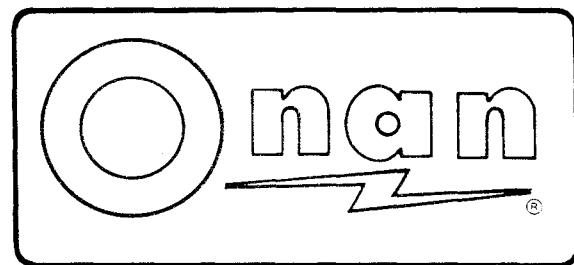
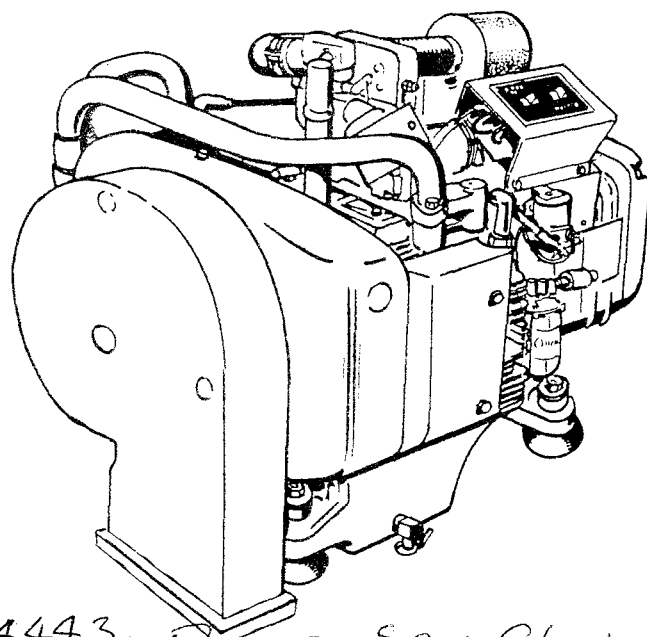


# operator's manual



## cck series

**R.V. Electric  
Generating Sets**



927-0120

5.0CCK3CR14443

KW Eng 4wire Remote  
FAM Recal start

Spec Charge  
10-75  
(Spec. R)

OPTIONAL Equip

# 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. A flexible section of fuel line must be used between the generator set and stationary fuel line in the vehicle. This flexible section must be 100% NON-METALIC 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.

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 cans, oily rags, chains, wooden blocks etc. A fire could result or the generator set operation may be adversely affected. Keep the 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."

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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

## MODEL DESIGNATION

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

4.0	CCK	-	3C	R	12000	R
1	2		3	4	5	6

1. Indicates kilowatt rating.
2. Series identification.
3. Number 3 is the voltage code for 120/240 volts single phase. "C" is the code for reconnectable (120 volts, 2 wire; and 120/240 volts, 3 wire).
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 a production modification.

Onan electric sets are given a complete running test under various load conditions and are thoroughly checked before leaving the factory. Upon receiving your unit, check it thoroughly for any damage that

may have occurred during shipping. Tighten loose parts, replace missing parts and repair any damage before operating the unit.

## YOUR MANUAL

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

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

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

Where applicable, metric equivalents appear in parentheses following the U.S. customary units.

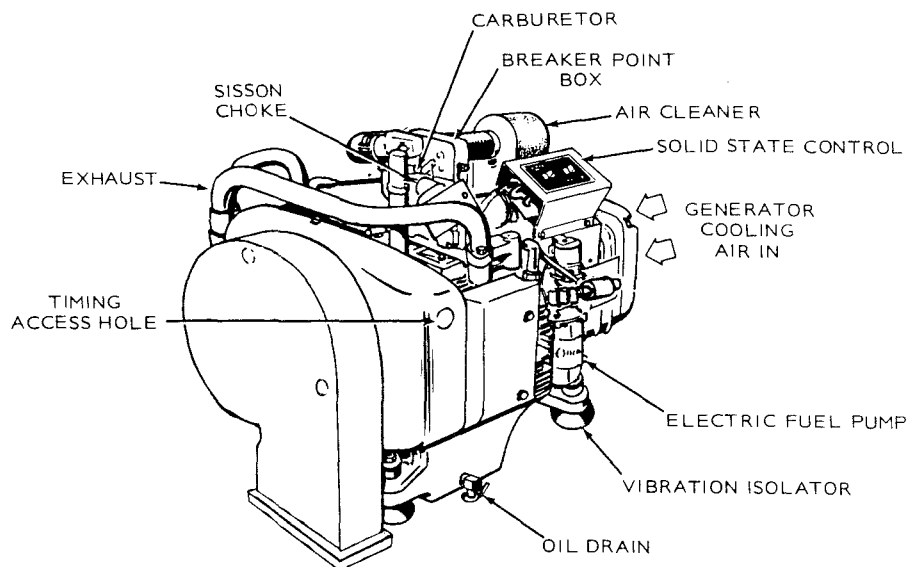


FIGURE 1. TYPICAL CCK FOR RECREATIONAL VEHICLES

# SPECIFICATIONS

(Dimensions in parenthesis are metric values)

## ENGINE DETAILS

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

## GENERATOR DETAILS

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

## CAPACITIES AND REQUIREMENTS

Oil Capacity .....	4 Quarts (3.78 Litres)
Recommended Battery .....	12 Volt, 74 Amp/hr
Battery Charge Rate .....	1.5 to 6 amperes
Average Fuel Consumption @ Rated Load	
4.0 CCK .....	0.7 gph
5.0 CCK .....	0.88 gph
Air Inlet Size Required (Minimum)	
4.0 CCK .....	100 in <sup>2</sup> (645 cm <sup>2</sup> )
5.0 CCK .....	120 in <sup>2</sup> (774 cm <sup>2</sup> )

## TUNE-UP SPECIFICATIONS

Spark Plug Gap .....	.025 inch (0.64 mm)
Breaker Point Gap .....	.020 inch (0.51 mm)
Ignition Timing .....	19° BTC
Valve Tappet Adjustment	
Intake .....	.007 inch (0.18 mm)
Exhaust .....	.016 inch (0.41 mm)

# INSTALLATION CHECKS

**NOTE:** For detailed installation procedures, refer to the individual Installation Guide #927-0610 (or T-012) which accompanies each set.

## 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:

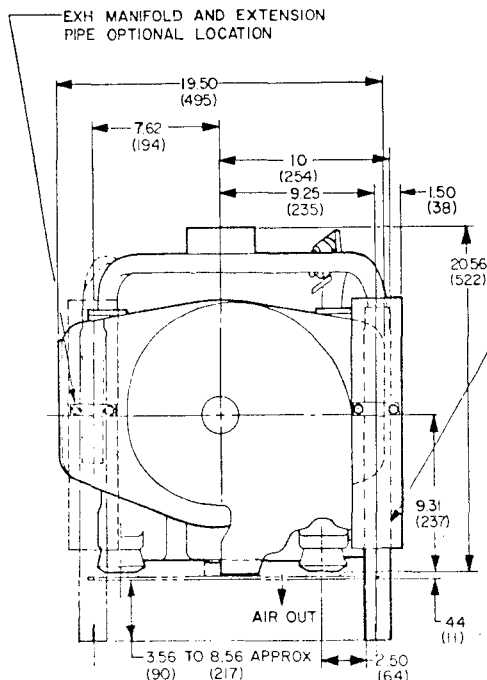
- Exhaust
- Fuel System
- Electrical
- Ventilation

## 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.

### WARNING

Do not terminate exhaust under vehicle.



DIMENSIONS IN ( ) ARE MILLIMETRES  
WEIGHT - NET 290 LBS (131 kg)

## FUEL SYSTEM

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

## ELECTRICAL

**AC Output:** All AC leads (M1, M2, M3 and M4) terminate in generator set's junction box. Connect these wires to distribution box with multistrand wire enclosed in a flexible conduit. Check all wires (to and from the generator set) for fraying and loose connections. For information on load connections refer to OPERATION section following.

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

### WARNING

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

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

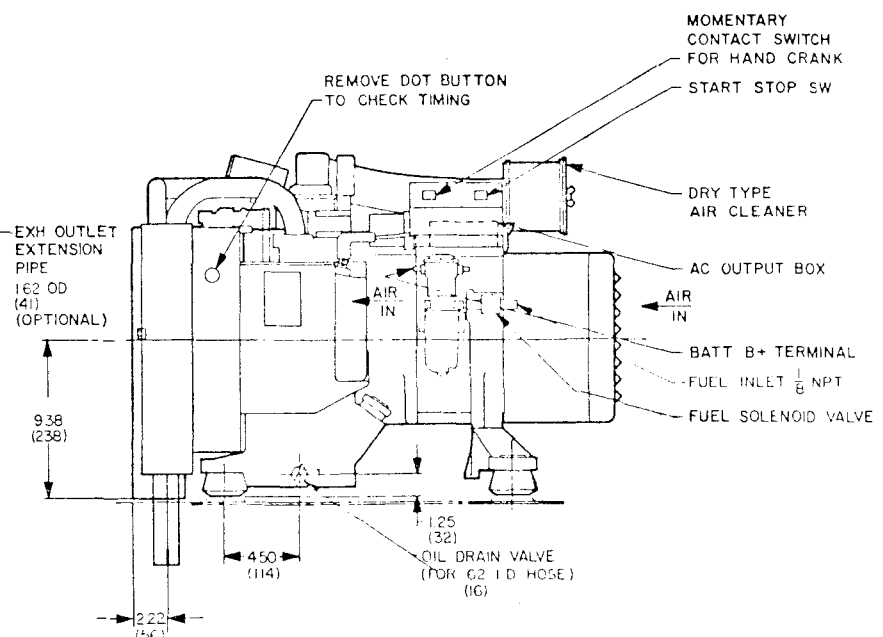
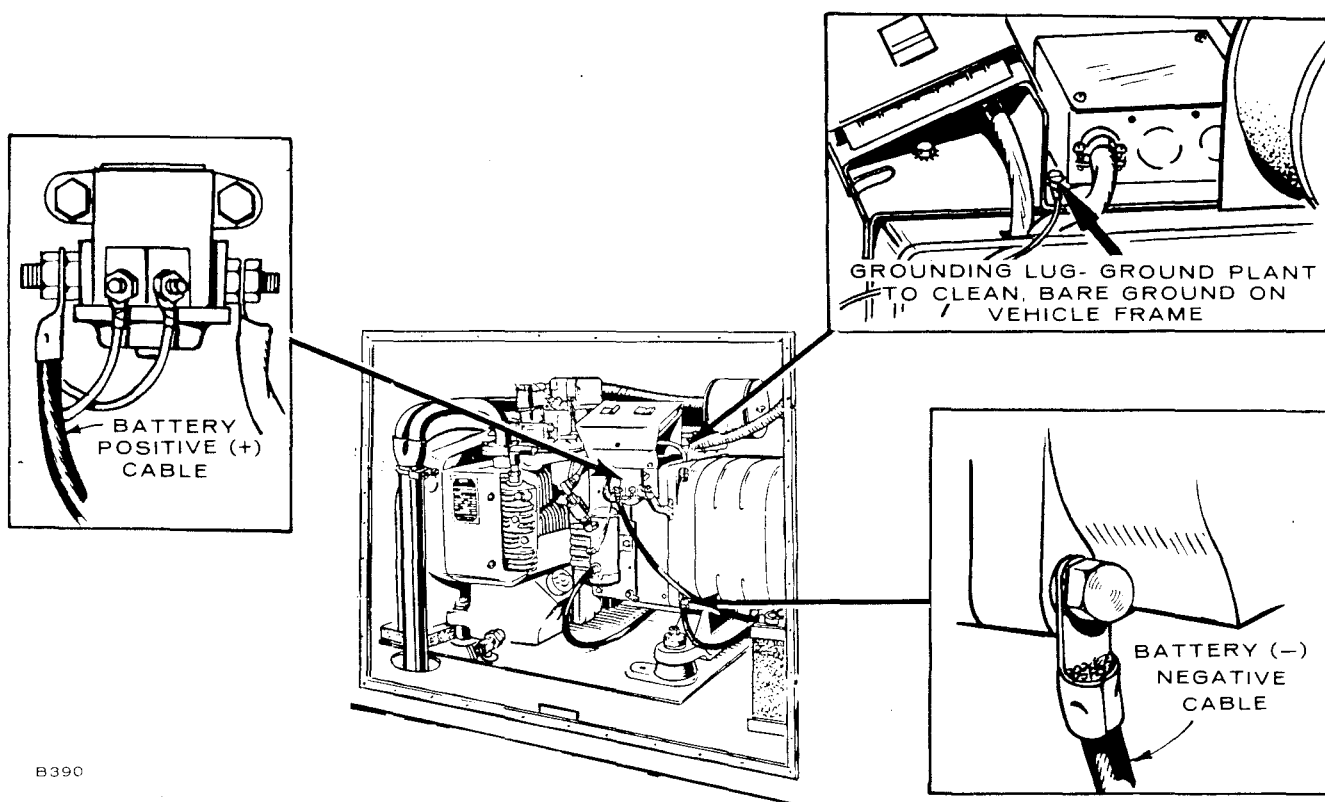


FIGURE 2. INSTALLATION OUTLINE

## VENTILATION

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

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



B390

FIGURE 3. BATTERY AND GROUND CONNECTION

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

# OPERATION

## BEFORE STARTING

### Crankcase Oil

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

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

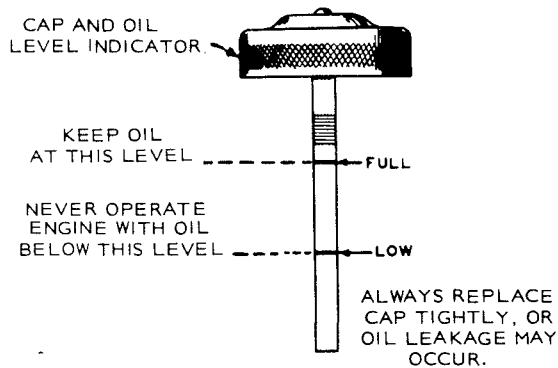


FIGURE 4. CHECKING OIL LEVEL

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

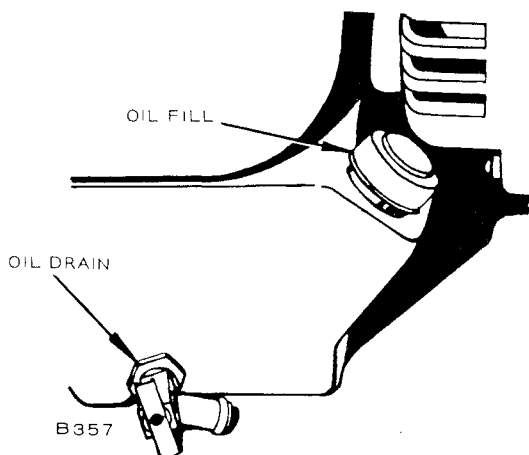


FIGURE 5. OIL DRAIN AND FILL

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

### TEMPERATURE

### GRADE

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

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

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

## Recommended Fuel

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

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

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

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



## STARTING

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

## Fuse Connection

A 9 amp fuse (F1) connects to terminal 5 on the set's control. If battery cables are accidentally reversed, this fuse will burn and set won't start. Before replacing fuse, reconnect the battery cables.

## STOPPING

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

## BREAK-IN PROCEDURE

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

1. One half hour at 1/2 load (with one air conditioner only).
2. One half hour at 3/4 load (with one air conditioner and approximately 1000 watts additional load).
3. Change crankcase oil after the first 50 hours of operation.

## APPLYING LOAD

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

## VOLTAGE SELECTION

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

## LOAD CONNECTIONS

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

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

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

## EXERCISE

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

## BATTERY CHARGING

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

## HIGH OPERATING TEMPERATURES

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

## LOW OPERATING TEMPERATURES

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

## OPERATION IN DUST AND DIRT

1. Keep unit clean. Keep cooling surfaces clean.
2. Service air cleaner as frequently as necessary.
3. Change crankcase oil every 50 operating hours.
4. Keep oil and gasoline in dust-tight containers.
5. Keep governor linkage clean.
6. Clean generator brushes, slip rings, and commutator, do *not* remove normal dark brown film. Do *not* polish.

## HIGH ALTITUDES

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

## POWER REQUIREMENTS FOR APPLIANCES

Appliance or Tool	Approximate Running Wattage
Refrigerator .....	600-1000
Electric broom .....	200-500
Coffee percolator .....	550-700
Electric frying pan .....	1000-1350
Hair dryer .....	350-500
Electric stove (per element) .....	350-1000
Electric iron .....	500-1200
Radio .....	50-200
Electric water heater .....	1000-1500
Space heater .....	1000-1500
Electric blanket .....	50-200
Television .....	200-600
Electric drill .....	250-750
Battery charger .....	Up to 800
Electric water pump .....	500-600
Air Conditioner .....	1400-2000
Converter .....	300-350

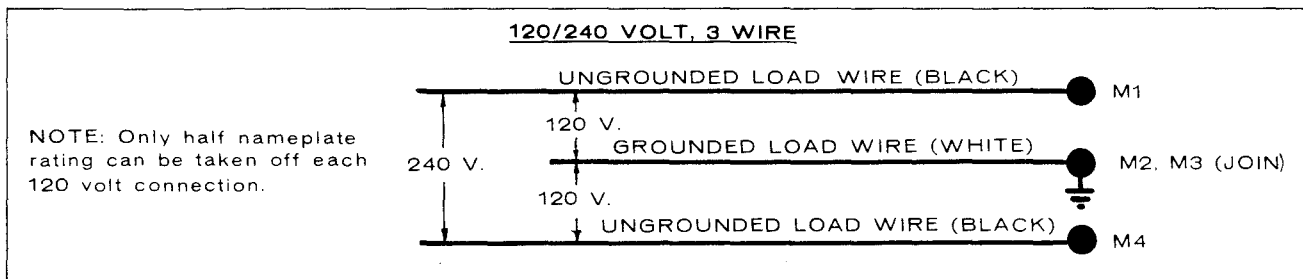
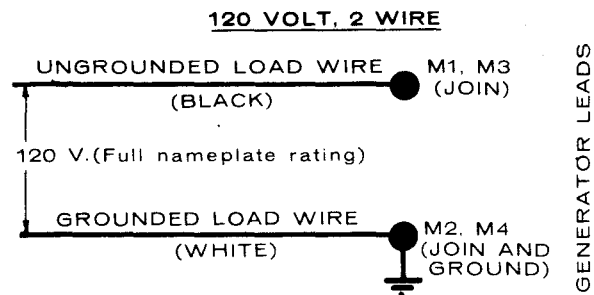


FIGURE 6. SINGLE-PHASE, "-3C" VOLTAGE CODE GENERATOR CONNECTIONS

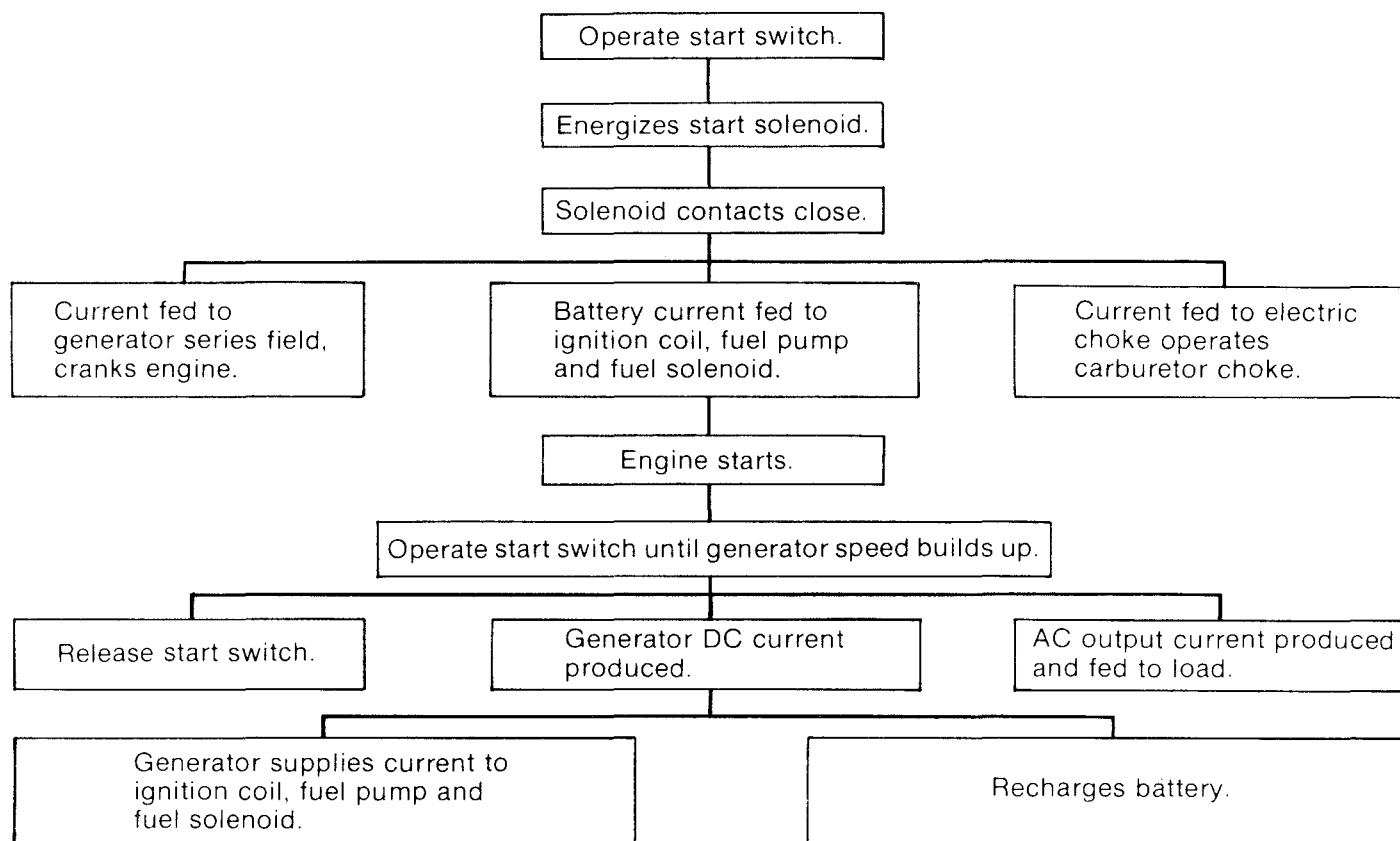


FIGURE 7. SEQUENCE OF OPERATION

## OUT-OF-SERVICE PROTECTION

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

1. Run the generator set with at least a 50 percent load until thoroughly warm (usually about 1 hour).
2. Turn off fuel supply and allow the engine to run out of fuel. Also operate the choke manually as the engine stops to help drain the carburetor completely.
3. Drain the oil from oil base while engine is still warm. Replace the oil filter if so equipped. Replace drain plug and refill. Attach a warning tag stating type and viscosity of oil used.
4. Remove spark plugs. Pour 1 ounce of rust inhibitor oil (or SAE #10) into each cylinder. (Spray cans work well for this application.) Turn engine over by hand at least 2 complete revolutions. Replace the spark plugs.
5. Replace the air cleaner at least on an annual basis.
6. Plug the exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
7. Clean and oil all exposed engine parts including carburetor and governor linkage.

8. Wipe generator brushes, slip rings, housing, etc. Do not apply any lubricant or preservative.
9. Remove the battery and store in a cool dry place. Coat the battery terminals and cable connections with vasoline or grease to prevent any corrosion. Recharge the battery at least monthly or maintain with a trickle type battery charger.
10. Provide a suitable cover if the unit is exposed to the elements.

## RETURNING THE UNIT TO SERVICE

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

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

# MAINTENANCE

## BATTERY CARE

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

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

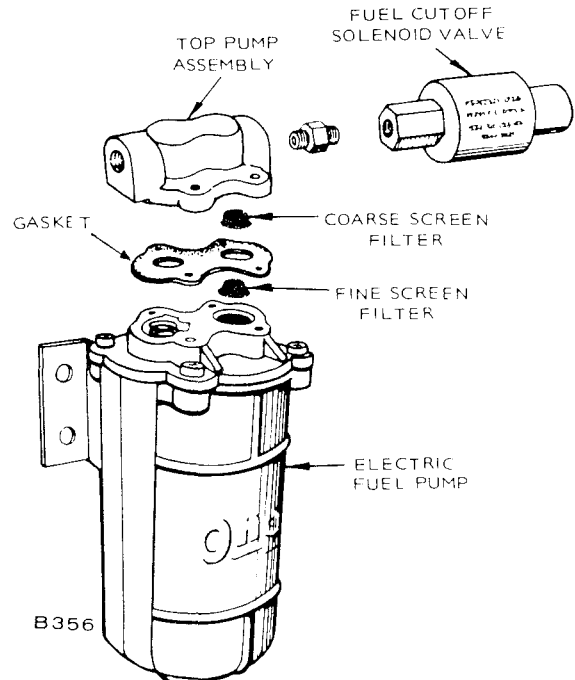


FIGURE 8. ONAN FUEL PUMP

## FUEL SOLENOID

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

## ONAN ELECTRIC FUEL PUMP

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

## COOLING SYSTEM

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

Check and clean (if necessary) the cooling fins at least every 100 hours of operation. Remove any dust, dirt or oil which may have accumulated. Check compartment air inlet and power plant air outlet for buildup of dirt, chaff, etc.

## AIR CLEANER

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

### WARNING

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

### WARNING

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

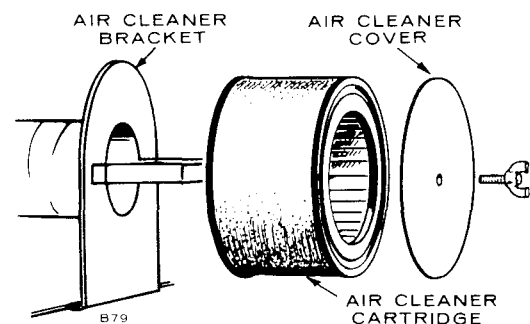


FIGURE 9. AIR CLEANER ELEMENT

## SPARK PLUGS

Replace spark plugs every 100 hours or at least once a year. A badly leaded plug will cause misfiring, poor operation or stopping when a load is applied.

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

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

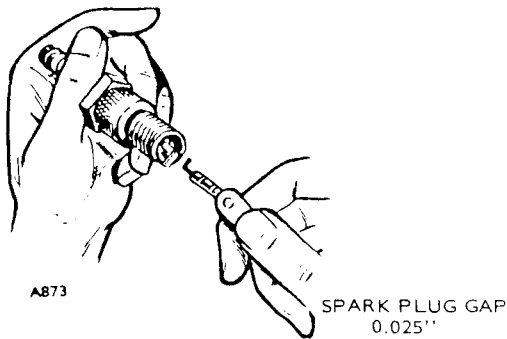


FIGURE 10. CHECKING SPARK PLUG GAP

## GOVERNOR LINKAGE

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

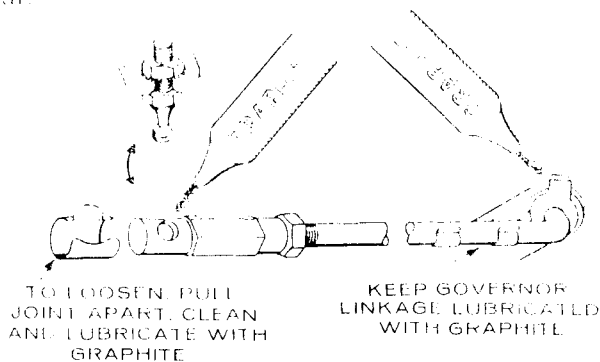


FIGURE 11. GOVERNOR LINKAGE

## CRANKCASE BREATHER

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

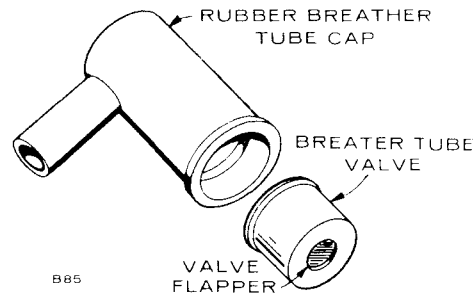


FIGURE 12. CRANKCASE BREATHER

## SPEED BOOSTER

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

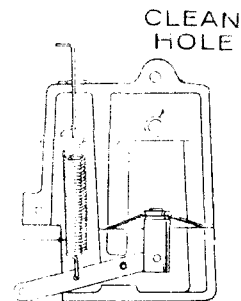


FIGURE 13. VACUUM SPEED BOOSTER

## GENERATOR MAINTENANCE

The generator normally needs little care other than a periodic check of the brushes, commutator and collector rings. If a major repair job on the generator should become necessary, have the equipment checked by a competent electrician who is thoroughly familiar with the operation of electric generator equipment.

### Brush Replacement

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

Collector rings acquire a glossy brown finish in normal operation. Do not attempt to maintain a bright newly machined appearing surface. Ordinary cleaning with a dry, lint free cloth is usually sufficient. Very fine sandpaper (#00) may be used to remove slight roughness. Use only light pressure on the sandpaper, while the unit is operating. Do not use emery, carborundum paper or cloth. Clean out all carbon dust from the generator.

### EXHAUST SPARK ARRESTERS

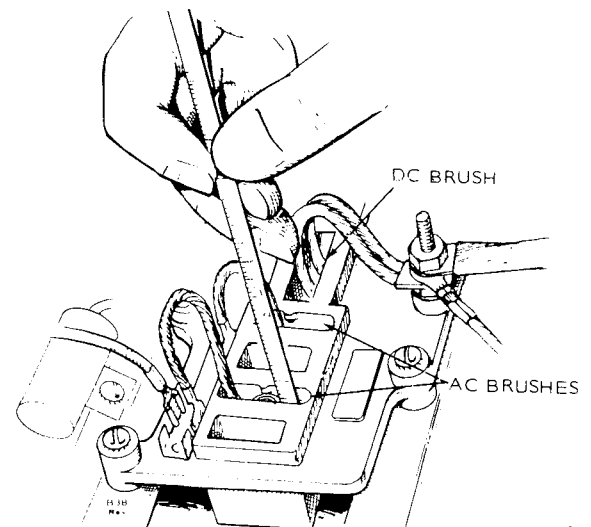
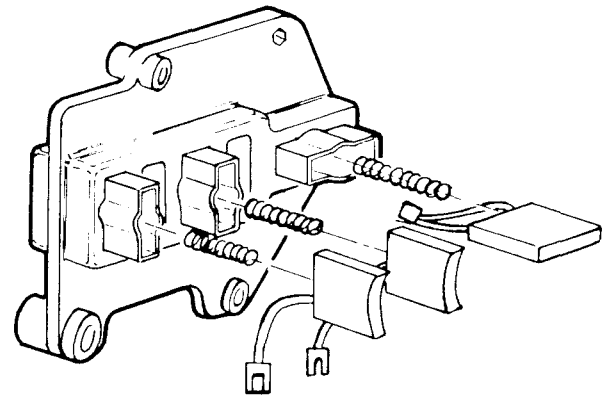
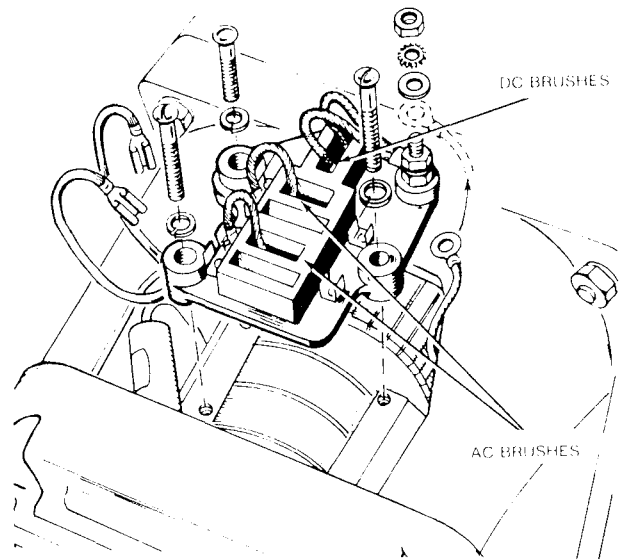
Exhaust spark arresters are necessary when operating in some parks and camps. Two basic types are used in the recreation vehicle industry. One is a spin-out type spark arrester, the other is a screen type spark arrester. All require periodic clean-out (every 50 to 100 operating hours) to maintain maximum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

#### Spin-Out Type Spark Arrester

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

#### Screen Type Spark Arrester

This arrester has a screen which traps carbon particles as they pass through. The screen is removed, cleaned or replaced after it has filled. A disadvantage of this type is the screen plugs as it collects the



MEASURE FROM TOP FACE OF  
BRUSH BLOCK TO TOP OF BRUSH

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

FIGURE 14. BRUSH LENGTH

particles and gradually increases exhaust back pressure. Back pressure causes a loss of engine power and can cause burned or damaged valves if pressure is high enough. It is very important this type be cleaned as recommended.



# PERIODIC MAINTENANCE SCHEDULE

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

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

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

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

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

x2 - Perform more often in extremely dusty conditions.

x3 - Replace if necessary.

x4 - Replace annually or prior to storage.

# ADJUSTMENTS

## BREAKER POINTS

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

## IGNITION TIMING

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

### Timing Procedure—Engine Running

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

### Timing Procedure—Engine Not Running

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

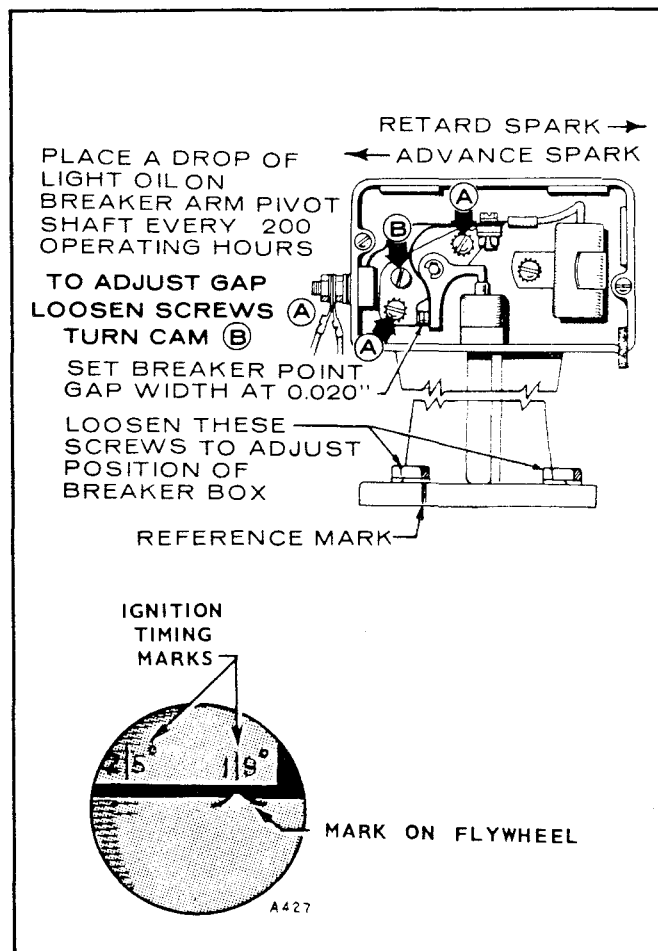


FIGURE 15. BREAKER BOX AND TIMING MARK

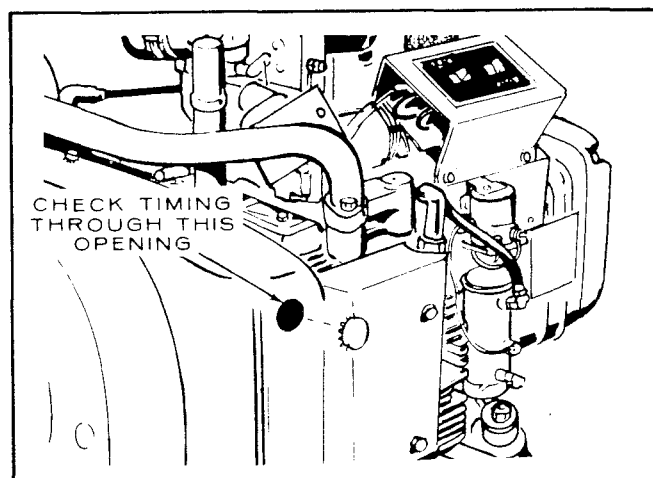


FIGURE 16. TIMING ACCESS HOLE

## CARBURETOR

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

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

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

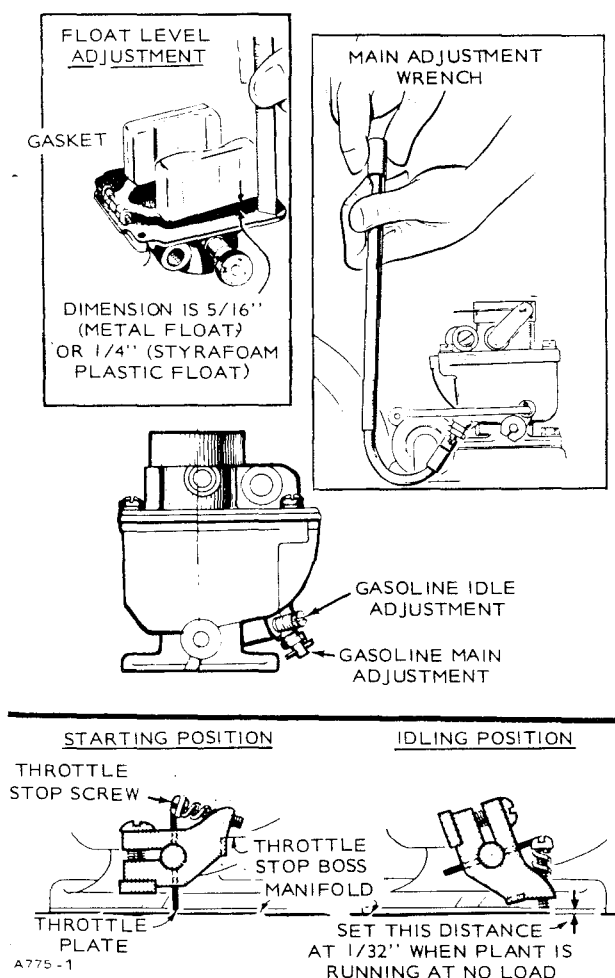


FIGURE 17. CARBURETOR ADJUSTMENTS

## ELECTRIC CHOKE

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

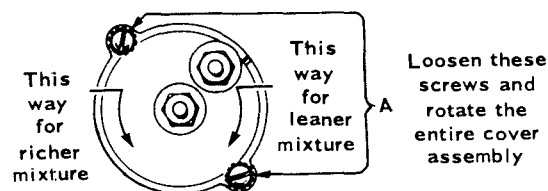


FIGURE 18. ELECTRIC CHOKE

## GOVERNOR AND BOOSTER

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

### Governor Adjustment

Before making adjustments, run the set about 15 minutes with a light load connected to reach normal operating temperature. (If governor is completely out of adjustment, make a preliminary adjustment at no load to first attain a safe voltage operating range.)

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

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

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

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

## Linkage

The engine starts at wide open throttle. The length of the linkage connecting the governor arm to the throttle shaft and lever is adjusted by rotating the ball joint. Adjust this length so that with the engine stopped and tension on the governor spring, the stop on the carburetor throttle lever just contacts the underside of the carburetor bowl. This setting allows immediate control by the governor after starting. It also synchronizes travel of the governor arm and the throttle shaft.

## Speed Adjustment

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

**VOLTAGE CHART  
FOR CHECKING GOVERNOR REGULATION**

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

**NOTE:** Output rating is at UNITY power factor load.

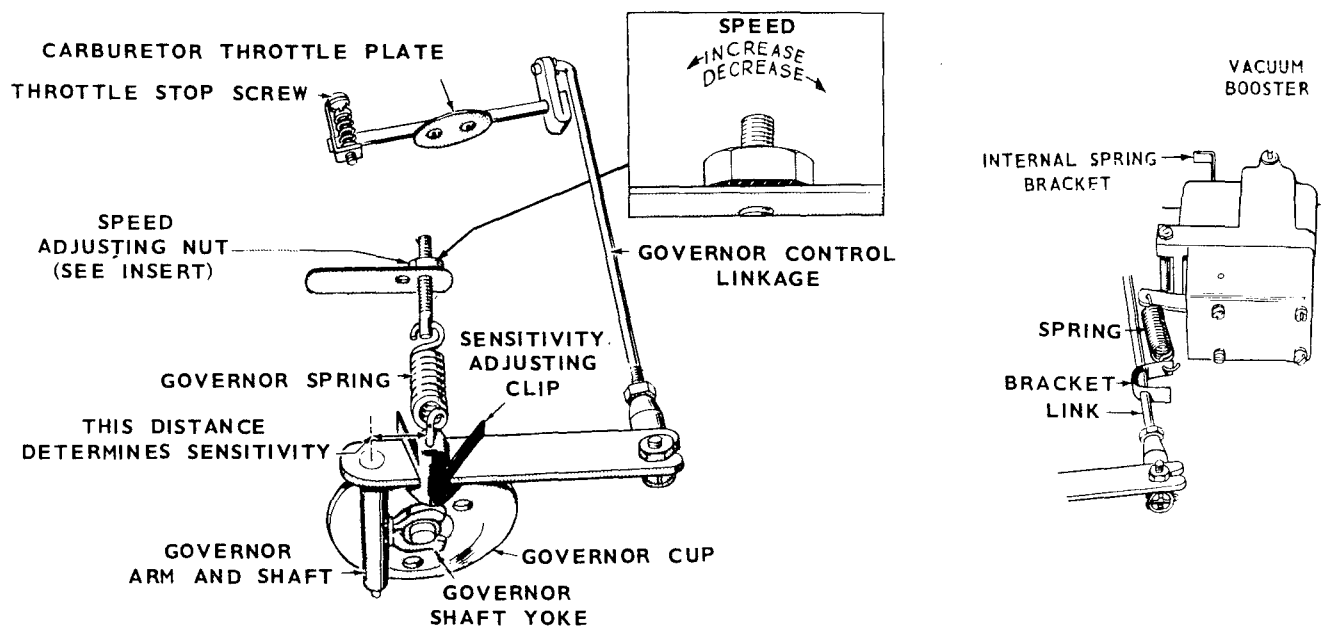
**SPEED CHART  
FOR CHECKING GOVERNOR REGULATION**

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

## Sensitivity Adjustment

Refer to the Governor Adjustment illustration, and to the Voltage and Speed Charts. Check the voltage and speed, first with no load connected and again with a full load. Adjust the sensitivity to give the closest regulation (least speed and voltage difference between no load and full load) without causing a hunting condition.

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



**FIGURE 19. GOVERNOR AND SPEED BOOSTER**

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

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

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

### **Speed Booster**

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

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

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

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

## GENERAL TROUBLESHOOTING GUIDE

PROBLEM	PROBABLE CAUSE	REMEDY
FAILS TO CRANK	1. BAD BATTERY CONNECTION	1. CLEAN AND TIGHTEN ALL BATTERY AND CABLE CONNECTIONS.
	2. LOW BATTERY	2. CHECK SPECIFIC GRAVITY. RECHARGE OR REPLACE BATTERY IF NECESSARY.
	3. FAULTY START SOLENOID	3. Push start switch. Check K1-1 terminal voltage to ground. Check K1-S1 contacts to ground. Battery voltage should appear at these terminals; if not, replace solenoid.
	4. FAULTY START SWITCH	4. REPLACE.
	5. REVERSE BATTERY CONNECTIONS	5. RECONNECT BATTERY CABLES TO CORRECT POSTS, THEN REPLACE 9 AMP FUSE (F1) THAT CONNECTS TO TERMINAL 5.
CRANKS SLOWLY	1. BAD BATTERY CONNECTION	1. SEE 1 ABOVE (FAILS TO CRANK)
	2. LOW BATTERY	2. SEE 2 ABOVE (FAILS TO CRANK)
CRANKS BUT WON'T START	1. FAULTY FUEL SOLENOID OR FUEL PUMP	1. Fuel solenoid must open during cranking and running. Check by removing steel line from carburetor and crank engine. If fuel solenoid is open, fuel will pulsate out of this line. If it does not, the fuel solenoid and fuel pump must be checked separately to determine defective part. <div style="border: 1px solid black; padding: 2px; display: inline-block;"><b>WARNING</b></div> 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.
	2. FAULTY IGNITION	2. Check to see if points open and close during cranking. If they do not open and close, adjust and set points. Plug and plug wires must be in good condition. Voltage at ignition coil negative terminal (-) must alternate from +12 volts to zero volts as points open and close during engine cranking.
	3. LOW OIL LEVEL	3. CHECK OIL LEVEL. IF LOW OR EMPTY, REFILL TO PROPER LEVEL.
	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 <i>ADJUSTMENT</i> section.
UNIT RUNS THEN STOPS	1. LOW OIL LEVEL	1. SEE 3 ABOVE (CRANKS BUT WON'T START)
UNIT RUNS BUT SURGES	1. STUCK CHOKE	1. SEE 4 ABOVE (CRANKS BUT WON'T START)
	2. GOVERNOR NOT ADJUSTED PROPERLY	2. READJUST GOVERNOR
UNIT STOPS	1. FAULTY IGNITION	1. SEE 2 ABOVE (CRANKS BUT WON'T START)
	2. OUT OF FUEL	2. REFILL FUEL TANK
	3. LOW OIL LEVEL	3. SEE 3 ABOVE (CRANKS BUT WON'T START)
REMOTE RUNNING TIME METER OR GENERATOR LAMP INOPERATIVE	1. BLOWN FUSE (F3)	1. DISCONNECT BATTERY CABLES, THEN REMOVE COVER FROM CONTROL. REPLACE F3 FUSE (BETWEEN TERMINAL 2 AND 10).

**CAUTION** Do not attempt to check for current flow on the printed circuit board by jumpering across components with a screwdriver, wire, etc.; damage to the board may occur. Always have these boards checked by an authorized Onan Service Center or a qualified electrician using the proper instruments (e.g. voltmeter, ohmmeter, or multimeter).

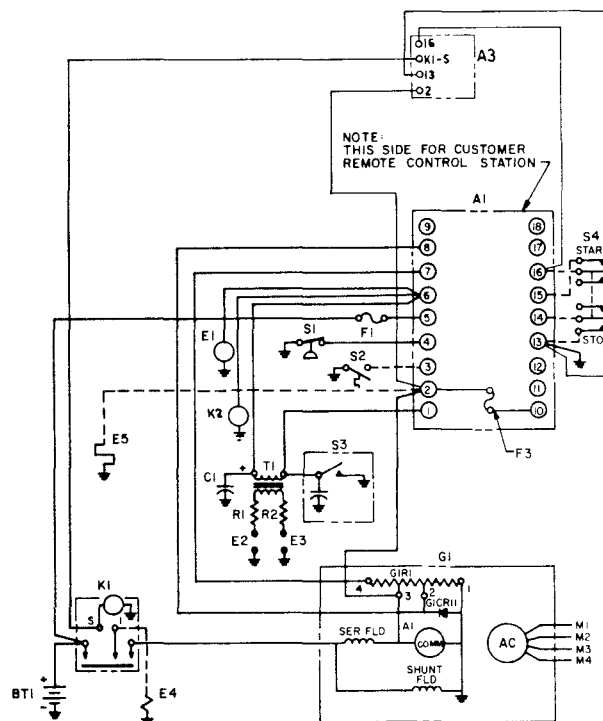


FIGURE 20. GENERATOR SET SCHEMATIC

**FOR COMPLETE WIRING DIAGRAM  
SEE ONAN #611-1086**

A1 .....	Control Assembly	K1 .....	Start Solenoid
A3 .....	Start Disconnect	F1 & F3 ....	9 Amp Fuses
BT1 .....	12 Volt Battery	K2 .....	Electric Fuel Pump
C1 .....	Capacitor	R1, R2 ....	Spark Plug Wires
E1 .....	Electric Fuel Pump	S1 .....	Low Oil Pressure Switch
E2, E3 .....	Spark Plugs	S3 .....	Breaker Points & Capacitor
E5 .....	Electric Choke	S4 .....	Remote Start-Stop Switch
G1 .....	Generator	T1 .....	Ignition Coil

**CAUTION**

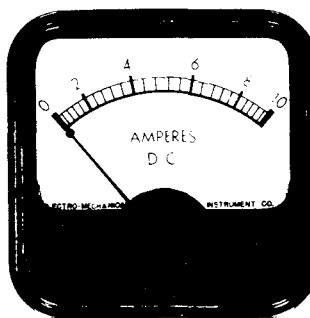
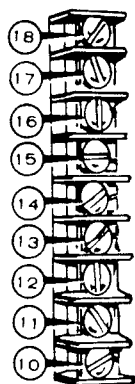
Do not attempt to check for current flow on the printed circuit board by jumpering across components with a screwdriver, wire, etc.; damage to the board may occur. Always have these boards checked by an authorized Onan Service Center or a qualified electrician using the proper instruments (e.g. voltmeter, ohmmeter, or multimeter).





# REMOTE ACCESSORIES

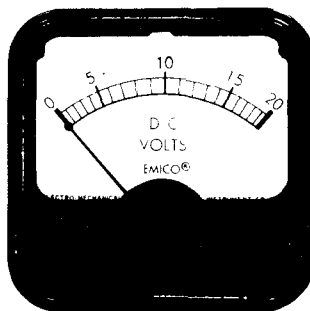
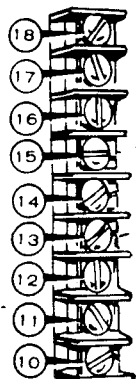
PRINTED CIRCUIT  
BOARD CONNECTION  
TERMINALS ON  
GENERATOR



ONAN NO.  
302-0561

**DC Ammeter:** Connect a direct reading 0 to 10 ampere ammeter to terminals 17 (+) and 18 (-). For distances up to 10 feet make connections with no smaller than number 18 wire. When installed, Jumper W1 must be removed from the printed circuit board. Jumper W1 is located near the 1-1/4 x 2 inch copper heat sink.

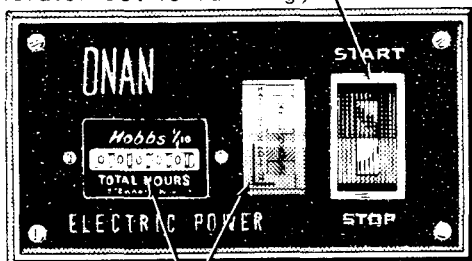
PRINTED CIRCUIT  
BOARD CONNECTION  
TERMINALS ON  
GENERATOR



ONAN NO.  
302-0562

**DC Voltmeter:** Connect DC voltmeter (0-20 volts) between terminals 15 and 13. Use number 18 wire or larger for this connection.

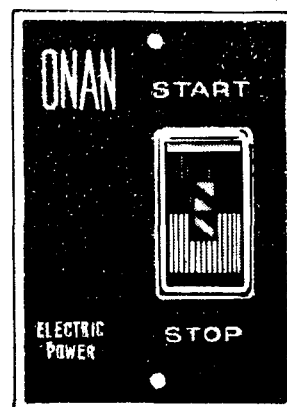
STOP-START SWITCH (DPDT)  
(Amber light glows when  
generator set is running)



RUNNING TIME METER — BATTERY CONDITION METER

DELUXE REMOTE CONTROL ASSEMBLY (300-0943)

**NOTE:** SEPARATE INSTALLATION INSTRUCTIONS ARE INCLUDED WITH SWITCH ASSEMBLY.



REMOTE CONTROL ASSEMBLY (300-0942)

# PARTS INFORMATION

The following Running Replacement Parts List consists of external items which may require replacement due to normal wear and service.

For additional information on parts or service, contact your nearest Onan Parts and Service Center or authorized dealer. A complete parts catalog is available and can be ordered under #927-0220.

## RUNNING REPLACEMENT PARTS

Part Number	Description
140-0495 .....	Air Cleaner Element
167-0242 (2 Req'd) .....	Spark Plug
160-0002 .....	Breaker Points
312-0069 .....	Condenser (Breaker Points)
166-0535 .....	Ignition Coil
142-0364 .....	Carburetor
141-0078 .....	Carburetor Base Gasket
149-1304 .....	Electric Fuel Pump (Onan)
214-0095 (DC) .....	Generator Brush
214-0096 (AC) .....	Generator Brush
307-1166 .....	Start Solenoid
307-1279 .....	Fuel Solenoid
168-0095 .....	Carbon Removal Gasket Kit
154-0360 (2 Req'd) .....	Exhaust Manifold Gasket
321-0194 (2 Req'd) .....	Fuse for Control
402-0283 (4 Req'd) .....	Vibration Isolator
155-1258 .....	Muffler/Spark Arrester (One Piece)
155-1222 .....	Muffler Only (Side Inlet)



**MANUFACTURER'S  
LIMITED  
WARRANTY**

Onan extends to the original purchaser of goods for use, the following warranty covering goods manufactured or supplied by Onan, subject to the qualifications indicated.

- (1) Onan warrants to original purchaser for the periods set forth below that goods manufactured or supplied by it will be free from defects in workmanship and material, provided such goods are installed, operated, and maintained in accordance with Onan's written instructions, and further provided, that installation inspection and initial start-up on commercial-industrial generator set or power system installations are conducted by an Onan Authorized Distributor or its designated service representative.

PRODUCT APPLICATION	PERIOD OF WARRANTY
<input type="checkbox"/> Goods used in personal, family and household applications.	One (1) year from date of purchase.
<input type="checkbox"/> Goods used in commercial-industrial applications.	One (1) year from date of purchase.
<input type="checkbox"/> Commercial-industrial stationary generator sets.	One (1) year from date of initial start-up.
<input type="checkbox"/> Commercial-industrial, standby power systems with nominal operating speeds of 1800 rpms or less which are installed in the U.S. or Canada (must include Onan supplied generator sets, automatic transfer switch, exerciser and running time meter).	* Five (5) years or 1500 hours, whichever occurs first from the date of initial start-up. Labor allowance for the first two (2) years or 1500 hours, whichever occurs first from the date of initial start-up.
<input type="checkbox"/> Commercial-industrial, standby power systems with nominal operating speeds of 1800 rpms or less which are installed outside the U.S. or Canada (must include Onan supplied generator set, automatic transfer switch, exerciser and running time meter).	* Two (2) years or 1500 hours, whichever occurs first from the date of initial start-up.
<input type="checkbox"/> Repair or replacement parts.	Ninety (90) days from date of purchase, excludes labor.

\* Must be registered on Form No. 23C065, to be provided and completed by seller.

- (2) Onan's sole liability and Purchaser's sole remedy for a failure of goods to perform as warranted shall be limited to the repair or replacement of goods returned to Onan's factory at 1400 73rd Avenue N.E., Minneapolis, Minnesota 55432, or to an Onan Authorized Distributor or its designated service representative, transportation prepaid.

Except as indicated below, this warranty does not include travel time and mileage labor for removal of Onan product from its application and reinstallation.

a) Removal and Reinstallation

- Garden Tractor Engines*—Onan will pay up to a maximum of two (2) hours labor for warranty work requiring removal and reinstallation of Onan industrial engines in garden tractor applications performed by an Onan Authorized Distributor or its designated service representative.
- Vehicles*—Onan will pay one (1) hour labor for warranty work requiring removal and reinstallation performed by an Onan Authorized Distributor or its designated service representative on vehicle applications utilizing a POWER DRAWER® and Onan supplied sliding tray generator set installations.

b) Travel Time and Mileage

- Marine Generator Set Installations*—Onan will, for six (6) months after date of purchase, pay travel time up to four (4) hours and mileage costs up to one hundred fifty (150) miles related to warranty repairs, provided, such travel and repairs are performed by an Onan Authorized Distributor or its designated service representative.
- Commercial-Industrial Standby Generator Set and System Installations*—Provided the generator set or system is permanently wired in a stationary installation, Onan will, for six (6) months after initial start-up, pay travel time up to four (4) hours and mileage costs up to one hundred fifty (150) miles for warranty repairs performed by an Onan Authorized Distributor or its designated service representative.

(3) THERE IS NO OTHER EXPRESS WARRANTY.

IMPLIED WARRANTIES INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO PERIODS OF WARRANTY SET FORTH ABOVE AND TO THE EXTENT PERMITTED BY LAW, ANY AND ALL IMPLIED WARRANTIES ARE EXCLUDED.

IN NO EVENT IS ONAN LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

(4) All claims must be brought to the attention of Onan or an Onan Authorized Distributor or its designated service representative within thirty (30) days after discovery that goods or parts fail to perform as warranted.

(5) THIS WARRANTY SHALL NOT APPLY TO:

- a) Cost of maintenance, adjustments, installation and start-up.
- b) Failures due to normal wear, accident, misuse, abuse, negligence or improper installation.
- c) Products which are altered or modified in manner not authorized by manufacturer in writing.
- d) Failure of goods caused by defects in the system or application in which the goods are installed.
- e) Telephone, telegraph, teletype or other communication expenses.
- f) Living and travel expenses of persons performing service, except as specifically included in Section 2.
- g) Rental equipment used while warranty repairs are being performed.
- h) Overtime labor requested by purchaser.
- i) Starting batteries.

(6) No person is authorized to give any other warranties or to assume any other liabilities on Onan's behalf, unless made or assumed in writing by an officer of Onan, and no person is authorized to give any warranties or assume any other liability on behalf of Seller unless made or assumed in writing by Seller.