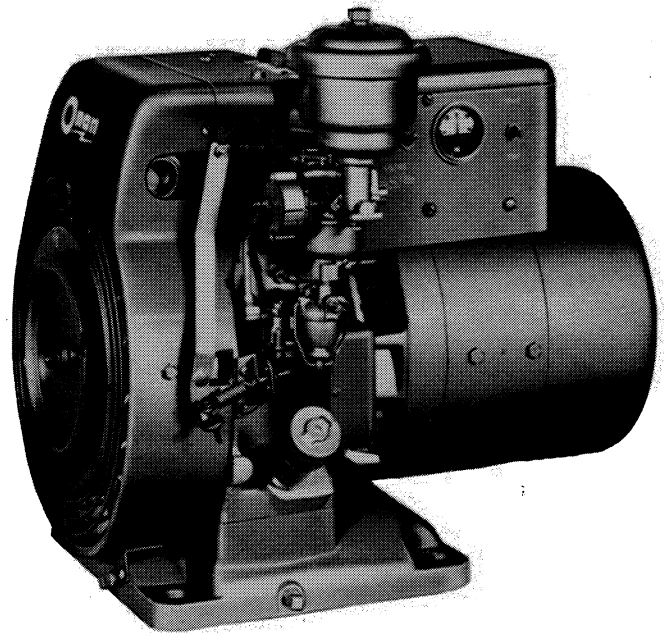


# Onan

## Operator's Manual LK GenSet



# Safety Precautions

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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 with the engine running unless tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR ALLOW AN OPEN FLAME near the generator set or fuel tank. Internal combustion engine fuels are highly flammable.
- Fuel lines must be adequately secured and free of leaks. Fuel connections at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure that 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

- Provide an adequate exhaust system to properly expel discharged gases. Inspect the exhaust system daily for leaks per the maintenance schedule. See that exhaust manifolds are secure and are 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

- Keep your hands away from moving parts.
- Before performing any maintenance on the generator set, disconnect the starting battery negative (–) ground lead first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.

- Do not wear loose clothing or jewelry while servicing any part of the generator set. 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 WILL CAUSE SEVERE PERSONAL INJURY OR DEATH

- Remove electric power 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. DO NOT tamper with interlocks.
- 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 THE GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL POWER 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

- Provide appropriate fire extinguishers and install them in convenient locations. Consult your local fire department for the correct type of extinguisher to use. Do not use foam on electrical fires. Use extinguisher rated ABC by NFPA.
- 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.
- 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.
- Make sure that rags are not left on or near the engine.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause over heating and engine damage, and present a potential fire hazard.
- Keep the generator set and the surrounding area clean and free from obstructions. Remove any debris from the set and keep the 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.



## Supplement 930-1004

**Date:** 5/82

**Insert with -**

**Title:** Operators Manual

**Number:** 930-0121

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The following supplemental information applies to all LK generator sets now advanced from Spec L to N.

All models (beginning Spec N) incorporate internal full pressure positive displacement oil lubrication to main and connecting rod bearings, crankshaft, camshaft and other internal components.

Oil capacity remains unchanged at 4 pints (1.9 L).



# GENERAL INFORMATION

Instructions in this manual may refer to a specific model of generator set. Identify the model by referring to the MODEL and SPECIFICATION NO. as shown on the set nameplate. Electrical characteristics are shown on the lower portion of the set nameplate.

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# SPECIFICATIONS

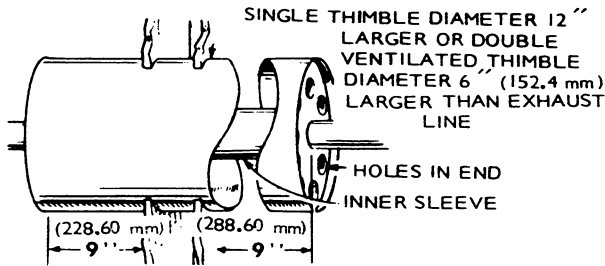
	<b>MODEL SERIES</b>	
	<b>M</b>	<b>R</b>
<b>M = manual start</b>		
<b>R = remote start (electric crank)</b>		
Nominal dimension of set (inches)		
Height .....	21	21 (533 mm)
Width .....	18-5/16	18-5/16 (465 mm)
Length .....	27-1/4 (692 mm)	25 (635 mm)
Number cylinders .....	1	1
Displacement (cubic inch) .....	24.9	24.9 (408.11 cm <sup>3</sup> )
Cylinder bore .....	3-1/4	3-1/4 (82.55 mm)
Piston stroke .....	3	3 (76.20 mm)
RPM (60 hertz) .....	1800	1800
RPM (50 hertz) .....	1500	1500
Compression ratio .....	5.5	5.5
Ignition (type)		
Flywheel magneto .....	Yes	No
Battery voltage (AC set) .....	None	12 volt
Battery size (AC set)		
SAE group 1H .....		Two 6 volt in series
Amp/hr SAE rating — 20 hr. (nominal) .....		105 (378 kC)
Starting by pull rope (recoil) only .....	Yes	No
Starting by exciter cranking .....	No	Yes
Battery charge rate (amperes) .....		8 Maximum
Ventilation required (cfm @ 1800 rpm)		
Engine .....	300	300 (.14 m <sup>3</sup> /sec)
Generator .....	60	60 (.03 m <sup>3</sup> /sec)
Combustion .....	20	20 (.01 m <sup>3</sup> /sec)
Output rating (power factor) .....	1.0	1.0
Rating (output in watts)		
60 hertz (general utility) .....	2500	2500
50 hertz (general utility) .....	1700	1700
AC voltage regulator in ± % .....	6	6
AC frequency regulation in % .....	5	5
Generator .....		Revolving Armature

## TUNE-UP SPECIFICATIONS

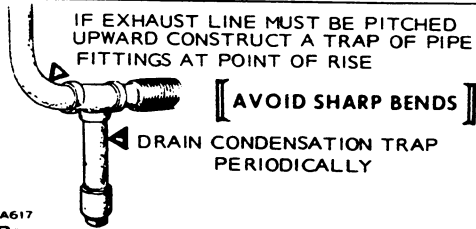
Spark Plug Gap	
Gasoline .....	.025 inch (0.64 mm)
Gas .....	.018 inch (0.45 mm)
Ignition breaker point gap (at full separation) .....	.020 inch (0.51 mm)
Ignition timing .....	19° BTC
Tappet adjustment	
Intake .....	.007 to .009 inch (.18 to .23 mm)
Exhaust .....	.015 to .017 inch (.38 to .43 mm)
Carburetor float adjustment .....	11/64 inch (4.37 mm)
Cylinder head torque .....	27 to 29 ft. lbs. (36 to 39 N•m)

# INSTALLATION

## EXHAUST

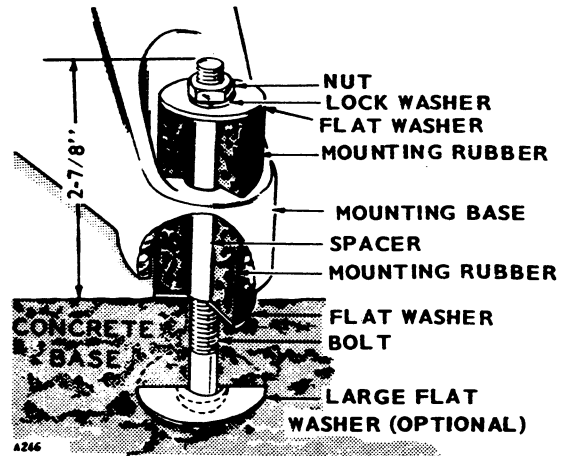


### EXHAUST LINE PASSING THROUGH WALL OR PARTITION



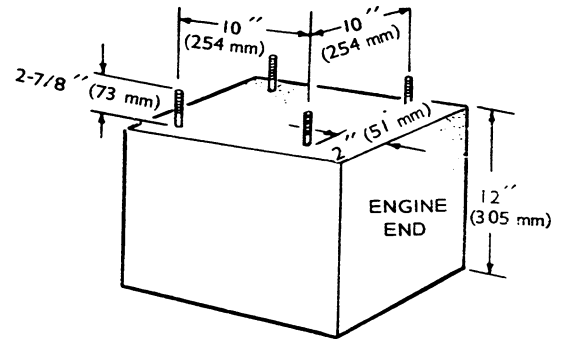
A617  
Rev.

## VIBRATION ISOLATORS



## RECOMMENDED MOUNTING BASE

BE SURE BASE IS SMOOTH  
AND LEVEL ON TOP.



LOCATE BASE TO ALLOW AT LEAST  
24" (610 mm) SPACE ON ALL SIDES.

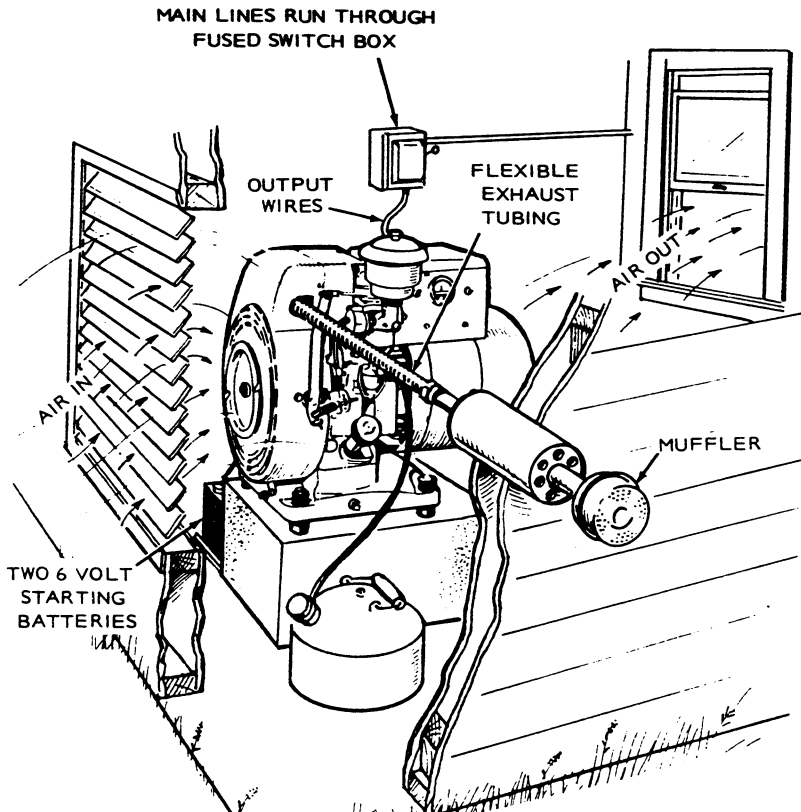


FIGURE 1. TYPICAL INSTALLATION

## COOLING AIR

Pressure cooled models require an air inlet opening and an air outlet of 3 square feet (.28m<sup>2</sup>). Position the outlet opening above and to the rear of the set, the inlet opening just opposite the blower housing.

## VACU-FLO COOLED

Air flow through Vacu-Flo units is reversed. Provide an air inlet of at least 41 square inches (265cm<sup>2</sup>) for 3000 or 3600 rpm units. Duct the heated air outside. An optional automatic air shutter and air duct is available for use in cold weather.

**WARNING** Utilizing exhaust manifold heat to warm a room or compartment occupied by people is not recommended due to possible leaking of exhaust gases.

## EXHAUST

**WARNING** Exhaust gases are deadly poisonous!

Vent exhaust gases outside. Use flexible tubing between the set's exhaust outlet and rigid piping. Shield the line if it passes through a combustible wall or partition. If turns are necessary, use one pipe size larger for each ten feet in length. Position the exhaust outlet away from the set's air intake.

## LOCATION

Provide a protected location that is dry, dust-free, and preferably heated in cold weather. For service convenience, provide at least 24 inch (610 mm) clearance around set.

## OIL DRAIN

For convenience in draining oil, remove the oil drain plug and install an extension pipe and coupling.

## GENERAL

Important installation points are: sufficient cooling, exhaust gas discharge, electrical and fuel connections, location and mounting.

Each installation must be considered individually — use these instructions as a general guide. Always check local building codes, fire ordinances, etc., for compliance. Provide a location that is protected from the weather and is dry, dust free, and preferably warm in cold weather. The air discharge side of set requires only a 3-inch (76 mm) clearance from wall to permit set to rock on its mounts but at least 24-inch (610 mm) clearance is required around all other sides for service accessibility.

## MOUNTING

A permanent installation needs a sturdy, level, mounting base of concrete, heavy wood or structural steel at least 12 inches (305 mm) high to aid oil changing and operating.

Carefully assemble the mounting cushions, washers and spacer bushing (Figure 1). The spacer bushing prevents compression of the snubber (upper rubber cushion). Space the 5/16 inch mounting bolts as shown.

## VENTILATION AND COOLING

Air circulation is needed to dissipate heat produced by the engine and generator in normal operation. Outdoor installations can rely on natural circulation, but mobile, indoor or housed installations need proper size and positioned vents for required air flow. See *SPECIFICATIONS* for the air requirements at 1800 rpm.

Vent sizes depend on variable conditions: (1) size of enclosure, (2) ambient temperature, (3) electrical load, (4) running time, (5) restrictions imposed by screens, louvers, shutters, or filters, and (6) prevailing wind direction.

**Remember that a required volume of air must reach the unit, absorb the heat, and be discharged away from the installation.**

Pressure cooled sets need an inlet vent with an unrestricted opening of at least 3 square feet for variables. For discharged air, install separate duct from the engine.

Auxiliary fans can be used to increase air flow to units installed in small, poorly ventilated rooms. Fan size and location should be such that the air inlet temperature to the engine does not exceed 120° F (49° C) when running at full rated load.

## GASOLINE TANK

If a separate fuel tank is used, install the tank so the bottom is less than four feet (1.22 m) below the fuel pump. The tank top must be below fuel pump level to prevent siphoning. Install a shut-off valve at the tank. When the fuel tank is shared with another engine, use a separate fuel line for each to avoid starving the set.

If fuel lift must exceed four feet, install an auxiliary electric fuel pump at the fuel supply. Wire it in parallel with the ignition coil (ahead of resistor). If an auxiliary reservoir fuel tank is used for a standby installation, note that fuel line connections must be changed (Figure 2).

## FUEL CONNECTION

For gasoline sets, connect the fuel line to the fuel pump inlet. Pump thread is 1/8-27 NPTF.

**Connect the set to the fuel source with a flexible line to avoid line failure due to vibration.**

For gaseous sets (see Figure 3) check with the local fuel supplier for gas regulations and line pressure.



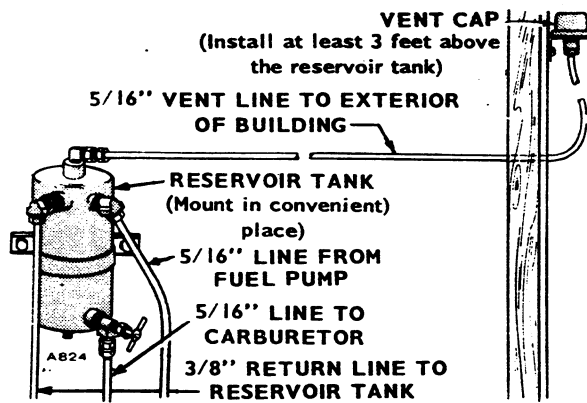


FIGURE 2. AUXILIARY FUEL TANK

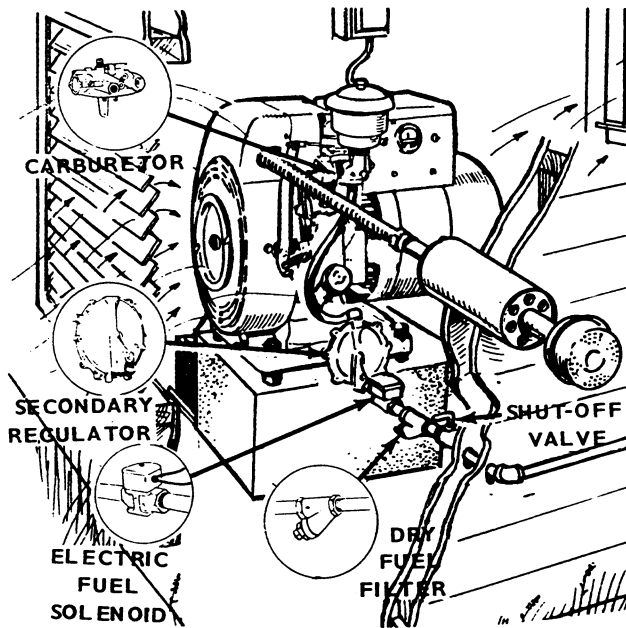
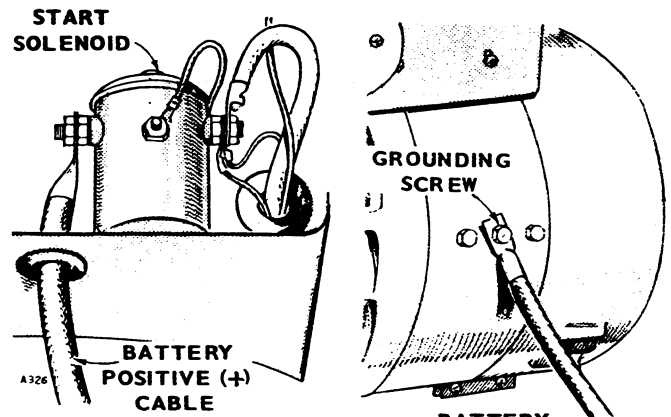


FIGURE 3. FUEL CONNECTIONS (GAS ONLY)

Provide a manual gas shutoff valve. A filter in the line may be necessary. Electric solenoid shutoff valves in the supply line are usually required for indoor automatic or remote starting installations. Connect solenoid wires to battery ignition circuit (Figure 3) to open valve during running. Install a demand type gas regulator according to instructions and position it near the set to aid starting (regulator line pressure must be within 2 to 8 ounces).

Always use flexible tubing between engine and the gas demand regulator.

Gas-Gasoline sets provide a manual shut-off valve in both fuel supply lines.



BATTERY POSITIVE (+) CABLE  
BATTERY NEGATIVE (-) CABLE

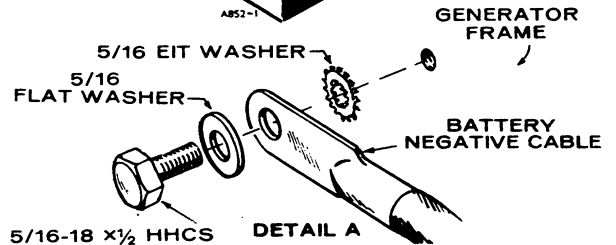
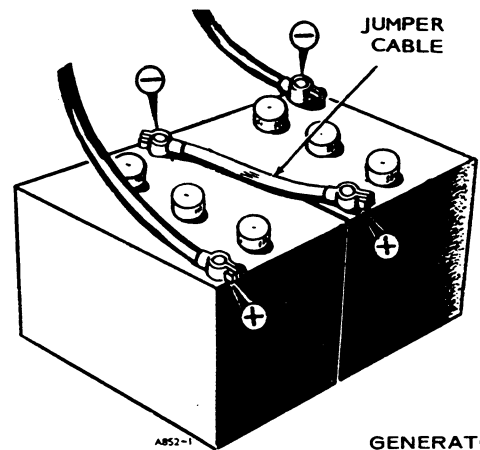


FIGURE 4. BATTERY CONNECTIONS

### BATTERY CONNECTION

Refer to the wiring diagram and Figure 4.

Provide two 6-volt batteries connected in series (one battery negative to other battery's positive) for a 12-volt source. See *SPECIFICATIONS* for minimum battery amperes.

**CAUTION** Connect battery positive (+) to the start solenoid (located in the control box). Connect the battery negative (-) to a good ground on the generator frame. Enter control box rear to install battery cable.

**CAUTION** Do not disconnect starting batteries while set is running. The resulting over-voltage condition will damage the electric choke and other control components.

## REMOTE START-STOP SWITCH (Optional)

For remote control starting and stopping, use three wires to connect the remote switch (single pole - double throw, momentary contact, center off type) to the terminal block marked B+, 1, 2, 3, in the set's control box using wire sizes listed in Figure 5.

**WARNING** If the installation is for standby service, a double throw transfer switch must always be used. Connect this switch (either automatic or manual) so that it is impossible for commercial power and generator current to be connected to the load at the same time. Instructions for connecting an automatic load transfer control are included with such equipment.

**WARNING** Personnel connecting the generator and any such auxiliary equipment must be fully qualified and understand wiring diagrams, circuits, etc.

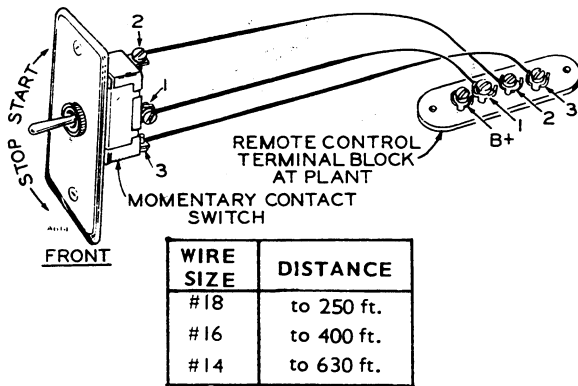
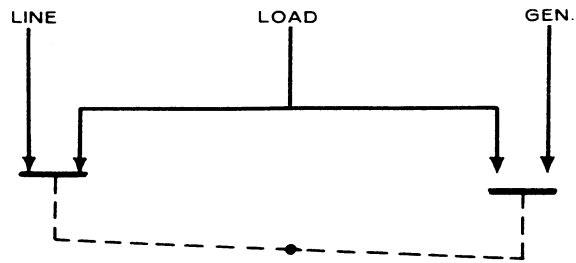


FIGURE 5. REMOTE CONTROL



NOTE: SHOWN WITH LINE CONNECTED TO LOAD.

FIGURE 6. DOUBLE-THROW TRANSFER SWITCH

## LOAD WIRE CONNECTIONS

Set nameplate shows the electrical output rating of the set in watts, volts, and hertz. The set wiring diagram shows the electrical circuits and connections necessary for the available output voltage. See Figure 7.

Meet all applicable electrical code requirements. Work should be done by a qualified serviceman or electrician because the installation will be inspected and approved.

The set control box has knockout sections to accommodate load wires. Use flexible conduit and stranded load wires near the set to absorb vibration. Use sufficiently large insulated wires. Strip insulation from wire ends as necessary for clean connections. Connect each load wire to the proper generator output lead inside the set control box. Insulate bare ends of ungrounded wires. Use a bolt (through the control box) to connect the grounded ( $\cong$ ) generator lead and load wire. Install a fused main switch (or circuit breaker) between the generator set and load.

**AC Portable Models:** These sets have outlet receptacles of the grounding type which serve for easy connection and disconnection of the load. Matching electrical plugs or caps must be provided on the load wires.

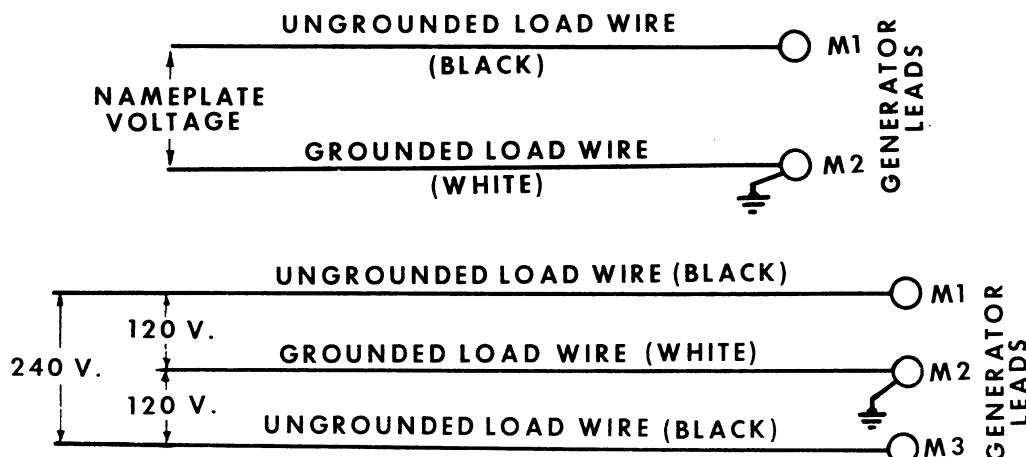


FIGURE 7. LOAD WIRE CONNECTIONS

**Output Lead Markings:** Generator leads are marked M1, M2, etc. These identifying marks also appear on the wiring diagram.

**Switchboard:** When an optional wall mounted switchboard containing ammeters, voltmeters, circuit breakers, is used, these load wire connections apply: Connect to the unused terminal of each ammeter, one ungrounded (hot) generator lead. Connect to the

ground stud in the switchboard, generator leads and load wires which are to be grounded — if any. Connect to the unused terminal of each circuit breaker, one ungrounded (hot) load wire. On models which generate more than one voltage, the voltmeter reads the higher voltage shown on the nameplate. The lower voltage is correct when the higher voltage is correct.

# OPERATION

## WARNING

### **EXHAUST GAS IS DEADLY!**

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

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

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

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

## INITIAL START

Check the engine to make sure it has been filled with oil and fuel. If engine fails to start at first attempt, inhibitor oil used at the factory may have fouled the spark plugs — remove, clean in a suitable solvent, dry thoroughly and install. Heavy exhaust smoke when the engine is first started is normal and is caused by the inhibitor oil.

**Crankcase Oil:** Use a good quality heavy-duty detergent oil that meets the API (American Petroleum Institute) service designations SE or SE/CC. Recommended SAE oil numbers for expected ambient temperature are as shown in Figure 8.

### WARNING

Do not remove oil fill cap with engine running; oil will blow out causing possible injury.

Do not mix brands nor grades. Refer to **MAINTENANCE** section for recommended oil changes and complete lubricating oil recommendations.

**Recommended Fuel:** Use clean, fresh, regular grade, automotive gasoline. Do not use highly leaded premium types. For new engines, most satisfactory results can be obtained by using unleaded gasoline. For older engines that have previously used leaded gasoline, heads must be taken off and all lead deposits removed from engine before switching to unleaded gasoline.

### CAUTION

If lead deposits are not removed from engine before switching from leaded to unleaded gasoline, pre-ignition could occur causing severe damage to the engine.

### WARNING

Never fill the tank when the engine is running. Leave some tank space for fuel expansion.

## ELECTRIC STARTING

**Remote Control, AC Models:** Push the start-stop switch to its start position. Release the switch as soon as the set starts.

## MANUAL STARTING

**Manual or Portable Models:** Adjust the manual carburetor choke as necessary for the temperature

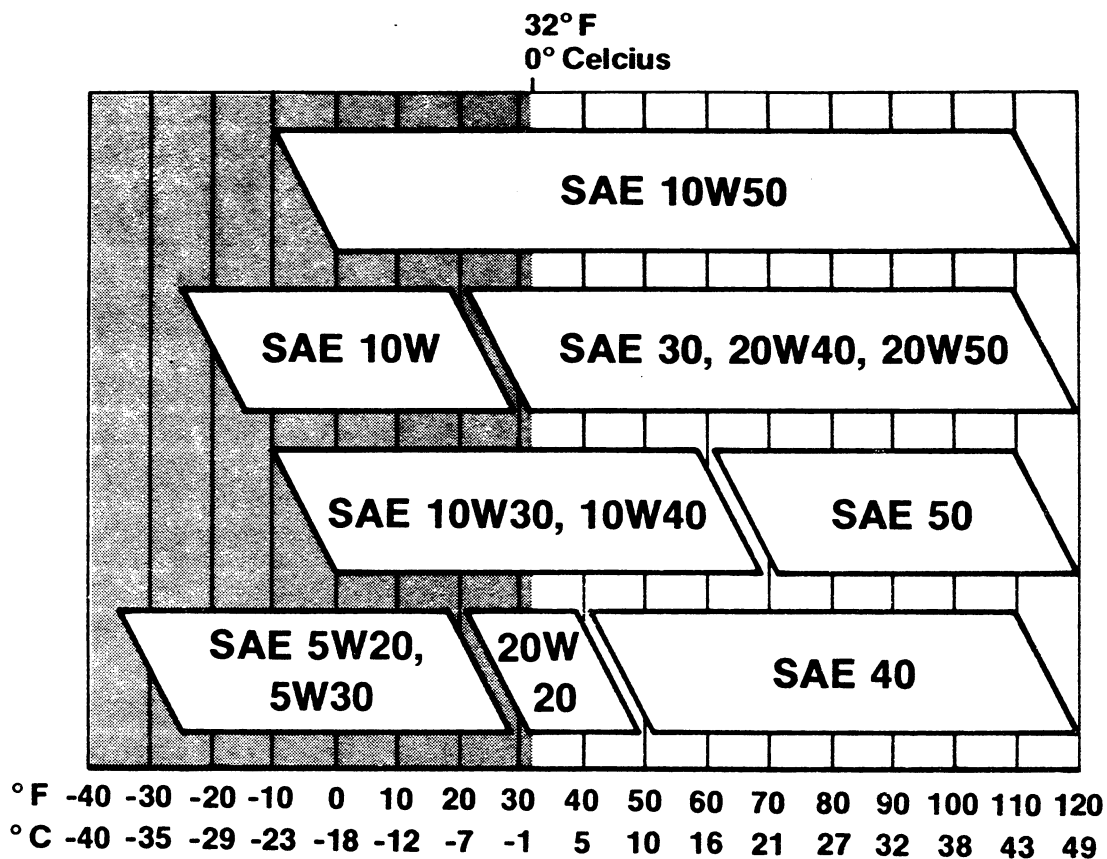


FIGURE 8. OIL RECOMMENDATIONS

conditions. Pull the start rope with a fast, steady pull to crank the engine. Do not jerk. As the set warms up, adjust the choke gradually to its fully open position.

**Remote Control, AC Models:** If the battery charge condition is too low to crank the engine, the set can be started manually. Set the control box switch (located inside the control box) to its manual start position. Pull the rope with a fast, steady pull to crank the engine. Do not jerk. After starting, return the control box switch to the electric start position to avoid discharging the battery.

### STOPPING

Push start-stop switch to stop position. Release switch when set stops. If stop circuit fails, close fuel valve.

### 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.

## BATTERY CHARGING

The battery charge rate is controlled by a 2-step voltage regulator and is not adjustable.

## INFREQUENT SERVICE

If the set is used infrequently (as in standby service for commercial power) extended shut-down periods can result in difficult starting. Run the set at least 30 minutes every week to eliminate hard starting.

## GAS-GASOLINE CONVERSION

Engines having a combination gas-gasoline carburetor can be switched to gasoline operation by the following procedure:

1. Close the manual fuel shut-off valve in supply line (the main fuel adjustment valve is not designed for use as a shut-off valve) for gaseous fuel. Set will not operate smoothly with both fuel supply lines turned on at the same time.
2. Open the gasoline fuel shut-off valve.
3. Set the spark plug gap as given in the *SPECIFICATIONS* section.
4. See that the choke is free and works easily. Be sure to release choke lock on sets with electric choke.
5. Start the engine in the manner described. If the engine runs unevenly under half or full load, due to faulty carburetor adjustment, the main jet needs adjusting.

To change back to gaseous fuel, reverse the above procedure and reset the spark plug gap as given in the *SPECIFICATION* section. Use all gasoline from the carburetor to avoid stale fuel. If engine is run with one of the fuel supply lines disconnected, plug other inlet to prevent drawing air and dirt.

## BREAK-IN PROCEDURE

The unit should be run in the following sequence using SE or SE/CC (see oil requirements for correct viscosity).

1. One half hour at half load.
2. One half hour at three quarter load.
3. Full load.

This method of load application speeds piston ring seating. Continuous running at half (light) load for the first few hundred hours usually results in poor piston ring seating, causing higher than normal oil consumption and blowby.

## DUST AND DIRT

1. Keep set clean. Keep cooling surfaces clean.
2. Service air cleaner as frequently as necessary.
3. Change crankcase oil every 50 operating hours or sooner.

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.

## EXTENDED OUT-OF-SERVICE PROTECTION — GASOLINE ENGINES

Generator sets removed from service for extended periods of time (over 30 days) should be protected from rust and corrosion. Onan recommends the following protective procedure:

1. Run set until thoroughly warm; generator under at least 50 percent load. Stop engine by shutting off fuel supply to allow engine to drain fuel lines and carburetor.
2. Drain oil base while still warm. Refill and attach a tag indicating viscosity of oil used.
3. Remove spark plug. Spray 1-ounce (28 g) of rust inhibiting oil (or SAE #10 oil) into each cylinder. Crank engine over several times. Install spark plug.
4. Service air cleaner.
5. Clean throttle and governor linkage, protect by wrapping with a clean cloth.
6. Plug exhaust outlet to prevent entrance of moisture, bugs, dirt, etc.
7. Clean off dirt and dry entire unit. Coat parts likely to rust with a light film of oil or grease.
8. Disconnect battery and follow standard battery storage procedure. Apply a film of nonconductive grease (e.g., vaseline) to battery cable terminal lugs.
9. Fill fuel tank to prevent condensate contamination.
10. Provide a suitable protective cover for the entire unit.

## RETURNING UNIT TO SERVICE

1. Remove cover and all protective wrapping. Remove plug from exhaust outlet.
2. Check tag on oil base and verify that oil viscosity is still correct for existing ambient temperature.
3. Clean and check battery. Measure specific gravity (1.260 at 77° F (25° C) and verify level to be at split ring. If specific is low, charge until correct value is obtained. If level is low, add distilled water and charge until specific gravity is correct. **DO NOT OVERCHARGE.**

### **WARNING**

**Do not smoke while servicing batteries. Explosive gases are emitted from batteries in operation. Ignition of these gases can cause severe personal injury.**

4. Connect batteries.
5. Verify that no loads are connected to the generator.
6. Start engine.

After engine has started, excessive blue smoke will be exhausted and the engine will run rough until the rust inhibitor or oil has burned away.

7. After start, apply load to at least 50 percent of rated capacity.
8. Check all gauges to be reading correctly. Unit is ready for service.

### **LOW TEMPERATURES**

1. Use correct SAE No. oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move the set to a warm location or apply heated air (do not use open flame) externally until oil flows freely.
2. Use fresh gasoline. Protect against moisture condensation. Below 0°F (-18°C) adjust carburetor main jet for slightly richer fuel mixture.
3. Keep ignition system clean, properly adjusted, and batteries in a well charged condition.
4. Partially restrict cool air flow but use care to avoid overheating.

### **HIGH 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.

### **HIGH ALTITUDE**

For operation at altitudes of 2500 feet (760 m) or more above sea level, close carburetor main jet adjustment slightly to maintain proper air-to-fuel ratio (refer to the *ADJUSTMENT* section. Maximum power will be reduced approximately 4 percent for each 1000 feet (305 m) above sea level, after the first 1000 feet.

# ADJUSTMENTS

## CHECK BREAKER POINTS

Replace burnt or faulty points. Measure gap with a feeler gauge and set gap at .020-inches (.51 mm)

**CAUTION** Always make sure that feeler gauge is free from grease and dirt. (Grease and dirt causes shorter life of points.)

Ignition breaker points must be correctly gapped for top performance (Figure 9). Crank engine to fully open breaker points (1/4 turn after top center). Loosen and move stationary contact to correct the gap at full separation. Tighten contact and check gap. (Repeat if needed.)

Ignition breaker points should break contact just when the 19 degree timing mark aligns with the flywheel timing mark. Timing is corrected by properly shifting the breaker point box on its mounting and using a timing light.

**CAUTION** Model should be timed correctly so top performance is achieved.

## CARBURETOR, GASOLINE

The carburetor (Figure 10) has a main fuel (high speed) adjustment and a idle fuel adjustment. The main adjustment affects operation under heavy load conditions. Idle adjustment affects operation at light

or no load. Under normal circumstances, factory carburetor adjustments should not be disturbed. If the adjustments have been disturbed turn needles off their seats, 1 to 1-1/2 turns to permit starting, then readjust them for smooth operation.

**CAUTION** Forcing the needle against its seat will damage it. The needle does not completely shut off fuel when turned fully in.

Before final adjustment, allow engine to warm up. Make idle adjustment with no load connected to the generator. Use a tachometer (or connect a frequency meter) to generator output. Slowly turn idle adjustment out until engine speed (or generator frequency) drops slightly below normal. Then turn needle in until speed (or frequency) returns to normal.

To set main fuel adjustment, apply a full electrical load to the generator. Carefully turn main adjustment screw in until engine speed (or output frequency) drops slightly below normal. Then turn needle out until speed (or frequency) returns to normal. Proper carburetor adjustment cannot be assured unless the governor is properly adjusted.

Set throttle stop screw (located on carburetor throttle lever) with no load connected and while running at rated speed. Turn the screw to give 1/32-inch (.80 mm) clearance between the screw and pin (Figure 10).

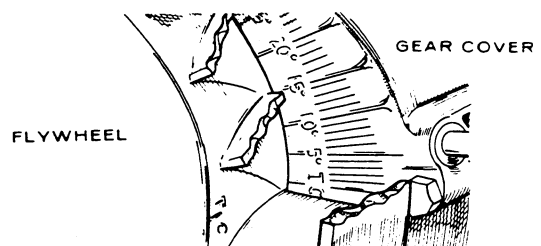
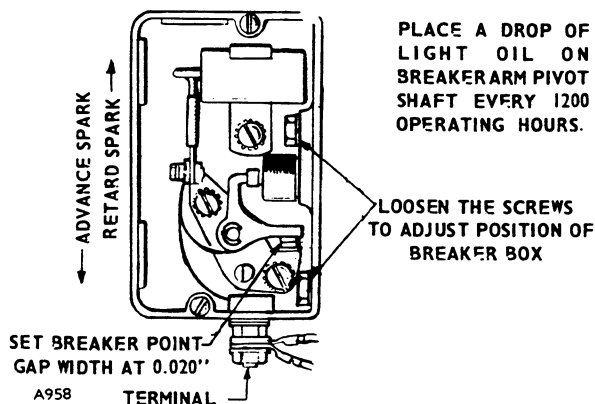


FIGURE 9. IGNITION SYSTEM



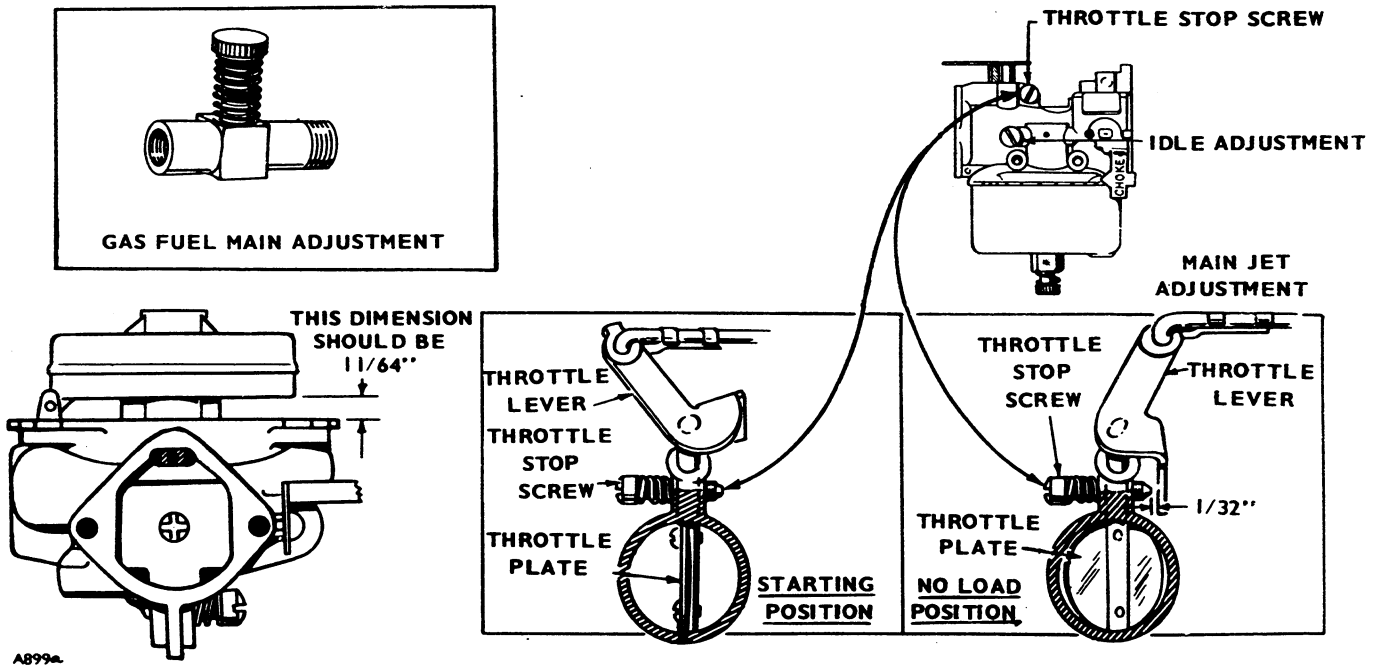


FIGURE 10. CARBURETOR ADJUSTMENTS

**ONAN CHOKE**

This choke uses a heating element and a heat sensitive bimetal spring to open the choke plate. The choke plate closes according to ambient temperature.

If adjustment is required, use the following instructions. Choke bimetal spring must be at ambient temperature. Allow engine to cool at least one hour before setting. Adjust choke by turning the choke body, which engages a link connected to a bimetal choke spring. Remove flame arrestor and adapter to expose the carburetor throat. Loosen the screw which secures the choke body. Rotate choke body clockwise to increase choke and counterclockwise to

decrease choke action (leaner mixture). At room temperature (70° F) the choke valve should be almost wide open.

Note that the direction marking "CHOKE" as appears cast on the body of some carburetors is correct for manually chocked sets but is wrong for electric chocked sets due to the choke valve arrangement. Choking position of the weight lever is vertical, on the shaft of electrically chocked sets. Choking position of the lever is horizontal on manually chocked sets.

**Gas Fuel:** Normal choke setting is fully closed with engine not running. Turn adjusting screw (Figure 11) in for less chocking, out for more chocking.

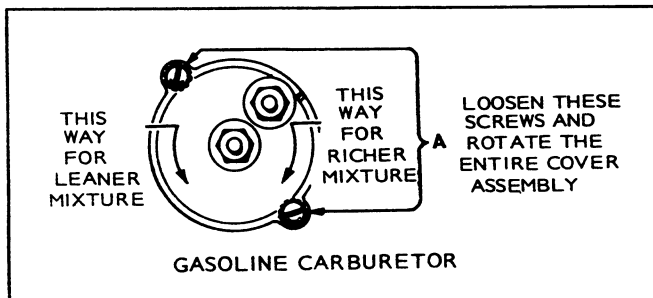
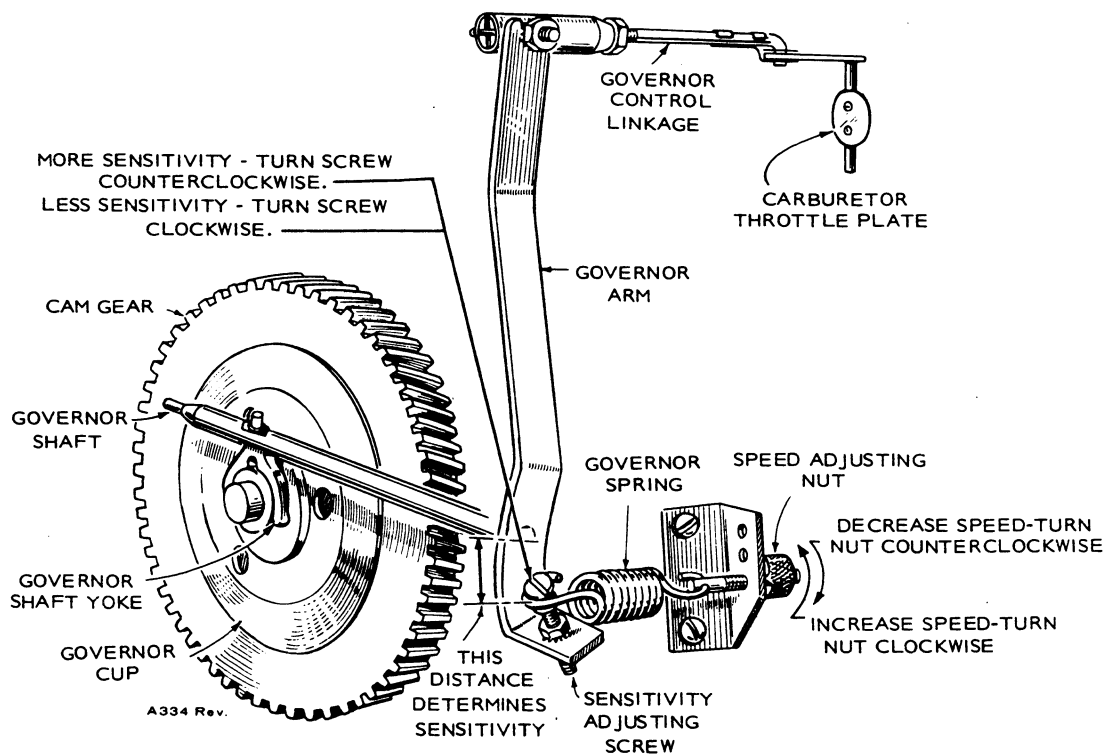


FIGURE 11. CHOKE ADJUSTMENT



**FIGURE 12. GOVERNOR ADJUSTMENT**

## GOVERNOR

Rated speed and voltage appear on the nameplate (also see *SPECIFICATIONS*). Engine speed equals frequency multiplied by 30, on a 4 pole generator, thus 1800 rpm gives 60 hertz frequency. Preferred speed varies approximately 2 to 3 hertz from no load to full load operation. Be sure throttle, linkage and governor mechanism operate smoothly (Figure 12).

**Linkage:** The engine starts at wide open throttle. The length of the linkage connecting the governor arm of the throttle arm is adjusted by rotating the ball joint. Adjust length so that with the engine stopped and tension on the governor spring, the stop screw on the carburetor throttle lever is 1/32-inch (.80 mm) from stop pin. This setting allows immediate control by the governor after starting and synchronizes travel of the governor arm and the throttle shaft.

**Speed Adjustment:** With the warmed-up set 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 on the nameplate.

**Sensitivity Adjustment:** 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), move the governor spring toward the governor shaft. An adjustment for too much sensitivity will cause alternate increase and decrease of engine speed (hunting).

To decrease sensitivity, move the governor spring 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.

## GAS REGULATOR

The regulator was factory adjusted to lock-off at a pressure of four ounces (7-inch water column). It will operate satisfactory at incoming pressures between 2 and 4 ounces (861 and 1723 Pa). If your gas supply pressure is within these limits, no regulator adjustment is required. If your gas supply pressure is under 2 ounces (861 Pa), the regulator will not operate. If your gas supply pressure is between 4 and 8 ounces (1723 and 3447 Pa), install an appliance regulator set for 2 ounces ahead of the regulator or adjust the regulator as follows:

### CAUTION

A soap bubble placed over the regulator outlet will not accurately test the regulator lock-off. The soap bubbles resistance when multiplied by the greater area of the diaphragm, is enough to shut off this very sensitive demand type regulator. A manometer must be used to show complete regulator shut-off.

### Gas Regulator Adjustment (Figure 13):

1. Use a manometer which reads up to 14-inch water column.

One ounce per square inch equals 1.73-inch water column. Likewise 1 inch water column equals 0.58 ounces per square inch.

2. Remove 1/8 inch pipe plug (C) and connect manometer.
3. With gas supply on and outlet hose removed, alternately cover and uncover the regulator outlet with your hand. If the regulator shuts off completely, as desired, the manometer will hold a steady reading. If the manometer reading drops slightly each time you remove your hand, the regulator is leaking.

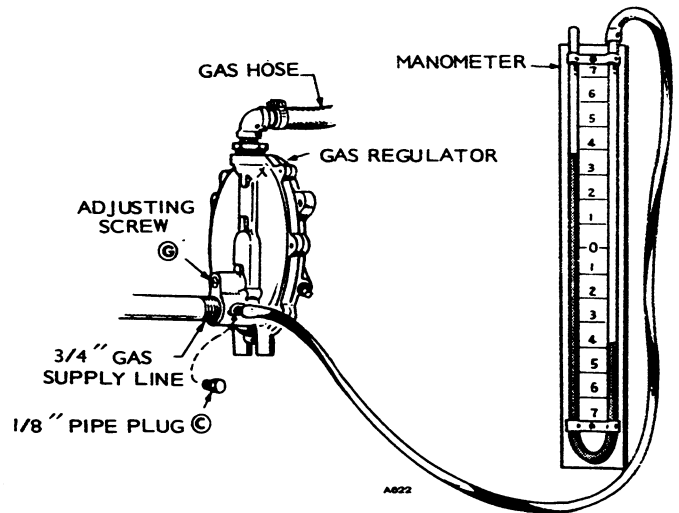


FIGURE 13. GAS REGULATOR

4. When necessary, adjust as follows: Turn the adjusting screw (G) inward just far enough so that manometer reading remains constant when you repeatedly cover and uncover the regulator outlet with your hand.
5. Operate the engine to ensure quick starting results.

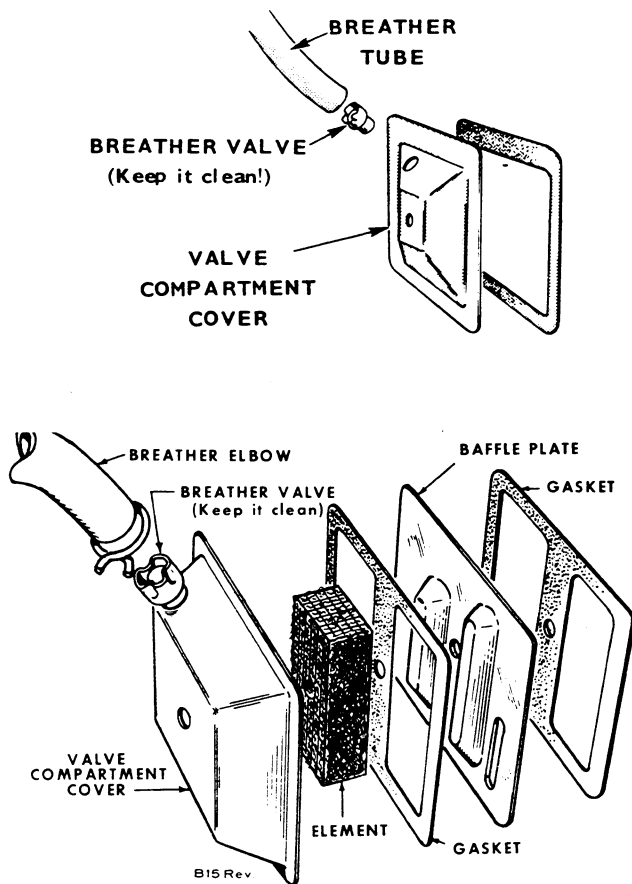
## CARBURETOR, GASEOUS FUELS

Adjust much the same as gasoline carburetors, using the gas fuel adjustment located in the fuel inlet (Figure 10) to adjust when running on gas. Gas only carburetors have no idle adjustment beginning Spec E.

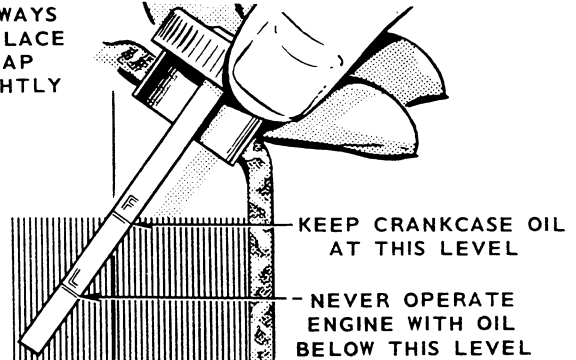
# GENERAL MAINTENANCE

## BREATHER VALVE

Remove the hose which carries expelled air from the breather valve at the valve compartment cover, to the air cleaner. Loosen the valve with pliers. Occasionally the valve will lift out and remain inside the hose. Wash the valve (also the element) in a suitable solvent. Dry and replace. The valve must work free and the hose must not be restricted to prevent expelled air from reentering the crankcase. Install parts removed.



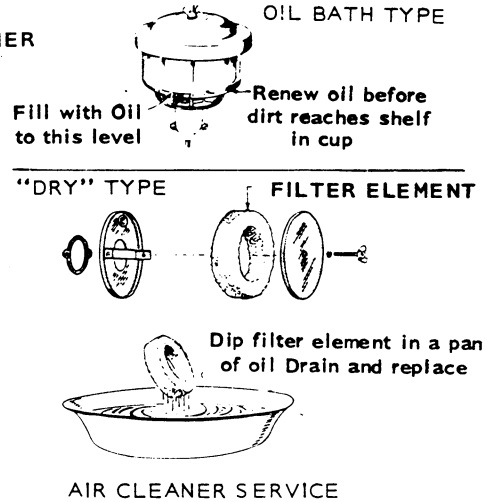
ALWAYS  
REPLACE  
CAP  
TIGHTLY



## WARNING

Do not remove oil fill cap with engine running; oil will blow out causing possible injury.

## AIR CLEANER



NOTE: Wash polyurethane wrapper used on some sets in a suitable solvent. Dip in oil and squeeze as dry as possible.

## GOVERNOR LINKAGE

### BALL JOINT

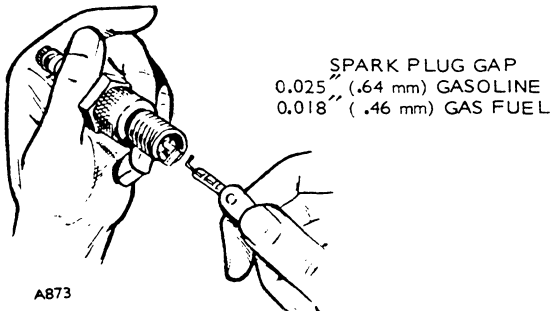
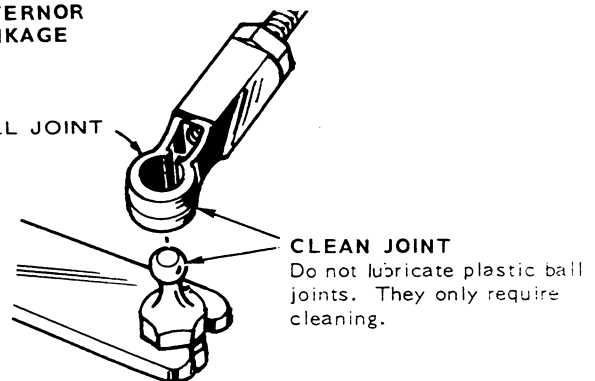


FIGURE 14. MAINTENANCE PROCEDURE

# PERIODIC SERVICE GUIDE

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 dealer.

SERVICE THESE ITEMS	AFTER EACH CYCLE OF OPERATING HOURS						
	8	50	100	200	500	1000	5000
Inspect Set	x1						
Check Fuel Supply	x						
Check Oil Level	x						
Check Governor Linkage		x2					
Change Crankcase Oil			x2				
Clean Crankcase Breather			x				
Replace Spark Plug				x			
Check Battery Electrolyte Level				x			
Inspect Magneto Breaker Points				x			
Clean Commutator Collector Rings				x			
Check Brushes				x3			
Check Valve Clearance					x		
Remove Carbon and Lead					x		
Clean Generator						x	
Remove and Clean Oil Base						x	
Grind Valves (If Required)						x	
Clean Carburetor						x	
Complete Reconditioning							x

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

x2 - Perform more often under extremely dusty conditions.

x3 - Replace commutator brushes when worn to 5/8".

## FUEL SEDIMENT

Empty carburetor and fuel filter (strainer) bowls of any accumulated sediment. Clean filter screen thoroughly. Reassemble and check for leaks.

# SPECIAL UTILITY SECTION

This section applies specifically to the *Utility Truck* models of the LK Series generating sets. Use these supplementary instructions where they apply, instead of the instructions for the standard generator sets.

For instructions not covered in this section, refer to the appropriate section for the standard sets.

The utility set is designed to supply 12 volt DC output for radio, etc., while the truck is stopped at a service job. At the same time, AC power is available for flood lights, power tools, etc. Thus, the generator set eliminates the necessity of running the truck engine to prevent battery run down at a service job. The generator set can also be used to recharge a low truck battery if AC power requirements are sufficiently reduced. In normal operation, the set supplies DC and AC current for the load, but does not recharge the battery.

## RATED OUTPUT

Alternating current and direct current are produced at the same time.

Combined AC and DC rated output.....	2500 watts
Maximum DC amperes (automatically limited) .....	30 amps
Maximum DC watts (maximum 30 amps x nominal 13 volts).....	390 watts
Available AC output (2500 watts less watts of DC charging current) Minimum (while full load DC connected - truck stopped) .....	2110 watts
Maximum (while truck running or battery charged and no DC load connected) .....	2500 watts
Open circuit DC voltage (12 volt battery charging) .....	15 volts
Nominal AC voltage (power for tools, etc.).....	120 volts

**CAUTION** Too high a voltage will overcharge and possibly damage the battery. Adjust the governor only to correct the DC voltage output of the generator at operating temperature. If a carburetor adjustment is made, check the governor adjustment also.

Do not become alarmed if the ammeter reads 45 amperes when first starting the set. After a few minutes the current will come down to normal as the generator warms up and the battery voltage comes up.

Consistently high charge rate (after warm up) could be due to a poor battery in the truck or running the set too fast.

Vacu-Flo cooling and remote control starting and stopping make the set suitable for installation in small compartments.

## CHARGE RATE

Rated DC output is 30 amperes. A circuit breaker opens the charge circuit to protect the generator if DC output is high. Equal time is consumed by the breaker to cut-in and cut-out and it may go through this cycle several times, each succeeding cycle becoming more rapid, until it acts and sounds like a buzzer, during an overload on the DC output. Generally, the battery will warm up and the charge rate will drop so that the breaker will not reach the buzzing stage.

As the battery reaches a charge condition, its terminal voltage approaches that of the generator set, resulting in a desirable tapering off charge rate. After the battery becomes fully charged, the charge rate equals the DC load (radio, lights, etc.) connected.

The set's charge ammeter reads zero while the truck's engine is running.

## AC OVERLOADING

It is not expected that men on the job will determine available load each time before plugging in tools, etc. Overloading is apt to occur especially during night work when both lights and tools are used. If the set speed drops, AC lights will dim, and part of the load must be disconnected. If more AC power is required, simply run the truck's motor to take over the DC load for that interval, and make the full rating available in AC output.

A short circuit across the AC terminals will collapse the field to protect the generator.

## GOVERNOR ADJUSTMENT

To check or correct the engine speed, a DC voltmeter is required; the set must be warm and all load disconnected. Proceed as follows:

1. Run set with full AC load connected for at least 1/2 hour to reach operating temperature.
2. With the load alternately removed and connected, adjust the governor sensitivity screw, if necessary, to attain a minimum drop in speed from no-load to full-load operating with no hunting condition.
3. Remove the AC load and stop the set, then disconnect the generator lead A1 at the relay in the set control.
4. Connect the DC voltmeter across lead A1 and ground.
5. Run the set and adjust the speed to deliver 15 volts DC.
6. Remove the voltmeter, reconnect the A1 lead to the relay and replace other parts removed.

**WARNING** In most vehicle applications since August, 1972, the vehicle uses an Evaporative Emission control system. These systems may become pressurized if the normal venting system becomes plugged. If this occurs when the generating set is not running and especially if vehicle is moving, gasoline can be forced through the carburetor flooding the generator set. For this reason a separate manual or electrical fuel shut-off **MUST** be provided in the fuel line between the supply tank and the generator set fuel pump inlet to prevent flooding the generator set when not in use.









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