

QSM11 Cummins

Shop Manual

P/N QSM11CUMMINSENG

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Illustrations used throughout this manual are used only as a representation of the actual piece of equipment, and may vary from the actual item.

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Important Reference Numbers

Fill in the part name and number in the blank spaces provided below. This will give you a reference whenever service or maintenance is required.

Part Name		Part Number
Engine Model		QSM11
Engine Serial Number (ESN)		
Control Parts List (CPL)		
Fuel Pump Part Number		
Electronic Control Module (ECM)		
Electronic Control Module Serial Numbers (ECM)		
Filter Part Numbers		
Air Cleaner Element	Outer	474-00038
	Inner	474-00037
Lubricating Oil Filter	DOOSAN	474-00034B
	Cummins	3101869 and 3101868
	Fleetguard	LF9001 or LF9000
Main Fuel Filter	DOOSAN	474-00033B
	Cummins	3329289
	Fleetguard	FS1000
Pre-Fuel Filter with Fuel-Water Separator	DOOSAN	K1006519
	Mann-Hummel	66 606 62 200
Coolant Filter	DOOSAN	474-00020B
	Cummins	3100308
	Fleetguard	WF2075

If particles that are smaller than the clearance between the parts while they are at rest (engine stopped), but larger than the running clearance then damage will occur when the parts move relative to each other (engine started). While the engine is running and there is oil pressure, particles that are smaller than the bearing clearance are likely to pass between the parts without damage and be trapped in the oil filter. However, particles larger than the bearing clearance will remove material from one part and can become embedded in one of the parts. Once embedded in one part it will abrade the other part until contact is no longer being made between the two parts. If the damage sufficiently degrades the oil film, the two parts will come into contact resulting in early wear out or failure from lack of effective lubrication.

Abrasive particles can fly about during cleaning it is very important to block these particles from entering the engine as much as possible. This is particularly true of lubricating oil ports and oil drilling holes, especially those located downstream of the lubricating oil filters. Plug the holes instead of trying to blow the abrasive particles and debris with compressed air because the debris is often simply blown further into the oil drilling.

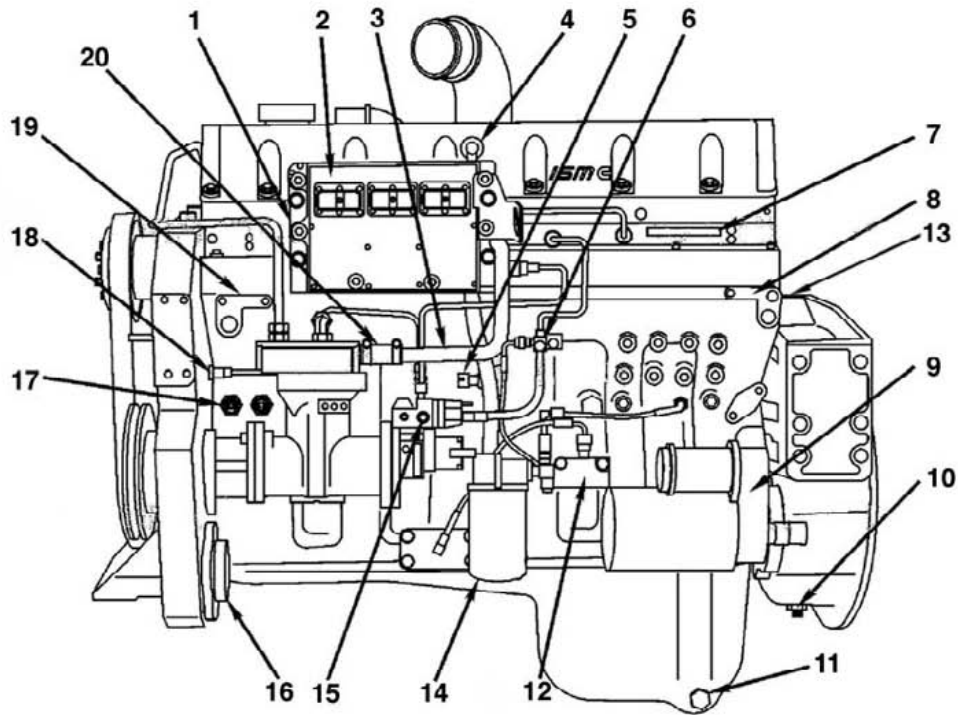
All old gasket material must be removed from the parts gasket surfaces. However, it is not necessary to clean and polish the gasket surface until the machining marks are erased. Excessive sanding or buffing can damage the gasket surface. Many newer gaskets are of the edge molded type (a steel carrier with a sealing member bonded to the steel). What little sealing material that can adhere is best removed with a blunt-edged scraper or putty knife. Cleaning gasket surfaces where an edge-molded gasket is used with abrasive pads or paper is usually a waste of time.



WARNING!

Excessive sanding or grinding the carbon ring from the top of the cylinder liners can damage the liner beyond reuse. The surface finish will be damaged and abrasive particles can be forced into the liner material which can cause early cylinder wear out or piston ring failures.

Tape off or plug all openings to any component interior before using abrasive pads or wire brushes. If really necessary because of time to use a power tool with abrasive pads, tape the oil drillings closed or use plug and clean as much of the surface as possible with the tool but clean around the oil hole/opening by hand so as to prevent contamination of the drilling.



FG005554

Figure 10 Industrial Drive - Fuel Pump Side

Reference Number	Description
1	ECM cooling plate
2	ECM
3	Compressor Air Inlet (not Used)
4	Blowby Measurement
5	Ambient Air Pressure Sensor
6	Fuel Return to Tank
7	Engine Data Tag
8	Engine Serial Number
9	Starter
10	Flywheel Ring Gear Speed Sensor
11	Side Oil Drain

Reference Number	Description
12	Centinel™ (Optional)
13	Fuel Inlet to Pump
14	Fuel Filter
15	Rail Pressure
16	Power Steering Pump Mounting Location (not Used)
17	Oil Pressure and Temperature Sensor
18	Engine Position Sensor
19	Freon Compressor Mounting Location
20	Compressor Air Discharge (not Used)

CAUTION!

Do not operate the engine beyond the maximum engine speed. Operating the engine beyond the maximum engine speed can cause severe engine damage. Use proper operating techniques for the vehicle, vessel, or equipment to prevent engine overspeed. The maximum engine speed specification is listed in Maintenance Specifications (Section V).

Engine Shutdown

For engines with shielded exhaust manifold and turbochargers, allow the engine(s) to idle for 10 - 12 minutes before shutting off after full load operation.

Otherwise, allow the engine(s) to idle 3 - 5 minutes before shutting off after full load operation. This allows the cool down of pistons, cylinders, bearings and turbocharger components.

If the engine does not shut down, refer to Troubleshooting Symptom (Section TS).

Turn the starter switch to the "OFF" position.

Electronic Controlled Fuel System

General Information

The system is an electronically controlled fuel injection system that optimizes fuel economy and reduces exhaust emissions. It does this by controlling the torque and horsepower curve, AFC function, engine high-speed, low idle, and road speed.

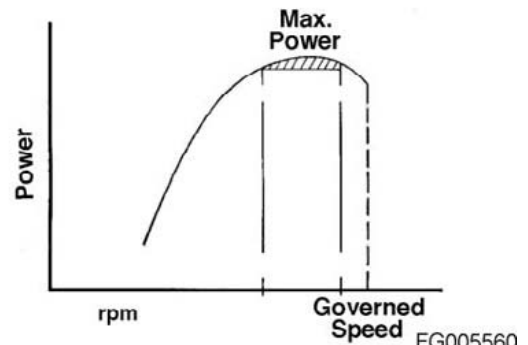


Figure 27

FG005560

CAUTION!

Select the correct oil change interval for your application. Cummins Engine Company, does not recommend exceeding these published intervals and is not responsible for damage sustained due to overextended drain intervals.

The maintenance monitor automatic mode is easily adjusted to accommodate severe-, normal-, or light-duty applications and Valvoline® Premium Blue 2000™, engine oil. This is done by using a Compulink™, or Echeck™, service tool to enter an interval factor that corresponds to the appropriate duty cycle and type of product used.

When selecting the correct interval factor for your application, refer to 102-002 (Maintenance Schedule) in Section 2, to determine which oil drain interval duty cycle fits your application: Severe duty, normal duty, or light duty. Once the duty cycle is chosen, use an interval factor of 1.00 for severe duty, 1.50 for normal duty, and 2.00 for light duty.

NOTE: *These interval factors must be adjusted accordingly if Valvoline® Premium Blue® 2000 oil is used to extend the oil drain interval. See the Valvoline® Premium Blue® 2000 product literature to determine how much your drain interval can be extended.*

The time mode allows the customer to enter a desired time interval. The maintenance monitor will then monitor the time the engine has been operating and alert the operator when the interval has been consumed.

Alerting the operator: The maintenance monitor will alert the operator of the need to change oil by flashing the engine maintenance indicator light for approximately 12 seconds after key-on. The flashing sequence will be three quick flashes, followed by a pause. This flash sequence will go through five cycles in the 12-second period. This sequence will occur at every key-on until the maintenance monitor has been reset.

NOTE: *The diagnostic switch must be in the "OFF" position for the flashing sequence to occur.*

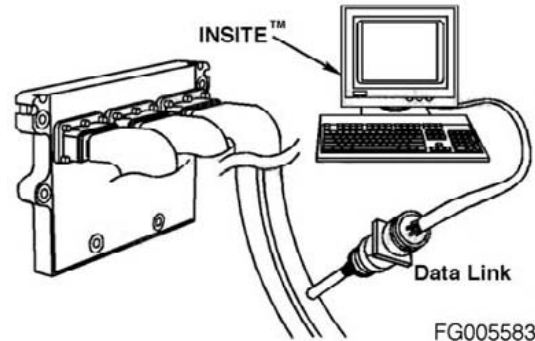


Figure 55

FG005583

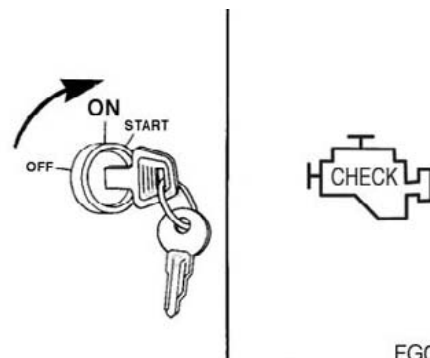


Figure 56

FG005584

Fan, Cooling

Inspect for Reuse

A visual inspection of the cooling fan is required daily. Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tighten the cap screws, if necessary.

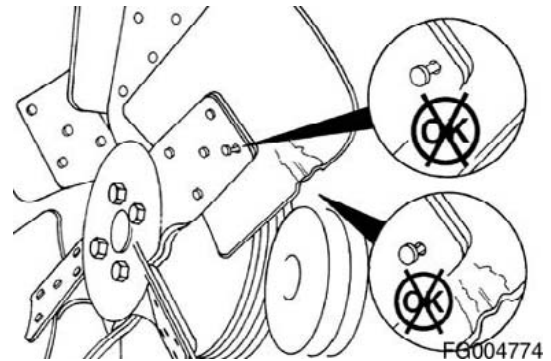


Figure 65



WARNING!

Do not straighten a bent fan blade or continue to use a damaged fan. A bent or damaged fan blade can fail during operation and cause personal injury or property damage.

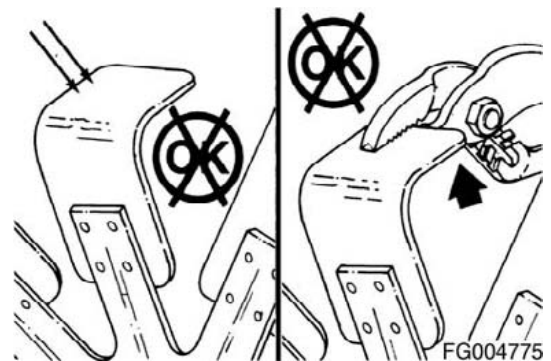


Figure 66

Replace original equipment fan that is damaged with a fan of the identical part number. Cummins Inc. must approve any other fan changes to be covered under warranty.

Refer to the vehicle or equipment manufacturer's specifications for cap screw torque.

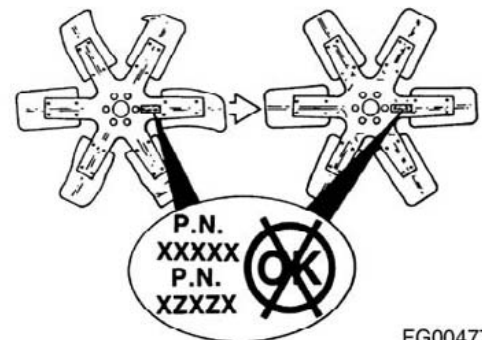


Figure 67

FG004776

Remove

 **WARNING!**

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C (120F) before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Remove the cooling system pressure cap.

Turn the valve on the remote-mounted coolant filter head to the "OFF" position.

Turn the valve on the coolant filter head to the "OFF" position.

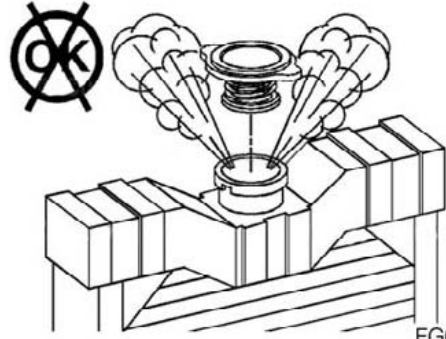


Figure 93

FG005616

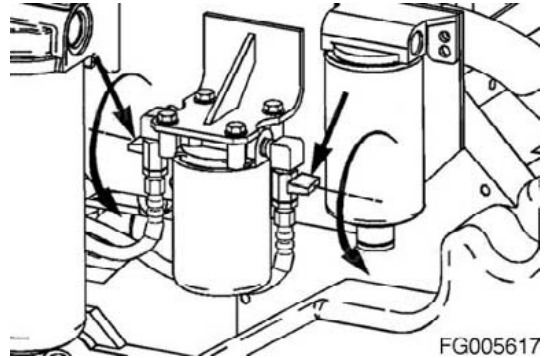


Figure 94

FG005617

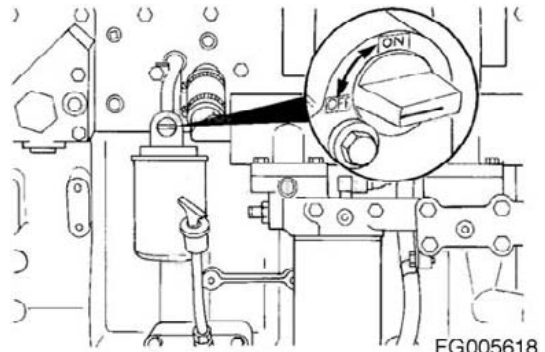


Figure 95

FG005618

 **WARNING!**

A small amount of coolant can leak when servicing the coolant filter with the shutoff valve in the "OFF" position. To reduce the possibility of personal injury, avoid contact with hot coolant.

Remove and discard the coolant filter.

Using a lint free cloth, clean the coolant filter head gasket's surface.

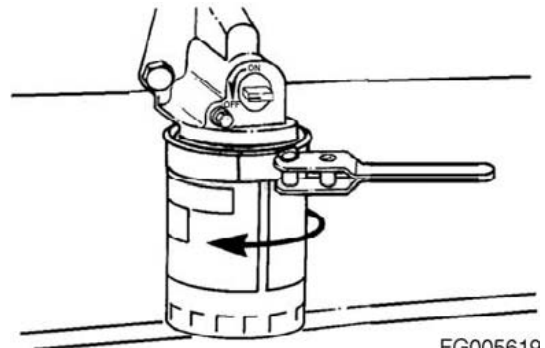


Figure 96

FG005619

If the valve cover gasket was not been damaged, it can be used again. If the gasket was damaged, it must be discarded and a new one used.

Install the gasket on the cover.

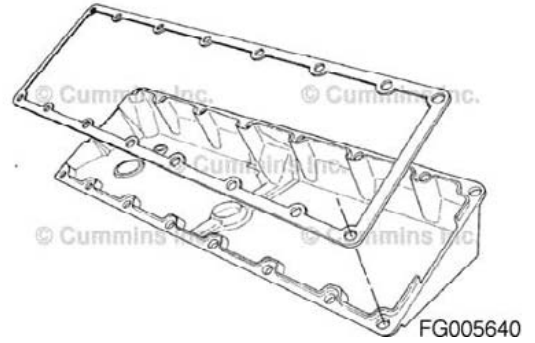


Figure 122

Install the cover on the rocker lever housing.

install the 16 isolators, spacers, and cap screws in the cover.

Tighten the cap screws in the sequence shown.

Torque Value: 15 Nm [130 in lb]

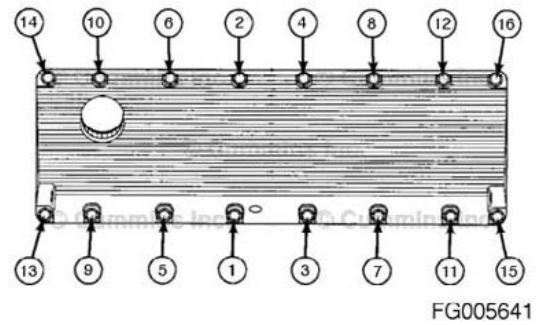


Figure 123

Cooling System

General Information

Restore™, is a heavy-duty cooling system cleaner that removes corrosion, silica gel, and other deposits. The performance of Restore™, is dependent on time, temperature, and concentration levels. An extremely scaled or flow-restricted system, for example, can require higher concentrations of cleaners, higher temperatures, or longer cleaning times, or the use of Restore Plus™,. Up to twice the recommended concentration levels of Restore™, can be used safely. Restore Plus™, must be used only at its recommended concentration level. Extremely scaled or fouled systems can require more than one cleaning.



Figure 149

FG004829

Clean

 **WARNING!**

Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C (120°F) before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Remove the radiator cap.

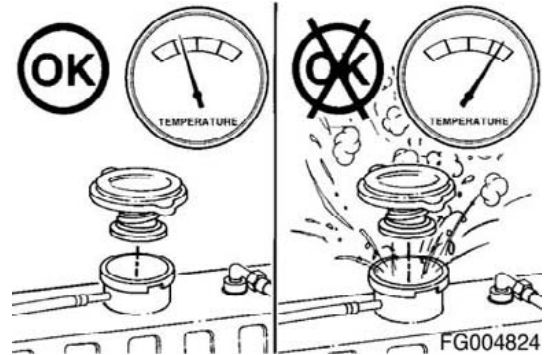


Figure 150

FG004824

 **WARNING!**

Coolant is toxic. Keep away from children and pets. If not reused, dispose of in accordance with local environmental regulations.

Drain the cooling system. Do not allow the cooling system to dry out.

Do not remove the coolant filter.

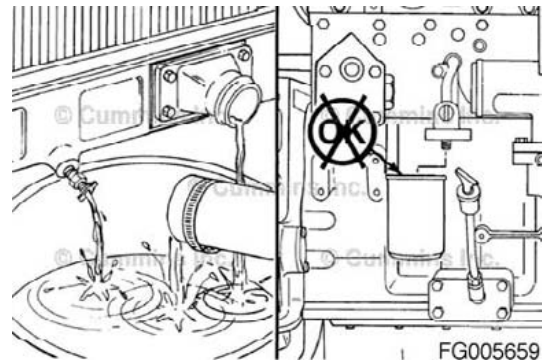


Figure 151

FG005659

Belt drive systems equipped with an automatic belt tensioner cannot be adjusted. A belt tension gauge will not give an accurate measure of the belt tension. The automatic belt tensioner is designed to maintain proper belt tension over the life of the belt. Only inspection of the tensioner is required.

The belt tensioner is designed to operate within the limit of arm movement provided by the cast stops when the belt length and geometry are correct.

If the tensioner is hitting either of the limits during operation, check the mounting brackets and the belt length. Loose brackets, bracket failure, alternator movement, incorrect belt length, or belt failure can cause the tensioner to hit the limits.

NOTE: *If the engine is equipped with a secondary alternator, reference to the vehicle manufacturer for the secondary alternator belt adjustment procedure.*

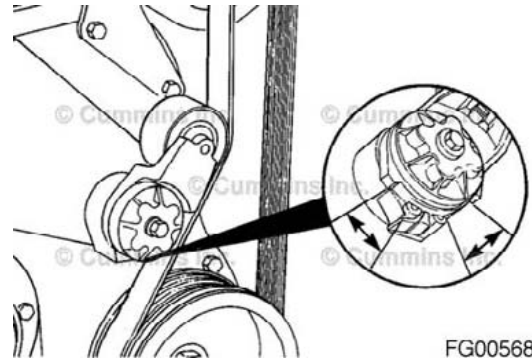


Figure 181

FG005681

Install the thermostat in the housing.

Install a new seal in the groove on the thermostat housing mounting surface.

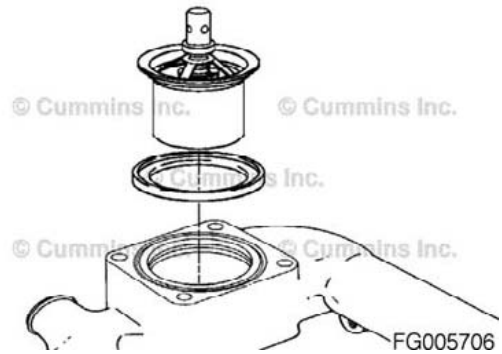


Figure 214

Install the hose on the thermostat housing bypass outlet.

Install the thermostat housing and four mounting cap screws.

Torque Value: 54 Nm [40 ft lb]

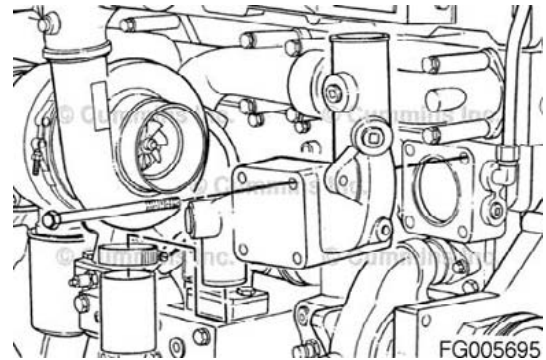


Figure 215

Equally space the bypass hose over the water pump connection and thermostat housing connection, and tighten the bypass hose clamps.

Torque Value: 3 Nm [27 in lb]

Install the upper and lower coolant hoses. Refer to the OEM's specifications for the correct torque value.

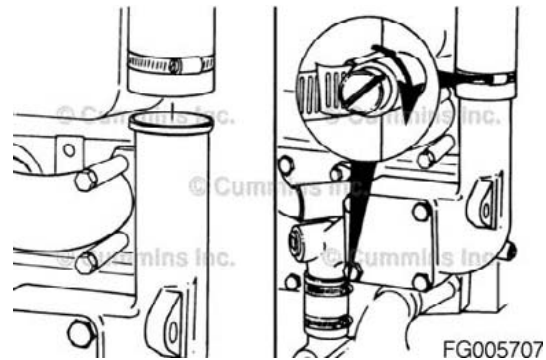


Figure 216

The oil seal must be installed with the lip of the seal and the shaft clean and dry. Do not lubricate. The yellow dust lip must be facing out.

Install the new gasket and oil seal. Use the installation sleeve provided with the new seal to install the seal.

The cap screw threads must be coated with thread sealant, Part No. 3823494, or equivalent, to prevent oil leakage.

Torque Value: Step1 7 Nm [62 in lb]

Step2 20 Nm [177 in lb]

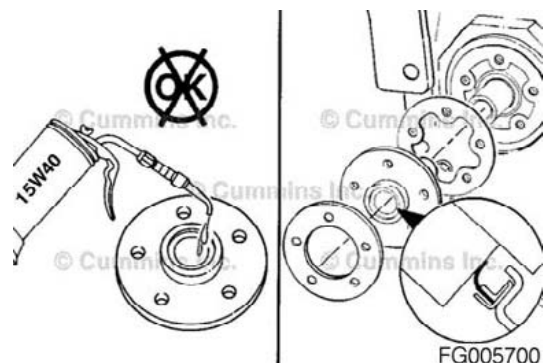


Figure 217

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SYSTEM DIAGRAMS

System Diagrams - Overview

General Information

The following drawings show the flow through the engine systems. Although parts can change between different applications and installations, the flow remains the same. The systems shown are:

- Fuel System
- Lubricating Oil System
- Coolant System
- Intake Air System
- Exhaust System

Knowledge of the engine systems can help you in troubleshooting, service, and general maintenance of your engine.

Information we need to take your Customized Parts Catalog Order. This information drives the cover content of the CPC.

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- Street Address
- Company Name (optional)
- Telephone no.
- Credit Card No.
- Cummins Engine Serial Number (located on the engine data plate)
- Please identify the required media: Printed Catalog, CD-ROM, or PDF File

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Engine Acceleration or Response Poor

Cause	Correction
<p><u>STEP 1</u> Electronic fault codes are active.</p>	<p>For instructions on how to read active fault codes, refer to Diagnostic Fault Codes in Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 2</u> Engine is operating at low ambient temperature</p>	<p>Check the winterfront, shutters, and under-the-hood air. Use under-the-hood intake air in cold weather. Refer to Procedure 101-015 (Operating the Engine) in Section 1.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 3</u> Air intake or exhaust leaks</p>	<p>Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Refer to Procedure 010-024 (Air Leaks, Air Intake and Exhaust Systems) in Section 6.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 4</u> Fuel temperature is above specification</p>	<p>Fill the fuel tanks. Turn off or bypass the fuel heater, if equipped. Refer to the OEM service manual.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 5</u> Fuel grade is not correct for the application or the fuel quality is poor</p>	<p>Operate the engine from a tank of high-quality fuel. Refer to Procedure 018-002 (Fuel Recommendations and Specifications) in Section V for specifications.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 6</u> Drivetrain is not correctly matched to the engine</p>	<p>Check for correct gearing and drivetrain components. Make sure the propeller size is correct.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 7</u> Engine is operating at high ambient temperature</p>	<p>Use outside air to the turbocharger in hot weather.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 8</u> Contact a Cummins Authorized Repair Facility</p>	

Engine Runs Rough at Idle

Cause	Correction
<p><u>STEP 1</u> Engine is operating at low ambient temperature</p>	<p>Check the winterfront, shutters, and under-the-hood air. Use under-the-hood intake air in cold weather. Refer to Procedure 101-015 (Operating the Engine) in Section 1.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 2</u> Electronic fault codes are active</p>	<p>For instructions on how to read active fault codes, refer to Procedure 101-007 (Electronic Controlled Fuel System) in Section 1 for the diagnostic fault codes. If fault codes are active, contact a Cummins Authorized Repair Facility.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 3</u> Engine mounts are worn, damaged, or not correct</p>	<p>Check the engine mounts. Refer to the OEM service manual.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 4</u> Engine idle speed is set too low (electronically controlled fuel systems)</p>	<p>Verify the correct idle speed setting. Increase the idle speed with the idle increment switch or an electronic service tool. Refer to a Cummins Authorized Repair Location.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 5</u> Air in the fuel system</p>	<p>Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe, and fuel filters as necessary.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 6</u> Fuel grade is not correct for the application or the fuel quality is poor</p>	<p>Operate the engine from a tank of high-quality fuel. Refer to Procedure 018-002 (Fuel Recommendations and Specifications) in Section V.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 7</u> Overhead adjustments are not correct</p>	<p>Measure and adjust the overhead settings. Refer to Procedure 003-004 (Overhead Set) in Section 5.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 8</u> Contact a Cummins Authorized Repair Facility</p>	

Cause

Correction

STEP 10

Programmable parameters or selected features are not correct

Check the programmable parameters and the selected features with an electronic service tool. Set the parameters and features again if necessary. Refer to a Cummins Authorized Repair Location.

OK
Go To Next Step

STEP 11

Contact a Cummins Authorized Repair Facility

Engine Will Not Shut Off

Cause

Correction

STEP 1

Key switch circuit is malfunctioning

Check the vehicle, equipment, or vessel starter switch circuit. Refer to the OEM service manual.

OK
Go To Next Step

STEP 2

Engine is running on fumes drawn into the air intake

Check the air intake ducts. Locate and isolate the source of the fumes. Repair as necessary. Refer to the OEM service manual.

OK
Go To Next Step

STEP 3

Contact a Cummins Authorized Repair Facility

PTO or Cruise Control Does Not Operate

Cause	Correction
<p><u>STEP 1</u> Cruise control/PTO on/off switch is off</p>	<p>Turn on the switch.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 2</u> Cruise control/PTO switch wires or connectors are loose</p>	<p>Check the cruise control/PTO on/off switch, selector switch, clutch switch, and brake switch for loose wires and connections.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 3</u> Electronic fault codes are active</p>	<p>For instructions on how to read active fault codes, refer to Procedure 101-007 (Electronic Controlled Fuel System) in Section 1 for diagnostic fault codes. If fault codes are active, contact a Cummins Authorized Repair Facility.</p>
<p>OK Go To Next Step</p>	
<p><u>STEP 4</u> Contact a Cummins Authorized Repair Facility</p>	

Synthetic engine oils, API category III, are recommended for use in Cummins engines operating in ambient temperature conditions consistently below -25°C (-13°F). Above this temperature, petroleum based multigrade lubricants are recommended. Synthetic 0W-30 oils that meet API category III can be used in operations where the ambient temperature never exceeds 0°C (32°F). Multiviscosity oils rated 0W-30 do not offer the same level of protection against fuel dilution as do higher multigrade oils. Higher cylinder wear can be experienced when using 0W-30 oils in high-load situations.

For further details and an explanation of engine lubricating oils for Cummins engines, refer to Cummins Engine Oil Recommendations, Bulletin 3810340.

Additional information regarding lubricating oil availability throughout the world is available in the Engine Manufacturing Association (EMA) Lubricating Oils Data Book for Heavy-Duty Automotive and Industrial Engines. The data book can be ordered from Engine Manufacturers Association, Two North LaSalle Street, Chicago, IL 60602; (312) 827-8733, (321) 827-8700, (www.engine-manufacturers.org).

The API service symbols are shown in the accompanying illustration.

1. The upper half of the symbols displays the appropriate oil categories.
2. The lower half contains words to describe oil energy-conserving features.
3. The center section identifies the SAE oil viscosity grade.

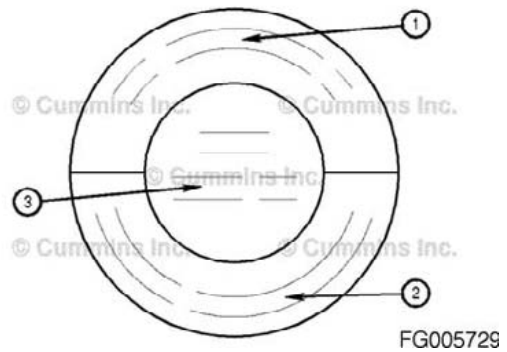


Figure 255

Oil viscosity should be chosen according to the typical climate conditions experienced by the user. Use of 15W-40 is recommended for the best engine durability at higher ambient temperature. For temperate or cold conditions, 10W-30 or 5W-30 viscosity can be used for easier starting, improved oil flow, and improved fuel economy.

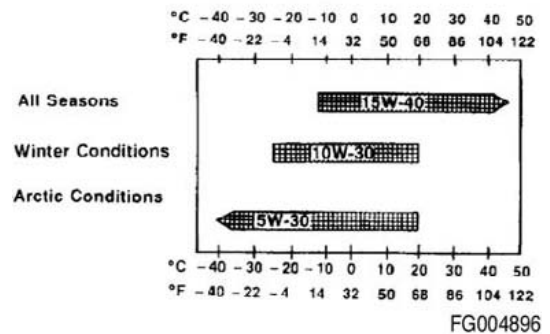


Figure 256

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