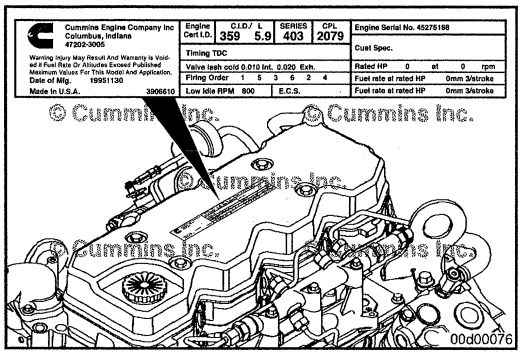
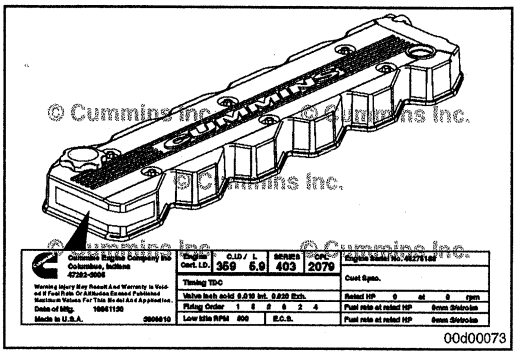
Table of Contents

Engine Identification

Engine Dataplate

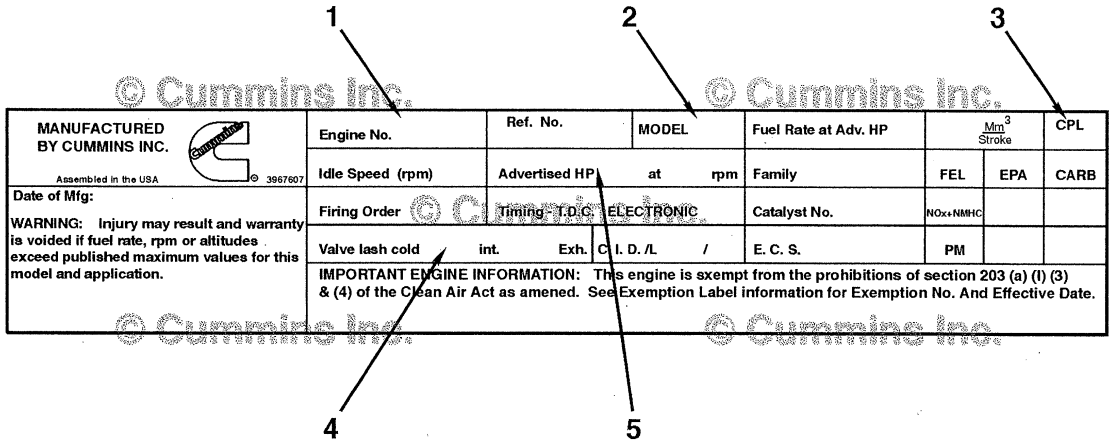




The engine dataplate shows specific facts about your engine. The dataplate is typically located on the engine rocker lever cover, but may also be located on the side of the gear housing. The engine serial number and CPL provide data for ordering parts and service. The engine dataplate **must not** be changed unless approved by Cummins Inc.

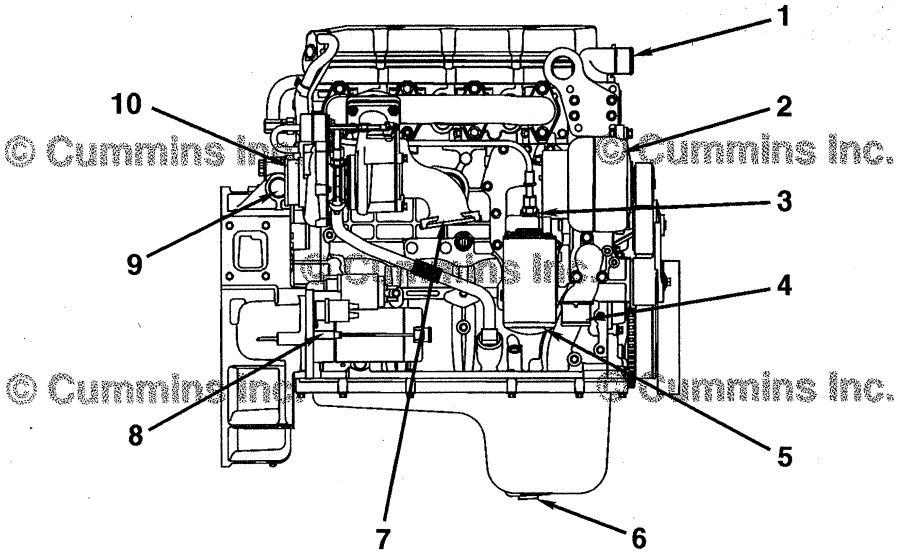
Have the following engine data available when communicating with a Cummins® Authorized Repair Location. The information on the dataplate is **mandatory** when sourcing service parts.

NOTE: The engines covered by this manual are produced worldwide. The data plates used on engines may differ in appearance and location of information. The following illustrations show examples of common data plates used and the information contained on the data plate.



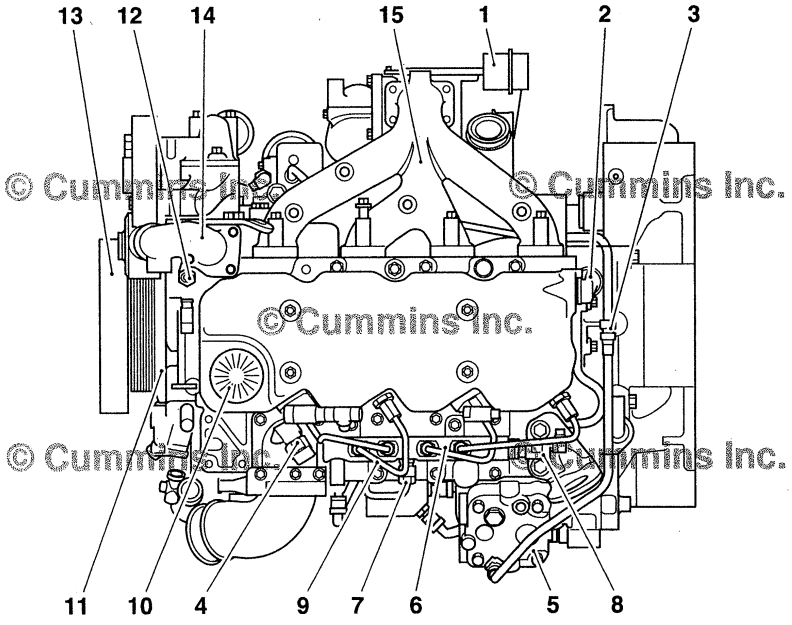
00d00269

1. Engine serial number
2. Engine model information
3. Control parts list (CPL)
4. Valve lash (overhead) setting
5. Horsepower and rpm rating.



QSB4.5 Engine Exhaust Side View

1. Coolant outlet
2. Alternator
3. Oil cooler
4. Coolant inlet
5. Oil filter
6. Oil pan drain plug
7. Turbocharger exhaust outlet
8. Starter
9. Flywheel housing
10. Turbocharger compressor inlet.



QSB4.5 Engine Top View

1. Turbocharger wastegate actuator
2. Crankcase breather
3. Air compressor coolant connection
4. Intake manifold pressure/temperature sensor
5. Air compressor
9. High-pressure fuel lines
10. Oil fill cap
11. Tone wheel
12. Coolant temperature sensor
13. Vibration damper (Optional)

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**

Maintenance Procedures - Overview

General Information

All maintenance checks and inspections listed in previous maintenance intervals **must** also be performed at this time, in addition to those listed under this maintenance interval.

Cooling System

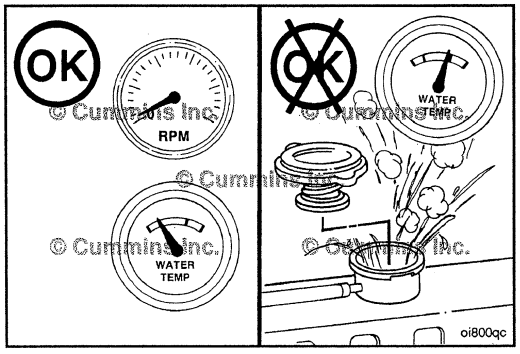
General Information

⚠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.

NOTE: Never use a sealing additive to stop leaks in the coolant system. This can result in coolant system plugging and inadequate coolant flow, causing the engine to overheat.

The engine coolant level **must** be checked daily.

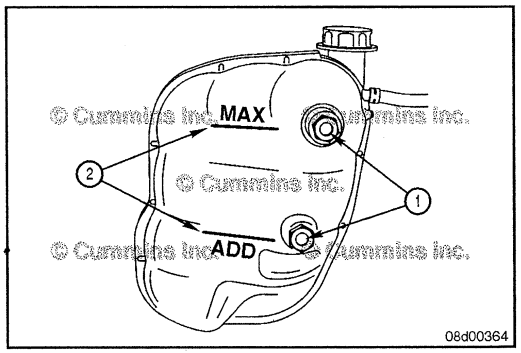


△CAUTION△

Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool below 50°C [120°F] before adding coolant.

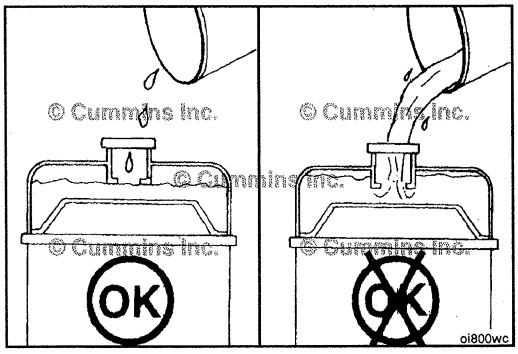
On applications that use a coolant recovery system, check to make sure the coolant is at the appropriate level on the coolant recovery tank, for the engine temperature.

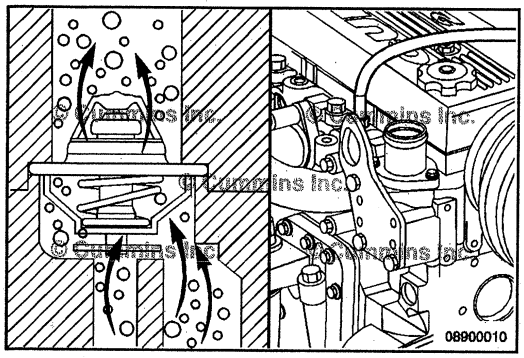
Many coolant recovery/expansion tanks, also called "top tanks", have sight glasses (1) or are made of a clear material (not shown) to aid in checking the coolant level (2) without removing the radiator cap.



Fill the cooling system with coolant to the bottom of the fill neck in the radiator fill or recovery/expansion tank.

NOTE: Some radiators have two fill necks, both of which **must** be filled when the cooling system is drained.





Fill

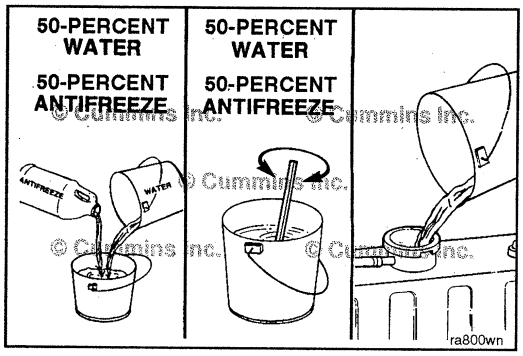
⚠CAUTION⚠

The system must be filled properly to prevent air locks. During filling, air must be vented from the engine coolant passages. Wait 2 to 3 minutes to allow air to be vented; then add mixture to bring the level to the top.

To be sure air is vented during the fill process:

- The thermostat has check balls that allow air to vent through the thermostat when the thermostat is closed.
- A deaeration port is located next to the water outlet connection which connects to the top tank/coolant recovery tank of the cooling system.

The system has a design fill rate of 19 liters [5 gal.] per minute.

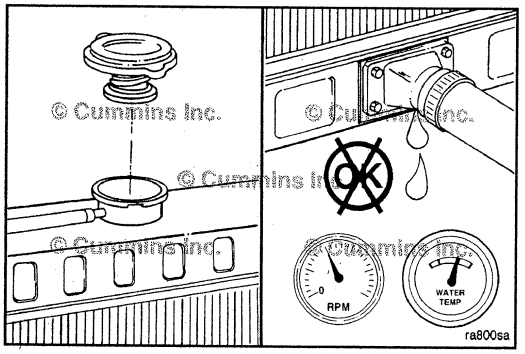


⚠CAUTION⚠

Never use water alone for coolant. Damage from corrosion can be the result of using water alone for coolant.

Use a mixture of 50-percent water and 50-percent ethylene glycol or propylene glycol antifreeze to fill the cooling system. Refer to the Cummins Coolant Requirements and Maintenance, Bulletin 3666132, for engine coolant specifications.

For cooling system capacity, refer to Procedure 018-018 (Cooling System) in Section V.



⚠WARNING⚠

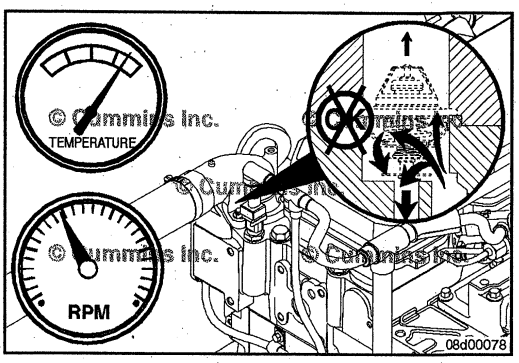
Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

Install the pressure cap. Operate the engine until it reaches a temperature of 80°C [180°F] and check for coolant leaks.

Check the coolant level again to make certain the system is full of coolant or that the coolant level has risen to the hot level in the recovery/expansion tank in the system, if so equipped.

⚠CAUTION⚠

Never operate the engine without a thermostat. Without a thermostat, the path of least resistance for the coolant is through the bypass to the water pump inlet. This can cause the engine to overheat.

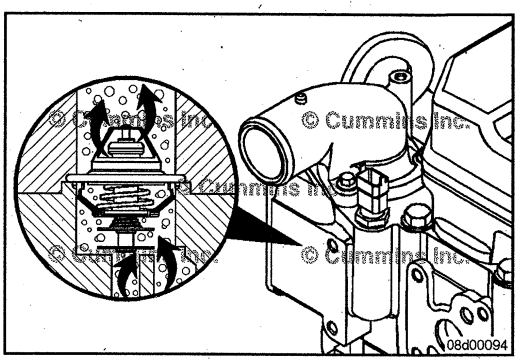


⚠CAUTION⚠

A missing check ball can cause the engine to run cold, resulting in engine damage.

The thermostat contains two check balls to vent air past the thermostat when it is closed. This is needed for the cooling system to fill.

NOTE: Some off-highway applications use a thermostat with one check ball. When servicing a thermostat always be sure to replace with the same part number. Though an incorrect thermostat will physically fit, it will lead to improper engine operation.

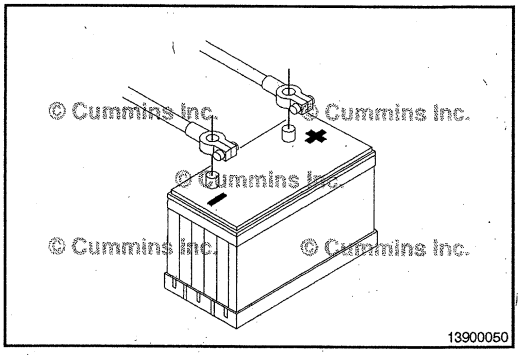


Preparatory Steps

⚠WARNING⚠

Batteries can emit explosive gases. To reduce the possibility of personal injury, always ventilate the compartment before servicing the batteries. To reduce the possibility of arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.

Disconnect the batteries.



Measure

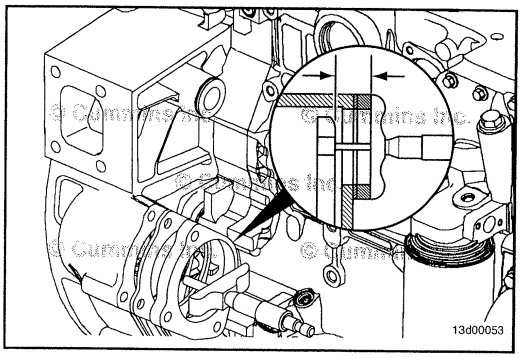
Using an inside micrometer or a vernier caliper, measure the distance from the starting motor mounting flange to the forward face of the front side of the flywheel ring gear.

NOTE: Include any spacers previously removed when completing the measurement.

Starting Motor Spacing

mm		in
49.28	MIN	1.94
52.32	MAX	2.06

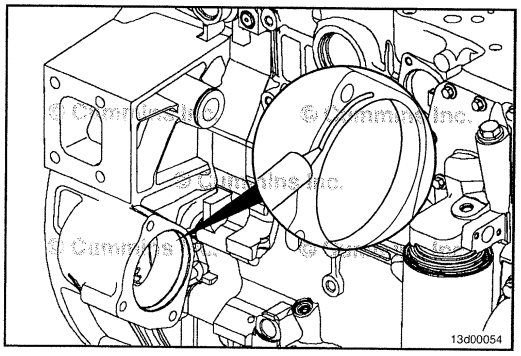
Add or remove spacers as necessary to achieve the correct starting motor spacing.



Install

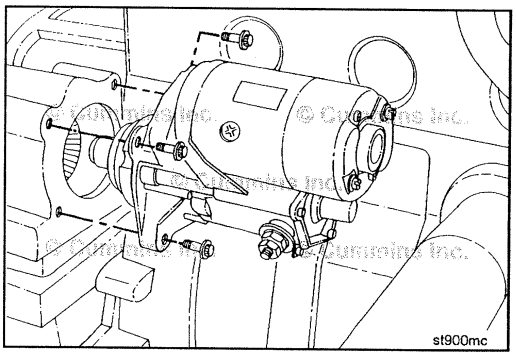
For engines with wet flywheel housings, apply a 1.5 to 2.0 mm [0.06 to 0.09 in] wide bead of sealant, Part Number 3164067 to the flywheel housing starting motor mounting flange.

NOTE: If a starting motor spacer is required, maker to apply sealant to the side of the spacer that contacts the starting motor.



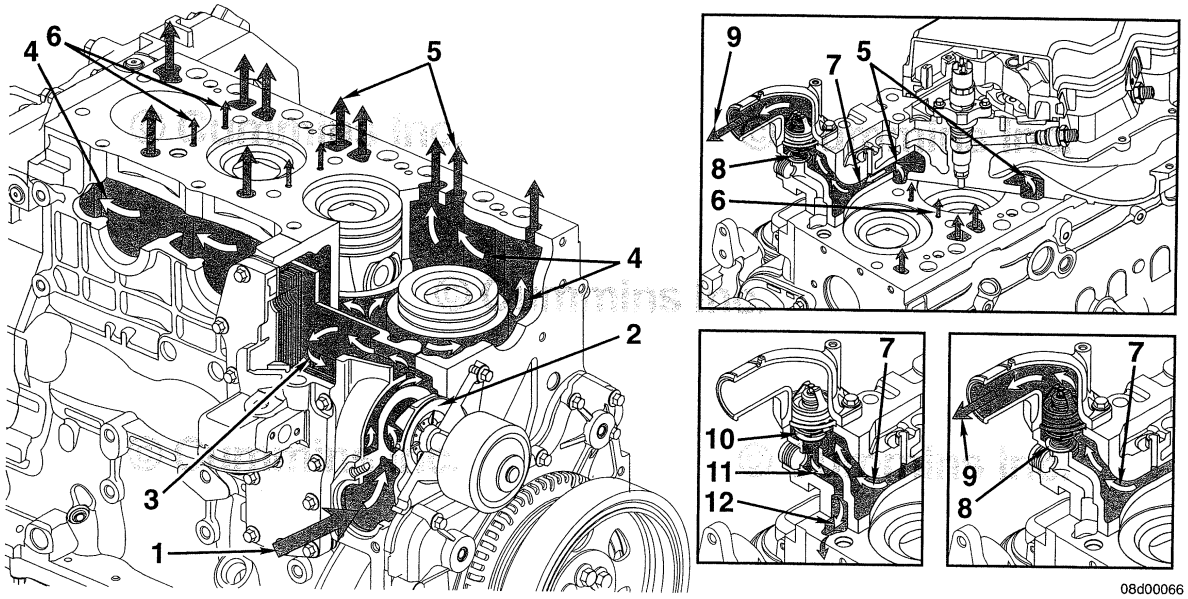
Install the three capscrews, the starting motor, and starting motor spacer (if required).

Torque Value: 43 N•m [32 ft-lb]



Flow Diagram, Cooling System

Flow Diagram



1. Coolant inlet
2. Pump impeller
3. Coolant flow past lubricating oil cooler
4. Coolant flow past cylinders
5. Coolant flow from cylinder block to cylinder head
6. Coolant flow between cylinders
7. Coolant flow to thermostat housing
8. Coolant bypass passage
9. Coolant flow back to radiator
10. Bypass open
11. Coolant bypass in cylinder head
12. Coolant flow to water pump inlet.

Cummins Customized Parts Catalog

General Information

Cummins is pleased to announce the availability of a parts catalog compiled specifically for you. Unlike the generic versions of parts catalogs that support general high volume parts content; Cummins Customized catalogs contains only the new factory parts that were used to build your engine.

The catalog cover, as well as the content, is customized with you in mind. You can use it in your shop, at your worksite, or as a coffee table book in your RV or boat. The cover contains your name, company name, address, and telephone number. Your name and engine model identification even appears on the catalog spine. Everybody will know that Cummins created a catalog specifically for you.

This new catalog was designed to provide you with the exact information you need to order parts for your engine. This will be valuable for customers that do not have easy access to the Cummins Electronic Parts Catalog or the Cummins Parts Microfilm System.

Additional Features of the Customized Catalog include:

- Engine Configuration Data
- Table of Contents
- Separate Option and Parts Indexes
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- ReCon Part Numbers (when applicable)

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The Customized Parts Catalog can be ordered On-Line from the Cummins Powerstore by credit card. Contact the Powerstore at WWW.POWERSTORE.CUMMINS.COM

Contact GDMS or the CUMMINS POWERSTORE for the current price; Freight may be an additional expense.

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

- Customer Name
- 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

Unfortunately not all Cummins Engines can be supported by this parts catalog. Engines older than 1984 or newer than 3 months may not have the necessary parts information to compile a catalog. We will contact you if this occurs and explain why we are unable to fill your order.

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Engine Difficult to Start or Will Not Start (No Exhaust Smoke)

Cause	Correction
STEP 1 Starting procedure is **not** correct	Verify the correct starting procedure. Refer to Section 1.
OK Go To Next Step	
STEP 2 Fuel level is low in the tank	Fill the supply tank. Refer to the OEM service manual.
OK Go To Next Step	
STEP 3 Fuel grade is **not** correct for the application or the fuel quality is poor	Operate the engine from a tank of high-quality fuel. Refer to Fuel Recommendations and Specifications in Section V.
OK Go To Next Step	
STEP 4 Electronic fault codes are active	For instructions on how to read active fault codes, refer to Section 1. If fault codes are active, contact a Cummins Authorized Repair Facility.
OK Go To Next Step	
STEP 5 OEM engine protection system is malfunctioning	Isolate the OEM engine protection system. Follow the OEM service manuals to check for a malfunction.
OK Go To Next Step	
STEP 6 Battery voltage is low	Check the batteries and the unswitched battery supply circuit. Refer to the OEM service manual.
OK Go To Next Step	
STEP 7 Keyswitch circuit is malfunctioning	Check the vehicle, equipment, or vessel keyswitch circuit. Refer to an Authorized Cummins Repair Facility.
OK Go To Next Step	
STEP 8 Battery voltage supply to the electronic control module (ECM) is low, interrupted, or open	Check the battery connections. Refer to the OEM service manual.
OK Go To Next Step	
STEP 9 Moisture in the wiring harness connectors	Dry the connectors with Cummins electronic cleaner, Part Number 3824510.
OK Go To Next Step	

Fault Code Warning Lamps Do Not Illuminate

Cause	Correction
STEP 1 Keyswitch is in the OFF position	Turn the keyswitch to the ON position.
OK Go To Next Step	
STEP 2 Battery voltage supply to the electronic control module (ECM) is low, interrupted, or open	Check the battery connections, the fuses, and the unswitched battery supply circuit. Refer to the OEM service manual.
OK Go To Next Step	
STEP 3 Idle shutdown or PTO shutdown features are activated	Check the time limit on idle and PTO shutdowns with an electronic service tool. Refer to Section 1.
OK Go To Next Step	
STEP 4 Contact a Cummins Authorized Repair Facility	