Air Compressor Air Pressure Rises Slowly

This is symptom tree T004.

Cause	Correction
Air intake system restriction to air compressor is excessive	Replace the air compressor air cleaner (if installed). Check the air intake piping. Check engine air intake restriction if the air compressor inlet is plumbed to the vehicle or equipment intake system. Refer to Procedure 010-031.
OK ▼	
Air system leaks	Block the vehicle wheels and check the air system for leaks with spring brakes applied and released. Check for leaks from the air compressor gaskets and the air system hoses, fittings, and valves. Refer to the Master Repair Manual, Holset® Air Compressor, Bulletin No. 3666121 and the OEM service manual.
OK ▼	
Air governor is malfunctioning	Check the air governor for correct operation. Make sure the air governor is located less than 2 feet from the air compressor. Refer to the Master Repair Manual, Holset® Air Compressor, Bulletin No. 3666121.
OK ▼	
Carbon buildup is excessive in the air discharge line, check valve, or cylinder head	Check for carbon buildup. Replace the air compressor discharge line if necessary. Check the turbocharger for oil leaks. Refer to Procedure 010-033.
OK ▼	
Air system component is malfunctioning	Check the operation of check valves, alcohol evaporators, air dryers, and other OEM-installed air system components. Refer to the OEM service manual.
OK ▼	
Unloader valve is malfunctioning	Check the unloader valve and unloader body seal. Refer to the Master Repair Manual, Holset® Air Compressor, Bulletin No. 3666121.
OK ▼	
Air compressor intake or exhaust valve leaks air	Inspect the air compressor intake and exhaust valve assemblies. Refer to the Master Repair Manual, Holset® Air Compressor, Bulletin No. 3666121.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Specifications

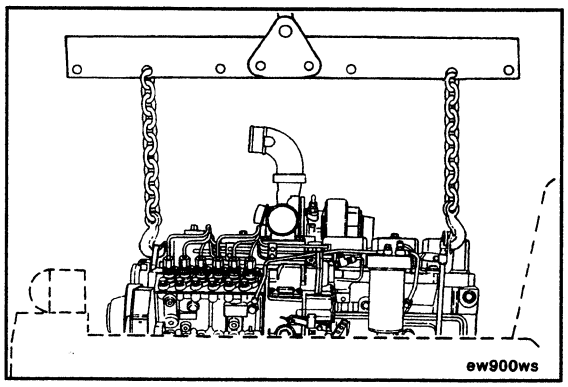
General Specifications

General Engine Data (automotive)

	B3.9	B5.9
Bore	102 mm [4.02 in]	102 mm [4.02 in]
Stroke	120 mm [4.72 in]	120 mm [4.72 in]
Displacement	3.9 liters [238 in^3]	5.9 liters [360 in^3]
Engine Weight (dry) Less Flywheel and Electric Components	308 to 329 kg [679 to 725 lb]	388 to 411 kg [855 to 906 lb]
Firing Order	1, 3, 4, 2	1, 5, 3, 6, 2, 4
Valve Clearances:		
-Intake	0.25 mm [0.010 in]	0.25 mm [0.010 in]
-Exhaust	0.51 mm [0.020 in]	0.51 mm [0.020 in]
Compression Ratio	(Rotary Pump) 17.6:1	(In-Line Pump) 17.9:1
Rotation, Viewed from the Front of the Engine	**Clockwise**	**Clockwise**
Aspiration:		
- Turbocharged	X	X
- Charge-Air Cooled	X	X

PREVIEW - YOUFIXTHIS.COM

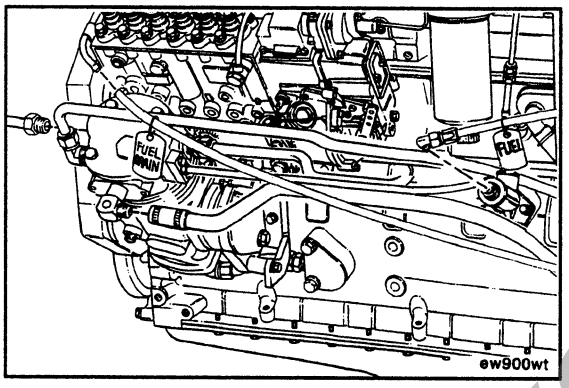
Download full manual at youfixthis.com



Complete Engine - General Information

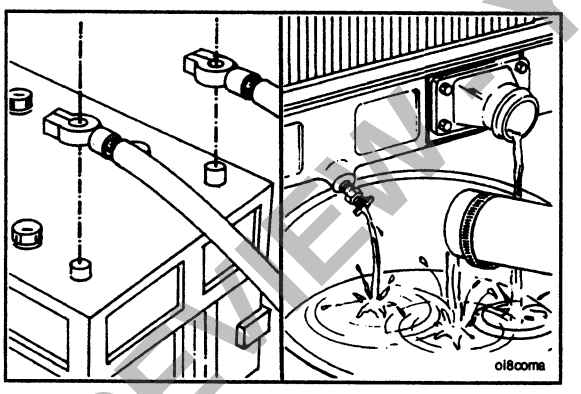
The procedures required to replace an engine will vary with different engine models, type of equipment, optional equipment, and shop facilities. Use the following procedures as a guide.

NOTE: All replacement steps will **not** apply to all equipment. Complete **only** the steps that apply to the equipment involved. Use the equipment manufacturer's recommendations and precautions for removal of chassis parts to gain access to the engine.



Engine Removal (000-001)

Place a tag on all hoses, lines, linkage, and electrical connections as they are removed to identify their locations.



⚠ WARNING ⚠

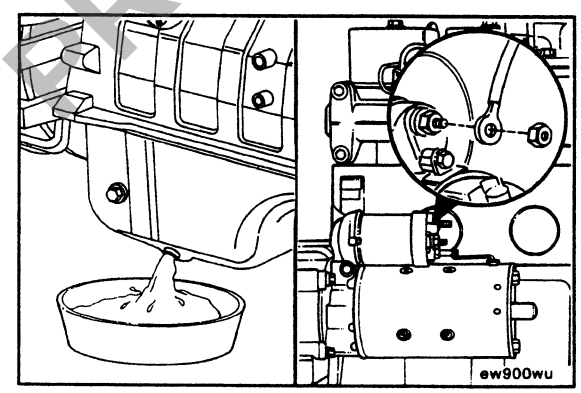
Batteries can emit explosive gases. To avoid personal injury, always ventilate the compartment before servicing the batteries. To avoid arcing, remove the negative (-) battery cable first, and attach the negative (-) battery cable last.

⚠ WARNING ⚠

Coolant is toxic. If not reused, dispose of in accordance with local environmental regulations.

Disconnect the battery cables.

Drain the engine coolant. Refer to Procedure 008-018.



⚠ WARNING ⚠

Some state and federal agencies have determined that used engine oil can be carcinogenic and cause reproductive toxicity. Avoid inhalation of vapors, ingestion, or prolonged contact with used engine oil.

Drain the lubricating oil. Refer to Procedure 007-025.

Disconnect the starter cable, engine ground straps, cab- or chassis-to-engine hoses, tubing, electrical wires, and hydraulic lines.

PREVIEW YOUFIXTHIS.COM

Download full manual at youfixthis.com

Engine Vibration Excessive

This is symptom tree T075.

Cause	Correction
Engine **not** running smoothly	Refer to the Engine Runs Rough or Misfires symptom tree.
OK ⬇	
Lubricating oil level is above specification	Check the oil level. Verify the dipstick calibration and oil pan capacity. Fill the system to the specified level. Refer to Procedure 007-025.
OK ⬇	
Fan is loose, damaged, or **not** balanced	Check the fan. Refer to the OEM service manual.
OK ⬇	
Fan hub malfunctioning	Inspect or replace the fan hub. Refer to Procedure 008-036.
OK ⬇	
Vibration damper malfunctioning (six cylinder **only**)	Inspect the vibration damper. Replace, if necessary. Refer to Procedure 001-052.
OK ⬇	
Engine mounts are worn, damaged, loose, or **not** correct	Verify the condition of the mounts. Refer to Procedure 016-010. Refer to OEM service manual.
OK ⬇	
Idle adjustment **not** correct	Check or adjust the bumper spring adjustment. Refer to Procedure 005-029.
OK ⬇	
Alternator bearing worn or damaged	Clean and replace the alternator. Refer to Procedure 013-001.
OK ⬇	
Power components loose or broken	Inspect the crankshaft and rods for damage that causes an unbalance. Refer to Procedure 001-016 or 001-014.
OK ⬇	

(Continued)

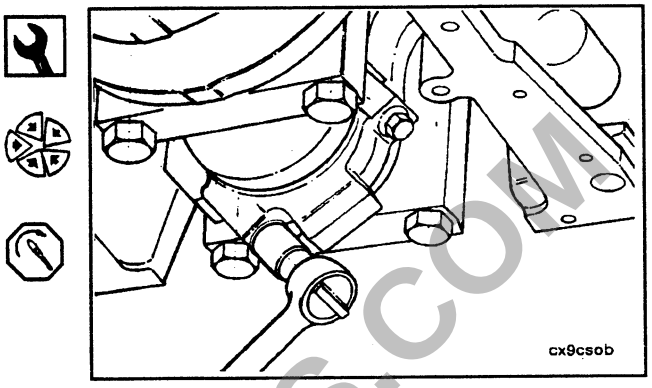
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

12 mm, Torque Wrench

Alternately tighten the two capscrews.

Torque Value: Step 1 30 N•m [22 ft-lb]
2 60 N•m [44 ft-lb]
3 Turn clockwise 60 degrees

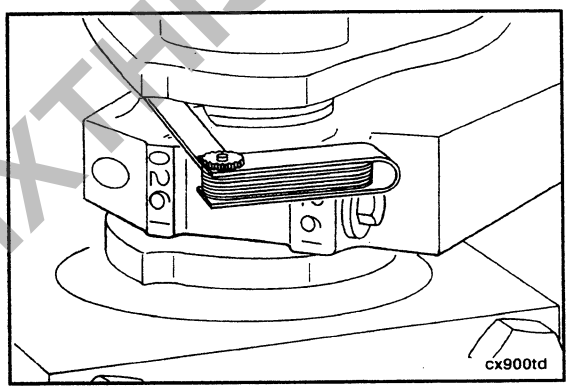


Measure the side clearance between the connecting rod and crankshaft.

Do **not** measure the clearance between the connecting rod cap and crankshaft.

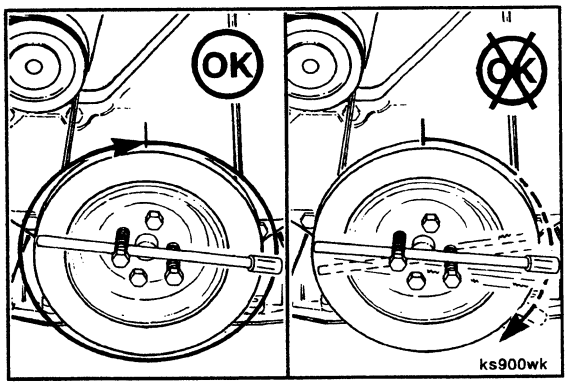
Connecting Rod Side Clearance Limits

mm		in
0.10	MIN	0.004
0.33	MAX	0.013



NOTE: The crankshaft **must** rotate freely.

Check for freedom of rotation as the connecting rod caps are installed. If the crankshaft does **not** rotate freely, check the installation of the connecting rod bearings and bearing size.

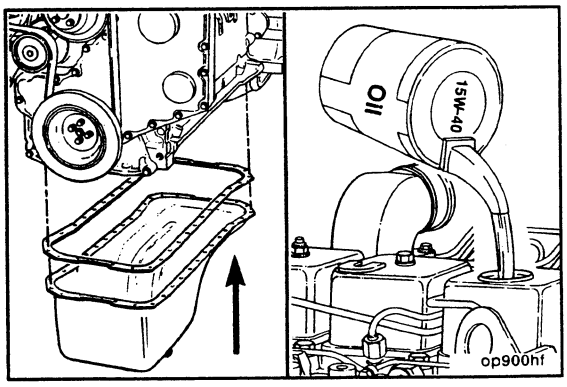


Install the suction tube, lubricating oil pan, and gasket. Refer to Procedure 007-025and 007-035.

Torque Value:
Lubricating Oil Pan 24 N•m [18 ft-lb]

Torque Value:
Lubricating Suction Tube 24 N•m [18 ft-lb]

Fill the lubricating oil pan. Refer to Section 7 - Lubricating Oil System, General Information, for the correct lubricating oil specification.



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Air Compressor Cycles Frequently

This is symptom tree T005.

Cause	Correction
Air compressor pumping time is excessive	Replace the desiccant cartridge on the Turbo/CR 2000 air dryer. Refer to the OEM service manual. Check the air compressor duty cycle. Install a larger air compressor, if necessary. Refer to the Master Repair Manual, Holset® Air Compressor, Bulletin No. 3666121.
OK	
Air dryer outlet check valve is sticking	Lubricate or replace the air dryer outlet check valve assembly. Refer to the OEM service manual.
OK	
Air governor is malfunctioning	Check the air governor for correct operation. Make sure the air governor is located less than 2 feet from the air compressor. Refer to the Master Repair Manual, Holset® Air Compressor, Bulletin No. 3666121.
OK	
Air system component is malfunctioning	Check the operation of check valves, alcohol evaporators, air dryers, and other OEM-installed air system components. Refer to the OEM service manual.
OK	
Air system leaks	Block the vehicle wheels and check the air system for leaks with spring brakes applied and released. Check for leaks from the air compressor gaskets and the air system hoses, fittings, and valves. Refer to the Master Repair Manual, Holset® Air Compressor, Bulletin No. 3666121 and the OEM service manual.
OK	
Carbon buildup is excessive in the air discharge line, check valve, or cylinder head	Check for carbon buildup. Replace the air compressor discharge line if necessary. Check the turbocharger for oil leaks. Refer to Procedrue 010-033.
OK	
E-type system is **not** plumbed correctly	Install an Econ valve, check valve, and system hoses. Refer to the Master Repair Manual, Holset® Air Compressor, Bulletin No. 3666121

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Refer to the following table for the contol parts list (CPL), engine model, engine horsepower rating, and corresponding rated turbocharger boost pressure.

NOTE: Measurement of boost pressure is **not** a shortcut to logical troubleshooting. Low power can be caused by the fuel used, filter maintenance, and several engine components. Follow the logic charts for Engine Power Output Low, and measure boost pressure as indicated. Refer to this section, General Information, for measurement instructions.

These pressures are valid **only** at rated conditions (rated speed and power). Any attempt to use the values at engine speeds and loads other than those specified will result in an incorrect diagnosis.

B Series Engines' Turbocharger Boost Pressure Specifications

CPL	MODEL ENGINE	hp @ rpm RATING	PEAK TORQUE ft-lb @ rpm	RATED BOOST (in Hg)			PEAK TORQUE BOOST (in Hg)		
				min	nom	max	min	nom	max
591	4B3.9	64 @ 2200	N/A	N/A	N/A	N/A	N/A	N/A	N/A
591	4B3.9	64 @ 2200	N/A	N/A	N/A	N/A	N/A	N/A	N/A
592	4BTA3.9	70 @ 2100	N/A	11	14	17	N/A	N/A	N/A
592	4BTA3.9	71 @ 2200	N/A	12	15	18	N/A	N/A	N/A
592	4BTA3.9	80 @ 2200	N/A	14	17	20	N/A	N/A	N/A
592	4BTA3.9	92 @ 2100	N/A	16	19	22	N/A	N/A	N/A
592	4BTA3.9	93 @ 2200	N/A	18	21	24	N/A	N/A	N/A
592	4BTA3.9	94 @ 2200	N/A	18	21	24	N/A	N/A	N/A
592	4BTA3.9	96 @ 2300	N/A	19	22	25	N/A	N/A	N/A
592	4BTA3.9	100 @ 2500	N/A	22	25	28	N/A	N/A	N/A
594	4BTA3.9	95 @ 2200	N/A	15	18	21	N/A	N/A	N/A
594	4BTA3.9	112 @ 2300	N/A	21	24	27	N/A	N/A	N/A
594	4BTA3.9	125 @ 2200	N/A	25	28	31	N/A	N/A	N/A
646	4BT3.9	71 @ 1500	N/A	9	12	15	N/A	N/A	N/A
646	4BT3.9	82 @ 1800	N/A	11	14	17	N/A	N/A	N/A
710	4BT3.9	75 @ 2200	N/A	13	16	19	N/A	N/A	N/A
710	4BT3.9	100 @ 2500	N/A	22	25	28	N/A	N/A	N/A
711	4BT3.9	71 @ 1500	N/A	9	12	15	N/A	N/A	N/A
711	4BT3.9	82 @ 1800	N/A	11	14	17	N/A	N/A	N/A
721	4B3.9	80 @ 2800	N/A	N/A	N/A	N/A	N/A	N/A	N/A
730	4BT3.9	85 @ 2500	235 @ 1200	17	20	23	9	10	11
730	4BT3.9	91 @ 2200	259 @ 1400	17	20	23	11	12	13
741	4BT3.9	130 @ 2500	N/A	18	21	24	N/A	N/A	N/A
741	4BT3.9	150 @ 2800	N/A	25	28	31	N/A	N/A	N/A
741	4BT3.9	150 @ 2800	N/A	25	28	31	N/A	N/A	N/A
762	4BT3.9	105 @ 2500	N/A	28	32	36	N/A	N/A	N/A
762	4BT3.9	105 @ 2800	N/A	31	35	39	N/A	N/A	N/A
763	4BT3.9	67 @ 2200	N/A	10	14	16	N/A	N/A	N/A
763	4BT3.9	71 @ 2200	N/A	10	14	16	N/A	N/A	N/A
767	4BT3.9	105 @ 2500	N/A	24	28	31	N/A	N/A	N/A
767	4BT3.9	105 @ 2800	N/A	27	30	33	N/A	N/A	N/A
826	4BT3.9	87 @ 1500	N/A	15	18	21	N/A	N/A	N/A
857	4BT3.9	120 @ 2500	N/A	40	44	48	N/A	N/A	N/A
858	4BT3.9	105 @ 2500	N/A	35	39	43	N/A	N/A	N/A
937	4BT3.9	74 @ 1500	N/A	10	13	16	N/A	N/A	N/A
971	4BT3.9	96 @ 2200	N/A	19	22	25	N/A	N/A	N/A
971	4BT3.9	100 @ 2500	N/A	22	25	28	N/A	N/A	N/A
986	4BTA3.9	120 @ 2500	N/A	28	31.0	34	17	19.4	21
1201	4BT3.9	80 @ 2500	N/A	19	22	25	N/A	N/A	N/A
1202	4BT3.9	74 @ 2500	N/A	18	21	24	N/A	N/A	N/A
1260	4BTA3.9	105 @ 2500	N/A	22	24.5	27	14	15.6	17
1268	4BT3.9	105 @ 2500	N/A	28	32	36	N/A	N/A	N/A
1520	4BTG2	104 @ 1800	N/A	19	21	23	N/A	N/A	N/A
1521	4BT3.9	74 @ 1500	N/A	3.4	6.4	9.4	N/A	N/A	N/A

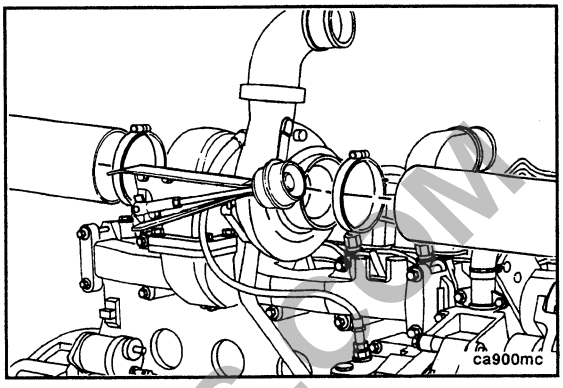
(Continued)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

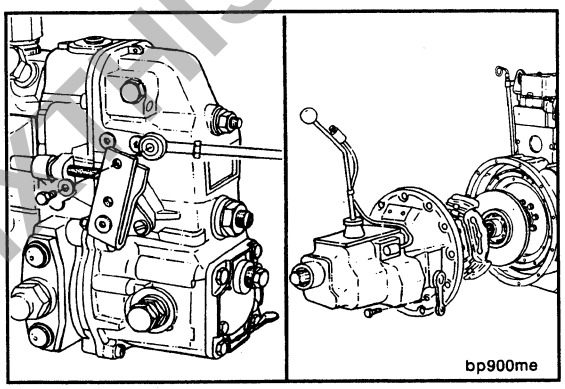
Disconnect the intake and exhaust pipes.

Disconnect all chassis-mounted, engine-driven accessories.



Disconnect the throttle linkage from the fuel injection pump control lever.

Disconnect the drive units from the flywheel.

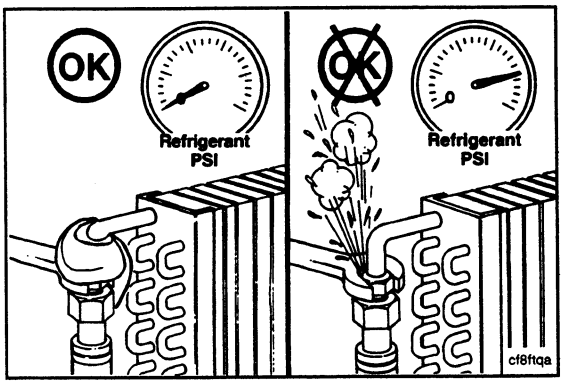


⚠ WARNING ⚠

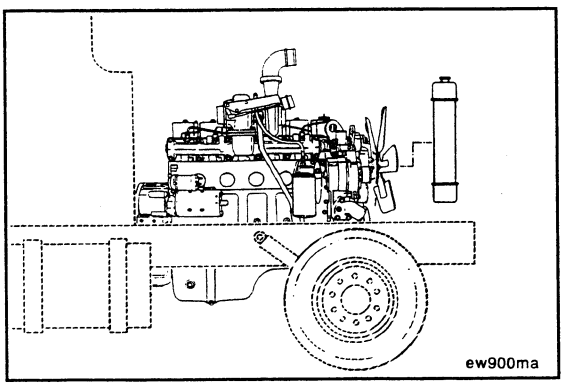
If a liquid refrigerant system (air conditioning) is used, wear eye and face protection, and wrap a cloth around the fittings before removal. Liquid refrigerant can cause serious eye and skin injury.

△ CAUTION △

To protect the environment, liquid refrigerant systems must be properly emptied and filled using equipment that prevents the release of refrigerant gas into the atmosphere. Federal law requires capturing and recycling the refrigerant.



Remove all chassis components necessary to remove the engine from the equipment.



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Engine Vibration Excessive (Continued)

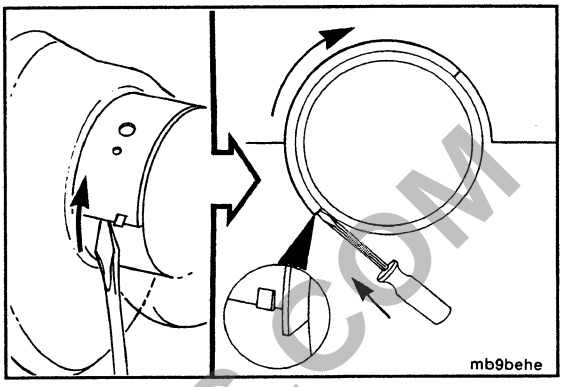
Cause	Correction
Drivetrain components worn or unbalanced	Check or repair components if necessary. Refer to OEM service manual.
OK ↓	
Flywheel housing is **not** aligned correctly	Check the flywheel housing alignment. Refer to Procedure 016-006.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Lubricate and install the main bearing.

Use the screwdriver to push the main bearing into position as you rotate the crankshaft.



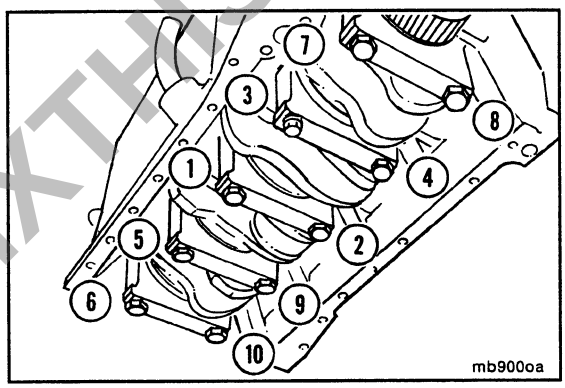
23 mm

NOTE: The crankshaft **must** rotate freely.

Tighten the capscrews evenly and in sequence.

Torque Value: Step 1 60 N•m [44 ft-lb]
2 90 N•m [66 ft-lb]
3 Turn clockwise 90 degrees.

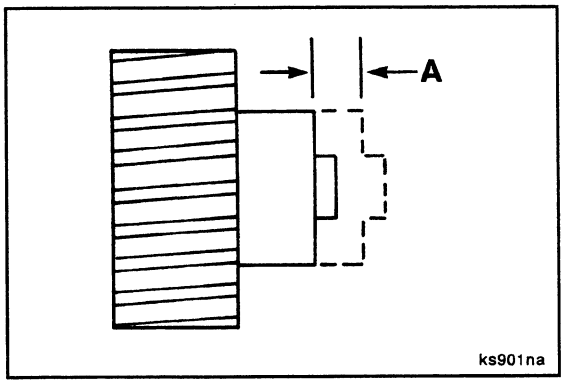
Check the main bearing installation and the size of the main bearings if the crankshaft does **not** rotate freely.



NOTE: The dimensions of the thrust bearing and crankshaft journal determine end play.

Measure the crankshaft end play.

Dim. (A) End Play Limits		
mm		in
0.102	MIN	0.004
0.432	MAX	0.017

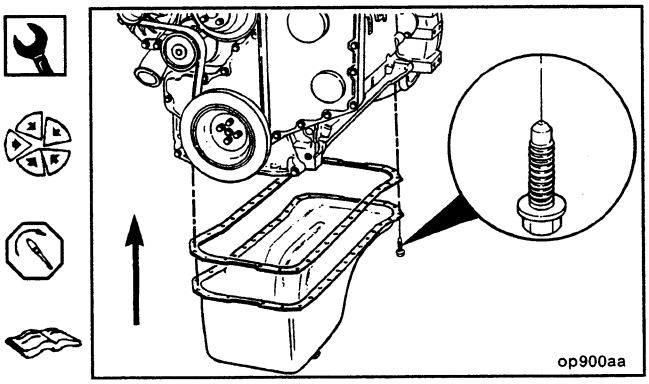


10 mm

Install the lubricating oil pan and gasket. Refer to Procedure 007-025.

Torque Value: 24 N•m [18 ft-lb]

Fill the lubricating oil pan. Refer to the Operation and Maintenance Manual, B Series Engines, Bulletin No. 3810205 for the correct lubricating specification.



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Table of Contents

	Section
Introduction	i
Engine Identification	E
Troubleshooting Symptoms	TS
Complete Engine - Group 00	0
Cylinder Block - Group 01	1
Cylinder Head - Group 02	2
Rocker Levers - Group 03	3
Cam Followers/Tappets - Group 04	4
Fuel Systems - Group 05	5
Injectors and Fuel Lines - Group 06	6
Lubricating System - Group 07	7
Cooling System - Group 08	8
Drive Units - Group 09	9
Air Intake System - Group 10	10
Exhaust System - Group 11	11
Compressed Air System - Group 12	12
Electrical Equipment - Group 13	13
Engine Testing - Group 14	14
Mounting Adaptations - Group 16	16
Miscellaneous - Group 17	17
Specifications	V
Component Manufacturers	M
Service Literature	L
Index	X

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

General Safety Instructions

Important Safety Notice

⚠ WARNING ⚠

Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation or other bodily injury or death.

Read and understand all of the safety precautions and warnings before performing any repair. This list contains the general safety precautions that **must** be followed to provide personal safety. Special safety precautions are included in the procedures when they apply.

- Make sure the work area surrounding the product is dry, well lit, ventilated, free from clutter, loose tools, parts, ignition sources and hazardous substances. Be aware of hazardous conditions that can exist.
- **Always** wear protective glasses and protective shoes when working.
- Rotating parts can cause cuts, mutilation or strangulation.
- Do **not** wear loose-fitting or torn clothing. Remove all jewelry when working.
- Disconnect the battery (negative [-] cable first) and discharge any capacitors before beginning any repair work. Disconnect the air starting motor if equipped to prevent accidental engine starting. Put a ''Do **Not** Operate'' tag in the operator's compartment or on the controls.
- Use ONLY the proper engine barring techniques for manually rotating the engine. Do **not** attempt to rotate the crankshaft by pulling or prying on the fan. This practice can cause serious personal injury, property damage, or damage to the fan blade(s) causing premature fan failure.
- If an engine has been operating and the coolant is hot, allow the engine to cool before you slowly loosen the filler cap and relieve the pressure from the cooling system.
- Do **not** work on anything that is supported ONLY by lifting jacks or a hoist. **Always** use blocks or proper stands to support the product before performing any service work.
- Relieve all pressure in the air, oil, fuel and the cooling systems before any lines, fittings, or related items are removed or disconnected. Be alert for possible pressure when disconnecting any device from a system that utilizes pressure. Do **not** check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.
- To prevent suffocation and frostbite, wear protective clothing and ONLY disconnect fuel and liquid refrigerant (freon) lines in a well ventilated area. To protect the environment, liquid refrigerant systems **must** be properly emptied and filled using equipment that prevents the release of refrigerant gas (fluorocarbons) into the atmosphere. Federal law requires capturing and recycling refrigerant.
- To avoid personal injury, use a hoist or get assistance when lifting components that weigh 23 kg [50 lb] or more. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity. Make sure hooks are positioned correctly. **Always** use a spreader bar when necessary. The lifting hooks **must not** be side-loaded.
- Corrosion inhibitor, a component of SCA and lubricating oil, contains alkali. Do **not** get the substance in your eyes. Avoid prolonged or repeated contact with skin. Do **not** swallow internally. In case of contact, immediately wash skin with soap and water. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. IMMEDIATELY CALL A PHYSICIAN. KEEP OUT OF REACH OF CHILDREN.
- Naptha and Methyl Ethyl Ketone (MEK) are flammable materials and **must** be used with caution. Follow the manufacturer's instructions to provide complete safety when using these materials. KEEP OUT OF REACH OF CHILDREN.
- To avoid burns, be alert for hot parts on products that have just been turned off, and hot fluids in lines, tubes, and compartments.
- **Always** use tools that are in good condition. Make sure you understand how to use them before performing any service work. Use ONLY genuine Cummins or Cummins ReCon® replacement parts.
- **Always** use the same fastener part number (or equivalent) when replacing fasteners. Do **not** use a fastener of lesser quality if replacements are necessary.
- Do **not** perform any repair when fatigued or after consuming alcohol or drugs that can impair your functioning.
- Some state and federal agencies in the United States of America have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- Coolant is toxic. If **not** reused, dispose of in accordance with local environmental regulations.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Foreword

This manual provides instructions for troubleshooting and repairing this engine in the chassis. Component and assembly rebuild procedures are provided in the engine shop manual. Refer to Section i - Introduction for instructions on how to use this manual.

Read and follow all safety instructions. Refer to the WARNING in the General Safety Instructions in Section i - Introduction.

The manual is organized to guide a service technician through the logical steps of identifying and correcting problems related to the engine. This manual does not cover vehicle or equipment problems. Consult the vehicle or equipment manufacturer for repair procedures.

A series of specific service manuals (for example: Shop, Specifications, and Alternative Repair) are available and can be ordered by filling out and mailing the Literature Order Form located in Section L - Service Literature.

The repair procedures used in this manual are recommended by Cummins Engine Co., Inc. Some service procedures require the use of special service tools. Use the correct tools as described.

Cummins Engine Company, Inc. encourages the user of this manual to report errors, omissions, and recommendations for improvement. Please use the postage paid, pre-addressed Literature Survey Form in the back of this manual for communicating your comments.

The specifications and rebuild information in this manual are based on the information in effect at the time of printing. Cummins Engine Company, Inc. reserves the right to make any changes at any time without obligation. If differences are found between your engine and the information in this manual, contact a Cummins Authorized Repair Location or call 1-800-DIESELS (1-800-343-7357) toll free in the U.S. and Canada.

The latest technology and the highest quality components are used to manufacture Cummins engines. When replacement parts are needed, we recommend using only genuine Cummins or ReCon® exchange parts. These parts can be identified by the following trademarks:

Cummins | Cummins ReCon | HOLSET | Fleetguard NELSON | Premium Blue O

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Engine Acceleration or Response Poor

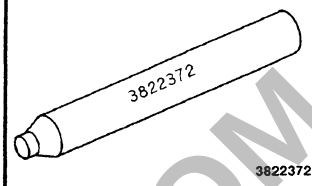
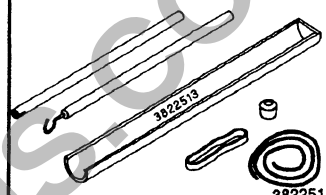
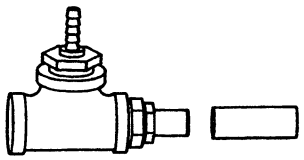
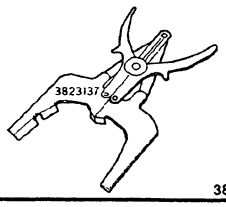
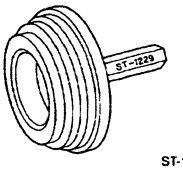
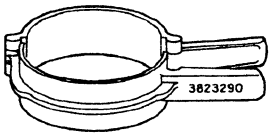
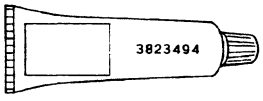
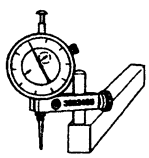
This is symptom tree T033.

Cause	Correction
Engine duty cycle has changed	Verify the engine duty cycle with an electronic service tool. Refer to the appropriate electronic service tool manual or a Authorized Cummins Repair Faciltiy.
OK ⬇	
Operator technique is **not** correct	Explain the correct engine operation to the operator. Refer to the Operation and Maintenance Manual, B Series Engine, Bulletin No. 3810205.
OK ⬇	
Fuel level is low in the tank	Fill the supply tank. Refer to the Operation and Maintenance Manual, B Series Engine, Bulletin No. 3810205.
OK ⬇	
Drivetrain is **not** correctly matched to the engine	Check for correct gearing and drivetrain components. Refer to the OEM vehicle specifications.
OK ⬇	
Clutch is malfunctioning or is **not** correct	Compare the drivetrain specifications to Cummins recommendations. Check the clutch for correct operation. Refer to the OEM service manual.
OK ⬇	
Vehicle parasitics are excessive	Check the vehicle brakes for dragging, transmission malfunction, cooling fan operation cycle time, and engine-driven units. Refer to the OEM service manual.
OK ⬇	
Fuel leak	Check the fuel lines, fuel connections, and fuel filters for leaks. Refer to the OEM service manual. Check the fuel lines to the supply tanks. Refer to the OEM service manual.
OK ⬇	
Fuel inlet restriction	Check for fuel inlet restriction. Refer to Procedure 006-020 .
OK ⬇	

(Continued)

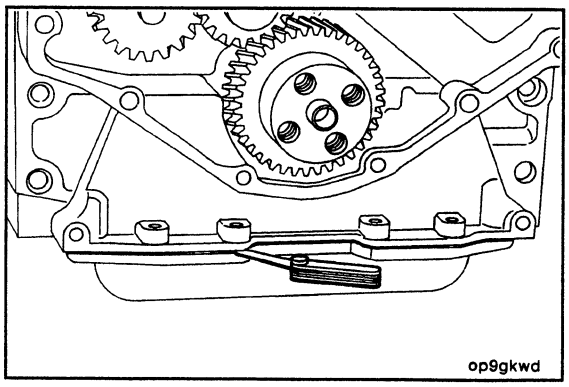
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

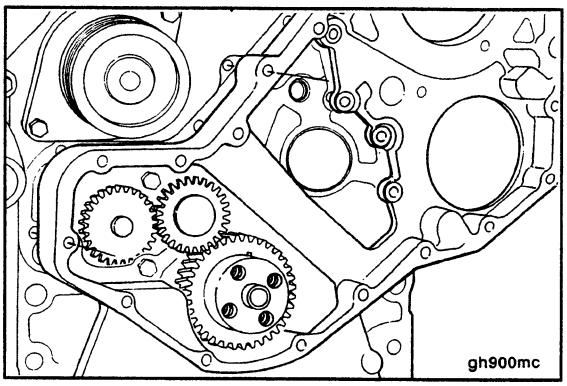
Tool No.	Tool Description	Tool Illustration
3822372	**Expansion Plug Driver** Used to install a 0.375-inch expansion plug to specified depth. Used with expansion plug driver handle, Part No. 3376795.	 3822372
3822513	**Tappet Removal Tool Kit** Used to remove and install valve tappets.	 3822513
3822566	**Blowby Check Tool** Used with manometer, Part No. ST-1111-3, to measure the engine crankcase pressure.	 eq8toqe
3823137	**Piston Ring Expander** Used to install piston rings onto pistons without damaging or distorting the rings.	 3823137
3823230	**Cylinder Liner Driver** Used to install the cylinder liner into the cylinder block.	 ST-1229
3823290	**Piston Ring Compressor** Used to compress the piston rings while installing the pistons into the cylinder bores.	 3823290
3823494	**Sealant, Three-Bond™ (150-gram tube)** Used for sealing tee joints and front gear cover.	 3823494
3823495	**Gauge Block** Used to measure cylinder liner protrusion on the cylinder block.	 3823495

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

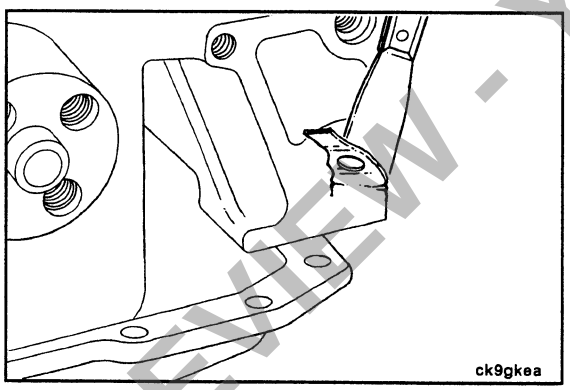


Using a feeler gauge, attempt to separate the lubricating oil pan gasket from the gear housing.



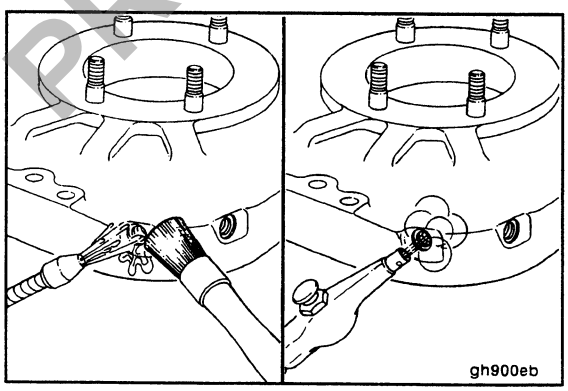
Plastic Hammer

Remove the gear housing.



Clean (001-033-006)

Clean the gasket material from the cylinder block.



⚠ WARNING ⚠

When using solvents, acids, or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to avoid personal injury.

⚠ WARNING ⚠

Wear appropriate eye and face protection when using compressed air. Flying debris and dirt can cause bodily injury.

Use solvent and a nylon brush to clean the oil drillings.

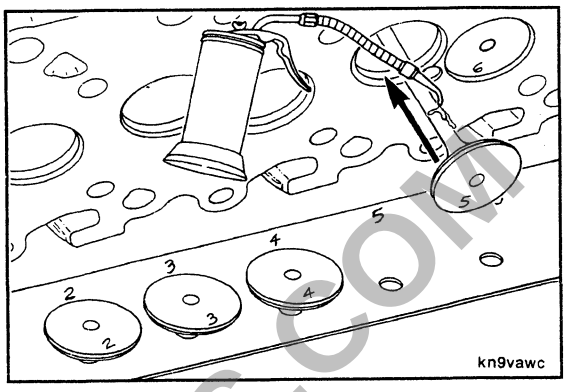
Dry the front gear housing with compressed air.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Lubricate the stems with SAE 90W engine oil before installing the valves.

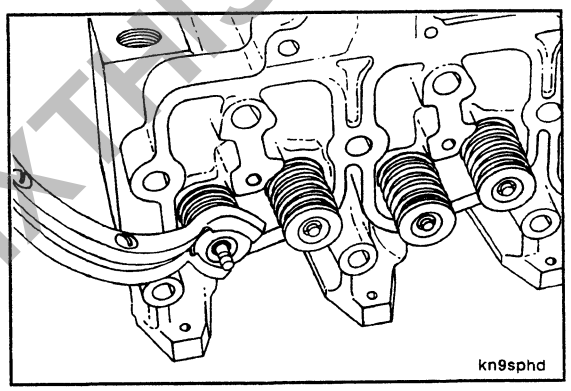
Install valves into their original location.



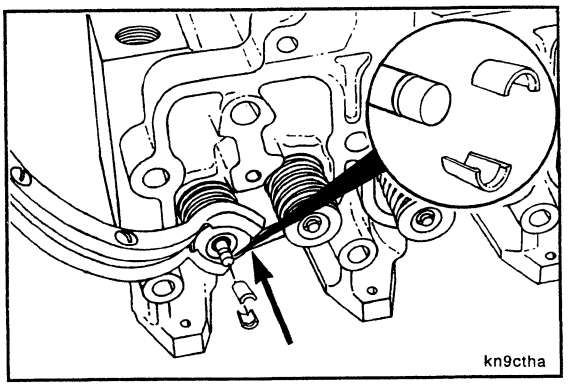
Valve Spring Compressor, Part No. 3375962

Install the valve spring and retainer.

Use the valve spring compressor, Part No. 3375962, to compress the valve spring and retainer assembly.



Install new valve collets and release the spring tension.

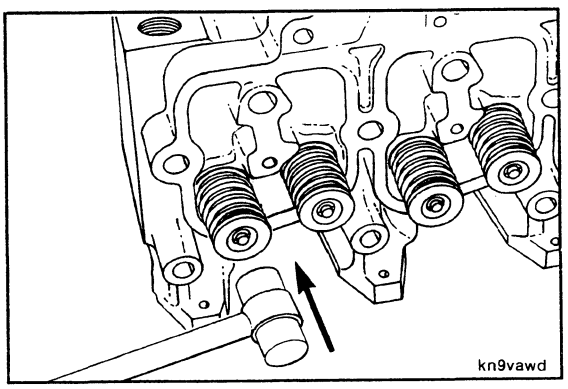


⚠ WARNING ⚠

Wear eye protection. If the collets are not correctly installed, they can fly out when the stems are hit with a hammer.

Plastic Hammer

After assembly, hit the valve stems with a plastic hammer to make sure that the collets are seated.

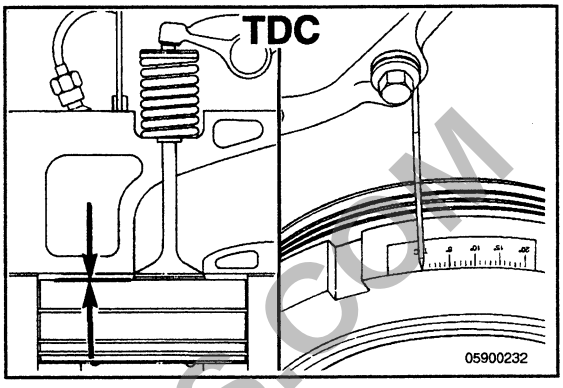


PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Step: 2

Locate top dead center (TDC) of the compression stroke on cylinder No. 1. The following procedure uses the engine timing pin, but other alternate methods, such as the dropped valve method, can be used.

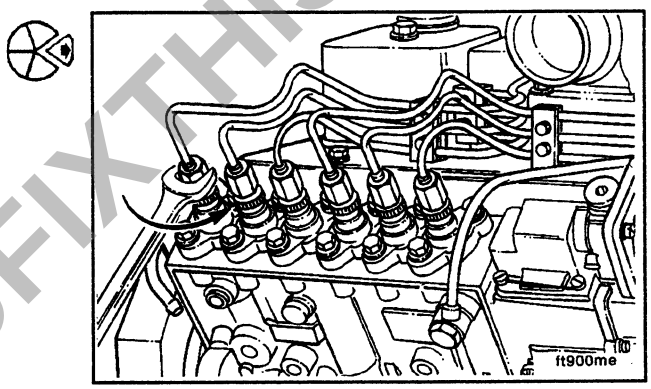


Step: 3

CAUTION

Do not bend the fuel lines. Bending the lines will cause line or injector failure.

If the injection lines have **not** already been removed, remove the No. 1 injection line.



Step: 4

WARNING

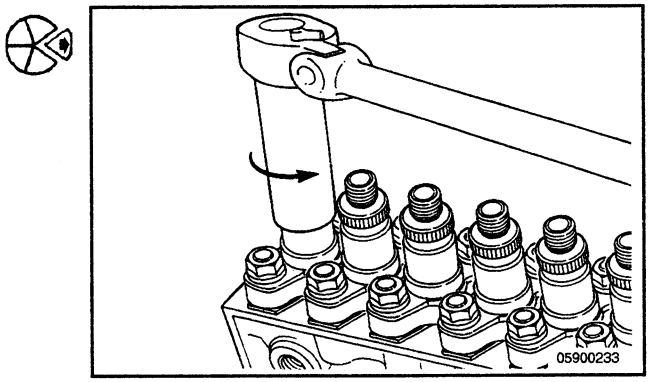
Wear appropriate eye and face protection when using compressed air. Flying debris and dirt can cause bodily injury.

CAUTION

Do not loosen the two barrel flange nuts located below the delivery valve holder. Loosening of these nuts will void the fuel injection pump warranty.

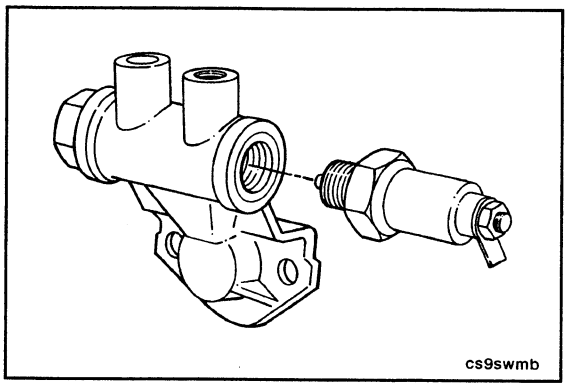
NOTE: There is an external o-ring on the holder to help prevent debris from getting into the pump; this can create a slight resistance as the holder is loosened.

With the engine at TDC, loosen, but do **not** remove the front (No. 1) delivery valve holder using the special socket provided in the timing kit. Use compressed air to remove any paint chips from around the delivery valve holder. Remove the special socket prior to removing the delivery valve holder from the fuel injection pump.



PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

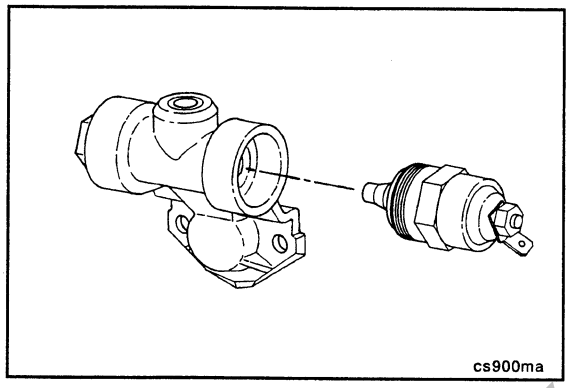


Disassemble (005-070-003)

22 mm

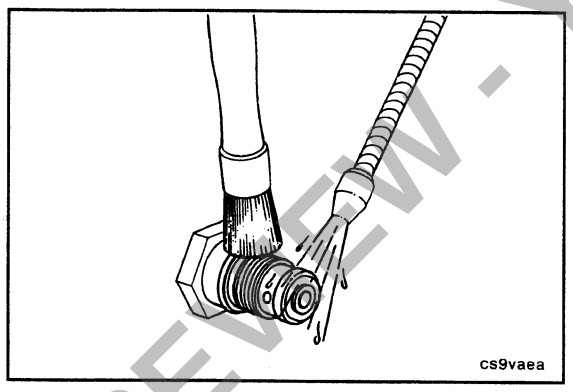
Loosen and remove the KSB electrical element from the KSB housing if equipped with a wax motor-style KSB.

NOTE: If equipped with a electrical solenoid-style KSB, proceed to the next step.



24 mm

Remove the KSB electrical solenoid from the KSB housing.



Clean (005-070-006)

⚠ WARNING ⚠

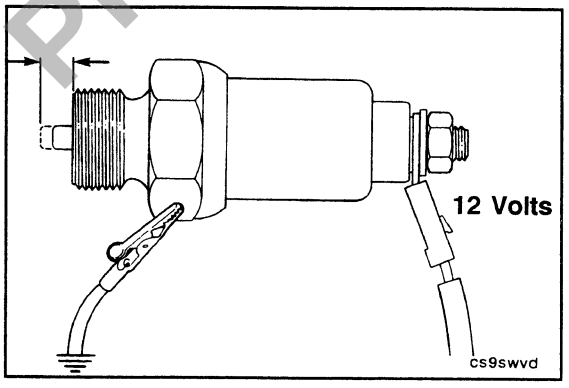
When using solvents, acids, or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to avoid personal injury.

⚠ WARNING ⚠

Wear appropriate eye and face protection when using compressed air. Flying debris and dirt can cause bodily injury.

Thoroughly flush the pressure relief valve with cleaning solution.

Dry with compressed air.



Test (005-070-012)

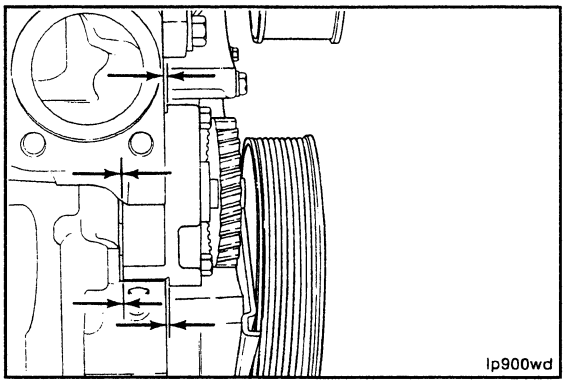
KSB Electric Element

Apply 12 VDC to the electrical terminal and a ground strap to the hexagonal portion of the element. Look for extensional movement of the plunger. If the plunger does **not** move after approximately 1 minute, check to make sure the element has been correctly connected to ground. If all connections are correct and the plunger does **not** move, the element is defective and **must** be replaced.

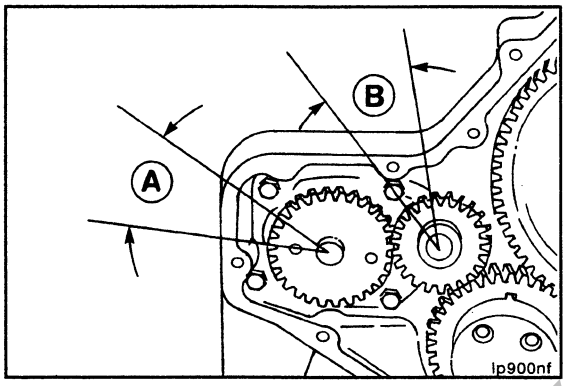
NOTE: The amount of plunger movement will vary depending upon the ambient temperature.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



NOTE: The back plate on the pump seats against the bottom of the bore in the cylinder block. When the lubricating oil pump is correctly installed, the flange on the lubricating oil pump will **not** touch the cylinder block.



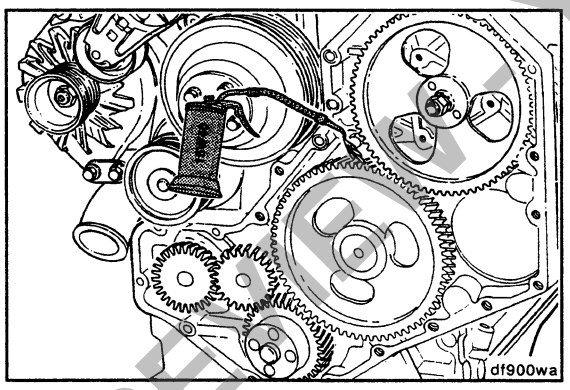
NOTE: Be sure the gear backlash is correct if installing a new lubricating oil pump.

Measure the gear backlash.

Backlash Limits

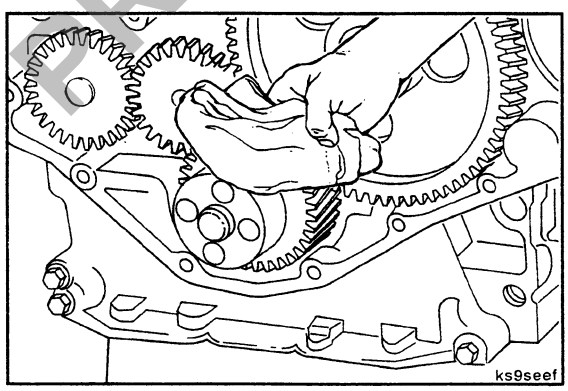
	mm		in
A	0.076	MIN	0.003
	0.330	MAX	0.013
B	0.076	MIN	0.003
	0.330	MAX	0.013

NOTE: If the adjoining gear moves when you measure the backlash, the reading will be incorrect.



Gear Cover - Installation

Lubricate the front gear train with clean lubricating engine oil.



⚠ CAUTION ⚠

The seal lip and the sealing surface on the crankshaft must be free from all oil residue to prevent seal leaks.

Thoroughly clean the front seal area of the crankshaft.

NOTE: Always replace the front seal when removing and installing the gear cover.

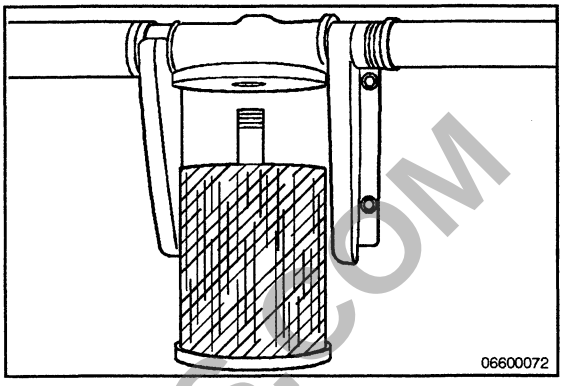
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

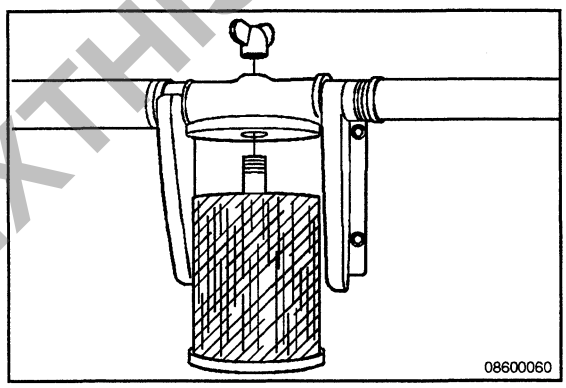
Assemble (008-057-025)

Install the sea water strainer.

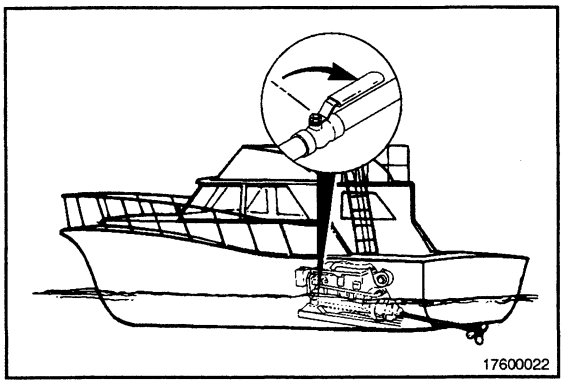
Inspect the o-ring seal for tears or damage. Replace if necessary. Be sure the o-ring is seated properly.



Install and tighten the wing nut(s).



Open the sea water inlet valves.



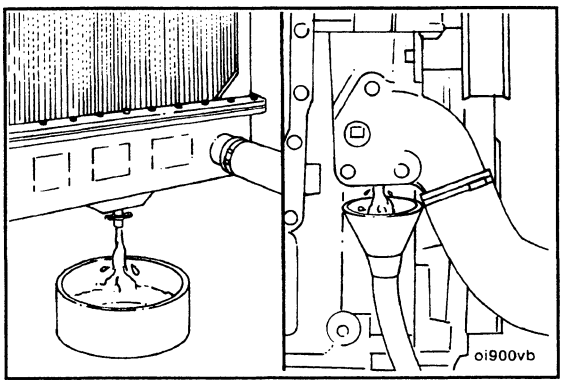
Water Pump (008-062)

Preparatory (008-062-000)

⚠ WARNING ⚠

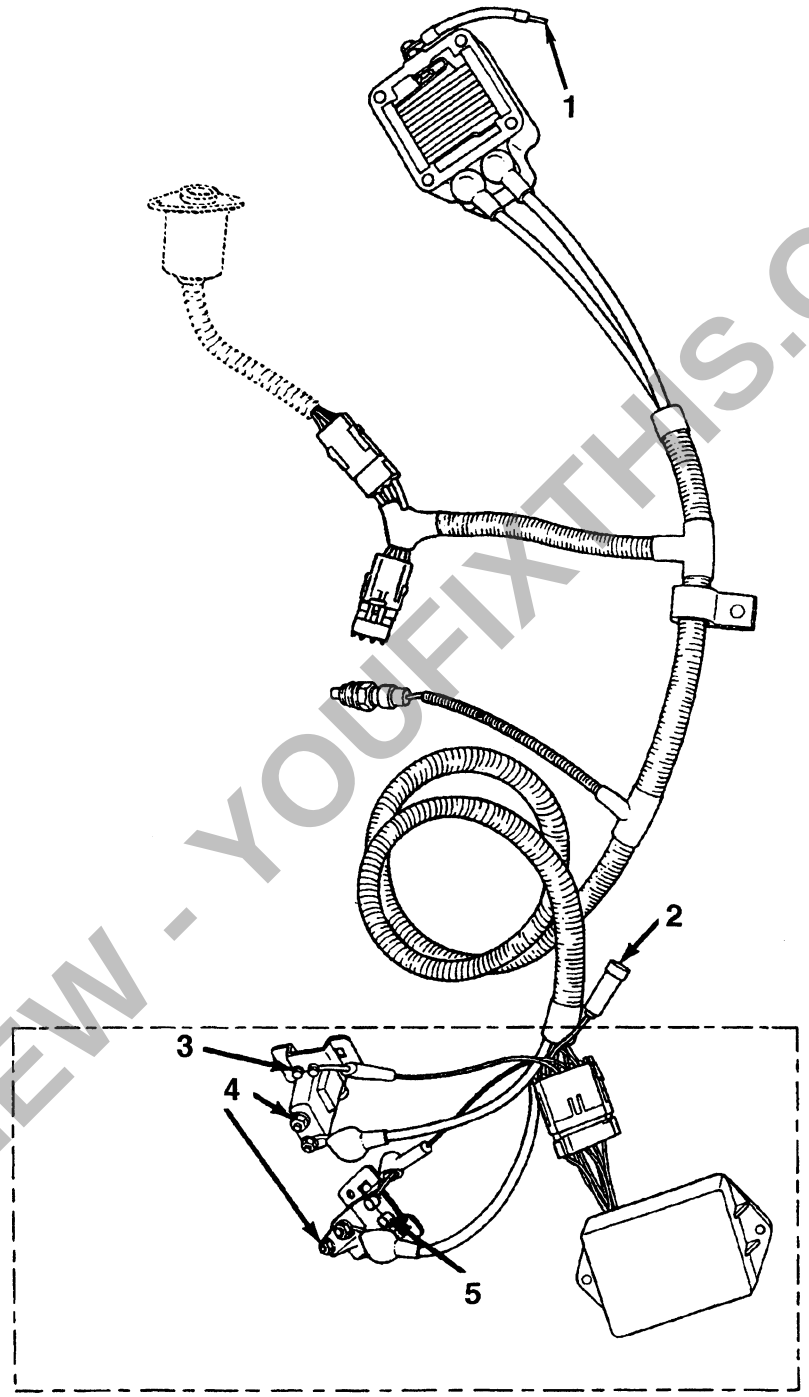
Coolant is toxic. If not reused, dispose of in accordance with local environmental regulations.

- Drain the coolant. Refer to Proceedure 008-018.



PREVIEW - YOUFIXTHIS.COM

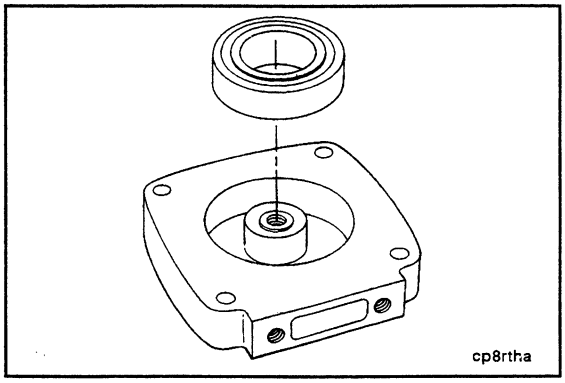
Download full manual at youfixthis.com



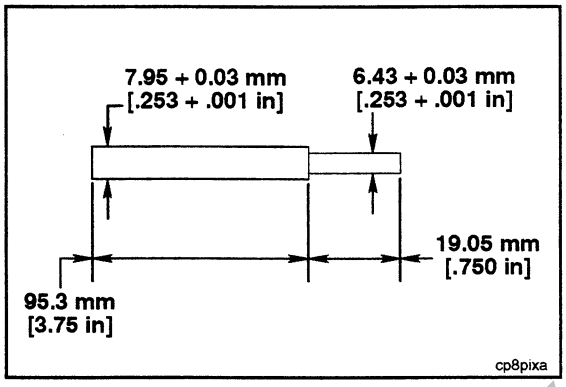
10900272

PREVIEW - YOUFIXTHIS.COM

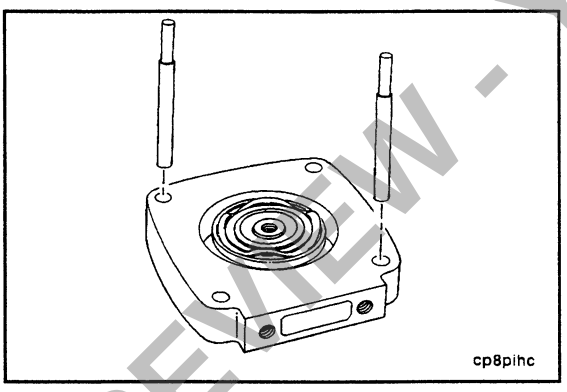
Download full manual at youfixthis.com



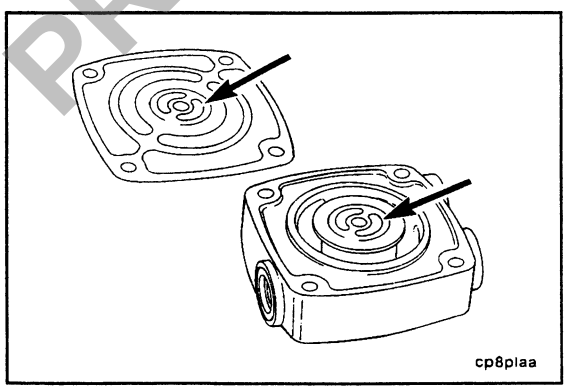
Slide the exhaust valve retainer over the valve plate. Make sure that the end of the retainer with the groove faces upward.



Fabricate or reuse the four guide pin tools.



Insert the larger end of two guide pins in opposite corner holes of the valve plate.

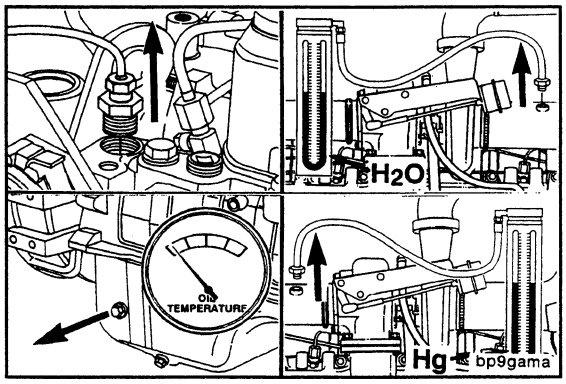


Determine the final orientation of the valve plate (air intake location) and the head (coolant ports in relation to air inlet or manifold location). Align the kidney-shaped slots in the head with the kidney-shaped slots in the gasket.

If orientation marks were made before disassembly, use them.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com



NOTE: If the engine is to be stored temporarily and does **not** have permanent-type antifreeze, it is necessary to drain all coolant.

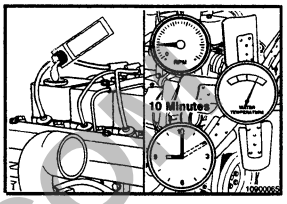
Remove all test instrumentation.

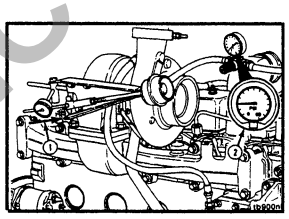
Remove the engine from the dynamometer.

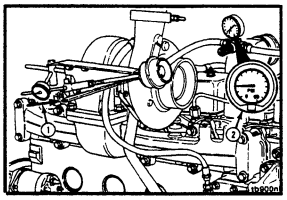
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Component or Assembly (Procedure)	Ref.No./Steps	Metric		U.S.
Turbocharger Turbine Seal Leaks (010-049)				
Engine Lubricating Oil:		38 liters		10 U.S.gal
Turbocharger Wastegate Actuator (010-050)				
Air Pressure:		200 kPa		29 psi
Rod:		0.33 to 1.27 mm		0.013 to 0.050 in
Wastegate Actuator Travel Measurement		0.033 mm 1.27 mm	MIN MAX	0.013 in 0.050 in







PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 25 of 936 pages

The full manual includes:

- All 936 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Cummins B3.9, B5.9 Troubleshooting and Repair Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual