Maintenance Schedule

General Information

For your convenience, listed below are the section numbers that contain specific instructions for performing the maintenance checks.

Perform maintenance at whichever interval that occurs first. At each scheduled maintenance interval, perform all previous maintenance checks that are due for scheduled maintenance.

Daily or Refueling - Maintenance Check[3] ..... **Section 3**
- Air Tank and Reservoirs - Drain
- Crankcase Breather Tube - Inspect
- Engine Coolant Level - Check/Correct
- Fuel-Water Separator - Drain

Every 250 Hours or 3 Months - Maintenance Check[3] ..... **Section 4**
- Air Cleaner Restriction - Check/Correct
- Air Compressor Mounting Hardware - Check/Correct
- Charge Air Cooler - Check/Correct
- Charge Air Piping - Check/Correct
- Radiator Hoses - Check
- Air Intake Piping — Inspect
- Cooling Fan — Check
- Coolant Level — Check/Correct
- Drive Belts — Check/Correct

Every 500 Hours or 6 Months - Maintenance Check[1, 2, 3] ..... **Section 5**
- Engine Coolant - Antifreeze Check
- Fuel Filter, Spin-on-Type - Replace
- Lubricating Oil and Filters - Change

Every 1000 Hours or 1 Year - Maintenance Check[3] ..... **Section 6**
- Cooling Fan Belt Tensioner - Check/Correct
- Fan Hub, Belt-Driven - Check/Correct

Every 2000 Hours, or 2 Years - Maintenance Check[2, 3] ..... **Section 7**
- Air Compressor Discharge Line - Check/Correct
- Cooling System - Drain, Flush, and Fill
- Vibration Damper, Rubber - Check
- Vibration Damper, Viscous - Check

Every 5000 Hours or 4 Years - Maintenance Check[3] ..... **Section 8**
- Overhead Set - Adjust

1. The lubricating oil and lubricating oil filter interval can be adjusted based on application, fuel consumption, gross vehicle weight, and idle time. See the Oil Drain Intervals in this section.
2. Antifreeze check interval is every oil change or 500 hours or 6 months, whichever occurs first. The operator **must** use a heavy-duty year-round antifreeze that meets the chemical composition of GM6038M. The antifreeze change interval is 2 years or 2000 hours whichever occurs first. Antifreeze is essential for freeze, overheat, and corrosion protection.
3. Follow the manufacturer's recommended maintenance procedures for the starter, alternator, generator, batteries, electrical components, exhaust brake, charge air cooler, radiator, air compressor, air cleaner, freon compressor, and fan clutch. Refer to Procedure 203-001 (Component Manufacturers) in Section M.

Oil Drain Intervals

Refer to table 1 to determine the maximum recommended oil change and filter change interval in hours or months, whichever comes first.

Table 1

American Petroleum Institute Classification (API)	European Classification (ACEA)	Engine Rating is 261Hp [195kW] or greater	Engine Rating is 260Hp [194W] or less
API CH-4/SJ	ACEA E-5	250 hours or 3 months	500 hours or 6 months
API CF-4/SG	ACEA E-3 and ACEA E-2	125 hours or 6 weeks	250 hours or 3 months
API CD API CE API CG-4/ SH	ACEA E-1	**Obsolete. Do not Use**	**Obsolete. Do Not Use**

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Air Compressor Air Pressure Rises Slowly

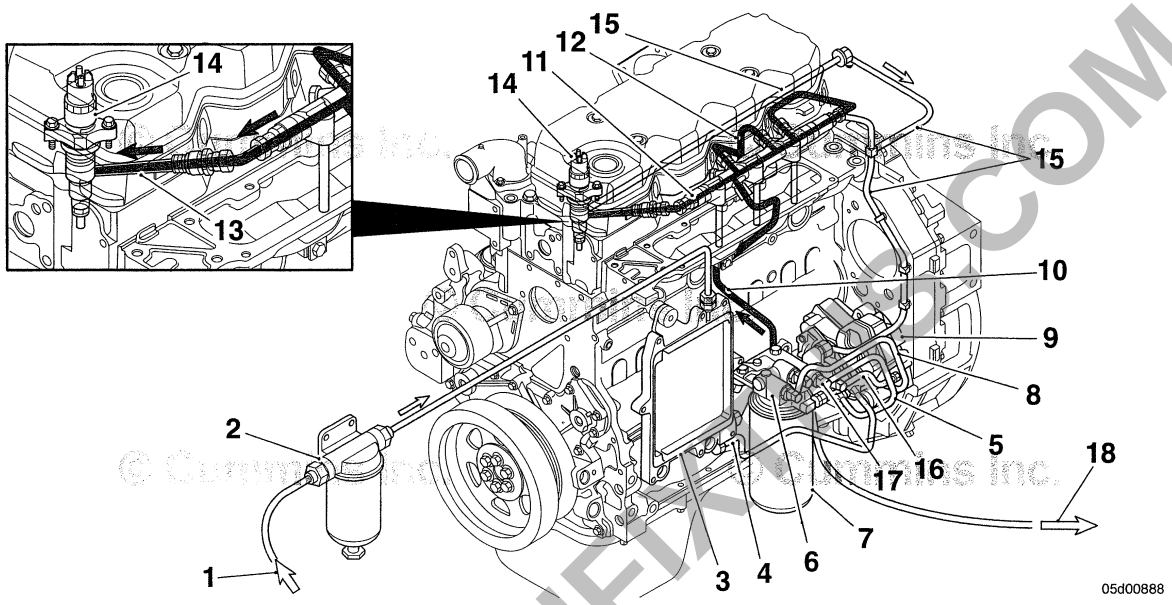
Cause	Correction
STEP 1 Air intake system restriction to air compressor is excessive	Replace the air compressor air cleaner (if installed). Check the air intake piping. Check engine air intake restriction if the air compressor inlet is plumbed to the vehicle or equipment intake system. Refer to Section 3 and Section 4.
OK Go To Next Step	
STEP 2 Air system leaks	Block the vehicle wheels and check the air system for leaks with spring brakes applied and released. Check for leaks from the air compressor gaskets and the air system hoses, fittings, tanks, and valves. Refer to the OEM service manuals.
OK Go To Next Step	
STEP 3 Carbon buildup is excessive in the air discharge line, downstream air valves, or cylinder head	Check for carbon buildup. Replace the air compressor discharge line and cylinder head assembly if necessary. Refer to Section 7.
OK Go To Next Step	
STEP 4 Contact a Cummins Authorized Repair Facility	

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Flow Diagram, Fuel System

Flow Diagram



1. From fuel supply tank
2. Water/fuel separator (**not** mounted on engine)
3. ECM cooling plate *
4. To fuel gear pump
5. To fuel filter
6. Fuel filter head
7. Fuel filter
8. To high-pressure pump
9. High-pressure pump
10. To fuel rail
11. Fuel rail
12. To injectors
13. High-pressure connector
14. Injector
15. Fuel return from injectors and fuel rail to fuel filter head
16. Fuel return from high-pressure pump to fuel filter head
17. Fuel return manifold
18. To fuel supply tank.

NOTE: * Engines are either equipped with an air cooled or fuel cooled ECM. If an air cooled ECM is used, the fuel enters the engine from the OEM connection at the gear pump inlet.

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General Engine

Specifications

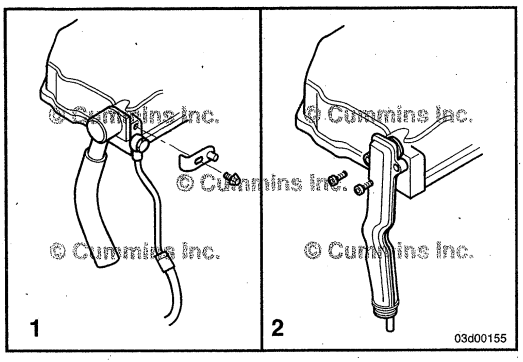
Listed below are the general specifications for this engine.

Horsepower.....Refer to engine dataplate
Bore and Stroke.....107 mm [4.21 in] X 124 mm [4.88 in]
Displacement (four-cylinder engine).....4.5 liters [274 C.I.D.]
Displacement (six-cylinder engine).....6.7 liters [409 C.I.D.]
Firing Order (four-cylinder engine).....1-3-4-2
Firing Order (six-cylinder engine).....1-5-3-6-2-4
Engine Weight (with standard accessories):
  Dry Weight for 4.5 Liters [274 C.I.D.].....374 kg [825 lb]
  Dry Weight for 6.7 Liters [409 C.I.D.].....485 kg [1070 lb]
Crankshaft Rotation (viewed from the front of the engine)..... **Clockwise**
Valve Clearance:
  Intake.....0.254 mm [0.010 in]
  Exhaust.....0.508 mm [0.020 in]

NOTE: The engine features a no-adjust overhead. The valve train is designed such that adjustment of the valve lash is **not** required for normal service during the first 241,402 km [150,000 mi, 5000 hr]. The valve train operates acceptably within the limits of 0.152- to 0.381-mm [0.006- to 0.015-in] intake valve lash and 0.381- to 0.762-mm [0.015- to 0.030-in] exhaust valve lash. It is recommended that the valve lash be checked around 241,402 km [150,000 mi, 5000 hr] and every 81,000 km [50,000 mi, 2000 hr] thereafter.

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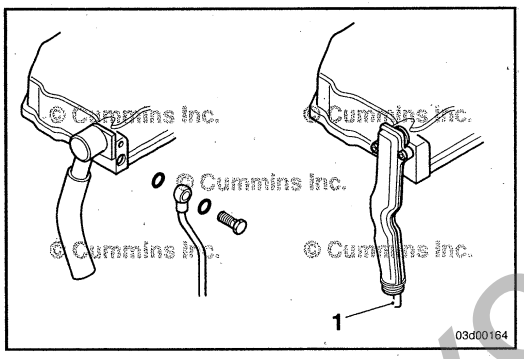


Disconnect the breather tube connection at the back of the rocker lever cover.

In general, two type of breather tube connections are used at the rocker lever cover:

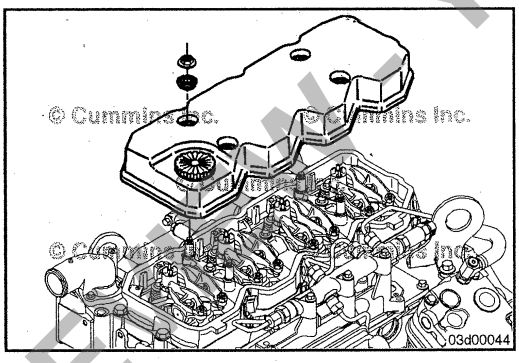
1. A clamping plate and capscrew hold the breather tube connection to the rocker lever cover. Remove the capscrew and clamping plate to disconnect the breather tube connection from the rocker lever cover.
2. 1 or 2 Capscrew(s) directly mount the breather tube connection to the rocker lever cover. Remove the capscrew(s) to disconnect the breather tube connection from the rocker lever cover.

NOTE: Some breather tube connections use internal Torx capscrews to secure the breather tube connection to the rocker lever cover.



If equipped, at the rear of the rocker lever cover, remove the banjo bolt and sealing washers connecting the breather oil drain line to the rocker lever cover.

NOTE: Not all engines with an internal mounted crankcase breather are equipped with an external breather oil drain line. On some engines the breather oil drain line is internal to the breather connection tube (1).



NOTE: Do **not** remove the rocker lever gasket on engines in which the rocker lever cover gasket is fit into a groove at the base of the rocker lever cover. The gasket is reusable. Once the gasket is removed from the rocker lever cover it **must** be replaced.

Remove the mounting nuts and isolators from the rocker lever cover.

NOTE: If equipped, it may be necessary to gently pry the breather tube connection from the back of the rocker lever cover while removing.

Remove the rocker lever cover.

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Prime

⚠WARNING⚠

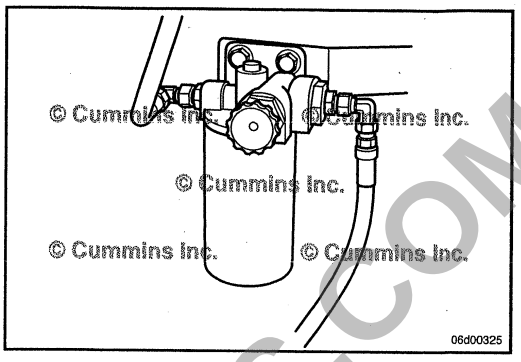
The fuel pump high-pressure fuel lines and fuel rail contain very high-pressure fuel. Never loosen any fittings while the engine is running . Personal injury and property damage can result.

To prime the engine use the OEM installed priming device. Typically, a priming pump is installed at or near the pre-filter. See the OEM's instructions for the number of strokes (hand primer) or the cycle time (electric priming pump) needed to prime the low pressure system.

NOTE: It is **not** necessary to vent air from the high pressure system before starting the engine.

NOTE: It is **not** necessary to pre-fill the on-engine fuel filter.

Operate the engine and check for leaks.



Lubricating Oil and Filters

Drain

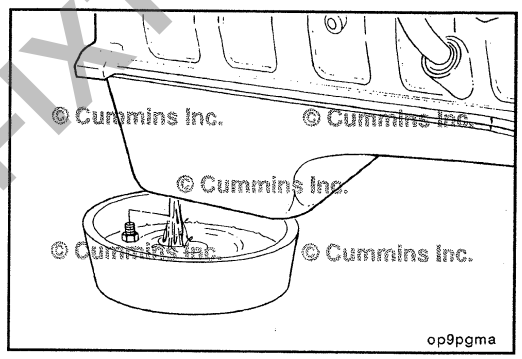
⚠WARNING⚠

Some state and federal agencies have determined that used engine oil can be carcinogenic and cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil. If not reused, dispose of in accordance with local environmental regulations.

⚠WARNING⚠

To reduce the possibility of personal injury, avoid direct contact of hot oil with your skin

Change the lubricating oil and filter(s) at the specified oil change interval. See the Maintenance Schedule to find the correct change interval for your application.

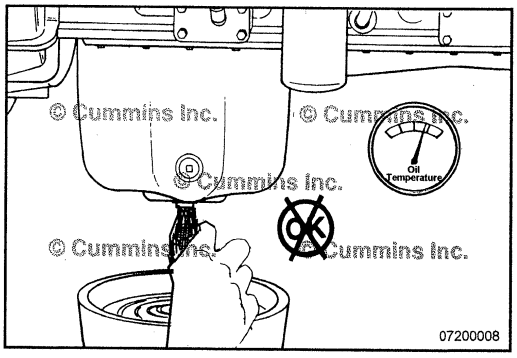


NOTE: For most engines use a container that can hold at least 20 liters [21 qt] of lubricating oil. Some engines may be equipped with an increased capacity oil pan requiring a container that will hold 28 liters [30 qt] of lubricating oil.

Operate the engine until the water temperature reaches 60°C [140°F].

Shut off the engine.

Remove the oil drain plug. Drain the oil immediately to be sure all the oil and suspended contaminants are removed from the engine.



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Alternator Not Charging or Insufficient Charging

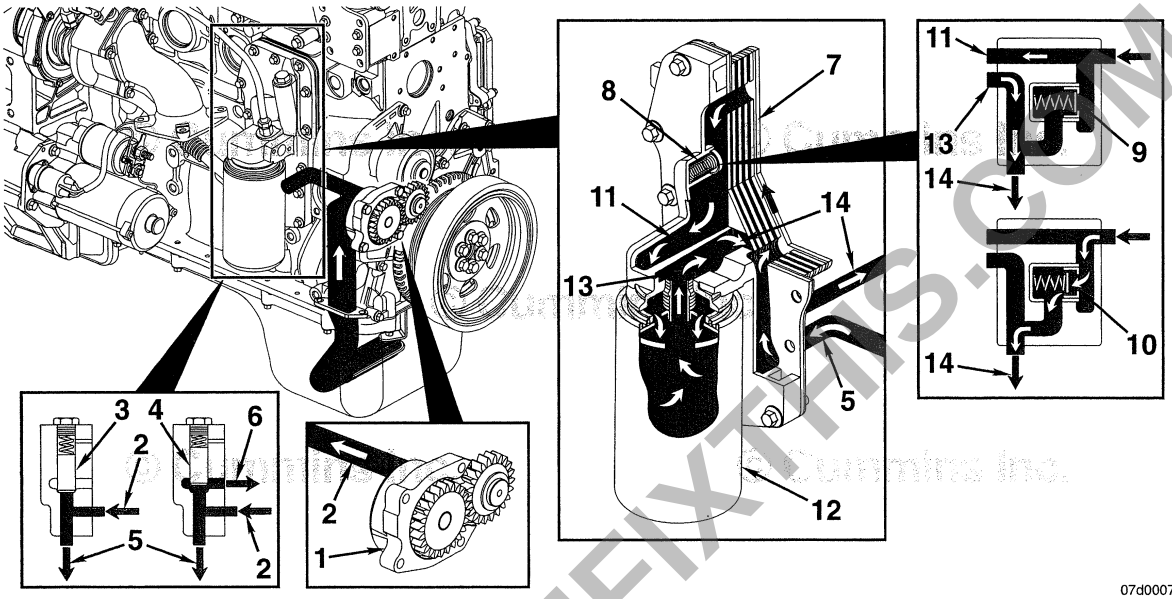
Cause	Correction
STEP 1 Alternator pulley is loose on the shaft	Tighten the pulley. Refer to OEM service manual.
OK — Go To Next Step	
STEP 2 Batteries have malfunctioned	Check the condition of the batteries. Replace the batteries, if necessary. Refer to OEM service manual.
OK — Go To Next Step	
STEP 3 Battery cables or connections are loose, broken, or corroded (excessive resistance)	Check the battery cables and connections.
OK — Go To Next Step	
STEP 4 Alternator is overloaded, or alternator capacity is below specification	Install an alternator with a higher capacity. Refer to the OEM service manual.
OK — Go To Next Step	
STEP 5 Alternator or voltage regulator is malfunctioning	Test the alternator output. Replace the alternator or voltage regulator if necessary. Refer to the OEM service manual.
OK — Go To Next Step	
STEP 6 Battery temperature is above specification	Position the batteries away from heat sources. Refer to the OEM service manual.
OK — Go To Next Step	
STEP 7 Electrical system is "open" (blown fuses, broken wires, or loose connections)	Check the fuses, wires, and connections. Refer to the OEM service manual and the manufacturer's wiring diagram.
OK — Go To Next Step	
STEP 8 Vehicle gauge is malfunctioning	Check the vehicle gauge. Refer to the OEM service manual.
OK — Go To Next Step	
STEP 9 Contact a Cummins Authorized Repair Facility	

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Flow Diagram, Lubricating Oil System

Flow Diagram



07d00073

1. Gerotor lubricating oil pump
2. From lubricating oil pump
3. Pressure regulating valve closed
4. Pressure regulating valve open
5. To lubricating oil cooler
6. To lubricating oil pan
7. Lubricating oil cooler
8. Filter bypass valve
9. Filter bypass valve closed
10. Filter bypass valve open
11. To lubricating oil filter
12. Full-flow lubricating oil filter
13. From lubricating oil filter
14. Main lubricating oil rifle.

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Drive Belt Tension

Tension Chart

SAE Belt Size	Belt Tension Gauge Part No.		Belt Tension New		Belt Tension Range Used*	
	Click-type	Burroughs	N	lbf	N	lbf
0.380 in	3822524		620	140	270 to 490	60 to 110
0.440 in	3822524		620	140	270 to 490	60 to 110
1/2 in	3822524	ST-1138	620	140	270 to 490	60 to 110
11/16 in	3822524	ST-1138	620	140	270 to 490	60 to 110
3/4 in	3822524	ST-1138	620	140	270 to 490	60 to 110
7/8 in	3822524	ST-1138	620	140	270 to 490	60 to 110
4 rib	3822524	ST-1138	620	140	270 to 490	60 to 110
5 rib	3822524	ST-1138	670	150	270 to 530	60 to 120
6 rib	3822525	ST-1293	710	160	290 to 580	65 to 130
8 rib	3822525	ST-1293	890	200	360 to 710	80 to 160
10 rib	3822525	3823138	1110	250	440 to 890	100 to 200
12 rib	3822525	3823138	1330	300	530 to 1070	120 to 240
12 rib K section	3822525	3823138	1330	300	890 to 1070	200 to 240

NOTE: This chart does not apply to automatic belt tensioners.

* A belt is considered used if it has been in service for ten minutes or longer.

* If used belt tension is less than the minimum value, tighten the belt to the maximum used belt value.

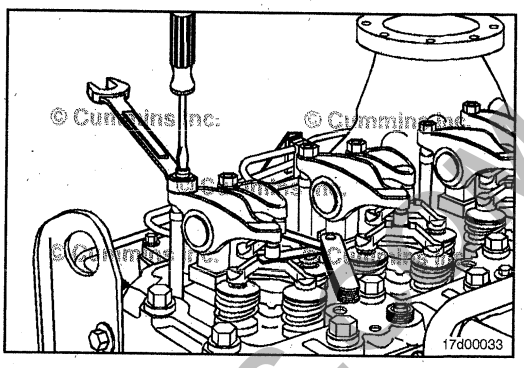
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NOTE: The clearance is correct when some resistance is "felt" when the feeler gauge is slipped between the crosshead and the rocker lever socket.

Measure lash by inserting a feeler gauge between the crosshead and the rocker lever socket. If the lash measurement is out of specification, loosen the locknut, and adjust the lash to nominal specifications.

Lash Specifications		
	mm	in
Intake	0.254	0.010
Exhaust	0.508	0.020



Tighten the locknut and remeasure.

Torque Value: 24 N•m [212 in-lb]

Using barring tool, Part Number 3824591, rotate the crankshaft 360 degrees.

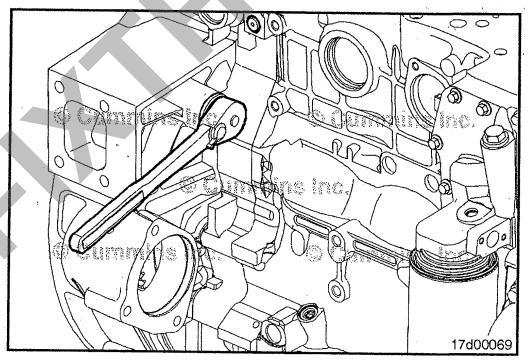
Following the same steps and specifications as previously stated, measure lash for the following rockers:

(E = Exhaust, I = Intake).

Four-cylinder 2E, 3I, 4E, and 4I:

Six-cylinder 2E, 3I, 4E, 5I, 6I, and 6E.

Reset if out of specification.



Install

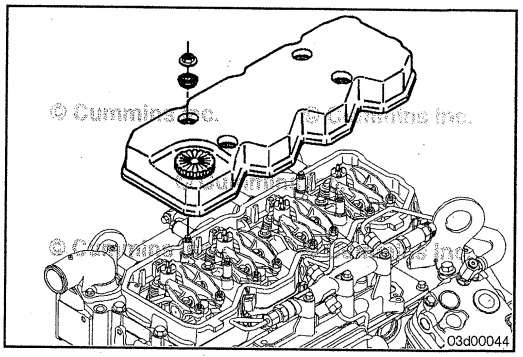
Stud Mounted Rocker Lever Cover.

Install the rocker lever cover over the mounting capscrews.

Install the isolators and mounting nuts.

Tighten the mounting nuts.

Torque Value: 24 N•m [18 ft-lb]



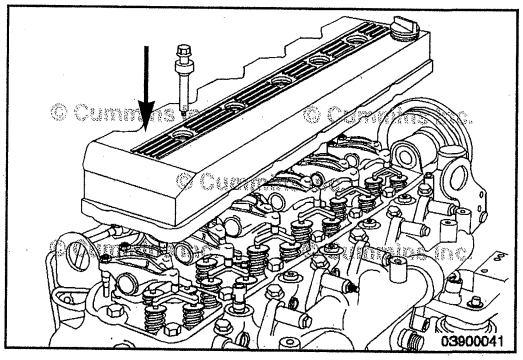
Capscrew Mounted Rocker Lever Cover.

Install the rocker lever cover.

Install the mounting capscrews and isolators.

Tighten the mounting capscrews.

Torque Value: 24 N•m [18 ft-lb]



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Foreword

This manual contains information for the correct operation and maintenance of your Cummins engine. It also includes important safety information, engine and systems specifications, troubleshooting guidelines, and listings of Cummins Authorized Repair Locations and component manufacturers.

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

Keep this manual with the equipment. If the equipment is traded or sold, give the manual to the new owner.

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

The latest technology and the highest quality components were used to produce this engine. When replacement parts are needed, we recommend using only genuine Cummins or ReCon® exchange parts.

NOTE: Note: Warranty information is located in Section W. Make sure you are familiar with the warranty or warranties applicable to your engine.

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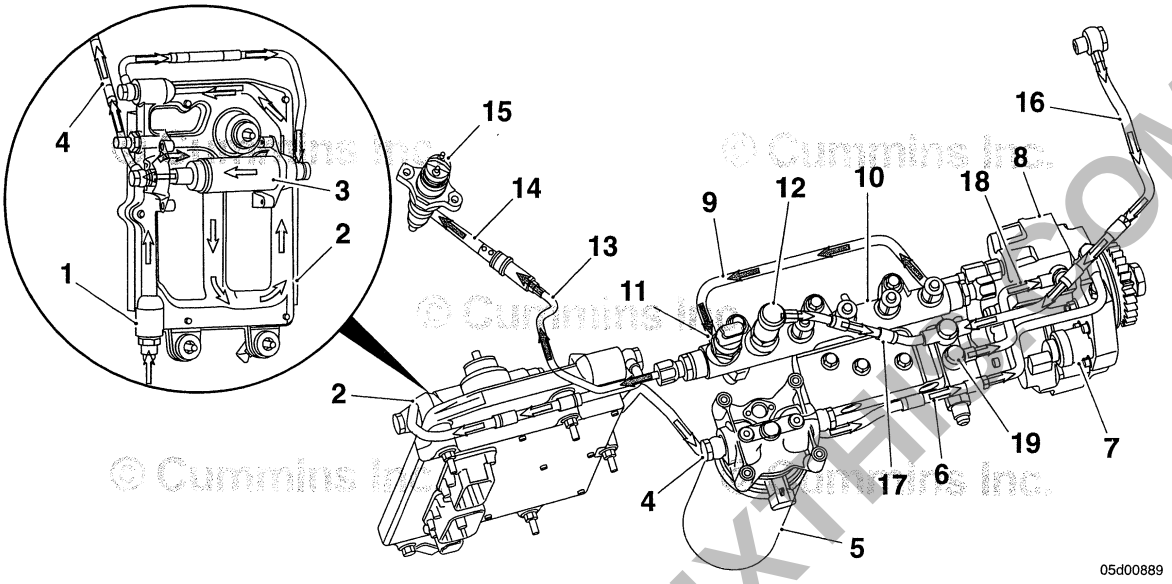
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With Electric Lift Pump



1. Fuel inlet - ECM cooling plate
2. ECM cooling plate
3. Lift pump
4. Fuel line (from lift pump to fuel filter)
5. Fuel filter
6. Fuel pump inlet to gear pump
7. EFC actuator
8. Fuel pump
9. High-pressure fuel line (fuel pump to rail)
10. Fuel rail
11. Fuel rail pressure sensor
12. Fuel pressure relief valve
13. High-pressure fuel line (fuel rail to fuel injector)
14. High-pressure connector to fuel injector
15. Fuel injector
16. Injector return line
17. Pressure relief return line
18. Fuel pump return line
19. Fuel return manifold.

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Air Compressor Noise is Excessive

Cause	Correction
STEP 1 Carbon buildup is excessive in the air discharge line, downstream air valves, or cylinder head	Check for carbon buildup. Replace the air compressor discharge line and cylinder head assembly if necessary. Refer to Section 7.

OK
Go To Next Step

STEP 2 Air compressor is sending air pulses into the air tanks	Install a ping tank between the air dryer and the wet tank. Refer to the manufacturer's instructions.

OK
Go To Next Step

STEP 3 Ice buildup in the air system components	For all models, check for ice in low spots of the air discharge line, dryer inlet, and elbow fittings. On Holset® models, also check the Econ valve (if equipped). Refer to the OEM service manual.

OK
Go To Next Step

STEP 4
Contact a Cummins Authorized Repair Facility

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Lubricating Oil Consumption Excessive

Cause	Correction
STEP 1 Crankcase ventilation system is plugged	Check and clean the crankcase breather and vent tube. Refer to Section 3.
OK Go To Next Step	
STEP 2 Lubricating oil does **not** meet specifications for operating conditions	Change the oil and filters. Refer to Section 5. Use the oil recommended in Section V.
OK Go To Next Step	
STEP 3 Lubricating oil drain interval is excessive	Verify the correct lubricating oil drain interval. Refer to Section 2.
OK Go To Next Step	
STEP 4 Lubricating oil leak (external)	Inspect the engine for external oil leaks. Tighten the capscrews, pipe plugs, and fittings. Replace gaskets, if necessary. Refer to Section V for specifications.
OK Go To Next Step	
STEP 5 Verify the oil consumption rate	Check the amount of oil added versus the hours of operation.
OK Go To Next Step	
STEP 6 Air compressor is pumping lubricating oil into the air system	Check the air lines for carbon buildup and lubricating oil. Refer to a Cummins Authorized Repair Facility.
OK Go To Next Step	
STEP 7 Contact a Cummins Authorized Repair Facility	

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