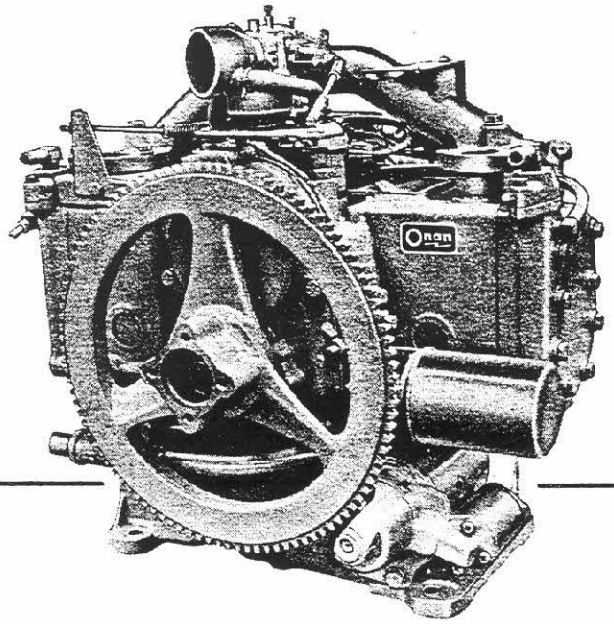
Onan

Service Manual

MCCK
RCCK
Engine



927-0752
RCCK SPEC A
MCCK Spec A-H
5-84
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Safety Precautions

It is recommended that you read your engine manual and become thoroughly acquainted with your equipment before you start the engine.

⚠WARNING ***This symbol is used throughout this manual to warn of possible serious personal injury.***

⚠CAUTION ***This symbol refers to possible equipment damage.***

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

Safety Codes

- All local, state and federal codes should be consulted and complied with.
- This engine is not designed or intended for use in aircraft. Any such use is at the owner's sole risk.

General

- Provide appropriate fire extinguishers and install them in convenient locations. Use an extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the engine are secure and accurately torqued. Keep guards in position over fans, driving belts, etc.
- If it is necessary to make adjustments while the engine is running, use extreme caution when close to hot exhausts, moving parts, etc.

Protect Against Moving Parts

- Do not wear loose clothing in the vicinity of moving parts, such as PTO shafts, flywheels, blowers, couplings, fans, belts, etc.
- Keep your hands away from moving parts.

Batteries

- Before starting work on the engine, disconnect batteries to prevent inadvertent starting of the engine.
- DO NOT SMOKE while servicing batteries. Lead acid batteries give off a highly explosive hydrogen gas which can be ignited by flame, electrical arcing or by smoking.
- Verify battery polarity before connecting battery cables. Connect negative cable last.

Fuel System

- DO NOT fill fuel tanks while engine is running.
- DO NOT smoke or use an open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.
- Fuel lines must be of steel piping, adequately secured, and free from leaks. Piping at the engine should be approved flexible line. Do not use copper piping for flexible lines as copper will work harden and become brittle enough to break.
- Be sure all fuel supplies have a positive shutoff valve.

Exhaust System

- Exhaust products of any internal combustion engine are toxic and can cause injury, or death if inhaled. All engine applications, especially those within a confined area, should be equipped with an exhaust system to discharge gases to the outside atmosphere.
- DO NOT use exhaust gases to heat a compartment.
- Make sure that your exhaust system is free of leaks. Ensure that exhaust manifolds are secure and are not warped by bolts unevenly torqued.

Exhaust Gas Is Deadly!

Exhaust gases contain carbon monoxide, a poisonous gas that might cause unconsciousness and death. It is an odorless and colorless gas formed during combustion of hydrocarbon fuels. Symptoms of carbon monoxide poisoning are:

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

If you experience any of these symptoms, get out into fresh air immediately, shut down the unit and do not use until it has been inspected.

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

Cooling System

- Coolants under pressure have a higher boiling point than water. DO NOT open a radiator pressure cap when coolant temperature is above 212 degrees F (100 degrees C) or while engine is running.

Keep The Unit And Surrounding Area Clean

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

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WARNING

INCORRECT SERVICE OR REPLACEMENT OF PARTS MIGHT RESULT IN SEVERE PERSONAL INJURY AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE.

General Information

INTRODUCTION

This manual deals with specific mechanical and electrical information needed by engine mechanics for troubleshooting, servicing, repairing, or overhauling the engine.

Use the table of contents for a quick reference to the separate engine system sections.

The troubleshooting guide is provided as a quick reference for locating and correcting engine trouble.

The illustrations and procedures presented in each section apply to the engines listed on the cover. The flywheel end of the engine is the front end so right and left sides are determined by viewing the engine from the front.

The disassembly section contains major overhaul procedures for step by step removal, disassembly, inspection, repair and assembly of the engine components.

If a major repair or an overhaul is necessary, a competent mechanic should either do the job or supervise and check the work of the mechanic assigned to do the job to ensure that all dimensions, clearances and torque values are within the specified tolerances.

The wiring diagram on the last page of the manual shows how the electrical components are interconnected.

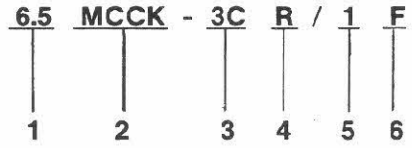
A parts catalog (available at the dealer level) contains detailed exploded views of each assembly and the individual piece part numbers and their proper names for ordering replacement parts.

Use only Genuine Onan replacement parts to ensure quality and the best possible repair and overhaul results. When ordering parts, always use the complete Model and Spec number as well as the Serial number shown on the nameplate.

ENGINE MODEL REFERENCE

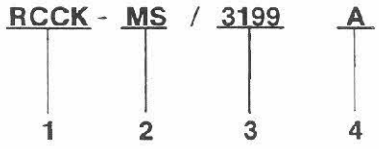
Identify your model by referring to the MODEL and SPEC (specification) NO. as shown on the unit nameplate. Always use this number and the engine serial number when making reference to your engine.

How to interpret *MODEL* and *SPEC NO. on generator set engines.*



1. Indicates kilowatt rating.
2. Series identification.
3. Voltage code of the generator.
4. Method of starting: A—automatic, R—remote electric starting, and E—electric starting.
5. Factory code for designating optional equipment, if any.
6. Specification letter which advances when the factory makes production modifications.

How to interpret *MODEL* and *SPEC NO on industrial engines.*



1. Factory code for general identification purposes.
2. Specific Type:
   MS-ELECTRIC starting with stub shaft, starter and generator.
3. Factory code for optional equipment supplied.
4. Specification (Spec Letter) advances with factory production modification.

Specifications

This manual contains SI metric equivalents that follow immediately in parentheses after the U.S. customary units of measure.

SPECIFICATION	UNIT OF MEASURE	SERIES	
		MCCK	RCCK
Number of Cylinders		2	2
Bore	in (mm)	3.250 (82.55)	3.250 (82.55)
Stroke	in (mm)	3.000 (76.2)	3.000 (76.2)
Displacement	cu in (cm^3)	49.8 (816)	49.8 (816)
Compression Ratio		7.0 to 1	7.0 to 1
Rated Speed (Maximum)	RPM	1800	3900
Power at Rated Speed	BHP (kW)	13.0 (9.7)	19.5 (14.5)
Oil Filter		Full Flow	Full Flow
Oil Capacity Without Filter	Qt (litre)	4 (3.8)	3.5 (3.3)
Oil Capacity With Filter Change	Qt (litre)	NA NA	4.0 (3.8)
Crankshaft Rotation (viewed from flywheel)		Clockwise	Clockwise
Governor		Mechanical	
Valve Clearance (Cold)			
Intake	in (mm)	0.012 (0.30)	0.012 (0.30)
Exhaust	in (mm)	0.012 (0.30)	0.012 (0.30)
Spark Plug Gap	in (mm)	0.025 (0.64)	0.025 (0.64)
Breaker Point Gap - Static (Full Separation and Engine Cold)	in (mm)	0.020 (0.51)	0.020 (0.51)
Ignition Timing	BTC	20°	20°

Dimensions and Clearances

All clearances given at room temperature of 70°F (21°C). All dimensions in inches (approximate millimetre dimensions in parentheses) unless otherwise specified.

DESCRIPTION	MINIMUM		MAXIMUM	
	Inches	(mm)	Inches	(mm)
CYLINDER BLOCK				
Cylinder Bore Honed Diameter	3.2490	(82.525)	3.2500	(82.550)
Maximum Allowable				
Taper			0.005	(0.127)
Out-of-Round			0.002	(0.051)
Main Bearing Inside Diameter (Without bearing)	2.187	(55.55)	2.188	(55.58)
Main Bearing Inside Diameter (Installed)	2.0020	(50.85)	2.0030	(50.88)
Camshaft Bearing Bore (Bearing installed)	1.3760	(34.95)	1.3770	(34.98)
CRANKSHAFT				
Main Bearing Journal Diameter	1.9992	(50.78)	2.0000	(50.80)
Main Bearing Clearance	0.0025	(0.064)	0.0038	(0.097)
Connecting Rod Journal Diameter	1.6252	(41.28)	1.6260	(41.30)
Crankshaft End Play	0.006	(0.152)	0.012	(0.305)
CONNECTING ROD				
Large Bore Diameter (Without bearing installed and rod bolts properly torqued)	1.7505	(44.46)	1.7510	(44.48)
Connecting Rod Side Clearance	0.0020	(0.051)	0.0160	(0.406)
Piston Pin Bushing Bore (Without bearing)	0.8115	(20.61)	0.8125	(20.64)
Piston Pin Bushing Bore with Bearing, (Finished bore)	0.7504	(19.05)	0.7508	(19.07)
Bearing to Crankshaft Clearance				
Nodular Iron Rod	0.0005	(0.013)	0.0023	(0.058)
Aluminum Rod	0.0020	(0.051)	0.0033	(0.084)
CAMSHAFT				
Bearing Journal Diameter	1.3740	(34.90)	1.3745	(34.91)
Bearing Clearance	0.0015	(0.038)	0.0030	(0.076)
End Play	0.0030	(0.076)	0.0120	(0.305)
Camshaft Lift		0.300	(7.62)	
PISTON				
Clearance in Cylinder				
Measure 90° to pin 0.10 inch below oil ring	0.0025	(0.064)	0.0045	(0.114)
Piston Pin Bore	0.7502	(19.055)	0.7506	(19.065)
Ring Groove Width				
Top 1 Compression Ring	0.0960	(2.438)	0.0970	(2.464)
No. 2 Compression Ring	0.0955	(2.426)	0.0965	(2.451)
No. 3 Oil Control Ring	0.188	(4.775)	0.189	(4.801)

DESCRIPTION	MINIMUM		MAXIMUM	
	Inches	(mm)	Inches	(mm)
PISTON PIN				
Clearance in Piston		Thumb Push Fit		
Clearance in Connecting Rod	0.0002	(0.005)	0.0007	(0.018)
Diameter	0.7500	(19.05)	0.7502	(19.06)
PISTON RINGS				
Clearance				
Top Groove	0.002	(0.051)	0.008	(0.203)
Ring End Gap in Cylinder	0.010	(0.254)	0.020	(0.508)
INTAKE VALVE				
Stem Diameter	0.3425	(8.70)	0.3430	(8.71)
Clearance (Stem to Guide)	0.0010	(0.025)	0.0025	(0.064)
Valve Face Angle		44°		
INTAKE VALVE SEAT				
Valve Seat Width	0.031	(0.787)	0.047	(1.194)
Valve Seat Angle		45°		
EXHAUST VALVE				
Stem Diameter	0.3410	(8.661)	0.3415	(8.674)
Clearance (Stem to Guide)	0.0025	(0.064)	0.004	(0.102)
Valve Face Angle		44°		
EXHAUST VALVE SEAT				
Seat Cylinder Head Bore Diameter	1.1890	(30.20)	1.1900	(30.23)
Seat Outside Diameter	1.1920	(30.28)	1.1930	(30.30)
Valve Seat Width	0.031	(0.787)	0.047	(1.194)
Valve Seat Angle		45°		
VALVE GUIDE				
Inside Diameter	0.344	(8.74)	0.346	(8.79)
TAPPET				
Body Diameter	0.7475	(18.99)	0.7480	(19.00)
Bore Diameter	0.7505	(19.06)	0.7515	(19.09)
Clearance in Bore	0.0015	(0.038)	0.003	(0.076)
VALVE SPRINGS INTAKE AND EXHAUST				
Valve Spring Free Length (Approx.)		1.662	(42.21)	
Valve Spring Length				
Valve Open		1.125	(28.58)	
Valve Closed		1.375	(34.93)	
Spring Load @ 1.375 inch (Valve Closed)	38 lb.	(17 kg)	42 lb.	(19 kg)
Spring Load @ 1.125 inch (Valve Open)	71 lb	(32 kg)	79 lb	(36 kg)
GEAR BACKLASH				
Timing Gear	0.002	(0.051)	0.003	(0.076)
Oil Pump Gear	0.002	(0.051)	0.005	(0.127)

Assembly Torques

The torque values given in Table 1 have been determined for the specific applications. Standard torque values must not be used where those listed in Table 1 apply. The engine assembly torques given here will assure proper tightness without danger of stripping threads. All threads must be clean and lubricated with new engine oil before torquing.

Check all studs, nuts, and capscrews, and tighten as required to keep them from working loose. Refer to the *PARTS MANUAL* for the location of washers and capscrews.

TABLE 1.

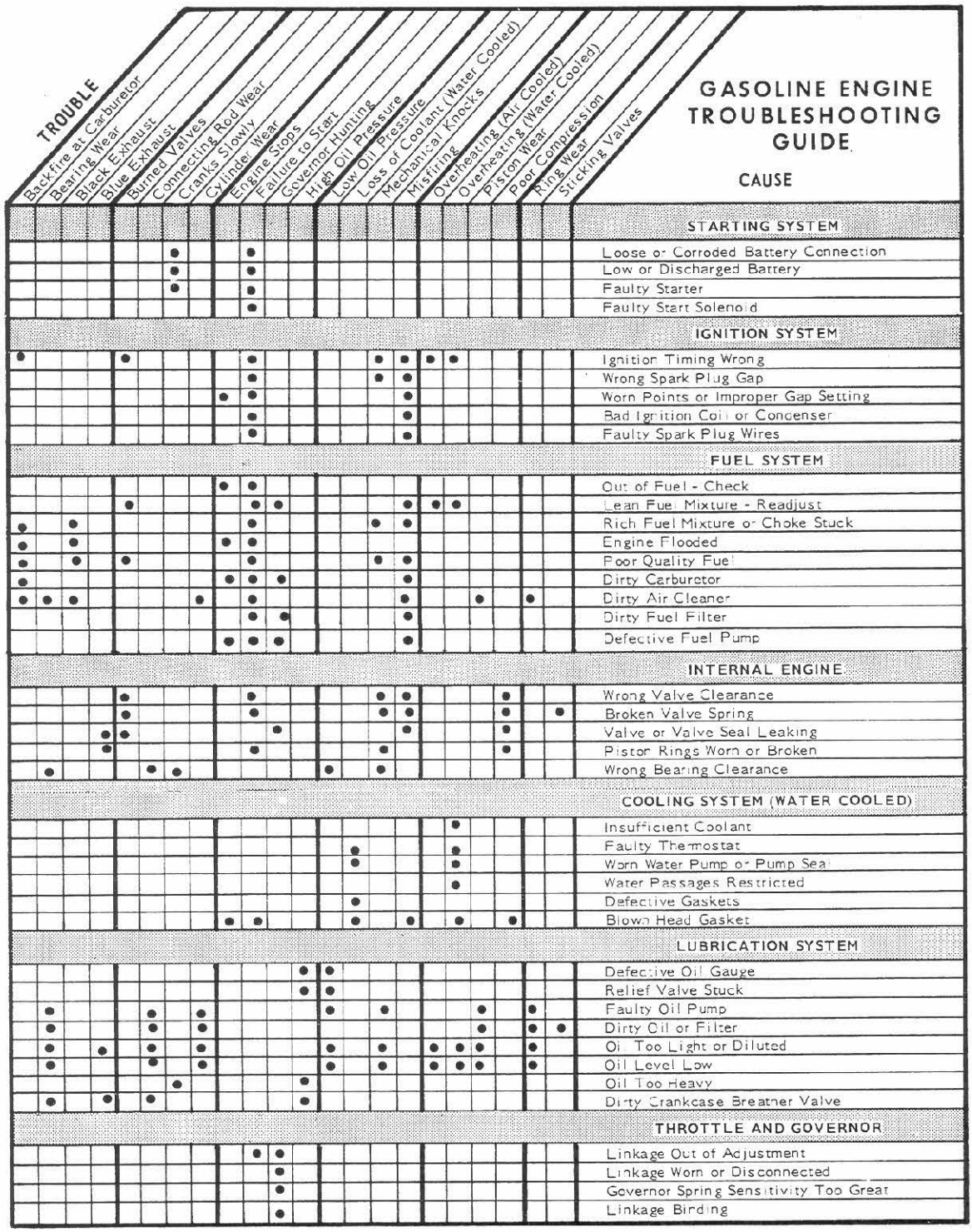
DESCRIPTION	TORQUE SPECIFICATION Ft.-Lb.	Nm
Cylinder Head Capscrews	29-31	(39-42)
Rear Bearing Plate	20-25	(27-34)
Connecting Rod Bolt		
Iron Rod	27-29	(37-39)
Aluminum Rod	24-26	(33-35)
Flywheel Capscrew	35-40	(48-54)
Starter Mounting Bracket to		
Oil Base Screws	25-35	(34-47)
Gear Case Cover	10-13	(14-18)
Oil Pump	7-9	(10-12)
Intake Manifold	15-20	(20-27)
Exhaust Manifold	14-17	(19-23)
Oil Base	43-48	(58-65)

Special Tools

The following special tools are available from Onan. For further information see *TOOL CATALOG 900-0019.*

Valve Seat Driver
Valve Guide Driver
Oil Guide and Driver
Combination Bearing Remover (Main and Cam)
Combination Bearing Driver (Main and Cam)
Flywheel Puller

Engine Troubleshooting



RCCK Installation

GENERAL

The type of installation can affect the life of the engine, the cost of operation and the frequency of necessary service. Plan the installation carefully to ensure the best performance.

Due to the great variety of uses, for the engine, these installation instructions are typical and general in nature. Use the installation recommendations given as a general guide, improvising or altering as necessary.

MOUNTING

There are several acceptable methods of mounting the engine. Among factors to be considered are: location, method of coupling the engine to the load, type of foundation or support, etc. The engine should be mounted level if possible. Maximum operation angle is 15° sideways, 30° front to rear tilt. If the engine will operate at an angle, be sure to re-mark the oil level indicator to compensate for the tilt.

VENTILATION

The engine must be provided with a supply of fresh air for radiator cooling and for combustion.

Open Air Installation: For installations where the engine is operated outside, ventilation usually is no problem. However, in protecting the engine from the elements, be sure nothing obstructs the flow of air around the engine.

EXHAUST

Vent exhaust gas outside enclosure. Shield the line if it passes through a combustible wall or partition. If turns are necessary, use sweeping type (long radius) elbows. Increase one pipe size (from manifold outlet size) for each additional 10 feet (3 m) in length. Locate the outlet away from the engine air intake.

WARNING ***Plan the exhaust system carefully. Exhaust gases are poisonous!***

CARBURETOR AIR INTAKE

Proper engine efficiency depends upon a supply of fresh air to the carburetor. Under special conditions, it may be necessary to move the air cleaner off the engine, using a longer connection hose as necessary. For extreme dust or dirt conditions, install a special heavy duty air cleaner.

FUEL SYSTEM

The engine uses a mechanical type fuel pump which is mounted on top of the engine, adjacent to the carburetor. A rubber fuel line connects the fuel pump to the carburetor.

The fuel supply tank may be installed in any safe, convenient location. If the tank is installed within the engine enclosure, provide a vent line to the outside of the enclosure. The top of the tank should be about 6 inches (152 mm) below the carburetor, but not more than 4 feet (1.2 m) below the fuel pump.

The installation of a fuel filter between the fuel tank and the fuel pump is recommended. Any fuel filter should be fitted with a shutoff valve and should be easily accessible for cleaning.

WARNING ***Fuel leaks create fire and explosion hazards which might result in severe personal injury or death. Always use flexible tubing between engine and the fuel supply to avoid line failure and leaks due to vibration. The fuel system must meet applicable codes.***

CONNECT TO THE LOAD

The dimensions of various power take-off shafts are as follows:

SHAFT	DIMENSIONS IN INCHES		
	DIAMETER	LENGTH	KEY SIZE
Standard	1-1/2 (38.10 mm)	2-3/4 (69.85 mm)	3/8 (9.53 mm)
Rockford Clutch	1-7/16 (36.51 mm)	3-1/2 (88.90 mm)	3/8 (9.53 mm)
Gear Reduction	1-1/4 (31.75 mm)	2-3/4 69.85 mm)	1/4 (6.35 mm)

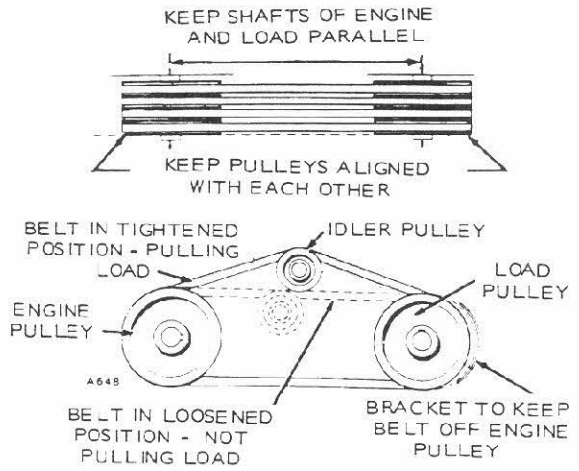


FIGURE 1. DRIVE BELT INSTALLATION

Belt Drive: V-belts are preferable to flat belts. Consult a reliable belting supplier for recommendations regarding size of pulleys, number of belts, etc., required. A typical belt drive installation is shown in Figure 1.

Comply with the following installation requirements:

1. Shafts of engine and load must be parallel with each other.
2. Pulleys of engine and load must be in alignment.
3. Mount engine pulleys as close to engine as possible.
4. If installation permits, belts should run horizontally.
5. Some method of disconnecting the load for starting is recommended. If a clutch is not used, a belt-tightener idler arrangement can be used.

Flexible Coupling: If a flexible coupling engine-to-load drive is used, the load shaft must be in line and centered with the engine shaft, Figure 2.

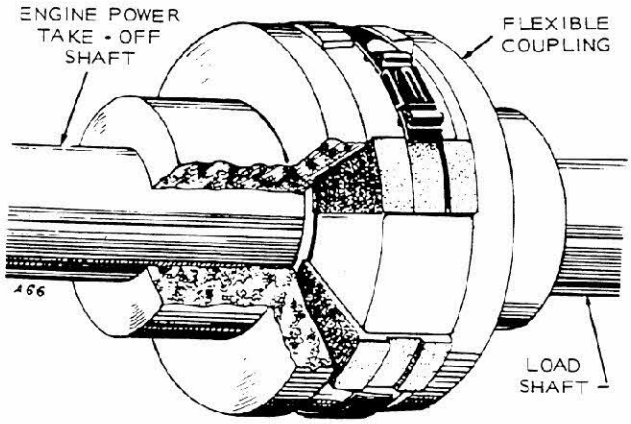


FIGURE 2. FLEXIBLE COUPLING

Reduction Gear Drive: Reduction gear drives are mounted at the factory (when ordered). The method of connecting the load is the same as when connecting directly to the engine shaft.

Clutch Installation: A Rockford clutch can be installed at the factory or in the field. Install the clutch according to the following instructions and Figure 3.

Drill a 13/64 inch (5.2 mm) hole (or filed slot) in the crankshaft for the clutch set screw. Locate center of hole 11/32 inch (9 mm) from the end and directly opposite the keyway in the crankshaft.

Install the clutch adapter, with drain slot downward using two cap screws 3/8-16 x 2 inches on the lower and one cap screw 3/8-16 x 1-3/4 inches on the upper number 2 cylinder side (cylinder nearer clutch). Install the 3/8-16 x 3-7/8-inch stud through the adapter into the engine block upper remaining hole. Use a lockwasher on each assembly screw. Use a flatwasher and a lockwasher under the stud nut.

Install the crankshaft key. Remove the clutch set screw.

Install the clutch assembly (less housing) to the crankshaft, driving it on carefully with a soft-faced hammer until set screw hole is aligned. Install set screw to bottom in crankshaft hole, then back it out one full turn. Tighten clutch retaining screws until clutch is clamped securely to crankshaft. Lock the screws and tighten the set screw.

Smear grease over splined power take-off shaft. Position the clutch throw-out collar to align the grease fitting with the hole in the housing (number 1 cylinder side, horizontal). Pull the throw-out collar outward to remove tension.

Install the clutch housing so that the clutch throw-out fork engages the throw-out collar. Be sure the serrated shaft is properly meshed with the clutch plate. Use two cap screws 7/16-14 x 2 inches on the lower and one cap screw 7/16-14 x 1-3/4 inches on the upper number 2 cylinder side. Install the stud washer and nut. Lubricate the two grease fittings just until grease appears.

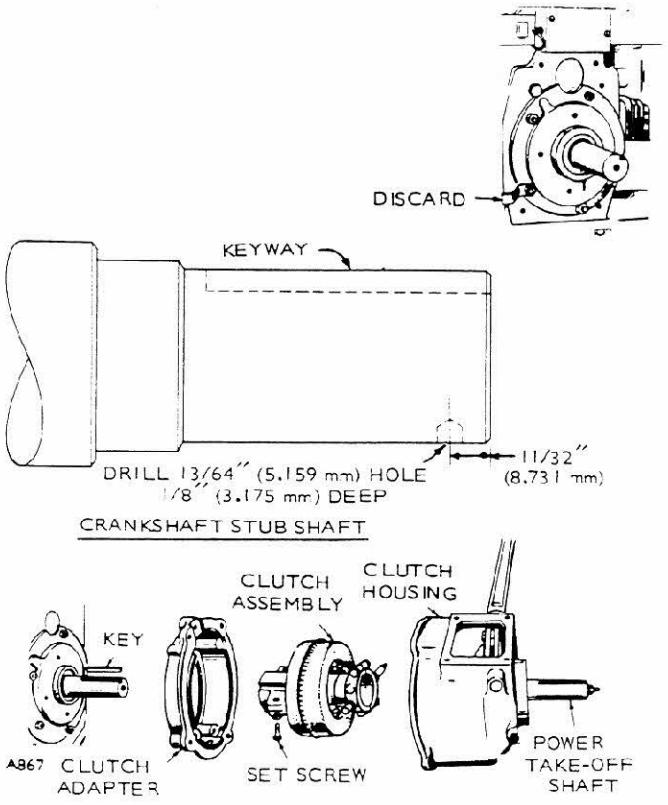


FIGURE 3. CLUTCH INSTALLATION

BATTERY CONNECTIONS (Engines with Electric Starter)

Connect the 12-volt battery positive cable to the engine start switch terminal. Connect the battery negative cable to the ground point on the engine oil base, Figure 4.

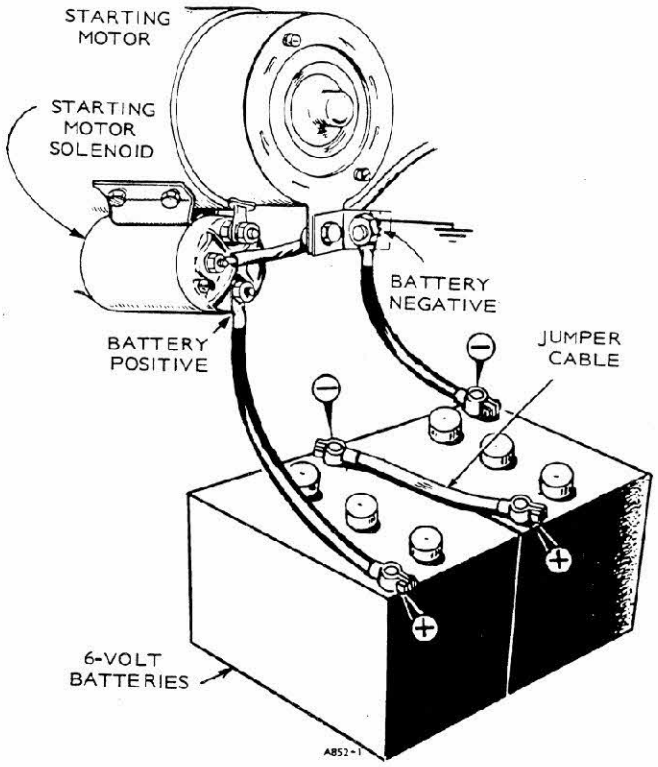


FIGURE 4. BATTERY CONNECTIONS

RCCK Fuel System

GENERAL

Satisfactory engine performance is largely dependent upon correct fuel system adjustments. However, adjustments cannot fully compensate for low engine power due to wear, etc. If trouble develops, follow an orderly procedure to determine the cause before making any adjustment.

Adjusting the carburetor is a means of obtaining the correct fuel-to-air mixture for smooth, efficient operation. Always adjust in two steps, first the load adjustment and then the idle adjustment.

GASOLINE CARBURETORS

Before adjusting the carburetor, be sure the ignition system is working properly and the governor is adjusted. Allow the engine to warm-up before starting carburetor adjustments.

If carburetor is completely out of adjustment so the engine will not run, open both valves 1 to 1-1/2 turns off their seats to permit starting. Do not force the needle valves against their seats. This can bend the needle.

Adjustments

1. With no load, turn idle fuel adjustment out until engine speed drops slightly below normal, Figure 5. Then turn needle in until speed returns to normal.
2. Apply a full load to engine.
3. Loosen packing nut and carefully turn main adjustment in until speed drops slightly below normal. Then turn needle out until speed returns to normal.
4. Tighten packing nut.

Alternate Method (No load adjustment possible)

1. Start engine and allow it to warm up.
2. Push in on governor mechanism to slow engine down to about 400 to 500 rpm.
3. Set idle fuel adjustment screw for even operation so engine is firing on both cylinders and running smoothly.
4. Release governor mechanism to allow engine to accelerate. If engine accelerates evenly and without a lag, the main adjustment is correct. If not, adjust the needle outward about 1/2 turn and again slow down the engine and release the mechanism. Continue until the engine accelerates evenly and without a time lag after releasing the governor.

CAUTION ***Loosen the packing nut before making main fuel adjustment and then tighten the nut to a snug fit after the adjustment has been made. This procedure makes it easier to use the carburetor adjusting tool and prevents fuel leaks around the packing nut. Fuel leaks cause hard starting because the float level becomes lower than normal.***

Cleaning and Repair: To clean the carburetor, soak all components thoroughly in a good carburetor cleaner following the cleaner manufacturer's instructions. Be sure all carbon is cleaned from the carburetor bore, especially in the area of the throttle valve. Blow out the passages with compressed air. If possible, avoid using wire to clean out the passages.

WARNING ***Cleaning solutions typically contain strong chemicals that may cause injury if used improperly. Read all warning labels before using.***

Check the adjusting needles and nozzle for damage. If the float is loaded with fuel or damaged, replace it. The float should fit freely on its pin without binding. Invert the carburetor body and measure the float level, Figure 6. If necessary, bend the small lip that the inlet valve rides on to adjust float level.

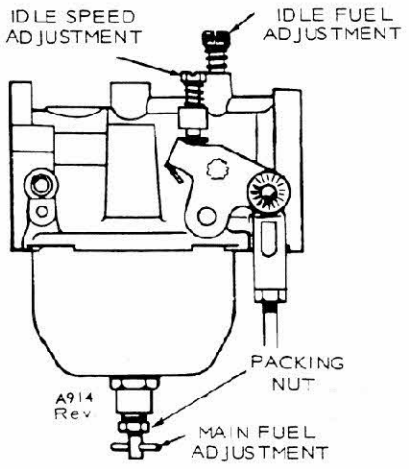


FIGURE 5. GASOLINE CARBURETOR

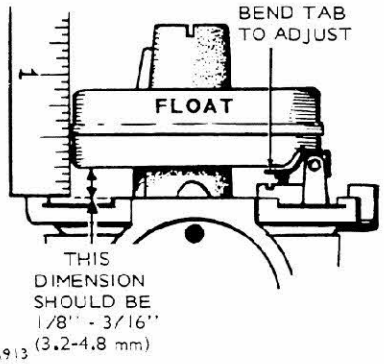


FIGURE 6. CHECKING FLOAT LEVEL

AMBIENT TEMP. (°F)	60	65	70	75	80	85	90	95	100
CHOKE OPENING (Inches)	1/8	9/64	5/32	11/64	3/16	13/64	7/32	15/64	1/4

FIGURE 6a. THERMAL MAGNETIC CHOKE SETTINGS

Check the choke and throttle shafts for excessive side play and replace if necessary.

THERMAL MAGNETIC CHOKE

This choke uses a heating element and a heat sensitive bimetal spring to open the choke. The choke solenoid, actuated during engine cranking only, closes the choke according to ambient temperature, Figure 6a.

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 counterclockwise to decrease choke action (leaner mixture). Refer to Figure 6a for correct choke setting according to ambient temperature. Use drill rod or shank of drill bit to measure choke opening.

Disassembly and Repair: If choke will not heat properly, check for broken heater wire, high-resistance connections, or broken lead wires to the bimetal and heater assembly. With the element at room temperature, check the heater resistance with an ohmmeter. The resistance should be about 30.6 to 37.4 ohms for a 12 volt system. If the heater is defective, replace it with a new one. When the start button is engaged, the solenoid should cause the spring-loaded armature to contact the solenoid core.

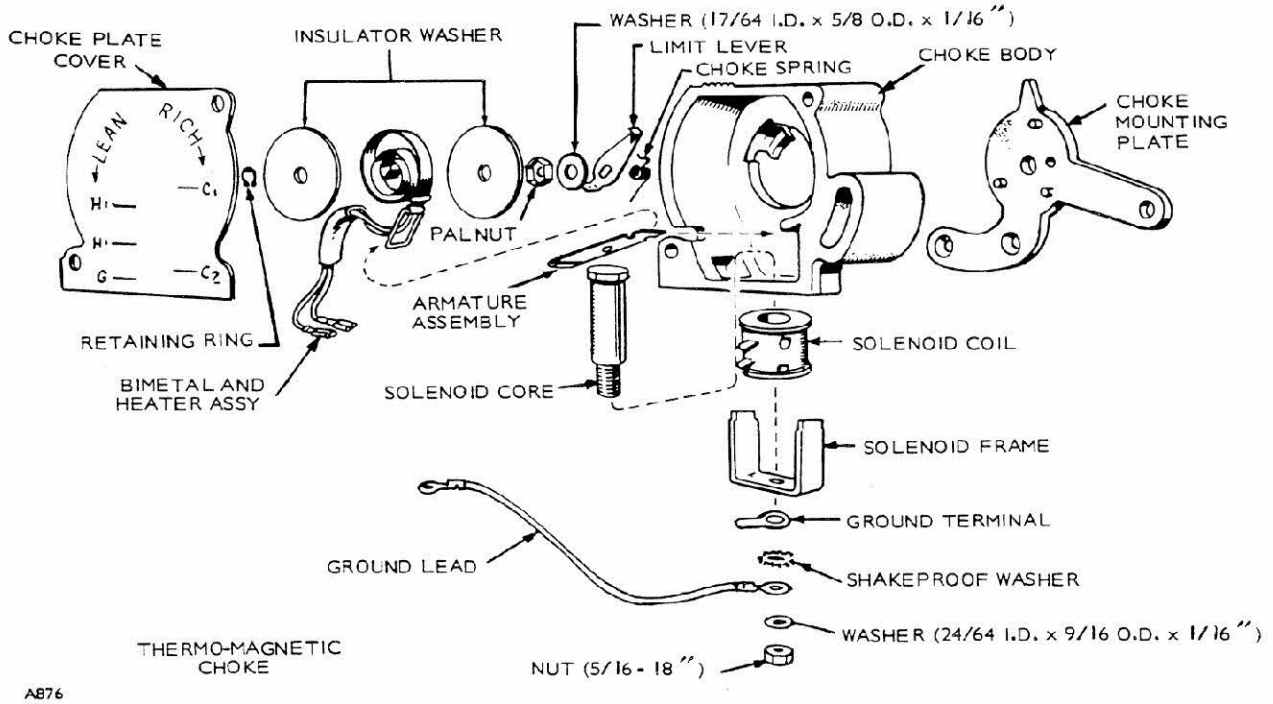


FIGURE 6b. THERMAL MAGNETIC CHOKE ASSEMBLY

If this does not occur, check for broken lead wires or a defective solenoid coil. There must be slack in the lead wires between the choke body and the bimetal and heater assembly. The solenoid coil resistance should be 2.09 to 2.31 ohms in a 12 volt system.

When replacing the cover on the thermostat and heater assembly, be certain that the choke heater lead wires have been correctly installed in the choke housing. Improper replacement of the lead wires can cause the choke assembly to malfunction.

The wires enter the choke assembly through a small notch that is cut in the edge of the housing. A cover holds the wires in place and prevents movement when tightened. When properly installed, the lead wires will hang freely under the bimetal coil when the choke is in either the open or closed position. The end of the heater wire sleeve should be located from 1/8 inch inside the choke housing to flush with the inside wall.

When assembling the thermo-magnetic choke, the bimetal and heater assembly is connected as follows:

1. Lead tagged G goes to ground terminal on coil solenoid.
2. Lead tagged H goes to either H^1 terminal on solenoid core.

FUEL PUMP

A diaphragm type fuel pump is used. If fuel does not reach the carburetor, check the fuel pump. To do this, disconnect the fuel line at the carburetor and, while cranking the engine slowly by hand, observe whether fuel comes through the line. Be sure there is fuel in the tank. If the line is open and no fuel comes through, the pump is defective. Failure of the pump is usually due to a leaking diaphragm valve or valve gasket, a weak or broken spring, or wear in the drive linkage. Oil diluted with gasoline may indicate a faulty diaphragm. If the operator chooses to repair the pump rather than install a new one, the use of a complete repair kit is recommended.

WARNING ***Fuel leakage is a fire and explosion hazard that might cause severe personal injury or death. Use care when reassembling fuel pump. All parts must align perfectly or pump will leak fuel.***

Fuel Pump Reconditioning

1. Remove fuel lines and mounting screws holding pump to engine, Figure 6c.
2. Make a mark with a file across a point where upper and lower body join to assure proper reassembly. Remove four assembly screws and remove upper pump body.
3. Turn upper pump body over and remove valve retainer screws and washers. Remove valve retainer, valves, valve springs and valve gasket, noting their position. Discard valve springs, valves and valve retainer gasket.

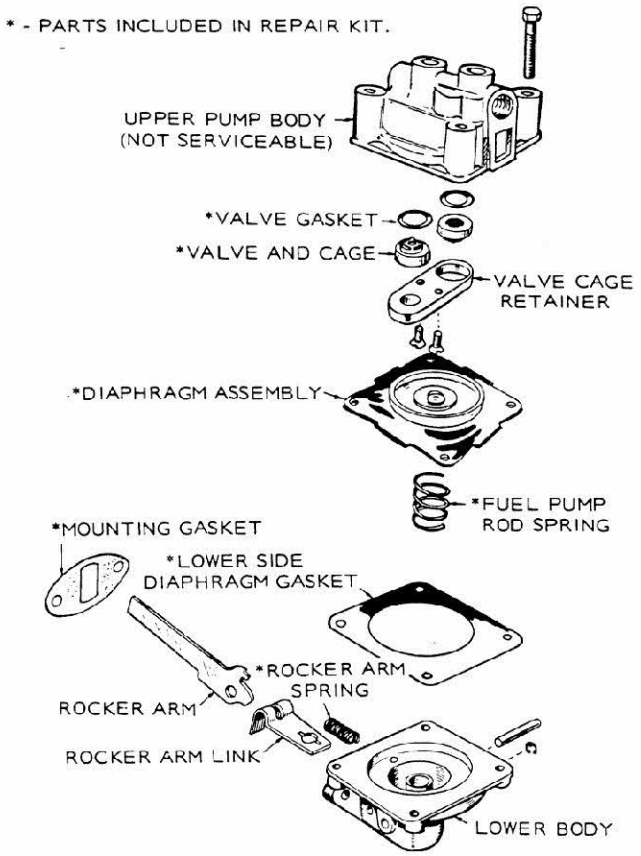


FIGURE 6c. FUEL PUMP ASSEMBLY

4. Clean pump body thoroughly with solvent and a fine wire brush.
5. Holding upper pump body with diaphragm surface up, place new valve gasket into cavity. Assemble valve spring and valves in cavity. Reassemble valve retainer. Lock in position by inserting and tightening valve retainer screws.
6. Place upper pump body assembly in a clean place and rebuild lower body.
7. Holding lower body, press down on diaphragm to compress spring under it, then turn bracket 90° to unhook diaphragm so it can be removed.
8. Clean lower body with a solvent and a fine wire brush.
9. Replace fuel pump rod spring, diaphragm gasket, stand new spring in casting, position diaphragm, compress spring and turn 90° to reconnect diaphragm.
10. Hold lower body, then place upper body on it (make sure that indicating marks are in line) and insert the four screws. DO NOT TIGHTEN. With hand on lower body only, push pump lever to limit of its travel and hold in this position while tightening the four screws. This is important to prevent stretching the diaphragm.
11. Mount fuel pump on engine, using new mounting gasket. Connect fuel lines.

ADJUSTABLE GOVERNOR

Where engine speed is governor controlled, the governor is set at the factory to allow a nominal engine speed of 2400 rpm at no-load operation (unless another speed is specified when the engine is ordered). Proper governor adjustment is one of the most important factors in maintaining the power and speed desired from the engine, Figure 6d.

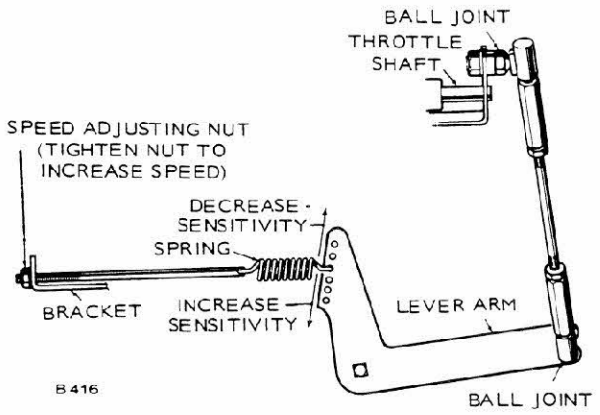


FIGURE 6d. GOVERNOR ADJUSTMENT LINKAGE

Before making governor adjustment, run the engine about 10 minutes to reach normal operating temperature. Be sure carburetor load and idle needles are properly adjusted before checking or adjusting governor system. For an accurate governor adjustment, a reliable tachometer is required.

WARNING ***Contact with rotating machinery might cause serious personal injury or death. Stay clear of rotating components and ensure that protective shields and guards are in place and secured before operating machinery.***

If the following checks do not remedy erratic operation, install a new governor spring. Springs become fatigued with age.

Linkage

Check the governor arm, linkage, throttle shaft and lever for a binding condition or excessive slack and wear at connecting points. A binding condition at any point will cause the governor to act slowly and regulation will be poor. Excessive looseness will cause a hunting condition and regulation will be erratic. Work the arm back and forth several times by hand while the engine idles. Replace parts as needed.

The engine starts at wide open throttle. The length of the linkage connecting the goveror arm to the throttle arm is adjusted by rotating the ball joint. Adjust length so with the engine stopped and tension on the governor spring, the carburetor throttle lever is wide open. This setting allows immediate control by the governor after starting and synchronizes travel of the governor arm and the throttle shaft.

Speed Adjustment

The speed at which the engine operates is determined by the tension applied to the governor spring. Increasing spring tension increases engine speed. Decreasing spring tension decreases engine speed. The no-load speed of the engine should be slightly higher than the speed requirements of the connected load. For example, if the connected load is to turn at 2310 rpm, set the no-load speed of the engine at about 2400 rpm. Check speed with a tachometer. If a speed adjustment is needed, turn the speed adjusting nut in to increase the speed or out to decrease the speed, Figure 6d.

Sensitivity Adjustment

The engine speed drop from no load to full load must be within 100 rpm. Check the engine speed with no-load connected and again after connecting a full-rated load.

The sensitivity of the governor depends upon the position of the arm end of the governor spring. A series of holes in the governor arm provides for adjustment. To increase sensitivity, move the governor spring toward the governor shaft. To decrease sensitivity, move the governor spring toward the linkage end of the governor arm.

A too-sensitive setting will result in a surging speed (hunting) condition, an alternate increase and decrease in engine speed. An opposite setting will result in too much speed variation between no-load and full-load conditions.

Always recheck the speed adjustment after a sensitivity adjustment. Increasing sensitivity will cause a slight decrease in speed and will require a slight increase in the governor spring tension.

MCCK Fuel System

Satisfactory engine performance is largely dependent upon correct fuel adjustments. However, adjustments cannot fully compensate for low engine power due to wear, etc. If trouble develops, follow an orderly procedure to determine the cause before making any adjustment.

Adjusting the carburetor is a means of obtaining the correct fuel-to-air mixture for smooth, efficient operation. Always adjust in two steps, first the load adjustment and then the idle adjustment.

Before adjusting the carburetor, be sure the ignition system is working properly and the governor is adjusted. Allow the engine to warm-up before starting carburetor adjustments.

CARBURETOR ADJUSTMENTS (Spec A-G)

If carburetor is completely out of adjustment so the engine will not run, open both needles 1 to 1-1/2 turns off their seats to permit starting. Do not force needles against their seats. This can bend the needle.

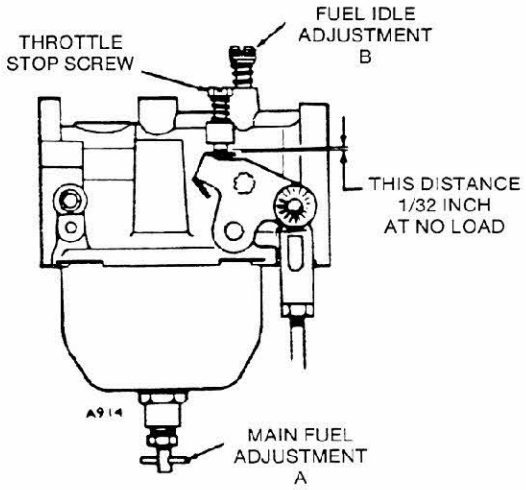
WARNING ***Inhalation of exhaust gases might result in serious personal injury or death. Be sure deadly exhaust gas is piped outside and away from windows, doors or other inlets to building.***

1. Apply a full load to engine.
2. Turn in load needle (Figure 7) until engine speed drops. Then turn out needle until engine speed returns to normal.
3. Remove load from engine.
4. Turn idle needle out until engine speed drops slightly. Then turn needle in until speed returns to normal.

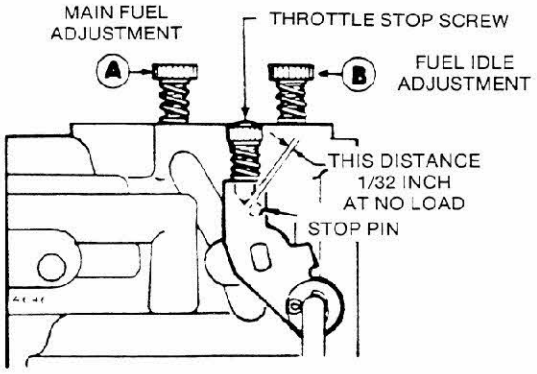
Alternate Method (No-Load adjustment possible)

1. Start engine and allow it to warm up.
2. Push in on governor mechanism to slow the unit down to about 400 to 500 rpm.
3. Release governor mechanism to allow the engine to accelerate. If engine accelerates evenly and without a lag, the load needle setting is correct. If not, adjust needle outward about 1/2 turn and again slow down the engine and release the mechanism. Continue until engine accelerates evenly and without a time lag after releasing governor.
4. Push in on governor mechanism to slow the unit to 400 to 500 rpm. Set idle needle for even operation so engine is firing on both cylinders and running smoothly.

A Zenith carburetor is used on Spec B-G engines. Carburetor adjustments are the same as the Spec A carburetor. The only difference is the location of adjustment needles (Figure 7). The main-fuel adjustment needle (A) is on the bottom of carburetor.



SPEC B-G



SPEC A

FIGURE 7. ADJUSTING SIDEDRAFT CARBURETOR

Throttle Stop Screw Setting

Throttle stop screw is located on the throttle shaft lever (side of carburetor by ignition coil). It must be adjusted and set for 1/32 inch clearance over the manifold surface when the engine is running with no load. See Figure 7a.

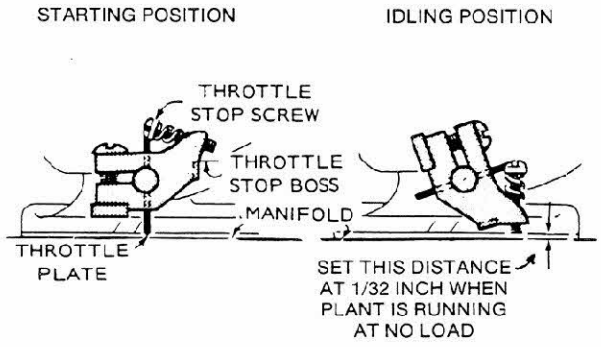


FIGURE 7a. THROTTLE STOP SCREW

Float Adjustment

To check float level, Figure 7b Spec B-G, Figure 7c Spec A, remove the entire main fuel adjustment assembly from float bowl (unscrew large nut from float bowl. The proper level from float to bowl flange gasket is 1/8 inch with fuel float weight on needle and spring. The float tab should just touch fuel inlet valve and not compress inlet valve spring. Adjust by bending tab on the float.

CAUTION ***Do not apply excessive pressure to float valve.***

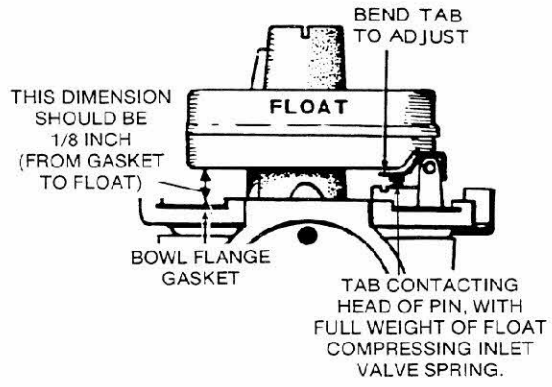


FIGURE 7b. FLOAT LEVEL ADJUSTMENT SPEC B-G

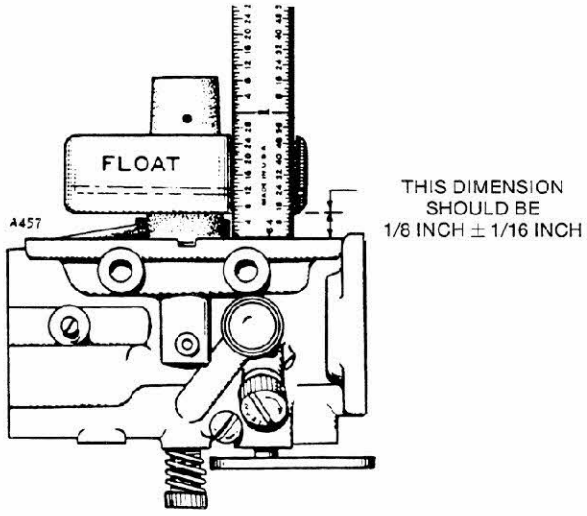


FIGURE 7c. FLOAT LEVEL ADJUSTMENT SPEC A

CARBURETOR ADJUSTMENTS (Begin Spec H)

The carburetor idle and main mixture screws were set for maximum efficiency at the factory and should normally not be disturbed. If adjustments seem necessary, first be sure the ignition system is working properly and is not the source of the problem.

If adjustment is needed, proceed as follows:

1. Turn both mixture screws in until lightly seated (Figure 7a), then back the idle mixture screw out 1 turn and the main mixture screw out 1-1/4 turns.

CAUTION ***Forcing the mixture adjustment screw tight will damage the needle and seat. Turn in only until light tension can be felt.***

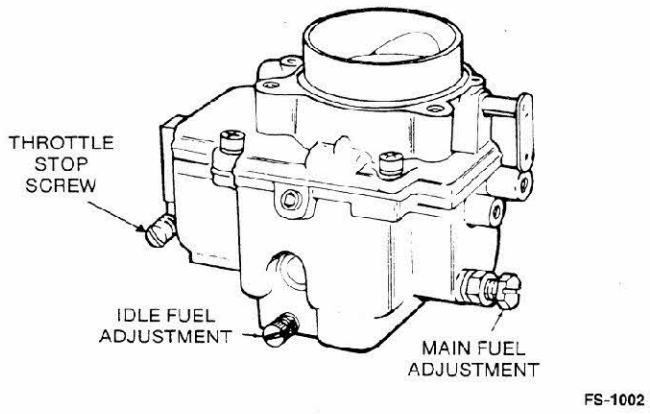


FIGURE 7d. DOWNDRAFT CARBURETOR ADJUSTMENT

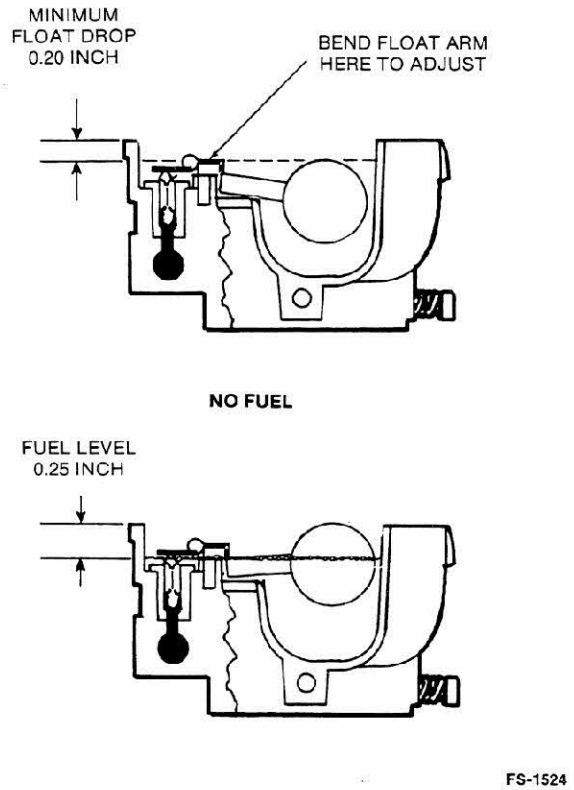
2. Start the engine and allow it to warm up thoroughly (at least 10 minutes).

3. Push in on governor arm to slow engine down to about 400 to 500 rpm.
4. Release governor arm allowing engine to accelerate. If engine accelerates evenly and without hesitation, main fuel adjustment is correct. If it does not, turn the main adjustment screw out in 1/8 turn increments until the engine accelerates smoothly, but do not turn it out more than 1/2 turn beyond the original setting.
5. Push in on governor arm to slow engine down to about 400-500 rpm. Turn the idle adjustment screw in until engine speed drops and then out until engine speed drops again. Over a narrow range between these two settings, engine speed will be at its maximum. Set the idle adjustment screw about 1/8 turn outward from the midpoint of this range.

Float Adjustment

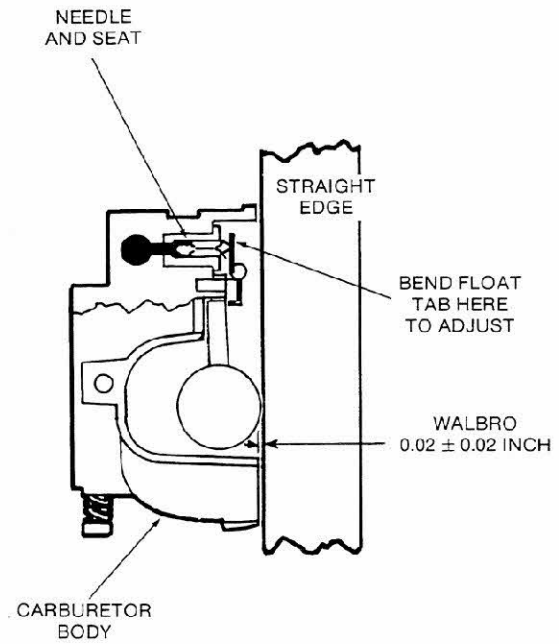
Turn carburetor and check float setting (see Figure 7e). The float should be a specific distance from the machined mating surface (without gasket). Bend the float level. Bend the float arm as required to adjust float drop.

When checking float level and float drop, measure to float body, not seam.



FLOAT DROP ADJUSTMENTS

FIGURE 7e. FLOAT ADJUSTMENT BEGIN SPEC H



FLOAT LEVEL ADJUSTMENT

CARBURETOR OVERHAUL

Carburetion problems that are not corrected by mixture or float adjustments are usually a result of gummed-up fuel passages or worn internal parts. The most effective solution is a complete carburetor overhaul.

In general, overhauling a carburetor consists of complete disassembly, a thorough cleaning, and replacement of worn parts. Carburetor repair kits are available that supply new gaskets and replacements for those parts most subject to wear.

General instructions for overhauling a carburetor are given below. Carefully note the position of all parts while removing to assure correct placement when reassembling. Read through all the instructions before beginning for a better understanding of the procedures involved. Carburetor components are shown in Figures 8 and 8a.

WARNING ***Ignition of fuel might cause serious personal injury or death by fire or explosion. Do not permit any flame, cigarette, or other igniter near the fuel system.***

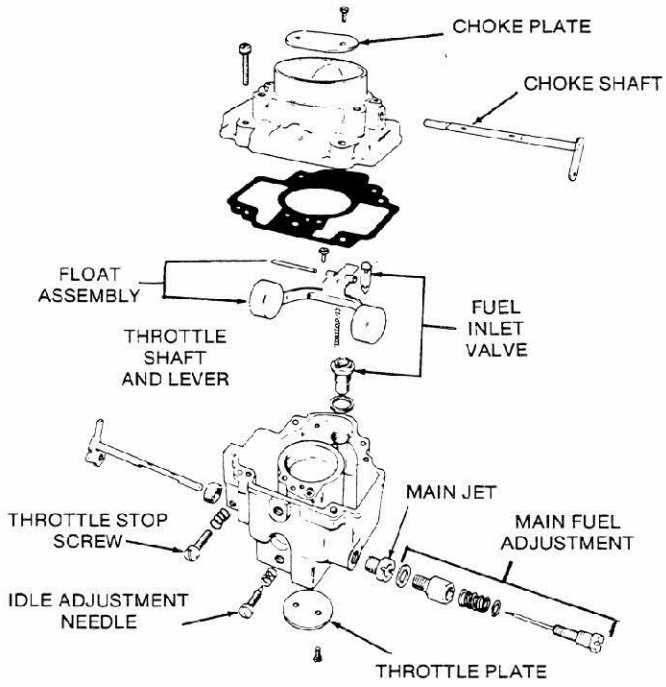


FIGURE 8. DOWNDRAFT LUA CARBURETOR ASSEMBLY

Removal and Disassembly

1. Disconnect all lines, linkages, wires, and attaching nuts or bolts; then, remove the carburetor from the engine. (Downdraft carburetors may require removal of the intake manifold to disconnect.)

2. Remove air cleaner adapter, if so equipped, and automatic choking assembly.

3. Remove throttle and choke plate retaining screws, then plates. Pull out throttle and choke shafts, being careful not to damage the teflon coating applied to some throttle shafts.

4. Remove main and idle mixture screw assemblies.

5. On downdraft carburetors, remove attaching screws and separate upper and lower carburetor sections. On sidedraft models, unscrew the retaining screw and remove fuel bowl from the upper carburetor body.

6. Carefully note position of float assembly parts, then slide out retaining pin and remove the float assembly, any springs or clips, and the needle valve.

7. Unscrew and remove needle valve seat.

Cleaning and Repair

1. Soak all metal components not replaced by repair kit in carburetor cleaner. Do not soak non-metal floats or other non-metal parts. Follow the cleaner manufacturer's recommendations.

2. Clean all carbon from the carburetor bore, especially where the throttle and choke plates seat. Be careful not to plug the idle or main fuel ports.

3. Blow out all passages with compressed air. Avoid using wire or other objects for cleaning that may increase the size of critical passages.