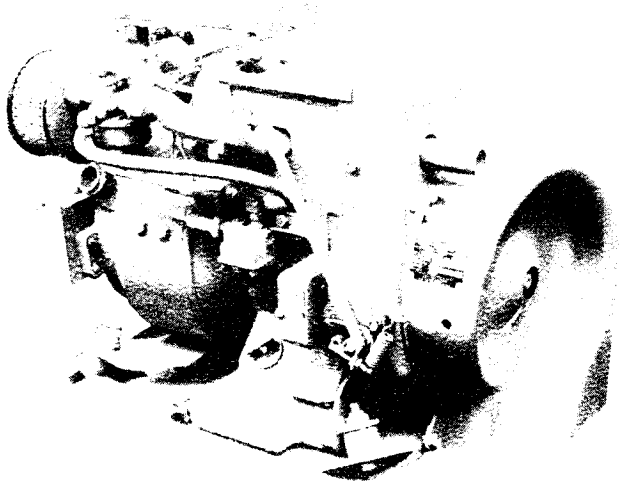
operator's manual

Onan

3.0 AJ

RV ELECTRIC GENERATING SETS



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SAFETY PRECAUTIONS

The following symbols in this manual signal potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to protect personnel as well as equipment.

WARNING **Onan uses this symbol throughout this manual to warn of possible serious personal injury.**

CAUTION **This symbol refers to possible equipment damage.**

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that could result in serious, personal injury. Take care in following these recommended procedures.

- **Use Extreme Caution Near Gasoline. A constant potential explosive or fire hazard exists.**

  Do not fill fuel tank near unit with engine running. Do not smoke or use open flame near the unit or the fuel tank.

  Be sure all fuel supplies have a positive shutoff valve.

  Fuel lines must be of steel piping, adequately secured and free of leaks. Use a flexible section of fuel line between generator set and stationary fuel line in the vehicle. This flexible section must be 100% NON-METALLIC to prevent electrical currents from using it as a conductor.

  Have a fire extinguisher nearby. Be sure extinguisher is properly maintained and be familiar with its proper use. Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department for the correct type of extinguisher for various applications.

- **Guard Against Electric Shock**

  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.

  Jewelry is a good conductor of electricity and should be removed when working on electrical equipment.

  Always use an appropriately sized, approved double-throw transfer switch with any standby generator set. DO NOT PLUG PORTABLE OR STANDBY SETS DIRECTLY INTO A HOUSE RECEPTACLE TO PROVIDE EMERGENCY POWER. It is possible for current to flow from generator into the utility line. This creates extreme hazards to anyone working on lines to restore power.

  Use extreme caution when working on electrical components. High voltages cause injury or death.

  Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician.

- **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 Toxic**

  Provide an adequate exhaust system to properly expel discharged gases. Check exhaust system regularly for leaks. Ensure that exhaust manifolds are secure and not warped.

  Be sure the unit is well ventilated.

- **Keep The Unit And Surrounding Area Clean**

  Remove all oil deposits. Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and subsequent engine damage and may present a potential fire hazard.

  Do NOT store anything in the generator compartment such as oil or gas cans, oily rags, chains, wooden blocks, propane tanks, 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.

- **Protect Against Moving Parts**

  Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be permitted because of the danger of becoming caught in moving parts.

  Make sure all nuts and bolts are secure. Keep power shields and guards in position.

  If adjustments *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

  Do not work on this equipment when mentally or physically fatigued.

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 **924-0222**.

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WARNING

TO PREVENT FIRE OR ACCIDENT HAZARD . . . THIS UNIT MUST BE INSTALLED ACCORDING TO THE MANUFACTURER'S DETAILED INSTALLATION 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

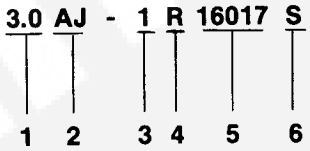
This manual contains operation and other information to properly maintain, service, and make adjustments on your AJ generator set. Study and follow the instructions carefully. A well-planned service and maintenance program will result in longer unit life and better performance. Because the most important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

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

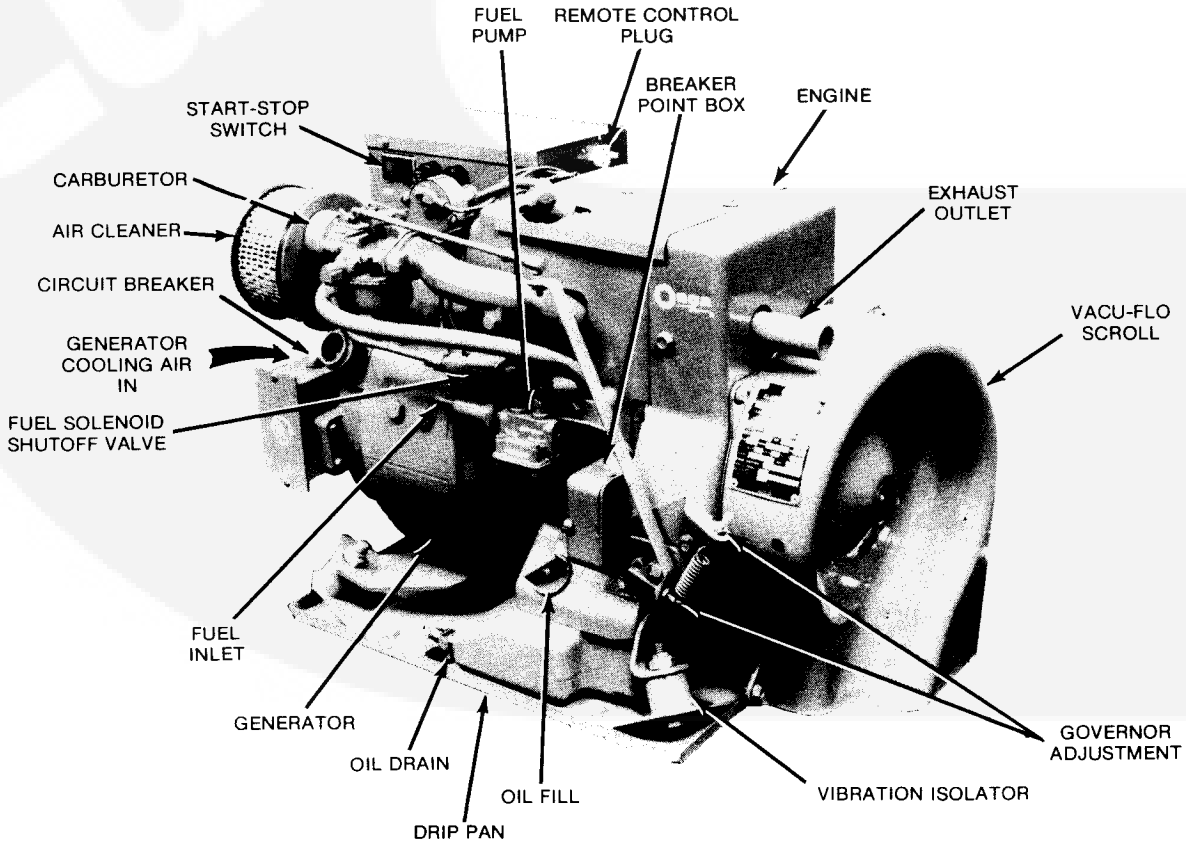
When contacting your Onan dealer, distributor, or the factory about the generator set, always supply the complete model number and serial number as shown on the nameplate (see *Model Designation* following). This information is necessary to identify your generator set among the many types manufactured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

MODEL DESIGNATION

The following typical model number is broken down into code segments used by Onan.



1. Indicates kilowatt rating.
2. Series identification.
3. Voltage code of the generator, 1 = 120 volts.
4. Method of starting:
   R—Remote electric starting.
5. Factory code for designating optional equipment, if any.
6. Specification letter which advances when the factory makes production modifications.



TYPICAL AJ RECREATIONAL VEHICLE GENERATOR SET

SPECIFICATIONS

This manual contains SI metric equivalents that follow immediately in parentheses after the U.S. customary units of measure.

GENERAL

Nominal Dimensions of Set	
Height	15.50 in. (394 mm)
Width	12 in. (305 mm)
Length	23.19 in. (589 mm)
Weight	160 lbs. (73 kg)

ENGINE DETAILS

Manufacturer	ONAN
Number of Cylinders	One
Displacement (cubic inches)	14.9 (244.16 cm^3)
Cylinder Bore	2-3/4 in. (69.85 mm)
Piston Stroke	2-1/2 in. (63.50 mm)
Compression Ratio	6.25:1
Engine Speed	3600 RPM
Engine Design	Four Cycle, Air Cooled, L Head
Starting System	Exciter Cranking Generator

GENERATOR DETAILS

Manufacturer	ONAN
Design	Revolving Armature, Two Pole, Inherently Regulated, 3600 RPM
Rating (in watts) 60 Hertz	3000 Watts (3 kW)
Voltage	120
Current Rating	25 Amperes
Phase	Single
Wire	Two
Power Factor	1.0
Cranking Current	40 Amps
Break-away Current	225 Amps

CAPACITIES AND REQUIREMENTS

Oil Capacity	2 qts. (1.89 litres)
Recommended Battery, Electric Start	12 Volt, 92 Amp/hr (331.20 kC)
Battery Charge Rate—Fixed	1 - 2 Amps
Ventilation Requirements (total)	50 sq. in. (323 cm^2)

TUNE-UP SPECIFICATIONS

Spark Plug Gap	.025 (0.64 mm)
Breaker Point Gap (cold setting)	.022 (0.56 mm)
Ignition Timing Reference (cold setting)	22° BTC
Valve Tappet Adjustment (engine cold)	
Intake	.011 (0.28 mm)
Exhaust	.018 (0.46 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
- Fuel System
- Electrical
- Ventilation

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.

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.

Inlet hose connection to fuel filter requires a clamp.

ELECTRICAL

AC Output

Two AC leads, M1 (hot) and M2 (ground), terminate in generator 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.

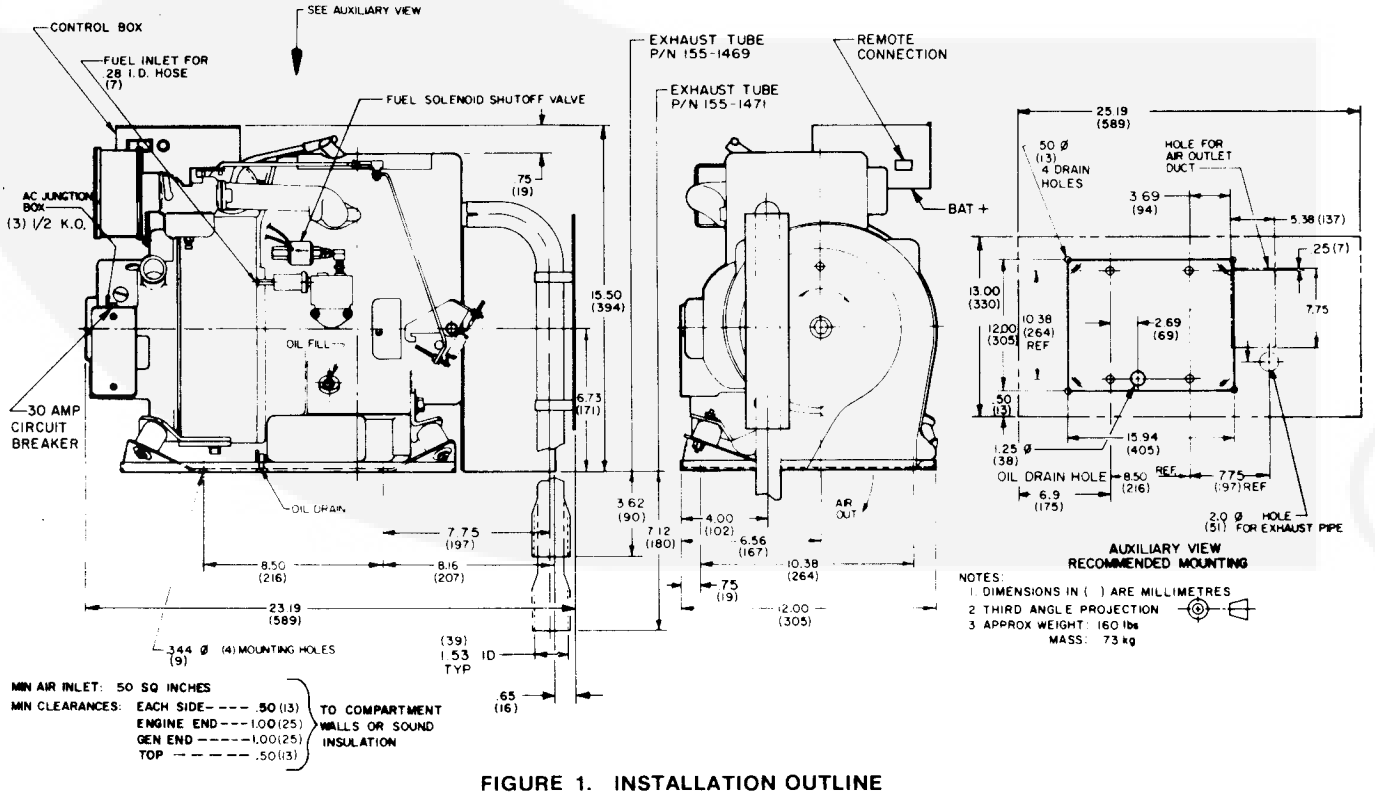


FIGURE 1. INSTALLATION OUTLINE

Onan recommends using a separate battery for operation of the generator set in addition to the regular vehicle starting battery. Refer to individual installation guide or T-012 for additional information on battery sharing.

Grounding: Generator must be effectively bonded to recreational vehicle chassis.

For additional information on installation contact your ONAN Service Representative or request Installation Guide #924-0611.

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 **Do not use discharged cooling air for compartment heating since it could contain poisonous exhaust gases.**

WARNING **Insulation must not reduce the minimum clearances as specified in Figure 1 to meet ANSI 198.1 AND CSA #946 temperature rise requirements for recreational vehicles.**

WARNING **Do not terminate poisonous carbon monoxide exhaust gas under vehicle. Direct exhaust gases away from window and door openings. Keep all openings above or to the rear of exhaust pipes closed when generator set is operating.**

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

WARNING **Do not smoke while servicing batteries. Lead acid batteries give off explosive gases while being charged.**

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

ENGINE EXHAUST GAS (CARBON MONOXIDE) IS DEADLY!

Carbon monoxide is an odorless, colorless gas formed by incomplete combustion of hydrocarbon fuels. Carbon monoxide is a dangerous gas that can cause unconsciousness and is potentially lethal. Some of the symptoms or signs of carbon monoxide inhalation are:

- **Dizziness**
- **Intense Headache**
- **Weakness and Sleepiness**
- **Vomiting**
- **Muscular Twitching**
- **Throbbing in Temples**

If you experience any of the above symptoms, get out into fresh air immediately.

The best protection against carbon monoxide inhalation is a regular inspection of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

OPERATION

GENERAL

Inspection: Inspect the engine visually before starting. Check for loose or missing parts or any shipping damage. The unit may be tilted during operation to any maximum angle not exceeding vehicle operation limitations.

Rust inhibitor oil has been placed in the engine combustion chamber at the factory and may foul the spark plug. If the plug should foul, remove it and clean thoroughly. Then dry and replace in engine.

RECOMMENDED FUEL

Use clean, fresh, unleaded or regular grade gasoline. Do not use highly leaded premium fuels. Using unleaded gasoline results in reduced valve and carbon cleanout maintenance.

If the use of unleaded gasoline is desired, use regular gasoline for the first 25 hours to allow the rings to seat well for best performance. Then use unleaded gasoline thereafter.

If regular gasoline is used continually, carbon and lead deposits must be removed from the cylinder heads as required because of engine power loss. Unleaded gasoline may be used safely after lead deposits have been removed.

WARNING **Leakage of gasoline 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.**

OIL

Check oil level daily (see Figure 2). Be sure unit is level when checking oil. Add oil to top of fill hole if required. See *MAINTENANCE* section of this manual for type of oil, oil viscosity and crankcase capacity.

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.**

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.

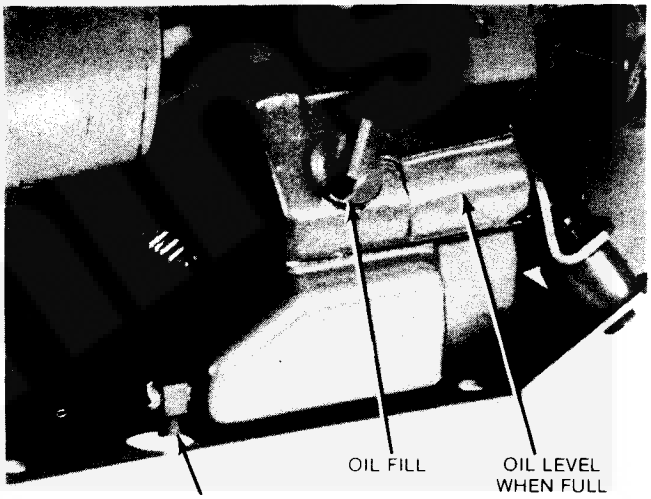


FIGURE 2. OIL LEVEL

STOPPING

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

Automatic Choke

An electric choke provides proper choking for starting and running the generator set.

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 running).
2. One half hour at 3/4 load (with one air conditioner) and approximately 500 watts additional load.
3. Change crankcase oil after the first 25 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.

BATTERY CHARGING

The battery charge rate is controlled by a fixed value resistor that allows a trickle charge rate of 1 - 2 amps under all conditions.

SET EXERCISING

Establish an exercise program if unit is not used for long periods of time. Start and run unit, with a full load connected if possible, for at least 30 minutes every week. This exercise program will:

- Lubricate internal engine parts.
- Assure proper starting when set is needed.
- Remove moisture.
- Keep carburetor filled with fuel.
- Bring engine up to operating temperature.
- Recharge battery.

ELECTRICAL OUTPUT

The generator set's wiring provides for 120 volts, with the total electrical load not to exceed 25 amperes.

CAUTION **Do not install any outlets between generator and distribution panel.**

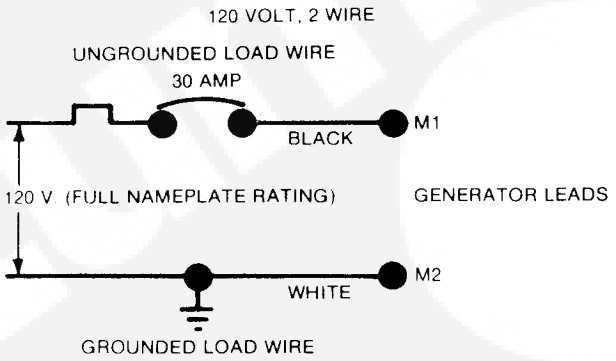


FIGURE 3. SINGLE-PHASE, "1R" VOLTAGE CODE GENERATOR CONNECTIONS

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
Microwave oven	700-1500

* - Starting wattages for motors can be three to four times more than the approximate running wattages.

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.

EXTREMELY DUSTY OR DIRTY

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 ALTITUDE OPERATION

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

WARNING **Do not use discharged air from blower scroll for compartment heating. Poisonous gas fumes may be present.**

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 plug. Spray 1 ounce of rust inhibitor oil (or SAE #10) into the cylinder. (Spray cans work well for this application.) Turn engine over by hand at least 2 complete revolutions. Replace the spark plug.
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. 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.
7. 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.
8. Unit is now ready for service.

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.

ADJUSTMENTS

TIMING AND BREAKER POINTS

Ignition points should break contact at 22° BTC (see Figure 4). Proper 22° BTC timing is obtained by setting breaker points and checking with a timing light.

22° BTC timing can be checked at timing hole on the front of blower housing ("D") or at another timing hole on the side of the blower housing ("C") just above the governor adjustment. Breaker point setting may vary from .017-.024 inch to get proper 22° BTC timing.

1. Turn engine over slowly in a clockwise direction until the TC mark appears in the middle of the window "D" (Figure 4). Turn slightly beyond this point to ensure points are fully open.
2. Remove cover on breaker point box, loosen screws "A" and turn cam "B" to obtain .020 inch setting. Use a clean, flat feeler gauge.
3. Retighten screws "A", replace breaker box cover and connect a timing light. With unit running and warmed up, notch should appear in timing reference hole "C". (If front of blower scroll is accessible, direct the timing light to small hole "D". 22° BTC mark should appear in this hole.)

CARBURETOR

Initial Adjustment

Adjust initially by turning idle and main (load) adjustment screws gently onto their seats. Then back off idle screw 1-1/4 turn and main screw 1-1/4 turns. This adjustment will allow initial starting of the generator set.

Adjustment

1. Start unit and allow it to warm up.
2. Remove all AC loads from the generator set.
3. Connect a voltmeter to the AC leads or use a plug-in voltmeter inserted into one of the receptacles. Hold governor arm to minimum speed and adjust the throttle stop screw so voltmeter indicates 75-80 volts.
4. With voltmeter still connected, hold governor arm against throttle stop and turn idle adjustment screw in until voltage drops. Then turn it out until the highest voltage is obtained. Release governor arm. Engine should accelerate to governed speed and become stable.

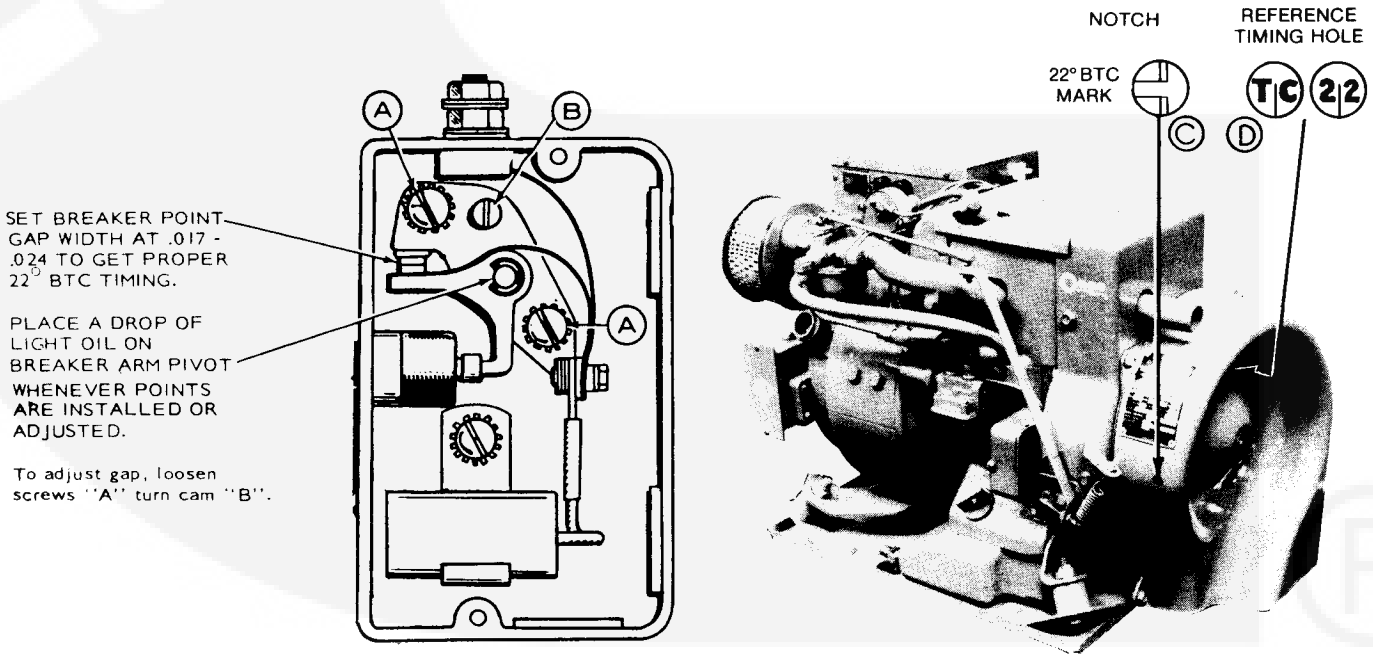


FIGURE 4. IGNITION AND TIMING ADJUSTMENTS

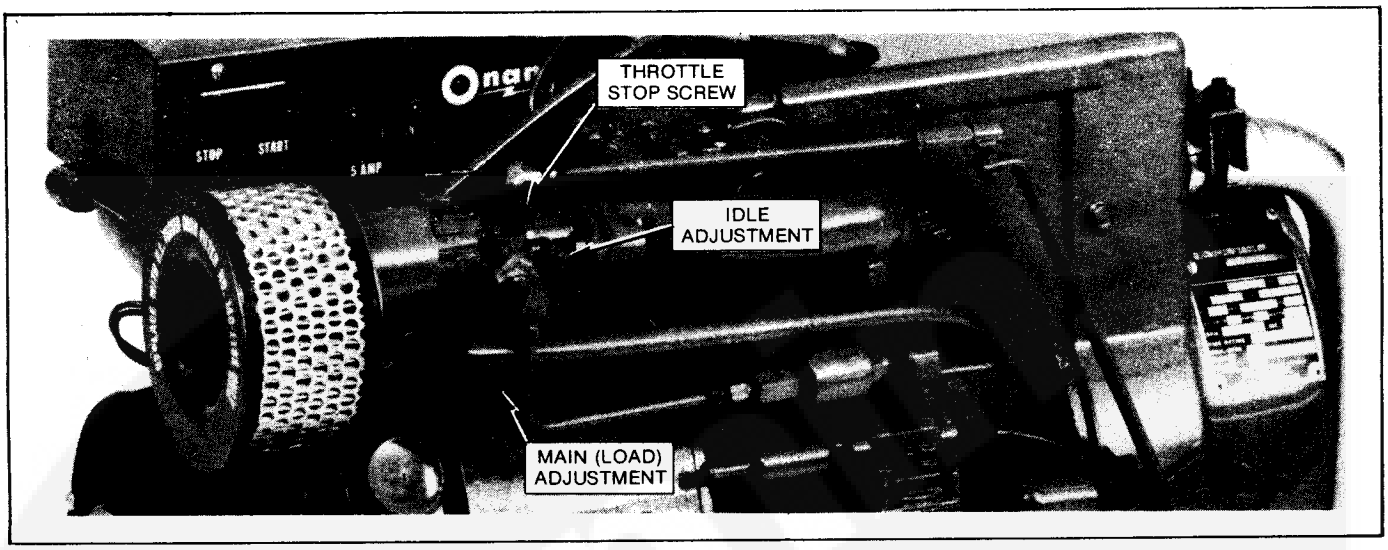


FIGURE 5. CARBURETOR ADJUSTMENTS

5. Connect a full rated load to the generator set. (Use RV appliances or Onan load test panel.)
6. Adjust main (load) adjustment screw to get the highest voltage. Remove load and hold governor arm to minimum speed. Release governor arm and observe acceleration. If surging occurs at governed speed, open the main jet slightly. If surging continues, adjust governor sensitivity.

Some units do not have a main (load) adjustment. Setting is factory fixed.

ELECTRIC CHOKE

Normal choke setting is 1/8 inch from its fully closed position at 70°F. If temperature changes occur, requiring choke adjustment, proceed as follows:

1. Loosen two outer screws at "A" (Figure 6).
2. Turn the cover assembly counterclockwise to decrease choking (leaner mixture).
3. To increase choking (richer mixture), turn cover assembly clockwise.
4. Tighten both screws to lock cover in place.

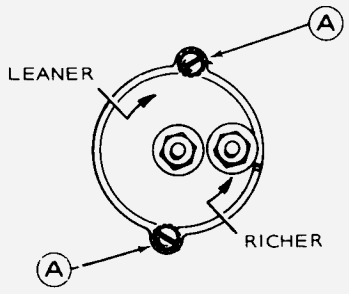


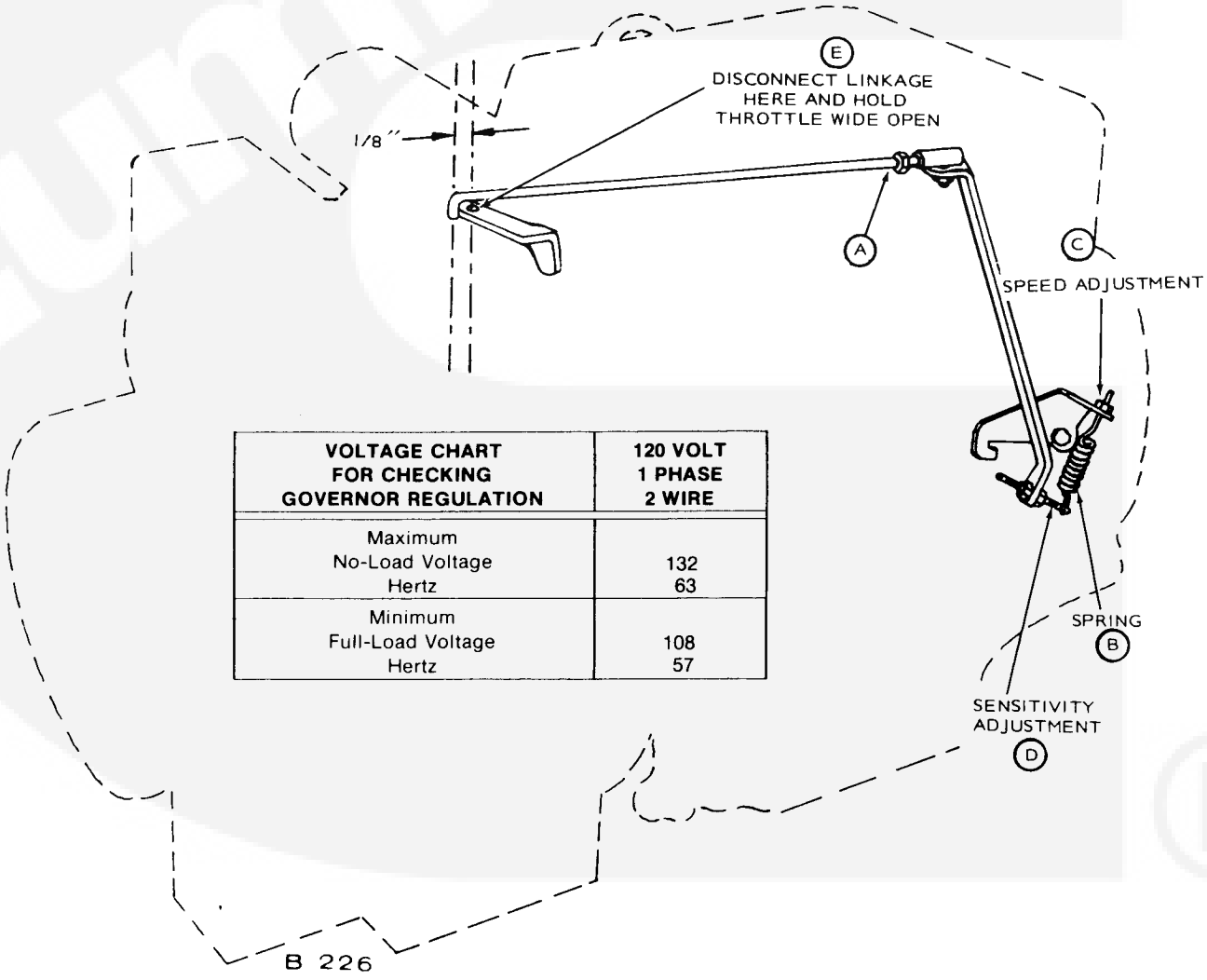
FIGURE 6. ELECTRIC CHOKE ADJUSTMENT

GOVERNOR

The governor controls engine speed by opening or closing the throttle according to the load taken off the set (Figure 7). The engine speed also determines voltage and frequency of the generator current. Before readjusting the governor linkage, check for binding at the linkage or throttle.

1. With unit stopped, disconnect governor control rod from hole (E) on throttle shaft. While holding throttle wide open, adjust length of governor control rod so center-to-center distance is 1/8 inch. Change governor control rod length by turning the threaded rod (A) near the ball joint. When 1/8 inch distance is reached, reconnect rod at point E.
2. Run the set with a load to thoroughly *warm it up.*
3. Connect a voltmeter across the generator output. With the set operating at no load, adjust the speed nut (C) until voltmeter reads 126 volts. When a full rated load is applied, voltage should not fall below 110 volts.
4. If voltage falls below 108 volts (with full load), loosen the hex nuts on sensitivity spring stud and screw stud (D) inward (clockwise) or recheck step 1. If voltage is within limits, but tends to surge (alternately increases and decreases), turn the spring stud outward (counterclockwise) until voltage stabilizes.
5. Retighten nuts on lower spring stud while holding stud in position with a screwdriver.

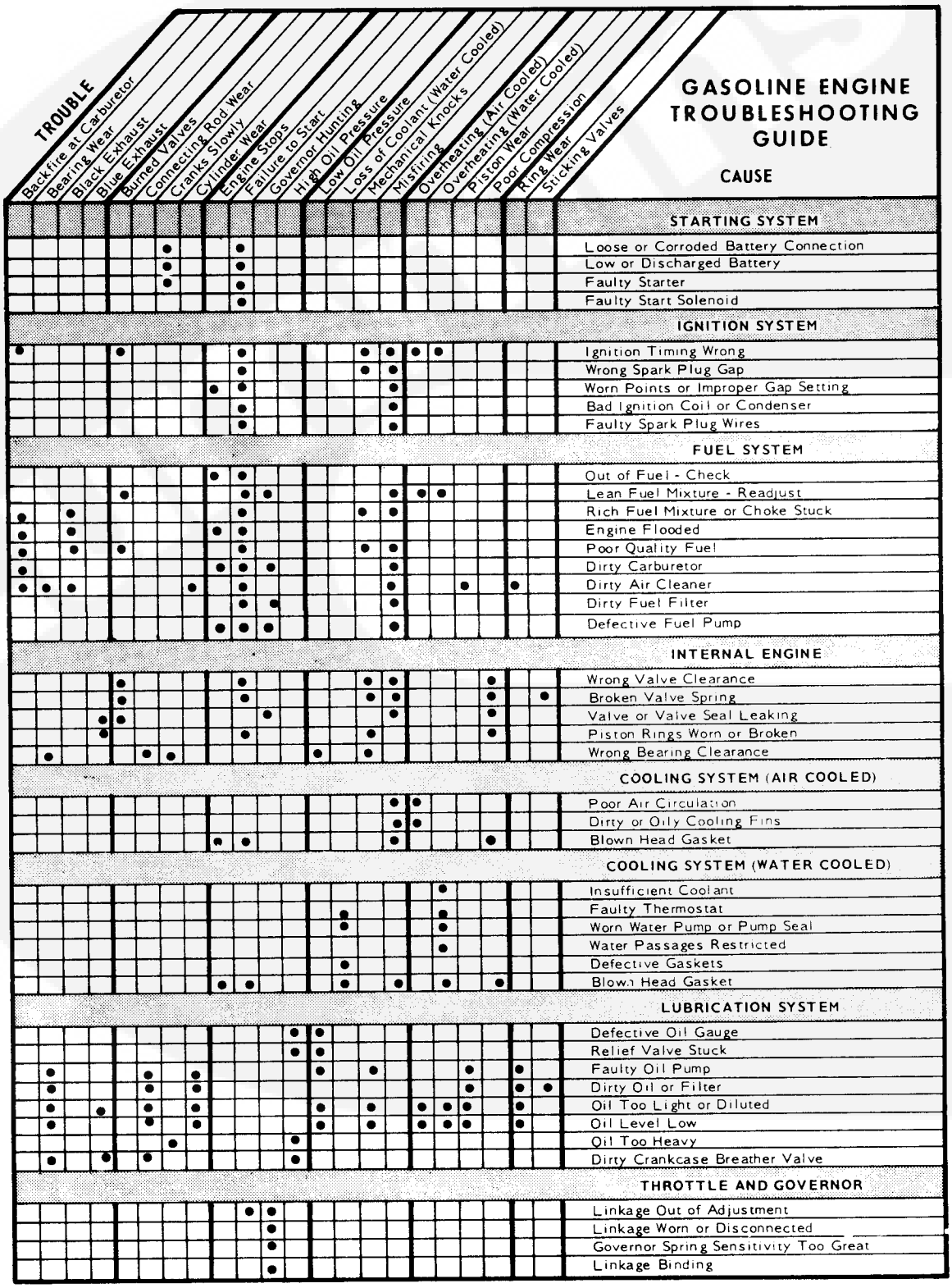
Turning sensitivity stud (D) in or out, usually requires a corresponding change in speed adjustment nut (C). Table in Figure 7 shows proper voltage speed and frequency ratings.



VOLTAGE CHART FOR CHECKING GOVERNOR REGULATION	120 VOLT 1 PHASE 2 WIRE
Maximum No-Load Voltage	132
Hertz	63
Minimum Full-Load Voltage	108
Hertz	57

FIGURE 7. GOVERNOR ADJUSTMENTS

ENGINE TROUBLESHOOTING GUIDE



MAINTENANCE

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.

WARNING **Always allow generator set to cool off before performing any maintenance or installation work on the set. Working on a hot set could cause severe burns.**

PERIODIC MAINTENANCE SCHEDULE

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS				
	8	50	100	200	400
General Inspection	x1				
Check Oil Level	x				
Check Battery Water Level		x2			
Blow Out Generator with Dry Air		x2			
Change Crankcase Oil (10W40)		x2			
Replace Air Cleaner			x2		
Replace Spark Plug—Gap .025"			x3		
Clean Crankcase Breather			x2		
Tune-Up				x4	
Check Breaker Points				x4	
Check Ignition Timing				x4	
Clean Cooling Fins				x2	
Remove Carbon & Lead from Cylinder Head			x4		
Adjust Tappets					x4
Replace Fuel Filter			x		
Check Generator Brushes (Replace if Necessary)	As Required				

x1 - Check for exhaust leaks, fuel leaks, proper mounting, etc.
x2 - Perform more often in extremely dusty conditions.
x3 - Replace at beginning of season or every 100 hours.
x4 - For detailed maintenance, contact your nearest authorized Onan Service Center.

WARNING **All exhaust system connections MUST be checked regularly for any leaks and tightened as necessary. Do NOT terminate exhaust pipe under vehicle or near any window 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.**

OIL LEVEL

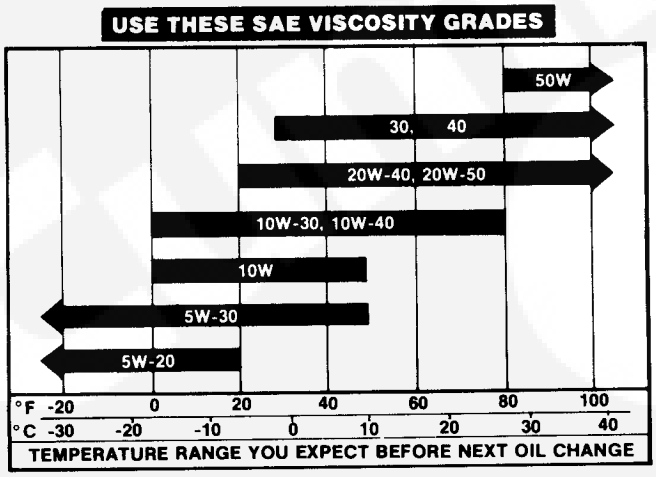
Check the oil level daily or at least every eight operating hours. Oil should just start to overflow from fill hole when crankcase is full.

Check oil when set (or vehicle) is level.

OIL CHANGE

The oil drain valve is located on the side (near the bottom) of the oil base. Change oil initially at 25 operating hours; change every 50 hours after that. Extremely dusty conditions require more frequent oil changes. See Figure 8.

Be sure to fill the crankcase with oil to the "FULL" mark on the oil level indicator. Use oil with the API (American Petroleum Institute) designation SE or SE/CC. Oil should be labeled as having passed MS Sequence Tests (also known as having passed ASTMG-1V Sequence Tests). Refer to oil chart for recommended viscosity and temperature. The engine's oil capacity is 2 quarts.



Oil consumption may be higher with a multigrade oil than 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. When adding oil between changes, use the same brand as in the crankcase. Various brands of oil might not be compatible when mixed.

Use of the same grade and quality of oil as that used in your recreational vehicle engine is acceptable as long as unit is serviced regularly and oil meets requirements shown in chart.

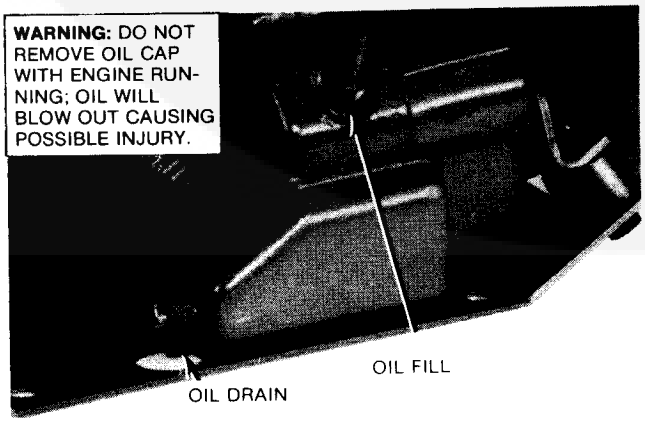


FIGURE 8. OIL FILL AND DRAIN

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

FUEL FILTER

An inline fuel filter mounts on inlet side of fuel pump. Replace at least every 100 hours or when poor performance is suspected.

CAUTION **When removing or replacing fuel solenoid always use wrench on hex (A), Figure 9. Do not exert turning force on B because solenoid will be damaged internally.**

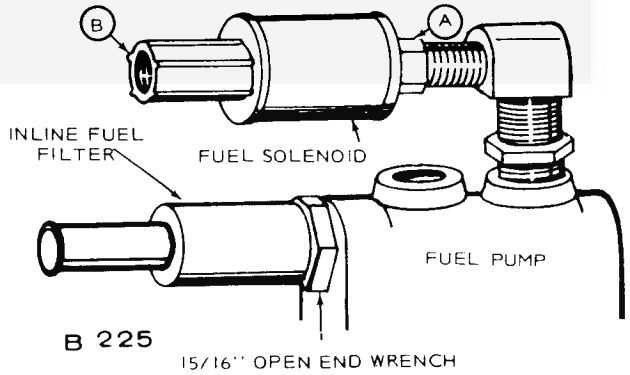


FIGURE 9. INLINE FUEL FILTER

FUEL SOLENOID

Evaporative control systems on late model motor homes require a positive fuel shutoff valve to prevent the generator set from flooding when not in use.

AIR CLEANER

Replace air cleaner every 100 hours (sooner in dusty conditions). Element used is a dry type and requires no oil. Some dirt can be removed by tapping element against a flat surface.

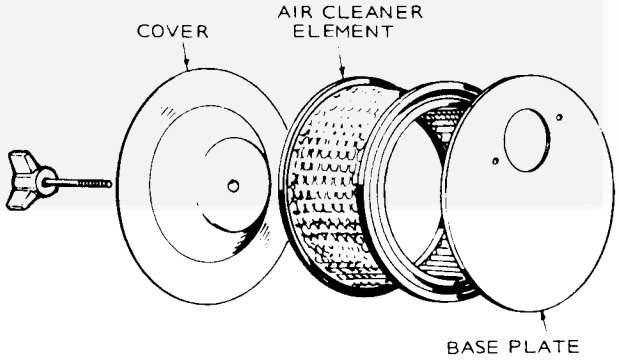


FIGURE 10. AIR CLEANER ELEMENT

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).

GOVERNOR LINKAGE

Check linkage periodically for freedom of movement. Disconnect ball joint and clean.

SPARK PLUG

Replace spark plug 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.

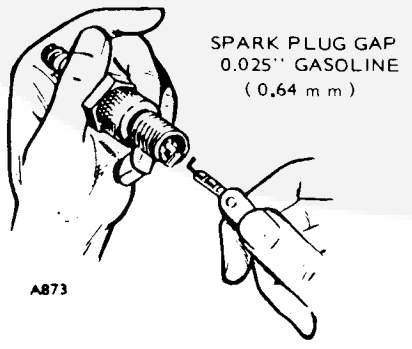


FIGURE 11. SPARK PLUG GAP

COOLING SYSTEM

Check cooling fins and shrouds at least every 200 hours or annually. Remove all foreign material (bugs, dirt, oil, leaves). Also check generator air inlet and air outlet for restrictions which can cause overheating.

CAUTION **Don't operate unit without the cooling shrouds installed; overheating will occur causing engine damage.**

BREATHER VALVE

Every 100 hours check the breather valve by removing breather tube and examining the valve in the crankcase. The ball-check valve must move freely in the valve housing chamber. If there is any excessive accumulation of sludge or dirt, replace the breather valve.

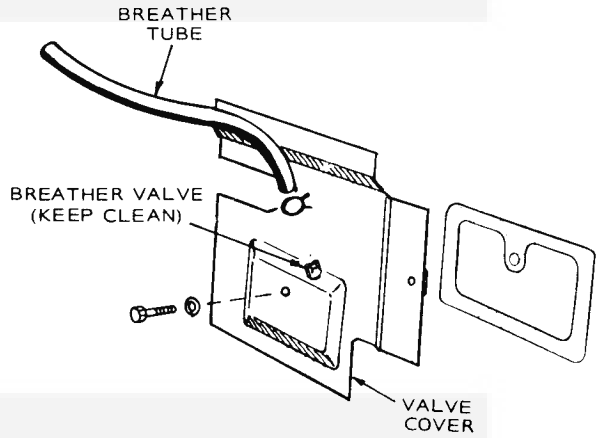


FIGURE 12. CRANKCASE BREATHER

GENERATOR

After approximately 500 hours of operation, remove the generator brushes and inspect for wear and scoring. To remove the brushes, unscrew the brush retainers (Figure 13) and pull the brush and spring assembly out of the bell housing. The four smaller retainers hold the slip ring brushes, and the two larger retainers secure the commutator brushes.

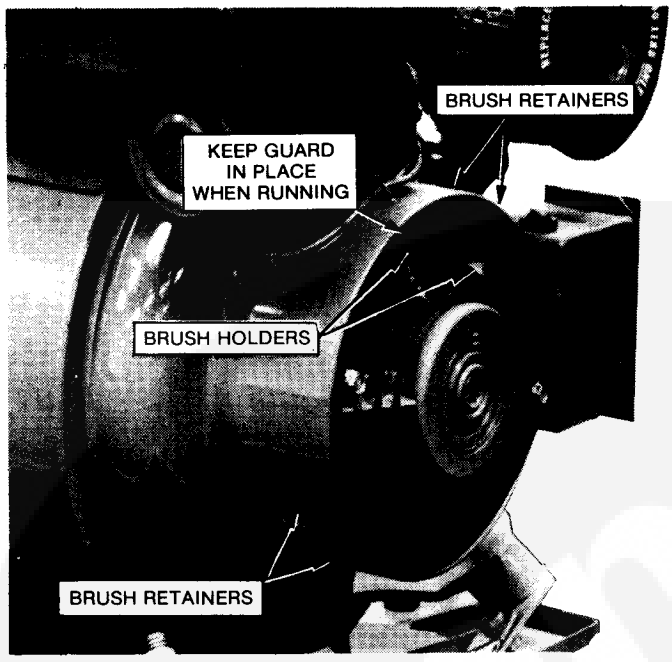


FIGURE 13. BRUSH LOCATION

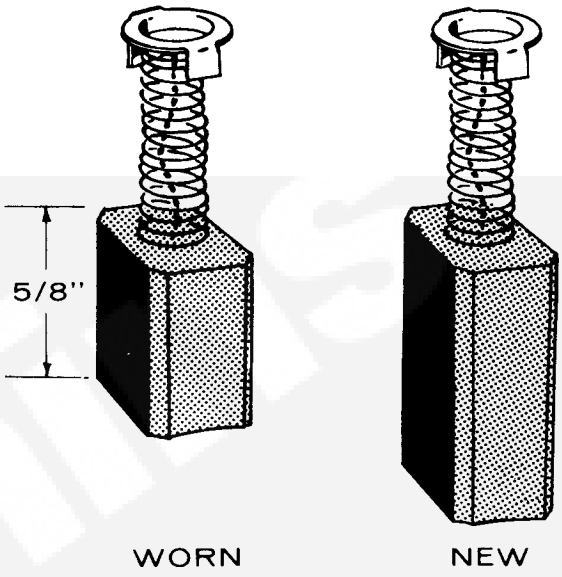


FIGURE 14. BRUSH REPLACEMENT

The brush faces should have a smooth, shiny surface to them, with no deep grooves present. If serious grooves are noted, the commutator and slip rings should be inspected to determine the cause for correction purposes. If slip ring and commutator dressing is required, your nearest Onan Service Center is best equipped to handle the job.

If brushes appear to be in satisfactory condition, and are at least 5/8 inch in length, replace them in the holders from which they were removed. Work the brushes up and down in the holders to be sure there is no sticking or binding. If they bind, clean out the holders with air pressure or a small bristle brush until the brushes slide freely in the holders. Replace the brush retainer screws.

If brushes are worn to less than 5/8 inch length, replace with new brushes (see Figure 14).

Every 500 hours, remove the brushes and blow out the dust in the generator by blowing compressed air (not over 35 psi) into all the brush holders with the brushes removed. Service more often if operating in extremely dusty conditions.

Replacement brushes are shaped to fit the curvature of the commutator and seldom need sanding to seat properly. If sparking does occur, run set at light loads until new brushes are properly seated.

CAUTION **Never use emery cloth or metal files to seat brushes. Use only brushes of correct part number (see your Onan Service Center). Replace brushes in the same position in holder as they were originally.**

EXHAUST SPARK ARRESTER

Exhaust spark arresters are necessary for SAFE OPERATION. All require periodic clean-out (every 50 to 100 operating hours) to maintain maximum efficiency. Some state and federal parks require them.

To clean spark arrester remove pipe plug in bottom of muffler. Run set under load for 5 minutes. Replace plug.

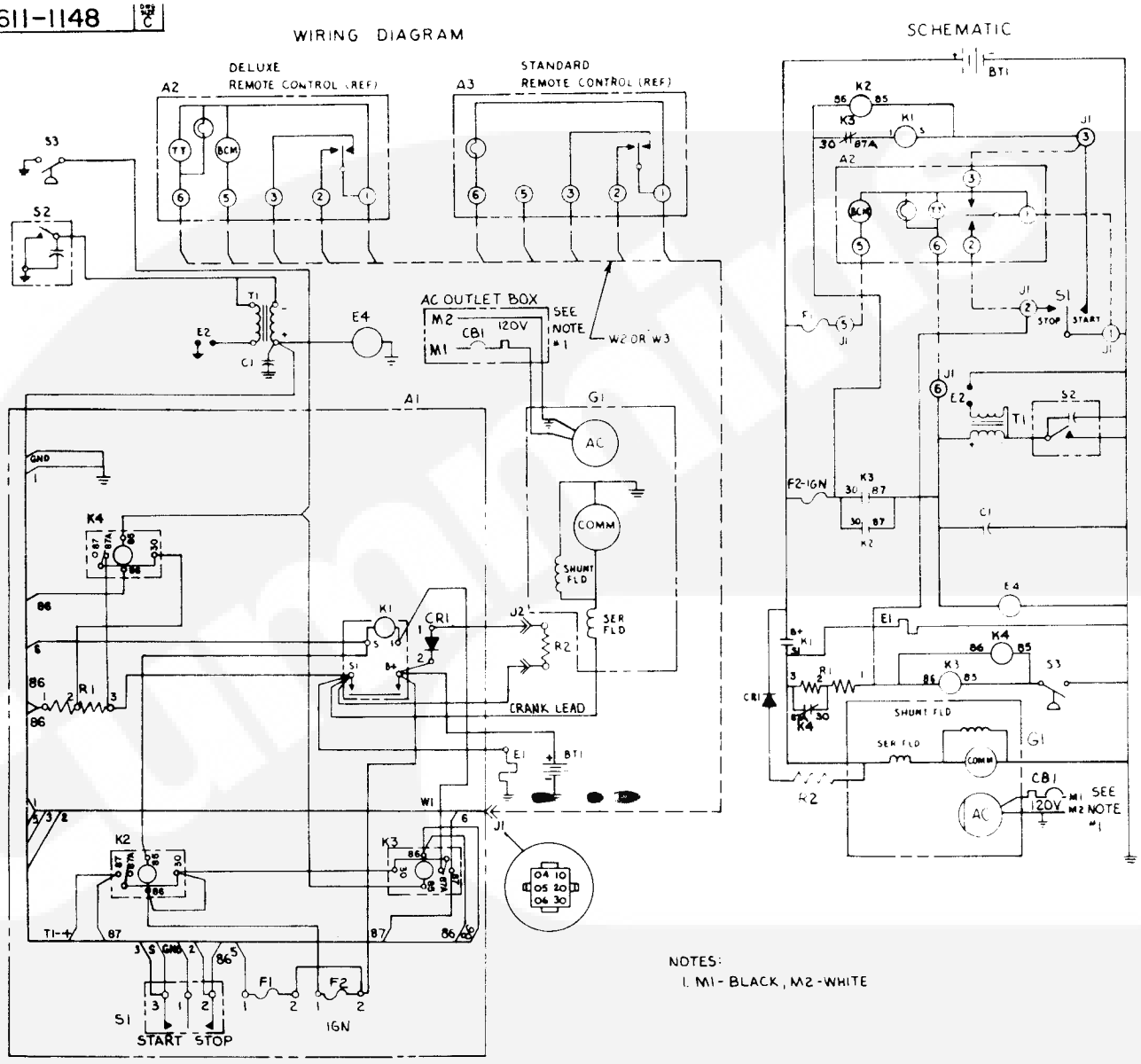
ASSEMBLY TORQUES

	LB-FT	N•m
Gearcase Cover	10-13	(13.6 - 17.6)
Cylinder Head Stud Nuts (Cold)	24-26	(32.5 - 35.3)
Rear Bearing Plate Screws	15-20	(20.3 - 27.1)
Connecting Rod Bolt	10-12	(13.6 - 16.3)
Flywheel Mounting Screw	35-40	(47.5 - 54.2)
Oil Base Mounting Screws	25-30	(33.9 - 40.7)
Generator Through Stud Nut	12-15	(16.3 - 20.3)
Armature Through Stud Nut	25-30	(33.9 - 40.7)
Crankshaft Blower Housing	20-25	(27.1 - 33.9)
Fuel Pump Mounting Screw	10-15	(13.6 - 20.3)
Intake Manifold Mounting Screw	15-20	(16.3 - 27.1)
Oil Pump Mounting Screw	7-9	(9.5 - 12.2)

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. Jumper switch (#3 terminal) to ground. If solenoid energizes, 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. **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.**
	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. Check oil level. If low or empty, refill to proper level.
UNITS RUNS BUT SURGES	1. Stuck Choke	1. See 4 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. Check oil level. If low or empty, refill to proper level.
REMOTE RUNNING TIME METER OR GENERATOR LAMP INOPERATIVE	1. Blown Fuse (F1)	1. Replace F1 fuse on control.

611-1148 C



A1	Control Assembly
A2	Delux Remote Control
A3	Standard Remote Control
S1	Start-Stop Switch
F1, F2	Fuse (5-amp, 32 Volt)
K1	Start Solenoid
K2	Relay-Crank Ignition
K3	Relay-Run Ignition
E1	Choke - Onan
E2	Spark Plug
E4	Fuel Shut Off Solenoid
T1	Ignition Coil
S2	Breaker Points Assembly
S3	Switch - Low Oil Pressure
G1	Generator
CB1	30 Amp Circuit Breaker
R2	Resistor (10-Ohm, 45 Watt)
BT1	Battery - 12 Volt

FIGURE 15. CONTROL SYSTEM SCHEMATIC

REMOTE ACCESSORIES

INSTALLING STANDARD OR DELUXE REMOTE START CONTROLS 300-0985 AND 300-0986

The standard control includes a start-stop switch and indicator lamp. The deluxe control contains these items plus a running time meter and a battery condition meter. Install as follows:

1. Select control location. Using Figure 16 or 17 as a guide, drill screw holes and cut hole to accommodate remote switch in dash panel.
2. Following national and local electrical codes and using #18 or larger insulated wires of predetermined length, connect remote control to generator set. Ensure that leads from remote control connect to corresponding terminals on generator set. Refer to Figure 18 for wiring connections.

CAUTION **Do not 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 woodscrews supplied with switch.

WARNING **Seal all holes that might allow noxious gases to enter motor home.**

CAUTION **Ensure that leads from remote switch connect with corresponding terminals on generator set.**

For sets without remote connector plug, connect terminals 1, 2, and 3 to corresponding terminals on generator set terminal block. Connect terminal #5 (if used) to B+ (on terminal block) or to battery connection on start solenoid. This connection should be protected with a 5 amp fuse. Connect terminal #6 to positive terminal on ignition coil and protect with a 5 amp fuse.

4. When wiring is complete, check for proper operation by starting and stopping set at the set control and by the remote start switch.

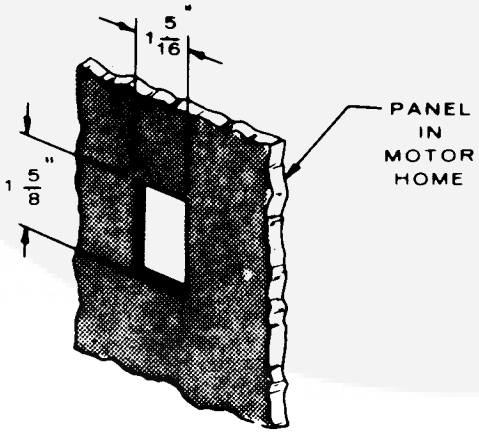


FIGURE 16. MOTOR HOME CUTOUT FOR 300-0985 STANDARD CONTROL PANEL

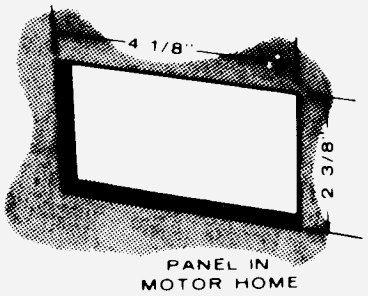
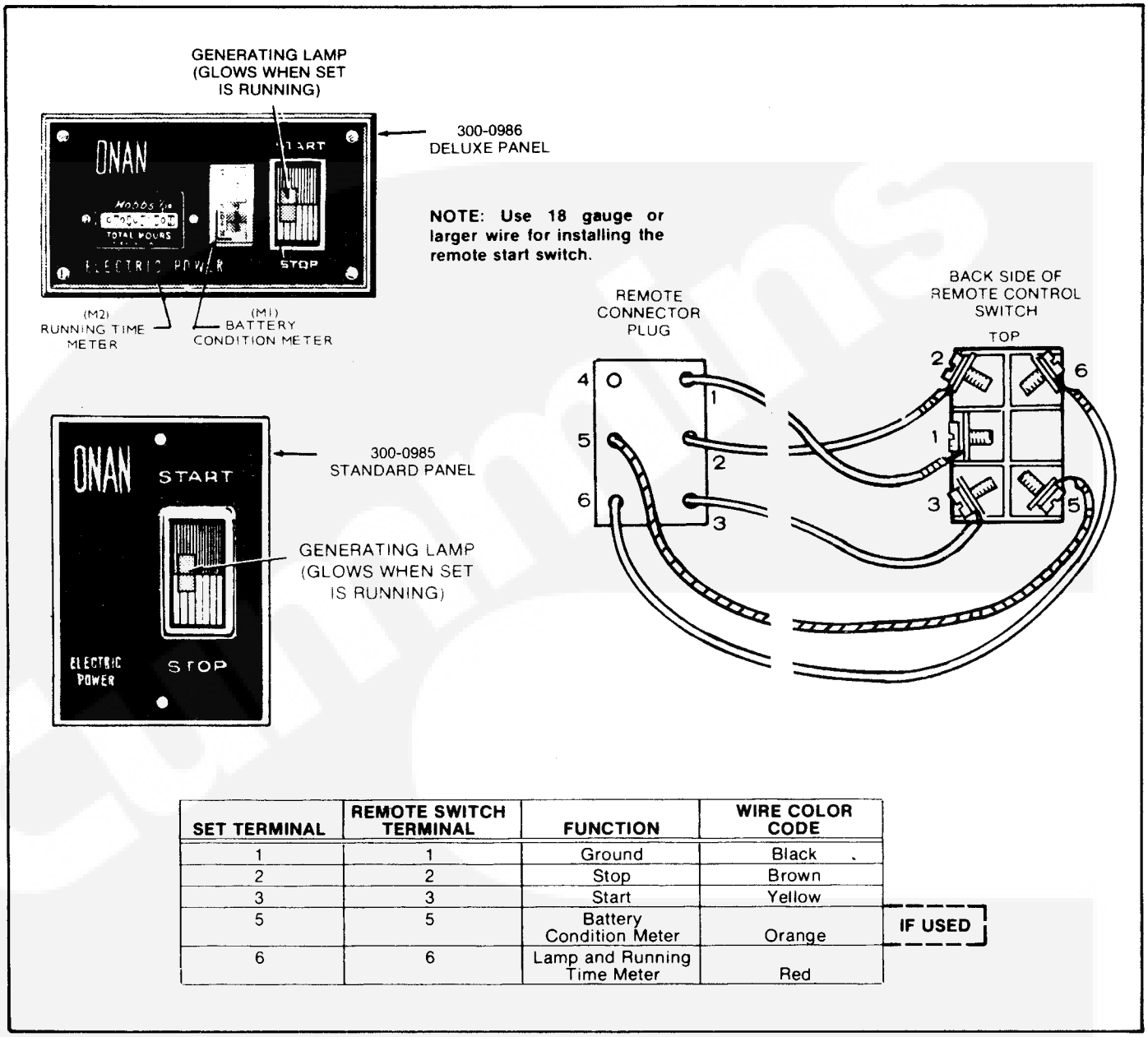


FIGURE 17. MOTOR HOME CUTOUT FOR 300-0986 DELUXE CONTROL PANEL



SET TERMINAL	REMOTE SWITCH TERMINAL	FUNCTION	WIRE COLOR CODE	
1	1	Ground	Black	
2	2	Stop	Brown	
3	3	Start	Yellow	
5	5	Battery Condition Meter	Orange	IF USED
6	6	Lamp and Running Time Meter	Red	

FIGURE 18. WIRING CONNECTIONS FOR 300-0985 AND 300-0986 REMOTE CONTROLS

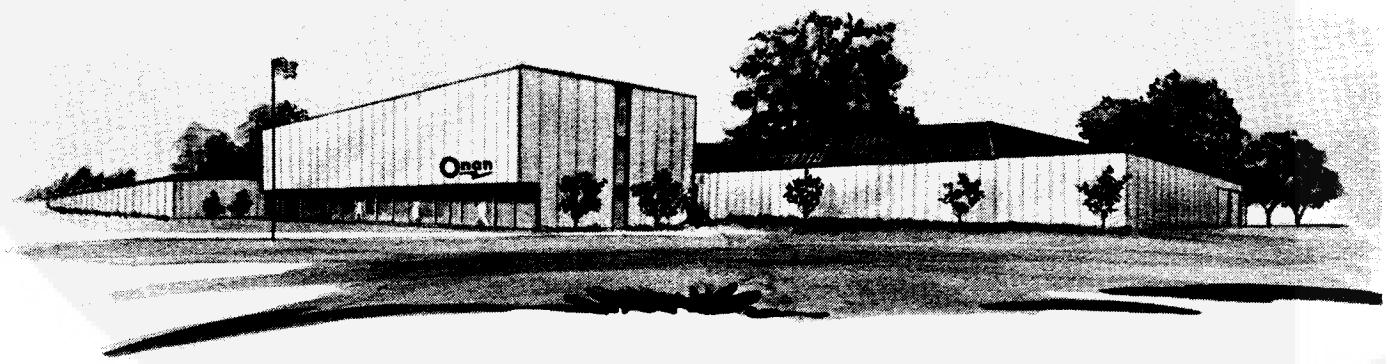
"RV" PARTS INFORMATION

For additional information on parts or service contact your nearest authorized Onan dealer or Service Center. A complete parts manual is available and may be ordered under 924-0222.

The following Running Replacement parts list consists of external items which may require replacement due to normal wear and service and can usually be installed by the operator.

RUNNING REPLACEMENT PARTS LIST

Part No.	Description
140-1188	Air Cleaner Element
167-0291	Spark Plug
160-0002	Breaker Points
312-0181	Condenser (Breaker Points)
321-0174 (2 each)	Fuses for Control



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