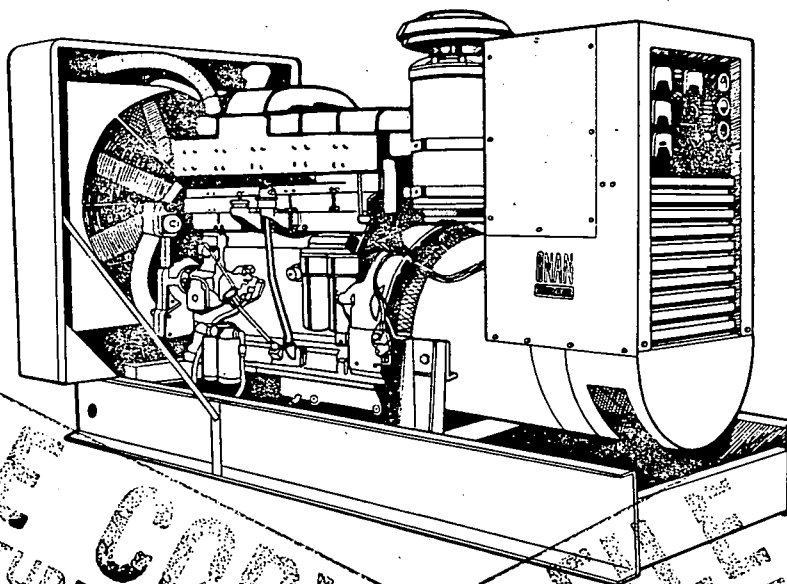


# OPERATOR'S MANUAL AND PARTS CATALOG

FOR  
**DFS**  
SERIES

**ELECTRIC GENERATING SETS**

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The need for an international standard of measurement has been increased by today's improved communication and transportation between countries.

This has prompted formation of modernized metrics known as the International System of Units, officially abbreviated SI.

ONAN products appear on the world market, therefore both metric and the present American system of units (CU) will be found in this manual.

To assist in familiarization, refer to the following terms.

TERM	METRIC	ENGLISH
Length	millimetre (mm)	Inch (in)
Pressure	kilopascals (kPa)	pounds per square inch (PSI)
Mass (Weight)	kilogram (kg)	pound (lb)
Volume (Liquid)	litre	gallon (gal)
Power	kilowatt	horsepower (HP)
Frequency	hertz (Hz)	cycles per second (CPS)
Energy	Joules (J)	BTU
Battery Capacity	Coulomb (C)	Ampere Hour (AH)
Revolutions per Minute	r/min	rpm
Temperature	Celsius (°C)	Fahrenheit (°F)

The customary unit of Brake Horsepower (BHP) becomes kilowatts (kW) when converted to SI metric units. This kW rating should not be confused with the kW rating of the generator which will always be lower due to losses inherent with any electrical induction device.

## WARNING

**TO AVOID POSSIBLE PERSONAL INJURY OR  
EQUIPMENT DAMAGE, A QUALIFIED ELECTRI-  
CIAN OR AN AUTHORIZED SERVICE  
REPRESENTATIVE MUST PERFORM IN-  
STALLATION AND ALL SERVICE.**

# INTRODUCTION

## FOREWORD

This manual is applicable to the DFS Series electric generating set, consisting of an ONAN YB generator, driven by a Cummins KT-1150-G Diesel Engine. See *SPECIFICATIONS* for generator sizes.

The manual is divided into two sections.

Section 1 provides information on installation, operation and troubleshooting.

Section 2 is a Parts Catalog for ONAN optional and standard equipment.

The manual should be used in conjunction with the Cummins engine manual, for specific engine information.

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

**CAUTION** This symbol refers to 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.

300.0	DFS	17R	/	1	A
1	2	3		4	5

1. Indicates Kilowatt rating (300.0 kW).
2. Factory code for SERIES identification.
3. 17 = 60 Hz. Reconnectible  
517 = 50 Hz. Reconnectible  
R—Indicates remote starting feature.
4. Factory code for designating optional equipment.
5. Specification letter. (Advances when factory makes production modifications.)

When contacting 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 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 Cummins nameplate is on the left hand side on the oil cooler.

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

# SAFETY PRECAUTIONS

Throughout this manual you will find eye-catching flags containing Warnings and Cautions. These will alert 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

### WARNING

Set forth below are a number of potential hazards which could result in some degree of personal injury. The suggested procedures should be adhered to.

### General

- Keep your electric 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 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. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts; cause shock or burning.
- If 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. Fuel contact with hot engine or exhaust is a potential fire hazard.
- 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—A POSSIBLE EXPLOSION AND FIRE CONDITION EXISTS!**

- Make sure that oily rags are not left on or near the engine. Oil soaked rags are combustible and present hazardous walking conditions.
- 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.
- 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 liquefied 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 serious personal injury, 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.
- Inspect exhaust system regularly to assure that system is free of leaks.

### **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 pressure 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 cabinet while the engine is running. High voltages are present and could cause serious personal injury.
- 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.

# SPECIFICATIONS

## ENGINE DETAILS

Engine Manufacturer .....	CUMMINS
Engine Series .....	KT 1150 G
Number of Cylinders .....	6
Displacement .....	1150-in <sup>3</sup> (18.9 litres)
BHP @ 1800 r/min .....	460 (343 kW)
Compression Ratio .....	15.5:1
Bore .....	6.25-inch (158.75 mm)
Stroke .....	6.25-inch (158.75 mm)
Fuel .....	Diesel
Battery Voltage .....	24
Battery Group (Two 12 Volt, 225 A.H. [810 kC]) .....	8D
Starting Method .....	Solenoid Shift
Governor Regulation .....	5% Max No Load—Full Load
Battery Charging Current .....	35-Amperes

## GENERATOR DETAILS

Type .....	YB 17 60 Hz
	YB 517 50 Hz
Rating (Watts)	
60 Hertz Continuous Standby .....	300 000 (375 kVA)
50 Hertz Continuous Standby .....	250 000 (312.5 kVA)
AC Voltage Regulation .....	± 2%
60 Hertz r/min .....	1800
50 Hertz r/min .....	1500
Output Rating .....	0.8 PF
AC Frequency Regulation .....	60 Hz 3 Hz
	50 Hz 2.5 Hz

## CAPACITIES AND REQUIREMENTS

Cooling System (Engine, Radiator and Aftercooler) .....	12.5 <del>22.5</del> gallons ( <del>85.0</del> litres)
Engine Oil Capacity (Filter, Lines, Crankcase) .....	85.0 <del>47.4</del> gallons ( <del>325</del> litres)
Exhaust Connection (inches pipe thread) .....	5.0 <del>OD male</del>

## AIR REQUIREMENTS (1800 r/min)

Engine Combustion .....	20575 <del>19600</del> 975-ft <sup>3</sup> /min (0.5 m <sup>3</sup> /s) 9.25
Radiator Cooled Engine .....	<del>19600</del> 975-ft <sup>3</sup> /min (0.5 m <sup>3</sup> /s) 9.71
Total for Radiator Cooled Model .....	<del>19600</del> 975-ft <sup>3</sup> /min (0.5 m <sup>3</sup> /s)
Alternator Cooling Air (1800 r/min) .....	1200-ft <sup>3</sup> /min (0.6 m <sup>3</sup> /s)
(1500 r/min) .....	1000-ft <sup>3</sup> /min (0.5 m <sup>3</sup> /s)
Fuel Consumption at Rated Load	
60 Hz .....	22.2 gal/hr ( <del>84.0</del> litres/hr)
50 Hz .....	18.5 gal/hr ( <del>70.0</del> litres/hr)

## GENERAL

Height .....	71.5-inches (1.82 m)
Width .....	55.0-inches (1.4 m)
Length .....	120.0-inches (3.05 m)
Approximate Weight (Mass) .....	7837 lb ( <del>3555</del> kg)

**TABLE 1. YB GENERATOR VOLTAGE/CURRENT OPTIONS**

300 kW 375 kVA 60 Hz  
250 kW 312.5 kVA 50 Hz

VOLTAGE	FREQ	PHASE	AMPERES	PARALLEL WYE	SERIES WYE	SERIES DELTA	REF XFMP TAP*
CODE 17							
120/208	60 Hz	3	1041	x			H3
127/220	60 Hz	3	984	x			H4
139/240	60 Hz	3	902	x			H5
240/416	60 Hz	3	520		x		H3
254/440	60 Hz	3	492		x		H4
277/480	60 Hz	3	451		x		H5
CODE 517							
110/190	50 Hz	3	950	x			H3
115/200	50 Hz	3	902	x			H4
120/208	50 Hz	3	867	x			H4
127/220	50 Hz	3	820	x			H5
220/380	50 Hz	3	475		x		H3
230/400	50 Hz	3	451		x		H4
240/416	50 Hz	3	434		x		H4
254/440	50 Hz	3	410		x		H5
CODE 5D**							
120/240	60 Hz	3	902			x	H5
CODE 6D**							
240/480	60 Hz	3	451			x	H5
CODE 7**							
220/380	60 Hz	3	570		x		H3
CODE 9X**							
347/600	60 Hz	3	361		x		H5

\* - Adjust voltage transformer on TB21 in control cabinet.

\*\* - Not reconnectable.

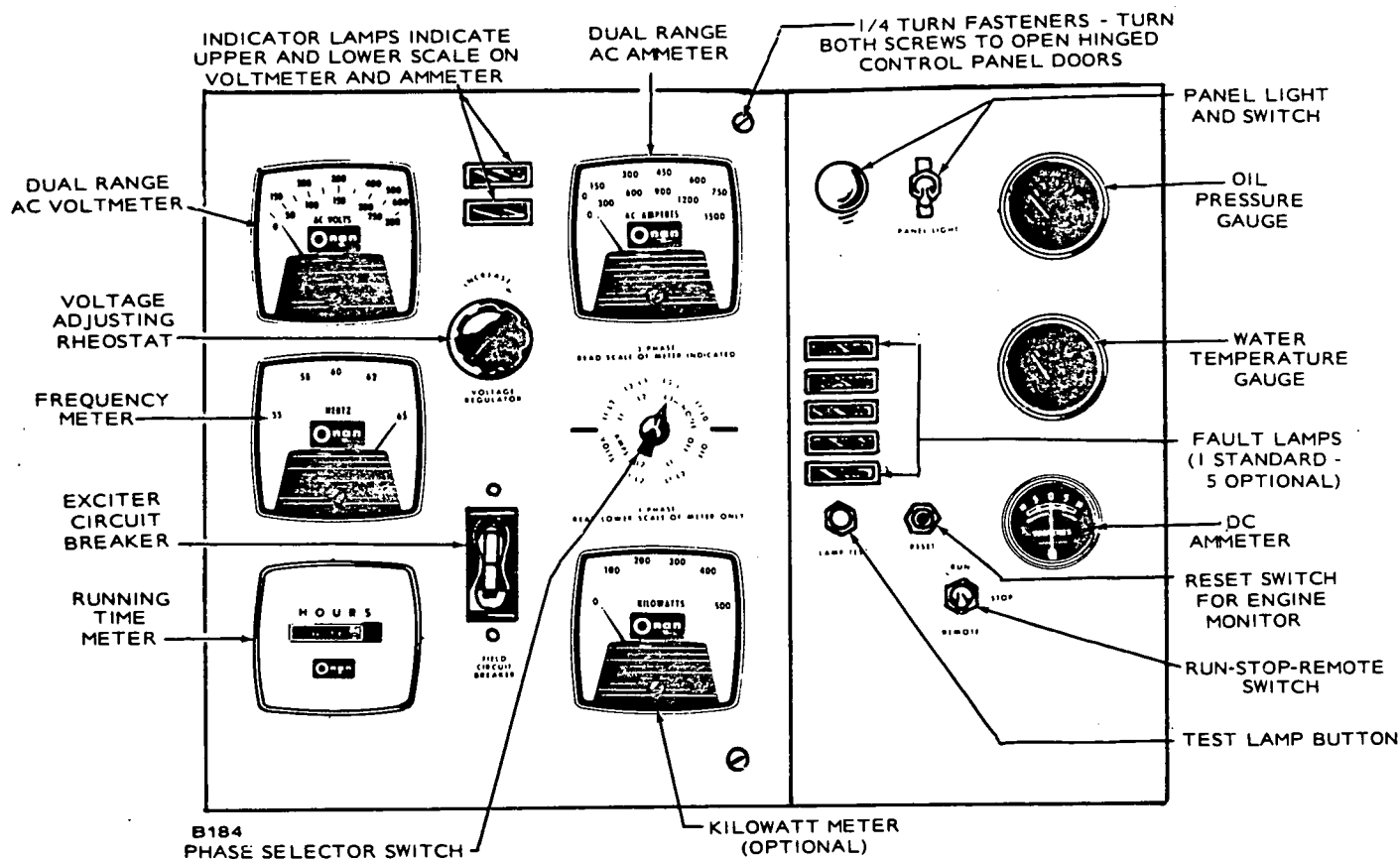


FIGURE 1. CONTROL PANEL

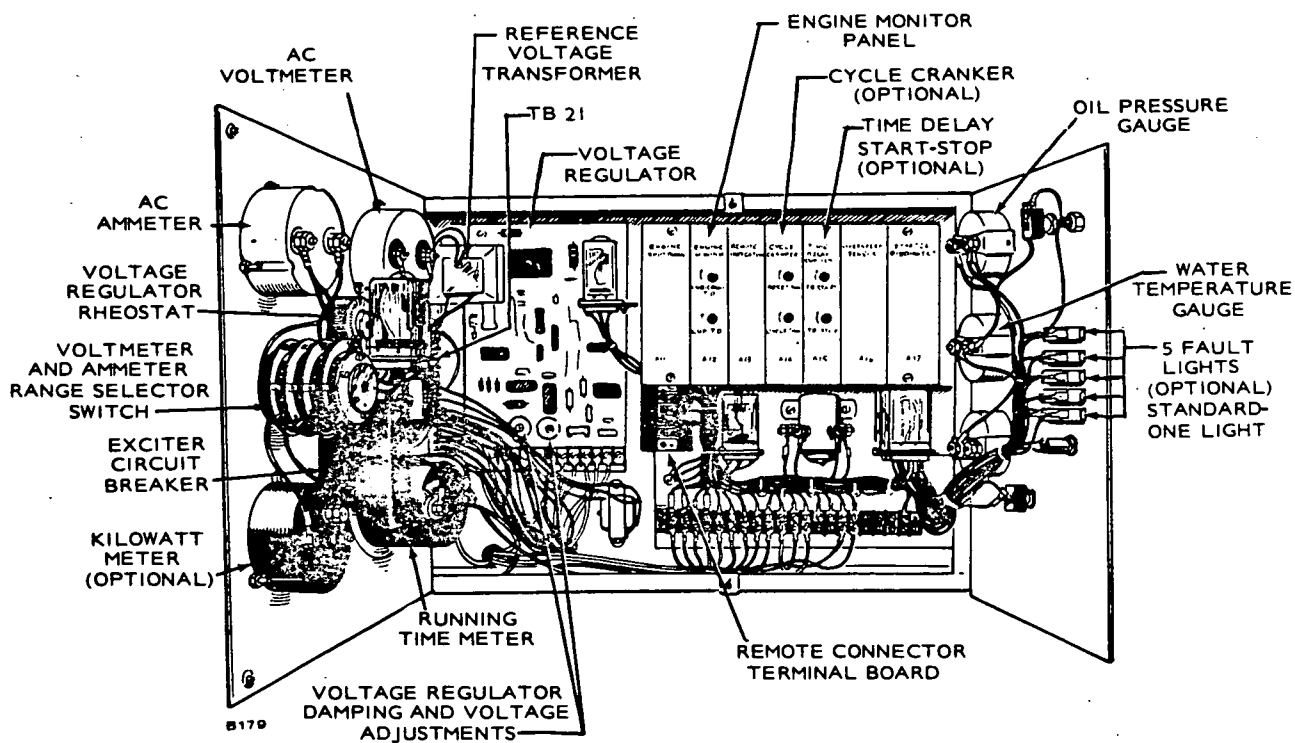


FIGURE 1A. CONTROL PANEL INTERIOR



# DESCRIPTION

## GENERAL

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

## ENGINE

The engine on the DFS is a Cummins KT-1150-G as described in the engine manual. Basic measurements and requirements will be found under *SPECIFICATIONS*. For operation, maintenance and service information, consult the Cummins manual.

## AC GENERATOR

The generator is an ONAN Type YB, 12 lead, 4-pole revolving field, reconnectable bus-bar, brushless unit. The main rotor is attached directly to the engine flywheel, therefore engine speed determines generator output frequency. The 60 Hz set operates at 1800 r/min, and the 50 Hz at 1500 r/min. Excitation is achieved as follows—

Residual alternating current from the stator winding is applied to the voltage regulator, where it is compared with a reference voltage, rectified and returned to the field of the exciter. Current induced in the exciter rotor is rectified and fed into the generator rotor. This induces a current in generator stator which is applied to the load.

## 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-Remote Switch:** Starts and stops the unit locally or from a remote location.

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

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

**Warning Light:** Indicates "Fault" in engine operation.

### 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 percent 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 r/min.)

## OPTIONAL EQUIPMENT

### DC Panel

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

- Overcrank (failed to start)
- Overspeed
- Low oil pressure
- High engine temperature
- Low engine temperature

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

## 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. Refer to Figure 1A for location of units mentioned.

**Terminal Board (TB) 21:** Connection of wire W22 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 16.

**Voltage Regulator:** Solid state unit, consisting of printed circuit board VR21, an SCR bridge CR21, with a commutating reactor L21 are located in the control panel as part of the voltage regulator system. AC output from generator is controlled at predetermined level regardless of load; regulation is plus or minus 2% from no load to full load, at 0.8 P.F.

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

1. A 75 second cranking period.
2. Approximately 12.5 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 exceeds 2000 r/min.
  - c. Low oil pressure 14 psi (96.5 kPa).
  - d. High engine temperature 205°F (96°C).

### CAUTION

High Engine Temperature Cutoff will shut down engine in an overheat condition only if coolant level is sufficiently high to physically contact shutdown switch. Loss of coolant will allow engine to overheat without protection of shutdown device, thereby causing severe damage to the engine. It is therefore imperative that adequate engine coolant levels be maintained, to ensure operational integrity of cooling system and engine coolant overheat shutdown protection.

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.

**Overspeed Shutdown:** Shutdown occurs if engine speed exceeds 2010 r/min. A sensor mounted on the generator shaft (Figure 2) signals an overspeed condition which shuts down the engine through control module A16.

**Start-Disconnect:** Plug-in module. Operates at approximately 100 r/min above maximum cranking speed to prevent the starter from being energized while engine is running.

## 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.

**Time Delay Start/Stop:** Operative from remote location only. Provides 1-10 seconds time delay on starting and 30-seconds to 5-minutes delay on stopping. Delay period adjustable on engine monitor panel.

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

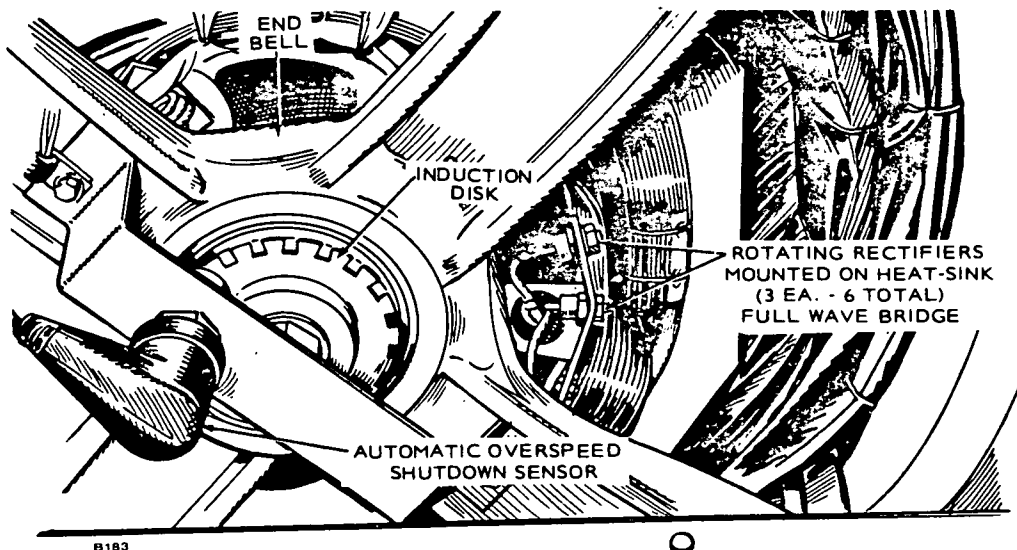


FIGURE 2. OVERSPEED SENSOR

**TABLE 2. FAULT LAMP OPTIONS**

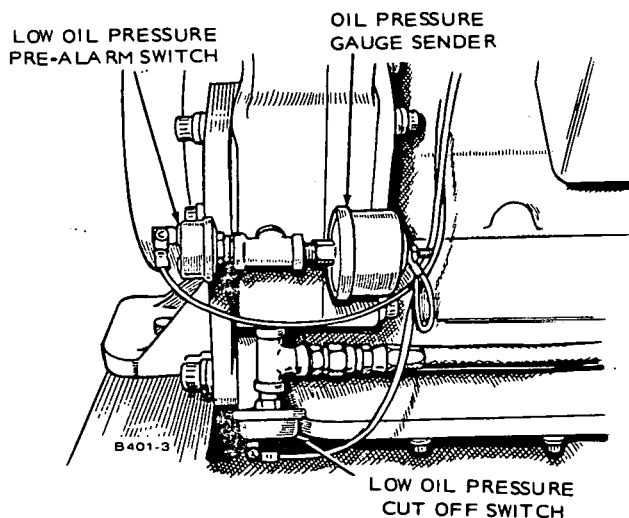
SYSTEM	FAULT	FAULT LAMP	STOP ENGINE	EXTERNAL ALARM	PRE-ALARM
PENN STATE SINGLE LIGHT	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x		x	
	High Engine Temperature	x		x	
STANDARD SINGLE LIGHT	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x	x	x	
	High Engine Temperature	x	x	x	
5 LIGHT	Overcrank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

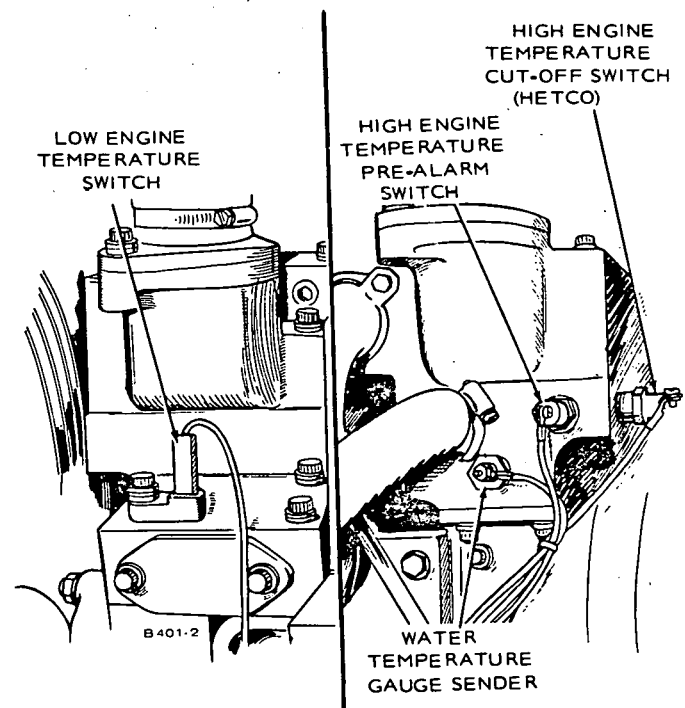
## ENGINE SENSORS

Resistance units and switches in the engine temperature and oil pressure monitoring and shut-down systems are sealed units and are not repairable.

For location, refer to Figures 3 and 4. When changing a sensor, do not substitute, use recommended replacement parts. Resistance units are matched to the gauge they supply, and cut-off switches are close-tolerance actuation parts, made for a specific application.



**FIGURE 3. OIL PRESSURE MONITORS**



**FIGURE 4. WATER TEMPERATURE MONITORS**

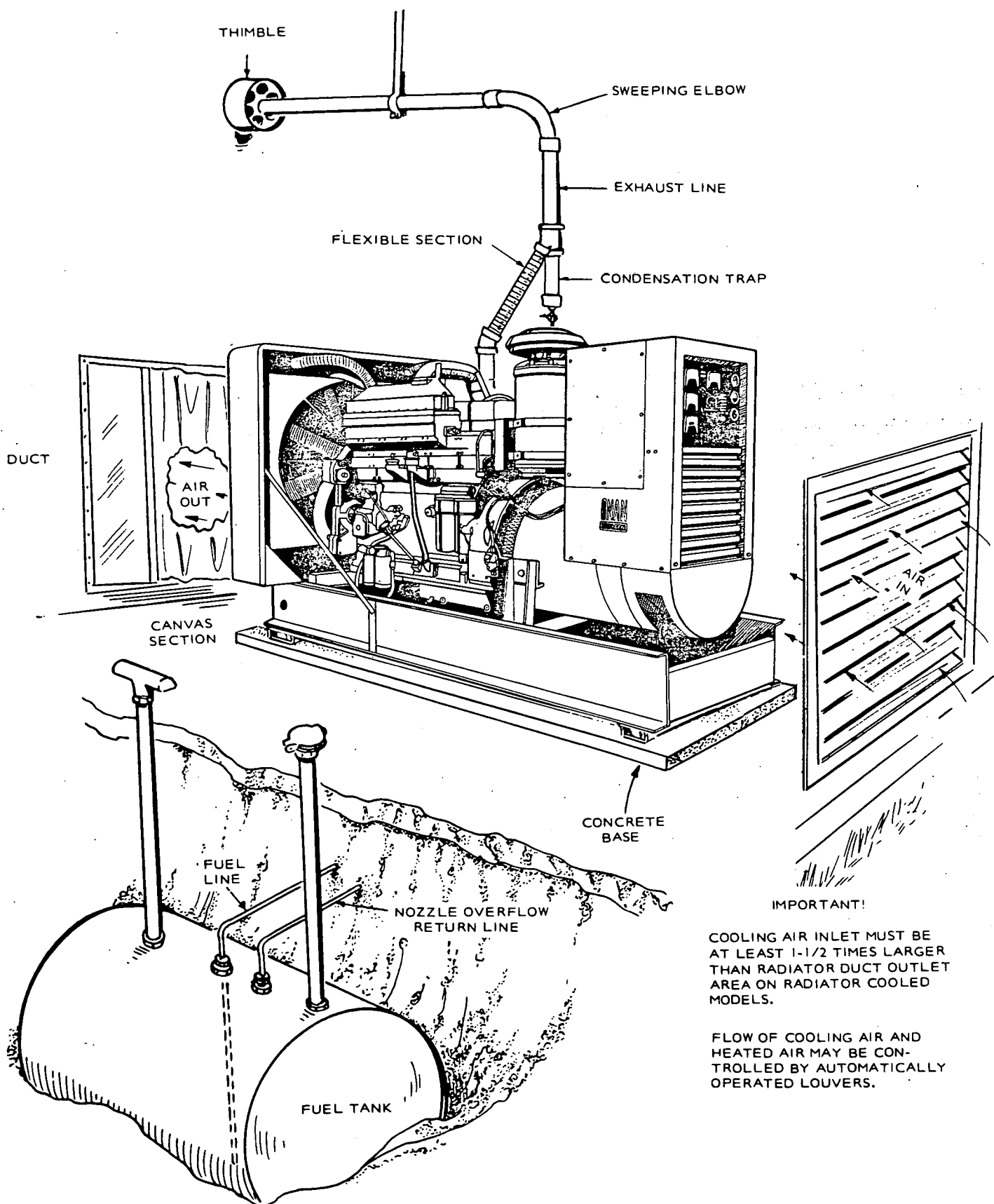


FIGURE 5. TYPICAL DFS INSTALLATION

# INSTALLATION

## GENERAL

Installations must be considered individually. Use these instructions as a general guide. All installations must meet regulations of state and local building codes, fire ordinances, etc., which may affect installation details. See Figure 5.

Requirements to be considered prior to installation:

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 installation.
8. Water supply (city water cooling).
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 extreme weather conditions.

## MOUNTING

Generator sets are mounted on a rigid skid base which provides proper support. The engine-generator assembly is isolated from the skid base by rubber mounts which provide adequate vibration isolation for normal installations. For installations where vibration control is critical, install additional spring-type isolators between skid base and foundation.

For convenience in general servicing and changing crankcase oil, mount set on raised pedestal at least 6-inches (150 mm) high. Refer to *ONAN Technical Bulletin T-030* for further installation information.

## VENTILATION

Generator sets create considerable heat which must be removed by proper ventilation. Outdoor installations rely on natural air circulation but 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 r/min.

Radiator set cooling air travels from the rear of the set and is removed by a pusher fan which blows out through the radiator. Locate the air inlet to the rear of the set. Make the inlet opening at least 1½-times larger than the radiator.

Locate the cooling air outlet directly in front of the radiator and as close as possible. 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.

For operation outside a building, 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 unit is running) of sufficient size to assure proper air circulation and evacuation of fumes.

## COOLING SYSTEM

**Standard Radiator Cooling**, uses a set mounted radiator and engine driven pusher type fan to cool engine water jacket. Air travels from the generator end of the set, across the engine and out through the radiator. An integral discharge duct adapter flange surrounds the radiator grille.

**Heat Exchanger Cooling (optional)**, uses a shell and tube type heat exchanger instead of the standard radiator and fan. Engine jacket coolant circulates through the shell side of the heat exchanger, while raw cooling water is pumped through the tubes. Engine coolant and raw water do not mix. This type of cooling separation is necessary when the raw water contains scale forming lime and other impurities.

This system reduces set enclosure airflow and noise levels. Proper operation depends upon a constant supply of raw water for heat removal. The engine coolant side of the system may be protected from freezing the raw water side cannot. See Figure 6 for typical installation.

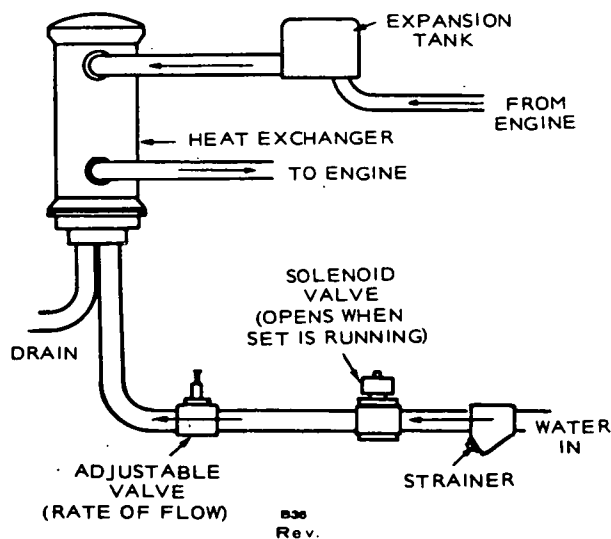


FIGURE 6. TYPICAL HEAT EXCHANGER SYSTEM

**Standpipe Cooling (optional)** substitutes a mixing (tempering) tank for the standard radiator and fan. Cooling water circulating through the engine jacket is mixed with raw water in the tank. Because raw water flows through the engine jacket, it must not contain scale forming impurities or fouling of the engine water will occur. Fouling results in engine overheating and costly repair bills.

This system reduces set enclosure airflow requirements and noise levels. Proper operation is dependent on a constant supply of cooling water. The system cannot be protected from freezing. See Figure 7.

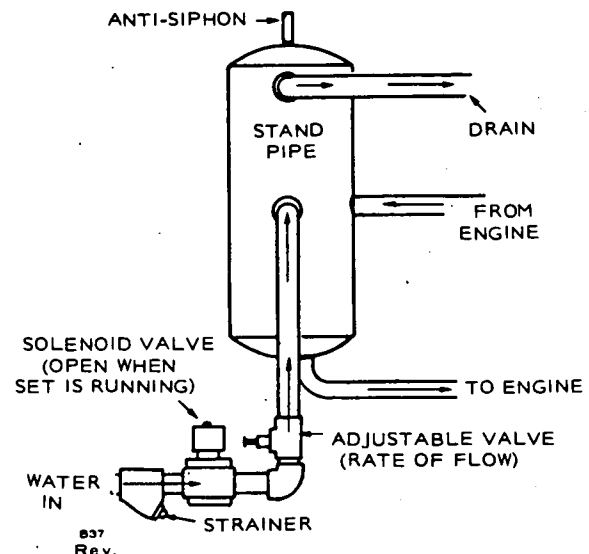


FIGURE 7. TYPICAL STANDPIPE SYSTEM

**Remote Radiator Cooling (optional)**, substitutes a remote mounted radiator and an electrically driven fan, for the set mounted components. Removal of the radiator and fan from the set reduces set enclosure airflow requirements and noise levels without forcing dependence on a continuous cooling water supply. The remote radiator system can be completely protected against freezing.

This system must be designed to meet specific requirements of the application.

**Water Jacket Heater (optional)** may be installed to keep engine coolant warm while engine is shut down. It heats and circulates the coolant within the engine, which reduces start-up time and engine wear caused by cold starts. It is electrically operated and thermostatically controlled.

## COOLING CONNECTIONS

The radiator cooled (standard) set does not require any external connections except as discussed under *Ventilation*. Allow clearance around the set for access to service the radiator and fan belts. See Figure 5.

Heat Exchanger and Standpipe cooled sets must be connected to a pressurized supply of cold water. Make connections to the set with flexible pipe to absorb vibration. On the cool water line install a solenoid valve to shut off the flow when the set is shut down and a rate of flow valve to control engine temperature. This valve can be either manual or automatic. Actual rate of flow will depend on inlet water temperature.

Adjust the flow to maintain water temperature between 165° F and 195° F (73.9° C and 90.6° C) 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.**

Remote radiator plumbing will vary with installation. All systems must comply with the following conditions—

1. Make all connections to the set and to the radiator, with flexible pipe.
2. Install an auxiliary circulating pump if the horizontal distance between the engine and pump exceeds 15-feet (4.65 m).
3. Install a hot-well system to relieve excess engine water jacket pressure if the top of the radiator is more than 15-feet (4.65 m) above the center-line of the engine crankshaft.

## COOLANT FILTER

A spin-on type corrosion filter is standard equipment on a DFS set. This precharge filter is compatible with plain water or all permanent ethylene glycol base permanent antifreeze coolants. Refer to engine manufacturer's manual for instructions if a methoxy propanol base antifreeze is desired.

Do not use any type of antifreeze with a stop-leak additive. The filter will remove the additive (usually a particulate) and become clogged and ineffective. Replace filter periodically as recommended in *GENERAL MAINTENANCE* section. A shut-off valve is located in the head of the bypass filter to facilitate filter changing (see Figure 8).

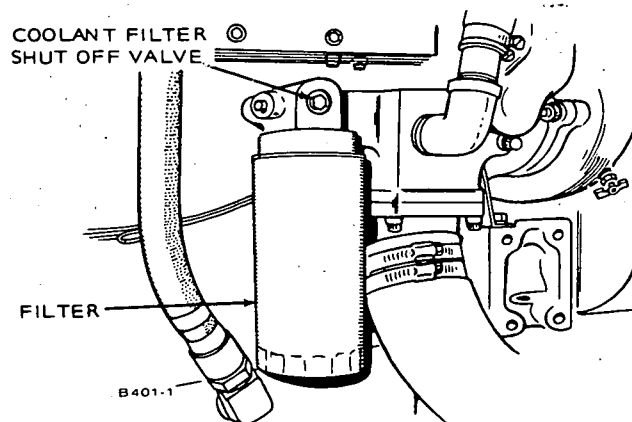


FIGURE 8. COOLANT FILTER INSTALLATION

## 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.

## 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 9) must be used where exhaust pipes pass through walls or partitions. Pitch exhaust pipes downward or install a condensation trap (Figure 10) 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 5 for a typical exhaust installation. Shield or insulate exhaust lines if there is danger of personal contact. Allow at least 9-inches (230 mm) of clearance if the pipes run close to a combustible wall or partition.

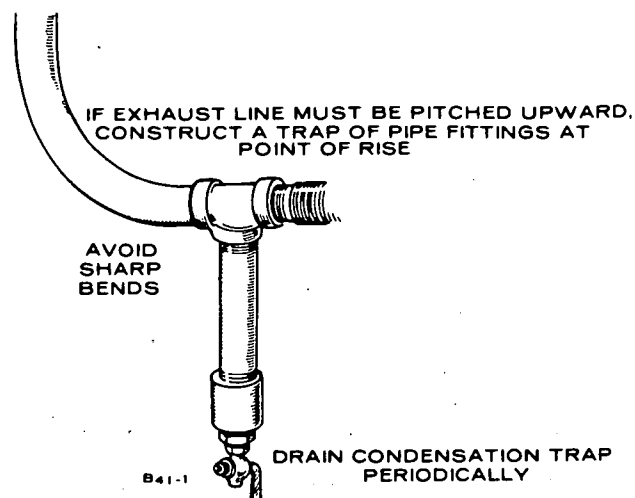


FIGURE 10. EXHAUST CONDENSATION TRAP

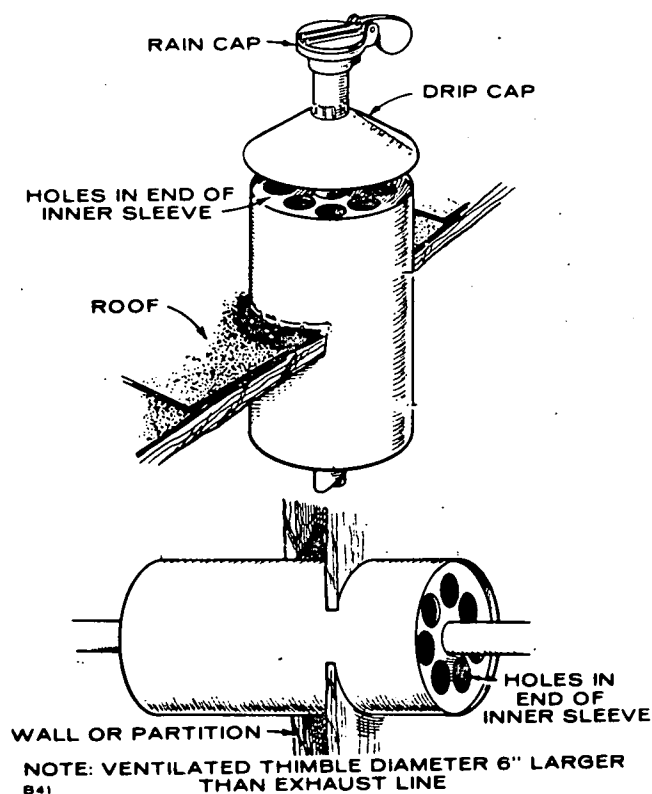


FIGURE 9. TYPICAL EXHAUST THIMBLE

Use a five-inch (127 mm) pipe with a flexible portion between the engine and muffler. Do not connect flexible line to the exhaust manifold.

A critical muffler recommended for this unit is sized for an eight-inch exhaust pipe. Maximum allowable length of exhaust pipe for this diameter is 375-feet (114 m).

Maximum permissible exhaust restriction (back pressure) is 3-inches (76.2 mm) Hg.



## FUEL SYSTEM

Cummins engines used on the DFS sets are designed for use with ASTM No. 2 Diesel fuel. They will however, operate on diesel fuels within the specifications delineated in the Cummins 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 <sup>5</sup>/<sub>12</sub>-feet (<sup>1.5</sup>/<sub>30</sub> m) is not recommended without a day tank installation, because of fuel drainage.

Fuel inlet connection is to the filter and is threaded for 7/8-inch 14 UNF fitting. Injector's return to the tank is threaded for 3/4-inch 16 UNF fitting. See Figure 11 for fuel system installation.

Maximum return line restriction, 4-inches (101.6 mm) Hg.

← max lift of pump

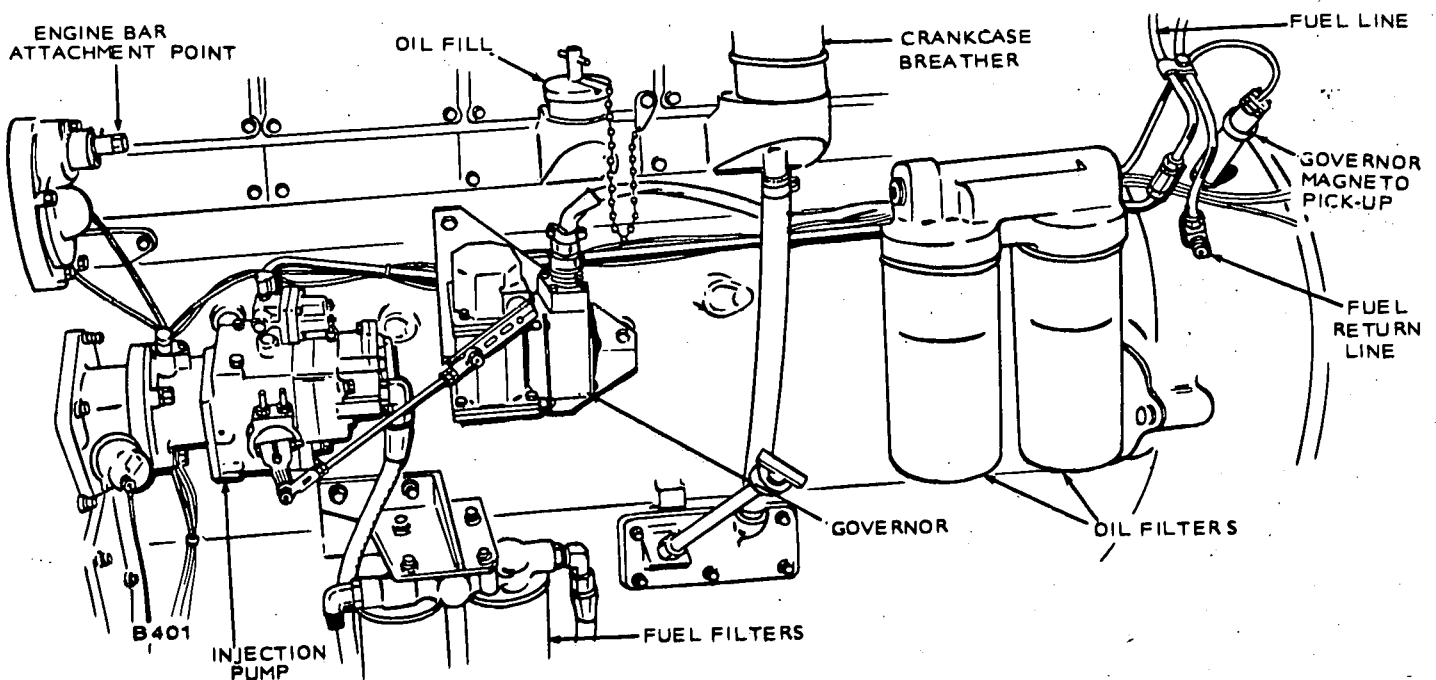


FIGURE 11. FUEL SYSTEM

## DAY TANK

Generator set installations may be equipped with an optional separate fuel day tank. A float operated valve controls fuel flow 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 main fuel tank. Refer to the installations included with the tank. See Figure 12 for an example of a day tank installation. Tank and lines must be below level of injector pump return outlet.

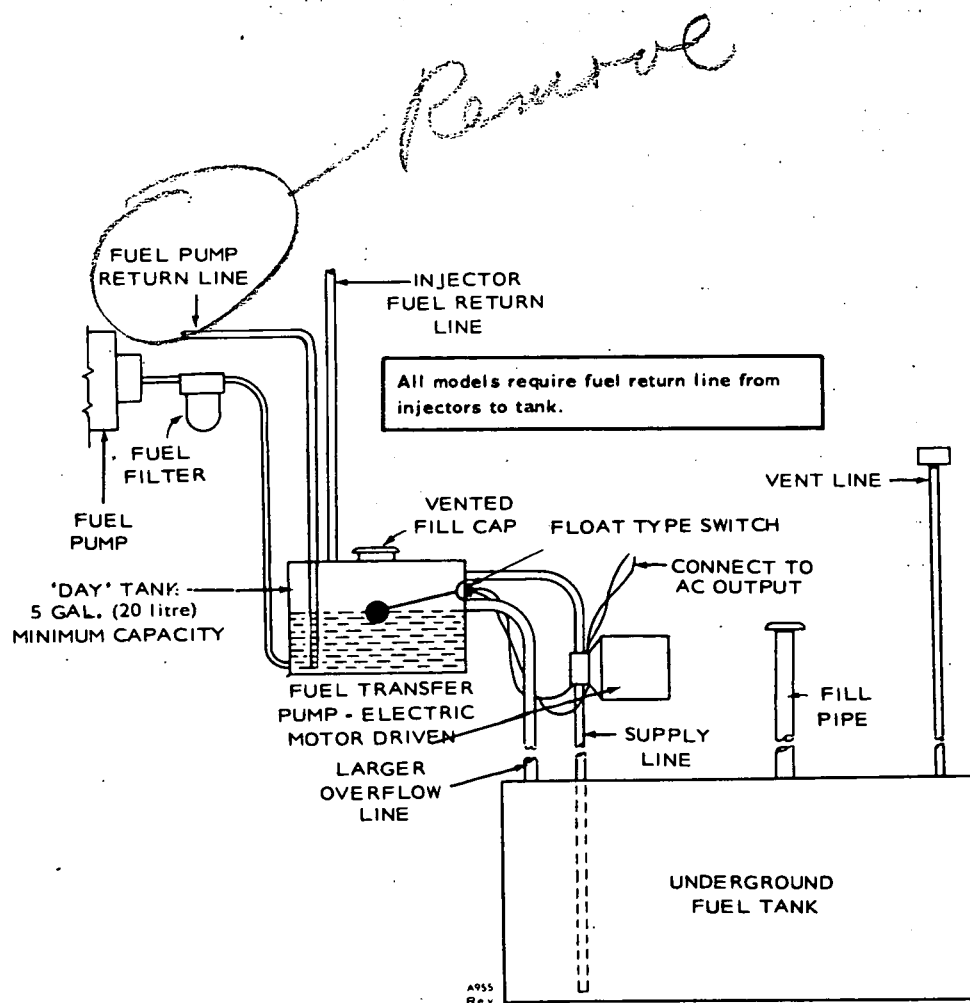


FIGURE 12. DAY TANK (TYPICAL)

## BATTERY

Starting the unit requires 24-volt battery current. Use two 12-volt (see *SPECIFICATIONS*) batteries for a normal installation. Connect the batteries in series (negative post of first battery to positive post of second) as in Figure 13. Necessary battery cables are on unit. Service the batteries as necessary. Infrequent unit use (as in emergency standby service) may allow the batteries to self-discharge to the point where they cannot start the unit. 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.

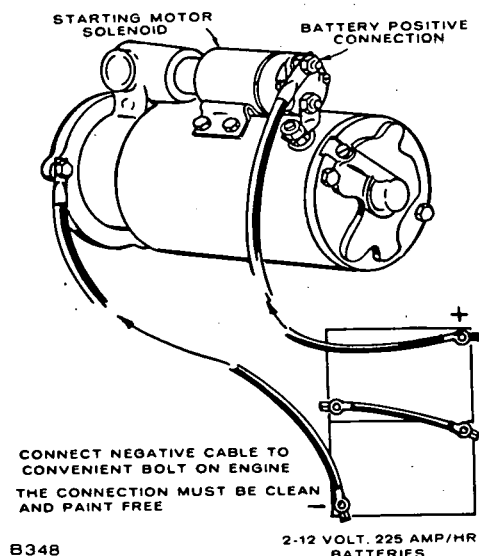


FIGURE 13. BATTERY CONNECTION

## BATTERY, HOT LOCATION

Batteries will self discharge very quickly when installed where the ambient temperature is consistently above 90° F (32.3° C) 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 (32.2° C), 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 a 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 14. If the distance between the set and remote station is less than 1000-feet (305 m), use No. 18 AWG wire; between 100- and 2000-feet (305 and 610 m), use No. 16 AWG wire.

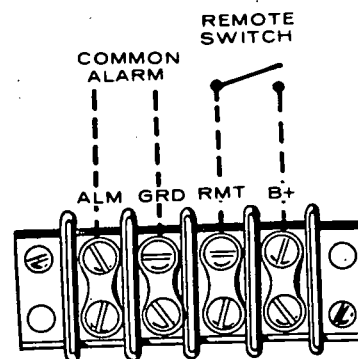


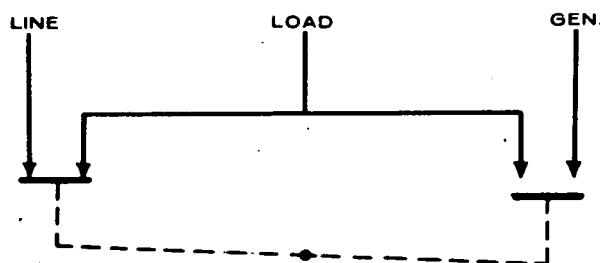
FIGURE 14. REMOTE START CONNECTION (TB12)

## 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.

Generator set grounding must be in accordance with National Electrical Code (NFPA 70-1975) Article 250.

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. See Figure 15. Instructions for connecting an automatic load transfer control are included with such equipment.



NOTE: SHOWN WITH LINE CONNECTED TO LOAD.

FIGURE 15. LOAD TRANSFER SWITCH (TYPICAL FUNCTION)

## CONTROL BOX CONNECTION

Reconnection lead W22 on TB21 is a jumper which connects a single phase output from the generator to the appropriate tap on the voltage reference transformer. This lead is connected at one end to terminal 63 on the terminal board. The other end will be connected to a terminal marked H3, H4 or H5 (see Figure 16) depending upon the voltage option required. Refer to Table 1 and Figure 20 for voltages available and correct hookup.

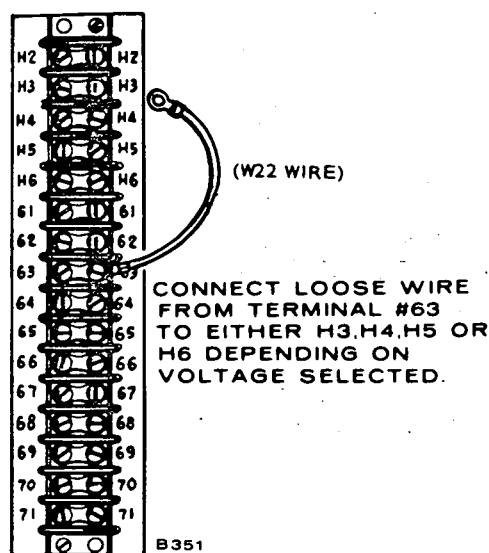


FIGURE 16. CONTROL BOX CONNECTION

## GENERATOR CONNECTIONS

The model YB17 generator is a 3-phase 60 Hz (YB517 is 50 Hz) unit which can be bus-bar connected (see Figure 18) in either series wye or parallel wye configuration to give the line-to-neutral or line-to-line options referred to in Table 1 and Figure 20. Special models -9X, -5D and -6D are connected at the factory and cannot be changed without extensive modification. Line-to-neutral voltage is the lower voltage noted on the unit nameplate, line-to-line voltage is the higher nameplate rating.

Refer to Figure 17 for an example of 120/208 voltage connection.

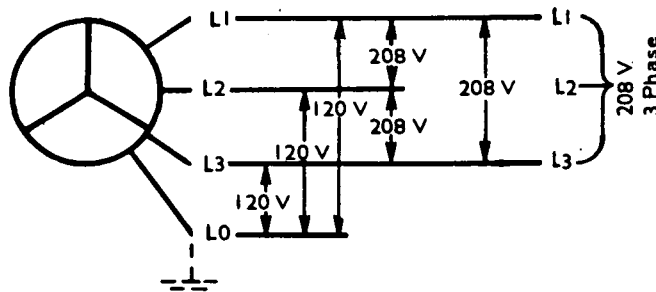


FIGURE 17. 3 PHASE WYE CONNECTION

For 3-phase loads connect separate load wires to each of the set terminals L1, L2 and L3 (Figure 17). For a large single phase load only, connect between terminals L1 and L2. Available capacity is 2/3 maximum output.

The terminal L0 can be grounded. For 1-phase loads connect the neutral wire to the L0 terminal. Connect the load wire to either terminal—L1, L2. Two separate single phase circuits are available with a total capacity of up to 2/3 of the generator rated 3-phase output.

If using 1-phase and 3-phase current at the same time, ensure the 1-phase load is properly balanced. Do not exceed rated line current.

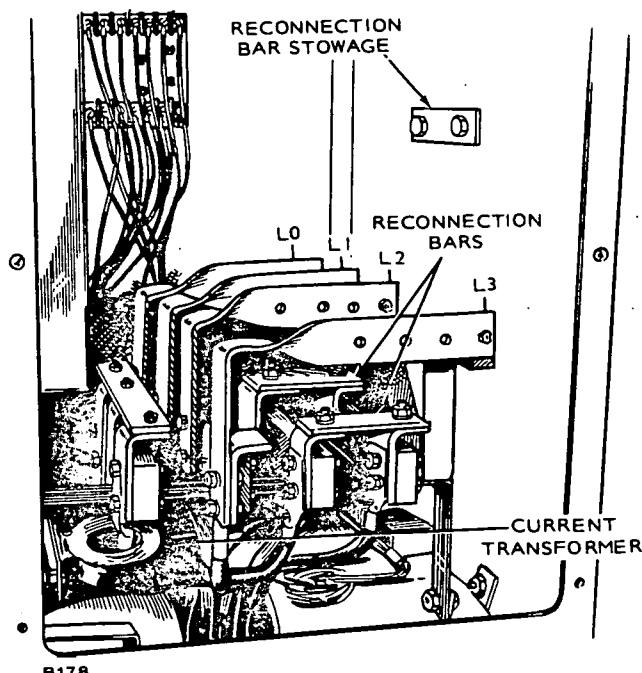


FIGURE 18. LOAD WIRE CONNECTIONS

Bus bars and reconnection bars are aluminum, plated with tin to retard electrolytic corrosion. Select connecting cables and terminal lugs with care, to keep dissimilar metals apart. Do not overtorque bolts. See Figure 18.

**Voltage Code -5D and -6D Delta Connected Sets:** Available in 60 Hz series delta winding only. The -5D unit is 120/240 volt, the -6D is 240/480 volt. These sets supply single phase and three phase current. For three phase operation connect load wires to generator terminals L1, L2 and L3, one wire to each terminal. Terminal L0 is not used.

For single phase operation, terminals L1 and L2 are supply terminals; L0 is neutral which can be tied to ground if required. For 120 volt (-5D) or 240 volt (-6D) single phase, connect load wire to either L1 or L2 terminal and the return to L0.

See Figure 19 for a typical connection to a delta wound unit.

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.

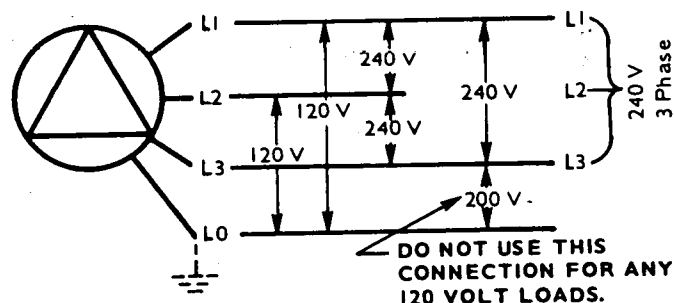


FIGURE 19. 3 PHASE, DELTA CONNECTION

NAMEPLATE VOLTAGE CODE	VOLTAGE	PHASE	FREQUENCY	CONNECT LEADS FROM TERMINAL 63 TO	GENERATOR CONNECTION	GENERATOR CONNECTION SCHEMATIC DIAGRAM	GENERATOR CONNECTION WIRING DIAGRAM
5D 6D	120/240 240/480	3	60	H5	SERIES DELTA		
17	120/208 127/220 139/240	3	60	H3 H4 H5	PARALLEL WYE		
517	110/190 115/200 120/208 127/220	3	50	H3 H4 H4 H5	PARALLEL WYE		
7	220/380	3	60	H3	SERIES WYE		
17	240/416 254/440 277/480	3	60	H3 H4 H5	SERIES WYE		
517	220/380 230/400 240/416 254/440	3	50	H3 H4 H4 H5	SERIES WYE		
9X	347/600	3	60	H5	SERIES WYE		

SINGLE PHASE NOTE NOT AVAILABLE

YB SERIES GENERATORS

98-2579(C)

FIGURE 20. OPTIONAL VOLTAGE CONNECTIONS

# OPERATION

## GENERAL

Onan DFS 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 crankcase to capacities shown below. After engine has been run, check dipstick, add oil to bring level to full mark. Record capacity for future oil changes.

Lubricating oil recommended for turbo-charged diesel engines is API Class CC/CD with a maximum sulphated ash content of 1.85%. Oils in this class should be satisfactory for most operating conditions. Do not mix brands nor grades of oil.

Oil viscosity should be as follows:

AMBIENT TEMPERATURES	VISCOSITY
-10°F (-23°C) and below	See engine manual.
-10 to 30°F (-23 to -1°C)	10W
20 to 60°F (-7 to 16°C)	20-20W
40°F (4°C) and above	30

Nominal lubricating oil capacity (including oil pan and filter) is ~~15.5~~ gallons (~~59~~ litres).

22.5

47.4

22.5

85.0

**Cooling System:** Cooling system was drained prior to shipment. Fill cooling system before starting. Nominal capacity is ~~15.5~~ gallons (~~59~~ litres). 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 Cummins engine manual for additional information.

### CAUTION

1. Verify that the electric solenoid valve used with city water cooled sets is open before initial starting of unit to allow coolant chambers to fill. Overheating and damage to the engine could result from noncompliance.

### CAUTION

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.

### WARNING

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 Cummins 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.

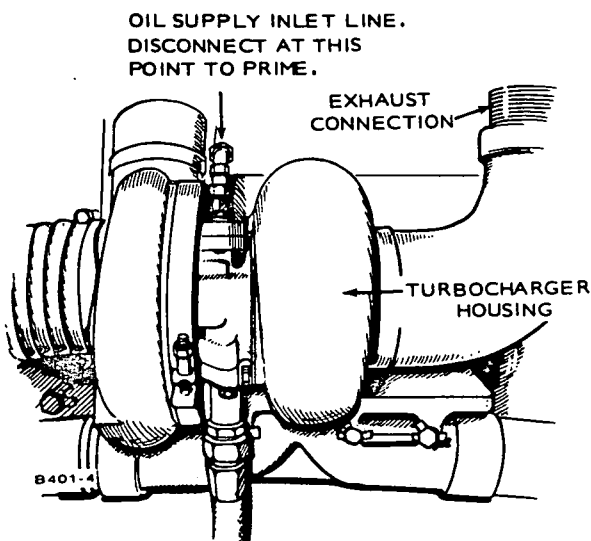
Condensate mixing with the sulphur in the fuel forms a sulphurous acid which will corrode and damage the engine. KEEP FUEL CLEAN.

### WARNING

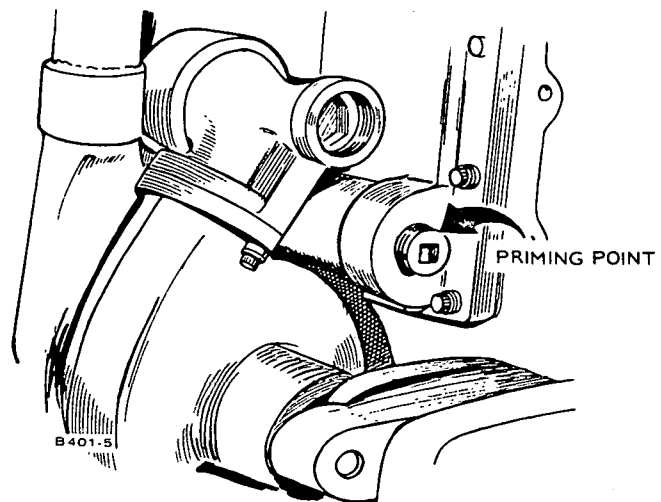
DO NOT SMOKE while handling fuel. Diesel fuel is flammable.

**Priming Oil System:** To prime oil system proceed as follows:

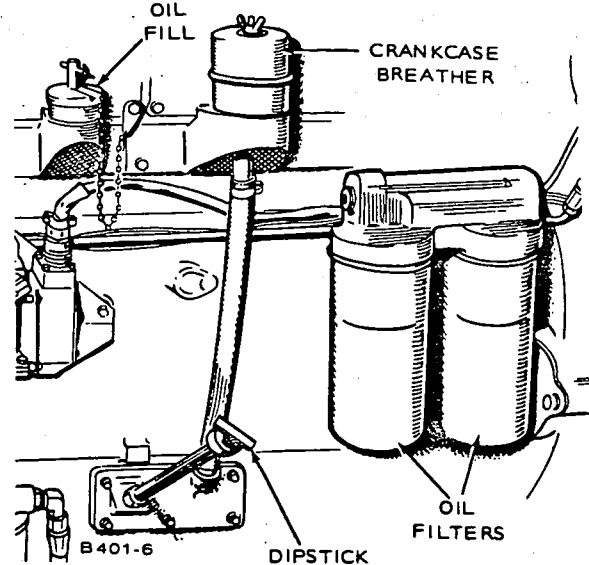
1. Remove oil inlet line from turbo-charger housing (Figure 21), fill bearing housing with clean engine lubricating oil; replace line, secure.
2. Fill crankcase to "L" (low) mark on dipstick (Figure 22).
3. Remove plug from head of oil filter housing (Figure 21A) and connect a hand or motor-driven priming pump from a source of clean lubricating oil to the plug boss in filter housing.
4. Prime until a 30 psi (207 kPa) pressure is obtained.
5. Disconnect wire from fuel solenoid valve (Figure 23), close throttle and crank engine while maintaining an external prime pressure of 15 psi (103 kPa), for 15 seconds.
6. Remove external priming equipment, replace plug in filter housing, torque 15 to 20 lb-ft (20 to 27 N.m).
7. Reconnect wire to fuel shut-off valve.
8. Complete oil fill to "H" (high) mark on dipstick.



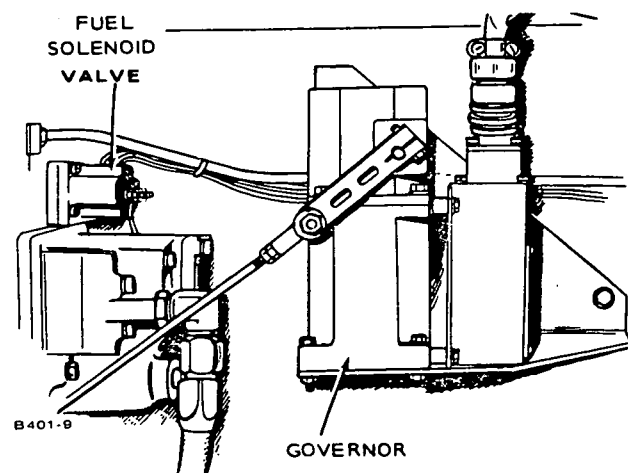
**FIGURE 21. PRIMING TURBOCHARGER**



**FIGURE 21A. LUBRICATION SYSTEM PRIMING POINT**



**FIGURE 22. OIL FILL AND DIPSTICK LOCATIONS**



**FIGURE 23. FUEL SOLENOID VALVE LOCATION**



**Priming Fuel System:** Priming should not be necessary as the set was checked out before shipping. If however it is desired to verify and reprime system, remove each fuel filter and fill with clean fuel oil. Replace filters and make sure that all connections are secure (see Figure 27).

## 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 (26.7°C). 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. Governor sump filled (Figure 24).
3. Cooling system filled—input solenoid valve open.
4. Batteries charged and connected.
5. 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 50- and 70 psi (345.0—483 kPa). 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 165°F to 195°F (74°C to 90.6°C). 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 165°F to 195°F (74°C to 90.6°C).

## STOPPING

To reduce and stabilize the engine temperatures and prevent turbocharger housing damage, 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.

## 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.

## EXERCISE PERIOD

Generator sets on continuous standby service are required to be operative at essential loads from a cold start in a short period of time 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 off 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**  
**(Engines with only one fault lamp)**

SYMPTOM	CORRECTIVE ACTION
1. Engine stops cranking and fault lamp lights, after cranking approximately 75 seconds.	1. See engine service manual for troubleshooting fuel system.  After correcting problem, reset engine monitor relay by placing Run-Stop/Reset-Remote switch to Stop/Reset, then back to the required running position.
2. Fault lamp lights immediately after engine starts.	2. Check for: Overspeed condition as engine starts.
3. Fault lamp lights and engine shuts down after running for a period.	3. Check the following: a. Oil level. Engine will shut down if sensor is closed. b. Check engine manual for troubleshooting oil system. c. High engine temperature. Check coolant level; check water flow (city water cooled systems); check radiator for free air flow, and fan belts for tightness. See engine manual for troubleshooting cooling system. d. Check for faulty oil pressure sensor or faulty high engine temperature sensor.
4. Engine runs, shuts down and cranks for 75-seconds. Cranking cycle stops; fault lamp lights.	4. Check fuel supply.
5. Fault lamp lights, no fault exists.	5. To check a no-fault condition, disconnect leads from TB11 terminals 29, 30 and 31. If fault lamp lights with leads disconnected, replace engine monitor board. Reconnect leads.

**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.  After correcting fault, reset engine monitor relay by placing Run-Stop/Reset-Remote switch to Stop/Reset position, depressing Reset button, then to the required running position.
2. Engine runs, shuts down, cranks for 75-seconds, cranking cycle stops, overcrank light ON.	2. Check fuel supply.
3. *Low oil pressure shutdown.	3. Check— a. Oil level. Replenish if necessary. b. Sensor. Faulty sensor will shut down engine. c. Refer to engine service manual for troubleshooting guide for oil system.
4. *High engine temperature shutdown.	4. Check— a. Coolant level. Replenish if necessary. b. City water cooled sets. Check water flow, valves, etc. c. Check sensor; check thermostat. d. Radiator model, check fan belts, radiator for obstructions, etc.
5. Overspeed shutdown.	5. Check governor and throttle linkages for freedom of movement. Check overspeed switch.
6. Overspeed light on, no shutdown.	6. Disconnect wire at TB11-29. Light on after reset; replace engine monitor board.
7. *Low oil pressure light ON. No shutdown.	7. Disconnect wire at TB11-30. Light ON after relay reset. Replace engine monitor board.
8. *High engine temperature light ON. No shutdown.	8. Disconnect wire at TB11-31. Light ON after relay reset. Replace engine monitor board.

\*NOTE: Not applicable on Pennsylvania State models.

## OUT-OF-SERVICE PROTECTION

If an engine remains out of service for three or four weeks (maximum six months), special precautions should be taken to prevent rust. The operations listed below are required to minimize or prevent damage to temporarily stored engines.

1. Engine must be started and operated until thoroughly warm. Disconnect fuel lines to engine fuel filter and injector drain line. Fill two containers, one with diesel fuel and a second with preservative oil.
2. Start engine with fuel line to filter using diesel fuel. The injector drain line can flow into the container with diesel fuel. After engine is running smoothly, switch fuel line to container with preservative oil. Operate five to ten minutes on preservative oil. Stop engine and reconnect the fuel lines.
3. Drain oil sump, fuel filters and fuel tank and reinstall drain plugs. Sump may remain empty until engine is ready for use; tag engine with warning tag.
4. Disconnect electrical wiring and turn fuel pump manual shut-off valve fully counterclockwise. Spray lubricating oil into intake manifold and air compressor while cranking engine slowly.
5. Cover all openings with tape to prevent entrance of dirt and moisture.
6. Drain coolant from cooling system unless it is permanent type antifreeze with rust inhibitor added.
7. Store engine in dry and uniform temperature area.
8. Bar engine crankshaft two or three revolutions each three to four weeks.

Above storage procedure is valid for a six month maximum period. For storage in excess of six months, refer to Cummins Service manual.

## PREPARING A STORED ENGINE FOR SERVICE

When an engine is removed from storage and put into service, the following operations should be performed.

### Clean Engine

1. Clean accumulated dirt from exterior of engine. Remove covers, tape and wrappings.

2. Use suitable cleaner to remove rust preventive compound from unpainted surfaces.
3. Refill crankcase with clean lubricating oil. Flush and fill cooling system.

## Inspection

1. When an engine has been stored for six months or less, it is necessary to adjust injectors, valves and belts, tighten cylinder head capscrews and connections; replace filters and check air filter and screens.
2. When an engine has been stored for six months or more, the following procedure should be followed:
  - a. Flush fuel system with clean fuel oil until all preservative oil is removed.
  - b. Remove plug from oil gallery and force hot, light mineral oil through the oil passages to flush away all preservative oil. Bar over engine crankshaft three or four revolutions during flushing operation.
  - c. Replace all filters and clean all screens before engine is started.
  - d. After inspecting engine and parts, make sure all preservative oil and gummed oil has been flushed away.
3. Clean and check battery. Measure specific gravity (1.250 at 77°F [25°C]) and verify 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 coolant level, adjust or refill as necessary.
5. Connect batteries.
6. Verify that no loads are connected to generator.
7. Perform 'PRESTART SERVICING.' Start engine.
8. After start, apply load to at least 50 percent of rated capacity.
9. Check all gauges to be reading correctly. Unit is ready for service.

## HIGH ALTITUDE

Ratings apply to altitudes up to 5000-feet (1500 m), standard cooling, normal ambients and with No. 2 Diesel fuel. Consult factory or nearest authorized Onan distributor for operating characteristics under other conditions.

## 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 Cummins 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.

# GENERAL MAINTENANCE

## GENERAL

Establish and adhere to a definite schedule of maintenance inspection and servicing, application and environment being the governing factors in determining such a schedule. If your set is a prime power application, base your schedule on operating hours. Use the running time meter to log hours run; maintain an accurate record of hours and service for warranty support.

A set on stand-by duty will need servicing at times other than those recommended by Onan and the engine manufacturer. Refer to Cummins manual for engine services and maintenance procedures. Adjust your schedule to satisfy the following conditions—

- Continuous duty (prime power)
- Standby power
- Extremes in ambient temperature
- Exposure to elements
- Exposure to salt water or sea water
- Exposure to dust, sand, etc.

Consult with your ONAN distributor or dealer for a schedule of maintenance and service more suitable to the unique environment and application of your set.

### **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.

**TABLE 5. OPERATOR MAINTENANCE SCHEDULE**

MAINTENANCE ITEMS	OPERATIONAL HOURS			
	8	50	100	200-250
Inspect Set	x			
Check Radiator Coolant	x			
Check Oil Level	x4			
Check Air Cleaner (Clean if Required)		x1		
Clean and Inspect Crankcase Breather			x	
Inspect Fan Belt			x2	
Check Cooling System			x3	
Clean and Inspect Battery Charging Alternator				x
Change Crankcase Oil			x1	
Replace Oil Filter Element			x1	
Check Batteries		x5		
Replace Fuel Filter				x
Check all hardware, fittings, clamps, fasteners, etc.			x6	

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

x2 - Or every 3 months, adjust to 1/2 inch depression between pulleys.

x3 - Or every 3 months, check for rust or scale formation. Flush if necessary.

x4 - For accurate readings, check oil level approximately 15 minutes after shutdown. Keep oil level as near "FULL" mark on dipstick as possible. See engine manual.

x5 - Or every two weeks.

x6 - Or every 3 months.

**NOTE:** The above schedule is a minimum requirement. For the recommended service periods for your engine, refer to engine manual.

## GOVERNOR ADJUSTMENTS - ENGINE SPEED

A Barber-Colman governor is standard equipment on DFS generator sets. Governor is set at the Onan testing facility and does not require further adjustment for normal standby service.

If however unit is used frequently or if the governor is removed for service, adjustment may be required. This is accomplished as follows:

1. Remove four screws and cover from governor controller (Figure 24).
2. Disconnect wire from TB11-22. This disconnects the starter solenoid.
3. Place Run-Stop-Remote switch to RUN position. Governor should stay at the minimum fuel position. If this position is not obtained, consult with Onan service representative.
4. Return Run-Stop-Remote switch to STOP. Reconnect wire at TB11-22.
5. Position speed control rheostat on generator control panel to midrange of travel (out 5-turns from low r/min).
6. Adjust speed reference potentiometer in governor controller counterclockwise four complete turns.
7. Start engine. Be prepared at this point, to assume manual control of engine in the event that adjustments are incorrect. If engine does not attain correct r/min it may be necessary to adjust the speed reference potentiometer. Clockwise to increase speed, counterclockwise to decrease.
8. Adjust Gain potentiometer slightly clockwise then counterclockwise as necessary until engine is stable and responsive to governor control.

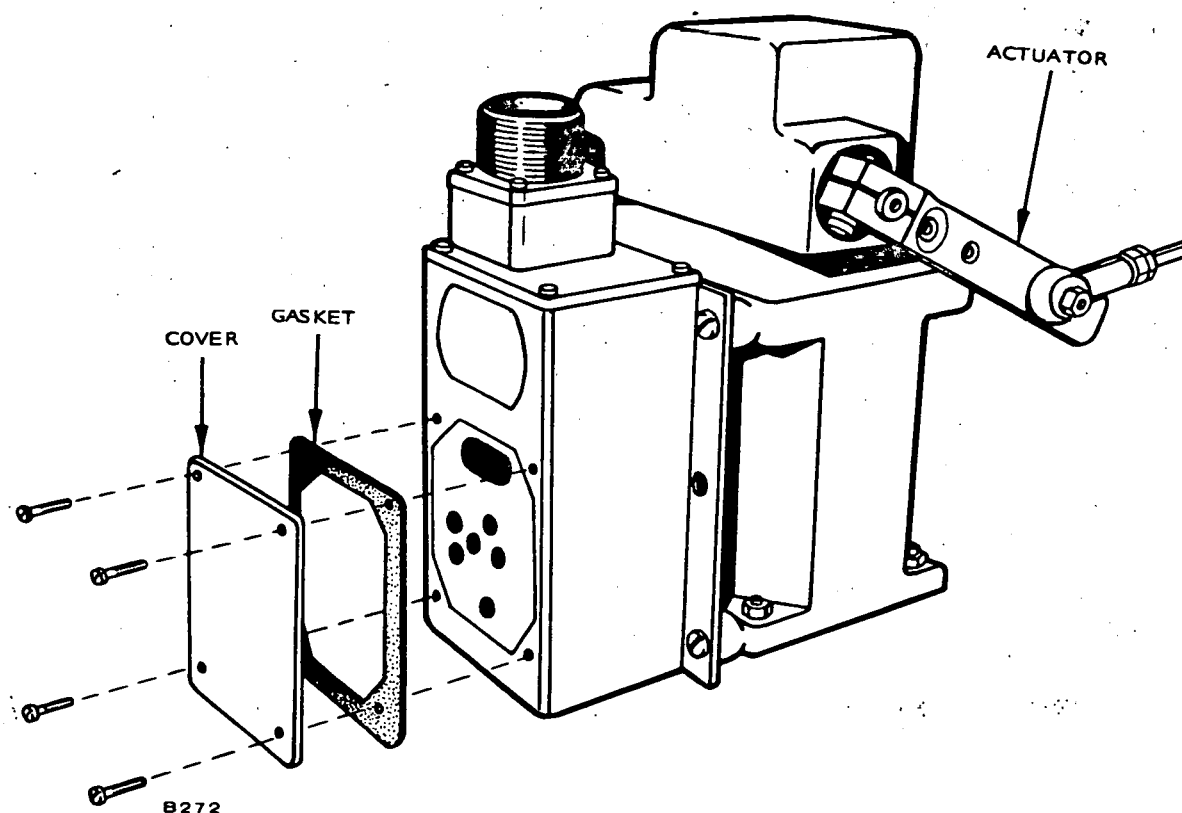
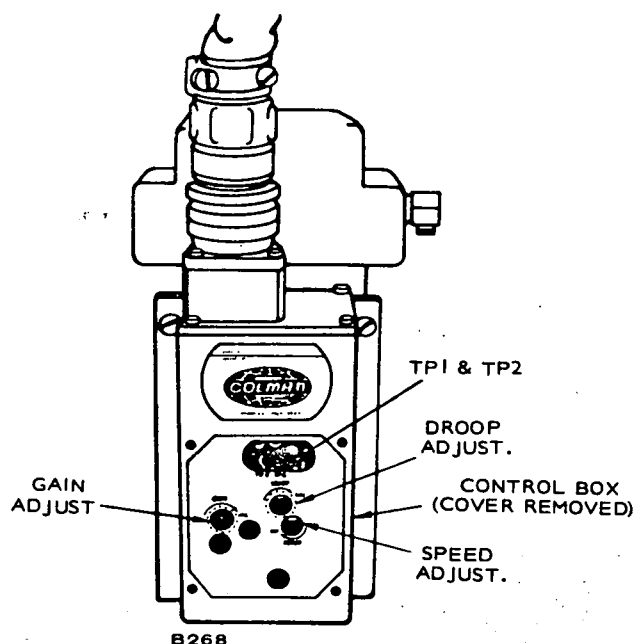


FIGURE 24. BARBER COLMAN GOVERNOR



**FIGURE 24A. GOVERNOR CONTROL BOX**

9. Load and unload engine several times to ensure correct gain adjustment.
10. Shut down engine. Restart engine to make sure that unit does not overspeed.
11. Shut down engine. Replace governor control box cover. Engine is now ready for service.

Any subsequent speed adjustment can be made at the control panel potentiometer.

When using 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 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.

## 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 1.280.

## 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.



## FILTERS

A planned program of filter cleaning or replacement will pay dividends in engine life, operation and reliability.

**Air Filter:** Replace or clean when plugged, or in accordance with service maintenance instructions. To remove filter element loosen eight nuts holding head, lift off head and remove filter element (see Figure 25).

Recommended cleaning method for element:

1. Blow dry compressed air (30 psi [207 kPa] maximum) through element from clean side. Hold air nozzle at least 1 inch (25 mm) away.
2. Soak for at least 15 minutes in water and Donaldsons D1400 solvent to remove soot and carbon as well as dirt. Rinse until water is clear (use low pressure water) and air dry. Do not use compressed air.

### CAUTION

Filters should be handled with care to prevent damage. If the filter does become damaged, install recommended replacement part.

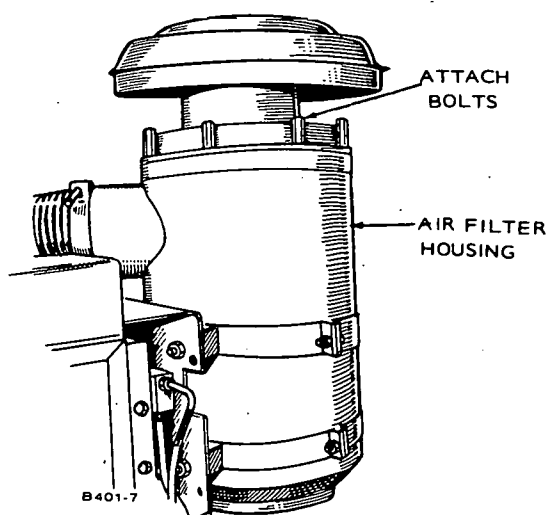


FIGURE 25. AIR FILTER

**Lubrication Oil Filter:** Spin-off throw away elements, replace at every oil change.

To change filter, proceed as follows—

1. Unscrew and discard filters (Figure 26).
2. Fill new filters with lubricating oil.
3. Position filter on adapter and hand tighten until seal contacts filter head. Advance one-half to three quarters turn. Do not overtighten.
4. Fill crankcase to "H" mark on dipstick, run engine to verify no oil leaks, shut down engine and add oil as necessary.

Always allow 15 minutes after engine shutdown before checking oil level. This will give oil time to drain back into the crankcase.

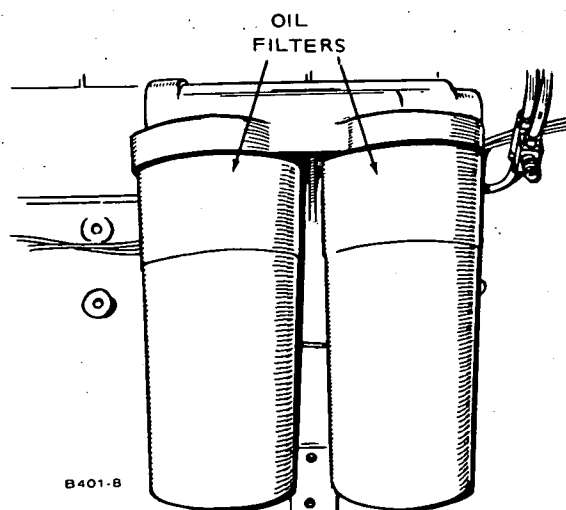


FIGURE 26. LUBRICATION OIL FILTER

**Fuel Filter:** Spin-off throw-away unit. A water drain is situated at the bottom of the filter case. This should be used to drain off moisture either daily or at the end of every exercise period, depending on unit application. When replacing filter, fill with clean fuel before installation (see Figure 27).

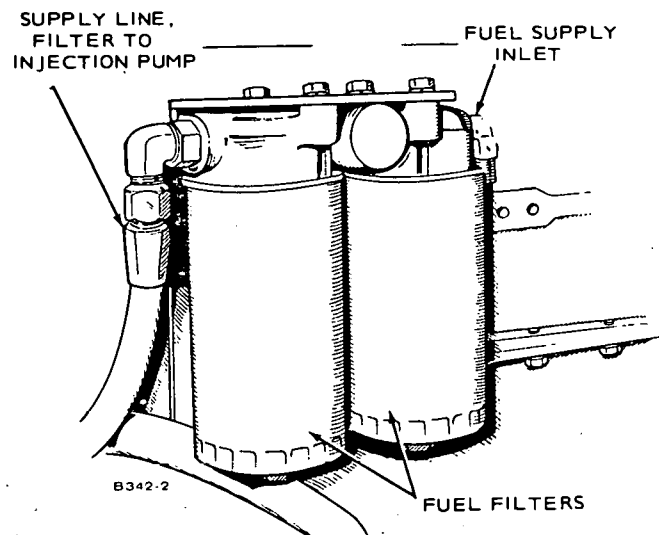


FIGURE 27. FUEL FILTERS

**Coolant Filter:** A shut off valve (see Figure 28) is installed in the coolant filter housing to be closed, for minimum coolant loss when the filter is removed. Refer to engine manufacturer's manual for coolant filter replacement information.

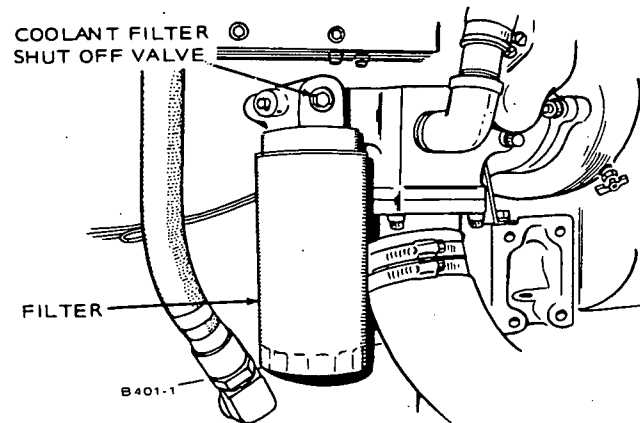


FIGURE 28. COOLANT FILTER

**Crankcase Breather Filter:** To clean crankcase breather filter elements, proceed as follows:

1. Remove wing nut, flat-washer and rubber washer holding cover, lift cover and remove (see Figure 29).
2. Lift out breather element. Discard element.
3. Inspect all parts, replace if necessary.
4. Reassemble filter assembly using new filter element, replace cover and secure.

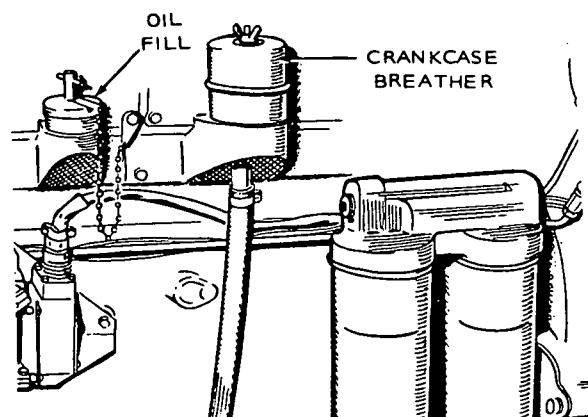



FIGURE 29. CRANKCASE BREATHER FILTER

# PARTS CATALOG

## 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.



# ONAN

## ELECTRIC GEN SET

MODEL:

SERIAL NO:

**IMPORTANT** ALWAYS GIVE ABOVE NOS WHEN ORDERING PARTS

---

CONTINUOUS  RATING  
 120/240 VOLT 60 HZ RPM 3600  
 PHASE PHASE

KW	KVA	KW	KVA	KW	KVA
VOLTS 120/240	127/220	139/240	12C/240	240/416	
AMPS					
VOLTS 254/440	277/480	347/600		120/240	
AMPS					
HAT <span style="border: 1px solid black; padding: 2px 20px;"></span>		VOLTS <span style="border: 1px solid black; padding: 2px 20px;"></span>			


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MANUFACTURED BY

**ONAN**


DIV. OF ONAN CORPORATION  
MINNEAPOLIS, MINN. 55432 U.S.A.

FOR ELECT. EQUIPMENT ONLY



## CUMMINS PARTS

All Cummins parts must be ordered from the Cummins Engine Company, Inc., Columbus, Indiana or their nearest authorized Cummins distributor or dealer. When ordering parts, refer to the Cummins nameplate and supply all information stated.

<b>CUMMINS</b>		CUMMINS ENGINE COMPANY, INC. COLUMBUS, INDIANA, U.S.A.					
SBM NO.	<input type="text"/>	MODEL	<input type="text"/>	ENG NO.	<input type="text"/>	OTHER REF. NO.	<input type="text"/>

This Parts Catalog applies to the standard DFS generator sets as listed below, powered by a Cummins KT1150G engine (see Cummins manual). Engine parts modified or added by Onan will be in this list and have Onan part numbers. These supersede similar parts listed in the Cummins manual. Onan parts are arranged in group of related items and are identified by a reference number. All parts illustrated are typical. Unless otherwise mentioned, parts are interchanged. Right and left generator set sides are determined by facing the front end of the engine.

**ELECTRIC GENERATING SET DATA TABLE**

MODEL AND SPEC NO.*	ELECTRICAL DATA			
	WATTS	VOLTS	HERTZ	PHASE
300.0DFS 5DR/	300,000	120/240	60	3
300.0DFS 6DR/	300,000	240/480	60	3
300.0DFS 7R/	300,000	220/380	60	3
300.0DFS 9XR/	300,000	347/600	60	3
300.0DFS 17R/	300,000	†	60	3
250.0DFS 517R/	250,000	†	50	3

\* - The Specification letter advances (A to B to C, etc.) with manufacturing changes.

† - These sets are reconnectable; refer to Specifications (generator details).

## REPLACEMENT ENGINE

100-1360

1 Engine Replacement (Cummins KT1150G)

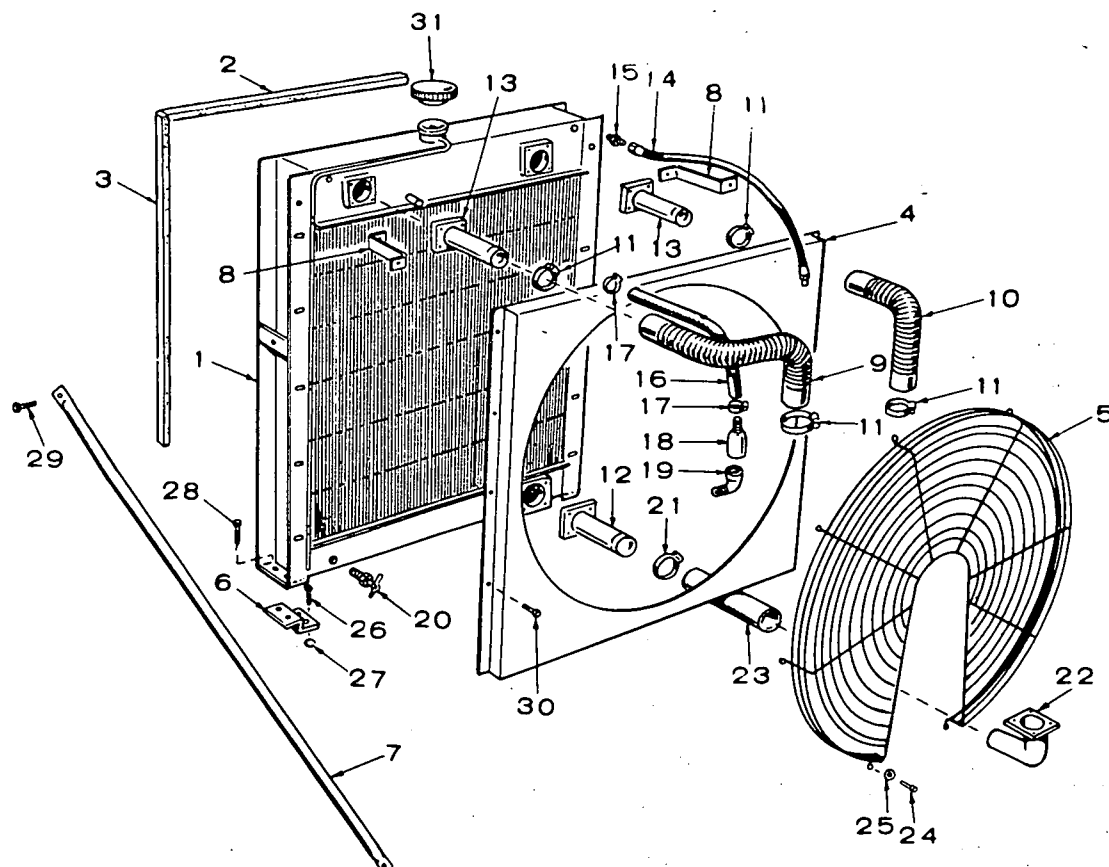
### General Description:

*Includes:* Complete Cylinder Block, Fuel Pump, Governor, Starter, Fan Blade (pusher type), Fan Belt, Flywheel, Water Pump, Turbocharger, Fuel Filter, Oil Filter

*Excludes:* Alternator, Water Temperature Sender, Oil Pressure Sender, Radiator, Ammeter, Voltage Regulator, Carburetor, Air Cleaner

**NOTE:** Replacement Engine is for Spec 1 generator sets—for all other Specs, refer to factory.

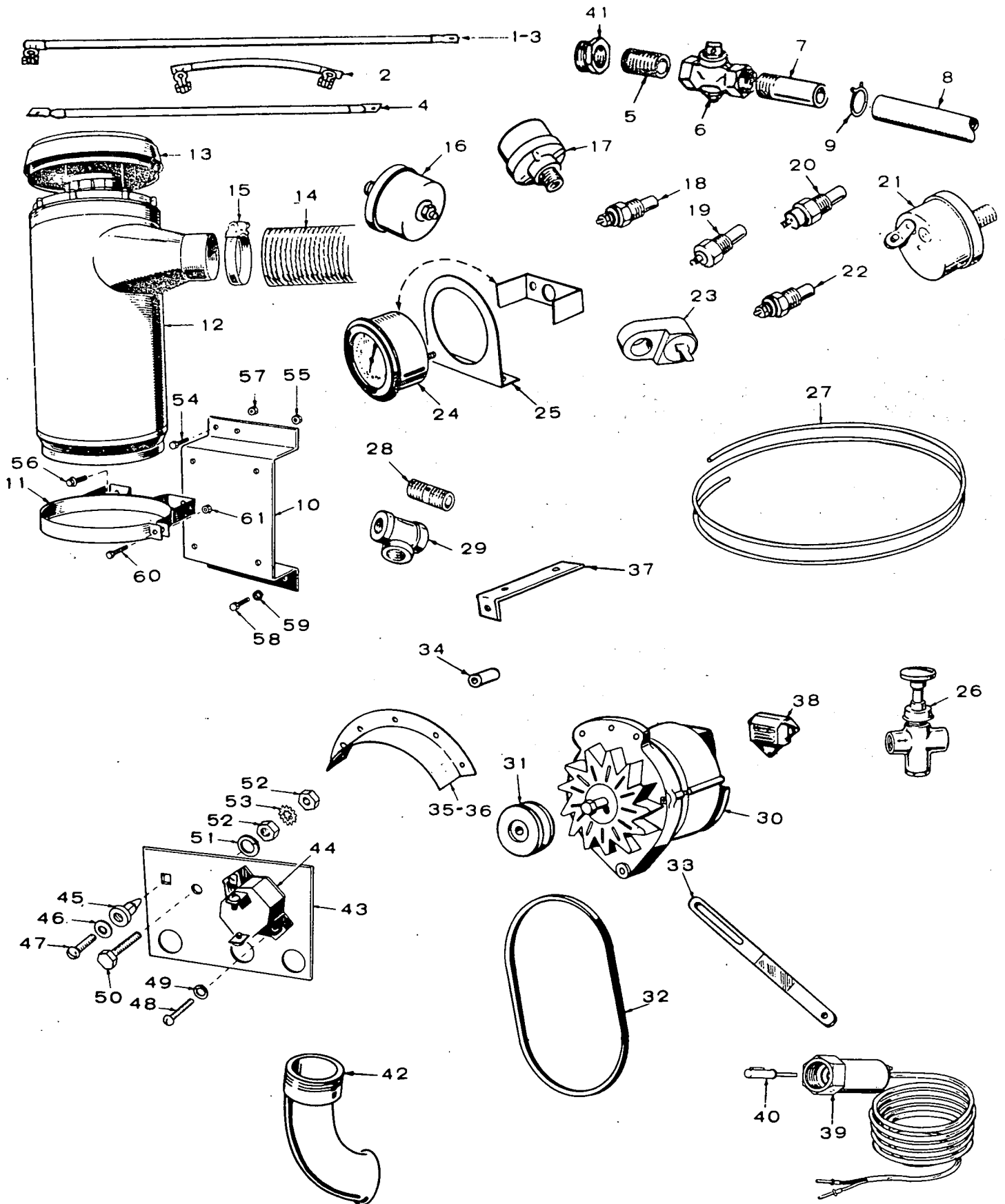
# RADIATOR GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130-1010	1	Radiator
2	130-1007	2	Foam, Insulation
3	130-1006	2	Foam, Insulation
4	130-1003	1	Shroud, Fan
5	130-1013	1	Guard, Fan
6	130-1004	2	Bracket, Radiator Support
7	130-0994	2	Brace, Radiator Support
8	130-0996	2	Brace, Radiator Support (Upper)
9	503-0629	1	Hose, Radiator
10	503-0615	1	Hose, Radiator
11	503-0354	4	Clamp, Radiator Hose
12	130-1001	1	Tube, Outlet
13	130-1002	1	Tube, Inlet
14	501-0087	1	Line, Flexible - Vent
15	502-0184	1	Connector, Male
16		1	Hose (Order 56" of Bulk Hose #503-0249)
17	503-0429	2	Clamp, Hose
18	505-0759	1	Adapter, Pipe (1")
19	505-0003	1	Elbow, Street (1")
20	504-0003	1	Cock, Drain
21	503-0518	2	Clamp, Hose
22	130-1028	1	Inlet, Water

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
23		1	Hose (Order 8" of Bulk Hose #503-0369)
24	821-0018	8	Screw, Cap - Lock Head - Radiator Fan Guard Mounting (1/4-20 x 5/8")
25	526-0018	8	Washer, Flat - Radiator Fan Guard Mounting (17/64" ID x 5/8" OD x 1/16" Thk)
26	800-0130	4	Screw, Cap - Hex Head - Radiator Support Mounting (5/8-11 x 1")
27	850-0070	4	Washer, Lock - Spring - Radiator Support Mounting (5/8")
28	821-0014	8	Screw, Cap - Lock Head - Radiator to Fan Guard Mounting (5/16-18 x 1/2")
29	821-0029	2	Screw, Cap - Lock Head - Radiator Support Brace Mounting (3/8-16 x 3/4")
30	821-0014	8	Screw, Cap - Lock Head - Radiator Shroud Mounting (5/16-18 x 1/2")
31	130-0449	1	Cap, Radiator

# MISCELLANEOUS ENGINE PARTS GROUP

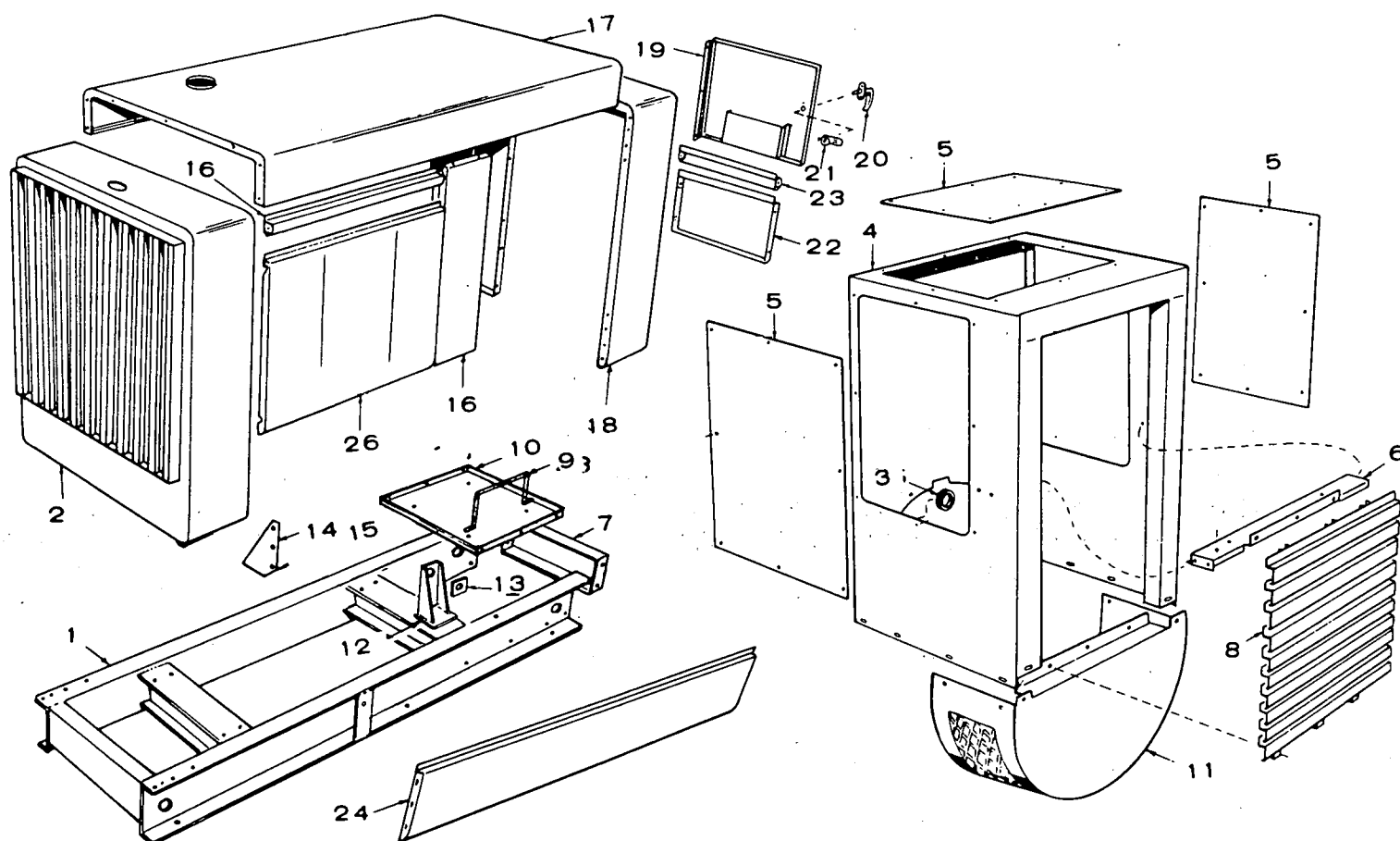


## MISCELLANEOUS ENGINE PARTS GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	416-0444	1	Cable, Battery - Positive	36	191-1150	1	Guard, Belt - Alternator (Left Hand)
2	416-0473	1	Cable, Jumper	37	191-1151	1	Bracket, Guard Mounting - Alternator
3	416-0445	1	Cable, Battery - Negative	38	191-0733	1	Regulator, Alternator (24 Volt)
4	416-0632	1	Cable, Starter	39	302-0750	1	Sender, Tachometer - (Optional)
5	505-0100	1	Nipple, Pipe - Oil Drain	40	302-0753	1	Tang, Tachometer Drive (Optional)
6	504-0011	1	Valve, Shut-off - Oil Drain	41	505-0117	1	Bushing, Reducer
7	505-0185	1	Nipple, Half - Oil Drain	42	155-1393	1	Elbow, Exhaust Outlet
8		1	Hose, Rubber - Oil Drain - (Order 8" of bulk hose #503-0098)	43	332-1382	1	Bracket, Terminal Mounting
9	503-0197	1	Clamp, Hose - Oil Drain	44	320-0240	1	Breaker, Circuit
10	140-1372	1	Bracket, Air Cleaner Mounting	45	870-0196	1	Nut, Insulated
11	140-1345	2	Band, Air Cleaner Mounting	46	508-0015	1	Washer, Fibre
12	140-1346	1	Cleaner, Air	47	809-0035	1	Screw, Machine - Round Head (#8 x 3/4")
13	140-1347	1	Cap, Air Cleaner	48	811-0103	2	Screw, Machine - Round Head (#10-32 x 3/4")
14		1	Hose, Flexible Air Cleaner (Order 40" of bulk hose #503-0641)	49	850-0030	2	Washer, Lock - Spring (#10)
15	503-0748	2	Clamp, Hose	50	800-0007	1	Screw, Cap - Hex Head (1/4-20 x 1")
16	193-0108	1	Sender, Oil Pressure Gauge	51	850-0040	1	Washer, Lock - Spring (1/4")
17	309-0169	1	Switch, Low Oil Pressure Cut-off	52	862-0001	2	Nut, Hex (1/4-20)
18	193-0109	1	Sender, Water Temperature	53	856-0006	1	Washer, Lock - External/Internal - (1/4")
19	309-0178	1	Switch, High Temperature	54	800-0050	2	Screw, Cap - Hex Head - Air Cleaner Bracket Mounting (3/8-16 x 1")
20	309-0179	1	Switch, High Water Shutdown	55	870-0281	2	Nut, Hex - Self Locking - Air Cleaner Bracket Mounting (3/8-16)
21	309-0272	1	Switch, Low Oil Alarm	56	821-0029	4	Screw, Cap - Lock Head - Air Cleaner Band Mounting (3/8-16 x 3/4")
22	193-0202	1	Sender, Oil Temperature	57	870-0281	4	Nut, Hex - Self Locking - Air Cleaner Band Mounting (3/8-16)
23	309-0269	1	Switch, Low Engine Temperature Alarm	58	801-0097	2	Screw, Cap - Hex Head - Air Cleaner Bracket Mounting (5/8-18 x 1-1/4")
24	193-0128	1	Gauge, Fuel Pressure (Optional)	59	850-0070	2	Washer, Lock - Spring - Air Cleaner Bracket Mounting (5/8")
25	193-0029	1	Bracket, Fuel Pressure Gauge Mounting	60	800-0032	2	Screw, Cap - Hex Head - Air Cleaner Band (5/16-18 x 1-3/4")
26	504-0064	1	Valve, Test	61	870-0257	2	Nut, Hex - Self Locking - Air Cleaner Band (5/16-18)
27		1	Line, Fuel Pressure Gauge - (Order 6 feet of bulk copper tubing #93-0059)				
28	505-0098	1	Nipple, Close (1/8)				
29	505-0059	1	Tee, Pipe (1/8)				
30	191-0688	1	*Alternator (24 Volt Negative Ground)				
31	191-0781	1	Pulley, Alternator				
32	511-0059	1	Belt, Alternator				
33	191-1152	1	Bracket, Alternator Adjusting				
34	191-1153	1	Spacer, Alternator Mounting				
35	191-1149	1	Guard, Belt - Alternator (Right Hand)				

\* - For Components, contact your nearest Motorola dealer or Automotive Products Inc. 9401 West Grand Avenue, Franklin Park, Illinois 60131

## MOUNTING AND HOUSING GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	403-1218	1	Skid, Base
2	405-2228	1	Panel, Front End (Radiator Cooled Models)
3	508-0001	1	Grommet, Rubber
4	301-3605	1	Housing, Control Box
5	301-3731	3	Plate, Control Box Side
6	301-3604	1	Shelf, Control Box Housing
7	403-1200	1	Panel, Base
8	234-0490	1	Grille, Generator Air Inlet
9	416-0635	2	Strap, Battery Hold-down
10	416-0674	1	Tray, Battery
11	234-0489	1	Cover, End Bell
12	232-2385	2	Plate, Generator Mounting Retainer
13	232-2389	2	Bracket, Generator Mounting
14	BRACKET, PANEL MOUNTING (Right Hand) - RADIATOR COOLED MODELS		
	405-2236	1	Unhoused Sets
	405-2236	3	Housed Sets
15	BRACKET, PANEL MOUNTING (Left Hand) - RADIATOR COOLED MODELS		
	405-2237	1	Unhoused Sets
	405-2237	3	Housed Sets

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
16	405-2220	2	*Panel, Center Radiator Cooled Models
17	405-2229	1	*Panel, Top Housing - Radiator Cooled Models
18	405-2227	1	*Panel, Rear End- Radiator Cooled Models
19	405-1880	1	*Door, Rear Housing - Radiator Cooled Models
20	406-0157	1	*Handle, Lock - Radiator Cooled Models
21	406-0089	1	*Catch, Lock Handle - Radiator Cooled Models
22	405-1858	2	*Panel, Rear Louver - Radiator Cooled Models
23	405-1856	1	*Panel, Lower Rear Housing - Radiator Cooled Models
24	405-2221	2	*Panel, Base - Radiator Cooled Models
25	405-2014	8	*Panel, Lower - Radiator Cooled Models
26	405-2011	4	*Door, Housing - Radiator Cooled Models

\*Housed Sets Only



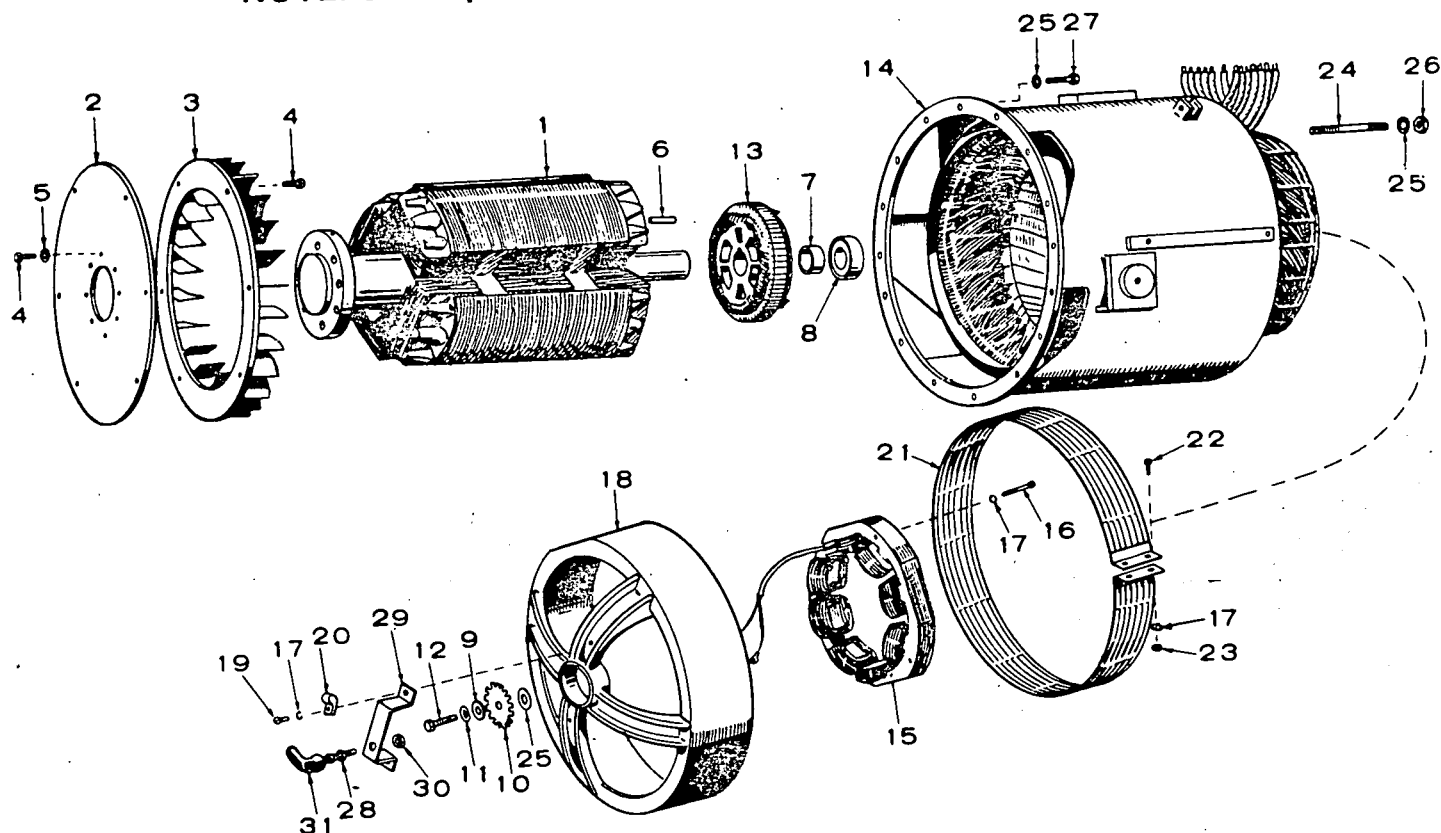
# MOUNTING AND HOUSING GROUP

## ASSOCIATED MOUNTING HARDWARE (Not Illustrated)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	800-0156	4	Screw, Cap - Hex Head - Generator Bracket Mounting (3/4-10 x 2-1/4")		800-0030	As Req	Screw, Cap - Hex Head - Rear Panel End Mounting (5/16-18 x 1-1/4")
	800-0156	2	Screw, Cap - Hex Head - Front Engine Mounting (3/4-10 x 2-1/4")		821-0014	As Req	Screw, Cap - Lock Head - Lower Panel Mounting (5/16-18 x 1/2")
	800-0131	4	Screw, Cap - Hex Head - Radiator Bracket Mounting (5/8-11 x 1-1/4")		850-0079	4	Washer, Lock - Spring - Generator Bracket Mounting (3/4")
	800-0131	2	Screw, Cap - Hex Head - Radiator Support Bracket Mounting (5/8-11 x 1-1/4")		850-0079	2	Washer, Lock - Spring - Front Engine Mounting (3/4")
	821-0016	6	Screw, Cap - Lock Head - Battery Tray Mounting (5/16-18 x 3/4")		850-0070	4	Washer, Lock - Spring - Radiator Bracket Mounting (5/8")
	800-0035	4	Screw, Cap - Hex Head - Battery Hold-down Strap Mounting (5/16-18 x 2-1/2")		850-0070	2	Washer, Lock - Spring - Radiator Support Bracket Mounting (5/8")
	821-0016	4	Screw, Cap - Lock Head - Bare Panel Mounting (5/16-18 x 3/4")		850-0045	4	Washer, Lock - Spring - Battery Hold-down Strap Mounting (5/16")
	821-0014	As Req	Screw, Cap - Lock Head - Control Box Mounting (5/16-18 x 1/2")		850-0060	As Req	Washer, Lock - Spring - Generator Mounting to Engine (1/2")
	821-0010	As Req	Screw, Cap - Lock Head - Grille Mounting - Panel Mounting (1/4-20 x 1/2")		850-0079	2	Washer, Lock - Spring - Generator Mounting to Bracket (3/4")
	800-0092	As Req	Screw, Cap - Hex Head - Generator Mounting to Engine (1/2-13 x 1-1/2")		862-0020	4	Nut, Hex - Generator Bracket Mounting (3/4-10)
	800-0153	2	Screw, Cap - Hex Head - Generator Mounting to Bracket (3/4-10 x 1-1/2")		862-0020	2	Nut, Hex - Front Engine Mounting (3/4-10)
	800-0030	As Req	Screw, Cap - Hex Head - Panel Bracket Mounting (5/16-18 x 1-1/4") - Not used on City Water Cooled Models		862-0007	4	Nut, Hex - Radiator Bracket Mounting (5/8-11)
	821-0010	As Req	Screw, Cap - Lock Head - Door Housing Mounting (1/4-20 x 1/2")		862-0007	2	Nut, Hex - Radiator Support Bracket Mounting (5/8-11)
	821-0014	As Req	Screw, Cap - Lock Head - Top Panel Mounting (5/16-18 x 1/2")		870-0257	6	Nut, Self Locking - Battery Tray Mounting (5/16-18)
	821-0014	As Req	Screw, Cap - Lock Head - Rear Lower Panel Mounting (5/16-18 x 1/2")		870-0257	As Req	Nut, Self Locking - Base Panel Mounting (5/16-18)
	821-0014	As Req	Screw, Cap - Lock Head - Rear Lower Panel Mounting (5/16-18 x 1/2")		870-0257	As Req	Nut, Self Locking - Panel Bracket Mounting (5/16-18) - Not used on City Water Cooled Models
	821-0014	As Req	Screw, Cap - Lock Head - Rear Lower Panel Mounting (5/16-18 x 1/2")		870-0258	As Req	Nut, Weld - Door Housing Mounting (1/4-20)
					870-0257	As Req	Nut, Self Locking - Lower Panel Mounting (5/16-18)
					870-0257	As Req	Nut, Self Locking - Top Panel Mounting (5/16-18)
					870-0212	As Req	Nut, Self Locking - Rear Door Mounting (1/4-20)

# GENERATOR GROUP

NOTE: See separate group for bus bar and exciter rotor parts.



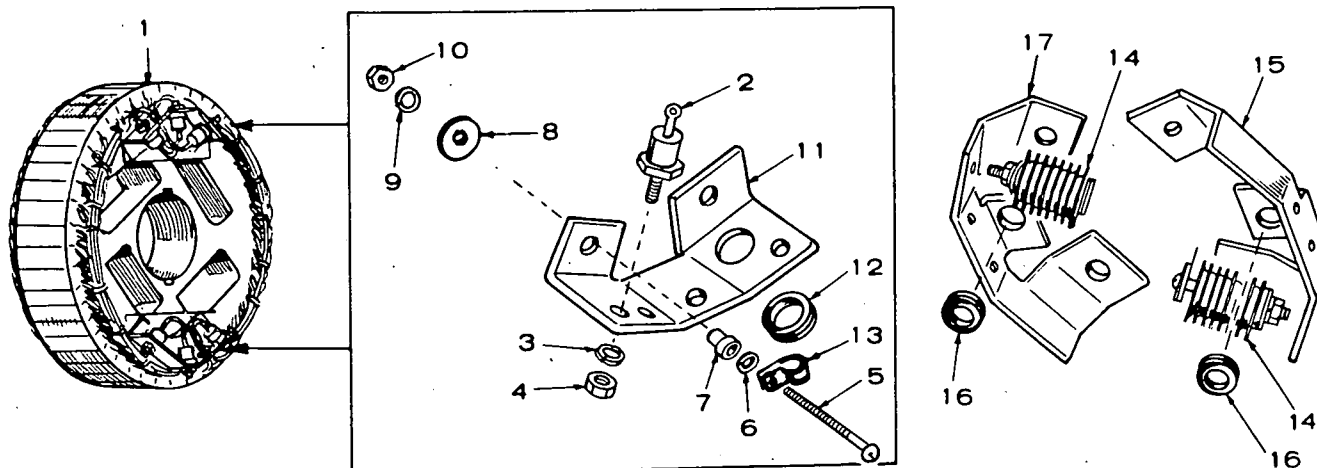
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	*	1	Rotor Assembly, Wound (Includes Parts Marked *)
2	232-2309	1	*Disc, Generator Drive
3	205-0103	1	*Fan, Generator
4	805-0035	14	*Bolt, Plate (5/8-11 x 1-1/2")
5	526-0259	8	*Washer, Flat -Steel (11/16" ID x 1-3/8" OD x 12 Ga.)
6	515-0145	1	*Key, Exciter Rotor
7	232-2317	1	*Spacer, Bearing
8	510-0106	1	*Bearing
9	526-0252	1	*Washer, Flat - Steel (13/16" ID x 2-3/8" OD x 5/32" Thk)
10	150-1405	1	*Wheel, Speed Sensor
11	850-0060	1	*Washer, Spring Lock (1/2")
12	800-0092	1	*Screw, Hex Cap - Steel (1/2-13 x 1-1/2")
13	201-1902	1	*Rotor Assembly, Wound - Exciter (See Separate Group for Components)
14	*	1	Stator Assembly, Wound
15	220-1920	1	Stator Assembly, Wound - Exciter
16	800-0009	4	Screw, Hex Cap - Steel (1/4-20 x 1-1/2")

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
17	850-0040	12	Washer, Spring Lock (1/4")
18	211-0214	1	Bell, End
19	800-0005	2	Screw, Hex Cap - Steel (1/4-20 x 3/4")
20	332-1554	1	Clamp, Loop
21	234-0455	1	Screen, Fan
22	800-0008	2	Screw, Hex Cap - Steel (1/4-20 x 1-1/4")
23	862-0001	2	Nut, Hex - Steel (1/4-20)
24	520-0780	4	Stud, End Bell Mounting (1/2 x 6-1/2")
25	850-0060	20	Washer, Spring Lock (1/2")
26	862-0016	4	Nut, Hex - Steel (1/2-13)
27	800-0092	16	Screw, Hex Cap - Steel (1/2-13 x 1-1/2")
28	150-1406	1	Sensor, Speed
29	150-1407	1	Bracket, Speed Sensor
30	868-0011	1	Nut, Hex - Steel (3/4-16)
31	150-1410	1	Cap, Insulator

\* - Refer to factory giving complete Model, Spec and Serial Number from Onan nameplate.

\* - Parts included in the Rotor Assembly.

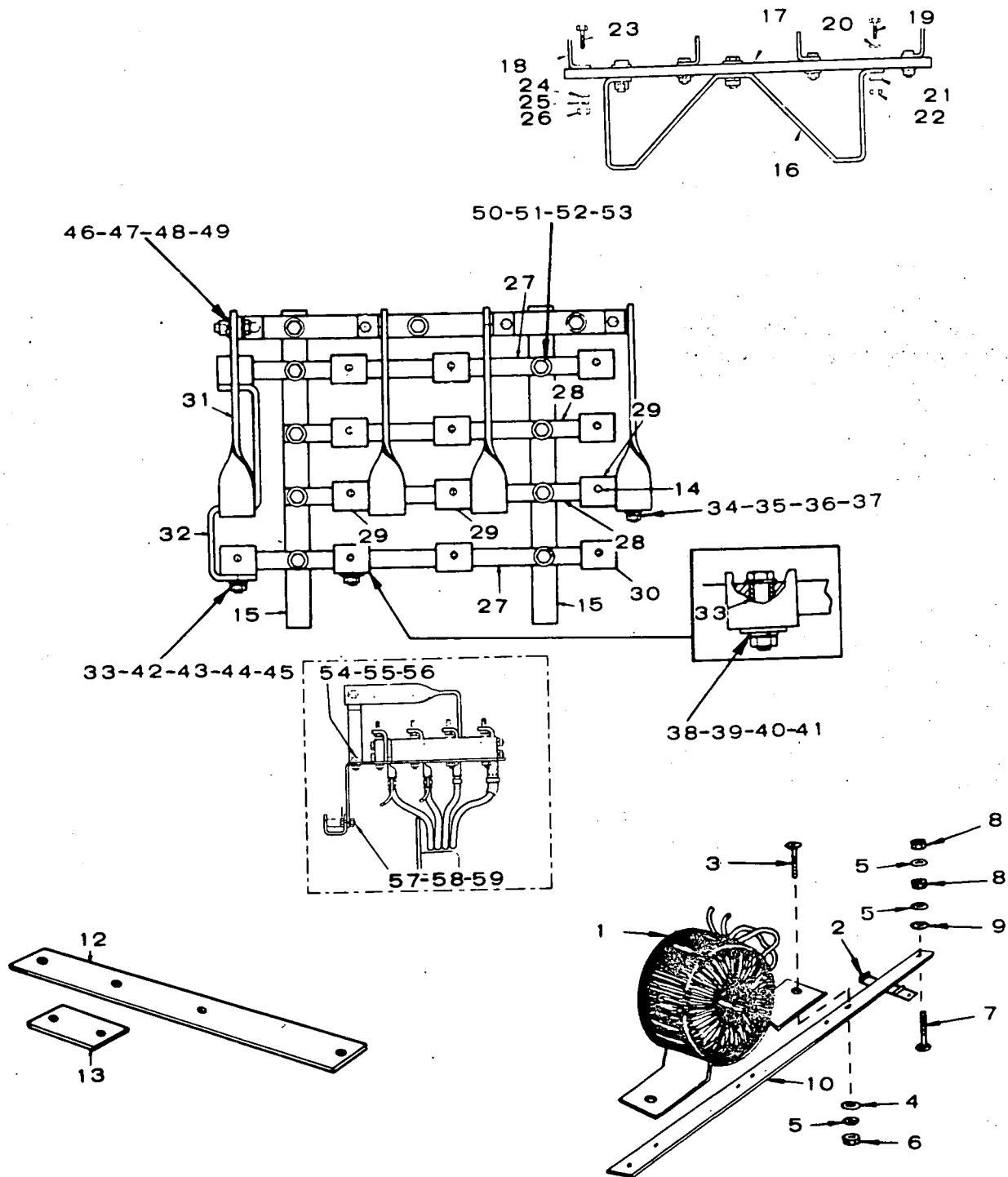
# EXCITER ROTOR GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	201-1902	1	Rotor Assembly, Exciter - Complete (Also shown in Generator Group)
2	RECTIFIER, DIODE		
	358-0011	3	Positive
	358-0012	3	Negative
3	850-0040	6	Washer, Spring Lock (1/4")
4	868-0001	6	Nut, Hex - Stud (1/4-20)
5	813-0110	4	Screw, Round Head Steel (#10-32 x 2")
6	526-0009	4	Washer, Flat - Steel (7/32" ID x 1/2" OD x 1/16" Thk)
7	508-0124	4	Bushing, Insulating
8	508-0156	4	Washer, Insulating
9	850-0030	4	Washer, Spring Lock (#10)
10	870-0053	4	Nut, Hex Steel (#10-32)
11	SINK, HEAT		
	363-0049	1	Positive
	363-0050	1	Negative
12	508-0093	2	Grommet, Rubber
13	332-0050	2	Clip, Wire
14	305-0526	2	*Suppressor, Voltage (Optional)
15	363-0054	1	*Heat Sink, Rectifier - Positive (Optional)
16	508-0093	2	*Grommet, Rubber (Optional)
17	363-0055	1	*Heat Sink, Rectifier - Negative (Optional)

\* - Parts Included in 232-2444 Heat Sink and Suppressor Assembly - Optional Equipment.

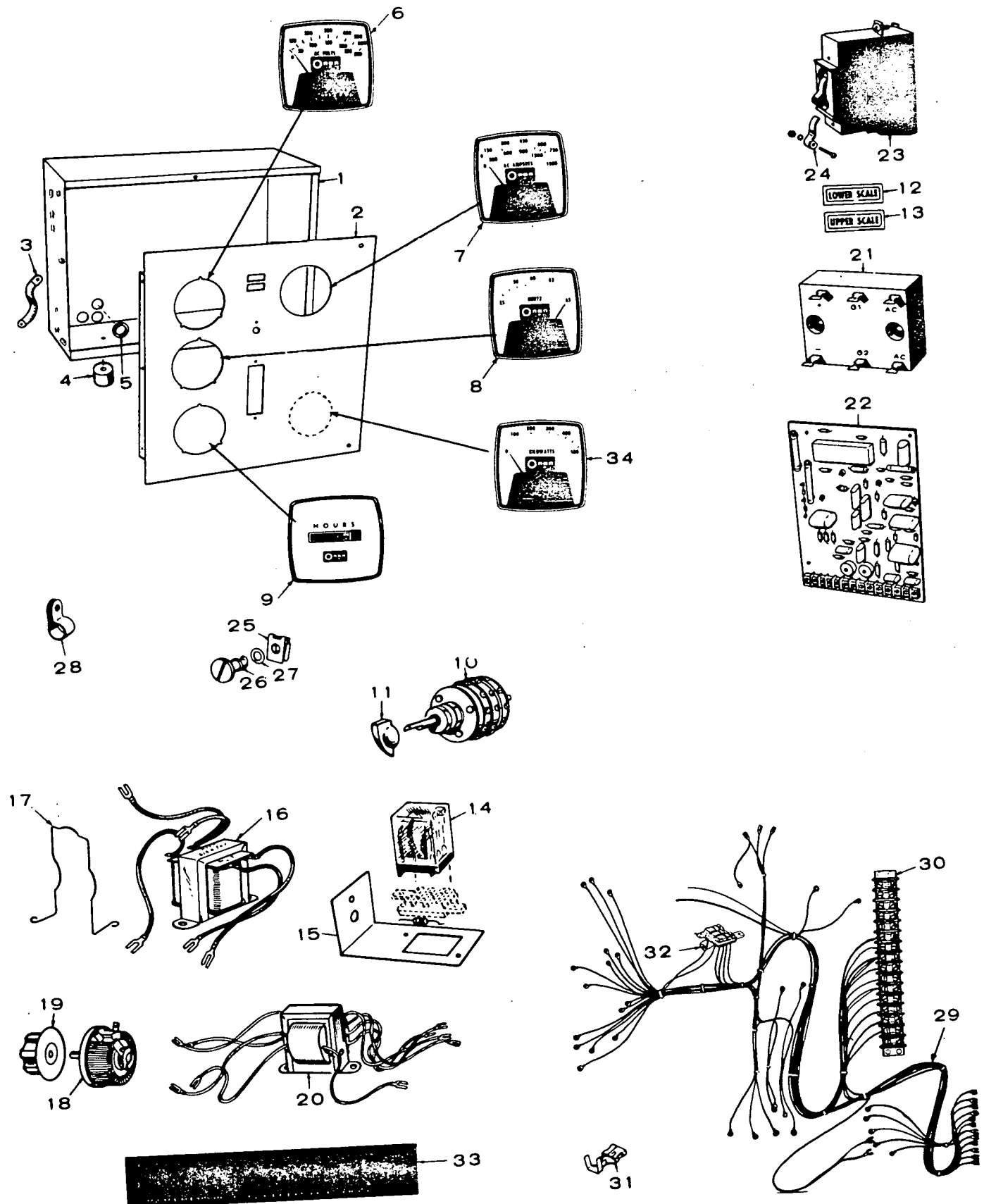
# BUS BAR GROUP



# BUS BAR GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	TRANSFORMER, CURRENT			31	232-2240	4	Bar, Bus
	302-0876	3	50 Hertz	32	232-2238	1	Bracket, Bus Bar
	302-0471	3	60 Hertz	33	232-2344	32	Spacer, Terminal Connection
2	232-2342	2	Bracket, Terminal Board Mounting	34	800-0028	4	Screw, Hex Cap - Steel (5/16-18 x 1")
3	SCREW, ROUND STEEL HEAD MACHINE - TRANSFORMER MOUNTING			35	526-0115	8	Washer, Flat - Steel (11/32" ID x 11/16" OD x 1/16" Thk)
	813-0100	4	#10-32 x 1/2"	36	850-0045	4	Washer, Spring Lock (5/16")
	813-0103	2	#10-32 x 3/4"	37	862-0015	4	Nut, Hex - Steel (5/16-18)
4	526-0008	6	Washer, Flat - Steel (13/64" ID x 7/16" OD x 1/32" Thk)	38	800-0032	24	Screw, Hex Cap - Steel (5/16-18 x 1-3/4")
5	856-0003	8	Washer, Lock - EIT (#10)	39	526-0115	24	Washer, Flat - Steel (11/32" ID x 11/16" OD x 1/16" Thk)
6	870-0053	6	Nut, Hex - Steel (#10-32)	40	850-0045	24	Washer, Spring Lock (5/16")
7	815-0203	1	Screw, Round Head Brass Machine Screw (#10-32 x 7/8")	41	862-0015	24	Nut, Hex - Steel (5/16-18)
8	871-0010	2	Nut, Hex - Brass (#10-32)	42	800-0033	8	Screw, Hex Head - Steel (5/16-18 x 2")
9	526-0049	1	Washer, Flat - Brass (.200" ID x 7/16" OD x 1/32" Thk)	43	526-0115	16	Washer, Flat - Steel (11/32" ID x 11/16" OD x 1/16" Thk)
10	315-0389	1	Plate, Transformer Mounting	44	850-0045	8	Washer, Spring Lock (5/16")
12	232-2246	2	Jumper, Bus Bar (15-3/4" Long)	45	862-0015	8	Nut, Hex - Steel (5/16-18)
13	232-2248	3	Jumper, Bus Bar (3-3/4" Long)	46	800-0051	4	Screw, Hex Cap - Steel (3/8-16 x 1-1/4")
14	520-0142	14	Stud (5/16 x 1-1/4")	47	526-0029	8	Washer, Flat - Steel (25/64" ID x 7/8" OD x 1/16" Thk)
15	232-2249	2	Bracket, Terminal Board Mounting	48	850-0050	4	Washer, Spring Lock (3/8")
16	232-2237	1	Bracket, Bus Bar Support	49	862-0003	4	Nut, Hex - Steel (3/8-16)
17	232-2245	1	Board, Insulating - Bus Bar	50	800-0056	8	Screw, Hex Cap - Steel (3/8-16 x 2-1/2")
18	232-2387	4	Bracket, Bus Bar	51	526-0029	8	Washer, Flat - Steel (25/64" ID x 7/8" OD x 1/16" Thk)
19	800-0051	3	Screw, Hex Cap - Steel (3/8-16 x 1-1/4")	52	850-0050	8	Washer, Spring Lock (3/8")
20	526-0029	3	Washer, Flat - Steel (25/64" ID x 7/8" OD x 1/16" Thk)	53	862-0003	4	Nut, Hex - Steel (3/8-16 x 1")
21	850-0050	3	Washer, Spring Lock (3/8")	54	800-0050	2	Screw, Hex Head - Steel (3/8-16 x 1")
22	862-0003	3	Nut, Hex - Steel (3/8-16)	55	850-0050	2	Washer, Spring Lock (3/8")
23	800-0007	4	Screw, Hex Cap - Steel (1/4-20 x 1")	56	862-0003	2	Nut, Hex - Steel (3/8-16)
24	526-0018	4	Washer, Flat (21/64" ID x 3/4" OD x 1/16" Thk)	57	800-0050	2	Screw, Hex Head - Steel (3/8-16 x 1")
25	850-0040	4	Washer, Spring Lock (1/4")	58	850-0050	2	Washer, Spring Lock (3/8")
26	862-0001	4	Nut, Hex - Steel (1/4-20)	59	862-0003	2	Nut, Hex - Steel (3/8-16)
27	232-2243	2	Board, Insulating				
28	232-2242	2	Board, Insulating				
29	232-2343	3	Bar, Bus				
30	232-2241	11	Bar, Bus				

# CONTROL GROUP (AC Portion)

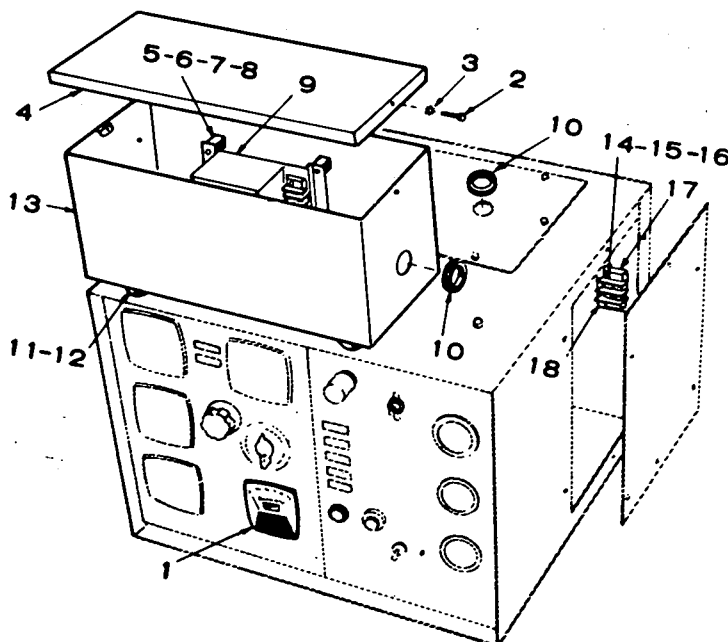


## CONTROL GROUP (AC Portion)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	301-3158	1	Box, Control	16	315-0384	1	Reactor Assembly, Commutator
2	PANEL, CONTROL BOX			17	307-1157	1	Spring, Relay Hold-down
	301-3279	1	Units Without Meters	18	303-0170	1	Rheostat, Voltage Adjusting
	301-3170	1	Units With Meters	19	303-0032	1	Knob, Rheostat
	301-3312	1	Units With Wattmeter and Meters	20	315-0342	1	Transformer, Voltage
3	337-0049	1	Strap, Electrical Ground	21	305-0524	1	Bridge, Rectifier
4	402-0078	4	Dampener, Vibration	22	332-1268	1	Board Assembly, Voltage Regulator (See Separate Group for Components)
5	508-0001	4	Grommet (1-1/16"), Rubber	23	BREAKER, CIRCUIT - 3 AMP		
6	302-0718	1	Voltmeter, AC - Dual Scale - (0-300, 0-600)		320-0455	1	Sets With Meters
7	AMMETER AC				320-0456	1	Sets Without Meters
	302-0878	1	50 Hertz - 250 kW - 0-1000	24	320-0307	1	Lock, Circuit Breaker Handle - Penn State Models (Optional)
	302-0879	1	60 Hertz - 300 kW - 0-1200	25	406-0332	2	Receptacle, Fastener
8	METER, FREQUENCY			26	406-0333	2	Stud, Fastener
	302-0894	1	50 Hertz	27	406-0334	2	Washer, Stud Fastener
	302-0810	1	60 Hertz	28	332-0050	1	Clip, Tinnerman
9	METER, RUNNING TIME			29	338-0730	1	Harness, Wiring (Includes Parts Marked *)
	302-0469	1	50 Hertz	30	332-0795	1	*Block, Terminal (16 Place)
	302-0466	1	60 Hertz	31	332-1280	As Req	*Terminal, Crimp
10	308-0284	1	Switch, Voltage & Ammeter	32	350-0556	1	*Resistor - 47,000-Ohms, 1/2 Watt
11	303-0076	1	Knob	33	332-1242	1	Strip, Terminal Block Marker (16 Place)
12	322-0131	1	Light, Upper Scale	34	WATTMETER, AC - OPTIONAL		(See Separate Group for Wattmeter and Associated Parts)
13	322-0130	1	Light, Lower Scale				
14	307-1061	1	Relay, Voltage Selector				
15	301-3244	1	Bracket, Relay Mounting				

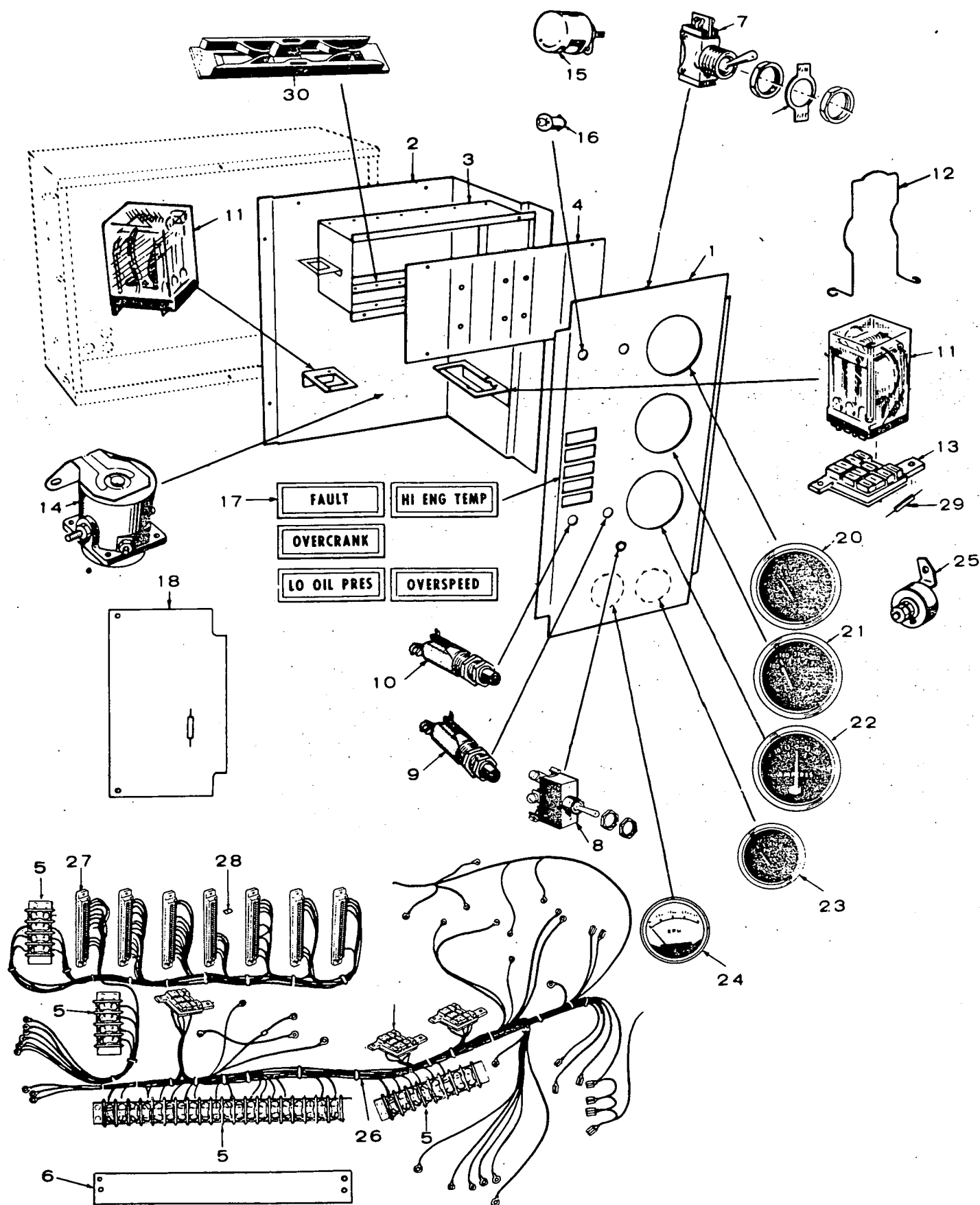
\* - Parts Included in 338-0730 Wiring Harness Assembly.

## WATTMETER GROUP — OPTIONAL



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	WATTMETER		
	302-0927	1	50 Hertz Sets (0-300)
	302-0928	1	60 Hertz Sets (0-500)
2	815-0026	2	Screw, Machine - Truss Head (#10-32 x 3/8")
3	853-0008	2	Washer, Lock - External Tooth (#10)
4	301-3476	1	Cover, Box - Transducer
5	860-0008	8	Nut, Hex (#8-32)
6	853-0005	8	Washer, Lock - External Tooth (#8)
7	526-0003	8	Washer, Flat (11/64" ID x 3/8" OD x 1/32" Thk)
8	402-0354	4	Mount, Vibration
9	302-0921	1	Transducer, Watt
10	508-0001	2	Grommet, Rubber (1-1/6" OD)
11	821-0014	4	Screw, Self-locking - Hex Head (5/16-18 x 1/2")
12	402-0070	4	Mount, Vibration
13	301-3477	1	Box, Transducer
14	812-0063	4	Screw, Machine - Round Head (#6-32 x 1/2")
15	853-0003	4	Washer, Lock - External Tooth (#6)
16	860-0006	4	Nut, Hex (#6-32)
17	332-0609	1	Board, Terminal (2 Place)
18	332-0610	1	Strip, Marker

# CONTROL GROUP (Engine Instruments Portion)



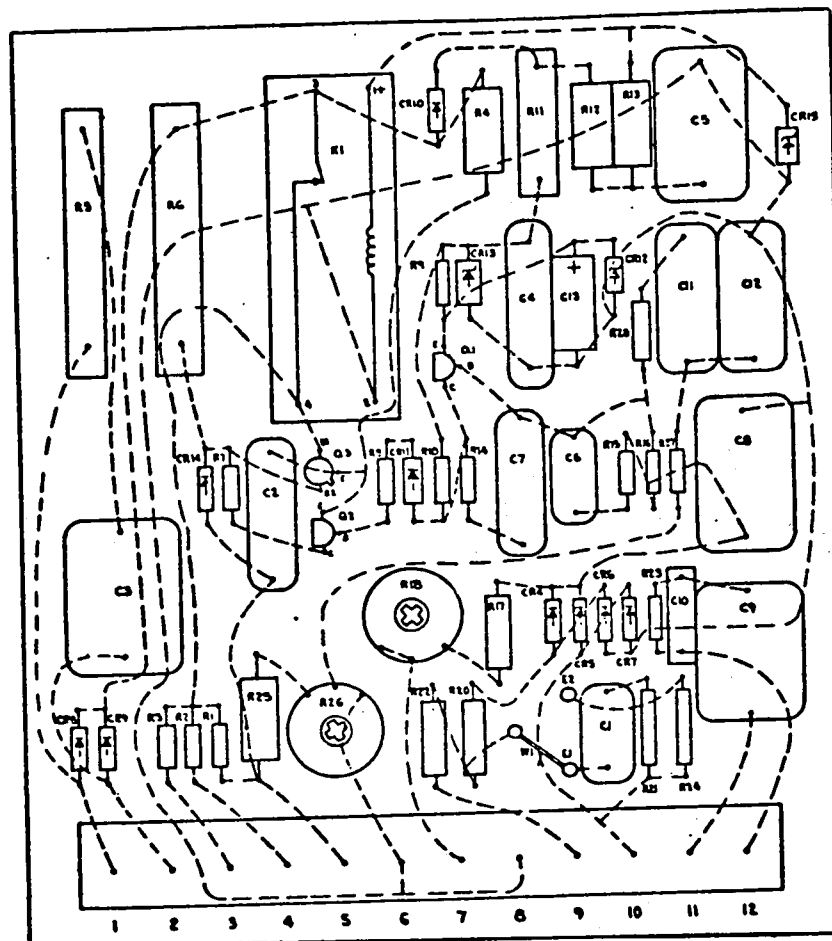


## CONTROL GROUP (Engine Instruments Portion)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL, ENGINE CONTROL			17	LAMP, FAULT		
	301-3661	1	Sets With One Fault Light		322-0129	1	Standard
	301-3629	1	Sets With Five Fault Lights (Optional)		322-0119	1	Overcrank (Optional)
	301-3977	1	Sets With Tachometer and Electric Oil Gauge (Optional)		322-0120	1	Low Oil Pressure (Optional)
2	301-3621	1	Bracket, Engine Control Mounting		322-0121	1	High Engine Temperature (Optional)
3	301-3588	1	Rack, Module		322-0123	1	Overspeed (Optional)
4	301-3635	1	Cover, Module Rack	18	MODULES (See Separate Group for Components)		
5	*BLOCK, TERMINAL				300-0977	1	Standard Cranker
	332-1005	1	20 Place		300-0956	1	Cycle Cranker (Optional)
	332-0537	2	4 Place		300-0954	1	Engine Shut-down
	332-0699	1	6 Place (Sets With Five Fault Lights)		300-0953	1	Engine Monitor
6	*STRIP, TERMINAL BLOCK MARKER				300-0955	1	Remote Indicator
	332-1559	1	20 Place (21-40)		300-0987	1	Bypass Plug (Includes Part Marked £)
	332-1239	1	4 Place (B+, Remote, Ground & Alarm)		300-0973	1	Time Delay Start Stop (Optional)
	332-1561	1	4 Place (1-4)		300-0957	1	Overspeed Sensor
	332-1560	1	6 Place (53-58) - Sets With Five Fault Lights		300-0958	1	Starter Disconnect
7	308-0002	1	Switch, Panel Light	19	321-0168	1	£Fuse, 1/4 Amp (Part of 300-0987 Module)
8	SWITCH, SELECTOR			20	193-0194	1	Gauge, Oil Pressure
	308-0220	1	Standard Control	21	103-0106	1	Gauge, Water Temperature
	308-0347	1	Penn State Models	22	302-0061	1	Gauge, Ammeter (30-0-30)
9	308-0337	1	Switch, Lamp Test	23	193-0187	1	Gauge, Oil Temperature (Optional) - Electric
10	308-0091	1	Switch, Reset	24	302-0749	1	Gauge, Electric Tachometer (Optional) - 2500 RPM
11	RELAY			25	193-0189	3	Resistor, Gauge - (1) Oil Pressure (1) Water Temperature (1) Oil Temperature
	307-1056	1	Start Disconnect	26	HARNESS, WIRING (Includes Parts Marked *)		
	307-1061	1	Starter Protection		338-0915	1	Sets With One Fault Light (Standard)
	307-1056	1	Ignition		338-0705	1	Sets With Five Fault Lights (Optional)
12	307-1157	3	Spring, Relay Hold-down	27	332-1271	6	*Housing, Module Terminal (Sets With Five Fault Lights Use Seven)
13	*SOCKET, RELAY			28	332-1276	As Req	*Plug, Keying
	323-0764	1	Starter Protection	29	357-0004	2	*Diode
	323-0765	2	Ignition, Start Disconnect	30	323-0814	12	Guide, Module (14 Used on Sets With Five Fault Lights)
14	307-0061	1	Solenoid, Start				
15	322-0149	1	Holder, Lamp				
16	322-0017	1	Lamp, Panel				

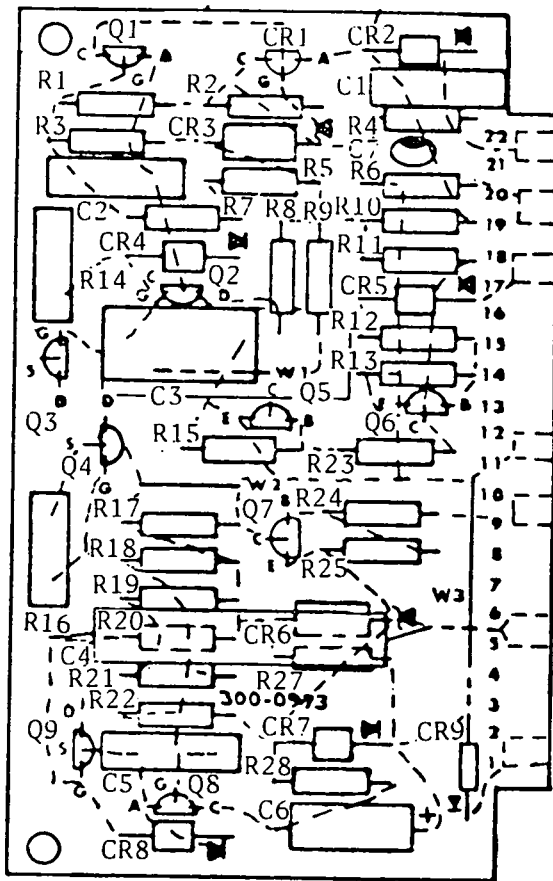
# PRINTED CIRCUIT BOARD ASSEMBLY GROUP (AC)

332-1268 - Printed Circuit Board, Complete

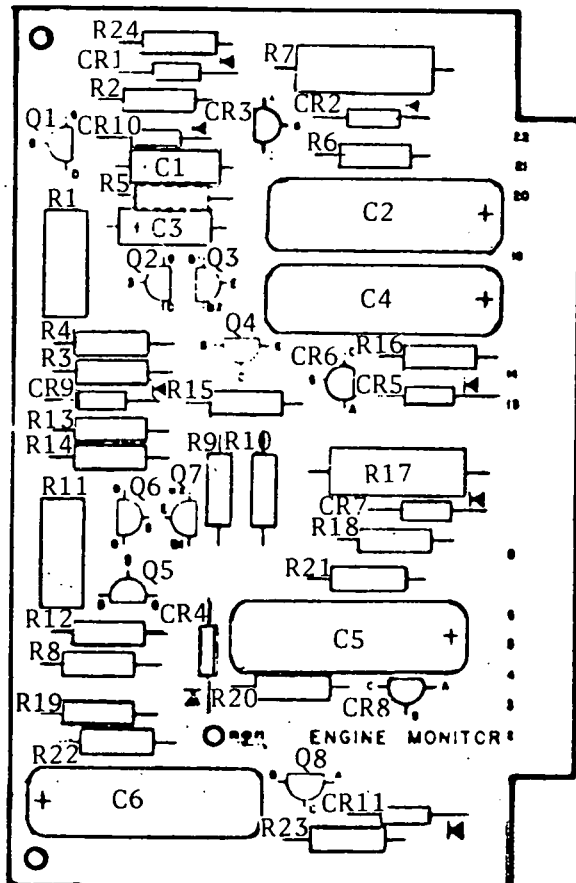


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
TB1	332-1252	1	Terminal Block	R18, R16	350-0447	2	Resistor (330,000-Ohm, 1/2 Watt)
C1	355-0018	1	Capacitor (.47., 100 Volt)	R9, R10	350-0423	2	Resistor (33,000-Ohm, 1/2 Watt)
C2, C7	355-0005	2	Capacitor (.22 Mfd., 200 Volt)	R11	352-0151	1	Resistor, Fixed (15,000-Ohm, 5 Watt)
C3, C9	355-0017	2	Capacitor (.47 Mfd., 400 Volt)	R12	350-1014	1	Resistor (13,000-Ohm, 2 Watt)
C4, C12	355-0006	2	Capacitor (.47 Mfd., 200 Volt)	R13	350-1007	1	Resistor (6,800-Ohm, 2 Watt)
C5, C8	355-0016	2	Capacitor (1 Mfd., 100 Volt)	R14	350-0443	1	Resistor (220,000-Ohm, 2 Watt)
C6	355-0015	1	Capacitor (.1 Mfd., 200 Volt)	R15, R27	350-0435	2	Resistor (100,000-Ohm, 1/2 Watt)
C10	355-0014	1	Capacitor (.047 Mfd., 200 Volt)	R17	351-0524	1	Resistor, Metal Film (13,000-Ohm, 1/4 Watt)
C11	355-0020	1	Capacitor (.1 Mfd., 400 Volt)	R18	303-0168	1	Potentiometer
C13	356-0039	1	Capacitor (100 Mfd., 10 Volt)	R20, R22	351-0520	2	Resistor, Metal Film (28,000-Ohm, 1/4 Watt)
CR4,5,6,7, 8,9,10,11	357-0014	8	Rectifier, Silicon	R21	351-0522	1	Resistor, Metal Film (5,110-Ohm, 1/4 Watt)
CR12	359-0035	1	Diode, Zener (6.8 Volt)	R24	351-0523	1	Resistor, Metal Film (8,870-Ohm, 1/4 Watt)
CR13	359-0025	1	Diode, Zener (20 Volt)	R25	350-1011	1	Resistor (10,000-Ohm, 2 Watt)
CR14	359-0026	1	Diode, Zener (18 Volt)	R26	303-0164	1	Potentiometer
CR15	359-0015	1	Diode, Zener (24 Volt)				
K1	307-1063	1	Relay, Magnetic Reed				
Q1, Q2	362-0017	2	Transistor, Silicon				
Q3	361-0004	1	Transistor, Unijunction				
R1, R23	350-0355	2	Resistor (47-Ohm, 1/2 Watt)				
R2, R3	350-0351	2	Resistor (33-Ohm, 1/2 Watt)				
R4	350-1075	1	Resistor (4.7 Megohm, 2 Watt)				
R5	353-0040	1	Resistor, Fixed (270-Ohm, 10 Watt)				
R6	353-0039	1	Resistor, Fixed (5,000-Ohm, 15 Watt)				
R7	350-0398	1	Resistor (3,000-Ohm, 1/2 Watt)				

# TIME DELAY (START-STOP) MODULE—OPTIONAL



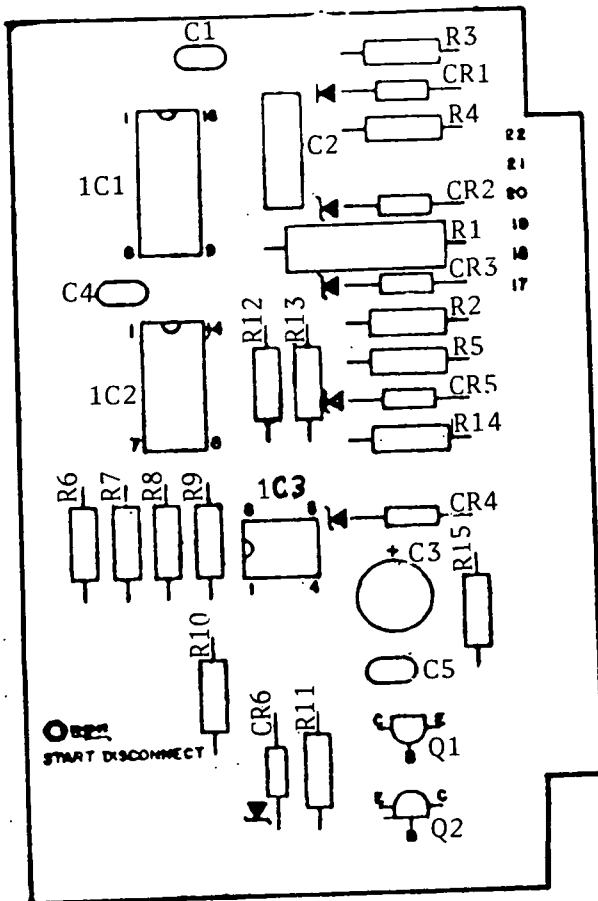
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0973	1	Module, Time Delay - Complete (Start-Stop) - Optional
C1,2,5	355-0025	3	Capacitor (.1 Mfd., 100 Volt)
C3	355-0028	1	Capacitor (.5 Mfd., 100 Volt)
C4	355-0027	1	Capacitor (10.0 Mfd., 50 Volt)
C6	356-0046	1	Capacitor (5 Mfd., 35 Volt)
C7	356-0053	1	Capacitor (1.0 Mfd., 35 Volt)
CR1	364-0011	1	Rectifier, Gate Control
CR2,4,5			
7,8,9	357-0004	6	Rectifier, Diode (400 MA. 400 Volt)
CR3,6	359-0015	2	Diode, Zener (24 Volt)
Q1,8	361-0006	2	Transistor (2N6027)
Q2,3,4,9	362-0031	4	Transistor (2N5716)
Q5,6,7	362-0007	3	Transistor, Signal (2N2925)
R1,3,18,22	350-0411	4	Resistor (10,000-ohms, 1/2 Watt)
R2	350-0379	1	Resistor (470-ohms, 1/2 Watt)
R4	350-0524	1	Resistor (100-ohms, 1/2 Watt)
R5,19	352-0200	2	Thermistor (10,000-ohms)
R6	350-0537	1	Resistor (1,200-ohms, 1/2 Watt)
R7, R21	350-0391	2	Resistor (1,500-ohms, 1/2 Watt)
R8,12,20,24	350-0548	4	Resistor (10,000-ohms, 1/2 Watt)
R13,15,25,28	350-0536	4	Resistor (1,000-ohm, 1/2 Watt)
R10,27	350-0528	2	Resistor (220-ohms, 1/2 Watt)
R9,17	350-0540	2	Resistor (2200-ohms, 1/2 Watt)
R14,16	303-0169	2	Potentiometer (3.5 Megohm)
R23,11	350-0545	2	Resistor (5600-ohms, 1/2 Watt)



## ENGINE MONITOR CONTROL MODULE

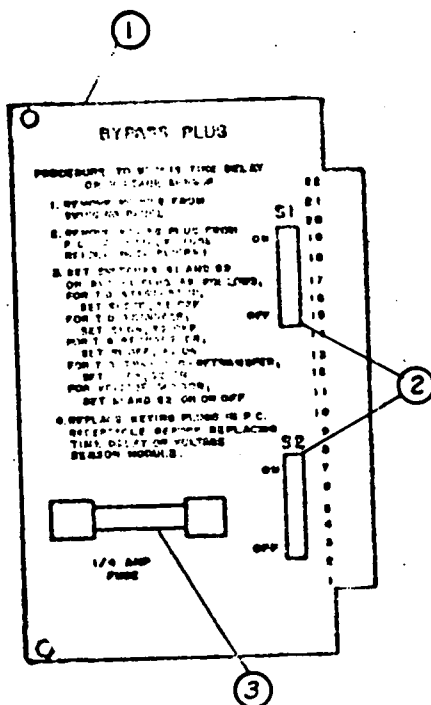
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0953	1	Control, Engine Monitor (Complete)
C1,3	356-0040	2	Capacitor, Electrolytic (10 Mfd., 20 Volt)
C2,4,5,6	355-0005	4	Capacitor, Composition (.22 Mfd., 200 Volt)
CR1,2,4,5			
7,10,11	357-0004	6	Rectifier, Diode
CR3,6,8	364-0011	3	Rectifier, Gate Control
CR9	359-0027	1	Diode, Zener (1 Watt, 5 Volt)
Q1,5	362-0025	2	Transistor, Field Effect (30 MA)
Q3,7	361-0007	2	Transistor, Unijunction
Q4	362-0014	1	Transistor, NPN
Q8	362-0027	1	Transistor, PNP
R1,11	303-0169	2	Potentiometer (3.5 Megohm)
R2,3,12,13	350-0548	4	Resistor (10,000-ohms, 1/2 Watt)
R4,14,10,24	350-0536	4	Resistor (1,000-ohm, 1/2 Watt)
R5,15,21	350-0517	3	Resistor (27-ohms, 1/2 Watt)
R6,16,18	350-0505	3	Resistor (2.7-ohms, 1/2 Watt)
R7,17	350-0980	2	Resistor (510-ohms, 2 Watt)
R8	350-0403	1	Resistor (4,700-ohms, 1/2 Watt)
R9	350-0405	1	Resistor (5,600-ohms, 1/2 Watt)
R19	350-0534	1	Resistor (680-ohms, 1/2 Watt)
R20,22	350-0533	2	Resistor (560-ohms, 1/2 Watt)
R23	350-0395	1	Resistor (2,200-ohms, 1/2 Watt)
Q2,6	362-0031	2	Transistor, Field Effect (.05 MA)

## STARTING MOTOR DISCONNECT MODULE



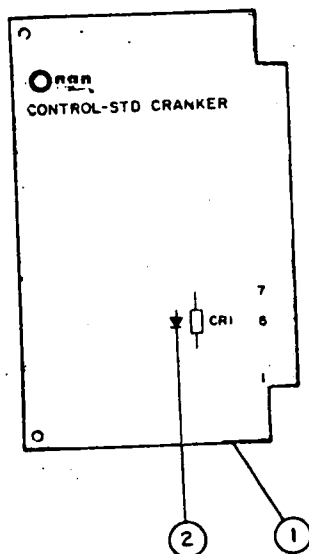
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0958	1	Module, Starter Motor Disconnect
1C1	367-0003	1	Integrated Circuit
1C2	367-0004	1	Integrated Circuit
1C3	367-0001	1	Integrated Circuit
C1,4	356-0051	2	Capacitor, Electrolytic (6.8 Mfd., 35 Volt)
C2	355-0028	1	Capacitor, Composition (.47 Mfd., 100 Volt)
C3	356-0038	1	Capacitor, Electrolytic (50 Mfd., 25 Volt)
Q1,2	362-0011	2	Transistor, Signal
CR1	357-0004	1	Rectifier, Diode (400 MA, 400 Volt)
CR2,3	359-0017	2	Diode, Zener (5.1 Volt, 400 MW)
CR4	359-0032	1	Diode, Zener (8.2 Volt, 400 MW)
CR5	359-0002	1	Diode, Zener (13 Volt, 400 MW)
CR6	359-0028	1	Diode, Zener (3.9 Volt, 500 MW)
R5	350-0383	1	Resistor (680-ohms, 1/2 Watt)
R2	350-0389	1	Resistor (1,200-ohms, 1/2 Watt)
R3,7,15	350-0422	3	Resistor (30,000-ohms, 1/2 Watt)
R6,11,12,13	350-0411	4	Resistor (10,000-ohms, 1/2 Watt)
R8,9	350-0418	2	Resistor (20,000-ohms, 1/2 Watt)
R10	350-0394	1	Resistor (2,000-ohms, 1/2 Watt)
R14	350-0404	1	Resistor (5,100-ohms, 1/2 Watt)
R1	350-0975	1	Resistor (330-ohms, 1/2 Watt)
R4	350-0420	1	Resistor (24,000-ohms, 1/2 Watt)
C5	356-0059	1	Capacitor, Electrolytic (2.2 Mfd., 35 Volt)

## BY PASS PLUG MODULE — OPTIONAL EQUIPMENT



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0987	1	Module, By Pass Plug (Complete)
1	332-1464	1	Printed Circuit Board
2	308-0324	2	Switch, Slide
3	321-0163	2	Clip, Fuse
4	321-0168	1	Fuse, 1/4 Amp

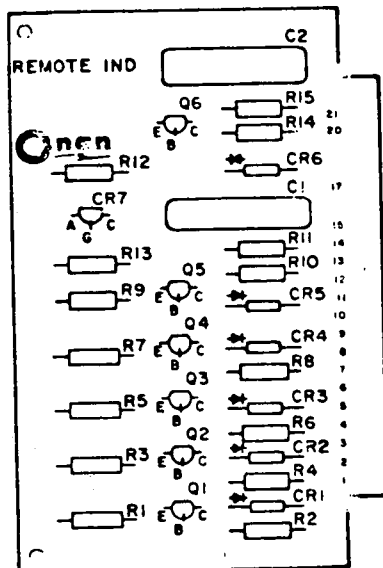
## STANDARD CRANKER MODULE



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0977	1	Module, Standard Cranker (Complete)
1	332-1552	1	Printed Circuit Board
2	352-0004	1	Rectifier, Diode

# **REMOTE INDICATOR CONTROL MODULE (UNITS WITH 5 FAULT LIGHTS)**

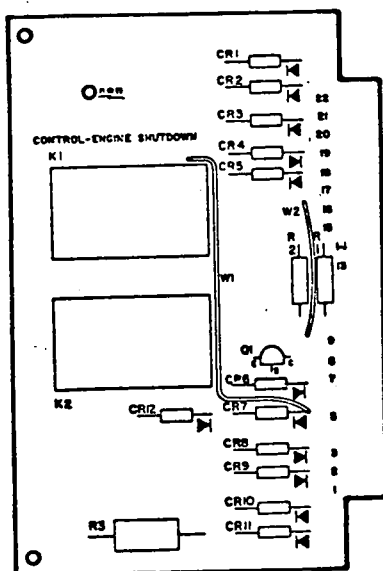
**300-0955**



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0955	1	Module, Remote Indicator
CR1 thru 6	357-0004	6	Rectifier, Diode (400 MA, 400 Volt)
CR7	364-0017	1	Rectifier, Gate Control
Q1 thru 6	362-0034	6	Transistor, PNP
R1,3,5,7,9,14	350-0529	6	Resistor (270-ohms, 1/2 Watt)
R2,6,8	350-0544	3	Resistor (4,700-ohms, 1/2 Watt)
R11	350-0505	1	Resistor (2,700-ohms, 1/2 Watt)
R12	350-0380	1	Resistor (510-ohms, 1/2 Watt)
R13	350-0517	1	Resistor (27-ohms, 1/2 Watt)
R15	350-0540	1	Resistor (2,200-ohms, 1/2 Watt)
C1,2	355-0005	2	Capacitor, Composition (.22 Mfd., 200 Volt)
R4,10	350-0389	2	Resistor (1,200-ohms, 1/2 Watt)

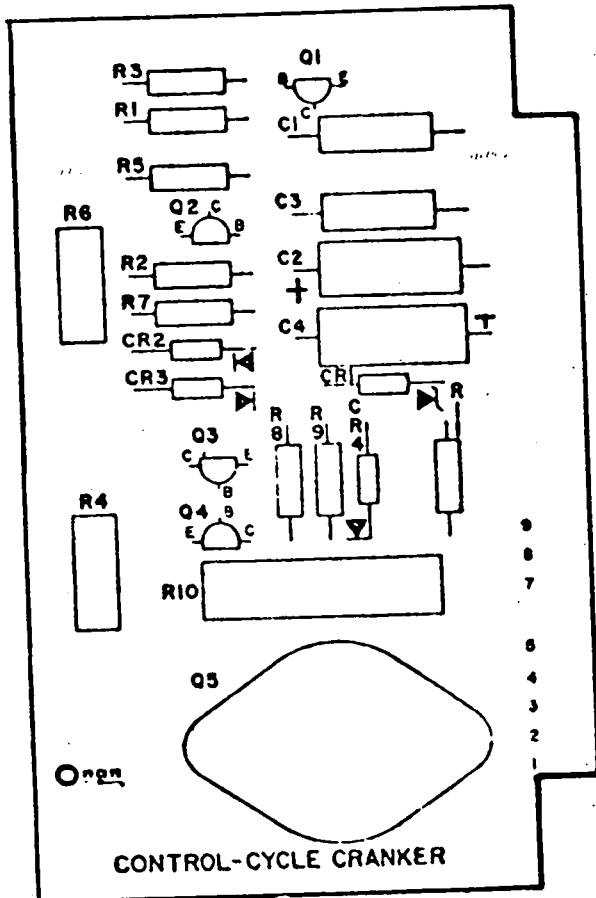
# **ENGINE SHUTDOWN CONTROL MODULE**

**300-0964**



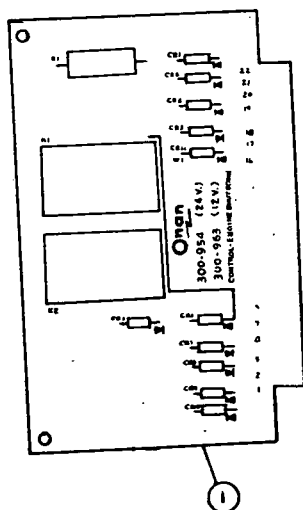
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0964	1	Control, Engine Shutdown (Complete)
CR1 thru 12	357-0004	12	Rectifier, Diode
K1,2	307-1076	2	Relay
R1	350-0548	1	Resistor (10,000-Ohms, 1/2 Watt)
R2	350-0545	1	Resistor (5,600-ohms, 1/2 Watt)
R3	350-1128	1	Resistor (220-ohms, 2 Watt)
Q1	362-0026	1	Transistor, PNP

## CYCLE CRANKER MODULE



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0956	1	Module, Cycle Cranker
C3	355-0010	1	Capacitor, Composition (.0022 Mfd., 100 Volt)
C2	356-0039	1	Capacitor, Electrolytic (100 Mfd., 10 Volt)
C4	356-0045	1	Capacitor, Electrolytic (25 Mfd., 15 Volt)
CR1	359-0027	1	Diode, Zener (1.0 Watt, 7.5 Volt)
CR2,3,4	357-0004	3	Rectifier, Diode (400 MA 400 Volt)
Q1,2	362-0008	2	Transistors, Signal
Q3	362-0011	1	Transistor, Signal
Q4	362-0026	1	Transistor, Signal
Q5	362-0033	1	Transistor, Power
R1	350-0558	1	Resistor (68,000-ohms, 1/2 Watt)
R2	350-0546	1	Resistor (6,800-ohms, 1/2 Watt)
R3,8	350-0548	2	Resistor (10,000-ohms, 1/2 Watt)
R4,6	303-0171	2	Potentiometer (100,000-ohms)
R5	350-0560	1	Resistor (100,000-ohms, 1/2 Watt)
R7	350-0420	1	Resistor (24,000-ohms, 1/2 Watt)
R9	350-0500	1	Resistor (1-ohms, 1/2 Watt)
R10	352-0158	1	Resistor (50-ohms, 5 Watt)
R11	350-0534	1	Resistor (680-ohms, 1/2 Watt)
C1	355-0029	1	Capacitor, Composition (.015 Mfd., 100 Volt)

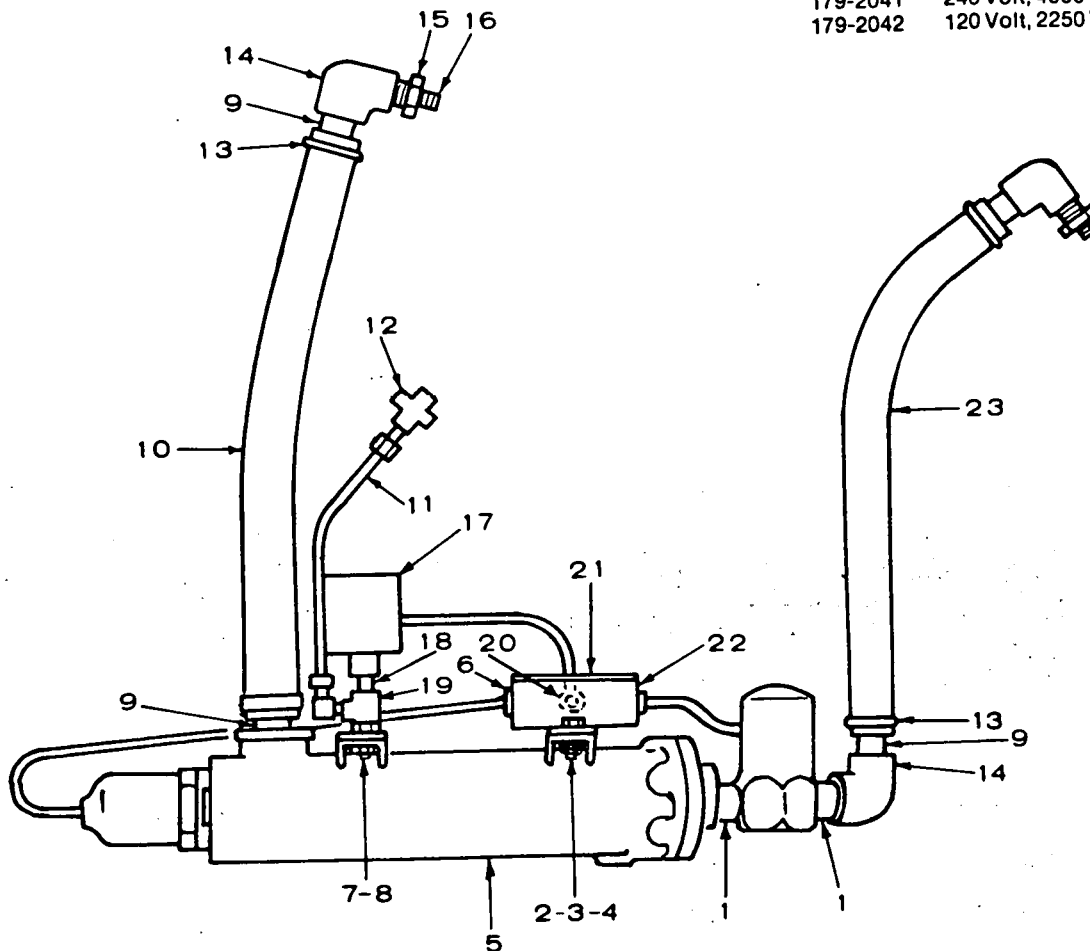
## ENGINE SHUTDOWN CONTROL MODULE



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0954	1	Control, Engine Shutdown (Complete)
CR1 - 11	357-0004	11	Rectifier, Diode
K1,2	307-1076	2	Relay
R1	350-1128	1	Resistor (220-Ohms, 2 Watt)

# WATER JACKET HEATER INSTALLATION — OPTIONAL EQUIPMENT

179-2041 240 Volt, 4000 Watt  
179-2042 120 Volt, 2250 Watt



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	505-0107	2	Nipple, Close (1" x 2")
2	813-0103	2	Screw, Machine - Round Head (10-32 x 3/4" lg)
3	850-0030	2	Washer, Lock - Spring (#10)
4	870-0053	2	Nut, Hex (10-32)
5	HEATER, ENGINE		
	333-0153	1	2250 Watt - 120 Volt
	333-0138	1	4000 Watt - 240 Volt
6	508-0008	2	Grommet, Rubber (1/2" ID x 1-1/16" OD)
7	800-0008	2	Screw, Cap - Hex Head (1/4-20 x 1-1/8" lg)
8	870-0212	2	Nut, Lock Head (1/4-20)
9	505-0759	4	Adapter, Pipe
10		1	Hose (Order 60" of Bulk Hose 503-0249)
11	501-0199	1	Line, Flexible
12	505-0059	1	Tee, Pipe
13	503-0429	4	Clamp, Hose
14	505-0041	2	Elbow (1" x 90°)
15	505-0129	2	Bushing, Reducer (1" x 3/4")
16	505-0102	2	Nipple, Pipe (3/4" x 1-3/8")
17	309-0271	1	Switch, Oil Pressure
18	505-0099	1	Nipple, Close (1/4" x 7/8")
19	333-0142	1	Support, Pressure Switch
20	331-0027	1	Connector (1/2" Romex)
21	330-0004	1	Cover, Box
22	330-0005	1	Box, Outlet
23		1	Hose (Order 22" of Bulk Hose 503-0249)
24	309-0253	1	Thermostat

£ - Check Heater for Correct Wattage and Voltage When Ordering.





**MANUFACTURER'S  
LIMITED  
WARRANTY**

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

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

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

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

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

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

a) Removal and Reinstallation

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

b) Travel Time and Mileage

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

(3) THERE IS NO OTHER EXPRESS WARRANTY.

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

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

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

(5) THIS WARRANTY SHALL NOT APPLY TO:

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

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