Onan®

OPERATORS MANUAL AND PARTS CATALOG

FOR

Onan®

ELECTRIC GENERATING SETS

OBS

MDJF

SERIES

968-0345

6AD73

TABLE OF CONTENTS

PERFORMANCE CERTIFIED

We certify that when properly installed and operated this Onan electric plant will deliver the full power and the voltage and frequency regulation promised by its nameplate and published specifications. This plant has undergone several hours of running-in and testing under realistic load conditions, in accordance with procedures certified by an independent testing laboratory.

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

IMPORTANT! RETURN WARRANTY CARD ATTACHED TO UNIT.

INTRODUCTION

THIS OPERATOR'S MANUAL CONTAINS INFORMATION PERTAINING TO THE INSTALLATION, OPERATION, AND MAINTENANCE OF YOUR ONAN UNIT. A PARTS CATALOG IS ALSO INCLUDED IN THIS MANUAL.

WE SUGGEST THAT THIS MANUAL AND THE WIRING DIAGRAM WHICH ACCOMPANIES EVERY ONAN UNIT BE RETAINED AND REFERRED TO WHEN MAKING EQUIPMENT ADJUSTMENTS OR ORDERING PARTS. ADDITIONAL COPIES ARE AVAILABLE FOR A NOMINAL CHARGE FROM YOUR ONAN DISTRIBUTOR.

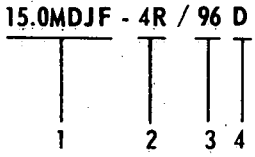
WHEN ORDERING PARTS REMEMBER TO INCLUDE THE ONAN MODEL, SPECIFICATION LETTER, AND SERIAL NUMBER LOCATED ON THE NAMEPLATE OF YOUR ONAN UNIT. THIS IS ESSENTIAL TO ENSURE THE CORRECT PART IS SHIPPED TO YOU.

FOR MAJOR REPAIR SERVICE, CONTACT YOUR ONAN AUTHORIZED DISTRIBUTOR.

GENERAL INFORMATION

When the instructions in this manual refer to a specific model of generating set, identify the 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 set nameplate.

How to Interpret MODEL and SPEC NO.



1. Factory code for general identification.
2. Specific Type:
   E - ELECTRIC. Electric starting at the set only.
   R - REMOTE. Electric starting. For permanent installation, can be connected to optional accessory equipment for remote or automatic control of starting and stopping.
3. Factory code for optional equipment.
4. Specification (Spec) letter (advances when factory makes production modifications).

CAUTION *Onan uses this symbol throughout the text to warn of possible equipment damage.*

WARNING *This symbol is used to warn of any possible personal injury.*

Onan

MANUFACTURER'S WARRANTY

Onan warrants, to the original user, that each product of its manufacture is free from defects in material and factory workmanship if properly installed, serviced and operated under normal conditions according to Onan's instructions.

Onan will, under this warranty, repair or replace, as Onan may elect, any part which on examination shall disclose to Onan's satisfaction to have been defective in material and workmanship; provided that such part shall be returned to Onan's factory or one of its Authorized Service Stations, transportation charges prepaid, not later than one (1) year after the product is first placed in service. Such defective part will be repaired or replaced free of charge, including labor (in accordance with rates approved by Onan) during the stated one (1) year coverage under this warranty.

THIS WARRANTY AND ONAN'S OBLIGATION THEREUNDER IS IN LIEU OF ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER OBLIGATIONS OR LIABILITIES, INCLUDING LIABILITY FOR INCIDENTAL AND CONSEQUENTIAL DAMAGE.

No person is authorized to give any other warranty or to assume any other liability on Onan's behalf unless made or assumed in writing by an Officer of Onan, and no person is authorized to give any warranty or to assume any liabilities on the Seller's behalf unless made or assumed in writing by such Seller.

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

SPECIFICATIONS

Nominal dimensions of generating set (inches):	
Height	26 11/16
Width	20 5/16
Length	51 3/8
Weight (approx. lb.)	865
Number cylinder (vertical in-line)	4
Displacement (cubic inch)	140
Cylinder bore	3 1/2
Piston stroke	3 5/8
BHP at 1800 rpm	33.3
RPM (for 60 hertz)	1800
RPM (for 50 hertz)	1500
Compression ratio	19:1
Battery voltage (AC set, except dual purpose)★	12
Batery size (AC set, except dual purpose)	
SAE group 1H - two in series	Yes
Amp - hr, SAE 20 - hr (nominal)	120
Battery charge rate amperes (normal) - AC sets	2 to 5
*Oil capacity in U.S. quarts - Refill	6
Cooling water flow (gallons per minute)	6
Generator cooling air (CFM at 1800 rpm)	136
Combustion air (CFM at 1800 rpm)	72
Total cu. ft. per min. of air required	208
Diesel fuel lift (maximum feet)	6
Maximum recommended power take-off from front pulley at any load	2 hp
Power take-off limit at rated load	1 hp
Injection pump (Am. Bosch type)	PSU
Output is rated at unity power factor load	1-phase
Output is rated at 0.8 power factor	3-phase
Rating (output in watts)	
AC, 50 hertz set	12,000
AC, 60 hertz set	15,000
AC voltage regulation in ± %	3
AC frequency regulation in %	5
Revolving field type generator	Yes
120/240 - volt single phase model reconnectible	Yes
Static type exciter (Magneciter)	Yes

* - Plus 1/2 quart for new filter.

★ . 24 and 32 volt batteries on certain modifications.

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

DIMENSIONS AND CLEARANCES

All clearances given at room temperature of 70°F.
All dimensions in inches unless otherwise specified.

	Minimum	Maximum
CAMSHAFT		
Bearing Journal Diameter, Front	2.2500	2.2505
Bearing Journal Diameter, Rear	1.1875	1.1880
Bearing Clearance Limit	.0012	.0037
End Play, Camshaft (in back position)	.007	.039
Cam Tappet Hole Diameter	.8755	.8765
Cam Tappet Diameter	.8730	.8725
CONNECTING RODS		
Large Bearing Diameter (I.D.)	2.0615	2.0630
Small Bushing Diameter (I.D.)	0.9903	0.9906
Clearance, Large Bearing to Crankshaft	.001	.0033
CYLINDER		
Cylinder Bore	3-1/2	
Cylinder Diameter Limits	3.4995	3.5005
CRANKSHAFT		
Main Bearing Journal Diameter	2.2427	2.2435
Crankshaft Main Bearing Clearance (Original Equipment)	.0030	.0043
Connecting Rod Journal Diameter	2.0597	2.0605
End Play, Crankshaft	.010	.015
PISTON (Measure 90° to Pin)		
Piston Clearance to Cylinder Wall below Oil Ring Groove	.0055	.0075
Piston Pin Hole Diameter	.99005	.99025
Ring Groove Width, Top	.097	.098
Ring Groove Width, 2nd	.0965	.0975
Ring Groove Width, 3rd	.0965	.0975
Ring Groove Width, 4th	.1895	.1880
PISTON PIN		
Length	3.003	2.988
Diameter	.9899	.9901
Piston Clearance	Thumb Push Fit	
Connecting Rod Bushing Clearance	.0002	.0007
PISTON RINGS		
Ring Type		
Top	Compression	
2nd	Compression	
3rd	Oil Scraper & Compression	
Ring Width		
Top	.0925	.0935
2nd	.0925	.0935
3rd	.0925	.0935

	Minimum		Maximum
STARTING MOTOR			
Rotation	Counterclockwise		
Pinion Clearance to Pinion Stop (Solenoid Plunger Bottomed)	.070		.120
Pinion Rest Position – Distance from Pinion Housing Mounting Face to Outer Edge of Pinion	1-9/32		1-15/32
Armature End Play	.005		.030
Test Specifications			
No Load	10 volts - 80 amps 5000 rpm Min.		
Stall Torque	4 volts - 420 amps 7.8 lbs. ft. Min.		
Brush Spring Tension	32-40 ounces with new brushes		
VALVE, INTAKE (Hardened Chrome Alloy)			
Stem Diameter	.3405		.3410
Clearance in Guide	.0015		.0030
Valve Face Seat Angle		42°	
Valve Clearance		.017	
VALVE, EXHAUST (Hardened Chrome Alloy)			
Stem Diameter	.3405		.3415
Clearance in Guide	.0030		.0050
Valve Face Seat Angle		45°	
Valve Clearance		.017	

ASSEMBLY TORQUES AND SPECIAL TOOLS

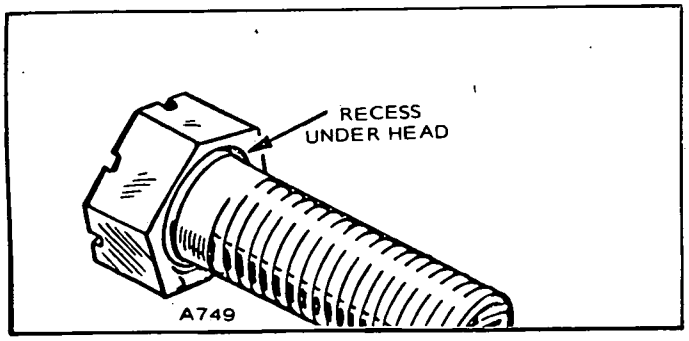
TORQUE SPECIFICATIONS	FT.-LB.
Center Main Bolt	97-102
Connecting Rod Bolt	27-29
Cover-Rocker Box	8-10
Cylinder Head Bolt	44-46
Exhaust Manifold Nuts	13-15 ★
Flywheel Mounting Screw	65-70
Flywheel Hub Nut	17-21
Fuel Pump Mounting Screws	15-20
Gear Case Cover	18-20
Glow Plug	10-15
Injection Nozzle Mounting Screws	20-21
Injection Pump Mounting Screws	15-16
Intake Manifold	13-15
Oil Base Mounting Screws	45-50
Oil Filter	Hand Tight + 1/4 to 1/2 Turn
Oil Pump Mounting Screws	15-20
Rear Bearing Plate	40-45
Rocker Arm Nut	4-10*
Rocker Arm Stud	35-40
Thru-Rotor-Stud Nut	55-60

* - This torque is friction between the threads only and locks the nuts in place. The rocker arm nuts are for adjusting valve lash.

★ **CAUTION** *Tighten nuts evenly to avoid manifold damage.*

Assembly torques assure proper tightness without danger of stripping threads. If a torque wrench is not available, estimate the degree of tightness. Use reasonable force and a wrench of normal length.

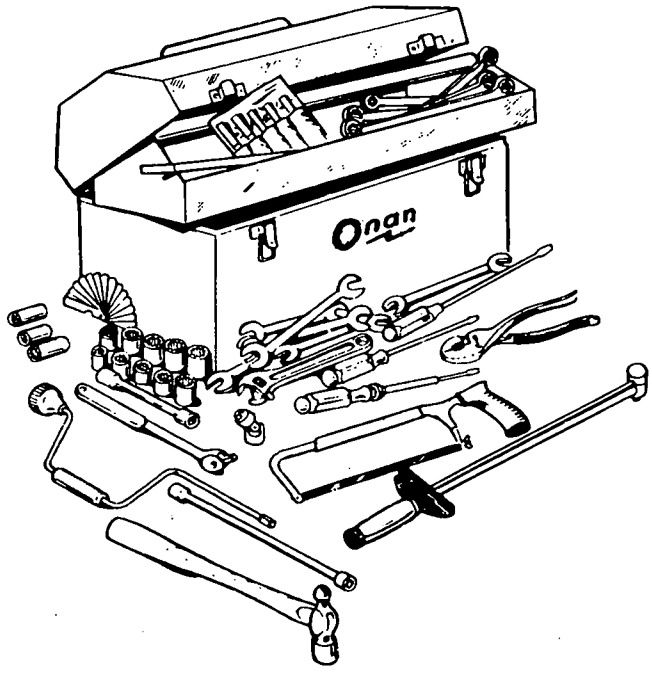
Special Place Bolts do not require lockwashers or gaskets. Never attempt to use a lockwasher with these bolts, it will defect their purpose. Check all studs, nuts and screws often. Tighten as needed.



SPECIAL TOOLS AND EQUIPMENT

These tools are available from Onan to aid service and repair work.

Crankshaft Gear Pulling Ring	420-0275
Diesel Compression Tester	420-0283
Diesel Nozzle Tester	420-0184
Diesel Pintle Nozzle Cleaning Tool Set (Includes injection nozzle centering tool)	420-0208
Driver, Front Camshaft Bearing	420-0252
Driver, Rear Camshaft Bearing	420-0251
Driver, Center Camshaft Bearing	420-0254
Driver, Main Bearing Front and Rear	420-0269
Driver, Valve Seat	420-0270
Oil Seal Guide and Driver Rear Front	420-0281
Ridge Reamer	420-0260
Replacement Blade for 420-0260	420-0261
Valve Seat Remover	420-0272
Replacement Blades for 420-0272	420-0274



INSTALLATION

GENERAL

Proper installation is very important. Consider the following points: adequate generator cooling air; discharge of circulated air; adequate fresh induction air; adequate engine cooling water; discharge of circulated water; discharge of exhaust gases; electrical connections; fuel connection; sturdy and flat floor; and accessible for operation and service. Use this manual as a guide to help with the installation; refer to Typical Installation, Figures 2 and 3. For more complete instructions, request Onan Technical Bulletin T-021.

Each installation must be considered individually and executed in compliance with all regulations which may affect the installation. The advice and guidance contained in the booklet entitled *Fire Protection Standard for Motor Craft:* (NFPA No. 302) offered by the National Fire Protection Association International, Boston 10, Massachusetts, will be helpful to the installer of equipment in vessels.

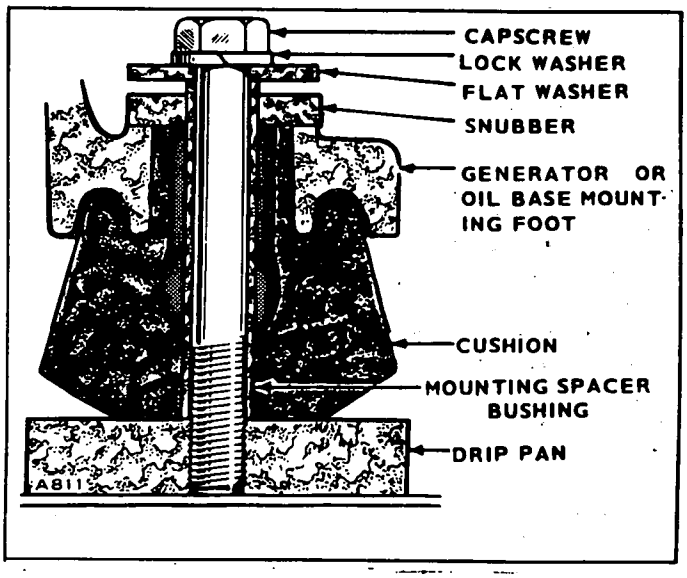


FIGURE 1. MOUNTING CUSHION

LOCATION

Select a location for the unit, preferably near the vessels main keel, which is dry, properly ventilated, above low lying vapors and splash from the bilge. Provide accessibility for minor servicing operations, draining of the crankcase, lubricating oil and the cooling system.

MOUNTING

The floor should be flat and give support directly under the set (Figure 1) mounting points. The unit will rock on its mounts.

A 2-1/2 inch clearance around the unit is required to permit rocking on its mounts without restraint. Use adequately flexible exhaust line, fuel line, battery cables, and electrical wires.

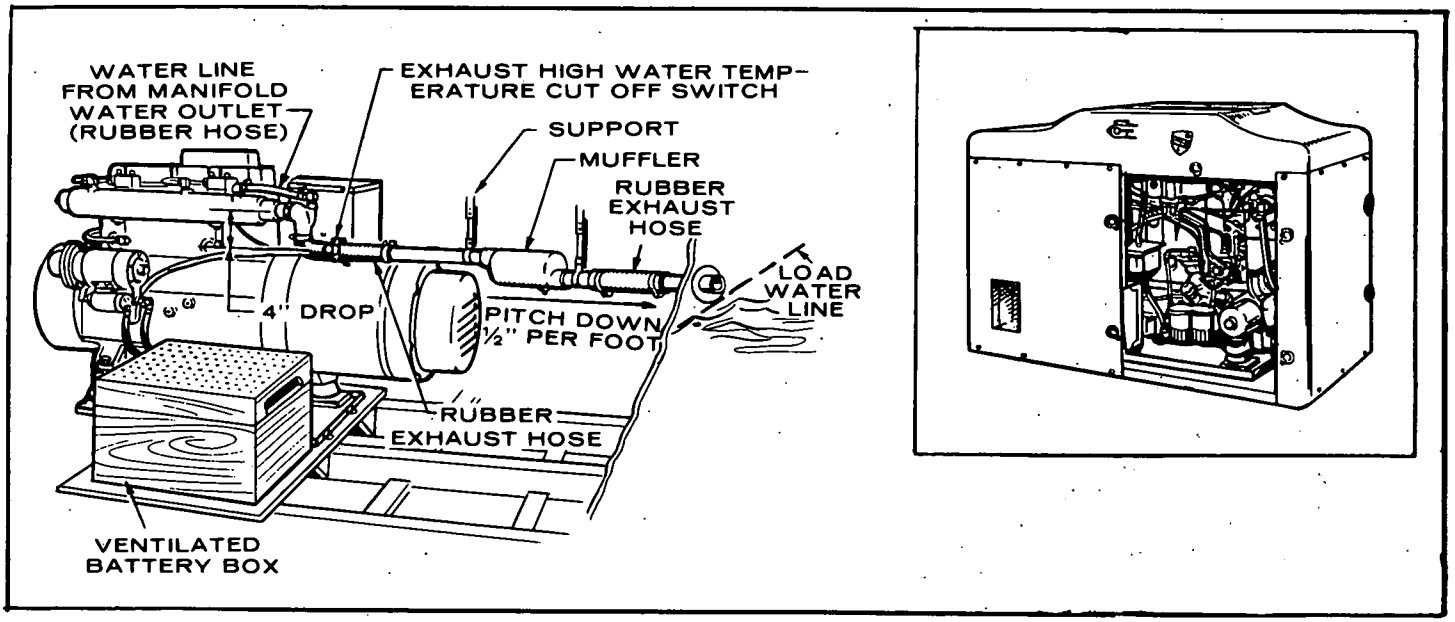


FIGURE 2. TYPICAL INSTALLATION

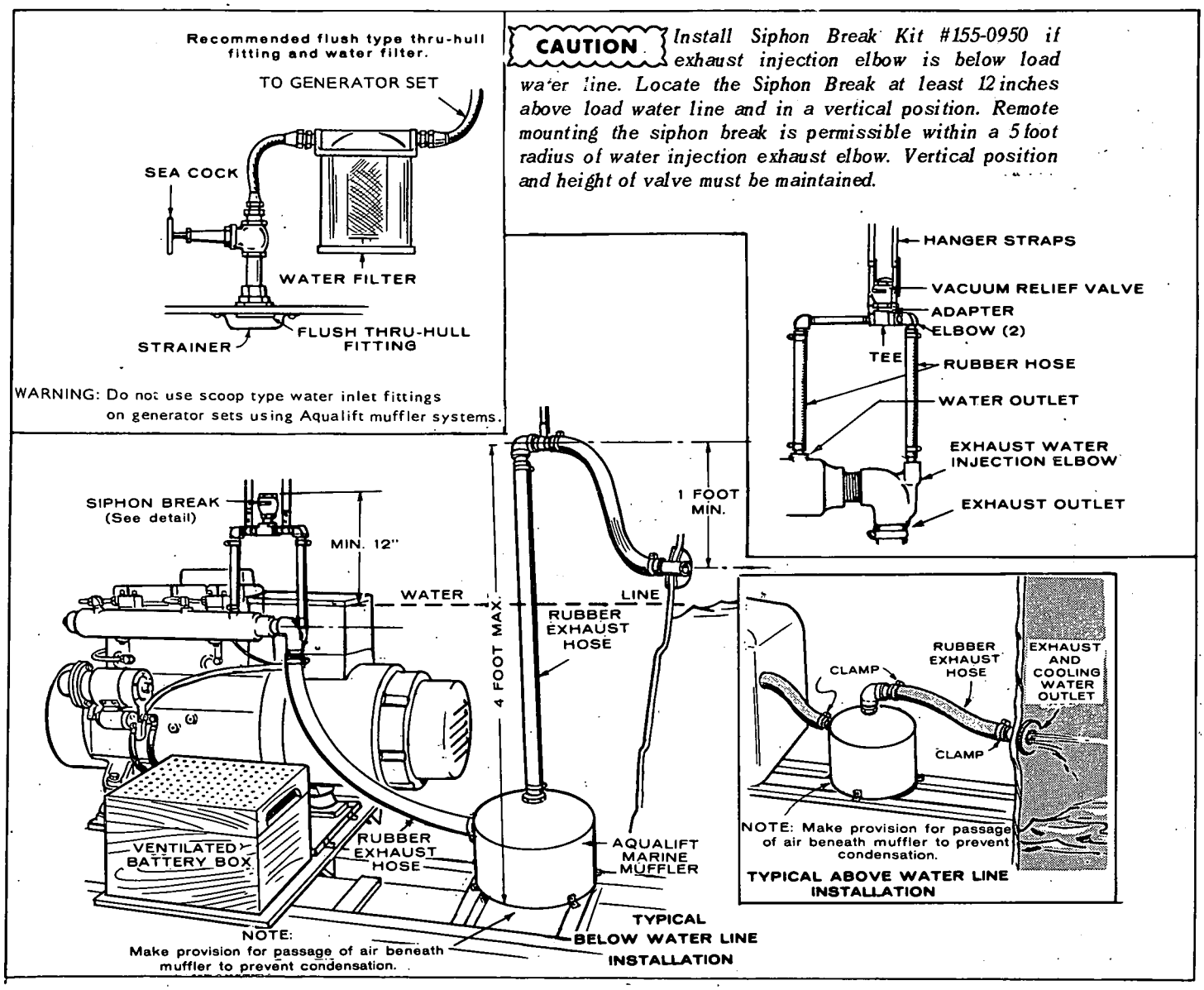


FIGURE 3. TYPICAL INSTALLATION

Install two hold-down clamps to the drip pan (front and rear or both sides). Secure the clamps to the mounting base. For maximum noise reduction on Onan MDJF units, install the Onan "Sound Shield" which is an insulated fiberglass enclosure which completely surrounds the generating set (Figure 2). Openings are provided for connection to all external lines and wires. Internal air ducts reduce air borne noise to a minimum. Contact your local ONAN dealer for noise reduction methods and the special kits which are available.

FUEL TANK

If a separate fuel tank is used, install the tank so the bottom is less than 6-feet below the fuel pump. The tank top must be below fuel pump level to prevent siphoning. Install a shut-off valve at the tank. When the fuel tank is shared with another engine, use a separate fuel line and return line for each to avoid starving the plant. (Figure 4).

If fuel lift must exceed 6-feet, install an auxiliary electric fuel pump at the fuel supply.

FUEL CONNECTION

Connect the fuel line to the fuel pump inlet. Pump is threaded 7/16-24 NPTF (American Standard Internal Tapered Pipe Thread). **Important:** *Always use flexible tubing between engine and the fuel supply.*

The diesel engine requires a fuel supply line and a separate fuel return line. Install the fuel return line from the 7/16-24 size opening in the overflow fitting located on the injection pump (where the nozzle fuel return line is also connected) to the top of the fuel supply tank (Fig. 5).

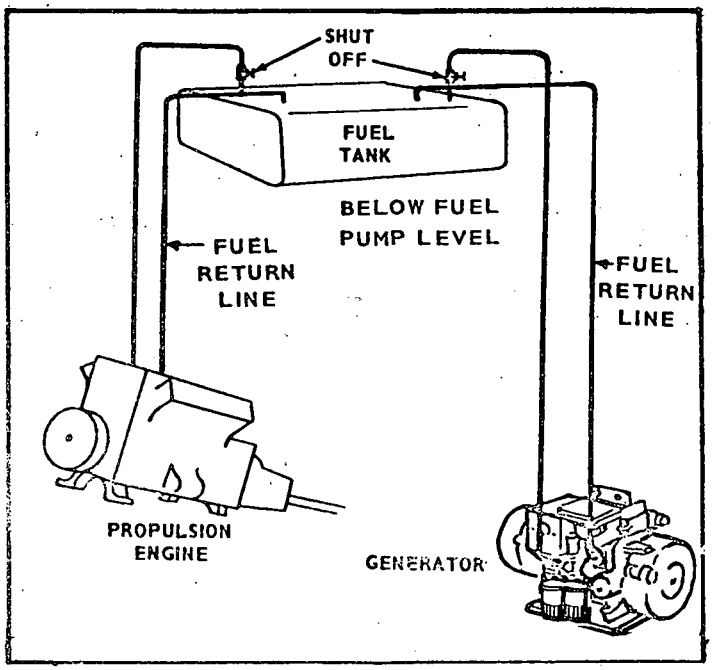


FIGURE 4. FUEL LINE ARRANGEMENT

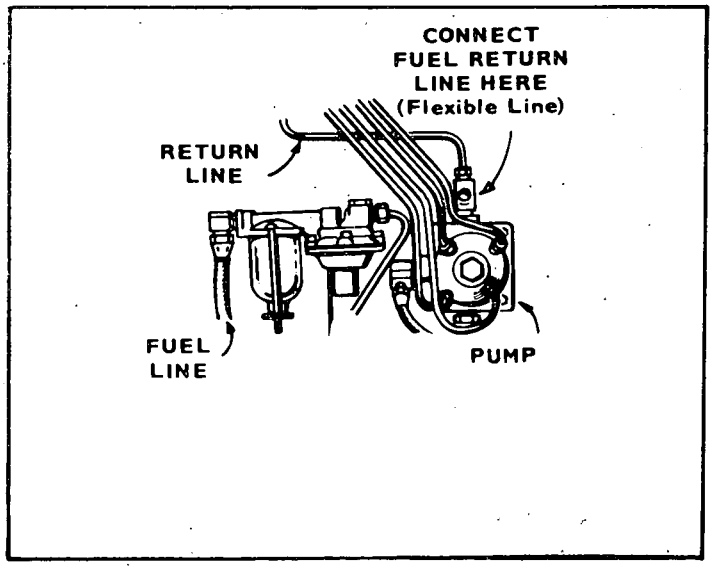


FIGURE 5. FUEL SYSTEM

Do not use galvanized lines, fittings, or fuel tanks in the fuel system. Carefully clean all fuel system components before putting the plant into operation. Any dirt or contamination may cause major damage to the fuel injection system.

OIL DRAIN

The oil drain may be extended to suit the installation. The oil base has a 1/2" pipe tapped hole.

VENTILATION

The generating set requires fresh air for combustion and generator cooling. Onan recommends that the ventilation system be able to deliver 1-1/2 to 2 times the air required by the set. When the ventilation system depends on wind or boat motion, use powered exhausters to provide ventilation when the boat is not in motion. For more information, refer to Onan Technical Bulletin T-021.

EXHAUST

WARNING *Pipe exhaust gases outside of the hull – exhaust gases are poisonous!*

See Installation, Figures 2 and 3. The engine exhaust connection is 1-1/2" pipe tapped.

Install a separate exhaust line as follows:

1. Above vessel load water line.
2. Pitched downward to prevent water backflow.
3. Shield line near combustible material.
4. Use flexible hose or tubing.
5. For turns use sweeping (long radius) elbows.
6. Increase one pipe size for every 10 ft. in length.

Provide a tee for water line connection for wet exhaust (Figure 3) - refer to Water Discharge Line Instructions. Raise the dry portion of the exhaust line high enough to prevent water backflowing into the engine under all conditions.

The water jacketed exhaust manifold is pipe tapped at both ends for convenience in exhaust line connection.

AQUALIFT MUFFLER (Optional)

The Aqualift is a highly efficient marine muffler designed for above or below water line installations when water cooled exhaust systems are used. Because of installation variables, customers must provide the brackets, hoses and clamps, required for installation.

IMPORTANT: DO NOT USE SCOOP TYPE WATER INLET FITTINGS when installing an Aqualift muffler. Forward facing scoops develop sufficient ram pressure to force water past the set's water pump, flooding the exhaust system where it may flow back, flooding the engine cylinders. This can happen only if the electric set is not running and boat is underway.

1. Secure the muffler to the predetermined location (within ten-feet of the engine exhaust outlet) using "L" brackets (Figure 6) or other suitable mounting devices such as wood blocks or metal straps. Flexible mounts may be used if so desired. Allow for air passage under muffler to prevent condensation.

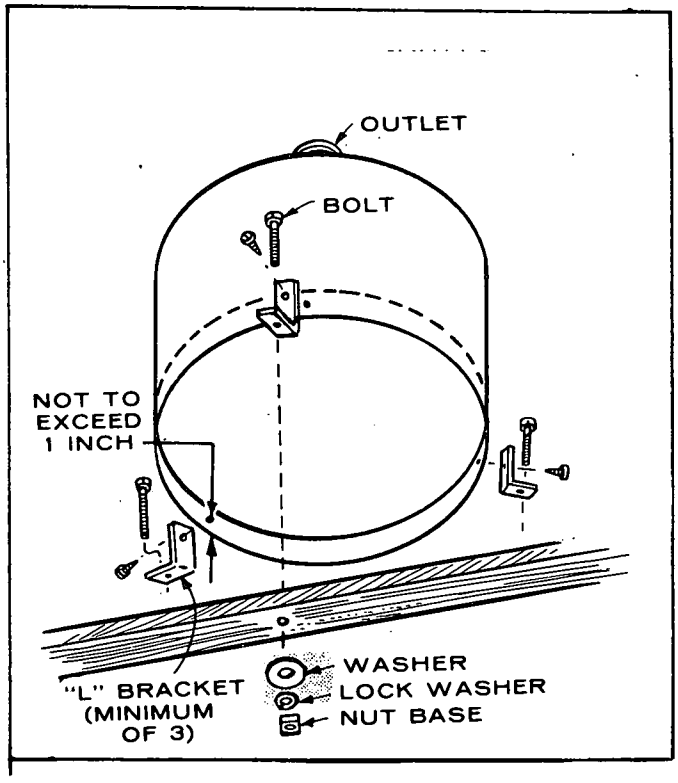


FIGURE 6. SECURING THE MUFFLER

CAUTION Do not drill holes higher than one inch above the extreme lower edge of the muffler when installing mounts.

2. Connect the exhaust line(1 1/2")to the marine elbow on the engine and to the exhaust inlet on the muffler. The distance from the base of the muffler to the upper elbow on the exhaust tubing from the muffler outlet must not exceed four-feet (see Figure 3).

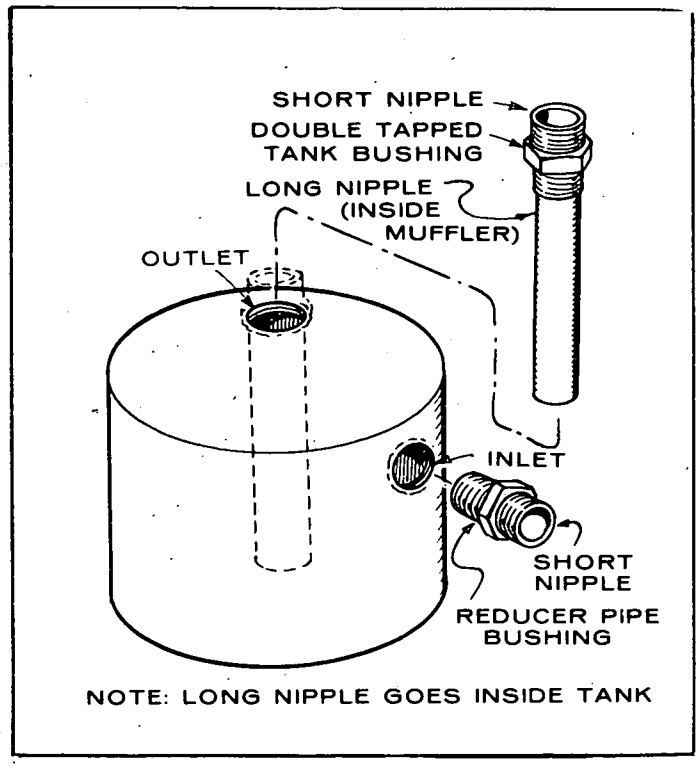


FIGURE 7. AQUALIFT MUFFLER

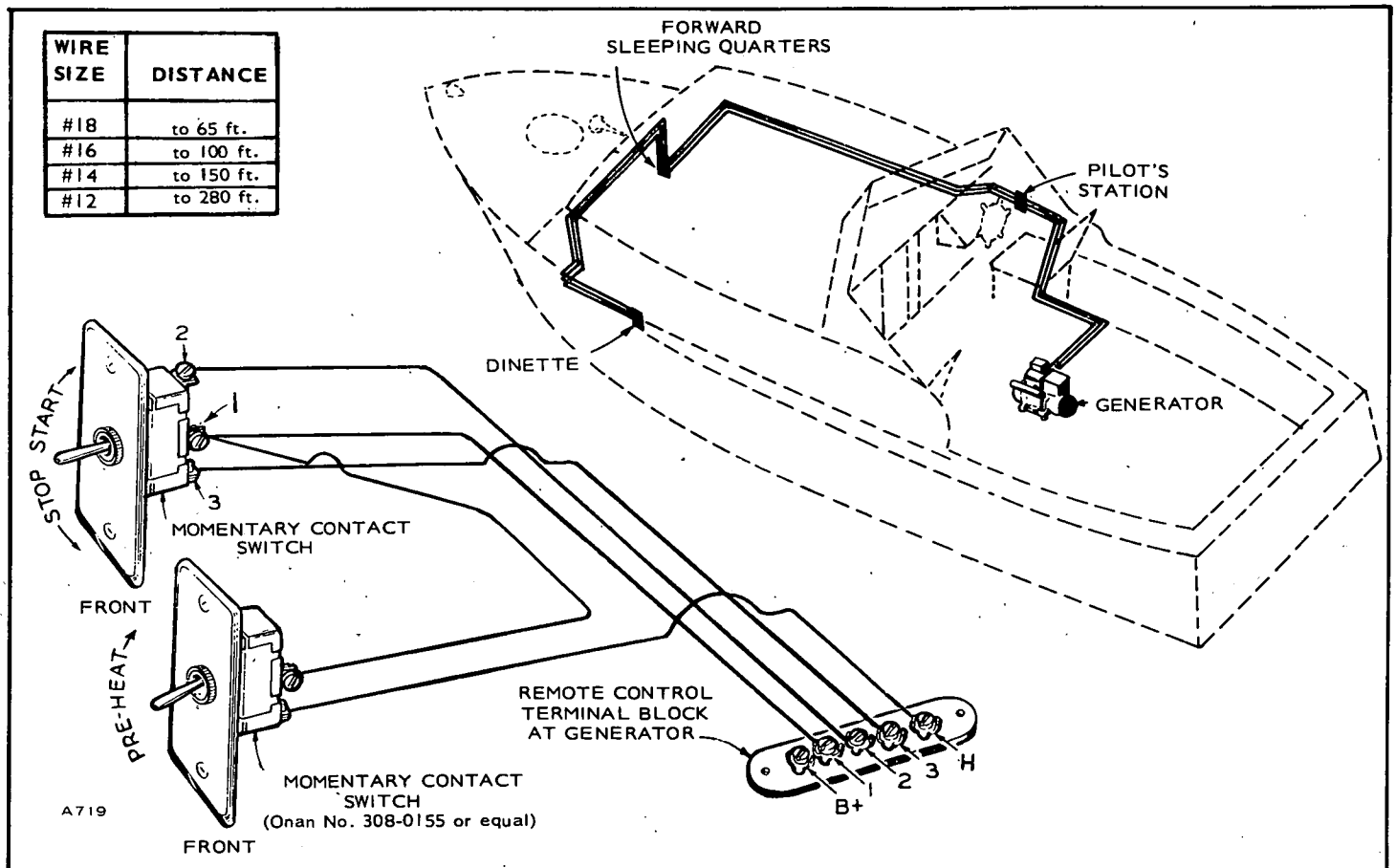
3. Connect the exhaust line to the muffler outlet and to the upper elbow. A conventional automobile tail-pipe hanger bracket may be used to hang the upper elbow. Rigid pipe may be used in place of flexible hose for certain applications. There must be a pitch of one-half inch per foot (i.e., a 2-1/2" drop for a 5' run) in the exhaust tubing between the engine exhaust elbow and the muffler inlet. Muffler may be mounted below the level of the engine if necessary. A minimum drop of one-foot is necessary between the engine exhaust outlet on the hull to prevent water from washing into the system (see Fig. 3). An increase of one standard pipe size for every ten running feet of exhaust from the muffler to the exhaust outlet is necessary to prevent excessive backpressure.

4. Connect the exhaust line from the upper elbow to the exhaust outlet on the hull. The exhaust outlet on the hull must be positioned so that a minimum of water will enter while at anchor or under way.

Important: Be sure all fittings are tight.

CAUTION *Welding on the muffler will damage the interior protective coating decreasing the life expectancy.*

WIRE SIZE	DISTANCE
#18	to 65 ft.
#16	to 100 ft.
#14	to 150 ft.
#12	to 280 ft.



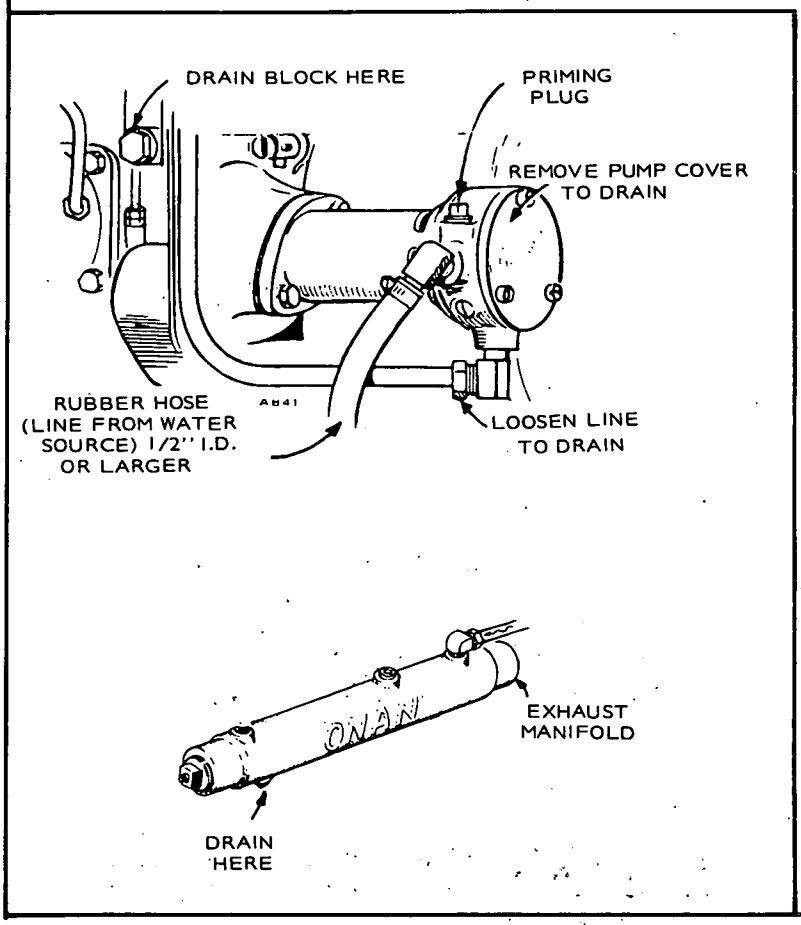


FIGURE 8. FILL AND DRAIN LOCATIONS

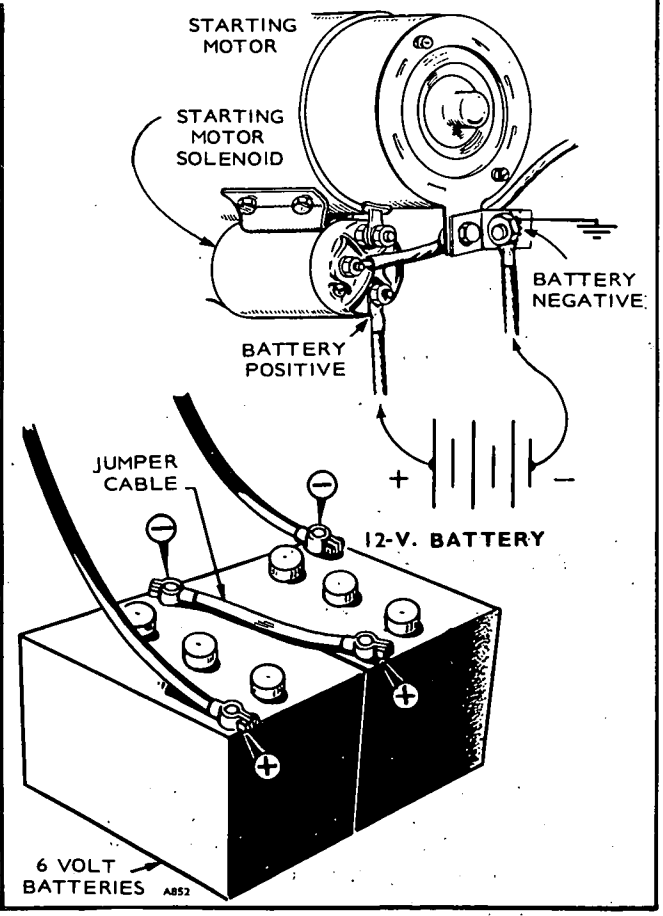


FIGURE 9. REMOTE CONTROLS AND BATTERY CONNECTIONS

BATTERY CONNECTION

Battery requires negative ground. Do not attempt to change battery polarity on these sets. Refer to set wiring diagram.

CAUTION *If the battery is connected to the charging circuit with the wrong polarity, damage will occur after three minutes while stopped or in five seconds while running. Alternator windings will be damaged almost instantly if battery charging circuit is shorted before the resistor.*

Refer to set nameplate for battery voltage. For AC plants with 12 volt system, provide two 6 volt batteries connected in series (one battery's negative to the other battery's positive, Figure 9) for 105 amp-hr, 12 volt source. For AC plants with 32 volt system, provide 32 volt set of batteries and 200 ampere fused switch, see wiring diagram for connections.

Connect the battery positive (+) to the starter engaging solenoid terminal post. Connect the battery negative (–) to a good ground on the engine. (Figure 9).

WATER SUPPLY LINE (FIGURE 8)

A continuous supply of cooling water is required. The water pump inlet is 1/4'' pipe thread to 1/2'' hose coupling. Use a section of flexible hose near the set to absorb vibrations. The inside diameter of the plumbing must be 1/2'' or larger. Use permatex or other pipe sealer on all pipe fittings in supply line to pump. Normally, the pump should deliver 6 gallons of cooling water per minute. Measure the discharged water flow after thermostat opens, to assure the supply line is large enough. Reduce resistance on pipe runs longer than 5-ft. by using larger inside diameter plumbing. To prove suction line is air tight, see that no bubbles appear in discharged water. An air leak reduces lubrication and shortens life of pumps impeller. Install a strainer in the water suction line inlet and where accessible for cleaning.

REMOTE START - STOP SWITCH (OPTIONAL)

For remote control starting and stopping, use 3 wires to connect the remote switch (SPDT, momentary contact, center-off type) to the terminal block marked B+, 1, 2, 3, in the set control box using wire sizes as listed in Figure 9. Preheat circuit requires an extra wire to terminal H and momentary contact switch (SPST) connection. Remove jumper between terminals 3 and H before installing remote wiring.

LOAD WIRE CONNECTIONS (AC)

The set nameplate shows the electrical output rating of the set in watts, volts and hertz. The set wiring diagram shows the electrical circuits and connections necessary for the for the available output voltage. Also see Figure 12.

Meet all applicable electrical code requirements. Work should be done by a qualified serviceman or electrician because the installation will be inspected and approved.

The set control box (junction box) has knock out sections to accommodate load wires. Use flexible conduit and stranded load wires near the set to absorb vibration. Use sufficiently large insulated wires. Strip insulation from wire ends as necessary for clean connections. Connect each load wire to the proper generator output lead inside the set control box. Insulate bare ends of ungrounded wires. Use a bolt (through the control box) to connect the grounded (⏚) generator lead and load wire. Install a fused main switch (or circuit breaker) between the generating set and load (Figure 11). If a test run indicates wrong rotation of 3 phase motors in the load circuit, switch the connections at any two generator terminals.

Balance All Loads: Current for any one output load must not exceed nameplate rating. Overloading can damage the generator windings. Divide the loads equally between output leads.

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

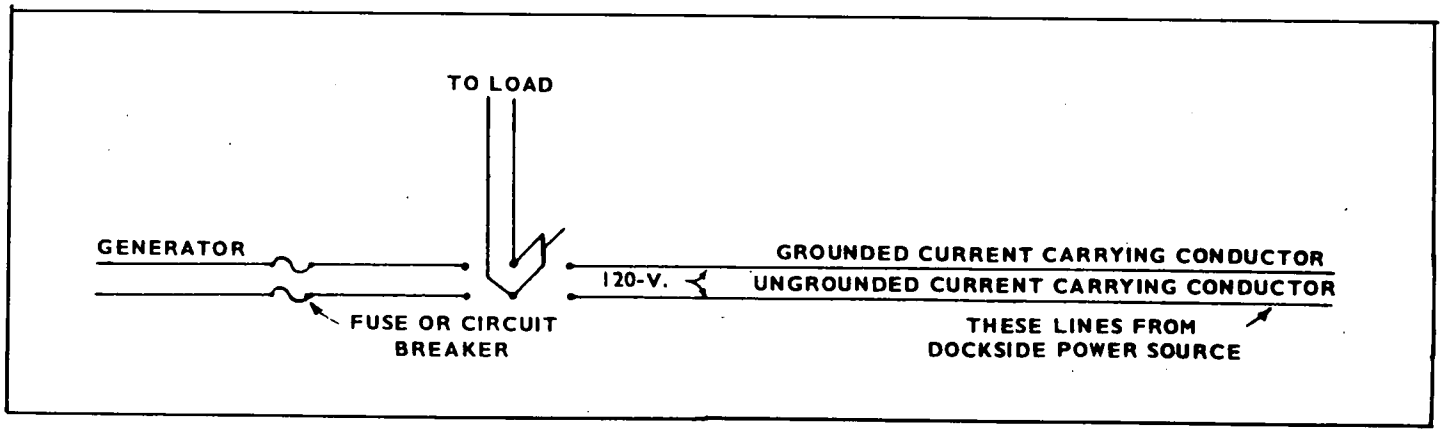


FIGURE 11. DOCKSIDE POWER SOURCE

Output Lead Markings: Generators are marked T1, T2, etc. These identifying marks also appear on the wiring diagram.

Voltage Selection on Reconnectible Single Phase Generators: These models are reconnectible for use as a 120/240 volt 3 wire; a 120 volt 2 wire or 240 volt 2 wire power source (Figure 12).

Load Connections: Refer to the figure which illustrates the load connections for the output shown on your set's nameplate.

Delta Generator: Generator lead T0 is the generator center tap between T1 and T2. The T0 lead is normally not grounded but can be grounded if required (Figure 12-B). Single phase power at center tapped leg available up to 2/3 of full rated three phase power.

HEAT EXCHANGER COOLING (Optional).

This is a closed cooling system commonly referred to as fresh water cooling. Water circulated through the engine is termed fresh water, hot water, jacketed water, etc. Water circulated through the heat exchanger only is called raw water, sea water, cold water, discharged water, etc. This system (with anti-freeze coolant) is recommended where freezing hazards exist or where the owner wants to prevent salt water problems.

Two conditions prevail: (1) Factory installed heat exchanger, and (2) Customer installed Onan heat exchanger kit. Get details from Onan.

CAUTION *Do not use existing neoprene impeller water pump for hot water side of cooling system. Heat or soluble oil (in many rust inhibitors and anti-freezes) will damage the impeller. Always connect the neoprene impeller pump to the cold water side. Use a centrifugal metal impeller water pump (Onan #132-0110 or equal) in the hot water side. Drive it with a belt from the set's power take-off.*

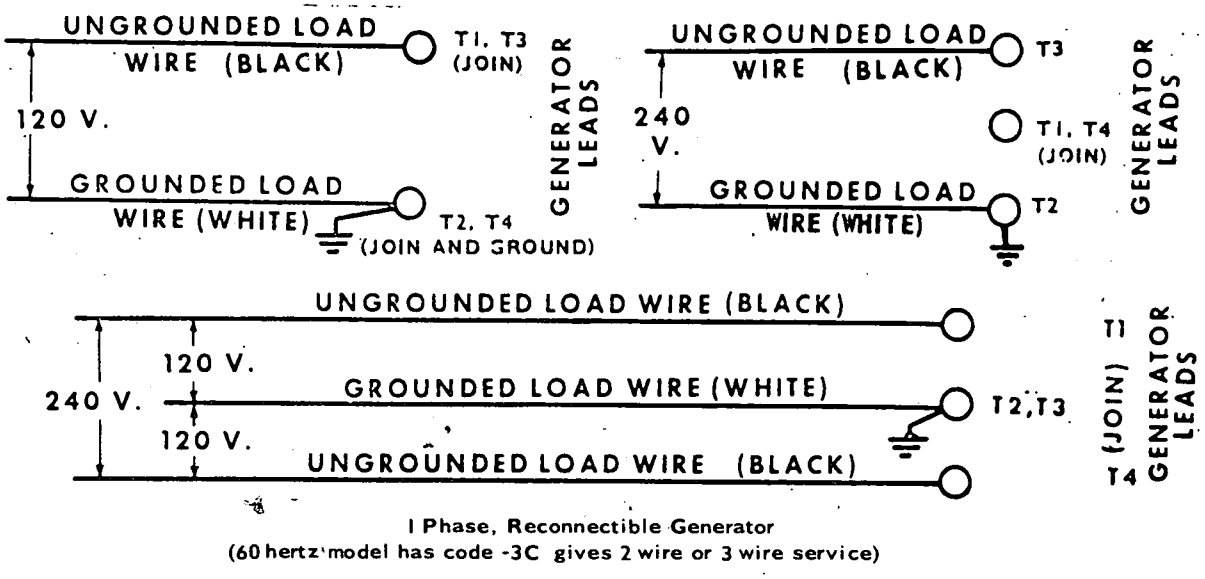
Spec A through C: Use an expansion tank in the hot water side.

Discharged water leaves at heat exchanger and then to exhaust system water inlet. Supply line connections are the same as standard system (Figure 13). Refer to the instructions for water supply line in this section.

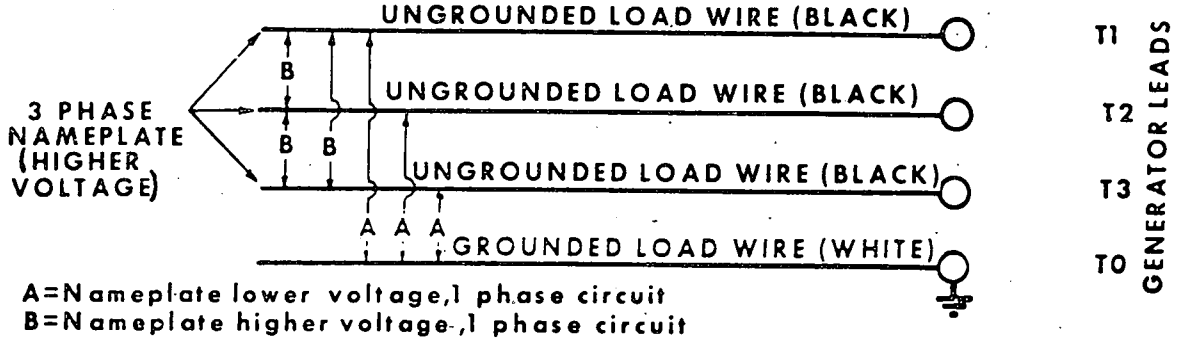
Fill closed cooling systems with clean, alkali-free water, to the proper level. Add an approved rust inhibitor to the coolant. If the coolant is anti-freeze, test it periodically.

Install a new zinc "pencil" (Figure 13) which screws into fresh water outlet end of heat exchanger, every two months or as inspection dictates.

CAUTION *Use high temperature cut-off switch in the hot water side to protect unit from overheating.*



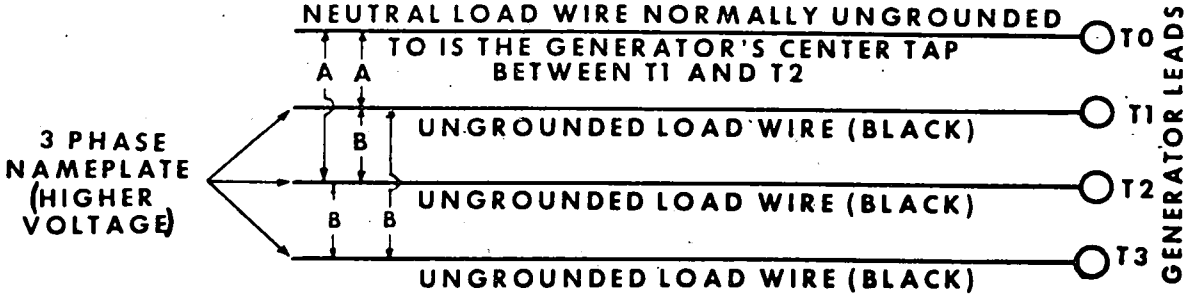
1 Phase, Reconnectible Generator
(60 hertz model has code -3C gives 2 wire or 3 wire service)



A=Nameplate lower voltage,1 phase circuit
B=Nameplate higher voltage,1 phase circuit

(60 hertz 120/208 volt model has code -4)

Y–Connected



A=Nameplate lower voltage,1 phase circuit
B=Nameplate higher voltage,1 phase circuit

Delta Connected (60 hertz 120/240 volt model has code -5D)

SINGLE PHASE POWER AT CENTER TAPPED LEG AVAILABLE UP TO 2/3 OF FULL RATED THREE PHASE POWER

FIGURE 12. WIRING CONNECTIONS

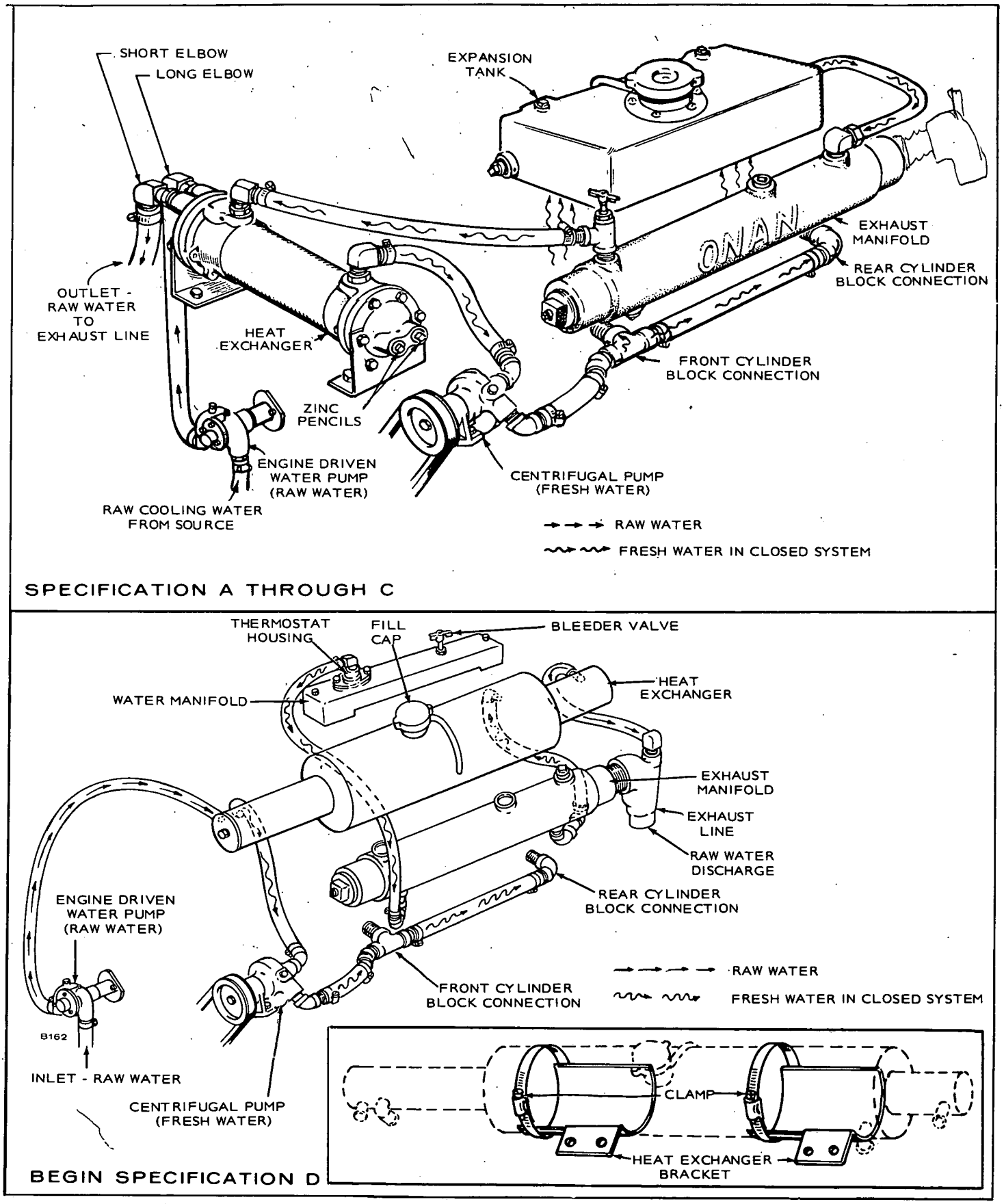


FIGURE 13. HEAT EXCHANGER PLUMBING

OPERATION

CRANKCASE OIL

Use an oil with the API designation CD/SE, or CD/SD (formerly DS) that has passed the Series 3 Test and at least Sequences IIA and IIIA of the Automotive Manufacturer's MS Sequence Tests. (DM oil which has passed the Automotive Manufacturer's MS Sequence Tests and the MIL-L-2104B Tests may also be used when ambient temperatures are lower than 30°F.) To reduce oil consumption to a normal level in the shortest time on a new or rebuilt "J" series diesel engine, use CC (formerly DM) oil (passing the MS Sequence Tests) for the first fill only (50 to 100 hours), then change to the recommended oil.

TEMPERATURE	GRADE
Above 32°F	SAE 30
0°F to 32°F	SAE 10W-30, 5W-20, or 10W, 5W-30
Below 0°F	SAE 5W-20 or 5W-30

Do not mix brands or grades. Refer to Maintenance Section for recommended oil changes.

RECOMMENDED FUEL

Depends on operating conditions. Use NO. 2 diesel fuel for best economy. Use NO. 1 diesel fuel (a) when ambient temperature is below 32°F., or (b) at all temperatures during long periods of light engine load, (c) if preferred by user. Use low sulfur content fuel having a pour point (ability to filter) of at least 10°F. below the lowest expected temperature. Keep fuel clean and protected from adverse weather. Leave some room for expansion when filling the tank.

INITIAL START

Check the engine to make sure it has been filled with oil and that fuel system is air-free.

Bleed air from fuel system as follows: Disconnect the fuel return line. See Fig. 14. Operate the hand priming lever on diaphragm type fuel transfer pump until there are no air bubbles in fuel flowing from the fuel return line fitting. Then connect the fuel return line. NOTE: If the camshaft pump lobe is up, crank engine one revolution to permit hand priming. When finished, return priming lever inward (disengaged position) to permit normal pump operation.

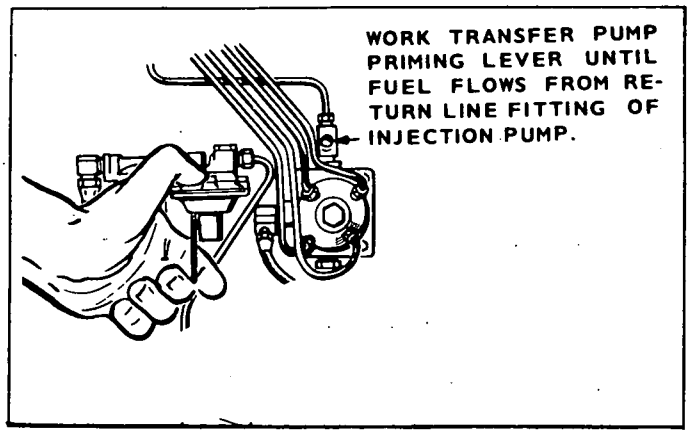


FIGURE 14. BLEEDING THE FUEL SYSTEM

Temporarily remove the plug from the water pump inlet fitting. Figure 10. Fill the pump with water to lubricate and prime it. Replace plug before operation.

STARTING

(1) For cold engine starting above 55°F, depress the manifold heater switch for one minute. (2) Push START-STOP switch to its START position. (3) Release switch after engine starts and reaches speed. (4) Oil pressure should read at least 20 psi (pressure-relief valve is not adjustable).

The most common failure to start is caused by unit running out of fuel---and then not properly bleeding the fuel system before attempting to start.

If the set control has a re-set button, push it to re-set after a shutdown resulting from low oil pressure or high water temperature occurs. Find the cause before re-starting the engine. If continuous false starting occurs, make sure the centrifugal switch (Fig. 16) closes during speed build-up.

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

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

Extremes in starting temperatures may require additional preheating. If engine fails to start quickly, rest engine several seconds and repeat starting sequence applying preheat for a longer interval.

CAUTION *Do not apply overvoltage to the starting circuit at any time. Overvoltage will destroy the glow-plugs and air heater in two to three*

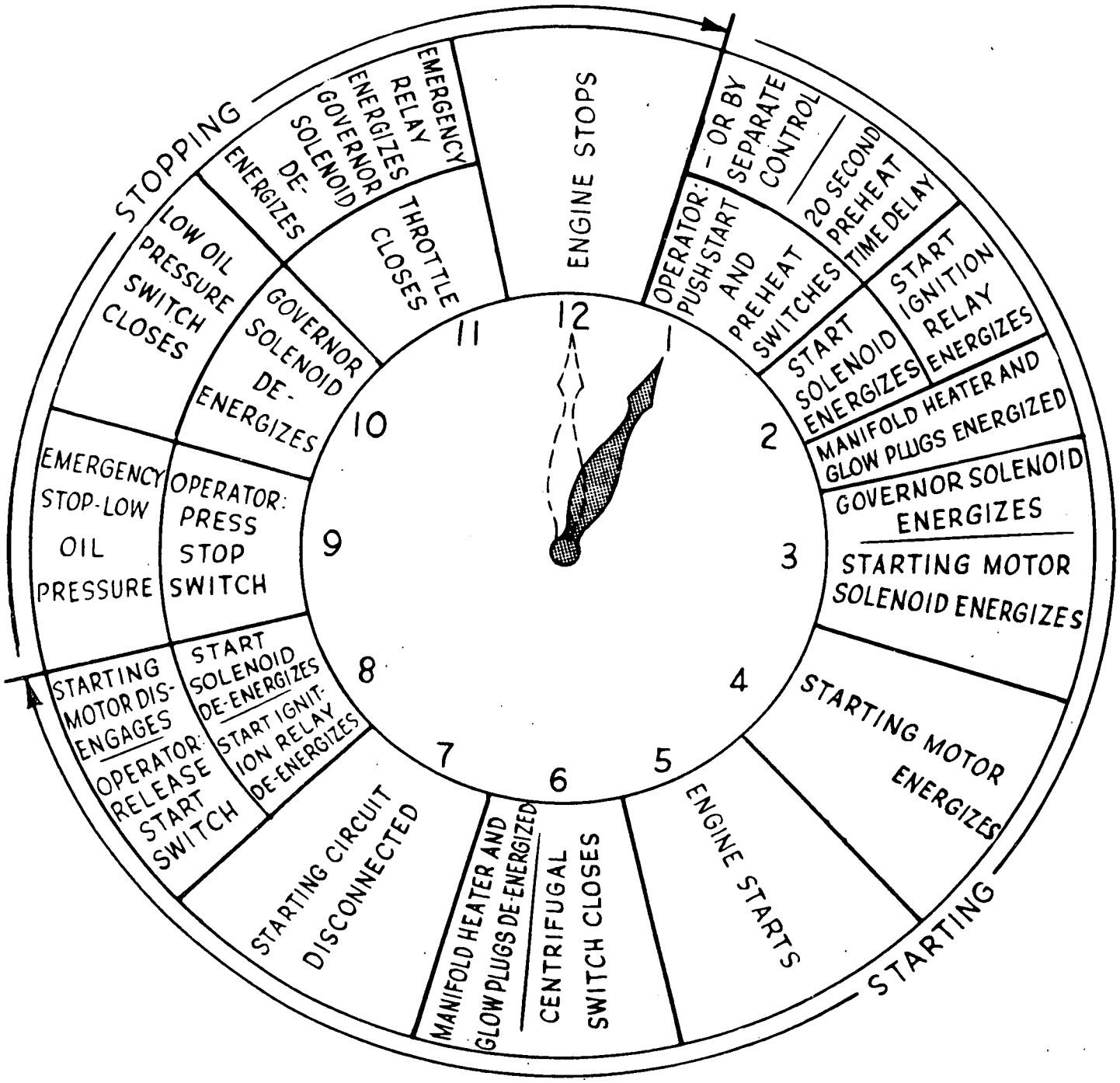


FIGURE 15. OPERATING CYCLE

seconds. If it becomes necessary to use an additional source of power to start the unit – use a 12volt battery connected in parallel.

AUTOMATIC STARTING AND STOPPING

Separate controls may be used for automatic start and stop, but must provide engine pre-heating.

The automatic control has a time delay relay to pre-heat glow plugs and the manifold heater for about 20-seconds before cranking occurs. Remove the jumper in the unit's control box which connects terminal H (heater) to terminal 3 (start circuit) and connect separate-control pre-heat circuit to the set H terminal when installing the control. The time delay relay also delays engagement of the starter when load is re-applied before the engine stops completely.

STOPPING

(1) Push *start-stop* switch to *stop* position.
(2) Release switch when unit stops. If stop circuit fails, close fuel valve.

APPLYING LOAD

If practicable, allow set to warm up before connecting a heavy load. Continuous generator overloading may cause high operating temperatures that can damage the windings. The generator can safely handle an overload temporarily, but for normal operation, keep the load within nameplate rating. The exhaust system may form carbon deposits during operation at

light loads. Apply full load occasionally before shut-down to prevent excessive carbon accumulations.

Try to connect the load in steps instead of full load at one time. Most installations use a line switch that must be closed to connect a portion of the load.

EXERCISE STANDBY SETS

Infrequent set use results in hard setting. Operate standby set a least 30 minutes each week. Run longer if battery needs charging.

BREAK-IN PROCEDURE

The unit should be run in the following sequence:

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

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

NOTE: *Drain the initial oil after 50 hours of operation while the engine is still hot.*

SAFETY DEVICES

In case of dangerously high coolant (water) temperature or low oil pressure, the cut-off switch stops the unit. After an emergency stop, investigate and correct the cause. Press re-set button before restarting.

EMERGENCY OPERATION IF BATTERY FAILS

MDJF generating sets require a battery for running. If the set battery fails completely and set must be operated during an emergency, a battery can be shared with other equipment provided the set charging circuit is disconnected as follows: Remove the ammeter wire connected to terminal No. 8 in the control box and tape the bare end. The set will not charge the battery with this lead wire disconnected.

HEAT EXCHANGER (OPTIONAL) FILLING

Improper filling of the heat exchanger can cause overheating of the engine. Therefore, to prevent this possibility, follow these instructions whenever adding cooling to the heat exchanger:

1. Remove fill cap.
2. Open fill vent valve (turn counterclockwise).
3. Remove vent plug. (Spec A through C).
4. Fill with coolant.
5. Close fill vent valve (turn clockwise).
6. Replace vent plug. (Spec A through C).
7. Replace fill cap.
8. Operate unit 10 minutes at full load, watch for leaks.
9. Shut down unit.

   After running unit 10 minutes, the closed cooling system is pressurized and hot. Open the 14 lb. pressure cap slowly to vent pressure.
10. Slowly open pressure cap and check water level.
11. Fill system to top with coolant.

OUT-OF-SERVICE PROTECTION

When taking unit out of service for 30-days or longer, proper storage methods must be used to prevent damage from corrosion, contamination, and temperature extremes.

Fuel System

1. Clean air cleaner (if used) - do not service air cleaner with oil. Check and clean air intake.
2. Cover or seal exposed air intake openings.
3. Clean throttle linkage (and governor linkage) thoroughly. Lubricate metal ball joints with light machine oil (do not lubricate plastic ball joints).

Oil System

1. Drain engine lubricating oil while engine is warm. Service the engine with proper oil. TAG the engine to IDENTIFY the lubricating oil installed. Secure the oil filter cap.
2. Remove fuel injectors. Pour 2 ounces of rust inhibitor oil (SAE50 substitute) into each cylinder. Crank engine over by hand several revolutions to lubricate cylinder walls, pistons, and rings. Install injectors.
3. Remove and service oil filter.

Cooling System

1. Drain entire cooling system including water cooled exhaust manifold and exhaust line. Drain heat exchanger or keel cooler components, engine cylinder block, and water pumps.

Generating units equipped with heat exchanger or keel cooling may be filled with a good quality anti-freeze if freezing temperatures are expected. Drain only those components not protected from freezing (exhaust lines, water intake and outlet lines, etc.).

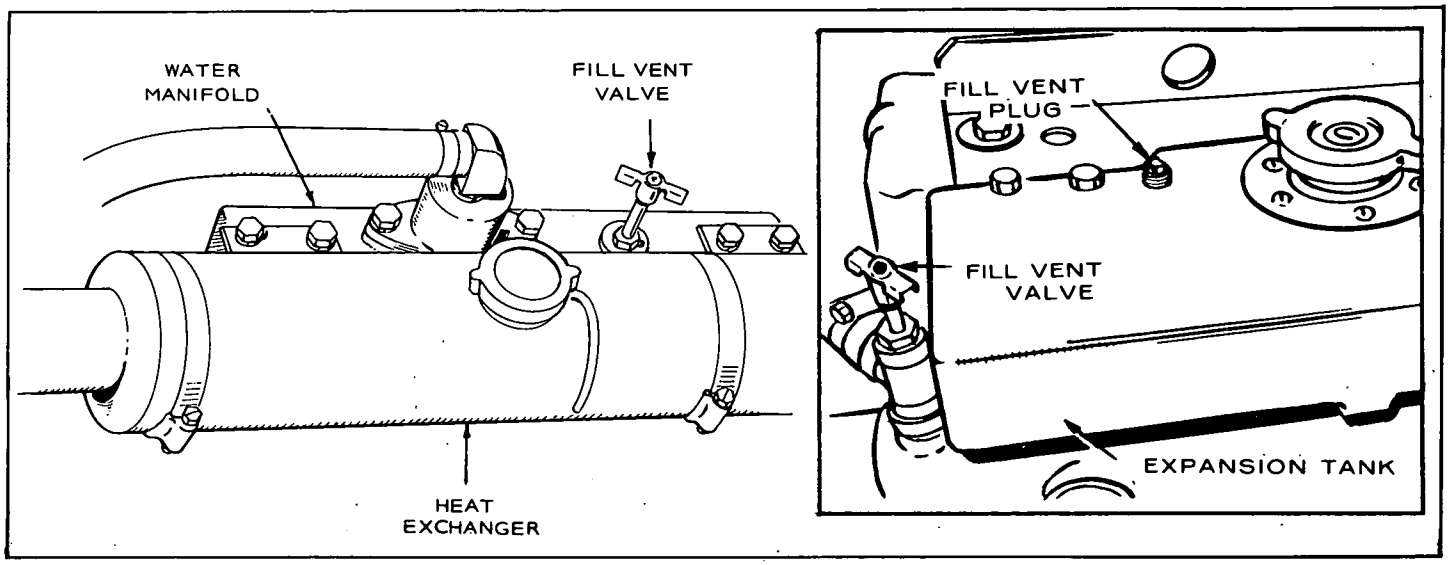


FIGURE 15-A. FILLING HEAT EXCHANGER

Whenever water flow is restricted, remove the 1/2-inch bolt, end cap and gasket at the front end of the heat exchanger and clean the water passages, Check raw water intake for seaweed, grass, etc.

Electrical System and Batteries

1. Clean generator brushes and slip rings by wiping with a clean, dry, lint-free cloth. *Do Not Lubricate These Parts.*
2. Clean static exciter with dry low-pressure air. Remove dust and dirt deposits in control box and junction boxes.
3. Disconnect batteries and remove from vessel. Service batteries by maintaining liquid level and using a trickle charger to maintain voltage.

CAUTION *Discharged batteries are subject to severe damage if exposed to freezing temperatures: STORE ALL BATTERIES IN A FULLY CHARGED CONDITION AND MAINTAIN CHARGE DURING STORAGE.*

General

1. Cover or seal all exposed openings (exhaust outlet, water ports, etc.)
2. Cover entire generating plant.
   TAG and IDENTIFY unit to indicate SERVICE REQUIRED BEFORE ATTEMPTING TO OPERATE. List all items requiring attention and service prior to operation

NOTE: *Aqualift muffler requires no out of service protection.*

RETURNING THE SET TO OPERATION

1. CHECK SERVICE IDENTIFICATION TAGS to properly service the plant.
2. Uncover and remove storage seals from entire unit. Remove any dust, dirt, or foreign matter.
3. CHECK fuel supply tanks for moisture accumulations (drain tanks if necessary). CHECK lubricating oil for moisture or contamination (drain if necessary). CHECK fuel line connections, all wiring connections, and exhaust line connections.
4. Service air cleaner (if used). Torque fuel injectors and bleed fuel system (if moisture or contamination are found in fuel, replace filters and clean fuel pump sediment bowl).
5. Service cooling system with clean fresh water. Prime water pump and see that all air is bled from cooling system. If anti-freeze was left in closed type cooling system, check level and service as required.
6. Check entire unit for water, fuel, or oil leaks. Correct leakage as required.
7. Install fully charged batteries.
8. Start the set in normal method. Check the running set for leaks, correct voltage output, proper cooling.

HIGH TEMPERATURES

1. See that nothing obstructs air flow to-and-from the set.
2. Keep cooling system clean. Maintain water level in closed system cooling.

LOW TEMPERATURES

1. Use correct SAE No. oil for temperature conditions. Change oil only when engine is warm. If an unexpected temperature drop causes an emergency, move the unit to a warm location or apply heated air (never an open flame) externally until oil flows freely.
2. Protect fuel against moisture condensation.
3. Keep batteries in a well charged condition.
4. Partially restrict cool air flow but use care to avoid overheating.
5. Add good quality anti-freeze if danger of freezing exists.

NOTE: *Aqualift muffler need not be drained.*

DIRTY CONDITIONS

1. Keep set clean. Keep cooling system clean.
2. Service air cleaner (if used) as frequently as necessary.
3. Change crankcase oil every 50 operating hours.
4. Keep oil and fuel supplies in dust-tight containers.
5. Keep governor linkage clean.
6. Clean generator brushes, slip rings, and commutator - do not remove normal (dark brown) film. Do not polish.

ADJUSTMENTS

CHECK CENTRIFUGAL BREAKER POINTS

Refer to *Dimensions and Clearances* for correct gap distances. Replace burned or faulty points.

If only slightly burned, dress smooth with file or fine stone. Measure gap with thickness gauge (Figure 16).

The centrifugal switch is wide open when engine is stopped. Loosen and move stationary contact to correct gap.

NOTE: *Rotate engine crankshaft a few degrees counterclockwise before adjusting points. To release any torsional forces created by the water pump impeller. Use a socket wrench on the flywheel retaining screw.*

GOVERNOR

The governor controls engine speed. Rated speed and voltage appear on the nameplate (see also Specifications). Engine speed equals frequency multiplied by 30 on a 4 pole generator, thus 1800 rpm is 60 hertz. The speed should not vary more than 3 hertz from no load to full-load operation. Be sure throttle, linkage and governor mechanism operate smoothly.

Speed Adjustment: To change the governor speed, change the spring tension by turning the governor spring nut (Figure 18). Turn the nut clockwise (more spring tension) to increase RPM and counterclockwise to reduce governed speed. Hold a tachometer against flywheel cap screw or use frequency meter.

Sensitivity Adjustment: To adjust governor sensitivity (no-load to full-load speed droop), turn the sensitivity adjusting ratchet (Figure 18). Counterclockwise gives more sensitivity (less speed drop when full load is applied), clockwise gives less sensitivity (more speed drop). If the governor is too sensitive, a rapid hunting condition occurs (alternate increasing and decreasing speed). Adjust for maximum sensitivity without hunting. After sensitivity adjustment, the speed will require readjustment. After adjusting the governor, secure lock nut.

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

VALVE CLEARANCE

Check valve clearance when the engine is at room temperature (about 70°F).

1. Turn the flywheel until the cylinder which is to have its valve adjusted is on its compression stroke. Use a socket wrench on the flywheel screw hex head.

   To determine if the cylinder is in its compression stroke, observe the action of the push rods as the engine is rotated in a clockwise direction. The exhaust valve push rod will be in its lowest position and the intake valve push rod will be moving downward. As the piston reaches top dead center, the flywheel timing mark should be aligned with the timing pointer and the valve push rods stationary.

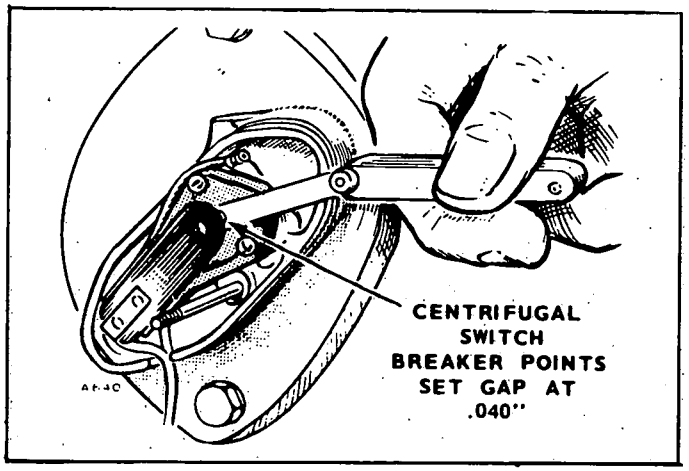


FIGURE 16. CENTRIFUGAL SWITCH

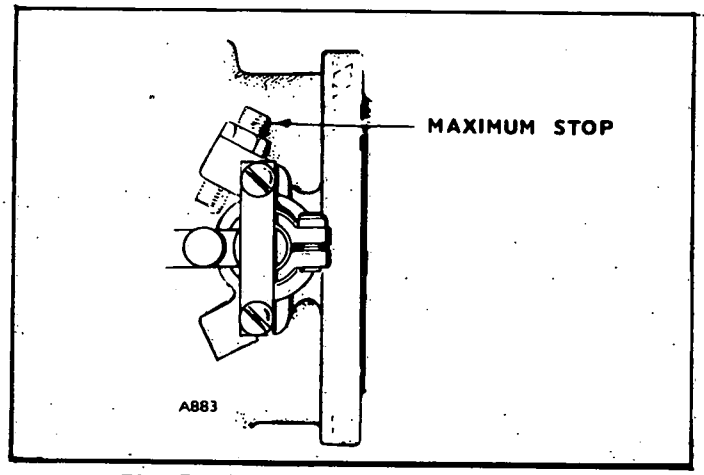


FIGURE 17. SETTING STOP SCREW

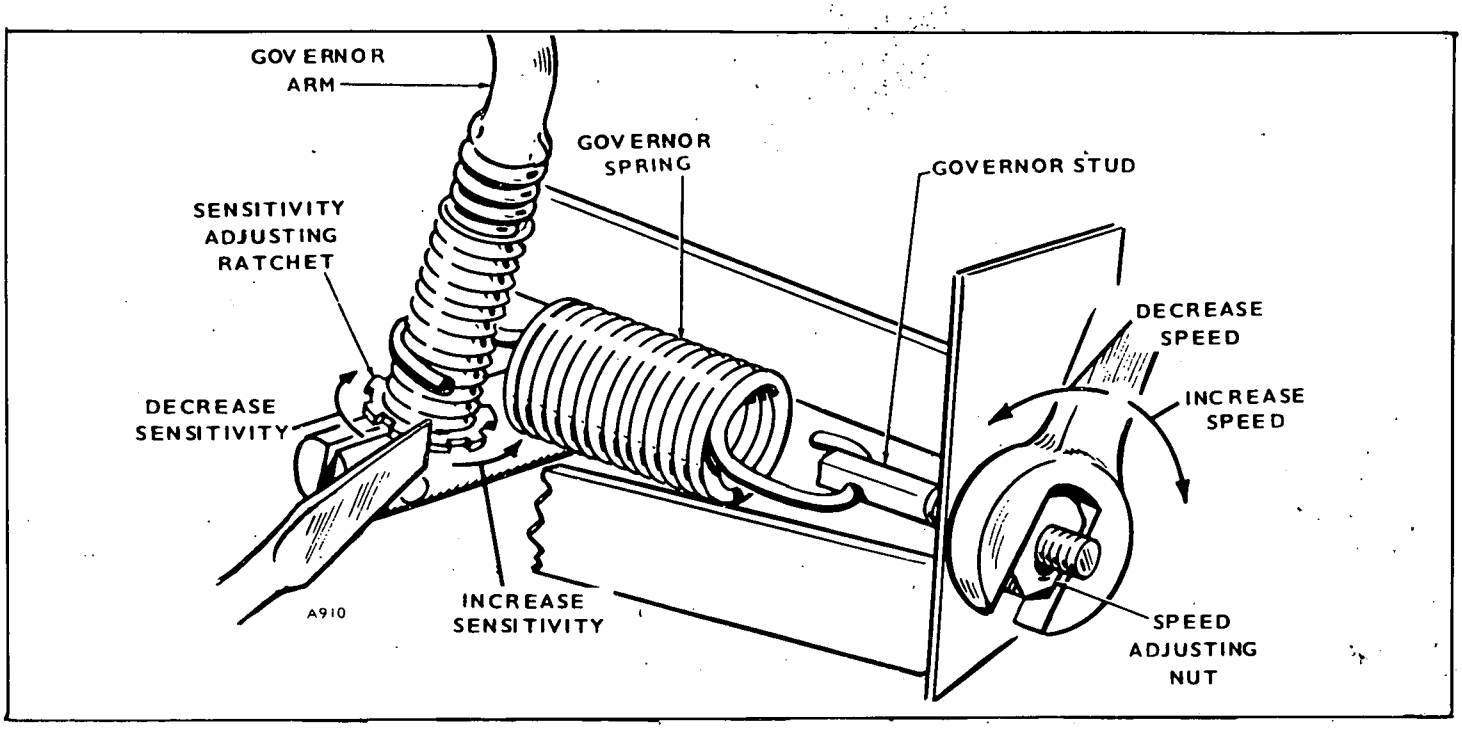


FIGURE 18. GOVERNOR ADJUSTMENT

2. Now turn the flywheel clockwise for an additional 10 to 45 degrees. There is no timing mark for this position so it must be estimated. With the piston located in this position, it will be in its power stroke with both valves completely closed.

3. To change the setting of valve clearance, adjust the locknut which secures the rocker arm to the cylinder head (see Figure 19). Loosen the locknut to increase clearance and tighten it to reduce clearance.

4. Using a feeler gauge, check the clearance between the rocker arm and the valve (see Fig. 20). Increase or reduce the clearance until the proper gap is established. Correct valve clearance is .017" intake and .017" exhaust.

5. Always adjust the valve clearances in the firing order (1-2-4-3) sequence. After allowing engine to cool, adjust #1 cylinder. After timing the #1 cylinder, adjust the valve clearance according to steps 2 and 3.

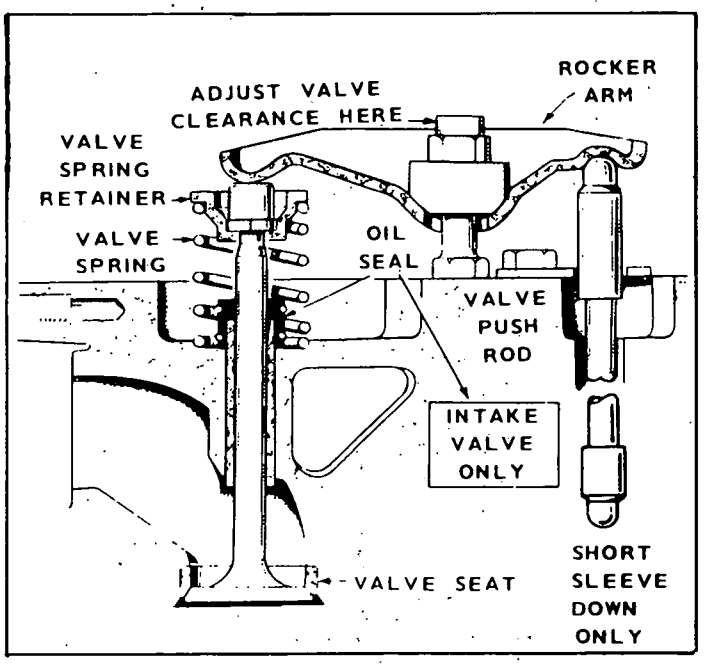


FIGURE 19. VALVE MECHANISM

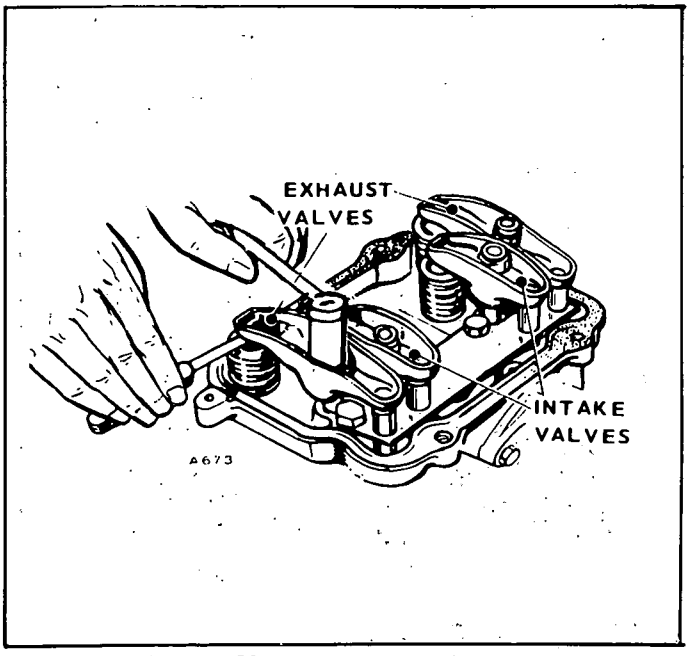


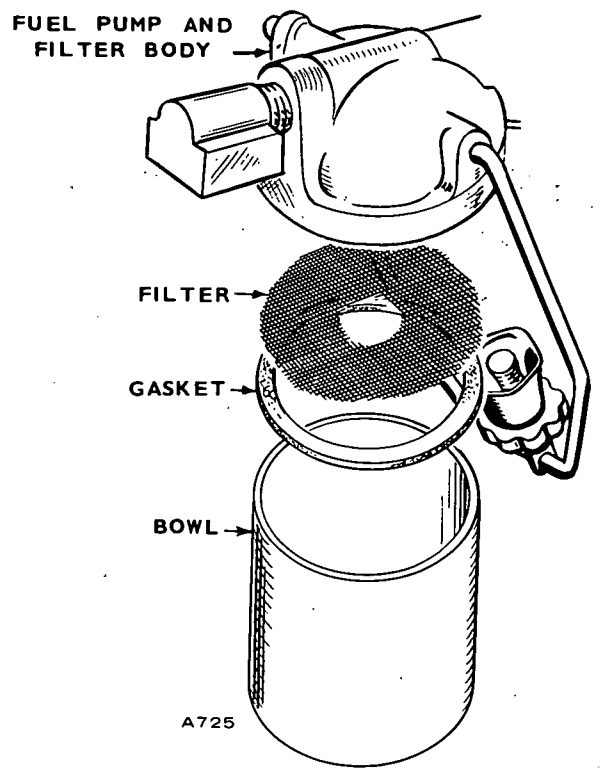
FIGURE 20. ADJUSTING VALVES

6. To adjust the valve clearance of #2 cylinder, tum the flywheel in a clockwise direction 180 degrees (one half revolution) from the position used when timing #1 cylinder. The flywheel position should be between 10 and 45 degrees past the BC (bottom center) flywheel mark.

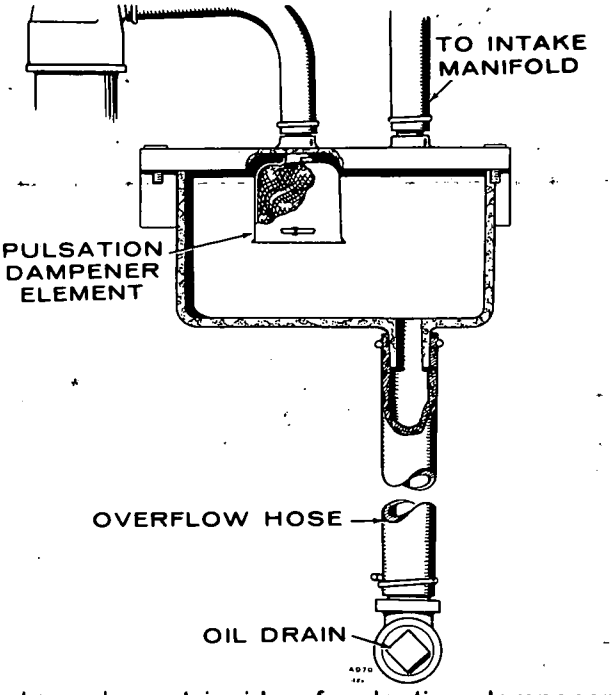
7. After positioning #2 cylinder, adjust the valve clearance according to steps 3 and 4.

8. To adjust #4 cylinder valve clearance, turn the flywheel in a clockwise direction 180-degrees (one-half revolution). The flywheel should be between 10- and 45-degrees past the TC (top center) flywheel mark.

9. After timing #4 cylinder, adjust the valve clearance according to steps 3 and 4.
10. To adjust the valve clearance for #3 cylinder, turn the flywheel in a clockwise direction 180-degrees (one-half revolution). The flywheel should be between 10- and 45-degrees past the BC (bottom center) flywheel mark.
11. After timing #3 cylinder, adjust the valve clearance according to steps 3 and 4.

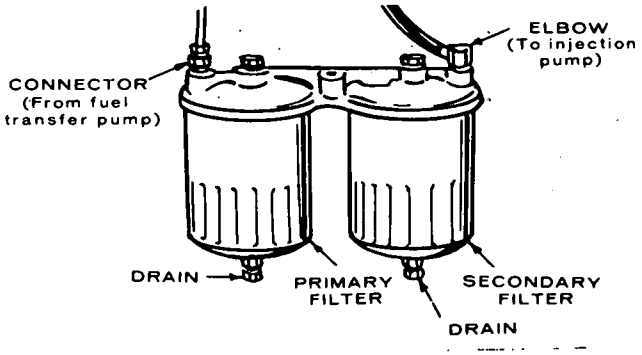


FUEL PUMP SEDIMENT BOWL



Replace element inside of pulsation dampener every 2000 hours.

BREATHER PULSATION DAMPENER SPECIFICATION A AND B

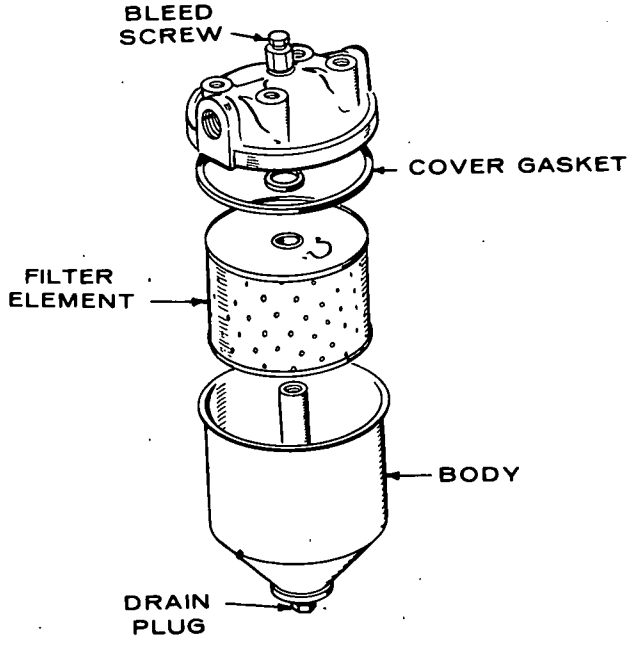


DUAL FUEL FILTER SYSTEM - BEGIN SPEC B

Drain water periodically as required. Replace primary filter every six hundred (600) hours. Perform more often in extremely dusty conditions. Replace secondary filter with every 5th change of the primary filter.

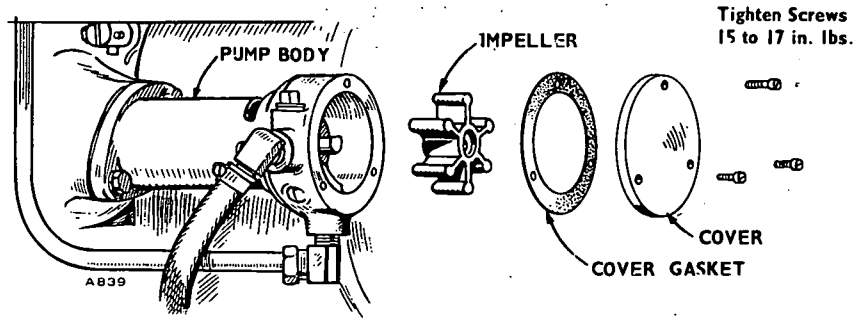
CAUTION Drain plug on fuel filters can tolerate only a limited amount of torque. Use two wrenches in combination for breaking plug loose and for final tightening.

DUAL FUEL FILTER

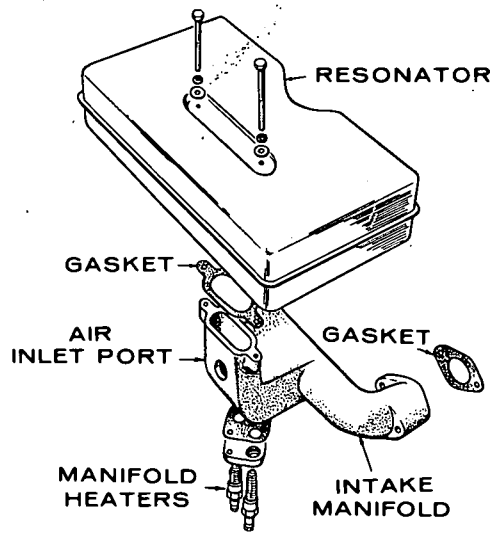


SECONDARY FUEL FILTER (Spec. A Only)

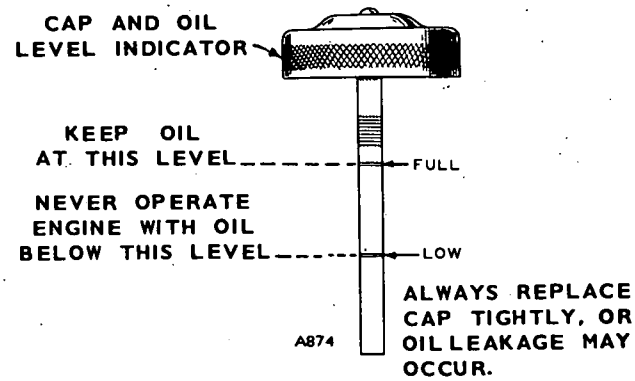
FIGURE 21. SERVICING PROCEDURES



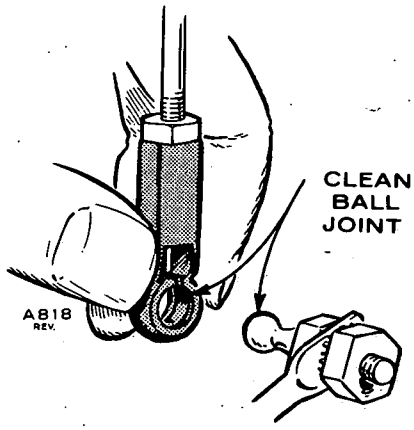
WATER PUMP



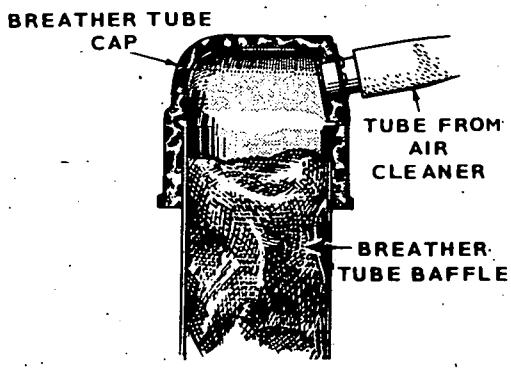
RESONATOR



OIL LEVEL INDICATOR



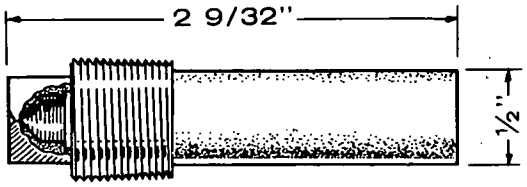
BALL JOINT



Remove breather cap. Remove baffle and wash in suitable solvent. Dry and reinstall.

CRANKCASE BREATHER
SPECIFICATION A AND B

FIGURE 22. SERVICING PROCEDURES



The raw water side of the heat exchanger is protected from corrosion by zinc pencil mounted on pipe plugs in one end of the heat exchanger. Inspect the pencil at least every 2 months and replace if deteriorated to less than 1/2 original size.

SPECIFICATION A THROUGH C

ZINC PENCIL

FIGURE 23. SERVICING PROCEDURES

GENERATOR SET ROUTINE CHECK CHART

Before generator set is put in operation, check all components for mechanical security. If any abnormal condition, defective part or operating difficulty is detected, repair or service as required. The generator set should be kept free of dust, dirt and spilled oil or fuel. Be sure proper operating procedure is followed.

WHAT TO CHECK	HOW TO CHECK	PRECAUTIONS
Engine oil	Check level (should be at full mark on oil indicator).	Add oil as necessary to bring level to full mark.
Engine fuel	Check level in tank.	See that fuel line is properly connected.
Engine radiator	Check ventilating openings and water level.	Remove any obstructions. Keep radiator full.
Connecting cables	Check for proper connections. Check for physical damage.	Tighten connections. Replace damaged connectors.
Battery	Check electrolyte level.	Keep level above plates. Add only approved water as necessary.

MAINTENANCE SCHEDULE

Use this factory recommended maintenance (based on favorable operating conditions) to serve as a guide to get long and efficient set life. Neglecting routine maintenance can result in failure or permanent damage to the set. Maintenance is divided into two categories: (1) OPERATOR MAINTENANCE – performed by the operator and (2) CRITICAL MAINTENANCE – performed by qualified service personnel.

OPERATOR MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	OPERATIONAL HOURS				
	8	100	200	600	3000
Inspect Unit	x				
Check Water Level (Heat Exchanger Models)	x				
Inspect Exhaust System	x6				
Check Fuel Supply	x3				
Check Oil Level	x				
Clean Governor Linkage		x2			
Change Crankcase Oil		x			
Drain Fuel System Condensation Traps		x3			
Check Battery			x		
Replace Oil Filter			x		
Change Primary Fuel Filter				x3	
Change Secondary Fuel Filter					x3
Empty Fuel Sediment Bowl			x		

CRITICAL MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	OPERATIONAL HOURS					
		200	500	1000	2000	5000
Check Slip Rings		x				
Check Brushes		x1				
Check Commutator		x				
Check Valve Clearance	*		x			
Inspect Water Pump F./Leaks and Wear, Replace if Necessary				x		
Clean Generator					x	
Grind Valves (If Required)					x	
Clean Rocker Box Oil Line Holes					x	
Check Nozzle Opening Pressure, Spray Pattern					x4	
General Overhaul (If Req.)						x
Change Fuel Filters	x5					

x Perform as indicated on Table.

x1 Replace collector ring brushes when worn to 5/16″, replace commutator brushes when worn to 5/8″.

x2 Perform more often in extremely dirty conditions. Lubricate the old style linkage. Plastic ball type require only cleaning. It may be advantageous to replace the old style metal linkage with the plastic ball type in extremely dirty operating conditions.

x3 Water or foreign material in the fuel can ruin the injection system. If daily inspection shows water or dirt in the fuel pump sediment bowl, fuel handling and storage facilities should be checked and situation corrected. Filter elements should be replaced following corrections of fuel contamination problems.

x4 This service must be conducted by trained diesel injection equipment personnel with suitable test facilities. Omit this service until these conditions can be met.

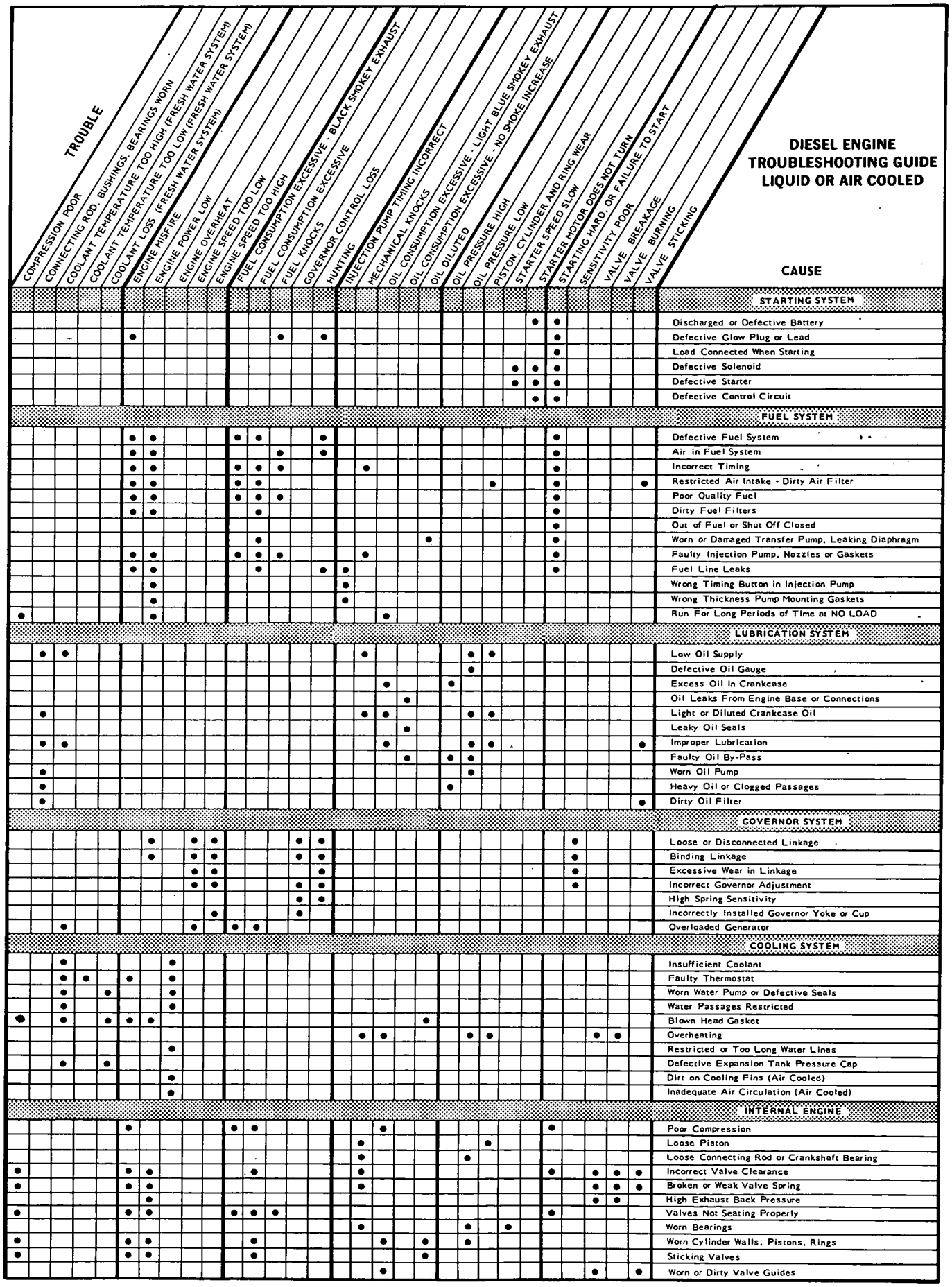
x5 Service per Operator Maintenance Schedule.

x6 With plant running, visually and audibly check exhaust system for leaks.

* Tighten head bolts and adjust valve clearance after first 50 hours on a new or overhauled engine.

For critical items not covered, see page 2 (A Major Service Manual is available).

DIESEL ENGINE TROUBLESHOOTING GUIDE LIQUID OR AIR COOLED



PARTS CATALOG

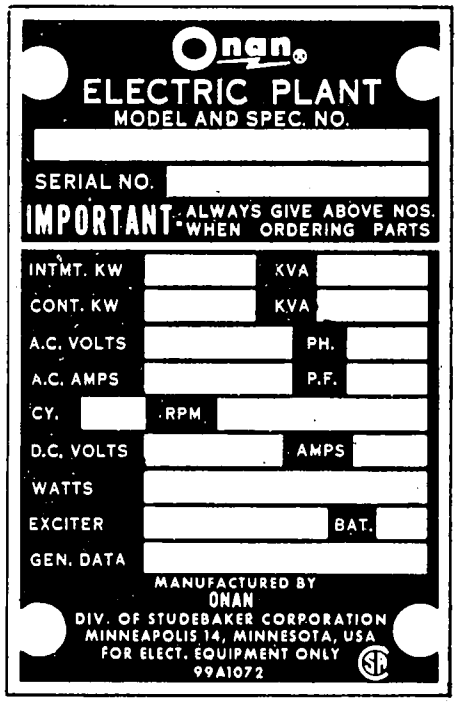
INSTRUCTIONS FOR ORDERING REPAIR PARTS

For parts or service, contact the dealer from whom you purchased this equipment or refer to your Nearest Authorized Onan Parts and Service Center.

To avoid errors or delay in filling your parts order, please furnish all information requested.

Always refer to the nameplate on your unit:

1. Always give the MODEL and SPEC NO. and SERIAL NO.



For handy reference, insert YOUR engine nameplate information in the spaces above.

2. Do not order by reference number or group number, always use part number and description.
3. Give the part number, description and quantity needed of each item. If an older part cannot be identified, return the part prepaid to your dealer or nearest AUTHORIZED SERVICE STATION. Print your name and address plainly on the package. Write a letter to the same address stating the reason for returning the part.
4. State definite shipping instructions. Any claim for loss or damage to your unit in transit should be filed promptly against the transportation company making the delivery. Shipments are complete unless the packing list indicates items are back ordered.

Prices are purposely omitted from this Parts Catalog due to the confusion resulting from fluctuating costs, import duties, sales taxes, exchange rates, etc.

For current parts prices, consult your Onan Dealer, Distributor or Parts and Service Center.

"En esta lista de partes los precios se omiten de proposito, ya que bastante confusion resulto de fluctuaciones de los precios, derechos aduanales, impuestos de venta, cambios extranjeros, etc."

Consiga los precios vigentes de su distribuidor de productos "ONAN".

This catalog applies to the standard MDJF Generating Sets as listed below. Parts are arranged in groups of related items and are identified by a reference number. Parts illustrations are typical. Using the Model and Spec No. from the Onan nameplate, select the Parts Key No. (1, 2, etc., in the last column) that applies to your unit. This Parts Key No. represents parts that differ between models. Unless otherwise mentioned in the description, parts are interchangeable between models. Right and left generating set sides are determined by facing the engine end (front) of the unit.

GENERATOR SET DATA TABLE

MODEL AND SPEC NO. ★	ELECTRICAL DATA					PARTS KEY NO.
	WATTS	VOLTS	HERTZ	WIRE	PHASE	
15.0MDJF-3CR/*	15000	120/240	60	**	1	1
15.0MDJF-4R/*	15000	120/208	60	4	3	1
15.0MDJF-5DR/*	15000	120/240	60	4	3	1
12.0MDJF-53CR/*	12000	120/240	50	**	1	1
12.0MDJF-54R/*	12000	120/208	50	4	3	1
12.0MDJF-55DR/*	12000	120/240	50	4	3	1
12.0MDJF-57R/*	12000	220/380	50	4	3	1
15.0MDJF-3CR4/* ⚓	15000	120/240	60	**	1	2
12.0MDJF-53CR4/* ⚓	12000	120/240	50	**	1	2
15.0MDJF-3CE/* (Formerly 15MDJF-3E3836/)	Workboat Models - See Special Parts List Following Standard Parts List.					

★ - New model designations shown, begin during 1969. Previous designations did not use a decimal in the KW rating. EXAMPLE: 15.0MDJF was formerly 15MDJF and 12.0MDJF was formerly 12MDJF.

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

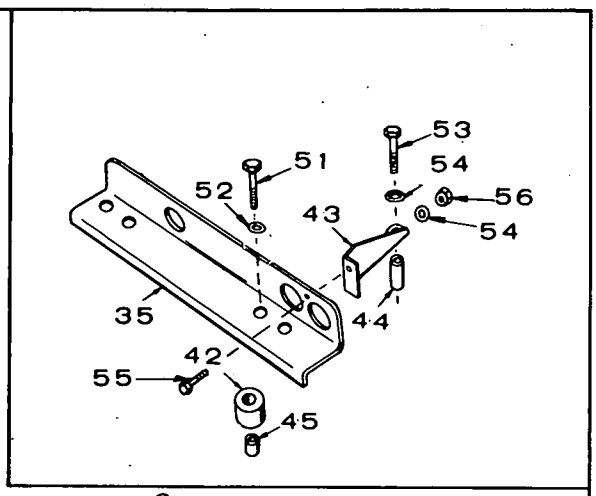
** - Set is reconnectible for 120 volt, 2 wire; 240 volt, 2 wire or 120/240 volt, 3 wire service. NOTE: Previously the C designation was not used in the model.

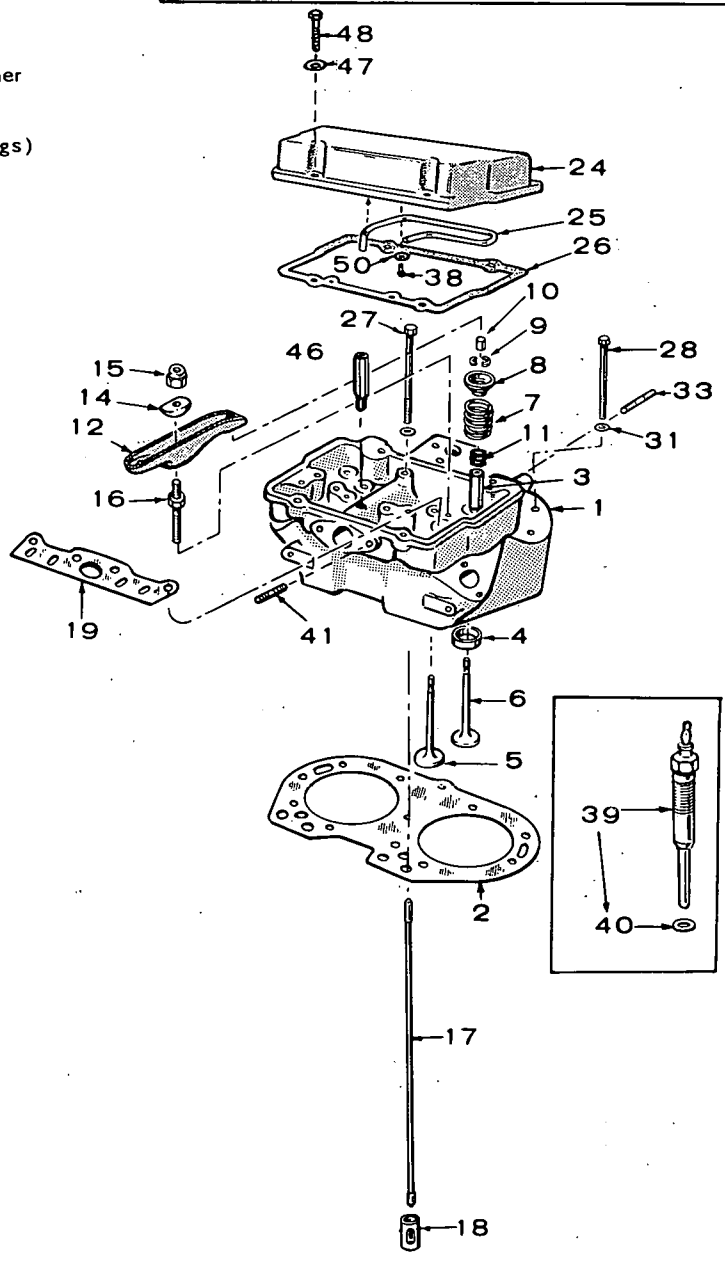
⚓ - These units have 32 volt DC system for engine requirements only (not auxiliary DC loads).

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

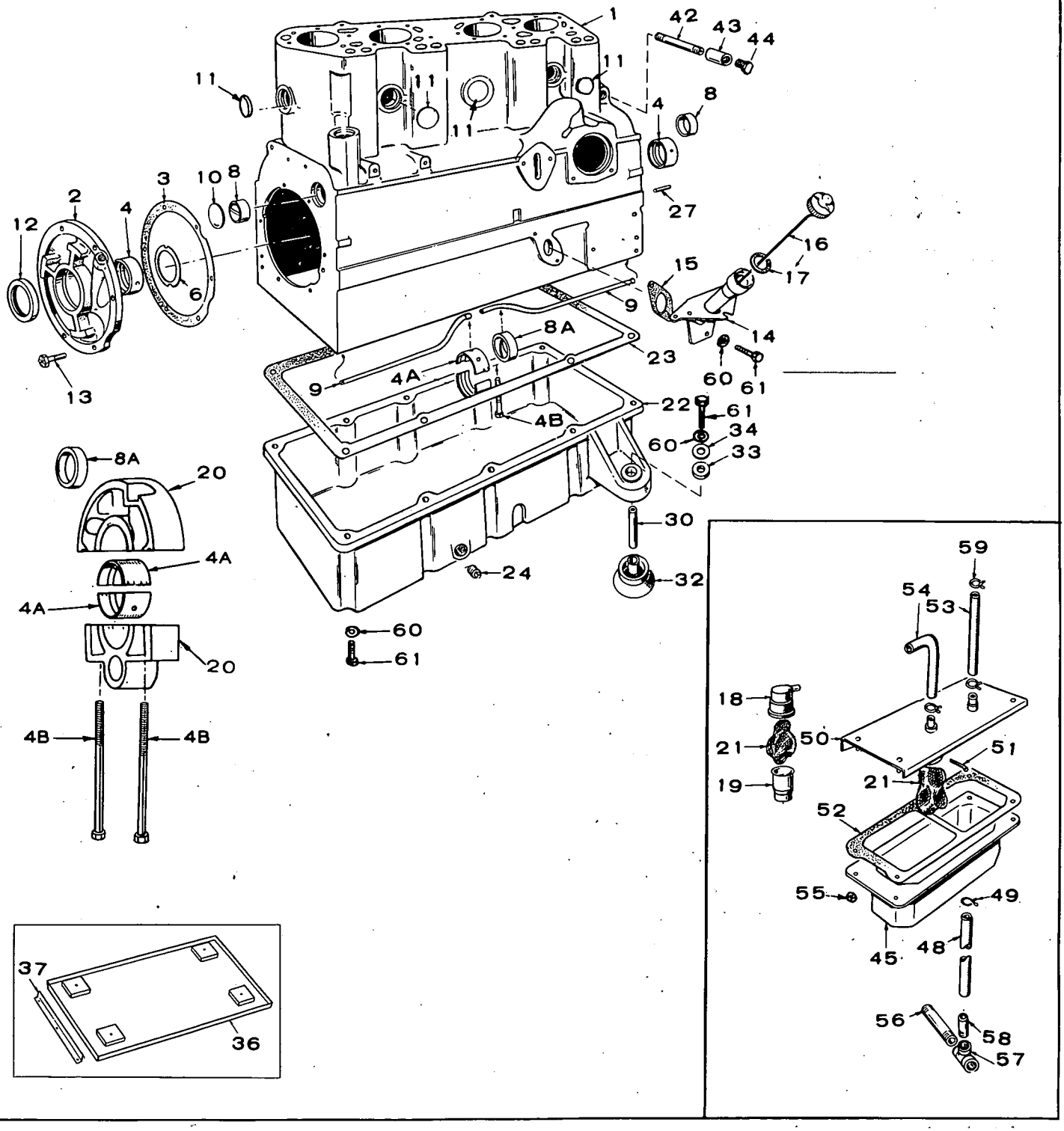
CYLINDER HEAD, VALVE AND ROCKER GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	HEAD, CYLINDER		
	110-1854	2	Sets Without Heat Exchanger
	110-1856	2	Sets With Heat Exchanger
2	110-1852	2	Gasket, Head
3	110-1501	8	Guide, Valve
4	INSERT, VALVE SEAT (STELLITE)		
	110-1268	8	Standard
	110-1268-02	8	.002" Oversize
	110-1268-05	8	.005" Oversize
	110-1268-10	8	.010" Oversize
	110-1268-25	8	.025" Oversize
5	110-1320	4	Valve, Intake
6	110-1278	4	Valve, Exhaust (Stellite)
7	110-1221	8	Spring, Valve
8	110-1220	8	Retainer, Valve Spring
9	110-0858	16	Lock, Valve Spring Retainer
10	110-0859	8	Cap, Valve Stem
11	509-0090	4	Seal, Oil - Intake Valve (Includes Retaining Rings)
12	ARM, ROCKER		
	115-0128	4	Exhaust
	115-0129	4	Intake
14	115-0127	8	Ball, Rocker Arm
15	115-0150	8	Locknut, Rocker Arm
16	114-0152	8	Stud, Rocker Arm
17	115-0149	8	Rod, Valve Push (Steel)
18	115-0195	8	Tappet, Valve
19	115-0196	2	Guide, Push Rod
24	115-0197	2	Cover, Rocker
25	120-0628	2	Line, Oil, Rocker Cover
26	115-0130	2	Gasket, Rocker Cover
27	110-1264	10	Screw (3/8-16 x 4-1/4") - Cylinder Head
28	800-0501	12	Screw (3/8-16 x 3-3/8") - Cylinder Head
31	526-0174	12	Washer, Cylinder Head
33	520-0608	8	Stud, Exhaust Manifold
35	403-0690	1	Bracket, Lifting
38	809-0042	2	Screw, Oil Line, Rocker Cover
39	PLUG, GLOW - INCLUDES GASKET		
	333-0106	4	Key 1 (12 Volt)
	333-0107	4	Key 1 (24 Volt)
	333-0112	4	Key 2 (32 Volt)
40	110-0546	4	Gasket, Glow Plug
41	520-0338	2	Stud, Intake Manifold
42	402-0361	2	Cushion, Vibration
43	403-0890	1	Brace, Lifting Bracket
44	403-0826	1	Spacer, Lifting Bracket
45	402-0362	2	Bushing, Spacer
46	123-1140	2	Standpipe - Begin Spec C
47	850-0045	8	Washer, Lock - Rocker Cover Mounting
48	800-0030	8	Screw, Hex Cap - Rocker Cover Mounting
50	526-0130	1	Washer (#10)
51	800-0094	2	Screw (1/2-13 x 2")
52	526-0100	2	Washer (1/2")
53	800-0038	1	Screw (5/16-18 x 3-1/4")
54	850-0044	2	Washer (5/16"), Lock
55	800-0025	1	Screw (5/16-18 x 3/8")
56	862-0015	1	Nut (5/16-18)



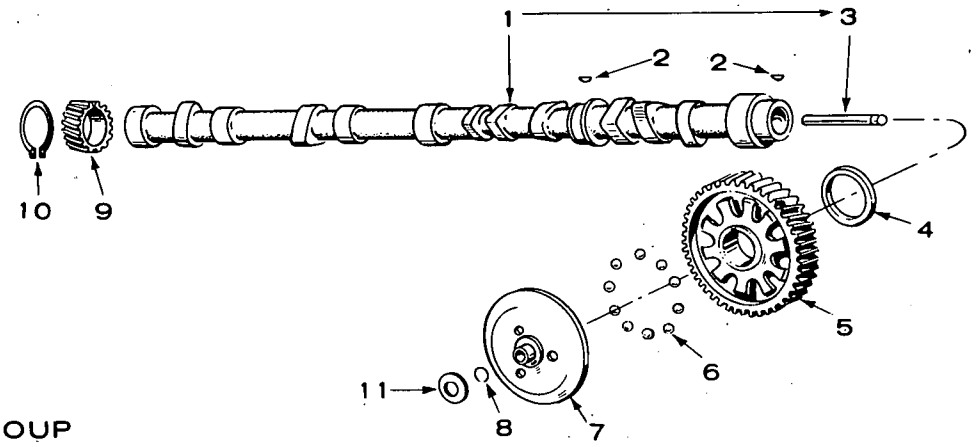


CRANKCASE AND OIL BASE GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	110-1665	1	Block Assembly (Includes Parts Marked *)
2	101-0337	1	*Plate, Rear Bearing (Less Bearing & Pins)
3	101-0386	1	*Gasket Kit, Rear Bearing Plate (Includes Shims)
4	*BEARING, PRECISION MAIN - FRONT & REAR		
	101-0359	2	Standard
	101-0359-02	2	.002" Undersize
	101-0359-10	2	.010" Undersize
	101-0359-20	2	.020" Undersize
	101-0359-30	2	.030" Undersize
4A	*BEARING HALF, PRECISION MAIN - CENTER		
	101-0361	2	Standard
	101-0361-02	2	.002" Undersize
	101-0361-10	2	.010" Undersize
	101-0361-20	2	.020" Undersize
	101-0361-30	2	.030" Undersize
4B	101-0342	2	*Bolt, Center Bearing Housing
5	526-0035	2	*Washer - (1/2") - Center Bearing Housing
6	104-0420	2	*Washer, Crankshaft Thrust
7	101-0363	1	*Bearing, Precision Cam Front (Standard Only)
8	101-0365	1	*Bearing, Precision Cam Rear (Standard Only)
8A	101-0364	1	*Bearing, Precision Cam Center (Standard Only)
9	*TUBE, CRANKCASE OIL		
	120-0586	1	Front
	120-0585	1	Rear
10	517-0053	1	*Plug, Expansion Rear Camshaft Opening
11	*PLUG, CYLINDER BLOCK EXPANSION (ORDER BY SIZE)		
	517-0059	As Req.	1-7/16"
	517-0096	As Req.	1-9/16"
	517-0097	As Req.	1-3/4"
12	509-0086	1	*Seal, Crankshaft Rear
13	805-0019	6	*Bolt, Rear Bearing Plate (3/8-16 x 1-1/4")
14	TUBE, OIL FILL		
	123-0681	1	Spec A Only
	123-1086	1	Begin Spec B
15	123-0667	1	Gasket
16	CAP AND INDICATOR		
	123-0698	1	Spec A Only
	123-1056	1	Begin Spec B
17	123-0191	1	Gasket, Cap
18	123-0787	1	Cap, Breather Tube - Spec A through B
19	123-0645	1	Tube, Breather - Spec A through B
20	101-0356	1	*Housing, Center Main Bearing
21	123-0865	2	Baffle, Breather - Spec A through B
22	102-0539	1	Base, Oil
23	102-0475	1	Gasket, Oil Base
24	505-0056	1	Plug (1/2")
27	516-0141	2	*Pin, Gear Cover Locating
30	402-0290	4	Bushing, Spacer - Vibration Mount
32	CUSHION, VIBRATION - CONE SHAPED		
	402-0285	2	Engine End
	402-0287	2	Generator End
33	402-0282	4	Snubber, Shock Mounting
34	526-0014	4	Washer (29/64" I.D. x 1-1/2" O.D. x 1/8")
35	WASHER		
	526-0198	As Req.	5/8" I.D. x 1-1/2" O.D. x 1/16"
36	405-1403	1	Pan, Drip
37	405-1265	2	Clamp, Drip Pan Hold-down
42	505-0449	1	Nipple, (1/4" x 6") Water Drain
43	505-0027	1	Coupling (1/4") Water Drain
44	502-0153	1	Plug (1/4") Water Drain
45	123-1061	1	Damper, Breather Pulsation - Spec A through B
48	503-0564	1	Hose, Overflow – Pulsation Damper - Spec A through B
49	503-0197	2	Clamp, Overflow Hose - Spec A through B
50	123-1045	1	Cover, Breather Pulsation Damper - Spec A through B
51	516-0177	1	Pin, Cotter - Filter Retainer - Spec A through B
52	123-1049	1	Gasket, Breather Pulsation Damper - Spec A through B
53	503-0563	1	Hose, Damper Cover to Manifold - Spec A through B
54	503-0562	1	Hose, Damper Cover to Breather Cap - Spec A through B
55	870-0240	4	Nut, Washer Base - Spec A through B
56	505-0681	1	Nipple, Oil Drain - Spec A through B
57	505-0682	1	Tee, Oil Drain - Spec A through B
58	505-0683	1	Nipple, Half - Damper Hose to Oil Drain - Spec A through B
59	503-0170	4	Clamp, Hose - Spec A through B
60	WASHER, LOCK		
	850-0045	2	Oil Fill Tube Mounting (5/16")
	850-0055	10	Oil Base Mounting (7/16")
	850-0055	4	Mounting Cushion (7/16")
61	SCREW, HEX CAP		
	800-0026	2	Oil Fill Tube Mounting
	800-0072	10	Oil Base Mounting (7/16-14 x 1-1/4")
	800-0081	4	Mounting Cushion

* - Included in Cylinder Block Assembly.

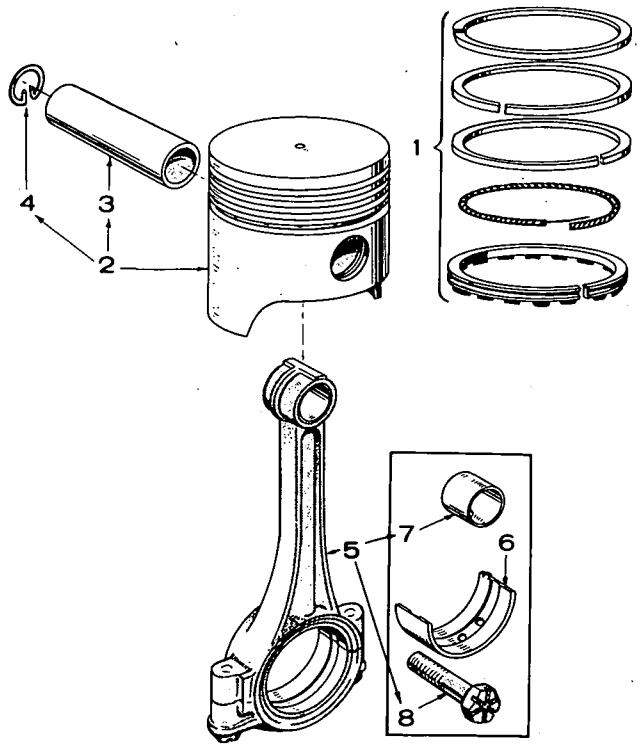


CAMSHAFT GROUP

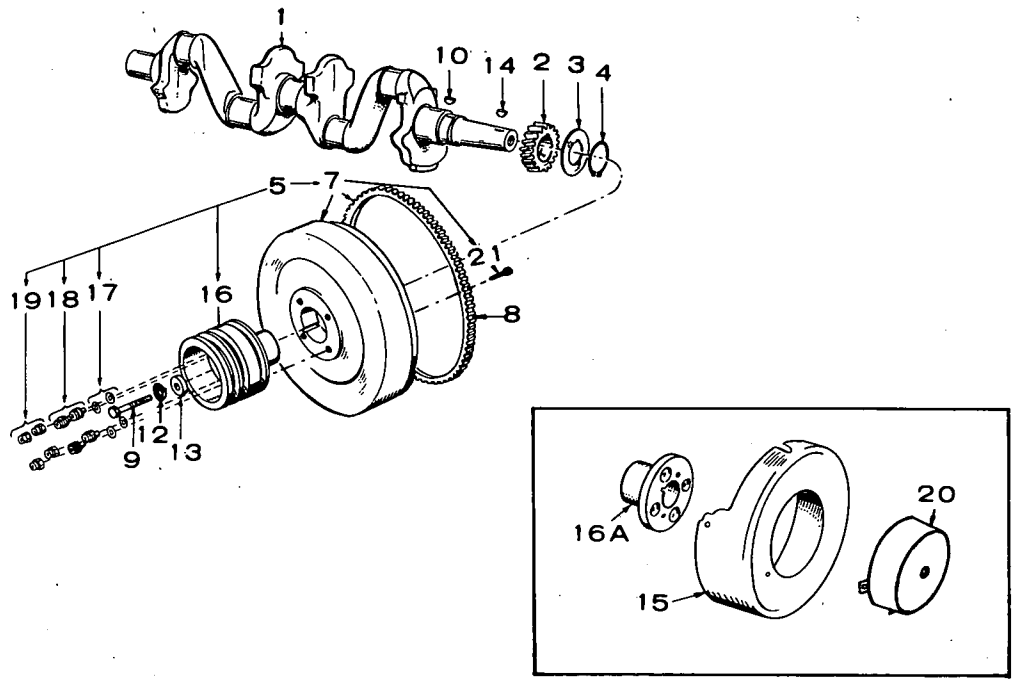
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	105-0274	1	Camshaft (Includes Pin)
2	515-0001	2	Key, Camshaft Gear and Injection Pump Drive Gear
3	150-0075	1	Pin, Camshaft Center
4	105-0205	1	Washer, Thrust
5	105-0218	1	Gear, Camshaft (Includes Spacer and Plate)
6	510-0046	10	Ball, Fly - Governor
7	150-0775	1	Cup, Governor
8	150-0078	1	Ring, Snap, Center Pin
9	147-0142	1	Gear, Injection Pump Drive
10	518-0195	1	Ring, Retainer, Injection Pump Drive Gear

PISTON AND CONNECTING ROD GROUP

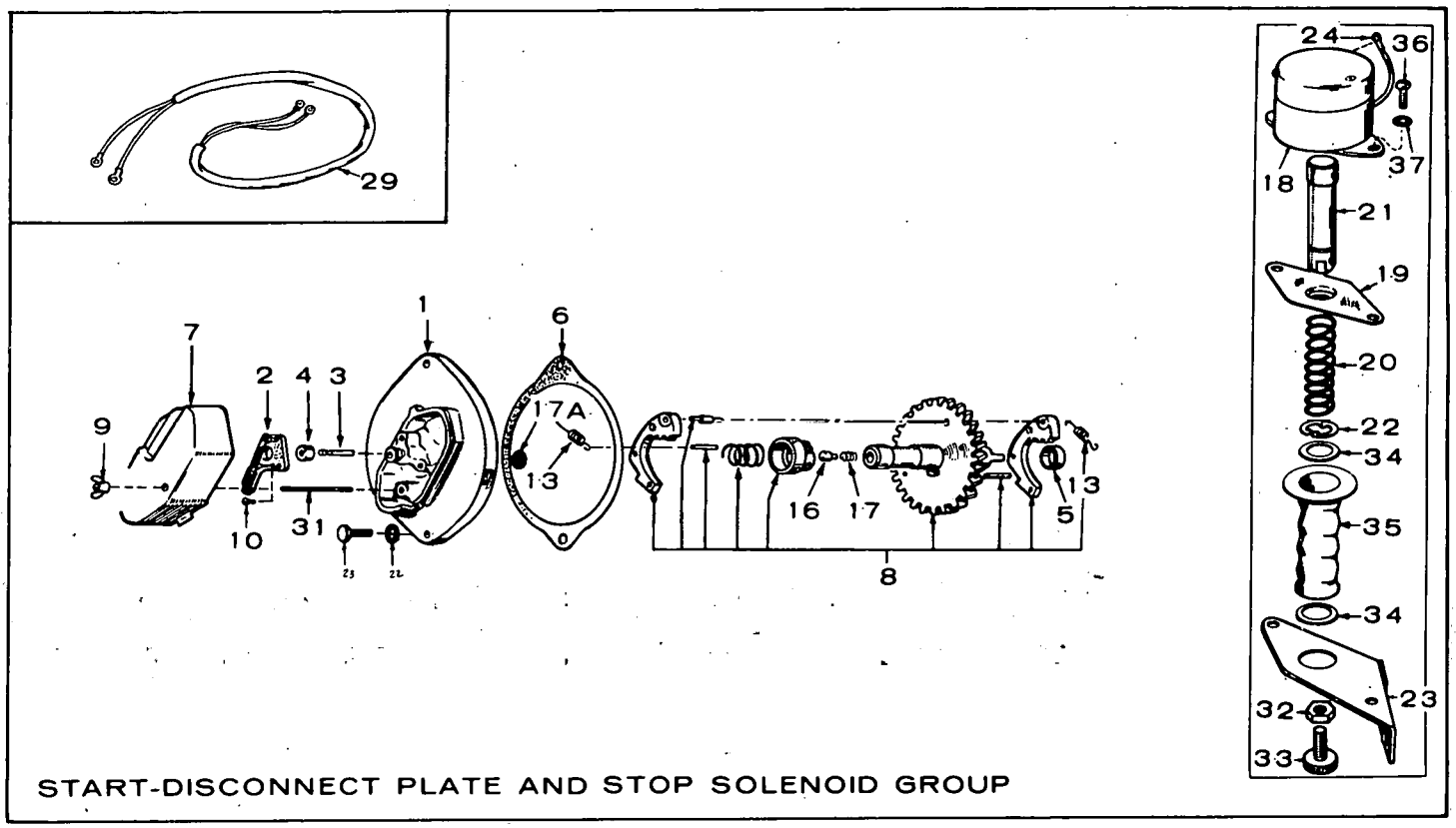
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	RING SET		
	113-0137	4	Standard
	113-0137-05	4	.005" Oversize
	113-0137-10	4	.010" Oversize
	113-0137-20	4	.020" Oversize
	113-0137-30	4	.030" Oversize
	113-0137-40	4	.040" Oversize
2	PISTON & PIN (INCLUDES PIN RETAINING RINGS)		
	112-0118	4	Standard
	112-0118-05	4	.005" Oversize
	112-0118-10	4	.010" Oversize
	112-0118-20	4	.020" Oversize
	112-0118-30	4	.030" Oversize
	112-0118-40	4	.040" Oversize
3	PIN, PISTON		
	112-0117	4	Standard
4	112-0085	8	Ring, Retaining, Pin
5	114-0168	4	Rod Assembly, Connecting (Forged)
6	BEARING HALF, CONNECTING ROD		
	114-0164	8	Standard
	114-0164-02	8	.002" Undersize
	114-0164-10	8	.010" Undersize
	114-0164-20	8	.020" Undersize
	114-0164-30	8	.030" Undersize
7	114-0170	8	Bushing, Piston Pin, Connecting Rod, Semi-finished
8	805-0012	8	Bolt, Place, (5/16-24 x 1-13/16")



CRANKSHAFT AND FLYWHEEL GROUP

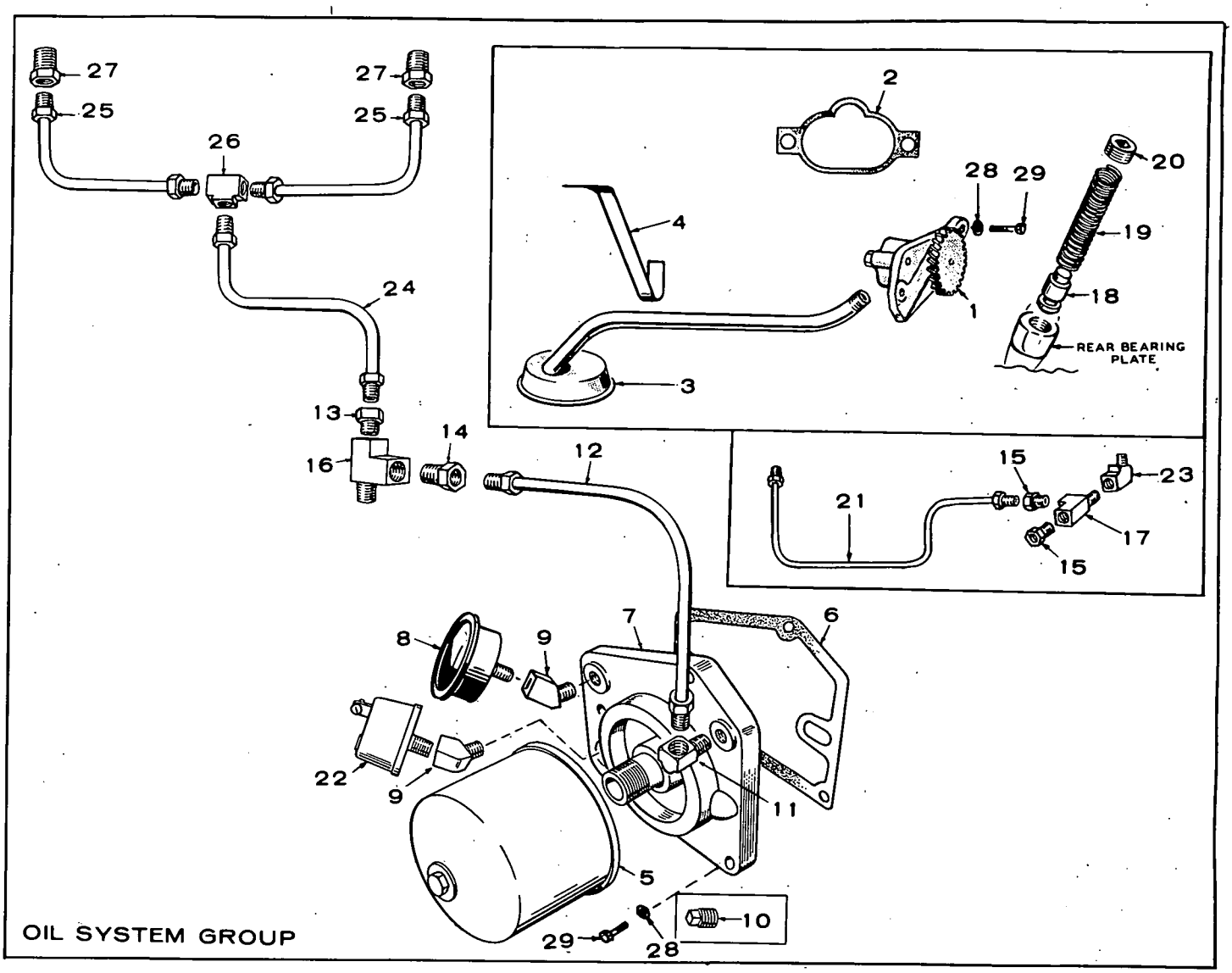


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	104-0464	1	Crankshaft
2	104-0418	1	Gear, Crankshaft
3	104-0416	1	Washer, Gear Retainer
4	518-0188	1	Ring, Lock
5	FLYWHEEL		
	104-0555	1	Includes Hub & Ring Gear
	104-0548	1	Includes Pulley & Ring Gear - Units with Heat Exchanger or Keel Cooling - Optional
7	104-0547	1	Flywheel - With Ring Gear - Less Hub
8	104-0423	1	Gear, Ring
9	800-0500	1	Screw (7/16-14 x 5-1/2″), Flywheel
10	515-0001	1	Key, Crankshaft Gear
12	850-0055	1	Washer, Lock (7/16″) - Flywheel Mounting
13	526-0185	1	Washer, Flywheel Mounting
14	515-0153	1	Key, Flywheel to Crankshaft
15	104-0444	1	Guard, Flywheel
16	104-0546	1	Hub & Pulley, Flywheel - Units with Heat Exchanger or Keel Cooling - Optional
16A	134-1401	1	Hub, Flywheel
17	526-0187	4	Washer, (Special) Hub to Flywheel
18	104-0543	4	Spacer & Washer Assembly, Hub to Flywheel
19	115-0150	4	Nut (3/8-24) - Hub to Flywheel
20	104-0594	1	Cover, Flywheel Guard - Not Used with Heat Exchanger
21	801-0054	4	Screw (3/8-24 x 2″) - Hub to Flywheel



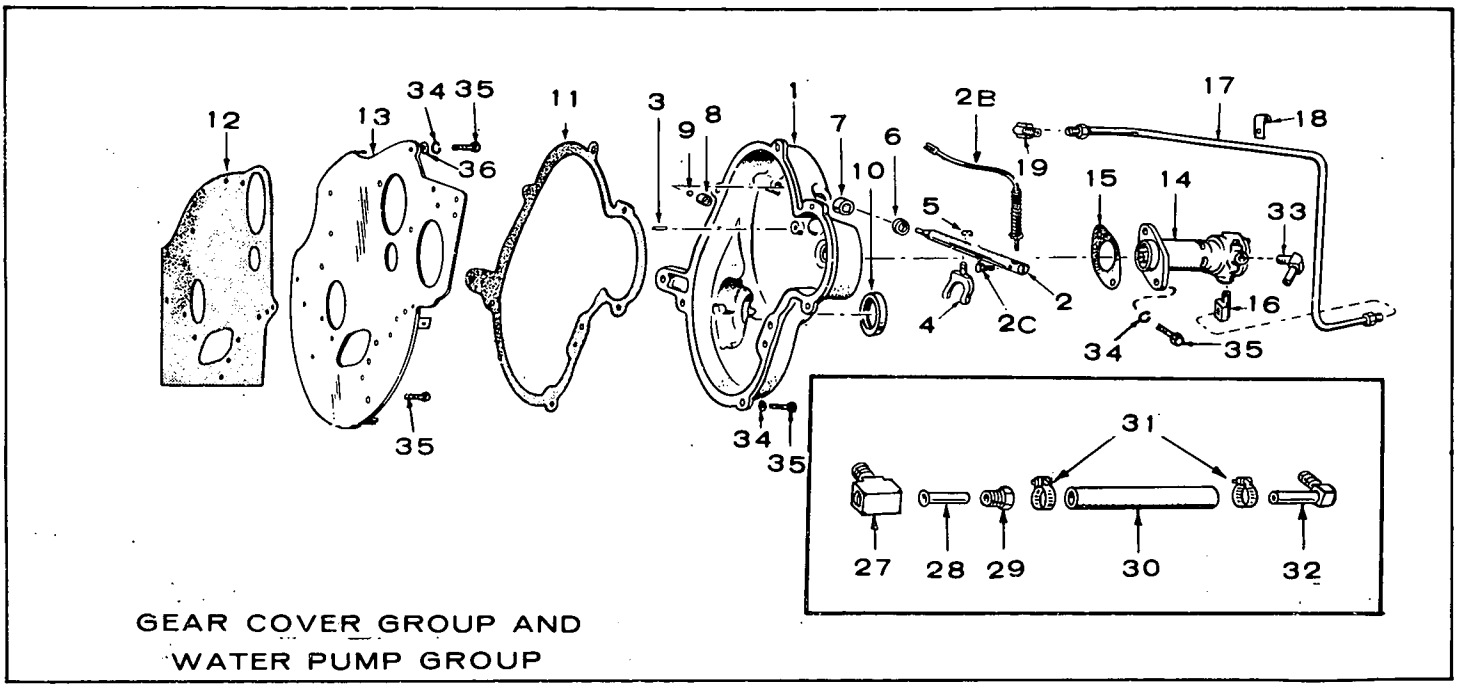
START-DISCONNECT PLATE AND STOP SOLENOID GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	191-0496	1	Plate, Start-Disconnect Switch
2	309-0134	1	Switch Assembly, Centrifugal
3	309-0152	1	Plunger, Switch
4	160-1143	1	Diaphragm, Switch Plunger
5	160-0720	1	Spacer, Switch Plate and/or Bearing Plate
6	160-0721	1	Gasket, Switch Plate and/or Bearing Plate
7	191-0392	1	Cover, Plate
8	191-0554	1	Control Assembly, Start-Disconnect Switch (Includes Weight Springs)
9	865-0011	1	Nut, Wing (10-32)
10	815-0201	2	Screw, Round Head with Shakeproof ET (8-32 x 3/8″) - Centrifugal Switch Mounting
13	160-0711	2	Spring Weight - Included in Control Assembly
16	160-0774	1	Plunger, Thrust
17	160-0773	1	Spring, Thrust Plunger
17A	160-0806	1	Disc, Thrust Plunger
18	SOLENOID, STOPPING		
	307-0628	1	Key 1 (12 Volt)
	307-0668	1	Key 1 (24 Volt)
	307-0680	1	Key 2
19	306-0162	1	Retainer, Solenoid Plunger
20	306-0161	1	Spring, Solenoid Plunger
21	306-0159	1	Plunger, Solenoid
22	518-0203	1	Ring, Snap - Spring Retaining
23	306-0158	1	Bracket, Solenoid
24	336-0706	1	Lead, Solenoid Ground
29	338-0263	1	Harness, Wiring - Switch Plate to Control
31	520-0347	1	Stud, Switch Plate Cover
32	862-0001	1	Nut (1/4-20)
33	306-0242	1	Screw, Solenoid Adjusting
34	518-0218	2	Ring, Retaining
35	306-0193	1	Cover, Solenoid Plunger
36	812-0148	2	Screw (1/4-20 x 1/2″) - Solenoid Mounting
37	850-0040	2	Washer (1/4″) Lock - Solenoid Mounting



OIL SYSTEM GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	120-0547	1	Pump Assembly, Oil
2	120-0580	1	Gasket Kit, Oil Pump
3	120-0601	1	Cup Assembly, Oil Pump Intake
4	120-0602	1	Bracket, Oil Pump Intake Cup
5	122-0185	1	Filter, Oil
6	122-0188	1	Gasket, Oil Adapter
7	122-0182	1	Adapter Assembly, Oil Filter
8	193-0006	1	Gauge, Oil Pressure
9	502-0053	2	Elbow, Street - 45° (1) Oil Gauge (1) Low Oil Pressure Switch
10	505-0057	1	Plug, Pipe (1/8") Adapter
11	502-0037	1	Elbow, Inverted Male - Oil Line to Adapter
12	120-0636	1	Line, Adapter to Injection Pump Tee
13	502-0097	1	Connector, Inverted Male - Injection Pump Lubrication Tee
14	CONNECTOR, INVERTED MALE - INJECTION PUMP LUBRICATION TEE		
	502-0097	1	Spec A Only
	502-0274	1	Begin Spec B (Restricted)
15	502-0097	2	Connector, Inverted Male - Front Cylinder Head Tee - Spec A through B
16	502-0242	1	Tee, Restricted - Injection Pump Lubrication
17	502-0282	1	Tee, Restricted - Front Cylinder Head - Spec A through B
18	120-0539	1	Valve, Oil By-Pass
19	120-0555	1	Spring, By-Pass Valve
20	505-0274	1	Plug, Pipe, Countersunk - Oil By-Pass
21	120-0635	1	Line, Oil - Rear Cylinder Head - Spec A through B
22	309-0169	1	Switch, Low Oil Pressure Cut-Off
23	502-0053	1	Elbow, Street - 45° - Cylinder Head Tee - Spec A through B
24	LINE, OIL - INJECTION PUMP TEE TO CYLINDER HEAD TEE		
	120-0630	1	Spec A through B
	120-0697	1	Begin Spec C
25	120-0695	2	Line, Oil - Cylinder Head - Begin Spec C
26	502-0373	1	Tee, Inverted Flare
27	CONNECTOR, INVERTED MALE - CYLINDER HEAD		
	502-0274	1	Rear - Spec A Only
	502-0281	1	Rear - Begin Spec B
	502-0281	1	Front - Begin Spec C
28	WASHER, LOCK		
	850-0045	2	Oil Pump Mounting
	850-0045	3	Oil Filter Adapter Mounting
29	SCREW, HEX CAP		
	800-0030	2	Oil Pump Mounting
	800-0026	3	Oil Filter Adapter Mounting

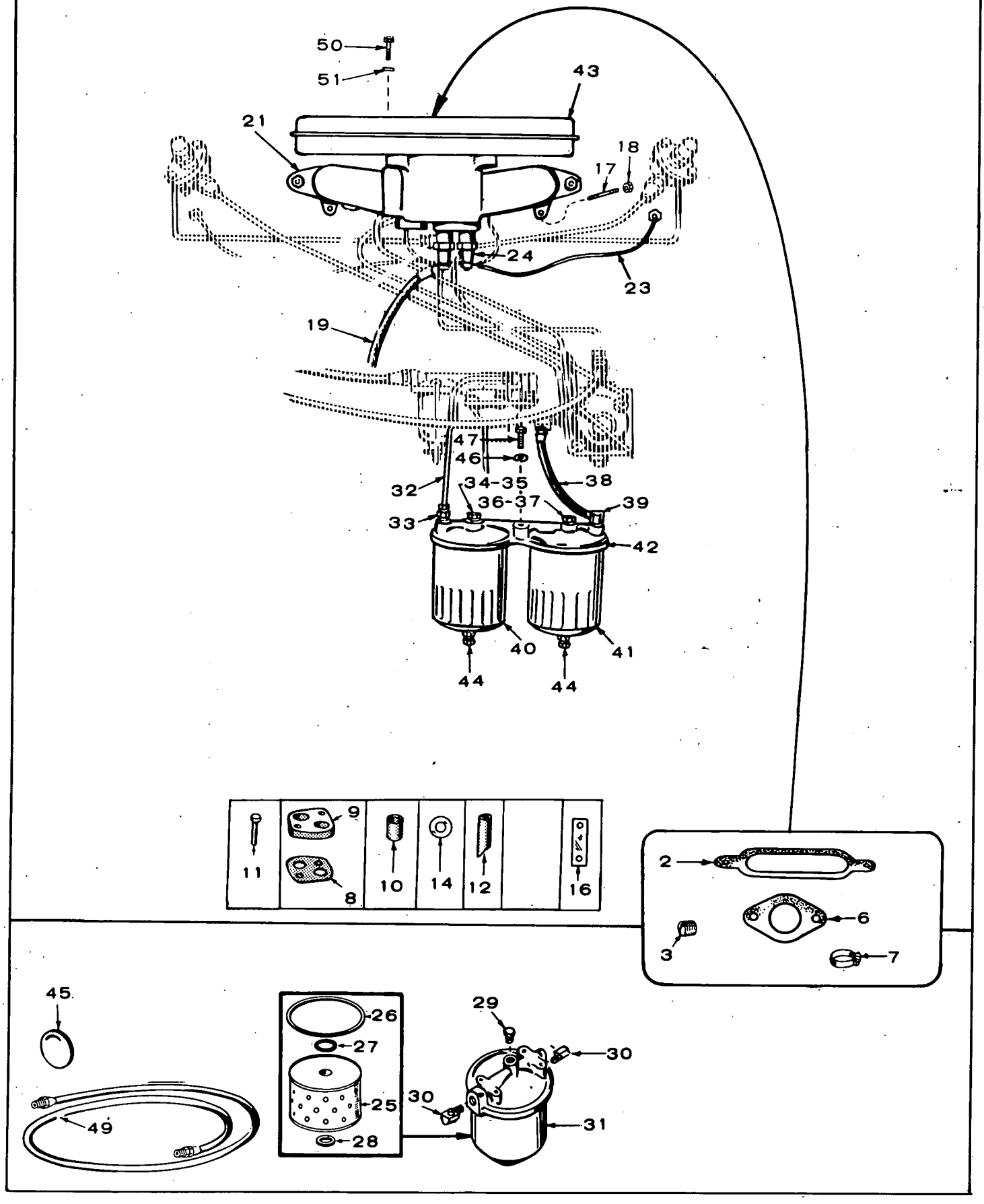


GEAR COVER GROUP AND
WATER PUMP GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	103-0267	1	Cover Assembly, Gear (Includes Parts Marked *)
2	150-0838	1	*Shaft, Governor
2B	150-1095	1	Arm, Governor
2C	815-0176	1	*Screw (#8-32 x 12″)
3	516-0117	1	*Pin, Roll - Governor Cup Stop
4	150-0777	1	*Yoke, Governor
5	518-0129	1	*Ring, Yoke Retaining
6	509-0088	1	*Seal, Governor Shaft
7	510-0048	1	*Bearing, 1/2″ Shaft
8	510-0082	1	*Bearing, 1/4″ Shaft
9	510-0043	1	*Ball, Governor Shaft Thrust
10	509-0087	1	*Seal
11	103-0251	1	Gasket, Gear Cover
12	103-0218	1	Gasket, Backplate
13	103-0228	1	Backplate
14	PUMP, WATER		
	131-0152	1	†Units Without Heat Exchanger
	132-0115	1	†Units With Heat Exchanger
15	131-0127	1	Gasket, Water Pump Mounting
16	502-0076	1	Elbow, Inverted Male - Water Pump Outlet
17	130-0628	1	Line, Water - Pump to Block
18	130-0511	1	Clamp, Water Line
19	502-0074	1	Elbow, Inverted Male - Water Line to Block
27	502-0247	1	Tee, Male - Cylinder Block Water Inlet - Rear
28	130-0533	1	Adapter, Hose
29	502-0239	1	Nut, Inverted - Hose Adapter to Tee
30	503-0394	1	Hose, Water - 9″ — Front to Rear Cylinder
31	503-0183	2	Clamp, Hose
32	502-0237	1	Elbow, Cylinder Block Inlet - Front
33	502-0304	1	Elbow, Water Pump Inlet
34	WASHER, LOCK		
	850-0040	2	Water Pump Mounting
	850-0045	5	Gear Cover Mounting
	850-0045	1	Gear Cover Backplate Mounting
	850-0025	1	*Governor Arm Mounting (#8)
35	SCREW, HEX CAP		
	800-0006	2	Water Pump Mounting
	800-0028	1	Gear Cover Mounting (5/16-18 x 1″)
	110-0879	4	Gear Cover Mounting (5/16-18 x 1-1/4″)
	800-0026	1	Gear Cover Backplate Mounting
	815-0347	2	Screw (1/4-20 x 1/2″) - Gear Cover Backplate Mounting
36	526-0115	5	Washer (5/16″) - Gear Cover Mounting

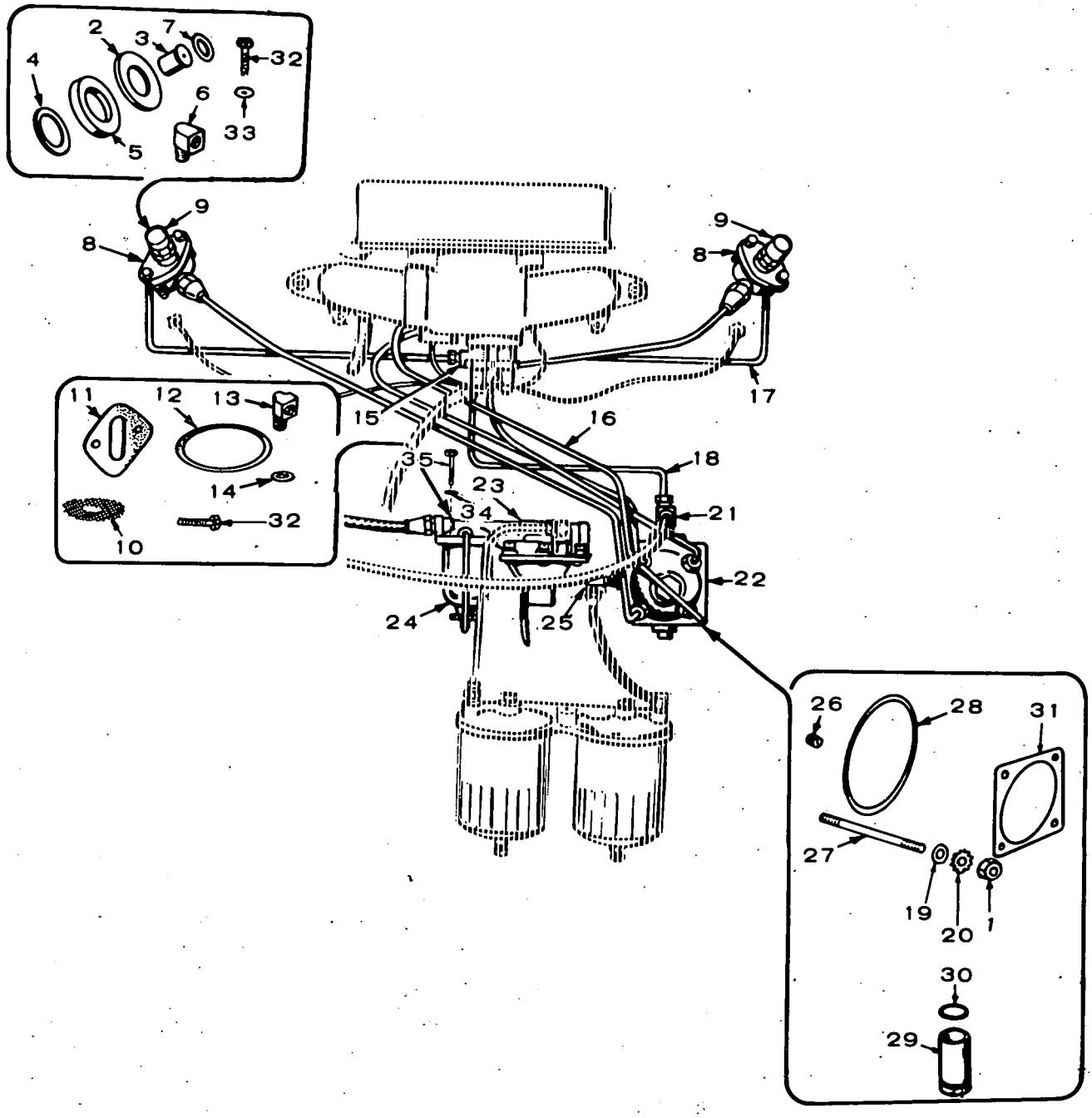
* - Contained in Gear Cover Assembly.
† - See Separate Group for Components.

AIR CLEANER AND FUEL FILTERS GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
2	140-0584	1	Gasket, Air Cleaner
3	505-0180	1	Plug, Pipe, 1/4", Intake Manifold
6	154-0733	2	Gasket, Intake Manifold
8	140-0706	1	Gasket, Manifold Heater Insulator
9	140-0705	1	Plate, Manifold Heater Mtg.
10	508-0103	2	Sleeve, Insulator Manifold Heater Mounting
11	114-0023	2	Screw (1/4-20 x 1-1/4") Manifold Heater Mounting
12	123-1116	1	Tube, Nylon, Breather Hose to Manifold - Spec A through B
14	508-0102	2	Washer, Insulator Mica - Manifold Heater Mounting
16	332-0829	1	Strap, Jumper, Air Heater
17	520-0011	4	Stud – Intake Manifold Mounting
18	870-0048	4	Nut (5/16-18) - Intake Manifold Mounting
19	336-1331	1	Lead, Air Heater to Solenoid in Control
21	MANIFOLD, INTAKE		
	154-1376	1	Key 1
	154-1379	1	Key 2
23	LEAD, GLOW PLUG TO AIR HEATER		
	336-1505	2	#2 & #3 Cylinder (5-1/4")
	336-1504	2	#1 & #4 Cylinder (12-1/4")
24	HEATER, MANIFOLD, INCLUDES GASKET (12VOLT)		
	154-0712	2	Key 1
	154-0712	3	Key 2
25	149-0428	1	Cartridge, Secondary Fuel Filter - Spec A Only
26	149-0456	1	Gasket, Secondary Filter, Bowl to Cover - Spec A Only
27	149-0455	1	Gasket, Secondary Filter, Cartridge to Head - Spec A Only
28	149-0493	1	Gasket, Secondary Filter, Cartridge to Retainer - Spec A Only
29	149-0769	1	Plug, Air Bleed, Secondary Filter - Spec A Only
30	502-0041	2	Elbow, Inverted Male, Secondary Filter Inlet & Outlet - Spec A Only
31	149-0408	1	Filter, Secondary Fuel, (Includes Cartridge) - NOTE: Bleed Plug 149-0769 is Available Separately - Spec A Only.
32	LINE, FUEL PUMP TO SECONDARY FILTER		
	149-0806	1	Spec A Only
	149-1189	1	Begin Spec B
33	502-0003	1	Connector, Primary Fuel Filter Inlet - Begin Spec B
34	526-0068	1	Washer, Primary Fuel Filter Mounting - Begin Spec B
35	801-0074	1	Screw, Hex Cap - Primary Fuel Filter Mounting - Begin Spec B
36	526-0066	1	Washer, Secondary Fuel Filter Mounting - Begin Spec B
37	801-0053	1	Screw, Hex Cap - Secondary Fuel Filter Mounting - Begin Spec B
38	LINE, FUEL, SECONDARY FILTER TO INJECTION PUMP		
	501-0091	1	Spec A Only
	501-0129	1	Begin Spec B
39	502-0099	1	Elbow, Reducer - Secondary Fuel Filter Outlet - Begin Spec B
40	122-0325	1	Filter, Fuel - Primary - Begin Spec B
41	122-0326	1	Filter, Fuel - Secondary - Begin Spec B
42	149-1185	1	Adapter, Fuel Filters - Begin Spec B
43	140-0803	1	Resonator - Begin Spec C
44	502-0080	2	Plug, Filter Drain
45	517-0104	1	Plug, Core Hole (Intake Manifold)
46	850-0045	3	Washer, Lock - Fuel Filter Adapter Mounting
47	800-0026	3	Screw, Hex Cap - Fuel Filter Adapter Mounting
49	501-0007	2	Line, Flexible - Fuel (24")
50	800-0012	2	Screw (1/4-20 x 2-1/4") - Resonator Mounting
51	850-0040	2	Washer (1/4") Lock - Resonator Mounting

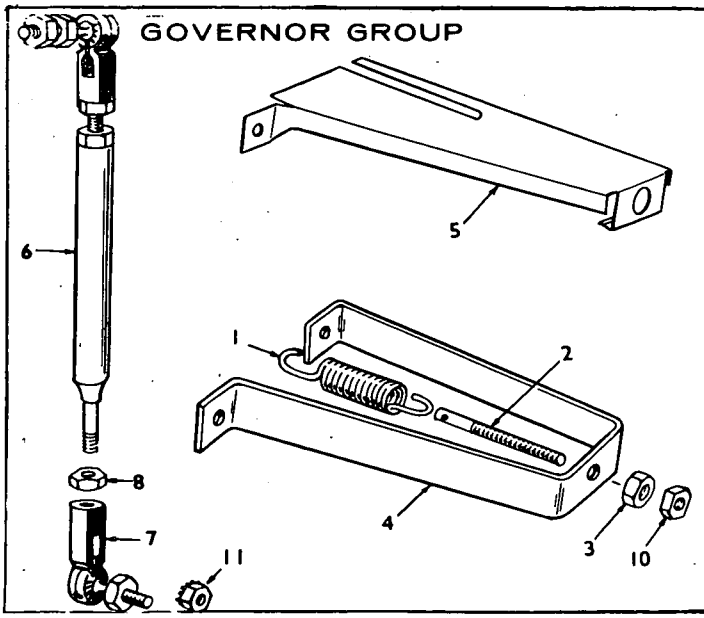
FUEL TRANSFER PUMP AND INJECTION SYSTEM GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	149-1046	1	Repair Kit, Fuel Pump (Includes Diaphragm & Gaskets)
1	862-0015	4	Nut, Injection Pump Mounting (5/16-18)
2	147-0043	4	Gasket, Nozzle Heat Shield (Asbestos)
3	147-0134	4	Nozzle Only, Component of Nozzle & Holder Assembly
4	110-0419	4	Gasket, Shield to Head (Copper)
5	147-0044	8	Shield, Nozzle Heat (Steel)
6	502-0065	2	Elbow, Inverted, 45°, Nozzle (Fuel Return Line)
6	502-0002	2	Elbow, Street - Nozzle (Fuel Return Line) - 90°
7	147-0243	4	Gasket, Nozzle
8	147-0141	4	Flange, Injection Nozzle Holddown
9	147-0136	4	Nozzle & Holder Assembly
10	149-0463	1	Screen, Fuel Pump Filter
11	149-0792	1	Gasket, Fuel Transfer Pump Mounting
12	149-0517	1	Gasket, Fuel Pump Bowl
13	502-0002	2	Elbow, Fuel Pump - Inlet and Outlet
14	526-0065	2	Washer, Fuel Pump Mounting
15	502-0245	1	Adapter, Return Lines
16	LINE, INJECTION PUMP TO NOZZLE, INCLUDES FITTING		
	149-1150	1	#1 Cylinder
	149-1151	1	#2 Cylinder
	149-1152	1	#3 Cylinder
	149-1153	1	#4 Cylinder
17	LINE, NOZZLE FUEL RETURN		
	149-1060	1	#1 Cylinder (19-1/8″)
	149-1059	2	#2 & #3 Cylinders (12-3/8″)
	149-1061	1	#4 Cylinder (19-5/16″)
18	149-1062	1	Line, Injection Pump to Fuel Retainer Lines Adapter
19	WASHER, FLAT		
	526-0122	4	Nozzle & Holder Mounting
	526-0022	4	Injection Pump Mounting
20	850-0045	4	Lockwashers, Injection Pump Mounting (5/16″)

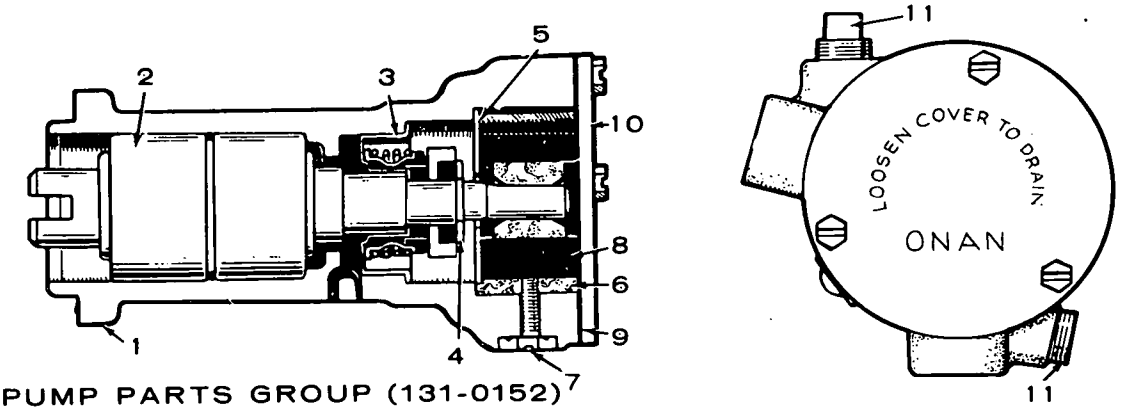
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
21	147-0183	1	Valve, Bleeder, Injection Pump
22	147-0232	1	Pump, Fuel Injection
23	149-1038	1	Pump, Fuel Transfer
24	149-0662	1	Bowl, Fuel Pump (Metal)
25	ELBOW, INJECTION PUMP INLET		
	502-0054	1	Spec A Only
	502-0039	1	Begin Spec B
26	BUTTON, INJECTION PUMP PLUNGER		
	147-0147	1	.119 - Marked 1 or A
	147-0148	1	.116 - Marked 2 or B
	147-0149	1	.113 - Marked 3 or C
	147-0150	1	.110 - Marked 4 or D
	147-0151	1	.107 - Marked 5 or E
	147-0161	1	.104 - Standard Marked 11 or No Mark
	147-0152	1	.101 - Marked 6 or F
	147-0153	1	.098 - Marked 7 or H
	147-0154	1	.095 - Marked 8 or J
	147-0155	1	.092 - Marked 9 or K
	147-0156	1	.089 - Marked 10 or L
	147-0190	1	.122 - Marked 12 or M
	147-0189	1	.125 - Marked 13 or N
	147-0188	1	.128 - Marked 14 or P
	147-0187	1	.131 - Marked 15 or R
	147-0186	1	.134 - Marked 16 or S
27	520-0129	4	Stud, Injection Pump Mounting
28	509-0094	1	Seat, O-Ring, Injection Pump to Crankcase
29	147-0182	1	Tappet, Injection Pump
30	147-0196	1	Gasket, O-Ring, Injection Pump Tappet
31	147-0145	1	Shim Kit, Injection Pump Mounting
32	SCREW, HEX CAP		
	114-0022	8	Nozzle & Holder Mounting (5/16-18 x 2-3/4″)
	800-0027	2	Transfer Pump Mounting (5/16-18 x 7/8″)
33	526-0122	8	Washer, Flat - Nozzle & Holder Mounting
34	526-0065	2	Washer (Copper) - Fuel Pump Mounting
35	800-0027	2	Screw (5/16-18 x 7/8″) - Fuel Pump Mounting

GOVERNOR GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	150-1084	1	Spring, Governor
2	150-1082	1	Stud, Governor Adjusting
3	862-0003	1	Nut, Governor Adjusting Stud
4	150-1103	1	Bracket, Governor Spring
5	150-0823	1	Cover, Governor Spring
6	150-1132	1	Linkage Assembly, Governor (Includes Parts Marked *)
7	150-1358	2	*Joint, Ball
8	870-0188	2	*Nut, Governor Linkage
10	870-0133	1	Palnut, Governor Adjusting Lock
11	870-0131	2	*Nut with Shakeproof ET (10-32)

* - Included in Governor Linkage Assembly.

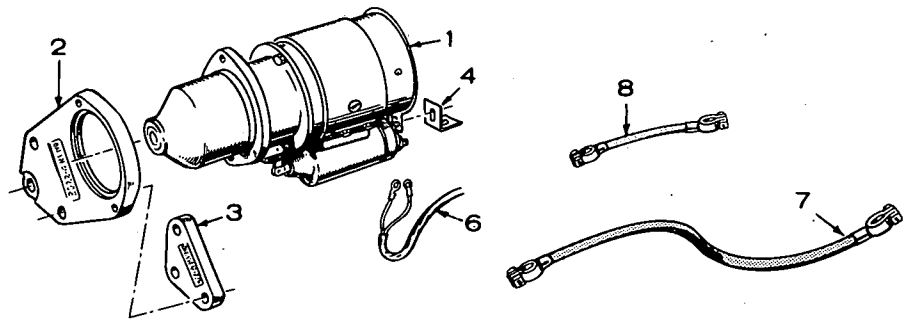


WATER PUMP PARTS GROUP (131-0152)

NOTE: This pump used on sets without heat exchanger only.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	131-0152	1	Pump, Water
	131-0179	1	Kit, Repair (Includes Parts Marked *)
1		1	Body (Not Sold Separately)
2	131-0154	1	Bearing & Shaft Assembly
3	131-0157	1	*Seal Assembly
4	518-0221	1	*Retaining Ring
5	131-0158	1	*Wear Plate, Rear
6	131-0159	1	*Cam
7	815-0283	4	Screw, Brass (1) *Cam Mounting (3) Cover Mounting
8	131-0160	1	*Impeller
9	131-0161	1	*Gasket, Cover
10	131-0162	1	*Cover
11	502-0080	2	Plug, Pipe

* - Included in the 131-0179 Repair Kit.

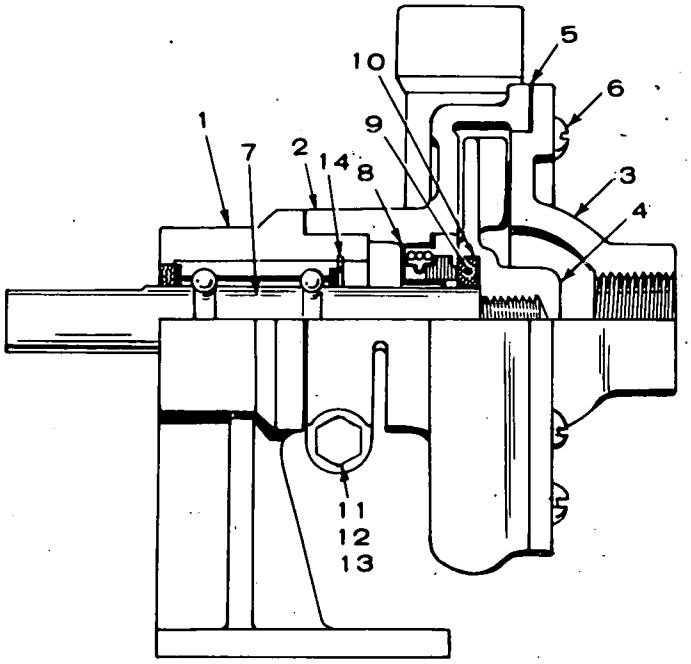


AUTOMOTIVE STARTER GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	*MOTOR STARTER (See Separate Group for Components)		
	191-0324	1	Key 1 (12 Volt)
	191-0443	1	Key 2 (24 Volt)
2	191-0512	1	Flange, Starter
3	191-0311	1	Spacer, Starter Flange
4	191-0365	1	Bracket, Starter Support
6	338-0265	1	Harness Assembly - Starter to Control
7	CABLE, BATTERY (SELECT BY LENGTH)		
	416-0021	2	20-1/2" Long
	416-0077	2	28-1/4" Long
	416-0004	1	Cable, Battery Jumper
8	CLUTCH, STARTER		
	191-0432	1	For 12 Volt
	191-0432	1	For 24 Volt
9	WASHER, LOCK (3/8")		
	850-0050	2	Starter Motor Mounting
	850-0050	3	Starter Flange Mounting
10	SCREW, HEX CAP		
	800-0051	2	Starter Motor Mounting (3/8-16 x 1-1/4")
	800-0054	3	Starter Flange Mounting (3/8-16 x 2")

* - See Separate Group for Component Parts.

WATER PUMP PARTS GROUP (132-0074)



NOTE: This pump used in units with keel cooling only.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	132-0074	1	Pump, Water - Complete
	132-0093	1	Repair Kit (Includes Parts Marked *)
1	132-0143	1	Pedestal
2	132-0144	1	Body, Pump
3	132-0145	1	Cover, Pump
4	132-0087	1	Impeller
5	132-0088	1	*Gasket, Cover
6	810-0099	8	*Screw (#10-24 x 7/16"), Brass
7	132-0089	1	*Shaft and Bearing Assembly
8	132-0101	1	*Seal, Mechanical
9	132-0091	1	*Ring, Seal Wear
10	132-0092	1	*Cap, Wear Ring
11	132-0138	1	Screw, Cap
12	132-0140	1	Nut
13	132-0139	1	Lockwasher
14	132-0132	1	Ring, Snap

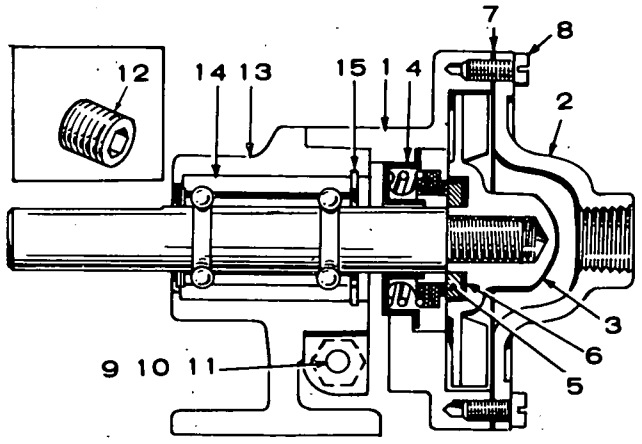
* - Included in the 132-0093 Repair Kit.

WATER PUMP PARTS GROUP (132-0110)

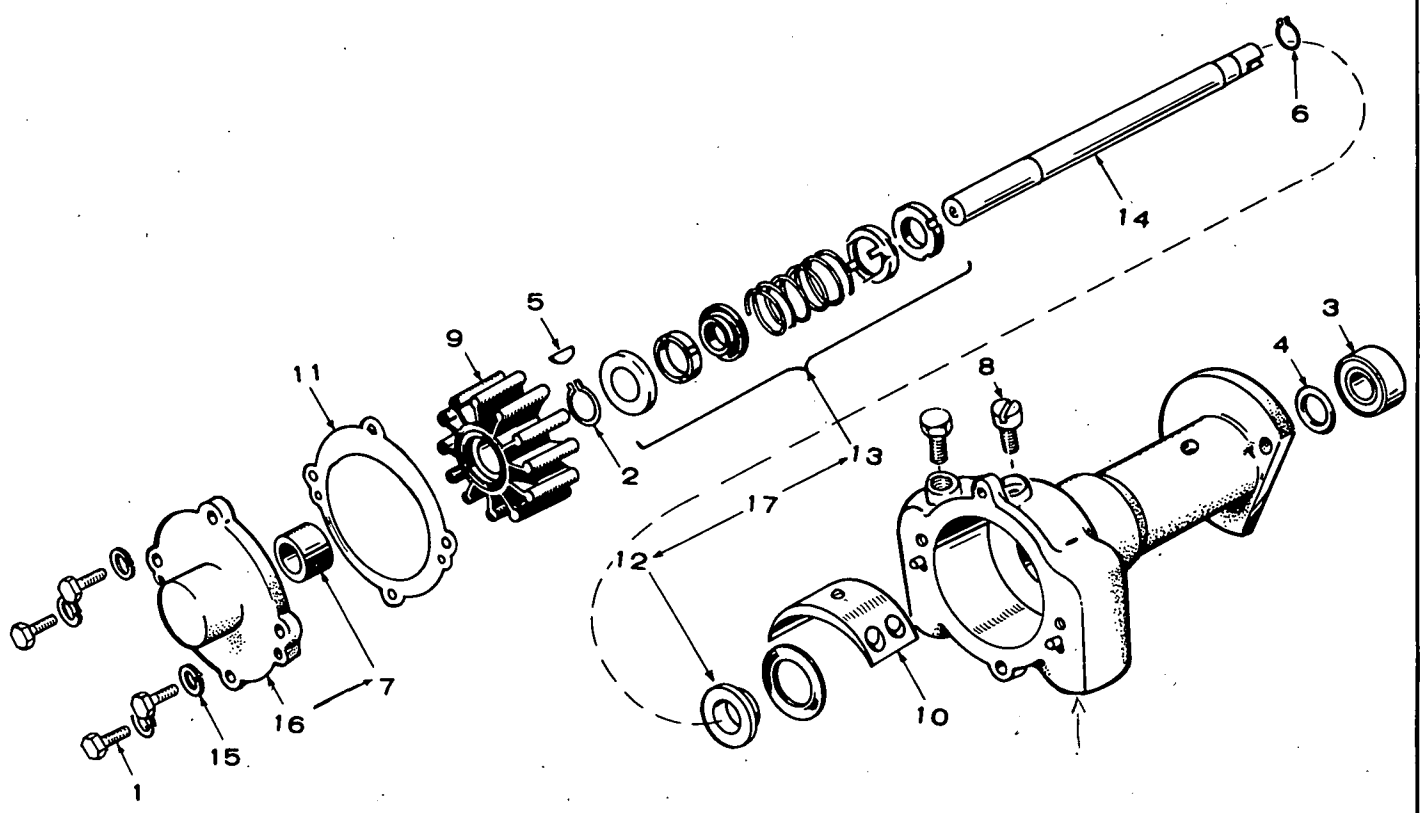
NOTE: This pump used on units with heat exchanger only.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	132-0110	1	Pump, Water - Complete
	132-0111	1	Repair Kit (Includes Parts Marked *)
1	132-0136	1	Body, Pump
2	132-0137	1	Cover, Pump
3	132-0114	1	*Impeller
4	132-0101	1	*Seal
5	132-0091	1	*Face, Wear
6	132-0092	1	*Seat, Seal
7	132-0112	1	*Gasket, Cover
8	132-0113	6	*Screw, Cover
9	132-0138	1	Screw, Cap
10	132-0139	1	Lockwasher
11	132-0140	1	Nut, Hex
12	132-0141	1	Plug, Drain
13	132-0142	1	Pedestal
14	132-0089	1	*Shaft and Bearing Assembly
15	132-0132	1	Ring, Snap

* - Included in the 132-0111 Repair Kit.



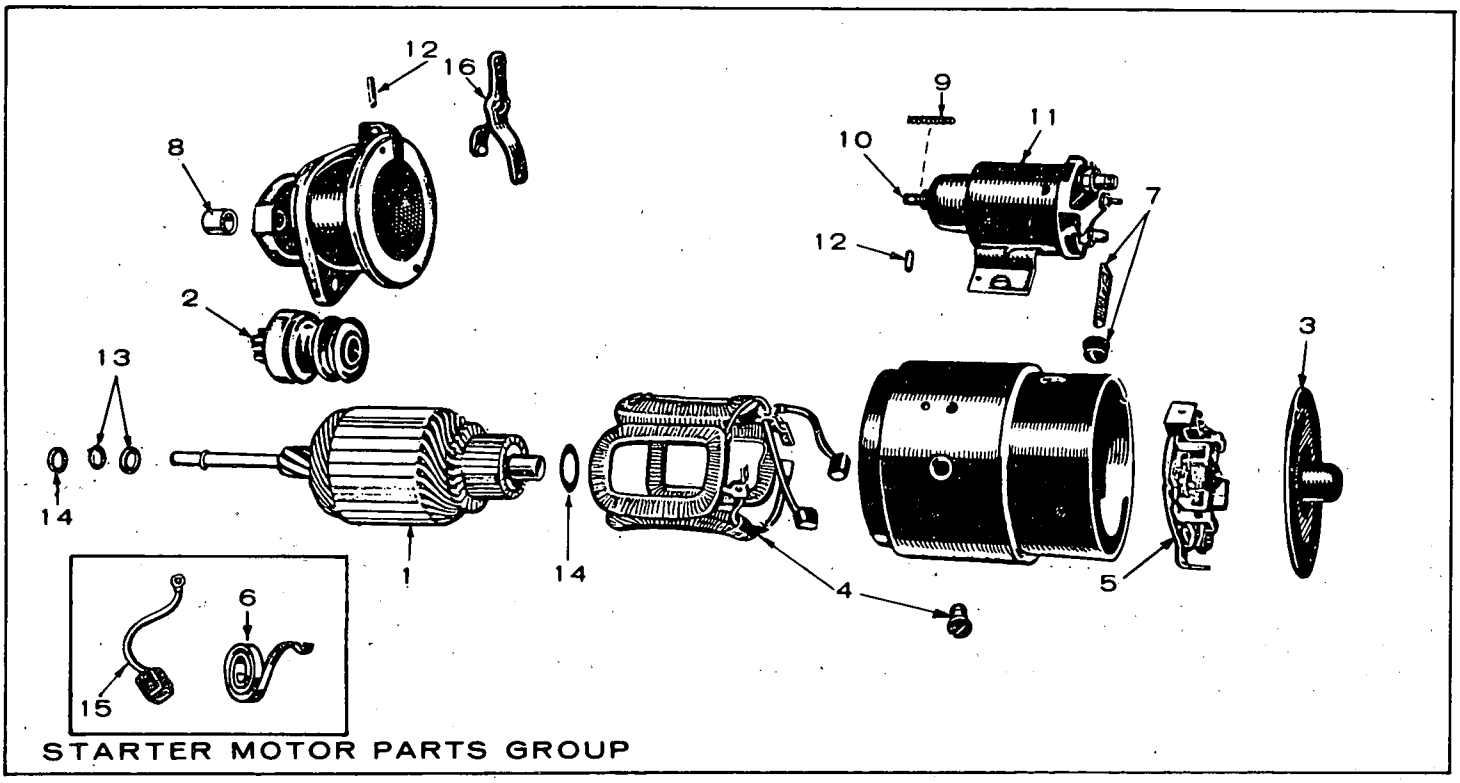
WATER PUMP PARTS GROUP (132-0115)



NOTE: This pump used on units with heat exchanger only.

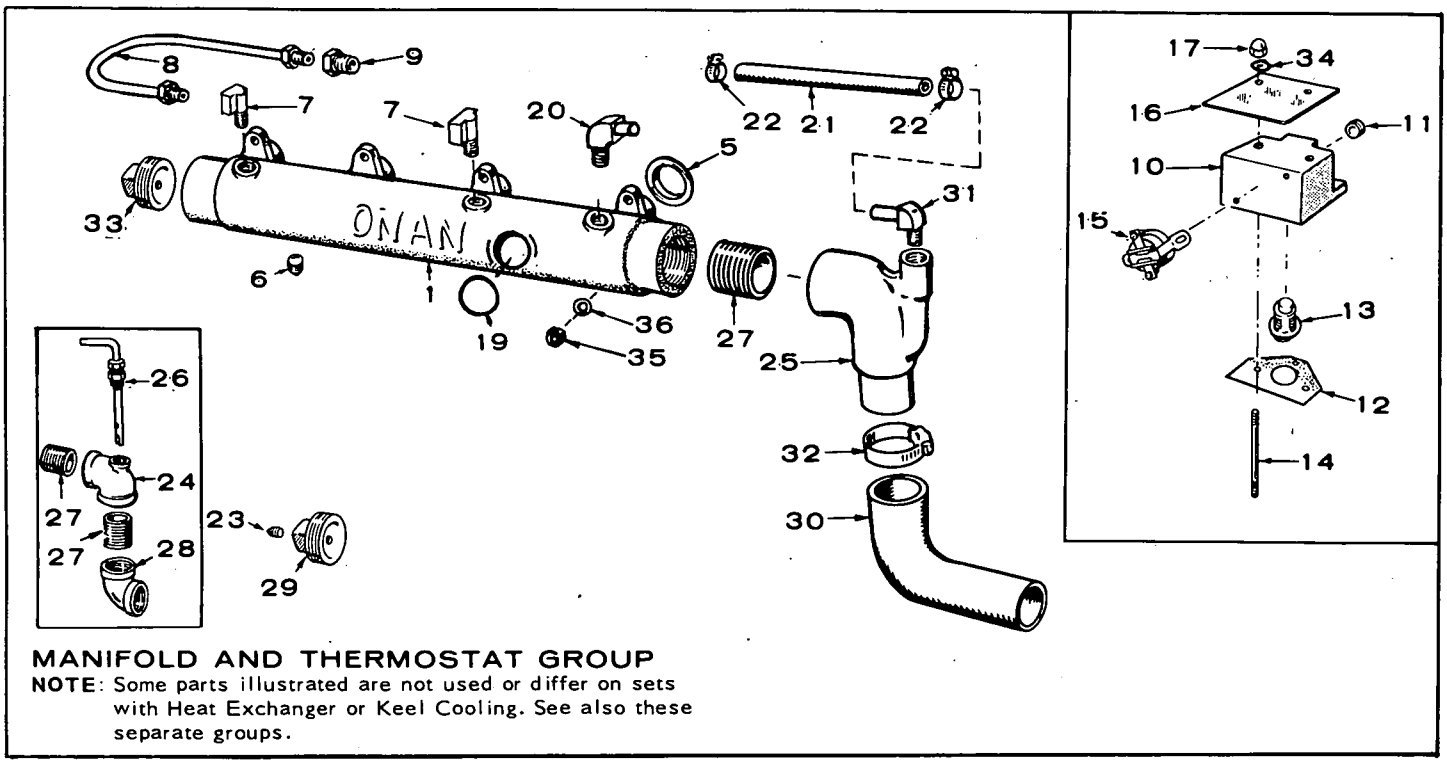
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	132-0115	1	Pump, Water - Complete
	132-0116	1	Kit, Repair (Includes Parts Marked *)
1	800-1003	4	Screw, Cap
2	132-0119	1	Ring, Retainer - Seat & Seal
3	132-0120	1	*Bearing, Ball
4	132-0121	1	Slinger
5	515-0002	1	Key
6	132-0122	1	Ring, Retainer - Drive End
7	132-0123	1	*Bushing
8	132-0124	1	Screw, Cam
9	132-0117	1	*Impeller
10	132-0125	1	Cam
11	132-0118	1	*Gasket, Cover
12	132-0126	1	*Seat
13	132-0127	1	*Seal
14	132-0128	1	Shaft
15	850-1040	1	Lockwasher, Cover Mounting
16	132-0129	1	Cover (Includes Bushing)
17	132-0130	1	Seal and Seat Package

* - Included in the 132-0116 Repair Kit.



STARTER MOTOR PARTS GROUP

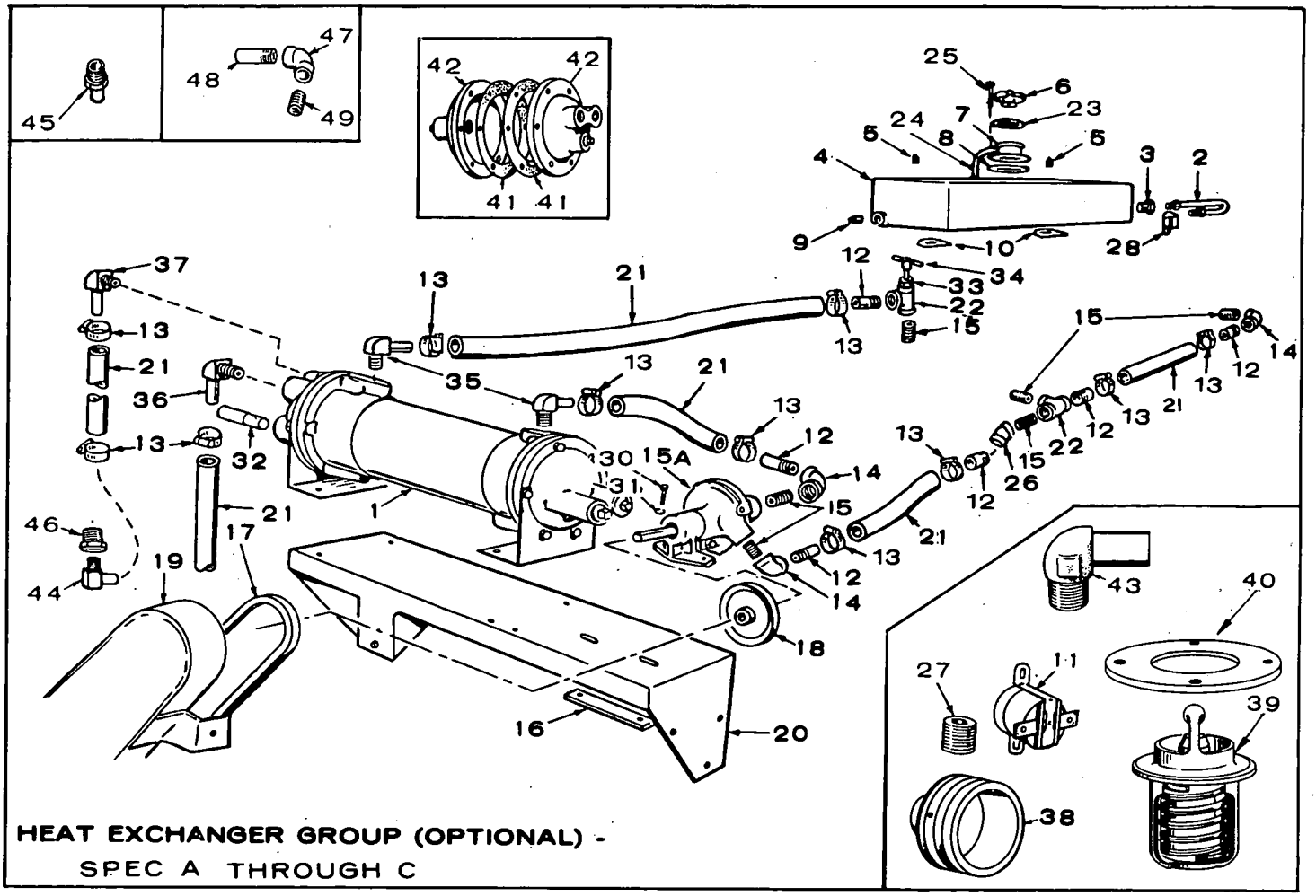
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	MOTOR, STARTER		
	191-0324	1	12 Volt
	191-0443	1	24 Volt
1	ARMATURE		
	191-0712	1	12 Volt
	191-0713	1	24 Volt
2	191-0432	1	Clutch
3	191-1023	1	Head Assembly, Commutator End
4	COIL PACKAGE, FIELD		
	191-1024	1	12 Volt
	191-1043	1	24 Volt
5	PLATE ASSEMBLY, BRUSH		
	191-1025	1	12 Volt
	191-1042	1	24 Volt
6	191-1020	1	Spring Set, Brush (Set of 4)
7	191-1026	1	Connector Package
8	191-0497	1	Bearing (Bronze), Drive End
9	191-1027	1	Spring, Plunger
10	191-1028	1	Core Assembly, Moving
11	SWITCH, SOLENOID		
	191-0433	1	12 Volt
	191-0715	1	24 Volt
12	191-1029	1	Yoke Parts Package
13	191-1030	1	Stop and Lock Ring Package, Pinion
14	191-1031	1	Thrust Washer Package, Armature (Use as Required)
15	BRUSH SET, SERVICE		
	191-0434	1	12 Volt
	191-0774	1	24 Volt
16	191-1032	1	Yoke



MANIFOLD AND THERMOSTAT GROUP

NOTE: Some parts illustrated are not used or differ on sets with Heat Exchanger or Keel Cooling. See also these separate groups.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	154-0723	1	Manifold, Exhaust, Water Cooled
5	154-1057	4	Gasket, Exhaust Manifold to Head
6	505-0110	1	Plug (3/8″), Manifold Water Drain
7	502-0074	2	Elbow, Inverted Male - Manifold Water Line Inlet
8	130-0510	2	Line, Water - Thermostat Cover to Manifold
9	502-0103	2	Connector, Inverted Male - Thermostat Cover Outlet
10	COVER, THERMOSTAT		
	309-0160	2	Sets Without Keel Cooling
	309-0161	2	Sets With Keel Cooling
11	505-0274	2	Plug (1/8″ - Countersunk) - Thermostat Cover
12	309-0145	2	Gasket, Thermostat Cover
13	309-0130	2	Thermostat
14	520-0143	4	Stud, Thermostat Cover
15	309-0156	1	Switch, High Temperature Cut-off
16	309-0154	1	Cover, Thermostat Switch - Sets With Switch Mounted on Cover
17	869-0002	4	Nut, Acorn (5/16-24) - Thermostat Cover Stud
19	PLUG, EXPANSION		
	517-0041	4	Brass - 1-1/8″ Diameter
	517-0059	1	Brass - 1-7/16″ Diameter
20	502-0237	1	Elbow, Brass - Exhaust Manifold Water Outlet
21	503-0586	1	Hose, Rubber (1/2 x 36″) - Water Outlet & Inlet
22	503-0446	2	Clamp, Water Hose
23	502-0080	1	Plug (1/8″ - Square Head Brass) - Manifold End Cap - (Used on some early models)
	TEE, REDUCING - EXHAUST (WITH PROVISION FOR WATER LINE)		
24	505-0486	1	Early Models
25	155-1059	1	Late Models
26	154-0894	1	Tube Assembly, Water Hose Adapter - Early Models
27	505-0194	1	Nipple, Close (1-1/2″) - Exhaust (Early Models used Qty. of 2)
28	505-0494	1	Elbow, Pipe (1-1/2″ x 90°) - Exhaust - Early Models
29	505-0489	1	Plug, Exhaust Manifold End (1-1/2 x 1/8″) - (Used on some early models)
30	503-0576	1	Elbow, Exhaust Hose - Late Models
31	502-0237	1	Elbow, Brass - Water Hose Adapter - Late Models
32	503-0465	2	Clamp, Hose - Exhaust Elbow
33	505-0402	1	Plug (1-1/2″) - Exhaust Manifold End - Begin Spec D
34	526-0022	4	Washer, Flat (5/16″) - Thermostat Cover Stud
35	110-0445	8	Nut, Hex (5/16-24) - Manifold Mounting
36	526-0045	8	Washer, Flat (5/16″) - Manifold Mounting
	155-0640	1	Muffler (Elasto Muffler) - Neoprene Rubber - For Wet Exhaust - Optional



HEAT EXCHANGER GROUP (OPTIONAL) -
SPEC A THROUGH C

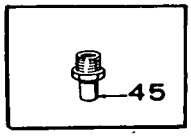
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130-0624	1	Exchanger, Heat
2	130-0575	1	Line, Water - Expansion Tank to Exhaust Manifold
3	502-0103	1	Connector, Inverted Male - Expansion Tank Outlet
4	130-0746	1	Tank, Expansion
5	502-0080	1	Plug, Expansion Tank Fill Vent
6	130-0589	1	Cap, Pressure
7	130-0590	1	Neck & Adapter, Expansion Tank Cap
8	130-0519	1	Gasket, Neck & Adapter
9	502-0155	3	Plug, (3/8″)
10	309-0145	2	Gasket, Thermostat Chamber
11	309-0156	1	Switch, Hi-Temp. Cut-Off
12	502-0258	6	Nipple (3/8″ x 2″), Half-Hose Connection
13	CLAMP, HOSE		
	503-0183	8	1-1/16″
	503-0446	2	25/32″
14	502-0263	3	Elbow (90° - 3/8″)
15	502-0085	6	Nipple (3/8″), Close Brass
15A	132-0110	1	*Pump, Centrifugal Water - Less Pulley
16	131-0130	1	Bar, Pump Hold-down
17	511-0067	1	Belt, Centrifugal Water Pump
18	512-0042	1	Pulley, Centrifugal Water Pump
19	130-0591	1	Guard, Belt
20	130-0692	1	Bracket, Heat Exchanger & Governor Spring
21	503-0217	1	Hose, Rubber (3/4″ I.D. x 56″ - Total length required for all hoses - except raw water pump)
21	503-0285	1	Hose, Rubber (1/2″ I.D. x 14″) - Raw Water Pump to Heat Exchanger - Begin Spec B
21	503-0478	1	Hose (3/4″ I.D. x 9″) - Cylinders #1 & #2 to Cylinder #3 & #4
21	503-0461	1	Hose, Rubber (3/4″ I.D. x 12-3/4″) Raw Water Pump to Heat Exchanger - Spec A Only
22	502-0257	2	Tee (3/8″)
23	130-0892	1	Stiffener, Filler Neck
24	503-0679	1	Hose (13″), Overflow
25	821-0005	6	Screw, Locking (10-32 x 1/2″) - Neck & Adapter Mounting
27	505-0266	1	Plug (3/8″), Exhaust Manifold
28	502-0074	1	Elbow, Inverted Male - Manifold Water Line Inlet
29	502-0298	1	Elbow, 45° x 3/8″
30	800-0005	2	Screw (1/4-20 x 3/4″) - Water Pump Mounting
31	850-0040	2	Washer (1/4″), Lock
32	130-0626	2	Pencil, Zinc (Included in Heat Exchanger)
33	502-0049	1	Bushing, Reducer (3/8″ x 1/8″)
34	504-0006	1	Valve, Air Bleed - Manifold Outlet
35	502-0300	2	Elbow, Heat Exchanger Fresh Water Hoses
36	502-0302	1	Elbow, Heat Exchanger Raw Water Outlet Hose - Begin Spec B
37	502-0237	1	Elbow, Heat Exchanger Raw Water Inlet Hose - Begin Spec B

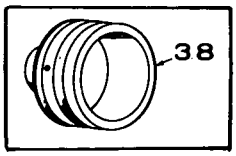
* - See Separate Group for Components.

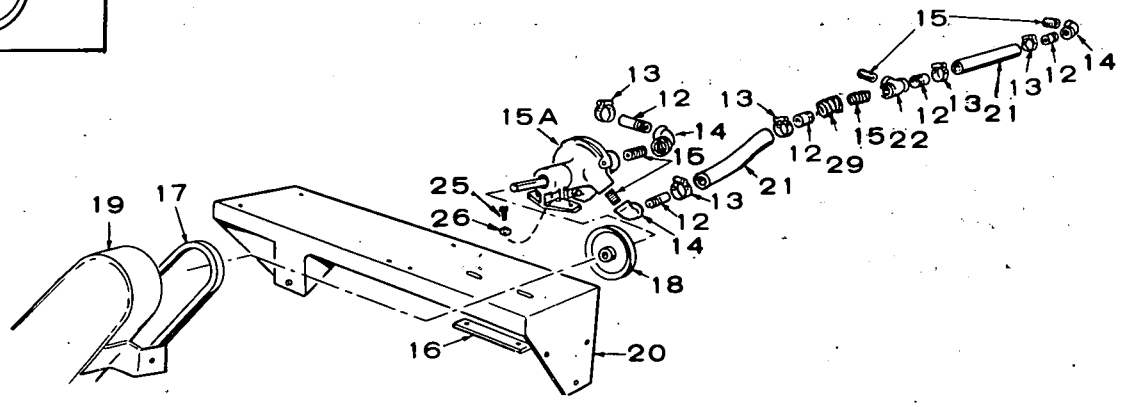
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
38	104-0546	1	Pulley, Flywheel
39	309-0238	1	Thermostat - Mounts Inside Expansion Chamber
40	130-0747	1	Plate, Thermostat Retainer
41	GASKET, HEAT EXCHANGER BONNET		
	130-0729	1	Fresh Water End
	130-0730	1	Raw Water End
42	BONNET, HEAT EXCHANGER		
	130-0731	1	Fresh Water End
	130-0732	1	Raw Water End
43	502-0278	2	Elbow, Pump Inlet & Outlet Spec A Only
44	502-0237	1	Elbow, Raw Water Pump Outlet - Begin Spec B
45	502-0370	1	Adapter, Hose- Raw Water Pump Inlet - Begin Spec B
46	502-0372	1	Bushing, Reducer - Raw Water Pump Outlet - Begin Spec B
47	502-0263	2	Elbow (3/8-90°) - Heat Exchanger Inlet & Outlet - Spec A Only
48	502-0258	2	Nipple, Half (3/8 x 2″), Heat Exchanger Inlet & Outlet - Spec A Only
49	502-0085	2	Nipple (3/8 x Close), Heat Exchanger Inlet & Outlet - Spec A Only

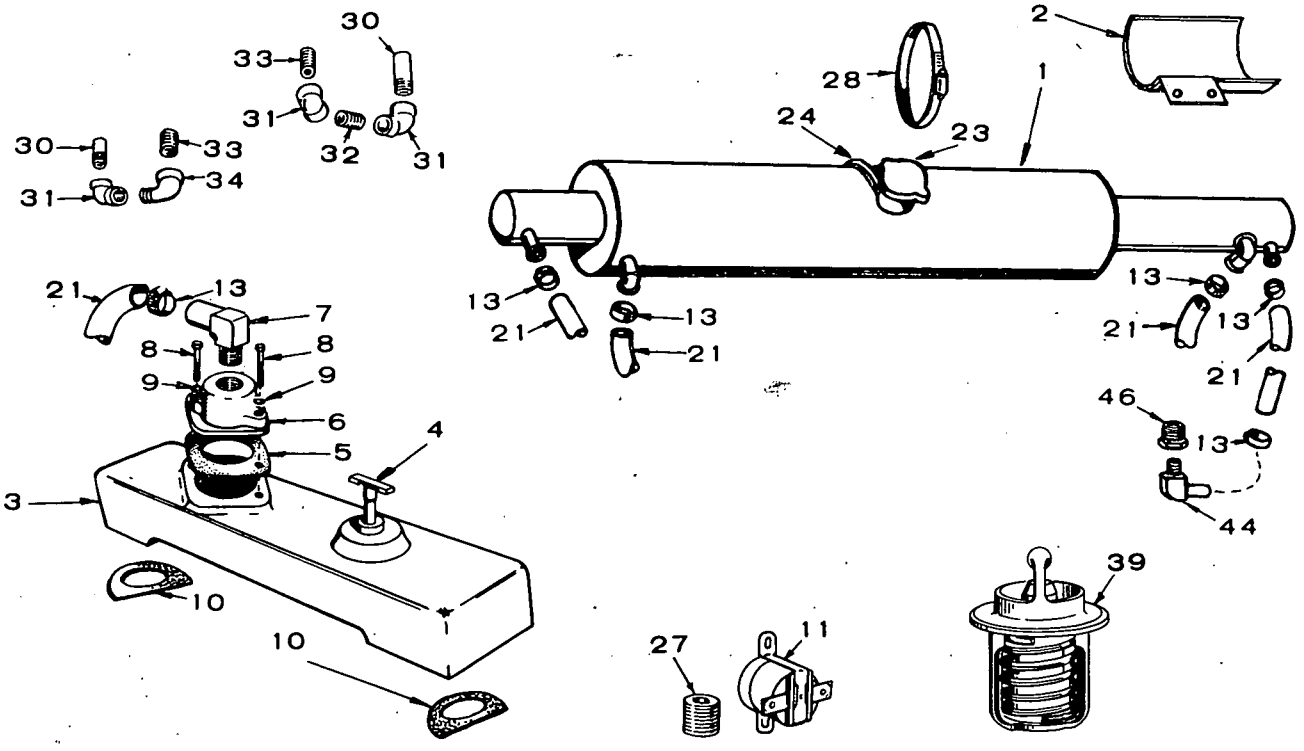
NOTE: For Raw Water Pump, See Gear Cover and Water Pump Group.

HEAT EXCHANGER GROUP- OPTIONAL EQUIPMENT BEGIN SPEC D





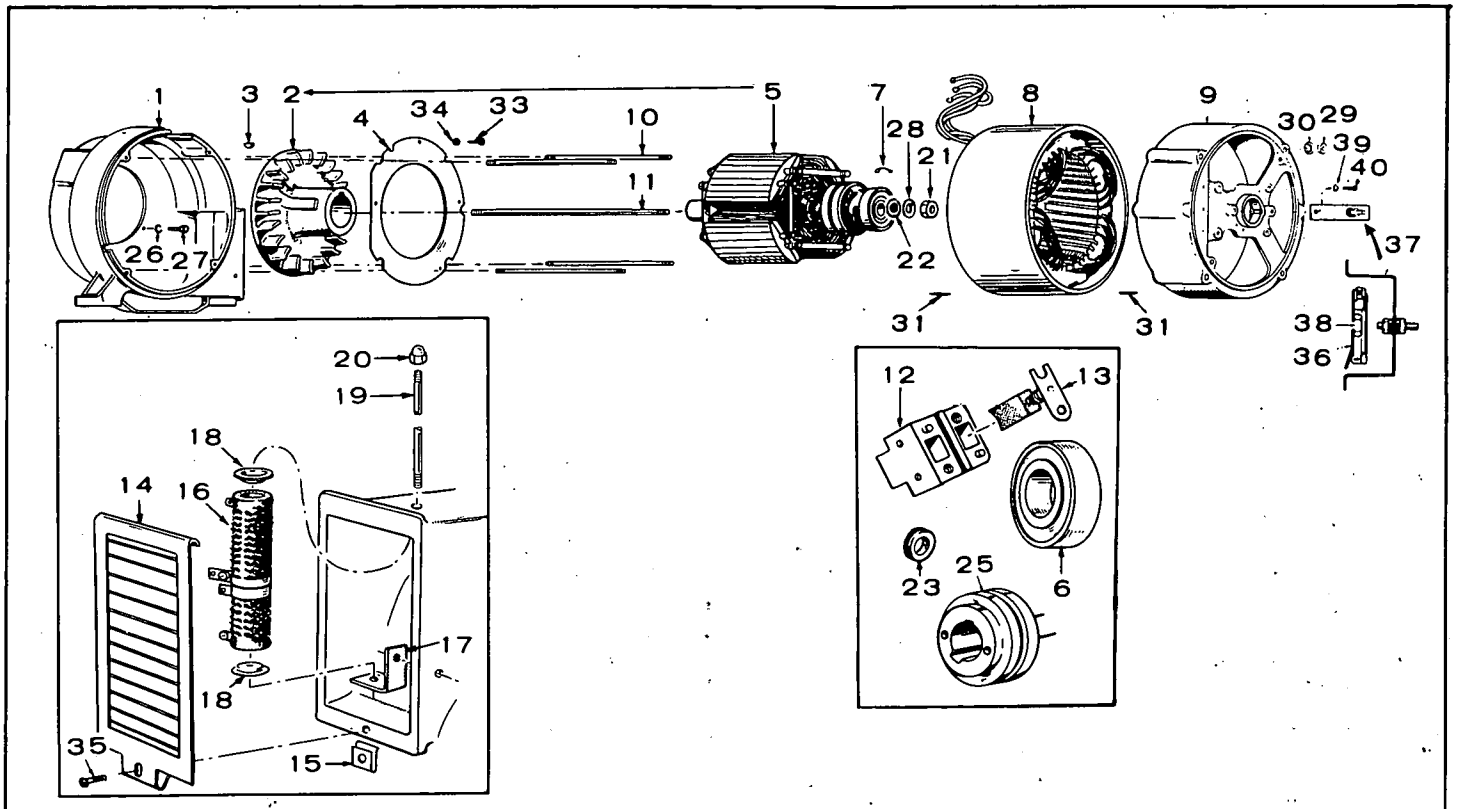




REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130-0911	1	Exchanger, Heat
2	130-0910	2	Bracket, Heat Exchanger Mtg.
3	131-0196	1	Manifold, Water
4	504-0006	1	Valve, Drain
5	131-0140	1	Gasket, Water Manifold Outlet
6	131-0197	1	Housing, Thermostat
7	502-0300	1	Elbow, Hose
8	800-0030	2	Screw (5/16-18 x 1-1/4″) - Water Pump Mounting
9	526-0065	2	Washer (5/16″), Copper
10	309-0145	2	Gasket, Water Manifold
11	309-0156	1	Switch, Hi-Temp. Cut-Off
12	502-0258	4	Nipple (3/8″ x 2″) Hose Connection
13	503-0183	As Req.	Clamp (1-1/16″)
14	502-0263	3	Elbow (90° - 3/8″)
15	502-0085	5	Nipple (3/8″), Close Brass
15A	132-0110	1	*Pump, Centrifugal Water - Less Pulley
16	131-0130	1	Bar, Pump Hold-down
17	511-0067	1	Belt, Centrifugal Water Pump
18	512-0042	1	Pulley, Centrifugal Water Pump
19	130-0591	1	Guard, Belt
20	130-0692	1	Bracket, Heat Exchanger and Governor Spring
21	HOSE, WATER		
	503-0495	1	Hose (1/2″) - Sea Water Discharge
	503-0564	1	Hose (3/4″) - Heat Exchanger to Water Pump
	503-0187	1	Hose (1/2″) - Sea Water Inlet
	503-0564	1	Hose (3/4″) - Exhaust Manifold to Heat Exchanger
	503-0478	1	Hose (3/4″) - Cylinders #1 & 2 to Cylinders #3 & 4
	503-0472	1	Hose (3/4″) - Water Pump Outlet to Block
	503-0699	1	Hose (3/4″) - Water Manifold to Exhaust Manifold
22	502-0257	1	Tee (3/8″)
23	130-0589	1	Cap, Pressure
24	503-0679	1	Hose (13″), Overflow
25	800-0005	2	Screw (1/4-20 x 3/4″) - Water Pump Mounting
26	850-0040	2	Washer (1/4″), Lock
27	505-0266	1	Plug (3/8″), Exhaust Manifold
28	503-0612	2	Clamp, Heat Exchanger Mounting
29	502-0298	1	Elbow (45° x 3/8″)
30	505-0135	2	Nipple, Half (3/8 x 1-1/2″)
31	505-0039	3	Elbow (3/8 x 90°)
32	505-0277	1	Nipple, Close (3/8 x 1-1/2″)
33	505-0101	2	Nipple, Close (3/8 x 1″)
34	505-0120	1	Elbow, Street (3/8 x 90°)
38	104-0546	1	Pulley, Flywheel
39	309-0238	1	Thermostat - Mounted in Water Manifold #131-0196
44	502-0237	1	Elbow, Raw Water Pump Outlet
45	502-0370	1	Adapter, Hose - Raw Water Pump Inlet
46	502-0372	1	Bushing, Reducer - Raw Water Pump Outlet
	130-0915	1	Conversion Kit, Heat Exchanger (Includes all necessary parts, hdwe. etc. for field installation)

NOTE: For Raw Water Pump, See Gear Cover and Water Pump Group.

* - For Component Parts, Refer to Separate Group.

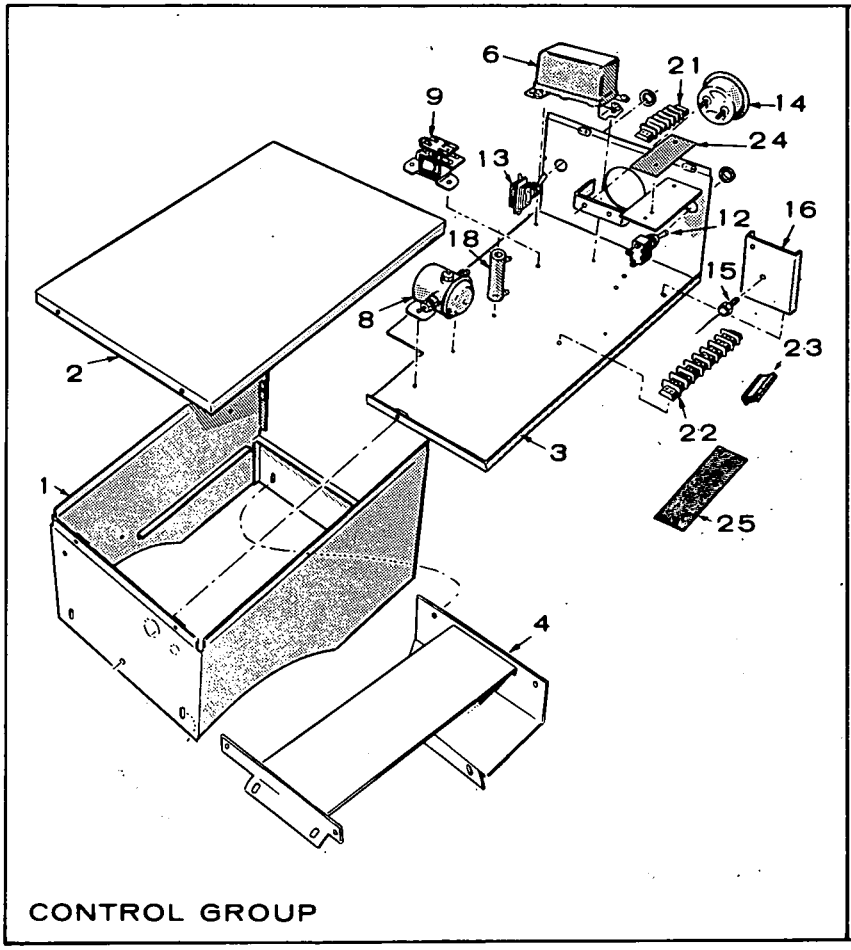


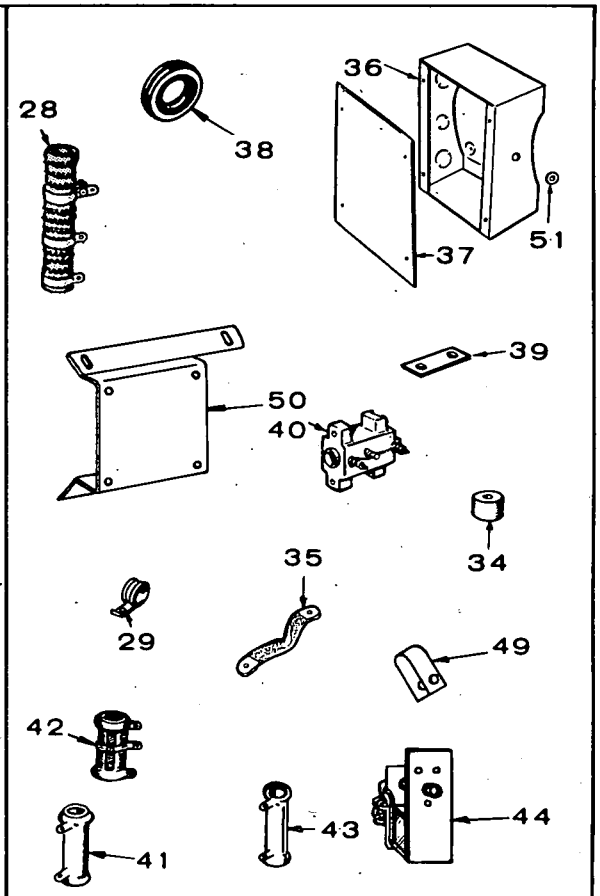
GENERATOR GROUP- ALTERNATOR PORTION
(REVOLVING FIELD TYPE)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	231-0112	1	Adapter, Engine to Generator
2	205-0064	1	Blower, Generator
3	515-0006	1	Key , Blower
4	234-0162	1	Baffle, Generator Air
5	*	1	Rotor Assembly, Wound (Includes Bearing & Blower)
6	510-0047	1	Bearing, Rotor
7	232-0596	1	Clip, Bearing, Stop
8	*	1	Stator Assembly, Wound
9	211-0146	1	Bell, End - Alternator to Exciter
10	520-0640	4	Stud, Generator Through
11	520-0615	1	Stud, Rotor Through
12	212-1064	2	Block, Collector Ring Brush
13	214-0059	4	Brush, Collector Ring
	212-0280	1	Rig Assembly, Brush (Includes Leads, Collector Ring Brushes (4) and Blocks (2) and Hdwe.) - Not Shown
14	234-0163	1	Cover, Air Outlet
15	870-0177	1	Clip, Air Outlet Cover
16	RESISTOR, TAPPED ADJUSTABLE		
	304-0500	1	Key 1
	304-0534	1	Key 2
17	232-1565	1	Bracket, Resistor Mounting
18	304-0006	2	Washer, Resistor Centering
19	520-0620	1	Stud, Resistor Mounting
20	866-0001	1	Nut, Resistor Mounting

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
21	870-0203	1	Nut, Rotor through Stud
22	232-0200	1	Washer, Tapered - Rotor through Stud
23	GROMMET, RUBBER		
	508-0095	1	Air Baffle
	508-0112	1	Lead Outlet
25	204-0061	1	Collector Ring
26	850-0040	4	Washer, Lock - Generator Adapter Mounting
27	SCREW, HEX CAP - GENERATOR ADAPTER MTG.		
	800-0051	2	3/8-16 x 1-1/4″
	800-0050	2	3/8-16 x 1″
28	850-0055	1	Washer, Lock (7/16″)
29	862-0015	4	Nut, Hex (5/16-18) - Generator Through Stud
30	850-0045	4	Washer, Lock (5/16″)
31	516-0083	2	Pin, Roll (3/16″ x 5/8″) - Alignment
33	813-0098	5	Screw (10-32 x 3/8″) - Baffle Mounting
34	850-0030	5	Washer, Lock (#10)
35	812-0102	1	Screw, Round Head - Air Outlet Cover Mounting
36	150-0956	1	Switch Assembly, Overspeed
37	150-0958	1	Bracket & Point Assembly, Overspeed
38	868-0004	1	Nut, Jam (7/16-20)
39	850-0030	2	Washer, Lock (#10)
40	813-0100	2	Screw (10-32 x 1/2″)

* - Order by Description, giving Model, Spec and Serial Number.

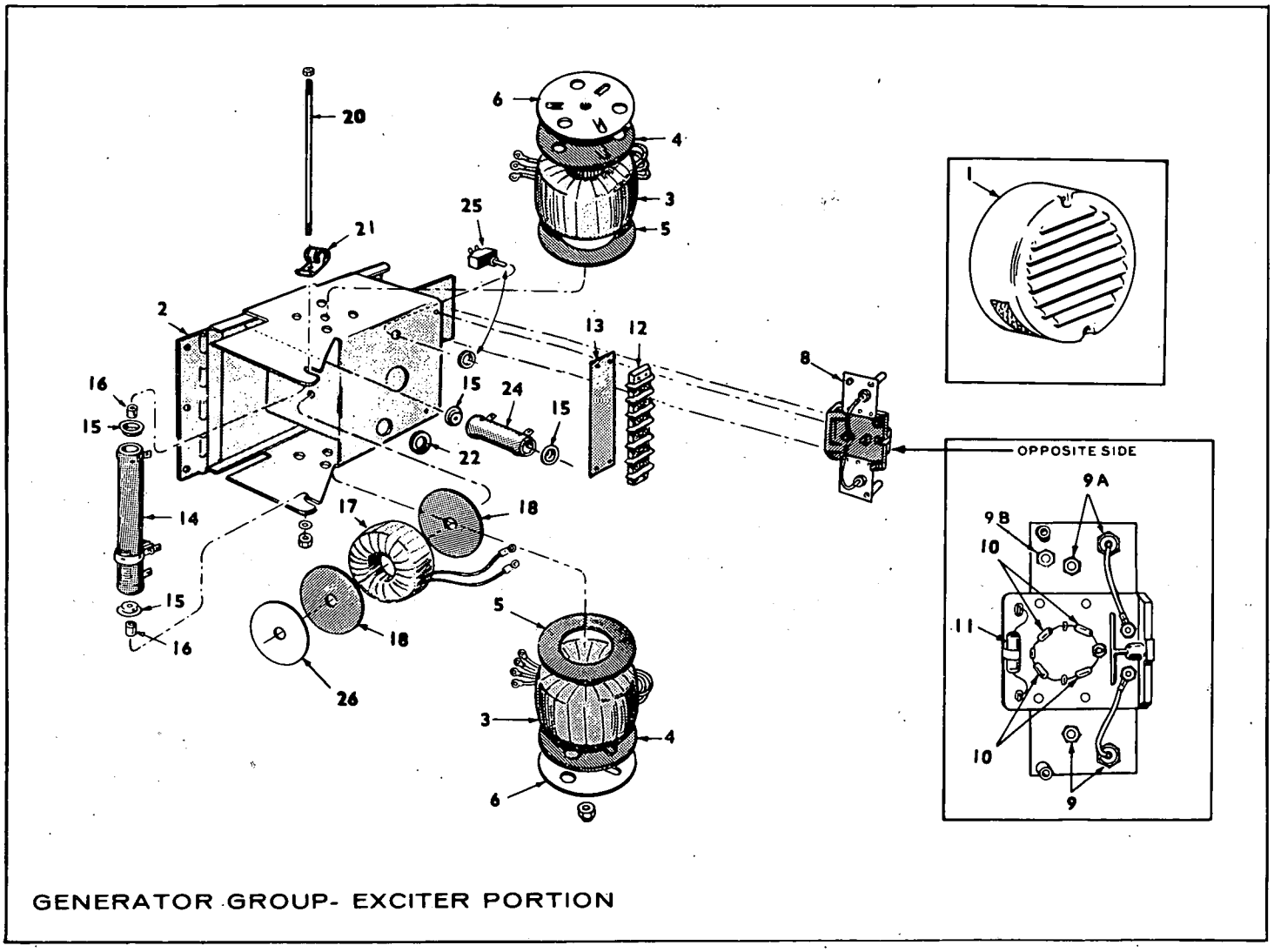




CONTROL GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	301-1962	1	Box, Control
2	301-1963	1	Cover, Control Box
3	PANEL, CONTROL BOX		
	301-1961	1	Standard
	301-2376	1	Sets with Overspeed Cut-off Switch
4	301-1968	1	Bracket, Control Box Mtg.
6	307-0597	1	Relay, Start
8	RELAY, MANIFOLD HEATER AND START SOLENOID		
	307-1046	2	Key 1
	307-0061	2	Key 2
9	307-0623	1	Relay, Ignition
12	308-0154	1	Switch, Start-Stop
13	308-0037	1	Switch, Manifold Heater
14	302-0446	1	Ammeter, Charge (5-0-5)
15	RECTIFIER, CHARGE		
	305-0235	1	Key 1
	305-0238	1	Key 2
16	305-0254	1	Bracket, Rectifier - Key 1
18	RESISTOR		
	304-0032	1	Fixed (15-Ohm, 10 Watt) - Key 1
	304-0247	1	Adjustable - Key 2
21	332-0604	1	Block, Terminal - 4 Place
22	332-0706	1	Block, Terminal - 8 Place
23	332-0750	1	Marker Strip & Wire Holder Kit, Battery Polarity (Used on some early models)
24	332-0616	1	Strip, Marker (B+, 1, 2, 3, H) - Remote Control
25	332-0739	1	Strip, Marker (4 through 9)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
28	RESISTOR, TAPPED ADJUSTABLE (Mounts in Generator Air Outlet)		
	304-0500	1	Key 1
	304-0534	1	Key 2
29	332-0052	1	Clip, Tinnerman
34	402-0078	4	Mount, Rubber - Control Box
35	337-0036	1	Strap, Ground - Control Box to Generator
36	301-2467	1	Box, Output
37	301-2466	1	Cover, Output Box
38	GROMMET, RUBBER		
	508-0001	1	For 1-1/16" Hole
	508-0009	1	For 1-5/16" Hole
39	332-0602	1	Jumper, Heater Solenoid to Start Solenoid
40	320-0104	1	Switch, Emergency - Units With Low Oil Pressure Cut-Off Switch
41	RESISTOR		
	304-0217	1	(1-Ohm, 10 Watt) - Key 1
	304-0005	1	(5-Ohm, 50 Watt) - Key 2
42	304-0005	1	Resistor, Adjusting - Key 2
43	353-0007	1	Resistor (5.5-Ohm, 50 Watt) - Key 2
44	307-0655	1	Relay, Overspeed Latching - Optional
49	416-0096	2	Clip, Harness Support
50	301-2468	1	Bracket, Output Box Mounting
51	508-0117	1	Grommet, Output Box - For 3/8" Hole



GENERATOR GROUP- EXCITER PORTION

GENERATOR GROUP - EXCITER PORTION

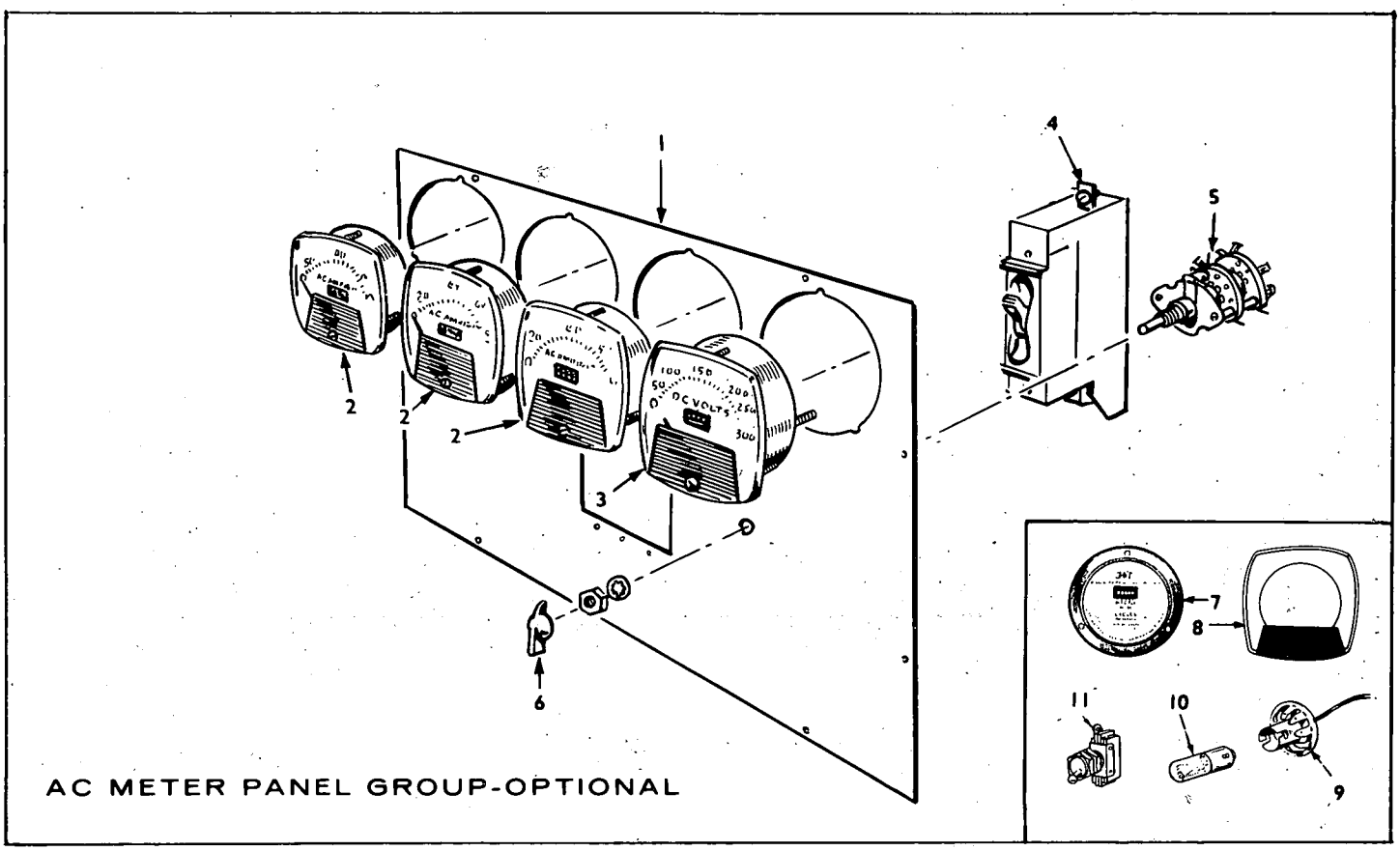
NOTE: 06SX1N1B used on 60 Hertz 120/240 Volt, 3 Phase sets.
06SX1N3B used on all 60 Hertz sets except 120/240 Volt, 3 Phase.
06SX51N1B used on 50 Hertz 120/240 Volt, 3 Phase sets.
06SX51N3B used on all 50 Hertz sets except 120/240 Volt, 3 Phase.

Check your set nameplate for the correct Magneciter number. Select the correct Part Number column that applies to your set.

Check your set nameplate for the correct Magneciter number. Select the correct Part Number column that applies to your set.

REF. NO.	QTY. USED	PART DESCRIPTION	06SX1N1B	06SX1N3B	06SX51N1B	06SX51N3B
	1	Exciter Complete (Less Cover)	209-0008	209-0010	209-0012	209-0013
1	1	Cover, Exciter	234-0185	234-0185	234-0185	234-0185
2	1	Panel Only, Exciter	234-0188	234-0188	234-0188	234-0188
3	2	Reactor, Gate	315-0102	315-0102	315-0104	315-0104
4	2	Gasket, Gate Reactor Mounting, Outer	232-1553	232-1553	232-1553	232-1553
5	2	Gasket, Gate Reactor Mounting, Inner	232-1551	232-1551	232-1551	232-1551
6	2	Retainer, Gate Reactor	232-1552	232-1552	232-1552	232-1552
8	1	Rectifier Assembly, Resistor and Complete	305-0264	305-0388	305-0264	305-0388
9	2	Rectifier Only, Power Field, Negative	305-0238	★305-0238	305-0238	★305-0238
9A	2	Rectifier Only, Power Field, Positive	305-0239	305-0239	305-0239	305-0239
9B	1	Rectifier, Field Flash		305-0239		305-0239
10	4	Rectifier, Voltage Control	305-0240	305-0240	305-0240	305-0240
11	1	Resistor, Included in Rectifier Assembly (150-Ohm, 5 Watt)	304-0512	304-0512	304-0512	304-0512
12	1	Block, Terminal	332-0745	332-0745	332-0745	332-0745
13	1	Strip, Block Marker	332-0746	332-0925	332-0746	332-0925
14	1	Resistor, Tapped, 500-Ohm (425 Fixed, 75 Adj.)	304-0527	304-0527	304-0527	304-0527
15	4	Washer, Resistor Centering	304-0015	304-0015	304-0015	304-0015
16	2	Spacer, Resistor Mounting	232-1474	232-1474	232-1474	232-1474
17	1	Reactor, Voltage Control	315-0100	315-0100	315-0105	315-0105
18	2	Gasket, Voltage Control Reactor	232-1548	232-1548	232-1548	232-1548
20	1	Stud.(or Screw), Tapped Resistor Mounting	520-0641	520-0641	520-0641	520-0641
21	1	Clip, Tinnerman	332-0050	332-0050	332-0050	332-0050
22	1	Grommet, Rubber, For 7/8" Hole	508-0008	508-0008	508-0008	508-0008
24	1	Resistor, Fixed (250-Ohm, 25 Watt)	304-0510	304-0510	304-0510	304-0510
25	1	Switch, Residual Reset	308-0175		308-0175	
26	1	Washer, Retainer, Voltage Control Reactor	526-0173	526-0173	526-0173	526-0173

★ - Later Models Use Quantity of 3.

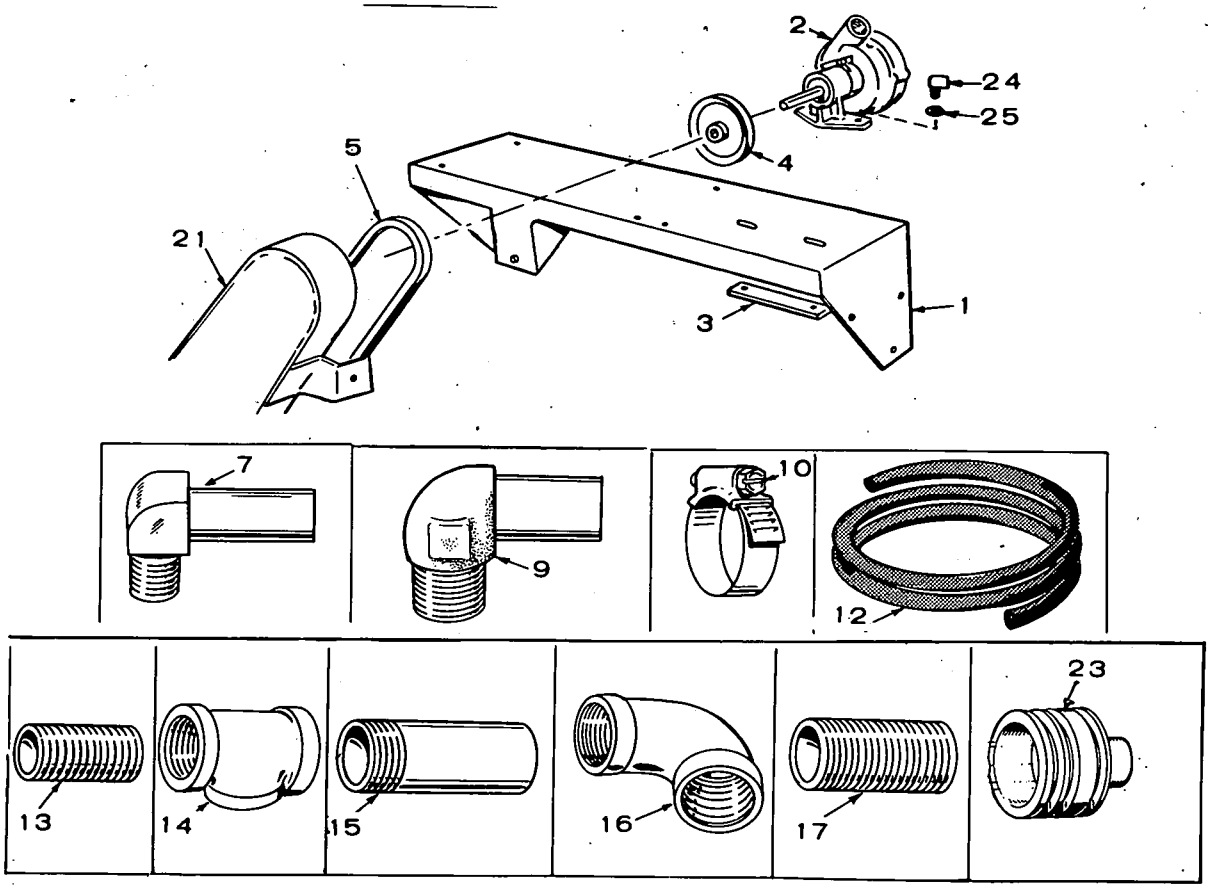


AC METER PANEL GROUP-OPTIONAL

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	*	1	Panel
2	AMMETER, AC (Check Scale, Select According to Rating)		
	302-0418	As Req.	Scale Reads 0-30
	302-0444	"	Scale Reads 0-35
	302-0419	"	Scale Reads 0-50
	302-0458	"	Scale Reads 0-80
3	VOLTMETER, AC (Check Scale, Select According to Rating)		
	302-0421	1	Scale Reads 0-300
	302-0422	1	Scale Reads 0-600
4	BREAKER, CIRCUIT (Check Original Part, Select According to Amp. and Voltage, 120/240 Volt is 1" Wide, 480 Volt is 1-1/2" Wide)		
	320-0150	As Req.	20 Amp., 480 Volt
	320-0151	"	25 Amp., 480 Volt
	320-0019	"	25 Amp., 120/240 Volt
	320-0020	"	35 Amp., 120/240 Volt
	320-0153	"	40 Amp., 120/240 Volt
	320-0198	As Req.	45 Amp., 120/240 Volt
	320-0052	"	50 Amp., 120/240 Volt
	320-0195	"	55 Amp., 120/240 Volt
	320-0148	"	70 Amp., 120/240 Volt
5	308-0012	1	Switch, Voltmeter Selector, 3 Phase Only
6	303-0076	1	Knob, Selector Switch, 3 Phase Only
7	METER, FREQUENCY		
	302-0213	1	60 Hertz
	302-0234	1	50 Hertz
8	302-0448	1	Plate, Meter Face
9	322-0072	2	Receptacle, Panel Lights
10	322-0004	2	Bulb, Panel Light
11	308-0002	1	Switch, Panel Light

* - Order by description, giving complete Model, Spec and Serial Number from nameplate.

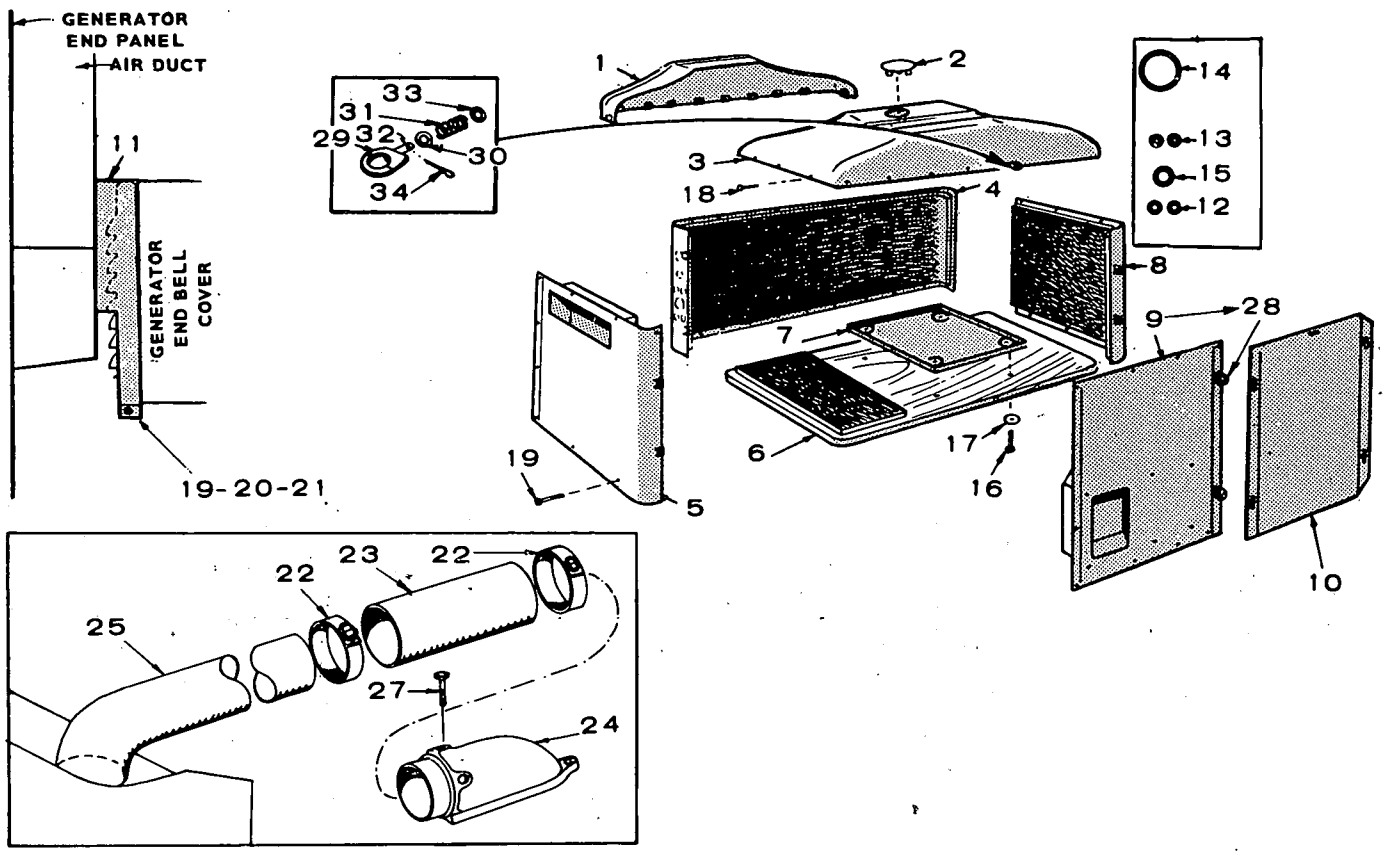
MANIFOLD AND THERMOSTAT GROUP



SPECIAL PARTS FOR KEEL COOLING MODELS- OPTIONAL EQUIPMENT

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	130-0692	1	Bracket, Pump & Governor Spring
2	132-0074	1	*Pump, Water - Less Pulley
3	131-0144	1	Bar, Pump Hold-down
4	512-0042	1	Pulley, Water Pump
5	511-0068	1	Belt, Water Pump Drive
7	502-0250	1	Elbow, Outlet (Brass) Pump
9	502-0278	1	Elbow, Pump Inlet - Brass
10	503-0183	4	Clamp, Hose
12	503-0315	1	Hose, Rubber - Total Length required for Pump to Block Hose and Front to Rear Cylinder
13	502-0085	2	Nipple (3/8″) Cylinder Block
14	502-0257	1	Tee, (3/8″) Cylinder Block
15	502-0258	4	Nipple (3/8 x 2″) (1) Exhaust Manifold (3) Block
16	502-0263	2	Elbow (90° - 3/8″) (1) Exhaust Manifold (1) Block
17	502-0085	1	Nipple (3/8″) Exhaust Manifold
21	130-0591	1	Guard, Belt
23	104-0546	1	Pulley, Flywheel
24	800-0005	2	Screw (1/4-20 x 3/4″) - Water Pump Mounting
25	850-0040	2	Washer (1/4″), Lock

* - See separate group for components.



SOUND SHIELD HOUSING GROUP- OPTIONAL

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	405-1520	1	Molding, Corner (Insulated)
2	405-1478	1	Plate, Cover
3	405-1523	1	Panel, Top (Insulated)
4	405-1504	1	Panel, Back (Insulated)
5	405-1500	1	Panel, Generator End - Includes Inlet Duct (Insulated)
6	405-1502	1	Base, Mounting (Insulated)
7	405-1494	1	Pan, Drip
8	405-1515	1	Panel, Engine End (Insulated)
9	405-1513	1	Panel, Door - Includes Air Outlet Duct (Insulated)
10	405-1517	1	Panel, Access (Insulated)
11	405-1536	1	Band, Duct Adapter
12	508-0008	2	Grommet, Fuel Inlet and Return (For 13/16″ Hole)
13	508-0071	2	Grommet, Battery Leads (For 7/8″ Hole)
14	508-0116	1	Grommet, Exhaust (For 2-3/4″ Hole)
15	508-0117	2	Grommet, Water Inlet and Leads (For 1-3/8″ Hole)
16	800-0084	4	Screw, Hex Cap - Set to Base (7/16-14 x 4-1/2″)
17	526-0195	4	Washer, Flat - Set to Base (7/16″)
18	808-0053	30	Screw, Sheet Metal (#14 x 3/4″)
19	SCREW, ROUND HEAD		
	812-0150	20	Panels to Base (1/4-20 x 5/8″)
	813-0105	1	Band Mounting (10-32 x 1″)
20	850-0030	1	Washer, Lock - Band Mounting (#10)
21	NUT, HEX		
	862-0004	4	Set to Base (7/16-14)
	870-0053	1	Band Mounting (10-32)
22	503-0267	2	Clamp, Hose
23	503-0691	1	Hose, Air Inlet
24	140-0645	1	Adapter, Air Cleaner
25	140-1278	1	Intake, Air
27	800-0006	1	Screw (1/4-20 x 7/8″) - Air Cleaner Adapter
28	406-0343	4	Latch, Folding
29	406-0342	2	Latch
30	406-0286	2	Washer, Latch
31	406-0283	2	Spring, Latch
32	406-0282	2	Clip, Latch
33	406-0285	2	Retainer, Spring
34	516-0037	2	Pin, Cotter (1/16 x 1/2″)

SERVICE KITS AND MISCELLANEOUS

NOTE: For other kits, refer to the group for the part in question.

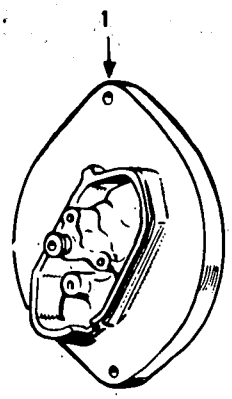
PART NO.	QTY. USED	PART DESCRIPTION
98-1807	1	Decal Kit
168-0107	1	Gasket Kit, Engine
522-0242	1	Overhaul Kit, Engine - Units Without Heat Exchanger - Spec A Only
522-0253	1	Overhaul Kit, Engine - Units Without Heat Exchanger - Begin Spec B
522-0243	1	Overhaul Kit, Engine - Units With Heat Exchanger - Spec A Only
522-0252	1	Overhaul Kit, Engine - Units With Heat Exchanger - Begin Spec B
525-0216	1	Paint, Touch-up (Pressurized Can) 16 ounce - Marine White Enamel
155-0954	1	Pipe Fitting Kit, Aqualift Muffler
155-1004	1	Muffler, Aqualift Marine

SPECIAL PARTS SECTION

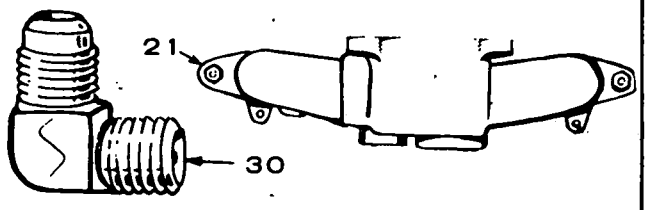
FOR 15.0MDJF-3CE/
(FORMERLY 15MDJF-3E3836/)
WORKBOAT MODEL

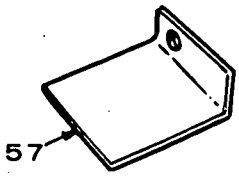
Parts not listed in this section, refer to the standard parts groups, using parts Key no. 1.

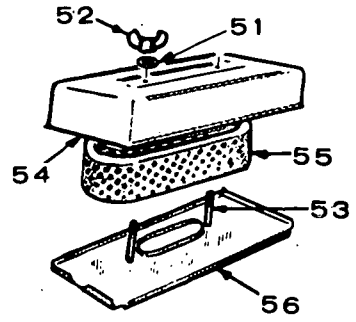
START DISCONNECT PLATE AND STOP SOLENOID GROUP

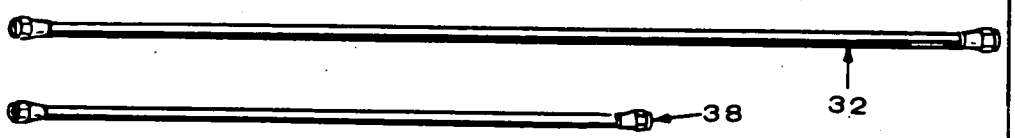


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	131-0142	1	Plate Assembly, Start-Disconnect Switch





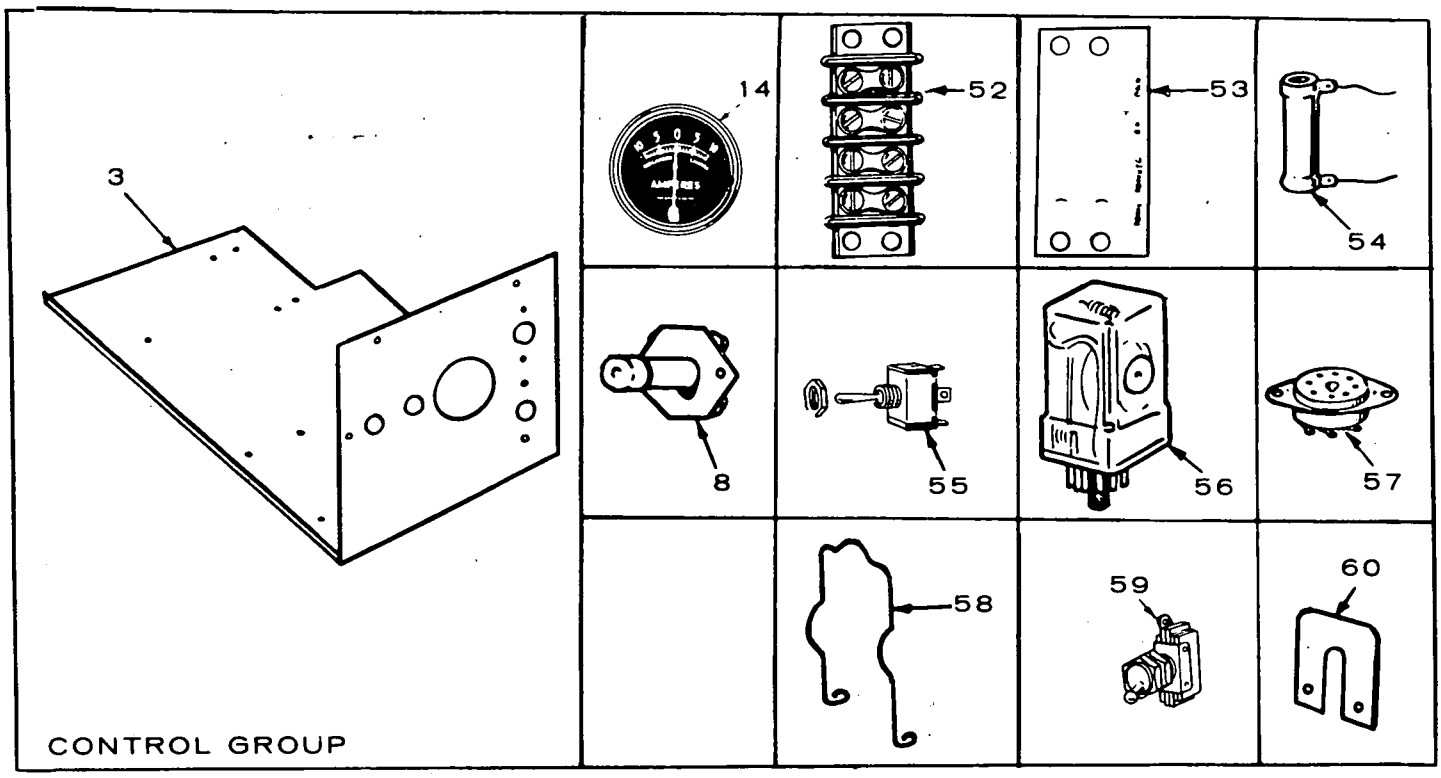




INTAKE MANIFOLD AND FUEL FILTERS GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
30	502-0148	2	Elbow, Male - Secondary Filter - Inlet & Outlet - Spec A Only
32	501-0098	1	Line, Flexible - Transfer Pump to Secondary Filter - Spec A Only
38	501-0097	1	Line, Flexible - Secondary Filter to Injection Pump - Spec A Only

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
54	140-1194	1	Cover, Air Cleaner
55	140-0606	1	Element, Air Cleaner
56	140-0607	1	Pan, Air Cleaner
57	147-0202	1	Lever, Stop - Injection Pump
51	140-0602	2	Washer, Air Cleaner
52	865-0020	2	Nut, Wing - Air Cleaner Only
53	520-0621	2	Stud, Air Cleaner Cover Mounting



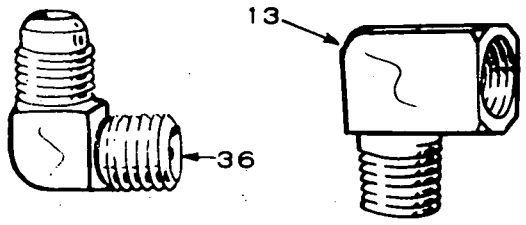
CONTROL GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
3	301-2409	1	Panel, Control Box
8	308-0028	2	Switch (1) Start (1) Heater
14	302-0058	1	Ammeter, Charge (10-0-10)
52	332-0254	1	Block, Terminal (4 Place)
53	332-0868	1	Strip, Block Marker
54	304-0330	1	Resistor, 20-Ohm, 10 Watt
55	308-0155	1	Switch, Alarm Test
56	307-0777	1	Relay, Alarm
57	323-0052	1	Socket, Alarm Relay
58	307-0778	1	Spring, Alarm Relay Hold-down
59	308-0069	1	Switch, Hi-Lo Charge
60	332-0439	1	Jumper, Terminal Block

HEAT EXCHANGER GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
11	309-0191	1	Switch, Hi-Temp. Cut-Off

FUEL TRANSFER PUMP AND INJECTION SYSTEM GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	ELBOW FUEL PUMP OUTLET		
13	502-0020	1	Elbow, Street - Fuel Pump Outlet - Spec A Only
36	502-0138	1	Elbow, Male - Fuel Pump Outlet - Spec A Only

OWNER'S MARINE SERVICE WARRANTY

QUALITY OF PRODUCT

Your Onan Marine Electric Generator set is engineered and designed especially for below-deck installation on pleasure and commercial craft. Only quality material and workmanship is used in the manufacture of this product. With proper installation, regular maintenance and periodic repair service, the equipment will provide many enjoyable hours of service.

GENERAL WARRANTY PRACTICES

All Onan marine engine-driven electric generator sets, separate generators and controls are manufactured and sold with a full one-year warranty. This warranty is issued only to the original user and promises that these products are free from defects in material and workmanship when properly installed, serviced, and operated under normal conditions, according to the manufacturer's instructions. The text of the Onan published warranty appears in the Onan Operator's Manual sent with the product, or is included in the boat manufacturer's manual.

1. **Warranty Registration:** A Warranty Registration card accompanies each Onan Marine Product. This card must be properly filled out and returned to Onan factory for you to qualify for Warranty consideration as covered in this bulletin. When requesting warranty repair work you must provide boat registration or license number, purchase date, Onan Model and Serial numbers of the equipment.

2. **Material Allowances:** Onan will allow credit or furnish free of charge to the Onan Authorized Distributor or his Approved and Registered Service Dealers, all genuine Onan parts used in a warranty repair of these products which fail because of defective material or workmanship.

3. **Labor Allowances:** Onan will allow warranty repair credit to the Onan Authorized Distributor and his Approved or Registered Dealers for straight labor time when the cause of failure is determined to be defective material or factory workmanship. This labor allowance will be based on the factory's standard time schedule of published flat rate labor allowances, or, otherwise a time judged reasonable by the factory. Repair work other than warranty will be charged to the boat owner.

4. **Miscellaneous Expense Allowances:** During the first six (6) months from the original owner's date of purchase, no charge will be made for travel time or mileage when it is necessary to perform actual warranty repair at the owner's boat location if such repair work is performed by an authorized Onan Distributor or his Approved or Registered Dealers, and if the boat is docked within the local area normally served by the approved servicing organization.

   The owner will be expected to pay the service organization a regular service fee for travel time and mileage after the first six(6) months period has elapsed, and, at any time during the one year warranty period or thereafter when repair work is not due to defective material or workmanship.

   The Onan Division's General Warranty practice does not provide for allowance of expenses such as start-up charges, communication charges, transportation charges, unit removal or reinstallation, cost of fuel, oil, normal maintenance adjustments, tune-up adjustments or parts maintenance items.

5. **Administration:** Warranty of Onan Marine Products is administered through Onan Authorized Distributor in whose territory the equipment is located. These Service Stations and their Approved or Registered Dealers are authorized to make settlement of all customer warranty claims within the limits of the manufacturer's warranty policy as described herein.

   Onan reserves the right to change warranty practices without prior notice.

MAINTENANCE

A Planned Preventive Maintenance Program is extremely important if you are to receive efficient operation and long service life from your Onan unit. Neglecting routine maintenance can result in premature failure or permanent damage to your equipment. The Onan Operator's Manual sent with the product, or the boat manufacturer's manual, contains recommended maintenance schedules and procedures.

Maintenance is divided into two categories:

1. Operator Maintenance . . . . . performed by the operator.
2. Critical Maintenance . . . . . performed only by qualified service personnel.

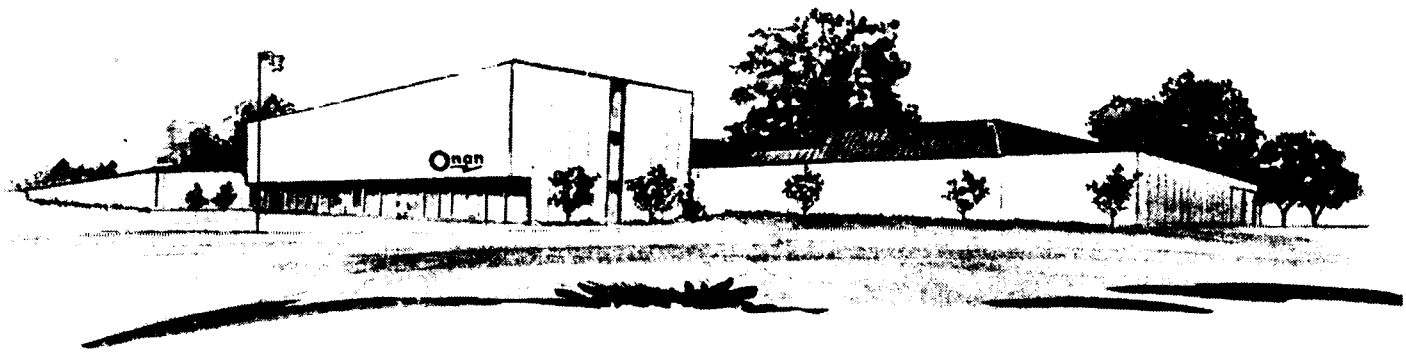
Regular maintenance will help you avoid sudden and costly repairs in the future. Adequate evidence of this scheduled maintenance must be offered when applying for a warranty claim.

INSTALLATION

Installation of Onan Marine Products is usually performed by the boat manufacturer or his dealer. If the owner experiences any difficulty with such items as mounting, ventilation, exhaust location, water or fuel lines, wiring, etc., he should immediately contact the dealer from whom he purchased the boat so that corrective action can be taken. Although the Onan Authorized Distributor or his Approved and Registered Dealers may be able to remedy certain installation difficulties, such repair work is not considered Onan warranty and there will be a charge for this service.

Onan, Division of Onan Corporation
Minneapolis, Minnesota 55432

MSS-21A
Replaces MS-12
Rev. 11-1-71



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