

OPERATORS MANUAL AND PARTS CATALOG

FOR
ELECTRIC GENERATING SETS

DDB
SERIES

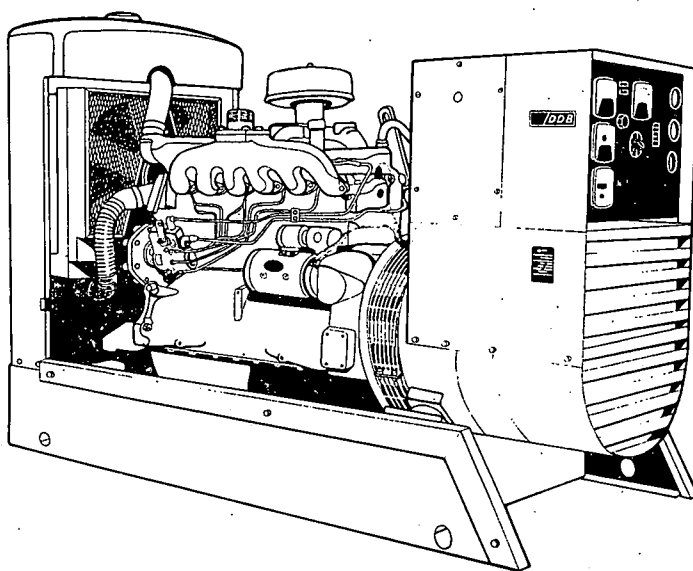


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WARNING

MANUFACTURER RECOMMENDS THAT ALL SERVICE INCLUDING INSTALLATION OF REPLACEMENT PARTS BE DONE BY QUALIFIED ELECTRICAL AND/OR MECHANICAL SERVICEMEN. FROM THE STANDPOINT OF POSSIBLE INJURY AND/OR EQUIPMENT DAMAGE IT IS IMPERATIVE THAT THE SERVICEMAN IS QUALIFIED.

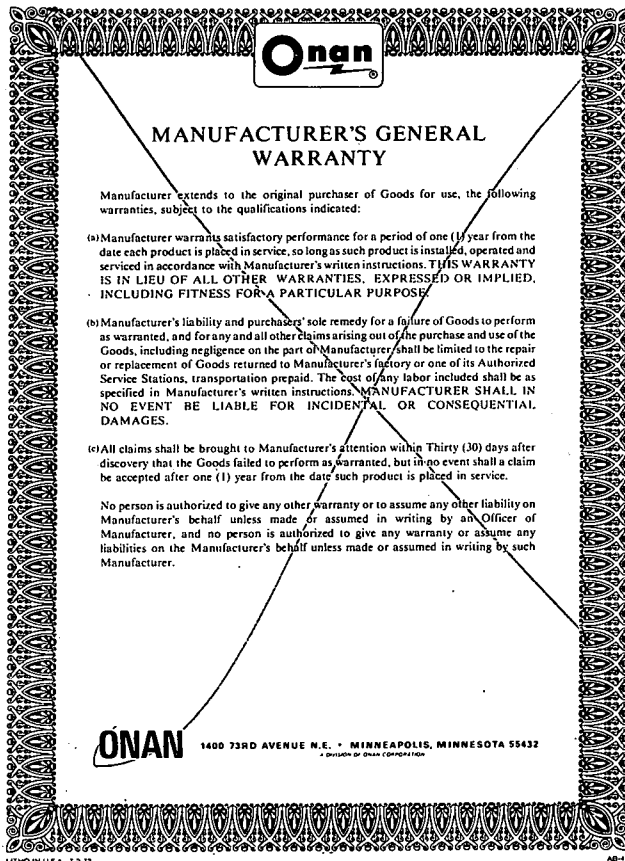
INTRODUCTION

FOREWORD

This manual is applicable to the DDB Series electric generating set, consisting of an Onan UR 50.0KW AC generator, driven by a John Deere 6329D diesel engine. Information is provided on installation, operation, troubleshooting and parts ordering for the set. The manual should be used in conjunction with the John Deere engine manual, as your specific engine may have variations due to optional equipment available.

WARNING Onan uses this symbol throughout the text to warn of possible injury or death.

CAUTION This symbol is used to warn of possible equipment damage.



MODEL IDENTIFICATION

Identify your model by referring to the MODEL and SPECIFICATION NO. as shown on the Onan nameplate. Electrical characteristics are shown on the lower portion of the nameplate.

50.0	DDB	15R	/	1	B
┆	┆	┆		┆	┆
1	2	3		4	5

1. Indicates Kilowatt rating.
2. Factory code for SERIES identification.
3. Indicates voltage code.
15 indicates reconnectible
R indicates remote electric start
4. Factory code for designating optional equipment.
5. Specification letter. (Advances when factory makes production modifications.)

If it is necessary to contact a dealer or the factory regarding the set, always mention the complete Model, Spec No. and Serial No. as given on the Onan nameplate. This nameplate information is necessary to properly identify your unit among the many types manufactured. Refer to the engine nameplate when requesting information from its manufacturer. The Onan nameplate is located on the right side of the generator; the John Deere nameplate is on the left side, on the engine block.

Left side and right side are considered when viewed from the engine or front end of the generating set.

IMPORTANT! RETURN WARRANTY CARD ATTACHED TO UNIT.

SPECIFICATIONS

ENGINE DETAILS

Engine Manufacturer	John Deere
Engine Series	300—6329D
Number of Cylinders.....	6
Displacement.....	329 cu. inches
BHP @ 1800 RPM	85
Compression Ratio	16.3:1
Bore	4.02-inches
Stroke	4.33-inches
Fuel	ASTM No.2 Diesel
Battery Voltage	12
Battery Group (Two 6-Volt, 135-A.H.)	2H
Starting Method	Solenoid Shift
Governor Regulation.....	5% No load — Full load

GENERATOR DETAILS

Type	UR 15R 60 Hz
	UR 515R 50 Hz
	UR 3R 60 Hz
Rating (Watts)	
60 Hertz Continuous Standby	50,000 (62.5KVA)
50 Hertz Continuous Standby	40,000 (50.0KVA)
AC Voltage Regulation	2%
60 Hertz RPM	1800
50 Hertz RPM	1500
Output Rating	0.8PF
AC Frequency Regulation	3.Hz
Battery Charging Current	35 Amperes

CAPACITIES AND REQUIREMENTS

Cooling System (Includes Radiator)	5 gal.
Engine Oil Capacity (Crankcase)	12 qts.
Exhaust Connection (inches pipe thread)	2½ qts.

AIR REQUIREMENTS (1800 RPM)

Engine Combustion.....	200 CFM
Radiator Cooled Engine.....	4185 CFM
Total for Radiator Cooled Model	4385 CFM
Alternator Cooling Air	
(1800 RPM)	1000 CFM
(1500 RPM)	834 CFM
Fuel Consumption at Rated Load	3.9 GPH

GENERAL

Height	52.6-inches
Width	33.0-inches
Length	79.75-inches
Weight (approx.)	2180-pounds

TABLE 1. UR GENERATOR VOLTAGE OPTIONS

VOLTS	FREQ.	PHASE	AMPERES	DOUBLE DELTA	SERIES DELTA	PARALLEL WYE	SERIES WYE	REF. VOLTAGE WIRE (W12) TAP
120/240	60 Hz	1	260	x				H5
115/230	50 Hz	1	216	x				H6
120/240	60 Hz	3	151		x			H5
115/230	50 Hz	3	125		x			H6
120/208	60 Hz	3	174			x		H3
127/220	60 Hz	3	164			x		H4
139/240	60 Hz	3	151			x		H5
110/190	50 Hz	3	151			x		H3
115/200	50 Hz	3	142			x		H4
240/416	60 Hz	3	87				x	H3
254/440	60 Hz	3	82				x	H4
277/480	60 Hz	3	75				x	H5
220/380	50 Hz	3	76				x	H3
230/400	50 Hz	3	72				x	H4
9 X R 347/600	60 Hz	3	60					H3 — Not Reconnectible

50.0KW 62.5KVA 60 Hz
40,000KW 50.0KVA 50 Hz

SAFETY PRECAUTIONS

Throughout this manual you will find eye-catching flags containing Warnings and Cautions, alerting you to conditions that could result in danger to you or the equipment, if the notice is ignored.

ONAN recommends that you read your manual and become thoroughly acquainted with it and your equipment before you start your unit. The accumulated experience of ONAN engineers is available to you, enabling you to operate your set in the most efficient and safest manner possible. These recommendations and the following safety precautions are for your protection. Study and know them!

REMEMBER. Most accidents are caused by failure to follow simple and fundamental safety rules or precautions.

Most accidents can be prevented!

KNOW YOUR MANUAL — KNOW YOUR EQUIPMENT

General

- Keep your generating set and the surrounding area clean and free from obstructions. Remove all oil deposits; keep the floor clean and dry.
- 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 or carbon tetrachloride on electrical fires. Use extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the generating set are secure. Tighten supports and clamps, keep guards in position over fans, driving belts, etc.
- Do not wear loose clothing in the vicinity of moving parts, or jewelry while working on electrical equipment.
- If it is necessary to make adjustments while the unit is running, use extreme caution when close to hot exhausts, moving parts, etc.
- Do not stand on a wet floor while working on electrical equipment. Use rubber insulative mats placed on dry wood platforms.

Fuel System

- DO NOT fill fuel tanks while engine is running, unless tanks are outside engine compartment.
- DO NOT SMOKE OR USE AN OPEN FLAME in the vicinity of the generator set or fuel tank. Internal combustion engine fuels are highly flammable.

REMEMBER — IF YOU CAN SMELL FUMES — YOU'RE COURTING A POSSIBLE EXPLOSION AND FIRE!

- Make sure that oily rags are not left on or near the engine.
- Fuel lines must be of steel piping, adequately secured, and free from leaks. Piping at the engine should be approved flexible line. Do not use copper piping on flexible lines as copper will work harden and become brittle. Use black pipe on natural gas or gaseous fuels, but not on gasoline or diesel fuel.
- Your engine installation should be equipped with a means of positive fuel shutoff in applications when fuel is conducted from a remote source. Fuels under pressure (e.g. natural gas or liquified petroleum gas) should be controlled by a positive shutoff valve, preferably automatic, in addition to any valve integral with the carburetor or gas regulator equipment.

Exhaust System

- Exhaust products of any internal combustion engine are toxic and can cause injury, or death if inhaled. All engine installations, especially those within a confine, should be equipped with an exhaust system to discharge gases to the atmosphere. Do not use exhaust gases to heat a compartment.
- Make sure that your exhaust system is free of leaks. Ensure that exhaust manifolds are secure and have not warped by bolts unevenly torqued.

Coolant System

- Coolants under pressure have a higher boiling point than that of water. DO NOT open a radiator or heat exchanger pressure cap or break a system while the engine is running, and in no case until the system has been bled off.
- Radiator fan belts are guarded for your protection. DO NOT remove covers or guards.
- Keep your hands away from moving parts.

Ventilation System

- Check remote radiators frequently. Remove any dirt, debris, bird nests, etc.
- Check ventilation louvres frequently. Make sure that free-fall louvres and motor operated louvres open and close properly and that there is no restriction in the free air flow.

Electrical System

The electrical installation exterior to your generator should have been performed by qualified licensed electricians. All local and state codes should have been consulted and complied with. It is essential that all load circuit breakers adequately protect electrical functions, all circuits are properly grounded and wiring is correct capacity.

- Tag open switches.
- DON'T tamper with interlocks.
- Before starting work on the generating set, disconnect batteries. This will prevent inadvertent starting of the set.
- Use extreme caution when making adjustments on the electrical components in the control panel while the engine is running. High voltages are present and could cause serious injury or death.
- DO NOT SMOKE while servicing batteries. Verify correct polarity of battery cables before connecting. Lead acid batteries give off a highly explosive hydrogen gas which can be ignited by electrical arcing or by smoking. When connecting batteries, connect the ground lead last.

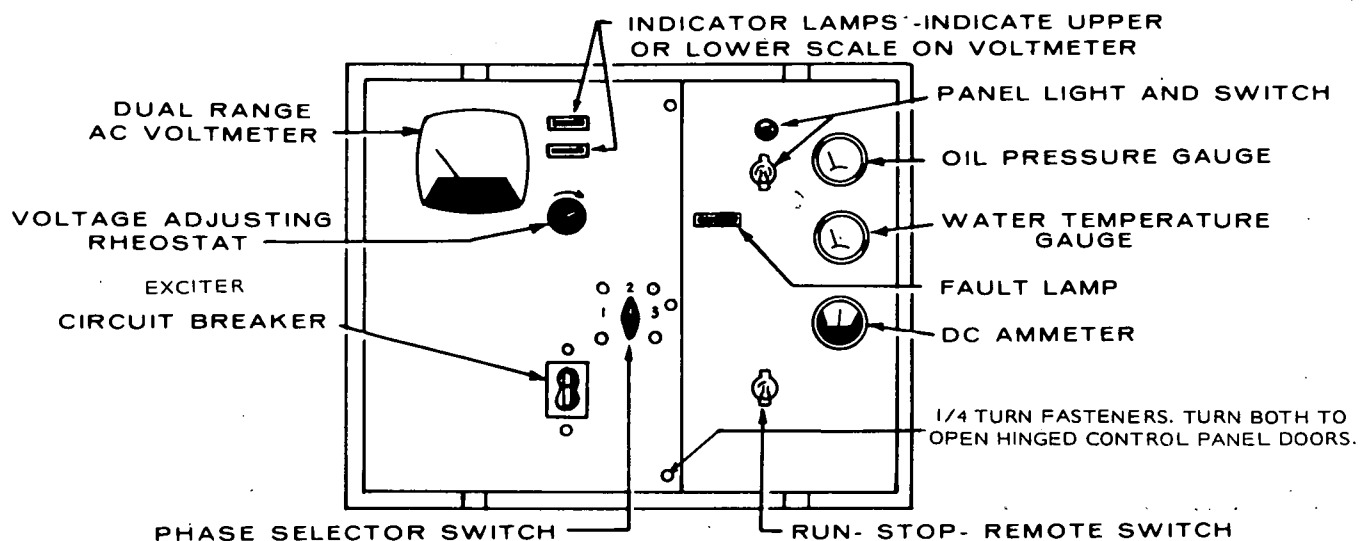


FIGURE 1. TYPICAL CONTROL PANEL (ONE FAULT LAMP)

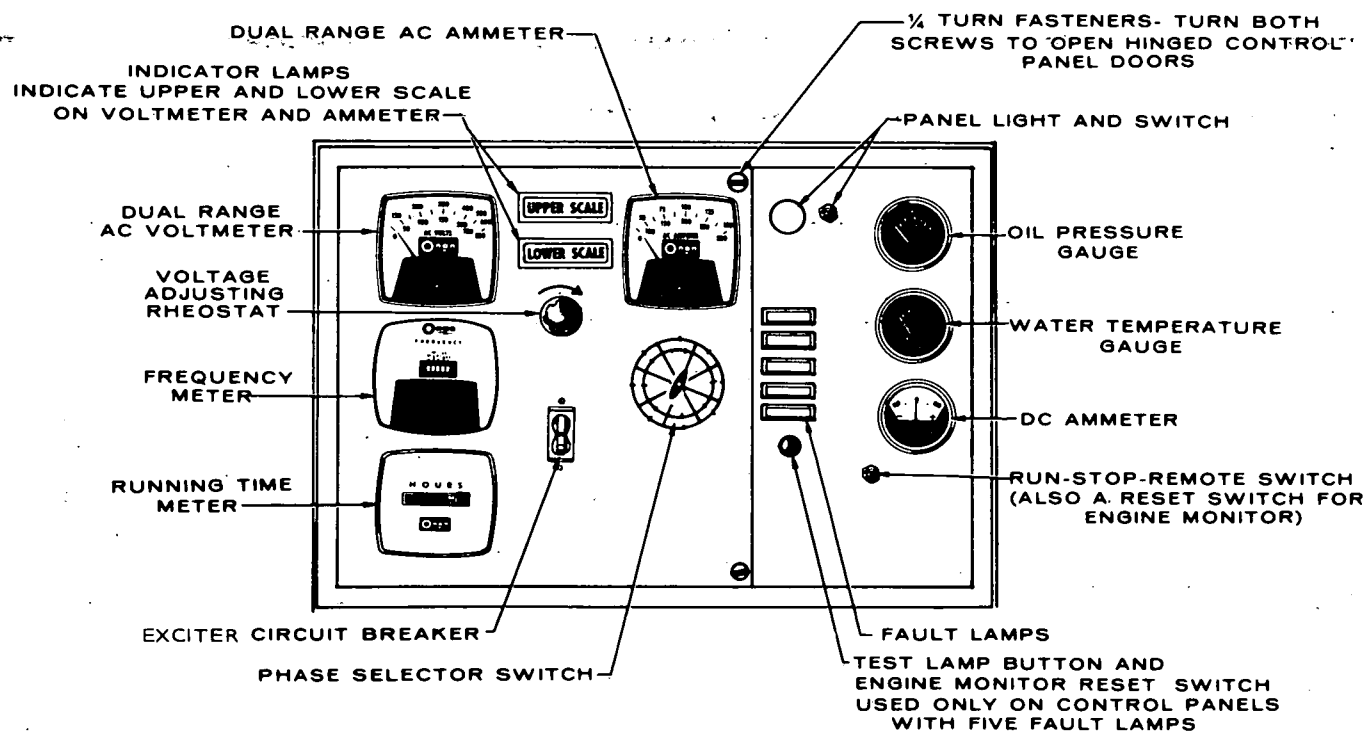


FIGURE 2. OPTIONAL CONTROL PANEL (FIVE FAULT LAMPS)

DESCRIPTION

GENERAL

An ONAN-DDB series electric generating set is a complete unit consisting of an engine driven AC generator, with controls and accessories as ordered.

ENGINE

The engine on the DDB is a John Deere 6329D as described in engine manual. Basic measurements and requirements will be found under Specifications. However, the engine used for your unit may have variations due to optional equipment available, therefore the John Deere manual should be consulted.

AC GENERATOR

The generator is an ONAN Type UR, 12 lead, 4 pole revolving field, reconnectable brushless unit. The alternating current is generated in the stator winding. The alternator rotor, attached directly to the engine flywheel turns at engine speed. Therefore, the speed at which the rotor turns, determines generator output frequency. The 60 hertz set operates at 1800 rpm and the 50 hertz at 1500 rpm. Excitation is achieved by feeding AC output to a voltage regulator, where it is compared with a reference voltage in the regulator, rectified and returned to the field of the exciter, then to the exciter armature, rectified and fed to the generator field. The UR generator is available in 3-phase and single phase. Excitation and regulation are the same for either unit.

CONTROL PANEL

The following is a brief description of each of the standard controls and instruments located on the face of the panel. See Figure 1.

DC PANEL

Panel Light and Switch: Illuminates control panel.

Oil Pressure Gauge: Indicates pressure of lubricating oil in engine (wired to a sensor unit located on the engine).

Water Temperature Gauge: Indicates temperature of circulating coolant in engine. (Wired to a sensor unit located on the engine.)

Battery Charge Rate DC Ammeter: Indicates the battery charging current.

Run-Stop/Reset-Remote Switch: Starts and stops the unit locally or from a remote location.

AC PANEL

AC Voltmeter: Indicates AC generator output voltage. Dual range instrument: measurement range in use shown on indicator light.

AC Ammeter: Indicates AC generator output current. Dual range instrument: measurement range in use shown on indicator lights.

Voltmeter-Ammeter Phase Selector Switch: Selects the phases of the generator output to be measured by the AC voltmeter and AC ammeter.

Voltage Regulator: Rheostat, provides approximately plus or minus 5% adjustment of the rated output voltage.

Exciter Circuit Breaker: Provides generator exciter and regulator protection from overheating in the event of certain failure modes of the generator, exciter and voltage regulator.

Running Time Meter: Registers the total number of hours, to 1/10th that the unit has run. Use it to keep a record for periodic servicing. Time is accumulative, meter cannot be reset.

Frequency Meter: Indicates the frequency of the generator output in hertz. It can be used to check engine speed. (Each hertz equals 30 rpm.)

OPTIONAL EQUIPMENT

DC PANEL

Warning Lights: Eliminates the one "Fault" light and substitutes five indicator lights to give warning of —

- a. Overcrank (failed to start)
- b. Overspeed
- c. Low oil pressure
- d. High engine temperature
- e. Low engine temperature

Operation of these lights will be discussed in conjunction with engine monitor panel.

Warning Lights: Indicates "Fault" in engine operation.

Reset Switch: Manual reset for engine monitor after shut-down.

Lamp Test: Press to test warning lamp bulbs (when engine is running only).

CONTROL PANEL INTERIOR

The only equipments discussed in this section will be those which the operator may have reason to adjust or inspect for service.

Terminal Board (TB) 21: Connection of wire W12 to terminals H3, H4, H5, and H6 is made at this point, to change reference voltage when reconnecting generator for different voltages. Refer to Figure 14.

Voltage Regulator: Solid state unit, consisting of VR21, CR21 and L21. Controls AC output from generator at predetermined level regardless of load. Regulation plus or minus 2% from no load to full load, 0.8 P.F.

Engine Monitor: Printed circuit plug-in modules provide the following functions:

1. A 75 second cranking period.
2. Approximately a 12-1/2 second time delay for oil pressure buildup.
3. An external alarm contact to light a fault lamp and shut down the set for alarm conditions such as:
 - a. Overcrank (failed to start after cranking 75 seconds).
 - b. Overspeed (engine speed reaches 2100 rpm).

- c. Low oil pressure (14 psi).
- d. High engine temperature (215°F).

On standard control panels, all four alarms are wired into one common fault lamp; on units with five fault lamps, four have shutdown alarms, the fifth (low engine temperature) lights a fault lamp only. Refer to Table 2.

Standard Cranking Module: Limits engine cranking time to 75 seconds. If engine fails to start after 75 seconds the engine monitor lights a fault lamp and opens the cranking circuit.

OPTIONAL MODULES

Cycle Cranker: Plug-in module replaces standard cranking circuit. Automatically provides a 15-second crank time and a 10-second rest time for three ON and two OFF cycles in 65 seconds. If engine fails to start, after 75-seconds the engine monitor lights a fault lamp and opens the cranking circuit.

Pre-Alarm: Gives advance warning for low oil pressure or high engine temperature. Requires two sensors each for engine temperature and oil pressure.

TABLE 2. FAULT LAMP OPTIONS

SYSTEM	FAULT	FAULT LAMP	STOP ENGINE	EXTERNAL ALARM	PRE- ALARM
PENN STATE. SINGLE LIGHT	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x		x	
	High Engine Temperature	x		x	
STANDARD SINGLE LIGHT	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x	x	x	
	High Engine Temperature	x	x	x	
5 LIGHT	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x	x	x	
	High Engine Temperature	x	x	x	
	Low Engine Temperature	x			
5 LIGHT PRE-ALARM	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x	*	x	x
	High Engine Temperature	x	*	x	x
	Low Engine Temperature	x			

* - With additional optional sensors.

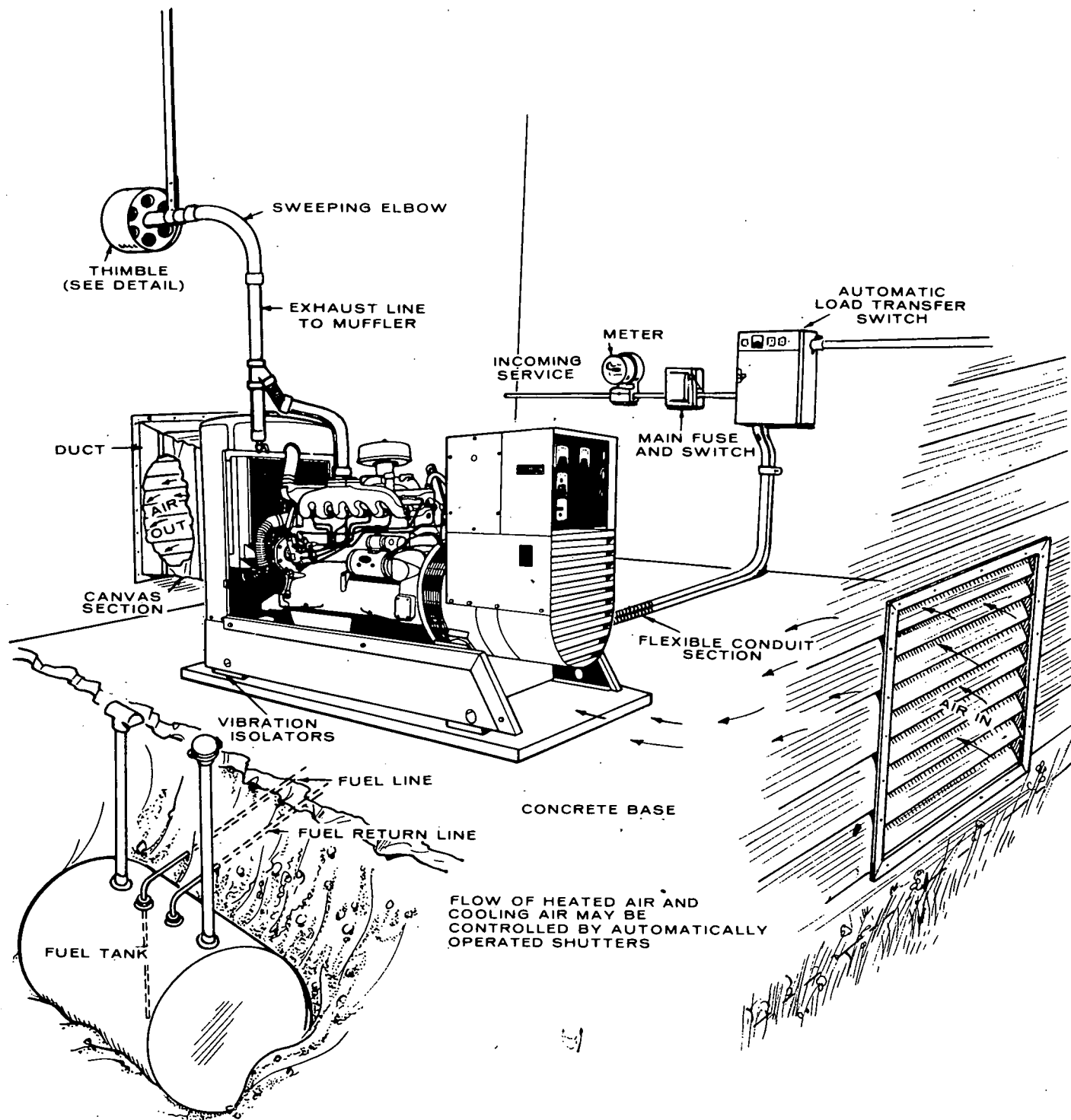


FIGURE 3. TYPICAL INSTALLATION

INSTALLATION

GENERAL

Installations must be considered individually. Use these instructions as a general guide. Meet regulations of local building codes, fire ordinances, etc., which may affect installation details. See Figure 3.

Installation points to consider 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. Water connections.
9. Accessibility for operation and servicing.
10. Vibration isolation.
11. Noise levels.

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 for protection from extremes in weather conditions.

MOUNTING

Generating sets are mounted on a rigid skid base which provides proper support. Install vibration isolators between skid base and foundation. For convenience in draining crankcase oil and general servicing, mount set on raised pedestals (at least 6 inches high). If mounting in a trailer, or for other mobile applications, bolt securely in place. Extra support for the vehicle flooring may be necessary. Bolting down is recommended for stationary installations.

VENTILATION

Generating sets create considerable heat which must be removed by proper ventilation. Outdoor installations rely on natural air circulation but mobile and indoor installations need properly sized and positioned vents for the required air flow. See *Specifications* for the air required to operate with rated load under normal conditions at 1800 rpm.

Radiator set cooling air travels from the rear of the set to the front end. Locate the room or compartment air inlet where most convenient, preferably to the rear of the set. Make the inlet opening at least as large as the radiator area (preferably 1-1/2 times larger).

Engine heat is removed by a pusher fan which blows cooling air out through the front of the radiator. Locate the cooling air outlet directly in front of the radiator and as close as practical. The opening size should be at least as large as the radiator area. Length and shape of the air outlet duct should offer minimum restriction to air flow. Use a duct of canvas or sheet metal between the radiator and the air outlet opening. The duct prevents recirculation of heated air.

Provide a means of restricting the air flow in cold weather to keep the room or compartment temperature at a normal point.

A shelter housing with electrically operated louvres is available as an option. Transformers connected across the generator output supply current to the motors.

When the generator is operating, current in the transformers actuate the motors and open the louvres. The louvres are held open for the duration of the set operation, then are closed by return springs when the set is shut down.

City water cooled sets do not use the conventional radiator. A constantly changing water flow cools the engine. Ventilation is seldom a problem, but sufficient air movement and fresh air must be available to properly cool the generator, disperse heat convected off the engine and support combustion in the engine.

For small compartments, a duct of equal or larger area than generator outlet is recommended to remove the heated air from the generator air outlet to the outside atmosphere. Limit bends and use radius type elbows where needed. A larger, well ventilated compartment or room does not require a hot air duct.

Installations made in a small room may require installation of an auxiliary fan (connected to operate only when the plant is running) of sufficient size to assure proper air circulation.

CITY WATER COOLING

An optional method of engine cooling, in place of the conventional radiator and fan, uses a constant pressure water supply. This is referred to as CITY WATER COOLING. There are two varieties of city water cooling: the HEAT EXCHANGER SYSTEM and STANDPIPE SYSTEM. See Figures 4 and 5.

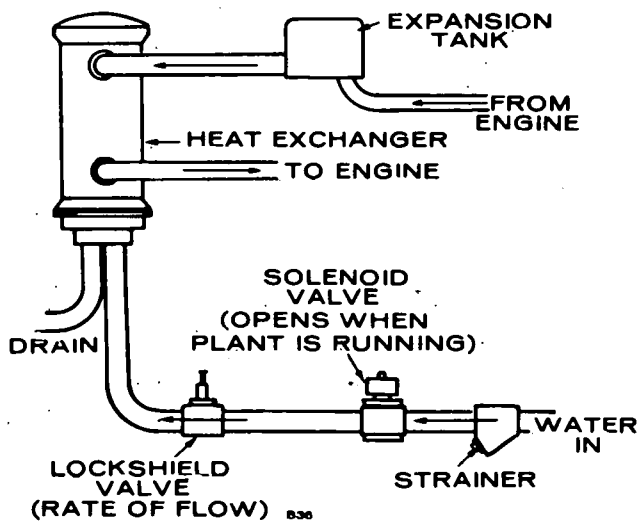


FIGURE 4. TYPICAL HEAT EXCHANGER SYSTEM

The HEAT EXCHANGER provides for a closed engine cooling system. Engine coolant flows through a tubed chamber, keeping the coolant separate from the cool "raw" water supply. The coolant chamber must be filled for operation, as for a radiator cooled set.

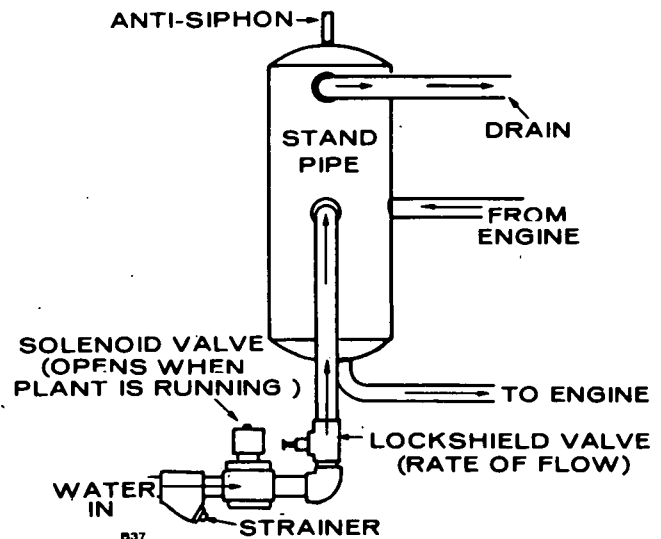


FIGURE 5. TYPICAL STANDPIPE SYSTEM

The STANDPIPE SYSTEM uses a mixing or tempering tank. Cooling water that circulates through the engine mixes with a source of cool "raw" water. The "raw" water supply must be free of scale forming lime or other impurities.

On both systems use flexible pipe for connecting water supply and outlet flow pipes to engine. Pipe the outlet flow to a convenient drain. Install an electric solenoid valve and a rate of flow valve in the water supply line. The electric solenoid valve opens and allows water flow through the system only when the plant operates. The rate of flow valve, either automatic or manual, provides for the proper flow rate to the engine. Adjust the flow to maintain water temperature between 165 degrees and 195 degrees while viewing the water temperature gauge.

Before filling cooling system check all hardware for security. This includes: hose clamps, capscrews, fittings and connections. Use flexible coolant lines with heat exchanger, standpipe or remote mounting radiator.

WATER JACKET HEATER (Optional)

This heater is installed to maintain an elevated engine temperature in lower ambient temperature applications. It heats and circulates engine coolant, and is thermostatically controlled (Figure 19).

EXHAUST

WARNING

Inhalation of exhaust gases can result in death.

Engine exhaust gas must be piped outside building or enclosure. Do not terminate exhaust pipe near inlet vents or combustible materials. An approved thimble (Figure 6) must be used where exhaust pipes pass through walls or partitions. Pitch exhaust pipes downward or install a condensation trap (Figure 7) at the point where a rise in the exhaust system begins. Avoid sharp bends; use sweeping long radius elbows. Provide adequate support for mufflers and exhaust pipes. Refer to Figure 3 for a typical exhaust installation. Shield or insulate exhaust lines if there is danger of personal contact. Allow at least 9-inches of clearance if the pipes run close to a combustible wall or partition. Use a pipe at least as large as the 3-inch pipe size outlet of the engine with a flexible portion

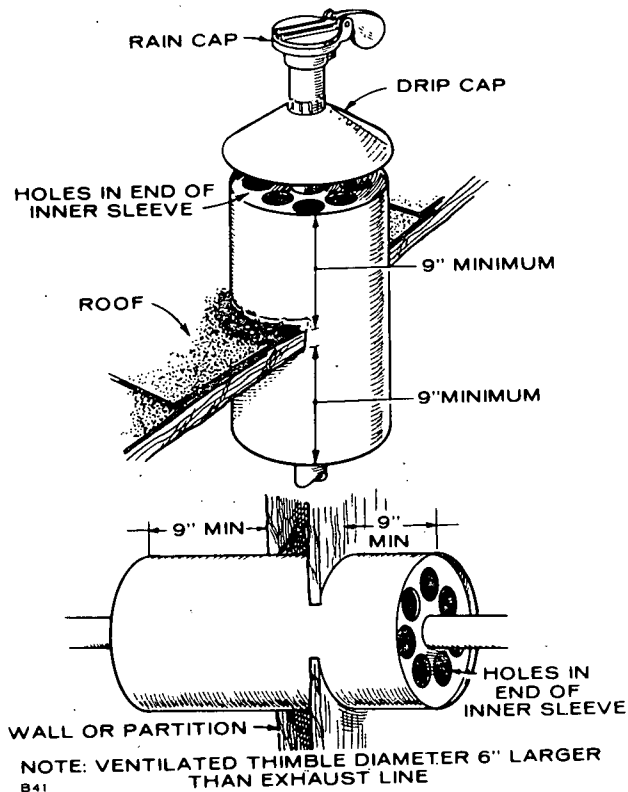


FIGURE 6. EXHAUST THIMBLE

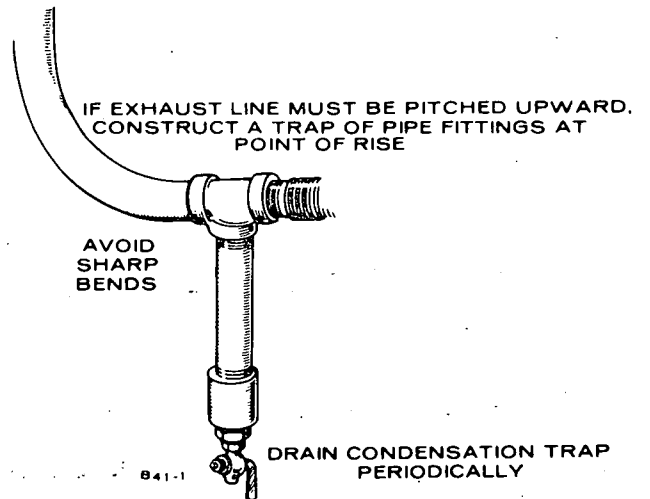


FIGURE 7. EXHAUST CONDENSATION TRAP

between the engine and the muffler. Do not connect a flexible line to the exhaust manifold. Minimum diameters and maximum lengths of pipe are as follows:

Single Exhaust system:

2½-inch pipe	58-feet
3-inch pipe	191-feet
3½-inch pipe	419-feet

Maximum permissible exhaust restriction (back pressure) is 25-inches H₂O (1.84-inches Hg.).

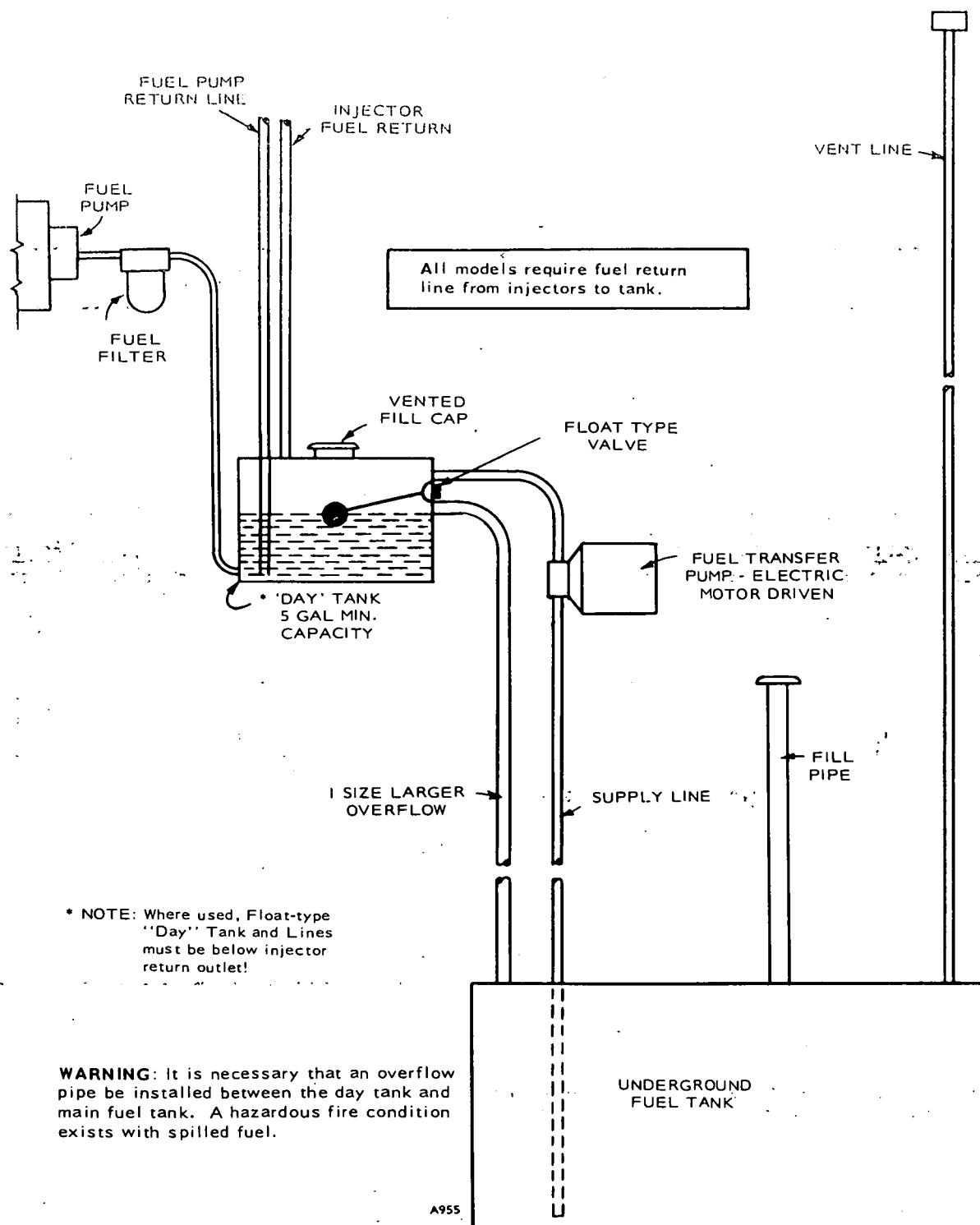


FIGURE 8. DAY TANK INSTALLATION

FUEL SYSTEM

The John Deere engines used on the DDB sets are designed for use with ASTM No.2 Diesel fuel. They will however, operate on diesel fuels within the specifications delineated in the John Deere engine manual.

FUEL CONNECTIONS

Check local regulations governing the installation of a fuel supply tank.

In any diesel engine installation, fuel system cleanliness is of utmost importance. Make every effort to prevent entrance of moisture or contaminants of any kind. Do not use lines or fittings of galvanized material.

A fuel lift in excess of 10-feet is not recommended without a day tank installation, because of fuel drainage. Horizontal run, if the supply tank is level with the fuel pump should not exceed 25-feet. However, a day tank is again recommended.

The fuel inlet is to the transfer pump and is threaded for 1/8-inch pipe. Injector pump return line is common with the injectors' return line, and requires a 1/8-inch low pressure hose connection.

DAY TANK

Generator set installations may be equipped with an optional integral fuel Day tank. A float operated valve controls fuel flow of up to 300 psi into the fuel tank. The correct level is maintained to assure a constant source of fuel. It is necessary to install an overflow line between the Day tank and the main fuel tank. Refer to the installations included with the tank. See Figure 8 for an example of a Day tank installation.

BATTERY

Starting the plant requires 12-volt battery current. Use two 6-volt (see specification) batteries for a normal installation. Connect the batteries in series (negative post of first battery to positive post of second) as in Figure 9. Necessary battery cables are on unit. Service the batteries as necessary. Infrequent plant use (as in emergency standby service) may allow the batteries to self-discharge to the point where they cannot start the plant. If installing an automatic transfer switch that has no built-in charge circuit, connect a separate trickle charger. Onan automatic transfer switches include such a battery charging circuit.

WARNING

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

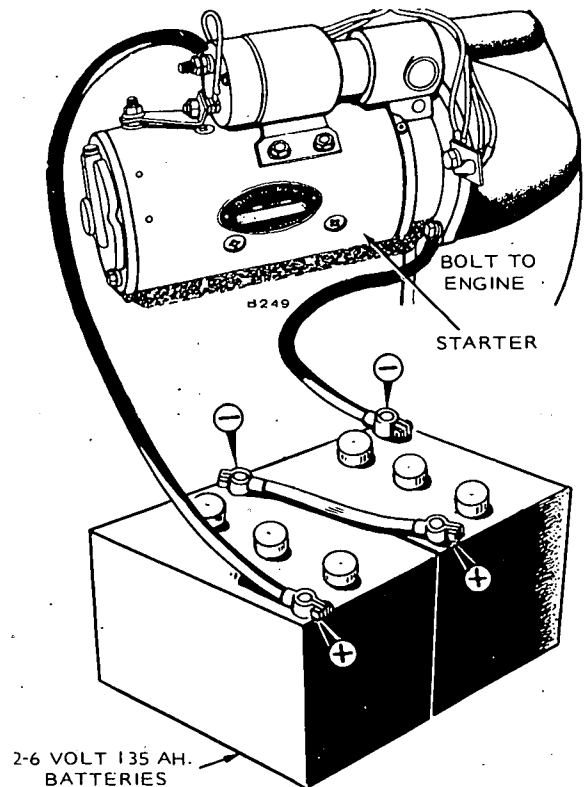


FIGURE 9. BATTERY CONNECTION

BATTERY, HOT LOCATION

Batteries will self discharge very quickly when installed where the ambient temperature is consistently above 90°F, such as in a boiler room. To lengthen battery life, dilute the electrolyte from its normal 1.275 specific gravity reading at full charge to a 1.225 reading. The cranking power is reduced slightly when the electrolyte is so diluted, but if the temperature is above 90°F, this should not be noticed. The lengthened battery life will be worth the effort.

1. Fully charge the battery.
2. With the battery still on charge, draw off the electrolyte above the plates in each cell. DO NOT ATTEMPT TO POUR OFF; use an hydrometer or filler bulb and dispose of it in a safe manner. Avoid skin or clothing contact with the electrolyte.
3. Refill each cell with distilled water, to normal level.
4. Continue charging for 1 hour at a 4 to 6 hour rate.
5. Test each cell. If the specific gravity is still above 1.255, repeat steps 2, 3, and 4 until the reading is reduced to 1.225. Usually, repeating steps twice is sufficient.

REMOTE CONTROL CONNECTIONS

Provision is made for addition of remote starting. This is accomplished on a 4 place terminal block situated within the control box. Connect one or more remote switches across remote terminal and B+ terminal as shown in Figure 10. If the distance between the set and remote station is less than 1000-feet, use No. 18 AWG wire; between 1000- and 2000-feet, use No. 16AWG wire.

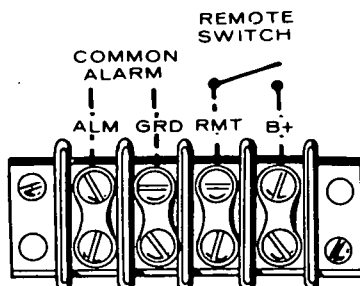
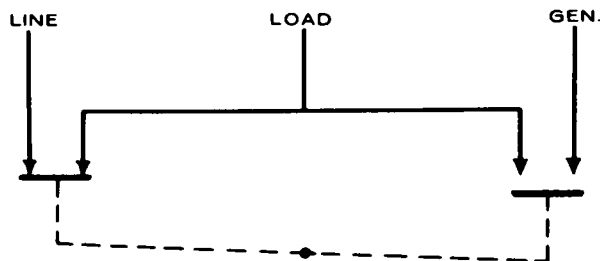


FIGURE 10. REMOTE STARTING

WIRING CONNECTIONS

Most local regulations require that wiring connections be made by a licensed electrician and that the installation be inspected and approved before operation. All connections, wire sizes, etc. must conform to requirements of electrical codes in effect at the installation site.

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



NOTE: SHOWN WITH LINE CONNECTED TO LOAD.

FIGURE 11. LOAD TRANSFER SWITCH

Control Box Connections: The factory ships these 12 lead generators with load connection wires NOT connected together in the control box. These 12 wires are labeled T1 through T12 and must be brought together before making load connections. Proceed as follows:

1. Remove either right, left or top panel from control box. See Figure 12.
2. Connect wires together as shown on panel and in Figure 13 according to voltage desired.
3. Open hinged control panel doors. Connect lead from terminal 63 to correct terminal for voltage desired. These terminals are labeled H2, H3, H4, H5 and H6. See Figure 14.

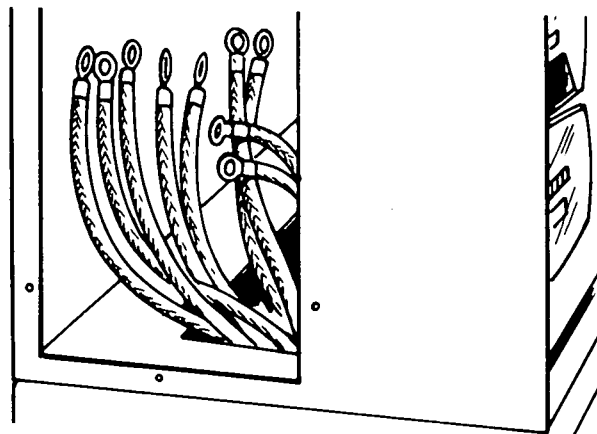
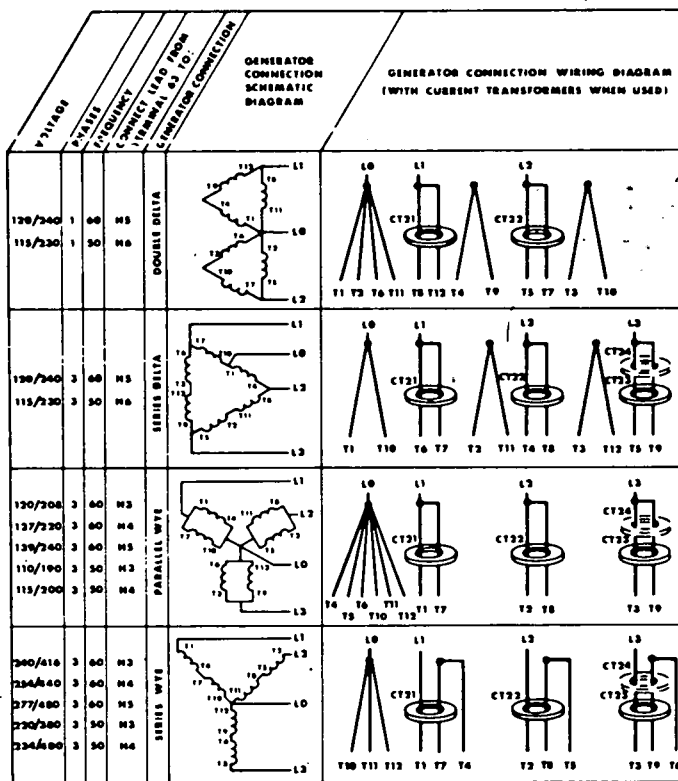


FIGURE 12. CONTROL BOX (SIDE PANEL REMOVED)

4. Close front panel and secure with 1/4 turn fasteners.
5. Connect load wires to generator leads.

Preceding instructions do not apply to models with a 347/600 voltage (designated 9X) or a 120/240 voltage (designated 3R); these connections are made at the factory. The installer must only connect load wires.



120/240 VOLT, 1 PHASE, 60 CYCLE

347/600 VOLT, 3 PHASE, 60 CYCLE

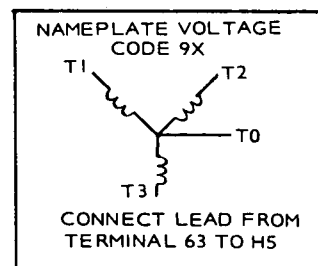
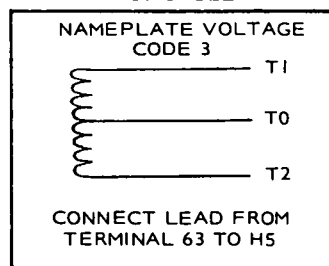


FIGURE 13. VOLTAGE CONNECTIONS

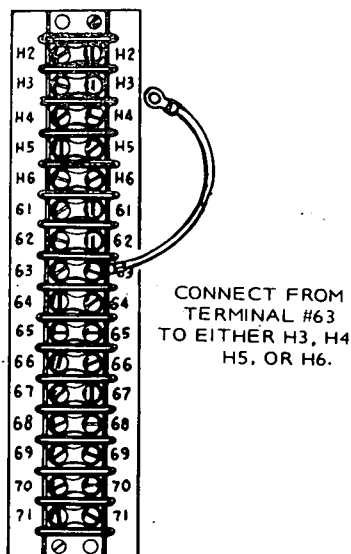


FIGURE 14. CONNECTING LEAD FROM TERMINAL 63

120/240 Volt, Single Phase, 12 Lead: Terminal connection L0 can be the ground (neutral). For 120 volts, connect the hot load wires to either the L1 or L2 connection, Figure 15. Connect the neutral load wire to the L0 connection. Two 120 volt circuits are thus available, with not more than 1/3 the rated capacity of the set available on either circuit. If using both circuits, be sure to balance the load between them.

For 240 volts, connect one load wire to the L1 connection and the second load wire to the L2 connection. Terminal connection L0 is not used for 240 volt service.

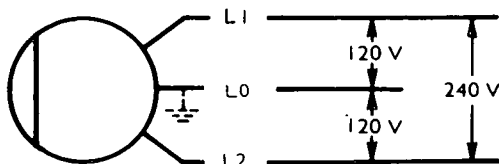


FIGURE 15. 120/240 VOLT, SINGLE PHASE, 12 LEAD

120/240 Volt, 3 Phase, 4 Wire Delta Connected Set; 12 Lead: The 3 phase Delta connected set is designed to supply 120- and 240 volt, 1 phase current and 240 volt, 3 phase current, Figure 16. For 3 phase operation, connect the three load wires to generator terminals L1, L2 and L3 — one wire to each terminal. For 3 phase operation the L0 terminal is not used.

For 120/240 volt, 1 phase, 3 wire operation, terminals L1 and L2 are the "hot" terminals. The L0 terminal is the neutral, which can be grounded if required. For 120 volt service, connect the black load wire to either the L1 or L2 terminal. Connect the neutral (white) wire to the L0 terminal. Two 120 volt circuits are available.

Any combination of 1 phase and 3 phase loading can be used at the same time as long as no terminal current exceeds the NAMEPLATE rating of the generator. If no 3 phase output is used, usable 1 phase output is 2/3 of 3 phase KVA.

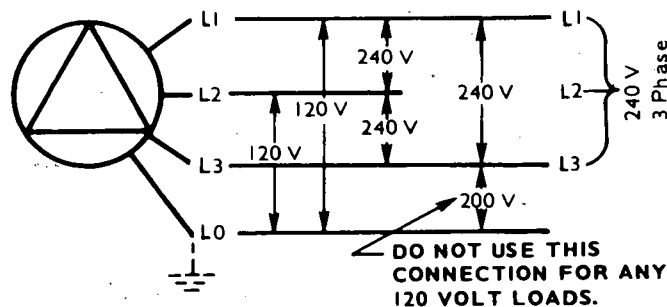


FIGURE 16. 3 PHASE, DELTA CONNECTION, 12 LEAD

3 Phase, 4 Wire, Wye Connected Set; 12 Lead: The 3 phase, 4 wire set produces line to neutral voltage and line to line voltage. The line to neutral voltage is the lower voltage as noted on the unit nameplate, and the line to line voltage is the higher nameplate voltage.

For 3 phase loads, connect separate load wires to each of the set terminals L1, L2 and L3. Single phase output is obtained between any two 3 phase terminals.

The terminal marked L0 can be grounded. For 1 phase loads, connect the neutral (white) load wire to the L0 terminal. Connect the black load wire to any one of the other three terminals — L1, L2 or L3. Three separate 1 phase circuits are available, with not more than 1/6 the rated capacity of the set from any one circuit.

If using 1 phase and 3 phase current at the same time, use care to properly balance the 1 phase load, and not to exceed rated line current.

Figure 17 shows load connections for 120/208 voltage. Other voltages are available from either parallel wye or series wye illustration in Figure 13.

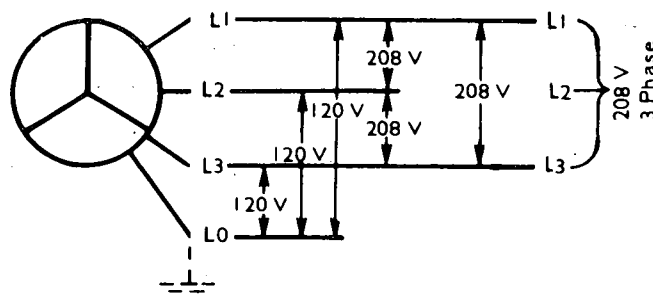


FIGURE 17. 3 PHASE, WYE CONNECTION, 12 LEAD

OPERATION

GENERAL

ONAN DDB Series electric generating sets are given a complete running test under various load conditions and are thoroughly checked before leaving the factory. Inspect your unit closely for loose or missing parts and damage which may have occurred in transit. Tighten loose parts, replace missing parts and repair any damage before putting set into operation.

PRESTART SERVICING

Lubrication System: Engine oil was drained prior to shipment. Fill engine to capacities shown. After engine has been run, check dipstick, add oil to bring level to full mark. Record total capacity for future oil changes. Do not mix brands or grades of lubricating oils.

AMBIENT TEMPERATURE	SINGLE VISCOSITY	MULTI-VISCOSITY
Below -10°F (-23°C)	SAE 5W	SAE 5W20
Between -10°F and 32°F (-23°C and 0°C)	SAE 10W	SAE 10W30
Above 32°F (0°C)	SAE 30	Not Recommended
Use oil conforming to these specifications	API CD/SD MIL-L-2104C* Series 3* *API CC or CD	API CC/SE, CC/SD or SD MIL-L-46152

Oil capacities (nominal)

Oil Pan and Filter — 12 quarts

Cooling System: Cooling system was drained prior to shipment. Fill cooling system before starting. Nominal capacity is 5 gallons. For units using either a radiator or heat exchanger (city water cooled), fill the system with clean soft water. Use a good rust and scale inhibitor additive. If a possibility exists of a radiator cooled set being exposed to freezing temperatures use anti-freeze with an ethylene-glycol base. During initial engine run, check the coolant level several times and replenish if necessary to compensate for air pockets which may have formed during filling. Refer to John Deere engine manual for additional information.

CAUTION

1. Verify that the electric solenoid valve used with city water cooled plants is open before initial starting of plant to allow coolant chambers to fill. Overheating and damage to the engine could result from non-compliance.

2. If engine is equipped with a cooling system filter, do not use antifreeze with an anti-leak formula. The stop leak element can prevent or retard the coolant flow through the filter, thereby eliminating the filtering process completely.

3. Be careful when checking coolant under pressure. It is advisable to shut engine down and bleed off pressure before removing pressure cap. Severe burns could result from contact with hot coolant.

Fuel System: Refer to the John Deere engine manual for fuel oil specifications. Check with fuel supplier and ensure that fuel supplied meets the specifications. Filter or strain fuel when filling tank. Fuel supply tanks should be kept as nearly full as possible by topping up each time engine is used. Warm fuel returning from the injector pump heats the fuel in the supply tank. If the fuel level is low in cold weather, the upper portion of the tank not heated by returning fuel tends to increase condensation. In warm weather both the supply tank and fuel are warm. Cool night air lowers the temperature of the tank more rapidly than the temperature of the fuel. Again this tends to increase condensation.

Condensate mixing with the sulphur in the fuel forms a sulphurous acid which will corrode and damage the engine. KEEP FUEL CLEAN.

WARNING

DO NOT SMOKE while handling fuel. Diesel fuel is flammable.

Priming Fuel System: Verify that all connections in the fuel system are secure and no leaks exist. Proceed with priming as follows:

1. Loosen bleed plug on top of fuel filter. Pump primer lever (Figure 18) until a solid stream of fuel, free of air bubbles, flows from bleed plug.
2. Secure bleed plug.
3. Loosen inlet fuel line on injector pump. Operate primer lever on fuel transfer pump until a solid stream of fuel, free of air bubbles, flows from inlet line opening.
4. Secure injector pump fuel inlet line.
5. Leave fuel transfer pump priming lever at lowest point of stroke.

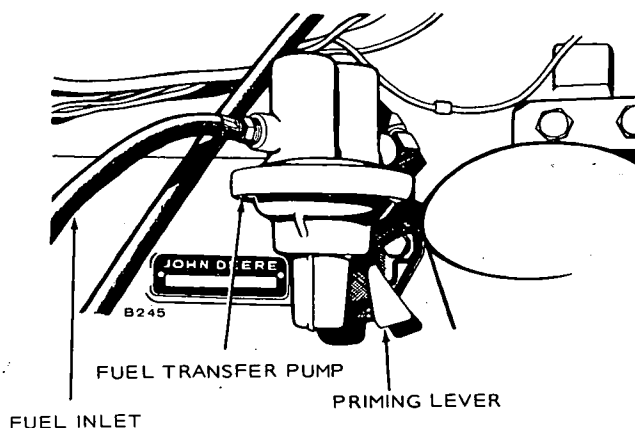


FIGURE 18. PRIMING FUEL SYSTEM

If the primer lever will not pump and no resistance is felt at upper end of stroke, turn engine over with starter to change position of fuel pump drive lobe on camshaft.

Check all connections in fuel system for security, to ensure that pressure will not bleed off when engine is not in use. Pressure should be maintained for immediate starting if unit is on standby service.

BATTERIES

Ensure that the cable connections to the batteries are secure. Coat connections with petroleum based or non-conductive grease to retard formation of corrosive deposits.

Check level of electrolyte to be at split ring mark. Measure specific gravity of electrolyte: SG 1.280 at 80°F. If distilled water has been added or specific gravity is less than 1.280, place batteries on charge until desired reading is reached. Do not over charge.

STARTING

When the preceding service functions have been performed, recheck to verify unit is ready to start.

1. Crankcase filled.
2. Cooling system filled — input solenoid valve open.
3. Batteries charged and connected.
4. Fuel solenoid valve open.

To start, move the "run-stop/reset-remote" switch to the "run" position. The engine should start after a few seconds of cranking. Immediately after start, observe the oil pressure gauge. Normal oil pressure is between 45 and 65 psi. Check the following gauges:

1. DC Ammeter — 10 to 30 amperes.
2. AC Voltmeter — AC generator output voltage.
3. Frequency Meter — AC generator output frequency.

After running 10 minutes under load the water temperature gauge should have stabilized at 180° to 195°F. On city water cooled units an adjustable valve is connected in the water supply line. Adjust the hand wheel valve to provide a water flow that will keep the water temperature gauge reading within the range of 180°F to 220°F.

STOPPING

To reduce and stabilize engine temperatures, run the engine at no-load for three to five minutes before shutting down.

Move the run-stop/reset-remote switch to stop position to shut down the set.

Break-In Note: Run set at 50 percent rated load for the first half-hour of initial operation after reaching operating temperature.

Non-Start: If after a few seconds of cranking engine fails to start, or starts and runs then stops and fault lamp lights, refer to appropriate troubleshooting chart, Table 3 or Table 4.

EXERCISE PERIOD

Generating sets on continuous standby service are required to be operative at full load from a cold start in less than 10-seconds in the event of a power outage.

This imposes severe conditions on the engine. Friction of dry piston rings upon dry cylinder walls causes scuffing and rapid wearing. These can be relieved by exercising the set at least once a week for a minimum time of 30-minutes per exercise period. Preferably, run the set under at least 50 percent load to allow the engine to reach normal operating temperature. This will keep engine parts lubricated, maintain fuel prime, prevent electrical relay contacts from oxidizing and insure easy emergency starts. ONAN automatic transfer switches contain an optional exercise switch which, by pre-selection, will start, determine run period and shut down a set on a weekly frequency. For example, the switch can be set for time of start, length of run, A.M. or P.M. and day of week.

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

TABLE 3
TROUBLESHOOTING ENGINE SHUTDOWN SYSTEM
(Units with only one fault lamp)

SYMPTOM	CORRECTIVE ACTION
1. Fault lamp lights and engine stops cranking after approximately 75 seconds.	1. See engine service manual for troubleshooting fuel system, ignition system, etc. After correcting problem, reset the engine monitor by moving run-stop/reset-remote switch to reset position. Release and return to run position.
2. Fault lamp lights immediately after engine starts.	2. Check for: a. overspeed condition as engine starts. b. high temperature condition. c. faulty high engine temperature sensor or overspeed switch. d. faulty starter disconnect.
3. Fault lamp lights after engine is running.	3. Check the following: a. Oil level-engine will shut down after approximately 12-1/2 seconds if low oil pressure sensor does not open. b. Oil pressure sensor may be defective. c. High engine temperature - caused by low coolant level, faulty thermostat, etc. d. Faulty high engine temperature sensor. e. Faulty starter disconnect.
4. Fault lamp lights - no fault condition exists.	4. Be certain that no fault condition exists. Disconnect lead 29, 30 and 31 from TB11 inside control box (refer to wiring diagram). If fault lamp still lights with leads disconnected, remove and replace engine monitor plug-in printed circuit board.

TABLE 4
TROUBLESHOOTING ENGINE SHUTDOWN SYSTEM
(Units with five fault lamps)

SYMPTOM	CORRECTIVE ACTION
1. Overcrank fault lamp lights and engine stops cranking after approximately 75 seconds.	1. See engine service manual for troubleshooting fuel system, ignition system, etc. After correcting fault, reset monitor by moving run-stop/reset-remote switch to reset position, then to either run or remote to restart engine.
2. Overcrank fault lamp lights after engine has run for approximately 75 seconds.	2. Replace start-disconnect circuit board.
3. High engine temperature lamp lights as soon as engine starts.	3. Check for defective sensor or actual high temperature condition.
4. Low oil pressure lamp lights after engine is running.	4. Check: a. Oil level - engine will shut down after approximately 12-1/2 seconds if oil pressure is low.
5. High engine temperature lamp lights after engine is running.	5. Check for: a. Defective thermostat/thermostats. b. Low coolant level. c. Defective high engine temperature sensor.
6. Overspeed lamp lights - no fault condition exists.	6. Replace overspeed circuit board.
7. Low oil pressure fault lamp lights - no fault condition exists.	7. Be certain that no fault condition exists. Disconnect lead 30 from TB11 inside control box (refer to wiring diagram). If low oil pressure lamp still lights, remove and replace engine monitor plug-in printed circuit board.
8. High engine temperature fault lamp lights - no fault condition exists.	8. Be certain that no fault condition exists. Remove lead 31 from TB11 inside control box (refer to wiring diagram). If high engine temperature lamp still lights, remove and replace engine monitor plug-in printed circuit board.
9. When pressing test lamp button - one or more fault lamps do not light.	9. Fault lamp/lamps burned out - replace. Engine not running.

NO LOAD OPERATION

Periods of no load operation should be held to a minimum. If it is necessary to keep the engine running for long periods of time when no electric output is required, best engine performance will be obtained by connecting a "dummy" electrical load. Such a load could consist of heater elements, etc.

OUT-OF-SERVICE PROTECTION

Protect a set that will be out-of-service for more than 30 days as follows:

1. Run set until thoroughly warm.
2. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
3. Remove each injector. Pour 1 ounce (two tablespoons) of rust inhibitor (or SAE #10 oil) into each cylinder. Crank engine over several times. Install injectors.
4. Service air cleaner
5. Clean throttle linkage and protect by wrapping with a clean cloth.
6. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
7. Wipe entire unit. Coat parts susceptible to rust with a light film of grease or oil.
8. Disconnect battery and follow standard battery storage procedure.
9. Provide a suitable cover for the entire unit.
10. See engine operation and maintenance manual.

HIGH ALTITUDE

Ratings apply to altitudes up to 1000 feet, standard cooling, normal ambients and with No. 2 Diesel fuel. Consult factory or nearest authorized Onan distributor for operating characteristics under other conditions.

Engine horsepower loss is approximately 3 percent for each 1000 feet of altitude above sea level for a naturally aspirated engine. Use lower power requirement at high altitudes to prevent smoke, over-fueling and high temperatures.

HIGH TEMPERATURES

1. See that nothing obstructs air flow to-and-from the set.
2. Keep cooling system clean.
3. Use correct SAE No. oil for temperature conditions.

LOW TEMPERATURES

1. Use correct SAE No. oil for temperature conditions. Change oil only when engine is warm.
2. Use fresh fuel. Protect against moisture condensation.
3. Keep fuel system clean and batteries in a well charged condition.
4. Partially restrict cool air flow but use care to avoid overheating.
5. Connect water jacket heater when set is not running.
6. Refer to John Deere manual for further information.

Water Jacket Heater: The function of this optional heater is to keep the engine warm enough to assure starting under adverse weather conditions. Connect the heater to a source of power that will be on during the time the engine is not running. Be sure the voltage rating is correct for the heater element rating (Figure 19).

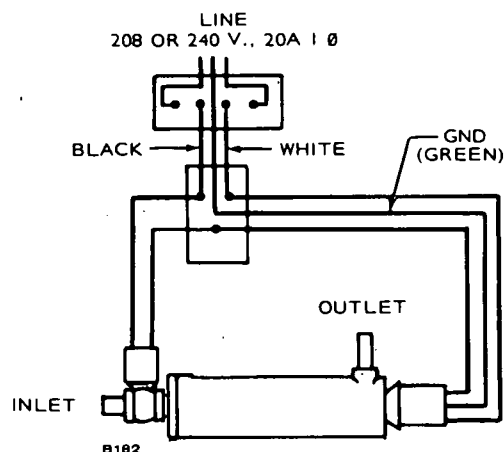


FIGURE 19. ENGINE HEATER

GENERAL MAINTENANCE

GENERAL

Follow a definite schedule of inspection and servicing, based on operating hours (Table 5). Keep an accurate logbook of maintenance, servicing, and operating time. Use the running time meter (optional equipment) to keep a record of operation and servicing. Service periods outlined in Table 5 are recommended for normal service and operating conditions. For continuous duty, extreme temperature, etc., service more frequently. For infrequent use, light duty, etc., service periods can be lengthened accordingly. Refer to John Deere engine manual for details of engine service and maintenance procedures.

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.

CAUTION

When changing oil filters, it is important that the replacement filter is a bypass type. Failure to use a bypass filter could cause the filter material to rupture during heavy pressures on cold starts, resulting in non-filtered oil and subsequent engine damage.

TABLE 5. OPERATOR MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	MAINTENANCE PERIOD						
	10 hrs.	50 hrs.	100 hrs.	200 hrs.	500 hrs.	1000 hrs.	6 mths.
Inspect plant	x						
Check coolant level	x						
Check oil level	x						
Air cleaner	x1						
Fuel filter	x						
Batteries		x					
Alternator and fan belt			x2				
Engine crankcase - drain - refill			x1				
Crankcase oil filter			x1				
Crankcase vent tube					x		
Valve tappets					x		
Hoses					x		
Injection pump - check timing						x	
Injection nozzles						x	
Fuel filter - change						x	
Starter						x	
Cooling system - drain, flush, refill							x3
Clean and inspect battery charging alternator				x			
Air cleaner - replace			x				

x1 - or every 3 months, perform more often in extremely dusty conditions.

x2 - or every 3 months. Adjust to 3/4 depression with 20 pounds force.

x3 - More often in extremely dusty conditions.

NOTE: The above schedule is a minimum requirement for your engine. Refer to the John Deere service manual for recommended service periods.

ENGINE SPEED

Generator frequency is in direct ratio to engine speed, which is controlled by the Governor.

A Roosa-Master governor is standard equipment on the DDB generator set. High speed and low speed limit stops are set at the ONAN testing facility and normally do not require further adjustment, therefore if your set is used on continuous standby service, the governor may never need to be touched. If however the unit is used frequently, adjustment may be required due to wear of internal components. This adjustment is achieved by backing off the high speed stop screw. Screw in the low speed adjusting screw until the generator output frequency meter reads 60 Hz (generator on load). Turn in the high speed adjusting screw until it bottoms; secure the locknuts.

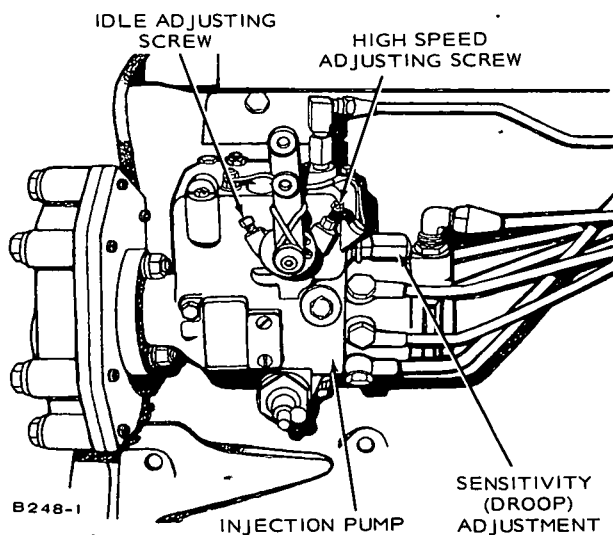


FIGURE 20. ROOSA-MASTER GOVERNOR

Governor sensitivity is adjusted by rotating an external knurled knob at the rear of the injector pump housing. Turning inward (clockwise) shortens governor control spring making it less sensitive, thereby increasing speed droop. Turning outward (counterclockwise) has opposite effect. Adjustment can be made with engine running. The speed droop is set at the ONAN plant to give a regulation of 3 percent to 5 percent from no-load to full-load.

When using the generator frequency meter to determine engine speed, multiply frequency by 30 to calculate engine speed.

Example: $30 \times 61 \text{ (Hz)} = 1830 \text{ rpm}$.

Adjust engine speed to 1800 rpm for 60 Hertz sets and 1500 rpm for 50 Hertz sets.

AC GENERATOR

There are no brushes, brush springs or collector rings on these generators, therefore they require very little servicing. Periodic inspections, to coincide with engine oil changes, will ensure good performance.

Generator Bearing: Inspect the bearing every 1000 hours with the unit running.

If using the unit for "prime power", replace the bearing every 10,000 hours or two years. If using the set for "standby", replace the bearing every five years.

Check generator voltage. It may be necessary to make a slight readjustment of the voltage rheostat to obtain the preferred voltage at average load.

INSPECTION AND CLEANING

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 will result in their failure. Blow out 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 30 in. lb. or finger tight plus a quarter turn. Blow dust out of control panel.

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 electrolyte at the proper level above the plates by adding distilled water. Check specific gravity, recharge if below 1.280.

CONNECTIONS (Fuel, Exhaust, etc.)

Operator should periodically make a complete visual inspection of the set while running at rated load. Some of the things to check for are as follows:

1. Check all fuel and oil lines for possible leakage.
2. Inspect exhaust lines and mufflers for possible leakage and cracks.
3. Periodically or daily, drain moisture from condensation traps.
4. Inspect water lines and connections for leaks and security.
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.

PARTS CATALOG

This catalog applies to the DDB generator sets listed below. Engine parts modified or added by Onan will be in this list and have Onan part numbers. These supersede similar parts listed in the John Deere manual. Onan parts are arranged in groups of related items and are identified by a reference. All part illustrations are typical. Using the Model and Specification from the Onan nameplate, select the parts from this catalog that apply to your set.

INSTRUCTIONS FOR ORDERING REPAIR PARTS

ONAN PARTS

All parts in this list are Onan parts. For Onan parts or service, contact the dealer from whom you purchased this equipment or your nearest authorized service station. To avoid errors or delay in filling your order, please refer to the Onan nameplate and give the complete MODEL, SPECIFICATION and SERIAL NUMBER.

MODEL AND SPECIFICATION**	WATTS
50.0DDB-15R/*	50,000
50.0DDB-9XR/*	50,000
40.0DDB-515R/*	40,000

Onan
ELECTRIC GEN SET

MODEL

SERIAL NO.

IMPORTANT - ALWAYS GIVE ABOVE NOS. WHEN ORDERING PARTS

CONTINUOUS RATING

HERTZ-60 RPM - 1800

3 PHASE		1 PHASE	
KW 	KVA 	KW 	KVA
VOLTS 120/208 127/220 139/240		120/240 240/416	
AMPS 		AMPS 	
VOLTS 254/440 277/480 347/600		120/240	
AMPS 		1Ø 	
BAT. VOLTS			

MANUFACTURED BY
ONAN
DIV. OF STUDEBAKER CORPORATION
MINNEAPOLIS, MINN. 55432, U.S.A.
FOR ELECT. EQUIPMENT ONLY

99A1034

- * - The Specification Letter advances (A to B, B to C, etc.) with manufacturing changes.
- ** - Refer to Specifications Section (Generator Details) in Operator's Manual for Electrical Data.

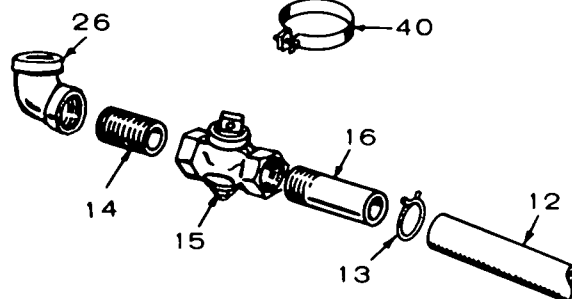
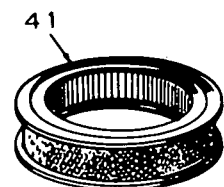
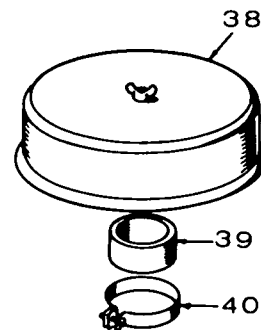
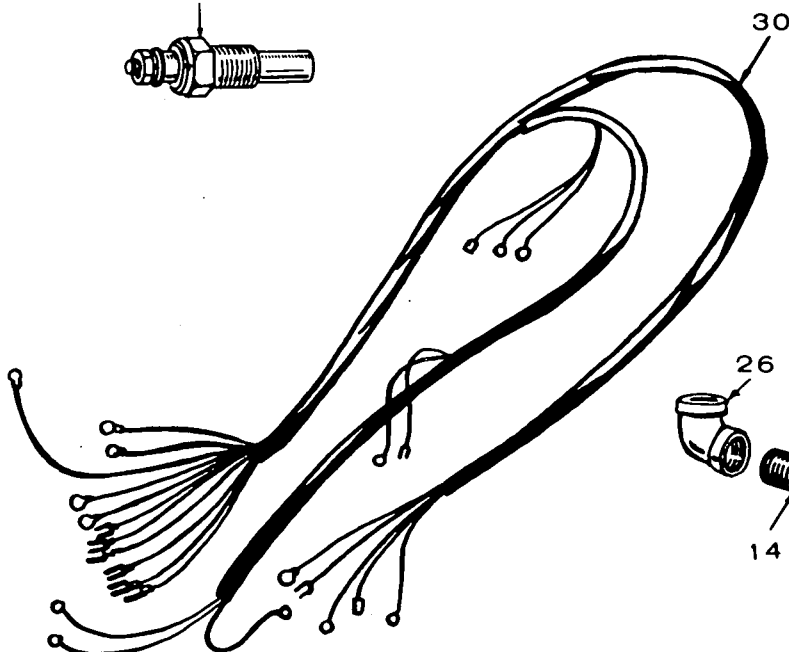
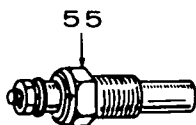
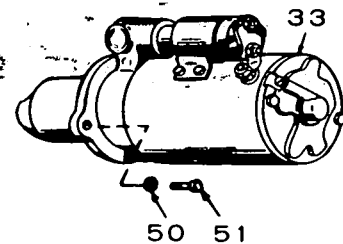
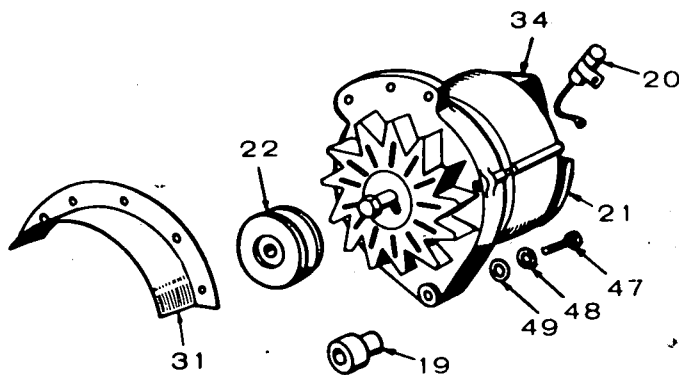
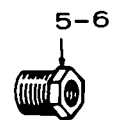
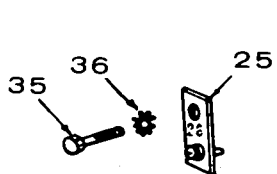
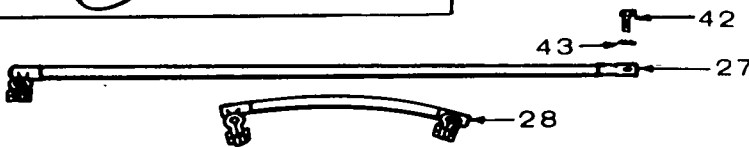
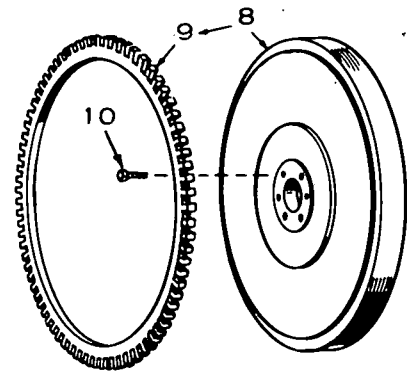
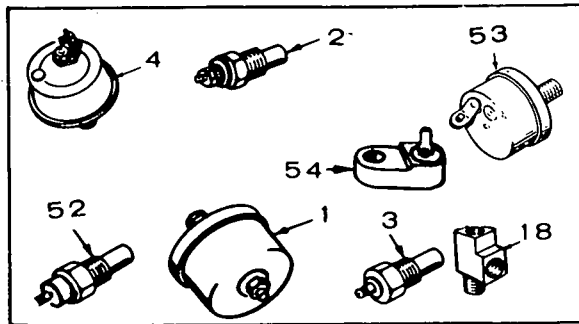
JOHN DEERE PARTS

All John Deere parts must be ordered from your nearest authorized John Deere distributor. When ordering parts, refer to the John Deere nameplate giving the complete engine TYPE and SERIAL NUMBER.

JOHN DEERE

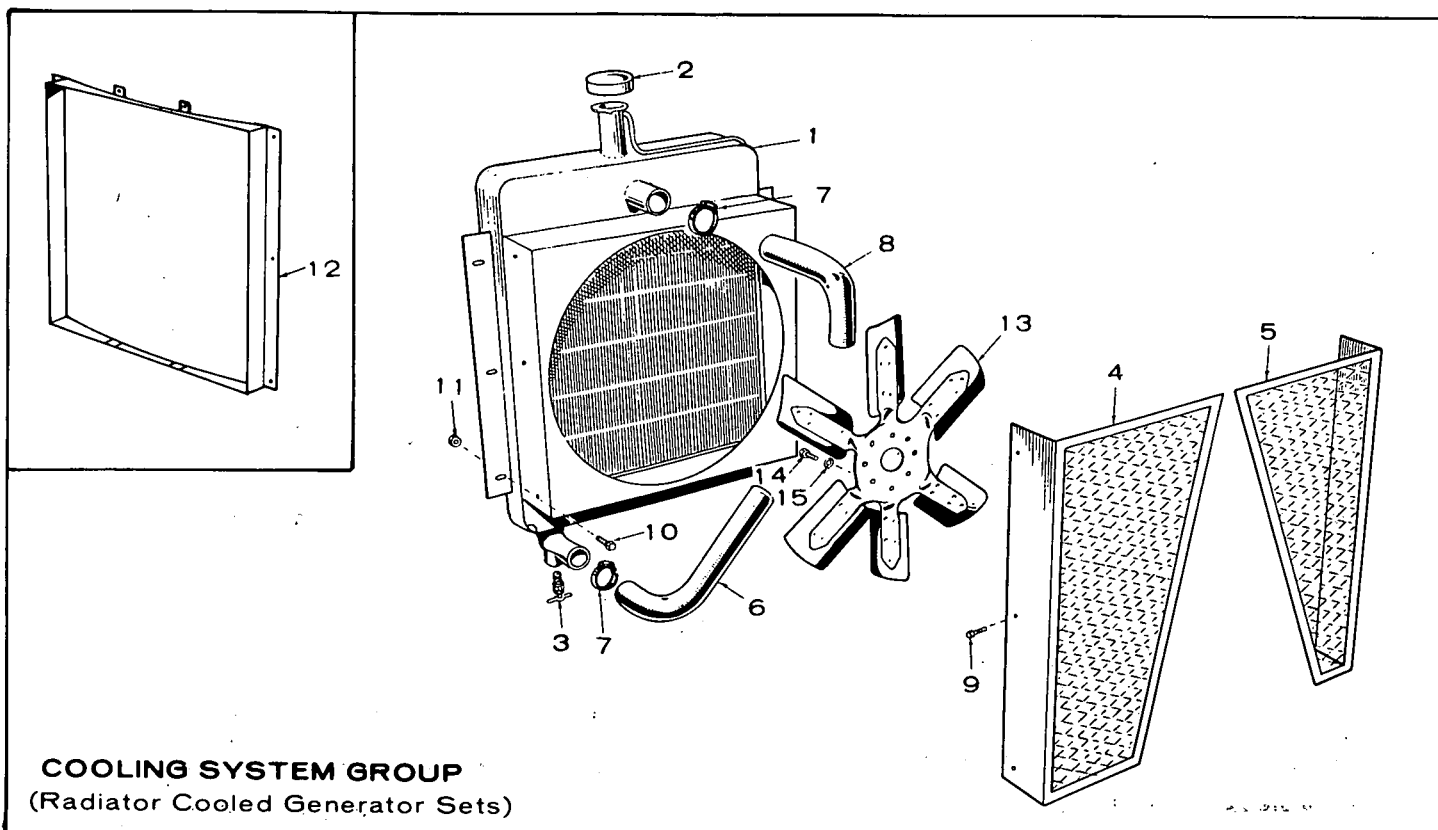
TYPE
SERIAL

MISCELLANEOUS ENGINE PARTS GROUP



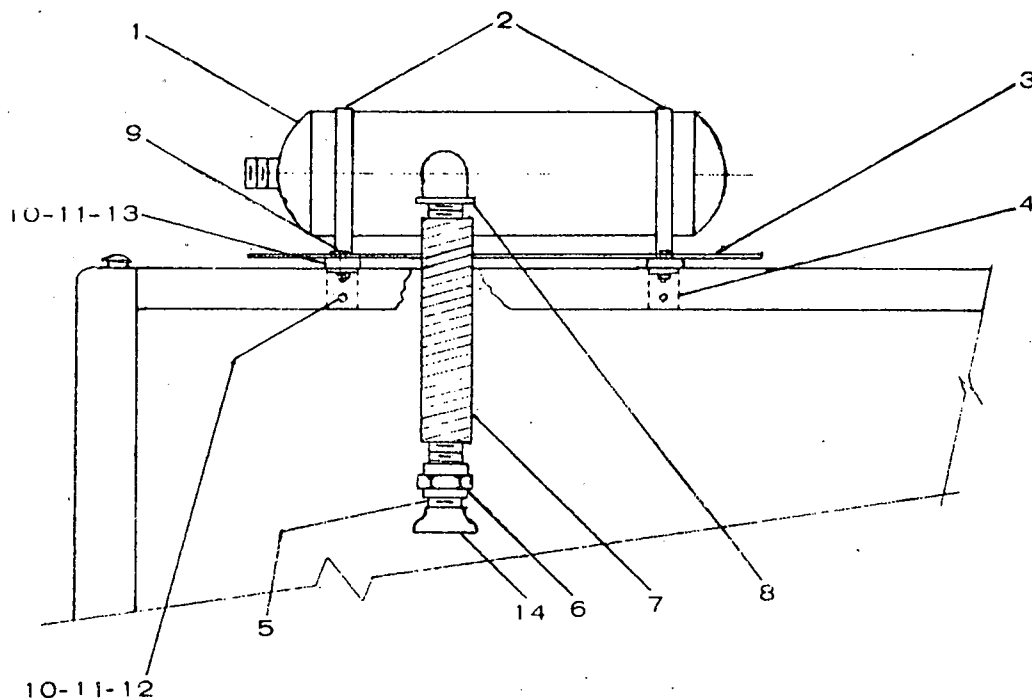
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	193-0108	1	Sender, Oil Pressure Gauge
2	193-0104	1	Sender, Water Temperature Gauge
3	309-0179	1	Switch, High Water Temperature
4	309-0169	1	Switch, Low Oil Pressure
5	505-0131	1	Bushing (3/4 x 3/8"), Reducer
6	505-0019	1	Bushing (1/2 x 3/8"), Reducer
8	104-0371	1	Flywheel (Includes Ring Gear)
9	104-0858	1	Gear, Ring
10	800-0094	4	Screw (1/2-13 x 2") - Flywheel Mounting
12	503-0098	1	Hose, Oil Drain
13	503-0197	1	Clamp, Oil Drain
14	505-0100	1	Nipple (1/2"), Close - Oil Drain
15	504-0011	1	Valve, Oil Drain
16	505-0185	1	Nipple (1/2 x 1-1/2"), Half - Oil Drain
18	502-0058	1	Tee (1/8") - Oil Sender and Switch
19	232-2183	1	Spacer, Alternator Mounting
20	312-0058	1	Condenser, Alternator
21	191-0665	1	Alternator, Charge (Includes Fan)
22	191-1098	1	Pulley, Alternator
25	332-1292	1	Bracket, Terminal Mounting
26	505-0050	1	Elbow (1/2 x 90°), Street - Oil Drain
27	CABLE, BATTERY		
	416-0531	1	Positive (24")
	416-0530	1	Negative (16")
28	416-0446	1	Cable, Battery Jumper

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
30	338-0772	1	Harness, Wiring - Engine
31	191-0725	1	Guard, Alternator Belt
33	191-1097	1	Motor, Starting
34	191-0732	1	Regulator, Voltage (Part of Alternator)
35	800-0026	1	Screw (5/16-18 x 3/4") - Terminal Bracket Mounting
36	856-0008	1	Washer (5/16"), Shakeproof EIT
38	140-1091	1	Cleaner, Air (Includes Element)
39	503-0597	1	Hose, Air Cleaner
40	503-0648	2	Clamp, Air Cleaner Hose
41	140-1089	1	Element, Air Cleaner
42	800-0090	1	Screw (1/2-13 x 1") - Battery Cable to Ground
43	856-0013	1	Washer (1/2"), Shakeproof EIT
47	SCREW, ALTERNATOR MOUNTING		
	800-0030	1	5/16-18 x 1-1/4"
	800-0024	1	5/16-18 x 1/2"
48	850-0045	2	Washer (5/16"), Lock
49	526-0115	2	Washer (5/16"), Flat
50	800-0051	3	Screw (3/8-16 x 1-1/4") - Starter Motor Mounting
51	850-0050	3	Washer (3/8"), Lock
52	309-0178	1	Switch, High Water Temperature Alarm - Optional
53	309-0064	1	Switch, Low Oil Pressure Shutdown - Optional
54	309-0269	1	Switch, Low Engine Temperature - Optional
55	193-0202	1	Sender, Oil Temperature - Optional



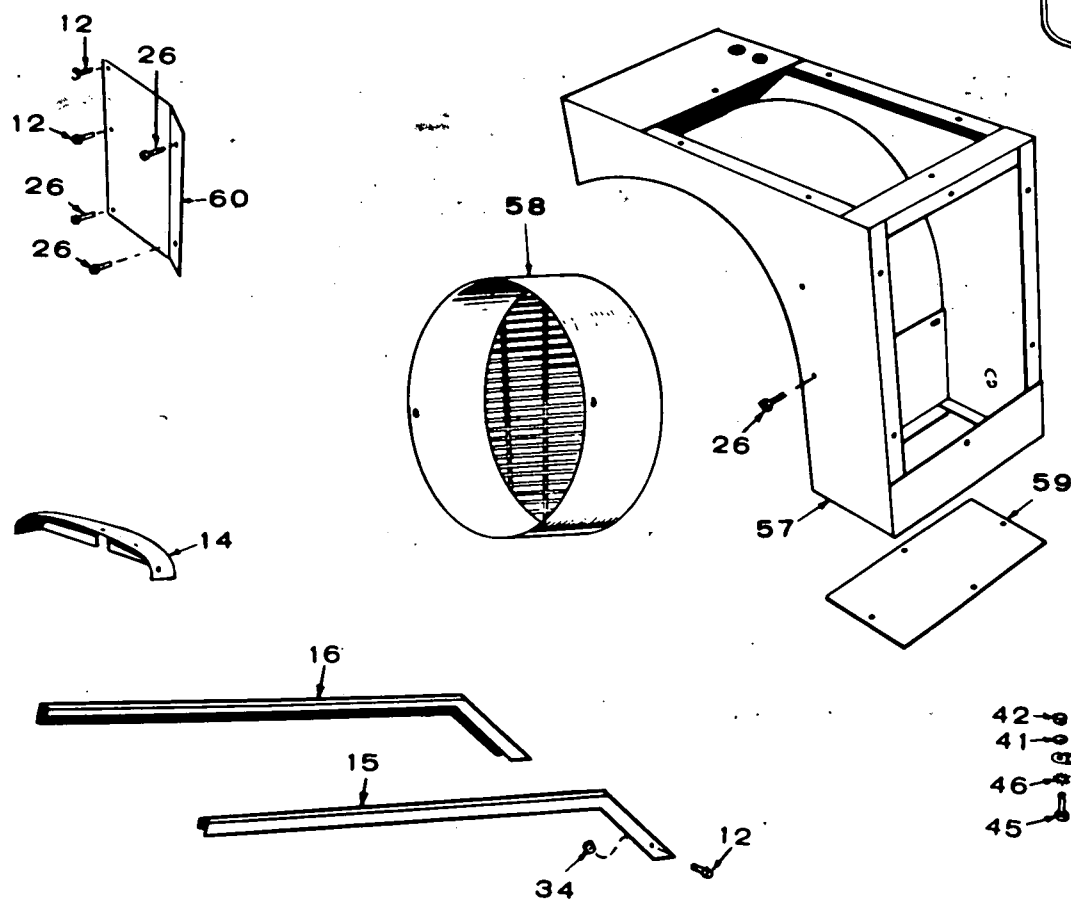
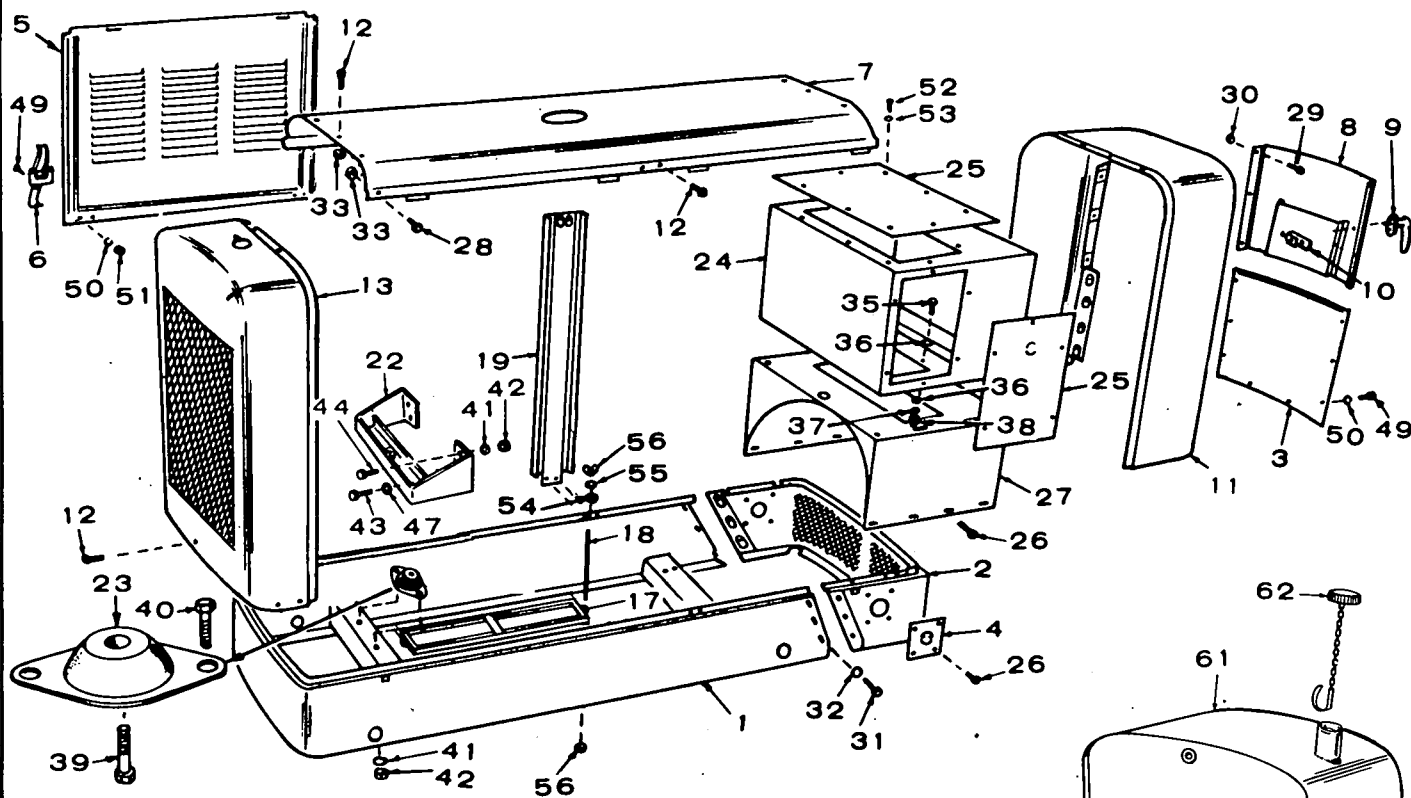
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130-0713	1	Radiator
2	130-0449	1	Cap, Radiator
3	504-0028	1	Valve, Radiator Drain
4	130-0352	1	Guard, Fan - Right Hand
5	130-0351	1	Guard, Fan - Left Hand
6	503-0722	1	Hose, Lower Radiator
7	503-0365	4	Clamp, Hose
8	503-0723	1	Hose, Upper Radiator
9	815-0181	8	Screw (10-32 x 1/2") - Fan Guard Mounting
10	821-0014	8	Screw (5/16-18 x 1/2"), Self Locking - Radiator Mounting
11	870-0113	8	Nut (5/16-18), Retainer - Radiator Mounting
12	405-1054	1	Flange, Radiator - Optional
13	130-0605	1	Blade, Fan
14	800-0050	4	Screw (3/8-16 x 1") - Fan Mounting
15	850-0050	4	Washer (3/8"), Lock

MUFFLER INSTALLATION



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	155-1268	1	Muffler
2	140-0649	2	Band, Muffler
3	155-1340	1	Shield, Heat
4	155-0789	2	Support
5	505-0172	1	Nipple (2"), Close
6	505-0454	1	Union (2")
7	155-1112	1	Tube, Exhaust
8	505-0175	1	Elbow (2" x 90°), Pipe
9	526-0172	4	Spacer
10	862-0015	10	Nut (5/16-18)
11	850-0045	10	Washer (5/16"), Lock
12	800-0026	6	Screw (5/16-18 x 3/4")
13	800-0028	4	Screw (5/16-18 x 1")
14	505-0111	1	Coupling (2-1/2 x 2") Reducer

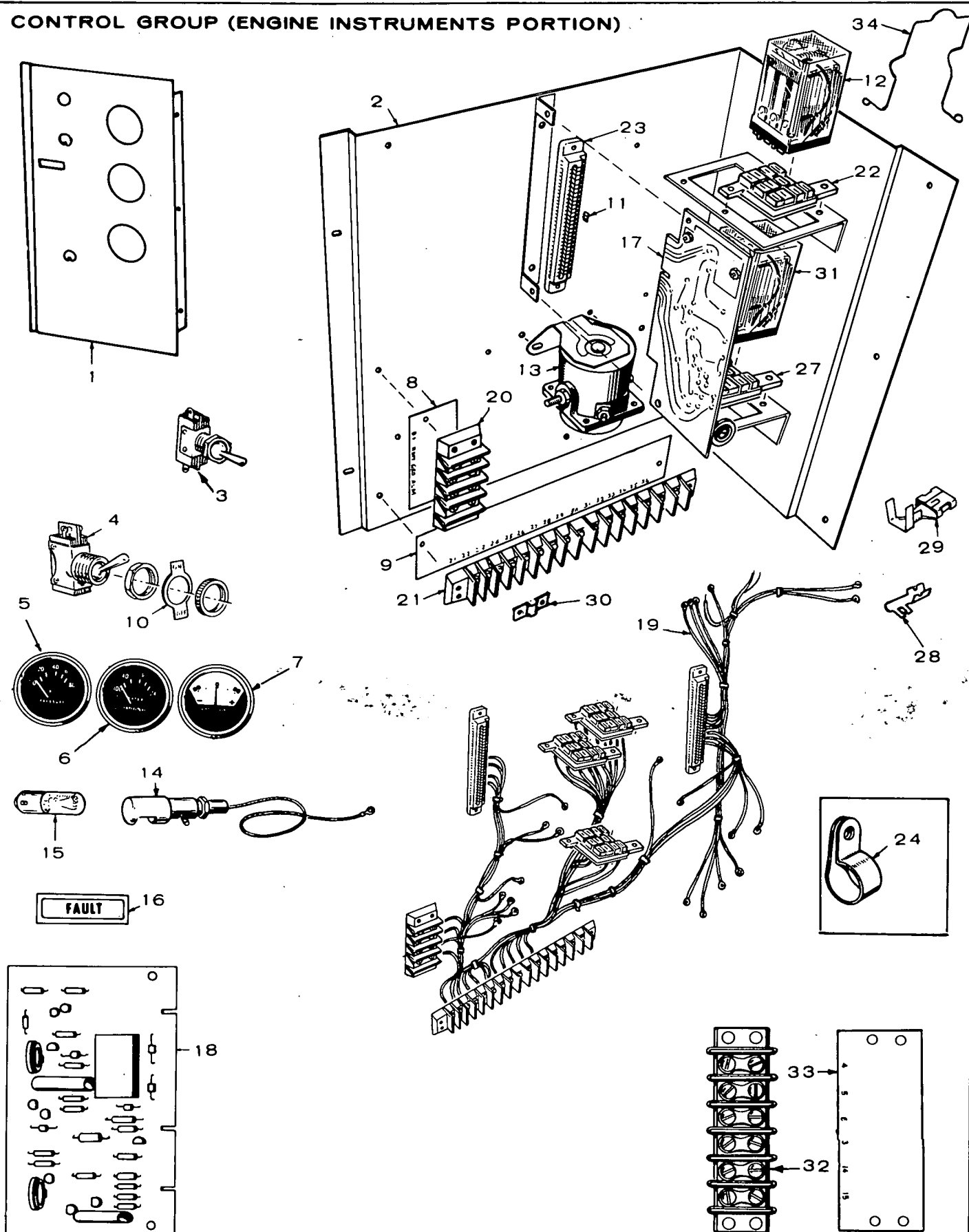
MOUNTING AND HOUSING GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	403-1112	1	Chassis, Front Mounting
2	403-0894	1	Chassis, Rear Mounting - Housed Sets
3	405-2158	1	Panel, Rear Housing Access - Housed Sets
4	403-0895	2	Cover, Conduit Opening - Housed Sets
5	405-1804	4	Panel (Side), Door - Housed Sets
6	406-0105	8	Clamp, Door - Housed Sets
7	405-2153	1	Panel, Top - Housed Sets
8	405-1777	1	Panel, Rear Door - Housed Sets
9	406-0157	1	Handle (Includes Keys), Door - Housed Sets
10	406-0089	1	Catch, Door - Housed Sets
11	405-2159	1	Panel, Rear - Housed Sets
12	821-0014	As Req.	Screw (5/16-18 x 1/2"), Self Locking
13	405-2150	1	Panel, Front - Radiator Cooled Sets
14	405-1409	1	Extension
15	403-0896	1	Trim, Right Hand Chassis - Unhoused Sets
16	403-0897	1	Trim, Left Hand Chassis - Unhoused Sets
17	416-0480	1	Frame, Battery Hold-down
18	520-0663	2	Stud, Battery Hold-down
19	405-1776	2	Support, Housing Center Housed Sets
20	337-0090	1	Strap, Ground
21	508-0001	1	Grommet, Control Box Housing (2 used on Housed Models)
22	403-1110	1	Support, Engine Mount
23	402-0030	1	Mount, Vibration
24	301-3155	1	Housing, Control Box - Unhoused Sets
25	PANEL CONTROL BOX HOUSING		
	301-3156	3	Unhoused Sets
	301-3156	2	Housed Sets
26	821-0010	As Req.	Screw (1/4-20 x 1/2"), Self Locking
27	301-3154	1	Saddle, Control Box Housing - Unhoused Sets
28	821-0016	4	Screw (5/16-18 x 3/4"), Self Locking - Housed Sets

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
29	809-0059	3	Screw (#14 x 1/2"), Self Locking - Housed Sets
30	870-0106	3	Nut (#14), Speed
31	800-0048	6	Screw (3/8-16 x 3/4") - Housed Sets
32	850-0050	6	Washer (3/8"), Lock - Housed Sets
33	870-0113	As Req.	Nut (5/16-18), Retainer
34	870-0020	6	Nut (5/16-18)
35	800-0003	4	Screw (1/4-20 x 1/2") - Unhoused Sets
36	526-0018	8	Washer (1/4"), Flat
37	850-0040	4	Washer (1/4"), Lock
38	862-0001	4	Nut (1/4-20), Hex
39	800-0520	1	Screw (3/4-10 x 1") - Vibration Mount to Support
40	800-0090	3	Screw (1/2-13 x 1") - Vibration Mount and Ground Strap
41	850-0060	5	Washer (1/2"), Lock
42	862-0016	5	Nut (1/2-13), Hex
43	800-0132	2	Screw (5/8-11 x 1-1/2") - Engine Mount Support
44	800-0095	2	Screw (1/2-13 x 2-1/4") - Engine Mount Support
45	800-0091	1	Screw (1/2-13 x 1-1/4") - Ground Strap
46	856-0013	2	Washer (1/2"), Shakeproof EIT
47	850-0070	2	Washer (5/8"), Lock
49	813-0098	22	Screw (10-32 x 3/8") - Housed Sets
50	850-0030	22	Washer (#10), Lock - Housed Sets
51	870-0053	16	Nut (10-32) - Housed Sets
52	815-0026	As Req.	Screw (10-32 x 3/8"), Truss Head - Control Box Panel Mounting
53	853-0008	As Req.	Washer (#10), Shakeproof E T
54	526-0115	2	Washer (5/16"), Flat
55	850-0045	2	Washer (5/16"), Lock
56	865-0007	2	Nut (5/16-18), Wing - Battery Hold-down Stud
57	301-3191	1	Box, Junction - Housed Sets
58	234-0369	1	Cover, End Bell - Housed Sets
59	301-3195	1	Plate, Junction Box Bottom - Housed Sets
60	301-3196	1	Bracket, Junction Box
61	159-1025	1	Tank, Fuel - Housed Sets
62	159-0020	1	Cap, Fuel Tank

CONTROL GROUP (ENGINE INSTRUMENTS PORTION)

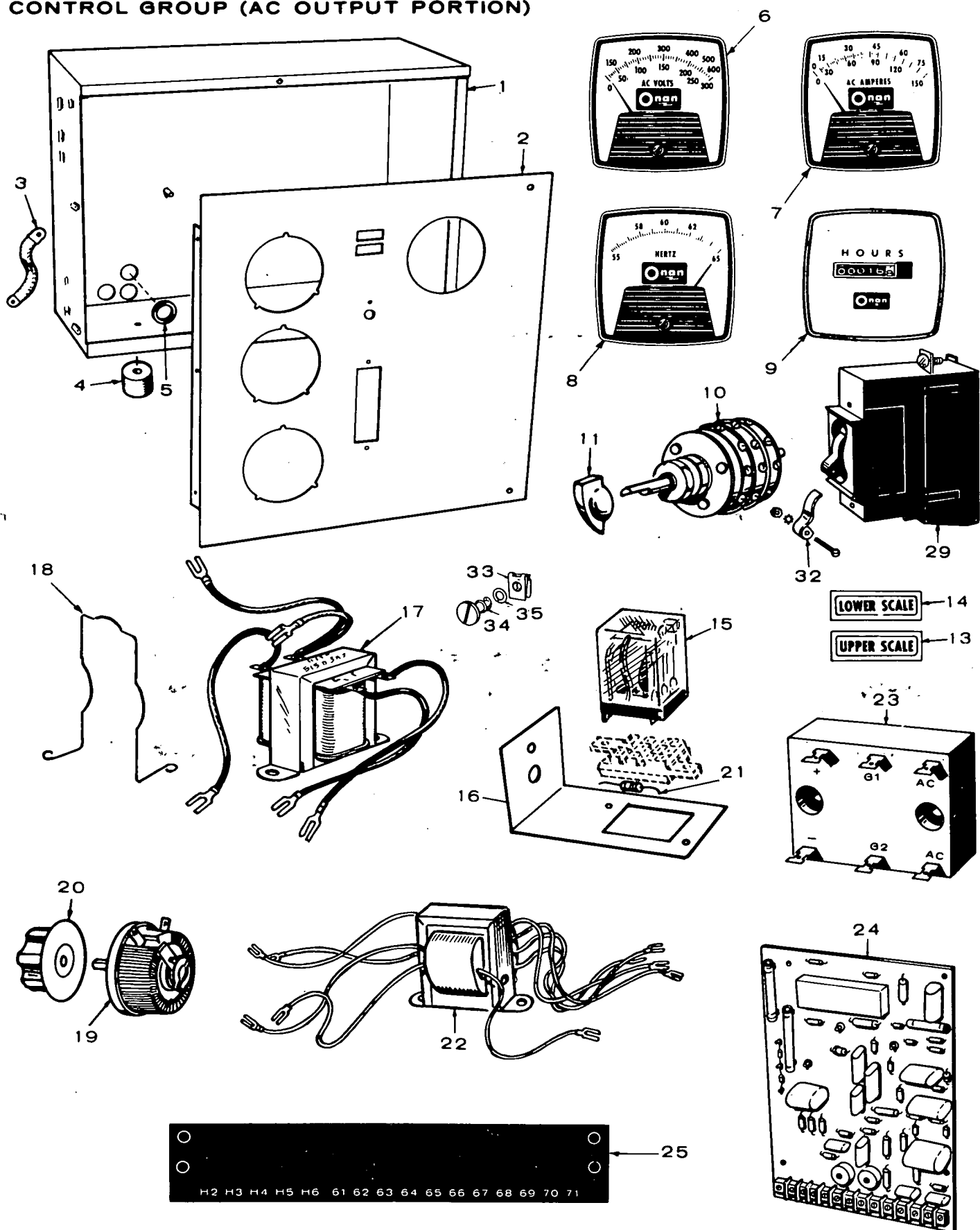


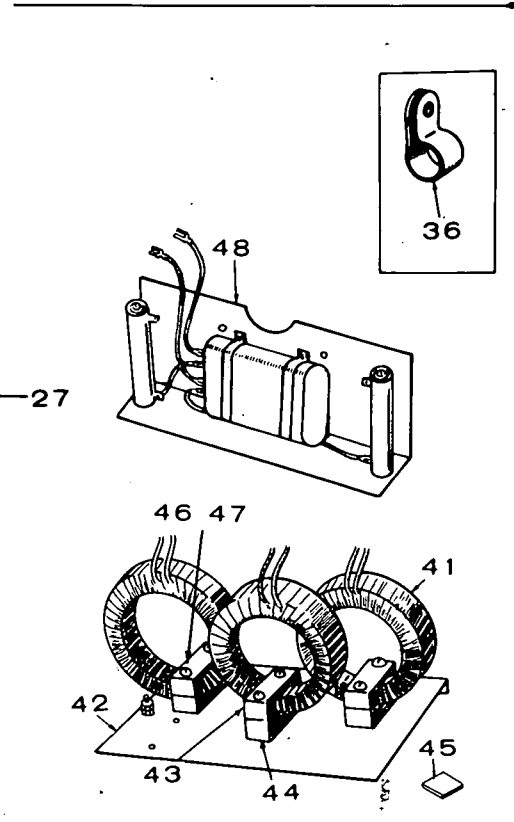
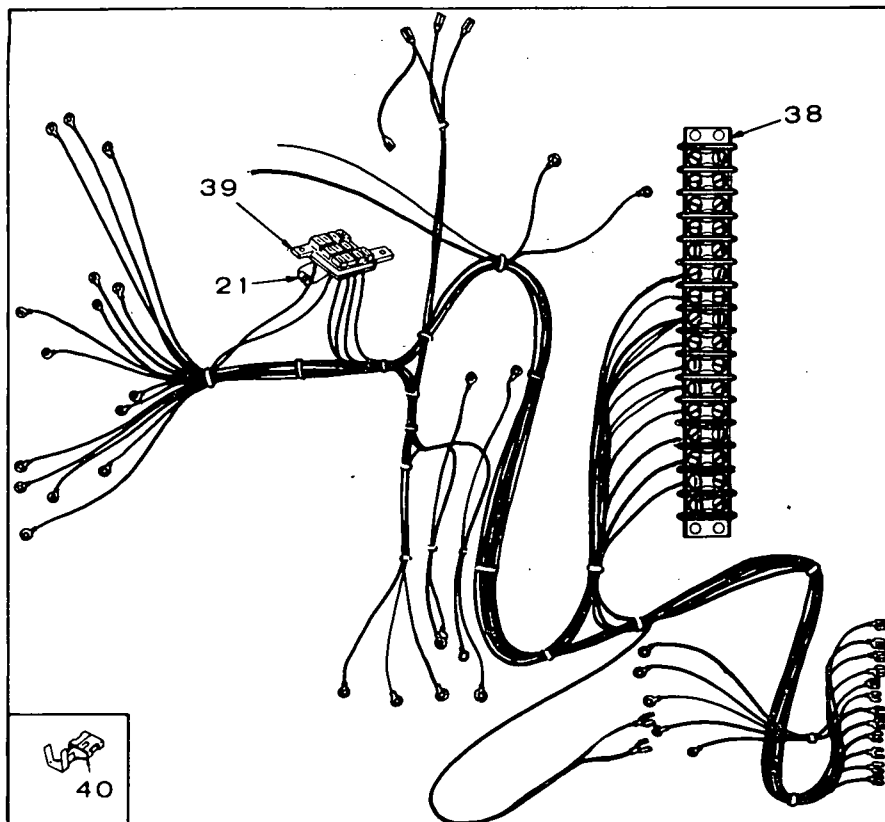
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL ONLY, ENGINE CONTROL		
	301-3165	1	Sets With One Fault Light
	301-3267	1	Sets With Five Fault Lights - Optional
2	301-3253	1	Bracket, Engine Control
3	SWITCH (S.P.D.T.), TOGGLE		
	308-0138	1	Standard Units
	308-0327	1	Penn State Units - Optional
4	308-0002	1	Switch, Panel Light
5	193-0107	1	Gauge, Oil Pressure
6	193-0106	1	Gauge, Water Temperature
7	302-0061	1	Ammeter, Charge (30-0-30)
8	332-1239	1	Strip, Marker (B+, Remote, Ground Alarm)
9	332-1241	1	Strip, Marker (21 through 36)
10	308-0003	1	Plate, Switch (On-Off)
11	332-1276	2	Plug, Keying (Sets With Five Fault Lights Use Quantity of 1)
12	307-1058	2	Relay (1) Start Disconnect, (1) Ignition
13	307-1031	1	Relay, Start Solenoid
14	322-0149	1	Holder, Lamp
15	322-0004	1	Lamp, Panel
16	LAMP, FAULT		
	322-0128	1	Standard Sets
	322-0107	1	Overcrank (Optional)
	322-0111	1	Overspeed (Optional)
	322-0108	1	Low Oil Pressure (Optional)
	322-0109	1	High Engine Temperature (Optional)
	322-0110	1	Low Engine Temperature (Optional)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
17	CONTROL, CRANKER		
	300-0733	1	Standard Cranker
	300-0714	1	Cycle Cranker (Optional)
18	MONITOR, ENGINE CONTROL		
	300-0679	1	Sets With One Fault Light - Standard
	300-0730	1	Sets With One Fault Light - Penn State Units - Optional
	300-0681	1	Sets With Five Fault Lights - Optional
19	HARNESS ASSEMBLY, WIRING - CONTROL (Includes Parts Marked *)		
	338-0528	1	Sets With One Fault Light - Standard
	338-0534	1	Sets With Five Fault Lights - Optional
20	332-0537	1	*Block, Terminal - 4 Place
21	332-0795	1	*Block, Terminal - 16 Place
22	323-0765	2	*Socket, Relay - 11 Place
23	332-1271	2	*Housing, Printed Circuit Board Terminal
24	332-0051	1	Clip, Tinnerman
27	323-0764	1	*Socket, Relay - 8 Place
28	332-1269	As Req.	*Terminal, PC Board
29	332-1280	As Req.	*Terminal, Crimp
30	332-1043	1	*Jumper, Terminal - Sets With One Fault Light
31	307-1061	1	Relay, Starter Protection
32	332-0699	1	*Block, Terminal (6 Place) - Sets With Five Fault Lights
33	332-1240	1	Strip, Marker (53 through 58) - Sets With Five Fault Lights
34	307-1157	3	Spring, Relay Hold-down

* - Included in Wiring Harness Assembly.

CONTROL GROUP (AC OUTPUT PORTION)



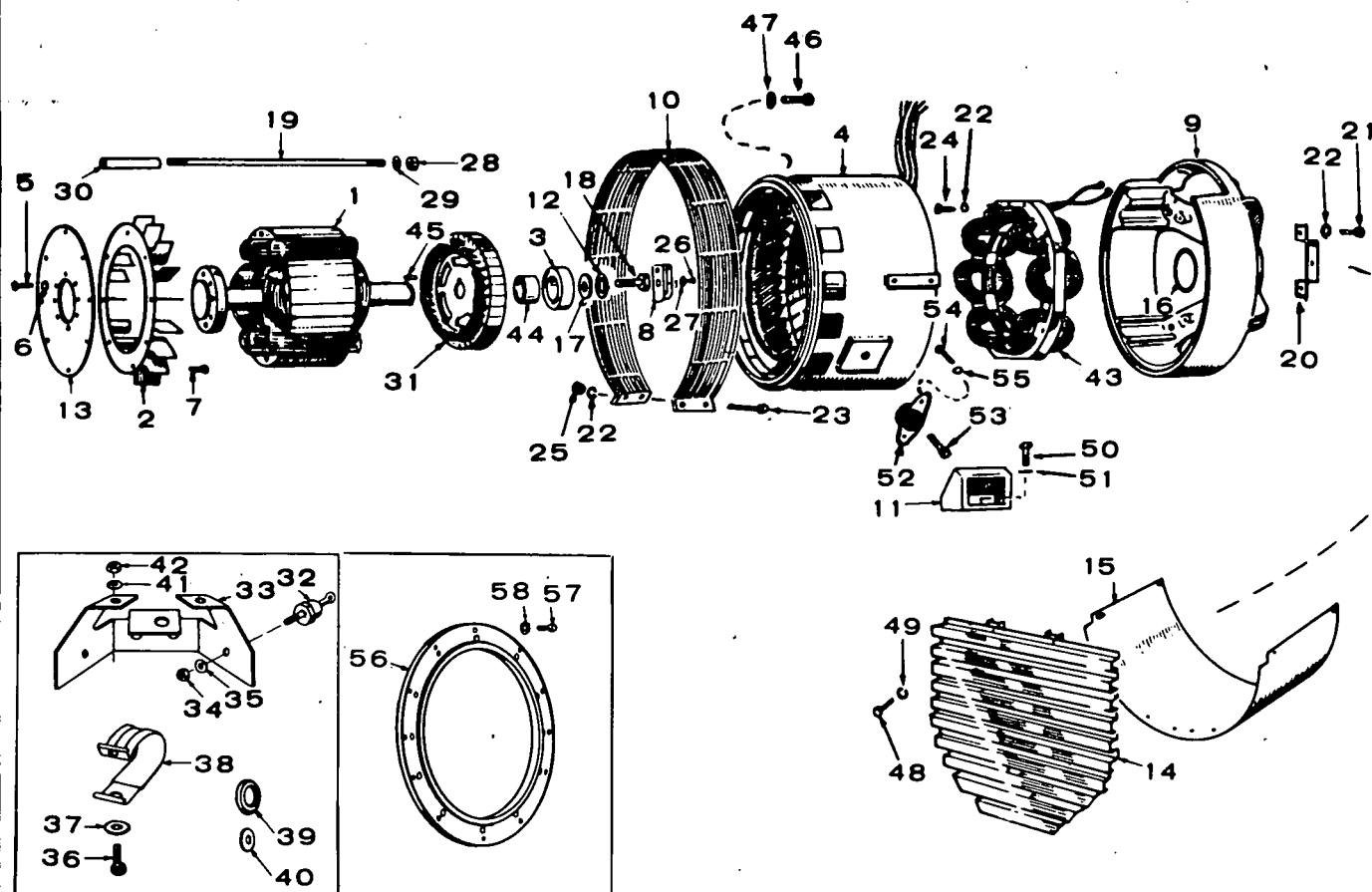


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	301-3158	1	Box, Control
2	PANEL, CONTROL BOX		
	301-3170	1	Sets With Meter Panel
	301-3168	1	Sets Without Meter Panel
3	337-0049	1	Strap, Bond
4	402-0078	4	Dampener, Vibration
5	508-0001	4	Grommet (1-1/16"), Rubber
6	302-0718	1	Voltmeter, AC - Dual Scale 0-300, 0-600
7	★AMMETER, AC		
	302-0721	1	50.0KW - Dual Scale 0-150, 0-300
	302-0720	1	40.0KW - Dual Scale 0-100, 0-200
8	★METER, FREQUENCY		
	302-0221	1	60 Hertz
	302-0256	1	50 Hertz
9	★METER, RUNNING TIME		
	302-0466	1	60 Hertz
	302-0469	1	50 Hertz
10	SWITCH, SELECTOR		
	308-0012	1	Voltmeter - Sets Without Meter Panel
	308-0284	1	Voltmeter and Ammeter - Sets With Meter Panel
11	303-0076	1	Knob, Selector Switch
13	322-0131	1	Light, Upper Scale
14	322-0130	1	Light, Lower Scale
15	307-1061	1	Relay, Voltage Selector
16	301-3244	1	Bracket, Relay Mounting
17	315-0384	1	Reactor Assembly, Commutator
18	307-1157	1	Spring, Relay Hold-down
19	303-0170	1	Rheostat, Voltage Adjusting
20	303-0032	1	Knob, Rheostat
21	350-0556	1	*Resistor
22	315-0342	1	Transformer, Voltage
23	305-0524	1	Bridge, Rectifier
24	332-1268	1	Board Assembly, Printed Circuit - Voltage Regulator

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
25	STRIP, MARKER		
	332-1248	1	(H2-H6, 61-67) - Sets Without Meter Panel
	332-1242	1	(H2-H6, 61-71) - Sets With Meter Panel
27	HARNESS, WIRING - AC CONTROL (Includes Parts Marked *)		
	338-0764	1	Sets Without Meter Panel
	338-0730	1	Sets With Meter Panel
29	320-0431	1	Breaker (2 Amp), Circuit (Exciter)
32	320-0307	1	Lock, Circuit Breaker Handle (Penn State Models) - Optional
33	406-0332	2	Receptacle, Fastener
34	406-0333	2	Stud, Fastener
35	406-0334	2	Washer, Stud Fastener
36	332-0050	1	Clip, Tinnerman
38	*BLOCK, TERMINAL		
	332-0607	1	12 Place - Sets Without Meter Panel
	332-0795	1	16 Place - Sets With Meter Panel
39	323-0764	1	*Socket, Relay
40	332-1280	As Req.	*Terminal, Crimp
41	★TRANSFORMER, CURRENT		
	302-0107	3	50.0KW Units
	302-0106	3	40.0KW Units
42	302-0729	1	★Bracket, Transformer Mounting
43	302-0235	3	★Clamp, Transformer Mounting - Upper
44	302-0236	3	★Clamp, Transformer Mounting - Lower
45	302-0253	As Req.	★Shim, Transformer Mounting
46	813-0110	6	★Screw (10-32 x 2"), Round Head
47	854-0010	6	★Washer (#10), Shakeproof IT
48	232-2219	1	Filter Assembly (For SCR Switched Loads) - Optional

★ - Units With Meter Panel Only.

* - Included in Wiring Harness Assembly.



GENERATOR GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1		1	Rotor Assembly, Wound (Includes Parts Marked ★)
2	205-0089	1	★Blower
3	510-0101	1	★Bearing
4		1	Stator Assembly, Wound
5	805-0033	8	★Bolt, Place - Drive Disc to Hub
6	526-0259	8	★Washer (5/8")
7	805-0018	8	Bolt, Place - Drive Disc to Engine
8	150-0717	1	Switch Assembly, Overspeed
9	211-0185	1	Bell, End
10	234-0365	1	Screen, Generator
11	232-2106	2	Bracket, Generator Mounting
12	850-0079	1	★Washer (3/4"), Lock
13	232-2078	1	★Disc, Generator Drive
14	234-0370	1	Grille, Generator Air Inlet - Unhoused Sets
15	234-0361	1	Wrapper, Generator End Bell - Unhoused Sets
16	509-0125	1	Seal, O-Ring - Bearing
17	526-0238	1	★Washer, Bearing Retainer
18	800-0513	1	★Screw, Bearing Retainer
19	STUD, GENERATOR THROUGH		
	520-0721	4	Three Phase Sets
	520-0724	4	Single Phase Sets
20	150-1456	1	Bracket and Point Assembly, Overspeed Switch

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
21	800-0003	2	Screw (1/4-20 x 1-1/4") - Bracket Mounting
22	850-0040	8	Washer (1/4"), Lock
23	800-0008	2	Screw (1/4-20 x 1-1/4") - Screen Mounting
24	800-0009	4	Screw (1/4-20 x 1-1/2") - Stator Mounting
25	862-0001	2	Nut (1/4-20) - Generator Screen
26	812-0189	1	Screw (3/8-16 x 3/4"), Round Head - Overspeed Switch Mounting
27	856-0010	1	Washer (3/8"), Shakeproof EIT
28	862-0011	4	Nut (3/8-16) - Generator Through Stud
29	850-0050	4	Washer (3/8")
30	503-0611	4	Hose, Insulator
31	201-1739	1	★Rotor Assembly, Wound - Exciter (Includes Diodes)
32	RECTIFIER, DIODE (Part of Exciter Rotor)		
	358-0015	3	Negative
	358-0016	3	Positive
33	HEAT SINK, DIODE		
	363-0055	1	Negative
	363-0054	1	Positive
34	870-0053	6	Nut (10-32) - Diode Mounting
35	850-0030	6	Washer (#10) - Diode Mounting

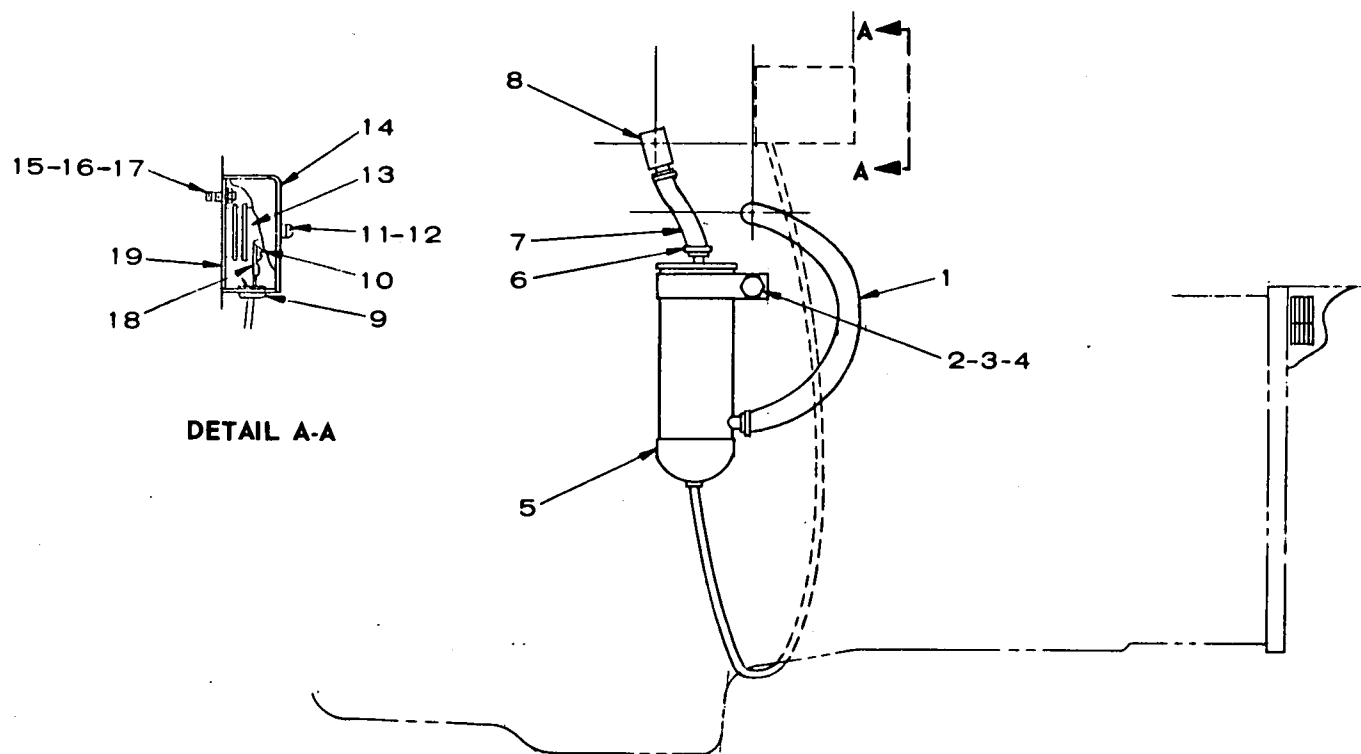
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
36	813-0110	4	Screw (10-32 x 2"), Round Head - Heat Sink Mounting
37	526-0140	4	Washer (#10)
38	332-0050	2	Clip, Wire
39	508-0124	4	Bushing, Insulating
40	508-0156	4	Washer, Insulating
41	850-0030	4	Washer (#10)
42	870-0053	4	Nut (10-32) - Heat Sink Mounting
43	220-2353	1	Stator Assembly, Wound - Exciter
44	232-2102	1	★Spacer, Bearing
45	515-0145	1	★Key, Exciter Rotor
46	800-0051	8	Screw (3/8-16 x 1-1/4") - Stator Assembly to Generator Adapter
47	850-0050	8	Washer (3/8"), Lock
48	812-0146	4	Screw (1/4-20 x 3/8"), Round Head - Air Inlet Grille Mounting
49	850-0040	4	Washer (1/4"), Lock

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
50	800-0091	4	Screw (1/2-13 x 1-1/4") - Generator Support to Chassis
51	850-0060	4	Washer (1/2"), Lock
52	402-0030	2	Mount, Vibration
53	800-0520	2	Screw (3/4-10 x 1") - Vibration Mount to Stator Assembly
54	800-0071	4	Screw (7/16-14 x 1") - Generator Support to Vibration Mount
55	850-0055	4	Washer (7/16"), Lock
56	231-0188	1	Adapter, Generator
57	802-0072	12	Screw (3/8-16 x 1"), Socket Head - Generator Adapter to Engine
58	850-0050	12	Washer (3/8"), Lock

* - Refer to factory giving complete Model, Spec and
Serial Number from the Onan Nameplate:

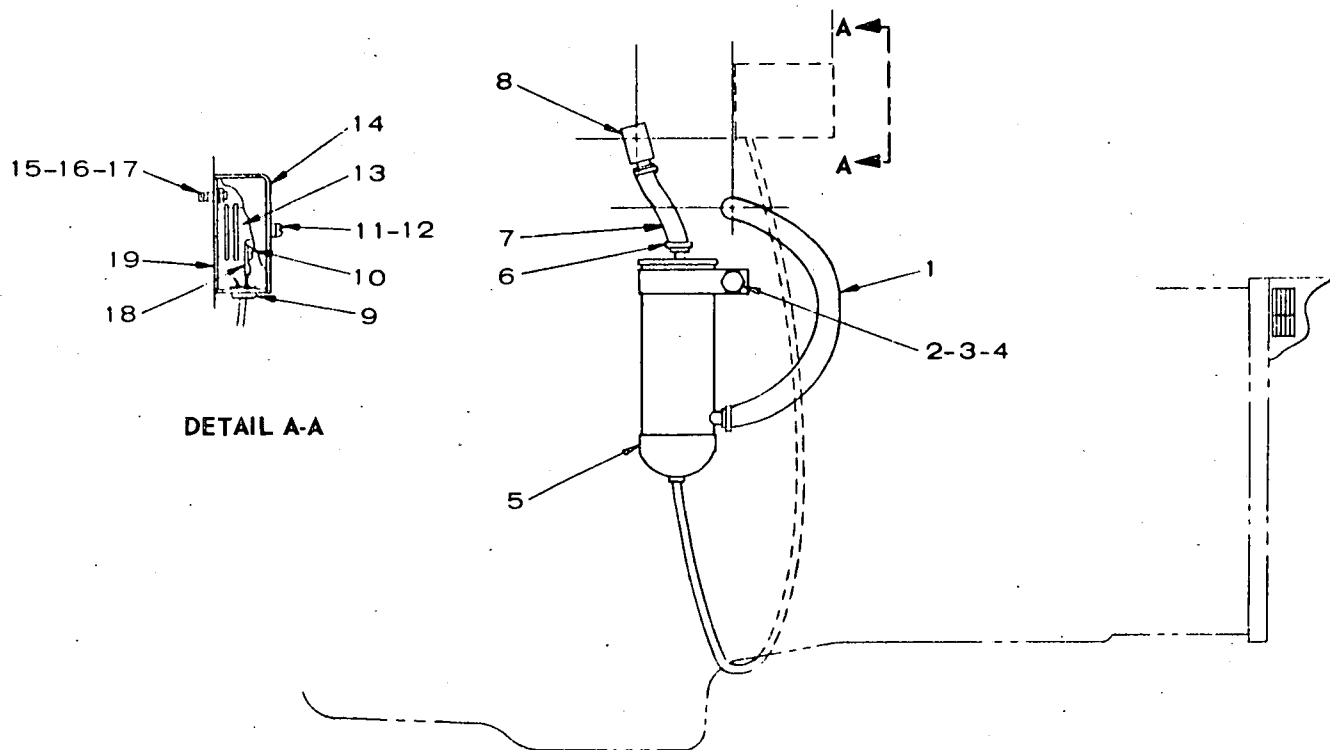
★ - Included in Wound Rotor Assembly.

WATER JACKET HEATER INSTALLATION - 120 VOLT



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1		1	Hose (Order 15" of Bulk Hose #503-0386)
2	856-0013	1	Washer (1/2"), Shakeproof EIT
3	850-0060	1	Washer (1/2"), Lock
4	800-0088	1	Screw (1/2-13 x 3/4")
5	333-0052	1	Heater, 1500 Watt
6	503-0183	4	Clamp, Hose
7		1	Hose (Order 6" of Bulk Hose #503-0386)
8	502-0054	1	Elbow, Street
9	508-0008	1	Grommet
10		2	Screw (Part of #13)
11	812-0076	2	Screw (#8-32)
12	850-0025	2	Washer (#8), Lock
13	309-0285	1	Thermostat
14	333-0013	1	Cover, Thermostat Mounting Box
15	520-0446	2	Stud (#10-32)
16	850-0030	2	Washer (#10), Lock
17	870-0053	2	Nut (#10-32)
18	332-0149	1	Terminal
19	333-0012	1	Box, Thermostat Mounting

WATER JACKET HEATER INSTALLATION - 240 VOLT



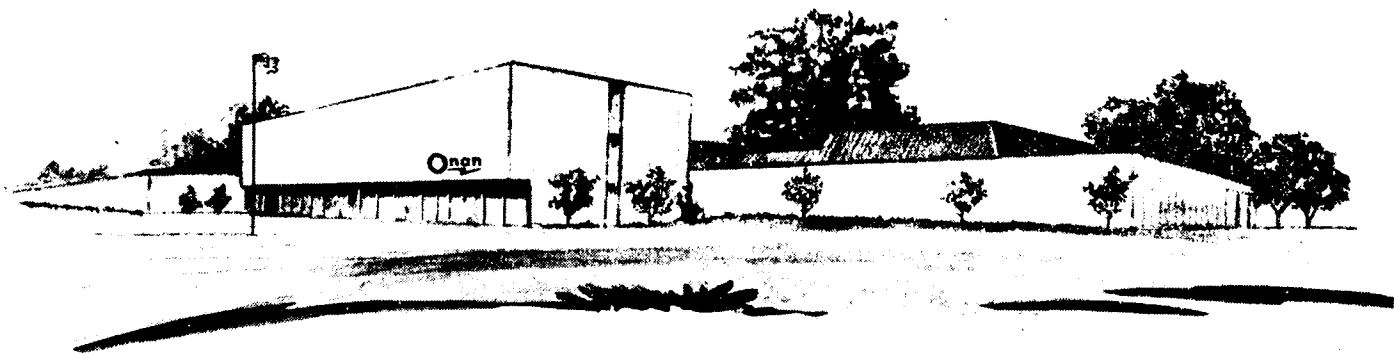
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1		1	Hose (Order 15" of Bulk Hose #503-0386)
2	856-0013	1	Washer (1/2"), Shakeproof EIT
3	850-0060	1	Washer (1/2"), Lock
4	800-0088	1	Screw (1/2-13 x 3/4")
5	333-0073	1	Heater, 2000 Watt
6	503-0183	4	Clamp, Hose
7		1	Hose (Order 6" of Bulk Hose #503-0386)
8	502-0054	1	Elbow, Street
9	508-0008	1	Grommet
10		2	Screw (Part of #13)
11	812-0076	2	Screw (#8-32)
12	850-0025	2	Washer (#8), Lock
13	309-0256	1	Thermostat
14	333-0056	1	Cover, Thermostat Mounting Box
15	332-0672	2	Stud (#10-32)
16	850-0030	2	Washer (#10), Lock
17	870-0053	2	Nut (#10-32)
18	332-0149	1	Terminal
19	333-0057	1	Box, Thermostat Mounting

We mean it.....

.....and this certificate with the Onan electric plant you purchased proves we mean it! When this plant left our factory in Minneapolis it took with it our sincere assurance that it will produce exactly as stated on its nameplate.

The name of ONAN is synonymous with satisfactory performance, certified performance.





ONAN 1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432
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