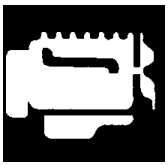
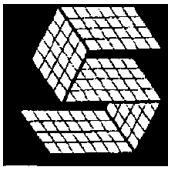
ENGINE

SECTION INDEX





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Generic Symbols

The following group of symbols have been used in this manual to help communicate the intent of the instructions. When one of the symbols appears, it conveys the meaning defined below.

WARNING - Serious personal injury or extensive property damage can result if the warning instructions are not followed.

CAUTION - Minor personal injury can result or a part, an assembly or the engine can be damaged if the caution instructions are not followed.

Indicates a **REMOVAL** or **DISASSEMBLY** step.

Indicates an **INSTALLATION** or **ASSEMBLY** step.

INSPECTION is required.

CLEAN the part or assembly.

PERFORM a mechanical or time **MEASUREMENT**.

LUBRICATE the part or assembly.

Indicates that a **WRENCH or TOOL SIZE** will be given.

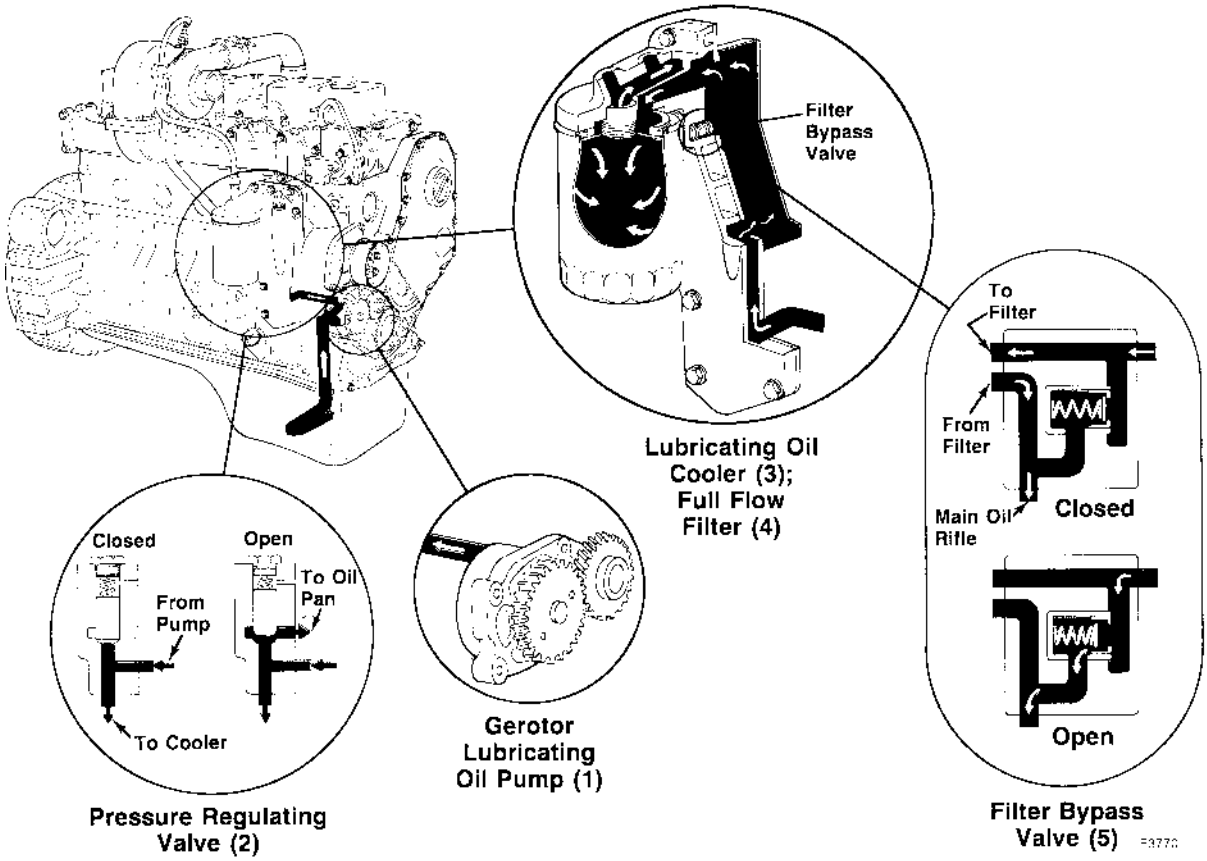
TIGHTEN to a specific torque.

PERFORM an electrical **MEASUREMENT**.

Refer to another location in this manual or another publication for additional information.

The component weighs 23 kg (50 lb) or more. To avoid personal injury, use a hoist or get assistance to lift the component.

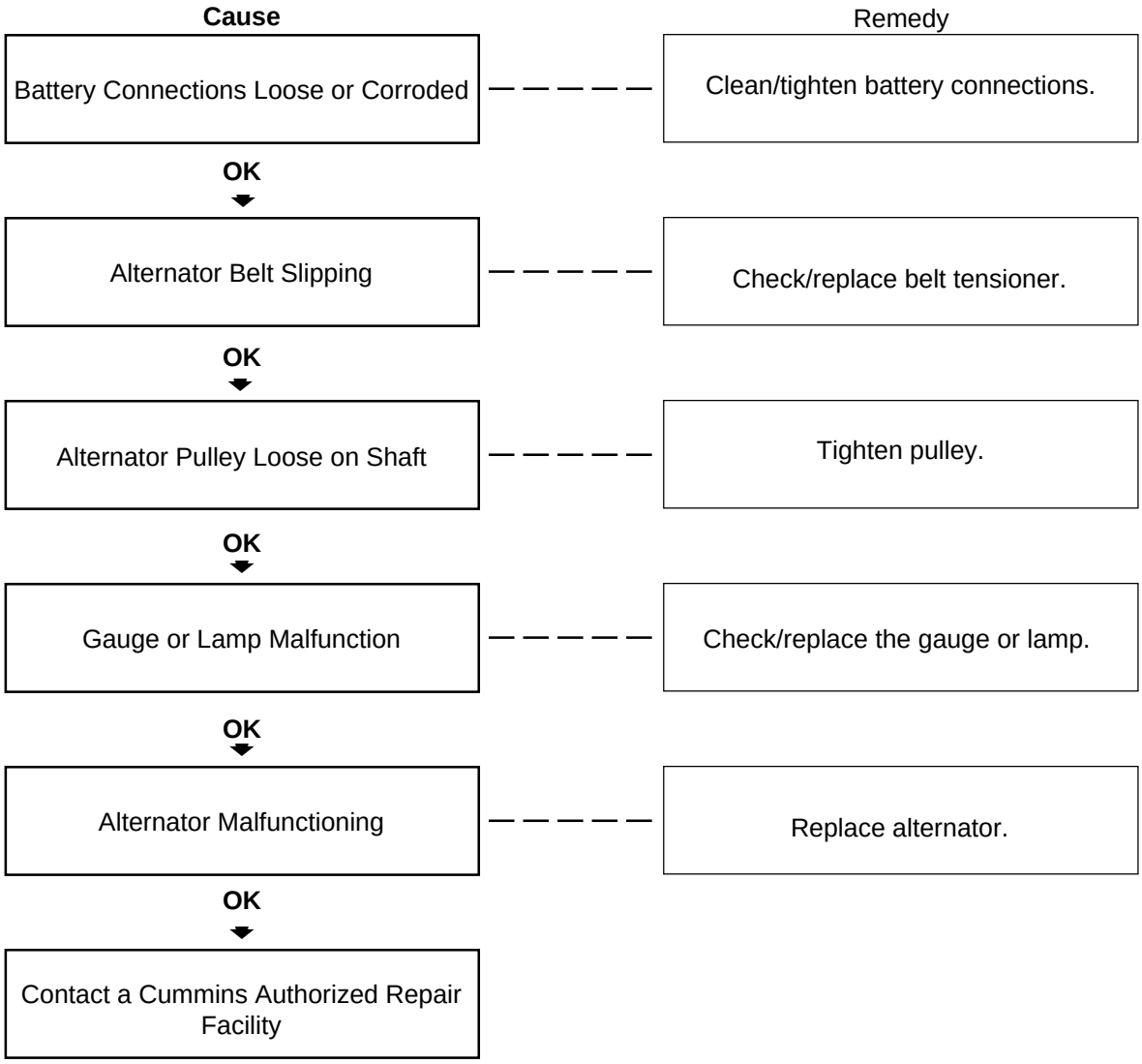
LUBRICATING SYSTEM



LUBRICATING OIL PRESSURE TOO HIGH

Cause	Remedy
Oil Pressure Gauge Malfunctioning	Check oil pressure gauge.
OK ▼	
Engine Running Too Cold	Refer to Troubleshooting Logic for Coolant Temperature Below Normal.
OK ▼	
Oil Specifications Incorrect	Check oil specification.
OK ▼	
Pressure Relief Valve Stuck Closed	Check/replace valve.
OK ▼	
Conctact a Cummins Authorized Repair Facility	

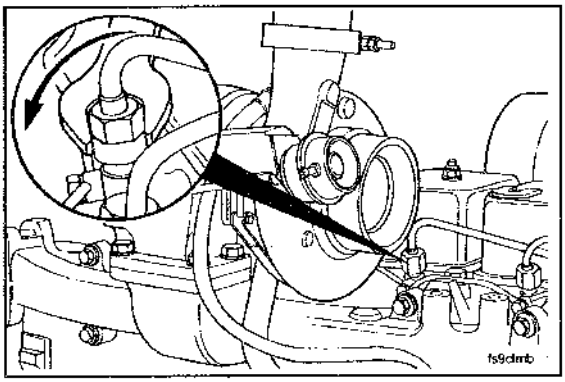
ALTERNATOR NOT CHARGING OR INSUFFICIENT CHARGING



8 mm, 17 mm, and 19 mm

NOTE: If individual lines are to be replaced, remove the support clamp from the set of lines containing the line to be replaced.

Disconnect the line(s) from the injectors.

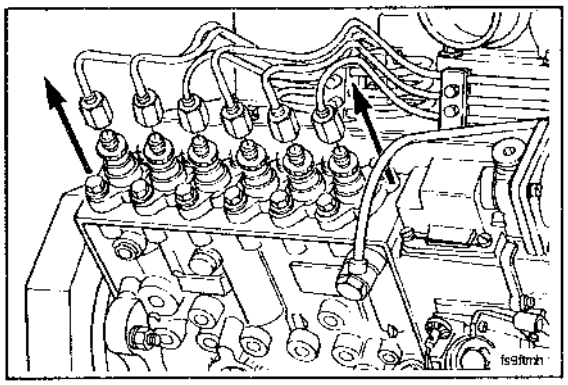


19 mm

Disconnect the line(s) from the fuel pump.
NOTE: If removed, reinstall the support clamp in the original position and make sure the lines do not contact each other or another component. Install a protective cover on the injectors and fuel delivery valves to prevent the entry of dirt into the system.

Install the lines in the reverse order of removal.

Torque Value: (Line Fittings) 24 Nm [18 ft-lb]
(Support Clamp) 6 Nm [52 in-lb]
(Support Bracket) 24 Nm [18 ft-lb]



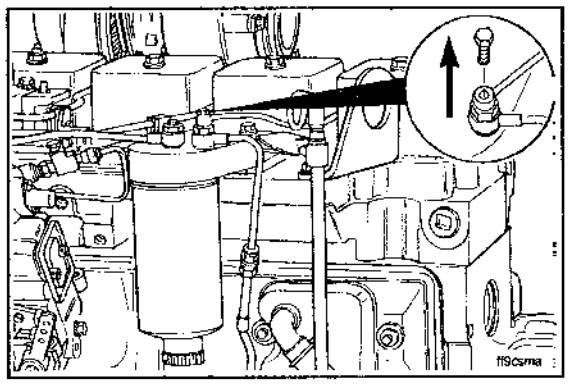
FUEL DRAIN MANIFOLD - REPLACEMENT

PREPARATORY STEPS:

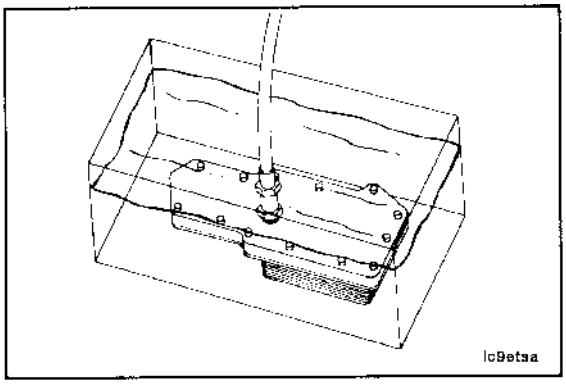
- Clean debris.

10 mm

Remove the drain line banjo capscrew from the fuel filter head. Remove the capscrew from bracket on the intake cover.



Pressurize the element to 690 kPa [100 psi] to check it for leaks.

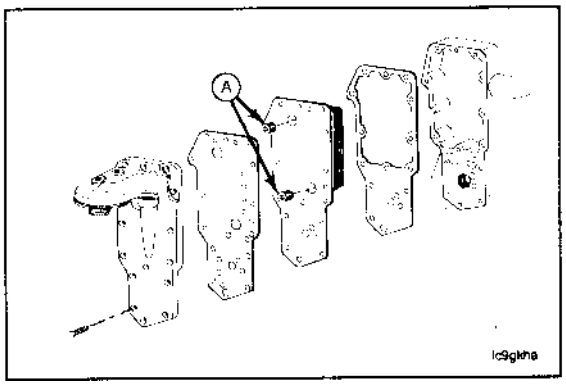


10 mm

Assemble the oil cooler gasket, element, cooler cover gasket and cooler cover to the cylinder block.

NOTE: Be sure to remove the shipping plugs (A) from the new cooler element.

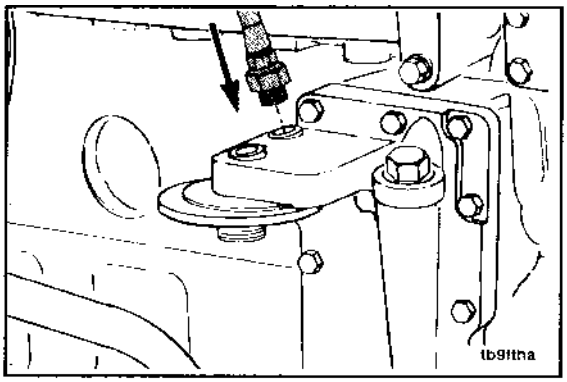
Torque Value: 24 Nm [18 ft-lb]



16 mm

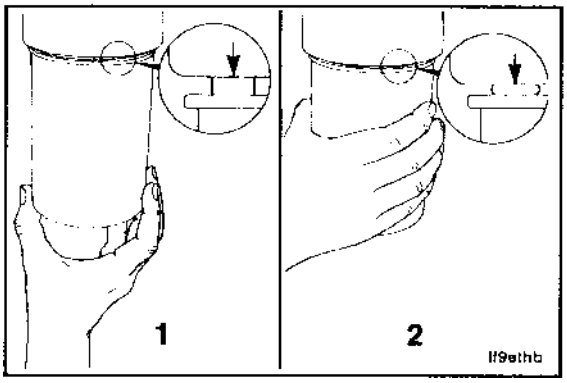
Connect the turbocharger oil supply line.

Torque Value: 35 Nm [26 ft-lb]

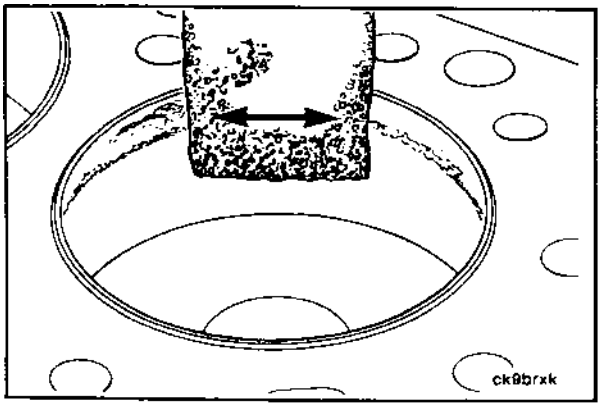


Install a new oil filter.

Follow the manufacturer's instructions for tightening.



Remove the remaining carbon with a Scotch-Brite® cleaning pad or equivalent.

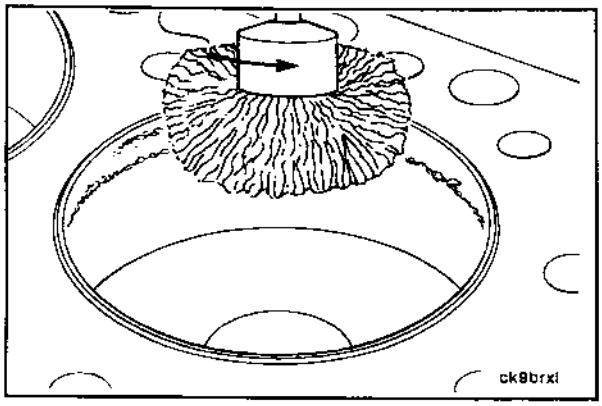


Warning: To prevent serious eye damage wear eye protection during this operation.

An alternative method to remove the carbon ridge is to use a high quality steel wire wheel installed in a drill or die grinder.

NOTE: An inferior quality wire wheel will lose steel bristles during operation, thus causing additional contamination.

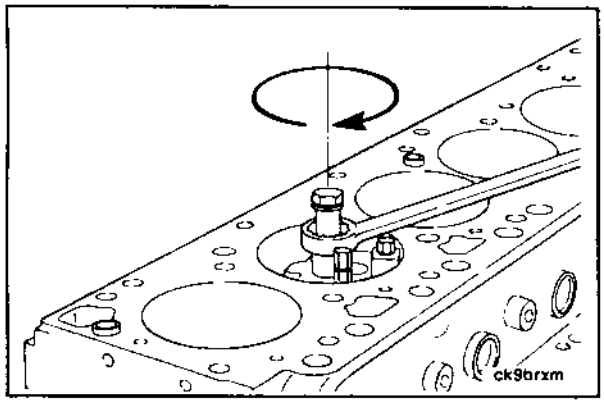
Do not use the steel wire wheel in the piston travel area. Operate the wheel in a circular motion to remove the deposits.



Ridge Reamer

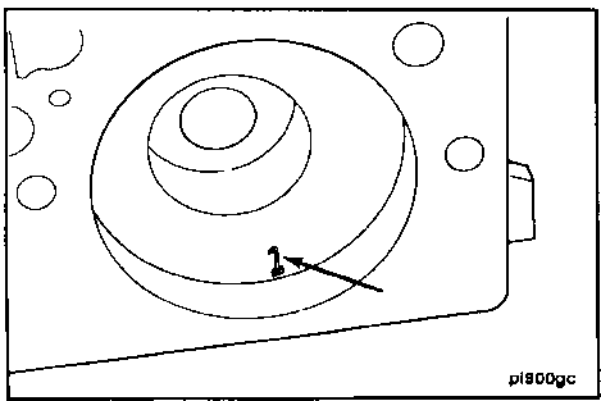
If required, cut the ridge from the top of the cylinders.

Make sure ridge reamer dees not gauge into the cylinder bore or remove more metal than needed.



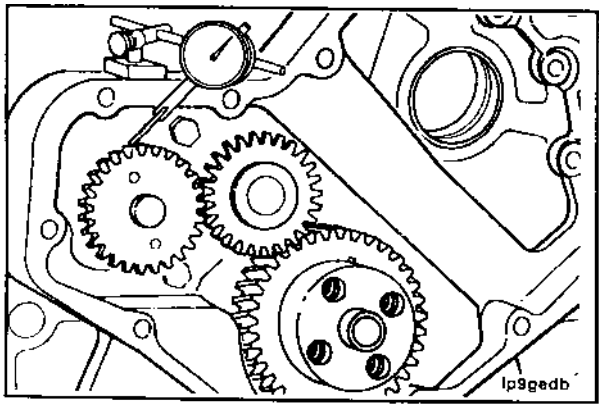
Mark each piston with the cylinder number.

During assembly, the piston **must** be installed into the corresponding cylinder number.



Caution: Be sure the gear backlash is correct if installing a new pump.

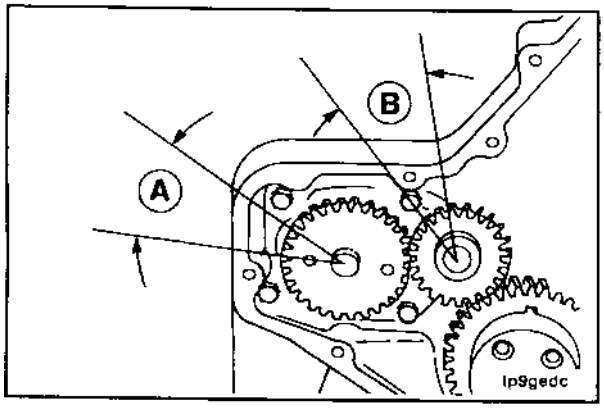
Use a dial indicator to measure gear backlash.



Measure gear backlash.

Backlash Limits	
A = mm. 0.08 - 0.33	[.003 to .013 in]
B = mm. 0.08 - 0.33	[.003 to .013 in]

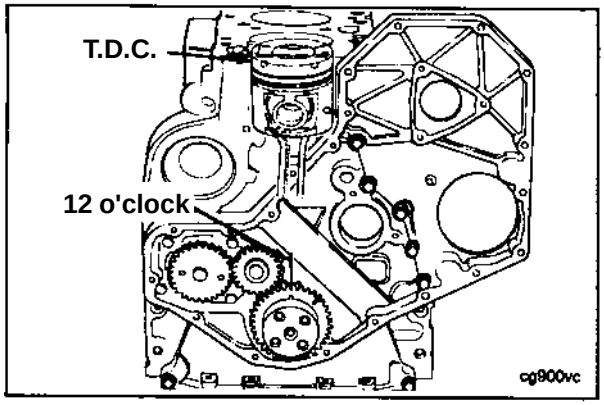
NOTE: Prevent movement of adjoining gears when checking backlash or the reading will be the total of both gears.



Camshaft - Installation (0-75)

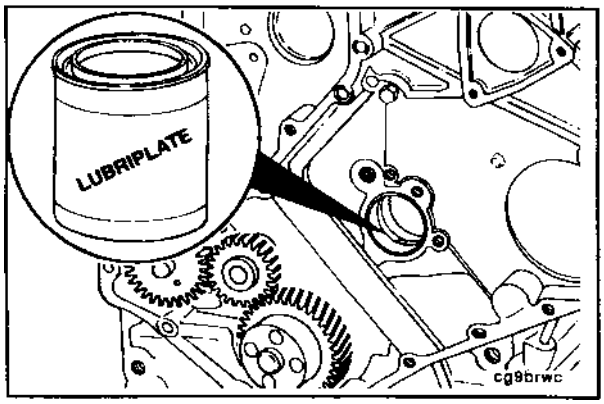
Rotate the crankshaft until the number one cylinder is approximately at the TDC position. When properly positioned, the crankshaft gear alignment pin will be positioned in the 12 o'clock position.

NOTE: If the crankshaft is not properly positioned, the camshaft may contact the connecting rods during installation.



Lubricate the camshaft bores with Lubriplate.

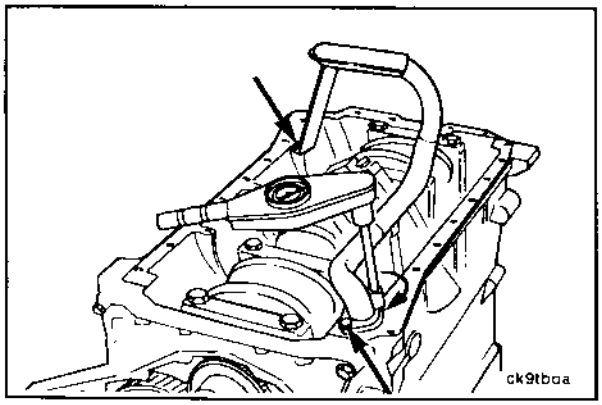
NOTE: If cam bushing has not been installed, refer to Component Section 1 for procedure.



10 mm, 13 mm

Tighten the oil suction tube and brace capscrews.

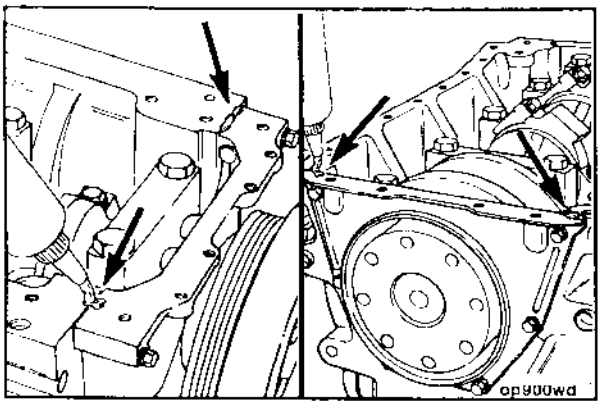
Torque Value: 2.4 daN.m [18 ft-lb]



Oil Pan - Installation (0-83)

Oil Pan Sealing Surfaces

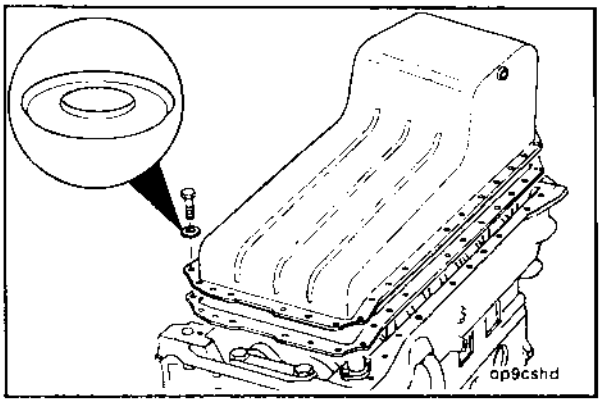
Use Three Bond 1207-C to fill the joints between the pan rail, gear housing and rear cover.



10 mm

Assemble the oil pan and capscrews as illustrated.

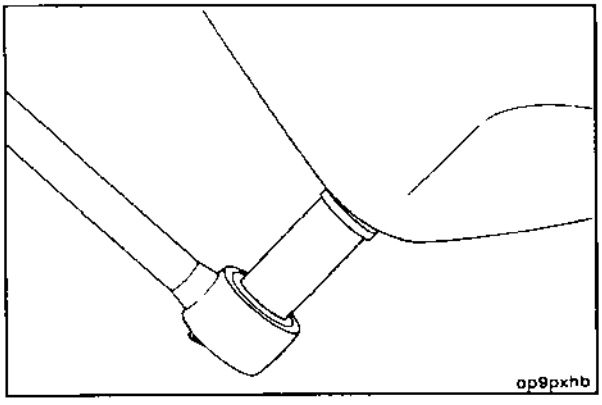
Torque Value: 2.4 daN.m [18 ft-lb]

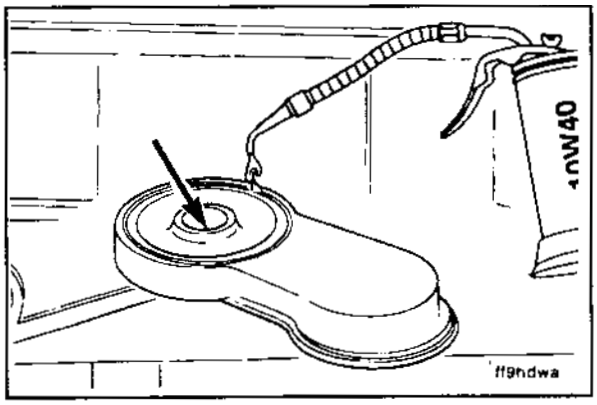


17 mm

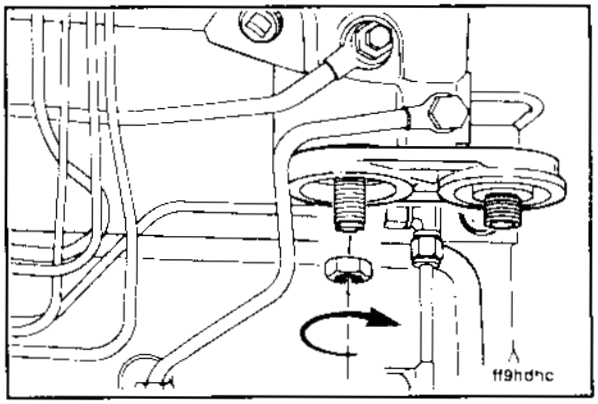
Install the drain plug and a new sealing washer.

Torque Value: 8.0 daN.m [59 ft-lb]





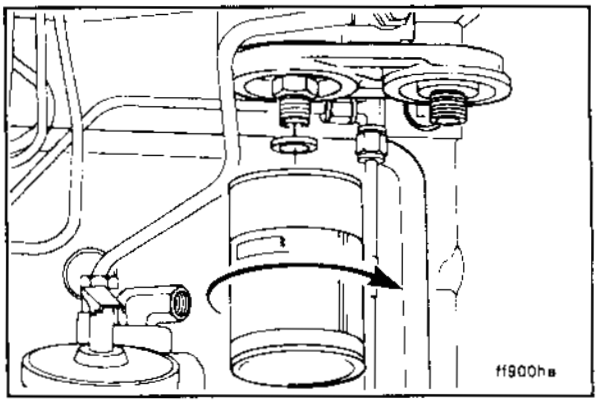
Lubricate the sealing ring and the center hole with engine oil.



24 mm
Install the dual filter head.

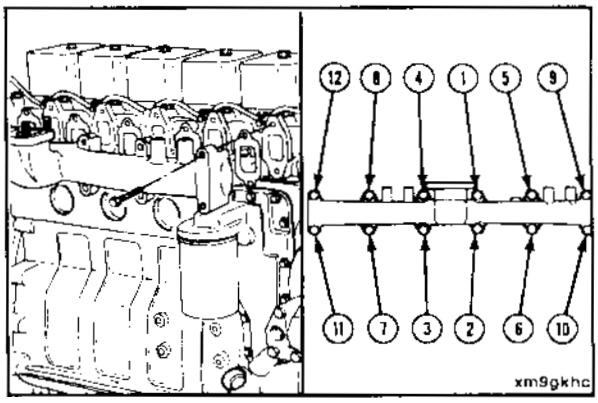
Tighten the nut.

Torque Value: 3.2 daN.m [24 ft-lb]



Temporarily install fuel filter(s).

NOTE: When the engine is ready to be put into service, fill the filter(s) with clean #2 diesel fuel and tighten 1/2 turn after the lubricated gasket contacts the filter head.



Exhaust Manifold - Installation (0-113)

"Package" the exhaust manifold capscrews and gaskets on the manifold. Apply anti-seize compound to the capscrews.
NOTE: The bead on the exhaust manifold gasket can be installed in either direction.
13 mm
Install the exhaust manifold and gaskets.
Torque Value: 4.3 daN.m [32 ft-lb]
Follow the sequence shown.

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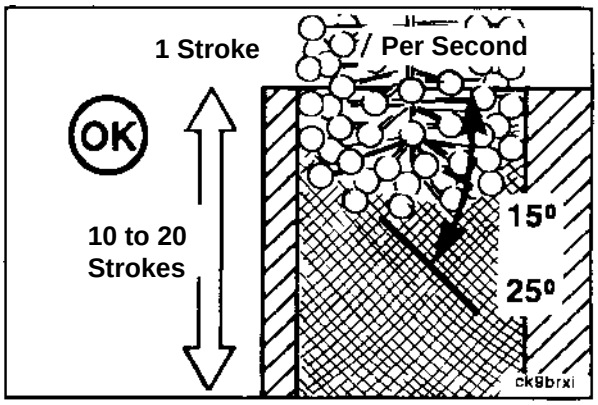
NOTE: Vertical strokes must be smooth continuous passes along the full length of the bore.

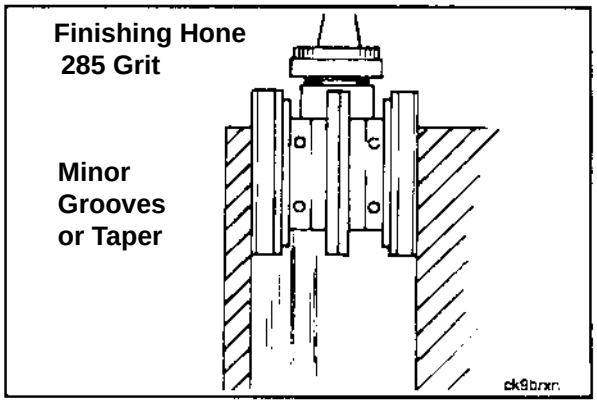
Inspect the bore after 10 strokes.



Caution: Be extremely careful not to hone the bore out of specification.

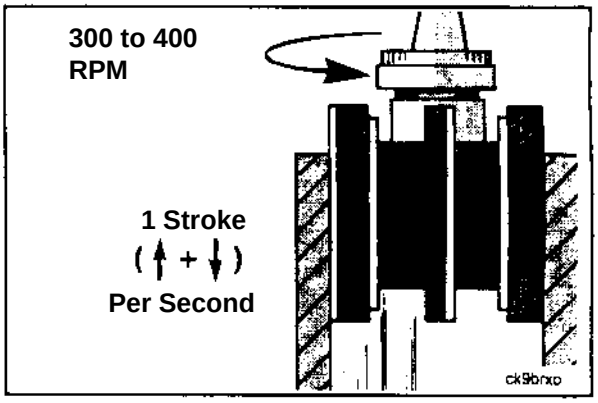
A sizing hone can be used to remove minor grooves or to correct minor out of taper.

Taper: 0.076 mm [0.003 in]



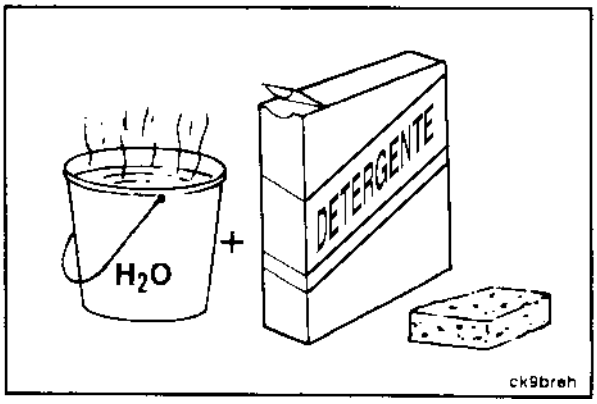
Operate the sizing hone similarly to the Flexi-Hone.

Inspect the bore after 10 strokes.

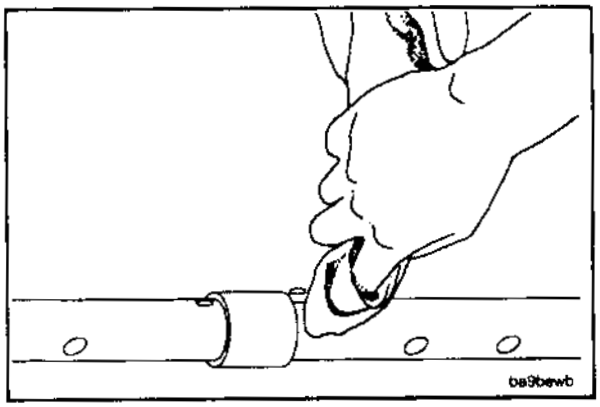


Immediately clean the cylinder bores with a strong solution of laundry detergent and hot water.

After rinsing, use compressed air to dry the block.

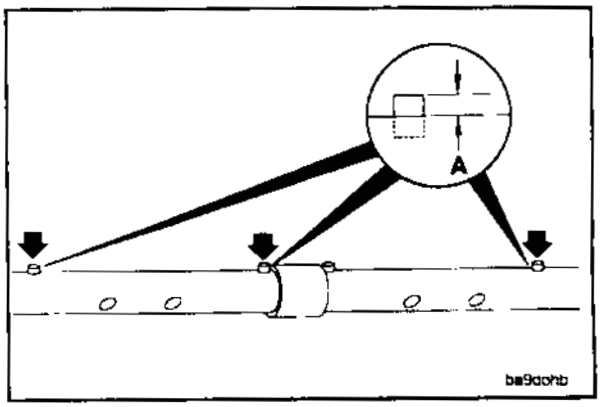


Remove the excessive Loctite from the shaft.

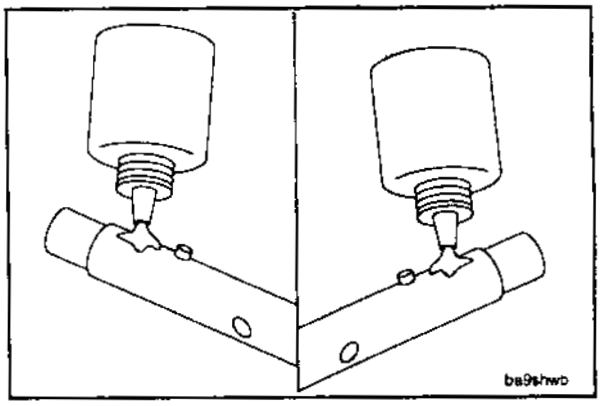


Install the three remaining roll pins.

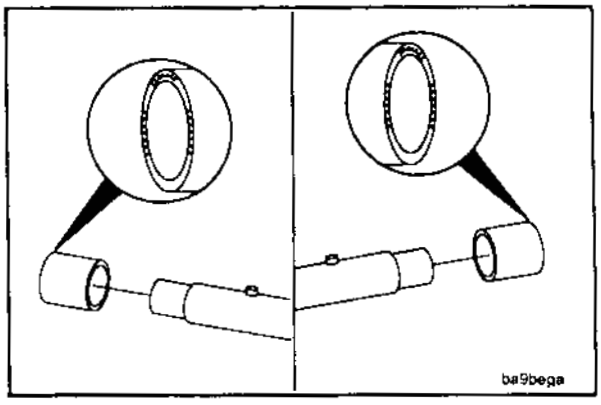
A = 2.5 mm [0.09 (3/32) in]



Apply a coat of Loctite 609 to the bearing surfaces.

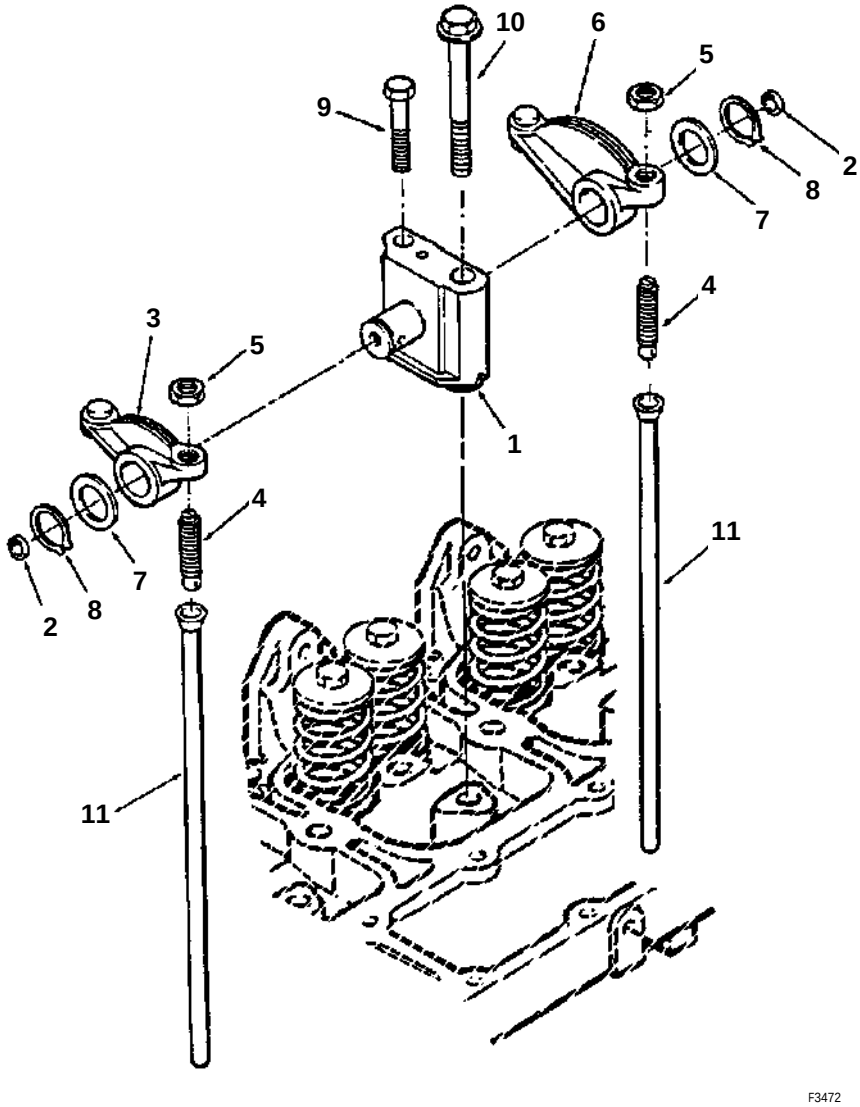


Slide two new inner races onto the ends of the shafts. The identification marks must be toward the end of the shaft.



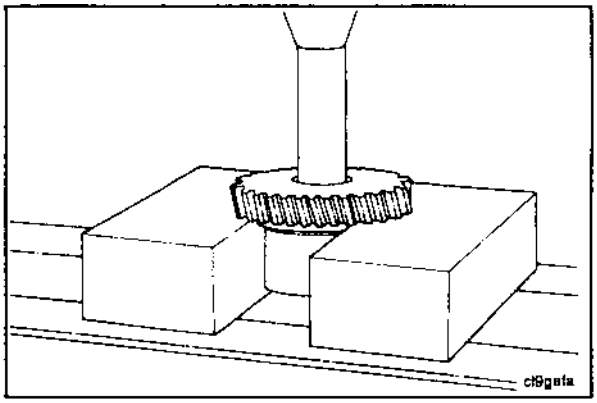
ROCKER UNIT

Rocker Lever Assembly - Exploded View



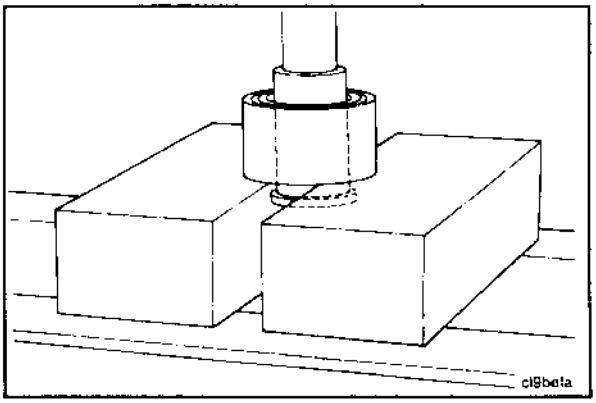
1 inch (25.4 mm) Drift

Press the shaft and bearing assembly out of the gear.



1 inch (25.4 mm) Drift

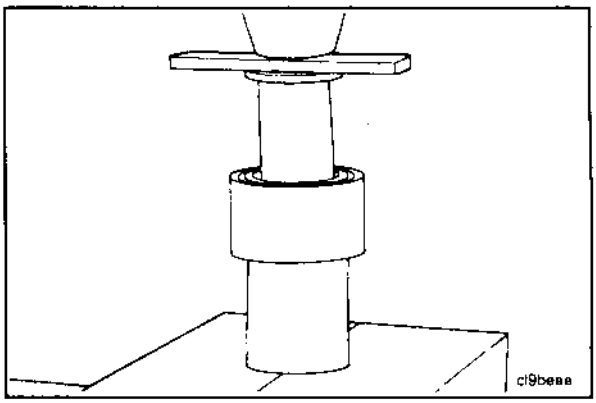
Support the bearing assembly and press the shaft from the bearing.



Accessory Drive Adaptor - Assembly (9 - 04)

1.25 inch (31.75 mm) Pipe Coupling

Support the inner race of the new bearing and press the shaft into the bearing until the shaft bottoms on the inner race.



2 inch (50.8 mm) Pipe

Caution: Press on the outer race of the bearing assembly. Pressing on the inner race will damage the bearing.

Support the housing and press the bearing and shaft assembly in until it bottoms.