit and seldom need sanding to seat properly. If some brush sparking occurs after replacing brushes, run the set under a light load until the brushes wear to a good seat.

Collector rings acquire a glossy brown finish in normal operation. Do not attempt to maintain a bright newly machined appearing surface. Ordinary cleaning with a dry, lint free cloth is usually sufficient. Very fine sandpaper (#00) may be used to remove slight roughness.



MEASURE FROM TOP FACE OF
BRUSH BLOCK TO TOP OF BRUSH

	DC	AC
NEW	5/8"	11/16"
1/2 WEAR	13/16"	7/8"
REPLACE	1"	1 1/16"

FIGURE 14. BRUSH LENGTH

EXHAUST SPARK ARRESTERS

Exhaust spark arresters are necessary when operating in some parks and camps. Two basic types are used in the recreation vehicle industry. One is a spin-out type spark arrester, the other is a screen type spark arrester. All require periodic clean-out (every 50 to 100 operating hours) to maintain maximum efficiency.

Spin-Out Type Spark Arrester

This type removes carbon particles by centrifugal force, catching the particles in a holding chamber. Removing a pipe plug from the arrester and operating the electric set (at a convenient time and place) cleans out the deposits. It is important to note this arrester does not plug up when the holding chamber is full and does not cause harmful, high exhaust back pressure. When full, particles pass through the arrester.

Screen Type Spark Arrester

This arrester has a screen which traps carbon particles as they pass through. The screen is removed, cleaned or replaced after it has filled. A disadvantage of this type is the screen plugs as it collects the particles and gradually increases exhaust back pressure. Back pressure causes a loss of engine power and can cause burned or damaged valves if pressure is high enough. It is very important this type be cleaned as recommended.

IMPORTANT: Certain states (particularly California) have state ordinances pertaining to the type and usage of exhaust muffler/spark arresters on internal combustion engines or engine driven equipment when used in a recreational vehicle such as electric generating sets. Be sure your installation meets all Federal, State and local codes pertaining to your unit. Failure to provide and maintain a spark arrester may be in violation of the law.

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.

1-RV

Regularly scheduled maintenance is the key to lower operating costs and longer service life for the unit. The following schedule can be used as a guide. However, actual operating conditions under which a unit is run should be the determining factor in establishing a maintenance schedule. When operating in very dusty or dirty conditions, some of the service periods may have to be reduced. Check

the condition of the crankcase oil, the filters, etc. frequently until the proper service time periods can be established.

For any abnormalities in operation, unusual noises from engine or accessories, loss of power, overheating, etc., contact your nearest authorized Onan Service Center.

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS				
	8	50	100	200	400
General Inspection	x1				
Check Oil Level	x				
Check Battery Electrolyte Level		x			
Change Crankcase Oil			x2		
Check Spark Plugs			x4		
Check Breaker Points			x3		
Clean Breather Valve			x		
Clean Governor Linkage			x		
Service Air Cleaner (Oil Bath)			x2		
Replace Air Cleaner Element (Dry)				x2	
Clean Cooling Fins				x2	
Change Oil Filter (If Used)				x2	
Replace Breaker Points				x4	
Clean Crankcase Breather				x	
Remove Carbon Deposits From Heads				x	
Adjust Tappets					x
Replace Fuel Filter (If Used)					x4
Clean Carburetor					x
Check Generator Brushes (Replace if Necessary)	As Required				

x1 - With set running, visually and audibly check exhaust system for leaks.

x2 - Perform more often in extremely dusty conditions.

x3 - Replace if necessary.

x4 - Replace annually or prior to storage.

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 or door openings. Inspect the vapor tight seals around all openings made in the set's compartment for wiring, conduit, etc., to prevent entrance of any noxious fumes to motor home interior.

ADJUSTMENTS

BREAKER POINTS

1. Remove the two screws and the cover on the breaker box.
2. Remove the two spark plugs so engine can be easily rotated by hand.
3. Turn flywheel in a clockwise direction approximately 1/4 turn after top center (TC).
4. To adjust gap refer to Figure 15. Loosen screws (A) and turn cam (B) until point gap measures .020-inch with a flat thickness gauge. Retighten screws (A) and recheck gap.
5. If points appear to be burned and pitted, replace them with a new set.
6. Replace spark plugs and breaker box cover.

IGNITION TIMING

Both spark plugs on the CCK fire simultaneously, thus the need for a distributor is eliminated. Spark advance is set at 19° BTC (before top center) and should be maintained for best engine performance. Always check timing after replacing ignition points or if noticing poor engine performance. Proceed as follows:

Timing Procedure—Engine Running

1. To accurately check the ignition timing, use a timing light when the engine is running. Connect the timing light according to its manufacturer's instructions. Either spark plug can be used as they fire simultaneously.
2. Remove the plug from the timing hole (Figure 16).
3. Start the engine and check the timing. The mark on the flywheel should line up with the 19° BTC mark on the cover.
4. If timing needs adjustment, loosen the mounting screws on breaker box and move left to advance or right to retard the timing.
5. Start engine to be sure mark on flywheel lines up with 19° mark on cover.
6. Tighten all screws; replace timing plug.

Timing Procedure—Engine Not Running

1. Connect a continuity test lamp set across the ignition breaker points. Touch one test prod to the breaker box terminal to which the coil lead is connected and touch the other test prod to a good ground on the engine.
2. Turn crankshaft against rotation (counterclockwise) until the points close. Then slowly turn the crankshaft with rotation (clockwise).
3. The lamp should go out just as the points break which is the time at which ignition occurs (19° BTC).

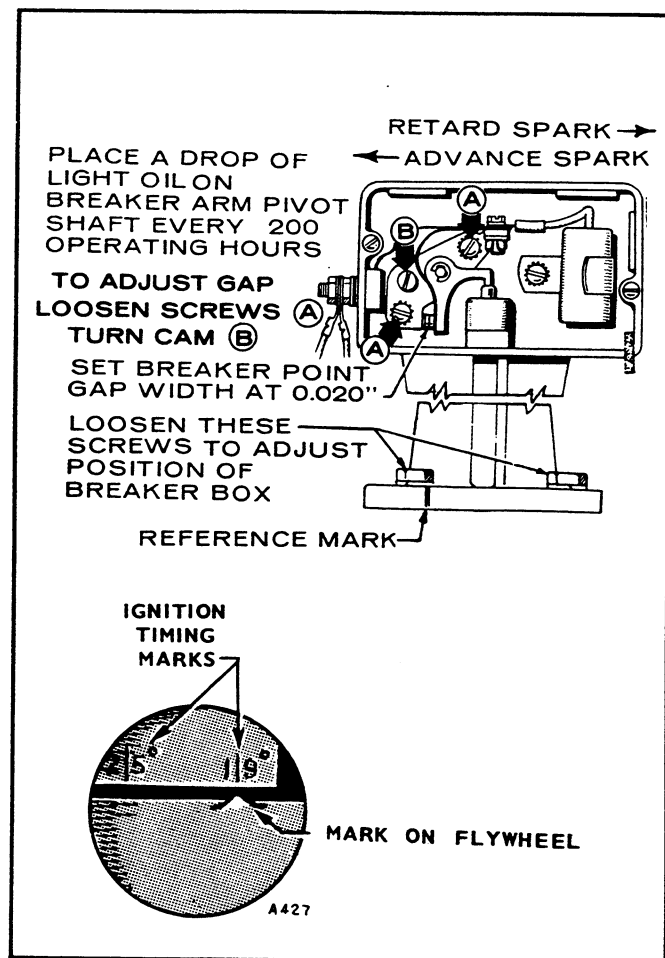


FIGURE 15. BREAKER BOX AND TIMING MARK

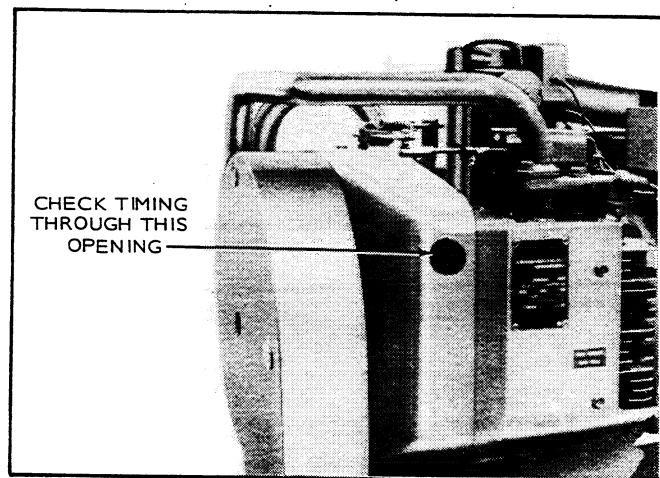


FIGURE 16. TIMING ACCESS HOLE

CARBURETOR

The carburetor has an adjustable idle and main jet. If the engine runs unevenly at half or full load due to faulty carburetion, the main adjusting screw requires adjustment. The idle adjustment screw normally requires little attention other than a periodic cleaning. A hunting condition (alternate increase and decrease in engine speed) at no load can sometimes be corrected by an idle adjustment. Make all adjustments with the engine at normal operating temperature.

To adjust the main screw, connect a full or nearly full load to the engine. Turn the main adjusting screw out about two full turns. Then turn it in slowly until the engine begins to lose power and speed. Then turn it out slowly until the engine runs smoothly at full power and speed. If the engine develops a hunting condition try correcting by opening the main adjusting screw a little more. Do not open more than 1/2 turn beyond the maximum power point. If this does not correct the condition, adjust the governor sensitivity.

Adjust the idle screw with no load connected to the engine. Turn the screw in until the engine loses considerable speed. Then turn it out until the engine runs smoothly.

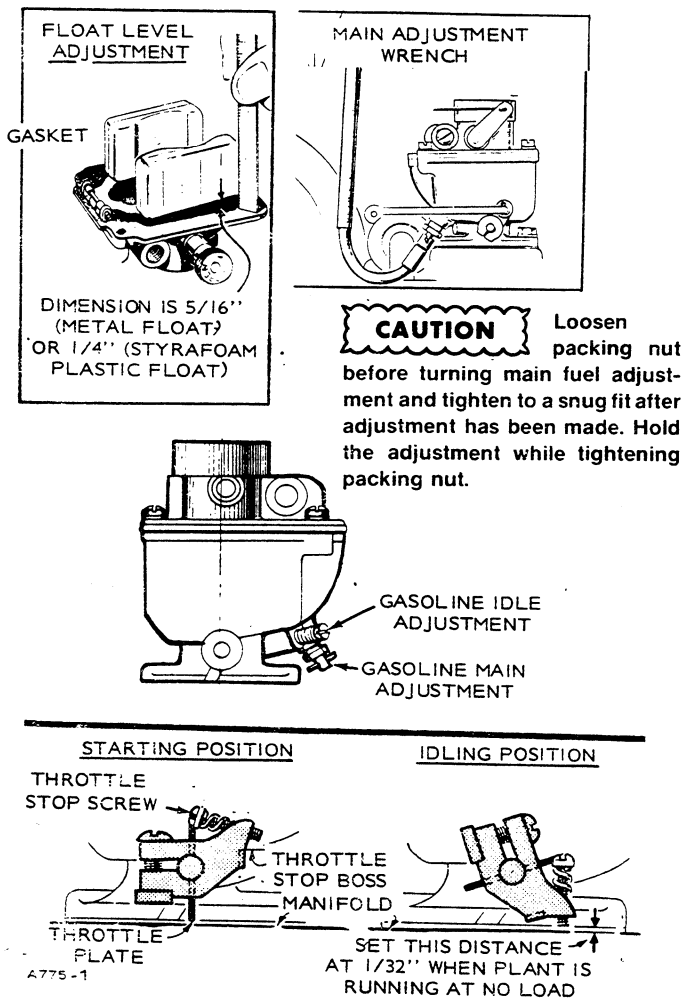


FIGURE 17. CARBURETOR ADJUSTMENTS

ELECTRIC CHOKE

If extremes in starting temperatures require a readjustment of the choke, slightly loosen the two cover retaining screws. 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.

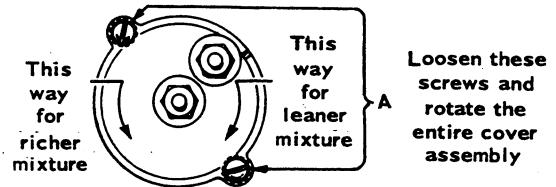


FIGURE 18. ELECTRIC CHOKE

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.

GOVERNOR AND BOOSTER

The governor and booster control the speed of the engine. A speed adjustment includes adjusting both devices (Figure 19).

Governor Adjustment

Before making adjustments, run the set about 15 minutes with a light load connected 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. Connect an accurate voltmeter or frequency meter (preferably both) 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. Use a tachometer to check engine speed.

A binding in the bearings of the governor shaft, in the ball joint, or in the carburetor throttle assembly causes 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.

1. Adjust the carburetor main jet for the best fuel mixture while operating the set with a full rated load connected.
2. Adjust the carburetor idle needle with no load connected.

3. Adjust the length of the governor linkage and check linkage and throttle shaft for binding or excessive looseness.,
4. Adjust the governor spring tension for rated speed at no load operation with booster disconnected (or held inoperative).
5. Adjust the governor sensitivity.
6. Recheck the speed adjustment.
7. Set the carburetor throttle stop screw.
8. Set the vacuum speed booster.

Linkage

The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle shaft and lever 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 carburetor throttle lever just contacts the underside of the carburetor bowl. This setting allows immediate control by the governor after starting. It also synchronizes travel of the governor arm and the throttle shaft.

Speed Adjustment

With the warmed-up unit operating at no load, and with the booster external spring disconnected (or otherwise held inactive), adjust the governor spring tension. Refer to Voltage Chart and the Speed Chart and select the column which corresponds to the nameplate of the unit in question. Turn the speed adjusting nut to obtain a voltage and speed reading within the limits shown.

**VOLTAGE CHART
FOR CHECKING GOVERNOR REGULATION**

AC GENERATING SETS	120 VOLT 1 PHASE 2 WIRE	120/240 VOLT 1 PHASE 3 WIRE
Maximum No Load Volts	126	126/252
Minimum Full Load Volts Without Booster	110	110/220

NOTE: Output rating is at UNITY power factor load.

**SPEED CHART
FOR CHECKING GOVERNOR REGULATION**

Maximum No Load Speed RPM Hertz (Current Frequency)	1890 63
Minimum Full Load Speed Without Booster RPM Hertz	1770 59

Sensitivity Adjustment

Refer to the Governor Adjustment illustration, and to the Voltage and Speed Charts. 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 condition.

To increase sensitivity (closer regulation), shift the adjusting clip toward the governor shaft.

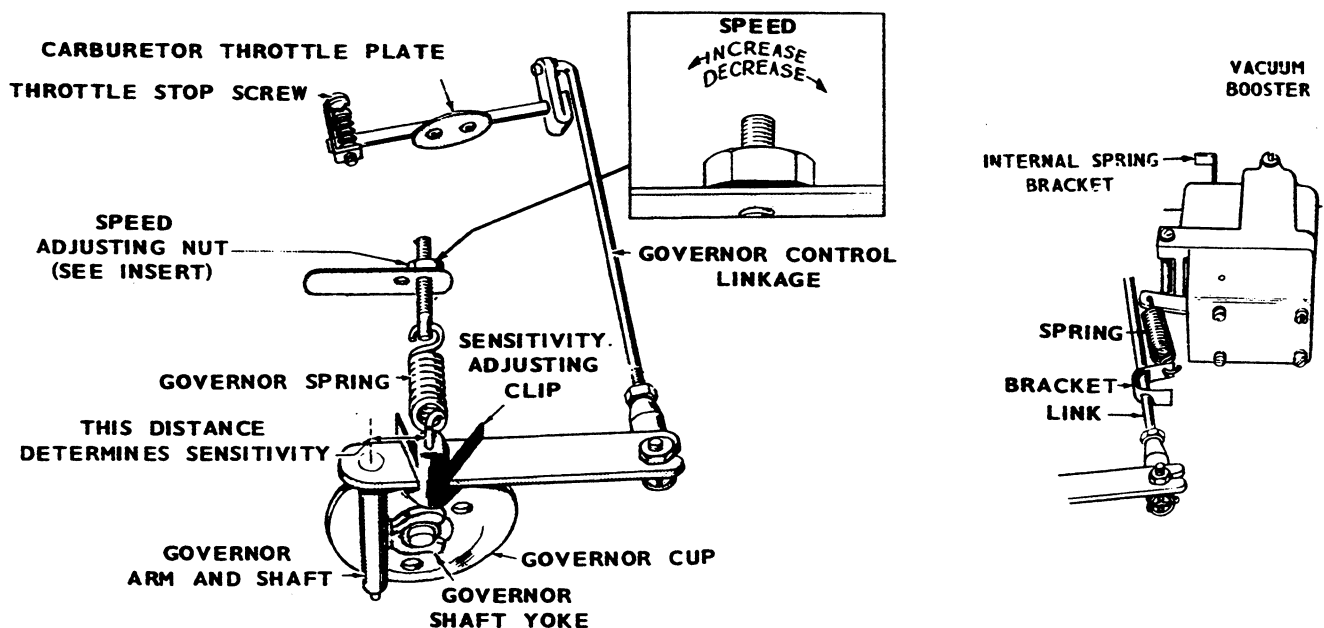


FIGURE 19. GOVERNOR AND SPEED BOOSTER

An adjustment for too much sensitivity will cause alternate increase and decrease of engine speed (hunting).

To decrease sensitivity, shift the adjusting clip toward the outer end of the governor arm. Too little sensitivity will result in too much difference in speed between no load and full load conditions.

Any change in the sensitivity adjustment usually requires a compensating speed (spring tension) adjustment.

Speed Booster (5.0 CCK Only)

After satisfactory governor performance under various loads has been attained by adjustments without the booster, the booster can be connected. Connect the booster external spring to the bracket on the governor link (rod). With the unit operating at no load, slide the bracket on the governor link just to the position where there is no tension on the external spring (Figure 19).

Apply a full rated electrical load to the generator. The output voltage should stabilize at nearly the same reading for full load as for no load operation. The speed may remain about the same or increase when the load is applied, resulting in a frequency 1 or 2 hertz *higher than* the no load frequency (1 hertz is equal to 30 rpm for a 4-pole generator). If the frequency rise is more than 2 hertz, lessen the internal spring tension. If there is a drop in the frequency, increase the booster internal spring tension. To increase the tension, pull out on the spring bracket and move the pin to a different hole.

With the booster disconnected, a maximum drop of 3 hertz from no load to full load is normal. With the booster in operation, a maximum *increase* of 2 hertz from no load to full load is normal. A drop of 1 hertz at 1/4 load is permissible, giving an overall spread of 3 hertz maximum.

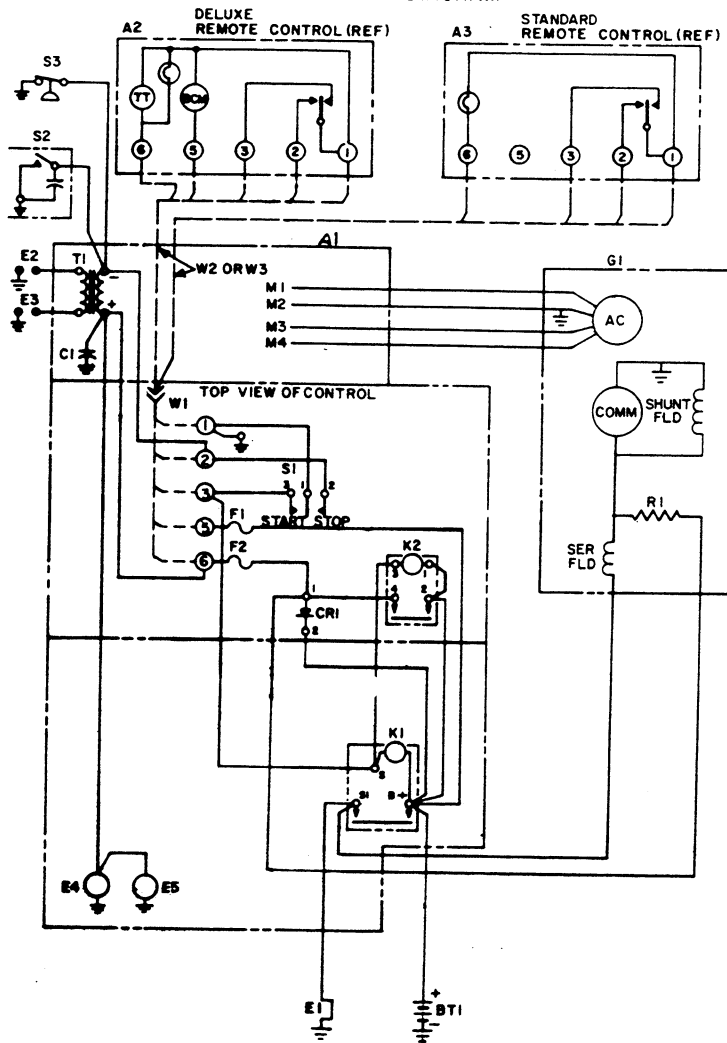
The effect of the booster is limited by the general condition of the engine. The booster cannot compensate for a loss in engine vacuum caused by leaky valves, worn piston rings, etc.

CONTROL TROUBLESHOOTING

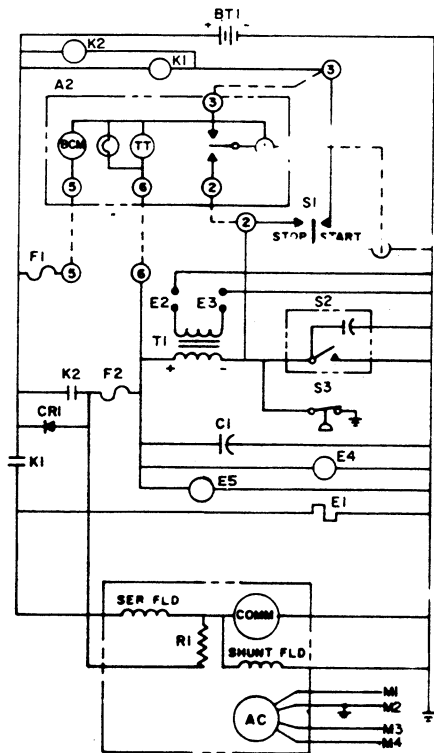
PROBLEM	PROBABLE CAUSE	REMEDY
FAILS TO CRANK	1. Bad Battery Connection	1. Clean and tighten all battery and cable connections.
	2. Low Battery	2A. Check specific gravity. Recharge or replace battery if necessary.
		2B. Reverse current diode (CR1) may be shorted or open causing a drain on the battery. R2 may be open.
	3. Faulty Start Solenoid (K1)	3. 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, replace start solenoid.
	4. Faulty Start Switch	4. Replace. Jumper solenoid (S1) terminal to ground. If solenoid does not energize replace switch.
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. Blown Fuse (F2)	1. Replace fuse (F2) on control.
	2. Faulty Fuel Solenoid Or Fuel Pump On later models, fuel solenoid is an integral part of fuel pump.	2. 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>
	3. Faulty Ignition	3. 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.
	4. Inoperative Choke	4. 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, bi-metal spring relaxes and allows choke vane to open fully. The lever will pulsate as engine warms up. See ADJUSTMENT section.
	5. Faulty Crank Ignition Relay (K2)	5. Check voltage from relay terminal "4" to ground while cranking unit. Battery voltage should appear at this terminal. If not, check for voltage at relay terminals "1" and "2". If battery voltage is present at terminals 1 and 2, but not at 4, replace relay. If not voltage appears at terminals 1 and 2 on relay 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. 2. Run Ignition Relay K3. 3. Low Oil Level 4. S3 Low oil pressure switch may be defective.	1. Check voltage on both sides of R1. With set running voltage should be 24-32 volts DC. 2. Check voltage on both sides of K3. Should be 12 volts. 3. Check oil level. If low or empty, refill to proper level. 4. Check S3. Switch should close with set running at 10 lbs. minimum oil pressure.
UNITS RUNS THEN STOPS	1. Low Oil Level	1. See 1 above
UNITS RUNS BUT SURGES	1. Stuck Choke	1. See 5 above (CRANKS BUT WON'T START)
	2. Governor Not Adjusted Properly	2. Readjust governor.
UNITS STOPS	1. Faulty Ignition	1. See 3 above (CRANKS BUT WON'T START)
	2. Out of Fuel	2. Refill fuel tank.
	3. Low Oil Level	3. See 1 above
REMOTE RUNNING TIME METER OR GENERATOR CAMP INOPERATIVE	1. Blown Fuse (F1)	1. Replace F1 fuse on control.

611-1127

WIRING DIAGRAM



SCHEMATIC



RECONNECTION CHART

120V, 2W	120/240V, 3W
M1	M1
M2	M2
M3	M3
M4	M4

FIGURE 20. GENERATOR SET SCHEMATIC

- A1 Set Control Assembly
- A2 Optional Deluxe Remote Control
- A3 Optional Std. Remote Control
- BT1 12 Volt Battery
- CR1 Reverse Current Diode
- E1 Electric Choke
- E2, E3 Spark Plugs
- E4 Electric Fuel Pump
- E5 Electric Fuel Solenoid
- F1 Fuse (5 Amp, 32 Volt)

- F2 Fuse (5 Amp, 32 Volt)
- G1 Generator
- K1 Start Solenoid
- K2 Crank Ignition Relay
- M1-M4 Generator Load Wires
- R1 Battery Charging Resistor
- S1 Start Stop Switch
- S2 Breaker Points
- S3 Low Oil Pressure Switch
- T1 Ignition Coil

REMOTE ACCESSORIES

INSTALLING STANDARD REMOTE CONTROL

This control includes a start-stop switch with an indicator lamp. Install as follows:

1. Select switch location. Using Figure 21 as a guide, drill screw holes and cut holes in RV panel.
2. Following national and local electrical codes and using four insulated wires of predetermined length (#18 or larger), connect remote switch to terminals on generator. See Figure 22.

CAUTION Ensure that leads from remote switch connect with corresponding terminals on generator terminal board.

CAUTION Don't route DC wires for remote control through conduit containing AC load wiring. Induced voltages may cause erratic operation.

3. Insert remote switch in hole cutout and secure with two #5 woodscrews supplied with switch.

WARNING

Seal all holes that might allow noxious gases from generator set into motor home.

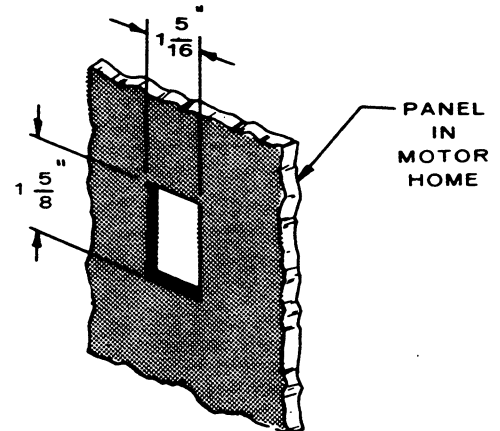


FIGURE 21. MOTOR HOME CUTOUT

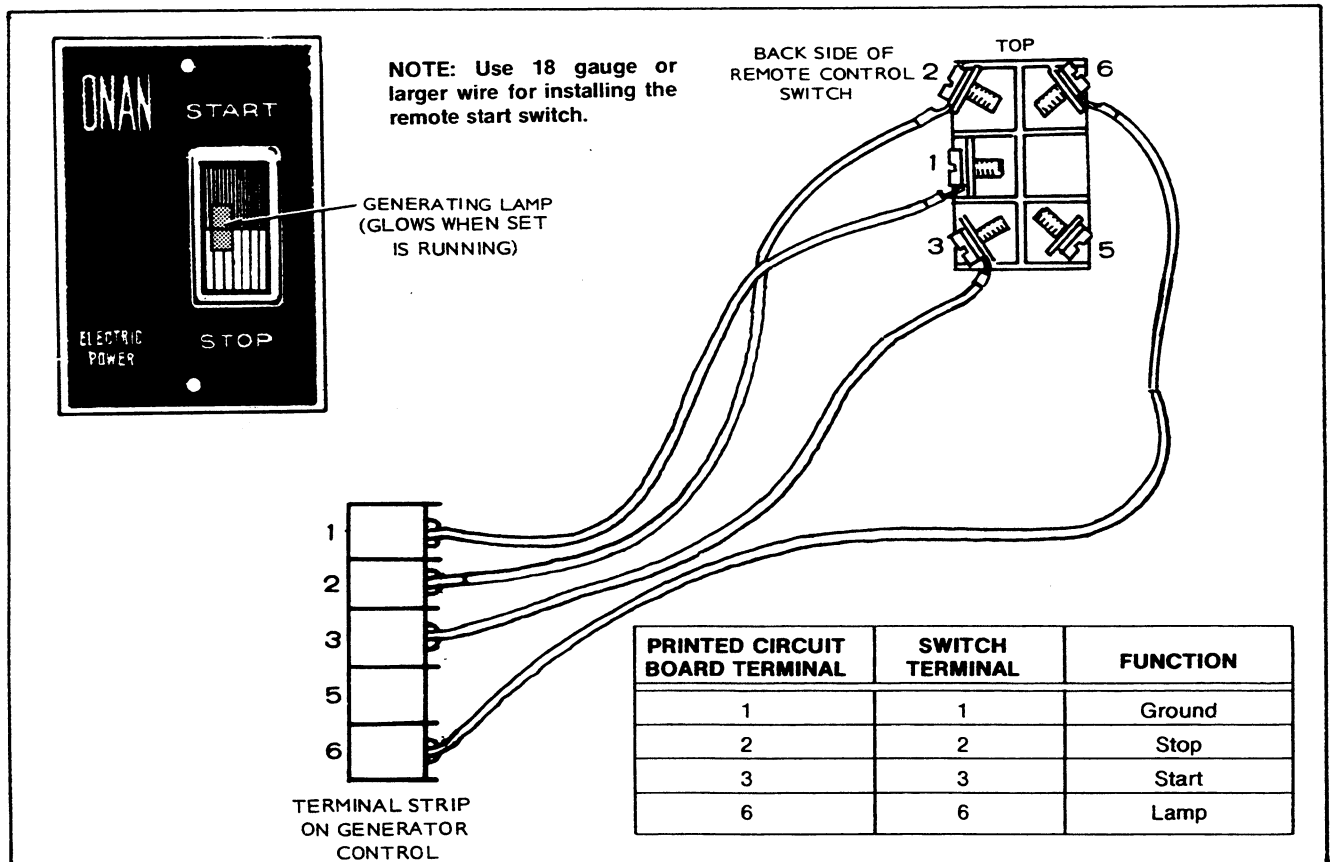


FIGURE 22. CONNECTING REMOTE CONTROL (300-0985)

INSTALLING DELUXE REMOTE CONTROL

This control includes a start-stop switch with an indicator lamp, a running time meter and a battery condition meter. Install and connect as follows:

1. Select control location. Using Figure 23 as a guide, drill screw holes and cut hole to accommodate remote switch in panel.
2. Following national and local electrical codes and using five insulated wires of predetermined length (#18 or larger), connect remote control to terminals on generator. Ensure that leads from remote control connect to corresponding terminals on generator terminal board. See Figure 24.

CAUTION Don't route DC wires for remote control through conduit containing AC load wiring. Induced voltages may cause erratic operation.

3. Insert remote control in hole cutout and secure with four #5 woodscrews supplied with switch.

WARNING To prevent noxious gases from entering vehicle interior, seal any openings made in the set's compartment for conduit, wiring, etc.

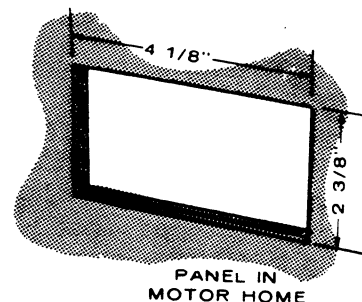


FIGURE 23. MOTOR HOME CUTOUT

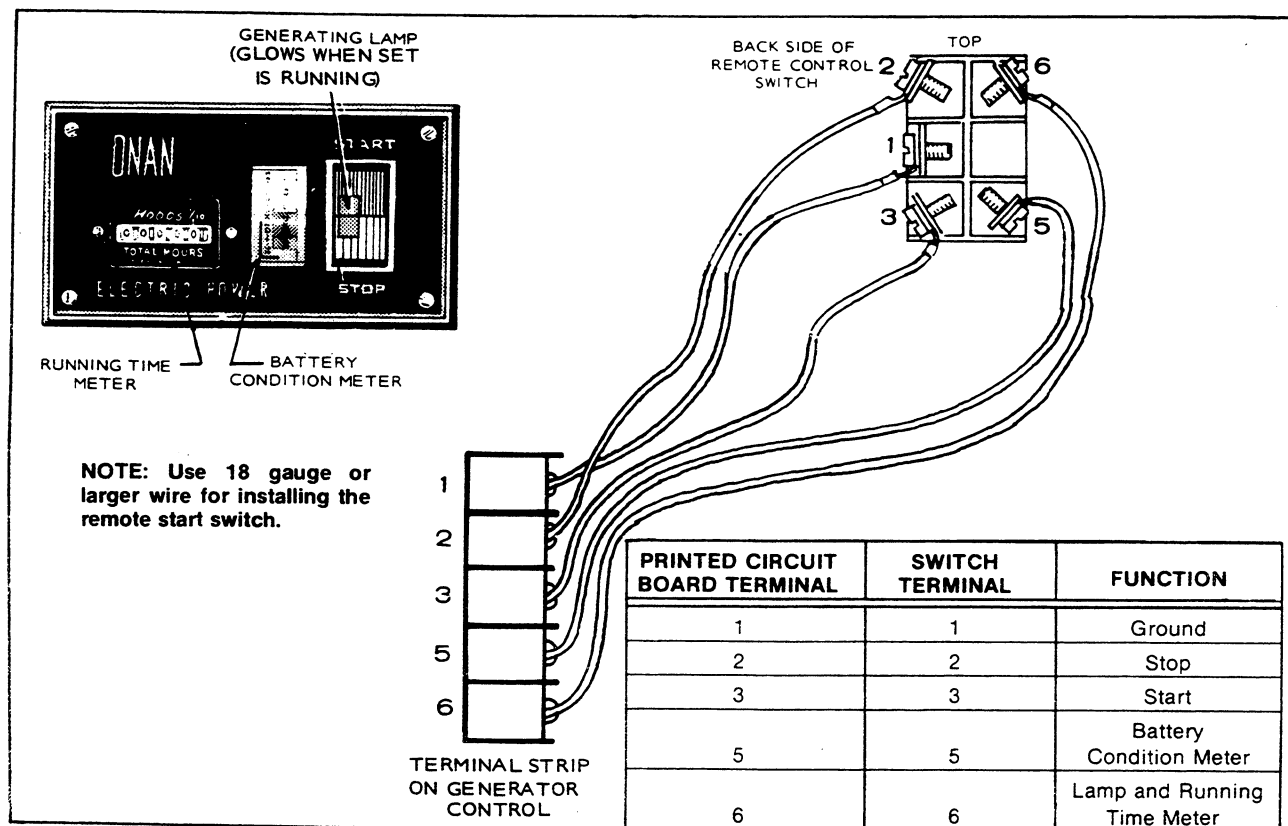


FIGURE 24. DELUXE REMOTE CONTROL



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