

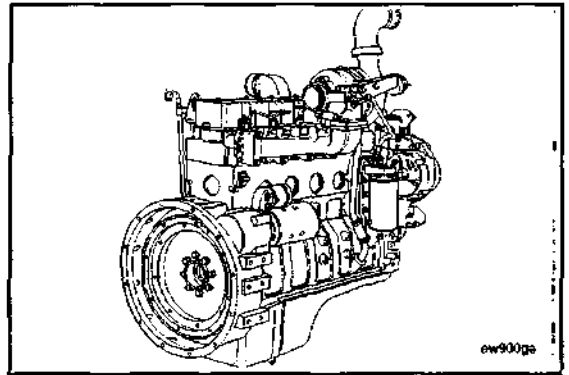
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**Engine Identification**

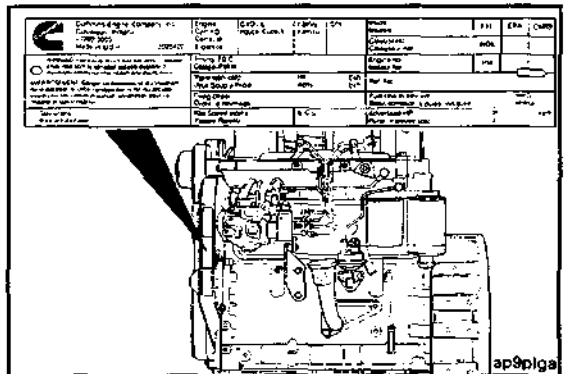
**General Information**

This section contains the specifications for the four-cylinder and six-cylinder B Series engines. The engine views show important components on the engine.



**Engine Dataplate**

The engine dataplate shows specific information about the engine. The engine serial number (ESN) and control parts list (CPL) provide information for ordering parts and for service needs. The engine dataplate **must not** be changed unless approved by Cummins Engine Company, Inc.



Have the following engine data available when communicating with a Cummins Authorized Repair Facility. The information on the dataplate is **mandatory** when sourcing service parts.

1. Engine Serial Number (ESN)
2. Control Parts List (CPL)
3. Model
4. Horsepower and rpm rating

Cummins Engine Company, Inc. Columbus, Indiana 47262-3005 Made in U.S.A. 3925422	Engine Cert. ID. Certificate d'identite	Cyl/L Pouces Cubes/L	Family Famille	CPL	Model MODELE	FEL	EPA	CARB
	Tiring-TD C Catalogue-PM H	Valve with coil Valve Soup à Froid	In Adm	Ed. Ec	Ref. No	Catalyst No Catalyseur No	MDX	
Firing Order Ordre d'Alimentage	Idle Speed (rpm) Vitesse Régime	E.C.S.	Fuel rate at adv. HP Débit combust. à puissance indiquée	r/min par/rev	Engine No Moteur No	PM		
Date of Mfg Date de Fabrication			Advanced HP Puiss. indiquée (cv)	2 1				

ap9plgb

## **Troubleshooting Procedures and Techniques**

A thorough analysis of the customer's complaint is the key to successful troubleshooting. The more information known about a complaint, the faster and easier the problem can be solved.

The Troubleshooting Symptom Charts are organized so that a problem can be located and corrected by doing the easiest and most logical things first. Complete all steps in the sequence shown from top to bottom.

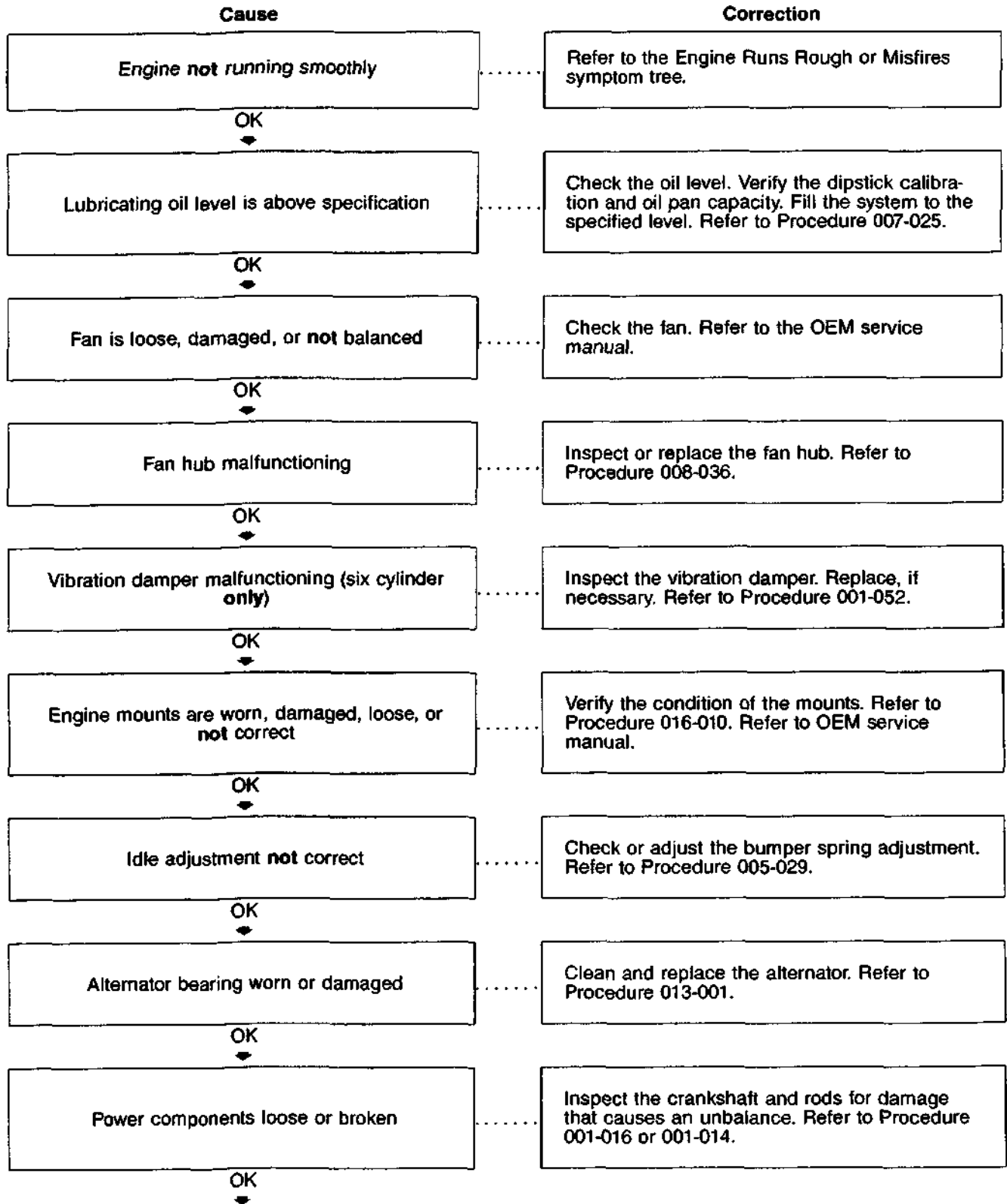
It is **not** possible to include all the solutions to problems that can occur; however, these charts are designed to stimulate a thought process that will lead to the cause and correction of the problem.

Follow these basic troubleshooting steps:

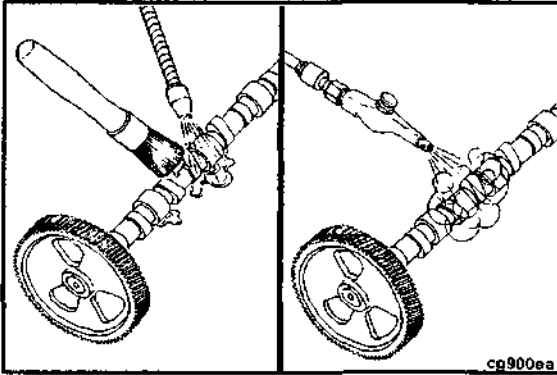
- Get all the facts concerning the complaint
- Analyze the problem thoroughly
- Relate the symptoms to the basic engine systems and components
- Consider any recent maintenance or repair action that can relate to the complaint
- Double-check before beginning any disassembly
- Solve the problem by using the symptom charts and doing the easiest things first
- Determine the cause of the problem and make a thorough repair
- After repairs have been made, operate the engine to make sure the cause of the complaint has been corrected

### Engine Vibration Excessive

This is symptom tree T075.



(Continued)



### Clean (001-008-006)

#### ▲ WARNING ▲

When using a steam cleaner, wear safety glasses or a face shield, as well as protective clothing. Hot steam can cause serious personal injury.

#### ▲ WARNING ▲

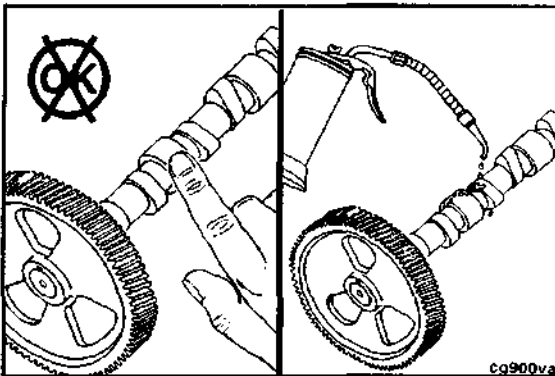
When using solvents, acids, or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to avoid personal injury.

#### ▲ WARNING ▲

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

Use solvent or steam to clean the camshaft.

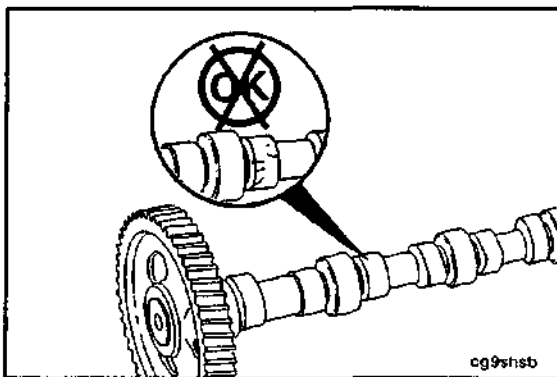
Dry with compressed air.



#### ▲ CAUTION ▲

Do not touch the machined surfaces with bare hands; this can cause rust to form on the camshaft.

Lubricate the camshaft with clean lubricating engine oil before handling.



### Inspect for Reuse (001-008-007)

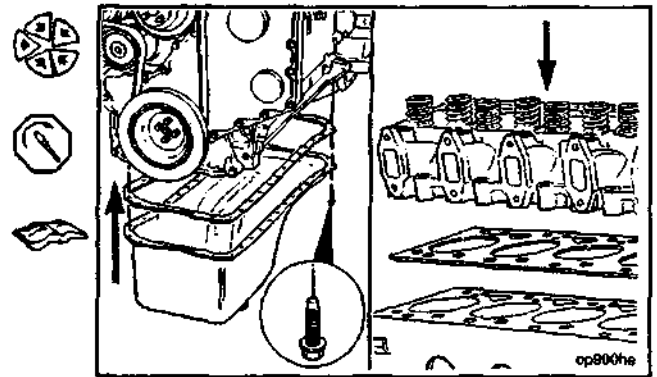
**NOTE:** Anytime a new camshaft is installed; new tappets and push tubes **must** be installed also.

Inspect the fuel transfer pump lobe, valve lobes, and bearing journals for cracking, pitting, or scoring.

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

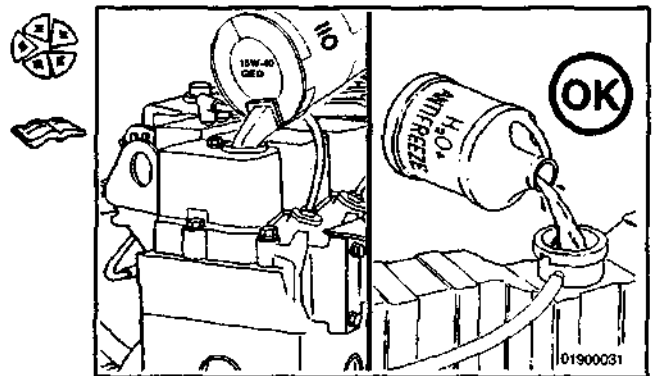
**Torque Value:** 24 N•m [18 ft-lb]

Install the cylinder head. Refer to Procedure 002-004.

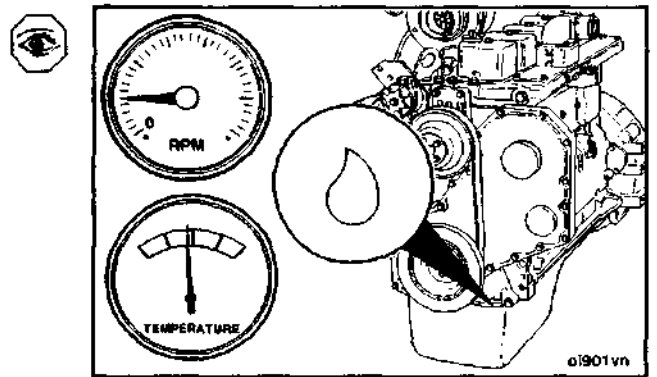


Fill the lubricating oil pan. Refer to the Operation and Maintenance Manual, B Series Engines, Bulletin No. 3810205 for the correct lubrication oil specification.

Fill the cooling system. Refer to Procedure 008-018.



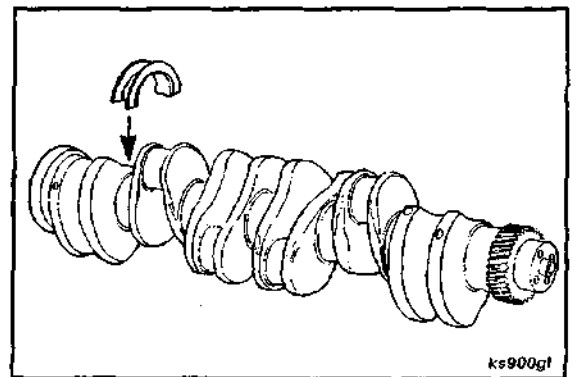
Operate the engine to normal operating temperature, and check for leaks.

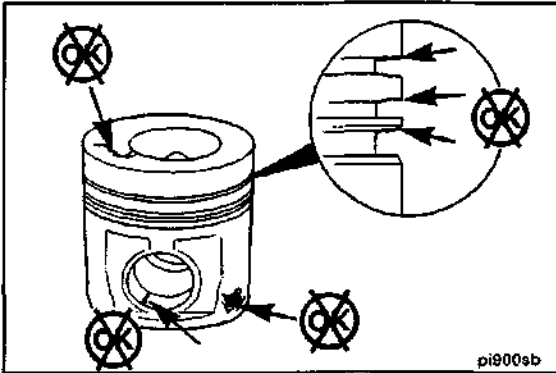


## **Crankshaft (001-016)**

### **General Information**

The crankshaft is a balanced, forged-steel unit. Four-cylinder engines have five main bearings. Six-cylinder engines have seven main bearings. The lower bearing shells are all the same. All of the upper bearing shells are also the same with the exception of the journal adjacent to the rear one. The next to last journal is fitted with a flanged upper bearing shell. The flanges control the end thrust of the crankshaft.

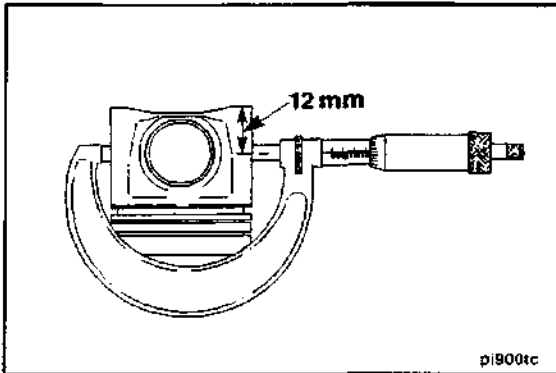




**Inspect for Reuse (001-043-007)**

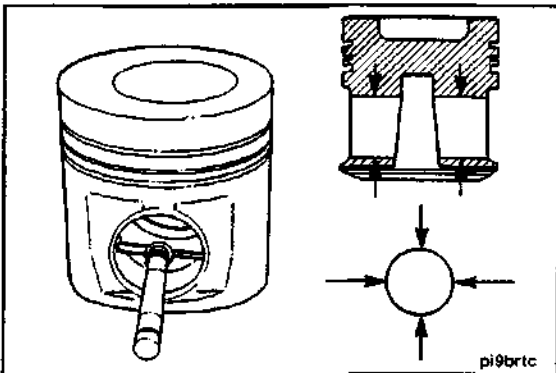
Inspect the piston for damage and excessive wear. Check the top, ring grooves, skirt, and pin bore.

**NOTE:** If severe piston damage has occurred, check the turbocharger and other exhaust components for damage from debris.



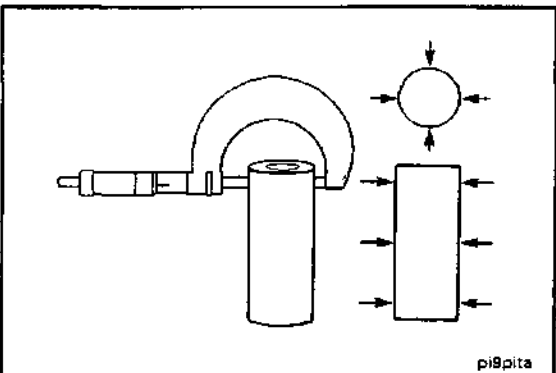
Measure the piston skirt diameter as illustrated.

Piston Skirt Diameter		
mm		in
101.823	MIN	4.0088
101.887	MAX	4.0107



Measure the pin bore.

Piston Pin Bore Diameter		
mm		in
40.006	MIN	1.5750
40.025	MAX	1.5758



**Piston Pin - Inspection**

Inspect the piston pin for nicks, gouges, and excessive wear.



Measure the pin diameter.

Pin Diameter		
mm		in
39.990	MIN	1.5744
40.003	MAX	1.5749

## Tappet (004-015)

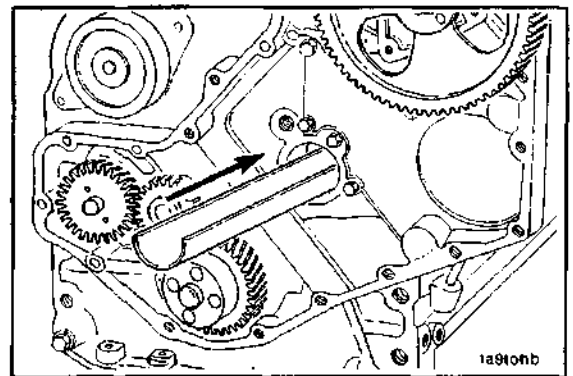
### Preparatory (004-015-000)

- Remove the rocker lever cover. Refer to Procedure 003-011.
- Remove the rocker levers. Refer to Procedure 003-008.
- Remove the push tubes. Refer to Procedure 004-014.
- Remove the vibration damper. Refer to Procedure 001-052.
- Remove the gear cover. Refer to Procedure 001-031.
- Remove the camshaft. Refer to Procedure 001-008.

### Remove (004-015-002)

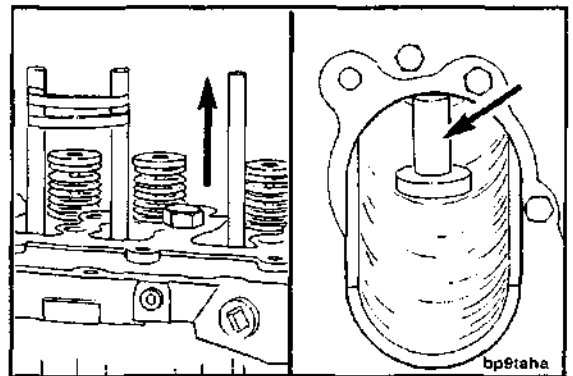
#### Tappet Replacement Kit, Part No. 3822513

Insert the trough from the tappet replacement kit, Part No. 3822513, to the full length of the cam bore.

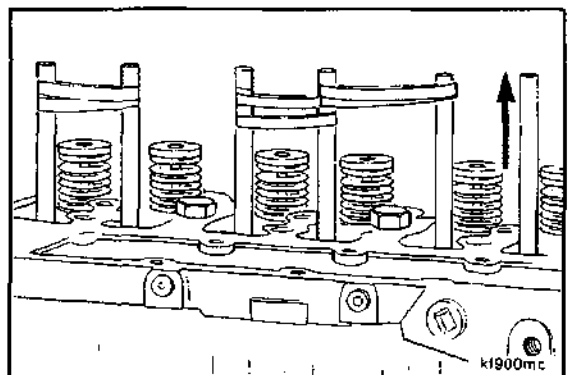


**NOTE:** Number each tappet with the cylinder number position as it is removed. Tappets **must** be installed in the same position as removed.

Make sure the trough is positioned so it will catch the tappet when the wooden dowel is removed.



Only remove one tappet at a time. Remove the rubber band from the two companion tappets, securing the tappet **not** to be removed with the rubber band.

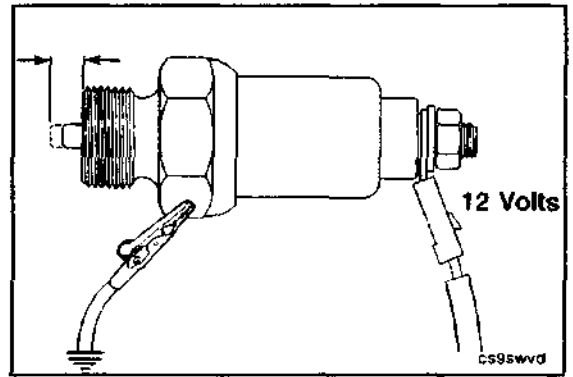




**Test (005-046-012)**

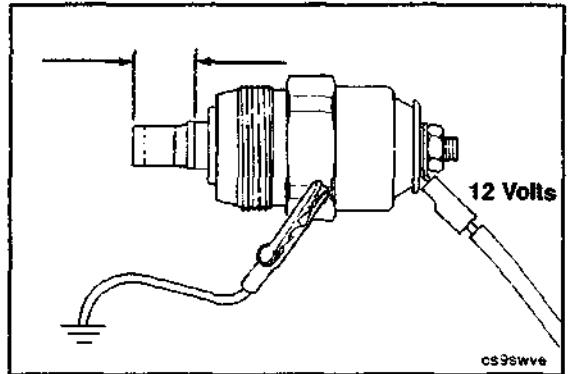
Apply 12 VDC to the electrical terminal and a ground strap to the hexagonal portion of the element. Check for extensional movement of the plunger. If the plunger does not move after approximately 1 minute, check to make sure the element has been correctly connected to ground. If all connections are correct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



Apply 12 VDC to the electrical terminal, and ground the hexagonal portion of the element. The magnetic coil of the solenoid must push the plunger outward.

If the plunger does not push outward when voltage is applied, the solenoid is defective and must be replaced.

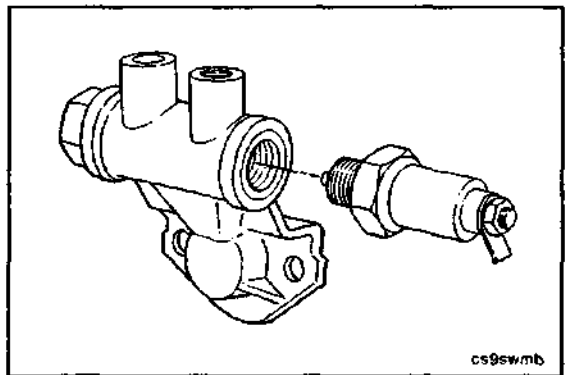


**Assemble (005-046-025)**

22 mm

Install the original element or a replacement into the KSB housing.

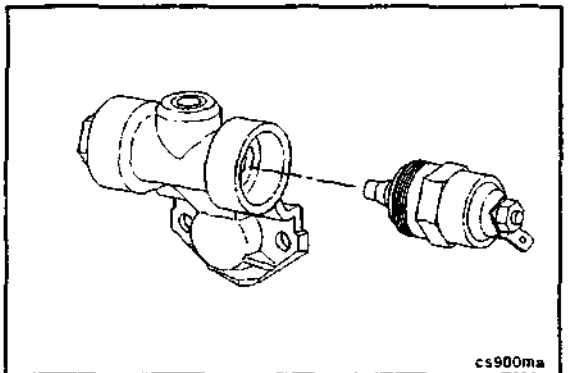
**Torque Value:** 22 N•m [16 ft-lb]

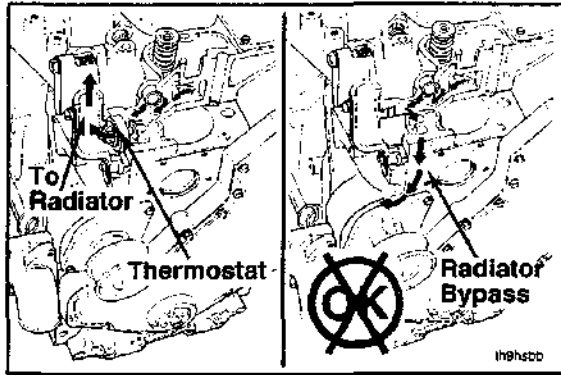


24 mm

Install the original solenoid or a replacement into the KSB housing.

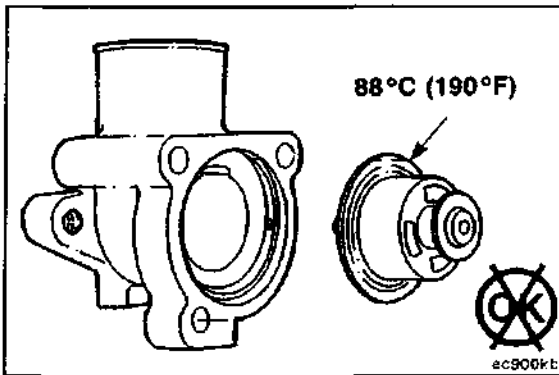
**Torque Value:** 22 N•m [16 ft-lb]



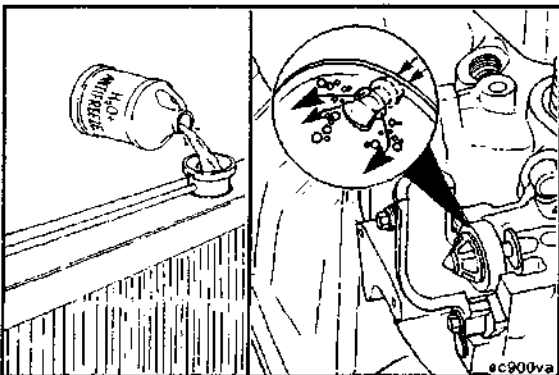


**⚠ CAUTION ⚠**

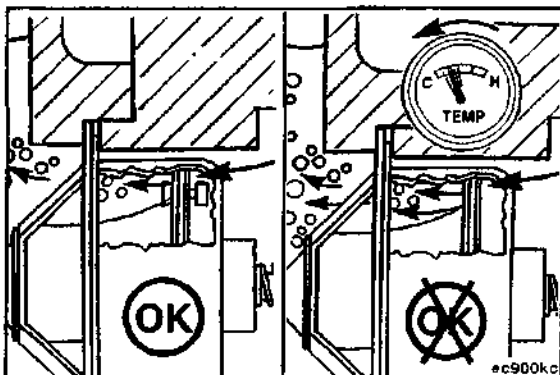
Always use the correct thermostat, and never operate the engine without a thermostat installed. The engine can overheat if operated without a thermostat because the path of least resistance for the coolant is through the bypass to the pump inlet.



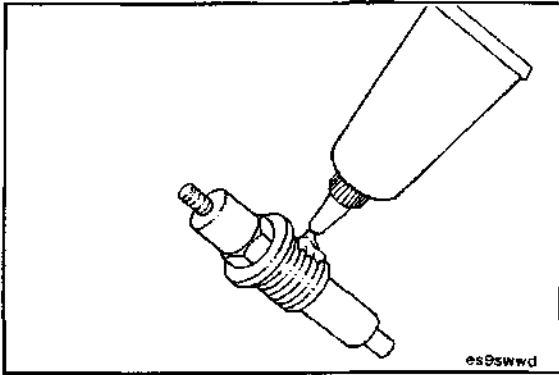
An incorrect or malfunctioning thermostat can cause the engine to overheat or run too cold.



As described in the coolant discussion, jiggle pins vent air during filling of the coolant system.



After the engine is vented and filled, the jiggle pins act as check valves to block the flow of coolant through the opening during engine operation.



**Install (008-070-026)**

22 mm



Apply liquid teflon sealant to the threads when installing the temperature sensor.

Reconnect the wiring.



**Torque Value:**

(Installed into  
Cast Iron)

50 N•m

[37 ft-lb]

(Installed into  
Aluminum)

30 N•m

[22 ft-lb]



Fill coolant to proper level. Refer to Procedure 008-018.



**Fan Belt Tensioner (008-087)**

**Preparatory (008-087-000)**



- Remove the drive belt. Refer to Procedure 008-002.



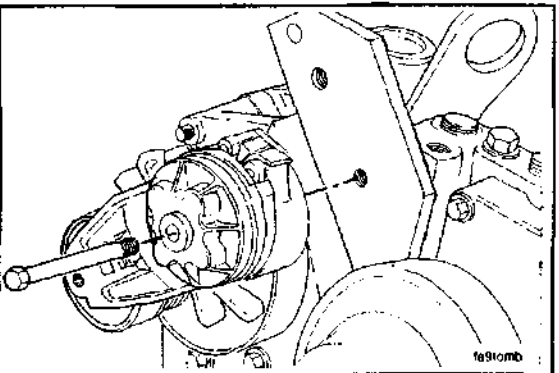
**Remove (008-087-002)**

3/8-Inch Square Drive



Lift belt tensioner to relieve tension in the belt, and remove the belt.

**NOTE:** The belt tensioner is spring loaded and must be pivoted away from the drive belt. Pivoting in the wrong direction can result in damage to the belt tensioner.



15 mm

Remove the capscrew and belt tensioner from the bracket.

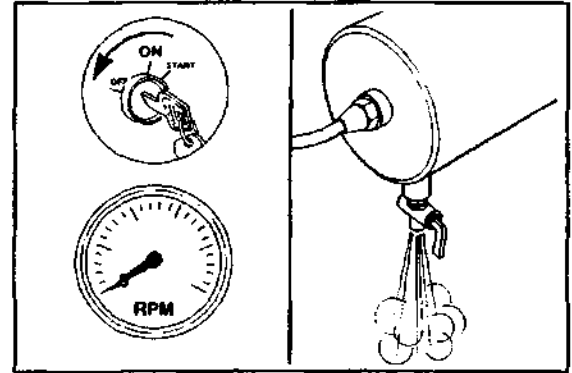


## Air Compressor Carbon Buildup (012-003)

### Initial Check (012-003-001)

Shut off the engine.

Open the draincock on the wet tank to release compressed air from the system.



### ▲ WARNING ▲

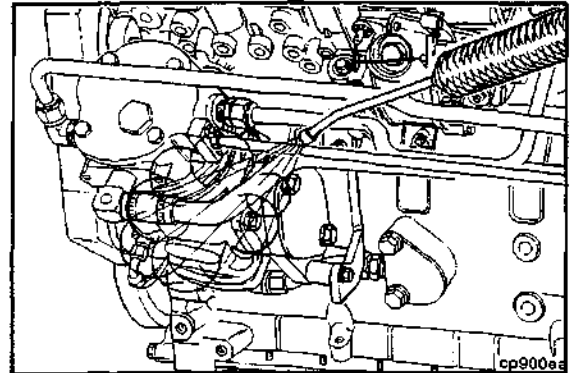
When using a steam cleaner, wear safety glasses or a face shield, as well as protective clothing. Hot steam can cause serious personal injury.

### ▲ WARNING ▲

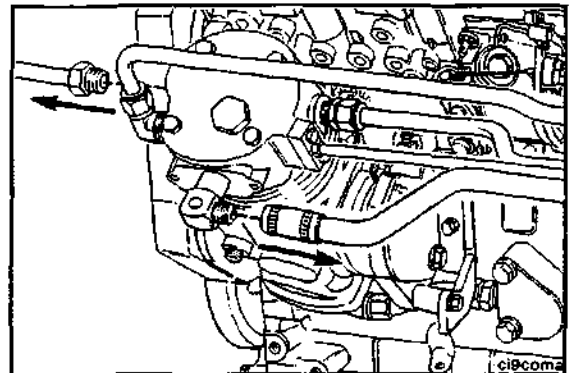
Compressed air used for cleaning purposes should not exceed 207 kPa [30 psi]. Wear appropriate eye and face protection when using compressed air. Flying debris and dirt can cause bodily injury.

Use steam to clean the compressor.

Use compressed air to dry.

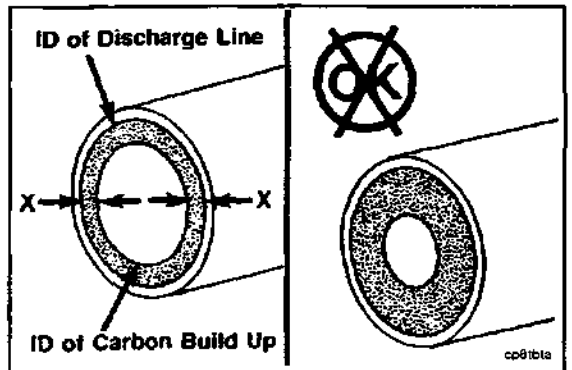


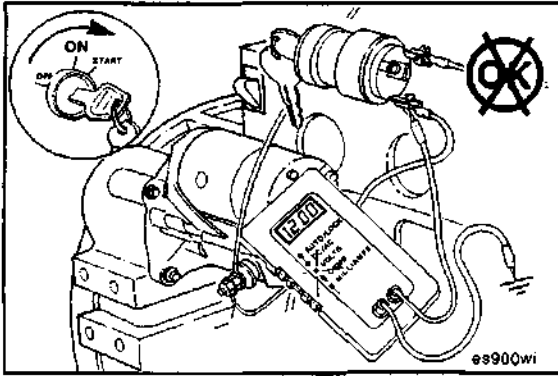
Remove the air inlet and outlet connections from the air compressor.



Measure the total carbon deposit thickness inside the air discharge line as shown.

**NOTE:** The carbon deposit thickness **must not** exceed 1.6 mm [0.0630 in].

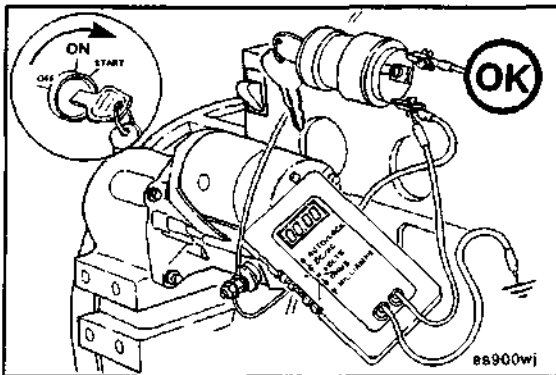




Turn the starter switch to the START position.

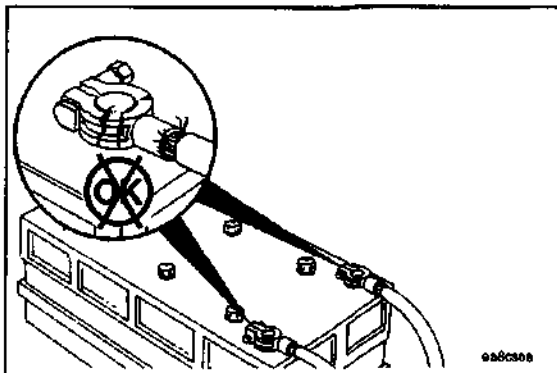
If the meter indicates system voltage at the starting motor switch input terminal, the starting motor switch is **not** the cause of the complaint.

Check the wiring from the starting switch to the starting motor solenoid "B" terminal, and from the starting motor solenoid to the battery for broken or damaged wires.



If the meter indicates no voltage, the switch is defective and **must** be replaced.

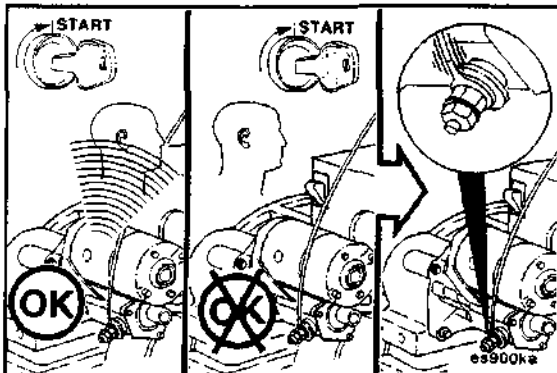
Check the wiring from the starting switch to the starting motor solenoid "B" terminal and from the starting motor solenoid to the battery for broken or damaged wires.



### Starter Solenoid (013-019)

#### Initial Check (013-019-001)

Before troubleshooting the starting motor, make sure the battery terminals are not loose or corroded.



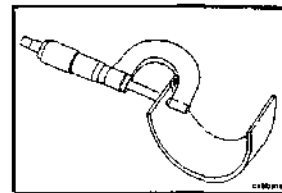
If the starting motor solenoid does **not** make a sound, check for loose wiring connections.

Component or Assembly (Procedure)	Ref.No./Steps	Metric	U.S.
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### Cylinder Block - Specifications Bearings, Connecting Rod (001-005)

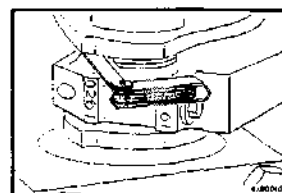
#### Connecting Rod Bearing Dimensions Standard

	1.955 mm	MIN	0.0770 in
	1.968 mm	MAX	0.0775 in
0.25 mm Oversize	2.080 mm	MIN	0.0819 in
	2.093 mm	MAX	0.0824 in
0.50 mm Oversize	2.205 mm	MIN	0.0868 in
	2.218 mm	MAX	0.0873 in
0.75 mm Oversize	2.330 mm	MIN	0.0917 in
	2.343 mm	MAX	0.0922 in
1.00 mm Oversize	2.455 mm	MIN	0.0967 in
	2.468 mm	MAX	0.0972 in



#### Connecting Rod Side Clearance Limits

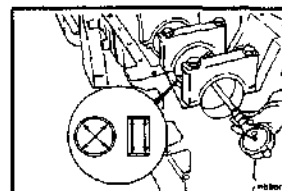
	0.10 mm	MIN	0.004 in
	0.33 mm	MAX	0.013 in



### Bearings, Main (001-006)

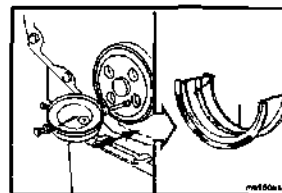
#### Main Bearing Bore Diameter (Maximum)

	83.106 mm	MAX	3.272 in
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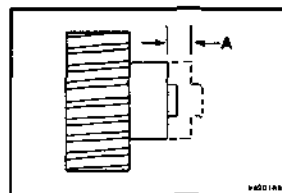
#### Dimension (A) End Play Limits

	0.127 mm	MIN	0.005 in
	0.431 mm	MAX	0.017 in



#### Dim. (A) End Play Limits

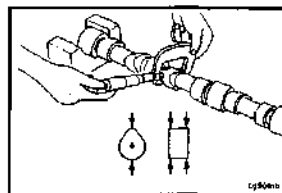
	0.102 mm	MIN	0.004 in
	0.432 mm	MAX	0.017 in

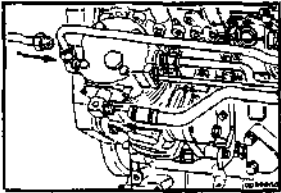
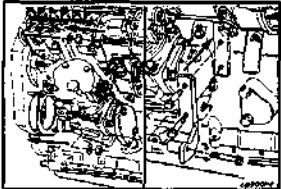
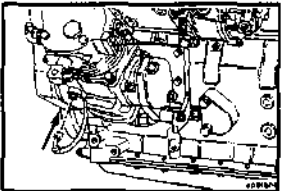
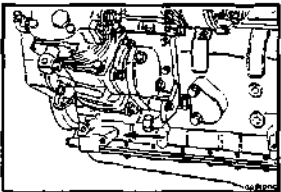
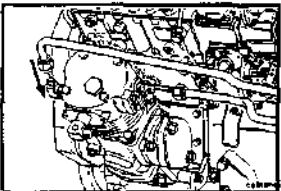
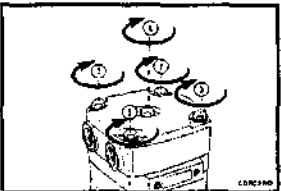


### Camshaft (001-008)

#### Fuel Transfer Pump Lobe Diameter

	35.50 mm	MIN	1.398 in
	36.26 mm	MAX	1.428 in



Component or Assembly (Procedure)	Ref.No./Steps	Metric	U.S.	
<b>Air compressor inlet and outlet torque</b> Inlet *Outlet		5 N•m 24 N•m	44 in-lb 18 ft-lb	
<b>Air compressor</b> Mounting Nuts Support Capscrews		77 N•m 24 N•m	57 ft-lb 18 ft-lb	
<b>Air compressor oil supply line</b>		15 N•m	133 in-lb	
<b>Air compressor oil drain line</b>		24 N•m	18 ft-lb	
<b>Air compressor support bracket</b>		24 N•m	18 ft-lb	
<b>Air Compressor Cylinder Head (Holset® QE Models) (012-104)</b>				
Holset® QE, Non-European cylinder head		28 N•m	21 ft-lb	
Holset® QE, European cylinder head		28 N•m	21 ft-lb	