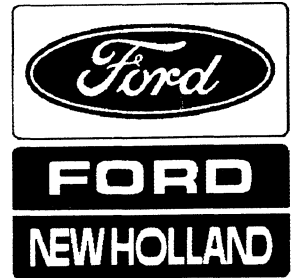


# FORD

## Service Manual



### Wheel Loaders A-62, A-64 and A-66

Part 1 – Engine System

Part 2 – Fuel System

Part 3 – Electrical System

Part 4 – Transmission

Part 5 – Engine-Transmission Removal

Part 6 – Axles, Brakes, Drive Shafts, Wheels and Tires

40006230A

Vol. 1



Reprinted

## **FOREWORD**

This manual provides information for the proper servicing of the Ford A62 — A64 — A66 Wheel Loaders. The manual is grouped into parts, each containing chapter divisions. The chapters contain such information as general operating principles, detailed inspection and repair procedures, and full specifics regarding trouble shooting, specifications, and special tools. Whenever possible, the special tools are illustrated performing their specific operations. Any reference made in the manual to right, left, front, rear, top, or bottom, is as viewed facing the direction of forward travel from the driver's seat.

The material contained in this manual was correct at the time the manual was approved for printing. Ford policy is one of continuous improvement and the Ford Motor Company reserves the right to discontinue models at any time or change specifications or design without notice and without incurring obligation.

**Ford Tractor Operations**  
**Ford Motor Company**

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<b>Part 2 – Fuel System</b>	<b>Vol. 1</b>
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<b>Part 4 – Transmission</b>	<b>Vol. 1</b>
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# **PART 1 ENGINE SYSTEM**

## **Chapter 1 ENGINE**

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# PART 1

# ENGINE SYSTEM

## Chapter 1

### ENGINE

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## 1. DESCRIPTION AND OPERATION

Direct injection diesel engines installed in Ford Wheel Loaders are in-line type with integral bores cast in the block and have overhead valves. This Chapter deals with the disassembly, inspection and repair, assembly and installation of both 4- and 6-cylinder engines. Servicing procedure for both engines is basically the same except where otherwise stated.

The cylinder head assembly incorporates the valves, valve springs and spring retainers. Valve guides are an integral part of the cylinder head with replaceable valve seats which are pressed into the valve ports. The exhaust valves are fitted with positive rotators and the push rods locate inside the tappets. The combustion chamber is in the piston crown and the fuel injectors are mounted outside the rocker cover.

**MANIFOLDS:** The intake and exhaust manifolds are on opposing sides of the cylinder head, providing better heat distribution. The intake manifold is provided with a tapped hole for installation of a thermostart or an ether cold starting aid.

**CYLINDER BLOCK ASSEMBLY:** The cylinder block features full length water jackets for cooling the cylinders, which are integral with the block. The firing order is 1-3-4-2 on the 4-cylinder and 1-5-3-6-2-4 on the 6-cylinder model.

The engine timing can be checked by observing the timing punch marks on the gears.

The crankshaft is supported in the cylinder block by five main bearings in the 4-cylinder engine and seven in the 6-cylinder. The thrust bearing is the third intermediate on the 4-cylinder engine and fifth intermediate on the 6-cylinder engine.

A slinger is machined on the rear of the crankshaft to direct oil away from the rear oil seal. The rear seal is a circular lip-type rubber seal that fits into a pocket machined into the cylinder block and into the rear main bearing cap. The cap also has two composition side seals. There is also a rear plate gasket to assist in sealing off the joint between the bearing cap and the block.

The 4-cylinder engine is equipped with a dynamic balancer which consists of a housing attached to the bottom of the cylinder block containing a drive gear and a driven gear. The balancer is driven by a gear machined on the crankshaft and the balancer gears are timed from the crankshaft balancer drive gear.

The pistons are trunk type with three compression and one oil control ring, all above the piston pin.

The connecting rods are heavy I-section which are drilled centrally to lubricate the piston pin and cool the piston crown on turbo-charged engines. The piston pin is free floating and held in place by two snap-rings (circlips).

The engine lubrication system oil flow, which is similar on the 4- and 6-cylinder engine is shown in Figure 1. A rotor-type oil pump, driven from a gear on the camshaft and mounted on the bottom of the cylinder block, takes oil through a filter screen and pumps the oil into the lubrication system.

A spring-loaded relief valve in the pump body limits the maximum pressure in the system by directing excess oil back to the intake side of the pump.

Oil flows from the pump to an external filter which contains a relief valve, permitting oil to bypass a blocked filter. This ensures that an oil flow is maintained to the engine at all times.

Oil flows from the filter to the main oil gallery, which runs the length of the cylinder block and intersects the tappet chambers.

The main oil gallery also supplies oil to the turbocharger bearings and all the crankshaft main bearings. Oil flow to the connecting rod journals is by way of the crankshaft. Camshaft bearings receive oil by means of drilled passages from the main bearings.

The camshaft drive gear bushing is pressure lubricated through a drilled passage from the front main bearing. The gear has small oil passages machined on both sides which allows the oil to exhaust.

The timing gears are splash-lubricated by oil from the tappet chamber and from the pressure-lubricated camshaft drive gear.

On the 4-cylinder engine, the balancer is lubricated through a drilled passage from the block intermediate thrust bearing web to the balancer housing. Oil flows through the balancer housing to the drilled balancer shafts and onto the bushings in the balancer gears.

Cylinder walls, pistons and piston pins are splash-lubricated by the crankshaft.

**NOTE: In the turbocharged engines the pistons and pins are pressure lubricated through passages in the connecting rod.**

An intermittent flow of oil is fed to the valve rocker arm shaft assembly through a drilled passage in the cylinder block at the No. 1 camshaft bearing which indexes with a hole in the cylinder head.

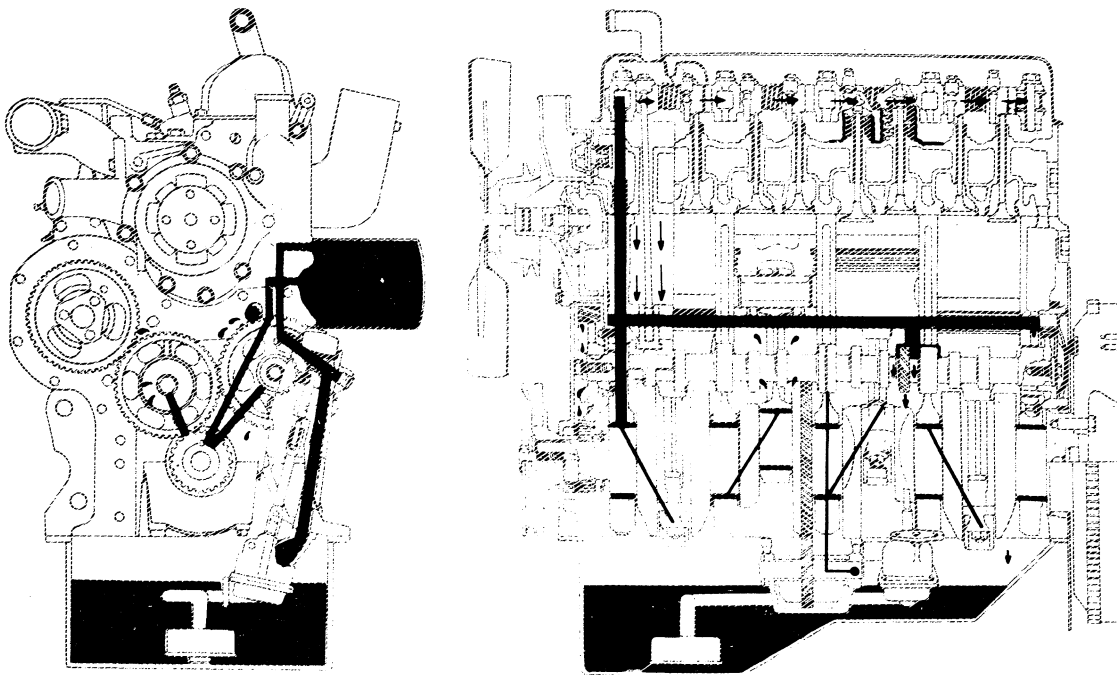


Figure 1

4-Cylinder Engine Lubrication System

From the head, the oil flows up around the No. 1 rocker arm support bolt to the rocker shaft, then from the shaft through drilled holes in each rocker arm to lubricate the valve end and adjusting screw end of the rocker arm. Oil from the ball ends of the rocker arms flows down the push rods and assists in lubricating the tappets and push rods.

Excess oil drains into the push rod chamber through the push rod holes in the cylinder head and then back to the oil pan sump through cored opening in the block.

A water-jacketed oil cooler, located in the base of the radiator, is connected into the system. The lubricating oil flows to the cooler from a tapping into the main oil gallery in the cylinder block, and returns to the oil pan sump via a pipe tapped into the skirt of the cylinder block.

## OVERHAUL

The service procedures in this Chapter are written as if the engine were removed from the unit. However, some of these repairs can be effectively carried out with the engine installed in the vehicle.

Part 5 details the procedure for removal and replacement of the engine.

The engine units have been treated in four sections to make the overhaul procedure easier to understand. These sections are:

- Cylinder Head Assembly.
- Timing Gears, Camshaft and Oil Pump.  
Balancer, Connecting Rods and Pistons,  
Bearings, Flywheel and Crankshaft.
- Block Assembly.

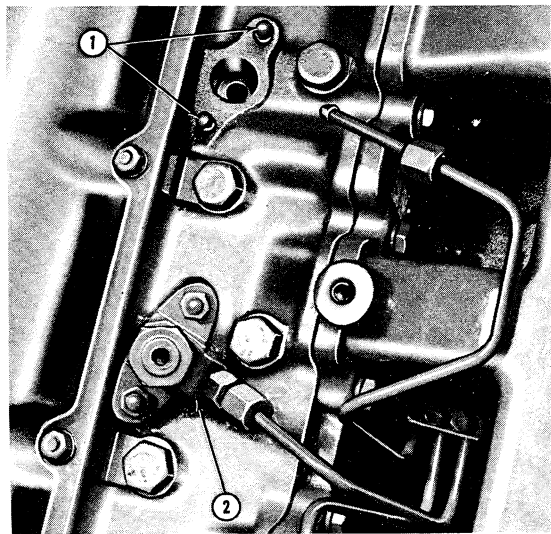
## 2. CYLINDER HEAD ASSEMBLY - OVERHAUL

### REMOVAL

1. Remove the muffler components.
2. Disconnect the air intake tube and on turbocharged engines:
  - (a) Disconnect and remove the air cleaner-to-turbocharger tube.
  - (b) Disconnect the oil pressure and return lines at the turbocharger and the engine, remove and cap the ends.
  - (c) Remove the turbocharger complete, and cover all parts to prevent entry of dirt.
3. Drain the engine coolant and disconnect the top radiator-to-engine hose.
4. Remove the exhaust manifold.
5. Remove the injector lines and cap all openings in the pump, injectors and lines.
6. Remove the fuel inlet line from the fuel lift pump.
7. Remove the intake manifold.
8. Remove the ventilation tube from the rocker cover and remove the cover and gasket.
9. Disconnect the injector leak-off pipe and remove the injector and washers, Figure 2. Keep the injector area clean. Cap the openings and protect the nozzle tips.
10. Before removing the push rods, visually check for straightness by rotating each rod with the valve closed. Replace any push rod found to be defective. Loosen the rocker shaft retaining bolts in the cylinder head evenly and alternately until all tension has been relieved. Then remove the head.

**NOTE:** The rocker shaft retaining bolts should be left in the rocker shaft supports during removal. The bolts hold the assembly together; only remove the bolts when it is necessary to disassemble the rocker shaft completely.

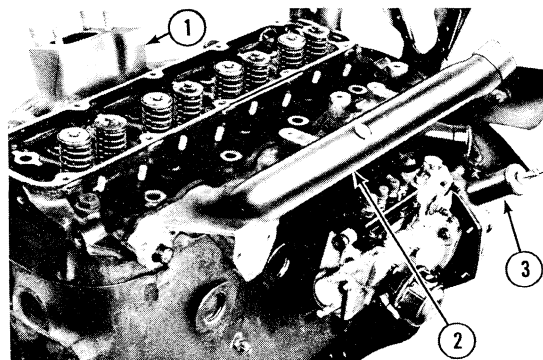
11. Remove the valve push rods and place in a rack in the order in which they were removed, so the rods may be installed in the same bores and along with the same tappets during reassembly.



**Figure 2**

Injector Removal

1. Injector Mounting Studs
2. Injector



**Figure 3**

4-Cylinder Diesel Engine  
With Valve Cover Removed

1. Intake Manifold
2. Exhaust Manifold
3. Engine Oil Filler Tube

12. Remove the cylinder head retaining bolts, working from the ends to the center of the head, and carefully lift the cylinder head from the block.

**DISASSEMBLY**

1. Remove the coolant outlet connection, the thermostat and gasket, Figure 4.
2. Clean the head thoroughly and then with a valve spring compressor, Figure 5, remove the retainer locks, spring retainer, spring and valve stem seal, Figure 6.
3. Lift out the valves and place in a numbered rack so they can be reinstalled in the respective guides. Keep the exhaust valve retainer (rotator) with the valve from which it was removed.
4. Remove the bolts that retain the rocker shaft supports to the rocker shaft, Figure 7.

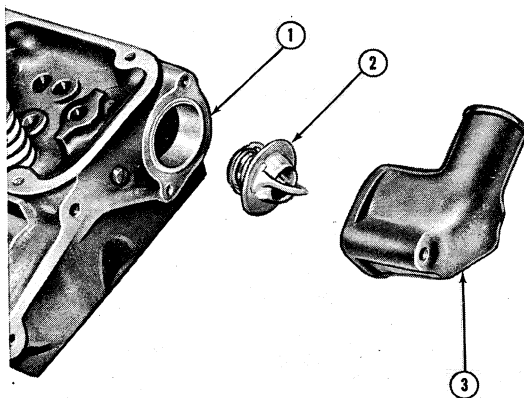
**INSPECTION AND REPAIR**

1. **CYLINDER HEAD:** Inspect the cylinder head for damage and, if necessary, remove burrs or nicks from the gasket surface with an oil stone. If required, install a new head.

2. Check the flatness of the cylinder head with a straight edge, Figure 8. Flatness specification is 0.006 in. (0.15 mm) overall or 0.003 in. (0.08 mm) in any 6 in. (152 mm).

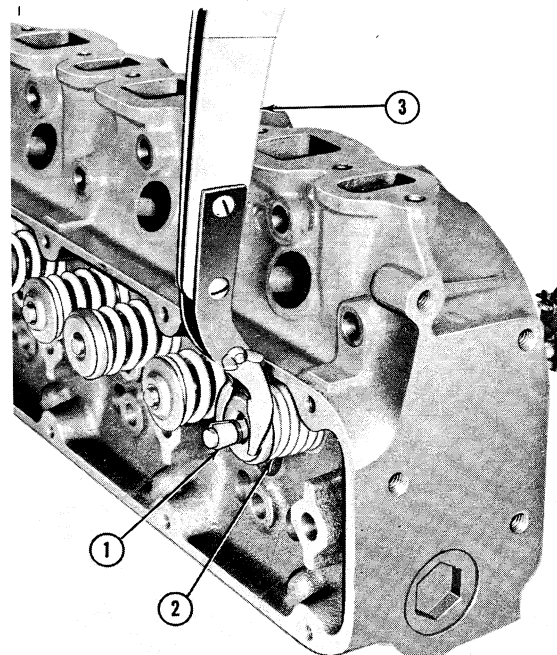
**NOTE:** If the cylinder head is not within the flatness specification, it may be skimmed providing the depth from cylinder head face after skimming to the valve head (with valve installed) is not less than .062 in. (1.58 mm).

3. If the cylinder head is skimmed, check whether any cylinder head bolt is bottoming by mounting the cylinder head on the block without the gasket fitted and by installing all bolts finger tight. If a 0.010 in. (0.25 mm) feeler gauge cannot be inserted under the bolt head, the bolts are not bottoming. In the case of the rocker support, ensure that the specified flat washer is fitted under the bolt head when carrying out the check. If a bolt is bottoming, the cylinder block bolt thread should be increased in depth. The thread size is ½ in. 13 t.p.i. UNC-2a.



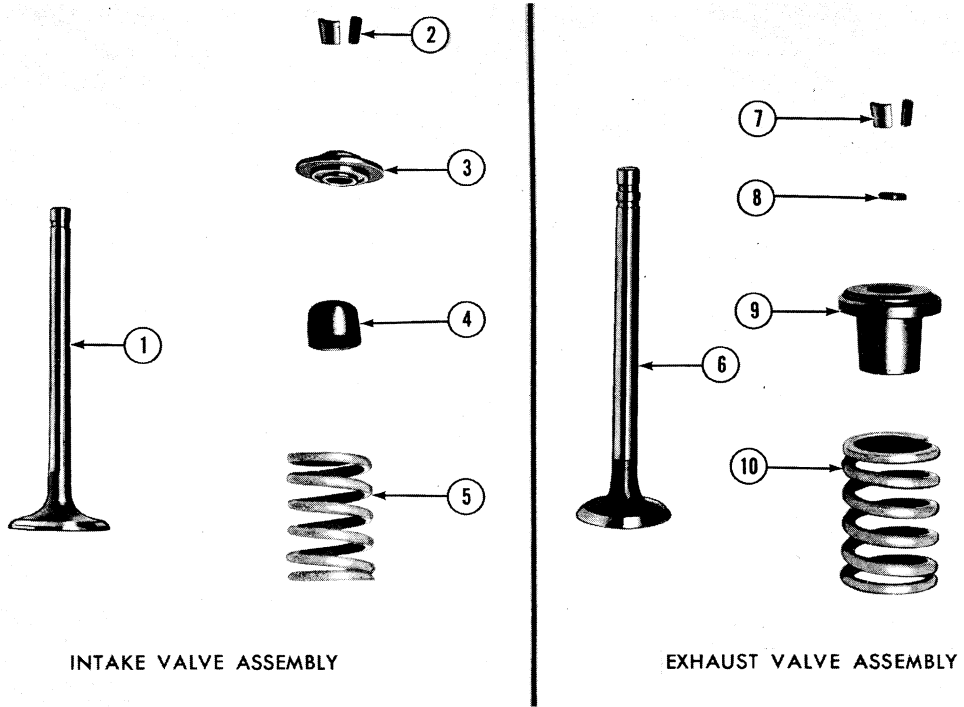
**Figure 4**  
Engine Thermostat

1. Gasket
2. Thermostat
3. Coolant Outlet Connection



**Figure 5**  
Removing Valves

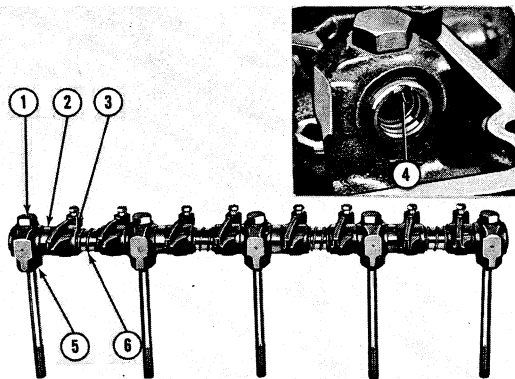
1. Retainer Locks
2. Valve Spring
3. Valve Spring Compressor



**Figure 6**

Valve Assembly Components

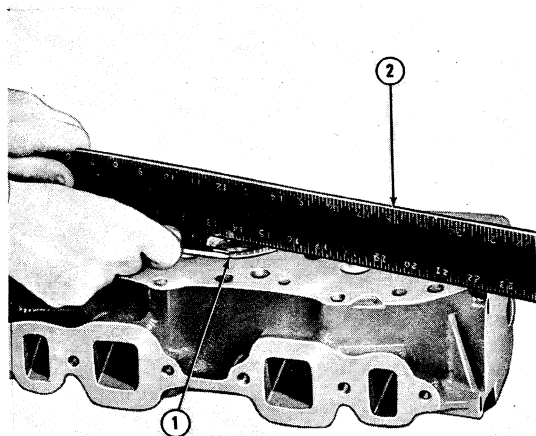
- |                   |                   |            |
|-------------------|-------------------|------------|
| 1. Intake Valve   | 5. Spring         | 9. Rotator |
| 2. Retainer Locks | 6. Exhaust Valve  | 10. Spring |
| 3. Retainer       | 7. Retainer Locks |            |
| 4. Seal           | 8. Seal           |            |



**Figure 7**

Rocker Arm Shafts

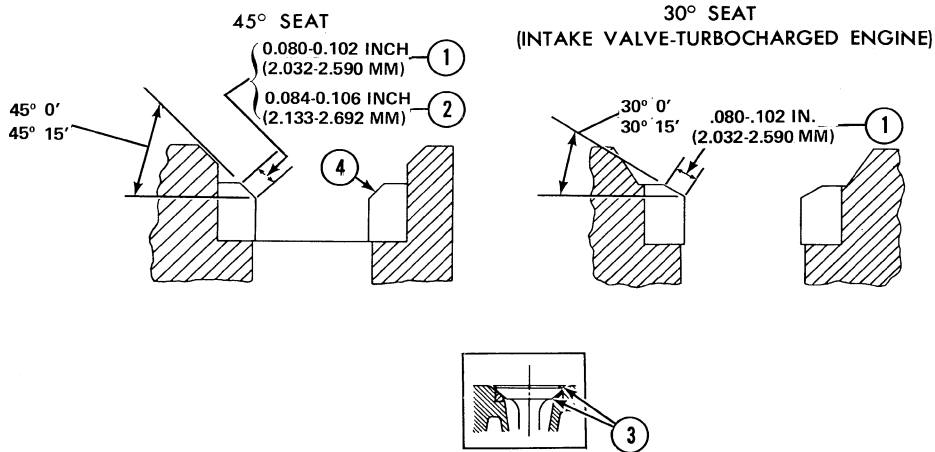
- |               |                             |
|---------------|-----------------------------|
| 1. Bolt       | 4. Notch                    |
| 2. Spacer     | 5. Rocker Arm Shaft Support |
| 3. Rocker Arm | 6. Spring                   |



**Figure 8**

Measuring Cylinder Head Flatness

- |                  |
|------------------|
| 1. Feeler Gauge  |
| 2. Straight Edge |



**Figure 9**  
Valve Seats and Face

- |                       |               |
|-----------------------|---------------|
| 1. Intake Valve Seat  | 3. Valve Face |
| 2. Exhaust Valve Seat | 4. Valve Seat |

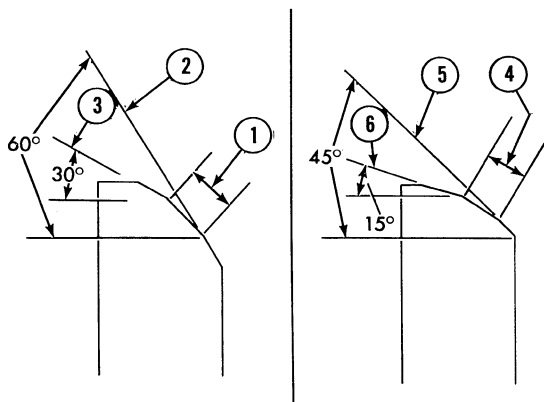
4. VALVE SEAT INSERTS: Examine the intake and exhaust valve seats and re-face or regrind if badly pitted or burred. If necessary, replace with an oversize insert (see Table 1 for dimensions).

**IMPORTANT:** Valve seat inserts of 0.010 in. (0.25 mm) and 0.020 in. (0.5 mm) oversize diameter are fitted to some cylinder heads in production. Heads

fitted with these inserts are stamped  $S_{010}^{OS}$  and  $S_{020}^{OS}$  on the exhaust manifold side in line with the valve seat.

5. The valve seat insert should be ground to give 1° interference fit with the valve. Valve seat insert angles are 45°00'–45°15' for all valve seats with the exception of the intake valve on turbocharged engines, where it is 30°00'–30°15'. See Figure 9.

**NOTE:** Grind valve seat inserts as shown in Figure 9A if required to obtain correct seat width and location.



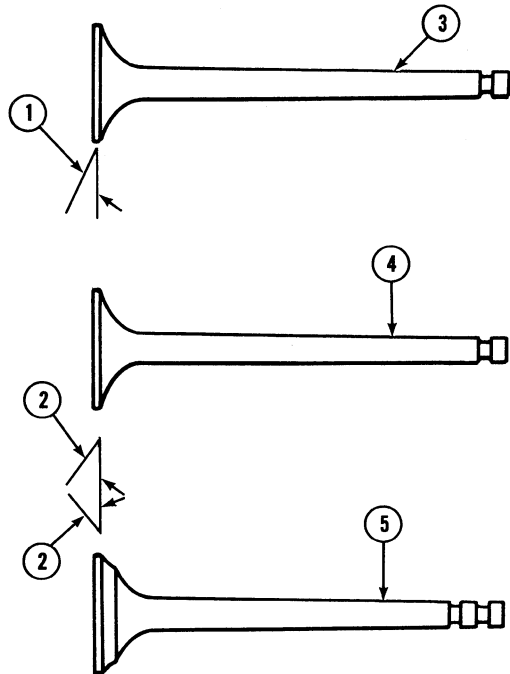
**Figure 9A**

Dressing Valve Seat Inserts

- |   |   |
|---|---|
| 1. 45° Valve Seat                                     | 5. Grind Bottom of Seat at Angle of 45° to Raise Seat |
| 2. Grind Bottom of Seat at Angle of 60° to raise seat | 6. Grind Top of Seat at Angle of 15° to Lower Seat    |
| 3. Grind Top of Seat at Angle of 30° to Lower Seat    |   |
| 4. 30° Seat   |   |

6. VALVES: If the valve face is unduly pitted, replace or reface all valves to 44° 15'–44° 30' except the intake valve on the turbo-charged engine, which is to be ground to 29° 15'–29° 30', Figure 10.

7. When new valve seat inserts or new valves are installed, the valves and seats should be ground to maintain a minimum dimensions of 0.062 in. (1.58 mm) from the cylinder head face to the top of the valve head.

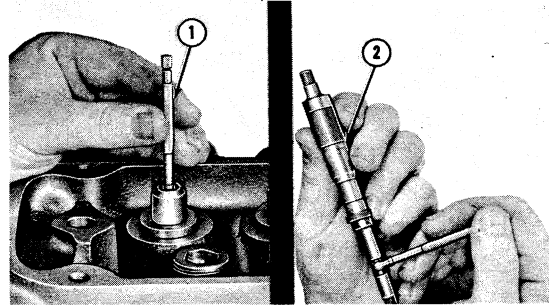


**Figure 10**

Exhaust and Intake Valves

- |                                     |  |
|-------------------------------------|--|
| 1. 29° 15' – 29° 30'                | 4. Naturally Aspirated Engine Intake Valve |
| 2. 44° 15' – 44° 30'                |  |
| 3. Turbocharged Engine Intake Valve | 5. Exhaust Valve                           |

**NOTE:** Before refacing ensure that the valve stem is not bent or worn. The thickness of the valve edge after refacing must not be less than 0.062 in. (1.58 mm) for turbocharged inlet valves, and 0.031 in. (0.79 mm) for other valves. Valve seat run-out, measured at right



**Figure 11**

Measuring Valve Guide

1. Telescope Gauge
2. Micrometer

angles to the seat, must not exceed a total of 0.0015 in. (0.038 mm) after re-facing.

8. VALVE GUIDES: Measure the valve to guide clearance with a telescoping gauge and micrometer, Figure 11. If the intake clearance is not within 0.001–0.0045 in. (0.025–0.11 mm) and the exhaust within 0.002–0.0055 in. (0.05–0.14 mm), ream the valve guide to fit the next over-size valve.

**IMPORTANT:** Some production cylinder heads may have one or more 0.015 in. (0.38 mm) oversize valve guides and valves installed. Where this condition applies, the exhaust manifold side of the cylinder head opposite the valve will be stamped "15" or "V015"<sub>05</sub>

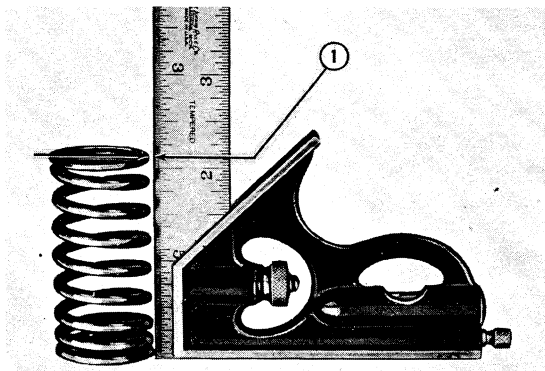
TABLE 1

Insert Oversize	Exhaust Valve Seat Insert	Intake Valve Seat Insert
	Counterbore Diameter in Cylinder Head	Counterbore Diameter in Cylinder Head
0.010 in. (0.254 mm)	1.607/1.608 in. (40.82/40.84 mm)	1.907/1.908 in. (48.44/48.46 mm)
0.020 in. (0.508 mm)	1.617/1.618 in. (41.07/41.10 mm)	1.917/1.918 in. (48.69/48.72 mm)
0.030 in. (0.762 mm)	1.627/1.628 in. (41.33/41.35 mm)	1.927/1.928 in. (48.95/48.97 mm)

9. To ream out a guide to accept an oversized valve, use kit SW502. The kit contains three oversize reamers, 0.003 in. (0.076 mm), 0.015 in. (0.38 mm) and 0.030 in. (0.76 mm). Along with the appropriate guides, always use the reamers in sequence and reface the valve seat after reaming.
10. VALVE SPRINGS: Discard valve springs that shows signs of erosion, rust, or are out of square in excess of 0.060 in. (1.6 mm), Figure 12. Check the specified free length and loaded length of the valve spring and replace any below specification. Be sure the valve spring retainer locks are in good condition.
11. ROCKER ARM ASSEMBLY: Examine the rocker arm adjusting screw and push rod end of the rocker arm for stripped or worn threads and the pad end for grooves or excessive wear and replace if severely damaged.
12. Examine the locating spring and spacer for breakage or damage and replace if necessary.
13. Check the rocker to shaft clearance and replace either or both parts if not within specification, Chapter 4.

**RE-ASSEMBLY**

1. CYLINDER HEAD: Re-assembly of the cylinder head components follows the disassembly procedure in reverse.



**Figure 12**

Checking Valve Spring Squareness

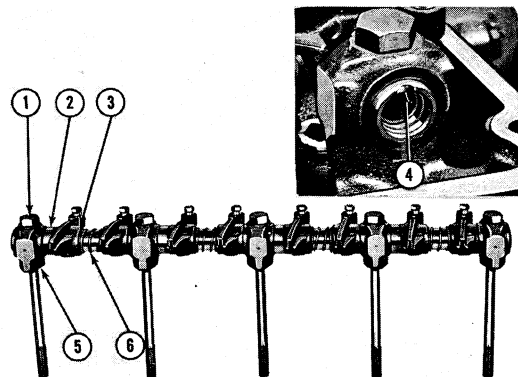
1. Maximum .060 in. (1.6 mm)

**NOTE: Turbo-charged engines have no seal fitted to the intake valve.**

2. ROCKER SHAFT: Coat all the components with engine oil and position the notch on the front of the rocker shaft upwards to locate the oil holes correctly, Figure 13.
3. Start the assembly from the shaft rear end and secure the rocker arm support with a long bolt, Figure 13, and proceed with the spacer, rocker arm, spring and rocker arm support. Repeat the procedure until complete.

**INSTALLATION**

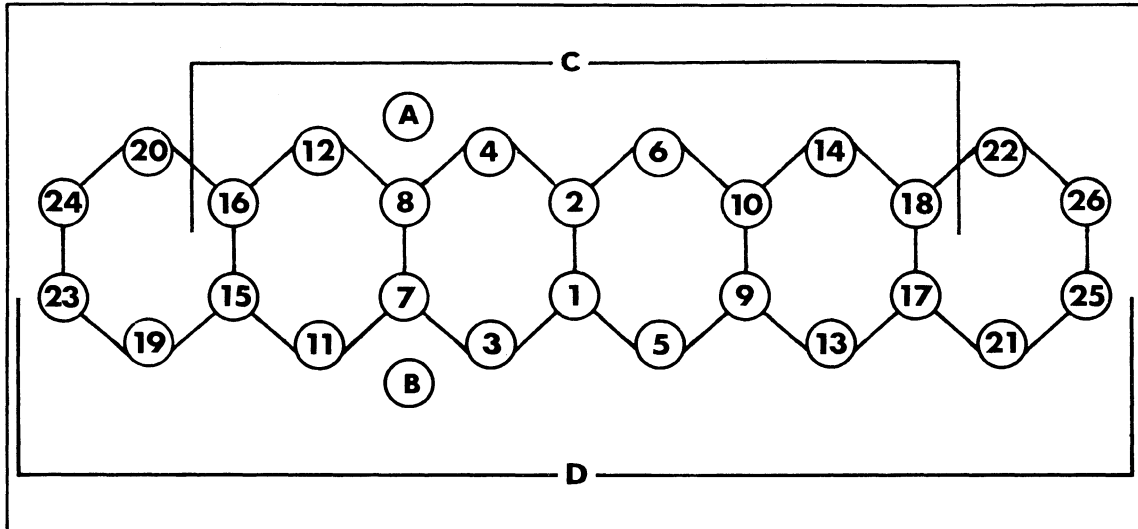
1. Install the cylinder head assembly with a new gasket.
2. Position the rocker shaft assembly on the head, lubricate the cylinder head bolts and install finger tight. Tighten the cylinder head bolts in the proper sequence, Figure 14. Tighten progressively in three steps: first 80 lb. ft. (11.04 kgm), then to 90 lb. ft. (12.42 kgm) and finally to 110 lb. ft. (15.21 kgm).



**Figure 13**

Rocker Arm Shafts

- |               |                             |
|---------------|-----------------------------|
| 1. Bolt       | 4. Notch                    |
| 2. Spacer     | 5. Rocker Arm Shaft Support |
| 3. Rocker Arm | 6. Spring                   |

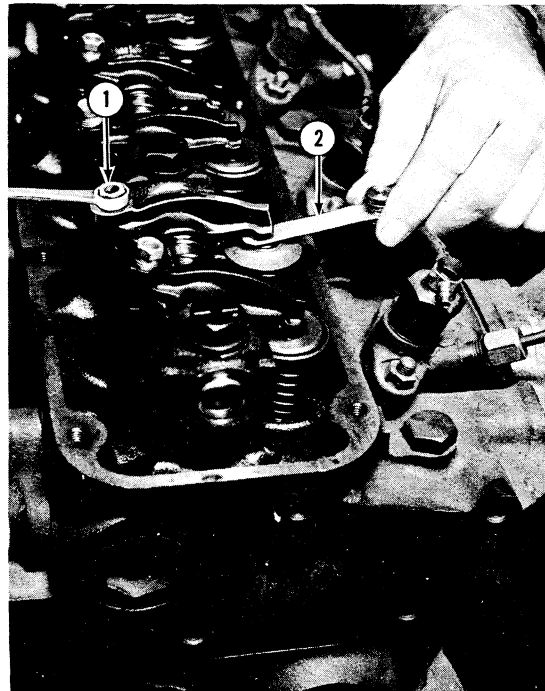


**Figure 14**  
Cylinder Head Tightening Sequence

A. Intake Side  
B. Exhaust Side

C. 4-Cylinder Head  
D. 6-Cylinder Head

3. Rotate the engine and set the valve lash Figure 15. See specification, Chapter 5 for specified limits. Install injectors with new washers and cork seals. Tighten progressively to the specified torque, Chapter 4, and install the leak-off line with new washers.
4. Replace the intake manifold, fuel filters, injector lines, exhaust manifold and on turbocharged engine, oil feed and return lines and the air cleaner components. Use new gaskets throughout and tighten bolts to the specified torque, see Chapter 4.
5. Bleed the fuel system as outlined in Part 2, "Fuel System" and check for leaks.



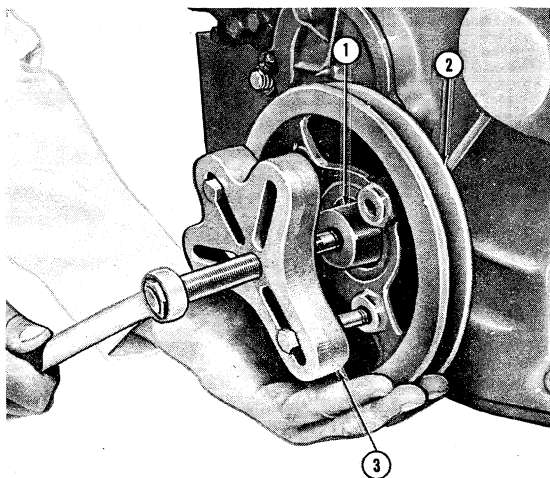
**Figure 15**  
Adjusting Valve Lash

1. Adjusting Screw
2. Checking Gap with Feeler Gauge

### 3. TIMING GEARS , CAMSHAFT AND OIL PUMP - OVERHAUL

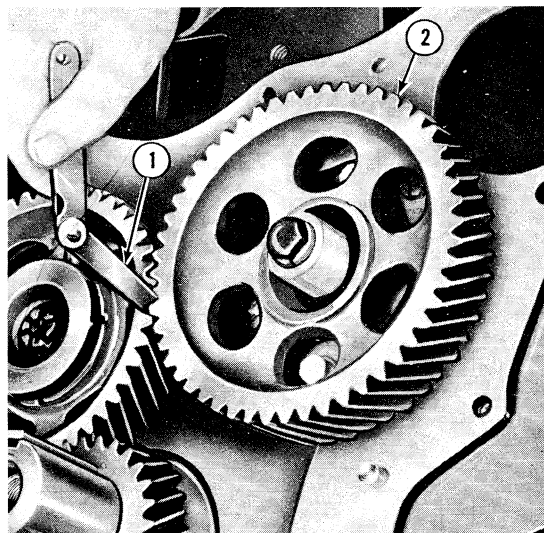
#### REMOVAL

1. **TIMING GEARS:** Remove the fan belt and crankshaft pulley, using tool No. 518 and shaft protector No. 625-1, Figure 16. Remove the alternator bracket.
2. Remove the front cover and measure the backlash between the timing gears in four equidistant places, Figure 17, prior to removal, see Chapter 4 for tolerance.
3. **CAMSHAFT:** Drain the engine oil and remove the cylinder head assembly, oil pan sump, tachometer drive fitting (A-62 only), oil pump drive gear and front cover.
4. Measure the clearance between the camshaft gear hub and the thrust plate, either with a dial indicator against the camshaft gear retaining bolt or with a feeler gauge. If the clearance exceeds the specified limit, Chapter 4, install a new thrust plate on re-assembly.
5. Invert the engine and remove the camshaft gear, thrust plate, key, spacer and camshaft.



**Figure 16**  
Removing Crankshaft Pulley

1. 625-1 Shaft Protector
2. Crankshaft Pulley
3. 518 Puller

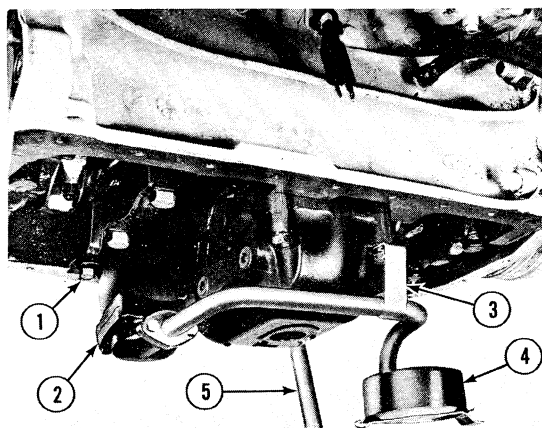


**Figure 17**

Checking Timing Gear Backlash

1. Feeler Gauge
2. Camshaft Gear

6. Remove tappets and number, so they can be installed in the same bore on re-assembly.
7. **OIL PUMP:** Remove the oil pump and intermediate shaft Figure 18.



**Figure 18**

Oil Pump and Filter

1. Mounting Bolt
2. Oil Pump
3. Support Bracket
4. Filter
5. Dipstick Tube



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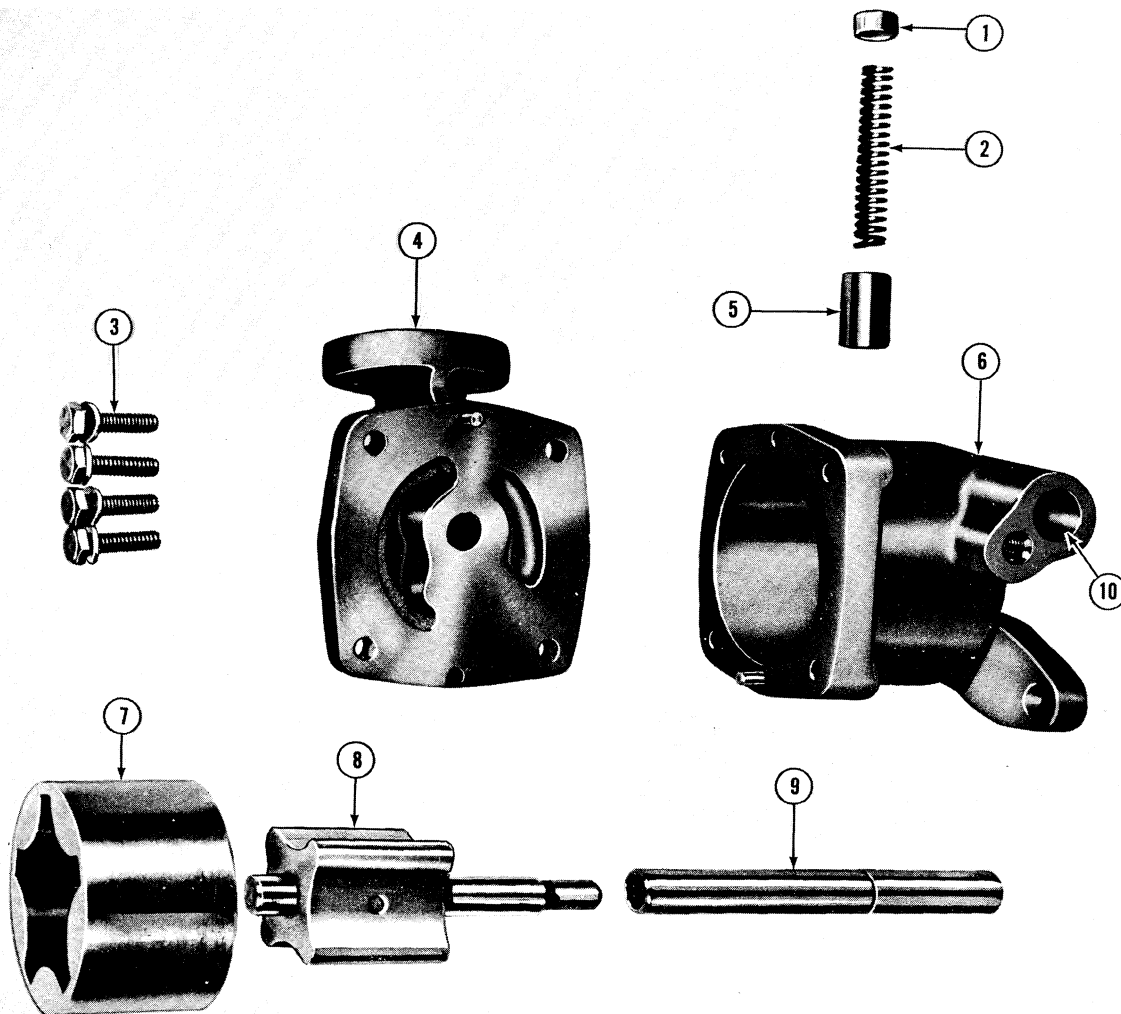
**DISASSEMBLY**

1. OIL PUMP: Remove the cover, outer rotor, inner rotor and shaft, Figure 19.
2. Remove the relief valve and spring by removing the plug with a self-tapping screw, Figure 19.

**INSPECTION AND REPAIR**

1. CAMSHAFT: Inspect the camshaft oil pump gear teeth and lobes. If badly worn, replace the camshaft, Clean the angle drilling on the No. 1 journal.

2. TIMING GEAR: Clean the gears and inspect teeth for wear. Remove minor imperfections with a carborundum stone but replace worn or severely damaged gears.
3. Inspect the camshaft drive gear bushing and adapter, Figure 20. Replace if worn.
4. FRONT COVER: Examine the oil seal and replace if necessary.
5. OIL PUMP: Clean the inside of the pump housing and relief valve chamber, check the inside of the pump cover for wear or score marks.



**Figure 19**  
Oil Pump Disassembled

- |              |                 |                          |
|--------------|-----------------|--------------------------|
| 1. Plug      | 5. Relief Valve | 9. Drive Shaft           |
| 2. Spring    | 6. Pump Body    | 10. Relief Valve Chamber |
| 3. Capscrews | 7. Outer Rotor  |                          |
| 4. Cover     | 8. Inner Rotor  |                          |

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