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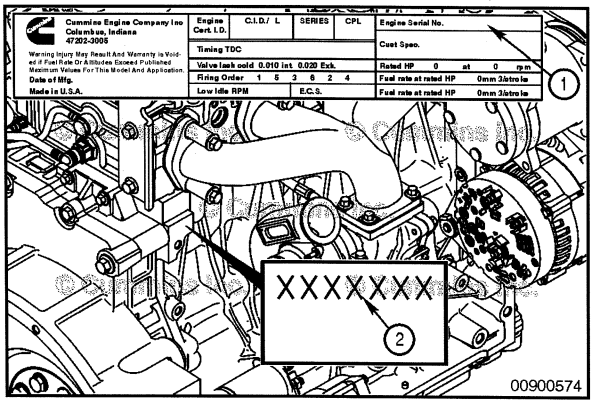
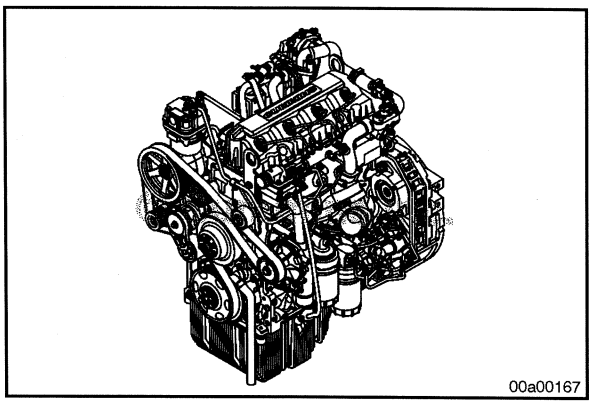


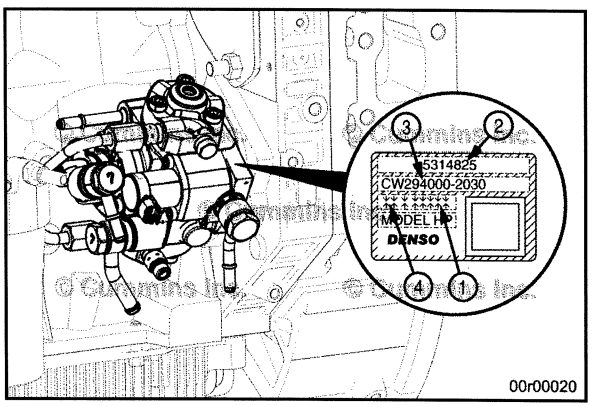
NOTE: If the engine dataplate (1) is **not** legible, the engine serial number (2) can be identified on the engine block. It is located on the exhaust side, next to the rear gear housing. Additional engine information is available by reading the engine control module (ECM) dataplate.



Cummins® Engine Nomenclature

The Cummins® Service Engine Model Identification procedure describes how to use the Cummins® Service Model Name to identify an engine. Refer to Procedure 100-005 in Section E.

The Cummins® Product Technology procedure provides the Cummins® Service Model Name and describes the unique technology used by the engine covered by this manual. Refer to Procedure 100-006 in section E.



Fuel Pump Dataplate

The Denso™ fuel pump dataplate is located on the fuel pump. This dataplate contains the following information to assist in servicing or replacement:

1 Customer part number

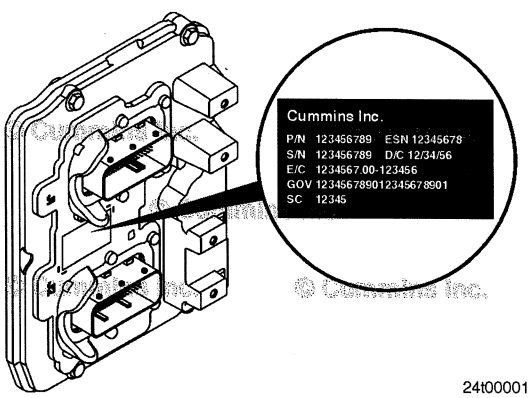
2 Denso™ part number

3 Production month serial number

4 Customer's certification number

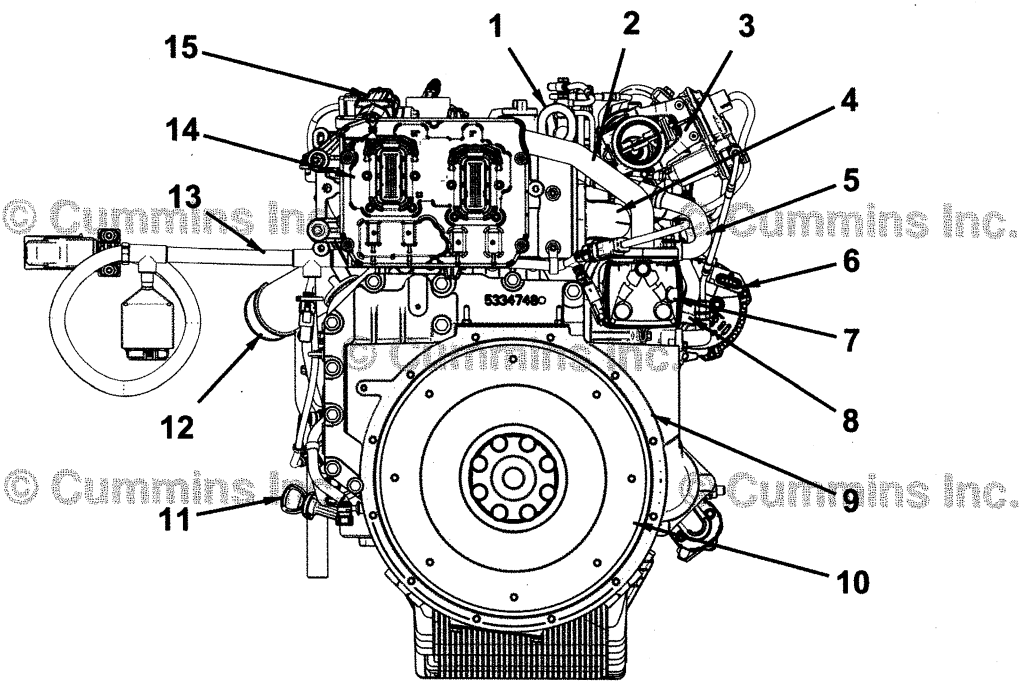
5 QR code.

Engine Control Module Dataplate



Engine Diagrams

General Information



Rear View

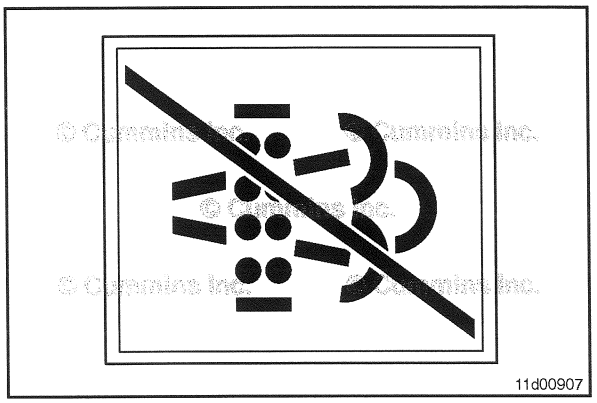
1 Rear engine lifting bracket
2 EGR crossover tube
3 Exhaust pressure regulator
4 Exhaust manifold
5 EGR coolant outlet tube
6 Alternator
7 EGR cooler
8 EGR coolant inlet tube
9 Flywheel housing
10 Flywheel
11 Lubricating oil dipstick
12 Intake air connection
13 Wiring harness
14 ECM
15 EGR valve.

SCR System Cleaning Inhibited Lamp

The SCR SYSTEM CLEANING DISABLED (INHIBIT) LAMP indicates that the inhibit switch is active, therefore automatic and manual (non-mission) SCR/exhaust system cleaning can **not** occur.

An illuminated SCR SYSTEM CLEANINGDISABLED (INHIBIT) lamp indicates that theinhibit switch is active and automatic ormanual (non-mission) SCR/exhaust systemcleaning will **not** occur. This can be correctedby switching the inhibit switch to permit mode. Refer to Procedure 101-050 in Section 1.

NOTE: The OEM determines whether or **not** the HIGH EXHAUST SYSTEM TEMPERATURE lamp is installed on the vehicle. The OEM also specifies the temperatures, vehicle speeds, and other conditions at which the lamp illuminates. See equipment manufacturer information for additional information regarding this lamp.

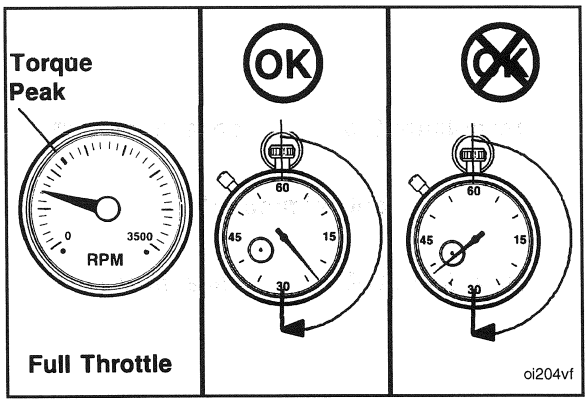


Engine Operating Range

General Information

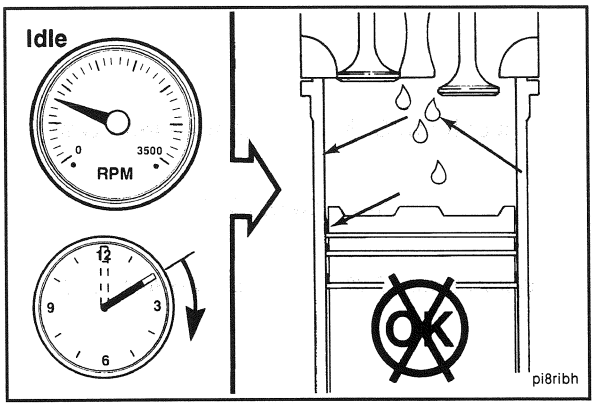
⚠CAUTION⚠
Do not operate the engine at full throttle below peak torque rpm (refer to engine dataplate for peak torque rpm) for more than 30 seconds. Operating the engine at full throttle below peak torque will shorten engine life to overhaul, can cause serious engine damage, and is considered engine abuse.

Cummins® engines are designed to operate successfully at full throttle under transient conditions down to peak torque engine speed. This is consistent with recommended operating practices.



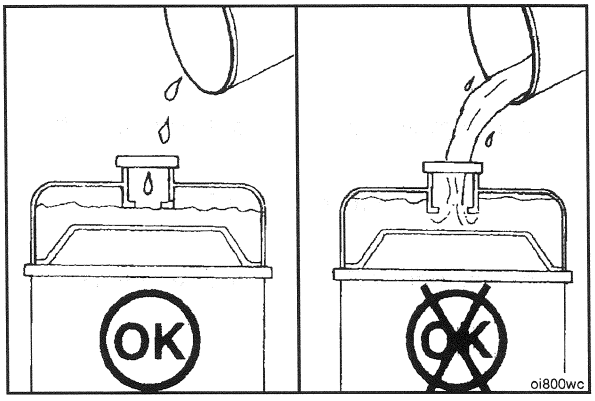
⚠CAUTION⚠
Do not operate the engine beyond the maximum engine speed. Operating the engine beyond the maximum engine speed can cause severe engine damage. Use proper operating techniques for the vehicle, vessel, or equipment to prevent engine overspeed. The maximum engine speed specification is listed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

⚠CAUTION⚠
Do not idle the engine for excessively long periods. Long periods of idling, more than 10 minutes, can cause poor engine performance.



Fill the cooling system with coolant. Refer to the markings on the radiator or expansion tank for coolant levels or refer to the OEM manual.

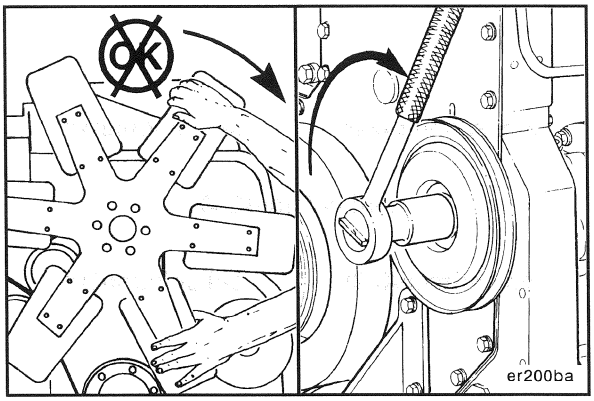
NOTE: Some radiators have two fill necks, both of which **must** be filled when the cooling system is drained.



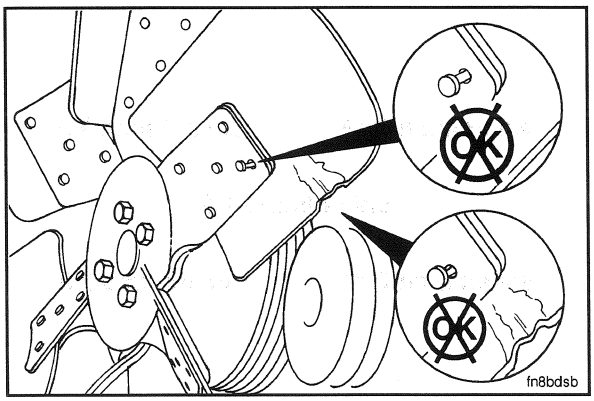
Fan, Cooling

Inspect for Reuse

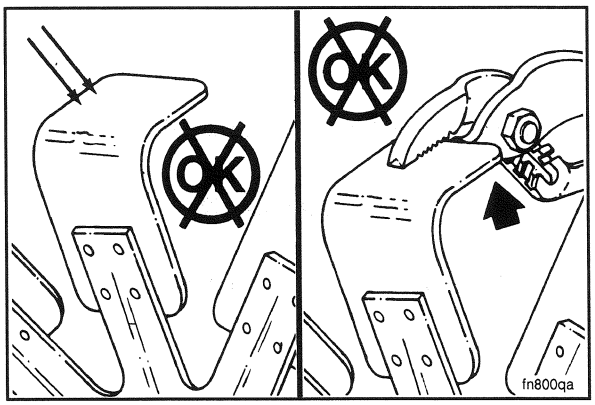
⚠WARNING⚠
Do not rotate the engine by pulling or prying on the fan. The fan blade(s) can be damaged and cause the fan to fail and cause personal injury or property damage. Use the accessory drive shaft or the crankshaft barring tool to rotate the crankshaft.



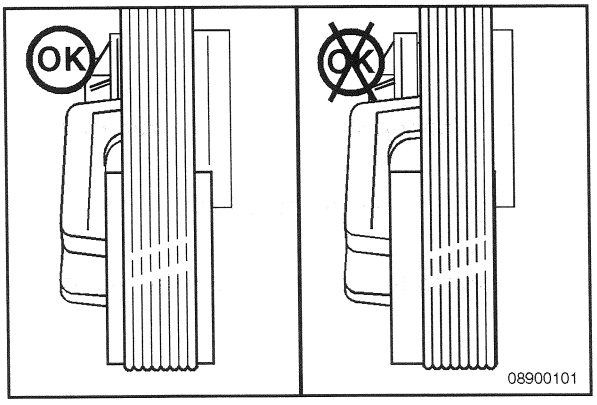
A visual inspection of the cooling fan is required daily. Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure it is securely mounted. Tighten the capscrews, if necessary.



⚠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.

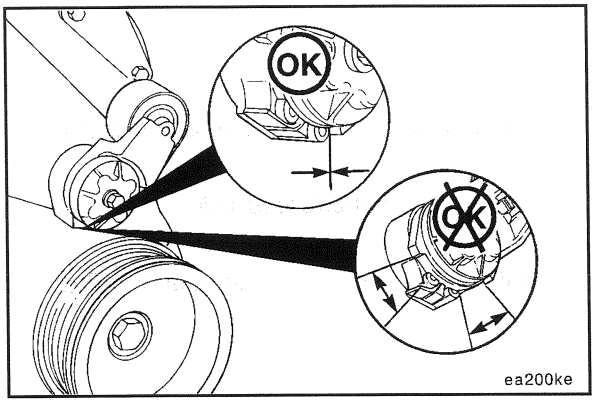


Check the location of the drive belt on the belt tensioner pulley. The belt should be centered on, or close to the middle of, the pulley. Misaligned belts, either too far forward or backward, can cause belt wear, belt roll-off malfunctions, or increase uneven tensioner bushing wear.



Remove the drive belt. Refer to Procedure 008-002 in Section A.

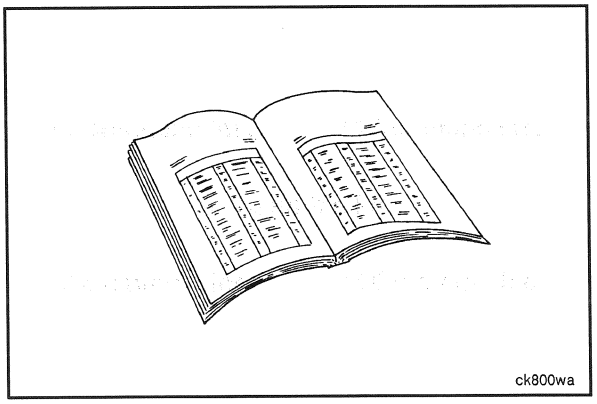
With the belt removed, verify the tensioner arm stop is in contact with the spring case stop. If they are **not** touching, the tensioner **must** be replaced.



Preparatory Steps

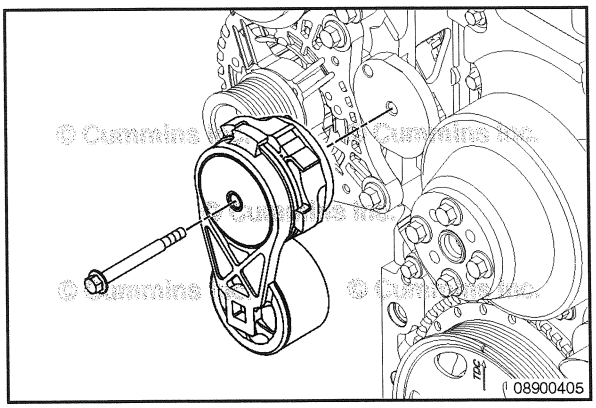
⚠WARNING⚠
Batteries can emit explosive gases. To reduce the possibility of personal injury, always ventilate the compartment before servicing the batteries. To reduce the possibility of arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.

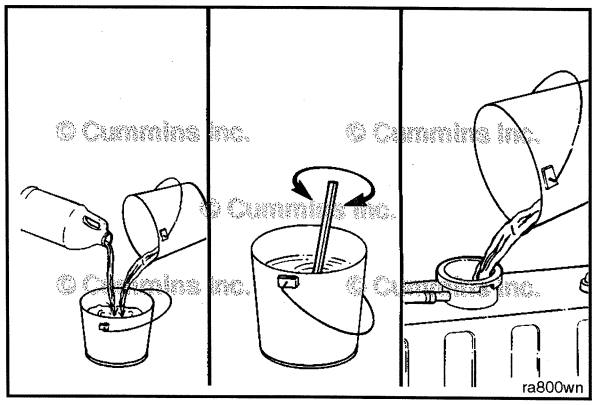
- Disconnect the batteries. See equipment manufacturer service information.
- Remove the drive belt. Refer to Procedure 008-002 in Section A.



Remove

Remove the capscrew and belt tensioner from the bracket.





⚠CAUTION⚠
Before topping off the cooling system, allow the system temperature to cool to ambient. This will allow an adequate amount of coolant to be available to the water pump during all periods of operation.

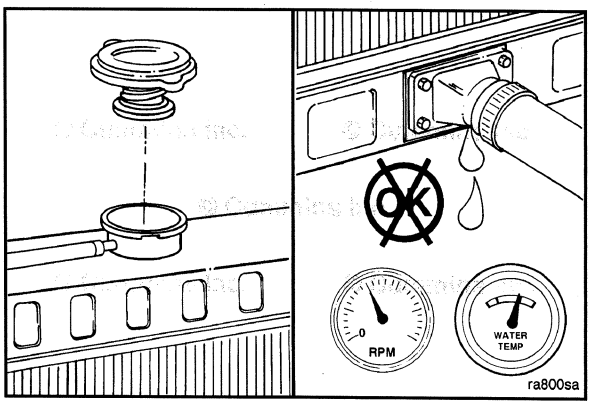
⚠CAUTION⚠
Engine and component damage may result if adequate cool down time is not given after the cooling system pressure has been relieved in order to top off with coolant. System pressure is only generated with the temperature rise of the coolant. Closing the cooling system while hot will not allow for pressure to build.

⚠CAUTION⚠
Do not use water alone for coolant. Damage from corrosion can severely damage the engine cooling system.

Use a mixture of 50-percent water and 50-percent ethylene glycol or propylene glycol antifreeze to fill the cooling system.

Reference the Cummins® Coolant Requirements and Maintenance, Bulletin 3666132, for engine coolant specifications.

Use the following procedure for cooling system capacity. Refer to Procedure 018-018 in Section V.



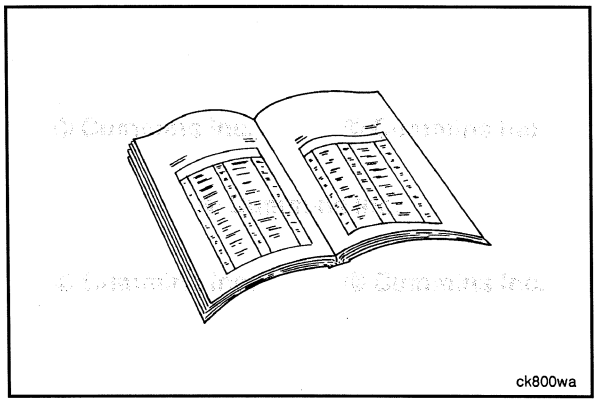
⚠WARNING⚠
Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F]before removing the pressure cap. Heated coolant spray or steam can cause personal injury.

⚠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 [176°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 equipped.

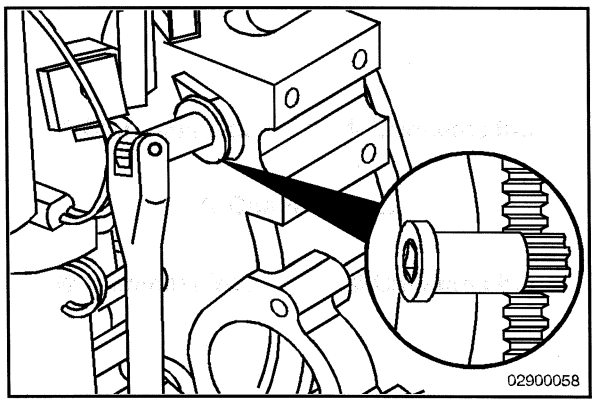


Finishing Steps

⚠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.

- Install the drive belt. Refer to Procedure 008-002 in Section A.
- Connect the batteries. See equipment manufacturer service information.
- Operate the engine to check for proper operation.



Starting Motor

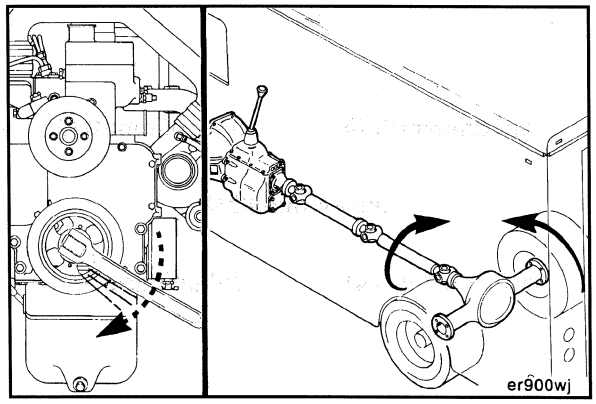
Rotation Check

If the starter solenoid is making a sound, but the engine is **not** rotating, turn the keyswitch to the OFF position, and attempt to bar the crankshaft in both directions.

Bar the engine with barring tool, Cummins® Part Number 3824591.

If the crankshaft will bar over, attempt to start the engine. If the starter motor cranks the engine, check the starter motor pinion gear and flywheel ring gear for damage.

If damage to the starter motor pinion gear and/or flywheel ring gear is found when replacing the components, make sure to measure the distance from the starting motor mounting flange to the forward face of the front side of the flywheel ring gear. Follow the measure step of this procedure.



If the crankshaft does **not** rotate or requires more than the normal effort to bar, check for an internal malfunction or a problem with the drive unit and/or accessories.

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Engine Shuts Off Unexpectedly or Dies During Deceleration

Cause	Correction
STEP 1 Engine will **not** restart	Refer to the Engine Difficult to Start or Will **Not** Start troubleshooting symptom tree in Section TS.
OK Go To Next Step	
STEP 2 Fuel level is low in the tank	Fill the supply tank. Refer to equipment manufacturer service information.
OK Go To Next Step	
STEP 3 Electronic fault codes are active or high counts of inactive fault codes	Review instructions for reading active fault codes.
OK Go To Next Step	
STEP 4 Idle Shutdown or power takeoff (PTO) Shutdown features are activated	Check the time limit on Idle Shutdown and PTO Shutdown features with an electronic service tool. Refer to Procedure 101-007 in Section 1.
OK Go To Next Step	
STEP 5 Moisture in the wiring harness connectors	Dry the connectors with electrical contact cleaner, Part Number 3824510.
OK Go To Next Step	
STEP 6 OEM engine protection system is malfunctioning	Isolate the OEM engine protection system. Follow the OEM service manual instructions to check for a malfunction.
OK Go To Next Step	
STEP 7 Battery voltage supply to the engine control module (ECM) is low, interrupted, or open	Check the battery connections, the fuses, and the unswitched battery supply circuit. Refer to equipment manufacturer service information.
OK Go To Next Step	
STEP 8 Air in the fuel system	Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank standpipe, and fuel filters as necessary.
OK Go To Next Step	
STEP 9 Contact a Cummins® Authorized Repair Facility	

Engine Will Not Reach Rated Speed (RPM)

Cause	Correction
STEP 1 Vehicle parasitics are excessive	Check the vehicle for brakes dragging, transmission malfunction, cooling fan operation cycle time, and engine-driven units. Refer to equipment manufacturer service information.
OK Go To Next Step	
STEP 2 Electronic fault codes are active or high counts of inactive fault codes	Review instructions for reading active fault codes.
OK Go To Next Step	
STEP 3 Vehicle speed is too low for adequate cooling with high engine load	Reduce the engine load. Increase the engine (fan) rpm by downshifting.
OK Go To Next Step	
STEP 4 Tachometer is **not** calibrated or is malfunctioning	Compare the tachometer reading with a handheld tachometer or an electronic service tool reading. Calibrate or replace the tachometer as necessary. Refer to equipment manufacturer service information.
OK Go To Next Step	
STEP 5 Air-fuel tube leaking, wastegate diaphragm ruptured, or wastegate plumbing damaged	Tighten the fittings, repair the plumbing, and/or replace the wastegate diaphragm. Refer to equipment manufacturer service information or contact a Cummins® Authorized Repair Location.
OK Go To Next Step	
STEP 6 Charge-air cooler restricted, if equipped	Inspect the charge-air cooler for internal and external restrictions. Replace the restricted cooler if necessary. See equipment manufacturer service information.
OK Go To Next Step	
STEP 7 Fuel supply is **not** adequate	Check the flow through the filter to locate the source of the restriction. Refer to equipment manufacturer service information.
OK Go To Next Step	
STEP 8 Exhaust back pressure too high	Measure and correct if above specification. Refer to equipment manufacturer service information or contact a Cummins® Authorized Repair Location.
OK Go To Next Step	

Smoke, White - Excessive

Cause	Correction
STEP 1 Starting procedure is **not** correct	Verify the correct starting procedure. Refer to Procedure 101-014 in Section 1.
OK Go To Next Step	
STEP 2 Engine is cold	Allow the engine to warm to operating temperature. If the engine will **not** reach operating temperature, refer to the Coolant Temperature Below Normal troubleshooting symptom tree in Section TS.
OK Go To Next Step	
STEP 3 Engine is operating at low ambient temperature	Check the winterfront, shutters, and under-the-hood air. Use under-the-hood intake air in cold weather. Refer to Procedure 101-015 in Section 1 or Operation of Diesel Engines in Cold Climates, Bulletin 3379009.
OK Go To Next Step	
STEP 4 Electronic fault codes are active or high counts of inactive fault codes	Review instructions for reading active fault codes.
OK Go To Next Step	
STEP 5 Starting aid is malfunctioning	Check for correct operation of cold-starting aid. Refer to Procedure 101-004 in Section 1 or a Cummins® Authorized Repair Location.
OK Go To Next Step	
STEP 6 Coolant temperature is below specification	Refer to the Coolant Temperature is Below Normal troubleshooting symptom tree in Section TS.
OK Go To Next Step	
STEP 7 Fuel grade is **not** correct for the application or the fuel quality is poor	Operate the engine from a tank of known high quality fuel. Refer to Procedure 018-002 in Section V.
OK Go To Next Step	
STEP 8 Air intake or exhaust leaks	Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. Refer to Procedure 010-058 in Section 3.
OK Go To Next Step	