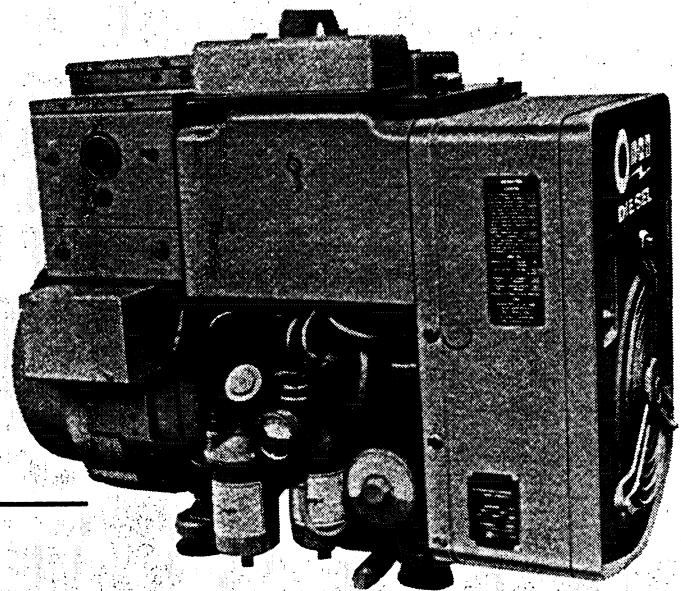


# Onan

## Operator's Manual

### DJE GenSet



# Safety Precautions

Before operating the generator set, read the Operator's Manual and become familiar with it and your equipment. **Safe and efficient operation can be achieved only if the equipment 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 and explosion can result from improper practices.

- DO NOT fill fuel tanks while engine is 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 connection 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 all fuel supplies have a positive shutoff valve.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

## EXHAUST GASES ARE DEADLY

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

## MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Keep your hands away from moving parts.

- Before starting work on the generator set, disconnect starting battery 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 near moving parts, or jewelry while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts and cause shock or burning.
- If adjustment *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

## ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

- 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 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 GENERATOR SET DIRECTLY TO ANY BUILDING ELECTRICAL SYSTEM. Hazardous voltages can flow from the generator set into the utility line. This creates a potential for electrocution or property damage. Connect only through an approved device and after building main switch is open. Consult an electrician in regard to emergency power use.

## GENERAL SAFETY PRECAUTIONS

- 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.
- 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 overheating and engine damage, which present a potential fire hazard.
- Keep your generator set and the surrounding area clean and free from obstructions. Remove any debris from 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.

# INTRODUCTION

## 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 to help you ... keep your unit running like new so that you can 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 received.

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 electric generating set ready to supply power at all times.

## TABLE OF CONTENTS

INTRODUCTION .....	1
GENERAL INFORMATION .....	2
SPECIFICATIONS .....	3
DESCRIPTION .....	4
INSTALLATION .....	6
OPERATION .....	12
ONAN DIESEL STARTING GUIDE .....	17
ADJUSTMENTS .....	18
GENERAL MAINTENANCE .....	19
PERIODIC MAINTENANCE SCHEDULE .....	19
ENGINE TROUBLESHOOTING GUIDE .....	22
PARTS INFORMATION .....	23

### WARNING

*TO AVOID POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, A QUALIFIED ELECTRICIAN OR AN AUTHORIZED SERVICE REPRESENTATIVE MUST PERFORM INSTALLATION AND ALL SERVICE.*

### KEEP FUEL CLEAN!

•

DIRTY FUEL IS ONE OF THE MAJOR CAUSES  
OF ENGINE FAILURE

•

REMEMBER—EVEN A TINY PARTICLE OF DIRT IN THE INJECTION SYSTEM MAY STOP YOUR ENGINE!

•

# GENERAL INFORMATION

## YOUR MANUAL

This manual contains operation and other information to properly maintain, service, and make adjustments on your DJE generator set. Study and follow 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. 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.**

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.

# SPECIFICATIONS

## ENGINE DETAILS

Exhaust connection (pipe tapped) ..... 1-1/4-inch (32 mm)  
 Fuel Connection..... 1/4-24 NPTF

## CAPACITIES AND REQUIREMENTS

Battery voltage ..... 12 Volt

## RECOMMENDED BATTERIES FOR DJE GEN SETS

Battery size ..... Two 6-volt in series

AMBIENT TEMP. RANGE	QTY. RQ'D	VOLTAGE	BCI GROUP SIZE	CRANKING PERF. (amps) @ 0°F MIN.	AMP. HR. 20 HR. RATE (REF.)
32° & Warmer	2	6	1	450	105
0° F & warmer	2	6	2	565	135
-25° F & warmer	2	6	5D	800	190

Battery charge rate amperes ..... 2-5

★Oil Capacity in U.S. quarts — Refill..... 3 (2.8 litre)

Diesel Fuel lift (maximum feet) ..... 6 (1.82 m)

★ - Plus 1/2 quart (0.473 litre) for new filter.

## GENERATOR

50 Hertz AC General Utility ..... 4500 (4.5 kW)

60 Hertz AC General Utility ..... 6000 (6.0 kW)

## TUNE-UP SPECIFICATIONS

Cylinder head bolt torque (lbs. ft.) ..... 37-40 (50-54 N •m)

Valve Clearance

Intake..... 0.010-inch (0.254 mm)

Exhaust ..... 0.007-inch (.178 mm)

Centrifugal Switch Breaker Point Gap ..... 0.020-inch (0.51 mm)

Timing (Port Closing)..... 18° BTC ± 4°

# DESCRIPTION

## CONTROL

The following is a brief description of typical controls and instruments on the face of the panels; these may vary according to the customer requirements.

### Standard

**Start-Stop Switch:** Starts and stops the unit locally.

**Battery Charge Rate DC Ammeter:** Indicates charging current.

**Exciter Field Circuit Breaker:** Provides protection for exciter and alternator, if voltage regulator develops a malfunction.

**Pre-Heater Switch:** Provides control for manifold heater and glow plugs for cold diesel engine starting.

**Oil Pressure Gauge:** Indicates pressure of lubricating oil in engine.

**Fuse:** Protects DC circuit against reversed battery terminals.

### Optional on Housed Units

**AC Voltmeter:** Indicates output voltage.

**Voltmeter Phase Selector Switch:** Selects the phases of the generator output to be measured.

**Voltage Adjust Rheostat:** Provides approximately plus or minus 5 percent adjustment of the rated output voltage.

**Running Time Meter:** Registers the total number of hours. Use as an indicator for periodic servicing.

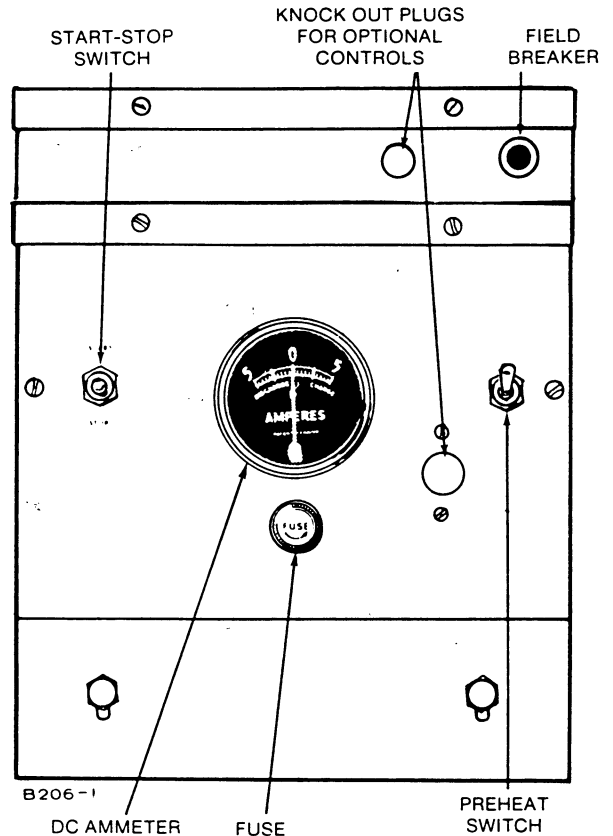


FIGURE 2. STANDARD CONTROL PANEL

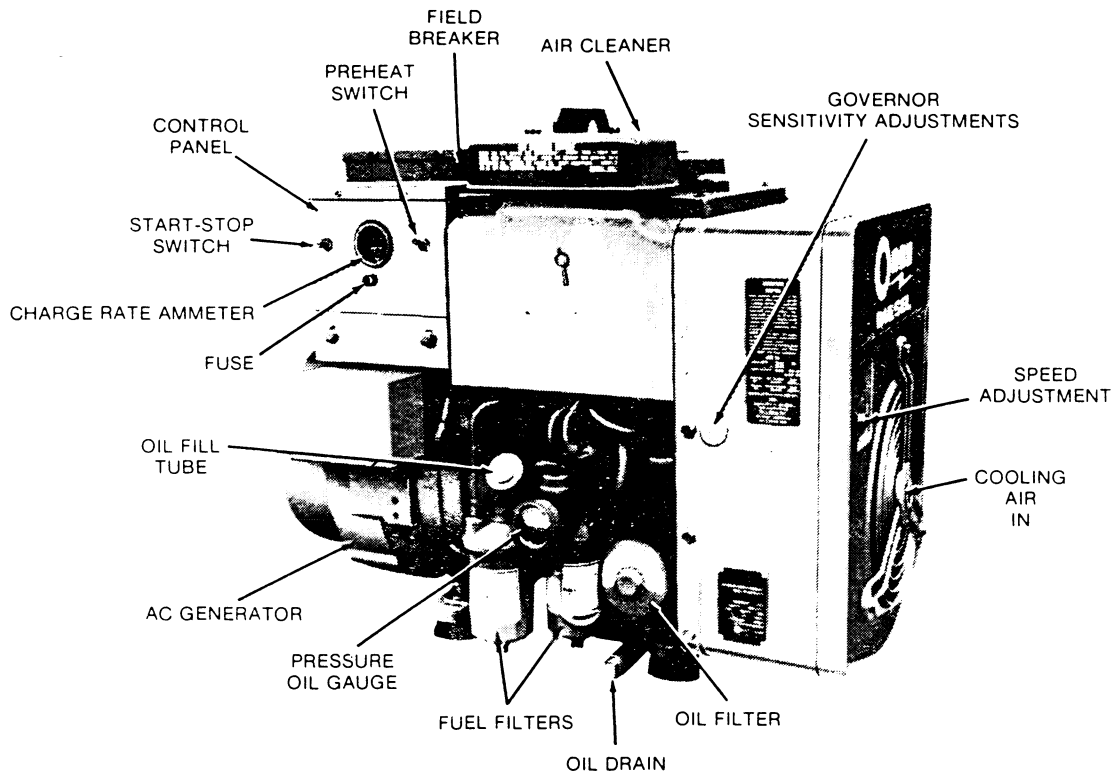


FIGURE 1. GENERATOR SET

**Frequency Meter:** Indicates the frequency of the output voltage in hertz. It can be used to check engine speed (30 rpm—produces one hertz).

**Warning Lights:** Red indicator lights give warning of:

- Overspeed
- Low oil pressure
- High engine temperature

Reset pushbuttons permit restarting after trouble is corrected.

**Line Circuit Breaker:** Protect generator from line overloads.

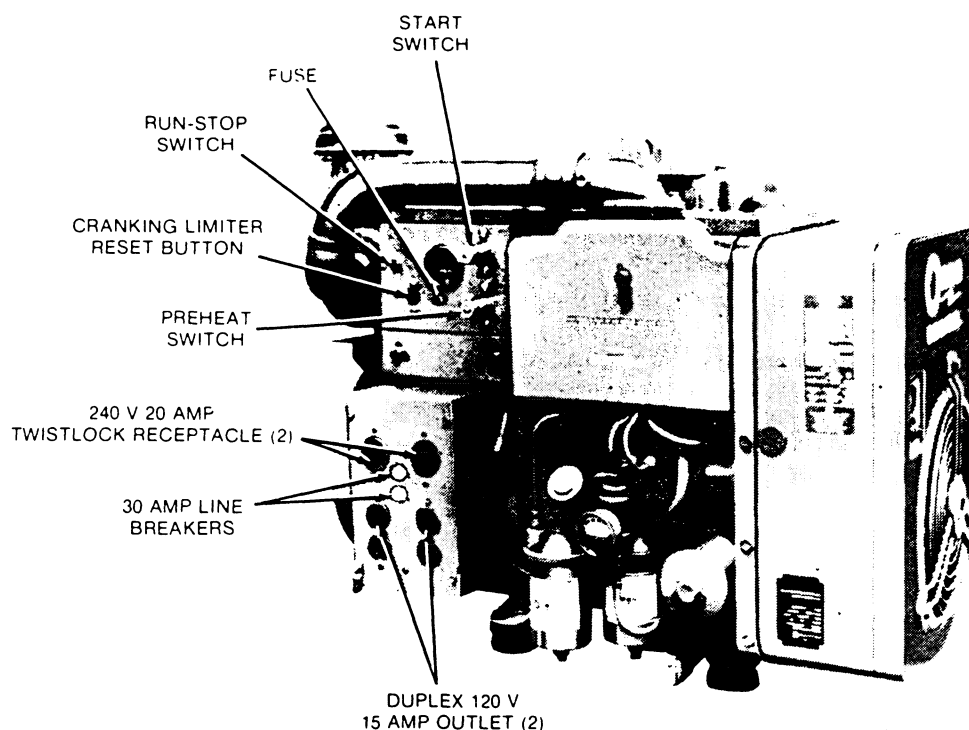
**Cranking Limiter:** Thermally actuated device limits cranking time to between 45 and 90 seconds depending on the ambient temperature. Red pushbutton pops out and cannot be reset until one minute has elapsed.

## VOLTAGE RECONNECTION WITH OPTIONAL INSTRUMENTS

The optional AC instruments on the control panel (such as voltmeters and running time meters) are installed for use with specific nameplate voltages. Control components may have to be changed to match new current ratings when field reconnections for other voltages are made.

### CAUTION

To prevent instrument damage, contact your Onan Service Center for required instrument changes, new wiring diagrams, proper specification number, and voltage before attempting to re-connect a generator with instruments on the control panel.



**CONTRACTOR MODEL**

# INSTALLATION

## GENERAL

Installations must conform to local building codes, fire ordinances, and other local, state, and federal regulations. See Figure 3.

Installation requirements include:

1. Level mounting surface.
2. Adequate cooling air.
3. Adequate fresh induction air.
4. Discharge of circulated air.
5. Discharge of exhaust gases.
6. Electrical connections.
7. Fuel connections.
8. Accessibility for operation and servicing.
9. Vibration isolation.
10. Noise level control.

## LOCATION

Provide a location that is protected from the weather and is dry, clean, dust free and well ventilated. If practical, install inside a heated building.

The air discharge side of set requires 3 inches (76 mm) clearance from wall to permit set to rock on its mounts; at least 24 inches (610 mm) clearance is required around all other sides for service accessibility.

## MOUNTING

A permanent type installation needs a sturdy, level, mounting base of concrete or structural steel at least 12 inches (305 mm) high to aid oil changing and operation. Place the 7/16 inch (11 mm) mounting bolts as shown in Figure 3.

Carefully assemble the mounting cushions, washers and spacer bushing on the mounting bolts. The spacer bushing prevents compression of the snubber (upper rubber cushion).

### CAUTION

One-half inch clearance is required between oil filter and mounting bolts to avoid puncturing filter. Allow 1/16 inch (1.6 mm) clearance between flat washers at upper end of mounting cushion bolts to prevent damage to the mounting spacer bushing, Figure 3. Do not over tighten.

## VENTILATION AND COOLING

Air circulation is needed to dissipate heat produced by the engine and generator in normal operation. *Outdoor* installations can rely on natural circulation, but *mobile, indoor or housed* installations need properly sized and positioned vents for required air flow at about 750 cfm (0.354 m<sup>3</sup>/sec - 21.2 m<sup>3</sup>/min).

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

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

Pressure cooled units need an inlet vent with an unrestricted opening of at least 5 square feet (4645 cm<sup>2</sup>) for variables. For discharged air, install separate ducts from the engine and generator (see exception) as follows:

1. The *engine discharge duct* must be 8 x 10 inches (203 x 254 mm). If a screen is used in the duct, increase the duct size in proportion to the restriction. Install the screen at a slant to reduce the restriction and increase duct size for runs over 9 feet (2.74 m). If bends are necessary, use large radius elbows. Use a canvas section at the set to isolate vibration and noise.
2. Use separate *generator outlet ducts* in compartments too small for operator to walk. Ducts are recommended for all indoor installations. The air outlet is 5-5/8 x 3 inches (143 x 76 mm). Follow the same principles of duct design and installation as used for the engine duct. Engine and generator require separate ducts.

Use *auxiliary fans* to increase air flow to units installed in small, poorly ventilated rooms. The fan size and location should be such that the air inlet to the engine doesn't exceed 120°F (49°C) when running at full rated load.

Onan *thermostatically controlled shutters* can be used to aid warm-up after starting and keep cold air out during shutdown. When the discharged air reaches 120°F (49°C), shutters begin to open; at 140°F (62°C), the shutters completely open.

### WARNING

Utilizing exhaust heat to warm a room or compartment occupied by people is not recommended due to possible leakage of harmful exhaust gases.

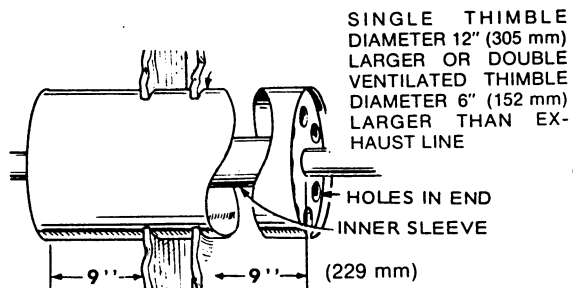
## EXHAUST

### WARNING

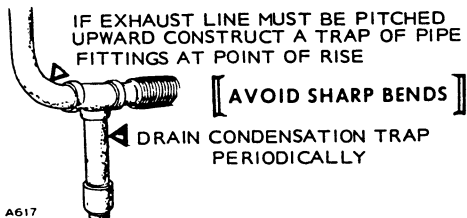
EXHAUST GASES ARE DEADLY POISONOUS!

Vent exhaust gases outside. Use flexible tubing between the engine exhaust outlet and rigid piping to prevent transmission of vibration.

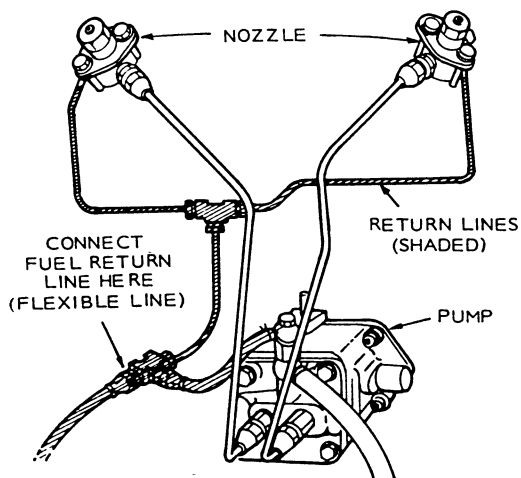




### EXHAUST LINE PASSING THROUGH WALL OR PARTITION

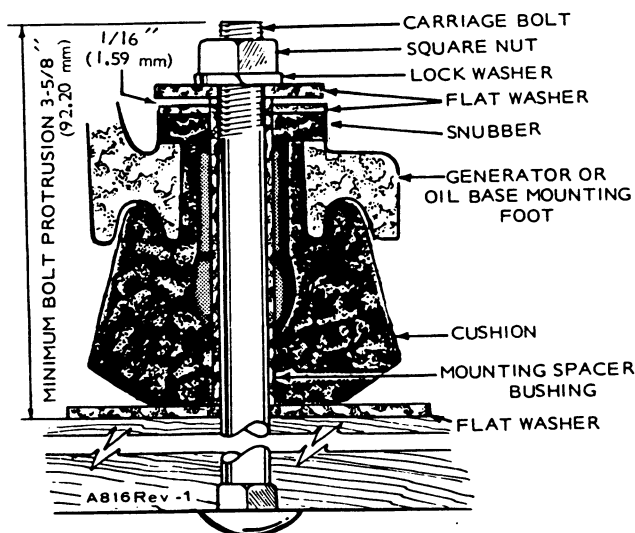


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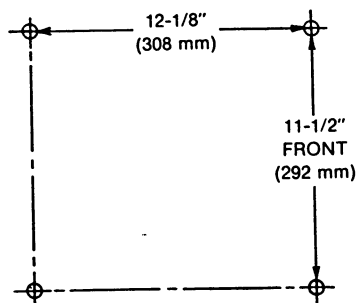
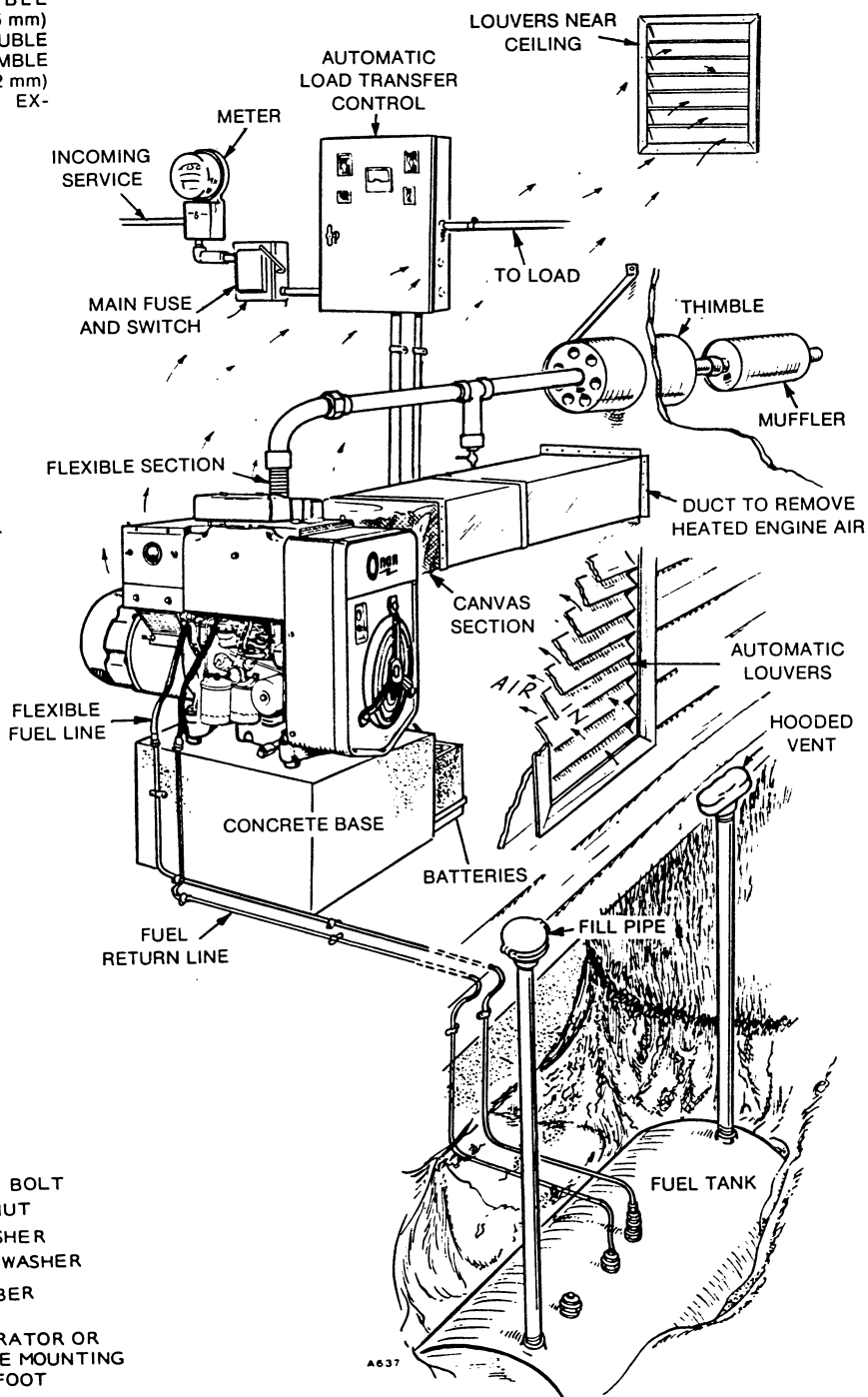


### INJECTION PUMP AND NOZZLE

B464



### MOUNTING CUSHIONS



### MOUNTING BOLT LOCATIONS

(4) 7/16 INCH (11 mm Bolts)

FIGURE 3. TYPICAL INSTALLATION

Shield the line with fire retardant material if it passes through a combustible wall or partition. If turns are necessary, use long sweeping type elbows. Use one pipe size larger for each ten feet (3.1 m) in length. Position the exhaust outlet away from the engine air intake.

## OIL DRAIN

Extend to suit installation. Oil base has a 1/2 inch pipe size tapped hole.

## FUEL CONNECTION

Connect fuel line to fuel pump inlet. Pump is threaded 1/4-24 NPTF (American Standard Internal Tapered Pipe Thread).

The engine requires a fuel supply line and a separate fuel return line. Install fuel return line from the 7/16-24 size opening in the overflow fitting located near the transfer pump (where nozzle fuel return line is also connected) to the top of the fuel supply tank (Figure 3).

**WARNING** The fuel system should meet applicable codes. Always use flexible tubing between engine and the fuel supply to avoid line failure and leaks due to vibration. Fuel leaks create fire hazards.

## SEPARATE FUEL TANKS

The following restrictions apply to separate fuel tank installation:

1. The bottom of an underground fuel tank must not be more than 6 feet (1.8 m) below the fuel transfer pump inlet, unless an auxiliary electric fuel pump is added. The maximum lift capacity of the transfer pump is six feet.
2. The top of an above ground tank must not be more than 9 feet (2.7 m) above the fuel line return fitting at the injection pump because of the static head of fuel in the return line. If the 9 foot maximum is exceeded, the capability of the fuel transfer pump (12 to 14 psi or 83 to 97 kPa) to pump the return line fuel back to the top of the tank may be exceeded.
3. If the tank is installed above the fuel pump inlet level without a supply line shutoff valve, a ruptured diaphragm in the pump could cause fuel leakage to the crankcase, oil dilution and loss of fuel.
4. If the maximum fuel lift must be exceeded on any installation, request Onan Technical Bulletin T-029 for day tank and electric solenoid shutoff valve installation information.
5. An electric or manual shutoff valve must be used whenever the minimum fuel level in the tank is above the pump inlet to ensure positive shutoff when the engine is shut down. It will also prevent

loss of fuel from possible fuel leaks between the tank and the fuel pump.

6. If the fuel tank is shared with two or more engines, use a separate fuel line for each engine to avoid starving one of the engines.

**WARNING** Do not use galvanized lines, fittings, or fuel tanks in underground portions of the fuel system. Hazardous fuel leaks may be caused by electrolytic corrosion from moisture and chemicals in the soil (galvanism). Some safety ordinances prohibit the use of galvanized materials in fuel systems and the use of threaded cast iron fittings as well.

Carefully clean all auxiliary fuel system components before putting the set into operation. Any dirt or contamination may cause major damage to the fuel injection system.

## INJECTION PUMP ADAPTER ASSEMBLY

A spring and plunger assembly on the side of the pump adapter (Figure 4) limits the maximum power output of the engine for safe operation and permits maximum fueling during starting.

**CAUTION** Do not change the adjustment of this device unless absolutely required. The warranty may be voided, if the fuel stop is intentionally altered to increase engine power.

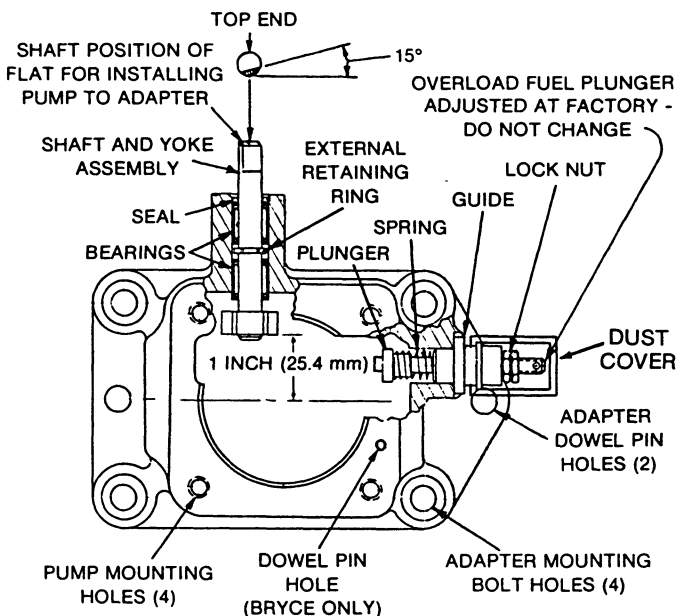


FIGURE 4. INJECTION PUMP ADAPTER ASSEMBLY

## ELECTRICAL CONNECTIONS

The nameplate on the generator set shows the electrical output rating of the generator in watts, volts, and hertz. The wiring diagram, shipped with the generator set, shows the electrical circuits and connections needed during installation.

**All electrical connections should be done by a qualified serviceman or electrician to meet the electrical code requirements in your area.**

### Load Wires

The control box (junction box) has knock out sections to accommodate load wires. Use flexible conduit and stranded load wires near the set to isolate vibration. Use suitable size insulated wires for the load rating applied.

Connect each load wire to the proper generator output lead inside the control box. Insulate bare ends of ungrounded wires. Use bolt provided on the control box to connect the generator ground lead or earth wire. Install a fused main switch (or circuit breaker) between the generator and load. If a test-run indicates wrong rotation of 3 phase motors in the load circuit, switch the connections at any two of the generator terminals.

**Standby:** If the installation is for standby service, install a double-throw transfer switch (either manual or automatic type) to prevent feeding generator output into the normal power source lines and to also prevent commercial power and generator output from being connected to the load at the same time. Instructions for connecting an automatic load transfer switch is included with such equipment.

**Balance All Loads:** Divide the loads equally between output leads. Load current for any one output lead must not exceed nameplate value.

#### CAUTION

Overloading can damage the generator windings. Divide the loads equally between output leads to prevent unbalanced loading and burned windings.

**Single Phase Loads on Three Phase Generators:** Any combination of single phase and three phase loading can be used at the same time as long as the current for any output lead does not exceed the generator nameplate value.

## SWITCHBOARD

A wall mounted switchboard containing ammeters, a voltmeter, and circuit breakers is optional. When used, the following connections apply:

1. Connect one ungrounded (hot) generator lead to the unused terminal on each ammeter.
2. Connect the generator lead and load wires which are to be grounded or earthed to the ground stud on the switchboard.
3. Connect one ungrounded (hot) wire to the unused terminal on each circuit breaker.

4. On sets that generate more than one voltage (example: 120/240), the voltmeter should be wired to indicate the higher of the two voltages.

## RECONNECTIBLE GENERATORS

The factory ships all special order sets with instruments on the control panels completely wired for the voltage code or voltage specified on the customers purchase order. Standard sets without instruments are shipped with the T<sup>1</sup>-T<sup>4</sup> or T<sup>1</sup>-T<sup>12</sup> output leads separated in the output box. These single phase and broad range generators are connectible or later reconnectible to provide any of the output voltages shown in Figure 5. Grounding or earthing procedure should comply with local electrical codes.

**Code 3C or 53C Reconnectible Generators:** The single phase, 60 and 50 Hertz generators have output leads T<sup>1</sup>, T<sup>2</sup>, T<sup>3</sup>, and T<sup>4</sup> available for making the single phase voltage and load connections shown in Figure 5 at the installation site.

**Code 18R or 518R Reconnectible Generators:** The three phase, broad range, 60 and 50 Hertz 12 lead generators have output leads T<sup>1</sup> through T<sup>12</sup> available for making several single and three phase voltage load connections shown in Figure 5.

**When connecting the output leads, be sure to connect jumper W10 on the voltage regulator printed circuit board between terminal V<sup>4</sup> (common) and V<sup>1</sup>, V<sup>2</sup>, or V<sup>3</sup> as listed on the reconnection diagram.**

**Code 9X Generators:** These special order three phase, 60 Hertz, 4 wire, generators are prewired at the factory to provide 347/600 VAC. Output leads T<sup>1</sup>, T<sup>2</sup>, T<sup>3</sup>, and T<sup>0</sup> are available for connection to the load wires. See connection diagram.

**Grounding or Earthing:** A number 8 or larger wire should be used to connect the generator housing to a rod or pipe that penetrates into moist earth. If a solderless connector is not provided on the generator, connect the ground wire at the battery negative stud on the engine.

## BATTERY CONNECTIONS

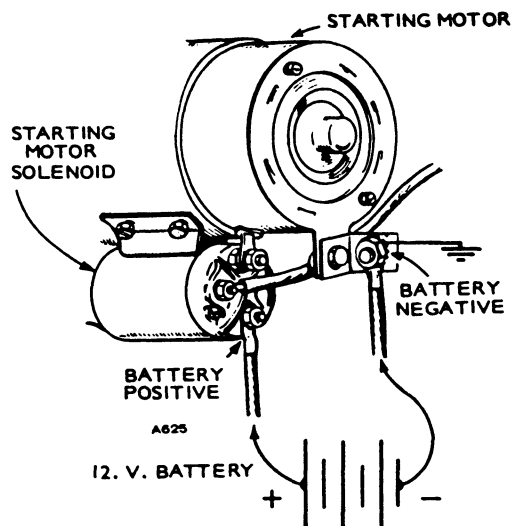
The battery is connected for negative (-) ground, Figure 6. Be sure all battery connections are tight.

Battery polarity must agree with the rectifier located in the control box. If battery polarity must be changed, reverse the rectifier connection in the control box.

#### CAUTION

If battery polarity is reversed, damage will occur within 3 minutes while stopped or 5 seconds while running. Alternator windings will be damaged almost instantly if battery charging circuit is shorted between resistor R21 and the B1 end of the charging winding.

NAMEPLATE VOLTAGE CODE					VOLTAGE		PHASE	FREQUENCY	CONNECT W/O JUMPER WIRE FROM V4 TO:	GENERATOR CONNECTION	GENERATOR CONNECTION SCHEMATIC DIAGRAM		LOAD TO GENERATOR CONNECTION WIRING DIAGRAM	
CONNECT X1 TO TERMINAL 5 OF PRINTED CIRCUIT BOARD FOR 50 HZ. TO TERMINAL 6 FOR 60 HZ.														
3C	120/240	I	60	V1		120	240	120/240						
53C	120/240	I	50	V3										
	115/230	I	50	V2										
	110/220	I	50	V1										
18	120/208	3	60	V1										
	127/220	3	60	V2										
	139/240	3	60	V4										
518	110/190	3	50	V1										
	115/200	3	50	V2										
	120/208	3	50	V3										
	127/220	3	50	V4										
18	240/416	3	60	V1										
	254/440	3	60	V2										
	277/480	3	60	V4										
518	220/380	3	50	V1										
	230/400	3	50	V2										
	240/416	3	50	V3										
	254/440	3	50	V4										
18	120/240	3	60	V1										
	110/220	3	50	V1										
	115/230	3	50	V2										
	120/240	3	50	V3										
518	110/220	3	50	V1										
	115/230	3	50	V2										
	120/240	3	50	V3										
18	120/240	I	60	V1										
	110/220	I	50	V1										
	115/230	I	50	V2										
	120/240	I	50	V3										
518	110/220	I	50	V1										
	115/230	I	50	V2										
	120/240	I	50	V3										
18	120	I	60	V1										
	110	I	50	V1										
	115	I	50	V2										
	120	I	50	V3										
518	110	I	50	V1										
	115	I	50	V2										
	120	I	50	V3										
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	120	I	50	V3										
518	110	I	50	V1										
	115	I	50	V2										
	120	I	50	V3										
18	120	I	60	V1										
	110	I	50	V1										
	115	I	50	V2										
	120	I	50	V3										
518	110	I	50	V1										



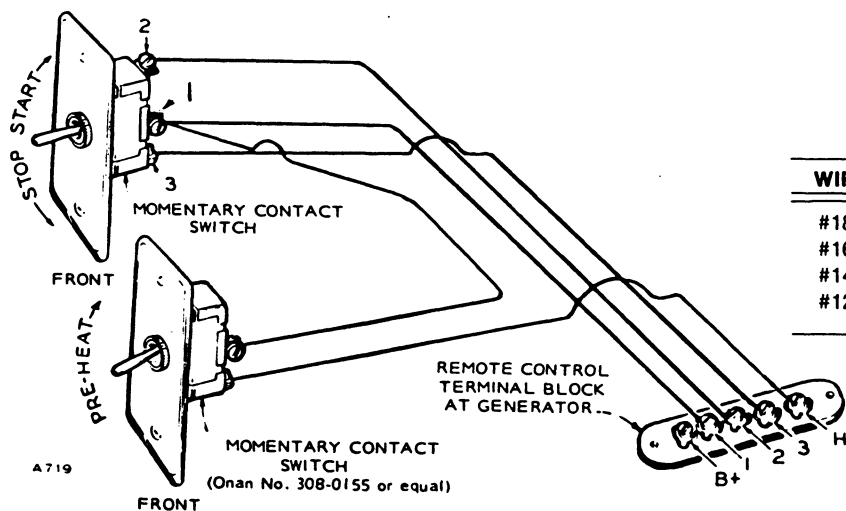
CABLE SIZE

mm	6.5	7.3	8.3	9.3	10.5	11.6
INCH	.258	.289	.325	.365	.410	.460
WIRE SIZE	2	1	0	00	000	0000
LOOP	4 ft. 1.24 m	5 ft. 1.55 m	7 ft. 2.17 m	9 ft. 2.79 m	11 ft. 3.41 m	14 ft. 4.34 m

FIGURE 6. BATTERY CONNECTIONS AND CABLE DIMENSIONS

## REMOTE START-STOP SWITCH (Optional)

For remote control starting and stopping, use 3 wires to connect the remote switch (single pole, double throw, momentary contact, center-off type) to the terminal block marked B+, 1, 2, 3, in the set control box using wire sizes as listed in Figure 7. Preheat circuit requires an extra wire to terminal H and momentary contact switch (SPST) connection. Remove jumper between terminals 3 and H before installing remote wiring.



WIRE SIZE	DISTANCE
#18 (1.02 mm)	to 65 ft. (20 m)
#16 (1.29 mm)	to 100 ft. (31 m)
#14 (1.63 mm)	to 150 ft. (47 m)
#12 (2.05 mm)	to 280 ft. (87 m)

FIGURE 7. REMOTE CONTROL

# OPERATION

## ⚠ WARNING

### EXHAUST GAS IS DEADLY!

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

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

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

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

1-P/EM

## PRE-STARTING

Before generator set is put into operation, check all components for mechanical security. If an abnormal condition, defective part, or operating difficulty is detected, repair or service as required. Generator set should be kept free of dust, dirt, and spilled oil or fuel.

## Crankcase Oil

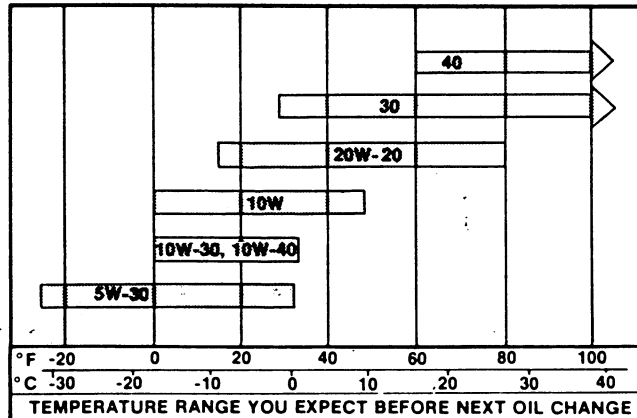
Use an oil with the American Petroleum Institute (API) designation CD/SE. However, to reduce oil consumption to a normal level in the shortest time possible on a new or rebuilt engine, use CC/SE oil for the first fill only (50 hours). Then use the recommended oil only. Select the correct SAE viscosity grade oil by referring to the following.

Multigrade oils (CC/SE or CD/SE) are recommended for temperatures of 32° F (0° C) and below, but they are not recommended for temperatures above 32° F (0° C). When adding oil between oil changes, use the same brand because different brands of oil may not be compatible.

## ⚠ WARNING

**Never check oil level while engine is running. Hot oil discharged from the engine could cause personal injury.**

## USE THESE SAE VISCOSITY GRADES



AMBIENT TEMP. RANGE	RECOMMENDED VISCOSITIES	REQ'D QUALITY LEVELS (API CLASS)
60° F and warmer	SAE 40	CD/SE
32° F and warmer	SAE 30	
15° F to 80° F	SAE 20W-20	
0° F to 50° F	SAE 10W	
0° F to 32° F	SAE 10W-30, 10W-40	CD/SE or CC/SE
-25° F to 32° F	SAE 5W-30	CD/SE or CC/SE

Refer to Chart for Celsius Temperature Conversions.

## Recommended Fuel

Use ASTM 2-D or 1-D fuel with a minimum Cetane number of 45. Number 2 diesel fuel gives the best economy for most operating conditions; however, use ASTM 1-D fuel during the following conditions:

1. When ambient temperatures are below 32° F (0° C);
2. During long periods of light engine load; or no load.

**NOTE:** Fuels with Cetane numbers higher than 45 may be needed in higher altitudes or when extremely low ambient temperatures are encountered to prevent misfires.

Use low sulfur content fuel having a pour point (ability to filter) of at least 10°F (6°C) below the lowest expected temperature. Keep the fuel clean and protected from adverse weather. Leave some room for expansion when filling the fuel tank.

### CAUTION

Due to the precise tolerances of diesel injection systems, it is extremely important the fuel be kept clean. Dirt or water in the system can cause severe damage to both the injection pump and the injection nozzles.

## Bleeding Fuel System

After replacing or cleaning the filters, bleed the fuel system of air. Bleed air from fuel system as follows:

1. Disconnect fuel return line at the tee near the transfer pump.
2. Operate hand priming lever on diaphragm type fuel transfer pump until there are no air bubbles in fuel flowing from the fuel return line, Figure 8.

If fuel tank is disconnected, use a separate container of fuel and connect a short hose line between the transfer pump inlet and the fuel container. The pump has enough suction to pull the fuel out of the container.

If the camshaft's transfer pump lobe is up, crank engine one revolution to permit hand priming. When finished, return priming lever inward (disengaged position) to permit normal pump operation.

3. Then connect the fuel return line at tee, Figure 3.

### CAUTION

A diesel engine cannot tolerate dirt in the fuel system. It is one of the major causes of diesel engine failure. A tiny piece of dirt in the injection system may stop your unit. When opening any part of the fuel system beyond the secondary fuel filter, place all parts in a pan of clean diesel fuel as they are removed. Before installing new or used parts, flush them thoroughly, and install while still wet.

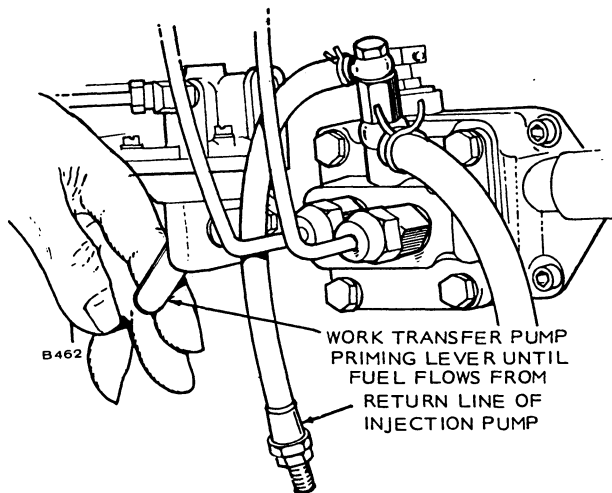


FIGURE 8. FUEL SYSTEM

## COLD WEATHER STARTING

Preheating for 60 seconds is recommended on all DJ-Series Diesels at 55° F, (13° C) or lower, and 30 seconds for temperatures above 55° F (13° C).

Refer to Onan Diesel Starting Guide, Page 17.

1. Engage PREHEAT switch for 1 minute. On contractor models, turn OFF-RUN switch to RUN.
2. Engage START switch. On contractor models, continue to hold PREHEAT switch until engine comes up to speed. On all other models, hold START switch to START until engine comes up to speed. (This will maintain heater operation until START switch is disengaged.)
3. If engine fails to start in 15-20 seconds, repeat steps 1 & 2, above. Absence of blue exhaust smoke during cranking indicates no fuel being delivered. Determine cause.
4. In extreme cold it may be necessary to maintain preheating up to 2 minutes after the engine starts to obtain firing or to smooth out all cylinders, especially at no load or light loads.

**CAUTION** Do not exceed the one minute preheat periods to prevent heater burn out and conserve the battery. Longer preheating time prior to cranking the engine can ruin the manifold heater and glow plugs because there is no incoming air flow to cool them. Additional operation of the preheaters for a few seconds during cranking in cold weather may help to preheat the incoming combustion air and prevent misfires as the engine starts running.

On "contractor" model, depress preheat switch for one minute and then push start switch. Both switches must be engaged for starting.

If the control has a reset button, push it to reset only after a shutdown resulting from oil pressure failure occurs. Find the cause before restarting the engine.

**CAUTION** Do not apply overvoltage to the starting circuit at any time. Overvoltage may destroy the glow plugs and air heater in seconds. If it becomes necessary to use an additional source of power to start the set — use a 12 volt battery connected in parallel.

## AUTOMATIC STARTING AND STOPPING

An optional automatic demand control may be used for starting and stopping, but it must provide engine preheating.

The automatic control has a time delay relay to preheat glow plugs and the manifold heater for about 20 seconds before cranking occurs. The time delay relay prevents immediate engagement of the starter in case a load is reapplied before the engine comes to a complete stop.

## STOPPING

1. Push start-stop switch to stop position.
2. Release switch when set stops. If stop circuit fails, push governor arm to rear of engine to shut off fuel in injection pump.

## APPLYING LOAD

Allow set to warm up before connecting a heavy load. Continuous generator overloading may cause engine damage and high operating temperatures that can damage the windings. For normal operation, keep the load within nameplate value. The exhaust system may form carbon deposits during operation at continuous light loads; apply full load occasionally before shutdown to prevent excessive carbon accumulations.

## BATTERIES

Check the condition of the starting batteries at least every two weeks. See that connections are clean and tight. A light coating of non-conductive grease will retard corrosion at terminals. Keep the electrolyte at the proper level above the plates by adding distilled water. Check specific gravity; recharge if below 1.260.

## BREAK-IN PROCEDURE

The unit should be run in the following sequence:

1. One half hour at 1/2 load.
2. One half hour at 3/4 load.
3. Full load.



Continuous running under one half load during the first few hundred hours usually results in poor piston ring seating, causing higher than normal oil consumption and blowby.

**Drain and replace the crankcase oil after first 50 hours of operation; drain while the engine is still hot.**

## OUT-OF-SERVICE PROTECTION

The natural lubricating qualities of diesel fuels should protect diesel engine fuel system components for at least 30 days when unit is not in service.

To protect a set that will be out of service for more than 30 days, proceed as follows:

1. Run set until thoroughly warm; generator under at least 50 percent load.
2. Shut down engine and drain oil base while warm. Refill and attach a warning tag indicating viscosity of oil used.
3. Remove glow plugs. Pour 1 ounce (30 ml) of rust inhibitor (or SAE #10 oil) into each cylinder.
4. After rust inhibitor oil is used in preparing the engine for long storage periods, do not use the starter motor to crank the engine. Crank the engine slowly by hand to distribute the inhibitor in the cylinders.

Reinstall glow plugs.

5. Clean throttle and governor linkage and protect by wrapping with a clean cloth.
6. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
7. Clean and wipe entire unit. Coat parts susceptible to rust with a light coat of grease or oil.
8. Disconnect battery and follow standard battery storage procedure.
9. Provide a suitable cover for the entire unit.

### Returning a Unit to Service

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

#### **WARNING**

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

4. Check that fuel injectors and fuel lines are secure, correctly torqued without leaks.
5. Clean cooling fin areas.
6. Connect batteries.
7. Verify that no loads are connected to generator.
8. Start engine and observe oil pressure gauge and charge rate ammeter.

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

9. After start, apply load to at least 50 percent of rated capacity.
10. Unit is ready for service.

## HIGH TEMPERATURES

1. See that nothing obstructs air flow to and from the set.
2. Keep cooling fins clean. Air housing should be properly installed and undamaged.
3. Use correct viscosity oil for temperature conditions.
4. Maximum power and the rated output will be reduced by two percent for each 10° F (6° C) increase in ambient or induction air temperature above 85° F (29° C).

## LOW TEMPERATURES

1. Use correct viscosity oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move the set to a warm location or apply heated air (never use open flame) externally until oil flows freely.
2. Use fresh fuel. Protect against moisture condensation.
3. Keep fuel system clean, and batteries in a well charged condition.
4. Extend preheating time during cold starts.

## DUST AND DIRT

1. Keep set clean. Keep cooling fins free of dirt, etc.
2. Service air cleaner as frequently as necessary.
3. Change crankcase oil every 100 operating hours.
4. Keep oil and fuel in dust-tight containers.
5. Keep governor linkage clean.

## HIGH ALTITUDE

Maximum power and rated output will be reduced approximately 4 percent for each 1000 feet (305 m) above sea level, after the first 500 feet (152 m).

## ENGINE RATINGS

Ratings apply to altitudes up to 1000 feet (305 m), standard cooling, normal ambients and with No. 2 Diesel fuel. Consult nearest Onan service center or factory for operating characteristics under other conditions.

## EXERCISING UNIT

Infrequent use of units can result in the following: Water condensing in engine fuel and lubrication system causing contamination and/or corrosion, loss of protective oil film on moving engine parts, loss of engine fuel prime due to drain-back and/or evaporation, battery discharge due to internal and external current leakage, and breakdown of generator insulation due to water absorption.

Proper exercising does the following: Elevates engine oil temperature to at least 180°F (82.2°C) evaporating water from engine lubrication system, re-establishes a protective oil film on engine parts, recharges battery to full normal potential, and brings generator up to normal operating temperature through actual application of load. The engine oil temperature should be held at 180°F (82.2°C) for at least 20 minutes and the unit should be exercised at least once each month.

Proper exercising can usually be accomplished by observing the following procedures.

1. Perform all specified maintenance checks, start unit and apply load by creating a simulated power failure\*. This exercises the control and switchgear systems.
2. Apply not less than 50 percent load and use thermostatic shutters if needed, to heat up engine and generator as described above.
3. Exercise unit long enough to provide at least 20 minutes running time at normal operating temperatures. This will require at least 60 minutes total running time.

4. Shut unit down by simulating return of normal power.\* Provide approximately 10 minutes of operation at no load to allow the engine to cool down.

**\*This applies to standby unit only. Other units should be started and loaded by control and load application systems normally associated with operation of the unit.**

Improper exercising may cause more damage than no exercising at all because of the following: Significant amounts of water and raw fuel will remain in the lubrication oil if the unit is not at the specified operating temperature; operating engine at no load or at temperatures below those specified causes carbon build-up and exhaust system fouling, and inadequate charging of battery. Continued operation in this manner may cause starting failure and/or engine damage. Exercising a generator set without exercising associated controls and switchgear does not ensure operation integrity of the controls and switchgear. If the associated equipment is not fully functional, the system may fail to provide power when required.

After each exercise period, refill fuel tank and check engine for leaks and general condition. Locate cause of leaks (if any) and correct.

# ONAN DIESEL STARTING GUIDE

## IMPORTANT!

KEEP ENTIRE FUEL SYSTEM CLEAN AND FREE FROM WATER

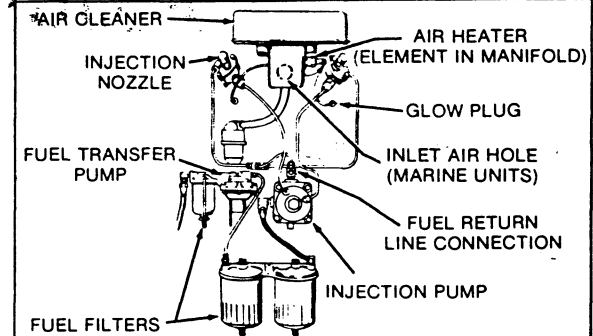
- DIESEL INJECTION PUMPS WILL FAIL IF SYSTEM CLEANLINESS IS NEGLECTED

INJECTION PUMPS AND NOZZLES ARE NOT FIELD REPAIRABLE

- WHEN TROUBLESHOOTING, CHECK ALL OTHER COMPONENTS FIRST

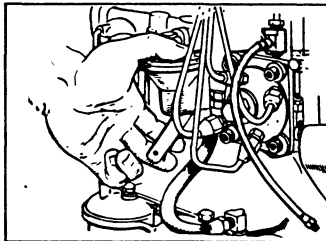
### WARNING

DO NOT USE ETHER STARTING AIDS! ETHER IS EXTREMELY EXPLOSIVE AND MAY CAUSE SERIOUS PERSONAL INJURY. ENGINE DAMAGE IS ALSO LIKELY.



## BEFORE STARTING:

CHECK FUEL SUPPLY. BE SURE SHUTOFF VALVES ARE OPEN.



PRIME FUEL SYSTEM IF: FUEL FILTERS WERE DRAINED OR CHANGED, SYSTEM WAS JUST INSTALLED, FUEL TANK RAN DRY.

TO PRIME PUMP, MOVE PRIMING LEVER UP AND DOWN UNTIL FUEL FLOWS STEADILY FROM RETURN LINE (DISCONNECTED).

PREHEAT



PREHEAT COLD ENGINE: PUSH PREHEAT SWITCH AND HOLD —

- 30 SECONDS IF ABOVE 55°F (13°C);
- 60 SECONDS IF BELOW 55°F (13°C).

## TO START:

PREHEAT



RELEASE PREHEAT

START



ENGAGE START SWITCH

STOP

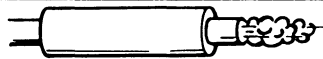
LIMIT CRANKING TO 15 TO 20 SECONDS TO CONSERVE BATTERY. ALLOW 1 MINUTE BEFORE RE-CRANKING.

## IF ENGINE DOES NOT START:

IF ENGINE FIRED, REPEAT ABOVE PROCEDURES, INCLUDING PRE-HEAT. IF IT STILL DOES NOT START, PROCEED AS FOLLOWS:

TEMPERATURES BELOW 32°F (0°C):

USE NUMBER 1 DIESEL FUEL. USE CORRECT VISCOSITY OIL. KEEP BATTERIES FULLY CHARGED. DO NOT USE ETHER STARTING AID.



OBSERVE ENGINE EXHAUST "SIGNALS":

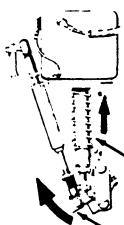
BLUE-WHITE EXHAUST SMOKE:  
ENGINE IS GETTING FUEL

LITTLE OR NO EXHAUST SMOKE: ENGINE IS NOT GETTING FUEL.

- PRIME FUEL SYSTEM AS SHOWN ABOVE:
- OBSERVE FUEL FLOW FROM RETURN LINE

1. OBSERVE AIR HEATER THRU AIR INLET HOLE OR BY REMOVING AIR CLEANER.
2. ENGAGE PREHEAT.
3. IF HEATER ELEMENT DOES NOT GLOW RED WITHIN 30 SECONDS, CHECK AIR HEATER AND GLOW PLUG WIRING:
  - CONNECTIONS TIGHT?
  - FREE FROM CORROSION?

FUEL FLOWS STEADILY



SOLENOID ROD  
THROTTLE ARM

CHECK FUEL SOLENOID:  
SOLENOID ROD SHOULD PULL IN AND THROTTLE ARM FOLLOW (AS SHOWN) WHEN START SWITCH IS TURNED ON. IF NOT, CHECK FOR

- BINDING LINKAGE
- LOOSE OR BROKEN WIRES

LITTLE OR NO FUEL FLOW

CHECK FUEL SUPPLY SYSTEM:

- FUEL TANK EMPTY?
- SHUTOFF VALVES CLOSED?
- FUEL LINES KINKED?
- LOOSE CONNECTIONS?
- CLOGGED FUEL FILTERS?

IF ENGINE IS STILL NOT GETTING FUEL, CHECK TRANSFER PUMP:  
1. CRANK ENGINE AND OBSERVE FUEL FLOW FROM RETURN LINE.  
2. IF FUEL DOES NOT SPURT OUT, PUMP MAY BE DEFECTIVE.

IF ENGINE STILL DOES NOT START, CONTACT AUTHORIZED ONAN SERVICE REPRESENTATIVE

2-79 900-0217

# ADJUSTMENTS

## CENTRIFUGAL SWITCH

The start-disconnect centrifugal switch (Figure 9) is located on the side of the engine above the oil filter. The switch opens when the engine stops and closes when engine speed reaches about 900 rpm. If necessary, loosen the stationary contact and adjust the point gap at 0.020 inch (0.51 mm). Replace burned or faulty points.

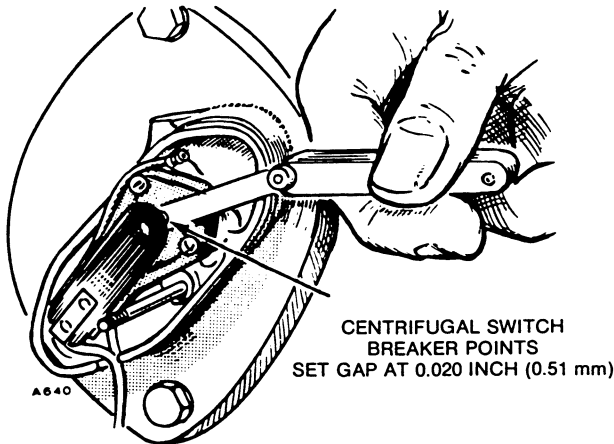


FIGURE 9. CENTRIFUGAL SWITCH ADJUSTMENT

## GOVERNOR

The governor controls engine speed. Engine speed equals frequency multiplied by 30, on a 4 pole generator, thus 1800 rpm generates 60 hertz; 1500 rpm generates 50 hertz. Preferred speed does not vary more than 3 hertz from no-load to full-load operation. Be sure throttle, linkage, and governor mechanism operate smoothly.

### Speed Adjustment

To change the governor speed, change the spring tension by turning the governor spring nut (Figure 10). Turn the nut clockwise (more spring tension) to increase rpm and counterclockwise to reduce governed speed. Hold a tachometer against flywheel-crankshaft cap screw or observe frequency meter.

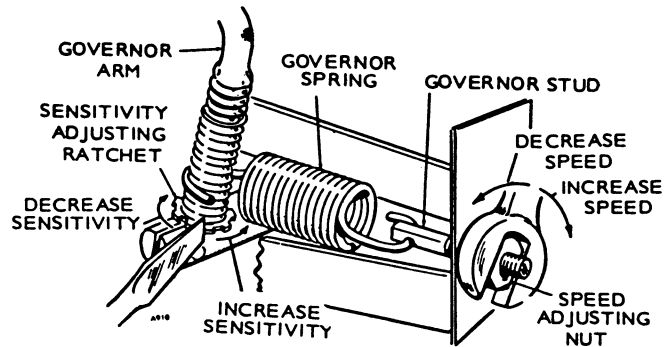


FIGURE 10. GOVERNOR ADJUSTMENT

### Sensitivity Adjustment

To adjust governor sensitivity (no load to full load speed droop), remove access plug and turn the sensitivity adjusting ratchet. Counterclockwise gives more sensitivity (less speed drop when full load is applied), clockwise gives less sensitivity (more speed drop). If the governor is too sensitive, a rapid hunting condition occurs (alternate increasing and decreasing speed). Adjust for maximum sensitivity without hunting. After sensitivity adjustment is made, speed readjustment will be required. When governor adjustment is completed, replace the access plug in the blower housing and secure speed stud lock nut.

Excessive droop may be caused by engine misfiring. Correct this condition before adjusting governor.

## CHARGE RATE ADJUSTMENT

The adjustable resistor slide tap (in the charging circuit) is set to give approximately 2 ampere charging rate. The resistor is located in the generator air outlet. For applications requiring frequent starts, check battery specific gravity periodically and, if necessary, increase the charging rate slightly (move slide tap up). Adjust only when engine is stopped. Avoid overcharging.

If using a separate automatic demand control for starting and stopping, adjust the charge rate for its maximum 4.5 amperes. This normally keeps battery charged even if starts occur as often as 15 minutes apart.

# GENERAL MAINTENANCE

## GENERAL

Follow a regular schedule of inspection and servicing, based on operating hours (Table 1). Keep an accurate logbook of maintenance, servicing, and operating time. Use running time meter (optional equipment) to keep a record of operating hours.

Repeat operator and service maintenance for period listed in Table 1, *Hours of Operation*. Refer to Figures 11 and 12 for engine maintenance information.

### WARNING

Before commencing any maintenance work on the engine, generator, control panel, automatic transfer switch or associated wiring, disconnect batteries. Failure to do so could result in damage to the unit or serious personal injury in the event of inadvertent starting.

## PERIODIC CHECKS

1. Check all fuel and oil lines for possible leakage.
2. Inspect exhaust lines and mufflers for possible leakage and cracks.
3. Periodically, drain moisture from condensation traps.
4. Inspect air shrouds for leaks and security. Be sure cooling fins are clean.
5. Inspect electrical wires and connections for security and fray damage.

If generator requires major repair or servicing, contact an authorized Onan dealer or distributor.

## VALVE ADJUSTMENT

The valves are adjusted cold. After the cooling period, adjust No. 1 cylinder first and the rest in the firing order.

To adjust valve clearance, proceed as follows:

1. Rotate flywheel clockwise until cylinder having its valves adjusted is up on a compression stroke and TC mark on flywheel lines up with timing pointer on the gear cover; then turn 10 to 45 degrees past TC to be sure lifter moves off ramp of cam.

In this position, both valves will be closed and the rocker arms are free to move slightly indicating maximum clearance.

2. Using a feeler gauge, check clearance between rocker arm and valve. See Figure 12.
3. Increase or reduce clearance until proper gap is established. Adjust with lock nut which secures rocker arm to cylinder head.

## OIL FILTER CHANGE

Place pan under oil filter and remove filter by turning counterclockwise. Clean filter mounting area. Oil filter gasket and install new filter. Turn filter on clockwise until gasket touches mounting base, then tighten 1/2 turn.

TABLE 1.  
OPERATOR AND SERVICE MAINTENANCE SCHEDULE

HOURS OF OPERATION	MAINTENANCE TASK
8	<ul style="list-style-type: none"><li>• Inspect exhaust system</li><li>• Inspect generator set</li><li>• Check fuel supply; see Note 1.</li><li>• Check oil level</li></ul>
50 (more often in dusty conditions)	<ul style="list-style-type: none"><li>• See Note 3.</li><li>• Check air cleaner.</li></ul>
100	<ul style="list-style-type: none"><li>• Clean governor linkage</li><li>• Change crankcase oil</li><li>• Drain fuel condensation traps in lines and filters; see Note 1</li></ul>
200	<ul style="list-style-type: none"><li>• Replace oil filter</li><li>• Check battery condition</li></ul>
500	<ul style="list-style-type: none"><li>• Clean crankcase breather</li><li>• Check start-disconnect circuit</li><li>• Check valve clearances</li></ul>
600	<ul style="list-style-type: none"><li>• Change primary filter</li></ul>
2000	<ul style="list-style-type: none"><li>• Grind valves (if required)</li><li>• Clean holes in rocker box oil line</li><li>• Check nozzle spray pattern; see Note 2</li><li>• Clean generator</li></ul>
3000	<ul style="list-style-type: none"><li>• Change secondary fuel filter</li></ul>
5000	<ul style="list-style-type: none"><li>• General overhaul (if required) See Note 3.</li></ul>

**NOTE 1.** Water or foreign material in fuel can ruin the injection system. If daily inspection shows water or excessive dirt in sediment bowl, fuel handling and storing facilities should be checked and situation corrected. Primary and secondary fuel filters can be replaced following correction of fuel contamination problem.

**2.** This service must be conducted by trained diesel injection equipment personnel with suitable test facilities. Omit this service until these conditions can be met.

**3.** Tighten head bolts and adjust valve clearance after first 50 hours on new and overhauled engines, and then adjust valve clearance each 500 hours thereafter.

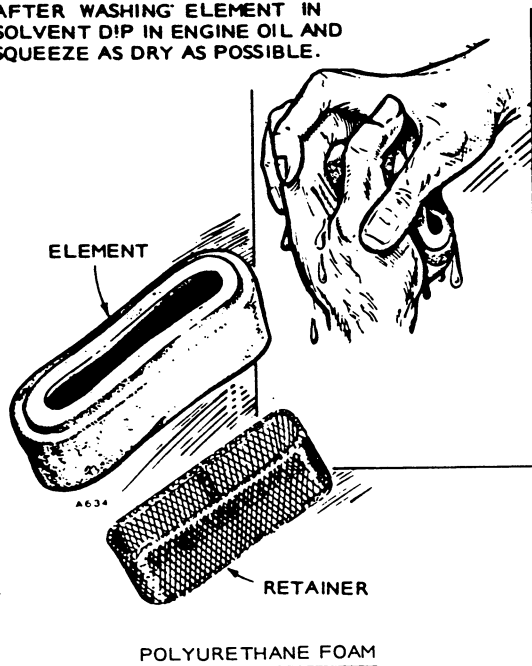
## AC GENERATOR

When inspecting the rotating rectifier assembly, make sure diodes are free of dust, dirt and grease. Excessive foreign matter on these diodes and heat sinks will cause the diodes to overheat and fail. Blow off the assembly periodically, with filtered, low pressure air. Also check to see that diodes and leadwires are properly torqued. The diodes should be torqued to 25 in. lb. (2.83 N•m).

## BATTERIES

Check batteries at least every two weeks. See that connections are clean and tight. A light coating of non-conductive grease will retard corrosion at terminals. Keep the electrolyte at the proper level above the plates by adding distilled water. Check specific gravity; recharge if below 1.260 at 80° F (176° C).

AFTER WASHING ELEMENT IN SOLVENT DIP IN ENGINE OIL AND SQUEEZE AS DRY AS POSSIBLE.

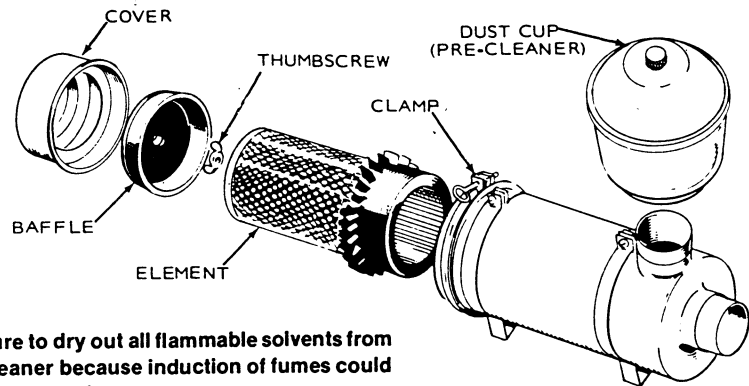
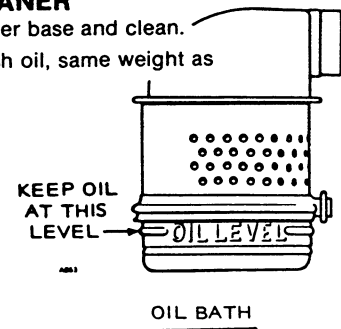


### WARNING

Be sure to dry out all flammable solvents from air cleaner because induction of fumes could cause a run-a-way engine on starting.

### OPTIONAL OIL BATH AIR CLEANER

1. Loosen bottom clamp, remove cleaner base and clean.
2. Refill base to oil level mark with fresh oil, same weight as used in engine.



### AIR CLEANERS

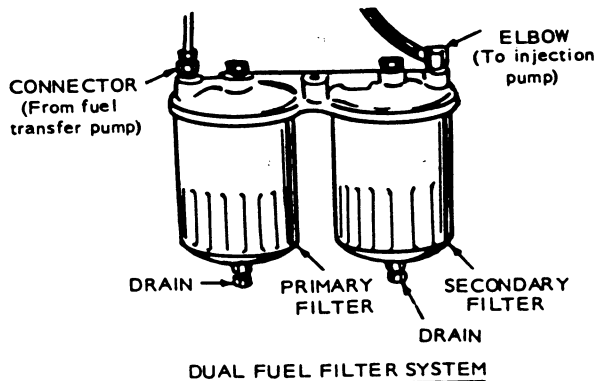
#### CAUTION

Do not dry with high pressure air which can damage or rupture filter element.

Drain and replace the crankcase oil after first 50 hours of operation; drain while the engine is still hot.

### CONTRACTOR MODEL AIR CLEANER

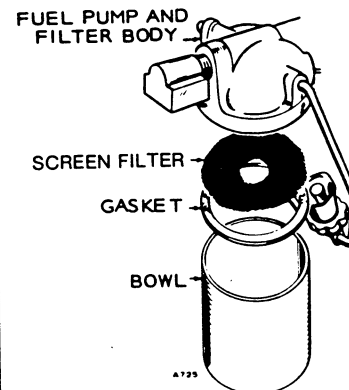
1. Remove pre-cleaner and wash out dirt. Dry and re-install.
2. Loosen clamp and remove end cover.
3. Remove thumbscrew and take out element. Wash element in detergent and water (use new element after 6 washings). Dry and re-install.
4. Remove air cleaner baffle from cover, wash out dirt, and re-install in cover.
5. Install cover with "TOP" up and tighten clamp.



#### CAUTION

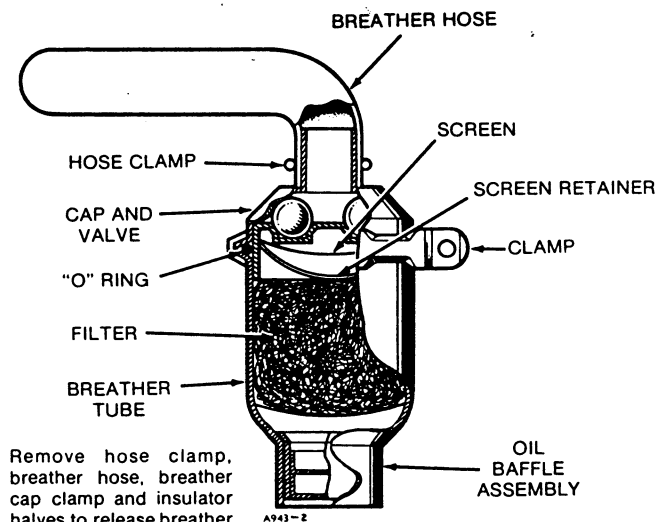
Drain plug on fuel filters can tolerate only a limited amount of torque. Use two wrenches in combination for breaking plug loose and for final tightening.

B208



### FUEL FILTERS

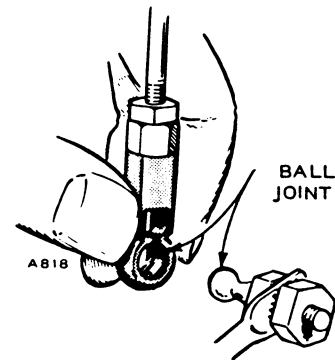
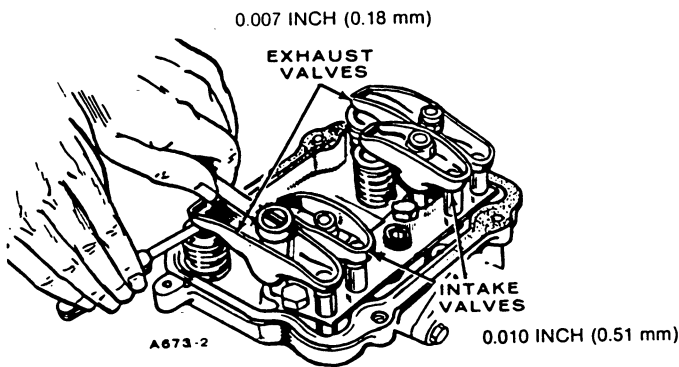
FIGURE 11. AIR CLEANER AND FUEL FILTER MAINTENANCE



Remove hose clamp, breather hose, breather cap clamp and insulator halves to release breather cap and valve assembly. Wash cap and valve assembly and the filter in suitable solvent and reinstall.

### CRANKCASE BREATHER

CLEAN BALL JOINT. IF INSERT IS PLASTIC, DO NOT LUBRICATE.



### VALVE CLEARANCE ADJUSTMENTS

### BALL JOINT

**WARNING** Never check oil level while engine is running. Hot oil discharged from the engine could cause personal injury.

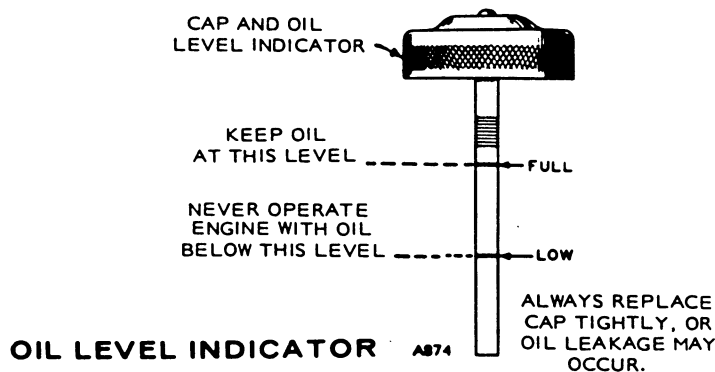


FIGURE 12. OIL LEVEL, GOVERNOR, AND CRANKCASE BREATHER MAINTENANCE





# PARTS INFORMATION

The following parts require replacement due to normal wear and service. They can usually be installed by the operator.

For additional information on parts or service, contact your nearest authorized dealer or Onan Parts and Service Center. A complete parts manual may be ordered under number 967-0225.

## RUNNING REPLACEMENT PARTS LIST

PART NO.	DESCRIPTION
122-0185	Oil Filter
122-0325	Primary Fuel Filter
122-0326	Secondary Fuel Filter
123-1283	Breather Filter
333-0106	12 Volt Glow Plug Kit (Includes Gasket)
110-0546	Glow Plug Gasket
154-0463	Exhaust Manifold Gasket
509-0117	Breather Tube O-Ring Seal
123-1203	Breather Cap and Valve Assembly
140-0636	Air Cleaner Element and Retainer
140-0584	Air Cleaner Gasket
115-0130	Rocker Cover Gasket
140-0765	Air Cleaner (Contractor Model)
149-0517	Fuel Pump Bowl Gasket
149-0463	Fuel Pump Bowl Screen





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