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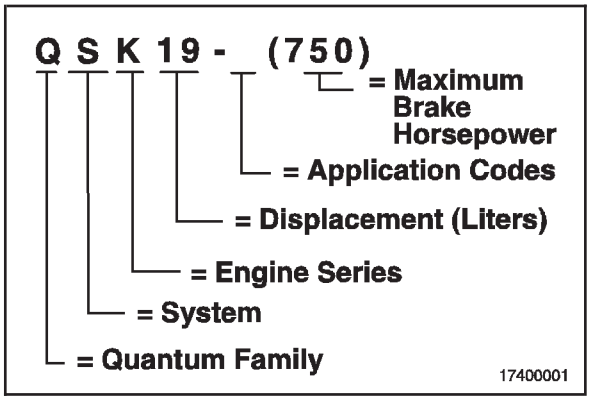
Engine Identification

Cummins Engine Nomenclature



The model name provides identification data for the engine. Refer to the illustration for the model name identification.

The application codes are:

A = Agricultural

C = Construction

D = Generator Drive

F = Fire Pump

G = Generator Set

L = Locomotive

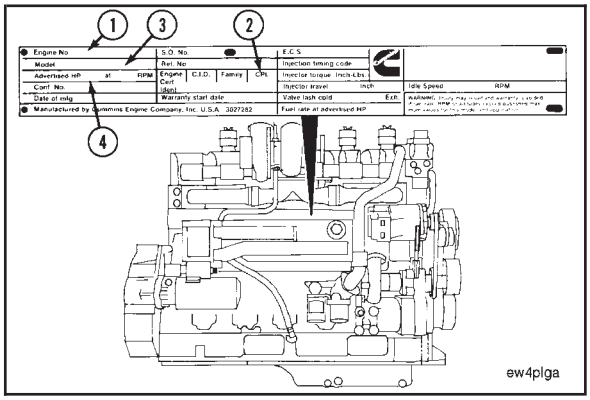
M = Marine

P = Power Unit

R = Railcar

T = Tactical Military

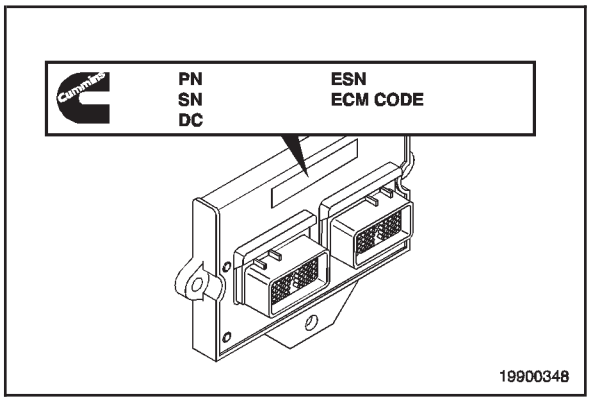
Engine Dataplate



The engine dataplate shows specific information about the engine. The engine serial number (ESN) (1), Control Parts List (CPL) (2), Model (3), and Horsepower and rpm rating (4) provide information for ordering parts and service needs.

NOTE: The engine dataplate **must not** be changed unless approved by Cummins Engine Company, Inc.

ECM Dataplate



The external ECM dataplate is located on top on the ECM.

The dataplate contains the following:

- ECM part number (P/N)
- ECM serial number (S/N)
- Manufacturer date code (D/C)
- Engine serial number (ESN)
- ECM code identifying the software in the ECM

Rail Applications

Remove the lubricating oil filters and filter head.

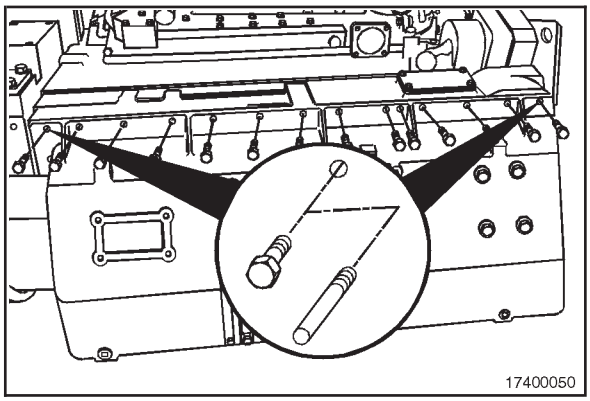
Remove the fuel filter and filter head.

Remove the coolant filter and filter head.

Rail Applications

Remove 15 capscrews on the top of the oil pan.

Install two 3/8 - 16 guide studs in the capscrew holes.

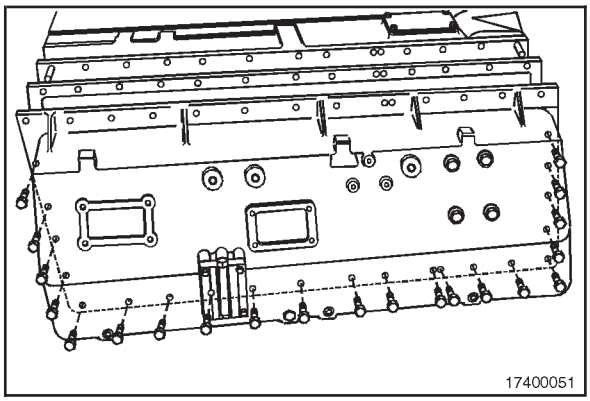


Rail Applications

Remove the remaining 23 capscrews.

Remove the lubricating oil pan.

Remove and discard the gasket.



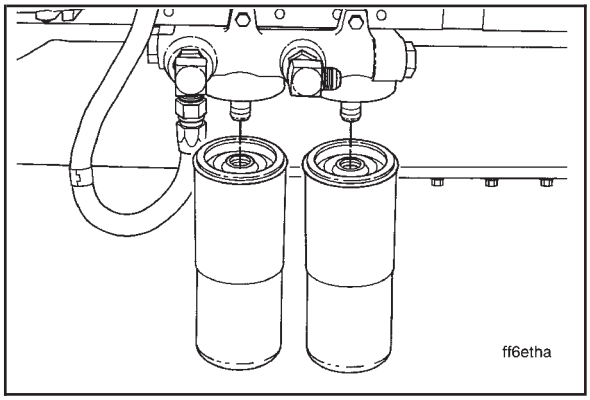
Remove the Fuel Filters

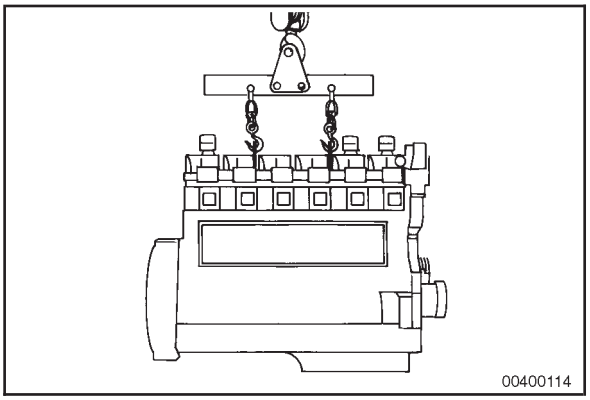
WARNING

Fuel is flammable. Do not allow cigarettes, flames, sparks, arcing switches or equipment, pilot lights, or other ignition sources near the fuel system.

Close the fuel line shutoff valve before changing the fuel filters, or the overhead tank can drain, causing a fuel leak.

Remove the fuel filter with filter wrench, Part No. 3376807.

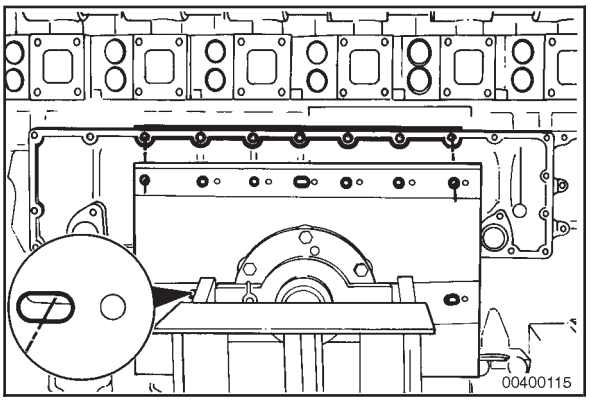




⚠ WARNING ⚠

Engine weighs 2045 kg [4508 lb]. Use a properly rated hoist and engine lifting fixture, Part No. 3822512, to lift the engine.

Lift the engine.



⚠ WARNING ⚠

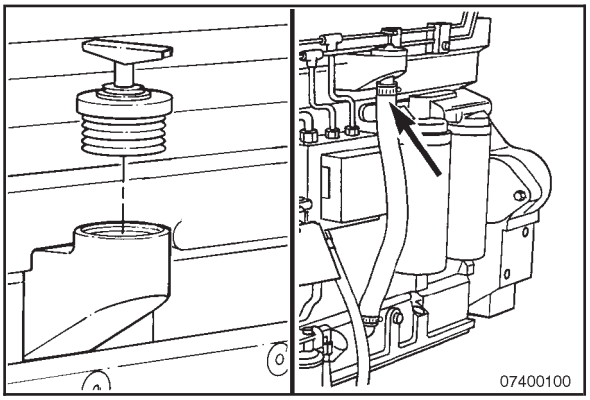
Be sure the locking pin on the engine stand is in the "LOCKED" position before removing the lifting hoist.

Use nine 3/8-16x3-3/4 in Grade 5 capscrews, plain washers, and lockwashers.

Attach the capscrews through the holes as shown.

Torque Value: 45 N•m [35 ft-lb]

Remove the hoist and lifting fixture.

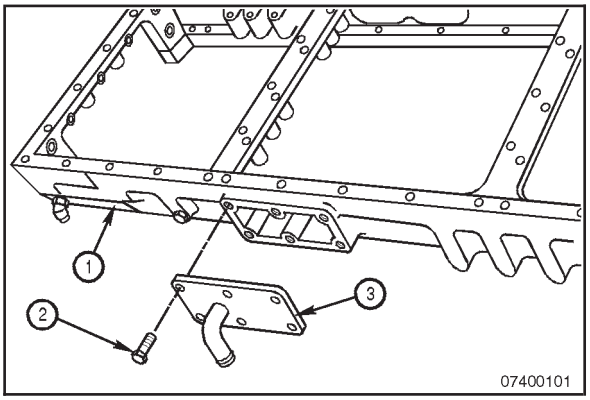


Remove the Oil Filler Cap and Hose

Remove oil filler cap from fill opening.

Remove cap, chain, washer and capscrew from engine.

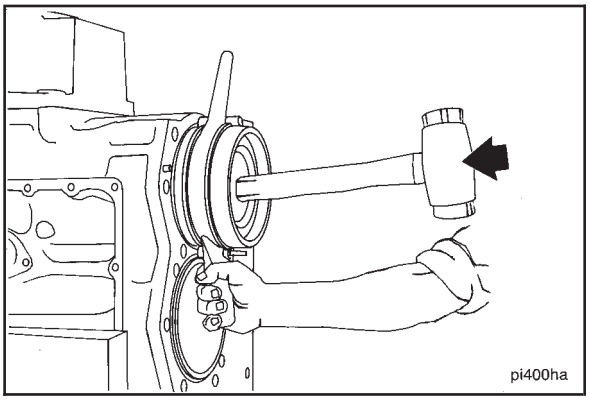
Loosen the two hose clamps. Remove the hose.



Remove the Hand Hole Cover with Hose Adapter

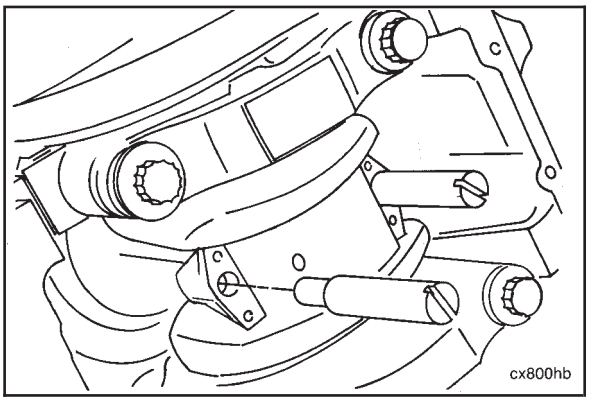
Remove six capscrews, hand hole cover and gasket.

Discard gasket.

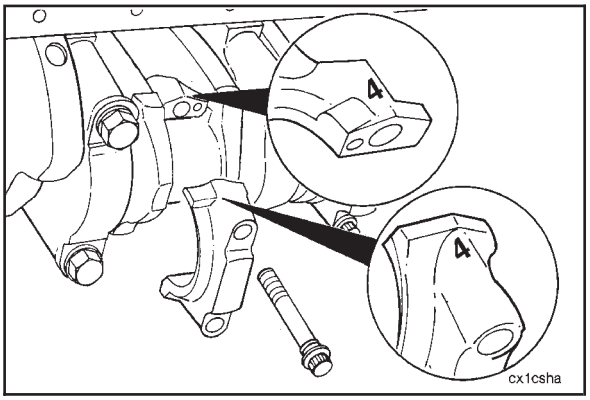


Install the rod and piston until the ring compressor touches the block. Align the rod with the crankshaft journal.

Hold the ring compressor firmly against the block. Use a wooden hammer handle to push the piston into the liner.



Push the piston into the bore until the rod bearing contacts the crankshaft journal. Remove the guide pins.



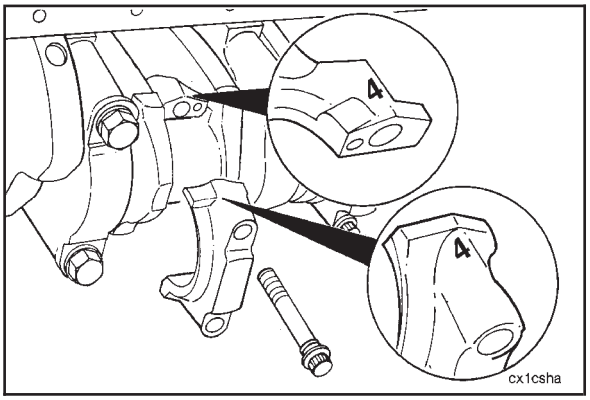
⚠ CAUTION ⚠

The cylinder number on the rod and cap must be the same.

⚠ CAUTION ⚠

The side of the cap with the cylinder number marking (bearing tang side) must be toward the camshaft.

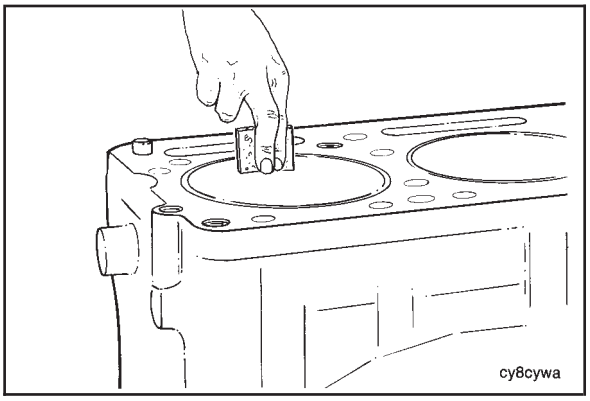
Install the connecting rod cap.



Tighten the capscrews alternately and evenly to pull the cap over the dowel pins. Use the following steps to tighten the capscrews.

Torque Value:

Connecting Rod Capscrews	Step 1	100 N•m	[75 ft-lb]
	2	205 N•m	[150 ft-lb]
	3	339 N•m	[250 ft-lb]
	4	Loosen	Loosen
	5	100 N•m	[75 ft-lb]
	6	205 N•m	[150 ft-lb]
	7	339 N•m	[250 ft-lb]

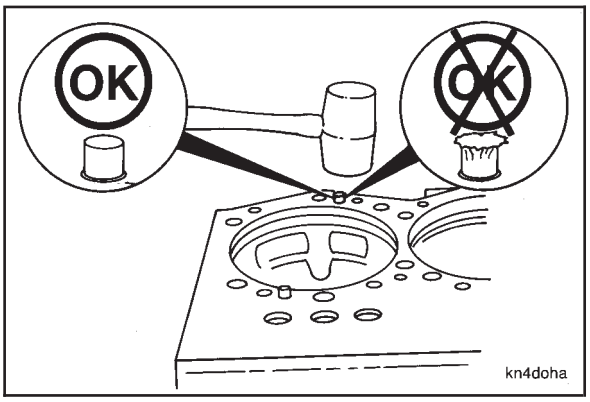


Clean the top of the cylinder block and the cylinder liners.

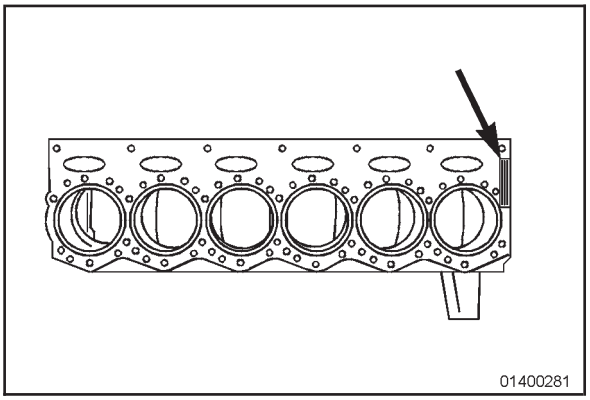
Use a scraper or a fibrous abrasive pad such as Scotch-Brite 7477, or equivalent, and solvent. Clean the top deck surface of the block. Do **not** allow any dirt into the cylinder. The surface **must** be free of dirt, oil, and gasket material, but does **not** have to look like new metal.

NOTE: Check the top surface of the block for wear. If fretting damage is present in an area where a head gasket seal ring or a grommet makes contact, the surface must be repaired. Refer to the Alternative Repair Manual.

NOTE: Fretting damage in any other area is acceptable **only** if it does not change the protrusion measurement of the counterbore or liner.

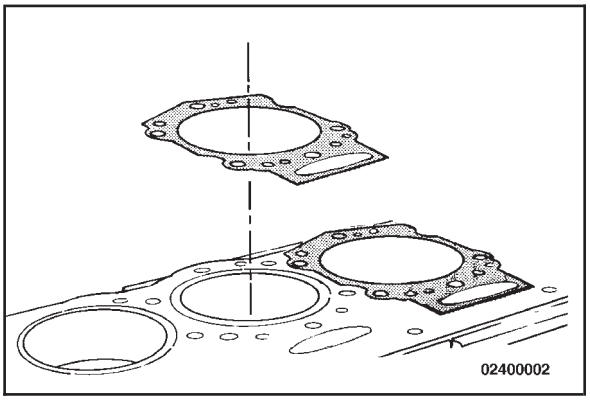


Visually inspect the groove pins for damage. Use the ST-1134 dowel pin extractor, or equivalent to remove the pins.



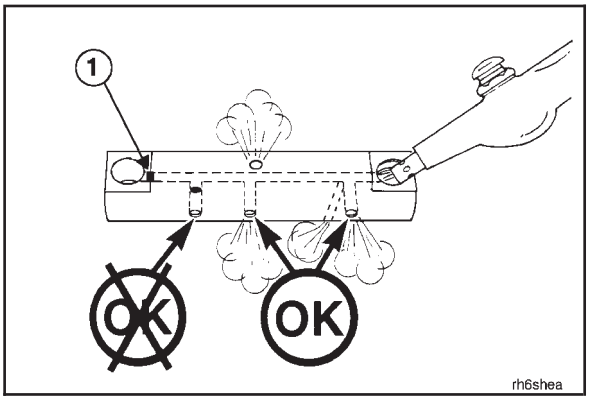
Inspect the cylinder block to determine if an oversize or a standard size head gasket is required.

NOTE: An oversize head gasket may be required on blocks that have had material removed from the top surface of the block. Check the block for markings indicating an oversized gasket is required.



NOTE: The word TOP stamped on top of the head gasket **must** be visible after the gasket is installed.

Install the gasket.



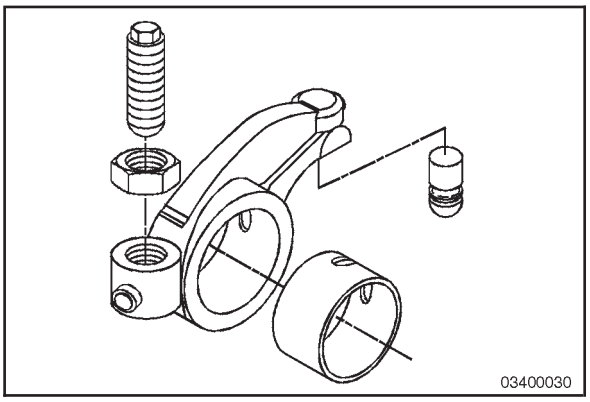
Clean

⚠ 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.

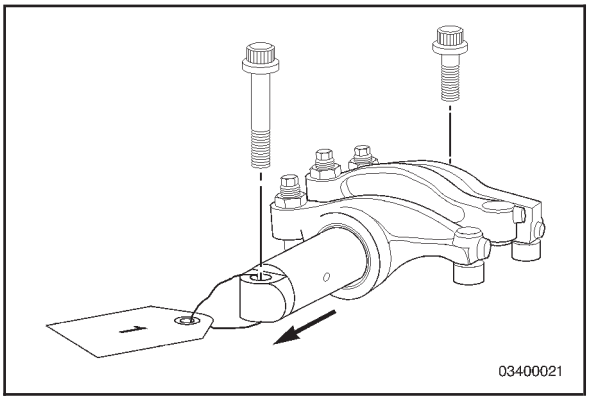
Use solvent. Clean the shaft. Use compressed air to blow through the oil drillings, to be sure that the nine oil holes are not blocked.

The plug (1) in the main oil rifle of the rocker shaft must be installed in the ring dowl end of the shaft (exhaust lever end).



Use solvent to clean the parts.

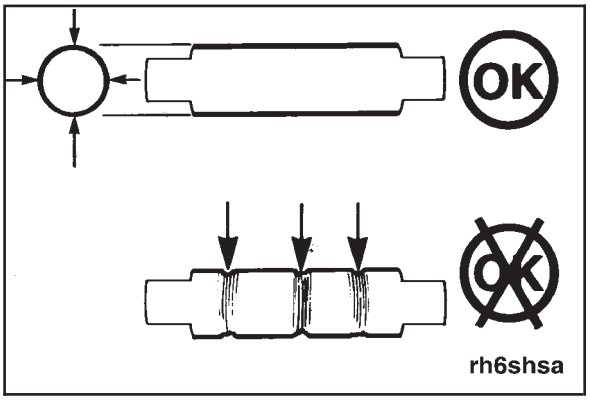
Use compressed air to blow through the oil drillings, to be sure that they are not blocked.



Inspect for Reuse

Remove the capscrews and hardened washers. Pull the shaft out of the rocker levers.

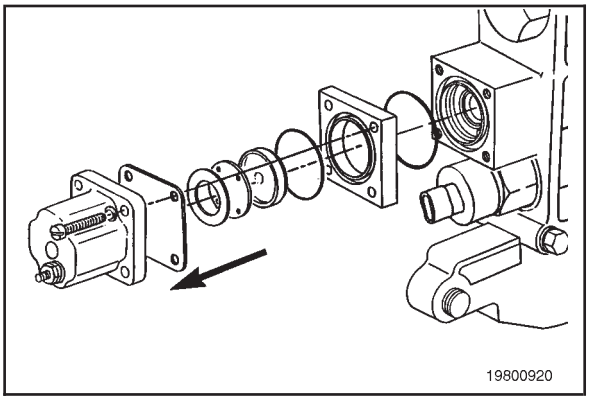
Clean and inspect the parts for damage.



Inspect the shaft for damage or roughness.

Measure the O.D.

Rocker Arm Shaft O.D.		
mm		in
47.592	MIN	1.8737
47.634	MAX	1.8753



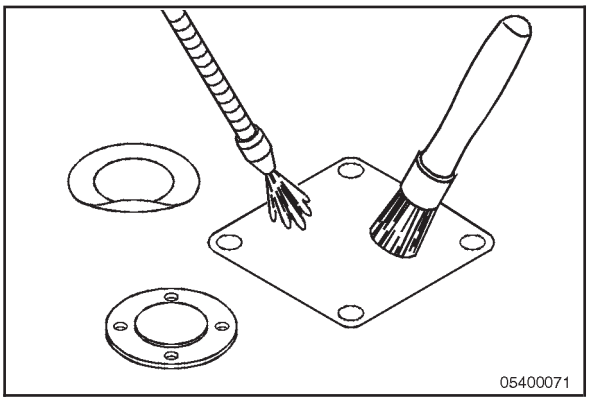
Remove the four capscrews.

Remove the coil housing and the fuel shield.

Discard the o-ring.

Remove the spring washer, valve disc, actuator disc, and actuator spacer from the valve housing.

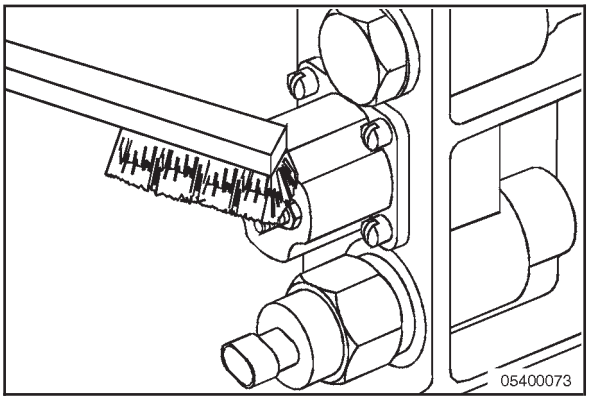
Discard the o-ring.



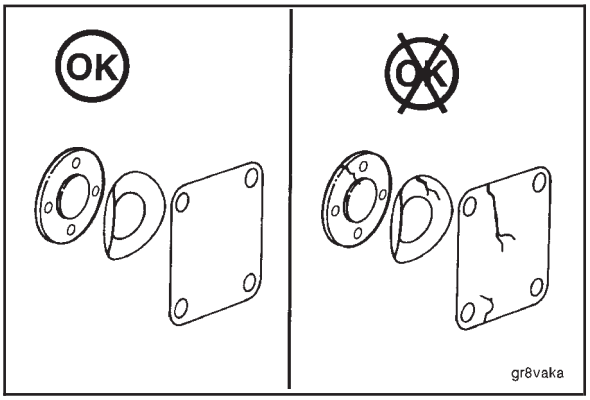
Clean

Use mineral spirits to clean all of the parts **except** the coil assembly.

NOTE: Do **not** get solvent on the coil. Clean the coil with a dry cloth. Use a 200 grit emery cloth and a flat surface to polish the coil surface.

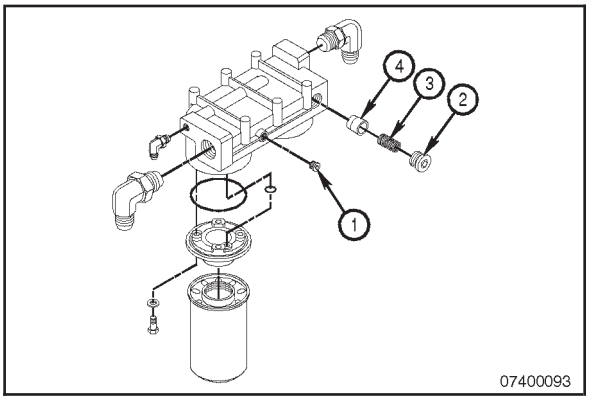


Use a wire brush to clean any corrosion from the coil terminal.



Inspect for Reuse

Visually check the valve disc, valve seat, and actuator disc for dirt, metal parts, bonding separation, corrosion, cracks, or wear. Replace if necessary.



Clean

⚠ WARNING ⚠

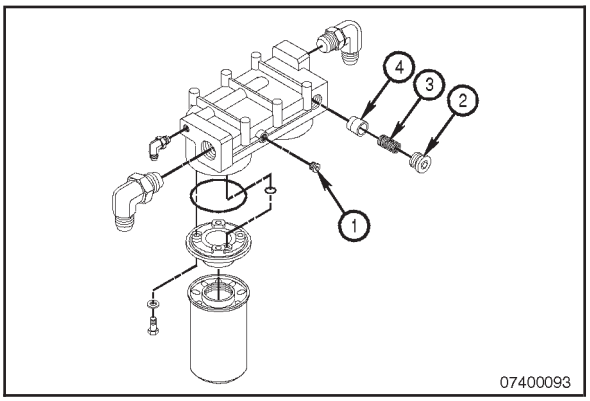
When using solvents, acids, or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to avoid personal injury.

⚠ CAUTION ⚠

All solvent must be removed from the filter head or engine damage could result.

Use solvent and clean all of the parts.

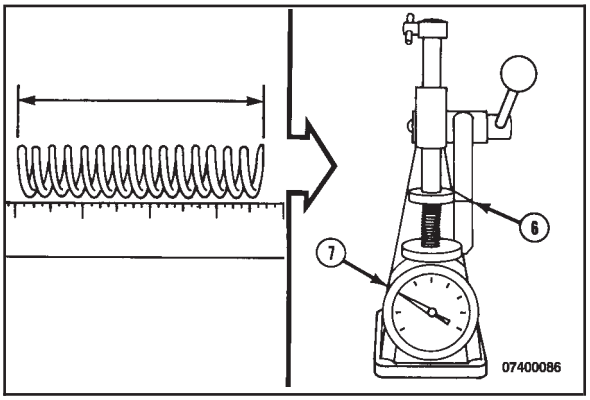
Dry with compressed air.



Inspect for Reuse

Inspect the filter head for crack.

If any cracks are found replace the filter head.

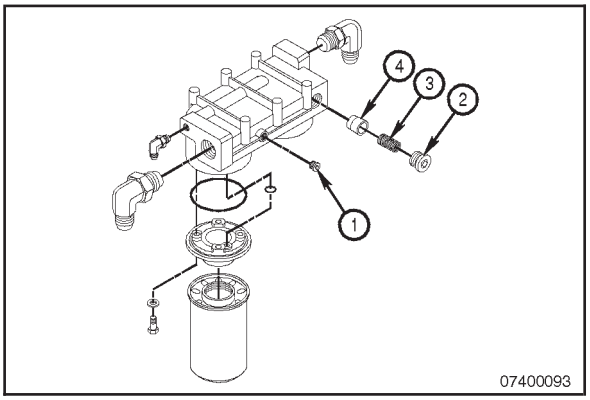


Check the bypass plunger spring.

Bypass Plunger Spring			
	mm		in
Free Length	88.98	MAX	3.500
Working Height (6)	50.80	MAX	2.000

Use a valve spring tester Part No. 3375182, or equivalent. Measure the spring force (7) and the working height (6).

Spring Force (7)		
N•m		ft-lb
26	MIN	19.3
29	MAX	21.3



Assemble

Use clean engine oil to lubricate the parts.

Install the new o-rings on the straight threaded plugs.

Install the plunger and spring.

Install the straight threaded o-ring plugs.

Tighten the plugs.

Torque Value:

9/16 Plug	14 N•m	[10 ft-lb]
1-3/16 Plug	54 N•m	[40 ft-lb]
1-7/8 Plug	95 N•m	[70 ft-lb]

Fan Drive Idler Arm Assembly (008-029)

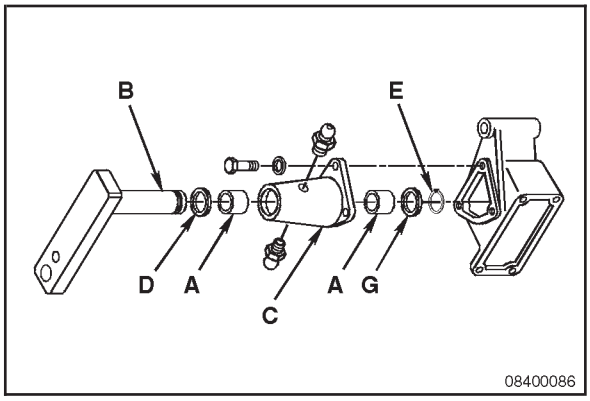
Disassemble

Remove the three mounting capscrews holding the pivot shaft support to the alternator support.

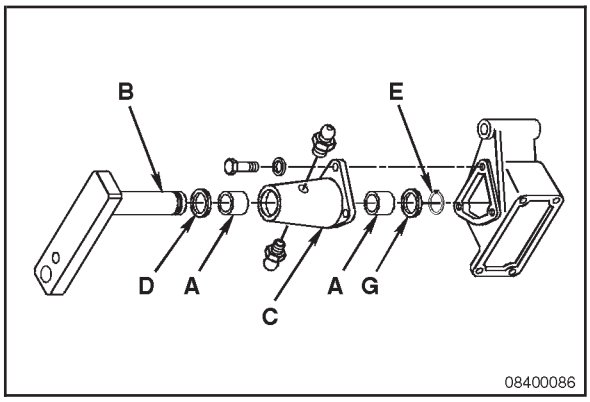
Remove the snap ring from the idler lever.

Remove the idler lever.

Remove the oil seals.



Remove the bushings from the pivot shaft support.



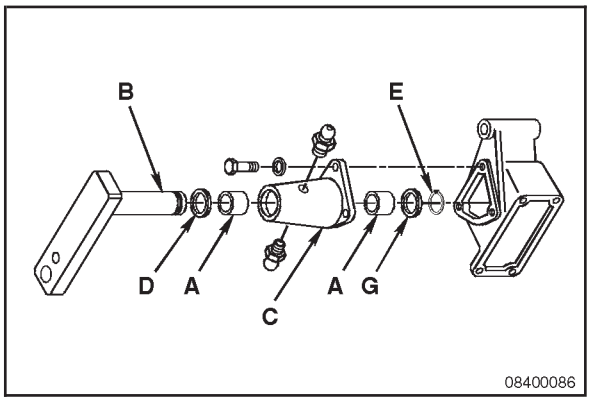
Clean

⚠ 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.

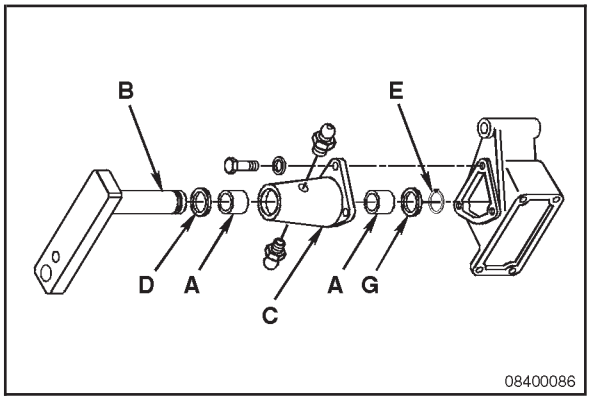
Use solvent to clean the parts.

Dry with compressed air.



Inspect for Reuse

Inspect the parts for any damage.



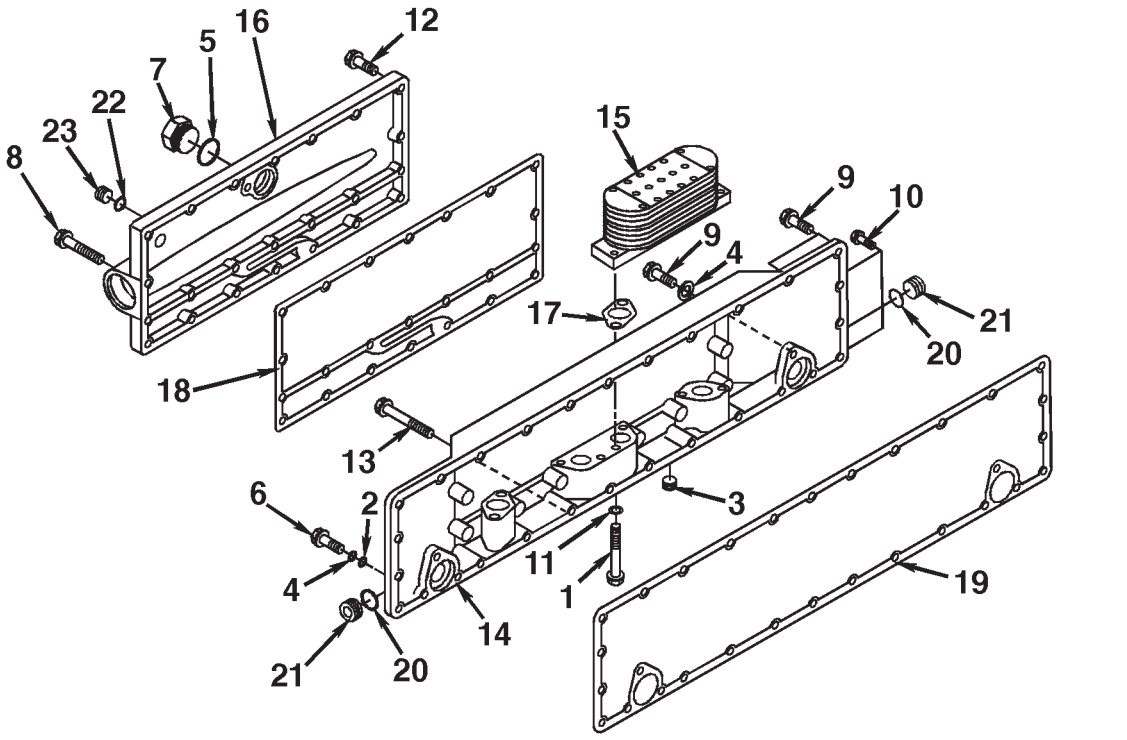
Torque Converter Cooler (008-065)

General Information

The engine mounted torque converter cooler is available as an **option**. This **option** can be added to a **standard** engine by purchasing the torque converter cooler housing, the cooler cover, and the elements.

The location of the turbocharger oil drain line, turbocharger water supply line, and the other components will have to be changed on some engines. The torque converter cooler is mounted and **replaces** the lubricating oil cooler cover. When the torque converter cooler **option** is selected, longer mounting capscrews **must** be used. With the torque converter cooler option, the turbocharger water supply line **must** also be moved from the oil cooler cover to a fitting in the top of the torque converter cooler housing.

Exploded View



07400103

1. Cover, Torque Converter Oil
2. Gasket, Lubricating Oil Cooler Cover
3. O-ring
4. Element, Lubricating Oil Cooler
5. Housing, Torque Converter Cooler
6. Nut, Self-Locking
7. Capscrew, Lock Washer, and Plain Washer
8. Capscrew and Lock Washer
9. Capscrew, Lock Washer, and Plain Washer
10. Capscrew, Lock Washer, and Plain Washer

Hydraulic Pump Drive (009-016)

General Information

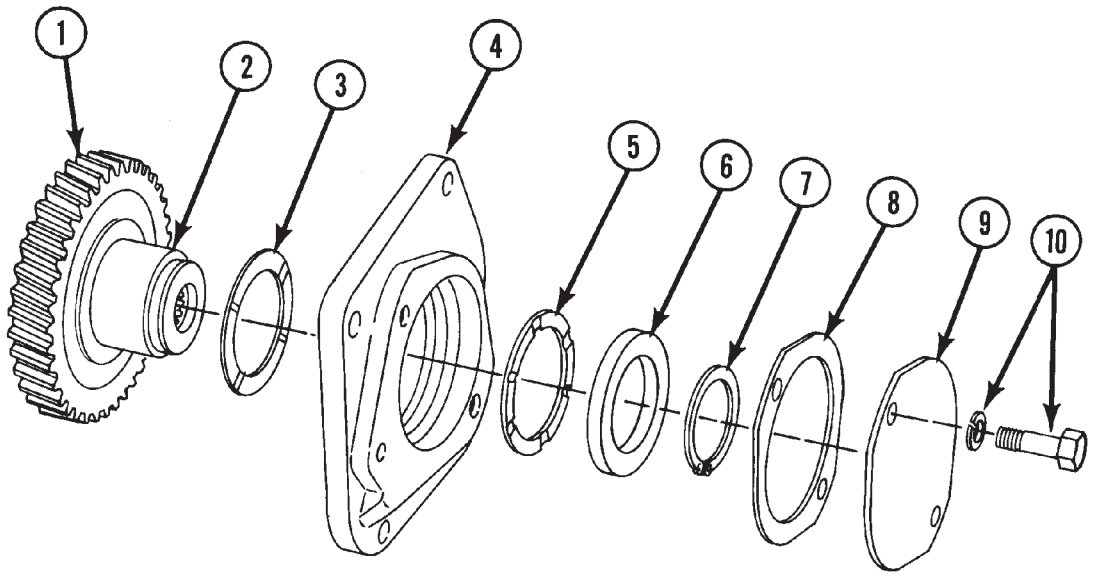
A hydraulic pump can be mounted on the **front** or at the **rear** of the gear cover.

The **SAE A two-bolt** type flange is required to mount a hydraulic pump at the **rear** of the gear cover. The **SAE B four-bolt** type flange is required for a hydraulic pump to be mounted on the **front** of the gear cover. There is a **specific** drive required to match the **different** sizes of spline drives required for the optional hydraulic pumps.

Engines that do **not** have a hydraulic pump drive **must** have parts that block the oil holes in the gear cover and housing for correct engine oil pressure. A **four-bolt** flange that has a blind plug welded to it **must** be installed on the **front** of the gear cover. The blind plug will extend into the bushing, blocking the oil drilling. A **three-bolt** cover that has two o-rings **must** be installed on the **rear** of the gear housing.

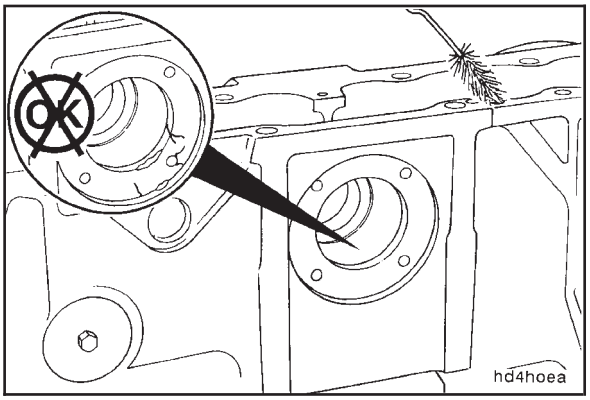
A hydraulic pump drive can be installed by removing the blind plug flange and the cover. If only the **rear** drive port is used, a plain **four-bolt** cover and gasket **must** be installed on the **front** of the cover. If only the **front** drive port is used, a **two-bolt** cover and gasket **must** be installed on the **rear** of the pump drive.

Exploded View



09400016

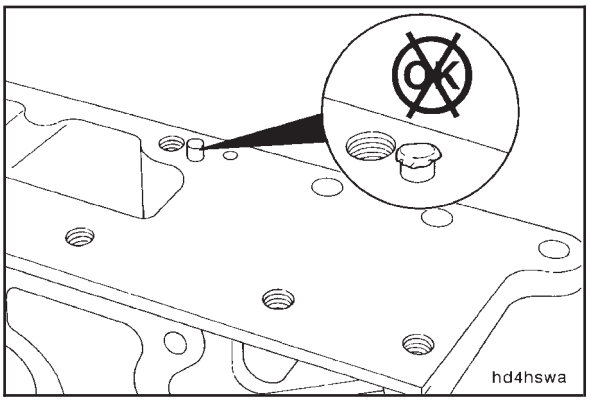
1. Gear, Hydraulic Pump Drive
2. Shaft, Hydraulic Pump Drive
3. Bearing, Thrust
4. Housing, Hydraulic Pump Drive
5. Bearing, Thrust
6. Washer, Clamping
7. Ring, Retaining
8. Gasket
9. Cover, Hydraulic Pump
10. Lock Washer and Locknut



Inspect for Reuse

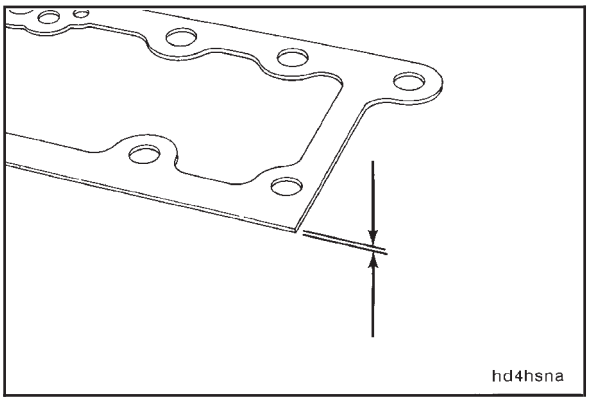
Use a bore cleaning brush and safety solvent. Clean and inspect the upper housing for damage. Clean and inspect all oil drillings for debris.

NOTE: Do **not** remove the 1-inch internal hex pipe plug in the upper housing near the center drive bore. Do **not** remove the 1/8-inch pipe plug that is on the same housings located on the engine side of the housing into the right side outboard hydraulic bushing bore.



Inspect the two rear gear train upper housing dowel pins in the top of the lower housing. Any damaged dowels **must** be replaced.

Use dowel pin remover, Part No. ST-1134, to remove the dowel pins. Use a brass or lead hammer to install the dowel pins.



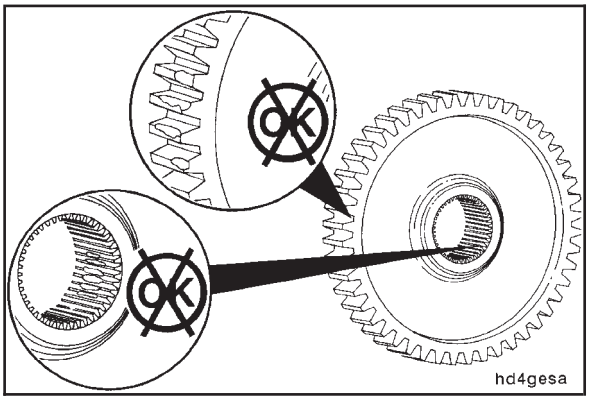
Measure the thickness of the gasket used on the rear gear train upper housing.

Refer to the following table for the part number and dimension.

Upper to Lower Housing Gasket Thickness — Nominal (New*)

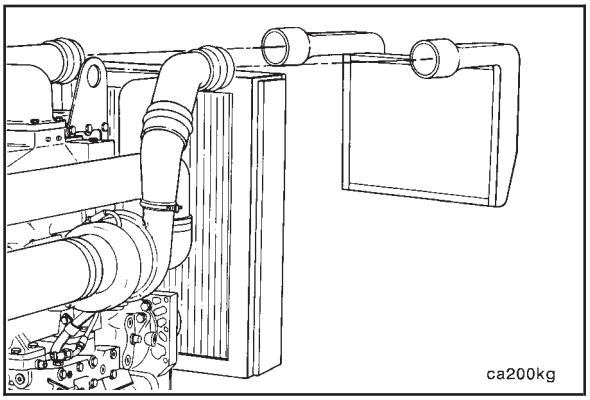
	mm		in
Part No. 205723	0.38	NOMINAL	0.015
Part No. 3077231	0.51	NOMINAL	0.020
Part No. 3201852	0.76	NOMINAL	0.030

NOTE: * Used gaskets measure thinner.



Clean and check the center gear for damage.

Check the gear teeth for excessive fretting. Check the internal splines for wear.

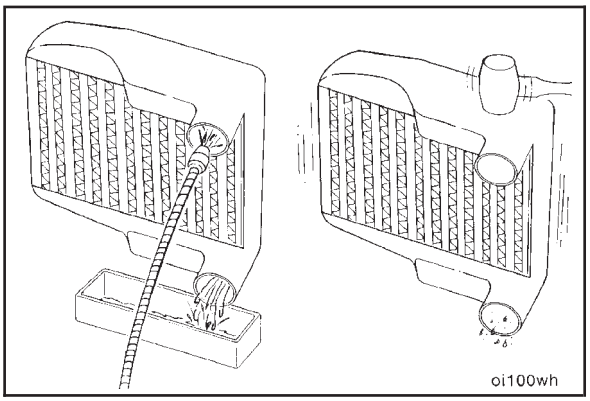


Charge Air Cooler (CAC) (010-027)

Clean

If the engine experiences a turbocharger failure or any other occasion where oil or debris is put into the CAC, (charge air cooler) the CAC **must** be cleaned.

Remove the CAC piping and CAC from the vehicle. Refer to the manufacturer's instructions.



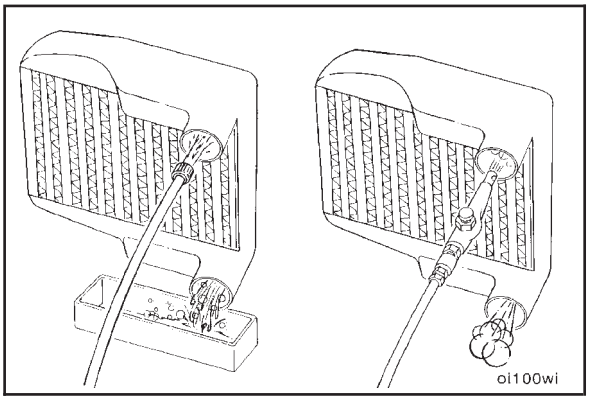
⚠ CAUTION ⚠

Do not use caustic cleaners to clean the CAC. Damage to the CAC will result.

Flush the CAC internally with solvent in the opposite direction of normal air flow. Shake the CAC and **lightly** tap on the end tanks with a rubber mallet to dislodge trapped debris. Continue flushing until **all** debris or oil is removed.

NOTE: Be sure the tubes are in the vertical direction when flushing.

If the debris **cannot** be totally removed from the CAC, the CAC **must** be replaced.

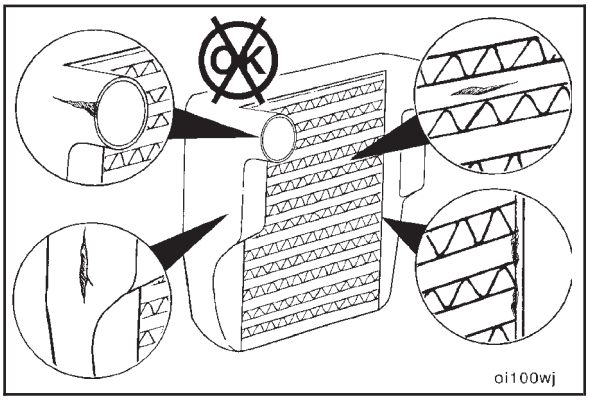


⚠ CAUTION ⚠

The CAC must be rinsed, dried and free of solvent, oil and debris or engine damage will result.

After the CAC has been thoroughly cleaned of all oil and debris with solvent, wash the CAC internally with hot soapy water to remove the remaining solvent. Rinse thoroughly with clean water.

Blow compressed air through the inside of the CAC in the opposite direction of normal air flow until the CAC is dry internally.



Inspect for Reuse

Visually inspect the CAC for cracks, holes or damage.

Inspect the tubes, the fins and the welds for tears, breaks or other damage. If any damage causes the CAC to fail the air leak check, the CAC **must** be replaced.

NOTE: Always clean and inspect the CAC piping and hoses prior to installation.

Short Circuit From Pin To Pin — Check

Short circuit from pin to pin is a condition where an electrical path exists between two pins where it is **not** suppose to exist.

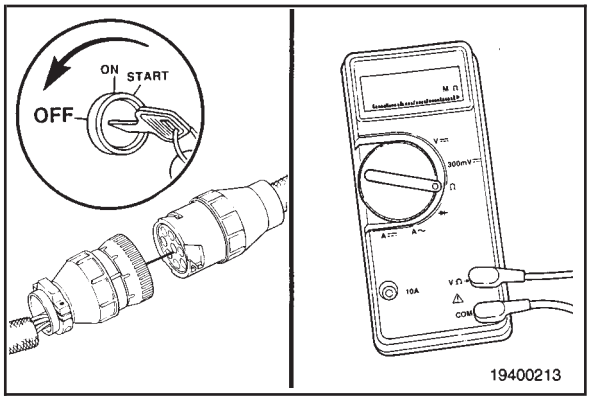
The procedure for checking short circuit from pin to pin is as follows:

Turn the key switch to the “OFF” position.

Disconnect the connector that needs to be tested.

Identify the pins that need to be tested.

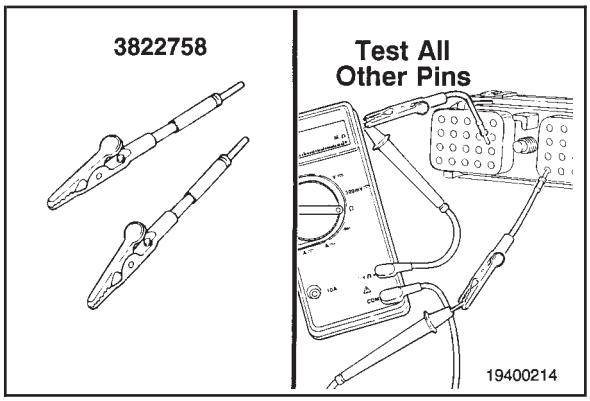
Turn the dial on the digital VOM to measure resistance.



Use the appropriate test leads from the wiring harness repair kit, Part No. 3822926, to avoid damage to the connector pins.

Touch one of the digital VOM leads to the correct pin to be tested on the harness side of the connector.

Touch the other lead of the digital VOM to all other pins on the harness side of this connector.



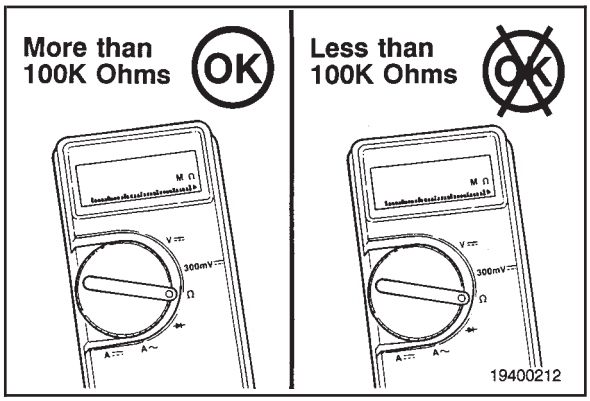
Read the value on the VOM display.

With the wiring harness disconnected from the ECM, theVOM **must** show greater than 100 KΩ which is an open circuit.

If the circuit is **not** open, the pins being checked are electrically connected.

Inspect the harness connectors for water which can cause an electrical connection.

Repair or replace the harness.



Voltage Checking

Voltage check is a procedure to measure the difference in voltage potential between two points.

To check voltage, turn the key switch to the “ON” position.

Disconnect the connectors that need to be tested.

Identify the pins that need to be tested.

Turn the dial on the digital VOM to AC voltage (V ~) or DC voltage (V-).