FIATALLIS®

8285
ENGINE

service manual

Form 73150208 English
9/89

SUBJECT INDEX

2.3 WATER PUMP, COOLANT FILTER AND THERMOSTAT

2.3.1
Loosen the hose clamps on hose between water pump and engine oil cooler.

2.3.2
Loosen the hose clamps on hose between thermostat housing and water manifold.

2.3.3
Remove the inlet and outlet plumbing that links engine oil cooler and thermostat housing.

2.3.4
Remove the coolant filter and filter feeder tubes.

2.3.5
Remove the thermostat housing and related plumbing. Remove and check condition of thermostats.

2.3.6
Remove the water pump.

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⚠ WARNING -Wear proper protective equipment such as safety goggles or safety glasses with side shields,hard hat,safety shoes, heavy gloves,when metal or other particles are apt to fly or fall.

2.4 CRANKSHAFT PULLEY, VIBRATION DAMPER, AND COUNTERWEIGHT

Remove the eight capscrews that attach pulley, vibration damper, and front counterweight to crankshaft. Be careful that pulley does not fall when the last capscrew is removed.

IMPORTANT: It is advisable to install a new vibration damper in conjunction with any crankshaft replacement.

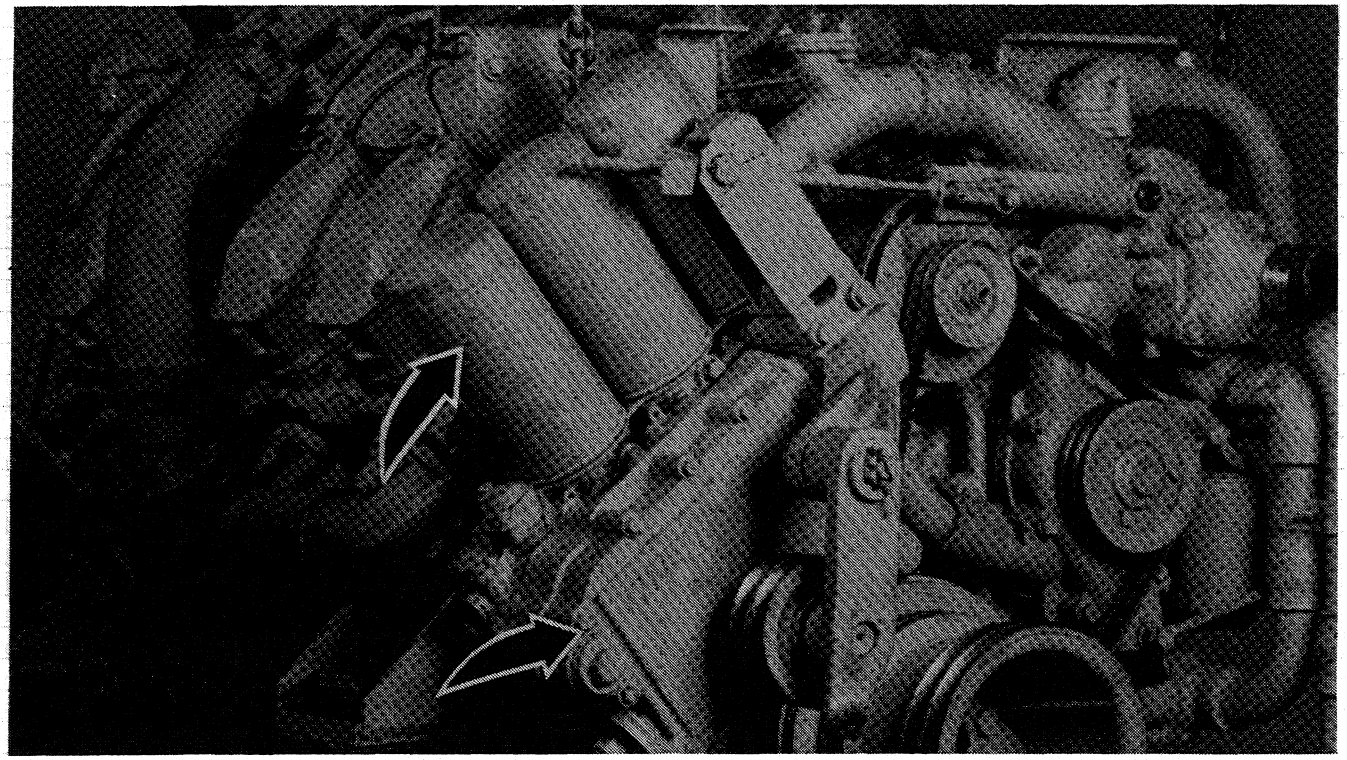


FIG. 8 ENGINE OIL HEAT EXCHANGER AND OIL FILTERS T-82313

4.2
In addition to the visual examination, the I.D. of all sleeves should be measured. Use a bore gauge as illustrated in Figs. 16 and 17. Within any sleeve, taper or out-of-round measurement variations of more than .15 mm (.006 in) between any two of the measured points should be considered cause for sleeve replacement.

NOTE: The correct nominal finished internal diameter of a new, honed, hardened, and installed sleeve is 145.000 to 145.030 mm (5.708 to 5.709 in).

4.3
The clearance between a sleeve wall and piston skirt should be .153-.197 mm (.006-.0077 in). When wear results in excessive clearance, the sleeve and/or piston must be replaced. See Figs. 18, 19, 20 for measurement details. The clearance is found by first measuring the outside diameter of the piston at a point 21 mm (.826 in) above bottom of the piston skirt and at a right angle to the pin bore, Fig. 19; subtract the piston O.D. from the I.D. of the sleeve, as measured in Fig.20. The difference, is the piston-to-sleeve gap.

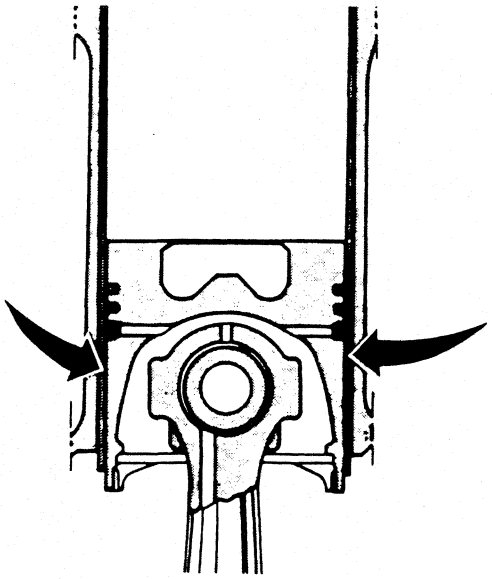


FIG.18 RELATIONSHIP BETWEEN PISTON & SLEEVE FOR GAP CALCULATION (Typical) T-81818

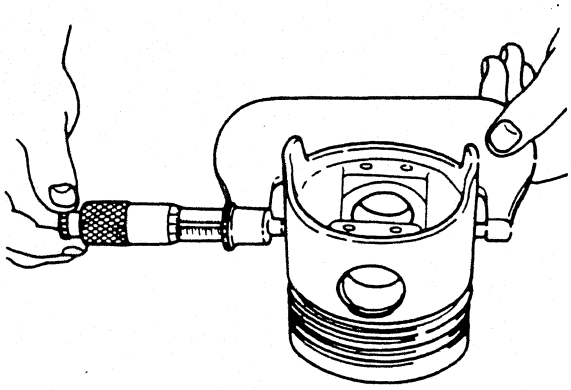


FIG. 19 MEASURING PISTON SKIRT (Typical) T-81819

NOTE: The outside diameter of a conventional new piston, when measured 21 mm (.826 in) above bottom of the piston skirt is 144.833-144.847 mm (5.7020-5.7026 in). (Refer to Section 4 for detailed information about piston wear.

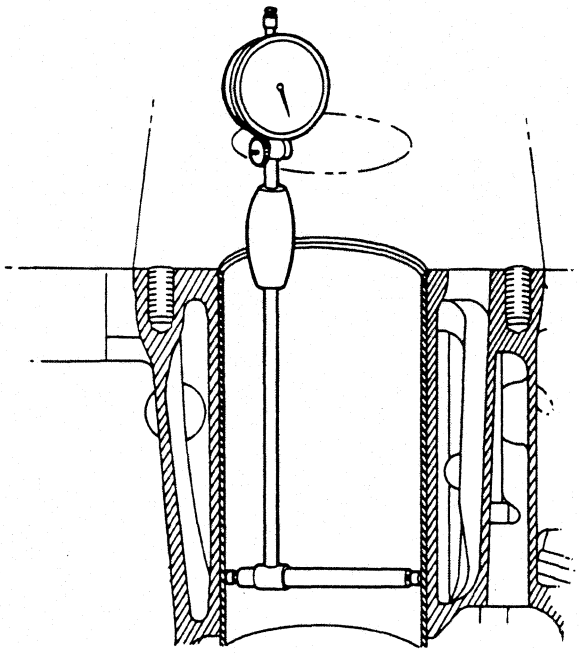


FIG.20 MEASURING SLEEVE FOR PISTON SKIRT TO SLEEVE GAP CALCULATIONS (Typical) T-81820

TOPIC 3 PISTONS AND RINGS

3.1 CLEANING

⚠ WARNING -Never use gasoline, solvent or other flammable fluids to clean parts. See Operation and Maintenance Instruction Manual.

Thoroughly clean pistons before beginning measurement procedures. Do not use a solvent that is harmful to aluminum. Remove all rings from ring grooves by using a conventional ring removal tool. To clean grooves, use a conventional caliper type cleaning tool.

3.2 PISTON INSPECTION AND MEASUREMENT

3.2.1
Pistons should be examined for cracks, checks, burning and ring land deterioration. Any noticable change in piston surface condition should arouse concern. Superficial heat cracks around the circumference of a piston combustion bowl are considered normal. Replace any piston with heat checks that are more than 1 cm (.3937 in) long.

NOTE: Oversize pistons (and rings) are not available because cylinder sleeves cannot be rebored or honed (due to the hard nitrogen sleeve coating). Oversize piston pins are available.

3.2.2
Piston inspection must include a diameter check. Fig. 19 illustrates procedure. Paragraph 4.3 of Section 3 explains procedure. The outside diameter of a conventional new piston, when measured 21 mm (.826 in) above bottom of piston skirt is 144.833-144.847 mm(5.7020-5.7026 in).

3.2.3
All of the pistons, fitted to any one engine, must be the same weight. The maximum weight difference allowed between the lightest and heaviest piston

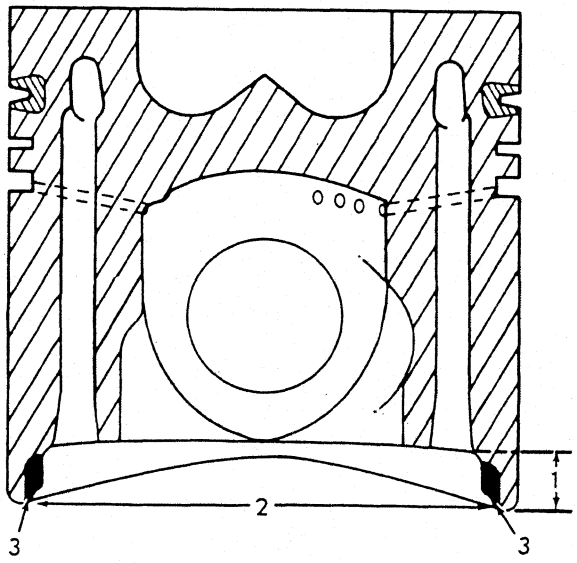


FIG. 29 PISTON SURFACE THAT MAY BE MACHINED TO REDUCE WEIGHT T-82269

1. 17 mm (.669 in)
2. 137 mm (5.393 in)
3. Removed material

is 15 grams(.536 oz). It is possible to mill stock from the base of a piston in order to equalize weights. Fig.29 illustrates the area of the piston pin boss from which material can be removed.

IMPORTANT: Do not remove more than 17 mm (.669 in) of stock from the piston area that is 137 mm (5.393 in) in diameter. The actual weight of each piston is stamped beside the word "Peso" (means weight) on each piston. The correct piston weight is 3.415-3.445 kg (7.529-7.488 lbs).

3.2.4
The dimensional tolerances between bosses of piston, piston pin, and the bushings in small end of connecting rod are critical. Always establish that these fits are acceptable, Fig. 31. Use conventional measuring instruments to verify dimensions. Additional connecting rod measurment procedures are presented under Topic 4 of this Section.

SECTION 5 CRANKSHAFT PULLEY, DAMPER, AND BALANCE WEIGHTS

TOPIC 1 GENERAL RECOMMENDATIONS

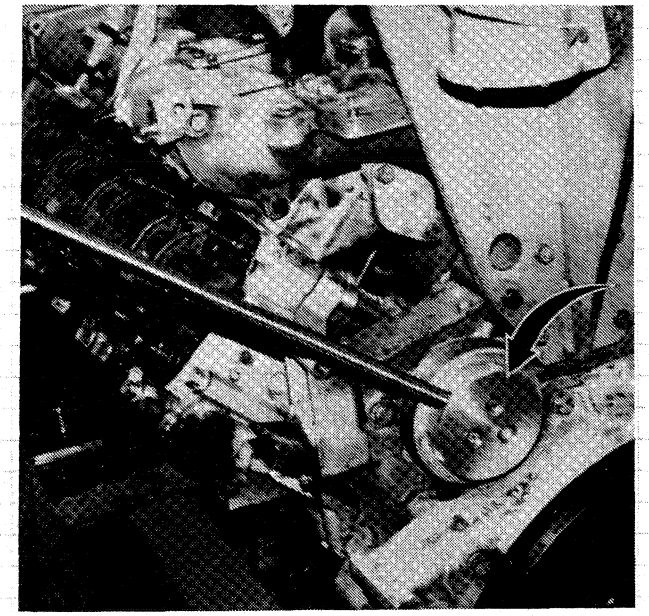


FIG. 42 LOCATION OF ACCESSSORY T-82271 PULLEY FOR MANUALLY ROTATING CRANKSHAFT

1.1
When it is necessary to manually rotate the crankshaft, use the pulley illustrated in Fig. 42 (pulley has special holes for the insertion of a bar). This device is also effective for "locking" the engine while applying torque to parts that normally turn.

1.2
The front balance weight and rear flywheel are compatible in all 8285 engines. These parts can be exchanged without regard to crankshaft balance.

1.3
The mechanical condition of the pulley and damper, attached to the crankshaft, is critical to the life of the engine.

IMPORTANT: It is advisable to install a new crankshaft damper if a crankshaft failure occurs.

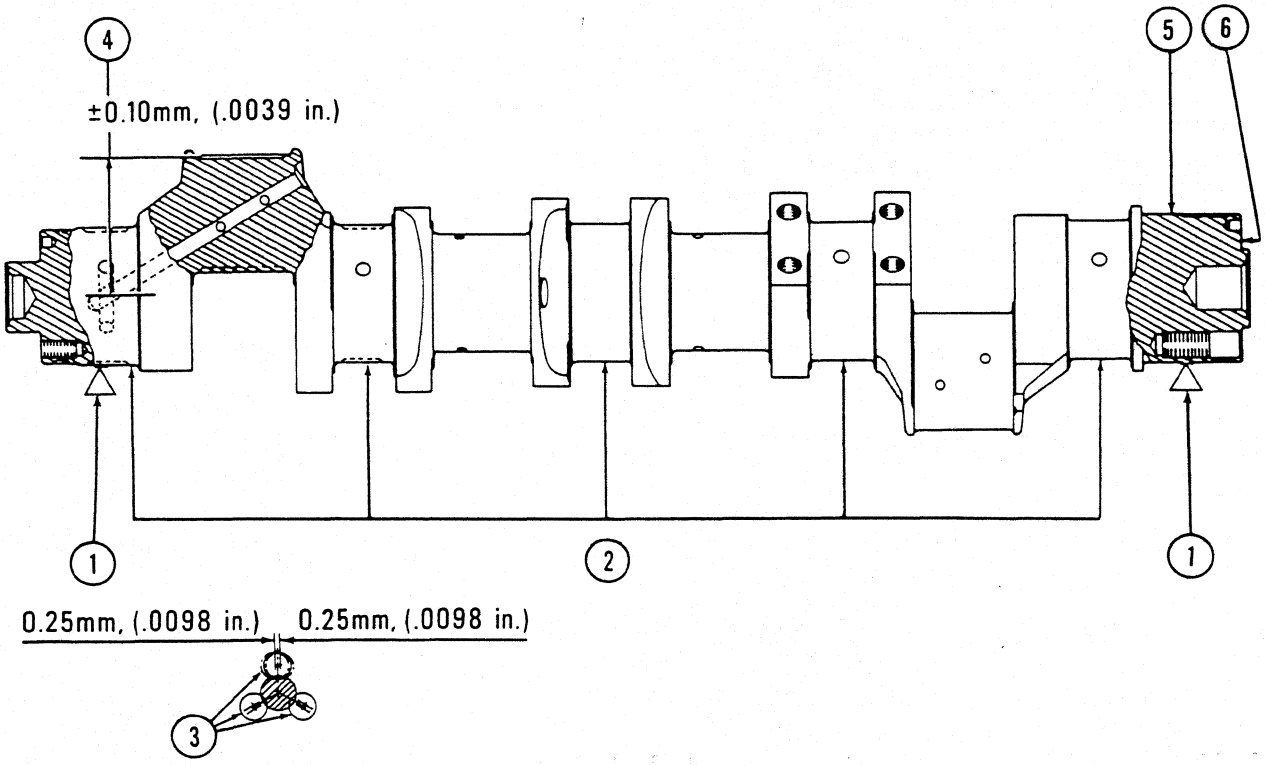


FIG. 47 CHECKING MAIN AND CONNECTING ROD JOURNAL ALIGNMENT T-82363

1. V-blocks
2. Shaft warp should not exceed .10mm(.004 in)
3. Connecting rod misalignment with respect to main journals should not exceed .25mm(.010 in)
4. ± .10mm(.004 in) between tops of all connecting rods and rotational axis.
5. Flywheel flange run-out not to exceed .01mm(.0007 in)
6. Machined surface eccentricity not to exceed .04mm(.0015 in)

equipment and fully trained personnel. Fiatallis recommends that a magnetic particle inspection be performed on all crankshafts, before and after regrinding.

3.3.3
When regrinding crankshaft journals, the utmost care should be taken to be sure fillet radii are maintained as shown in Fig. 46. The fillets must be blended and polished smoothly into the journal and crankshaft cheeks.

NOTE: Grinding burns cannot be tolerated.

3.3.4
Crankshaft should be ground in the direction opposite to crankshaft rotation. To reduce grinding burrs, always include a polishing operation following each grinding operation(polish surface insame direction as the journal will rotate).

3.3.5
After grinding is completed, be sure the sharp edges that have been chamfered around the lubrication holes in bearing journals are rounded off. Repolish as necessary.

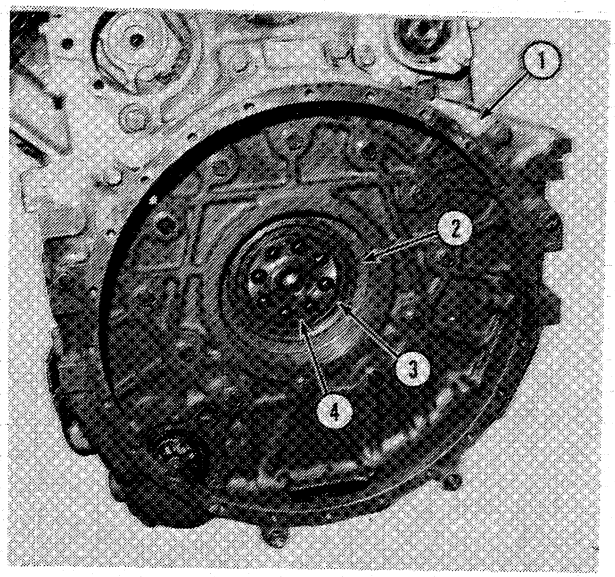


FIG.62 REAR OIL SEALS T-82277

1. Flywheel housing
2. Timing gear housing
3. Seals (2) and drilling location
4. Crankshaft

5.4.2.6
Install capscrews to secure housing; torque capscrews securing gear housing and plate to block, to 19.6 daNm (145 lbs.ft.). Torque capscrews securing gear housing to plate only, to 2.4 daNm (18 lbs.ft.).

5.4.2.7
Reinstall the oil line.

5.5 REAR OIL SEAL REMOVAL AND INSTALLATION(Flywheel housing installed)

NOTE: There are two crankshaft rear oil seals located in the timing gear housing. The seals may be removed, and new seals installed with or without removing the timing gear housing and flywheel housing.

Refer to Fig. 62; drill a hole approximately 3.1mm (.125") in diameter, or less, through the metal part of seals; install a metal screw through the seals, and using a slide hammer-puller, remove the seals.

5.5.2 INSTALLATION

5.5.2.1.
Check the seal bore, and O.D. of new seals, for cleanliness and small burrs or nicks.

IMPORTANT: The seal bore is not machined completely through the housing; a very thin seal stop should be evident. The inner seal must fit against this stop, but maximum care must be taken to prevent breaking the stop. Also, seal retainer compound is not necessary.

5.5.2.2
Using clean grease, grease the garter spring and spring seat (on seal) to better retain spring during seal installation; carefully tap the seal into position in bore (seal lip toward engine).

IMPORTANT: Garter spring may come off of seal, therefore, insert a seal pick (a pick with one end bent at a 90° angle) between the seal and crankshaft, and lift the spring into position (can be seen with a light) by rotating the pick completely around the shaft.

5.5.2.3
Install the outer seal (lip of seal toward outside) by tapping into position against inner seal.

5.5.2.4
Lubricate the seal lips with clean grease.

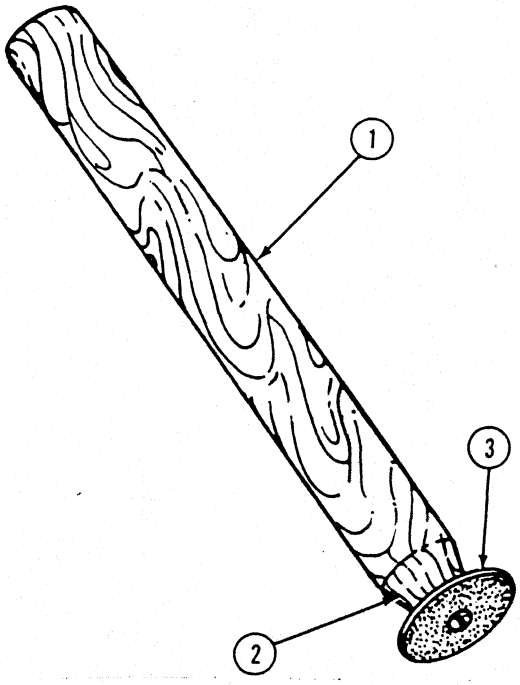


FIG.71 SANDPAPER STICK T-82284

1. Dowel Rod(diameter somewhat less than sleeve internal diameter)
2. Taper(should match taper of sleeve seat)
3. Discs of "0" and "00" grade emery paper

Set head in a drill press; use a 5/16 in. bit to drill a hole approximately 19.05 mm(.75 in) deep into top of pin. Tap the hole using a 3/8 in. NC tap. Attach a slide hammer with a 3/8 in. NC adapter to pin and pull pin from head. Paragraph 6.3 of Topic 6 explains pin installation.

VALVE GUIDE FITTING TABLE

VALVE GUIDE	O.D. OF VALVE GUIDE	DIAMETER OF GUIDE BORE
Standard Size Valve Guide	17.028–17.038 mm (.6704–.6708 in)	17.000–17.018 mm (.6693–.6700 in)
.04 mm(.0015 in) Oversized Guide	17.068–17.079 mm (.6719–.6723 in)	17.040–17.058 mm (.6708–.6715 in)
.20 mm(.0078 in) Oversized Guide	17.228–17.239 mm (.6782–.6786 in)	17.200–17.218 mm (.6771–.6778 in)
.24 mm(.0094 in) Oversized Guide	17.268–17.279 mm (.6798–.6802 in)	17.240–17.258 mm (.6787–.6794 in)

5.4.2
After guide bore machining is completed, carefully clean the bores and surrounding area. Recheck dimensions before installing replacement guides.

5.5 INSTALLING VALVE GUIDES

5.5.1
There are no dimensional differences between intake guides and exhaust guides. To install new guides, coat outside surface of each guide with a mixture of white lead and lubricating oil.

5.5.2
Drive each valve guide into it's respective hole in top of head until the upper edge of guide lies 1.5–2.5 mm(.06–.10 in) below the top deck of head.

IMPORTANT: The I.D. of each installed valve guide should be checked after installation. There is a valve reamer available for I.D. corrections. See service tools list in Section 15 of this manual.

After all valve guide repairs and measurements are completed, carefully press new valve stem seals into place on each valve guide.

5.5.3
Use a conventional arbor press to install guide pins in cylinder head. Pins should be pressed downward until they seat solidly on bottom.

IMPORTANT: Make sure that the bridge pin bores are clean and dry. Do not lubricate pins for installation.

5.6 GRINDING VALVES

5.6.1
The faces of the valves must be correctly finished as they are compatable with the newly machined seats. Use a conventional valve grinding setup to reface valves to the correct angle, Fig. 85. Notice that the specified angle of valve faces is slightly different than that of the valve seats, Fig. 79. By grinding valve face and seat at slightly different angles, a precise sealing edge between the face and seat is obtained.

5.6.2
After finish grinding is completed, check the worth of the seal between a valve face and seat; wipe a thin film of Prussion Blue on the valve face and then bounce the valve once on the seat.

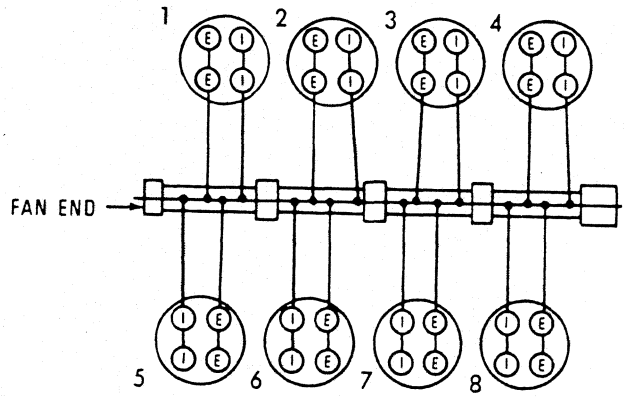
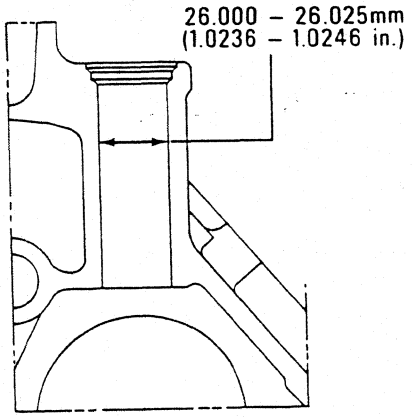


FIG.96 VALVE POSITIONS RELATIVE TO CAMSHAFT LOBES T-82291



1.2 VALVE LIFTER AND PUSH ROD SPECIFICATONS

1.2.1
Lifter to block bore clearance .050–.098mm(0019–.0038 in)

1.2.2
Push rod length 330mm(12.992 in)

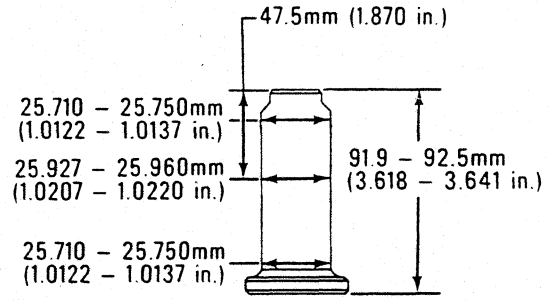
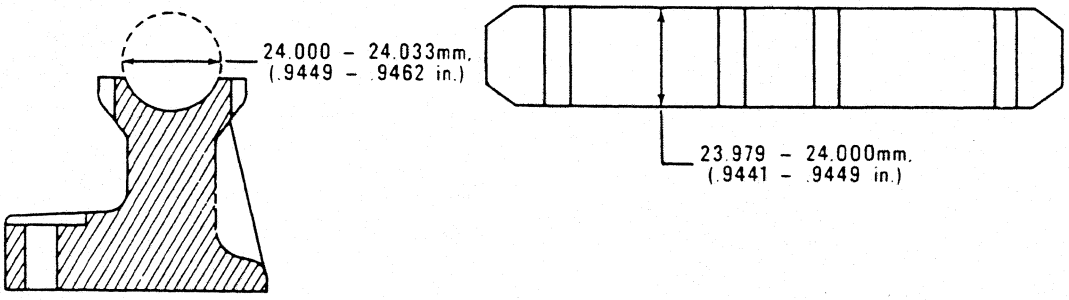


FIG.97 VALVE LIFTER SPECIFICATIONS (Standard) T-82368



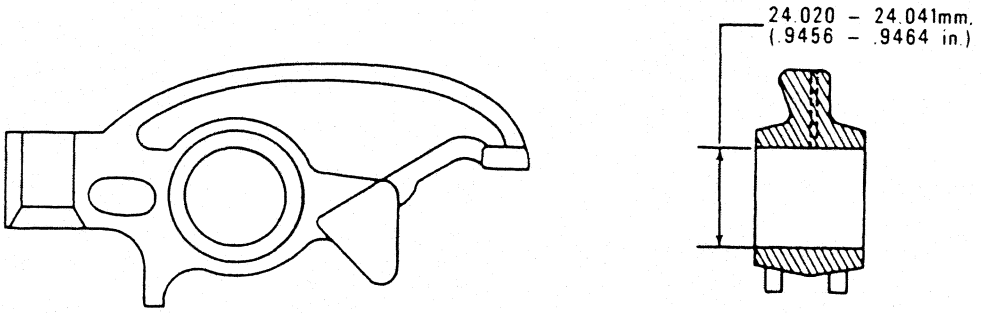


FIG. 98 ROCKER ARM, SHAFT AND BRACKET SPECIFICATIONS T-82292

provision for bushing replacement. The correct clearance between rocker arm bore and shaft is .020–.062mm (.0007–.0024 in).

5.2.5
See Fig. 104 (6). Examine the bores and contact surfaces of valve bridges for wear. Replace valve bridge pins when contact surfaces show signs of hammering.

5.3 ASSEMBLY

5.3.1
IMPORTANT: Do not install rocker arm assembly on head until timing gear alignment is verified. The alignment and timing of gear train is explained in Section 9. Valve clearance adjustment procedure is explained in Topic 7 of Section 7.

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⚠ WARNING –Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non–flammable, non–toxic solvents.

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⚠ WARNING –Wear safety glasses with side shields or goggles when using compressed air for cleaning to reduce the danger of personal injury from flying particles. Limit the pressure to 2.07 bar (30 psi) according to local or national requirements.

5.3.2
Clean oil holes in rocker arms and rocker arm shaft with solvent, a small wire and compressed air. If there is any reason to believe that shaft core is clogged, remove an end plug from shaft and clean with solvent and a brush. Replacement plugs are available.

5.3.3
Fig. 105. There is an oil hole drilled into one of the shaft supports in each head assembly. Always insure that this hole is clear of obstruction.

5.4 INSTALLATION OF ONE ROCKER ARM ASSEMBLY

5.4.1
Lubricate the rocker arm components with clean engine oil.

NOTE: Do not lubricate capscrew threads.

5.4.2
Insert pushrods into their respective block holes, and slide valve bridges over the pins.

5.4.3
Place shaft support on level and align all capscrew holes. Insert the capscrew that holds support to head and tighten lightly.

5.4.4
Install rocker arms on shaft. Place shaft in support (making sure that rocker arm spurs are correctly aligned over valve bridges) and align all capscrew holes. Insert the "allen head" capscrews that hold shaft to support.

5.4.5
Carefully align the pushrods so they mate with rocker arm adjustment screws.

IMPORTANT: Always insure that rocker arm shaft is correctly installed in support cradle.

5.4.6
Tighten the four "allen head" capscrews to a torque of 6.9 daNm (51 lbs.ft.). Tighten the capscrew that holds support against head to a torque of 2.4 daNm (18 lbs.ft.).

5.4.7
Make sure that the adjusting screws in rocker arms are loose enough to insure that piston–to–valve interference cannot occur. Recommended preliminary

TOPIC 5 TIMING GEAR INSTALLATION

5.1
Install and align the oil pump drive gear with the crankshaft gear. Refer to Section 6 for crankshaft and crankshaft gear installation. Refer to Section 10 for oil pump installation.

5.2
Push the hub of fuel injection pump drive gear into place against the rear surface of injection pump variator shaft.

NOTE: One of the holes drilled in the gear is offset, therefore, the gear will only fit on shaft one way. Install the six capscrews that hold injection pump drive gear to shaft and tighten them to a torque of 2.4 daNm (18 lbs. ft.).

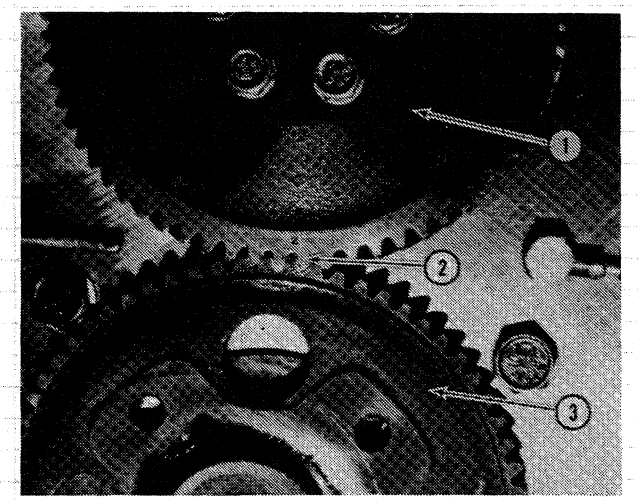

FIG.113 ALIGNING NUMBERS ON F.I.P.GEAR AND CAMSHAFT GEAR T-82304

1. F.I.P. drive gear
2. Numbers "2" aligned
3. Camshaft gear

5.3
Carefully insert the camshaft (with gear attached) into camshaft gallery. Topic 3.4 of Section 8 explains procedure.

IMPORTANT: Lubricate camshaft lobes with engine oil before installing camshaft in engine.

Align the numbers "2", and install gears, Fig.113 (2). Rotate the camshaft gear enough to expose the holes in camshaft thrust plate and block plate. Install the four capscrews that hold camshaft thrust plate to block and tighten to a torque of 2.4 daNm (18 lbs.ft.).

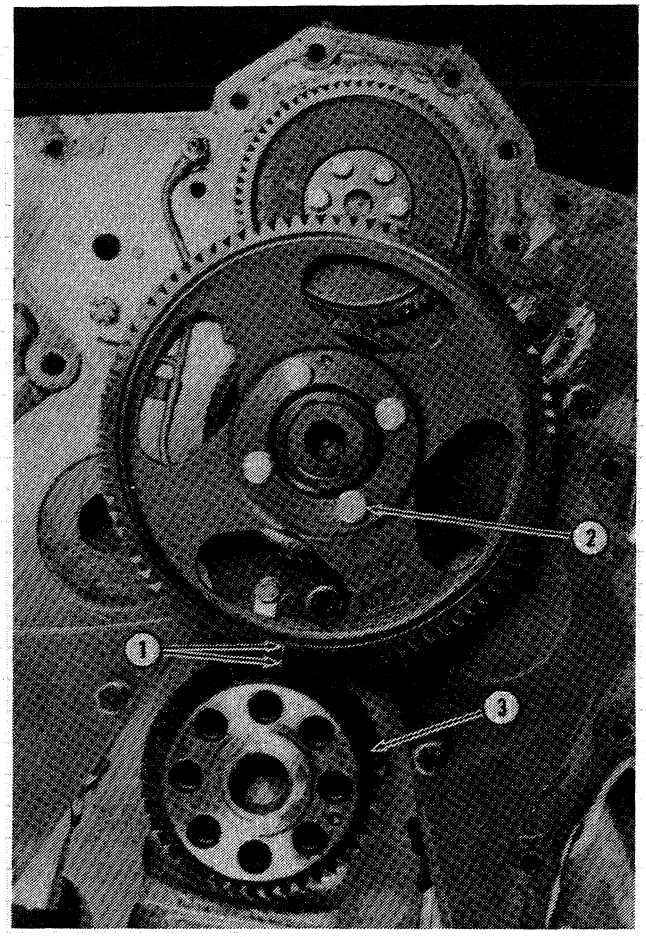

FIG.114 ALIGNING NUMBERS ON CRANKSHAFT GEAR AND DRIVING GEAR T-82305

1. Numbers "1" aligned
2. Driving gear capscrews
3. Crankshaft gear

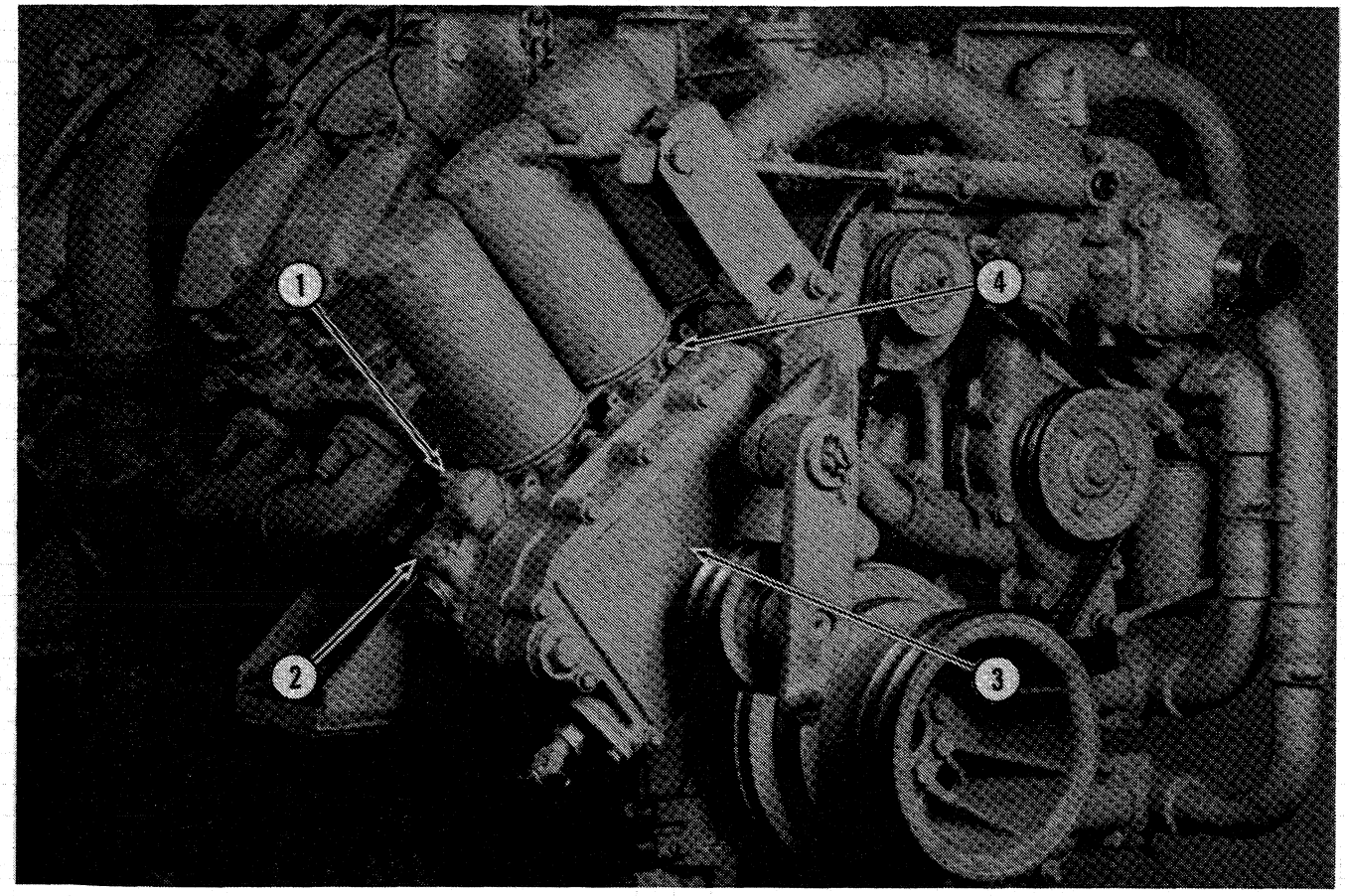

FIG. 123 ENGINE OIL COOLER, FILTERS, AND FILTER BASE T-82313

1. Cold oil bypass valve
2. Main oil pressure regulating valve
3. Oil cooler cover
4. Oil filter base

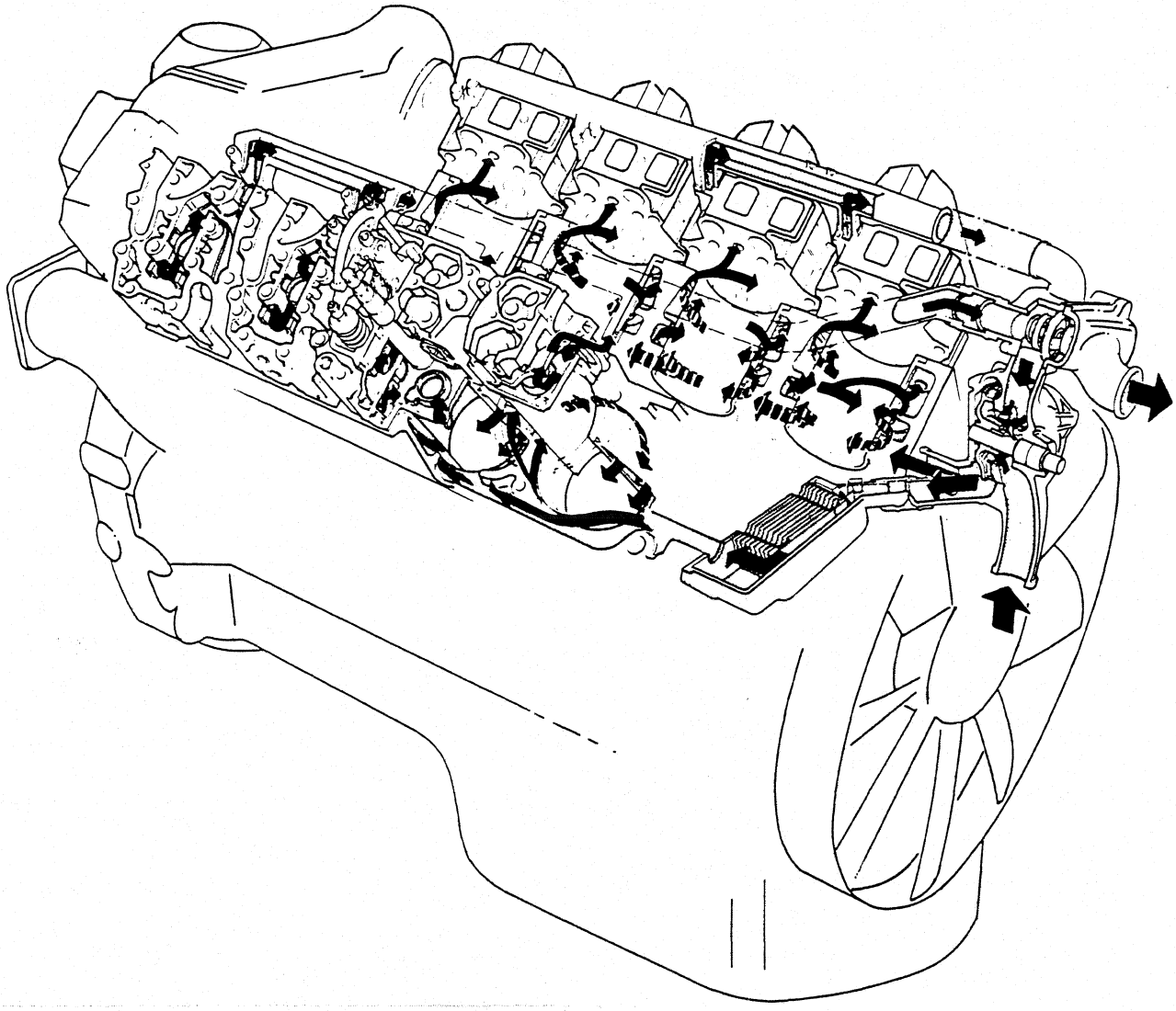

FIG. 133 FLOW DIAGRAM OF COOLING SYSTEM (Typical) T-82320

1.1
There is an interference fit of .010-.037mm(.0003-.001 in) between the water pump shaft/bearing assembly and pump body.

1.2
Interference fit between impeller and shaft is .017-.060mm(.0006-.0023 in).

1.3
Interference fit between hub and shaft is .017-.060mm (.0006-.0023 in).

1.4
A rebuilt water pump must be pressure checked for leaks to 1.18 bar (17.0 psi).

6.3.8
Clean and thoroughly inspect all parts. Check bearings for looseness, roughness, and/or binding. Make certain that impeller vanes are not damaged or cracked. Examine the face of the carbon washer for roughness, cracks or excessive wear.

NOTE: The bearing of the water pump is an integral part of the impeller shaft. If either the shaft or bearing require replacement, the entire shaft/bearing assembly must be replaced.

6.4 WATER PUMP ASSEMBLY

⚠ WARNING -Never use gasoline or solvent or other flammable fluid to clean parts. Use authorized commercial, non-flammable, non-toxic solvents.

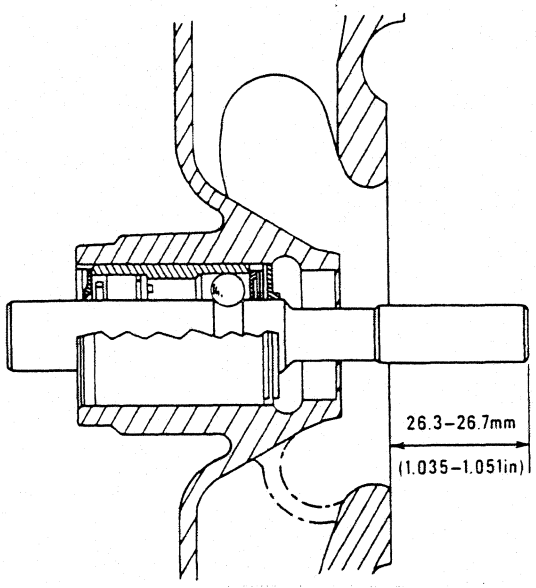

FIG. 141 WATER PUMP SHAFT PROTRUSION T-82327

6.4.1
Thoroughly clean all surfaces of pump body, impeller and cover plate.

6.4.2
Replace the half of pump seal that fits into pump body as follows: Position the pump body in an arbor press with the impeller gallery up. Center the new seal over hole in pump body. Place the special water pump seal installing tool against seal. Carefully press the seal into place until stop tabs contact pump body.

6.4.3
Reposition the pump body in press so the shaft and bearing assembly can be pressed into pump body. Start the shaft and bearing assembly into bore of water pump body. Place the water pump bearing driving tool against the outer bearing race, and press the bearing into place. Fig. 141 illustrates the critical distance that shaft must extend beyond the internal flat surface of pump body. The interference fit between bearing assembly and pump body is .010-.037mm (.0004-.0014 in).

6.4.4
Fig. 140. Press the cushioned ceramic bushing (8) into the recess in impeller (7)(cushioned side in).

6.4.5
Fig. 138. Apply a thin coating of Loctite 515 to the internal diameter surface of the hub. Do not apply Loctite to the pump shaft. Carefully press hub (3) onto pump shaft (4) until the outer edge of hub and end of shaft are flush. The interference fit between hub and shaft is .017-.060mm (.0007-.0023 in). While holding impeller, apply 0.147 daNm (130 lbs.in.) torque to shaft--impeller should not slip.

6.4.6
Fig. 138. Apply a thin coating of Loctite 515 to the internal diameter surface of impeller. Do not apply Loctite to the pump shaft. Carefully press the impeller (7) onto pump shaft (4) until the end of shaft is flush with the outer face of impeller. The interfer

TOPIC 5 ENGINE BREATHER

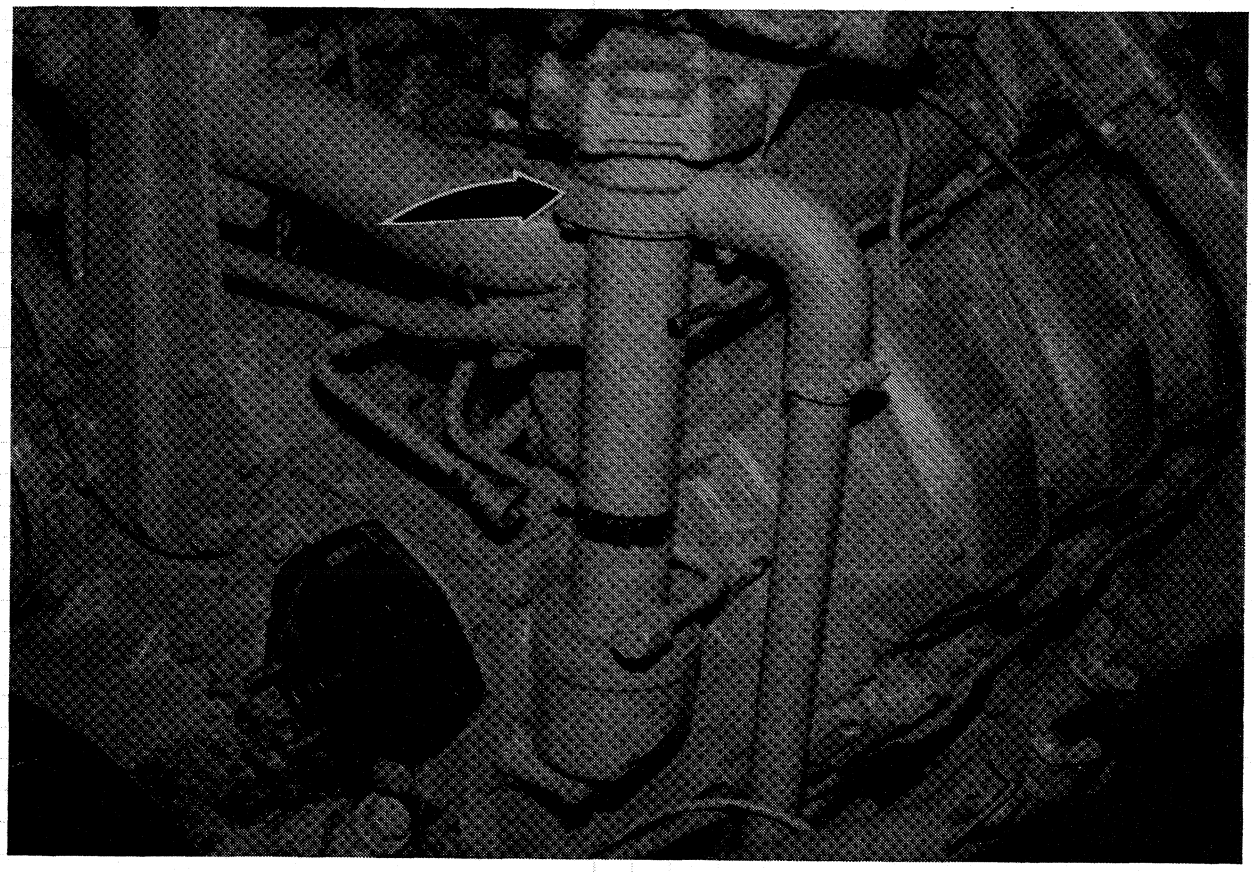

FIG. 146 ENGINE BREATHER T-85215

5.1 GENERAL

5.1.1
The breather, Fig.146 is used to regulate the crankcase pressure. The breather has a fabric-reinforced diaphragm that is spring regulated.

5.1.2
The breather allows a major portion of crankcase blowby to breathe to the atmosphere thru the vent tube.

5.1.3
The breather assembly has a built-in filter to protect the system in the event of a "back-flow" condition.

5.2 REMOVAL AND INSPECTION

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⚠ **WARNING** -Never use gasoline solvent or other flammable fluids to clean element. Use authorized commercial,non-flammable,non-toxic solvents.

5.2.1
Inspect the hose's and tubes for any type of damage. Be sure that all clamps and capscrews are tight. Refer to Fig. 147.

TOPIC 4 FUEL TRANSFER PUMP

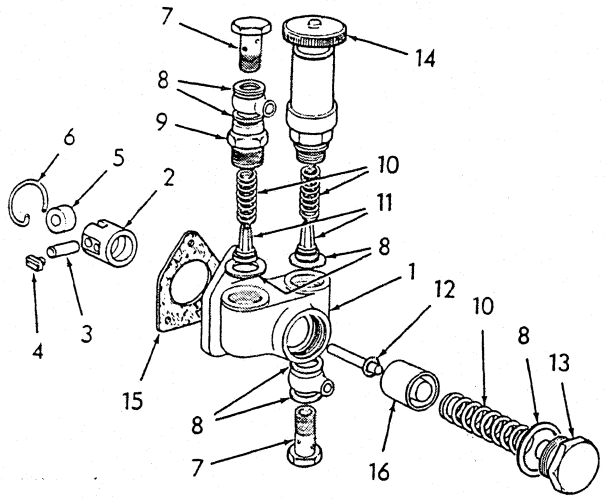

FIG. 152 FUEL TRANSFER PUMP T-82016

1. Tappet assembly
2. Snap ring
3. Valves
4. Springs
5. Sealing washer
6. Plug
7. Pump
8. O-ring
9. Spring
10. Washer
11. Plug

4.1
The fuel transfer pump on the 8285 engine and other engines in the same family is the BOSCH FP/K 22.

4.2
Mounted directly on the fuel injection pump, the fuel transfer pump supplies fuel under low pressure to the fuel gallery of the injection pump, Fig. 152.

NOTE: A fuel regulating valve located in the fuel return line fitting controls the low pressure fuel system, Fig. 149 (8). See Paragraph 8.5.1 of this section for details.

4.3
If the valves of transfer pump are in good condition, the pump should prime itself in approximately 30 seconds at 200 rpm. When properly primed, the transfer pump should pressurize the low pressure system to 1.2-1.8 bar (17.4-26.1 psi) at 500-500 rpm.

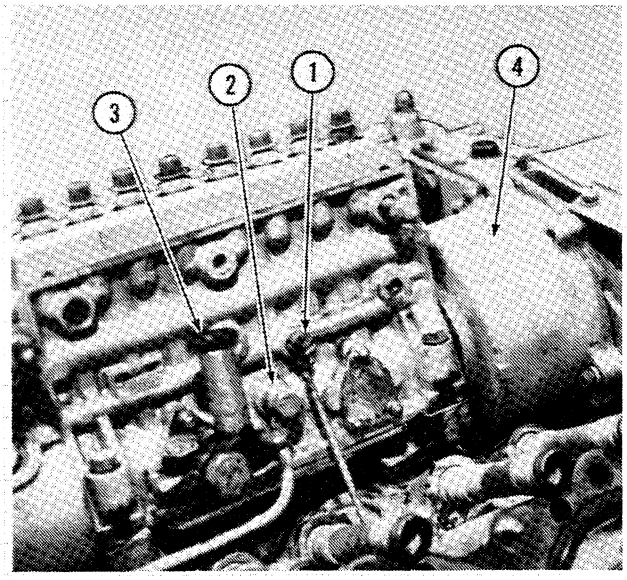

FIG. 153 INJECTION PUMP AND LUBRICATION LINES T-82333

1. Oil inlet line
2. Oil return line
3. Primer pump
4. Variator housing

4.4
If it is necessary to remove and rebuild the transfer pump, always refill the injection pump crankcase with .5 L(.5 qt) engine oil before reinstalling the transfer pump.

NOTE: An external oil supply line supplies the fuel injection pump sump with lubricating oil, Fig. 153 (1). A constant oil level is maintained by an orifice in the oil return line (2).

4.5
A hand operated primer pump, built into the transfer pump, Fig. 153 (3) provides a way to prime the low pressure system and a means of bleeding air from the supply lines (refer to the appropriate Operation and Maintenance Instruction Manual for fuel system priming.

TOPIC 7 NOZZLE HOLDER SLEEVES

7.1 DESCRIPTION AND INSPECTION

7.1.1
The bore in the cylinder head that each holder fits into extends directly through the cylinder head water jacket. Each hole is lined with a copper sleeve, pressed into place. These sleeves form water tight receptacles for the holders. Coolant in the cylinder head flows around the sleeves and helps to cool the holder assemblies. Whenever the cylinder head of engine is removed, the holder sleeves should be thoroughly cleaned and inspected.

7.1.2
An improper fit between the nozzle/holder and nozzle sleeve can cause loss of compression. Always consider the relationship between nozzles, nozzle holders, and sleeves when making any injection system repair. A sleeve seat cutting tool is available for making seat corrections (refer to Service Tool List in Section 15). If loss of compression persists after cutting, the sleeve should be replaced.

7.2 REMOVAL

7.2.1
Position the cylinder head (top side up) on a clean work bench in such a way that it can be clamped down. Clamp head to bench.

7.2.2
Use the service tool provided for sleeve removal (refer to Section 15). Cut threads into the wall of the sleeve.

7.2.3
Assemble the plate, threaded rod, and pulling tool. Screw the pulling tool into wall of threaded sleeve. Pull sleeve. Repeat procedure for each sleeve to be removed.

7.3 FITTING SLEEVES TO BLOCK SEATS

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⚠ WARNING -Never use gasoline, solvent or other flammable fluids to clean parts. Use authorized commercial, non-flammable, non-toxic solvents.

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⚠ WARNING -Wear safety glasses with side shields or goggles when using compressed air for cleaning to reduce the danger of personal injury from flying particles. Limit the pressure to 2.07 bar (30 psi) according to local or national requirements.

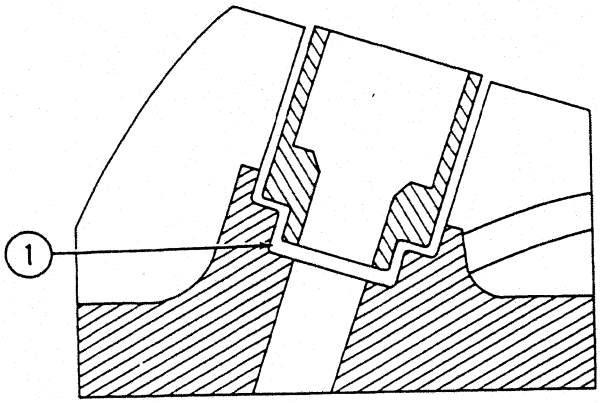

FIG. 164 CROSS SECTION OF INJECTION SLEEVE SEATED IN HEAD (Before Swaging)(Typical) T-82340

1. .5mm(.019 in) space before swaging

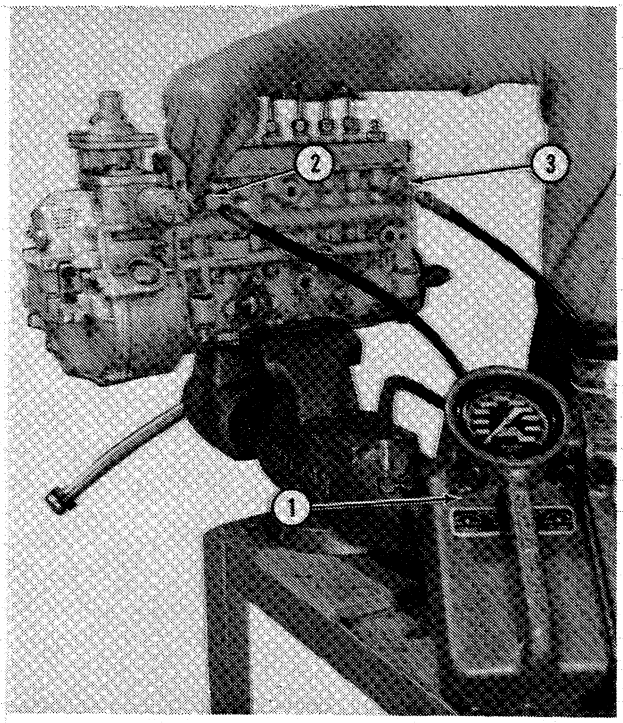

FIG. 175 TEMPORARY NOZZLE PUMP AND FUEL LINES INSTALLED ON FUEL INJECTION PUMP T-82502

1. Self-contained fuel system nozzle test pump
2. Fuel inlet port
3. Fuel return port tool

typical self-contained fuel system nozzle testing pump (1) with line attached to fuel inlet port (2). Installation of a fuel return port service tool and line is also illustrated (3).

IMPORTANT: The fitting that is used on the fuel return port (3) must be used. The tool contains a poppet that is set at about 20 bar (300 psi). This poppet protects the injection pump delivery valves from excessive pressure that the self contained fuel system nozzle testing pump can generate during the flow timing procedure, and at the same time, creates enough back pressure in the pump to lift delivery valve for

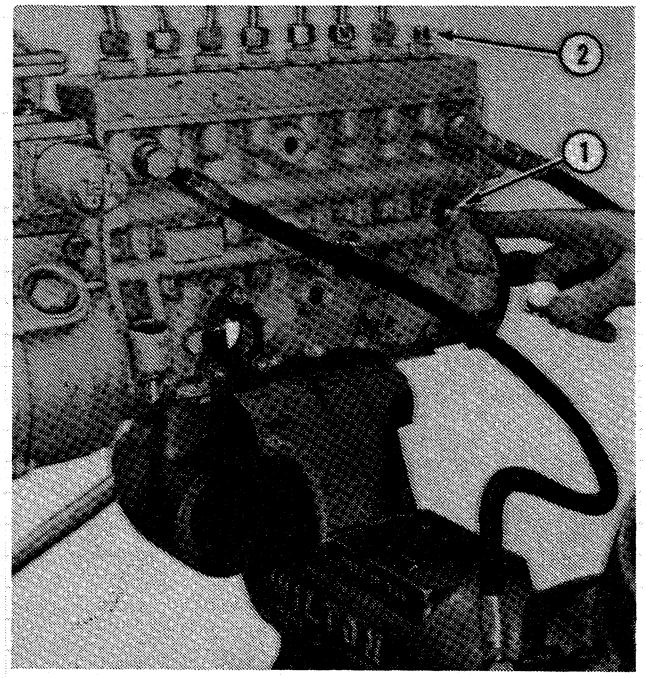

FIG. 176 FUEL PUMP READY TO FLOW TIME T-82503

1. Observation window (plug removed)
2. Number eight delivery valve (fuel line removed)

flow timing procedure. Refer to the Service Tools List in Section 15 for tool part numbers.

8.5.4
Fig. 176. Remove the plug from the observation window (1), so the number eight pump spring can be observed. Remove the high pressure fuel line from the number eight delivery valve holder (2).

IMPORTANT: Do not remove the delivery valve. The pressure developed by the temporary pump makes delivery valve removal unnecessary.

8.5.5
If the injection pump is being flow timed prior to any repair or alteration, do not disturb the adjustable coupling until after it is determined by an initial flow timing test that engine is out of time.