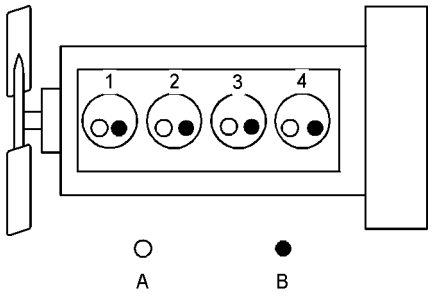
Specifications Section

i04134174

Engine Design



g01353215

Illustration 1

Cylinder and valve location

(A) Inlet valve
(B) Exhaust valve

Bore ..... 99 mm (3.90 inch)

Stroke ..... 110 mm (4.33 inch)

Displacement ..... 3.4 L (207 in^3)

Cylinder arrangement ..... In-line

Type of combustion ..... Direct injection

Compression ratio

Turbocharged aftercooled 17.5:1

Number of cylinders 4

Valves per cylinder 2

Firing order 1, 3, 4, 2

When the crankshaft is viewed from the flywheel end of the engine, the crankshaft rotates in the following direction: ..... Counterclockwise

When the camshaft is viewed from the flywheel end of the engine, the camshaft rotates in the following direction: ..... Counterclockwise

Note: The left side and the right side of the engine are viewed from the flywheel end. The No. 1 cylinder is the front cylinder.

i04346189

Fuel Injection Lines

⚠ WARNING

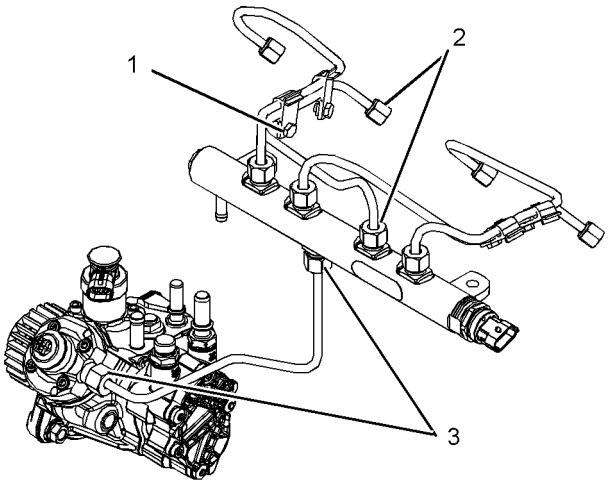
Contact with high pressure fuel may cause fluid penetration and burn hazards. High pressure fuel spray may cause a fire hazard. Failure to follow these inspection, maintenance and service instructions may cause personal injury or death.

Refer to Operation and Maintenance Manual, “General Hazard Information and High Pressure Fuel Lines” before adjustments and repairs are performed.

NOTICE

Refer to Systems Operation, Testing, and Adjusting, “Cleanliness of Fuel System Components” for detailed information on the standards of cleanliness that must be observed during ALL work on the fuel system.

Ensure that all adjustments and repairs are performed by authorized personnel that have had the correct training.



g02501177

Illustration 2

Typical example

(1) Tighten the screws to the following torque. ..... 10 N·m (89 lb in)

(2), (3) Torque for the nuts on the high-pressure fuel lines ..... 10 N·m (89 lb in)

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i04425594

Fuel Injection Pump

NOTICE
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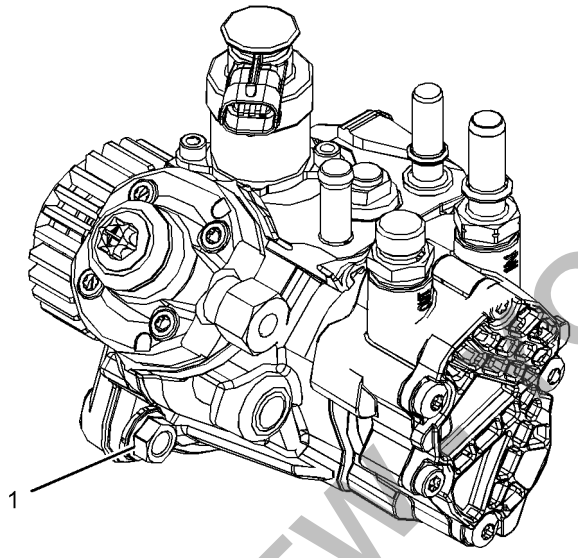


Illustration 3 g02621683
Typical example

Tighten the studs (not shown) to the following torque. ..... 10 N·m (89 lb in)

(1) Tighten the nuts to the following torque. .. 25 N·m (18 lb ft)

i04605670

Fuel Injectors

Refer to Operation and Maintenance Manual, “General Hazard Information and High Pressure Fuel Lines” before adjustments and repairs are performed.

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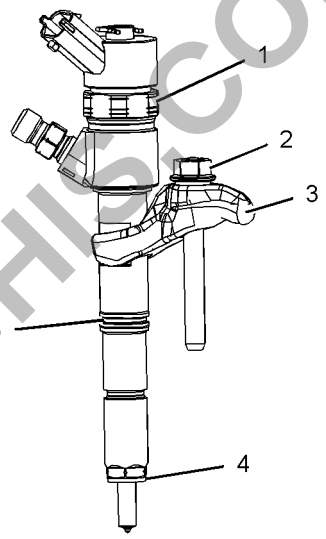


Illustration 4 g02501296
Typical example
(3) Clamp
(4) Washer
(5) O ring seal

(1) Tighten the injector fastening nut to an initial torque. ..... 15 N·m (11 lb ft)

(1) Tighten the injector fastening nut to a final torque. ..... 25 N·m (18 lb ft)

(2) Torque for the bolt in the clamp for the fuel injection nozzle ..... 20 N·m (15 lb ft)

i04424589

Fuel Filter Base (Secondary Fuel Filter Base)

NOTICE
Refer to Systems Operation, Testing, and Adjusting, “Cleanliness of Fuel System Components” for detailed information on the standards of cleanliness that must be observed during ALL work on the fuel system.

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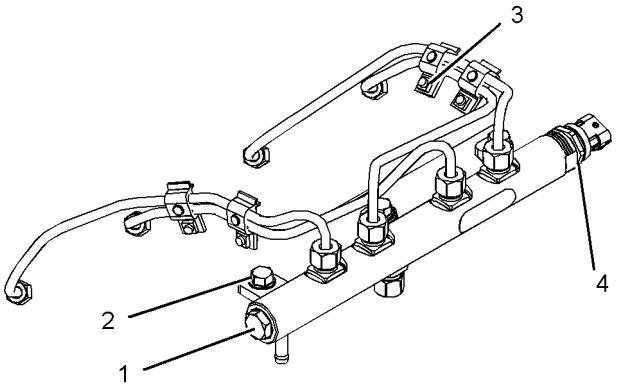


Illustration 7 g02621238
Typical example

(1) Tighten the fuel pressure relief valve to the following torque. ..... 100 N·m (74 lb ft)

(2) Tighten the bolts to the following torque. .. 25 N·m (18 lb ft)

(3) Tighten the bolts to the following torque. .. 10 N·m (89 lb in)

(4) Tighten the fuel pressure sensor to the following torque. ..... 70 N·m (52 lb ft)

i04332521

Lifter Group

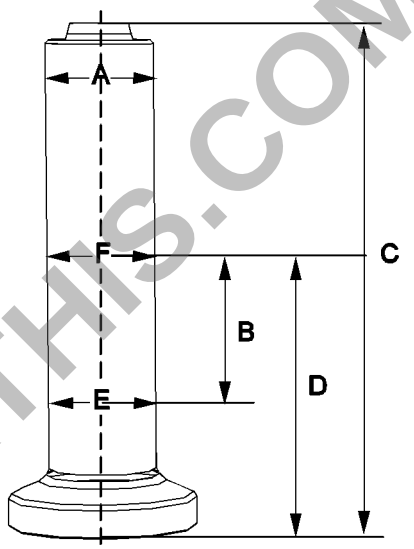


Illustration 8 g02488296
Typical example
(B) 26 mm (1.02362 inch)
(D) 38 ± 0.25 mm (1.49606 ± 0.00984 inch)

(A) Diameter of the lifter body ..... 14.780 ± 0.04 mm (0.58189 ± 0.00157 inch)

(C) Height of the lifter body ..... 67 ± 0.25 mm (2.63779 ± 0.00984 inch)

(E) Diameter of the lifter body ..... 14.970 ± 0.02 mm (0.58937 ± 0.00079 inch)

(F) Diameter of the lifter body ..... 14.780 ± 0.04 mm (0.58189 ± 0.00157 inch)

Bore diameter in the cylinder block .. 15.4 to 15.6 mm (0.60630 to 0.61417 inch)

Clearance

Clearance of the lifter ..... 0.020 to 0.054 mm (0.00079 to 0.00213 inch)

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Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or to other persons.

The hazards are identified by the “Safety Alert Symbol” and followed by a “Signal Word” such as “DANGER”, “WARNING” or “CAUTION”. The Safety Alert “WARNING” label is shown below.

⚠ WARNING

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning explains the hazard and can be either written or pictorially presented.

Operations that may cause product damage are identified by “NOTICE” labels on the product and in this publication.

Perkins cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. If a tool, procedure, work method or operating technique that is not specifically recommended by Perkins is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that the product will not be damaged or be made unsafe by the operation, lubrication, maintenance or repair procedures that you choose.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Perkins dealers or Perkins distributors have the most current information available.

⚠ WARNING

When replacement parts are required for this product Perkins recommends using Perkins replacement parts.

Failure to heed this warning can lead to premature failures, product damage, personal injury or death.

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The end play of the idler gear ... 0.3 to 0.483 mm (0.01181 to 0.01902 inch)

Number of teeth 31

(4) Camshaft gear

Torque for the bolt for the camshaft gear .. 36 N·m (27 lb ft)

Number of teeth 72

(5) Crankshaft gear

Bore diameter of crankshaft gear .... 50.88 to 50.92 mm (2.00315 to 2.00472 inch)

Outside diameter of crankshaft hub ..... 50.984 to 51.000 mm (2.00724 to 2.00787 inch)

Clearance of gear on crankshaft ..... −0.06 to -0.12 mm (−0.00236 to -0.00472 inch)

Number of teeth 36

(6) Oil pump idler gear

Inside diameter of oil pump idler gear bearing ..... 16.012 to 16.043 mm (0.63039 to 0.63161 inch)

Outside diameter of oil pump idler gear shaft ..... 15.987 to 16.000 mm (0.62941 to 0.62992 inch)

End play of the oil pump idler gear ..... 0.05 to 0.15 mm (0.00197 to 0.00591 inch)

(7) Oil pump gear

Inside diameter of oil pump gear bearing ..... 15.932 to 15.957 mm (0.62724 to 0.62823 inch)

Outside diameter of oil pump gear shaft ..... 15.987 to 16.013 mm (0.62941 to 0.63043 inch)

End play of the oil pump gear ... 0.05 to 0.15 mm (0.00197 to 0.00591 inch)

Backlash values

Backlash between the fuel injection pump gear (1) and the idler gear (2) ..... 0.07 to 0.17 mm (0.00276 to 0.00669 inch)

Backlash between the idler gear (2) and the accessory drive gear (if equipped) (3) ... 0.07 to 0.17 mm (0.00276 to 0.00669 inch)

Backlash between the idler gear (2) and the camshaft gear (4) ..... 0.07 to 0.17 mm (0.00276 to 0.00669 inch)

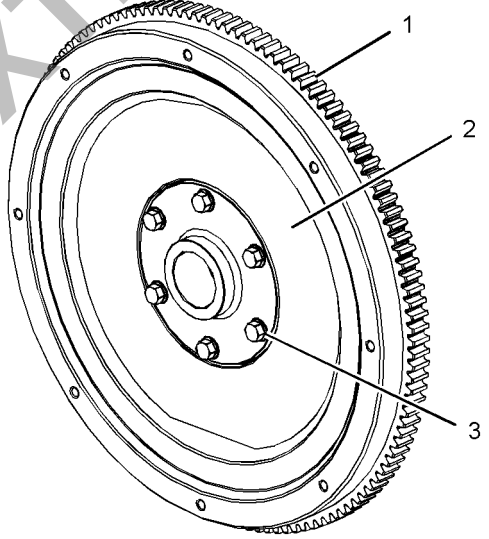
Backlash between the camshaft gear (4) and the crankshaft gear (5) ..... 0.07 to 0.17 mm (0.00276 to 0.00669 inch)

Backlash between the crankshaft gear (5) and the oil pump idler gear (6) ..... 0.07 to 0.17 mm (0.00276 to 0.00669 inch)

Backlash between the oil pump idler gear (6) and the oil pump gear (7) ..... 0.07 to 0.17 mm (0.00276 to 0.00669 inch)

i04346169

Flywheel



g02501156

Illustration 58

Typical example

(1) Flywheel ring gear

Heat the flywheel ring gear to the following temperature. ..... 180° C (356° F)

Note: Do not use an oxyacetylene torch to heat the flywheel ring gear.

(2) Flywheel

(3) Bolt

Tighten the flywheel bolts to an initial torque. ..... 30 N·m (22 lb ft)
Tighten the flywheel bolts to the additional amount. ..... 90 degrees

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Table 1

854F-E34T and 854E-E34TA Engine Specifications	
Operating Range (rpm)	800 to 2500[1]
Number of Cylinders	4 In-Line
Bore	99 mm (3.89763 inch)
Stroke	110 mm (4.33070 inch)
Power	854F 45 to 55.4 kW (60.345 to 74.3 hp) 854E 62 to 86 kW (83.142 to 115.326 hp)
Aspiration	854F Turbocharged 854E Turbocharged charge cooled
Compression Ratio	17: 1
Displacement	3.4 L (207.48 cubic inch)
Firing Order	1-3-4-2
Rotation (flywheel end)	Counterclockwise

(1) The operating rpm is dependent on the engine rating, the application, and the configuration of the throttle.

Engine Type

There are three different engine types. The 854E-E34TA is turbocharged, charge cooled engine, with a wall flow DPF. The letters JR will be on the identification plate.

The 854F-E34T is divided into two different engine types. The engine with JS on the identification plate will have a wall flow DPF. The engine with the letters JT on the identification plate will have a through flow DPF.

Electronic Engine Features

The engine operating conditions are monitored. The Electronic Control Module (ECM) controls the response of the engine to these conditions and to the demands of the operator. These conditions and operator demands determine the precise control of fuel injection by the ECM. The electronic engine control system provides the following features:

- Engine monitoring
- Engine speed governing
- Control of the injection pressure
- Cold start strategy
- Automatic air/fuel ratio control
- Torque rise shaping
- Injection timing control
- System diagnostics
- Aftertreatment Regeneration

For more information on electronic engine features, refer to the Operation and Maintenance Manual, “Features and Controls” topic (Operation Section).

Engine Diagnostics

The engine has built-in diagnostics in order to ensure that the engine systems are functioning correctly. The operator will be alerted to the condition by a “Stop or Warning” lamp. Under certain conditions, the engine horsepower and the vehicle speed may be limited. The electronic service tool may be used to display the diagnostic codes.

There are three types of diagnostic codes: active, logged, and event.

Most of the diagnostic codes are logged and stored in the ECM. For additional information, refer to the Operation and Maintenance Manual, “Engine Diagnostics” topic (Operation Section).

The ECM provides an electronic governor that controls the injector output in order to maintain the desired engine rpm.

Engine Cooling and Lubrication

The cooling system and lubrication system consists of the following components:

- Belt driven centrifugal water pump
- Water temperature regulator which regulates the engine coolant temperature
- Gear-driven rotor type oil pump
- Multi plate oil cooler

The engine lubricating oil is cooled and the engine lubricating oil is filtered.

Engine Service Life

Engine efficiency and maximum utilization of engine performance depend on the adherence to proper operation and maintenance recommendations. In addition, use recommended fuels, coolants, and lubricants. Use the Operation and Maintenance Manual as a guide for required engine maintenance.

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Table 4

Indicator Operation					
During passive regeneration no indicator will be illuminated					
Aftertreatment Indicator	**Aftertreatment Indicator State**	**Warning Indicator**	**Warning Indicator State**	**Description**	**Action Required**
Regeneration Active indicator	On Solid	None	None	Regeneration is activated. The indicator will stay illuminated during regeneration.	None
			-		
DPF Indicator	On Solid	None	None	The indicator provides a general indication of the soot load. The indicator is off when the soot load is normal.	A regeneration is required. In automatic mode the ECM will decide when to allow the active regeneration. If the DPF indicator stays illuminated allow a manual regeneration without interruption. An uninterrupted active regeneration will reset the DPF indicator.
			-		
DPF Indicator	On Solid	Amber indicator	Flashing	The indicator indicates that the soot load has increased. The engine will derate.	A manual regeneration is required. Perform a manual regeneration, or a service regeneration will be required.
			-		
DPF Indicator	On Solid	Amber indicator	Flashing	The flashing warning indicator and red stop indicator indicates that the engine has continued to be operated while a regeneration is required. The engine will be derated and the engine should be shut down immediately.	**Once the engine enters into shutdown mode, you must contact your Perkins distributor or your Perkins dealer.** Your dealer or distributor will need to perform a service level regeneration. **The DFP may need to be replaced.**
-	-	Red indicator (STOP)	On Solid		

Note: Amber or yellow warning indicator can be used as a diagnostic lamp. For more information refer to this Operation and Maintenance Manual, “Diagnostic Lamp”.

Regeneration Operation

Regeneration will require the following conditions:

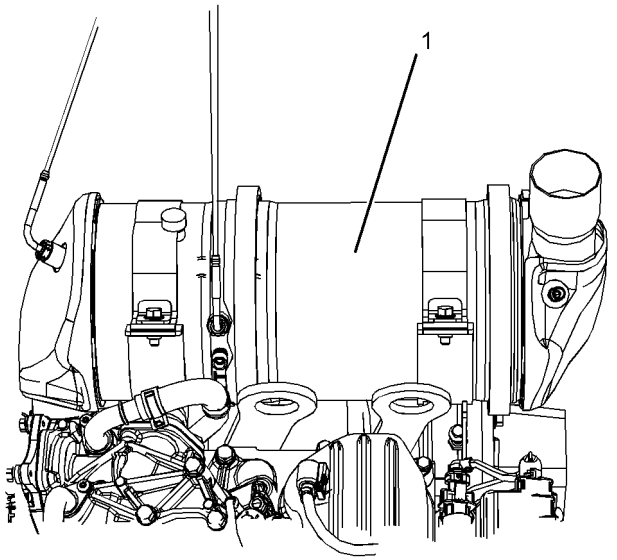
Automatic Regeneration

In order for an automatic regeneration to take place the engine must be at operating temperature.

Turning the keyswitch to the OFF position during a regeneration will stop the regeneration. An interrupted regeneration will not remove the soot from the DPF and will waste fuel.

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g02524596

Illustration 47

Typical example

Note: Only the wall flow type of aftertreatment requires a service period, in order to remove the ash. The wall flow aftertreatment uses active regeneration in order to remove soot.

For information on removal of the (1) diesel particulate filter, refer to Disassembly and Assembly, “DPF - Remove”. Also, refer to System Operation Testing and Adjusting, “Diesel Particulate Filter - Clean”.

i02151646

Driven Equipment - Check

Refer to the OEM specifications for more information on the following maintenance recommendations for the driven equipment:

- Inspection
- Adjustment
- Lubrication
- Other maintenance recommendations

Perform any maintenance for the driven equipment which is recommended by the OEM.

i03991933

Engine - Clean

⚠ WARNING

Personal injury or death can result from high voltage.

Moisture can create paths of electrical conductivity.

Make sure that the electrical system is OFF. Lock out the starting controls and tag the controls “DO NOT OPERATE”.

NOTICE

Accumulated grease and oil on an engine is a fire hazard. Keep the engine clean. Remove debris and fluid spills whenever a significant quantity accumulates on the engine.

Periodic cleaning of the engine is recommended. Steam cleaning the engine will remove accumulated oil and grease. A clean engine provides the following benefits:

- Easy detection of fluid leaks
- Maximum heat transfer characteristics
- Ease of maintenance

Note: Caution must be used in order to prevent electrical components from being damaged by excessive water when the engine is cleaned. Pressure washers and steam cleaners should not be directed at any electrical connectors or the junction of cables into the rear of the connectors. Avoid electrical components such as the alternator, the starter, and the ECM. Protect the fuel injection pump from fluids in order to wash the engine.

Aftertreatment

During the engine cleaning process, ensure that water or cleaning fluids cannot enter the aftertreatment system. If cleaning fluids enters the aftertreatment system, damage could occur.

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Important Safety Information

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Failure to heed this warning can lead to premature failures, product damage, personal injury or death.

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The operating range for the engine oil pressure switch ..... 30 to 90 kPa (4 to 13 psi)

Temperature Sensors

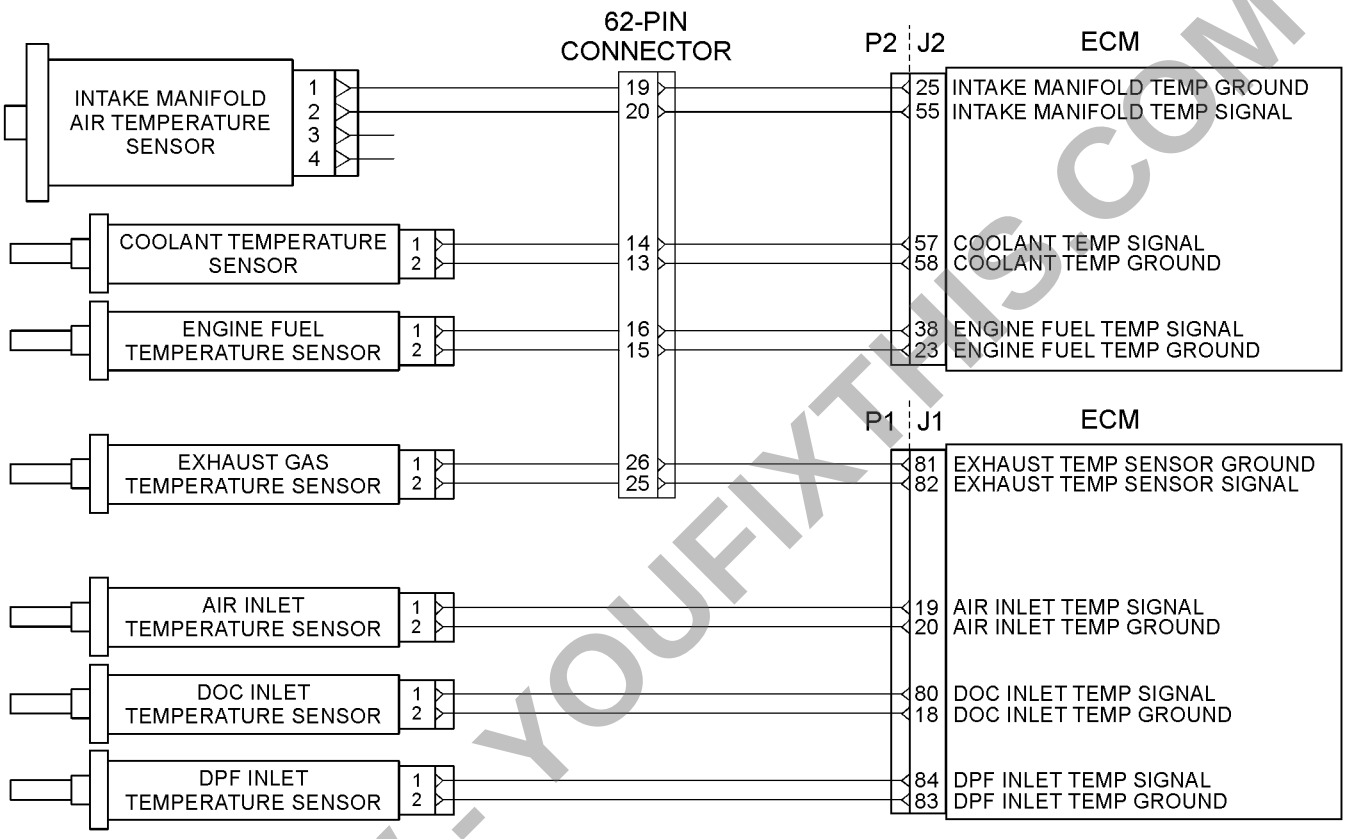


Illustration 34 g02638984

Schematic for the temperature sensors

The air inlet temperature sensor and the coolant temperature sensor are passive sensors. Each sensor provides a temperature input to the ECM. The ECM controls following operations:

- Fuel delivery
- Injection timing

The sensors are also used for engine monitoring.

i04356329

Power Sources

Introduction

The engine supplies power to the ECM. The ECM powers the following components:

- All sensors
- The control valve for the fuel injection pump
- The solenoid for the wastegate
- Diagnostic connector
- Electronic unit injectors

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2. Remove the water temperature regulator housing.

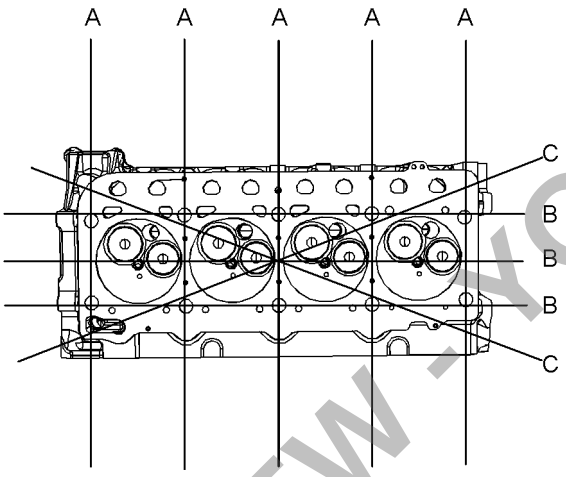
3. Inspect the cylinder head for signs of gas or coolant leakage.

4. Remove the valve springs and valves.

5. Clean the bottom face of the cylinder head thoroughly. Clean the coolant passages and the lubricating oil passages. Make sure that the contact surfaces of the cylinder head and the cylinder block are clean, smooth, and flat.

6. Inspect the bottom face of the cylinder head for pitting, corrosion, and cracks. Inspect the area around the valve seat inserts and the holes for the fuel injection nozzles carefully.

7. Test the cylinder head for leaks at a pressure of 200 kPa (29 psi).



g02490336

Illustration 60

Flatness of the cylinder head (typical example)

(A) Side to side
(B) End to end
(C) Diagonal

8. Measure the cylinder head for flatness. Use a straight edge and a feeler gauge to check the cylinder head for flatness.

   - Measure the cylinder head from one side to the opposite side (A).
   - Measure the cylinder head from one end to the opposite end (B).
   - Measure the cylinder head from one corner to the opposite corner (C).

Refer to Specifications, “Cylinder Head” for more information.

i04156372

Piston Height - Inspect

Table 10

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	21825617	Dial Gauge	1
B	21825496	Dial gauge holder	1

If the height of the piston above the cylinder block is not within the tolerance that is given in Specifications, “Piston and Rings”, the bearing for the piston pin must be checked. Refer to Systems Operation, Testing and Adjusting, “Connecting Rod - Inspect”. If any of the following components are replaced or remachined, the piston height above the cylinder block must be measured:

- Crankshaft
- Cylinder head
- Connecting rod
- Bearing for the piston pin

The correct piston height must be maintained in order to ensure that the engine conforms to the standards for emissions.

Note: The top of the piston should not be machined. If the original piston is installed, be sure that the original piston is assembled to the correct connecting rod and installed in the original cylinder.

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24. Repeat Step 19 through Step 23 in order to remove the remaining fuel injection lines from the fuel manifold to the electronic unit injectors.

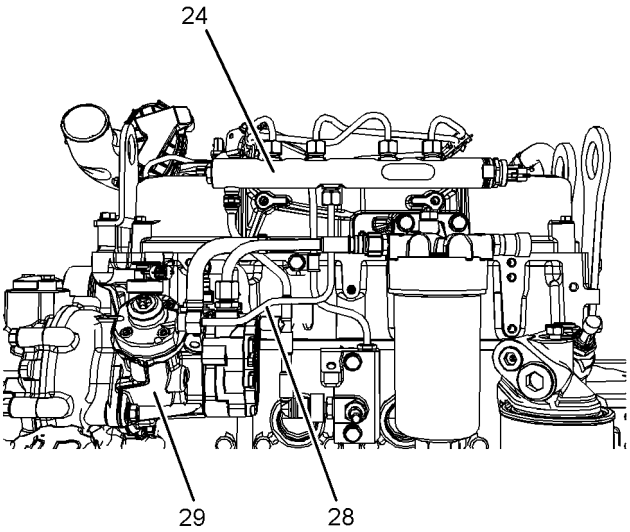


Illustration 23 g02688011

25. Clean the area around the nuts for fuel injection line (28). Ensure that the area is free from contamination before beginning disassembly.

26. Disconnect fuel injection line (28) from fuel injection pump (29).

27. Disconnect fuel injection line (28) from fuel manifold (24).

28. Remove fuel injection line (28). **Discard the fuel injection line.**

29. Use Tooling (A) in order to cap all open ports immediately in fuel manifold (24) and in fuel injection pump (29).

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Fuel Injection Lines - Install

Installation Procedure

Table 7

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
B	-	LASER 4920 1/2 Inch Drive HP Fuel Line Socket Set	1

NOTICE

Ensure that all adjustments and repairs that are carried out to the fuel system are performed by authorized personnel that have the correct training.

Before beginning ANY work on the fuel system, refer to Operation and Maintenance Manual, "General Hazard Information and High Pressure Fuel Lines" for safety information.

Refer to System Operation, Testing and Adjusting, "Cleanliness of Fuel System Components" for detailed information on the standards of cleanliness that must be observed during ALL work on the fuel system.

Note: The following procedure should be adopted in order to install the fuel injection lines when the electronic unit injectors or the fuel manifold have not been removed. If the electronic unit injectors or the fuel manifold have been removed, refer to Disassembly and Assembly, "Electronic Unit Injector - Install" and Disassembly and Assembly, "Fuel Manifold - Install" for more information.

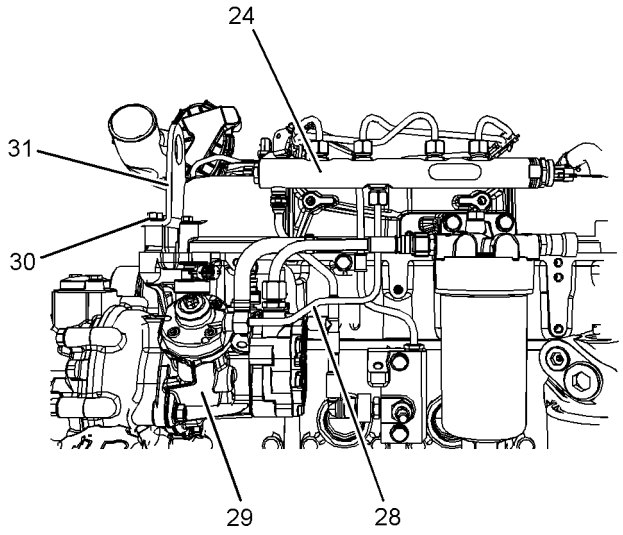


Illustration 24 g02699457

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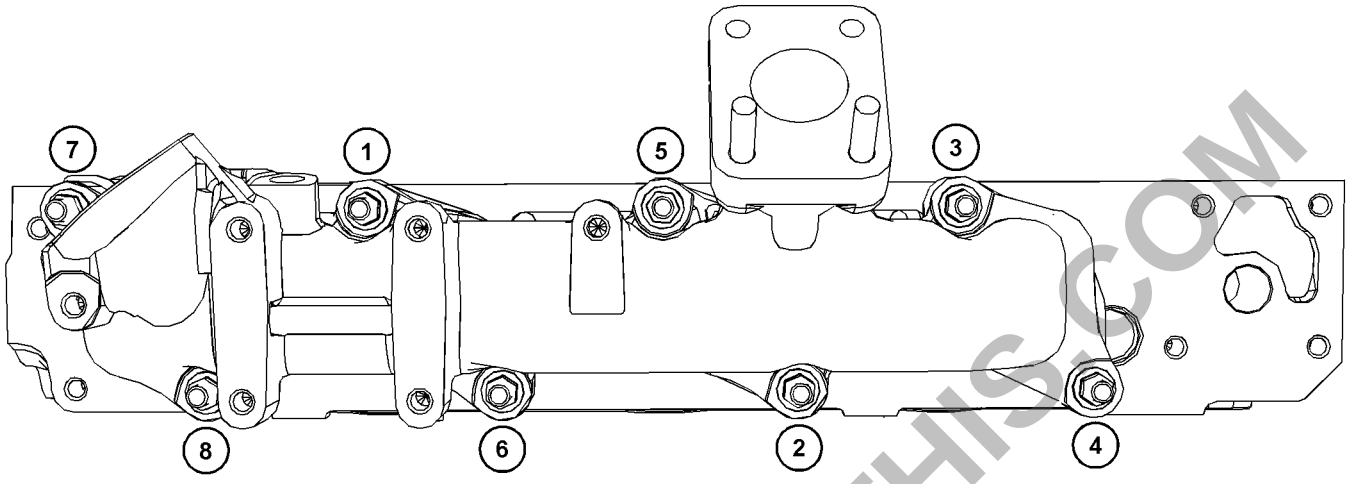


Illustration 92 g02725251

Tighten sequence of exhaust manifold

1. Remove tube assembly (1). Refer to Disassembly and Assembly, “Air Control Valve - Remove and Install” for the correct procedure.

2. Loosen nuts (5) in reverse numerical order. Refer to Illustration 92.

Note: Loosening the bolts in reverse numerical order will help prevent distortion of the exhaust manifold.

3. Remove nuts (5) and remove exhaust manifold (3) from the cylinder head.

4. Remove exhaust manifold gasket (6) (not shown).

5. If necessary, remove studs (2) from the exhaust manifold.

6. If necessary, remove studs (4) from the cylinder head.

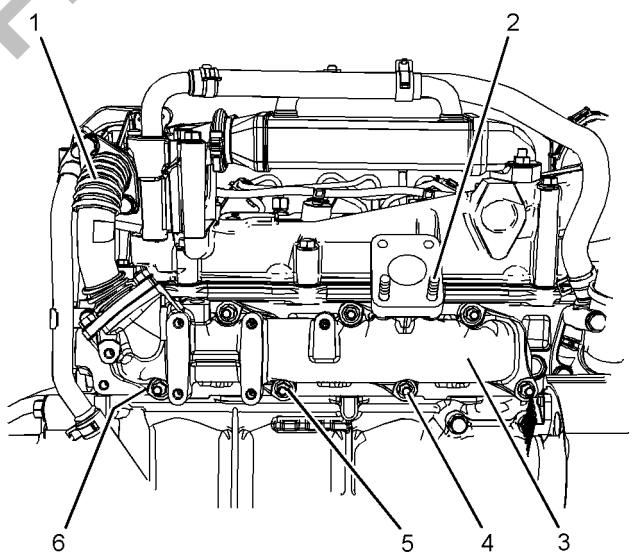


Illustration 93 g02725206

Installation Procedure

1. Ensure that the exhaust manifold is clean and free from damage. If necessary, replace the exhaust manifold. Clean the gasket surface of the cylinder head.

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Start By:

a. Remove the crankshaft rear seal. Refer to Disassembly and Assembly, “Crankshaft Rear Seal - Remove and Install” for the correct procedure.

b. Remove the engine oil pan. Refer to Disassembly and Assembly, “Engine Oil Pan - Remove and Install” for the correct procedure.

NOTICE
Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

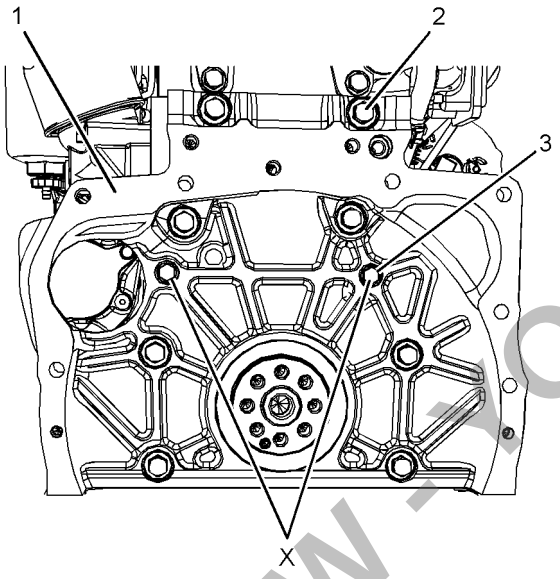


Illustration 161 g02879298

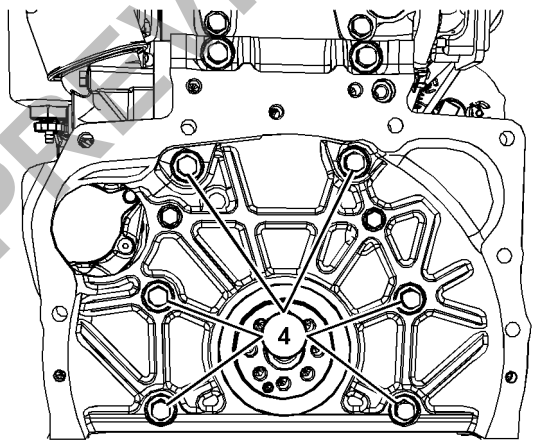


Illustration 162 g02879337

1. Remove the electric starting motor. Refer to Disassembly and Assembly, “Electric Starting Motor - Remove and Install” for the correct procedure.

2. Remove bolts (3) from Position (X) from flywheel housing (1).

3. Install Tooling (A) into Position (X) on flywheel housing (1).

4. Install a suitable lifting device to the flywheel housing in order to support the flywheel housing. The weight of the flywheel housing is approximately 40 kg (88 lb).

5. Remove bolts (2) from flywheel housing (1).

6. Remove bolts (4) from flywheel housing (1).

7. Use the suitable lifting device in order to remove flywheel housing (1) from the cylinder block.

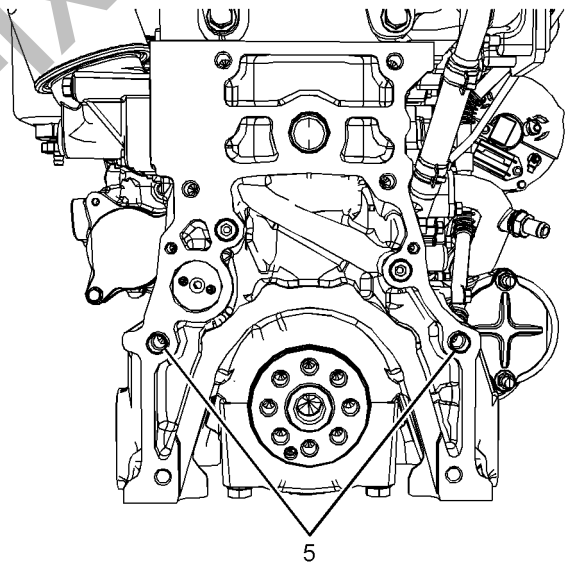


Illustration 163 g02879456

8. If necessary, remove dowels (5).

Installation Procedure

Table 32

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	-	Guide Stud M8 by 100 mm	2
B	-	Loctite 5970	1

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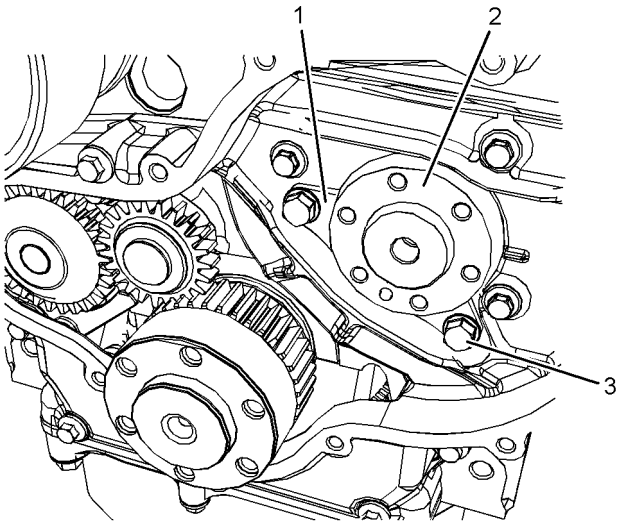


Illustration 240 g02946416

1. Clean camshaft (2) and clean thrust plate (1). Inspect the camshaft and the thrust plate for wear and damage. Refer to Specifications, “Camshaft” for more information. If necessary, replace any components that are worn or damaged.

2. Clean the camshaft bearing in the cylinder block. Inspect the camshaft bearing for wear and damage. Refer to Specifications, “Camshaft Bearings” for more information. If necessary, replace the camshaft bearing. Refer to Disassembly and Assembly, “Camshaft Bearing - Remove and Install”.

NOTICE
Replace all lifters when a new camshaft is installed.

3. Inspect the lifters for wear and for damage. Refer to Specifications, “Lifter Group” for more information. If necessary, replace any lifters that are worn or damaged. Refer to Disassembly and Assembly, “Lifter Group - Remove and Install” for the correct procedure.

4. Lubricate the lobes and the bearing surfaces of the camshaft with clean engine oil.

NOTICE
Do not damage the lobes or the bearings when the camshaft is removed or installed.

5. Carefully install camshaft (3) into the cylinder block. Leave the camshaft slightly protruding in order to allow installation of the thrust plate.

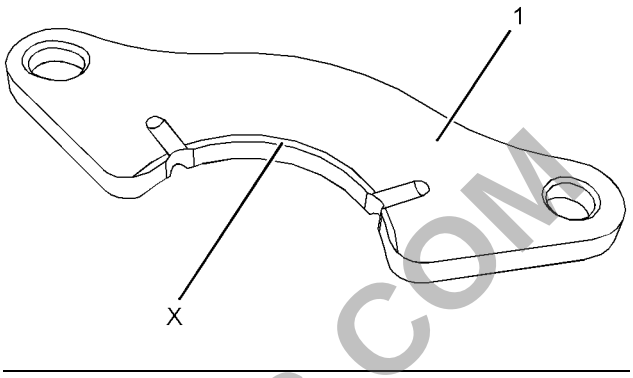


Illustration 241 g02948296

6. Lubricate thrust plate (1) with clean engine oil. Position the thrust plate onto the camshaft with the chamfer in Position (X) facing towards the cylinder block. Slide the camshaft into the cylinder block.

7. Install bolts (3) to thrust plate (1). Tighten the bolts to a torque of 25 N·m (221 lb in)

End By:

a. Install the camshaft gear. Refer to Disassembly and Assembly, “Camshaft Gear - Remove and Install” for the correct procedure.

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Camshaft Gear - Remove and Install

Removal Procedure

Table 52

Required Tools			
Tool	**Part Number**	**Part Description**	**Qty**
A	T400089	Timing Pin (Crankshaft)	1
B	-	Timing Pin (Camshaft)	1
C	-	Snap-on PBS650 Small Pry Bar	1

Start By:

a. Remove the rocker shaft and pushrods. Refer to Disassembly and Assembly, “Rocker Shaft and Pushrod - Remove” for the correct procedure.

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NOTICE

Ensure that all adjustments and repairs that are carried out to the fuel system are performed by authorized personnel that have the correct training.

Before beginning ANY work on the fuel system, refer to Operation and Maintenance Manual, "General Hazard Information and High Pressure Fuel Lines" for safety information.

Refer to System Operation, Testing and Adjusting, "Cleanliness of Fuel System Components" for detailed information on the standards of cleanliness that must be observed during ALL work on the fuel system.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Dispose of all fluids according to local regulations and mandates.

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Turn the fuel supply to the OFF position.
2. Turn the battery disconnect switch to the OFF position.

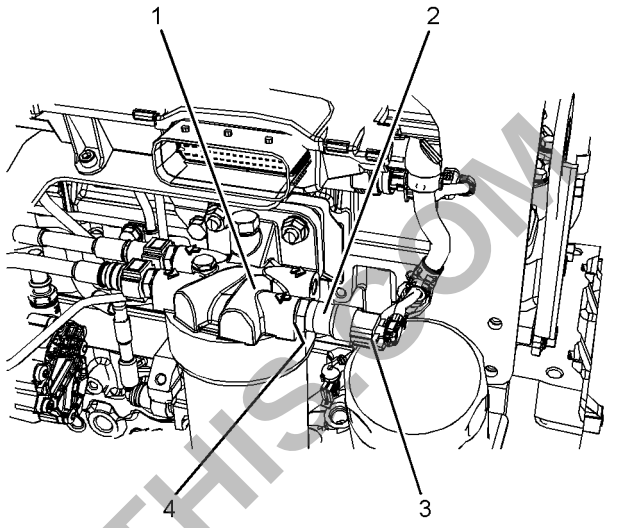


Illustration 302 g02876777

3. Disconnect harness assembly (3) from fuel temperature sensor (2).
4. Use a deep socket in order to remove fuel temperature sensor (2) from fuel filter base (1).
5. Use Tooling (A) to plug the open port of the fuel injection pump.
6. Remove sealing washer (4) (not shown) from fuel temperature sensor (2).

Installation Procedure

NOTICE

Keep all parts clean from contaminants.

Contaminants may cause rapid wear and shortened component life.

1. Ensure that all components are free from wear and damage. Replace any components that are worn or damaged.

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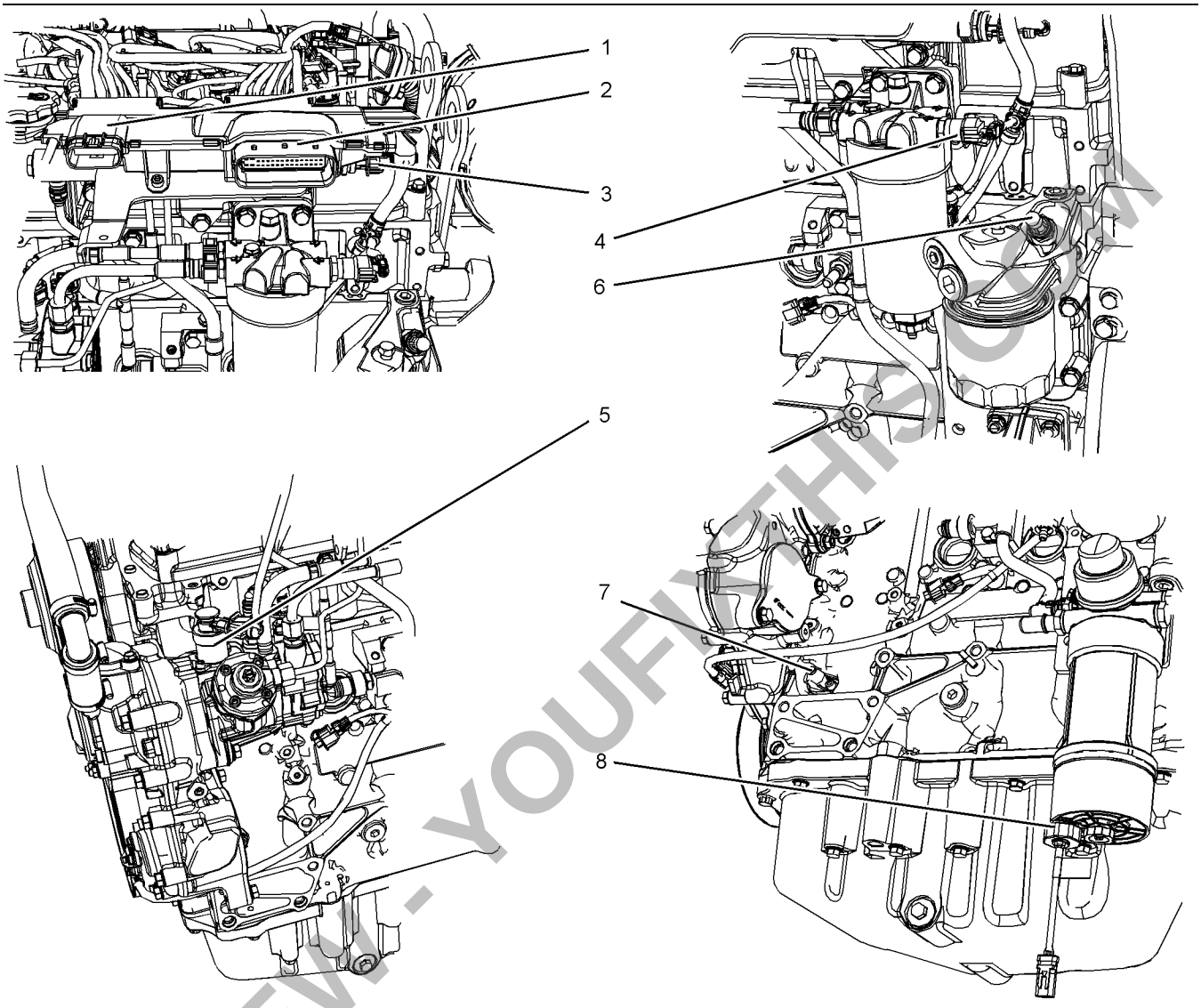


Illustration 8 g02737996

Close up views of the sensor locations on the left side of the engine (typical example)

(1) 10-pin engine interface connector (optional)
(2) 62-pin engine interface connector (optional)
(3) Fuel rail pressure sensor
(4) Fuel temperature sensor
(5) High-pressure fuel pump inlet metering valve
(6) Oil pressure switch
(7) Primary speed/timing sensor (crankshaft)
(8) Water In Fuel (WIF) sensor

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Table 14

Troubleshooting Test Steps	Values	Results
1. Insulation on the Exhaust Duct (if equipped) A. Check the insulation on the exhaust duct between the engine and the Clean Emissions Module (CEM). Make sure that insulation is not missing or damaged.	Codes	**Result:** The insulation is missing or damaged. Repair or replace the insulation. **Result:** The insulation is OK. Proceed to Test Step 2.
2. Diagnostic Codes A. Connect the electronic service tool to the diagnostic connector. B. Check for active diagnostic codes. C. Use the electronic service tool to perform a service regeneration. D. Check for active diagnostic codes on the electronic service tool.	Diagnostic codes	**Result:** There are active diagnostic codes. Investigate any active codes before continuing with this procedure. Refer to Troubleshooting, “Diagnostic Trouble Codes”. **Result:** There are no active diagnostic codes. Proceed to Test Step 3.
3. Maintenance Schedule A. Check the maintenance schedule for the DPF. Refer to the Operation and Maintenance Manual, “Maintenance Interval Schedule”.	Maintenance schedule	**Result:** The DPF is due for an ash service. Perform an ash service. Refer to the Operation and Maintenance Manual, “Diesel Particulate Filter - Clean”. **Result:** The DPF is not due for an ash service. Proceed to Test Step 4.

(continued)

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(Table 34, contd)

Troubleshooting Test Steps	Values	Results
5. Turbocharger **Note:** The turbocharger that is installed on the engine is a non-serviceable item. If any mechanical fault exists, then the faulty turbocharger must be replaced. A. Ensure that the mounting bolts for the turbocharger are tight. B. Check that the oil drain for the turbocharger is not blocked or restricted. C. Check that the compressor housing for the turbocharger is free of dirt and debris. Make sure that the housing is not damaged. D. Check that the turbine housing for the turbocharger is free of dirt and debris. Make sure that the housing is not damaged. E. Check that the turbine blades rotate freely in the turbocharger. F. Ensure that the wastegate on the turbocharger is adjusted correctly. Refer to Systems Operation, Testing, and Adjusting, “Turbocharger - Inspect”. If the wastegate actuator is faulty, replace the turbocharger. Refer to Disassembly and Assembly, “Turbocharger - Remove” and Disassembly and Assembly, “Turbocharger - Install”.	Turbocharger	**Result:** There is a fault on the turbocharger. Repair the turbocharger or replace the turbocharger. Refer to Disassembly and Assembly, “Turbocharger - Remove” and Disassembly and Assembly, “Turbocharger - Install”. **Result:** The turbocharger is OK. Proceed to Test Step 6.
6. Low Compression (Cylinder Pressure) A. Perform a compression test. Refer to Systems Operation, Testing, and Adjusting, “Compression - Test”.	Low compression	**Result:** Low compression is recorded on one or more cylinders. Possible causes of low compression are shown in the following list: ·Loose glow plugs ·Faulty piston ·Faulty piston rings ·Worn cylinder bores ·Worn valves ·Faulty cylinder head gasket ·Damaged cylinder head Make any repairs, as necessary. **Result:** No faults found. Proceed to Test Step 7.

(continued)

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Oil Pressure Is Low

This procedure covers the following diagnostic code:

Table 58

Diagnostic Trouble Codes for Low Engine Oil Pressure		
J1939 Code	**Description**	**Notes**
100-17	Engine Oil Pressure : Low - least severe (1)	The Electronic Control Module (ECM) detects that the engine oil pressure is low. The engine speed is greater than 500 RPM. If equipped, the warning lamp will come on and the oil pressure lamp will come on.

NOTICE
Do not operate the engine with low oil pressure. Engine damage will result. If measured oil pressure is low, discontinue engine operation until the fault is corrected.

The Electronic Control Module (ECM) monitors the engine oil pressure.

Probable Causes

- Visible Leaks
- Engine oil level
- Oil specification
- Engine oil filter
- Engine oil pressure switch
- Engine oil relief valve
- Engine oil cooler
- Fuel in the engine oil
- Piston cooling jets
- Engine oil suction tube
- Engine oil pump
- Bearing clearance

Recommended Actions

Note: The procedures have been listed in order of probability. Complete the procedures in order.

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Table 76

Troubleshooting Test Steps	Values	Results
1. Check for Diagnostic Codes That Are Related to this Procedure A. Connect the electronic service tool to the diagnostic connector. B. Turn the keyswitch to the ON position. C. Check for any active diagnostic codes that are listed in Table 75 . D. Make a note of the active diagnostic codes.	Diagnostic codes	**Result:** A 630-2 diagnostic code is active. Proceed to Test Step 2. **Result:** An XXX-20 or XXX-21 diagnostic code is active. Proceed to Test Step 4.
2. Enter the Injector Codes Using the Electronic Service Tool A. Connect the electronic service tool to the diagnostic connector. Refer to Troubleshooting, “Electronic Service Tools”. B. Turn the keyswitch to the ON position. C. Manually enter the injector codes using the electronic service tool. Refer to Troubleshooting, “Injector Code - Calibrate”. D. Use the electronic service tool to clear all active diagnostic codes. E. Start the engine. F. Use the electronic service tool to check for active diagnostic codes. G. Turn the keyswitch to the OFF position.	Diagnostic codes	**Result:** The 630-2 diagnostic code is no longer active. Return the engine to service. **Result:** The 630-2 diagnostic code is still active. Proceed to Test Step 3.
3. Re-Flash the ECM A. Reflash the ECM. Refer to Troubleshooting, “ECM Software - Install”. B. Ensure that all of the injector codes are programmed. Refer to Troubleshooting, “Injector Code - Calibrate”. C. Use the electronic service tool to clear all active diagnostic codes. D. Start the engine. E. Use the electronic service tool to check for active diagnostic codes.	Diagnostic codes	**Result:**The 630-2 diagnostic code is no longer active. Return the engine to service. **Result:** The 630-2 diagnostic code is still active Proceed to Test Step 7.

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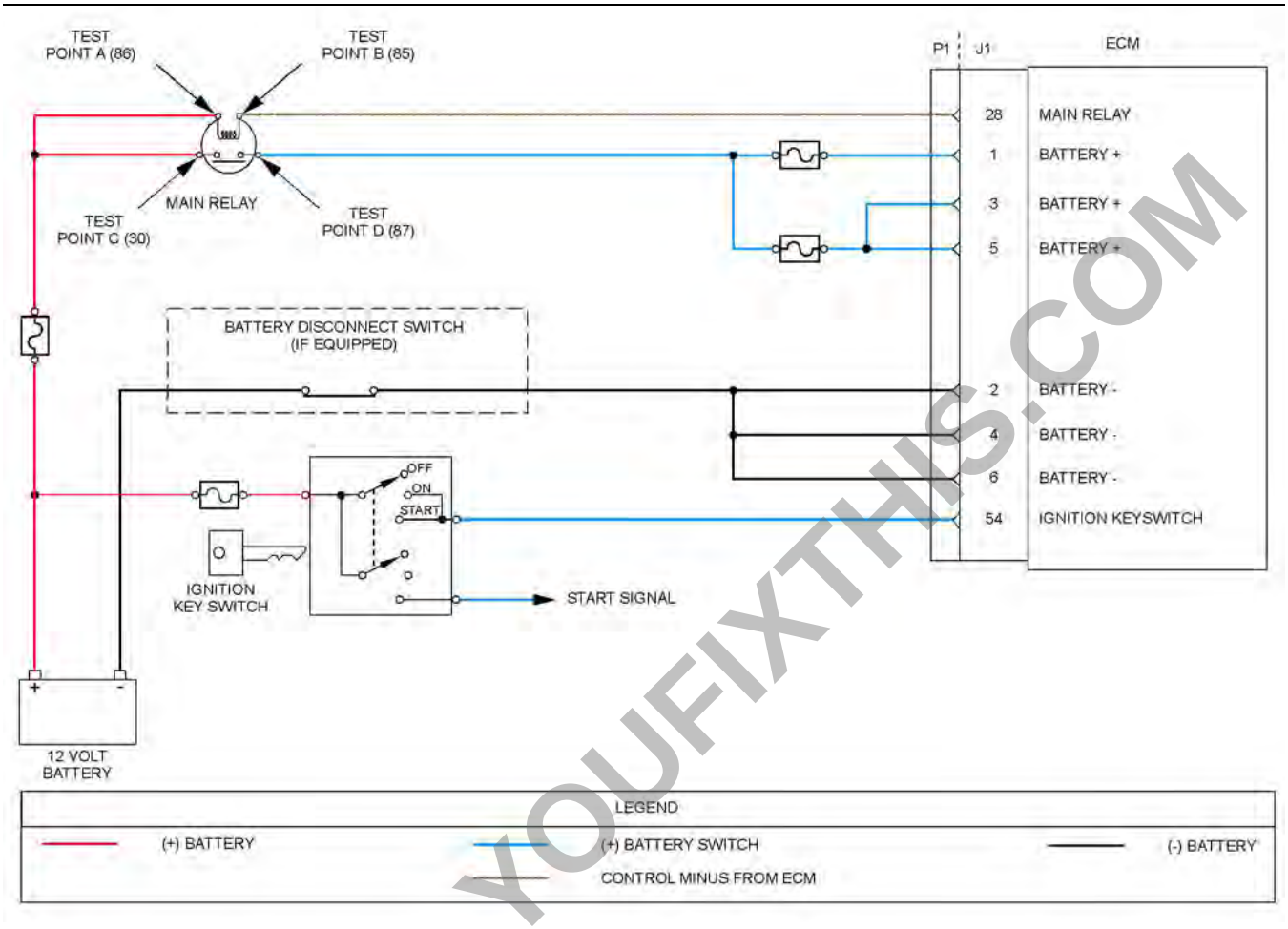


Illustration 47 g03729651

Schematic diagram for the ECM main relay

Not all connectors are shown. Refer to the Electrical Schematic for the application.

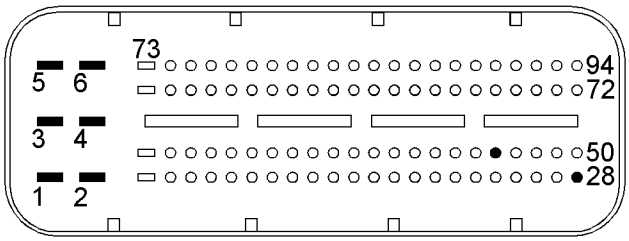


Illustration 48 g02716384

View of the pin locations on the P1 connector for the ignition keyswitch and battery supply circuit

(1) Battery+
(2) Battery ground
(3) Battery+
(4) Battery ground
(5) Battery+
(6) Battery ground
(28) ECM main relay
(54) Ignition key switch

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(Table 102, contd)

Troubleshooting Test Steps	Values	Results
4. Check the Engine Wiring Harness A. Turn the keyswitch to the OFF position. B. Disconnect the primary speed/timing sensor. Disconnect the P2 ECM connector. C. Measure the resistance between pin 1 on the harness connector for the primary speed/timing sensor and P2:59. D. Measure the resistance between pin 2 on the harness connector for the primary speed/timing sensor and P2:44.	Less than 5 Ohms	**Result:** At least one of the resistance measurements is greater than 5 Ohms. The fault is in the wiring between the primary speed/timing sensor and the P2 connector. Check all wiring between the primary speed/timing sensor and the ECM. Refer to the appropriate Electrical Schematic. Replace the faulty wiring. Use the electronic service tool to clear all logged diagnostic codes and verify that the repair eliminates the fault. **Result:** Both resistance measurements are less than 5 Ohms. Proceed to Test Step 10.
5. Check the Sensor Supply Voltage at the Sensor Connector A. Turn the keyswitch to the OFF position. B. Disconnect the connector for the secondary speed/timing sensor. C. Turn the keyswitch to the ON position. Do not start the engine. D. Measure the voltage between pin 1 and pin 3 on the harness connector for the secondary speed/timing sensor. E. Turn the keyswitch to the OFF position. F. Reconnect the connector for the secondary speed/timing sensor.	4.9 V to 5.1 V	**Result:** The measured voltage is not within the expected range. The fault is in the wiring between the secondary speed/timing sensor and the P2 connector. Replace the faulty wiring. Use the electronic service tool to clear all logged diagnostic codes and verify that the repair eliminates the fault. **Result:** The measured voltage is within the expected range. Proceed to Test Step 6.
6. Check for Signal Voltage at the Sensor Connector A. Turn the keyswitch to the OFF position. B. Disconnect the connector for the secondary speed/timing sensor. C. Turn the keyswitch to the ON position. Do not attempt to start the engine. D. Measure the voltage between pin 1 and pin 2 on the harness connector for the secondary speed/timing sensor. E. Turn the keyswitch to the OFF position. F. Reconnect the secondary speed timing sensor.	4.52 to 4.72 V	**Result:** The measured voltage is within the expected range. Replace the secondary speed/timing sensor. Refer to Disassembly and Assembly, “Camshaft Position Sensor - Remove and Install” for the correct procedure. Start the engine. Use the electronic service tool to clear all logged diagnostic codes and verify that the repair eliminates the fault. **Result:** The measured voltage is not within the expected range. Proceed to Test Step 7.

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