Perkins

POWER SERVICE

WORKSHOP MANUAL

Peregrine	6 cylinder diesel engines for automotive applications
1300 Series	6 cylinder diesel engines for agricultural and industrial applications

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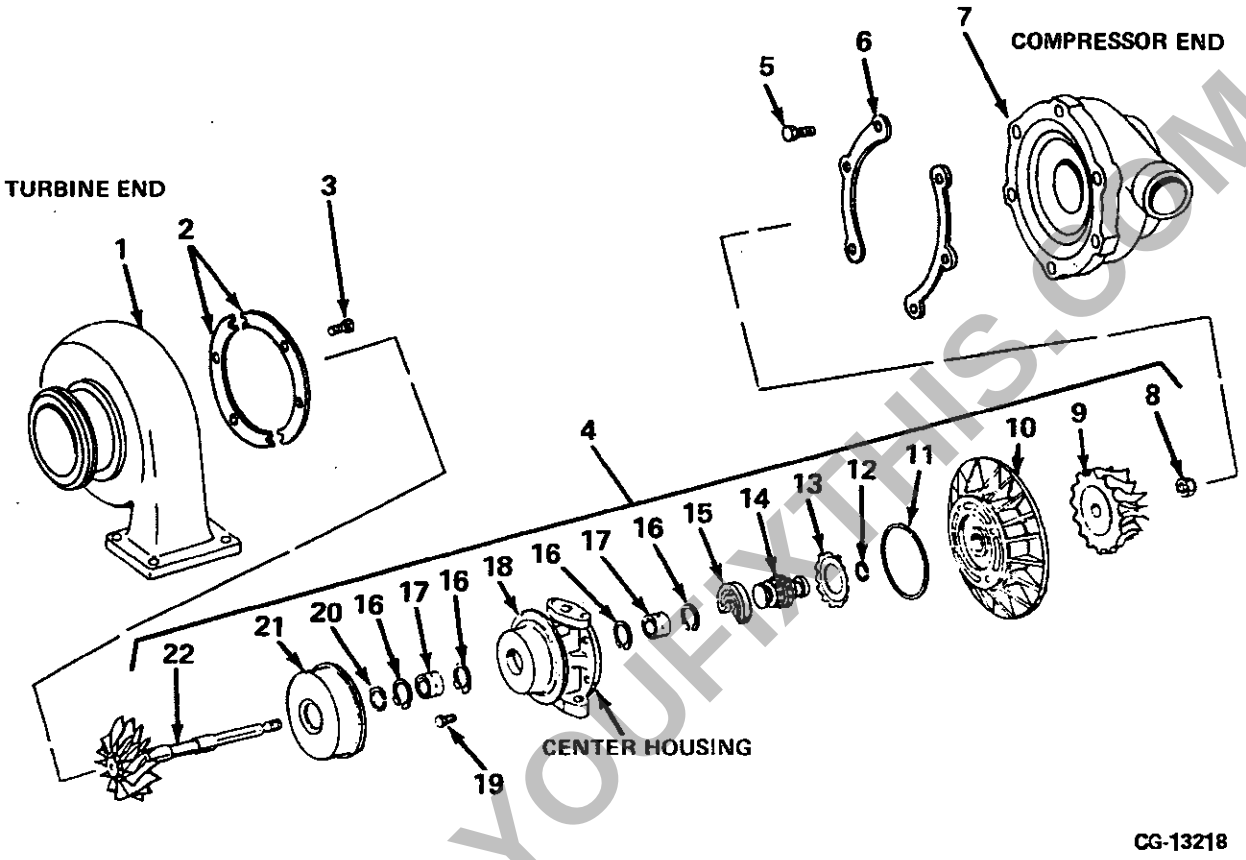


Figure 2.2. Turbocharger Components (T04E)

1. Housing, Turbine
2. Clamp, Housing
3. Screw, Hex Hd Cap
4. Core Assembly
5. Screw, Hex Hd Cap
6. Clamp, Housing
7. Housing, Compressor
8. Nut, Impeller Lock
9. Impeller, Compressor
10. Plate, Back
11. Ring, Plate Seal
12. Ring, Piston
13. Spring, Plate
14. Collar, Thrust
15. Washer, Thrust
16. Ring, Retaining
17. Bearing, Journal
18. Housing, Center
19. Screw, Hex Hd Cap
20. Ring, Seal
21. Shroud, Turbine
22. Turbine Wheel Assembly

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SPECIAL TORQUES

Back Plate–to–Center Housing Capscrews ..... 117.5 lbf–in. (13.3 Nm)

Impeller Shaft Locknut (Tighten finger tight plus 90°)
(Use tee handle wrench only) ..... 19 lbf–in. (2.15 Nm)

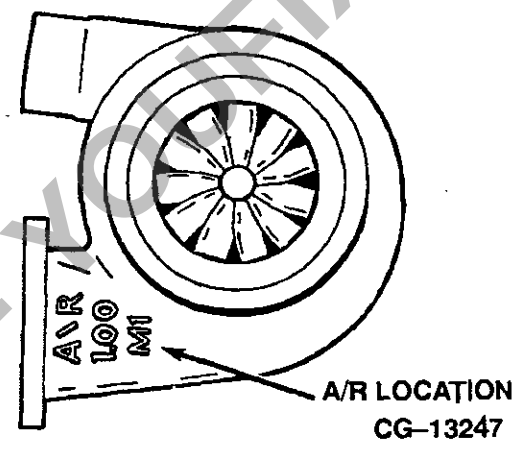
Center Housing–to–Turbine Housing Capscrews ..... 115 lbf–in. (13.5 Nm)

Center Housing–to–Compressor Housing Capscrews ..... 150 lbf–in. (16.9 Nm)

Turbocharger Mounting Bolts/Nuts ..... 35 lbf–ft. (47 Nm)

TURBOCHARGER A/R

MODEL	PART NUMBER	A/R
TO4E 17	1 817 796 C91	1.00



Turbine Housing A/R Identification

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REMOVAL AND REASSEMBLY

Removal

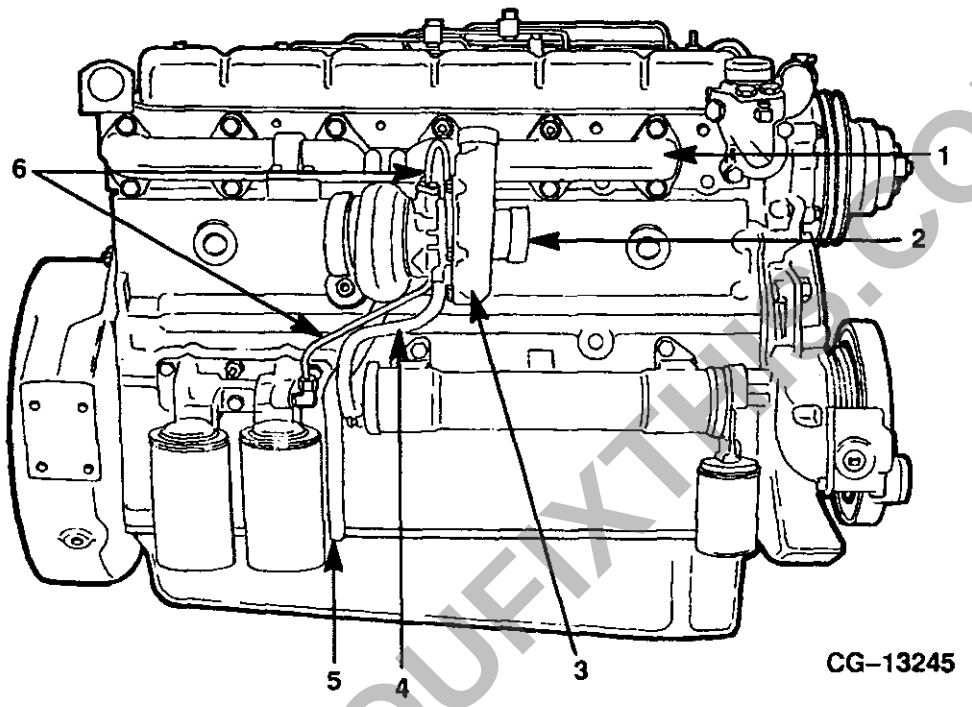


Figure 2.4. Turbocharger Removal

1. Exhaust Manifold
2. Air Inlet
3. Turbocharger
4. Oil–Outlet Tube
5. Crankcase Breather Tube
6. Oil–Inlet Tube

1. Disconnect and remove turbo oil inlet tube assembly at filter header. (See Figures 2.5 and 2.6).

2. Remove tube nut at oil filter header (See Figure 2.5.)

3. Remove the two capscrews from oil inlet tube flange. (See Figure 2.6.)

4. Remove oil inlet tube flange and discard gasket. (See Figure 2.6.)

5. Remove oil inlet tube assembly and discard the rubber sleeve located at the nut end.

6. Cap turbo oil inlet tube elbow at oil filter header to prevent debris from entering.

7. Cap ALL openings as specified in Figure 2.8.

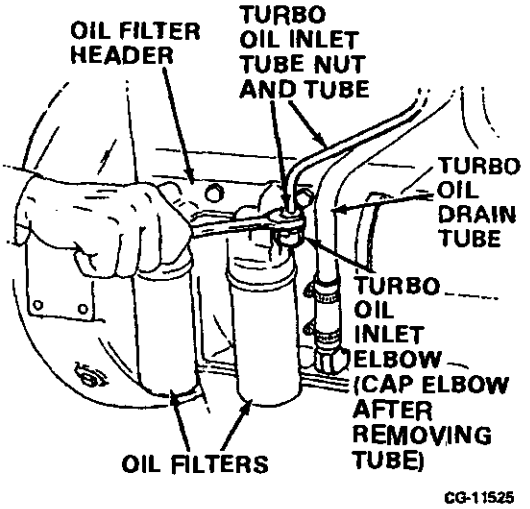


Figure 2.5. Removing Turbo Oil Inlet Tube and Sleeve at Oil Inlet Elbow

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TURBOCHARGERS

TROUBLESHOOTING

CONDITION	POSSIBLE CAUSE	REMEDY
Shaft and Turbine Wheel		
a. Bearing surfaces scratched or worn.	a. Dirty or insufficient oil. Wheel overspeeding.	a. Replace.
b. Discoloration.	b. Overheating or insufficient oil.	b. Reuse if slightly discolored and not deeply scratched.
c. Worn on one side only.	c. Operating with unbalanced wheel.	c. Replace.
d. Cracked, bent or damaged blades.	d. Foreign objects, heat or fatigue	d. Replace.
Bearings		
a. Both ID and OD scratched and worn.	a. Dirty or insufficient oil. Wheel overspeeding.	a. Replace.
b. Seized on shaft or excessive OD wear.	b. Overheating or lubrication failure.	b. Replace.
c. Worn on one side only.	c. Operating with unbalanced wheel.	c. Replace.
Bearing Housing		
a. Bore scratched or worn.	a. Dirty or insufficient oil.	a. Replace.
b. Carbon deposits.	b. Oil leaking, overfueling.	b. Clean housing. Remove any restriction from air intake system or oil drain.
Compressor End		
Dirty	a. Excessive intake restriction or a restricted oil drain line.	a. Check for clogged air cleaner element, collapsed hose or leaks in air inlet pipe. Clean compressor end and oil drain line.
	b. Insufficient air filtration.	b. Secure the connections between the air cleaner and turbocharger.
	c. Long period of operation without cleaning. (Refer to operation and maintenance manual for maintenance schedule.)	c. Disassemble and clean the unit.

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GENERAL ENGINE SPECIFICATIONS

DTA–466 ENGINE SPECIFICATIONS

ENGINE SPECIFICATIONS	DTA–466	
Number of Cylinders	6	
Configuration	In–Line	
Bore	4.30 in. (109.2 mm)	
Stroke	5.35 in. (135.9 mm)	
Displacement	466.4 cu. in. (7.6 Liter)	
Compression Ratio	16.5 :1	
Firing Order	1–5–3–6–2–4	
Valve Tappet Clearance	Intake	Exhaust
(Cold) DT/DTA–466	0.025 in. (0.635 mm)	0.025 in. (0.635 mm)
Engine Lube Oil Pressure		
(Engine Lube Oil Pressure with SAE 30 oil)		
Low Idle (700 RPM))	20–33 psi (138–228 kPa)	
High Idle	50–70 psi (345–483 kPa)	
Brake Horsepower @RPM*	213 BHP @1500 RPM	
Horsepower (A.M.A.)	44.37	
Idle Speed No–Load (RPM ±50)	700 RPM	
Governed Speed No–Load (RPM ±10)	1590 RPM	
Governed Speed Full Load	1500 RPM	
Crankcase Refill Capacity	w/o Oil Filters	with Oil Filters
	16 quarts	21 quarts

*Horsepower based on J1349 Standards 500 ft. (152.4 meters) altitude and 85° F (29.5° C) ambient. No deration required up to 10,000 ft. (3048 meters).

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SERVICE MANUAL

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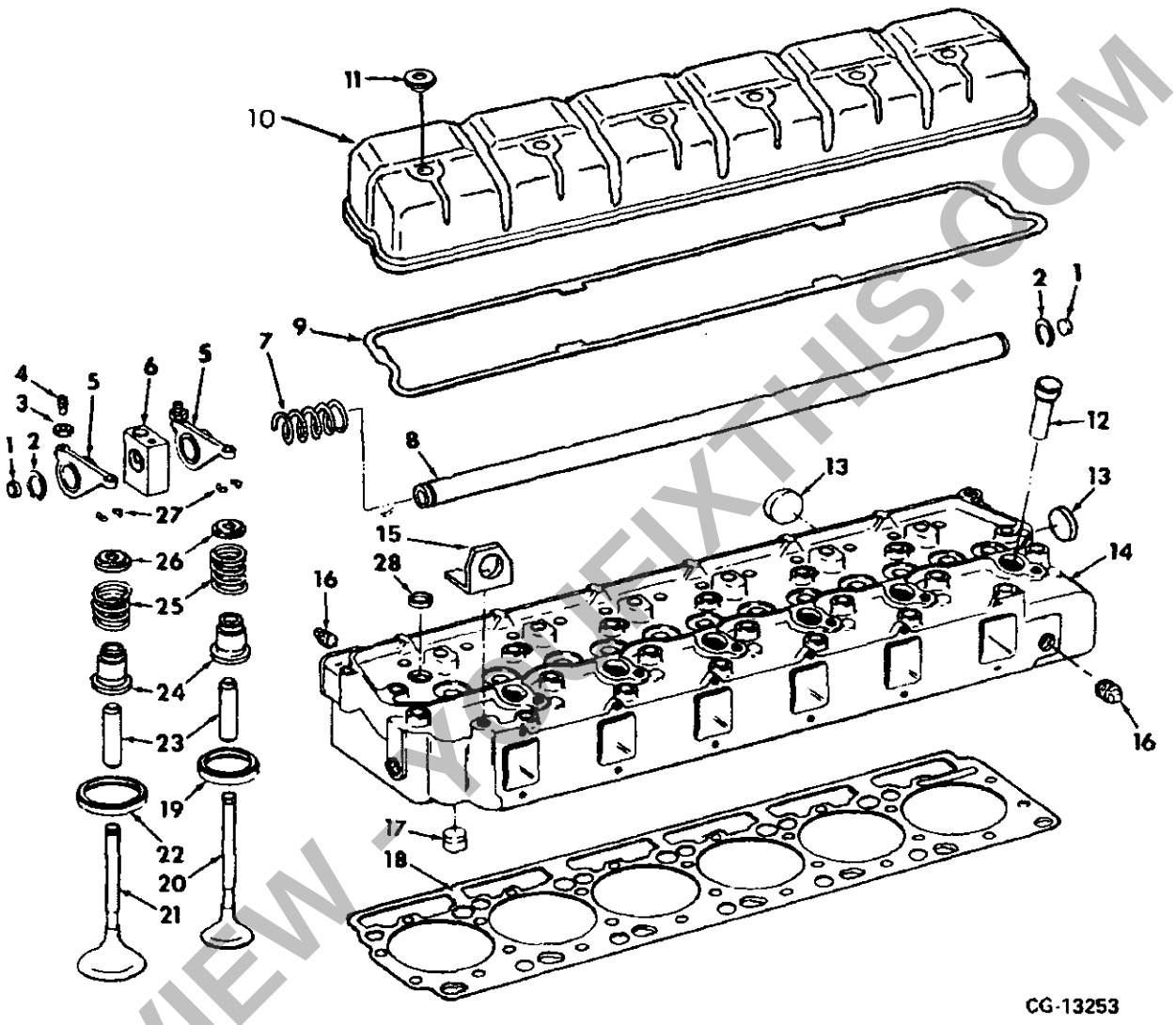


Figure 4.1. Cylinder Head, Valves and Related Parts

1. Plug, Cup
2. Ring, retainer
3. Nut, Adjusting Screw
4. Screw, Rocker Arm Adjusting
5. Arm, Valve Rocker
6. Bracket, Rocker Arm Shaft
7. Spring, Rocker Arm Shaft
8. Shaft, Rocker Arm
9. Gasket, valve cover
10. Cover, Valve
11. Grommet, Valve Cover
12. Sleeve, Injector
13. Plug, Cup
14. Head Assembly, Cylinder
15. Lifting Eye (2)
16. Plug, pipe, 1/2"–14 NPTF
17. Director, Water
18. Gasket, Cylinder Head
19. Insert, Exhaust Valve
20. Valve, Exhaust
21. Valve, Intake
22. Insert, Intake Valve
23. Guide, Valve
24. Seal, Valve Stem
25. Spring, Valve
26. Rotator, Valve
27. Lock Valve Spring
28. Plug, Cup

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CYLINDER HEAD INSTALLATION – Continued

- Run the long cylinder head bolts in finger–tight (except the two end bolts). Place a 0.005 in. feeler gauge between the outside brackets and the rocker levers to prevent binding. Refer to **Figure 4.61**.

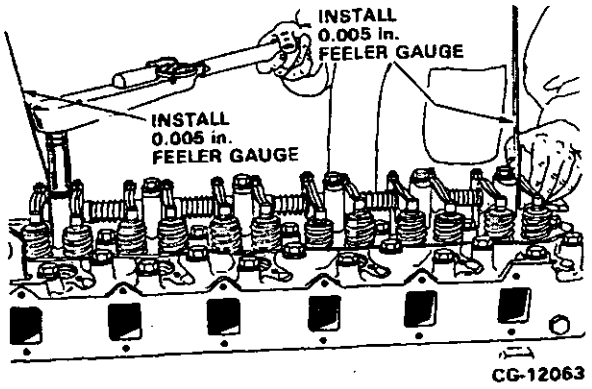


Figure 4.61. Install Feeler Gauges to Prevent Rocker Lever Binding

- Tighten the cylinder head bolts in three stages as specified under **"SPECIAL TORQUES"** in this section.

NOTE: Check the two end rocker arms for freedom of movement after tightening the cylinder head bolts.

- Remove the two 0.005 in. feeler gauges.

10. Adjust valve lash as follows:

NOTE: All valves are adjusted by rotating the engine only twice.

- Rotate the crankshaft until the #1 piston is on the compression stroke and the timing pointer on the front cover is in line with the TDC mark on the vibration damper.

NOTE: Confirm that the #1 piston is on the compression stroke by turning both push rods by hand to verify that both valves are closed. The valves are closed when the push rods are loose and can be turned easily.

- Set valve lash by loosening the lock nut and turning the valve adjustment screw with the appropriate size feeler gauge inserted between the rocker arm and valve stem tip. Tighten the valve adjustment screw until the valve lever can support the feeler gauge. Refer to **Figure 4.62** and **"SPECIFICATIONS"** for valve lash.

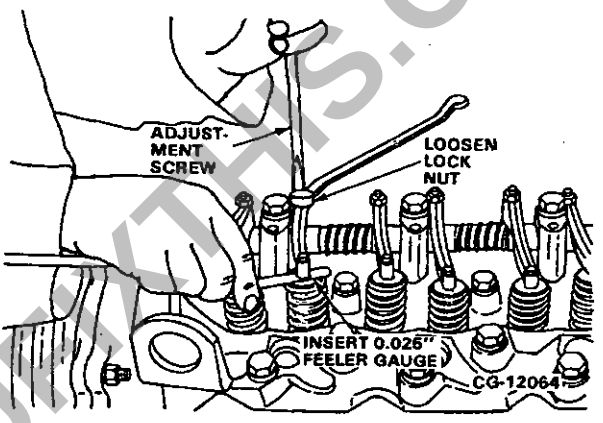


Figure 4.62. Adjust Valve Lash

- Tighten the lock nut once the valve adjustment is set. Remove the feeler gauge. Refer to **Figure 4.63**.

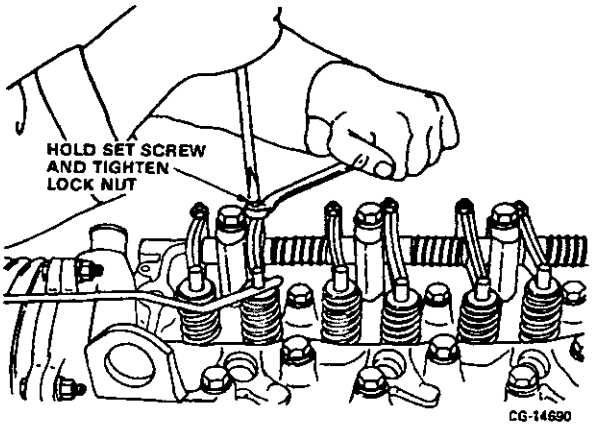


Figure 4.63. Tighten Valve Adjustment Screw Lock Nut

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CONNECTING RODS, PISTON, RINGS AND SLEEVES – Continued

Removal – Continued

• **PISTON & ROD ASSEMBLY REMOVAL – Continued**

6. Remove the upper connecting rod bearing insert by carefully inserting a small screwdriver at the edge of the bearing insert (between the connecting rod and the crankshaft journal) to release the tang. Refer to Figure 6.7.

IMPORTANT

BE CAREFUL NOT TO SCRATCH THE CRANKSHAFT JOURNAL.

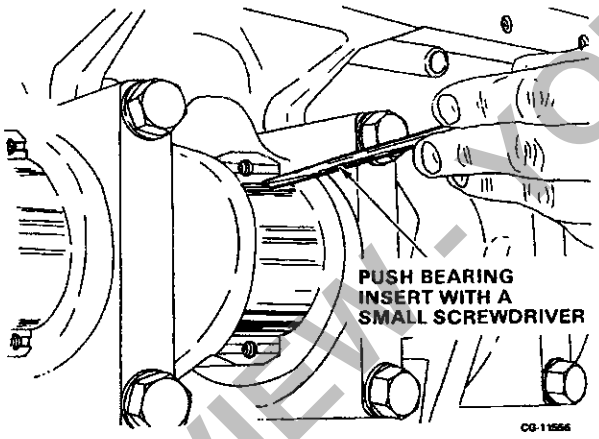


Figure 6.7. Release Bearing Insert Tang

7. Push the connecting rod up slightly to release pressure on the bearing insert. Slide the insert around the crankshaft journal and remove. Refer to Figure 6.8.

NOTE: With the connecting rod bearings removed, tape the halves together to form a circle. Mark the tape to indicate the cylinder location. This will aid during bearing inspection.

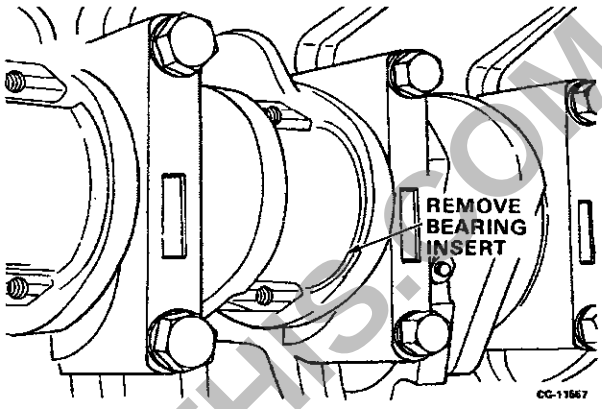


Figure 6.8. Remove Bearing Insert

8. Remove the piston and connecting rod assemblies as follows:

a. Push the piston and rod assembly from the cylinder bore using a wood or plastic handle. Once the piston rings are free of the cylinder bore, the assembly can be removed from the top of the crankcase. Refer to Figure 6.9.

b. Rotate the engine and remove all of the remaining pistons as outlined. Be sure to replace each bearing cap on its respective connecting rod after removal of the piston from the engine.

c. Identify the connecting rod and piston assemblies upon removal so they can be reinstalled in their respective cylinder bores.

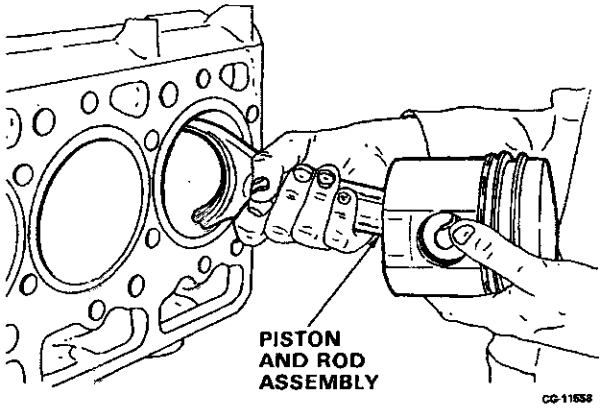


Figure 6.9. Remove Piston and Connecting Rod Assembly

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CRANKCASE
(Reconditioning)

- CLEANING – Continued

6. install new main oil gallery cup plugs as follows:

a. Clean mating surfaces on plug and crankcase.

b. Apply Loctite® to the outside edge of the cup plug.

c. Drive the cup plug in using an arbor approximately 1/4 in. smaller in diameter than the plug being installed.

d. Recess the plug 1/8 inch.

NOTE: Two nylon patch bolts are used to attach the breather opening cover. Installation of non–patch type bolts could result in oil leaks at the cover opening. Refer to Figure 7.43. for cover location.

- INSPECTION AND REPAIR

NOTE: Threaded holes with damaged threads may be salvaged with the use of a "Heli–Coil repair".

1. Inspect the crankcase deck for flatness using a straightedge and feeler gauge. Use the checking pattern shown in Figure 7.44. If a 0.003 in. feeler gauge can pass, the crankcase must be replaced.

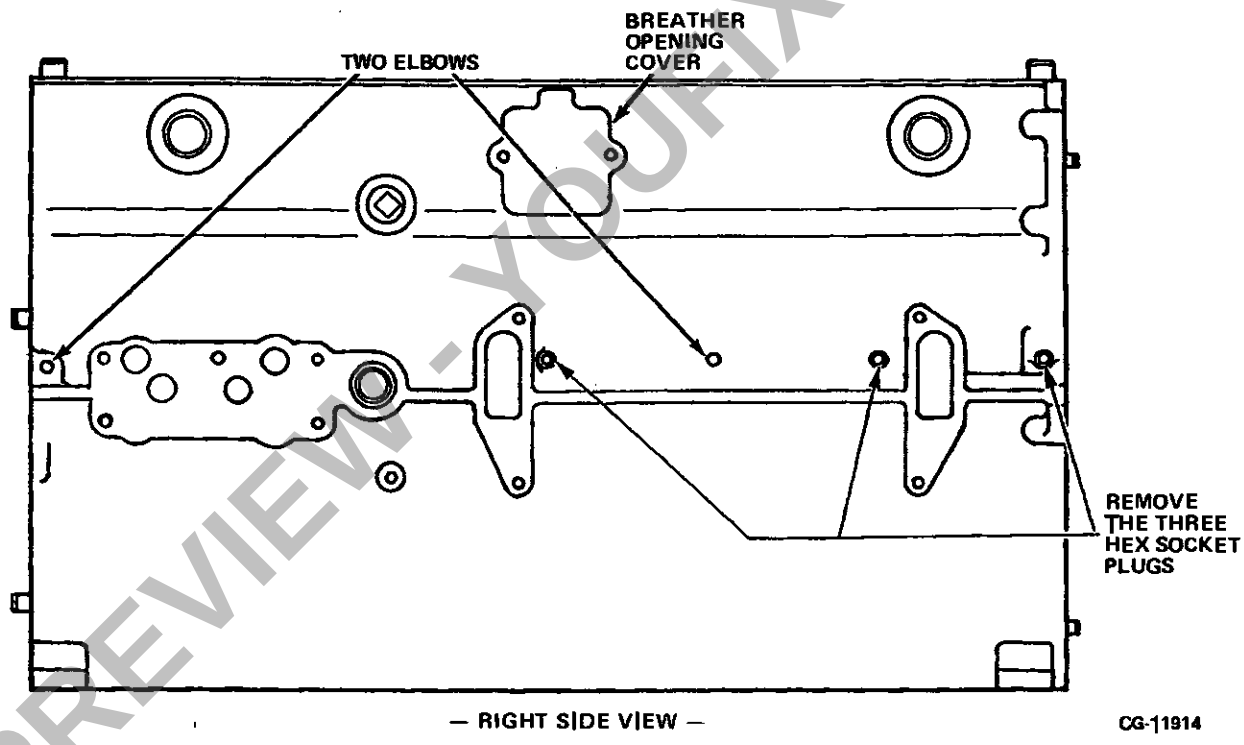


Figure 7.43. Cross Drilling Plug and Breather Opening Cover Locations

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FRONT COVER – Continued

• **REMOVAL – Continued**

3. Remove the injection pump drive gear and the injection pump as described in Section 11.

IMPORTANT

PRIOR TO REMOVING THE INJECTION PUMP, FOLLOW THE INJECTION PUMP TO ENGINE TIMING PROCEDURE TO FACILITATE REASSEMBLY, REFER TO SECTION 11.

4. Remove the front cover as follows:

a. On engines equipped with a gear driven pump remove the two nuts which secure the hydraulic pump at the rear of the front cover and front plate. If unit is equipped with a cover, remove the cover and discard the gasket. Refer to Figure 8.5. for location.

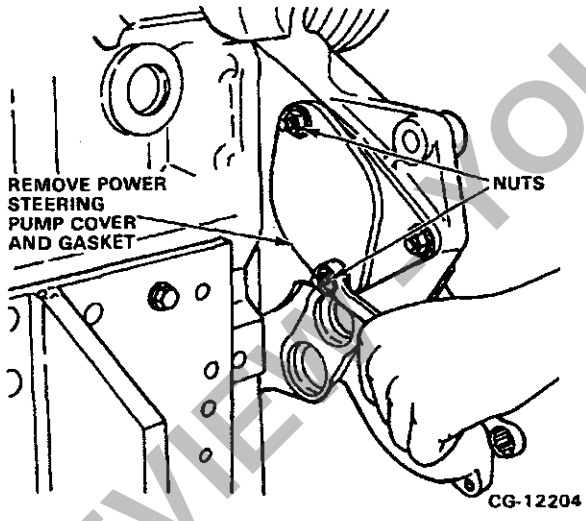


Figure 8.5. Remove Power Steering Pump Cover and Gasket

NOTE: Rotate the engine to the vertical position, on the engine stand. (Front cover facing up.) This allows retention of the hardware in the cover and minimizes the chances of crankshaft damage.

b. Loosen (but do not remove) all the front cover mounting bolts which secure the front cover to the crankcase. Refer to Figure 8.6.

c. Lift the front cover (with hardware) from the crankcase and set aside.

d. Remove front cover gasket and discard.

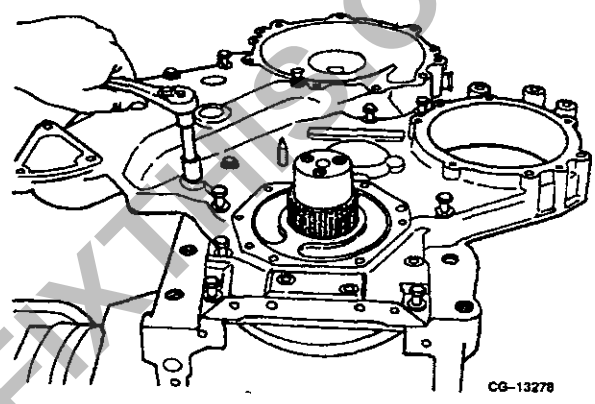


Figure 8.6. Remove Crankcase Front Cover (With Engine in Vertical Position)

• **CLEANING**

1. Remove all gasket material using a scraper or wire brush from the following mating surfaces:

- Injection pump drive gear access cover
- Water pump
- Oil pan
- Oil pickup tube
- Crankcase front cover

2. Clean all bolt threads prior to reassembly.

• **INSPECTION**

1. Visually inspect the front cover for cracks or porosity.

NOTE: This is especially important if oil and coolant contamination has been found and no other cause is discovered.

2. Replace any front cover which fails visual inspection.

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OIL PICKUP TUBE – Continued

- **INSPECTION AND REPAIR – Continued**

9. If leakage is found at the tube, housing with inlet screen, support bracket or mounting flange elbow, replace the oil pickup tube assembly.

10. If leakage is found at the mounting flange mating surface, remove the assembly and investigate the cause. Check for a damaged or missing gasket or damaged mounting flange mating surface.

NOTE: If the mounting flange mating surface is found to be damaged, replace the oil pickup tube assembly. Refer to Section 7 for installation instructions if the oil pickup tube must be replaced.

11. Remove the test gauge and reinstall the oil drain plug at the oil cooler.

12. Reinstall the oil pan using a new gasket. Refer to Section 7.

13. Install the vibration damper as described in Section 7.

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FUEL INJECTION PUMP

• REMOVAL

NOTE: FUEL INJECTION PUMP MODELS MW AND PES6A REMOVAL AND REASSEMBLY PROCEDURES ARE SIMILAR. WHERE SPECIFIC PROCEDURES ARE DIFFERENT, THOSE STEPS WILL BE DETAILED.

IMPORTANT

CLEANLINESS IS OF UTMOST IMPORTANCE WHEN SERVICING FUEL INJECTION SYSTEMS. ALWAYS CLEAN ENGINE BEFORE INJECTION PUMP IS REMOVED OR DISCONNECTING FUEL LINES. ALWAYS PLUG OR CAP ANY OPENING TO PREVENT DIRT, PAINT CHIPS OR OTHER FOREIGN MATERIAL FROM ENTERING THE FUEL SYSTEM. DO NOT CLEAN WITH ENGINE RUNNING.

• Set Injection Pump to Engine Timing Prior to Pump Removal as Follows:

1. Disconnect battery cables

2. Disconnect accelerator cable or linkage from outer injection pump control lever.

3. Remove injection pump timing pointer plug and gasket from left side of pump mounting adapter.

WARNING

Shut–off must be in no–fuel position before proceeding.

4. Rotate the engine in the normal operating direction until the engine front cover timing pointer is on the degree mark on the damper pulley for the particular application.

5. Visually inspect the hub scribe line and timing pointer for alignment. If the scribe line and timing pointer are aligned, the #1 piston is on the compression stroke. Refer to Figure 11.10.

NOTE: The above procedure establishes the accuracy of the previous timing and avoids the necessity of removing the valve cover to establish the #1 compression stroke during reassembly.

• Verify Injection Pump to Engine Timing as Follows, if Gear Train was Disassembled:

1. Verify that the #1 piston is on the compression stroke by:

a. Removing the valve cover.

b. Check to see if the #1 cyiinder intake and exhaust valve levers are loose by turning the push rods by hand.

c. If loose, the #1 piston is on the compression stroke and the injection pump may be removed.

d. If the #1 cylinder valve levers are NOT loose, set the pump to engine static timing as described in steps 2–4.

2. Rotate the engine one complete revolution. The engine should now be on the #1 compression stroke.

3. Observe the engine front cover timing pointer and damper pulley degree alignment. To ensure an accurate reading, view the pointer straight on. Refer to Figure 11.10.

The engine should now be positioned at specified static pump to engine timing. Refer to Specifications.

NOTE: if timing is not within specifications, rotate engine to correct crankshaft position (specified degrees before top dead center) before removing injection pump. If necessary to rotate engine in opposite direction of normal rotation to achieve specified timing, rotate engine to 90 degrees before top dead center and then rotate engine to specified timing. This procedure takes up gear backlash.

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TROUBLESHOOTING

1. Where good combustion, specified engine temperature control and clean fuel prevail, nozzles require little attention.

Nozzle trouble is usually indicated by:

- Combustion knock

Other symptoms may include:

- Hard starting or failure to start
- Engine misses
- Excessive black smoke at idle
- Excessive black smoke under load
- Low power or loss of power
- Excessive fuel consumption
- Erratic idle speed
- Frequent engine stalls
- Surging at governed RPM

2. While the above symptoms may be caused by defective nozzles, they may also be caused by other engine related problems such as:

- Incorrect fuel
- Water in fuel
- Dirty or damaged fuel filter
- Incorrect maximum fuel setting
- Faulty injection pump
- Insufficient engine lubrication
- Incorrect pump timing
- Faulty engine valves
- Air in fuel

3. Where faulty nozzle operation is suspected on an engine that is knocking, a simple test can be made to determine which cylinder is causing the difficulty.

NOTE: Keep hands and clothing away from moving items on engine when loosening connections.

4. With the engine running at a speed that makes the defect most pronounced, momentarily loosen the high pressure fuel inlet connection on one nozzle assembly sufficiently to "cut out" the cylinder.

5. Check each cylinder in the same manner. If one is found where loosening causes knocking to cease, the injection nozzle for that cylinder should be tested.

6. Nozzle testing, disassembly, cleaning and reconditioning must be done only by an authorized Dealer or other diesel service outlet equipped and qualified to perform such services.

NOTE: When servicing injection nozzle assemblies, the necessity of cleanliness cannot be over-emphasized. A clean workbench, clean washing fluid containers, clean tools and clean hands are all essential to produce satisfactory results. The use of suitable tools for this type of work is equally important.

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