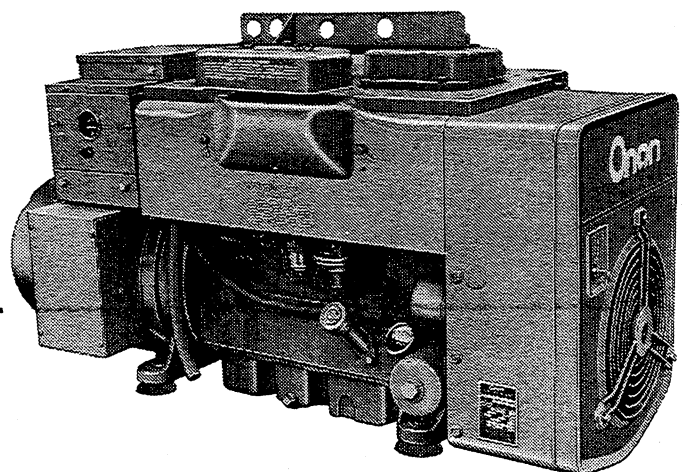


Onan

Operator's Manual

JB&JC GenSets



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Safety Precautions

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

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

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

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

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

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

- DO NOT fill fuel tanks with the engine running unless tanks are outside the engine compartment. Fuel contact with hot engine or exhaust is a potential fire hazard.
- DO NOT SMOKE OR ALLOW AN OPEN FLAME near the generator set or fuel tank. Internal combustion engine fuels are highly flammable.
- Fuel lines must be adequately secured and free of leaks. Fuel connections at the engine should be made with an approved flexible line. Do not use copper piping on flexible lines as copper will work harden and become brittle.
- Be sure that all fuel supplies have a positive shut-off valve.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

EXHAUST GASES ARE DEADLY

- Provide an adequate exhaust system to properly expel discharged gases. Inspect the exhaust system daily for leaks per the maintenance schedule. See that exhaust manifolds are secure and are not warped. Do not use exhaust gases to heat a compartment.
- Be sure the unit is well ventilated.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

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

- Do not wear loose clothing or jewelry while servicing any part of the generator set. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

ELECTRICAL SHOCK WILL CAUSE SEVERE PERSONAL INJURY OR DEATH

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

GENERAL SAFETY PRECAUTIONS

- Provide appropriate fire extinguishers and install them in convenient locations. Consult your local fire department for the correct type of extinguisher to use. Do not use foam on electrical fires. Use extinguisher rated ABC by NFPA.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Benzene and lead, found in some gasoline, have been identified by some state and federal agencies as causing cancer or reproductive toxicity. When checking, draining or adding gasoline, take care not to ingest, breathe the fumes, or contact gasoline.
- Make sure that rags are not left on or near the engine.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause over heating and engine damage, and present a potential fire hazard.
- Keep the generator set and the surrounding area clean and free from obstructions. Remove any debris from the set and keep the floor clean and dry.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

Important Safety Precautions

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

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

FUEL, ENGINE OIL, AND FUMES ARE FLAMMABLE AND TOXIC

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

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

EXHAUST GAS IS DEADLY

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

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

Make sure exhaust is properly ventilated.

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

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

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

BATTERY GAS IS EXPLOSIVE

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

DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS

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

HOT COOLANT CAN CAUSE SEVERE PERSONAL INJURY

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

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

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

If the cabinet must be opened for any reason:

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

MEDIUM VOLTAGE GENERATOR SETS (601V TO 15kV)

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

GENERAL SAFETY PRECAUTIONS

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

KEEP THIS DOCUMENT NEAR EQUIPMENT FOR EASY REFERENCE.

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Section 1. Introduction

GENERAL

This manual provides basic information and instructions for installation, operation and maintenance of the Series JB and JC generator sets. Good performance and safe operation depend on careful observance of these instructions.

Contact an authorized Onan dealer for service. The dealer will need to know the Model and Serial numbers to help you. These are found on the nameplate on the fan housing.

⚠ WARNING *Faulty service can lead to severe injury or death or to damage to the set or property. Service must be performed by qualified persons.*

Each Onan generator set undergoes a full cycle of tests and adjustments before it leaves the factory. Examine the set closely when it arrives for possible shipping damage. Tighten loose parts, replace missing parts and repair all visible damage before starting the set.

DESCRIPTION

Figure 1-1 illustrates a typical generator set. See *Specifications* for details.

Controls and instruments vary according to customer requirements.

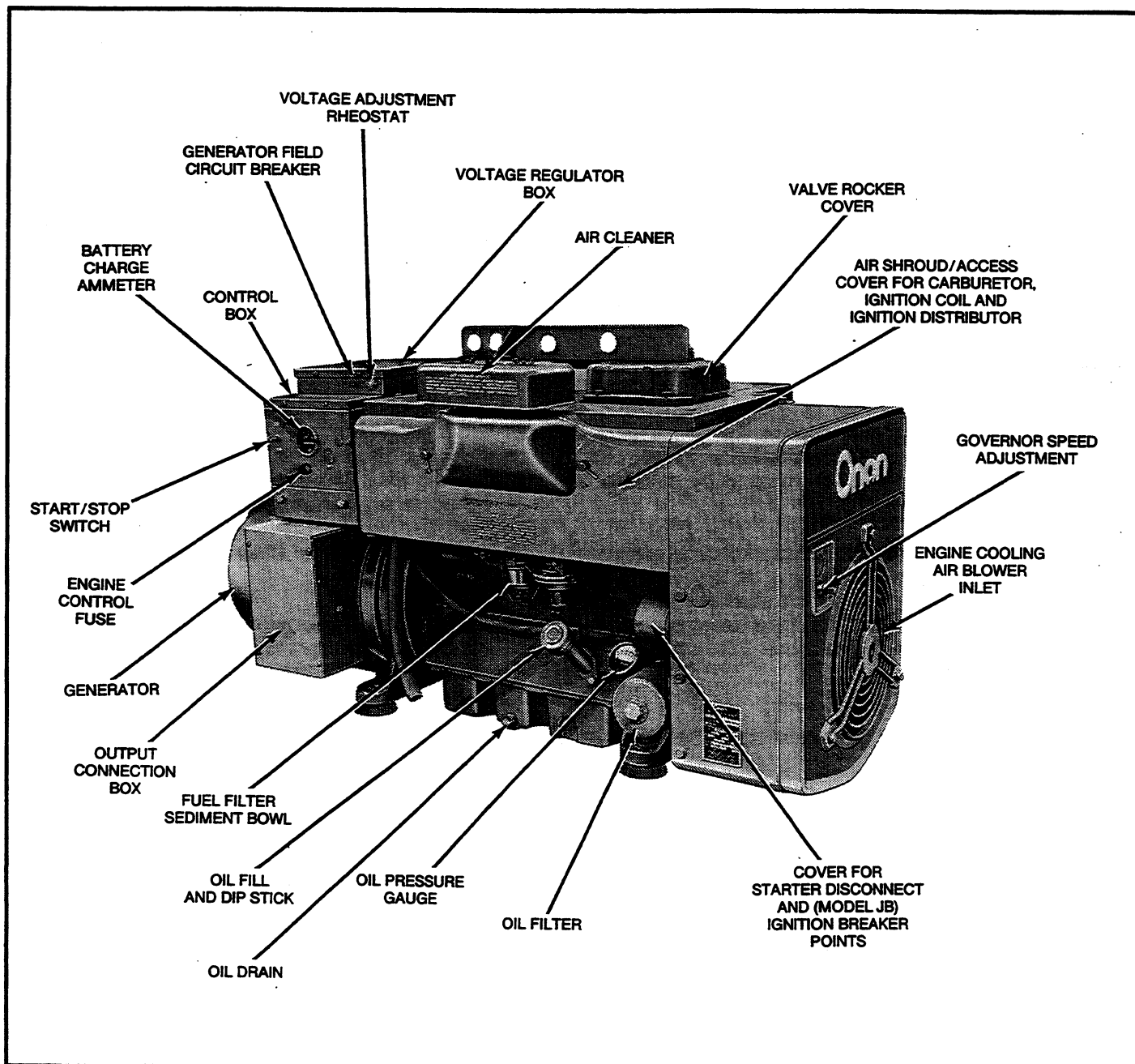
Standard Controls and Meters

- **Start/Stop Switch:** Starts and stops the set.
- **Control Fuse:** Protects the engine control circuits.
- **Battery Charge Ammeter:** Indicates the battery charging rate.
- **Field Circuit Breaker:** Protects the generator if the voltage regulator malfunctions.
- **Oil Pressure Gauge:** Indicates the engine lubricating oil pressure.

Optional Controls and Meters

Optional meters are mounted on a separate meter panel.

- **AC Voltmeter:** Indicates the output voltage. A selector switch is provided for 3 phase.
- **AC Ammeter:** Indicates the output current in each leg (separate meter for each leg).
- **AC Frequency Meter:** Indicates the output frequency (Hz). The meter can be used to determine engine speed (one Hz equals 30 rpm).
- **Running Time Meter:** Records the accumulated running time. The meter cannot be reset. Use it to schedule maintenance and service.
- **Voltage Adjustment Rheostat:** Adjusts output voltage $\pm 5\%$.
- **Safety Circuits:** Sensors monitor engine running conditions and open the ignition circuit to stop the engine if a fault condition arises. The condition is also indicated by a red warning light, and a reset switch must be pressed before the engine can be restarted. Available safety circuits include:
 - Low Oil Pressure
 - High Engine Temperature.
- **Line Circuit Breakers:** Protect the generator from overloads.



**FIGURE 1-1. TYPICAL GENERATOR SET
(PRESSURE COOLED MODEL JC SHOWN)**

Section 2. Specifications

(All dimensions are in inches unless otherwise indicated.)

APPROXIMATE WEIGHTS AND DIMENSIONS

	JB SERIES	JC SERIES
Weight	470 lbs (213 kg)	682 lbs (309 kg)
Height	26.62 (676 mm)	26.56 (675 mm)
Width	17.88 (454 mm)	19.5 (495 mm)
Length	32.69 (830 mm)	47.5 (1206 mm)

ENGINE

Design: Onan four stroke gasoline, overhead valve, vertical in line, air cooled J block.

	JB SERIES	JC SERIES
Number of Cylinders	2	4
Displacement	60 in ³ (1 l)	120 in ³ (2 l)
Cylinder Bore	3.25 (83 mm)	3.25 (83 mm)
Piston Stroke	3.625 (92 mm)	3.625 (92 mm)
Compression Ratio		
All Fuels	6.5:1	6.5:1
Natural Gas Only*	9.2:1	9.2:1
RPM (50/60 Hz)	1500/1800	1500/1800

Recommended Fuels: Gasoline/propane/natural gas.

Starting System: Remote, 12 Volt, 3 wire, negative ground, solenoid shift starter.

Ignition System: Battery powered.

Lubrication System: Full pressure.

Oil Filter: Full flow, spin-on type.

Governor: Adjustable, mechanical flyball, 3Hz droop.

FULL LOAD FUEL CONSUMPTION

	JB SERIES (at 7.5 kW)	JC SERIES (at 12.5/15.0 kW)
Gasoline	1.24 gph (4.7 l/h)	2.1 gph (7.95 l/h)/ 2.4 gph (9.08 l/h)
Natural gas*	134 cfh (3.8 m ³ /h)	230 cfh (6.5 m ³ /h)/ 255 cfh (7.2 m ³ /h)
Propane	68 cfh (1.92 m ³ /h)	92 cfh (2.6 m ³ /h)/ 110 cfh (3.1 m ³ /h)

*High compression pistons are necessary for full rated output.

GENERATOR

Design: Onan YD series having a 4-pole revolving field, brushless exciter and solid state voltage regulator. See *Installation* regarding voltage codes and connectibility. The generator rotor is directly coupled to the engine by a keyed taper and rotor through bolt and is supported on the other end by a ball bearing. A centrifugal blower on the rotor pulls air through for cooling. The generator includes a 2-5 amp battery charging circuit consisting of a winding, diode rectifier and resistor for charge rate adjustment.

	JB SERIES	JC SERIES
Maximum Output Ratings at 50/60 Hz	6.0/7.5 kW	10.0/12.5 kW 12.5/15.0 kW
Voltage Regulation, No Load to Full Load	±3%	±2%

INSTALLATION AND MAINTENANCE REQUIREMENTS

	JB SERIES	JC SERIES
Battery Voltage	12 Volts	12 Volts
Battery Size	74 Amp/Hr	74 Amp/Hr
Oil Capacity	3.5 quarts (3.1 l)*	6.5 quarts (6.2 l)*
Fuel Pump Inlet	7/16-24 NPTF	7/16-24 NPTF
Maximum Fuel Pump Lift	6 ft (1.8 m)	6 ft (1.8 m)
Exhaust Connection	1-1/4 NPT	1-1/2 NPT
Maximum Exhaust Back Pressure	27 inches H ₂ O	27 inches H ₂ O
Maximum Ambient Air Temperature	120 F (49 C)	120 F (49 C)
Ventilation		
Engine Cooling	560 cfm (16 m ³ /min)	890 cfm (25 m ³ /min)
Generator Cooling	160 cfm (4.5 m ³ /min)	160 cfm (4.5 m ³ /min)
Combustion	25 cfm (.7 m ³ /min)	50 cfm (1.4 m ³ /min)

*Includes 0.5 quarts (0.47 l) for the oil filter.

TUNE-UP SPECIFICATIONS

	JB SERIES	JC SERIES
Cylinder Head Bolt Torque	28-30 ft-lbs (38-41 N m)	28-30 ft-lbs (38-41 N m)
Spark Plug Gap	0.025 (0.64 mm)	0.035 (0.89 mm)
Ignition Breaker Point Gap	0.019-0.021 (0.48-0.53 mm)	—
Distributor Point Gap	—	0.018-0.022 (0.46-0.58mm)
Dwell Angle	—	48-54
Distributor Rotation	—	Clockwise
Firing Order	—	1-2-4-3
Ignition Timing (Degrees BTC, at 1800 RPM)		
Gasoline	25	25
Gas and Combination Gas/Gasoline	35	35
Valve Clearances (Cold, crank at 10-45 Degrees ATC on power stroke)		
Gasoline		
Intake	0.012 (0.30 mm)	0.012 (0.30 mm)
Exhaust	0.015 (0.38 mm)	0.015 (0.38 mm)
Gas and Combination Gas/Gasoline		
Intake	0.013 (0.33 mm)	0.013 (0.33 mm)
Exhaust	0.020 (0.51 mm)	0.020 (0.51 mm)
Starter Disconnect Breaker Point Gap	0.020 (0.51 mm)	0.020 (0.51 mm)

⚠ WARNING

EXHAUST GAS IS DEADLY!

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

- | | |
|--|---|
| <ul style="list-style-type: none"> ● <i>Dizziness</i> ● <i>Nausea</i> ● <i>Headache</i> ● <i>Weakness and Sleepiness</i> | <ul style="list-style-type: none"> ● <i>Throbbing in Temples</i> ● <i>Muscular Twitching</i> ● <i>Vomiting</i> ● <i>Inability to Think Coherently</i> |
|--|---|

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

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

1-P/EM

Section 3. Installation

GENERAL

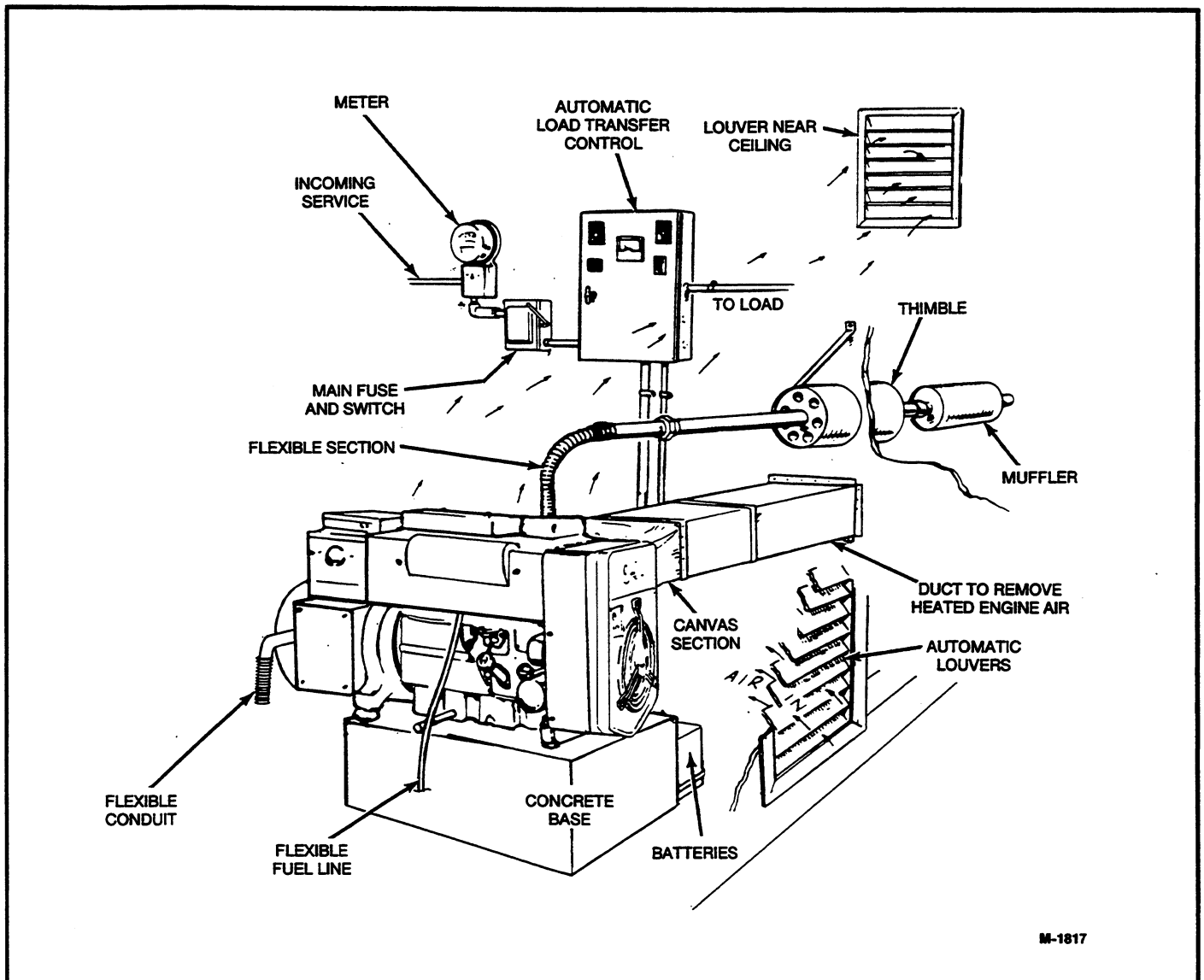
A generator set installation must comply with building codes, fire ordinances, and other local, state and federal regulations. Figure 3-1 illustrates a typical installation. Obtain Onan Technical Bulletin T-029 for more detailed instructions, or contact an authorized Onan service representative.

⚠ WARNING *Faulty installation can lead to severe injury or death or to damage to the set or property. The installation must be performed by a qualified person in compliance with the applicable codes.*

LOCATION

Provide a location for the generator set that is dry, clean, well ventilated, and protected from the weather.

Provide a clearance of at least 3 inches (76 mm) from the air discharge side to allow the set to rock freely on its mounts. Provide slide-out rails or a service door to service the starter motor if minimum clearance is provided on the air discharge side. There should be at least 24 inches (610 mm) clearance around all other sides for service access and ventilation.



M-1817

FIGURE 3-1. TYPICAL INSTALLATION

MOUNTING

Provide a sturdy, level mounting base of concrete, heavy wood or structural steel. Operating and servicing the set will be easier if the base is at least 12 inches above floor level. Four mounting cushions are provided (Figure 3-2). Series JB sets have number 4 and 5 cushions, and Series JC sets number 5 and 6. Cushions with the higher number are stiffer and should be placed under the generator, which is the heavier end. The installation drawing packaged with the set indicates the correct spacing of the mounting bolts. The bolts should protrude out of the base at least 3-5/8 inches (92 mm).

⚠ CAUTION

The oil filter can be punctured as the set rocks on its mounts if the mounting bolt below is too long. Allow 1/2 inch clearance between the tip of the mounting bolt and the oil filter.

COOLING SYSTEM

A generator set produces considerable heat that must be removed in order to maintain a normal operating temperature. These generator sets have separate centrifugal blowers for the engine and generator. Pressure cooled models push the air through the cylinder cooling fins, and Vacu-flo models pull the air through in the opposite direction.

- The fresh air inlet for the room or compartment must have a free area of at least 3.5 square feet (.32 M²) for Series JB and at least 5 square feet (.46 M²) for Series JC sets.
- The hot air from the engine should be ducted directly to the out-of-doors. Use a canvas duct connector at the engine outlet to allow the set to rock on its mounts. The duct must have at least the same cross sectional area as the outlet. Increase the duct size at least 50 per cent if the duct run is greater than eight feet or if there are more than two 90 degree bends.

⚠ WARNING

Exhaust gas is deadly. Cooling air discharged from the engine may carry exhaust gas. Never heat an enclosed space with engine cooling air.

- The hot air from the generator should also be removed in a separate duct to the out-of-doors, unless the room is large in comparison with the set (room large enough to enter for servicing). The same rules apply as for ducting hot air from the engine.
- If the room or compartment is poorly vented, it may be necessary to provide vent openings and/or fans. Venting must be adequate to ensure that air for cooling and combustion does not exceed 120°F (49°C).

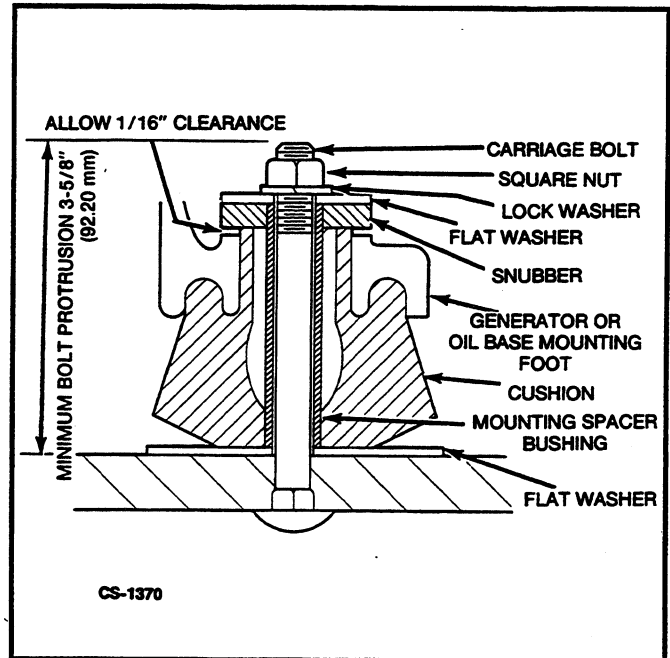


FIGURE 3-2. MOUNTING CUSHION

EXHAUST SYSTEM

Generator sets installed indoors must have the exhaust piped to the out-of-doors, away from doors, windows and vents.

⚠ WARNING *Exhaust gas is deadly. Make sure the exhaust system is adequate to remove all exhaust gas and that it does not leak. Fix exhaust leaks before placing the set in service.*

- Provide a flexible connector to allow the set to rock on its mounts.
- Provide exhaust piping the same size or larger than the exhaust outlet. See *Specifications*. Schedule 40 black iron pipe is recommended.
- Route the pipe at least 9 in. from combustible construction and fuel lines. Use an approved thimble to maintain the clearance through walls (Figure 3-3).

⚠ WARNING *Exhaust piping is hot and can cause a fire if clearances are not maintained. Check for compliance with the applicable codes.*

- Provide insulation or guards where accidental contact with hot exhaust piping is likely.
- Provide a rain cap if the piping terminates vertically.
- Provide a condensate drip leg where piping turns to rise vertically.
- Slope horizontal pipe to drain to a drip leg or to the outside.
- Provide sweeping bends to minimize exhaust back pressure.

- Do not terminate the exhaust pipe near a window, door or building air intake opening. Check for compliance with local building codes.
- Support exhaust piping with non-combustible hangers.
- Check the exhaust system back pressure, which must not exceed 27 inches (686 mm) water column.
- Look and listen carefully for exhaust leaks and fix them before placing the set in service.

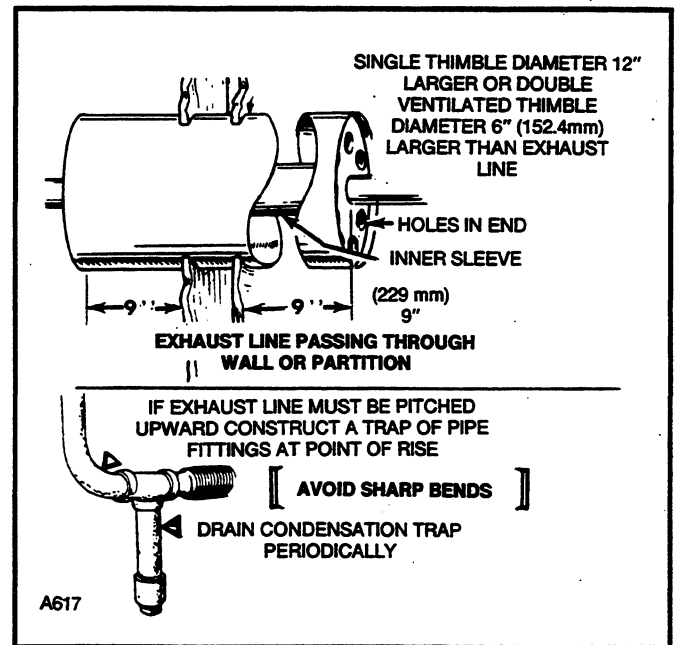


FIGURE 3-3. EXHAUST PIPING DETAILS

FUEL SUPPLY SYSTEM

⚠ WARNING *Gas and gasoline are highly flammable and explosive. Fuel supply systems must not leak. The installation must be performed by persons qualified to install fuel supply systems in compliance with the applicable codes.*

Do not smoke near fuel or fuel tanks, and keep sparks, flames, pilot lights and other ignition sources away.

- Install an approved flexible fuel line at the fuel inlet to allow the set to rock on its mounts. Do not use copper tubing as a flexible fuel line - it will crack and spill gasoline.
- The highest fuel level in the fuel tank must be lower than the inlet of the fuel pump to prevent spillage of fuel if a leak occurs (because of a faulty connection, ruptured pump diaphragm, etc.).
- The bottom of the fuel tank suction line should not be more than 6 feet below the inlet of the fuel pump.
- Provide a separate fuel line for each set served by the same fuel tank to prevent either set from being starved for fuel.
- Install a manual fuel shut-off valve at the outlet of an above-ground fuel tank to facilitate service.
- Install a manual or electric fuel shut-off valve on vehicle mounted sets.

⚠ WARNING *A vehicle mounted set could be flooded with gasoline, leading to fire, if the vehicle evaporative emission control vent plugs up causing the fuel tank to become pressurized. A manual or electric shut-off valve must be installed to prevent flooding of the set when not in use.*

- For a combination gas/gasoline set, provide a manual shut-off valve in each fuel line. Plug an unused fuel inlet. The air/fuel ratio will be upset if both fuels are available at the same time or if air enters an unused fuel inlet, resulting in poor performance.
- Do not use galvanized piping, fittings or tanks. The zinc coating reacts with elements in the fuel, resulting in contamination of the fuel.

ELECTRICAL CONNECTIONS

⚠ WARNING *Faulty electrical connections can lead to severe injury or death from electrocution or to damage to the set or property from fire. Connections must be performed by a qualified person in compliance with the applicable electrical codes.*

- If the installation is for standby service, it will be necessary to provide an approved manual or automatic load transfer switch to switch the load from the utility to the generator set, and back, and to prevent accidental interconnection of the utility and the generator set.

⚠ WARNING *High voltages can build up if the generator set and the utility are interconnected, leading to possible fire or electrocution. Never connect the generator set directly to the utility system. Connections must be through an approved transfer switch.*

- Provide a section of flexible conduit at the output connection box and stranded load leads to allow the set to rock on its mounts.
- Interconnect the output leads and load leads to obtain the required voltage (Figure 3-4). It should be noted that when a three phase generator is connected for single phase, the output is only 2/3's the three phase KVA rating.
- If the set is provided with the optional AC meters, and reconnections are made, it may be necessary to change the meters to correspond to the changed voltage and amperage of the output.
- Reduce the maximum connectable load 4 percent for each 1000 feet (303 M) of elevation greater than an elevation of 1000 feet (303 M) above sea level.
- Connect loads so that the current does not exceed the nameplate rating in any leg.
- Provide grounding for the entire electrical power supply system in accordance with the applicable electrical codes.

⚠ WARNING *Improperly grounded metal parts of the electrical power supply system can become "hot" under fault conditions and cause electrocution and/or fire. All metal parts of the electrical power supply system that could become energized under a fault condition must be bonded to the grounding point of the system in accordance with the applicable electrical codes.*

NAMEPLATE VOLTAGE CODE					VOLTAGE		PHASE		FREQUENCY		CONNECT W/O JUMPER WIRE FROM V4 TO:		GENERATOR CONNECTION		GENERATOR CONNECTION SCHEMATIC DIAGRAM		LOAD-TO-GENERATOR CONNECTIONS										
CONNECT X1 TO TERMINAL 5 OF PRINTED CIRCUIT BOARD FOR 50 HZ. TO TERMINAL 6 FOR 60 HZ.																											
J	120/240	1	60	V1		240 V	120 V	120/240 V	240 V	120 V	120/240 V	240 V	120 V	120/240 V													
P	120/240	1	50	V3																							
	115/230	1	50	V2																							
	110/220	1	50	V1																							
L	120/208	3	60	V1	PARALLEL WYE																						
	127/220	3	60	V2																							
	139/240	3	60	V4																							
Z	110/190	3	50	V1	PARALLEL WYE																						
	115/200	3	50	V2																							
	120/208	3	50	V3																							
	127/220	3	50	V4																							
L	240/416	3	60	V1	SERIES WYE																						
	254/440	3	60	V2																							
	277/480	3	60	V4																							
Z	220/380	3	50	V1	SERIES WYE																						
	230/400	3	50	V2																							
	240/416	3	50	V3																							
	254/440	3	50	V4																							
L	120/240	3	60	V1	SERIES DELTA																						
	Z	110/220	3	50														V1									
		115/230	3	50														V2									
	120/240	3	50	V3	SERIES DELTA																						
L	120/240	1	60	V1	DOUBLE DELTA																						
	Z	110/220	1	50														V1									
		115/230	1	50														V2									
	120/240	1	50	V3	DOUBLE DELTA																						
L	120	1	60	V1	PARALLEL DELTA																						
	Z	110	1	50														V1									
		115	1	50														V2									
	120	1	50	V3	PARALLEL DELTA																						
H	347/600	3	60	V4	WYE																						

FIGURE 3-4. GENERATOR WIRING AND CONNECTIONS DIAGRAMS

BATTERY CONNECTIONS

See *Specifications* for minimum battery requirements. Locate the battery as close to the starter motor as practical. Connect the positive (+) post to the starter solenoid terminal. Connect the negative (-) post to a solid ground connection on the engine. Be sure all battery cable connections are tight (Figure 3-5).

CAUTION

Reversed battery connections could damage the charging circuit.

WARNING

Batteries emit highly explosive hydrogen gas. Never smoke near a battery, and keep sparks, flames and other sources of ignition away. Always disconnect the negative (-) cable first, and reconnect it last, to prevent sparks if a tool accidentally touches the frame of the set or other grounded metal parts while connecting or disconnecting the positive (+) cable.

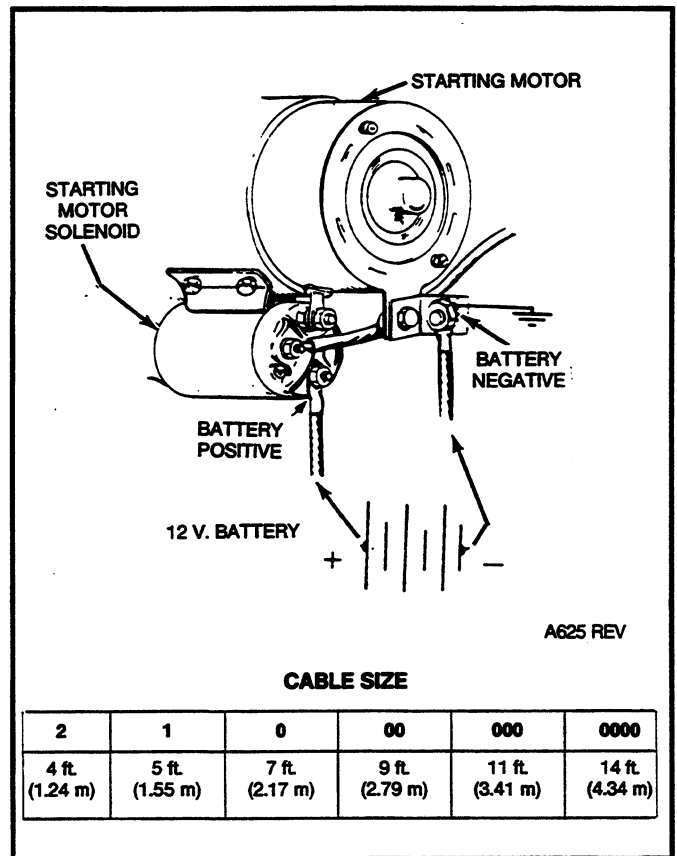


FIGURE 3-5. BATTERY CONNECTIONS

REMOTE START-STOP SWITCH (Optional)

Remote control can be provided by a three wire connection of a single pole, double throw, momentary contact, center-off switch (Figure 3-6).

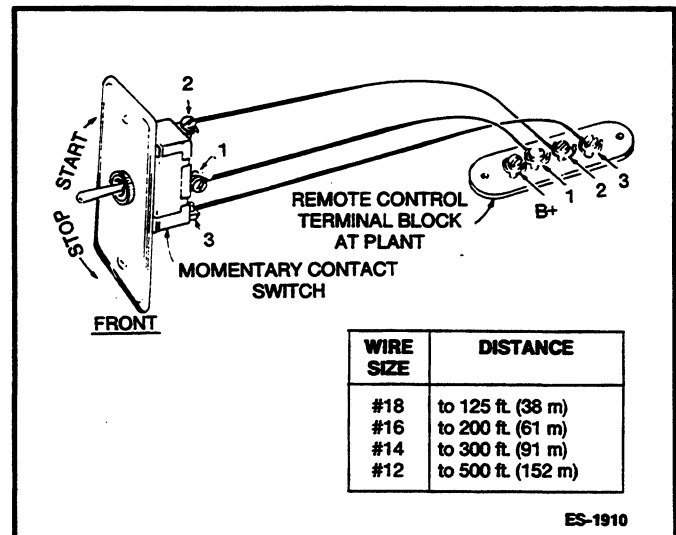


FIGURE 3-6. REMOTE START-STOP SWITCH

Section 4. Operation

GENERAL

Always make sure the generator set is ready for operation before starting it. Perform regular maintenance and service as detailed in *Maintenance* to keep the set operating safely and efficiently.

CRANKCASE OIL

Use heavy duty detergent oil with the API service classification SF or SF/CC. The oil should be labeled as having passed the MS Sequence Tests (or ASTMG-IV Sequence Tests). Do not use Service DS oil. Recommended SAE grades for expected ambient temperatures are as follows.

Oil capacity is 3-1/2 quarts on Series JB and 6-1/2 quarts on Series JC sets, including 1/2 quart for the oil filter. Fill the crankcase until the oil reaches FULL on the oil dip stick. When oil is added between regular oil changes, add the same brand as in the engine to ensure compatibility of the oils.

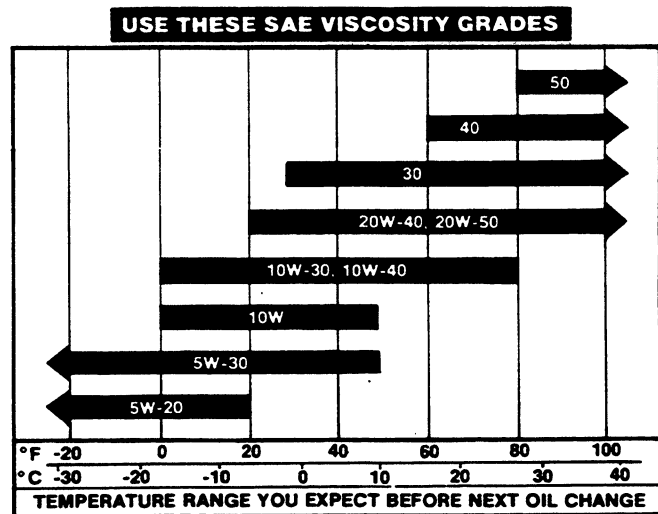
⚠ WARNING *Hot oil can cause burns. Shut down the set before checking the oil level to prevent hot oil from blowing out on you.*

STARTING

1. Check the fuel and oil levels.
2. Make sure all the air shrouds and service access covers are in place.

⚠ CAUTION *Pressure cooled engines can quickly overheat and be damaged if run without the front air shroud/access cover in place.*

3. Press the START/STOP switch to START until the engine starts. The starter is disengaged automatically by the start disconnect switch.
4. Do not crank for more than 30 seconds at a time. Allow 60 seconds between cranks.
5. A new set may not start right away if the spark plug electrodes are coated by the rust inhibiting oil injected into the cylinders at the factory. Remove the spark plugs and clean the oil off. Also, heavy smoke on the initial start-up is temporary, and is caused by burn-off of the rust inhibiting oil.
6. The oil pressure gauge should indicate at least 20 psi.
7. Connect the load, following the procedure below. Follow the break-in procedure below for the initial start-up.



STOPPING

1. Disconnect the load and let the generator set run for 10 minutes to cool off.
2. Press the START/STOP switch to STOP until the engine stops.
3. If a safety circuit stops the engine (high engine temperature or low oil pressure), determine the cause and service or repair as necessary before placing the set back into service.

BREAK-IN PROCEDURE

1. Connect 1/2 of the full rated load for the first half hour of operation.
2. Connect 3/4 of the full rated load for the next half hour of operation.
3. Operate with the full rated load connected any time thereafter.
4. Drain and replace the engine oil after the first 50 hours of operation.

CAUTION

Running the set continuously with less than 1/2 full rated load during the first hundred hours can result in poor seating of the piston rings and consequent problems with ring blowby and high oil consumption.

CONNECTING THE LOAD

1. When possible, allow the set to warm up before connecting the full load.
2. When possible, connect the load in steps.
3. Carbon deposits can form in the exhaust system during operation under light loads. Occasionally connect the full rated load to burn off the carbon deposits.

CAUTION

Overloading can cause the generator to overheat and fail. The load may exceed the nameplate rating only momentarily, such as during the starting of a large motor.

COMBINATION GAS/GASOLINE SETS

1. The engine will not run properly if it can draw on both fuel sources at the same time. Select the fuel to be used and close the supply valve for the other fuel.
2. Engage the choke lock wire to keep the choke open when using gas fuel and release it when using gasoline fuel.

EXERCISING THE SET

The generator set can deteriorate if it is used infrequently. Exercise the set once a month by running it for an hour under at least 1/2 rated load. Exercising:

- Evaporates corrosive condensate in the fuel and lubricant systems
- Reestablishes a protective oil film on engine parts
- Recharges the battery
- Drives moisture out of the generator windings and controls
- Tests the operating integrity of the associated controls and switch gear
- Allows refueling before fuel deteriorates in the fuel tank.

OUT-OF-SERVICE PROTECTION

See *Maintenance* for procedures to follow to protect the generator set if it is to be out-of-service for 30 days or more.

Section 5. Maintenance

Schedule maintenance and service on the basis of running time as outlined in Table 5-1. Use the running time meter if the set is so equipped. Keep an accurate record of maintenance and service. Increase the frequency of scheduled maintenance if the set has to operate under dusty conditions or extremes of high or low ambient temperature. If major repairs or service are required, contact an authorized Onan dealer.

**TABLE 5-1.
MAINTENANCE AND SERVICE SCHEDULE**

HOURS OF RUNNING	MAINTENANCE OR SERVICE TASK
8 (Daily)	<ul style="list-style-type: none"> Inspect the generator set Check the fuel supply Check the oil level Inspect the exhaust system
50	<ul style="list-style-type: none"> Check the condition of the battery Check the air cleaner Change the crankcase oil after the first 50 hours Tighten the head bolts and adjust the valves after the first 50 hours*
100	<ul style="list-style-type: none"> Clean the governor linkage Clean the fuel filter sediment bowl Change the crankcase oil
200	<ul style="list-style-type: none"> Service the ignition breaker points (Series JB) or distributor (Series JC)* Check the spark plug gap Clean the crankcase breather (Series JB) Replace the oil filter Clean the generator
500	<ul style="list-style-type: none"> Service the starter disconnect breaker points Clean the PCV valve (Series JC) Adjust the valves*
1000	<ul style="list-style-type: none"> Remove and clean the oil pan Grind the valves if necessary*

* - Contact an authorized Onan dealer.

INSPECTIONS AND MAINTENANCE (8 Hours or Daily)

- Keep the fuel tank full and fix any leaks immediately.

⚠ WARNING *Gasoline is highly flammable. Do not fill the fuel tank while the engine is running, unless the tank is outside the room. Leaks must be fixed before the set is returned to service. Do not smoke near gasoline, and keep sparks, pilot lights, flames or other ignition sources away.*

- Keep the crankcase oil level up to the FULL mark on the dipstick (Figure 5-1).

⚠ WARNING *Hot oil can cause burns. Shut down the set before checking the oil level to prevent hot oil from blowing out on you.*

- Fix any exhaust piping or muffler leaks immediately.
- Drain condensate from exhaust pipe traps.
- Tighten any parts that have come loose, such as panels and air shrouds.
- Do not let dust, oil or grease accumulate on the set.
- Do not use the generator room or enclosure for storage. Keep the floor clean and dry.

⚠ CAUTION *The engine and generator can overheat and be damaged if they are allowed to become dirty or if air shrouds are left off or if material stored in the enclosure interferes with ventilation.*

BATTERY (50 Hours or Every Two Weeks)

The battery charge rate adjusting resistor is located in the outlet of the generator cooling blower (Figure 5-2). It is factory set to charge at a rate of about 2 amps. Check battery charge frequently at first and adjust the slide tap up to increase the charge rate if necessary to maintain a specific gravity of at least 1.260. Shut down the set before adjusting the slide tap.

Do not overcharge. Generally, the shorter the running times and the more frequent the starts, the higher the charge rate will have to be. A trickle charger should be considered to maintain the battery charge if the set is used very infrequently.

Keep battery terminals clean and tight. A light coat of vasoline will retard corrosion. Fill the cells with distilled water as often as necessary to keep the electrolyte level up to the split rings.

⚠ WARNING *Batteries emit highly explosive hydrogen gas. Never smoke near a battery, and keep sparks, flames and other sources of ignition away. Always disconnect the negative (-) cable first, and reconnect it last, to prevent sparks if a tool accidentally touches the frame of the set or other grounded metal parts while connecting or disconnecting the positive (+) cable.*

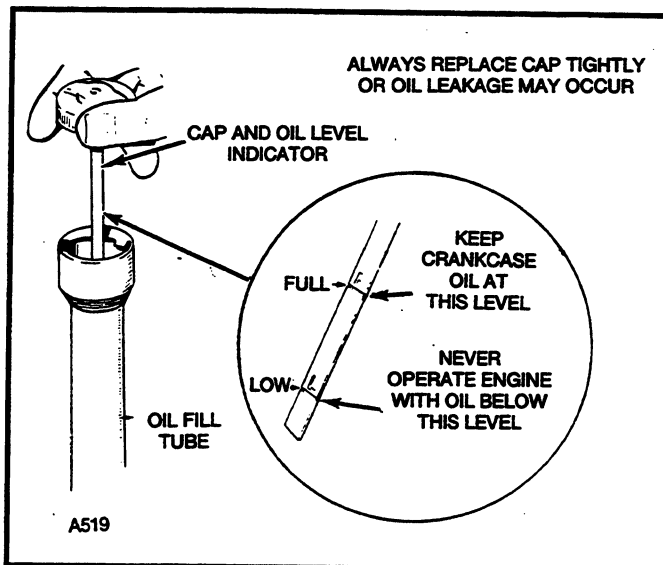


FIGURE 5-1. OIL LEVEL INDICATOR

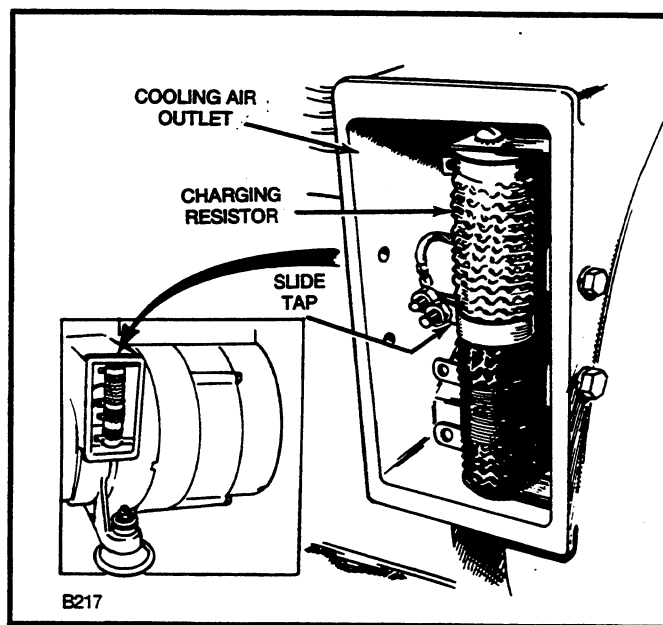


FIGURE 5-2. CHARGING RESISTOR

AIR CLEANER (50 Hours)

Clean the filter element (Figure 5-3). If of the oil bath type (Figure 5-4), refill the base with fresh oil of the same weight as in the crankcase.

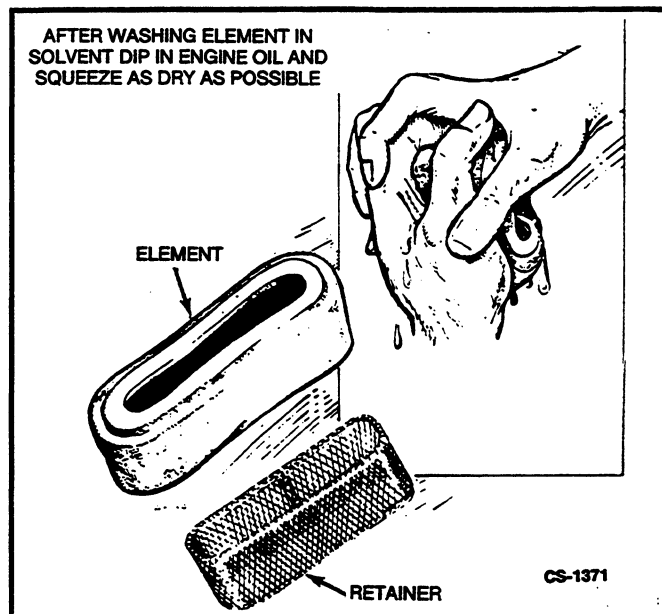


FIGURE 5-3. POLYURETHANE FOAM AIR CLEANER

OIL CHANGE (100 Hours)

Drain the crankcase oil while the engine is still hot. Refill with oil of the correct API designation and SAE viscosity grade suitable for the ambient temperature. See *Operation*.

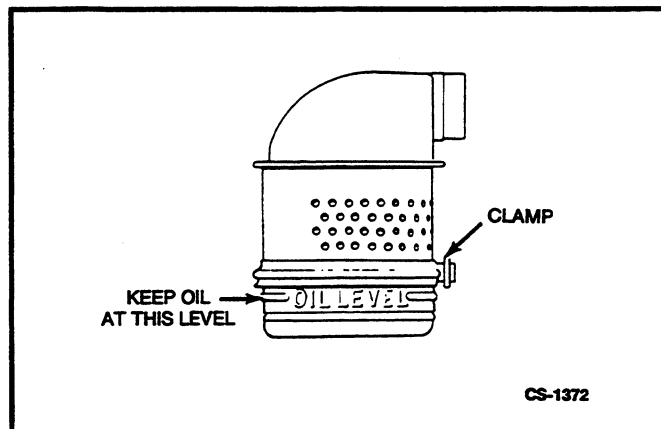


FIGURE 5-4. OIL BATH AIR CLEANER

GOVERNOR LINKAGE (100 Hours)

Carefully pull the governor rod ball joints apart and clean, but do not lubricate (Figure 5-5).

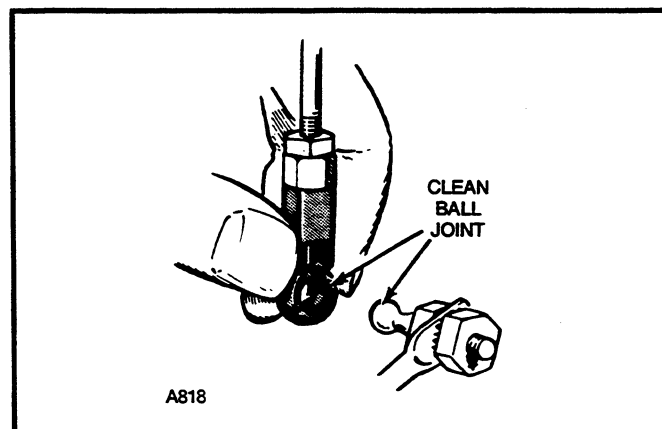


FIGURE 5-5. GOVERNOR BALL JOINTS

FUEL FILTER (100 Hours)

Clean out the fuel filter sediment bowl (Figure 5-6). Make sure the gasket and screen are assembled correctly and that it does not leak.

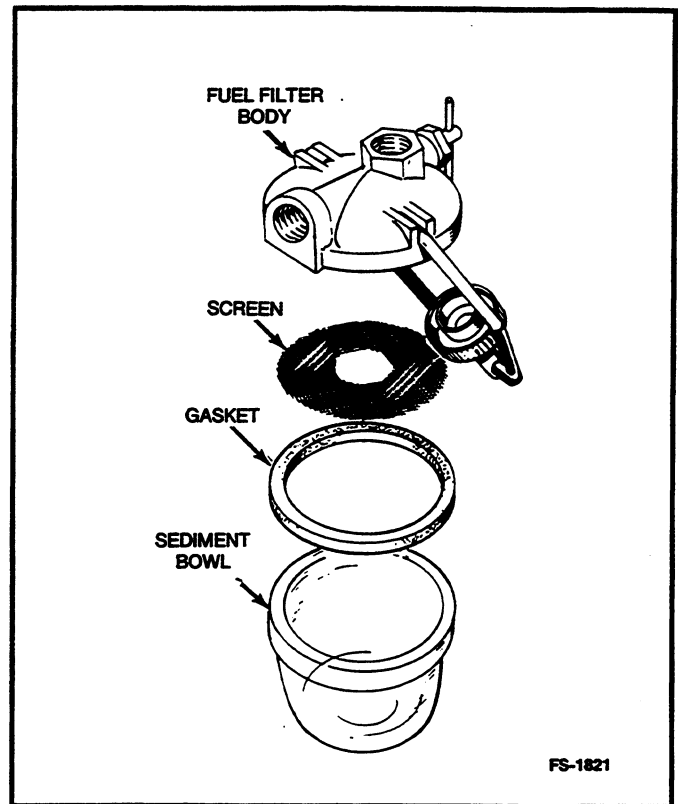


FIGURE 5-6. FUEL FILTER

IGNITION SYSTEM (200 Hours)

Clean and re-gap the spark plugs (Figure 5-7).

CAUTION *The engine will not perform satisfactorily unless the ignition system is serviced and timed properly. It is recommended that you contact an authorized Onan dealer to perform the following service procedures.*

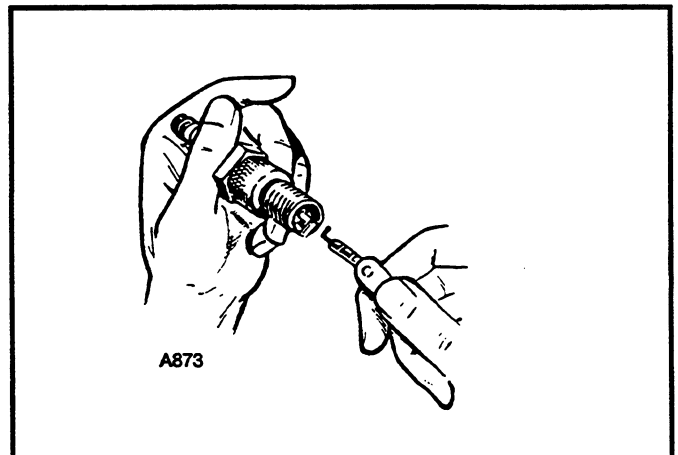


FIGURE 5-7. SPARK PLUG

Check the ignition breaker points and replace if dirty or pitted and adjust the gap (Figures 5-8 and 5-9).

Check the distributor cap and rotor (Series JC) for cracks, carbon runners, corroded high tension terminals and burned contacts. Add three drops of medium engine oil to the felt in the end of rotor shaft. Add one drop of light engine oil to the breaker arm and fly weight hinge pins. Grease each cam lobe lightly. Do not over lubricate the distributor. Wipe up excess grease and oil.

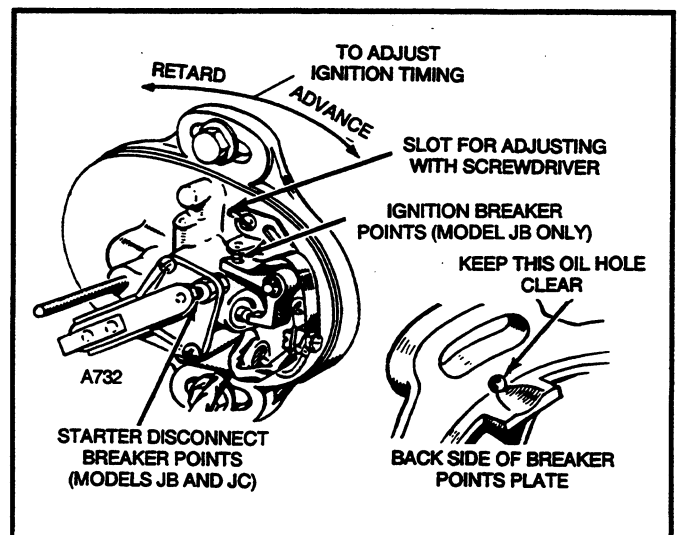


FIGURE 5-8. BREAKER POINTS

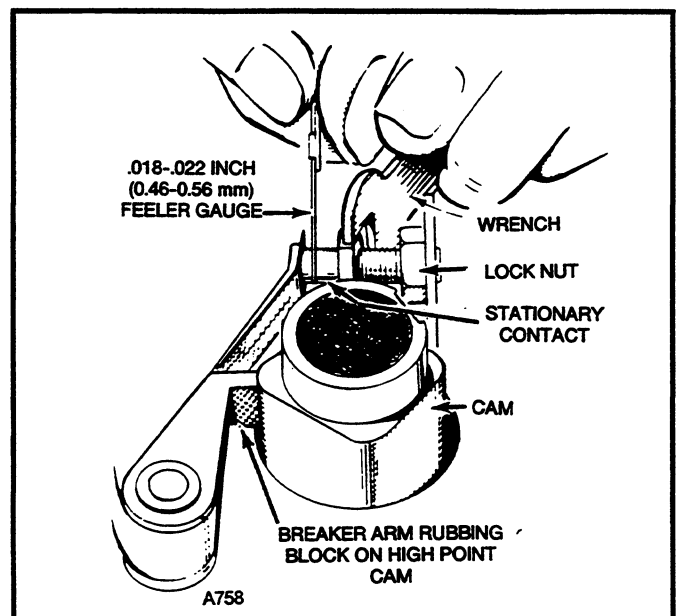


FIGURE 5-9. SETTING DISTRIBUTOR BREAKER POINTS (MODEL JC ONLY)

See *Specifications* for timing specifications. It is recommended that a timing light be used. The timing mark is visible as shown in Figure 5-10.

CAUTION *On pressure cooled models, the front access cover, which has to be removed for timing the ignition, directs air from the blower to the cylinder cooling fins. Do not run the engine for more than one minute at a time while timing the ignition, or the engine could overheat and be damaged.*

OIL FILTER (200 Hours)

When installing a new filter, lightly oil the gasket, turn the filter on by hand until the gasket just touches the block and then tighten 1/2 turn more.

CRANKCASE BREATHER (Series JB Only)(200 Hours)

Unclamp the cap and remove the valve and baffle for cleaning (Figure 5-11). Replace defective parts.

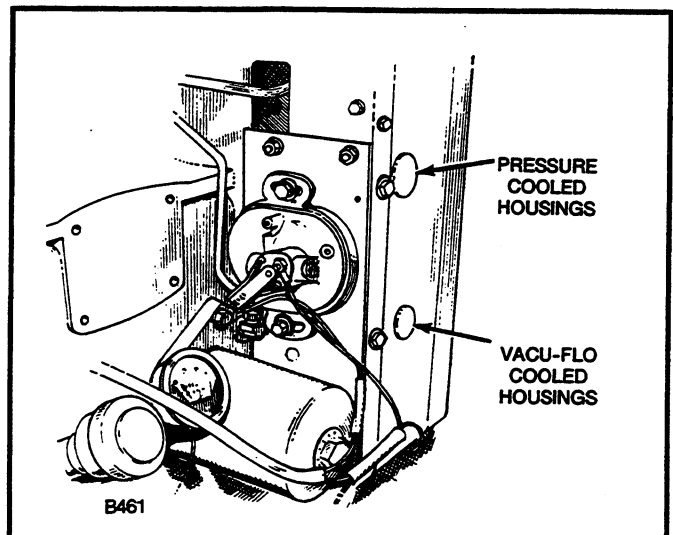


FIGURE 5-10. LOCATION OF OPENINGS TO VIEW FLYWHEEL TIMING MARKS

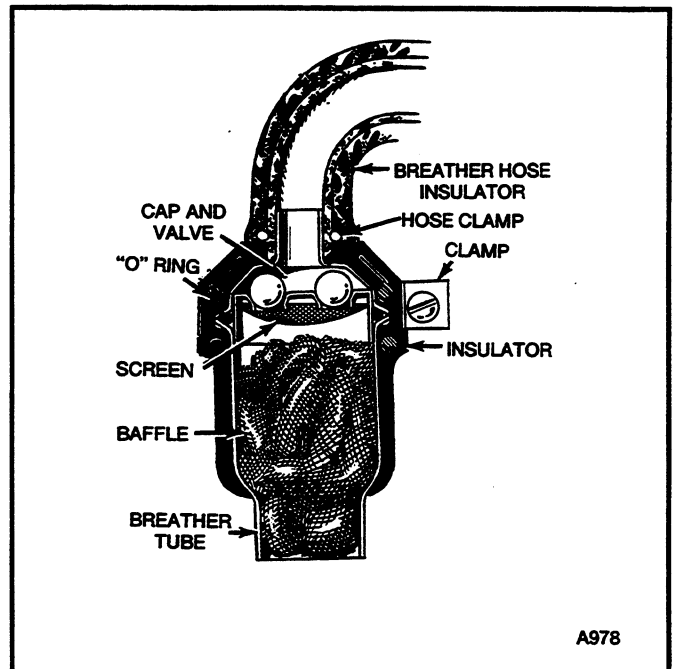


FIGURE 5-11. CRANKCASE BREATHER

GENERATOR (200 Hours)

Remove the generator end cover for access to the rotating rectifiers (Figure 5-12). Use filtered, low pressure compressed air to blow away accumulated dust on the diodes. Also, torque the diode studs to 25 ft-lbs (33 Nm). Loose or dust covered diodes can overheat and fail.

STARTER DISCONNECT BREAKER POINTS (500 Hours)

The starter disconnect breaker points (Figure 5-8) are open when the engine is not running. They are closed by a centrifugal mechanism when the engine reaches approximately 900 RPM. The starter is disconnected as a result.

Replace burned points. Adjust the point gap to 0.020 inch (.51mm) while the engine is not running.

PCV VALVE (Series JC Only)(500 Hours)

Remove both rocker covers for access (Figure 5-13). Remove the circlip in each PCV to disassemble and clean. Be careful not to let the parts fly off when the circlip is removed.

OUT-OF-SERVICE PROTECTION

To protect a set that is to be out-of-service 30 days or more, proceed as follows:

- Perform all scheduled maintenance.
- Change the oil and attach a tag indicating the viscosity grade.
- Pour one ounce of rust inhibiting oil (or SAE Grade 10) into each cylinder. Crank the engine several times and replace the spark plugs.
- Plug the exhaust outlet to prevent the entrance of insects, dust and moisture.
- Lightly wipe with grease or oil metal parts that would otherwise rust.
- Disconnect the battery (negative [-] cable first) and store it following standard procedures.
- Cover the set to protect it from dust and moisture.

Return the set to service as follows:

- Unplug the exhaust and remove the protective cover.
- Change the oil if the viscosity grade recorded on the tag is not suitable for the current ambient temperature.
- Service the battery and connect it (negative [-] cable last).
- See *Operation* for starting and operating the set.

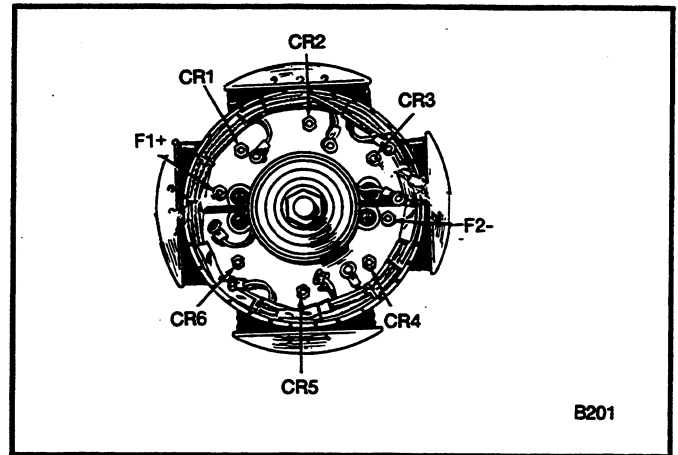


FIGURE 5-12. ROTATING RECTIFIERS

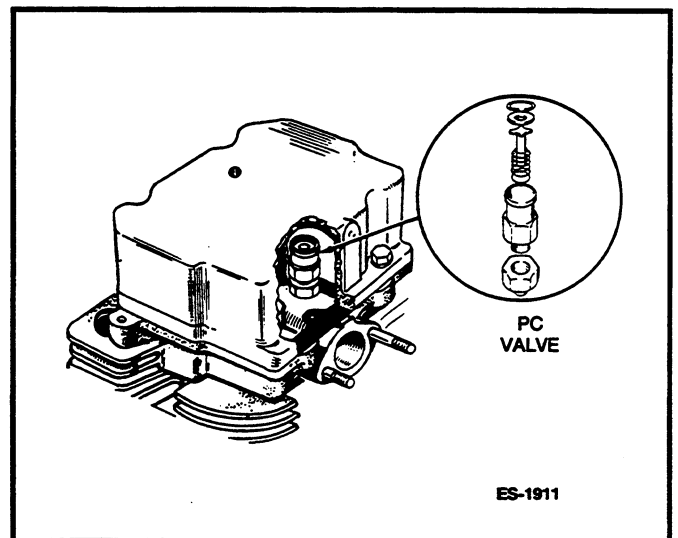


FIGURE 5-13. PCV VALVE



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