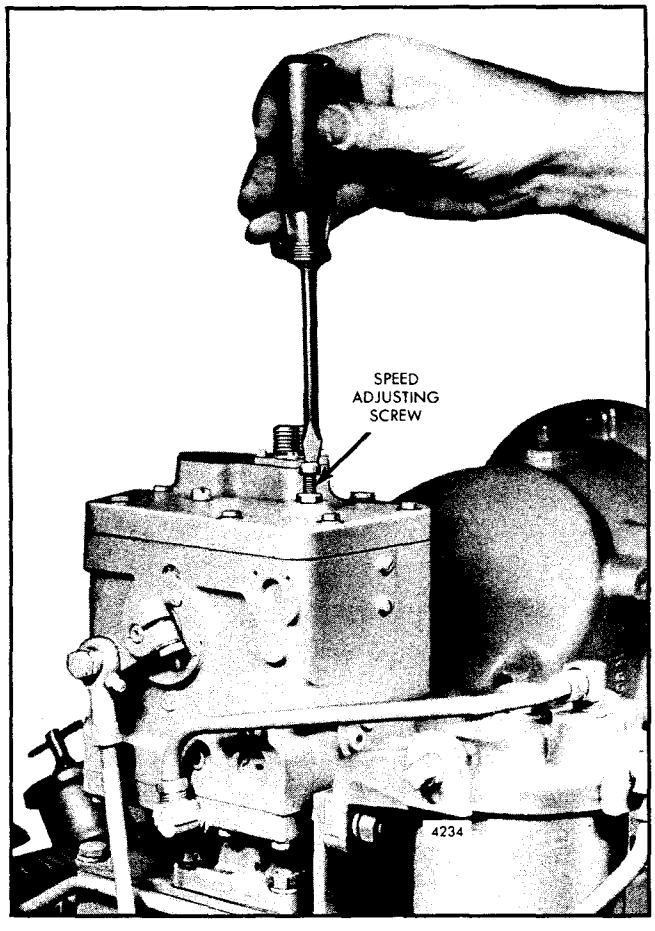


Fig. 5 - Adjusting Maximum No-Load Engine Speed

Adjust Maximum No-Load Speed

When shipped from the factory, the speed adjusting screw is set for a speed approximately 4-1/2% above rated speed at no-load (the usual factory droop setting of 3% will reduce the speed to approximately 1-1/2% above rated speed at full travel of the centrifugal governor power piston). With the speed adjusting screw at this setting during normal operation (i.e., with the electric section controlling), the centrifugal governor power piston will be held in its maximum fuel position.

If adjustment of the maximum no-load speed is required, proceed as follows:

1. Disconnect the wiring at the receptacle on the governor cover.

2. Start the engine and run it at no-load.

3. Turn the speed adjusting screw (Fig. 5) until the desired speed is obtained. Turning the screw counterclockwise will decrease the speed setting.

Adjust Needle Valve

When starting the engine for the first time, eliminate any air which may be trapped in the actuator oil passages as follows:

1. Open the needle valve of the centrifugal governor section (Fig. 6) until the engine hunts or surges. After a half minute, gradually close the needle valve until the engine speed just stabilizes. Closing the needle valve farther than necessary will make the governor slow to return to normal speed after a load change. Never close the needle valve tight.

2. Test the action by manually disturbing the speed of the engine. The engine should promptly return to its original steady-state speed with only a small overshoot or undershoot.

Speed Droop Adjustment

The governor is set with approximately 3% droop when shipped from the factory. When the electric governor section is controlling the engine, the speed droop adjustment has no effect on operation and should be left as factory set. When, for some reason, the centrifugal governor section is controlling the engine, the speed droop setting can be adjusted, if necessary, to suit the operating requirements. The

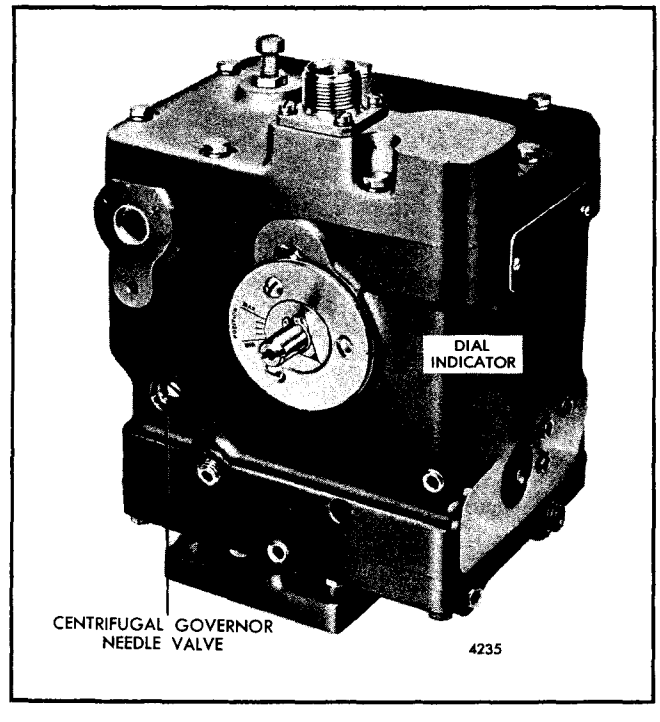


Fig. 6 - Location of Centrifugal Governor Needle Valve

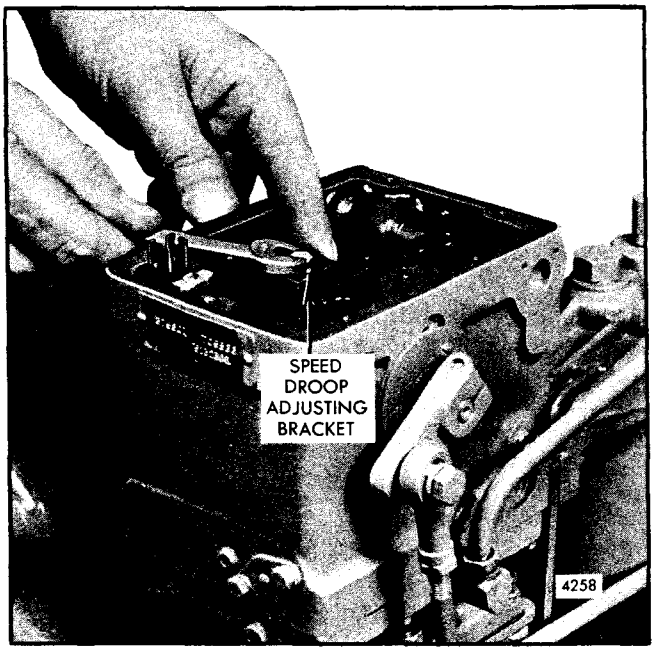


Fig. 7 - Adjusting Speed Droop

governor should never be set at "zero" droop unless the unit is maintaining the frequency of paralleled alternators or is operating as a single, isolated unit. Not more than one unit in a system of paralleled alternators with engines controlled by centrifugal governors can be operated on "zero" droop.

If necessary, adjust the speed droop as follows:

1. Start the engine and run it at approximately half-load until the lubricating oil temperature is stabilized; governor regulation will become more stable as the oil temperature increases.

2. Stop the engine and remove the actuator cover.

3. Loosen the speed droop adjusting bracket screw and move the bracket (Fig. 7) slightly to obtain the desired droop; moving the bracket toward the flyweight end of the actuator will increase the droop. Tighten the screw.

4. Install the actuator cover and, with the engine running, adjust the speed until the engine is operating at the desired speed above the rated full-load speed.

5. Apply the full rated load on the engine and readjust the speed to the correct full-load speed.

6. Remove the rated load and note the engine speed after it stabilizes under no load. If necessary, stop the engine, remove the actuator cover and readjust the speed droop bracket.

After the engine tune-up is completed, reconnect the electrical circuit of the governor at the receptacle on the actuator cover. If necessary, refer to the Woodward Governor Company's Bulletin 37709 for the procedures to be followed in checking the electrical system.

16V ENGINE

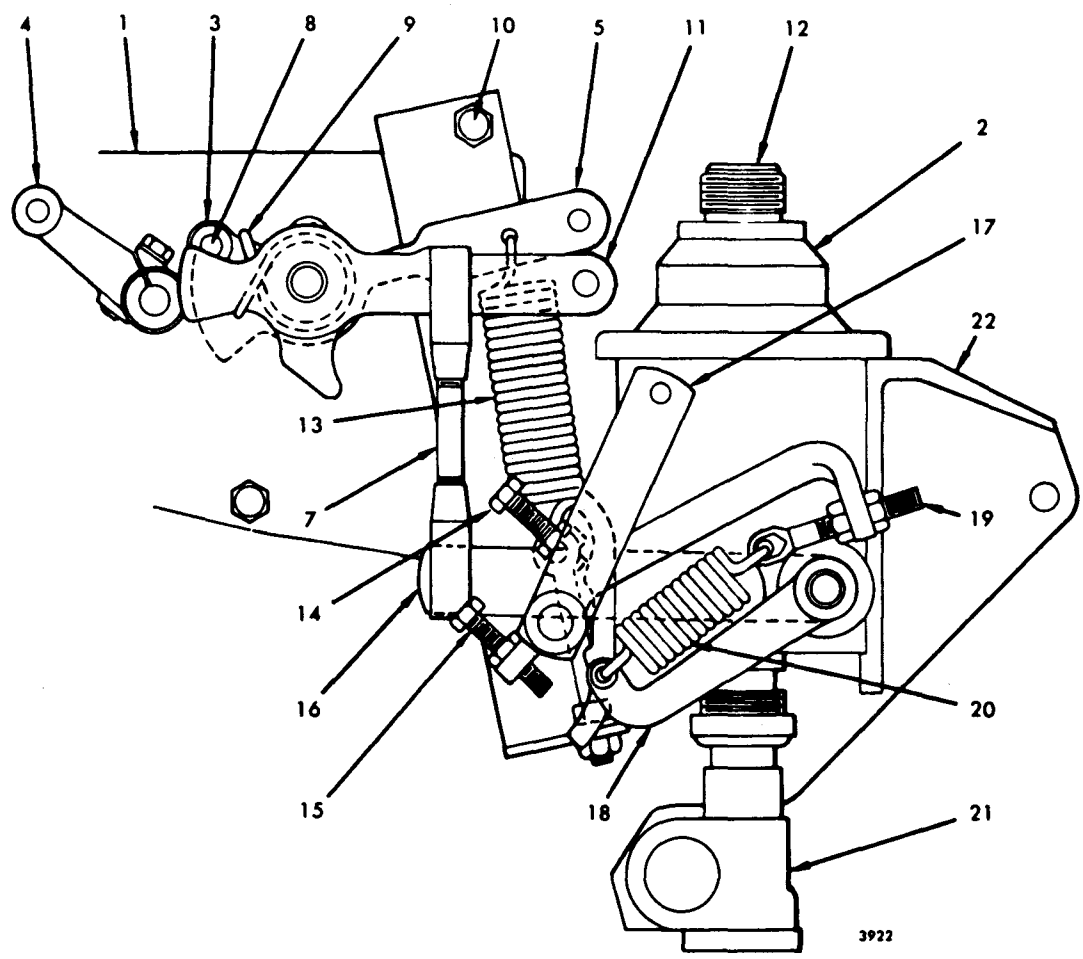
The tune-up procedure for a 16V engine equipped with the EG-B electric governor is similar to the procedure used on the 6, 8 or 12V engines. To position the injector rack control levers, use the same linkage gage (J 22195) but follow the procedure outlined in the variable speed hydraulic governor (6, 8 and 12V) or in the variable speed hydraulic governor (16V). The governor adjustments, however, are the same as on the 6, 8 and 12V engines.

MECHANICAL OUTPUT SHAFT GOVERNOR AND LINKAGE ADJUSTMENT

A Pierce mechanical governor is used to maintain a near constant output shaft speed on engines equipped with a torque converter. The governor is mounted at the front of the engine (Fig. 1) and driven by a flexible shaft from the converter output shaft.

The output shaft governor is lubricated by engine oil contained within the governor housing. The governor sump is filled through the hinged cap oiler until the oil begins to drip out of the oil level hole. After filling, a plug is installed in the oil level hole to prevent leakage. The oil level should be checked every 8 service hours and changed every 500 hours.

The output shaft governor is connected to the engine governor by control rods and levers as illustrated in Fig. 1. The control rod end ball joints are sealed assemblies and do not require lubrication. Other moving parts of the control linkage should be lubricated with engine oil.



1. Governor--Engine
2. Governor--Output Shaft
3. Lever--Throttle Control
4. Lever--Shut-Down
5. Lever--Engine Governor Operating
7. Rod--Output Shaft Governor
8. Pin--Stop
9. Spring--Torsion
10. Bolt (Stop)
11. Lever--Output Shaft Governor
12. Drive--Flexible Shaft
13. Spring--Governor Lever Return
14. Bolt--Minimum Speed Adjusting
15. Bolt--Maximum Speed Adjusting
16. Lever--Rocker Shaft
17. Lever--Speed Adjusting
18. Lever--Spring
19. Eye Bolt--Droop Adjusting
20. Spring--Speed Adjusting
21. Drive--Tachometer
22. Bracket--Output Shaft Governor Mounting

Fig. 1 - Mechanical Output Shaft Governor and Linkage

The centrifugal force of the revolving output shaft governor flyweights is converted into linear motion which is transmitted through a riser, thrust bearing, operating fork, and rocker shaft to an external speed adjusting spring. The speed of the torque converter output shaft is governed by the tension of the speed adjusting spring. This spring tension is established by the operator when he moves the output shaft governor speed adjusting lever to the desired speed setting.

The engine governor operating lever is positioned by the operator to limit the maximum fuel input to the engine. For most purposes, such as drag line and shovel operation, the lever is advanced to its maximum position to permit the output shaft governor to obtain full power from the engine. The lever may be used as an overrule lever when performing such jobs as laying of structural steel. A spring is used to return the lever to the idle position. Travel of the governor operating lever is limited by a stop (bolt).

The engine governor throttle control lever is pinned to the throttle shaft. The engine governor operating lever is mounted below the throttle control lever and rides on the throttle shaft boss on the governor cover. The output shaft governor lever is mounted above the throttle control lever and is retained on the shaft by a snap ring. A stop pin, pressed into the throttle control lever, transmits movement of the output shaft governor lever and/or engine governor operating lever through the throttle control lever to the injector racks. The torsion spring, used to retain the throttle control lever stop pin against the output shaft governor lever, yields to permit the governor operating lever to move the throttle control lever toward the idle position, regardless of the position of the output shaft governor lever. A slot in the underside of the governor cover hub limits the travel of the throttle control lever in both its maximum and minimum speed positions.

Movement of the output shaft governor speed adjusting lever is limited by the maximum and minimum speed adjusting bolts.

The engine shut-down lever is connected through a shaft to another lever, under the governor cover, which bears against the pin in the differential lever. To stop the engine, the shut-down lever is used to move the differential lever to the no-fuel position.

Operation

When the output shaft governor speed adjusting lever is advanced, the tension on the speed adjusting spring is increased. The force resulting from the increased spring tension is transmitted through the rocker shaft lever and control linkage to the throttle control lever which advances the injector racks. Engine speed increases, as a result of the increased fuel, until the output shaft governor weight force is sufficient to balance the increased spring tension. The weights then move against the spring and reduce the injector rack fuel setting to an amount sufficient to maintain the higher engine speed setting.

If the operator moves the speed adjusting shaft lever to a decreased speed position, the tension on the speed adjusting spring will decrease and the governor weights will overcome the spring tension and move the rocker shaft lever to a decreased fuel position. The engine speed will be reduced until the force of the output shaft governor weights equals the tension of the speed adjusting spring. The engine will then operate at the desired reduced engine speed.

When a load is applied to the unit, the output shaft slows down and the force exerted by the governor flyweights is reduced, allowing the spring to move the rocker shaft lever to an increased fuel position to provide sufficient power to equal the new load.

When the load on the unit is removed, the output shaft speed will increase and the force exerted by the governor flyweights will increase, overcoming the spring tension and moving the rocker shaft lever to a decreased fuel position to reduce the power to match the reduced load.

Tune-Up

Adjust the exhaust valve clearance, time the fuel injectors and adjust the engine and output shaft governors as follows:

1. Adjust the exhaust valve clearance and time the injectors.

2. Disconnect the output shaft governor rod and the linkage to the engine governor operating lever. Then, adjust the engine governor as outlined under *Limiting Speed Mechanical Governor and Injector Rack Control Adjustment.*

> **NOTE:** Set the No-Load engine speed to that specified on the engine option plate. The No-Load speed varies with the converter used and the maximum output shaft speed setting.

3. Reconnect the linkage to the governor operating lever and check the total travel of the operating lever. The lever should move the stop (bolt) in one direction and the governor lever return spring should move the lever, in the other direction, until the throttle control lever reaches the end of its travel.

4. Move the governor operating lever to the maximum speed position (against the stop bolt).

5. Move the output shaft governor rocker shaft lever to the maximum fuel position and retain it by moving the speed adjusting lever to the full-speed position. Then move the output shaft governor lever and the throttle control lever together to the maximum speed position and retain there.

NOTE: This operation closes the low speed gap which may require more torque than is available from the torsion spring between the above two levers. Thus, it is important that they be held together, permitting no space between the throttle control lever pin and the arm of the output shaft governor lever.

6. Adjust the output shaft governor rod length until it will just slide into the inner hole of the output shaft governor lever (Fig. 1). Then, increase the length of the rod until there is approximately .020" clearance between the stop pin and the output shaft governor lever. Tighten the adjustment.

7. Adjust the governor operating lever return spring by retaining the rocker shaft lever in the full-speed position and increasing the tension on the spring by adjusting the eye bolt and nuts, until the tension of the torsion spring is overcome and the throttle control lever is moved against its stop in the idle position.

8. Move the output shaft governor speed adjusting lever to the minimum speed position and start the engine.

9. Advance the output shaft governor speed adjusting lever to the desired maximum output shaft speed and adjust the maximum speed adjusting bolt to retain the lever.

10. Move the output shaft governor speed adjusting shaft lever to the desired minimum speed position and adjust the minimum speed adjusting bolt to retain the lever.

11. Recheck the output shaft maximum and minimum speeds and readjust the position of the speed adjusting bolts, if necessary.

12. To check the unit for stability as affected by governor speed droop, move the speed adjusting shaft lever, with the engine operating at no load, to the maximum speed position. Then move the output shaft governor rod to cause a speed decrease of several hundred rpm. Release the rod and check for hunting when the governor returns the engine to the maximum speed setting. If the engine stabilizes in less than three surges, the droop may be set too high; if the engine does not stabilize in five surges, the droop may be set too low. Set the speed droop as follows:

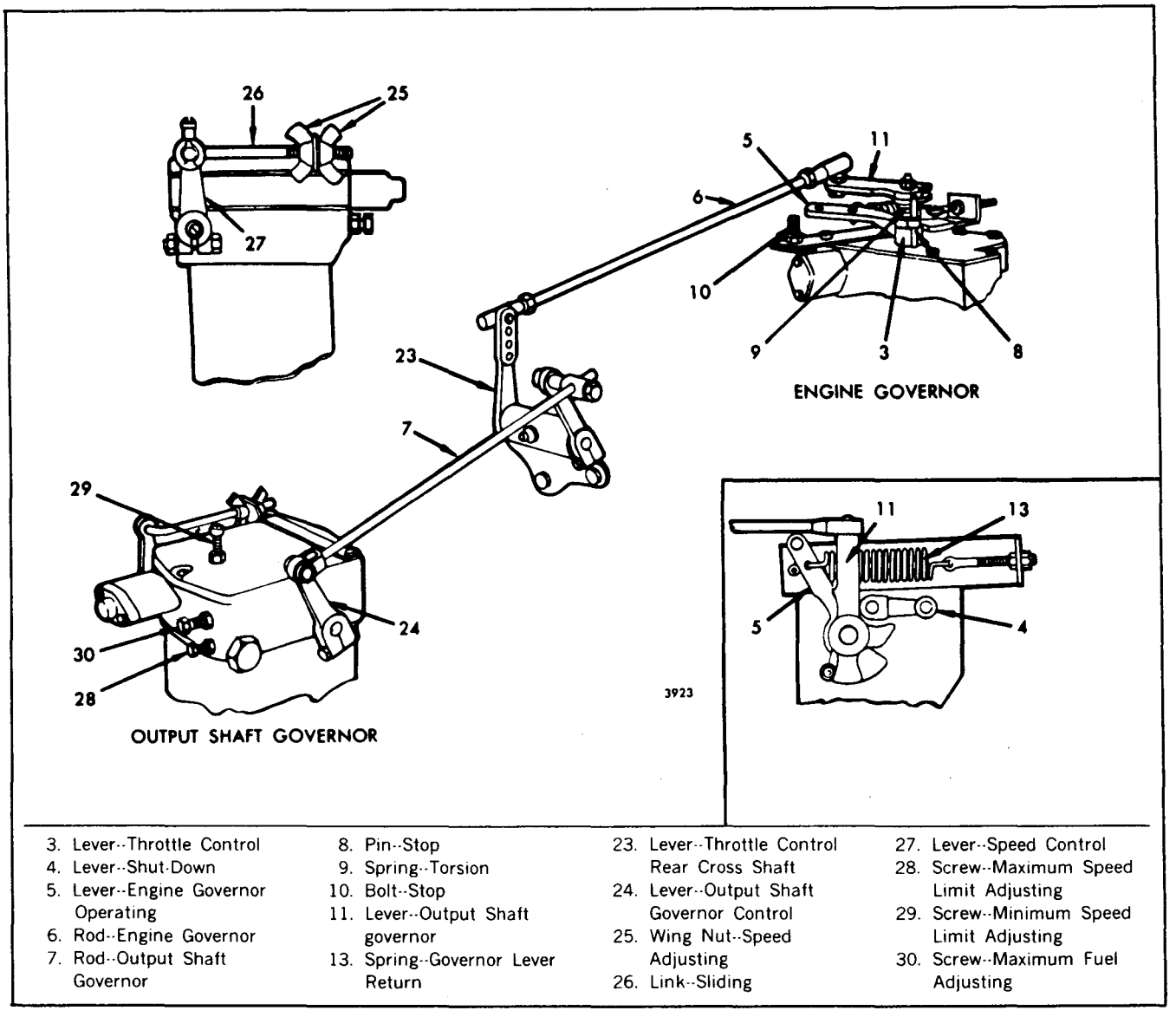
a. If the engine hunts less than three surges, back off the inner speed adjusting spring eye bolt nut one full turn and tighten the inner nut one turn to retain the adjustment. If the engine hunts more than five surges, back off the outer speed adjusting spring eye bolt nut one full turn and tighten the outer nut one turn to retain the adjustment.

NOTE: The eye of the bolt must be in a horizontal plane to avoid twisting the spring.

b. Reset the maximum engine no-load speed, if necessary, as outlined in Steps 9 and 10.

c. Recheck the speed droop. The engine speed should be stable when the governor droop is 7-1/2% to 10% of the full-load speed. For example, at an output shaft speed setting of 1800 rpm full load, the output shaft speed droop should be 150 to 200 rpm. Therefore, the no-load output shaft speed should be set at 1950 to 2000 rpm.

HYDRAULIC OUTPUT SHAFT GOVERNOR AND LINKAGE ADJUSTMENT



3. Lever--Throttle Control
4. Lever--Shut-Down
5. Lever--Engine Governor Operating
6. Rod--Engine Governor
7. Rod--Output Shaft Governor
8. Pin--Stop
9. Spring--Torsion
10. Bolt--Stop
11. Lever--Output Shaft governor
13. Spring--Governor Lever Return
23. Lever--Throttle Control Rear Cross Shaft
24. Lever--Output Shaft Governor Control
25. Wing Nut--Speed Adjusting
26. Link--Sliding
27. Lever--Speed Control
28. Screw--Maximum Speed Limit Adjusting
29. Screw--Minimum Speed Limit Adjusting
30. Screw--Maximum Fuel Adjusting

Fig. 1 - Hydraulic Output Shaft Governor and Linkage

A hydraulic governor is used to maintain a near constant output shaft speed on engines equipped with a Series 500 or larger Torqmatic converter. The governor is mounted on the converter and gear driven from the output shaft.

The output shaft governor is connected to the engine governor by control rods and levers (Fig. 1). The control rod end ball joints are sealed assemblies and do not require lubrication. Other moving parts of the control linkage should be lubricated with engine oil.

In most applications, such as drag line and shovel operation, it is desirable to have the output shaft governor control the fuel input to maintain a relatively constant output shaft speed. The output shaft speed will be constant up to full power of the engine, except for the amount of governor droop. The speed setting of the engine governor must be sufficiently higher than the speed setting of the output shaft governor so the engine governor will not reduce the fuel input to the engine before full power is required by the output shaft governor. As load is applied to the output shaft, the output shaft speed will decrease gradually up to the amount of the output shaft governor droop at full

load. At the same time, the engine speed will gradually increase until full load is reached.

In some types of operation, such as laying of structural steel, it is desirable to operate the unit with a very low output shaft speed. This speed could be so low that the output shaft governor ball head assembly would not actuate the governor pilot valve and spring seat assembly. In such applications, the engine governor operating lever, used as an overrule lever, can be moved toward the idle speed position sufficiently to provide the desired low output shaft speed. Output shaft speeds down to zero can be obtained through this type of engine governor control. The engine governor would maintain control unless the output shaft speed increased to the speed setting of the output shaft governor.

Adjustments

The engine governor throttle control lever (Fig. 1) is pinned to the throttle shaft. The engine governor operating lever is mounted below the throttle control lever and rides on the throttle shaft boss on the governor cover. The output shaft governor lever is mounted above the throttle control lever and is retained on the shaft by a snap ring. A stop pin, pressed into the throttle control lever, transmits movement of the output shaft governor lever and/or engine governor operating lever through the throttle control lever to the injector racks. The torsion spring, used to retain the throttle control lever stop pin against the output shaft governor lever, yields to permit the governor operating lever to move the throttle control lever toward the idle position, regardless of the position of the output shaft governor control lever. A slot in the underside of the governor cover hub limits the travel of the throttle control lever in both the maximum and minimum speed positions.

The engine shut-down lever is connected through a shaft to another lever, under the governor cover, which bears against the pin in the differential lever. To stop the engine, the shut-down lever is used to move the differential lever to the no-fuel position.

The following linkage and governor adjustments should be made with the engine stopped and after the limiting speed engine governor has been adjusted.

1. Connect the linkage to the governor operating lever and check the total travel of the lever. The lever should move to the stop bolt in one direction and the governor lever return spring should move the lever, in the other direction, until the throttle control lever reaches the end of its travel.

2. Move the governor operating lever to the maximum speed position (against the stop bolt).

3. Move the output shaft governor control lever to the full-fuel position and retain it by moving the speed control lever to the maximum speed position. Then, move the output shaft governor lever (on the engine governor cover) and the throttle control lever together to the maximum speed position and retain there.

> **NOTE:** This operation closes the low speed gap (in the engine governor) which may require more torque than is available from the torsion spring between the two levers. Thus, it is important that they be held together, permitting no space between the throttle control lever pin and the arm of the output shaft governor lever.

4. To adjust the linkage between the output shaft governor and the engine governor, loosen the output shaft governor rod clamping bolt in the ball joint in the rear cross-shaft lever. Next, move the output shaft governor rod until there is approximately .020" clearance between the stop pin and the output shaft governor lever. Then, tighten the clamping bolt securely.

> **NOTE:** The engine governor control rod is connected to the outer bolt hole in the output shaft governor lever.

5. To adjust the governor operating lever return spring, retain the output shaft governor control lever in the full-fuel position and increase the tension on the spring by adjusting the eye bolt and lock nuts until the tension of the torsion spring is overcome and the throttle control lever is moved against the stop in the idle position.

Final Adjustments

Move the output shaft governor lever in the idle speed position and start the engine.

After the engine reaches normal operating temperature, advance the output shaft governor speed control lever to the maximum speed position and check the Torqmatic converter output shaft speed. This speed will vary depending upon engine application.

If it is necessary to adjust the output shaft speed, loosen the wing nuts on the sliding link and move the speed control lever to increase or decrease the speed as needed.

The output shaft governor is driven through the converter and there is a high droop. Therefore, the no-load speed setting should be at least 150 rpm higher

than the desired full-load speed setting. Tighten the wing nuts after completing the adjustment.

CAUTION: Do not set the Torqmatic converter output shaft speed in excess of the speed specified by the equipment manufacturer, to prevent damage to the driven machinery.

It will be noted during engine operation that the minimum droop will vary between 150 and 175 rpm. If the droop requires adjustment, move the droop bracket (inside the output shaft governor) to decrease or increase the amount of droop.

NOTE: To compensate for the output shaft speed droop, the engine no-load speed must be set approximately 175 rpm above the required engine full-load speed.

Move the output shaft governor speed control lever to the idle speed position and adjust the idle speed by means of the minimum speed limit adjusting screw.

The maximum fuel adjusting screw and the maximum speed limit adjusting screw are not used and should be backed out to prevent interference.

TROUBLE SHOOTING

Certain abnormal conditions which sometimes interfere with satisfactory engine operation, together with methods of determining the cause of such conditions, are covered on the following pages.

Satisfactory engine operation depends primarily upon:

1. An adequate supply of air compressed to a sufficiently high compression pressure.

2. The injection of the proper amount of fuel at the right time.

Lack of power, uneven running, excessive vibration, stalling at idle speed, and hard starting may be caused by either low compression, faulty fuel injection in one or more cylinders, or lack of sufficient air.

Since proper compression, fuel injection and the proper amount of air are important to good engine performance, detailed procedures for their investigation are given as follows:

Locating a Misfiring Cylinder

1. Start the engine and run it at part load until it reaches normal operating temperature.

2. Stop the engine and remove the valve rocker covers. Discard the gaskets.

3. Check the valve clearance. The clearance should be .009" (two valve cylinder head) or .014" (four valve cylinder head).

4. Start the engine and hold an injector follower down with a screw driver to prevent operation of the injector. If the cylinder has been misfiring, there will be no noticeable difference in the sound and operation of the engine. If the cylinder has been firing properly, there will be a noticeable difference in the sound and operation when the injector follower is held down. This is similar to short-circuiting a spark plug in a gasoline engine.

5. If the cylinder is firing properly, repeat the procedure on the other cylinders until the faulty one has been located.

6. Provided that the injector operating mechanism of the faulty cylinder is functioning satisfactorily, remove the fuel injector and install a new one by performing the removal and installation procedure outlined under *Fuel System.*

7. If installation of a new injector does not eliminate misfiring, check the compression pressure.

Checking Compression Pressure

Compression pressure is affected by altitude as shown in Table 1.

Check the compression pressure as follows:

1. Start the engine and run it at approximately one-half rated load until normal operating temperature is reached.

Minimum Compression Pressure (psi) at 600 rpm		Altitude, Feet Above Sea Level
Standard and Turbocharged Engines	"N" Engines	
425	515	0
395	480	2,500
365	440	5,000
340	410	7,500
315	380	10,000

TABLE 1

Cylinder	Gage Reading
1L	445 psi
1R	440 psi
2L	405 psi
2R	435 psi
3L	450 psi
3R	445 psi

TABLE 2

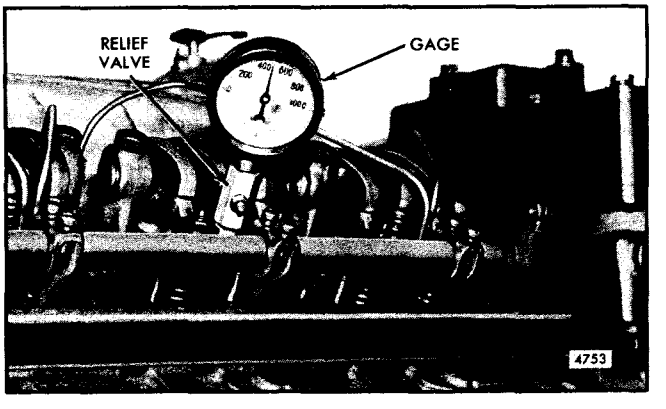


Fig. 1 - Checking Compression Pressure

2. Stop the engine and remove the fuel pipes from the No. 1 injector and the fuel connectors.

3. Remove the injector and install adaptor J 7915-02 and pressure gage and hose assembly J 6992 (Fig. 1).

4. Use one of the fuel pipes as a jumper connection between the fuel inlet and return manifold connectors. This will permit fuel to flow directly to the fuel return manifold.

5. Start the engine and run it at 600 rpm. Observe and record the compression pressure indicated on the gage.

> **NOTE:** Do not crank the engine with the starting motor to check the compression pressure.

6. Perform Steps 2 through 5 on each cylinder. The compression pressure in any one cylinder should not be less than 425 psi (515 psi for a V-71 "N" engine) at 600 rpm. In addition, the variation in compression pressures between cylinders must not exceed 25 psi.

> **EXAMPLE:** If the compression pressure readings were as shown in Table 2, it would be evident that No. 2L cylinder should be examined and the cause of the low compression pressure be determined and corrected.

The above pressures are for an engine operating at altitudes near sea level.

Note that all of the cylinder pressures are above the low limit for satisfactory engine operation. Nevertheless, the No. 2L cylinder compression pressure indicates that something unusual has occurred and that a localized pressure leak has developed.

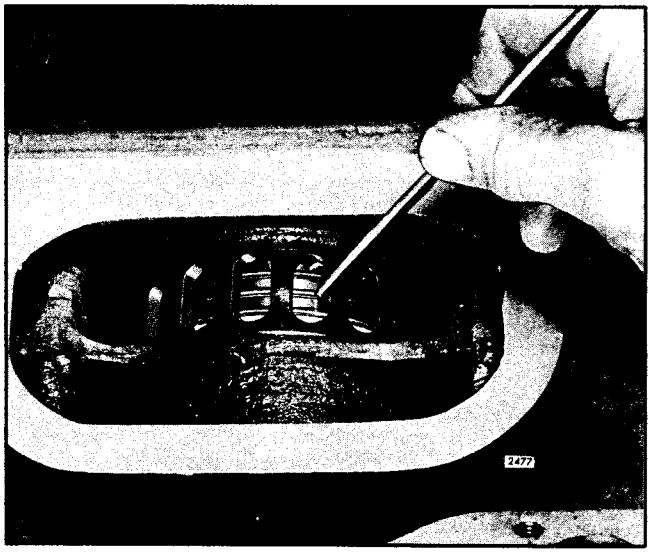


Fig. 2 - Inspecting for Broken Piston Rings Through Cylinder Liner Air Ports

Low compression pressure may result from any one of several causes:

A. Piston rings may be stuck or broken. To determine the condition of the rings, remove the air box cover and press on the compression rings (Fig. 2) with a blunt tool. A broken or stuck ring will not have a spring-like action.

B. Compression pressure may be leaking past the cylinder head gasket, valve seats, injector tube, or through a hole in the piston.

To correct any of these conditions, consult your authorized *Detroit Diesel Allison Service Outlet.*

Engine Out of Fuel

The problem in restarting the engine after it has run out of fuel stems from the fact that after the fuel is exhausted from the fuel tank, fuel is then pumped

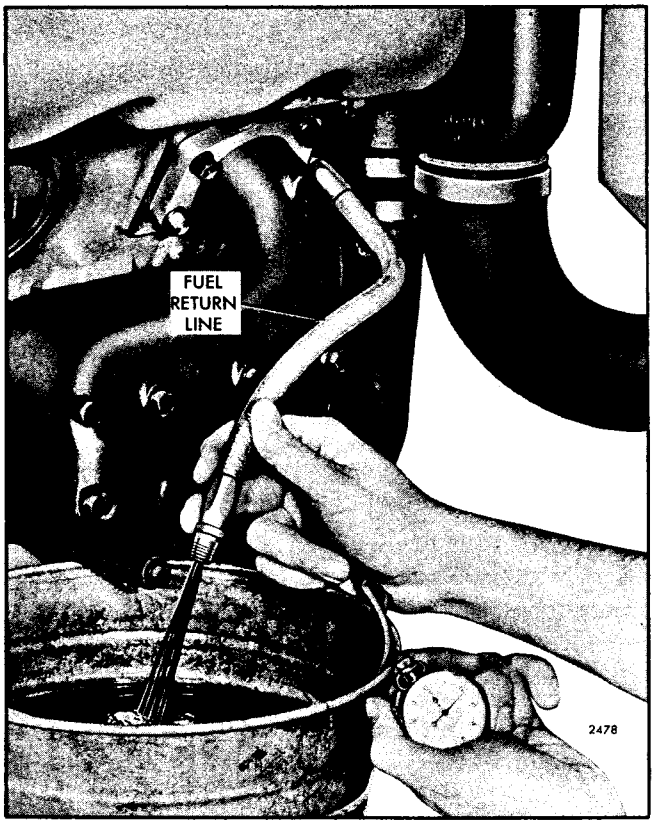


Fig. 3 - Measuring Fuel Flow from Fuel Return Manifold

from the primary fuel strainer and sometimes partially removed from the secondary fuel filter before the fuel supply becomes insufficient to sustain engine firing. Consequently, these components must be refilled with fuel and the fuel pipes rid of air in order for the system to provide adequate fuel for the injectors.

When an engine has run out of fuel, there is a definite procedure to follow for restarting the engine.

1. Fill the fuel tank with the recommended grade of fuel oil. If only partial filling of the tank is possible, add a minimum of ten gallons of fuel.

2. Remove the fuel strainer shell and element from the strainer cover and fill the shell with fuel oil. Install the shell and element.

3. Remove and fill the fuel filter shell and element with fuel oil as in Step 2.

4. Start the engine. Check the filter and strainer for leaks.

> **NOTE:** In some instances, it may be necessary to remove a valve rocker cover and loosen a fuel pipe nut in order to bleed trapped air from the fuel system. Be sure the fuel pipe is retightened securely before replacing the rocker cover.

Primer J 5956 may be used to prime the entire fuel system. Remove the filler plug in the fuel filter cover and install the primer. Prime the system. Remove the primer and install the filler plug.

Fuel Flow Test

1. Disconnect the fuel return hose from the fitting at the fuel tank and hold the open end of the hose in a suitable container (Fig. 3).

2. For non-turbocharged engines, start and run the engine at 1200 rpm and measure the fuel flow for a period of one minute. A flow of approximately 0.8 gallon of fuel per minute is specified for 6, 8 and 12V engines (with a fuel line restriction fitting having an .080" spill orifice) or 1.2 gallons per minute for 16V engines (with restriction fittings having an .070" spill orifice).

For 8, 12 and 16V turbocharged engines (with a restriction fitting having an .070" spill orifice), start and run the engine at 1800 rpm and measure the fuel flow for a period of one minute. A flow of 1.8 gallons per minute is specified for engines equipped with a T 1865 or T 1805 turbocharger, or a flow of 1.4 gallons per minute for engines equipped with a T 18A40 turbocharger.

3. Immerse the end of the fuel line in the fuel in the container. Air bubbles rising to the surface of the fuel will indicate air being drawn into the fuel system on the suction side of the pump. If air is present, tighten all fuel line connections between the fuel tank and the fuel pump.

If the fuel flow fails to meet the amount specified, the fuel strainer, filter, or pump should be serviced.

Crankcase Pressure

The crankcase pressure indicates the amount of air passing between the oil control rings and the cylinder liner into the crankcase, most of which is clean air from the air box. A slight pressure in the crankcase is desirable to prevent the entrance of dust. A loss of engine lubricating oil through the governor breather tube, crankcase ventilator, or dipstick hole in the cylinder block is indicative of excessive crankcase pressure.

The causes of high crankcase pressure may be traced to excessive blow-by due to worn piston rings, a hole or crack in a piston crown, loose piston pin retainers, worn blower seals, defective blower, cylinder head or end plate gaskets, or excessive exhaust back pressure. Also, the breather tube or crankcase ventilator should be checked for obstructions. If necessary, clean the breather pads located behind the cylinder block rear end plate.

The crankcase pressure may be checked with a manometer connected to the oil level dipstick opening in the cylinder block. Check the readings obtained at various engine speeds with the specifications in Table 3.

Exhaust Back Pressure

A slight pressure in the exhaust system is normal. However, excessive exhaust back pressure seriously affects engine operation. It may cause an increase in the air box pressure with a resultant loss in the efficiency of the blower. This means less air for scavenging, which results in poor combustion and higher temperatures.

Causes of high exhaust back pressure are usually a result of an inadequate or improper type of muffler, an exhaust pipe which is too long or too small in diameter, an excessive number of sharp bends in the exhaust system, or obstructions such as excessive carbon formation or foreign matter in the exhaust system.

CRANKCASE PRESSURE (Max. in inches of Water)*				
Engine	Speed (rpm)			
	1200	1800	2000	2100
V-71 (2 Valve)	0.2	0.7	-	1.0
V-71 (4 Valve) "N"	1.0	2.2	-	3.0
8V-71T(T1865-1.50 A/R Housing)	-	1.3	1.7	2.0
8V-71T(T18A40-1.70 A/R Housing) Except Stand By Generator Set	-	2.2	2.7	3.0
8V-71T(T18A40-1.70 A/R Housing) Stand By Generator Set	-	2.2	-	-
12 and 16V-71T Except Stand By Generator Set	-	2.2	2.7	3.0
12 and 16V-71T Stand By Generator Set	-	2.2	-	-

TABLE 3

The exhaust back pressure, measured in inches of mercury, may be checked with a manometer or pressure gage connected to the exhaust manifold. Remove the 1/8" pipe plug, which is provided for that purpose, from the manifold. If there is no opening provided, one can be made by drilling an 11/32" hole in the exhaust manifold companion flange and tapping a 1/8" pipe thread.

On turbo-charged engines, check the exhaust back pressure in the exhaust piping 6" to 12" from the rear face of the turbine. The tapped hole must be in a comparatively straight area for an accurate measurement.

Check the readings obtained at various speeds (no load) with the specifications in Table 4.

Air Inlet Restriction

Excessive restriction of the air inlet will affect the flow of air to the cylinders and result in poor combustion and lack of power. Consequently, the restriction must be kept as low as possible considering the size and capacity of the air cleaner. An obstruction in the air inlet system or dirty or damaged air cleaners will result in a high blower inlet restriction.

The air inlet restriction may be checked with a water manometer connected to a fitting in the air inlet ducting located 2" above the air inlet housing. When practicability prevents the insertion of a fitting at this point, the manometer may be connected to the engine air inlet housing. The restriction at this point should be checked at a specific engine speed. Then the air cleaner and ducting should be removed from the air inlet housing and the engine again operated at the same speed while noting the manometer reading.

EXHAUST BACK PRESSURE—NO-LOAD (Max. in inches of Mercury)				
Engine	Speed (rpm)			
	1200	1800	2000	2100
V-71 (2 - 4 Valve) "N"	1.0	2.1	—	2.6
8 V-71T, 12 V-71T and 16 V-71T	—	1.1	1.6	1.8

TABLE 4

AIR INLET RESTRICTIONS (In Inches of Water)				
Engine	Speed (rpm)			
	1200	1800	2000	2100
Max. with Dirty Air Cleaner Oil Bath or Dry Type				
All V-71 2 Valve, 4 Valve and "N"	12.4	25.0	—	25.0
Max. with Clean Air Cleaner Oil Bath or Dry with Precleaner				
All V-71 2 Valve, 4 Valve and "N"	8.7	13.4	—	15.9
Max. with Clean Air Cleaner Dry Type Less Precleaner				
All V-71 2 Valve, 4 Valve and "N"	5.2	9.1	—	11.5
Max. with Dirty Air Cleaner Dry Type*				
8V71T, 12V71T, 16V71T Except Stand by Gen. Sets	—	14.5	18.0	20.0
Max. with Clean Air Cleaner Dry Type with Precleaner *				
8V71T, 12V71T, 16V71T Except Stand by Gen. Sets	—	8.7	10.8	12.0
Max. with Clean Air Cleaner Dry Type Less Precleaner*				
8V71T, 12V71T, 16V71T Except Stand by Gen. Sets	—	5.8	7.2	8.0
Max. with Dirty Air Cleaner Oil Bath *				
16VT Except Stand by Gen. Sets	—	14.8	18.0	20.0
Max. with Clean Air Cleaner Oil Bath*				
16VT Except Stand by Gen. Sets	—	11.8	14.5	16.0
Max. Dirty Air Cleaner Oil Bath *				
8V-71T,12V71T and 16V71T Stand by Gen. Sets	—	16.0	—	—
Max. with Clean Air Cleaner Oil Bath *				
8V-71T,12V71T and 16V71T Stand by Gen. Sets	—	13.0	—	—

*Full Load Speed

TABLE 5

AIR BOX PRESSURE-FULL LOAD (In Inches of Mercury)				
Min. with Max. Exhaust Back Pressure				
Engine	Speed (rpm)			
	1200	1800	2000	2100
V-71 (2 Valve)	2.9	6.7	-	9.2
V-71 (4 Valve) "N"	2.3	6.4	-	8.2
8V-71T(T1865-1.50 A/R Housing Turbocharger N65 Injector	-	22.8	27.7	30.5
N75 Injector	-	24.5	30.5	33.0
8V-71T(T18A40-1.70 A/R Housing Turbocharger N65 Injector	-	16.4	21.8	24.5
N70 Injector	-	19.9	25.3	28.0
N75 Injector	-	20.9	26.3	29.0
12V-71T(T1805 Turbocharger) N70 Injector	-	22.0	26.5	29.0
N75 Injector	-	22.5	27.3	30.0
N80 Injector (Stand By Generator Set)	-	31.2	-	-
12V-71T(T18A40-1.14 A/R Hsg.) N65 Injector	-	17.9	21.8	23.5
N70 Injector	-	19.4	23.3	25.0
N75 Injector	-	20.4	24.3	27.0
16V-71T(T1865 Turbocharger) N65 Injector	-	20.7	25.0	27.5
N70 Injector	-	22.0	27.0	29.5
N75 Injector	-	23.7	29.0	32.0
N80 Injector (Stand By Gen. Set)	-	31.2	-	-
Min. with Zero Exhaust Back Pressure				
V-71 (2 Valves)	1.7	4.1	-	6.0
V-71 (4 Valves) "N"	1.1	3.8	-	5.0
8V-71T(T1865-1.50 A/R Housing Turbocharger) N65 Injector	-	21.6	26.0	28.5
N75 Injector	-	23.1	28.2	31.0
8V-71T(T18A40-1.70 A/R Housing Turbocharger) N65 Injector	-	17.5	23.5	26.5
N70 Injector	-	21.0	27.0	30.0
N75 Injector	-	22.0	28.0	31.0
12V-71T(T1805 Turbocharger) N70 Injector	-	20.5	24.0	27.0
N75 Injector	-	21.0	25.5	28.0
N80 Injector (Stand By Gen. Set)	-	30.0	-	-
12V-71T(T18A40 Turbocharger) N65 Injector	-	19.0	23.5	25.5
N70 Injector	-	20.5	25.0	27.0
N75 Injector	-	21.5	26.0	28.0
16V-71T(T1865 Turbocharger) N65 Injector	-	19.5	23.5	25.5
N70 Injector	-	20.8	25.2	27.5
N75 Injector	-	22.5	27.3	30.0
N80 Injector (Stand By Gen. Set)	-	30.0	-	-

TABLE 6

The difference between the two readings, with and without the air cleaner and ducting, is the actual restriction caused by the air cleaner and ducting.

Check the normal air intake vacuum at various speeds (at no load) and compare the results with the specifications in Table 5.

Air Box Pressure

Proper air box pressure is required to maintain sufficient air for combustion and scavenging of the burned gases. Low air box pressure is caused by a high air inlet restriction, damaged blower rotors, an air leak from the air box (such as leaking end plate gaskets), or a clogged blower air inlet screen. Lack of power or black or grey exhaust smoke are indications of low air box pressure.

To check the air box pressure, connect a manometer to an air box drain tube. Check the readings obtained at various speeds with the specifications in Table 6.

PROPER USE OF MANOMETER

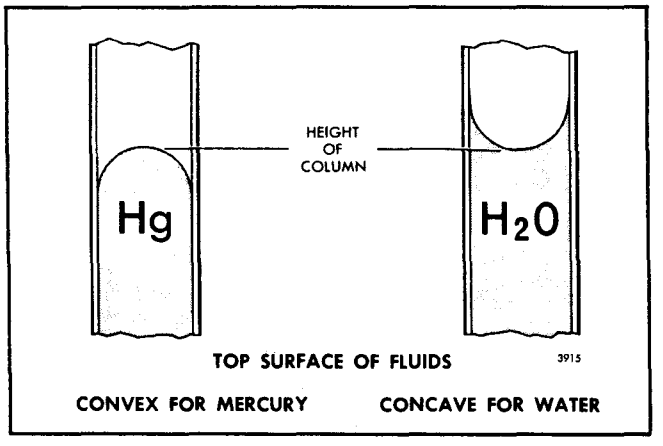


Fig. 4 - Comparison of Column Height for Mercury and Water Manometers

The U-tube manometer is a primary measuring device indicating pressure or vacuum by the difference in the height of two columns of fluid.

Connect the manometer to the source of pressure, vacuum, or differential pressure. When the pressure is imposed, add the number of inches one column of fluid travels up to the amount the other column travels down to obtain the pressure (or vacuum) reading.

PRESSURE CONVERSION CHART

1" water	=	.0735" mercury
1" water	=	.0361 psi
1" mercury	=	.491 psi
1" mercury	=	13.6" water
1 psi	=	27.7" water
1 psi	=	2.036" mercury

TABLE 7

The height of a column of mercury is read differently than that of a column of water. Mercury does not wet the inside surface; therefore, the top of the column has a convex meniscus (shape). Water wets the surface and therefore has a concave meniscus. A mercury column is read by sighting horizontally between the top of the convex mercury surface (Fig. 4) and the scale. A water manometer is read by sighting horizontally between the bottom of the concave water surface and the scale.

Should one column of fluid travel further than the other column, due to minor variations in the inside diameter of the tube or to the pressure imposed, the accuracy of the reading obtained is not impaired.

The manometer reading may be converted into other units of measurement by use of the pressure conversion Table 7.

ENGINE ELECTRICAL GENERATING SYSTEM

Whenever trouble is indicated in the engine electrical generating system, the following quick checks can be made to assist in localizing the cause:

1. A fully charged battery and low charging rate indicates normal alternator-regulator operation.

2. A low battery and high charging rate indicates normal alternator-regulator operation.

3. A fully charged battery and high charging rate condition usually indicates the voltage regulator is set too high or is not limiting the alternator output. A high charging rate to a fully charged battery will damage the battery and other electrical components.

4. A low battery and low or no charging rate condition could be caused by: Loose connections or damaged wiring, defective battery or alternator, or a defective regulator or improper regulator setting.

Contact an authorized *Detroit Diesel Allison Service Outlet* if more information is needed.

STORAGE

PREPARING ENGINE FOR STORAGE

When an engine is to be stored or removed from operation for a period of time, special precautions should be taken to protect the interior and exterior of the engine, transmission and other parts from rust accumulation and corrosion. The parts requiring attention and the recommended preparations are given below.

It will be necessary to remove all rust or corrosion completely from any exposed part before applying a rust preventive compound. Therefore, it is recommended that the engine be processed for storage as soon as possible after removal from operation.

The engine should be stored in a building which is dry and can be heated during the winter months. Moisture absorbing chemicals are available commercially for use when excessive dampness prevails in the storage area.

TEMPORARY STORAGE (30 days or less)

To protect an engine for a temporary period of time, proceed as follows:

1. Drain the engine crankcase.

2. Fill the crankcase to the proper level with the recommended viscosity and grade of oil.

3. Fill the fuel tank with the recommended grade of fuel oil. Operate the engine for two minutes at 1200 rpm and no load.

> **NOTE:** Do not drain the fuel system or the crankcase after this run.

4. Check the air cleaner and service it, if necessary, as outlined under *Air System.*

5. If freezing weather is expected during the storage period, add a high boiling point type antifreeze solution in accordance with the manufacturer's recommendations. Drain the raw water system and leave the drain cocks open.

6. Clean the entire exterior of the engine (except the electrical system) with fuel oil and dry it with air.

7. Seal all of the engine openings. The material used for this purpose must be water proof, vaporproof and possess sufficient physical strength to resist puncture and damage from the expansion of entrapped air.

An engine prepared in this manner can be returned to service in a short time by removing the seals at the engine openings, checking the engine coolant, fuel oil, lubricating oil, transmission and priming the raw water pump, if used.

EXTENDED STORAGE (30 days or more)

When an engine is to be removed from operation for an extended period of time, prepare it as follows:

1. Drain and thoroughly flush the cooling system with clean, soft water.

2. Refill the cooling system with clean, soft water.

3. Add a rust inhibitor to the cooling system (refer to *Corrosion Inhibitor* under *Cooling System).*

4. Remove, check and recondition the injectors, if necessary, to make sure they will be ready to operate when the engine is restored to service.

5. Reinstall the injectors in the engine, time them, and adjust the valve clearance.

6. Circulate the coolant through the entire system by operating the engine until normal operating temperature is reached (160° F. to 185° F.).

7. Stop the engine.

8. Remove the drain plug and completely drain the engine crankcase. Reinstall and tighten the drain plug. Install new lubricating oil filter elements and gaskets.

9. Fill the crankcase to the proper level with a 30-weight preservative lubricating oil MIL-L-21260, Grade 2 (P10), or equivalent.

10. Drain the engine fuel tank.

11. Refill the fuel tank with enough rust preventive fuel oil such as American Oil Diesel Run-In Fuel

(LF 4089), Mobil 4Y17, or equivalent, to enable the engine to operate 10 minutes.

12. Drain the fuel filter and strainer. Remove the retaining bolts, shells and elements. Discard the used elements and gaskets. Wash the shells in clean fuel oil and insert new elements. Fill the cavity between the element and shell about two-thirds full of the same rust preventive compound as used in the fuel tank and reinstall the shell.

13. Operate the engine for 10 minutes to circulate the rust preventive throughout the engine.

14. Refer to *Air System* and service the air cleaner.

15. MARINE GEAR

a. Drain the oil completely and refill with clean oil of the proper viscosity and grade as is recommended. Remove, clean or replace the strainer and replace the filter element.

b. Start and run the engine at 600 rpm for 10 minutes so that clean oil can coat all of the internal parts of the marine gear. Engage the clutches alternately to circulate clean oil through all of the moving parts.

16. TORQMATIC CONVERTER

a. Start the engine and operate it until the temperature of the converter oil reaches 150° F.

b. Remove the drain plug and drain the converter.

c. Remove the filter element.

d. Start the engine and stall the converter for twenty seconds at 1000 rpm to scavenge the oil from the converter. *Due to lack of lubrication, do not exceed the 20 second limit.*

e. Install the drain plug and a new filter element.

f. Fill the converter to the proper operating level with a commercial preservative oil which meets Government specifications MIL-L-21260, Grade 1. Oil of this type is available from the major oil companies.

g. Start the engine and operate the converter for at least 10 minutes at a minimum of 1000 rpm. Engage the clutch, then stall the converter to raise the oil temperature to 225° F.

CAUTION: Do not allow the oil temperature to exceed 225° F. If the unit does not have a temperature gage, *do not stall the converter for more than thirty seconds.*

h. Stop the engine and permit the converter to cool to a temperature suitable to touch.

i. Seal all of the exposed openings and the breather with moisture proof tape.

j. Coat all exposed, unpainted surfaces with preservative grease. Position all of the controls for minimum exposure and coat them with grease. The external shafts, flanges and seals should also be coated with grease.

17. POWER TAKE-OFF

a. Use an all purpose grease such as Shell Alvania No. 2, or equivalent, and lubricate the clutch throwout bearing, clutch pilot bearing, drive shaft main bearing, clutch release shaft, and the outboard bearings (if so equipped).

b. Remove the inspection hole cover on the clutch housing and lubricate the clutch release lever and link pins with a hand oiler. Avoid getting oil on the clutch facing.

c. If the unit is equipped with a reduction gear, drain and flush the gear box with light engine oil. If the unit is equipped with a filter, clean the shell and replace the filter element. Refill the gear box to the proper level with the grade of oil indicated on the name plate.

18. HYDROSTARTER SYSTEM

Refer to *Hydraulic Starting System* in the section on *Engine Equipment* for the lubrication and preventive maintenance procedure.

19. TURBOCHARGER

The turbocharger bearings are lubricated by pressure through the external oil line leading from the engine cylinder block while performing the previous operations above and no further attention is required.

20. Apply a *non-friction* rust preventive compound, to all exposed parts. If it is convenient, apply the rust preventive compound to the engine flywheel. If not, disengage the clutch mechanism to prevent the clutch disc from sticking to the flywheel.

CAUTION: Do not apply oil, grease or any wax base compound to the flywheel. The cast iron will absorb these substances which can "sweat" out during operation and cause the clutch to slip.

21. Drain the engine cooling system.

22. The oil may be drained from the engine crankcase if so desired. If the oil is drained, reinstall and tighten the drain plug.

23. Remove and clean the battery and battery cables with a baking soda solution and rinse them with fresh water. Do not allow the soda solution to enter the battery. Add distilled water to the electrolyte, if necessary, and fully charge the battery. Store the battery in a cool (never below 32° F.) dry place. Keep the battery fully charged and check the level and the specific gravity of the electrolyte regularly.

24. Insert heavy paper strips between the pulleys and belts to prevent sticking.

25. Seal all of the openings in the engine, including the exhaust outlet, with moisture resistant tape. Use cardboard, plywood or metal covers where practical.

26. Clean and dry the exterior painted surfaces of the engine. Spray the surfaces with a suitable liquid automobile body wax, a synthetic resin varnish or a rust preventive compound.

27. Cover the engine with a good weather-resistant tarpaulin or other cover if it must be stored outdoors. A clear plastic cover is recommended for indoor storage.

The stored engine should be inspected periodically. If there are any indications of rust or corrosion, corrective steps must be taken to prevent damage to the engine parts. Perform a complete inspection at the end of one year and apply additional treatment as required.

PROCEDURE FOR RESTORING AN ENGINE TO SERVICE WHICH HAS BEEN IN EXTENDED STORAGE

1. Remove the valve rocker covers and pour at least one-half gallon of oil, of the same grade as used in the crankcase, over the rocker arms and push rods.

2. Reinstall the valve rocker covers.

3. Remove the covers and tape from all of the openings of the engine, fuel tank and electrical equipment. *Do not overlook the exhaust outlet.*

4. Wash the exterior of the engine with fuel oil to remove the rust preventive.

5. Remove the rust preventive from the flywheel.

6. Remove the paper strips from between the pulleys and the belts.

7. Check the crankcase oil level. Fill the crankcase to the proper level with the heavy-duty lubricating oil recommended under *Lubricating Oil Specifications.*

8. Fill the fuel tank with the fuel specified under *Diesel Fuel Oil Specifications.*

9. Close all of the drain cocks and fill the engine cooling system with clean soft water and a rust inhibitor. If the engine is to be exposed to freezing temperatures, add a high boiling point type antifreeze solution to the cooling system (the antifreeze contains a rust inhibitor).

10. Install and connect the battery.

11. Service the air cleaner as outlined under *Air System.*

12. POWER GENERATOR

Prepare the generator for starting as outlined under *Operating Instructions.*

13. MARINE GEAR

Check the Marine gear; refill it to the proper level, as necessary, with the correct grade of lubricating oil.

14. TORQMATIC CONVERTER

a. Remove the tape from the breather and all of the openings.

b. Remove all of the preservative grease with a suitable solvent.

c. Start the engine and operate the unit until the temperature reaches 150° F. Drain the preservative oil and remove the filter. Start the engine and stall the converter for twenty seconds at 1000 rpm to scavenge the oil from the converter.

CAUTION: A Torqmatic converter containing preservative oil should only be operated enough to bring the oil temperature up to 150° F.

d. Install the drain plug and a new filter element.

e. Refill the converter with the oil that is recommended under *Lubrication and Preventive Maintenance.*

15. POWER TAKE-OFF

Remove the inspection hole cover and inspect the clutch release lever and link pins and the bearing ends of the clutch release shaft. Apply engine oil sparingly, if necessary, to these areas.

16. HYDROSTARTER

a. Open the relief valve on the side of the hand pump and release the pressure in the system.

b. Refer to the filling and purging procedures outlined in *Hydraulic Starting System.* Then drain, refill and purge the Hydrostarter system.

17. TURBOCHARGER

a. Thoroughly clean the area around the turbocharger air inlet tube and the oil inlet line.

b. Disconnect the air inlet tube from the compressor housing.

c. Disconnect the oil inlet line from the top of the center housing.

d. Pour approximately four ounces of lubricating oil in the oil inlet opening of the center housing. Reach in through the air inlet opening in the compressor housing and turn the rotating assembly by hand to coat the bearings, thrust ring and thrust washer with oil. Then fill the oil inlet line with engine oil.

e. Connect the oil inlet line to the top of the center housing. Then connect the air inlet tube to the compressor housing.

18. After all of the preparations have been completed, start the engine. The small amount of rust preventive compound which remains in the fuel system will cause a smoky exhaust for a few minutes.

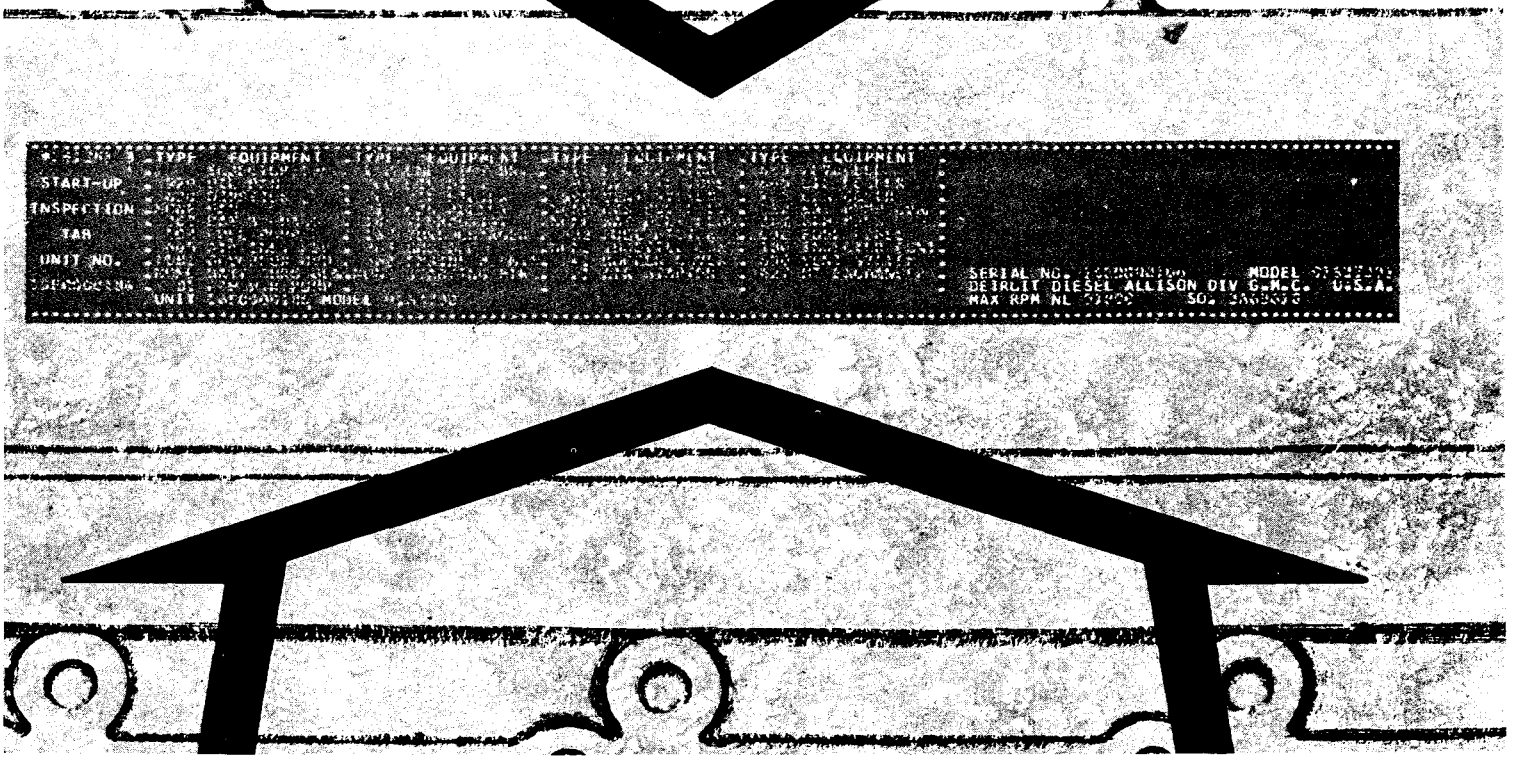
NOTE: Before subjecting the engine to a load or high speed, it is advisable to check the engine tune-up.

BUILT-IN

PARTS BOOK

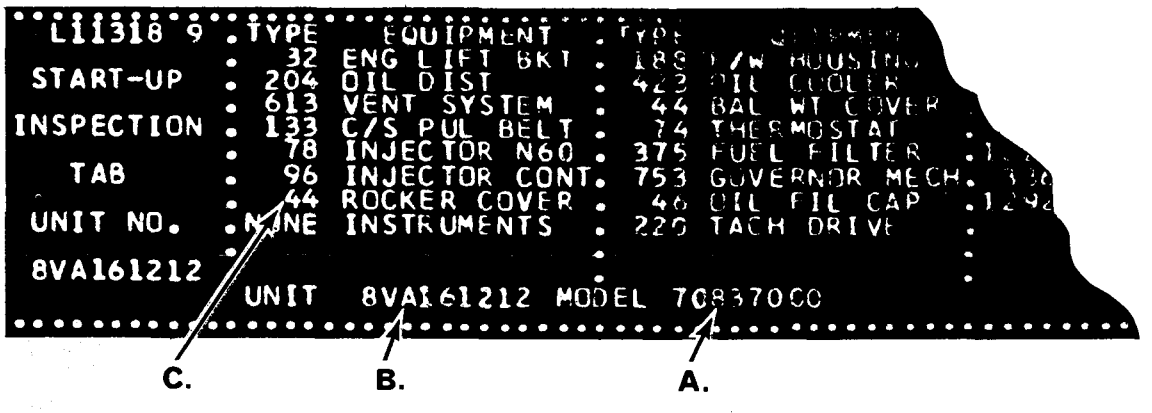
for

DETROIT DIESEL ENGINES



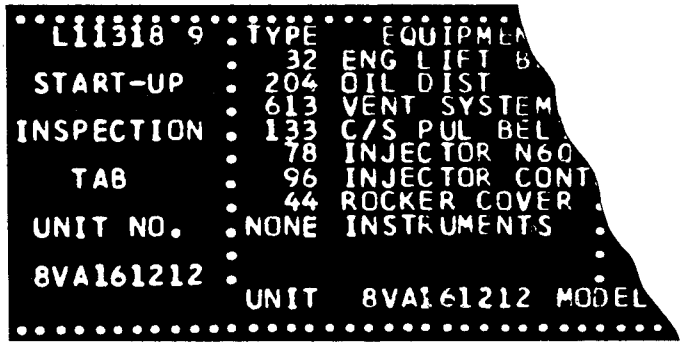
Progress in industry comes at a rapid pace. In order for the engine manufacturer to keep pace with progress he needs a versatile product for the many models and arrangements of accessories and mounting parts needed to suit a variety of equipment. In addition, engine refinements and improvements are constantly being introduced. All of this dynamic action must be documented so that the equipment can be serviced if and when it's needed. It is fully documented in the manufacturer's plant and in dealer Parts Departments with Master Files and adequate supporting records. But, what about YOU the user of this equipment? You have neither the time nor the inclination to ferret out specific part number data. What is the answer? – It is Detroit Diesel's exclusive BUILT-IN PARTS BOOK which is furnished with each engine. It takes the form of an "Option Plate" mounted on the rocker cover of the engine. With it, ordering parts becomes as simple as A, B, C. You have merely to provide the Dealer with . . .

A. The "Model" number **B.** The "UNIT" number **C.** The "TYPE" number

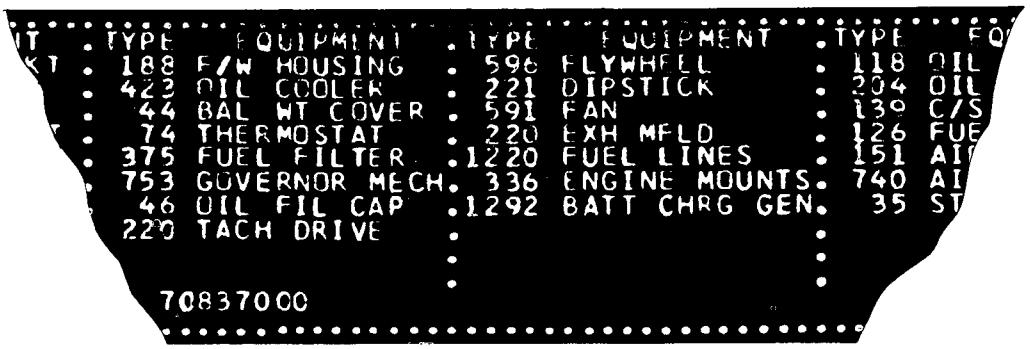


From that much information, the dealer with his complete records on all engine models, can completely interpret your parts requirements.

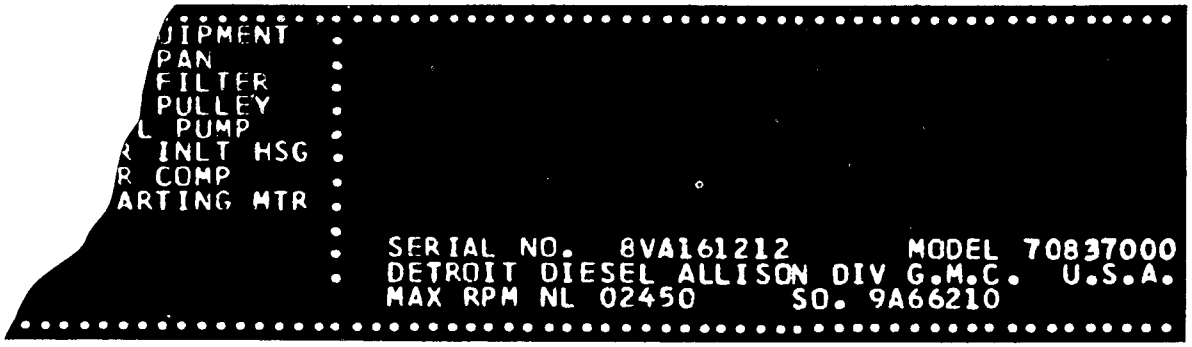
What is this "built-in" book? It is an anodized aluminum plate that fits into a holding channel on the engine rocker cover.



ON THE LEFT SIDE of the plate is the Start-up Inspection Tab which is removed by the dealer when he has completed the inspection.



NEXT is the type number and the equipment description. On the left is the type number. The type number designates all service parts applicable to the equipment. On the right is a brief description of the equipment.



ON THE RIGHT SIDE of the plate is pertinent data on the model number, serial number and the related governor setting.

All engine components are divided into groups of functionally related parts. A complete listing of the twelve major groups and their many sub-groups is shown below.

GROUP NOMENCLATURE

1.0000 ENGINE (less major assemblies)
- 1.1000 Cylinder Block
- 1.1000A Air Box Drains
- 1.2000 Cylinder Head
- 1.2000A Engine Lifter Bracket
- 1.3000 Crankshaft
- 1.3000A Crankshaft Front Cover
- 1.3000B Vibration Damper
- 1.3000C Crankshaft Pulley
- 1.3000D Crankshaft Pulley Belt
- 1.4000A Flywheel
- 1.5000A Flywheel Housing
- 1.5000B Flywheel Housing Adaptor
- 1.6000 Connecting Rod and Piston
- 1.7000 Camshaft and Gear Train
- 1.7000A Balance Weight Cover
- 1.7000B Accessory Drive
- 1.8000 Valve and Injector Operating Mechanism
- 1.8000A Rocker Cover

2.0000 FUEL SYSTEM
- 2.1000A Fuel Injector
- 2.2000 Fuel Pump
- 2.2000A Fuel Pump Drain
- 2.3000A Fuel Filter
- 2.4000 Fuel Manifold and/or Connections
- 2.5000A Fuel Lines
- 2.6000A Fuel Tank
- 2.7000A Mechanical Governor
- 2.8000A Hydraulic Governor
- 2.9000 Injector Controls
- 2.9000A Throttle Controls

3.0000 AIR SYSTEM
- 3.1000A Air Cleaner and/or Adaptor
- 3.2000A Air Silencer
- 3.3000A Air Inlet Housing
- 3.4000 Blower
- 3.4000A Blower Drive Shaft
- 3.5000A Turbocharger

4.0000 LUBRICATING SYSTEM
- 4.1000A Oil Pump
- 4.1000B Oil Distribution System
- 4.1000C Oil Pressure Regulator
- 4.2000A Oil Filter
- 4.3000A Oil Filter Lines
- 4.4000A Oil Cooler
- 4.5000A Oil Filler
- 4.6000A Dipstick
- 4.7000A Oil Pan
- 4.8000A Ventilating System

5.0000 COOLING SYSTEM
- 5.1000 Fresh Water Pump
- 5.1000A Fresh Water Pump Cover
- 5.2000A Water Outlet Manifold and/or Elbow
- 5.2000B Thermostat
- 5.2000C Water By-pass Tube
- 5.3000A Radiator
- 5.3000B Water Connections
- 5.4000A Fan
- 5.4000B Fan Shroud
- 5.5000A Heat Exchanger or Keel Cooling
- 5.6000A Raw Water Pump
- 5.7000A Water Filter

6.0000 EXHAUST SYSTEM
- 6.1000A Exhaust Manifold
- 6.2000A Exhaust Muffler and/or Connections

7.0000 ELECTRICAL-INSTRUMENTS
- 7.1000A Battery Charging Generator
- 7.2000B Automatic Starting
- 7.3000A Starting Motor
- 7.4000A Instruments
- 7.4000B Tachometer Drive
- 7.4000C Shut-off or Alarm System
- 7.5000A Power Generator
- 7.6000A Control Cabinet
- 7.7000A Wiring Harness
- 7.8000A Air Heater

8.0000 POWER TAKE-OFF
- 8.1000A Power Take-off and/or Clutch
- 8.3000A Torque Converter
- 8.3000B Torque Converter Lines

9.0000 TRANSMISSION AND PROPULSION
- 9.1000A Hydraulic Marine Gear
- 9.3000A Power Transfer Gear
- 9.4000 Transmission-Highway
- 9.7000 Transmission-Off-highway

10.0000 SHEET METAL
- 10.1000A Engine Hood

11.0000 ENGINE MOUNTING
- 11.1000A Engine Mounting and Base

12.0000 MISCELLANEOUS
- 12.2000A Bilge Pump
- 12.3000A Vacuum Pump
- 12.4000A Air Compressor
- 12.5000A Hydraulic Pump
- 12.6000A Gasoline Starter
- 12.6000B Air Starter
- 12.6000C Cold Weather Starting Aid
- 12.6000D Hydraulic Starter
- 12.6000E Hydraulic Starter Accessories

Within each of these sub-groups, various designs of similar equipment are categorized as "Types" and identified by a Type Number.

The Distributor/Dealer has a Model Index for each engine model. The Model Index lists all of the "Standard" and "Standard Option" equipment for that model.

DETROIT DIESEL V-71 7064-7002 (RC)

STANDARD AND STANDARD OPTION EQUIPMENT

GROUP NAME	GROUP NO.	TYPE
Cylinder Block	1.1000	34
Air Box Drains (water below port block)	1.1000A	103
Cylinder Head	1.2000	27
Engine Lifter Bracket	1.2000A	37
Crankshaft	1.3000	23
Crankshaft Pulley	1.3000C	134
Flywheel	1.4000A	170
Flywheel Housing (SAE #1)	1.5000A	192
Connecting Rod and Piston	1.6000	88
Camshaft and Gear Train	1.7000	38
Balance Weight Cover	1.7000A	19
Valve Operating Mechanism	1.8000	24
Rocker Cover	1.8000A	43
Fuel Injector *N55*	2.1000A	77
Fuel Pump	2.2000	71
Fuel Filter	2.3000A	360
Fuel Manifold Connections	2.4000	55
Fuel Lines	2.5000A	1265
Governor, Mechanical	2.7000A	753
Injector Controls	2.9000	95

NOTE The option plate reflects which choice of options has been built into the engine. The Distributor/Dealer uses his model index to interpret the standard equipment. The plate, therefore, lists only the non-standard or choice items.

So, give the dealer the

A—Model No._____
B—Unit No. _____
***C—Type No.** _____

*(If not shown, indicate "NONE". The dealer knows the "standard" for the model).

FOR READY REFERENCE, Record the information on the Option Plate to this record.

MODEL NO._____ **UNIT NO.**_____

EQUIPMENT	TYPE	EQUIPMENT	TYPE	EQUIPMENT	TYPE
Engine Base		Water Bypass Tube		Battery Chrg. Generator	
Engine Lifter Brkt.		Thermostat		Starter	
Flywheel Housing		Water Filter		Hyd. Starter Acces.	
Vibration Damper		Exhaust Manifold		Starting Aid	
Flywheel		Air Cleaner or Silencer		Marine Gear	
Flywheel Hsg. Adptr.		Fuel Pump		Torque Converter	
Oil Pan		Injector		Torque Converter Lines	
Oil Pump		Blower		Muffler & Conn.	
Oil Distribution		Blower Drive Shaft		Engine Hood	
Dipstick		Fuel Filter		Wiring Harness	
Oil Pan Drain Tube		Fuel Lines		Instruments	
Oil Filler Tube or Cap		Air Inlet Housing		Tach. Drive	
Oil Cooler		Alarm or Shutoff		Radiator	
Oil Filter		Overspeed Governor		Heat Ex. or Keel Cooling	
Oil Lines		Throttle Controls		Raw Water Pump	
Ventilating System		Injector Controls		Power Generator	
Crankshaft Cover		Governor Mech or Hyd		Control Cabinet	
Balance Wgt. Cover		Engine Mounts		Cylinder Head	
Fan		Power Take-off		Conn Rod & Piston	
Crankshaft Pulley		Hydraulic Pump		Valve Mechanism	
Crankshaft Pulley Belt		Air Compressor		Fuel Manifold Conn	
Fan Shroud		Camshaft & Gear Train			
Water Connections		Rocker Cover			
Water Pump Cover		Accessory Drive			
Water Manifold					

OTHER USEFUL INFORMATION:

Each fuel and lube oil filter on your engine has a decal giving the service package part number for the element. It is advisable to have your own personal record of these part numbers by filling in the chart provided below:

TYPE	LOCATION	PACKAGE PART NO.
Fuel Strainer		
Fuel Filter		
Lube Oil Filter Full-Flo		
Lube Oil Filter By-Pass*		

*Not Standard

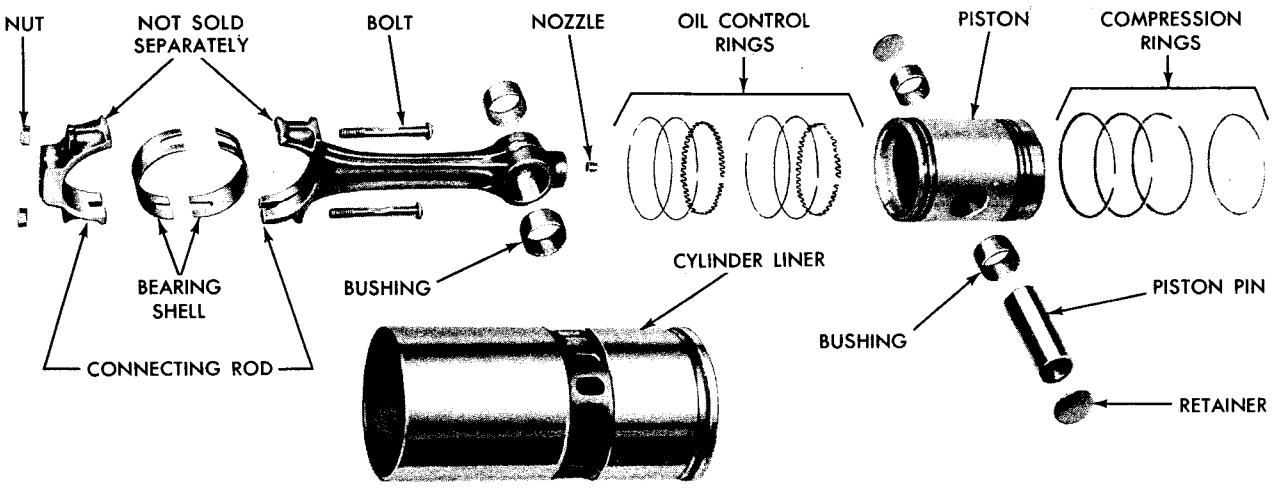
AIR CLEANER

If dry-type, indicate make and number of filter element:

_____

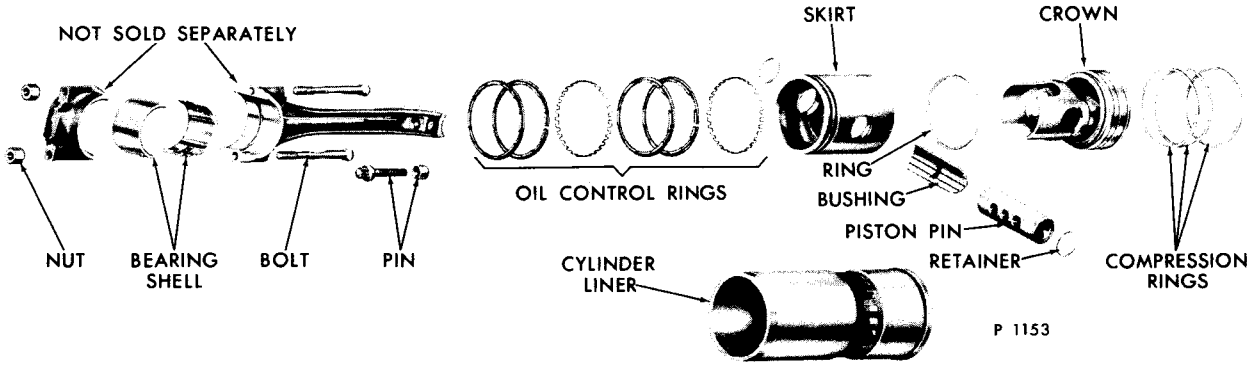
_____

Wet type, indicate capacity_____qts.

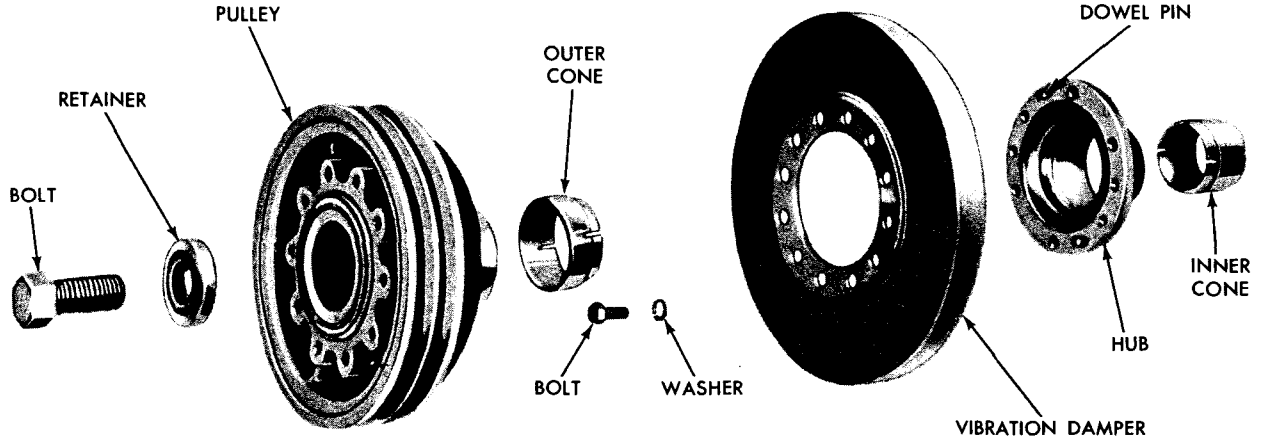


CONNECTING ROD AND TRUNK TYPE PISTON

P 607B

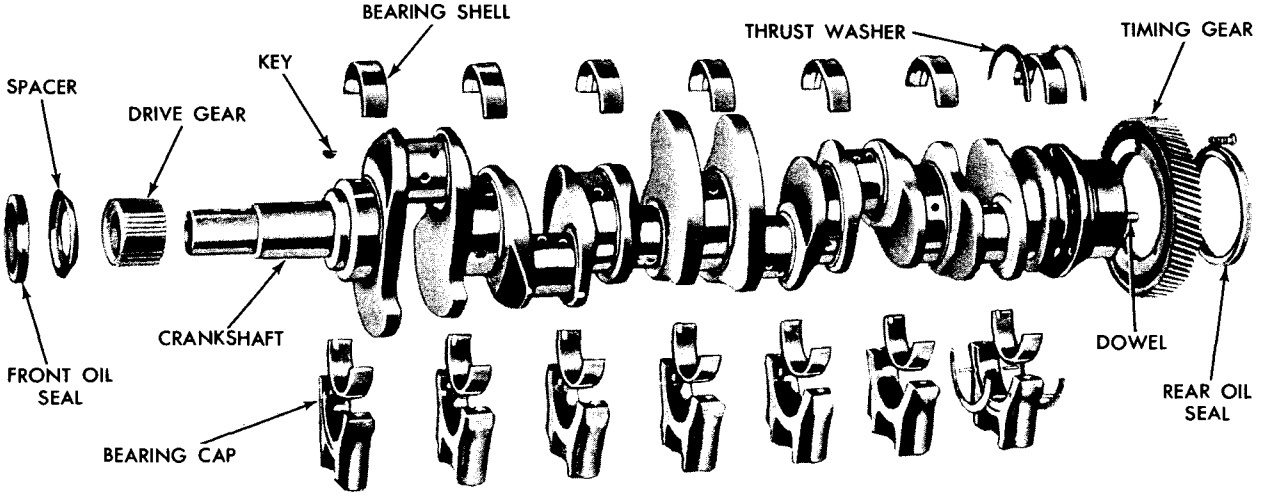


CONNECTING ROD AND CROSS-HEAD PISTON



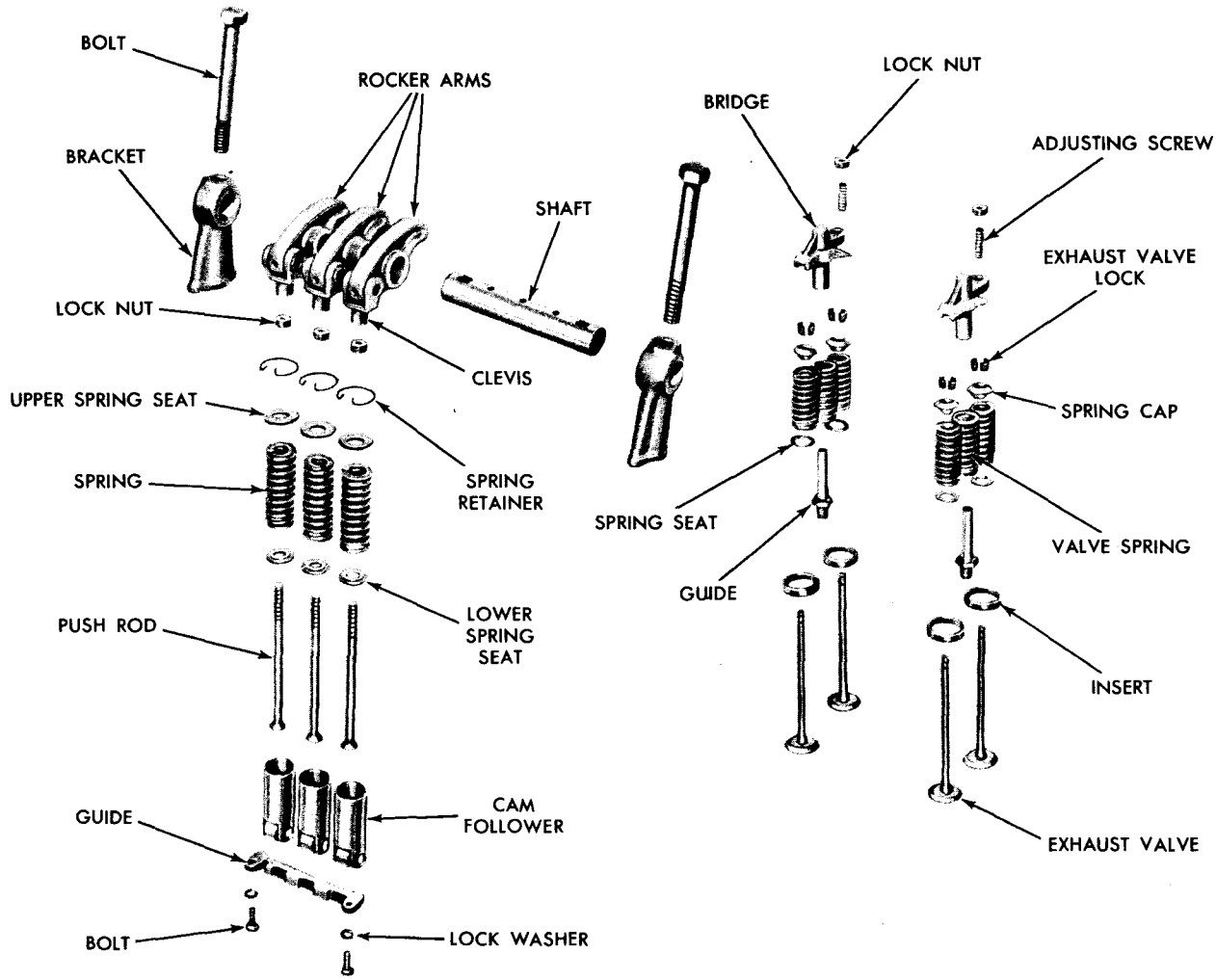
CRANKSHAFT PULLEY, VIBRATION DAMPER AND HUB

P 607A



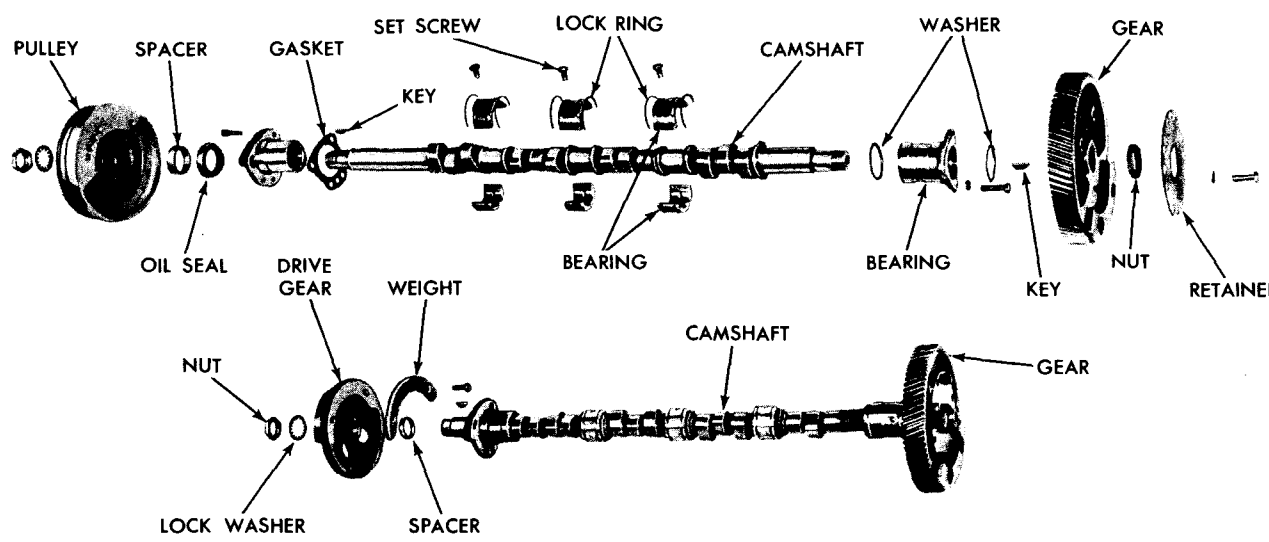
CRANKSHAFT

P 607



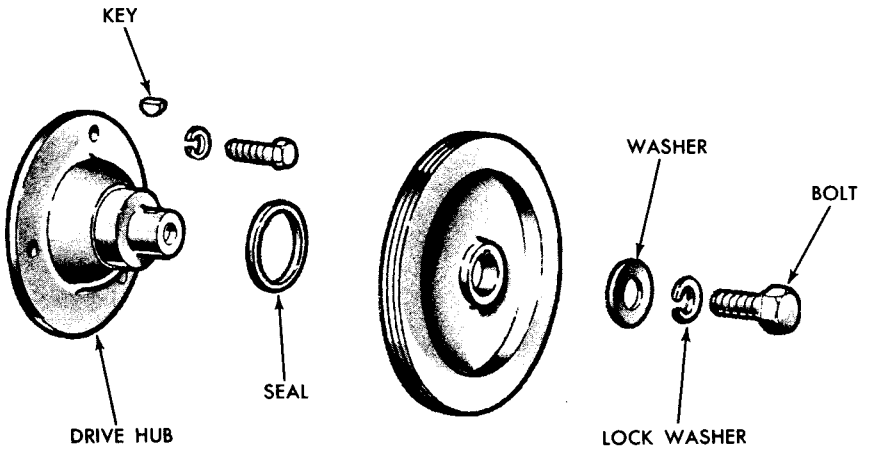
VALVE OPERATING MECHANISM (4 VALVE)

P 600A



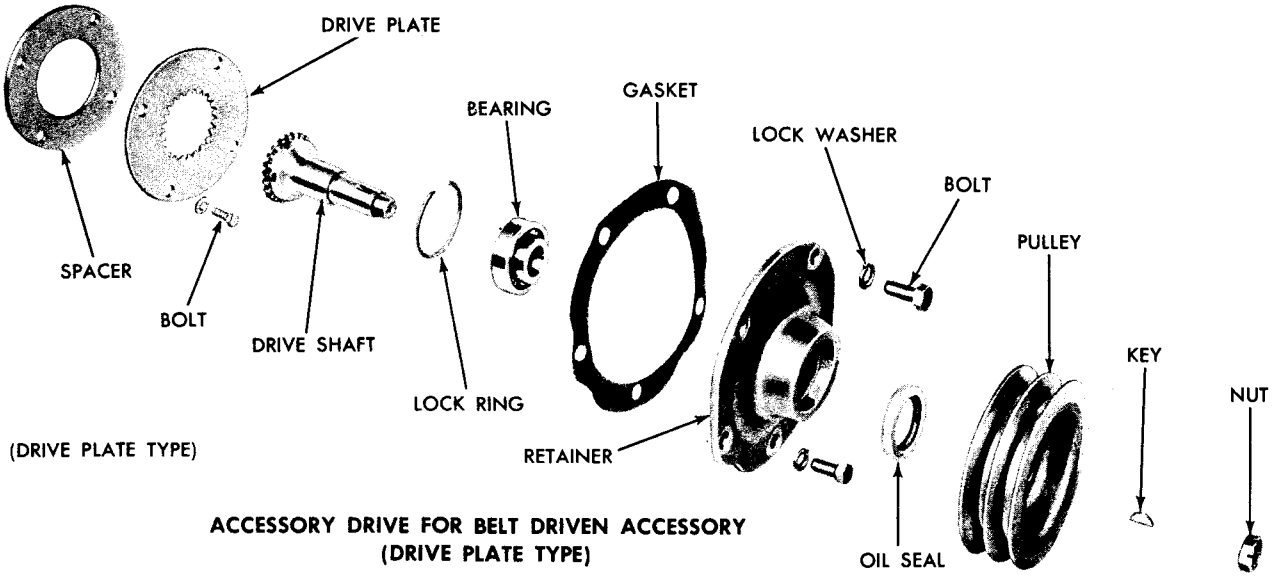
CAMSHAFT AND GEARS

P 600



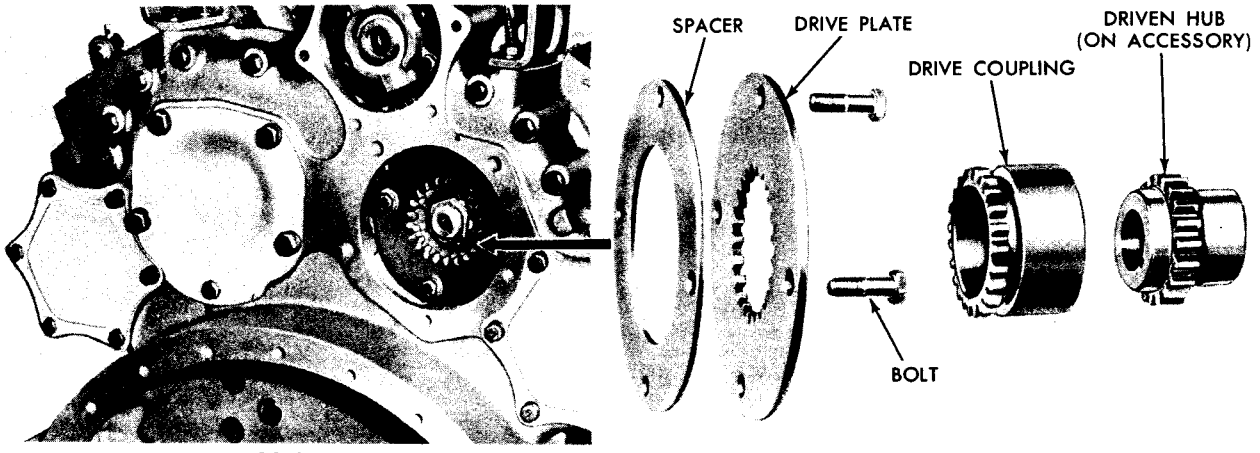
ACCESSORY DRIVE FOR BELT DRIVEN ACCESSORY (FRONT MOUNTED TYPE)

P 609B



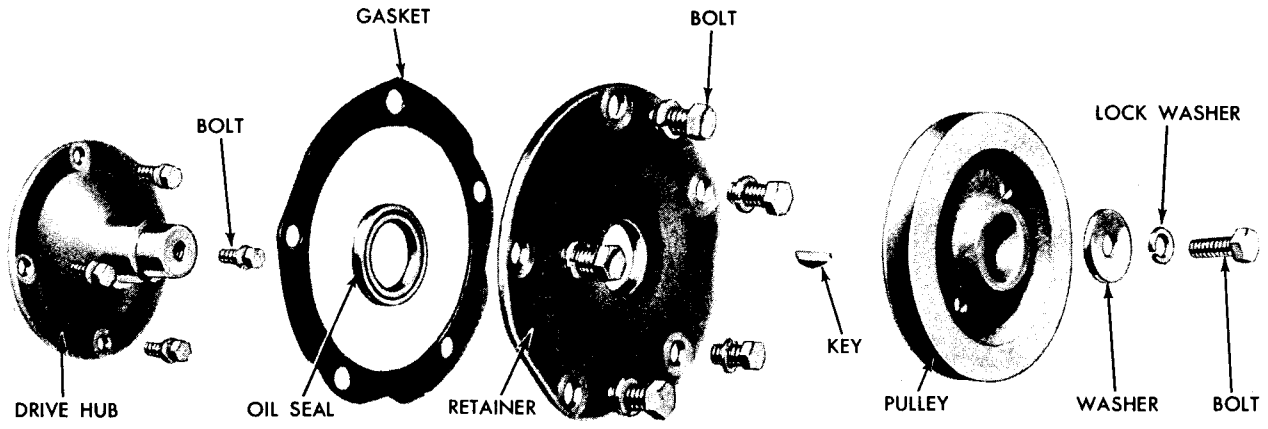
ACCESSORY DRIVE FOR BELT DRIVEN ACCESSORY (DRIVE PLATE TYPE)

P 609A



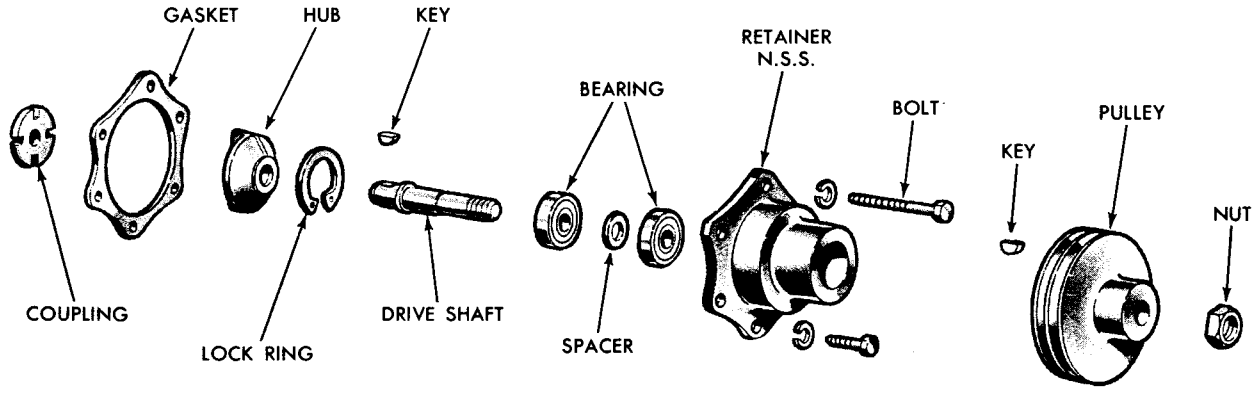
ACCESSORY DRIVE FOR DIRECT DRIVEN ACCESSORY (CAMSHAFT GEAR)

P 609



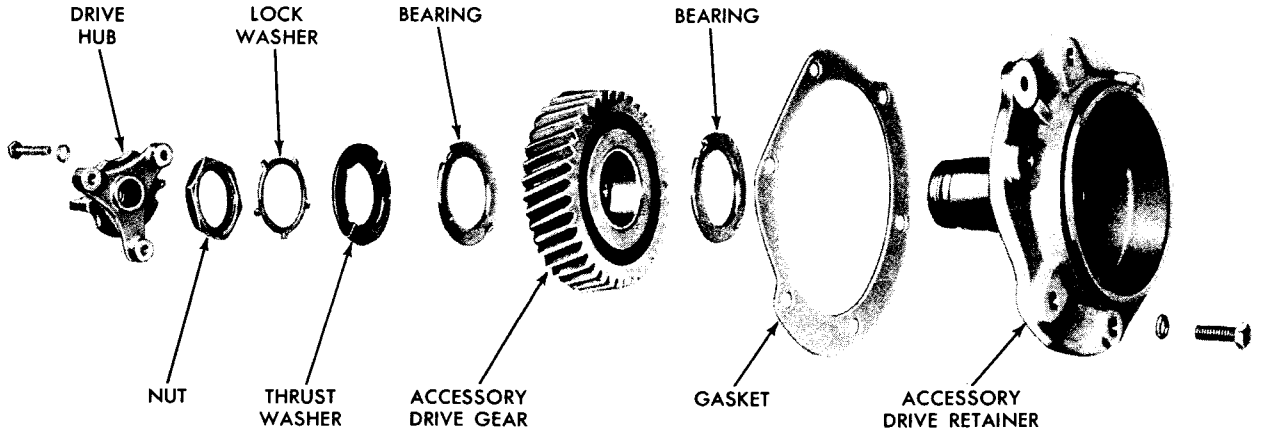
ACCESSORY DRIVE FOR BELT DRIVEN ACCESSORY (DRIVE HUB TYPE)

P 603B



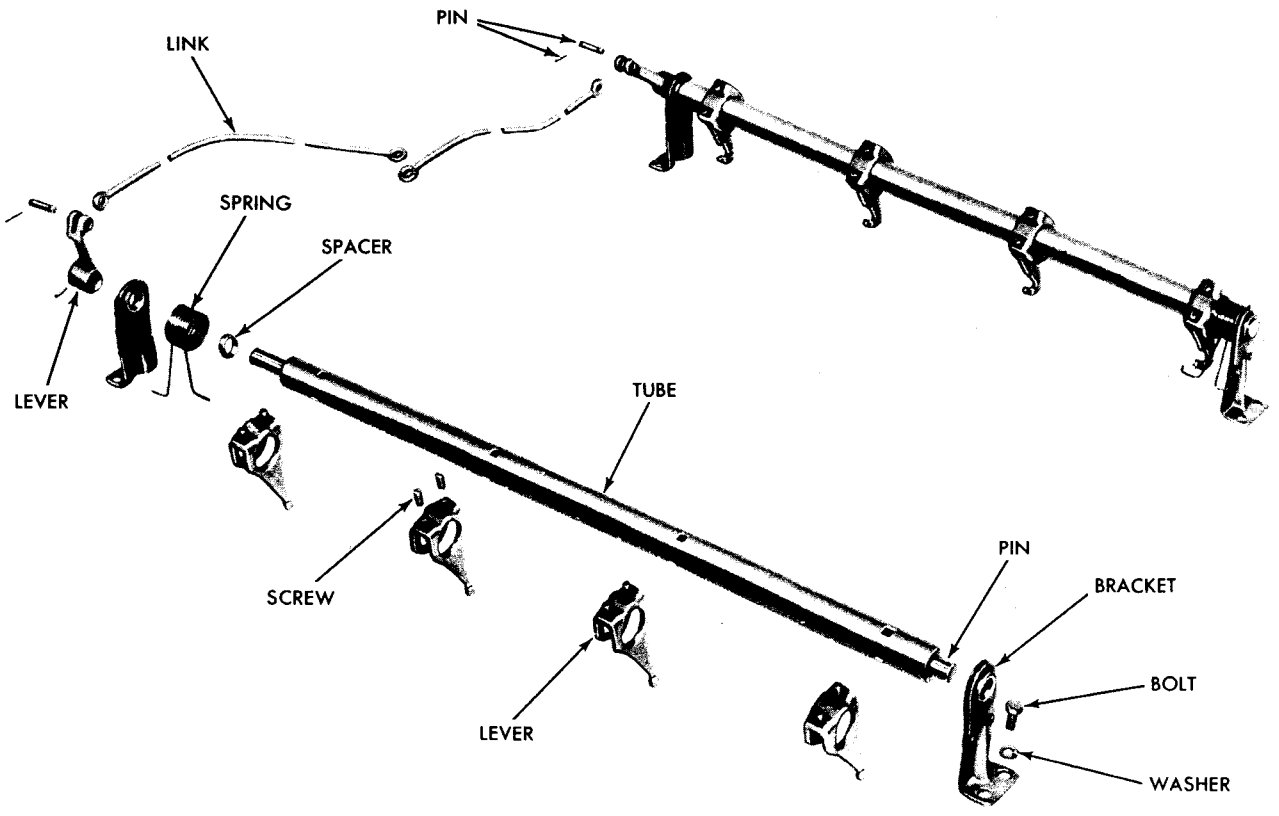
ACCESSORY DRIVE FOR BELT DRIVEN ACCESSORY (DRIVE DISC COUPLING TYPE)

P 603A



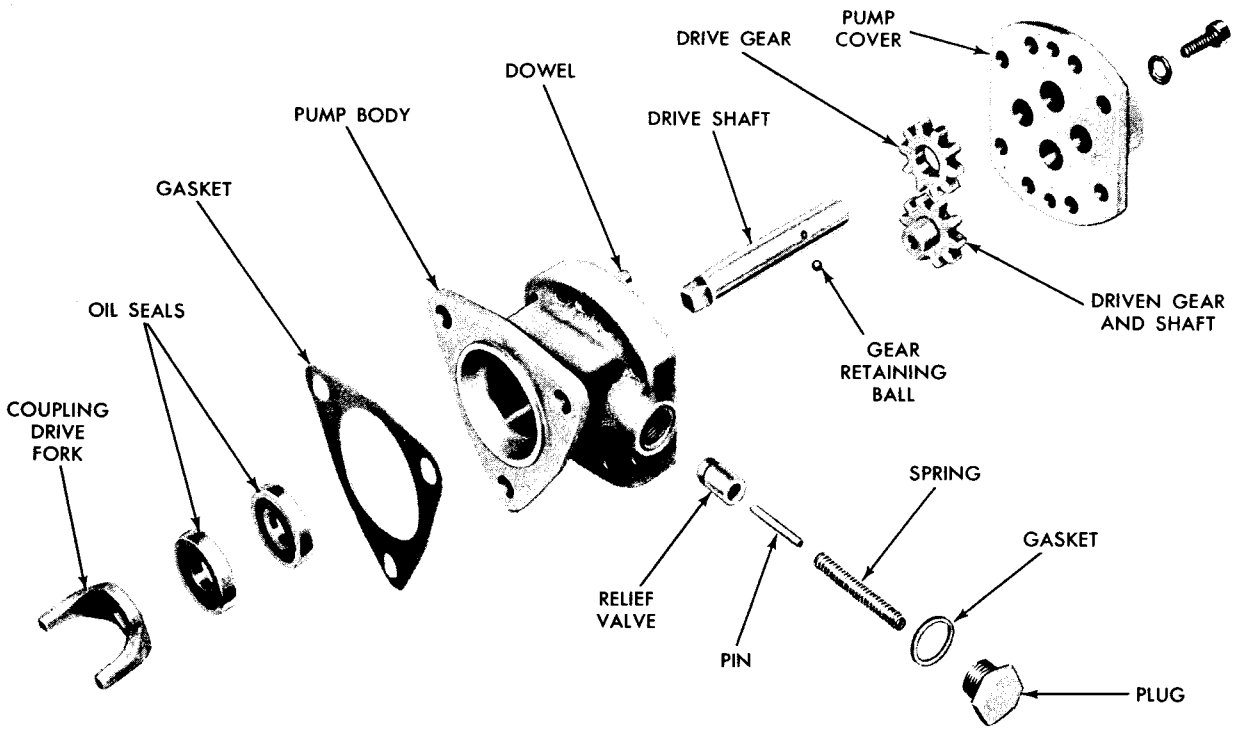
ACCESSORY DRIVE FOR BELT DRIVEN ACCESSORY (ACCESSORY GEAR)

P 603



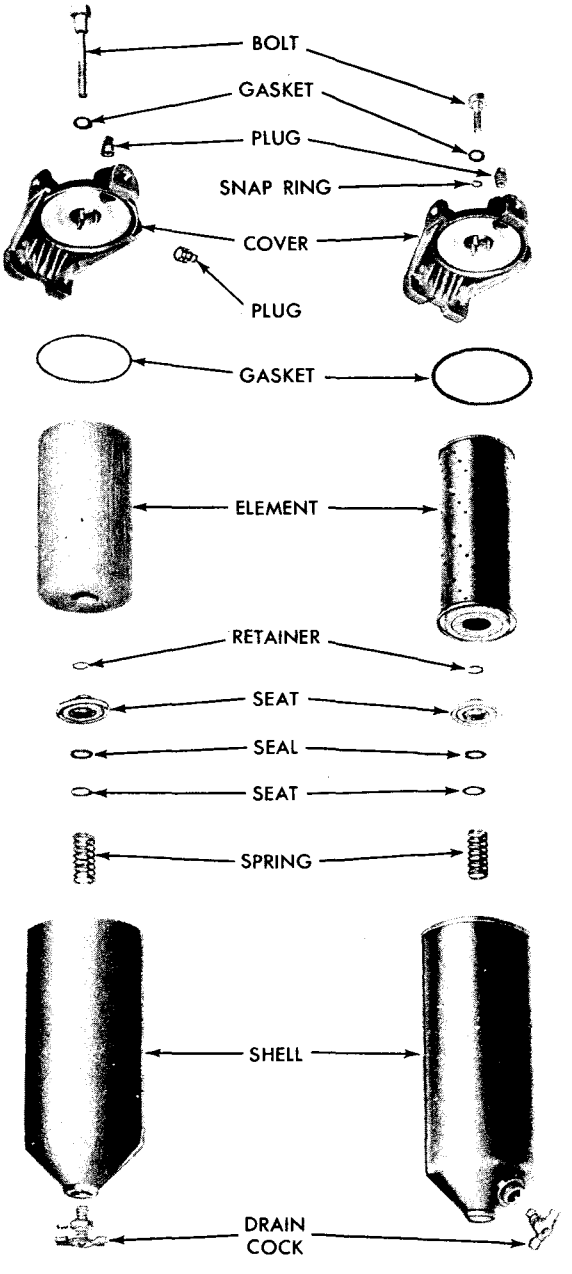
INJECTOR CONTROLS

P 602A



TYPICAL FUEL PUMP

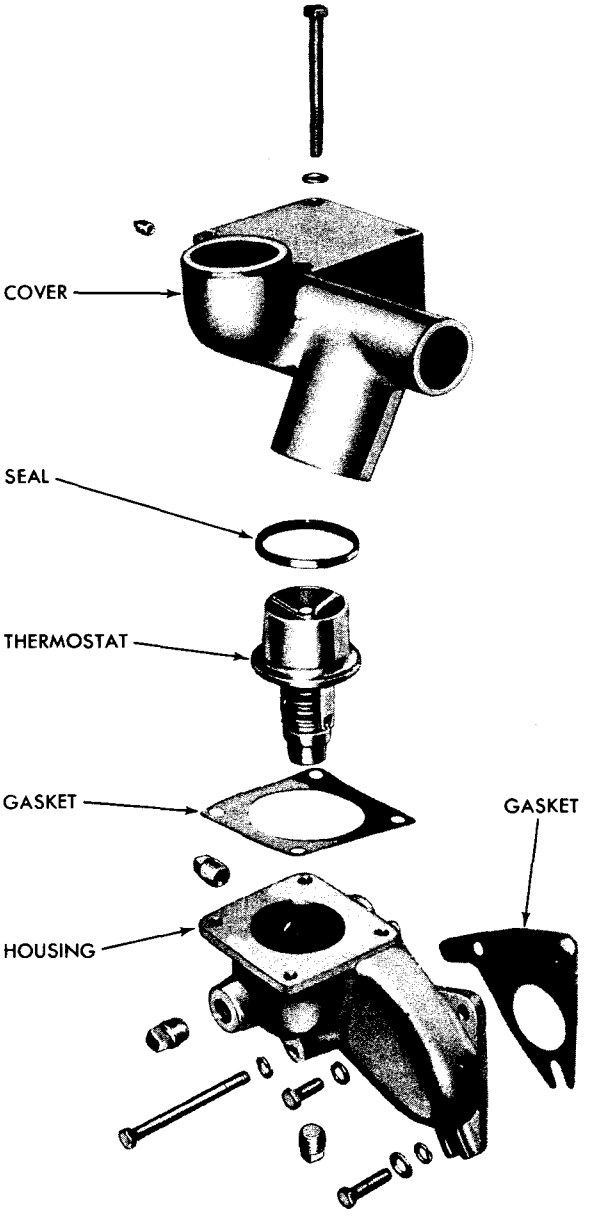
P 602



TYPICAL FUEL OIL STRAINER

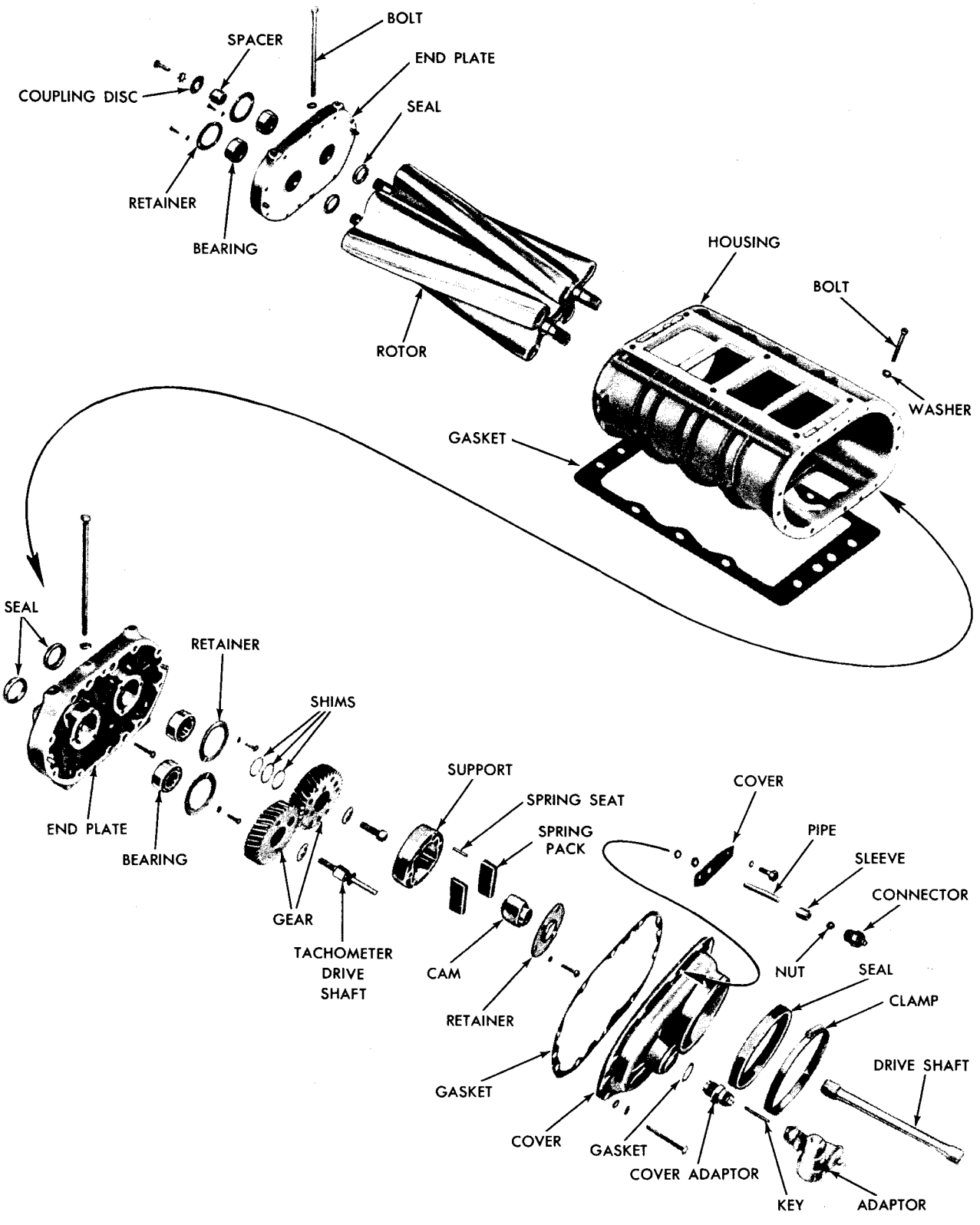
TYPICAL FUEL OIL FILTER

P 601A



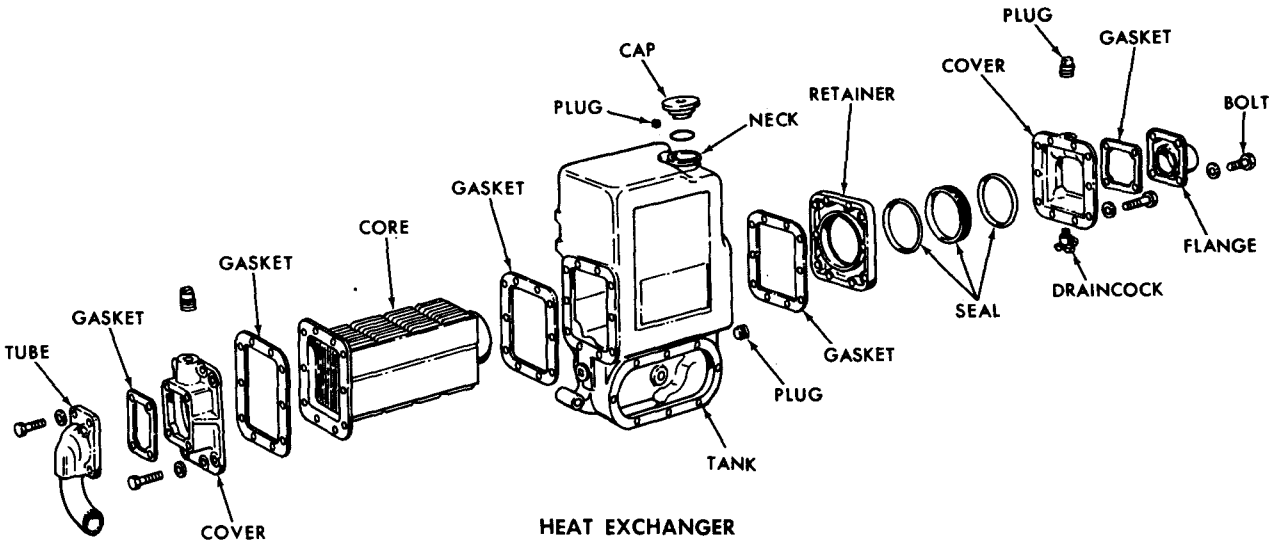
THERMOSTAT HOUSING

P 601


BOLT
SPACER
END PLATE
COUPLING DISC
SEAL
RETAINER
BEARING
ROTOR
HOUSING
BOLT
WASHER
GASKET
SEAL
RETAINER
SHIMS
END PLATE
BEARING
SUPPORT
SPRING SEAT
SPRING PACK
COVER
PIPE
SLEEVE
CONNECTOR
GEAR
TACHOMETER DRIVE SHAFT
CAM
NUT
SEAL
RETAINER
CLAMP
GASKET
DRIVE SHAFT
COVER
GASKET
COVER ADAPTOR
KEY
ADAPTOR

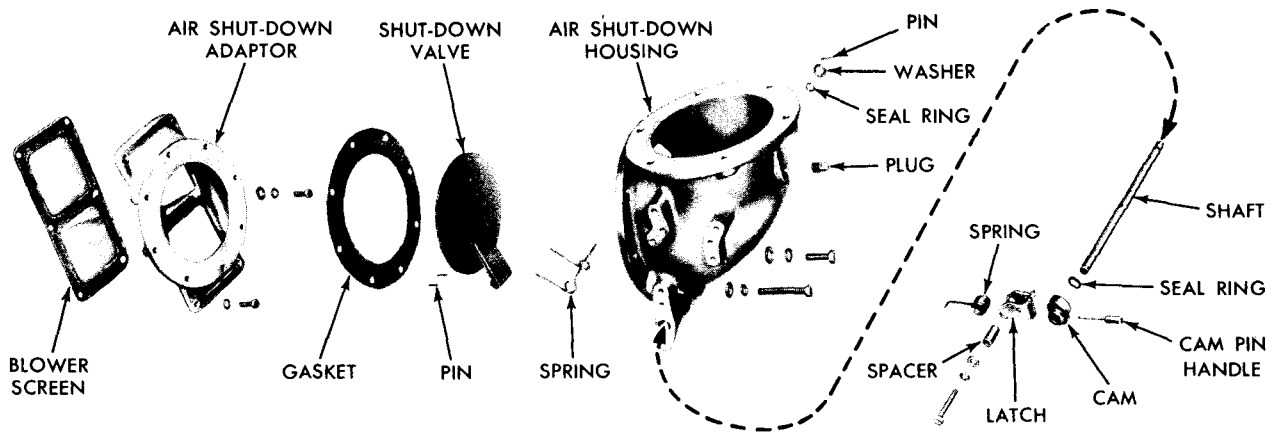
BLOWER

P 606



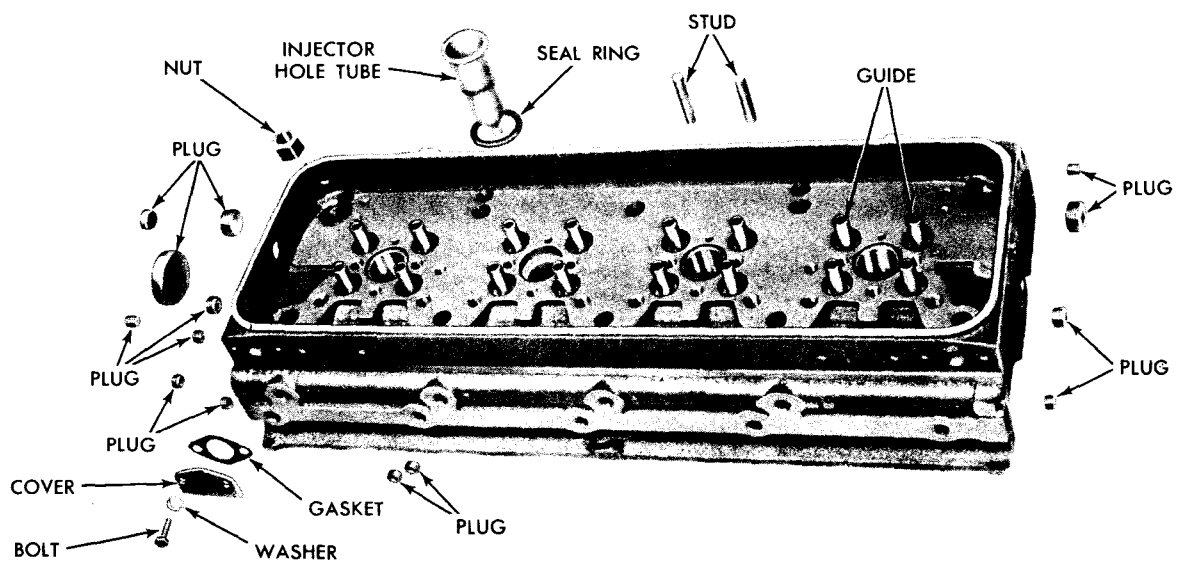
HEAT EXCHANGER

P 1250



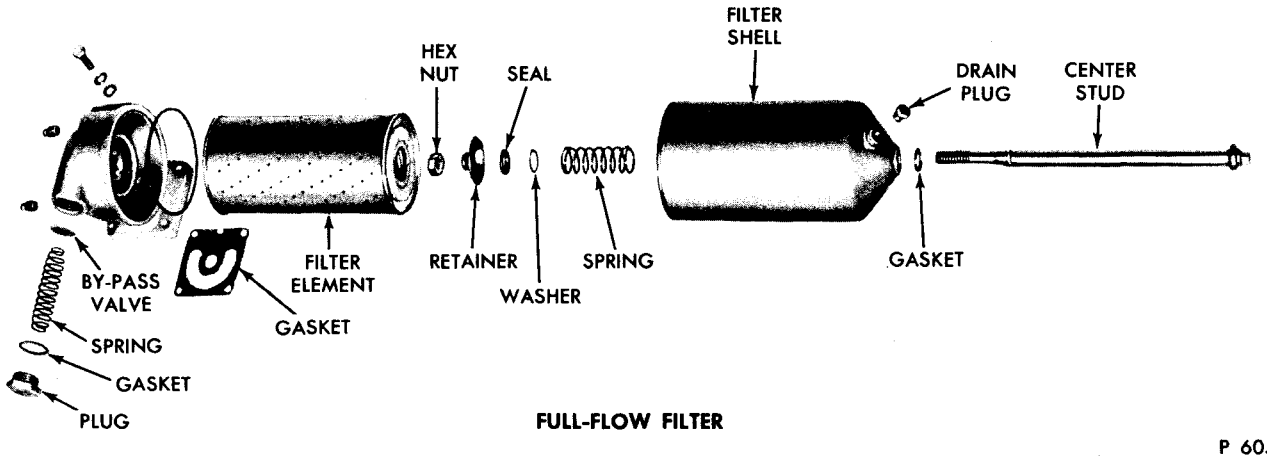
AIR SHUT-DOWN HOUSING

P 604A



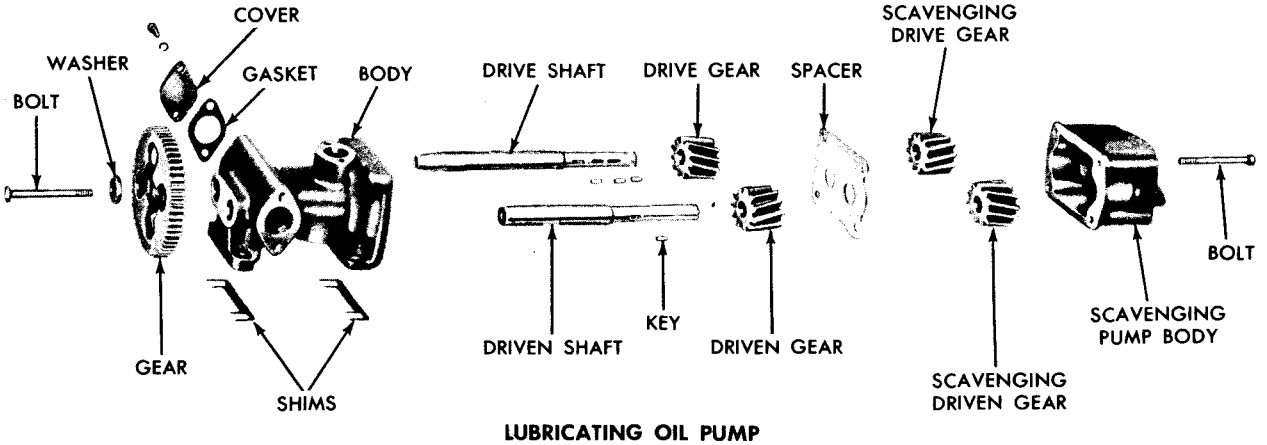
4 VALVE CYLINDER HEAD

P 604



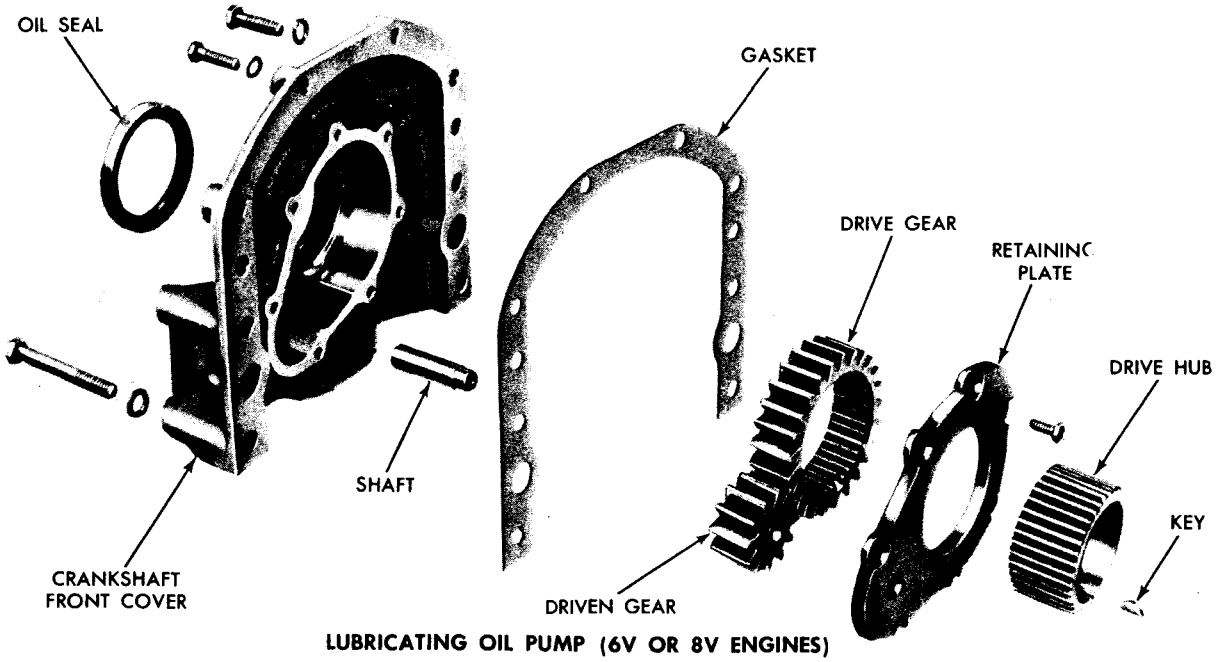
FULL-FLOW FILTER

P 605B



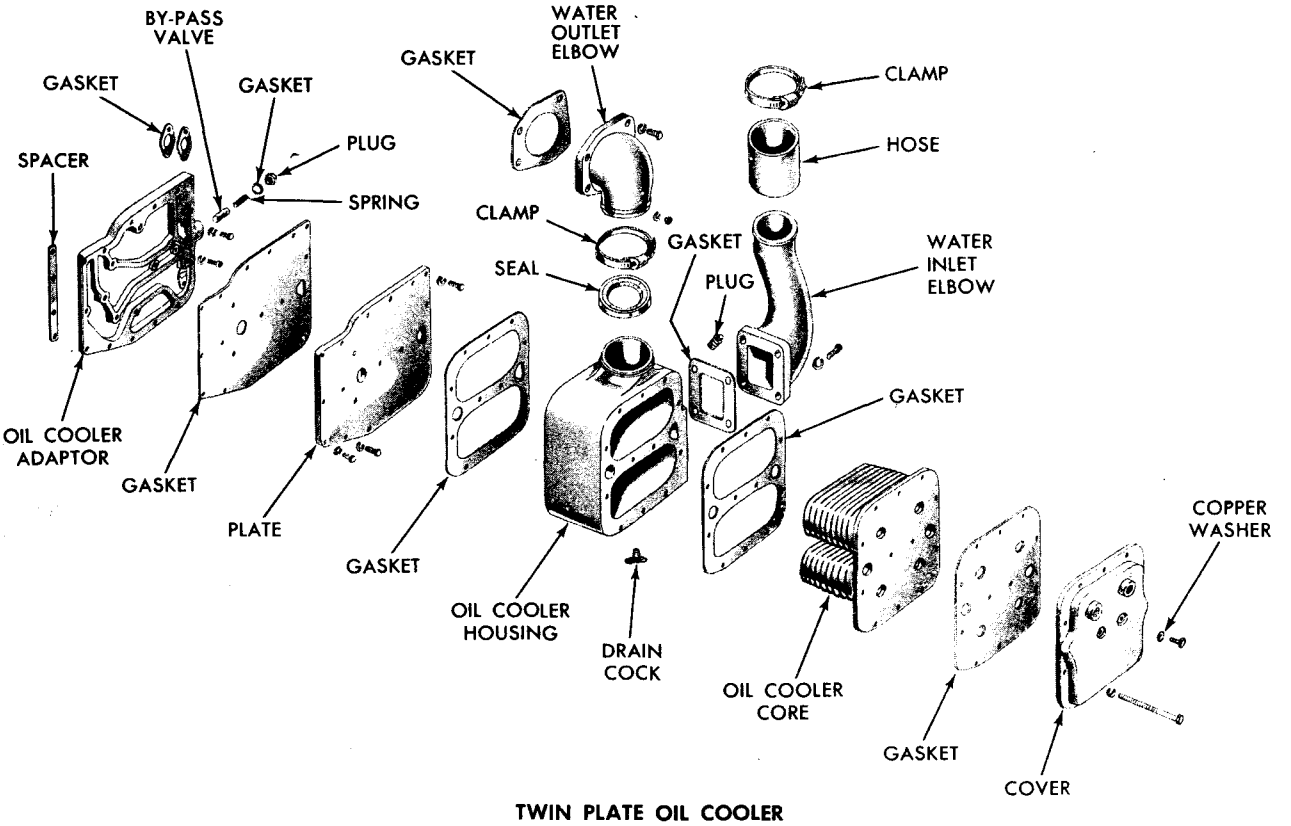
LUBRICATING OIL PUMP

P 605A



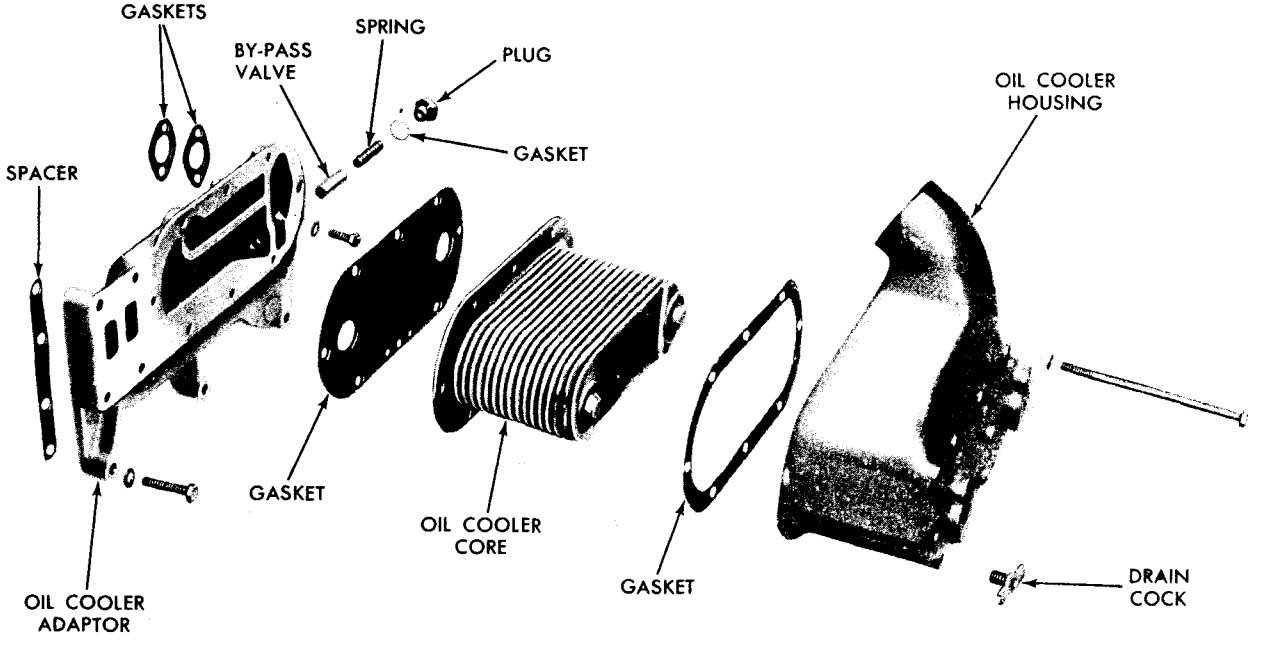
LUBRICATING OIL PUMP (6V OR 8V ENGINES)

P 605



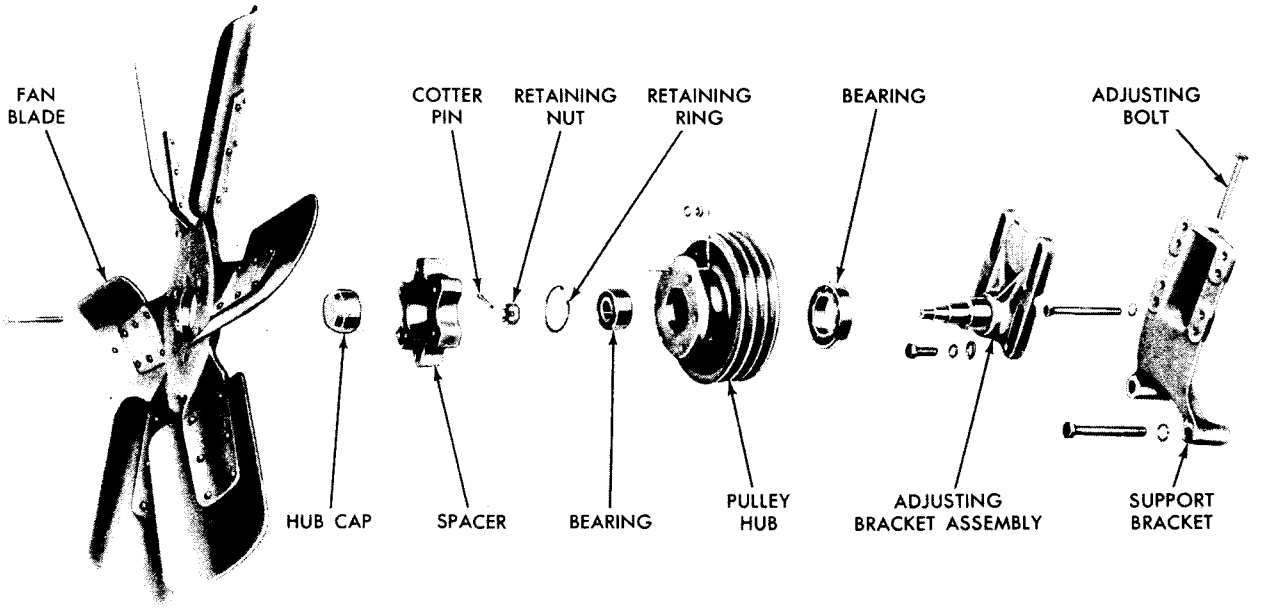
TWIN PLATE OIL COOLER

P 608B



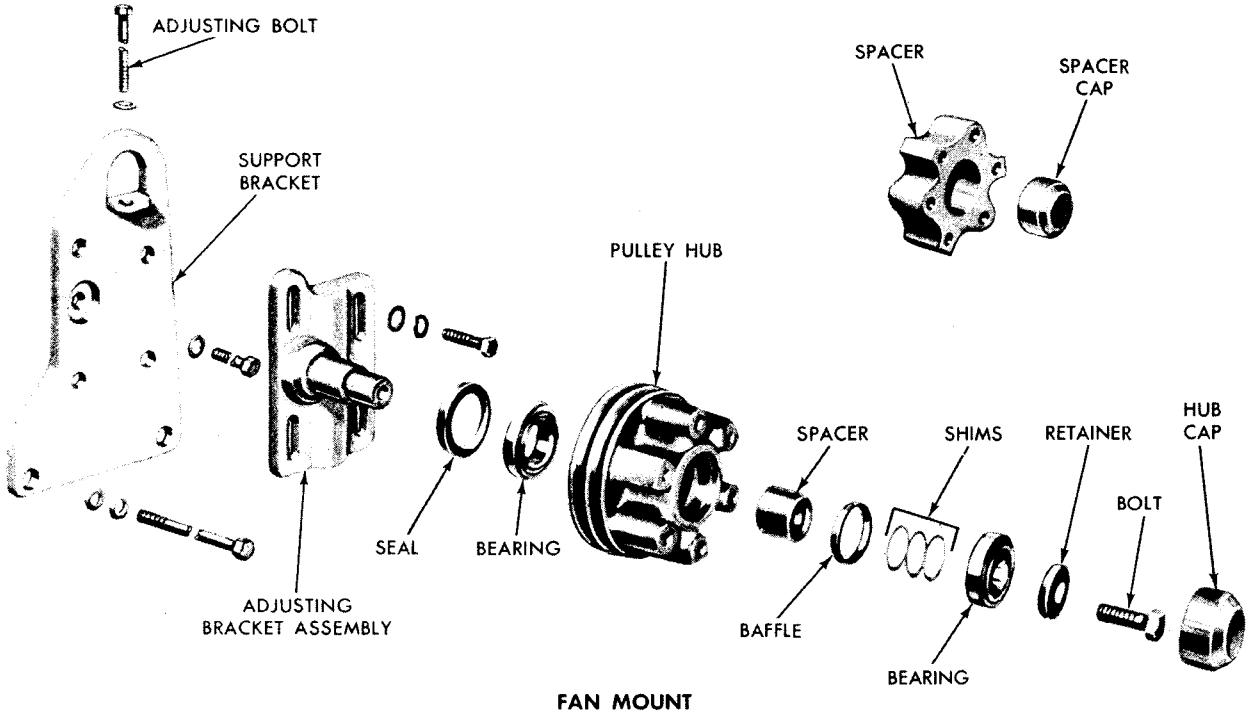
OIL COOLER

P 608



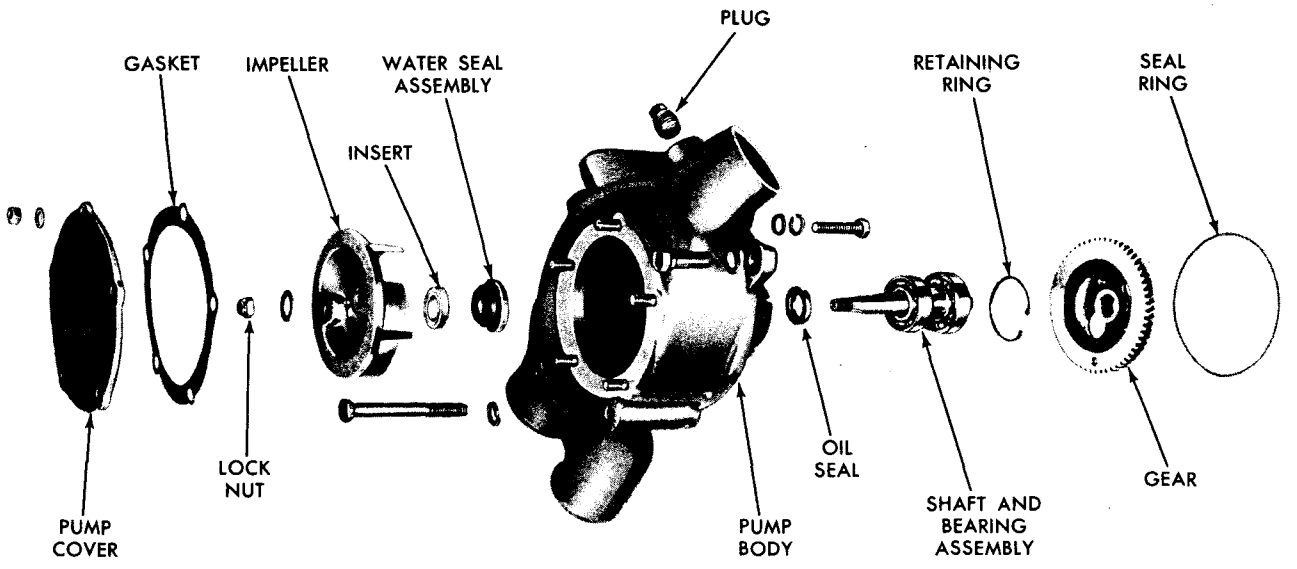
FAN ASSEMBLY

P 610A



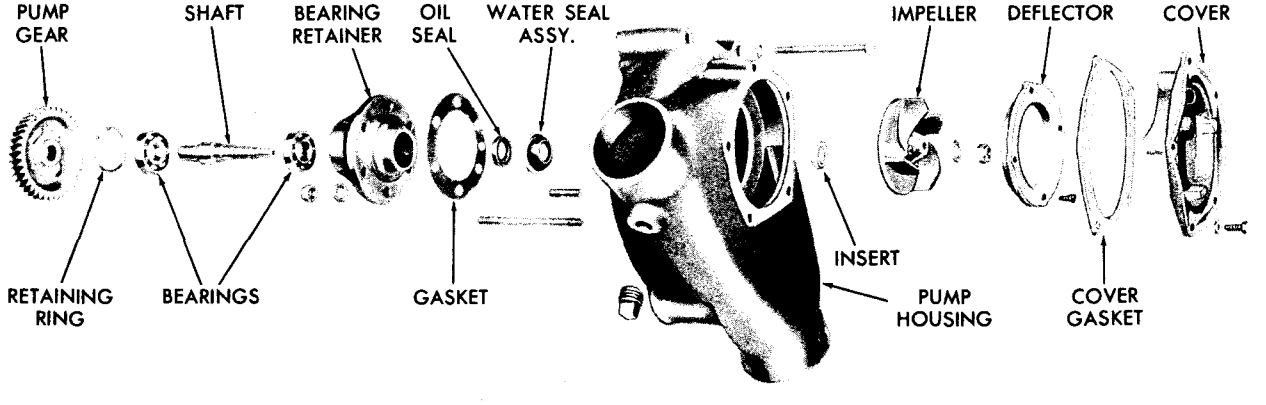
FAN MOUNT

P 610



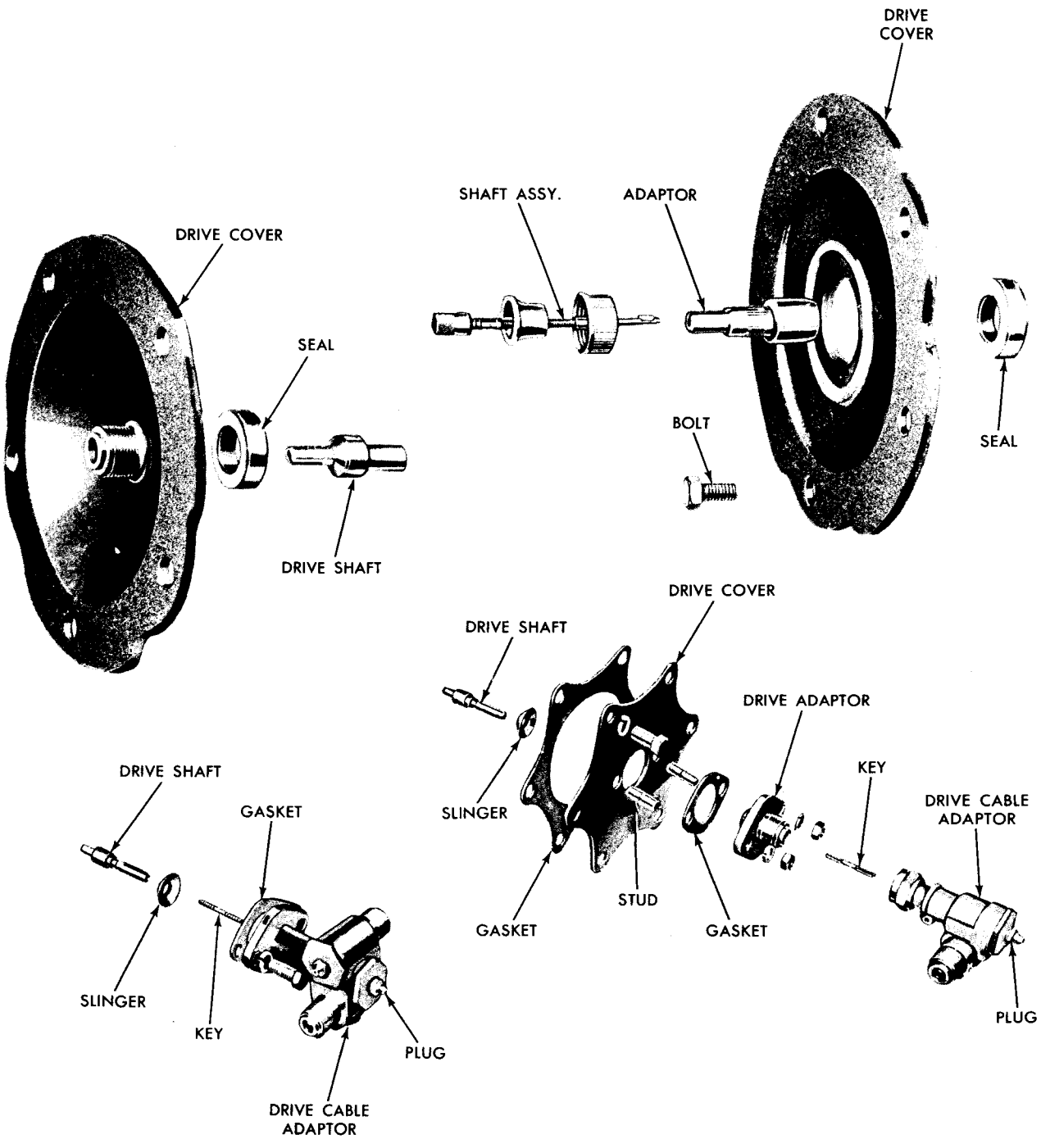
FRESH WATER PUMP (6, 8, 12V)

P 612A



FRESH WATER PUMP (16V)

P 612



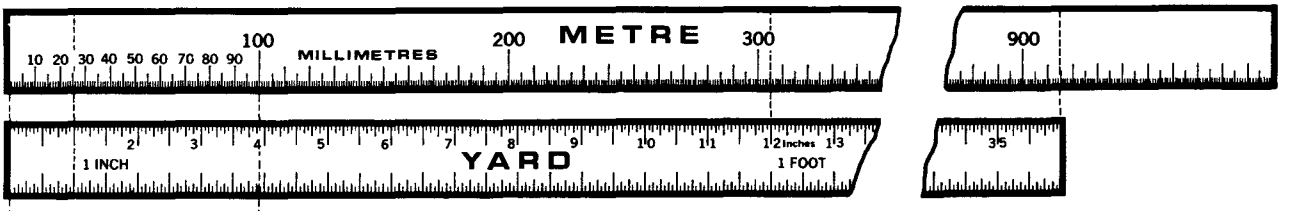
TACHOMETER DRIVE COVERS AND ADAPTORS

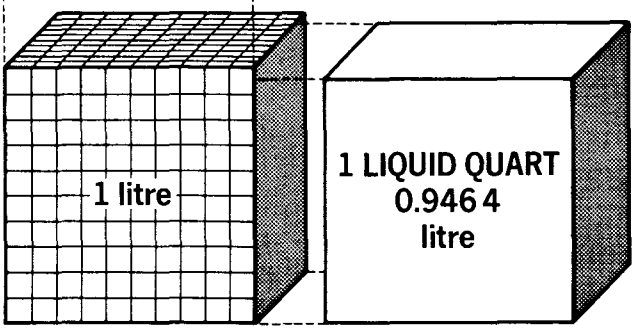
P 611

ALPHABETICAL INDEX

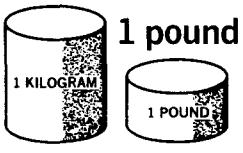
Detroit Diesel Allison

IS GOING METRIC





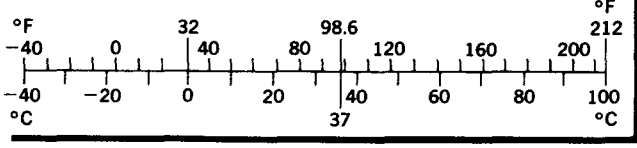
The comparative dimensions of the metre and the yard, the litre and the quart, and the kilogram and the pound are shown.



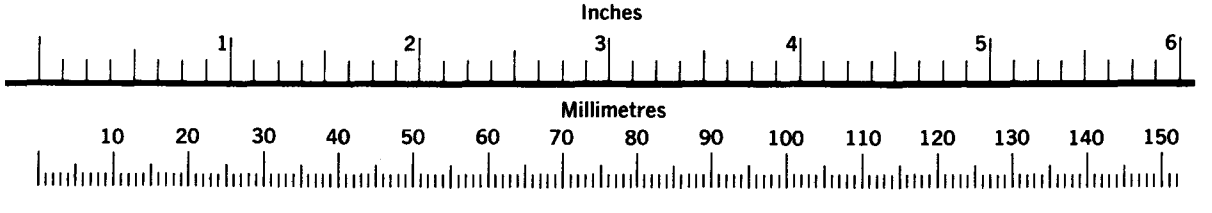
1 pound = 0.453 6 kg

TABLE OF FREQUENTLY USED UNITS

Multiply	by	to get equivalent number of:
LENGTH		
Inch	25.4	millimetres (mm)
Foot	0.304 8	metres (m)
Yard	0.914 4	metres
Mile	1.609	kilometres (km)
AREA		
Inch^2	645.2	millimetres^2 (mm^2)
	6.45	centimetres^2 (cm^2)
Foot^2	0.092 9	metres^2 (m^2)
Yard^2	0.836 1	metres^2
VOLUME		
Inch^3	16 387.	mm^3
	16.387	cm^3
	0.016 4	litres (l)
Quart	0.946 4	litres
Gallon	3.785 4	litres
Yard^3	0.764 6	metres^3 (m^3)
MASS		
Pound	0.453 6	kilograms (kg)
Ton	907.18	kilogram
Ton	0.907	tonne (t)
FORCE		
Kilogram	9.807	newtons (N)
Ounce	0.278 0	newtons
Pound	4.448	newtons
TEMPERATURE		
Degree Fahrenheit	(†°F-32) ÷ 1.8	degree Celsius (C)



Multiply	by	to get equivalent number of:
ACCELERATION		
Foot/sec^2	0.304 8	metre/sec^2 (m/s^2)
Inch/sec^2	0.025 4	metre/sec^2
TORQUE		
Pound-inch	0.112 98	newton-metres (N·m)
Pound-foot	1.355 8	newton-metres
POWER		
Horsepower	0.746	kilowatts (kW)
PRESSURE OR STRESS		
Inches of water	0.249 1	kilopascals (kPa)
Pounds/sq. in.	6.895	kilopascals
ENERGY OR WORK		
BTU	1 055.	joules (J)
Foot-pound	1.355 8	joules
Kilowatt-hour	3 600 000 or 3.6×10^6	joules (J = one W·s)
LIGHT		
Footcandle	10.764	lumens/metre^2 (lm/m^2)
FUEL PERFORMANCE		
Miles/gal	0.425 1	kilometres/litre (km/l)
Gal/mile	2.352 7	litres/kilometre (l/km)
VELOCITY		
Miles/hour	1.609 3	kilometres/hr. (km/h)



11410