# ENGINE OPERATION and MAINTENANCE MANUAL

## Cummins QSL9 Engine

Bulletin: 3666472-00 (January 2000)



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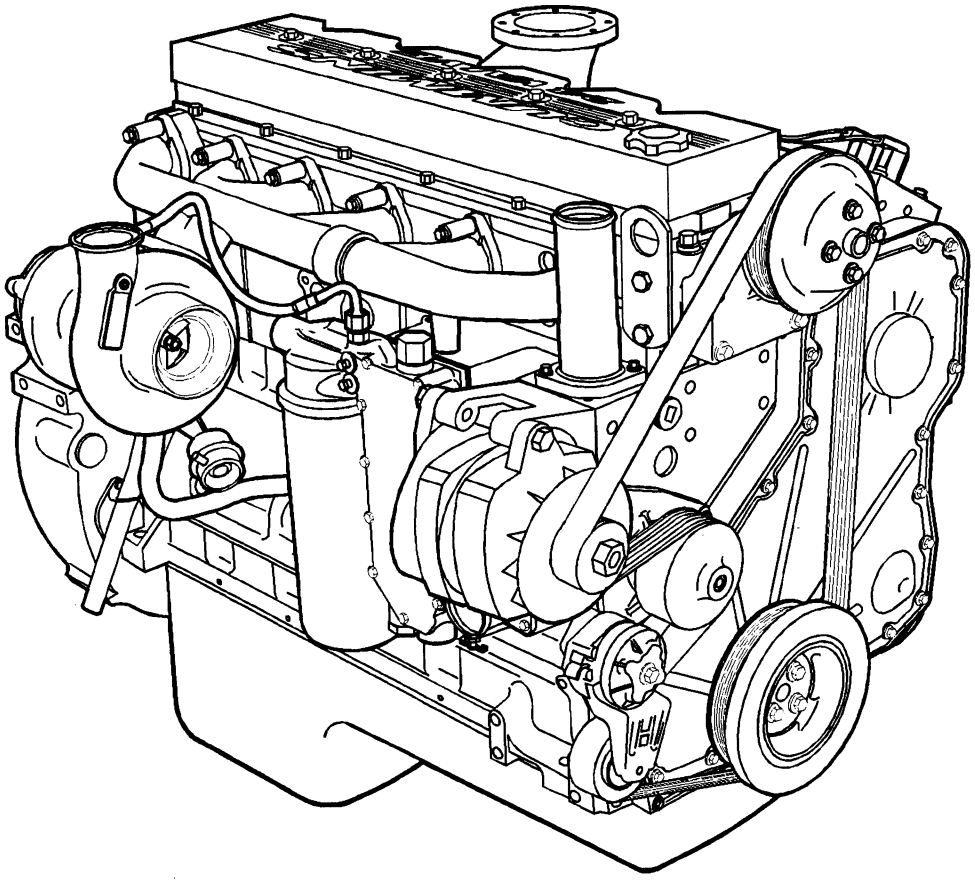
Doosan Infracore Portable Power

# Operation and Maintenance Manual
# QSL9 Engine



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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 Engine Company, 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. These parts can be identified by the following trademarks:


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

# Table of Contents

# 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 | Part Number |
|---|---|---|
| Engine Model | | |
| 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 | | |
| • Lubricating Oil Filter | | |
| • Fuel | | |
| • Fuel-Water Separator | | |
| • Coolant | | |
| • Remote Gas | | |
| Governor Control Module (GCM) (if applicable) | | |
| Belt Part Numbers: | | |
| • | | |
| • | | |
| • | | |
| Clutch or Marine Gear (if applicable): | | |
| • Model | | |
| • Serial Number | | |
| • Part Number | | |
| • Oil Type | | |
| • Sea Water Pump | | |
| – Model | | |
| – Part Number | | |

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# To the Owner and Operator

Preventative maintenance is the easiest and least expensive type of maintenance. Follow the maintenance schedule recommendations outlined in the Maintenance Guidelines (Section 2).

Keep records of regularly scheduled maintenance.

Use the correct fuel, oil, and coolant in the engine as specified in the Maintenance Specifications (Section V).

Cummins Engine Company, Inc. uses the latest technology and the highest quality components to produce its engines. Cummins recommends using **only** genuine Cummins parts and ReCon® exchange parts.

The personnel at Cummins Authorized Repair Facilities have been trained to provide expert service and parts support. If there is a problem that can **not** be resolved by a Cummins Authorized Repair Facility, follow the steps outlined in Service Assistance (Section S).

**△ CAUTION △**

**Welding on a vehicle with an electronically controlled fuel system is not recommended. Disconnect both the positive (+) and ground (-) battery cables from the battery before welding on the vehicle. Attach the welder ground (-) cable no more than 0.61 m [2 ft] from the part being welded. Do not connect the ground (-) cable of the welder to the electronic control module (ECM). Welding on the engine or engine-mounted components is not recommended.**

# About the Manual

This manual contains information needed to operate and maintain the engine correctly as recommended by Cummins Engine Company, Inc. Additional service literature can be ordered from a local Cummins Distributor or by calling 1-800-DIESELS (1-800-343-7357) in the U.S.A. and Canada.

This manual does **not** cover vehicle or equipment maintenance procedures. Consult the vehicle or original equipment manufacturer (OEM) for specific maintenance recommendations.

Both metric and U.S. customary values are listed in this manual. The metric value is listed first, followed by the U.S. customary equivalent in brackets [ ].

Numerous illustrations and symbols are used to aid in understanding the meaning of the text. Refer to Symbols in this section for a complete list of the symbols and their definitions.

Each section is preceded by a Section Contents to aid in locating information quickly.

# How to Use the Manual

This manual is organized according to the intervals that maintenance on the engine is to be performed. A maintenance chart (table) that lists the intervals and required maintenance procedures is in Section 2. Locate the interval of the maintenance to be performed; then follow the procedures in that section. In addition, the procedures listed under previous maintenance intervals **must** also be performed.

Keep a record of all the checks and inspections made. A form for recording the maintenance checks performed is in Section 2.

Refer to Section TS for a guide to troubleshooting the engine. Follow the directions to locate and repair engine problems.

Refer to Section V for the specifications recommended by Cummins Engine Company, Inc. for the engine. Refer to Section V for the specifications and torque values for each engine.

# Symbols

The following symbols have been used in this manual to help communicate the intent of the instructions. When one of the symbols appears, it conveys the meaning defined below:

**WARNING** - Serious personal injury or extensive property damage can result if the warning instructions are **not** followed.

**CAUTION** - Minor personal injury can result or a part, an assembly, or the engine can be damaged if the caution instructions are **not** followed.

Indicates a **REMOVAL or DISASSEMBLY** step.

Indicates an **INSTALLATION or ASSEMBLY** step.

**INSPECTION** is required.

**CLEAN** the part or assembly.

**PERFORM** a mechanical or time **MEASUREMENT**.

**LUBRICATE** the part or assembly.

Indicates that a **WRENCH or TOOL SIZE** will be given.

**TIGHTEN** to a specific torque.

**PERFORM** an electrical **MEASUREMENT**.

Refer to another location in this manual or another publication for additional information.

The component weighs 23 kg [50 lb] or more. To avoid personal injury, use a hoist or get assistance to lift the component.

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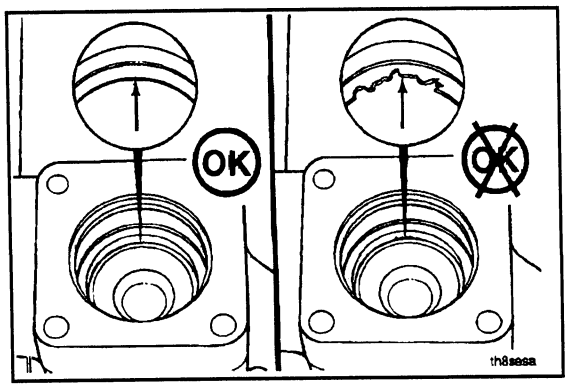
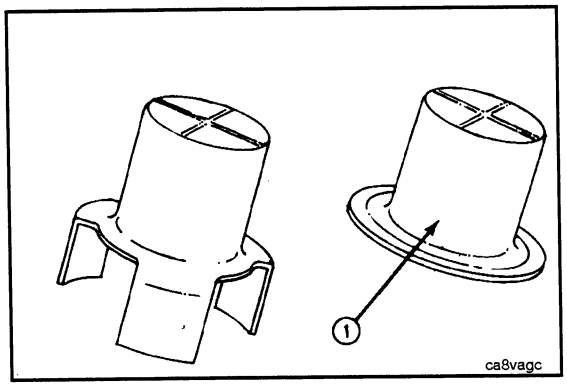
## Illustrations

Some of the illustrations throughout this manual are generic and will **not** look exactly like the engine or parts used in your application. The illustrations can contain symbols to indicate an action required and an acceptable or **not** acceptable condition.




The illustrations are intended to show repair or replacement procedures. The procedure will be the same for all applications, although the illustration can differ.



# General Safety Instructions

## Important Safety Notice

**⚠ WARNING ⚠**

**Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation or other bodily injury or death.**

Read and understand all of the safety precautions and warnings before performing any repair. This list contains the general safety precautions that **must** be followed to provide personal safety. Special safety precautions are included in the procedures when they apply.

- Make sure the work area surrounding the product is dry, well lit, ventilated, free from clutter, loose tools, parts, ignition sources and hazardous substances. Be aware of hazardous conditions that can exist.
- **Always** wear protective glasses and protective shoes when working.
- Rotating parts can cause cuts, mutilation or strangulation.
- Do **not** wear loose-fitting or torn clothing. Remove all jewelry when working.
- Disconnect the battery (negative [-] cable first) and discharge any capacitors before beginning any repair work. Disconnect the air starting motor if equipped to prevent accidental engine starting. Put a "Do **Not** Operate" tag in the operator's compartment or on the controls.
- Use ONLY the proper engine barring techniques for manually rotating the engine. Do **not** attempt to rotate the crankshaft by pulling or prying on the fan. This practice can cause serious personal injury, property damage, or damage to the fan blade(s) causing premature fan failure.
- If an engine has been operating and the coolant is hot, allow the engine to cool before you slowly loosen the filler cap and relieve the pressure from the cooling system.
- Do **not** work on anything that is supported ONLY by lifting jacks or a hoist. **Always** use blocks or proper stands to support the product before performing any service work.
- Relieve all pressure in the air, oil, fuel and the cooling systems before any lines, fittings, or related items are removed or disconnected. Be alert for possible pressure when disconnecting any device from a system that utilizes pressure. Do **not** check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.
- To prevent suffocation and frostbite, wear protective clothing and ONLY disconnect fuel and liquid refrigerant (freon) lines in a well ventilated area. To protect the environment, liquid refrigerant systems **must** be properly emptied and filled using equipment that prevents the release of refrigerant gas (fluorocarbons) into the atmosphere. Federal law requires capturing and recycling refrigerant.
- To avoid personal injury, use a hoist or get assistance when lifting components that weigh 23 kg [50 lb] or more. Make sure all lifting devices such as chains, hooks, or slings are in good condition and are of the correct capacity. Make sure hooks are positioned correctly. **Always** use a spreader bar when necessary. The lifting hooks **must not** be side-loaded.
- Corrosion inhibitor, a component of SCA and lubricating oil, contains alkali. Do **not** get the substance in your eyes. Avoid prolonged or repeated contact with skin. Do **not** swallow internally. In case of contact, immediately wash skin with soap and water. In case of contact, immediately flood eyes with large amounts of water for a minimum of 15 minutes. IMMEDIATELY CALL A PHYSICIAN. KEEP OUT OF REACH OF CHILDREN.
- Naptha and Methyl Ethyl Ketone (MEK) are flammable materials and **must** be used with caution. Follow the manufacturer's instructions to provide complete safety when using these materials. KEEP OUT OF REACH OF CHILDREN.
- To avoid burns, be alert for hot parts on products that have just been turned off, and hot fluids in lines, tubes, and compartments.
- **Always** use tools that are in good condition. Make sure you understand how to use them before performing any service work. Use ONLY genuine Cummins or Cummins ReCon® replacement parts.
- **Always** use the same fastener part number (or equivalent) when replacing fasteners. Do **not** use a fastener of lesser quality if replacements are necessary.
- Do **not** perform any repair when fatigued or after consuming alcohol or drugs that can impair your functioning.
- Some state and federal agencies in the United States of America have determined that used engine oil can be carcinogenic and can cause reproductive toxicity. Avoid inhalation of vapors, ingestion, and prolonged contact with used engine oil.
- Coolant is toxic. If **not** reused, dispose of in accordance with local environmental regulations.

# Acronyms and Abbreviations

| | |
|---|---|
| **AFC** | Air Fuel Control |
| **API** | American Petroleum Institute |
| **ASA** | Air Signal Attenuator |
| **ASTM** | American Society of Testing and Materials |
| **°C** | Celsius |
| **CARB** | California Air Resources Board |
| **C.I.D.** | Cubic Inch Displacement |
| **CNG** | Compressed Natural Gas |
| **CPL** | Control Parts List |
| **cSt** | Centistokes |
| **ECM** | Electronic Control Module |
| **ECS** | Emission Control System |
| **EPA** | Environmental Protection Agency |
| **EPS** | Engine Position Sensor |
| **°F** | Fahrenheit |
| **GVW** | Gross Vehicle Weight |
| **Hg** | Mercury |
| **hp** | Horsepower |
| **$H_2O$** | Water |
| **ICM** | Ignition Control Module |
| **km/l** | Kilometers per Liter |
| **kPa** | Kilopascal |
| **LNG** | Liquid Natural Gas |
| **LTA** | Low Temperature Aftercooling |
| **MIP** | Mixer Inlet Pressure |
| **MPa** | Megapascal |
| **mph** | Miles Per Hour |
| **mpq** | Miles Per Quart |
| **N•m** | Newton-meter |
| **NG** | Natural Gas |
| **OEM** | Original Equipment Manufacturer |
| **ppm** | Parts Per Million |
| **psi** | Pounds Per Square Inch |
| **PTO** | Power Takeoff |
| **rpm** | Revolutions Per Minute |
| **SAE** | Society of Automotive Engineers |
| **SCA** | Supplemental Coolant Additive |
| **STC** | Step Timing Control |
| **VS** | Variable Speed |
| **VSS** | Vehicle Speed Sensor |

# NOTES

# Section E - Engine Identification

## Section Contents

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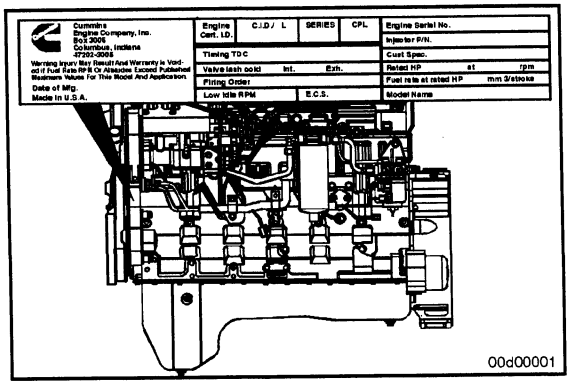
# Engine Identification

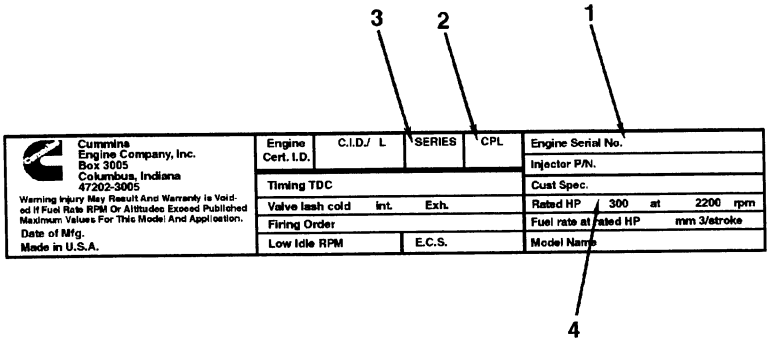
## Engine Dataplate

The engine dataplate provides important facts about the engine. The engine serial number (ESN) and control parts list (CPL) provide information for service and ordering parts. The engine dataplate **must not** be changed unless approved by Cummins Engine Company, Inc.

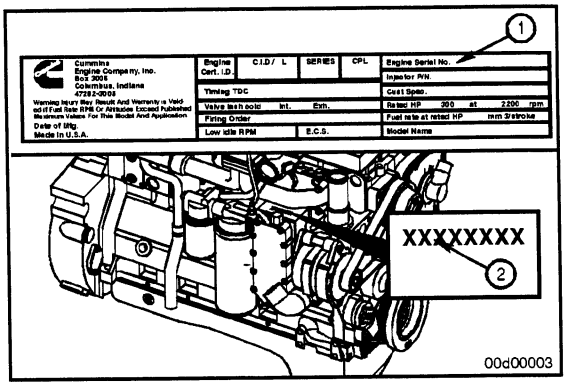


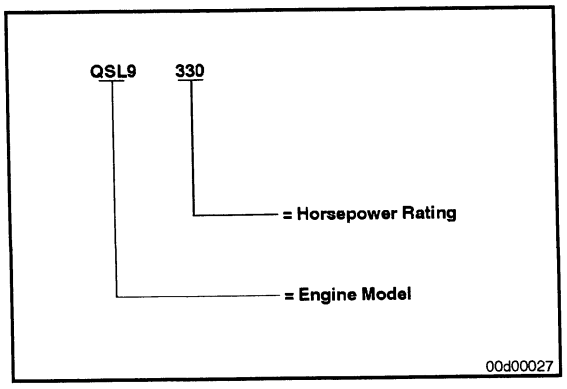

The dataplate is located on the top side of the gear housing. Have the following engine data available when communicating with a Cummins Authorized Repair Facility. The information on the dataplate is mandatory when sourcing service parts.

1. Engine serial number (ESN)
2. Control parts list (CPL)
3. Model number
4. Horsepower and rpm rating.



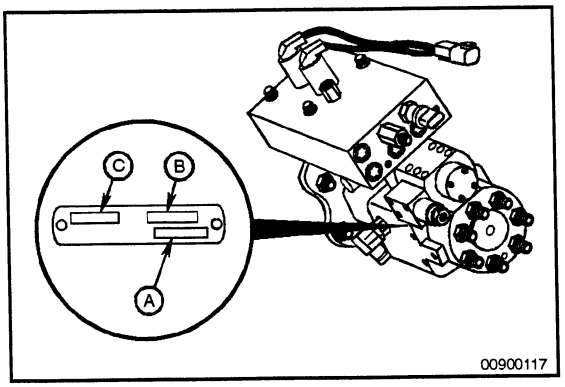

**NOTE:** If the engine dataplate (1) is **not** readable, the engine serial number (ESN) (2) can be found on the engine block on top of the lubricating oil cooler housing. Additional engine information is on the electronic control module (ECM) dataplate.






## Cummins Engine Nomenclature

The Cummins engine nomenclature provides the engine model and horsepower rating.



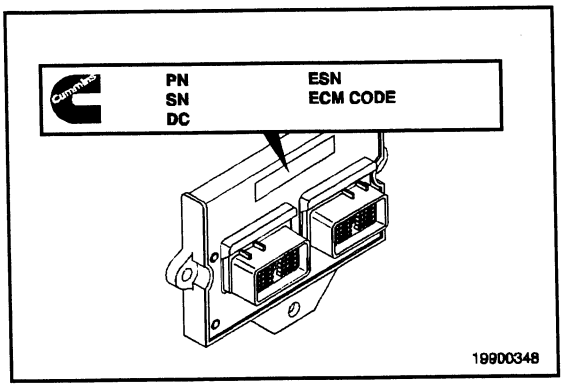

## Fuel Injection Pump Dataplate

The Cummins accumulator pump system (CAPS) fuel injection pump dataplate is located on the side of the injection pump. The dataplate contains the following information:

A. Cummins part number

B. Pump serial number

C. Factory code.




## ECM Dataplate

The electronic control module (ECM) dataplate shows important facts about the ECM and how it is programmed. The dataplate is located on the ECM above the ECM connectors.

The following information is found on the ECM dataplate:

- ECM part number (PN)
- ECM serial number (SN)
- ECM date code (DC)
- Engine serial number (ESN)
- ECM Code identifying the software number that indicates how the ECM is programmed.

**NOTE:** When communicating with a Cummins Authorized Repair Facility, the ECM code is required.

# Specifications

## General Specifications

Horsepower ..... (Refer to engine dataplate)

QSL9 Engine Speed @ Maximum Power Output:
- Standard Rating ..... 2100 rpm
- Governed Speed ..... 2300 rpm

Bore and Stroke ..... 114 mm [4.49 in] x 144.5 mm [5.69 in]

Displacement ..... 8.9 liters [543 C.I.D.]

Compression Ratio ..... 16.6:1

Firing Order ..... 1-5-3-6-2-4

QSL9 Approximate Engine Weight (with standard accessories) ..... 706 kg [1556 lb]

Crankshaft Rotation (viewed from the front of the engine) ..... **Clockwise**

Valve Clearance:
- Intake ..... 0.3048 mm [0.012 in]
- Exhaust ..... 0.5588 mm [0.022 in]

**NOTE:** The QSL9 engine features a no-adjust overhead. The QSL9 valve train is designed such that adjustment of the valve lash is **not** required for normal service during the first 241,500 km [150,000 mi] or 5000 hours. The valve train operates acceptably within the limits of 0.152 to 0.559 mm [0.006 to 0.022 in] intake valve lash and 0.381 to 0.813 mm [0.015 to 0.032 in] exhaust valve lash.

## Fuel System

Engine Idle Speed ..... 600 to 1200 rpm

Maximum Lift Pump Inlet Restriction at Rated ..... 102 mm Hg [4 in Hg]

Maximum Fuel Filter Outlet Restriction at Rated ..... 254 mm Hg [10 in Hg]

Minimum Fuel Filter Inlet Pressure during Cranking ..... 508 mm Hg [20 in Hg]

Maximum Fuel Drain Line Pressure ..... 254 mm Hg [10 in Hg]

Maximum Fuel Inlet Temperature ..... 71°C [160°F]

Minimum Engine Cranking Speed ..... 150 rpm

## Lubricating Oil System

Oil Pressure:
- At Low Idle (minimum allowable) ..... 69 kPa [10 psig]
- At Rated Speed (minimum allowable) ..... 207 kPa [30 psig]

Regulated Pressure ..... 517 kPa [75 psi]

Oil Pan Capacity, Low to High:
- Standard Oil Pan ..... 18.9 to 22.7 liters [20 to 24 qt]
- Standard Oil Pan with Block Stiffener ..... 19.9 to 23.7 liters [21 to 25 qt]

Total System Capacity:
- Standard Oil Pan ..... 22.7 liters [24 qt]
- Standard Oil Pan with Block Stiffener ..... 23.7 liters [25 qt]

Oil Capacity of Standard Engine:
- Standard Oil Pan
  - Pan **Only** ..... 22.7 liters [24 qt]

**NOTE:** Some applications use a slightly different oil pan capacity. Contact a local Cummins Distributor if there are any questions.

## Cooling System

Coolant Capacity (engine **only**) ..... 10.9 liters [11.5 qt]

Standard Modulating Thermostat - Range ..... 84 to 91°C [183 to 196°F]

Maximum Allowable Operating Temperature ..... 100°C [212°F]

Minimum Recommended Operating Temperature ..... 70°C [158°F]

Minimum Recommended Pressure Cap ..... 50 kPa [7 psi]

## Air Intake System

Maximum Intake Restriction (clean air filter element) ..... 254 mm $H_2O$ [10.0 in $H_2O$]

Maximum Intake Restriction (dirty air filter element) ..... 635 mm $H_2O$ [25.0 in $H_2O$]

## Exhaust System

Maximum Exhaust Back Pressure ..... 76 mm Hg [3 in Hg]

## Electrical System

Recommended Battery Capacity

| System Voltage | Ambient Temperature | | | |
|---|---|---|---|---|
| | -18°C [0°F] | | -29°C [-20°F] | |
| | Cold Cranking Amperes | Reserve Capacity (Minutes) (1) | Cold Cranking Amperes | Reserve Capacity (Minutes) (1) |
| 12 VDC | 1500 | 360 | 1875 | 360 |
| 24 VDC (2) | 750 | 180 | 900 | 180 |

1. The number of plates within a given battery size determines reserve capacity. Reserve capacity determines the length of time for which a battery at 27°C [81°F] can supply 25 amperes at 10.5 volts or greater.
2. CCA ratings are based on two 12-VDC batteries in series.

## Batteries (Specific Gravity)

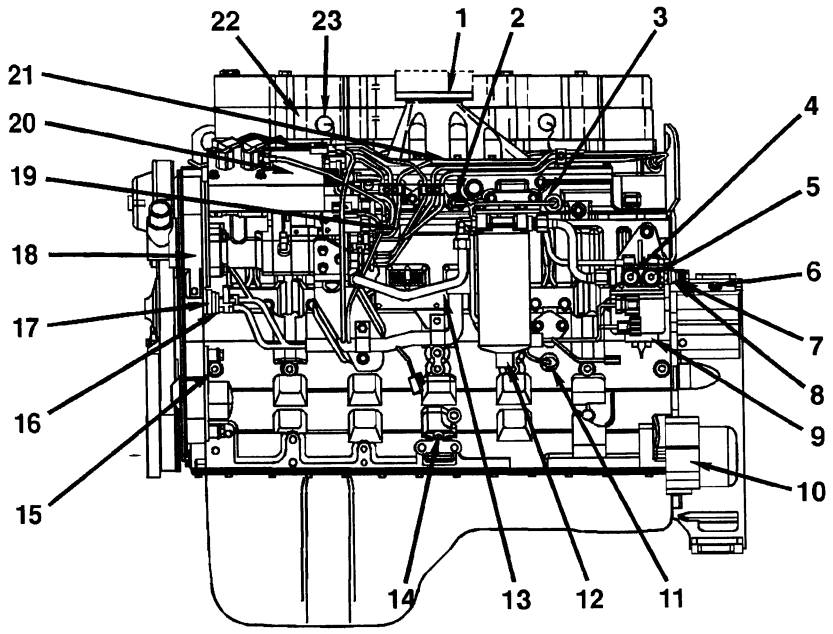
| Specific Gravity at 27°C [81°F] | State of Charge |
|---|---|
| 1.260 to 1.280 | 100% |
| 1.230 to 1.250 | 75% |
| 1.200 to 1.220 | 50% |
| 1.170 to 1.190 | 25% |
| 1.110 to 1.130 | Discharged |

# Engine Diagrams

## Engine Views

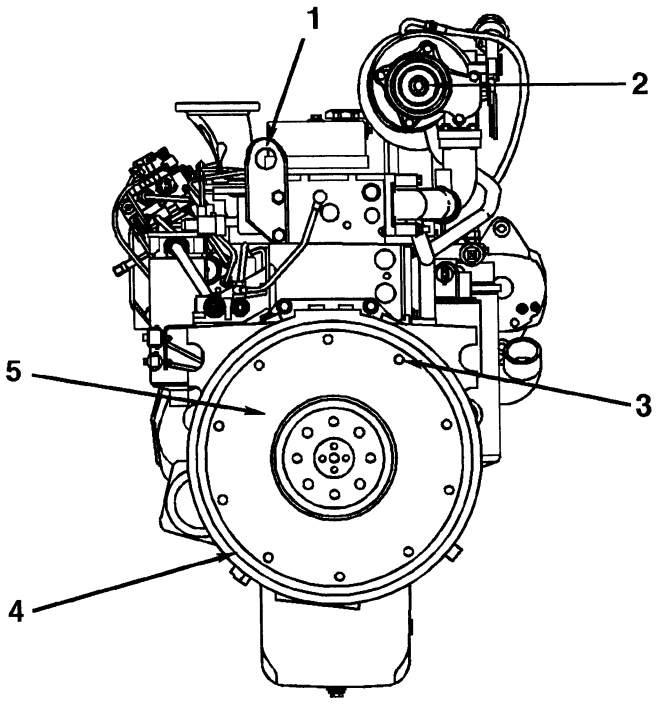
The following illustrations provide the locations of the major external engine components, filters, and other service and maintenance points. Some external components will be at different locations for different engine models.

**NOTE:** The illustrations are **only** a reference to show a typical engine.




**Fuel Pump Side View**

1. Engine air inlet
2. Intake manifold pressure sensor
3. Intake manifold temperature sensor
4. M10 (STOR) fuel pressure after-lift pump
5. M10 (STOR) fuel pressure before-lift pump
6. Magnetic pickup location 3/4-16 UNF
7. Fuel return connection
8. Fuel inlet connection
9. Fuel lift pump
10. Starter mounting flange
11. Oil pressure sensor
12. Fuel filter/water separator
13. Electronic control module (ECM)
14. Dipstick location
15. M10 (STOR) oil pressure port
16. Engine position sensor (EPS) - (inboard)
17. Engine speed sensor (ESS) - (outboard)
18. Engine dataplate
19. High-pressure fuel lines
20. Cummins accumulator pump system (CAPS) injection pump
21. Intake air heater
22. Engine brake spacer (optional)
23. Engine brake harness pass-through.

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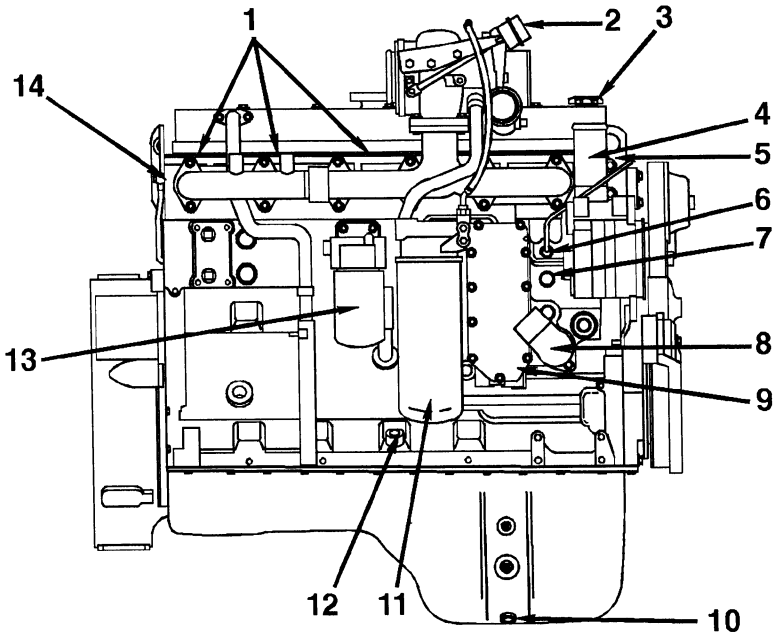
**Rear View**

1. Rear engine lifting bracket
2. Turbocharger exhaust outlet
3. Clutch mounting holes
4. Flywheel housing
5. Flywheel.

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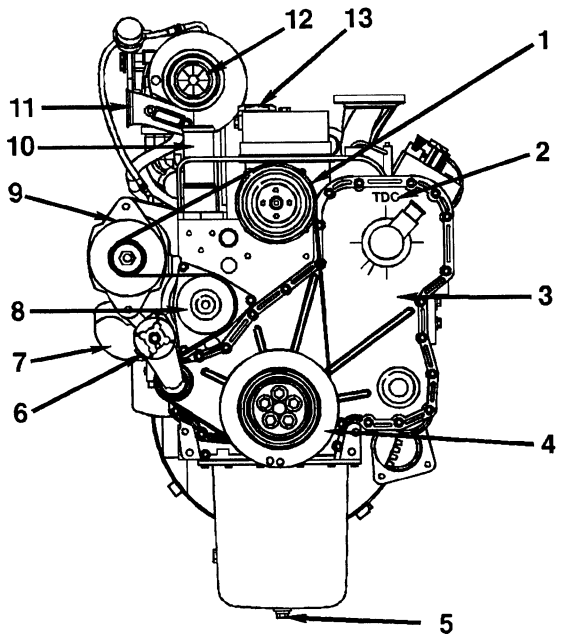
**Exhaust Side View**

1. 1/2-inch (NPTF) coolant taps
2. Turbocharger wastegate actuator
3. Engine oil fill
4. Coolant outlet
5. Front engine lifting bracket
6. Coolant temperature sensor
7. Coolant heater port
8. Coolant inlet
9. Lubricating oil cooler
10. Engine oil pan drain plug
11. Lubricating oil filter
12. Dipstick location
13. Coolant filter
14. Injector drain fuel outlet connection.

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**Front View**

1. Fan pulley
2. Top dead center (TDC) mark
3. Front gear cover
4. Vibration damper
5. Engine oil pan drain plug
6. Automatic belt tensioner
7. Water inlet
8. Water pump
9. Alternator
10. Water outlet
11. Turbocharger air outlet
12. Turbocharger air inlet
13. Engine oil fill.

# Section 1 - Operating Instructions

## Section Contents

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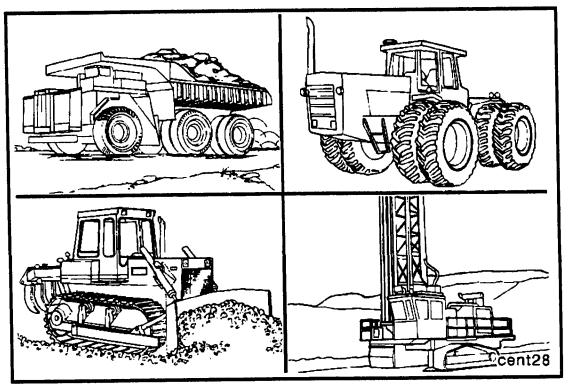
# Operating Instructions - General Information

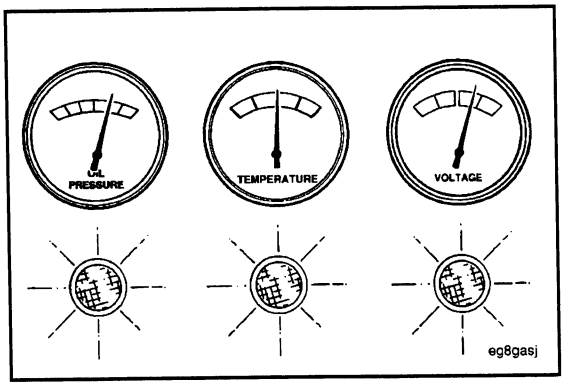



**⚠ WARNING ⚠**

**Cummins Engine Company, Inc., does not know how you will use your engine. The equipment owner and operator, therefore, is responsible for safe operation in a hostile environment. Consult your Cummins Authorized Repair Location for further information.**

Correct care of the engine will result in longer life, better performance, and more economical operation.

- Follow the daily maintenance checks listed in Maintenance Guidelines (Section 2).
- Avoid exposing the engine to corrosive chemicals.

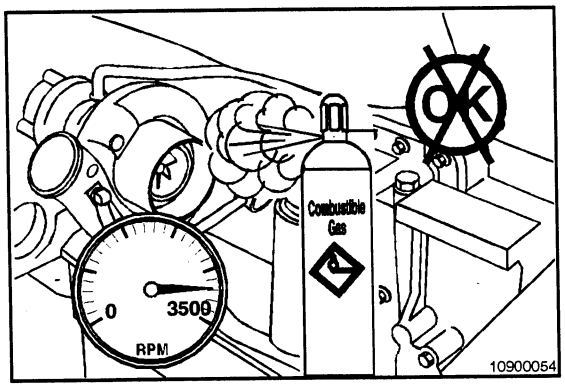



Check the oil pressure indicator, temperature indicator, warning lights, and other gauges daily to make sure they are operational.

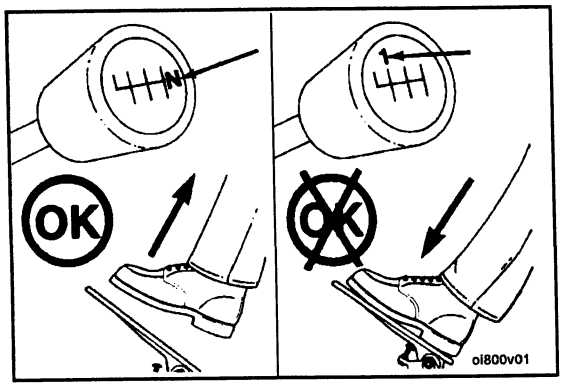
The Cummins engine associated with this manual does **not** require a "break-in" procedure. This manual provides all of the necessary information required for proper engine operation.

**⚠ WARNING ⚠**

**Do not operate a diesel engine where there are or can be combustible vapors. These vapors can be sucked through the air intake system and cause engine acceleration and overspeeding, which can result in a fire, an explosion, and extensive property damage.**




These vapors can be drawn in through the air intake system and can cause engine acceleration and overspeeding that can result in a fire, explosion, and extensive property damage.

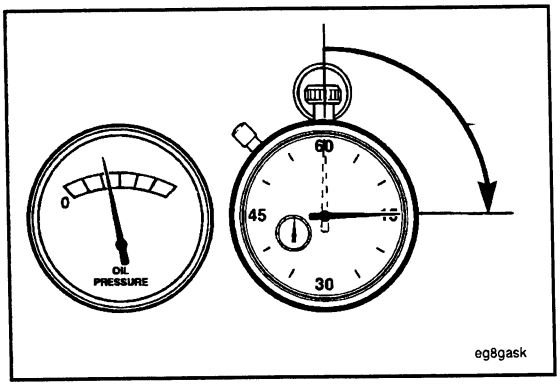



# Normal Starting Procedure

**△ CAUTION △**

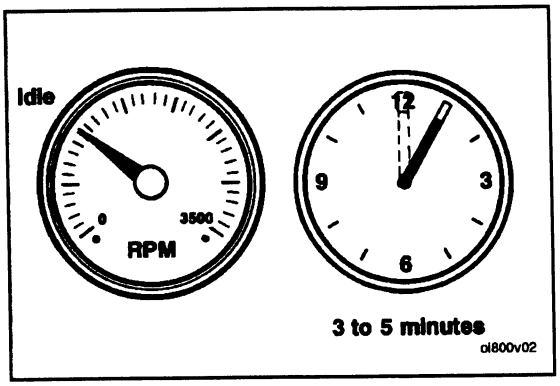
**To prevent damage to the starting motor, do not engage the starting motor for more than 30 seconds. Wait 2 minutes between each attempt to start (electrical starting motors only).**

- Disengage the drive unit, or if equipped, put the transmission in neutral.
- With the throttle in the idle position, turn the key to the ON position; wait for the WAIT TO START lamp to extinguish; then turn the key to the START position.
- If the engine does **not** start after three attempts, check the fuel supply system. An absence of blue or white exhaust smoke during cranking indicates that no fuel is being delivered to the combustion chambers.



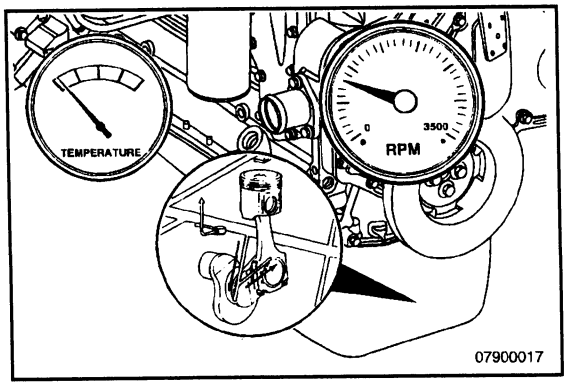

**△ CAUTION △**

**The engine must have adequate oil pressure within 15 seconds after starting. If the WARNING lamp indicating low oil pressure has not extinguished, or there is no oil pressure indicated on the gauge within 15 seconds, shut off the engine immediately to avoid engine damage. Confirm the correct oil level in the oil pan.**



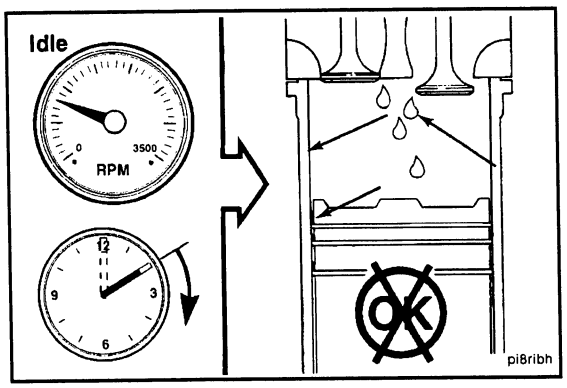

Idle the engine for 3 to 5 minutes before operating with a load.

Increase the engine speed (rpm) slowly to provide adequate lubrication to the bearings and to allow the oil pressure to stabilize.




**⚠ CAUTION ⚠**

**Do not keep the engine at low idle for long periods. Long periods at low idle, more than 10 minutes, can damage an engine because combustion chamber temperatures drop so low that the fuel will not burn completely. This will cause carbon to build up around the injector spray holes and piston rings, which can cause the valves to stick.**



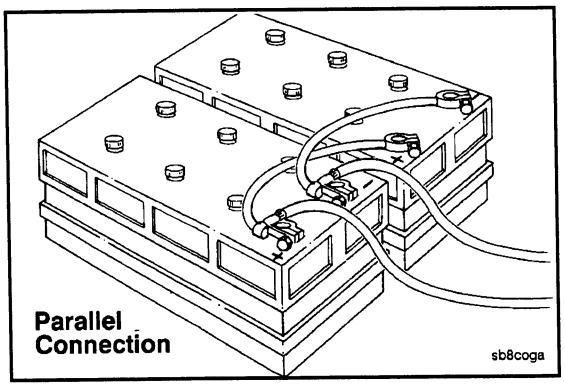

**⚠ WARNING ⚠**

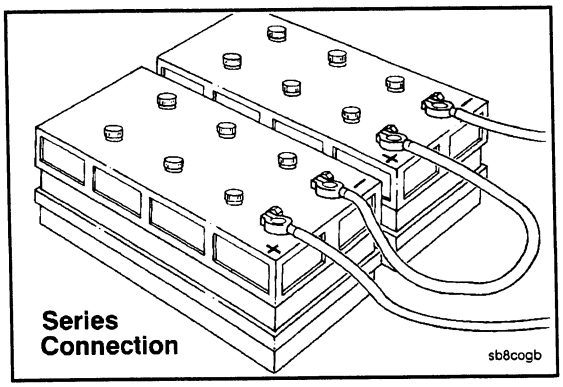
**Batteries can emit explosive gases. To avoid personal injury, always ventilate the compartment before servicing the batteries. To avoid arcing, remove the negative (-) battery cable first and attach the negative (-) battery cable last.**

**⚠ CAUTION ⚠**

**To avoid damage to the QSL9 engine parts, do not connect jumper starting or battery charging cables to any QSL9 parts. When using an external electrical source to start the engine, turn the disconnect switch to the OFF position.**

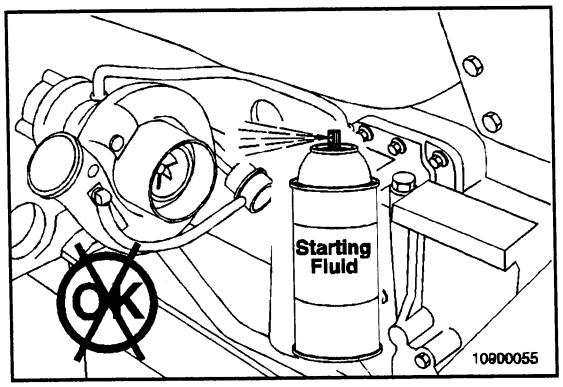
The accompanying illustration shows a typical parallel battery connection. This arrangement, positive (+) to positive (+) and negative (-) to negative (-), doubles the cranking amperage.






The accompanying illustration shows a typical series battery connection.

This arrangement, positive ( + ) to negative (-), doubles the voltage.

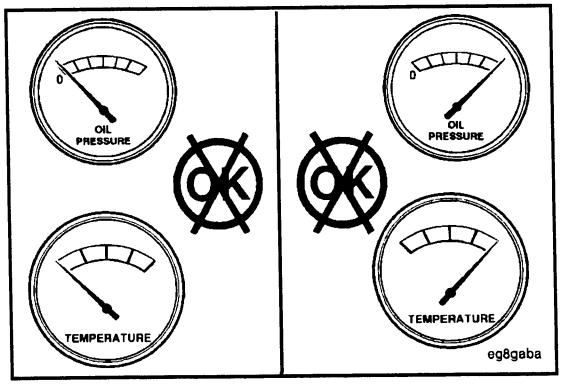



## Cold Weather Starting Using Starting Fluid

### Ether Starting Aids

**⚠ WARNING ⚠**

**To avoid personal injury and property damage, never use starting fluid if the grid heater option is used. Starting fluid, which contains ether, can cause an explosion.**



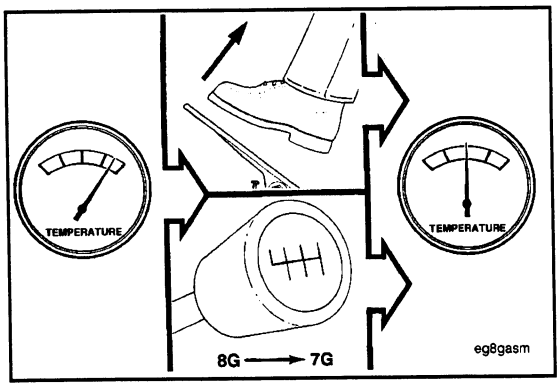

## Operating the Engine

### General Information

**△ CAUTION △**

**Continuous operation with a low coolant temperature, below 60°C [140°F], or a high coolant temperature, above 100°C [212°F], can damage the engine.**

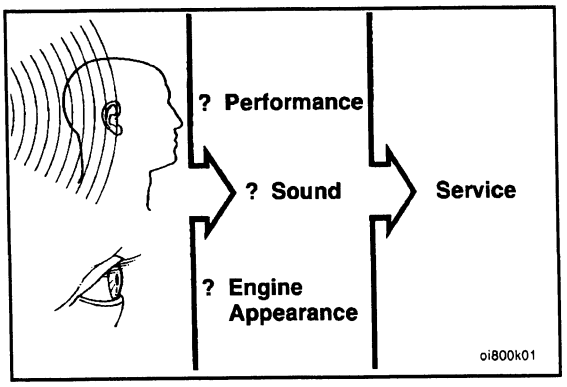
Monitor the oil pressure and coolant temperature gauges frequently. Refer to Lubricating Oil System Specifications and Cooling System Specifications in Section V for recommended operating pressures and temperatures. Shut off the engine if any pressure or temperature does **not** meet the specifications.




If an overheating condition starts to occur, reduce the power output of the engine by releasing the throttle pedal pressure or shifting the transmission to a lower gear, or both, until the temperature returns to the normal operating range. If the engine temperature does **not** return to normal, shut off the engine, and refer to Troubleshooting Symptoms (Section TS), or contact a Cummins Authorized Repair Facility.

Most failures give an early warning. Look and listen for changes in performance, sound, or engine appearance that can indicate service or engine repair is needed. Some changes to look for are as follows:

- Engine misfires
- Vibration
- Unusual engine noises
- Sudden changes in engine operating temperatures or pressures
- Excessive smoke
- Loss of power
- An increase in oil consumption
- An increase in fuel consumption
- Fuel, oil, or coolant leaks.



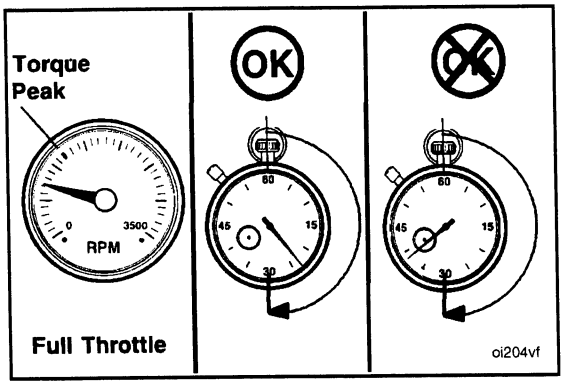

# Engine Operating Range

## General Information

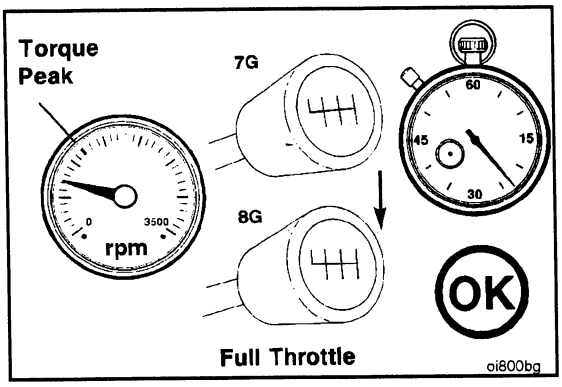
**△ CAUTION △**

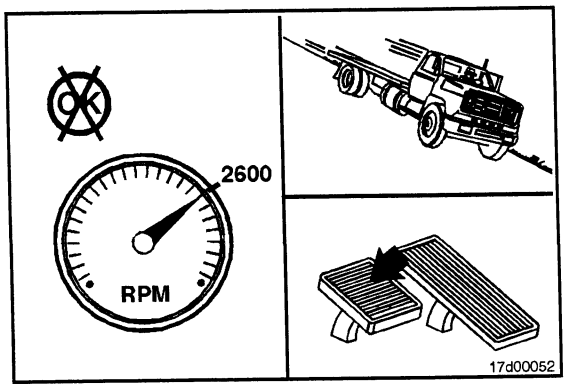
**Do not operate the engine at excessive full throttle below peak torque rpm for more than 30 seconds. This will shorten engine life to overhaul, can cause serious engine damage, and is considered driver abuse.**

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.




Operation of the engine below peak torque rpm can occur during gear shifting due to the difference of ratios between transmission gears, but engine operation **must not** be sustained for more than 30 seconds at full throttle below peak torque rpm.






**⚠ CAUTION ⚠**

**Do not operate the engine beyond high-idle speed (2600 rpm) under any circumstances. Operating the engine beyond high-idle speed can cause severe engine damage. When descending a steep grade, use a combination of transmission gears and engine or service brakes to control the vehicle and engine speed.**

# Cold Weather Operation

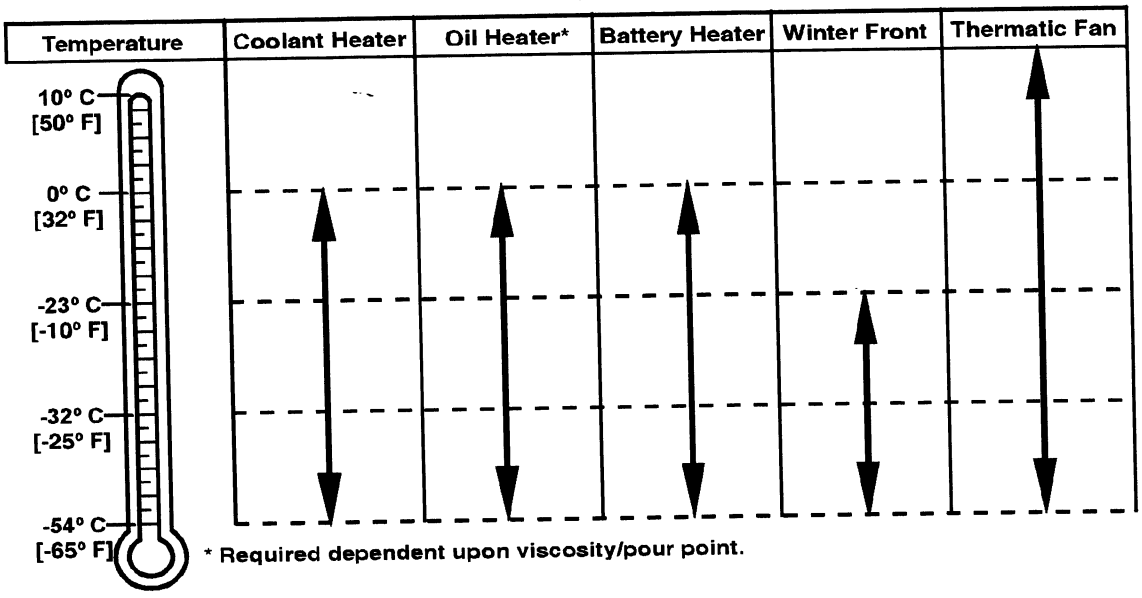
## General Information

It is possible to operate diesel engines in extremely cold environments if they are properly prepared and maintained. The correct lubricants, fuels, and coolants **must** be used for the cold weather range in which the vehicle is operated. Refer to the chart below for recommendations in different operating ranges.

| Winterize<br>-32°C to 0°C<br>[-26°F to 32°F] | Arctic Specification<br>-54°C to -32°C<br>[-65°F to -26°F] |
|---|---|
| Use 50-percent ethylene glycol or propylene glycol antifreeze and 50-percent water in the coolant mixture. | Use 60-percent ethylene glycol or propylene glycol antifreeze and 40-percent water in the coolant mixture. |
| Use multiviscosity oil meeting API CG-4 or CH-4 specifications. | Use arctic oil meeting API CG-4 or CH-4 specifications. |
| Fuel to have maximum cloud and pour points 6°C [43°F] lower than ambient temperature in which engine operates. | Fuel to have maximum cloud and pour points 6°C [43°F] lower than ambient temperature in which engine operates. |

The following cold weather operating aids are suggested for cold weather situations:

## Cold Weather Operating Aids




* Required dependent upon viscosity/pour point.

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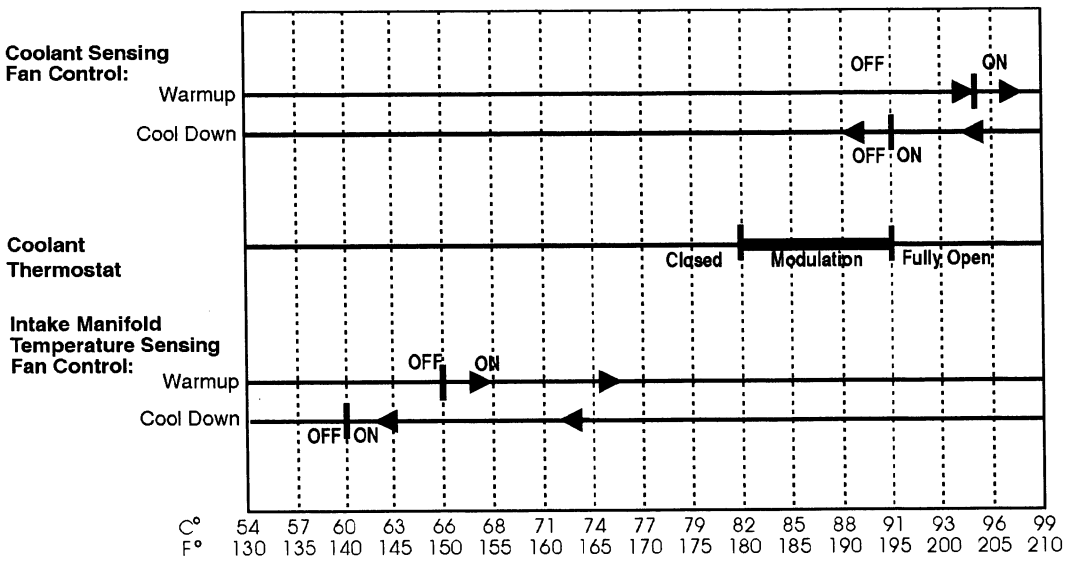
## Customer Precharge Method

The temperatures listed in the following chart for coolant temperature sensing fan control and intake manifold temperature sensing fan control are correct for vehicles that allow the electronic control module (ECM) to control the on and off operation of the cooling fan. Consult the local original equipment manufacturer (OEM) for other kinds and styles of controls.

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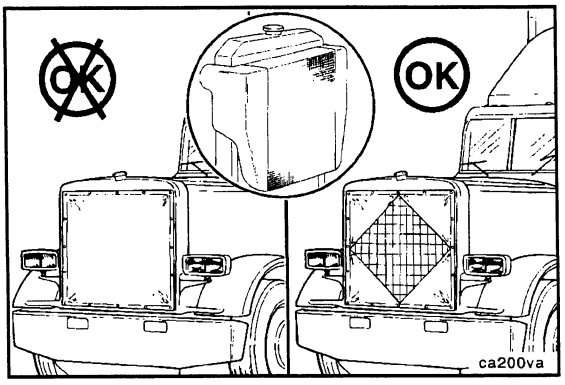
## Winterfronts

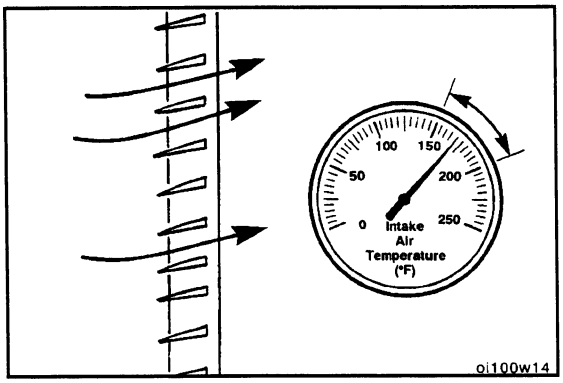
Winterfronts can be used on a vehicle equipped with charge-air cooling, but they **must** be designed to partially cover the frontal area of the cooling system **only**. An area of 784 sq cm [120 sq in], or approximately 28 x 28 cm [11 x 11 in], **must** be left open to allow airflow for the charge-air cooler to function correctly.




## Shutters

**⚠ CAUTION ⚠**

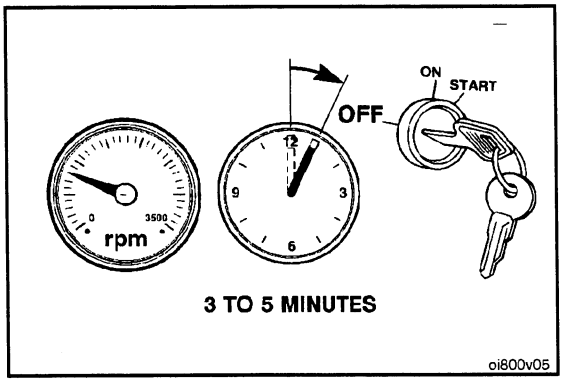
**A charge-air cooled engine with shutters also requires an intake manifold air temperature switch to open the shutters to prevent excessive intake manifold temperatures. This reduces possibility of engine damage from high intake manifold temperatures as a result of blocked airflow across the charge-air cooler.**




# Engine Shutdown

## General Information

- Allow the engine to idle 3 to 5 minutes after a full-load operation before shutting it off. This allows the engine to cool gradually and uniformly.
- Turn the ignition keyswitch to the OFF position.

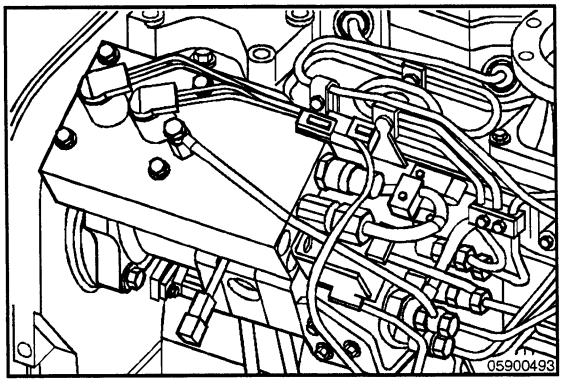


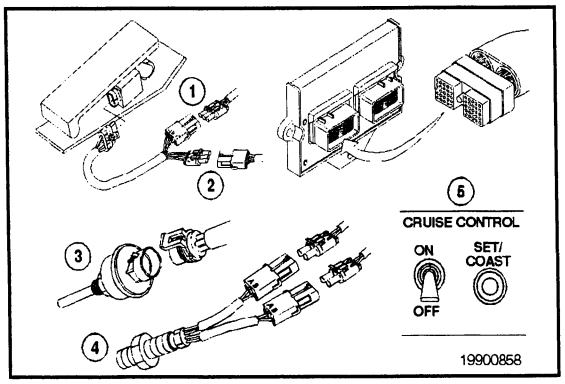

# Electronic Controlled Fuel System

## General Information

The QSL9 engine control system is electronically controlled and also provides many operator and vehicle or equipment features.

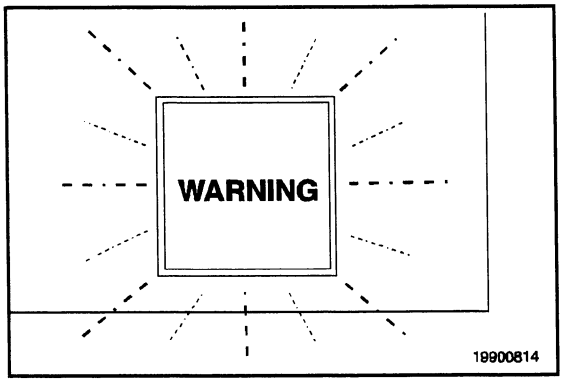
The base functions of the control system include fueling and timing control, limiting the engine speed operating range between the low- and high-idle set points, and reducing exhaust emissions while optimizing engine performance.





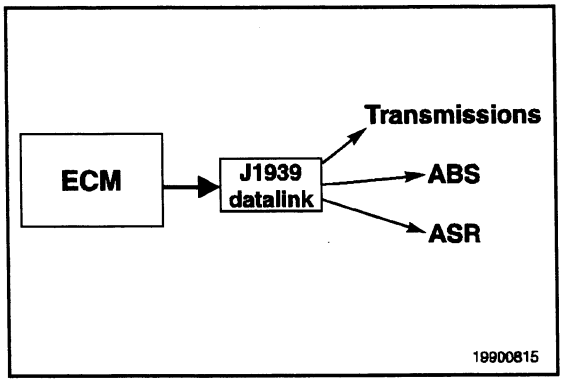

The control system uses inputs from the operator and engine sensors to determine the fueling and timing required to operate at the desired engine speed.

The electronic control module (ECM) is the control center of the system. It processes all of the inputs and sends commands to the fuel system, vehicle, and engine control devices.




The electronic control module (ECM) performs diagnostic tests on most of its circuits and will activate a fault code if a problem is detected in one of these circuits. Along with the fault code identifying the problem, a snapshot of the engine operating parameters at the time of the fault activation is stored in memory.

Most fault codes will activate a diagnostic lamp to signal the driver.

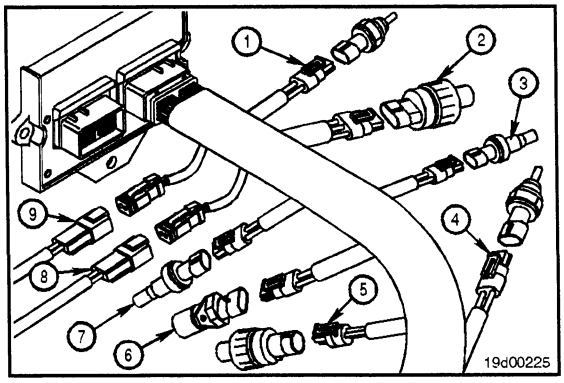



The ECM communicates with service tools and other vehicle controllers such as the transmission, antilock brake system (ABS), and antislip reduction (ASR) through an SAE J1939 datalink.

Some vehicles and equipment will have J1939 networks that link many of the "smart" controllers together. Vehicle control devices can temporarily command engine speed or torque to perform one of its functions such as transmission shifting or antilock braking.

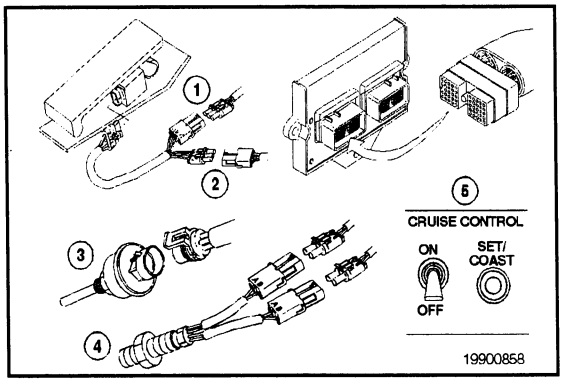
The control system utilizes a number of sensors to provide data on engine operating parameters. These sensors include the following:

1. Coolant temperature sensor
2. Oil pressure sensor
3. Cummins accumulator pump system (CAPS) fuel pressure sensor
4. Intake air temperature sensor
5. Intake manifold pressure sensor
6. Engine speed and position sensors
7. CAPS fuel temperature sensor
8. Injection control valve (ICV)
9. Pumping control valves (PCVs).




The following inputs are provided by original equipment manufacturer (OEM)-selected devices:

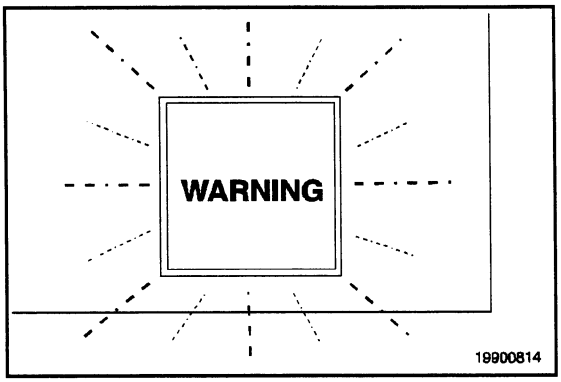
1. Accelerator pedal position sensor
2. Idle validation switch
3. Coolant level sensor
4. Vehicle speed sensor (VSS)
5. Feature control switches such as cruise control, power take-off (PTO), and fan clutch control
6. Accelerator interlock (**not** shown)
7. OEM pressure sensor (**not** shown)
8. Intermediate speed control (**not** shown).




**NOTE:** These inputs are application-dependent. Some applications will **not** use all of these inputs.

## Engine Protection System

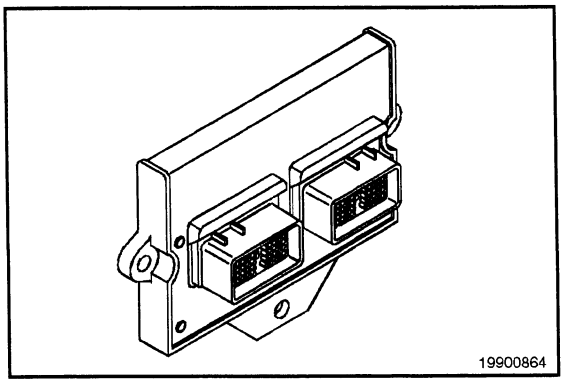
The QSL9 engine is equipped with an engine protection system. The system monitors critical engine temperatures and pressures, and it will log diagnostic faults if an over or under normal operation condition occurs. If an out-of-range condition exists, and an engine derate action is initiated, the operator will be alerted by an in-cab WARNING lamp. The WARNING lamp will blink or flash if out-of-range conditions worsen.




The engine protection system monitors the following data:

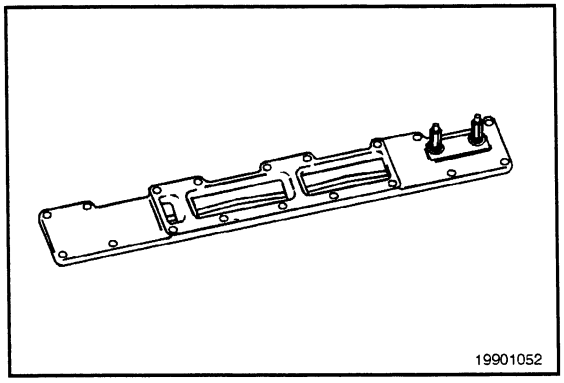
- Coolant temperature
- Coolant level (optional)
- Oil pressure
- Intake manifold temperature
- Engine overspeed
- Fuel temperature
- OEM switch (optional).

**NOTE:** Engine power and speed will gradually reduce depending on the severity of the observed condition. The engine protection system will **not** shut down the engine unless the engine protection shutdown feature has been enabled.



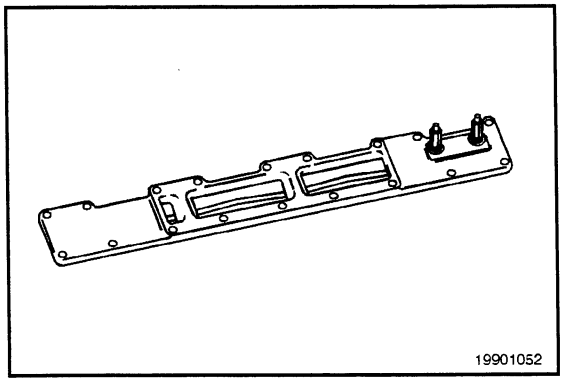

## Basic Features

The electronic control module (ECM) for the QSL9 engine provides some basic electronic features that are calibration-dependent. The following section describes the function of each feature. Whether a feature is available in a given application is calibration-dependent.



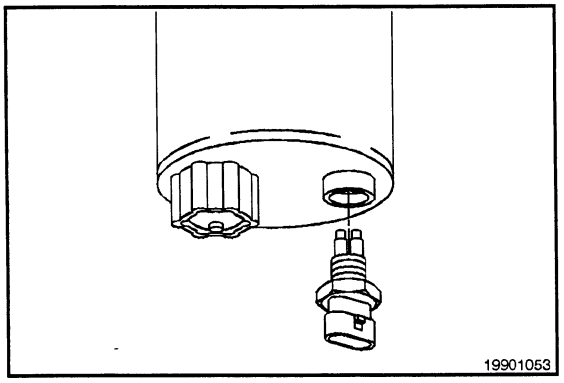

### *Intake Air Heater*

This feature controls the heating elements that are located in the engine's intake airstream. These elements heat the intake air when starting the engine in cold ambient conditions. Startability and white smoke control are enhanced by the use of an intake air heater. A WAIT TO START lamp is located on the operator controls to indicate when to crank the engine.




The ECM checks the intake manifold temperature to determine how long to energize the air heater before extinguishing the WAIT TO START lamp. (This is for the preheat phase.)

Once the engine is started, the heater will be energized again for a time period determined by intake air temperature and fuel temperature. (This is for the post-heat phase.) To minimize cranking time in cold weather, the engine can **not** be started until the WAIT TO START lamp is extinguished.



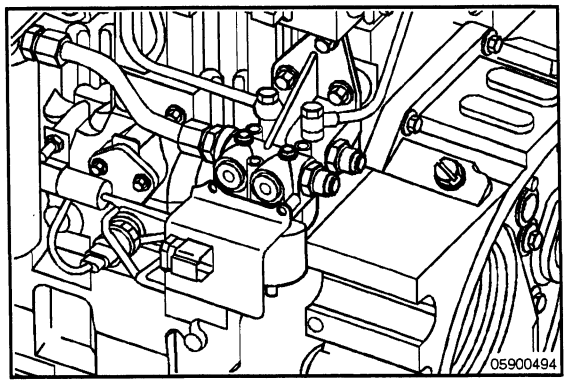

### *Water-in-Fuel Sensor*

This sensor is located in the canister of the fuel filter housing. Once the storage space in the bottom of the filter housing fills with a certain amount of water, the sensor will signal the ECM. A WATER IN FUEL lamp will illuminate at the operator controls indicating that the water needs to be drained from the fuel filter assembly.

**NOTE:** Refer to Section 3 for instructions to drain the fuel filter water seperator.

### *Electric Lift Pump*

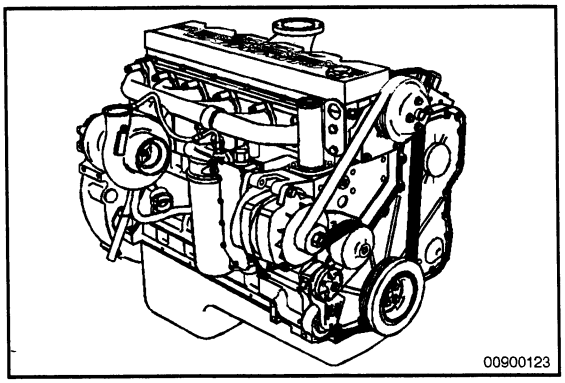
The ECM controls the electric lift pump (located in between the fuel tank and the injection pump). When the keyswitch is turned on, the lift pump will be energized for 30 seconds to make sure that the low-pressure fuel lines are fully primed. The electric lift pump does **not** start again unless the keyswitch is cycled off for 30 seconds allowing the ECM to power down and cycle back on.




### *Engine Warm-Up Protection*

This feature inhibits the throttle, datalink control, and intermediate speed control switches to keep the engine at low idle for a brief time after the engine starts or until adequate oil pressure is obtained. This allows oil to reach all the critical engine components before the engine speed is increased above low idle.

**NOTE:** The maintenance lamp is illuminated while this feature is in operation.

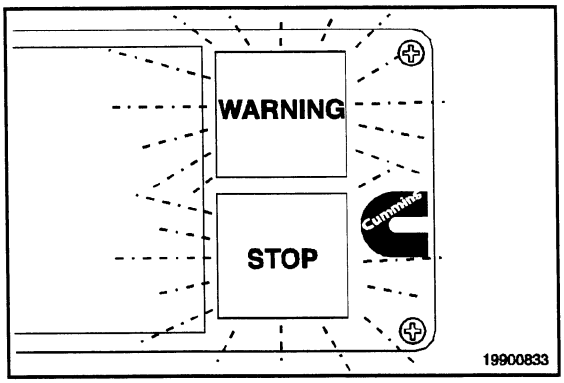


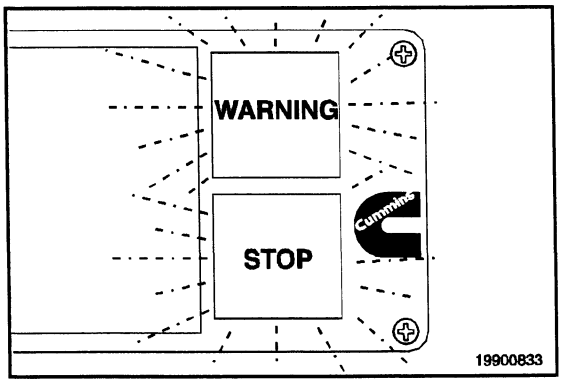

### *Engine Protection Shutdown*

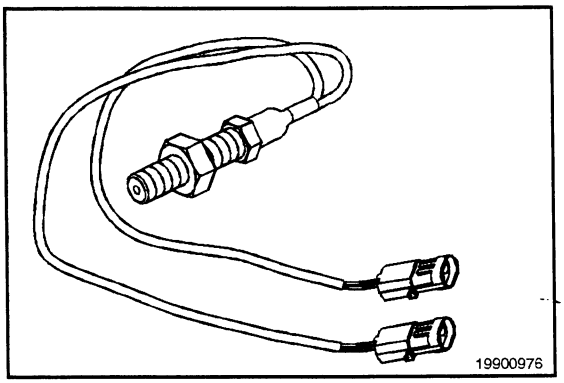
This feature automatically shuts off the engine when the temperature, pressure, or coolant level sensors indicate that the engine is operating over or under normal operating conditions.

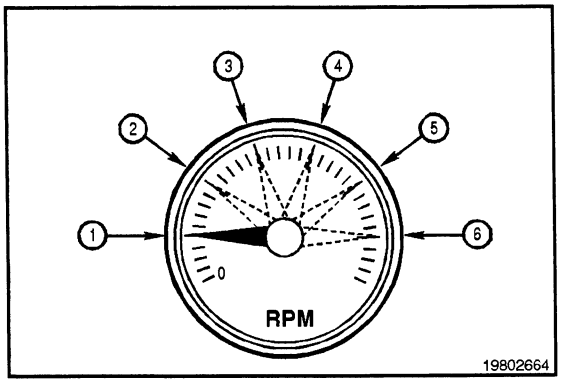
The red STOP lamp in the cab will flash for 30 seconds prior to shutdown to alert the driver.

**NOTE:** The length of time that the red STOP lamp flashes can be adjusted using INSITE™.






### *Engine Protection Shutdown Override*

This feature, when enabled, allows the operator to override a pending engine shutdown. Prior to engine shut down, the red STOP lamp will flash for 30 seconds to notify the operator that the engine is about to shutdown. The operator can override the engine shutdown through the use of an OEM switch (such as the clutch switch). If the vehicle is **not** equipped with a clutch switch, then the OEM will provide a dash-mounted switch marked as the engine protection shutdown override switch. When the operator triggers this switch, while the red STOP lamp is flashing, a timer within the ECM will reset and allow the engine to run an additional 30 seconds before engine shutdown occurs. Each time the operator triggers the switch, the time within the ECM is reset, allowing the engine to run for an additional 30 seconds.

### *Vehicle Speed Sensor (VSS) Type*

The sensor communicates the type of vehicle speed sensor (VSS) being used to the ECM.

The sensor can be one of the following:

- None - No vehicle speed sensor (VSS)
- Magnetic - Most typical, usually located on transmission
- Other - OEM device, also known as mechanical
- J1939 datalink - Speed sensor connected to J1939 datalink
- Tachograph - Primarily used for European applications.

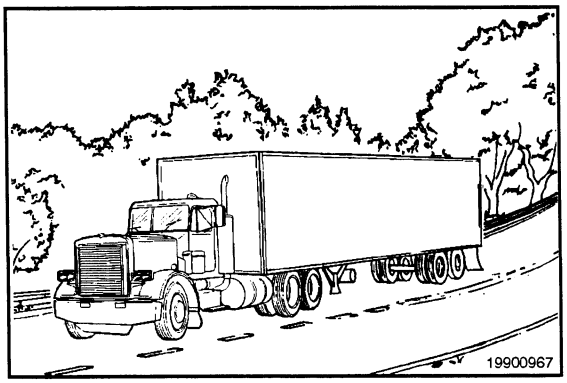
### *Maximum Engine Speed without Vehicle Speed Sensor (VSS)*

This sets the maximum engine speed allowed when no vehicle speed sensor is detected.

- Maximum engine speed without vehicle speed sensor (VSS) (5)
- Maximum engine speed with vehicle speed sensor (VSS) (6).

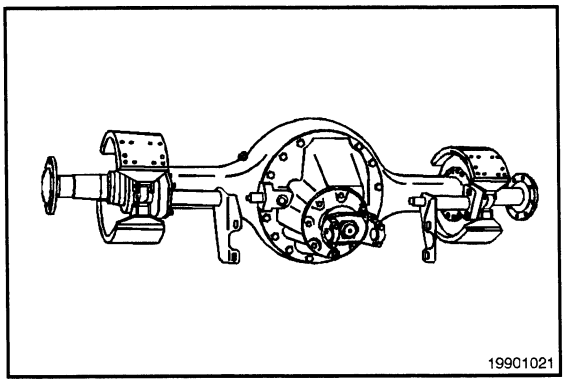
### *Tire Revolutions per Mile*

This is used to tell the electronic control module (ECM) how many times the tire makes a complete revolution in 1 mile.



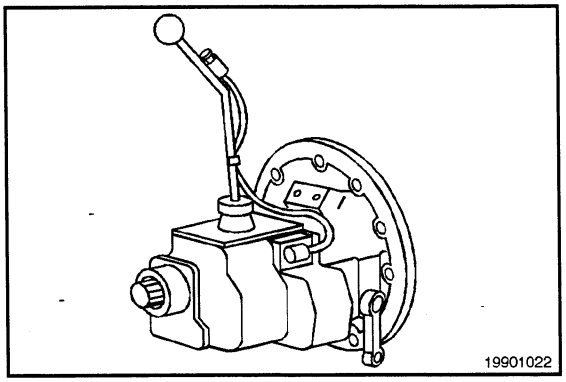

### *Rear Axle Ratio*

This feature tells the ECM the gear ratio of the rear axle.




### *Number of Transmission Tailshaft Gear Teeth*

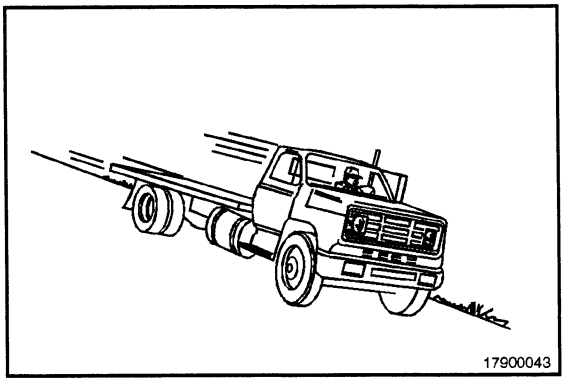
This feature tells the ECM the number of gear teeth on the transmission tailshaft.

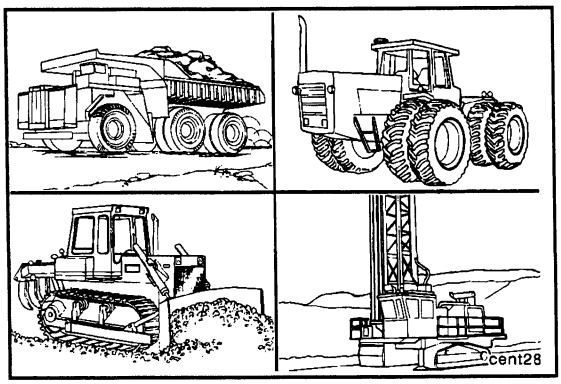



### *Vehicle Speed Sensor (VSS) Antitampering (Fault Code 242)*

This feature gives the customer the option of disabling Fault Code 242.

**NOTE:** Fault Code 242 is logged when an invalid or inappropriate vehicle speed signal is detected by the ECM indicating an intermittent connection or signal tampering. This fault code is **not** proof that vehicle speed sensor (VSS) tampering has occurred.

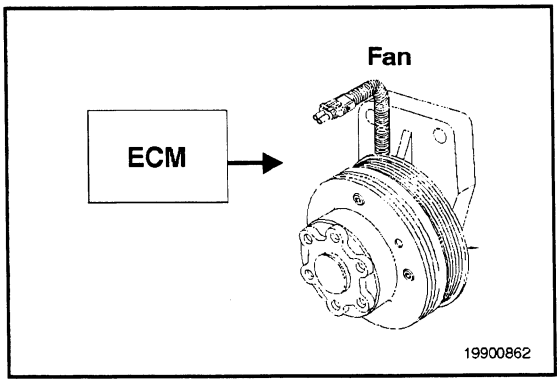





## Programmable Features

The electronic control system provides many features that are integrated into the vehicle operation. Some of these features can be adjusted, enabled, or disabled with a service tool, but some are set at the factory and can **not** be changed.

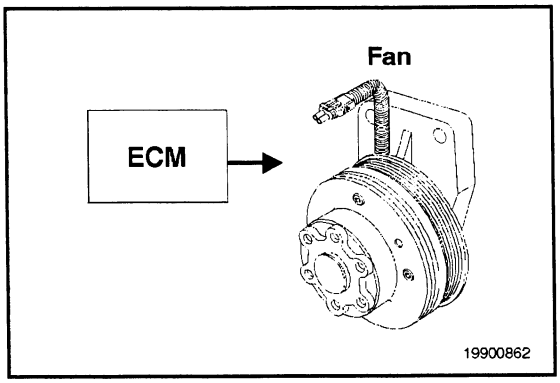
The following section describes the functions of each feature. Whether a feature is available in a given application is OEM-dependent.




### *Fan Clutch Enable*

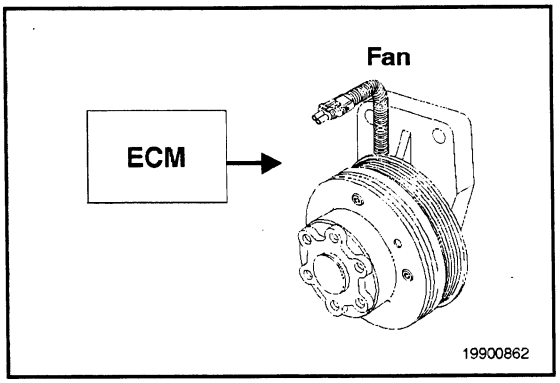
The ECM can control the cooling fan based on inputs from the coolant temperature sensor and the intake manifold temperature sensor.

Some applications also provide inputs to the ECM for auxiliary device cooling (such as air conditioner pressure and power steering temperature). An application can also include a manual switch for fan control.




### *Fan On with Exhaust Brake*

This feature enables an electric fan when the exhaust brake is engaged. This increases the total braking power by increasing the parasitic load on the engine.

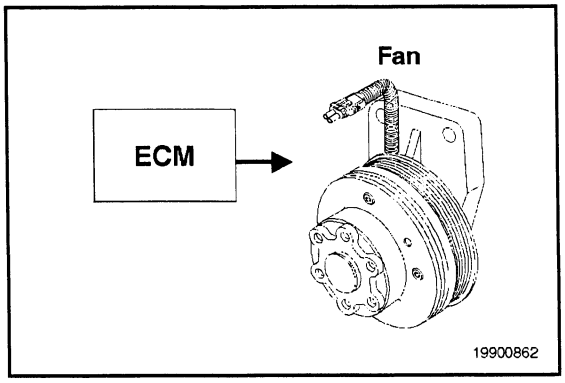



### *Programmable Fan Logic*

Select either 0 VDC = ON or 12 VDC = ON to match the fan clutch logic used in the application. A relay can be used for fans that draw more than 6 amps.

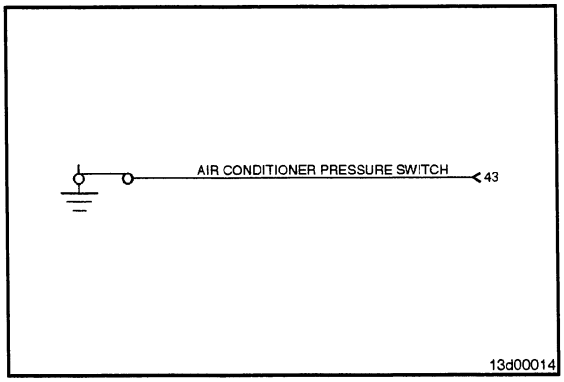
### *Minimum Fan On Time with Air Conditioner Pressure Switch*

This feature controls the minimum amount of time that the fan will stay on when activated by the air conditioner pressure switch. This reduces excessive fan cycling.




### *Air Conditioner Pressure Switch Input*

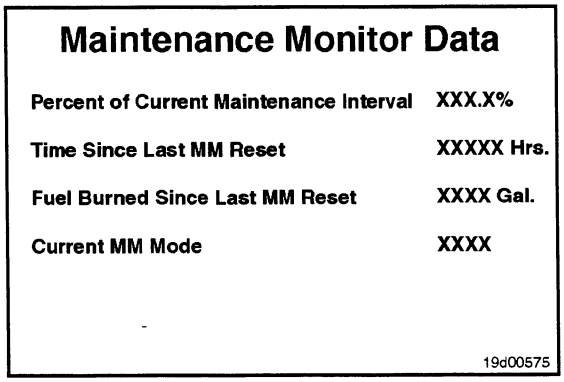
This allows the air conditioner pressure switch input to be disabled if that input into the ECM is **not** being used. Enable this feature if the air conditioner pressure switch input into the ECM is used to control the fan.




### *Maintenance Monitor Data*

Using the INSITE™ service tool, the following maintenance data can be viewed or printed from the ECM:

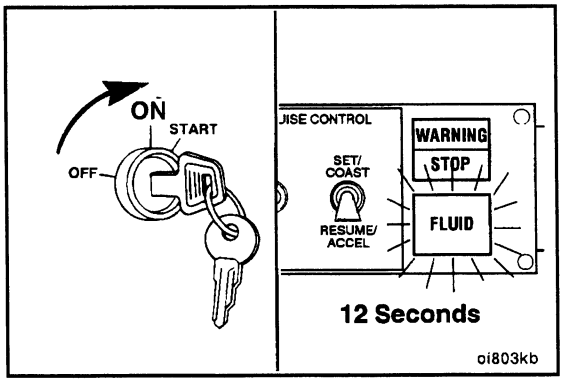
- Percent of current interval consumed (by time or fuel burned)
- Time since last reset
- Fuel burned since last reset
- Current maintenance monitor mode.




### *Alerting the Operator*

The maintenance monitor, if enabled, will alert the operator of the need to change oil by flashing the FLUID lamp for approximately 12 seconds after keyswitch is turned 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 every time the keyswitch is turned on until the maintenance monitor has been reset.

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



**Maintenance Monitor Reset Log 1**

| | Maximum Threshold | Adjusted Threshold | Interval Reset@ |
|---|---|---|---|
| Fuel: | XXXX | XXXX | XXXX |
| Time: | XXXX | XXXX | XXXX |

19d00576

***Maintenance Monitor Reset Log***

The maximum threshold is entered by the user either directly using the time mode, or by entering the interval factor in the automatic mode.

The adjusted threshold is the new threshold set automatically by the maintenance monitor when the automatic mode is selected, and it automatically reduces the maintenance intervals.

The "interval reset at" is the interval time and fuel recorded by the ECM at the time the maintenance monitor was reset.

**Maintenance Monitor Reset Log 2**

| | Cumulative Reset @ | Possible Error |
|---|---|---|
| Fuel: | XXXX | XXXX |
| Time: | XXXX | XXXX |

19d00577

The "cumulative reset at" is the total time and fuel recorded by the ECM at the time the maintenance monitor was reset.

The possible error will contain an "X" next to a row of data that can be inaccurate due to a system fault. The "X" will be triggered when a vehicle speed sensor fault or power-down fault occurs. These faults can cause data to either **not** accumulate or accumulate inaccurately.

### *Maintenance Monitor Reset*

The maintenance monitor reset can be accomplished by clicking the reset button on the maintenance monitor screen using the INSITE™ service tool, or using one of the following procedures:

1) Procedure for applications **with** a throttle pedal.
   a. Turn the keyswitch to the ON position (but do **not** start the engine) and turn the diagnostic switch to the ON position.
   b. Fully depress the throttle pedal (100 percent) for at least 3 seconds and then release it.
   c. Fully depress the throttle pedal (100 percent), twice, for less than 3 seconds each time.
   d. Fully depress the throttle pedal (100 percent) for at least 3 seconds and then release it.

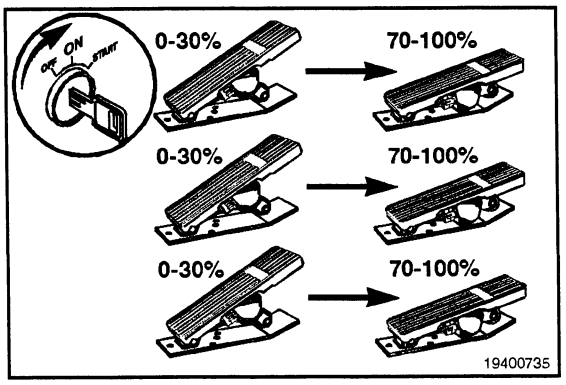
2) Procedure for applications **without** a throttle pedal.
   a. Turn the keyswitch to the ON position (but do **not** start the engine).
   b. Turn the diagnostic switch to the ON position for at least 3 seconds and then turn it to the OFF position.
   c. Turn the diagnostic switch to the ON position (for less than 3 seconds) and then to the OFF position, twice, with less than 3 seconds between each switching.
   d. Turn the diagnostic switch to the ON position for at least 3 seconds and then turn it to the OFF position.

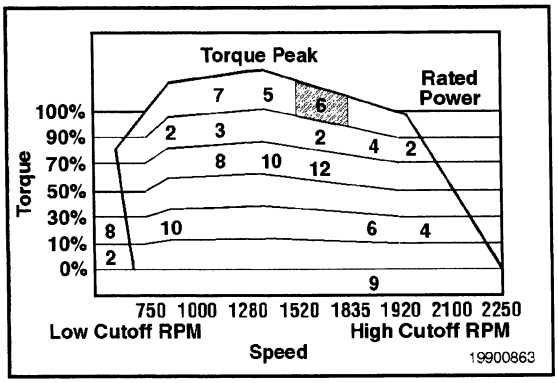
**NOTE:** Procedure **must** be completed within 20 seconds after initiating steps 1)a through d or steps 2)a through d or the data will **not** reset.

**NOTE:** The WARNING lamp will flash three times to indicate that the reset has been completed.

### *Trip Information System*

The trip information system records fuel consumption and time information for the engine during normal operation, and in certain operating modes such as intermediate speed control and idle. Either data can be displayed using the INSITE™ service tool. Some data can **not** be reset and reflect the performance of the engine over its lifetime. Other data, as well as trip data, can be reset using the INSITE™ service tool.

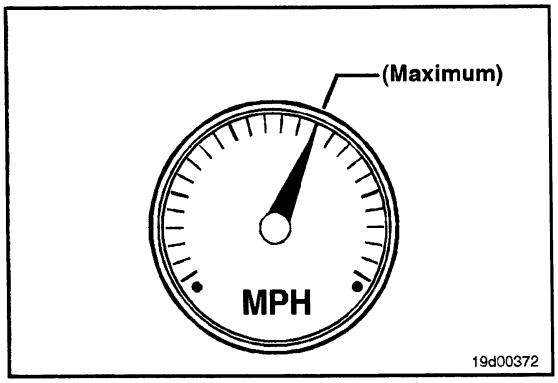





### *Duty Cycle Monitor*

With this feature the ECM tracks engine load and speed. These data are stored in the ECM, and the INSITE™ service tool is used to display the data. The INSITE™ service tool display shows a duty cycle "map" that shows the whole engine's operating range in terms of speed and load. This "map" is divided into fifty regions. The percent of the engine operating time spent in each region is shown on the display.

The ECM contains duty cycle data for the whole life of the engine and for two 500-hour operating periods. The two 500-hour maps can be reset with the INSITE™ service tool.



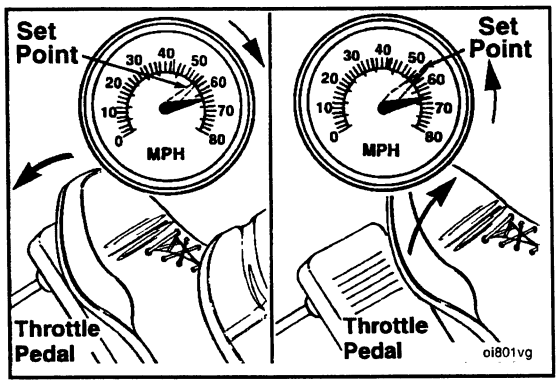

### *Road Speed Governor*

The road speed governor limits the maximum road speed of the vehicle in top gear.

The maximum vehicle speed in top gear is the maximum road speed for the vehicle. This speed **must** be greater than or equal to the maximum cruise speed if the cruise control feature is enabled.

The maximum road speed in top gear can be adjusted by using the INSITE™ service tool.

**NOTE:** The auxiliary governor needs to be disabled to utilize the road speed governor.




### *Cruise Control*

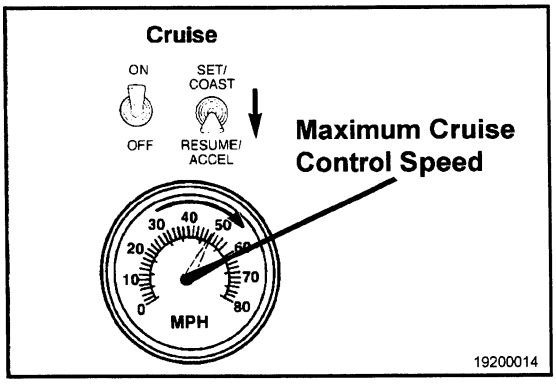
**⚠ WARNING ⚠**

**Do not use cruise control when the road is slippery, in heavy traffic, or when the weather is inclement. Loss of vehicle control can result.**

The cruise control feature gives the driver the capability of a foot-off accelerator cruise operation. It is similar to an automobile's cruise control.

The cruise control feature can be enabled or disabled using the INSITE™ service tool.

**NOTE:** Both cruise control and intermediate speed control can **not** be active at the same time.




### *Maximum Cruise Control Speed*

This speed is the maximum allowable cruise set speed.

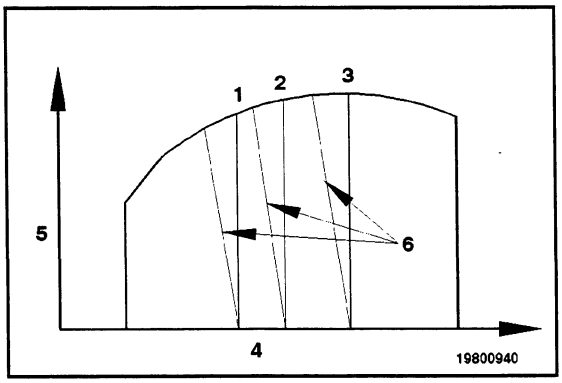
The maximum cruise control speed can be adjusted using the INSITE™ service tool.

**NOTE:** The maximum cruise control speed can **not** exceed the maximum vehicle speed in top gear setting.

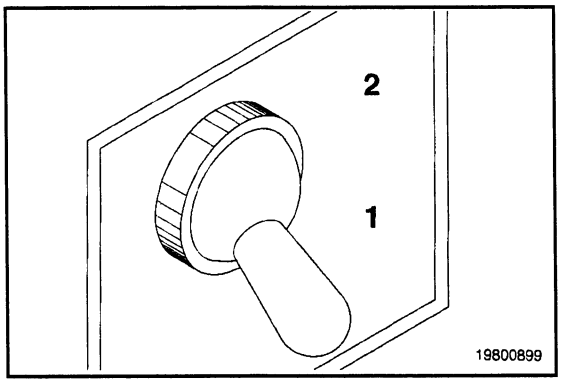
### *Intermediate Speed Control*

The intermediate speed control feature controls the engine at a constant rpm. Up to three intermediate speed control set speeds (1, 2, and 3) can be selected depending on original equipment manufacturer (OEM) availability (the axis 4 equals engine speed and 5 equals engine torque).

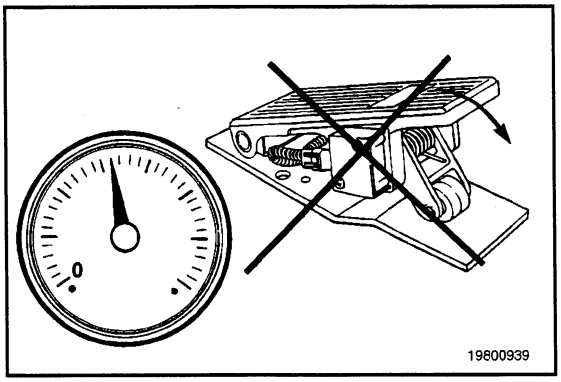
**NOTE:** An additional 5 set speeds can be obtained through use of the variable intermediate speed input signal.



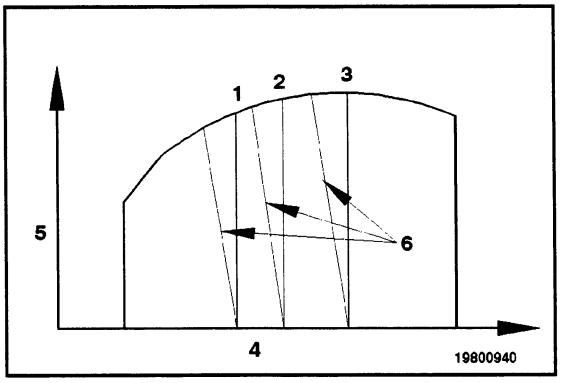

The intermediate speed control feature provides the ability to select an intermediate speed control set speed by an original equipment manufacturer (OEM)-provided switch (1 is the OFF position and 2 is the ON position), depending on original equipment manufacturer availability.

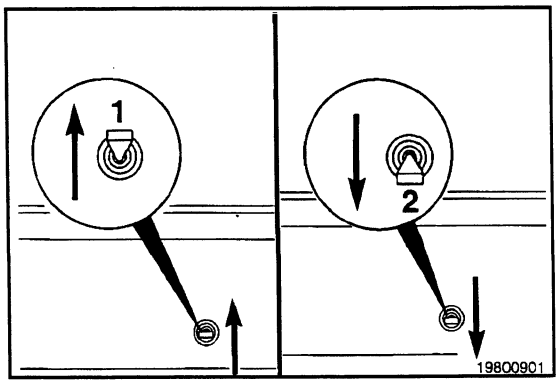



This feature will override the throttle and control the engine speed to the intermediate speed control speed setting. This feature allows throttle control above the set speed or below the set speed, according to the calibration setup.

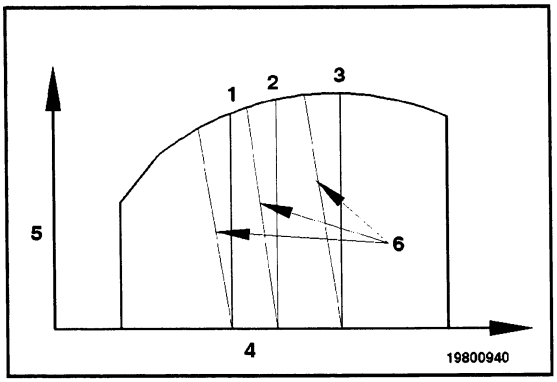



The intermediate speed control feature provides a single droop (6) for up to three intermediate speeds (1, 2, and 3). An additional 5 set speeds can be obtained through use of the variable intermediate speed input signal. This droop is independent of all other selectable droops and is enforced during intermediate speed control operation **only** (the axis 4 equals engine speed and 5 equals engine torque).



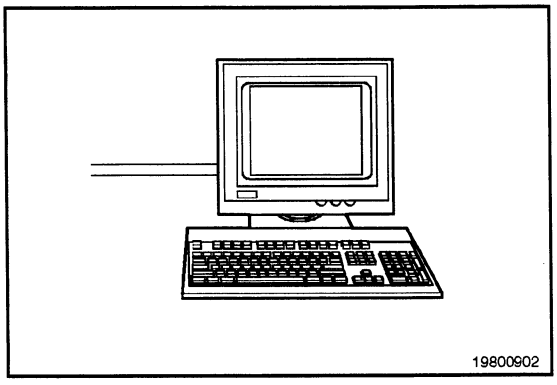



The intermediate speed control set speed can be adjusted by the intermediate speed control increment (1) or decrement (2) switch. Setting speed changes using this switch will be saved to the electronic control module (ECM) when the keyswitch is turned to the OFF position if the save increment or decrement option is enabled.



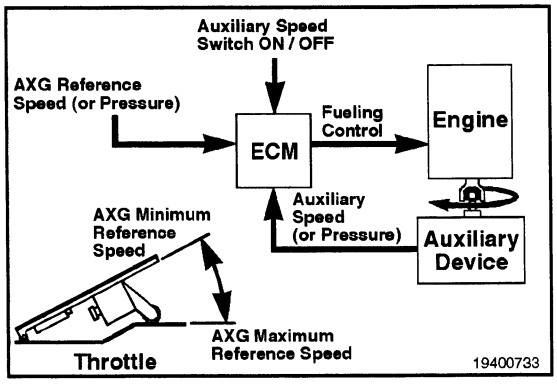

The intermediate speed control feature can be enabled or disabled using the INSITE™ service tool if this feature is available in the calibration. The intermediate speed control set speeds (1, 2, and 3) can be adjusted using the INSITE™ service tool along with the intermediate speed control droop.

**NOTE:** This option is **not** allowed by some OEM's.




### *Hybrid Governor*

The hybrid governor can be enabled or disabled with the INSITE™ service tool if the feature is available in the calibration. The hybrid governor achieves partial-throttle operation with the same power and torque rise characteristics of the full-throttle operation. It will allow the application to be operated in a more fuel efficient manner and with a greater capability of driving at partial throttle.

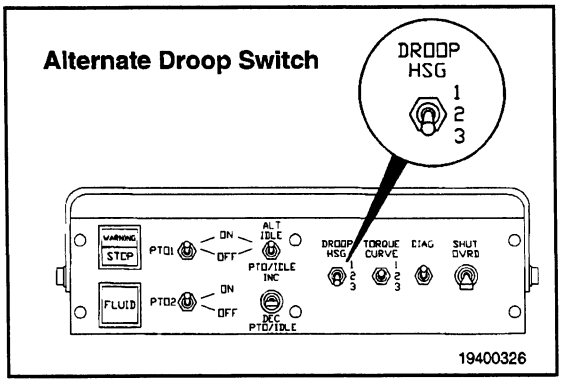



### *Auxiliary Speed Governor*

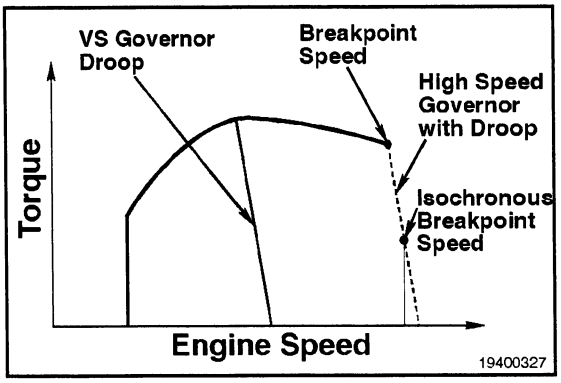
The auxiliary speed governor is an application-specific feature that allows the engine to be governed by either an auxiliary speed or pressure signal. The feature uses a manual switch input to turn the governor operation on and off.

**NOTE:** The switch **must** go from OFF to ON position while the engine is running to activate this feature. It can **not** be on all the time.

Depending on original equipment manufacturer (OEM) availability the alternate droop feature provides the ability to select up to two additional alternate droop settings (1, 2, or 3) by an original equipment manufacturer (OEM) provided switch.

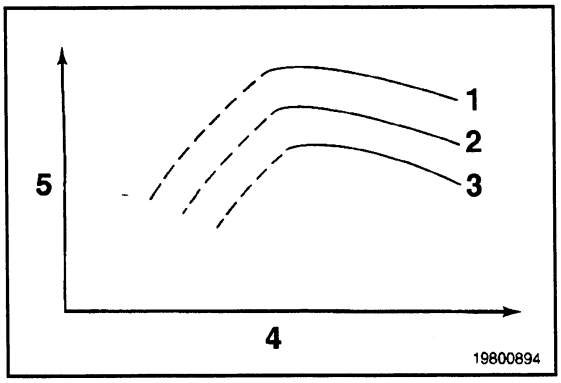



Each alternate droop setting provides the ability to select the high speed governor break point speed and droop percent. Droop percent at minimum and maximum throttle for the all speed governor is also adjustable. The break point speed determines the position on the engine torque curve where high speed governor will start to limit engine torque output. Selection of the alternate droop feature is accomplished by using the INSITE™ service tool if the alternate droop feature is available in the calibration.

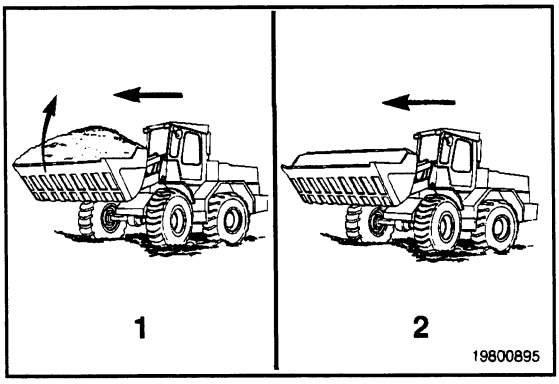


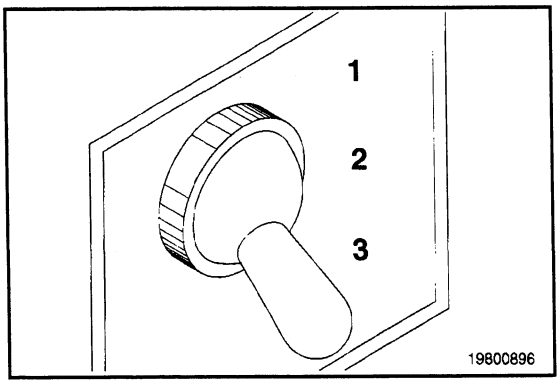

***Switched Torque***

The switched torque feature allows the operator to switch between the 100-percent throttle torque curve (1) and up to two derated torque curves (2 and 3). (The axis 4 is engine speed and 5 is engine torque.)

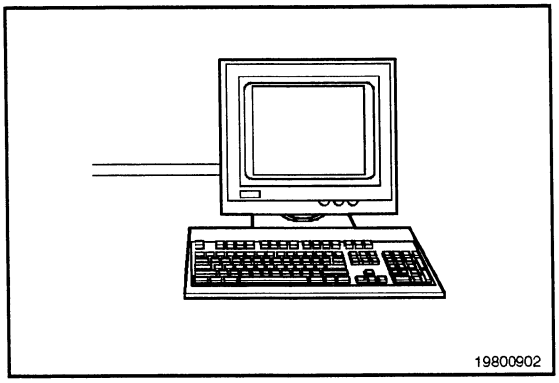



This feature improves operating efficiency in loaded (1) versus unloaded (2), as well as protecting the transmission and drivetrain.

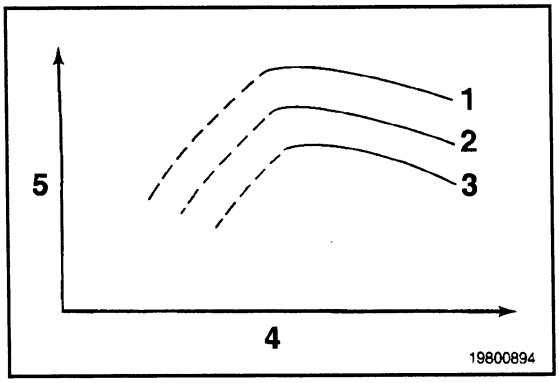





Depending on original equipment manufacturer (OEM) availability the switched torque feature provides the ability to select two additional derated torque curves with an original equipment manufacturer (OEM)-provided switch.



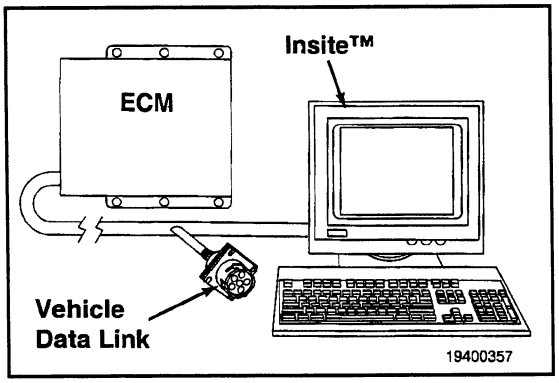

This feature can be enabled or disabled by using the INSITE™ service tool if the alternate torque feature is available in the calibration.




***Boost Power***

The boost power feature provides the operator with enhanced torque and power for a fraction of the operating period. If the feature is enabled, boost power can be engaged by a cab-mounted switch or automatically if the automatic boost power feature is enabled. The additional power is limited by a calibrated time period, thresholds for intake manifold temperature, coolant temperature, and engine speed.

**NOTE:** Boost power is **not** available continuously.




The INSITE™ service tool can enable or disable the boost power feature if the feature is available in the calibration. The service tool can also monitor the cab-mounted boost power switch.

If the boost power feature is enabled, the boost power can be engaged by using a cab-mounted switch. When the automatic boost power feature is enabled, it automatically switches the engine to boost power curve based on the engine operating conditions, and no manual switch is needed.

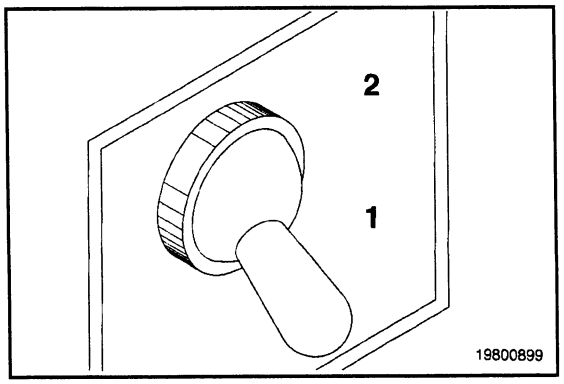
The automatic boost power feature can be enabled or disabled using the INSITE™ service tool.

### *Remote Throttle*

The remote throttle feature allows the operator to control the engine from a position other than the driver's seat. This feature is selected by the operator through an original equipment manufacturer (OEM) cab-mounted switch.

There are three modes available for the remote throttle feature.

The remote throttle feature, if allowed, can be enabled or disabled using the INSITE™ service tool if the feature is available in the calibration.

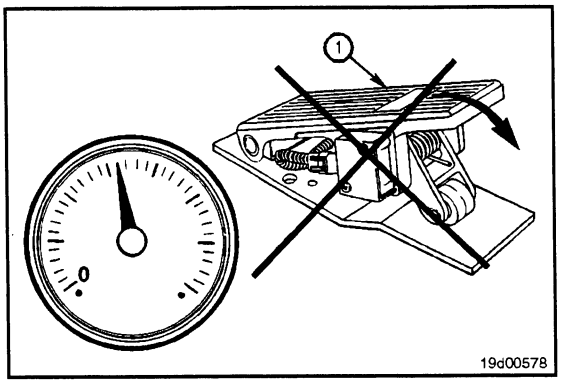



### *Remote Throttle Mode One (default)*

This mode will override the primary throttle (1) control and control the engine speed with the remote throttle setting.

**NOTE:** Remote throttle mode one does **not** employ idle validation and is intended for stationary applications, **only**.

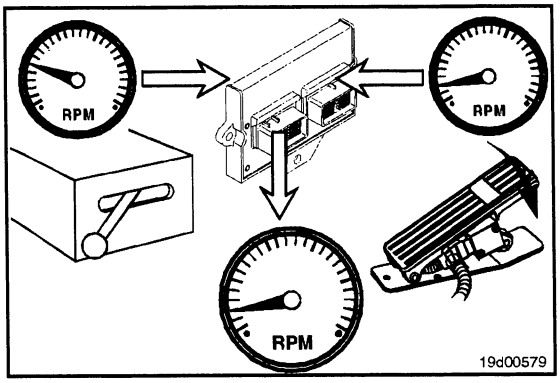
**NOTE:** The interlock feature (if enabled) switches the throttle to be equal or less than the throttle in control before the control is switched.




### *Remote Throttle Mode Two (select minimum)*

Remote throttle mode two is a select minimum throttle using two different throttles. One example is equipment that uses a hand throttle as your primary throttle and a foot throttle as a decelerating throttle.

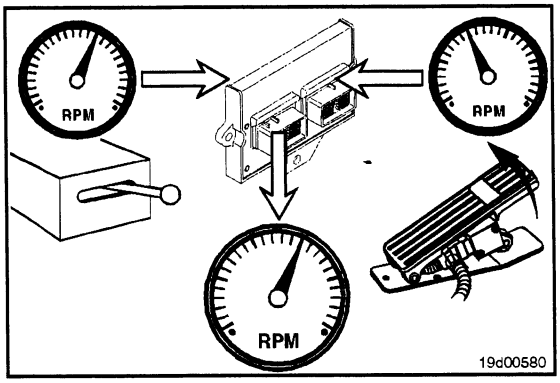
**NOTE:** Remote throttle mode two does **not** employ idle validation.

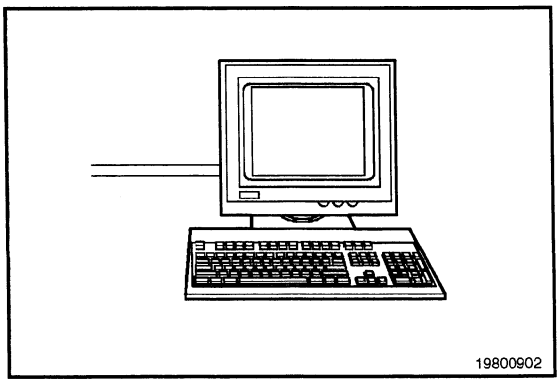



### *Remote Throttle Mode Three (select maximum)*

Remote throttle mode three is a select maximum throttle using two different throttles. One example is, equipment using a hand throttle as your primary throttle and a foot throttle as an accelerating throttle.

**NOTE:** Remote throttle mode three does **not** employ idle validation.

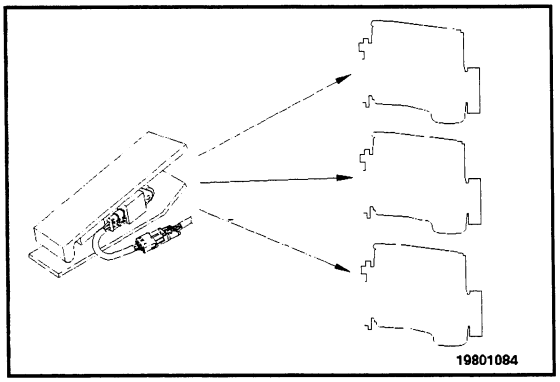





### *Frequency Throttle*

The frequency throttle feature converts a frequency input into a requested throttle percentage. The frequency throttle feature is applicable in industrial and marine applications in which a position (electronic or log signal) is **not** appropriate. The frequency throttle feature supports idle validation.

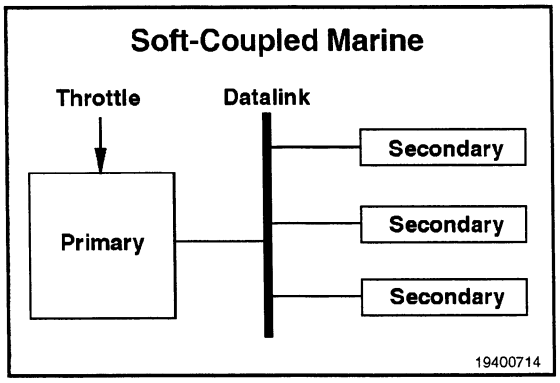
The frequency throttle feature can be enabled or disabled using the INSITE™ service tool if the feature is available in the calibration.




### *Multiple Unit Synchronization*

The multiple unit synchronization feature allows two or more engines to be controlled by a single throttle signal.

The multiple unit synchronization feature can be enabled or disabled using the INSITE™ service tool if the feature is available in the calibration.

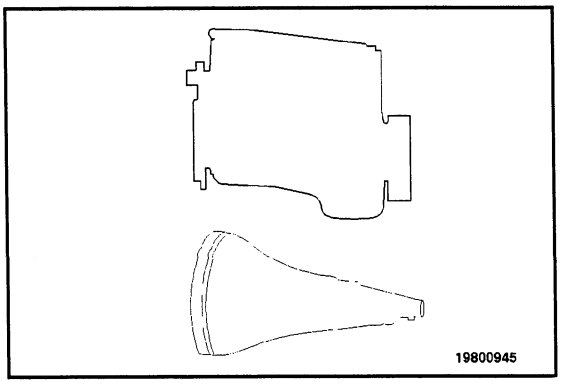



All soft-coupled marine configuration engines are connected to a J1939 datalink.

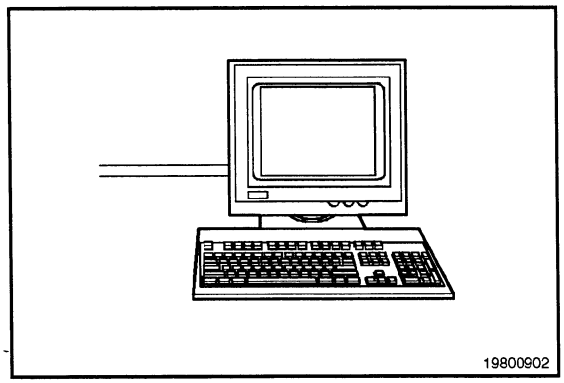
### *Pulse-Width Modulate Output*

This feature allows the electronic control module to output a pulse-width modulation signal that is proportional to either engine speed, engine load, engine torque output, or throttle input.

The pulse-width modulate output signal is intended to be used to control an engine or transmission that relies on an analog signal input. This signal can also be configured as an on/off signal where the signal is either 12 VDC (v battery) or open, depending on the load.



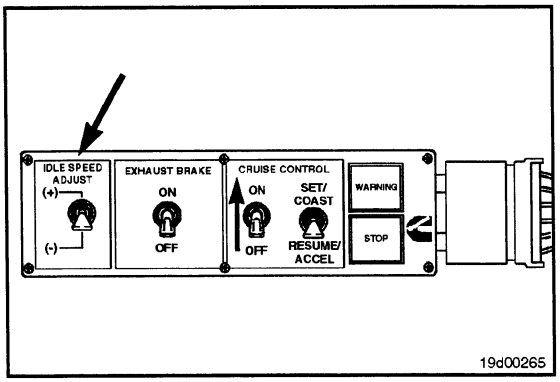

The pulse-width modulate output feature can be adjusted using the INSITE™ service tool if the feature is adjustable in the calibration.




### *Low-Idle Speed*

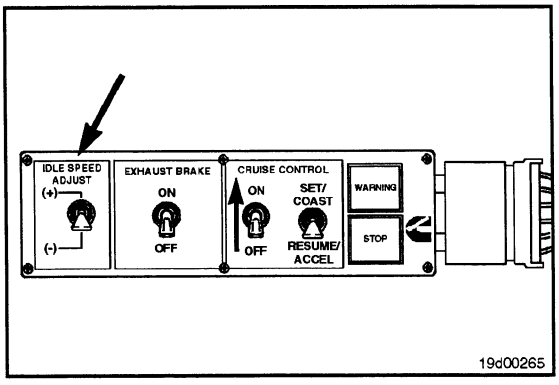
This parameter is the engine speed at which the engine will idle. This speed can be adjusted by a cab switch if the switch is installed and the low-idle adjustment feature is enabled.

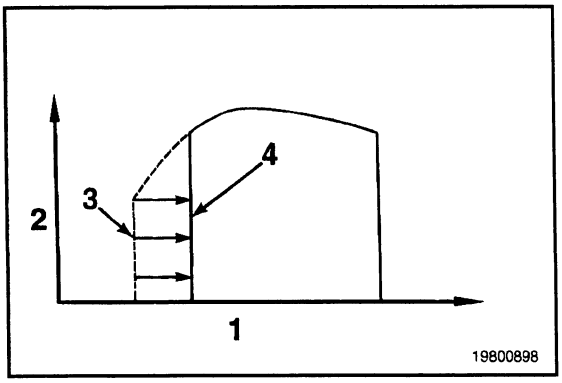
Low-idle speed feature can be adjusted using the INSITE™ service tool if the feature is adjustable in the calibration.




### *Low-Idle Adjustment*

This feature allows the idle speed range to be increased or decreased in 25-rpm standard increments with the in-cab increment or decrement switch. Depending on the calibration, the rpm increment could not be 25-rpm. There are limits on how high or low the low-idle speed can be adjusted. The allowable adjustment range for a QSL9 engine is 600 to 1200 rpm.

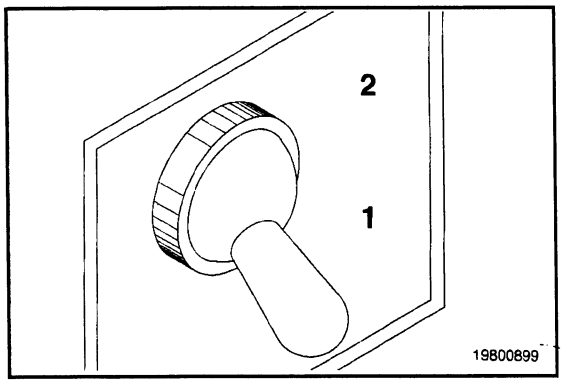





### *Alternate Low-Idle Speed Control*

This feature allows the operator to switch between the low idle speed setting (3) and an alternate low-idle speed setting (4) (the axis 1 is engine speed and 2 is engine torque).

**NOTE:** On the QSL9 engine during cold start-ups, and with engine temperatures less than 21°C [70°F], pilot injection has priority over alternate low-idle speed until the engine is properly warmed up.




Depending on original equipment manufacturer (OEM) availability the alternate low-idle speed control feature provides the ability to select an alternate idle speed by an original equipment manufacturer (OEM)-provided switch (1 is in the OFF position, and 2 is in the ON position).

**NOTE:** The alternate low idle speed can **not** be adjusted by the idle increment or decrement switch.

### *Idle Shutdown*

This feature automatically shuts off an engine after a period of engine idling when there is no activity from the driver such as engine speed changing or having the engine under load.

The idle shutdown system will **not** be active at coolant temperatures below 37.8°C [100°F].

After an engine has been automatically shut off, the keyswitch **must** be turned off for 15 to 20 seconds before attempting a restart.

The idle shutdown feature can be enabled or disabled using the INSITE™ service tool.

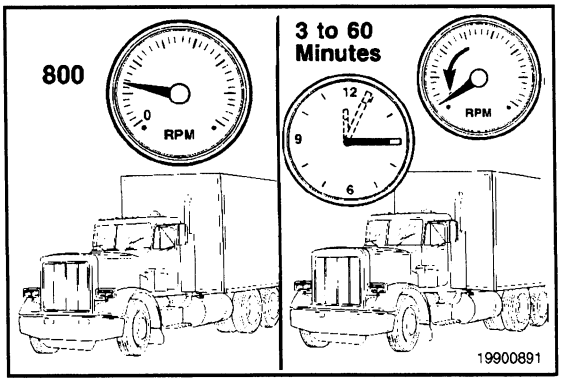
**NOTE:** This feature will shut off the engine **only**. It will **not** remove power from other accessories powered by the keyswitch. These can drain the battery.

### *Idle Shutdown Time*

This is a period of engine idling time when there is no activity from the driver before the engine automatically shuts off.

The idle shutdown time, if allowed, can be changed using the INSITE™ service tool.

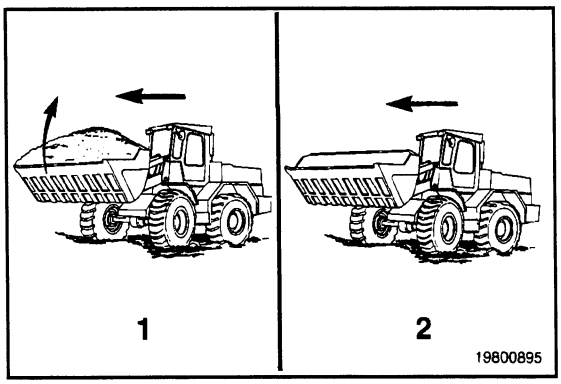
**NOTE:** This parameter will **not** appear if the idle shutdown feature is turned off.




### *Idle Shutdown Override*

This feature allows the driver to override the idle shutdown by changing the engine speed (2) or putting the engine under load (1).

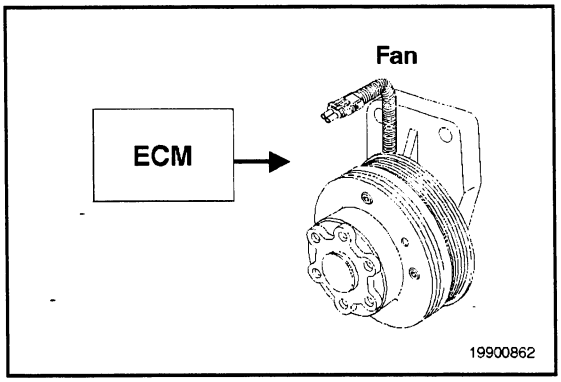
The idle shutdown warning period lasts for a calibrated period of time prior to engine shutdown. The yellow WARNING lamp on the dash will flash during the idle shutdown warning period.




### *Manual Fan Switch Enable*

The ECM can control the cooling fan based on inputs from the coolant temperature sensor and the intake manifold temperature sensor.

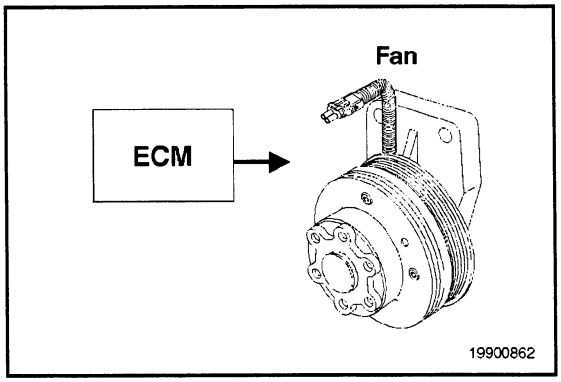
Some applications will also provide inputs to the electronic control module (ECM) for auxiliary device cooling, such as air conditioner pressure and power steering temperature. Your application also can include a manual switch for fan control.

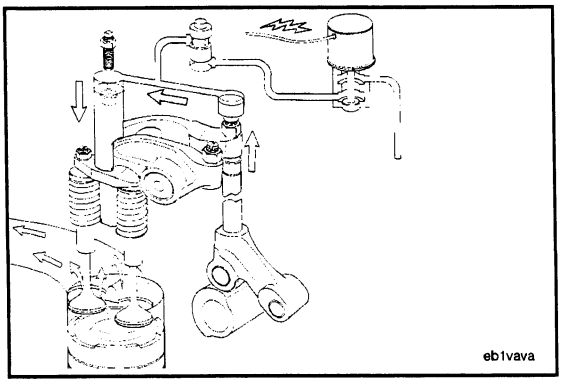



### *Minimum Fan-on Time with Air Conditioner Pressure Switch*

This feature controls the minimum amount of time that the fan will stay on when it is activated by the air conditioner pressure switch to reduce excessive fan cycling.

The minimum fan-on time with air conditioner pressure switch can be adjusted by using the INSITE™ service tool.





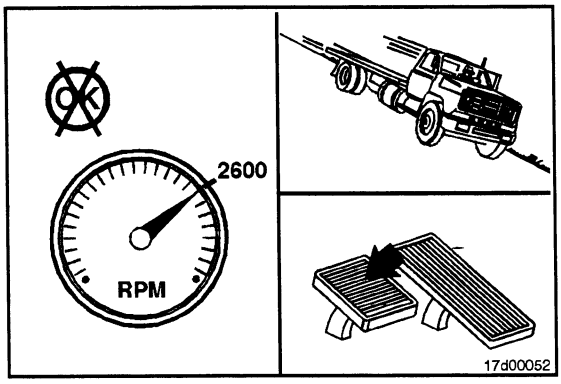

### *Engine Brakes*

Some engines are equipped with engine brakes.

Engine brakes are devices that use the energy of engine compression to provide vehicle retardation. Engine brakes provide the maximum retarding power at rated speed; therefore, gear selection is important.

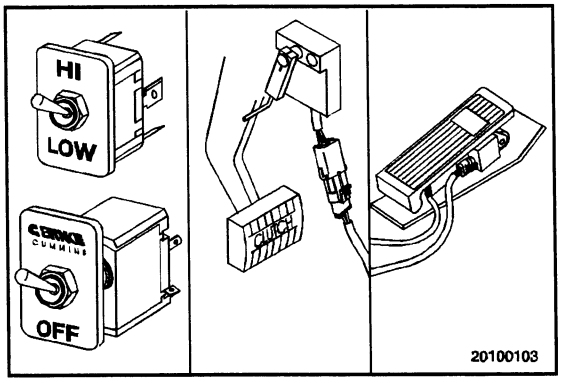
The engine brakes convert the engine to an energy-absorbing device to reduce vehicle speed.

This is accomplished by a hydraulic circuit that opens an exhaust valve near the end of the compression stroke.



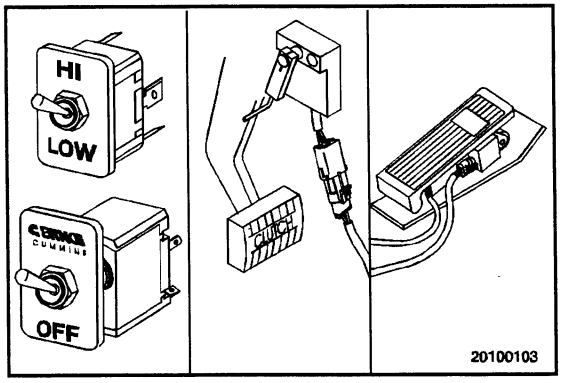

**⚠ CAUTION ⚠**

**Engine brakes can be operated continuously at engine speeds below 2300 rpm. Engine brakes can be operated intermittently at engine speeds between 2300 and 2600 rpm. Do not exceed 2600 rpm under any circumstances because engine damage can occur. The engine brakes are designed to assist the vehicle's service brakes to slow down the vehicle. Do not use the engine brakes as the primary means to stop the vehicle. If other engine brakes are used, refer to the component manufacturer's manual.**




Engine brake controls with the fuel system consist of the following:

- A two-position selector switch (optional)
- An on/off switch
- A clutch switch
- A throttle sensor.

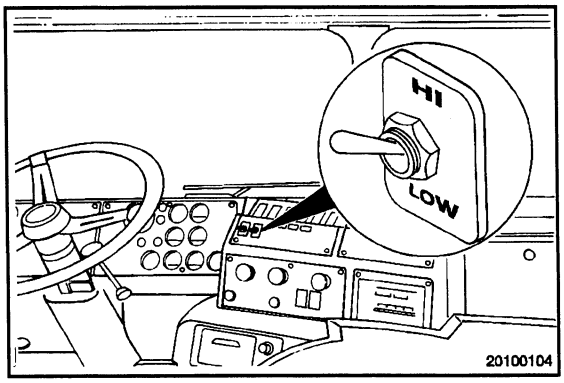



Several operating conditions **must** be true to activate the compression brake:

1. The exhaust brake switch **must** be in the ON position.
2. The operator's foot **must** be off of the accelerator pedal (pedal at low-idle position).
3. The engine speed **must** be above 1000 rpm.

The optional two-position selector switch is located near the on/off switch in the cab and allows the selection of the retarding power of one or two brakes.

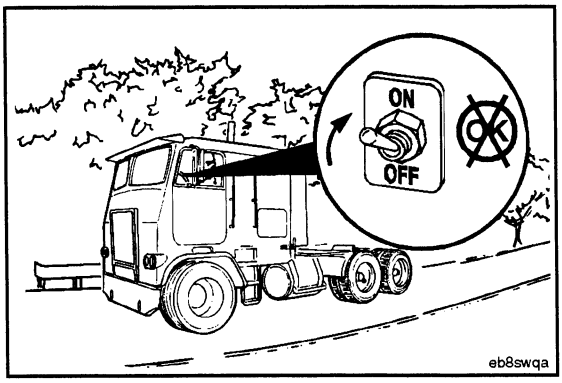
LOW activates the engine brakes on three cylinders, and HI activates the engine brakes on six cylinders.




**⚠ CAUTION ⚠**

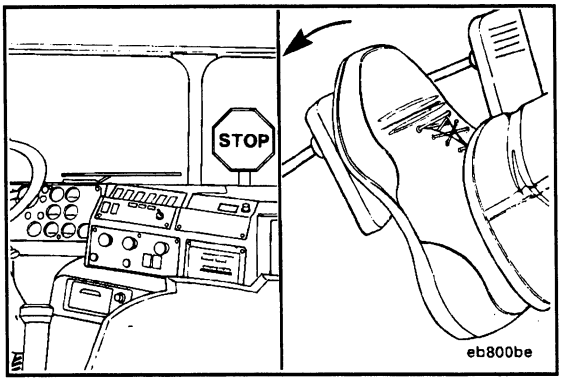
**Do not use the engine brakes while bobtailing or pulling an empty trailer. With the engine brakes in operation, wheel lockup can occur more quickly when the service brakes are applied, especially on vehicles with single-drive axles.**

Make sure that the engine brakes are switched to the OFF position when bobtailing or pulling an empty trailer.



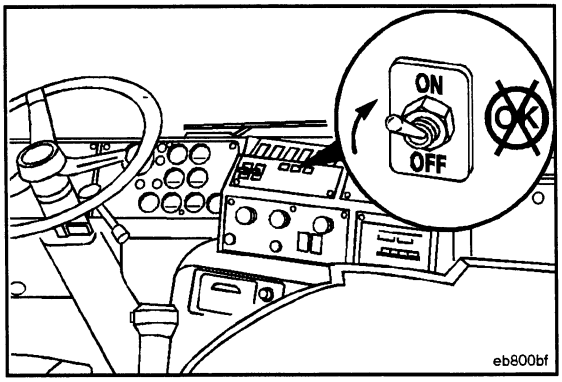

**NOTE:** The engine brakes are designed to assist the vehicle's service brakes when slowing the vehicle to a stop.

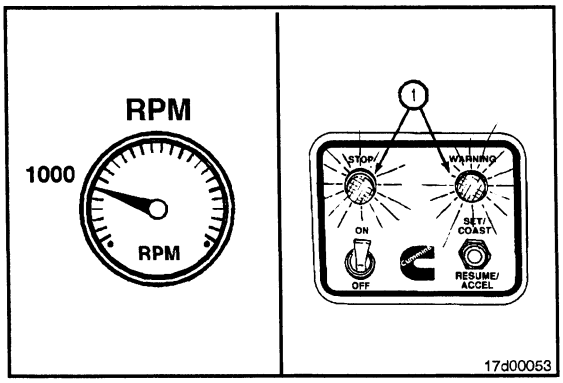
Remember, service brakes will be required to bring the vehicle to a stop.



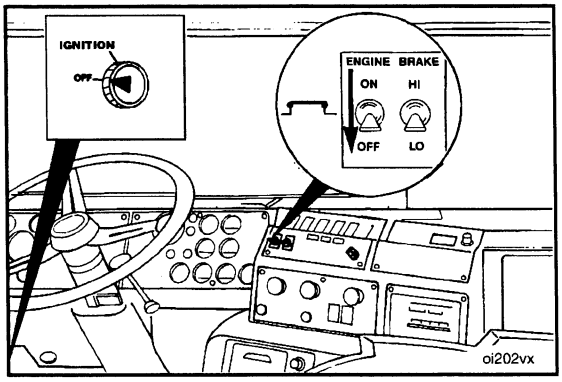

**⚠ CAUTION ⚠**

**Do not use the engine brakes to aid in clutchless gear shifting. This can cause the engine to stall or lead to engine damage.**





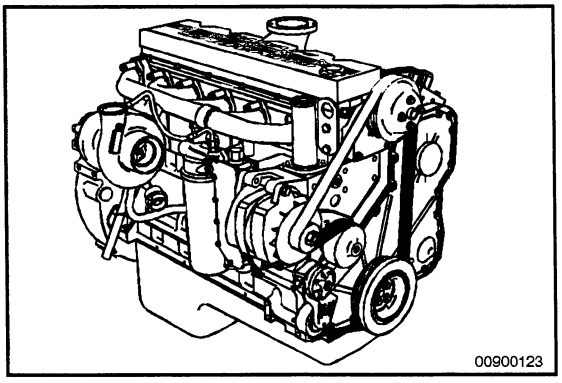

The ECM will disable the engine brakes when engine speed is below 1000 rpm or when certain electronic fault codes are active.




**⚠ CAUTION ⚠**

**Do not operate the engine if the engine brakes will not deactivate. To do so can cause severe engine damage.**

If the engine brakes will **not** shut off, shut off the engine immediately, and contact a Cummins Authorized Repair Facility.



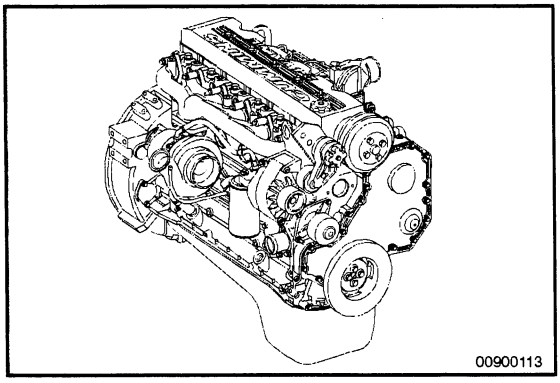

***Engine Warm-up Protection***

This feature inhibits the throttle, intermediate control switch, and datalink control inputs to keep the engine at low idle. This allows oil to reach all critical engine components before engine speed is increased above low idle.

To limit the engine's speed at start-up, the following inputs are limited:

1. Throttle input
2. Intermediate speed control switches
3. Datalink control inputs.

**NOTE:** The MAINTENANCE lamp is turned on while this feature is operating. Once adequate oil pressure is supplied to the engine, the lamp is turned off.




***Hot Shutdown Monitor/Hot Shutdown Load Percent***

This feature is **always** enabled. The electronic control module (ECM) will log an inactive fault code when the engine is turned off while still "hot" by the operator or by the engine protection feature.

An engine is considered "hot" when the hot shutdown load percent of the engine is above the threshold set by the INSITE™ service tool. The hot shutdown load percent is based on the duty cycle load factor that is determined from the engine's fueling levels.

*Maintenance Monitor*

**⚠ CAUTION ⚠**

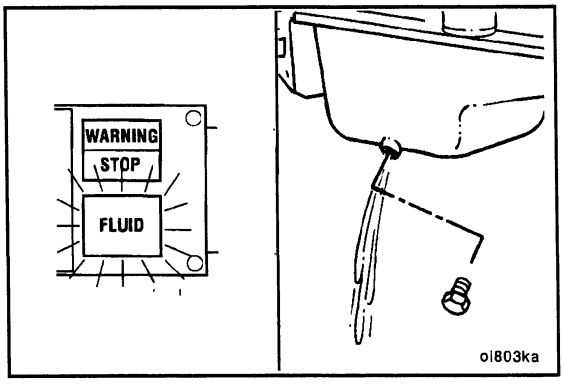
**The maintenance monitor is designed to alert the operator of the need for a routine maintenance stop. Maintenance records must still be maintained for historical purposes.**

**⚠ CAUTION ⚠**

**The maintenance monitor uses data received from the electronic control module (ECM) to determine the amount of fuel burned. Whenever a battery voltage fault has occurred, the maintenance monitor data can be inaccurate.**

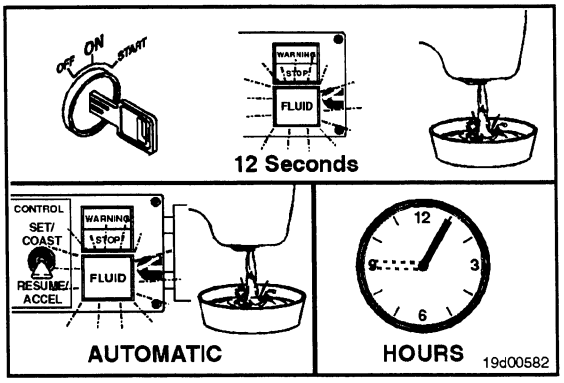
The maintenance monitor is an optional feature that will alert the operator when it is time to change oil and perform any other simultaneous maintenance tasks. The maintenance monitor continuously monitors the time the engine has been operating and the amount of fuel burned, to determine when it is time to change oil.

**NOTE:** The operator **must** still be alert for any indications that the engine needs other service.




The maintenance monitor has two modes of operation:

- Automatic mode
- Manual mode



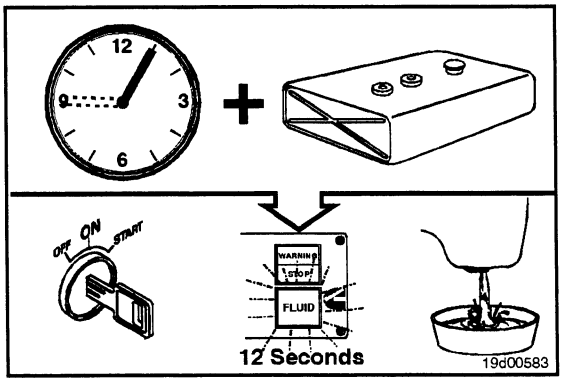

*Maintenance Monitor Automatic Mode*

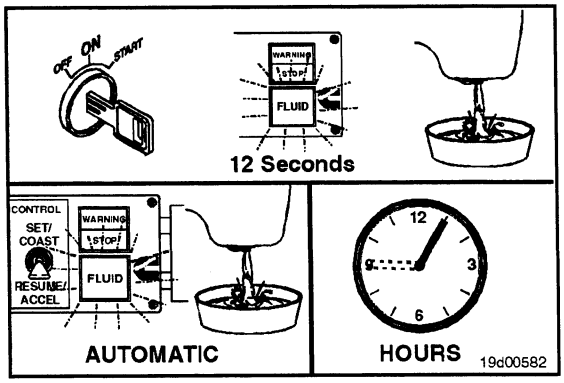
**⚠ CAUTION ⚠**

**The use of synthetic-base oil does not justify extended oil change intervals. Extended oil change intervals will decrease engine life because of factors such as corrosion, deposits, and wear.**

The automatic mode alerts the operator when it is time to change oil based on Cummins recommended interval. It determines the maintenance interval based on coolant temperature and load factor.

When the automatic mode is selected, the severe oil drain interval duty cycle is the default.

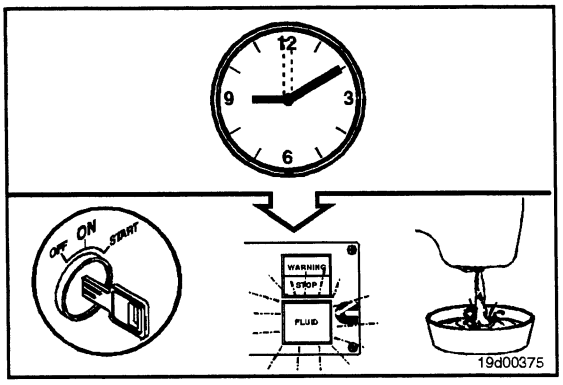





### *Maintenance Monitor Interval Factor*

The interval factor is used **only** in the maintenance monitor automatic mode. It is used to adjust the maintenance interval for severe, normal, or light-duty applications.

The original factory programmed value is SEVERE.

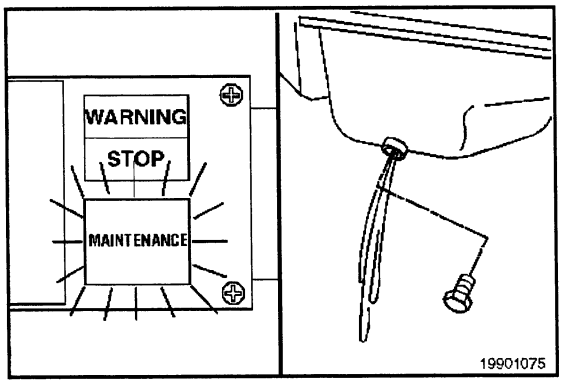



### *Maintenance Monitor Manual Mode*

**△ CAUTION △**

**When selecting the correct oil-change interval for your application, Cummins Engine Company, Inc. does not recommend exceeding published intervals and is not responsible for damage sustained from overextended drain intervals.**

Refer to Lubricating Oil Drain Intervals in Section V.




### *Maintenance Monitor Interval Alert Percentage*

This feature allows the user to enter the percentage of the current interval at which the light comes on, indicating the need for an oil change. The parameter allows the user to obtain an early warning of the need for a maintenance stop.

For example, if the time mode is set to 100 hours, and the interval alert percentage is set to 90 percent, the MAINTENANCE lamp will illuminate at 90 hours (90 percent of 100 hours).

### *Engine Time Offset*

This parameter is part of the trip information system. The value entered here will be added to total ECM time to get total engine time. This parameter allows the time on the engine to be entered when an ECM is replaced.

Engine time offset can be adjusted using the INSITE™ service tool.

### *Engine Distance Offset*

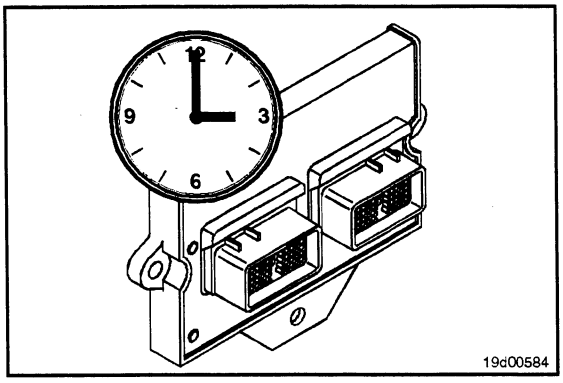
This feature is part of the Trip Informtion System. The value entered here will be added to the total ECM distance to equal the total engine distance. This allows the distance on the engine to be entered when the ECM is replaced.

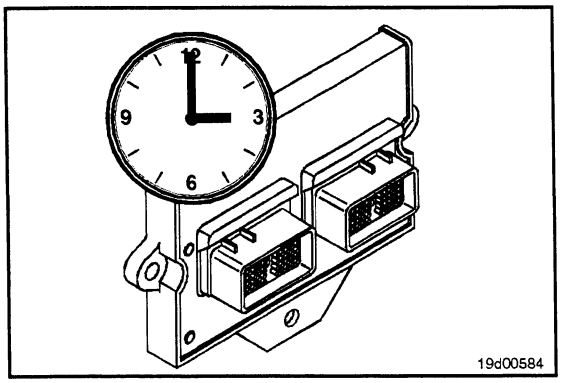
**NOTE:** This feature can be used when there is **not** a vehicle speed sensor installed.

### *Real-Time Clock*

The real-time clock provides time and date for stamping of operational events. The real time clock will maintain time value in units of year, month, day, hour (24-hour base), minute, and second. Loss of clock accuracy will be indicated with a diagnostic fault code. This feature can be set manually or automatically (to the PC time and date) through the INSITE™ service tool.

| | Standard Setting | Customer Selection |
|---|---|---|
| Auto Set (set to PC time and date) | No | __ Yes __ No |
| Manual Date | ____ | ____ |
| Date | __/__/__ | Adjust Date |
| Time | __/__/__ | Adjust Time |



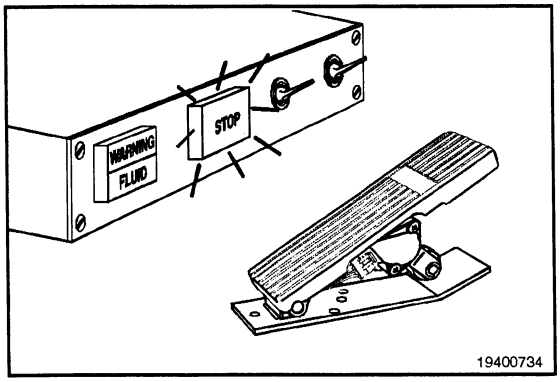



Reduced accuracy will be indicated with the diagnostic Fault Code 319. Upon loss of clock accuracy, the real-time clock will be "initialized" with the last known real time.

The loss of the real-time clock can occur due to a hardware failure (chip fails) or a loss of power. There is no battery backup for the clock. Therefore, if the battery is removed from the system for 5 seconds, the real-time clock will be lost.

To reinitialize the real-time clock, use the INSITE™ service tool, the menu item "Adjustments - Feature and Parameters." At this point a screen will pop up in which you can manually enter a new time and date, or you can select "Real-Time Clock Autoset" and the time and date will be set to the PC's time and date. After reinitializing the real time clock, INSITE™ service tool will set the Fault Code 319 inactive.

**NOTE:** Once the real-time clock has been enabled, you can **not** disable the feature.

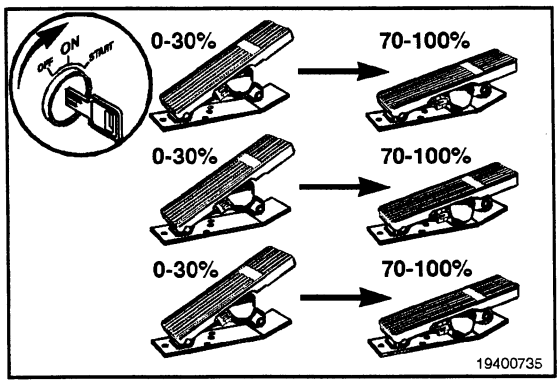



***Throttle-Activated Diagnostic Switch***

Throttle-activated diagnostic switch is intended to eliminate the need for a dash-mounted diagnostic switch, which is used to activate the diagnostic mode to display active fault codes in a sequence of flashing lamps. The throttle-activated diagnostic switch feature eliminates the need for a dash-mounted diagnostic switch by providing a simple sequence of throttle movements that activate the diagnostic mode.

**NOTE:** The feature will work with all throttle types.

**NOTE:** In order to reset the maintenance monitor data, a diagnostic switch **must** be installed.

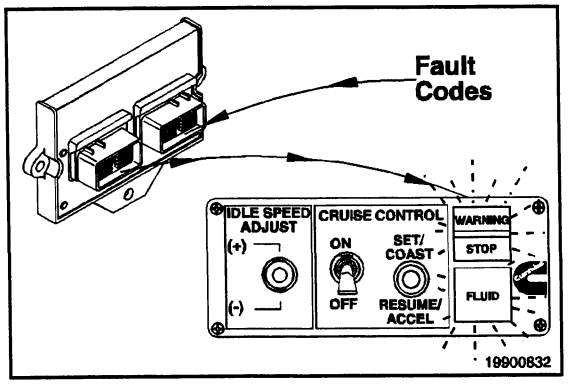



When the engine is **not** running, a sequence of three throttle cycles after the keyswitch is turned on will activate the diagnostic mode. The increment or decrement switch can be used to navigate to the next or previous fault code. In the case that these switches are **not** available, a single throttle cycle will also increment to the next fault code.

## Diagnostic Fault Codes

The QSL9 control system can show and record operation anomalies that present themselves as fault codes. These codes will make troubleshooting easier. The fault codes are recorded in the ECM. They can be read using the fault lamps on the dash or with the INSITE™ service tool.

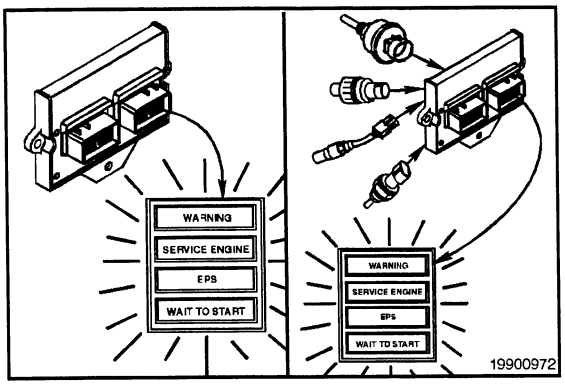
**NOTE: Not** all QSL9 control system anomalies are shown as fault codes.




There are three kinds of system codes:

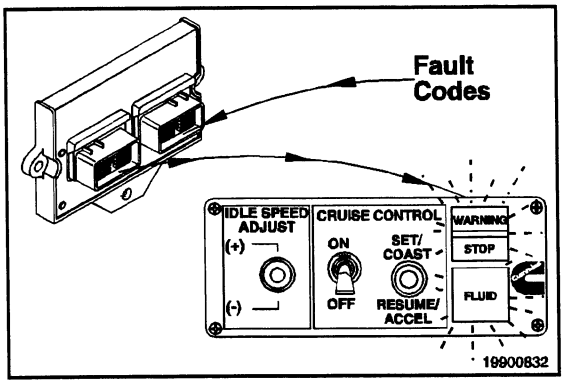
- Engine electronic control system fault codes
- Engine protection system fault codes
- Engine maintenance indicator codes.

All fault codes recorded will be either active (fault code is currently active on the engine) or inactive (fault code was active at some time but at the moment is **not** active).

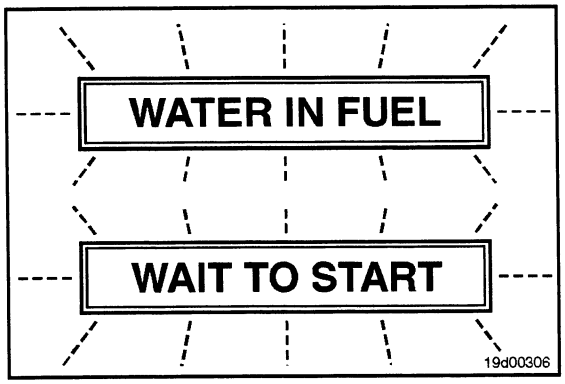


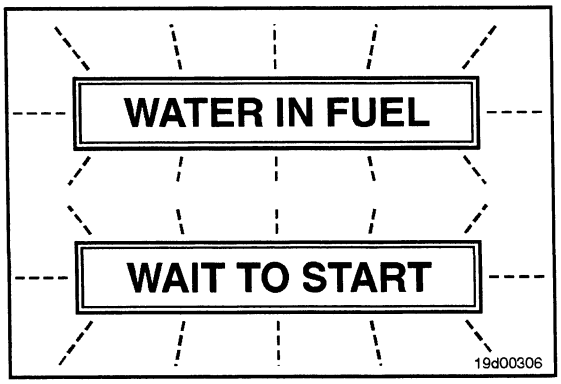

Most, but **not** all, of the electronic fault codes will light a lamp when they are active. There are three possible lamps that can be illuminated when a fault code is active:

- The WARNING or CHECK ENGINE lamp is yellow and indicates the need to repair the fault at the first available opportunity.
- The STOP or STOP ENGINE lamp is red and indicates the need to stop the engine as soon as it can be safely done. It is recommended that the engine remains shut down until the fault can be repaired.
- The MAINTENANCE lamp will illuminate when an engine maintenance function needs to be performed.

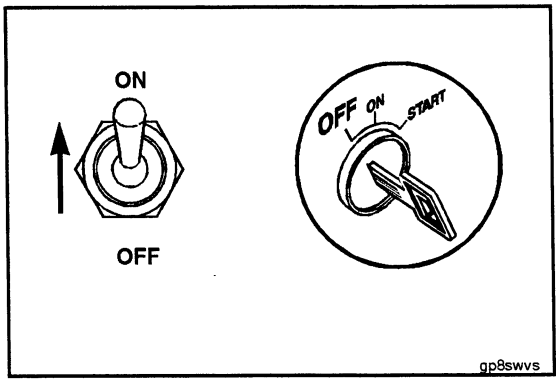



Some vehicles will also have a WAIT TO START lamp and a WATER IN FUEL lamp. The WAIT TO START lamp is illuminated during the preheat time that takes place at key-on during cold-weather starting. To minimize cranking time during cold-weather starting, the engine can **not** be cranked until the WAIT TO START lamp has been extinguished.

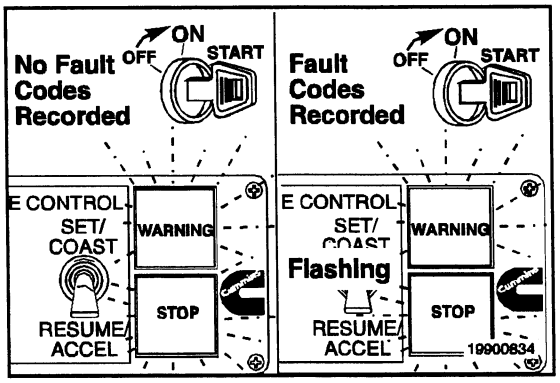





The WATER IN FUEL lamp indicates that the engine's fuel-water separator needs to be drained. This task **must** be performed as soon as possible whenever this lamp is illuminated. Some vehicle OEMs will combine the functions of the MAINTENANCE and WATER IN FUEL lamps. In these cases, the MAINTENANCE lamp indicates a WATER IN FUEL warning, in addition to other maintenance indicators.



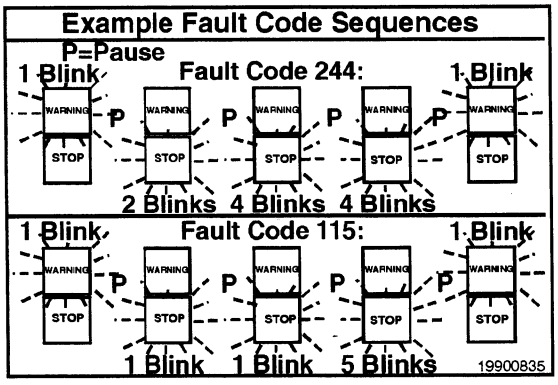

To check for active engine electronic system fault codes and maintenance indicator codes, turn the keyswitch to the OFF position, and move the diagnostic switch to the ON position, or connect the shorting plug into the diagnostic connector.




Turn the vehicle keyswitch to the ON position.

If no active fault codes are recorded, both the WARNING and STOP lamps will illuminate and stay on.

If active fault codes are recorded, both the WARNING and STOP lamps will illuminate momentarily then begin to flash the codes of the recorded faults.

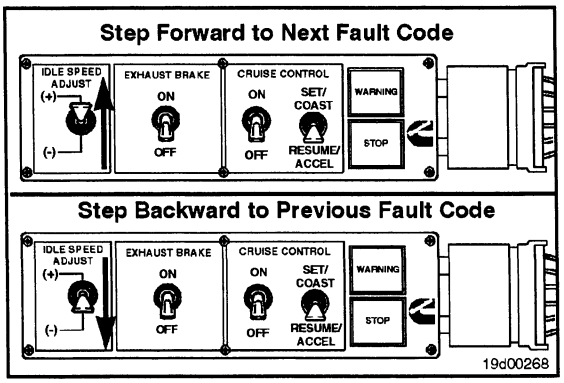



The fault code will flash in the following sequence:

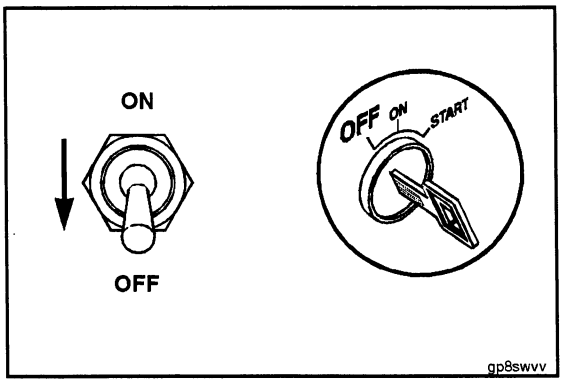
1. A yellow WARNING lamp will flash.
2. There is a short 1- or 2-second pause.
3. The fault code will flash on the red STOP lamp.
4. There is a short 1- or 2-second pause between each number.

When the number has finished flashing in red, a yellow WARNING lamp will appear again. The fault code sequence will repeat.

Each fault code will flash two times before advancing to the next code. To skip to the next fault code, move the IDLE SPEED ADJUST switch (if equipped) momentarily to the (+) position. Go back to the previous fault code by momentarily moving the IDLE SPEED ADJUST switch (if equipped) to the (-) position. If **only** one active fault code is recorded, the QSL9 control system will continuously display the same fault code with either the (+) or (-) selected.

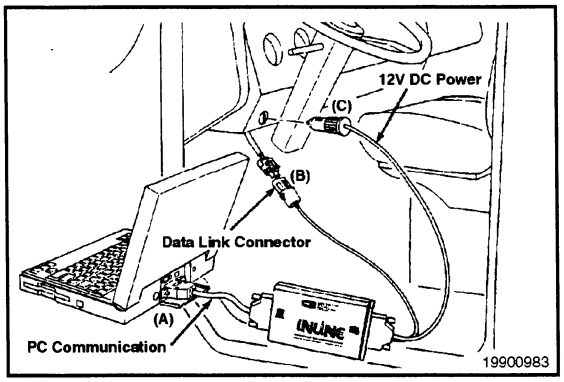



When **not** using the diagnostic system, turn off the diagnostic switch, or remove the shorting plug. If the diagnostic switch is left on or the shorting plug left in, the electronic control module (ECM) will **not** log some fault codes.




### Fault Code Snapshot Data

This additional fault code information can be obtained by using the INSITE™ service tool. The snapshot data records the value or state of the control system sensors and switches at the time a fault code occurred. Either set of data is stored for the first occurrence of the fault, since it was last cleared, and for the most recent occurrence. This data can be very valuable when trying to re-create or determine engine operating conditions at the time of a fault.




### Trip Information

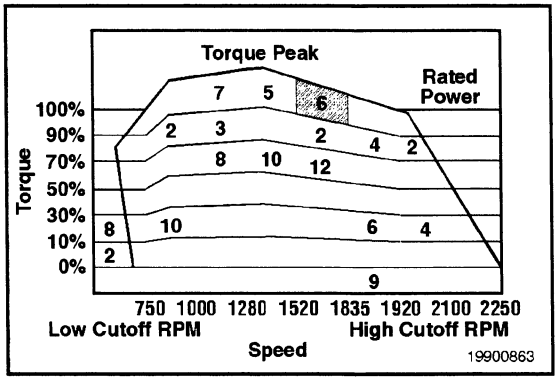
The Trip Information System records fuel consumption, distance, and time information for the engine during normal operation and in certain operating modes such as PTO and idle. This data can be displayed using the INSITE™ service tool. Some data can **not** be reset and reflects the performance of the engine over its lifetime. Other data, such as trip data, can be reset using the INSITE™ service tool.

### Engine Time Offset

This feature is part of the Trip Information System. The value entered here will be added to the total ECM time to equal the total engine time. This allows the time on the engine to be entered when the ECM is replaced.

### Engine Distance Offset

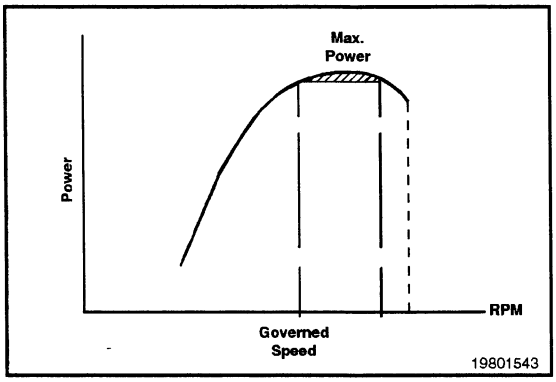
This feature is part of the Trip Information System. The value entered here will be added to the total ECM distance to equal the total engine distance. This allows the distance on the engine to be entered when the ECM is replaced.




### Duty Cycle Monitor

With this feature, the ECM tracks engine load and speed. This data is stored in the ECM until the INSITE™ service tool is used to display it. The INSITE™ service tool displays a duty cycle "map" that shows the whole engine operating range in terms of speed and load. This "map" is divided into 50 regions. The percent of engine operating time spent in each region is shown on the display.

The ECM contains duty cycle data for the whole life of the engine and for two 500-hour operating periods. The two 500-hour maps can be reset with the INSITE™ service tool.




# Driving Techniques

## General Information

The QSL9 engine produces maximum power at an rpm less than governed engine speed. Placement of maximum power has been changed on QSL9 engines to encourage operation in the most fuel efficient engine speed range.

To obtain optimum engine performance on a grade, allow the engine speed to load down to near torque peak before shifting. This technique will result in an engine operating speed in the maximum power zone after the shift is completed.

# Electromagnetic Interference (EMI)

## General Information

Some diesel engine applications utilize accessories (such as CB radios and mobile transmitters) that generate and use radio frequency energy that, if **not** installed and used properly, can cause electromagnetic interference (EMI) conditions to exist between the accessory and the Cummins QSL9 electronically controlled fuel system. Cummins is **not** liable for any performance problems with either the QSL9 fuel system or the accessory due to EMI. EMI is **not** considered by Cummins to be an engine failure and, therefore, is **not** warrantable.

## System EMI Susceptibility

The Cummins product has been designed and tested for minimum sensitivity to incoming electromagnetic energy. Testing has shown that there is no engine performance degradation at relatively high energy levels; however, if very high energy levels are encountered, then some noncritical diagnostic fault code logging can occur. The QSL9 fuel system EMI susceptibility level will protect the engine from most, if **not** all, electromagnetic energy-emitting devices that meet the FCC legal requirements.

## System EMI Radiation Levels

Cummins products have also been designed and tested to emit minimum electromagnetic energy. Testing has shown that the QSL9 fuel system, when properly installed in a vehicle, meets or exceeds by a wide margin Part 15 of the FCC Rules and SAE J1551 specifications. Other accessories can be designed with proper filtering to reject electromagnetic noise emission from their system. Experience has shown that the QSL9 control system on a vehicle will **not** interfere with on-board communication equipment for urban and suburban background electromagnetic noise levels; however, the system, if used with accessories which are **not** installed properly or do **not** utilize adequate filtering designs, can interfere with on-board communications equipment in rural applications where background radio frequency noise levels are very low.

If an interference condition is observed, follow the suggestions below to reduce the amount of interference:

1. Locate the receiving antenna as far away from the engine and as high as possible.
2. Locate the receiving antenna as far away as possible from all metal obstructions such as exhaust stacks.
3. Consult a representative of the accessory supplier to
   - — Accurately calibrate the device for proper frequency, power output, and sensitivity (both base- and remote-site devices **must** be properly calibrated).
   - — Obtain antenna reflective energy data measurements to determine the optimum antenna location.
   - — Obtain optimum antenna-type and mounting arrangement for an application.
   - — Make sure the accessory equipment model is built for maximum filtering to reject incoming electromagnetic noise.

**Welding on a Vehicle with Electronic Components is Not Recommended**

**⚠ CAUTION ⚠**

**Disconnect both the positive (+) and ground, or negative, (-) battery cables from the battery before welding on the vehicle. Attach the welder ground cable no more than 0.61 m [2 ft] from the part being welded. Do not connect the ground cable of the welder to any electronic component or component-mounting location. Welding on the engine or engine-mounted components is not recommended.**

# NOTES

# Section 2 - Maintenance Guidelines

## Section Contents

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# Maintenance Guidelines - General Information

Cummins Engine Company, Inc. recommends that the engine be maintained according to the Maintenance Schedule in this section.

If the engine is operating in ambient temperatures consistently below -18°C [0°F] or above 38°C [100°F], perform maintenance at shorter intervals. Shorter maintenance intervals are also required if the engine is operated in a dusty environment or if frequent stops are made. See a Cummins Authorized Repair Facility for recommended intervals.

If the engine is equipped with a component or an accessory **not** manufactured by Cummins Engine Company, Inc., refer to the component manufacturer's maintenance recommendations. A listing of suppliers' addresses and telephone numbers is provided in Component Manufacturers (Section M).

Use the chart provided at the end of this section as a convenient way to keep a record of maintenance performed.

**NOTE:** The QSL9 engine features a no-adjust overhead. The QSL9 valve train is designed such that adjustment of the valve lash is **not** required for normal service within the first 241,500 km [150,000 mi] or 5000 hours. The valve train operates acceptably within the limits of 0.152 to 0.559 mm [0.006 to 0.022 in] intake valve lash and 0.381 to 0.813 mm [0.015 to 0.032 in] exhaust valve lash. It is recommended that the valve lash be checked around 241,500 km [150,000 mi] or 5000 hours.

## Tool Requirements

Most of the maintenance operations described in this manual can be performed with common hand tools (metric and SAE wrenches, sockets, and screwdrivers).

The following is a list of special service tools required for some maintenance operations:

| Tool Part No. | Description |
|---|---|
| ST-1273 | Pressure Gauge |
| 3375045 | Torque Wrench (0 to 175 ft-lb) |
| 3375049 | Oil Filter Wrench |
| 3376807 | Engine Coolant and Fuel Filter Wrench |
| 3822524 | Belt Tension Gauge, Click-Type (v-belts and v-ribbed with 4 or 5 ribs) |
| 3822525 | Belt Tension Gauge, Click-Type (v-ribbed with 6 to 12 ribs) |
| 3824556 | Charge-Air Cooler (CAC) Pressure Kit |
| 3824591 | Engine Barring Gear |
| 3824783 | Torque Wrench (0 to 300 in-lb) |
| CC-2800 | Refractometer |
| CC-2802 | Coolant Test Kit |
| 3163468 | Roller Follower Removal and Installation Tool |
| 3163681 | Brake Lash Feeler Gauge |
| 3824842 | Compucheck® Fitting |

Contact the nearest Cummins Authorized Repair Facility for the required service tools.

A computer is required to run the OEM software. Contact a Cummins Authorized Repair Facility for information on hardware requirements.

# Maintenance Schedule

| QSL9 Engine Maintenance Schedule | | | | | |
|---|---|---|---|---|---|
| **Daily or Refueling** | **Every 14,500 km [9000 mi], 250 Hours, or 3 Months** | **Every 29,000 km [18,000 mi], 500 Hours, or 6 Months (1), (2), (4)** | **Every 58,000 km [36,000 mi], 1000 Hours, or 1 Year (4)** | **Every 116,000 km [72,000 mi], 2000 Hours, or 2 Years (3)** | **Every 241,500 km [150,000 mi], 5000 Hours, or 4 Years (4)** |
| Maintenance Check | Check/Inspect | Change/ Replace/ Inspect | Check/Inspect | Check/Inspect/ Replace | Check/Inspect |
| • Check and correct<br>– Engine oil level<br>– Coolant level<br>• Drain air tanks and reservoirs<br>• Drain fuel-water separator<br>• Inspect cooling fan<br>• Check crankcase breather tube<br>• Check intake piping | • Mounting hardware such as injection pump and air compressor<br>• Operate engine, and check air intake system | • Fuel filter<br>• Lubricating oil (1)<br>• Lubricating oil filter (1)<br>• Coolant filter<br>• Check engine (2) coolant SCA concentration level | • Fan hub<br>• Belt tensioner<br>• Drive belts | • Replace antifreeze (2)<br>• Vibration damper | • Overhead valve lash (5)<br>• Engine brake lash |

1. The lubricating oil and lubricating oil filter interval can be adjusted based on application, fuel consumption, gross vehicle weight, and idle time. Refer to Maintenance Specifications (Section V).
2. Service interval is every oil change or 29,000 km [18,000 mi], 500 hours, or 6 months, whichever occurs first. A heavy-duty year-round antifreeze that meets the chemical composition of GM6038M **must** be used. The change interval is 2 years or 385,000 km [239,227 mi], whichever occurs first. Antifreeze is essential for freeze, overheat, and corrosion protection.
3. Service interval is 2 years or 385,000 km [239,227 mi], whichever occurs first.
4. Follow the manufacturers' recommended maintenance procedures for the starter, alternator, batteries, electrical components, engine brake, exhaust brake, charge-air cooler, radiator, air compressor, air cleaner, freon compressor, and fan clutch. Refer to Component Manufacturers (Section M).
5. Reset valve lash, if needed, to nominal specification 0.305 mm [0.012 in] for intake valve lash and 0.559 mm [0.022 in] for exhaust valve lash.

## Oil Drain Intervals

Refer to the following flowchart to determine the maximum recommended oil change and filter change intervals in kilometers, miles, hours, or months, whichever occurs first.

Is the vehicle one of those listed below?

- Truck crane/yard spotter
- Paver/crane/backhoe
- Dozer/scraper/skidder

**If Yes -**

Select the correct oil drain interval from Table 1.

**If No -**

Is the vehicle one of those listed below?

- Tractor/combine/irrigation equipment
- Genset/air compressor/fire pump

**If Yes -**

Select the correct oil drain interval from Table 2.

**If No -**

Select the correct oil drain interval from Table 3.

**Table 1, Oil Drain Intervals**

| Vehicle/Equipment | Kilometers | Miles | Hours | Months |
|---|---|---|---|---|
| Truck crane/ yard spotter | 14,500 | 9000 | 500 | 6 |
| Paver/crane/backhoe | N/A | N/A | 500 | 6 |
| Dozer/scraper/ skidder | N/A | N/A | 500 | 6 |

**Table 2, Oil Drain Intervals**

| Vehicle/Equipment | Kilometers | Miles | Hours | Months |
|---|---|---|---|---|
| Tractor/combine/ irrigation equipment | N/A | N/A | 500 | 6 |
| Genset/ air compressor/ fire pump | N/A | N/A | 500 | 6 |

**Table 3, Oil Drain Intervals**

| Vehicle/Equipment | Kilometers | Miles | Hours | Months |
|---|---|---|---|---|
| All Others | 14,500 | 9000 | 500 | 6 |

# Page References for Maintenance Instructions

For convenience, listed below are the page numbers that contain specific instructions for performing the maintenance checks listed in the maintenance schedule.

# Maintenance Record Form

| Maintenance Record | |
|---|---|
| Engine Serial No.: | Engine Model: |
| Owner's Name: | Equipment Name/Number: |

Key to table headings:

A = Date
B = km [Miles], Hours or Time Interval
C = Actual km [Miles] or Hours
D = Maintenance Check Performed
E = Check Performed By
F = Comments

| A | B | C | D | E | F |
|---|---|---|---|---|---|
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# NOTES

# Section 3 - Maintenance Procedures at Daily Interval

## Section Contents

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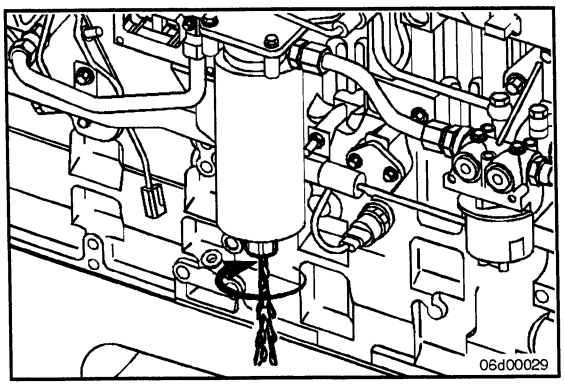
# Daily Maintenance Procedures - General Information

## General Information

Preventative maintenance begins with day-to-day awareness of the condition of the engine and its systems. Before starting the engine, check the oil and coolant levels. Look for the following:

- Leaks
- Loose or damaged parts, especially in fuel or exhaust systems
- Worn or damaged belts
- Any change in engine appearance
- Odor of fuel.




# Fuel-Water Separator

## Drain

**⚠ WARNING ⚠**

**Drain the fuel-water separator into a container, and dispose of contents in accordance with local environmental regulations. Avoid contact with skin.**

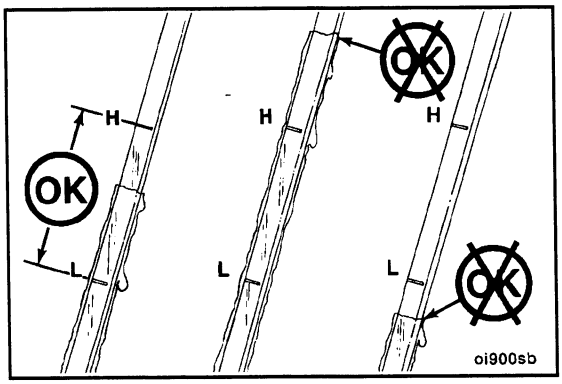
**NOTE:** The water and sediment can contain petroleum products. Please consult the local environmental agency for recommended disposal guidelines.

Cummins Engine Company, Inc. requires a fuel-water separator be installed in the fuel supply system. Drain the water and sediment from the separator daily.

Shut off the engine. Open the drain valve by hand.

Open the drain valve until fluid drains out of the drain tube.

Drain the filter sump until clear fuel is visible.




# Lubricating Oil Level

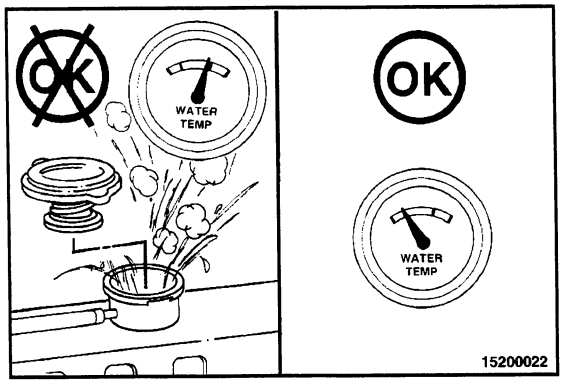
## Maintenance Check

The vehicle **must** be level when checking the oil level to make sure the measurement is correct.

Shut off the engine for an accurate reading.

Do **not** operate the engine with the oil level below the "L" (low) mark or above the "H" (high) mark. Wait at least 10 minutes after shutting off the engine to check the oil. This allows time for the oil to drain into the oil pan.

For additional oil recommendations, refer to Lubricating Oil Recommendations and Specifications in Section V.




# Coolant Level

## Maintenance Check

**⚠ 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.**

**△ CAUTION △**

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

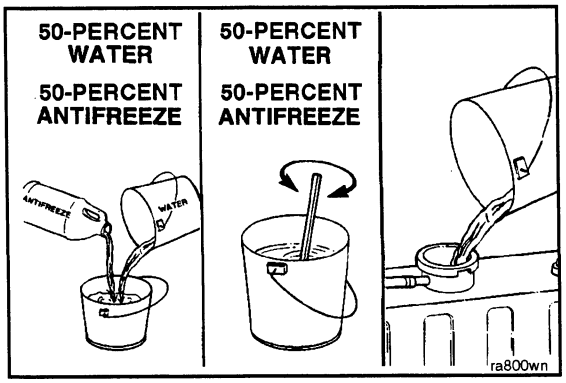
The coolant level **must** be checked daily.

**⚠ CAUTION ⚠**

**Do not add cold coolant to a hot engine. Engine castings can be damaged. Allow the engine to cool to below 50°C [122°F] before adding coolant.**

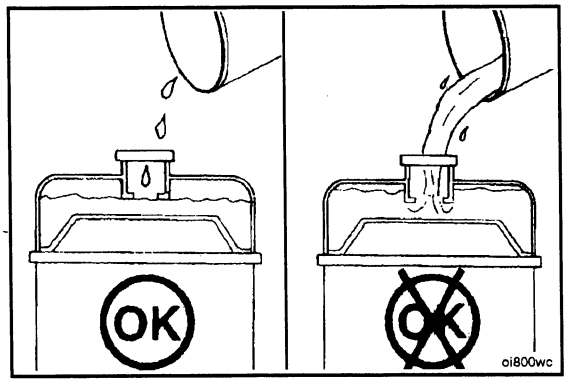
If additional coolant is added to the cooling system, a 50-percent mixture of water and antifreeze **must** be premixed before being added to the system. Since the ability of antifreeze to remove heat from the engine is **not** as good as water, pouring antifreeze into the engine first could contribute to an overheated condition before the liquids are completely mixed. Refer to Coolant Recommendations and Specifications (Section V).

**NOTE:** On applications that use a coolant recovery system, check to make sure that the coolant is at the appropriate level in the coolant recovery tank, depending on the engine temperature.




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

**NOTE:** Some radiators have two fill necks: Both **must** be filled when the cooling system is drained.

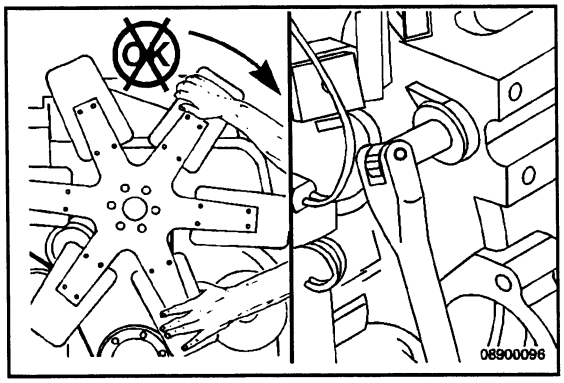


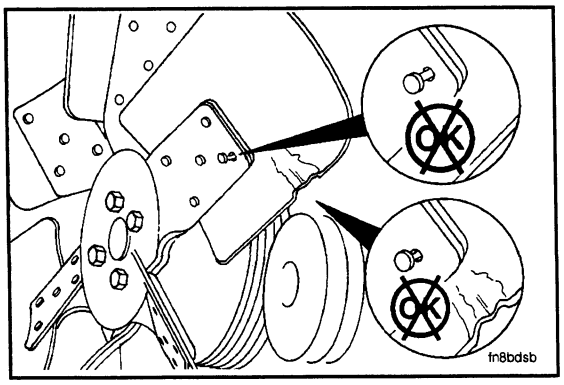

# Fan, Cooling

## Inspect for Reuse

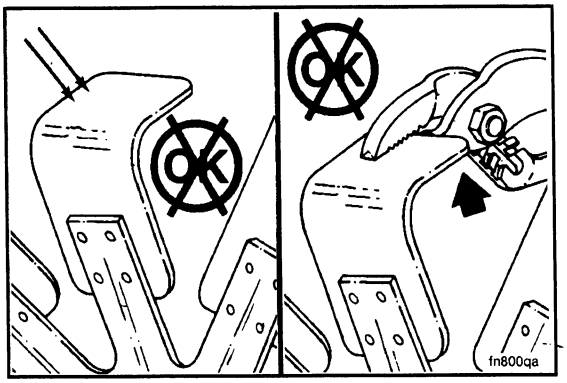
**⚠ WARNING ⚠**

**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 serious personal injury or property damage. Use the engine barring gear to rotate the crankshaft.**



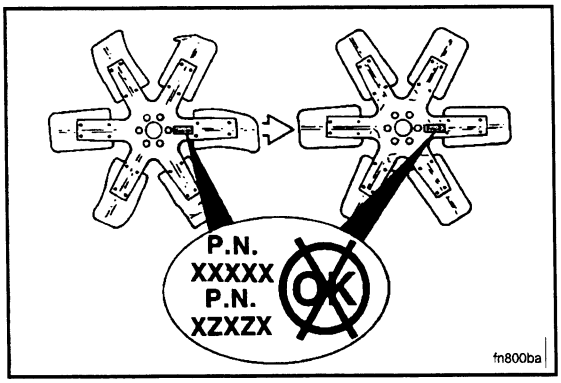



Inspect the cooling fan daily. Check for cracks, loose rivets, and bent or loose blades. Check the fan to make sure that it is securely mounted. Tighten the capscrews, if necessary.

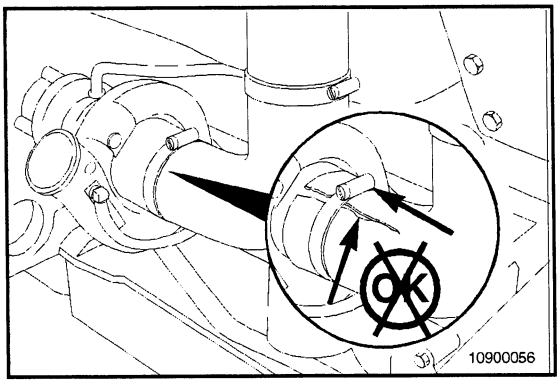



**⚠ WARNING ⚠**

**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 serious personal injury or property damage.**




Replace any original equipment fan that is damaged with a fan of the identical part number. Cummins Engine Company, Inc. **must** approve any other fan changes.




# Air Intake Piping

## Maintenance Check

Inspect the intake piping daily for wear points, damage to piping, loose clamps, and punctures that can damage the engine.

Replace damaged pipes, and tighten loose clamps, as necessary, to prevent the air system from leaking.

**Torque Value:** 8 N•m [71 in-lb]

Check for corrosion under the clamps and hoses of the intake system piping. Corrosion can allow corrosive products and dirt to enter the intake system. Remove clamps and hoses, and clean as required.

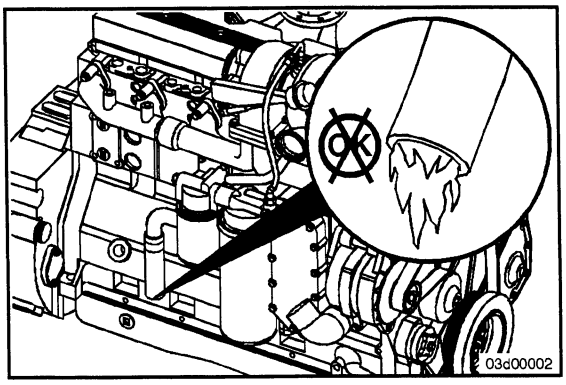
# Crankcase Breather Tube

## Maintenance Check

Check the crankcase breather tube daily during cold weather operation for ice buildup, that can obstruct the tube.

If an ice buildup is present, remove the breather tube, if necessary, and clear the obstruction.

The QS9 engine is equipped with a block-mounted breather tube.



# NOTES

# Maintenance Procedures at 14,500 Kilometers [9000 Miles], 250 Hours, or 3 Months

## Section Contents

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# Maintenance Procedures - General Information

## General Information

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

Fleetguard® is a subsidiary of Cummins Engine Company, Inc. Fleetguard® filters are developed through joint testing at Cummins and Fleetguard®. Fleetguard® filters are standard on new Cummins engines. Cummins Engine Company, Inc. recommends their use.

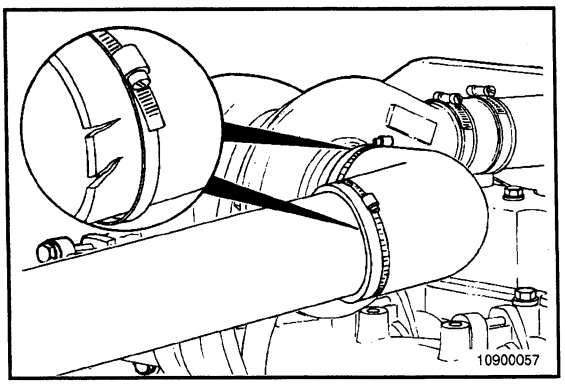
Fleetguard® products meet all Cummins Source Approval Test standards to provide the quality filtration necessary to achieve the engine's design life. If other brands are substituted, insist on products that the supplier has tested to meet Cummins high-quality standards.

Cummins can **not** be responsible for problems caused by nongenuine filters that do **not** meet Cummins performance or durability requirements.

***Welding on a Vehicle with an Electronically Controlled System Is Not Recommended***

**⚠ CAUTION ⚠**

**Disconnect both the positive (+) and ground (-) (negative) battery cables from the battery before welding on the vehicle. Attach the welder ground (-) cable no more than 0.61 m [2 ft] from the part being welded. Do not connect the ground (-) cable of the welder to the electronic control module (ECM) cooling plate or the ECM. Welding on the engine or engine-mounted components is not recommended because engine component damage can result.**



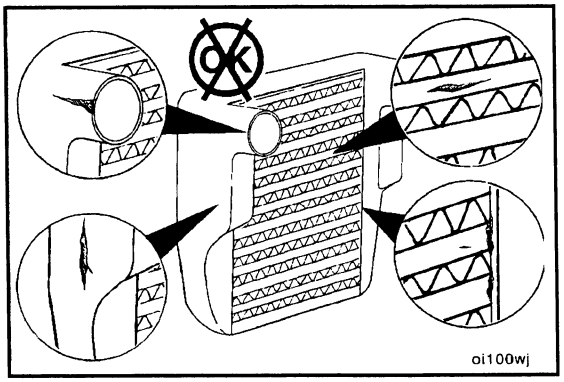

## Charge-Air Piping

### Maintenance Check

Inspect the charge-air piping and hoses for holes, cracks, and loose connections.

Tighten the hose clamps, if necessary.

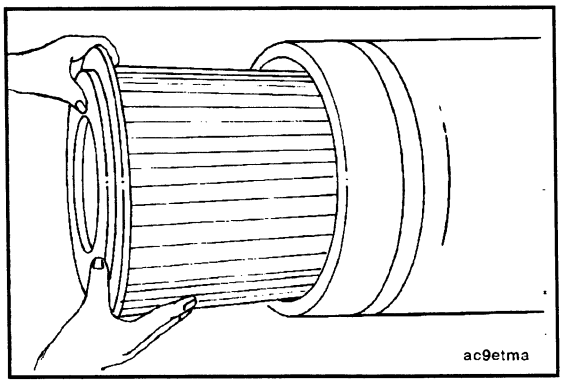
**Torque Value:** 8 N•m [71 in-lb]




## Charge-Air Cooler (CAC)

### Maintenance Check

Inspect the charge-air cooler for dirt and debris blocking the fins. Check for cracks, holes, and other damage. If damage is found, refer to the original equipment manufacturer (OEM) dealer.

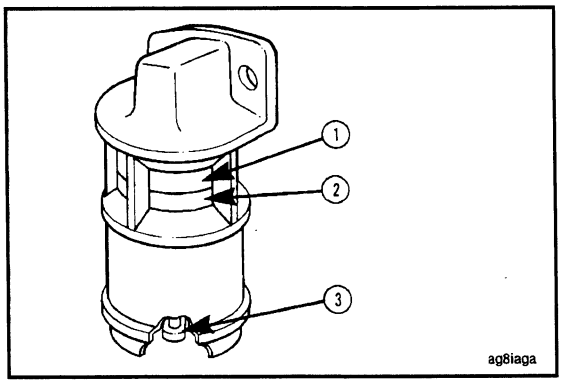



## Air Intake Restriction

### Maintenance Check

The maximum intake air restriction is 635 mm [25 in] of water for turbocharged engines.

Turbocharged engines **must** be operated at rated rpm and full load to check maximum intake air restriction. Replace the air cleaner element when the restriction reaches the maximum allowable limit, or clean according to the manufacturer's recommendations.




**⚠ CAUTION ⚠**

**Never operate the engine without an air cleaner. Intake air must be filtered to prevent dirt and debris from entering the engine and causing premature wear.**

**NOTE:** Follow the manufacturer's instructions when cleaning or replacing the air cleaner element.

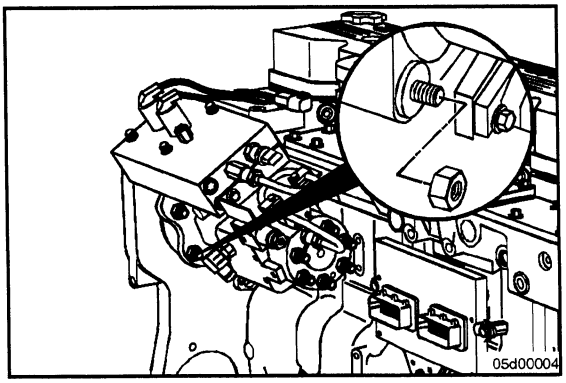
Check the air cleaner service indicator, if equipped. Change the filter element when the red indicator flag (2) is at the raised position in the window (1).

After the air cleaner has been serviced, push the button (3) to reset the service indicator.

# Fuel Pump

## Maintenance Check

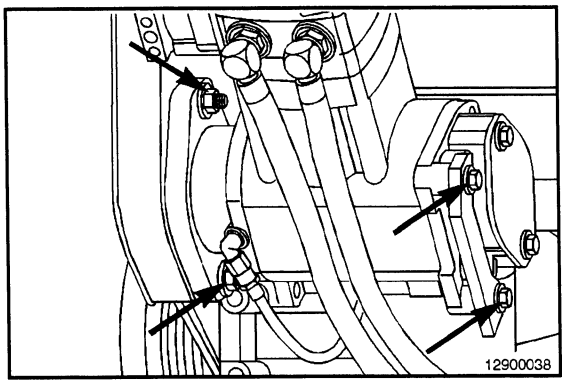
Inspect the fuel injection pump mounting nuts, including the tail support bracket and the top support bracket, for loose and damaged hardware.




# Air Compressor

## Maintenance Check

Inspect the air compressor mounting nuts, including the tail support bracket, for loose and damaged hardware.



# NOTES

# Maintenance Procedures at 29,000 Kilometers [18,000 Miles], 500 Hours, or 6 Months

## Section Contents

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# Maintenance Procedures - General Information

## General Information

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

Fleetguard® is a subsidiary of Cummins Engine Company, Inc. Fleetguard® filters are developed through joint testing at Cummins and Fleetguard®. Fleetguard® filters are standard on new Cummins engines. Cummins Engine Company, Inc. recommends their use.

Fleetguard® products meet all Cummins Source Approval Test standards to provide the quality filtration necessary to achieve the engine's design life. If other brands are substituted, insist on products that the supplier has tested to meet Cummins high-quality standards.

Cummins can **not** be responsible for problems caused by nongenuine filters that do **not** meet Cummins performance or durability requirements.

***Welding on a Vehicle with an Electronically Controlled System Is Not Recommended***

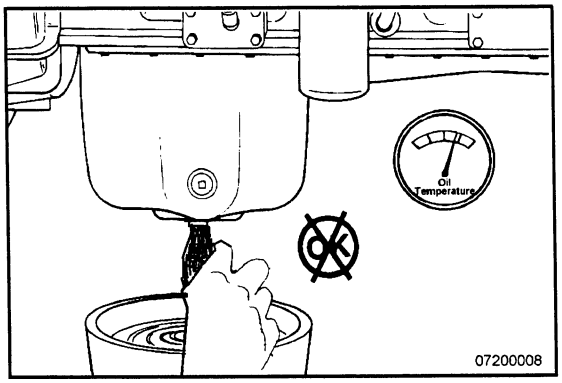
**△ CAUTION △**

**Disconnect both the positive (+) and ground (-) (negative) battery cables from the battery before welding on the vehicle. Attach the welder ground (-) cable no more than 0.61 m [2 ft] from the part being welded. Do not connect the ground (-) cable of the welder to the electronic control module (ECM) cooling plate or the ECM. Welding on the engine or engine-mounted components is not recommended because engine component damage can result.**

# Lubricating Oil and Filters

## Oil Drain Intervals

Refer to Maintenance Guidelines (Section 2) to determine the maximum recommended oil change and filter change intervals in kilometers, miles, hours, or months, whichever occurs first.



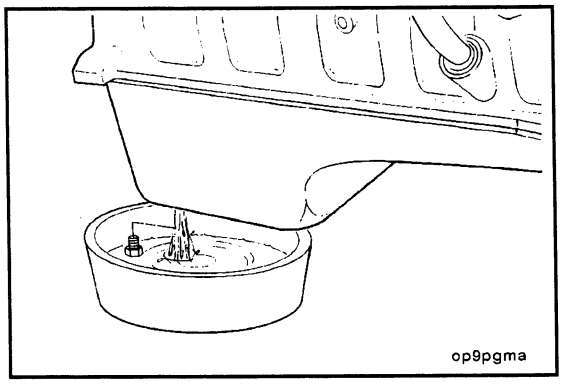

**⚠ WARNING ⚠**

**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.**

**⚠ WARNING ⚠**

**To avoid personal injury, avoid direct contact of hot oil with your skin.**

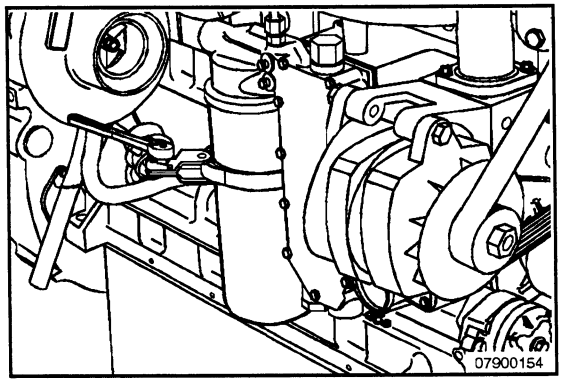
Change the lubricating oil and filter(s) at the specified oil change interval. Refer to Lubricating Oil Recommendations and Specifications in Section V to find the correct change interval for the application.




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

**NOTE:** Use a container that can hold at least 24 liters [25 qt] of lubricating oil.

Remove the oil drain plug from the bottom of the lubricating oil pan.




**Remove the Oil Filter**

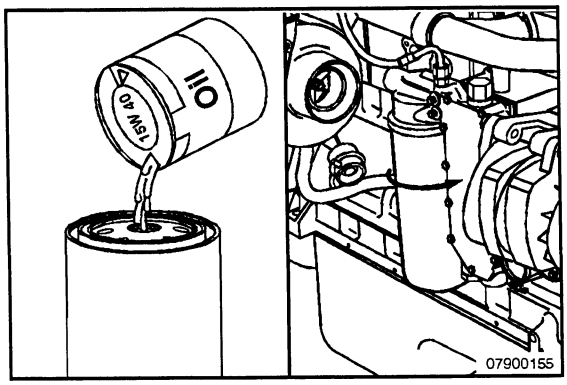
Clean the area around the lubricating oil filter head. Remove the filter. Clean the gasket surface of the filter head.

**NOTE:** The o-ring can stick on the filter head. Make sure that it is removed before installing the new filter.

Make sure that the correct oil filter is used:

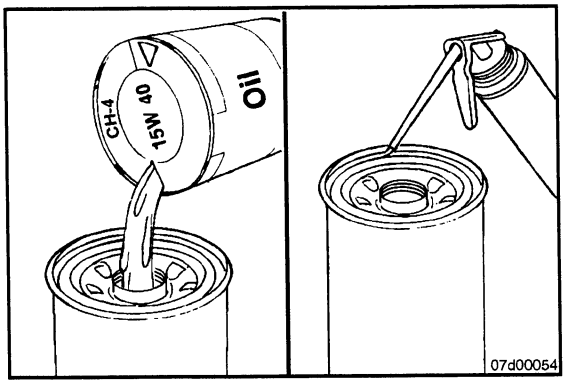
Fleetguard® Part No. LF9009 or

Cummins Part No. 3401544.




**NOTE:** Fill the filter with clean lubricating oil before installation.

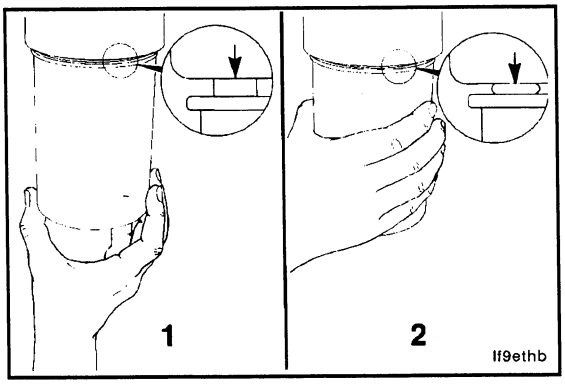
Apply a light film of lubricating oil to the gasket sealing surface before installing the filter.




**⚠ CAUTION ⚠**

**Mechanical overtightening can distort the threads or damage the filter element seal.**

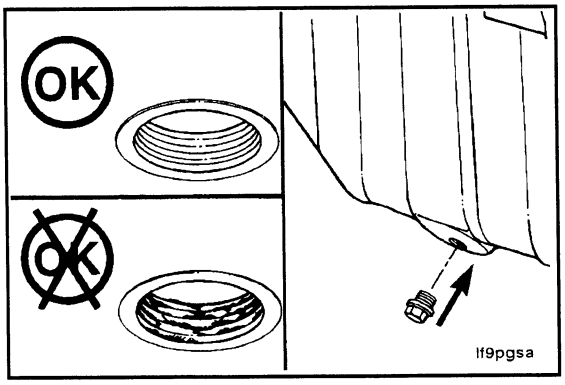
Install the filter as specified by the filter manufacturer.



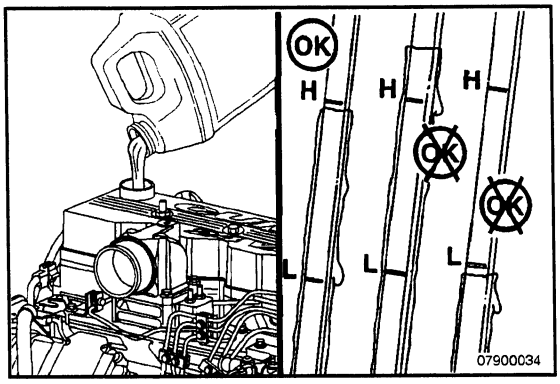

Check and clean the oil drain plug threads and sealing surface.

Install the drain plug.

**Torque Value:** 80 N•m [59 ft-lb]




**NOTE:** Use a high-quality 15W-40 multiviscosity lubricating oil such as Valvoline® Premium Blue®, or its equivalent, in Cummins engines. Choose the correct lubricating oil for the operating climate as outlined in Section V.

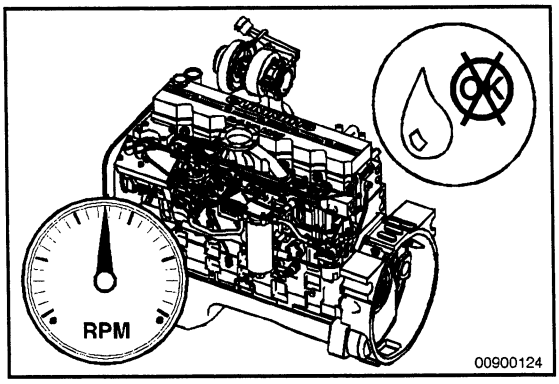



Fill the engine with clean lubricating oil to the proper level.

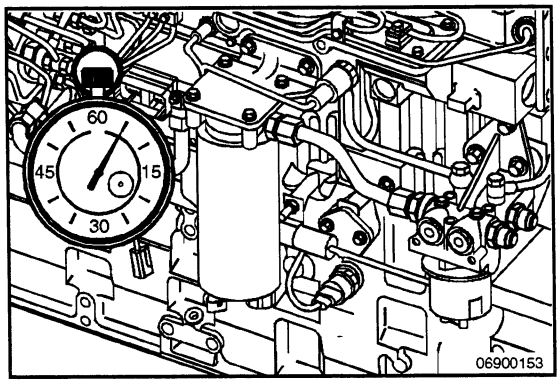
**NOTE:** Total system capacity assumes lubricating oil pan plus lubricating oil filter.

Some applications use a slightly different lubricating oil pan capacity, and all lubricating oil quantities **must** be adjusted accordingly. Contact the local Cummins Distributor if there are any questions.

| Lubricating Oil Capacity | | | |
|---|---|---|---|
| | liters | | U.S.qt |
| Standard Oil Pan | 22.7 | MAX | 24 |
| Standard Oil Pan with Block Stiffener | 23.7 | MAX | 25 |




Operate the engine, and check for leaks at the filters and the oil drain plug.




## Fuel Filter (Spin-On Type)

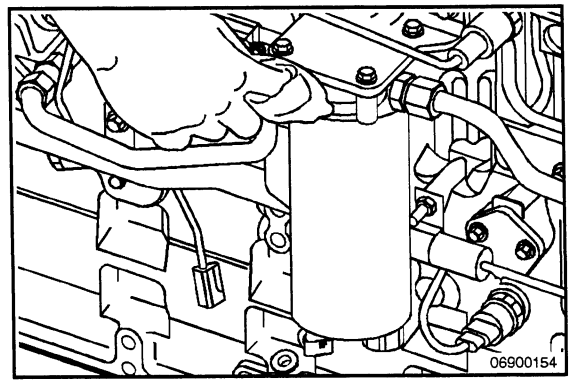
### Preparatory

**⚠ WARNING ⚠**

**Water can contain toxic and carcinogenic material. Avoid contact with skin. Drain the fuel filter into a container and dispose of in accordance with local environmental regulations.**

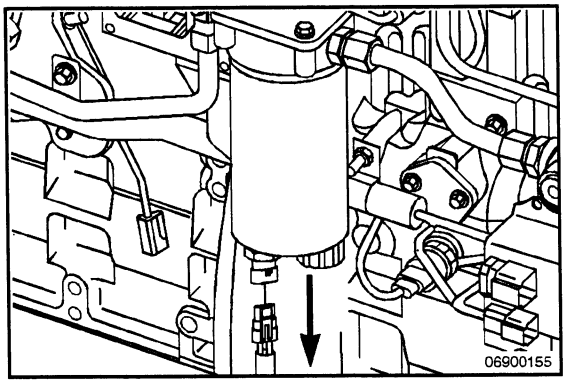
Use the filter drain valve to drain fuel out of the filter for approximately 5 seconds. This will prevent fuel from running over the top of the filter upon removal.

Clean all debris from around the fuel filter head.

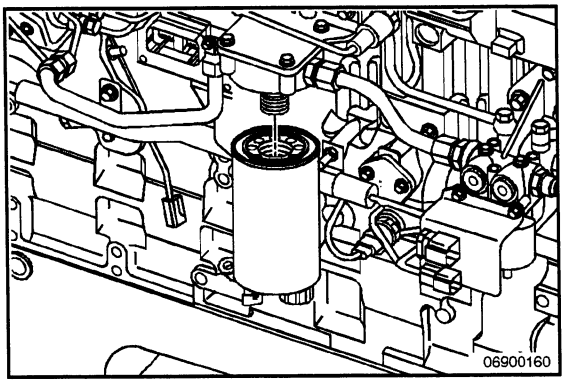



## Remove

Disconnect the water-in-fuel sensor from the wiring harness.

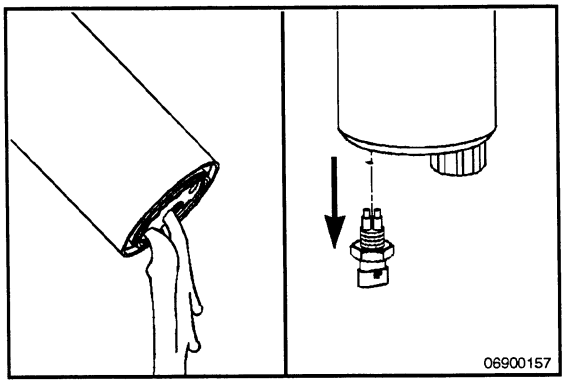


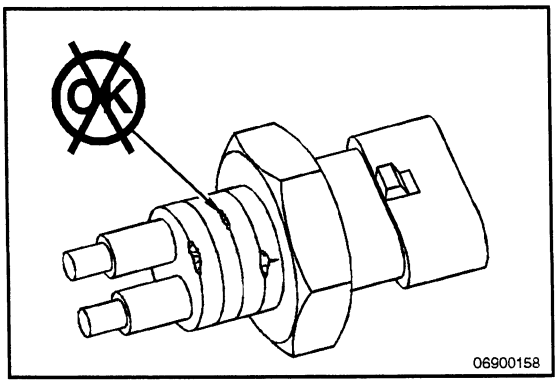

Remove the fuel filter.




Drain the fuel filter.

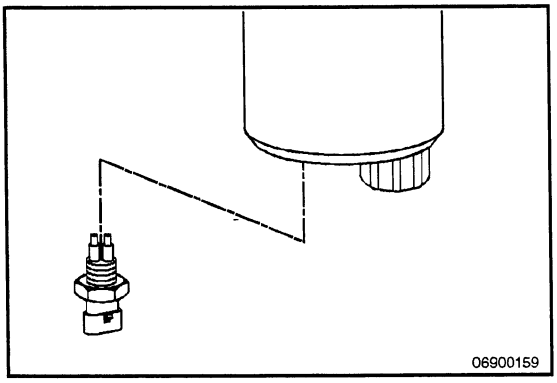
Remove the water-in-fuel sensor from the fuel filter.






## Inspect for Reuse

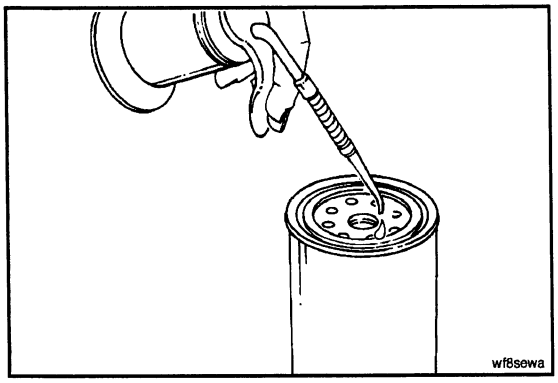
Inspect the water-in-fuel sensor for cracks and damage.




## Install

Install the water-in-fuel sensor into the new fuel filter, Cummins Part No. 3944269 (Fleetguard® Part No. FS1022), if necessary.

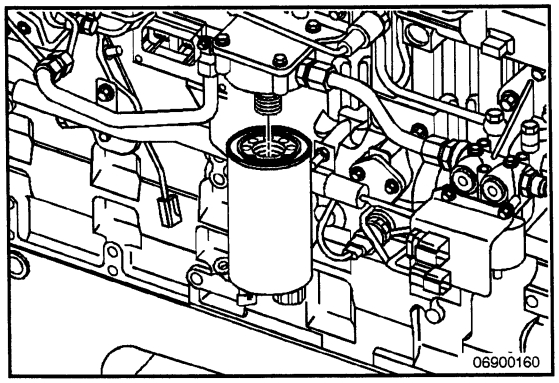
The reusable water-in-fuel assembly is Cummins Part No. 3944270.




**⚠ CAUTION ⚠**

**The QSL9 engine has a self-priming, low-pressure system that purges the air from the fuel system. Do not prefill the fuel filter. Prefilling the fuel filter can cause fuel pump damage.**

Lubricate the o-ring with clean lubricating oil.



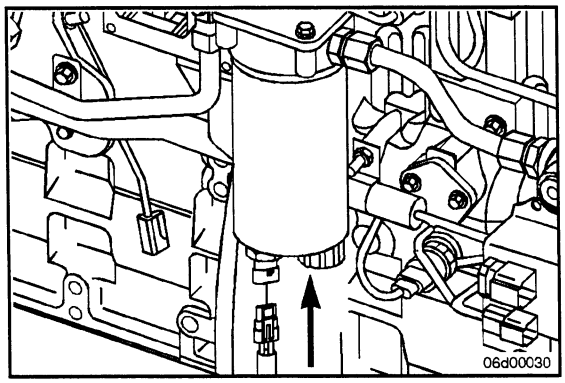

**⚠ CAUTION ⚠**

**Mechanical overtightening can distort the threads as well as damage the filter element seal or filter canister.**

Install the filter as specified by the filter manufacturer.

Connect the water-in-fuel sensor to the wiring harness.

Connect the wiring harness to the heater (if equipped).

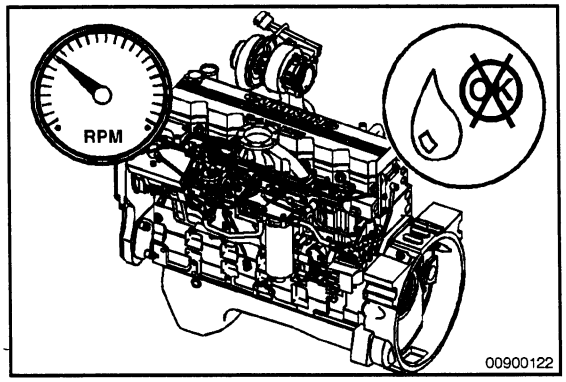



Turn the key to the RUN position, but do **not** attempt to start the engine for 30 seconds. The electric fuel transfer pump will run and purge air from the system for about 30 seconds. After 30 seconds, attempt to start the engine. If the engine does **not** start, turn the key to the OFF position for approximately 30 seconds to allow the electronic module to power down. Turn the key to the ON position allowing the electric fuel transfer pump to cycle again. After 30 seconds, attempt to start the engine again.

If the engine cranks for 30 seconds without starting, vent the fuel supply lines.

To vent the fuel supply lines, loosen the banjo fitting on the fuel pump inlet. Run the electric fuel transfer pump until the air has been bled from the system.

Operate the engine, and check for leaks.




# Cooling System

## Maintenance Check

**⚠ CAUTION ⚠**

**Overconcentration of antifreeze or use of high-silicate antifreeze can cause engine damage.**

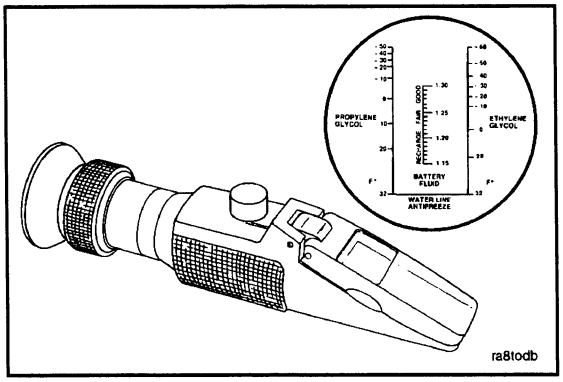
Check the antifreeze concentration. Use a mixture of 50-percent water and 50-percent ethylene glycol or propylene-glycol-based antifreeze to protect the engine to -32°C [-26°F] year-around.

The Fleetguard® refractometer, Part No. C2800, provides a reliable, easy-to-read, and accurate measurement of freezing point protection and glycol (antifreeze) concentration.

**NOTE:** Antifreeze is essential in every climate.

Antifreeze broadens the operating temperature range by lowering the coolant freezing point and by raising its boiling point.

The corrosion inhibitors also protect the cooling system components from corrosion and prolong component life.

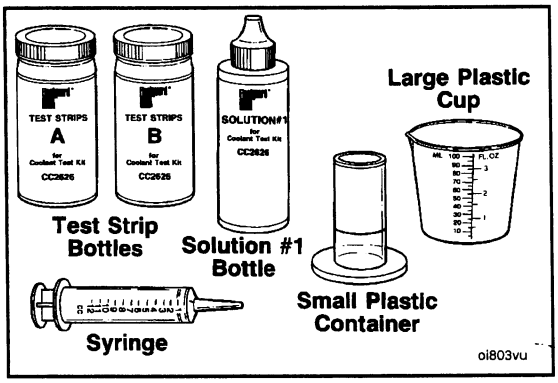



### Coolant Additive Concentration Checking

**⚠ CAUTION ⚠**

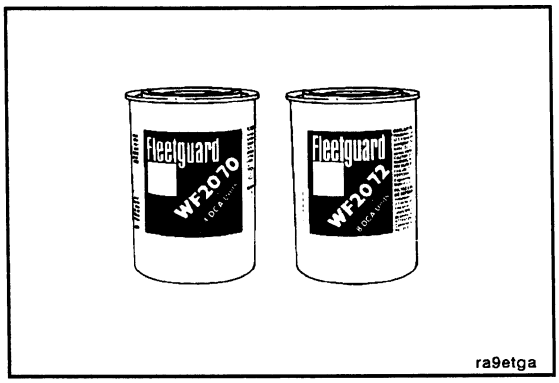
**Inadequate concentration of the coolant additive can result in major corrosive damage to the cooling system components. Overconcentration can cause formation of a "gel" that can cause restriction, plugging of coolant passages, or overheating.**

**NOTE:** If the engine coolant is changed, the coolant filters **must** also be changed.




The cooling system **must** contain the proper coolant additive units to provide the best chemical protection. Refer to Maintenance Specifications (Section V).

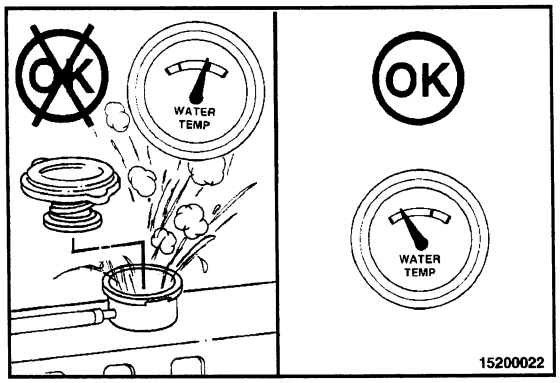
**NOTE:** Use **only** the DCA4 Coolant Test Kit, Fleetguard® Part No. CC-2626, to check the coolant additive concentration in the cooling system.




### Coolant Filter/DCA4 Corrosion Resistor Cartridge

The correct coolant filter is determined by the total cooling system capacity and other operational factors.

Refer to the DCA4 Maintenance Guide in Maintenance Specifications (Section V) for the correct selection of the filter.




## Coolant Filter

### Preparatory

**⚠ WARNING ⚠**

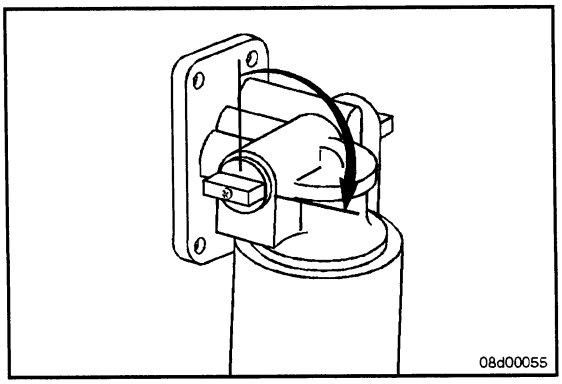
**Do not remove the pressure cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.**

## Remove

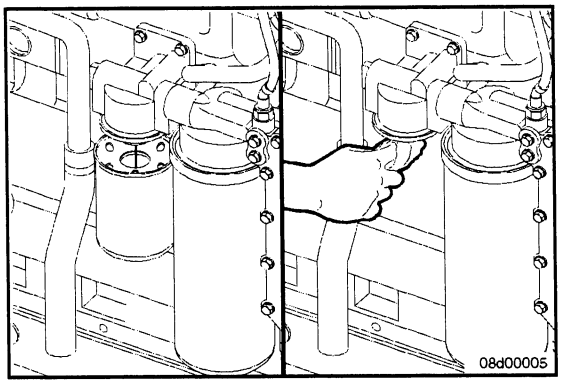
**⚠ WARNING ⚠**

**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.**

Turn the shutoff valve to the OFF position by rotating the knob from vertical to horizontal in the direction shown in the accompanying illustration.

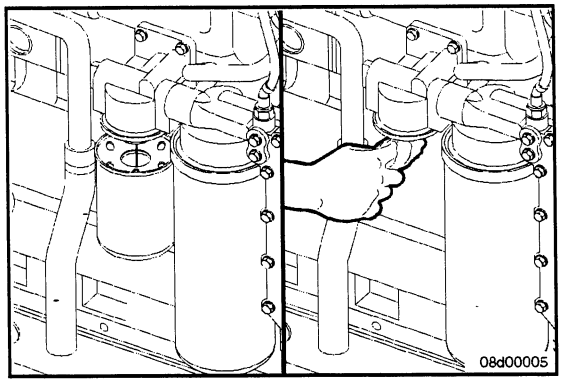


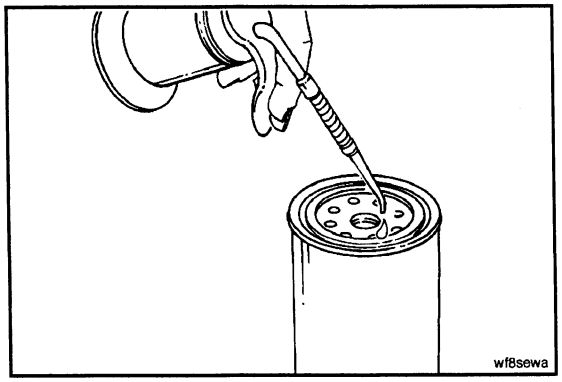

Remove and discard the coolant filter.




## Clean

Clean the gasket surface.






## Install

**⚠ CAUTION ⚠**

**Do not allow oil to get into the filter. Oil will damage the DCA.**

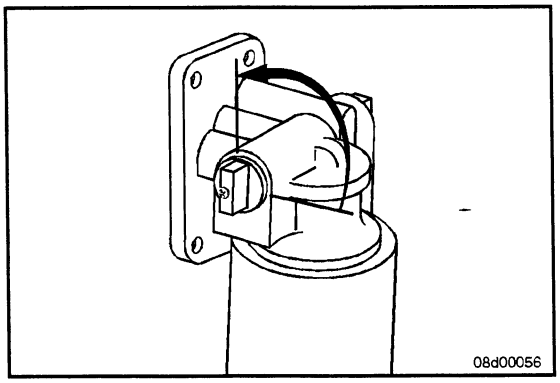
**⚠ CAUTION ⚠**

**Mechanical overtightening can distort the threads or damage the filter head.**

Apply a thin film of lubricating oil to the gasket sealing surface before installing the new coolant filter.

Install the coolant filter on the filter head. Tighten the filter until the gasket contacts the filter head surface.

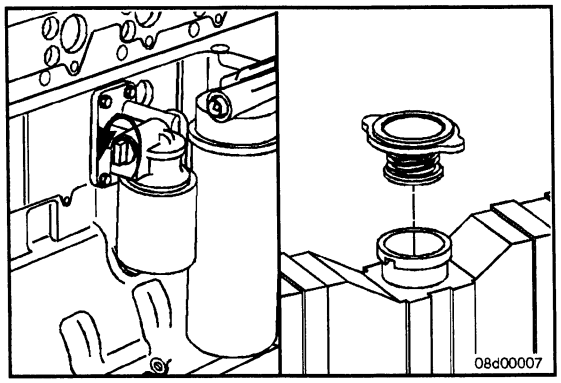
Tighten the coolant filter an additional 1/2 to 3/4 of a turn, or as specified by the manufacturer.



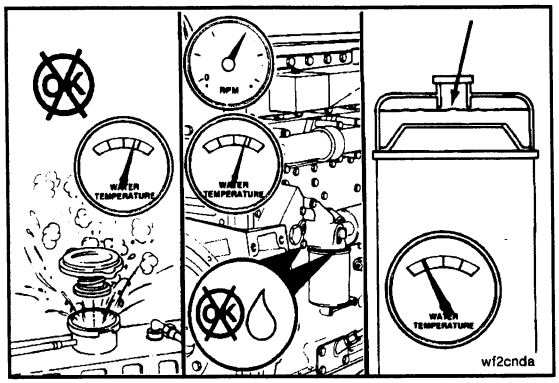

**⚠ CAUTION ⚠**

**The valve must be in the ON position to prevent engine damage.**

Turn the shutoff valve to the ON position by rotating the knob from horizontal to vertical in the direction shown in the accompanying illustration.




Install the coolant system pressure cap.




Operate the engine, and check for coolant leaks.

After the air has been purged from the system, check the coolant level again.

# Maintenance Procedures at 58,000 Kilometers [36,000 Miles], 1000 Hours, or 1 Year

## Section Contents

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# Maintenance Procedures - General Information

## General Information

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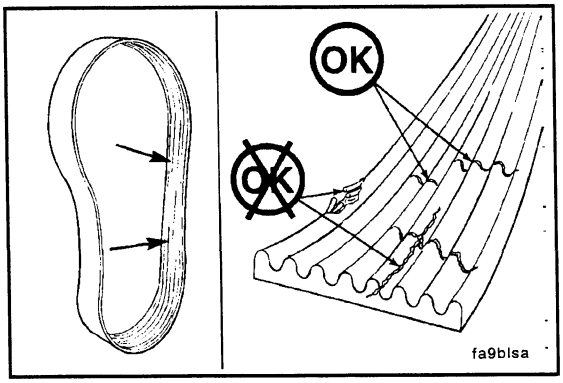
Cummins can **not** be responsible for problems caused by nongenuine filters that do **not** meet Cummins performance or durability requirements.

***Welding on a Vehicle with an Electronically Controlled System Is Not Recommended***

**⚠ CAUTION ⚠**

**Disconnect both the positive (+) and ground (-) (negative) battery cables from the battery before welding on the vehicle. Attach the welder ground (-) cable no more than 0.61 m [2 ft] from the part being welded. Do not connect the ground (-) cable of the welder to the electronic control module (ECM) cooling plate or the ECM. Welding on the engine or engine-mounted components is not recommended because engine component damage can result.**



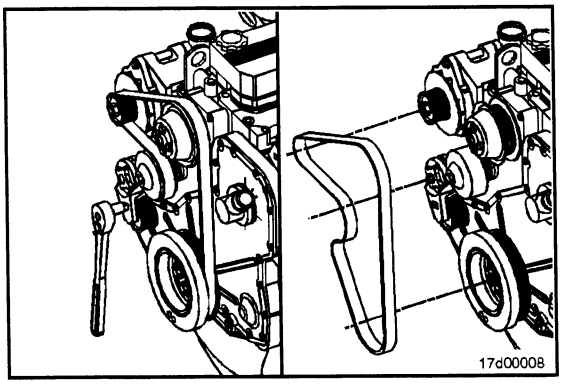

# Drive Belts

## Maintenance Check

Inspect the belts daily. Check the belts for intersecting cracks. Transverse (across the belt width) cracks are acceptable. Longitudinal (direction of the belt length) cracks that intersect the transverse cracks are **not** acceptable. Replace a belt if it is frayed or has pieces of material missing. Refer to Section A for belt adjustment and replacement procedures.

Belt damage can be caused by

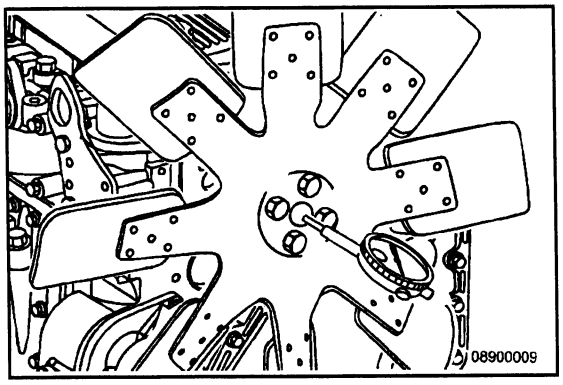
- Incorrect tension
- Incorrect size or length
- Pulley misalignment
- Incorrect installation
- Severe operating environment
- Oil and grease on the belts.




# Fan Hub, Belt Driven

## Maintenance Check

Remove the drive belt.




**NOTE:** The fan hub **must** rotate without any wobble or excessive end play.

- Check the fan hub bearing.

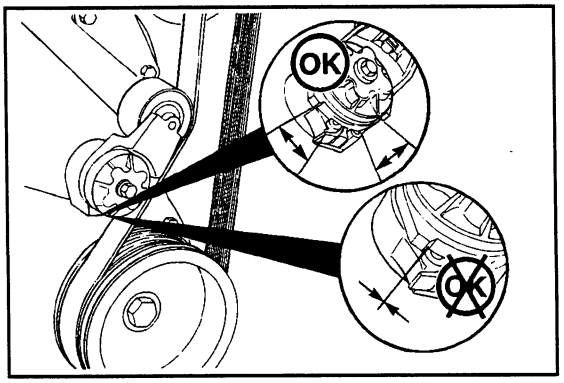
| Fan Hub End Play | | |
|---|---|---|
| mm | | in |
| 0.15 | MAX | 0.006 |

# Belt Tensioner, Automatic

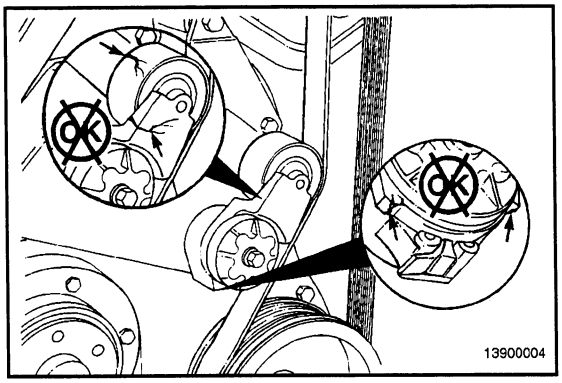
## Maintenance Check

Every 58,000 km [36,000 mi], 1000 hours, or 1 year, whichever occurs first, inspect the automatic belt tensioner.

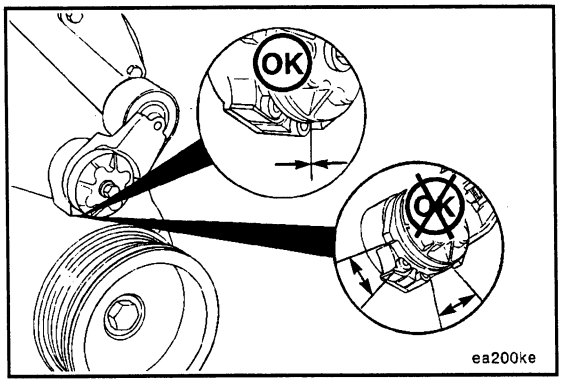
With the engine turned off, check that neither the top nor the bottom tensioner arm stop is touching the cast boss on the tensioner body. If either of the stops is touching a boss, the alternator belt **must** be replaced. Check to make sure that the correct belt part number is being used if either condition exists.



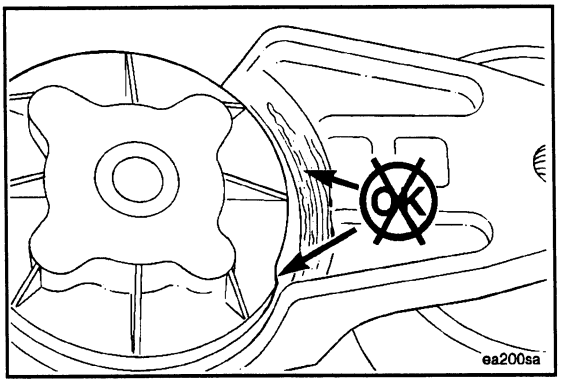

Check the tensioner pulley and body for cracks. If any cracks are noticed, the tensioner **must** be replaced. Refer to a Cummins Authorized Repair Facility. Check the tensioner for dirt buildup. If this condition exists, the tensioner **must** be removed and steam-cleaned.




Check that the bottom tensioner arm stop is in contact with the bottom tensioner arm stop boss on the tensioner body. If these two are **not** touching, the tensioner **must** be replaced.




Inspect the tensioner for evidence of the pivoting tensioner arm contacting the stationary circular base. If there is evidence of these two areas touching, the pivot tube bushing has failed, and the tensioner **must** be replaced.



# NOTES

# Maintenance Procedures at 116,000 Kilometers [72,000 Miles], 2000 Hours, or 2 Years

## Section Contents

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# Maintenance Procedures - General Information

## General Information

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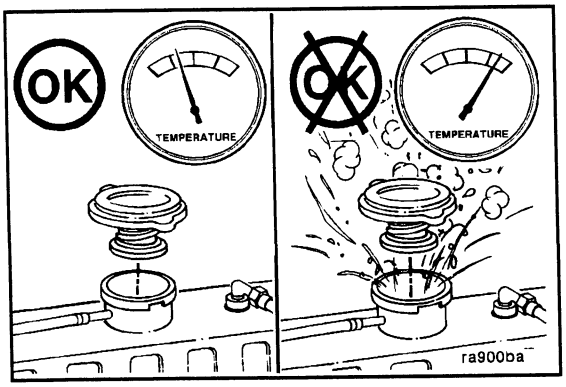
Cummins can **not** be responsible for problems caused by nongenuine filters that do **not** meet Cummins performance or durability requirements.

***Welding on a Vehicle with an Electronically Controlled System Is Not Recommended***

**⚠ CAUTION ⚠**

**Disconnect both the positive (+) and ground (-) (negative) battery cables from the battery before welding on the vehicle. Attach the welder ground (-) cable no more than 0.61 m [2 ft] from the part being welded. Do not connect the ground (-) cable of the welder to the electronic control module (ECM) cooling plate or the ECM. Welding on the engine or engine-mounted components is not recommended because engine component damage can result.**




# Cooling System

## Drain

**⚠ WARNING ⚠**

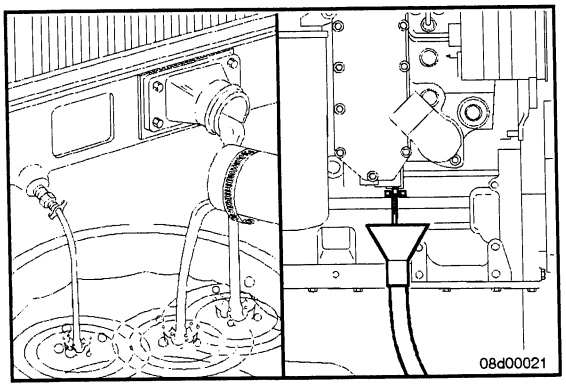
**Do not remove the pressue cap from a hot engine. Wait until the coolant temperature is below 50°C [122°F] before removing the pressure cap. Heated coolant spray or steam can cause personal injury.**

**⚠ WARNING ⚠**

**Avoid prolonged or repeated skin contact with used antifreeze. Such prolonged, repeated contact can cause skin disorders or other bodily injury. Wash skin thoroughly after contact. Keep out of reach of children.**

**△ CAUTION △**

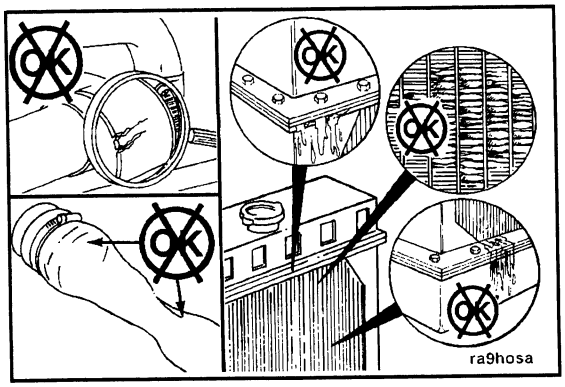
**Protect the environment: Handling and disposing of used antifreeze is subject to federal, state, and local regulations. Use authorized waste disposal facilities, including civic amenity sites and garages providing authorized facilities for the receipt of used antifreeze. If in doubt, contact local authorities of the Environmental Protection Agency (EPA) for guidance as to proper handling of used antifreeze.**




**⚠ WARNING ⚠**

**Coolant is toxic. If not reused, dispose of in accordance with local environmental regulations.**

Drain the cooling system by opening the drain valve on the radiator and removing the plug in the bottom of the water inlet hose. A drain pan with a capacity of 19 liters [5 gal] will be adequate for most applications.




Check for damaged hoses and loose or damaged hose clamps. Replace as required.

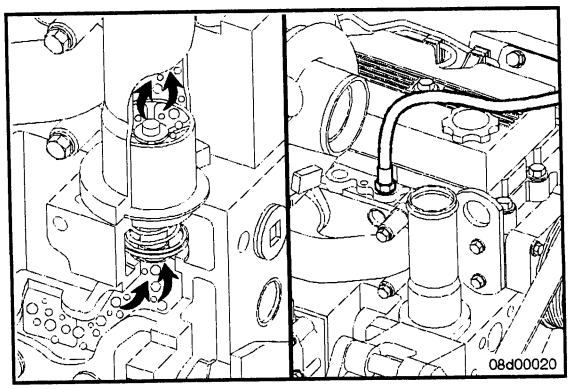
Check the radiator for leaks, damage, and buildup of dirt. Clean and replace as required.

## Flush

**⚠ CAUTION ⚠**

**The system must be filled properly to prevent air locks. During filling, air must be purged from the engine coolant passages. Be sure to open the petcock on the aftercooler for aftercooled engines. Wait 2 to 3 minutes to allow air to be vented; then add mixture to bring the level to the top.**

**NOTE:** Adequate venting is provided for a fill rate of 19 liters [5 gal] per minute.

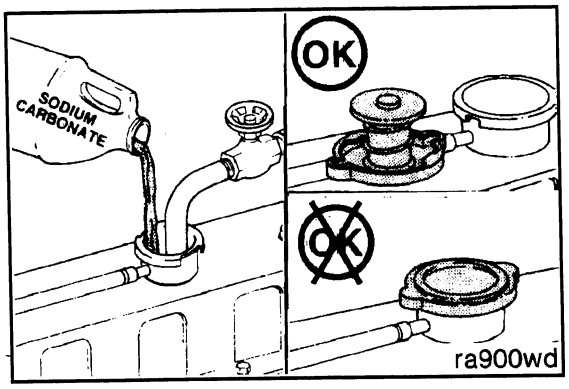



**⚠ CAUTION ⚠**

**Do not install the radiator cap. The engine is to be operated without the cap for this process.**

Fill the system with a mixture of sodium carbonate and water (or a commercially available equivalent).

**NOTE:** Use 0.5 kg [1lb] of sodium carbonate for every 23 liters [6 gal] of water.

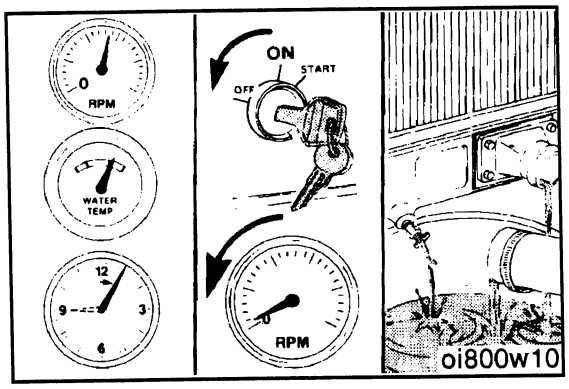



**⚠ WARNING ⚠**

**Coolant is toxic. If not reused, dispose of in accordance with local environmental regulations.**

Operate the engine for 5 minutes with the coolant temperature above 80°C [176°F].

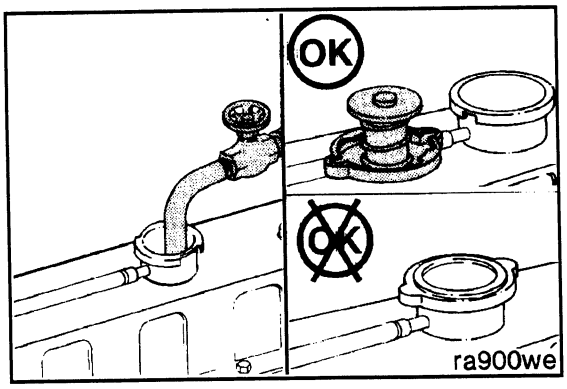
Shut the engine off, and drain the cooling system.

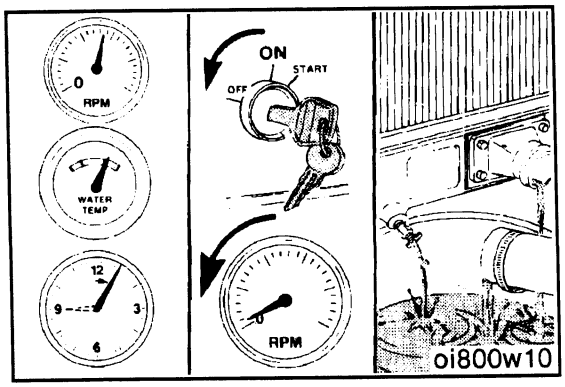



Fill the cooling system with high-quality water.

**NOTE:** Be sure to vent the engine and aftercooler for complete filling.

**NOTE:** Do **not** install the radiator cap or the new coolant filter.

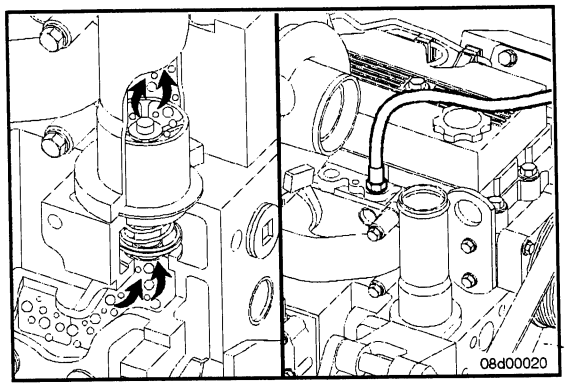





Operate the engine for 5 minutes with the coolant temperature above 80°C [176°F].

Shut the engine off, and drain the cooling system.

**NOTE:** If the water being drained is still dirty, the system **must** be flushed again until the water is clean.




## Fill

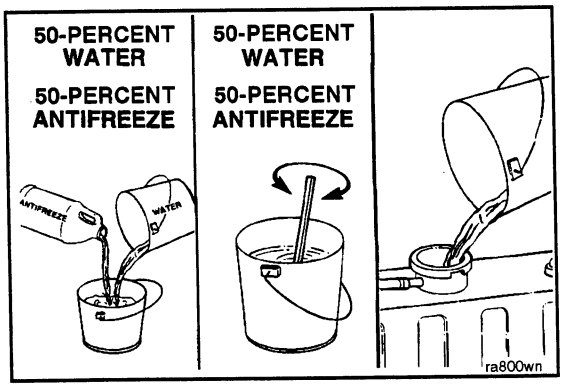
**⚠ CAUTION ⚠**

**The system must be filled properly to prevent air locks. During filling, the air must be vented from the engine coolant passages. Be sure to open the petcock on the aftercooler for aftercooled engines. Wait 2 to 3 minutes to allow the air to be vented; then add the mixture to bring the level to the top.**

The system is designed to use a specific quantity of coolant. If the coolant level is low, the engine will run hot.

If frequent addition of coolant is necessary, the engine or system has a leak. Find and repair the leak.

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

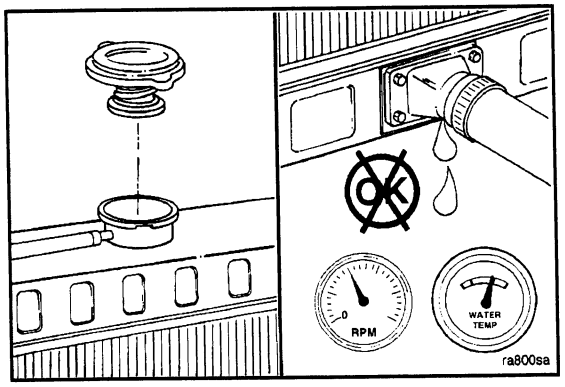



**⚠ CAUTION ⚠**

**Never use water alone for coolant. This can result in damage from corrosion.**

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

| Coolant Capacity (Engine Only) | | | |
|---|---|---|---|
| | liters | | U.S.qt |
| QSL9 (Charge-Air Cooled) | 10.9 | MAX | 11.5 |




**⚠ 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.**

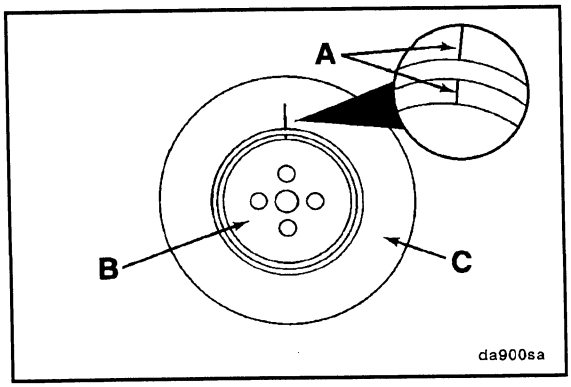
Install the pressure cap. Operate the engine until the coolant reaches a temperature of 80°C [176°F], and check for coolant leaks.

Check the coolant level again to make sure that the system is full of coolant or that the coolant level has risen to the hot level in the recovery bottle on the system, if so equipped.

## Vibration Damper, Rubber

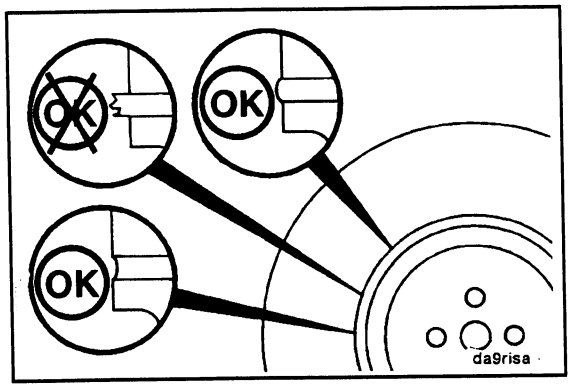
### Inspect

Check the index lines (A) in the vibration damper hub (B) and the inertia member (C). If the lines are more than 1.59 mm [0.06 in] out of alignment, replace the vibration damper.




Inspect the rubber member for deterioration. If pieces of the rubber are missing, or if the elastic member is more than 3.18 mm [0.13 in] below the metal surface, replace the damper.

**NOTE:** Look for forward movement on the damper ring on the hub. Replace the vibration damper if any movement is detected.




## Vibration Damper

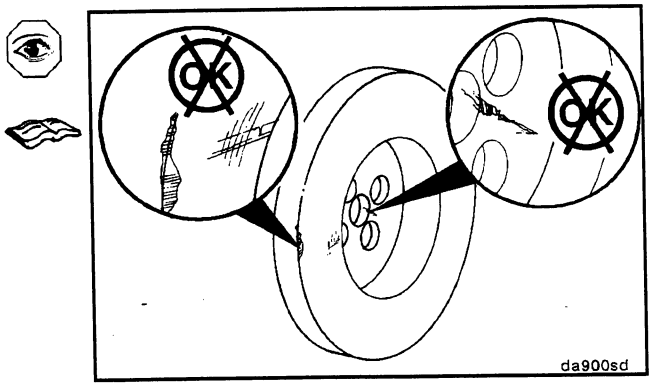
### Inspect

**⚠ CAUTION ⚠**

**The silicone fluid in the vibration damper will become solid after extended service and will make the damper inoperative. An inoperative vibration damper can cause major engine or drivetrain failures.**

Check the vibration damper for evidence of fluid loss, dents, and wobble. Inspect the vibration damper thickness for any deformation or raising of the damper cover plate.

If any variations or deformations are detected, refer to the Troubleshooting and Repair Manual, ISL Engine, Bulletin No. 3666469, for inspection procedures.



# NOTES

# Maintenance Procedures at 241,500 Kilometers [150,000 Miles], 5000 Hours, or 4 Years

## Section Contents

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## General Information

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***Welding on a Vehicle with an Electronically Controlled System Is Not Recommended***

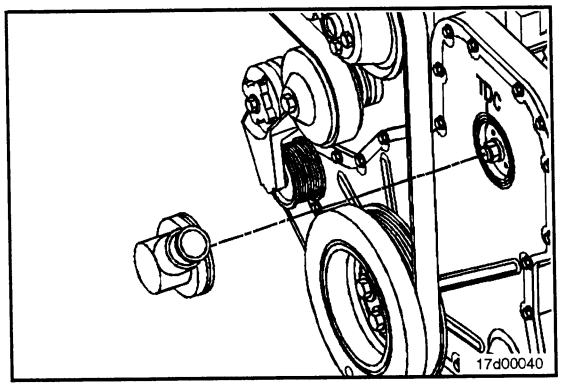
**△ CAUTION △**

**Disconnect both the positive (+) and ground (-) (negative) battery cables from the battery before welding on the vehicle. Attach the welder ground (-) cable no more than 0.61 m [2 ft] from the part being welded. Do not connect the ground (-) cable of the welder to the electronic control module (ECM) cooling plate or the ECM. Welding on the engine or engine-mounted components is not recommended because engine component damage can result.**

# Overhead Set

## General Information

A valve lash check **must** be performed at 241,500 km [150,000 mi] and at 81,000 km [50,000 mi] intervals thereafter.

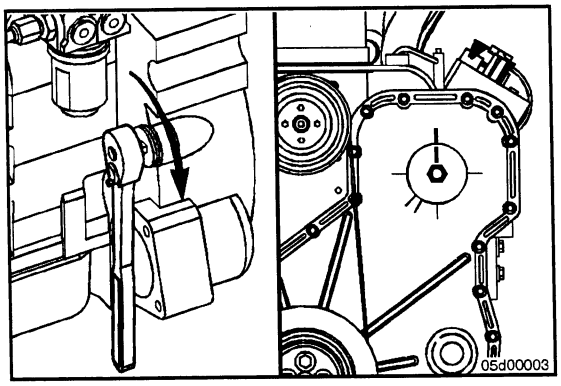



### Measure

**⚠ CAUTION ⚠**

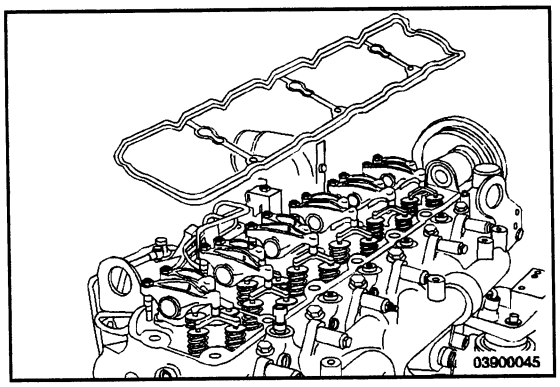
**Engine coolant temperature must be less than 60°C [140°F].**

Remove the plastic fuel pump drive cover located on the front of the engine.




**Engine Barring Tool, Part No. 3824591**

Use the barring tool, Cummins Part No. 3824591, to rotate the crankshaft to align the top dead center (TDC) marks on the gear cover and fuel pump gear.




Remove the rocker lever cover and gasket.

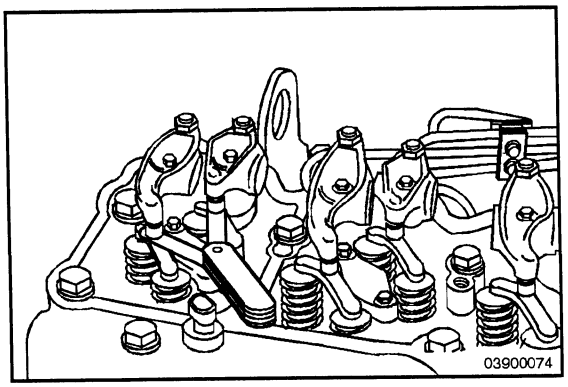
With the engine in this position, the lash can be reset on the following rocker arms: 1I, 1E, 2I, 3E, 4I, and 5E.

| Nominal Valve Lash | | | |
|---|---|---|---|
| Intake | 0.305 mm | Nominal | 0.012 in |
| Exhaust | 0.559 mm | Nominal | 0.022 in |

Reset the lash to the nominal specification above.

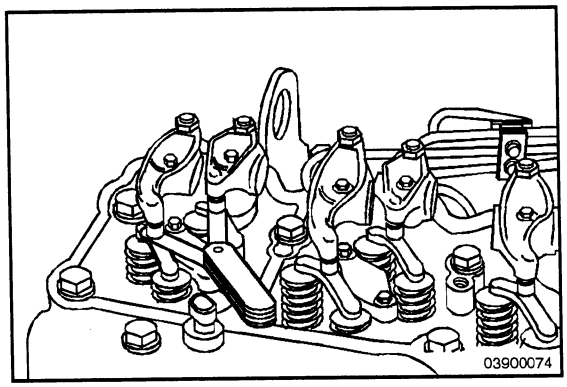
**NOTE:** Valve lash measurements are sometimes performed as part of a troubleshooting procedure. If the lash measurement does **not** coincide with a scheduled lash reset (at 241,500 km [150,000 mi] or 81,000 km [50,000 mi] intervals thereafter), and the measurement falls within the following range, the lash does **not** need to be reset. Lash measurements in this range will **not** affect engine performance, noise, emissions, or durability.

| Valve Lash Acceptable Range | | | |
|---|---|---|---|
| | mm | | in |
| Intake | 0.152 | MIN | 0.006 |
| | 0.559 | MAX | 0.022 |
| Exhaust | 0.381 | MIN | 0.015 |
| | 0.813 | MAX | 0.032 |




Reset the valve lash by inserting the proper feeler gauge between the crosshead and the rocker lever ball insert and socket. If the lash measurement is out of specification, loosen the locknut, and adjust the lash to nominal specifications.

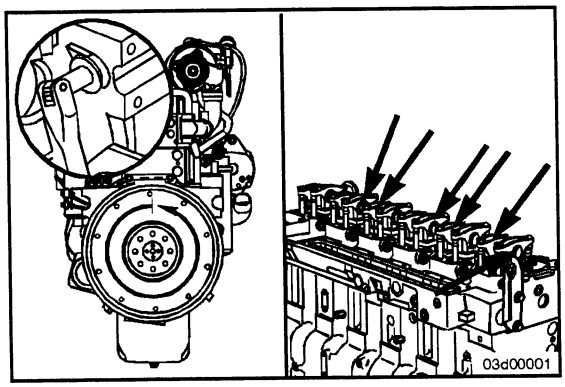
Tighten the locknut to the rocker lever, and measure again.

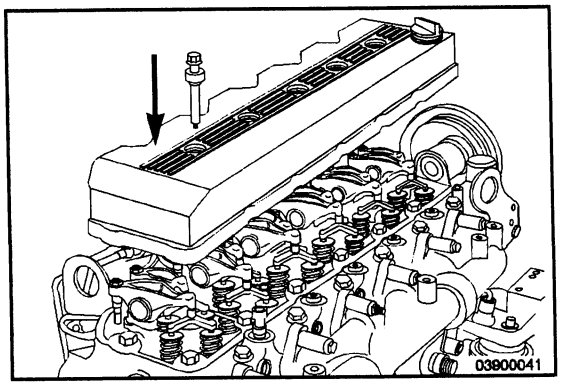



**Engine Barring Tool, Part No. 3824591**

Use a barring tool, Cummins Part No. 3824591, to rotate the crankshaft 360 degrees (the mark on the fuel pump gear rotates 180 degrees), and measure the lash for rocker arms 2E, 3I, 4E, 5I, 6I, and 6E.

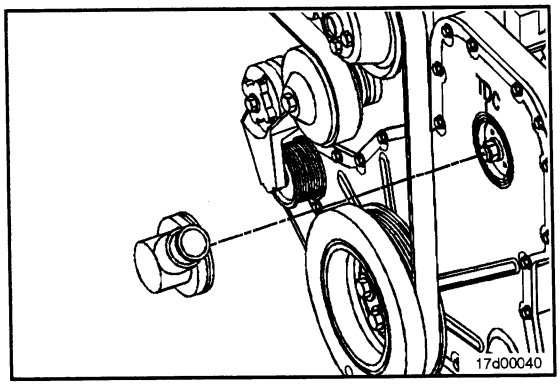
Reset to nominal specifications.



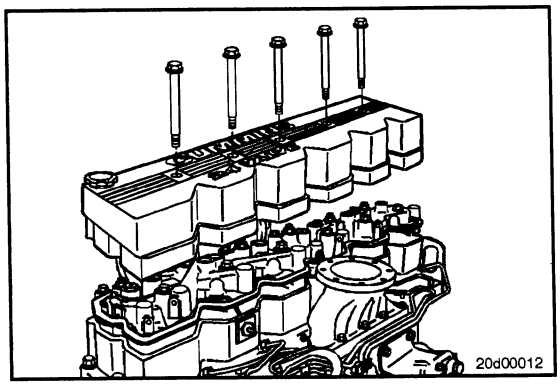



Install the gasket and rocker lever cover.

**Torque Value:** 12 N•m [106 in-lb]




Install the fuel pump drive cover.

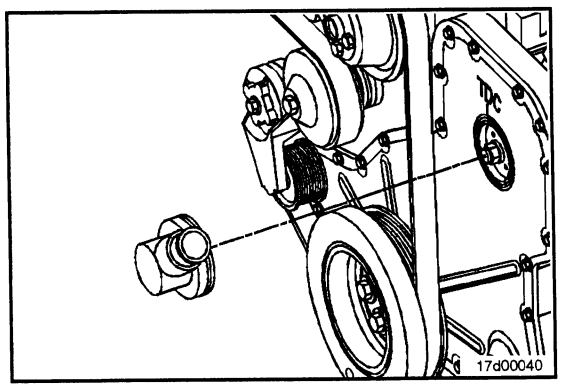



**Engine Brake Lash Adjustment**

**⚠ CAUTION ⚠**

**To get maximum brake operating efficiency and to prevent engine damage, the instructions in this section must be followed.**

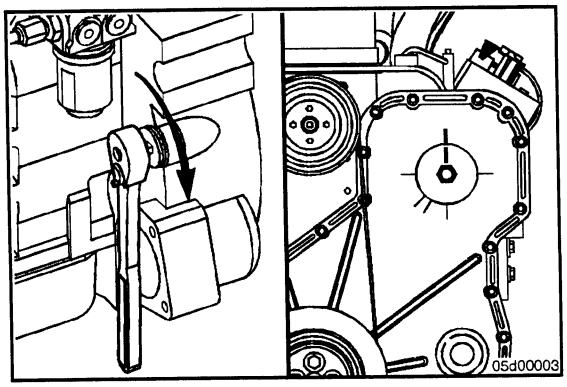
Remove the rocker lever cover.




Remove the plastic fuel pump drive cover located on the front of the engine.

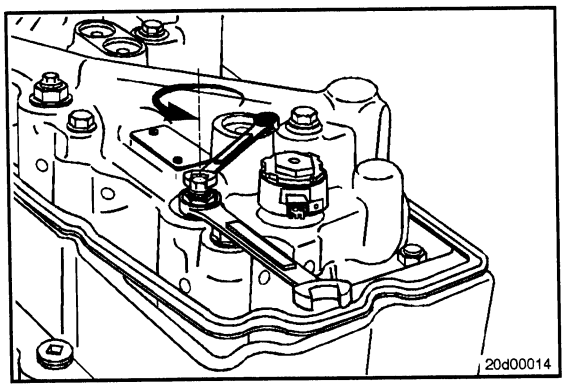
**Engine Barring Tool, Part No. 3824591**

Use the barring tool, Part No. 3824591, to rotate the crankshaft to align the mark on the fuel pump gear with the top dead center (TDC) mark on the gear cover.




When the engine is in the top dead center (TDC) position, the brake lash can be set on cylinders No. 1, 3, and 5.

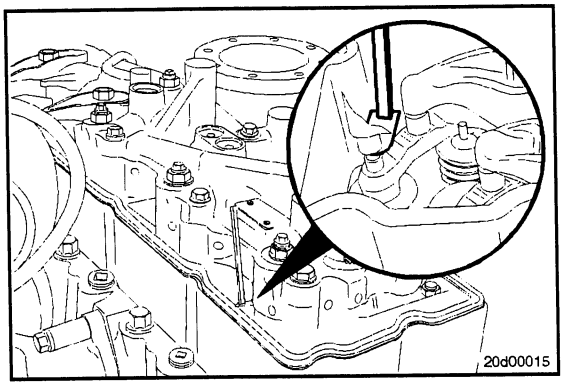
Use two wrenches to hold the adjusting nut and loosen the locknuts on the brake at cylinders No. 1, 3, and 5.




**Brake Lash - Feeler Gauge Method**

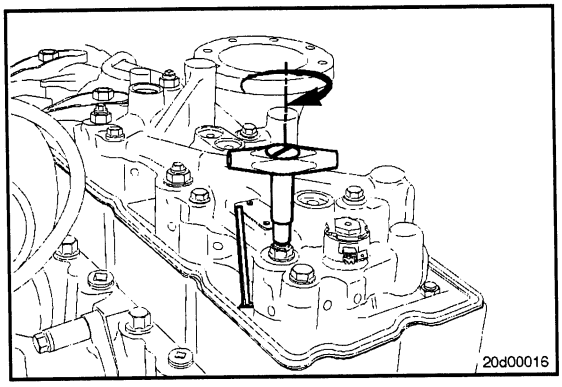
Insert the appropriate brake lash feeler gauge between the brake slave piston and the exhaust crosshead pin on cylinder No. 1.

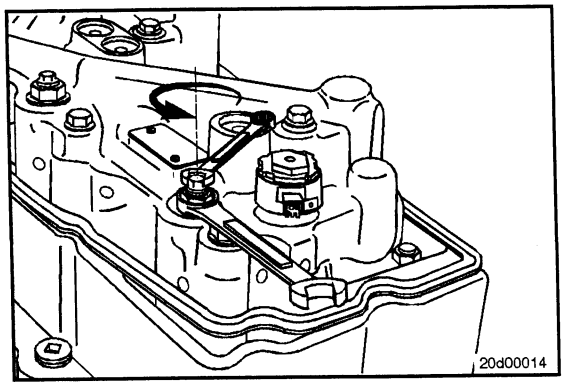
| Brake Lash - Feeler Gauge | | |
|---|---|---|
| Turbo | Tool Part No. | Lash Specification |
| Wastegate | 3163681 | 2.286 mm [0.090 in] |




Use the 6 in-lb torque wrench, Part No. 3376592, to tighten the adjusting nut until the torque wrench "clicks," or until drag is felt on the feeler gauge.

**Torque Value:** 0.7 N•m [6 in-lb]

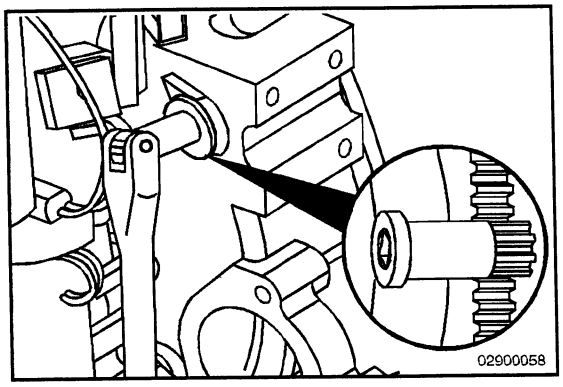





Remove the feeler gauge, and use two wrenches to hold the adjusting nut and tighten the locknut.

**Torque Value:** 35 N•m [26 ft-lb]

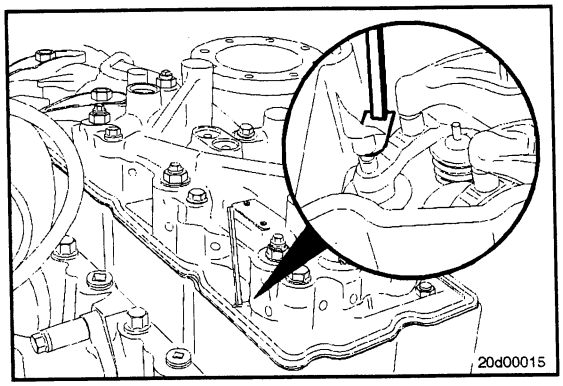
Repeat for cylinders No. 3 and 5.




**Engine Barring Tool, Part No. 3824591**

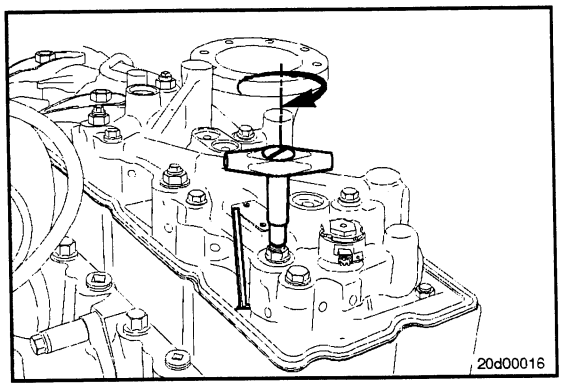
Use the engine barring tool, Part No. 3824591, to rotate the crankshaft 360 degrees to align the mark on the fuel pump gear with the mark on the gear cover, which is 180 degrees away from top dead center (TDC).

When the engine is in position, the back lash can be set on cylinders No. 2, 4, and 6.




Insert the appropriate brake lash feeler gauge between the brake sleeve piston and the exhaust crosshead pin on cylinder No. 2.

| Brake Lash - Feeler Gauge | | |
|---|---|---|
| Turbo | Tool Part No. | Lash Specification |
| Wastegate | 3613681 | 2.286 mm [0.090 in] |



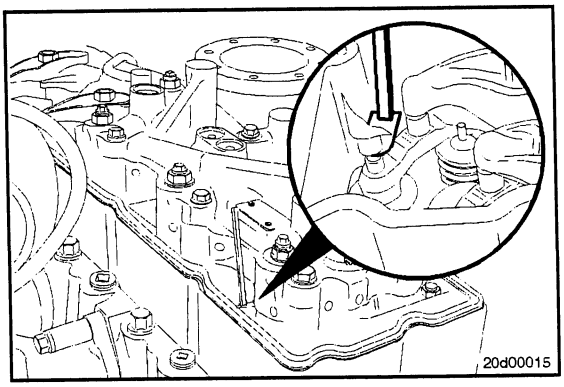

Use the 6 in-lb torque wrench, Part No. 3376592, to tighten the adjusting nut until the torque wrench "clicks," or until drag is felt on the feeler gauge.

**Torque Value:** 0.7 N•m [6 in-lb]

Remove the feeler gauge, and use two wrenches to hold the adjusting nut and tighten the locknut.

**Torque Value:** 35 N•m [26 ft-lb]

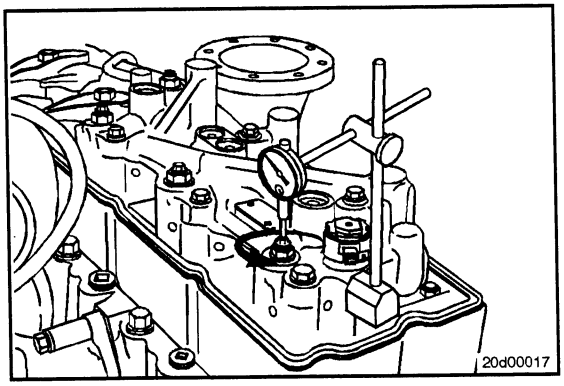
Repeat for cylinders No. 4 and 6.




**Brake Lash Dial Indicator Method**

Tighten the brake lash adjusting nut on cylinder No. 1 until resistance is felt. Place the dial indicator tip on the adjusting nut, and zero the dial indicator. Turn the lash adjusting nut in a **counterclockwise** direction until the appropriate lash is reached.

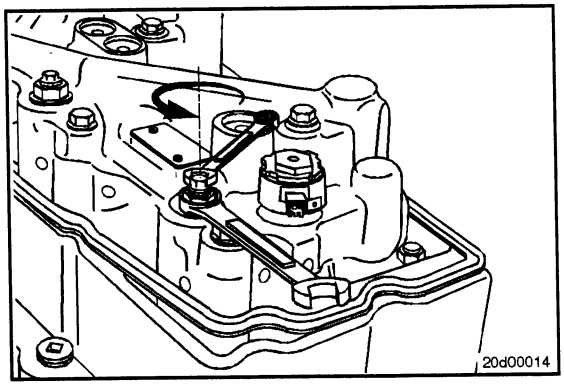
| Brake Lash | |
|---|---|
| Turbo | Lash Specification |
| Wastegate | 2.286 mm [0.090 in] |




Use two wrenches to hold the adjusting nut and tighten the locknut.

**Torque Value:** 35 N•m [26 ft-lb]

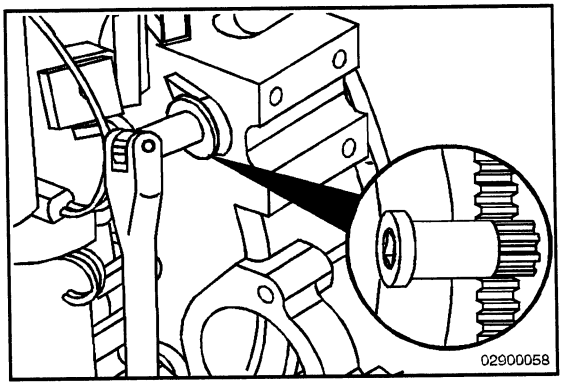
Repeat for cylinders No. 3 and 5.

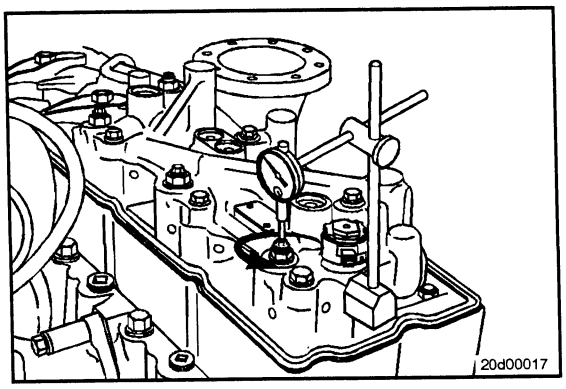



**Engine Barring Tool, Part No. 3824591**

Use the engine barring tool, Part No. 3824591, to rotate the crankshaft 360 degrees to align the mark on the fuel pump gear with the mark on the gear cover, which is 180 degrees away from top dead center (TDC).

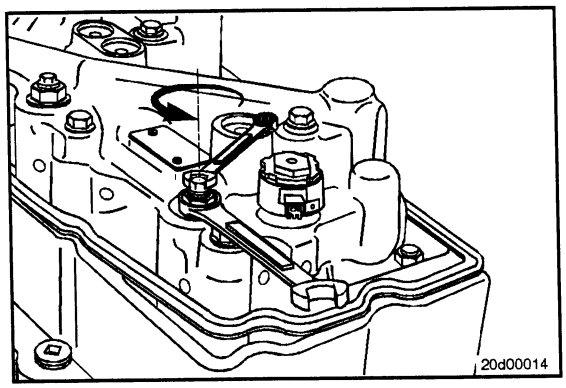
When the engine is in position, the back lash can be set on cylinders No. 2, 4, and 6.






Tighten the brake lash adjusting nut on cylinder No. 2 until resistance is felt. Place the dial indicator tip on the adjusting nut, and zero the dial indicator. Turn the lash adjusting nut in a **counterclockwise** direction until the appropriate lash is reached.

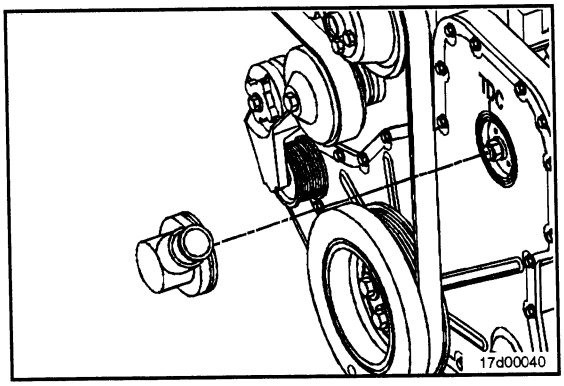
| Brake Lash | |
|---|---|
| Turbo | Lash Specification |
| Wastegate | 2.286 mm [0.090 in] |



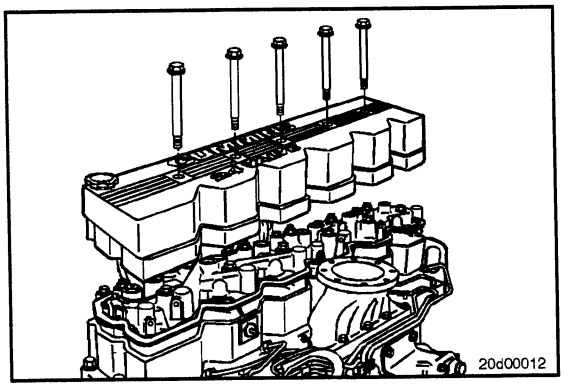

Use two wrenches to hold the adjusting nut and tighten the locknut.

**Torque Value:** 35 N•m [26 ft-lb]

Repeat for cylinders No. 4 and 6.




Install the plastic fuel pump drive cover located on the front of the engine.




Install the rocker lever cover.

**Torque Value:** 12 N•m [106 in-lb]

# Section A - Adjustment, Repair, and Replacement

## Section Contents

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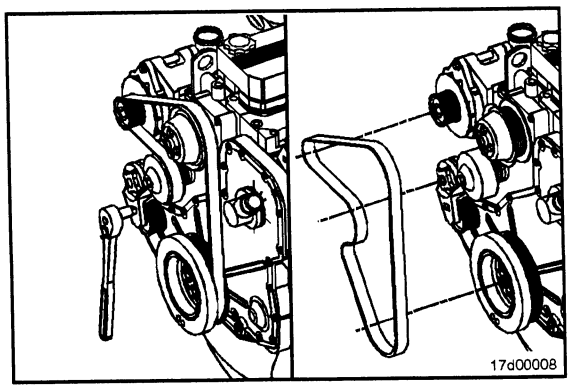
# Drive Belt, Water Pump

## Remove

### 3/8-Inch Square Drive

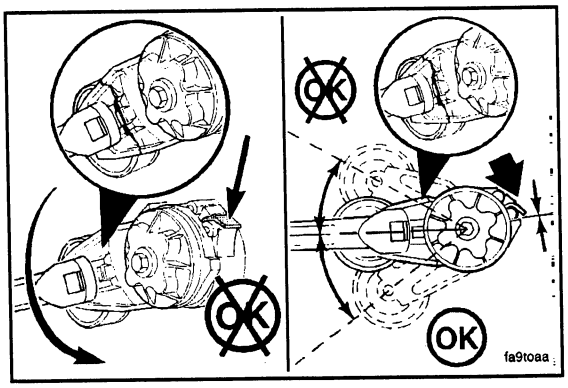
Lift the tensioner to remove the drive belt.

**NOTE:** The belt tensioner winds in the direction that the spring tang is bent over the tensioner body. To loosen the tension on the belt, rotate the tensioner to wind the spring tighter.




**⚠ CAUTION ⚠**

**Applying excessive force in the opposite direction of wind-up or after the tensioner has been wound-up to the positive stop can cause the tensioner arm to break.**



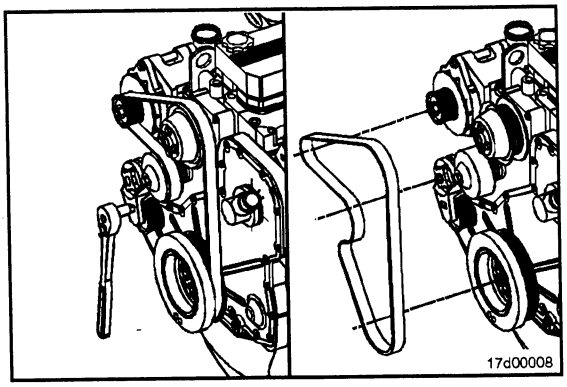

## Install

### 3/8-Inch Square Drive

**⚠ CAUTION ⚠**

**The belt tensioner is spring-loaded and must be pivoted away from the drive belt. Pivoting in the wrong direction can damage the belt tensioner.**

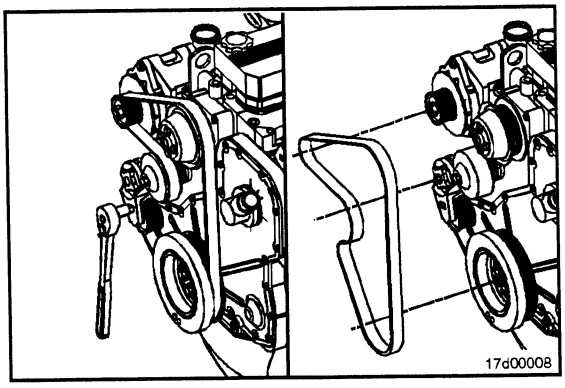
Lift the tensioner to install the drive belt.

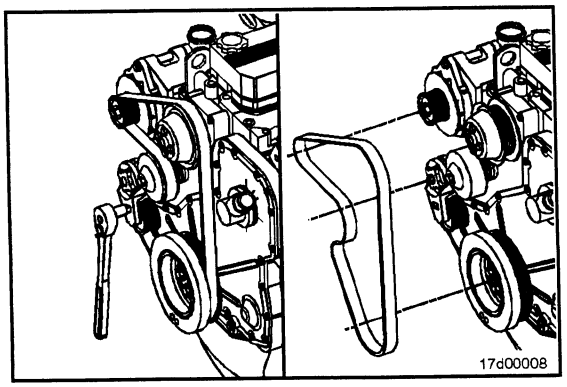



# Belt Tensioner, Automatic

## Preparatory

Remove the drive belt.





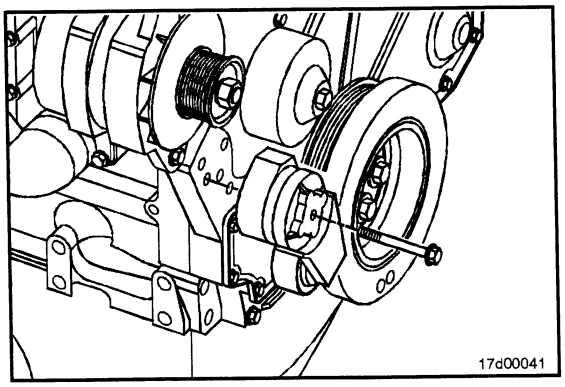

## Remove

**3/8-Inch Square Drive**

**△ CAUTION △**

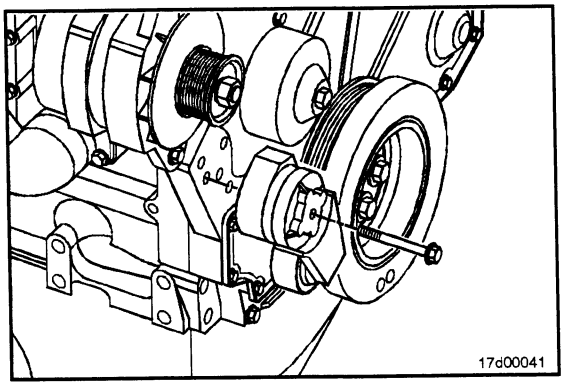
**The belt tensioner is spring-loaded and must be pivoted away from the drive belt. Pivoting in the wrong direction can damage the belt tensioner.**

Lift the belt tensioner to relieve tension in the belt, and remove the belt.




**15 mm**

Remove the capscrew and belt tensioner from the bracket.

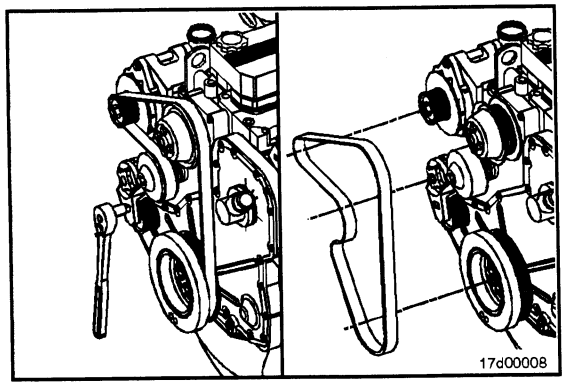



## Install

**15 mm**

Install the belt tensioner and capscrews.

**Torque Value:** 43 N•m [32 ft-lb]




**3/8-Inch Square Drive**

Lift and hold the tensioner. Install the drive belt, and release the tensioner.

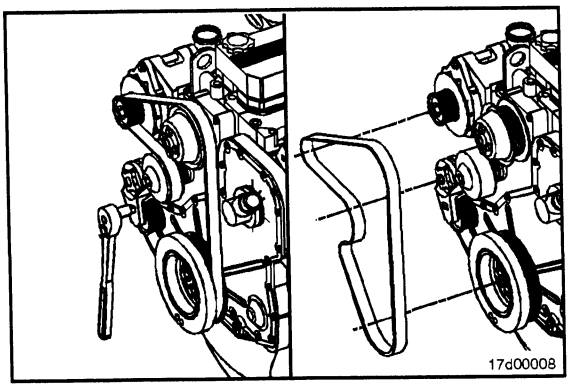
**Service Tip:** If difficulty is experienced installing the drive belt, or if the belt seems too short, position the belt over the grooved pulleys first; then, while holding the tensioner up, slide the belt over the water pump pulley.

# Fan Spacer and Pulley

## Preparatory

Remove the drive belt.

**SERVICE TIP:** Loosen the capscrews before removing the belt, and tighten the capscrews after the belt is installed.



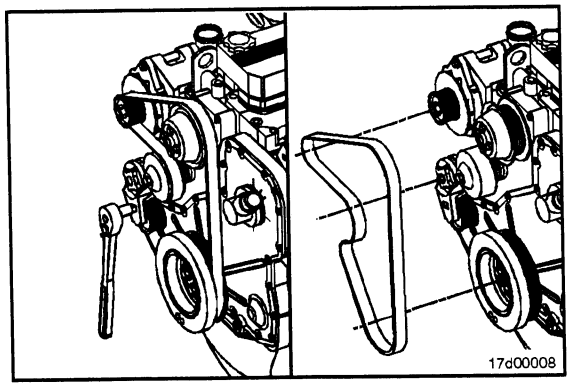

## Remove

**3/8-Inch Square Drive**

**⚠ CAUTION ⚠**

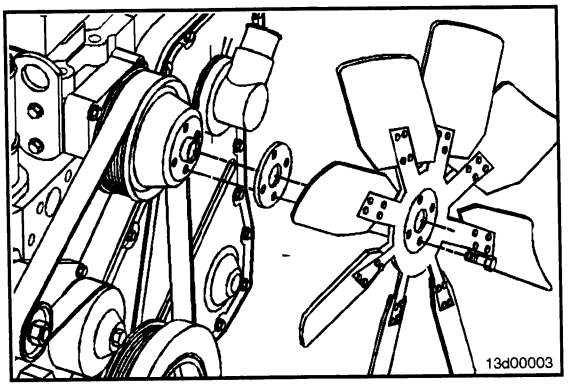
**The belt tensioner is spring-loaded and must be pivoted away from the drive belt. Pivoting in the wrong direction can result in damage to the belt tensioner.**

Lift the tensioner to relieve tension in the belt. Remove the belt.




Remove the fan capscrews, fan, and spacer.

Remove the fan pulley.



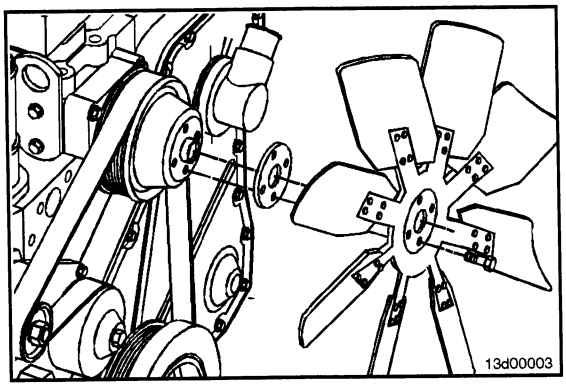

## Install

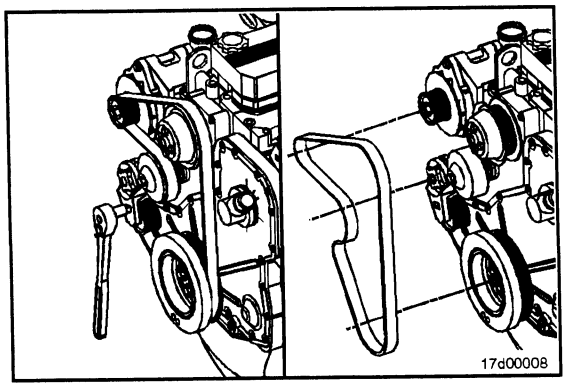
**13 mm**

Install the fan pulley.

Install the spacer, fan, and fan capscrews.

**Torque Value:** 24 N•m [18 ft-lb]

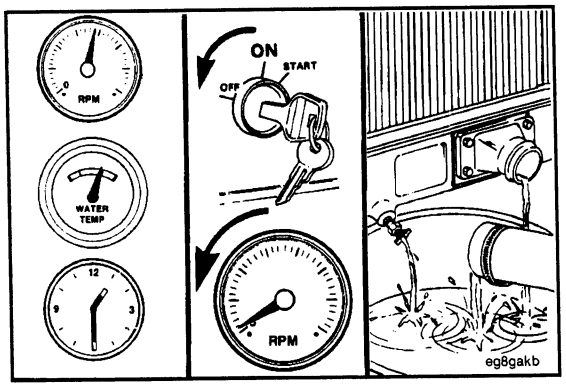





**3/8-Inch Square Drive**

Lift the tensioner, and install the belt.

**Service Tip:** If difficulty is experienced installing the drive belt, or if the belt seems to short, position the belt over the grooved pulleys first; then, while holding the tensioner up, slide the belt over the water pump pulley.




# Coolant Thermostat

## Preparatory

**⚠ WARNING ⚠**

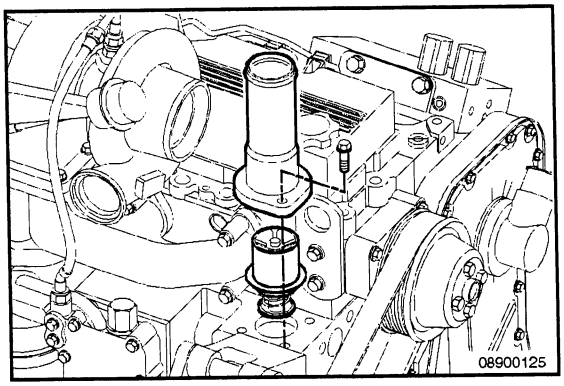
**Coolant is toxic. If not reused, dispose of in accordance with local environmental regulations.**

**⚠ 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.**

Drain the coolant from the radiator.

Disconnect the upper radiator hose.

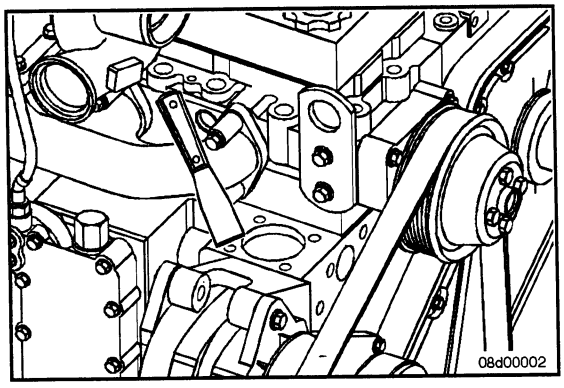



## Remove

**10 mm**

Remove the water outlet tube capscrews and water outlet tube.

Remove the thermostat.




## Clean

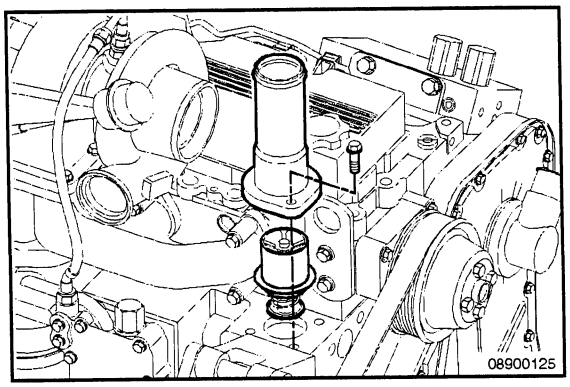
**⚠ CAUTION ⚠**

**Do not let any debris fall into the thermostat cavity when cleaning the surfaces. Failure to do so will result in engine damage.**

Clean all the mating surfaces.

## Install

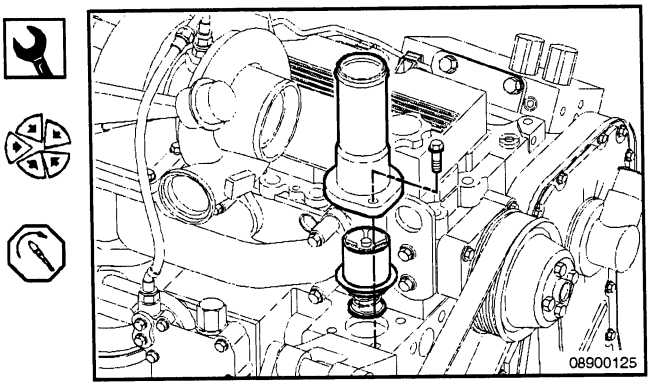
Install the new thermostat into the thermostat housing. Make sure that the top and bottom o-rings are in place.




**10 mm**

Install the water outlet tube and capscrews.

**Torque Value:** 24 N•m [18 ft-lb]

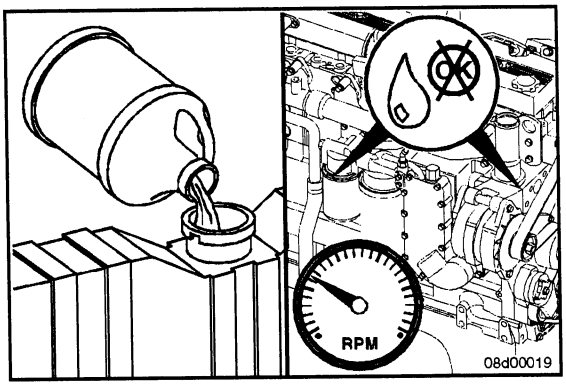



**⚠ CAUTION ⚠**

**Always vent the engine and aftercooler during filling to remove air from the coolant system, or overheating will result.**

Fill the cooling system.

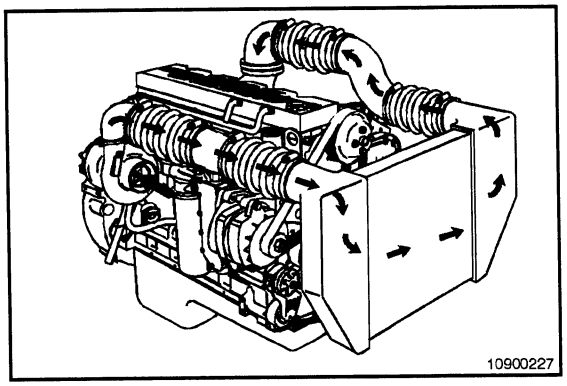
Operate the engine, and check for leaks.

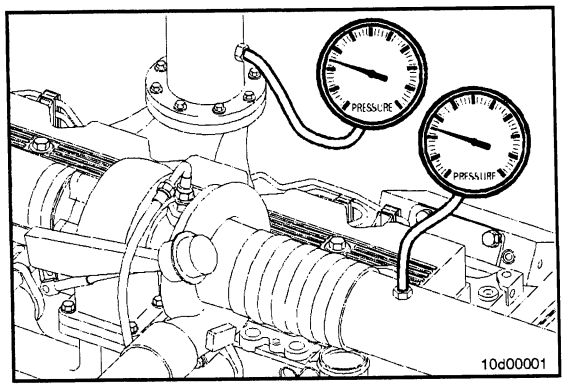



# Charge-Air Cooler (CAC)

## General Information

**NOTE:** The long-term integrity of the charge-air cooler (CAC) system is the responsibility of the vehicle and component manufacturers; however, the following can be checked by any Cummins Authorized Repair Facility.






## Pressure Test

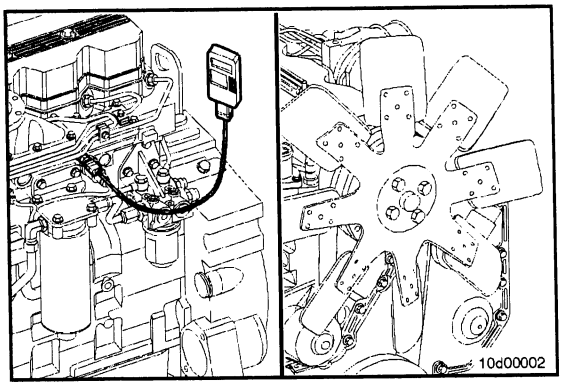
**Pressure Gauge, Part No. ST-1273**

Install the pressure gauge, Part No. ST-1273, to the fitting in the turbocharger outlet.

Install another pressure gauge, Part No. ST-1273, in the intake manifold.

Operate the engine at rated rpm and load. Record the readings on the two gauges.

If the differential pressure is greater than 50 kPa [7 psi], check the charge-air cooler (CAC) for plugging. Clean or replace, if necessary.

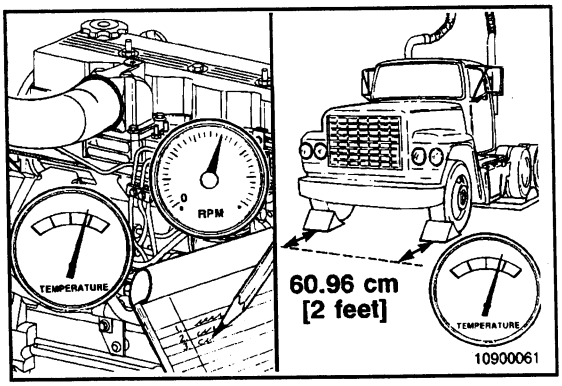



## Temperature Differential Test

Install a temperature gauge in the intake manifold.

Lock the fan drive in the ON mode to prevent erratic test results. This can be done by installing a jumper across the temperature switch or supplying shop air to the fan. Refer to the fan drive manufacturer for lockup procedure.

**NOTE:** Some trucks have a manual switch that will lock on the fan.

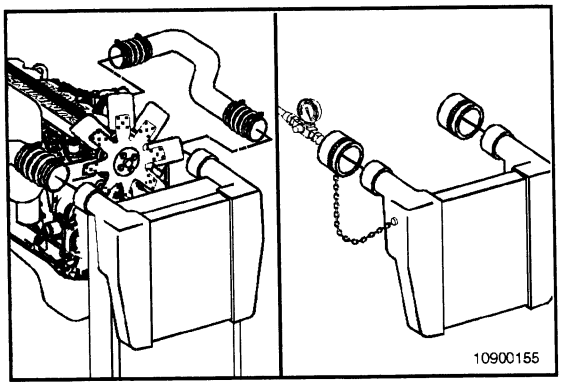



Operate the engine at rated rpm and load. Record the intake manifold temperature.

Measure the ambient temperature at least 2 feet in front of the vehicle.

The maximum temperature differential **must not** be greater than 25°C [77°F].

If the temperature differential is greater than 25°C [77°F], check the charge-air cooler (CAC) or dirt and debris on the fins, and clean as necessary. If the problem still exists, check the cooler for internal contamination or plugging.




## Leak Test

**△ CAUTION △**

**Pressure caps must be attached with a chain to the charge-air cooler (CAC).**

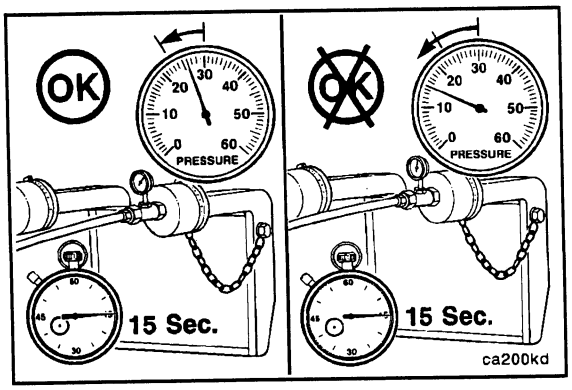
To check the charge-air cooler (CAC) for cracked tubes or header, remove the inlet and outlet hoses from the cooler.

Remove the charge-air cooler (CAC).

Use service tool No. 3824556 to install a cap over the outlet side of the cooler. Install a pressure gauge and a shop air supply line to the inlet side of the cooler.

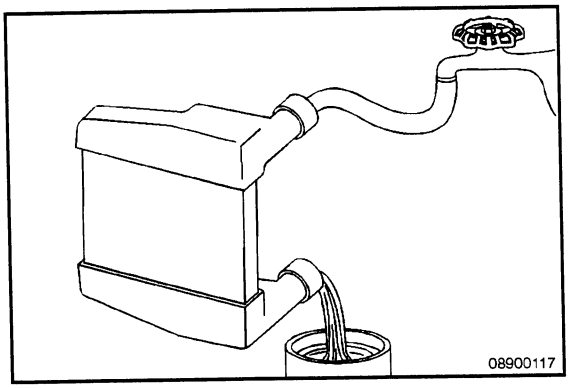
Apply 207 kPa [30 psi] of air pressure to the cooler. If the pressure drop is 48 kPa [7 psi] or more in 15 seconds, the charge-air cooler (CAC) **must** be repaired or replaced. Refer to the charge-air cooler (CAC) manufacturer for repair instructions.

**NOTE:** A leak tank can be used to locate the air leak.




**⚠ CAUTION ⚠**

**The charge-air cooler (CAC) must be cleaned following any turbocharger or air cleaner failure. Debris trapped in the charge-air cooler (CAC), if not cleaned, can cause internal engine damage.**

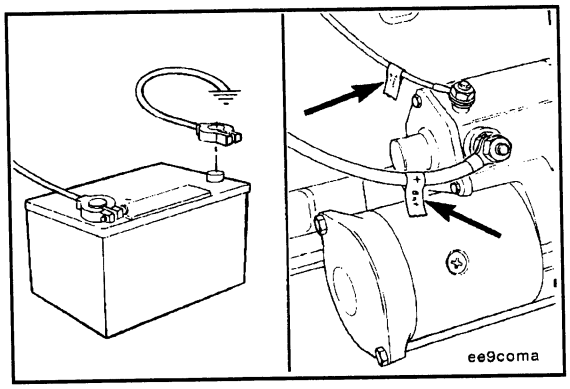



## Starting Motor

### Preparatory

Disconnect the ground cable from the battery terminal.

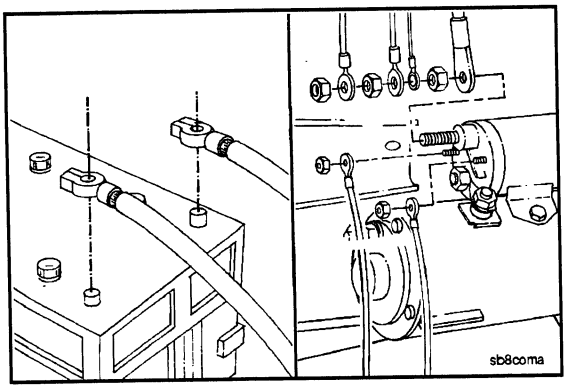
Identify each electrical wire with a tag indicating location.

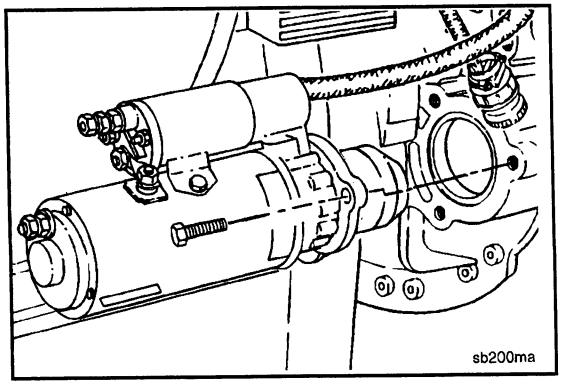



### Remove

Remove the electrical connections from the batteries, negative (-) cable first.

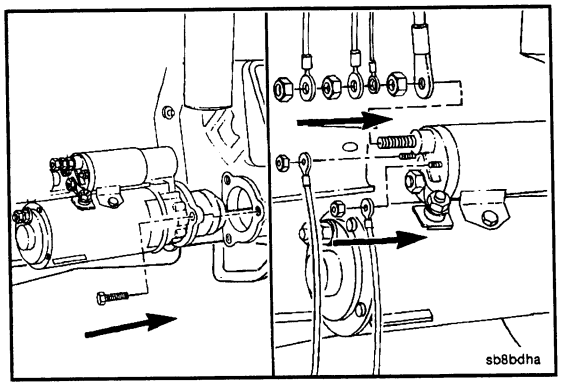
Remove the electrical connections from the starter motor, and identify each wire with a tag indicating location.






**10 mm**

Remove the three capscrews and the starter motor.



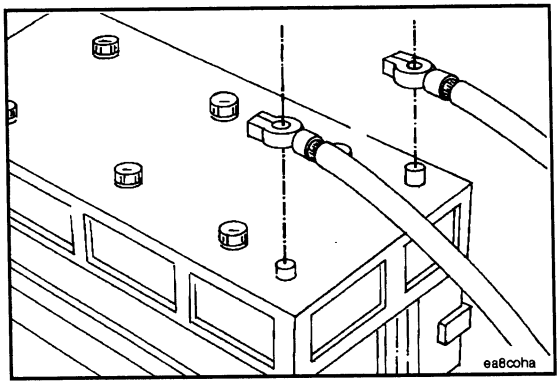

## Install

**10 mm**

Install the starter motor in the reverse order of removal.

Connect all the cables. Connect the negative (-) cable last.

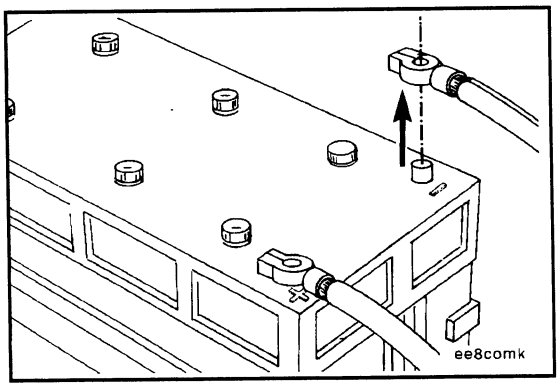
**Torque Value:** 43 N•m [32 ft-lb]




**⚠ WARNING ⚠**

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

Install and tighten the battery electrical connections. Connect the negative (-) cable last.




## Alternator

### Preparatory

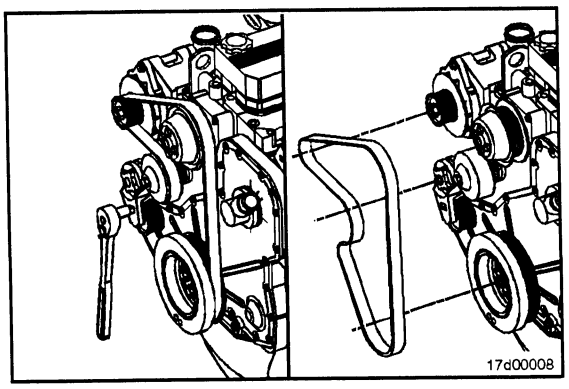
**⚠ WARNING ⚠**

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

Disconnect the ground (-) cable from the battery terminal.

Remove and tag all the wires.

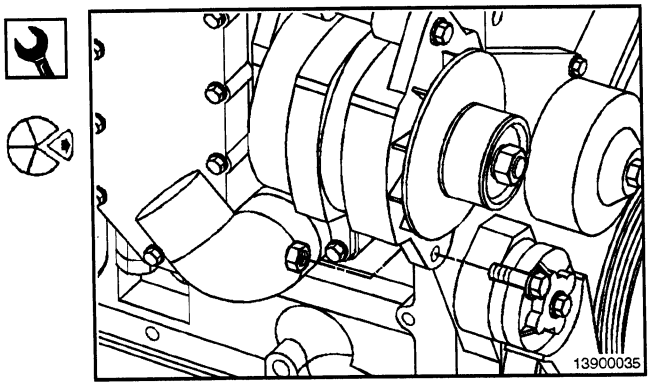
Remove the drive belt from the alternator pulley.




## Remove

**13 mm**

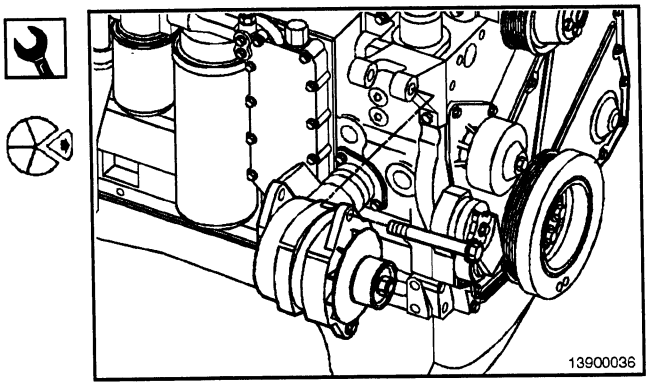
Remove the alternator link capscrew.




**16 mm**

Remove the alternator mounting capscrew.

Remove the alternator.

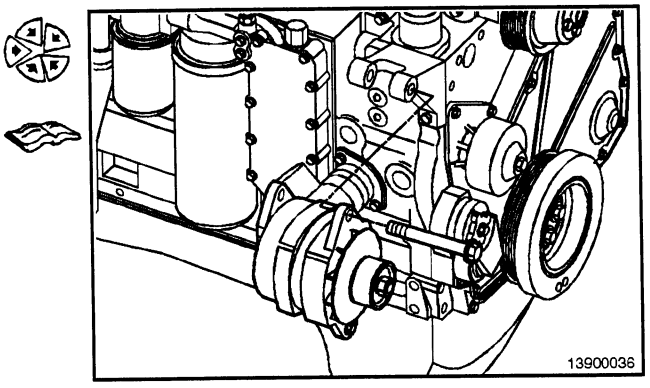



## Install

To install the alternator, the alternator mounting components **must** be tightened in the following sequence:

1. Alternator-to-alternator bracket capscrew
2. Lower brace-to-alternator capscrew
3. Lower alternator brace-to-water pump capscrew
4. Water inlet-to-block capscrews.

**NOTE:** The wrench size and torque value is determined by the make and model of the alternator. Refer to the OEM service manual.



# NOTES

# Section D - System Diagrams

## Section Contents

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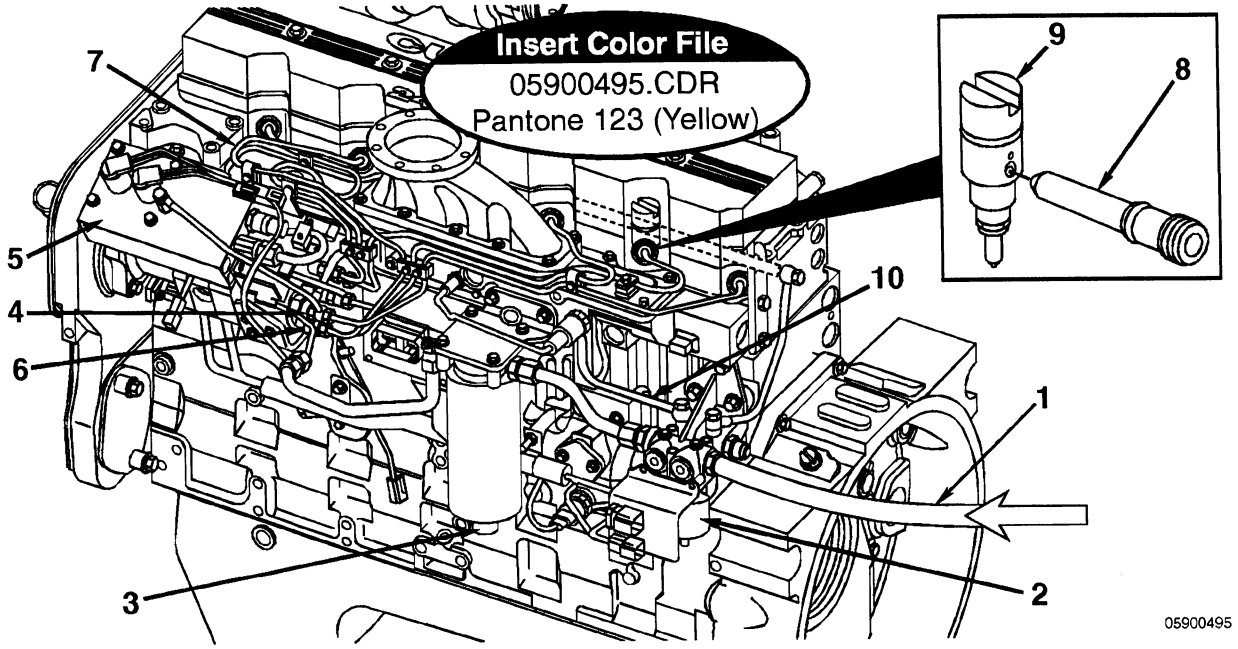
# System Diagrams - General Information

The following drawings show the flow through the engine systems. Although the parts can be different for various applications and installations, the flow remains the same. The systems shown are

- Fuel system
- Lubricating oil system
- Coolant system
- Intake air system
- Exhaust system
- Compressed air system.

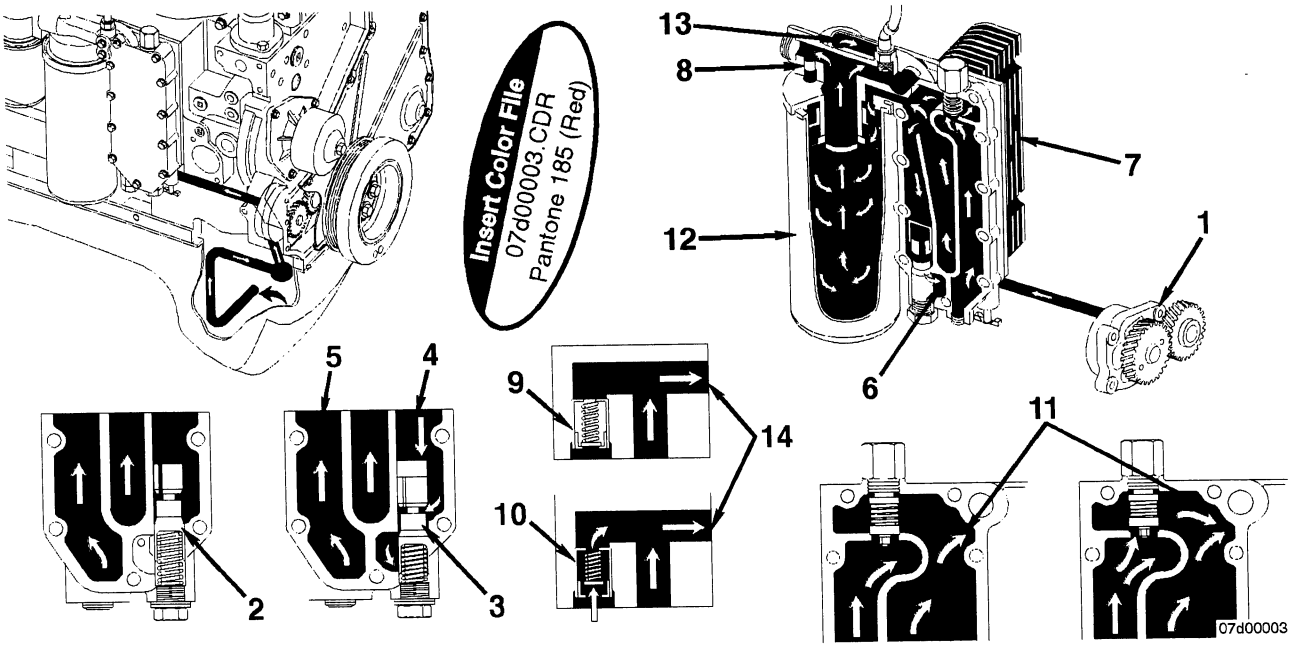
Knowledge of the engine systems can help in troubleshooting, servicing, and general maintenance of the engine.

# Flow Diagram, Fuel System



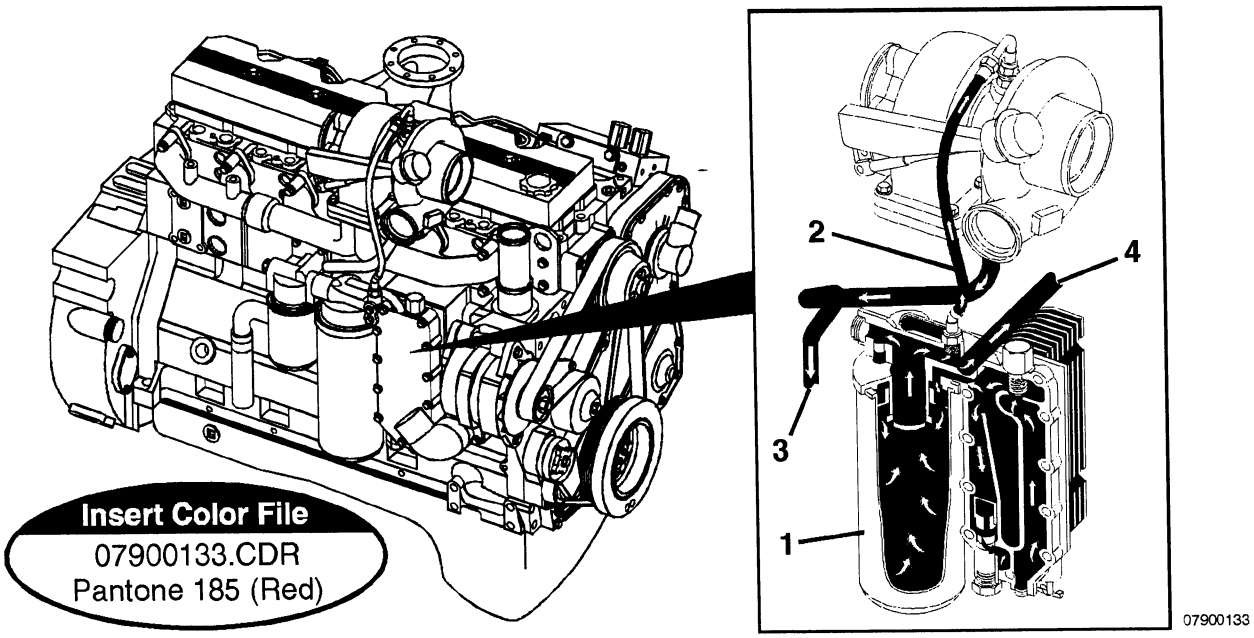

1. Fuel from supply tank
2. Electronic lift pump
3. Fuel filter and water separator
4. Fuel drain line
5. Cummins accumulator pump system (CAPS) injection pump
6. Distributor outlet fitting
7. High-pressure supply lines
8. Fuel connector
9. Injectors
10. Fuel return to supply tank.

# Flow Diagram, Lubricating Oil System




1. Gerotor lubricating oil pump
2. Pressure-regulating valve closed
3. Pressure-regulating valve open
4. From lubricating oil pump
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.

**Lubrication for the Turbocharger**




1. Lubricating oil filter
2. Turbocharger lubricating oil supply
3. Turbocharger lubricating oil drain
4. To main lubricating oil rifle.

**Lubrication for the Power Components**

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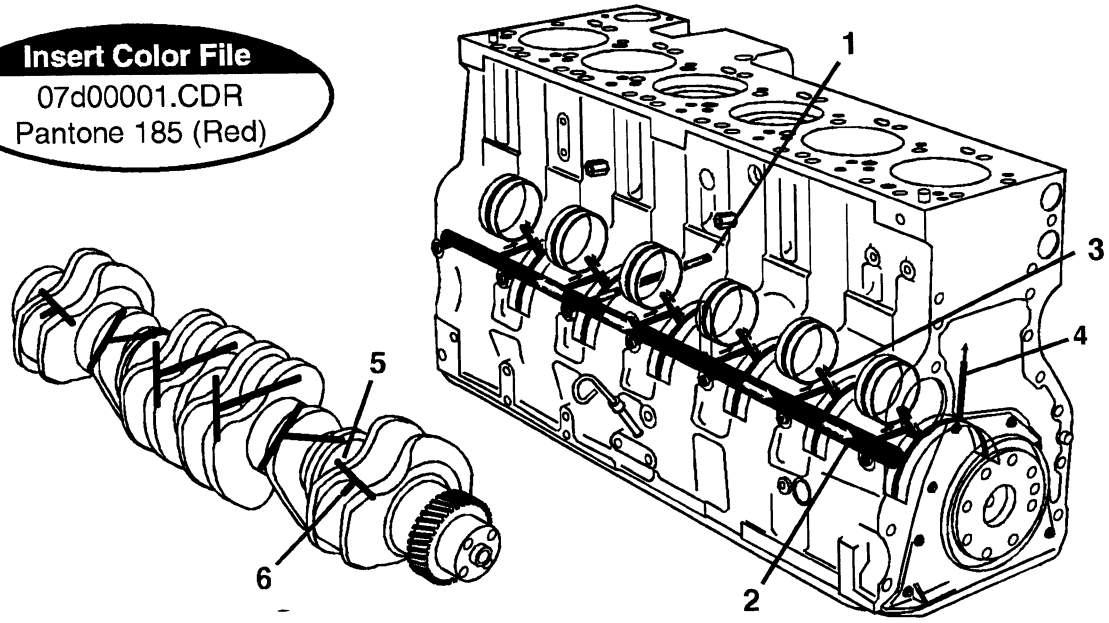
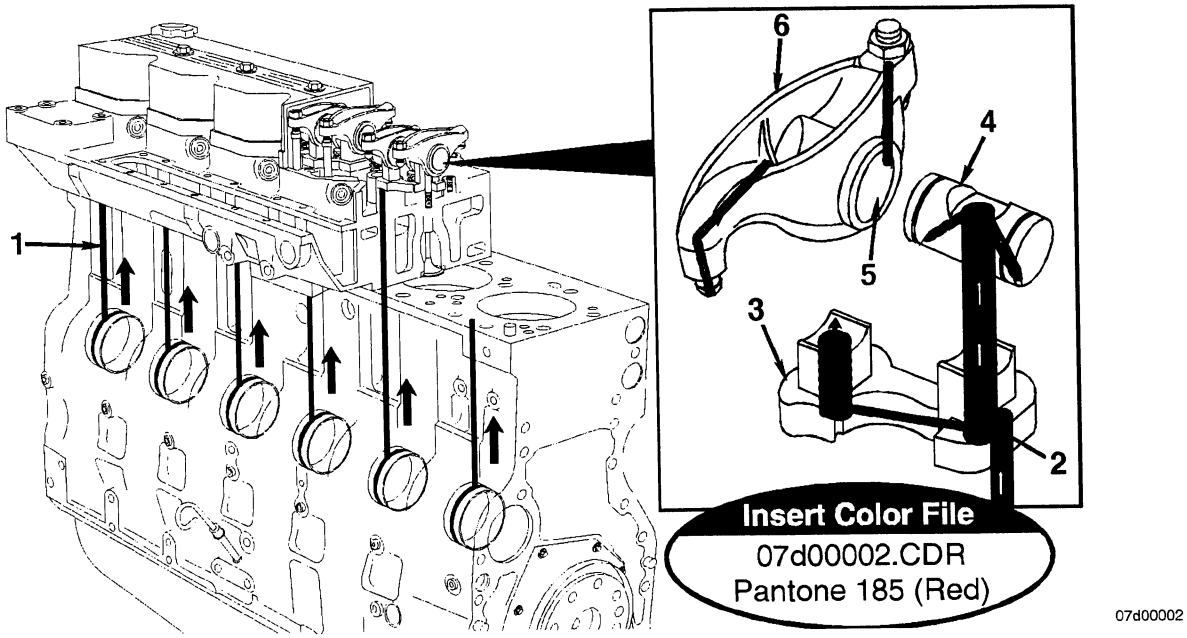
07d00001.CDR
Pantone 185 (Red)




07d00001

1. From lubricating oil cooler
2. Main lubricating oil rifle
3. To camshaft
4. From main lubricating oil rifle
5. To piston cooling nozzle
6. To connecting rod bearing.

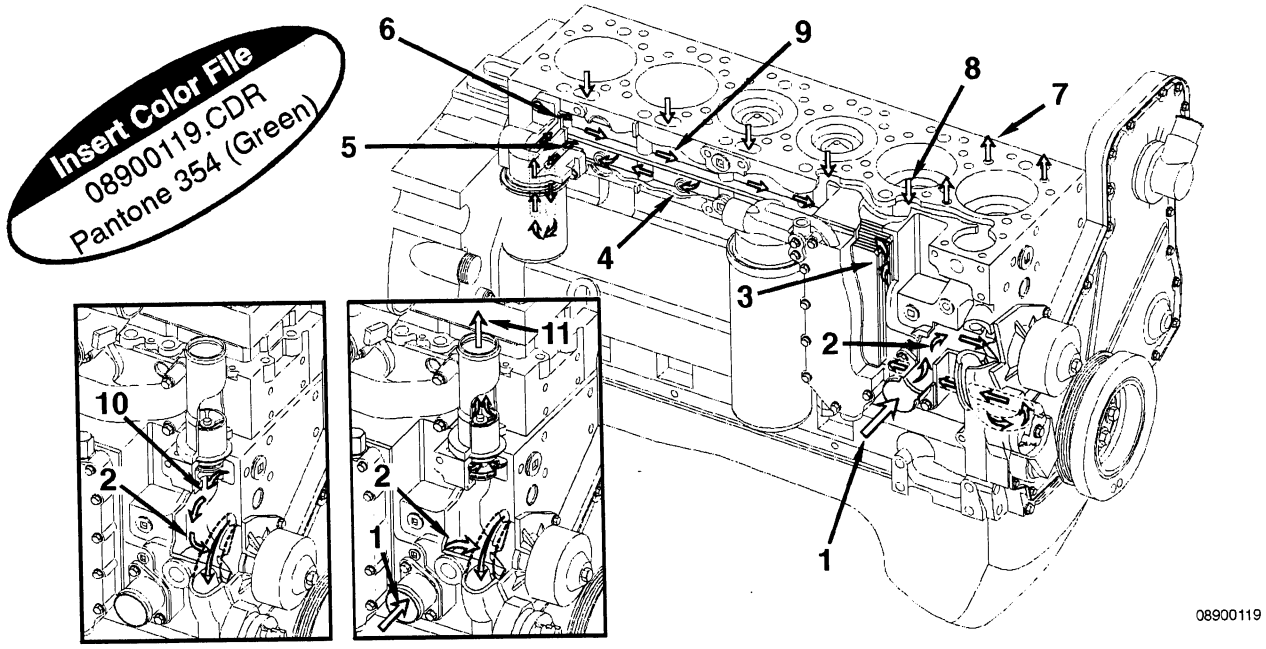
## Lubrication for the Overhead




07d00002

1. From cam bushings
2. Transfer slot
3. Rocker lever support
4. Rocker lever shaft
5. Rocker lever bore
6. Rocker lever.

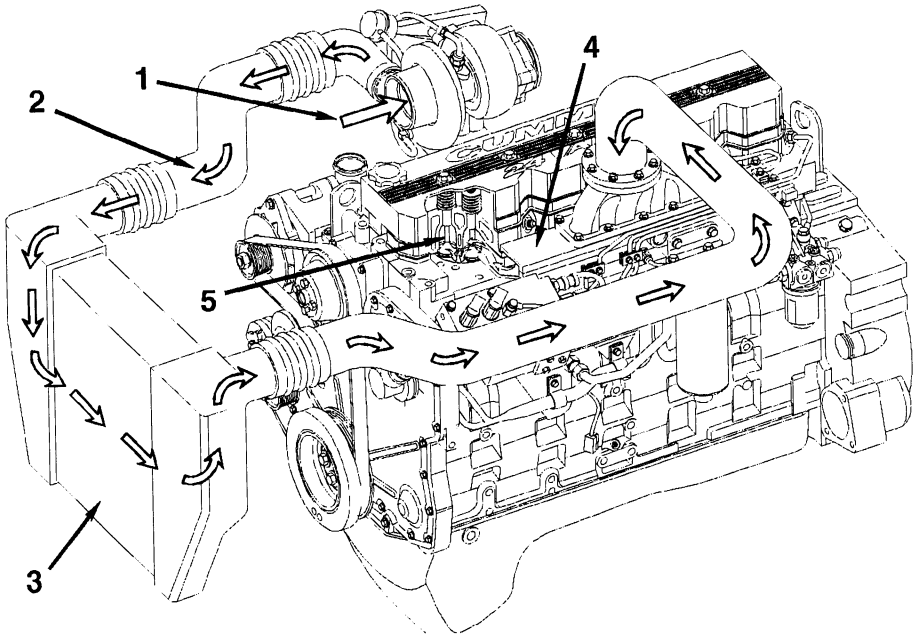
# Flow Diagram, Cooling System




1. Coolant inlet from radiator
2. Water pump suction
3. Coolant flow through lubricating oil cooler
4. Block lower water manifold (to cylinders)
5. Coolant filter inlet
6. Coolant filter outlet
7. Coolant supply to cylinder head
8. Coolant return from cylinder head
9. Block upper water manifold
10. Thermostat bypass
11. Coolant return to radiator.

# Flow Diagram, Air Intake System

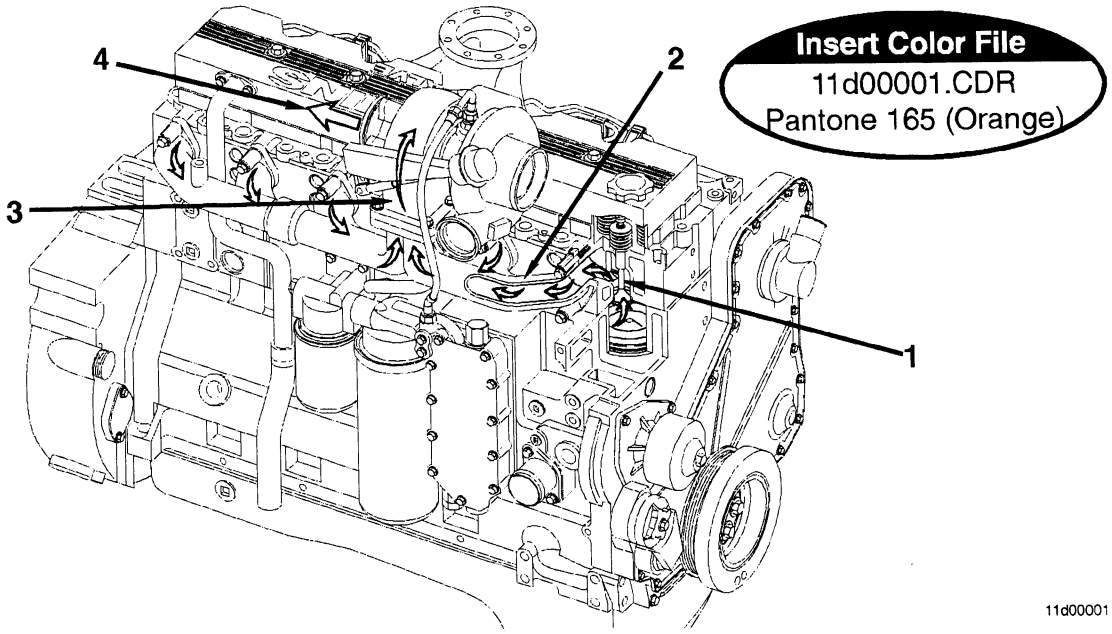
Insert Color File
10900225.CDR
Pantone 299 (Blue)




10900225

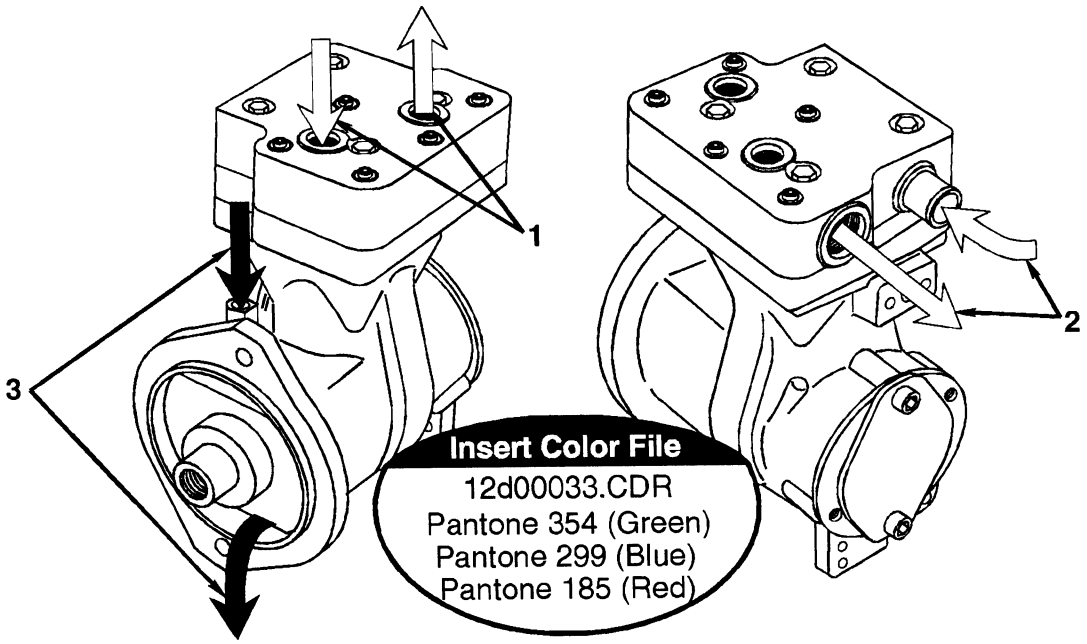
1. Intake air inlet to turbocharger
2. Turbocharger air to charge-air cooler (CAC)
3. Charge-air cooler (CAC)
4. Intake manifold (integral part of cylinder head)
5. Intake valve.

# Flow Diagram, Exhaust System




1. Exhaust valve
2. Exhaust manifold (pulse-type)
3. Dual-entry turbocharger
4. Turbocharger exhaust outlet.

# Flow Diagram, Compressed Air System




12d00033

1. Coolant
2. Air
3. Lubricant

# Section L - Service Literature

## Section Contents

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# Additional Service Literature

## General Information

The following publications can be purchased.

| Bulletin No. | Title of Publication |
|---|---|
| 3666469 | Troubleshooting and Repair Manual, ISL Engine |
| 3666271 | Troubleshooting and Repair Manual, Electronic Controlled System, ISC, QSC8.3, and ISL Engines |
| 3666416 | ISL Wiring/Fault Code Diagram |
| 3669001 | Fuel for Cummins Engines Bulletin |
| 3810340 | Cummins Engine Oil Recommendations Bulletin |
| 3666132 | Coolant Requirements and Maintenance Bulletin |

# Service Literature Ordering Location

## General Information

| Region | Ordering Location |
|---|---|
| United States and Canada | Cummins Distributors<br>or<br>Contact 1-800-DIESELS<br>(1-800-343-7357) |
| U.K., Europe, Mid-East, Africa, and Eastern European Countries | Cummins Engine Co., Ltd.<br>Royal Oak Way South<br>Daventry<br>Northants, NN11 5NU, England |
| South and Central America (excluding Brazil and Mexico) | Cummins Americas, Inc.<br>16085 N.W. 52nd Avenue<br>Hialeah, FL 33104 |
| Brazil and Mexico | Cummins Engine Co., Inc.<br>International Parts Order Dept., MC 40931<br>Box 3005<br>Columbus, IN 47202-3005 |
| Far East (excluding Australia and New Zealand) | Cummins Diesel Sales Corp.<br>Literature Center<br>8 Tanjong Penjuru<br>Jurong Industrial Estate<br>Singapore |
| Australia and New Zealand | Cummins Diesel Australia<br>Maroondah Highway, P.O.B. 139<br>Ringwood 3134<br>Victoria, Australia |

Obtain current price information from your local Cummins Distributor.

# Section M - Component Manufacturers

## Section Contents

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# Component Manufacturers' Addresses

## General Information

**NOTE:** The following list contains addresses and telephone numbers of suppliers of accessories used on Cummins engines. Suppliers can be contacted directly for any specifications **not** covered in this manual.

## Air Compressors

Bendix Heavy Vehicles Systems
Div. of Allied Automotive
901 Cleveland Street
Elyria, OH 44036
Telephone: (216) 329-9000

Holset Engineering Co., Inc.
1320 Kemper Meadow Drive
Suite 500
Cincinnati, OH 45240
Telephone: (513) 825-9600

Midland-Grau
Heavy Duty Systems
Heavy Duty Group Headquarters
10930 N. Pamona Avenue
Kansas City, MO 64153
Telephone: (816) 891-2470

## Air Cylinders

Bendix Ltd.
Douglas Road
Kingswood
Bristol
England
Telephone: 0117-671881

Catching Engineering
1733 North 25th Avenue
Melrose Park, IL 60160
Telephone: (708) 344-2334

TEC - Hackett Inc.
8909 Rawles Avenue
Indianapolis, IN 46219
Telephone: (317) 895-3670

## Air Heaters

Fleetguard, Inc.
1200 Fleetguard Road
Cookeville, TN 38502
Telephone: (615) 526-9551

Kim Hotstart Co.
P.O. Box 11245
Spokane, WA 99211-0245
Telephone: (509) 534-6171

## Air Starting Motors

Ingersoll Rand
Chorley New Road
Horwich
Bolton
Lancashire
England
BL6 6JN
Telephone: 01204-65544

Ingersoll-Rand Engine
Starting Systems
888 Industrial Drive
Elmhurst, IL 60126
Telephone: (708) 530-3875

StartMaster
Air Starting Systems_
A Division of Sycon Corporation
9595 Cheney Avenue
P. O. Box 491
Marion, OH 43302
Telephone: (614) 382-5771

## Alternators

Robert Bosch Ltd.
P.O. Box 98
Broadwater Park
North Orbital Road
Denham
Uxbridge
Middlesex UD9 5HG
England
Telephone: 01895-833633

Butec Electrics
Cleveland Road
Leyland
PR5 1XB
England
Telephone: 01744-21663

C.A.V. Electrical Equipment
P.O. Box 36
Warple Way
London
W3 7SS
England
Telephone: 01-743-3111

A.C. Delco Components Group
Civic Offices
Central Milton Keynes
MK9 3EL
England
Telephone: 01908-66001

C. E. Niehoff & Co.
2021 Lee Street
Evanston, IL 60202
Telephone: (708) 866-6030

Delco-Remy America
2401 Columbus Avenue
P.O. Box 2439
Anderson, IN 46018
Telephone: (317) 646-3528

Leece-Neville Corp.
400 Main Street
Arcade, NY 14009
Telephone: (716) 492-1700

## Auxiliary Brakes

The Jacobs Manufacturing Company
Vehicle Equipment Division
22 East Dudley Town Road
Bloomfield, CT 06002
Telephone: (203) 243-1441

## Belts

Dayco Rubber U.K.
Sheffield Street
Stockport
Cheshire
SK4 1RV
England
Telephone: 061-432-5163

T.B.A. Belting Ltd.
P.O. Box 77
Wigan
Lancashire
WN2 4XQ
England
Telephone: 01942-59221

Dayco Mfg.
Belt Technical Center
1955 Enterprize
Rochester Hills, MI 48309
Telephone: (810) 853-8300

Gates Rubber Company
900 S. Broadway
Denver, CO 80217

Goodyear Tire and
Rubber Company
Industrial Products Div.
2601 Fortune Circle East
Indianapolis, IN 46241
Telephone: (317) 898-4170

## Catalytic Converters

Donaldson Company, Inc.
1400 West 94th Street
P.O. Box 1299
Minneapolis, MN 55440
Telephone: (612) 887-3835

Nelson Division
Exhaust and Filtration Systems
1801 U.S. Highway 51 P.O. Box 428
Stoughton, WI 53589
Telephone: (608) 873-4200

Walker Manufacturing
3901 Willis Road
P.O. Box 157
Grass Lake, MI 49240
Telephone: (517) 522-5500

## Coolant Level Switches

Robertshaw Controls Company
P.O. Box 400
Knoxville, TN 37901
Telephone: (216) 885–1773

## Clutches

Twin Disc International S.A.
Chaussee de Namur
Nivelles
Belguim
Telephone: 067-224941

Twin Disc Incorporated
1328 Racine Street
Racine, WI 53403
Telephone: (414) 634-1981

## Coolant Heaters

Fleetguard, Inc.
1200 Fleetguard Road
Cookeville, TN 38502
Telephone: (615) 526-9551

## Drive Plates

Detroit Diesel Allison
Division of General Motors
Corporation
P.O. Box 894
Indianapolis, IN 46206-0894
Telephone: (317) 242-5000

## Electric Starting Motors

Butec Electrics
Cleveland Road
Leyland
PR5 1XB
England
Telephone: 01744-21663

C.A.V. Electrical Equipment
P.O. Box 36
Warple Way
London
W3 7SS
England
Telephone: 01-743-3111

A.C. Delco Components Group
Civic Offices
Central Milton Keynes
MK9 3EL
England
Telephone: 0908-66001

Delco-Remy America
2401 Columbus Avenue
P.O. Box 2439
Anderson, IN 46018
Telephone: (317) 646-3528

Leece-Neville Corp.
400 Main Street
Arcade, NY 14009
Telephone: (716) 492-1700

Nippondenso Inc.
2477 Denso Drive
P.O. Box 5133
Southfield, MI 48086
Telephone: (313) 350-7500

## Electronic Switches

Cutler-Hammer Products
Eaton Corporation
4201 N. 27th Street
Milwaukee, WI 53216
Telephone: (414) 449–6600

## Engine Protection Controls

Flight Systems Headquarters
Hempt Road
P.O. Box 25
Mechanicsburg, PA 17055
Telephone: (717) 697–0333

The Nason Company
2810 Blue Ridge Blvd.
West Union, SC 29696
Telephone: (803) 638-9521

Teddington Industrial
Equipment
Windmill Road
Sunburn on Thames
Middlesex
TW16 7HF
England
Telephone: 09327-85500

## Fan Clutches

Kysor Cooling Systems N.A.
6040 West 62nd Street
Indianapolis, IN 46278
Telephone: (317) 328–3330

Holset Engineering Co. Ltd.
P.O. Box A9
Turnbridge
Huddersfield, West Yorkshire
England HD6 7RD
Telephone: 01484-22244

Horton Industries, Inc.
P.O. Box 9455
Minneapolis, MN 55440
Telephone: (612) 378-6410

Rockford Clutch Company
1200 Windsor Road
P.O. Box 2908
Rockford, IL 61132-2908
Telephone: (815) 633-7460

## Fans

Truflo Ltd.
Westwood Road
Birmingham
B6 7JF
England
Telephone: 021-557-4101

Hayes-Albion Corporation
Jackson Manufacturing Plant
1999 Wildwood Avenue
Jackson, MI 49202
Telephone: (517) 782-9421

Engineered Cooling Systems, Inc.
201 W. Carmel Drive
Carmel, IN 46032
Telephone: (317) 846-3438

Brookside Corporation
P.O. Box 30
McCordsville, IN 46055
Telephone: (317) 335-2014

TCF Aerovent Company
9100 Purdue Rd., Suite 101
Indianapolis, IN 46268-1190
Telephone: (317) 872-0030

Kysor-Cadillac
1100 Wright Street
Cadillac, MI 49601
Telephone: (616) 775-4681

Schwitzer
6040 West 62nd Street
P.O. Box 80-B
Indianapolis, IN 46206
Telephone: (317) 328-3010

## Fault Lamps

Cutler-Hammer Products
Eaton Corporation
4201 N. 27th Street
Milwaukee, WI 53216
Telephone: (414) 449–6600

## Filters

Fleetguard International Corp.
Cavalry Hill Industrial Park
Weedon
Northampton NN7 4TD
England
Telephone: 01327-41313

Fleetguard, Inc.
1200 Fleetguard Road
Cookeville, TN 38502
Telephone: 1–800–22–Filters
(1–800–223–4583)

## Flexplates

Corrugated Packing and
Sheet Metal
Hamsterley
Newcastle Upon Tyne
England
Telephone: 01207-560-505

Allison Transmission
Division of General Motors
Corporation
P.O. Box 894
Indianapolis, IN 46206-0894
Telephone: (317) 242-5000

Midwest Mfg. Co.
29500 Southfield Road, Suite 122
Southfield, MI 48076
Telephone: (313) 642-5355

Wohlert Corporation
708 East Grand River Avenue
P.O. Box 20217
Lansing, MI 48901
Telephone: (517) 485-3750

## Fuel Coolers

Hayden, Inc.
1531 Pomona Road
P.O. Box 848
Corona, CA 91718–0848
Telephone: (909) 736–2665

## Fuel Pumps

Robert Bosch Corp.
Automotive Group
2800 South 25th Ave.
Broadview, IL 60153

## Fuel Warmers

Fleetguard, Inc.
1200 Fleetguard Road
Cookeville, TN 38502
Telephone: (615) 526-9551

## Gauges

A.I.S.
Dyffon Industrial Estate
Ystrad Mynach
Hengoed
Mid Glamorgan
CF8 7XD
England
Telephone: 01443-812791

Grasslin U.K. Ltd.
Vale Rise
Tonbridge
Kent
TN9 1TB
England
Telephone: 01732-359888

Icknield Instruments Ltd.
Jubilee Road
Letchworth
Herts
England
Telephone: 04626-5551

Superb Tool and Gauge Co.
21 Princip Street
Birmingham
B4 61E
England
Telephone: 021-359-4876

Kabi Electrical and Plastics
Cranborne Road
Potters Bar
Herts
EN6 3JP
England
Telephone: 01707-53444

Datcon Instruments
P.O. Box 128
East Petersburg, PA 17520
Telephone: (717) 569-5713

Rochester Gauges, Inc.
11616 Harry Hines Blvd.
P.O. Box 29242
Dallas, TX 75229
Telephone: (214) 241-2161

## Governors

Woodward Governors Ltd.
P.O. Box 15
663/664 Ajax Avenue
Slough
Bucks
SL1 4DD
England
Telephone: 01753-26835

Woodward Governor Co.
P.O. Box 1519
Fort Collins, CO 80522
Telephone: (303) 482-5811
(800) 523-2831

Barber Colman Co.
1354 Clifford Avenue
Loves Park, IL 61132
Telephone: (815) 637-3000

United Technologies
Diesel Systems
1000 Jorie Blvd.
Suite 111
Oak Brook, IL 69521
Telephone: (312) 325-2020

## Heat Sleeves

Bentley Harris Manufacturing Co.
100 Bentley Harris Way
Gordonville, TN 38563
Telephone: (313) 348-5779

## Hydraulic and Power Steering Pumps

Hobourn Automotive
Temple Farm Works
Priory Road
Strood
Rochester
Kent, England
ME2 2BD
Telephone: 01634-71773

Honeywell Control Systems Ltd.
Honeywell House
Charles Square
Bracknell
Berks RG12 1EB
Telephone: 01344-4245

Sundstrand Hydratec Ltd.
Cheney Manor Trading Estate
Swindon
Wiltshire
SN2 2PZ
England
Telephone: 01793-30101

Sperry Vickers
P.O. Box 302
Troy, MI 48084
Telephone: (313) 280-3000

Z.F.
P.O. Box 1340
Grafvonsoden Strasse
5-9 D7070
Schwaebisch Gmuend
Germany
Telephone: 7070-7171-31510

## In-Line Connectors

Pioneer-Standard Electronics, Inc.
5440 Neiman Parkway
Solon, OH 44139
Telephone: (216) 349–1300

Deutsch
Industrial Products Division
37140 Industrial Avenue
Hemet, CA 92343
Telephone: (714) 929–1200

## Oil Heaters

Fleetguard, Inc.
1200 Fleetguard Road
Cookeville, TN 38502
Telephone: (615) 526-9551

Kim Hotstart Co.
P.O. Box 11245
Spokane, WA 99211-0245
Telephone: (509) 534-6171

## Prelubrication Systems

RPM Industries, Inc.
Suite 109
55 Hickory Street
Washington, PA 15301
Telephone: (412) 228–5130

## Radiators

JB Radiator Specialties, Inc.
P.O. Box 292087
Sacramento, CA 95829–2087
Telephone: (916) 381–4791

The G&O Manufacturing Company
100 Gando Drive
P.O. Box 1204
New Haven, CT 06505–1204
Telephone: (203) 562–5121

Young Radiator Company
2825 Four Mile Road
Racine, WI 53404
Telephone: (910) 271–2397

L and M Radiator, Inc.
1414 East 37th Street
Hibbing, MN 55746
Telephone: (218) 263–8993

## Throttle Assemblies

Williams Controls, Inc.
14100 SW 72nd Avenue
Portland, OR 97224
Telephone: (503) 684–8600

## Torque Converters

Twin Disc International S.A.
Chaussee de Namur
Nivelles
Belgium
Telephone: 067-224941

Twin Disc Incorporated
1328 Racine Street
Racine, WI 53403-1758
Telephone: (414) 634-1981

Rockford Powertrain, Inc.
Off-Highway Systems
1200 Windsor Road
P.O. Box 2908
Rockford, IL 61132-2908
Telephone: (815) 633-7460

Modine Mfg. Co.
1500 DeKoven Avenue
Racine, WI 53401
Telephone: (414) 636-1640

# NOTES

# Section S - Service Assistance

## Section Contents

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# Service Assistance

## Routine Service and Parts

Personnel at Cummins Authorized Repair Locations can assist you with the correct operation and service of your engine. Cummins has a worldwide service network of more than 5,000 Distributors and Dealers who have been trained to provide sound advice, expert service, and complete parts support. Check the telephone directory yellow pages or refer to the directory in this section for the nearest Cummins Authorized Repair Location.

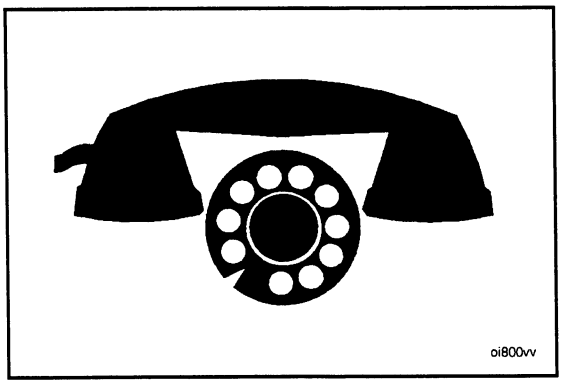
## Emergency and Technical Service

The Cummins Customer Assistance Center provides a 24-hour, toll free telephone number to aid in technical and emergency service when a Cummins Authorized Repair Location can **not** be reached or is unable to resolve an issue with a Cummins product.

If additional assistance is required, call Toll-Free:

1-800-DIESELS
(1-800-343-7357)

- Includes all 50 states, Bermuda, Puerto Rico, Virgin Islands, and the Bahamas.
- Outside of North America contact your Regional Office. Telephone numbers and addresses are listed in the International Directory.



## Problem Solving

Normally, any problem that arises with the sale, service, or repair of your engine can be handled by a Cummins Authorized Repair Location in your area. Refer to the telephone directory yellow pages for the one nearest you. If the problem has **not** been handled satisfactorily, follow the steps outlined below:

1. If the disagreement is with a Dealer, talk to the Cummins Distributor with whom he has his service agreement.
2. If the disagreement is with a Distributor, call the nearest Cummins Division or Regional Office; however, most problems are solved below the Division or Regional office level. Telephone numbers and addresses are listed in this section. Before calling, write down the following information:
   a. Engine model and serial number
   b. Type and make of equipment
   c. Total kilometers [miles] or hours of operation
   d. Warranty start date
   e. Nature of problem
   f. Summary of the current problem arranged in the order of occurrence
   g. Name and location of the Cummins Distributor or Dealer
3. If a problem can **not** be resolved satisfactorily through your Cummins Authorized Repair Location or Division Office, write to:

Cummins Customer Assistance Center - 41403, Cummins Engine Company, Inc., Box 3005, Columbus, IN 47202-3005

# Division and Regional Offices

**NOTE:** The following list contains offices in U.S., Canada, Australia, New Zealand, and Puerto Rico.

## United States

### Southern Division Office
Cummins Engine Company, Inc.
425 Franklin Road S.W.
Suite 500
Marietta, GA 30067
Telephone: (770) 423-1108
FAX: (770) 499-8240

### Plains Regional Office
Cummins Engine Company, Inc.
1901 Central Drive
Suite 356
Bedford, TX 76021
Telephone: (817) 267-3172
FAX: N/A

## Canada

### Canadian Division Office
Cummins Diesel of Canada, Ltd.
5575 North Service Road
Burlington, Ontario L726M1
Telephone: (905) 331-5944
FAX: (905) 331-0276

### Western Canada Regional Office
Cummins Diesel of Canada, Ltd.
18452 - 96th Avenue
Surrey, B.C. V3T 4W2
Telephone: (604) 882-5727
FAX: (604) 882-9110

### Eastern Canada Regional Office
Cummins Diesel of Canada Ltd.
7200 Trans Canada Hwy.
Pt. Cuaire, Quebec H9R 1C0
Telephone: (514) 695-2402
FAX: (514) 695-8917

### Central Canada Regional Office
Cummins Diesel of Canada Ltd.
4887 – 35th Street SE
Calgary, Alberta T2B 3C6
FAX: (403) 569-9974

## Australia Regional Office

### Cummins Engine Company Pty. Ltd.
2 Caribbean Drive
Scoresby, Victoria 3179
Australia
Telephone: (61-3) 9765-3222
FAX: (61-3) 9763-0079

**NOTE:** This office also serves New Zealand.

## Cummins Americas Regional Office

### Cummins Latin America
3088 N. Commence Parkway
MPC #14, Building A
Miramar, FL 33025
Telephone: (305) 621-1300

**NOTE:** This office serves Puerto Rico and South America excluding Brazil.

# Regional Offices - International

## North Africa Regional Office - Algiers

Cummins Corporation
Bureau de Liaison
38, Lotissement Benachour Abdelkader
Cheraga
42300 Wilaya de Tipasa
Algeria
Telephone: (213) 2374326

Country Covered: Algeria

## European Regional Office - Mechelen

Cummins Diesel N.V.
Blarenberglaan 4
Industriepark Noord 2
2800 Mechelen
Brussels
Telephone: (32-15) 20003

Countries Covered:
- Austria
- Belgium
- Czech Republic
- Denmark
- Finland
- Greece
- Hungary
- Iceland
- Israel
- Luxembourg
- Netherlands
- Norway
- Portugal
- Slovakia
- Spain
- Sweden
- Switzerland

## Cumbrasa Regional Office - Brazil

Cummins Brasil S.A.
Rua Jati, 266
07180-900 Guarulhos
Sao Paulo, Brazil

Mailing Address:
P.O. Box 13
07180-900 Guarulhos
Sao Paulo, Brazil
Telephone: (55-11) 945-9811

Country Covered: Brazil

## Beijing Regional Office - China

Cummins Corporation
China World Tower, Suite 917
China World Trade Center
No. 1 Jian Guo Men Wai
Beijing 100004
People's Republic of China
Telephone: (86-1) 505-4209/10

Countries Covered:
- China
- Mongolia

## Bogota Regional Office - Columbia

Cummins Engine Co. de Colombia S.A.
Carrera 11A No. 90-15 Of. 601/602
Bogota, D.E., Colombia
Telephone: (57-1) 610-4849

Mailing Address:
Apartado Aereo 90988
Bogota D.E., Colombia

Countries Covered:
- Argentina
- Bolivia
- Chile
- Colombia
- Ecuador
- Paraguay
- Peru
- Uruguay

## Lyon Regional Office - France

Cummins Diesel Sales Corporation
39, rue Ampere - Zone Industrielle
69680 Chassieu
France
Telephone: (33) 72-22-92-72

Countries Covered:
- Algeria
- France
- Guadeloupe
- Guyana
- Martinique
- New Caledonia
- Reunion

## Gross-Gerau Regional Office - Germany

Cummins Diesel Deutschland GmbH
Odenwaldstr. 23
D-6080 Gross-Gerau
Germany
Telephone: (49-6152) 174-0

Countries Covered:
- Albania
- Bulgaria
- *Czech Republic
- Germany
- Luxembourg
- Poland
- Romania
- Southeastern Europe
- Slovika

*Marine Only

## Hong Kong Regional Office - Hong Kong

Cummins Engine H.K. Ltd.
Unison Industrial Centre
15th Floor, Units C & D
27-31 Au Pui Wan Street
P. O. Box 840 Shatin
Fo Tan, Shatin, N.T.
Hong Kong
Telephone: (852) 606-5678

Country Covered: Hong Kong

## Pune Kirloskar Regional Office - India

Kirloskar Cummins Limited
Kothrud
Pune - 411 029, India
Telephone: (91-212) 33-0240, 33-5435, 33-1105

Countries Covered:
- Bhutan
- India
- Nepal

## Milan Regional Office - Italy

Cummins Diesel Italia S.P.A.
Piazza Locatelli 8
Zona Industriale
20098 San Giuliano Milanese
Milan, Italy
Telephone: (39-2) 982-81235/6/7

Country Covered: Italy

## North Asia Regional Office - Japan

Cummins Diesel Sales Corporation
1-12-10 Shintomi
Chuo-ku, Tokyo 104
Japan
Telephone: (81-3) 3555-3131/2/3/4/5

Country Covered: Japan

## Seoul Regional Office - Korea

Cummins Korea Ltd.
5th Floor, Hye Sung Building
35-26 Sam Sung Dong, Kang Nam Ku
Seoul, South Korea
Telephone: (82-2) 516-0431/2/3, 517-3370/1

Country Covered: South Korea

## Cummsa Regional Office - Mexico

Cummins, S.A. de C.V.
Arquimedes No. 209
Col. Polanco
11560 Mexico, D.F.
Mexico
Telephone: (52-5) 254-3822/3783/3622

Mailing/Shipping Address:
Gonzalez de Castilla Inc.
P.O. Box 1391
4605 Modern Lane
Modern Industrial Park
Laredo, TX 78040
Telephone: (512) 722-5207

Country Covered: Mexico

## Moscow Regional Office - Russia

Cummins Engine Co., Inc.
Park Place
Office E708
Leninsky Prospect 113
Russia 11798
Telephone: (7-502) 256-5122 or 256-5123

Countries Covered:

| | |
|---|---|
| Armenia | Lithuania |
| Azerbaijan | Moldova |
| Bolarus | Russia |
| Estonia | Tadzhikstan |
| Georgia | Turkmenistan |
| Kirghizia | Ukraina |
| Latvia | Uzbekistan |

## South And East Asia Area Office - Singapore

Cummins Diesel Sales Corporation
8 Tanjong Penjuru
Jurong Industrial Estate
Singapore 2260
Telephone: (65) 265-0155

Countries Covered:

| | |
|---|---|
| Bangladesh | Malaysia |
| Brunei | Mongolia |
| Burma/Mynamar | Philippines |
| Cambodia | Singapore |
| China | Sri Lanka |
| Hong Kong | Taiwan |
| Indonesia | Thailand |
| Laos | Vietnam |
| Macau | |

## Taipei Regional Office - Taiwan

Cummins Corporation - Taiwan
12th Floor, No. 149
Min-Sheng E. Road
Section 2
Taipei, Taiwan
R.O.C. 104
Telephone: (886-2) 515-0891

Country Covered: Taiwan

## Turkey and Iran Regional Office - Turkey

Cummins Corporation
Istanbul Office
Buyukdere Cad.
Beytem Han, Kat 11
Sisli 80220
Istanbul
Telephone: (90-1) 246-2575/2775/2545

Countries Covered:
Iran
Turkey

## Middle East Regional Office - Daventry (U.K.)

Cummins Engine Company Ltd.
Royal Oak Way South
Daventry, Northants NN11 5NU
England
Telephone: (44-1327) 76000

Countries Covered:

MIDEAST

| | | |
|---|---|---|
| Afghanistan | Jordan | Saudi Arabia |
| Bahrain | Kuwair | Sudan |
| Cyprus | Lebanon | Syria |
| Djibouti | Oman | U.A.E. |
| Egypt | Pakistan | Yemen |
| Iraq | Qatar | |

## Africa Regional Office - Daventry (U.K.)

Cummins Engine Company Ltd.
Royal Oak Way South
Daventry, Northants NN11 5NU
England
Telephone: (44-1327) 76000

Countries Covered:

NORTH/WEST AFRICA

| | | |
|---|---|---|
| Benin | Gabon | Mauritania |
| Burkina-Paso | Gambia | Morocco |
| Cameroon | Ghana | Niger |
| Cape Verde | Guinea | Nigeria |
| Central African Republic | Guinea-Bissau | Sao Tome & Principe |
| Chad | Liberia | Senegal |
| Cote d'Ivoire | Libya | Siera Leone |
| Equatorial Guinea | Mali | Togo |
| | Malta | Tunisia |

SOUTH AFRICA

| | | |
|---|---|---|
| Botswana | Namibia | Swaziland |
| Lesotho | South Africa | |

## New Malden Regional Office - U.K.

Cummins Engine Company Limited
46-50 Coombe Road
New Malden
Surrey KT3 4QL
England
Telephone: (44-81) 949-6171

Countries Covered:
Ireland
United Kingdom

## Latin America Regional Office - Miramar (U.S.A.)

Cummins Americas, Inc.
Miramar Park of Commerce
3450 Executive Way
Miramar, FL 33025
Telephone: (305) 431-5511

Countries Covered:

| | |
|---|---|
| Argentina | Guatemala |
| Bolivia | Honduras |
| Chile | Nicaragua |
| Colombia | Panama |
| Costa Rica | Paraguay |
| Dominican Republic | Peru |
| El Salvador | Uruguay |
| Eucador | Venezuela |

## Caracas Regional Office - Venezuela

Cummins Engine Company
Oficina de Delegado
Torre La Primera, Oficina 5-D
Av. Francisco de Miranda
Chacao, Caracas 1060

Mailing Address:
Cummins Engine Company M-227
c/o Jet Cargo International
P.O. Box 020010
Miami, FL 33102-0010 U.S.A.
Telephone: (58-2) 32-0563, 32-718

Counties Covered:

| | |
|---|---|
| Costa Rica | Honduras |
| Dominican Republic | Nicaragua |
| El Salvador | Panama |
| Guatemala | Venezuela |

## East/Southern Africa Regional Office - Harare, Zimbabwe

Cummins Zimbabwe (Private) Limited
72 Birmingham Road
Southerton
Harare, Zimbabwe

Mailing Address:
P.O. Box ST363
Southerton
Harare, Zimbabwe
Telephone: (263-4) 67645, 60553, 69220

Countries Covered:

| | |
|---|---|
| Angola | Reunion |
| Burundi | Rwanda |
| Comoros Island | Seychelles |
| Congo | Somalia |
| Ethiopia | Tanzania |
| Kenya | Uganda |
| Madagascar | Zaire |
| Malawi | Zambia |
| Mauritius | Zimbabwe |
| Mozambique | |

# Distributors and Branches - United States

## Alabama

### Birmingham Distributor
Cummins Alabama, Inc.
2200 Pinson Highway
P.O. Box 1147
Birmingham, AL 35201
Telephone: (205) 841-0421
FAX: (205) 849–5926

### Mobile Branch
Cummins Alabama, Inc.
1924 N. Beltline Hwy.
Mobile, AL 36601–1598
Telephone: (334) 456-2236
FAX: (334) 452–6419

### Mobile Onan/Marine Branch
Cummins Alabama, Inc.
3422 Georgia Pacific Avenue
Mobile, AL 36617
Telephone: (334) 452-6426
FAX: (334) 473-6657

### Montgomery Branch
Cummins Alabama, Inc.
2325 West Fairview Avenue
Montgomery, AL 36108
Telephone: (205) 263-2594
FAX: (205) 263–2594

## Alaska

### Anchorage - (Branch of Seattle)
Cummins Northwest, Inc.
2618 Commercial Drive
Anchorage, AK 99501-3095
Telephone: (907) 279-7594
FAX: (907) 276-6340

## Arizona

### Phoenix Distributor and Branch
Cummins Southwest, Inc.
2239 N. Black Canyon Hgwy
Phoenix, AZ 85009
Telephone: (602) 252-8021
FAX: (602) 253–6725

### Tucson Branch
Cummins Southwest, Inc.
1912 West Prince Road
Tucson, AZ 85705
Telephone: (520) 887-7440
FAX: (520) 887–4173

## Arkansas

### Little Rock - (Branch of Memphis)
Cummins Mid-South, Inc.
6600 Interstate 30
Little Rock, AR 72209
Telephone:
Sales: (501) 569-5600
Service: (501) 569–5656
Parts: (501) 569–5613
FAX: (501) 565–2199

## California

### San Leandro Distributor
Cummins West, Inc.
14775 Wicks Blvd.
San Leandro, CA 94577–6779
Telephone: (510) 351-6101
FAX: (510) 352–3925

### Arcata Branch
Cummins West, Inc.
4801 West End Road
Arcata, CA 95521
Telephone: (707) 822–7392
FAX: (707) 822–7585

### Bakersfield Branch
Cummins West, Inc.
4601 East Brundage Lane
Bakersfield, CA 93307
Telephone: (805) 325-9404
FAX: (805) 861–8719

### Fresno Branch
Cummins West, Inc.
2740 Church Avenue
Fresno, CA 93706
Telephone: (209) 495–4745
FAX: (209) 486–7402

### Redding Branch
Cummins West, Inc.
20247 Charlanne Drive
Redding, CA 96001
Telephone: (916) 222–4070
FAX: (916) 224–4075

### Stockton Branch
Cummins West, Inc.
41 West Yokuts Avenue
Suite 131
Stockton, CA 95207
Telephone: (209) 473–0386
FAX: (209) 478–2454

### West Sacramento Branch
Cummins West, Inc.
2661 Evergreen Avenue
West Sacramento, CA 95691
Telephone: (916) 371-0630
FAX: (916) 371–2849

### Los Angeles Distributor
Cummins Cal Pacific Inc.
1939 Deere Avenue (Irvine)
Irvine, CA 92606
Telephone: (949) 253–6000
FAX: (949) 253–6080

### Montebello Branch
Cummins Cal Pacific Inc.
1105 South Greenwood Avenue
Montebello, CA 90640
Telephone: (323) 728–8111
FAX: (323) 889–7422

### Bloomington Branch
Cummins Cal Pacific Inc.
3061 S. Riverside Avenue
Bloomington, CA 92377
Telephone: (909) 877-0433
FAX: (909) 877-3787

### San Diego Branch
Cummins Cal Pacific Inc.
310 N. Johnson Avenue
El Cajon, CA 92020
Telephone: (619) 593-3093
FAX: (619) 593–0600

### Ventura Branch
Cummins Cal-Pacific Inc.
3958 Transport St.
Ventura, CA 93003
Telephone: (805) 644–7281
FAX: (805) 644–7284

## Colorado

### Denver Distributor
Cummins Rocky Mountain, Inc.
5100 East 58th Avenue
Commerce City, CO 80022
Telephone: (303) 287-0201
FAX: (303) 288–7080

### Denver Onan/Industrial Branch
Cummins Rocky Mountain, Inc.
5100 East 58th Ave.
Commerce City, CO 80022
Telephone: (303) 286-7697
FAX: (303) 287–4837

### Durango Branch
Cummins Rocky Mountain, Inc.
13595 County Road 213
Durango, CO 81301
Telephone: (970) 259–7470
FAX: (970) 259–7482

### Grand Junction Branch
Cummins Rocky Mountain, Inc.
2380 U.S. Highway 6 & 50
P.O. Box 339
Grand Junction, CO 81501
Telephone: (303) 242-5776
FAX: (303) 243–5495

## Connecticut

### Rocky Hill - (Branch of Bronx)
Cummins Metropower, Inc.
914 Cromwell Ave.
Rocky Hill, CT 06067
Telephone: (860) 529–7474
FAX: (860) 529–7524

## Florida

### Tampa Distributor
Cummins Southeastern Power, Inc.
Corporate Office
5421 N. 59th Street
Tampa, FL 33610
Telephone: (813) 621-7202
FAX: (813) 621–8250

### Ft. Myers Branch
Cummins Southeastern Power, Inc.
2671 Edison Avenue
Ft. Myers, FL 33902
Telephone: (941) 337–1211
FAX: (941) 337-5374

### Jacksonville Branch
Cummins Southeastern Power, Inc.
755 Pickettville Rd.
Jacksonville, FL 32220
Telephone: (904) 378-1902
FAX: (904) 378–1904

### Hialeah (Miami) Branch
Cummins Southeastern Power, Inc.
9900 N.W. 77th Avenue
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200
FAX: (305) 557-2992

### Ocala Branch
Cummins Southeastern Power
321 Southwest 52nd Ave.
Ocala, FL 34474–1892
Telephone: (352) 861–1122
FAX: (352) 861–1130

### Orlando Branch
Cummins Southeastern Power, Inc.
4020 North
Orange Blossom Trail
Orlando, FL 32810
Telephone: (407) 298-2080
FAX: (407) 290-8727

### Tampa Branch
Cummins Southeastern Power, Inc.
5912 E. Hillsborough Avenue
Tampa, FL 33610
Telephone: (813) 626-1101
FAX: (813) 628–4183

## Georgia

### Atlanta Distributor
Cummins South, Inc.
5125 Georgia Highway 85
College Park, GA 30349
Telephone: (404) 763-0151
FAX: (404) 766–2132

### Albany Branch
Cummins South, Inc.
1915 W. Oakridge Drive
Albany, GA 31707–4938
Telephone: (912) 888-6210
FAX: (912) 883–1670

### Atlanta Branch
Cummins South, Inc.
100 University Avenue, S.W.
Atlanta, GA 30315-2202
Telephone: (404) 527-7800
FAX: (404) 527–7832

### Augusta Branch
Cummins South, Inc.
1255 New Savannah Road
Augusta, GA 30901-3891
Telephone: (706) 722-8825
FAX: (706) 722–7553

### Savannah Branch
Cummins South, Inc.
8 Interchange Court
Savannah, GA 31401–1627
Telephone: (912) 232-5565
FAX: (912) 232–5145

## Hawaii

### Kapolei Distributor
Cummins Hawaii Diesel Power, Inc.
91–230 Kalaeloa Blvd.
Kapolei, HI 96707
Telephone: (808) 682–8110
FAX: (808) 682–8477

## Idaho

### Boise - (Branch of Salt Lake City)
Cummins Intermountain, Inc.
2851 Federal Way City
Boise, ID 83705
Telephone: (208) 336-5000
FAX: (208) 338-5436

### Pocatello - (Branch of Salt Lake City)
Cummins Intermountain, Inc.
14299 Highway 30 West
Pocatello, ID 83201
Telephone: (208) 234-1661
FAX: (208) 234–1662

## Illinois

### Chicago Distributor
Cummins Northern Illinois, Inc.
7145 Santa Fe Drive
Hodgkins, IL 60525
Telephone: (708) 579-9222
FAX: (708) 352-7547

### Bloomington-Normal – (Branch of Indianapolis)
Cummins Mid-States Power, Inc.
(at U.S. 51 N and I-55)
414 W. Northtown Road
Bloomington-Normal, IL 61761
Telephone: (309) 452-4454
FAX: (309) 452–1642

### Onan Branch
Cummins/Onan Northern Illinois
8745 W. 82nd Place
Justin, IL 60458
Telephone: (708) 563–7070
FAX: (708) 563–7095

### Harrisburg (Branch of St. Louis)
Cummins Gateway, Inc.
Highway 45 North
Harrisburg, IL 62946
Telephone: (618) 273-4138
FAX: (618) 273–4531

### Rock Island - (Branch of Omaha)
Cummins Great Plains Diesel, Inc.
7820 - 42nd Street West
Rock Island, IL 61204
Telephone: (309) 787-4300
FAX: (309) 787–4397

### Onan Branch
Cummins Gateway, Inc.
#1 Extra Mile Drive
Collinsville, IL 62234
Telephone: (618) 345–0123
FAX: (314) 531–6604

## Indiana

### Indianapolis Distributor
Cummins Mid-States Power, Inc.
P.O. Box 42917
3762 West Morris Street
Indianapolis, IN 46242-0917
Telephone: (317) 243-7979
FAX: (317) 240–1925

### Evansville - (Branch of Louisville)
Cummins Cumberland, Inc.
7901 Highway 41 North
Evansville, IN 47711
Telephone: (812) 867-4400
FAX: (812) 421–3282

### Ft. Wayne Branch
Cummins Mid-States Power, Inc.
3415 Coliseum Blvd. West
(At Jct. I-69 & 30/33)
Ft. Wayne, IN 46808
Telephone: (219) 482-3691
FAX: (219) 484–8930

### Gary - (Branch of Chicago)
Cummins Northern Illinois, Inc.
1440 Texas Street
Gary, IN 46402
Telephone: (219) 885-5591
FAX: (219) 883-4817

### Indianapolis Branch
Cummins Mid-States Power, Inc.
P. O. Box 42917
3621 West Morris Street
Indianapolis, IN 46242-0917
Telephone: (317) 244-7251
FAX: (317) 240–1215

### Onan Branch
Mid-States Power, Inc.
4301 W. Morris Street
P.O. Box 42917
Indianapolis, IN 46240–0917
Telephone: (317) 240–1967
FAX: (317) 240–1975

## Iowa

**Cedar Rapids - (Branch of Omaha)**
Cummins Great Plains Diesel, Inc.
625 - 33rd Avenue SW
Cedar Rapids, IA 52406
Telephone: (319) 366-7537 (24 hours)
FAX: (319) 366–7562

**Des Moines - (Branch of Omaha)**
Cummins Great Plains Diesel, Inc.
1680 N.E. 51st Avenue
P.O. Box B
Des Moines, IA 50313
Telephone: (515) 262-9591
Parts: (515) 262-9744
FAX: (515) 262–0626

**Des Moines - (Branch of Omaha)**
Midwestern Power Products
Division of Cummins Great Plains Diesel, Inc.
5194 N.E. 17th Street
Des Moines, IA 50313
Telephone: (515) 264-1650
FAX: (515) 264-1651

## Kansas

**Colby - (Branch of Kansas City, Missouri)**
Cummins Mid-America, LLC.
1880 South Range
Colby, KS 67701
Telephone: (785) 462-3945
FAX: (785) 462-3970

**Garden City - (Branch of Kansas City, Missouri)**
Cummins Mid-America, Inc.
1285 Acraway
Garden City, KS 67846
Telephone: (316) 275-2277
FAX: (316) 275–2533

**Wichita - (Branch of Kansas City, Missouri)**
Cummins Mid-America, Inc.
5101 North Broadway
Wichita, KS 67201
Telephone: (316) 838-0875
FAX: (316) 838–0704

## Kentucky

**Louisville Distributor**
Cummins Cumberland, Inc.
(Corporate Office)
2301 Nelsonville Parkway
Louisville, KY 40223
Telephone: (502) 254-3363
FAX: (502) 254–9272

**Hazard Branch**
Cummins Cumberland, Inc.
Highway 15 South
P.O. Box 510
Hazard, KY 41701
Telephone: (606) 436-5718
FAX: (606) 436–5038

**Louisville Branch**
Cummins Cumberland, Inc.
9820 Bluegrass Parkway
Louisville, KY 40299
Telephone: (502) 491-4263
FAX: (502) 499–0896

## Louisiana

**Morgan City - (Branch of Memphis)**
Cummins Mid-South, Inc.
Hwy. 90 East
P.O. Box 1229
Amelia, LA 70340
Telephone: (504) 631-0576
FAX: (504) 631–0081

**New Orleans - (Branch of Memphis)**
Cummins Mid-South, Inc.
110 E. Airline Highway
Kenner, LA 70062
Telephone: (504) 468-3535
FAX: (504) 465–3408

## Maine

**Bangor (Branch of Boston)**
Cummins Northeast, Inc.
221 Hammond Street
Bangor, ME 04401
Telephone: (207) 941-1061
FAX: (207) 945–3170

**Scarborough - (Branch of Boston)**
Cummins Northeast, Inc.
10 Gibson Road
Scarborough, ME 04074
Telephone: (207) 883-8155
FAX: (207) 883–5526

## Maryland

**Baltimore Distributor**
Cummins Power Systems, Inc.
1907 Parkwood Drive
MD 21061
Telephone: (410) 590–8700
FAX: (410) 590–8723

## Massachusetts

**Boston Distributor**
Cummins Northeast, Inc.
100 Allied Drive
Dedham, MA 02026
Telephone: (781) 329-1750
FAX: (781) 329–4428

**Springfield Branch**
Cummins Northeast, Inc.
177 Rocus Street
Springfield, MA 01104
Telephone: (413) 737-2659
FAX: (413) 731–1082

## Mexico

**Tijuana - (Branch of Los Angeles)**
Distribuidora Cummins De Baja
Blvd. 3ra. Oeste No. 17523
Fracc. Industrial
Garita de Otay C.P. 22400
Tijuana, Baja California
Mexico
Telephone: 011–52–66–238433
FAX: 011–52–66–238649

## Michigan

**Detroit (Novi) Distributor**
Cummins Michigan, Inc.
41216 Vincenti Court
Novi, MI 48375
Telephone: (248) 478-9700
FAX: (248) 478-1570

**Blissfield, Michigan**
Diesel Fuel Systems, Inc.
Subsidiary of Cummins Michigan Inc.
211 N. Jipson Street
Blissfield, MI 49228
Telephone: (517) 486-4324
FAX: (517) 486-3614

**Dearborn Branch**
Cummins Michigan, Inc.
3760 Wyoming Avenue
Dearborn, MI 48120
Telephone: (313) 843-6200
FAX: (313) 843-6070

**Grand Rapids Branch**
Cummins Michigan, Inc.
3715 Clay Avenue, S.W.
Grand Rapids, MI 49508
Telephone: (616) 538-2250
FAX: (616) 538-3830

**Grand Rapids Branch**
Standby Power, Inc.
7580 Expressway Drive S.W.
Grand Rapids, MI 49548
Telephone: (616) 281-2211
FAX: (616) 281-3177

**Iron Mountain - (Branch of De Pere)**
Cummins Great Lakes, Inc.
1901 Stevenson Avenue
Iron Mountain, MI 49801
Telephone: (906) 774-2424
(800) 236-2424
FAX: (906) 774-1190

**Novi Branch**
Cummins Michigan, Inc.
25100 Novi Road
Novi, MI 48375
Telephone: (248) 380-4300
FAX: (248) 380-0910

**Power Products (Branch of Detroit)**
Cummins Michigan, Inc.
41326 Vincenti Ct.
Novi, MI 48375
Telephone: (248) 426-9300
FAX: (248) 473-8560

### Saginaw Branch
Cummins Michigan, Inc.
722 N. Outer Drive
Saginaw, MI 48605
Telephone: (517) 752-5200
FAX: (517) 752-4194

### Standby Power - (Branch of Detroit)
Cummins Michigan, Inc.
12130 Dixie
Redford, MI 48239
Telephone: (313) 538-0200
FAX: (313) 538-3966

## Minnesota

### St. Paul Distributor
Cummins North Central, Inc.
3030 Centre Pointe Drive
Suite 500
Roseville, MN 55113
Telephone: (651) 636-1000
FAX: (651) 638-2442

### Duluth Branch
Cummins Diesel Sales, Inc.
3115 Truck Center Drive
Duluth, MN 55806–1786
Telephone: (218) 628-3641
FAX: (218) 628–0488

### St. Paul Branch
Cummins North Central, Inc.
2690 Cleveland Ave. North
St. Paul, MN 55113
Telephone: (651) 636-1000
FAX: (651) 638-2497

## Mississippi

### Jackson - (Branch of Memphis)
Cummins Mid-South, Inc.
325 New Highway 49 South
Jackson, MS 39288-4224
Telephone:
Admin.: (601) 932-7016
Parts: (601) 932-2720
Service: (601) 939-1800
FAX: (601) 932–7399

## Missouri

### Kansas City Distributor and Branch
Cummins Mid-America, Inc.
8201 NE Parvin Road
Kansas City, MO 64161
Telephone: (816) 414–8200
FAX: (816) 414–8299

### Joplin Branch
Cummins Mid-America, Inc.
3507 East 20th Street
Joplin, MO 64801
Telephone: (417) 623-1661
FAX: (417) 623–1817

### Springfield Branch
Cummins Mid-America, Inc.
3637 East Kearney
Springfield, MO 65803
Telephone: (417) 862-0777
FAX: (417) 862-4429

### St. Louis Distributor
Cummins Gateway, Inc.
7210 Hall Street
St. Louis, MO 63147
Telephone: (314) 389-5400
FAX: (314) 389–9671

### Columbia Branch
Cummins Gateway, Inc.
5221 Highway 763 North
Columbia, MO 65202
Telephone: (314) 449-3711
FAX: (314) 449–3712

### Sikeston Branch
Cummins Gateway, Inc.
101 Keystone Drive
Sikeston, MO 63801
Telephone: (314) 472-0303
FAX: (314) 472–0306

### Industrial Power Branch
Cummins Gateway, Inc.
3256 E. Outer Road
Scott City, MO 63788
Telephone: (573) 335-9399
FAX: (573) 335-7062

## Montana

### Billings - (Branch of Denver)
Cummins Rocky Mountain, Inc.
5151 Midland Road
Billings, MT 59101
Telephone: (406) 245-4194
FAX: (406) 245–7923

### Great Falls - (Branch of Denver)
Cummins Rocky Mountain, Inc.
415 Vaughn Road
Great Falls, MT 59404
Telephone: (406) 452-8561
FAX: (406) 452–9911

### Missoula - (Branch of Seattle)
Cummins Northwest, Inc.
4950 North Reserve Street
Missoula, MT 59802-1498
Telephone: (406) 728-1300
FAX: (406) 728-8523

## Nebraska

### Omaha Distributor and Branch
Cummins Great Plains Diesel, Inc.
5515 Center Street
P.O. Box 6068
Omaha, NE 68106
Telephone: (402) 551-7678 (24 Hours)
FAX: (402) 551–1952

### Kearney Branch
Cummins Great Plains Diesel, Inc.
515 Central Avenue
Kearney, NE 68847
Telephone: (308) 234-1994
FAX: (308) 234–5776

## Nevada

### Elko - (Branch of Salt Lake City)
Cummins Intermountain, Inc.
5370 East Idaho Street
Elko, NV 89801
Telephone: (775) 738-6405
FAX: (775) 738–1719

### Las Vegas - (Branch of Salt Lake City)
Cummins Intermountain, Inc.
2750 Losee Road
North Las Vegas, NV 89030
Telephone: (702) 399-2339
FAX: (702) 399–7457

### Sparks - (Branch of Salt Lake City)
Cummins Intermountain, Inc.
150 Glendale Avenue
Sparks, NV 89431
Telephone: (775) 331-4983
FAX: (775) 331–7429

## New Jersey

### Newark - (Branch of Bronx)
Cummins Metropower, Inc.
41-85 Doremus Ave.
Newark, NJ 07105
Telephone: (973) 491–0100
FAX: (973) 578–8873

## New Mexico

### Albuquerque - (Branch of Phoenix)
Cummins Southwest, Inc.
1921 Broadway N.E.
Albuquerque, NM 87102
Telephone: (505) 247-2441
FAX: (505) 842–0436

### Farmington - (Branch of Phoenix)
Cummins Southwest, Inc.
1101 North Troy King Road
Farmington, NM 87401
Telephone: (505) 327-7331
FAX: (505) 326–2948

## New York

### Bronx Distributor
Cummins Metropower, Inc.
890 Zerega Avenue
Bronx, NY 10473
Telephone: (718) 892-2400
FAX: (718) 892–0055

### Albany - (Branch of Boston)
Cummins Northeast, Inc.
101 Railroad Avenue
Albany, NY 12205
Telephone: (518) 459-1710
FAX: (518) 459–7815

### Buffalo - (Branch of Boston)
Cummins Northeast, Inc.
480 Lawrence Bell Dr.
Williamsville, NY 14221-7090
Telephone: (716) 631-3211
FAX: (716) 626–0799

**Syracuse - (Branch of Boston)**
Cummins Northeast, Inc.
29 Eastern Avenue
Syracuse, NY 13211
Telephone: (315) 437-2751
FAX: (315) 437-8141

## North Carolina

**Charlotte Distributor**
Cummins Atlantic, Inc.
11101 Nations Ford Road (28273)
P.O. Box 240729
Charlotte, NC 28224-0729
Telephone: (704) 588-1240
FAX: (704) 587-4870

**Charlotte Branch**
Cummins Atlantic, Inc.
3700 North Interstate 85
Charlotte, NC 28206
Telephone: (704) 596-7690
FAX: (704) 596–3038

**Greensboro Branch**
Cummins Atlantic, Inc.
513 Preddy Boulevard (27406)
P.O. Box 22066
Greensboro, NC 27420-2066
Telephone: (336) 275-4531
FAX: (336) 275–8304

**Wilson Branch**
Cummins Atlantic, Inc.
1514 Cargill Avenue (27893)
P.O. Box 1177
Wilson, NC 27894-1117
Telephone: (252) 237-9111
FAX: (252) 237–9132

## North Dakota

**Fargo - (Branch of St. Paul)**
Cummins North Central, Inc.
3801 - 34th Ave. SW
Fargo, ND 58104
Telephone: (701) 282-2466
FAX: (701) 277–5399

**Grand Forks - (Branch of St. Paul)**
Cummins North Central, Inc.
4728 Gateway Drive
Grand Forks, ND 58201
Telephone: (701) 775-8197
FAX: (701) 775–4833

**Minot - (Branch of St. Paul)**
Cummins North Central, Inc.
1501 - 20th Avenue, S.E.
Minot, ND 58702
Telephone: (701) 852-3585
FAX: (701) 852–3588

## Ohio

**Columbus Distributor and Branch**
Cummins Interstate Power, Inc.
4000 Lyman Drive
Hilliard (Columbus), OH 43026
Telephone: (614) 771-1000
FAX: (614) 771–0769

**Columbus Distributor**
Cummins Interstate Power, Inc.
2297 Southwest Bldv., Suite K
Grove City, OH 43123
Telephone: (614) 771-1000
FAX: (614) 527-2576

**Cincinnati Branch**
Cummins Interstate Power, Inc.
10470 Evendale Drive
Cincinnati, OH 45241
Telephone: (513) 563-6670
FAX: (513) 563–0594

**Cleveland Branch**
Cummins Interstate Power, Inc.
7585 Northfield Road
Cleveland, OH 44146
Telephone: (440) 439-6800
FAX: (440) 439–7390

**Strasburg Branch**
Cummins Interstate Power, Inc.
777 South Wooster Avenue
Strasburg, OH 44680
Telephone: (216) 878-5511
FAX: (216) 878–7666

**Toledo Branch**
Cummins Interstate Power, Inc.
801 Illinois Avenue
Maumee
(Toledo), OH 43537
Telephone: (419) 893-8711
FAX: (419) 893–5362

**Youngstown Branch**
Cummins Interstate Power, Inc.
7145 Masury Road
Hubbard
(Youngstown), OH 44425
Telephone: (216) 534-1935
FAX: (216) 534–5606

## Oklahoma

**Oklahoma City - (Branch of Arlington)**
Cummins Southern Plains, Inc.
5800 West Reno
Oklahoma City, OK 73127
Telephone: (405) 946-4481 (24 hours)
FAX: (405) 946–3336

**Tulsa - (Branch of Arlington)**
Cummins Southern Plains, Inc.
16525 East Skelly Drive
Tulsa, OK 74116
Telephone: (918) 234–3240
FAX: (918) 234–2342

## Oregon

**Bend - (Branch of Seattle)**
Cummins Northwest, Inc.
3500 N. Highway 97 (97701-5729)
P.O. Box 309
Bend, OR 97709-0309
Telephone: (541) 389-1900
FAX: (541) 389–1909

**Coburg/Eugene - (Branch of Seattle)**
Cummins Northwest, Inc.
91201 Industrial Parkway
Coburg, OR 97401
(Mailing Address)
P.O. Box 10877
Eugene, OR 97440-2887
Telephone: (541) 687-0000
FAX: (541) 687–1977

**Medford - (Branch of Seattle)**
Cummins Northwest, Inc.
4045 Crater Lake Highway
Medford, OR 97504-9796
Telephone: (541) 779-0151
FAX: (541) 772–2395

**Pendleton - (Branch of Seattle)**
Cummins Northwest, Inc.
223 S.W. 23rd Street
Pendleton, OR 97801-1810
Telephone: (541) 276-2561
FAX: (541) 276-2564

**Portland - (Branch of Seattle)**
Cummins Northwest, Inc.
4711 N. Basin Avenue
P. O. Box 2710 (97208-2710)
Portland, OR 97217-3557
Telephone: (503) 289-0900
FAX: (503) 286-5938

## Pennsylvania

**Philadelphia Distributor**
Cummins Power Systems, Inc.
2727 Ford Road
Bristol, PA 19007
Telephone: (215) 785-6005 and
(609) 563–0005
FAX: (215) 785-4085

**Bristol Branch**
Cummins Power Systems, Inc.
2727 Ford Road
Bristol, PA 19007
Telephone: (215) 785-6005 and
(609) 563–0005
FAX: (215) 785–4728

**Pittsburgh Branch**
Cummins Power Systems, Inc.
3 Alpha Drive
Pittsburgh, PA 15238–2901
Telephone: (412) 820–8300
FAX: (412) 820–8308

**Harrisburg Branch**
Cummins Power Systems, Inc.
4499 Lewis Road
Harrisburg, PA 17111-2541
Telephone: (717) 564-1344
FAX: (717) 558-8217

## Puerto Rico

### Puerto Nuevo - (Branch of Tampa)
Cummins Diesel Power, Inc.
#31 Calle "C"
El Matadero
Puerto Nuevo, Puerto Rico 00920
Telephone: (787) 793–0300
FAX: (787) 793–1072

## South Carolina

### Charleston - (Branch of Charlotte)
Cummins Atlantic, Inc.
3028 West Montague Avenue
Charleston, SC 29418–5593
Telephone: (843) 554-5112
FAX: (843) 745–0745

### Charleston - (Branch of Charlotte)
Cummins Atlantic Inc.
231 Farmington Road
Charleston, SC 29483
Telephone: (843) 851-9819
FAX: (843) 875–4338

### Columbia - (Branch of Charlotte)
Cummins Atlantic, Inc.
1233 Bluff Road (29201)
P.O. Box 13543
Columbia, SC 29201–3543
Telephone: (803) 799-2410
FAX: (803) 779–3427

## South Dakota

### Sioux Falls - (Branch of Omaha)
Cummins Great Plains Diesel, Inc.
701 East 54th Street North
Sioux Falls, SD 57104
Telephone: (605) 336-1715
FAX: (605) 336–1748

## Tennessee

### Memphis Distributor & Distribution Center
Cummins Mid-South, Inc.
666 Riverside Drive
Memphis, TN 38703
Telephone: (901) 577-0666
FAX: (901) 522–8758

### Chattanooga - (Branch of Atlanta)
Cummins South, Inc.
1509 East 26th Street
Chattanooga, TN 37407-1095
Telephone: (615) 629-1447
FAX: (615) 629–1494

### Knoxville - (Branch of Louisville)
Cummins Cumberland, Inc.
1211 Ault Road
Knoxville, TN 37914
Telephone: (423) 523-0446
FAX: (423) 523-0343

### Memphis Branch
Cummins Mid-South, Inc.
1784 E. Brooks Road
Memphis, TN 38116
Telephone:
Sales/Admin.: (901) 345-7424
Parts: (901) 345-1784
Service: (901) 345-6185
FAX: (901) 346–4735

### Nashville - (Branch of Louisville)
Cummins Cumberland, Inc.
706 Spence Lane
Nashville, TN 37217
Telephone: (615) 366-4341
FAX: (615) 366–5693

## Texas

### Arlington Distributor
Cummins Southern Plains, Inc.
600 N Watson Road
Arlington, TX 76004-3027
Telephone: (817) 640-6801
FAX: (817) 640-6852

### Amarillo Branch
Cummins Southern Plains, Inc.
5224 Interstate 40 -
Expressway East
P.O. Box 31570
Amarillo, TX 79120-1570
Telephone: (806) 373-3793 (24 hours)
FAX: (806) 372–8547

### Dallas Branch
Cummins Southern Plains, Inc.
3707 Irving Boulevard
Dallas, TX 75247
Telephone: (214) 631-6400 (24 hours)
FAX: (214) 631–2322

### El Paso - (Branch of Phoenix)
Cummins Southwest, Inc.
14333 Gateway West
El Paso, TX 79927
Telephone: (915) 852-4200
FAX: (915) 852-3295

### Fort Worth Branch
Cummins Southern Plains, Inc.
3250 North Freeway
Fort Worth, TX 76111
Telephone: (817) 624-2107 (24 hours)
FAX: (817) 624–3296

### Houston Branch
Cummins Southern Plains, Inc.
4750 Homestead Road
P.O. Box 1367
Houston, TX 77251-1367
Telephone: (713) 675-7421 (24 hours)
FAX: (713) 675–1515

### Mesquite Branch
Cummins Southern Plains, Inc.
2615 Big Town Blvd.
Mesquite, TX 75150
Telephone: (214) 321-5555 (24 hours)
FAX: (214) 328–2732

### Odessa Branch
Cummins Southern Plains, Inc.
1210 South Grandview
P.O. Box 633
Odessa, TX 79760-0633
Telephone: (915) 332-9121 (24 hours)
FAX: (915) 333–4655

### San Antonio Branch
Cummins Southern Plains, Inc.
6226 Pan Am Expressway North
P.O. Box 18385
San Antonio, TX 78218–0385
Telephone: (512) 655-5420 (24 hours)
FAX: (512) 655–3865

### Houston Onan Branch
Southern Plains Power
A Division of Cummins Southern Plains
1155 West Loop North
Houston, TX 77055
Telephone: (713) 956-0020
FAX: (713) 956-0266

## Utah

### Salt Lake City Distributor
Cummins Intermountain, Inc.
1030 South 300 West
Salt Lake City, UT 84101
Telephone: (801) 355-6500
FAX: (801) 524–1351

### Vernal Branch
Cummins Intermountain, Inc.
1435 East 335 South
Vernal, UT 84078
Telephone: (435) 789-5732
FAX: (435) 789-2853

## Virginia

### Cloverdale - (Branch of Charlotte)
Cummins Atlantic, Inc.
263 Simmons Drive
Cloverdale, VA 24077
Telephone: (540) 966-3169
FAX: (540) 966-3749

### Richmond - (Branch of Charlotte)
Cummins Atlantic, Inc.
3900 Deepwater Terminal Road
Richmond, VA 23234
Telephone: (804) 232-7891
FAX: (804) 232-7428

### Tidewater - (Branch of Charlotte)
Cummins Atlantic, Inc.
Atlantic Power Generation
3729 Holland Blvd.
Chesapeake, VA 23323
Telephone: (757) 485-4848
FAX: (757) 485-5085

## Washington

### Seattle Distributor
Cummins Northwest, Inc.
811 S.W. Grady Way (98055-2944)
P.O. Box 9811
Renton, WA 98057–9811
Telephone: (425) 235-3400
FAX: (425) 235–8202

### Chehalis Branch
Cummins Northwest, Inc.
926 N.W. Maryland
Chehalis, WA 98532-0339
Telephone: (360) 748-8841
FAX: (360) 748–8843

### Spokane Branch
Cummins Northwest, Inc.
11134 W. Westbow Blvd.
Spokane, WA 99204
Telephone: (509) 455–4411
FAX: (509) 624–4681

### Tacoma Branch
Cummins Northwest, Inc.
3701 Pacific Highway East
Tacoma, WA 98424-1135
Telephone: (253) 922-2191
FAX: (253) 922–2379

### Yakima Branch
Cummins Northwest, Inc.
1905 East Central Avenue (98901-3609)
P.O. Box 9129
Yakima, WA 98909-0129
Telephone: (509) 248-9033
FAX: (509) 248–9035

## West Virginia

### Charleston - (Branch of Louisville)
Cummins Cumberland, Inc.
3100 MacCorkle Ave. SW
P.O. Box 8456
South Charleston, WV 25303
Telephone: (304) 744-6373
FAX: (304) 744-8605

### Fairmont - (Branch of Louisville)
Cummins Cumberland, Inc.
South Fairmount Exit, I-79
145 Middletown Road
Fairmont, WV 26554
Telephone: (304) 367-0196
FAX: (304) 367–1077

## Wisconsin

### DePere Distributor
Cummins Great Lakes, Inc.
Corporate Office
875 Lawrence Drive
P.O. Box 5070
DePere, WI 54115–5070
Telephone: (920) 337-1991
FAX: (920) 337-9746

### Chippewa Falls Branch
Cummins Great Lakes, Inc.
2030 St. Highway 53
Chippewa Falls, WI 54729
Telephone: (715) 720-0680
FAX: (715) 720–0685

### DePere Branch
Cummins Great Lakes, Inc.
939 Lawrence Drive
P. O. Box 5070
DePere, WI 54115–5070
Telephone: (920) 336-9631
(800) 236–1191
FAX: (920) 336–8984

### Milwaukee Branch
Cummins Great Lakes, Inc.
9401 South 13th Street
P.O. Box D
Oak Creek, WI 53154
Telephone: (414) 768-7400
(800) 472-8283
FAX: (414) 768-9441

### Wausau Branch
Cummins Great Lakes, Inc.
4703 Rib Mountain Drive
Wausau, WI 54401
Telephone: (715) 359-6888
(800) 236-3744
FAX: (715) 359-3744

## Wyoming

### Gillette - (Branch of Denver)
Cummins Rocky Mountain, Inc.
2700 Hwy. 14 & 16 North
P.O. Box 1207 (82717)
Gillette, WY 82716
Telephone: (307) 682-9611
FAX: (307) 682–8242

### Rock Springs - (Branch of Salt Lake City)
Cummins Intermountain, Inc.
2000 Foothill Blvd.
P.O. Box 1634
Rock Springs, WY 82901
Telephone: (307) 362-5168
FAX: (307) 362–5171

# Distributors and Branches - Canada

## Alberta

### Edmonton Distributor and Branch
Cummins Alberta
11751 - 181 Street
Edmonton, AB T5S 2K5
Telephone: (780) 455-2151
FAX: (780) 454-9512

### Calgary Branch
Cummins Alberta
4887 - 35th Street S.E.
Calgary, Alberta T2B 3H6, Canada
Telephone: (403) 569-1122
FAX: (403) 569-0027

### Grande Prairie
Cummins Alberta - Grande Praire
RR2, Site 9, Box 22
Sexsmith, AB CN T0H 3C0
Telephone: (780) 568-3359
FAX: (780) 568-2263

### Hinton Branch
Cummins Alberta
135 Veats Avenue
Hinton, Alberta T7V 1S8, Canada
Telephone: (780) 865-5111
FAX: (780) 865-5714

### Lethbridge Branch
Cummins Alberta
240 - 24th Street North
Lethbridge, Alberta T1H 3T8, Canada
Telephone: (403) 329-6144
FAX: (403) 320-5383

## British Columbia

### Vancouver Distributor
Cummins British Columbia
18452 - 96th Avenue
Surrey, B.C., Canada
V4N 3P8
Telephone: (604) 882-5000
FAX: (604) 882-5080

### Kamloops Branch
Cummins British Columbia
976 Laval Crescent
Kamloops, B.C. Canada V2C 5P5
Telephone: (250) 828-2388
FAX: (250) 828-6713

### Prince George Branch
Cummins British Columbia
102- 3851- 18th Avenue
Prince George, B.C. V2N 1B1
Telephone: (250) 564-9111
FAX: (250) 564-5853

### Sparwood Branch
Cummins British Columbia
731 Douglas Fir Road
Sparwood, B.C. VOB 2GO, Canada
Telephone: (250) 425-0522
FAX: (250) 425–0323

### Tumbler Ridge Branch
Cummins British Columbia
Industrial Site, Box 226
Tumbler Ridge, B.C.
Canada VOC 2WO
Telephone: (250) 242-4217
FAX: (250) 242–4906

## Manitoba

### Winnipeg Distributor
Cummins Mid-Canada Ltd.
489 Oak Point Road
P.O. Box 1860
Winnipeg, MB R3C 3R1, Canada
Telephone: (204) 632-5470
FAX: (204) 697–0267

## New Brunswick

### Fredericton - (Branch of Montreal)
Cummins Eastern Canada, Inc.
R.R.#1 Doak Road
P.O. Box 1178, Station 'A'
Fredericton,
New Brunswick E3B 4X2, Canada
Telephone: (506) 451-1929
FAX: (506) 451-1921

## Newfoundland

### St. John's - (Branch of Montreal)
Cummins Eastern Canada, Inc.
122 Clyde Avenue
Donovans Industrial Park
Mount Pearl, Newfoundland A1N 2C2
Canada
Telephone: (709) 747-0176
FAX: (709) 747–2283

### Wabush - (Branch of Montreal)
Cummins Eastern Canada, Inc.
Wabush Industrial Park
Wabush, Newfoundland A0R 1B0
Telephone: (709) 282-3626
FAX: (709) 282–3108

## Nova Scotia

### Halifax - (Branch of Montreal)
Cummins Eastern Canada, Inc.
50 Simmonds Drive
Dartmouth, Nova Scotia B3B 1R3
Telephone: (902) 468-7938
FAX: (902) 468–5177
Parts: (902) 468–6560

## Ontario

### Toronto Distributor
Cummins Ontario, Inc.
7175 Pacific Circle
Mississauga, ON L5T 2A5
Telephone: (905) 795–0050
FAX: (905) 795–0021

### Kenora - (Branch of Winnipeg)
Cummins Mid-Canada Ltd.
Highway 17 East
P.O. Box 8
Kenora, Ontario P9N 3X1
Telephone: (807) 548–1941
FAX: (807) 548–8302

### Ottawa Branch
Cummins Ontario Inc.
3189 Swansea Crescent
Ottawa, Ontario K1G 3W5,
Telephone: (613) 736-1146
FAX: (613) 736-1202

### Thunder Bay Branch
Cummins Ontario Inc.
1400 W. Walsh Street
Thunder Bay
Ontario P7E 4X4
Telephone: (807) 577-7561
FAX: (807) 577–1727

### Whitby Branch
Cummins Ontario Inc.
1311 Hopkins Street
Whitby, Ontario L1N 2C2, Canada
Telephone: (905) 668-6886
FAX: (905) 668-1375

## Quebec

### Montreal Distributor
Cummins Eastern Canada, Inc.
7200 Trans Canada Highway
Pointe Claire, Quebec H9R 1C2,
Telephone: (514) 695-8410
FAX: (514) 695–8917

### Montreal Branch
Cummins Eastern Canada, Inc.
7200 Trans Canada Highway
Pointe Claire, Quebec H9R 1C2,
Canada
Telephone: (514) 695-8410
Sales: (514) 695-4555
Parts: (514) 694-5880
FAX: (514) 695–8917

### Dorval Onan Branch
Cummins, Eastern Canada, Inc.
580 Lepihe
Dorval, Quebec H9H 1G2
Telephone: (514) 631-5000
FAX: (514) 631-0104

### Quebec City Branch
Cummins Diesel
Branch of Cummins Americas, Inc.
2575 Dalton Street
Ste. Foy, Quebec G1P 3S7
Telephone: (418) 653-6411
FAX: (418) 653-5844

### Val D'Or Branch
Cummins, Eastern Canada, Inc.
1025 Rue Del
Val D'Or, Quebec 59P 4P6
Telephone: (819) 825-0993
FAX: (819) 825-8488

## Saskatchewan

### Lloydminster - (Branch of Winnipeg)
Cummins Mid-Canada Ltd.
4005 52nd
Lloydminster, SK S9V 0Y9
Telephone: (305) 825–2062
FAX: (305) 825–6702

### Regina - (Branch of Winnipeg)
Cummins Mid-Canada Ltd.
110 Kress Street
P.O. Box 98
Regina, SK S4P 2Z5
Telephone: (306) 721-9710
FAX: (306) 721–2962

### Saskatoon - (Branch of Winnipeg)
Cummins Mid-Canada, Ltd.
3001 Faithful Avenue
P.O. Box 7679
Saskatoon, SK S7K 4R4, Canada
Telephone: (306) 933-4022
FAX: (306) 242–1722

# Distributors and Branches - Australia

## Branches:

### Gepps Cross
Cummins Engine Company, Pty. Ltd.
P.O. Box 108
Blair Athol, 5084
South Australia, Australia
Location:
45-49 Cavan Road
Gepps Cross, 5094
Telephone: (61-8) 8262-5211

### Dosra
Cummins Engine Company, Pty. Ltd.
P.O. Box 124
Darra, 4076
Queensland, Australia
Location:
33 Kimberley Street
Darra, 4076, Australia
Telephone: (61-7) 3375-3277

### Bunbury
Cummins Engine Company, Pty. Ltd.
P.O. Box 1751
Bunbury, WA 6230
Australia
Location:
11 Dryanda Court
Picton, WA 6230
Telephone: (61-8) 9725-6777
FAX: (61-8) 9725-6444

### Cairns
Cummins Engine Company, Pty. Ltd.
P.O. Box 7189
Cairns Mail Centre, 4870
Queensland, Australia
Location:
Liberty Street
Cairns, 4870
Telephone: (61-7) 935-2999

### Campbellfield
Cummins Engine Company, Pty. Ltd.
Private Bag 9
Campbellfield, 3061
Victoria, Australia
Location:
1788-1800 Hume Highway
Campbellfield, 3061
Telephone: (613) 9357-9200

### Dandenong
Cummins Engine Company, Pty. Ltd.
Lot 7 Greens Road
Dandenong, 3175
Victoria, Australia
Telephone: (613) 9706-8088

### Darwin
Cummins Engine Company, Pty. Ltd.
P.O. Box 37587
Winnellie, 0821
Northern Territory, Australia
Location:
Lot 1758 Graffin Crescent
Winnellie, 0821
Telephone: (61-8) 8947-0766

### Devonport
Cummins Engine Company, Pty. Ltd.
P.O. Box 72E
Tasmania, Australia
Location:
2 Matthews Way
Devonport, 7310
Telephone: (61-3) 6424-8800

### Emerald
Cummins Engine Company, Pty. Ltd.
P.O. Box 668
Emerald, 4720
Queensland, Australia
Location:
Capricorn Highway
Emerald, 4720
Telephone: (61-7) 4982-4022

### Grafton
Cummins Engine Company, Pty. Ltd.
P.O. Box 18
South Grafton, 2461
New South Wales, Australia
Location:
18-20 Induna Street
South Grafton, 2461
Telephone: (61-2) 6642-3655

### Hexham
Cummins Engine Company, Pty. Ltd.
21 Galleghan Street
Hexham
New South Wales, Australia
Telephone: (61-2) 4964-8466
FAX: (61-2) 4964-8616

### Kalgoorlie
Cummins Engine Company, Pty. Ltd.
P.O. Box 706
Kalgoorlie, 6430
Western Australia, Australia
Location:
16 Atbara Street
Kalgoorlie, 6430
Telephone: (61-8) 9021-2588

### Karratha
Cummins Engine Company, Pty. Ltd.
P.O. Box 377
Karratha, WA 6714
Australia
Location:
1490 Lambert Road
Karratha, WA 6714
Australia
Telephone: (61-8) 9144-4646
FAX: (61-8) 9143-1507

### Laverton
Cummins Engine Company, Pty. Ltd.
Locked Bag 1
Laverton, Victoria 3028
Australia
Location:
195 Boundary Road
Laverton North, Victoria 3028
Australia
Telephone: (61-3) 9360-0800
FAX: (61-3) 9360-0438

### Leeton
Cummins Engine Company, Pty. Ltd.
P.O. Box 775
Leeton, NSW 2705
Australia
Location:
29 Brady Way
Leeton, NSW 2705
Australia
Telephone: (61-2) 6953-3077
FAX: (61–2) 6953-3109

### Mackay
Cummins Engine Company, Pty. Ltd.
P.O. Box 842
Mackay, 4740
Queensland, Australia
Location:
4 Presto Avenue
Mackay, 4746
Telephone: (61-7) 4955-1222

### Mount Gambier
Cummins Engine Company, Pty. Ltd.
P.O. Box 2219
Mount Gambier, 5290
South Australia, Australia
Location:
2 Avey Road
Mount Gambier, 5290
Telephone: (61-87) 25-6422

### Penrith
Cummins Engine Company, Pty. Ltd.
P.O. Box 132
Cambridge Park, 2747
New South Wales, Australia
Location:
7 Andrews Road
Penrith, 2750
Telephone: (61-2) 4729-1313

### Queanbeyan
Cummins Engine Company, Pty. Ltd.
P.O. Box 527
Queanbeyan, 2620
New South Wales, Australia
Location:
15-27 Bayldon Road
Queanbeyan, 2620
Telephone: (61-2) 6297-3433
FAX: (61-2) 6297-6709

**Regency Park**
Cummins Engine Company, Pty. Ltd.
P.O. Box 2147
Regency Park, SA 5942
Australia
Location:
11 Manton Street
Hindmarsh, SA 5942
Australia
Telephone: (61-8) 8346-3832
FAX: (61-8) 8340-2045

**Swan Hill**
Cummins Engine Company, Pty. Ltd.
P.O. Box 1264
Swan Hill, 3585
Victoria, Australia
Location:
5 McAllister Road
Swan Hill, 3585
Telephone: (61-3) 5032-1511

**Tamworth**
Cummins Engine Company, Pty. Ltd.
P.O. Box 677
Tamworth, 2320
New South Wales, Australia
Location:
Lot 65 Gunnedah Road
Tamworth, 2340
Telephone: (61-2) 6765-5455

**Townsville**
Cummins Engine Company, Pty. Ltd.
P.O. Box 7339
Garbutt Business Centre, QLD4814
Australia
Location:
704-710 Ingham Road
Townsville, QLD 4814
Telephone: (61-7) 4774-7733
FAX: (61-7) 4774-7640

**Welshpool**
Cummins Engine Company, Pty. Ltd.
P. O. Box 52
Welshpool, 6986
Western Australia, Australia
Location:
50 Kewdale Road
Welshpool, 6106
Telephone: (61-8) 9458-5911

**Wetherill Park**
Cummins Engine Company, Pty. Ltd.
Private Bag 150
Wetherill Park, NSW 2164
Australia
Location:
492-494 Victoria Street
Wetherill Park, NSW 2164
Australia
Telephone: (61-2) 9616-5300
FAX: (61-2) 9616-5399

**Wodonga**
Cummins Engine Company, Pty. Ltd.
P.O. Box 174
Wodonga, 3690
Victoria, Australia
Location:
9-11 McKoy Street
Wodonga, 3690
Telephone: (61-2) 6024-3655

# Distributors and Branches - New Zealand

## Auckland

Cummins Diesel Sales & Service (NZ) Ltd.
Private Bag 92804
Penrose, Auckland, New Zealand
Location:
440 Church Street
Penrose
Telephone: (64-9) 579-0085

## Branches:

### Auckland

Cummins Diesel Engines
Private Bag 92804
Penrose, Auckland, New Zealand
Location:
440 Church Street
Penrose
Telephone: (64-9) 579-0085

### Christchurch

Cummins Diesel Engines
P.O. Box 16-149
Hornby, Christchurch, New Zealand
Location:
35 Parkhouse Road
Sockburn, Christchurch
Telephone: (64-3) 348-8170

### Mt. Maunganui

Cummins Diesel Engines
P.O. Box 4005
Mt. Maunganui, New Zealand
Location:
101 Totara Street
Mt. Maunganui
Telephone: (64-7) 575-0545

### Palmerston North

Cummins Diesel Engines
P.O. Box 9024
Palmerston North, New Zealand
Location:
852-860 Tremaine Avenue
Telephone: (64-6) 356-2209

# Distributors - International

## ABU DHABI

- See United Arab Emirates

## AFGHANISTAN

- See Middle East Regional Office

## ALBANIA

- See Germany Regional Office - Gross-Gerau

## ALGERIA

### Algiers

Cummins Corporation
Bureau de Liaison
38, Lotissement Benachour Abdelkader
Cheraga
43200 Wilaya de Tipasa
Algeria
Telephone: (213) 237-43-26

## AMERICAN SAMOA

- See South Pacific Regional Office

## ANDORRA

- See European Regional Office - Mechelen

## ANTIGUA

Miami (Office In U.S.A.)
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## ARGENTINA

### Buenos Aires

Distribuidora Cummins, S.A.
(DICUMAR)
Av. Del Libertador 602 Piso 5
Buenos Aires, Argentina
Telephone: (54-1)814-1895/1395/1393

## ARUBA, ISLAND OF

- See Netherlands Antilles

## AUSTRIA

### Neudoerfl

Cummins Diesel Motorenvertriebsges
m.b.H. Trenner & Co.
Bickfordstr. 25
A-7201 Neudoerfl
Austria
Telephone: (43-2622) 77418/77625

## BAHAMAS

### Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## BAHRAIN

### Bahrain

Yusuf Bin Ahmed Kanoo W.L.L.
P.O. Box 45, Manama
Bahrain
Telephone: (973) 400414/400506

## BALEARIC ISLANDS

### Madrid (Office in Spain)

Cummins Ventas y Servicio, S.A.
Torrelaguna, 56
28027 Madrid, Spain
Telephone: (34-91) 367-2000
376-2404

## BANGLADESH

### Dhaka

Equipment & Engineering Co., Ltd.
G.P.O. Box 2339
Dhaka 1000, Bangladesh
Location:
56, Dilkusha Commercial Area
2nd Floor/Eastern Block
Telephone: (880-2) 234357, 234060

## BARBADOS

### Miami (Office in U.S.A.)

Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## BELGIUM

### Brussels

Cummins Distributor
Belgium S.A.
623/629 Chaussee de Haecht
B-1030 Brussels, Belgium
Telephone: (24 hr.)
(32-2) 216-81-10

## BELIZE

### Tampa (Office in U.S.A.)

Cummins Southeastern Power, Inc.
5421 N. 59th Street
Tampa, FL 33610
Telephone: (813) 621-7202

## BENIN

- See Togo

## BERMUDA

### Bronx (Office in U.S.A.)

Cummins Metropower, Inc.
890 Zerega Avenue
Bronx, NY 10473
Telephone: (718) 892-2400

## BHUTAN

### Pune (Office in India)

Cummins Diesel Sales &
Service (India) Ltd.
35A/1/2, Erandawana
Pune - 411 038, India
(State of Maharashtra) India
Telephone: (91-212) 331234/331554/
331635/330066/
330166/330356/
31703

## BOLIVIA

### La Paz

Machinery & Auto Service
Casilla 4042
La Paz, Bolivia
Location:
Av. 20 de Octubre Esq.
Rosendo Gutierrez
Telephone: (591-2) 379650, 366394

## BONAIRE, ISLAND OF

- See Netherlands Antilles

## BOTSWANA

- See East and Southern Africa Regional Office - Harare

## BRAZIL

### Ananindeua

Marcos Marcelino & Companhia
Ltda.
Rodovia BR-316, Km 9
67020-010 Ananindeua, Para,
Brazil
Telephone: (55-91) 235-4100/4132/
4143/4012

### Belo Horizonte

Distribuidora Cummins
Minas S.A.
31950-640 Olhos D'Agua Norte
Belo Horizonte, MG
Brazil
Telephone: (55-31) 288-1344

### Campo Grande

Distribuidora Cummins
Mato Grosso Ltda.
Rodovia BR 163 Km 01
79060-000 Campo Grande
Mato Grosso do Sul, Brazil
Telephone: (55-67) 787-1166

### Curitiba

Distribuidora Cummins Parana S.A.
Rua Brasilio Itibere, 2195
80230 Curitiba, Parana
Brazil
Telephone: (55-41) 222-4036

**Fortaleza**
Distribuidora Cummins Diesel
Do Nordeste Ltda.
Av. da Abolicao, 3882,
Mucuripe
60165-081 Fortaleza, Ceara
Brazil
Telephone: (55-85) 263-1212

**Goianian**
Distribuidora de Motores Cummins
Centro Oeste Ltda.
Av. Caiapo 777 - Setor Sta. Genoveva
74672-400 Goiania, Goias
Brazil
Telephone: (55-62) 207-1010

**Manaus**
Distribuidora Cummins
Amazonas Ltda.
Estrada da Ponta Negra, 6080 - Sao Jorge
69037 Manaus, Amazonas,
Brazil
Telephone: (55-92) 656-5444

**Porto Alegre**
Distribuidora Cummins
Meridional S.A.
Rua Dona Alzira, 98, Sarandi
91110-010 Porto Alegre,
Rio Grande do Sul, Brazil
Telephone: (55-51) 340-8222

**Rio de Janeiro**
Distribuidora Cummins
Leste Ltda.
Rua Sariema, 138-Olaria
21030-550 Rio de Janeiro,
Rio de Janeiro, Brazil
Telephone: (55-21) 290-7899

**Sao Paulo**
Companhia Distribuidora
de Motores Cummins
Rua Martin Burchard, 291 - Bras
03043-020 Sao Paulo,
Sao Paulo, Brazil
Telephone: (55-11) 270-2311

## BRITISH VIRGIN ISLANDS
- See Puerto Rico

## BRUNEI
- See Malaysia

## BURKINA - FASO
- See North/West Africa Regional Office - Daventry

## BULGARIA
-See Germany Regional Office - Gross-Gerau

## BURMA

**Kuala Lumpur (Office In Malaysia)**
Contact: Scott &
English (M) Sdn Bhd
P.O. Box 10324
50710 Kuala Lumpur
West Malaysia
Location:
16 Jalan Chan Sow Lin
55200 Kuala Lumpur
West Malaysia
Telephone: (60-3) 2211033

## BURUNDI

**Brussels (Office in Belgium)**
Bia, S.A.
Rameistraat, 123
B-3090 - Overijse, Belgium
Telephone: (32-2) 6892811

## CAMBODIA
- See South & East Asia Regional Office
- Singapore

## CANARY ISLANDS

**Madrid (Office in Spain)**
Cummins Ventas y
Servicio, S.A.
Torrelaquna, 56
28027 Madrid, Spain
Telephone: (34-91) 3672000/3672404

## CAPE VERDE
- See North/West Africa Regional Office
- Daventry

## CENTRAL AFRICAN REPUBLIC
- See North/West Africa Regional Office
- Daventry

## CEYLON
- See Sri Lanka

## CHAD
- See North/West Africa Regional Office
- Daventry

## CHILE

**Santiago**
Distribuidora Cummins Diesel
S.A.C.I.
Casilla Postal 1230
Calle Bulnes 1203
Santiago, Chile
Corporate Office:
Av. Providencia 2653, Office 1901
Santiago, Chile
Telephone: (56-2) 698-2113/4/5,
697-3566/7/8,
697-2709

## CHINA, PEOPLE'S REPUBLIC
- See China Regional Office - Beijing

## COLOMBIA

**Barranquilla**
Cummins de Colombia S.A.
Apartado Aereo 5347
Barranquilla, Colombia
Location: Calle 30, No. 19 - 21
Telephone: (57-58) 40-02-06/40-13-46

**Bogota**
Cummins Colombiana Ltda.
Apartado Aereo No. 7431
Bogota, D.E. Colombia
Location:
Av. Americas X Carrera
42C No. 19-45
Telephone: (57-1) 244-5688/5882

**Bucaramanga**
Cummins API, Ltda.
Apartado Aereo 352
Bucaramanga, Colombia
Location:
Autopista a Giron, Km 7
Telephone: (57-76) 468060

**Cali**
Distribuidora Cummins del Valle, Ltda.
Apartado Aereo No. 6398
Cali, Colombia
Location:
Av. 3a. # 39-35 - Vipasa
Telephone: (57-3) 65-4343

**Medellin**
Equipos Tecnicos Ltda.
Apartado Aereo No. 2046
Medellin, Colombia
Location: Carrera 52 No. 10-184
Telephone: (57-4) 255-4200

**Pereira**
Equipos Tecnicos Ltda. C.Q.R.
Apartado Aereo No. 1240
Pereira, Colombia
Location: Carrera 8a. No. 45-39
Telephone: (57-63) 366341

## COMOROS
- See East and Southern Africa Regional Office - Harare

## CONGO, PEOPLE'S REPUBLIC

**Brussels (Office in Belgium)**
Bia, S.A.
Rameistraat, 123
B-3090
Overijse, Belgium
Telephone: (32-2) 6892811

## CORSICA
- See France

## COSTA RICA

**San Jose**
Servicios Unidos, S.A.
P.O. Box 559
San Jose, Costa Rica
Location:
100 metros al este de
Excelsior Antiguo
Curridabat, San Jose
Telephone Office: (506) 53-93-93
Telephone Service Shop:
(506) 26-00-76

## CUBA

**Miami (Office in U.S.A.)**
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## CYPRUS

**Nicosia**
Alexander Dimitriou & Sons Ltd.
P.O. Box 1932
Nicosia, Cyprus
Location:
4 Salamis Avenue
Telephone: (357-2) 349450

## CZECH REPUBLIC

- See European Regional Office - Mechelen

## DENMARK

**Glostrup**
Preben Lange Industrimaskiner A/S
Post Box 166
2605 Broendby, Denmark
Location:
Midtager 22
Telephone: (45-43) 96-21-61

## DJIBOUTI

- See Middle East Regional Office - Daventry

## DOMINICA

**Miami (Office in U.S.A.)**
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## DOMINICAN REPUBLIC

**Santo Domingo**
Argico C. Por A.
P.O. Box 292-2 Feria
Santo Domingo
Dominican Republic, ZP-6
Location:
Calle Jose A. Soler
No. 3, ESQ.
Avenida Lope de Vega
Telephone: (809) 562-6281

## DUBAI

- See United Arab Emirates

## ECUADOR

**Guayaquil**
Motores Cummins (MOTCUM) S.A.
P.O. Box 1062
Guayaquil, Ecuador
Location:
Avenida Carlos Julio
Arosemena Km. 4
Telephone: (593-4) 203995/201177

**Quito**
Rectificadora Botar S.A.
P.O. Box 17-01-3344
Quito, Ecuador
Location:
Av. 10 de Agosto No. 5980
Telephone: (593-2) 465-176/177/
178/195/197

## EGYPT

**Cairo**
ADAT
P.O. Box 1572
Cairo, Egypt
Sales and Service Location:
25, Pyramid Road
Giza, Cairo, Egypt
Telephone: (20-2) 384-6607/384-6609
385-4001/2/4/5/6/8/9

## EL SALVADOR

**San Salvador**
Salvador Machinery
Company, S.A. de C.V.
P.O. Box 125
San Salvador, El Salvador
Location:
Blvd. Ejercito Nacional
Telephone: (503) 711022, 228388

## ENGLAND

- See United Kingdom

## EQUATORIAL GUINEA

- See North/West Africa Regional Office - Daventry

## ESTONIA

- See Moscow Regional Office - Moscow

## FAROE ISLANDS

**Wellingborough (Office in United Kingdom)**
Cummins Diesel
Denington Industrial Estate
Wellingborough
Northants NN8 2QH,
England
Telephone: (44-933) 276231

## FERNANDO PO

- See Spain

## FIJI

- See Cummins Diesel Sales & Service New Zealand Ltd.

## FINLAND

**Helsinki**
Machinery OY
P.O. Box 56
SF 00511 Helsinki, Finland
Location:
Teollisuuskatu 29
Telephone: Int: (358-9) 77221

## FRANCE

**Lyon**
Cummins Diesel
Sales Corporation
39, rue Ampere Z.I.
69680 Chassieu, France
Telephone: (33) 72-22-92-72
Parts and Service Telephone:
(33) 72-22-92-69

## GABON

- See North/West Africa Regional Office - Daventry

## GAMBIA

Senegal (Matforce)

## GEORGIA

- See Moscow Regional Office - Moscow

## GERMANY

**Gross-Gerau**
Cummins Diesel Deutschland GmbH
P.O. Box 1134
D-6080 Gross-Gerau,
Germany
Location: Odenwaldstr. 23
Telephone: (49-6152) 174-0

## GHANA

**Accra**
Leyland DAF (Ghana) Ltd.
P.O. Box 2969
Accra, Ghana
Location:
39/40 Ring Road South
Industrial Estate
Telephone: (233-21) 22-88-06

## GREECE

**Athens**
Eliopoulos Brothers Ltd.
P.O.B. 51528
14 Km. National Rd.
Athens-Lamia
14510 Kifissia, Greece
Telephone: (30-1) 6202401/6202066/
6201955

## GREENLAND

- See Denmark

## GRENADA

**Miami (Office in U.S.A.)**
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## GUADELOUPE

**Miami (Office in U.S.A.)**
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## GUAM

**Barrigada**
Mid-Pac Far East, Inc.
Airport Industrial Park
825 Tiyan Parkway
Barrigada, Guam 96921
Telephone: (671) 632-5160

## GUATEMALA

**Guatemala City**
Maquinaria y Equipos, S.A.
P.O. Box 2304
Guatemala City, Guatemala
Location:
Carretera Amatitlan
Km 12 zona 12
Telephone: (502-2) 773334/7/9

## GUINEA BISSAU

- See North/West Africa Regional Office - Daventry

## GUYANA

**Miami (Office in U.S.A.)**
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## GUYANA, FRENCH

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## HAITI

**Miami (Office in U.S.A.)**
Cummins Southeastern Power, Inc.
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## HOLLAND

- See Netherlands

## HONDURAS

**Tegucigalpa**
Comercial Laeisz
Honduras, S.A.
P.O. Box 1022
Tegucigalpa, D.C., Honduras
Location:
Zona La Burrera,
Blvd. Toncontin
Frente a Gasolinera Esso.
Telephone: (504) 333570/335615

## HONG KONG

**Kowloon**
Cummins Engine H. K. Ltd.
P.O. Box 840 Shatin
N.T., Hong Kong
Location:
Unison Industrial Centre
15th Floor, Units C & D
27-31 Au Pui Wan Street
Fo Tan, Shatin, Hong Kong
Telephone: (852) 606-5678

## INDIA

**Pune**
Cummins Diesel Sales &
Service (India) Ltd.
35A/1/2, Erandawana
Pune - 411 038, (State of Maharashtra)
India
Telephone: (91-212) 331234, 331554,
331635, 330066,
330166, 330356,
331703

**Bombay**
Cummins Diesel Sales &
Service (I) Ltd.
298, Perin Nariman Street, Fort,
Bombay 400001, India
Telephone: (91-22) 2863566/2862247

**Calcutta**
Cummins Diesel Sales &
Service (I) Ltd.
94, Tivoli Court, I/C Ballygunge
Circular Road
Calcutta 700 019 (West Bengal), India
Telephone: (91-33) 2478065/2470481/
2470774

**New Delhi**
Cummins Diesel Sales &
Service (I) Ltd.
Flat No. 307, Meghdoot Building
94 Nehru Place
New Delhi 110 019, India
Telephone: (91-11) 6431051/6445756/
6452817

**Raipur**
Cummins Diesel Sales &
Service (I) Ltd.
Plot No. 15, Jalashay Marg
Choube Colony
Raipur 492 001 (Madhya Pradesh),
India
Telephone: (91-771) 24994/23157/29498

**Ranchi**
Cummins Diesel Sales &
Service (I) Ltd.
Shanti Kunj' C-202, Vidyalaya Marg
Road No. 1, Ashoknagar
Ranchi 834 002 (Bihar)
India
Telephone: (91-651) 301948/303623

## INDONESIA

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P.T. Alltrak 1978
P.O. Box 64/KBYL
Jakarta Selatan 12330, Indonesia
Location:
J1. R.S.C. Veteran No. 4
Bintaro, Rempoa
Telephone: (62-21) 736-1978/736-3302

## IRAN

**Tehran**
Technical Service Development
Company
P.O. Box 13445/741
No. 152 Sohravardi Crossing
Dr. Beheshti Avenue
Tehran, Iran
Telephone:
Head Office: (98-21) 846666, 851021-7
Work Shop: (98-21) 995021-2/993240

## IRAQ

- See Middle East Regional Office - Daventry

## IRELAND

**Wellingborough (Office in England)**
Cummins Diesel
Denington Estate
Wellingborough
Northants NN8 2QH, England
Telephone: (44-933) 276231

## ISRAEL

**Tel Aviv**
Israel Engines &
Trailers Co. Ltd.
Levinson Brothers Engineers
P. O. Box 390
33 Hahashmal Street
Tel Aviv, Israel 61003
Telephone: (972-3) 5607671

## ITALY

### Milan
Cummins Diesel Italia S.p.A.
Piazza Locatelli, 8
Zona Industriale Sesto Ulteriano
20098 S. Giuliano
Milanese (Milan), Italy
Telephone: (39-2) 9828-1235/6/7

## IVORY COAST
- See Cote d' Ivoire

## JAMAICA

### Miami (Office in U.S.A.)
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## JAPAN

### Tokyo
Cummins Diesel (Japan) Ltd.
1-12-10-Shintomi
Chuo-ku, Tokyo 104
Japan
Telephone: (81-3) 3555-8511

## JORDAN

### Amman
S.E.T.I. Jordan Limited
P.O. Box 8053
Amman, Jordan
Telephone: (962-6) 621867/621884

## KENYA

### Nairobi
Werrot & Company Limited
P.O. Box 41216
Nairobi, Kenya
Location:
Lusaka Road
Telephone: (254-150) 20316

## KOREA, SOUTH

### Seoul
Hwa Chang Trading Co., Ltd.
Central P.O. Box No. 216
Seoul, South Korea
Location:
143-11 Doksan-dong, Kuro-ku
Telephone: (82-2) 854-0071/2/3/4/5,
869-1411/2/3

## KUWAIT

### Kuwait
General Transportation &
Equipment Co.
(Sales Department)
P.O. Box 1096
13011 Safat, Kuwait
Location:
Shuwaikh Behind
Canada Dry Factory
Telephone: (965) 4833380/1/2

### Kuwait
General Transportation &
Equipment Co.
(Service Department)
East Ahmadi Area
13011 Safat, Kuwait
Telephone: (965) 3981577

## LAOS
- See South and East Asia Regional Office - Singapore

## LATVIA
- See Moscow Regional Office - Moscow

## LEBANON

### Beirut
S.E.T.I. Charles Keller
S.A.L.
B.P. 16-6726
Beirut, Lebanon
Location:
Corniche du Fleuve
Telephone: (961-1) 425040/41

## LESOTHO
- See South Africa

## LIBYA
- See North/West Africa Regional Office
- Daventry

## LIECHTENSTEIN
- See Switzerland

## LUXEMBOURG

### Gross-Gerau (Office in Germany)
Cummins Diesel Deutschland GmbH
P.O. Box 11 34
Odenwaldstrasse 23
D-6080 Gross-Gerau, Germany
Telephone: (49-6152) 174-0

## MACAU
- See Hong Kong

## MADAGASCAR
- See East and Southern Africa Regional Office - Harare

## MADEIRA ISLANDS
- See Portugal

## MALAYSIA

### Kuala Lumpur
Cummins Diesel Sales & Service
Div. of Scott & English
(M) Sdn. Bhd.
P.O. Box 10324
50710 Kuala Lumpur, West Malaysia
Location:
16 Jalan Chan Sow Lin
55200 Kuala Lumpur
Telephone: (60-3) 2211033

## MALI
- See Senegal (Matforce)

## MALTA

### Valletta
Plant & Equipment Ltd.
Regency House
254, Republic Street
Valletta, Malta
Telephone: (356) 23-26-20, 23-33-43,
23-16-23, 24-75-17

## MARTINIQUE

### Miami (Office in U.S.A.)
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
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## MEXICO

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Cummins Del Occidente, S.A.
Lazaro Cardenas No. 2950
Fracc. Alamo Industrial
45560 Guadalajara, Jal. Mexico
Telephone: (52-3) 670-93-06, 670-53-38,
670-63-61, 670-62-33

### Monterrey
Tecnica Automotriz, S.A.
Av. Alfonso Royes
No. 3637 Nte.
Monterrey, Nuevo Leon, Mexico
Telephone: (52-83) 51-41-51, 51-46-56

### Merida
Cummins Del Sureste, S.A. de C.V.
Av. Aviacion Civil No. 647
Esquina Calle 100
Col. Sambula
97259 Merida, Yucatan, Mexico
Telephone: (52-99) 24-11-55, 24-00-15

### Puebla
Cummins de Oriente, S.A. de C.V.
Av. Reforma No. 2112,
Puebla, Pue. Mexico
Telephone: (52-22) 48-76-74, 48-76-75

### Queretaro
Distribuidor Cummins Del Centro, S.A.
de C.V.
Blvd. Bernardo Quintana No. 518
Col. Arboledas
C.P. 76140 Queretaro, Qro., Mexico
Telephone: (52-42) 12-41-90, 12-58-90,
12-62-94, 14-04-16,
14-08-81, 14-15-91

### Tlalnepantla
Distribuidor Cummins
Metropolitana, S.A. DE C.V.
Sor Juana Ines de la Cruz No. 555
54000 Tlalnepantla, Edo. de Mexico,
Mexico
Telephone: (52-5) 327-38-00, 390-64-37,
390-12-27

## MOROCCO

### Casablanca
Societe Auto-Hall, S.A.
44 Avenue Lalla Yacout
Casablanca, Morocco
Telephone: (212) 31-84-60, 31-70-52, 31-90-56, 31-70-44

## MOZAMBIQUE
- See East and Southern Africa Regional Office - Harare

## NAMIBIA (Southwest Africa)

### Windhoek
Propower, Namibia
P.O. Box 3637, Windhoek 9000
Namibia (Southwest Africa)
Location:
7 Nasmyth Street
Southern Inudustria
Telephone: (264-61) 37693

## NEPAL

### Pune (Office in India)
Cummins Diesel Sales & Service (India) Ltd.
35A/1/2, Erandawana
Pune, - 411 038, (State of Maharashtra)
India
Telephone: (91-212) 331234, 331554, 331635, 330066, 330166, 330356, 331703

## NETHERLANDS

### Dordrecht
Cummins Diesel Sales & Service, b.v.
Galvanistraat 35
3316 GH Dordrecht
Netherlands
Telephone: (31-78) 18-12-00

## NETHERLANDS ANTILLES

### Miami (Office in U.S.A.)
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## NEW CALEDONIA
- See South Pacific Regional Office - Melbourne

## NEW GUINEA
- See Papua New Guinea

## NICARAGUA

### Managua
F. Alf. Pellas & Cia.
Apartado Postal No. 46
Managua, Nicaragua
Location:
6a. Calle
30 y 31 Avs. N.O., Zona 5
Telephone: (505-2) 660616

## NIGERIA

### Lagos
SCOATRAC MOSEL
P.M.B. 21108
Ikeja, Lagos
Nigeria
Location:
Apapa-Oshodi Expressway
Isolo Industrial Estate,
Isolo
Telephone: (234-1) 52-15-39, 52-19-31, 52-46-70

### Paris (Office in France)
SCOATRAC MOSEL
c/o SCOA
9 et 11 rue Robert de Flers
75740 Paris, Cedex 15
France
Telephone: (33-1) 40-58-48-48

## NORTHERN IRELAND
- See United Kingdom

## NORWAY

### Oslo
Cummins Diesel Salg & Service A/S
P.O. 6288
Etterstad 0603, Oslo 6
Norway
Location:
Verkseler Furulunds vei 11
Telephone: (47) 22326110

## OMAN

### Ruwi
Universal Engineering Services L.L.C.
P.O. Box 5688
Ruwi
Sultanate of Oman
Telephone: (968) 590830, 591304

## PAKISTAN

### Karachi
- See Middle East Regional Office - Daventry

## PANAMA

### Panama City
Grupo Tiesa, S.A.
Apartado Postal #55-0549
Partillo, Panama
Telephone: (507) 67-3866

## PAPUA NEW GUINEA

### Sydney (Office in Australia)
Cummins Diesel Sales & Service
P.O. Box 150
Cabramatta, 2166
New South Wales, Australia

## PARAGUAY

### Asuncion
Automotores y Maquinaria, S.R.L.
Yegros y Fulgencio R. Moreno
P.O. Box 1160
Asuncion, Paraguay
Telephone: (595-21) 493111, 493115

## PERU

### Lima
Comercial Diesel del Peru S.A.
P.O. Box 14-0234
Lima, Peru
Location:
Ave. V.R. Haya
de la Torre 2648
Lima 3, Peru
Telephone: (51-14) 74-3173/4374/3144/2281

## PHILIPPINES

### EDSA
Power Systems, Inc. EDSA
P.O. Box 3241
Manila
Philippines 1501
Location:
79E. Delos Santos Ave.
Mandaluyong, Metro Manila
Telephone: (63-2) 791769, 791771, 5311945, 5315448, 5311934, 5312531, 53414513

## POLAND
- See Germany Regional Office - Gross-Gerau

## PORTUGAL

### Lisbon
Electro Central Vulcanizadora, Lda.
P.O. Box 3077
1302 Lisbon, Portugal
Location:
Rua Conselheiro
Martins de Carvalho
Lote 1480
1400 Lisboa (Restelo)
Telephone: (351-1) 3015361

## QATAR

### Doha
Jaidah Motors & Trading Co.
P.O. Box 150
Doha, Qatar (Arabian Gulf)
Telephone: (974) 810000

## REUNION
- See Lyon Regional Office - Lyon

## RIO DE ORO
- See Spain

## ROMANIA

- See Germany Regional Office - Gross-Gerau

## RUSSIA

- See Moscow Regional Office - Moscow

## RWANDA

**Brussels (Office in Belgium)**
Bia, S.A.
Rameistraat, 123
B-3090 - Overijse, Belgium
Telephone: (32-2) 6892811

## ST. LUCIA

**Miami (Office in U.S.A.)**
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
Telephone: (305) 821-4200

## ST. VINCENT

**Miami (Office in U.S.A.)**
Cummins Southeastern Power, Inc.
9900 N.W. 77 Court
Hialeah Gardens, FL 33016
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## SAN MARINO

- See Italy

## SAO TOME AND PRINCIPE

- See North/West Africa Regional Office - Daventry

## SAUDI ARABIA

**Dammam**
General Contracting Company
P.O. Box 5111
Dammam 31422, Saudi Arabia
Telephone: (966-3) 842-1216

## SCOTLAND

- See United Kingdom

## SENEGAL

**Dakar**
Matforce
B.P. 397
Dakar, Senegal
Location:
10 Avenue Faidherbe
Telephone: (221) 22-30-40

## SEYCHELLES

- See East/Southern Africa Regional Office - Harare

## SIERRA LEONE

- See North/West Africa Regional Office - Daventry

## SINGAPORE

**Singapore**
Applied Diesel Sales & Service Pte Ltd
8 Tanjong Penjuru
Jurong Industrial Estate
Singapore 2260
Telephone: (65) 261-3555

## SLOVAKIA

- See European Regional Office - Mechelen

## SOLOMON ISLANDS

- See South Pacific Regional Office - Melbourne

## SOMALIA

- See East and Southern Africa Regional Office - Harare

## SOUTH AFRICA

**Johannesburg**
Propower Pty. Ltd.
Private Bag X4
Wendywood 2144
South Africa
Location:
13 Eastern Service Roade
Kelvin 2054
Telephone: (27-11) 444-3225

## SOUTHWEST AFRICA

- See Namibia

## SPAIN

**Madrid**
Cummins Ventas y
Servicio S.A.
Torrelaguna, 56
28027 Madrid, Spain
Telephone: (34-91) 367-2000/3672404

## SPANISH GUINEA

- See Spain

## SRI LANKA

**Colombo**
Trade Promoters Ltd
P.O. Box 321
69, Walukarama Road
Colombo 3
Sri Lanka
Telephone: (94-1) 573927, 574651, 575005

## SUDAN

**Khartoum**
Bittar Engineering Ltd.
P.O. Box 1011
Gamhouria Street
Khartoum, Sudan
Telephone: (249-11) 70952, 71245, 70306

## SURINAM

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Hialeah Gardens, FL 33016
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## SWAZILAND

- See South Africa

## SWEDEN

**Stockholm**
SMA Maskin AB
Aggelundavagen 7
S-17562 Jarfalla
Sweden
Telephone: (46-8) 621-25-00

## SWITZERLAND

**Regensdorf**
Robert Aebi AG
Riedthofstrasse 100
8105 Regensdorf
Switzerland
Telephone: (41-1) 842-5111

## SYRIA

**Damascus**
Puzant Yacoubian & Sons
P.O. Box 3617
Damascus, Syria
Location:
Abou Baker El Saddik Street
Kafar Sousse Square
Telephone: (963-11) 231547/8/9

## TAHITI, ISLAND OF

- See French Polynesia

## TAIWAN

**Taipei**
Cummins Corporation - Taiwan Branch
12th Floor, No. 149
Min-Sheng E. Road, Sec. 2
Taipei, Taiwan
Telephone: (886-2) 515-0891

## TANZANIA

**Dar es Salaam**
Riddoch Motors 1987 Ltd
P.O. Box 40040
Dar es Salaam
Tanzania
Location:
92 Kipawa-Pugu Road-
Dar es Salaam
Telephone: (255-51) 44493, 41140

## THAILAND

**Bangkok**
Diethelm & Company Ltd.
1696 New Petchburi Road
Bangkok 10310, Thailand
Telephone: (66-2) 254-4900

## TOGO (and BENIN)

### Lome
Togomat
B.P. 1641
Lome, Togo
Location:
Zone Industrielle CNPPME
Telephone: (228) 21-23-95

## TONGA, ISLAND OF
- See South Pacific Regional Office - Melbourne

## TRINIDAD and TOBAGO

### Miami (Office in U.S.A.)
Cummins Southeastern Power Inc.
9900 N.W. 77 Court
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## TURKEY

### Istanbul
Hamamcioglu Muesseseleri
Ticaret T.A.S.
P.K. 136
80222 Sisli
Istanbul, Turkey
Location:
Buyukdere Caddesi, 13/A
80260 Sisli
Istanbul, Turkey
Telephone: (90-1) 231-3406, 234-5123

## UKRAINA
- See Moscow Regional Office - Moscow

## UNITED ARAB EMIRATES

### Abu Dhabi
Technical Oilfield Supplies Centre
P.O. Box 2647
Abu Dhabi,
United Arab Emirates
Telephone: (971-2) 723863, 723298

## UNITED KINGDOM

### Wellingborough
Cummins Diesel
Denington Estate
Wellingborough
Northants NN8 2QH, England
Telephone: (44-933) 276231

## UPPER VOLTA
- See Burkina - Faso

## URUGUAY

### Montevideo
Santaro S.A.
P.O. Box 379
Montevideo
Uruguay
Location:
Avenida Millan No. 2441
Telephone:(598-2) 293908

## U.S.S.R.
- See Moscow Regional Office - Moscow

## VATICAN CITY
- See Italy

## VENEZUELA

### Caracas
Sudimat
Apartado Postal 1322
Carmelitas
Caracas 1010
Venezuela
Location:
Final Avenida San Martin
Urb. la Quebradita
Caracas 1061
Telephone: (58-2) 442-6161/2647

## VIETNAM

### Hanoi
Diethelm & Co. Ltd. Engineering
Room No. 1, 2nd Floor
8 Trang Thi Street
Hanoi, Vietnam
Telephone: (84-4) 260-332, 244-394

### Ho Chi Minh City
Diethelm & Co. Ltd. Engineering
3rd Floor, IBC Building
1 Me Linh Square
District 1
Ho Chi Minh City, Vietnam
Telephone: (84-8) 294-102, 294-103

## WESTERN SAMOA
- See South Pacific Regional Office - Melbourne

## YEMEN ARAB REPUBLIC

### Sana'a
Zubieri Trading Co.
P.O. Box 535
Sana'a, Yemen Arab Republic
Location:
Zubieri Street
Telephone: (967-1) 244400/79149

## YEMEN, SOUTH
- See Middle East Regional Office - Daventry

## YUGOSLAVIA
- See Southeastern Europe

## ZAIRE

### Brussels (Office in Belgium)
N.V. Bia, S.A.
Rameistraat, 123
B-3090 - Overijse, Belgium
Telephone: (32-2) 689-28-11

## ZAMBIA

### Ndola
N.E.I. (Zambia) Ltd.
P.O. Box 71501
Ndola, Zambia
Telephone: (260-2) 610729

## ZIMBABWE

### Harare
Cummins Zimbabwe (Pvt) Ltd.
P.O. Box ST363
Southerton
Harare, Zimbabwe
Location:
72 Birmingham Road
Southerton, Harare
Telephones: (263-4) 67645, 69220

# Section TS - Troubleshooting Symptoms

## Section Contents

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# Troubleshooting Procedures and Techniques

## General Information

This guide describes some typical engine operating problems, their causes, and some acceptable corrections to those problems. Unless noted otherwise, the problems listed are those which an operator can diagnose and repair.

**⚠ WARNING ⚠**

**Performing troubleshooting procedures NOT outlined in this section can result in equipment damage or personal injury or death. Troubleshooting must be performed by trained, experienced technicians. Consult a Cummins Authorized Repair Location for diagnosis and repair beyond that which is outlined, and for symptoms not listed in this section. Before beginning any troubleshooting, refer to General Safety Instructions in Section i of this manual.**

Follow the suggestions below for troubleshooting:

- Study the complaint thoroughly before acting
- Refer to the engine system diagrams
- Do the easiest and most logical things first
- Find and correct the cause of the complaint

# Troubleshooting Symptoms Charts

## General Information

Use the following charts to aid in diagnosing specific engine symptoms. Read each row of blocks from top to bottom. Follow the arrows through the chart to identify corrective action.

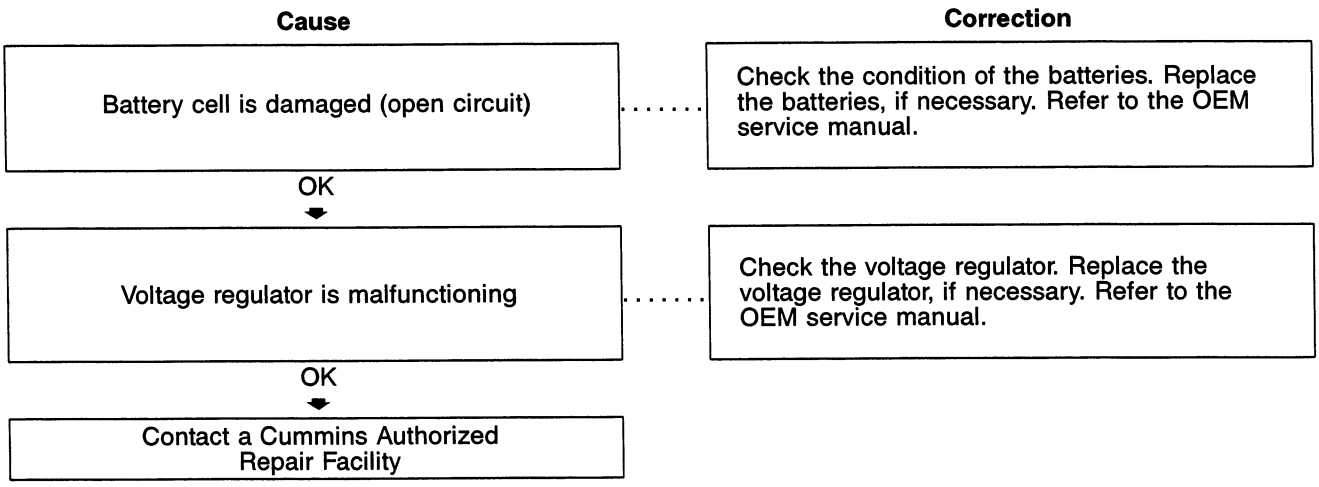
**⚠ WARNING ⚠**

**Troubleshooting presents the risk of equipment damage, personal injury or death. Troubleshooting must be performed by trained experienced technicians.**

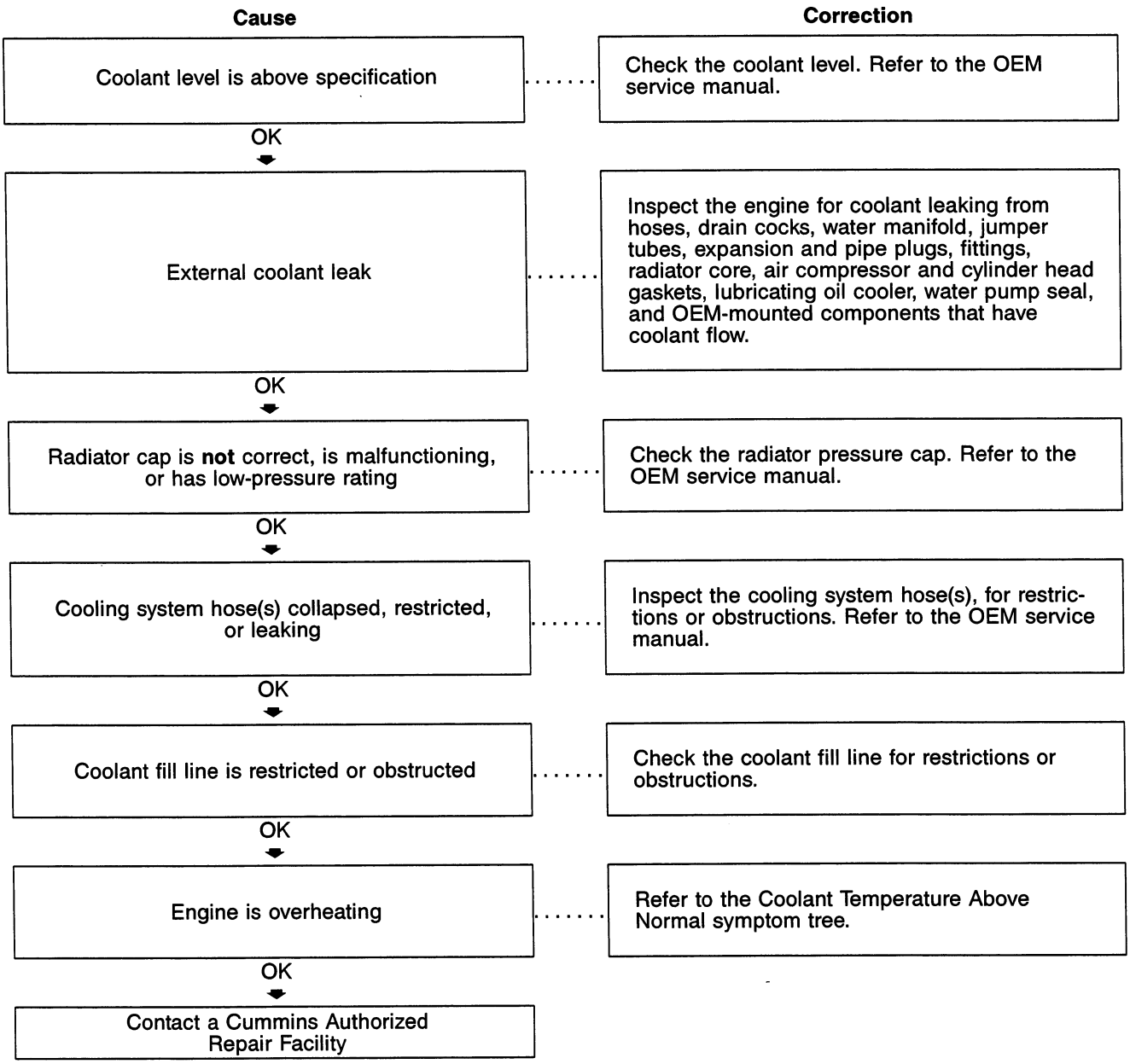
## Alternator Not Charging or Insufficient Charging

| Cause | Correction |
|---|---|
| Alternator pulley is loose on the shaft | Tighten the pulley. Refer to the OEM service manual. |
| OK ↓ | |
| Batteries have failed | Check the condition of the batteries. Replace the batteries, if necessary. Refer to the OEM service manual. |
| OK ↓ | |
| Battery cables or connections are loose, broken, or corroded (excessive resistance) | Check the battery cables and connections. |
| OK ↓ | |
| Alternator is overloaded, or alternator capacity is below specification | Install an alternator with a higher capacity. Refer to the OEM service manual. |
| OK ↓ | |
| 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 ↓ | |
| Battery temperature is above specification | Position the batteries away from heat sources. Refer to the OEM service manual. |
| OK ↓ | |
| 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 diagrams. |
| OK ↓ | |
| Vehicle gauge is malfunctioning | Check the vehicle gauge. Refer to the OEM service manual. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Alternator Overcharging



## Coolant Loss – External

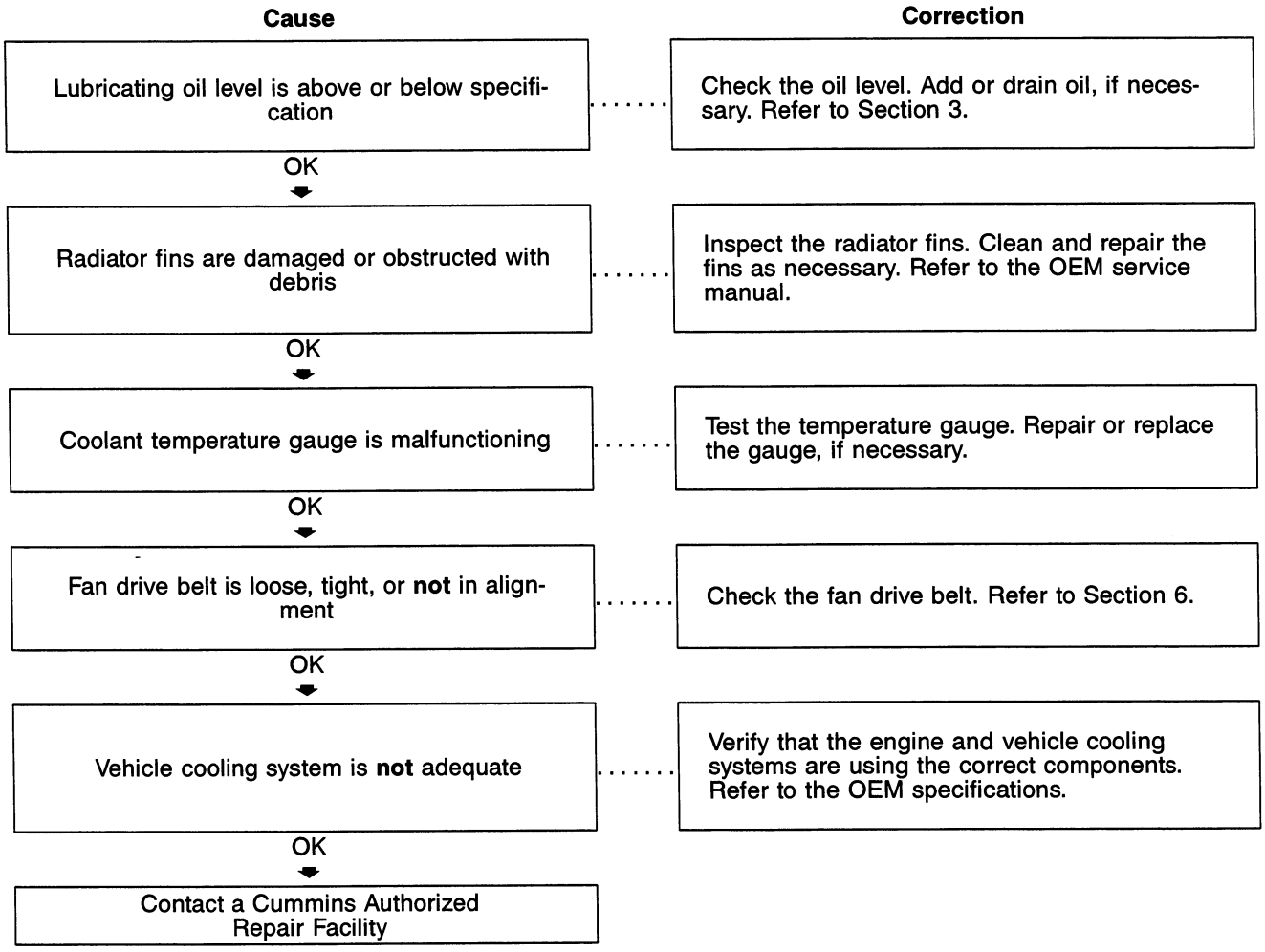


## Coolant Temperature Above Normal – Gradual Overheat

| Cause | Correction |
|---|---|
| Charge-air cooler (CAC) fins, radiator fins, or air conditioner condenser fins are damaged or obstructed with debris | Inspect the CAC, air conditioner condenser, and radiator fins. Clean, if necessary. Refer to Section 4. |
| OK ▼ | |
| Cold weather radiator cover or winterfront is closed | Open the cold weather radiator cover or the winterfront. Maintain a minimum of 784 $cm^2$ [120 $in^2$], or approximately 28 x 28 cm [11 x 11 in], of opening at all times. Refer to Section 1. |
| OK ▼ | |
| Coolant level is below specification | Inspect the engine and cooling system for external coolant leaks. Repair if necessary. Add coolant. Refer to Section 3. |
| OK ▼ | |
| Electronic fault codes are active | 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. |
| OK ▼ | |
| Fan shroud is damaged or missing, or the air recirculation baffles are damaged or missing | Inspect the shroud and the recirculation baffles. Repair, replace, or install, if necessary. Refer to the OEM service manual. |
| OK ▼ | |
| Lubricating oil is contaminated with coolant or fuel | Contact a Cummins Authorized Repair Facility. |
| OK ▼ | |
| Cooling system hose(s) collapsed, restricted, or leaking | Inspect the cooling system hose(s), for restrictions or obstructions. Refer to the OEM service manual. |
| OK ▼ | |
| Coolant mixture of antifreeze and water is **not** correct | Verify the concentration of antifreeze in the coolant. Add antifreeze or water to correct the concentration. Refer to Section 5. |
| OK ▼ | |

(Continued)

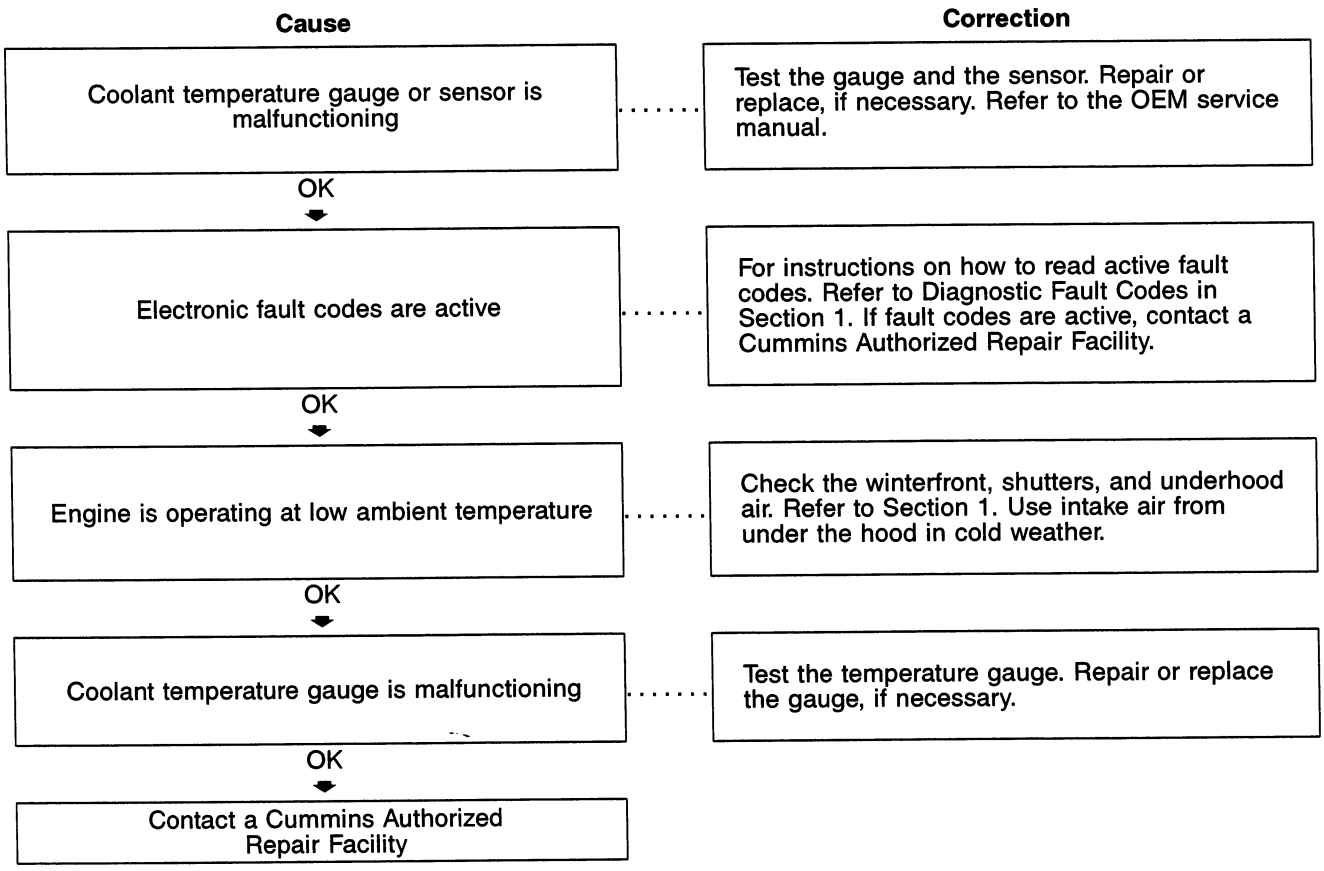
## Coolant Temperature Above Normal – Gradual Overheat (Continued)



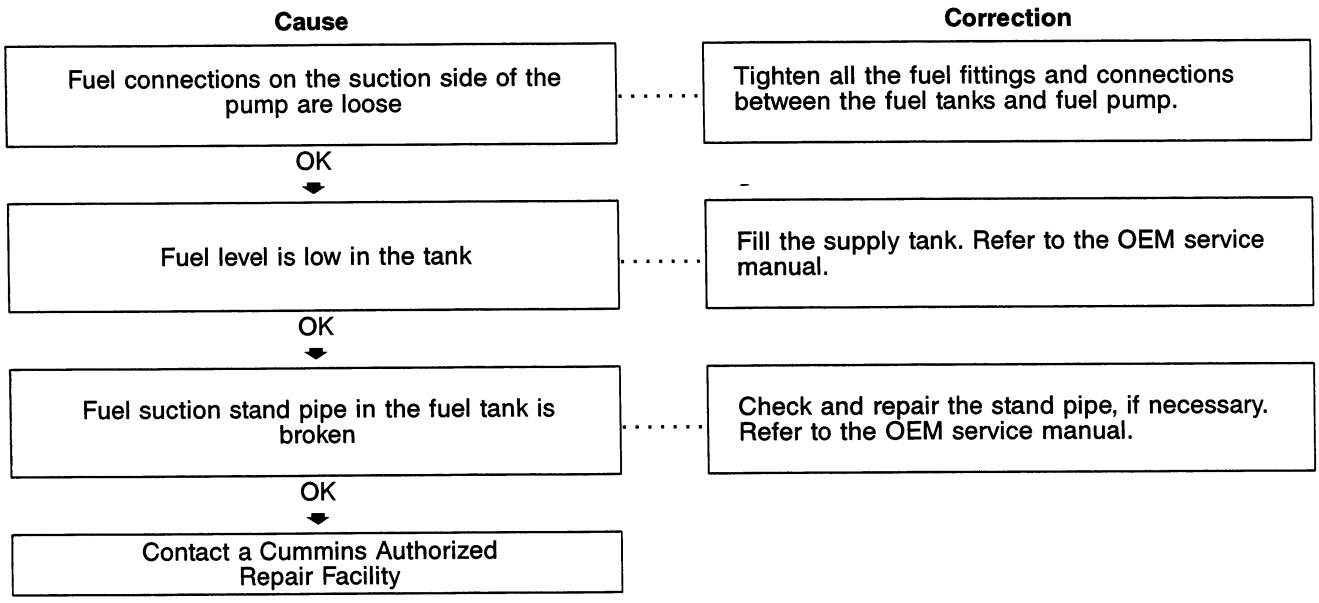
## Coolant Temperature is Above Normal – Sudden Overheat

| Cause | Correction |
|---|---|
| Coolant level is below specification | Inspect the engine and cooling system for external coolant leaks. Repair if necessary. Add coolant. Refer to Section 3. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Fan drive belt is broken | Check the fan drive belt. Replace the belt, if necessary. Refer to Section 6. |
| OK ↓ | |
| Radiator cap is **not** correct, is malfunctioning, or has low-pressure rating | Check the radiator pressure cap. Refer to the OEM service manual. |
| OK ↓ | |
| Cooling system hose(s) collapsed, restricted, or leaking | Inspect the cooling system hose(s), for restrictions or obstructions. Refer to the OEM service manual. |
| OK ↓ | |
| Coolant temperature gauge is malfunctioning | Test the temperature gauge. Repair or replace the gauge, if necessary. |
| OK ↓ | |
| Charge-air cooler (CAC) fins, radiator fins, or air conditioner condenser fins are damaged or obstructed with debris | Inspect the CAC, air conditioner condenser, and radiator fins. Clean, if necessary. Refer to Section 4. |
| OK ↓ | |
| Cold weather radiator cover or winterfront is closed | Open the cold weather radiator cover or the winterfront. Maintain a minimum of 784 $cm^2$ [120 $in^2$], or approximately 28 x 28 cm [11 x 11 in], of opening at all times. Refer to Section 1. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Coolant Temperature is Below Normal



## Cranking Fuel Pressure is Low



## Engine Acceleration or Response Poor

| Cause | Correction |
|---|---|
| Operator technique is **not** correct | Refer to Operating Instructions in Section 1. |
| OK ↓ | |
| Fuel level is low in the tank | Fill the supply tank. Refer to the OEM service manual. |
| OK ↓ | |
| Vehicle parasitics are excessive | Check the vehicle brakes for dragging, transmission malfunction, cooling fan operation cycle time, and engine-driven units. Refer to the OEM service manual. |
| OK ↓ | |
| Clutch is malfunctioning or is **not** correct | Compare the drivetrain specifications to Cummins recommendations. Check the clutch for correct operation. Refer to the OEM service manual. |
| OK ↓ | |
| Drivetrain is **not** correctly matched to the engine | Check for correct gearing and drivetrain components. Refer to the OEM service manual. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Fuel leak | Check the fuel lines, fuel connections, and fuel filters for leaks. Check the fuel lines to the supply tanks. Refer to the OEM service manual. |
| OK ↓ | |
| Intake manifold air temperature is above specification | Refer to or the OEM service manual. |
| OK ↓ | |

(Continued)

## Engine Acceleration or Response Poor (Continued)

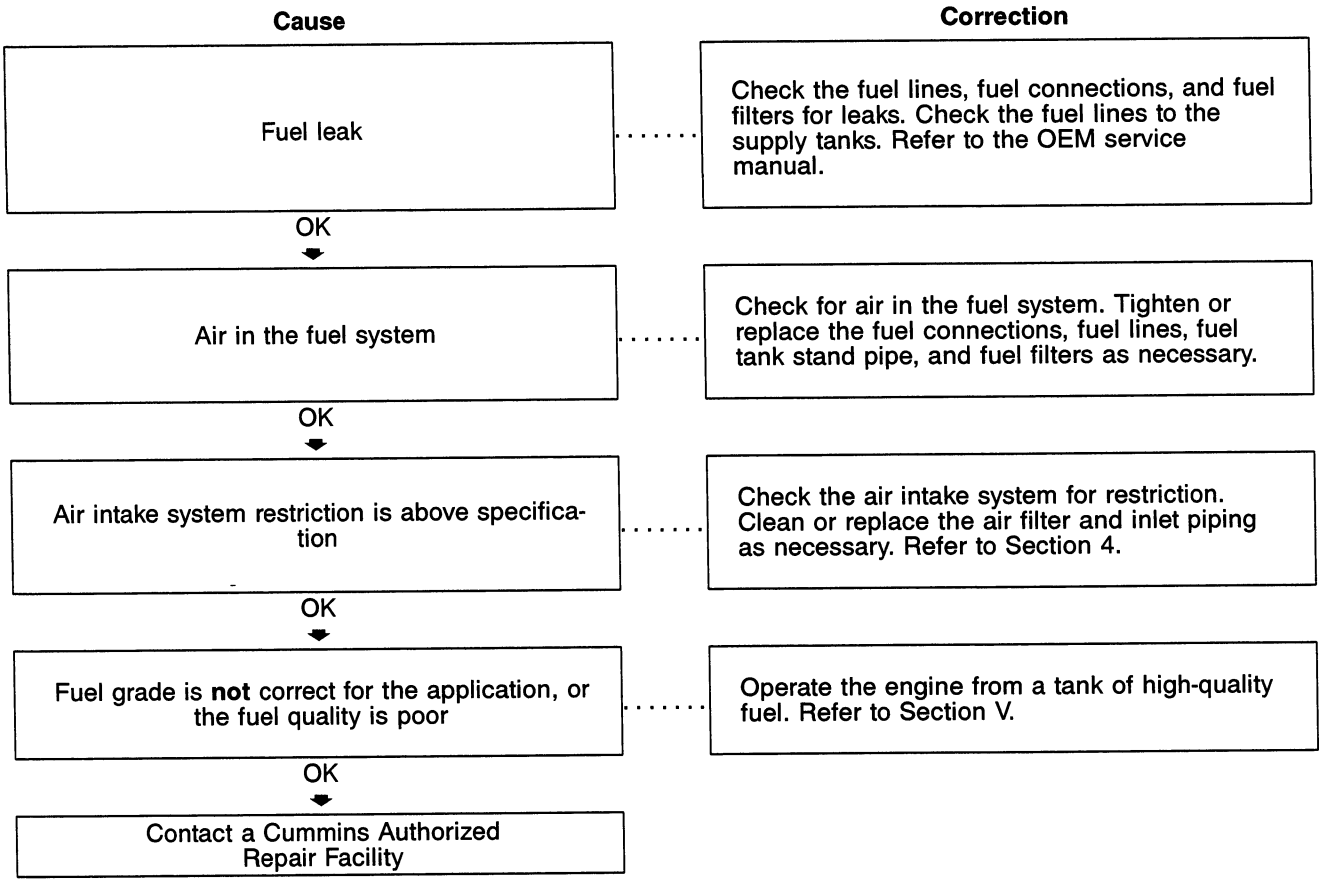
| Cause | Correction |
|---|---|
| Fuel supply line restriction between the fuel pump and the injectors | Check the fuel supply line from the fuel pump to the cylinder head for sharp bends that can cause restrictions. Refer to a Cummins Authorized Repair Facility. |
| OK ↓ | |
| Charge-air cooler (CAC) is restricted or leaking | Inspect the CAC for air restrictions or leaks. |
| OK ↓ | |
| Air intake or exhaust leaks | Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. |
| OK ↓ | |
| Air intake system restriction is above specification | Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 4. |
| OK ↓ | |
| 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 Section V. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Engine Difficult to Start or Will Not Start (Exhaust Smoke)

| Cause | Correction |
|---|---|
| Fuel level is low in the tank | Fill the supply tank. Refer to the OEM service manual. |
| OK ⬇ | |
| Electronic fault codes are active | 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. |
| OK ⬇ | |
| Starting aid is necessary for cold weather, or starting aid is malfunctioning | Check for the correct operation of the starting aid. Refer to the manufacturer's instructions. Refer to Cold Weather Starting Aids in Section 1. |
| OK ⬇ | |
| Engine block heater is malfunctioning (if equipped) | Check the electrical sources and wiring to the cylinder block heater. Replace the block heater, if necessary. Refer to the OEM service manual. |
| OK ⬇ | |
| Fuel heater is malfunctioning (if equipped) | Check the fuel heater and replace, if necessary. Refer to to the manufacturer's instructions. |
| OK ⬇ | |
| Battery voltage is low | Inspect the batteries and the unswitched battery supply circuit. Refer to the OEM service manual. |
| OK ⬇ | |
| Engine cranking speed is too slow | If the cranking speed is slower than 150 rpm, refer to the Engine Will Not Crank or Cranks Slowly (Electric Start) symptom tree. |
| OK ⬇ | |
| Vehicle parasitics are excessive | Check the vehicle brakes for dragging, transmission malfunction, cooling fan operation cycle time, and engine-driven units. Refer to the OEM service manual. |
| OK ⬇ | |

(Continued)

## Engine Difficult to Start or Will Not Start (Exhaust Smoke) (Continued)



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

| Cause | Correction |
|---|---|
| Fuel level is low in the tank | Fill the supply tank. Refer to the OEM service manual. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| OEM engine protection system is malfunctioning | Isolate the OEM engine protection system. Follow the OEM service manuals to check for a malfunction. |
| OK ↓ | |
| Battery voltage is low | Inspect the batteries and the unswitched battery supply circuit. Refer to the OEM service manual. |
| OK ↓ | |
| Battery voltage supply to the electronic control module (ECM) is low, interrupted, or open | Check the battery connections. Check the fuses and the unswitched battery supply circuit. Refer to the OEM service manual. |
| OK ↓ | |
| Moisture in the wiring harness connectors | Dry the connectors with Cummins electronic cleaner, Part No. 3824510. |
| OK ↓ | |
| Air in the fuel system | Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary. |
| OK ↓ | |
| Electronic control module (ECM) is locked up | Disconnect the battery cables for 30 seconds. Connect the battery cables, and start the engine. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Engine Noise Excessive

| Cause | Correction |
|---|---|
| Fan drive belt is loose, tight, or **not** in alignment | Check the fan drive belt. Refer to Section 6. |
| OK ↓ | |
| Lubricating oil is thin or diluted | Refer to the Lubricating Oil Contaminated symptom tree or the Lubricating Oil Specifications in Section V. |
| OK ↓ | |
| Vibration damper is damaged | Inspect the vibration damper. Refer to Section 7. |
| OK ↓ | |
| Air intake or exhaust leaks | Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. |
| OK ↓ | |
| Air intake or exhaust piping is contacting the chassis or cab | Inspect the air piping, chassis, and cab for contact points. Refer to Section 4. |
| OK ↓ | |
| Air intake system restriction is above specification | Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 4. |
| OK ↓ | |
| Coolant temperature is above specification | Refer to the Coolant Temperature is Above Normal - Sudden Overheat symptom tree. |
| OK ↓ | |
| Engine mounts are worn, damaged, or **not** correct | Inspect the engine mounts. Refer to the OEM service manual. |
| OK ↓ | |
| Fan clutch, hydraulic pump, or freon compressor noise is excessive | Isolate each component and check for noise. Refer to the OEM service manual. |
| OK ↓ | |

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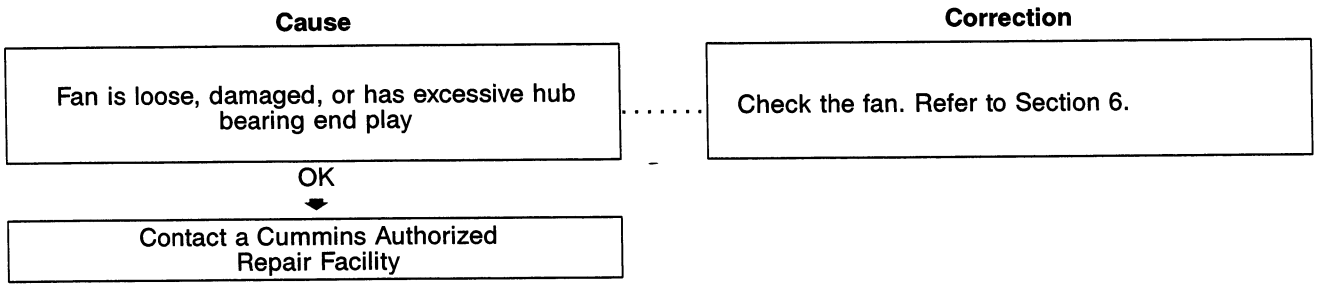
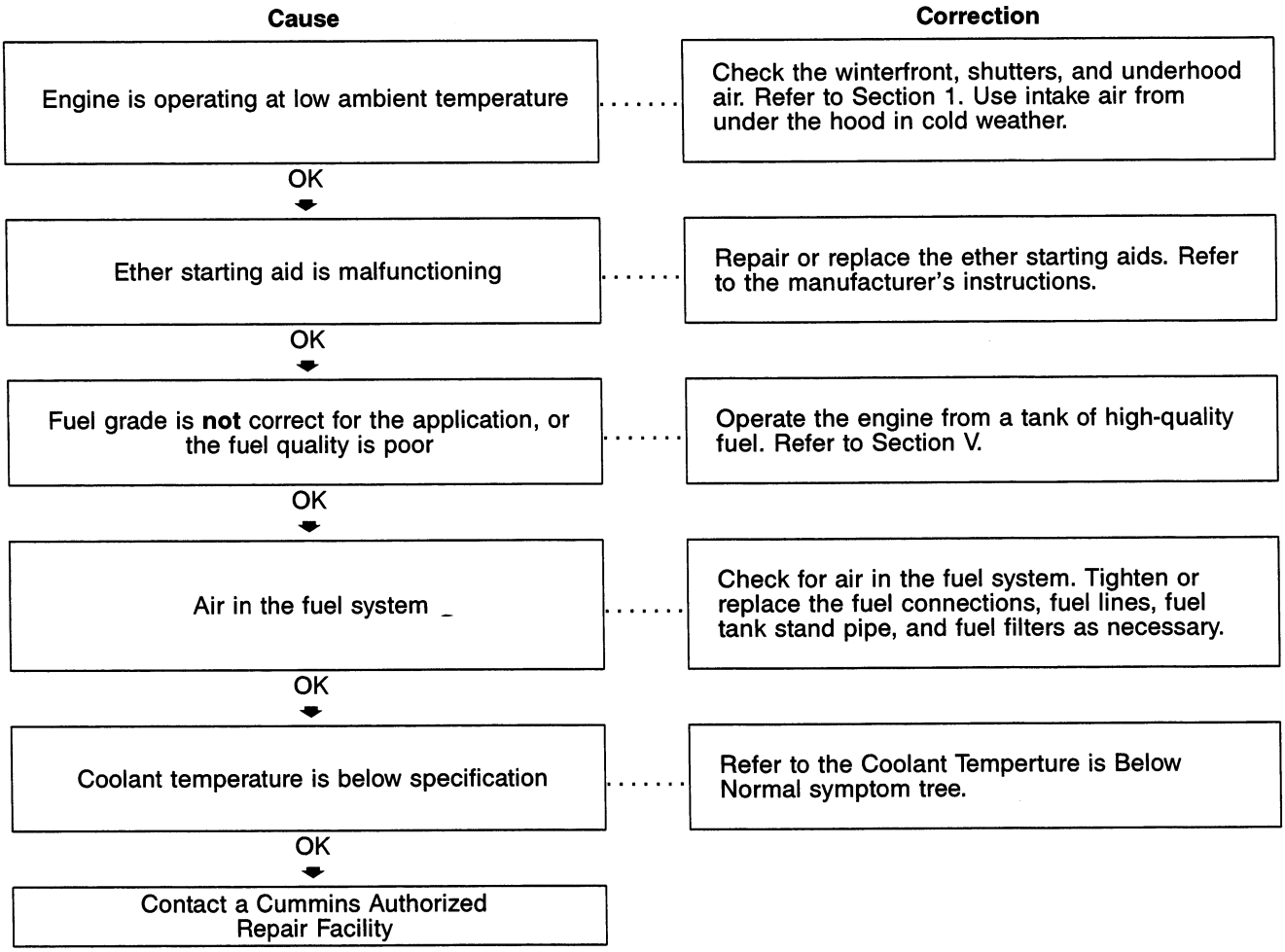
## Engine Noise Excessive (Continued)



## Engine Noise Excessive — Combustion Knocks



## Engine Power Output Low

| Cause | Correction |
|---|---|
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Fuel level is low in the tank | Fill the supply tank. Refer to the OEM service manual. |
| OK ↓ | |
| Engine is operating above recommended altitude | Engine power decreases above recommended altitude. Refer to the Engine Data Sheet for specifications. |
| OK ↓ | |
| 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 the OEM service manual. |
| OK ↓ | |
| Air intake system restriction is above specification | Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 4. |
| OK ↓ | |
| Air intake or exhaust leaks | Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. |
| OK ↓ | |
| Fuel leak | Check the fuel lines, fuel connections, and fuel filters for leaks. Check the fuel lines to the supply tanks. Refer to the OEM service manual. |
| OK ↓ | |
| Air in the fuel system | Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary. |
| OK ↓ | |

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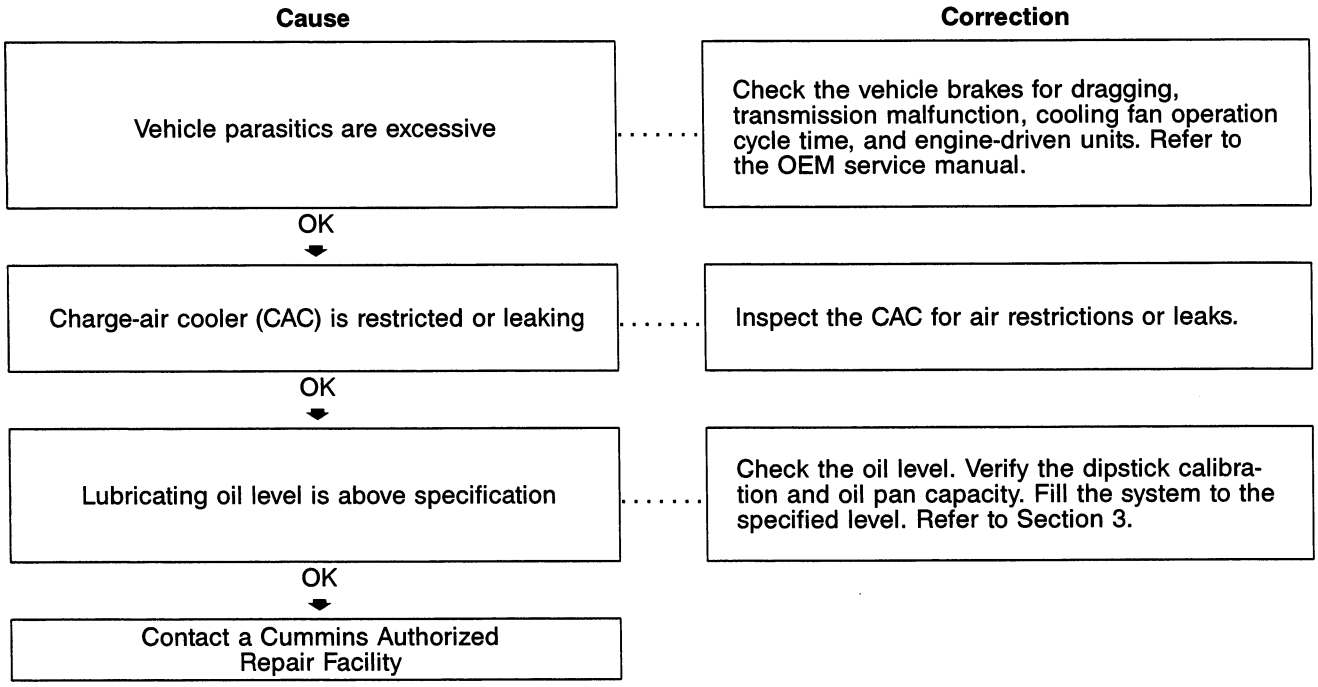
## Engine Power Output Low (Continued)



## Engine Runs Rough at Idle

| Cause | Correction |
|---|---|
| Engine is cold | Allow the engine to warm to operating temperature. If the engine will **not** reach operating temperature, refer to the Coolant Temperature is Below Normal symptom tree. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Air in the fuel system | Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary. |
| OK ↓ | |
| Fuel supply line restriction between the fuel pump and the injectors | Check the fuel supply line from the fuel pump to the cylinder head for sharp bends that can cause restrictions. Refer to a Cummins Authorized Repair Facility. |
| OK ↓ | |
| Engine mounts are worn, damaged, or **not** correct | Check the engine mounts. Refer to the OEM service manual. |
| OK ↓ | |
| Moisture in the wiring harness connectors | Dry the connectors with Cummins electronic cleaner, Part No. 3824510. |
| OK ↓ | |
| 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 Section V. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Engine Runs Rough or Misfires

| Cause | Correction |
|---|---|
| Engine is cold | Allow the engine to warm to operating temperature. If the engine will **not** reach operating temperature, refer to the Coolant Temperature is Below Normal symptom tree. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Air in the fuel system | Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary. |
| OK ↓ | |
| Fuel supply line restriction between the fuel pump and the injectors | Check the fuel supply line from the fuel pump to the cylinder head for sharp bends that can cause restrictions. Refer to a Cummins Authorized Repair Facility. |
| OK ↓ | |
| Engine mounts are worn, damaged, or **not** correct | Check the engine mounts. Refer to the OEM service manual. |
| OK ↓ | |
| Moisture in the wiring harness connectors | Dry the connectors with Cummins electronic cleaner, Part No. 3824510. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Engine Shuts Off Unexpectedly or Dies During Deceleration

| Cause | Correction |
|---|---|
| Fuel level is low in the tank | Fill the supply tank. Refer to the OEM service manual. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Idle shutdown or PTO shutdown features are activated | Refer to Electronically Controlled Fuel System in Section 1. |
| OK ↓ | |
| Moisture in the wiring harness connectors | Dry the connectors with Cummins electronic cleaner, Part No. 3824510. |
| OK ↓ | |
| OEM engine protection system is malfunctioning | Isolate the OEM engine protection system. Follow the OEM service manuals to check for a malfunction. |
| OK ↓ | |
| Air in the fuel system | Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

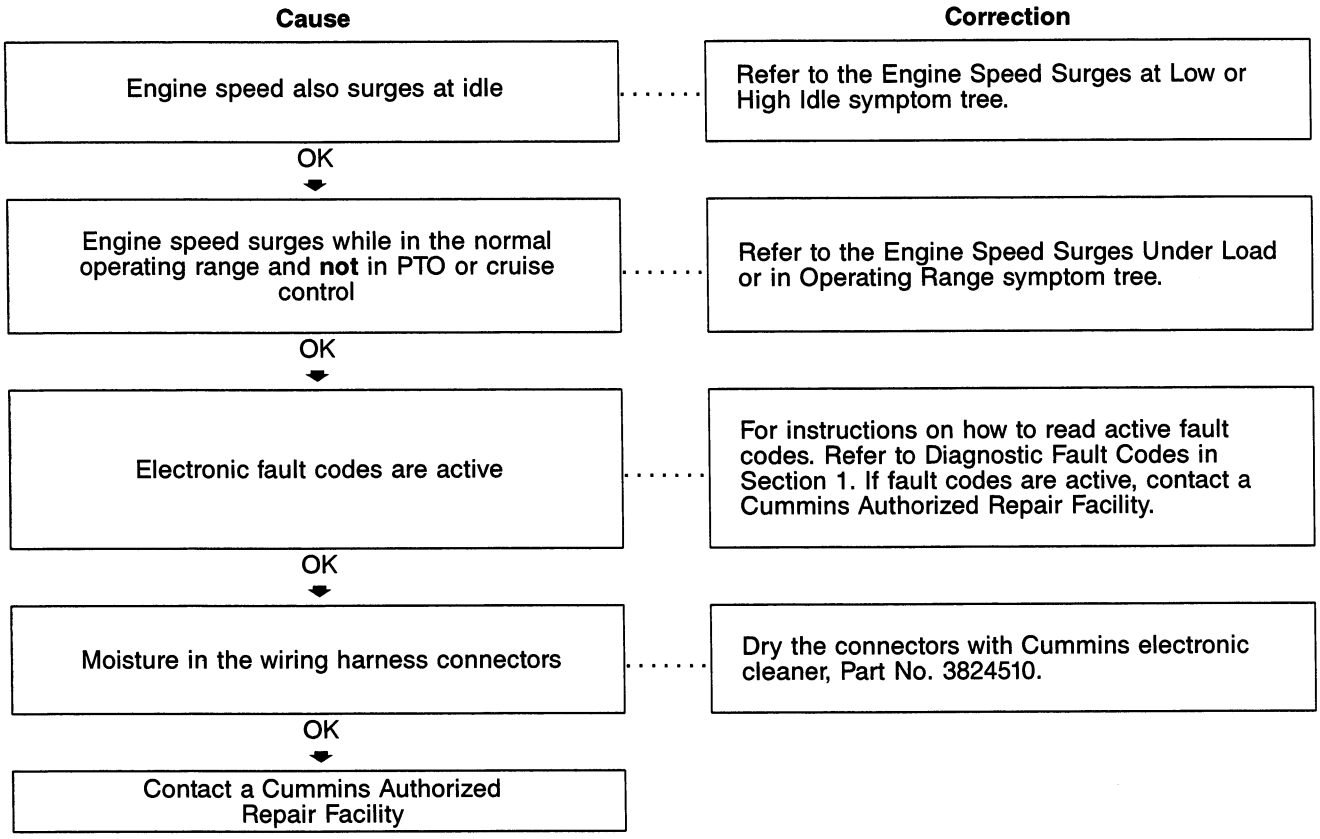
## Engine Speed Surges at Low or High Idle

| Cause | Correction |
|---|---|
| Fuel level is low in the tank | Fill the supply tank. Refer to the OEM service manual. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Moisture in the wiring harness connectors | Dry the connectors with Cummins electronic cleaner, Part No. 3824510. |
| OK ↓ | |
| Air in the fuel system | Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary. |
| OK ↓ | |
| 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 ↓ | |
| Contact a Cummins Authorized Repair Facility | |

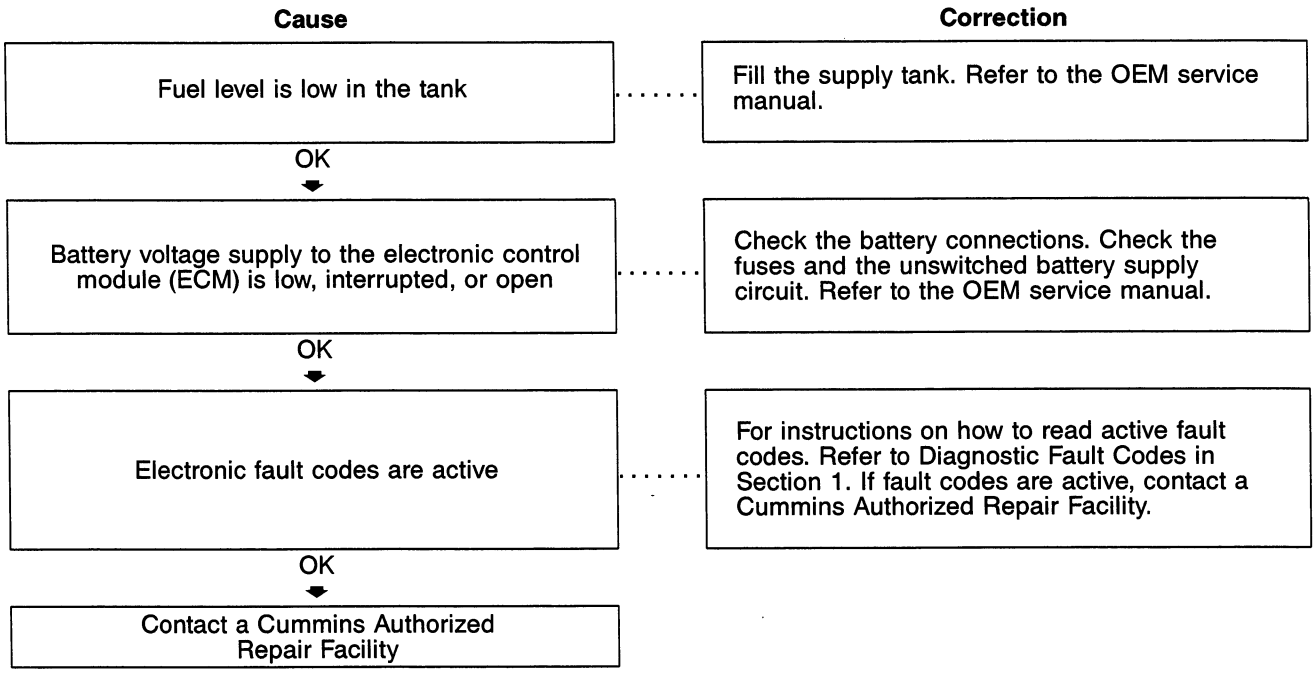
## Engine Speed Surges Under Load or in Operating Range

| Cause | Correction |
|---|---|
| Fuel level is low in the tank | Fill the supply tank. Refer to the OEM service manual. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Moisture in the wiring harness connectors | Dry the connectors with Cummins electronic cleaner, Part No. 3824510. |
| OK ↓ | |
| Air in the fuel system | Check for air in the fuel system. Tighten or replace the fuel connections, fuel lines, fuel tank stand pipe, and fuel filters as necessary. |
| OK ↓ | |
| Idling with excessive load | Use the PTO feature for loaded conditions at low engine speeds. Refer to Programmable Features in Section 1. |
| OK ↓ | |
| Vehicle parasitics are excessive | Check the vehicle brakes for dragging, transmission malfunction, cooling fan operation cycle time, and engine-driven units. Refer to the OEM service manual. |
| OK ↓ | |
| Clutch is malfunctioning or is **not** correct | Compare the drivetrain specifications to Cummins recommendations. Check the clutch for correct operation. Refer to the OEM service manual. |
| OK ↓ | |
| 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 ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Engine Speed Surges in PTO or Cruise Control



## Engine Starts But Will Not Keep Running



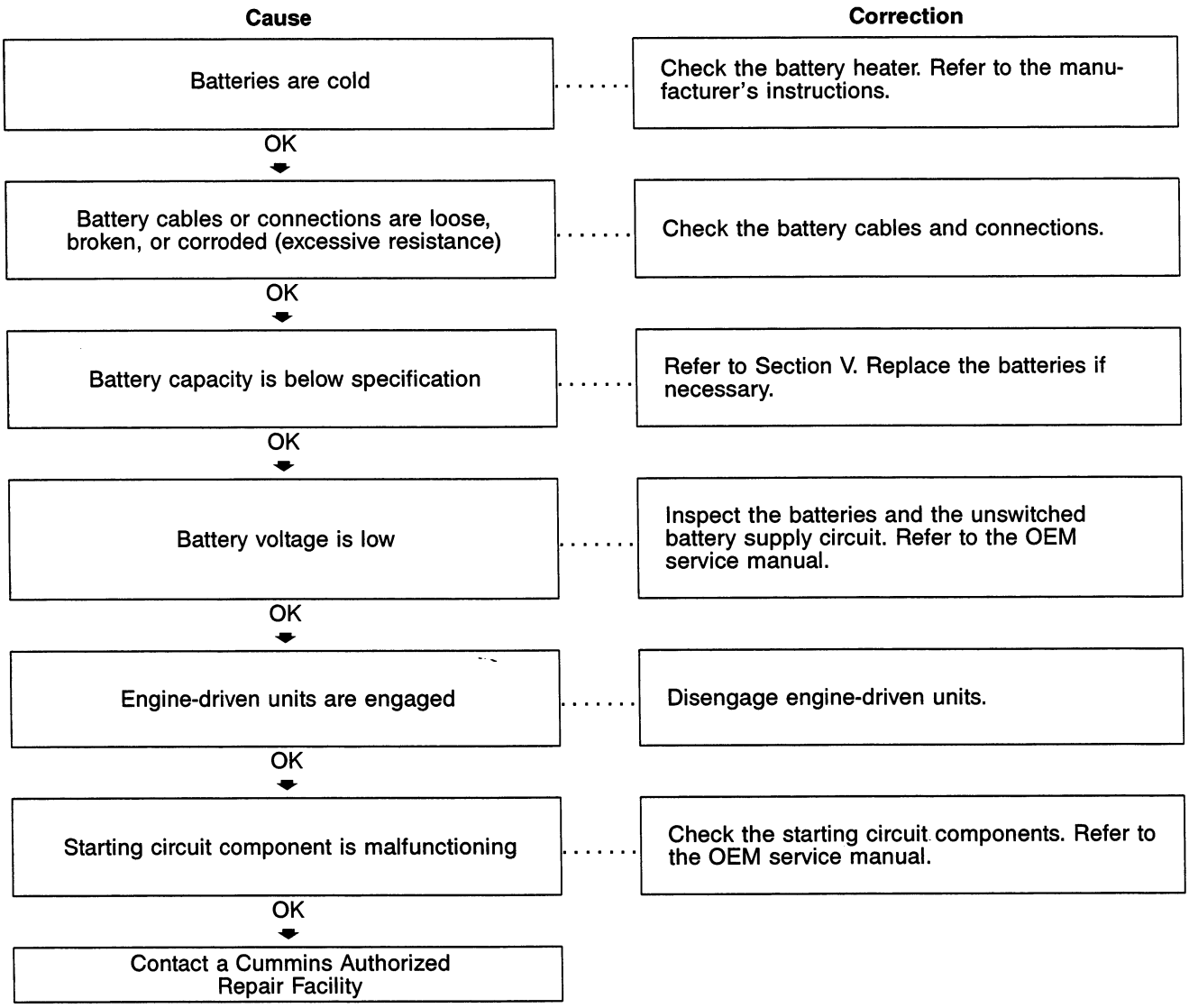
## Engine Vibration Excessive

| Cause | Correction |
|---|---|
| Belt-driven accessories are malfunctioning | Check the fan hub, alternator, freon compressor, and hydraulic pump for interference. Isolate belt-driven accessories, and check for vibration. |
| OK ↓ | |
| Engine idle speed is set too low (electronically controlled fuel systems) | Verify the correct idle speed setting. Increase the idle speed with the idle increment switch or an electronic service tool. |
| OK ↓ | |
| Engine mounts are worn, damaged, or **not** correct | Check the engine mounts. Refer to the OEM service manual. |
| OK ↓ | |
| Fan is loose, damaged, or has excessive hub bearing end play | Check the fan. Refer to Section 6. |
| OK ↓ | |
| Engine is misfiring | Refer to the Engine Runs Rough or Misfires symptom tree. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Vibration damper is damaged | Inspect the vibration damper. Refer to Section 7. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

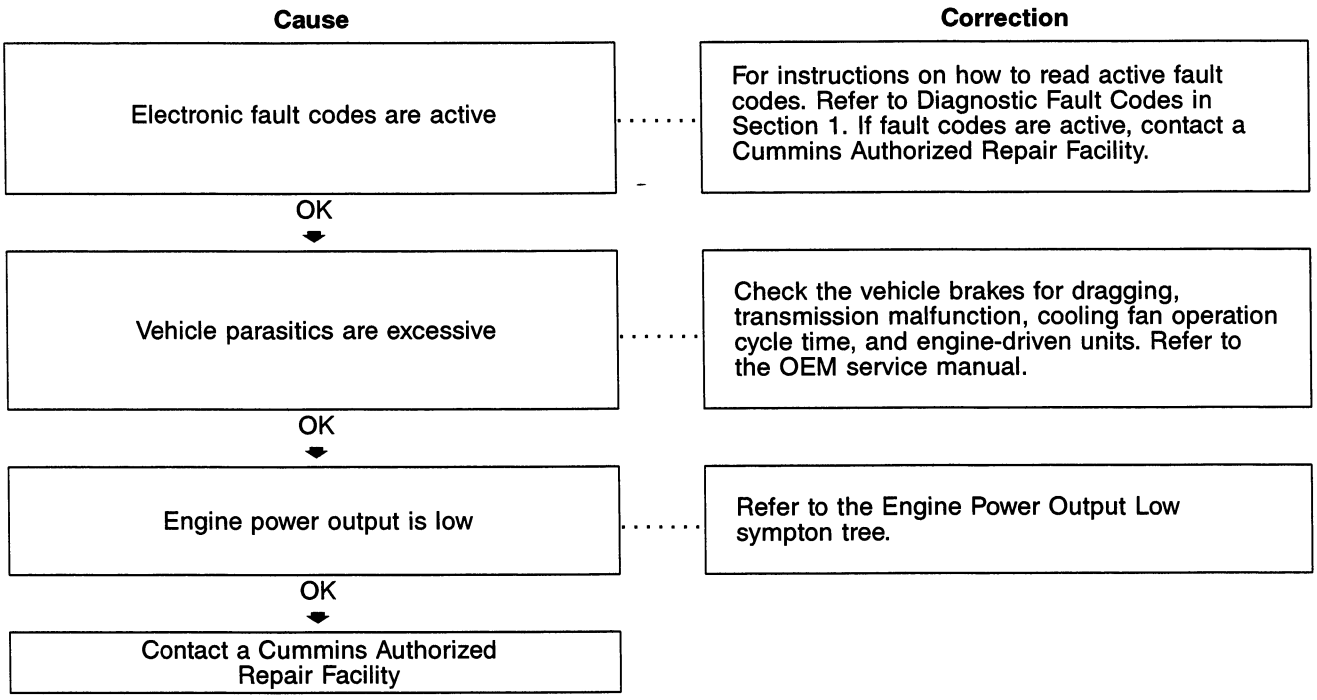
## Engine Will Not Crank or Cranks Slowly (Air Starter)

| Cause | Correction |
|---|---|
| Air pressure is low in the air tanks | Increase air pressure with an external air source. |
| OK ↓ | |
| Engine-driven units are engaged | Disengage engine-driven units. |
| OK ↓ | |
| Lubricating oil level is above specification | Check the oil level. Verify the dipstick calibration and oil pan capacity. Fill the system to the specified level. Refer to Section 3. |
| OK ↓ | |
| 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 ↓ | |
| Starting motor is malfunctioning, or starting motor is **not** correct | Check the starting motor operation. Compare the starting motor with the engine and vehicle specifications. Refer to the manufacturer's instructions. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

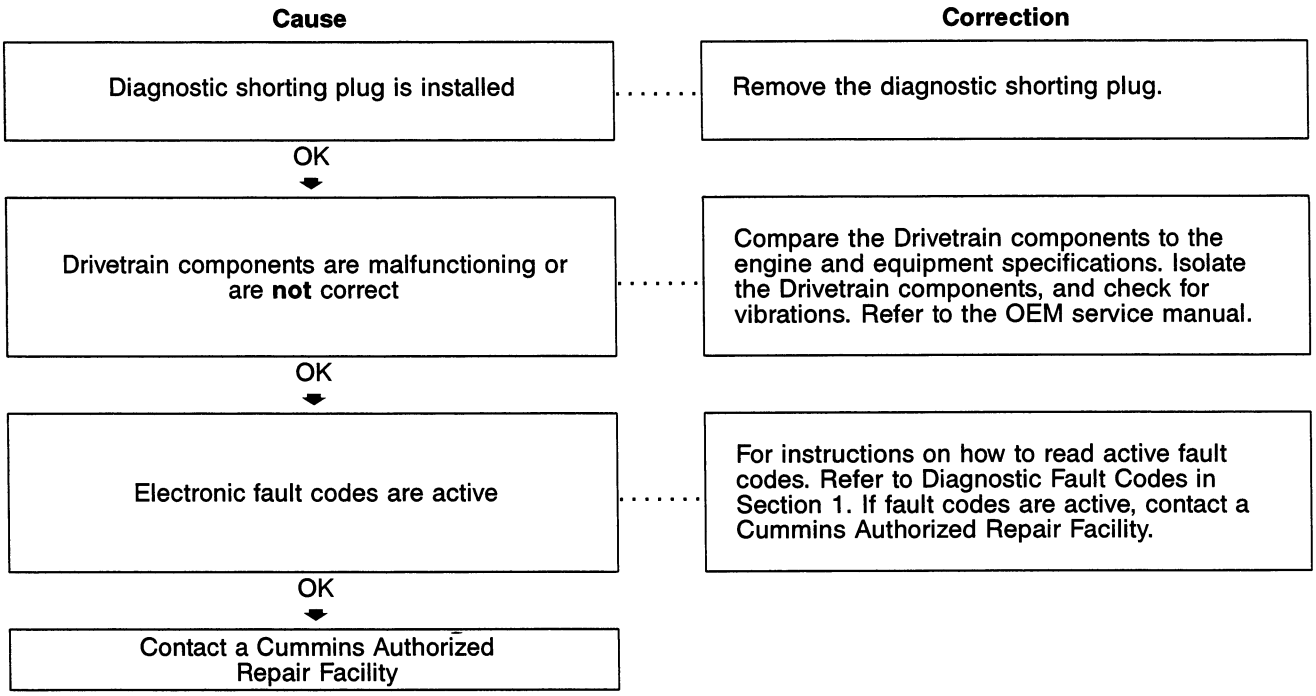
## Engine Will Not Crank or Cranks Slowly (Electric Starter)



## Engine Will Not Reach Rated Speed (RPM)



## Fault Code Warning Lamps Stay On (No Apparent Reason)



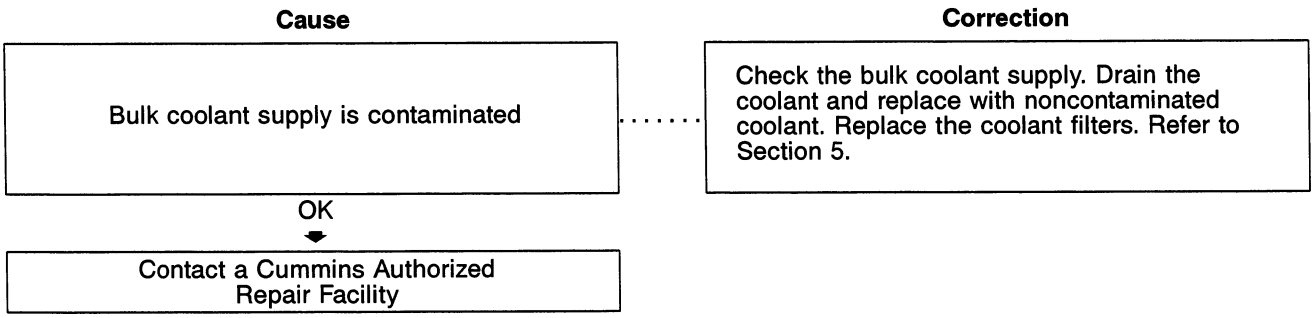
## Fault Code Warning Lamps Do Not Illuminate

| Cause | Correction |
| --- | --- |
| Keyswitch is in the OFF position | Turn the keyswitch to the ON position. |
| OK ↓ | |
| Battery voltage supply to the electronic control module (ECM) is low, interrupted, or open | Check the battery connections. Check the fuses and the unswitched battery supply circuit. Refer to the OEM service manual. |
| OK ↓ | |
| Idle shutdown or PTO shutdown features are activated | Refer to Electronically Controlled Fuel System in Section 1. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Fuel Consumption Excessive

| Cause | Correction |
|---|---|
| Operator technique is **not** correct | Refer to the Operating Instructions in Section 1. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Fuel leak | Check the fuel lines, fuel connections, and fuel filters for leaks. Check the fuel lines to the supply tanks. Refer to the OEM service manual. |
| OK ↓ | |
| Hubometer or odometer is miscalibrated | Check the hubometer and odometer calibrations. Calibrate or replace the hubometer or odometer, if necessary. Calculate fuel consumption with new mileage figures. |
| OK ↓ | |
| Air intake or exhaust leaks | Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. |
| OK ↓ | |
| Air intake system restriction is above specification | Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 4. |
| OK ↓ | |
| Equipment and environmental factors are affecting fuel consumption | Consider ambient temperatures, wind, tire size, axle alignment, routes, and use of aerodynamic aids when evaluating fuel consumption. |
| OK ↓ | |
| Lubricating oil level is above specification | Check the oil level. Verify the dipstick calibration and oil pan capacity. Fill the system to the specified level. Refer to Section 3. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Fuel in Coolant



## Fuel in the Lubricating Oil

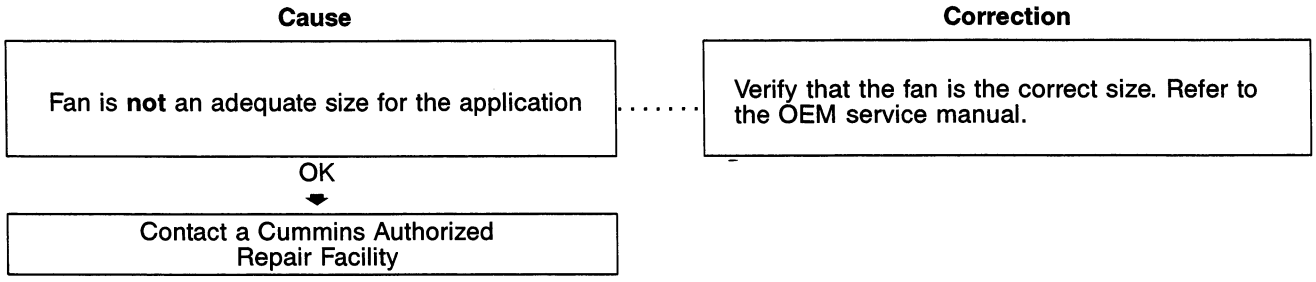
| Cause | Correction |
| --- | --- |
| Engine idle time is excessive | Low oil and coolant temperatures can be caused by long idle time (greater than 10 minutes). Shut off the engine rather than idle for long periods. If idle time is necessary, raise the idle speed. |
| OK ⬇ | |
| Bulk oil supply is contaminated | Check the bulk oil supply. Drain the oil and replace with noncontaminated oil. Replace the oil filters. Refer to Section 5. |
| OK ⬇ | |
| Contact a Cummins Authorized Repair Facility | |

## Intake Manifold Air Temperature Above Specification

| Cause | Correction |
|---|---|
| Charge-air cooler (CAC) fins, radiator fins, or air conditioner condenser fins are damaged or obstructed with debris | Inspect the CAC, air conditioner condenser, and radiator fins. Clean, if necessary. Refer to Section 4. |
| OK ⬇ | |
| Cold weather radiator cover or winterfront is closed | Open the cold weather radiator cover or the winterfront. Maintain a minimum of 784 $cm^2$ [120 $in^2$], or approximately 28 x 28 cm [11 x 11 in], of opening at all times. Refer to Section 1. |
| OK ⬇ | |
| Fan drive belt or water pump belt is broken | Check the fan drive belt and water pump belt. Replace the belts if necessary. Refer to Section 6. |
| OK ⬇ | |
| Fan shroud is damaged or missing, or the air recirculation baffles are damaged or missing | Inspect the shroud and the recirculation baffles. Repair, replace, or install, if necessary. Refer to the OEM service manual. |
| OK ⬇ | |
| Radiator shutters are **not** opening completely, or the shutterstat setting is wrong | Inspect the radiator shutters. Repair or replace if necessary. Refer to the manufacturer's instructions. Check the shutterstat setting. |
| OK ⬇ | |
| Vehicle speed is too low for adequate cooling with high engine load | Reduce the engine load. Increase the engine (fan) rpm by downshifting. |
| OK ⬇ | |
| Vehicle cooling system is **not** adequate | Verify that the engine and vehicle cooling systems are using the correct components. Refer to the OEM service manual. |
| OK ⬇ | |
| Intake manifold temperature gauge is malfunctioning, if equipped | Test the temperature gauge. Refer to the OEM service manual. |
| OK ⬇ | |

(Continued)

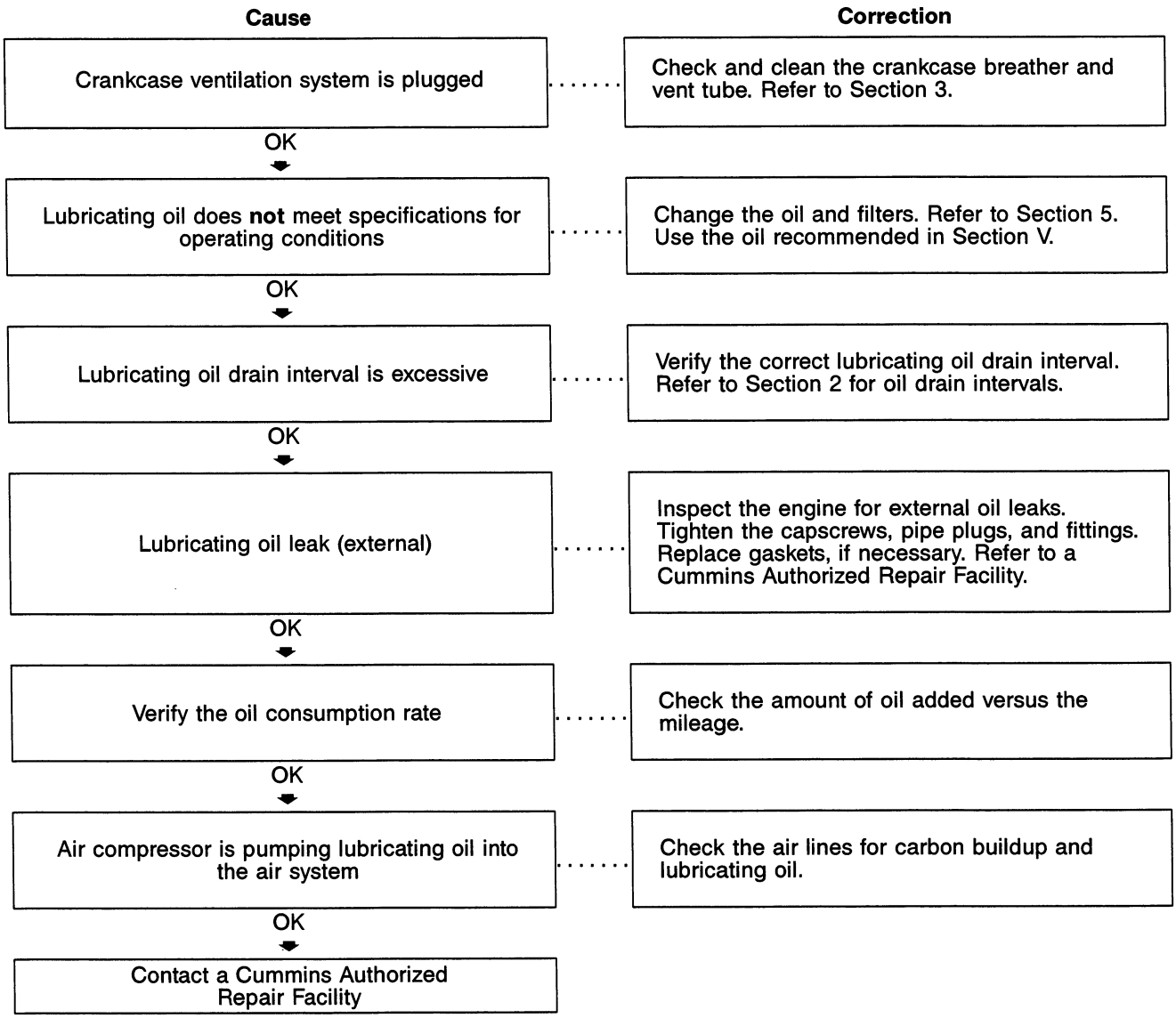
## Intake Manifold Air Temperature Above Specification (Continued)



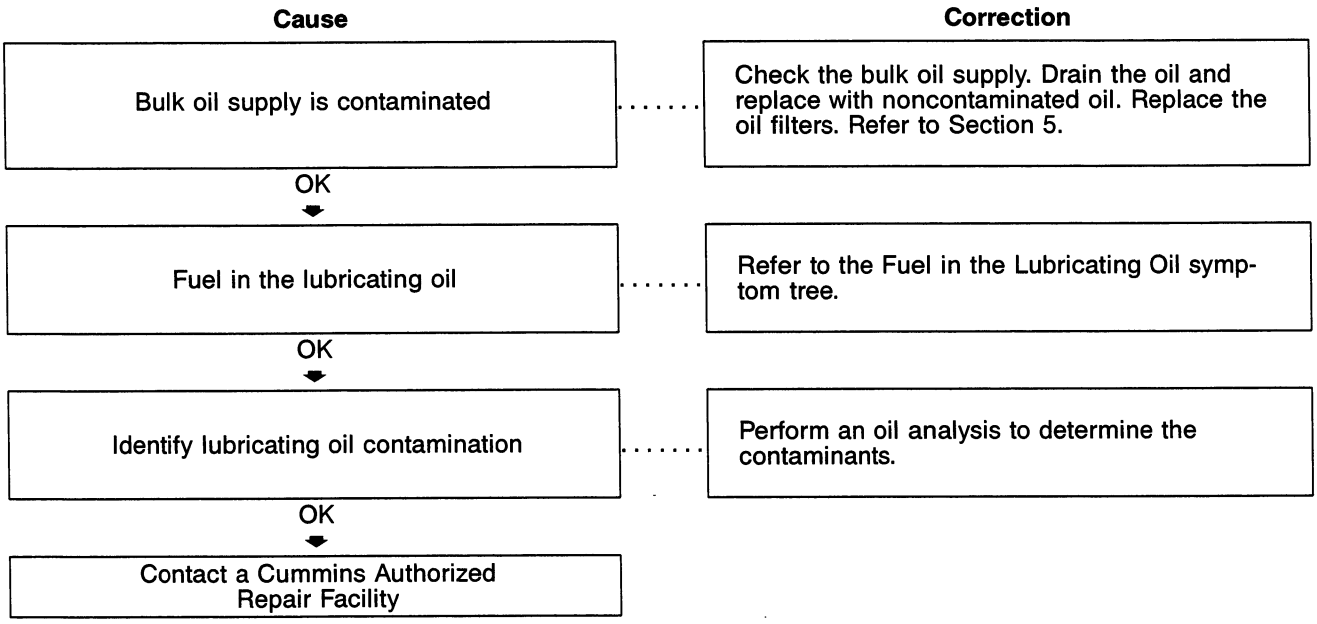
## Intake Manifold Pressure (Boost) is Below Normal

| Cause | Correction |
|---|---|
| Air intake or exhaust leaks | Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. |
| OK ↓ | |
| Air intake system restriction is above specification | Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 4. |
| OK ↓ | |
| Charge-air cooler (CAC) is restricted or leaking | Inspect the CAC for air restrictions or leaks. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Engine power output is low | Refer to the Engine Power Output Low symptom tree. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

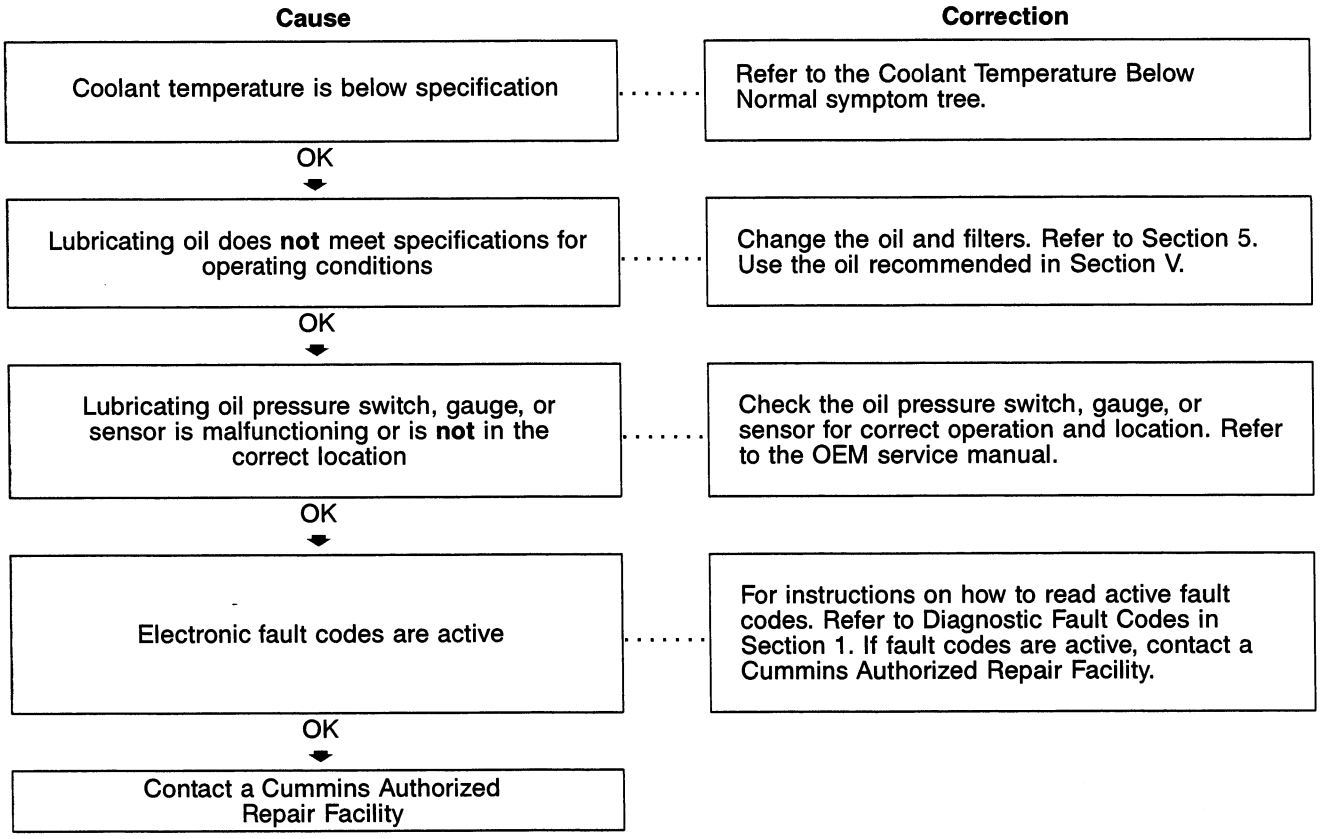
## Lubricating Oil Consumption Excessive



## Lubricating Oil Contaminated



## Lubricating Oil Pressure High



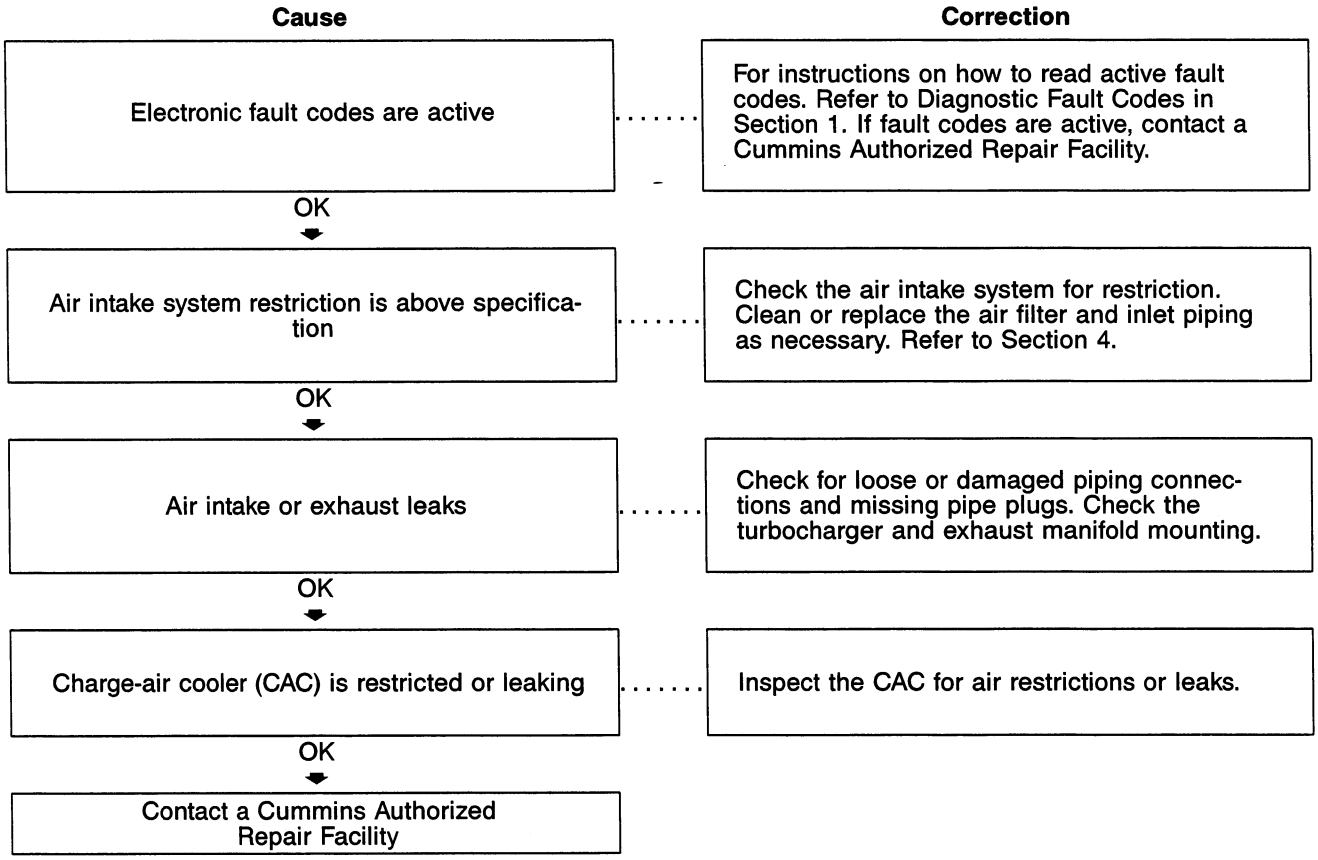
## Lubricating Oil Pressure Low

| Cause | Correction |
|---|---|
| Engine angularity during operation exceeds specification | Refer to the Engine Specifciation data sheet. |
| OK ↓ | |
| 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 ↓ | |
| Lubricating oil filter is plugged | Change the oil and filter. Refer to Section 5. Review the oil change interval. |
| OK ↓ | |
| Lubricating oil is contaminated with coolant or fuel | Contact a Cummins Authorized Repair Facility. |
| OK ↓ | |
| Lubricating oil leak (external) | Inspect the engine for external oil leaks. Tighten the capscrews, pipe plugs, and fittings. Replace gaskets, if necessary. Refer to a Cummins Authorized Repair Facility. |
| OK ↓ | |
| Lubricating oil level is above or below specification | Check the oil level. Add or drain oil, if necessary. Refer to Section 3 or Section 5. |
| OK ↓ | |
| Lubricating oil pressure switch, gauge, or sensor is malfunctioning or is **not** in the correct location | Check the oil pressure switch, gauge, or sensor for correct operation and location. Refer to the OEM service manual. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Lubricating Oil Sludge in the Crankcase Excessive

| Cause | Correction |
|---|---|
| Bulk oil supply is contaminated | Check the bulk oil supply. Drain the oil and replace with noncontaminated oil. Replace the oil filters. Refer to Section 5. |
| OK ↓ | |
| Coolant temperature is below specification | Refer to the Coolant Temperature Below Normal symptom tree. |
| OK ↓ | |
| Crankcase ventilation system is plugged | Check and clean the crankcase breather and vent tube. Refer to Section 3. |
| OK ↓ | |
| 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 ↓ | |
| 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 ↓ | |
| Contact a Cummins Authorized Repair Facility | |

## Smoke, Black — Excessive

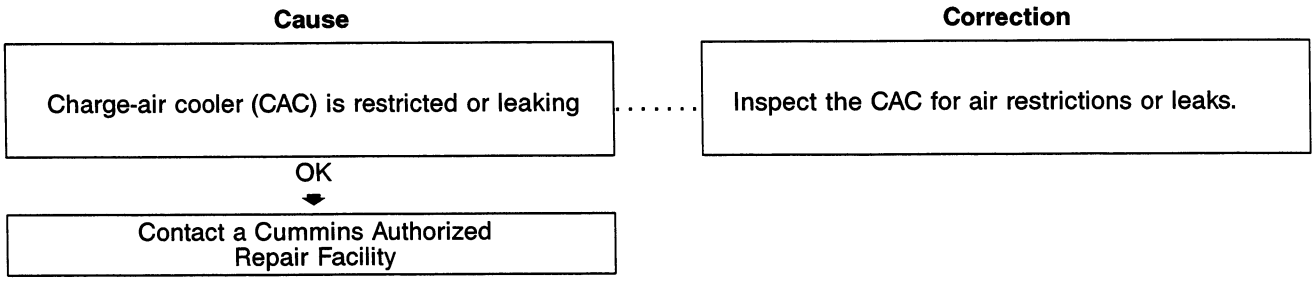


## Smoke, White — Excessive

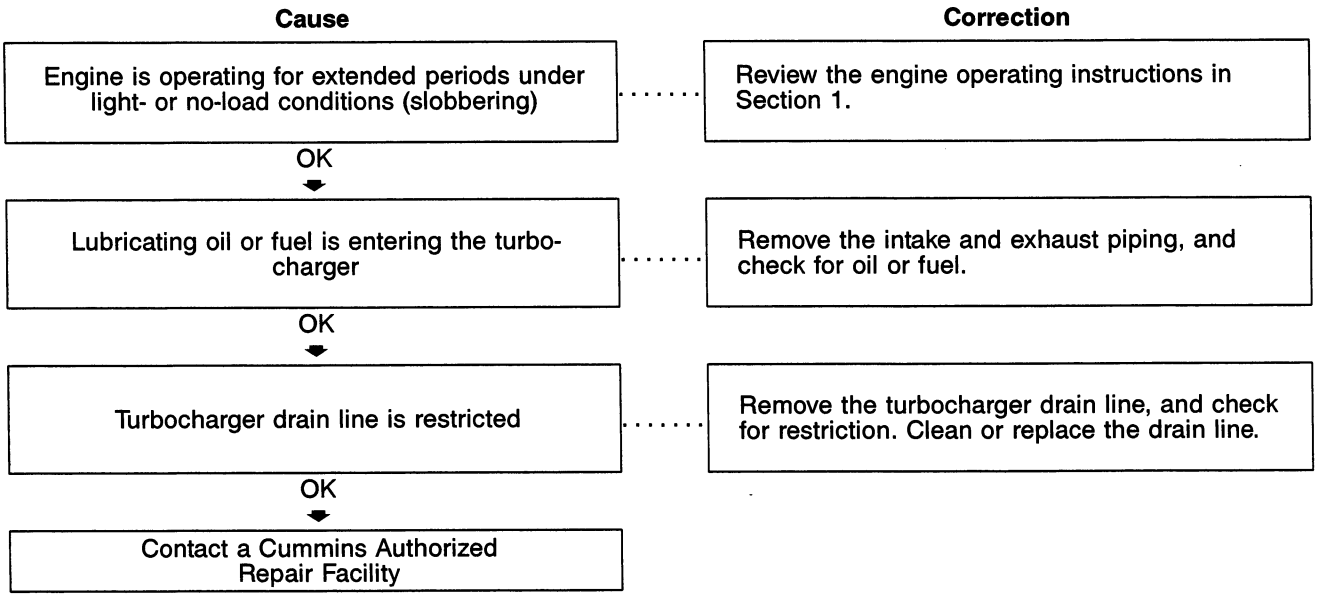
| Cause | Correction |
|---|---|
| Engine is cold | Allow the engine to warm to operating temperature. If the engine will **not** reach operating temperature, refer to the Coolant Temperature Below Normal symptom tree. |
| OK ↓ | |
| Engine is operating at low ambient temperature | Check the winterfront, shutters, and underhood air. Refer to the Cold Weather Operation, Bulletin No. 3387266, and Section 1. Use intake air from under the hood in cold weather. |
| OK ↓ | |
| Starting aid is necessary for cold weather, or starting aid is malfunctioning | Check for the correct operation of the starting aid. Refer to the manufacturer's instructions. Refer to Cold Weather Starting Aids in Section 1. |
| OK ↓ | |
| Electronic fault codes are active | 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. |
| OK ↓ | |
| 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 ↓ | |
| Air intake or exhaust leaks | Check for loose or damaged piping connections and missing pipe plugs. Check the turbocharger and exhaust manifold mounting. |
| OK ↓ | |
| Air intake system restriction is above specification | Check the air intake system for restriction. Clean or replace the air filter and inlet piping as necessary. Refer to Section 4. |
| OK ↓ | |

(Continued)

## Smoke, White — Excessive (Continued)



## Turbocharger Leaks Engine Oil or Fuel



# Section V - Maintenance Specifications

## Section Contents

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# Specifications

## General Specifications

Horsepower ..... (Refer to engine dataplate)

QSL9 Engine Speed @ Maximum Power Output:
- Standard Rating ..... 2100 rpm
- Governed Speed ..... 2300 rpm

Bore and Stroke ..... 114 mm [4.49 in] x 144.5 mm [5.69 in]

Displacement ..... 8.9 liters [543 C.I.D.]

Compression Ratio ..... 16.6:1

Firing Order ..... 1-5-3-6-2-4

QSL9 Approximate Engine Weight (with standard accessories) ..... 706 kg [1556 lb]

Crankshaft Rotation (viewed from the front of the engine) ..... **Clockwise**

Valve Clearance:
- Intake ..... 0.3048 mm [0.012 in]
- Exhaust ..... 0.5588 mm [0.022 in]

**NOTE:** The QSL9 engine features a no-adjust overhead. The QSL9 valve train is designed such that adjustment of the valve lash is **not** required for normal service during the first 241,500 km [150,000 mi] or 5000 hours. The valve train operates acceptably within the limits of 0.152 to 0.559 mm [0.006 to 0.022 in] intake valve lash and 0.381 to 0.813 mm [0.015 to 0.032 in] exhaust valve lash.

## Fuel System

Engine Idle Speed ..... 600 to 1200 rpm

Maximum Lift Pump Inlet Restriction at Rated ..... 102 mm Hg [4 in Hg]

Maximum Fuel Filter Outlet Restriction at Rated ..... 254 mm Hg [10 in Hg]

Minimum Fuel Filter Inlet Pressure during Cranking ..... 508 mm Hg [20 in Hg]

Maximum Fuel Drain Line Pressure ..... 254 mm Hg [10 in Hg]

Maximum Fuel Inlet Temperature ..... 71°C [160°F]

Minimum Engine Cranking Speed ..... 150 rpm

## Lubricating Oil System

Oil Pressure:
- At Low Idle (minimum allowable) ..... 69 kPa [10 psig]
- At Rated Speed (minimum allowable) ..... 207 kPa [30 psig]

Regulated Pressure ..... 517 kPa [75 psi]

Oil Pan Capacity, Low to High:
- Standard Oil Pan ..... 18.9 to 22.7 liters [20 to 24 qt]
- Standard Oil Pan with Block Stiffener ..... 19.9 to 23.7 liters [21 to 25 qt]

Total System Capacity:
- Standard Oil Pan ..... 22.7 liters [24 qt]
- Standard Oil Pan with Block Stiffener ..... 23.7 liters [25 qt]

Oil Capacity of Standard Engine:
- Standard Oil Pan
  - Pan **Only** ..... 22.7 liters [24 qt]

**NOTE:** Some applications use a slightly different oil pan capacity. Contact a local Cummins Distributor if there are any questions.

## Cooling System

Coolant Capacity (engine **only**) ..... 10.9 liters [11.5 qt]

Standard Modulating Thermostat - Range ..... 84 to 91°C [183 to 196°F]

Maximum Allowable Operating Temperature ..... 100°C [212°F]

Minimum Recommended Operating Temperature ..... 70°C [158°F]

Minimum Recommended Pressure Cap ..... 50 kPa [7 psi]

## Air Intake System

Maximum Intake Restriction (clean air filter element) ..... 254 mm $H_2O$ [10.0 in $H_2O$]

Maximum Intake Restriction (dirty air filter element) ..... 635 mm $H_2O$ [25.0 in $H_2O$]

## Exhaust System

Maximum Exhaust Back Pressure ..... 76 mm Hg [3 in Hg]

## Electrical System

Recommended Battery Capacity

| System Voltage | Ambient Temperature | | | |
|---|---|---|---|---|
| | -18°C [0°F] | | -29°C [-20°F] | |
| | Cold Cranking Amperes | Reserve Capacity (Minutes) (1) | Cold Cranking Amperes | Reserve Capacity (Minutes) (1) |
| 12 VDC | 1500 | 360 | 1875 | 360 |
| 24 VDC (2) | 750 | 180 | 900 | 180 |

1. The number of plates within a given battery size determines reserve capacity. Reserve capacity determines the length of time for which a battery at 27°C [81°F] can supply 25 amperes at 10.5 volts or greater.
2. CCA ratings are based on two 12-VDC batteries in series.

## Batteries (Specific Gravity)

| Specific Gravity at 27°C [81°F] | State of Charge |
|---|---|
| 1.260 to 1.280 | 100% |
| 1.230 to 1.250 | 75% |
| 1.200 to 1.220 | 50% |
| 1.170 to 1.190 | 25% |
| 1.110 to 1.130 | Discharged |

## Cummins/Fleetguard®/Nelson Filter Specifications

Fleetguard® is a subsidiary of Cummins Engine Company, Inc. Fleetguard® filters are developed through joint testing at Cummins and Fleetguard®. Fleetguard® filters are standard on new Cummins engines. Cummins Engine Company, Inc. recommends their use.

Fleetguard® products meet all Cummins Source Approval Test standards to provide the quality filtration necessary to achieve the engine's design life. If other brands are substituted, insist on products that the supplier has tested to meet Cummins high-quality standards.

Cummins can **not** be responsible for problems caused by nongenuine filters that do **not** meet Cummins performance or durability requirements.

# Fuel Recommendations and Specifications

## Fuel Recommendations

**⚠ WARNING ⚠**

**Do not mix gasoline, alcohol, or gasohol with diesel fuel. This mixture can cause an explosion.**

**△ CAUTION △**

**Due to the precise tolerances of diesel injection systems, it is extremely important that the fuel be kept clean and free of dirt or water. Dirt or water in the system can cause severe damage to both the fuel pump and the fuel injectors.**

**△ CAUTION △**

**Lighter fuels can reduce fuel economy and can damage the fuel injection pump.**

Cummins Engine Company, Inc. recommends the use of ASTM No. 2D fuel. The use of No. 2D fuel will result in optimum engine performance.

At operating temperatures below 0°C [32°F], acceptable performance can be obtained by using blends of No. 2D and No. 1D.

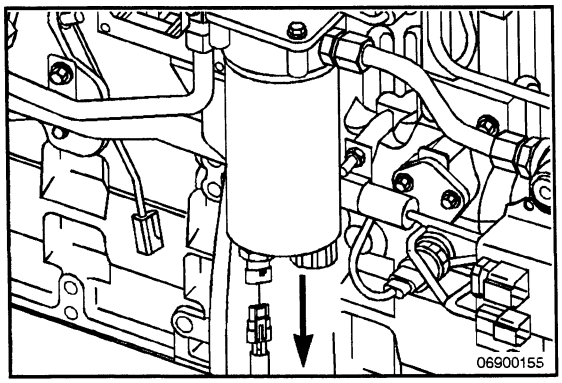
The viscosity of the fuel **must** be kept above 1.3 cSt at 40°C [104°F] to provide adequate fuel system lubrication.

The following chart lists acceptable alternate fuels for QSL9 Series engines.

| Acceptable Substitute Fuels - Cummins QSL9 Fuel System | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **No. 1D Diesel(1)(2)** | **No. 2D Diesel** | **No. 1K Kerosene** | **Jet-A** | **Jet-A1** | **JP-5** | **JP-8** | **Jet-B** | **JP-4** | **CITE** |
| OK | OK | OK | OK | OK | OK | OK | **NOT** OK | **NOT** OK | **NOT** OK |

1. Any adjustment to compensate for reduced performance with a fuel system using alternate fuel is **not** warrantable.
2. Winter blend fuels, such as those found at commercial fuel dispensing outlets, are combinations of No. 1D and No. 2D diesel fuel and are acceptable.

Additional information for fuel recommendations and specifications can be found in Fuel for Cummins Engines, Bulletin No. 3379001. See the ordering information in the back of this manual.




## Cummins/Fleetguard®/Nelson Filter Specifications

### Fuel Filters

- Fuel-water separator with a water-in-fuel sensor used in single filter applications
- Spin-on filter (Fleetguard® Part No. FS1022) (Cummins Part No. 3944264, element)
- Reusable water-in-fuel assembly (Cummins Part No. 3944270)
- Efficiency rating **must** meet Cummins specifications for the Cummins accumulator pump system (CAPS) fuel system.

# Lubricating Oil Recommendations and Specifications

## New Engine Break-in Oils

**⚠ CAUTION ⚠**

**A sulfated ash limit of 1.85 percent has been placed on all engine lubricating oils recommended for use in Cummins engines. Higher ash oils can cause valve and/or piston damage and lead to excessive oil consumption.**

**⚠ CAUTION ⚠**

**The use of a synthetic-based oil does not justify extended oil change intervals. Extended oil change intervals can decrease engine life due to factors such as corrosion, deposits, and wear.**

Special "break-in" engine lubricating oils are **not** recommended for new or rebuilt Cummins engines. Use the same kind of oil during the "break-in" as used in normal operation.

Additional information regarding lubricating oil availability throughout the world is available in the E.M.A. Lubricating Oils Data Book for Heavy-Duty Automotive and Industrial Engines. The data book can be ordered from the Engine Manufacturers Association, One Illinois Center, 111 East Wacker Drive, Chicago, IL U.S.A. 60601. The telephone number is (312) 644-6610.

### *Arctic Operation Engine Oil*

If an engine is operated in ambient temperatures consistently below -23°C [-9°F], and there are no provisions to keep the engine warm when it is **not** in operation, use a synthetic CE/SF or higher API classification engine oil with adequate low-temperature properties (such as 5W-20 or 5W-30).

The oil supplier is responsible for meeting the performance service specification represented with its product.

## General Information

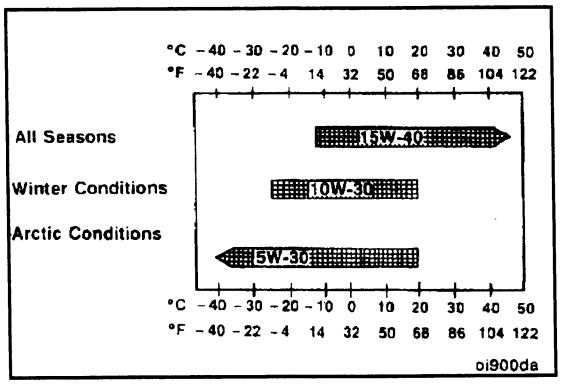
The use of quality engine lubricating oils, combined with appropriate oil drain and filter change intervals, are critical factors in maintaining engine performance and durability.

Cummins Engine Company, Inc. recommends the use of a high-quality SAE 15W-40 multiviscosity heavy-duty engine oil, such as Cummins Premium Blue®, that meets the requirements of Cummins Engineering Specification CES20071 or CES20076 or the American Petroleum Institute (API) performance classification CG-4 or CH-4.

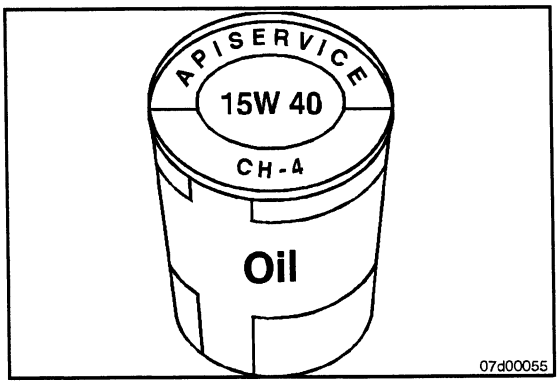
**NOTE:** In areas where CG-4 or CH-4 lubricating oils are **not** available, CES20075 or CF-4 lubricating oil can be used, but the lubricating oil change interval **must** be reduced to 14,400 km [9000 mi], 250 hours or 6 months.

A sulfated ash limit of 1.0 mass percent is suggested for optimum valve and piston deposit and oil consumption control. The sulfated ash **must not** exceed 1.85 mass percent.

For further details and discussion of engine lubricating oils for Cummins engines, refer to Cummins Engine Oil Recommendations, Bulletin No. 3810340, or a Cummins Authorized Repair Facility.




The use of low-viscosity oils, such as 10W or 10W-30, can be used to aid in starting the engine and in providing sufficient oil flow at ambient temperatures below -5°C [23°F]. However, continuous use of low-viscosity oils can decrease engine life due to wear. Refer to the accompanying chart.




The API service symbols are shown in the accompanying illustration. The upper half of the symbol displays the appropriate oil categories.

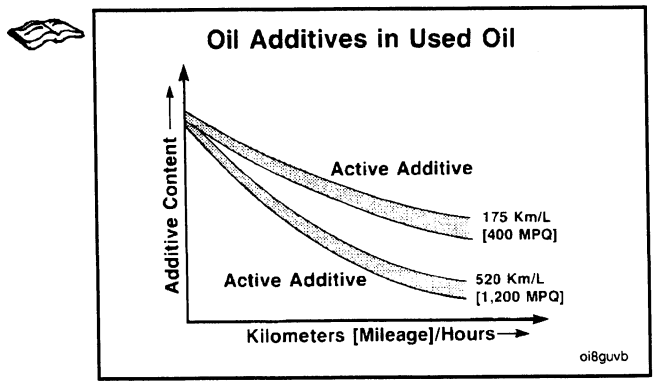
The lower half can contain a description of oil energy conserving features.

The center section identifies the SAE oil viscosity grade.

As the engine oil becomes contaminated, essential oil additives are depleted. Lubricating oils protect the engine as long as these additives are functioning properly. Progressive contamination between oil and filter change intervals is normal. The amount of contamination will vary depending on the operation of the engine, kilometers [miles] on the oil, fuel consumed, and new oil added.

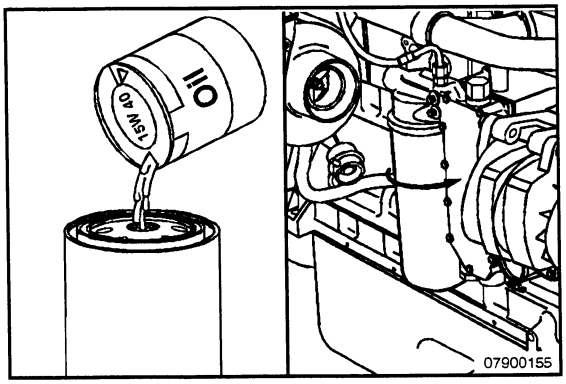
Extending oil and filter change intervals beyond the recommendations will decrease engine life due to factors such as corrosion, deposits, and wear.

Refer to the Oil Drain Interval Chart in this section to determine which oil drain interval to use for an application.




## Cummins/Fleetguard®/Nelson Filter Specifications

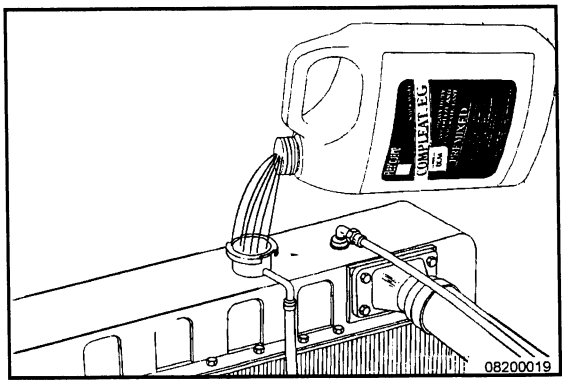
- Fleetguard® Part No. LF9009
- Cummins Part No. 3401544.




# Coolant Recommendations and Specifications

## Fully Formulated Coolant/Antifreeze

Cummins Engine Company, Inc. recommends using either a 50/50 mixture of high-quality water and fully formulated antifreeze or fully formulated coolant when filling the cooling system. The fully formulated antifreeze or coolant **must** meet TMC RP 329 or TMC RP 330 specifications.




**△ CAUTION △**

**High-quality water is important for cooling system performance. Excessive levels of calcium and magnesium contribute to scaling problems, and excessive levels of chlorides and sulfates cause cooling system corrosion.**

| Water Quality | |
|---|---|
| Calcium Magnesium (Hardness) | Maximum 170 ppm as ($CaCO_3$ + $MgCO_3$) |
| Chloride | 40 ppm as(Cl) |
| Sulfur | 100 ppm as ($SO_4$) |

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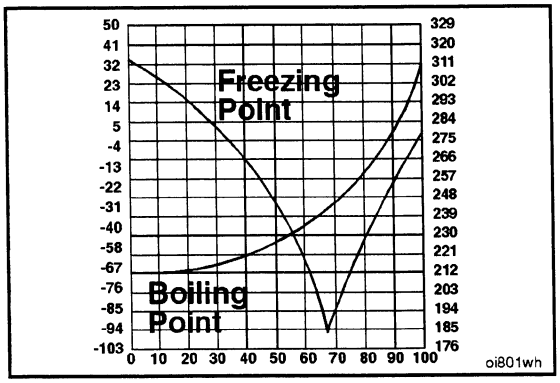
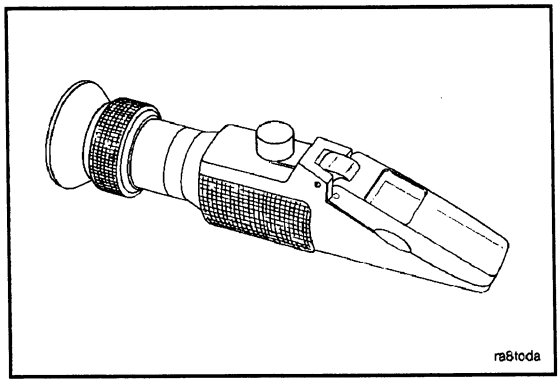
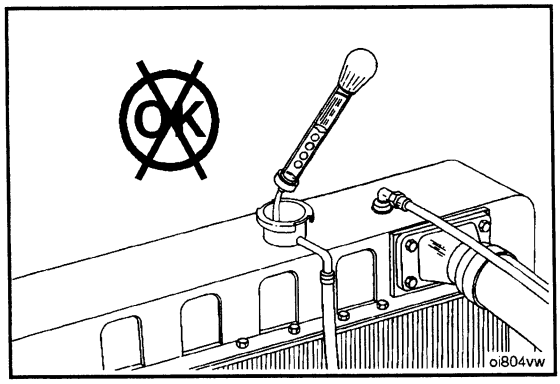
Cummins Engine Company, Inc. recommends using Fleetguard® Compleat. It is available in both glycol forms (ethylene and propylene) and complies with TMC standards.




Fully formulated antifreeze **must** be mixed with high-quality water at a 50/50 ratio (40- to 60-percent working range). A 50/50 mixture of antifreeze and water has a -36°C [-33°F] freezing point and a 110°C [230°F] boiling point, which is adequate for North America. The actual lowest freezing point of ethylene glycol antifreeze is at 68 percent. Using higher concentrations of antifreeze will raise the freezing point of the solution and increase the possibility of a silicate gel problem.




A refractometer **must** be used to measure the freezing point of the coolant accurately.




Do **not** use a floating ball hydrometer. Use of a floating ball hydrometer can give an incorrect reading.

### Specifications

Use a low-silicate antifreeze that meets ASTM4985 test (GM6038M specification) criteria.

### Concentration

Antifreeze **must** be used in any climate for both freezing- and boiling-point protection. Cummins recommends a 50-percent concentration level (40- to 60-percent range) of ethylene glycol or propylene glycol in most climates. Antifreeze at 68-percent concentration provides the maximum freeze protection and **must never** be exceeded under any condition. Antifreeze protection decreases above 68 percent.

| Ethylene Glycol | Propylene Glycol |
|---|---|
| 40% equals -23°C [-9°F] | 40% equals -21°C [-6°F] |
| 50% equals -37°C [-35°F] | 50% equals -33°C [-27°F] |
| 60% equals -54°C [-65°F] | 60% equals -49°C [-56°F] |
| 68% equals -71°C [-96°F] | 68% equals -63°C [-81°F] |

### Concentration Testing

Antifreeze concentration **must** be checked using a refractometer (such as Fleetguard® Part No. CC2800). "Floating-Ball"-type density testers or hydrometers are **not** accurate enough for use with heavy-duty diesel cooling systems.

### Coolant Change Recommendation

The coolant **must** be drained and replaced every 2 years or 385,000 km [239,227 mi] to eliminate buildup of harmful chemicals.

## Cooling System Additives

### Supplemental Coolant Additives (SCA)

Supplemental coolant additives (SCA) are recommended for all Cummins cooling systems. Antifreeze alone does **not** provide sufficient protection for heavy-duty diesel engines.

### DCA4

DCA4 is the recommended SCA for all Cummins engines. Other brands can be used if they provide adequate engine protection and do **not** cause seal or gasket degradation or corrosion/fouling.

### SCA Concentration

The recommended concentration level of DCA4 is 1.5 units for every 3.7 liters [1 gal]. The DCA4 concentration **must never** exceed 3.0 units for every 3.7 liters [1 gal] nor fall below 1.2 units for every 3.7 liters [1 gal].

### DCA4 Filter Change Interval

Supplemental coolant additives deplete during normal engine operation. Cummins recommends that the level be maintained by installation of a service coolant filter on the engine at every 10,000-km [6214-mi], 250-hour, or 3-month interval.

### DCA4 Concentration Test

As noted above, the primary method is to maintain proper DCA4 concentration levels by changing the service coolant filter at every 10,000 km [6214 mi], 250 hours, or 3 months. Fleetguard® DCA4 "dipstick" test kit, Part No. CC2626, or Fleetguard® Monitor C™, Part No. CC2700, **must** be used if testing is deemed necessary due to one of the following reasons:

- Addition of untreated make-up coolant in excess of 5.7 liters [6 qt] between maintenance intervals
- Troubleshooting of cooling system problems in the fleet (such as corrosion or seal leakage)
- An optional program in some fleets to monitor SCA levels to determine if maintenance intervals are acceptable.

**NOTE:** The practice of using a test kit to determine when to add or change the coolant filter is specifically **not** recommended. No other test kit (such as Fleetguard® titration test kit, Part No. 3300846-S or 3825379-S) can be used on Cummins engines with DCA4.

**DCA4 Unit Maintenance Guide**

| Fleetguard® Part No. | Cummins Part No. | DCA4 Units |
|---|---|---|
| **DCA4 Liquid** | | |
| DCA 60L | 3315459 | 4* |
| **DCA4 Filter** | | |
| WF-2070 | 3318157 | 2 |
| WF-2071 | 3315116 | 4 |
| WF-2072 | 3318201 | 6 |
| WF-2073 | 3315115 | 8 |
| WF-2074 | 3316053 | 12 |
| WF-2077 | None | 0 |
| *If DCA 60L is used, do **not** use a coolant filter that contains coolant additives. The combination of liquid and filter coolant additives will result in overconcentration. | | |

**DCA4 Maintenance Guide**

| Maintenance Intervals | | |
|---|---|---|
| **Total Cooling System Capacity** | **Initial Charge (B)** | **10,000 km [6000 mi], 250 Hours, or 3 Months** |
| 30 to 57 liters [8 to 15 gal] | WF-2074 | WF-2070 |

**Notes:**

A. Consult the vehicle equipment manufacturer's maintenance information for the total cooling system capacity.

B. After draining and replacing the coolant, install the initial per-charge coolant filter to provide the recommended level of DCA4 concentration.

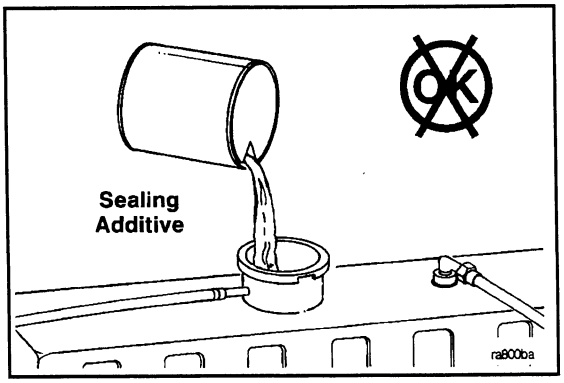
C. Change the coolant filter at regular intervals to protect the cooling system.

D. Check the coolant additive concentration regularly. Check the cooling system using Fleetguard® DCA4 **only** with DCA4 coolant test kit, Part No.CC-2626.

### Cooling System Sealing Additives

Do **not** use sealing additives in the cooling system. The use of sealing additives will

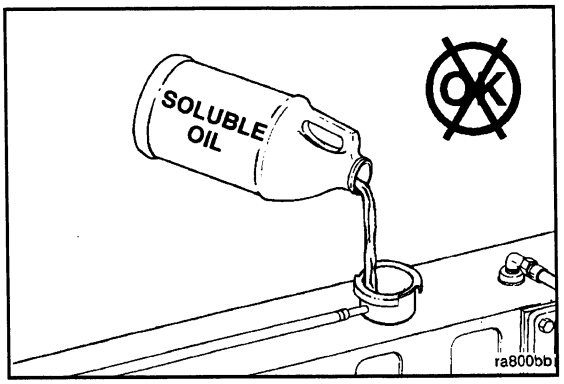
- Build up in coolant low-flow areas
- Clog coolant filters
- Plug the radiator and oil cooler
- Possibly damage the water pump seal.




## Cooling System Soluble Oils

Do **not** use soluble oils in the cooling system. The use of soluble oils will

- Allow cylinder liner pitting
- Corrode brass and copper
- Damage heat transfer surfaces
- Damage seals and hoses.



# Drive Belt Tension

| 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.

# Engine Component Torque Values

## Torque Table

| Component | Wrench Size | Torque Value | | |
|---|---|---|---|---|
| | | N•m | ft-lb | in-lb |
| Aftercooler mounting | 10 mm | 24 | 18 | |
| Aftercooler water hose clamp | 8 mm | 5 | | 44 |
| Alternator link (Delco 10-15 SI) | 13 mm | 24 | 18 | |
| Alternator link (Delco 20-27 SI) | 3/4 in | 43 | 32 | |
| Alternator mtg. bolt 10-15 SI | 15 mm | 43 | 32 | |
| Alternator mtg. 27 SI | 18 mm | 77 | 57 | |
| Alternator support (upper) | 10 mm | 24 | 18 | |
| Belt tensioner flat bracket | Allen 5 mm | 24 | 18 | |
| Belt tensioner mounting | 15 mm | 43 | 32 | |
| Crankshaft damper and pulley | 15 mm | 137 | 101 | |
| Crossover clamp | 5/16 in | 5 | | 44 |
| Tee-bolt-type clamp | 11 mm | 8 | | 71 |
| Exhaust outlet pipe, v-band clamp | 7/16 in | 8 | | 71 |
| Fan bracket mounting | 10 mm | 24 | 18 | |
| Fan pulley | 10 mm | 24 | 18 | |
| Fan pulley | 13 mm | 43 | 32 | |
| Fuel filter | 75 to 85 mm | Install as specified by filter manufacturer. | | |
| Fuel filter adapter nut | 24 mm | 32 | 24 | |
| Lubricating oil filter | 75 to 85 mm | 3/4 of a turn after contact | | |
| Lubricating oil cooler assembly | 10 mm | 24 | 18 | |
| Lubricating oil pan drain plug | 17 mm | 80 | 59 | |
| Lubricating oil pan heater plug | 27 mm | 80 | 59 | |
| Lubricating oil pressure regulator plug | 19 mm | 80 | 59 | |
| Starter mounting | 10 mm | 43 | 32 | |
| Thermostat housing | 10 mm | 24 | 18 | |
| Water inlet connection | 15 mm | 43 | 32 | |
| Water pump mounting | 13 mm | 24 | 18 | |
| Rocker lever (valve) cover | 15 mm | 12 | | 106 |
| Water-in-fuel sensor | 19 mm | Hand-tighten | | |

# Arctic Operation

## ⚠ CAUTION ⚠

**The use of a synthetic-based oil does not justify extended oil change intervals. Extended oil change intervals can decrease engine life due to factors such as corrosion, deposits, and wear.**

If an engine is operated in ambient temperatures consistently below -23°C [-9°F], and there are no provisions to keep the engine warm when it is **not** in operation, use a synthetic CE/SF or higher API classification engine oil with adequate low-temperature properties (such as 5W-20 or 5W-30).

The oil supplier is responsible for meeting the performance service specifications represented with its product.

# Sealants

Use either the sealants listed below or sealants containing equivalent properties.

| Item Description | Sealing Method |
|---|---|
| Pipe plugs | Precoated teflon or pipe sealer |
| Cup plugs | Loctite 277 or 11,264 |
| O-rings | Lubriplate™ 105 |
| Rear camshaft expansion plug | Precoated or Loctite 59,241 liquid teflon |
| Fuel block mounting studs | Loctite 609 |
| Turbocharger drain in block | Loctite 277 or 11,264 |
| Front seal in gear cover | Loctite 277 or 11,264 |
| Rear seal in gear cover | No sealant |
| Oil pan at T-joint | Three-Bond™ 1207C (Cummins Part No. 3823494) |

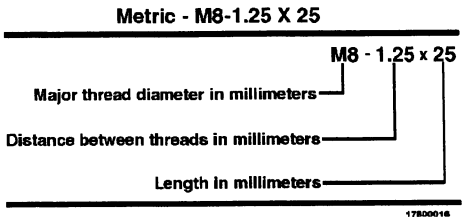
# Capscrew Markings and Torque Values

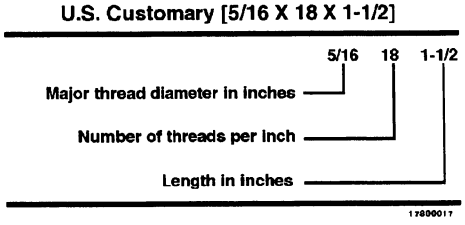
## △ CAUTION △

**When replacing capscrews, always use a capscrew of the same measurement and strength as the capscrew being replaced. Using the wrong capscrews can result in engine damage.**

Metric capscrews and nuts are identified by the grade number stamped on the head of the capscrew or on the surface of the nuts. U.S. Customary capscrews are identified by radial lines stamped on the head of the capscrew.

The following examples indicate how capscrews are identified:

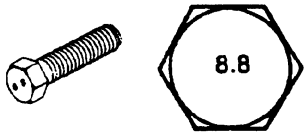
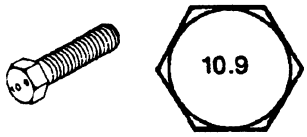
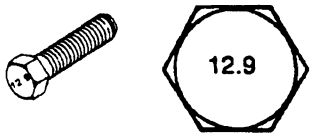



**NOTES:**

1. **Always** use the torque values listed in the following tables when specific torque values are **not** available.
2. Do **not** use the torque values in place of those specified in other sections of this manual.
3. The torque values in the table are based on the use of lubricated threads.
4. When the ft-lb value is less than 10, convert the ft-lb value to in-lb to obtain a better torque with an in-lb torque wrench. Example: 6 ft-lb equals 72 in-lb.

# Capscrew Markings and Torque Values - Metric

| Commercial Steel Class | 8.8 | 10.9 | 12.9 |
|---|---|---|---|
| Capscrew Head Markings |  |  |  |

| Body Size | Torque | | | | Torque | | | | Torque | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diameter | Cast Iron | | Aluminum | | Cast Iron | | Aluminum | | Cast Iron | | Aluminum | |
| mm | N•m | ft-lb | N•m | ft-lb | N•m | ft-lb | N•m | ft-lb | N•m | ft-lb | N•m | ft-lb |
| 6 | 9 | 5 | 7 | 4 | 13 | 10 | 7 | 4 | 14 | 9 | 7 | 4 |
| 7 | 14 | 9 | 11 | 7 | 18 | 14 | 11 | 7 | 23 | 18 | 11 | 7 |
| 8 | 23 | 17 | 18 | 14 | 33 | 25 | 18 | 14 | 40 | 29 | 18 | 14 |
| 10 | 45 | 33 | 30 | 25 | 65 | 50 | 30 | 25 | 70 | 50 | 30 | 25 |
| 12 | 80 | 60 | 55 | 40 | 115 | 85 | 55 | 40 | 125 | 95 | 55 | 40 |
| 14 | 125 | 90 | 90 | 65 | 180 | 133 | 90 | 65 | 195 | 145 | 90 | 65 |
| 16 | 195 | 140 | 140 | 100 | 280 | 200 | 140 | 100 | 290 | 210 | 140 | 100 |
| 18 | 280 | 200 | 180 | 135 | 390 | 285 | 180 | 135 | 400 | 290 | 180 | 135 |
| 20 | 400 | 290 | — | — | 550 | 400 | — | — | — | — | — | — |

# Capscrew Markings and Torque Values - U.S. Customary

| SAE Grade Number | 5 | | | | 8 | | | |
|---|---|---|---|---|---|---|---|---|
| Capscrew Head Markings<br>These are all SAE Grade 5 (3 line) |  | | | |  | | | |
| | Capscrew Torque - Grade 5 Capscrew | | | | Capscrew Torque - Grade 8 Capscrew | | | |
| Capscrew Body Size | Cast Iron | | Aluminum | | Cast Iron | | Aluminum | |
| | N•m | ft-lb | N•m | ft-lb | N•m | ft-lb | N•m | ft-lb |
| 1/4 - 20 | 9 | 7 | 8 | 6 | 15 | 11 | 8 | 6 |
| 1/4 - 28 | 12 | 9 | 9 | 7 | 18 | 13 | 9 | 7 |
| 5/16 - 18 | 20 | 15 | 16 | 12 | 30 | 22 | 16 | 12 |
| 5/16 - 24 | 23 | 17 | 19 | 14 | 33 | 24 | 19 | 14 |
| 3/8 - 16 | 40 | 30 | 25 | 20 | 55 | 40 | 25 | 20 |
| 3/8 - 24 | 40 | 30 | 35 | 25 | 60 | 45 | 35 | 25 |
| 7/16 - 14 | 60 | 45 | 45 | 35 | 90 | 65 | 45 | 35 |
| 7/16 - 20 | 65 | 50 | 55 | 40 | 95 | 70 | 55 | 40 |
| 1/2 - 13 | 95 | 70 | 75 | 55 | 130 | 95 | 75 | 55 |
| 1/2 - 20 | 100 | 75 | 80 | 60 | 150 | 110 | 80 | 60 |
| 9/16 - 12 | 135 | 100 | 110 | 80 | 190 | 140 | 110 | 80 |
| 9/16 - 18 | 150 | 110 | 115 | 85 | 210 | 155 | 115 | 85 |
| 5/8 - 11 | 180 | 135 | 150 | 110 | 255 | 190 | 150 | 110 |
| 5/8 - 18 | 210 | 155 | 160 | 120 | 290 | 215 | 160 | 120 |
| 3/4 - 10 | 325 | 240 | 255 | 190 | 460 | 340 | 255 | 190 |
| 3/4 - 16 | 365 | 270 | 285 | 210 | 515 | 380 | 285 | 210 |
| 7/8 - 9 | 490 | 360 | 380 | 280 | 745 | 550 | 380 | 280 |
| 7/8 - 14 | 530 | 390 | 420 | 310 | 825 | 610 | 420 | 310 |
| 1 - 8 | 720 | 530 | 570 | 420 | 1100 | 820 | 570 | 420 |
| 1 - 14 | 800 | 590 | 650 | 480 | 1200 | 890 | 650 | 480 |

# NOTES

# Section W - Warranty

## Section Contents

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# Off-Highway Engines United States and Canada

## Coverage

### Products Warranted

This warranty applies to new Engines sold by Cummins and delivered to the first user on or after April 1, 1999, that are used in industrial (off-highway) applications in the United States* and Canada, except for Engines used in marine, generator drive and certain defense applications, for which different warranty coverage is provided.

### Base Engine Warranty

This warranty covers any failures of the Engine, under normal use and service, which result from a defect in material or factory workmanship (Warrantable Failures).

Coverage begins with the sale of the Engine by Cummins. Coverage continues for two years or 2,000 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first. If the 2,000 hour limit is exceeded during the first year, Coverage continues until the end of the first year.

### Extended Major Components Warranty

The Extended Major Components Warranty covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts).

Bushing and bearing failures are not covered.

This Coverage begins with the expiration of the Base Engine Warranty and ends three years or 10,000 hours of operation from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

### Consumer Products

The warranty on Consumer Products in the United States is a LIMITED warranty. **CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.** Any implied warranties applicable to Consumer Products in the United States terminate concurrently with the expiration of the express warranties applicable to the product. In the United States, some states do not allow the exclusion of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the limitations or exclusions herein may not apply to you.

**These warranties are made to all Owners in the chain of distribution, and Coverage continues to all subsequent Owners until the end of the periods of Coverage.**

## Cummins' Responsibilities

### During The Base Engine Warranty

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure.

Cummins will pay for the lubricating oil, antifreeze, filter elements, and other maintenance items that are not reusable due to the Warrantable Failure.

Cummins will pay reasonable costs for mechanics to travel to and from the equipment site, including meals, mileage and lodging, when the repair is performed at the site of the failure.

Cummins will pay reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

### During The Extended Major Components Warranty

Cummins will pay for the repair or, at its option, replacement of the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered part.

## Owner's Responsibilities

### During The Base Engine Warranty

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items provided during warranty repairs unless such items are not reusable due to the Warrantable Failure.

### During The Extended Major Components Warranty

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor to remove and reinstall the Engine. When Cummins elects to repair a part instead of replacing it, Owner is not responsible for the labor needed

to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

### During The Base Engine and Extended Major Components Warranties

Owner is responsible for the operation and maintenance of the Engine as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the Engine available for repair by such facility. Locations in the United States and Canada are listed in the Cummins Off Highway Authorized Dealer Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

## Limitations

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

For power units and fire pumps (package units), this warranty applies to accessories, except for clutches and filters, supplied by Cummins which bear the name of another company.

Except for power units and fire pumps, this warranty does not apply to accessories which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans**, air conditioning compressors, clutches, filters, transmissions, torque converters, steering pumps, and non-Cummins fan drives, engine compression brakes and air compressors.

Cummins Compusave units are covered by a separate warranty.

Before a claim for excessive oil consumption will be considered, Owner must submit adequate documentation to show that consumption exceeds Cummins published standards.

Failures of belts and hoses supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first.

Parts used to repair a Warrantable Failure may be new Cummins parts, Cummins-approved rebuilt parts, or repaired parts. Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.

A new Cummins or Cummins-approved rebuilt part used to repair a Warrantable Failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.

**CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.**

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

**THESE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS IN REGARD TO THESE ENGINES. CUMMINS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

## Emission Warranty

### Products Warranted

This emission warranty applies to new Engines marketed by Cummins that are used in the United States* in vehicles designed for Industrial off-highway use. This warranty applies to Engines delivered to the ultimate purchaser on or after April 1, 1999 for engines up to 750 horsepower, on or after January 1, 2000 for engines 751 horsepower and over.

## Coverage

Cummins warrants to the ultimate purchaser and each subsequent purchaser that the Engine is designed, built and equipped so as to conform at the time of sale by Cummins with all U.S. Federal emission regulations applicable at the time of manufacture and that it is free from defects in workmanship or material which would cause it not to meet these regulations within the longer of the following periods: (A) Five years or 3,000 hours of operation, whichever occurs first, as measured from the date of delivery of the Engine to the ultimate purchaser, or (B) The Base Engine Warranty.

If the vehicle in which the Engine is installed is registered in the state of California, a separate California Emission Warranty also applies.

## Limitations

Failures, other than those resulting from defects in materials, or workmanship, are not covered by this warranty.

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect fuel or by water, dirt or other contaminants in the fuel.

Cummins is not responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all business costs or other losses resulting from a Warrantable Failure.

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

* Includes American Samoa, the Commonwealth of Northern Mariana Islands, Guam, Puerto Rico, and the U.S. Virgin Islands.

** Alternators, starters, and fans ARE covered for the duration of the base engine warranty on B3.3 engines.

# Off-Highway Engines International

## Coverage

### PRODUCTS WARRANTED

This warranty applies to new Engines sold by Cummins and delivered to the first user on or after April 1, 1999, that are used in industrial (off-highway) applications anywhere in the world where Cummins-approved service is available, except the United States* and Canada. Different warranty coverage is provided for Engines used in marine, generator drive and certain defense applications.

### BASE ENGINE WARRANTY

This warranty covers any failures of the Engine, under normal use and service, which result from a defect in material or factory workmanship (Warrantable Failure).

Coverage begins with the sale of the Engine by Cummins. Coverage continues for two years or 2,000 hours of operation, whichever occurs first, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or when the Engine has been operated for 50 hours, whichever occurs first. If the 2,000 hour limit is exceeded during the first year, coverage continues until the end of the first year.

### EXTENDED MAJOR COMPONENTS WARRANTY

The Extended Major Components Warranty covers Warrantable Failures of the Engine cylinder block, camshaft, crankshaft and connecting rods (Covered Parts).

Bushing and bearing failures are not covered.

This coverage begins with the expiration of the Base Engine Warranty and ends three years or 10,000 hours of operation, from the date of delivery of the Engine to the first user, or from the date the unit is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

**These warranties are made to all Owners in the chain of distribution, and Coverage continues to all subsequent Owners until the end of the periods of Coverage.**

## Cummins' Responsibilities

### DURING THE BASE ENGINE WARRANTY

Cummins will pay for all parts and labor needed to repair the damage to the Engine resulting from a Warrantable Failure.

Cummins will pay for the lubricating oil, antifreeze, filter elements, and other maintenance items that are not reusable due to a Warrantable Failure.

Cummins will pay reasonable costs for mechanics to travel to and from the equipment site, including meals, mileage and lodging, when the repair is performed at the site of the failure.

Cummins will pay reasonable labor costs for Engine removal and reinstallation when necessary to repair a Warrantable Failure.

### DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

Cummins will pay for the repair or, at its option, replacement of the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered part.

## Owner's Responsibilities

### DURING THE BASE ENGINE WARRANTY

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during warranty repairs unless such items are not reusable due to the Warrantable Failure.

### DURING THE EXTENDED MAJOR COMPONENTS WARRANTY

Owner is responsible for the cost of all labor needed to repair the Engine, including the labor to remove and reinstall the Engine. When Cummins elects to repair a part instead of replacing it, Owner is not responsible for the labor needed to repair the part.

Owner is responsible for the cost of all parts required for the repair except for the defective Covered Part and any Covered Part damaged by a Warrantable Failure of the defective Covered Part.

Owner is responsible for the cost of lubricating oil, antifreeze, filter elements and other maintenance items replaced during repair of a Warrantable Failure.

## DURING THE BASE ENGINE AND EXTENDED MAJOR COMPONENTS WARRANTIES

Owner is responsible for the operation and maintenance of the Engine as specified in the applicable Cummins Operation and Maintenance Manual. Owner is also responsible for providing proof that all recommended maintenance has been performed.

Before the expiration of the applicable warranty, Owner must notify a Cummins distributor, authorized dealer or other repair location approved by Cummins of any Warrantable Failure and make the product available for repair by such facility. Locations are listed in the Cummins International Sales and Service Directory.

Owner is responsible for communication expenses, meals, lodging and similar costs incurred as a result of a Warrantable Failure.

Owner is responsible for non-Engine repairs, "downtime" expenses, cargo damage, fines, all applicable taxes, all business costs and other losses resulting from a Warrantable Failure.

# Limitations

Cummins is not responsible for failures or damage resulting from what Cummins determines to be abuse or neglect, including, but not limited to: operation without adequate coolants or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or intake systems; improper storage, starting, warm-up, run-in or shutdown practices; unauthorized modifications of the Engine. Cummins is also not responsible for failures caused by incorrect oil or fuel or by water, dirt or other contaminants in the fuel or oil.

For power units and fire pumps (package units) the warranty applies to accessories, except for clutches and filters supplied by Cummins which bear the name of another company.

Starters, alternators, power steering pumps and non-Cummins air compressors supplied by Cummins on B or C Series Engines that are not supplied as part of a package unit are covered for six months* from the date of delivery of the Engine to the first user, or the date the Engine is first leased, rented or loaned, or from when the Engine has been operated for 50 hours, whichever occurs first.

Except for the accessories noted previously, Cummins does not warrant accessories which bear the name of another company. Such non-warranted accessories include, but are not limited to: alternators, starters, fans*, air conditioning compressors, clutches, filters, transmissions, torque converters, steering pumps, non-Cummins fan drives, and air cleaners.

Cummins Compusave units are covered by a separate warranty.

Before a claim for excessive oil consumption will be considered, Owner must submit adequate documentation to show that consumption exceeds Cummins published standards.

Failures of belts and hoses supplied by Cummins are not covered beyond the first 500 hours or one year of operation, whichever occurs first.

Parts used to repair a Warrantable Failure may be new Cummins parts, Cummins-approved rebuilt parts, or repaired parts. Cummins is not responsible for failures resulting from the use of parts not approved by Cummins.

A new Cummins or Cummins-approved rebuilt part used to repair a Warrantable Failure assumes the identity of the part it replaced and is entitled to the remaining coverage hereunder.

**CUMMINS DOES NOT COVER WEAR OR WEAROUT OF COVERED PARTS.**

**CUMMINS IS NOT RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.**

**THESE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS IN REGARD TO THESE ENGINES. CUMMINS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.**

In case of consumer sales, in some countries, the Owner has statutory rights which cannot be affected or limited by the terms of this warranty.

Nothing in this warranty excludes or restricts any contractual rights the Owner may have against third parties.

* Alternators, starters, and fans ARE covered for the duration of the base engine warranty on B3.3 engines.

# California Emission Control System Warranty, Off-Highway

## Products Warranted

This Emission Control System Warranty applies to off-road diesel engines certified with the California Air Resources Board beginning with the year 1996 for engines up to 750 horsepower, beginning with the year 2000 for 751 horsepower and over, marketed by Cummins, and registered in California for use in industrial off-highway applications.

## Your Warranty Rights and Obligations

The California Air Resources Board and Cummins Engine Company, Inc., are pleased to explain the emission control system warranty on your engine. In California, new off-road diesel engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Cummins must warrant the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, Cummins will repair your off-road diesel engine at no cost to you including diagnosis, parts and labor.

## Manufacturer's Warranty Coverage

This warranty coverage is provided for 5 years or 3,000 hours of engine operation, whichever first occurs from the date of delivery of the engine to the first user. If any emission-related part on your engine is defective, the part will be repaired or replaced by Cummins.

## Coverage

This emission control system warranty applies only to the following emission control parts:

**Fuel Pump**
- Static Timing
- Delivery Valve
- Injector Supply Line
- Injection Control Valve Module

**Injectors**
- Calibration
- Needle
- Nozzle
- Spring

**Turbocharger**
- Compressor Wheel
- Turbine Wheel
- Turbine Oil Seal
- Wastegate Valve

**Intake Manifold**
- Charge Air Cooler

**Exhaust Manifold**

**Oxidation Catalyst**

**Electronic Control System**
- Control Module
- Boost Pressure Sensor
- Coolant Temperature Sensor
- Fuel Pressure Sensor

## Owner's Warranty Responsibilities

As the off-road diesel engine owner, you are responsible for the performance of the required maintenance listed in your Cummins Operation and Maintenance Manual. Cummins recommends that you retain all receipts covering maintenance on your off-road diesel engine, but Cummins cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

You are responsible for presenting your off-road diesel engine to a Cummins dealer as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

As the off-road diesel engine owner, you should also be aware that Cummins may deny you warranty coverage if your off-road diesel engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with California's emissions requirements.

If you have any questions regarding your warranty rights and responsibilities, you should contact Cummins Customer Assistance Department at 1-800-343-7357 (1-800-DIESELS) or the California Air Resources Board at 9528 Telstar Avenue, El Monte, CA 91731.

Prior to the expiration of the applicable warranty, Owner must give notice of any warranted emission control failure to a Cummins distributor, authorized dealer or other repair location approved by Cummins and deliver the engine to such facility for repair. Repair locations are listed in Cummins United States and Canada Service Directory.

Owner is responsible for incidental costs such as: communication expenses, meals, lodging incurred by Owner or employees of Owner as a result of a warrantable failure.

Owner is responsible for business costs and losses, "downtime" expenses, and cargo damage resulting from a warrantable failure. CUMMINS IS NOT RESPONSIBLE FOR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCIDENTAL OR CONSEQUENTIAL DAMAGES INCLUDE BUT ARE NOT LIMITED TO FINES, THEFT, VANDALISM OR COLLISIONS.

## Replacement Parts

Cummins recommends that any service parts used for maintenance, repair or replacement of emission control systems be new, genuine Cummins or Cummins approved rebuilt parts and assemblies, and that the engine be serviced by a Cummins distributor, authorized dealer or the repair location approved by Cummins. The owner may elect to have maintenance, replacement or repair of the emission control parts performed by a facility other than a Cummins distributor, an authorized dealer or a repair location approved by Cummins, and may elect to use parts other than new genuine Cummins or Cummins approved rebuilt parts and assemblies for such maintenance, replacement or repair; however, the cost of such service or parts will not be covered under this emission control system warranty.

## Cummins Responsibilities

Repairs and service will be performed by any Cummins distributor, authorized dealer or other repair location approved by Cummins using new, genuine Cummins or Cummins approved rebuilt parts and assemblies. Cummins will repair any of the emission control parts found by Cummins to be defective without charge for parts or labor (including diagnosis which results in determination that there has been a failure of a warranted emission control part).

## Emergency Repairs

In the case of an emergency where a Cummins distributor, authorized dealer, or other repair location approved by Cummins is not available, repairs may be performed by any available repair location using any replacement parts. Cummins will reimburse the Owner for expenses (including diagnosis), not to exceed the manufacturer's suggested retail price for all warranted parts replaced and labor charges based on the manufacturer's recommended time allowance for the warranty repair and the geographically appropriate hourly labor rate. A part not being available within 30 days or a repair not being complete within 30 days constitutes an emergency. Replaced parts and paid invoices must be presented at a Cummins authorized repair facility as a condition of reimbursement for emergency repairs not performed by a Cummins distributor, authorized dealer, or other repair location approved by Cummins.

## Warranty Limitations

Cummins is not responsible for failures resulting from Owner or operator abuse or neglect, such as: operation without adequate coolant, fuel or lubricants; overfueling; overspeeding; lack of maintenance of lubricating, cooling or air intake systems; improper storage, starting, warm-up, run-in or shutdown practices.

The manufacturer warrants to the ultimate purchaser and each subsequent purchaser that the engine is designed, built, and equipped so as to conform with all applicable regulations adopted by the Air Resources Board, and that it is free from defects in materials and workmanship which cause the failure of a warranted part.

Any warranted part which is not scheduled for replacement as required maintenance, or which is scheduled only for regular inspection to the effect of "repair or replace as necessary" is warranted for the warranty period.

Any warranted part which is scheduled for replacement as required maintenance is warranted for the period of time prior to the first scheduled replacement point for that part.

The owner will not be charged for diagnostic labor which leads to the determination that a warranted part is defective, if the diagnostic work is performed at a warranty station.

The manufacturer is liable for damages to other engine components caused by the failure under warranty of any warranted part.

Cummins is not responsible for failures resulting from improper repair or the use of parts which are not genuine Cummins or Cummins approved parts.

These warranties, together with the express commercial warranties and emission warranty are the sole warranties of Cummins. There are no other warranties, express or implied, or of merchantability or fitness for a particular purpose.

# NOTES

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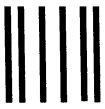

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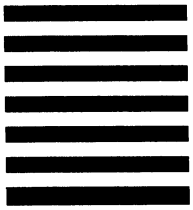

# BUSINESS REPLY MAIL

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–POSTAGE WILL BE PAID BY ADDRESSEE–

Cummins Engine Company, Inc.
Product Registration Dept. (CAC)
P O Box 3005 M/C 91200
Columbus, IN 47202-3005

In order to serve you better it is very important that you fill out and return this card **within** 30 days of purchase.

---

Customer Name _____

Address _____

City / State _____

Zip Code _____

Home Phone Number (____)_____

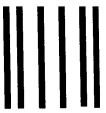
Truck Phone / Cell Phone (____)_____

E-mail Address _____

Engine Serial Number _____

Date Purchased ____/____/____ VIN # _____

THANK YOU!!



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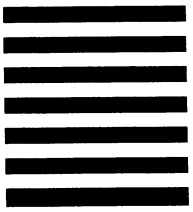

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BOX 3005
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| the information easy to understand? | | |
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| re subjects in the Index specific enough to locate in the manual? | | |
| re the important points sufficiently emphasized? | | |
| re the illustrations easy to understand? | | |
| oes the text support the operation being illustrated? | | |
| o you use the Table of Contents and Section Contents? | | |
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