

**OPERATORS MANUA
AND
PARTS CATALOG**

FOR



ELECTRIC GENERATING SETS

**MAJ
SERIES**

TABLE OF CONTENTS

TITLE	PAGE
General Information	3
Specifications	4
Dimensions and Clearances	5
Assembly Torques and Special Tools	6
Periodic Service Guide	7
Troubleshooting	8
Installation	9
Operation	17
Adjustments	20
Maintenance	22
Parts Catalog	23



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.

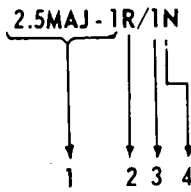
WARNING

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

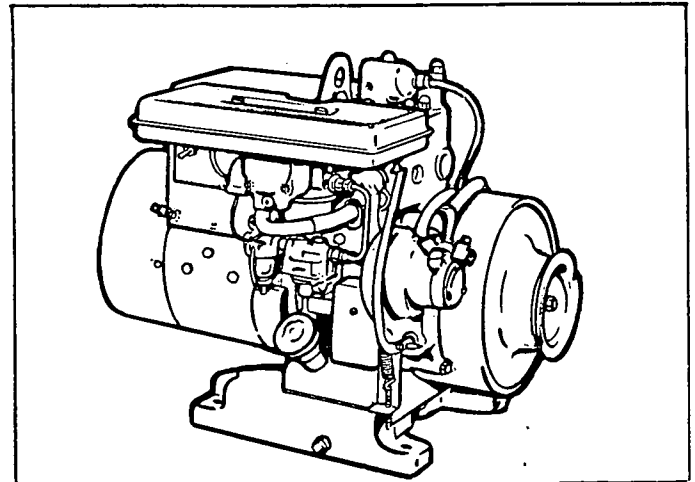
GENERAL INFORMATION

When instructions in this manual refer to a specific model of generating plant, identify the model by referring to the **MODEL AND SPECIFICATION NO.** as shown on the plant nameplate. Electrical characteristics are shown on the lower portion of the plant nameplate.

How to interpret **MODEL** and **SPEC. NO.**



1. Factory code for general identification.
2. Specific Type:
E - ELECTRIC. Electric starting at the plant only.
R - REMOTE. Electric starting. 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).



TYPICAL MODEL MAJ



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 plant (inches)	
Height	18"
Width	16"
Length	*
Weight	**
Number of cylinders	1
Displacement (cubic inch)	14.9
Cylinder bore	2-3/4"
Piston stroke	2-1/2"
Oil Capacity	3-1/2 pints
RPM (2.5 MAJ)	3600
RPM (.6MAJ, 1.0MAJ, 1.5MAJ)	
AC plants	1800
DC plants	2400
Compression ratio	6.25 : 1
Battery voltage	
1.5MAJ-224R/	24 volt
1.5MAJ-232R/	32 volt
Battery voltage (.6MAJ, 1.0MAJ, 2.5MAJ)	12 volt
Battery size (1.0MAJ, 2.5MAJ)	
SAE group 1H	two in series
Amp/hr. SAE rating - 20 hours (nominal)	105
Battery charge rate amperes	
2.5MAJ	1.5-2
.6MAJ, 1.0MAJ, 1.5MAJ	2-6
Ventilation required (cfm @ 3600 rpm)	
Generator	60
Combustion	16
Ventilation required (cfm @ 2400 rpm)	
Generator	40
Combustion	12
Output rated at unity power factor load	1 phase
AC voltage regulation in $\pm\%$	3
AC frequency regulation in %	5
Revolving armature generator	Yes
Revolving exciter	Yes

* .6MAJ-1R/-19-5/8", 1.0MAJ-1 & 3R/-22-7/16", 1.5MAJ 224 & 232R/-22-13/16", 2.5MAJ-1R/-23-7/8", 2.5MAJ-3R/-24-1/2".

** .6MAJ-1R/-150 lbs., 1.0MAJ 1 & 3R/-160 lbs., 1.5MAJ 224 & 232R/-180 lbs., 2.5MAJ-1R/-185 lbs., 2.5MAJ-3R/-190 lbs.

NOTE: New model designations shown, begin during 1969. Previous designations did not use a decimal point in the KW rating. EXAMPLE: 1.0MAJ was formerly 1MAJ and 1.5MAJ was formerly 105MAJ.

DIMENSIONS AND CLEARANCES

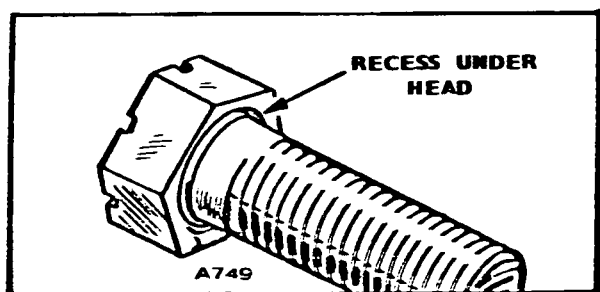
All clearances given at room temperature of 70°F.
All dimensions in inches unless otherwise specified.

	MINIMUM	MAXIMUM
CAMSHAFT		
Camshaft End Play . . . . .	.003	
Camshaft Bearing to Camshaft . . . . .	.0015	.003
CONNECTING ROD		
Connecting Rod End Play . . . . .	.012	.035
CYLINDER		
Cylinder Bore-Standard Size	2.752	2.753
CRANKSHAFT		
Crankshaft End Play . . . . .	.008	.012
Crankshaft Main Bearing Journal to Bearing Clearance . . . . .	.0015	.004
Crankshaft Main Bearing Journal-Standard Size	1.6857	1.6865
Crankshaft Rod Bearing Journal-Standard Size	1.3742	1.375
Crankshaft Rod Journal to Rod Bearing Clearance . . . . .	.0015	.0025
IGNITION AND FLICKER		
Spark Plug Gap . . . . .		.025
Ignition Breaker Point Gap @ Full Separation . . . . .		.022
Flicker Point Gap . . . . .		.020
Magneto Pole Shoe Air Gap . . . . .	.010	.015
Ignition Timing Advance		
2400 RPM		25°BTC
1800 RPM		19°BTC
OIL PUMP		
Oil Pump Gear Backlash . . . . .	.002	.005
PISTON		
Piston Clearance in Cylinder-Measured at Bottom of Skirt, 90° from Pin . . . . .	.004	.006
PISTON PIN		
Piston to Pin (70°)		Hand Push Fit
Pin to Connecting Rod		Thumb Push Fit
PISTON RINGS		
Piston Ring Gap in Cylinder . . . . .	.006	.024
TIMING GEAR		
Timing Gear Backlash . . . . .	.002	.003
VALVES AND TAPPETS		
Tappet to Cylinder Block Clearance . . . . .	.0015	.003
Valve Seat Width	1/32	3/64
Valve Stem to Guide -Intake . . . . .	.001	.0025
Valve Stem to Guide -Exhaust . . . . .	.0025	.004
Valve Tappet Clearance -Intake (70°) . . . . .	.010	.012
Valve Tappet Clearance -Exhaust (70°) . . . . .	.010	.012
Valve Face Angle		44°
Valve Seat Angle		45°

ASSEMBLY TORQUES AND SPECIAL TOOLS

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 defeat 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.

Camshaft Bearing Driver	420A66
Connecting Rod Aligning Set	420P195
Main Bearing Driver	420B127
Oil Seal Guide and Driver	420B181
Piston Ring Spreader	420P146
Ridge Reamer	420P260
Replacement Blade for Reamer	420P261
Ring Compressor	420P214
Valve Grinding Tool	420P120
Replacement Cup for Above	420P121
Valve Lock Replacer	420P105
Valve Seat Driver	420A70
Valve Spring Compressor	420P119

TORQUE SPECIFICATIONS

FT.-LB.

Connecting Rod Bolt	10-12
Flywheel Mounting Screw	35-40
Fuel Pump Mounting Screw	10-15
Oil Pump (For over 3000 RPM)	7-9
Gearcase Cover	15-20
Rear Bearing Plate	20-25
Oil Base Mounting Screws	25-30
Cylinder Head Bolt	24-26
Spark Plug	25-30
Generator Through-Stud Nut	20-25
Valve Cover Nut	4-8
Carburetor Mounting Stud Nuts	8-12
Armature Through-Stud Nut	25-30

PERIODIC SERVICE GUIDE

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS						
	8	50	100	200	500	1000	5000
Inspect Plant	x1						
Check Fuel Supply	x						
Check Oil Level	x						
Check Flame Arrestor		x3					
Clean Governor Linkage		x3					
Check Spark Plug			x				
Change Crankcase Oil			x3				
Clean Crankcase Breather			x				
Check Battery Electrolyte Level		x					
Inspect Magneto Breaker Points				x			
Clean Commutator and Collector Rings				x3			
Check Brushes				x2			
Check Valve Clearance					x		
Remove Carbon and Lead					x		
Clean Generator						x	
Remove and Clean Oil Base						x	
Grind Valves (If Required)						x	
Clean Carburetor						x	
Complete Reconditioning							x

x1 With plant running, visually and audibly check exhaust system for leaks.

x2 Replace commutator brushes when worn to 5/8 inch.

x3 Perform more often in extremely dusty conditions.

TROUBLE-SHOOTING

OPERATOR'S TROUBLE-SHOOTING GUIDE for ONAN GASOLINE ENGINES (Air Cooled)		TROUBLE																	
CAUSE		Hard Starting or Failure to Start	Starter Motor Doesn't Turn	Engine Misfires	Speed Too High	Speed Too Low	Hunting Condition	No Governor Control	Poor Sensitivity	Excessive Oil Consumption	Excessive Fuel Consumption	Low Oil Pressure	High Oil Pressure	Engine Backfires at Carburetor	Engine Overheats	Mechanical Knocks	Black Smoky Exhaust	Blue Smoky Exhaust	
COOLING SYSTEM	Blown Head Gasket	•		•															
	Overheating									•						•	•		
	Dirt on Cooling Fins														•	•			
	Inadequate Air Circulation (Ventilation)									•					•				
FUEL SYSTEM	Out of Fuel, or Shut-off Valve Closed	•																	
	Poor Quality Fuel	•		•						•							•		
	Dirty Fuel Filter	•		•															
	Fuel Line Leaks	•		•			•			•									
	Mixture Too Rich	•		•						•				•				•	
	Mixture Too Lean	•		•											•				
	Engine Flooded	•												•					
	Run for Long Periods of Time at No Load			•															
Restricted Air Intake, Dirty Air Filter	•		•						•								•		
GOVERNOR SYSTEM	Linkage Loose or Disconnected								•										
	Linkage Binding						•	•	•										
	Excessive Wear in Linkage							•	•	•									
	Incorrect Governor Adjustment					•	•		•										
	Spring Sensitivity Too Great				•		•												
LUBRICATION SYSTEM	Low Oil Supply											•				•	•		
	Defective Gauge											•	•						
	Excess Oil in Crankcase									•		•						•	
	Oil Leaks From Engine Base or Connections									•		•				•	•		
	Crankcase Oil Too Light or Diluted									•		•			•	•		•	
	Crankcase Oil Too Heavy	•											•						
STARTING SYSTEM AND IGNITION SYSTEM	Battery Discharged or Defective	•	•																
	Loose Battery Connections	•	•																
	Load Connected When Starting	•																	
	Open Solenoid	•	•																
	Defective Starter	•	•																
	Wrong Plug or Point Setting	•		•															
	Incorrect Timing	•		•						•					•	•	•	•	
	Spark Too Far Advanced														•	•			

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.

Installations 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.

LOCATION

Select a location for the plant, 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.

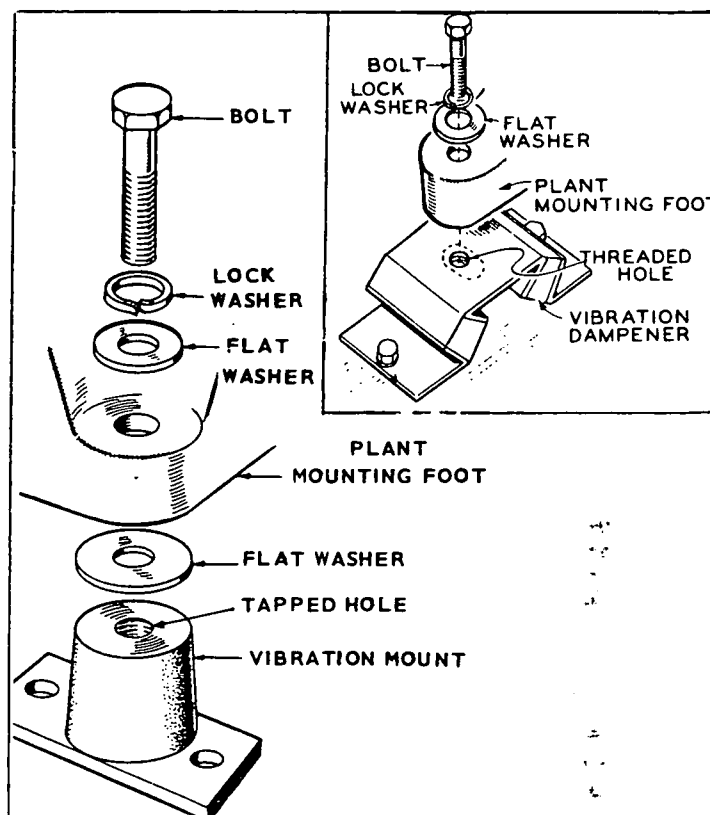


FIGURE 1. MOUNTING CUSHION

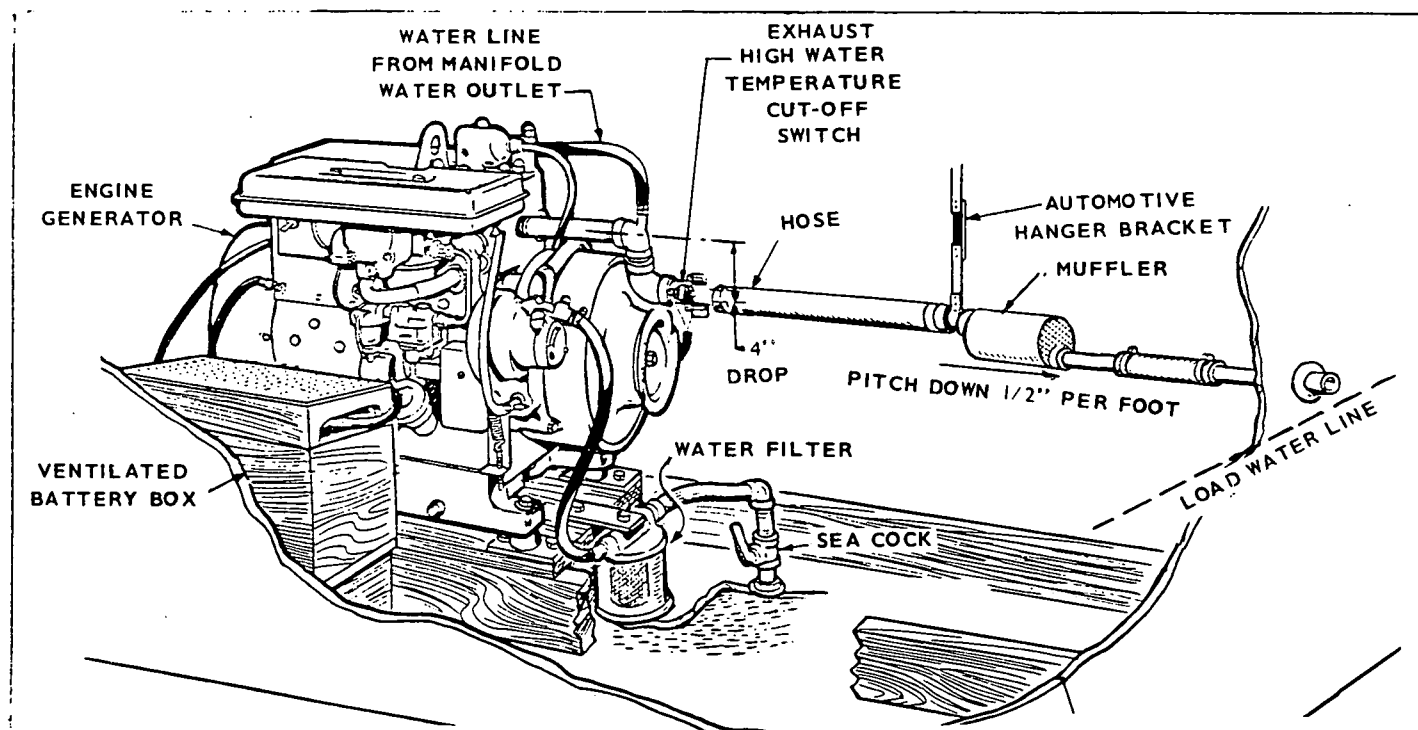
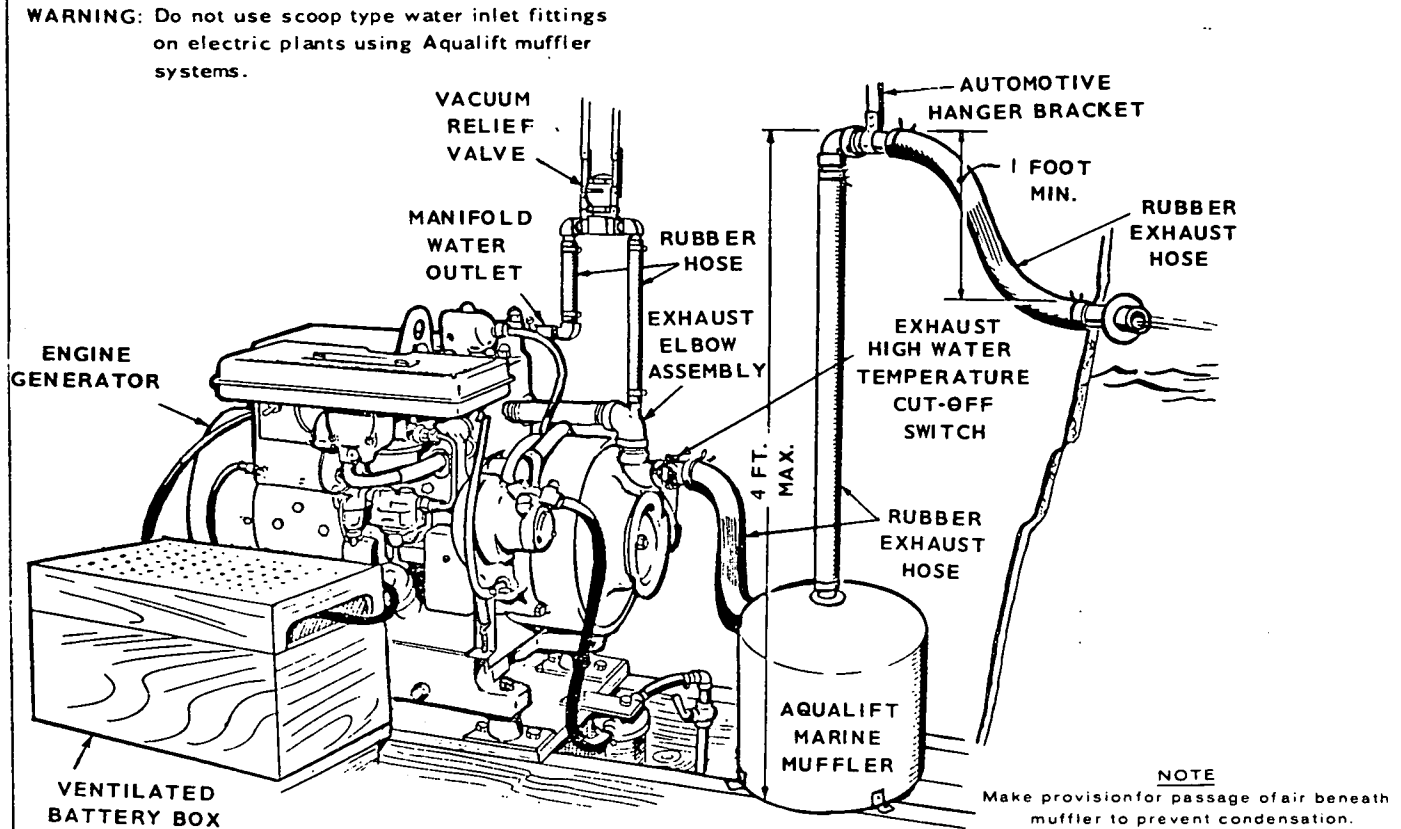


FIGURE 2. TYPICAL INSTALLATION

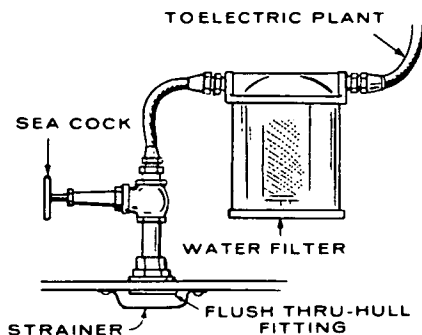
MOUNTING

The floor should be flat and give support directly under the plant mounting points. 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.

To install vibration mounts, place them under the oil base and generator support. Secure the vibration mount to the floor. Secure the plant to the mounts with the associated hardware (Figure 1).



Recommended flush type thru-hull fitting and water filter.



WARNING: Do not use scoop type water inlet fittings on electric plants using Aqualift muffler systems.

CAUTION

Install Siphon Break Kit #155K950 if exhaust injection elbow is below load water line. Locate the Siphon Break at least 12" above load water line and in a vertical position. Remote mounting the siphon break is permissible within a 5' radius of water injection exhaust elbow. Vertical position and height of valve must be maintained.

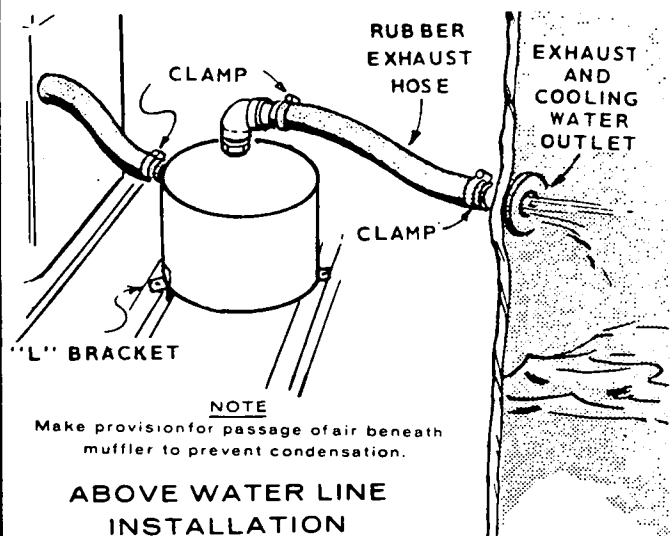


FIGURE 3. TYPICAL INSTALLATION

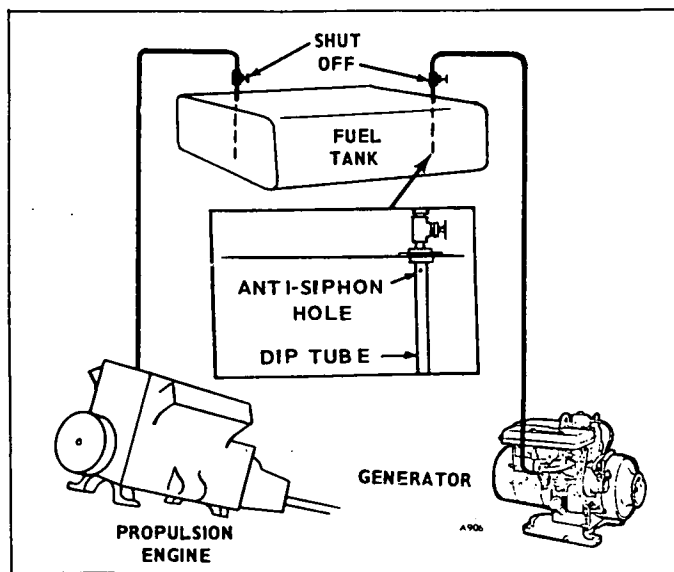


FIGURE 4. FUEL SYSTEM

FUEL TANK AND LINES

When a separate fuel tank (installed below the generating plant) is used, position it so the bottom of the tank will be less than 4' below the fuel pump. If the vertical lift exceeds 4', or vapor lock occurs, install an auxiliary electric fuel pump near the fuel supply.

When a separate fuel tank (installed above the generating plant) is used, provide a siphon break to prevent siphoning if a system leak occurs. Drill a small hole (approximately #75 drill size) at the top of the diptube inside the fuel tank (Fig. 4).

If a fuel tank is shared, do not connect to an existing line at a point above the fuel supply level. This avoids starving the plant.

A shut-off valve at the tank and near the plant is recommended for service convenience (Figures 5 and 6).

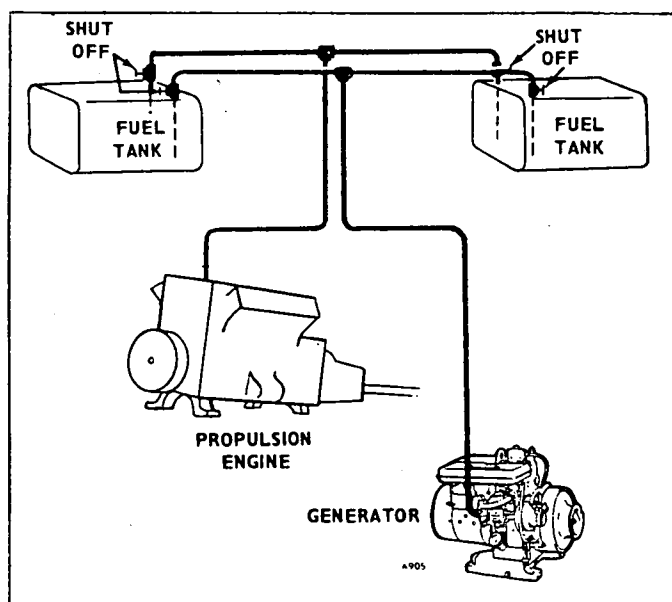


FIGURE 5. FUEL SYSTEM

Use approved flexible rubber fuel line next to the engine. Install the fuel supply line from near the bottom of the supply tank to the 1/8" pipe tapped inlet of the fuel pump (see Fig. 6).

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 plant requires fresh air for combustion and

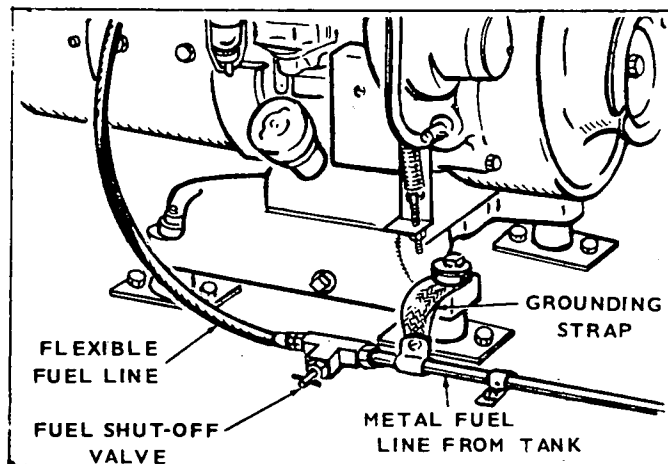


FIGURE 6. FUEL SHUT-OFF VALVE

generator cooling. Onan recommends that the ventilation system be able to deliver 1-1/2 to 2 times the air required by the plant. 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

See Installation, Fig. 2 and 3. The engine exhaust connection is 3/4" pipe tapped. Pipe exhaust gases outside of the hull.

WARNING

Exhaust gases are deadly poisonous!

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 (see Fig. 2 and 3).
5. For turns use sweeping (long radius) elbows
6. Increase one pipe size for every 10' in length

Provide a tee for water line connection for wet exhaust (Fig. 7) - refer to Water Discharge Line Instructions. Raise the dry portion of the exhaust line high enough to prevent water back-flowing into the engine under all conditions.

Onan recommends using the Aqualift muffler for maximum silencing efficiency and ease of installation. A cast iron muffler is also available. Provide a recommended or equal silencer and install it near the end of the wet exhaust line.

CAUTION

Dry exhaust will burn a neoprene silencer.

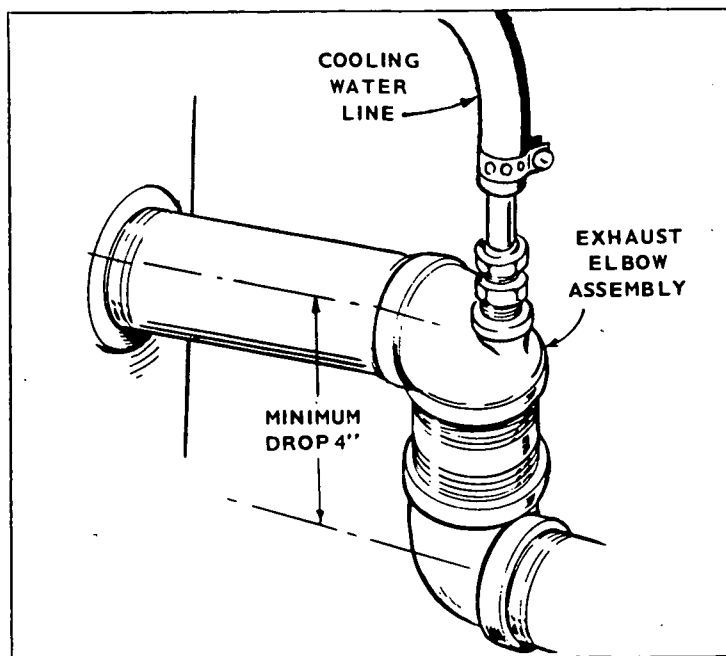


FIGURE 7. WATER OUTLET CONNECTIONS
(RAW WATER ONLY)

AQUALIFT MUFFLER

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 plant's water pump, flooding the exhaust system where it may flow back, flooding the engine cylinders. This can happen only if the electric plant is not running and boat is underway.

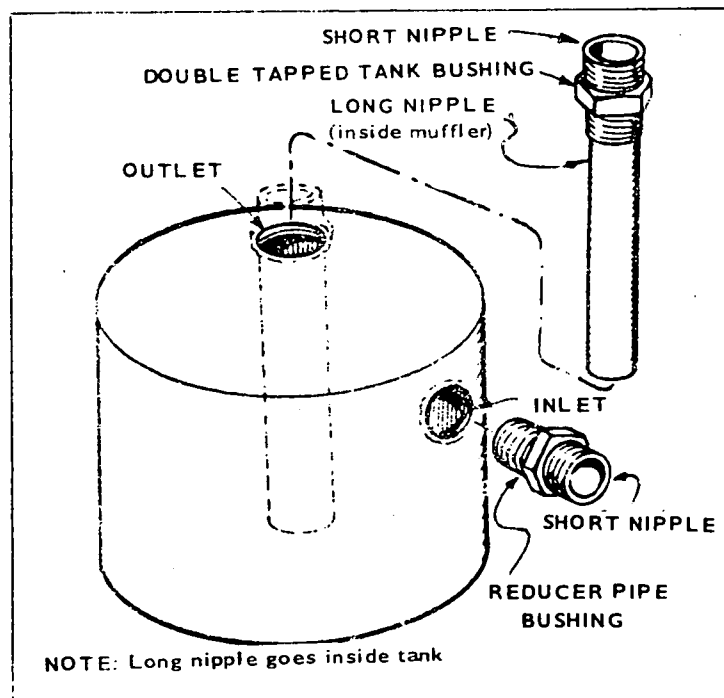


FIGURE 8. AQUALIFT MUFFLER ASSEMBLY

1. Secure the muffler to the predetermined location (within ten-feet of the engine exhaust outlet) using "L" brackets (Fig. 9) or other suitable mounting devices such as wood blocks or metal straps. Flexible mounts may be used if so desired.

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 (1-1/4 inch) 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).
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. See Figure 3. There must be a pitch of one-half inch per foot (i.e., a 2-1/2 inch drop for a 5 foot 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 Figure 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.

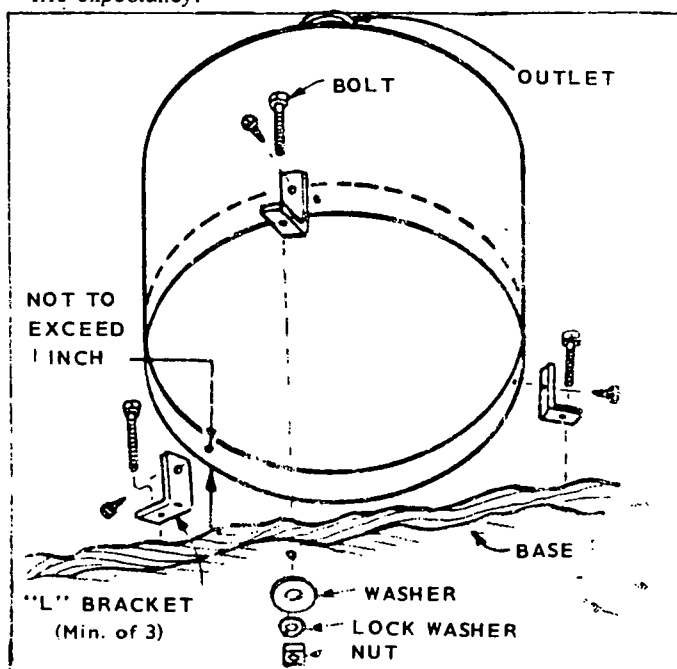


FIGURE 9. INSTALLATION OF AQUALIFT MUFFLER

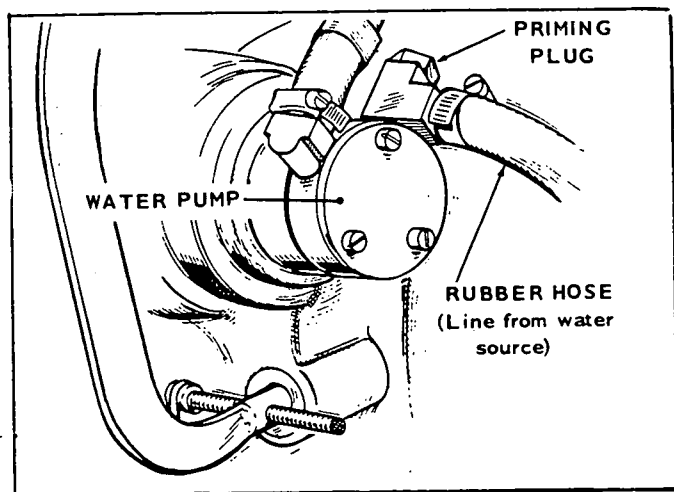


FIGURE 10. WATER PUMP INLET HOSE

WATER SUPPLY LINE

A continuous supply of cooling water is required. The water pump inlet has a 1/8" pipe fitting (see Fig. 10). Use a section of hose (that will not collapse) near the plant (or entire run) to absorb vibrations. The inside diameter of the plumbing must be 1/8" or larger. Use permatex or other pipe sealer on all pipe fittings in supply line to pump. Reduce resistance on pipe runs longer than 5' 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 pump impeller life*. Install a strainer in the water suction line inlet where accessible

for cleaning. A thermostat located on the engine cylinder head, controls engine operating temperature at approximately 160°F.

WATER DISCHARGE LINE

The 1/4" pipe size fitting water outlet is on the front of the cylinder head (see Figures 2 and 3).

Use plumbing at least as large as the supply line. Use a section of hose near the plant or the entire run. Connect the line to discharge the heated cooling water into the exhaust line several feet ahead of the muffler. Be sure water will not back flow into exhaust line and engine port.

BATTERY CONNECTION (Battery Charging Plants).

The 12, 24, and 32-volt battery charging plants have ungrounded systems. On the 24- and 32-volt plants, install a fused, double pole, single throw switch between the battery and the plant; see the wiring diagram and Fig. 11. Provide battery cables of the proper size and length.

1. Plants prior to Spec. H - Connect the battery positive (+) to the POSitive terminal on the control box. Connect the battery negative (-) to the NEGative terminal on the control box.
2. Plants beginning with Spec. H - Enter the control box and connect the battery positive to the start solenoid's terminal marked B+. Connect the battery negative to the reverse current relay's terminal marked A2, B-.

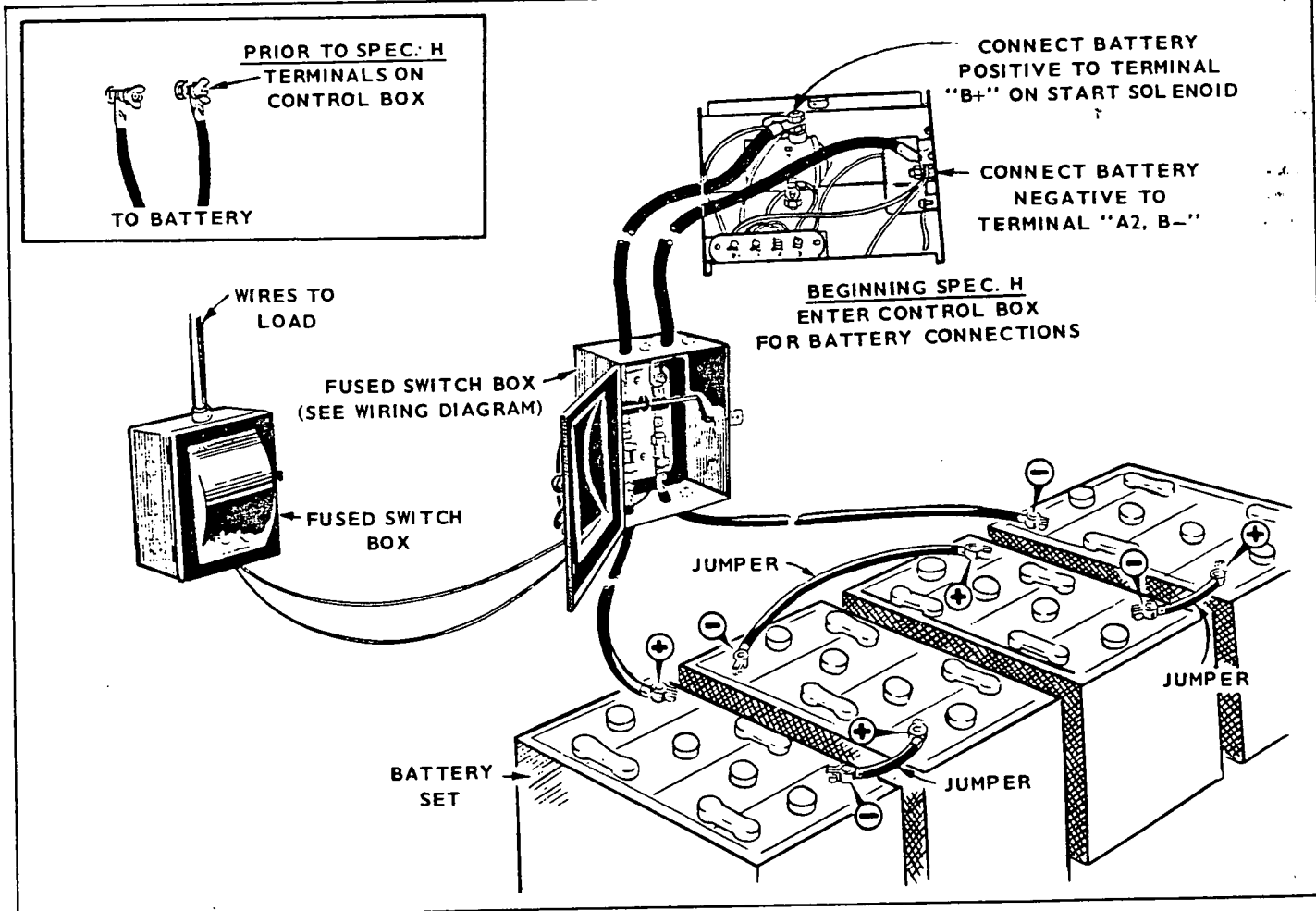


FIGURE 11. BATTERY CONNECTION ON 24 AND 32 VOLT PLANTS

BATTERY CONNECTIONS
SHOWN HERE ARE FOR A
NEGATIVE GROUND

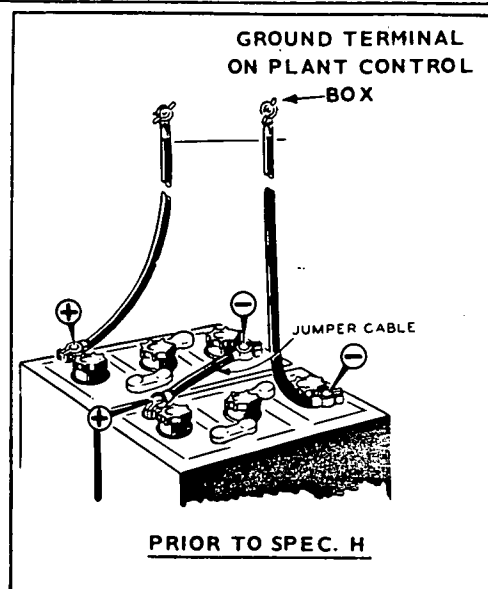
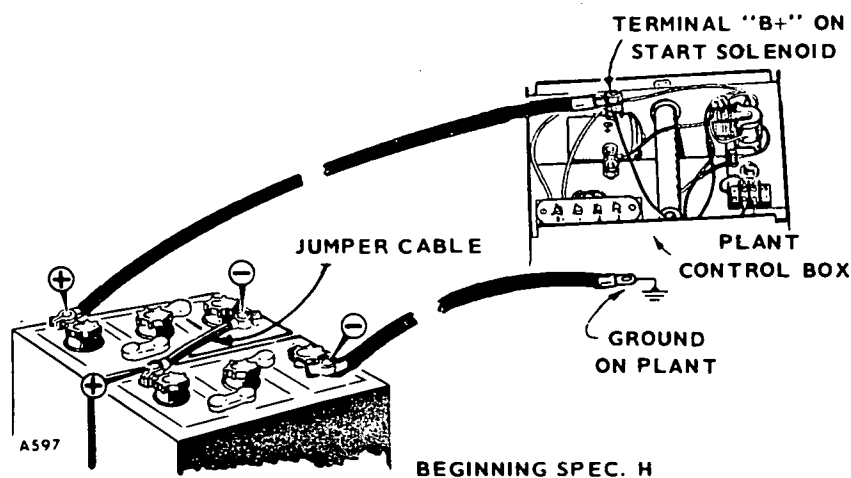


FIGURE 12. BATTERY CONNECTIONS ON 12 VOLT PLANTS

Beginning with Spec N on 32 volt models, the 12 volt battery circuit has a silicon diode to prevent reverse current.

CAUTION Battery connections must be made with a negative ground. An incorrect connection (positive ground) will cause instant damage to the diode in the battery charge circuit.

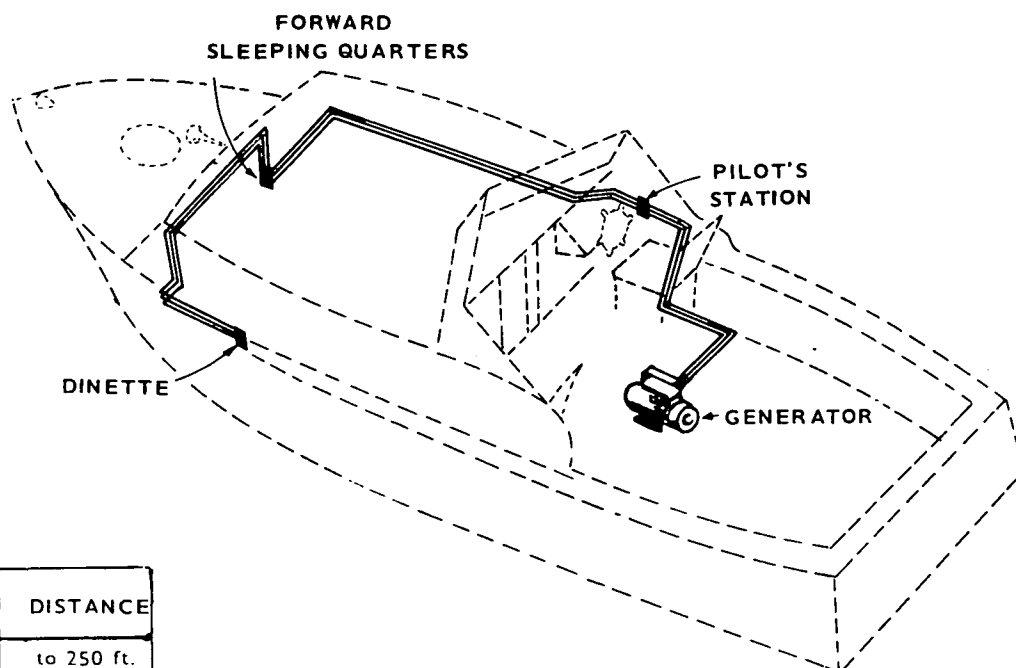
BATTERY CONNECTION (AC Plants)

On models ending in Spec A through Spec G, connect the battery positive (+) to the control box B+ terminal. Beginning

with Spec H models, enter the control box and connect the battery positive to the start solenoid's terminal marked B+. Connect the battery negative (-) to the B- or ground terminal on the plant. See Figure 12.

DC REMOTE START-STOP SWITCH (Optional)

On ungrounded systems, four wires are used to complete the remote circuit. The remote control, four-place, terminal block is marked B+, 1, 2, 3. The remote control switch has terminals marked B, 1, 2, 3. Connect between the switch terminal and the plant terminal. See Figure 14.



WIRE SIZE	DISTANCE
#18	to 250 ft.
#16	to 400 ft.
#14	to 630 ft.

FIGURE 13. REMOTE CONTROL WIRING

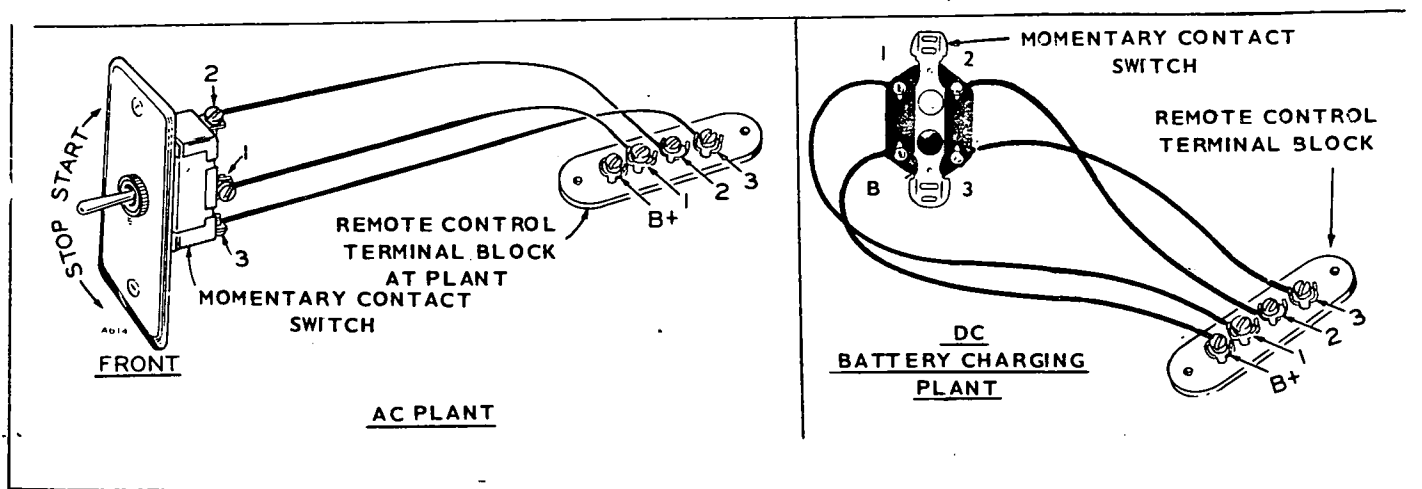


FIGURE 14. REMOTE CONTROL SWITCH

CAUTION Do not disconnect starting batteries while plant is running. The resulting over-voltage condition will damage electric choke and control components.

AC REMOTE START-STOP SWITCH (Optional)

For remote control of starting and stopping use three wires to connect a remote switch (SPDT, momentary contact, center-off type) to the terminal block marked B+, 1, 2, 3 in the plant control box (Fig. 14). Use correct wire size according to switch distance from plant. See Fig. 13.

LOAD WIRE CONNECTIONS

Plant nameplate shows the electrical output rating of the plant in watts, volts, and hertz. The plant wiring diagram shows the electrical circuits and connections necessary for the available output voltage. Also see Fig. 15.

The 120/240 volt, single phase (3R) plants beginning spec J, full rated output of 2500 watts can be taken from M1 M2 leads providing little or no load on M2-M3 leads. Maximum output on M2 M3 leads is half the nameplate rating.

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

Plant control boxes have knockout sections to accommodate load wires. Use flexible conduit and stranded load wires near the plant 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 plant box. Insulate bare ends of ungrounded wires. Use a bolt (through the control box) to connect the grounded (\perp) generator lead and load wire. Install a fused main switch (or circuit breaker) between the generating plant and load.

Output Lead Markings: Revolving armature generator leads are marked M1, M2, etc. These identifying marks also appear on the wiring diagram.

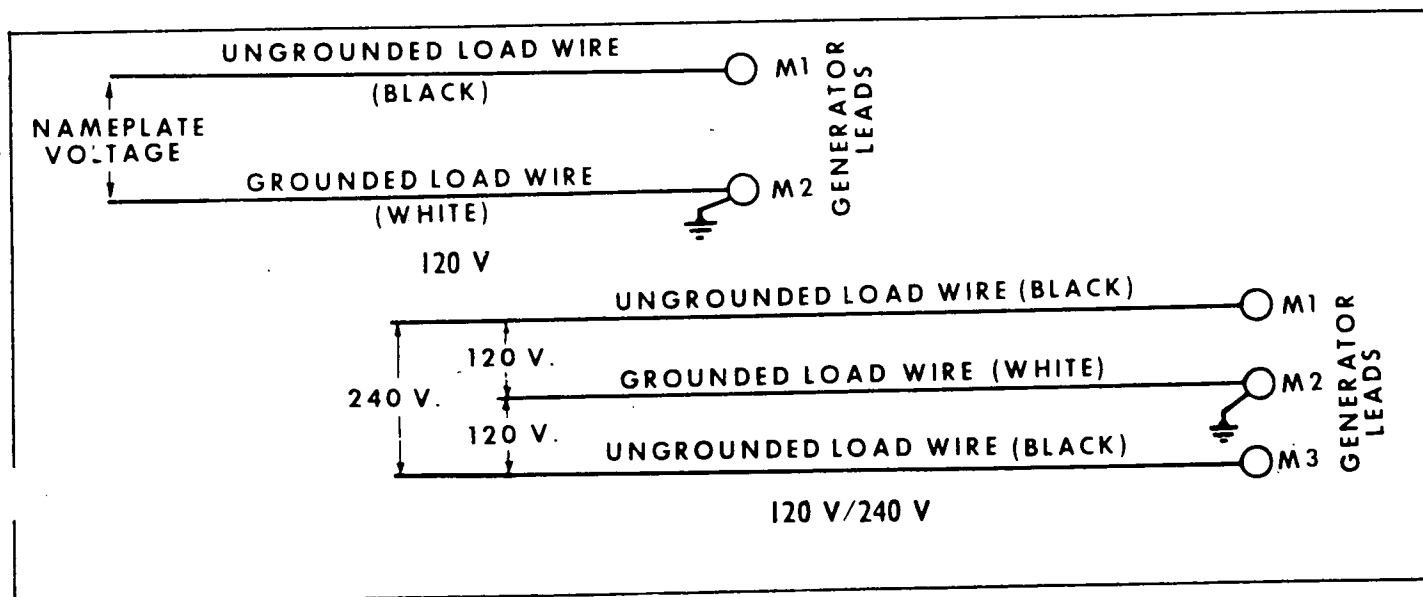


FIGURE 15. LOAD WIRE CONNECTIONS

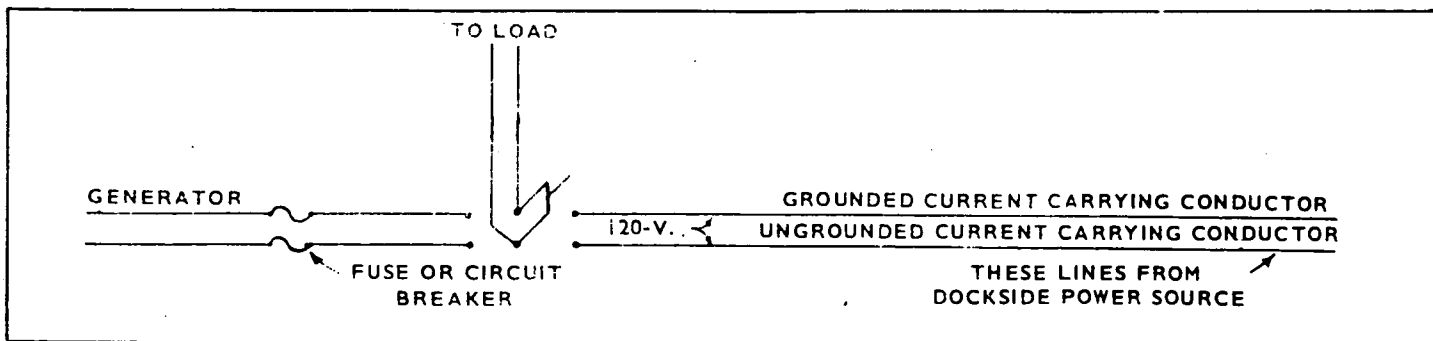


FIGURE 16. SHORE POWER WIRING CONNECTIONS

Shore Power: If the installation connects to shore power, install a double-throw transfer switch (either manual or automatic type), such as *Onan* #308B204, to prevent feeding generator output into the shore power source lines and to also prevent commercial power and generator output from being connected *to the load at the same time*. Instructions for connecting an automatic load transfer switch are included with such equipment. See Fig. 16.

Equipment Ground: The installation may include an equipment ground which provides a common ground for all electrical equipment aboard the vessel. Connect this ground to the generator frame. Do not tie this ground into generator current carrying conductor.

OPERATION

INITIAL START

Check the engine to make sure it has been filled with oil and fuel. Prime water pump (Fig. 10). If engine fails to start at first attempt, inhibitor oil used at the factory may have fouled the spark plug – remove, clean in suitable solvent, dry thoroughly and install. Heavy exhaust smoke when the engine is first started is normal and is caused by the inhibitor oil.

The engine fuel system can be hand primed using the fuel pump priming lever (Fig. 17). **NOTE:** *If the camshaft's pump lobe is up (fuel pump priming lever operates with very little resistance), crank engine one revolution to permit hand priming. When finished, return priming lever inward (disengaged position) to permit normal pump operation.*

Crankcase Oil: Use a good quality heavy duty detergent oil that meets the API (American Petroleum Institute) service designations MS, MS/DG, MS/DM, SE or SE/CC. Oil should be labeled as having passed the MS Sequence Tests and the MIL-L-2104B Tests. Recommended SAE oil numbers for expected ambient temperatures are as follows:

Above 90°F	SAE 50
32°F to 90°F	SAE 30
0°F to 32°F	SAE 10W-40, 5W-30
Below 0°F	SAE 5W-30

Do not mix brands or grades. Refer to Maintenance Section for recommended oil changes and complete lubricating oil recommendations.

Recommended Fuel: Use clean, fresh, regular grade, automotive gasoline. Do not use highly leaded premium types. For new engines, most satisfactory results can be obtained by using unleaded gasoline. For older engines that have previously used leaded gasoline, heads must be taken off and all lead deposits removed from engine before switching to unleaded gasoline.

CAUTION

If lead deposits are not removed from engine before switching from leaded to unleaded gasoline, preignition could occur causing severe damage to the engine.

WARNING

Never fill the tank when the engine is running. Leave some tank space for fuel expansion.

ELECTRIC STARTING (AC Plant)

1. Push *start-stop* switch to *start* position.
2. Release the switch when plant starts.

ELECTRIC STARTING (Battery Charging Plant)

1. Close the switch between the plant and battery. Do not start or run plant without battery connected into load circuit.
2. Push *start* switch to crank the engine.
3. Release *start* switch when the plant starts.

MANUAL STARTING (Batteries Connected)

1. Pull starting rope slowly until piston passes over compression.
2. Rewind the rope to starting position.
3. Pull rope with a fast, steady pull, to crank engine. Do not jerk.

IMPORTANT: *Never start or run battery charging plants unless the battery is connected. Be sure the plant-battery switch is closed and fuses are good.*

MANUAL EMERGENCY START (ac plant)

1. If the starting battery is connected, follow the Manual starting procedure.
2. If the starting battery is disconnected, certain wires inside the control box *must* also be disconnected, depending upon the plant model (see Fig. 18).
 - a. 2.5MAJ-1R/, 2.5MAJ-3R/, 205MAJ-1R/, and 205MAJ-3R/ - Models: For Spec H models, disconnect generator lead A1 from terminal A1 and resistor wire 4 from the small terminal block. For models prior to Spec H, disconnect generator leads A1 from terminal A1 and S1 from start solenoid terminal S1. Disconnect the electric choke wire at the choke. Tape all disconnected wires.
 - b. 1.0MAJ-1R/ and 1MAJ-1R/ - Models: Disconnect the wire from the slide charge resistor clip. Disconnect electric choke wire at the choke. Tape both disconnected wires.
 - c. Mark the electric choke original setting (see Adjustment Section) and re-adjust for full open position. Operate the choke manually while the battery is disconnected (see Fig. 18).
 - d. Follow the Manual Starting procedure.

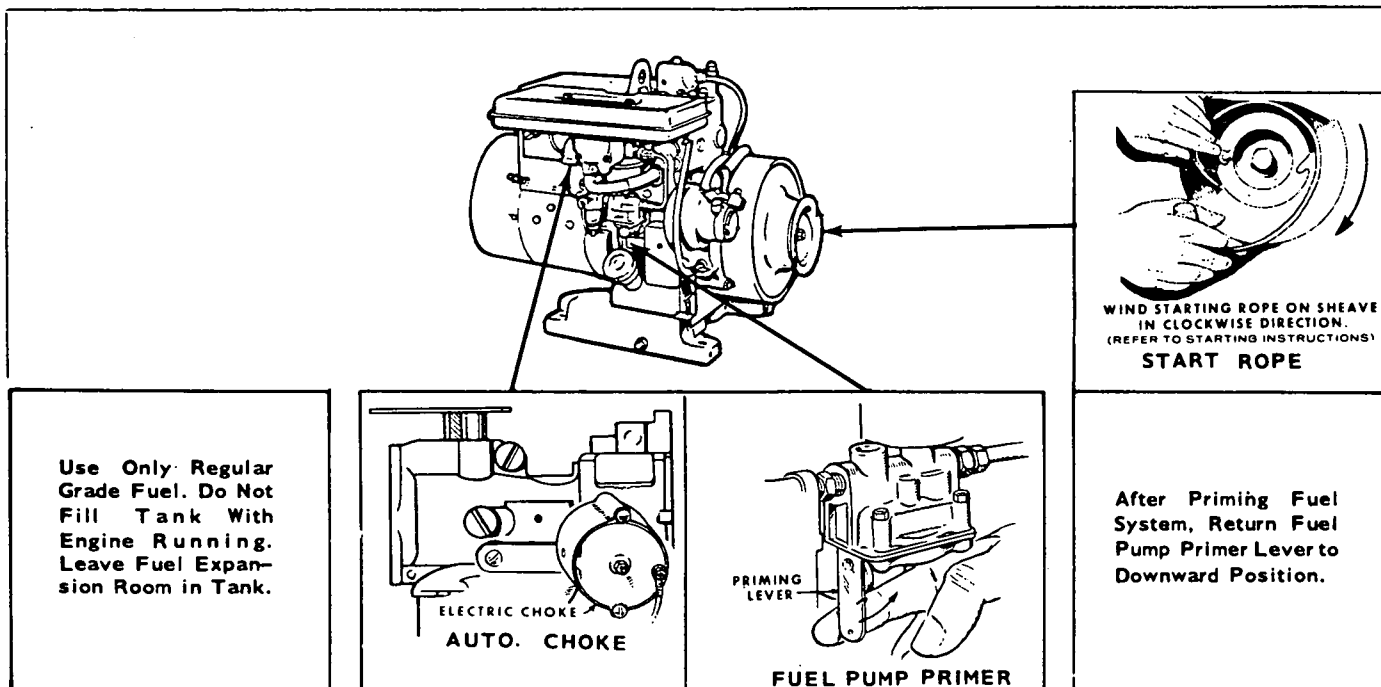


FIGURE 17. STARTING PLANT

STOPPING

Press *stop* switch on control box until the plant comes to a complete stop. If the switch is released too soon, the plant will continue to run.

PLANT EXERCISE

Infrequent use results in hard starting. Operate plant one 30-minute period each week. Run longer if battery needs charging.

Continuous over-loading of the generator may cause overheating and serious damage to the windings. The generator safely handles over-loads temporarily, but for normal operation, keep the load within nameplate rating.

Battery Charge Rate, AC Models: Some plants have a charge rate ammeter and *hi-lo* toggle switch. Use the *lo* position (approximately 1-1/2 amps) for normal operation. Use the *hi* position if frequent starts and short operating periods cause the battery charge condition to fall.

LOAD OPERATION

Warm up the plant before connecting a heavy electrical load.

Utility Boat Model: When the vessel's engine stops, the generating plant dc output can supply the dc load demands (radio, etc.) or to re-charge the vessel's battery. The rated

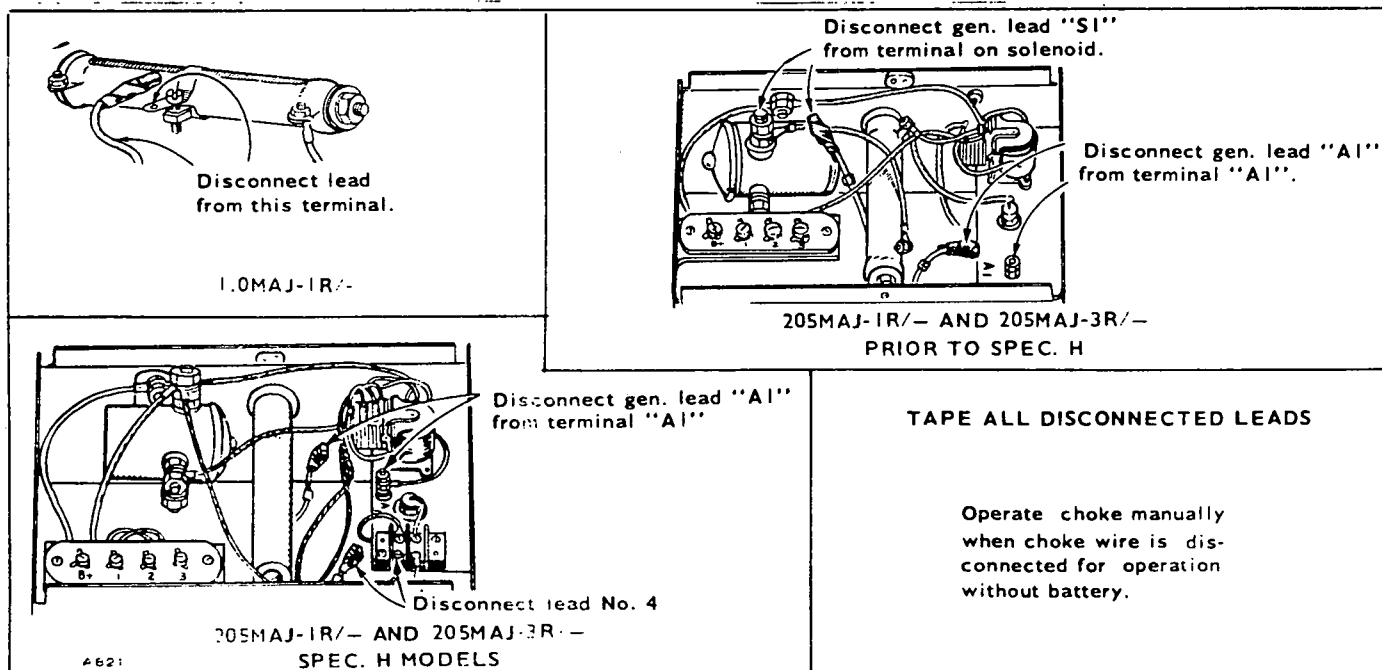


FIGURE 18. DISCONNECTING LEADS FOR MANUAL EMERGENCY STARTING

dc output is 30 amps. The plant ammeter may read 45 amps when the plant is first started, but as the generator warms up and battery charge condition rises to normal, the reading will drop. Continuous high charge rate indicates a defective battery or improper plant speed (governor) adjustment. If the vessel's engine is running, the plant ammeter should read zero (a relay in the plant circuit prevents harmful interaction between the two systems).

The amount of ac output available for flood lights, power tools, etc., varies with dc requirements. Over-loading (indicated by dimming flood lights, slowing of power tools) can usually be avoided by alternating the use of power tools. If more ac power is required, let the vessel's engine take over the dc load for the period of increased ac demand.

BATTERY CHARGING PLANT

The battery charge rate depends on engine speed. Regulate by turning the governor adjusting nut (see *Adjustment Section*). Follow recommendations of battery manufacturer for rate of charge, when to charge, etc. *Never operate plant without battery connected to plant.*

BREAK-IN PROCEDURE

The unit should be run in the following sequence, using MS/DG, DM, SE or SE/CC oil (see oil requirements for correct viscosity).

1. One half hour at half load.
2. One half hour at three quarter load.
3. Full load.

This method of load application speeds piston ring seating. Continuous running at half (light) load for the first few hundred hours usually results in poor piston ring seating, causing higher than normal oil consumption and blowby.

During *break in*, check oil level at least every eight (8) operational hours. Add oil if the level is at *low* on the dipstick. Never over-fill. This may cause oil to foam and enter the breather system.

Drain the initial oil fill after 50 hours of operation while the engine is hot.

Controlled *break in* with proper oil and a conscientiously applied maintenance program will help assure satisfactory service for thousands of hours from your Onan electric plant.

OUT-OF-SERVICE PROTECTION

Protect a plant that is to be out-of-service for more than 30 days as follows:

1. Run plant until thoroughly warm.
2. Turn off fuel supply and run until plant stops.
3. Drain oil from oil base while still warm. Refill and attach a warning tag stating oil viscosity used.
4. Remove spark plug. Pour 1 oz. (two tablespoons) of rust inhibitor (or SAE #50 oil) into cylinder. Crank engine slowly (by hand) several times. Install spark plug.
5. Service flame arrester.
6. Plug exhaust outlet to prevent entrance of moisture, and dirt.
7. Wipe generator brushes, slip rings, etc. Do not apply lubricant or preservative.
8. Provide a suitable cover for the entire unit.
9. Drain cooling system if danger of freezing exists during storage.
10. Disconnect battery and follow standard battery storage procedure.

HIGH TEMPERATURES

1. See that nothing obstructs air flow to-and-from the plant.
2. Keep cooling system clean.
3. Keep ignition timing properly adjusted.

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, apply heated air (never use open flame) externally until oil flows freely.
2. Use fresh (not *premium*) gasoline. Protect against moisture condensation. Below 00°F adjust carburetor main jet for slightly richer fuel mixture.
3. Keep ignition system clean, properly adjusted, and batteries in a well charged condition.
4. Drain plant cooling at block, water pump and exhaust muffler after each running to prevent freezing.

DUSTY AND DIRTY CONDITIONS

1. Keep plant clean. Keep cooling system clean.
2. Service flame arrester as frequently as necessary.
3. Change crankcase oil every 50 operating hours.
4. Keep oil and gasoline 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

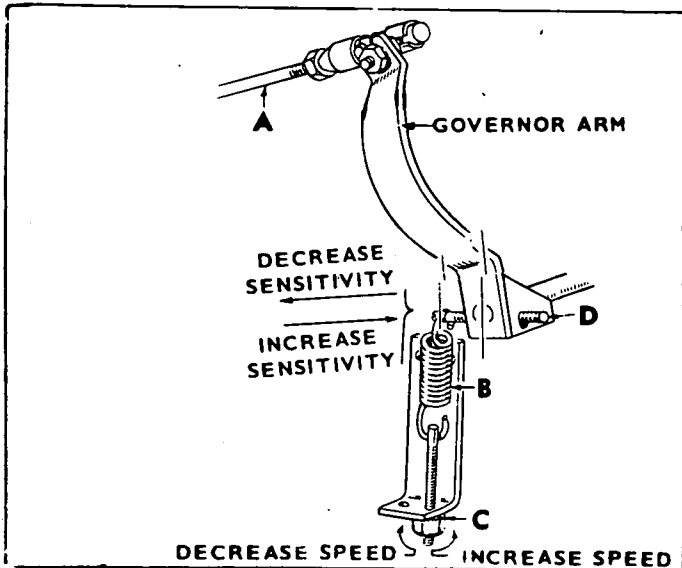


FIGURE 19. GOVERNOR DETAILS

GOVERNOR

The governor controls engine speed and engine speed determines the voltage and frequency of the generator current. On battery charging plants, engine speed also determines battery charge rate. Binding at any point of the governor, linkage, or carburetor throttle, causes slow governor action. Loose or worn parts cause erratic governor action.

With the plant stopped, the length of linkage A must (with tension on spring B) allow the carburetor throttle stop lever to just clear (maximum 1/32") the carburetor body (Fig. 19). Alter linkage length by turning the ball joint on the threaded rod. Run the plant (under load) to thoroughly warm it up.

1. **Alternating Current Plant:** Connect a voltmeter across the generator output. With the plant operating at no-load, adjust the speed nut C (Fig. 19) for a voltmeter reading of 126 volts for 120 volt plants (252 volts for 240 volt plants). Voltage should not fall below 108 volts for a 120 volt plant (216 volts for a 240 volt plant) under full rated load.

If voltage drop from load to no-load is too great, turn sensitivity screw D clockwise (Fig. 19). If voltage drop is within the above limits, but is unsteady with a tendency to alternately increase and decrease, turn the sensitivity screw counterclockwise. Any change in the sensitivity screw D setting requires a compensating change in the speed adjustment nut C.

3. **Battery Charging Plant:** Turn speed nut C (Fig. 19) to give the desired charge rate. Normal speed, as specified on the nameplate, is approximately 2400 rpm. If the charge rate tends to "taper off" too soon, turn the sen-

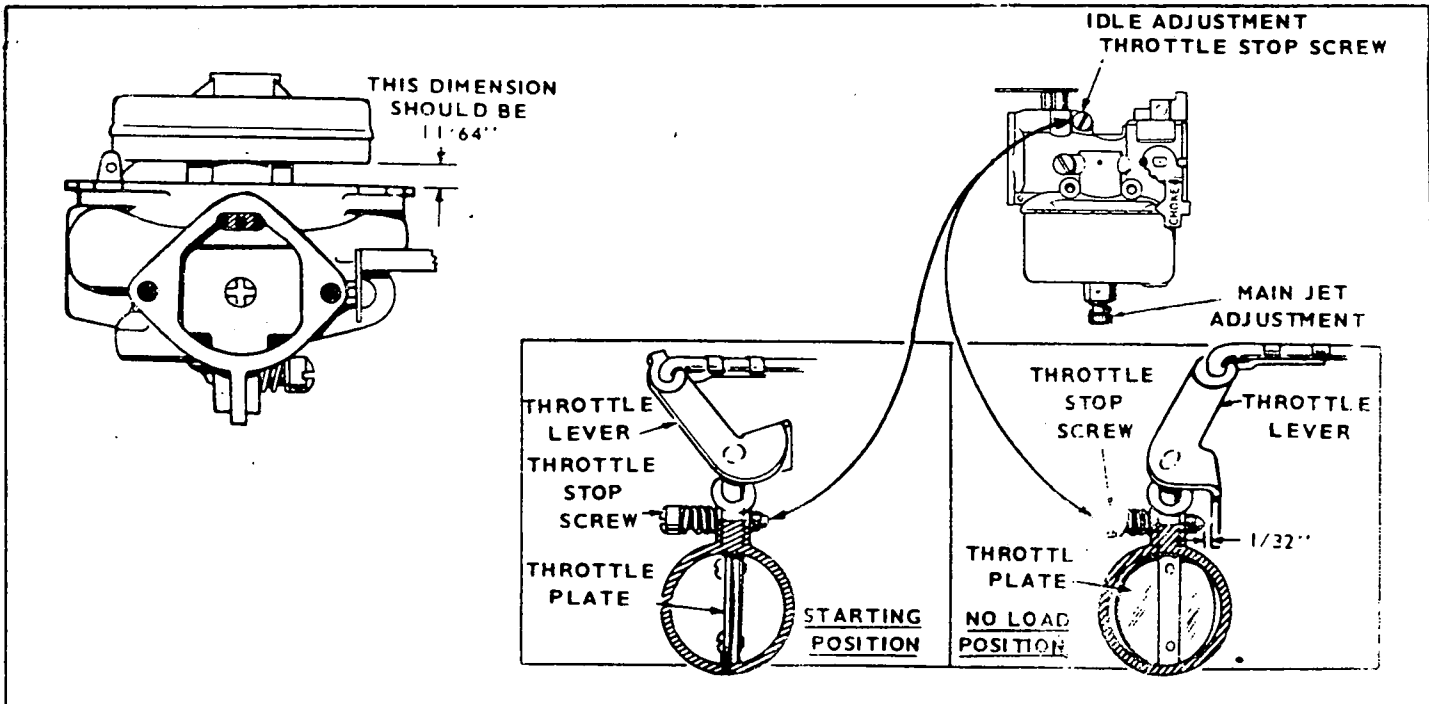


FIGURE 20. CARBURETOR ADJUSTMENTS

sitivity screw D clockwise. If the charge rate is unsteady, turn the sensitivity screw D counterclockwise.

4. "Utility" Plant: Adjust the governor for proper sensitivity as instructed for a standard ac plant. With the plant stopped, disconnect generator lead A1 from the "Gen" terminal of the reverse current relay (inside control box). Connect a dc voltmeter between lead A1 and ground. Start the plant and (no ac load connected) adjust the speed nut to deliver 15 volts dc. Remove voltmeter and connect A1 lead to the relay.

CARBURETOR ADJUSTMENT

If the carburetor is completely out of adjustment, turn the idle adjustment (Fig. 20) and main adjustment needle B in gently onto their seats. Do not use force — tight seating causes damage. Back off idle needle A one turn and main needle B 2 1/2 turns to permit starting the plant. Location of adjusting needles differ on early models with Carter carburetor.

Start the plant and allow it to warm up. With full rated load connected, turn main needle B in slowly until the plant begins to lose speed (or voltage drops). Then turn the needle back out to the point where the plant will carry the full load. Check operation under various loads. If there is any tendency to hunt, turn the needle B (out) to the point where operation is steady. Do not turn out more than 1/2

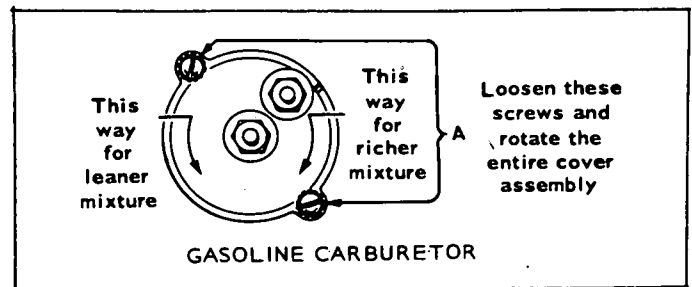


FIGURE 21. CHOKE ADJUSTMENT

turn past the point of smooth full-load operation. Continuous unstable operation may be due to improper governor adjustment. Adjust idle needle A with no ac load connected (or at the lowest possible charge rate if unit is a battery charging plant). Turn the needle in slowly until the plant loses speed. Then turn the needle out to the point of smooth operation. With the plant still running under no-load, turn the throttle lever stop screw D so it just touches the stop lever, then back off one full turn.

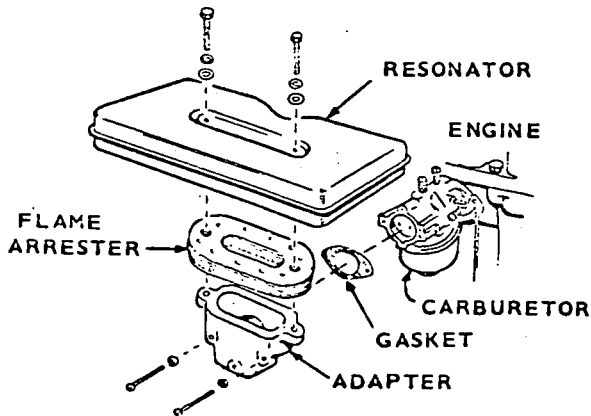
AUTOMATIC CHOKE

Normal choke setting is in slightly closed position at 70° F. If temperature changes require choke adjustment, loosen two screws at A (Fig. 21). Turn the cover assembly counterclockwise to decrease choking. To increase choking turn clockwise. Tighten both screws to lock cover in place.

MAINTENANCE

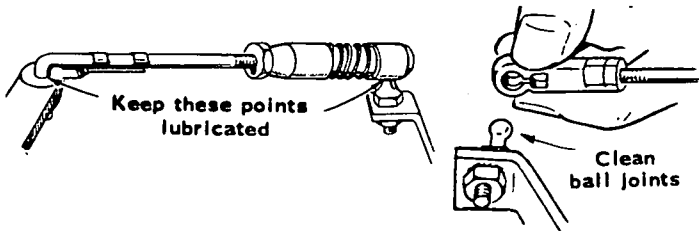
FLAME ARRESTER

Remove and clean in a suitable solvent as often as necessary. Dry and reinstall.



GOVERNOR LINKAGE

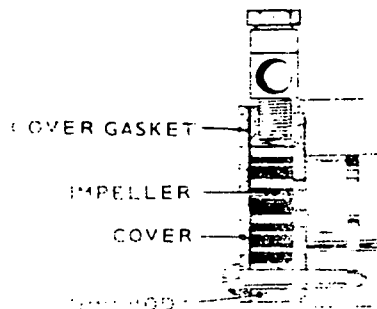
Lubricate the linkage at the carburetor and ball joint ends with powdered graphite (preferably), or a light, sewing machine type oil. Do not lubricate plastic ball joints, they only require cleaning.



WATER PUMP IMPELLER

Remove water pump cover and inspect neoprene impeller. If worn or damaged, install new impeller. Pump should discharge a nominal .56 gal./min. on 1800-rpm plants or .85 gal./min. on 3600-rpm plants when thermostat is open. Install pump cover air tight to prevent early pump impeller failure.

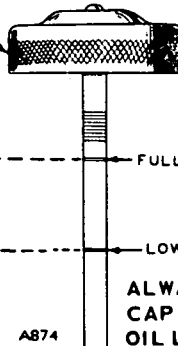
Tighten Screws
15 to 17 in. lbs.



LATER MODELS

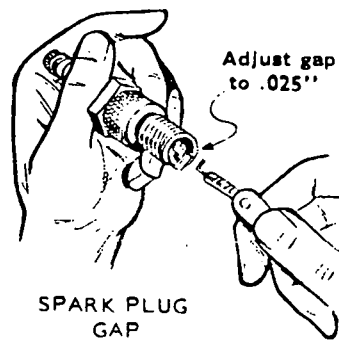
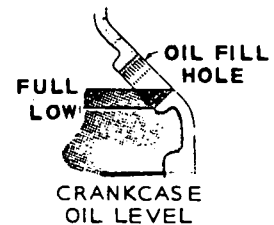
CAP AND OIL
LEVEL INDICATOR

KEEP OIL
AT THIS LEVEL ----- FULL
NEVER OPERATE
ENGINE WITH OIL
BELOW THIS LEVEL ----- LOW

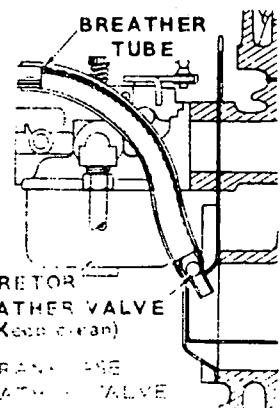


ALWAYS REPLACE
CAP TIGHTLY, OR
OIL LEAKAGE MAY
OCCUR.

EARLY MODELS



SPARK PLUG
GAP



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.

Onan
ELECTRIC PLANT
MODEL AND SPEC. NO. _____

SERIAL NO. _____

IMPORTANT ALWAYS GIVE ABOVE NOS. WHEN ORDERING PARTS

A.C. VOLTS: _____ PH. _____

K.V.A. _____ WATTS _____

P.F. _____ AMPS. _____ CY. _____

D.C. VOLTS _____ AMPS _____

WATTS _____

R.P.M. _____ PAT. _____

MANUFACTURED BY
ONAN
DIV. OF STUDEBAKER CORPORATION
MINNEAPOLIS, MINN. U.S.A.
FOR ELECT. EQUIPMENT ONLY
99A873

For handy reference, insert YOUR plant 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 MAJ Plants as listed below. Parts are arranged in groups of related items. Each illustrated part is identified by a reference number corresponding to the same reference number below the illustration. Parts illustrations are typical. Using the MODEL and SPEC NO. from the plant nameplate, select the Parts Key No. (1, 2, etc. in the last column) that applies to your Plant Model and Spec No. This Parts Key No. represents parts that differ between models. Unless otherwise mentioned in the description, parts are interchangeable between models. Right and left plant sides are determined by FACING the engine end (front) of the plant.

PLANT DATA TABLE

MODEL NO. AND SPECIFICATION £	ELECTRICAL DATA			PARTS KEY NO.
	WATTS	VOLTS **	HERTZ	
1.0MAJ-1R/1*	1000	120	60	1
*** .6MAJ-212R/1*	600	12	DC	2
1.5MAJ-224R/1*	1500	24	DC	3
1.5MAJ-232R/1*	1500	32	DC	3
2.5MAJ-1R/*	2500	120	60	4
2.5MAJ-3R/*	2500	120/240	60	5
"Utility" (or "Mobile Communications") Models --- See Special Group.				

* The Spec Letter Advances (A to B, B to C, etc.) with manufacturing changes.

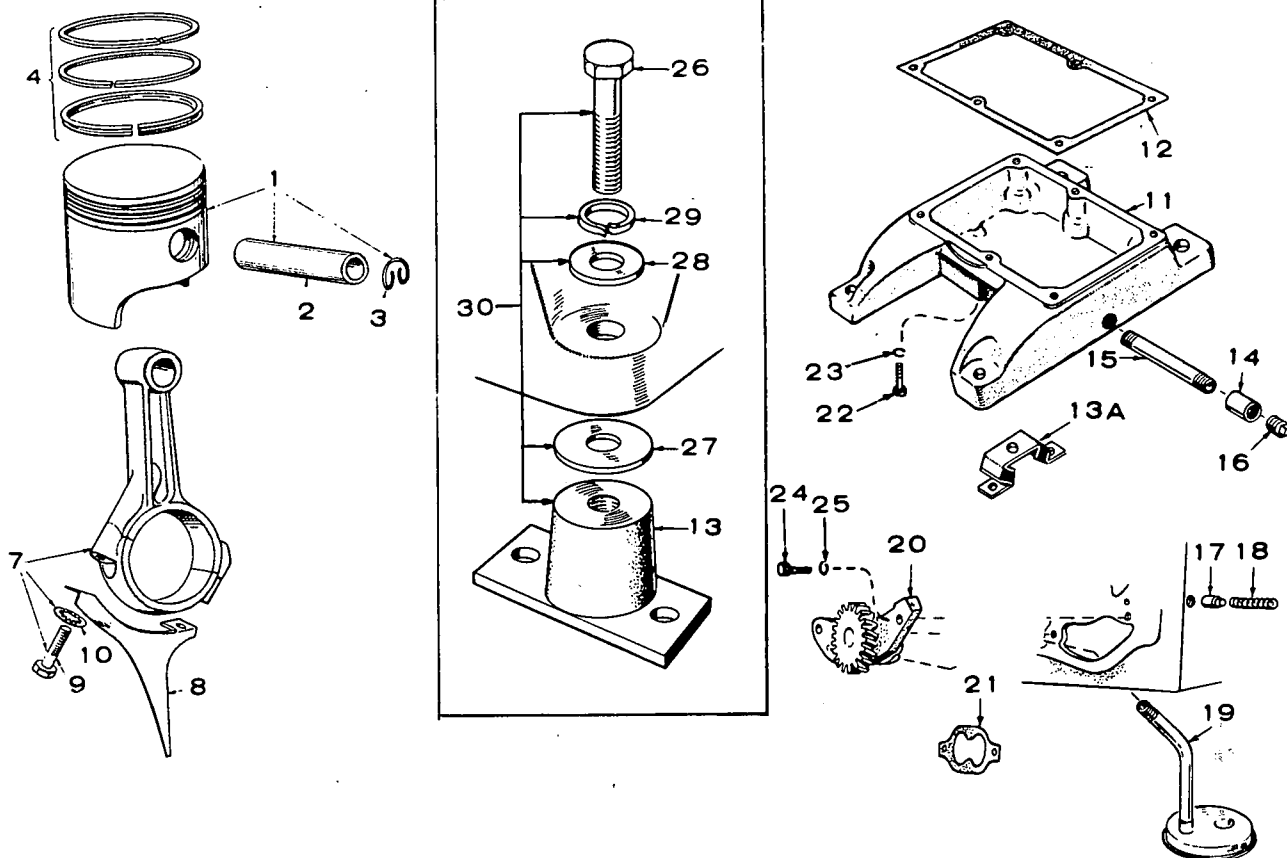
** Reference to 120, 240 and 120/240 volt also applies to 115, 230 and 115/230 volt.

*** Applies also to former 05MAJ-212R/, 500 watt plant.

£ New model designation shown, begin during 1969. Previous designations did not use a decimal in the KW rating.

EXAMPLE: 1.0MAJ was formerly 1MAJ and 1.5MAJ was formerly 105MAJ.

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

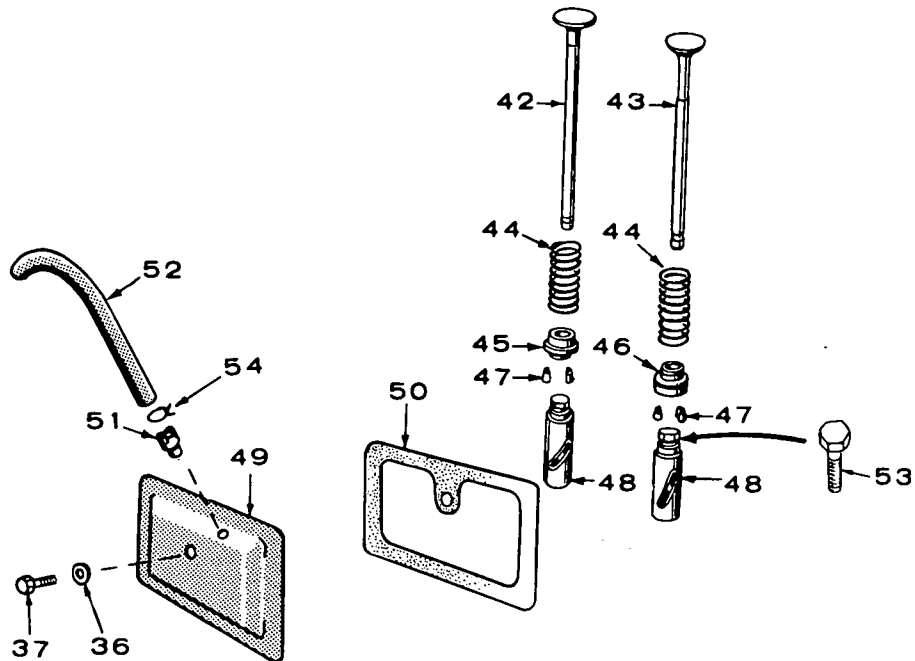
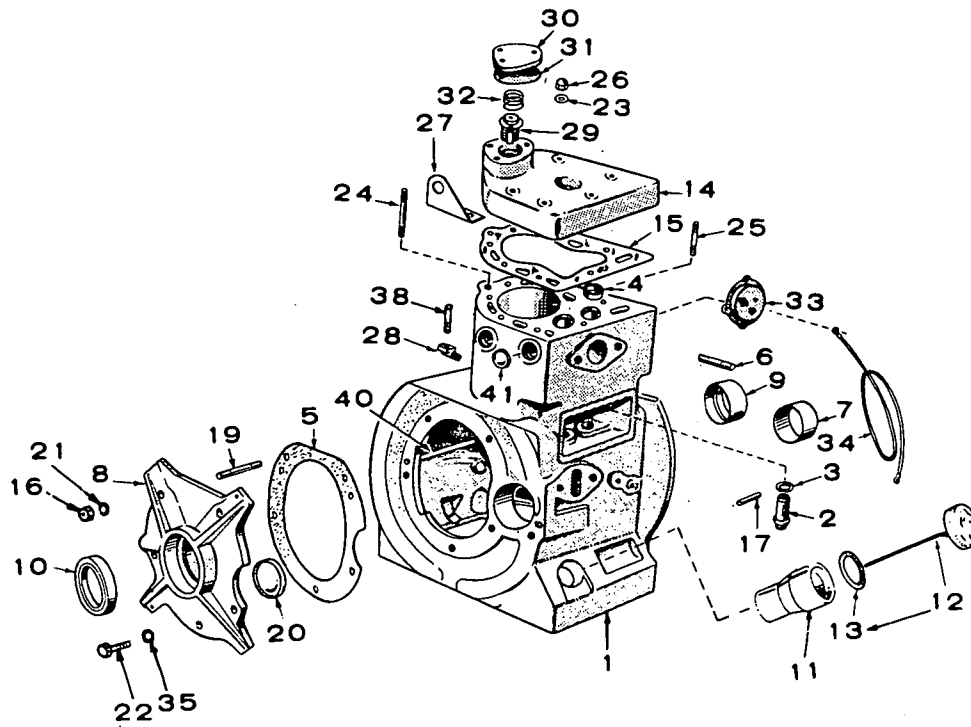


OIL BASE, OIL PUMP, PISTON AND CONNECTING ROD GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	PISTON AND PIN ASSEMBLY		
	112A74	1	Standard
	112A74-10	1	.010" Oversize
	112A74-20	1	.020" Oversize
	112A74-30	1	.030" Oversize
	112A74-40	1	.040" Oversize
2	PIN, PISTON		
	112A63	1	Standard
	112A63-02	1	.002" Oversize
3	112A13	2	Ring, Piston Pin Retaining
4	RING SET, PISTON		
	113-84	1	Standard
	113-84-10	1	.010" Oversize
	113-84-20	1	.020" Oversize
	113-84-30	1	.030" Oversize
	113-84-40	1	.040" Oversize
7	ROD, CONNECTING		
	114C95	1	Standard
	114C95-10	1	.010" Undersize
	114C95-20	1	.020" Undersize
	114C95-30	1	.030" Undersize
8	114A89	1	Dipper, Oil-Connecting Rod - Key 1, 2, 3
9	114A23	2	Screw, Hex Head-Connecting Rod Cap
10	854-14	2	Washer, Lock-Connecting Rod Screw
11	102D439	1	Base, Oil
12	102B18	1	Gasket, Oil Base
13	402P261	4	Mount, Vibration - Key 2, 3, 4, 5

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
13A	MOUNT, VIBRATION - KEY 1		
	402A224	2	Engine End
	402A225	2	Generator End
14	505-28	1	Coupling, (3/8") - Oil Drain - Optional Equipment
15	505-76	1	Nipple (3/8 x 3"), Oil Drain - Optional Equipment
16	505-110	1	Plug, Square Head Pipe (3/8") - Oil Drain
17	120A12	1	Plunger, Oil By-Pass - Key 4, 5
18	120A140	1	Spring, Oil By-Pass - Key 4, 5
19	120A571	1	Cup Assembly, Oil Pump Intake (Includes Pipe, Cup & Screen) - Key 4, 5
20	120A394	1	Pump, Oil-With 1/4 Pipe Thread Inlet - Key 4, 5
21	120K161	1	Gasket Kit, Oil Pump - Key 4, 5
22	SCREW, OIL BASE MOUNTING		
	800-51	3	3/8-16 x 1-1/4"
	800-53	3	3/8-16 x 1-3/4"
23	850-50	6	Washer, Lock (3/8)
24	800-7	2	Screw (1/4-20 x 1") - Oil Pump Mounting - Key 4, 5
25	850-40	2	Washer, Lock (1/4) - Key 4, 5
26	114A22	4	Screw (5/16-18 x 1-3/4") - Vibration Mount
27	526-76	4	Washer, Flat (11/32" I.D. x 1-1/2" O.D. x 1/16" Thick)
28	526A41	4	Washer, Flat (21/64" I.D. x 1" O.D. x 1/16" Thick)
29	850-46	4	Washer, Lock (5/16")
30	402K265	1	Mounting Kit, Vibration

CYLINDER BLOCK GROUP

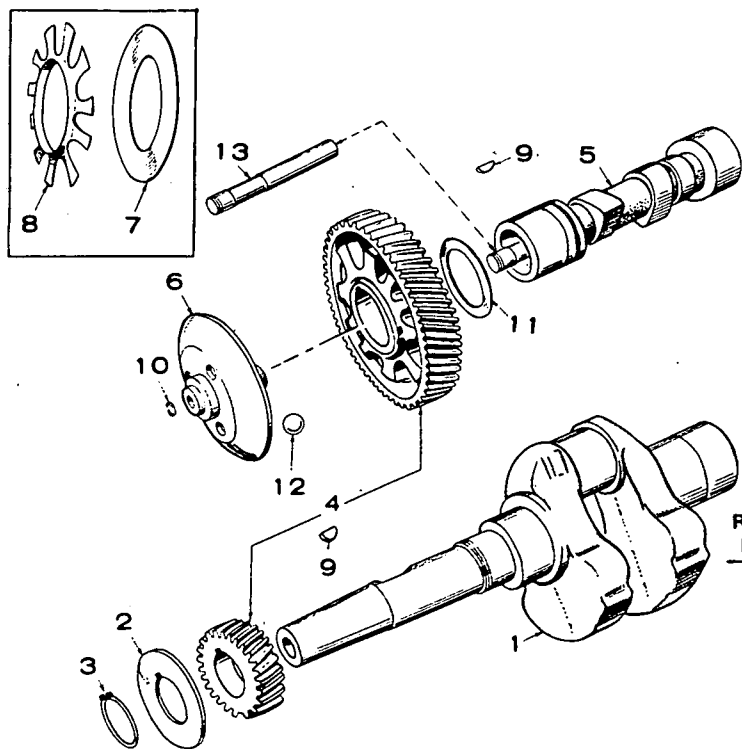


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	BLOCK ASSEMBLY, CYLINDER (INCLUDES PARTS MARKED *)		
	110K1053	1	Splash Lubrication - Key 1, 2, 3
	110A1257	1	Pressure Lubrication - Key 4, 5
2	110A441	2	*Guide, Valve
3	110A68	1	*Gasket, Valve Guide - Intake
4	* INSERT, EXHAUST VALVE SEAT - STELLITE		
	110A826	1	Standard
	110A826-02	1	.002" Oversize
	110A826-05	1	.005" Oversize
	110A826-10	1	.010" Oversize
	110A826-25	1	.025" Oversize
5	101K257	1	*Gasket Kit, Bearing Plate to Engine
6	STUD		
	520A24	2	Intake Manifold Mounting - Key 1, 2, 3
	520A363	2	Carburetor Mounting - Key 4, 5 - Prior to Spec M
	520A632	2	Carburetor Mounting - Begin Spec M
7	101A367	2	*Bearing, Camshaft
8	* PLATE, REAR BEARING AND GENERATOR TO ENGINE - EXCLUDES BEARING		
	101C233	1	Splash Lubrication - Key 1, 2, 3
	101C252	1	Pressure Lubrication - Key 4, 5
9	* BEARING, CRANKSHAFT - PRECISION TYPE		
	101B290	2	Standard
	101B290-02	2	.002" Undersize
	101B290-10	2	.010" Undersize
	101B290-20	2	.020" Undersize
	101B290-30	2	.030" Undersize
10	509A41	1	Seal, Oil - Crankshaft Rear
11	123A313	1	Tube, Oil Fill - Plants Built Beginning Dec. 1, 1963
12	123A824	1	Indicator & Cap, Oil Level - Plants Built Beginning December 1, 1963
13	123A191	1	Gasket, Oil Fill Cap - Plants Built Beginning Dec. 1, 1963
14	110C939	1	Head, Cylinder
15	110B940	1	Gasket, Cylinder Head
16	110A445	4	Nut, Hex (5/16-24) - Bearing Plate
17	516A12	2	*Pin, Dowel - Gear Cover Alignment
18	505-130	1	Plug, Square Head Pipe (3/4") Oil Fill (Early Model Plants Built Prior to Dec. 1, 1963)
19	520A526	4	*Stud, Rear Bearing Plate
20	517-48	1	*Plug, Expansion - Camshaft Bearing Opening
21	850-45	4	Washer, Lock (5/16)
22	800-28	1	Screw (5/16-18 x 1") - Bearing Plate (Bottom)
23	526-65	7	Washer, Cylinder Head - Flat (Copper)
24	520A144	2	Stud, Cylinder Head (5/16" x 3-3/4")

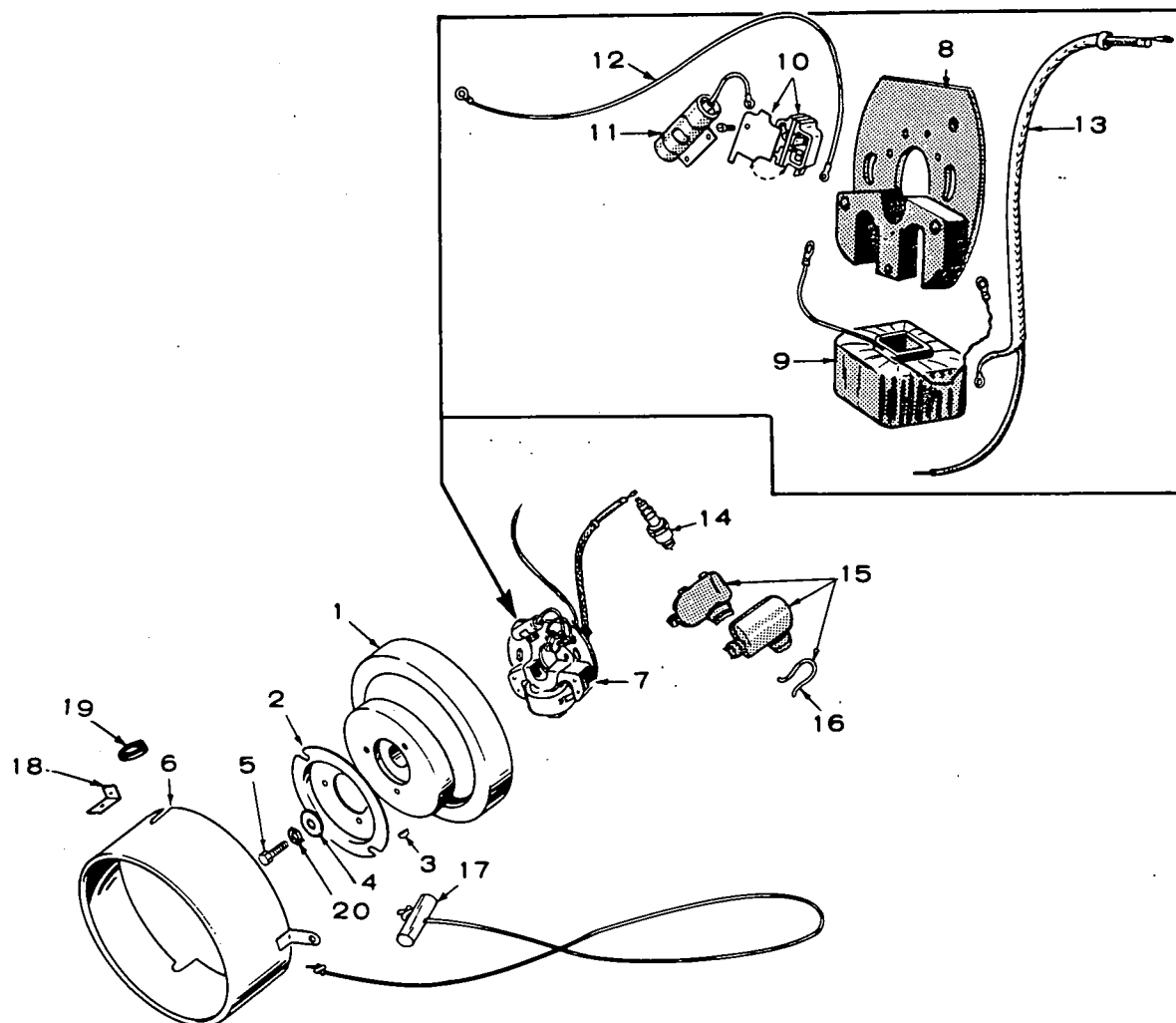
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
25	520A143	5	Stud, Cylinder Head (5/16" x 2-11/32")
26	869-2	7	Nut, Cylinder Head (5/16-24)
27	405A1039	1	Bracket, Lifting
28	131A64	1	Elbow Assembly, Inverted Male - Water Inlet & Drain - Includes Hardware (Early Model Plants With Copper Waterline)
28	502-20	1	Elbow, Street - Water Inlet - Late Model Plants With Rubber Waterline
29	309B57	1	Thermostat - Cylinder Water Temperature
30	309A3	1	Plate, Thermostat Cover
31	309A4	1	Gasket, Thermostat Cover Plate
32	309A88	1	Spring, Thermostat
33	309A2	1	Switch, High Water Temperature Cut-Off
34	336A1264	1	Lead, Temperature Cut-Off Switch to Control Box
35	526-65	1	Washer, Flat (Copper) - Bearing Plate Bottom
36	526-63	1	Washer, Flat (Copper) - Valve Compartment
37	800-15	1	Screw (1/4-20 x 3") - Valve Compartment Cover
38	502P368	1	Connector, Hose
39	502-82	1	Nipple, Hex - Water Inlet - Some Late Model Plants With Rubber Waterline
40	120A387	1	*Line, Main Bearing Oil - Internal Key 4, 5
41	517-41	4	*Plug, Expansion (1-1/8") - Water Jacket
42	110B828	1	Valve, Intake
43	110B827	1	Valve, Exhaust - Stellite
44	110A609	2	Spring, Valve
45	110A558	1	Retainer, Valve Spring - Intake
46	110A540	1	Rotocap, Valve - Exhaust
47	110A8	4	Lock, Valve Spring Retaining
48	TAPPET, VALVE		
	115A6	2	Standard
	115A6-05	2	.005" Oversize
49	110A942	1	Cover, Valve - Complete With Baffle
50	110A832	1	Gasket, Valve Compartment Cover
51	123A486	1	Valve, Breather - (5/16" Ball)
52	HOSE, BREATHER		
	503A299	1	Key 1, 2, 3 - Prior to Spec L
	503A271	1	Key 4, 5 - Prior to Spec L
	503B557	1	Begin Spec L
53	115-49	2	Screw, Valve Tappet
	526-63	1	Washer, Copper
54	503-170	2	Clamp, Breather Hose

* Parts in Cylinder Block Kit.

CRANKSHAFT, CAMSHAFT AND GOVERNOR CUP GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	CRANKSHAFT		
	104C236	1	Key 1, 2, 3
	104C265	1	Key 4, 5
2	104A50	1	Washer, Crankshaft Gear
3	518-12	1	Ring, Lock - Crankshaft Gear Washer
4	105-235	1	Gear Set, Timing - Crank & Cam - Cam Gear Includes Flyball Spacer & Plate
5	105A139	1	Camshaft & Pin Assembly
6	150B612	1	Cup, Governor
7	150A77	1	Plate, Governor Ball - Prior to Serial #668253
8	150B85	1	Spacer, Governor Ball - Prior to Serial #668253
9	515-1	2	Key, Gear
10	150A78	1	Ring, Lock - Camshaft Center Pin
11	105A4	1	Washer, Camshaft Thrust
12	BALL, FLY - GOVERNOR		
	510P15	10	Key 1, 2, 3
	510P15	5	Key 4, 5
13	150A75	1	Pin, Camshaft Center



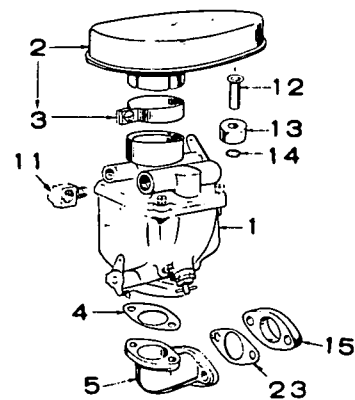
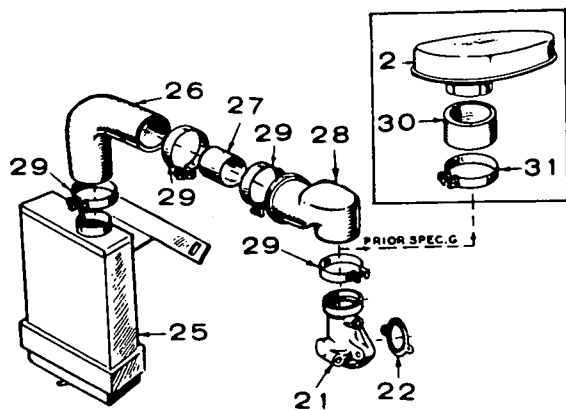
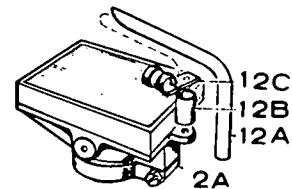
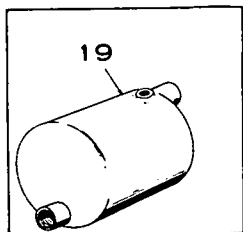
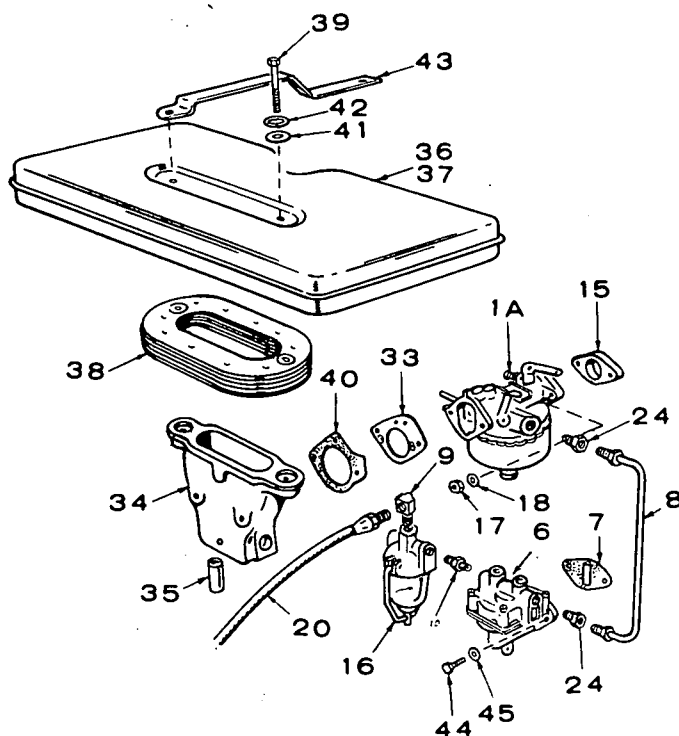
IGNITION GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	160C604	1	Flywheel, Magneto - Prior to Serial 581639 also order Sheave #192B261 & Washer #526-141
2	SHEAVE, ROPE		
	160A233	1	Prior to Serial #581639
	192B261	1	Begin with Serial #581639
3	515A113	1	Key, Flywheel Mounting
4	WASHER, FLYWHEEL MOUNTING		
	104A304	1	Prior to Serial #581639
	526-17	1	Begin with Serial #581639
5	104A237	1	Screw, Hex Head - Flywheel Mounting
6	160C528	1	Guard, Flywheel
7	160A487	1	Backplate Assembly, Magneto - Includes Parts Marked *

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
8	160A454	1	*Backplate & Poleshoe
9	160B155	1	*Coil, Magneto
10	160K540	1	*Point Set, Contact - Complete
11	312A33	1	*Condenser
12	336A345	1	*Lead, Stop
13	167A1272	1	*Cable, Spark Plug
14	167A28	1	Plug, Spark
15	167A67	1	Shield & Clamp, Spark Plug
16	167A64	1	Clamp Only, Spark Plug Shield
17	192A23	1	Rope & Handle, Manual Starting
18	160A237	1	Bracket, Support - Flywheel Guard to Gear Cover
19	508P21	1	Grommet (For 3/4" Hole)
20	850-55	1	Washer, Lock (7/16")

* - Parts in Backplate Assembly.

FUEL SYSTEM GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	CARBURETOR ASSEMBLY		
1	142A311	1	Key 1, 2, 3 - Prior to Spec L
1A	146K126	1	Spec L Only
1A	146C93	1	All, Begin Spec M
2	140B41	1	Cleaner, Air - Includes Clamp Key 1, 2, 3 - Prior to Spec K & Key 4, 5 - Prior to Spec G
2A	ARRESTER ASSEMBLY, FLAME (COAST GUARD APPROVED)		
	145-263	1	Spec K Only - Key 1, 2, 3
	145-82	1	Key 4, 5 - Spec K Only
3	503A19	1	Clamp, Air Cleaner to Carburetor - Key 1, 2, 3 - Prior to Spec L
4	141A78	1	Gasket, Carburetor Mounting - Key 1, 2, 3 - Prior to Spec L
5	142A310	1	Adapter, Carburetor - Key 1, 2, 3 - Prior to Spec L
6	149D693	1	Pump Assembly, Fuel
7	149A3	1	Gasket, Fuel Pump Mounting
8	LINE, FUEL - PUMP TO CARBURETOR		
	149A677	1	Key 1, 2, 3 - Prior to Spec L
	149A561	1	Key 4, 5 - Prior to Spec L
	149A561	1	All - Spec L Only
	149A1110	1	Begin Spec M
9	ELBOW, STREET		
	502-20	1	Fuel Filter Inlet - All
	502-20	1	Fuel Pump Inlet - Key 4, 5 - Begin Spec G
10	502-82	1	Nipple, Hex - Fuel Filter Elbow to Pump or Filter to Pump
11	502-2	As Req.	Elbow, Inverted Male - Fuel Filter Inlet, Fuel Pump Outlet & Carburetor Inlet - Key 1, 2, 3
12	123A292	1	Adapter, Breather Tube - Air Cleaner - Key 1, 2, 3 - Prior to Spec K
12A	145A346	1	Adapter, Breather Tube - Flame Arrestor - Key 1, 2, 3 - Spec K Only
12B	145A347	1	Spacer, Breather Tube to Flame Arrestor - Key 1, 2, 3 - Spec K Only
12C	332-50	1	Clip, Breather Tube to Flame Arrestor - Key 1, 2, 3 - Spec K Only
13	402A76	1	Bushing, Breather Adapter Rubber - Air Cleaner, Key 1, 2, 3 - Prior to Spec K
14	851-9	1	Washer, Breather Adapter Retaining Retaining - Key 1, 2, 3 - Prior to Spec K
15	145A110	1	Gasket, Carburetor Mounting
16	149B282	1	Filter Assembly, Fuel
17	868-1	2	Nut, Hex (1/4-28) - Carburetor Mounting
18	853-13	2	Washer, Lock (Shakeproof)
19	155C84	1	Muffler, Water Cooled
20	501A9	1	Line, Fuel - 36"
21	140A446	1	Adapter, Air Cleaner - Key 4, 5 - To Spec K - Plug Bottom Hole With Sheet Metal Screw

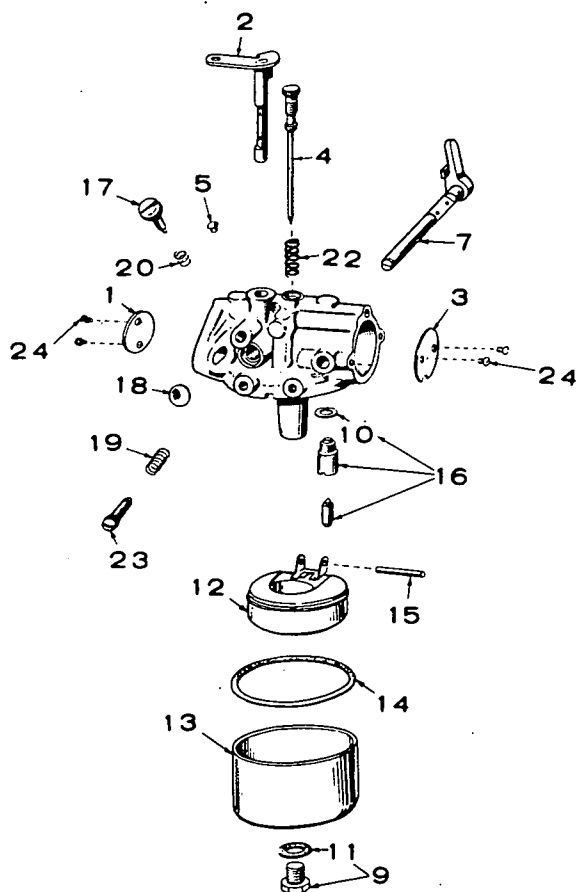
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
22	145A111	1	Gasket, Adapter to Carburetor - Begin Spec L & Key 4, 5 - Prior to Spec K
23	145A63	1	Gasket, Carburetor Adapter - Key 1, 2, 3 - Prior to Spec L
24	502-3	2	Connector, Inverted Male - Carburetor Inlet - Key 3, 4, 5 - Fuel Pump Outlet - All
25	CLEANER (SILENCER) AIR - KEY 4, 5		
	140C557	1	Spec G Only
	140C586	1	Spec H through Spec J
26	HOSE, AIR CLEANER - KEY 4, 5		
	503A286	1	Spec G Only
	503A376	1	Spec H through Spec J
27	140A211	1	Sleeve, Hose to Air Inlet - Key 4, 5 - Spec G through Spec J
28	145B79	1	Inlet, Carburetor Air - Rubber - Key 4, 5 - Spec G through Spec J
29	503-280	4	Clamp, Hose - Air Hose & Inlet - Key 4, 5 - Spec G through Spec J
30	503A363	1	Hose, (1-1/2 x 1-7/8 x 1-5/16") Key 4, 5 - Prior to Spec G
31	503-280	1	Clamp, Hose (1-7/8") Key 4, 5 - Prior to Spec G
33	SPACER, RESONATOR ADAPTER		
	140A856	1	Spec L Only
	140A979	1	Begin Spec M
34	* ADAPTER, RESONATOR TO CARBURETOR		
	140A845	1	Spec L Only
	140A932	1	Begin Spec M
35	123A893	1	* Tube, Flame Arrestor Adapter to Breather Hose - Spec L Only
36	ARRESTOR AND RESONATOR ASSEMBLY, FLAME (COAST GUARD APPROVED) - INCLUDES PARTS MARKED *		
	145B354	1	Spec L Only
	145B386	1	Begin Spec M
37	* RESONATOR		
	140B830	1	Spec L Only
	140B976	1	Begin Spec M
38	140B802	1	* Flame Arrestor - Begin Spec L
39	800P720	1	* Screw, Cap - Resonator Mounting - Begin Spec L
40	GASKET, RESONATOR ADAPTER TO SPACER		
	140A585	1	Spec L Only
	140A921	1	Begin Spec M
41	526-21	2	* Washer, Flat (1/4)
42	850-40	2	* Washer, Lock (1/4)
43	140B1166	1	Bracket, Resonator Support - Later Models
44	815-111	2	Screw (1/4-20 x 5/8") - Fuel Pump Mounting
45	526A63	2	Washer, Flat (Copper)
	155B713	1	Tubing, Flexible (10") - 3/4" Male Pipe Thread Both Ends - (Optional)
	155P552	1	Tubing, Flexible Exhaust (24") - 3/4" Male Pipe Thread Both Ends - (Optional)

* Included in Flame Arrestor and Resonator Assembly.

CARBURETOR PARTS GROUP

KEY 4, 5 AND ALL
SPEC. L ONLY (CARTER CARBURETOR)

NOTE: See separate groups for carburetor parts - beginning
Spec M and parts Key 1, 2, 3 - Prior to Spec L.



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	146K126	1	Carburetor Replacement Kit
	143K81	1	Repair Parts Kit, Carb. - Incl. parts marked * and **.
	143K80	1	**Gasket Kit, Carb. - Incl. parts marked *.
	145A110	1	*Gasket, Spacing - Carb. Flange
1	143-97	1	Valve, Throttle
2	143-98	1	Shaft & Lever, Throttle
3	143-99	1	Valve, Choke
4	143-78	1	**Needle, Idle Jet & High Speed Adj.
5	143-30	1	Plug, Idle Passage
7	143-100	1	Shaft and Weight, Choke
9	143-118	1	Screw and Gasket, Bowl
10	143A15	1	*Gasket, Fuel Inlet Valve
11	143-36	1	*Gasket, Bowl Screw
12	143-105	1	Float and Lever
13	143-119	1	Bowl
14	143-77	1	*Gasket, Bowl Ring
15	143-107	1	Pin, Float Lever
16	143-39	1	**Valve, Fuel Inlet.
17	143-109	1	Screw, Idle Adjustment
18	143-110	1	Plug, Expansion
19	143-111	1	Spring, Throttle Lever Adj. Screw
20	143-112	1	Spring, Idle Adj. Screw
22	143-114	1	Spring, High Speed Adj. Needle
23	143-115	1	Screw, Throttle Lever Adj.
24	812-14	4	**Screw, R. H (#3-48 x 3/16) Choke & Throttle Valve Attaching.

* - Parts in Gasket Kit.

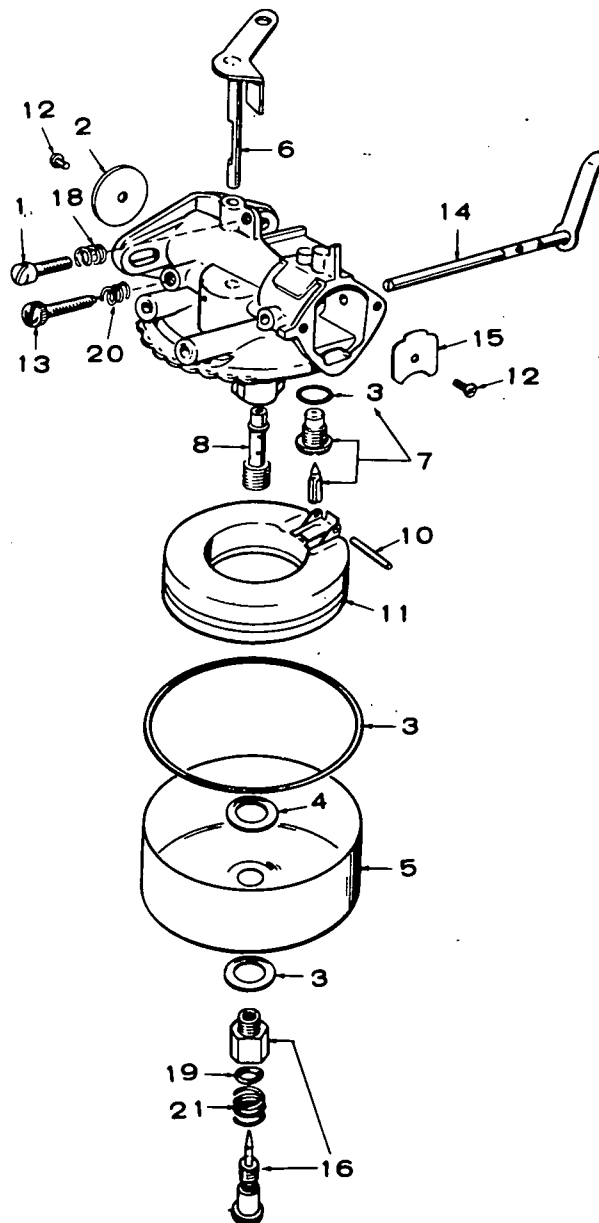
** - Parts in Repair Kit.

CARBURETOR PARTS GROUP

BEGIN SPEC M
(WALBRO CARBURETOR)

NOTE: See separate groups for carburetor parts
prior to Spec M.

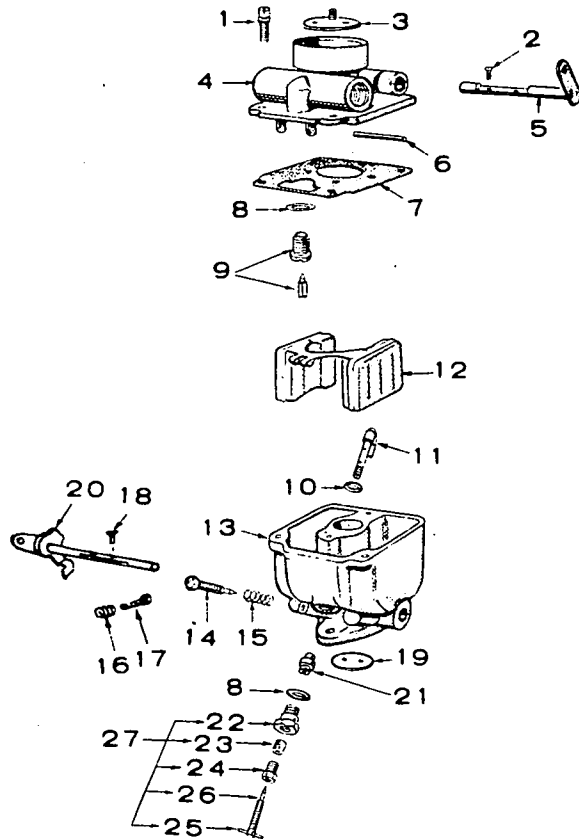
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	146C93	1	Carburetor
	146P123	1	Repair Kit, Carburetor
1	146P122	1	Screw, Throttle Stop
2	146P119	1	Valve, Throttle
3	146P124	1	Gasket, Kit, Carburetor
5	146P118	1	Bowl, Fuel
6	146P112	1	Shaft, Assembly, Throttle
7	146P115	1	Float Valve, Seat, and Gasket Assy.
8	146P113	1	Nozzle
10	146P111	1	Shaft, Float
11	146P110	1	Float Assembly
12	146P109	2	Screw & Washer
13	146P116	1	Needle, Idle
14	146P107	1	Shaft Assembly, Choke
15	146P104	1	Valve, Choke
16	146P102	1	Needle Assy., power
18	146P121	2	Spring, Throttle Stop Screw and Idle Screw
19	146P120	1	Seal, "O" Ring - High Speed Needle
21	146P117	1	Spring, High Speed Needle



CARBURETOR PARTS GROUP

PARTS KEY NOS. 1, 2, 3
TO SPEC. L (MARVEL SCHEBLER CARBURETOR)

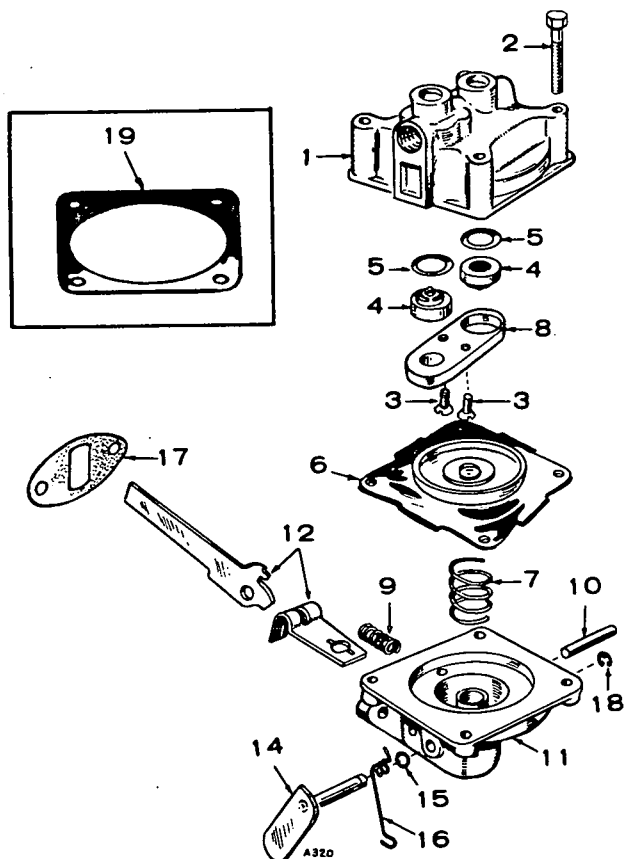
NOTE: See separate groups for carburetor parts beginning Spec L.



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	142A311	1	Carb. Assy.
1	815-103	3	Screw, Bowl Cover
2	815-91	2	**Screw, Choke Plate
3	142-37	1	Plate, Choke
4	142-205	1	Cover, Bowl
5	142-183	1	Shaft, Choke
6	142-39	1	**Shaft, Float
7	142-31	1	Gasket, Cover to Bowl
8	148A17	2	Gasket - (1) Fuel Valve, (1) Main Adjusting
9	142-49	1	**Valve Assy. Fuel
10	142-32	1	Gasket, Nozzle
11	142-285	1	Nozzle, Discharge
12	142-38	1	Float & Lever Assy.
13		1	Body & Bowl Assy. (Not Sold Separately)
14	142-40	1	**Needle, Idle Adjusting
15	142-282	1	Spring, Idle Needle Adj.
16	142-35	1	Spring, Throttle Stop Screw
17	815-106	2	Screw, Throttle Stop
18	142-26	2	**Screw, Throttle Plate
19	142-25	1	Plate, Throttle
20	142A316	1	**Shaft Assy. Throttle
21	142-290	1	Nut, Nozzle Ret. & Jet
22	142-46	1	Retainer, Main Adj. Needle
23	142-206	1	Packing, Main Adj. Needle
24	142-45	1	Retainer, Main Adj. Needle Packing
25	516A27	1	Pin, Main Adj. Needle
26	142-41	1	Needle, Main Adj. - With Pin
27	142-42	1	Needle Assy. Main Adj.
	142-33	1	**Gasket Kit
	142K414	1	Repair Parts Kit. - Incl. Parts Marked **

** - Parts in Repair Kit.

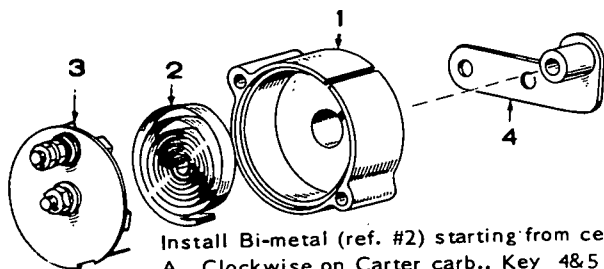
FUEL PUMP PARTS GROUP



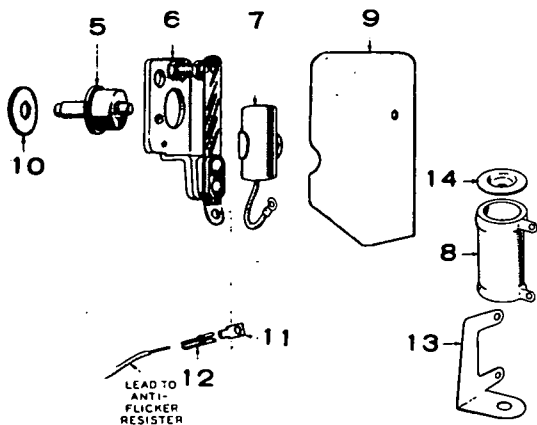
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	149D693	1	Pump, Fuel (Illustrated in Fuel System Group)
	149K526	1	Repair Parts Kit, Includes Parts Marked *
1		1	Body, Not Sold Separately
2	815-148	4	Screw, Machine #8-32 x 7/8"
3	815-147	2	Screw, Phillips Self Tapping, #6-32 x 5/8", Valve Retainer
4	149-96	2	*Valve and Cage
5	149A95	2	*Gasket, Valve
6	149A582	1	*Diaphragm Assembly
7	149A672	1	*Spring
8	149A539	1	Retainer, Valve Cage
9	149A675	1	*Spring
10	516A113	1	Pin, Rocker Arm
11		1	Body, Not Sold Separately
12	149-710	1	Link and Arm, Rocker, (Only as a set)
14	149A551	1	Lever, Primer
15	509-65	2	Seal, "O" Ring
16	149A404	1	Spring, Primer Lever
17	149A3	1	*Gasket, Pump Mounting
18	518-129	1	Ring, Retainer, Primer Lever
19	149A858	1	*Gasket, Diaphragm - Lower Side

* - Parts in Repair Kit.

ELECTRIC CHOKE AND ANTI-FLICKER GROUP

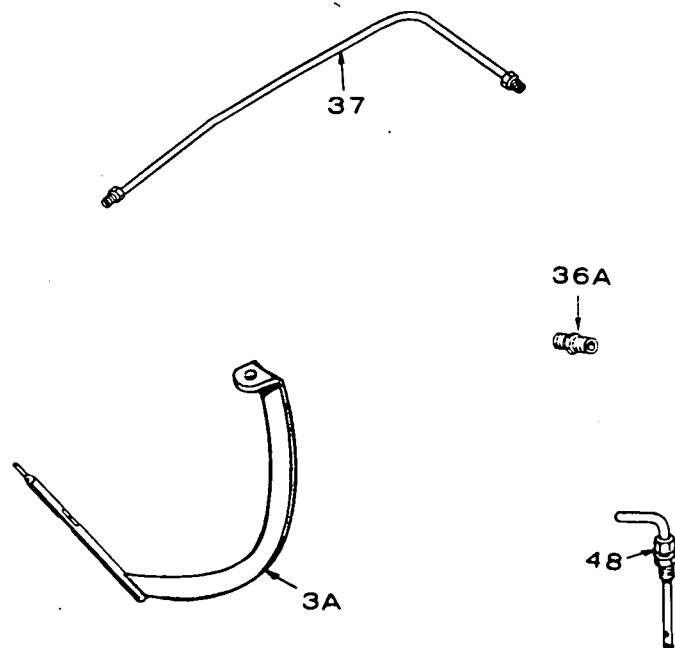
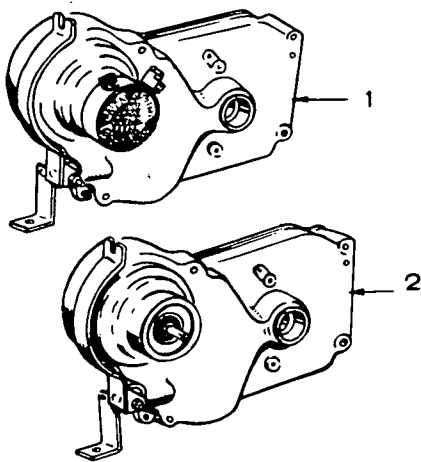
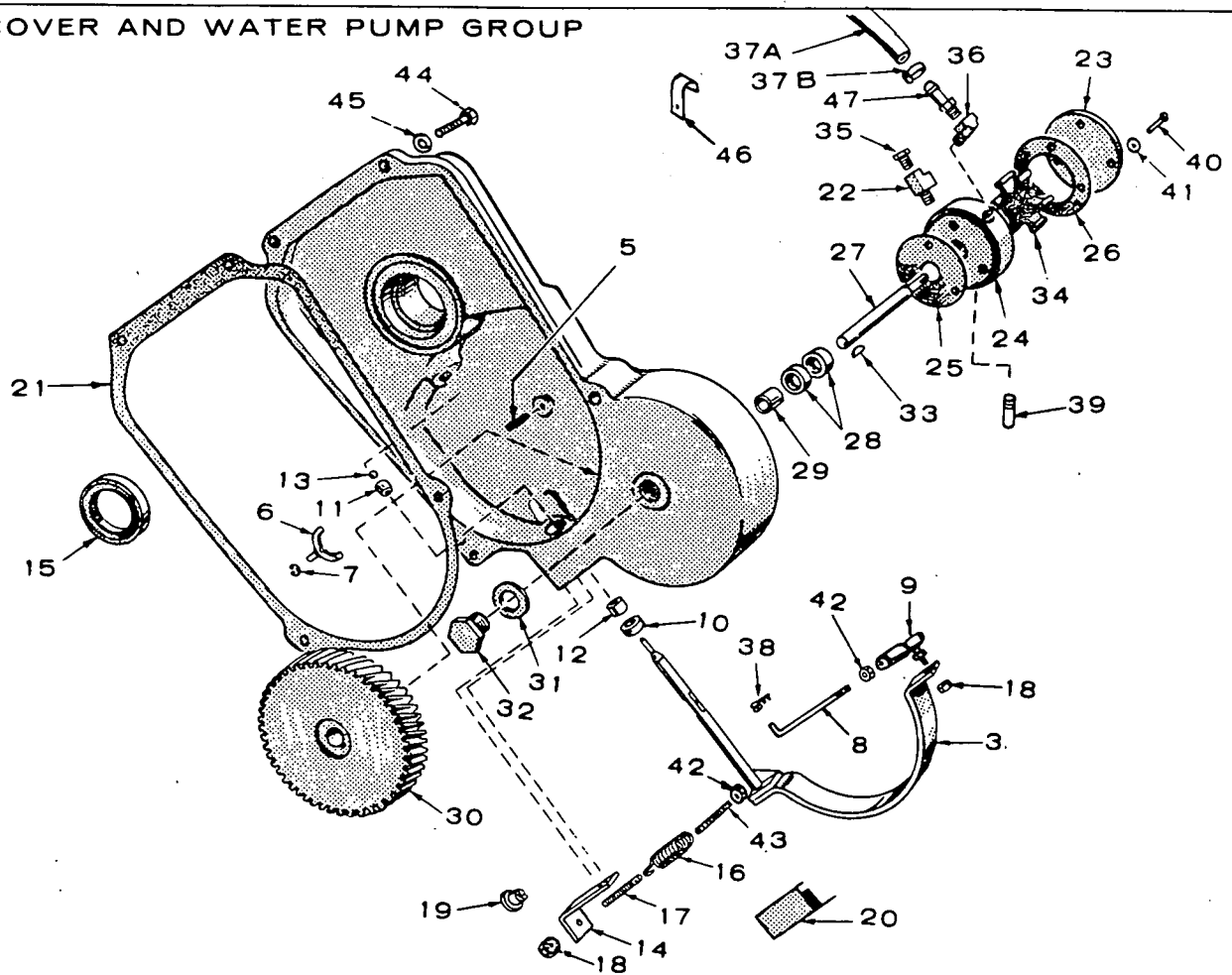


Install Bi-metal (ref. #2) starting from center:
 A. Clockwise on Carter carb., Key 4&5
 B. Counterclockwise on Marvel-Schebler and Walbro carb., Parts Keys 1, 2, & 3.



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	153A58	1	Bracket, Choke Hsg.
2	153A17	1	Element, Choke Bimetal
3	COVER ASSY. CHOKE - INCL. HEATING ELEMENT		
	153A124	1	Key 2 (12 Volt)
	153A114	1	Key 1 (all) 3 (24 Volt only)
	153A116	1	Key 3 (32 Volt Ungrded)
	153A330	1	Key 4, 5 Prior to Spec J (40 V)
	153A115	1	Key 4, 5 (Begin Spec J)(40-V)
4	ADAPTER, ELEC. CHOKE		
	153A196	1	Key 4,5 Prior to Spec M
	153A420	1	All, Begin Spec M
5	160A447	1	Plunger Assy. - Incl. plunger, guide & diaph. (Does not include gasket)
6	160B478	1	Point Set, Contact
7	312A19	1	Condenser - 0.5 Mfd.
8	RESISTOR, FIXED (MTS IN GEN.)		
	304A321	1	2.5 Ohm, 25 Watt (9/16 x 2") - Prior to Spec H
	304A168	1	1.5 Ohm, 25 Watt (9/16 x 2") - Begin Spec H
9	166A254	1	Cover, Contact Points
10	160A461	1	Gasket, Plunger Guide
11	332A527	1	Terminal, Solderless - Male Only - Lead Connection
12	332P529	1	Terminal, Solderless - Female Only - Fastens to Lead
13	304A304	1	Bracket, Res. Mtg. (In Gen.)
14	304A14	2	Washer, Res. Centering (In Gen.)

GEAR COVER AND WATER PUMP GROUP

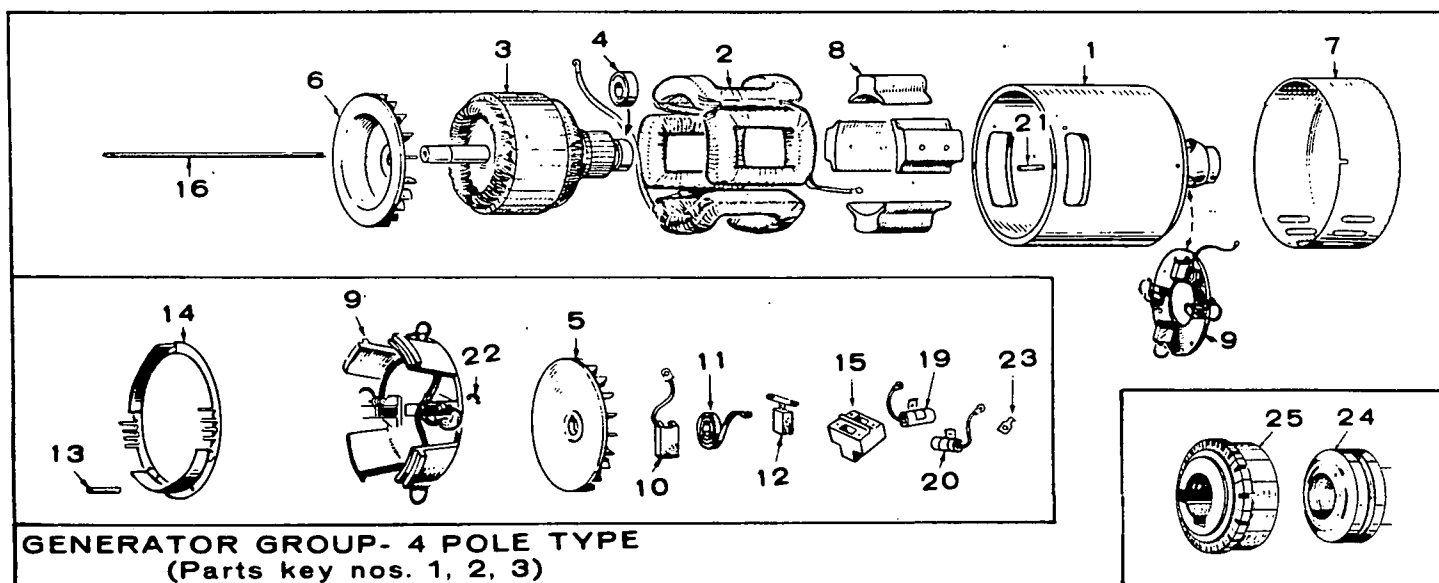


REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	COVER ASSEMBLY, GEAR & WATER PUMP (INCLUDES PARTS MARKED *)		
	131C108	1	Key 1, 2, 3 - Prior to Spec L
	131C124	1	Key 4, 5 - Prior to Spec L
	131C124	1	Begin Spec L
2	*COVER, GEAR (INCLUDES PARTS MARKED **)		
	103C167	1	Key 1, 2, 3 - Prior to Spec L
	103C211	1	Key 4, 5 - Prior to Spec L
	103C211	1	Begin Spec L
3	150A257	1	**Arm & Shaft Assy., Governor - Includes Adj. Stud & Hdwe - Key 1, 2, 3 - Prior to Spec L
3A	150B765	1	**Arm & Shaft, Governor - Excludes Adj. Stud - Key 4, 5 - Prior to Spec L
3A	150B765	1	**Arm & Shaft, Governor - Excludes Adj. Stud - Begin Spec L
4	150A177	1	**Stud, Governor Sensitivity Adj.
5	516-117	1	**Pin, Roll (3/16" x 13/16") Governor Cup Stop
6	150A620	1	**Yoke, Governor Shaft - Includes Retainer Ring
7	518-129	1	Ring, Governor Yoke Retainer
8	LINK, GOVERNOR ARM TO CARBURETOR		
	150A663	1	Key 1, 2, 3 - Prior to Spec L
	150A786	1	Key 4, 5 - Prior to Spec L
	150A766	1	Spec L Only
	150A786	1	Begin Spec M
9	JOINT, BALL - GOVERNOR LINK		
	150A639	1	Prior to Spec M
	150A974	1	Begin Spec M
10	509P8	1	**Seal, Oil - Governor Shaft
11	510-8	1	**Bearing, Governor Shaft - Lower
12	510-13	1	**Bearing, Governor Shaft - Upper
13	510-14	1	**Ball, Thrust - Governor Shaft
14	150A156	1	**Bracket, Governor Spring
15	509A12	1	**Seal, Oil - Gear Cover
16	150A98	1	Spring, Governor
17	150A213	1	Stud, Governor Spring Tension Adjustment
18	870-131	2	Nut, #10-32 - With Lock Washer (1) Ball Joint to Stud (1) Governor Adjustment
19	150A33	1	Nut, Governor Adjustment
20	150A198	1	Cover, Governor Spring
21	103B13	1	Gasket, Gear Cover
22	502-58	1	**Tee, St. - Water Pump Body
23	131A42	1	*Cover, Water Pump
24	131B45	1	*Body, Water Pump
25	131A43	1	*Gasket, Water Pump Mounting
26	131A44	1	*Gasket, Water Pump Cover
27	131A47	1	**Shaft, Drive - Water Pump
28	509-44	2	**Seal, Oil - Water Pump Drive Shaft

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
29	131A51	1	**Bearing, Water Pump Drive Shaft
30	131A28	1	**Gear, Water Pump Drive Shaft
31	131A35	1	**Gasket, Screw Plug
32	131A41	1	**Plug, Screw - Water Pump - 1" Hex
33	515A116	1	**Key, Drive Shaft Gear - Water Pump
34	131A50	1	*Impeller Assembly, Water Pump - Includes Roll Pin
35	502-28	1	*Plug, (1/8") Brass - Water Pump Body Tee
36	502-4	1	*Elbow, Inv. Male - Water Pump Early plants with copper water line
36	502-20	1	*Elbow, St. - Water Pump - Late model plants with rubber water line
36A	502-82	1	*Nipple, Hex - Water Pump - Some Late model plants with rubber water line
37	131B113	1	Line, Water - Pump to Cylinder Block - Early plants built to Sep. 20, 1963
37A	503A449	1	Hose, Water (3/8" ID x 11/16" OD x 12-1/2") - Late model plants built begin Dec 1, 1963
37B	503-170	2	Clamp, Hose - Late model plants with rubber water line
38	518-4	1	Clip, Governor Link to Carburetor End
39	131A126	1	Tube, Water Pump Drain (Not Used Prior 1961)
40	811-105	3	Screw, Rd. Hd. Brass - #10-32 x 1" - Water Pump Assembly
41	526-71	3	Washer, Flat Copper - Water Pump Assembly
42	870-53	2	Nut, Hex (10-32)
43	150A177	1	Stud, Governor Sensitivity
44	SCREW, GEAR COVER MOUNTING		
	114A22	2	5/16-18 x 1-3/4"
	800-34	2	5/16-18 x 2-1/4"
45	850-45	4	Washer, Lock (5/16")
46	130A612	1	Clamp, Water Line Hold-down
47	502P368	1	Connector, Hose
48	154B894	1	Tube Assembly, Water Injection - Exhaust
	131K107	1	Repair Kit, Water Pump - Includes Body, Cover, Imp. Oil Seals, Gaskets & Cover Mounting Hardware

* - Parts in Gear Cover and Water Pump Assembly.

** - Parts in Gear Cover Assembly.



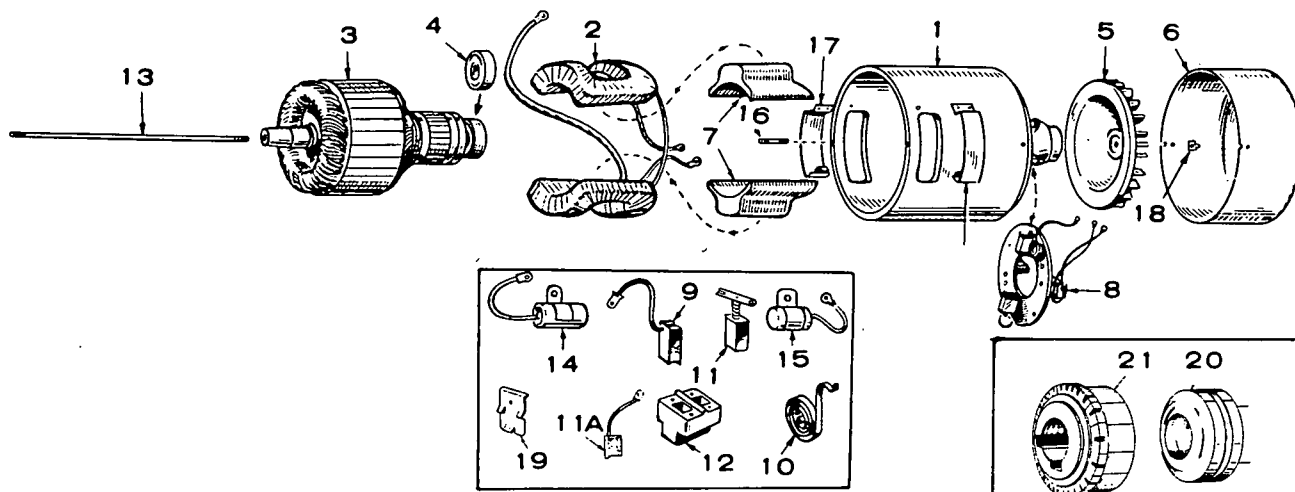
GENERATOR GROUP- 4 POLE TYPE
(Parts key nos. 1, 2, 3)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION	REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	FRAME GENERATOR - MACHINED & DRILLED				234C125	1	Key 3 - Spec E through Spec G
	210B1449	1	Key 1 - Prior to Spec H		234C4	1	Key 2 - Prior to Spec H
	210C1739	1	Begin Spec H		234C127	1	Key 1, 2, 3 - Begin Spec H
	210C254	1	Key 2 - Prior to Spec H	8	SHOE, POLE		
	210C332	1	Key 2 - Begin Spec H		221B110	4	Key 1
	210C240	1	Key 3 - Prior to Spec E (32 V Only)		221A111	4	Key 2
	210C279	1	Key 3 - Spec E and Spec F (32 V Only)		221B114	4	Key 3
	210B1638	1	Key 3, Begin Spec H (32 V Only)	9	RIG ASSY. BRUSH - INCL. BRUSHES & SPRGS.		
	210C336	1	Key 3, Begin Spec H (24 V Only)		212C209	1	Key 1
2	COIL ASSY. FIELD - SET OF 4 COILS, WIRED TOGETHER				212C228	1	Key 2
	222A1400	1	Key 1 - Prior to Spec H		212C253	1	Key 2, Begin Spec H
	222A1573	1	Key 1, Begin Spec H		212C221	1	Key 3 - Prior to Spec H
	222A1408	1	Key 2		212C251	1	Key 3, Begin Spec H
	222A1411	1	Key 3 (32 V Only)	10	BRUSH, COMMUTATOR		
	222-1605	1	Key 3 (24 V Only)		214A41	4	Key 1
3	ARMATURE ASSEMBLY				214A44	4	Key 2
	201A677	1	Key 1 (Incl. Blower & Brg.) - Prior to Spec H		214A47	4	Key 3 - Prior to Spec H
	201A1072	1	Key 1 - Begin Spec H		214A9	4	Key 3, Begin Spec H
	201A794	1	Key 2	11	SPRING, COMMUTATOR BRUSH		
	201A693	1	Key 3 (Incl. Blower & Brg.) - Prior to Spec H (32 V Only)		212A1003	4	Key 1
	201A1093	1	Key 3 - Begin Spec H (32 V Only)		212A1003	4	Key 3, Begin Spec H
	201-1189	1	Key 3 - Begin Spec H (24 V Only)		212B1105	4	Key 2
4	510A47	1	Bearing, Ball - Arm. Key 1,3		212A1106	4	Key 3 - Prior to Spec H
5	BLOWER, ARMATURE (MTS AT ENG. END)			12	214A59	4	Brush & Spring, Coll. Ring - Key 1
	205B47	1	Key 3 - Prior to Spec H				
	205B47	1	Key 1 - Prior to Spec H	13	232A1197	2	Spacer, - Mtg. Scroll - Key 1, 3 - Prior to Spec H
6	BLOWER, ARMATURE - (MOUNTS AT BRUSH RIG END)			14	234B7	1	Scroll, Air - Gen. Key 1, 3 - Prior to Spec H
	205B56	1	Key 2	15	212A1064	2	Guide, Coll. Ring Brush - Key 1
	205B56	1	Key 1, Begin Spec H	16	STUD, ARMATURE THROUGH		
	205B56	1	Key 3, - Begin Spec H		520A274	1	Key 1 - Prior to Spec H
7	COVER, GENERATOR END				520A56	1	Key 1 - Begin Spec H
	232C1214	1	Key 1 - Prior to Spec H		520A529	1	Key 2 - Prior to Spec H
	232C1214	1	Key 3 - Prior to Spec E		520A571	1	Key 2 - Begin Spec H
					520A275	1	Key 3 - Prior to Spec H
					520A279	1	Key 3, Begin Spec H
				19	312A17	1	Condenser - 0.5 Mfd. - DC Brush
				20	312A58	1	Condenser - 0.1 Mfd. - AC Brush
							Key 1
				21	520A363	2	Stud, Gen. Frame to Eng.
				22	232A596	1	Clip, Brg. Stop - Key 3, To Spec H

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
23	232A1362	2	Clip, Gen. End Cover (Key Washer)
24	204A87	1	Collector Ring
25	COMMUTATOR		
	203A133	1	Key 1
	203A48	1	Key 2

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	203A111	1	Key 3
	115A25	2	Nut, Hex-1/4-28, -Gen.to Eng.

NOTE: Resistor mounted in generator for Parts Key No. 1 appears in Anti-Flicker Group.

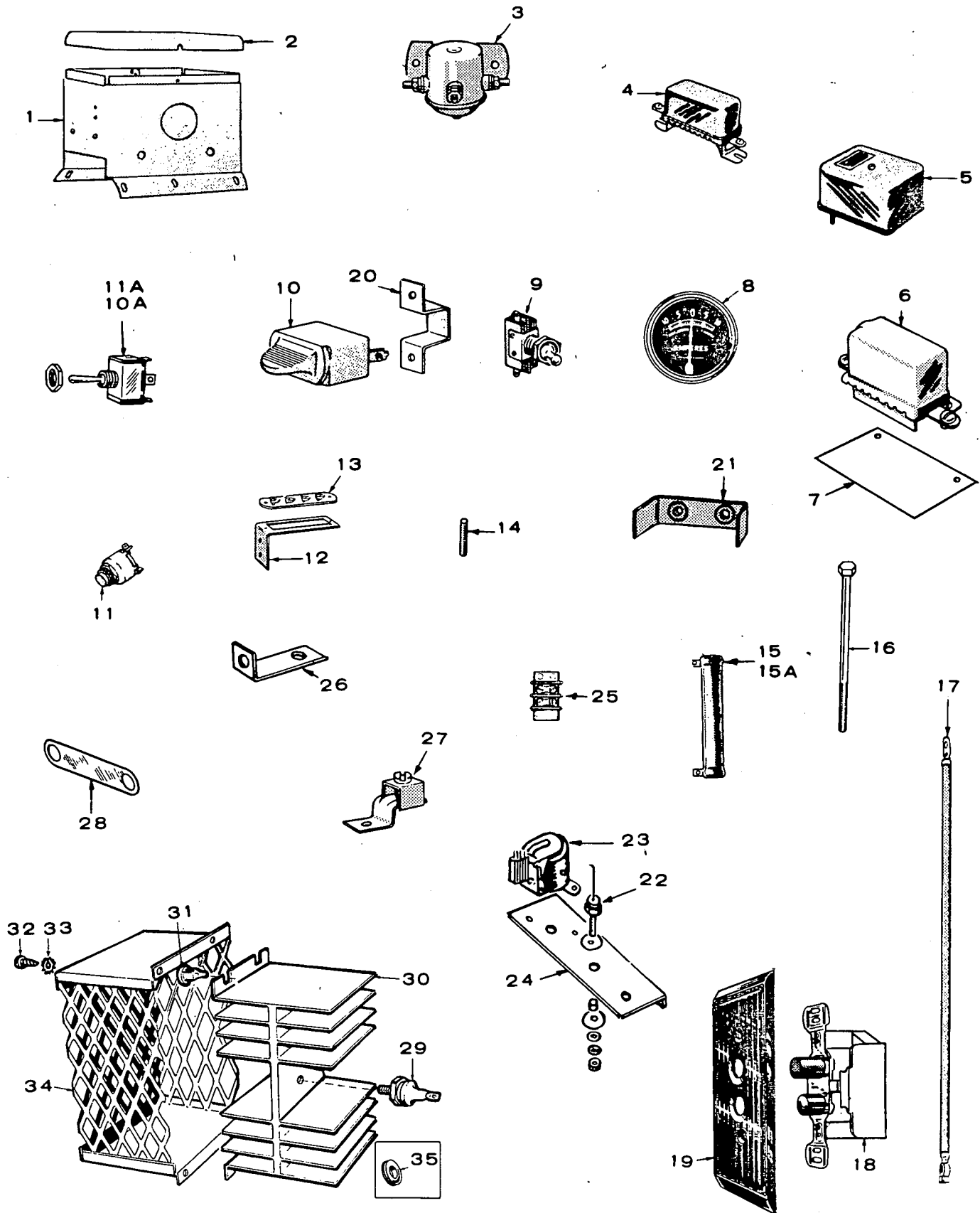


GENERATOR GROUP- 2 POLE TYPE
(Parts key nos. 4 and 5)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	FRAME ONLY (MACHINED & DRILLED)		Key 4
	210B1704	1	Prior to Spec H
	210B1719	1	Begin Spec H
			Key 5
	210B1701	1	Prior to Spec H
	210B1720	1	Begin Spec H
2	COIL ASSY., FIELD (Set of 2 coils)		
	222A1561	1	Prior to Spec J
	222A1598	1	Begin Spec J
3	ARMATURE ASSEMBLY (Incl. Brg.)		Key 4
	201A1044	1	Prior to Spec J
	201A1141	1	Begin Spec J
			Key 5
	201A1043	1	Prior to Spec J
	201A1140	1	Begin Spec J
4	510A47	1	Bearing, Ball-Armature
5	205B56	1	Blower, Armature
6	COVER, GENERATOR END		Key 4
	234C34	1	Prior to Spec H
	234C127	1	Begin Spec H
			Key 5
	234C31	1	Prior to Spec H
	234C129	1	Begin Spec H
7	221B135	2	Shoe, Pole
8	RIG ASSY., BRUSH (Incl. Brushes & Sprgs.)		
	212C277	1	Key 4
	212C273	1	Key 5
9	214A70	2	Brush, Commutator
10	212A1011	2	Spring, Commutator Brush

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
11	BRUSH, COLLECTOR RING - PRIOR TO SPEC J		
	214A59	4	Key 4
	214A59	6	Key 5
11A	BRUSH, COLLECTOR RING - BEGIN SPEC J		
	214A72	2	Key 4
	214A73	3	Key 5
12	GUIDE, SLIP RING BRUSH - PRIOR TO SPEC J		
	212A1064	2	Key 4
	212A1162	2	Key 5
13	STUD ARMATURE THROUGH		
	520A285	1	Key 4
	520A563	1	Key 5
14	CONDENSER, DC - 0.5 MFD.		Key 4
	312A27	1	Prior to Spec H
	312A17	1	Begin Spec H
	312A17	1	Key 5
15	CONDENSER, AC - 0.1 MFD.		
	312A58	1	Key 4
	312A58	2	Key 5
16	520A363	4	Stud, Gen. Frame to Eng.
17	COVER, GENERATOR FRAME AIR OPENING		
	234B124	2	Prior to Spec H
	234B119	2	Begin Spec H
18	232A1557	2	Clip, Gen. End Cover
19	212B1105	2	Spring & Support Assy. AC Brush - Begin Spec J
20	COLLECTOR RING		
	204A87	1	Key 4
	204A89	1	Key 5
21	203A133	1	Commutator
	115A25	4	Nut, Hex-Gen.Mtg. (1/4-28)

CONTROL GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	BOX ONLY, CONTROL		
	30ID1059	1	Key 1 - Prior to Spec H
	30ID1859	1	Key 1 - Begin Spec H
	30ID1127	1	Key 2 - Prior to Spec H
	30ID1868	1	Key 2 - Begin Spec H
	30ID2104	1	Key 3 - Begin Spec H (24 Volt Only)
	30ID1127	1	Key 3 - Prior to Spec F (32 Volt Only)
	30ID1128	1	Key 3 - Spec F & Spec G (32 Volt Only)
	30ID1868	1	Key 3 - Spec H Through Spec M (32 Volt Only)
	30ID3408	1	Key 3 - Begin Spec N (32 Volt Only)
	30ID1823	1	Key 4, 5 - Prior to Spec H
	30ID1867	1	Key 4, 5 - Spec H
	30ID2082	1	Key 4, 5 - Begin Spec J
2	COVER, CONTROL BOX		
	30IB1060	1	Prior to Spec H
	30IC1858	1	Begin Spec H
3	SWITCH, START SOLENOID		
	307B1046	1	Key 1, 2, 4, 5
	307B61	1	Key 3
	RELAY, REVERSE CURRENT		
4	307B180	1	Key 1
5	307B144	1	Key 2 - Prior to Spec H
5	307B185	1	Key 3 - Prior to Spec F (32 Volt Only)
5	307B77	1	Key 3 - Begin Spec H (24 Volt Only)
6	307B496	1	Key 3 - Spec F Through Spec M (32 Volt Only)
7	INSULATOR, REVERSE CURRENT RELAY MOUNTING		
	301A592	1	Key 2 - Begin Spec H
	301A592	1	Key 3 - Begin Spec F (24 Volt Only)
	301A592	1	Key 3 - Spec F Through Spec M (32 Volt Only)
8	AMMETER, CHARGE		
	302A58	1	Key 1
	302A62	1	Key 2, 3 (12 & 32 Volt Only)
	302A63	1	Key 3, (24 Volt)
9	308P2	1	Switch, High-Low Charge Rate - Key 1
10	308-90	1	Switch, Start-Stop - Key 1, 4, 5 - Prior to Spec H
10A	308P154	1	Switch, Start-Stop Key 1, 4, 5 - Begin Spec H
11	308A29	2	Switch, Start or Stop - Key 2, 3 - Prior to Spec H

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
11A	308P155	2	Switch, Start or Stop - Key 2, 3 - Begin Spec H
12	332A198	1	Bracket, Terminal Block
13	332A222	1	Block, Terminal - 4 Place
14	332A125	1	Stud, Brass (1/4-20 x 1-3/4") Key 2, 3
15	304A268	1	Resistor, Charge - Adj. - 10-Ohm, 50Watt (3/4 x 4") Key 1
15A	RESISTOR, CHARGE - FIXED - KEY 4, 5		
	304P2	1	15-Ohm, 50Watt - Prior to Spec J
	304A46	1	10-Ohm, 50Watt - Begin Spec J
16	812-165	1	Screw, Resistor Mounting (1/4-20 x 4-1/2") Key 4, 5
17	416A77	2	Cable, Battery (28") Key 1, 4, 5
18	308A53	1	Switch, Remote Start-Stop
19	308-41	1	Plate, Remote Start-Stop Switch
20	301A974	1	Bracket, Start-Stop Switch Mtg. - Key 1, 4, 5 - Prior to Spec H
21	302P270	1	Bracket, Ammeter Mtg. - Key 1
22	305A235	1	Rectifier, 10 Amp, 100 Volt Peak - Key 4, 5 - Prior to Spec J
23	RELAY, START-DISC. - KEY 4, 5		
	307A566	1	Prior to Spec J
	307B642	1	Begin Spec J
24	301A1829	1	Bracket, Relay & Rectifier - Key 4, 5 - Prior to Spec J
25	332A609	1	Block, Terminal - 2 Place - Key 4, 5 (Used with 305A235 Rectifier from Serial 634772 Through Spec H)
26	332A523	1	Strip, Solenoid Terminal Jumper - Key 1, 4, 5, - Prior to Spec H
27	332-142	1	Terminal, Ground - Key 4, 5
28	332A592	1	Jumper, Ground - Key 1
29	358A38	1	Rectifier, Diode - Key 3 (32 Volt Only) - Begin Spec N
30	363B57	1	Sink, Heat - Rectifier Mounting - Key 3 (32 Volt Only) - Begin Spec N
31	870P196	4	Nut, Insulating - Heat Sink Mtg. - Key 3 (32 Volt Only) - Begin Spec N
32	809-35	4	Screw, Sheet Metal - Heat Sink Mounting - Key 3 (32 Volt Only) - Begin Spec N
33	853-5	4	Washer, Lock - Heat Sink Mtg. - Key 3 (32 Volt Only) - Begin Spec N
34	301C3395	1	Box, Heat Sink Mounting - Key 3 (32 Volt Only) - Begin Spec N
35	508A109	1	Grommet, Diode Leads - Key 3 (32 Volt Only) - Begin Spec N

SERVICE KITS AND MISCELLANEOUS

For other service kits refer to the group for the part in question.

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	98C1807	1	Decal Kit
	168K69	1	Gasket Kit, Plant
	OVERHAUL KIT		
	522K214	1	Prior to Spec M
	522K231	1	Begin Spec M
	PAINT, TOUCH-UP ENAMEL		
	525P90		Mouse Grey, 12 Oz. Pressurized Can
	525P137		Green, 16 Oz. Pressurized Can
	525P216		Marine White, 16 Oz. Pressurized Can

SPECIAL PARTS GROUP FOR
 ("UTILITY" or "MOBILE COMMUNICATIONS" Purpose Plant)

<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
NOTE: For Parts not listed in this group, use Parts Key No. 1 in the Standard Group			
	ARMATURE ASSY. GEN. - INCL. BLOWER & BRG.		
	Describe	1	For Model 1.0MAJ-2R
	201A946	1	For Model 1.0MAJ-1R - Prior to Spec H
	201A1074	1	For Model 1.0MAJ-1R - Begin Spec H
	222A1532	1	Coil Assy. Gen. Field - Set of 4 Coils
	153A113	1	Cover Assy. Elec. Choke - Incl. 12 V Heating Element

<u>REF. NO.</u>	<u>PART NO.</u>	<u>QTY. USED</u>	<u>PART DESCRIPTION</u>
	307B495	1	Relay, Reverse Current
	307B454	1	Relay, Charge Disconnect
	302A62	1	Ammeter, Charge 45-0-45
	320A158	1	Breaker, Circuit
	304-132	1	Resistor - 1 Ohm, 25 Watt - Anti- flicker
	BOX ONLY, CONTROL		
	301D1628	1	Prior to Spec H
	301D1874	1	Begin Spec H



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