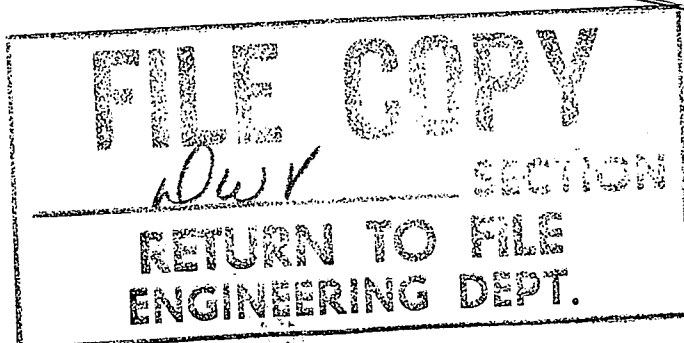
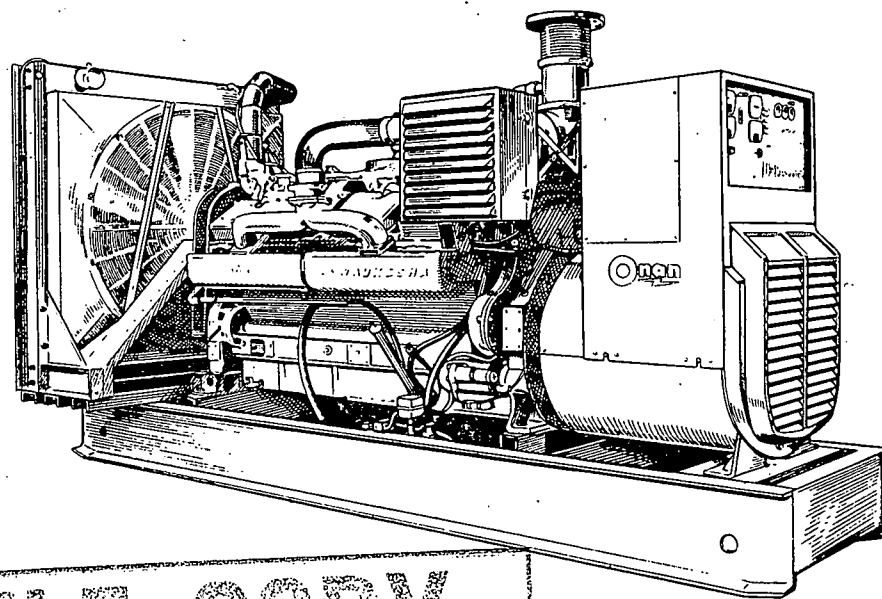


# **OPERATOR'S MANUAL AND PARTS CATALOG**

FOR  
**DWV**  
SERIES  
**ELECTRIC GENERATING SETS**



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The world-wide trend toward a standard system of measurement has resulted in the International System of Units, officially abbreviated SI.

Onan's products are available on the world market, therefore, both English and SI or modernized metric units appear in this manual.

To assist in familiarization, the following cross reference should be used.

TERM	METRIC	ENGLISH
Length	millimetre (mm)	Inch (in)
Pressure	Pascals (Pa)	pounds per square inch (PSI)
Mass (Weight)	kilogram (kg)	pound (lb)
Volume (Liquid)	litre	gallon (gal)
Power	kilowatt (kW)	horsepower (HP)
Frequency	hertz (Hz)	cycler per second (CPS)

## *WARNING*

*TO AVOID POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, AN AUTHORIZED SERVICE REPRESENTATIVE MUST PERFORM ALL SERVICE.*

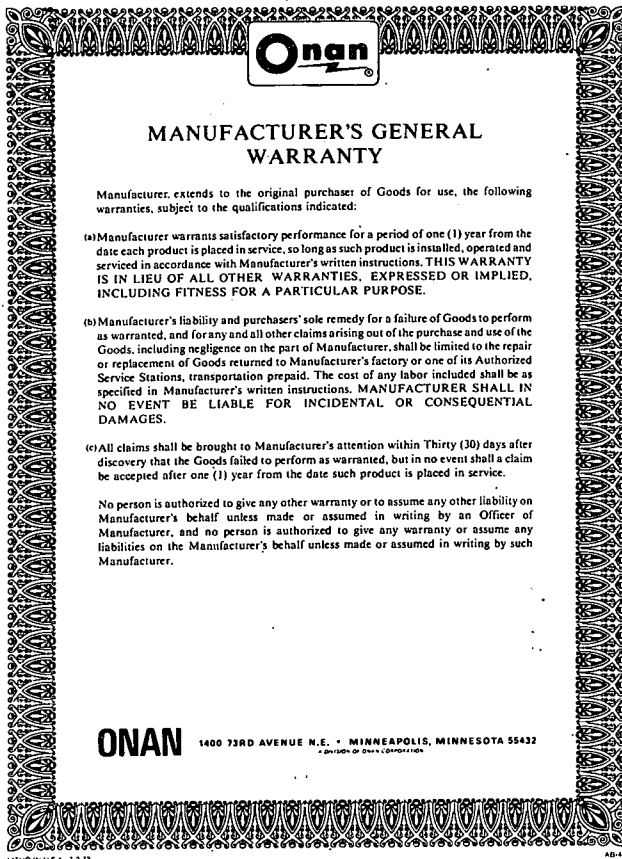
# INTRODUCTION

## FOREWORD

This manual is applicable to the DWV Series electric generating set, consisting of an Onan UV 600.0KW AC generator, driven by a Waukesha P2154 DSI Diesel engine. Information is provided on installation, operation, troubleshooting and parts ordering for the set. The manual should be used in conjunction with the Waukesha engine manual,

**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.

600.0 DWV 4XR / 13644 A

1 2 3 4 5

1. Indicates Kilowatt rating.
2. Factory code for SERIES identification.
3. Indicates voltage code.  
4X indicates 277/480 VAC  
R indicates remote electric start
4. Factory code for designating optional equipment.
5. Specification letter. (Advances when factory makes production modifications.)

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

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

**IMPORTANT! RETURN WARRANTY CARD ATTACHED TO UNIT.**

# SPECIFICATIONS

## ENGINE DETAILS

Engine Manufacturer .....	Waukesha
Engine Series .....	P2154 DSI
Number of Cylinders .....	V16
Displacement .....	2154-in <sup>3</sup> (16.38 lit)
BHP @ 1800 RPM .....	979 (730.33 kW)
Compression Ratio .....	14.0:1
Bore .....	5.75-inches (146.05 mm)
Stroke .....	5.1875-inches (131.76 mm)
Fuel .....	Diesel
Battery Voltage .....	24
Battery Group (Two 12-Volt, 225 A.H.) .....	8D
Starting Method .....	Solenoid Shift
Governor Regulation .....	Adjustable Isochronous to 5%
Battery Charging Current .....	35 Amperes

## GENERATOR DETAILS

Type .....	UV Brushless
Rating (Watts)	
60 Hertz Continuous Standby .....	600,000 (750 kVA)
50 Hertz Continuous Standby .....	500,000 (625 kVA)
AC Voltage Regulation .....	2%
60 Hertz RPM .....	1800
50 Hertz RPM .....	1500
Output Rating .....	0.8 PF
AC Frequency Regulation .....	0- to 3% No Load—Full Load

## CAPACITIES AND REQUIREMENTS

Cooling System (Including Radiator and Plumbing) .....	21-Gallons (80-lit)
Engine .....	44-Gallons (167-lit)
Engine and Radiator .....	65-Gallons (246-lit)
Engine Oil Capacity (Filter, Lines, Crankcase Oil Cooler) .....	28-Gallons (106 lit)
Exhaust Connection (pipe flange) .....	10-in (254 mm) Diameter

## AIR REQUIREMENTS (1800 RPM)

Engine Combustion .....	2400-CFM (68 m <sup>3</sup> /min)
Radiator Cooled Engine .....	50,400-CFM (1427 m <sup>3</sup> /min)
Total for Radiator Cooled Model .....	52,800-CFM (1495 m <sup>3</sup> /min)
Alternator Cooling Air (1800 RPM) .....	3120-CFM (88.5 m <sup>3</sup> /min)
(1500 RPM) .....	2600-CFM (74 m <sup>3</sup> /min)
Fuel Consumption at Rated Load ASTM No. 2 Diesel .....	48.0-GPH (182 lit/hr)

## GENERAL

Height .....	102.88-inches (2.61 m)
Width .....	74.12-inches (1.88 m)
Length .....	168.00-inches (4.27 m)
Weight (Approximate) .....	17,450-lb. (7915 kg)

**TABLE 1. GENERATOR VOLTAGE OPTIONS**

GENERATOR VOLTAGE OPTIONS					
VOLTS	PHASE	FREQ.	MODEL NUMBER	AMPERES	KVA
120/208	3	60 Hz	600.0DWV - 4R	3612/2084	750
120/240*	3	60 Hz	600.0DWV - 5DR	3612/1806	750
240/416	3	60 Hz	600.0DWV - 7XR	1806/1042	750
240/480*	3	60 Hz	600.0DWV - 6DR	1806/903	750
277/480	3	60 Hz	600.0DWV - 4XR	1565/903	750
347/600	3	60 Hz	600.0DWV - 9XR	1254/720	750
220/380	3	50 Hz	500.0DWV - 57R	1640/950	625

\* - Delta Wound.

# SAFETY PRECAUTIONS

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

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

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

*Most accidents can be prevented!*

## KNOW YOUR MANUAL—KNOW YOUR EQUIPMENT

### 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 generating set and the surrounding area clean and free from obstructions. Remove all oil deposits; keep the floor clean and dry.
- Provide appropriate fire extinguishers and install them in convenient locations. Consult your local fire department for the correct type of extinguisher to use. Do not use foam or carbon tetrachloride on electrical fires. Use extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the generating set are secure. Tighten supports and clamps, keep guards in position over fans, driving belts, etc.
- Do not wear loose clothing in the vicinity of moving parts, or jewelry while working on electrical equipment. 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 — YOU'RE COURTING A POSSIBLE EXPLOSION AND FIRE!

- 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 has been bled off.
- Radiator fan belts are guarded for your protection. DO NOT remove covers or guards.
- Keep your hands away from moving parts.

### **Ventilation System**

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

### **Electrical System**

- The electrical installation exterior to your generator should have been performed by qualified licensed electricians. All local and state

codes should have been consulted and complied with. It is essential that all load circuit breakers adequately protect electrical functions, all circuits are properly grounded and wiring is correct capacity.

- Tag open switches.
- DON'T tamper with interlocks.
- Before starting work on the generating set, disconnect batteries. This will prevent inadvertent starting of the set.
- Use extreme caution when making adjustments on the electrical components in the control panel while the engine is running. High voltages are present and could cause serious 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.

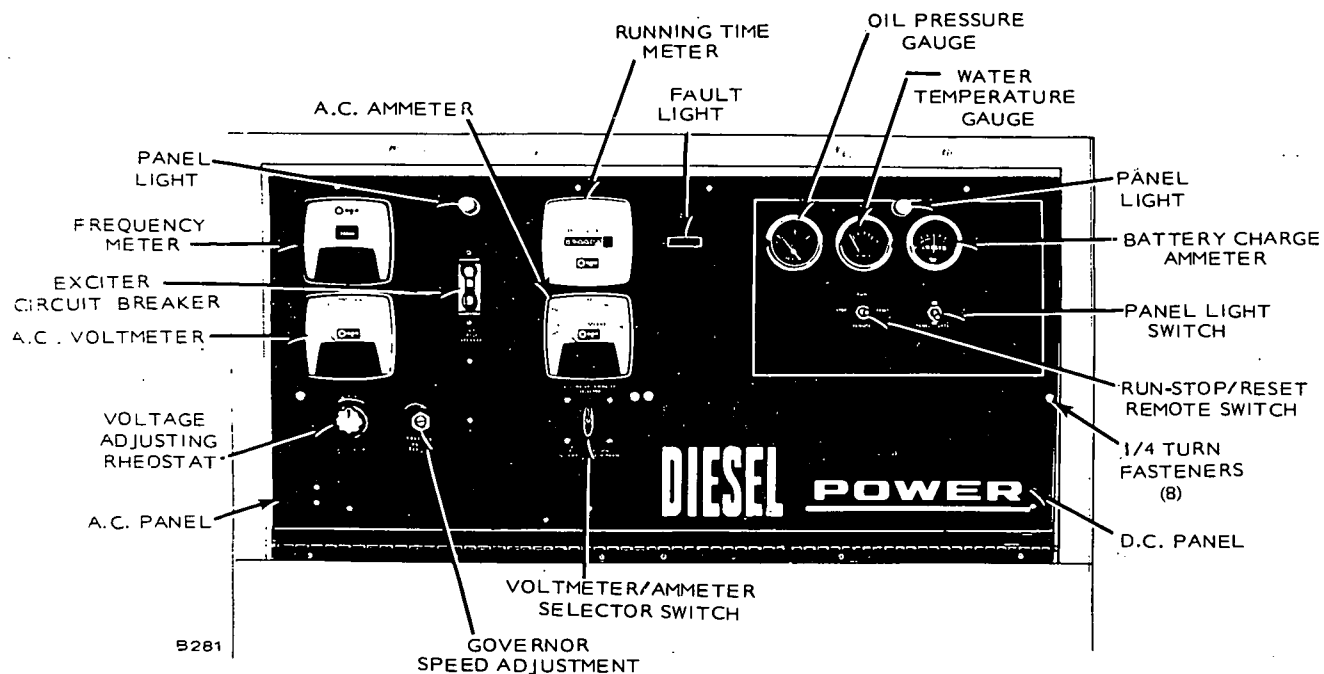


FIGURE 1. TYPICAL CONTROL PANEL (ONE FAULT LAMP)

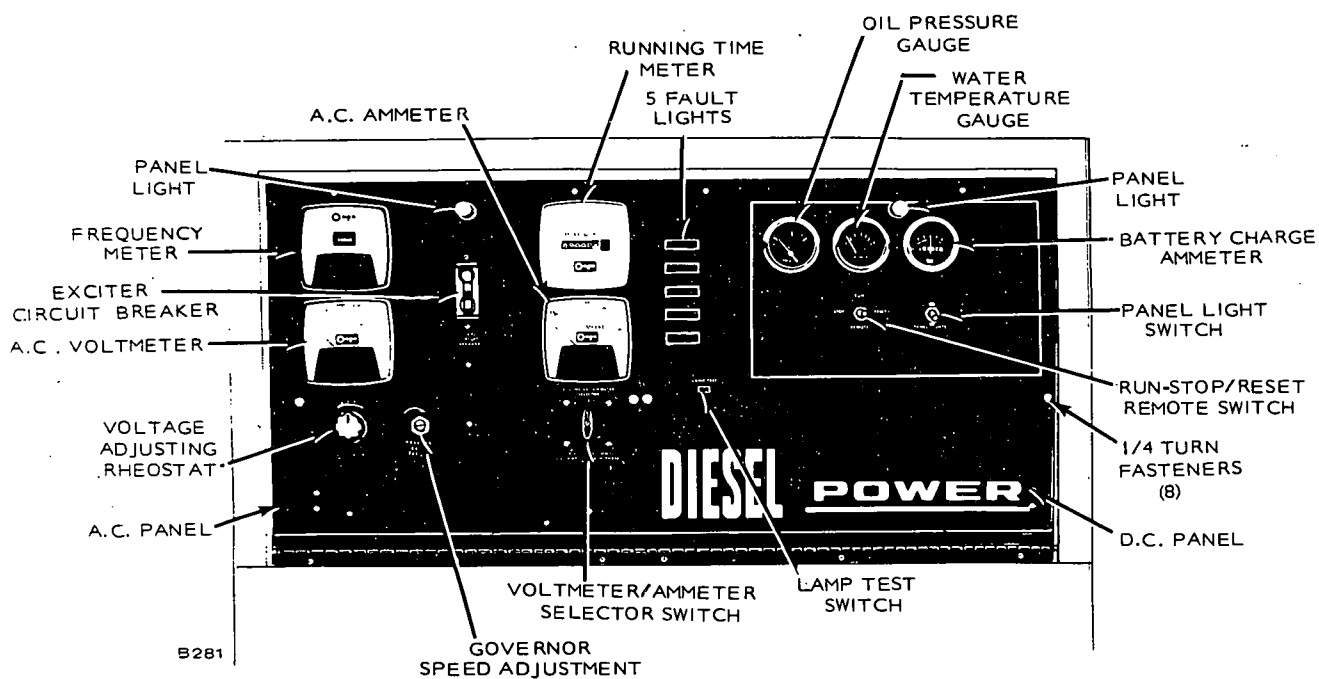


FIGURE 2. OPTIONAL CONTROL PANEL (FIVE FAULT LAMPS)



# DESCRIPTION

## GENERAL

An Onan DWV Series electric generating set is a complete unit consisting of an engine driven AC generator, with controls and accessories as ordered.

## ENGINE

The engine on the DWV is a Waukesha P2154 DSI as described in engine manual. Basic measurements and requirements will be found under *Specifications*. However, the engine used for your unit may have variations due to optional equipment available.

## AC GENERATOR

The generator is an Onan Type UV, 4 wire, 4 pole, revolving field brushless unit. Alternating current is generated in the stator winding. The alternator rotor, attached directly to the engine flywheel turns at engine speed. Therefore, the speed at which the rotor turns, determines generator output frequency. The 60 hertz set operates at 1800 rpm and the 50 hertz at 1500 rpm. Excitation is achieved by feeding AC output to a voltage regulator, where it is compared with a reference voltage in the regulator, rectified and returned to the field of the exciter, then to the exciter armature, rectified and fed to the generator field.

## 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 Lights and Switch:** Illuminates control panels.

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

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

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

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

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

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

### AC Panel

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

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

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

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

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

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

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

## OPTIONAL EQUIPMENT

For location of optional panel equipment, see Figure 2.

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

- Overcrank
- Overspeed
- Low oil pressure
- High engine temperature
- Low engine temperature

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

**TABLE 2. FAULT LAMP OPTIONS**

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

\* - With additional optional sensors.

## CONTROL PANEL INTERIOR

**Voltage Regulator:** Solid state unit controls AC output from generator at predetermined level regardless of load. Regulation plus or minus 2% from no load to full load, 0.8 P.F.

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

1. A 75 second cranking period.
2. Approximately a 12.5-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 reaches 2100 rpm). See Figure 3.
  - c. Low oil pressure 14 psi (96.53k Pa).
  - d. High engine temperature 205° F (96° C).

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 3.

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

## OPTIONAL MODULES

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

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

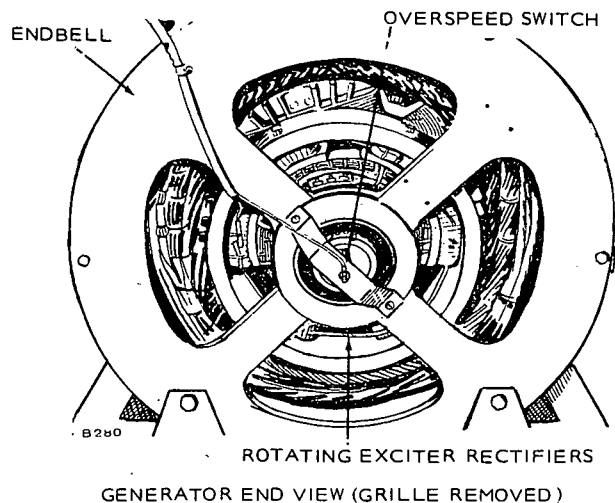


FIGURE 3. OVERSPEED SWITCH

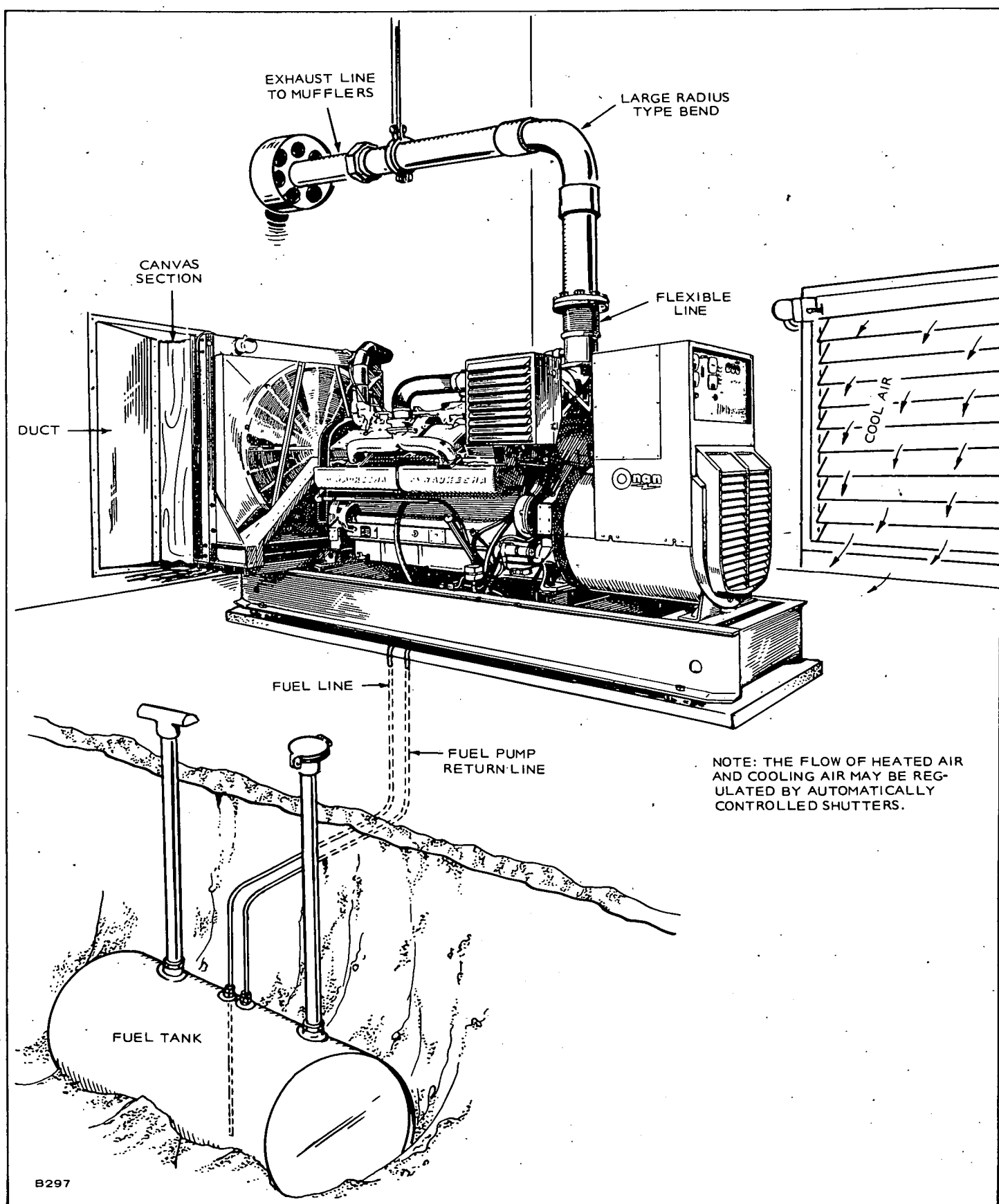


FIGURE 4. TYPICAL INSTALLATION

# INSTALLATION

## GENERAL

Installations must be considered individually. Use these instructions as a general guide. Meet regulations of local building codes, fire ordinances, etc., which may affect installation details. See Figure 4.

Installation points to consider include:

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

## LOCATION

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

## MOUNTING

Generating sets are mounted on a rigid skid base which provides proper support. Install vibration isolators between skid base and foundation. For convenience in draining crankcase oil and general servicing, mount set on raised pedestals (at least 6 inches high [155 mm]). If mounting in a trailer, or for other mobile applications, bolt securely in place. Extra support for the vehicle flooring may be necessary. Bolting down is recommended for stationary installations.

### CAUTION

The generator support must be aligned to the skid base to prevent premature generator bearing failure, vibration and possible drive disc failure. Failure to do so could void the warranty. Align the generator support to the skid base according to the following instructions.

1. Set the unit on its mounting foundation, using vibration isolators between skid base and foundation (Figure 5). Secure the skid base to the isolators and the isolators to the mounting foundation. Remove the two mounting bolts; use them as jack screws by moving them to the adjacent threaded holes, then raise the generator and remove the shims from between the generator and support and skid base.

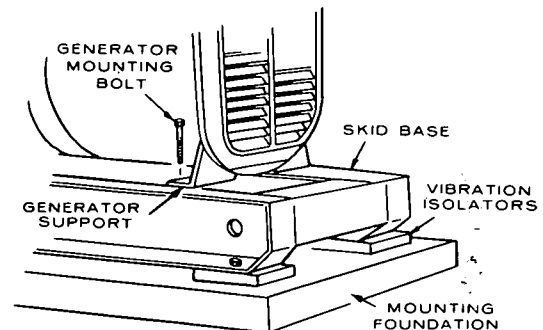
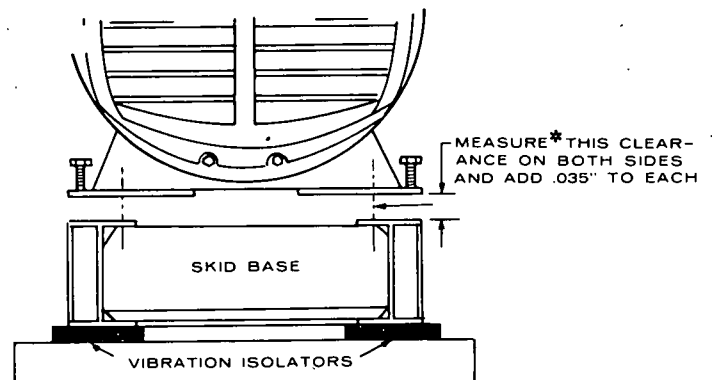


FIGURE 5

2. Remove the tension from the jackscrews and allow generator to hang free. Using a feeler gauge, measure the clearance from the top surface of the skid base to each generator support mounting surface (Figure 6). To this measured clearance, add .035 inches (0.89 mm) to each side of the skid base—this total clearance will determine the amount of shims required.

The clearance may be different for each side of the skid base. If there is a great difference, loosen the generator support and realign.



\*The measurement should be taken in line with bolt hole.

FIGURE 6

- After determining the proper clearance for each side of the skid base, turn jackscrews in the threaded holes to allow a clearance for placing the shims between skid base and generator support (Figure 7). Lower generator (using jackscrews) and allow to rest on shims. Recheck the total generator clearance, base to support; it must equal the base to support clearance plus the .035 inches.

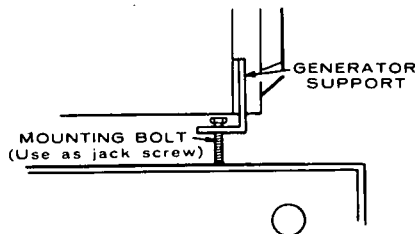


FIGURE 7

- Remove the jackscrews and reinstall as mounting bolts through generator support, shims and skid base. Secure and lock the mounting bolts in place (Figure 8).

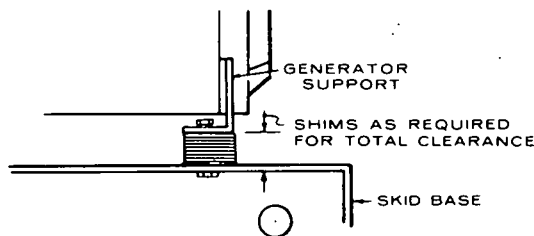


FIGURE 8

## VENTILATION

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

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

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

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

**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 and support combustion in the engine.

## CITY WATER COOLING

An optional method of engine cooling, in place of the conventional radiator and fan, uses a constant pressure water supply. This is referred to as CITY WATER COOLING or HEAT EXCHANGER SYSTEM. See Figure 9 for typical system.

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

Use flexible pipe for connecting water supply and outlet flow pipes to engine. Pipe the outlet flow to a convenient drain. Install an electric solenoid valve and a rate of flow valve in the water supply line. The electric solenoid valve opens and allows water flow through the system only when the plant operates. The rate of flow valve, either automatic or manual, provides for the proper flow rate to the engine. Adjust the flow to maintain water temperature between 165° and 195° F (74° and 91° 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.**

## WATER JACKET HEATER (Optional)

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

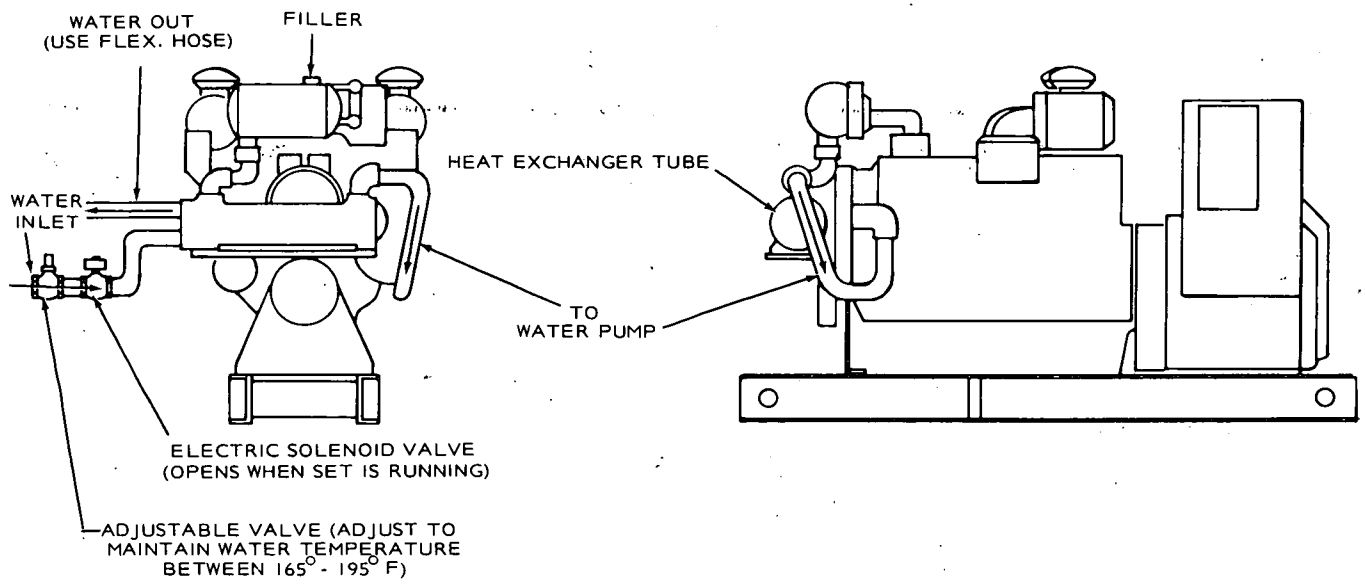


FIGURE 9. HEAT EXCHANGER COOLING (TYPICAL)

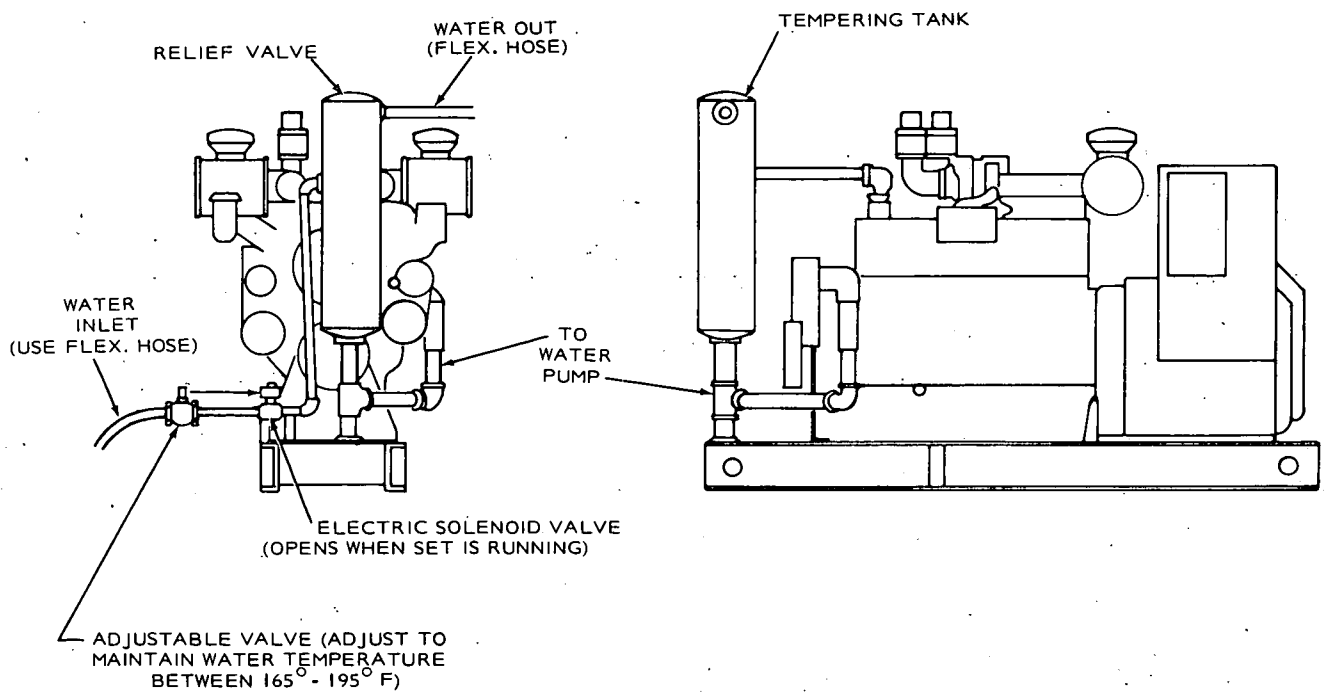


FIGURE 10. STANDPIPE COOLING (TYPICAL)

## EXHAUST

### WARNING

Inhalation of exhaust gases can result in death.

Engine exhaust gas must be piped outside building or enclosure. Do not terminate pipe in the vicinity of ventilating air inlet duct or venturi; gases will be pulled back into building. Where pipe has to be joined make sure that welds are leak free. When a pipe is run along a combustible wall, it should be far enough from the wall to prevent heat damage. Where exhaust duct is run through a wall, an insulating thimble should be used which will adjust for thermal movement and also prevent heat from the exhaust damaging the wall.

Sharp bends should be avoided, but where this is not possible a condensation trap (Figure 11) should be installed. Drain this trap frequently. Provide adequate support for mufflers and exhaust pipes. Refer to Figure 4 for a typical exhaust installation. Shield or insulate exhaust lines if there is danger of personal contact.

Use a pipe at least as large as the 10-inch diameter of the engine outlet. Maximum length is 400-feet (126 m) for a 10-inch exhaust pipe.

Maximum allowable back pressure is 27.2-inches H<sub>2</sub>O (2.0-inches Hg) or 690.9 mm H<sub>2</sub>O (50.8 mm Hg).

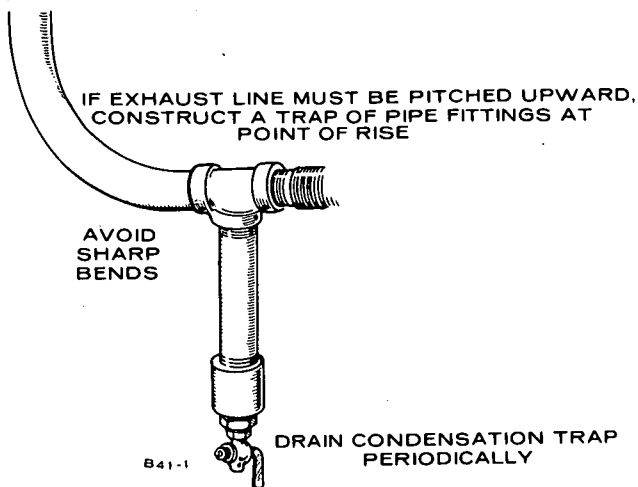


FIGURE 11. EXHAUST CONDENSATION TRAP

## FUEL SYSTEM

The Waukesha engines used on the DWV sets are designed for use with No. 2 Diesel fuel. They will however operate on other fuels within the specifications delineated in section 4-19. of the Waukesha 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.

The maximum fuel lift without any horizontal run should not exceed 10 feet. The horizontal run, if the supply tank is level with the fuel pump, should not exceed 12-1/2 feet. Use 3/8-inch tubing for the fuel supply line. The inlet fitting on the fuel filter is threaded for a 3/8-inch pipe fitting. The fuel pump return line is threaded for a 1/4-inch pipe fitting. Use 1/8 inch tubing for the fuel pump return line.

## DAY TANK

Generator set installations may be equipped with an optional fuel day tank. A float operated switch controls a fuel transfer pump. The correct level is maintained to assure a constant source of fuel. It is necessary to install an overflow line between the day tank and the main fuel tank. Refer to the instructions included with the tank. See Figure 12 for an example of a day tank installation.



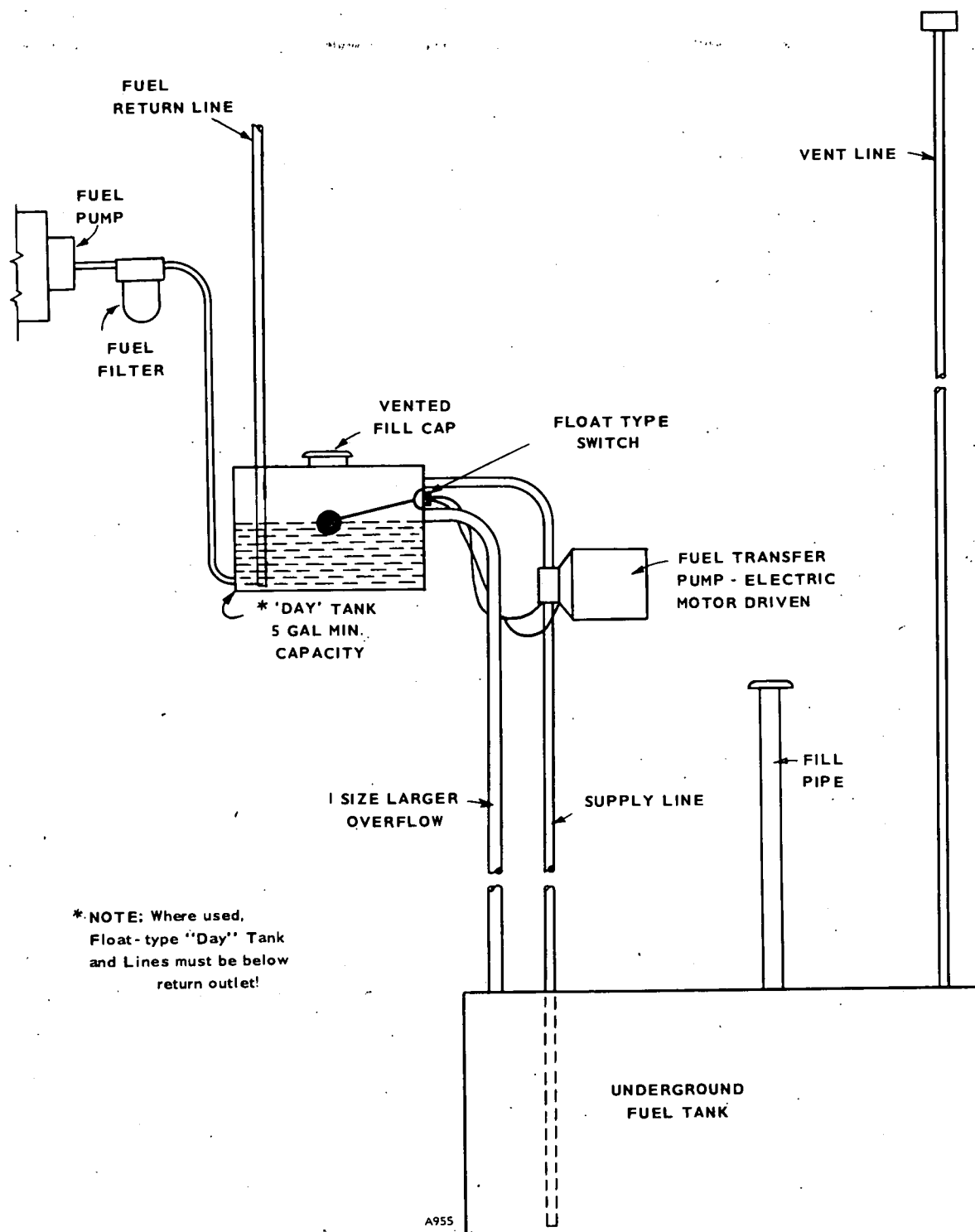


FIGURE 12. DAY TANK INSTALLATION

## BATTERY

Starting the plant requires 24-volt battery current. Use two 12-volt (see specification) batteries for a normal installation. Connect the batteries in series (negative post of first battery to positive post of second) as in Figure 13. Necessary battery cables are on unit. Service the batteries as necessary. Infrequent plant use (as in emergency standby service) may allow the batteries to self-discharge to the point where they cannot start the plant. If installing an automatic transfer switch that has no built-in charge circuit, connect a separate trickle charger. Onan automatic transfer switches include such a battery charging circuit.

### WARNING

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

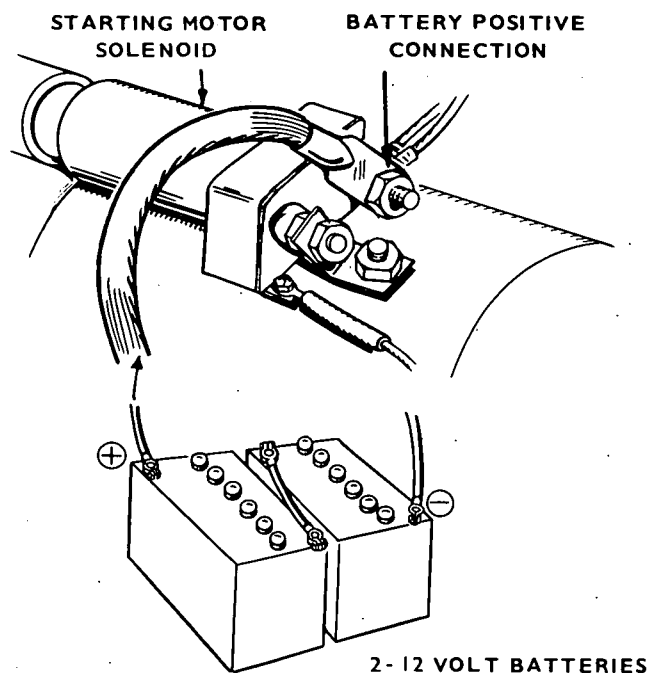


FIGURE 13. BATTERY CONNECTION

## BATTERY, HOT LOCATION

Batteries will self discharge very quickly when installed where the ambient temperature is consistently above 90°F (32°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°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 an hydrometer or filler bulb and dispose of it in a safe manner. Avoid skin or clothing contact with the electrolyte.
3. Refill each cell with distilled water, to normal level.
4. Continue charging for 1 hour at a 4 to 6 hour rate.
5. Test each cell. If the specific gravity is still above 1.255, repeat steps 2, 3, 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 1000- and 2000-feet (305 m and 610 m), use No. 16 AWG wire.

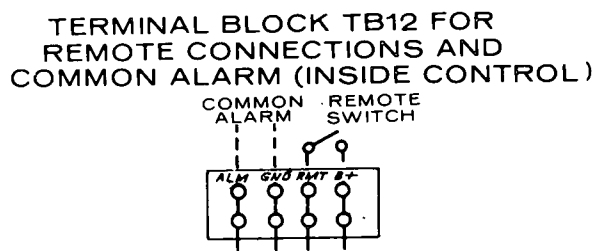
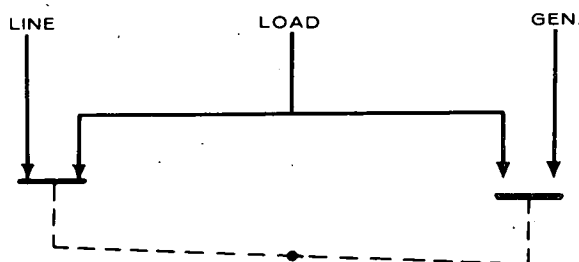


FIGURE 14. REMOTE CONTROL CONNECTION

## WIRING CONNECTIONS

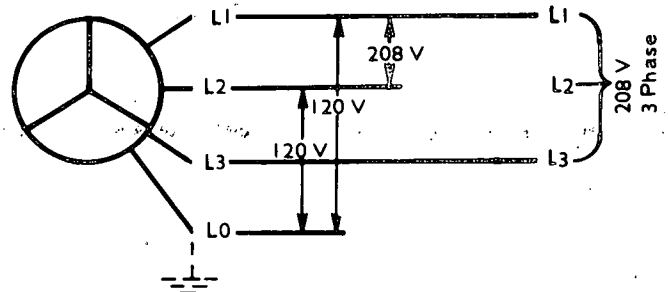
Most local regulations require that wiring connections be made by a licensed electrician and that the installation be inspected and approved before operation. All connections, wire sizes, etc. must conform to requirements of electrical codes in effect at the installation site.

If the installation is for standby service, a double throw transfer switch (Figure 15) must always be used. Connect this switch (either automatic or manual) so that it is impossible for commercial power and generator power to be connected to the load at the same time. Instructions for connecting an automatic transfer switch are included with such equipment.

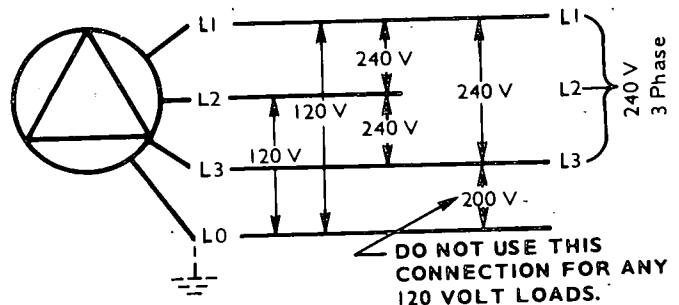


NOTE: SHOWN WITH LINE CONNECTED TO LOAD.

FIGURE 15. LOAD TRANSFER SWITCH (TYPICAL)



3-PHASE WYE CONNECTION



3-PHASE DELTA CONNECTION

FIGURE 16.

## GENERATOR CONNECTIONS

Voltage output of the model UV generator is predetermined at the factory by the internal connections to the bus-bars. It is not recommended that these be changed. The generator is rated in two voltages, the lower being line to neutral and the higher is the line-to-line voltage. Refer to the rating plate on the generator. For maximum current available at these voltages, see Table 1.

For 3-phase loads connect separate load wires to each of the set terminals L1, L2 and L3 (Figure 16). 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 load wire to the L0 terminal. Connect the "hot" (black) 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.

ONAN recommends that all connections from the generator to the bus-bars and from the bus-bars to the load be made by a qualified electrician. All applicable local and state laws should be complied with.

# OPERATION

## GENERAL

ONAN DWV Series electric generating sets are given a complete running test under various load conditions and 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

**Lubricating System:** Engine oil was drained prior to shipment. Fill engine to capacities shown. After engine has been run, check dipstick, add oil to bring level to full mark. Record total capacity for future oil changes. Refer to Waukesha engine manual for engine oil recommendations. Note that for average operating conditions oils conforming to Military Specifications MIL-L-2104C and MIL-L-45199B (Series 3) are recommended. Do not mix brands nor grades of lubricating oils.

Recommended oil viscosity is SAE 40 for all temperatures. Use a coolant heater for ambients below 70° F (21° C).

### Oil Capacities (nominal)

Oil Pan .....	18 gallons (68.13 litres)
Filter and Oil Lines .....	10 gallons (37.85 litres)
Total .....	28 gallons (106 litres)

**CAUTION** After changing or filling engine crankcase, pre-fill oil filters. If this is not performed, the engine will be starved for oil until the filters fill up, and damage will result.

**CAUTION** Use a manual, electric pump or air pressure method of filling engine oil system including the turbo-charger oil supply lines. Operation of the turbo without adequate oil flow to the bearings can cause severe damage to turbo within five seconds. Refer to Waukesha manual on turbo-charger operation.

**Cooling System:** Cooling system was drained prior to shipment. Fill cooling system before starting. Total capacity is 65 gallons (246 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 Waukesha manual for additional information.

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

Ensure that water supply for city water cooling is turned ON.

**Fuel System:** Refer to the Waukesha 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.

Remove suction line from fuel pump and prime with clean fuel. Reconnect suction line. Check all connections in fuel system, for security, to ensure that pressure will not bleed off when engine is not in use. Pressure should be maintained for immediate starting if unit is on standby service.

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

Check level of electrolyte to be at split ring mark. Measure specific gravity of electrolyte: SG 1.280 at 80° F (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.

- a. Crankcase filled.
- b. Cooling system filled — input solenoid valve open.
- c. Batteries charged and connected.
- d. Fuel solenoid valve open.

To start, move the "run-stop-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 40 and 50 psi (275.8 and 344.8 kPa). Check the following gauges:

- a. DC Ammeter — 10 to 30 amperes.
- b. AC Voltmeter — AC generator output voltage.
- c. Frequency Meter — AC generator output frequency.

After running 10 minutes under load the water temperature gauge should have stabilized at 160° to 180° F (71° to 82° 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° to 195° F (74° to 91° C).

**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.

## STOPPING

To reduce and stabilize temperatures within the engine and turbocharger run the engine at no load for 3-5 minutes before shutting down.

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

## EXERCISE PERIOD

Generating sets on continuous standby service are required to be operative at essential load 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 pressure, prevent electrical relay contacts from oxidizing and insure easy emergency starts. ONAN automatic transfer switches contain an optional exercise switch which, by pre-selection, will start, determine run period and shut down a set on a weekly frequency. For example, the switch can be set for time of start, length of run, A.M. or P.M. and day of week.

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

## HIGH ALTITUDE

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

## 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.

## DUST AND DIRT

1. Keep set clean. Keep cooling system free of dirt, etc.
2. Service air cleaners regularly.
3. Change crankcase oil at proper intervals.
4. Ensure air inlet system is leak free.

**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.	<p>1. See engine service manual for troubleshooting fuel system.</p> <p>After correcting problem, reset engine monitor relay by placing Run-Stop/Reset-Remote switch to Stop/Reset, then back to the required running position.</p>
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.	<p>3. Check the following:</p> <ul style="list-style-type: none"> <li>a. Oil level. Engine will shut down if sensor is closed.</li> <li>b. Check engine manual for troubleshooting oil system.</li> <li>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.</li> <li>d. Check for faulty oil pressure sensor or faulty high engine temperature sensor.</li> </ul>
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**  
**(Units with five fault lamps)**

<b>SYMPTOM</b>	<b>CORRECTIVE ACTION</b>
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

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

1. Run set until thoroughly warm.
2. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
3. Refer to Chapter 6 (storage) of Waukesha engine manual.
4. Clean throttle linkage and protect by wrapping with a clean cloth.
5. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
6. Wipe entire unit. Coat parts susceptible to rust with a light film of grease or oil.
7. Disconnect battery and follow standard battery storage procedure.
8. Provide a suitable cover for the entire unit.

## LOW TEMPERATURES

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

**Engine Heater:** The function of this optional heater is to keep the engine warm enough to assure starting under adverse weather conditions. Connect the heater to a source of power that will be ON during the time the engine is not running. Be sure the voltage rating is correct for the heater element rating (Figure 17).

### CAUTION

Do not energize heater until engine cooling system is filled with coolant.

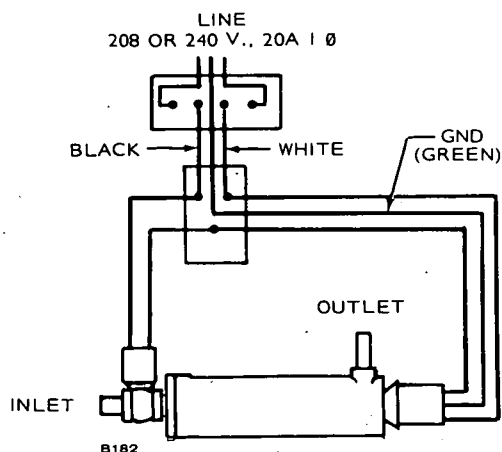


FIGURE 17. ENGINE HEATER (TYPICAL)

## 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.



# GENERAL MAINTENANCE

## GENERAL

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

### WARNING

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

**TABLE 5. OPERATOR MAINTENANCE SCHEDULE**

MAINTENANCE ITEMS	OPERATIONAL HOURS				
	8	50	100	200-250	500
Inspect Plant	x				
Check Coolant Level	x				
Check Oil Level	x4				
Check Air Cleaner (Clean if Required)		x1			
Inspect Fan Belt		x2			
Check Cooling System, Hoses, etc.		x3			
Check Batteries		x			
Clean and Inspect Crankcase Breather			x		
Change Oil Filter Element				x1	
Clean and Inspect Battery Charging Alternator				x	
Change Crankcase Oil				x1	
Check Security of all fasteners			x5		

x1 - Every 3 months. Perform more often in extremely dusty conditions.

x2 - Every 3 months adjust to 1/2 inch (13 mm) depression between pulleys.

x3 - Check for rust or scale formation. Flush if necessary.

x4 - For accurate readings, check oil level approximately 30 minutes after shut down.

Keep oil level as near "H" mark on dipstick as possible. See engine manual.

x5 - Every 3 months.

## GOVERNOR ADJUSTMENTS — ENGINE SPEED

A Barber-Colman governor is standard equipment on DWV generator sets. Governors are set at the Onan testing facility and do not require further adjustment for normal standby service.

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

1. Remove four screws and cover from governor controller (see Figure 18).
2. Disconnect wire from TB11-22 in generator control cabinet. This disconnects the starter solenoid.
3. Place the Run-Stop-Remote switch to RUN position, by-pass the governor fail safe system by using a short (approx 6") jumper wire from TP1 to TP2 as shown in Figure 19. If the actuator arm does not move to the FULL FUEL position, adjust the activator stroke limit potentiometer (L) in the governor controller box until the actuator linkage moves to full fuel position. Then back the adjustment off slightly such that the linkage is just at the full fuel position.

4. Return Run-Stop-Remote switch to STOP. Reconnect wire TB11-22.
5. Position speed control rheostat on generator control panel to midrange of travel (out 5-turns from low rpm).
6. Adjust speed reference potentiometer in governor controller counterclockwise four complete turns.
7. Start engine. As engine approaches rated speed (1500 rpm or 1800 rpm), the actuator should back away from the full fuel position and control engine speed.

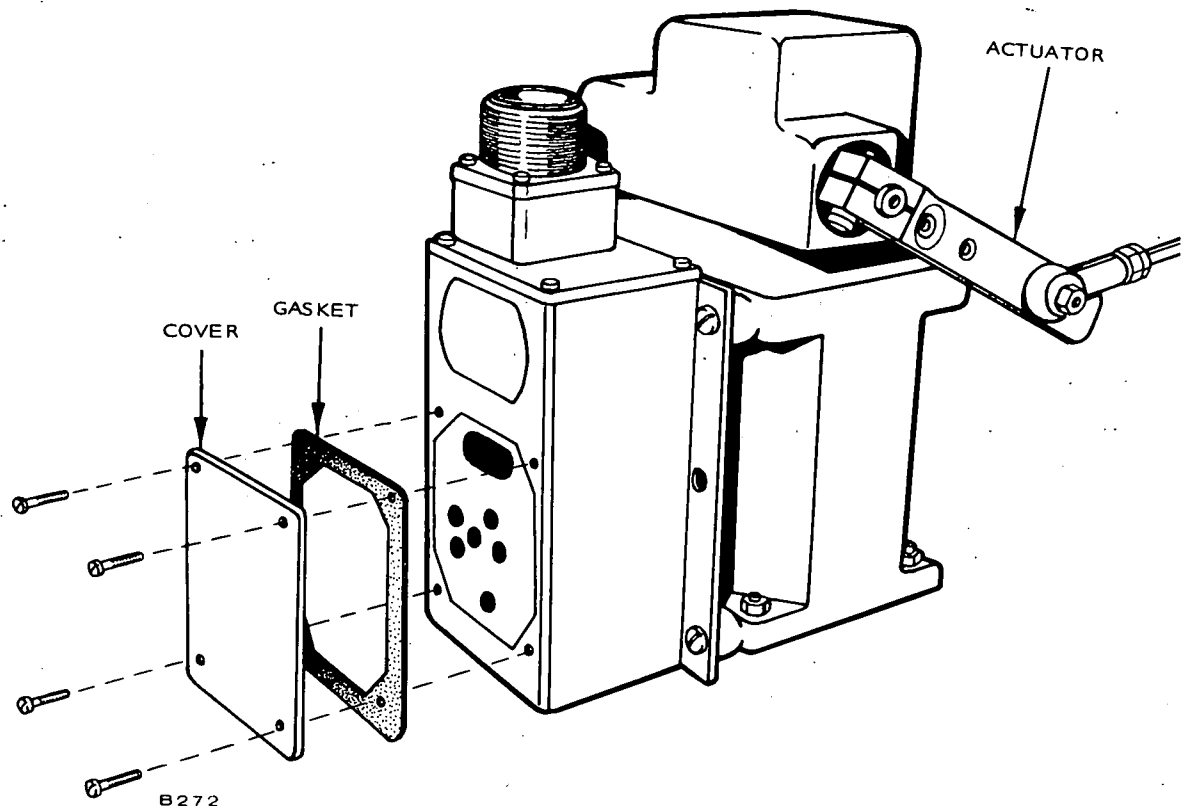
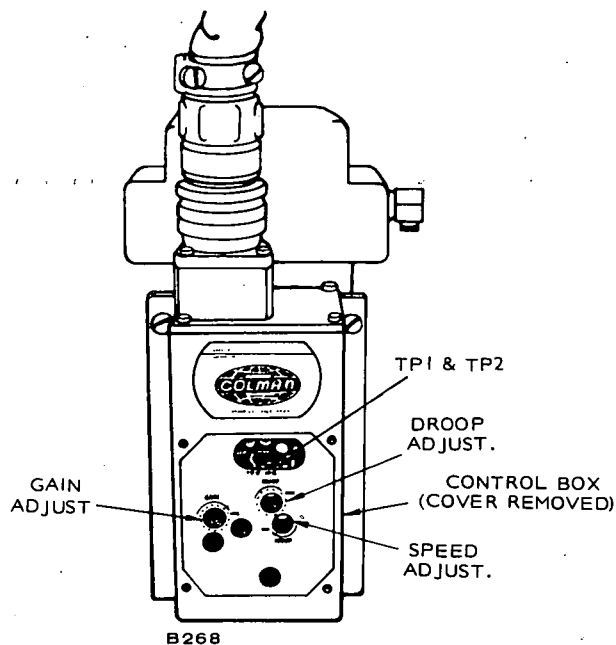


FIGURE 18. BARBER-COLMAN GOVERNOR



**FIGURE 19. GOVERNOR CONTROL BOX ADJUSTMENTS**

9. Adjust Gain potentiometer slightly clockwise then counterclockwise as necessary until engine is stable and responsive to governor control.
10. Load and unload engine several times to ensure correct gain adjustment.
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.

# PARTS CATALOG

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


## 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.

<b>Onan</b> <sup>®</sup>	
<b>ELECTRIC GEN SET</b>	
MODEL AND SPEC NO. <input type="text"/>	
SERIAL NO. <input type="text"/>	
<b>IMPORTANT:</b> ALWAYS GIVE ABOVE NOS. WHEN ORDERING PARTS	
A.C. VOLTS <input type="text"/>	PH. <input type="text"/>
K.V.A. <input type="text"/>	KW <input type="text"/>
P.F. <input type="text"/>	AMPS <input type="text"/> Hz <input type="text"/>
D.C. VOLTS <input type="text"/>	AMPS <input type="text"/>
WATTS <input type="text"/>	
R.P.M. <input type="text"/>	BAT <input type="text"/>
MANUFACTURED BY <b>ONAN</b> DIVISION OF ONAN CORPORATION MINNEAPOLIS, MINNESOTA, U.S.A. 99A941	

## WAUKESHA PARTS

All Waukesha parts must be ordered from the Waukesha Motor Company of Waukesha, Wisconsin or their nearest authorized Waukesha distributor or dealer. When ordering parts or requesting service information, supply Waukesha with all information stated on the engine nameplate.

<b>DIESEL ENGINE</b>					
					
MODEL <input type="text"/>			SIZE <input type="text"/>		
SERIAL <input type="text"/>	LOT <input type="text"/>	SPEC. <input type="text"/>			
GOV'N'D SPEED <input type="text"/>		SET VALVES COLD INT <input type="text"/> EXH <input type="text"/>			
OIL SPEC SAE NO. WINTER <input type="text"/>	SUMMER <input type="text"/>	SPARK ADV <input type="text"/>	DEG. AT <input type="text"/>	R.P.M. <input type="text"/>	
WAUKESHA MOTOR COMPANY			WAUKESHA, WISCONSIN		
MADE IN U.S.A.					

This catalog applies to the standard DWV generator sets as listed below. Powered by a Waukesha engine (see the Waukesha 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 Waukesha manual. Onan parts are arranged in groups of related items and are identified by a reference. All parts illustrations are typical. Unless otherwise mentioned, parts are interchangeable. Right and left sides are determined by facing the front end of the engine.

### GENERATOR SET DATA TABLE

MODEL AND SPEC NO. *	ELECTRICAL DATA				
	WATTS	VOLTS	HERTZ	PHASE	WIRE
600DWV-4R8/	600,000	120/208	60	3	4
600DWV-4XR8/	600,000	277/480	60	3	4
600DWV-7XR8/	600,000	249/416	60	3	4
600DWV-5DR8/	600,000	120/240	60	3	4
600DWV-6DR8/	600,000	240/480	60	3	4
600DWV-9XR8/	600,000	347/600	60	3	4

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

**NOTE:** Hertz is a unit of frequency equal to one cycle per second.

### REPLACEMENT ENGINE:

100-1295. . . . . 1

Engine, Replacement (Waukesha Motor Company Model P2154DSIU)

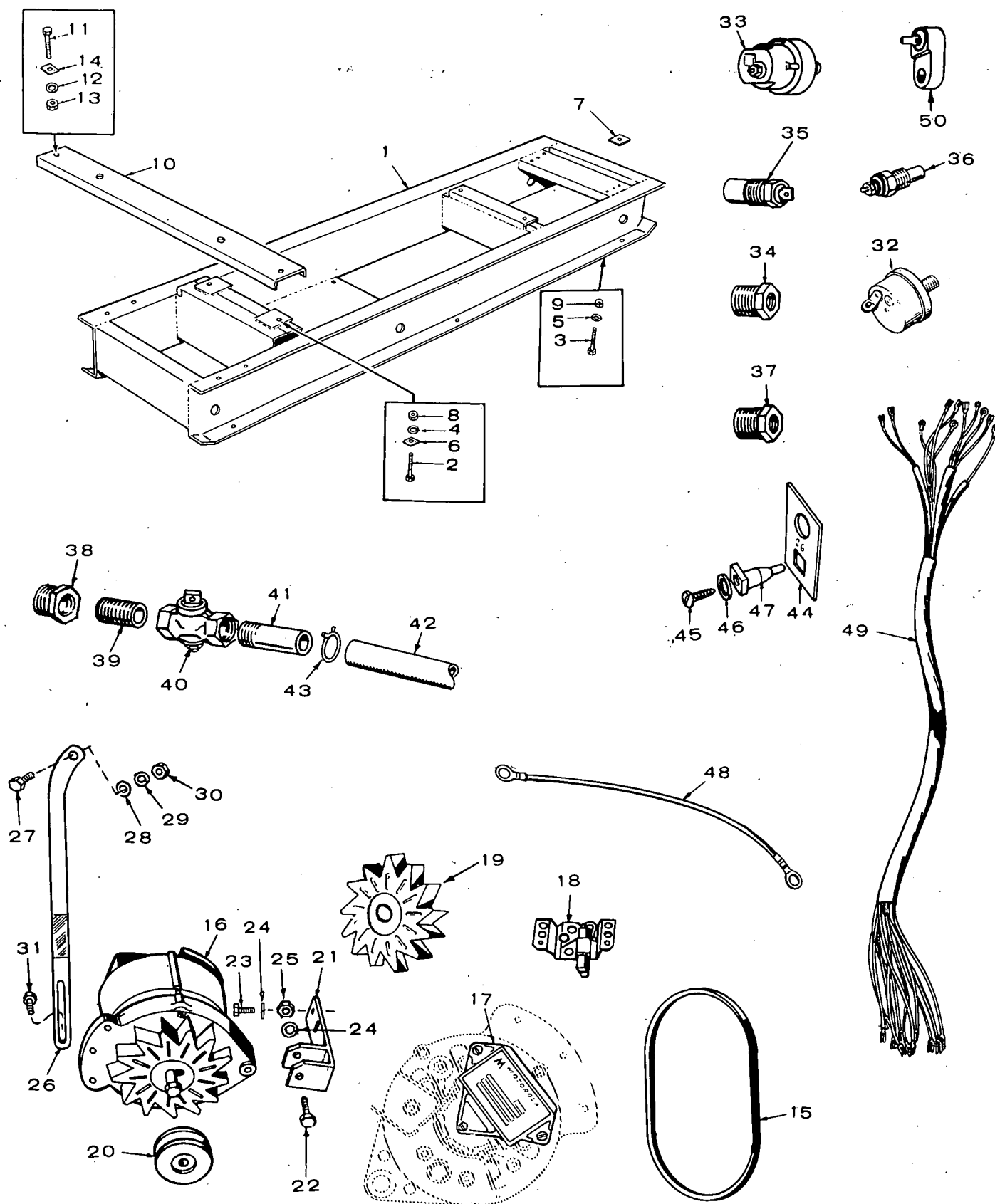
#### General Description:

Includes — Complete Cylinder Block, Air Cleaner, Fuel Filter, Starter Motor (24 Volt), Fan Blades, Fan Belts, Fan Guard, Flywheel, Flywheel Housing, Water Pump, Engine Supports, Oil Pan, Oil Cooler, Exhaust Manifold, Vibration Damper, Radiator Brace, Radiator and Aftercooler.

Excludes — Alternator, Alternator Mounting Brackets, Alternator Belt, Temperature Sender, Oil Pressure Sender, Governor.

**NOTE:** Replacement engine listed above applies to standard Spec I generator sets. Refer to factory for all other specifications.

# MISCELLANEOUS ENGINE PARTS GROUP

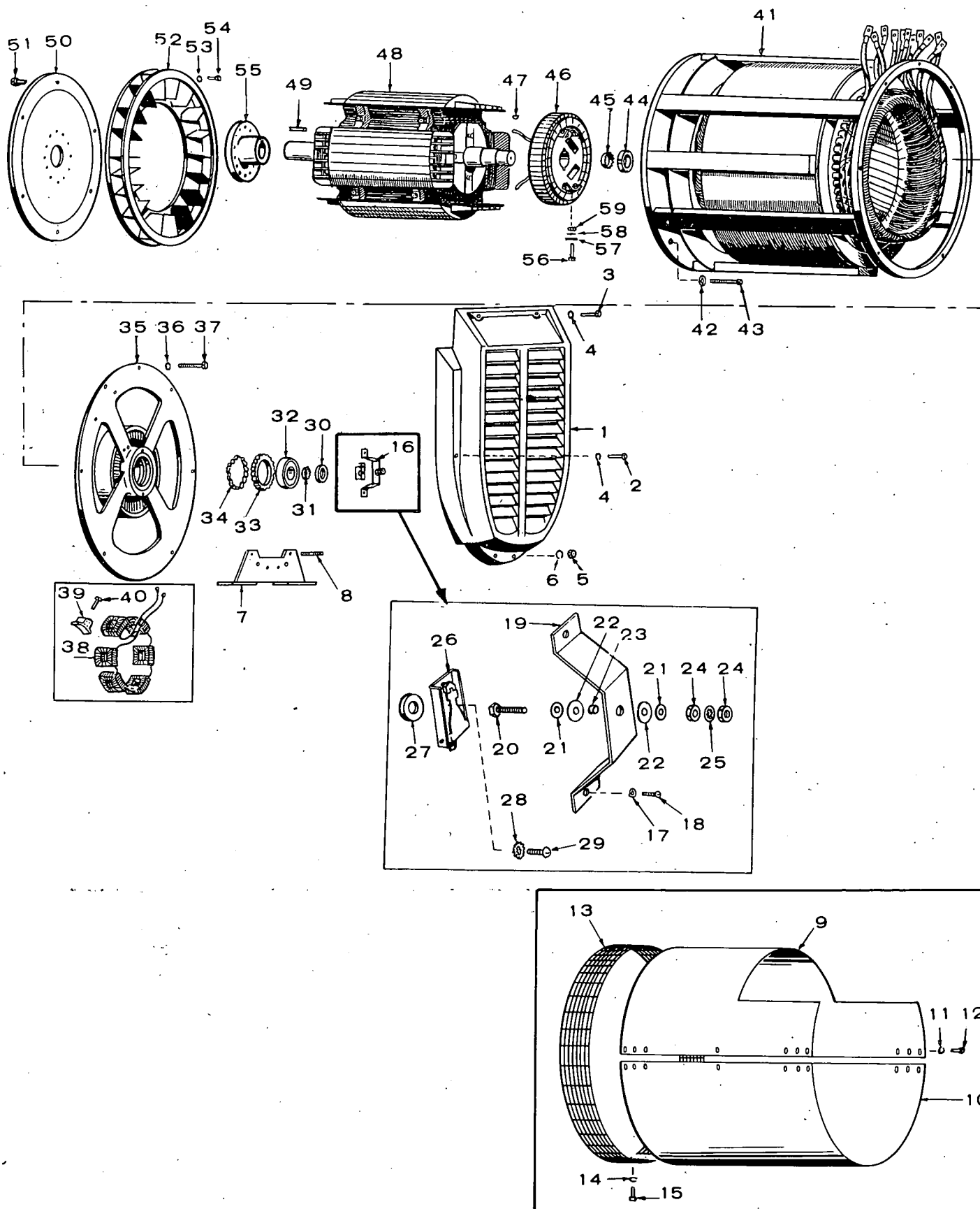


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	403-1096	1	Base, Mounting
2	800-0176	4	Screw, Hex Cap - Engine to Base (7/8-9 x 3")
3	800-0156	2	Screw, Hex Cap - Generator to Base (3/4-10 x 2-1/4")
4	850-0084	4	Washer, Lock - Engine to Base (7/8")
5	850-0079	2	Washer, Lock - Generator to Base (3/4")
6	403-1141	2	Washer, Bevel - Engine to Base
7	SHIM, GENERATOR TO MOUNTING BASE		
	232-1817	As Req.	.062"
	232-1489	As Req.	.0598"
	232-1490	As Req.	.0359"
8	862-0009	4	Nut, Hex - Engine to Base (7/8-9)
9	862-0008	2	Nut, Hex - Generator to Base (3/4-10)
10	130-0932	3	Support, Radiator
11	800-0156	12	Screw, Hex Cap - Radiator to Support and Support to Base (3/4-10 x 2-1/4")
12	850-0079	12	Washer, Lock - Radiator to Support and Support to Base (3/4")
13	862-0008	12	Nut, Hex - Radiator to Support and Support to Base (3/4-10)
14	403-1141	6	Washer, Bevel - Radiator Support to Base
15	511-0092	1	Belt, Alternator Drive
16	191-0688	1	*Alternator, Charge - Includes Regulator and Fan (Motorola #70D44039B04)
17	191-0733	1	Regulator, Voltage (Part of 191-0688 Alternator)
18	191-0659	1	Brush Assembly (Part of 191-0688 Alternator)
19	191-0871	1	Fan, Blower (Part of 191-0688 Alternator)
20	191-0649	1	Pulley, Alternator
21	191-1093	1	Bracket, Alternator Mounting
22	800-0095	1	Screw, Hex Cap - Alternator Mtg. (1/2-13 x 2-1/4")

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
23	800-0090	2	Screw, Hex Cap - Alternator Bracket Mounting (1/2-13 x 1")
24	850-0060	3	Washer, Lock - Alternator Mtg. (1/2")
25	862-0005	1	Nut, Hex - Alternator Mounting (1/2-13)
26	191-1100	1	Strap, Alternator Adjusting
27	800-0030	1	Screw, Hex Cap - Adjusting Strap Mtg. (5/16-18 x 1-1/4")
28	526-0115	1	Washer, Flat - Adjusting Strap Mounting (5/16")
29	850-0045	1	Washer, Lock - Adjusting Strap Mounting (5/16")
30	862-0015	1	Nut, Hex - Adjusting Strap Mounting (5/16-18)
31	821-0016	1	Screw, Hex Cap - Flanged - Adjusting Strap to Alternator (5/16-18 x 3/4")
32	309-0272	1	Switch, Low Oil Pressure
33	193-0195	1	Sender, Oil Pressure
34	505-0007	2	Bushing, Pipe - Reducer (1/4 x 1/8")
35	309-0178	1	Switch, High Water Temperature
36	193-0109	1	Sender, Water Temperature
37	505-0022	1	Bushing, Reducer (1 x 1/2")
38	505-0021	1	Bushing, Reducer - Oil Drain (3/4 x 1/2")
39	505-0100	1	Nipple, Close - Oil Drain (1/2")
40	504-0011	1	Valve, Shut-Off - Oil Drain
41	505-0185	1	Nipple, Half - Oil Drain
42	503-0509	1	Hose, Oil Drain (13")
43	503-0197	1	Clamp, Hose - Oil Drain
44	332-1281	1	Bracket, Terminal
45	809-0035	1	Screw, Sheet Metal Type - Terminal Bracket (#8 x 3/4")
46	508-0015	1	Washer, Fibre - Terminal Bracket
47	870-0196	1	Nut, Insulated - Terminal Bracket
48	336-1250	1	Lead, Alternator to Ground
49	HARNESSES, WIRING		
	338-0769	1	Engine to Control
	338-0903	1	Line to Control
50	309-0269	1	Switch, Low Engine Temperature - Optional

# GENERATOR GROUP

NOTE: See separate group for Bus Bar and Exciter Rotor parts.





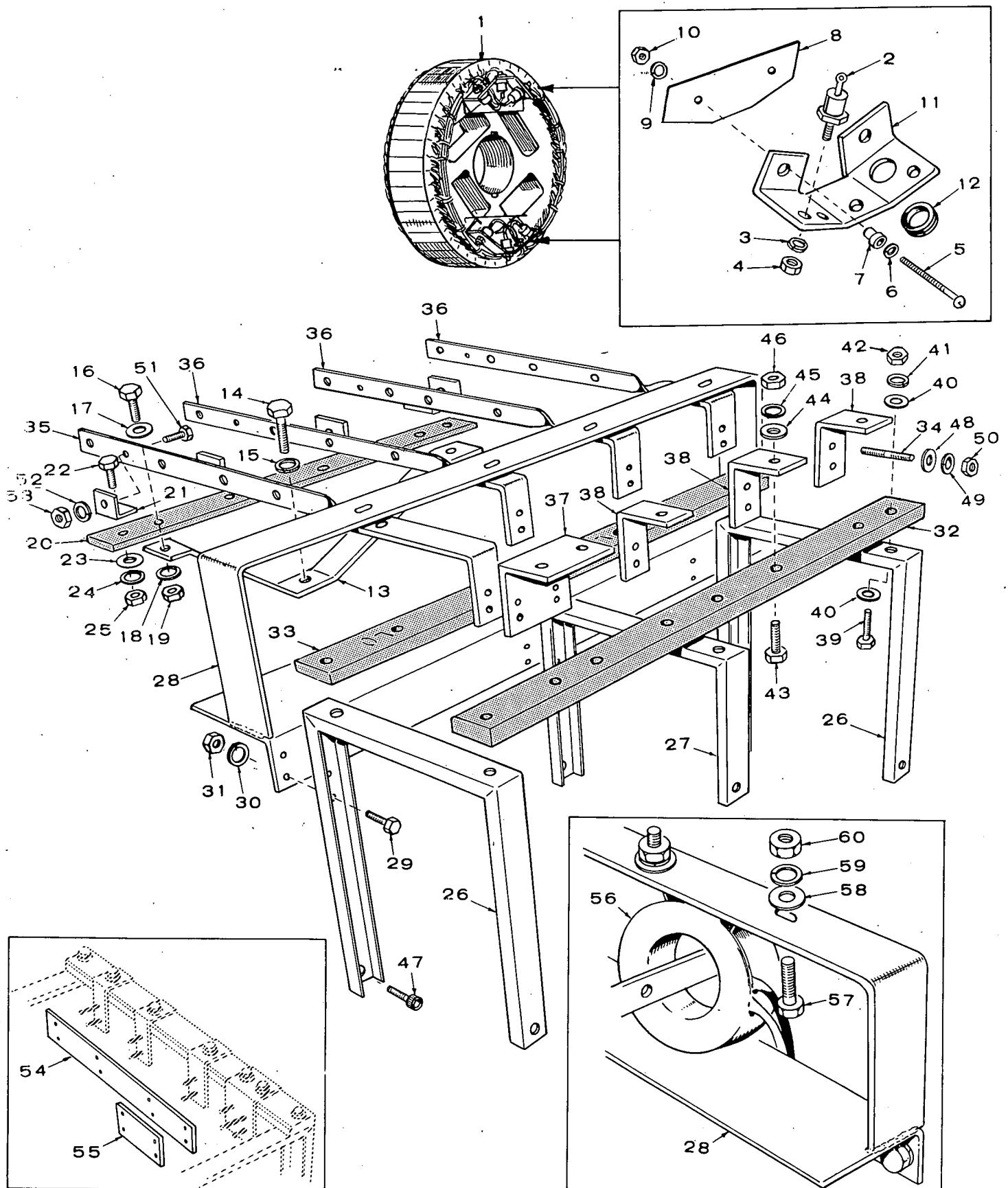
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	232-1973	1	Grill, End Bell
2	800-0013	2	Screw, Hex Cap (1/4-20 x 2-1/2")
3	800-0009	4	Screw, Hex Cap (1/4-20 x 1-1/2")
4	850-0040	6	Washer, Lock (1/4")
5	862-0007	4	Nut, Hex (5/8-11)
6	850-0070	4	Washer, Lock (5/8")
7	232-1957	1	Support, Generator Mounting
8	520-0692	2	Stud, Generator Support
9	234-0291	1	Band, Stator - Top
10	234-0281	1	Band, Stator - Bottom
11	850-0040	6	Washer, Lock (1/4")
12	800-0005	6	Screw, Hex Cap (1/4-20 x 3/4")
13	234-0272	1	Cover, Fan
14	850-0040	1	Washer, Lock (1/4")
15	800-0003	1	Screw, Hex Cap (1/4-20 x 1/2")
16	150-1447	1	Point Assembly, Overspeed Switch (Includes Parts Marked †)
17	850-0040	2	Washer, Lock (1/4")
18	812-0148	2	Screw, Round Head (1/4-20 x 1/2")
19	150-1194	1	†Bracket, Overspeed Switch
20	150-0723	1	†Contact, Overspeed Switch
21	526-0052	2	†Washer, Flat - Brass
22	508-0018	2	†Washer, Insulator
23	508-0006	1	†Washer, Insulator
24	871-0016	2	†Nut, Hex - Brass (1/4-20)
25	854-0014	1	†Washer, Lock (I.T.) (1/4")
26	150-0717	1	Switch Assembly, Overspeed
27	526-0030	1	Washer, Flat (3/8")
28	856-0010	1	Washer, Lock (E.I.T.) (3/8")
29	812-0189	1	Screw, Round Head (3/8-16 x 3/4")
30	510-0091	1	Nut, Bearing Lock (Special)
31	510-0093	1	Washer, Bearing Lock (Special)
32	510-0090	1	Bearing, Ball
33	232-1923	1	Ring, Bearing Holder
34	232-1924	1	Spring, Bearing Holder
35	211-0170	1	Bell, End (Includes Parts Marked £)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
36	850-0050	6	Washer, Lock (3/8")
37	800-0051	6	Screw, Hex Cap (3/8-16 x 1-1/4")
38	222-1693	1	£Coil Assembly, Field - Exciter (Set of Six Coils)
39	221-0153	6	£Shoe, Pole - Exciter
40	800-0031	12	£Screw, Hex Cap (5/16-18 x 1-1/2")
41		1	Stator Assembly, Wound
42	850-0060	16	Washer, Lock (1/2")
43	800-0092	16	Screw, Hex Cap (1/2-13 x 1-1/2")
44	510-0092	1	Nut, Bearing Lock (Special)
45	510-0094	1	Washer, Bearing Lock (Special)
46	201-1501	1	Rotor Assembly, Exciter - Wound - See Separate Group for Components
47	515-0152	1	Key, Exciter Rotor
48		1	Rotor Assembly, Wound
49	515-0161	1	Key, Hub
50	232-1880	1	Disc, Rotor Drive
51	805-0035	12	Bolt, Place (5/8-11 x 1-1/2")
52	205-0076	1	Fan, Generator
53	850-0070	6	Washer, Lock (5/8")
54	800-0133	6	Screw, Hex Cap (5/8-11 x 1-3/4")
55	232-1870	1	Hub, Rotor Drive
56	820-0067	2	Screw, Pan Head (#10-32 x 1")
57	526-0009	2	Washer, Flat (#10)
58	850-0030	2	Washer, Lock (#10)
59	870-0053	2	Nut, Hex (#10-32)

† - Included in 150-1447 Overspeed Point Assembly.

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

# EXCITER ROTOR AND BUS BAR GROUP

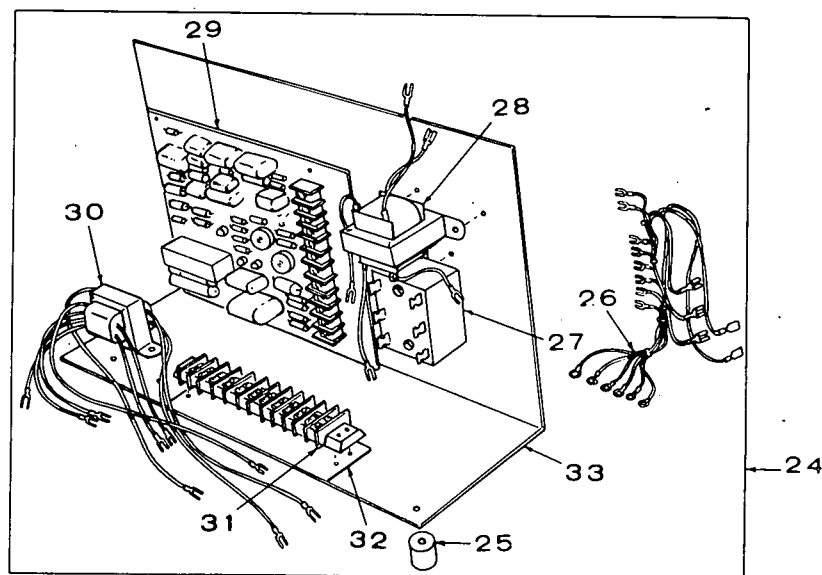
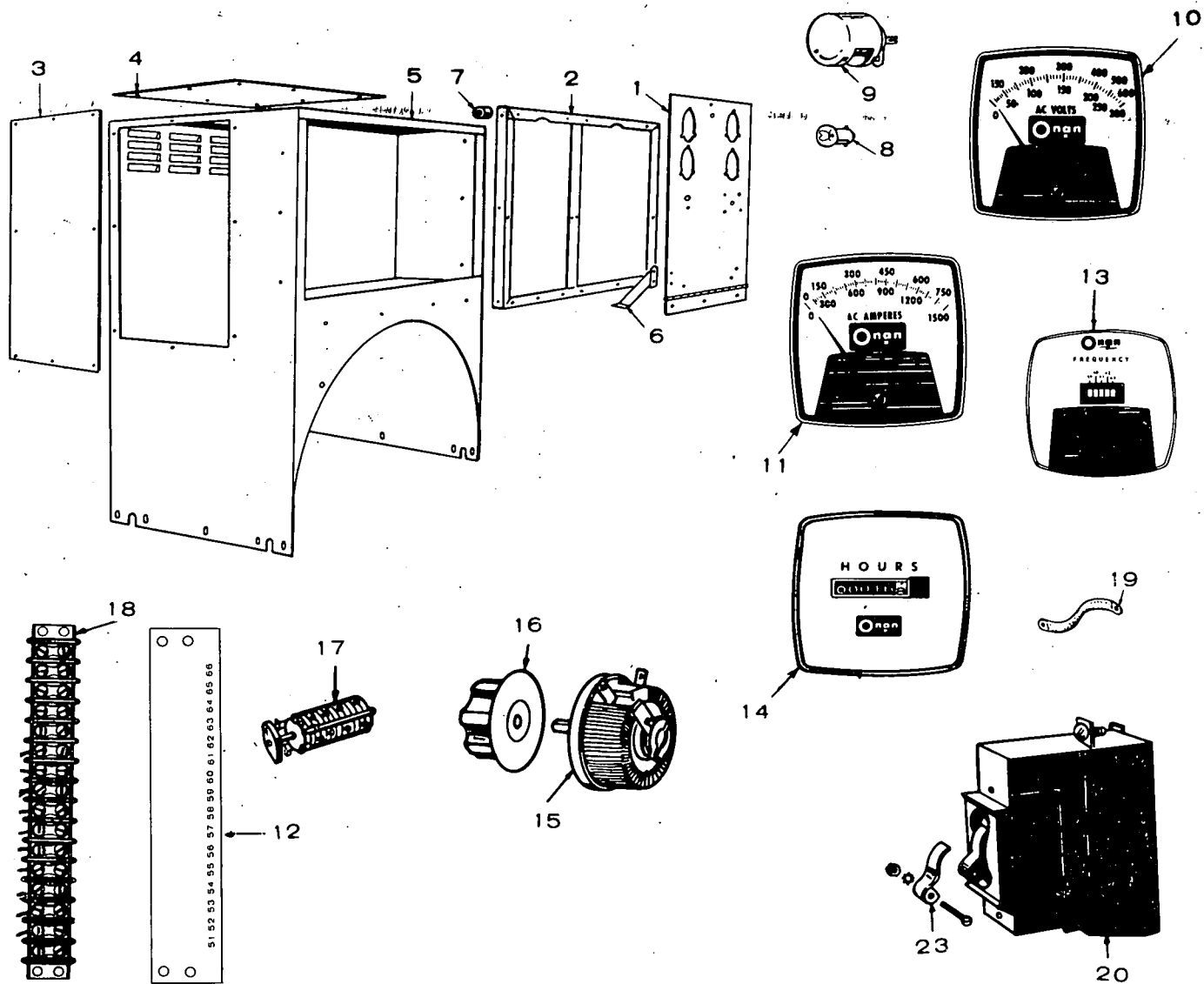


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	201-1501	1	Rotor Assembly, Exciter - Wound (Includes Parts Marked †) - Also shown in Generator Group
2	†RECTIFIER		
	358-0011	3	Positive Stud
	358-0012	3	Negative Stud
3	850-0040	6	†Washer, Lock (1/4")
4	868-0001	6	†Nut, Hex Jam (1/4-28)
5	813-0114	4	†Screw, Round Head (#10-32 x 3")
6	526-0008	4	†Washer, Flat (#10)
7	508-0124	4	†Bushing, Shoulder - Insulating
8	232-1985	4	†Insulator, Heat Shield
9	850-0030	4	†Washer, Lock (#10)
10	870-0053	4	†Nut, Hex (#10-32)
11	†SINK HEAT, RECTIFIER		
	363-0033	1	Negative
	363-0025	1	Positive
12	508-0093	1	†Grommet, Rubber
13	232-1994	1	Bracket, Bus Bar
14	800-0151	1	Screw, Hex Cap (3/4-10 x 1")
15	850-0079	1	Washer, Lock (3/4")
16	800-0051	2	Screw, Hex Cap (3/8-16 x 1-1/4")
17	526-0029	2	Washer, Flat (3/8")
18	850-0050	2	Washer, Lock (3/8")
19	862-0003	2	Nut, Hex (3/8-16)
20	232-1997	1	Board, Insulating
21	232-1992	4	Bracket, Bus Bar
22	800-0007	4	Screw, Hex Cap (1/4-20 x 1")
23	526-0018	4	Washer, Flat (1/4")
24	850-0040	4	Washer, Lock (1/4")
25	862-0001	4	Nut, Hex (1/4-20)
26	232-1999	2	Bracket, Terminal Board Mtg.
27	232-2000	1	Bracket, Terminal Board Mtg.
28	315-0302	1	Shelf, Current Transformer
29	800-0005	6	Screw, Hex Cap (1/4-20 x 3/4")
30	850-0040	6	Washer, Lock (1/4")
31	862-0001	6	Nut, Hex (1/4-20)
32	232-1998	1	Board, Insulating
33	232-1995	1	Board, Insulating

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
34	520-0693	16	Stud, Terminal (5/16 x 1-5/8")
35	232-1996	1	Bar, Bus (17-3/8" Long)
36	232-2001	3	Bar, Bus (13-1/4" Long)
37	232-1991	1	Bar, Bus (Double)
38	232-1990	3	Bar, Bus
39	800-0052	9	Screw, Hex Cap (3/8-16 x 1-1/2")
40	526-0029	18	Washer, Flat (3/8")
41	850-0050	9	Washer, Lock (3/8")
42	862-0003	9	Nut, Hex (3/8-16)
43	800-0052	6	Screw, Hex Cap (3/8-16 x 1-1/2")
44	526-0029	6	Washer, Flat (3/8")
45	850-0050	6	Washer, Lock (3/8")
46	862-0003	6	Nut, Hex (3/8-16)
47	802-0069	6	Screw, Socket Head (3/8-16 x 5/8")
48	526-0115	32	Washer, Flat (5/16")
49	850-0045	32	Washer, Lock (5/16")
50	862-0015	32	Nut, Hex (5/16-18)
51	800-0005	4	Screw, Hex Cap (1/4-20 x 3/4")
52	850-0040	4	Washer, Lock (1/4")
53	862-0001	4	Nut, Hex (1/4-20)
54	232-1993	1	Jumper, Bus Bar (Used on Parallel Wye Wound Generator)
55	232-2005	1	Jumper, Bus Bar (Used on Delta Wound Generator)
56	TRANSFORMER, CURRENT (CHECK TRANSFORMER NAMEPLATE - SELECT ACCORDING TO RATING)		
	302-0547	3	Nameplate Reads 500/5
	302-0625	3	Nameplate Reads 750/5
	302-0589	3	Nameplate Reads 1000/5
	302-0643	3	Nameplate Reads 1200/5
	302-0644	3	Nameplate Reads 1500/5
	302-0645	3	Nameplate Reads 2000/5
57	800-0052	6	Screw, Hex Cap (3/8-16 x 1-1/2)
58	526-0029	6	Washer, Flat (3/8")
59	850-0050	6	Washer, Lock (3/8")
60	862-0003	6	Nut, Hex (3/8-16)

† - Included in 201-1501 Exciter Rotor Assembly.

# CONTROL GROUP (AC PORTION)

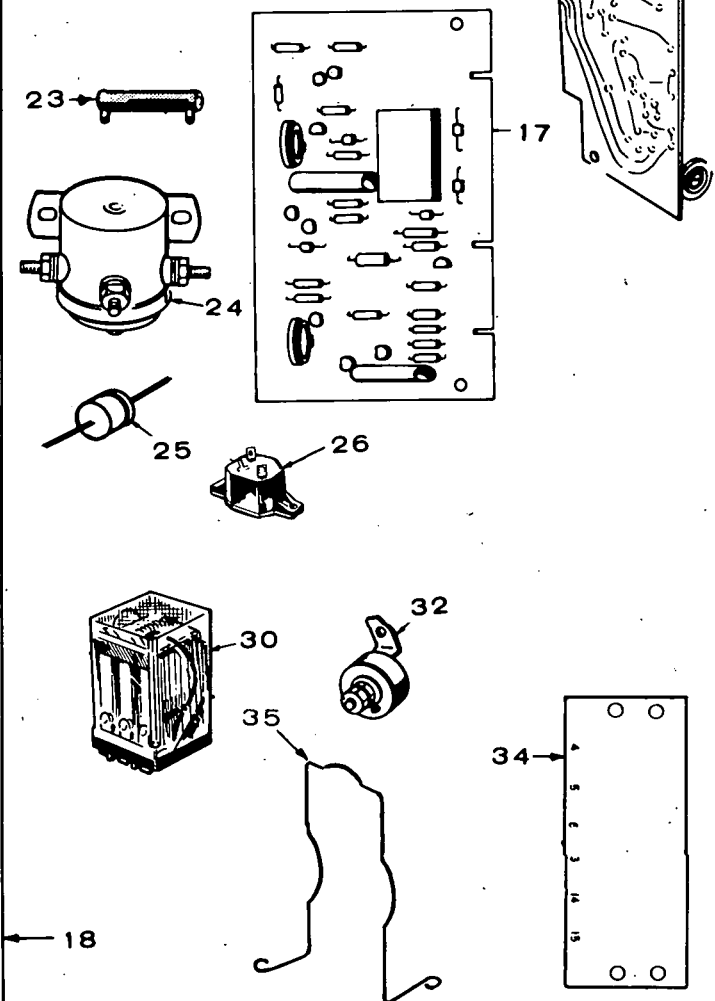
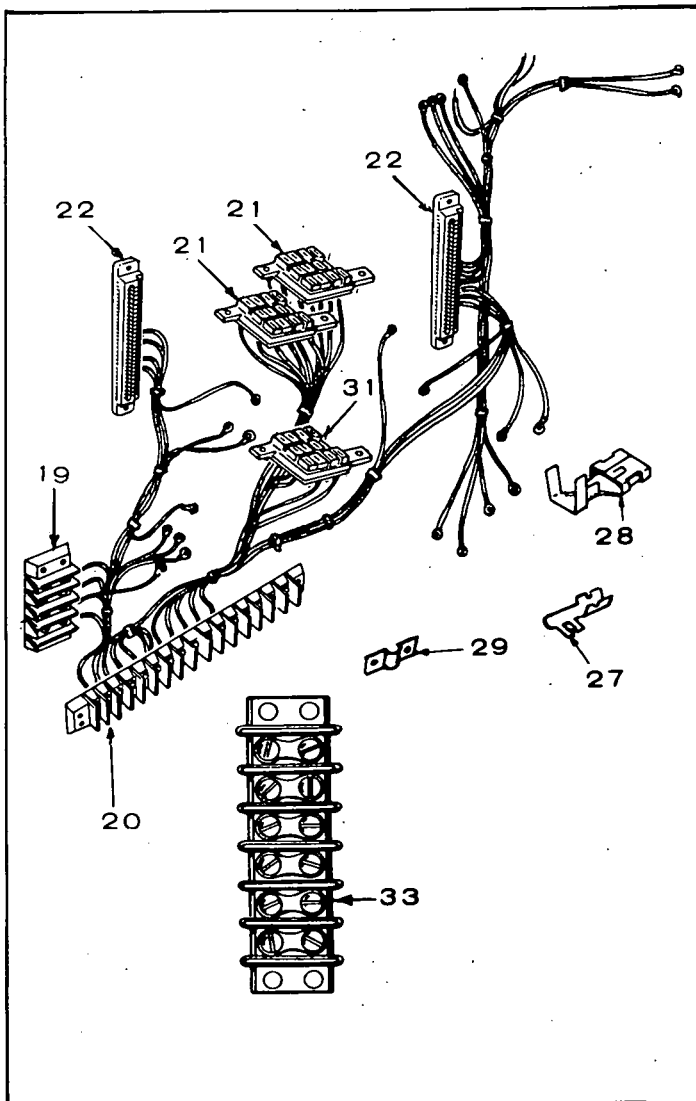
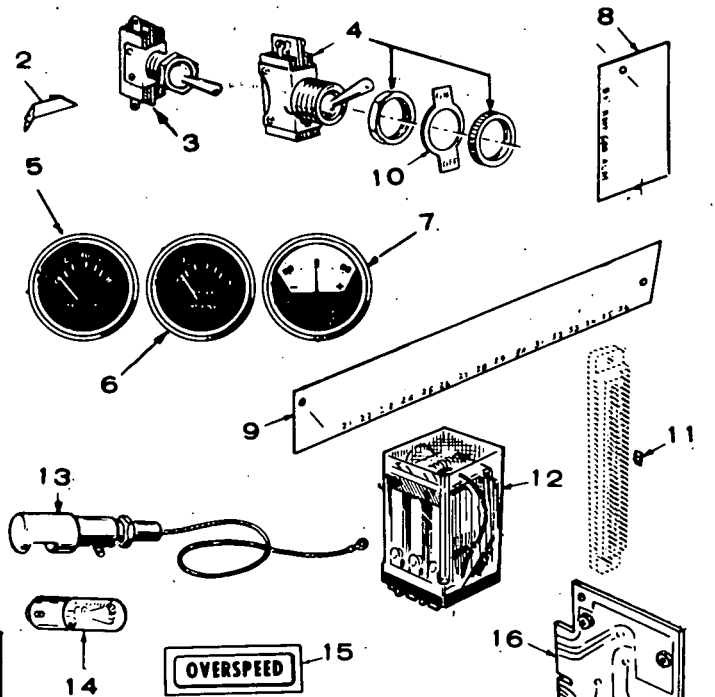
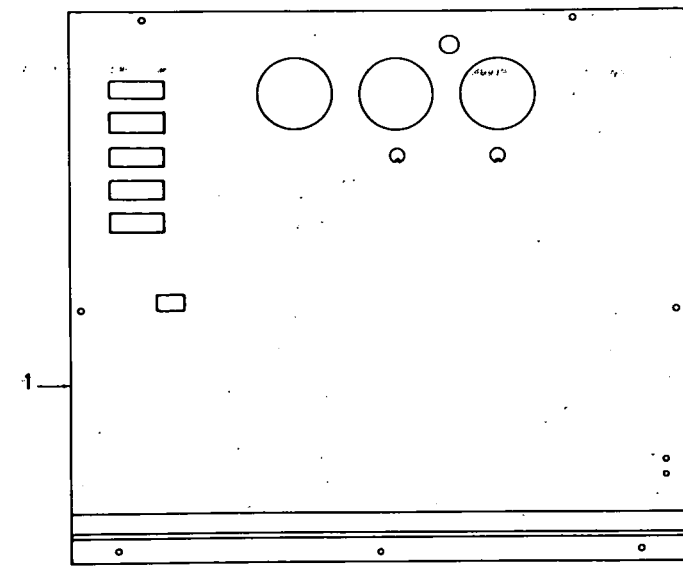


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL, CONTROL		
	301-2980	1	Without Meters
	301-2908	1	With Meters
2	301-2906	1	Frame, Control Panel Mtg.
3	301-2905	2	Plate, Control Box - Side
4	301-2904	1	Plate, Control Box - Top
5	301-2903	1	Box, Control
6	301-1914	1	Bracket, Panel Stop
7	402-0078	5	Mount, Rubber - Control Box Frame
8	322-0017	1	Lamp, Panel
9	322-0149	1	Receptacle, Panel Lamp
10	VOLTMETER, AC (CHECK VOLTMETER SCALE - SELECT ACCORDING TO RATING)		
	302-0421	1	Scale Reads 0-300
	302-0612	1	Scale Reads 0-500
	302-0422	1	Scale Reads 0-600
	302-0423	1	Scale Reads 0-750
11	AMMETER, AC (CHECK AMMETER SCALE - SELECT ACCORDING TO RATING)		
	302-0414	1	Scale Reads 0-500
	302-0415	1	Scale Reads 0-750
	302-0416	1	Scale Reads 0-1000
	302-0640	1	Scale Reads 0-1200
	302-0641	1	Scale Reads 0-1500
	302-0642	1	Scale Reads 0-2000
12	332-1134	1	Strip, Marker (Marked 51 through 66)
13	METER, FREQUENCY		
	302-0213	1	120/208 and 120/240 Volt - 3 Phase - 60 Hertz
	302-0716	1	240/480 and 277/480 Volt - 3 Phase - 60 Hertz
	302-0717	1	347/600 Volt - 3 Phase - 60 Hertz

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
14	METER, RUNNING TIME		
	302-0465	1	120/208, 120/240, and 347/600 Volt - 3 Phase - 60 Hertz
	302-0466	1	240/480 Volt - 3 Phase - 60 Hertz
	302-0467	1	277/480 Volt - 3 Phase - 60 Hertz
15	303-0170	1	Rheostat, Voltage Adjustment
16	303-0032	1	Knob, Rheostat
17	308-0022	1	Switch, Voltage and Current Selector
18	332-0795	1	Block, Terminal (16 Place)
19	337-0044	1	Strap, Ground
20	320-0455	1	Breaker, Circuit (3 amp)
21	508-0001	3	Grommet, Rubber
22	331-0088	1	Bushing (Nylon)
23	320-0307	1	Lock, Circuit Breaker (Penn State Only)
24	305-0545	1	Regulator Assembly, Voltage (Includes Parts Marked *)
25	402-0078	3	*Dampener, Vibration
26	338-0894	1	*Harness, Wiring (Regulator Assembly)
27	305-0524	1	*Reactor, Bridge
28	315-0343	1	*Reactor Assembly, Comm.
29	332-1704	1	*Board Assembly, Printed Control (See Separate Group for Components)
30	315-0342	1	*Transformer, Voltage
31	332-0607	1	*Block, Terminal
32	332-1760	1	*Strip, Marker
33	301-3967	1	*Bracket, Regulator Mounting

\* - Parts included in 305-0545 Regulator Assembly.

# CONTROL GROUP (ENGINE PORTION)

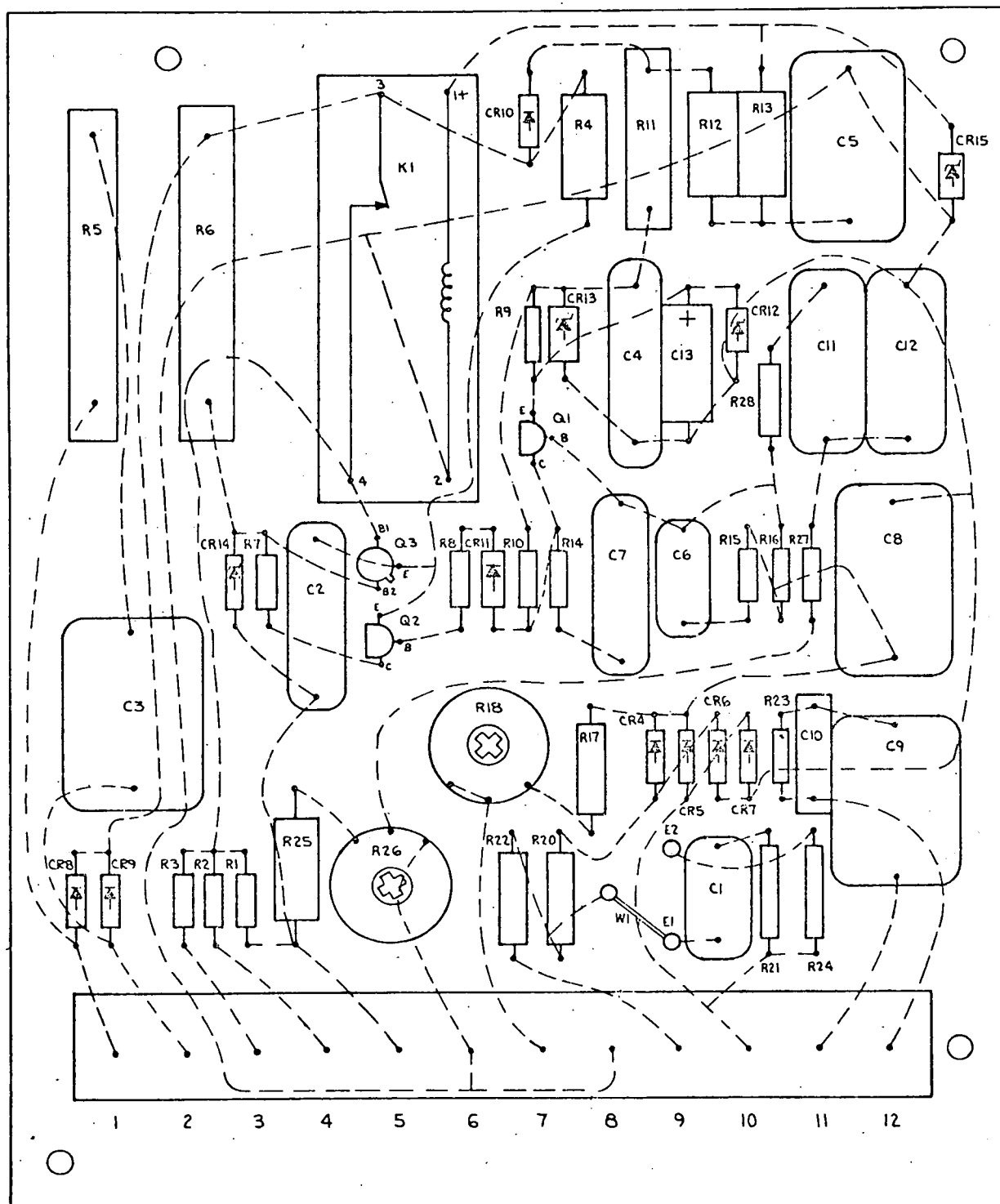


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL ONLY, ENGINE CONTROL		
	301-3400	1	For One Fault Light
	301-3401	1	For Five Fault Lights (Opt.)
2	301-2951	1	Bracket, Panel Stop
3	308-0138	1	Switch, Selector
4	308-0002	1	Switch, Panel Light
5	193-0194	1	Gauge, Oil Pressure
6	193-0106	1	Gauge, Water Temperature
7	302-0061	1	Ammeter, Charge (30-0-30)
8	332-1239	1	Strip, Marker (B+, Remote, Ground, Alarm)
9	332-1241	1	Strip, Marker (21 through 36)
10	308-0003	1	Plate, Switch (On-Off)
11	332-1276	4	Plug, Keying (3 Used on Sets With Five Fault Lights)
12	307-1056	2	Relay, (1) Start Disconnect (1) Ignition
13	322-0149	1	Holder, Lamp
14	322-0017	1	Lamp, Panel
15	LAMP, INDICATOR		
	322-0129	1	Fault (Standard)
	322-0119	1	Overcrank (Optional)
	322-0123	1	Overspeed (Optional)
	322-0120	1	Low Oil Pressure (Optional)
	322-0121	1	High Engine Temperature (Opt.)
	322-0122	1	Low Engine Temperature (Opt.)
16	CONTROL, CRANKER		
	300-0751	1	Standard Cranker (Includes (1) #357-0004 Rectifier)
	300-0715	1	Cycle Cranker (Optional) - (See Separate Group for Components)
17	MONITOR, ENGINE CONTROL (SEE SEPARATE GROUP FOR COMPONENTS)		
	300-0680	1	Sets With One Fault Light - Standard
	300-0682	1	Sets With Five Fault Lights - Optional
	300-0731	1	Penn State Sets With One Fault Light

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
18	HARNESS ASSEMBLY, WIRING - CONTROL (INCLUDES PARTS MARKED *)		
	338-0617	1	Sets With One Fault Light - Standard
	338-0618	1	Sets With Five Fault Lights - Optional
19	332-0537	1	*Block, Terminal - 4 Place
20	332-0795	1	*Block, Terminal - 16 Place
21	323-0765	2	*Socket, Relay - 11 Place
22	332-1271	2	*Housing, Printed Circuit Board Terminal
23	304-0262	1	Resistor, Oil Pressure Gauge
24	307-0061	1	Relay, Starter Pilot
25	357-0004	1	Rectifier, Diode
26	320-0240	1	Breaker, Circuit (12.5 Amp)
27	332-1269	As Req.	*Terminal, PC Board
28	332-1280	As Req.	*Terminal, Crimp
29	332-1043	1	*Jumper, Terminal - Std. Sets
30	307-1143	1	Relay, Starter Protection
31	323-0764	1	*Socket, Relay - 8 Place
32	193-0189	1	Resistor, Water Temperature Gauge
33	332-0699	1	*Block, Terminal (6 Place) - Sets With Five Fault Lights (Optional)
34	332-1240	1	Strip, Marker (53 through 58) - Sets With Five Fault Lights (Optional)
35	307-1157	3	Spring, Relay Holddown

\* - Included in Control Wiring Harness Assembly.

# PRINTED CIRCUIT BOARD ASSEMBLY (332-1704)



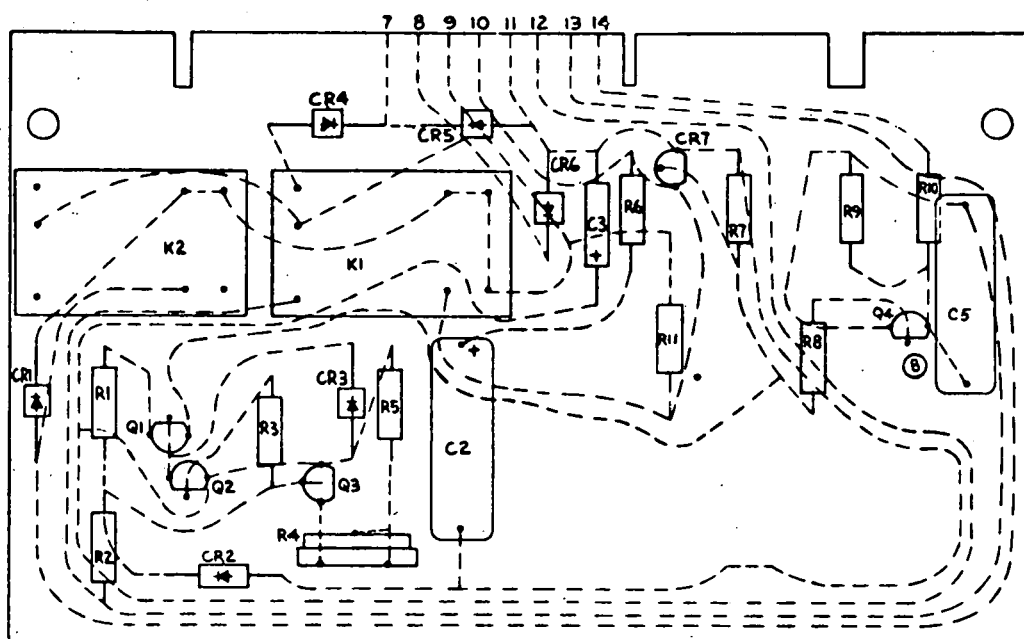


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	332-1704	1	Board Assembly, Printed (Complete)
TB1	332-1252	1	Block, Terminal
C1	355-0018	1	Capacitor (.47 Mfd., 100 Volt)
C2, C7	355-00052	1	Capacitor (.22 Mfd., 200 Volt)
C3, C9, C11	355-0017	3	Capacitor (.47 Mfd., 400 Volt)
C4	355-0006	1	Capacitor (.47 Mfd., 200 Volt)
C5, C8	355-0016	2	Capacitor (1 Mfd., 100 Volt)
C6	355-0034	1	Capacitor (.33 Mfd., 100 Volt)
C10	355-0014	1	Capacitor (.047 Mfd., 200 Volt)
C12	355-0033	1	Capacitor (1.0 Mfd., 200 Volt)
C13	356-0039	1	Capacitor (Electrolytic - .100 Mfd., 100 Volt)
CR4 thru CR11	357-0014	8	Rectifier, Silicon
CR12	359-0035	1	Diode, Zener
CR13	359-0025	1	Diode, Zener
CR14	359-0026	1	Diode, Zener
CR15	359-0015	1	Diode, Zener
K1	307-1063	1	Relay, Magnetic Reed
Q1, Q2	362-0017	2	Transistor, Silicon NPN
Q3	361-0004	1	Transistor, Unijunction
R1, R23	350-0355	2	Resistor (1/2 Watt, 47 Ohm)
R2, R3	350-0351	2	Resistor (1/2 Watt, 33 Ohm)
R4	350-1075	1	Resistor (2 Watt, 4.7 Megohm)
R5	353-0040	1	Resistor, Fixed (10 Watt, 270 Ohm)
R6	353-0039	1	Resistor, Fixed (15 Watt, 5000 Ohm)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
R7	350-0398	1	Resistor (1/2 Watt, 3000 Ohm)
R8, R16	350-0447	2	Resistor (1/2 Watt, 330,000 Ohm)
R9, R10	350-0423	2	Resistor (1/2 Watt, 33,000 Ohm)
R11	352-0151	1	Resistor, Fixed (5 Watt, 15,000 Ohm)
R12	350-1014	1	Resistor (2 Watt, 13,000 Ohm)
R13	350-1007	1	Resistor (2 Watt, 8,000 Ohm)
R14	350-0443	1	Resistor (1/2 Watt, 220,000 Ohm)
R27, R15	350-0435	2	Resistor (1/2 Watt, 100,000 Ohm)
R17	351-0524	1	Resistor, Metal Film (1/4 Watt, 13,000 Ohm)
R18	303-0168	1	Potentiometer
R20, R22	351-0520	2	Resistor, Metal Film (1/4 Watt, 28,000 Ohm)
R21	351-0522	1	Resistor, Metal Film (1/4 Watt, 5,110 Ohm)
R24	351-0523	1	Resistor, Metal Film (1/4 Watt, 8,870 Ohm)
R25	350-1011	1	Resistor (2 Watt, 10,000 Ohm)
R26	303-0164	1	Potentiometer
R28	350-0459	1	Resistor (1/2 Watt, 1 Megohm)

# ENGINE CONTROL MONITOR GROUP (PENN STATE)

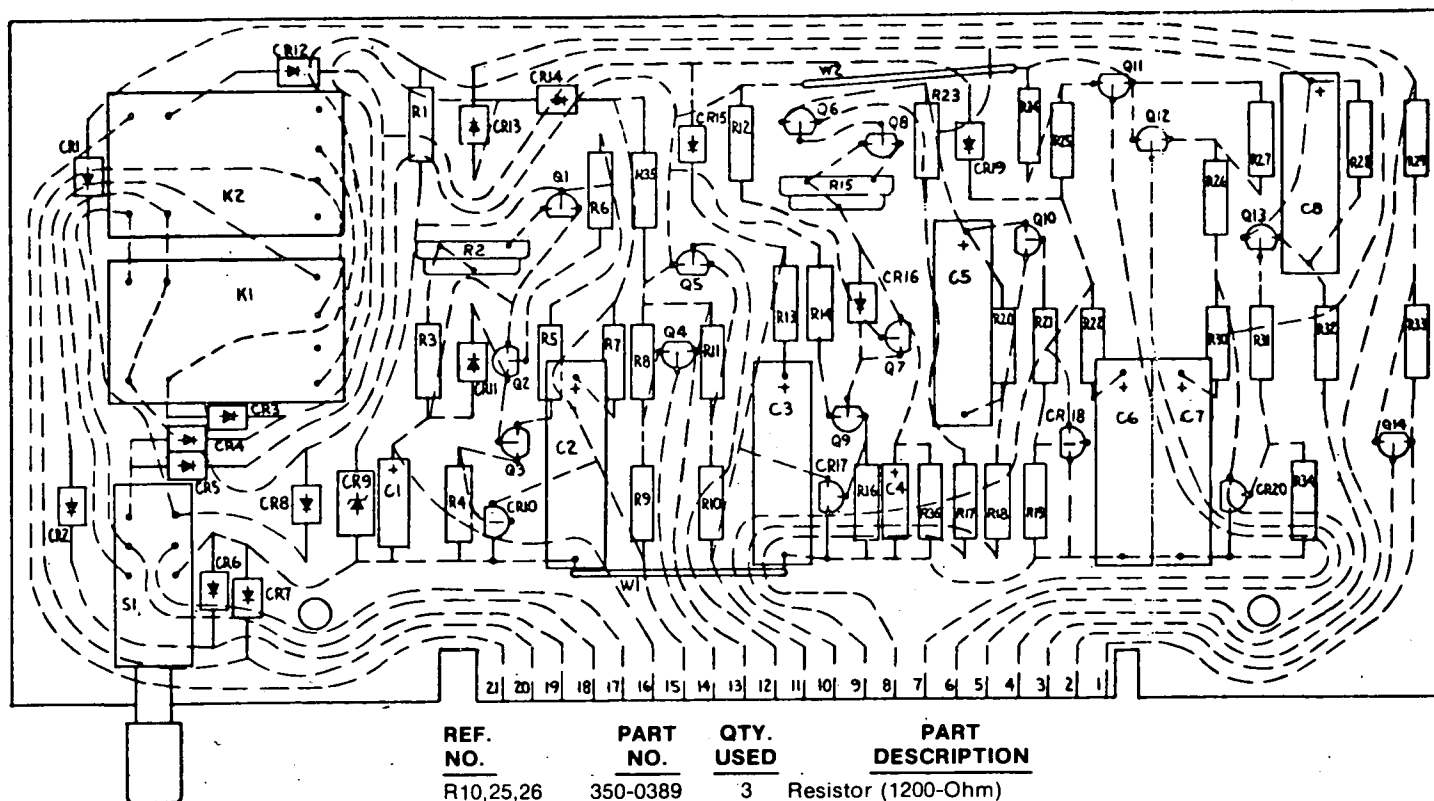
300-0731 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
R11	350-0980	1	Resistor (510-Ohm, 2 Watt)
R8	350-0380	1	Resistor (510-Ohm, 1/2 Watt)
R10	350-0544	1	Resistor (4,700-Ohm)
R9	350-0529	1	Resistor (270-Ohm)
R7	350-0517	1	Resistor (27-Ohm)
R6	350-0505	1	Resistor (2.7-Ohm)
R5	350-0572	1	Resistor (1.0 Megohm)
R4	303-0169	1	Potentiometer
R3	350-0552	1	Resistor (22,000-Ohm)
R2	350-0534	1	Resistor (680-Ohm)
R1	350-0536	1	Resistor (1000-Ohm)
Q4	362-0027	1	Transistor, Silicon
Q2, Q3	362-0025	2	Transistor, Field Effect
Q1	361-0003	1	Transistor
CR7	364-0011	1	Rectifier, Gate Control
CR2	359-0027	1	Diode, Zener
CR1,3,4, 5,6	357-0004	5	Rectifier, Diode
C3	356-0040	1	Capacitor (10 Mfd.)
C2, 5	355-0005	2	Capacitor (.22 Mfd.)
K1, K2	307-1076	2	Relay

# ENGINE CONTROL MONITOR GROUP (FIVE FAULT LIGHTS) - OPTIONAL

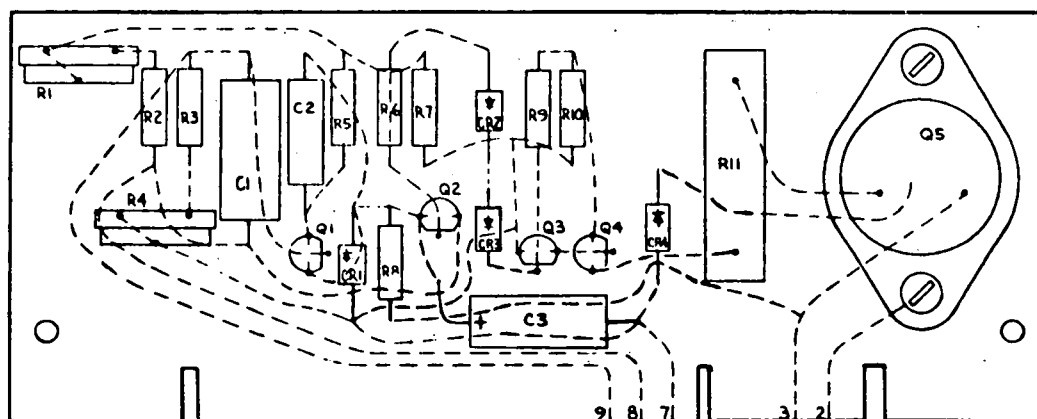
300-0682 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
R10,25,26	350-0389	3	Resistor (1200-Ohm)
R15	303-0182	1	Potentiometer
Q7, 8	362-0031	2	Transistor, Field Effect
R21,R31	350-0380	2	Resistor (510-Ohm)
R6	350-0548	1	Resistor (10,000-Ohm)
R36	350-0587	1	Resistor (18 Megohm)
R35	350-0980	1	Resistor (510-Ohm)
S1	308-0280	1	Switch, Push Button
R9,17,18 29,32	350-0544	6	Resistor (4700-Ohm)
R8,11,20,23, 24,27,28,33	350-0529	8	Resistor (270-Ohm)
R7,13,22,30	350-0505	4	Resistor (2.7-Ohm)
R12	350-0552	1	Resistor (22,000-Ohm)
R5,14	350-0536	2	Resistor (1000-Ohm).
R4,16,19,34	350-0517	4	Resistor (27-Ohm)
R3	350-0572	1	Resistor (1 Megohm)
R2	303-0169	1	Potentiometer
R1	350-0534	1	Resistor (680-Ohm)
Q4,5,6,10, 11,12,13,14	362-0027	8	Transistor, Silicon
Q3, 9	361-0003	2	Transistor
Q1, 2	362-0025	2	Transistor, Field Effect
K1, K2	307-1076	2	Relay
CR10,17,18, 20	364-0011	4	Rectifier, Gate Control
CR9	359-0027	1	Diode, Zener
CR1,2,3,4,5, 6,7,8,11, 12,13,14, 15,16,19	357-0004	15	Rectifier, Diode
Q4	356-0030	1	Capacitor (1.0 Mfd.)
C2,3,5,6 7,8	355-0005	6	Capacitor (.22 Mfd.)
C1	356-0040	1	Capacitor (10 Mfd.)

## CONTROL, CYCLE CRANKER GROUP (OPTIONAL EQUIPMENT)

300-0715 - Printed Circuit Board, Complete

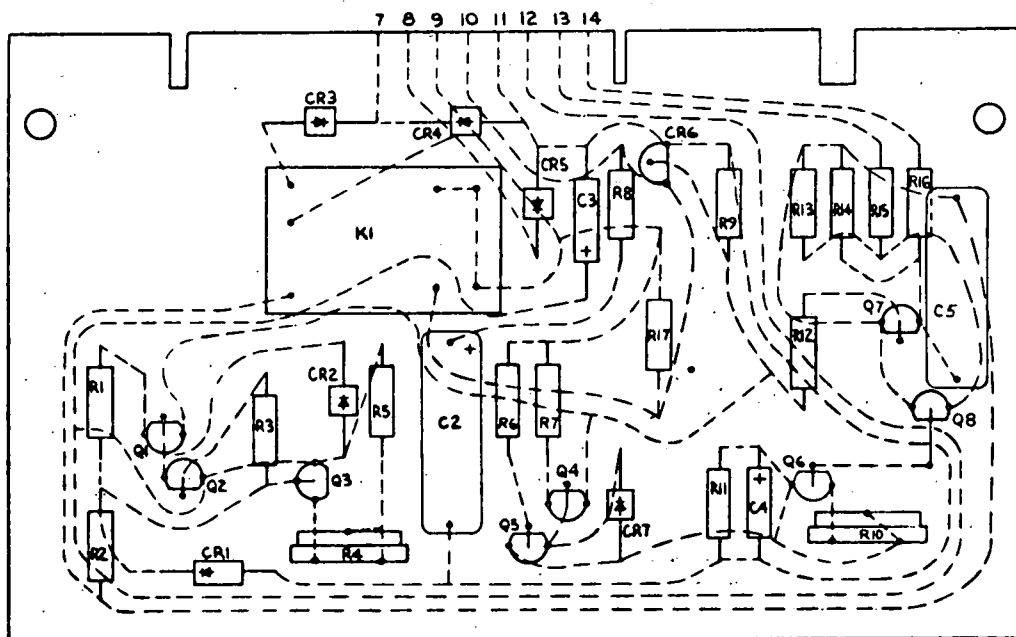


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
C3	356-0045	1	Capacitor, Electrolytic 25 Mfd., 15 Volt
C2	355-0010	1	Capacitor, Dielectric .0022 Mfd., 100 Volt
H3	860-0006	2	Nut, RMS (#6-32)
H2	853-0003	2	Washer, ET Lock (#6)
H1	812-0061	2	Screw, RHM (#6-32 x 3/8")
R11	352-0158	1	Resistor, Fixed (5 Watt, 50-Ohm)
R10	350-0500	1	Resistor, Fixed (1.0-Ohm)
R8	350-0534	1	Resistor, Fixed (6.8-Ohm)
R7	350-0546	1	Resistor, Fixed (6.8-Ohm)
R6	350-0420	1	Resistor, Fixed (24,000-Ohm)
R5	350-0558	1	Resistor, Fixed (68,000-Ohm)
R3, R9	350-0548	2	Resistor, Fixed (10,000-Ohm)
R2	350-0560	1	Resistor, Fixed (100,000-Ohm)
R1, R4	303-0171	2	Potentiometer
Q5	362-0019	1	Transistor, Power
Q4	362-0026	1	Transistor, Signal
Q3	362-0011	1	Transistor
Q1, Q2	362-0008	2	Transistor, Signal
CR2,3,4	357-0004	3	Rectifier, Diode
CR1	359-0027	1	Diode, Zener (7.5 Volts)
C1	356-0039	1	Capacitor, Electrolytic (100 Mfd.)

# ENGINE CONTROL MONITOR GROUP (STANDARD SETS WITH ONE FAULT LIGHT)

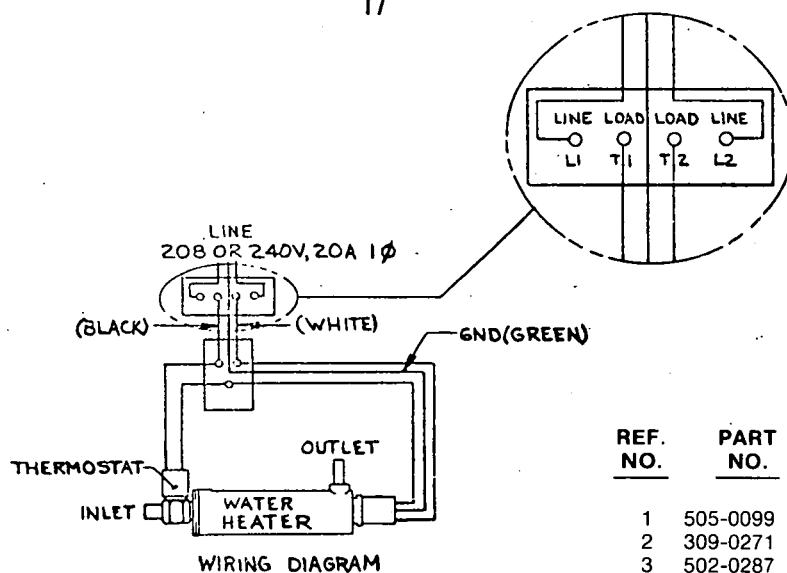
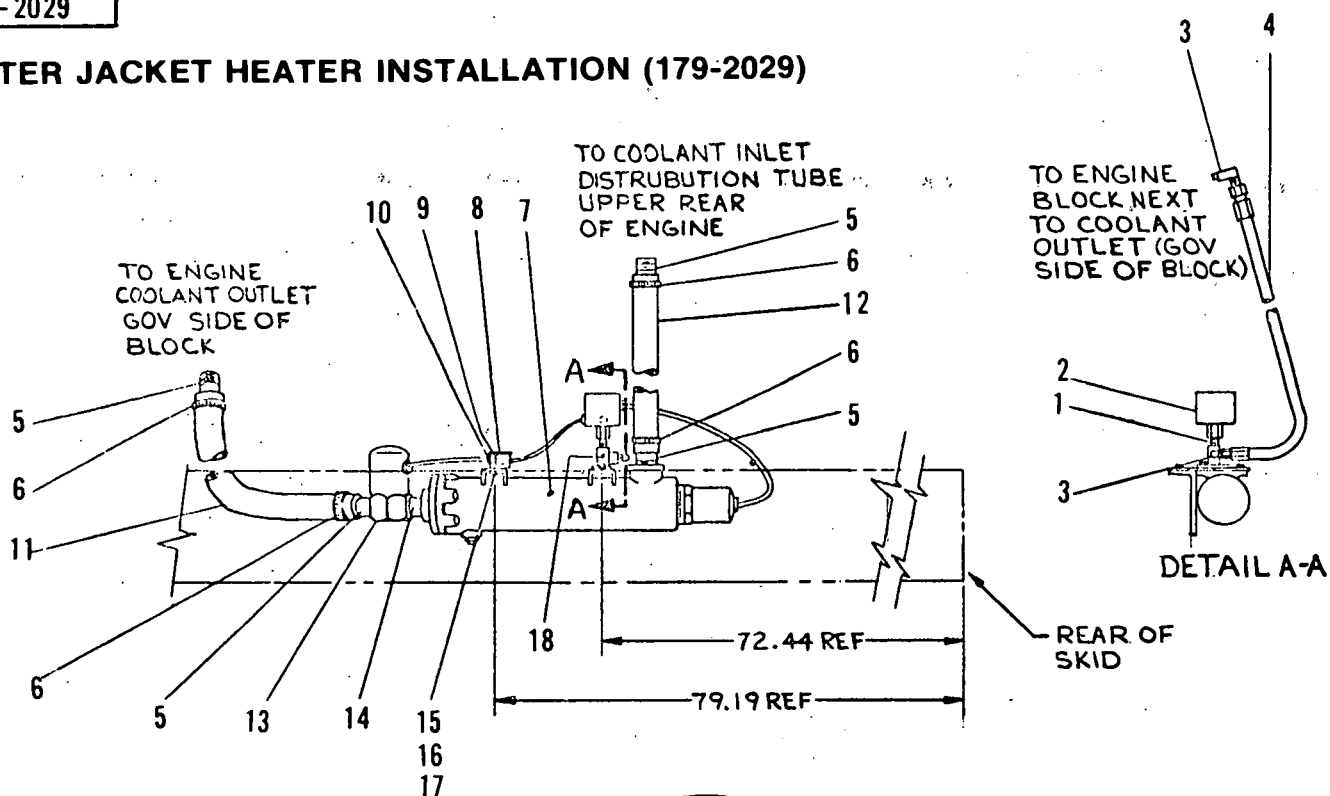
24 Volt

300-0680 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0680	1	Printed Circuit Board - Complete
R10	303-0182	1	Potentiometer (1.0 Megohm)
Q5, 6	362-0031	2	Transistor, Field Effect
R3	350-0548	1	Resistor (10,000-Ohm)
R17	350-0980	1	Resistor (510-Ohm)
R12	350-0380	1	Resistor (510-Ohm)
R15, R16	350-0544	2	Resistor (4,700-Ohm)
R13, 14	350-0529	2	Resistor (270-Ohm)
R11	350-0587	1	Resistor (18 Megohm)
R9	350-0517	1	Resistor (27-Ohm)
R8	350-0505	1	Resistor (2.7-Ohm)
R5	350-0572	1	Resistor (1.0 Megohm)
R4	303-0169	1	Potentiometer (3.5 Megohm)
R6	350-0552	1	Resistor (22,000-Ohm)
R2	350-0534	1	Resistor (680-Ohm)
R1, R7	350-0536	2	Resistor (1000-Ohm)
Q7, Q8	362-0027	2	Transistor, Silicon
Q2, 3	362-0025	2	Transistor, Field Effect
Q1, Q4	361-0003	2	Transistor
CR6	364-0011	1	Rectifier, Gate Control
CR2,3,4, 5,7	357-0004	5	Rectifier, Diode
CR1	359-0027	1	Diode, Zener
C4	356-0030	1	Capacitor (1 Mfd.)
C3	356-0040	1	Capacitor (10 Mfd.)
C2,5	355-0005	2	Capacitor (.22 Mfd.)
K1	307-1076	1	Relay

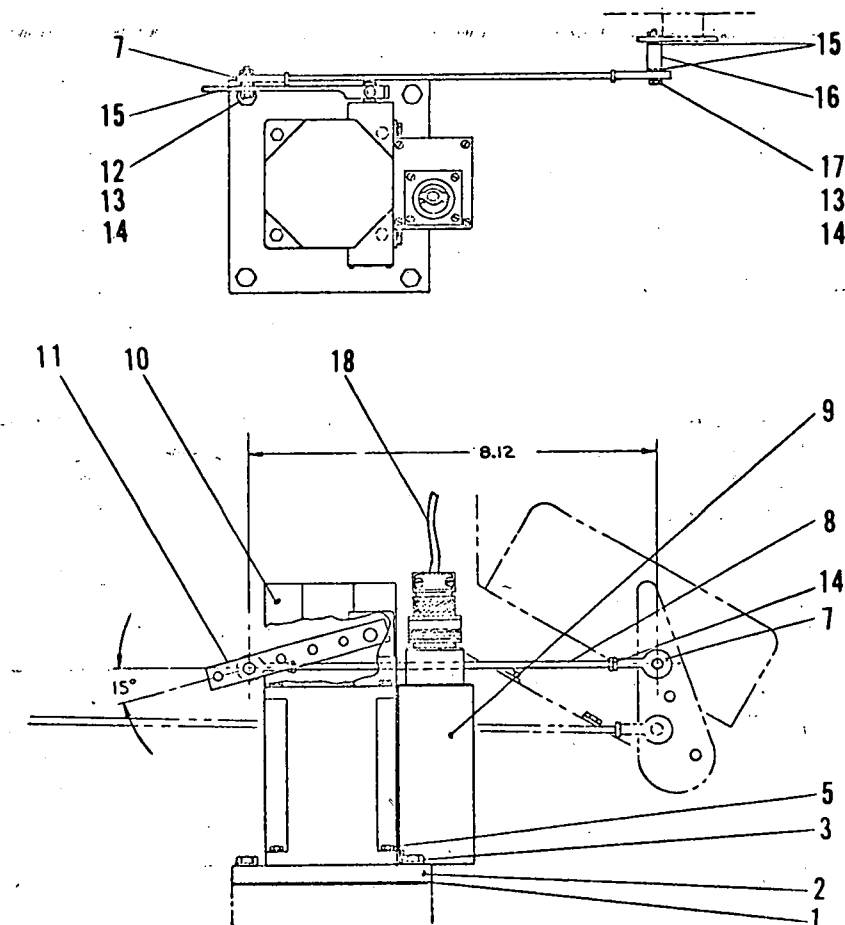
## WATER JACKET HEATER INSTALLATION (179-2029)



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	505-0099	1	Nipple, Pipe (1/4 x 7/8")
2	309-0271	1	Switch, Oil Pressure
3	502-0287	2	Elbow, Inverted Male
4	501-0188	1	Line, Flexible
5	505-0759	4	Adapter, Pipe to Hose (1")
6	503-0429	4	Clamp, Hose
7	333-0138	1	Heater, Engine
8	330-0004	1	Cover, Box
9	330-0005	1	Box, Outlet
10	503-0008	2	Grommet
11		1	Hose (Order 61" of Bulk Hose #503-0249)
12		1	Hose (Order 38" of Bulk Hose #503-0249)
13	309-0253	1	Thermostat
14	505-0107	1	Nipple, Pipe (1 x 2")
15	813-0103	2	Screw, Round Head (#10-32 x 3/4")
16	850-0030	2	Washer, Lock (#10)
17	870-0053	2	Nut, Hex (#10-32)
18	333-0142	1	Support, Pressure Switch

179-0446

# GOVERNOR INSTALLATION (179-0446)



## NOTE:

1. WIRING HARNESS INCLUDES THE ADAPTER THAT ATTACHES TO THE CONTROLLER, THE MAG PICK-UP, AND THE SPEEDSETTING POT.

2. MAG PICK-UP NOT SHOWN ON DWG. TO BE MGT ON FLYWHEEL HOUSING IN EXISTING TAPPED HOLE ON RIGHT SIDE OF ENGINE.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1		1	Gasket (Supplied with Engine - See Engine Manufacture Parts Catalog)
2	150-1490	1	Plate, Governor Mounting
3	800-0050	4	Screw, Hex Cap (3/8-16 x 1")
4	850-0050	4	Washer, Lock (3/8")
5	800-0007	4	Washer, Lock (1/4")
7	150-1119	2	End, Rod - Special
8	520-0846	1	Stud, Steel
9	151-0399	1	Control
10	151-0398	1	Actuator
11	151-0400	1	Lever, Governor Actuator
12	800-0008	1	Screw, Hex Cap (1/4-20 x 1-1/4")
13	850-0040	4	Washer, Lock (1/4")
14	862-0001	4	Nut, Hex (1/4-20)
15	526-0016	4	Washer, Flat (1/4")
16	232-0225	1	Spacer
17	800-1009	2	Screw, Hex Cap
18	151-0401	1	Harness, Wiring
19	151-0402	1	Potentiometer

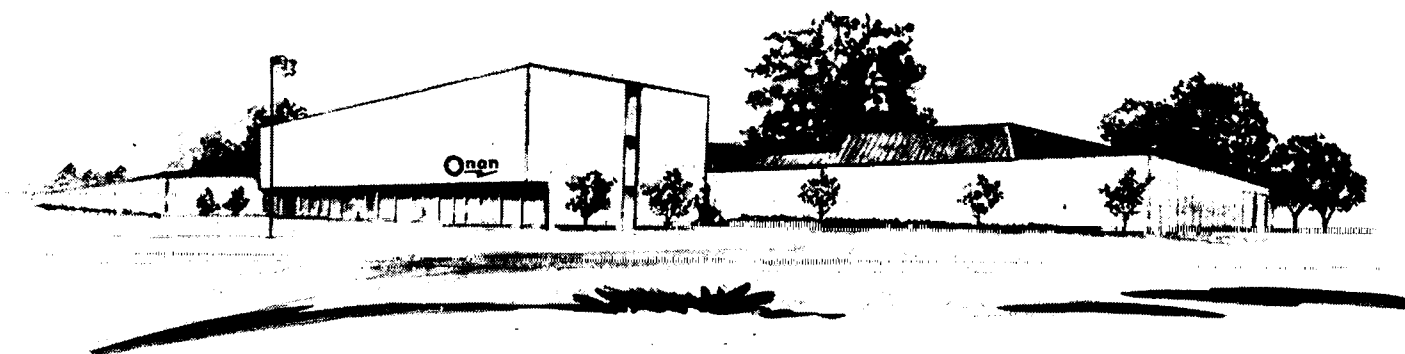
# **We mean it.....**

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

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

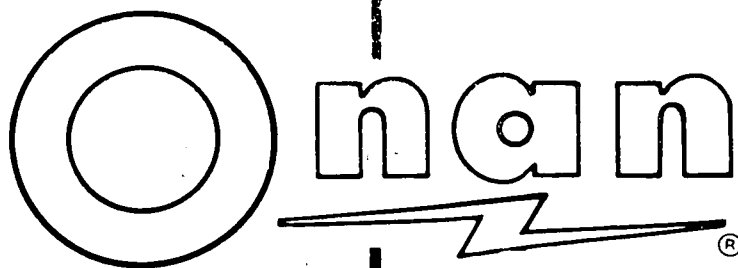






**ONAN** 1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432  
A DIVISION OF ONAN CORPORATION





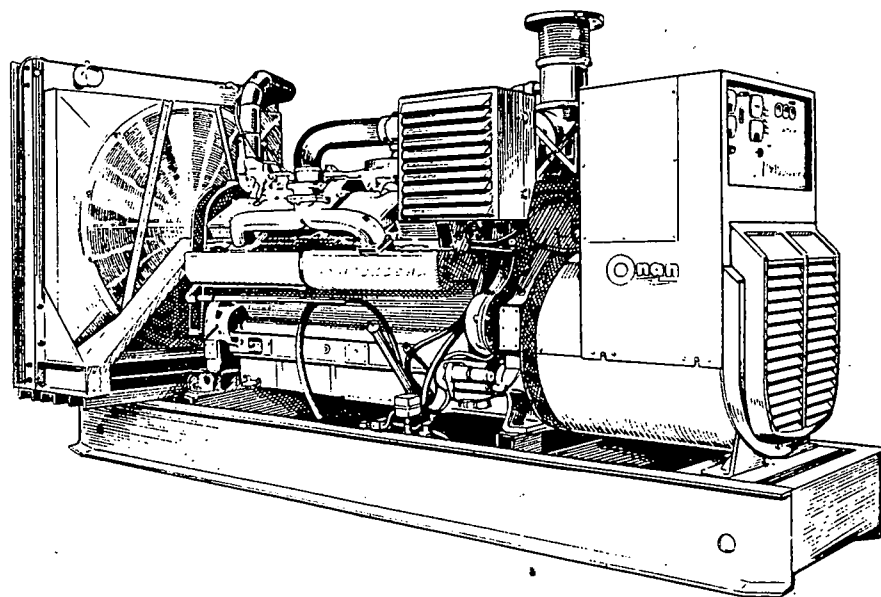
# **OPERATOR'S MANUAL AND PARTS CATALOG**

FOR

## **DWV**

**SERIES**

## **ELECTRIC GENERATING SETS**



### **NOTE!!**

The ONAN Manual and/or Parts Catalog only has been supplied. This early model and spec is no longer in production. Due to reasons beyond our control we no longer stock or supply the engine manufacturers Manual or Parts Catalog. However we believe they are available direct from the engine manufacturer providing you furnish the **SERIAL NUMBER** and **SPEC** from the engine manufacturers nameplate on the engine. Refer to Parts Catalog and order from manufacturer as indicated under "Instructions for Ordering Repair Parts".

*Master*

# TABLE OF CONTENTS

TITLE	PAGE
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Specifications .....	2
Safety Precautions .....	4
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Parts Catalog .....	27

The world-wide trend toward a standard system of measurement has resulted in the International System of Units, officially abbreviated SI.

Onan's products are available on the world market, therefore, both English and SI or modernized metric units appear in this manual.

To assist in familiarization, the following cross reference should be used.

TERM	METRIC	ENGLISH
Length	millimetre (mm)	Inch (in)
Pressure	Pascals (Pa)	pounds per square inch (PSI)
Mass (Weight)	kilogram (kg)	pound (lb)
Volume (Liquid)	litre	gallon (gal)
Power	kilowatt (kW)	horsepower (HP)
Frequency	hertz (Hz)	cycler per second (CPS)

## WARNING

TO AVOID POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, AN AUTHORIZED SERVICE REPRESENTATIVE MUST PERFORM ALL SERVICE.

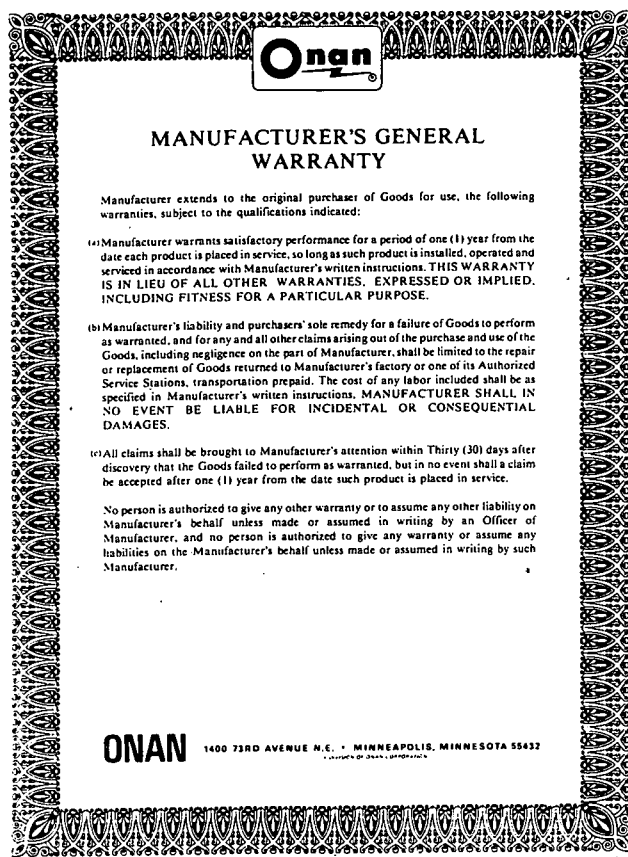
# INTRODUCTION

## FOREWORD

This manual is applicable to the DWV Series electric generating set, consisting of an Onan UV 600.0KW AC generator, driven by a Waukesha P2154 DSI Diesel engine. Information is provided on installation, operation, troubleshooting and parts ordering for the set. The manual should be used in conjunction with the Waukesha engine manual,

**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.

600.0 DWV 4XR / 13644 A

1 2 3 4 5

1. Indicates Kilowatt rating.
2. Factory code for SERIES identification.
3. Indicates voltage code.  
4X indicates 277/480 VAC  
R indicates remote electric start
4. Factory code for designating optional equipment.
5. Specification letter. (Advances when factory makes production modifications.)

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

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

**IMPORTANT! RETURN WARRANTY CARD ATTACHED TO UNIT.**

# SPECIFICATIONS

## ENGINE DETAILS

Engine Manufacturer .....	Waukesha
Engine Series .....	P2154 DSI
Number of Cylinders.....	V16
Displacement.....	2154-in <sup>3</sup> (16.38 lit)
BHP @ 1800 RPM .....	979 (730.33 kW)
Compression Ratio .....	14.0:1
Bore .....	5.75-inches (146.05 mm)
Stroke .....	5.1875-inches (131.76 mm)
Fuel .....	Diesel
Battery Voltage.....	24
Battery Group (Two 12-Volt, 225 A.H.) .....	8D
Starting Method .....	Solenoid Shift
Governor Regulation.....	Adjustable. Isochronous to 5%
Battery Charging Current .....	35 Amperes

## GENERATOR DETAILS

Type .....	UV Brushless
Rating (Watts)	
60 Hertz Continuous Standby .....	600,000 (750 kVA)
50 Hertz Continuous Standby .....	500,000 (625 kVA)
AC Voltage Regulation.....	2%
60 Hertz RPM .....	1800
50 Hertz RPM .....	1500
Output Rating .....	0.8 PF
AC Frequency Regulation.....	0- to 3% No Load—Full Load

## CAPACITIES AND REQUIREMENTS

Cooling System (Including Radiator and Plumbing) .....	21-Gallons (80-lit)
Engine .....	44-Gallons (167-lit)
Engine and Radiator .....	65-Gallons (246-lit)
Engine Oil Capacity (Filter, Lines, Crankcase Oil Cooler) .....	28-Gallons (106 lit)
Exhaust Connection (pipe flange) .....	10-in (254 mm) Diameter

## AIR REQUIREMENTS (1800 RPM)

Engine Combustion.....	2400-CFM (68 m <sup>3</sup> /min)
Radiator Cooled Engine.....	50,400-CFM (1427 m <sup>3</sup> /min)
Total for Radiator Cooled Model .....	52,800-CFM (1495 m <sup>3</sup> /min)
Alternator Cooling Air (1800 RPM) .....	3120-CFM (88.5 m <sup>3</sup> /min)
(1500 RPM) .....	2600-CFM (74 m <sup>3</sup> /min)
Fuel Consumption at Rated Load ASTM No. 2 Diesel .....	48.0-GPH (182 lit/hr)

## GENERAL

Height .....	102.88-inches (2.61 m)
Width .....	74.12-inches (1.88 m)
Length .....	168.00-inches (4.27 m)
Weight (Approximate) .....	17,450-lb. (7915 kg)

**TABLE 1. GENERATOR VOLTAGE OPTIONS**

GENERATOR VOLTAGE OPTIONS					
VOLTS	PHASE	FREQ.	MODEL NUMBER	AMPERES	KVA
120/208	3	60 Hz	600.0DWV - 4R	3612/2084	750
120/240*	3	60 Hz	600.0DWV - 5DR	3612/1806	750
240/416	3	60 Hz	600.0DWV - 7XR	1806/1042	750
240/480*	3	60 Hz	600.0DWV - 6DR	1806/903	750
277/480	3	60 Hz	600.0DWV - 4XR	1565/903	750
347/600	3	60 Hz	600.0DWV - 9XR	1254/720	750
220/380	3	50 Hz	500.0DWV - 57R	1640/950	625

\* - Delta Wound.

# SAFETY PRECAUTIONS

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

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

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

*Most accidents can be prevented!*

## KNOW YOUR MANUAL—KNOW YOUR EQUIPMENT

### **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 generating set and the surrounding area clean and free from obstructions. Remove all oil deposits; keep the floor clean and dry.
- Provide appropriate fire extinguishers and install them in convenient locations. Consult your local fire department for the correct type of extinguisher to use. Do not use foam or carbon tetrachloride on electrical fires. Use extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the generating set are secure. Tighten supports and clamps, keep guards in position over fans, driving belts, etc.
- Do not wear loose clothing in the vicinity of moving parts, or jewelry while working on electrical equipment. 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 — YOU'RE COURTING A POSSIBLE EXPLOSION AND FIRE!**

- 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 has been bled off.
- Radiator fan belts are guarded for your protection. DO NOT remove covers or guards.
- Keep your hands away from moving parts.

### **Ventilation System**

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

### **Electrical System**

- The electrical installation exterior to your generator should have been performed by qualified licensed electricians. All local and state

codes should have been consulted and complied with. It is essential that all load circuit breakers adequately protect electrical functions, all circuits are properly grounded and wiring is correct capacity.

- Tag open switches.
- DON'T tamper with interlocks.
- Before starting work on the generating set, disconnect batteries. This will prevent inadvertent starting of the set.
- Use extreme caution when making adjustments on the electrical components in the control panel while the engine is running. High voltages are present and could cause serious 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.



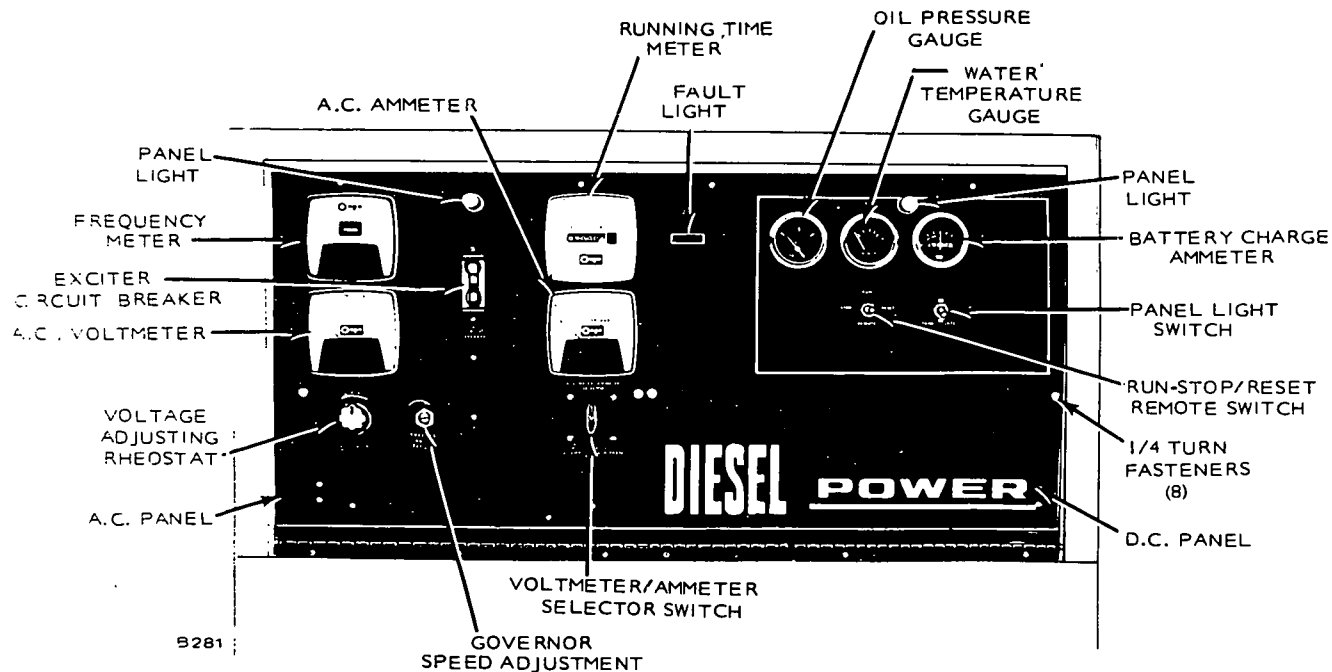


FIGURE 1. TYPICAL CONTROL PANEL (ONE FAULT LAMP)

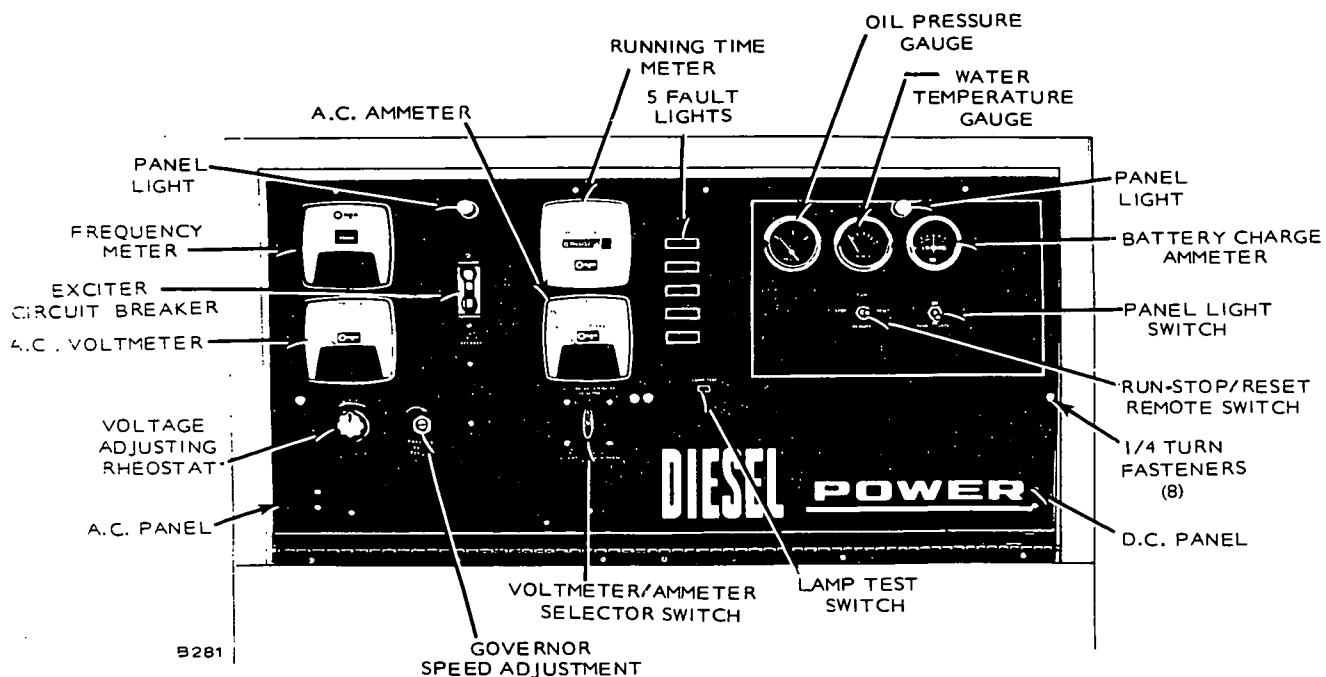


FIGURE 2. OPTIONAL CONTROL PANEL (FIVE FAULT LAMPS)

# DESCRIPTION

## GENERAL

An Onan DWV Series electric generating set is a complete unit consisting of an engine driven AC generator, with controls and accessories as ordered.

## ENGINE

The engine on the DWV is a Waukesha P2154 DSI as described in engine manual. Basic measurements and requirements will be found under *Specifications*. However, the engine used for your unit may have variations due to optional equipment available.

## AC GENERATOR

The generator is an Onan Type UV, 4 wire, 4 pole, revolving field brushless unit. Alternating current is generated in the stator winding. The alternator rotor, attached directly to the engine flywheel turns at engine speed. Therefore, the speed at which the rotor turns, determines generator output frequency. The 60 hertz set operates at 1800 rpm and the 50 hertz at 1500 rpm. Excitation is achieved by feeding AC output to a voltage regulator, where it is compared with a reference voltage in the regulator, rectified and returned to the field of the exciter, then to the exciter armature, rectified and fed to the generator field.

## 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 Lights and Switch:** Illuminates control panels.

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

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

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

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

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

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

### AC Panel

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

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

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

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

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

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

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

## OPTIONAL EQUIPMENT

For location of optional panel equipment, see Figure 2.

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

- Overcrank
- Overspeed
- Low oil pressure
- High engine temperature
- Low engine temperature

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

**TABLE 2. FAULT LAMP OPTIONS**

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

\* - With additional optional sensors.

## CONTROL PANEL INTERIOR

**Voltage Regulator:** Solid state unit controls AC output from generator at predetermined level regardless of load. Regulation plus or minus 2% from no load to full load. 0.8 P.F.

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

1. A 75 second cranking period.
2. Approximately a 12.5-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 reaches 2100 rpm). See Figure 3.
  - c. Low oil pressure 14 psi (96.53k Pa).
  - d. High engine temperature 205° F (96° C).

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 3.

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

## OPTIONAL MODULES

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

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

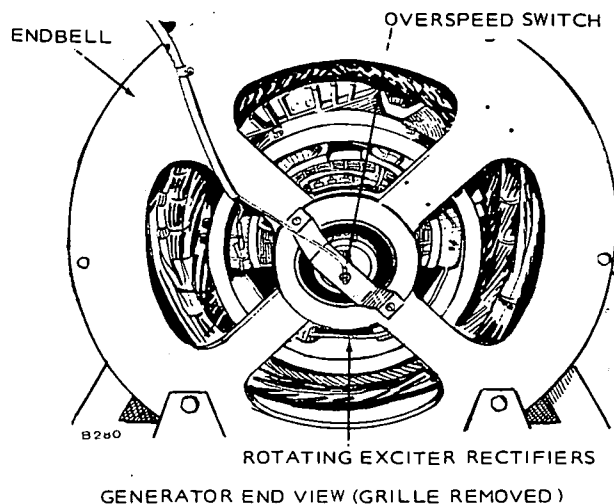


FIGURE 3. OVERSPEED SWITCH

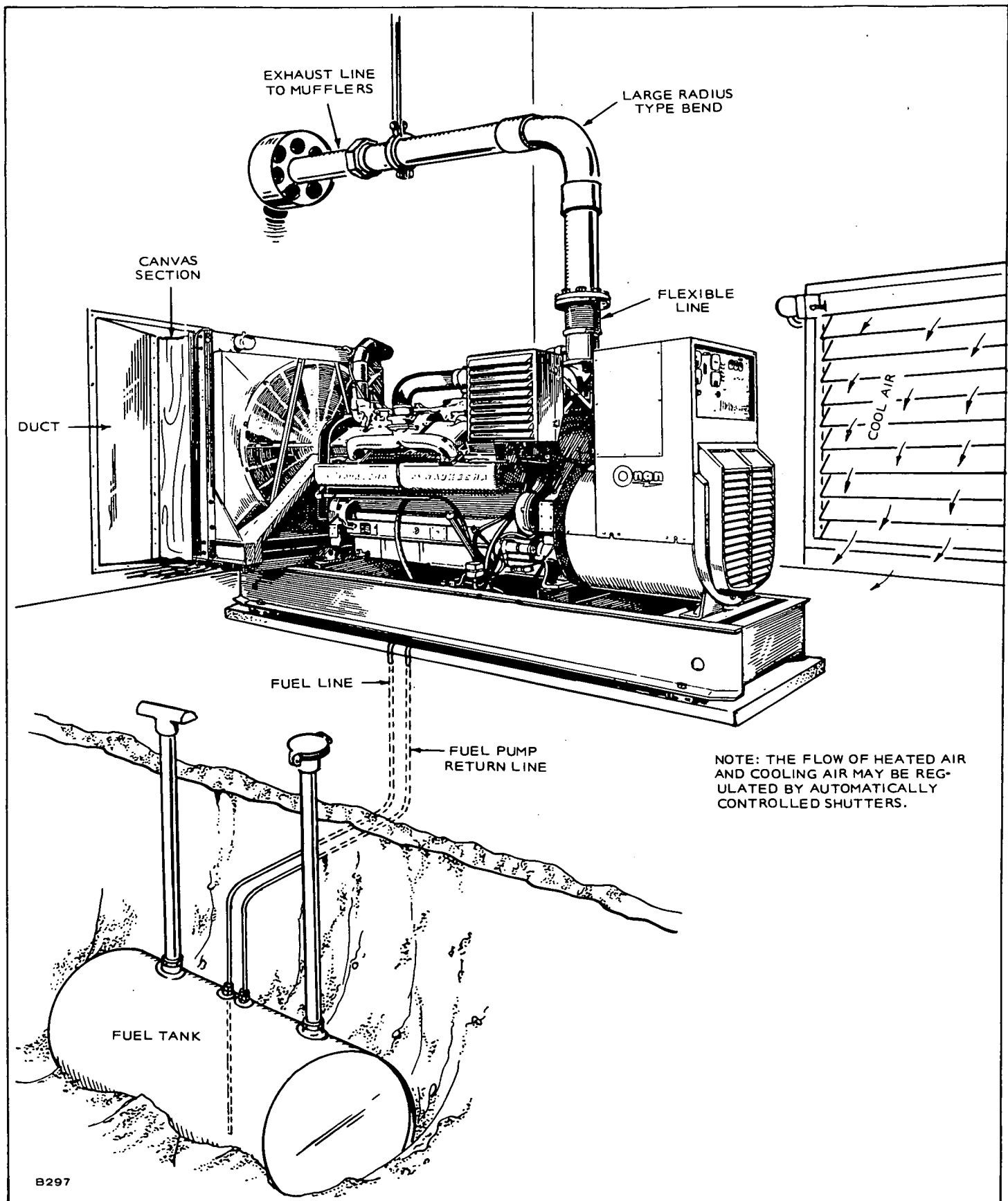


FIGURE 4. TYPICAL INSTALLATION

# INSTALLATION

## GENERAL

Installations must be considered individually. Use these instructions as a general guide. Meet regulations of local building codes, fire ordinances, etc., which may affect installation details. See Figure 4.

Installation points to consider include:

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

## LOCATION

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

## MOUNTING

Generating sets are mounted on a rigid skid base which provides proper support. Install vibration isolators between skid base and foundation. For convenience in draining crankcase oil and general servicing, mount set on raised pedestals (at least 6 inches high [155 mm]). If mounting in a trailer, or for other mobile applications, bolt securely in place. Extra support for the vehicle flooring may be necessary. Bolting down is recommended for stationary installations.

### CAUTION

The generator support must be aligned to the skid base to prevent premature generator bearing failure, vibration and possible drive disc failure. Failure to do so could void the warranty. Align the generator support to the skid base according to the following instructions.

1. Set the unit on its mounting foundation, using vibration isolators between skid base and foundation (Figure 5). Secure the skid base to the isolators and the isolators to the mounting foundation. Remove the two mounting bolts; use them as jack screws by moving them to the adjacent threaded holes, then raise the generator and remove the shims from between the generator and support and skid base.

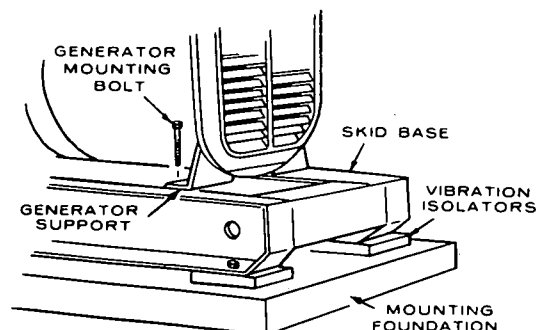
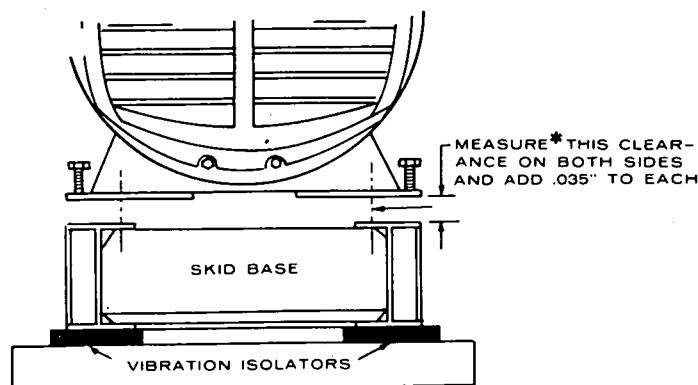


FIGURE 5

2. Remove the tension from the jackscrews and allow generator to hang free. Using a feeler gauge, measure the clearance from the top surface of the skid base to each generator support mounting surface (Figure 6). To this measured clearance, add .035 inches (0.89 mm) to each side of the skid base—this total clearance will determine the amount of shims required.

The clearance may be different for each side of the skid base. If there is a great difference, loosen the generator support and realign.



\*The measurement should be taken in line with bolt hole.

FIGURE 6

- After determining the proper clearance for each side of the skid base, turn jackscrews in the threaded holes to allow a clearance for placing the shims between skid base and generator support (Figure 7). Lower generator (using jackscrews) and allow to rest on shims. Recheck the total generator clearance, base to support; it must equal the base to support clearance plus the .035 inches.

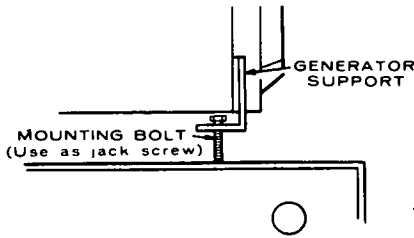


FIGURE 7

- Remove the jackscrews and reinstall as mounting bolts through generator support, shims and skid base. Secure and lock the mounting bolts in place (Figure 8).

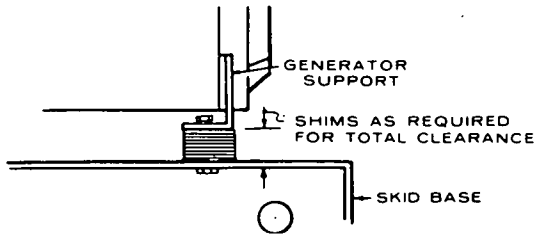


FIGURE 8

## VENTILATION

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

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

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

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

**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 and support combustion in the engine.

## CITY WATER COOLING

An optional method of engine cooling, in place of the conventional radiator and fan, uses a constant pressure water supply. This is referred to as CITY WATER COOLING or HEAT EXCHANGER SYSTEM. See Figure 9 for typical system.

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

Use flexible pipe for connecting water supply and outlet flow pipes to engine. Pipe the outlet flow to a convenient drain. Install an electric solenoid valve and a rate of flow valve in the water supply line. The electric solenoid valve opens and allows water flow through the system only when the plant operates. The rate of flow valve, either automatic or manual, provides for the proper flow rate to the engine. Adjust the flow to maintain water temperature between 165° and 195° F (74° and 91° 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.**

## WATER JACKET HEATER (Optional)

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

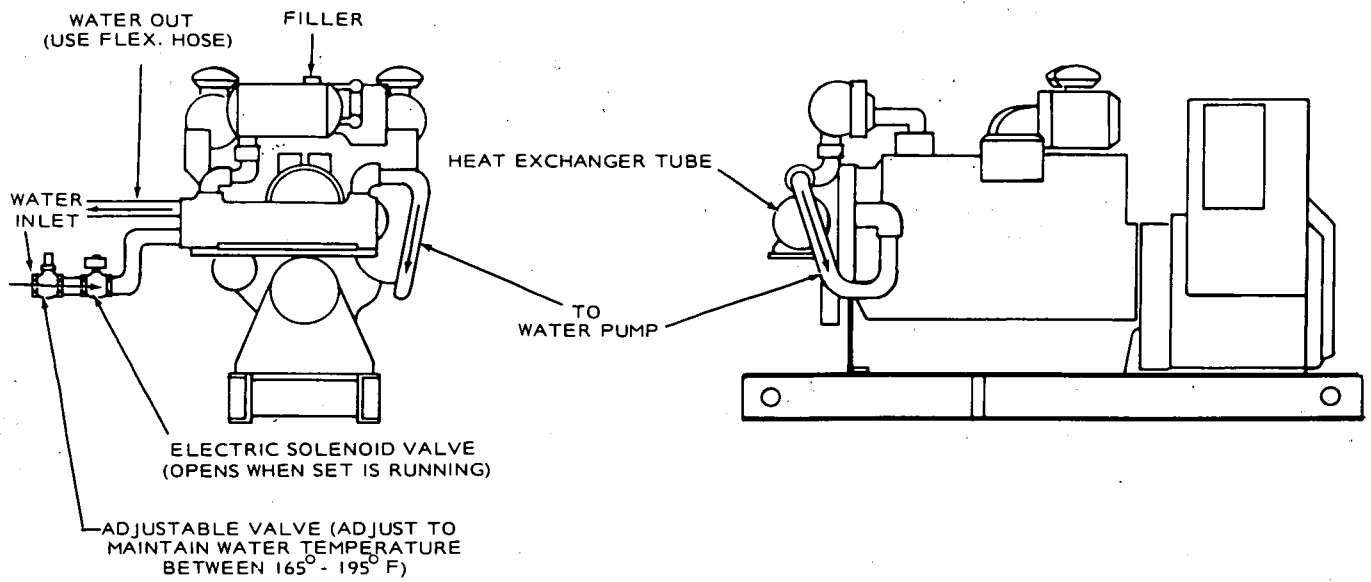


FIGURE 9. HEAT EXCHANGER COOLING (TYPICAL)

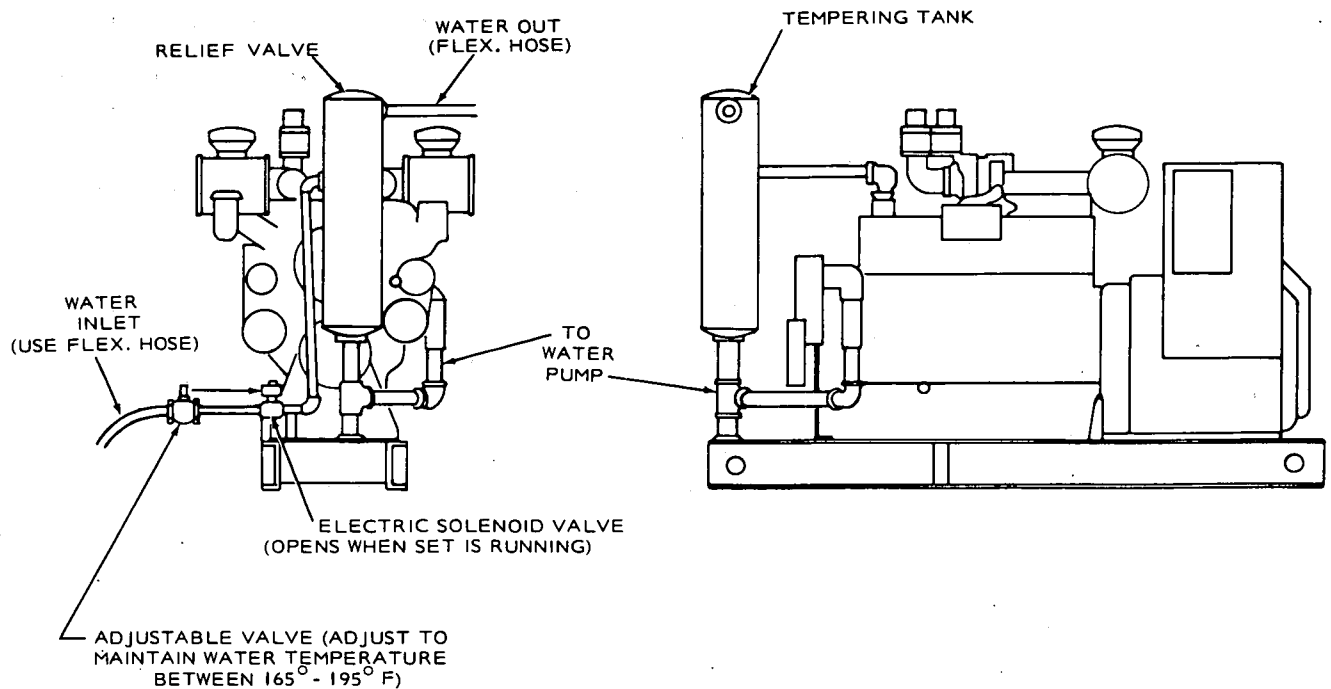


FIGURE 10. STANDPIPE COOLING (TYPICAL)



## EXHAUST

### WARNING

Inhalation of exhaust gases can result in death.

Engine exhaust gas must be piped outside building or enclosure. Do not terminate pipe in the vicinity of ventilating air inlet duct or venturi; gases will be pulled back into building. Where pipe has to be joined make sure that welds are leak free. When a pipe is run along a combustible wall, it should be far enough from the wall to prevent heat damage. Where exhaust duct is run through a wall, an insulating thimble should be used which will adjust for thermal movement and also prevent heat from the exhaust damaging the wall.

Sharp bends should be avoided, but where this is not possible a condensation trap (Figure 11) should be installed. Drain this trap frequently. Provide adequate support for mufflers and exhaust pipes. Refer to Figure 4 for a typical exhaust installation. Shield or insulate exhaust lines if there is danger of personal contact.

Use a pipe at least as large as the 10-inch diameter of the engine outlet. Maximum length is 400-feet (126 m) for a 10-inch exhaust pipe.

Maximum allowable back pressure is 27.2-inches H<sub>2</sub>O (2.0-inches Hg) or 690.9 mm H<sub>2</sub>O (50.8 mm Hg).

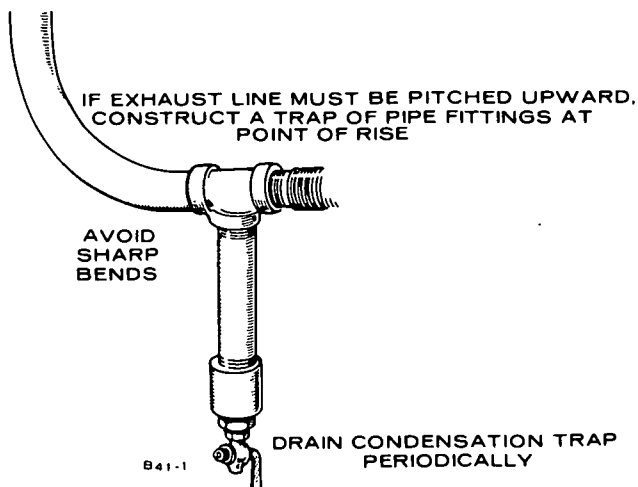


FIGURE 11. EXHAUST CONDENSATION TRAP

## FUEL SYSTEM

The Waukesha engines used on the DWV sets are designed for use with No. 2 Diesel fuel. They will however operate on other fuels within the specifications delineated in section 4-19 of the Waukesha 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.**

The maximum fuel lift without any horizontal run should not exceed 10 feet. The horizontal run, if the supply tank is level with the fuel pump, should not exceed 12-1/2 feet. Use 3/8-inch tubing for the fuel supply line. The inlet fitting on the fuel filter is threaded for a 3/8-inch pipe fitting. The fuel pump return line is threaded for a 1/4-inch pipe fitting. Use 1/8 inch tubing for the fuel pump return line.

## DAY TANK

Generator set installations may be equipped with an optional fuel day tank. A float operated switch controls a fuel transfer pump. The correct level is maintained to assure a constant source of fuel. It is necessary to install an overflow line between the day tank and the main fuel tank. Refer to the instructions included with the tank. See Figure 12 for an example of a day tank installation.

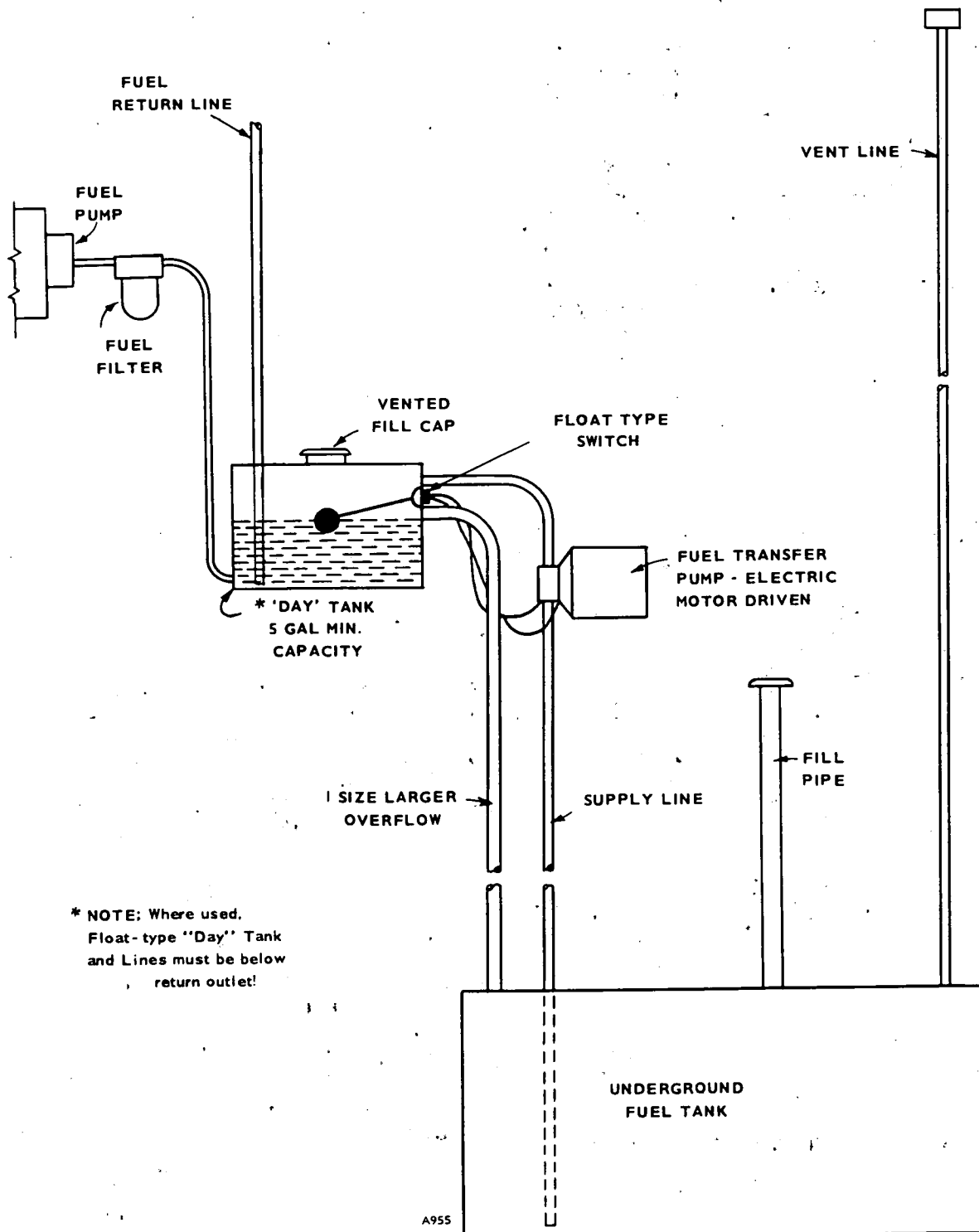


FIGURE 12. DAY TANK INSTALLATION

## BATTERY

Starting the plant requires 24-volt battery current. Use two 12-volt (see specification) batteries for a normal installation. Connect the batteries in series (negative post of first battery to positive post of second) as in Figure 13. Necessary battery cables are on unit. Service the batteries as necessary. Infrequent plant use (as in emergency standby service) may allow the batteries to self-discharge to the point where they cannot start the plant. If installing an automatic transfer switch that has no built-in charge circuit, connect a separate trickle charger. Onan automatic transfer switches include such a battery charging circuit.

### WARNING

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

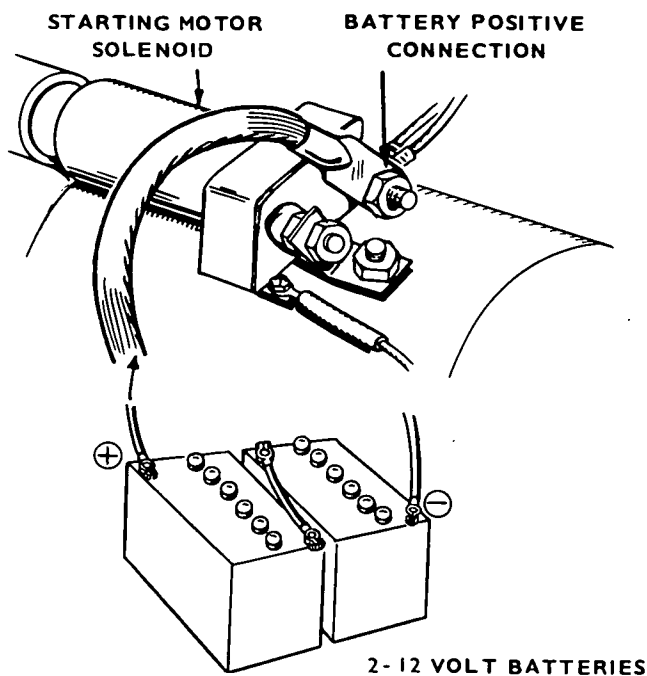


FIGURE 13. BATTERY CONNECTION

## BATTERY, HOT LOCATION

Batteries will self discharge very quickly when installed where the ambient temperature is consistently above 90° F (32° 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° 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 an hydrometer or filler bulb and dispose of it in a safe manner. Avoid skin or clothing contact with the electrolyte.
3. Refill each cell with distilled water, to normal level.
4. Continue charging for 1 hour at a 4 to 6 hour rate.
5. Test each cell. If the specific gravity is still above 1.255, repeat steps 2, 3, 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 1000- and 2000-feet (305 m and 610 m), use No. 16 AWG wire.

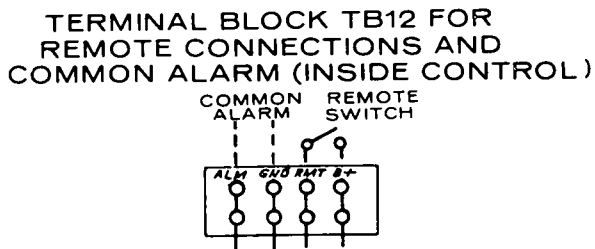
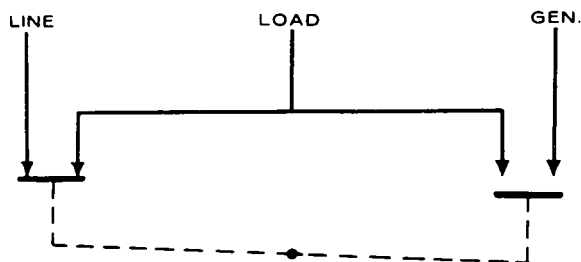


FIGURE 14. REMOTE CONTROL CONNECTION

## WIRING CONNECTIONS

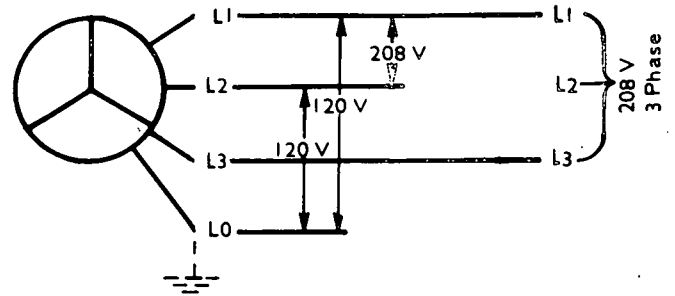
Most local regulations require that wiring connections be made by a licensed electrician and that the installation be inspected and approved before operation. All connections, wire sizes, etc. must conform to requirements of electrical codes in effect at the installation site.

If the installation is for standby service, a double throw transfer switch (Figure 15) must always be used. Connect this switch (either automatic or manual) so that it is impossible for commercial power and generator power to be connected to the load at the same time. Instructions for connecting an automatic transfer switch are included with such equipment.

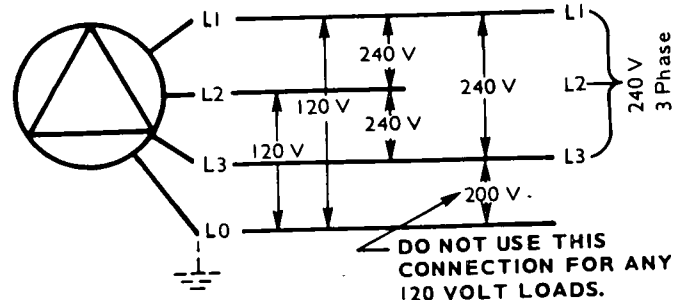


NOTE: SHOWN WITH LINE CONNECTED TO LOAD.

FIGURE 15. LOAD TRANSFER SWITCH (TYPICAL)



3-PHASE WYE CONNECTION



3-PHASE DELTA CONNECTION

FIGURE 16.

## GENERATOR CONNECTIONS

Voltage output of the model UV generator is predetermined at the factory by the internal connections to the bus-bars. It is not recommended that these be changed. The generator is rated in two voltages, the lower being line to neutral and the higher is the line-to-line voltage. Refer to the rating plate on the generator. For maximum current available at these voltages, see Table 1.

For 3-phase loads connect separate load wires to each of the set terminals L1, L2 and L3 (Figure 16). 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 load wire to the L0 terminal. Connect the "hot" (black) 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.

ONAN recommends that all connections from the generator to the bus-bars and from the bus-bars to the load be made by a qualified electrician. All applicable local and state laws should be complied with.

# OPERATION

## GENERAL

ONAN DWV Series electric generating sets are given a complete running test under various load conditions and 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

**Lubricating System:** Engine oil was drained prior to shipment. Fill engine to capacities shown. After engine has been run, check dipstick, add oil to bring level to full mark. Record total capacity for future oil changes. Refer to Waukesha engine manual for engine oil recommendations. Note that for average operating conditions oils conforming to Military Specifications MIL-L-2104C and MIL-L-45199B (Series 3) are recommended. Do not mix brands nor grades of lubricating oils.

Recommended oil viscosity is SAE 40 for all temperatures. Use a coolant heater for ambients below 70° F (21° C).

### Oil Capacities (nominal)

Oil Pan .....	18 gallons (68.13 litres)
Filter and Oil Lines .....	10 gallons (37.85 litres)
Total .....	28 gallons (106 litres)

**CAUTION** After changing or filling engine crankcase, pre-fill oil filters. If this is not performed, the engine will be starved for oil until the filters fill up, and damage will result.

**CAUTION** Use a manual, electric pump or air pressure method of filling engine oil system including the turbo-charger oil supply lines. Operation of the turbo without adequate oil flow to the bearings can cause severe damage to turbo within five seconds. Refer to Waukesha manual on turbo-charger operation.

**Cooling System:** Cooling system was drained prior to shipment. Fill cooling system before starting. Total capacity is 65 gallons (246 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 Waukesha manual for additional information.

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

Ensure that water supply for city water cooling is turned ON.

**Fuel System:** Refer to the Waukesha 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.

Remove suction line from fuel pump and prime with clean fuel. Reconnect suction line. Check all connections in fuel system, for security, to ensure that pressure will not bleed off when engine is not in use. Pressure should be maintained for immediate starting if unit is on standby service.

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

Check level of electrolyte to be at split ring mark. Measure specific gravity of electrolyte: SG 1.280 at 80° F (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.

- a. Crankcase filled.
- b. Cooling system filled — input solenoid valve open.
- c. Batteries charged and connected.
- d. Fuel solenoid valve open.

To start, move the "run-stop-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 40 and 50 psi (275.8 and 344.8 kPa). Check the following gauges:

- a. DC Ammeter — 10 to 30 amperes.
- b. AC Voltmeter — AC generator output voltage.
- c. Frequency Meter — AC generator output frequency.

After running 10 minutes under load the water temperature gauge should have stabilized at 160° to 180° F (71° to 82° 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° to 195° F (74° to 91° C).

**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.

## STOPPING

To reduce and stabilize temperatures within the engine and turbocharger run the engine at no load for 3-5 minutes before shutting down.

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

## EXERCISE PERIOD

Generating sets on continuous standby service are required to be operative at essential load 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 pressure, prevent electrical relay contacts from oxidizing and insure easy emergency starts. ONAN automatic transfer switches contain an optional exercise switch which, by pre-selection, will start, determine run period and shut down a set on a weekly frequency. For example, the switch can be set for time of start, length of run, A.M. or P.M. and day of week.

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

## HIGH ALTITUDE

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

## 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.

## DUST AND DIRT

1. Keep set clean. Keep cooling system free of dirt, etc.
2. Service air cleaners regularly.
3. Change crankcase oil at proper intervals.
4. Ensure air inlet system is leak free.

**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**  
**(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

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

1. Run set until thoroughly warm.
2. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
3. Refer to Chapter 6 (storage) of Waukesha engine manual.
4. Clean throttle linkage and protect by wrapping with a clean cloth.
5. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
6. Wipe entire unit. Coat parts susceptible to rust with a light film of grease or oil.
7. Disconnect battery and follow standard battery storage procedure.
8. Provide a suitable cover for the entire unit.

## 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. Keep fuel system clean, and batteries in a well charged condition.
3. Partially restrict cool air flow but use care to avoid overheating.
4. Connect water jacket heater when set is not running.
5. Refer to Waukesha manual for further information.

**Engine Heater:** The function of this optional heater is to keep the engine warm enough to assure starting under adverse weather conditions. Connect the heater to a source of power that will be ON during the time the engine is not running. Be sure the voltage rating is correct for the heater element rating (Figure 17).

### CAUTION

Do not energize heater until engine cooling system is filled with coolant.

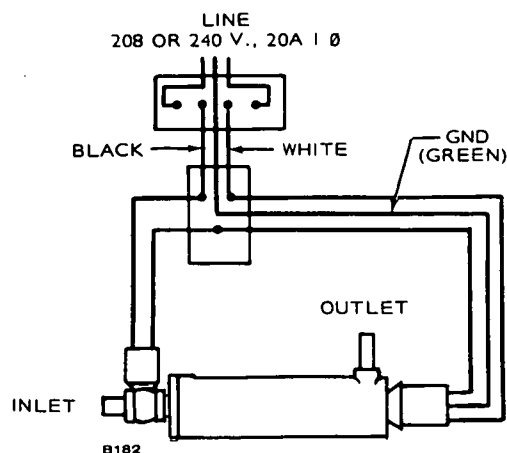


FIGURE 17. ENGINE HEATER (TYPICAL)

# GENERAL MAINTENANCE

## GENERAL

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

### WARNING

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

**TABLE 5. OPERATOR MAINTENANCE SCHEDULE**

MAINTENANCE ITEMS	OPERATIONAL HOURS				
	8	50	100	200-250	500
Inspect Plant	x				
Check Coolant Level	x				
Check Oil Level	x4				
Check Air Cleaner (Clean if Required)		x1			
Inspect Fan Belt		x2			
Check Cooling System, Hoses, etc.		x3			
Check Batteries		x			
Clean and Inspect Crankcase Breather			x		
Change Oil Filter Element				x1	
Clean and Inspect Battery Charging Alternator				x	
Change Crankcase Oil				x1	
Check Security of all fasteners			x5		

x1 - Every 3 months. Perform more often in extremely dusty conditions.

x2 - Every 3 months adjust to 1/2 inch (13 mm) depression between pulleys.

x3 - Check for rust or scale formation. Flush if necessary.

x4 - For accurate readings, check oil level approximately 30 minutes after shut down.

Keep oil level as near "H" mark on dipstick as possible. See engine manual.

x5 - Every 3 months.

## GOVERNOR ADJUSTMENTS — ENGINE SPEED

A Barber-Colman governor is standard equipment on DWV generator sets. Governors are set at the Onan testing facility and do not require further adjustment for normal standby service.

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

1. Remove four screws and cover from governor controller (see Figure 18).
2. Disconnect wire from TB11-22 in generator control cabinet. This disconnects the starter solenoid.
3. Place the Run-Stop-Remote switch to RUN position, by-pass the governor fail safe system by using a short (approx 6") jumper wire from TP1 to TP2 as shown in Figure 19. If the actuator arm does not move to the FULL FUEL position, adjust the activator stroke limit potentiometer (L) in the governor controller box until the actuator linkage moves to full fuel position. Then back the adjustment off slightly such that the linkage is just at the full fuel position.

4. Return Run-Stop-Remote switch to STOP. Reconnect wire TB11-22.
5. Position speed control rheostat on generator control panel to midrange of travel (out 5-turns from low rpm).
6. Adjust speed reference potentiometer in governor controller counterclockwise four complete turns.
7. Start engine. As engine approaches rated speed (1500 rpm or 1800 rpm), the actuator should back away from the full fuel position and control engine speed.

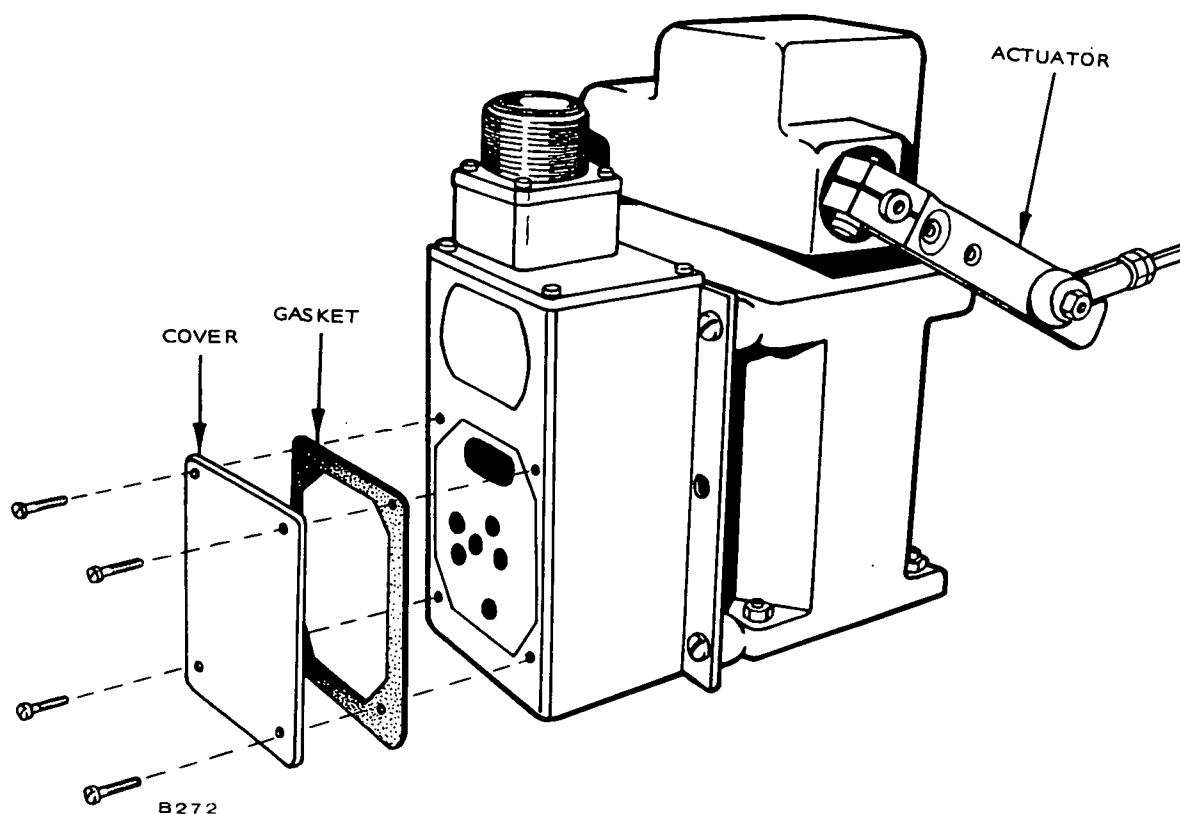
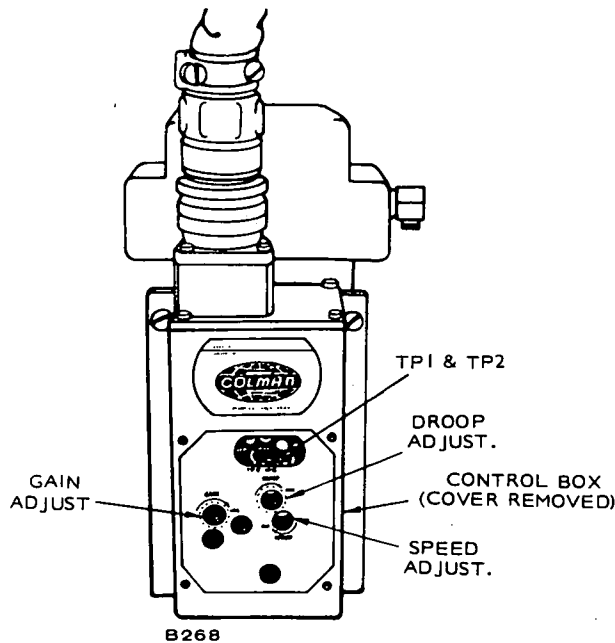


FIGURE 18. BARBER-COLMAN GOVERNOR



**FIGURE 19. GOVERNOR CONTROL BOX ADJUSTMENTS**

9. Adjust Gain potentiometer slightly clockwise then counterclockwise as necessary until engine is stable and responsive to governor control.
10. Load and unload engine several times to ensure correct gain adjustment.
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.

# PARTS CATALOG

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


## 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.

<b>Onan</b> ELECTRIC GEN SET	
MODEL AND SPEC NO. <input type="text"/>	
SERIAL NO. <input type="text"/>	
<b>IMPORTANT:</b> ALWAYS GIVE ABOVE NOS. WHEN ORDERING PARTS	
A.C. VOLTS <input type="text"/>	PH. <input type="text"/>
K.V.A. <input type="text"/>	KW <input type="text"/>
P.F. <input type="text"/>	AMPS <input type="text"/> Hz <input type="text"/>
D.C. VOLTS <input type="text"/>	AMPS <input type="text"/>
WATTS <input type="text"/>	
R.P.M. <input type="text"/>	BAT <input type="text"/>
MANUFACTURED BY <b>ONAN</b> DIVISION OF ONAN CORPORATION MINNEAPOLIS, MINNESOTA, U.S.A. 99A941	

## WAUKESHA PARTS

All Waukesha parts must be ordered from the Waukesha Motor Company of Waukesha, Wisconsin or their nearest authorized Waukesha distributor or dealer. When ordering parts or requesting service information, supply Waukesha with all information stated on the engine nameplate.

<b>DIESEL ENGINE</b>					
					
MODEL <input type="text"/>			SIZE <input type="text"/>		
SERIAL <input type="text"/>	LOT <input type="text"/>	SPEC. <input type="text"/>			
GOV'D SPEED <input type="text"/>			SET VALVES COLD INT <input type="text"/> EXH <input type="text"/>		
OIL SPEC SAE NO. WINTER <input type="text"/>	SUMMER <input type="text"/>	SPARK ADV <input type="text"/>	DEG. AT <input type="text"/>	R.P.M. <input type="text"/>	
WAUKESHA MOTOR COMPANY      WAUKESHA, WISCONSIN MADE IN U.S.A.					

This catalog applies to the standard DWV generator sets as listed below. Powered by a Waukesha engine (see the Waukesha 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 Waukesha manual. Onan parts are arranged in groups of related items and are identified by a reference. All parts illustrations are typical. Unless otherwise mentioned, parts are interchangeable. Right and left sides are determined by facing the front end of the engine.

### GENERATOR SET DATA TABLE

MODEL AND SPEC NO. *	ELECTRICAL DATA				
	WATTS	VOLTS	HERTZ	PHASE	WIRE
600DWV-4R8/	600,000	120/208	60	3	4
600DWV-4XR8/	600,000	277/480	60	3	4
600DWV-7XR8/	600,000	249/416	60	3	4
600DWV-5DR8/	600,000	120/240	60	3	4
600DWV-6DR8/	600,000	240/480	60	3	4
600DWV-9XR8/	600,000	347/600	60	3	4

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

**NOTE:** Hertz is a unit of frequency equal to one cycle per second.

### REPLACEMENT ENGINE:

100-1295

1

Engine, Replacement (Waukesha Motor Company Model P2154DSIU)

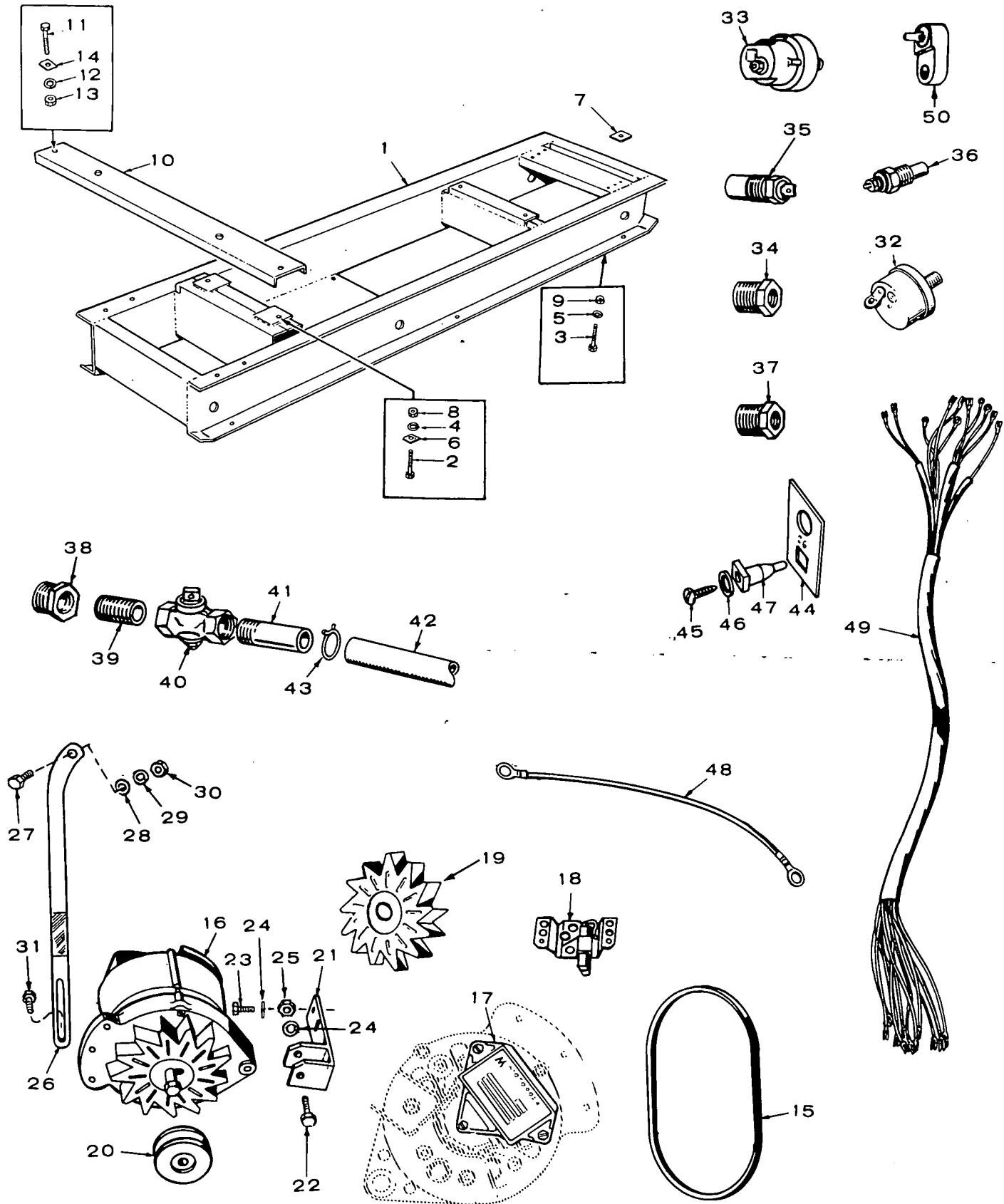
#### General Description:

Includes — Complete Cylinder Block, Air Cleaner, Fuel Filter, Starter Motor (24 Volt), Fan Blades, Fan Belts, Fan Guard, Flywheel, Flywheel Housing, Water Pump, Engine Supports, Oil Pan, Oil Cooler, Exhaust Manifold, Vibration Damper, Radiator Brace, Radiator and Aftercooler.

Excludes — Alternator, Alternator Mounting Brackets, Alternator Belt, Temperature Sender, Oil Pressure Sender, Governor.

**NOTE:** Replacement engine listed above applies to standard Spec I generator sets. Refer to factory for all other specifications.

# MISCELLANEOUS ENGINE PARTS GROUP



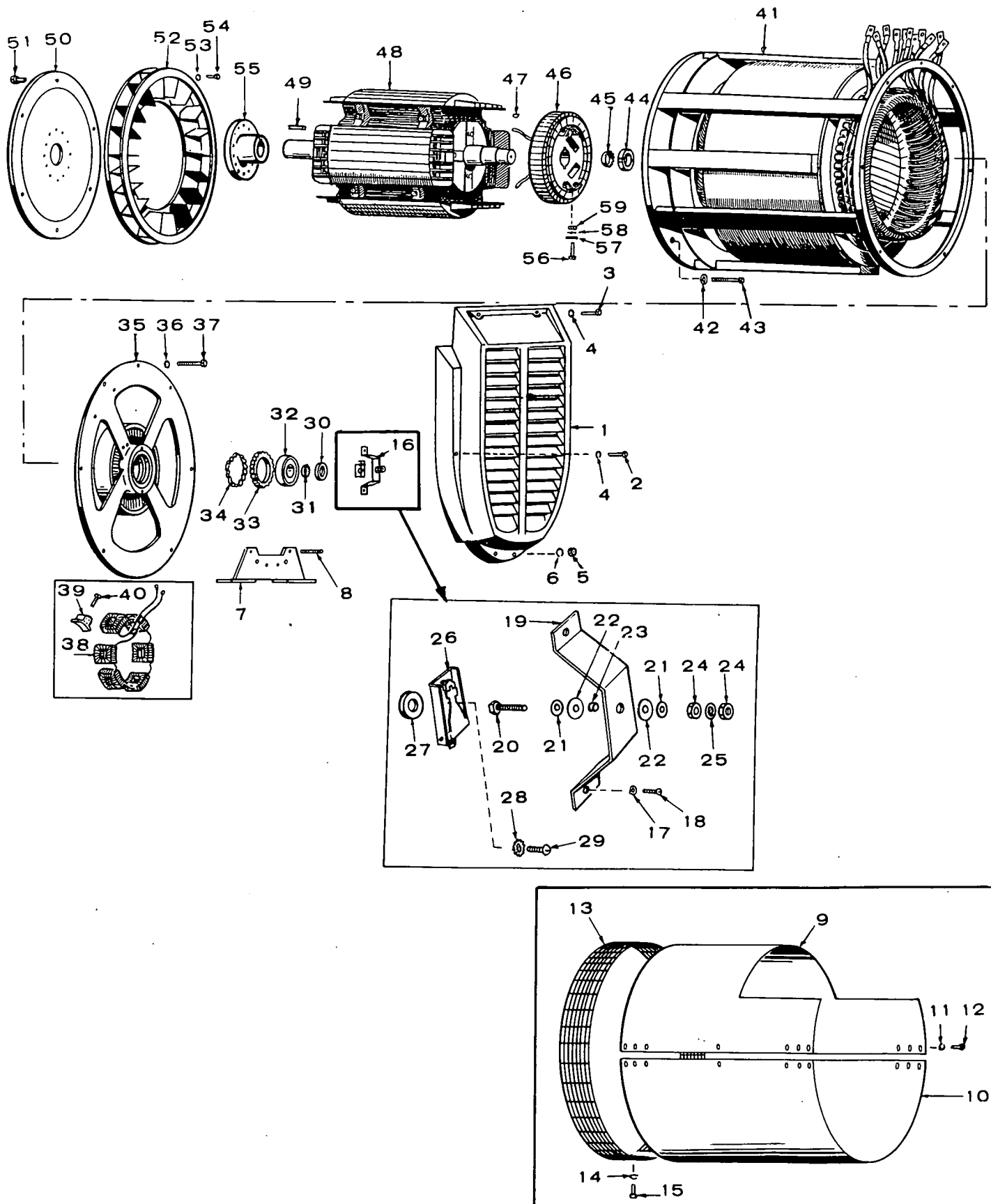
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	403-1096	1	Base, Mounting
2	800-0176	4	Screw, Hex Cap - Engine to Base (7/8-9 x 3")
3	800-0156	2	Screw, Hex Cap - Generator to Base (3/4-10 x 2-1/4")
4	850-0084	4	Washer, Lock - Engine to Base (7/8")
5	850-0079	2	Washer, Lock - Generator to Base (3/4")
6	403-1141	2	Washer, Bevel - Engine to Base
7	SHIM, GENERATOR TO MOUNTING BASE		
	232-1817	As Req.	.062"
	232-1489	As Req.	.0598"
	232-1490	As Req.	.0359"
8	862-0009	4	Nut, Hex - Engine to Base (7/8-9)
9	862-0008	2	Nut, Hex - Generator to Base (3/4-10)
10	130-0932	3	Support, Radiator
11	800-0156	12	Screw, Hex Cap - Radiator to Support and Support to Base (3/4-10 x 2-1/4")
12	850-0079	12	Washer, Lock - Radiator to Support and Support to Base (3/4")
13	862-0008	12	Nut, Hex - Radiator to Support and Support to Base (3/4-10)
14	403-1141	6	Washer, Bevel - Radiator Support to Base
15	511-0092	1	Belt, Alternator Drive
16	191-0688	1	*Alternator, Charge - Includes Regulator and Fan (Motorola #70D44039B04)
17	191-0733	1	Regulator, Voltage (Part of 191-0688 Alternator)
18	191-0659	1	Brush Assembly (Part of 191-0688 Alternator)
19	191-0871	1	Fan, Blower (Part of 191-0688 Alternator)
20	191-0649	1	Pulley, Alternator
21	191-1093	1	Bracket, Alternator Mounting
22	800-0095	1	Screw, Hex Cap - Alternator Mtg. (1/2-13 x 2-1/4")

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
23	800-0090	2	Screw, Hex Cap - Alternator Bracket Mounting (1/2-13 x 1")
24	850-0060	3	Washer, Lock - Alternator Mtg. (1/2")
25	862-0005	1	Nut, Hex - Alternator Mounting (1/2-13)
26	191-1100	1	Strap, Alternator Adjusting
27	800-0030	1	Screw, Hex Cap - Adjusting Strap Mtg. (5/16-18 x 1-1/4")
28	526-0115	1	Washer, Flat - Adjusting Strap Mounting (5/16")
29	850-0045	1	Washer, Lock - Adjusting Strap Mounting (5/16")
30	862-0015	1	Nut, Hex - Adjusting Strap Mounting (5/16-18)
31	821-0016	1	Screw, Hex Cap - Flanged - Adjusting Strap to Alternator (5/16-18 x 3/4")
32	309-0272	1	Switch, Low Oil Pressure
33	193-0195	1	Sender, Oil Pressure
34	505-0007	2	Bushing, Pipe - Reducer (1/4 x 1/8")
35	309-0178	1	Switch, High Water Temperature
36	193-0109	1	Sender, Water Temperature
37	505-0022	1	Bushing, Reducer (1 x 1/2")
38	505-0021	1	Bushing, Reducer - Oil Drain (3/4 x 1/2")
39	505-0100	1	Nipple, Close - Oil Drain (1/2")
40	504-0011	1	Valve, Shut-Off - Oil Drain
41	505-0185	1	Nipple, Half - Oil Drain
42	503-0509	1	Hose, Oil Drain (13")
43	503-0197	1	Clamp, Hose - Oil Drain
44	332-1281	1	Bracket, Terminal
45	809-0035	1	Screw, Sheet Metal Type - Terminal Bracket (#8 x 3/4")
46	508-0015	1	Washer, Fibre - Terminal Bracket
47	870-0196	1	Nut, Insulated - Terminal Bracket
48	336-1250	1	Lead, Alternator to Ground
49	HARNESS, WIRING		
	338-0769	1	Engine to Control
	338-0903	1	Line to Control
50	309-0269	1	Switch, Low Engine Temperature - Optional



# GENERATOR GROUP

NOTE: See separate group for Bus Bar and Exciter Rotor parts.

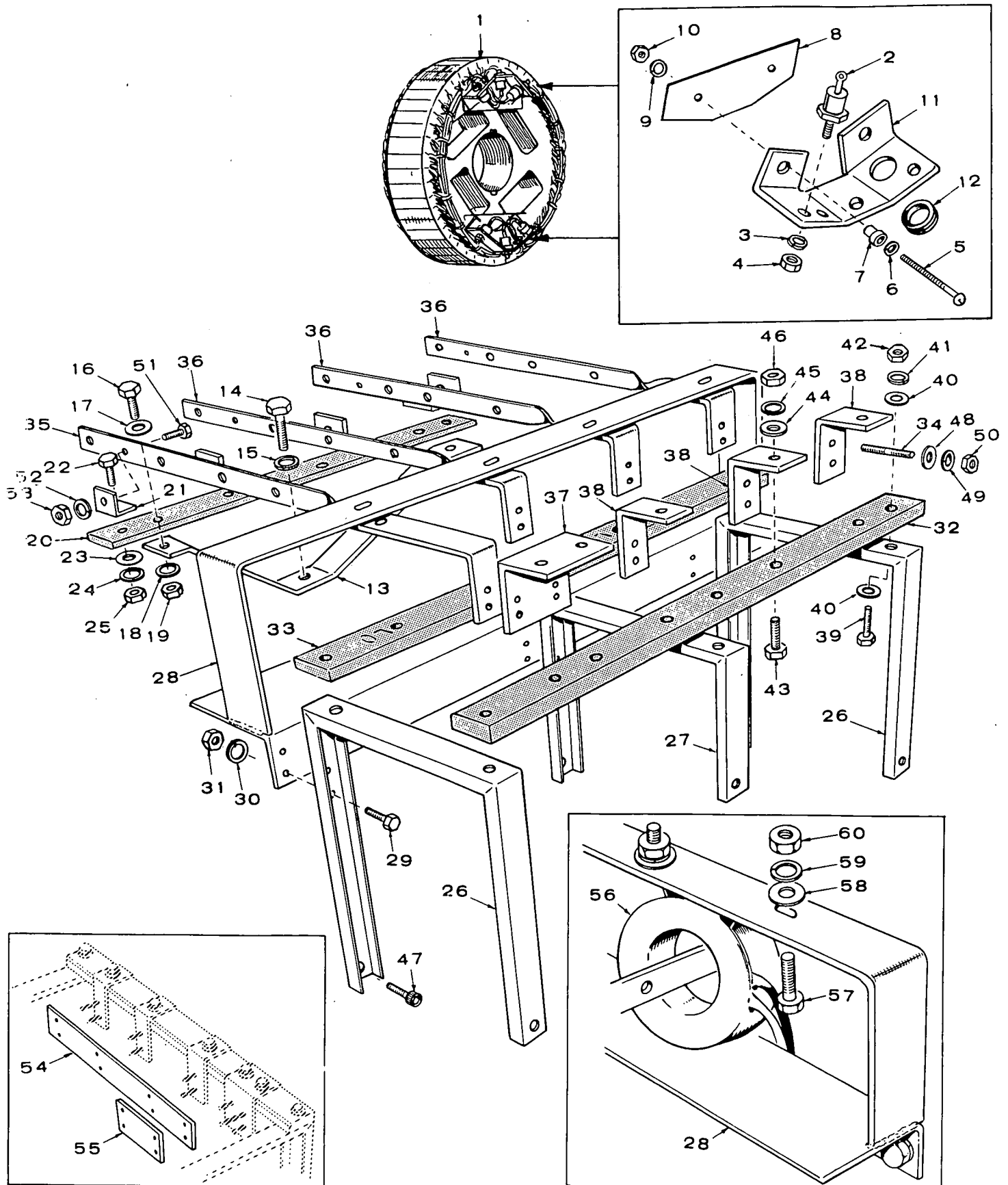


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	232-1973	1	Grill, End Bell
2	800-0013	2	Screw, Hex Cap (1/4-20 x 2-1/2")
3	800-0009	4	Screw, Hex Cap (1/4-20 x 1-1/2")
4	850-0040	6	Washer, Lock (1/4")
5	862-0007	4	Nut, Hex (5/8-11)
6	850-0070	4	Washer, Lock (5/8")
7	232-1957	1	Support, Generator Mounting
8	520-0692	2	Stud, Generator Support
9	234-0291	1	Band, Stator - Top
10	234-0281	1	Band, Stator - Bottom
11	850-0040	6	Washer, Lock (1/4")
12	800-0005	6	Screw, Hex Cap (1/4-20 x 3/4")
13	234-0272	1	Cover, Fan
14	850-0040	1	Washer, Lock (1/4")
15	800-0003	1	Screw, Hex Cap (1/4-20 x 1/2")
16	150-1447	1	Point Assembly, Overspeed Switch (Includes Parts Marked †)
17	850-0040	2	Washer, Lock (1/4")
18	812-0148	2	Screw, Round Head (1/4-20 x 1/2")
19	150-1194	1	†Bracket, Overspeed Switch
20	150-0723	1	†Contact, Overspeed Switch
21	526-0052	2	†Washer, Flat - Brass
22	508-0018	2	†Washer, Insulator
23	508-0006	1	†Washer, Insulator
24	871-0016	2	†Nut, Hex - Brass (1/4-20)
25	854-0014	1	†Washer, Lock (I.T.) (1/4")
26	150-0717	1	Switch Assembly, Overspeed
27	526-0030	1	Washer, Flat (3/8")
28	856-0010	1	Washer, Lock (E.I.T.) (3/8")
29	812-0189	1	Screw, Round Head (3/8-16 x 3/4")
30	510-0091	1	Nut, Bearing Lock (Special)
31	510-0093	1	Washer, Bearing Lock (Special)
32	510-0090	1	Bearing, Ball
33	232-1923	1	Ring, Bearing Holder
34	232-1924	1	Spring, Bearing Holder
35	211-0170	1	Bell, End (Includes Parts Marked £)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
36	850-0050	6	Washer, Lock (3/8")
37	800-0051	6	Screw, Hex Cap (3/8-16 x 1-1/4")
38	222-1693	1	£Coil Assembly, Field - Exciter (Set of Six Coils)
39	221-0153	6	£Shoe, Pole - Exciter
40	800-0031	12	£Screw, Hex Cap (5/16-18 x 1-1/2")
41		1	Stator Assembly, Wound
42	850-0060	16	Washer, Lock (1/2")
43	800-0092	16	Screw, Hex Cap (1/2-13 x 1-1/2")
44	510-0092	1	Nut, Bearing Lock (Special)
45	510-0094	1	Washer, Bearing Lock (Special)
46	201-1501	1	Rotor Assembly, Exciter - Wound - See Separate Group for Components
47	515-0152	1	Key, Exciter Rotor
48		1	Rotor Assembly, Wound
49	515-0161	1	Key, Hub
50	232-1880	1	Disc, Rotor Drive
51	805-0035	12	Bolt, Place (5/8-11 x 1-1/2")
52	205-0076	1	Fan, Generator
53	850-0070	6	Washer, Lock (5/8")
54	800-0133	6	Screw, Hex Cap (5/8-11 x 1-3/4")
55	232-1870	1	Hub, Rotor Drive
56	820-0067	2	Screw, Pan Head (#10-32 x 1")
57	526-0009	2	Washer, Flat (#10)
58	850-0030	2	Washer, Lock (#10)
59	870-0053	2	Nut, Hex (#10-32)

† - Included in 150-1447 Overspeed Point Assembly.  
 \* - Refer to factory giving complete Model, Spec and  
 Serial Number.

EXCITER ROTOR AND BUS BAR GROUP

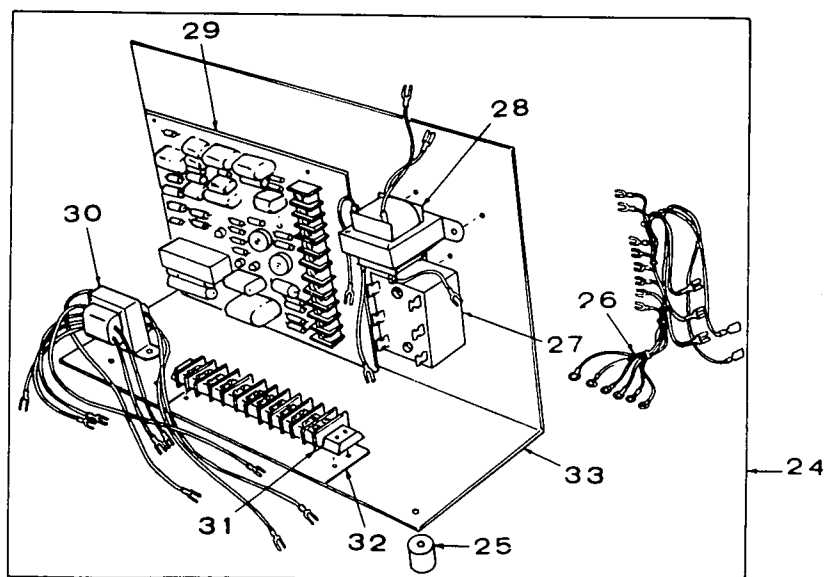
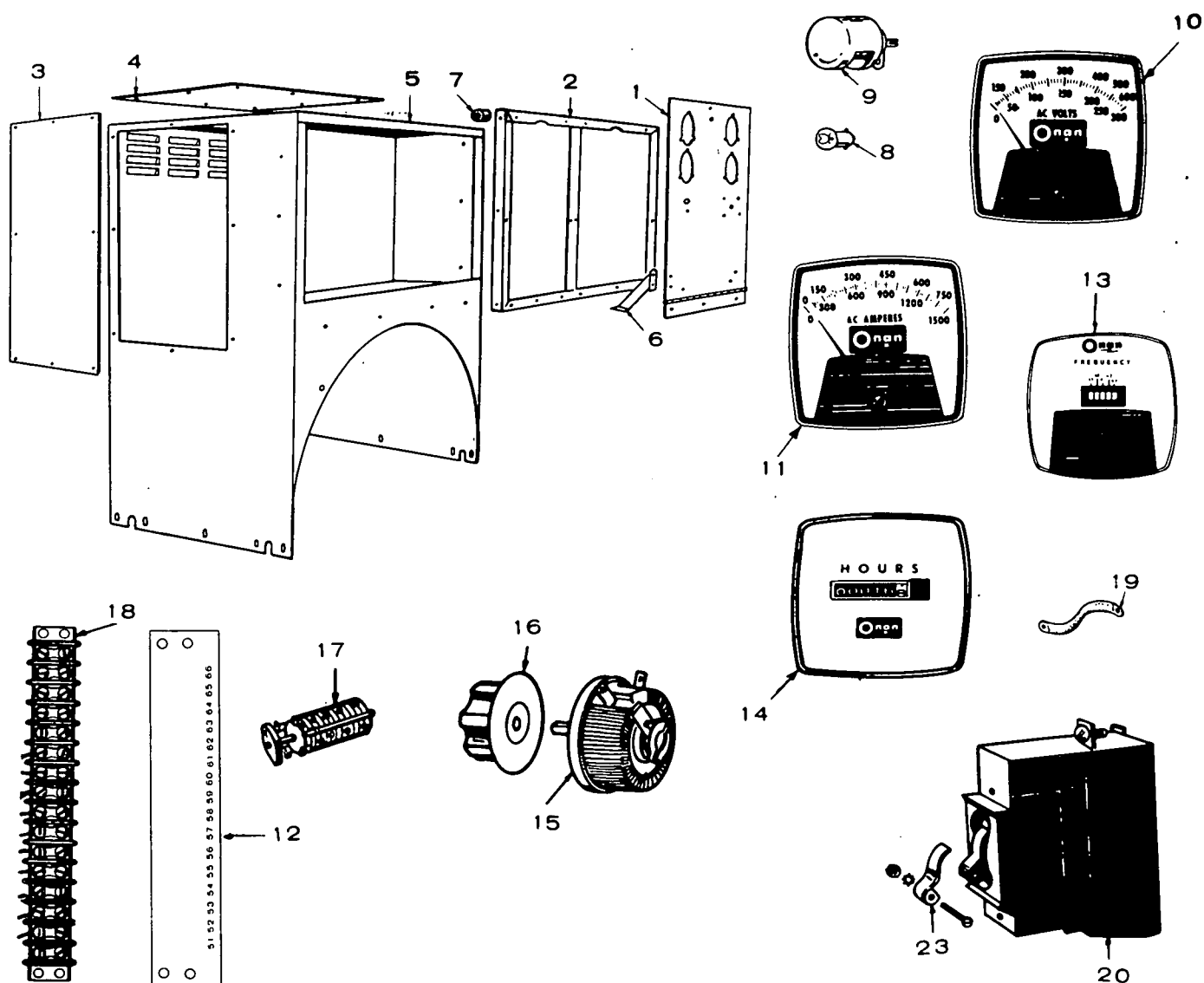


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	201-1501	1	Rotor Assembly, Exciter - Wound (Includes Parts Marked †) - Also shown in Generator Group
2	†RECTIFIER		
	358-0011	3	Positive Stud
	358-0012	3	Negative Stud
3	850-0040	6	†Washer, Lock (1/4")
4	868-0001	6	†Nut, Hex Jam (1/4-28)
5	813-0114	4	†Screw, Round Head (#10-32 x 3")
6	526-0008	4	†Washer, Flat (#10)
7	508-0124	4	†Bushing, Shoulder - Insulating
8	232-1985	4	†Insulator, Heat Shield
9	850-0030	4	†Washer, Lock (#10)
10	870-0053	4	†Nut, Hex (#10-32)
11	†SINK HEAT RECTIFIER		
	363-0033	1	Negative
	363-0025	1	Positive
12	508-0093	1	†Grommet, Rubber
13	232-1994	1	Bracket, Bus Bar
14	800-0151	1	Screw, Hex Cap (3/4-10 x 1")
15	850-0079	1	Washer, Lock (3/4")
16	800-0051	2	Screw, Hex Cap (3/8-16 x 1-1/4")
17	526-0029	2	Washer, Flat (3/8")
18	850-0050	2	Washer, Lock (3/8")
19	862-0003	2	Nut, Hex (3/8-16)
20	232-1997	1	Board, Insulating
21	232-1992	4	Bracket, Bus Bar
22	800-0007	4	Screw, Hex Cap (1/4-20 x 1")
23	526-0018	4	Washer, Flat (1/4")
24	850-0040	4	Washer, Lock (1/4")
25	862-0001	4	Nut, Hex (1/4-20)
26	232-1999	2	Bracket, Terminal Board Mtg.
27	232-2000	1	Bracket, Terminal Board Mtg.
28	315-0302	1	Shelf, Current Transformer
29	800-0005	6	Screw, Hex Cap (1/4-20 x 3/4")
30	850-0040	6	Washer, Lock (1/4")
31	862-0001	6	Nut, Hex (1/4-20)
32	232-1998	1	Board, Insulating
33	232-1995	1	Board, Insulating

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
34	520-0693	16	Stud, Terminal (5/16 x 1-5/8")
35	232-1996	1	Bar, Bus (17-3/8" Long)
36	232-2001	3	Bar, Bus (13-1/4" Long)
37	232-1991	1	Bar, Bus (Double)
38	232-1990	3	Bar, Bus
39	800-0052	9	Screw, Hex Cap (3/8-16 x 1-1/2")
40	526-0029	18	Washer, Flat (3/8")
41	850-0050	9	Washer, Lock (3/8")
42	862-0003	9	Nut, Hex (3/8-16)
43	800-0052	6	Screw, Hex Cap (3/8-16 x 1-1/2")
44	526-0029	6	Washer, Flat (3/8")
45	850-0050	6	Washer, Lock (3/8")
46	862-0003	6	Nut, Hex (3/8-16)
47	802-0069	6	Screw, Socket Head (3/8-16 x 5/8")
48	526-0115	32	Washer, Flat (5/16")
49	850-0045	32	Washer, Lock (5/16")
50	862-0015	32	Nut, Hex (5/16-18)
51	800-0005	4	Screw, Hex Cap (1/4-20 x 3/4")
52	850-0040	4	Washer, Lock (1/4")
53	862-0001	4	Nut, Hex (1/4-20)
54	232-1993	1	Jumper, Bus Bar (Used on Parallel Wye Wound Generator)
55	232-2005	1	Jumper, Bus Bar (Used on Delta Wound Generator)
56	TRANSFORMER, CURRENT (CHECK TRANSFORMER NAMEPLATE - SELECT ACCORDING TO RATING)		
	302-0547	3	Nameplate Reads 500/5
	302-0625	3	Nameplate Reads 750/5
	302-0589	3	Nameplate Reads 1000/5
	302-0643	3	Nameplate Reads 1200/5
	302-0644	3	Nameplate Reads 1500/5
	302-0645	3	Nameplate Reads 2000/5
57	800-0052	6	Screw, Hex Cap (3/8-16 x 1-1/2")
58	526-0029	6	Washer, Flat (3/8")
59	850-0050	6	Washer, Lock (3/8")
60	862-0003	6	Nut, Hex (3/8-16)

† - Included in 201-1501 Exciter Rotor Assembly.

# CONTROL GROUP (AC PORTION)

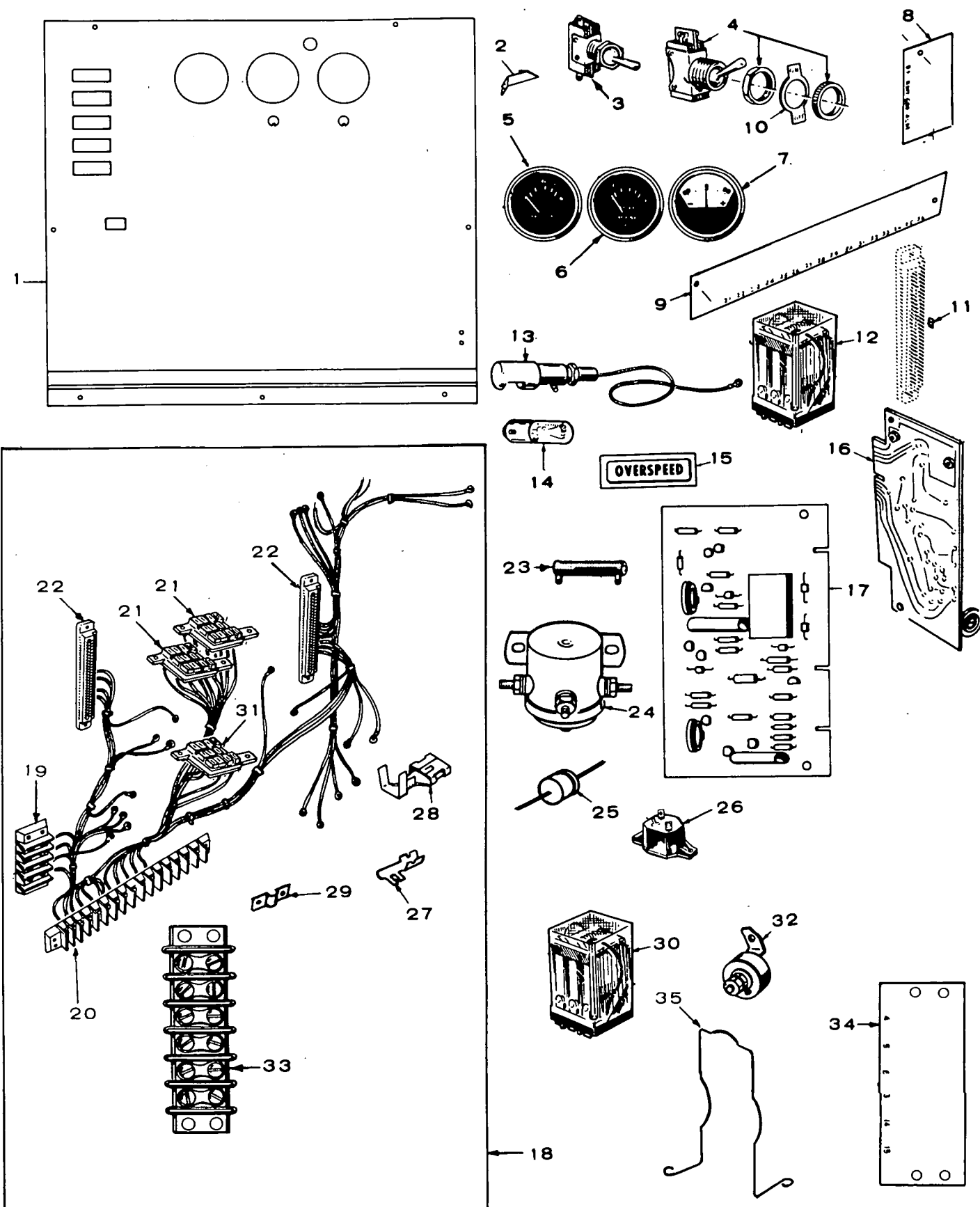


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL, CONTROL		
	301-2980	1	Without Meters
	301-2908	1	With Meters
2	301-2906	1	Frame, Control Panel Mtg.
3	301-2905	2	Plate, Control Box - Side
4	301-2904	1	Plate, Control Box - Top
5	301-2903	1	Box, Control
6	301-1914	1	Bracket, Panel Stop
7	402-0078	5	Mount, Rubber - Control Box Frame
8	322-0017	1	Lamp, Panel
9	322-0149	1	Receptacle, Panel Lamp
10	VOLTMETER, AC (CHECK VOLTMETER SCALE - SELECT ACCORDING TO RATING)		
	302-0421	1	Scale Reads 0-300
	302-0612	1	Scale Reads 0-500
	302-0422	1	Scale Reads 0-600
	302-0423	1	Scale Reads 0-750
11	AMMETER, AC (CHECK AMMETER SCALE - SELECT ACCORDING TO RATING)		
	302-0414	1	Scale Reads 0-500
	302-0415	1	Scale Reads 0-750
	302-0416	1	Scale Reads 0-1000
	302-0640	1	Scale Reads 0-1200
	302-0641	1	Scale Reads 0-1500
	302-0642	1	Scale Reads 0-2000
12	332-1134	1	Strip, Marker (Marked 51 through 66)
13	METER, FREQUENCY		
	302-0213	1	120/208 and 120/240 Volt - 3 Phase - 60 Hertz
	302-0716	1	240/480 and 277/480 Volt - 3 Phase - 60 Hertz
	302-0717	1	347/600 Volt - 3 Phase - 60 Hertz

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
14	METER, RUNNING TIME		
	302-0465	1	120/208, 120/240, and 347/600 Volt - 3 Phase - 60 Hertz
	302-0466	1	240/480 Volt - 3 Phase - 60 Hertz
	302-0467	1	277/480 Volt - 3 Phase - 60 Hertz
15	303-0170	1	Rheostat, Voltage Adjustment
16	303-0032	1	Knob, Rheostat
17	308-0022	1	Switch, Voltage and Current Selector
18	332-0795	1	Block, Terminal (16 Place)
19	337-0044	1	Strap, Ground
20	320-0455	1	Breaker, Circuit (3 amp)
21	508-0001	3	Grommet, Rubber
22	331-0088	1	Bushing (Nylon)
23	320-0307	1	Lock, Circuit Breaker (Penn State Only)
24	305-0545	1	Regulator Assembly, Voltage (Includes Parts Marked *)
25	402-0078	3	*Dampener, Vibration
26	338-0894	1	*Harness, Wiring (Regulator Assembly)
27	305-0524	1	*Reactor, Bridge
28	315-0343	1	*Reactor Assembly, Comm.
29	332-1704	1	*Board Assembly, Printed Control (See Separate Group for Components)
30	315-0342	1	*Transformer, Voltage
31	332-0607	1	*Block, Terminal
32	332-1760	1	*Strip, Marker
33	301-3967	1	*Bracket, Regulator Mounting

\* - Parts included in 305-0545 Regulator Assembly.

# CONTROL GROUP (ENGINE PORTION)



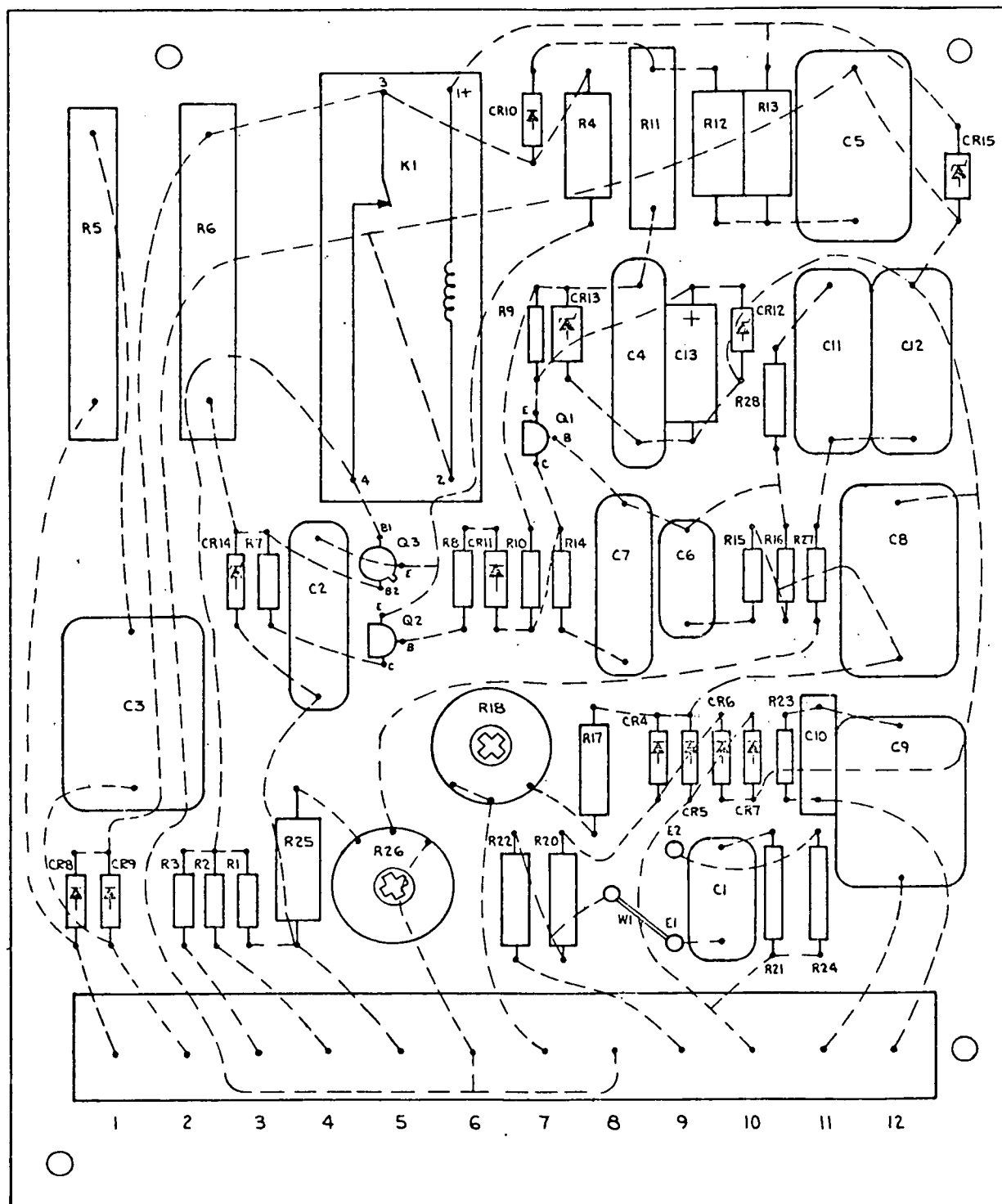
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL ONLY, ENGINE CONTROL		
	301-3400	1	For One Fault Light
	301-3401	1	For Five Fault Lights (Opt.)
2	301-2951	1	Bracket, Panel Stop
3	308-0138	1	Switch, Selector
4	308-0002	1	Switch, Panel Light
5	193-0194	1	Gauge, Oil Pressure
6	193-0106	1	Gauge, Water Temperature
7	302-0061	1	Ammeter, Charge (30-0-30)
8	332-1239	1	Strip, Marker (B+, Remote, Ground, Alarm)
9	332-1241	1	Strip, Marker (21 through 36)
10	308-0003	1	Plate, Switch (On-Off)
11	332-1276	4	Plug, Keying (3 Used on Sets With Five Fault Lights)
12	307-1056	2	Relay, (1) Start Disconnect (1) Ignition
13	322-0149	1	Holder, Lamp
14	322-0017	1	Lamp, Panel
15	LAMP, INDICATOR		
	322-0129	1	Fault (Standard)
	322-0119	1	Overcrank (Optional)
	322-0123	1	Overspeed (Optional)
	322-0120	1	Low Oil Pressure (Optional)
	322-0121	1	High Engine Temperature (Opt.)
	322-0122	1	Low Engine Temperature (Opt.)
16	CONTROL, CRANKER		
	300-0751	1	Standard Cranker (Includes (1) #357-0004 Rectifier)
	300-0715	1	Cycle Cranker (Optional) - (See Separate Group for Components)
17	MONITOR, ENGINE CONTROL (SEE SEPARATE GROUP FOR COMPONENTS)		
	300-0680	1	Sets With One Fault Light - Standard
	300-0682	1	Sets With Five Fault Lights - Optional
	300-0731	1	Penn State Sets With One Fault Light

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
18	HARNESS ASSEMBLY, WIRING - CONTROL (INCLUDES PARTS MARKED *)		
	338-0617	1	Sets With One Fault Light - Standard
	338-0618	1	Sets With Five Fault Lights - Optional
19	332-0537	1	*Block, Terminal - 4 Place
20	332-0795	1	*Block, Terminal - 16 Place
21	323-0765	2	*Socket, Relay - 11 Place
22	332-1271	2	*Housing, Printed Circuit Board Terminal
23	304-0262	1	Resistor, Oil Pressure Gauge
24	307-0061	1	Relay, Starter Pilot
25	357-0004	1	Rectifier, Diode
26	320-0240	1	Breaker, Circuit (12.5 Amp)
27	332-1269	As Req.	*Terminal, PC Board
28	332-1280	As Req.	*Terminal, Crimp
29	332-1043	1	*Jumper, Terminal - Std. Sets
30	307-1143	1	Relay, Starter Protection
31	323-0764	1	*Socket, Relay - 8 Place
32	193-0189	1	Resistor, Water Temperature Gauge
33	332-0699	1	*Block, Terminal (6 Place) - Sets With Five Fault Lights (Optional)
34	332-1240	1	Strip, Marker (53 through 58) - Sets With Five Fault Lights (Optional)
35	307-1157	3	Spring, Relay Holddown

\* - Included in Control Wiring Harness Assembly.



# PRINTED CIRCUIT BOARD ASSEMBLY (332-1704)

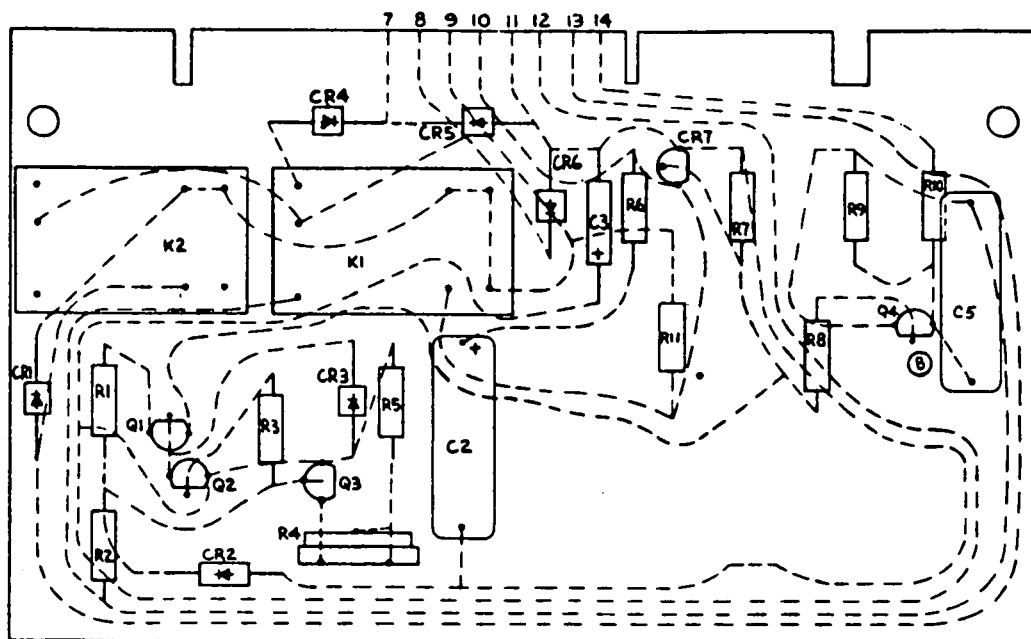


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	332-1704	1	Board Assembly, Printed (Complete)
TB1	332-1252	1	Block, Terminal
C1	355-0018	1	Capacitor (.47 Mfd., 100 Volt)
C2, C7	355-00052	1	Capacitor (.22 Mfd., 200 Volt)
C3, C9, C11	355-0017	3	Capacitor (.47 Mfd., 400 Volt)
C4	355-0006	1	Capacitor (.47 Mfd., 200 Volt)
C5, C8	355-0016	2	Capacitor (1 Mfd., 100 Volt)
C6	355-0034	1	Capacitor (.33 Mfd., 100 Volt)
C10	355-0014	1	Capacitor (.047 Mfd., 200 Volt)
C12	355-0033	1	Capacitor (1.0 Mfd., 200 Volt)
C13	356-0039	1	Capacitor (Electrolytic - .100 Mfd., 100 Volt)
CR4 thru CR11	357-0014	8	Rectifier, Silicon
CR12	359-0035	1	Diode, Zener
CR13	359-0025	1	Diode, Zener
CR14	359-0026	1	Diode, Zener
CR15	359-0015	1	Diode, Zener
K1	307-1063	1	Relay, Magnetic Reed
Q1, Q2	362-0017	2	Transistor, Silicon NPN
Q3	361-0004	1	Transistor, Unijunction
R1, R23	350-0355	2	Resistor (1/2 Watt, 47 Ohm)
R2, R3	350-0351	2	Resistor (1/2 Watt, 33 Ohm)
R4	350-1075	1	Resistor (2 Watt, 4.7 Megohm)
R5	353-0040	1	Resistor, Fixed (10 Watt, 270 Ohm)
R6	353-0039	1	Resistor, Fixed (15 Watt, 5000 Ohm)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
R7	350-0398	1	Resistor (1/2 Watt, 3000 Ohm)
R8, R16	350-0447	2	Resistor (1/2 Watt, 330,000 Ohm)
R9, R10	350-0423	2	Resistor (1/2 Watt, 33,000 Ohm)
R11	352-0151	1	Resistor, Fixed (5 Watt, 15,000 Ohm)
R12	350-1014	1	Resistor (2 Watt, 13,000 Ohm)
R13	350-1007	1	Resistor (2 Watt, 8,000 Ohm)
R14	350-0443	1	Resistor (1/2 Watt, 220,000 Ohm)
R27, R15	350-0435	2	Resistor (1/2 Watt, 100,000 Ohm)
R17	351-0524	1	Resistor, Metal Film (1/4 Watt, 13,000 Ohm)
R18	303-0168	1	Potentiometer
R20, R22	351-0520	2	Resistor, Metal Film (1/4 Watt, 28,000 Ohm)
R21	351-0522	1	Resistor, Metal Film (1/4 Watt, 5,110 Ohm)
R24	351-0523	1	Resistor, Metal Film (1/4 Watt, 8,870 Ohm)
R25	350-1011	1	Resistor (2 Watt, 10,000 Ohm)
R26	303-0164	1	Potentiometer
R28	350-0459	1	Resistor (1/2 Watt, 1 Megohm)

# ENGINE CONTROL MONITOR GROUP (PENN STATE)

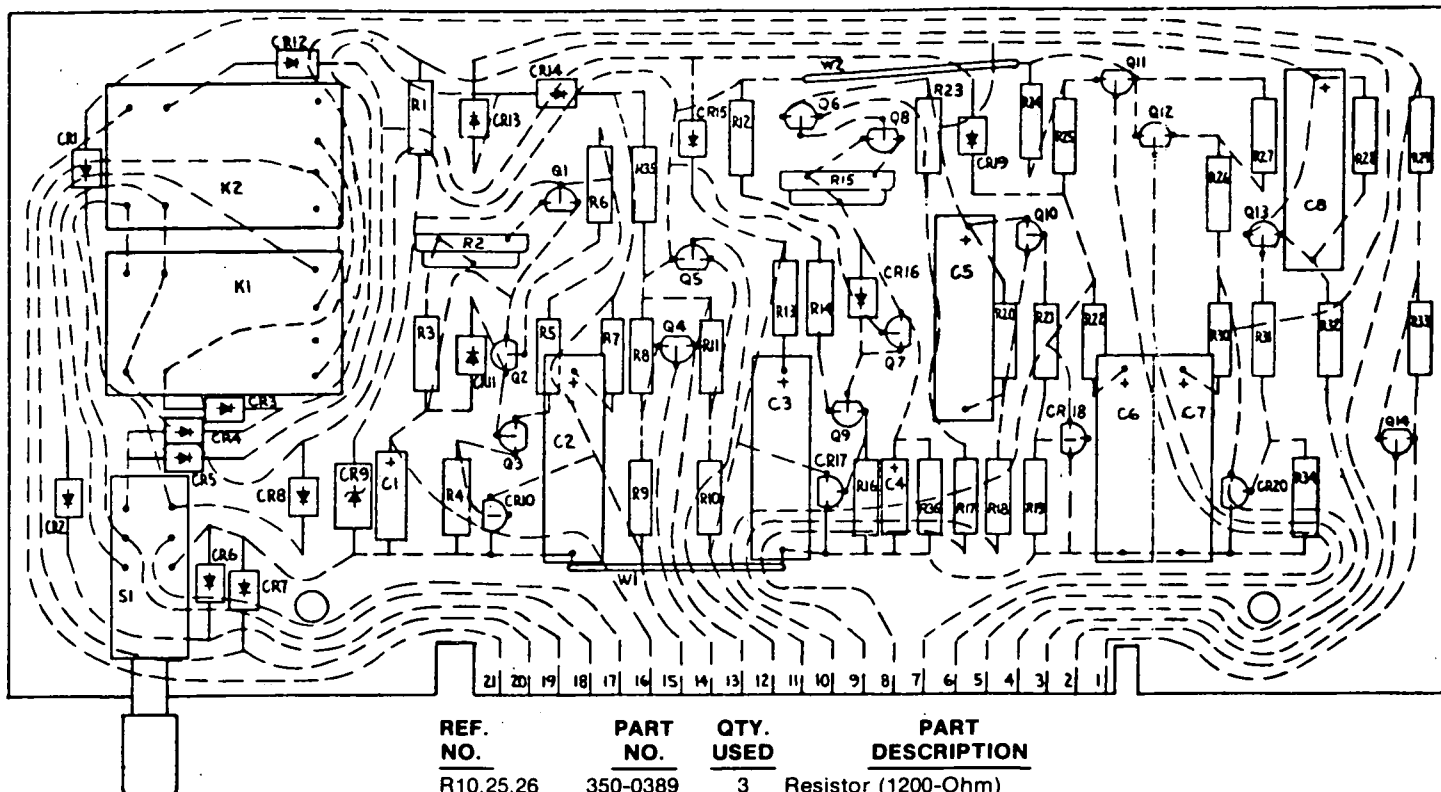
300-0731 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
R11	350-0980	1	Resistor (510-Ohm, 2 Watt)
R8	350-0380	1	Resistor (510-Ohm, 1/2 Watt)
R10	350-0544	1	Resistor (4,700-Ohm)
R9	350-0529	1	Resistor (270-Ohm)
R7	350-0517	1	Resistor (27-Ohm)
R6	350-0505	1	Resistor (2.7-Ohm)
R5	350-0572	1	Resistor (1.0 Megohm)
R4	303-0169	1	Potentiometer
R3	350-0552	1	Resistor (22,000-Ohm)
R2	350-0534	1	Resistor (680-Ohm)
R1	350-0536	1	Resistor (1000-Ohm)
Q4	362-0027	1	Transistor, Silicon
Q2, Q3	362-0025	2	Transistor, Field Effect
Q1	361-0003	1	Transistor
CR7	364-0011	1	Rectifier, Gate Control
CR2	359-0027	1	Diode, Zener
CR1,3,4, 5,6	357-0004	5	Rectifier, Diode
C3	356-0040	1	Capacitor (10 Mfd.)
C2, 5	355-0005	2	Capacitor (.22 Mfd.)
K1, K2	307-1076	2	Relay

# ENGINE CONTROL MONITOR GROUP (FIVE FAULT LIGHTS) - OPTIONAL

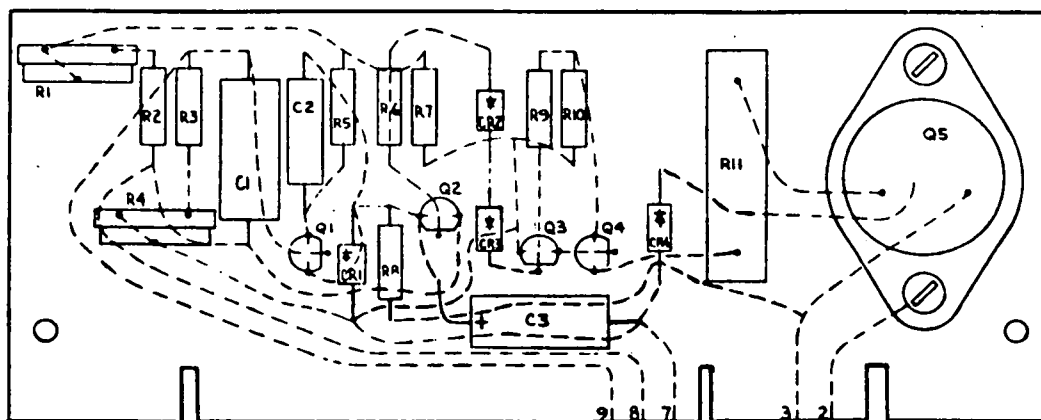
300-0682 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
R10,25,26	350-0389	3	Resistor (1200-Ohm)
R15	303-0182	1	Potentiometer
Q7, 8	362-0031	2	Transistor, Field Effect
R21,R31	350-0380	2	Resistor (510-Ohm)
R6	350-0548	1	Resistor (10,000-Ohm)
R36	350-0587	1	Resistor (18 Megohm)
R35	350-0980	1	Resistor (510-Ohm)
S1	308-0280	1	Switch, Push Button
R9,17,18, 29,32	350-0544	6	Resistor (4700-Ohm)
R8,11,20,23, 24,27,28,33	350-0529	8	Resistor (270-Ohm)
R7,13,22,30	350-0505	4	Resistor (2.7-Ohm)
R12	350-0552	1	Resistor (22,000-Ohm)
R5,14	350-0536	2	Resistor (1000-Ohm)
R4,16,19,34	350-0517	4	Resistor (27-Ohm)
R3	350-0572	1	Resistor (1 Megohm)
R2	303-0169	1	Potentiometer
R1	350-0534	1	Resistor (680-Ohm)
Q4,5,6,10, 11,12,13,14	362-0027	8	Transistor, Silicon
Q3, 9	361-0003	2	Transistor
Q1, 2	362-0025	2	Transistor, Field Effect
K1, K2	307-1076	2	Relay
CR10,17,18, 20	364-0011	4	Rectifier, Gate Control
CR9	359-0027	1	Diode, Zener
CR1,2,3,4,5, 6,7,8,11, 12,13,14, 15,16,19	357-0004	15	Rectifier, Diode
Q4	356-0030	1	Capacitor (1.0 Mfd.)
C2,3,5,6, 7,8	355-0005	6	Capacitor (.22 Mfd.)
C1	356-0040	1	Capacitor (10 Mfd.)

## CONTROL, CYCLE CRANKER GROUP (OPTIONAL EQUIPMENT)

300-0715 - Printed Circuit Board, Complete

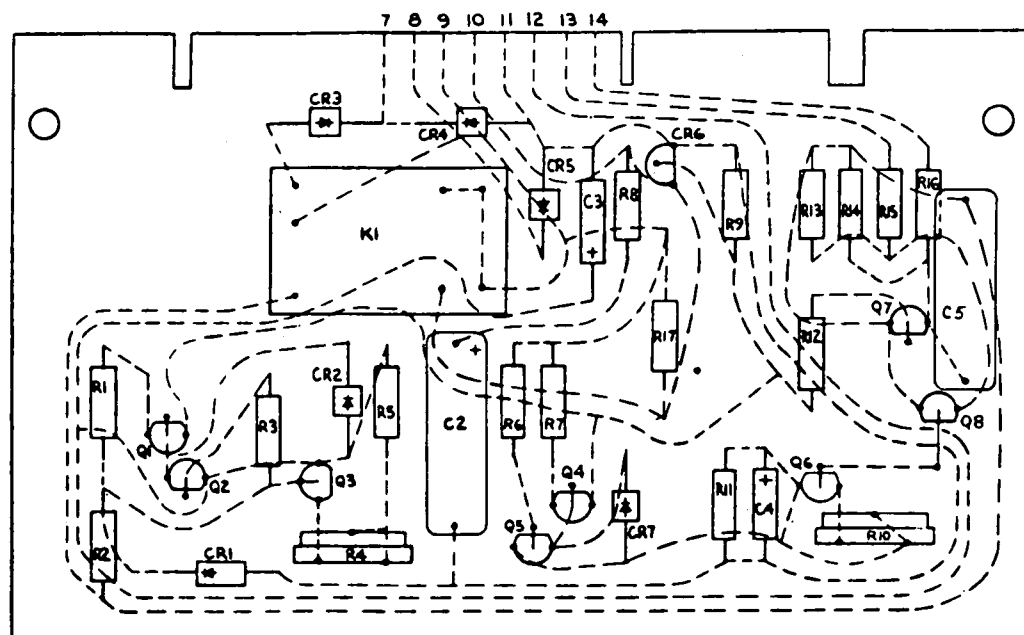


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
C3	356-0045	1	Capacitor, Electrolytic 25 Mfd., 15 Volt
C2	355-0010	1	Capacitor, Dielectric .0022 Mfd., 100 Volt
H3	860-0006	2	Nut, RMS (#6-32)
H2	853-0003	2	Washer, ET Lock (#6)
H1	812-0061	2	Screw, RHM (#6-32 x 3/8")
R11	352-0158	1	Resistor, Fixed (5 Watt, 50-Ohm)
R10	350-0500	1	Resistor, Fixed (1.0-Ohm)
R8	350-0534	1	Resistor, Fixed (6.8-Ohm)
R7	350-0546	1	Resistor, Fixed (6.8-Ohm)
R6	350-0420	1	Resistor, Fixed (24,000-Ohm)
R5	350-0558	1	Resistor, Fixed (68,000-Ohm)
R3, R9	350-0548	2	Resistor, Fixed (10,000-Ohm)
R2	350-0560	1	Resistor, Fixed (100,000-Ohm)
R1, R4	303-0171	2	Potentiometer
Q5	362-0019	1	Transistor, Power
Q4	362-0026	1	Transistor, Signal
Q3	362-0011	1	Transistor
Q1, Q2	362-0008	2	Transistor, Signal
CR2,3,4	357-0004	3	Rectifier, Diode
CR1	359-0027	1	Diode, Zener (7.5 Volts)
C1	356-0039	1	Capacitor, Electrolytic (100 Mfd.)

# ENGINE CONTROL MONITOR GROUP (STANDARD SETS WITH ONE FAULT LIGHT)

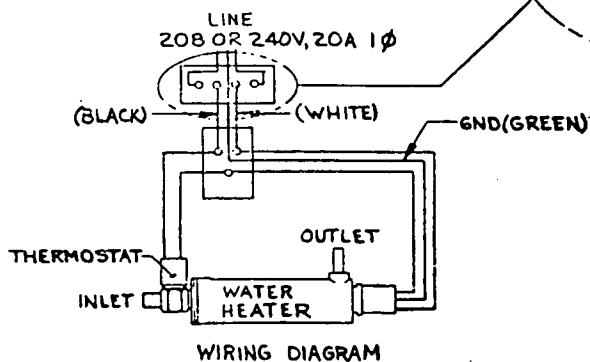
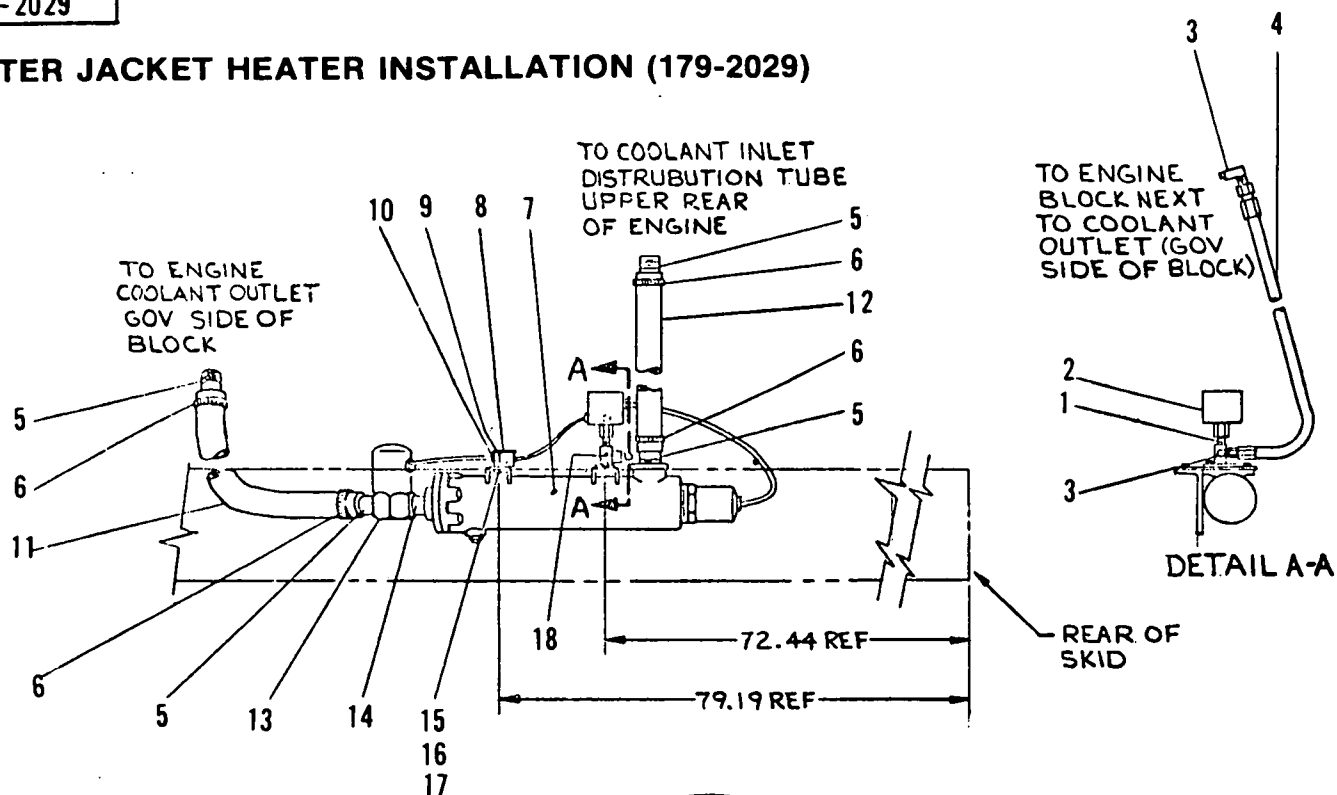
24 Volt

300-0680 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0680	1	Printed Circuit Board - Complete
R10	303-0182	1	Potentiometer (1.0 Megohm)
Q5, 6	362-0031	2	Transistor, Field Effect
R3	350-0548	1	Resistor (10,000-Ohm)
R17	350-0980	1	Resistor (510-Ohm)
R12	350-0380	1	Resistor (510-Ohm)
R15, R16	350-0544	2	Resistor (4,700-Ohm)
R13, 14	350-0529	2	Resistor (270-Ohm)
R11	350-0587	1	Resistor (18 Megohm)
R9	350-0517	1	Resistor (27-Ohm)
R8	350-0505	1	Resistor (2.7-Ohm)
R5	350-0572	1	Resistor (1.0 Megohm)
R4	303-0169	1	Potentiometer (3.5 Megohm)
R6	350-0552	1	Resistor (22,000-Ohm)
R2	350-0534	1	Resistor (680-Ohm)
R1, R7	350-0536	2	Resistor (1000-Ohm)
Q7, Q8	362-0027	2	Transistor, Silicon
Q2, 3	362-0025	2	Transistor, Field Effect
Q1, Q4	361-0003	2	Transistor
CR6	364-0011	1	Rectifier, Gate Control
CR2,3,4, 5,7	357-0004	5	Rectifier, Diode
CR1	359-0027	1	Diode, Zener
C4	356-0030	1	Capacitor (1 Mfd.)
C3	356-0040	1	Capacitor (10 Mfd.)
C2,5	355-0005	2	Capacitor (.22 Mfd.)
K1	307-1076	1	Relay

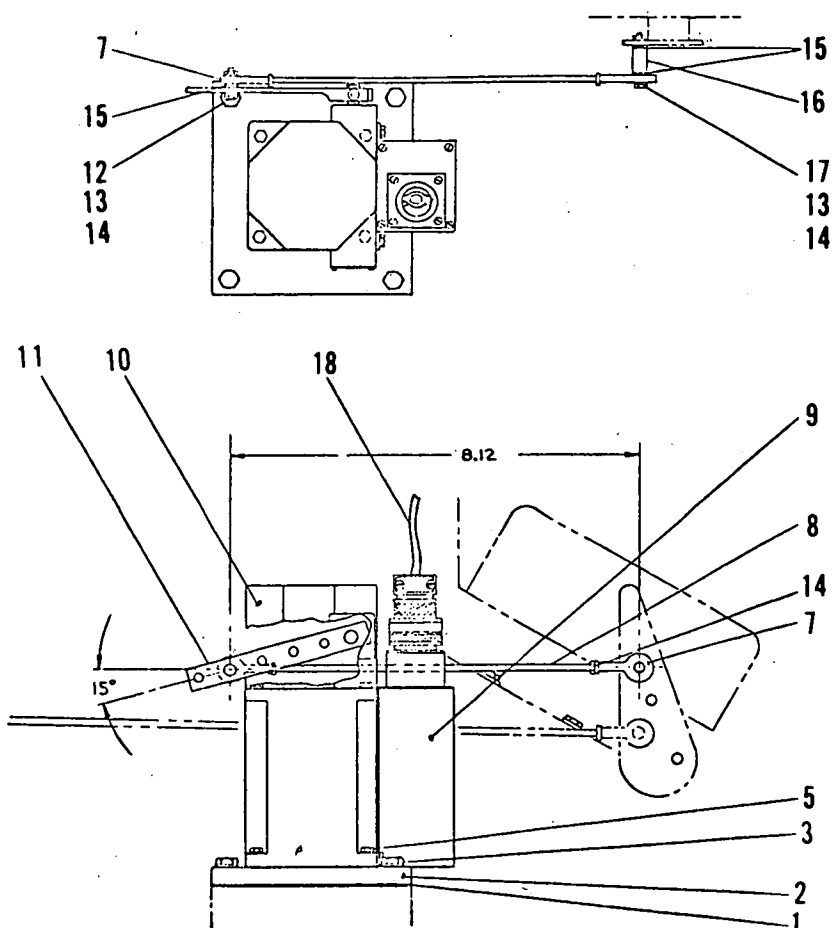
## WATER JACKET HEATER INSTALLATION (179-2029)



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	505-0099	1	Nipple, Pipe (1/4 x 7/8")
2	309-0271	1	Switch, Oil Pressure
3	502-0287	2	Elbow, Inverted Male
4	501-0188	1	Line, Flexible
5	505-0759	4	Adapter, Pipe to Hose (1")
6	503-0429	4	Clamp, Hose
7	333-0138	1	Heater, Engine
8	330-0004	1	Cover, Box
9	330-0005	1	Box, Outlet
10	503-0008	2	Grommet
11		1	Hose (Order 61" of Bulk Hose #503-0249)
12		1	Hose (Order 38" of Bulk Hose #503-0249)
13	309-0253	1	Thermostat
14	505-0107	1	Nipple, Pipe (1 x 2")
15	813-0103	2	Screw, Round Head (#10-32 x 3/4")
16	850-0030	2	Washer, Lock (#10)
17	870-0053	2	Nut, Hex (#10-32)
18	333-0142	1	Support, Pressure Switch

179-0446

# GOVERNOR INSTALLATION (179-0446)



## NOTE:

1. WIRING HARNESS INCLUDES THE ADAPTER THAT ATTACHES TO THE CONTROLLER, THE MAG PICK-UP, AND THE SPEEDSETTING POT.

2. MAG PICK-UP NOT SHOWN ON DWG. TO BE MGT ON FLYWHEEL HOUSING IN EXISTING TAPPED HOLE ON RIGHT SIDE OF ENGINE.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1		1	Gasket (Supplied with Engine - See Engine Manufacture Parts Catalog)
2	150-1490	1	Plate, Governor Mounting
3	800-0050	4	Screw, Hex Cap (3/8-16 x 1")
4	850-0050	4	Washer, Lock (3/8")
5	800-0007	4	Washer, Lock (1/4")
7	150-1119	2	End, Rod - Special
8	520-0846	1	Stud, Steel
9	151-0399	1	Control
10	151-0398	1	Actuator
11	151-0400	1	Lever, Governor Actuator
12	800-0008	1	Screw, Hex Cap (1/4-20 x 1-1/4")
13	850-0040	4	Washer, Lock (1/4")
14	862-0001	4	Nut, Hex (1/4-20)
15	526-0016	4	Washer, Flat (1/4")
16	232-0225	1	Spacer
17	800-1009	2	Screw, Hex Cap
18	151-0401	1	Harness, Wiring
19	151-0402	1	Potentiometer

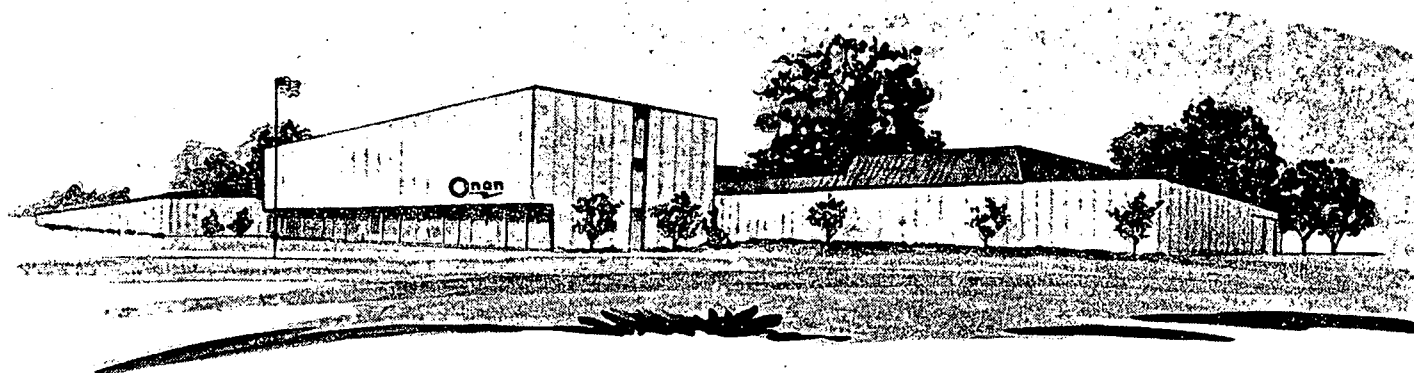


# ***We mean it.....***

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

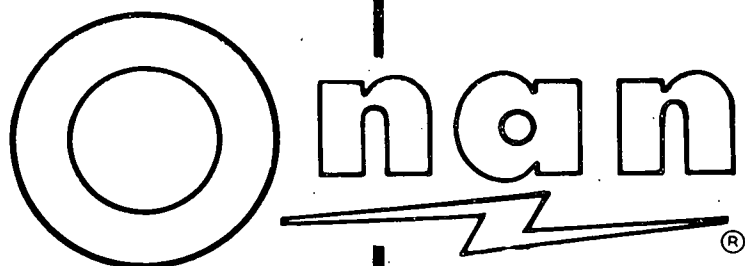
The name of ONAN is synonymous with satisfactory performance, certified performance.





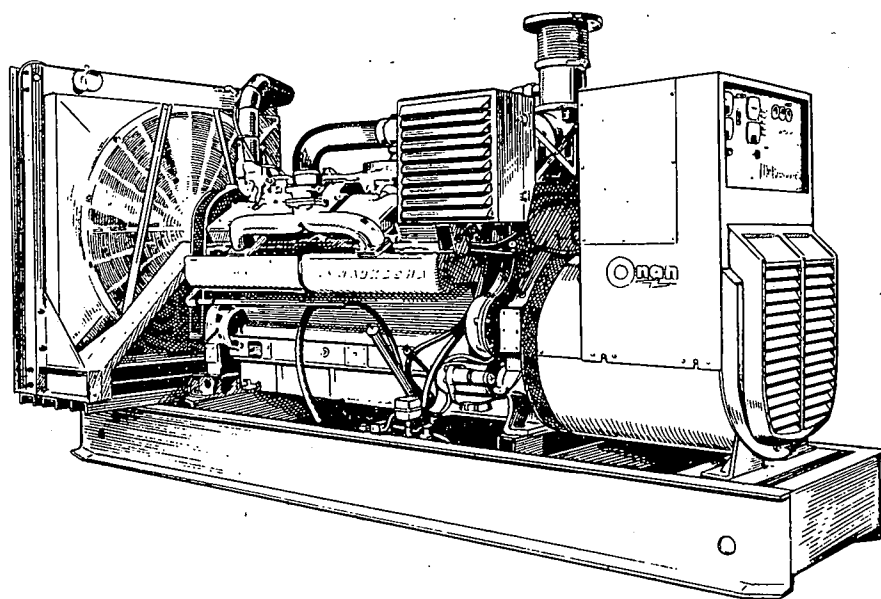
**ONAN** 1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432  
A DIVISION OF ONAN CORPORATION





# **OPERATOR'S MANUAL AND PARTS CATALOG**

FOR  
**DWV**  
SERIES  
**ELECTRIC GENERATING SETS**



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The world-wide trend toward a standard system of measurement has resulted in the International System of Units, officially abbreviated SI.

Onan's products are available on the world market, therefore, both English and SI or modernized metric units appear in this manual.

To assist in familiarization, the following cross reference should be used.

TERM	METRIC	ENGLISH
Length	millimetre (mm)	Inch (in)
Pressure	Pascals (Pa)	pounds per square inch (PSI)
Mass (Weight)	kilogram (kg)	pound (lb)
Volume (Liquid)	litre	gallon (gal)
Power	kilowatt (kW)	horsepower (HP)
Frequency	hertz (Hz)	cycler per second (CPS)

## WARNING

TO AVOID POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, AN AUTHORIZED SERVICE REPRESENTATIVE MUST PERFORM ALL SERVICE.

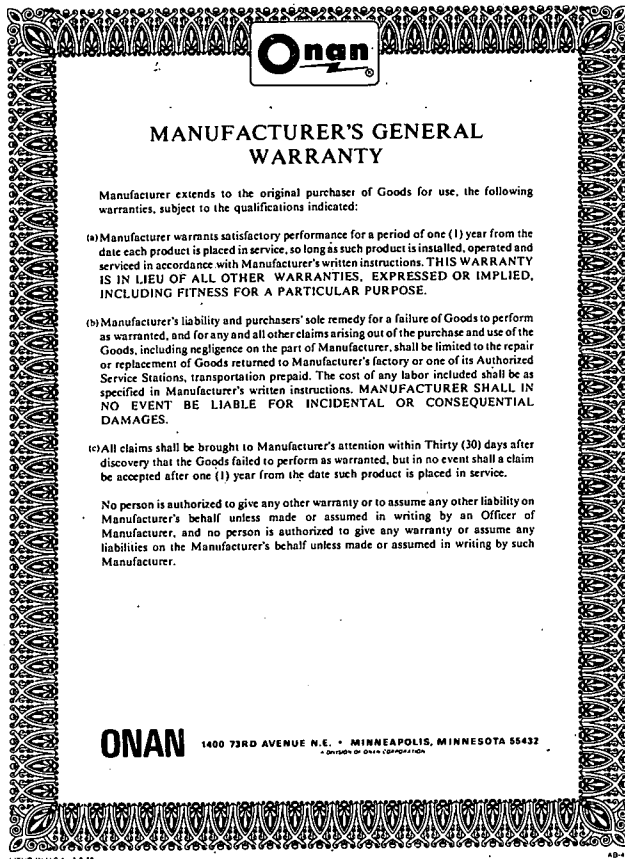
# INTRODUCTION

## FOREWORD

This manual is applicable to the DWV Series electric generating set, consisting of an Onan UV 600.0KW AC generator, driven by a Waukesha P2154 DSI Diesel engine. Information is provided on installation, operation, troubleshooting and parts ordering for the set. The manual should be used in conjunction with the Waukesha engine manual,

**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.

600.0 DWV 4XR / 13644 A

1 2 3 4 5

1. Indicates Kilowatt rating.
2. Factory code for SERIES identification.
3. Indicates voltage code.  
4X indicates 277/480 VAC  
R indicates remote electric start
4. Factory code for designating optional equipment.
5. Specification letter. (Advances when factory makes production modifications.)

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

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

**IMPORTANT! RETURN WARRANTY CARD ATTACHED TO UNIT.**

# SPECIFICATIONS

## ENGINE DETAILS

Engine Manufacturer .....	Waukesha
Engine Series .....	P2154 DSI
Number of Cylinders .....	V16
Displacement .....	2154-in <sup>3</sup> (16.38 lit)
BHP @ 1800 RPM .....	979 (730.33 kW)
Compression Ratio .....	14.0:1
Bore .....	5.75-inches (146.05 mm)
Stroke .....	5.1875-inches (131.76 mm)
Fuel .....	Diesel
Battery Voltage .....	24
Battery Group (Two 12-Volt, 225 A.H.) .....	8D
Starting Method .....	Solenoid Shift
Governor Regulation .....	Adjustable. Isochronous to 5%
Battery Charging Current .....	35 Amperes

## GENERATOR DETAILS

Type .....	UV Brushless
Rating (Watts)	
60 Hertz Continuous Standby .....	600,000 (750 kVA)
50 Hertz Continuous Standby .....	500,000 (625 kVA)
AC Voltage Regulation .....	2%
60 Hertz RPM .....	1800
50 Hertz RPM .....	1500
Output Rating .....	0.8 PF
AC Frequency Regulation .....	0- to 3% No Load—Full Load

## CAPACITIES AND REQUIREMENTS

Cooling System (Including Radiator and Plumbing) .....	21-Gallons (80-lit)
Engine .....	44-Gallons (167-lit)
Engine and Radiator .....	65-Gallons (246-lit)
Engine Oil Capacity (Filter, Lines, Crankcase Oil Cooler) .....	28-Gallons (106 lit)
Exhaust Connection (pipe flange) .....	10-in (254 mm) Diameter

## AIR REQUIREMENTS (1800 RPM)

Engine Combustion .....	2400-CFM (68 m <sup>3</sup> /min)
Radiator Cooled Engine .....	50,400-CFM (1427 m <sup>3</sup> /min)
Total for Radiator Cooled Model .....	52,800-CFM (1495 m <sup>3</sup> /min)
Alternator Cooling Air (1800 RPM) .....	3120-CFM (88.5 m <sup>3</sup> /min)
(1500 RPM) .....	2600-CFM (74 m <sup>3</sup> /min)
Fuel Consumption at Rated Load ASTM No. 2 Diesel .....	48.0-GPH (182 lit/hr)

## GENERAL

Height .....	102.88-inches (2.61 m)
Width .....	74.12-inches (1.88 m)
Length .....	168.00-inches (4.27 m)
Weight (Approximate) .....	17,450-lb. (7915 kg)

**TABLE 1. GENERATOR VOLTAGE OPTIONS**

<b>GENERATOR VOLTAGE OPTIONS</b>					
<b>VOLTS</b>	<b>PHASE</b>	<b>FREQ.</b>	<b>MODEL NUMBER</b>	<b>AMPERES</b>	<b>KVA</b>
120/208	3	60 Hz	600.0DWV - 4R	3612/2084	750
120/240*	3	60 Hz	600.0DWV - 5DR	3612/1806	750
240/416	3	60 Hz	600.0DWV - 7XR	1806/1042	750
240/480*	3	60 Hz	600.0DWV - 6DR	1806/903	750
277/480	3	60 Hz	600.0DWV - 4XR	1565/903	750
347/600	3	60 Hz	600.0DWV - 9XR	1254/720	750
220/380	3	50 Hz	500.0DWV - 57R	1640/950	625

\* - Delta Wound.

# SAFETY PRECAUTIONS

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

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

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

*Most accidents can be prevented!*

## KNOW YOUR MANUAL—KNOW YOUR EQUIPMENT

### 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 generating set and the surrounding area clean and free from obstructions. Remove all oil deposits; keep the floor clean and dry.
- Provide appropriate fire extinguishers and install them in convenient locations. Consult your local fire department for the correct type of extinguisher to use. Do not use foam or carbon tetrachloride on electrical fires. Use extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the generating set are secure. Tighten supports and clamps, keep guards in position over fans, driving belts, etc.
- Do not wear loose clothing in the vicinity of moving parts, or jewelry while working on electrical equipment. 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 — YOU'RE COURTING A POSSIBLE EXPLOSION AND FIRE!**

- 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 has been bled off.
- Radiator fan belts are guarded for your protection. DO NOT remove covers or guards.
- Keep your hands away from moving parts.

### **Ventilation System**

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

### **Electrical System**

- The electrical installation exterior to your generator should have been performed by qualified licensed electricians. All local and state

codes should have been consulted and complied with. It is essential that all load circuit breakers adequately protect electrical functions, all circuits are properly grounded and wiring is correct capacity.

- Tag open switches.
- DON'T tamper with interlocks.
- Before starting work on the generating set, disconnect batteries. This will prevent inadvertent starting of the set.
- Use extreme caution when making adjustments on the electrical components in the control panel while the engine is running. High voltages are present and could cause serious 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.

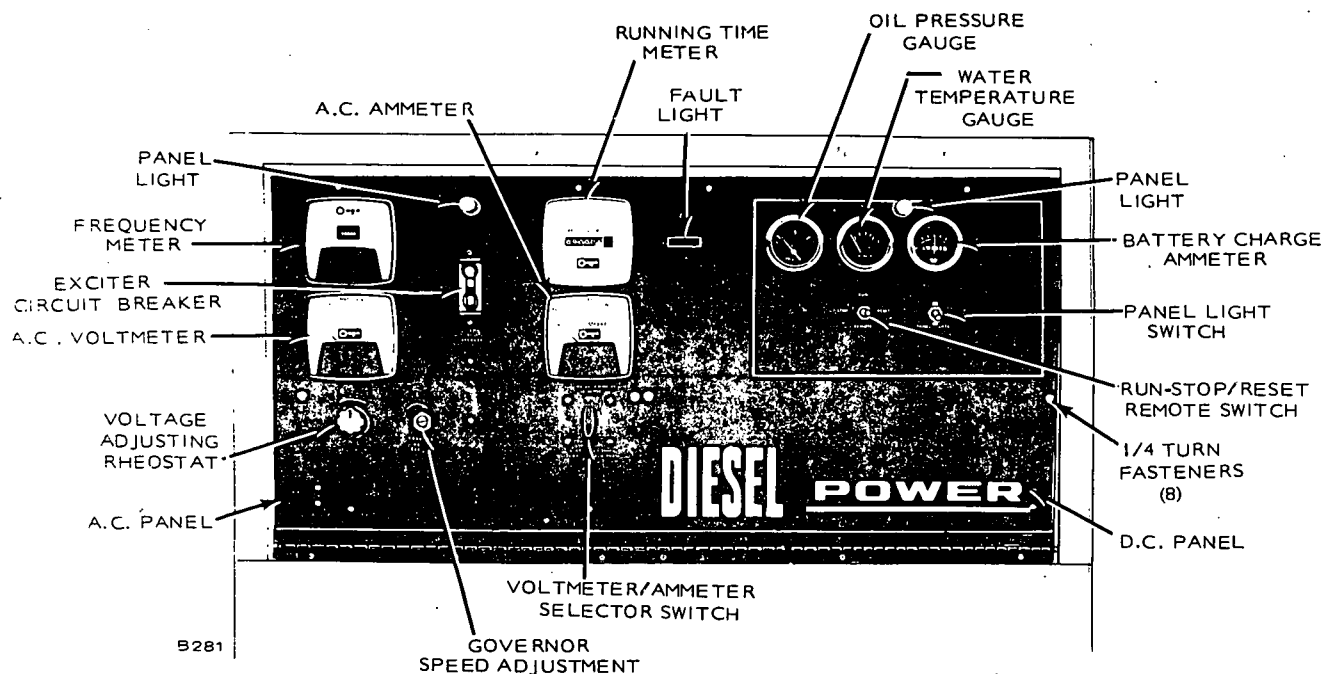


FIGURE 1. TYPICAL CONTROL PANEL (ONE FAULT LAMP)

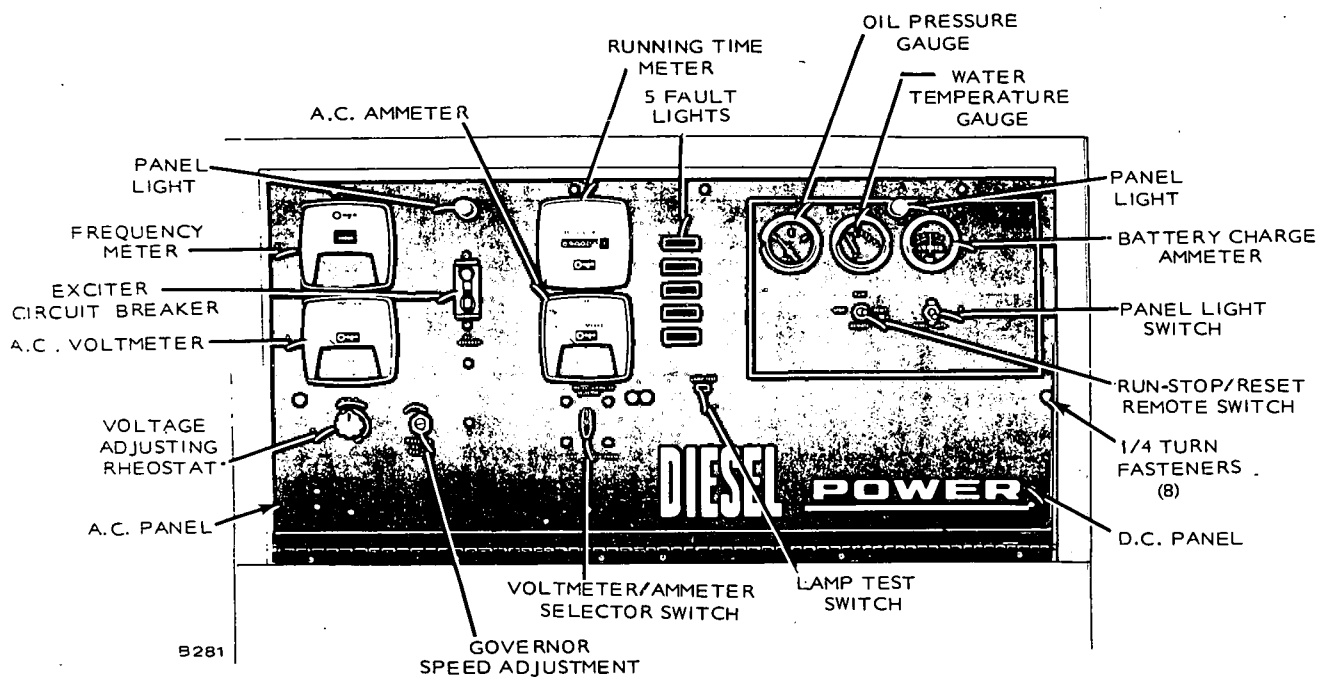


FIGURE 2. OPTIONAL CONTROL PANEL (FIVE FAULT LAMPS)

# DESCRIPTION

## GENERAL

An Onan DWV Series electric generating set is a complete unit consisting of an engine driven AC generator, with controls and accessories as ordered.

## ENGINE

The engine on the DWV is a Waukesha P2154 DSI as described in engine manual. Basic measurements and requirements will be found under *Specifications*. However, the engine used for your unit may have variations due to optional equipment available.

## AC GENERATOR

The generator is an Onan Type UV, 4 wire, 4 pole, revolving field brushless unit. Alternating current is generated in the stator winding. The alternator rotor, attached directly to the engine flywheel turns at engine speed. Therefore, the speed at which the rotor turns, determines generator output frequency. The 60 hertz set operates at 1800 rpm and the 50 hertz at 1500 rpm. Excitation is achieved by feeding AC output to a voltage regulator, where it is compared with a reference voltage in the regulator, rectified and returned to the field of the exciter, then to the exciter armature, rectified and fed to the generator field.

## 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 Lights and Switch:** Illuminates control panels.

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

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

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

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

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

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

### AC Panel

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

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

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

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

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

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

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

## OPTIONAL EQUIPMENT

For location of optional panel equipment, see Figure 2.

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

- Overcrank
- Overspeed
- Low oil pressure
- High engine temperature
- Low engine temperature

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

**TABLE 2. FAULT LAMP OPTIONS**

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

\* - With additional optional sensors.

## CONTROL PANEL INTERIOR

**Voltage Regulator:** Solid state unit controls AC output from generator at predetermined level regardless of load. Regulation plus or minus 2% from no load to full load, 0.8 P.F.

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

1. A 75 second cranking period.
2. Approximately a 12.5-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 reaches 2100 rpm). See Figure 3.
  - c. Low oil pressure 14 psi (96.53k Pa).
  - d. High engine temperature 205° F (96° C).

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 3.

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

## OPTIONAL MODULES

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

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

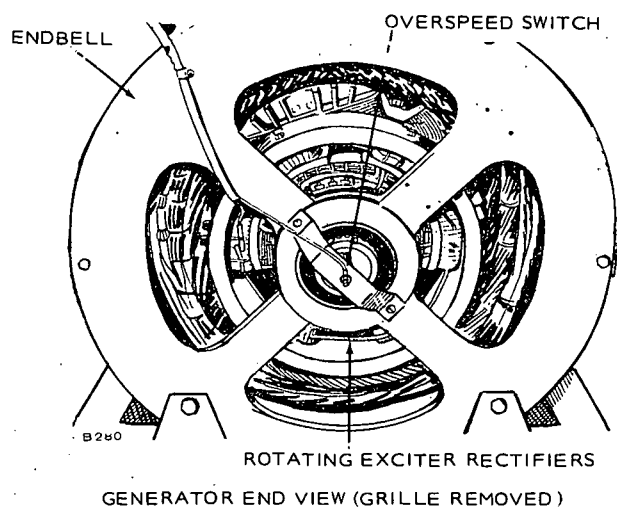


FIGURE 3. OVERSPEED SWITCH

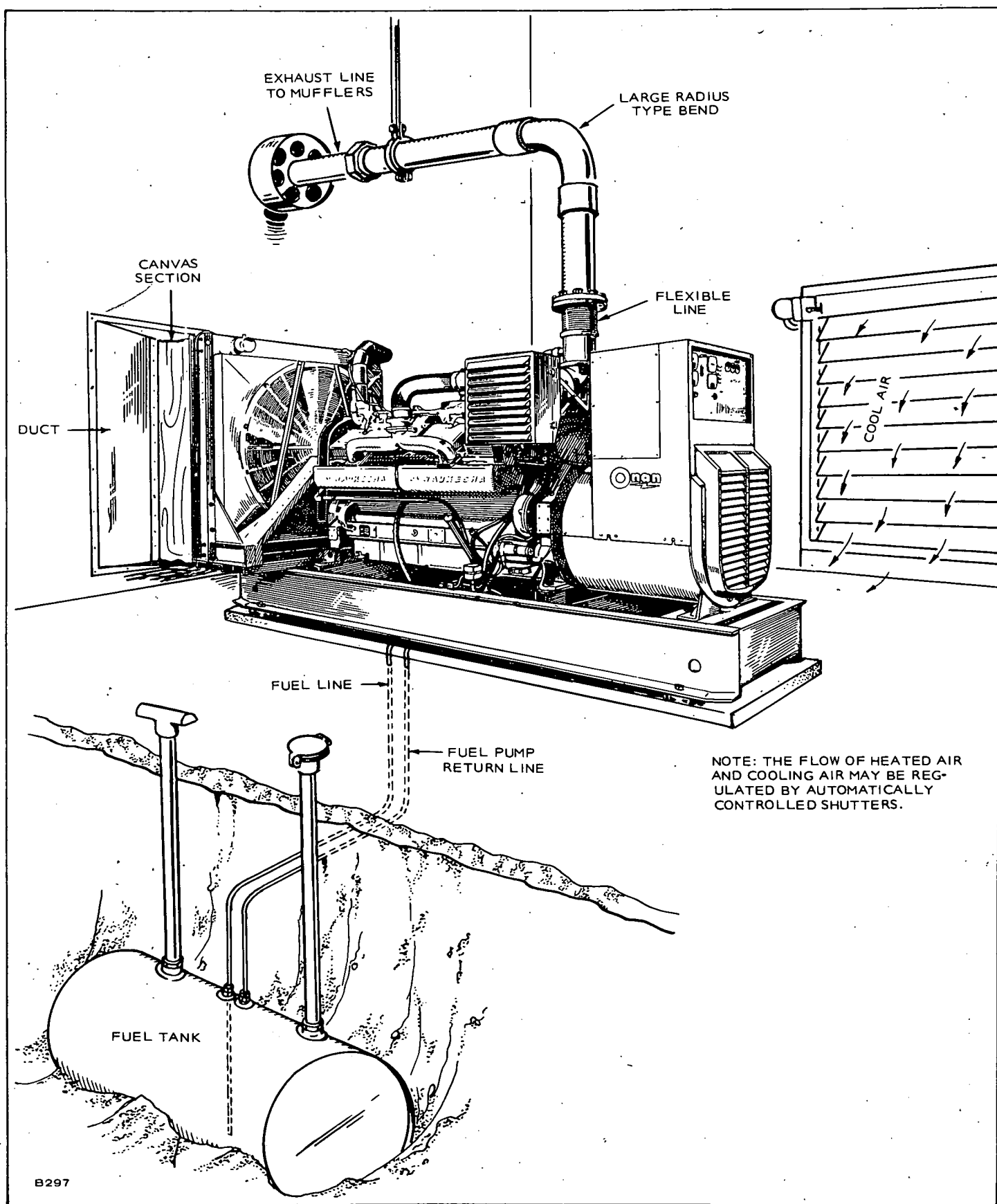


FIGURE 4. TYPICAL INSTALLATION

# INSTALLATION

## GENERAL

Installations must be considered individually. Use these instructions as a general guide. Meet regulations of local building codes, fire ordinances, etc., which may affect installation details. See Figure 4.

Installation points to consider include:

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

## LOCATION

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

## MOUNTING

Generating sets are mounted on a rigid skid base which provides proper support. Install vibration isolators between skid base and foundation. For convenience in draining crankcase oil and general servicing, mount set on raised pedestals (at least 6 inches high [155 mm]). If mounting in a trailer, or for other mobile applications, bolt securely in place. Extra support for the vehicle flooring may be necessary. Bolting down is recommended for stationary installations.

### CAUTION

The generator support must be aligned to the skid base to prevent premature generator bearing failure, vibration and possible drive disc failure. Failure to do so could void the warranty. Align the generator support to the skid base according to the following instructions.

1. Set the unit on its mounting foundation, using vibration isolators between skid base and foundation (Figure 5). Secure the skid base to the isolators and the isolators to the mounting foundation. Remove the two mounting bolts; use them as jack screws by moving them to the adjacent threaded holes, then raise the generator and remove the shims from between the generator and support and skid base.

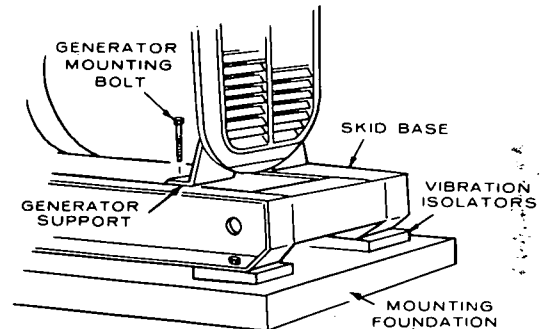
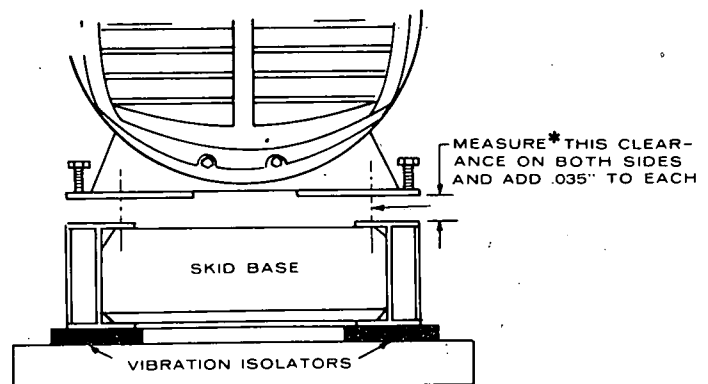


FIGURE 5

2. Remove the tension from the jackscrews and allow generator to hang free. Using a feeler gauge, measure the clearance from the top surface of the skid base to each generator support mounting surface (Figure 6). To this measured clearance, add .035 inches (0.89 mm) to each side of the skid base—this total clearance will determine the amount of shims required.

The clearance may be different for each side of the skid base. If there is a great difference, loosen the generator support and realign.



\*The measurement should be taken in line with bolt hole.

FIGURE 6

- After determining the proper clearance for each side of the skid base, turn jackscrews in the threaded holes to allow a clearance for placing the shims between skid base and generator support (Figure 7). Lower generator (using jackscrews) and allow to rest on shims. Recheck the total generator clearance, base to support; it must equal the base to support clearance plus the .035 inches.

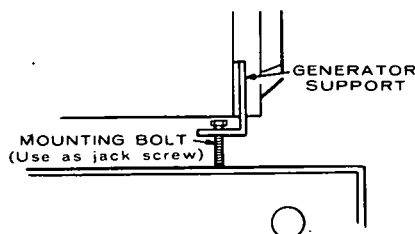


FIGURE 7

- Remove the jackscrews and reinstall as mounting bolts through generator support, shims and skid base. Secure and lock the mounting bolts in place (Figure 8).

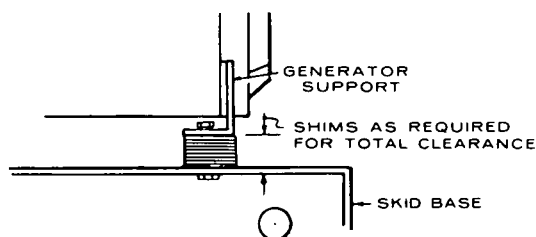


FIGURE 8

## VENTILATION

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

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

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

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

**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 and support combustion in the engine.

## CITY WATER COOLING

An optional method of engine cooling, in place of the conventional radiator and fan, uses a constant pressure water supply. This is referred to as CITY WATER COOLING or HEAT EXCHANGER SYSTEM. See Figure 9 for typical system.

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

Use flexible pipe for connecting water supply and outlet flow pipes to engine. Pipe the outlet flow to a convenient drain. Install an electric solenoid valve and a rate of flow valve in the water supply line. The electric solenoid valve opens and allows water flow through the system only when the plant operates. The rate of flow valve, either automatic or manual, provides for the proper flow rate to the engine. Adjust the flow to maintain water temperature between 165° and 195° F (74° and 91° 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.**

## WATER JACKET HEATER (Optional)

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



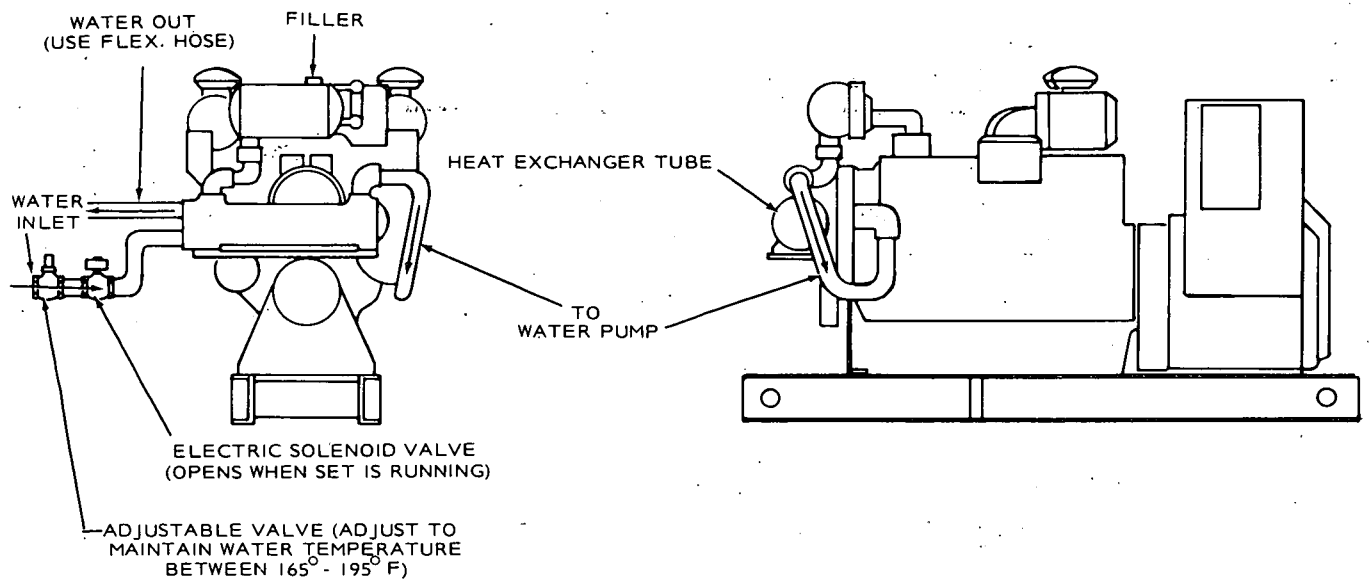


FIGURE 9. HEAT EXCHANGER COOLING (TYPICAL)

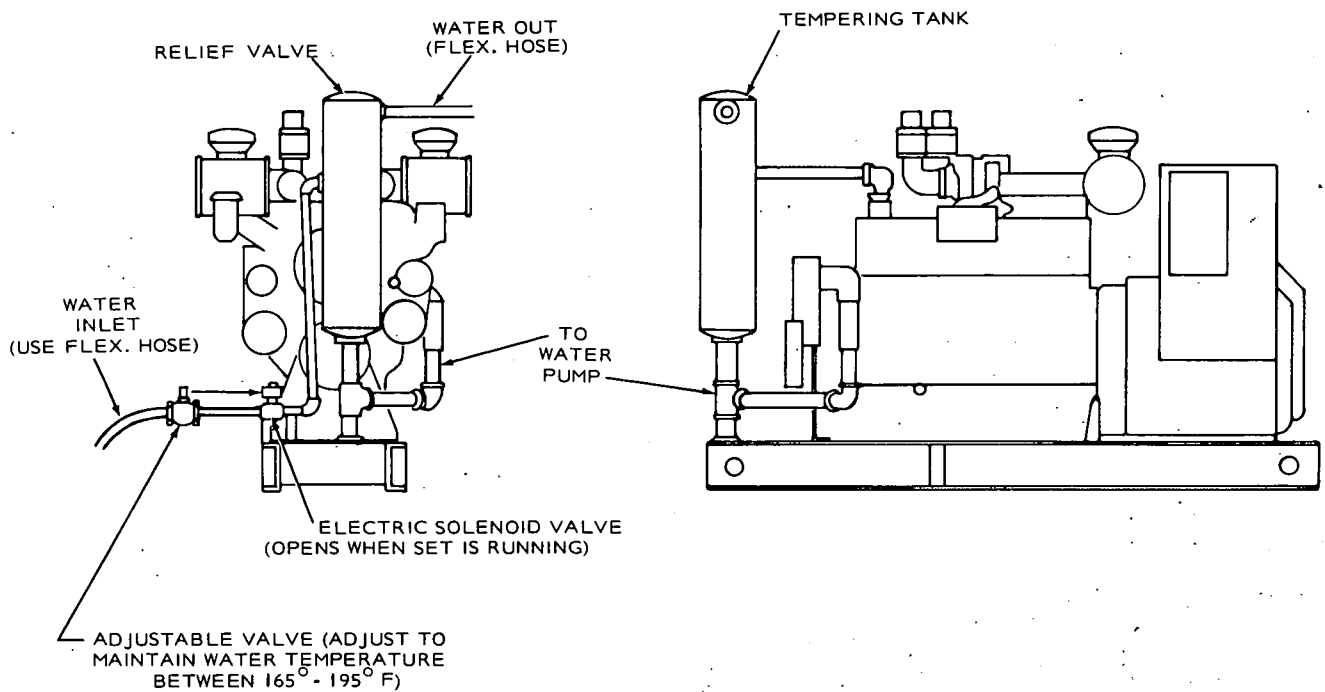


FIGURE 10. STANDPIPE COOLING (TYPICAL)

## EXHAUST

### WARNING

Inhalation of exhaust gases can result in death.

Engine exhaust gas must be piped outside building or enclosure. Do not terminate pipe in the vicinity of ventilating air inlet duct or venturi; gases will be pulled back into building. Where pipe has to be joined make sure that welds are leak free. When a pipe is run along a combustible wall, it should be far enough from the wall to prevent heat damage. Where exhaust duct is run through a wall, an insulating thimble should be used which will adjust for thermal movement and also prevent heat from the exhaust damaging the wall.

Sharp bends should be avoided, but where this is not possible a condensation trap (Figure 11) should be installed. Drain this trap frequently. Provide adequate support for mufflers and exhaust pipes. Refer to Figure 4 for a typical exhaust installation. Shield or insulate exhaust lines if there is danger of personal contact.

Use a pipe at least as large as the 10-inch diameter of the engine outlet. Maximum length is 400-feet (126 m) for a 10-inch exhaust pipe.

Maximum allowable back pressure is 27.2-inches H<sub>2</sub>O (2.0-inches Hg) or 690.9 mm H<sub>2</sub>O (50.8 mm Hg).

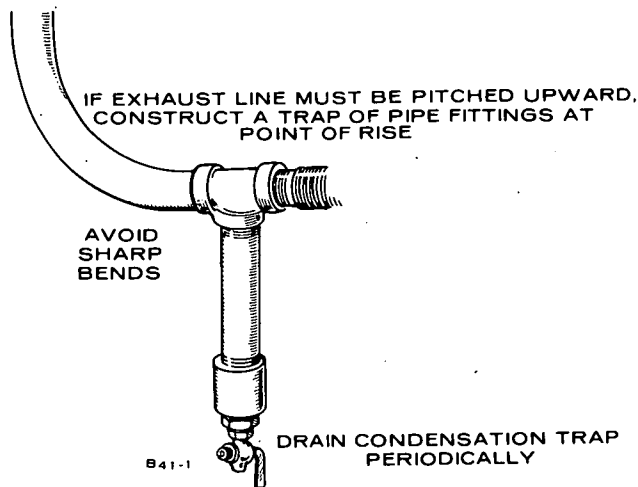


FIGURE 11. EXHAUST CONDENSATION TRAP

## FUEL SYSTEM

The Waukesha engines used on the DWV sets are designed for use with No. 2 Diesel fuel. They will however operate on other fuels within the specifications delineated in section 4-19 of the Waukesha 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.

The maximum fuel lift without any horizontal run should not exceed 10 feet. The horizontal run, if the supply tank is level with the fuel pump, should not exceed 12-1/2 feet. Use 3/8-inch tubing for the fuel supply line. The inlet fitting on the fuel filter is threaded for a 3/8-inch pipe fitting. The fuel pump return line is threaded for a 1/4-inch pipe fitting. Use 1/8 inch tubing for the fuel pump return line.

## DAY TANK

Generator set installations may be equipped with an optional fuel day tank. A float operated switch controls a fuel transfer pump. The correct level is maintained to assure a constant source of fuel. It is necessary to install an overflow line between the day tank and the main fuel tank. Refer to the instructions included with the tank. See Figure 12 for an example of a day tank installation.

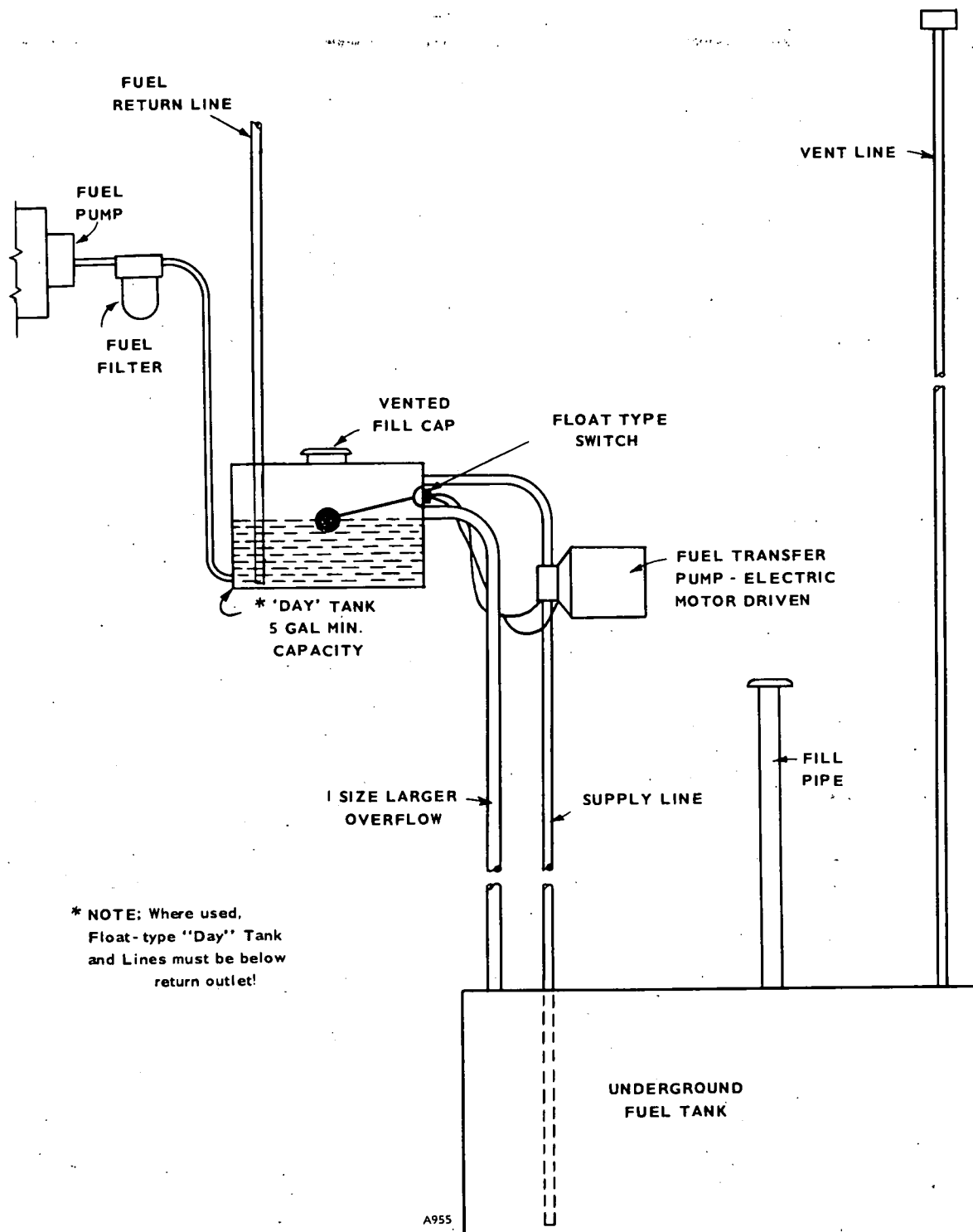


FIGURE 12. DAY TANK INSTALLATION

## BATTERY

Starting the plant requires 24-volt battery current. Use two 12-volt (see specification) batteries for a normal installation. Connect the batteries in series (negative post of first battery to positive post of second) as in Figure 13. Necessary battery cables are on unit. Service the batteries as necessary. Infrequent plant use (as in emergency standby service) may allow the batteries to self-discharge to the point where they cannot start the plant. If installing an automatic transfer switch that has no built-in charge circuit, connect a separate trickle charger. Onan automatic transfer switches include such a battery charging circuit.

### WARNING

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

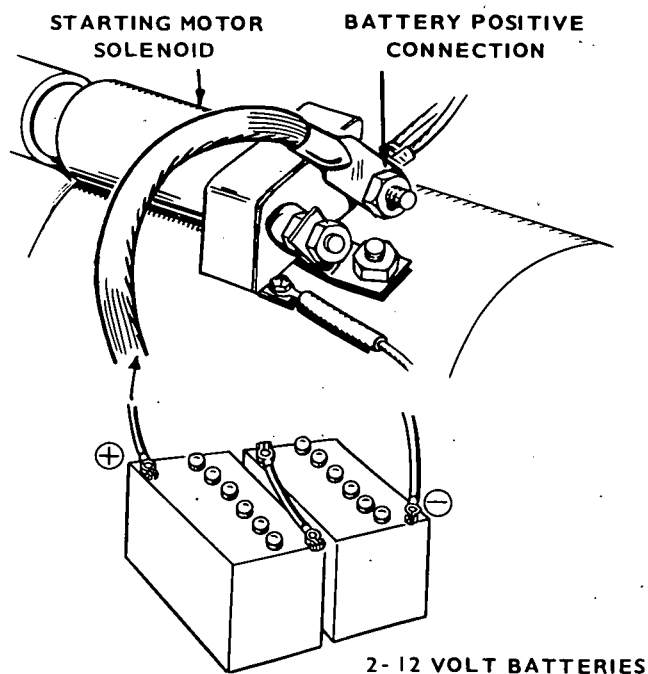


FIGURE 13. BATTERY CONNECTION

## BATTERY, HOT LOCATION

Batteries will self discharge very quickly when installed where the ambient temperature is consistently above 90°F (32°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°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 an hydrometer or filler bulb and dispose of it in a safe manner. Avoid skin or clothing contact with the electrolyte.
3. Refill each cell with distilled water, to normal level.
4. Continue charging for 1 hour at a 4 to 6 hour rate.
5. Test each cell. If the specific gravity is still above 1.255, repeat steps 2, 3, 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 1000- and 2000-feet (305 m and 610 m), use No. 16 AWG wire.

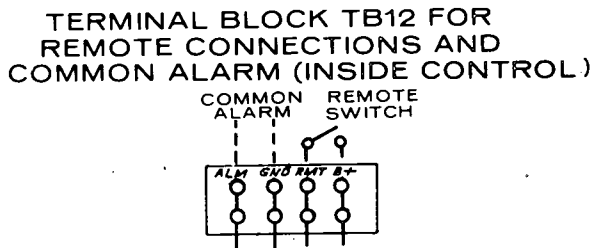
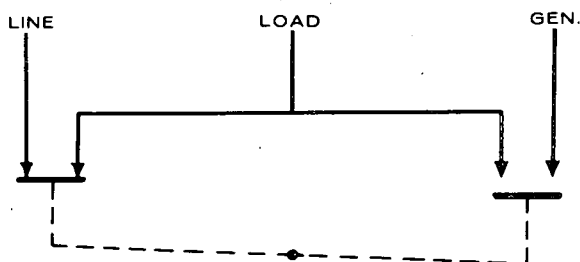


FIGURE 14. REMOTE CONTROL CONNECTION

## WIRING CONNECTIONS

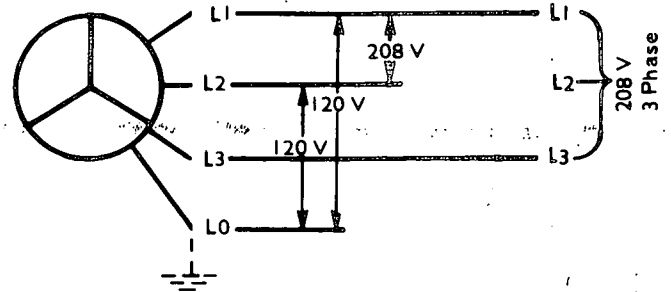
Most local regulations require that wiring connections be made by a licensed electrician and that the installation be inspected and approved before operation. All connections, wire sizes, etc. must conform to requirements of electrical codes in effect at the installation site.

If the installation is, for standby service, a double throw transfer switch (Figure 15) must always be used. Connect this switch (either automatic or manual) so that it is impossible for commercial power and generator power to be connected to the load at the same time. Instructions for connecting an automatic transfer switch are included with such equipment.

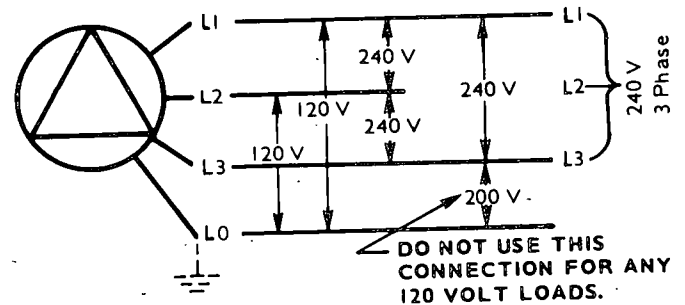


NOTE: SHOWN WITH LINE CONNECTED TO LOAD.

FIGURE 15. LOAD TRANSFER SWITCH (TYPICAL)



3-PHASE WYE CONNECTION



3-PHASE DELTA CONNECTION

FIGURE 16.

## GENERATOR CONNECTIONS

Voltage output of the model UV generator is predetermined at the factory by the internal connections to the bus-bars. It is not recommended that these be changed. The generator is rated in two voltages, the lower being line to neutral and the higher is the line-to-line voltage. Refer to the rating plate on the generator. For maximum current available at these voltages, see Table 1.

For 3-phase loads connect separate load wires to each of the set terminals L1, L2 and L3 (Figure 16). 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 load wire to the L0 terminal. Connect the "hot" (black) 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.

ONAN recommends that all connections from the generator to the bus-bars and from the bus-bars to the load be made by a qualified electrician. All applicable local and state laws should be complied with.

# OPERATION

## GENERAL

ONAN DWV Series electric generating sets are given a complete running test under various load conditions and 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

**Lubricating System:** Engine oil was drained prior to shipment. Fill engine to capacities shown. After engine has been run, check dipstick, add oil to bring level to full mark. Record total capacity for future oil changes. Refer to Waukesha engine manual for engine oil recommendations. Note that for average operating conditions oils conforming to Military Specifications MIL-L-2104C and MIL-L-45199B (Series 3) are recommended. Do not mix brands nor grades of lubricating oils.

Recommended oil viscosity is SAE 40 for all temperatures. Use a coolant heater for ambients below 70° F (21° C).

### Oil Capacities (nominal)

Oil Pan .....	18 gallons (68.13 litres)
Filter and Oil Lines .....	10 gallons (37.85 litres)
Total .....	28 gallons (106 litres)

**CAUTION** After changing or filling engine crankcase, pre-fill oil filters. If this is not performed, the engine will be starved for oil until the filters fill up, and damage will result.

**CAUTION** Use a manual, electric pump or air pressure method of filling engine oil system including the turbo-charger oil supply lines. Operation of the turbo without adequate oil flow to the bearings can cause severe damage to turbo within five seconds. Refer to Waukesha manual on turbo-charger operation.

**Cooling System:** Cooling system was drained prior to shipment. Fill cooling system before starting. Total capacity is 65 gallons (246 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 Waukesha manual for additional information.

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

Ensure that water supply for city water cooling is turned ON.

**Fuel System:** Refer to the Waukesha 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.

Remove suction line from fuel pump and prime with clean fuel. Reconnect suction line. Check all connections in fuel system, for security, to ensure that pressure will not bleed off when engine is not in use. Pressure should be maintained for immediate starting if unit is on standby service.

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

Check level of electrolyte to be at "split ring" mark. Measure specific gravity of electrolyte: SG 1.280 at 80° F (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.

- a. Crankcase filled.
- b. Cooling system filled — input solenoid valve open.
- c. Batteries charged and connected.
- d. Fuel solenoid valve open.

To start, move the "run-stop-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 40 and 50 psi (275.8 and 344.8 kPa). Check the following gauges:

- a. DC Ammeter — 10 to 30 ampères.
- b. AC Voltmeter — AC generator output voltage.
- c. Frequency Meter — AC generator output frequency.

After running 10 minutes under load the water temperature gauge should have stabilized at 160° to 180° F (71° to 82° 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° to 195° F (74° to 91° C).

**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.

## STOPPING

To reduce and stabilize temperatures within the engine and turbocharger run the engine at no load for 3-5 minutes before shutting down.

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

## EXERCISE PERIOD

Generating sets on continuous standby service are required to be operative at essential load 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 pressure, prevent electrical relay contacts from oxidizing and insure easy emergency starts. ONAN automatic transfer switches contain an optional exercise switch which, by pre-selection, will start, determine run period and shut down a set on a weekly frequency. For example, the switch can be set for time of start, length of run, A.M. or P.M. and day of week.

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

## HIGH ALTITUDE

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

## 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.

## DUST AND DIRT

1. Keep set clean. Keep cooling system free of dirt, etc.
2. Service air cleaners regularly.
3. Change crankcase oil at proper intervals.
4. Ensure air inlet system is leak free.

**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.	<p>1. See engine service manual for troubleshooting fuel system.</p> <p>After correcting problem, reset engine monitor relay by placing Run-Stop/Reset-Remote switch to Stop/Reset, then back to the required running position.</p>
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.	<p>3. Check the following:</p> <ul style="list-style-type: none"> <li>a. Oil level. Engine will shut down if sensor is closed.</li> <li>b. Check engine manual for troubleshooting oil system.</li> <li>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.</li> <li>d. Check for faulty oil pressure sensor or faulty high engine temperature sensor.</li> </ul>
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**  
**(Units with five fault lamps)**

<b>SYMPTOM</b>	<b>CORRECTIVE ACTION</b>
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

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

1. Run set until thoroughly warm.
2. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
3. Refer to Chapter 6 (storage) of Waukesha engine manual.
4. Clean throttle linkage and protect by wrapping with a clean cloth.
5. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
6. Wipe entire unit. Coat parts susceptible to rust with a light film of grease or oil.
7. Disconnect battery and follow standard battery storage procedure.
8. Provide a suitable cover for the entire unit.

## LOW TEMPERATURES

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

**Engine Heater:** The function of this optional heater is to keep the engine warm enough to assure starting under adverse weather conditions. Connect the heater to a source of power that will be ON during the time the engine is not running. Be sure the voltage rating is correct for the heater element rating (Figure 17).

**CAUTION** Do not energize heater until engine cooling system is filled with coolant.

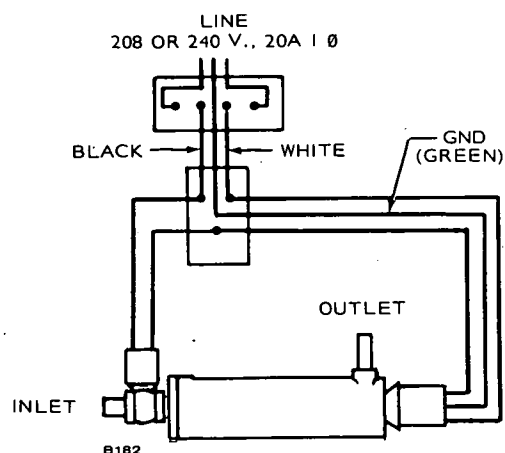


FIGURE 17. ENGINE HEATER (TYPICAL)

## 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.

# GENERAL MAINTENANCE

## GENERAL

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

### WARNING

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

**TABLE 5. OPERATOR MAINTENANCE SCHEDULE**

MAINTENANCE ITEMS	OPERATIONAL HOURS				
	8	50	100	200-250	500
Inspect Plant	x				
Check Coolant Level	x				
Check Oil Level	x4				
Check Air Cleaner (Clean if Required)		x1			
Inspect Fan Belt		x2			
Check Cooling System, Hoses, etc.		x3			
Check Batteries		x			
Clean and Inspect Crankcase Breather			x		
Change Oil Filter Element				x1	
Clean and Inspect Battery Charging Alternator				x	
Change Crankcase Oil				x1	
Check Security of all fasteners			x5		

x1 - Every 3 months. Perform more often in extremely dusty conditions.

x2 - Every 3 months adjust to 1/2 inch (13 mm) depression between pulleys.

x3 - Check for rust or scale formation. Flush if necessary.

x4 - For accurate readings, check oil level approximately 30 minutes after shut down.

Keep oil level as near "H" mark on dipstick as possible. See engine manual.

x5 - Every 3 months.

## GOVERNOR ADJUSTMENTS — ENGINE SPEED

A Barber-Colman governor is standard equipment on DWV generator sets. Governors are set at the Onan testing facility and do not require further adjustment for normal standby service.

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

1. Remove four screws and cover from governor controller (see Figure 18).
2. Disconnect wire from TB11-22 in generator control cabinet. This disconnects the starter solenoid.
3. Place the Run-Stop-Remote switch to RUN position, by-pass the governor fail safe system by using a short (approx 6") jumper wire from TP1 to TP2 as shown in Figure 19. If the actuator arm does not move to the FULL FUEL position, adjust the activator stroke limit potentiometer (L) in the governor controller box until the actuator linkage moves to full fuel position. Then back the adjustment off slightly such that the linkage is just at the full fuel position.

4. Return Run-Stop-Remote switch to STOP. Reconnect wire TB11-22.
5. Position speed control rheostat on generator control panel to midrange of travel (out 5-turns from low rpm).
6. Adjust speed reference potentiometer in governor controller counterclockwise four complete turns.
7. Start engine. As engine approaches rated speed (1500 rpm or 1800 rpm), the actuator should back away from the full fuel position and control engine speed.

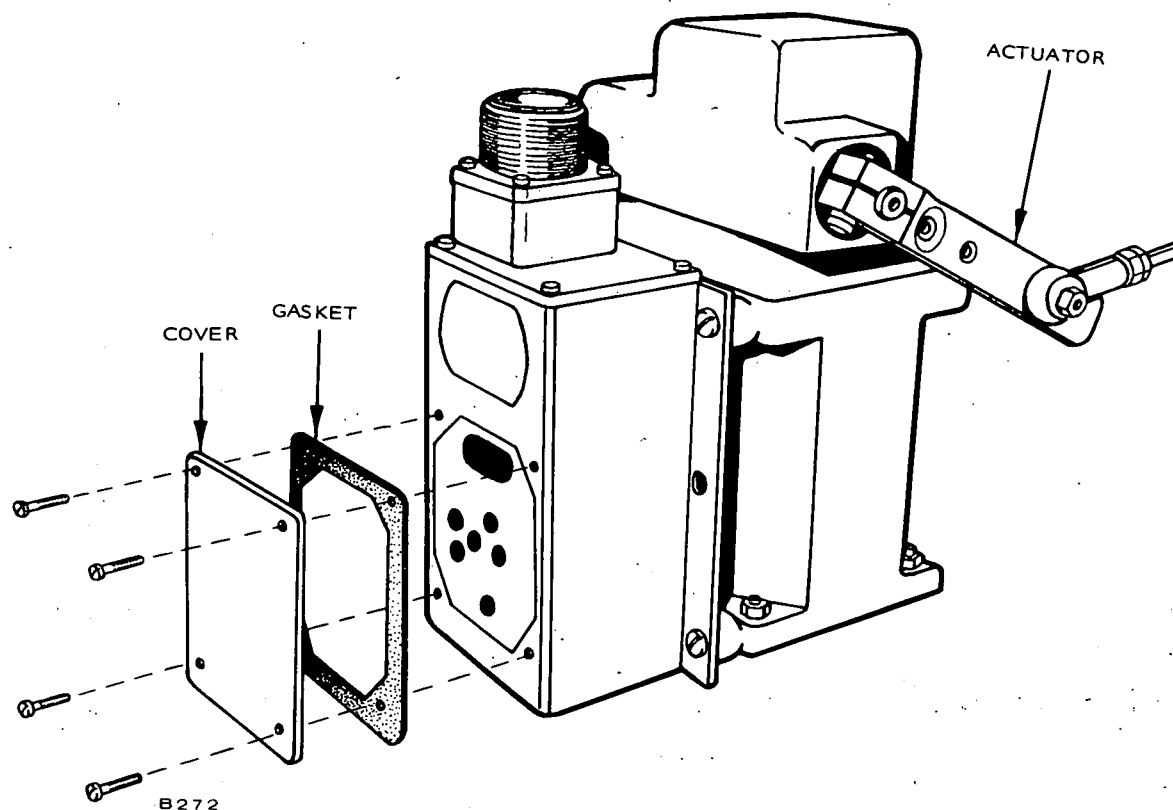
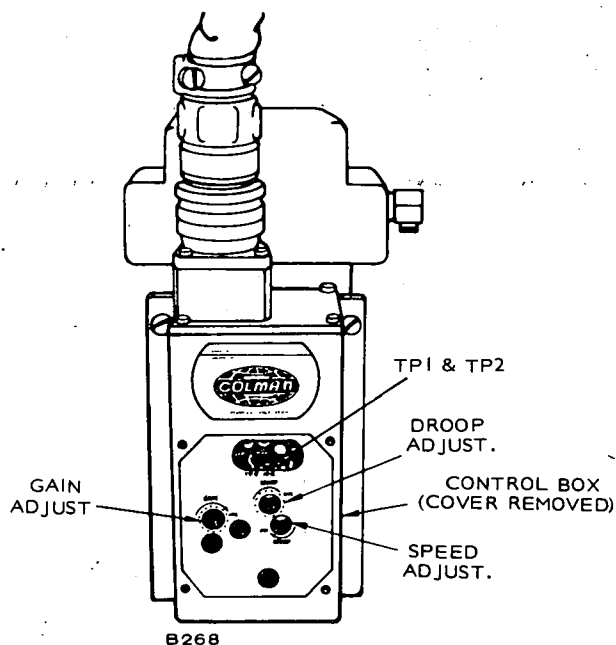


FIGURE 18. BARBER-COLMAN GOVERNOR



**FIGURE 19. GOVERNOR CONTROL BOX ADJUSTMENTS**

9. Adjust Gain potentiometer slightly clockwise then counterclockwise as necessary until engine is stable and responsive to governor control.
10. Load and unload engine several times to ensure correct gain adjustment.
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.

# PARTS CATALOG

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


## 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.

<b>Onan</b> <sup>®</sup>	
<b>ELECTRIC GEN SET</b>	
MODEL AND SPEC NO. <input type="text"/>	
SERIAL NO. <input type="text"/>	
<b>IMPORTANT:</b> ALWAYS GIVE ABOVE NOS. WHEN ORDERING PARTS	
A.C. VOLTS <input type="text"/>	PH. <input type="text"/>
K.V.A. <input type="text"/>	KW <input type="text"/>
P.F. <input type="text"/>	AMPS <input type="text"/> Hz <input type="text"/>
D.C. VOLTS <input type="text"/>	AMPS <input type="text"/>
WATTS <input type="text"/>	
R.P.M. <input type="text"/>	BAT <input type="text"/>
MANUFACTURED BY <b>ONAN</b> DIVISION OF ONAN CORPORATION MINNEAPOLIS, MINNESOTA, U.S.A. 99A941	

## WAUKESHA PARTS

All Waukesha parts must be ordered from the Waukesha Motor Company of Waukesha, Wisconsin or their nearest authorized Waukesha distributor or dealer. When ordering parts or requesting service information, supply Waukesha with all information stated on the engine nameplate.

<b>DIESEL ENGINE</b>	
	
MODEL <input type="text"/> SIZE <input type="text"/>	
SERIAL <input type="text"/>	LOT <input type="text"/> SPEC. <input type="text"/>
GOV'N'D SPEED <input type="text"/>	SET VALVES COLD INT <input type="text"/> EXH <input type="text"/>
OIL SPEC SAE NO. WINTER <input type="text"/>	SUMMER <input type="text"/> SPARK ADV <input type="text"/> DEG. AT <input type="text"/> R.P.M. <input type="text"/>
WAUKESHA MOTOR COMPANY      WAUKESHA, WISCONSIN MADE IN U.S.A.	

This catalog applies to the standard DWV generator sets as listed below. Powered by a Waukesha engine (see the Waukesha 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 Waukesha manual. Onan parts are arranged in groups of related items and are identified by a reference. All parts illustrations are typical. Unless otherwise mentioned, parts are interchangeable. Right and left sides are determined by facing the front end of the engine.

### GENERATOR SET DATA TABLE

MODEL AND SPEC NO. *	ELECTRICAL DATA				
	WATTS	VOLTS	HERTZ	PHASE	WIRE
600DWV-4R8/	600,000	120/208	60	3	4
600DWV-4XR8/	600,000	277/480	60	3	4
600DWV-7XR8/	600,000	249/416	60	3	4
600DWV-5DR8/	600,000	120/240	60	3	4
600DWV-6DR8/	600,000	240/480	60	3	4
600DWV-9XR8/	600,000	347/600	60	3	4

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

**NOTE:** Hertz is a unit of frequency equal to one cycle per second.

### REPLACEMENT ENGINE:

100-1295

1

Engine, Replacement (Waukesha Motor Company Model P2154DSIU)

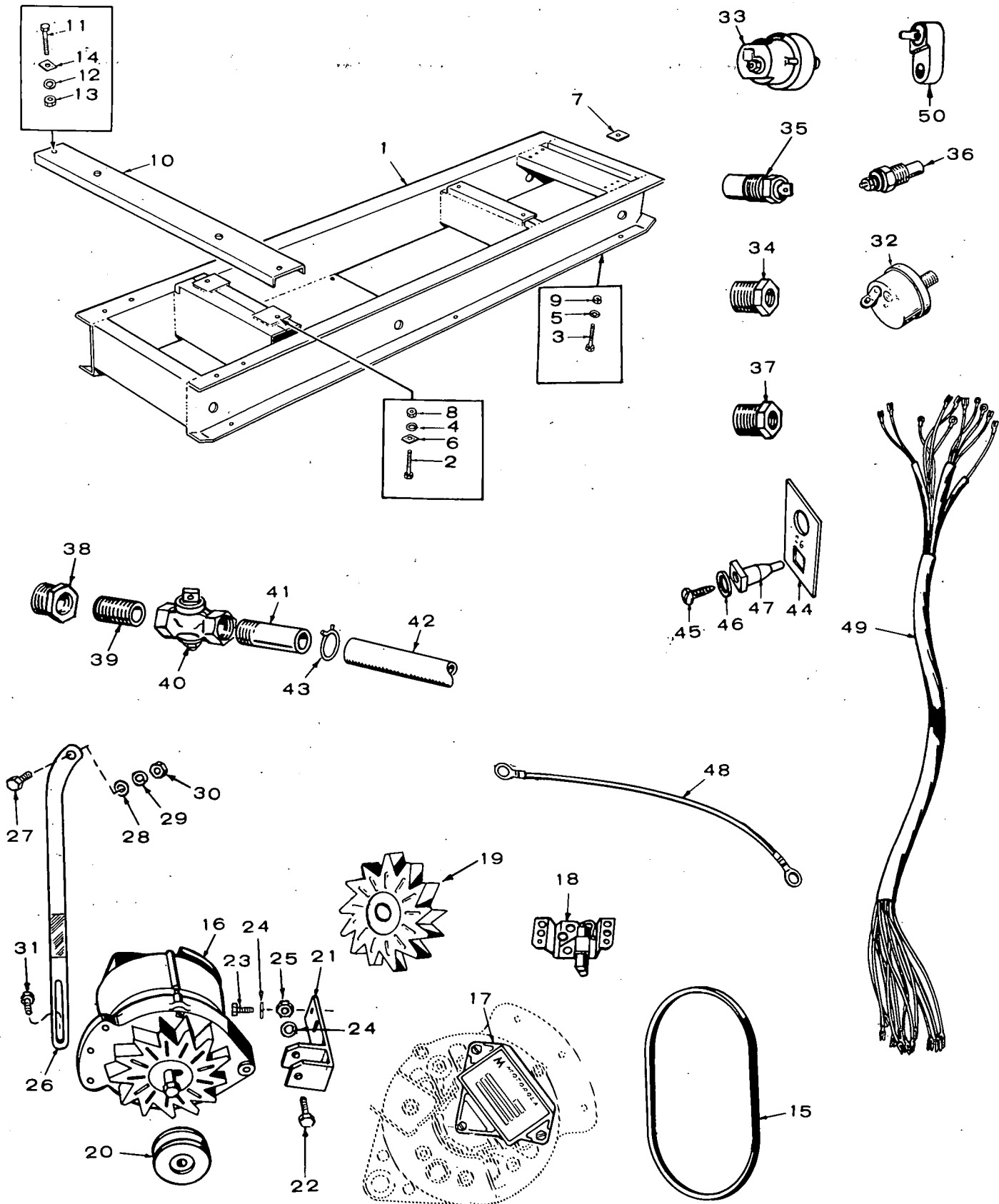
#### General Description:

Includes — Complete Cylinder Block, Air Cleaner, Fuel Filter, Starter Motor (24 Volt), Fan Blades, Fan Belts, Fan Guard, Flywheel, Flywheel Housing, Water Pump, Engine Supports, Oil Pan, Oil Cooler, Exhaust Manifold, Vibration Damper, Radiator Brace, Radiator and Aftercooler.

Excludes — Alternator, Alternator Mounting Brackets, Alternator Belt, Temperature Sender, Oil Pressure Sender, Governor.

**NOTE:** Replacement engine listed above applies to standard Spec I generator sets. Refer to factory for all other specifications.

# MISCELLANEOUS ENGINE PARTS GROUP



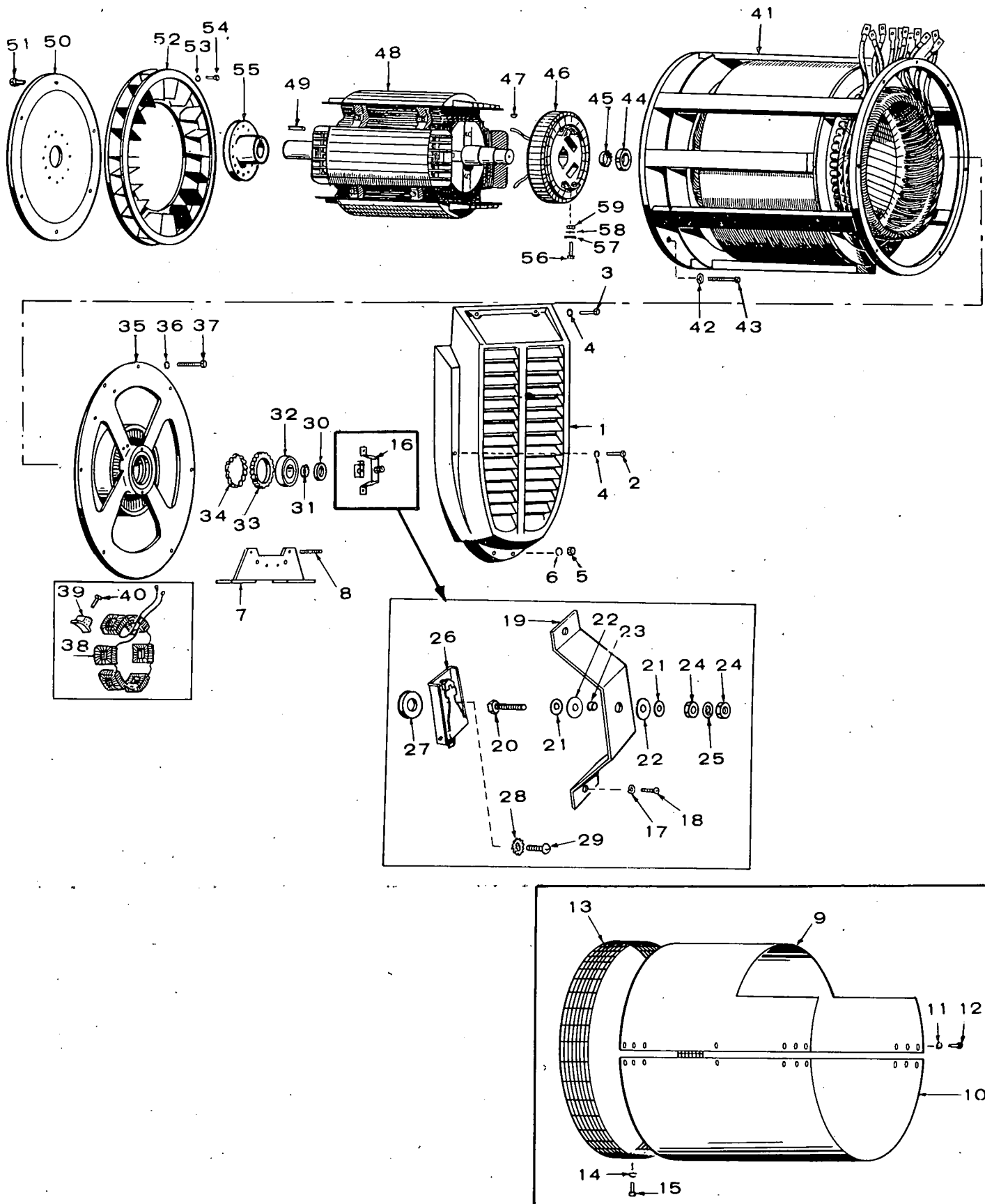


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	403-1096	1	Base, Mounting
2	800-0176	4	Screw, Hex Cap - Engine to Base (7/8-9 x 3")
3	800-0156	2	Screw, Hex Cap - Generator to Base (3/4-10 x 2-1/4")
4	850-0084	4	Washer, Lock - Engine to Base (7/8")
5	850-0079	2	Washer, Lock - Generator to Base (3/4")
6	403-1141	2	Washer, Bevel - Engine to Base
7	SHIM, GENERATOR TO MOUNTING BASE		
	232-1817	As Req.	.062"
	232-1489	As Req.	.0598"
	232-1490	As Req.	.0359"
8	862-0009	4	Nut, Hex - Engine to Base (7/8-9)
9	862-0008	2	Nut, Hex - Generator to Base (3/4-10)
10	130-0932	3	Support, Radiator
11	800-0156	12	Screw, Hex Cap - Radiator to Support and Support to Base (3/4-10 x 2-1/4")
12	850-0079	12	Washer, Lock - Radiator to Support and Support to Base (3/4")
13	862-0008	12	Nut, Hex - Radiator to Support and Support to Base (3/4-10)
14	403-1141	6	Washer, Bevel - Radiator Support to Base
15	511-0092	1	Belt, Alternator Drive
16	191-0688	1	*Alternator, Charge - Includes Regulator and Fan (Motorola #70D44039B04)
17	191-0733	1	Regulator, Voltage (Part of 191-0688 Alternator)
18	191-0659	1	Brush Assembly (Part of 191-0688 Alternator)
19	191-0871	1	Fan, Blower (Part of 191-0688 Alternator)
20	191-0649	1	Pulley, Alternator
21	191-1093	1	Bracket, Alternator Mounting
22	800-0095	1	Screw, Hex Cap - Alternator Mtg. (1/2-13 x 2-1/4")

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
23	800-0090	2	Screw, Hex Cap - Alternator Bracket Mounting (1/2-13 x 1")
24	850-0060	3	Washer, Lock - Alternator Mtg. (1/2")
25	862-0005	1	Nut, Hex - Alternator Mounting (1/2-13)
26	191-1100	1	Strap, Alternator Adjusting
27	800-0030	1	Screw, Hex Cap - Adjusting Strap Mtg. (5/16-18 x 1-1/4")
28	526-0115	1	Washer, Flat - Adjusting Strap Mounting (5/16")
29	850-0045	1	Washer, Lock - Adjusting Strap Mounting (5/16")
30	862-0015	1	Nut, Hex - Adjusting Strap Mounting (5/16-18)
31	821-0016	1	Screw, Hex Cap - Flanged - Adjusting Strap to Alternator (5/16-18 x 3/4")
32	309-0272	1	Switch, Low Oil Pressure
33	193-0195	1	Sender, Oil Pressure
34	505-0007	2	Bushing, Pipe - Reducer (1/4 x 1/8")
35	309-0178	1	Switch, High Water Temperature
36	193-0109	1	Sender, Water Temperature
37	505-0022	1	Bushing, Reducer (1 x 1/2")
38	505-0021	1	Bushing, Reducer - Oil Drain (3/4 x 1/2")
39	505-0100	1	Nipple, Close - Oil Drain (1/2")
40	504-0011	1	Valve, Shut-Off - Oil Drain
41	505-0185	1	Nipple, Half - Oil Drain
42	503-0509	1	Hose, Oil Drain (13")
43	503-0197	1	Clamp, Hose - Oil Drain
44	332-1281	1	Bracket, Terminal
45	809-0035	1	Screw, Sheet Metal Type - Terminal Bracket (#8 x 3/4")
46	508-0015	1	Washer, Fibre - Terminal Bracket
47	870-0196	1	Nut, Insulated - Terminal Bracket
48	336-1250	1	Lead, Alternator to Ground
49	HARNESS, WIRING		
	338-0769	1	Engine to Control
	338-0903	1	Line to Control
50	309-0269	1	Switch, Low Engine Temperature - Optional

# GENERATOR GROUP

NOTE: See separate group for Bus Bar and Exciter Rotor parts.



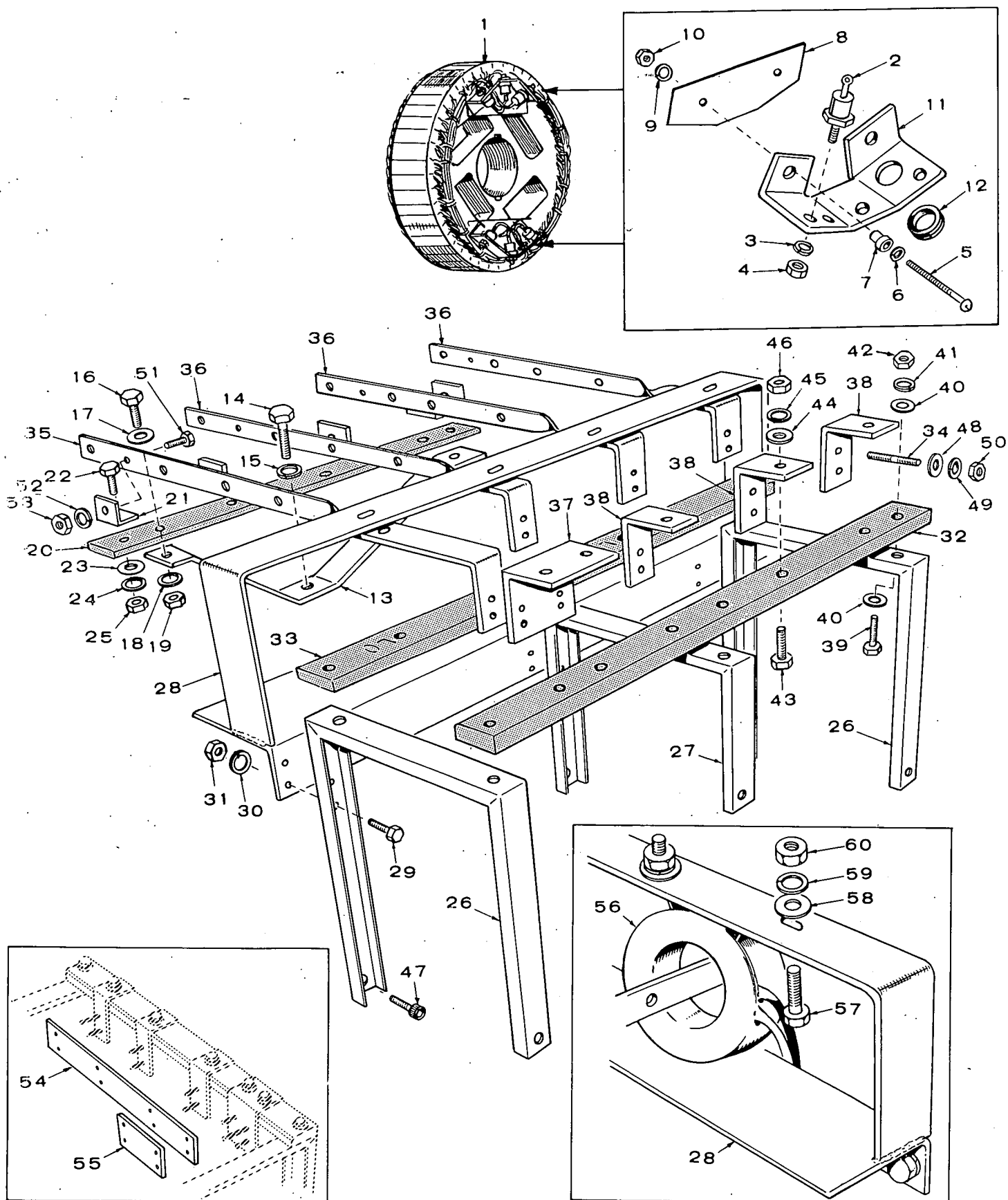
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	232-1973	1	Grill, End Bell
2	800-0013	2	Screw, Hex Cap (1/4-20 x 2-1/2")
3	800-0009	4	Screw, Hex Cap (1/4-20 x 1-1/2")
4	850-0040	6	Washer, Lock (1/4")
5	862-0007	4	Nut, Hex (5/8-11)
6	850-0070	4	Washer, Lock (5/8")
7	232-1957	1	Support, Generator Mounting
8	520-0692	2	Stud, Generator Support
9	234-0291	1	Band, Stator - Top
10	234-0281	1	Band, Stator - Bottom
11	850-0040	6	Washer, Lock (1/4")
12	800-0005	6	Screw, Hex Cap (1/4-20 x 3/4")
13	234-0272	1	Cover, Fan
14	850-0040	1	Washer, Lock (1/4")
15	800-0003	1	Screw, Hex Cap (1/4-20 x 1/2")
16	150-1447	1	Point Assembly, Overspeed Switch (Includes Parts Marked †)
17	850-0040	2	Washer, Lock (1/4")
18	812-0148	2	Screw, Round Head (1/4-20 x 1/2")
19	150-1194	1	†Bracket, Overspeed Switch
20	150-0723	1	†Contact, Overspeed Switch
21	526-0052	2	†Washer, Flat - Brass
22	508-0018	2	†Washer, Insulator
23	508-0006	1	†Washer, Insulator
24	871-0016	2	†Nut, Hex - Brass (1/4-20)
25	854-0014	1	†Washer, Lock (I.T.) (1/4")
26	150-0717	1	Switch Assembly, Overspeed
27	526-0030	1	Washer, Flat (3/8")
28	856-0010	1	Washer, Lock (E.I.T.) (3/8")
29	812-0189	1	Screw, Round Head (3/8-16 x 3/4")
30	510-0091	1	Nut, Bearing Lock (Special)
31	510-0093	1	Washer, Bearing Lock (Special)
32	510-0090	1	Bearing, Ball
33	232-1923	1	Ring, Bearing Holder
34	232-1924	1	Spring, Bearing Holder
35	211-0170	1	Bell, End (Includes Parts Marked †)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
36	850-0050	6	Washer, Lock (3/8")
37	800-0051	6	Screw, Hex Cap (3/8-16 x 1-1/4")
38	222-1693	1	£Coil Assembly, Field - Exciter (Set of Six Coils)
39	221-0153	6	£Shoe, Pole - Exciter
40	800-0031	12	£Screw, Hex Cap (5/16-18 x 1-1/2")
41		1	Stator Assembly, Wound
42	850-0060	16	Washer, Lock (1/2")
43	800-0092	16	Screw, Hex Cap (1/2-13 x 1-1/2")
44	510-0092	1	Nut, Bearing Lock (Special)
45	510-0094	1	Washer, Bearing Lock (Special)
46	201-1501	1	Rotor Assembly, Exciter - Wound - See Separate Group for Components
47	515-0152	1	Key, Exciter Rotor
48		1	Rotor Assembly, Wound
49	515-0161	1	Key, Hub
50	232-1880	1	Disc, Rotor Drive
51	805-0035	12	Bolt, Place (5/8-11 x 1-1/2")
52	205-0076	1	Fan, Generator
53	850-0070	6	Washer, Lock (5/8")
54	800-0133	6	Screw, Hex Cap (5/8-11 x 1-3/4")
55	232-1870	1	Hub, Rotor Drive
56	820-0067	2	Screw, Pan Head (#10-32 x 1")
57	526-0009	2	Washer, Flat (#10)
58	850-0030	2	Washer, Lock (#10)
59	870-0053	2	Nut, Hex (#10-32)

† - Included in 150-1447 Overspeed Point Assembly.

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

# EXCITER ROTOR AND BUS BAR GROUP

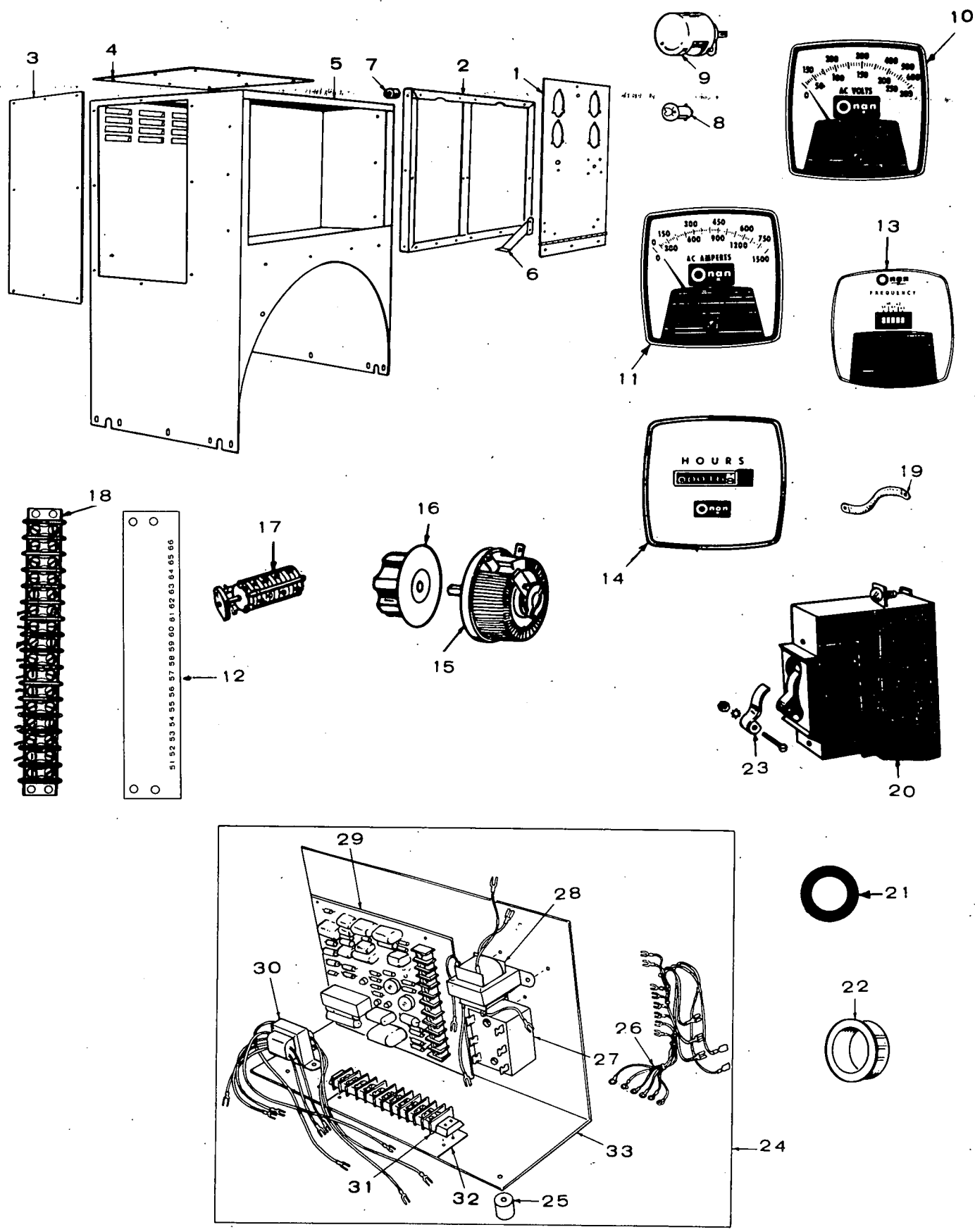


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	201-1501	1	Rotor Assembly, Exciter - Wound (Includes Parts Marked †) - Also shown in Generator Group
2	†RECTIFIER		
	358-0011	3	Positive Stud
	358-0012	3	Negative Stud
3	850-0040	6	†Washer, Lock (1/4")
4	868-0001	6	†Nut, Hex Jam (1/4-28)
5	813-0114	4	†Screw, Round Head (#10-32 x 3")
6	526-0008	4	†Washer, Flat (#10)
7	508-0124	4	†Bushing, Shoulder - Insulating
8	232-1985	4	†Insulator, Heat Shield
9	850-0030	4	†Washer, Lock (#10)
10	870-0053	4	†Nut, Hex (#10-32)
11	†SINK HEAT, RECTIFIER		
	363-0033	1	Negative
	363-0025	1	Positive
12	508-0093	1	†Grommet, Rubber
13	232-1994	1	Bracket, Bus Bar
14	800-0151	1	Screw, Hex Cap (3/4-10 x 1")
15	850-0079	1	Washer, Lock (3/4")
16	800-0051	2	Screw, Hex Cap (3/8-16 x 1-1/4")
17	526-0029	2	Washer, Flat (3/8")
18	850-0050	2	Washer, Lock (3/8")
19	862-0003	2	Nut, Hex (3/8-16)
20	232-1997	1	Board, Insulating
21	232-1992	4	Bracket, Bus Bar
22	800-0007	4	Screw, Hex Cap (1/4-20 x 1")
23	526-0018	4	Washer, Flat (1/4")
24	850-0040	4	Washer, Lock (1/4")
25	862-0001	4	Nut, Hex (1/4-20)
26	232-1999	2	Bracket, Terminal Board Mtg.
27	232-2000	1	Bracket, Terminal Board Mtg.
28	315-0302	1	Shelf, Current Transformer
29	800-0005	6	Screw, Hex Cap (1/4-20 x 3/4")
30	850-0040	6	Washer, Lock (1/4")
31	862-0001	6	Nut, Hex (1/4-20)
32	232-1998	1	Board, Insulating
33	232-1995	1	Board, Insulating

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
34	520-0693	16	Stud, Terminal (5/16 x 1-5/8")
35	232-1996	1	Bar, Bus (17-3/8" Long)
36	232-2001	3	Bar, Bus (13-1/4" Long)
37	232-1991	1	Bar, Bus (Double)
38	232-1990	3	Bar, Bus
39	800-0052	9	Screw, Hex Cap (3/8-16 x 1-1/2")
40	526-0029	18	Washer, Flat (3/8")
41	850-0050	9	Washer, Lock (3/8")
42	862-0003	9	Nut, Hex (3/8-16)
43	800-0052	6	Screw, Hex Cap (3/8-16 x 1-1/2")
44	526-0029	6	Washer, Flat (3/8")
45	850-0050	6	Washer, Lock (3/8")
46	862-0003	6	Nut, Hex (3/8-16)
47	802-0069	6	Screw, Socket Head (3/8-16 x 5/8")
48	526-0115	32	Washer, Flat (5/16")
49	850-0045	32	Washer, Lock (5/16")
50	862-0015	32	Nut, Hex (5/16-18)
51	800-0005	4	Screw, Hex Cap (1/4-20 x 3/4")
52	850-0040	4	Washer, Lock (1/4")
53	862-0001	4	Nut, Hex (1/4-20)
54	232-1993	1	Jumper, Bus Bar (Used on Parallel Wye Wound Generator)
55	232-2005	1	Jumper, Bus Bar (Used on Delta Wound Generator)
56	TRANSFORMER, CURRENT (CHECK TRANSFORMER NAMEPLATE - SELECT ACCORDING TO RATING)		
	302-0547	3	Nameplate Reads 500/5
	302-0625	3	Nameplate Reads 750/5
	302-0589	3	Nameplate Reads 1000/5
	302-0643	3	Nameplate Reads 1200/5
	302-0644	3	Nameplate Reads 1500/5
	302-0645	3	Nameplate Reads 2000/5
57	800-0052	6	Screw, Hex Cap (3/8-16 x 1-1/2")
58	526-0029	6	Washer, Flat (3/8")
59	850-0050	6	Washer, Lock (3/8")
60	862-0003	6	Nut, Hex (3/8-16)

† - Included in 201-1501 Exciter Rotor Assembly.

**CONTROL GROUP (AC PORTION)**

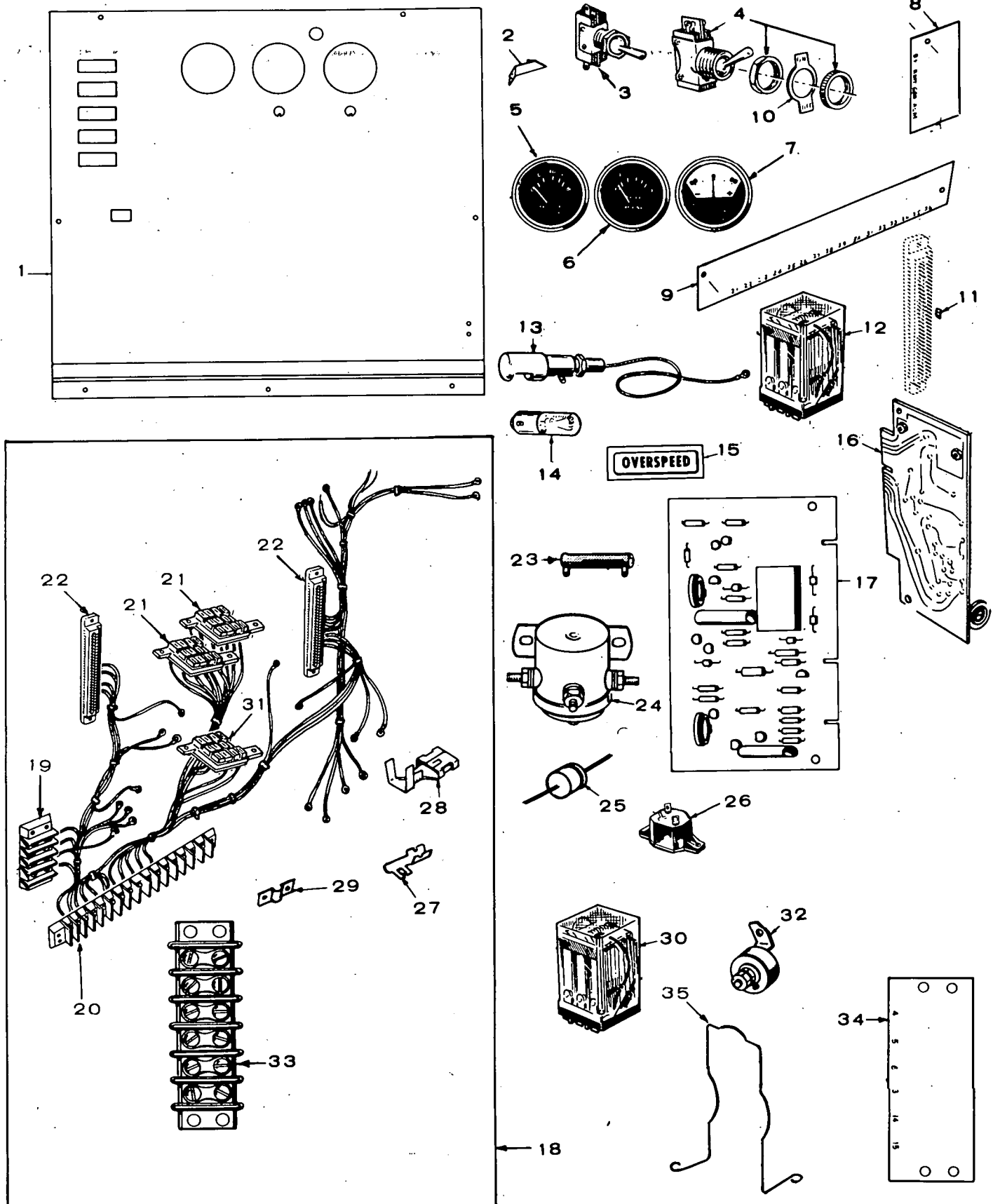


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL, CONTROL		
	301-2980	1	Without Meters
	301-2908	1	With Meters
2	301-2906	1	Frame, Control Panel Mtg.
3	301-2905	2	Plate, Control Box - Side
4	301-2904	1	Plate, Control Box - Top
5	301-2903	1	Box, Control
6	301-1914	1	Bracket, Panel Stop
7	402-0078	5	Mount, Rubber - Control Box Frame
8	322-0017	1	Lamp, Panel
9	322-0149	1	Receptacle, Panel Lamp
10	VOLTMETER, AC (CHECK VOLTMETER SCALE - SELECT ACCORDING TO RATING)		
	302-0421	1	Scale Reads 0-300
	302-0612	1	Scale Reads 0-500
	302-0422	1	Scale Reads 0-600
	302-0423	1	Scale Reads 0-750
11	AMMETER, AC (CHECK AMMETER SCALE - SELECT ACCORDING TO RATING)		
	302-0414	1	Scale Reads 0-500
	302-0415	1	Scale Reads 0-750
	302-0416	1	Scale Reads 0-1000
	302-0640	1	Scale Reads 0-1200
	302-0641	1	Scale Reads 0-1500
	302-0642	1	Scale Reads 0-2000
12	332-1134	1	Strip, Marker (Marked 51 through 66)
13	METER, FREQUENCY		
	302-0213	1	120/208 and 120/240 Volt - 3 Phase - 60 Hertz
	302-0716	1	240/480 and 277/480 Volt - 3 Phase - 60 Hertz
	302-0717	1	347/600 Volt - 3 Phase - 60 Hertz

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
14	METER, RUNNING TIME		
	302-0465	1	120/208, 120/240, and 347/600 Volt - 3 Phase - 60 Hertz
	302-0466	1	240/480 Volt - 3 Phase - 60 Hertz
	302-0467	1	277/480 Volt - 3 Phase - 60 Hertz
15	303-0170	1	Rheostat, Voltage Adjustment
16	303-0032	1	Knob, Rheostat
17	308-0022	1	Switch, Voltage and Current Selector
18	332-0795	1	Block, Terminal (16 Place)
19	337-0044	1	Strap, Ground
20	320-0455	1	Breaker, Circuit (3 amp)
21	508-0001	3	Grommet, Rubber
22	331-0088	1	Bushing (Nylon)
23	320-0307	1	Lock, Circuit Breaker (Penn State Only)
24	305-0545	1	Regulator Assembly, Voltage (Includes Parts Marked *)
25	402-0078	3	*Dampener, Vibration
26	338-0894	1	*Harness, Wiring (Regulator Assembly)
27	305-0524	1	*Reactor, Bridge
28	315-0343	1	*Reactor Assembly, Comm.
29	332-1704	1	*Board Assembly, Printed Control (See Separate Group for Components)
30	315-0342	1	*Transformer, Voltage
31	332-0607	1	*Block, Terminal
32	332-1760	1	*Strip, Marker
33	301-3967	1	*Bracket, Regulator Mounting

\* - Parts included in 305-0545 Regulator Assembly.

# CONTROL GROUP (ENGINE PORTION)



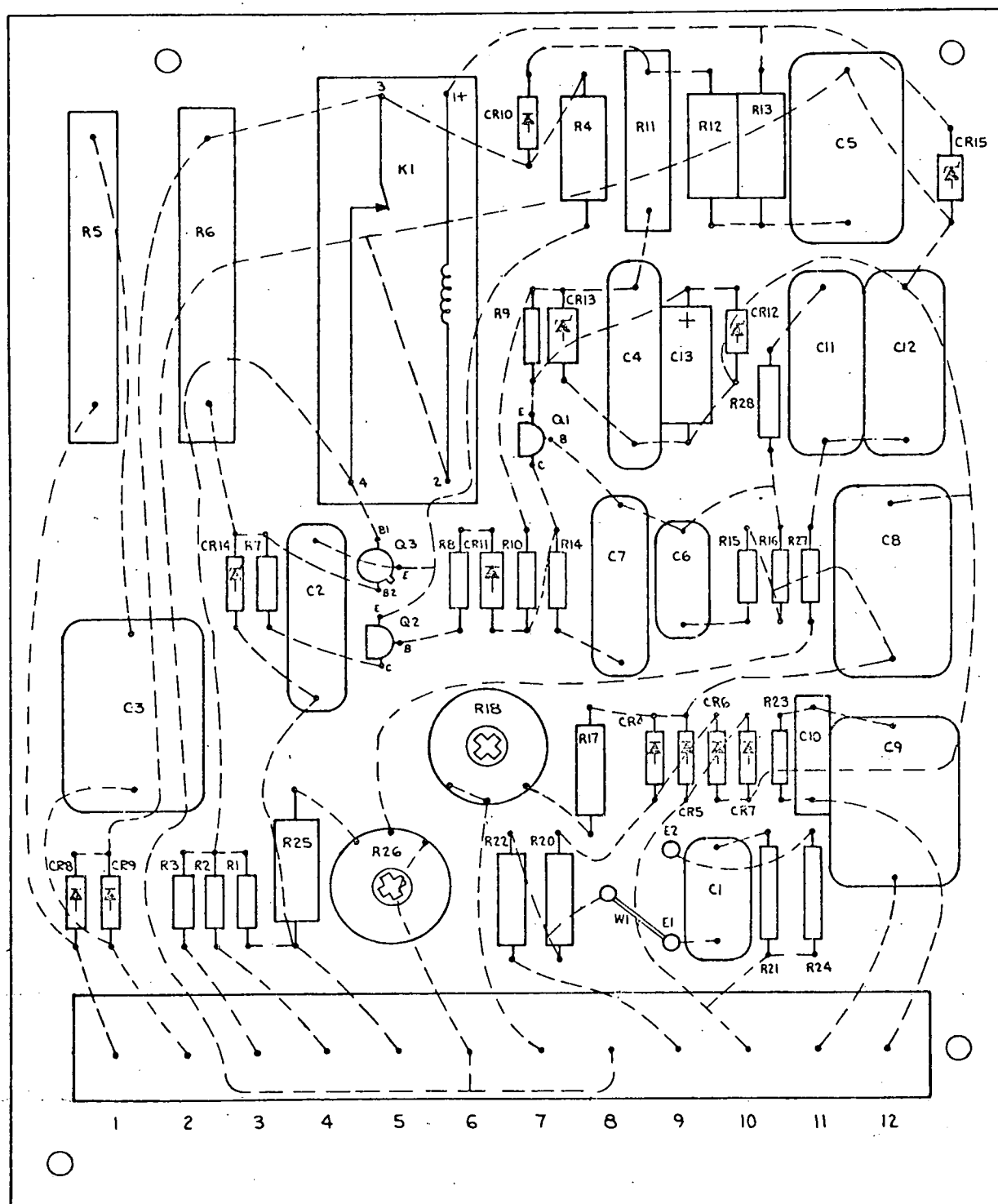


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL ONLY, ENGINE CONTROL		
	301-3400	1	For One Fault Light
	301-3401	1	For Five Fault Lights (Opt.)
2	301-2951	1	Bracket, Panel Stop
3	308-0138	1	Switch, Selector
4	308-0002	1	Switch, Panel Light
5	193-0194	1	Gauge, Oil Pressure
6	193-0106	1	Gauge, Water Temperature
7	302-0061	1	Ammeter, Charge (30-0-30)
8	332-1239	1	Strip, Marker (B+, Remote, Ground, Alarm)
9	332-1241	1	Strip, Marker (21 through 36)
10	308-0003	1	Plate, Switch (On-Off)
11	332-1276	4	Plug, Keying (3 Used on Sets With Five Fault Lights)
12	307-1056	2	Relay, (1) Start Disconnect (1) Ignition
13	322-0149	1	Holder, Lamp
14	322-0017	1	Lamp, Panel
15	LAMP, INDICATOR		
	322-0129	1	Fault (Standard)
	322-0119	1	Overcrank (Optional)
	322-0123	1	Overspeed (Optional)
	322-0120	1	Low Oil Pressure (Optional)
	322-0121	1	High Engine Temperature (Opt.)
	322-0122	1	Low Engine Temperature (Opt.)
16	CONTROL, CRANKER		
	300-0751	1	Standard Cranker (Includes (1) #357-0004 Rectifier)
	300-0715	1	Cycle Cranker (Optional) - (See Separate Group for Components)
17	MONITOR, ENGINE CONTROL (SEE SEPARATE GROUP FOR COMPONENTS)		
	300-0680	1	Sets With One Fault Light - Standard
	300-0682	1	Sets With Five Fault Lights - Optional
	300-0731	1	Penn State Sets With One Fault Light

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
18	HARNESS ASSEMBLY, WIRING - CONTROL (INCLUDES PARTS MARKED *)		
	338-0617	1	Sets With One Fault Light - Standard
	338-0618	1	Sets With Five Fault Lights - Optional
19	332-0537	1	*Block, Terminal - 4 Place
20	332-0795	1	*Block, Terminal - 16 Place
21	323-0765	2	*Socket, Relay - 11 Place
22	332-1271	2	*Housing, Printed Circuit Board Terminal
23	304-0262	1	Resistor, Oil Pressure Gauge
24	307-0061	1	Relay, Starter Pilot
25	357-0004	1	Rectifier, Diode
26	320-0240	1	Breaker, Circuit (12.5 Amp)
27	332-1269	As Req.	*Terminal, PC Board
28	332-1280	As Req.	*Terminal, Crimp
29	332-1043	1	*Jumper, Terminal - Std. Sets
30	307-1143	1	Relay, Starter Protection
31	323-0764	1	*Socket, Relay - 8 Place
32	193-0189	1	Resistor, Water Temperature Gauge
33	332-0699	1	*Block, Terminal (6 Place) - Sets With Five Fault Lights (Optional)
34	332-1240	1	Strip, Marker (53 through 58) - Sets With Five Fault Lights (Optional)
35	307-1157	3	Spring, Relay Holddown

\* - Included in Control-Wiring Harness Assembly.

# PRINTED CIRCUIT BOARD ASSEMBLY (332-1704)

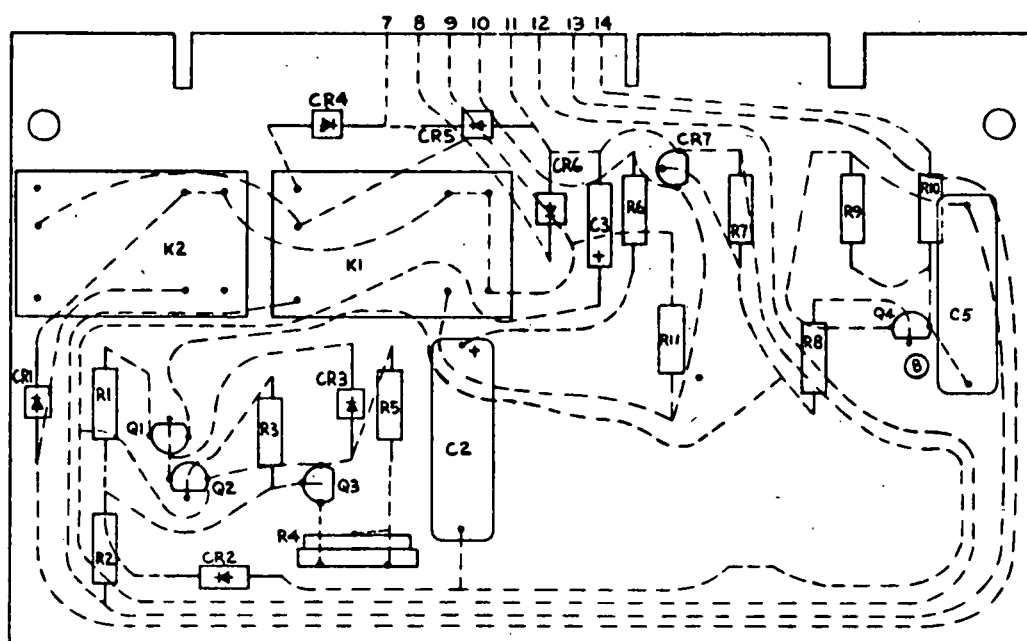


<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
	332-1704	1	Board Assembly, Printed (Complete)
TB1	332-1252	1	Block, Terminal
C1	355-0018	1	Capacitor (.47 Mfd., 100 Volt)
C2, C7	355-00052	1	Capacitor (.22 Mfd., 200 Volt)
C3, C9, C11	355-0017	3	Capacitor (.47 Mfd., 400 Volt)
C4	355-0006	1	Capacitor (.47 Mfd., 200 Volt)
C5, C8	355-0016	2	Capacitor (1 Mfd., 100 Volt)
C6	355-0034	1	Capacitor (.33 Mfd., 100 Volt)
C10	355-0014	1	Capacitor (.047 Mfd., 200 Volt)
C12	355-0033	1	Capacitor (1.0 Mfd., 200 Volt)
C13	356-0039	1	Capacitor (Electrolytic - .100 Mfd., 100 Volt)
CR4 thru CR11	357-0014	8	Rectifier, Silicon
CR12	359-0035	1	Diode, Zener
CR13	359-0025	1	Diode, Zener
CR14	359-0026	1	Diode, Zener
CR15	359-0015	1	Diode, Zener
K1	307-1063	1	Relay, Magnetic Reed
Q1, Q2	362-0017	2	Transistor, Silicon NPN
Q3	361-0004	1	Transistor, Unijunction
R1, R23	350-0355	2	Resistor (1/2 Watt, 47 Ohm)
R2, R3	350-0351	2	Resistor (1/2 Watt, 33 Ohm)
R4	350-1075	1	Resistor (2 Watt, 4.7 Megohm)
R5	353-0040	1	Resistor, Fixed (10 Watt, 270 Ohm)
R6	353-0039	1	Resistor, Fixed (15 Watt, 5000 Ohm)

<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
R7	350-0398	1	Resistor (1/2 Watt, 3000 Ohm)
R8, R16	350-0447	2	Resistor (1/2 Watt, 330,000 Ohm)
R9, R10	350-0423	2	Resistor (1/2 Watt, 33,000 Ohm)
R11	352-0151	1	Resistor, Fixed (5 Watt, 15,000 Ohm)
R12	350-1014	1	Resistor (2 Watt, 13,000 Ohm)
R13	350-1007	1	Resistor (2 Watt, 8,000 Ohm)
R14	350-0443	1	Resistor (1/2 Watt, 220,000 Ohm)
R27, R15	350-0435	2	Resistor (1/2 Watt, 100,000 Ohm)
R17	351-0524	1	Resistor, Metal Film (1/4 Watt, 13,000 Ohm)
R18	303-0168	1	Potentiometer
R20, R22	351-0520	2	Resistor, Metal Film (1/4 Watt, 28,000 Ohm)
R21	351-0522	1	Resistor, Metal Film (1/4 Watt, 5,110 Ohm)
R24	351-0523	1	Resistor, Metal Film (1/4 Watt, 8,870 Ohm)
R25	350-1011	1	Resistor (2 Watt, 10,000 Ohm)
R26	303-0164	1	Potentiometer
R28	350-0459	1	Resistor (1/2 Watt, 1 Megohm)

# ENGINE CONTROL MONITOR GROUP (PENN STATE)

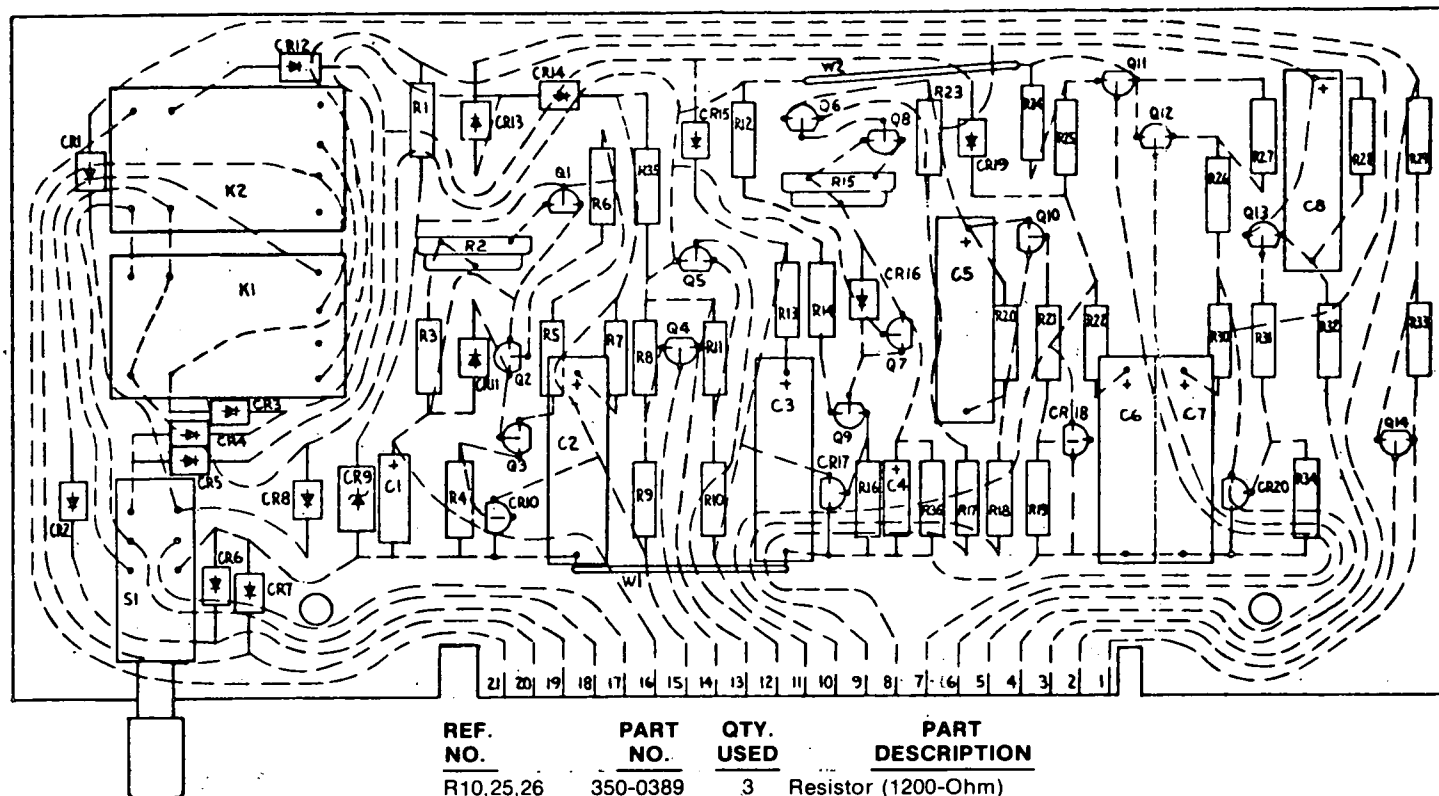
300-0731 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
R11	350-0980	1	Resistor (510-Ohm, 2 Watt)
R8	350-0380	1	Resistor (510-Ohm, 1/2 Watt)
R10	350-0544	1	Resistor (4,700-Ohm)
R9	350-0529	1	Resistor (270-Ohm)
R7	350-0517	1	Resistor (27-Ohm)
R6	350-0505	1	Resistor (2.7-Ohm)
R5	350-0572	1	Resistor (1.0 Megohm)
R4	303-0169	1	Potentiometer
R3	350-0552	1	Resistor (22,000-Ohm)
R2	350-0534	1	Resistor (680-Ohm)
R1	350-0536	1	Resistor (1000-Ohm)
Q4	362-0027	1	Transistor, Silicon
Q2, Q3	362-0025	2	Transistor, Field Effect
Q1	361-0003	1	Transistor
CR7	364-0011	1	Rectifier, Gate Control
CR2	359-0027	1	Diode, Zener
CR1,3,4, 5,6	357-0004	5	Rectifier, Diode
C3	356-0040	1	Capacitor (10 Mfd.)
C2, 5	355-0005	2	Capacitor (.22 Mfd.)
K1, K2	307-1076	2	Relay

# ENGINE CONTROL MONITOR GROUP (FIVE FAULT LIGHTS) - OPTIONAL

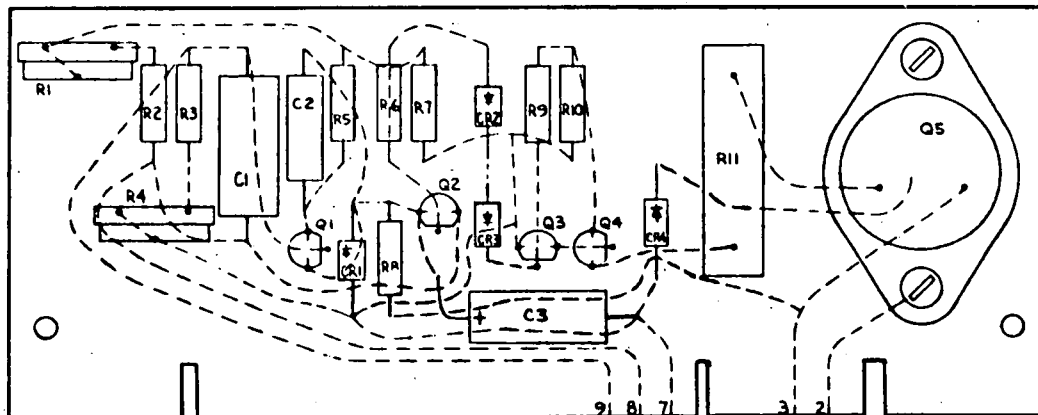
300-0682 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
R10,25,26	350-0389	3	Resistor (1200-Ohm)
R15	303-0182	1	Potentiometer
Q7, 8	362-0031	2	Transistor, Field Effect
R21,R31	350-0380	2	Resistor (510-Ohm)
R6	350-0548	1	Resistor (10,000-Ohm)
R36	350-0587	1	Resistor (18 Megohm)
R35	350-0980	1	Resistor (510-Ohm)
S1	308-0280	1	Switch, Push Button
R9,17,18,29,32	350-0544	6	Resistor (4700-Ohm)
R8,11,20,23,24,27,28,33	350-0529	8	Resistor (270-Ohm)
R7,13,22,30	350-0505	4	Resistor (2.7-Ohm)
R12	350-0552	1	Resistor (22,000-Ohm)
R5,14	350-0536	2	Resistor (1000-Ohm)
R4,16,19,34	350-0517	4	Resistor (27-Ohm)
R3	350-0572	1	Resistor (1 Megohm)
R2	303-0169	1	Potentiometer
R1	350-0534	1	Resistor (680-Ohm)
Q4,5,6,10,11,12,13,14	362-0027	8	Transistor, Silicon
Q3, 9	361-0003	2	Transistor
Q1, 2	362-0025	2	Transistor, Field Effect
K1, K2	307-1076	2	Relay
CR10,17,18,20	364-0011	4	Rectifier, Gate Control
CR9	359-0027	1	Diode, Zener
CR1,2,3,4,5,6,7,8,11,12,13,14,15,16,19	357-0004	15	Rectifier, Diode
Q4	356-0030	1	Capacitor (1.0 Mfd.)
C2,3,5,6,7,8	355-0005	6	Capacitor (.22 Mfd.)
C1	356-0040	1	Capacitor (10 Mfd.)

# CONTROL, CYCLE CRANKER GROUP (OPTIONAL EQUIPMENT)

300-0715 - Printed Circuit Board, Complete

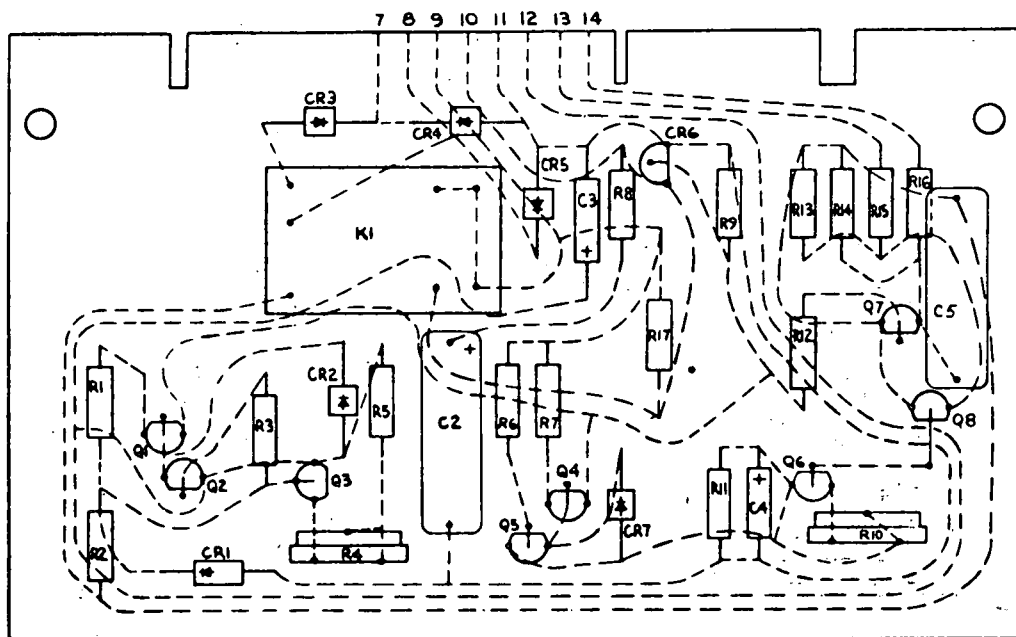


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
C3	356-0045	1	Capacitor, Electrolytic 25 Mfd., 15 Volt
C2	355-0010	1	Capacitor, Dielectric .0022 Mfd., 100 Volt
H3	860-0006	2	Nut, RMS (#6-32)
H2	853-0003	2	Washer, ET Lock (#6)
H1	812-0061	2	Screw, RHM (#6-32 x 3/8")
R11	352-0158	1	Resistor, Fixed (5 Watt, 50-Ohm)
R10	350-0500	1	Resistor, Fixed (1.0-Ohm)
R8	350-0534	1	Resistor, Fixed (6.8-Ohm)
R7	350-0546	1	Resistor, Fixed (6.8-Ohm)
R6	350-0420	1	Resistor, Fixed (24,000-Ohm)
R5	350-0558	1	Resistor, Fixed (68,000-Ohm)
R3, R9	350-0548	2	Resistor, Fixed (10,000-Ohm)
R2	350-0560	1	Resistor, Fixed (100,000-Ohm)
R1, R4	303-0171	2	Potentiometer
Q5	362-0019	1	Transistor, Power
Q4	362-0026	1	Transistor, Signal
Q3	362-0011	1	Transistor
Q1, Q2	362-0008	2	Transistor, Signal
CR2,3,4	357-0004	3	Rectifier, Diode
CR1	359-0027	1	Diode, Zener (7.5 Volts)
C1	356-0039	1	Capacitor, Electrolytic (100 Mfd.)

# ENGINE CONTROL MONITOR GROUP (STANDARD SETS WITH ONE FAULT LIGHT)

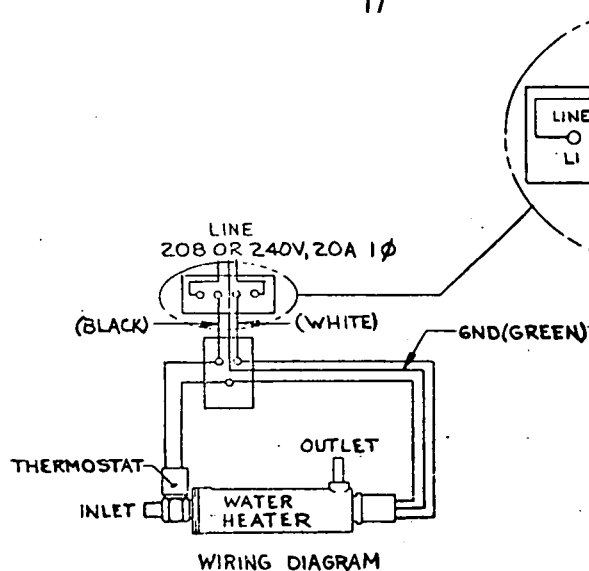
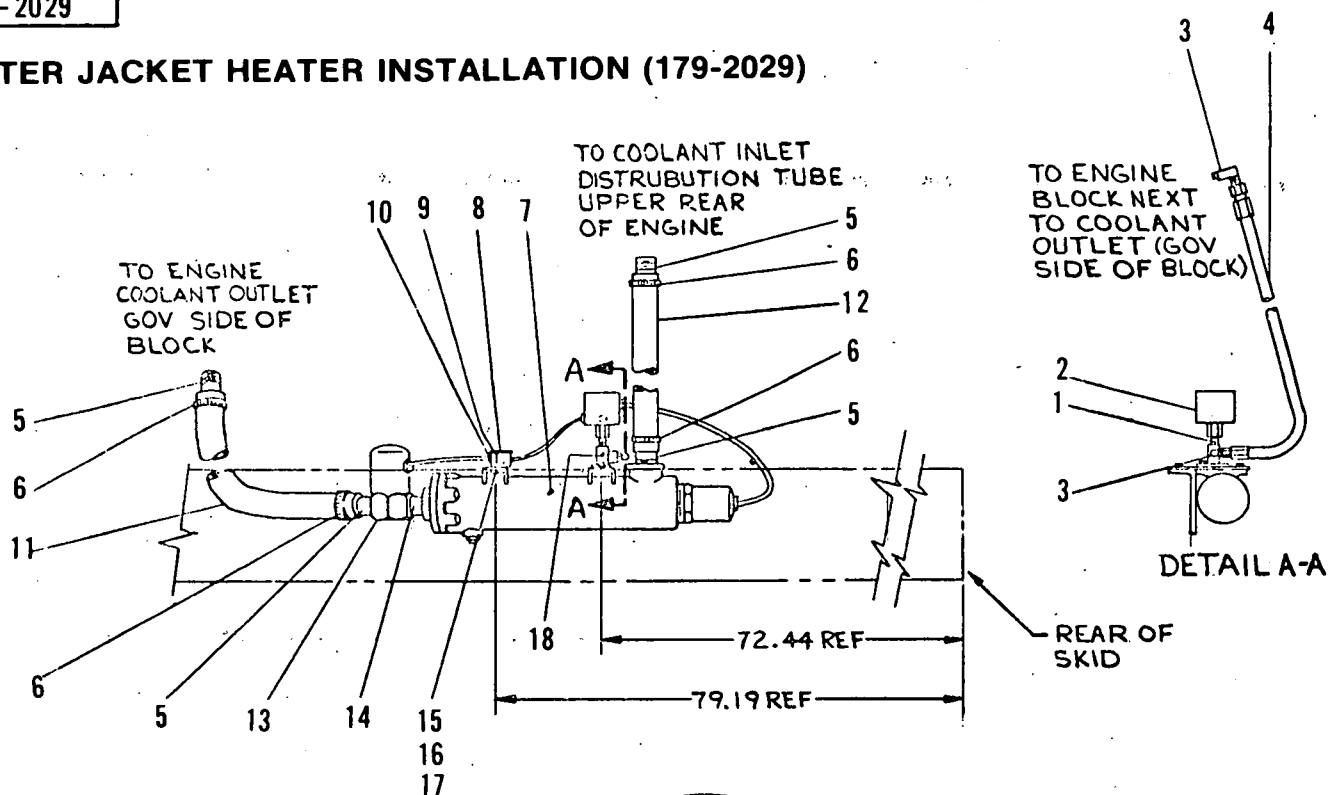
24 Volt

300-0680 - Printed Circuit Board, Complete



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	300-0680	1	Printed Circuit Board - Complete
R10	303-0182	1	Potentiometer (1.0 Megohm)
Q5, 6	362-0031	2	Transistor, Field Effect
R3	350-0548	1	Resistor (10,000-Ohm)
R17	350-0980	1	Resistor (510-Ohm)
R12	350-0380	1	Resistor (510-Ohm)
R15, R16	350-0544	2	Resistor (4,700-Ohm)
R13, 14	350-0529	2	Resistor (270-Ohm)
R11	350-0587	1	Resistor (18 Megohm)
R9	350-0517	1	Resistor (27-Ohm)
R8	350-0505	1	Resistor (2.7-Ohm)
R5	350-0572	1	Resistor (1.0 Megohm)
R4	303-0169	1	Potentiometer (3.5 Megohm)
R6	350-0552	1	Resistor (22,000-Ohm)
R2	350-0534	1	Resistor (680-Ohm)
R1, R7	350-0536	2	Resistor (1000-Ohm)
Q7, Q8	362-0027	2	Transistor, Silicon
Q2, 3	362-0025	2	Transistor, Field Effect
Q1, Q4	361-0003	2	Transistor
CR6	364-0011	1	Rectifier, Gate Control
CR2,3,4, 5,7	357-0004	5	Rectifier, Diode
CR1	359-0027	1	Diode, Zener
C4	356-0030	1	Capacitor (1 Mfd.)
C3	356-0040	1	Capacitor (10 Mfd.)
C2,5	355-0005	2	Capacitor (.22 Mfd.)
K1	307-1076	1	Relay

## WATER JACKET HEATER INSTALLATION (179-2029)

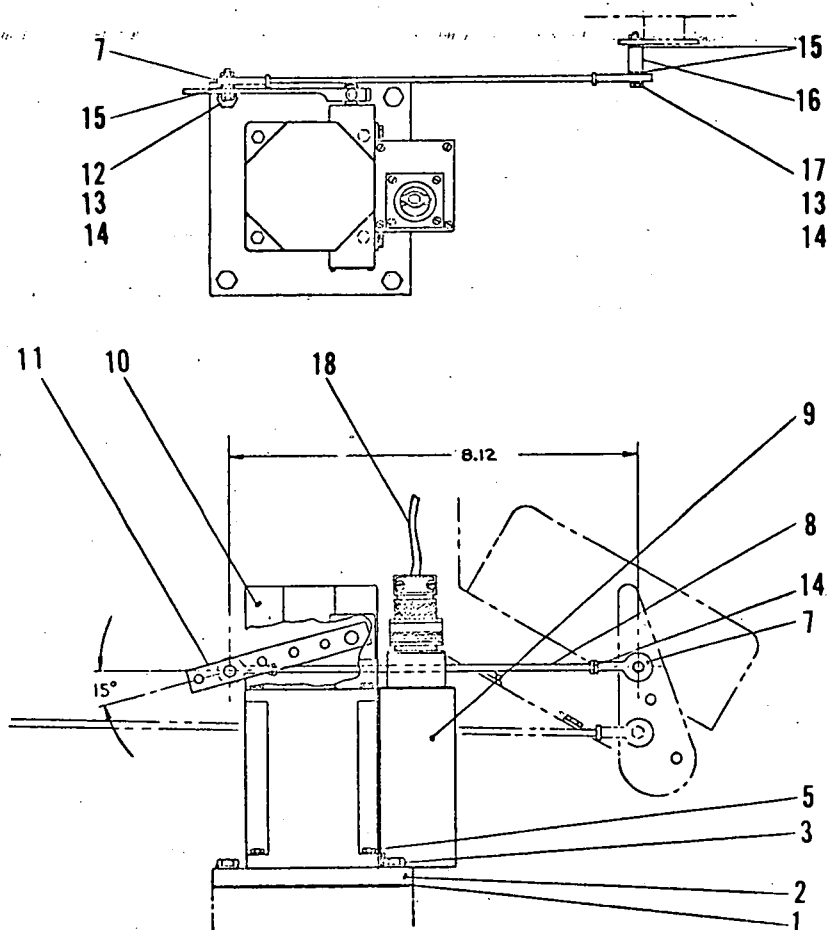


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	505-0099	1	Nipple, Pipe (1/4 x 7/8")
2	309-0271	1	Switch, Oil Pressure
3	502-0287	2	Elbow, Inverted Male
4	501-0188	1	Line, Flexible
5	505-0759	4	Adapter, Pipe to Hose (1")
6	503-0429	4	Clamp, Hose
7	333-0138	1	Heater, Engine
8	330-0004	1	Cover, Box
9	330-0005	1	Box, Outlet
10	503-0008	2	Grommet
11		1	Hose (Order 61" of Bulk Hose #503-0249)
12		1	Hose (Order 38" of Bulk Hose #503-0249)
13	309-0253	1	Thermostat
14	505-0107	1	Nipple, Pipe (1 x 2")
15	813-0103	2	Screw, Round Head (#10-32 x 3/4")
16	850-0030	2	Washer, Lock (#10)
17	870-0053	2	Nut, Hex (#10-32)
18	333-0142	1	Support, Pressure Switch



179-0446

# GOVERNOR INSTALLATION (179-0446)



## NOTE:

1. WIRING HARNESS INCLUDES THE ADAPTER THAT ATTACHES TO THE CONTROLLER, THE MAG PICK-UP, AND THE SPEEDSETTING POT.

2. MAG PICK-UP NOT SHOWN ON DWG. TO BE MGT ON FLYWHEEL HOUSING IN EXISTING TAPPED HOLE ON RIGHT SIDE OF ENGINE.

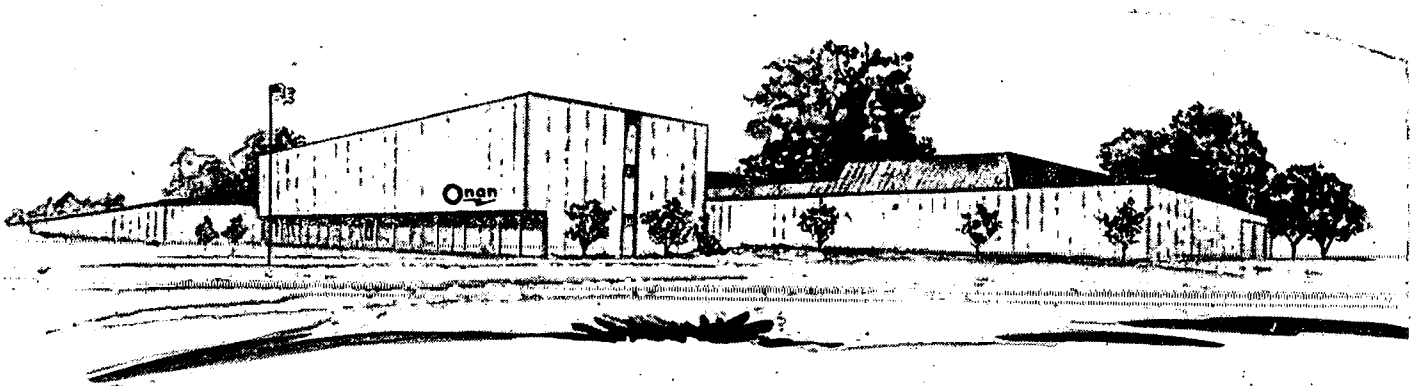
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1		1	Gasket (Supplied with Engine - See Engine Manufacture Parts Catalog)
2	150-1490	1	Plate, Governor Mounting
3	800-0050	4	Screw, Hex Cap (3/8-16 x 1")
4	850-0050	4	Washer, Lock (3/8")
5	800-0007	4	Washer, Lock (1/4")
7	150-1119	2	End, Rod - Special
8	520-0846	1	Stud, Steel
9	151-0399	1	Control
10	151-0398	1	Actuator
11	151-0400	1	Lever, Governor Actuator
12	800-0008	1	Screw, Hex Cap (1/4-20 x 1-1/4")
13	850-0040	4	Washer, Lock (1/4")
14	862-0001	4	Nut, Hex (1/4-20)
15	526-0016	4	Washer, Flat (1/4")
16	232-0225	1	Spacer
17	800-1009	2	Screw, Hex Cap
18	151-0401	1	Harness, Wiring
19	151-0402	1	Potentiometer

# **We mean it.....**

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

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





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