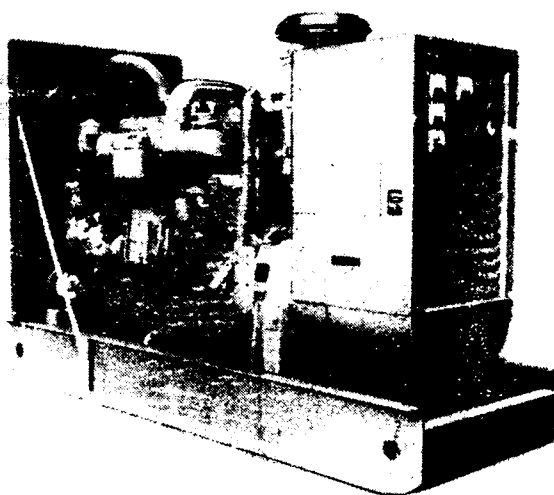


OPERATOR'S MANUAL AND PARTS CATALOG

FOR
DYH
SERIES
ELECTRIC GENERATING SETS



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(Spec C-D)

SAFETY PRECAUTIONS

The following symbols in this manual signal potentially dangerous conditions to the operator or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to protect personnel as well as equipment.

ONAN recommends that you read your manual and become thoroughly acquainted with it and your equipment before you start your unit. These recommendations and the following safety precautions are for your protection.

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that could result in serious, personal injury. Take care in following these recommended procedures.

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

CAUTION This symbol refers to possible equipment damage.

General

- Keep your electric generating set and the surrounding area clean and free from obstructions. Remove any debris from set and keep the floor clean and dry.
- Provide appropriate fire extinguishers and install them in convenient locations. Consult your local fire department for the correct type of extinguisher to use. Do not use foam on electrical fires. Use extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the generating set are secure. Tighten supports and clamps, keep guards in position over fans, driving belts, etc.
- Do not wear loose clothing in the vicinity of moving parts, or jewelry while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts. Jewelry can short out electrical contacts; cause shock or burning.
- If adjustment *must* be made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.
- Do not work on this equipment when mentally or physically fatigued.
- Coolants under pressure have a higher boiling point than water. DO NOT open a radiator or heat exchanger pressure cap while the engine is running. Bleed the system pressure first.

Protect Against Moving Parts

- Keep your hands away from moving parts.

- Before starting work on the generating set, disconnect batteries. This will prevent starting the set accidentally.

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.
- 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.
- Be sure all fuel supplies have a positive shutoff valve.

Guard Against Electric Shock

- Remove electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.
- Use extreme caution when working on electrical components. High voltages cause injury or death. DON'T tamper with interlocks.
- Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches.
- DO NOT SMOKE while servicing batteries. Lead acid batteries emit a highly explosive hydrogen gas that can be ignited by electrical arcing or by smoking.

Exhaust Gases Are Toxic

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

Keep the Unit and Surrounding Area Clean

- Make sure that oily rags are not left on or near the engine.
- Remove all oil deposits. Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and subsequent engine damage and may present a potential fire hazard.

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WARNING

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

INTRODUCTION

FOREWORD

This manual is applicable to the DYH 200 kW and 250 kW Series electric generating set, consisting of an Onan YB17 Series AC generator, driven by an Allis-Chalmers 21000 MKII engine. Information is provided on installation, operation, troubleshooting and parts ordering for the DYH set. The manual should be used in conjunction with the Allis-Chalmers engine manual, as your specific engine may have variations due to optional equipment available.

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.

200.0	DYH	17R/	1	C
1	2	3	4	5

1. Indicates Kilowatt rating.
2. Factory code for SERIES identification.
3. Indicates voltage code.
15 indicates 60 Hz reconnectible.
R indicates remote electric start.
4. Factory code for designating optional equipment.
5. Specification letter. (Advances when factory makes production modifications.)

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

WARNING

ENGINE EXHAUST GAS (CARBON MONOXIDE) IS DEADLY!

Carbon monoxide is an odorless, colorless gas formed by incomplete combustion of hydrocarbon fuels. Carbon monoxide is a dangerous gas that can cause unconsciousness and is potentially lethal. Some of the symptoms or signs of carbon monoxide inhalation are:

- Dizziness
- Intense Headache
- Weakness and Sleepiness
- Vomiting
- Muscular Twitching
- Throbbing in Temples

If you experience any of the above symptoms, get out into fresh air immediately.

The best protection against carbon monoxide inhalation is a regular inspection of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

SPECIFICATIONS

ENGINE DETAILS

Engine Manufacturer
 Engine Series
 Number of Cylinders
 Displacement
 BHP @ 1800 RPM
 Compression Ratio
 Bore
 Stroke
 Fuel
 Battery Voltage
 Battery Group (Two 12-Volt, 225 A.h)
 Starting Method
 Governor Regulation.....

200 kW

250 kW

Allis-Chalmers
 21000 MKII
 6
 844-cu. inch (13.8 litres)
 325 390
 15.1:1 15.4:1
 5.25-inches (133.3 mm)
 6.5-inches (165.1 mm)
 ASTM No. 2 Diesel
 24
 8D - over 25° F (-4.C) Operating Temp.
 Solenoid Shift
 5% Maximum

GENERATOR DETAILS

Type
 Rating (Watts)
 60 Hertz Continuous Standby
 50 Hertz Continuous Standby
 AC Voltage Regulation
 60 Hertz RPM
 50 Hertz RPM
 Output Rating
 AC Frequency Regulation
 Battery Charging Current

YB 17/1, Brushless (60 Hz)
 YB 517/1 (50 Hz)
 200,000 250,000
 165,000 208,000
 ±2%
 1800
 1500
 0.8 PF
 3.0 Hz No Load—Full Load
 35 Amps

CAPACITIES AND REQUIREMENTS

Cooling System (including Radiator and Intercooler) ...
 Engine Oil Capacity (Filter, Lines, Crankcase).....
 Exhaust Connection (inches pipe thread)

16.5 Gallons (62.5 litres)
 11.25 Gallons (29.3 litres) 15 Gallons (56.8 litres)
 6

AIR REQUIREMENTS (1800 RPM)

Engine Combustion.....
 Radiator Cooled Engine.....
 Total for Radiator Cooled Model
 Alternator Cooling Air (1800 RPM)
 (1500 RPM)
 Fuel Consumption at Rated Load (No. 2 Diesel)

648 CFM (18.78 m³/min)
 18,400 CFM (521.08 m³/min)
 20,248 CFM (539.86 m³/min)
 1,200 CFM (33.96 m³/min)
 1,000 CFM (28.32 m³/min)
 15.5-gph (58.7 lit/hr) 19.0-gph (68.22 lit/hr)

GENERAL

Height
 Width
 Length
 Weight (Approx.)

72.875-inches (1851 mm) 70.00-inches (1778 mm)
 37.5-inches (950 mm) 44.00-inches (1117 mm)
 110.313-inches (2800 mm) 109.00-inches (2768 mm)
 7,060-lbs (3201 kg) 6,500-lbs (2951 kg)

200 kW 60 Hz
165 kW 50 Hz

TABLE 1. GENERATOR VOLTAGE OPTIONS

VOLTAGE	PHASE	FREQUENCY	MAXIMUM CURRENT	PARALLEL WYE	SERIES WYE	CONNECT WIRE W12
(YB17)						
120/208	3	60 Hz	694 AMPS	x		H3
127/220	3	60 Hz	656 AMPS	x		H4
139/240	3	60 Hz	600 AMPS	x		H5
240/416	3	60 Hz	347 AMPS		x	H3
254/440	3	60 Hz	328 AMPS		x	H4
277/480	3	60 Hz	300 AMPS		x	H5
(YB517)						
110/190	3	50 Hz	616 AMPS	x		H3
115/200	3	50 Hz	598 AMPS	x		H4
120/208	3	50 Hz	573 AMPS	x		H4
127/220	3	50 Hz	543 AMPS	x		H5
220/380	3	50 Hz	313 AMPS		x	H3
230/400	3	50 Hz	294 AMPS		x	H4
240/416	3	50 Hz	287 AMPS		x	H4
254/440	3	50 Hz	272 AMPS		x	H5

250 kW 60 Hz
208 kW 50 Hz

TABLE 1A. GENERATOR VOLTAGE OPTIONS

VOLTAGE	PHASE	FREQUENCY	MAXIMUM CURRENT	PARALLEL WYE	SERIES WYE	CONNECT WIRE W12
(YB17)						
120/208	3	60 Hz	868 AMPS	x		H3
127/220	3	60 Hz	820 AMPS	x		H4
139/240	3	60 Hz	750 AMPS	x		H5
240/416	3	60 Hz	434 AMPS		x	H3
254/440	3	60 Hz	410 AMPS		x	H4
277/480	3	60 Hz	376 AMPS		x	H5
(YB517)						
110/190	3	50 Hz	788 AMPS	x		H3
115/200	3	50 Hz	752 AMPS	x		H4
120/208	3	50 Hz	720 AMPS	x		H4
127/220	3	50 Hz	688 AMPS	x		H5
220/380	3	50 Hz	394 AMPS		x	H3
230/400	3	50 Hz	376 AMPS		x	H4
240/416	3	50 Hz	360 AMPS		x	H4
254/440	3	50 Hz	344 AMPS		x	H5

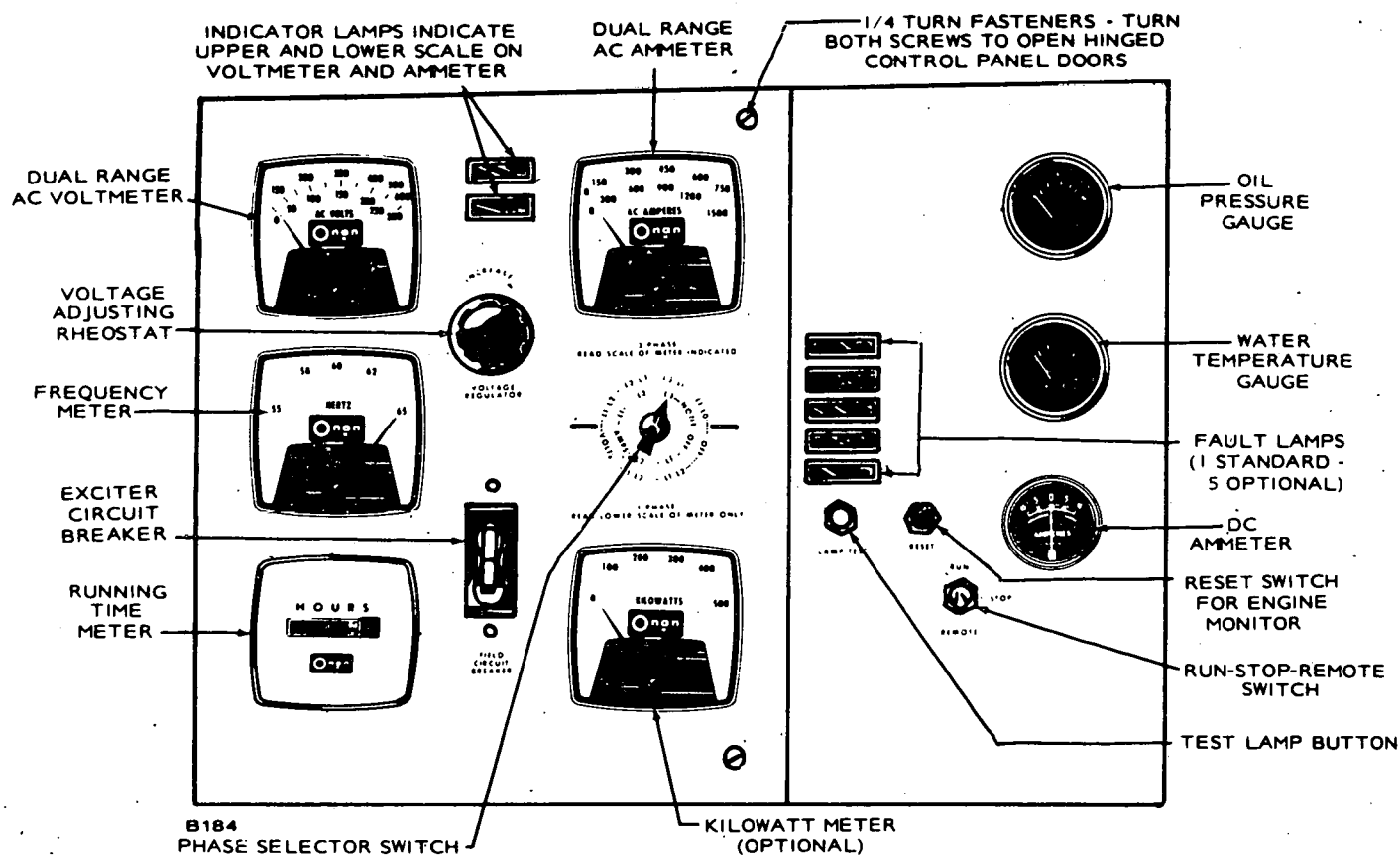


FIGURE 1. CONTROL PANEL

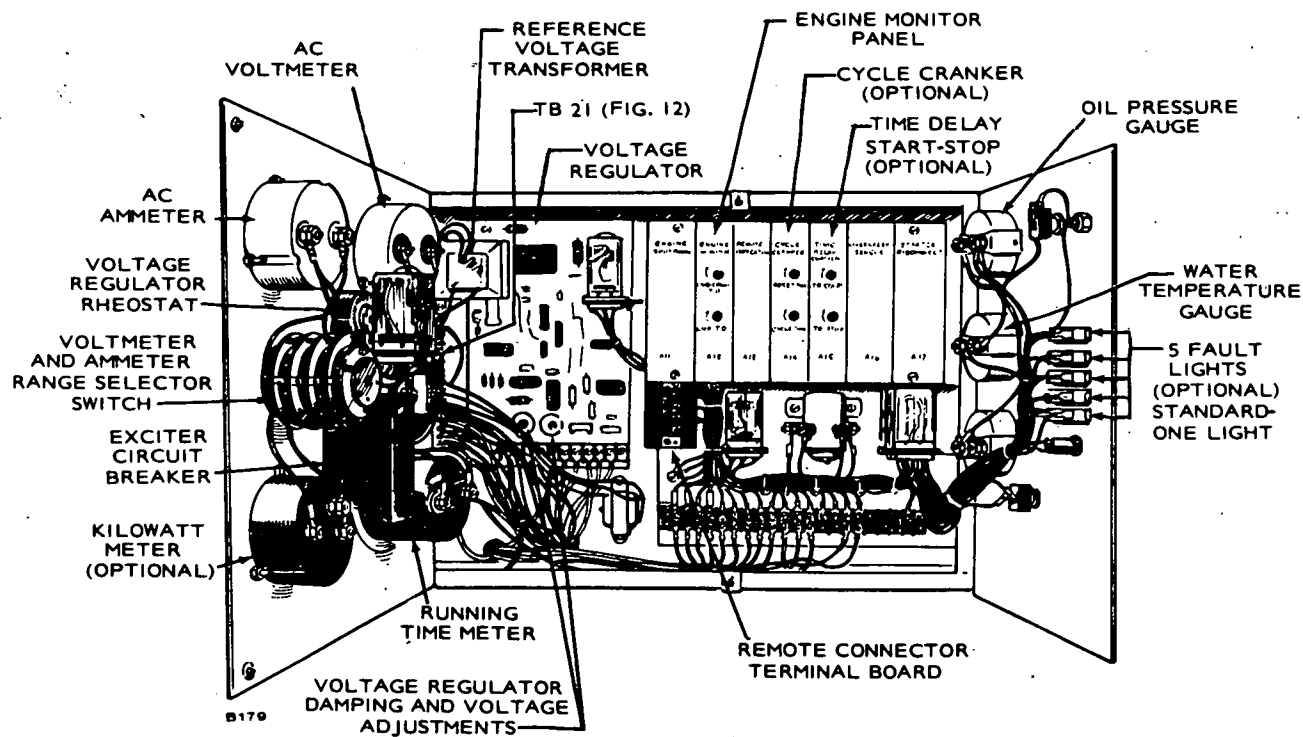


FIGURE 2. CONTROL PANEL INTERIOR

DESCRIPTION

GENERAL

An ONAN DYH 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 DYH is an Allis Chalmers 21000 MK II as described in engine manual. Basic measurements and requirements will be found under *Specifications*. However, the engine used for your unit may have variations due to optional equipment available, therefore the Allis Chalmers manual should be consulted.

AC GENERATOR

The 200 and 250 kW sets use an Onan Type YB17 /1 12 lead, 4 pole revolving field, reconnectible bus-bar brushless unit. The alternating current is generated in the stator winding. The alternator rotor, attached directly to the engine flywheel turns at engine speed. Therefore, the speed at which the rotor turns, determines generator output frequency. The 60 hertz set operates at 1800 rpm and the 50 hertz at 1500 rpm. Excitation is achieved by feeding AC output to a voltage regulator, where it is compared with a reference voltage in the regulator, rectified and returned to the field of the exciter, then to the exciter armature, rectified and fed to the generator field.

CONTROL PANEL

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

DC PANEL

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

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

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

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

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

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

Warning Light: Indicates "Fault" in engine operation.

AC PANEL

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

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

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

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

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

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

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

OPTIONAL EQUIPMENT

DC Panel

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

- a. Overcrank
- b. Overspeed
- c. Low oil pressure
- d. High engine temperature
- e. Low engine temperature

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

AC Panel

Kilowatt Meter: Indicates output of the AC generator in kilowatts. Connected into a transducer mounted in the control box housing.

CONTROL PANEL INTERIOR

Discussed below is equipment which the operator may have reason to adjust or inspect for service.

Terminal Board (TB) 21: Connection of wandering lead (W12) to terminals H3, H4, H5 is made at this point, to change voltage regulator tap when reconnecting generator for different voltages. Refer to Figure 15.

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 r/min).
 - c. Low oil pressure - 14 psi (96.5 kPa).
 - d. High engine temperature - 215° F (102° C).

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

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

TABLE 2. FAULT LAMP OPTIONS

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

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.

Start-Disconnect and Overspeed: Plug-in module. Operates at approximately 100 rpm above maximum cranking speed to prevent the starter from being energized while engine is running. Overspeed operates at 2000-2200 rpm. See Figure 3.

OPTIONAL MODULES

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

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

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

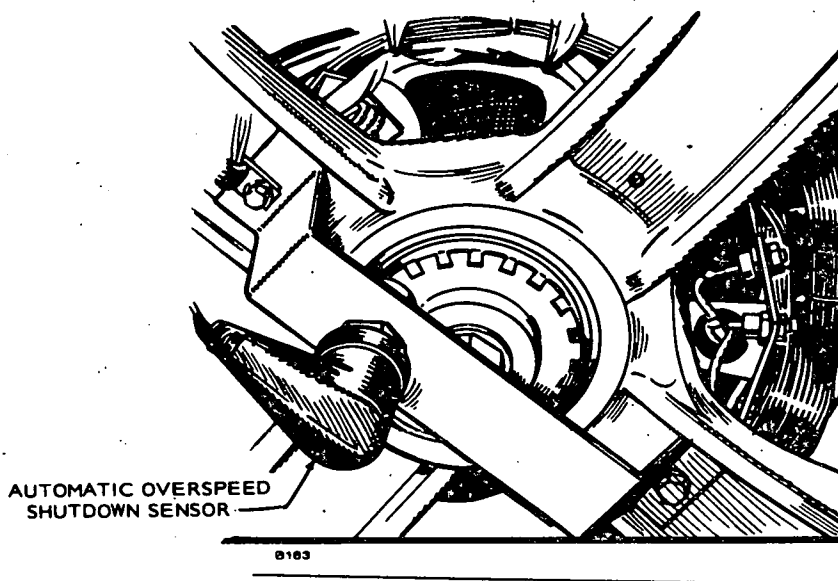


FIGURE 3. OVERSPEED SENSOR

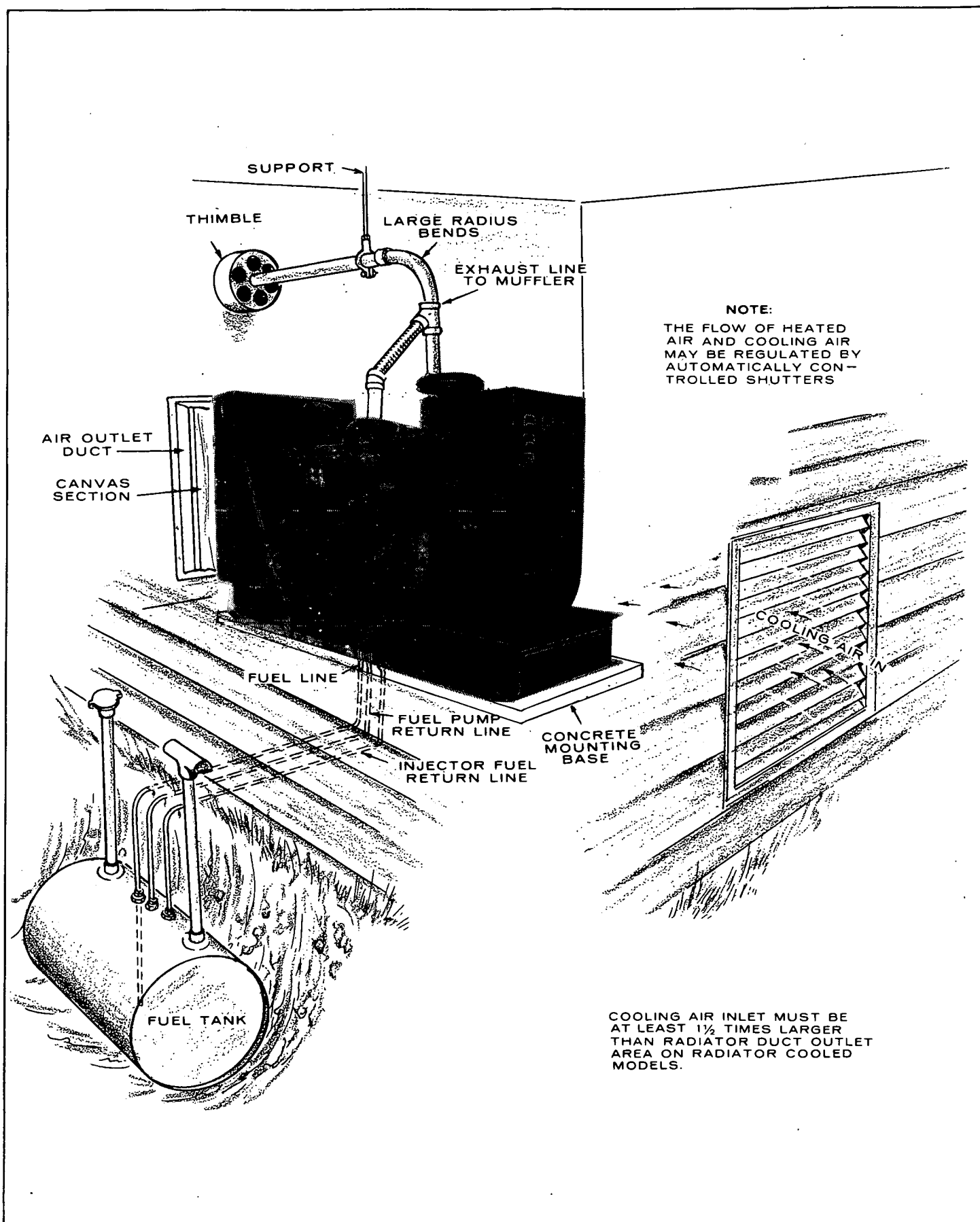


FIGURE 4. A TYPICAL STANDBY INSTALLATION

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 circulated air.
5. Discharge of exhaust gases.
6. Electrical connections.
7. Fuel connections.
8. Water connections.
9. Accessibility for operation and servicing.
10. Vibration isolation.
11. Noise levels.

LOCATION

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

MOUNTING

Generating sets are mounted on a rigid skid base which provides proper support. Install vibration isolators between skid base and foundation. For convenience in draining crankcase oil and general servicing, mount set on raised pedestals (at least 6-inches [150 mm] high). If mounting in a trailer, or for other mobile applications, bolt securely in place. Extra support for the vehicle flooring may be necessary. Bolting down is recommended for stationary installations.

VENTILATION

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

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

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

Provide a means of restricting the air flow in cold weather to keep the room or compartment temperature at a normal point. Keep in mind, however, that the engine must get adequate cooling air.

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

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

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

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

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

CITY WATER COOLING

An optional method of engine cooling, in place of the conventional radiator and fan, uses a constant pressure water supply. This is referred to as CITY WATER COOLING. There are two varieties of city water cooling; the HEAT EXCHANGER SYSTEM and STANDPIPE SYSTEM. See Figures 5 and 6.

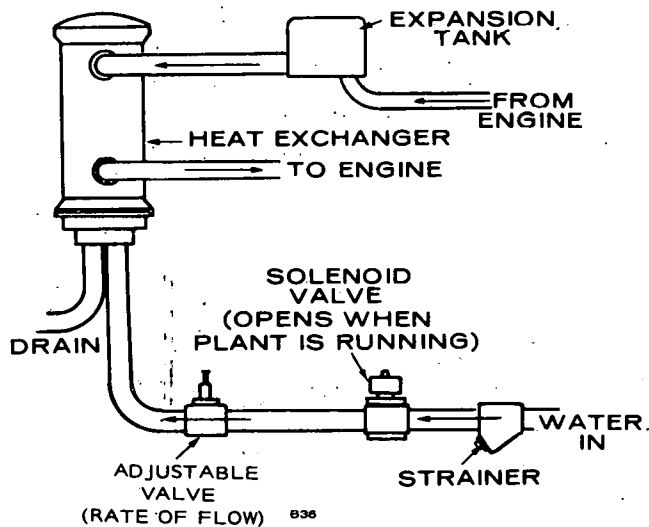


FIGURE 5. TYPICAL HEAT EXCHANGER SYSTEM

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

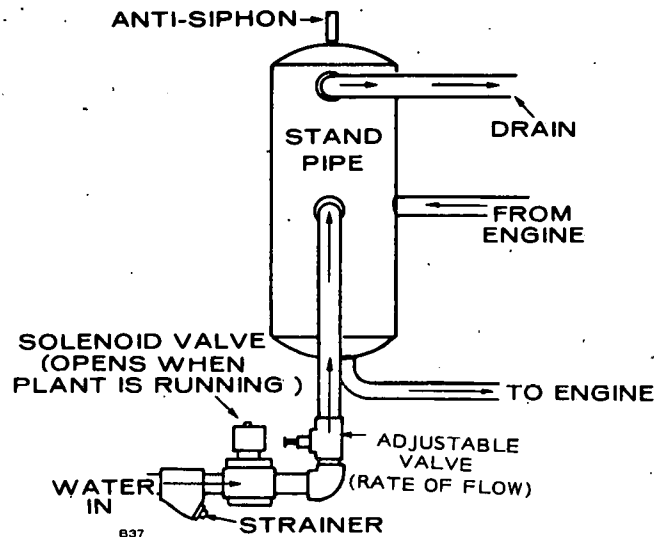


FIGURE 6. TYPICAL STANDPIPE SYSTEM

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

On both systems use flexible pipe for connecting water supply and outlet flow pipes to engine. Pipe the outlet flow to a convenient drain. Install an electric solenoid valve and a rate of flow valve in the water supply line. The electric solenoid valve opens and allows water flow through the system only when the plant operates. The rate of flow valve, either automatic or manual, provides for the proper flow rate to the engine. Adjust the flow to maintain water temperature between 165° F and 195° F (73.9° C and 90.6° C) while viewing the water temperature gauge.

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

WATER JACKET HEATER (Optional)

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

EXHAUST

WARNING

Inhalation of exhaust gases can result in death.

Engine exhaust gas must be piped outside building or enclosure. Do not terminate exhaust pipe near inlet vents or combustible materials. An approved thimble (Figure 7) must be used where exhaust pipes pass through walls or partitions. Pitch exhaust pipes downward or install a condensation trap (Figure 8) at the point where a rise in the exhaust system begins. Avoid sharp bends; use sweeping long radius elbows. Provide adequate support for mufflers and exhaust pipes. Refer to Figure 4 for a typical exhaust installation. Shield or insulate exhaust lines if there is danger of personal contact. Allow at least 9-inches (230 mm) of clearance if the pipes run close to a combustible wall or partition. Use a pipe at least as large as the 6-inch (152 mm) pipe size outlet of the engine with a flexible portion between the engine and the muffler.

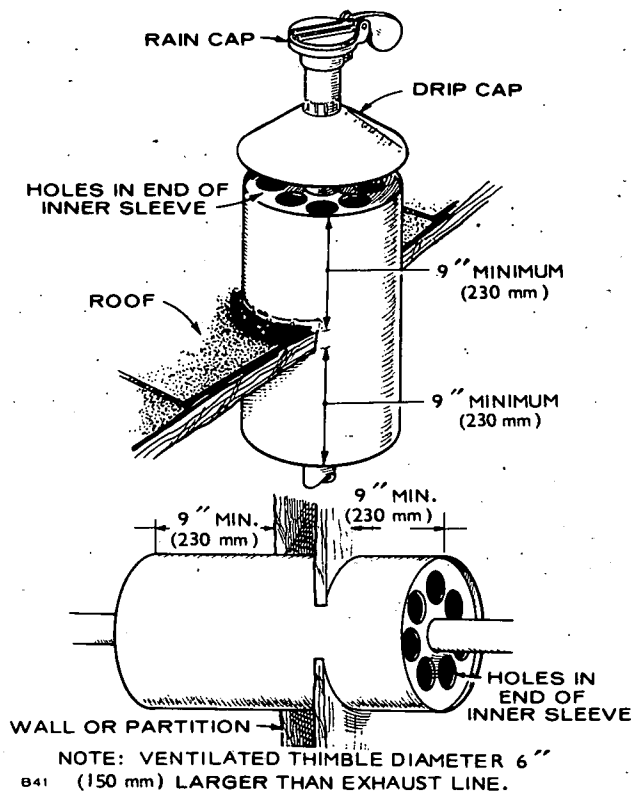


FIGURE 7. EXHAUST THIMBLE

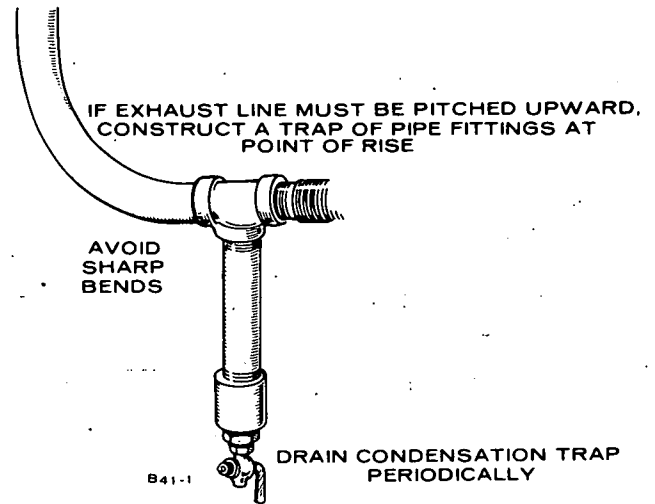


FIGURE 8. EXHAUST CONDENSATION TRAP

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

Single Exhaust system:

5-inch (127 mm) pipe	50 feet (15 m)
6-inch (152.4 mm) pipe	150 feet (46 m)
8-inch (203.2 mm) pipe	500 feet (152 m)

Maximum permissible exhaust restriction (back pressure) is 2-inches Hg. (6754 N/m²).

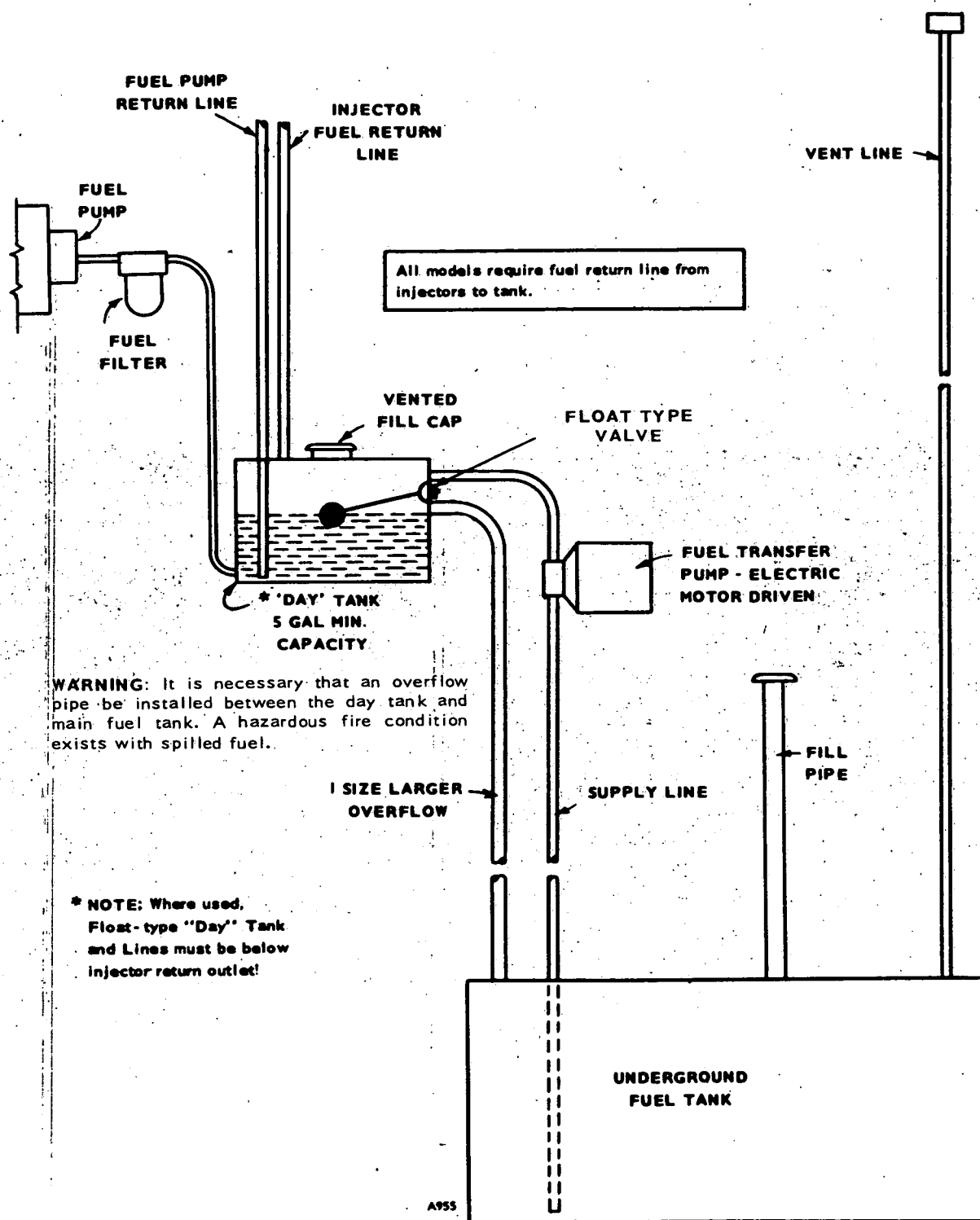


FIGURE 9. DAY TANK INSTALLATION

FUEL SYSTEM

Allis-Chalmers engines used on the DYH sets are designed for use with ASTM No. 2 Diesel fuel. They will however, operate on diesel fuels within the specifications delineated in the Allis-Chalmers engine manual.

FUEL CONNECTIONS

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

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

A fuel lift in excess of 8 feet (2.44 m) is not recommended without a day tank installation, because of fuel drainage. Horizontal run, if the supply tank is level with the fuel pump, should not exceed 25-feet (7.6 m). However, a day tank is again recommended.

The fuel inlet is to the transfer pump and is threaded for 3/8-inch pipe. Injectors' return line requires a 1/4-inch low pressure hose connection.

DAY TANK

Generator set installations may be equipped with an optional separate fuel day tank. A float operated valve controls fuel flow into the fuel tank. The correct level is maintained to assure a constant source of fuel. It is necessary to install an overflow line between the day tank and the main fuel tank. Refer to the installations included with the tank. See Figure 9 for an example of a day tank installation.

BATTERY

Starting the unit requires 24-volt battery current. Use two 12-volt (see *Specifications*) batteries for a normal installation. Connect the batteries in series (negative post of first battery to positive post of second) as in Figure 10. Necessary battery cables are on unit. Service the batteries as necessary. Infrequent unit use (as in emergency standby service) may allow the batteries to self-discharge to the point where they cannot start the unit. If installing an automatic transfer switch that has no built-in charge circuit, connect a separate trickle charger. Onan automatic transfer switches include such a battery charging circuit.

WARNING

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

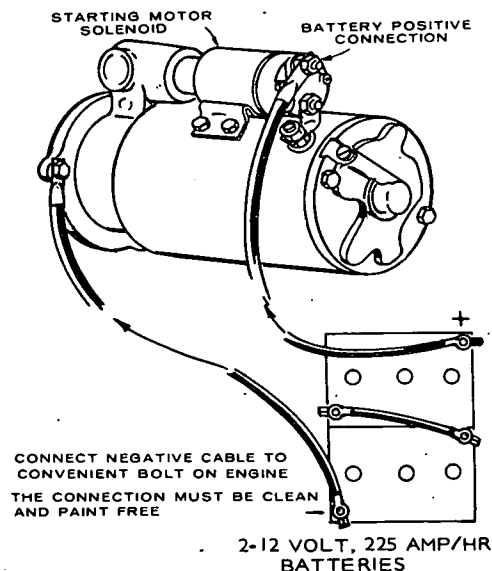


FIGURE 10. BATTERY CONNECTION

BATTERY, HOT LOCATION

Batteries will self discharge very quickly when installed where the ambient temperature is consistently above 90° F (32.2° C) such as in a boiler room. To lengthen battery life, dilute the electrolyte from its normal 1.275 specific gravity reading at full charge to a 1.225 reading. The cranking power is reduced slightly when the electrolyte is so diluted, but if the temperature is above 90° F (32.2° C), this should not be noticed. The lengthened battery life will be worth the effort.

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

REMOTE CONTROL CONNECTIONS

Provision is made for addition of remote starting. This is accomplished on a 4 place terminal block situated within the control box. Connect one or more remote switches across remote terminal and B+ terminal as shown in Figure 11. If the distance between the set and remote station is less than 1000-feet, use No. 18 AWG wire, between 1000- and 2000-feet, use No. 16AWG wire.

TERMINAL BLOCK TB12 FOR
REMOTE CONNECTIONS AND
COMMON ALARM (INSIDE CONTROL)

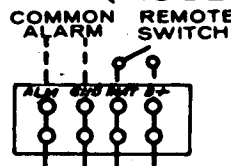
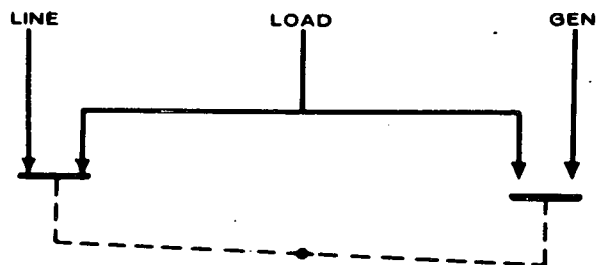


FIGURE 11. REMOTE STARTING

WIRING CONNECTIONS

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

If the installation is for standby service, a double-throw transfer switch (Figure 12) 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 12. LOAD TRANSFER SWITCH

CONTROL BOX CONNECTION

Reconnection lead W12 on TB21 is a jumper which connects a single phase output from the generator to the appropriate tap on the voltage reference transformer. This lead is connected at one end to terminal 63 on the terminal board. The other end will be connected to a terminal marked H3, H4 or H5 depending upon the voltage option required. Refer to Table 1 and Figure 15 for voltages available and correct hookup.

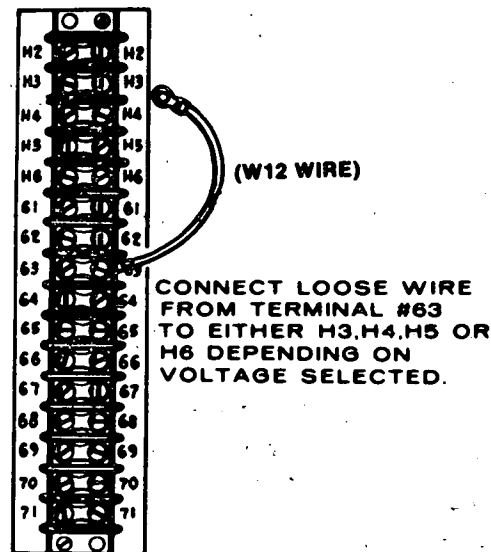


FIGURE 13. CONTROL BOX CONNECTION

GENERATOR CONNECTIONS

The model YB17 generator is a 3-phase 60-Hertz (or 50-Hertz) set which can be connected in either series wye or parallel wye configuration to give the line to neutral and line to line voltage options referred to in Table 1 and Figure 15. The line to neutral voltage is the lower voltage noted on the unit nameplate, while the line to line voltage is the higher nameplate rating. Refer to Figure 14 for an example of 120/208 voltage.

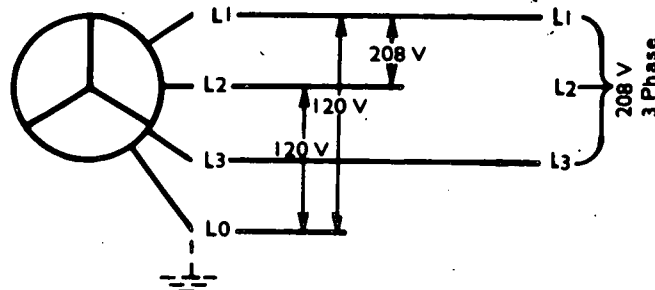
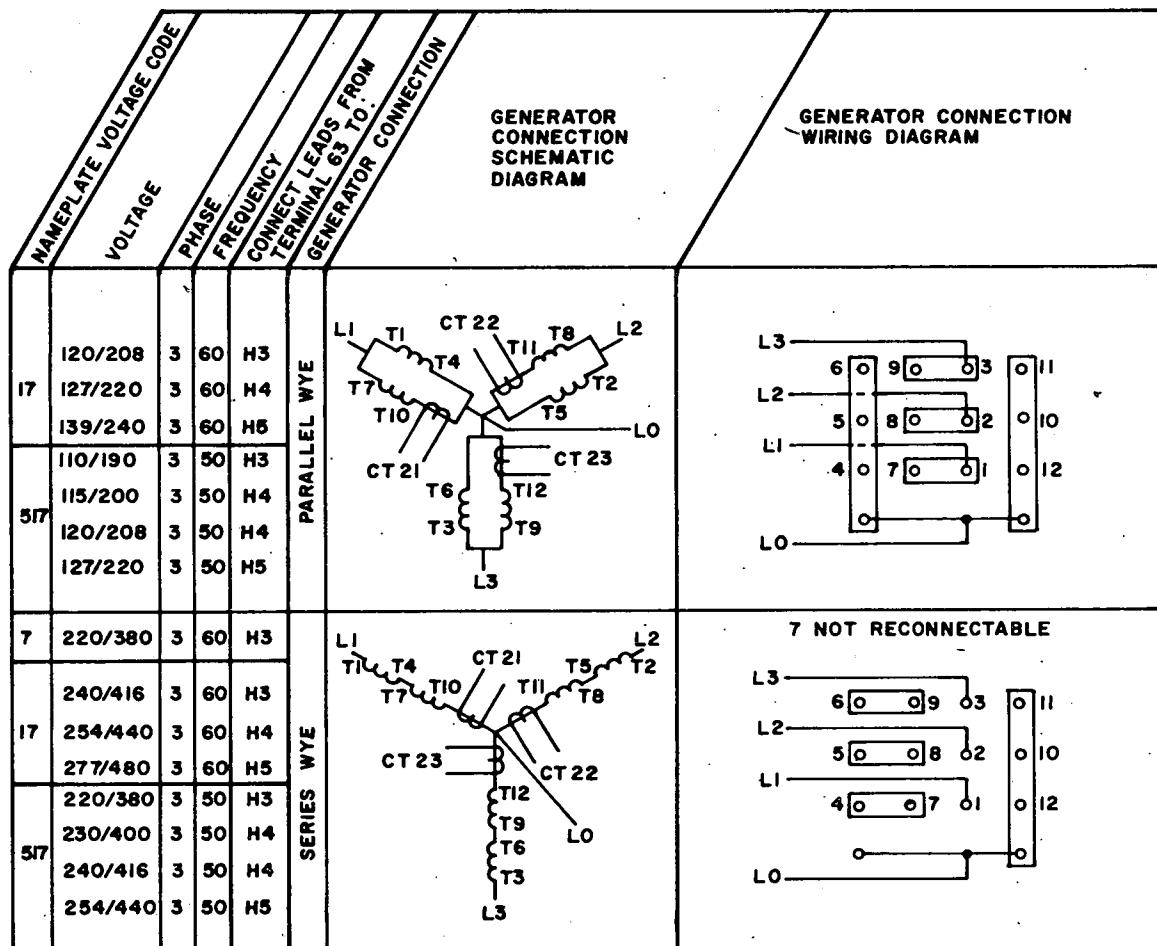


FIGURE 14. 3 PHASE WYE CONNECTION



SINGLE PHASE — NOT AVAILABLE

YB SERIES GENERATORS

98-2579(C)

FIGURE 15. VOLTAGE CONNECTIONS

For 3-phase loads connect separate load wires to each of the set terminals L1, L2 and L3 (Figure 14). For a large single phase load only, connect between terminals L1 and L2. Available capacity is 2/3 maximum output.

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

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

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

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.

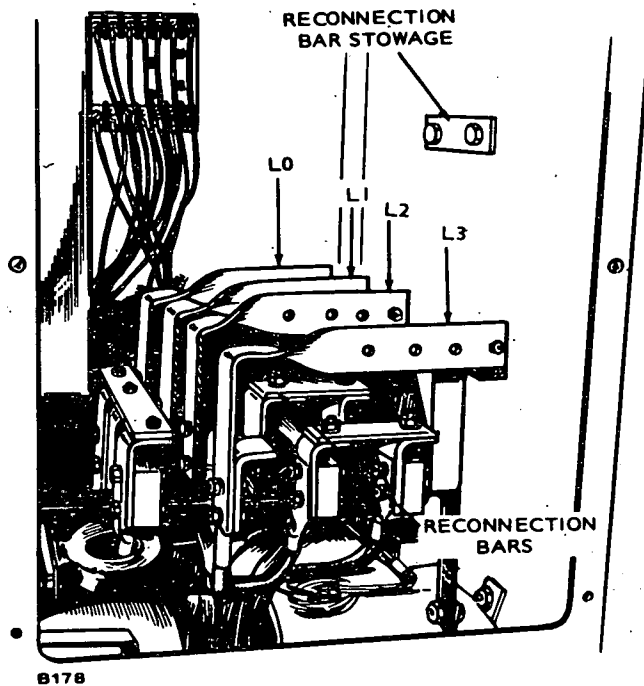


FIGURE 16. LOAD WIRE CONNECTIONS

OPERATION

GENERAL

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

PRESTART SERVICING

Lubrication System: Engine oil was drained prior to shipment. Fill engine to capacities shown. After engine has been run, check dipstick, add oil to bring level to full mark. Record total capacity for future oil changes. For all operating conditions grade CD lubricating oil is recommended for turbocharged engines. Do not mix brands nor grades of lubricating oils.

Oil Viscosity should be as follows:

AMBIENT TEMPERATURE	USE SAE VISCOSITY
0° F (-17.8° C) and below	10W
0° F to 32° F (-17.8° C to 0° C)	20-20W
Above 32° F (0° C)	30W

Oil Capacities (nominal)

Oil Pan and Filter — 60 Quarts (56.7 litres)

Oil quantity dipsticks have dual marking with high and low-level marks; static oil level on one side and engine at low speed marks on opposite side. Be sure to use proper scale.

Turbocharger: Remove oil inlet of center housing and pour 85- to 120-cc of engine lubricating oil into the turbocharger housing. Fill oil inlet line with engine lubricating oil before reconnecting. Do this prior to initial start, and before starting if the engine has not been run for 30 days or more.

Cooling System: Cooling system was drained prior to shipment. Fill cooling system before starting. Nominal capacity is 16.5-gallons (62.5 lit). 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 Allis-Chalmers engine manual for additional information.

CAUTION

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

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

WARNING

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

Fuel System: Refer to the Allis-Chalmers 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.

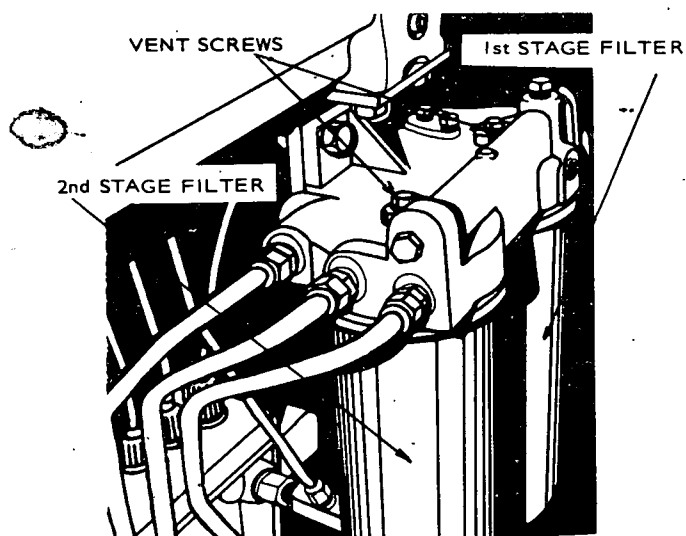


FIGURE 17. FUEL FILTERS

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

1. Loosen 2nd stage filter vent screw (Figure 17).
2. Using hand pump (Figure 18), prime system until fuel flow around filter vent screw is free of bubbles.
3. Secure vent screw and hand pump.

To bleed fuel injection pump sump refer to Figure 18. Disconnect fuel line from overflow valve and actuate hand primer. Continue pumping until fuel flow from valve is free of bubbles. Reconnect fuel line to overflow valve.

Ensure that hand primer pump is screwed in and secured before attempting to start engine.

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.

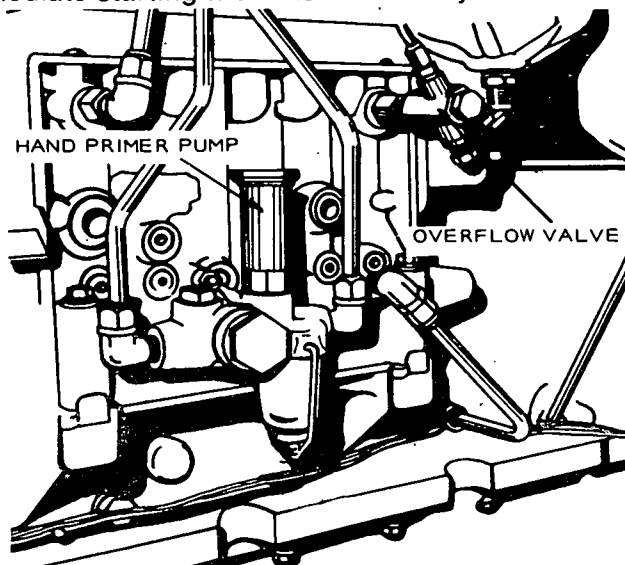


FIGURE 18. FUEL INJECTION SYSTEM

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 80F (26C). If distilled water has been added or specific gravity is less than 1.280, place batteries on charge until desired reading is reached. Do not over charge.

STARTING

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

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

To start, move the "run-stop/reset-remote" switch to the "run" position. The engine should start after a few seconds of cranking. Immediately after start, observe the oil pressure gauge. Normal oil pressure is between 30 and 55 psi (207- and 379. kPa). Check the following gauges:

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

After running 10 minutes under load the water temperature gauge should have stabilized at 180° to 195° F (82.2° - to 90.6° C). On city water cooled units an adjustable valve is connected in the water supply line. Adjust the hand wheel valve to provide a water flow that will keep the water temperature gauge reading within the range of 180° F to 200° F (82.2° - to 93.3° C).

STOPPING

To reduce and stabilize engine temperatures, run the engine at no load for three to five minutes before shutting down. This will prevent damage to the turbocharger.

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

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

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

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"> 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.

EXERCISE PERIOD

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

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

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

NO LOAD OPERATION

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

OUT-OF-SERVICE PROTECTION

Generator sets removed from service for extended periods of time should be protected from rust and corrosion. The natural lubrication qualities of ASTM No. 2 Diesel fuel should protect a diesel engine for at least 30-days when unit is not in service. To protect a unit that will be out of service over 30 days, Onan recommends the following procedure:

1. Liquid cooled units. Check coolant, top up if necessary using recommended anti-freeze.
2. Run set until thoroughly warm; generator under at least 50% load.
3. Shut down engine and drain oil base while still warm. Refill and attach a warning tag indicating viscosity of oil used.
4. Service air cleaner.
5. Clean throttle and governor linkage and protect by wrapping with a clean cloth.
6. Plug exhaust outlets to prevent entrance of moisture, bugs, dirt, etc.
7. Clean off dirt and dry entire unit. Coat parts likely to rust with a light coat of grease or oil.

8. Disconnect battery and follow standard battery storage procedure. Apply a film of non-conductive grease (e.g., vaseline) to battery cable lugs.
9. Fill fuel tank to prevent condensation contamination.
10. Provide a suitable cover for the entire unit.

RETURNING A UNIT TO SERVICE

1. Remove cover and all protective wrapping. Remove plug from exhaust outlet.
2. Check warning tag on oil base and verify that oil viscosity is still correct for existing ambient temperature.
3. Clean and check battery. Measure specific gravity (1.280 at 80° F [25° C]) and verify level to be at split ring. If specific gravity is low, charge until correct value is obtained. If level is low, add distilled water and charge until specific gravity is correct. **DO NOT OVERCHARGE.**

WARNING

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

4. Check coolant level, adjust if necessary.
5. Connect batteries.
6. Verify that no loads are connected to generator.
7. Start engine.
8. After start, apply load to at least 50% of rated capacity.
9. Check all gauges to be reading correctly. Unit is ready for service.

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.

Engine horsepower loss is approximately 3 percent for each 1000 feet (305 m) of altitude above sea level. Use lower power requirement at high altitudes to prevent smoke, over-fuelling and high temperatures.

HIGH TEMPERATURES

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

LOW TEMPERATURES

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

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

GENERAL MAINTENANCE

GENERAL

Follow a definite schedule of inspection and servicing, based on operating hours (Table 5). Keep an accurate logbook of maintenance, servicing, and operating time. Use the running time meter (optional equipment) to keep a record of operation and servicing. Service periods outlined below 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 Allis-Chalmers engine manual for details of engine service and maintenance procedures.

WARNING

Before performing 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.

ENGINE SPEED

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

A Woodward SG governor is standard equipment on the DYG generator set. High speed and low speed limit stops are set at the ONAN testing facility and normally do not require further adjustment, therefore if your set is used on continuous standby service, the governor may never need to be touched. If however the unit is used frequently, adjustment may be required due to wear of internal components. This adjustment is achieved by backing off the high speed stop screw. Screw in the low speed adjusting screw until the generator output frequency meter reads 60 Hz (generator on load). Turn in the high speed adjusting screw until it bottoms; secure the locknuts. Refer to Figure 19.

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

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

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

Engine crankcase oil flows through the governor. Dirty oil can degrade governor operation.

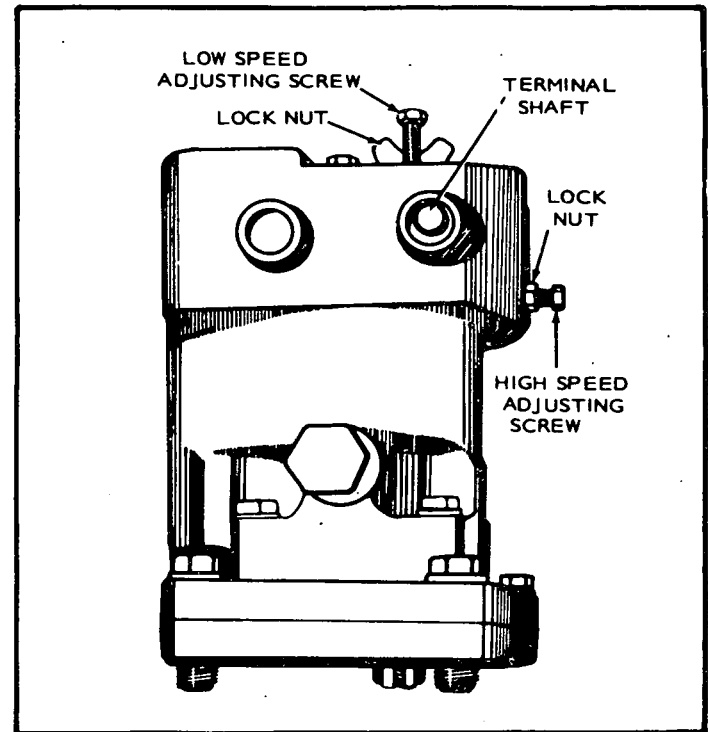


FIGURE 19. WOODWARD GOVERNOR

DUST AND DIRT

1. Keep set clean. Keep cooling system free of dirt, etc.
2. Service air cleaners frequently.
3. Store oil and fuel in dust-tight containers.
4. See engine operation and maintenance manual.

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. (3.4 N•m) or finger tight plus a quarter turn. Blow dust out of control panel.

BATTERIES

Check the condition of the starting batteries at least every two weeks. See that connections are clean and tight. A light coating of non-conductive grease will retard corrosion at terminals. Keep 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.

TABLE 5. OPERATOR MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	OPERATIONAL HOURS			
	8	50	100	200-250
Inspect Plant	x5			
Check Radiator Coolant	x			
Check Oil Level	x4			
Check Air Cleaner (Clean if Required)		x1		
Clean and Inspect Crankcase Breather			x	
Inspect Fan Belt			x2	
Check Cooling System			x3	
Clean and Inspect Battery Charging Alternator				x
Change Crankcase Oil			x1	
Replace Oil Filter Element			x1	
Check Batteries		x		

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

x2 - Or every 3 months, adjust to 1/2-inch (12 mm) depression between pulleys.

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

x4 - For accurate readings, check oil level approximately 30 minutes after shut down. Keep oil level as near "FULL" mark on dipstick as possible. See engine manual.

x5 - Check exhaust.

NOTE: The above schedule is a minimum requirement. For the recommended service periods for your engine, refer to Topic 8 of the Allis-Chalmers engine manual.


PARTS CATALOG

This catalog applies to the DYH 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 Allis-Chalmers manual. Onan parts are arranged in groups of related items and are identified by a reference. All part illustrations are typical. Using the Model and Specification from the Onan nameplate, select the parts from this catalog that apply to your set.

INSTRUCTIONS FOR ORDERING REPAIR PARTS

ONAN PARTS

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

Onan ELECTRIC GEN SET			
MODEL <input type="text"/>			
SERIAL NO. <input type="text"/>			
IMPORTANT - ALWAYS GIVE ABOVE NOS. WHEN ORDERING PARTS			
CONTINUOUS <input type="text"/>		RATING <input type="text"/>	
HERTZ - 60 RPM - 1800			
3 PHASE		1 PHASE	
KW <input type="text"/>	KVA <input type="text"/>	KW <input type="text"/>	KVA <input type="text"/>
VOLTS 120/208 127/220 139/240 120/240 240/416			
AMPS <input type="text"/>			
VOLTS 254/440 277/480 347/600 120/240			
AMPS <input type="text"/>			
BAT. <input type="text"/> VOLTS <input type="text"/>			
MANUFACTURED BY ONAN DIV. OF STUDEBAKER CORPORATION MINNEAPOLIS, MINN. 55432, U.S.A. FOR ELECT. EQUIPMENT ONLY 			
99A1C84			

ALLIS-CHALMERS PARTS

All Allis-Chalmers parts must be ordered from the Allis-Chalmers Company of Harvey, Illinois or your nearest authorized distributor. When ordering parts, refer to the Allis-Chalmers nameplate giving the complete engine model, catalog number and serial number.

ALLIS-CHALMERS HARVEY, ILLINOIS • MADE IN U.S.A.	
<input type="text"/>	<input type="text"/>
ENGINE MODEL	ENG. CATALOG NO.
ENGINE SERIAL NO.	<input type="text"/>
HT-53100	

This catalog applies to the standard Generator Sets as listed below. Parts are arranged in groups of related items. Each illustrated part is identified by a reference number corresponding to the same reference number in the parts list for that group. Parts illustrations are typical. Using the *Model* and *Spec No.* from the nameplate, select the parts from this catalog that apply to your set. Unless otherwise mentioned in the description, parts are interchangeable between models. Right and left sides are determined by facing the engine end (front) of the set.

SET DATA TABLE

MODEL AND SPEC NO.	ELECTRICAL DATA					KEY
	WATTS	VOLTS	HERTZ	WIRE	PHASE	
165.0DYH-517R/*	165,000	£	50	12	3	1
200.0DYH-17R/*	200,000	£	60	12	3	2
180.0DYH-517R/*	180,000	£	50	12	3	3
250.0DYH-17R/*	250,000	£	60	12	3	4

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

£ - These sets are reconnectible; refer to Specifications (Generator Details) for Electrical Data.

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

REPLACEMENT ENGINE

100-1248	1	Engine, Replacement (Allis-Chalmers Model 21000 MKII, Spec 4393881) Keys 1, 2
100-1478	1	Engine, Replacement (Allis-Chalmers Model 17000, Spec 4395206) - Keys 3, 4

General Description:

Includes—Complete Cylinder Block, Fuel Pump, Fuel Filter, Oil Filter, Governor, Fan Blades (pusher type), Flywheel, Water Pump, Oil Pan, Exhaust Manifold, Fan Belt and Fuel Shut-off Valve

Excludes—Alternator, Alternator Mounting Brackets, Alternator Belt, Temperature Sender, Oil Pressure Sender, Starter, Radiator and Air Cleaner

NOTE: Replacement engine is for standard Spec 1 generator sets.
For all other Specs refer to factory.

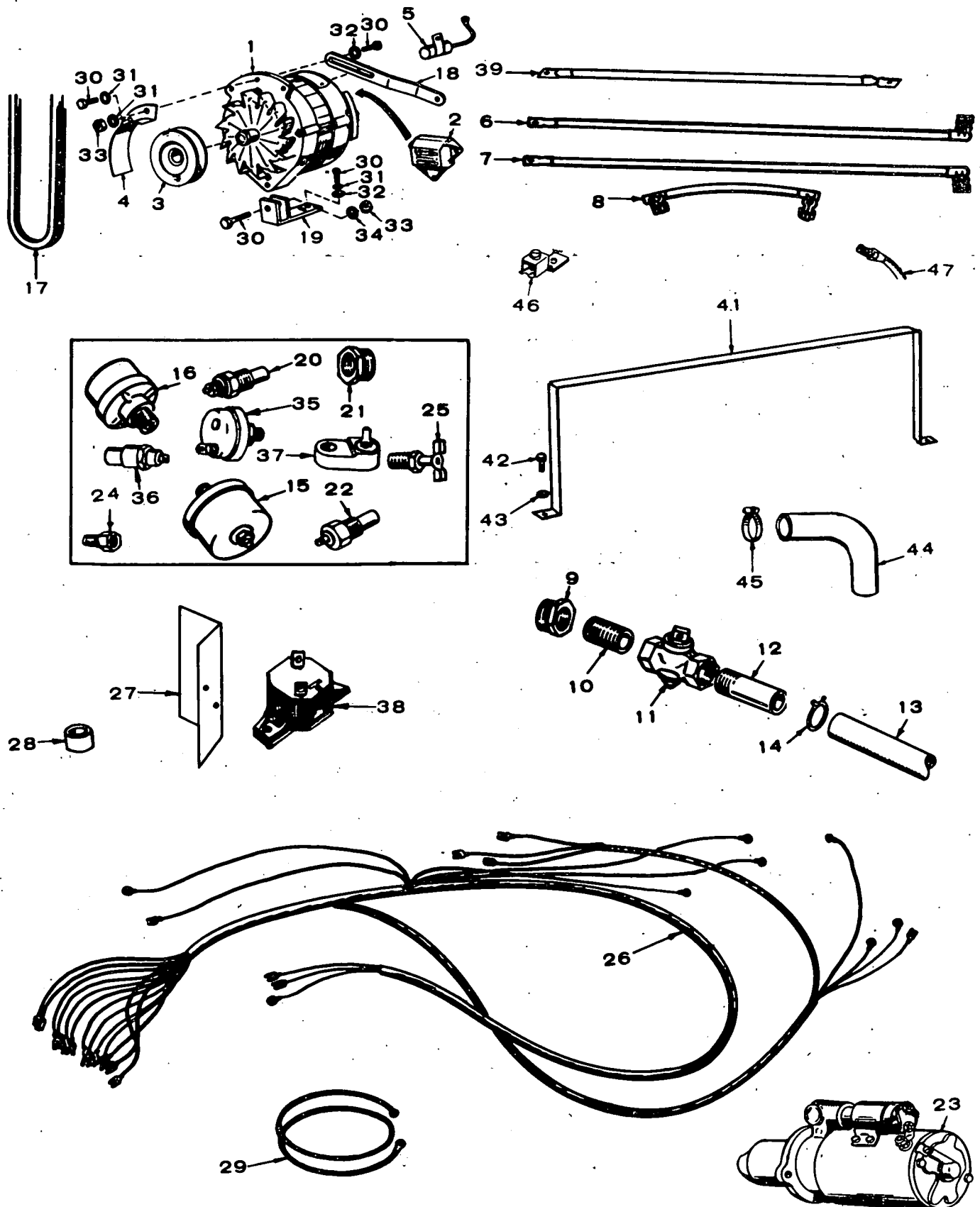
NOTICE!

ITEMS REFERENCED AS **OPTIONAL** INDICATE PART IS FACTORY INSTALLED AND MAY NOT BE APPLICABLE TO ALL MODELS. FOR FIELD CONVERSIONS, ADDITIONAL PARTS ARE USUALLY REQUIRED.

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MISCELLANEOUS ENGINE PARTS GROUP



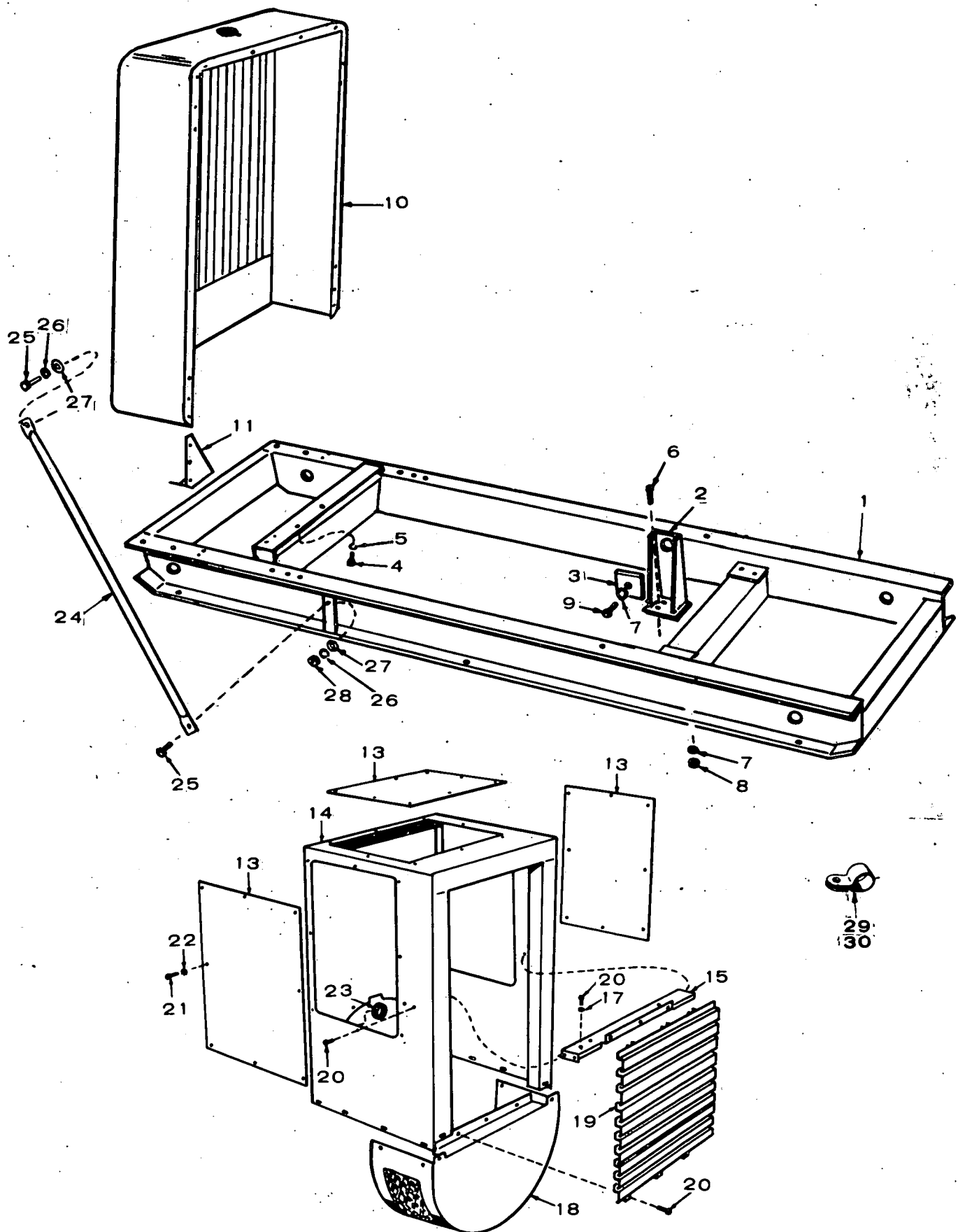
MISCELLANEOUS ENGINE PARTS GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	191-0688	1	*Alternator, Charge - Includes Regulator & Fan (Motorola #70D44039B04) <i>Wiper NG</i>	31	WASHER, LOCK - SPRING 850-0050	2	Alternator Mounting Bracket (3/8")
2	191-0733	1	Regulator, Alternator		850-0045	2	Alternator Belt Guard (5/16")
3	191-0781	1	Pulley, Alternator		850-0070	3	Starter Motor Mounting (5/8")
4	191-0725	1	Guard, Alternator Belt	32	WASHER, FLAT 526-0183	2	Alternator Mounting Bracket (3/8")
5	312-0058	1	Condenser, Alternator - .10MFD		526-0022	1	Alternator to Adjusting Bracket (5/16")
6	416-0636	1	Cable, Battery - Positive	33	NUT, HEX 862-0015	1	Alternator to Adjusting Bracket (5/16-18)
7	416-0445	1	Cable, Battery - Negative		862-0016	1	Alternator to Mounting Bracket (1/2 x 13)
8	416-0473	1	Cable, Jumper	34	850-0060	1	Washer, Lock - Alternator to Mounting Bracket (1/2")
9	505-0022	1	Bushing, Reducer (1 x 1/2")	35	309-0169	1	Switch, Oil Pressure (Pre-Alarm) - Optional
10	505-0100	1	Nipple, Close (1/2 x 1-1/8")	36	309-0179	1	Switch, High Engine Temperature (Pre-Alarm) - Optional
11	504-0011	1	Valve, Shutoff - Oil Drain	37	309-0269	1	Switch, Low Engine Temperature (Pre-Alarm) - Optional
12	505-0185	1	Nipple, Half (1/2 x 1-1/2")	38	320-0240	1	Circuit Breaker, Starter - 12.5 Amp.
13			Hose, Drain (3/4 x 1") - Order 12" of Bulk Hose #503-0098	39	416-0632	1	Cable Assembly, Starter
14	503-0197	1	Clamp, Hose	41	416-0635	2	Strap, Battery Holddown
15	193-0244	1	Sender, Oil Pressure	42	800-0035	4	Screw (5/16-18 x 2-1/2")
16	309-0169	1	Switch, Oil Pressure Cutoff	43	850-0045	4	Washer (5/16"), Lock
17	511-0092	1	Belt, Alternator	44	503-0441	1	Hose - Breather Tube
18	191-0856	1	Bracket, Alternator Adjusting	45	503-0365	1	Clamp, Hose
19	191-0858	1	Bracket, Alternator	46	332-1473	1	Lug, Solderless - Ground
20	193-0247	1	Sender, Water Temperature	47	501-0229	2	Line, Fuel - Begin Spec D
21	505-0117	1	Bushing (1/2 x 3/8"), Brass Reducer				
22	309-0178	1	Switch, High Water Temperature				
23	191-0852	1	*Motor, 24 V Starting (Delco Remy #1113892)				
24	502-0175	2	Adapter (1/8"), Pipe				
25	504-0028	1	Valve, Drain - Radiator				
26	338-0706	1	Harness, Engine				
27	309-0246	1	Shield, Heat				
28	403-0851	8	Spacer				
29	416-0632	1	Lead, Starter Ground				
30	SCREW, CAP - HEX HEAD 800-0048	2	Alternator Mounting Bracket (3/8-16 x 3/4")				
	800-0025	1	Alternator Belt Guard (5/16-18 x 5/8")				
	800-0030	1	Alternator to Adjusting Bracket (5/16-18 x 1-1/4")				
	800-0095	1	Alternator to Mounting Bracket (1/2-13 x 2-1/4")				
	800-0135	3	Starter Motor Mounting (5/8-11 x 2-1/4")				

* - For components, contact your nearest Motorola Dealer or Motorola Automotive Products, Inc. 9401 W. Grand Ave., Franklin Park, Illinois 60131.

* - For components, contact your nearest Delco Remy Dealer or Delco Remy Division of General Motors Corporation, Anderson, Indiana 46011.

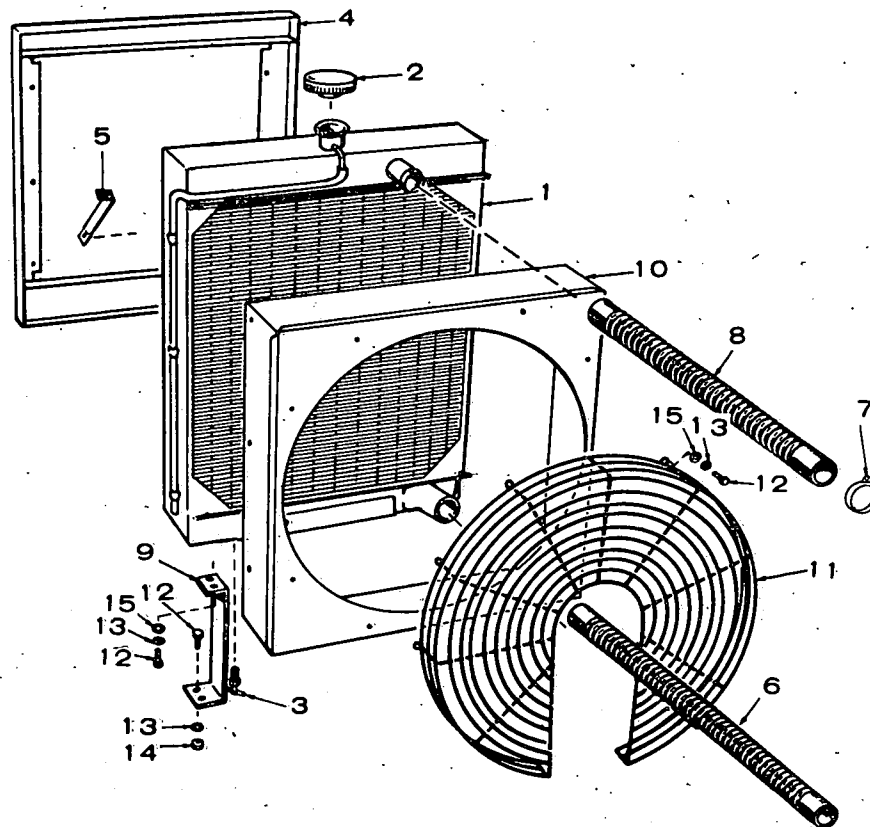
MOUNTING GROUP



MOUNTING GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	403-1025	1	Base, Skid	13	301-3731	3	Plate, Control Box
2	232-2389	2	Bracket, Generator Mounting	14	301-3605	1	Housing, Control Box
3	232-2385	2	Plate, Generator Mounting Retainer	15	301-3604	1	Shelf, Control Box Housing
4	800-0132	2	Screw (5/8-11 x 1-1/2")	17	856-0006	2	Washer (1/4"), Shakeproof EIT
5	850-0070	2	Washer (5/8"), Lock	18	234-0489	1	Cover, End Bell
6	800-0156	4	Screw (3/4-10 x 2-1/4") - Generator to Skid	19	234-0490	1	Grille, Generator Air Inlet
7	850-0079	6	Washer (3/4"), Lock	20	821-0010	9	Screw (1/4-20 x 1/2")
8	862-0020	4	Nut (3/4-10)	21	815-0241	24	Screw (1/4-20 x 1/2"), Truss Head
9	800-0153	2	Screw (3/4-10 x 1-1/2") - Retainer Plate	22	853-0013	24	Washer (1/4"), Shakeproof ET
10	405-1884	1	Panel, Front	23	508-0001	1	Grömmet, Rubber
11	405-2016	2	Bracket, Panel Mounting - Right Hand	24	405-1888	2	Brace, Radiator Support
				25	800-0050	4	Screw (3/8-16 x 1")
				26	850-0050	4	Washer (3/8"), Lock
				27	526-0013	4	Washer (3/8")
				28	862-0003	2	Nut (3/8-16)
				29	332-1402	1	Clamp, Loop
				30	332-0052	2	Clamp, Loop

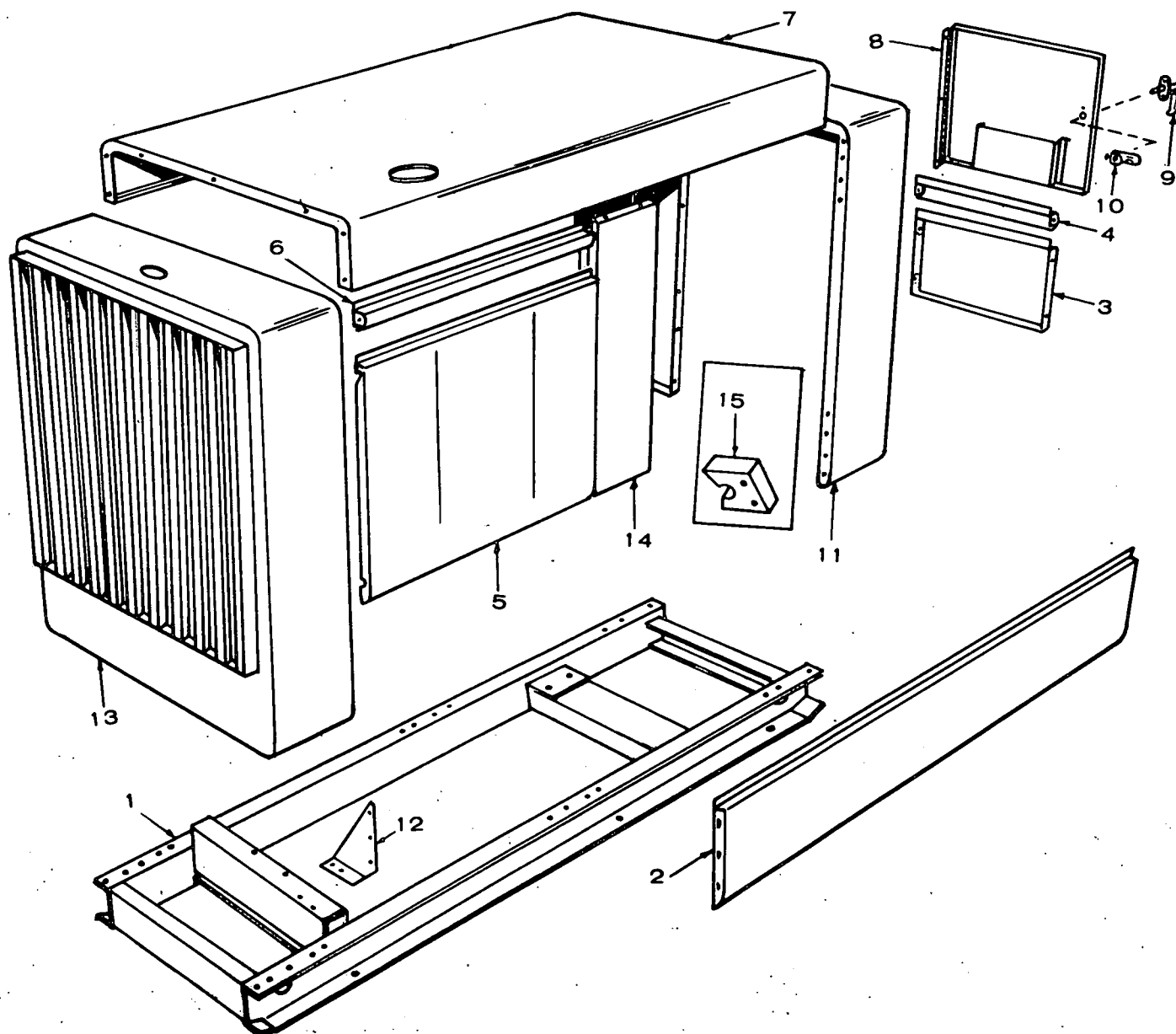
COOLING SYSTEM GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130-0836	1	Radiator
2	130-0449	1	Cap, Radiator
3	504-0028	1	Valve, Radiator Drain
4	130-0842	1	Shroud, Radiator
5	130-0848	2	Brace, Radiator Support
6	503-0615	1	Hose, Radiator - Lower
7	503-0354	4	Clamp, Hose
8	503-0616	1	Hose, Radiator - Upper
9	130-0917	2	Bracket, Radiator Support
10	130-0918	1	Shroud, Fan
11	130-0924	1	Guard, Fan
12	SCREW, HEX HEAD 800-0092	4	(1/2-13 x 1-1/2") - Support Bracket Mounting
	821-0018	8	(1/4-20 x 5/8") - Fan Guard Mounting
	821-0010	6	(1/4-20 x 1/2") - Radiator Mounting
	800-0130	4	Support Bracket to Radiator (5/8-11 x 1-1/4")

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
13	WASHER, LOCK 850-0060	4	(1/2") - Support Bracket Mounting
	850-0040	8	(1/4") - Fan Guard Mounting
	850-0070	4	Support Bracket to Radiator (5/8")
14	NUT, HEX 862-0016	4	(1/2-13) - Support Bracket Mounting
	870-0257	2	(3/4-10) - Mount Support to Vibration Mount
15	WASHER, FLAT 526-0045	8	Washer (1/4") - Fan Guard Mounting
	526-0112	4	Support Bracket to Radiator (5/8")

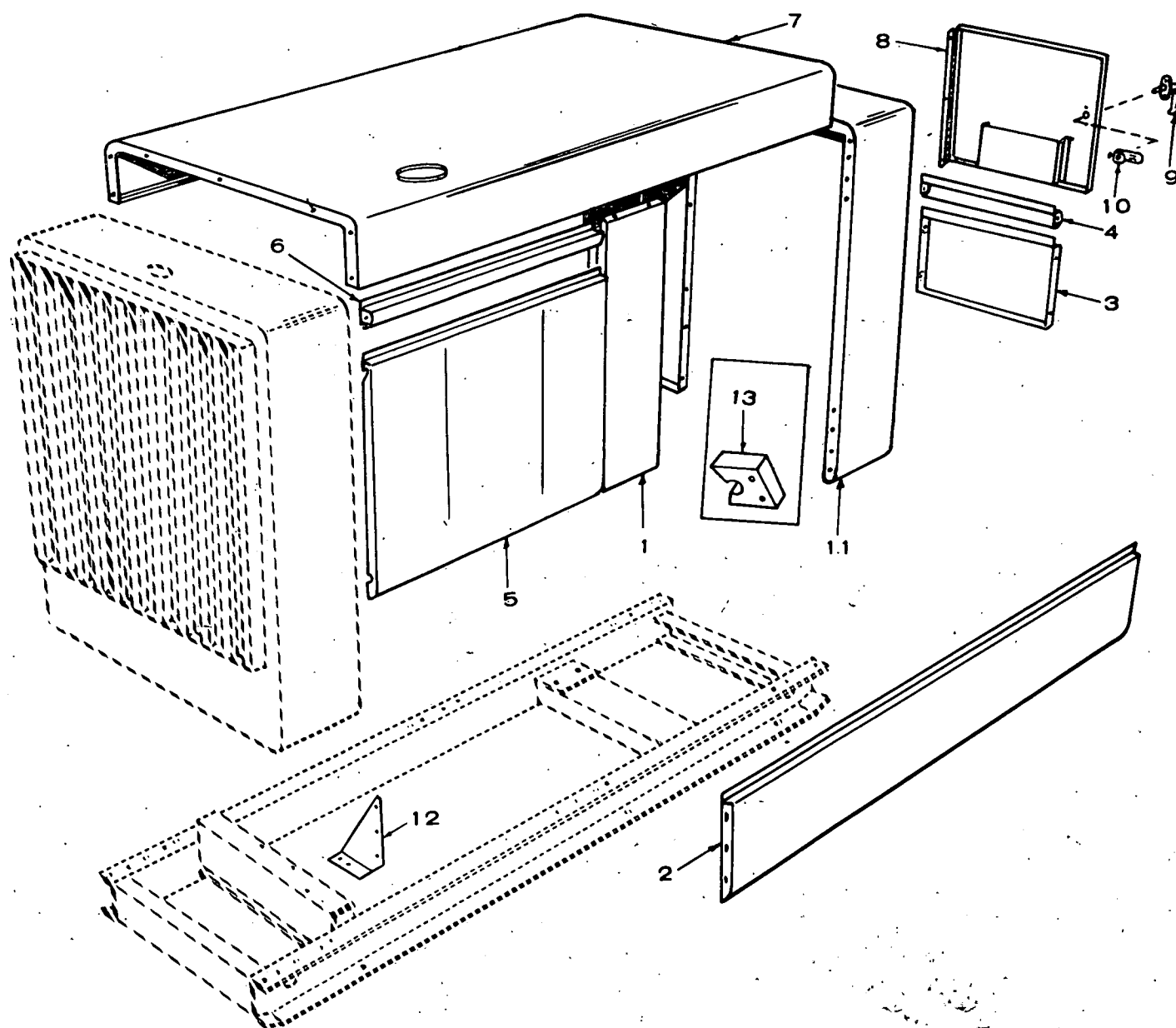
HOUSING GROUP—KEYS 1, 2 (OPTIONAL EQUIPMENT)



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	403-1025	1	Base, Skid
2	405-2015	2	Panel, Base
3	405-1856	1	Panel, Lower Rear Housing
4	405-1858	2	Panel, Rear Louver
5	405-2011	4	Door, Housing (Each Include 4 Door Clips)
6	405-2014	8	Panel, Louver
7	405-2013	1	Panel, Top
8	405-1880	1	Panel, Rear Door

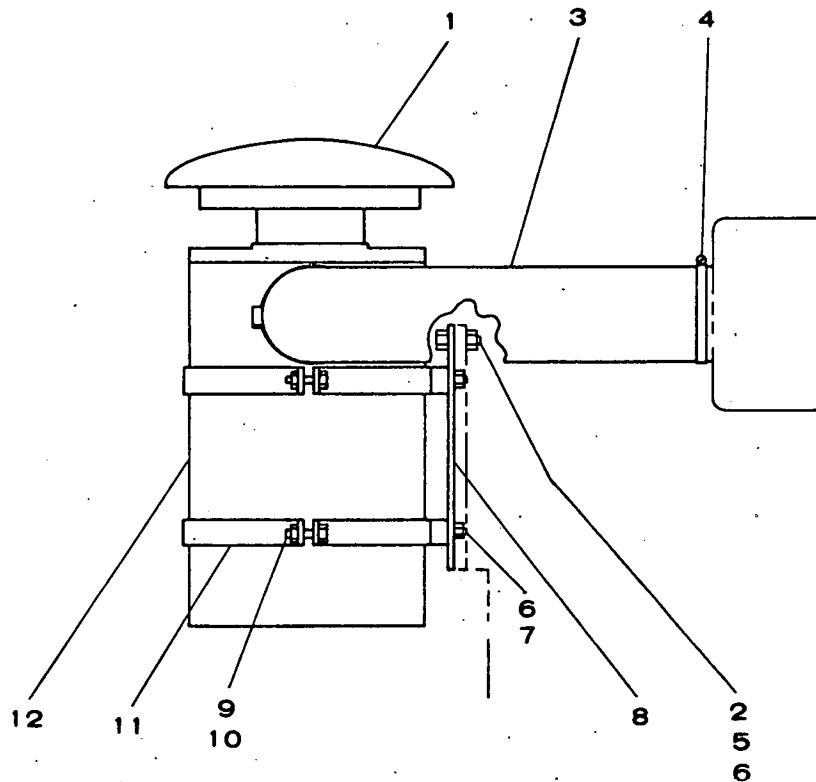
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
9	406-0157	1	Handle, Door
10	406-0089	1	Catch, Door
11	405-1883	1	Panel, Rear
12	BRACKET, PANEL MOUNTING		
	405-2016	4	Right Hand
	405-2017	4	Left Hand
13	405-1884	1	Panel, Front
14	405-1873	2	Panel, Center
15	405-1872	16	Clip, Door

HOUSING GROUP—KEYS 3, 4 (OPTIONAL EQUIPMENT)



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	405-1873	2	Panel, Center
2	405-2015	2	Panel, Base
3	405-1856	1	Panel, Lower Rear Housing
4	405-1858	2	Panel, Rear Louver
5	405-2011	4	Door, Housing (Each Include 4 Door Clips)
6	405-2014	8	Panel, Louver
7	405-2013	1	Panel, Top
8	405-1880	1	Panel, Rear Door
9	406-0157	1	Handle, Door
10	406-0089	1	Catch, Door
11	405-1883	1	Panel, Rear
12	405-2016	4	Bracket, Panel Mounting
13	405-1872	16	Clip, Door

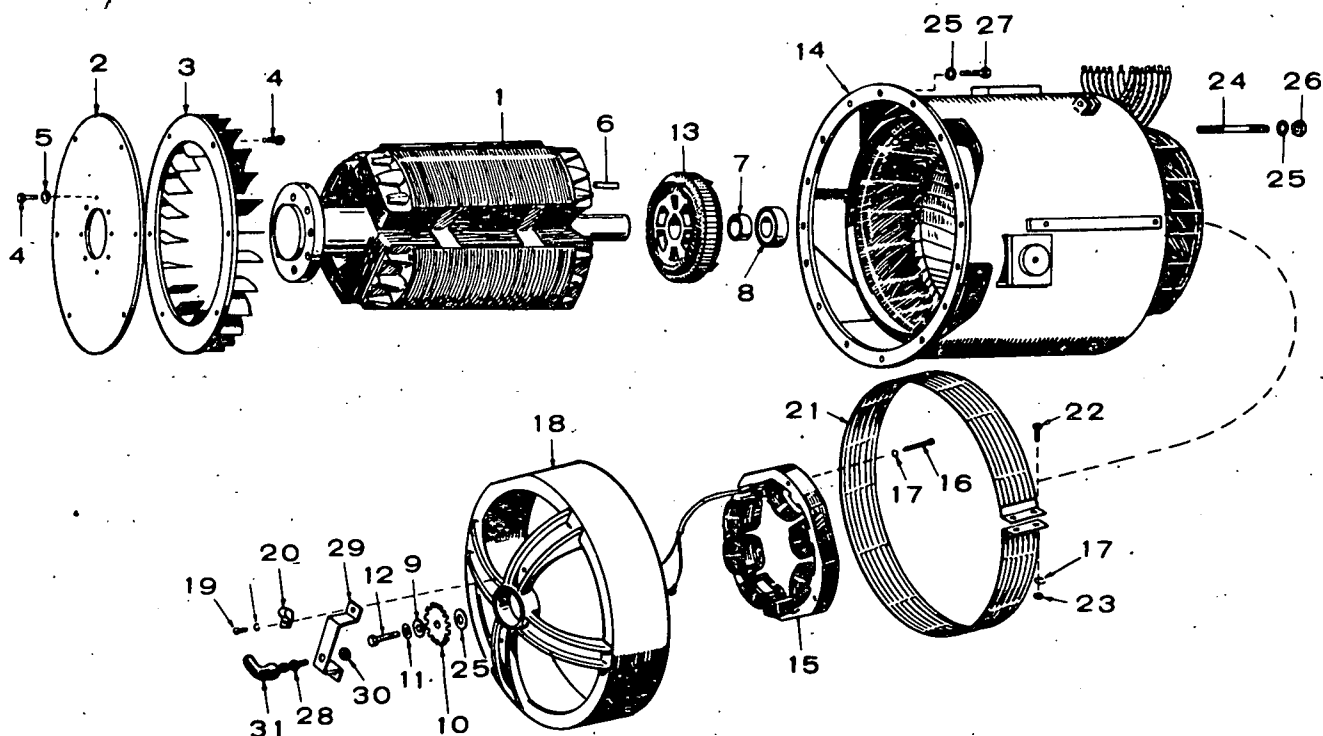
AIR CLEANER GROUP - BEGIN SPEC D



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	140-1347	1	Cap, Air Cleaner
2	526-0195	1	Washer, Flat (29/64" ID x 3-1/4" OD x 1/8" Thk)
3		1	Hose, Flexible (Order 18" of Bulk Hose Number 503-0641)
4	503-0748	2	Clamp, Hose
5	821-0030	1	Screw, Cap - Hex Head Locking (3/8-16 x 1")
6	870-0281	5	Nut, Hex - Locking (3/8-16)
7	821-0029	4	Screw, Cap - Hex Head - Locking (3/8-16 x 3/4")
8	140-1475	1	Bracket, Air Cleaner
9	800-0031	2	Screw, Cap - Hex Head (5/16-18 x 1-1/2")
10	870-0257	2	Nut, Hex - Locking (5/16-18)
11	140-1345	2	Band, Air Cleaner
12	140-1346	1	Cleaner, Air

GENERATOR GROUP

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

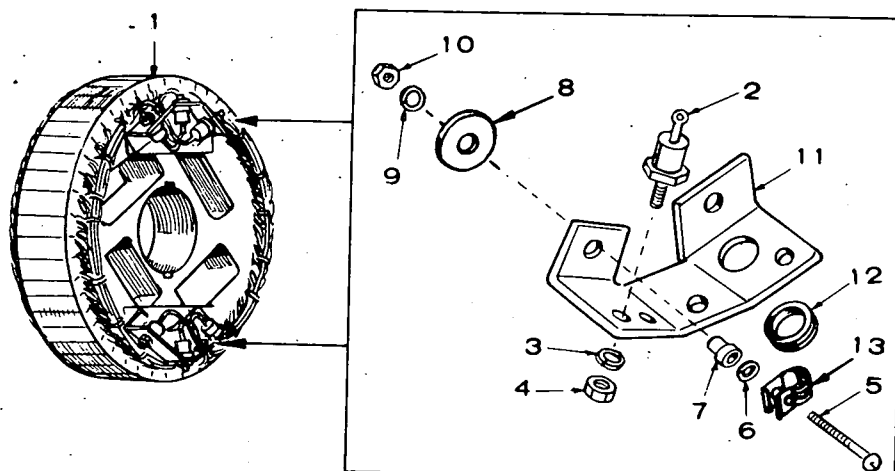


REF. NO.	PART NO.	QTY. USED	PART description
1	201-1942	1	Rotor Assembly, Wound (Includes Parts Marked *)
2	232-2580	1	*Disc, Generator
3	205-0095	1	*Fan, Generator
4	805-0035	14	*Bolt, Place (5/8-11 x 1-1/2")
5	526-0002	8	*Washer, Flat - (.156 ID x 3/8" OD x 3/64" Thk)
6	515-0145	1	*Key, Exciter Rotor
7	232-2317	1	*Spacer, Bearing
8	510-0106	1	*Bearing
9	526-0252	1	*Washer, Flat - (13/16" ID x 2-3/8" OD x 5/32" Thk)
10	150-1405	1	*Wheel, Speed Sensor
11	850-0060	1	*Washer, Lock - Spring (1/2")
12	800-0092	1	*Screw, Cap - Hex Head (1/2-13 x 1-1/2")
13	201-1902	1	*Rotor Assembly, Wound - Exciter (See Separate Group for Components)
14	220-1904	1	Stator Assembly, Wound
15	220-1920	1	Stator Assembly, Wound - Exciter

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
16	800-0009	4	Screw, Cap - Hex Head (1/4-20 x 1-1/2")
17	850-0040	12	Washer, Lock - Spring (1/4")
18	211-0214	1	Bell, End
19	800-0005	2	Screw, Cap - Hex Head (1/4-20 x 3/4")
20	332-1554	1	Clamp, Loop
21	234-0455	1	Screen, Fan
22	800-0008	2	Screw, Cap - Hex Head (1/4-20 x 1-1/4")
23	862-0001	2	Nut, Hex - (1/4-20)
24	520-0780	4	Stud, End Bell Mounting (1/2 x 6-1/2")
25	850-0060	20	Washer, Lock - Spring (1/2")
26	862-0016	4	Nut, Hex - (1/2-13)
27	800-0092	16	Screw, Cap - Hex Head (1/2-13 x 1-1/2")
28	150-1406	1	Sensor, Speed
29	150-1407	1	Bracket, Speed Sensor
30	868-0011	1	Nut, Hex - (3/4-16)
31	150-1410	1	Cap, Insulator

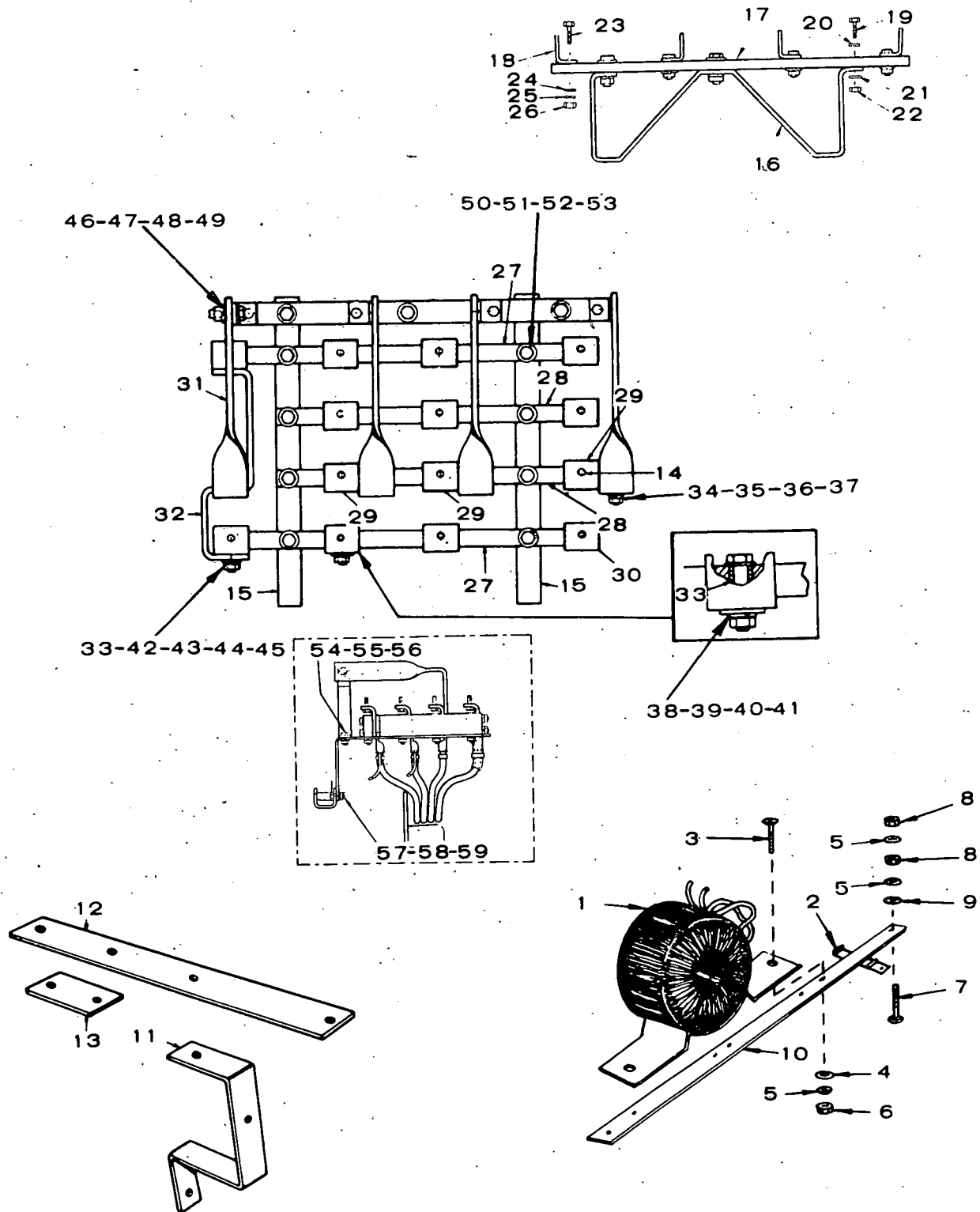
* - Parts Included in the 201-1940 Rotor Assembly.

EXCITER ROTOR GROUP



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

BUS BAR GROUP

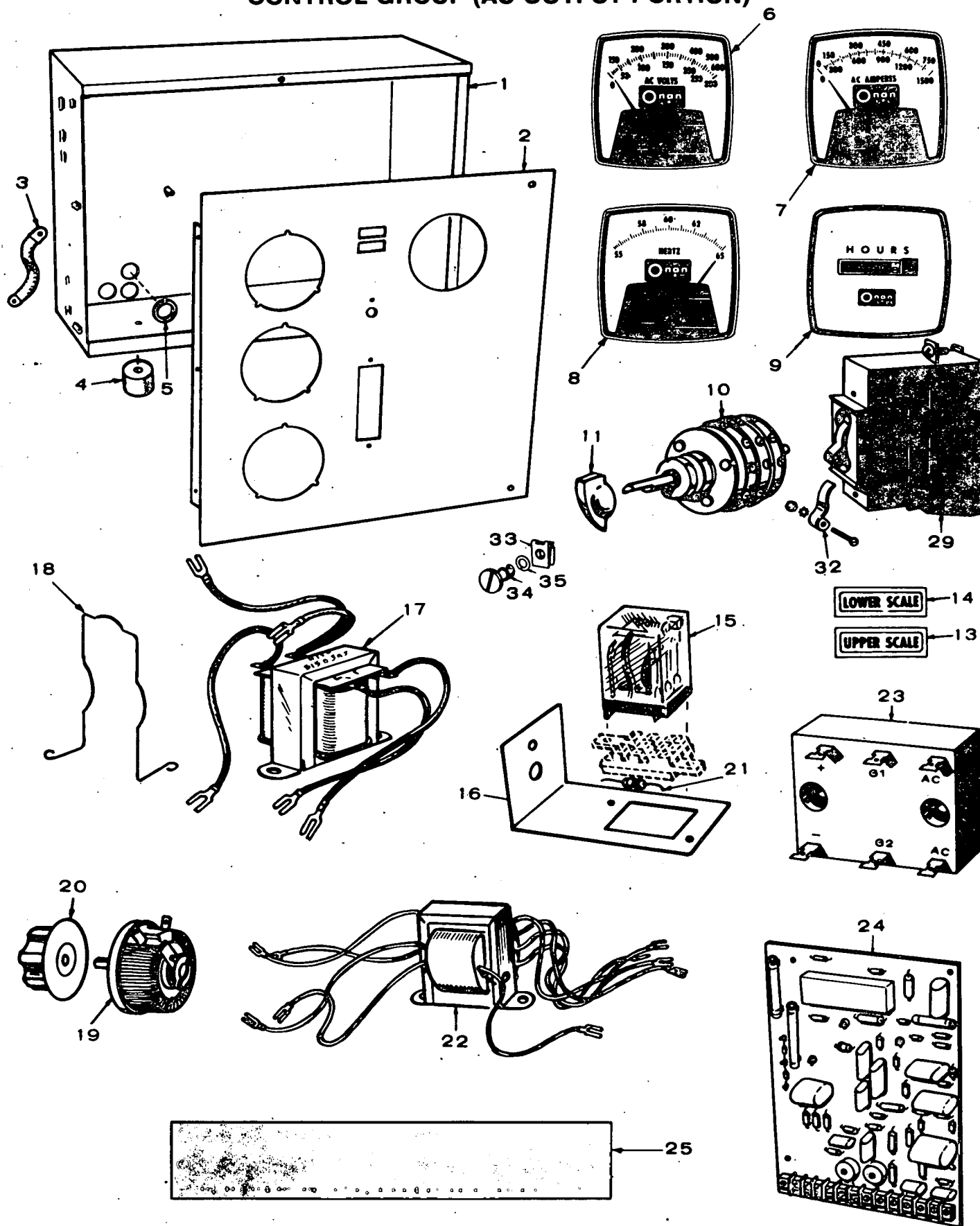


BUS BAR GROUP

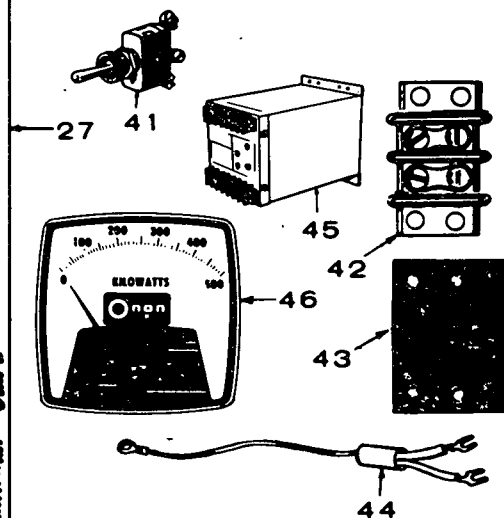
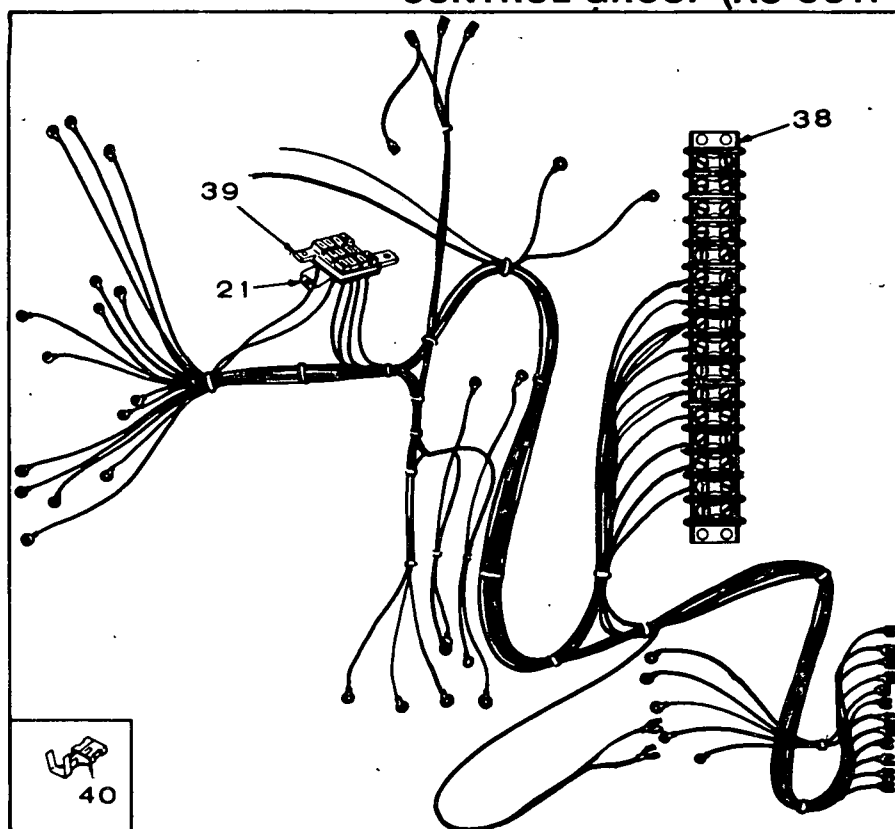
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	302-0608	3	Transformer, Current
2	232-2342	2	Bracket, Terminal Board Mtg.
3	SCREW, MACHINE - ROUND HEAD		
	TRANSFORMER MOUNTING		
	813-0100	4	#10-32 x 1/2"
	813-0103	2	#10-32 x 3/4"
4	526-0008	6	Washer, Flat - (13/64" ID x 7/16" OD x 1/32" Thk)
5	856-0003	8	Washer, Lock - EIT (#10)
6	870-0053	6	Nut, Hex - (#10-32)
7	815-0203	1	Screw, Machine - Round Head Brass (#10-32 x 7/8")
8	871-0010	2	Nut, Hex - Brass (#10-32)
9	526-0049	1	Washer, Flat - Brass (.200" ID x 7/16" OD x 1/32" Thk)
10	315-0389	1	Plate, Transformer Mounting
11	332-1402	1	Clamp
12	232-2246	2	Bar, Reconnection
13	232-2248	3	Bar, Reconnection
14	520-0142	14	Stud (5/16 x 1-1/4")
15	232-2249	2	Bracket, Terminal Board Mtg.
16	232-2237	1	Bracket, Bus Bar Support
17	232-2245	1	Board, Insulating - Bus Bar
18	232-2387	4	Bracket, Bus Bar
19	800-0051	3	Screw, Cap - Hex Head (3/8-16 x 1-1/4")
20	526-0029	3	Washer, Flat (25/64" ID x 7/8" OD x 1/16" Thk)
21	850-0050	3	Washer, Lock - Spring (3/8")
22	862-0003	3	Nut, Hex - (3/8-16)
23	800-0007	4	Screw, Cap - Hex Head (1/4-20 x 1")
24	526-0018	4	Washer, Flat (21/64 ID x 3/4 OD x 1/16" Thk)
25	850-0040	4	Washer, Lock - Spring (1/4)
26	862-0001	4	Nut, Hex - (1/4-20)
27	232-2243	2	Board, Insulating
28	232-2242	2	Board, Insulating
29	232-2343	3	Bar, Bus
30	232-2241	11	Bar, Bus

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
31	232-2240	4	Bar, Bus
32	232-2238	1	Bracket, Bus Bar
33	232-2344	32	Spacer, Terminal Connection
34	800-0028	4	Screw, Cap - Hex Head (5/16-18 x 1")
35	526-0115	8	Washer, Flat - (11/32" ID x 11/16" OD x 1/16" Thk)
36	850-0045	4	Washer, Lock - Spring (5/16")
37	862-0015	4	Nut, Hex - (5/16-18)
38	800-0032	24	Screw, Hex Cap - Steel (5/16-18 x 1-3/4")
39	526-0115	24	Washer, Flat (11/32" ID x 11/16" OD x 1/16" Thk)
40	850-0045	24	Washer, Lock - Spring (5/16")
41	862-0015	24	Nut, Hex - (5/16-18)
42	800-0033	8	Screw, Cap - Hex Head (5/16-18 x 2")
43	526-0115	16	Washer, Flat - (11/32" ID x 11/16" OD x 1/16" Thk)
44	850-0045	8	Washer, Lock - Spring (5/16")
45	862-0015	8	Nut, Hex - (5/16-18)
46	800-0051	4	Screw, Cap - Hex Head (3/8-16 x 1-1/4")
47	526-0029	8	Washer, Flat (25/64" ID x 7/8" OD x 1/16" Thk)
48	850-0050	4	Washer, Lock - Spring (3/8")
49	862-0003	4	Nut, Hex - (3/8-16)
50	800-0056	8	Screw, Cap - Hex Head (3/8-16 x 2-1/2")
51	526-0029	8	Washer, Flat - (25/64" ID x 7/8" OD x 1/16" Thk)
52	850-0050	8	Washer, Lock - Spring (3/8")
53	862-0003	4	Nut, Hex - (3/8-16 x 1")
54	800-0050	2	Screw, Cap - Hex Head (3/8-16 x 1")
55	850-0050	2	Washer, Lock - Spring (3/8")
56	862-0003	2	Nut, Hex - (3/8-16)
57	800-0050	2	Screw, Cap - Hex Head (3/8-16 x 1")
58	850-0050	2	Washer, Lock - Spring (3/8")
59	862-0003	2	Nut, Hex - (3/8-16)

CONTROL GROUP (AC OUTPUT PORTION)



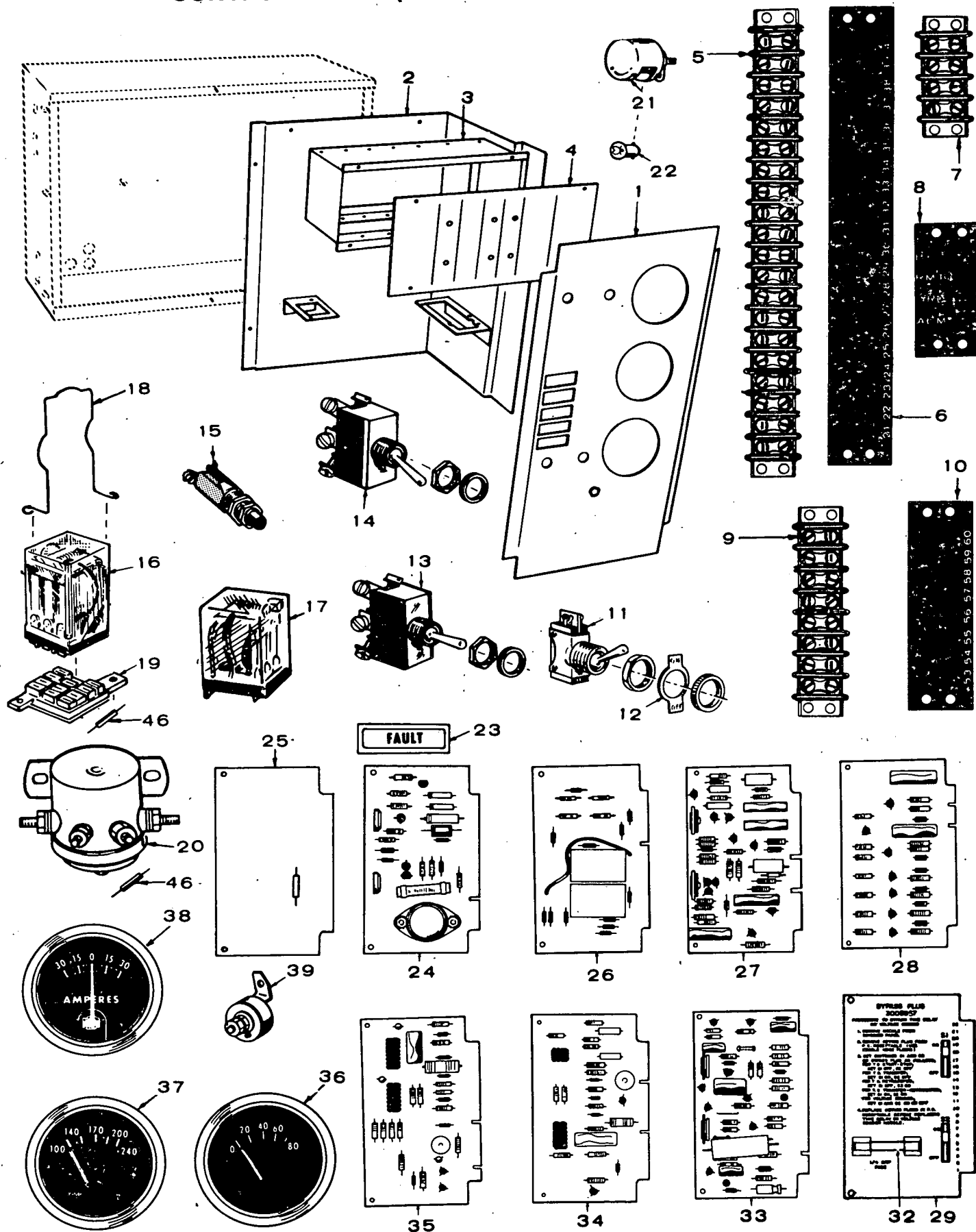
CONTROL GROUP (AC OUTPUT PORTION)



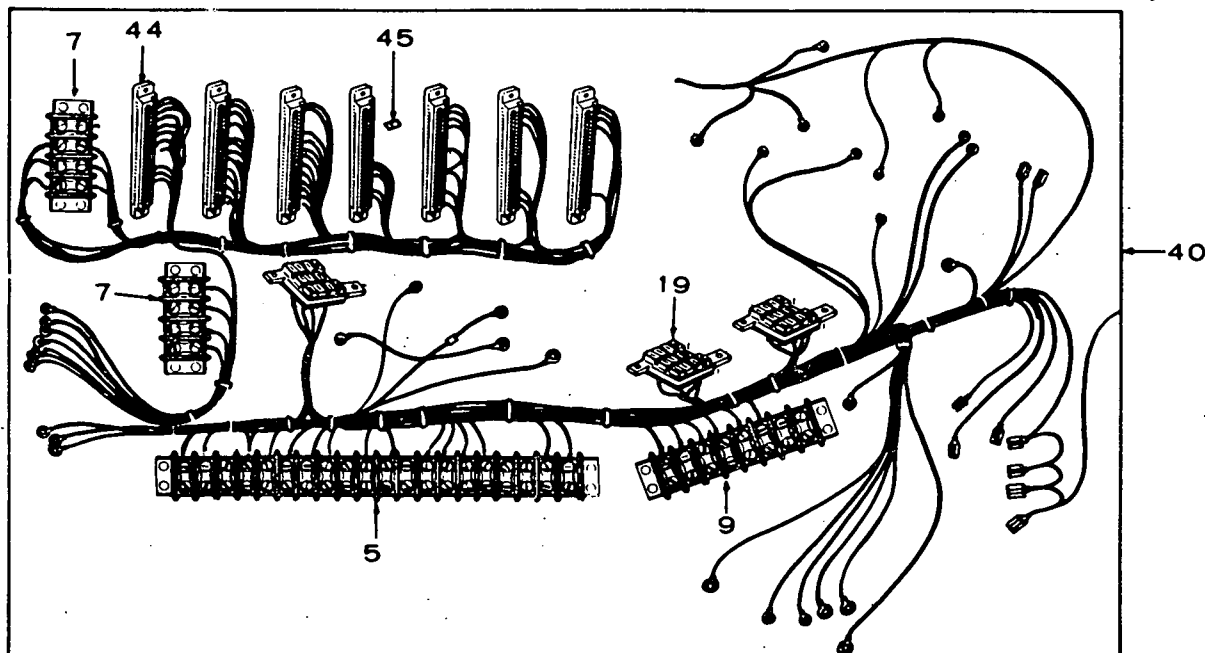
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	301-3158	1	Box, Control	23	305-0524	1	Bridge, Rectifier
2	PANEL, CONTROL BOX			24	332-1268	1	Board Assembly, Printed Circuit
	301-3170	1	Standard Units	25	332-1242	1	Voltage Regulator
	301-3312	1	Units With Wattmeter	27	338-0730	1	Strip, Marker (H2-H6, 61-71)
3	337-0049	1	Strap, Bond				Harness, Wiring - AC Control
4	402-0070	4	Dampener, Vibration				(Includes Parts Marked *)
5	508-0001	4	Grommet (1-1/16"), Rubber	29	320-0455	1	Circuit Breaker (3 Amp)
6	302-0718	1	Voltmeter, AC - Dual Scale	32	320-0307	1	Lock, Circuit Breaker Handle
			0-300, 0-600				(Penn State Models) -
7	302-0877	1	Ammeter, AC - Dual Scale				Optional
			0-400, 0-800	33	406-0332	2	Receptacle, Fastener
8	METER, FREQUENCY			34	406-0333	2	Stud, Fastener
	302-0810	1	60 Hertz	35	406-0334	2	Washer, Stud Fastener
	302-0894	1	50 Hertz	36	332-0050	1	Clip, Tinnerman
9	METER, RUNNING TIME			38	332-0795	1	*Block, Terminal - 16 Place
	302-0466	1	60 Hertz	39	323-0764	1	*Socket, Relay
	302-0469	1	50 Hertz	40	332-1280	1	*Terminal, Crimp
10	308-0284	1	Switch, Voltage & Ammeter	41	308-0154	1	Switch, Governor Control -
11	303-0076	1	Knob				Optional (Used With
13	322-0131	1	Light, Upper Scale				Motorized Governor)
14	322-0130	1	Light, Lower Scale	42	332-0609	1	Block, Terminal (2 Place) -
15	307-1061	1	Relay, Voltage Selector				Optional (Motorized Governor)
16	301-3244	1	Bracket, Relay Mounting	43	332-0610	1	Strip, Marker (2 Place) -
17	315-0384	1	Reactor Assembly, Comm				Optional
18	307-1157	1	Spring, Relay Holddown	44	357-0019	1	Diode Assembly - Optional
19	303-0170	1	Rheostat, Voltage Adj.				(Used With Motorized Governor)
20	303-0032	1	Knob, Rheostat	45	302-0921	1	Transducer, Watt - Optional
21	350-0556	1	*Resistor	46	302-0926	1	Wattmeter, AC (Scale
22	315-0342	1	Transformer, Voltage				Reads 0-300)

* - Included in Wiring Harness Assembly.

CONTROL GROUP (ENGINE INSTRUMENTS PORTION)



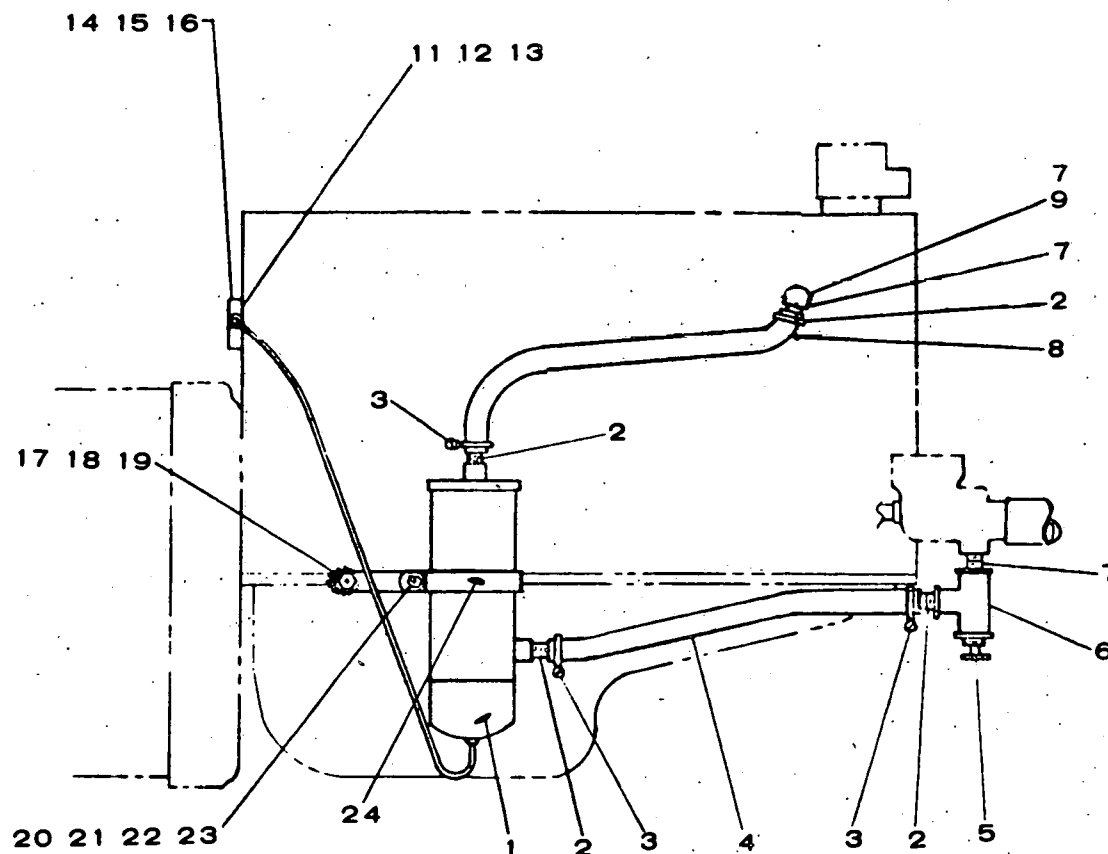
CONTROL GROUP (ENGINE INSTRUMENTS PORTION)



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PANEL, ENGINE CONTROL						
	301-3661	1	Sets With One Fault Light		322-0120	1	Low Oil Pressure (Opt.)
	301-3629	1	Sets With Five Fault Lights		322-0121	1	High Engine Temperature (Optional)
2	301-3621	1	Bracket, Engine Control		322-0122	1	Low Engine Temperature (Optional)
3	301-3588	1	Rack, Module	24	300-0956	1	Control, Cycle Cranker (Optional)
4	301-3635	1	Cover Assembly, Rack	25	300-0977	1	Control, Standard Cranker
5	332-1005	1	*Block, Terminal - 20 Place	26	300-0954	1	Control, Engine Shutdown -
6	332-1559	1	Strip, Terminal Block Marker (21-40)	27	300-0953	1	Control, Engine Monitor
7	332-0537	2	*Block, Terminal - 4 Place	28	300-0955	1	Control, Remote Indicator -
8	STRIP, TERMINAL BLOCK MARKER (4-Place)						Sets With Five Fault Lights
	332-1239	1	B+, Remote, Ground, Alarm	29	300-0987	1	Module, Bypass Plug
	332-1561	1	1-4	32	321-0168	1	Fuse, 1/4 Amp (Part of 300-0987 Module)
9	332-0699	1	*Block, Terminal - 8 Place - Set With Five Fault Lights	33	300-0973	1	Module, Time Delay Start-Stop (Optional)
10	332-1560	1	Strip, Terminal Block Marker (53-60) - Sets With Five Fault Lights	34	300-0957	1	Control, Overspeed Sensor
11	308-0002	1	Switch, Panel Light	35	300-0958	1	Control, Starter Disconnect -
12	308-0003	1	Plate, On-Off Switch	36	193-0107	1	Gauge, Oil Pressure
13	SWITCH, SELECTOR			37	193-0106	1	Gauge, Water Temperature
	308-0220	1	Standard Control	38	302-0061	1	Ammeter, Charge (30-0-30)
	308-0347	1	Penn State Models (Optional)	39	193-0189	2	Resistor, Gauge (1) Start Solenoid (1) Start Disconnect Relay
14	308-0337	1	Switch, Lamp Test	40	Harness, Wiring (Includes Parts Marked *)		
15	308-0091	1	Switch, Reset		338-0715	1	Sets With One Fault Light
16	307-1056	2	Relay (1) Start Disconnect (1) Ignition		338-0705	1	Sets With Five Fault Lights
17	307-1061	1	Relay, Starter Protection	44	332-1271	6	*Housing, Printed Circuit Board Terminal (Seven on Sets With Five Fault Lights)
18	307-1157	3	Spring, Relay Holddown	45	332-1276	As Req.	*Plug, Keying
19	323-0765	3	*Socket, Relay - 11 Place	46	357-0004	2	*Rectifier, Diode
20	307-0061	1	Relay, Start Solenoid	48	323-0814	12	Guide, Printed Circuit Board (14 Used on Sets with Five Fault Lights)
21	322-0149	1	Holder, Lamp				
22	322-0017	1	Lamp, Panel				
23	LAMP, FAULT						
	322-0129	1	Standard				
	322-0119	1	Overcrank (Optional)				
	322-0123	1	Overspeed (Optional)				

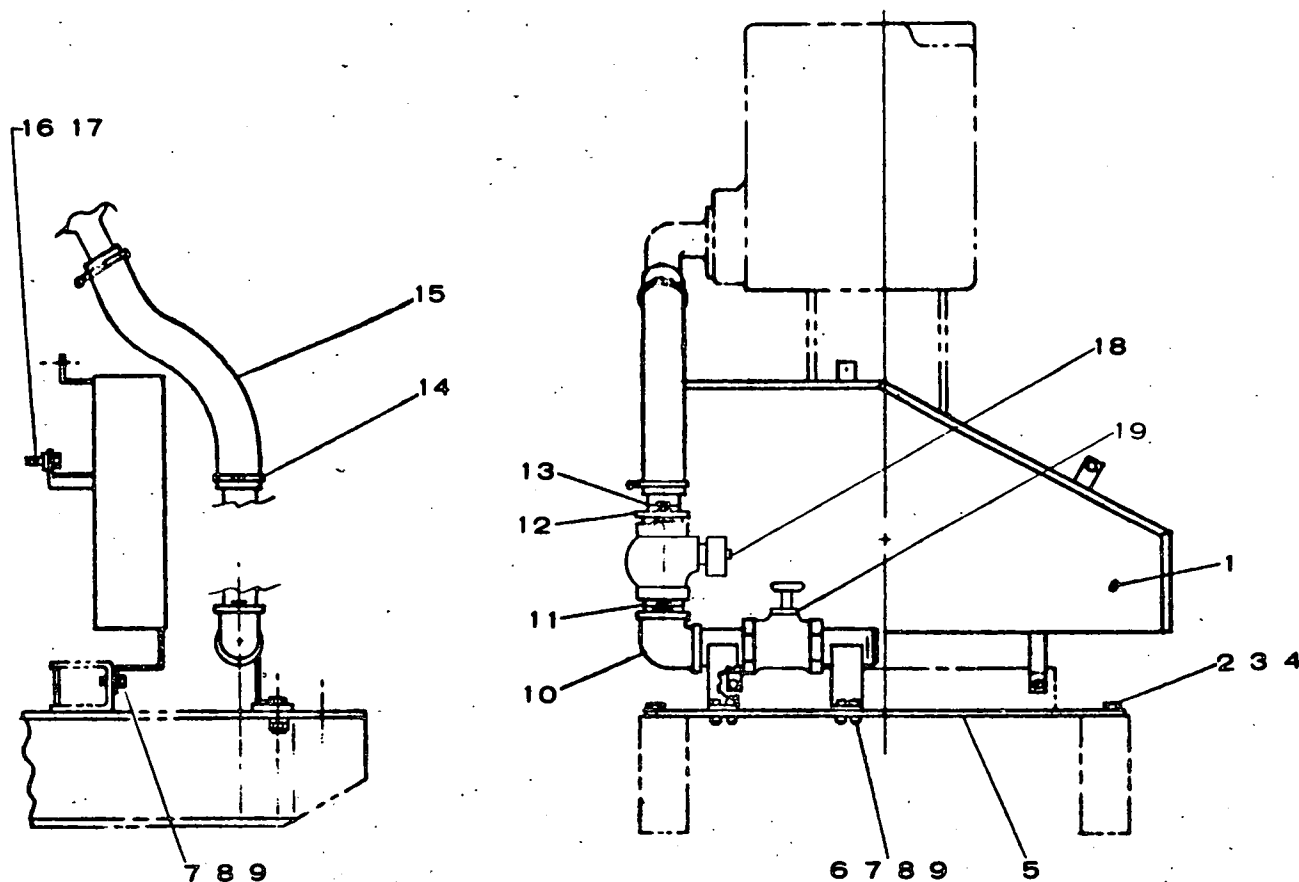
* - Included in Wiring Harness Assembly.

WATER JACKET HEATER INSTALLATION - 120 VOLT



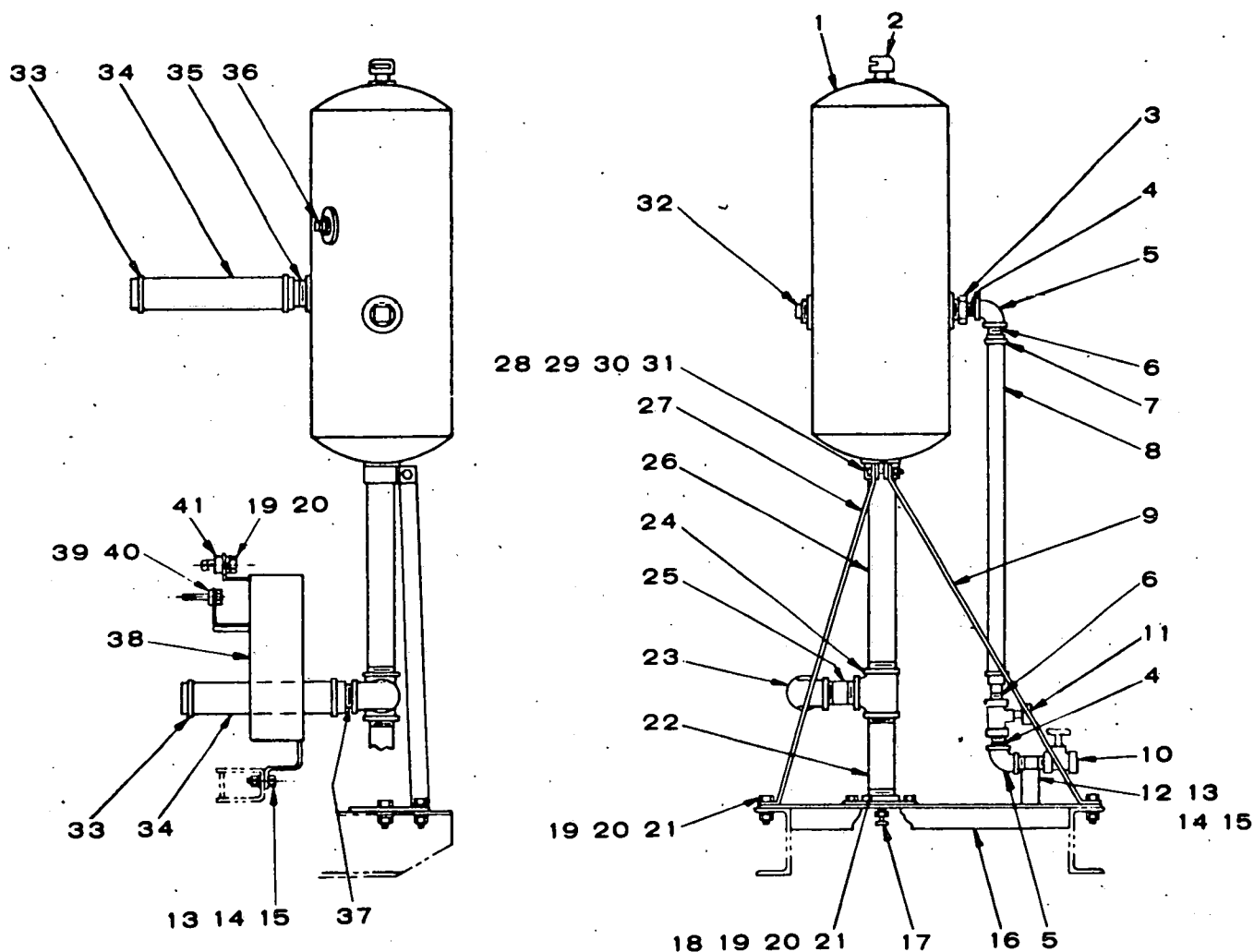
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	333-0053	1	Heater (2000 Watt, 120-Volt)
2	505-0135	4	Nipple (3/8 x 1-1/2"), Half
3	503-0183	4	Clamp, Hose
4		1	Hose (Order 7" of Bulk Hose #503-0386)
5	504-0028	1	Cock (3/8"), Drain
6	505-0060	1	Tee (3/8"), Pipe
7	505-0101	2	Nipple (3/8 x 1"), Close
8		1	Hose (Order 17" of Bulk Hose #503-0386)
9	505-0039	1	Elbow (3/8 x 90°), Pipe
11	520-0446	2	Stud
12	850-0030	2	Washer (#10), Lock
13	870-0053	2	Nut (10-32)
14	309-0106	1	Thermostat
15	333-0012	1	Box, Thermostat
16	333-0013	1	Cover, Thermostat Box
17	856-0013	1	Washer (1/2"), Shakeproof EIT
18	850-0060	1	Washer (1/2"), Lock
19	800-0091	1	Screw (1/2-13 x 1-1/2")
20	800-0031	1	Screw (5/16-18 x 1-1/2")
21	526-0115	2	Washer (5/16")
22	856-0008	2	Washer (5/16"), Shakeproof
23	862-0015	1	Nut (5/16-18)
24	130-0755	1	Bracket

REGULATOR & SOLENOID INSTALLATION



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	191-0878	1	Guard, Belt
2	800-0092	2	Screw (1/2-13 x 1-1/2")
3	850-0060	2	Washer (1/2"), Lock
4	862-0005	2	Nut (1/2-13)
5	130-0926	1	Plate, Solenoid and Regulator Mounting
6	130-0801	2	Bracket and Nipple Assembly
7	800-0007	6	Screw (1/4-20 x 1")
8	850-0040	6	Washer (1/4"), Lock
9	862-0001	6	Nut (1/4-20)
10	505-0175	1	Elbow (2" x 90°), Pipe
11	505-0172	1	Nipple (2 x 2"), Close
12	505-0187	1	Bushing (2 x 1-1/2"), Reducer
13	505-0385	1	Nipple (1-1/2 x 2"), Half
14	503-0365	2	Clamp, Hose
15	503-0635	1	Hose, Radiator
16	526-0030	1	Washer (3/8"), Flat
17	800-0058	1	Screw (3/8-16 x 3")
18	307-0844	1	Valve, Solenoid
19	504-0057	1	Valve, Gate

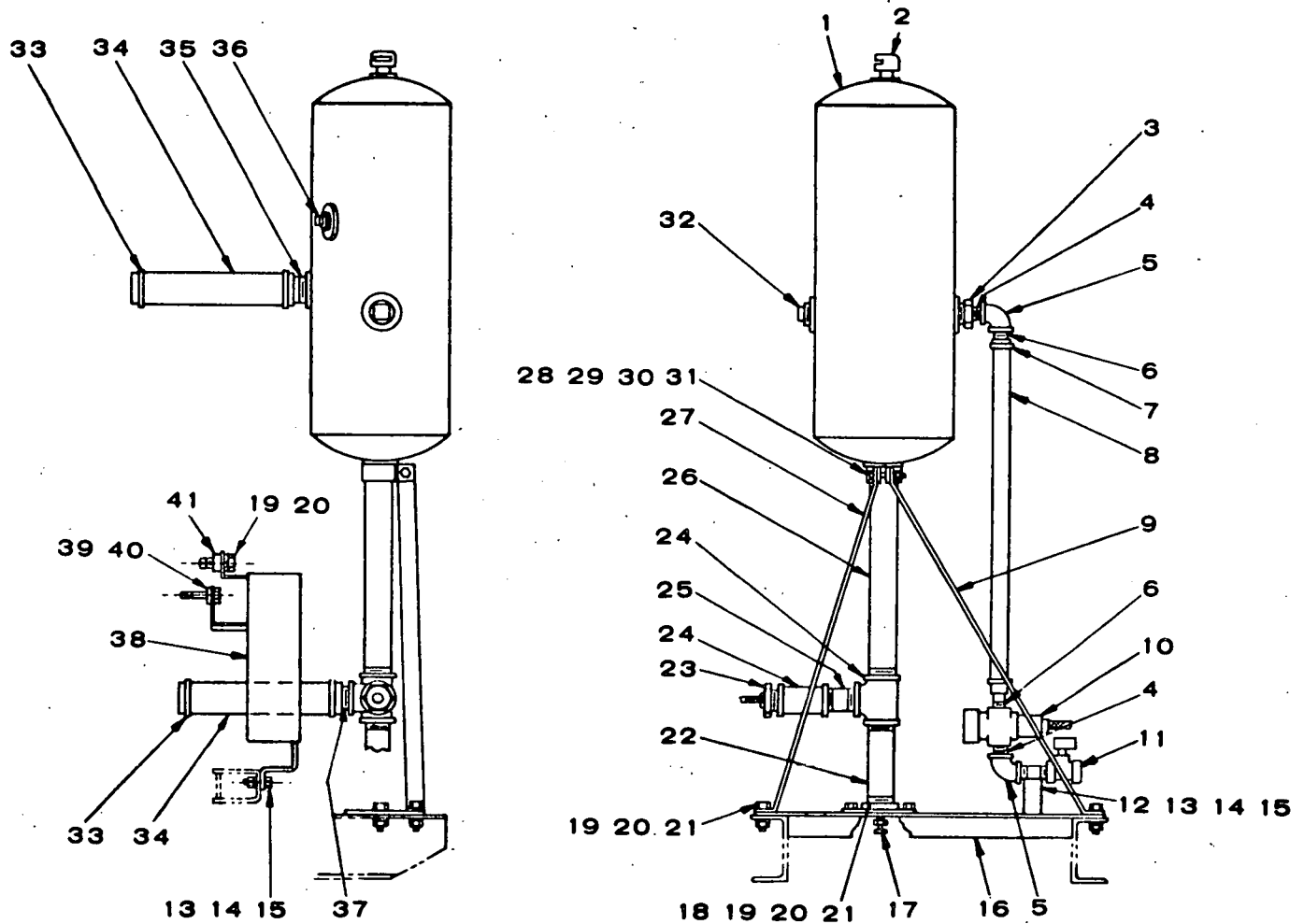
STANDPIPE INSTALLATION



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130-0425	1	Standpipe
2	504-0062	1	Valve, Vacuum Relief
3	505-0023	1	Bushing (1-1/4 x 1")
4	505-0004	2	Nipple (1 x 1-1/2"), Close
5	505-0041	2	Elbow (1" x 90°), Pipe
6	505-0330	2	Nipple (1 x 2"), Half
7	503-0189	2	Clamp, Hose
8	503-0361	1	Hose (1-1/4 I.D. x 36")
9	130-0869	1	Brace, Standpipe
10	504-0090	1	Valve, Globe
11	307-1135	1	Valve, Solenoid
12	130-0797	1	Nipple Assembly, Waterline
13	800-0007	4	Screw (1/4-20 x 1")
14	850-0040	4	Washer (1/4"), Lock
15	862-0001	4	Nut (1/4 x 20)
16	130-0927	1	Support, Standpipe Mounting
17	504-0006	1	Valve, Drain
18	130-0442	1	Base, Standpipe
19	800-0092	9	Screw (1/2-13 x 1-1/2")
20	850-0060	9	Washer (1/2"), Lock
21	862-0005	8	Nut (1/2-13)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
22	505-0421	1	Nipple (2 x 8"), Pipe
23	505-0175	1	Elbow (2" x 90°), Pipe
24	505-0374	1	Tee (2"), Pipe
25	505-0405	1	Nipple (2 x 5"), Pipe
26	505-0377	1	Nipple (2 x 18-1/2"), Pipe
27	130-0870	1	Brace, Standpipe
28	130-0871	1	Clamp, Standpipe Mounting
29	800-0051	1	Screw (3/8-16 x 1-1/4")
30	850-0050	1	Washer (3/8"), Lock
31	862-0003	1	Nut (3/8-16)
32	505-0359	1	Plug (1-1/4"), Square Head
33	503-0354	4	Clamp, Hose
34	503-0631	2	Hose, Radiator
35	505-0204	1	Nipple (2 x 2"), Half
36	505-0140	1	Plug (1"), Square Head
37	505-0764	1	Nipple (2 x 4"), Half
38	191-0878	1	Guard, Belt
39	526-0030	1	Washer (3/8"), Flat
40	800-0058	1	Screw (3/8 x 16 x 3")
41	191-0879	1	Spacer, Belt Guard

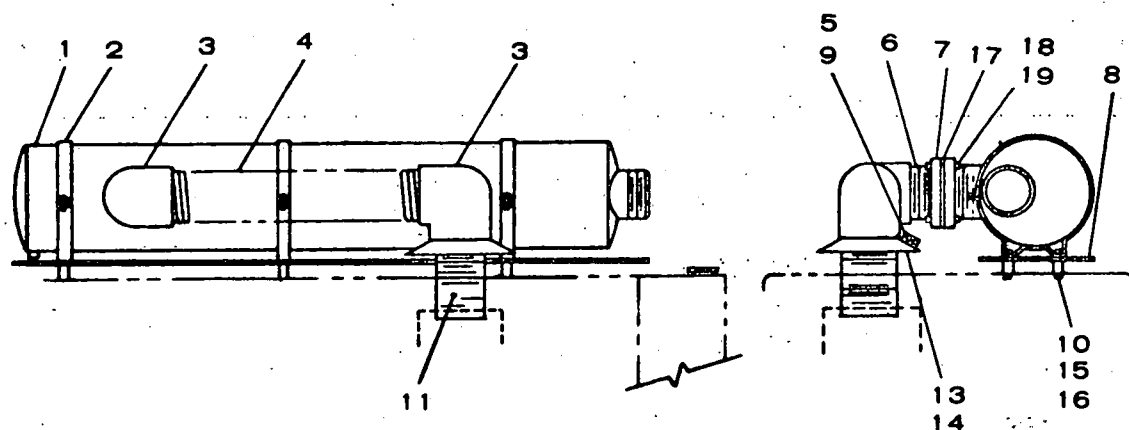
STANDPIPE INSTALLATION (With Marsh Regulator)



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130-0425	1	Standpipe
2	504-0062	1	Valve, Vacuum Relief
3	505-0023	1	Bushing (1-1/4 x 1")
4	505-0004	2	Nipple (1 x 1-1/2"), Close
5	505-0041	2	Elbow (1" x 90°), Pipe
6	505-0330	2	Nipple (1 x 2"), Half
7	503-0189	2	Clamp, Hose
8	503-0361	1	Hose (1-1/4 I.D. x 36")
9	130-0869	1	Brace, Standpipe
10	309-0242	1	Valve, Water Temperature Control
11	307-1135	1	Valve, Solenoid
12	130-0797	1	Nipple Assembly, Waterline
13	800-0007	4	Screw (1/4-20 x 1")
14	850-0040	4	Washer (1/4"), Lock
15	862-0001	4	Nut (1/4 x 20)
16	130-0927	1	Support, Standpipe Mounting
17	504-0006	1	Valve, Drain
18	130-0442	1	Base, Standpipe
19	800-0092	9	Screw (1/2-13 x 1-1/2")
20	850-0060	9	Washer (1/2"), Lock
21	862-0005	8	Nut (1/2-13)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
22	505-0421	1	Nipple (2 x 8"), Pipe
23	505-0351	1	Bushing (2 x 3/4"), Reducer
24	505-0374	2	Tee (2"), Pipe
25	505-0405	1	Nipple (2 x 5"), Pipe
26	505-0377	1	Nipple (2 x 18-1/2"), Pipe
27	130-0870	1	Brace, Standpipe
28	130-0871	1	Clamp, Standpipe Mounting
29	800-0051	1	Screw (3/8-16 x 1-1/4")
30	850-0050	1	Washer (3/8"), Lock
31	862-0003	1	Nut (3/8-16)
32	505-0359	1	Plug (1-1/4"), Square Head
33	503-0354	4	Clamp, Hose
34	503-0631	2	Hose, Radiator
35	505-0204	1	Nipple (2 x 2"), Half
36	505-0140	1	Plug (1"), Square Head
37	505-0764	1	Nipple (2 x 4"), Half
38	191-0878	1	Guard, Belt
39	526-0030	1	Washer (3/8"), Flat
40	800-0058	1	Screw (3/8 x 16 x 3")
41	191-0879	1	Spacer, Belt Guard

MUFFLER INSTALLATION

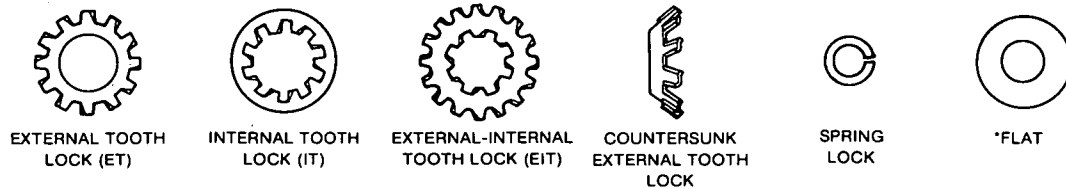


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	155-1158	1	Muffler, Exhaust
2	140-0757	3	Clamp, Muffler Mounting
3	505-0741	2	Elbow, Pipe (8" x 90°)
4	155-1160	1	Tube Assembly - Exhaust
5	813-0105	2	Screw, Machine - Round Head (#10-32 x 1")
6	505-0740	1	Nipple, Pipe (6 x 4-1/2")
7	155-0652	2	Flange, Companion
8	155-1404	1	Shield, Muffler Heat
9	870-0188	1	Nut, Hex - Locking (#10-32)
10	155-1430	6	Spacer, Muffler Mounting
11	505-0821	1	Nipple, Pipe (6 x 16-1/2")
13	155-1426	1	Shield, Rain
14		1	Insulator (Order 21" of Bulk Asbestos #895-0007)
15	800-0508	6	Screw, Cap - Hex Head (5/16-18 x 2-3/4")
16	870-0048	6	Nut, Hex - Self Locking (5/16-18)
17	155-0676	1	Gasket, Asbestos
18	800-0160	8	Screw, Cap - Hex Head (3/4-10 x 3-1/4")
19	862-0008	8	Nut, Hex (3/4-10)

HARDWARE IDENTIFICATION

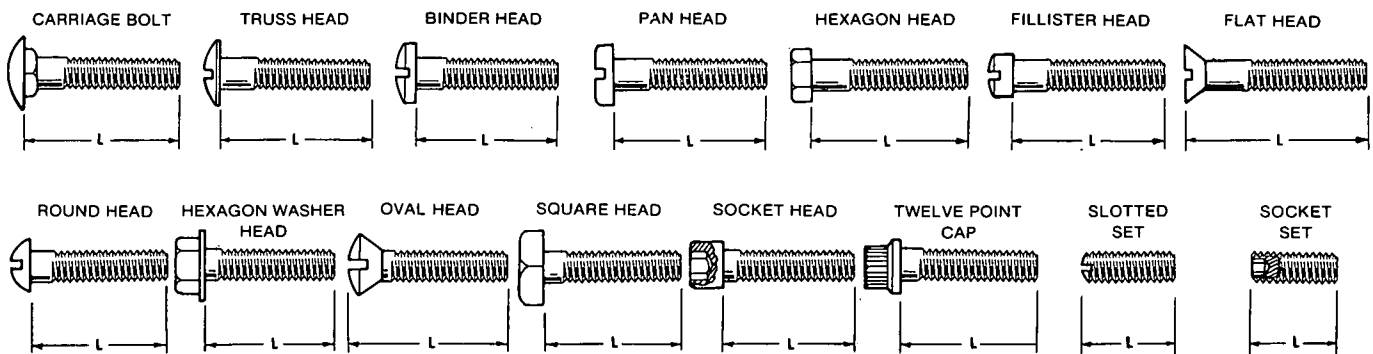
Illustrated hardware items are only for identification purposes. All hardware items listed throughout this parts catalog are steel SAE grade five (5) or lower (zinc plated with clear chromate dip) unless parts description indicates differently. All dimensions are in inches.

WASHER TYPES



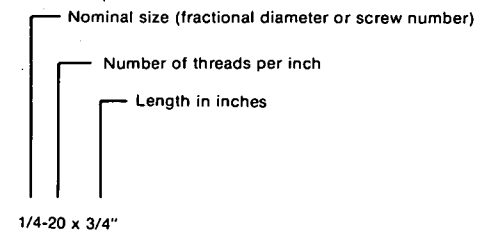
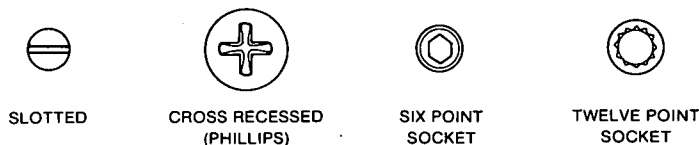
* - Flat washer dimensions given are: Inside Diameter (ID), Outside Diameter (OD) and Thickness (Thk).

BOLT AND SCREW TYPES



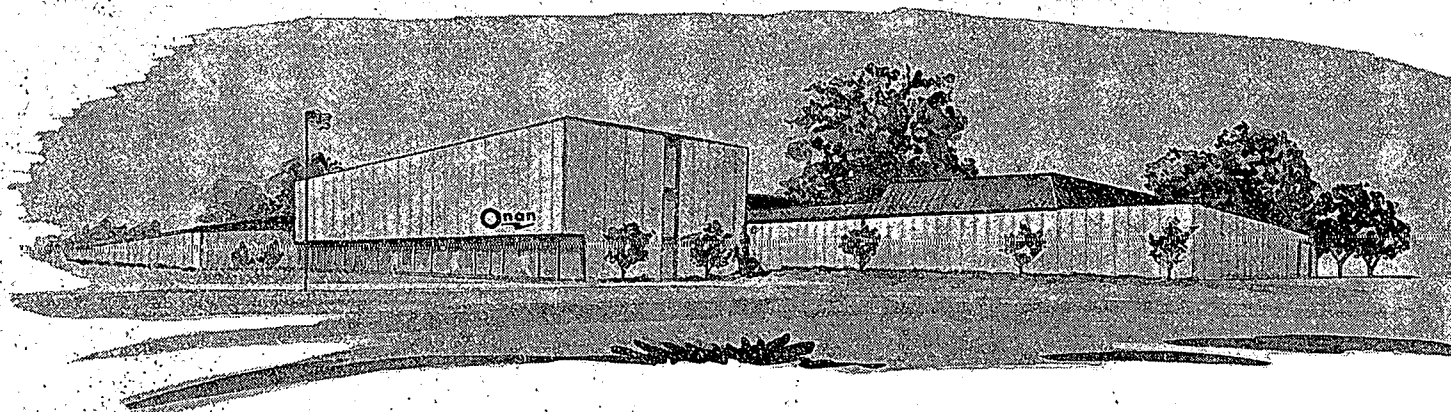
L - Measure length between these points.

INTERNAL DRIVE TYPES



NUT TYPES





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