OPERATOR'S MANUAL AND PARTS CATALOG

Onan®

ELECTRIC

POWER PLANTS

FOR RECREATIONAL VEHICLES

•

SERIES

LK

A-L

•

SPEC

Dear Customer

Onan has revised its warranty form in accordance with the recently enacted Magnuson-Moss Warranty Act. The revised warranty covering all Onan products has been inserted in this manual and replaces the warranty which is printed in the manual.

If you have any questions concerning this revision, please contact the Onan Service Department or a local Onan Authorized Service Distributor or Dealer.

Onan Corporation

930-310

5AJ73

Printed in U.S.A.

Important Safety Precautions

Read and observe these safety precautions when using or working on electric generators, engines and related equipment. Also read and follow the literature provided with the equipment.

Proper operation and maintenance are critical to performance and safety. Electricity, fuel, exhaust, moving parts and batteries present hazards that can cause severe personal injury or death.

FUEL, ENGINE OIL, AND FUMES ARE FLAMMABLE AND TOXIC

Fire, explosion, and personal injury can result from improper practices.

- Used engine oil, and benzene and lead, found in some gasoline, have been identified by government agencies as causing cancer or reproductive toxicity. When checking, draining or adding fuel or oil, do not ingest, breathe the fumes, or contact gasoline or used oil.
- Do not fill tanks with engine running. Do not smoke around the area. Wipe up oil or fuel spills. Do not leave rags in engine compartment or on equipment. Keep this and surrounding area clean.
- Inspect fuel system before each operation and periodically while running.
- Equip fuel supply with a positive fuel shutoff.
- Do not store or transport equipment with fuel in tank.
- Keep an ABC–rated fire extinguisher available near equipment and adjacent areas for use on all types of fires except alcohol.
- Unless provided with equipment or noted otherwise in installation manual, fuel lines must be copper or steel, secured, free of leaks and separated or shielded from electrical wiring.
- Use approved, non-conductive flexible fuel hose for fuel connections. Do not use copper tubing as a flexible connection. It will work–harden and break.

EXHAUST GAS IS DEADLY

- Engine exhaust contains carbon monoxide (CO), an odorless, invisible, poisonous gas. Learn the symptoms of CO poisoning.
- Never sleep in a vessel, vehicle, or room with a genset or engine running unless the area is equipped with an operating CO detector with an audible alarm.
- Each time the engine or genset is started, or at least every day, thoroughly inspect the exhaust system. Shut down the unit and repair leaks immediately.
- Warning: Engine exhaust is known to the State of California to cause cancer, birth defects and other reproductive harm.

Make sure exhaust is properly ventilated.

- Vessel bilge must have an operating power exhaust.
- Vehicle exhaust system must extend beyond vehicle perimeter and not near windows, doors or vents.
- Do not use engine or genset cooling air to heat an area.
- Do not operate engine/genset in enclosed area without ample fresh air ventilation.
- Expel exhaust away from enclosed, sheltered, or occupied areas.
- Make sure exhaust system components are securely fastened and not warped.

MOVING PARTS CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not remove any guards or covers with the equipment running.
- Keep hands, clothing, hair, and jewelry away from moving parts.
- Before performing any maintenance, disconnect battery (negative [–] cable first) to prevent accidental starting.
- Make sure fasteners and joints are secure. Tighten supports and clamps, keep guards in position over fans, drive belts, etc.
- If adjustments must be made while equipment is running, use extreme caution around hot manifolds and moving parts, etc. Wear safety glasses and protective clothing.

BATTERY GAS IS EXPLOSIVE

- Wear safety glasses and do not smoke while servicing batteries.
- Always disconnect battery negative (–) lead first and reconnect it last. Make sure you connect battery correctly. A direct short across battery terminals can cause an explosion. Do not smoke while servicing batteries. Hydrogen gas given off during charging is explosive.
- Do not disconnect or connect battery cables if fuel vapors are present. Ventilate the area thoroughly.

DO NOT OPERATE IN FLAMMABLE AND EXPLOSIVE ENVIRONMENTS

Flammable vapor can be ignited by equipment operation or cause a diesel engine to overspeed and become difficult to stop, resulting in possible fire, explosion, severe personal injury and death. **Do not operate diesel equipment where a flammable vapor environment can be created by fuel spill, leak, etc., unless equipped with an automatic safety device to block the air intake and stop the engine.**

HOT COOLANT CAN CAUSE SEVERE PERSONAL INJURY

- Hot coolant is under pressure. Do not loosen the coolant pressure cap while the engine is hot. Let the engine cool before opening the pressure cap.

ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH

- Do not service control panel or engine with unit running. High voltages are present. Work that must be done while unit is running should be done only by qualified service personnel.
- Do not connect the generator set to the public utility or to any other electrical power system. Electrocution can occur at a remote site where line or equipment repairs are being made. An approved transfer switch must be used if more than one power source is connected.
- Disconnect starting battery (negative [–] cable first) before removing protective shields or touching electrical equipment. Use insulative mats placed on dry wood platforms. Do not wear jewelry, damp clothing or allow skin surface to be damp when handling electrical equipment.
- Use insulated tools. Do not tamper with interlocks.
- Follow all applicable state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician. Tag open switches to avoid accidental closure.
- With transfer switches, keep cabinet closed and locked. Only authorized personnel should have cabinet or operational keys. Due to serious shock hazard from high voltages within cabinet, all service and adjustments must be performed by an electrician or authorized service representative.

If the cabinet must be opened for any reason:

1. Move genset operation switch or Stop/Auto/Handcrank switch (whichever applies) to Stop.
2. Disconnect genset batteries (negative [–] lead first).
3. Remove AC power to automatic transfer switch. If instructions require otherwise, use extreme caution due to shock hazard.

MEDIUM VOLTAGE GENERATOR SETS (601V TO 15kV)

- Medium voltage acts differently than low voltage. Special equipment and training are required to work on or around medium voltage equipment. Operation and maintenance must be done only by persons trained and qualified to work on such devices. Improper use or procedures will result in severe personal injury or death.
- Do not work on energized equipment. Unauthorized personnel must not be permitted near energized equipment. Induced voltage remains even after equipment is disconnected from the power source. Plan maintenance with authorized personnel so equipment can be de-energized and safely grounded.

GENERAL SAFETY PRECAUTIONS

- Do not work on equipment when mentally or physically fatigued or after consuming alcohol or drugs.
- Carefully follow all applicable local, state and federal codes.
- Never step on equipment (as when entering or leaving the engine compartment). It can stress and break unit components, possibly resulting in dangerous operating conditions from leaking fuel, leaking exhaust fumes, etc.
- Keep equipment and area clean. Oil, grease, dirt, or stowed gear can cause fire or damage equipment by restricting airflow.
- Equipment owners and operators are solely responsible for operating equipment safely. Contact your authorized Onan/Cummins dealer or distributor for more information.

KEEP THIS DOCUMENT NEAR EQUIPMENT FOR EASY REFERENCE.

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

This manual includes instructions for the installation, operation, maintenance and a parts list of the LK electric generating plants used in mobile applications. Identify the model by referring to the MODEL AND SPECIFICATION NUMBER as shown on the Onan nameplate. Electrical characteristics are shown on the lower portion of the nameplate.

How to interpret MODEL and SPEC NO.

2.5 LK-1 R / 12000 J

1 2 3 4

1. Factory code for general identification.
2. Specific type:
   M - MANUAL. Manually cranked. For permanent or portable installations.
   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).

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
INTERNATIONAL OFFICE EMPIRE STATE BUILDING NEW YORK, N.Y.

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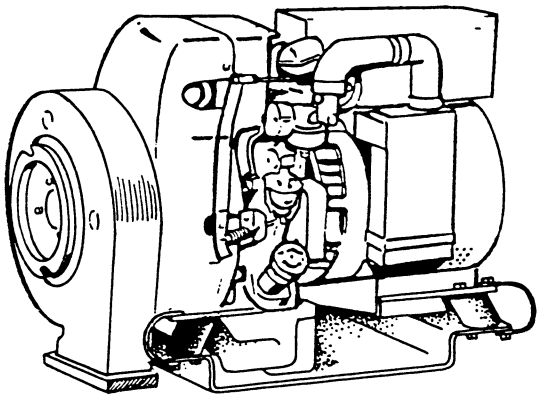


TYPICAL MODEL LK FOR MOBILE APPLICATIONS

SPECIFICATIONS

Nominal dimension of plant (inches)	
Height	19
Width	16-13/16
Length	26-1/2
Number cylinders	1
Displacement (cubic inch)	24.9
Cylinder bore	3-1/4
Piston stroke	3
RPM	1800
Compression ratio	5.5:1
Battery voltage	12 Volt
** Battery size	
SAE group 1H	two 6 Volt in series
Amp/hr. SAE rating - 20 hour (nominal)	105
Oil capacity in U.S. quarts - Refill	2
Starting by exciter cranking	Yes
Ventilation Required (cfm 1800 rpm)	
Engine	300
Generator	60
Combustion	20
Rating (output in watts)	
60 hertz, AC continuous service	2500
AC voltage regulation in ±%	6
AC frequency regulation in %	5
Revolving armature type generator	Yes

** - One 72 ampere hour, 12 volt battery can be used for mobile application where temperatures are 1°F or above. Heavy duty cables must be used and battery must be kept charged for this type installation.

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
Intake Valve Tappet Clearance at 70°F	0.015		0.017
Exhaust Valve Tappet Clearance at 70°F	0.015		0.017
Intake Valve Stem Clearance in Guide	0.001		0.0025
Exhaust Valve Stem Clearance in Guide	0.0025		0.004
Valve Seat Width	1/32		3/64
Valve FACE Angle		44°	
Valve SEAT Angle		45°	
Valve Interference Angle		1°	
Crankshaft Main Bearing Clearance	0.002		0.003
Crankshaft End Play	0.006		0.012
Camshaft Bearing Clearance	0.0015		0.0030
Camshaft End Play	0.003		
Connecting Rod Bearing Clearance (Alum. Rod)	0.002		0.003
Connecting Rod End Play	0.002		0.016
Timing Gear Backlash	0.002		0.003
Piston Clearance in Cylinder, Conformatic Type (at bottom of skirt)			
Interference	0.0005		
Clearance			0.0015
Piston Pin Clearance in Piston at 70°F		Thumb Push Fit	
Piston Pin Clearance in Rod at 70°F	0.0001		0.0007
Piston Ring Gap in Cylinder	0.010		0.023
Breaker Point Gap at Full Separation		0.020	
Spark Plug Gap – For Gaseous Fuel		0.018	
Spark Plug Gap – For Gasoline Fuel		0.025	
Crankshaft Main Bearing Journal – Std. Size	1.9995		2.000
Crankshaft Rod Bearing Journal – Std. Size	1.6255		1.6260
Cylinder Bore – Standard Size	3.249		3.250
Magneto Pole Shoe Air Gap	0.010		0.015

ASSEMBLY TORQUES

TORQUE	LB. FT.
Cylinder Head Capscrews	27 to 29
Rear Bearing Plate Nuts	20 to 25
Connecting Rod Bolts	26 to 28
Flywheel Capscrew	40 to 45
Generator Thru - Stud and Nut	20 to 25
Gearcase Cover	15 to 20
Oil Base Mounting Screws	43 to 48
Spark Plug	25 to 30
Other 5/16 inch Cylinder Block Studs and Nuts	10 to 12

TROUBLE-SHOOTING GUIDE

OPERATOR'S TROUBLE-SHOOTING GUIDE for ONAN GASOLINE ENGINES (Air Cooled)

CAUSE	TROUBLE	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 Toc 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

If the mobile electric plant is to operate properly, it must be correctly installed. This manual gives some of the more important aspects of installation. For more details, a Technical Bulletin T-012 is available from Onan.

Ventilation is the most important factor to be considered.

The unit must have enough cooling air to operate safely and efficiently. The heated air must be disposed of to keep the engine from overheating and losing power.

For the LK electric plant running at 1800 rpm, the amount of air discharged is 450 cfm. The minimum free air inlet with no filter or restriction is 100 sq. inch.

Onan Vacu-Flo cooled units are specifically designed for mounting in small compartments (where proper cooling is difficult) and are equipped to provide sufficient cooling air and adequate disposition of heated air. With this type of cooling, a centrifugal fan in a scroll housing pulls cooling air into the compartment and over the cooling fins and surfaces of the engine. Heated air is expelled through a single discharge and away from the unit and installation area.

WARNING *Utilizing exhaust manifold heat to warm a room or compartment occupied by people is not recommended due to possible leaking of exhaust gasses.*

LOCATION

The compartment itself should be of vapor tight design and completely independent of living quarters. A sheet metal covered compartment may be readily sealed and lends itself easily to treatment. The plant may have to be removed for service, so make the door large enough to facilitate removal of the unit.

The compartment location is determined by physical size, access opening, and most important, best mounting support. Allow 2″ clearance on all sides of the plant for rocking on mounts.

POSITIONING

The following should be considered for accessibility when mounting the unit in a compartment: (Position so operating instructions and nameplate are visible - and/or install an accessible nameplate, data decal or sticker).

1. Make air discharge duct as short as possible. Position so exhaust heated air is not drawn into cool air inlet.
2. Air cleaner should be easy to remove and service.
3. Battery or batteries must be accessible for service.
4. Oil fill tube cap should be easy to reach.
5. The control box switch should be visible.
6. Provide space for muffler - preferably outside of engine compartment.
7. Oil drain should be readily accessible
8. Cylinder head readily accessible for service.
9. Rope start sheave (if used) should be accessible.

MOUNTING

For vibration free performance, the greatest emphasis must be placed on the mounting base and supports. Channel, box, or angle iron can be used for a frame with a light sheet metal cover. This will provide the greatest support plus a base sealed against air, dirt and sound. Do not use sheet metal or thin plate without a supporting frame. Plywood of sufficient thickness for strength can be used but, unless it is suitably sealed, it is vulnerable to climatic elements, will tend to become oil soaked, and is not fireproof.

NOTE: *Proper mounting and bolt location is critical in reducing to a minimum the transmission of noise and vibration to the mobile van.*

It is desirable to mount the unit on a pull-out tray to facilitate service and repair. The load wires, control wires and fuel lines, must have enough slack and be flexible so the unit can slide out without disconnecting them. When using a pull-out tray, pipe the exhaust gases into the air outlet. The air outlet duct may face the bottom, side or top of the enclosure, depending on how the unit is installed.

Bolt the unit securely in place. Rubber mounting cushions are furnished with all mobile electric power plants. These cushions are satisfactory for the average installation. If extra vibration dampening is desired, special equipment is available. The cushions and vibration isolators must be properly installed to minimize plant vibration transmission to the vehicle.

Do not tighten the snubbing washers on top of mounting feet too tight (approximately 1/16″ clearance). The mounting bolts must be properly spaced to prevent side loading of the rubbers. The supporting base or platform must be strong enough to stand the shock from sharp turns, bumps, holes, etc., which accompany mobile applications. Brace the mounting platform to eliminate any chance of platform bowing or bending. The Onan

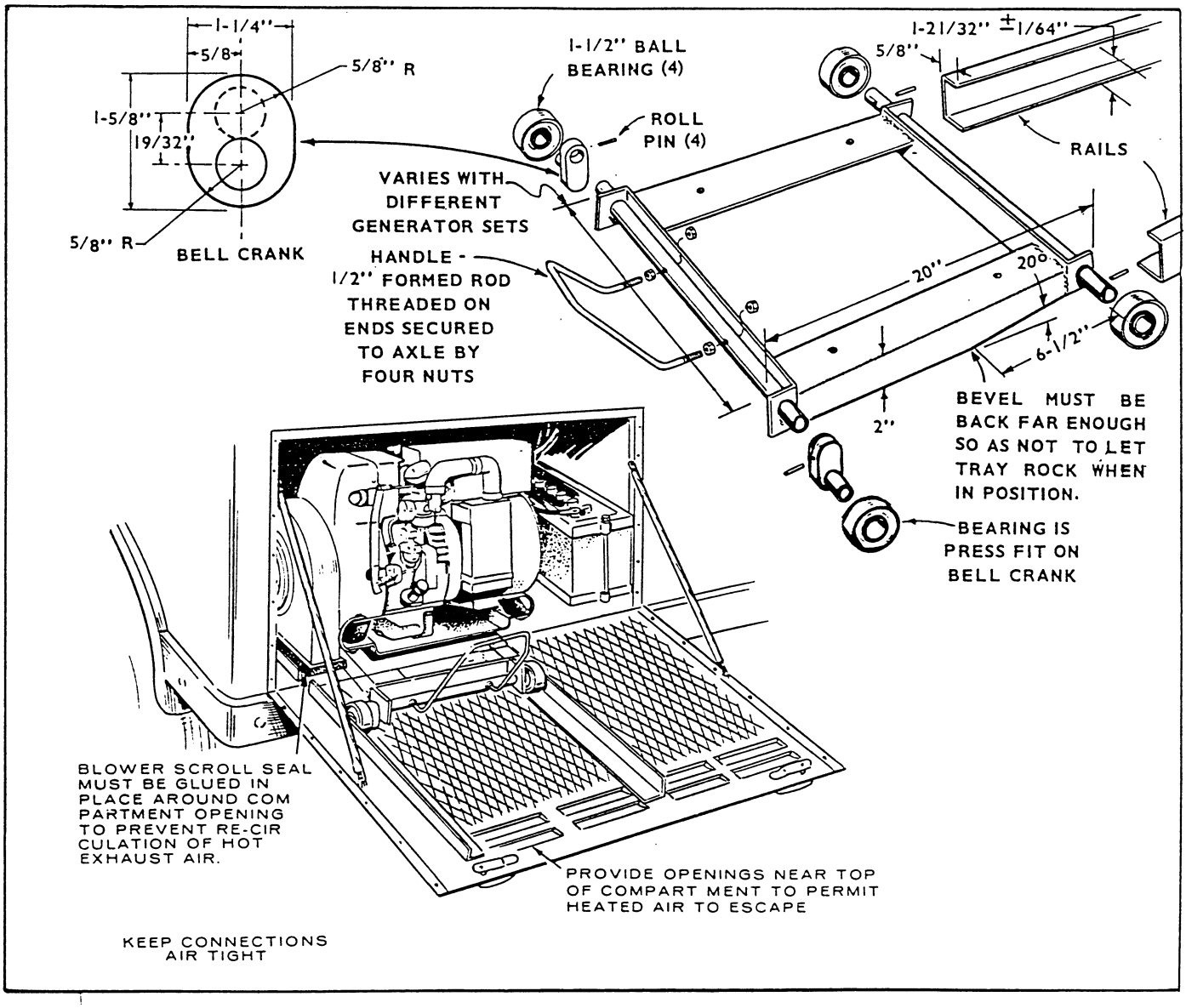


FIGURE 1. TYPICAL "SLIDE OUT" TRAY FOR COMPARTMENT MOUNTING

mounts are a "fail-safe" type with mounting bolts that prevent the unit from breaking loose if the mounts are damaged.

FUEL SUPPLY (Gasoline)

Install a separate fuel tank for the unit. If the plant has to be connected to the vehicle supply tank, do not tee off the vehicle supply line. The generating unit must have a separate fuel line because the more powerful vehicle fuel pump will starve the generating unit for gasoline.

When the lift from the tank to the pump exceeds 4 feet or where temperatures are high, use an electric fuel pump. Do not use pumps that exceed 3 1/4 psi as fuel pressure at the carburetor is critical. If in doubt, use an adjustable regulator and set for recommended pressure. The use of highly leaded, premium type gasoline is not recommended for generating plants.

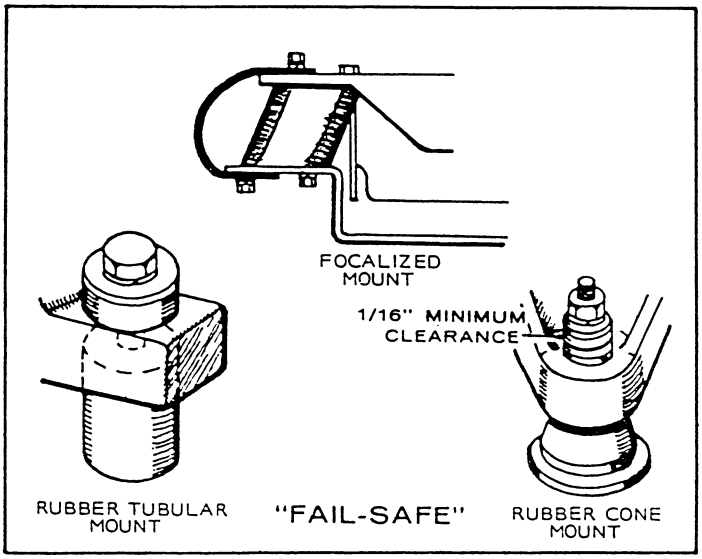


FIGURE 2. ONAN VIBRATION ISOLATORS

FUEL LINES

Use annealed copper or seamless steel tubing and flared connections. Use flexible fuel line connection to fuel pump - to allow for engine vibration. Run fuel lines, at the top level of the tank to a point as close to the engine as possible, to reduce the danger of fuel siphoning out of the tank if the line should break. Install lines so they are accessible at all times and protected from mechanical injury. Use nonferrous metal straps, without sharp edges, to secure the fuel lines.

PROPANE OR BUTANE GAS

This fuel gives reduced maintenance cost because there will be less carbon buildup on the pistons and valves. Because it is cleaner burning, this fuel extends lubricating oil change intervals. Gasoline units can be converted or factory equipped for gaseous fuel operation. A secondary regulator is supplied with the unit or the conversion kit. Consult your local gas distributor about the tank and fuel lines.

Some vehicles already use LPG fuels for appliances (refrigerators, stoves, furnaces, etc.). These systems are vapor withdrawal and usually are not large enough to run an electric plant, so either the supply tank size must be increased or a separate liquid withdrawal line and a vaporizor used.

NOTE: Some states do not allow this type fuel and/or container in highway tunnels. Be sure to check state laws.

WARNING *Leakage of gasoline or gaseous fuel in or around the compartment is a definite hazard. The ventilation system should provide a constant flow of air to expel any accumulation of fuel vapor while the vehicle is in transit. Compartments should be essentially vapor tight to isolate fumes within* the compartment itself - not within the vehicle.

EXHAUST

If the unit is permanently mounted, pipe the exhaust to a muffler mounted under the floor. If the unit is mounted on a slide-out tray, vent the exhaust through the air discharge duct. Flexible exhaust tubing (used between the unit and the muffler) absorbs unit vibration. If the exhaust line passes through a flammable floor or partition, insulate with asbestos backed metal collars where it passes through these barriers. Exhaust lines may be asbestos wrapped to reduce heat radiation within the compartment, however, care should be taken to see that flexible exhaust sections that are wrapped still retain their flexibility.

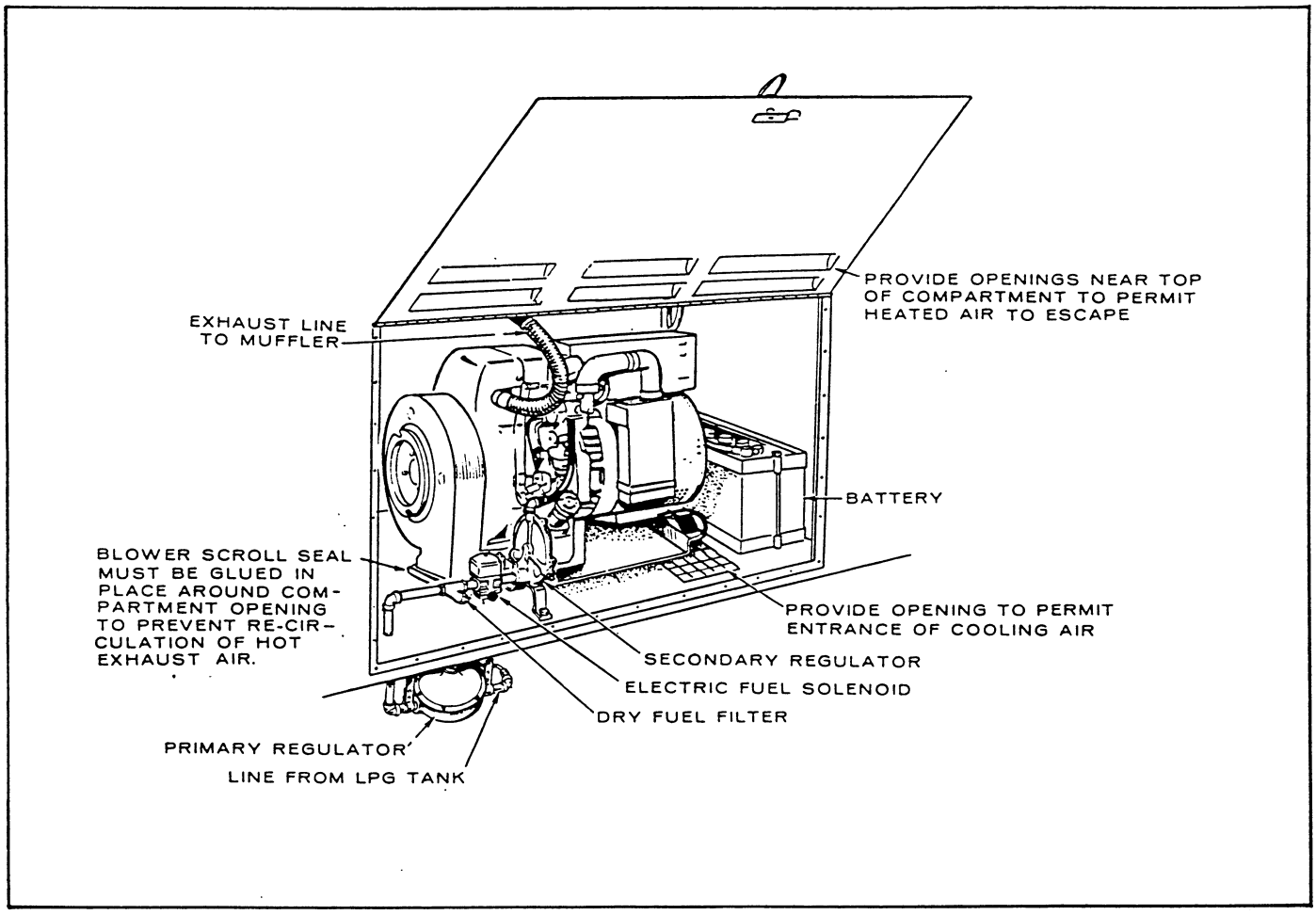


FIGURE 3. GAS INSTALLATION

When installing mufflers, other than those supplied with plant or if the exhaust system is excessively complicated, the exhaust back pressure should be checked. Exhaust back pressure at full rated load, measured at the exhaust manifold, should not exceed 2 inch Hg. (Mercury column). Where a tapped hole is not provided, the manifold and/or a pipe coupling may be drilled and tapped. After measurement is made plug the hole with an ordinary pipe plug.

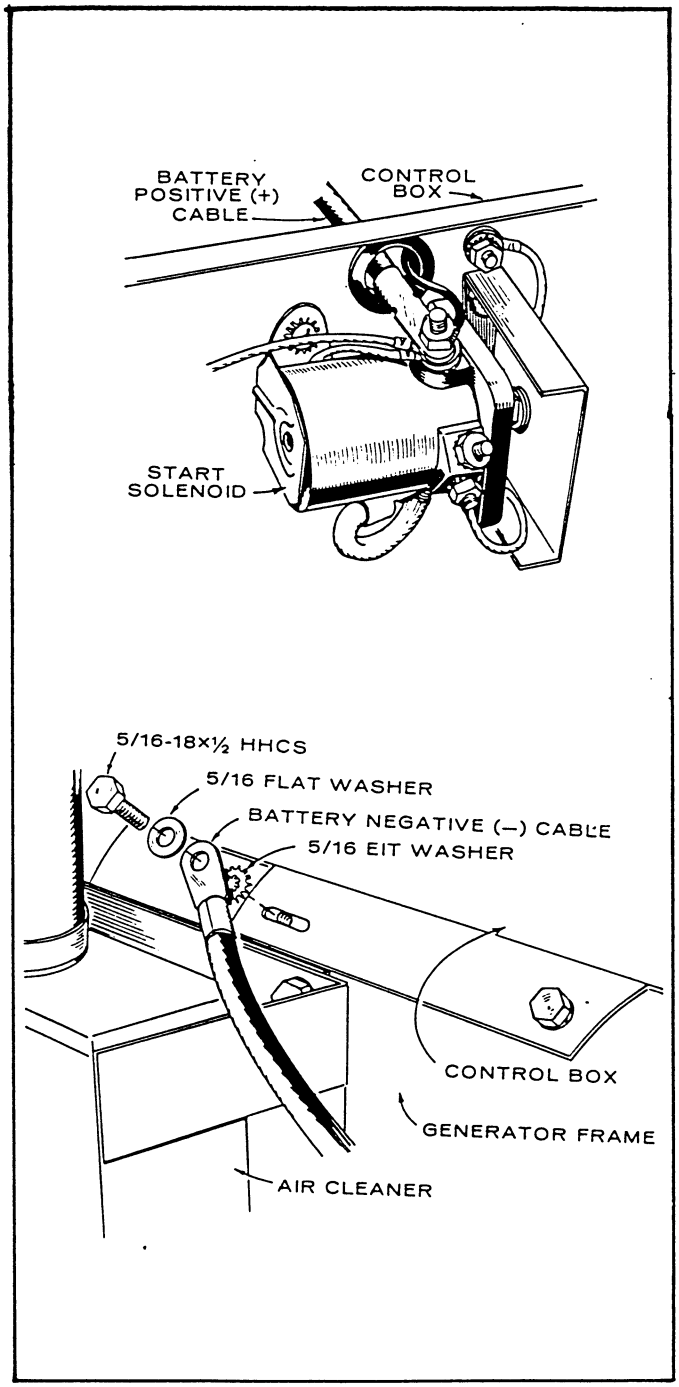


FIGURE 4. BATTERY CONNECTIONS

BATTERY

In mobile applications where the generator is normally operated in ambient temperatures above 0°F and the battery is kept charged by frequent running of the unit, a single 12 volt battery of 72 amp/hr capacity - minimum is sufficient.

Connect the positive battery lead to the start solenoid (located in the control box). Attach the negative lead to a good ground on the generator frame.

CAUTION *Do not disconnect the starting batteries while the engine is running. The resulting overvoltage will damage the electric choke and other control components.*

CAUTION *Beginning with Spec letter H, a negative ground battery system must be used in order not to damage the diodes and components in the battery charging circuit.*

WIRING

All wiring must meet applicable local electrical codes. Wires must be of adequate size, properly insulated and supported in an approved manner. Have a qualified electrician install and inspect the wiring.

Mount switches and controls securely to prevent damage from vibration and road shocks. All switches should be vibration-proof to prevent accidental opening or closing while the vehicle is in motion. Protect load circuits and generator output circuits by proper size fuses or circuit breakers to prevent severe overload conditions from damaging the generator.

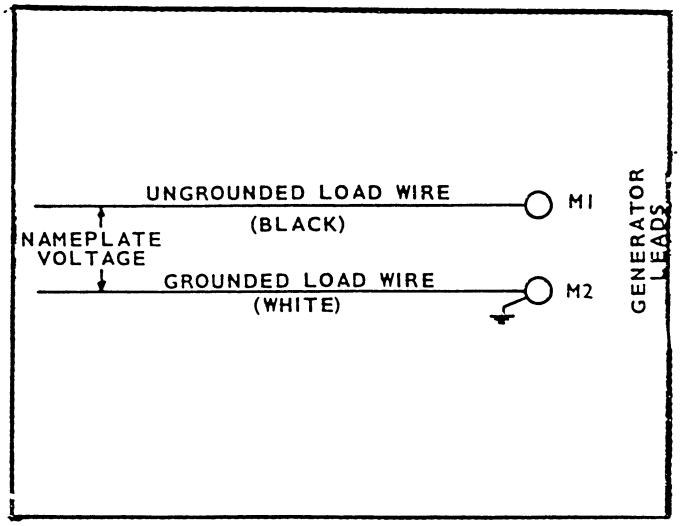


FIGURE 5. LOAD WIRE CONNECTIONS

REMOTE START-STOP CONTROLS

Standard start-stop controls for Onan remote starting electric plants consist of a single pole- double throw momentary contact switch, connected by three wires to the plant remote control terminal block. Pushing the switch up engages the starter, the center position is for running and pushing it down stops the plant.

CAUTION *Be sure the start-stop switch makes momentary contact only. A longer contact will damage the start solenoid.*

To control the plant from several locations, install separate switches and wire them in parallel (Figure 6). Any number of switches may be used.

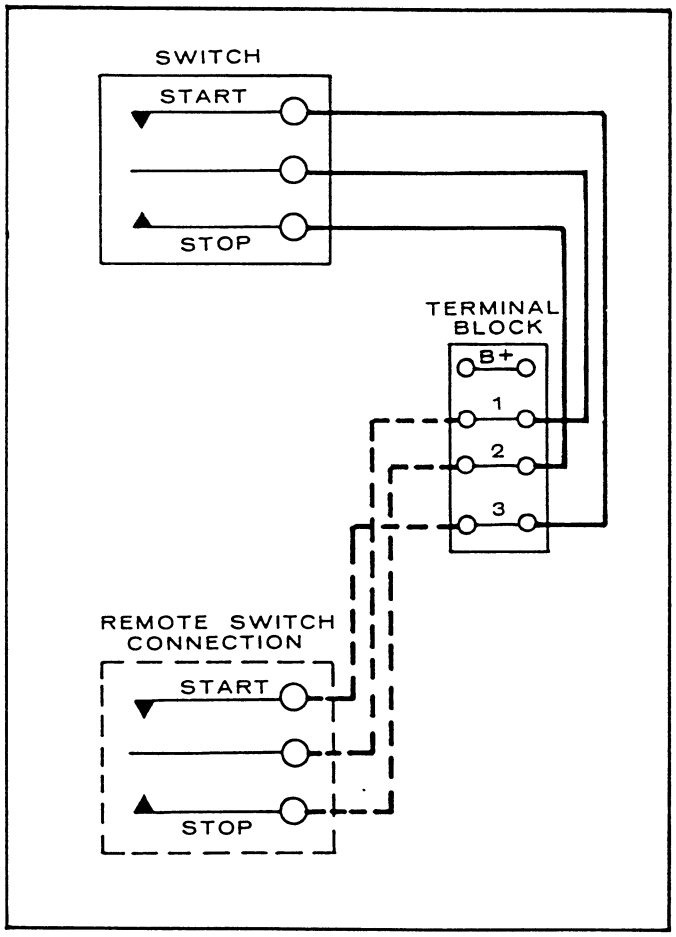


FIGURE 6. REMOTE SWITCH CONNECTIONS

OPERATION

BEFORE STARTING

Be sure the crankcase has been filled with oil. Fill to *FULL* mark on the oil level indicator. The oil capacity is two U.S. quarts.

Refer to the Maintenance Section for the recommended oil changes and complete lubricating oil recommendations.

Fill the fuel tank with clean, fresh regular grade automotive gasoline. Do not use highly leaded premium types. Never fill the tank when the engine is running Leave some space in the tank for fuel expansion.

ELECTRIC STARTING

Push the start-stop switch to its *start* position. Release the switch as soon as the engine starts.

If the engine fails to start at first try, inhibitor oil used at the factory may have fouled the spark plug. Remove the plug, clean in a suitable solvent, dry thoroughly and install. Heavy exhaust smoke when the engine is first started is normal and is caused by the inhibitor oil.

Emergency Manual Starting: If the battery charge condition is too low to crank the engine, the plant can be started manually. Set the control box switch (located on the control box) to its *manual* start position. Pull the rope with a fast, steady pull to crank the engine. Do not jerk.

CAUTION *After starting, return the control box switch to the electric start position to avoid discharging the battery. If switch is left in manual position engine will not stop when stop switch is pressed.*

APPLYING LOAD

If practical, allow plant to warm up before connecting a heavy load. Continuous generator overloading may cause high operating temperatures that can damage the windings. Keep the load within nameplate rating.

STOPPING

(1) Push start-stop switch to *stop* position.
(2) Release switch when plant stops. If stop circuit fails close fuel valve or check to see that Elect-Manual start switch is in electric start position.

BREAK-IN PROCEDURE

Controlled break-in with the proper oil and a conscientiously applied maintenance program will help to assure satisfactory service from your Onan electric plant.

When operating the engine for the first time, use the following sequence using SD/CB (formerly MS/DG) oil:

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

BATTERY CHARGING

The battery charge rate is controlled by a 2-step voltage regulator and is not adjustable.

INFREQUENT SERVICE

If the plant is used infrequently, extended shut-down periods can result in difficult starting. Run the plant at least 30 minutes every week to eliminate hard starting.

HIGH TEMPERATURES

1. See that nothing obstructs air flow to and from the plant.
2. Keep cooling fins clean. Air housing should be properly installed and undamaged.
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, move the plant to a warm location or apply heated air externally (never use open flame).
2. Use fresh, standard grade gasoline. Protect against moisture condensation. Below 0°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. Partially restrict cool air flow but use care to avoid overheating.

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.

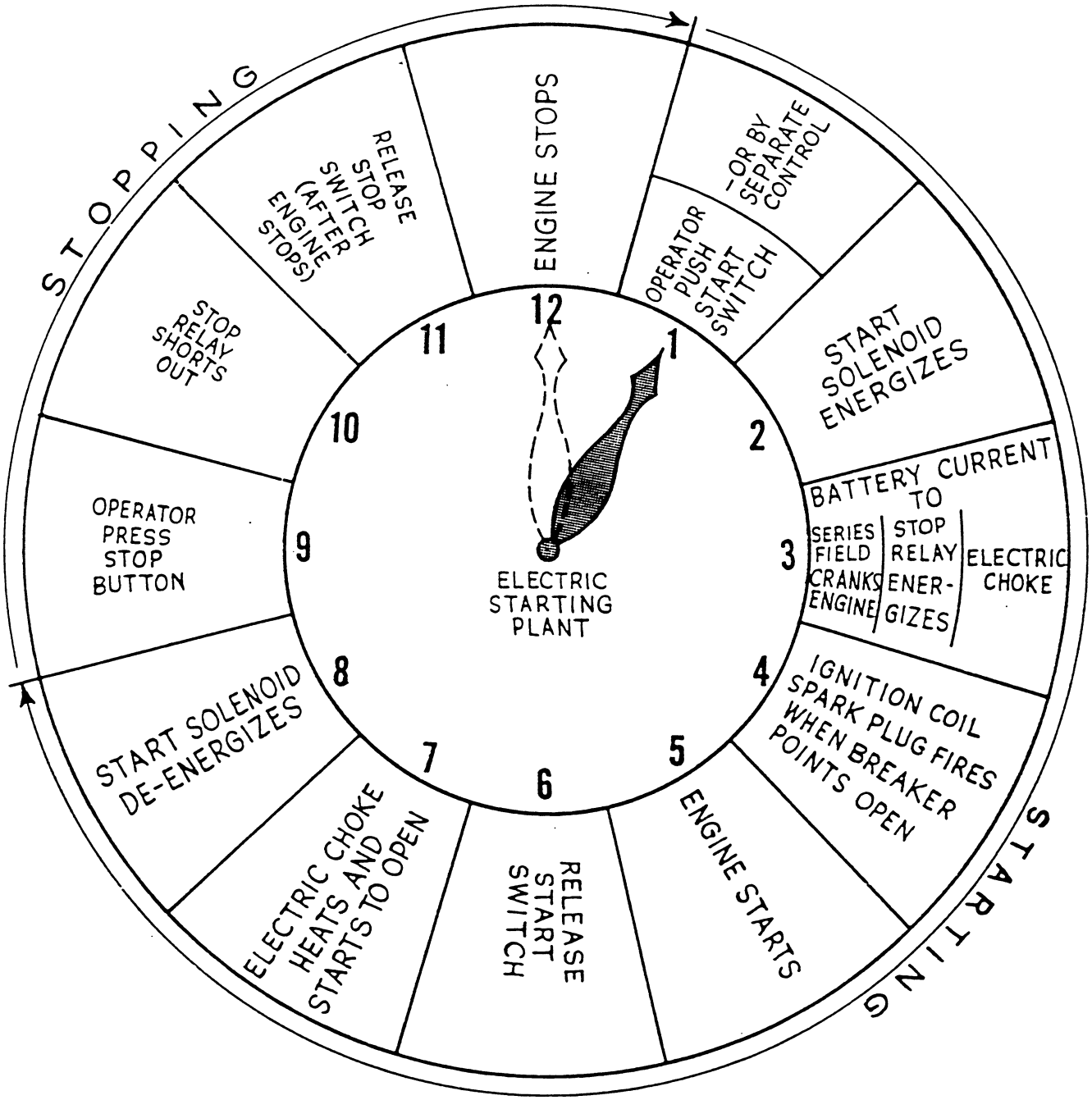


FIGURE 7. STARTING AND STOPPING SEQUENCE

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 air cleaner.
6. Clean governor linkage and protect by wrapping with a clean cloth.
7. Plug exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
8. Wipe generator brushes, slip rings, etc. Do not apply lubricant or preservative.
9. Wipe entire unit. Coat rustable parts with a light film of grease or oil.
10. Provide a suitable cover for the entire unit.
11. If battery is used, disconnect and follow standard battery storage procedure.

DUST AND DIRT

1. Keep plant clean. Keep cooling surfaces clean.
2. Service air cleaner 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.

HIGH ALTITUDE

For operation at altitudes of 2500 feet above sea level, close carburetor main jet adjustment slightly to maintain proper air-to-fuel ratio (refer to the Adjustments Section). Maximum power will be reduced approximately 4% for each 1000 feet above sea level, after the first 1000 feet.

ADJUSTMENTS

CHECK BREAKER POINTS

Replace burned or faulty points. Measure gap with thickness gauge, set point gap.

Ignition breaker points (Figure 8), must be correctly gapped. Crank engine to fully open breaker points (1/4 turn after top center). Loosen and move stationary contact to correct the gap at full separation. Tighten contact and check gap.

Ignition points should break contact just when the timing mark aligns with the flywheel timing mark (see Figure 8). Timing is corrected by shifting the breaker point box on its mounting and using a timing light.

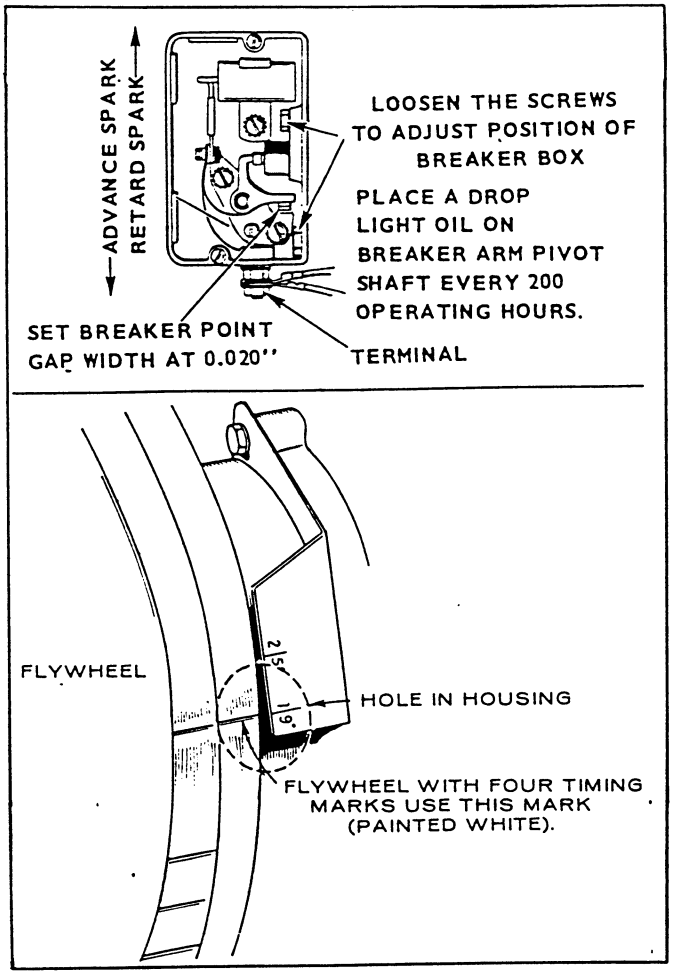


FIGURE 8. BREAKER POINTS AND TIMING MARKS

CARBURETOR, GASOLINE

The carburetor (Figure 9) has a fuel main (high speed) adjustment (needle A) and a fuel idle adjustment (needle B). The main adjustment affects operation under heavy load conditions. Idle adjustment affects operation at light or no load. Under normal circumstances, factory carburetor adjustments should not be disturbed. If the adjustments have been disturbed, turn needles off their seats, 1 to 1-1/2 turns to permit starting, then, re-adjust them for smooth operation.

CAUTION *Forcing the needle against its seat will damage it. The needle does not completely shut off fuel when turned fully in.*

Before final adjustment, allow engine to warm up. Make idle adjustment with no load connected to the generator. Use a tachometer (or connect a frequency meter) to generator output. Slowly turn idle adjustment out until engine speed (or generator frequency) drops slightly below normal. Then turn needle in until speed (or frequency) returns to normal.

To set fuel main adjustment, apply a full electrical load to the generator. Carefully turn main adjustment screw in until engine speed (or output frequency) drops slightly below normal. Then turn needle out until speed (or frequency) returns to normal. Proper carburetor adjustment cannot be assured unless the governor is properly adjusted.

Set throttle stop screw (located on carburetor throttle lever) with no load connected and while running at rated speed. Turn the screw to give 1/32" clearance between the screw and pin (Figure 9).

CARBURETOR, GASEOUS FUELS

Adjust much the same as gasoline carburetors, using gas fuel adjustment located in the fuel inlet (Figure 9) to adjust when running on gas. Gas-only carburetors have no idle adjustment beginning Spec E.

The weighted carburetor choke (prior to Spec E) should just close, but must be free to open with the air stream during operation. Some chokes are fitted with an adjusting screw – turn in for less choking action, turn out for more choking action.

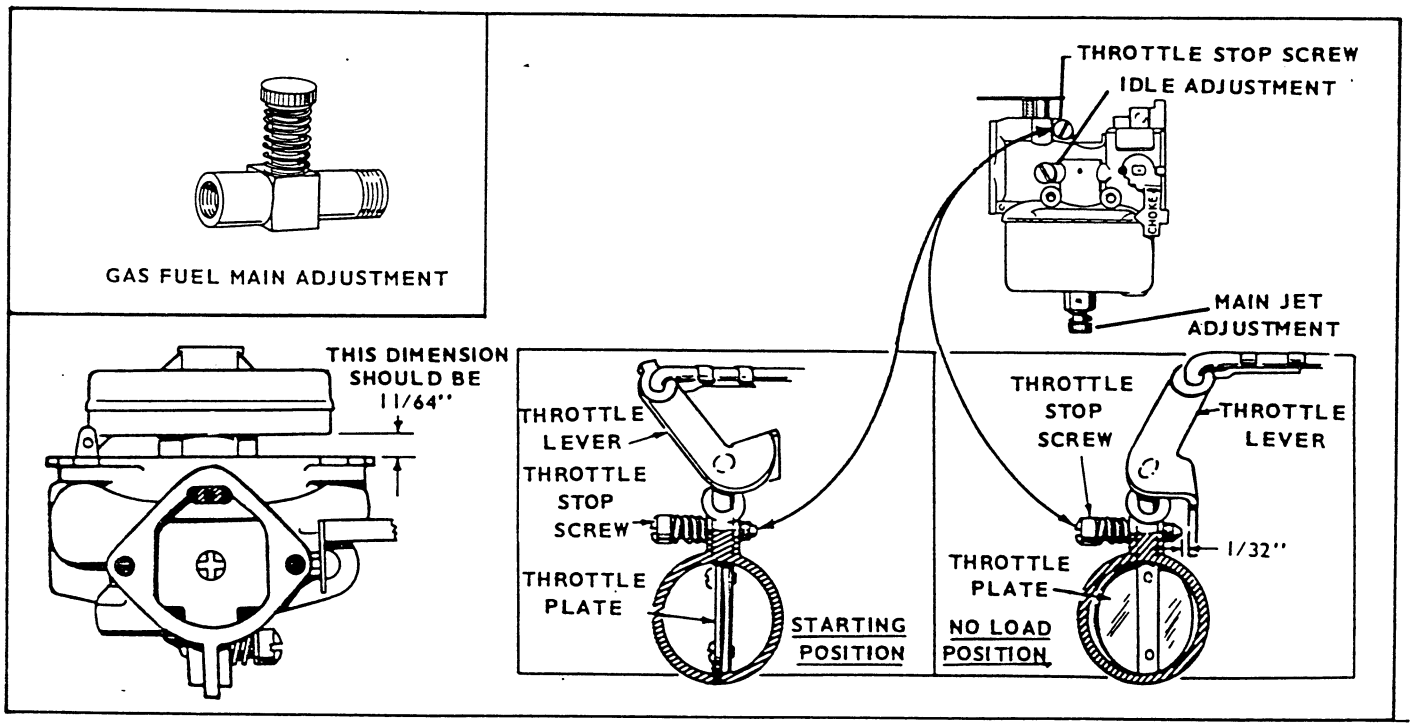


FIGURE 9. CARBURETOR ADJUSTMENTS

ONAN CHOKE

This choke uses a heating element and a heat sensitive bimetal spring to open the choke plate. The choke plate closes according to ambient temperature.

If adjustment is required, use the following instructions. Choke bimetal spring must be at ambient temperature. Allow engine to cool at least one hour before setting. Adjust choke by turning the choke body, which engages a link connected to a bimetal choke spring. Remove air cleaner and adapter to expose the carburetor throat. Loosen the screw which secures the choke body. Rotate choke body clockwise to increase choke and counter-clockwise to decrease choke action (leaner mixture). At room temperature (70°) the choke valve should be almost wide open.

Note that the direction marking "CHOKE →" as appears cast on the body of some carburetors is correct for manually choked plants, but is wrong for electric choked plants due to the choke valve arrangement. Choking position of the weight lever is vertical, on the shaft of electrically choked plants. Choking position of the lever is horizontal on manually choked plants.

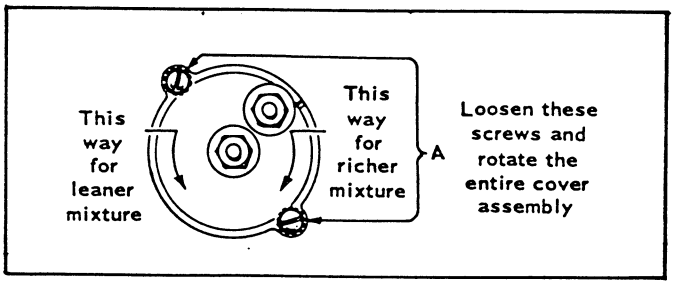


FIGURE 10. ELECTRIC CHOKE ADJUSTMENT

Gas Fuel: Normal choke setting is fully closed with engine not running. Turn adjusting screw (Figure 9) in for less choking, out for more choking. Units beginning with Spec E do not have a choke.

GASEOUS FUEL OPERATION

The regulator was factory adjusted to shut-off at up to a pressure of 4 ounces (7"water column). It will operate satisfactory at incoming pressures between 2 and 4 ounces. If your gas supply pressure is within these limits, no regulator adjustment is required. If your gas supply pressure is under 2 ounces, the regulator will not operate. If your gas supply pressure is between 4 and 8 ounces, install an appliance regulator set for 2 ounces ahead of the regulator or adjust the regulator as follows:

1. Use a manometer which reads up to 14" water column. (Note: 1 ounce per square inch equals 1.73" water column. Likewise 1" water column equals 0.58 ounces per square inch).
2. Remove 1/8" pipe plug (C) and connect manometer.
3. With gas supply on and outlet hose removed, alternately cover and uncover the regulator outlet with your hand. If the regulator shuts off completely, as desired, the manometer will hold a steady reading. If the manometer reading drops slightly each time you remove your hand, the regulator is leaking.
4. When necessary, adjust as follows: Turn the adjusting screw (G) inward just far enough so that manometer reading remains constant when you repeatedly cover and uncover the regulator outlet with your hand.

5. Operate the engine to ensure quick starting results.

WARNING *A soap bubble placed over the regulator outlet will not accurately test the regulator lock-off. The soap bubble's resistance when multiplied by the greater area of the diaphragm, is enough to shut off this very sensitive demand type regulator. A manometer must be used to show complete regulator shut-off.*

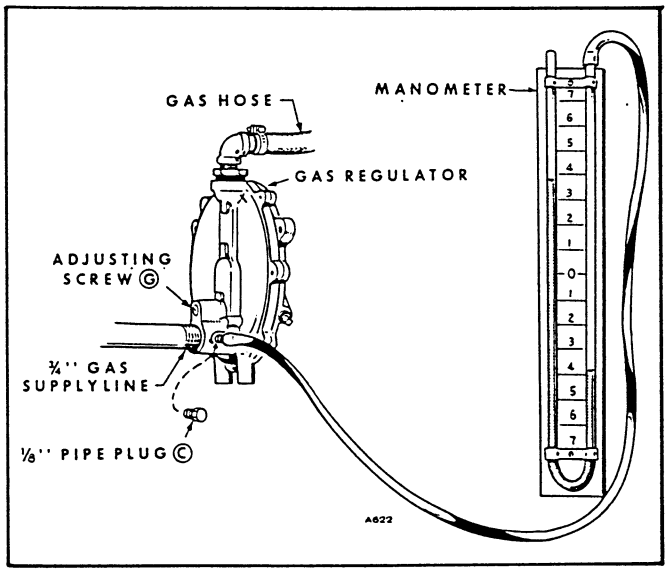


FIGURE 11. GAS REGULATOR ADJUSTMENT

GOVERNOR

The governor controls the engine speed. On AC generating plants, engine speed determines generator output voltage and current frequency. By increasing engine speed, generator voltage and frequency is increased. An accurate voltmeter is required in adjusting the governor on AC plants. A small speed drop not noticeable without instruments will result in an objectionable voltage drop.

The governor arm is fastened to a shaft which extends from the gear cover. It is connected by a ball joint and link to the carburetor throttle arm. If the carburetor has been removed, or the governor disassembled, it may be necessary to readjust the governor.

A binding in the bearings of the shaft which extends from the gear cover, in the ball joint, or in the carburetor throttle assembly will cause slow governor action or poor regulation. Looseness or excessive wear in the governor mechanism will cause erratic governor action or an alternate increase and decrease in speed (hunting). A lean carburetor adjustment may also cause hunting. Springs of all kinds have a tendency to lose their calibrated tension through fatigue after long usage. If all governor and carburetor adjustments are properly made, and the governor action is still erratic, replacing the spring with a new one and resetting the adjustments will usually correct the trouble.

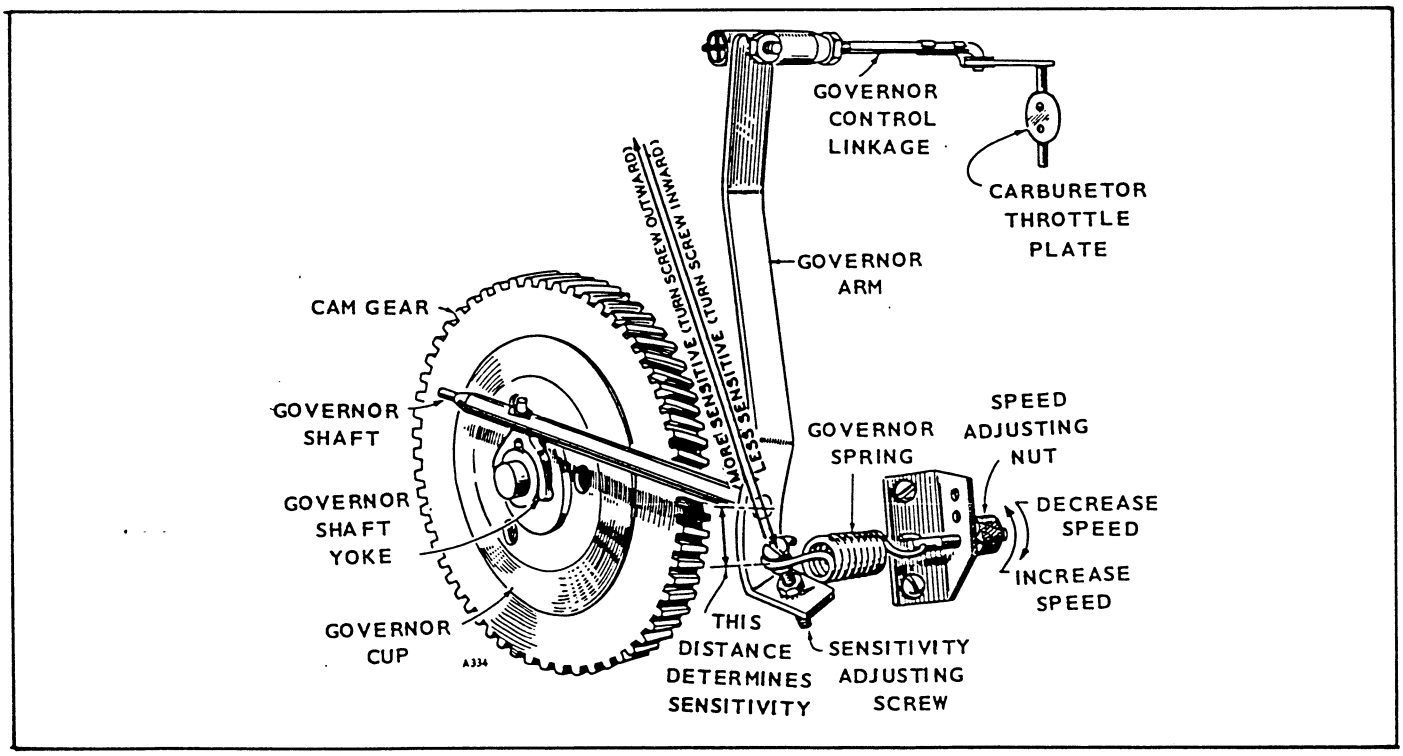


FIGURE 12. GOVERNOR ADJUSTMENT

When the plant is stopped, tension of the governor spring should hold the carburetor throttle arm at the wide open position. At wide open position, the lever on the throttle shaft should just touch the carburetor body or clear it by no more than 1/32″. This setting can be obtained by increasing or decreasing the length of the connecting linkage as necessary by turning the ball joint on the threads of the link. Be sure to re-tighten the ball joint to the governor arm. This operation synchronizes governor action with carburetor throttle action.

Adjusting the Governor: Refer to Figure 12. Connect a voltmeter across the output of the generator. With no electrical load connected, start the plant and adjust the speed adjusting nut to give a voltmeter reading of approximately 126 volts maximum for a 120 volt plant. Apply a full rated electrical load and again observe the voltage reading, which should be approximately 110 volts. The correct sensitivity adjustment gives the closest regulation without causing a hunting condition. If the voltage spread between no load and full load conditions is too great, move the end of the governor spring closer to the governor shaft. Test the governor action at various load conditions. If voltage regulation is good, but there is a tendency toward hunting at times, the sensitivity adjustment is too close or sharp and the sensitivity stud must be turned inward slightly. Any change in the sensitivity adjustment will require a speed readjustment.

If a tachometer is used for adjusting the governor, engine speed at full-load for a 60 hertz plant should be approximately 1800 rpm for a 4 pole generator, with a spread of not more than 100 rpm between no load and full load.

SERVICE AND MAINTENANCE

CRANKCASE OIL

Use a good quality detergent oil that meets the API (American Petroleum Institute) service designations SE or SE/CC (formerly MS, MS/DG). Oil should be labeled as having passed the MS sequence tests (also known as the ASTM G-IV sequence tests) and the MIL-L-2104B tests. Recommended SAE oil numbers for expected ambient temperatures are as follows:

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

Do not use service DS oil. Do not mix brands or grades. Refer to Maintenance Schedule for recommended oil changes. Oil capacity is 2 U.S. quarts.

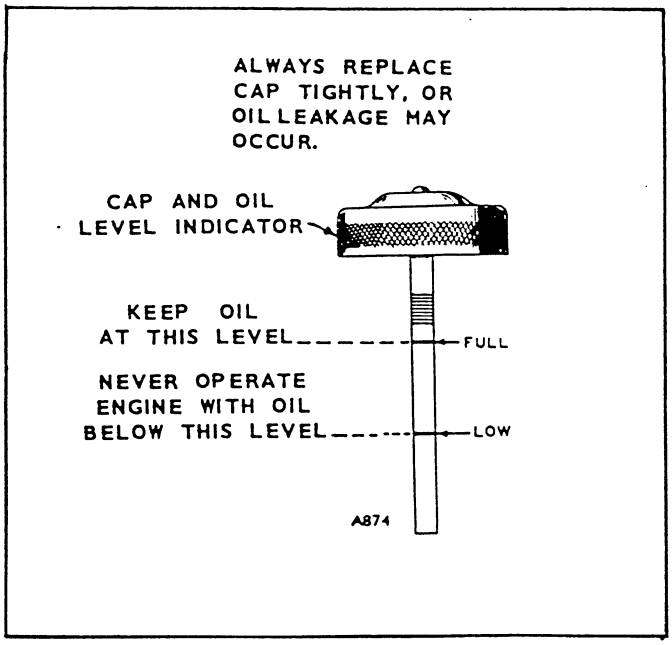


FIGURE 13. OIL LEVEL INDICATOR

AIR CLEANER

Fill to level indicated on cup. Use the same type of oil as used in crankcase.

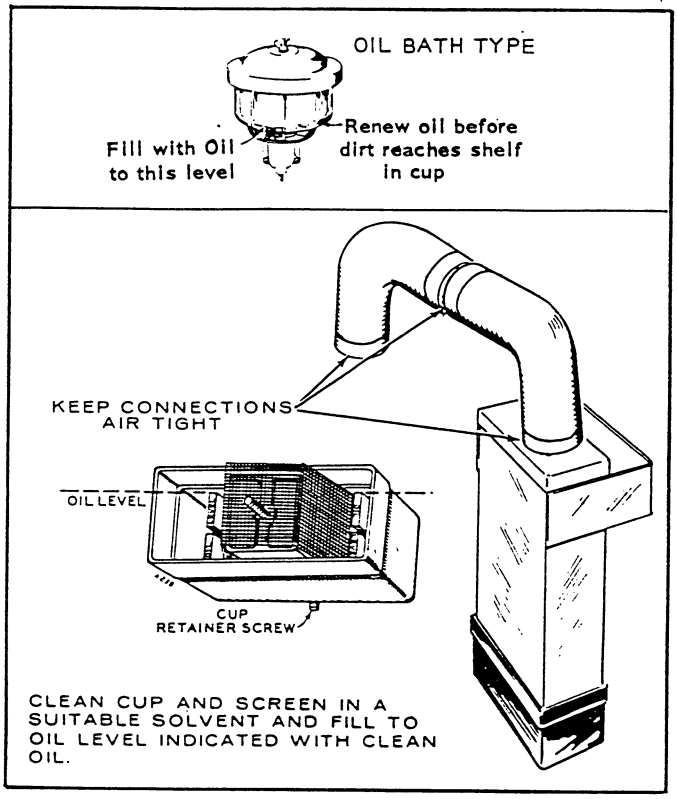


FIGURE 14. AIR CLEANER

BREATHER VALVE

Remove the hose which carries expelled air from the breather valve at the valve compartment cover, to the carburetor adapter. Loosen the valve with pliers. Occasionally the valve will lift out and remain inside the hose. Wash the valve in kerosene or other suitable solvent. Dry and replace. The valve must work free and the hose must not be restricted to prevent expelled air from reentering the crankcase. Install parts removed.

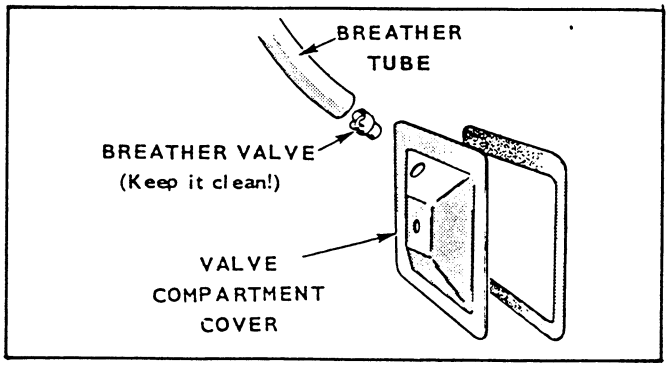


FIGURE 15. BREATHER VALVE

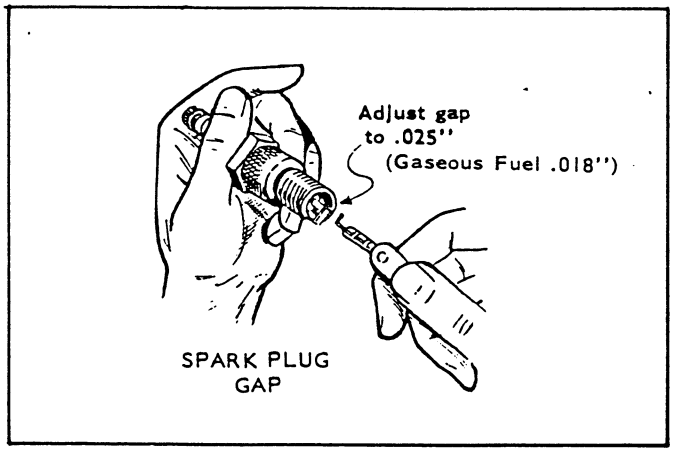


FIGURE 16. SPARK PLUG GAP

GOVERNOR LINKAGE

The linkage must be able to move freely through its entire travel. Every 50 hours of operation, clean the plastic joints (do not lubricate) as shown in Figure 17. Also inspect the linkage for binding, excessive slack and wear.

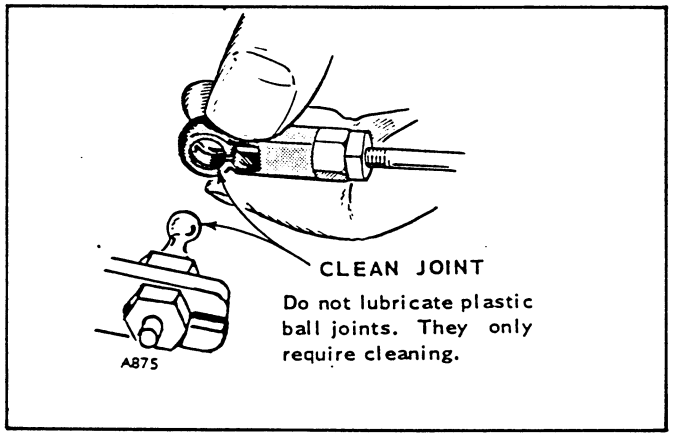


FIGURE 17. GOVERNOR BALL JOINTS

FUEL SEDIMENT

Empty carburetor and fuel filter (strainer) bowls of any accumulated sediment. Clean filter screen thoroughly. Reassemble and check for leaks.

GENERATOR MAINTENANCE

The generator normally needs little care other than a periodic check of the brushes, commutator and collector rings. If a major repair job on the generator should become necessary, have the equipment checked by a competent electrician who is thoroughly familiar with the operation of electric generating equipment.

Brushes

Install new commutator brushes and other rectangular brushes when the old ones are worn to 5/8" or less in length. The collector ring brush may be used until worn to 5/16" in length. It is not necessary to remove the brush rig to install new brushes. Remove the end cover to expose the brush rig. Brushes and leads are then easily accessible. New brushes are shaped to fit and seldom need sanding to seat properly. Always use the correct brush as listed in the parts list, never substitute a brush which may appear to be the same, but may have different electrical characteristics. Be sure to tighten the brush lead terminal nuts. If some brush sparking occurs after replacing brushes, run the plant at a light load until the brushes wear to a good seat.

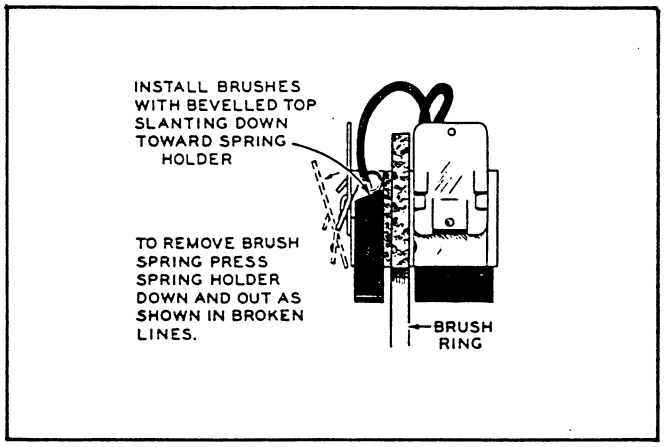


FIGURE 18. BRUSH SPRING INSTALLATION

Collector Rings

Collector rings acquire a glossy brown finish in normal operation. Do not attempt to maintain a bright newly machined appearing surface. Ordinary cleaning with a dry, lint free cloth is usually sufficient. Very fine sandpaper (#00) may be used to remove slight roughness. Use only light pressure on the sandpaper, while the plant is operating. Do not use emery or carborundum paper or cloth. Clean out all carbon dust from the generator.

MAINTENANCE SCHEDULE

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

CAUTION *Generator brushes must be kept clean and free – check often.*

OPERATOR MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	OPERATIONAL HOURS			
	8	50	100	200
Inspect Plant	x			
Check Fuel	x			
Check Oil Level	x			
Check Air Cleaner		x1		
Clean Governor Linkage		x1		
Check Spark Plug			x	
Change Crankcase Oil			x1	
Clean Crankcase Breather				x
Clean Fuel System				x
Check Battery				x

x1 - Perform more often in extremely dusty conditions.

For any abnormalities in operation, unusual noises from engine or generator, loss of power, overheating, etc., contact your Onan dealer.

CRITICAL MAINTENANCE SCHEDULE

MAINTENANCE ITEMS	OPERATIONAL HOURS			
	200	500	1000	5000
Check Breaker Points	x			
Clean Commutator and Collector Rings	x1			
Check Brushes	x2			
Remove Carbon & Lead		x		
Check Valve Clearance		x		
Clean Carburetor		x		
Clean Generator			x	
Remove & Clean Oil Base			x	
Grind Valves			x	
General Overhaul				x

x1 - Perform more often in extremely dusty conditions.

x2 - Replace collector ring brushes when worn to 5/16" or less –Replace all commutator brushes when worn to 5/8" or less.

PARTS CATALOG

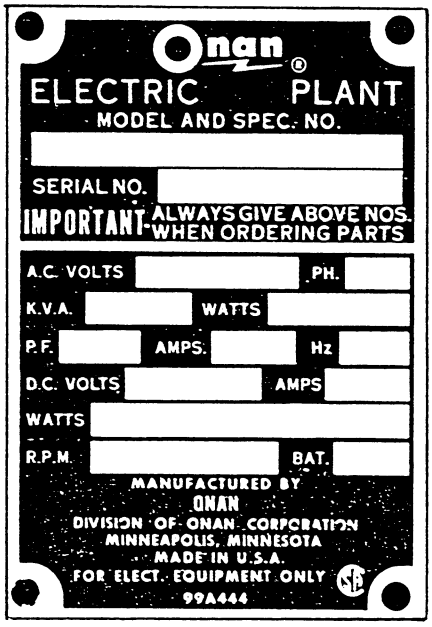
INSTRUCTIONS FOR ORDERING REPAIR PARTS

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 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".

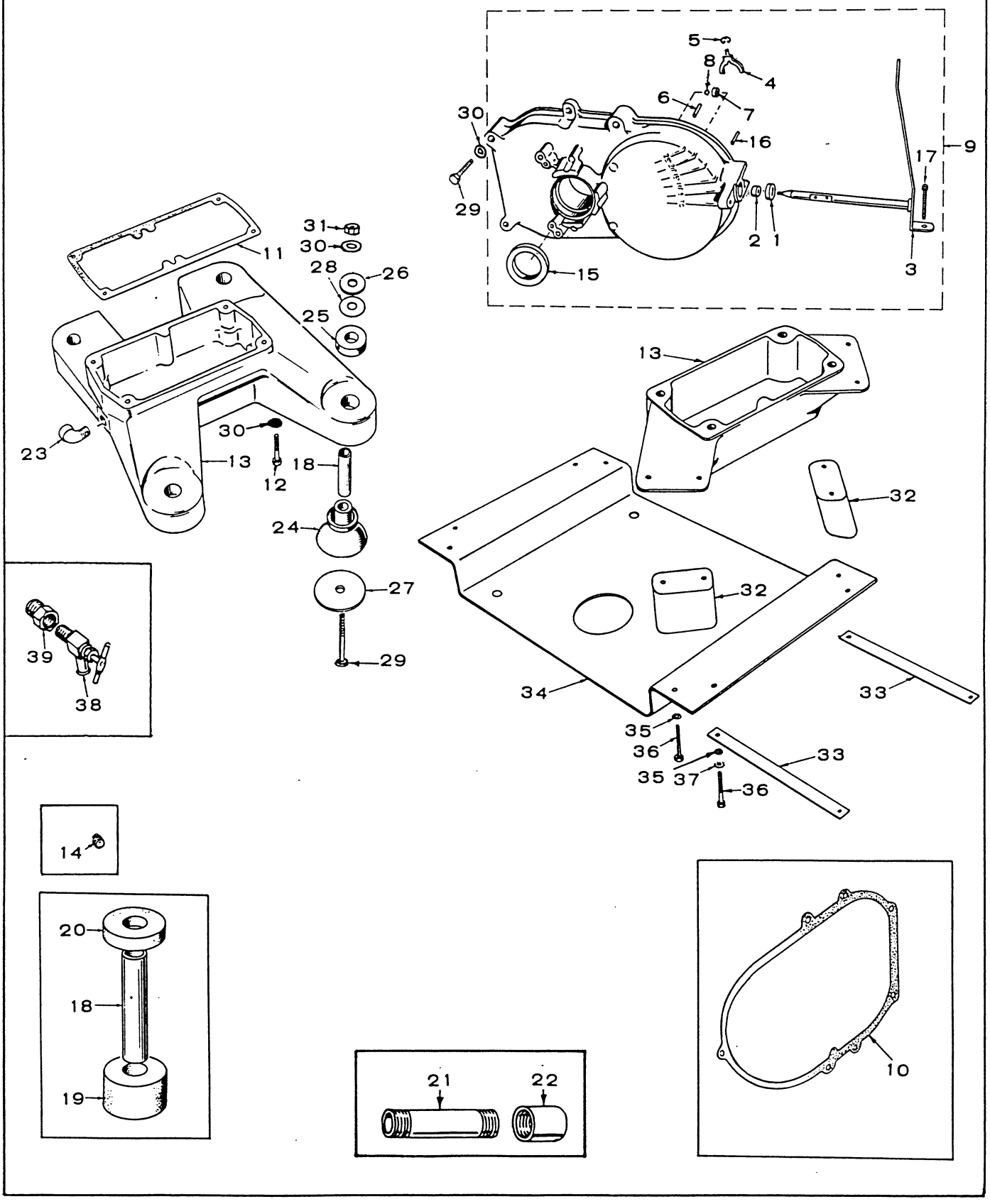
This catalog applies to the LK series Mobile Application Generator Plants (120volt only). Parts are arranged in groups of related items. Each illustrated part is identified by a reference number corresponding to the same reference number below the illustration. Parts illustrations are typical. Right and left plant sides are determined by FACING the engine end (front) of the plant. Spec Letter advances with manufacturing changes (A to B, B to C, etc.).

NOTICE

The Onan part numbering system has been changed to computerize the numbers. Letter in the number will be replaced with a dash (–) and number after the dash will be zero filled. Parts invoices will have the new computerized number, part remains the same. Parts catalogs will be revised as time permits.

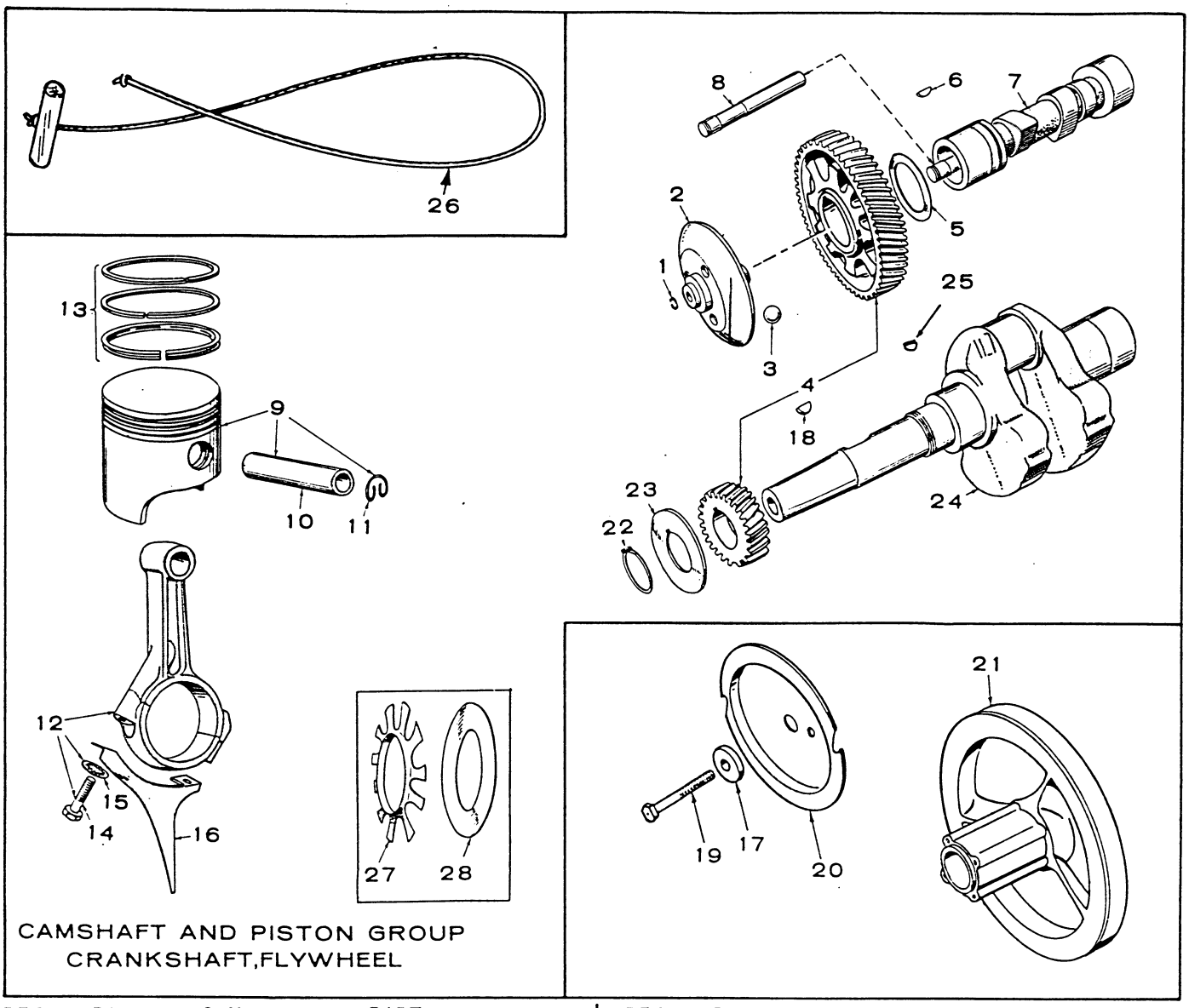
EXAMPLE:	Old Number	New Number
	101A86	101-0086
	110A1895	110-1895

GEAR COVER AND OIL BASE GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	509P8	1	Seal, Oil, Governor Shaft
2	510P13	1	Bearing, Governor Shaft (Upper)
3	150B610	1	Shaft & Arm, Governor
4	150A620	1	Yoke, Governor Shaft
5	518-129	1	Ring, Yoke, Retainer
6	516-130	1	Pin, Governor, Cup Stop (in Gear Cover)
7	510A8	1	Bearing, Governor Shaft (Lower)
8	510P14	1	Ball, Bearing, Governor Shaft
9	103C160	1	Cover Assembly, Gear
10	103B11	1	Gasket, Gear Cover
11	102B107	1	Gasket, Oil Base Mounting
12	800-56	4	Screw, Cap - Oil Base to Block
13	BASE, OIL		
	102D100	1	Spec A through E
	102D625	1	Begin Spec F
	102D690	1	Used on Plants with Focalized Mounts - Optional
14	505-110	1	Plug, Oil Drain - Early Models
15	509A40	1	Seal, Gear Cover
16	516A11	2	Pin, Gear Cover (5/16 " x 1-1/8 ")
17	150A136	1	Stud, Governor Sensitivity
18	BUSHING, SPACER MOUNTING CUSHIONS		
	402A148	4	Spec A through E
	402A290	4	*Begin Spec F
19	402A146	4	Cushion, Mounting - Lower - Spec A through E
20	402A147	4	Cushion, Mounting - Upper - Spec A through E
21	505-76	1	Nipple, Oil Drain - Spec A through E
22	505-28	1	Coupling, Oil Drain - Spec A through E
23	505-120	1	Elbow, Street - Oil Drain - Begin Spec F
24	402B283	4	Cushion Mounting - Begin Spec F
25	402A282	4	*Snubber, Shock Mounting - Begin Spec F
26	526-14	4	*Washer (29/64 " I.D. x 1-1/2 " O.D. x 1/8 ") - Begin Spec F
27	526A195	4	*Washer (29/64 " I.D. x 3-1/4 " O.D. x 1/8 ") - Begin Spec F
28	526A198	As Req.	*Washer (5/8 " I.D. x 1-1/2 " O.D. x 1/16 ") - Begin Spec F
29	SCREW, HEX CAP		
	800-32	4	Gear Cover Mounting - 5/16-18 x 1-3/4 "
	800-34	1	Gear Cover Mounting - 5/16-18 x 2-1/4 "
	800-82	4	*Plant Mounting
30	LOCKWASHER		
	850-50	4	Oil Base Mounting
	850-45	5	Gear Cover Mounting
	850-55	4	*Plant Mounting
31	862-4	4	*Nut, Hex - Plant Mounting
32	402B385	4	Mount, Focalized - Optional
33	402A387	4	Strap, Restrainer - Used with Focalized Mounts - Optional
34	403C979	1	Tray, Plant Mounting - Used with Focalized Mounts - Optional
35	526-158	16	Washer, Flat - Focalized Mount Mounting - Optional
36	SCREW, FOCALIZED MOUNT MOUNTING - Optional		
	800-3	6	1/4-20 x 1/2 "
	800-5	10	1/4-20 x 3/4 "
37	853-13	16	Washer, Shakeproof - Focalized Mount Mounting - Optional
38	504-92	1	Valve, Oil Drain - Late Models
39	505-19	1	Bushing, Oil Drain - Used with Drain Valve - Late Models
	402B364	1	Hardware Set, Mounting - Includes 4 Each of the Parts Marked *

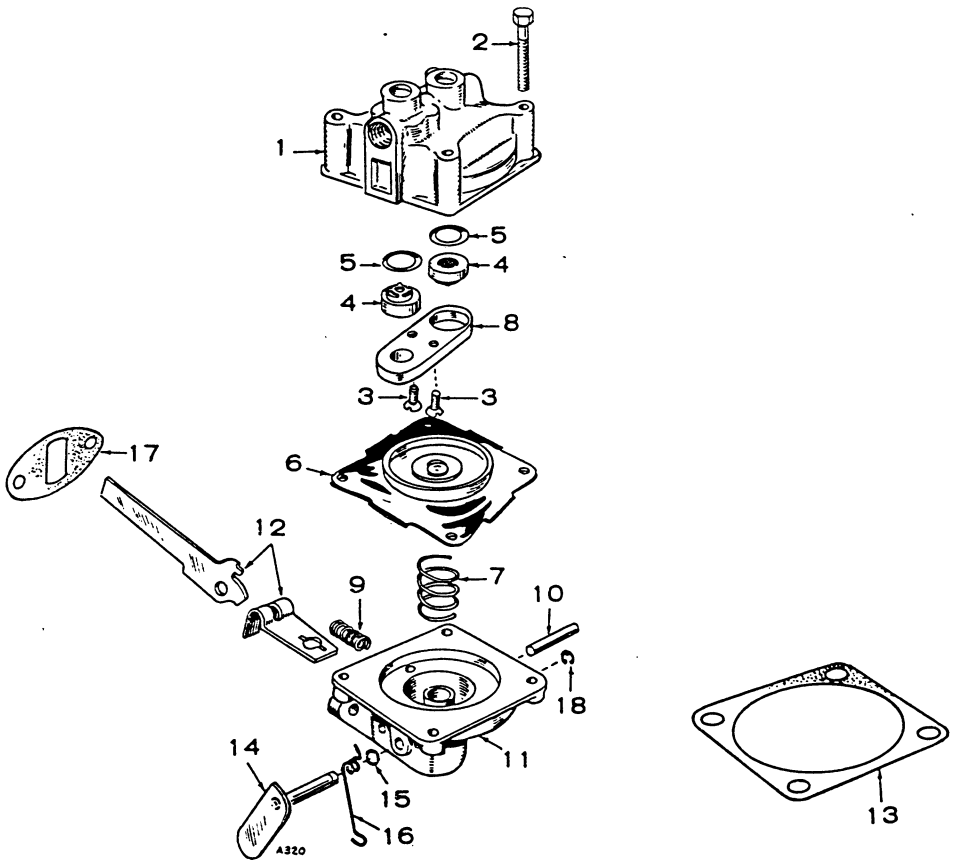
* - Included in Mounting Hardware Set.



CAMSHAFT AND PISTON GROUP
CRANKSHAFT,FLYWHEEL

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	150A78	1	Ring, Camshaft Center Pin
2	150A612	1	Cup, Governor
3	510-15	10	Ball, Fly, Governor
4	105A353	1	Gear Set, Timing, Includes 1 ea. (Includes Flyball Spacer and Plate)
5	105A4	1	Washer, Camshaft Gear Thrust
6	515-1	1	Key, Camshaft Gear Mounting
7	105-141	1	Camshaft (Includes Center Pin)
8	150A75	1	Pin, Center, Camshaft
9	PISTON & PIN (INCLUDES RETAINING RINGS)		
	112-71	1	Standard
	112-71-05	1	.005″ Oversize
	112-71-10	1	.010″ Oversize
	112-71-20	1	.020″ Oversize
	112-71-30	1	.030″ Oversize
	112-71-40	1	.040″ Oversize
10	PIN, PISTON		
	112A69	1	Standard
	112A69-02	1	.002″ Oversize
11	112A3	2	Ring, Piston Pin Retaining
12	ROD, CONNECTING (INCLUDES LOCK WASHERS & SCREWS)		
	114B107	1	Standard
	114B107-10	1	.010″ Undersize
	114B107-20	1	.020″ Undersize
	114B107-30	1	.030″ Undersize

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
13	RING SET, PISTON		
	113A87	1	Standard
	113A87-05	1	.005″ Oversize
	113A87-10	1	.010″ Oversize
	113A87-20	1	.020″ Oversize
	113A87-30	1	.030″ Oversize
	113A87-40	1	.040″ Oversize
14	110A284	2	Screw, Hex Cap - Connecting Rod Cap
15	114A59	2	Washer, Connecting Rod - Locking
16	114B108	1	Dipper, Oil
17	526A17	1	Washer, Wheel Mounting
18	515-2	1	Key, Wheel Mounting
19	104A170	1	Screw, Wheel Mounting
20	192B272	1	Sheave, Starter Rope
21	104D615	1	Flywheel
22	518-14	1	Lock, Crankshaft Gear Washer
23	104A43	1	Washer, Crankshaft Gear Retaining
24	104D272	1	Crankshaft
25	515-1	1	Key, Crankshaft Gear Mtg.
26	192A23	1	Rope, Manual Starting
27	150B1257	1	Spacer, Governor Flyball
28	150A77	1	Plate, Governor Flyball

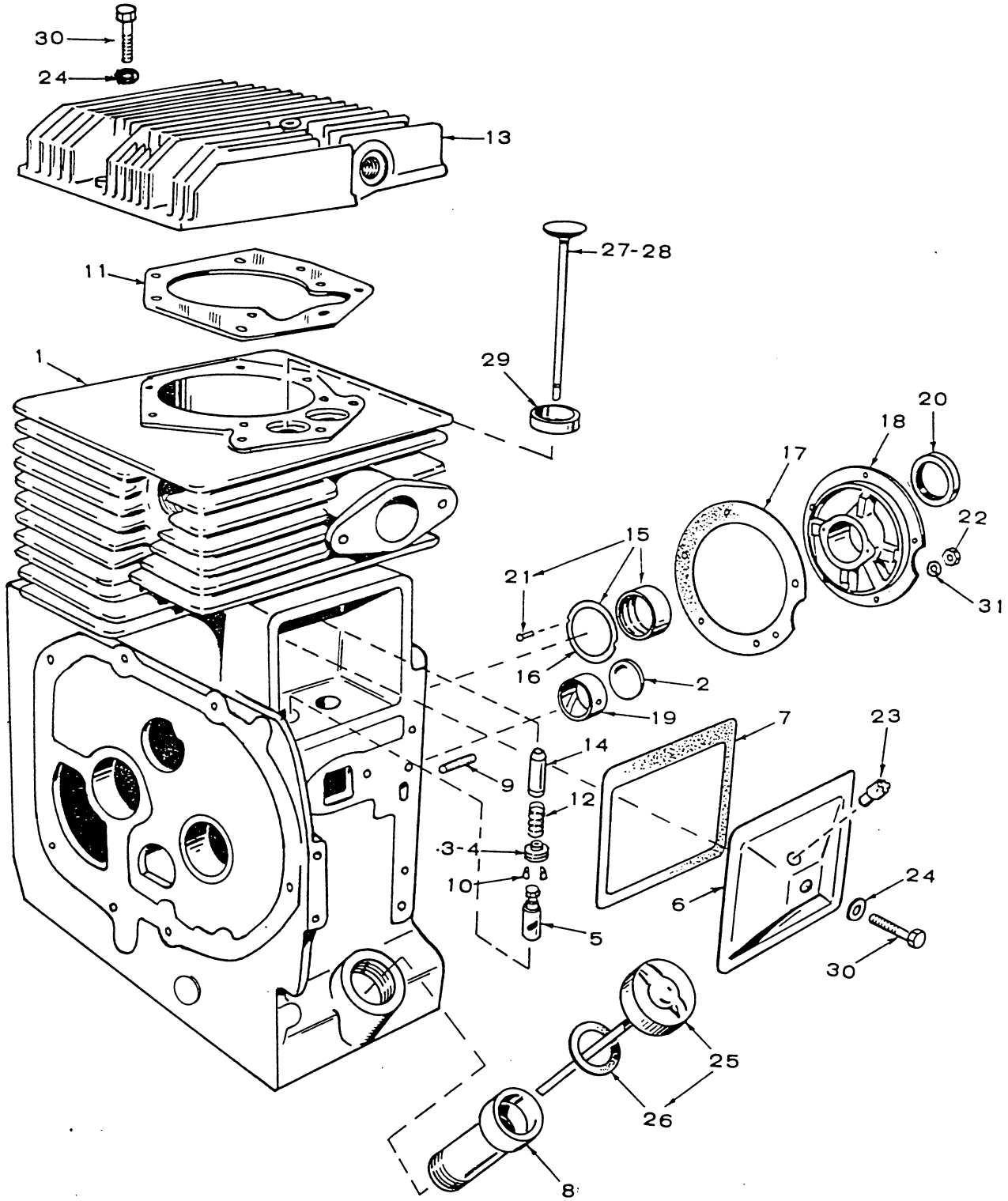


FUEL PUMP PARTS GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	149D693	1	Pump, Fuel
	149K526	1	Kit, Fuel Pump Repair - Includes Parts Marked *
1			Body, Upper (Not Sold Separately)
2	815-148	4	Screw, Slotted Head (3-32 x 7/8)
3	815-147	2	Screw, Phillips Flat Head (6-32 x 5/8)
4	149-96	2	*Valve & Cage
5	149A95	2	*Gasket, Valve
6	149A582	1	*Diaphragm Assembly
7	149A672	1	Spring, Diaphragm
8	149A539	1	Retainer, Valve Cage
9	149A675	1	*Spring, Rocker Arm
10	516A113	1	Pin, Rocker Arm
11			Body, Lower - (Not Sold Separately)
12	149-710	1	Arm & Link, Rocker
13	149A858	1	▲Gasket, Diaphragm - Optional
14	149A551	1	Lever, Hand Primer
15	509-65	2	Seal, "O" Ring
16	149A404	1	Spring, Priming Lever
17	149A3	1	*Gasket, Fuel Pump Mounting
18	518-129	1	Ring, Retainer - Primer Lever

* - Parts Included in 149K526 Repair Kit.
▲ - Used on some models to prevent air leak.

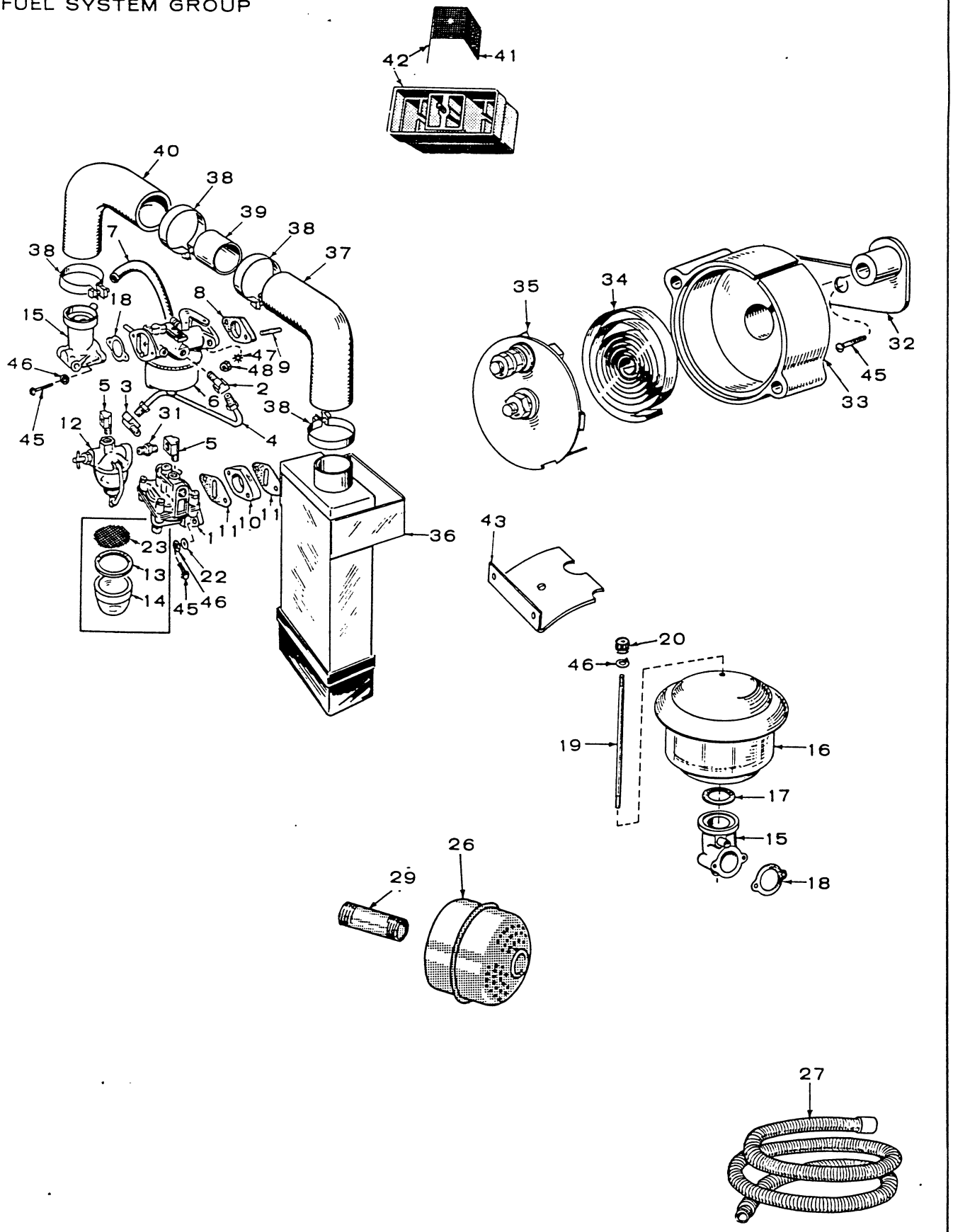
CYLINDER BLOCK GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	110A1622	1	Block Assembly, Cylinder (Includes Parts Marked *)
2	517-48	1	*Plug, Expansion - Camshaft
3	110A904	1	Rotocap, Valve - Exhaust
4	110A893	1	Retainer, Valve Spring Intake
5	TAPPET, VALVE		
	115A6	2	Standard
	115A6-05	2	.005" Oversize
6	110A1595	1	Cover, Valve Compartment
7	110A667	1	Gasket, Valve Cover
8	123A517	1	Tube, Oil Fill
9	*STUD, REAR BEARING PLATE MOUNTING		
	520A114	4	5/16" x 1-5/16"
	520A532	1	5/16" x 1-3/16"
10	110A639	4	Lock, Valve & Spring Retaining
11	110A892	1	Gasket, Cylinder Head
12	110A539	2	Spring, Valve
13	HEAD, CYLINDER		
	110D891	1	Gasoline Fueled Plants
	110D883	1	Gas Fueled Plants
14	110A902	2	*Guide, Valve
15	*BEARING, CRANKSHAFT		
	101K420	2	Standard
	101K420-02	2	.002" Undersize
	101K420-10	2	.010" Undersize
	101K420-20	2	.020" Undersize
	101K420-30	2	.030" Undersize
16	104A575	2	*Washer, Crankshaft Bearing Thrust
17	101K115	1	*Gasket Kit, Bearing Plate
18	101C396	1	*Plate, Rear Bearing (Excluding Bearing)
19	101A367	2	*Bearing, Camshaft Front & Rear (Precision)
20	509A41	1	Seal, Bearing Plate
21	516A72	4	*Pin, Main Bearing Stop
22	110A445	5	*Nut, Bearing Plate Stud
23	123A486	1	Valve, Breather
24	WASHER, FLAT		
	526-63	1	Valve Compartment Cover (Copper)
	526A122	9	Cylinder Head Mounting
25	123A519	1	Cap & Indicator, Oil Fill
26	123A191	1	Gasket, Oil Fill Cap
27	110B881	1	Valve, Intake
28	110B880	1	Valve, Exhaust (Stellite)
29	*INSERT, EXHAUST VALVE SEAT (STELLITE)		
	110A872	1	Standard
	110A872-02	1	.002" Oversize
	110A872-05	1	.005" Oversize
	110A872-10	1	.010" Oversize
	110A872-25	1	.025" Oversize
30	SCREW, HEX HEAD CAP		
	110A879	4	Cylinder Head (5/16-18 x 1-1/4")
	114A22	5	Cylinder Head (5/16-18 x 1-3/4")
	800-15	1	Valve Compartment Cover
31	850-45	5	Washer, Lock - Bearing Plate Mounting (5/16")

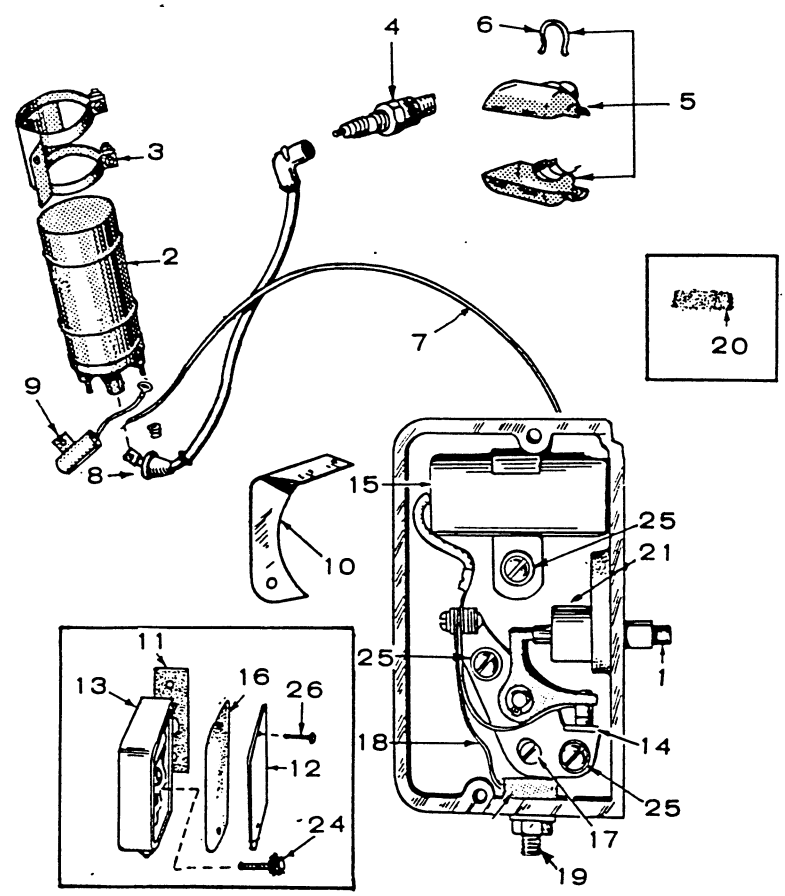
* - Included in 110A1622 Block Assembly.

FUEL SYSTEM GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	149K526	1	Repair Kit, Fuel Pump
1	149D693	1	Pump, Fuel
2	502-2	1	Elbow, Carburetor Inlet
3	502-2	1	Elbow, Fuel Pump Outlet
4	149A1112	1	Line, Fuel, Pump to Carburetor
5	502-20	2	Elbow (1) Fuel Filter (1) Fuel Pump Inlet
6	146C140	1	Carburetor, Gasoline (Separate Group for Components)
7	503A271	1	Hose, Breather (5/16 ″ I.D. x 5-1/4 ″)
8	145B110	1	Gasket, Carburetor Mounting
9	520A632	2	Stud, Carburetor Mounting
10	149A45	1	Spacer, Pump Mounting
11	149A3	2	Gasket, Pump Mounting
12	149B79	1	Filter, Fuel
13	149-149	1	Gasket, Filter Bowl
14	149-150	1	Bowl, Fuel Filter
15	140B493	1	Adapter, Air Cleaner
16	140B441	1	Cleaner, Air - Oil Bath - Spec A through F
17	140A443	1	Gasket, Air Cleaner - Spec A through F
18	145A111	1	Gasket, Adapter to Carburetor
19	520A538	1	Stud, Air Cleaner - Spec A through F
20	140P587	1	Nut, Air Cleaner - Plastic - Spec A through F
22	526-63	2	Washer (Copper) , Pump Mtg.
23	149-202	1	Screen, Fuel Filter
26	MUFFLER, EXHAUST		
	155B484	1	Spec A through E
	155B76	1	Begin Spec F
27	155B491	1	Tube, Exhaust, Flexible
29	NIPPLE, EXHAUST		
	505-87	1	1 ″ x 3 ″ - Spec A through E
	505-89	1	1 ″ x 5 ″ - Begin Spec F

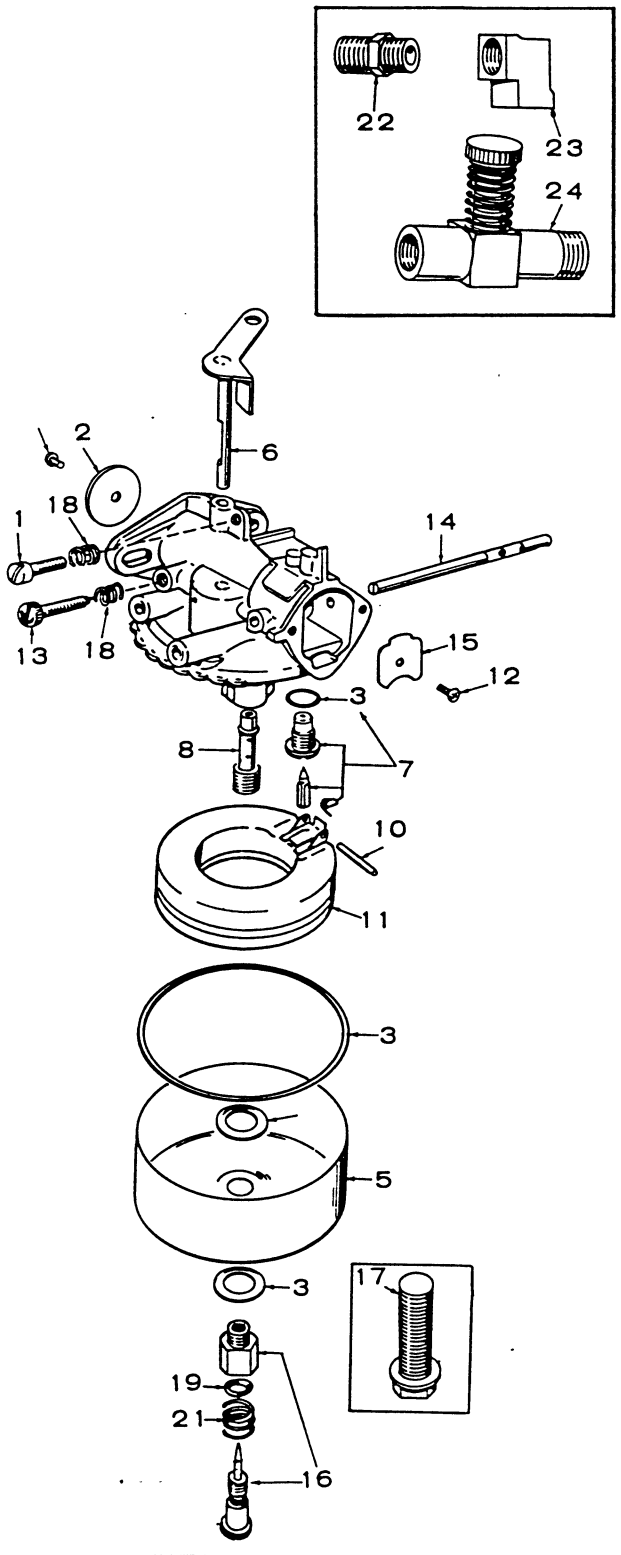
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
31	502-82	1	Nipple, Fuel Filter
32	153A420	1	Adapter, Electric Choke
33	153A440	1	Bracket, Electric Choke
34	153A17	1	Element, Choke Bimetal
35	153A113	1	Cover Assembly, Choke (12 Volt Element)
36	140C1030	1	Cleaner, Air - Begin Spec G
37	503A567	1	Hose, Air Cleaner - Begin Spec G
38	503A280	4	Clamp, Air Cleaner Hose - Begin Spec G
39	140A211	1	Tube, Air Cleaner Hose - Begin Spec G
40	503A464	1	Hose, Air Cleaner - Begin Spec G
41	140A68	1	Screen, Air Cleaner - Begin Spec G
42	140K403	1	Cup Assembly, Air Cleaner (Includes Screen) - Begin Spec G
43	140A1060	1	Bracket, Air Cleaner Mtg. - Begin Spec H
45	SCREW, ROUND HEAD		
	815-222	2	Fuel Pump Mounting - (1/4-20 x 1-1/4 ″)
	812-82	2	Air Cleaner Adapter Mtg. - (#8-32 x 3/4 ″)
	815-190	2	Choke Adapter Mounting - (#8-32 x 3/8 ″)
46	WASHER, LOCK		
	850-30	1	Air Cleaner - Spec A through F (#10)
	850-40	2	Fuel Pump Mounting (1/4 ″)
	850-25	2	Air Cleaner Adapter Mounting (#8)
47	853-13	2	Washer, Shakeproof - Carburetor Mounting (1/4 ″)
48	868-1	2	Nut, Hex - Carburetor Mounting (1/4-28)



IGNITION GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	160A262	1	Plunger, Assembly Breaker (Includes Plunger, Diaphragm, and Guide)
2	166B278	1	Coil, Ignition
3	166B433	1	Bracket, Coil Mounting
4	167-241	1	Plug, Spark
5	167A139	1	Shield, Spark Plug - Includes Clamp - Early Models
6	167A64	1	Clamp, Spark Plug Shield - Early Models
7	334-28	1	Lead, 4 Ft. Piece of Wire
8	167A1565	1	Cable, Spark Plug
9	312A58	1	Condenser, 0.1 Mfd. - Ignition Coil
10	160B500	1	Bracket, Timing - Vacu-Flo Plant
11	160A1152	1	Gasket, Breaker Box Mounting
12	160A930	1	Cover, Breaker Box
13	160A257	1	Box Assembly, Ignition Breaker - Includes Cover & Gasket
14	160A2	1	Point Set, Breaker
15	312A69	1	Condenser, Breaker Points
16	160A150	1	Gasket, Breaker Box Cover
17	160A75	1	Cam, Point Gap Adjusting
18	160A428	1	Strap, Point Set to Terminal Block
19	160A349	1	Block & Terminal Assembly
20	160A261	1	Wick, Breaker Box Oil Drain - Used on some older models.
21	160A263	1	Diaphragm, Breaker Plunger
24	815P353	2	Screw, Round Head - Breaker Box Mounting (Includes Washer)
25	518-49	3	Screw, Breaker Points and Condenser Mounting
26	812-77	2	Screw, Breaker Box Cover

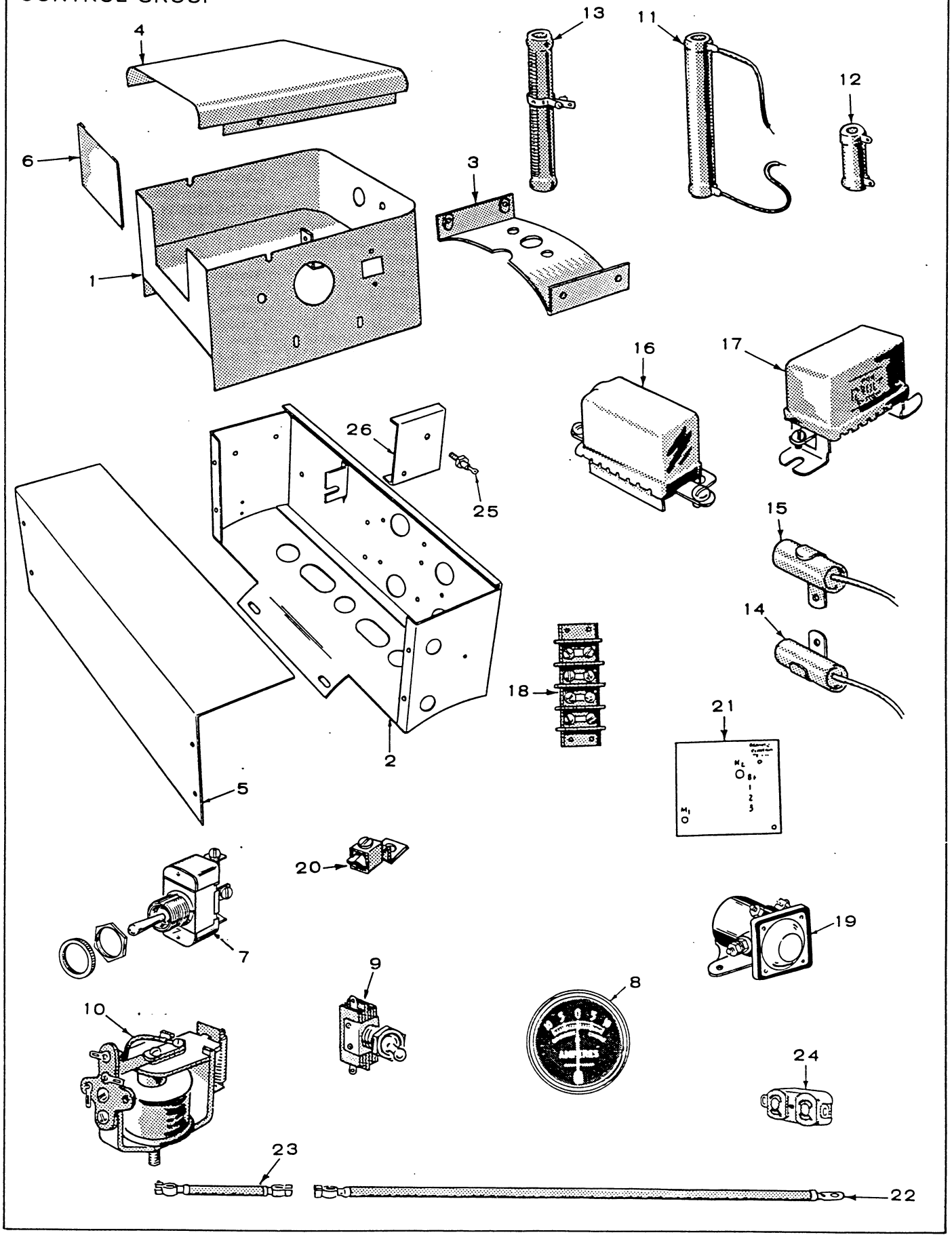
CARBURETOR (WALBRO) PARTS GROUP



REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
	146C140	1	Carburetor, Gasoline
	146C132	1	Carburetor, Gas-Gasoline
	146C127	1	Carburetor, Gas
	REPAIR KIT, CARBURETOR (NOTE: This kit doesn't apply to Gas Carburetors) - INCLUDES PARTS MARKED *		
	146P123	1	Gas-Gasoline Carburetor
	146P149	1	Gasoline 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	*FLOAT VALVE, SEAT & GASKET PACKAGE		
	146P115	1	Gas-Gasoline Carburetor
	146P145	1	Gasoline Carburetor
8	146P113	1	Nozzle (Gasoline Carburetors)
10	146P111	1	*Shaft, Float (Gasoline and Gas-Gasoline Carburetors)
11	146P110	1	Float Assembly (Gasoline and Gas-Gasoline Carburetors)
12	146P109	2	Screw & Washer (One only for Gas Carburetors)
13	146P116	1	*Needle, Idle (Gasoline and Gas-Gasoline Carburetors)
14	SHAFT, ASSEMBLY, CHOKE		
	146P107	1	Gasoline Carburetors
	146P106	1	Gas-Gasoline Carburetors
15	146P104	1	Valve, Choke (Gasoline Carburetors)
16	146P102	1	*Needle Assy., High Speed (Gasoline and Gas-Gasoline Carburetors)
17	146P103	1	Screw, Bowl Retainer (Gas Only Carburetors)
18	146P121	2	Spring, Throttle Stop Screw and Idle Screw
19	146P120	1	Seal, "O" Ring - High Speed Needle (Gasoline and Gas-Gasoline Carburetors)
21	146P117	1	Spring, High Speed Needle (Gasoline and Gas-Gasoline Carburetors)
22	502-82	1	Nipple - Gas (Gas and Gas-Gasoline Carburetors)
23	502-55	1	Elbow Gas (Gas and Gas-Gasoline Carburetors)
24	148P178	1	Adjustment Assy., Gas (Gas and Gas-Gasoline Carb.)
25	146P142	1	Screw Assy. & Washer (Gasoline Carburetors)
26	146P143	1	Baffle, Splash (Gasoline Carburetors)

* - Included in Repair Kit.

CONTROL GROUP

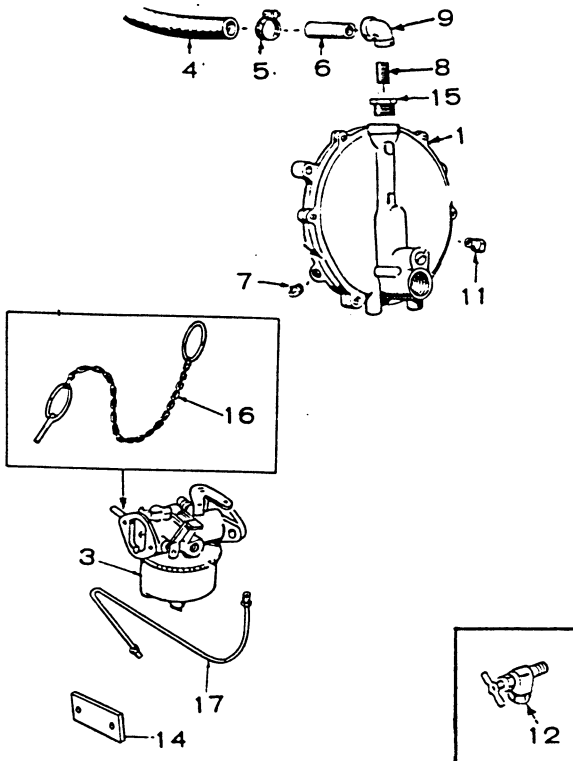


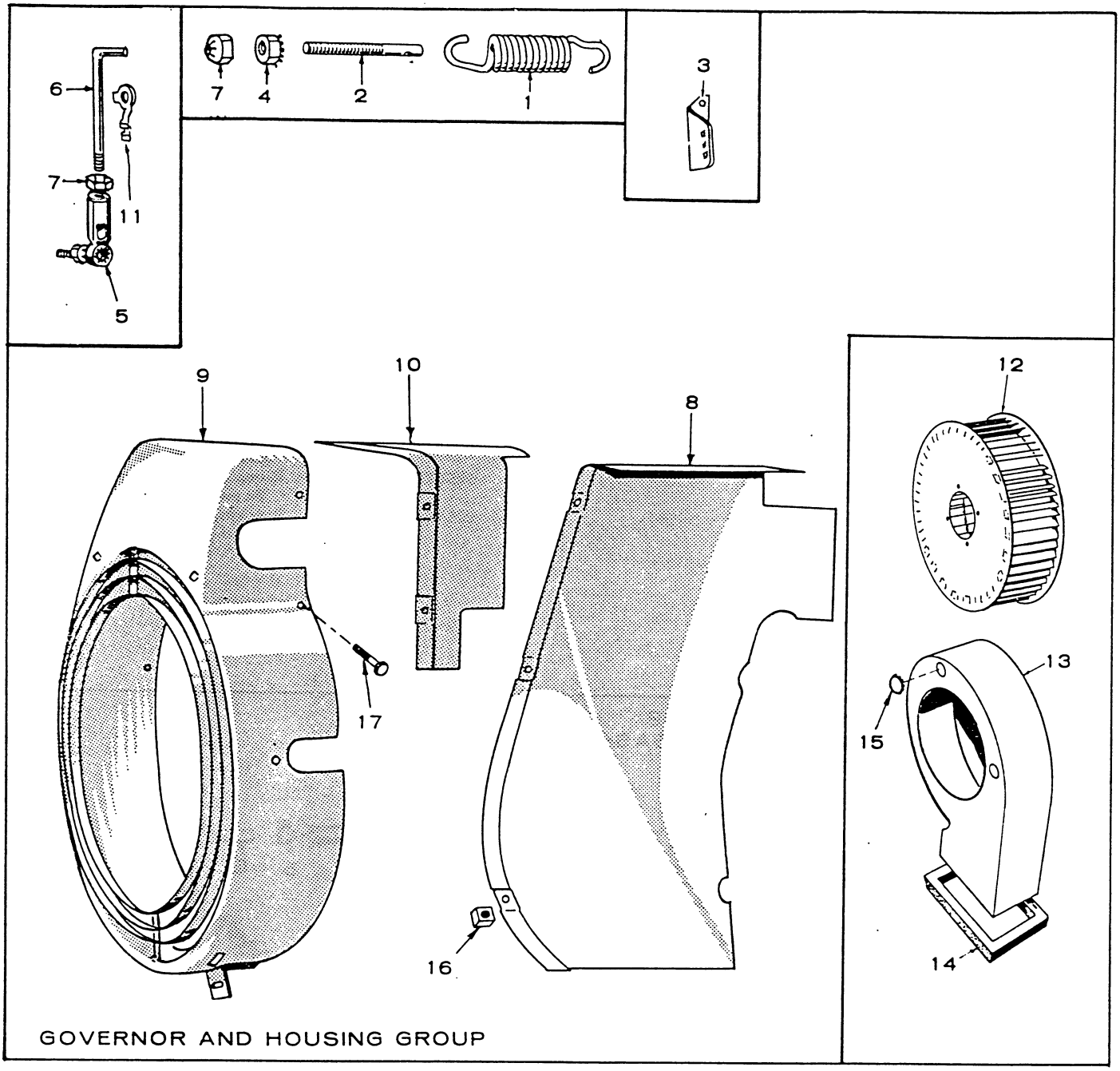
REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	301C1160	1	Box, Control - Includes Panel & Resistor Bracket - Spec A through G
2	301D3101	1	Box, Control - Begin Spec H
3	301B1198	1	Bracket, Control Box Mounting - Spec A through G
4	301C1244	1	Cover, Control Box - Spec A through G
5	301D3102	1	Cover, Control Box - Begin Spec H
6	301B1271	1	Plate, End - Spec A through G
7	308P154	1	Switch, Start-Stop
8	302-58	1	Ammeter, Charge (10-0-10)
9	308-2	1	Switch, Toggle - Manual, Electric Start
10	307B253	1	Relay, Stop
11	304-251	1	Resistor, Fixed (30-Ohm, 5-Watt)
12	304A344	1	Resistor, Fixed (1-Ohm, 25-Watt)
13	304-175	1	Resistor, Adjusting (1-Ohm, 50-Watt)
14	312A58	As Req.	Condenser, 0.1 Mfd. - Load Terminal
15	312A57	1	Condenser, 1 Mfd. - Start Solenoid
16	REGULATOR, VOLTAGE - CHARGE CIRCUIT		
	305A1	1	Spec A through G
	305B383	1	Begin Spec H
17	307B180	1	Relay, Reverse Current
18	332A537	1	Block, Terminal - Remote Control
19	SOLENOID, START		
	307B1046	1	Spec A through G
	307B845	1	Begin Spec H
20	TERMINAL, SOLDERLESS		
	332-142	1	Spec A through G
	332-517	1	Begin Spec H
21	MARKER, LOAD TERMINAL		
	332A540	1	Spec A through G
	332A566	1	Begin Spec H
22	416A77	2	Cable, Battery
23	416A4	1	Cable, Battery Jumper
24	RECEPTACLE, DUPLEX		
	323P184	As Req.	Two Parallel Blades, One Ground Pin
	323-213	As Req.	Two Tandem Blades, One Ground Pin
25	305B235	1	Diode, Reverse Current - Begin Spec H
26	305A254	1	Bracket, Diode Mounting - Begin Spec H

OPTIONAL FUEL SYSTEM GROUP (GAS AND COMBINATION GAS-GASOLINE)

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	148C311	1	Regulator, Gas (Garretson)
3	*CARBURETOR		
	146C132	1	Gas-Gasoline
	146C127	1	Gas Only
4	503-315	1	Hose, Regulator to Carb.
5	503P32	2	Clamp, Hose
6	505-302	1	Nipple, Half (1/4 x 1-1/2")
7	505-57	1	Plug, 1/8", Regulator
8	505-99	1	Nipple, (1/4 x 1/8"), Regulator Outlet
9	505-38	1	Elbow, (1/4") Regulator Outlet
11	148A107	1	Vent, Regulator
12	504-7	1	Valve, Shut-off (Fuel Pump Inlet) - Gas-Gasoline
14	149A136	1	Plate, Fuel Pump Hole Crankcase
15	505-17	1	Bushing, Reducer (3/8 x 1/4")
16	153A319	1	Pin, Choke Lock - Gas-Gasoline
17	149B943	1	Line, Fuel - Pump to Carb. (Gas-Gasoline Plants)
	148P390	1	Repair Kit, Gas Regulator (Garretson)

* - See separate group for components.

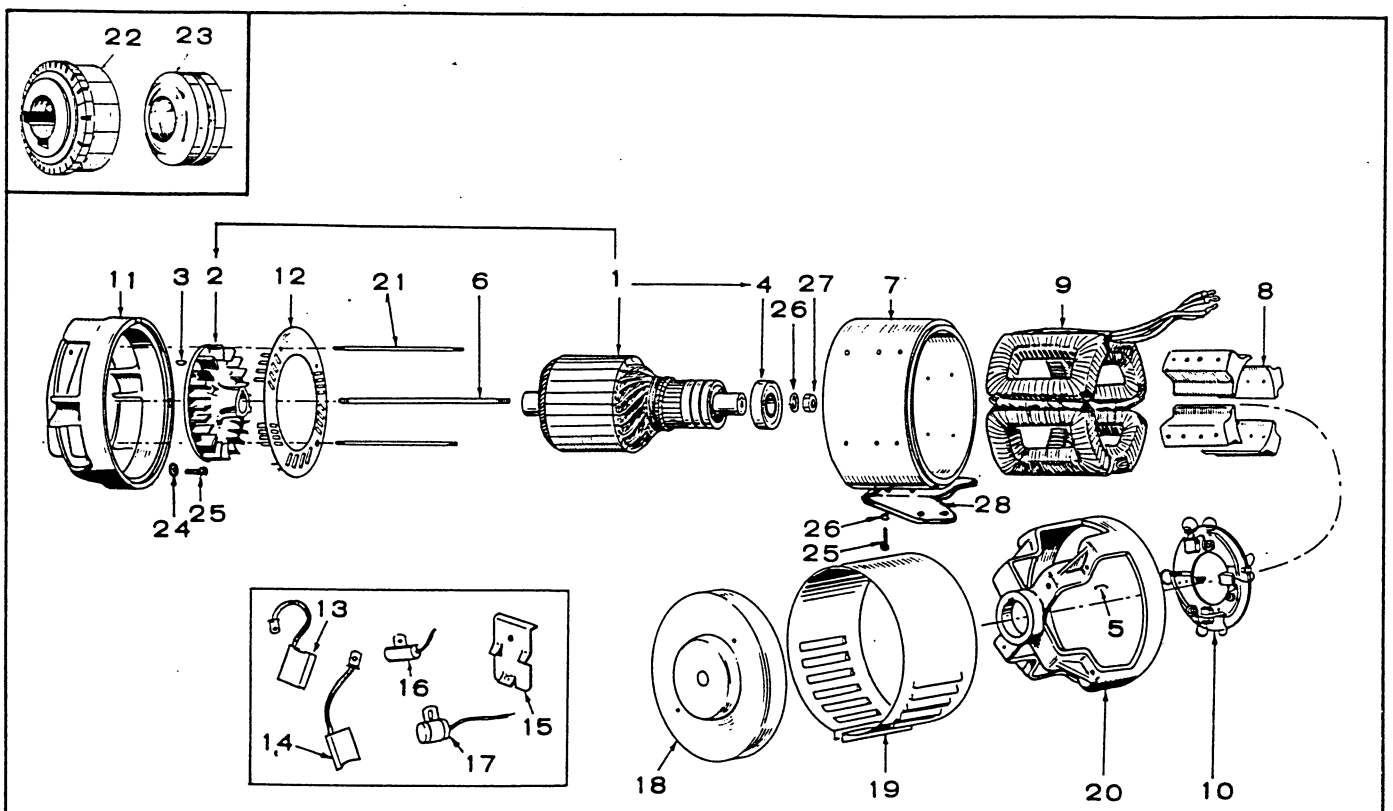




GOVERNOR AND HOUSING GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	150A98	1	Spring, Governor
2	150A96	1	Stud, Speed Adjusting
3	150A611	1	Bracket, Speed Stud
4	870-131	1	Nut, Speed Adjusting
5	150A974	1	Joint, Ball
6	150A732	1	Link, Throttle
7	870P188	2	Palnut, Locking
8	HOUSING, CYLINDER AIR		
	134D584	1	Standard Plants
	134D2380	1	Plants With Focalized Mounts - Optional
9	HOUSING, BLOWER		
	134C618	1	Standard Plants
	134C2379	1	Plants With Focalized Mounts - Optional

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
10	134C586	1	Cover, Cylinder Air
11	518-6	1	Clip, Governor Link to Carburetor
12	134B565	1	Wheel, Blower
13	SCROLL, BLOWER		
	134D564	1	Spec A through H
	134B2110	1	Begin Spec J
14	134A2112	1	Seal, Blower Scroll
15	517-21	3	Plug, Dot Button
16	870-107	6	Nut, Tinnerman - Housing Mounting
17	809-59	6	Screw, Sheet Metal - Housing Mounting



GENERATOR GROUP

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
1	*	1	Armature Assembly, Includes Bearing & Blower
2	205C53	1	Blower, Generator
3	515-6	1	Key, Blower to Crankshaft
4	510A47	1	Bearing (Ball), Armature
5	232A596	1	Clip, Bearing Stop
6	520A408	1	Stud, Armature Through
7	210C243	1	Frame Only, Generator (Machined & Drilled, Less Coils & Pole Shoe)
8	221A86	4	Shoe, Pole, Field
9	*	1	Coil Assembly, Field (Set of 4 Coils)
10	212C294	1	Rig Assembly, Brush
11	231B1006	1	Adapter, Generator to Engine
12	232B1256	1	Scroll, Air Baffle
13	214A50	4	Brush, Commutator
14	214A61	4	Brush, Collector Ring
15	212B1105	8	Spring, Brush
16	312A17	1	Condenser (.5Mfd.) DC
17	312A58	1	Condenser (.1Mfd.) AC
18	211C99	1	Cover, End Bell
19	234B2	1	Band, End Bell
20	211D97	1	Bell, End

REF. NO.	PART NO.	QTY. USED	PART DESCRIPTION
21	520A337	2	Stud, Generator Through
22	203A8	1	Commutator
23	204A9	1	Collector Ring
24	850-50	4	Lockwasher, Generator Adapter Mounting
25	SCREW, HEX CAP		
	800-33	2	Generator Foot Mounting - Plants With Focalized Mounts - Optional
	800-50	4	Generator Adapter Mounting (2/8-16 x 1 ″)
26	WASHER, LOCK		
	850-55	1	Armature Through Stud (7/16 ″)
	850-45	2	Generator Foot Mounting - Plants With Focalized Mounts - Optional (5/16 ″)
27	862-4	1	Nut, Armature through Stud
28	232D2285	1	Foot, Generator Mounting - Plants With Focalized Mounts - Optional

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

SERVICE KITS AND MISCELLANEOUS

98C1100	1	Decal Kit
168K65	1	Gasket Kit, Plant
522K240	1	Overhaul Kit, Plant
525P137	1	Paint, Touch-up (Pressurized Can) 16 oz. Silver Green (Metallic)
525-305	1	Paint, Touch-up (Pressurized Can) 13 oz. - Non-Metallic Green

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

CUSTOMER SERVICES

OWNER'S WARRANTY SERVICE -
ENGINE DRIVEN ELECTRIC GENERATOR SETS,
SEPARATE GENERATORS, INDUSTRIAL ENGINES

QUALITY OF PRODUCT

Onan products are engineered and designed to perform as stated on product nameplate and published specification. Only quality material and workmanship are 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-manufactured engine-driven electric generator sets, separate generators, and industrial engines are 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 or factory 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.

Warranty Registration: A Warranty Registration card accompanies each Onan Product. This card must be properly filled out and returned to the Onan Factory in order to qualify for warranty consideration as covered in this bulletin. When requesting warranty repair work you must provide the purchase date, Onan model and serial number of the equipment.

Warranty Authorization: Warranty service must be performed by Onan Factory or Onan Authorized Distributors or their Approved and Registered Service Dealers. A complete listing of these Onan Authorized Parts and Service Centers is provided in our brochure F-115, a copy of which is supplied with each Onan Product. These Onan Authorized Service Centers have trained service personnel, parts stock, and the necessary facilities and tools for the service and repair of Onan equipment.

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

Labor Allowance: Onan will allow warranty repair credit to the Onan Authorized Parts and Service Center and his Approved Dealer at straight time labor 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 owner. The Onan Division's Warranty practice does not provide for allowance of expenses such as start-up charges, communication charges, transportation charges, travel time and/or mileage, unit removal or installation expense, cost of fuel, oil, normal maintenance adjustments, tune-up adjustments or parts maintenance items.

Administration: Warranty of Onan Products is administered through Onan Authorized Distributors in whose territory the equipment is located. These Distributors and their Approved or Registered Onan Service 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 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.

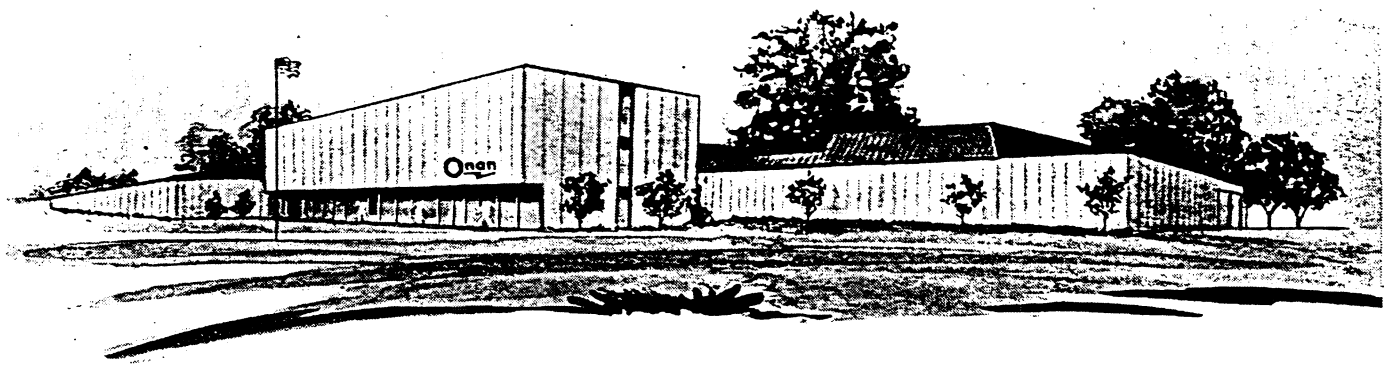
INSTALLATION

Installation is extremely important and all Onan Products should be installed in accordance with the manufacturer's recommendations. If the owner experiences any difficulty with such items as mounting, ventilation, exhaust location, fuel lines, wiring, etc., he should immediately contact the company from whom he purchased the equipment so that corrective action can be taken. Although the Onan Authorized Distributor and his Approved or Registered Service 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

Minneapolis, Minnesota 55432

MSS-22A
Replaces 23B054
Rev. 11-1-71



ONAN 1400 73RD AVENUE N.E. • MINNEAPOLIS, MINNESOTA 55432
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